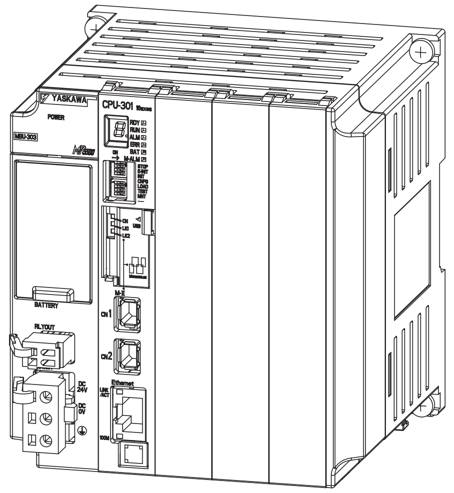
YASKAWA

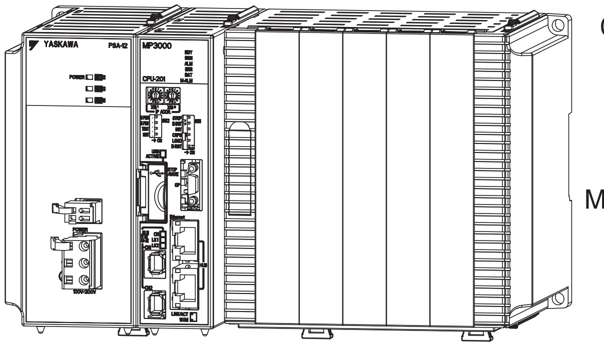
Machine Controller MP3000 Series

Motion Control

USER'S MANUAL

SVC/SVR, SVC32/SVR32





MANUAL NO. SIEP C880725 11F

About this Manual

This manual describes the specifications, system configurations, and operating methods for the SVC, SVR, SVC32, and SVR32 Function Modules that are used in an MP3000-series Machine Controller for motion control.

Read this manual carefully to ensure the correct usage of the Machine Controller and apply the Machine Controller to control your manufacturing system.

Keep this manual in a safe place so that it can be referred to whenever necessary.

Outline of Manual

The contents of the chapters of this manual are described in the following table. Refer to the chapters of this manual as required for your application.

Chapter	Chapter Title	Contents
1	Basic Information on Motion Control	Describes the types of programs and the type of motion control that are used to perform motion control with the MP3000.
2	Basic Information on Motion Control Function Modules	Provides basic information on Motion Control Function Modules that are built into the MP3000.
3	Parameters for Motion Control	Describes motion parameters required for motion control.
4	Motion Control Program Commands and Instructions	Describes the motion commands required to write ladder programs and the motion language instructions required to write motion programs.
5	Machine-Specific Motion Control	Provides information and describes settings that are necessary to perform machine-specific motion control.
6	Other Useful Functions	Describes convenient functions related to motion control that are provided by the MP3000.
7	Making Settings for Motion Control with the MPE720	Describes how to confirm information and make settings for the Motion Control Function Module.
8	Sample Programming	Provides sample programming for motion control.
9	Stepping Motor Drive Operation	Of the information that is necessary to perform motion control with a Stepping Motor Drive, provides the information that is different from when a Servo Drive is connected.
10	Inverter Operation	Describes the operations, commands, and parameter settings that are necessary to perform motion control with an Inverter.
11	Appendices	Provides supplemental information related to motion control.

Related Documents

◆ MP2000/MP3000 Series Related Manuals

The following table lists the manuals that are related to the MP2000/MP3000-series Machine Controllers. Refer to these manuals as required.

Category	Manual Name	Manual Number	Contents
Basic functionality	Machine Controller MP2000/MP3000 Series Machine Controller System Setup Manual	SIEP C880725 00	Describes the functions of the MP2000/MP3000-series Machine Controllers and the procedures that are required to use the Machine Controller, from installation and connections to settings, programming, trial operation, and debugging.
	Machine Controller MP3000 Series MP3200/MP3300 Troubleshooting Manual	SIEP C880725 01	Describes troubleshooting an MP3000-series Machine Controller.
	Machine Controller MP3000 Series MP3200 User's Manual	SIEP C880725 10	Describes the specifications and system configuration of the Basic Units in an MP3000-series Machine Controller and the functions of the CPU Unit.
	Machine Controller MP3000 Series MP3300 Product Manual	SIEP C880725 21	Describes the specifications and system configuration of an MP3000-series MP3300 Machine Controller and the functions of the CPU Module.
Communications functionality	Machine Controller MP3000 Series Communications User's Manual	SIEP C880725 12	Describes the specifications, system configuration, and communications connection methods for the Ethernet communications that are used with an MP3000-series Machine Controller.
Motion control functionality	Machine Controller MP2000 Series SVA-01 Motion Module User's Manual	SIEP C880700 32	Describes the functions, specifications, and operating methods of the MP2000-series SVA-01 Motion Module.
	Machine Controller MP2000 Series Built-in SVB/SVB-01 Motion Module User's Manual	SIEP C880700 33	Describes the functions, specifications, and operating methods of the MP2000-series Motion Module (built-in Function Modules: SVB, SVB-01, and SVR).
	Machine Controller MP2000 Series SVC-01 Motion Module User's Manual	SIEP C880700 41	Describes the functions, specifications, and operating methods of the MP2000-series SVC-01 Motion Module.
	Machine Controller MP2000 Series Pulse Output Motion Module PO-01 User's Manual	SIEP C880700 28	Describes the functions, specifications, and operating methods of the MP2000-series PO-01 Motion Module.
Programming	Machine Controller MP3000 Series Ladder Programming Manual	SIEP C880725 13	Describes the ladder programming specifications and instructions of MP3000-series Machine Controller.
	Machine Controller MP3000 Series Motion Programming Manual	SIEP C880725 14	Describes the motion programming and sequence programming specifications and instructions of MP3000-series Machine Controller.
	Machine Controller MP900/MP2000 Series User's Manual, Ladder Programming	SIEZ-C887-1.2	Describes the instructions used in MP2000 ladder programming.
	Machine Controller MP2000 Series User's Manual for Motion Programming	SIEP C880700 38	Describes the instructions used in MP2000 motion programming.

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Category	Manual Name	Manual Number	Contents
MECHATROLINK I/O	MECHATROLINK-III Compatible I/O Module User's Manual	SIEP C880781 04	Describes the functions, specifications, operating methods, and MECHATROLINK-III communications for the Remote I/O Modules for MP2000/ MP3000-series Machine Controllers.
	Machine Controller MP900/MP2000 Series Distributed I/O Module User's Manual, MECHATROLINK System	SIE-C887-5.1	Describes MECHATROLINK distributed I/O for MP900/MP2000-series Machine Controllers.
Engineering Tool	Machine Controller MP2000/MP3000 Series Engineering Tool MPE720 Version 7 User's Manual	SIEP C880761 03	Describes how to operate MPE720 version 7.

Using this Manual

◆ Basic Terms

Unless otherwise specified, the following definitions are used:

- Machine Controller: MP3000-series Machine Controller or MP2000-series Machine Controller.
- MPE720: The Engineering Tool or a personal computer running the Engineering Tool
- M-III: MECHATROLINK-III communications
- Fixed parameters: The fixed parameters in the motion parameters.
- Setting parameters: The setting parameters in the motion parameters.
- Monitor parameters: The monitor parameters in the motion parameters.
- PLC: A Programmable Logic Controller
- MP3000: A generic name for the MP3100, MP3200, and MP3300.
- MP3200: A generic name for the Power Supply Unit, CPU Unit, Base Unit, and Rack Expansion Interface Unit.
- MP3300: A generic name for the CPU Module and Base Unit.
- SVC Function Module: A generic name for the SVC and SVC32.
- SVR Function Module: A generic name for the SVR and SVR32.

◆ Engineering Tools Used in This Manual

In this manual, the operation is described using MPE720 screen captures.

◆ Trademarks

- QR code is a trademark of Denso Wave Inc.
- MECHATROLINK is a trademark of the MECHATROLINK Members Association.
- Ethernet is a registered trademark of the Xerox Corporation.
- Other product names and company names are the trademarks or registered trademarks of the respective company. “TM” and the ® mark do not appear with product or company names in this manual.

◆ Visual Aids

The following aids are used to indicate certain types of information for easier reference.

Important	Indicates precautions or restrictions that must be observed. Indicates alarm displays and other precautions that will not result in machine damage.

Term	Indicates definitions of difficult terms or terms that have not been previously explained in this manual.

Example	Indicates operating or setting examples.
Information	Indicates supplemental information to deepen understanding or useful information.

Safety Precautions

◆ Safety Information

To prevent personal injury and equipment damage in advance, the following signal words are used to indicate safety precautions in this document. The signal words are used to classify the hazards and the degree of damage or injury that may occur if a product is used incorrectly. Information marked as shown below is important for safety. Always read this information and heed the precautions that are provided.

⚠ DANGER

- Indicates precautions that, if not heeded, are likely to result in loss of life, serious injury, or fire.

⚠ WARNING

- Indicates precautions that, if not heeded, could result in loss of life, serious injury, or fire.

⚠ CAUTION

- Indicates precautions that, if not heeded, could result in relatively serious or minor injury, or in fire.

NOTICE

- Indicates precautions that, if not heeded, could result in property damage.

◆ Safety Precautions That Must Always Be Observed

■ General Precautions

⚠ WARNING

- **The installation must be suitable and it must be performed only by an experienced technician.**
  There is a risk of electrical shock or injury.
- **Before connecting the machine and starting operation, make sure that an emergency stop procedure has been provided and is working correctly.**
  There is a risk of injury.
- **Do not approach the machine after a momentary interruption to the power supply. When power is restored, the Machine Controller and the device connected to it may start operation suddenly. Provide safety measures in advance to ensure human safety when operation restarts.**
  There is a risk of injury.
- **Do not touch anything inside the Machine Controller.**
  There is a risk of electrical shock.
- **Do not remove the front cover, cables, connector, or options while power is being supplied.**
  There is a risk of electrical shock, malfunction, or damage.
- **Do not damage, pull on, apply excessive force to, place heavy objects on, or pinch the cables.**
  There is a risk of electrical shock, operational failure of the product, or burning.
- **Do not attempt to modify the Machine Controller in any way.**
  There is a risk of injury or device damage.

■ Storage Precautions

⚠ CAUTION

- **Hold onto the main body of the Machine Controller when transporting it.**
  Holding the cables or connectors may damage them or result in injury.
- **Do not overload the Machine Controller during transportation. (Follow all instructions.)**
  There is a risk of injury or an accident.
- **Never subject the Machine Controller to an atmosphere containing halogen (fluorine, chlorine, bromine, or iodine) during transportation.**
  There is a risk of malfunction or damage.
- **If disinfectants or insecticides must be used to treat packing materials such as wooden frames, pallets, or plywood, the packing materials must be treated before the product is packaged, and methods other than fumigation must be used.**
  Example: Heat treatment, where materials are kiln-dried to a core temperature of 56°C for 30 minutes or more.
  If the electronic products, which include stand-alone products and products installed in machines, are packed with fumigated wooden materials, the electrical components may be greatly damaged by the gases or fumes resulting from the fumigation process. In particular, disinfectants containing halogen, which includes chlorine, fluorine, bromine, or iodine can contribute to the erosion of the capacitors.

NOTICE

- **Do not install or store the SERVOPACK in any of the following locations.**
  - Locations that are subject to direct sunlight
  - Locations that are subject to ambient temperatures that exceed SERVOPACK specifications
  - Locations that are subject to relative humidities that exceed SERVOPACK specifications
  - Locations that are subject to condensation as the result of extreme changes in temperature
  - Locations that are subject to corrosive or flammable gases
  - Locations that are near flammable materials
  - Locations that are subject to dust, salts, or iron powder
  - Locations that are subject to water, oil, or chemicals
  - Locations that are subject to vibration or shock that exceeds SERVOPACK specifications

  If you store or install the SERVOPACK in any of the above locations, the SERVOPACK may fail or be damaged.

■ Installation Precautions

⚠ CAUTION

- Never install the Machine Controller in an atmosphere containing halogen (fluorine, chlorine, bromine, or iodine).
  There is a risk of malfunction or damage.
- Do not step on the Machine Controller or place heavy objects on the Machine Controller.
  There is a risk of injury or an accident.
- Do not block the air exhaust ports on the Machine Controller. Do not allow foreign objects to enter the Machine Controller.
  There is a risk of internal element deterioration, malfunction, or fire.
- Always mount the Machine Controller in the specified orientation.
  There is a risk of malfunction.
- Leave the specified amount of space between the Machine Controller, and the interior surface of the control panel and other devices.
  There is a risk of fire or malfunction.
- Do not subject the Machine Controller to strong shock.
  There is a risk of malfunction.
- Suitable battery installation must be performed and it must be performed only by an experienced technician.
  There is a risk of electrical shock, injury, or device damage.
- Do not touch the electrodes when installing the Battery.
  Static electricity may damage the electrodes.

NOTICE

- Do not install or store the SERVOPACK in any of the following locations.
  - Locations that are subject to direct sunlight
  - Locations that are subject to ambient temperatures that exceed SERVOPACK specifications
  - Locations that are subject to relative humidities that exceed SERVOPACK specifications
  - Locations that are subject to condensation as the result of extreme changes in temperature
  - Locations that are subject to corrosive or flammable gases
  - Locations that are near flammable materials
  - Locations that are subject to dust, salts, or iron powder
  - Locations that are subject to water, oil, or chemicals
  - Locations that are subject to vibration or shock that exceeds SERVOPACK specifications
  - Locations near devices that generate strong magnetic fields
  - Locations that are subject to radiation

  If you store or install the SERVOPACK in any of the above locations, the SERVOPACK may fail or be damaged.

■ Wiring Precautions

⚠ DANGER

- **Do not change any wiring while power is being supplied.**
  There is a risk of electric shock or injury.

⚠ CAUTION

- **Check the wiring to be sure it has been performed correctly.**
  There is a risk of motor run-away, injury, or accidents.
- **Always use a power supply of the specified voltage.**
  There is a risk of fire or accident.
- **In places with poor power supply conditions, ensure that the input power is supplied within the specified voltage range.**
  There is a risk of device damage.
- **Install breakers and other safety measures to provide protection against shorts in external wiring.**
  There is a risk of fire.
- **Provide sufficient shielding when using the Machine Controller in the following locations.**
  - Locations that are subject to noise, such as from static electricity
  - Locations that are subject to strong electromagnetic or magnetic fields
  - Locations that are subject to radiation
  - Locations that are near power lines

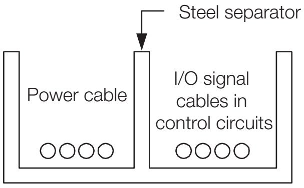
  There is a risk of device damage.
- **Configure the circuits to turn ON the power supply to the CPU Unit/CPU Module before the 24-V I/O power supply. Refer to the following manuals for details on circuits.**

  📖 MP3000 Series CPU Unit Instructions (Manual No.: TOMP C880725 16)

  📖 MP3000 Series MP3300 CPU Module Instructions (Manual No.: TOMP C880725 23)

  If the power supply to the CPU Unit/CPU Module is turned ON after the external power supply, e.g., the 24-V I/O power supply, the outputs from the CPU Unit/CPU Module may momentarily turn ON when the power supply to the CPU Unit/CPU Module turns ON. This can result in unexpected operation that may cause injury or device damage.
- **Provide emergency stop circuits, interlock circuits, limit circuits, and any other required safety measures in control circuits outside of the Machine Controller.**
  There is a risk of injury or device damage.
- **If you use MECHATROLINK I/O Modules, use the establishment of MECHATROLINK communications as an interlock output condition.**
  There is a risk of device damage.
- **Connect the Battery with the correct polarity.**
  There is a risk of battery damage or explosion.
- **Select the I/O signal wires for external wiring to connect the Machine Controller to external devices based on the following criteria:**
  - Mechanical strength
  - Noise interference
  - Wiring distance
  - Signal voltage
- **Separate the I/O signal cables for control circuits from the power cables both inside and outside the control panel to reduce the influence of noise from the power cables.**
  If the I/O signal lines and power lines are not separated properly, malfunction may occur.

Example of Separated Cables



■ Operation Precautions

⚠ CAUTION

- **Follow the procedures and instructions in the user's manuals for the relevant products to perform normal operation and trial operation.**
  Operating mistakes while the Servomotor and machine are connected may damage the machine or even cause accidents resulting in injury or death.
- **Implement interlock signals and other safety circuits external to the Machine Controller to ensure safety in the overall system even if the following conditions occur.**
  - Machine Controller failure or errors caused by external factors
  - Shutdown of operation due to Machine Controller detection of an error in self-diagnosis and the subsequent turning OFF or holding of output signals
  - Holding of the ON or OFF status of outputs from the Machine Controller due to fusing or burning of output relays or damage to output transistors
  - Voltage drops from overloads or short-circuits in the 24-V output from the Machine Controller and the subsequent inability to output signals
  - Unexpected outputs due to errors in the power supply, I/O, or memory that cannot be detected by the Machine Controller through self-diagnosis.

  There is a risk of injury, device damage, or burning.
- **Observe the setting methods that are given in the manual for the following parameters.**
  - Parameters for absolute position detection when the axis type is set to a finite-length axis
    ☞ *5.2.6 Position Management Method for Each Machine Operation Type – Finite-length Operation (page 5-26)*
  - Parameters for simple absolute infinite-length position control when the axis type is set to an infinite-length axis
    ☞ *5.2.6 Position Management Method for Each Machine Operation Type – Infinite-length Operation (page 5-31)*

  If any other methods are used, offset in the current position when the power supply is turned OFF and ON again may result in device damage.
- **OL☐☐☐48 (Zero Point Position Offset in Machine Coordinate System) is always valid when the axis type is set to a finite-length axis. Do not change the setting of OL☐☐☐48 while the Machine Controller is operating.**
  There is a risk of machine damage or an accident.

■ Maintenance and Inspection Precautions

⚠ DANGER

- **Do not change any wiring while power is being supplied.**
  There is a risk of electric shock or injury.

⚠ CAUTION

- **Do not attempt to disassemble or repair the Machine Controller.**
  There is a risk of electrical shock, injury, or device damage.
- **Do not change any wiring while power is being supplied.**
  There is a risk of electrical shock, injury, or device damage.
- **Suitable battery replacement must be performed and it must be performed only by an experienced technician.**
  There is a risk of electrical shock, injury, or device damage.
- **Replace the Battery only while power is supplied to the Machine Controller.**
  Replacing the Battery while the power supply to the Machine Controller is turned OFF may result in loss of the data stored in memory in the Machine Controller.
- **Do not touch the electrodes when replacing the Battery.**
  Static electricity may damage the electrodes.
- **Do not forget to perform the following tasks when you replace the CPU Unit/CPU Module:**
  - Back up all programs and parameters from the CPU Unit/CPU Module that is being replaced.
  - Transfer all saved programs and parameters to the new CPU Unit/CPU Module.

  If you operate the CPU Unit/CPU Module without transferring this data, unexpected operation may occur. There is a risk of injury or device damage.

■ Disposal Precautions

- When disposing of the product, treat it as ordinary industrial waste. However, local ordinances and national laws must be observed. Implement all labeling and warnings for the final product as required.

■ Other General Precautions

- Figures provided in this manual are typical examples or conceptual representations. There may be differences between them and actual wiring, circuits, and products.
- The products shown in illustrations in this manual are sometimes shown with their covers or protective guards removed to illustrate detail. Always replace all covers and protective guards before you use the product.
- If you need a new copy of this document because it has been lost or damaged, contact your nearest Yaskawa representative or one of the offices listed on the back of this manual.
- This manual is subject to change without notice for product improvements, specifications changes, and improvements to the manual itself.
  We will update the document number of the manual and issue revisions when changes are made.
- Any and all quality guarantees provided by Yaskawa are null and void if the customer modifies the SERVOPACK in any way. Yaskawa disavows any responsibility for damages or losses that are caused by modified SERVOPACKs.

Warranty

◆ Details of Warranty

■ Warranty Period

The warranty period for a product that was purchased (hereinafter called the “delivered product”) is one year from the time of delivery to the location specified by the customer or 18 months from the time of shipment from the Yaskawa factory, whichever is sooner.

■ Warranty Scope

Yaskawa shall replace or repair a defective product free of charge if a defect attributable to Yaskawa occurs during the above warranty period.
This warranty does not cover defects caused by the delivered product reaching the end of its service life and replacement of parts that require replacement or that have a limited service life.

This warranty does not cover failures that result from any of the following causes.

- Improper handling, abuse, or use in unsuitable conditions or in environments not described in product catalogs or manuals, or in any separately agreed-upon specifications
- Causes not attributable to the delivered product itself
- Modifications or repairs not performed by Yaskawa
- Use of the delivered product in a manner in which it was not originally intended
- Causes that were not foreseeable with the scientific and technological understanding at the time of shipment from Yaskawa
- Events for which Yaskawa is not responsible, such as natural or human-made disasters

◆ Limitations of Liability

- Yaskawa shall in no event be responsible for any damage or loss of opportunity to the customer that arises due to failure of the delivered product.
- Yaskawa shall not be responsible for any programs (including parameter settings) or the results of program execution of the programs provided by the user or by a third party for use with programmable Yaskawa products.
- The information described in product catalogs or manuals is provided for the purpose of the customer purchasing the appropriate product for the intended application. The use thereof does not guarantee that there are no infringements of intellectual property rights or other proprietary rights of Yaskawa or third parties, nor does it construe a license.
- Yaskawa shall not be responsible for any damage arising from infringements of intellectual property rights or other proprietary rights of third parties as a result of using the information described in catalogs or manuals.

◆ Suitability for Use

- It is the customer's responsibility to confirm conformity with any standards, codes, or regulations that apply if the Yaskawa product is used in combination with any other products.
- The customer must confirm that the Yaskawa product is suitable for the systems, machines, and equipment used by the customer.
- Consult with Yaskawa to determine whether use in the following applications is acceptable. If use in the application is acceptable, use the product with extra allowance in ratings and specifications, and provide safety measures to minimize hazards in the event of failure.
  - Outdoor use, use involving potential chemical contamination or electrical interference, or use in conditions or environments not described in product catalogs or manuals
  - Nuclear energy control systems, combustion systems, railroad systems, aviation systems, vehicle systems, medical equipment, amusement machines, and installations subject to separate industry or government regulations
  - Systems, machines, and equipment that may present a risk to life or property
  - Systems that require a high degree of reliability, such as systems that supply gas, water, or electricity, or systems that operate continuously 24 hours a day
  - Other systems that require a similar high degree of safety
- Never use the product for an application involving serious risk to life or property without first ensuring that the system is designed to secure the required level of safety with risk warnings and redundancy, and that the Yaskawa product is properly rated and installed.
- The circuit examples and other application examples described in product catalogs and manuals are for reference. Check the functionality and safety of the actual devices and equipment to be used before using the product.
- Read and understand all use prohibitions and precautions, and operate the Yaskawa product correctly to prevent accidental harm to third parties.

◆ Specifications Change

The names, specifications, appearance, and accessories of products in product catalogs and manuals may be changed at any time based on improvements and other reasons. The next editions of the revised catalogs or manuals will be published with updated code numbers. Consult with your Yaskawa representative to confirm the actual specifications before purchasing a product.

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Revision History

Basic Information on Motion Control

1

This chapter describes the types of programs and the types of motion control that are used to perform motion control with the MP3000.

1.1 Types of Programs

Ladder programs and motion programs are used to implement motion control. This section describes each type of program.

Ladder Programs

Ladder programming is a programming language for executing position control, phase control, torque control, and speed control. However, programming becomes complex if you try to use ladder programs for path control.

Motion Programs

Motion programming is a programming language for executing position control. Motion programs allow you to create programs in a simple and easy-to-understand text format.

1.2 Types of Motion Control

Motion control includes position control, phase control, torque control, and speed control. This section describes each type of motion control.

1.2.1 Position Control

To implement position control, the target axis is moved to the target position according to the specified travel distance and travel speed. There are two types of position control: positioning and interpolation.

Positioning

Positioning is used to accurately stop the target axis at the target position. Positioning can be performed for individual axes. When positioning commands are executed for multiple axes at the same time, each axis is moved from the current position and stopped at the specified target position independently.

The following table describes programming for positioning.

Program	Command/Instruction	Reference	
		Programming	Command/Instruction
Ladder program	POSING (Positioning), EX_POSING (External Positioning), etc.	📖 Machine Controller MP3000 Series Ladder Programming Manual (Manual No.: SIEP C880725 13) ☞ *8.1 One Axis Positioning* on page 8-2	☞ *4.1 Commands* on page 4-3
Motion program	MOV (Positioning), EXM (External Positioning), etc.	📖 Machine Controller MP3000 Series Motion Programming Manual (Manual No.: SIEP C880725 14) ☞ *8.1 One Axis Positioning* on page 8-2	☞ *4.5 Motion Language Instructions* on page 4-188

Interpolation

Interpolation synchronizes the operation of multiple axes to move the controlled object along a specified trajectory to a target position. The target object can be moved in a linear, circular, or helical trajectory.

Interpolation can also be performed for a single axis.

The following table describes programming for interpolation.

Program	Command/Instruction	Reference	
		Programming	Command/Instruction
Ladder program	INTERPOLATE (Interpolation)	📖 Machine Controller MP3000 Series Ladder Programming Manual (Manual No.: SIEP C880725 13)	☞ *4.1 Commands* on page 4-3
Motion program	MVS (Linear Interpolation), MCW (Clockwise Circular Interpolation), MCC (Counterclockwise Circular Interpolation), etc.	📖 Machine Controller MP3000 Series Motion Programming Manual (Manual No.: SIEP C880725 14) ☞ *8.2 Interpolation of Two Axes* on page 8-6	☞ *4.5 Motion Language Instructions* on page 4-188

1.2.2 Phase Control

Phase control is used to synchronize multiple axes and move a machine along a specified path. It enables continuous motion without stopping at target positions, in the same way as an electronic cam or electronic shaft. The continuous nature of the operation is what distinguishes phase control from position control performed with interpolation.

The following table describes programming for phase control.

Program	Command/Instruction	Reference	
		Programming	Command/Instruction
Ladder program	PHASE (Phase Control)	📖 Machine Controller MP3000 Series Ladder Programming Manual (Manual No.: SIEP C880725 13) ☞ *8.4 Phase Control* on page 8-11	☞ *4.1 Commands* on page 4-3

1.2.3 Torque Control

Torque control is used to ensure that the output of the motor is always at a specified torque (or force).

The following table describes programming for torque control.

Program	Command/Instruction	Reference	
		Programming	Command/Instruction
Ladder program	TRQ (Issue Torque/ Force Reference)	📖 Machine Controller MP3000 Series Ladder Programming Manual (Manual No.: SIEP C880725 13) ☞ *8.3 Torque Control* on page 8-9	☞ *4.1 Commands* on page 4-3

1.2.4 Speed Control

Speed control is used to move an axis at a specified speed.

The following table describes programming for speed control.

Program	Command/Instruction	Reference	
		Programming	Command/Instruction
Ladder program	VELO (Speed Reference), FEED (Jogging), EX_FEED (Jog mode with external positioning), etc.	📖 Machine Controller MP3000 Series Ladder Programming Manual (Manual No.: SIEP C880725 13)	☞ *4.1 Commands* on page 4-3

Basic Information on Motion Control Function Modules

2

This chapter provides basic information on the Motion Control Function Modules that are built into the MP3000.

2.1 Overview

The following two Motion Control Function Modules are built into the MP3000.

- SVC/SVC32
- SVR/SVR32

This section outlines the motion control function, provides a conceptual diagram, and describes the external appearance and indicators on the MP3000.

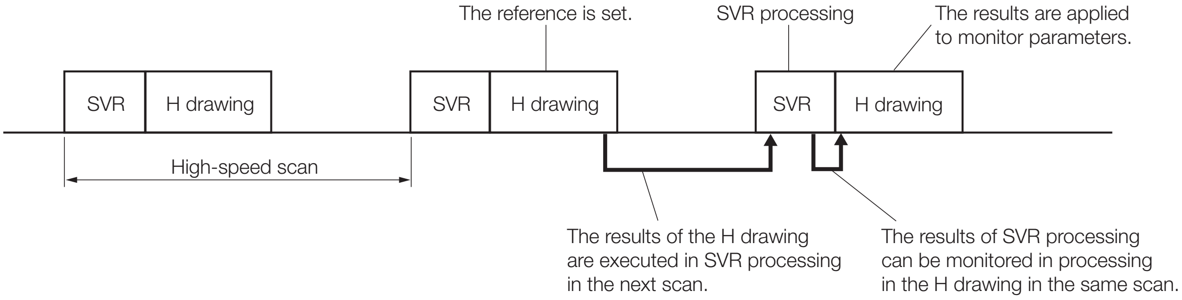
2.1.1 SVC Function Module

The SVC Function Module performs motion control for MECHATROLINK-III slave devices that are connected through MECHATROLINK-III communications from the MP3000. The main slave devices are SERVOPACKs, Distributed I/O Modules, Inverters, and Stepping Motor Drives.

2.1.2 SVR Function Module

The SVR Function Module performs motion control for virtual axes, i.e., it is not actually connected to motors. It performs motion control that synchronizes physical axes with simulated control of virtual mechanisms such as electronic cams or electronic shafts. You can also use a motion program to apply control that was executed by the SVR Function Module to multiple axes to perform multi-axis synchronized control.

The SVR Function Module executes processes at the beginning of the high-speed scan. SVR processing is executed during the next scan after the scan in which the reference is set. The results of the processing are applied to the monitor parameters.



When fixed parameter No. 0 (Operation Mode Selection) is set to 0 (Normal operation mode), processing starts for the virtual axes in the SVR Function Module (32 virtual axes max.). The default for the Operation Mode Selection parameter is 1 (Axis unused).

Approximate processing times per axis for the SVR Function Module are given in the following table.

Instruction	Processing Time
NOP	5 + (2 × Number of axes) (μs)
POSING	5 + (2.5 × Number of axes) (μs)

Note: Number of axes: This is the number of axes (1 to 32) for which fixed parameter No. 0 (Operation Mode Selection) is set to 0 (Normal operation mode).
The above formulas do not apply when the number of axes is 0.

Term

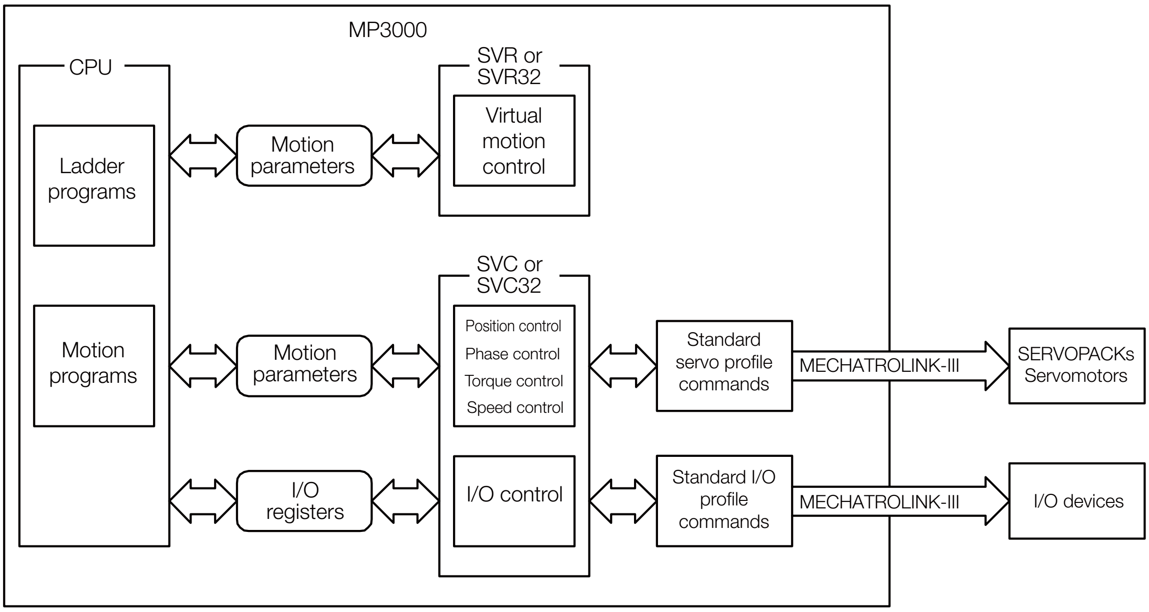
Differences between the SVR Function Module and Simulation Mode with the SVC Function Module

Due to the following differences between the SVR Function Module and Simulation Mode with the SVC Function Module, we recommend that you use the SVR Function Module for the virtual master to create master axis operating patterns.

- Simulation Mode with SVC Function Module
  Simulation Mode allows you to simulate the same movements within the SVC Function Module as when connected to a physical Servo Drive. Position information is updated every scan in the same way as an SVR Function Module. However, the same processing is performed as when references are set for a physical Servo Drive. This may create a delay in the responses reported in the monitor parameters to references for motion commands.
- SVR Function Module
  Because the positioning function of the MP3000 distributes the reference, position information is updated each scan toward the final target position, just as it would be for a physical axis.

2.1.3 Conceptual Diagram

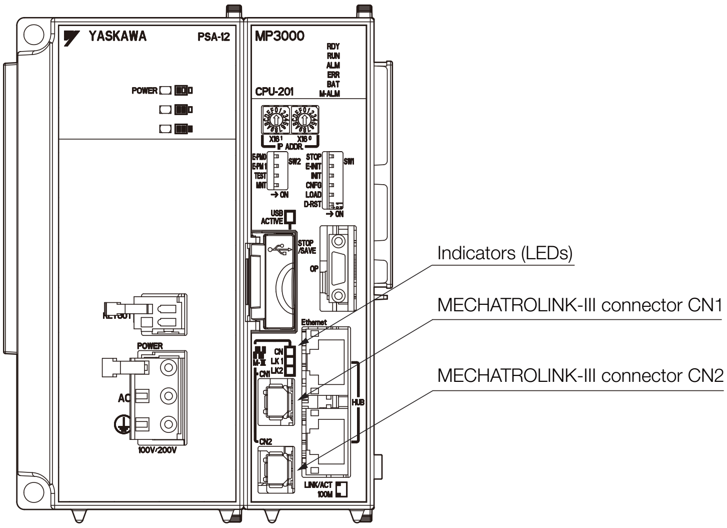
A conceptual diagram of the Motion Control Function Modules with the MP3000 is provided below.



2.1.4 External Appearance and Indicators

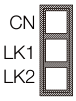
External Appearance

The following figure shows the indicators and connectors that are related to the SVC32.



Indicators

The following table describes the indicators that show the operating status of the SVC32 and error information.

Indicator	Indicator Name	Color	Meaning When Lit
	CN	Green	MECHATROLINK-III communications are established as a slave (i.e., the CONNECT command is ON).
	LK1	Green	Port 1 is performing MECHATROLINK-III communications.
	LK2	Green	Port 2 is performing MECHATROLINK-III communications.

2.2 Specifications

This section provides the specifications of each Motion Control Function Module and the specifications of the MECHATROLINK-III communications used with the SVC Function Module.

2.2.1 Motion Control Function Module Specifications

The following table gives the specifications of the Motion Control Function Modules.

The differences in specifications between the MP2000 and the MP3000 are outlined in the following table.

Item	MP3000		MP2000 SVC-01 Module
	SVC	SVC32	
Maximum Number of Connectable Stations	21 (Servo Drives can be connected for up to 16 axes)	42 (Servo Drives can be connected for up to 32 axes)	21 (Servo Drives can be connected for up to 16 axes)
Register Range	You can assign registers for one circuit.	You can assign registers for one[*1] or two circuits.	The registers for one circuit are assigned.
Transmission Cycle	125 μs, 250 μs, 500 μs, 1 ms	125 μs, 250 μs, 500 μs, 1 ms, 1.5 ms, 2 ms, 3 ms	125 μs, 250 μs, 500 μs, 1ms
Slave CPU Synchronization	Supported.[*2]		Not supported.
Simulation Mode	Simulation is achieved by distributing virtual travel distance data every cycle within the SVC Function Module.		Simulation is achieved through echoed references.
Software Limit Parameter Selection (Bit C of fixed parameter No. 1)	Supported.		Not supported.

[*1] If only one circuit is assigned, you can use a maximum of only 16 axes.

Note: Refer to the following section for other specifications.

☞ *2.2.3 SVC Function Module Specifications* on page 2-8

☞ *2.2.4 SVR Function Module Specifications* on page 2-10

[*2] Refer to the following section for details.

☞ *6.6 Slave CPU Synchronization* on page 6-18

2.2.2 MECHATROLINK-III Communications Specifications for the SVC Function Module

The specifications of MECHATROLINK-III communications for the SVC Function Module are given below.

Item	Specifications
Communications Interface	Master
Communications Cycle (Reference Update Cycle)	500 μs to 32.0 ms
Transmission Cycle*	125 μs, 250 μs, 500 μs, or 1 ms
Communications Cable	MECHATROLINK-III Communications Cable
Maximum Number of Connectable Stations	SVC: 21 stations, SVC32: 42 stations
Topologies	Cascade connections, star connections, or mixed cascade/star connections
Terminating Resistor	Not necessary
Connectable Slave Devices	Any of the following devices that support MECHATROLINK-III communications: SERVOPACKs, Stepping Motor Drives, Inverters, I/O Modules, and Machine Controllers
Supported Profiles	MECHATROLINK-III servo standard profile, MECHATROLINK-III I/O standard profile, MECHATROLINK-III inverter standard profile, and MECHATROLINK-III stepping motor standard profile

* The transmission cycle is used to perform communications between the SVC Function Module and the slave devices through the MECHATROLINK-III transmission line.

2.2.3 SVC Function Module Specifications

Item			Specification
MECHATROLINK Communications	Number of Communications Lines		1
	Number of Communications Ports (Connectors)		2
	Terminating Resistor		Not necessary
	Network Topologies		Cascade, star, and point-to-point
	Communications Cable		CAT5e STP (shielded twisted-pair cable)
	Connectors		RJ45 or an industrial mini-connector made by TYCO AMP
	Communications Method		4B/5B MULT-3
	Types of Connected Stations		C1 master station: Network management station C2 master station: Message master station Slave stations
	Control Method		Master/Slave
	Number of Bytes in the Information Field		16, 32, 48, or 64 (can be mixed)
	Isolation for Communications Path		Transformer
	Master Function	Communications Interface	MECHATROLINK-III (2:N synchronous)
		Transmission Speed	100 Mbps
		Transmission Cycle	125 µs, 250 µs, 500 µs, 1 ms, 1.5 ms, 2 ms, or 3 ms
		Number of Link Communications Bytes	16, 32, 48, or 64 (depending on the profile)
		Number of Connected Stations	SVC32: 42 max. (32 Servo axes max.) SVC: 21 max. (16 Servo axes max.)
		C1 Messaging (Master Function)	Supported (selectable).
		Retry Function	Supported (selectable).
		Supported Slave Devices	SERVOPACKs, I/O devices, and Machine Controllers
		Event-driven Communications	Supported.
		Supported Profiles	MECHATROLINK-III-compliant Servos and MECHATROLINK-III-compliant I/O
	Slave Function	Communications Interface	MECHATROLINK-III (2:N asynchronous)
		Transmission Speed	100 Mbps
		Minimum Transmission Cycle	125 µs
		Maximum Transmission Cycle	32 ms
		Transmission Cycle Increment (Granularity)	03 hex
		Station Addresses	03 to EF hex
		Number of Link Communications Bytes	16, 32, 48, or 64
		Messaging (Slave Function)	Supported.
		Event-driven Communications	Supported.
		Cyclic Communications	Supported.
		Supported Profiles	Primary: MECHATROLINK-III-standard I/O

Continued on next page.

Continued from previous page.

Item			Specification
Servo Control	Communication Methods		Synchronous communications through single send transmissions Transmission/communications error detection (hardware) provided. Synchronous communications error detection (software) provided. No automatic recovery function (recovery occurs when alarms are cleared).
	I/O Registers		I/O using motion registers (synchronized with the high-speed scan).
	Command Modes		Motion Command Mode and MECHATROLINK Transmission Reference Mode
	Supported Servomotors		Standard, linear, and DD servomotors
	Control Types		Position control, speed control, torque control, and phase control can be selected during operation.
	Motion Commands		Positioning, external positioning, zero point returns, interpolation, interpolation with latch input, jogging, STEP operation, speed references, torque references, phase control, jogging with external positioning, etc.
	Acceleration/Deceleration Methods		One-step asymmetric trapezoidal acceleration/deceleration, exponential acceleration/deceleration filter, and moving average filter
	Position Unit		Pulses, millimeters, inches, degrees, or micrometers
	Speed Unit		Reference units/s, 10^n reference units/min, or percentage of rated speed (0.01% or 0.0001%)
	Acceleration Unit		Reference units/s^2 or milliseconds (acceleration time from 0 to the rated speed)
	Torque Unit		Percentage of rated torque (0.01% or 0.0001%)
	Electronic Gear		Supported.
	Position Management Methods		Finite-length position management, infinite-length position management, absolute infinite-length position management, and simple absolute infinite-length position management
	Software Limits		One each in positive and negative directions
	Zero Point Return Method		13 types
	SERVOPACK Parameter Management		SERVOPACK parameters can be managed in the MPE720's SERVOPACK Parameter Tab Page.
	Simulation Mode		Supported.
	SVR or SVR32	Maximum Number of Controlled Axes	SVR32: 32 axes SVR: 16 axes
		Register Range	The registers for two circuits are assigned.
I/O Control Functions	Communication Methods		Synchronous communications through single send transmissions Transmission/communications error detection (hardware) provided. Synchronous communications error detection not provided. Automatic recovery function provided.
	I/O Registers		I/O using I/O registers, synchronized on the high-speed scan or low-speed scan (selectable)
	I/O Commands		Only I/O MECHATROLINK-III standard profile can be used. Data I/O, reading parameters, writing parameters, reading alarms/warnings, and clearing alarms
Self Configuration			Module and slave devices can be automatically assigned.
Synchronization between Modules			Synchronization is supported when the high-speed scan cycle is an integral multiple or integral factor of the transmission cycle. We recommend saving the settings to flash memory and then turning the power supply OFF and ON again whenever these settings are changed.
Synchronization between Slaves			Supported.

2.2.4 SVR Function Module Specifications

Item		Specification
Servo Control	I/O Registers	I/O using motion registers (synchronized with the high-speed scan)
	Command Modes	Motion command mode
	Supported Servomotors	Standard and linear Servomotors
	Control Types	Position control, speed control, torque control, and phase control can be selected during operation.
	Motion Commands	Positioning, external positioning, zero point returns, interpolation, interpolation with latch input, jogging, STEP operation, speed references, torque references, phase control, etc.
	Acceleration/Deceleration Methods	Exponential acceleration/deceleration filter (The bias speed can be set.)
	Position Unit	Pulses, millimeters, inches, degrees, or micrometers
	Speed Unit	Reference units/s, 10^n reference units/min, or percentage of rated speed (0.01% or 0.0001%)
	Acceleration Unit	Reference units/s^2 or milliseconds (acceleration time from 0 to the rated speed)
	Torque Unit	Percentage of rated torque (0.01% or 0.0001%)
	Electronic Gear	Supported.
	Position Management Methods	Finite-length position management and infinite-length position management
	Zero Point Return Method	Cannot be set. The axis immediately returns to the zero point when the ZRET command is executed.
	Maximum Number of Controlled Axes	SVR32: 32 axes SVR: 16 axes
	Register Range	The registers for two circuits are assigned.

Note: The functionality of some motion commands is restricted. (For example, performing a latch operation via an external signal is not possible.) Refer to the following chapter for details.

☞ *Chapter 4 Motion Control Program Commands and Instructions*

2.2.5 Applicable Versions for Additional Functions

The following tables list the MP3000 and Engineering Tool versions that support the additional functions.

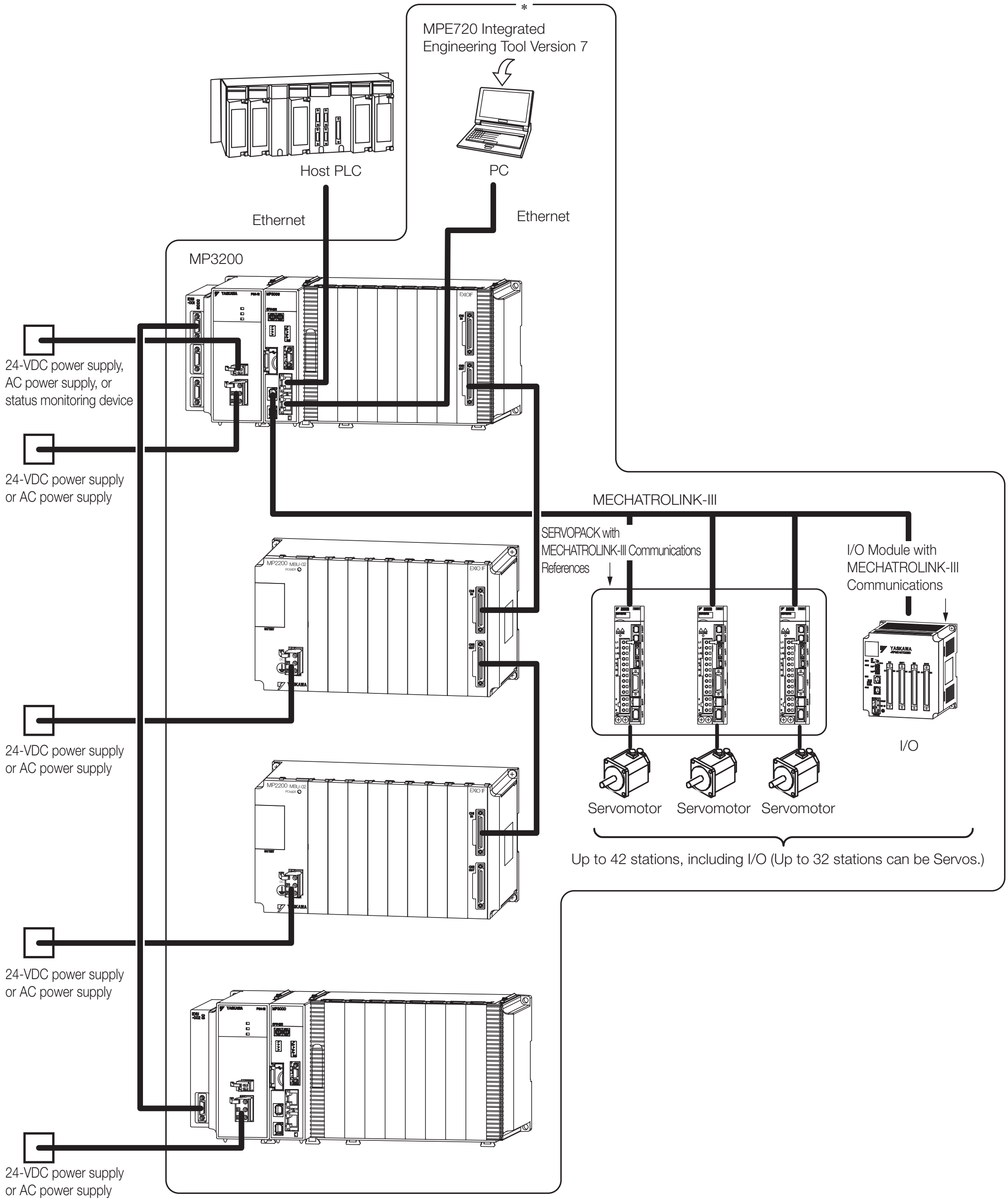
Function	MP3000					Engineering Tool
	CPU-201	CPU-202	CPU-301	CPU-302	MP3100	MPE720 Version 7
	JEPMC-CP3201-E	JEPMC-CP3202-E	JAPMC-CP3301-1-E JAPMC-CP3301-2-E	JAPMC-CP3302-1-E JAPMC-CP3302-2-E	JAPMC-MC3100-1-E JAPMC-MC3100-2-E	CPMC-MPE780D
Support for Σ-7-series AC SERVOPACKs with MECHATROLINK-III Communications for Rotational Motors	Version 1.12 or later	Version 1.12 or later	Version 1.12 or later	All versions	All versions	Version 7.28 or later
Support for MECHATROLINK-III Standard Inverter Profile for A1000 and V1000	Version 1.12 or later	Version 1.12 or later	Version 1.12 or later	All versions	All versions	Version 7.23 or later
Support for Σ-7-series AC SERVOPACKs with MECHATROLINK-III Communications for Linear Motors	Version 1.14 or later	Version 1.14 or later	Version 1.14 or later	All versions	All versions	Version 7.30 or later
Support for MECHATROLINK-III Standard Stepping Motor Drive Profile	Version 1.18 or later	Version 1.18 or later	Version 1.18 or later	All versions	All versions	Version 7.33 or later
Fixed Parameter No.1 Bit D: Torque Base Unit of SERVOPACK	Version 1.28 or later	Version 1.28 or later	Version 1.28 or later	Version 1.28 or later	All versions	Version 7.38 or later
ABS_RST (Absolute Encoder Reset) motion command	Version 1.30 or later	Version 1.30 or later	Version 1.30 or later	Version 1.30 or later	Version 1.30 or later	Version 7.39 or later
MLTTRN_SET (Multi-turn Limit Setting) motion command	Version 1.30 or later	Version 1.30 or later	Version 1.30 or later	Version 1.30 or later	Version 1.30 or later	Version 7.39 or later

2.3 System Configuration Example

The following figure shows a system configuration example that uses the Motion Control Function Module.

◆ Configuration with the MP3200

The following figure shows a system configuration example that uses the SVC32.



* This manual primarily describes this area.

Note: 1. Refer to the following manual for information on cables, connectors, and applicable SERVOPACKs.

MP3000 Series MP3200 User's Manual (Manual No.: SIEP C880725 10)

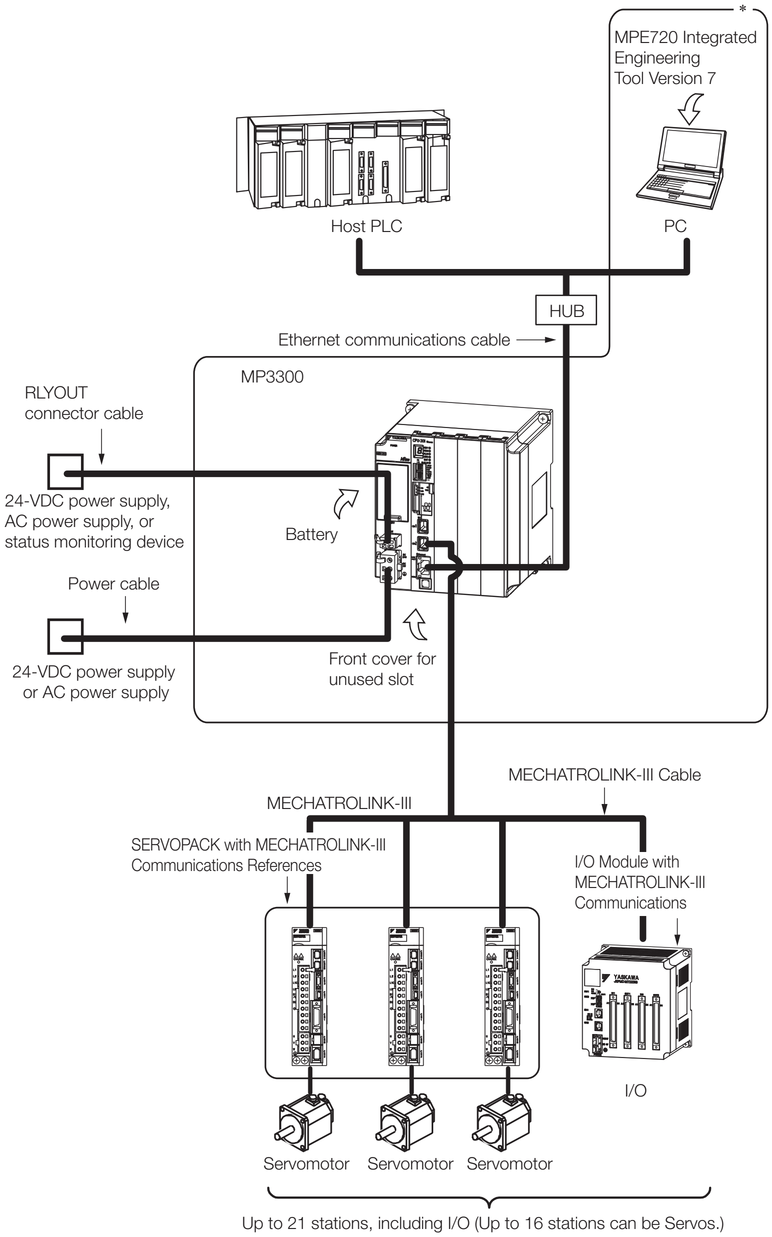
2. When you connect a SERVOPACK through MECHATROLINK communications, connect the wiring for input signals, such as overtravel, the zero point return deceleration limit switch, and external latches, to the SERVOPACK. Refer to the relevant SERVOPACK manual for details on the connections.

Important

Turn ON the power supply to the MECHATROLINK-III slave devices first or at the same time as the MP3000. If turning ON the power supply to the MP3000 first is unavoidable, reset the network after you turn ON the power supply to the MECHATROLINK slave devices. Otherwise, MECHATROLINK communications may not be performed correctly.

◆ Using the MP3300

The following figure shows a system configuration example that uses the SVC.



* This manual primarily describes this area.

Note: 1. Refer to the following manual for information on cables, connectors, and applicable SERVOPACKs.
MP3000 Series MP3300 Product Manual (Manual No.: SIEP C880725 21)

2. When you connect a SERVOPACK through MECHATROLINK communications, connect the wiring for input signals, such as overtravel, the zero point return deceleration limit switch, and external latches, to the SERVOPACK. Refer to the relevant SERVOPACK manual for details on the connections.

Important

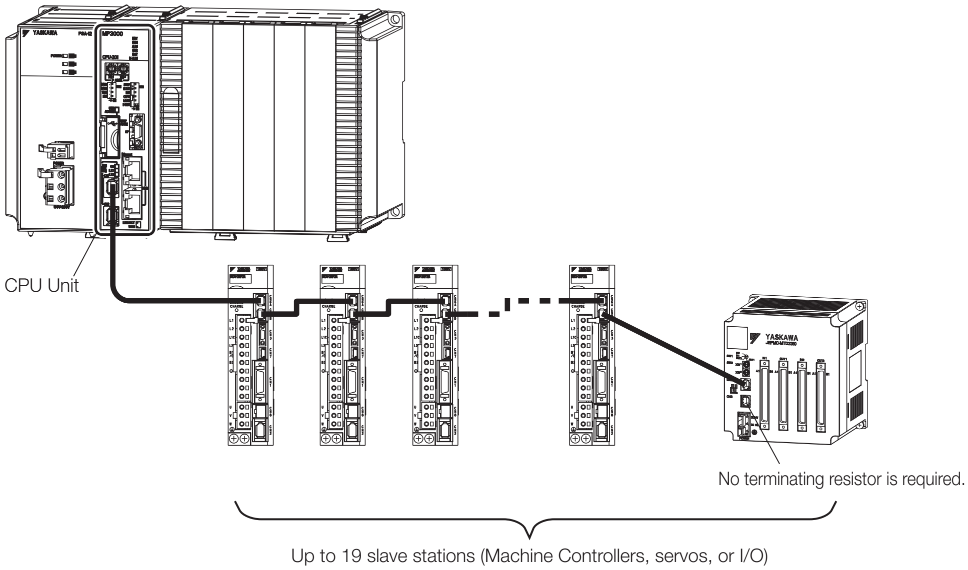
Turn ON the power supply to the MECHATROLINK-III slave devices first or at the same time as the MP3000. If turning ON the power supply to the MP3000 first is unavoidable, reset the network after you turn ON the power supply to the MECHATROLINK slave devices. Otherwise, MECHATROLINK communications may not be performed correctly.

2.4 Topologies

The SVC Function Module uses MECHATROLINK-III communications to control slave devices. You can connect the MP3000 and MECHATROLINK-III slave devices with cascade, star, or mixed cascade/star topologies. This section describes these topologies.

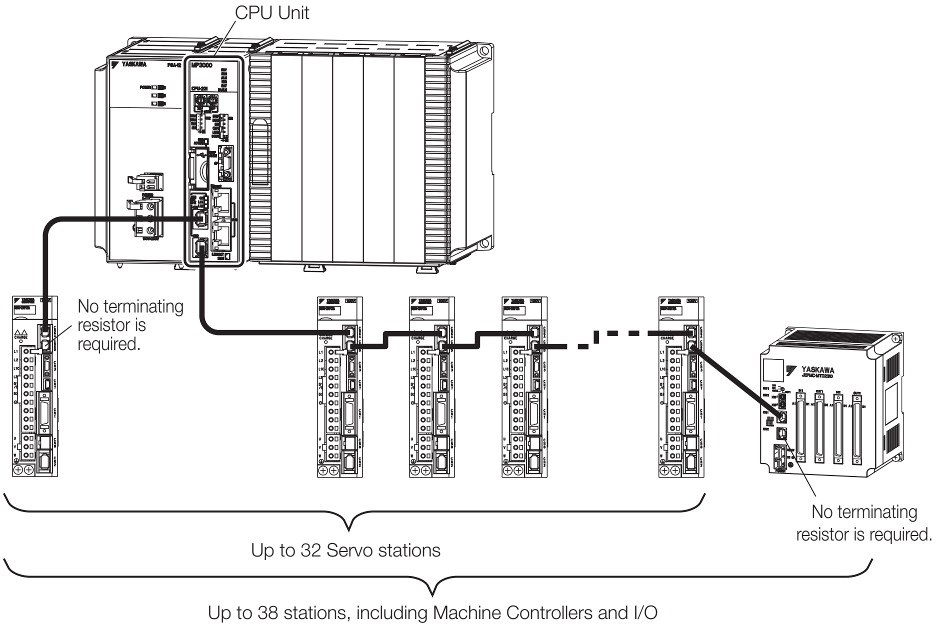
2.4.1 Cascade Connections

Cascade connections allow you to connect one or more series of slave stations from the MECHATROLINK-III communications port (CN6) on the MP3000.



Note: This connection example uses a transmission cycle of 3 ms.

Figure 2.1 Cascade Connections Using Only One Port



Note: This connection example uses a transmission cycle of 3 ms.

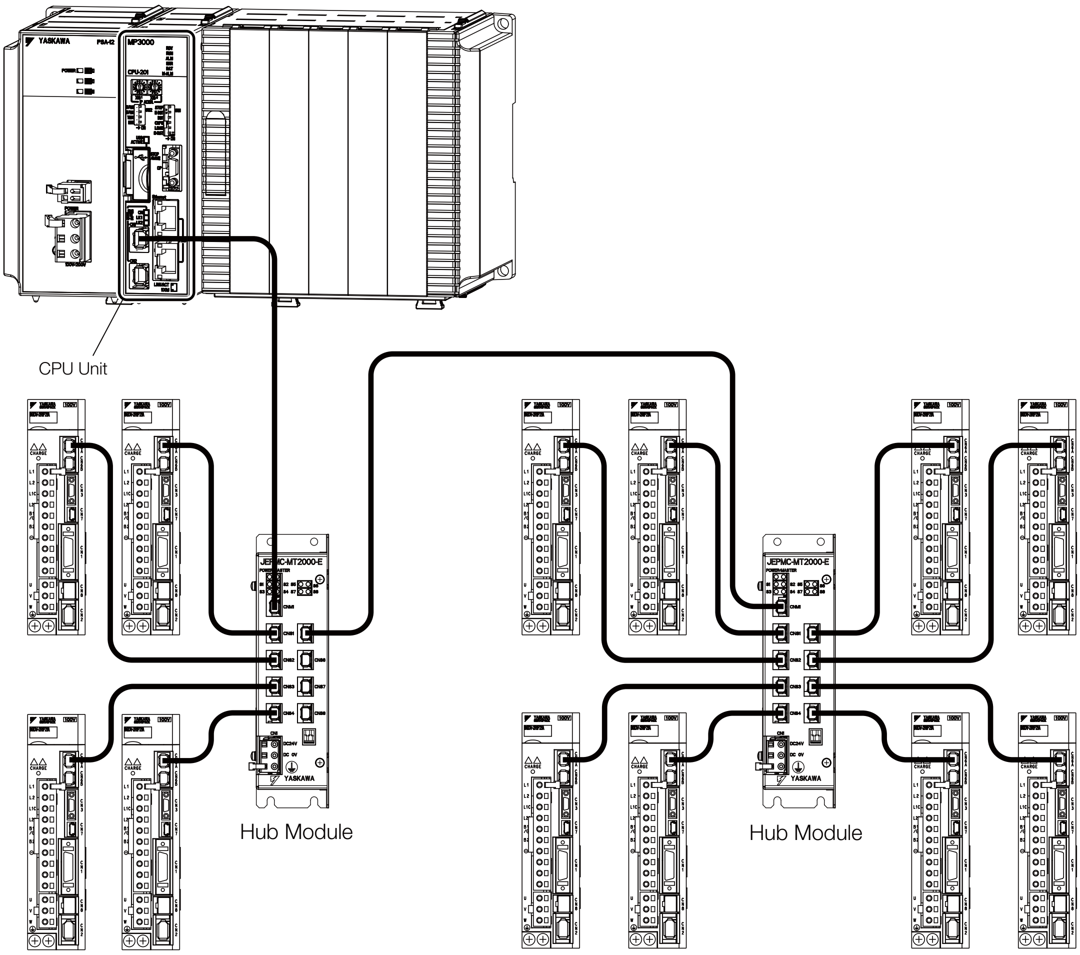
Figure 2.2 Cascade Connections Using Two Ports

Important

1. Do not connect more than 19 stations up to the final slave stations to any one CPU Unit port.
2. The maximum number of stations that you can connect with cascade connections depends on the transmission cycle. Refer to the following section for details.
   ☞ *MECHATROLINK Transmission Cycle and the Number of Connected Slave Stations (page 2-17)*

2.4.2 Star Connections

Star connections allow you to connect slave stations through Hub Modules that are connected to the MECHATROLINK-III communications port (CN6) on the MP3000. In this topology, each port on the Hub Module connects to one slave station.

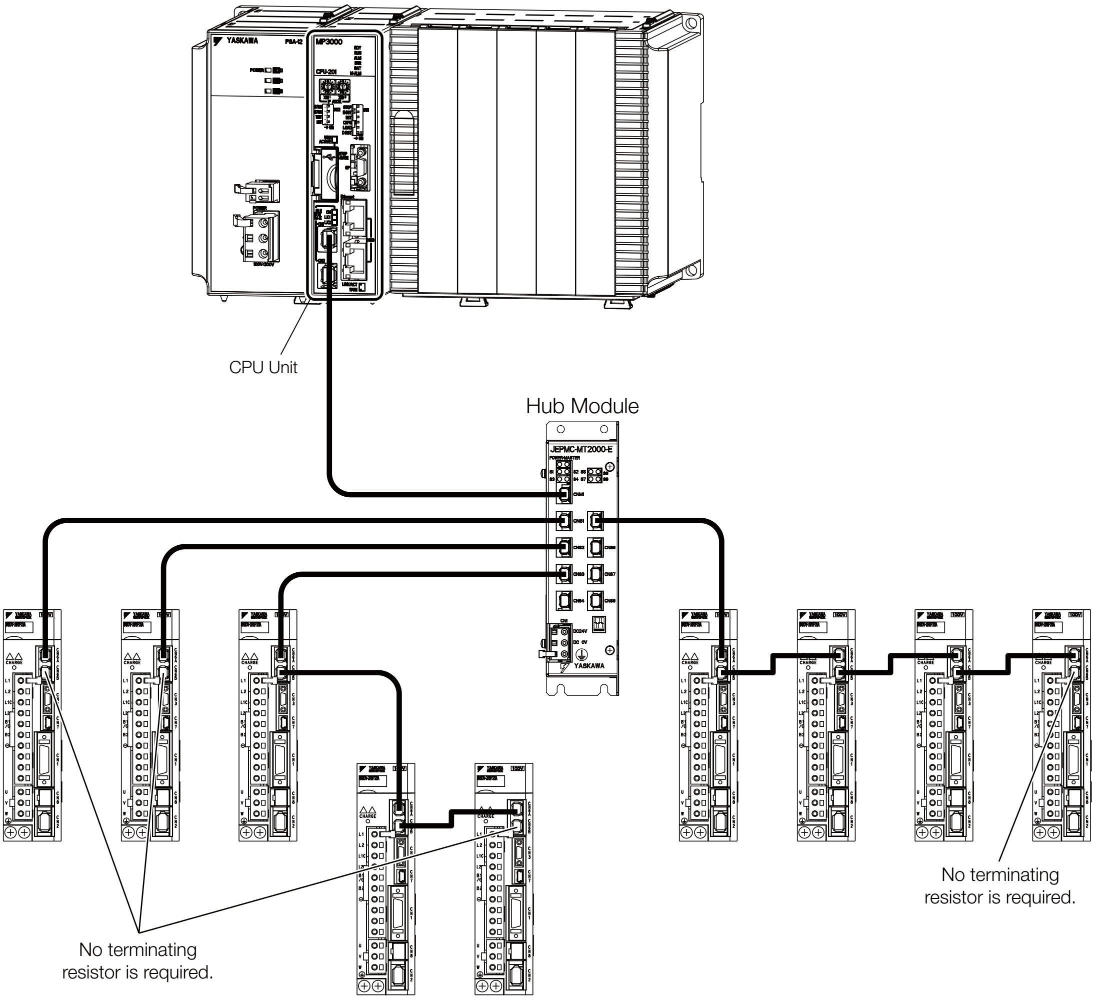


Important

1. Terminating resistors are not required at the SERVOPACKs.
2. The maximum number of stations that you can connect with star connections depends on the transmission cycle. Refer to the following section for details.
   ☞ *MECHATROLINK Transmission Cycle and the Number of Connected Slave Stations (page 2-17)*

2.4.3 Mixed Cascade/Star Connections

A mixed cascade/star topology combines both cascade and star connections.



Important

1. Do not connect more than 19 stations up to the final slave stations to any one CPU Unit port, including the Hub Modules.
2. The maximum number of stations that you can connect with a mixed cascade/star connections depends on the transmission cycle. Refer to the following section for details.
   ☞ *MECHATROLINK Transmission Cycle and the Number of Connected Slave Stations (page 2-17)*

2.5 MECHATROLINK Transmission Cycle and the Number of Connected Slave Stations

The relationship between the MECHATROLINK transmission cycle and the number of connected slave stations when the SVC Function Module is used is given in the following tables.

◆ Cascade Connections

Transmission Cycle	Number of Connected Stations		Connection Conditions
	SVC	SVC32	
125 µs	1 to 3	1 to 3	–
250 µs	1 to 7	1 to 7	–
500 µs	1 to 12	1 to 12	–
1 ms	1 to 21[*1]	1 to 21	If more than 17 stations are connected, two ports must be used.
1.5 ms	–	1 to 27	If more than 19 stations are connected, two ports must be used. No more than 19 stations can be connected to a single port.
2 ms	–	1 to 32	If more than 19 stations are connected, two ports must be used. No more than 19 stations can be connected to a single port.
3 ms	–	1 to 38[*2]	If more than 19 stations are connected, two ports must be used. No more than 19 stations can be connected to a single port.

*1. Up to 16 Servo Drive stations can be connected.
*2. Up to 32 Servo Drive stations can be connected.

◆ Star Connections

Transmission Cycle	Number of Connected Stations	
	SVC	SVC32
125 µs	1 to 4	1 to 4
250 µs	1 to 8	1 to 8
500 µs	1 to 14	1 to 14
1 ms	1 to 21[*1]	1 to 29
1.5 ms	–	1 to 42[*2]
2 ms	–	1 to 42[*2]
3 ms	–	1 to 42[*2]

*1. Up to 16 Servo Drive stations can be connected.
*2. Up to 32 Servo Drive stations can be connected.

◆ Mixed Cascade/Star Connections

Transmission Cycle	Number of Connected Stations		Connection Conditions
	SVC	SVC32	
125 µs	1 to 4	1 to 4	Only star connections can be used.
250 µs	1 to 8	1 to 8	A single cascade connection series must consist of no more than 2 stations.
500 µs	1 to 14	1 to 14	A single cascade connection series must consist of no more than 6 stations.
1 ms	1 to 21[*1]	1 to 29	A single cascade connection series must consist of no more than 7 stations.
1.5 ms	–	1 to 42[*2]	A single cascade connection series must consist of no more than 8 stations.
2 ms	–	1 to 42[*2]	A single cascade connection series must consist of no more than 16 stations.
3 ms	–	1 to 42[*2]	A single cascade connection series must consist of no more than 18 stations.

*1. Up to 16 Servo Drive stations can be connected.

*2. Up to 32 Servo Drive stations can be connected.

Note: The above connection conditions assume that the following conditions are met: Number of transmission bytes: 48, Distance between stations: 100 m., Number of retries: 1.

Important

If the SigmaWin+ is connected through the MP3000, the SigmaWin+ may not be usable if there are too many SERVOPACK stations connected.
If this occurs, either connect the SigmaWin+ to the SERVOPACK (CN7) directly, or lengthen the transmission cycle.

2.6 Synchronization of the MECHATROLINK-III Transmission Cycle and High-Speed Scan Cycle

To perform motion control with the SVC Function Module, the MECHATROLINK transmission cycle and the high-speed scan cycle of the CPU must be synchronized. This section describes synchronization of the MECHATROLINK transmission cycle and the high-speed scan cycle.

Important

If an asynchronous state results from changes in the MECHATROLINK transmission cycle or the high-speed scan cycle, a Scan Setting Error alarm (IL□□□04 bit 16) occurs for the axis and an I/O error occurs for the I/O station.

2.6.1 Synchronization Conditions

To synchronize the MECHATROLINK transmission cycle and the high-speed scan cycle of the CPU, the high-speed scan cycle setting must be an integral multiple or integral fraction of the MECHATROLINK transmission cycle setting.

2.6.2 Timing at Which the MECHATROLINK Transmission Cycle and the High-speed Scan Cycle Are Synchronized

The MECHATROLINK transmission cycle and the high-speed scan cycle are automatically synchronized when the power supply is turned OFF and ON again.

If you perform any of the following operations after turning ON the power supply, save the settings to flash memory and then turn the power supply OFF and ON again.

- When executing self configuration from the MPE720
- When loading a Module configuration definition
- When operation changes from asynchronized to synchronized as a result of changing the transmission cycle
- When operation changes from synchronized to asynchronized or from asynchronized to synchronized as a result of changing the high-speed scan setting
- When fixed parameters are written after turning ON the power supply

2.6.3 Changing Synchronization Cycles

This section describes communications when the MECHATROLINK transmission cycle or the high-speed scan cycle is changed.

Changing the MECHATROLINK Transmission Cycle

If the MECHATROLINK transmission cycle is changed, operation is automatically synchronized as long as the high-speed scan setting is an integral multiple or integral fraction of the transmission cycle setting. It is not necessary to turn the power supply OFF and ON again. If the high-speed scan setting is not an integral multiple or integral fraction of the transmission cycle setting, operation will not be synchronized, and an alarm will occur for the axis, and an I/O error will occur for the I/O station.

Important

If asynchronous operation results from changing the transmission cycle, set the high-speed scan cycle to an integral multiple or integral fraction of the MECHATROLINK transmission cycle, save the setting to flash memory, and then turn the power supply OFF and ON again.

Changing High-speed Scan Cycle

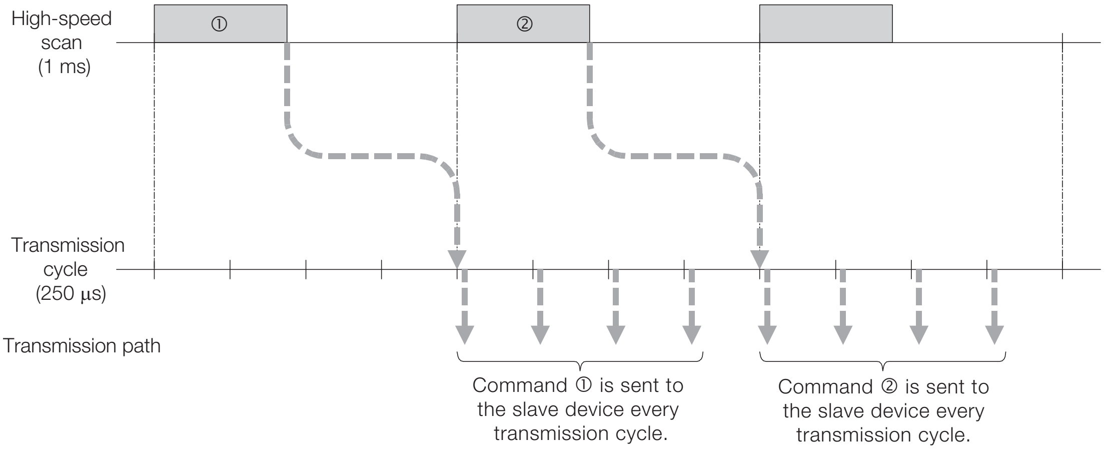
When the high-speed scan cycle is changed, MECHATROLINK communications with all slave stations connected to the SVC Function Module are reset. If the high-speed scan setting is an integral multiple or integral fraction of the MECHATROLINK transmission cycle, operation is automatically synchronized when communications are restored.

Important

1. When you change the high-speed scan cycle, do so either with the CPU stopped or when motion commands are not being executed. Otherwise, application operations may be affected.
2. When the high-speed scan cycle setting is changed, MECHATROLINK communications are reset, and the following will occur.
    - The axis position information is lost and bit 5 (Zero Point Return/Setting Completed) in IW☐☐☐0C changes to 0 (Zero point return/setting not completed).
    - The software limits will be disabled when bit 5 (Zero Point Return/Setting Completed) in IW☐☐☐0C changes to 0 (Zero point return/setting not completed).

2.6.4 Reference Output Timing

References that are set during the high-speed scan are output on the transmission path in the timing shown in the following figure.



2.6.5 Precautions When Combining with Other Modules

The SVC Function Module and the SVC-01 and SVB-01 Modules operate in synchronization with the high-speed scan of the CPU Function Module. Therefore, the operation of all the Modules will be synchronized.

However, the SVC Function Module and SVC-01 Module have different MECHATROLINK communications methods from the SVB-01 Module. Because of this, even if the references are received in the same scan with the same transmission cycle setting, the timing at which those references are transmitted to slave stations via MECHATROLINK will not coincide even though the same transmission cycle settings are used.

The SVC Function Module minimizes the delay between the time a reference is set and a response is received. Therefore, the timing at which references are transmitted to the slave stations will not coincide even between the SVC Function Module and SVC-01 Module.

Observe the following precautions.

- References that are set in the same scan by the application are transmitted in the same scan to the SVC Function Module and the SVC-01 and SVB-01 Modules. However, a specific difference occurs in the timing in which these references are transmitted to slave stations via MECHATROLINK. Therefore, interpolation operations cannot be performed between the SVC Function Module or SVC-01 Module and the SVB-01 Module.
- Interpolation operations cannot be performed between the SVC Function Module and SVC-01 Module.
- For applications that require synchronicity among more than one Module, either use only SVC-01 Modules or only SVB-01 Modules.

Refer to the following manuals for details on the SVB-01 and SVC-01 Modules.

📖 MP2000 Series Built-in SVB/SVB-01 Motion Module User's Manual (Manual No.: SIEP C880700 33)

📖 MP2000 Series SVC-01 Motion Module User's Manual (Manual No.: SIEP C880700 41)

Parameters for Motion Control

3

This chapter describes motion parameters required for motion control.

3.1 Types of Motion Parameters

Motion parameters are necessary to perform motion control. Motion parameters include fixed parameters, setting parameters, and monitor parameters.

Descriptions of the various types of motion parameters are given in the following table.

Parameters	Overview
Fixed Parameters	These parameters are used to make settings related to the servo system.
Setting Parameters	These parameters are used to set detailed aspects of control references used in motion control.
Monitor Parameters	These parameters are used to monitor the servo system.

Refer to the following section for details on the setting methods for parameters.

☞ *7.3 Setting Motion Parameters* on page 7-19

3.2 Motion Parameter Registers

Motion parameter registers are used to store setting parameters and monitor parameters.

Specific motion parameter register addresses are determined by the circuit number that is used for the Motion Control Function Module and the axis number that is assigned. This section describes the default settings of the motion parameter registers that are allocated to the SVC and SVR Function Modules, and the motion parameter registers that can be used.

Use the following formula to obtain the addresses of the first registers for the motion parameters for each axis.

Circuit Number	First Address of Motion Parameter Registers
1 to 16	I (or O) word 8000 + (Circuit number – 1) × 800 hex + (Axis number – 1) × 80 hex

Note: If two circuits are assigned, the SVC or SVC32 circuit number will never be even.

The following tables list the motion parameter register addresses.

◆ When Two Circuits Are Assigned (Default)

■ Axis Numbers 1 to 8

Circuit Number	Axis Number 1	Axis Number 2	Axis Number 3	Axis Number 4	Axis Number 5	Axis Number 6	Axis Number 7	Axis Number 8
1	8000 to 807F	8080 to 80FF	8100 to 817F	8180 to 81FF	8200 to 827F	8280 to 82FF	8300 to 837F	8380 to 83FF
3	9000 to 907F	9080 to 90FF	9100 to 917F	9180 to 91FF	9200 to 927F	9280 to 92FF	9300 to 937F	9380 to 93FF
5	A000 to A07F	A080 to A0FF	A100 to A17F	A180 to A1FF	A200 to A27F	A280 to A2FF	A300 to A37F	A380 to A3FF
7	B000 to B07F	B080 to B0FF	B100 to B17F	B180 to B1FF	B200 to B27F	B280 to B2FF	B300 to B37F	B380 to B3FF
9	C000 to C07F	C080 to C0FF	C100 to C17F	C180 to C1FF	C200 to C27F	C280 to C2FF	C300 to C37F	C380 to C3FF
11	D000 to D07F	D080 to D0FF	D100 to D17F	D180 to D1FF	D200 to D27F	D280 to D2FF	D300 to D37F	D380 to D3FF
13	E000 to E07F	E080 to E0FF	E100 to E17F	E180 to E1FF	E200 to E27F	E280 to E2FF	E300 to E37F	E380 to E3FF
15	F000 to F07F	F080 to F0FF	F100 to F17F	F180 to F1FF	F200 to F27F	F280 to F2FF	F300 to F37F	F380 to F3FF

■ Axis Numbers 9 to 16

Circuit Number	Axis Number 9	Axis Number 10	Axis Number 11	Axis Number 12	Axis Number 13	Axis Number 14	Axis Number 15	Axis Number 16
1	8400 to 847F	8480 to 84FF	8500 to 857F	8580 to 85FF	8600 to 867F	8680 to 86FF	8700 to 877F	8780 to 87FF
3	9400 to 947F	9480 to 94FF	9500 to 957F	9580 to 95FF	9600 to 967F	9680 to 96FF	9700 to 977F	9780 to 97FF
5	A400 to A47F	A480 to A4FF	A500 to A57F	A580 to A5FF	A600 to A67F	A680 to A6FF	A700 to A77F	A780 to A7FF
7	B400 to B47F	B480 to B4FF	B500 to B57F	B580 to B5FF	B600 to B67F	B680 to B6FF	B700 to B77F	B780 to B7FF
9	C400 to C47F	C480 to C4FF	C500 to C57F	C580 to C5FF	C600 to C67F	C680 to C6FF	C700 to C77F	C780 to C7FF
11	D400 to D47F	D480 to D4FF	D500 to D57F	D580 to D5FF	D600 to D67F	D680 to D6FF	D700 to D77F	D780 to D7FF
13	E400 to E47F	E480 to E4FF	E500 to E57F	E580 to E5FF	E600 to E67F	E680 to E6FF	E700 to E77F	E780 to E7FF
15	F400 to F47F	F480 to F4FF	F500 to F57F	F580 to F5FF	F600 to F67F	F680 to F6FF	F700 to F77F	F780 to F7FF

■ Axis Numbers 17 to 24

Circuit Number	Axis Number 17	Axis Number 18	Axis Number 19	Axis Number 20	Axis Number 21	Axis Number 22	Axis Number 23	Axis Number 24
1	8800 to 887F	8880 to 88FF	8900 to 897F	8980 to 89FF	8A00 to 8A7F	8A80 to 8AFF	8B00 to 8B7F	8B80 to 8BFF
3	9800 to 987F	9880 to 98FF	9900 to 997F	9980 to 99FF	9A00 to 9A7F	9A80 to 9AFF	9B00 to 9B7F	9B80 to 9BFF
5	A800 to A87F	A880 to A8FF	A900 to A97F	A980 to A9FF	AA00 to AA7F	AA80 to AAFF	AB00 to AB7F	AB80 to ABFF
7	B800 to B87F	B880 to B8FF	B900 to B97F	B980 to B9FF	BA00 to BA7F	BA80 to BAFF	BB00 to BB7F	BB80 to BBFF
9	C800 to C87F	C880 to C8FF	C900 to C97F	C980 to C9FF	CA00 to CA7F	CA80 to CAFF	CB00 to CB7F	CB80 to CBFF
11	D800 to D87F	D880 to D8FF	D900 to D97F	D980 to D9FF	DA00 to DA7F	DA80 to DAFF	DB00 to DB7F	DB80 to DBFF
13	E800 to E87F	E880 to E8FF	E900 to E97F	E980 to E9FF	EA00 to EA7F	EA80 to EAFF	EB00 to EB7F	EB80 to EBFF
15	F800 to F87F	F880 to F8FF	F900 to F97F	F980 to F9FF	FA00 to FA7F	FA80 to FAFF	FB00 to FB7F	FB80 to FBFF

■ Axis Numbers 25 to 32

Circuit Number	Axis Number 25	Axis Number 26	Axis Number 27	Axis Number 28	Axis Number 29	Axis Number 30	Axis Number 31	Axis Number 32
1	8C00 to 8C7F	8C80 to 8CFF	8D00 to 8D7F	8D80 to 8DFF	8E00 to 8E7F	8E80 to 8EFF	8F00 to 8F7F	8F80 to 8FFF
3	9C00 to 9C7F	9C80 to 9CFF	9D00 to 9D7F	9D80 to 9DFF	9E00 to 9E7F	9E80 to 9EFF	9F00 to 9F7F	9F80 to 9FFF
5	AC00 to AC7F	AC80 to ACFF	AD00 to AD7F	AD80 to ADFF	AE00 to AE7F	AE80 to AEFF	AF00 to AF7F	AF80 to AFFF
7	BC00 to BC7F	BC80 to BCFF	BD00 to BD7F	BD80 to BDFF	BE00 to BE7F	BE80 to BEFF	BF00 to BF7F	BF80 to BFFF
9	CC00 to CC7F	CC80 to CCFF	CD00 to CD7F	CD80 to CDFF	CE00 to CE7F	CE80 to CEFF	CF00 to CF7F	CF80 to CFFF
11	DC00 to DC7F	DC80 to DCFF	DD00 to DD7F	DD80 to DDFF	DE00 to DE7F	DE80 to DEFF	DF00 to DF7F	DF80 to DFFF
13	EC00 to EC7F	EC80 to ECFF	ED00 to ED7F	ED80 to EDFF	EE00 to EE7F	EE80 to EEFF	EF00 to EF7F	EF80 to EFFF
15	FC00 to FC7F	FC80 to FCFF	FD00 to FD7F	FD80 to FDFF	FE00 to FE7F	FE80 to FEFF	FF00 to FF7F	FF80 to FFFF

◆ When One Circuit Is Assigned

■ Axis Numbers 1 to 8

Circuit Number	Axis Number 1	Axis Number 2	Axis Number 3	Axis Number 4	Axis Number 5	Axis Number 6	Axis Number 7	Axis Number 8
1	8000 to 807F	8080 to 80FF	8100 to 817F	8180 to 81FF	8200 to 827F	8280 to 82FF	8300 to 837F	8380 to 83FF
2	8800 to 887F	8880 to 88FF	8900 to 897F	8980 to 89FF	8A00 to 8A7F	8A80 to 8AFF	8B00 to 8B7F	8B80 to 8BFF
3	9000 to 907F	9080 to 90FF	9100 to 917F	9180 to 91FF	9200 to 927F	9280 to 92FF	9300 to 937F	9380 to 93FF
4	9800 to 987F	9880 to 98FF	9900 to 997F	9980 to 99FF	9A00 to 9A7F	9A80 to 9AFF	9B00 to 9B7F	9B80 to 9BFF
5	A000 to A07F	A080 to A0FF	A100 to A17F	A180 to A1FF	A200 to A27F	A280 to A2FF	A300 to A37F	A380 to A3FF
6	A800 to A87F	A880 to A8FF	A900 to A97F	A980 to A9FF	AA00 to AA7F	AA80 to AAFF	AB00 to AB7F	AB80 to ABFF
7	B000 to B07F	B080 to B0FF	B100 to B17F	B180 to B1FF	B200 to B27F	B280 to B2FF	B300 to B37F	B380 to B3FF
8	B800 to B87F	B880 to B8FF	B900 to B97F	B980 to B9FF	BA00 to BA7F	BA80 to BAFF	BB00 to BB7F	BB80 to BBFF
9	C000 to C07F	C080 to C0FF	C100 to C17F	C180 to C1FF	C200 to C27F	C280 to C2FF	C300 to C37F	C380 to C3FF
10	C800 to C87F	C880 to C8FF	C900 to C97F	C980 to C9FF	CA00 to CA7F	CA80 to CAFF	CB00 to CB7F	CB80 to CBFF
11	D000 to D07F	D080 to D0FF	D100 to D17F	D180 to D1FF	D200 to D27F	D280 to D2FF	D300 to D37F	D380 to D3FF
12	D800 to D87F	D880 to D8FF	D900 to D97F	D980 to D9FF	DA00 to DA7F	DA80 to DAFF	DB00 to DB7F	DB80 to DBFF
13	E000 to E07F	E080 to E0FF	E100 to E17F	E180 to E1FF	E200 to E27F	E280 to E2FF	E300 to E37F	E380 to E3FF
14	E800 to E87F	E880 to E8FF	E900 to E97F	E980 to E9FF	EA00 to EA7F	EA80 to EAFF	EB00 to EB7F	EB80 to EBFF
15	F000 to F07F	F080 to F0FF	F100 to F17F	F180 to F1FF	F200 to F27F	F280 to F2FF	F300 to F37F	F380 to F3FF
16	F800 to F87F	F880 to F8FF	F900 to F97F	F980 to F9FF	FA00 to FA7F	FA80 to FAFF	FB00 to FB7F	FB80 to FBFF

■ Axis Numbers 9 to 16

Circuit Number	Axis Number 9	Axis Number 10	Axis Number 11	Axis Number 12	Axis Number 13	Axis Number 14	Axis Number 15	Axis Number 16
1	8400 to 847F	8480 to 84FF	8500 to 857F	8580 to 85FF	8600 to 867F	8680 to 86FF	8700 to 877F	8780 to 87FF
2	8C00 to 8C7F	8C80 to 8CFF	8D00 to 8D7F	8D80 to 8DFF	8E00 to 8E7F	8E80 to 8EFF	8F00 to 8F7F	8F80 to 8FFF
3	9400 to 947F	9480 to 94FF	9500 to 957F	9580 to 95FF	9600 to 967F	9680 to 96FF	9700 to 977F	9780 to 97FF
4	9C00 to 9C7F	9C80 to 9CFF	9D00 to 9D7F	9D80 to 9DFF	9E00 to 9E7F	9E80 to 9EFF	9F00 to 9F7F	9F80 to 9FFF
5	A400 to A47F	A480 to A4FF	A500 to A57F	A580 to A5FF	A600 to A67F	A680 to A6FF	A700 to A77F	A780 to A7FF
6	AC00 to AC7F	AC80 to ACFF	AD00 to AD7F	AD80 to ADFF	AE00 to AE7F	AE80 to AEFF	AF00 to AF7F	AF80 to AFFF
7	B400 to B47F	B480 to B4FF	B500 to B57F	B580 to B5FF	B600 to B67F	B680 to B6FF	B700 to B77F	B780 to B7FF
8	BC00 to BC7F	BC80 to BCFF	BD00 to BD7F	BD80 to BDFF	BE00 to BE7F	BE80 to BEFF	BF00 to BF7F	BF80 to BFFF
9	C400 to C47F	C480 to C4FF	C500 to C57F	C580 to C5FF	C600 to C67F	C680 to C6FF	C700 to C77F	C780 to C7FF
10	CC00 to CC7F	CC80 to CCFF	CD00 to CD7F	CD80 to CDFF	CE00 to CE7F	CE80 to CEFF	CF00 to CF7F	CF80 to CFFF
11	D400 to D47F	D480 to D4FF	D500 to D57F	D580 to D5FF	D600 to D67F	D680 to D6FF	D700 to D77F	D780 to D7FF
12	DC00 to DC7F	DC80 to DCFF	DD00 to DD7F	DD80 to DDFF	DE00 to DE7F	DE80 to DEFF	DF00 to DF7F	DF80 to DFFF
13	E400 to E47F	E480 to E4FF	E500 to E57F	E580 to E5FF	E600 to E67F	E680 to E6FF	E700 to E77F	E780 to E7FF
14	EC00 to EC7F	EC80 to ECFF	ED00 to ED7F	ED80 to EDFF	EE00 to EE7F	EE80 to EEFF	EF00 to EF7F	EF80 to EFFF
15	F400 to F47F	F480 to F4FF	F500 to F57F	F580 to F5FF	F600 to F67F	F680 to F6FF	F700 to F77F	F780 to F7FF
16	FC00 to FC7F	FC80 to FCFF	FD00 to FD7F	FD80 to FDFF	FE00 to FE7F	FE80 to FEFF	FF00 to FF7F	FF80 to FFFF

3.3 Motion Parameter Tables

This section provides tables of the motion parameters.

3.3.1 Fixed Parameter Table

Fixed parameters are used to make settings related to the servo system. The following table lists the fixed parameters.

No.	Name	Description	SVC Function Module	SVR Function Module	Reference Page
0	Operation Mode Selection	0: Normal Operation Mode	✓	✓	page 3-27
		1: Unused Axis (Axis unused)	✓	✓	
		2: Simulation Mode	✓	–	
		3: SERVOPACK Transmission Reference Mode	✓	–	
		4 and 5: Reserved.	–	–	
1	Function Selection Flags 1	Bit 0: Axis Selection[*1] 0: Finite-length axis 1: Infinite-length axis	✓	✓	page 3-28
		Bit 1: Enable Positive Software Limit (Soft limit (positive direction) enable/disable) 0: Disabled, 1: Enabled	✓	–	
		Bit 2: Enable Negative Software Limit (Soft limit (negative direction) enable/disable) 0: Disabled, 1: Enabled	✓	–	
		Bit 3: Enable Positive Overtravel (Overtravel positive direction enable/disable) 0: Disabled, 1: Enabled	✓	–	
		Bit 4: Enable Negative Overtravel (Overtravel negative direction enable/disable) 0: Disabled, 1: Enabled	✓	–	
		Bits 5 to 7: Reserved.	–	–	
		Bit 8: Interpolation Segment Distribution Processing 0: Enabled, 1: Disabled	✓	–	
		Bit 9: Simple Absolute Infinite Axis Position Management[*1] (Simple ABS rotary Pos. mode) 0: Disabled, 1: Enabled	✓	–	
		Bit A: SERVOPACK Parameter Auto-Write (User constants self-writing function) 0: Enabled, 1: Disabled	✓	–	
		Bit B: User-specified SERVOPACK Parameter Auto-Write (User select User constants self-writing function) 0: Disabled, 1: Enabled	✓	–	
		Bit C: Software Limit Parameter Selection 0: Fixed parameter 1: Setting parameter	✓	–	
		Bit D: Torque Base Unit of SERVOPACK 0: Set by user, 1: Set by system	✓	–	
		Bits E and F: Reserved.	–	–	

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No.	Name	Description	SVC Function Module	SVR Function Module	Reference Page
2	Function Selection Flags 2	Bit 0: Mask Communications Error Detection (Communication abnormality detection mask) 0: Disabled, 1: Enabled	✓	–	page 3-30
		Bit 1: Mask Watchdog Error Detection (WDT abnormality detection mask) 0: Disabled, 1: Enabled	✓	–	
		Bits 2 to 4: Reserved.	–	–	
		Bit 5: Finite-length Multiturn Limit Setting Disagreement Detection Mask (Multiturn Limit Setting Mismatch Detection Mask) 0: Disabled, 1: Enabled	✓	–	
		Bits 6 to F: Reserved.	–	–	
3	–	Reserved.	–	–	–
4	Reference Unit Selection*2	0: Pulses 1: mm 2: Degrees 3: Inches 4: µm	✓	✓	page 3-31
5	Number of Digits Below Decimal Point	1 = 1 digit	✓	✓	page 3-31
6	Travel Distance per Machine Rotation (Rotary Motor)	1 = 1 reference unit	✓	✓	page 3-32
	Linear Scale Pitch (Linear Motor)	1 = 1 reference unit	✓	✓	page 3-32
8	Servomotor Gear Ratio Term*3	1 = 1 revolution	✓	✓	page 3-32
9	Machine Gear Ratio Term*3	1 = 1 revolution	✓	✓	
10	Infinite-length Axis Reset Position (POSMAX)*3	1 = 1 reference unit	✓	✓	page 3-32
12	Positive Software Limit	1 = 1 reference unit	✓	–	page 3-33
14	Negative Software Limit	1 = 1 reference unit	✓	–	page 3-33
16 to 28	–	Reserved.	–	–	–
29	Motor Type Selection	0: Rotary motor 1: Linear motor	✓	✓	page 3-33
30	Encoder Selection	0: Incremental encoder 1: Absolute encoder 2: Absolute encoder used as incremental encoder (Absolute encoder (Incremental encoder is used)) 3: Reserved.	✓	–	page 3-33
31 to 33	–	Reserved.	–	–	–
34	Rated Motor Speed (Rotary Motor)	1 = 1 min^{-1}	✓	✓	page 3-34
	Rated Speed (Linear Motor)	1 = 0.1 m/s	✓	✓	page 3-34

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No.	Name	Description	SVC Function Module	SVR Function Module	Reference Page
36	Number of Pulses Per Motor Rotation (Rotary Motor)	1 = 1 pulse/rev	✓	✓	page 3-34
	Number of Pulses Per Linear Scale Pitch (Linear Motor)	1 = 1 pulse/scale pitch	✓	✓	page 3-34
38	Maximum Number of Absolute Encoder Rotations*3*4	1 = 1 revolution	✓	–	page 3-35
40 to 41	–	Reserved.	–	–	–
42	Feedback Speed Movement Averaging Time Constant	1 = 1 ms	✓	✓	page 3-35
43	–	Reserved.	–	–	–
44	User-specified SERVOPACK Parameter Number	The SERVOPACK parameter number to apply automatically.	✓	–	page 3-35
45	User-specified SERVOPACK Parameter Size	The data size of the above SERVOPACK parameter. 1 = 1 W	✓	–	page 3-35

*1. Always set this bit to 0 for linear motors.

*2. For linear motors, you can use 0 (pulses), 1 (mm), or 4 (μm). If 2 (degrees) or 3 (inches) is selected, the unit is converted to mm.

*3. This parameter is not valid for linear motors.

*4. Set this parameter to 0 when a direct-drive motor is used.

3.3.2 Setting Parameter Table

These parameters are used to set detailed aspects of control references used in motion control. The following table lists the setting parameters.

Information The boxes (□□□) in “OW□□□00” are determined by the circuit number and the axis number. Refer to the following section for details on register addresses.
☞ *3.2 Motion Parameter Registers* on page 3-3

Register Address	Name	Description	SVC Function Module	SVR Function Module	Reference Page
OW□□□00	Run Command Settings	Bit 0: Servo ON 0: OFF, 1: ON	✓	✓	page 3-36
		Bit 1: Machine lock 0: Machine lock mode released 1: Machine lock mode	✓	–	
		Bits 2 and 3: Reserved.	–	–	
		Bit 4: Latch Detection Request (Latch detection demand) 0: OFF, 1: ON	✓	–	
		Bit 5: Reserved.	–	–	
		Bit 6: Number of POSMAX Turns Preset Request[*1] (POSMAX turn number presetting demand) 0: OFF, 1: ON	✓	✓	
		Bit 7: Absolute Infinite-length Position Information Load Request[*1] (Request ABS rotary pos. load) 0: OFF, 1: ON	✓	–	
		Bit 8: Positive External Torque/Force Limit Input (Forward outside limiting torque/thrust input) 0: OFF, 1: ON	✓	–	
		Bit 9: Negative External Torque/Force Limit Input (Reverse outside limiting torque/thrust input) 0: OFF, 1: ON	✓	–	
		Bit A: Reserved.	–	–	
		Bit B: Reset Integration (Integration reset) 0: OFF, 1: ON	✓	–	
		Bit C: Reset Network (Network reset) 0: OFF, 1: ON	✓	–	
		Bit D: Latch Completed Status Clear Request (Latch completion status clear request) 0: OFF, 1: ON	✓	–	
		Bit E: Reset Communications (Communication reset) 0: OFF, 1: ON	✓	–	
		Bit F: Clear Alarm (Alarm clear) 0: OFF, 1: ON	✓	✓	

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Register Address	Name	Description	SVC Function Module	SVR Function Module	Reference Page
OW□□□01	Mode Settings 1	Bit 0: Excessive Deviation Error Level Setting 0: Alarm, 1: Warning	✓	–	page 3-39
		Bits 1 and 2: Reserved.	–	–	
		Bit 3: Speed Loop P/PI Switch 0: PI control, 1: P control	✓	–	
		Bit 4: Switch Gain (Gain switch) 0: OFF, 1: ON	✓	–	
		Bit 5: Switch Gain 2 0: OFF, 1: ON	✓	–	
		Bits 6 to F: Reserved.	–	–	
OW□□□02	Mode Settings 2	Bits 0 to 7: Reserved.	–	–	page 3-40
		Bits 8 to F: Stop Mode Selection 0: Stop according to the Linear Deceleration Rate/Deceleration Time Constant parameter (Decelerate to a stop according to the linear deceleration time constant). 1: Stop immediately. (Stop reference output.)	✓	–	
OW□□□03	Function Settings 1	Bits 0 to 3: Speed Unit Selection 0: Reference units/s (Reference unit/sec) 1: 10^n reference units/min 2: Percentage of rated speed (1 = 0.01%) 3: Percentage of rated speed (1 = 0.0001%)	✓	✓	page 3-40
		Bits 4 to 7: Acceleration/Deceleration Rate Unit Selection 0: Reference units/s^2 1: ms	✓	✓	
		Bits 8 to B: Filter Type Selection 0: No filter (Filter none) 1: Exponential acceleration/deceleration filter 2: Moving average filter	✓	✓	
		Bits C to F: Torque Unit Selection 0: Percentage of rated torque (1 = 0.01%) 1: Percentage of rated torque (1 = 0.0001%)	✓	✓	
OW□□□04	Function Settings 2	Bits 0 to 3: Latch Detection Signal Selection 0: – 1: – 2: Phase-C pulse 3: /EXT1 4: /EXT2 5: /EXT3	✓	–	page 3-41
		Bits 4 to 7: External Positioning Signal Setting 0: – 1: – 2: Phase-C pulse 3: /EXT1 4: /EXT2 5: /EXT3	✓	–	
		Bits 8 to F: Reserved.	–	–	

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Register Address	Name	Description	SVC Function Module	SVR Function Module	Reference Page
OW□□□05	Function Settings 3	Bit 0: Reserved.	–	–	page 3-41
		Bit 1: Disable Phase Reference Calculation 0: Enabled, 1: Disabled	✓	–	
		Bit 2: External Positioning Final Travel Distance Write Selection 0: Automatically apply 1: Do not automatically apply	✓	–	
		Bits 3 to A: Reserved.	–	–	
		Bit B: Zero Point Return Input Signal 0: OFF, 1: ON	✓	–	
		Bits C to F: Reserved.	–	–	
OW□□□06	M-III Vendor-specific Servo Command Output Signal	This parameter is used as a vendor-specific output area.	✓	–	page 3-42
OW□□□07	–	Reserved.	–	–	–

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Register Address	Name	Description	SVC Function Module	SVR Function Module	Reference Page
OW□□□08	Motion Commands	0: NOP (No Operation) (No command)	✓	✓	page 3-43
		1: POSING (Positioning)	✓	✓	
		2: EX_POSING (External Positioning)	✓	✓	
		3: ZRET (Zero Point Return)	✓	✓	
		4: INTERPOLATE (Interpolation)	✓	✓	
		5: Reserved.	–	–	
		6: LATCH (Latch) (Interpolation mode with latch input)	✓	✓	
		7: FEED (Jog) (Jog mode)	✓	✓	
		8: STEP (STEP Operation) (Relative position mode)	✓	✓	
		9: ZSET (Set Zero Point)	✓	✓	
		10: ACC (Change Acceleration Time)	✓	–	
		11: DCC (Change Deceleration Time)	✓	–	
		12: SCC (Change Filter Time Constant)	✓	–	
		13: CHG_FILTER (Change Filter Type)	✓	–	
		14: KVS (Change Speed Loop Gain)	✓	–	
		15: KPS (Change Position Loop Gain)	✓	–	
		16: KFS (Change Feedforward)	✓	–	
		17: PRM_RD (Read SERVOPACK Parameter) (Read user constant)	✓	–	
		18: PRM_WR (Write SERVOPACK Parameter) (Write user constant)	✓	–	
		19: ALM_MON (Monitor Alarms) (Alarm monitor)	✓	–	
		20: ALM_HIST (Monitor Alarm History) (Alarm history monitor)	✓	–	
		21: ALMHIST_CLR (Clear Alarm History)	✓	–	
		22: ABS_RST (Reset Absolute Encoder)	✓	–	
		23: VELO (Issue Speed Reference) (Speed reference)	✓	✓	
		24: TRQ (Issue Torque/Force Reference) (Torque/Thrust reference)	✓	✓	
		25: PHASE (Issue Phase Reference) (Phase reference)	✓	✓	
		26: KIS (Change Position Loop Integral Time Constant)	✓	–	
		27: PPRM_WR (Write Non-volatile Parameter) (Stored parameter write)	✓	–	
		28 to 33: Reserved.	–	–	
		34: EX_FEED (Jog with External Positioning) (Jog mode with external positioning)	✓	–	
		35: MEM_RD (Read Memory)	✓	–	
		36: MEM_WR (Write Memory)	✓	–	
		37: PMEM_RD (Read Non-volatile Memory)	✓	–	
		38: PMEM_WR (Write Non-volatile Memory)	✓	–	
		39: MLTTRN_SET (Multiturn Limit Setting)	✓	–	

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Register Address	Name	Description	SVC Function Module	SVR Function Module	Reference Page
OW☐☐☐09	Motion Command Control Flags	Bit 0: Hold Command (Holds a command) 0: OFF, 1: ON	✓	✓	page 3-44
		Bit 1: Cancel Command (Interrupt a command) 0: OFF, 1: ON	✓	✓	
		Bit 2: Travel Direction (Moving direction (JOG/STEP)) 0: Forward, 1: Reverse	✓	✓	
		Bit 3: Zero Point Return Direction Selection 0: Reverse, 1: Forward	✓	–	
		Bit 4: Latch Zone Enable (Latch zone effective selection) 0: Disabled, 1: Enabled	✓	–	
		Bit 5: Position Reference Type 0: Incremental value addition method (Incremental value add method) 1: Absolute value specification method (Absolute value set method)	✓	✓	
		Bit 6: Electric Cam Phase Compensation Type (Phase Compensation Type) 0: Incremental value addition method (Incremental value add method) 1: Absolute value specification method (Absolute value set method)	✓	–	
		Bit 7: Reserved.	–	–	
		Bit 8: SERVOPACK Parameter Access Selection (Access target servo driver user constant) 0: Vendor-specific parameters 1: Common parameters	✓	–	
		Bits 9 to F: Reserved.	–	–	
OW☐☐☐0A	Motion Subcommands	0: NOP (No Operation)	✓	✓	page 3-45
		1: PRM_RD (Read SERVOPACK Parameter) (Read user constant)	✓	–	
		2: PRM_WR (Write SERVOPACK Parameter) (Write user constant)	✓	–	
		3: INF_RD (Read Device Information)	✓	–	
		4: SMON (Monitor Status)	✓	–	
		5: FIXPRM_RD (Read Fixed Parameter)	✓	✓	
		6: FIXPRM_CHG (Change Fixed Parameter) (Write fixed parameter)	✓	–	
OW☐☐☐0B	–	Reserved.	–	–	–
OL☐☐☐0C	Torque/Force Reference Setting or Torque Feedforward Compensation	The unit is set in bits C to F (Torque Unit Selection) of OW☐☐☐03.	✓	✓	page 3-46
OW☐☐☐0E	Speed Limit for Torque/Force Reference	1 = 0.01% (percentage of rated speed)	✓	–	page 3-46
OW☐☐☐0F	–	Reserved.	–	–	–

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Register Address	Name	Description	SVC Function Module	SVR Function Module	Reference Page
OL□□□10	Speed Reference Setting	The unit is set in bits 0 to 3 (Speed Unit Selection) of OW□□□03.	✓	✓	page 3-47
OW□□□12	Speed Limit	1 = 0.01% (percentage of rated motor speed (rotary motor) or rated speed (linear motor))	✓	–	page 3-47
OW□□□13	–	Reserved.	–	–	–
OL□□□14	Torque/Force Limit	The unit is set in bits C to F (Torque Unit Selection) of OW□□□03.	✓	–	page 3-48
OL□□□16	Second Speed Compensation	The unit is set in bits 0 to 3 (Speed Unit Selection) of OW□□□03.	✓	✓	page 3-48
OW□□□18	Override	1 = 0.01%	✓	–	page 3-49
OW□□□19 to OW□□□1B	–	Reserved.	–	–	–
OL□□□1C	Position Reference Setting	1 = 1 reference unit	✓	✓	page 3-49
OL□□□1E	Positioning Completion Width	1 = 1 reference unit	✓	–	page 3-49
OL□□□20	NEAR Signal Output Width	1 = 1 reference unit	✓	–	page 3-50
OL□□□22	Excessive Deviation Detection Value	1 = 1 reference unit	✓	–	page 3-51
OL□□□24	–	Reserved.	–	–	–
OW□□□26	Positioning Completion Check Time	1 = 1 ms	✓	–	page 3-51
OW□□□27	–	Reserved.	–	–	–
OL□□□28	Phase Compensation Setting	1 = 1 reference unit	✓	–	page 3-52
OL□□□2A	Latch Zone Lower Limit Setting	1 = 1 reference unit	✓	–	page 3-52
OL□□□2C	Latch Zone Upper Limit Setting	1 = 1 reference unit	✓	–	
OW□□□2E	Position Loop Gain	1 = 0.1 /s	✓	–	page 3-54
OW□□□2F	Speed Loop Gain	1 = 1 Hz	✓	–	page 3-54
OW□□□30	Speed Feedforward Compensation	1 = 0.01% (percentage of distribution segment)	✓	–	page 3-54
OW□□□31	Speed Compensation	1 = 0.01% (percentage of rated speed)	✓	✓	page 3-55
OW□□□32	Position Loop Integral Time Constant	1 = 1 ms	✓	–	page 3-55
OW□□□33	–	Reserved.	–	–	–
OW□□□34	Speed Loop Integral Time Constant	1 = 0.01 ms	✓	–	page 3-55
OW□□□35	–	Reserved.	–	–	–

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Register Address	Name	Description	SVC Function Module	SVR Function Module	Reference Page
OL□□□36	Linear Acceleration Rate/Acceleration Time Constant	The unit is set in bits 4 to 7 (Acceleration/Deceleration Rate Unit Selection) of OW□□□03.	✓	✓	page 3-56
OL□□□38	Linear Deceleration Rate/ Deceleration Time Constant	The unit is set in bits 4 to 7 (Acceleration/Deceleration Rate Unit Selection) of OW□□□03.	✓	✓	page 3-56
OW□□□3A	Filter Time Constant	1 = 0.1 ms	✓	✓	page 3-57
OW□□□3B	Bias Speed for Indexed Deceleration/Acceleration Filter	The unit is set in bits 0 to 3 (Speed Unit Selection) of OW□□□03.	–	✓	page 3-58
OW□□□3C	Zero Point Return Method	0: DEC1 + C pulse	✓	–	page 3-58
		1: ZERO signal	✓	–	
		2: DEC1 + ZERO signal	✓	–	
		3: C pulse	✓	–	
		4 to 10: Reserved.	–	–	
		11: C pulse only	✓	–	
		12: P-OT + C pulse	✓	–	
		13: P-OT only	✓	–	
		14: HOME LS + C pulse	✓	–	
		15: HOME only	✓	–	
		16: N-OT + C pulse	✓	–	
		17: N-OT only	✓	–	
		18: INPUT + C pulse	✓	–	
		19: INPUT only	✓	–	
OW□□□3D	Zero Point Position Output Width	1 = 1 reference unit	✓	✓	page 3-59
OL□□□3E	Approach Speed	The unit is set in bits 0 to 3 (Speed Unit Selection) of OW□□□03.	✓	–	page 3-59
OL□□□40	Creep Speed	The unit is set in bits 0 to 3 (Speed Unit Selection) of OW□□□03.	✓	–	page 3-59
OL□□□42	Zero Point Return Travel Distance	1 = 1 reference unit	✓	–	page 3-59
OL□□□44	STEP Travel Distance	1 = 1 reference unit	✓	✓	page 3-60
OL□□□46	External Positioning Final Travel Distance	1 = 1 reference unit	✓	–	page 3-61
OL□□□48	Zero Point Position Offset in Machine Coordinate System	1 = 1 reference unit	✓	✓	page 3-61
OL□□□4A	Working Coordinate System Offset	1 = 1 reference unit	✓	✓	page 3-61
OL□□□4C[*2]	Number of POSMAX Turns Preset Data	1 = 1 revolution	✓	✓	page 3-62

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Register Address	Name	Description	SVC Function Module	SVR Function Module	Reference Page
OW□□□4E	SERVOPACK User Monitor Setting	Bits 0 to 3: Monitor 1 (Cannot be set.) Bits 4 to 7: Monitor 2 Bits 8 to B: Monitor 3 (Cannot be set.) Bits C to F: Monitor 4	✓	–	page 3-62
OW□□□4F	SERVOPACK Alarm Monitor Number	Sets the number of the alarm to monitor.	✓	–	page 3-63
OW□□□50	SERVOPACK Parameter Number	Sets the SERVOPACK parameter number.	✓	–	page 3-63
OW□□□51	SERVOPACK Parameter Size	Sets the size of the SERVOPACK parameter in words.	✓	–	page 3-63
OL□□□52	SERVOPACK Parameter Set Value	Sets the set value for the SERVOPACK parameter.	✓	–	page 3-64
OW□□□54	Auxiliary SERVOPACK Parameter Number	Sets the SERVOPACK parameter number.	✓	–	page 3-64
OW□□□55	Auxiliary SERVOPACK Parameter Size	Sets the size of the SERVOPACK parameter in words.	✓	–	page 3-64
OL□□□56	Auxiliary SERVOPACK Parameter Set Value	Sets the set value for the SERVOPACK parameter.	✓	–	page 3-64
OL□□□58	Address Setting	Sets the target address for the MEM_RD, MEM_WR, PMEM_RD, and PMEM_WR motion commands.	✓	–	page 3-65
OW□□□5A	–	Reserved.	–	–	–
OW□□□5B	Device Information Selection Code	00 hex: Disabled 01 hex: Vendor ID code 02 hex: Device code 03 hex: Device version 04 hex: Device information file version 05 hex: Serial number	✓	–	page 3-65
OW□□□5C	Fixed Parameter Number	Sets the number of the fixed parameter to read with the FIXPRM_RD motion subcommand.	✓	✓	page 3-65
OW□□□5D	–	Reserved.	–	–	–
OL□□□5E[*3]	Power OFF Encoder Position (Encoder position when power is off) (Lower 2 Words)	1 = 1 pulse	✓	–	page 3-66
OL□□□60[*3]	Power OFF Encoder Position (Encoder position when power is off) (Upper 2 Words)	1 = 1 pulse	✓	–	
OL□□□62[*3]	Power OFF Pulse Position (Pulse position when power is off) (Lower 2 Words)	1 = 1 pulse	✓	–	

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Register Address	Name	Description	SVC Function Module	SVR Function Module	Reference Page
OL□□□64[*3]	Power OFF Pulse Position (Pulse position when power is off) (Upper 2 Words)	1 = 1 pulse	✓	–	page 3-66
OL□□□66	Positive Software Limit	1 = 1 reference unit	✓	–	page 3-66
OL□□□68	Negative Software Limit	1 = 1 reference unit	✓	–	page 3-67
OL□□□6A	–	Reserved.	–	–	–
OL□□□6C	–	Reserved.	–	–	–
OL□□□6E	–	Reserved.	–	–	–
OL□□□70	User-specified SERVOPACK Parameter Set Value	Enter the value to set for the SERVOPACK parameter that is set with fixed parameter No. 44.	✓	–	page 3-67
OW□□□68 to OW□□□7F[*4]	Command Buffers for SERVOPACK Transmission Reference Mode	This area is used for command data when MECHATROLINK Servo commands are specified directly.	✓	–	page 3-67

*1. Always set this bit to 0 for linear motors.
*2. This parameter is not valid for linear motors.
*3. Do not set this parameter for linear motors.
*4. These parameters are used in SERVOPACK Transmission Reference Mode only.

3.3.3 Monitor Parameter Table

These parameters are used to monitor the servo system. The following table lists the monitor parameters.

Information The boxes (□□□) in "IW□□□00" are determined by the circuit number and the axis number. Refer to the following section for details on register addresses.
☞ *3.2 Motion Parameter Registers* on page 3-3

Register Address	Name	Description	SVC Function Module	SVR Function Module	Reference Page
IW□□□00	RUN Status	Bit 0: Motion Operation Ready 0: Motion operation not ready 1: Motion operation ready	✓	✓	page 3-68
		Bit 1: Running with Servo ON (Running (At servo on)) 0: Stopped, 1: Running with Servo ON	✓	✓	
		Bit 2: System Busy 0: System not busy, 1: System busy	✓	–	
		Bit 3: Servo Ready 0: Servo not ready, 1: Servo ready	✓	–	
		Bit 4: Latch Mode 0: Latch detection request not received 1: Latch detection request received	✓	–	
		Bits 5 to F: Reserved.	–	–	

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Register Address	Name	Description	SVC Function Module	SVR Function Module	Reference Page
IW□□□01	Out-of-range Parameter Number	Setting parameter: 0 and higher Fixed parameter: 1000 and higher	✓	✓	page 3-69
IL□□□02	Warnings	Bit 0: Excessive Deviation 0: In normal deviation range 1: Excessive deviation detected	✓	–	page 3-69
		Bit 1: Setting Parameter Error (Set parameter error) 0: In setting range 1: Outside setting range	✓	✓	
		Bit 2: Fixed Parameter Error 0: In setting range 1: Outside setting range	✓	✓	
		Bit 3: Servo Driver Error 0: No warning, 1: Warning	✓	–	
		Bit 4: Motion Command Setting Error (Motion command set error) 0: No command setting error 1: Command setting error	✓	✓	
		Bit 5: Reserved.	–	–	
		Bit 6: Positive Overtravel (Positive direction overtravel) 0: No positive overtravel 1: Positive overtravel occurred	✓	–	
		Bit 7: Negative Overtravel 0: No negative overtravel 1: Negative overtravel occurred	✓	–	
		Bit 8: Servo ON Incomplete 0: Servo ON, 1: Servo ON incomplete	✓	–	
		Bit 9: SERVOPACK Communications Warning 0: Communications normal 1: Communications error detected	✓	–	
		Bit A: SERVOPACK Stop Signal Active 0: There is no stop signal input 1: There is a stop signal input	✓	–	
		Bits B to 1F: Reserved.	–	–	

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Register Address	Name	Description	SVC Function Module	SVR Function Module	Reference Page
IL□□□04 (Continued on next page.)	Alarms	Bit 0: SERVOPACK Error 0: No SERVOPACK alarm 1: SERVOPACK alarm occurred	✓	–	page 3-71
		Bit 1: Positive Overtravel (Positive direction overtravel) 0: No positive overtravel 1: Positive overtravel occurred	✓	–	
		Bit 2: Negative Overtravel (Negative direction overtravel) 0: No negative overtravel 1: Negative overtravel occurred	✓	–	
		Bit 3: Positive Software Limit (Positive direction software limit) 0: Positive software limit not exceeded 1: Positive software limit exceeded	✓	–	
		Bit 4: Negative Software Limit (Negative direction software limit) 0: Negative software limit not exceeded 1: Negative software limit exceeded	✓	–	
		Bit 5: Servo OFF 0: Servo ON, 1: Servo OFF	✓	✓	
		Bit 6: Positioning Time Exceeded (Positioning time over) 0: No timeout, 1: Timeout occurred	✓	–	
		Bit 7: Excessive Positioning Travel Distance (Excessive positioning moving amount) 0: Normal travel distance 1: Excessive travel distance	✓	–	
		Bit 8: Excessive Speed 0: Normal speed, 1: Excessive speed	✓	–	
		Bit 9: Excessive Deviation 0: Normal following deviation 1: Excessive deviation	✓	–	
		Bit A: Filter Type Change Error 0: No change error 1: Change error occurred	✓	–	
		Bit B: Filter Time Constant Change Error 0: No change error 1: Change error occurred	✓	–	
		Bit C: Reserved.	–	–	
		Bit D: Zero Point Unset[*1] (Zero point unsetting) 0: Zero point is set 1: Zero point unset error occurred	✓	–	
		Bits E and F: Reserved.	–	–	

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Register Address	Name	Description	SVC Function Module	SVR Function Module	Reference Page
IL□□□04 (Continued from previous page.)	Alarms	Bit 10: SERVOPACK Synchronized Communications Error (Servo Driver Synch. Comm. error) 0: No synchronized communications error 1: Synchronized communications error occurred	✓	–	page 3-71
		Bit 11: SERVOPACK Communications Error 0: No consecutive synchronized communications errors 1: Consecutive synchronized communications errors occurred	✓	–	
		Bit 12: SERVOPACK Communications Timeout Error 0: SERVOPACK command completed within the specified time 1: SERVOPACK command not completed within the specified time	✓	–	
		Bit 13: Excessive Absolute Encoder Rotations*1 (Excessive ABS encoder rotations) 0: In valid range 1: Outside valid range	✓	–	
		Bits 14 and 15: Reserved.	–	–	
		Bit 16: Scan Setting Error 0: No scan setting error 1: Scan setting error occurred	✓	–	
		Bits 17 to 1B: Reserved.	–	–	
		Bit 1C: Cyclic Communications Initialization Incomplete 0: Initialization completed (default) 1: Initialization not completed	✓	–	
		Bit 1D: Detected SERVOPACK Model Error 0: Match, 1: Mismatch	✓	–	
		Bit 1E: Motor Type Setting Error 0: Match, 1: Mismatch	✓	–	
		Bit 1F: Connected Encoder Model Error 0: Match, 1: Mismatch	✓	–	
IL□□□06	–	Reserved.	–	–	–
IW□□□08	Motion Command Response Code	Same as OW□□□08 (motion commands).	✓	✓	page 3-74

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Register Address	Name	Description	SVC Function Module	SVR Function Module	Reference Page
IW□□□09	Motion Command Status	Bit 0: Command Execution Flag (BUSY) 0: READY (Completed) 1: BUSY (Processing)	✓	✓	page 3-74
		Bit 1: Command Hold Completed (HOLDL) 0: Command hold not completed 1: Command hold completed	✓	✓	
		Bit 2: Reserved.	–	–	
		Bit 3: Command Error End (FAIL) (Command error completed status) 0: Completed normally 1: Completed with an error	✓	✓	
		Bits 4 to 6: Reserved.	–	–	
		Bit 7: Absolute Encoder Reset Completed (ABS_RSTC) 0: Reset not completed 1: Reset completed	✓	–	
		Bit 8: Command Execution Completed (COMPLETE) 0: Normal execution not completed 1: Normal execution completed	✓	✓	
		Bits 9 to F: Reserved.	–	–	
IW□□□0A	Motion Subcommand Response Code	Same as OW□□□0A (Motion Subcommands).	✓	✓	page 3-75
IW□□□0B	Motion Subcommand Status	Bit 0: Command Execution Flag 0: READY (Completed) 1: BUSY (Processing)	✓	✓	page 3-75
		Bits 1 to 2: Reserved.	–	–	
		Bit 3: Command Error End (Command error completed status) 0: Completed normally 1: Completed with an error	✓	✓	
		Bits 4 to 7: Reserved.	–	–	
		Bit 8: Command Execution Completed 0: Normal execution not completed 1: Normal execution completed	✓	✓	
		Bits 9 to F: Reserved.	–	–	

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Register Address	Name	Description	SVC Function Module	SVR Function Module	Reference Page
IW□□□0C	Position Management Status	Bit 0: Distribution Completed (DEN) (Discharging completed) 0: Distributing pulses 1: Distribution completed	✓	✓	page 3-76
		Bit 1: Positioning Completed (POSCOMP) 0: Outside positioning completed range 1: Within positioning completed range	✓	✓	
		Bit 2: Latch Completed (LCOMP) 0: Latch not complete 1: Latch completed	✓	–	
		Bit 3: Near Position (NEAR) 0: Outside near position range 1: Within near position range	✓	✓	
		Bit 4: Zero Point Position (ZERO) 0: Outside zero point position range 1: Within zero point position range	✓	✓	
		Bit 5: Zero Point Return/Setting Completed (ZRNC) (Zero point return [setting] completed) 0: Zero point return/setting not completed 1: Zero point return/setting completed	✓	✓	
		Bit 6: Machine Locked (MLKL) (During machine lock) 0: Machine Lock Mode released 1: Machine locked	✓	–	
		Bit 7: Reserved.	–	–	
		Bit 8: Absolute Infinite-length Position Information Load Completed (ABSLDE)*1 (ABS rotary pos. LOAD complete) 0: Load not complete 1: Load completed	✓	–	
		Bit 9: POSMAX Turn Preset Completed (TPRSE)*1 (POSMAX turn preset complete) 0: Preset not completed 1: Preset completed	✓	✓	
		Bits A to F: Reserved.	–	–	
IW□□□0D	–	Reserved.	–	–	–
IL□□□0E	Machine Coordinate System Target Position (TPOS)	1 = 1 reference unit	✓	✓	page 3-77
IL□□□10	Machine Coordinate System Calculated Position (CPOS)	1 = 1 reference unit	✓	✓	page 3-78
IL□□□12	Machine Coordinate System Reference Position (MPOS)	1 = 1 reference unit	✓	✓	page 3-78
IL□□□14	32-bit DPOS (DPOS)	1 = 1 reference unit	✓	✓	page 3-78

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Register Address	Name	Description	SVC Function Module	SVR Function Module	Reference Page
IL□□□16	Machine Coordinate System Feedback Position (APOS)	1 = 1 reference unit	✓	✓	page 3-79
IL□□□18	Machine Coordinate System Latch Position (LPOS)	1 = 1 reference unit	✓	–	page 3-79
IL□□□1A	Position Deviation (PERR)	1 = 1 reference unit	✓	–	page 3-79
IL□□□1C	Target Position Increment Monitor (PDV) (Target position difference monitor)	1 = 1 reference unit	–	✓	page 3-79
IL□□□1E[*1]	Number of POSMAX Turns	1 = 1 turn	✓	✓	page 3-79
IL□□□20	Speed Reference Output Monitor	pulse/s	✓	–	page 3-80
IL□□□22 to IL□□□27	–	Reserved.	–	–	–
IL□□□28	M-III Servo Command Input Signal Monitor	Reports the signal information that is input.	✓	–	page 3-80
IL□□□2A	M-III Servo Command Status	Reports the Servo command information that is input to MECHATROLINK-III.	✓	–	page 3-80
IW□□□2C	M-III Command Status	Bit 0: Drive Alarm (D_ALM) (Drive Alarm Occurrence) Bit 1: Drive Warning (D_WAR) (Drive Warning Occurrence) Bit 2: Command Ready (CMDRDY) Bit 3: Alarm Clear Execution Completed (ALM_CLR_CMP) (Alarm Clear Execution Completion) Bits 4 and 5: Reserved. Bits 6 and 7: Echo-back of Command ID (RCMD_ID) Bits 8 to B: Command Error (CMD_ALM) Bits C to F: Communication Error (COM-M_ALM)	✓	–	page 3-81
IW□□□2D	SERVOPACK Alarm Code	Reports the alarm code from the SERVOPACK.	✓	–	page 3-82
IW□□□2E	–	Reserved.	–	–	–
IW□□□2F	SERVOPACK User Monitor Information	Bits 0 to 3: Monitor 1 (Cannot be set.) Bits 4 to 7: Monitor 2 Bits 8 to B: Monitor 3 (Cannot be set.) Bits C to F: Monitor 4	✓	–	page 3-82
IL□□□30	SERVOPACK User Monitor 2	Reports the result of the selected monitor item.	✓	–	page 3-82
IL□□□32	–	Reserved.	–	–	–
IL□□□34	SERVOPACK User Monitor 4	Reports the result of the selected monitor item.	✓	–	page 3-83
IW□□□36	SERVOPACK Parameter Number	Reports the number of the target parameter.	✓	–	page 3-83

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Register Address	Name	Description	SVC Function Module	SVR Function Module	Reference Page
IW□□□37	Auxiliary SERVOPACK Parameter Number	Reports the number of the target parameter.	✓	–	page 3-83
IL□□□38	SERVOPACK Parameter Read Data	The data of the SERVOPACK parameter that was read.	✓	–	page 3-83
IL□□□3A	Auxiliary SERVOPACK Parameter Read Data	The data of the SERVOPACK parameter that was read.	✓	–	page 3-83
IW□□□3C to IW□□□3E	–	Reserved.	–	–	–
IW□□□3F	Motor Type	Reports the type of the connected motor. 0: Rotary motor, 1: Linear motor	✓	–	page 3-83
IL□□□40	Feedback Speed	The unit is set in bits 0 to 3 (Speed Unit Selection) of OW□□□03.	✓	✓	page 3-84
IL□□□42	Torque/Force Reference Monitor	The unit is set in bits C to F (Torque Unit Selection) of OW□□□03.	✓	✓	page 3-84
IW□□□44	–	Reserved.	–	–	–
IW□□□45	–	Reserved.	–	–	–
IW□□□46 to IW□□□55	–	Reserved.	–	–	–
IL□□□56	Fixed Parameter Monitor	Stores the execution results of the FIXPRM_RD motion subcommand.	✓	✓	page 3-85
IW□□□58 to IW□□□5A	–	Reserved.	–	–	–
IW□□□5B	Device Information Monitor Code	00 hex: Disabled 01 hex: Vendor ID code 02 hex: Device code 03 hex: Device version 04 hex: Device information file version 05 hex: Serial number	✓	–	page 3-85
IL□□□5C	–	Reserved.	–	–	–
IL□□□5E	Power OFF Encoder Position (Encoder position when power is off) (Lower 2 Words)	1 = 1 pulse	✓	–	page 3-85
IL□□□60	Power OFF Encoder Position (Encoder position when power is off) (Upper 2 Words)	1 = 1 pulse	✓	–	

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Register Address	Name	Description	SVC Function Module	SVR Function Module	Reference Page
IL□□□62	Power OFF Pulse Position (Pulse position when power is off) (Lower 2 Words)	1 = 1 pulse	✓	–	page 3-85
IL□□□64	Power OFF Pulse Position (Pulse position when power is off) (Upper 2 Words)	1 = 1 pulse	✓	–	
IW□□□66 to IW□□□6F	–	Reserved.	–	–	–
IW□□□70 to IW□□□7F	Device Information Monitor Data	Reports the information that was read with the INF_RD subcommand.	✓	–	page 3-86
IW□□□68 to IW□□□7F[*2]	Response Buffers for SERVOPACK Transmission Reference Mode	Stores MECHATROLINK Servo responses.	✓	–	page 3-86

[*1] This bit or parameter is not valid for linear motors.

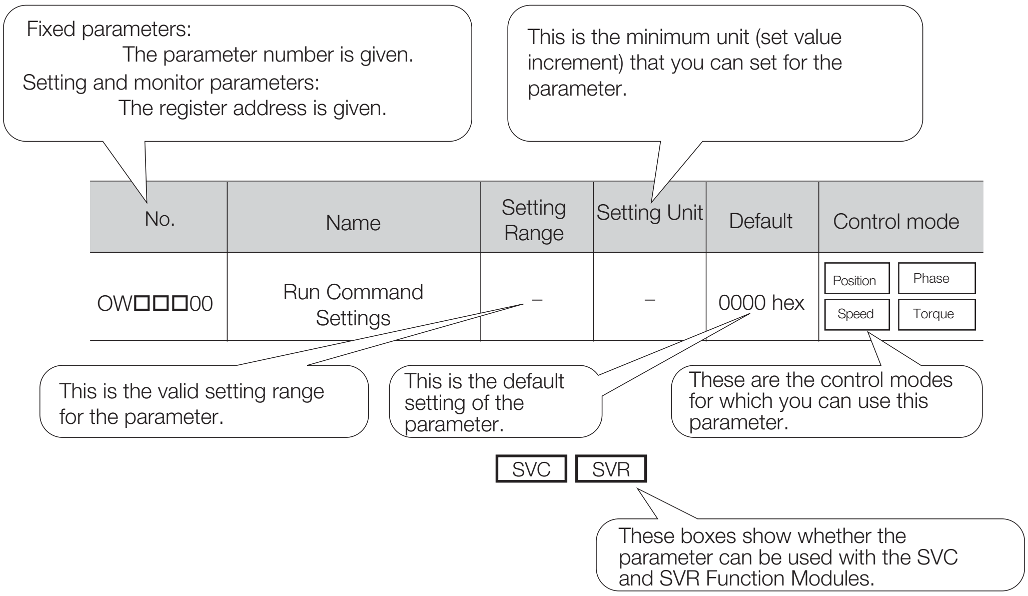
[*2] These parameters are used in SERVOPACK Transmission Reference Mode only.

3.4 Motion Parameter Details

This section provides details on each of the motion parameters (fixed parameters, setting parameters, and monitor parameters).

■ Parameter Descriptions

Parameters are described in the following format:



3.4.1 Fixed Parameter Details

This section provides details on each of the fixed parameters.

Refer to the following section for a list of the fixed parameters.

☞ *3.3.1 Fixed Parameter Table* on page 3-7

Operation Mode Selection

◆ Operation Mode Selection

This parameter specifies how to use the axis.

No.	Name	Setting Range	Setting Unit	Default
0	Operation Mode Selection	0 to 3	–	0

0: Normal Operation Mode (default) SVC SVR

Use this setting to use an axis.

1: Unused Axis SVC SVR

Select this mode when an axis is not used to reduce the processing time.

Setting Precautions

- You cannot control an axis if Unused Axis is selected.
- You cannot update monitor parameters if Unused Axis is selected. If you change an axis from any other operation mode to Unused Axis, the monitor parameters will retain their last status from the other operation mode. The IW□□□00 monitor parameter (RUN Status) will be 0.

2: Simulation Mode SVC

In Simulation Mode, position information is reported in the monitor parameters even if a slave SERVOPACK is not connected.

This mode is used to virtually check the operation of application programs.

3: SERVOPACK Transmission Reference Mode SVC

SERVOPACK Transmission Reference Mode is used to directly control the command-response communications with the slave SERVOPACK from an application.

Setting Precautions

- No processing other than communications processing with the SERVOPACK is performed in this mode. Position control and other processing must be performed in the application.
- Commands to the SERVOPACK are set in the area starting with the OW□□□68 setting parameter and responses are reported in the area starting with the IW□□□68 monitor parameter.

Term

Report
"Report" is used for information that is automatically transferred by the system in the CPU without any action by the user.

Function Selection Flags 1

◆ Function Selection Flags 1

No.	Name	Setting Range	Setting Unit	Default
1	Function Selection Flags 1	–	–	0000 hex

■ Bit 0: Axis Selection SVC SVR

Set whether there is a limit on the movement of the controlled axis.

0: Finite-length axis (default).

This setting specifies a finite-length axis. Software limits can be used.

1: Infinite-length axis.

This setting specifies an infinite-length axis. Software limits cannot be used.
If an infinite-length axis is set, the position information is reset each time the position exceeds the value that is set for fixed parameter No. 10 (Infinite-length Axis Reset Position).

Setting Precautions

Always set this parameter to 0 for linear motors.

■ Bit 1: Enable Positive Software Limit SVC

Enable or disable the software limit in the forward direction.

0: Disabled (default).

1: Enabled.

Setting Precautions

- This setting is ignored if the axis is set as an infinite-length axis.
- Set the software limit in fixed parameter No. 12 (Positive Software Limit).
- The software limit is valid only after bit 5 (Zero Point Return/Setting Completed) in the IW□□□0C monitor parameter changes to 1 (Completed).

Refer to the following section for details on the software limits.

☞ *6.3 Software Limits* on page 6-9

■ Bit 2: Enable Negative Software Limit SVC

Enable or disable the software limit in the reverse direction.

0: Disabled (default).

1: Enabled.

Setting Precautions

- This setting is ignored if the axis is set as an infinite-length axis.
- Set the software limit in fixed parameter No. 14 (Negative Software Limit).
- The software limit is valid only after bit 5 (Zero Point Return/Setting Completed) in the IW□□□0C monitor parameter changes to 1 (Completed).

Refer to the following section for details on the software limits.
☞ *6.3 Software Limits* on page 6-9

■ Bit 3: Enable Positive Overtravel SVC

Enable or disable overtravel detection in the positive direction.

0: Disabled (default).

1: Enabled.

Setting Precautions

- Make sure that this setting agrees with the corresponding setting in the SERVOPACK.
- A warning occurs if a positive overtravel signal is input when this parameter is set to 0 (Disabled).

Refer to the relevant SERVOPACK manual for details on overtravel.

■ Bit 4: Enable Negative Overtravel SVC

Enable or disable overtravel detection in the negative direction.

0: Disabled (default).

1: Enabled.

Setting Precautions

- Make sure that this setting agrees with the corresponding setting in the SERVOPACK.
- A warning occurs if a negative overtravel signal is input when this parameter is set to 0 (Disabled).

Refer to the relevant SERVOPACK manual for details on overtravel.

■ Bit 8: Interpolation Segment Distribution Processing SVC

Enable or disable the function to distribute reference values that were generated in the high-speed scan cycle to reference values for the MECHATROLINK communications cycle when an interpolation command (INTERPOLATE, LATCH, or PHASE) is executed.

0: Enabled (default).

1: Disabled.

Setting Precautions

- Always set this parameter to 0 when an interpolation command is used.

■ Bit 9: Simple Absolute Infinite Axis Position Management SVC

Enable or disable infinite-length axis position control based on the condition that the number of rotations that the encoder counts is an integral multiple of the number of rotations for the reset cycle for the reference unit.

This eliminates the need to save and load absolute infinite-length position management information from a ladder program.

0: Disabled (default).

1: Enabled.

Setting Precautions

- Always set this parameter to 0 for linear motors.
- We recommend that this bit is set to 1 (Enabled) for absolute infinite-length axes. Refer to the following sections for details.
  ☞ *Infinite-length Operation with Simple Absolute Infinite Axis Position Management* on page 5-32

■ Bit A: SERVOPACK Parameter Auto-Write SVC

Enable or disable automatic writing of MP3000 setting parameters to the SERVOPACK parameters when any of the following three triggers occur.

- MECHATROLINK communications are established.
- A setting parameter is modified.
- A motion command is executed.

0: Enabled (default).

1: Disabled.

Refer to the following section for details.
☞ *3.5 Automatically Updated Parameters* on page 3-87

■ Bit B: User-specified SERVOPACK Parameter Auto-Write SVC

Enable or disable writing to the SERVOPACK parameter that is set in fixed parameter No. 44 (User-specified SERVOPACK Parameter Number).

0: Disabled (default).

1: Enabled.

■ Bit C: Software Limit Parameter Selection SVC

Select whether the software limit is set in a fixed parameter or in a setting parameter.

0: Fixed parameter (default).

1: Setting parameter.

Refer to the following section for details on the software limits.
☞ *6.3 Software Limits* on page 6-9

■ Bit D: Torque Base Unit of SERVOPACK SVC

This specifies the method for setting common parameter No. 48 (Torque Base Unit).
This function can be used when a Σ-7C SERVOPACK with version 1.01 or higher and MPE720 with version 7.39 or higher are combined.

0: Set by user (default)
Use this setting to manually set common parameter No. 48 (Torque Base Unit) according to the setting of bits C to F (Torque Unit Selection) in the OW□□03 setting parameter. Refer to the following section for details.
☞ *<Common Parameter No. 48 Setting>* on page 3-84

1: Set by system
You can use this setting only for the following SERVOPACKs with MECHATROLINK-III Communications.
- SGDV-□□□□2□□
- SGD7S-□□□□20□
- SGD7W-□□□□20□

This setting is used only when automatically setting common parameter No. 48 (Torque Base Unit).
The MP3000 will automatically set common parameter No. 48 to -4. Common parameter No. 48 is automatically set at the following times.
- When a MECHATROLINK-III communications connection is established
- When the network (bit C in OW□□00) or communications (bit E in OW□□00) are reset
- When the power supply is turned OFF and ON again after saving the data to flash memory

Function Selection Flags 2

◆ Function Selection Flags 2

No.	Name	Setting Range	Setting Unit	Default
2	Function Selection Flags 2	–	–	0000 hex

■ Bit 0: Mask Communications Error Detection SVC

You can set this parameter to ignore any MECHATROLINK communications errors that are detected in the MP3000.

0: Disabled (default).

1: Enabled.

■ Bit 1: Mask Watchdog Error Detection SVC

You can set this parameter to ignore any MECHATROLINK watchdog timer errors that are detected in the MP3000.

0: Disabled (default).

1: Enabled.

■ Bit 5: Finite-length Multiturn Limit Setting Disagreement Detection Mask SVC

Use this bit to specify whether or not to detect a multiturn limit setting disagreement during finite-length operation.

0: Disabled (default).

1: Enabled.

Reference Unit Selection

◆ Reference Unit Selection SVC SVR

Set the reference unit.

The reference unit is determined by this parameter and fixed parameter No. 5 (Number of Digits Below Decimal Point). Refer to the following section for details on reference units.

☞ *5.1.1 Reference Unit* on page 5-3

No.	Name	Setting Range	Setting Unit	Default
4	Reference Unit Selection	0 to 4	–	0

0: Pulses

1: mm

2: Degrees

3: Inches

4: mm

Setting Precautions

- For linear motors, you can use 0 (pulses), 1 (mm), and 4 (μm). If 2 (degrees) or 3 (inches) is selected, the selected unit is converted to mm.
- If 0 (pulse) is selected, the electronic gear ratio that is set in fixed parameter No. 8 (Servomotor Gear Ratio Term) and fixed parameter No. 9 (Machine Gear Ratio Term) is disabled.

◆ Number of Digits Below Decimal Point SVC SVR

Set the number of digits below the decimal point for reference units.

The minimum reference unit is determined by this parameter and fixed parameter No. 4 (Reference Unit Selection). Refer to the following section for details on reference units.

☞ *5.1.1 Reference Unit* on page 5-3

No.	Name	Setting Range	Setting Unit	Default
5	Number of Digits Below Decimal Point	0 to 5	–	3

Example When Reference Unit Selection is set to mm and Number of Digits Below Decimal Point is set to 3, a reference value of 1 means 0.001 mm.

Setting Precautions

This parameter is not used if fixed parameter No. 4 (Reference Unit Selection) is set to 0 (Pulses).

◆ Travel Distance per Machine Rotation (Rotary Motor) SVC SVR

Specify the amount of travel in the load in reference units for each turn of the machine.

Refer to the following section for details.

☞ *5.1.2 Electronic Gear* on page 5-3

No.	Name	Setting Range	Setting Unit	Default
6	Travel Distance per Machine Rotation	1 to 2^{31}–1	Reference units	10,000

◆ Linear Scale Pitch (Linear Motor) SVC SVR

Set the linear scale pitch that is used for linear motor position detection.

No.	Name	Setting Range	Setting Unit	Default
6	Linear Scale Pitch	1 to 2^{31}–1	Reference units	10,000

Setting Precautions

If fixed parameter No. 4 (Reference Unit Selection) is set to 0 (Pulses), set the scale pitch in μm or nm.

◆ Servomotor Gear Ratio Term and Machine Gear Ratio Term

SVC SVR

Set the gear ratio between the motor and the load.

The following two values are set for a machine configuration in which the load axis turns n times in response to m turns of the motor axis.

- Servomotor gear ratio term = m
- Machine gear ratio term = n

Refer to the following section for details.

☞ *5.1.2 Electronic Gear* on page 5-3

No.	Name	Setting Range	Setting Unit	Default
8	Servomotor Gear Ratio Term	1 to 65,535	revolutions	1
9	Machine Gear Ratio Term	1 to 65,535	revolutions	1

Setting Precautions

- This parameter is not used if fixed parameter No. 4 (Reference Unit Selection) is set to 0 (Pulses).
- This parameter is not valid for linear motors.

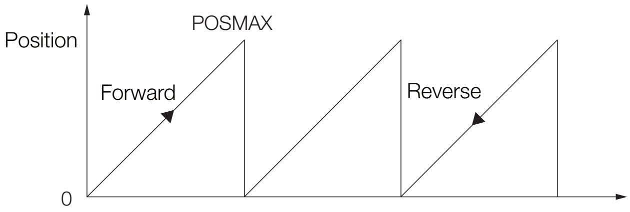
Infinite-length Axis Reset Position

◆ Infinite-length Axis Reset Position (POSMAX) SVC SVR

Set the reset position for an infinite-length axis.

This parameter is valid when bit 0 (Axis Selection) in fixed parameter No. 1 is set to 1 (Infinite-length axis). The position information for infinite-length axes is controlled in the range from 0 to POSMAX.

No.	Name	Setting Range	Setting Unit	Default
10	Infinite-length Axis Reset Position	1 to 2^{31}–1	Reference units	360,000



Software Limits

◆ Positive Software Limit SVC

Set the position to detect the software limit in the forward direction for the MP3000.

No.	Name	Setting Range	Setting Unit	Default
12	Positive Software Limit	-2^{31} to $2^{31}-1$	Reference units	$2^{31}-1$

Setting Precautions

- If an axis attempts to move in the forward direction past this position, a positive software limit alarm occurs and bit 3 in the IL□□□04 monitor parameter changes to 1.
- This parameter is valid when bit 1 (Enable Positive Software Limit) in fixed parameter No. 1 is set to 1 (Enabled).
- The software limit is enabled only after bit 5 (Zero Point Return/Setting Completed) in the IW□□□0C monitor parameter changes to 1 (Completed). Refer to the following section for details.

  ☞ *6.3 Software Limits* on page 6-9

◆ Negative Software Limit SVC

Set the position to detect the software limit in the reverse direction for the MP3000.

No.	Name	Setting Range	Setting Unit	Default
14	Negative Software Limit	-2^{31} to $2^{31}-1$	Reference units	-2^{31}

Setting Precautions

- If an axis attempts to move in the reverse direction past this position, a negative software limit alarm occurs and bit 4 in the IL□□□04 monitor parameter changes to 1.
- This parameter is valid when bit 2 (Enable Negative Software Limit) in fixed parameter No. 1 is set to 1 (Enabled).
- The software limit is enabled only after bit 5 (Zero Point Return/Setting Completed) in the IW□□□0C monitor parameter changes to 1 (Completed). Refer to the following section for details.

  ☞ *6.3 Software Limits* on page 6-9

SERVOPACK Settings

◆ Motor Type Selection SVC

Select the motor type to use.

No.	Name	Setting Range	Setting Unit	Default
29	Motor Type Selection	0, 1	–	0

0: Rotary motor

1: Linear motor

◆ Encoder Selection SVC

Set the encoder type to use.

No.	Name	Setting Range	Setting Unit	Default
30	Encoder Selection	0 to 2	–	0

0: Incremental encoder.

1: Absolute encoder.

2: Absolute encoder used as incremental encoder.

3: Reserved.

Setting Precautions

For linear motors, set the encoder type that matches the linear scale and SERVOPACK settings.

Encoder Settings

◆ Rated Motor Speed (Rotary Motor) SVC SVR

Set the rated motor speed in revolutions per minute.

No.	Name	Setting Range	Setting Unit	Default
34	Rated Motor Speed (Rotary Motor)	1 to 100,000	min^{-1}	3,000

Setting Precautions

Set this parameter based on the specifications of the motor.

◆ Rated Speed (Linear Motor) SVC SVR

Set the rated speed.

No.	Name	Setting Range	Setting Unit	Default
34	Rated Speed (Linear Motor)	1 to 100,000	0.1 m/s, 0.1 mm/s	3,000

Setting Precautions

- Set this parameter according to the specifications of the linear motor.
- When fixed parameter No. 4 (Reference Unit Selection) is set to 0 (Pulses), the setting unit is either 0.1 m/s or 0.1 mm/s.
  Use 0.1 m/s for the rated speed unit when the linear scale pitch is set in μm.
  Use 0.1 mm/s for the rated speed unit when the linear scale pitch is set in nm.
- When fixed parameter No. 4 (Reference Unit Selection) is set to 1 (mm), the setting unit is 0.1 m/s.
- When fixed parameter No. 4 (Reference Unit Selection) is set to 4 (μm), the setting unit is 0.1 mm/s.

Refer to the following section for details on the linear scale.

☞ *5.1.8 Linear Scale Pitch and Rated Speed* on page 5-15

◆ Number of Pulses Per Motor Rotation (Rotary Motor) SVC SVR

Set the number of feedback pulses per motor rotation.

No.	Name	Setting Range	Setting Unit	Default
36	Number of Pulses Per Motor Rotation (Rotary Motor)	1 to $2^{31}-1$	pulse	65,536

Setting Precautions

Set this parameter based on the specifications of the motor. If you are using a 24-bit encoder, refer to the following section and set the number of pulses per motor rotation.

☞ *5.4 Absolute Encoders with 24-Bit Resolution* on page 5-53

Example For a 16-bit encoder, set 2^{16} = 65,536.

◆ Number of Pulses Per Linear Scale Pitch (Linear Motor) SVC SVR

Set the number of pulses that is equivalent to the value that is set for fixed parameter No. 6 (Linear Scale Pitch).

No.	Name	Setting Range	Setting Unit	Default
36	Number of Pulses Per Linear Scale Pitch (Linear Motor)	1 to $2^{31}-1$	pulses/linear scale pitch	65,536

Setting Precautions

Set this parameter according to the specifications of the linear scale.

◆ Maximum Number of Absolute Encoder Rotations SVC

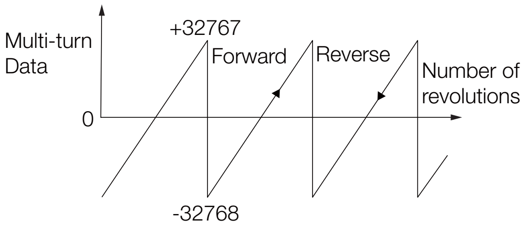
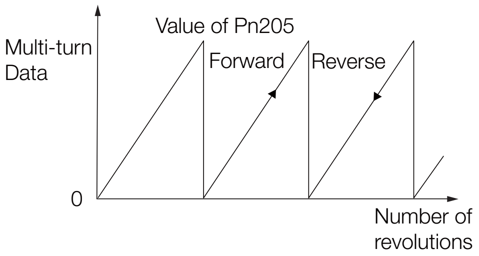
Set the maximum number of rotations that the absolute encoder can manage.

No.	Name	Setting Range	Setting Unit	Default
38	Maximum Number of Absolute Encoder Rotations	0 to $2^{31}-1$	Revolutions	65,534

Setting Precautions

- Set this parameter to match the settings for the encoder.
- Set this parameter to match the value set for the Multiturn Limit SERVOPACK parameter.

Example For infinite-length axes (i.e., when bit 0 in fixed parameter No. 1 is set to 1), set this parameter to any value less than or equal to 65,534 (the same value as Pn205).

Fixed Parameter No. 38 and SERVOPACK Parameter Pn205 = 65,535	Fixed Parameter No. 38 and SERVOPACK Parameter Pn205 ≠ 65,535
	

◆ Feedback Speed Movement Averaging Time Constant SVC SVR

Set the moving average time constant for the feedback speed. The IL□□□40 monitor parameter (Feedback Speed) contains the value that is determined by the time constant in this parameter and the unit-converted difference between feedback positions for each high-speed scan.

No.	Name	Setting Range	Setting Unit	Default
42	Feedback Speed Movement Averaging Time Constant	0 to 32	ms	10

◆ User-specified SERVOPACK Parameter Number SVC

Specify the SERVOPACK parameter number (the □□□ in Pn□□□) that is to be applied automatically.

The value set for the OL□□□70 setting parameter (User-specified SERVOPACK Parameter Set Value) is automatically written to the SERVOPACK parameter that is set in this parameter.

No.	Name	Setting Range	Setting Unit	Default
44	User-specified SERVOPACK Parameter Number	0 to 65,535	0	0

Setting Precautions

This parameter is valid when bit B (User-specified SERVOPACK Parameter Auto-Write) in fixed parameter No. 1 is set to 1 (Enabled).

◆ User-specified SERVOPACK Parameter Size SVC

Set the data size of the SERVOPACK parameter that is specified in fixed parameter No. 44 (User-specified SERVOPACK Parameter Number).

No.	Name	Setting Range	Setting Unit	Default
45	User-specified SERVOPACK Parameter Size	1 or 2	word	1

3.4.2 Setting Parameter Details

This section provides details on each of the setting parameters.

Information
- Refer to the following section for a list of the setting parameters.
  ☞ *3.3.2 Setting Parameter Table* on page 3-10
- The boxes (☐☐☐) in “OW☐☐☐00” are determined by the circuit number and the axis number. Refer to the following section for details on register addresses.
  ☞ *3.2 Motion Parameter Registers* on page 3-3

Run Command Settings

◆ Run Command Settings

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OW☐☐☐00	Run Command Settings	–	–	0000 hex	Position Phase Speed Torque

■ Bit 0: Servo ON SVC SVR

Use this bit to turn the power to the Servomotor ON or OFF.

0: OFF (default).

1: ON.

■ Bit 1: Machine Lock SVC

Use this bit to set the Machine Lock Mode.

0: Machine lock mode released (default).

1: Machine lock mode.

Setting Precautions

- When the machine is locked, the axis does not move and only the IL☐☐☐10 monitor parameter (Machine Coordinate System Calculated Position (CPOS)) is updated.
- The Machine Lock Mode can be set or released only after distribution has been completed.
- The Machine Lock Mode cannot be set or released during speed or torque control.

■ Bit 4: Latch Detection Request SVC

When this bit is set to 1, the position at the moment the latch signal turns ON is reported in the IL☐☐☐18 monitor parameter (Machine Coordinate System Latch Position (LPOS)).

When the latch is completed, bit 2 (Latch Completed) in the IW☐☐☐0C monitor parameter changes to 1 (Completed).

0: Latch detection request OFF (default).

1: Latch detection request ON.

Setting Precautions

- To detect the latch again, reset this bit to 0 and then set to 1 again.
- Set bits 0 to 3 (Latch Detection Signal Selection) in the OW☐☐☐04 setting parameter to select the signal to use as the latch signal.

■ Bit 6: Number of POSMAX Turns Preset Request SVC SVR

Set this bit to 1 to preset the IL☐☐☐1E monitor parameter (Number of POSMAX Turns) to the value set for the OL☐☐☐4C setting parameter (Number of POSMAX Turns Preset Data).

0: Number of POSMAX turns preset request OFF (default).

1: Number of POSMAX turns preset request ON.

Setting Precautions

Always set this parameter to 0 for linear motors.

■ Bit 7: Absolute Infinite-length Position Information Load Request SVC

When an infinite-length axis is used with an absolute encoder, this bit can be set to 1 to reset the position information with the encoder and pulse positions that were set when the power was last turned OFF.

When processing is completed, bit 8 (Absolute Infinite-length Position Information Load Completed) in the IW☐☐☐0C monitor parameter changes to 1 (Completed).

0: Absolute infinite-length position information load request OFF (default).

1: Absolute infinite-length position information load request ON.

Setting Precautions

- Always set this parameter to 0 for linear motors.
- Refer to the following section for details on how to use this bit.

☞ ◆ *Turning ON the Power after Setting the Origin in the Machine Coordinate System* on page 5-36

■ Bit 8: Positive External Torque/Force Limit Input SVC

Set this bit to 1 to limit the torque or force by the value set in the SERVOPACK parameters.

The setting of this parameter is applied to the reference to the slave SERVOPACK when the servo is ON unless one of the following motion commands (OW☐☐☐08) is being executed.

- Monitor Alarms (= 19)
- Monitor Alarm History (= 20)
- Clear Alarm History (= 21)
- Read Memory (= 35)
- Write Memory (= 36)
- Read Non-volatile Memory (= 37)
- Write Non-volatile Memory (= 38)

0: Positive external torque/force input OFF (default).

1: Positive external torque/force input ON.

■ Bit 9: Negative External Torque/Force Limit Input SVC

Set this bit to 1 to limit the torque or force by the value set in the SERVOPACK parameters.

The setting of this parameter is applied to the reference to the slave SERVOPACK when the servo is ON unless one of the following motion commands (OW☐☐☐08) is being executed.

- Monitor Alarms (= 19)
- Monitor Alarm History (= 20)
- Clear Alarm History (= 21)
- Read Memory (= 35)
- Write Memory (= 36)
- Read Non-volatile Memory (= 37)
- Write Non-volatile Memory (= 38)

0: Negative external torque/force input OFF (default).

1: Negative external torque/force input ON.

■ Bit B: Reset Integration SVC

Set this bit to 1 to reset the integration term in the position loop in the slave SERVOPACK.

This setting is enabled when a travel motion command or a command to turn ON the Servomotor's power is executed.

0: Reset integration OFF (default).

1: Reset integration ON.

■ Bit C: Reset Network SVC

Set this bit to 1 to reset the entire MECHATROLINK network.

0: Reset network OFF (default).

1: Reset network ON.

Setting Precautions

MECHATROLINK-III communications allows connections to a network where communications are already in progress. In some cases, however, connection may not be possible due to conditions such as the transmission cycle and the number of slave stations that are connected. In this case, a cyclic communications initialization incomplete alarm occurs (i.e., bit 1C in IL□□□04 changes to 1). Use this function to reset the entire network to enable the station where the alarm occurred to rejoin the network. However, be aware that communications with all stations, not just the one with the alarm, are disconnected and resumed after the network is reset.

■ Bit D: Latch Completed Status Clear Request SVC

When this bit is set to 1, bit 2 (Latch Completed) in the IW□□□0C monitor parameter changes to 0 (Latch not completed).

0: Latch completed status clear request OFF (default).

1: Latch completed status clear request ON.

■ Bit E: Reset Communications SVC

Set this bit to 1 to disconnect and then reestablish communications with the slave SERVOPACK.

0: Reset communications OFF (default).

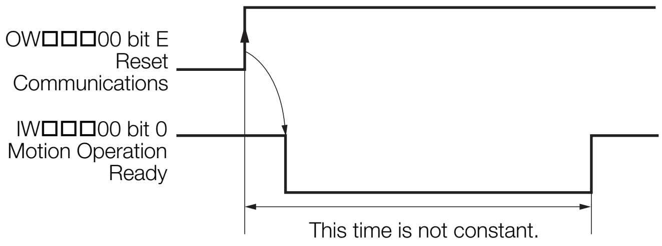
1: Reset communications ON.

Resetting communications enables the following:

- It enables the non-volatile parameters that require the power to be turned OFF and ON again to change the settings.
- It clears the phase-C position data that is saved in the linear scale interpolator (when using a linear scale manufactured by Magnescale Co., Ltd.).

Communications can be reset regardless of the current communications and alarm status.

Check bit 0 (Motion Operation Ready) in the IW□□□00 monitor parameter to determine when the communications reset is completed.



Setting Precautions

Do not reset communications when an axis is in motion due to a motion command. A sudden stop of the axis may affect machine operation or may cause damage to the machine.

■ Bit F: Clear Alarm SVC SVR

Set this bit to 1 to clear an alarm.

If a communications error occurs, communications can be reestablished by clearing the alarm.

0: Clear Alarm OFF (default).

1: Clear Alarm ON.

Setting Precautions

- Bit 2 (Fixed Parameter Error) in the IL□□□02 monitor parameter cannot be cleared with the Clear Alarm Bit. In this case, eliminate the cause of the alarm to clear it.
- Do not execute a clear alarm operation when an axis is in motion due to a motion command. Doing so may affect axis movement.

Mode Settings 1

◆ Mode Settings 1

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OW□□□01	Mode Settings 1	–	–	0000 hex	Position Phase Speed

■ Bit 0: Excessive Deviation Error Level Setting SVC

Use this bit to set whether excessive deviation is treated as a warning or as an alarm.

0: Alarm (default).

The axis operation stops when excessive deviation is detected.

1: Warning.

The axis operation continues even if excessive deviation is detected.

Related Parameters

- OL□□□22 (Excessive Deviation Detection Value)
- IL□□□02 bit 0 (Excessive Deviation Warning)
- IL□□□04 bit 9 (Excessive Deviation Alarm)

■ Bit 3: Speed Loop P/PI Switch SVC

Use this bit to set the SERVOPACK's speed loop to PI control or P control.

This setting is enabled when a travel motion command or a command to turn ON the Servomotor's power is executed.

0: PI control (default).

1: P control.

■ Bit 4: Switch Gain SVC

Set this bit to 1 to switch the gains to the values that are set for Gain Settings 2 in the SERVOPACK parameters.

This setting is enabled when a travel motion command or a command to turn ON the Servomotor's power is executed.

0: Switch gain OFF (default).

1: Switch gain ON.

■ Bit 5: Switch Gain 2 SVC

In combination with bit 4, you can switch between four different gains.

0: Switch gain OFF (default).

1: Switch gain ON.

Mode Settings 2

◆ Mode Settings 2

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OW□□□02	Mode Settings 2	–	–	0000 hex	Position Phase Speed Torque

■ Bits 8 to F: Stop Mode Selection SVC

Set the stop method for an axis that is in motion for a travel motion command.

0: Stop according to the Linear Deceleration Rate/Deceleration Time Constant parameter (default).

1: Stop immediately.

Function Settings 1

◆ Function Settings 1

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OW□□□03	Function Settings 1	–	–	0011 hex	Position Phase Speed Torque

■ Bits 0 to 3: Speed Unit Selection SVC SVR

Set the unit for speed references.

0: Reference units/s

1: 10^n reference units/min ("n" is set in fixed parameter No. 5 (Number of Digits Below Decimal Point).)

2: Percentage of rated speed (1 = 0.01%).

3: Percentage of rated speed (1 = 0.0001%).

Setting Precautions

Refer to the following section for setting examples that combine this parameter with different numbers of digits below the decimal point.

☞ *5.1.5 Speed References* on page 5-9

■ Bits 4 to 7: Acceleration/Deceleration Rate Unit Selection SVC SVR

Set whether to specify accelerations and decelerations as acceleration/deceleration rates or acceleration/deceleration time constants.

0: Reference units/s^2.

1: ms (default).

■ Bits 8 to B: Filter Type Selection SVC SVR

Set the acceleration/deceleration filter type.

0: No filter (default).

1: Exponential acceleration/deceleration filter.

2: Moving average filter.

Setting Precautions

When a filter is used, set the filter type in this parameter and execute the CHG_FILTER motion command to apply the change. Refer to the following section for details.

☞ *4.2.12 CHG_FILTER (Change Filter Type)* on page 4-68

However, when bit A (SERVOPACK Parameter Auto-Write) in fixed parameter No. 1 is 0 (Enabled), the filter type is changed to the set filter type when reference pulse distribution is completed, even if the CHG_FILTER command is not executed.

■ Bits C to F: Torque Unit Selection SVC SVR

Set the unit for torque references.

0: Percentage of rated torque (1 = 0.01%).

1: Percentage of rated torque (1 = 0.0001%).

Function Settings 2

◆ Function Settings 2

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OW□□□04	Function Settings 2	–	–	0033 hex	Position Phase Speed Torque

■ Bits 0 to 3: Latch Detection Signal Selection SVC

Set the latch detection signal. The latch signal is input to the SERVOPACK.

This setting is valid when the LATCH motion command is executed or when a modal latch is used.

0: –

1: –

2: Phase-C pulse

3: /EXT1 (default)

4: /EXT2

5: /EXT3

■ Bits 4 to 7: External Positioning Signal Setting SVC

Set the external signal to use for external positioning.

0: –

1: –

2: Phase-C pulse

3: /EXT1 (default)

4: /EXT2

5: /EXT3

Function Settings 3

◆ Function Settings 3

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OW□□□05	Function Settings 3	–	–	0000 hex	Position Phase

■ Bit 1: Disable Phase Reference Calculation SVC

Use this bit to enable or disable phase reference calculations when phase control commands are executed.

0: Enabled (default).

1: Disabled.

Setting Precautions

- Set this bit to 0 (Enabled) when an electronic shaft application is used.
- Set this bit to 1 (Disabled) when an electronic cam application is used.

■ Bit 2: External Positioning Final Travel Distance Write Selection SVC

This bit specifies whether or not to automatically apply the external positioning final travel distance to the SERVOPACK during external positioning. This setting is applied at the start of execution of the EX_POSING (External Positioning) and EX_FEED (Jog with External Positioning) motion commands.

0: Automatically apply (default).
The external positioning final travel distance is written to the SERVOPACK.

1: Do not automatically apply.
The external positioning final travel distance is not written to the SERVOPACK.

■ Bit B: Zero Point Return Input Signal SVC

This bit functions as the INPUT signal when the INPUT+C Pulse method or the INPUT Only method is used for the Zero Point Return Method.

0: INPUT signal OFF (default).

1: INPUT signal ON.

Servo Command Output Signals

◆ M-III Vendor-specific Servo Command Output Signal SVC

When the profile is set to Standard Servo, this parameter is used for the SVCMD_IO servo I/O settings. The settings are output to bytes 10 and 11 of the MECHATROLINK Servo command.

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OW□□□06	M-III Vendor-specific Servo Command Output Signal	–	–	0000 hex	Position Phase Speed Torque

You can use the following functions.

Refer to the following manual for details.

Σ-7-Series MECHATROLINK-III Communications Standard Servo Profile Command Manual (Manual No.: SIEP S800001 31)

■ High-speed Acceleration/Deceleration Parameter Bank Switching

You can switch between different banks of acceleration/deceleration parameters for positioning.

You can switch parameter banks by using a combination of bits.

Bits 0 to 3: Bank Selection

■ I/O Signal Output Control

I/O signal output control allows you to control signal outputs SO1 to SO3 by setting the Pn50E, Pn50F, and Pn510 SERVOPACK parameters to 0. The relationship between these bits and the signal outputs are as follows:

Bit 4: SO1

Bit 5: SO2

Bit 6: SO3

Important

All bits other than those listed above (bits 7 to F) are reserved for system use. Do not set these other bits.

Motion Commands

◆ Motion Commands

Set the motion command.

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OW□□□08	Motion Commands	0 to 39	–	0	Position Phase Speed Torque

0: NOP (No Operation) SVC SVR
1: POSING (Positioning) SVC SVR
2: EX_POSING (External Positioning) SVC SVR
3: ZRET (Zero Point Return) SVC SVR
4: INTERPOLATE (Interpolation) SVC SVR
5: – (Reserved)
6: LATCH (Interpolate with Latch Input) SVC SVR
7: FEED (Jog) SVC SVR
8: STEP (STEP Operation) SVC SVR
9: ZSET (Set Zero Point) SVC SVR
10: ACC (Change Acceleration Time) SVC
11: DCC (Change Deceleration Time) SVC
12: SCC (Change Filter Time Constant) SVC
13: CHG_FILTER (Change Filter Type) SVC
14: KVS (Change Speed Loop Gain) SVC
15: KPS (Change Position Loop Gain) SVC
16: KFS (Change Feedforward) SVC
17: PRM_RD (Read SERVOPACK Parameter) SVC
18: PRM_WR (Write SERVOPACK Parameter) SVC
19: ALM_MON (Monitor Alarms) SVC
20: ALM_HIST (Monitor Alarm History) SVC
21: ALMHIST_CLR (Clear Alarm History) SVC
22: ABS_RST (Reset Absolute Encoder) SVC
23: VELO (Issue Speed Reference) SVC SVR
24: TRQ (Issue Torque/Force Reference) SVC SVR
25: PHASE (Issue Phase Reference) SVC SVR
26: KIS (Change Position Loop Integral Time Constant) SVC
27: PPRM_WR (Write Non-volatile Parameter) SVC
28 to 33: – (Reserved)
34: EX_FEED (Jog with External Positioning) SVC
35: MEM_RD (Read Memory) SVC
36: MEM_WR (Write Memory) SVC
37: PMEM_RD (Read Non-volatile Memory) SVC
38: PMEM_WR (Write Non-volatile Memory) SVC
39: MLTTRN_SET (Multiturn Limit Setting) SVC

Refer to the following chapter for details on these commands.

☞ *Chapter 4 Motion Control Program Commands and Instructions*

Motion Command Control Flags

◆ Motion Command Control Flags

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OW□□□09	Motion Command Control Flags	–	–	0000 hex	Position Phase Speed Torque

■ Bit 0: Hold Command SVC SVR

The axis decelerates to a stop if this bit is set to 1 while an axis is in motion for a POSING (Positioning), EX_POSING (External Positioning), STEP (STEP Operation), VELO (Issue Speed Reference) or TRQ (Issue Torque/Force Reference) motion command.

The axis remains held as long as this bit is 1. When the bit changes to 0, the hold on the axis is released and the axis begins the operation again. When the hold is released, bit 1 (Command Hold Completed) in the IW□□□09 monitor parameter changes to 1.

0: Hold Command OFF (default).

1: Hold Command ON.

■ Bit 1: Cancel Command SVC SVR

The axis decelerates to a stop and cancels all remaining movement if this bit is set to 1 while an axis is in motion for a POSING (Positioning), EX_POSING (External Positioning), ZRET (Zero Point Return), FEED (Jog), STEP (STEP Operation), VELO (Issue Speed Reference), TRQ (Issue Torque/Force Reference) or EX_FEED (Jog with External Positioning) motion command.

0: Cancel Command OFF (default).

1: Cancel Command ON.

■ Bit 2: Travel Direction (JOG/STEP) SVC SVR

Specify the travel direction for the FEED (Jog), STEP (STEP Operation), and EX_FEED (Jog with External Positioning) motion commands.

0: Forward (default).

1: Reverse.

■ Bit 3: Zero Point Return Direction Selection SVC

Specify the travel direction for the ZRET (Zero Point Return) motion command (valid for DEC1+Phase-C Pulse, ZERO, DEC1+ZERO, and Phase-C Pulse).

0: Reverse (default).

1: Forward.

■ Bit 4: Latch Zone Enable SVC

Use this bit to enable or disable the area where the external signal is valid (the latch zone) for the EX_POSING (External Positioning) motion command.

0: Disabled (default).

1: Enabled.

Setting Precautions

Always set this bit to 0 (Disabled) when a latch motion command other than the EX_POSING command (i.e., LATCH or ZRET) is executed.

Related Parameters

- OL□□□2A setting parameter (Latch Zone Lower Limit Setting)
- OL□□□2C setting parameter (Latch Zone Upper Limit Setting)

■ Bit 5: Position Reference Type SVC SVR

Set the value of the OL□□□1C setting parameter (Position Reference Setting) to either 0 (Incremental value addition method) or 1 (Absolute value specification method).

0: Incremental value addition method (default).

This method adds the amount to move to the current position reference value and then issues the reference.

1: Absolute value specification method.

This method is used to set an absolute position.

■ Bit 6: Electronic Cam Phase Compensation Type SVC

Set the reference method for the OL□□□28 setting parameter (Phase Compensation Setting). This parameter is valid only when the system is used as an electronic cam (i.e., when bit 1 in OW□□□05 is 1).

0: Incremental value addition method (default).

1: Absolute value specification method.

Electronic Cam Precautions (When Bit 1 in OW□□□05 Is 1)

- If this parameter is set to 1 (Absolute value specification method), implement measures to prevent drastic changes in the reference position before you use phase control. If not, the axis may move abruptly, which is extremely dangerous.

Example Set the OL□□□28 setting parameter (Phase Compensation Setting) to the same value as that of the IL□□□14 monitor parameter (32-bit DPOS).

- This parameter can be changed at any time, but do not change this setting during phase control. The axis may move abruptly, which is extremely dangerous.

Electronic Shaft Precautions (When Bit 1 in OW□□□05 Is 0)

- The increment that is set in the OL□□□28 setting parameter (Phase Compensation Setting) (i.e., the difference between the previous high-speed scan and the current high-speed scan) is added to the target position regardless of the setting of this bit.

■ Bit 8: SERVOPACK Parameter Access Selection SVC

Set whether the common parameters or the vendor-specific parameters for each vendor are used for the commands.

0: Vendor-specific parameters (default).

1: Common parameters.

Motion Subcommands

◆ Motion Subcommands

Set the motion subcommand that is used with a motion command.

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OW□□□0A	Motion Subcommands	0 to 6	–	0	Position Phase Speed Torque

0: NOP (No Operation) SVC SVR

1: PRM_RD (Read SERVOPACK Parameter) SVC

2: PRM_WR (Write SERVOPACK Parameter) SVC

3: INF_RD (Read Device Information) SVC

4: SMON (Monitor Status) SVC

5: FIXPRM_RD (Read Fixed Parameter) SVC SVR

6: FIXPRM_CHG (Change Fixed Parameter) SVC

Torque Reference

◆ Torque/Force Reference Setting or Torque Feedforward Compensation SVC SVR

This meaning of this subcommand depends on the motion command.

- When the TRQ (Issue Torque/Force Reference) motion command is executed, set the torque reference. Refer to the following section for details.
  ☞ *TRQ (Issue Torque/Force Reference)* on page 4-94
- When the INTERPOLATE (Interpolation), VELO (Issue Speed Reference), or PHASE (Issue Phase Reference) motion command is executed, set the torque feedforward compensation.

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OL□□□0C	Torque/Force Reference Setting or Torque Feedforward Compensation	-2^{31} to $2^{31}-1$	The unit that is set in the Torque Unit Selection bits is used.	0	Position Phase Speed Torque

Setting Precautions

The unit that is set in the Torque Unit Selection bits (OW□□□03 bits C to F) is used for this parameter.

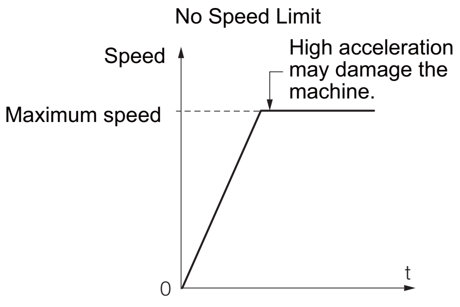
◆ Speed Limit for Torque/Force Reference SVC

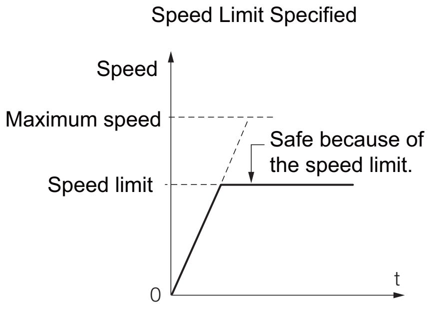
Set the speed limit as a percentage of the rated speed when the TRQ (Issue Torque/Force Reference) motion command is executed. The absolute value of the setting is the speed limit value.

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OW□□□0E	Speed Limit for Torque/Force Reference	-32,768 to 32,767	0.01%	15,000	Torque

Torque control is used to control the Servomotor to output the specified torque. It does not control the motor speed. Therefore, when an excessive reference torque is set relative to the load torque of the machine, the machine's torque is overpowered by the torque reference and the motor speed rapidly increases.

The torque reference speed limit serves to limit the Servomotor speed during torque control to protect the machine.





Setting Precautions

This parameter setting is used when the TRQ command is executed.

Related Parameters

Pn002 = n.□□x□, Pn407, and Pn408 = n.□□x□ SERVOPACK parameters

Speed Reference Setting

◆ Speed Reference Setting SVC SVR

Set the speed reference.

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OL□□□10	Speed Reference Setting	-2^{31} to $2^{31}-1$	The unit that is set in the Speed Unit Selection bits is used.	3,000	Position Phase Speed

This parameter is used by the following motion commands.

1: POSING (Positioning)

2: EX_POSING (External Positioning)

3: ZRET (Zero Point Return)

7: FEED (Jog)

8: STEP (STEP Operation)

23: VELO (Issue Speed Reference)

25: PHASE (Issue Phase Reference)

34: EX_FEED (Jog with External Positioning)

Refer to the following chapter for details on these commands.

☞ *Chapter 4 Motion Control Program Commands and Instructions*

Setting Precautions

The unit that is set in the Speed Unit Selection bits (OW□□□03 bits 0 to 3) is used for this parameter.

◆ Speed Limit SVC

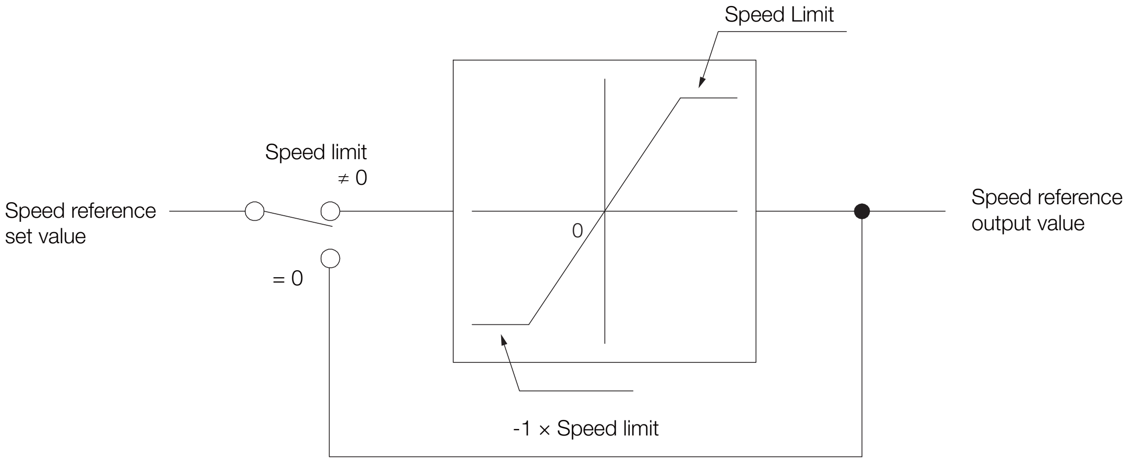
Set the upper speed limit as a percentage.

- Rotary motor: A percentage of the rated rotation speed
- Linear motor: A percentage of the rated speed

This value is an absolute value. It is used in both the forward and reverse directions.

The speed limit that is set is the maximum speed for travel motion command.

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OW□□□12	Speed Limit	0 to 32,767	0.01%	0	Position Phase Speed



Setting Precautions

- The speed limit can be changed during operation. However, if an incorrect setting is made during operation, it may affect the movement of the machine.
- If this parameter is set to 0, no speed limit check is performed.
- If a value outside the valid setting range is set for the speed limit, no limit processing is performed. (Operation is the same as for a set value of 0.)
- If a speed reference is issued that exceeds the set speed limit when any of the following motion commands is executed, a reference is issued to the slave SERVOPACK with the value of the speed limit. In this case, the following warning also occurs.
  Applicable commands: POSING, EX_POSING, ZRET, FEED, STEP, VELO, and EX_FEED
  Warning: Setting Parameter Error (IL□□□02, Bit 1)
- If a speed reference is issued that exceeds the set speed limit when any of the following motion commands is executed, the following alarm occurs and the axis is stopped.
  Applicable commands: INTERPOLATE, LATCH, and PHASE
  Alarm: Excessive Speed (IL□□□04, Bit 8)

Torque/Force Limit

◆ Torque/Force Limit SVC

Set the torque limit. The same value is used in both the forward and reverse directions.

This setting is used when a torque limit is required at a certain time during machine operation.

Example Applications of this parameter include pressing operations to stop movement and holding workpieces.

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OL□□□14	Torque/Force Limit	-2^{31} to $2^{31}-1$	The unit that is set in the Torque Unit Selection bits is used.	30,000	Position Phase Speed

Setting Precautions

The unit that is set in the Torque Unit Selection bits (OW□□□03 bits C to F) is used for this parameter.

Second Speed Compensation

◆ Second Speed Compensation SVC SVR

Set the speed feedforward compensation when the INTERPOLATE (Interpolation), LATCH (Latch), or PHASE (Issue Phase Reference) motion command is executed.

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OL□□□16	Second Speed Compensation	-2^{31} to $2^{31}-1$	The unit that is set in the Speed Unit Selection bits is used.	0	Position Phase

Setting Precautions

- The unit that is set in the Speed Unit Selection bits (OW□□□03 bits 0 to 3) is used for this parameter.
- The setting unit for the OW□□□31 setting parameter (Speed Compensation) is always 0.01%. The unit for this parameter, however, is set in the Speed Unit Selection bits. When this parameter is used at the same time as OW□□□31, speed compensation is performed twice.

Override

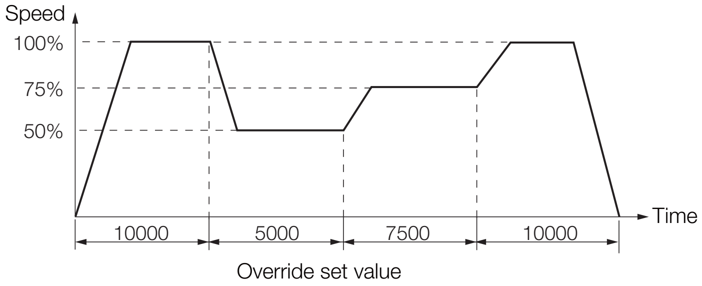
◆ Override SVC

Set the percentage of the OL□□□10 setting parameter (Speed Reference Setting) to output in increments of 0.01%.

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OW□□□18	Override	0 to 32,767	0.01%	10,000	Position Speed

Setting Precautions

- The Override parameter is always enabled. If you do not want to use this parameter, keep the override set to 10,000.
- If the override is set to 0, the output speed is 0 and the motor will not operate.
  Speed reference (OL□□□10) × Override (OW□□□18) = Output speed
- The override can be changed during execution of a speed reference. Acceleration or deceleration occurs immediately according to the set value.



Position Reference Setting

◆ Position Reference Setting SVC SVR

Set the position reference.

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OL□□□1C	Position Reference Setting	Reference units	-2^{31} to $2^{31}-1$	0	Position

This parameter is used by the following motion commands.

1: POSING (Positioning).

2: EX_POSING (External Positioning).

4: INTERPOLATE (Interpolation).

6: LATCH (Interpolate with Latch Input).

Refer to the following chapter for details on these commands.

☞ *Chapter 4 Motion Control Program Commands and Instructions*

Related Parameters

OW□□□09 setting parameter, bit 5 (Position Reference Type)

Positioning Completion Width

◆ Positioning Completion Width SVC

This parameter applies the set value of this parameter to the SERVOPACK parameter.

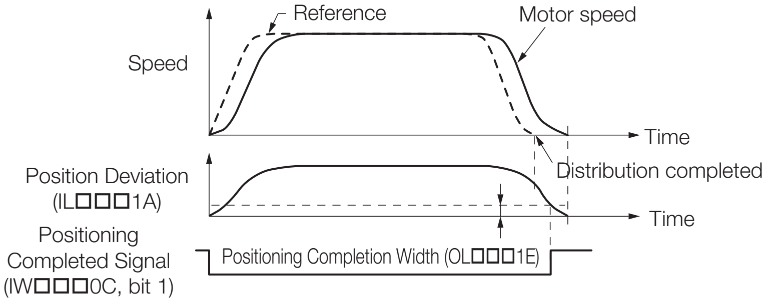
Refer to the following section for details.

☞ *3.5 Automatically Updated Parameters* on page 3-87

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OL□□□1E	Positioning Completion Width	0 to 65,535	Reference units	100	Position Phase

Setting Precautions

- After all position reference pulses have been distributed for position control, bit 1 (Positioning Completed) in the IW□□□0C monitor parameter changes to 1 (Within positioning completed range) when the Positioning Completed signal from the slave SERVOPACK turns ON (i.e., when bit E in the IL□□□28 monitor parameter changes to 1).
- Set a value that is appropriate for the machine specifications in the system. If the value is too small, a long time will be required for positioning to be completed.



Related Parameters

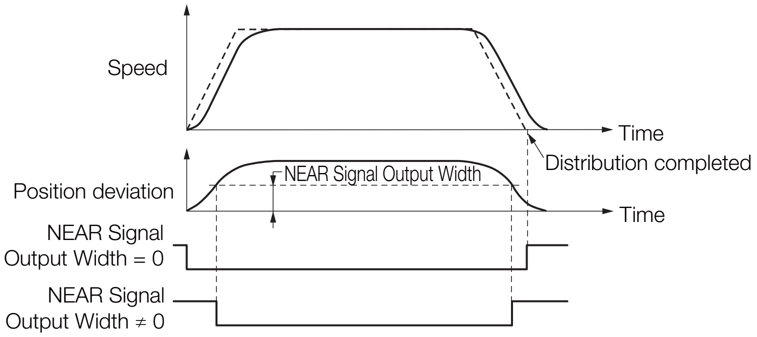
- Fixed parameter No. 4 (Reference Unit Selection)
- Fixed parameter No. 5 (Number of Digits Below Decimal Point)
- Fixed parameter No. 6 (Travel Distance per Machine Rotation)
- Fixed parameter No. 8 (Servomotor Gear Ratio Term)
- Fixed parameter No. 9 (Machine Gear Ratio Term)
- OW□□□2E setting parameter (Position Loop Gain)
- IW□□□0C monitor parameter, bit 0 (Distribution Completed (DEN))
- IW□□□0C monitor parameter, bit 1 (Positioning Completed (POSCOMP))

NEAR Signal Output Width

◆ NEAR Signal Output Width SVC

Bit 3 in the IW□□□0C monitor parameter (Near Position) changes to 1 (Within near position range) when the absolute value of the difference between the reference position and the feedback position is within the width that is set for this parameter.

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OL□□□20	NEAR Signal Output Width	0 to 65,535	Reference units	0	Position Phase



Setting Precautions

- When Set to 0
  When bit 0 in the IW□□□0C monitor parameter (Distribution Completed) changes to 1 (Completed), bit 3 in the IW□□□0C changes to 1.
- When Not Set to 0
  Bit 3 in the IW□□□0C changes to 1 in the following case, regardless of the status of the Distribution Completed Flag.
  |(IL□□□12) – (IL□□□16)| ≤ OL□□□20
  IL□□□12: Machine Coordinate System Reference Position (MPOS)
  IL□□□16: Machine Coordinate System Feedback Position (APOS)
  OL□□□20: NEAR Signal Output Width
- This parameter has no relation to the NEAR Signal Width parameter in the SERVOPACK.

Related Parameters

IW□□□0C monitor parameter, bit 3 (Near Position)

Excessive Deviation Detection Value

◆ Excessive Deviation Detection Value SVC

Set the value to detect an excessive deviation during position control.

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OL□□□22	Excessive Deviation Detection Value	0 to $2^{31}-1$	Reference units	$2^{31}-1$	Position Phase

Setting Precautions

Bit 9 in the IL□□□04 monitor parameter (Excessive Deviation) changes to 1 (Excessive deviation) in the following case.

|Position Deviation (IL□□□1A)| > Excessive Deviation Detection Value

Excessive deviation is not detected when this parameter is set to 0.

Related Parameters

Bit 0 in the OW□□□01 setting parameter (Excessive Deviation Error Level Setting) can be set to treat excessive deviation errors as either warnings or alarms.

Bit 0 in OW□□□01 = 0: Treat as an alarm (default). Axis operation stops.

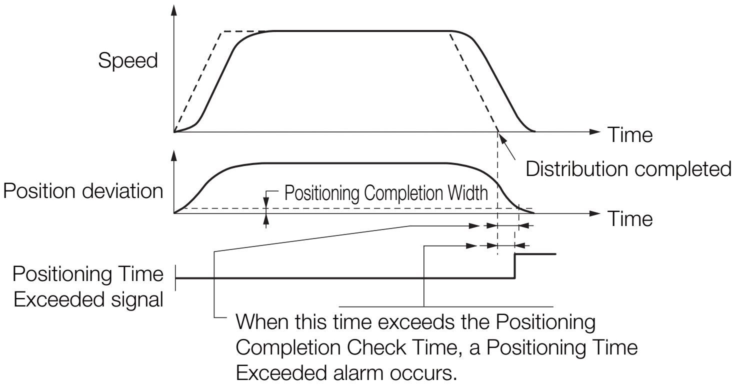
Bit 0 in OW□□□01 = 1: Treat as a warning. Axis operation continues.

Positioning Completion Check Time

◆ Positioning Completion Check Time SVC

Set the time to detect a Positioning Time Exceeded error.

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OW□□□26	Positioning Completion Check Time	0 to 65,535	ms	0	Position Phase



Setting Precautions

- If, during position control, the IW□□□0C monitor parameter does not change to 1 (Within positioning completed range) even after the time that is set for this parameter is exceeded from when distribution is completed, a Positioning Time Exceeded alarm occurs (bit 6 in IL□□□04 changes to 1).
- If this parameter is set to 0, the above check is not performed.

Phase Compensation Setting

◆ Phase Compensation Setting SVC

Set the phase bias in reference units to use when the PHASE (Issue Phase Reference) motion command is executed.

Refer to the following section for details on the PHASE command.

☞ *PHASE (Issue Phase Reference)* on page 4-99

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OL□□□28	Phase Compensation Setting	-2^{31} to $2^{31}-1$	Reference units	0	Phase

Setting Precautions

- Use for an Electronic Shaft
  Use this parameter to compensate for references in a control system without rigidity, in which higher gain cannot be applied.
- Use for an Electronic Cam
  Use this parameter as the target position for the cam pattern.

Latches

◆ Latch Zone Lower Limit Setting and Latch Zone Upper Limit Setting SVC

Set the zone (from the zero position to the specified position) where the latch signal is valid when the EX_POSING (External Positioning) motion command is executed.

If bit 4 in the OW□□□09 setting parameter (Latch Zone Enable) is set to 1 (Enabled) when the EX_POSING command is executed, latching is performed in the zone between OL□□□2A and OL□□□2C.

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OL□□□2A	Latch Zone Lower Limit Setting	-2^{31} to $2^{31}-1$	Reference units	-2^{31}	Position
OL□□□2C	Latch Zone Upper Limit Setting	-2^{31} to $2^{31}-1$	Reference units	$2^{31}-1$	Position

■ Latch Zone Setting Conditions

The latch zone is valid if the following conditions are met.

- Bit 4 in the OW□□□09 setting parameter (Latch Zone Enable) is set to 1 (Enabled)

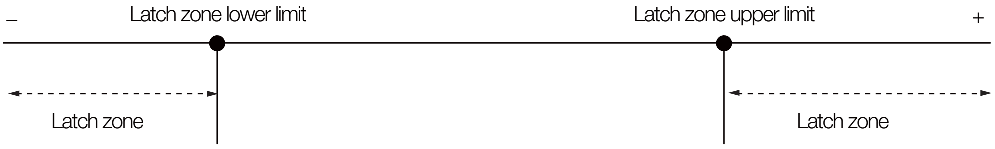
and,

- OL□□□2A setting parameter (Latch Zone Lower Limit Setting) ≠ OL□□□2C setting parameter (Latch Zone Upper Limit Setting)

If the above conditions are not met, the latch zone is not valid regardless of the position.

- Latch Zone Lower Limit < Latch Zone Upper Limit

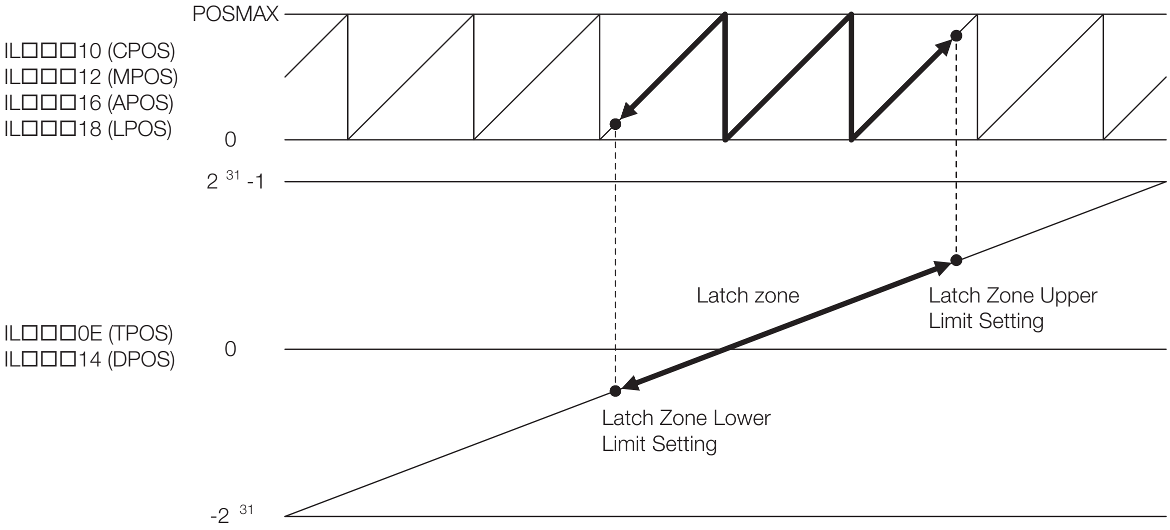
- Latch Zone Lower Limit > Latch Zone Upper Limit



■ Infinite-length Axes and Latch Zones

When bit 0 in fixed parameter No. 1 (Axis Selection) is set to 1 (Infinite-length axis), the latch zone setting is specified in a 32-bit coordinate system.

Therefore, as shown in the following figure, a multi-turn area of the value that is specified for fixed parameter No. 10 (Infinite-length Axis Reset Position (POSMAX)) can be set as the latch zone.



■ Precautions for Setting Latch Zones

Latch zones are implemented in a software process in the SVC Function Module. However, the actual latching is performed by the slave SERVOPACK. Therefore, depending on the transmission cycle, reference speed, and position deviation, the actual zone may vary from the set zone. Set a latch zone that provides some leeway.

Gain and Compensation

◆ Position Loop Gain SVC

This parameter determines the responsiveness of the SERVOPACK's position loop.

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OW□□□2E	Position Loop Gain	0 to 32,767	0.1 /s	300	Position Phase

Setting Precautions

- If the position loop gain is set to a high value, the responsiveness is high and the positioning time is short. Set the optimum value for the machine rigidity, inertia, and type of Servomotor.
- The actual machine operation follows the settings in the SERVOPACK parameters. Refer to the following section for details on automatically applying settings to the SERVOPACK parameters.
  ☞ *3.5 Automatically Updated Parameters* on page 3-87
- If automatic parameter application is enabled and this parameter changes, the corresponding SERVOPACK parameter will change automatically. If changes must be made and automatic parameter application is not enabled, use the KPS (Change Position Loop Gain) motion command to change the parameter.

◆ Speed Loop Gain SVC

This parameter determines the responsiveness of the SERVOPACK's speed loop.

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OW□□□2F	Speed Loop Gain	1 to 2,000	Hz	40	Position Phase Speed

Setting Precautions

- The Servo system will be more stable the higher this parameter is set, as long as the value is within the range in which the mechanical system does not oscillate.
- The actual machine operation follows the settings in the SERVOPACK parameters. Refer to the following section for details on automatically applying settings to the SERVOPACK parameters.
  ☞ *3.5 Automatically Updated Parameters* on page 3-87
- If automatic parameter application is enabled and this parameter changes, the corresponding SERVOPACK parameter will change automatically. If changes must be made and automatic parameter application is not enabled, use the KVS (Change Speed Loop Gain) motion command to change the parameter.

◆ Speed Feedforward Compensation SVC

Use this parameter to reduce positioning time by applying feedforward compensation.

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OW□□□30	Speed Feedforward Compensation	0 to 32,767	0.01%	0	Position Phase

Setting Precautions

- This parameter is valid for position control.
- Always set this parameter to 0 for phase control.
- If automatic parameter application is enabled and this parameter changes, the corresponding SERVOPACK parameter will change automatically. If changes must be made and automatic parameter application is not enabled, use the KFS (Change Feedforward) motion command to change the parameter.

◆ Speed Compensation SVC SVR

Set the speed feedforward amount as a percentage of the rated speed when the INTERPOLATE (Interpolate), PHASE (Issue Phase Reference), or LATCH (Latch) motion command is executed.

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OW□□□31	Speed Compensation	-32,768 to 32,767	0.01%	0	Position Phase

Setting Precautions

- The setting unit for this parameter is always 0.01%.
- When this parameter (OW□□□31) is used at the same time as the OL□□□16 setting parameter (Second Speed Compensation), speed compensation is performed twice.

◆ Position Loop Integral Time Constant SVC

Set the position loop integral time constant. Use this parameter to improve the following precision in applications such as electronic cams or shafts.

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OW□□□32	Position Loop Integral Time Constant	0 to 32,767	ms	0	Position Phase

Setting Precautions

- The actual machine operation follows the settings in the SERVOPACK parameters. Refer to the following section for details on automatically applying settings to the SERVOPACK parameters.
  ☞ *3.5 Automatically Updated Parameters* on page 3-87
- If automatic parameter application is enabled and this parameter changes, the corresponding SERVOPACK parameter will change automatically. If changes must be made and automatic parameter application is not enabled, use the KIS (Change Position Loop Integral Time Constant) motion command to change the parameter.

◆ Speed Loop Integral Time Constant SVC

The speed loop has an integral element to enable response to minute inputs.

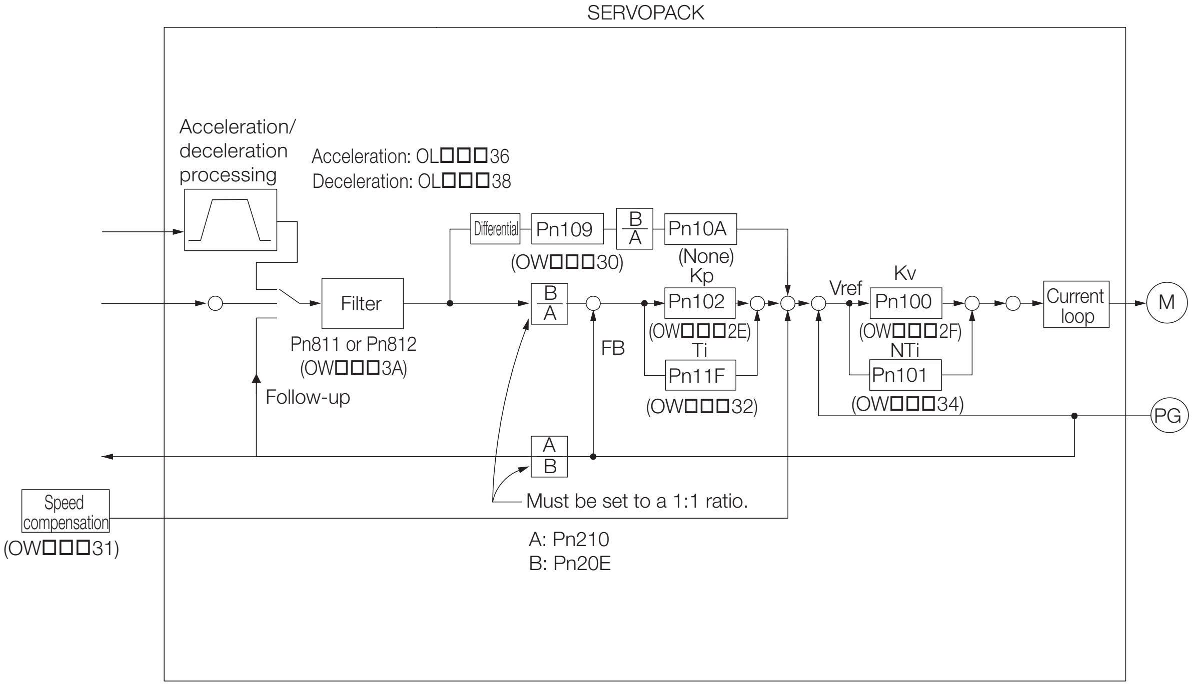
Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OW□□□34	Speed Loop Integral Time Constant	15 to 65,535	0.01 ms	2,000	Position Phase Speed

Setting Precautions

- However, this element also causes a delay in the Servo system, adversely affecting responsiveness if the time constant is set too large.
- The actual machine operation follows the settings in the SERVOPACK parameters. Refer to the following section for details on automatically applying settings to the SERVOPACK parameters.
  ☞ *3.5 Automatically Updated Parameters* on page 3-87

◆ Relationship between SERVOPACK Parameters and Motion Parameters

The above parameters (OW□□□2E to OW□□□34) are applied to the parameters of the SERVOPACK as shown in the following block diagram.



Acceleration/Deceleration Settings

◆ Linear Acceleration Rate/Acceleration Time Constant SVC SVR

Set the linear acceleration rate or linear acceleration time constant.

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OL□□□36	Linear Acceleration Rate/Acceleration Time Constant	0 to $2^{31}-1$	The unit that is set in the Acceleration/Deceleration Rate Unit Selection bits is used.	0	Position Speed

Setting Precautions

The unit that is set in the Acceleration/Deceleration Rate Unit Selection bits (bits 4 to 7 in the OW□□□03 setting parameter) is used for this parameter.

◆ Linear Deceleration Rate/Deceleration Time Constant SVC SVR

Set the linear deceleration rate or linear deceleration time constant.

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OL□□□38	Linear Deceleration Rate/Deceleration Time Constant	0 to $2^{31}-1$	The unit that is set in the Acceleration/Deceleration Rate Unit Selection bits is used.	0	Position Speed

Setting Precautions

The unit that is set in the Acceleration/Deceleration Rate Unit Selection bits (bits 4 to 7 in the OW□□□03 setting parameter) is used for this parameter.

◆ Specifying Acceleration/Deceleration Rates

You can use either of the following two methods to specify an acceleration/deceleration rate.

■ Setting the Acceleration/Deceleration Rate Directly

Set the rate within the range of 0 to 2,147,483,647 reference units/s^2.

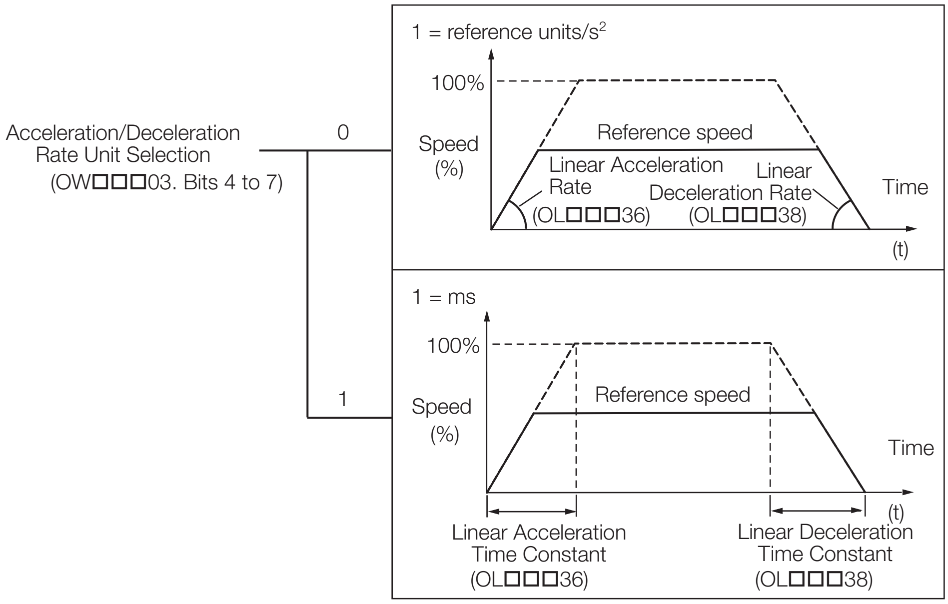
If a negative value is set, a setting parameter warning occurs and the axis operates at the maximum acceleration or deceleration rate.

■ Setting the Time to Reach the Rated Rotation Speed from Zero Speed

Set the rate within the range of 0 to 32,767 ms.

If a negative value is set, a setting parameter warning occurs and the axis operates as if a setting of 0 was specified.

If a value greater than 32,767 is set, a setting parameter warning occurs and the axis operates as if a setting of 32,767 was specified.



Note: Refer to the following sections for details on acceleration and deceleration parameters.

☞ *5.1.6 Acceleration/Deceleration Settings* on page 5-11

☞ *5.1.7 Acceleration/Deceleration Filter Settings* on page 5-14

Filter

◆ Filter Time Constant SVC SVR

Set the acceleration/deceleration filter time constant.

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OW□□□3A	Filter Time Constant	0 to 65,535	0.1 ms	0	Position Phase Speed

Setting Precautions

- Always make sure that bit 0 in the IW□□□0C monitor parameter is set to 1 (Distribution completed) before you change the filter time constant.

- The actual machine operation follows the settings in the SERVOPACK parameters. Refer to the following section for details on automatically applying settings to the SERVOPACK parameters.
  ☞ *3.5 Automatically Updated Parameters* on page 3-87
- The setting range is limited by the specifications of the SERVOPACK.
- This parameter is used as the filter time constant for CHG_FILTER (Change Filter Type) motion command (depending on the motion command settings).
- Set the filter type first before you change the time constant.

■ Procedure for Setting the Filter Time Constant

1. **Select the filter type in bits 8 to B in the OW□□□03 setting parameter.**
2. **Execute the CHG_FILTER command.**
   However, when bit A (SERVOPACK Parameter Auto-Write) in fixed parameter No. 1 is 0 (Enabled), the filter type is changed to the set filter type when reference pulse distribution is completed, even if the CHG_FILTER command is not executed.
3. **Use the OW□□□3A setting parameter to set the filter time constant.**
4. **Execute the SCC (Change Filter Time Constant) command.**

Information

- After you set the filter type with the motion command, the setting is held until the power supply is turned OFF or the filter type is changed again.
- There are two types of acceleration/deceleration filters: an exponential acceleration/deceleration filter and a moving average filter.
- Refer to the following sections for details on acceleration and deceleration parameters.
  ☞ *5.1.6 Acceleration/Deceleration Settings* on page 5-11
  ☞ *5.1.7 Acceleration/Deceleration Filter Settings* on page 5-14

◆ Bias Speed for Indexed Deceleration/Acceleration Filter SVR

Set the bias speed for the indexed deceleration/acceleration filter.

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OW□□□3B	Bias Speed for Indexed Deceleration/Acceleration Filter	0 to 32,767	The unit that is set in the Speed Unit Selection bits is used.	0	Position Phase Speed

Setting Precautions

The unit that is set in the Speed Unit Selection bits (OW□□□03 bits 0 to 3) is used for this parameter.

Origin Return

◆ Zero Point Return Method SVC

Set the operation method when the ZRET (Zero Point Return) motion command is executed.

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OW□□□3C	Zero Point Return Method	0 to 19	–	0	Position

Setting Precautions

- With an incremental encoder, there are 13 different methods that you can use for the origin return operation. Refer to the following section for details on these operation methods.
  ☞ *ZRET (Zero Point Return)* on page 4-20
- With an absolute encoder, the axis is returned to the origin of the machine coordinate system regardless of which method is used.

◆ Zero Point Position Output Width SVC SVR

Set the width for which bit 4 (Zero Point Position) in the IW□□□0C monitor parameter will be 1 (Within zero point position range).

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OW□□□3D	Zero Point Position Output Width	0 to 65,535	Reference units	100	Position

◆ Approach Speed SVC

Set the travel speed for the origin return operation after the deceleration limit switch (DEC) signal is detected.

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OL□□□3E	Approach Speed	-2^{31} to $2^{31}-1$	The unit that is set in the Speed Unit Selection bits is used.	1,000	Position

Setting Precautions

The unit that is set in the Speed Unit Selection bits (bits 0 to 3 in the OW□□□03 setting parameter) is used for this parameter.

◆ Creep Speed SVC

Set the creep speed for the origin return operation after a ZERO signal is detected.

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OL□□□40	Creep Speed	-2^{31} to $2^{31}-1$	The unit that is set in the Speed Unit Selection bits is used.	500	Position

Setting Precautions

The unit that is set in the Speed Unit Selection bits (bits 0 to 3 in the OW□□□03 setting parameter) is used for this parameter.

◆ Zero Point Return Travel Distance SVC

Set the distance from where the origin signal is detected to the origin.

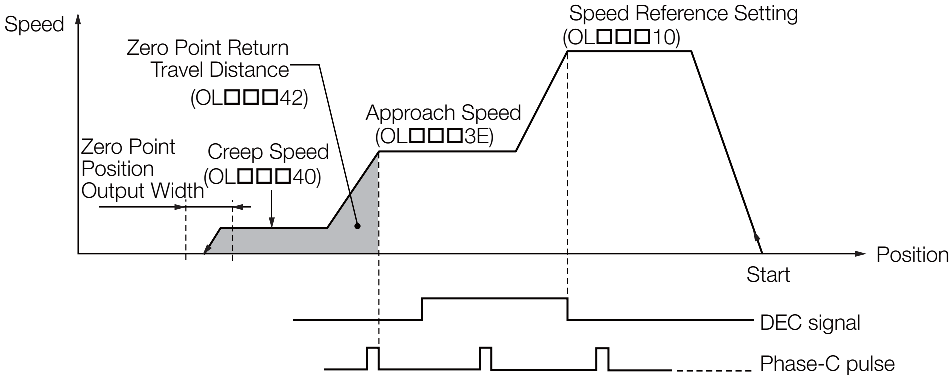
Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OL□□□42	Zero Point Return Travel Distance	-2^{31} to $2^{31}-1$	Reference units	0	Position

◆ Origin Return Example

A typical example of an origin return operation is shown below.

Refer to the following section for details on the origin return operation.

☞ *ZRET (Zero Point Return)* on page 4-20



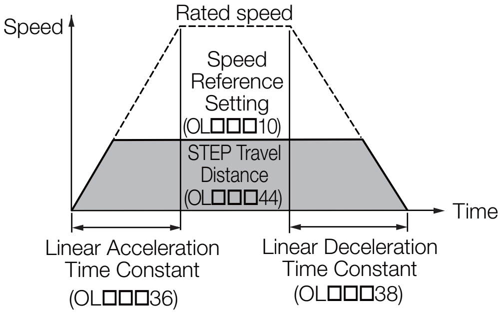
STEP Travel Distance

◆ STEP Travel Distance SVC SVR

Set the travel distance for the STEP (STEP Operation) motion command. Refer to the following section for details on the STEP command.

☞ *STEP (STEP Operation)* on page 4-55

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OL□□□44	STEP Travel Distance	0 to 2^{31}–1	Reference units	1,000	Position



External Positioning Final Travel Distance

◆ External Positioning Final Travel Distance SVC

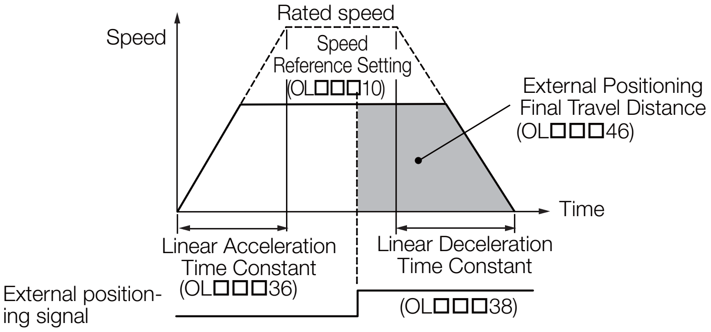
Set the travel distance from when the external signal is input for the EX_POSING (External Positioning) or EX_FEED (Jog with External Positioning) motion command. Refer to the following section for details on the EX_POSING command.

☞ *4.2.2 EX_POSING (External Positioning)* on page 4-13

Refer to the following section for details on the EX_FEED command.

☞ *4.2.27 EX_FEED (Jog with External Positioning)* on page 4-107

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OL□□□46	External Positioning Final Travel Distance	-2^{31} to $2^{31}-1$	Reference units	0	Position



Coordinate System Settings

◆ Zero Point Position Offset in Machine Coordinate System SVC SVR

To set the origin of the machine coordinate system, set the offset to compensate for deviation from the origin of the absolute encoder.

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OL□□□48	Zero Point Position Offset in Machine Coordinate System	-2^{31} to $2^{31}-1$	Reference units	0	Position Phase Speed Torque

Setting Precautions

- This parameter is always enabled. Set this parameter correctly to match the machine.
- Refer to the following section for details on the use of the coordinate system settings.
  ☞ *Setting the Origin of the Machine Coordinate System* on page 5-19

◆ Working Coordinate System Offset SVC SVR

Set the offset to use to shift the working coordinate system.

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OL□□□4A	Working Coordinate System Offset	-2^{31} to $2^{31}-1$	Reference units	0	Position Phase Speed Torque

Setting Precautions

This parameter is always enabled. Set this parameter correctly to match the machine.

◆ Number of POSMAX Turns Preset Data SVC SVR

Set the preset value to set in the IL□□□1E monitor parameter (Number of POSMAX Turns) when bit 6 (Number of POSMAX Turns Preset Request) in the OW□□□00 setting parameter changes to 1 (ON).

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OL□□□4C	Number of POSMAX Turns Preset Data	-2^{31} to $2^{31}-1$	rev	0	Position Phase Speed Torque

Setting Precautions

- This parameter is not valid for linear motors.
- Refer to the following section for details on the use of the coordinate system settings.
  ☞ *5.2 Absolute Encoders* on page 5-17

SERVOPACK User Monitor Setting

◆ SERVOPACK User Monitor Setting SVC

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OW□□□4E	SERVOPACK User Monitor Setting	–	–	0700H	Position Phase Speed Torque

■ Bits 4 to 7: Monitor 2

Select the SERVOPACK information to report in the IL□□□30 monitor parameter (SERVOPACK User Monitor 2) from the following list.

0: APOS (feedback position).

1: CPOS (reference position).

2: PERR (position deviation).

3: LPOS1 (latch position 1).

4: LPOS2 (latch position 2).

5: FSPD (feedback speed).

6: CSPD (reference speed).

7: TRQ (torque/force reference).

8: ALARM (detailed information on the first alarm).

If an alarm occurs after a warning, the alarm is given.

9 to B: Reserved.

C: CMN1 (common monitor 1).

The monitor data that is specified in common parameter No. 89 is reported.

For details on the contents of monitor data, refer to information on the SERVOPACK common parameter No. 89.

D: CMN2 (common monitor 2).

The monitor data that is specified in common parameter No. 8A is reported.

For details on the contents of monitor data, refer to information on the SERVOPACK common parameter No. 8A.

E: OMN1 (optional monitor 1).

The monitor data that is specified in the parameter is reported. The monitor data depends on the product specifications.

F: OMN2 (optional monitor 2).

The monitor data that is specified in the parameter is reported. The monitor data depends on the product specifications.

■ Bits C to F: Monitor 4

Select the SERVOPACK information to report in the IL□□□34 monitor parameter (Servo Driver User Monitor 4) from the following list.

0 to F: Same as monitor 2.

SERVOPACK References

◆ SERVOPACK Alarm Monitor Number SVC

Set the alarm number to monitor for the following motion commands.

- ALM_MON (Monitor Alarms)
- ALM_HIST (Monitor Alarm History)

Monitoring results are reported in the IW□□□2D monitor parameter (SERVOPACK Alarm Code).

Refer to the following chapter for details.

☞ *Chapter 4 Motion Control Program Commands and Instructions*

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OW□□□4F	SERVOPACK Alarm Monitor Number	0 to 9	–	0	Position Phase Speed Torque

◆ SERVOPACK Parameter Number SVC

Specify the number of the SERVOPACK parameter to process for the following motion commands.

- PRM_RD (Read SERVOPACK Parameter)
- PRM_WR (Write SERVOPACK Parameter)
- PPRM_WR (Write Non-volatile Parameter)

Refer to the following chapter for details.

☞ *Chapter 4 Motion Control Program Commands and Instructions*

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OW□□□50	SERVOPACK Parameter Number	0 to 65,535	–	0	Position Phase Speed Torque

◆ SERVOPACK Parameter Size SVC

Specify the size, in words, of the SERVOPACK parameter to process for the following motion commands.

- PRM_RD (Read SERVOPACK Parameter)
- PRM_WR (Write SERVOPACK Parameter)
- PPRM_WR (Write Non-volatile Parameter)
- MEM_RD (Read Memory)
- MEM_WR (Write Memory)
- PMEM_RD (Read Non-volatile Memory)
- PMEM_WR (Write Non-volatile Memory)

Refer to the following chapter for details.

☞ *Chapter 4 Motion Control Program Commands and Instructions*

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OW□□□51	SERVOPACK Parameter Size	1 or 2	word	1	Position Phase Speed Torque

◆ SERVOPACK Parameter Set Value SVC

Set the SERVOPACK parameter value to be written for the following motion commands.

- PRM_WR (Write SERVOPACK Parameter)
- PPRM_WR (Write Non-volatile Parameter)

Refer to the following chapter for details.

☞ *Chapter 4 Motion Control Program Commands and Instructions*

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OL□□□52	SERVOPACK Parameter Set Value	-2^{31} to $2^{31}-1$	–	0	Position Phase Speed Torque

◆ Auxiliary SERVOPACK Parameter Number SVC

Specify the number of the SERVOPACK parameter to process for the following motion subcommands.

- PRM_RD (Read SERVOPACK Parameter)
- PRM_WR (Write SERVOPACK Parameter)

Refer to the following chapter for details.

☞ *Chapter 4 Motion Control Program Commands and Instructions*

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OW□□□54	Auxiliary SERVOPACK Parameter Number	0 to 65,535	–	0	Position Phase Speed Torque

◆ Auxiliary SERVOPACK Parameter Size SVC

Specify the size, in words, of the SERVOPACK parameter to process for the following motion subcommands.

- PRM_RD (Read SERVOPACK Parameter)
- PRM_WR (Write SERVOPACK Parameter)

Refer to the following chapter for details.

☞ *Chapter 4 Motion Control Program Commands and Instructions*

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OW□□□55	Auxiliary SERVOPACK Parameter Size	1, 2	word	1	Position Phase Speed Torque

◆ Auxiliary SERVOPACK Parameter Set Value SVC

Set the SERVOPACK parameter value to be written for the PRM_WR (Write SERVOPACK Parameter) motion subcommand. Refer to the following chapter for details.

☞ *Chapter 4 Motion Control Program Commands and Instructions*

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OL□□□56	Auxiliary SERVOPACK Parameter Set Value	-2^{31} to $2^{31}-1$	–	0	Position Phase Speed Torque

◆ Address Setting SVC

Set the memory address for the following motion commands.

- MEM_RD (Read Memory)
- MEM_WR (Write Memory)
- PMEM_RD (Read Non-volatile Memory)
- PMEM_WR (Write Non-volatile Memory)

Refer to the following chapter for details.

☞ *Chapter 4 Motion Control Program Commands and Instructions*

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OL□□□58	Address Setting	0 to FFFFFFFF hex	–	0	Position Phase Speed Torque

◆ Device Information Selection Code SVC

Set the information to read with the INF_RD (Read Device Information) motion subcommand.

The information that is read is reported in the area from the IW□□□70 monitor parameter onward.

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OW□□□5B	Device Information Selection Code	0 to 65,535	–	0	Position Phase Speed Torque

00 hex: Disabled

01 hex: Vendor ID code

02 hex: Device code

03 hex: Device version

04 hex: Device information file version

05 hex: Serial number

Auxiliary Settings

◆ Fixed Parameter Number SVC SVR

Set the number of the fixed parameter to read with the FIXPRM_RD (Read Fixed Parameter) motion subcommand.

The information that is read is reported in the IW□□□56 monitor parameter (Fixed Parameter Monitor).

Refer to the following section for details.

☞ *FIXPRM_RD (Read Fixed Parameter)* on page 4-133

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OW□□□5C	Fixed Parameter Number	0 to 65,535	–	0	Position Phase Speed Torque

Absolute Infinite-length Position Management Information

◆ Power OFF Encoder Position (Lower 2 Words) and Power OFF Encoder Position (Upper 2 Words) SVC

These parameters store information for infinite-length position management when an absolute encoder is used. The encoder position is stored in 4 words.

When bit 7 (Absolute Infinite-length Position Information Load Request) in the OW□□□00 setting parameter is set to 1 (Request ON), the position information is recalculated based on the set value of this parameter and the OL□□□62 and OL□□□64 setting parameters (Power OFF Pulse Position).

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OL□□□5E	Power OFF Encoder Position (Lower 2 Words)	-2^{31} to $2^{31}-1$	pulse	0	Position Phase Speed Torque
OL□□□60	Power OFF Encoder Position (Upper 2 Words)	-2^{31} to $2^{31}-1$	pulse	0	Position Phase Speed Torque

Setting Precautions

Set this parameter to 0 for linear motors.

◆ Power OFF Pulse Position (Lower 2 Words) and Power OFF Pulse Position (Upper 2 Words) SVC

These parameters store information for infinite-length position management when an absolute encoder is used.

The axis pulse position that is managed internally by the MP3000 is stored in 4 words.

When bit 7 (Absolute Infinite-length Position Information Load Request) in the OW□□□00 setting parameter is set to 1 (Request ON), the position information is recalculated based on the set value of this parameter and the OL□□□5E and OL□□□60 setting parameters (Power OFF Encoder Position).

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OL□□□62	Power OFF Pulse Position (Lower 2 Words)	-2^{31} to $2^{31}-1$	pulse	0	Position Phase Speed Torque
OL□□□64	Power OFF Pulse Position (Upper 2 Words)	-2^{31} to $2^{31}-1$	pulse	0	Position Phase Speed Torque

Setting Precautions

Set this parameter to 0 for linear motors.

Software Limits

◆ Positive Software Limit SVC

Set the position to detect the software limit in the forward direction for the MP3000.

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OL□□□66	Positive Software Limit	-2^{31} to $2^{31}-1$	Reference units	$2^{31}-1$	Position Phase Speed Torque

Setting Precautions

- This parameter is valid when bit 1 (Enable Positive Software Limit) in fixed parameter No. 1 is set to 1 (Enabled) and bit C (Software Limit Parameter Selection) is set to 1 (Setting parameter).

- If an axis attempts to move in the forward direction past this position, a positive software limit alarm occurs and bit 3 in the IL□□□04 monitor parameter changes to 1.
- The software limit is enabled only after bit 5 (Zero Point Return/Setting Completed) in the IW□□□0C monitor parameter changes to 1 (Completed). Refer to the following section for details.
  Refer to the following section for details.
  ☞ *6.3 Software Limits* on page 6-9

◆ Negative Software Limit SVC

Set the position to detect the software limit in the reverse direction for the MP3000.

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OL□□□68	Negative Software Limit	-2^{31} to $2^{31}-1$	Reference units	-2^{31}	Position Phase Speed Torque

Setting Precautions

- This parameter is valid when bit 2 (Enable Negative Software Limit) in fixed parameter No. 1 is set to 1 (Enabled) and bit C (Software Limit Parameter Selection) is set to 1 (Setting parameter).
- If an axis attempts to move in the reverse direction past this position, a negative software limit alarm occurs and bit 4 in the IL□□□04 monitor parameter changes to 1.
- The software limit is enabled only after bit 5 (Zero Point Return/Setting Completed) in the IW□□□0C monitor parameter changes to 1 (Completed). Refer to the following section for details.
  Refer to the following section for details.
  ☞ *6.3 Software Limits* on page 6-9

SERVOPACK Parameters

◆ User-specified SERVOPACK Parameter Set Value SVC

Set the data to automatically apply to the SERVOPACK parameter specified by fixed parameter No. 44 (User-specified SERVOPACK Parameter Number).

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OL□□□70	User-specified SERVOPACK Parameter Set Value	-2^{31} to $2^{31}-1$	–	0	–

SERVOPACK Transmission Reference Mode

◆ Command Buffers for SERVOPACK Transmission Reference Mode SVC

These parameters are used for command data when MECHATROLINK Servo commands are specified directly.

These parameters are used in SERVOPACK Transmission Reference Mode only. Set fixed parameter No. 0 (Operation Mode Selection) to 3 (SERVOPACK Transmission Reference Mode).

Refer to the following section for details.

☞ *3.4.1 Fixed Parameter Details* on page 3-27 – ◆ *Operation Mode Selection* on page 3-27

Register Address	Name	Setting Range	Setting Unit	Default	Control mode
OW□□□68 to OW□□□7F	Command Buffers for SERVOPACK Transmission Reference Mode	–	–	0	–

3.4.3 Monitor Parameter Details

This section provides details on each of the monitor parameters.

Information
- Refer to the following section for a list of the monitor parameters.
  ☞ *3.3.3 Monitor Parameter Table* on page 3-18
- The boxes (□□□) in "IW□□□00" are determined by the circuit number and the axis number. Refer to the following section for details on register addresses.
  ☞ *3.2 Motion Parameter Registers* on page 3-3

RUN Status

◆ RUN Status

Register Address	Name	Range	Unit
IW□□□00	RUN Status	–	–

■ Bit 0: Motion Operation Ready SVC SVR

0: Motion operation not ready.

1: Motion operation ready.

This bit changes to 1 when the SVC or SVR Function Module is in ready for motion operation.

This bit changes to 0 in the following situations.
- Major fault error occurred.
- Unused axis was selected.
- Fixed parameter setting error occurred.
- Fixed parameter is being changed.
- Communications are not synchronized.
- SERVOPACK parameters are being accessed by a command from an MPE720.
- The Motion Parameter Tab Page is open on the MPE720.

Precautions

Configure an OR circuit with bit 2 (System Busy) in the IW□□□00 monitor parameter for a Servo ON interlock.

■ Bit 1: Running with Servo ON SVC SVR

0: Stopped.

1: Running with Servo ON.

This bit is 1 while the axis is in the Servo ON state.

■ Bit 2: System Busy SVC

0: System not busy.

1: System busy.

This bit changes to 1 when a motion command cannot be processed due to the execution of any of the following system processes.
- Fixed parameter is being changed.
- SERVOPACK parameters are being read for a command from an MPE720.
- SERVOPACK parameters are being written for a command from an MPE720.

■ Bit 3: Servo Ready SVC

0: Servo not ready.

1: Servo ready.

This bit changes to 1 when all of the following conditions are satisfied.
- Communications are synchronized.
- The main power supply for the SERVOPACK is ON.
- There are no alarms in the SERVOPACK.

■ Bit 4: Latch Mode SVC

0: Latch detection request not received.

1: Latch detection request received.

This bit changes to 1 when a request is received in bit 4 (Latch Detection Request) in the OW□□□00 setting parameter.

Out-of-range Parameter Number

◆ Out-of-range Parameter Number SVC SVR

This parameter reports the number of the setting or fixed parameter that exceeds the setting range either individually or in combination with the settings of other parameters.

For fixed parameters, this parameter is the value of the parameter number plus 1,000.

- Setting parameter: 0 and higher
- Fixed parameter: 1000 and higher

Register Address	Name	Range	Unit
IW□□□01	Out-of-range Parameter Number	0 to 65,535	–

Warnings

◆ Warnings

Register Address	Name	Range	Unit
IL□□□02	Warnings	–	–

■ Bit 0: Excessive Deviation SVC

0: In normal deviation range.

1: Excessive deviation detected.

This bit changes to 1 in the following situations.

- Bit 0 (Excessive Deviation Error Level Setting) in the OW□□□01 setting parameter is set to 1 (Warning).
- The position deviation exceeds the value of the OL□□□22 setting parameter (Excessive Deviation Detection Value).

■ Bit 1: Setting Parameter Error SVC SVR

0: In setting range.

1: Outside setting range.

This bit changes to 1 when one or more of the setting parameters are set outside of the setting range. The parameter number that is detected outside of the valid setting range is reported in the IW□□□01 monitor parameter (Out-of-range Parameter Number).

■ Bit 2: Fixed Parameter Error SVC SVR

0: In setting range.

1: Outside setting range.

This bit changes to 1 when one or more of the fixed parameters are set outside of the setting range. The parameter number that is detected outside of the valid setting range is reported in the IW□□□01 monitor parameter (Out-of-range Parameter Number).

■ Bit 3: Servo Driver Error SVC

0: No warning.

1: Warning.

This bit changes to 1 when a warning occurs in the SERVOPACK. You can view the details of the warning in the IW□□□2D monitor parameter (SERVOPACK Alarm Code).

■ Bit 4: Motion Command Setting Error SVC SVR

0: No command setting error.

1: Command setting error.

This bit changes to 1 when an unusable motion command is set.

■ Bit 6: Positive Overtravel SVC

0: No positive overtravel.

1: Positive overtravel occurred.

This bit changes to 1 when positive overtravel is disabled in the fixed parameter settings and a positive overtravel signal is input.

Positive Overtravel Warning Signal

The positive overtravel warning signal turns ON when all of the following conditions are met.

- SERVOPACK Parameter Settings
  Pn50A is H2881 (P-OT is valid when CN1-8 is at the low level).
  Pn50B is H8881 (N-OT is valid when CN1-7 is at the low level).
- Fixed Parameter Settings
  Bit 3 in fixed parameter No. 1 is 0 (Disabled).
  Bit 4 in fixed parameter No. 1 is 0 (Disabled).
- The power supply to the Servomotor is ON (Servo ON).
- A motion command such as POSING (Positioning) or FEED (Jog) is executed.
- The reference is in the P-OT or N-OT direction.
- The SERVOPACK’s P-OT or N-OT input signal turns ON.

■ Bit 7: Negative Overtravel SVC

0: No negative overtravel.

1: Negative overtravel occurred.

This bit changes to 1 when negative overtravel is disabled in the fixed parameter settings and a negative overtravel signal is input.

Negative Overtravel Warning Signal

The negative overtravel warning signal turns ON under the same conditions as the positive overtravel warning signal.

■ Bit 8: Servo ON Incomplete SVC

0: Servo ON.

1: Servo ON incomplete.

This bit is 1 if the Servomotor’s power is not ON, even if bit 0 (Servo ON) in the OW□□□00 setting parameter is set to 1.

■ Bit 9: SERVOPACK Communications Warning SVC

0: Communications normal.

1: Communications error detected.

This bit changes to 1 when an error occurs in communications with the slave SERVOPACK. This bit is cleared automatically when communications are restored to normal operation.

■ Bit A: SERVOPACK Stop Signal Active SVC

0: There is no stop signal input.

1: There is a stop signal input.

This bit changes to 1 when an emergency stop signal is input to the SERVOPACK.

Alarms

◆ Alarms

Register Address	Name	Range	Unit
IL□□□04	Alarms	–	–

■ Bit 0: Servo Driver Error SVC

0: No SERVOPACK alarm.

1: SERVOPACK alarm occurred.

This bit changes to 1 when an alarm occurs in the SERVOPACK.

You can view the details of the alarm in the IW□□□2D monitor parameter (SERVOPACK Alarm Code).

■ Bit 1: Positive Overtravel SVC

0: No positive overtravel.

1: Positive overtravel occurred.

This bit changes to 1 when a positive overtravel signal is input and a travel motion command is executed in the forward direction.

■ Bit 2: Negative Overtravel SVC

0: No negative overtravel.

1: Negative overtravel occurred.

This bit changes to 1 when a negative overtravel signal is input and a travel motion command is executed in the reverse direction.

■ Bit 3: Positive Software Limit SVC

0: Positive software limit not exceeded.

1: Positive software limit exceeded.

This bit changes to 1 when a travel command is executed that exceeds the positive software limit in the following situations.
- When bit 0 (Axis Selection) in fixed parameter No. 1 is 0 (Finite-length axis).
- When the positive software limit is enabled.
- When the origin return operation is completed.

Refer to the following section for details.

☞ *6.3 Software Limits* on page 6-9

■ Bit 4: Negative Software Limit SVC

0: Negative software limit not exceeded.

1: Negative software limit exceeded.

This bit changes to 1 when a travel command is executed that exceeds the negative software limit in the following situations.
- When bit 0 (Axis Selection) in fixed parameter No. 1 is 0 (Finite-length axis).
- When the negative software limit is enabled.
- When the origin return operation is completed.

Refer to the following section for details.

☞ *6.3 Software Limits* on page 6-9

■ Bit 5: Servo OFF SVC SVR

0: Servo ON.

1: Servo OFF.

This bit changes to 1 if a travel motion command is executed when the Servomotor's power is turned OFF.

■ Bit 6: Positioning Time Exceeded SVC

0: No timeout.

1: Timeout occurred.

This bit changes to 1 when positioning is not completed within the specified time in the OW□□□26 setting parameter (Positioning Completion Check Time) after distribution is completed.

■ Bit 7: Excessive Positioning Travel Distance SVC

0: Normal travel distance.

1: Excessive travel distance.

This bit changes to 1 when a travel distance is specified that exceeds the valid positioning travel distance setting range.

■ Bit 8: Excessive Speed SVC

0: Normal speed.

1: Excessive speed.

This bit changes to 1 when a speed reference is issued that exceeds the valid setting range.

■ Bit 9: Excessive Deviation SVC

0: Normal following deviation.

1: Excessive deviation.

If bit 0 (Excessive Deviation Error Level Setting) in the OW□□□01 setting parameter is set to 0 (Alarm), this bit changes to 1 when the position deviation exceeds the value of the OL□□□22 setting parameter (Excessive Deviation Detection Value).

■ Bit A: Filter Type Change Error SVC

0: No change error.

1: Change error occurred.

This bit changes to 1 if the filter type is changed while distribution is not completed.

■ Bit B: Filter Time Constant Change Error SVC

0: No change error.

1: Change error occurred.

This bit changes to 1 if the filter time constant is changed while distribution is not completed.

■ Bit D: Zero Point Unset SVC

0: Zero point is set.

1: Zero point unset error occurred.

This bit changes to 1 if a travel motion command (excluding FEED and STEP) is executed when bit 0 (Axis Selection) in fixed parameter No. 1 is set to 1 (Infinite-length axis) while the origin is not set.

■ Bit 10: SERVOPACK Synchronized Communications Error SVC

0: No synchronized communications error.

1: Synchronized communications error occurred.

This bit changes to 1 when an error in synchronized communications with the slave SERVOPACK is detected.

■ Bit 11: SERVOPACK Communications Error SVC

0: No consecutive synchronized communications errors.

1: Consecutive synchronized communications errors occurred.

This bit changes to 1 when an error in synchronized communications with the slave SERVOPACK is detected twice in succession.

■ Bit 12: SERVOPACK Communications Timeout Error SVC

0: SERVOPACK command completed within the specified time.

1: SERVOPACK command not completed within the specified time.

This bit changes to 1 when a command that was sent to the slave SERVOPACK is not completed within the specified time.

■ Bit 13: Excessive Absolute Encoder Rotations SVC

0: In valid range.

1: Outside valid range.

This bit changes to 1 when the number of rotations of the absolute encoder exceeds the range that can be handled by the SVC Function Module.

Precautions

- This bit is valid when an absolute encoder is used and bit 0 (Axis Selection) in fixed parameter No. 1 is set to 0 (Finite-length axis).
- This bit also changes to 1 if the result of the calculation to convert the current position when the power supply is turned ON into reference units exceeds 32 bits.
- This bit is not valid for linear motors.

■ Bit 16: Scan Setting Error SVC

0: No scan setting error.

1: Scan setting error occurred.

This bit is 1 while the high-speed scan cycle setting and the MECHATROLINK communications cycle setting are asynchronous.

■ Bit 1C: Cyclic Communications Initialization Incomplete SVC

0: Initialization completed (default).

1: Initialization not completed.

MECHATROLINK-III communications allows connections to a network where communications are already in progress. In some cases, however, connection may not be possible due to conditions such as the transmission cycle and the number of slave stations that are connected. This bit changes to 1 if that occurs.

Precautions

If this alarm occurs, turn the power supplies to the MP3000 OFF and ON again or reset the network (bit C in OW□□□00).

■ Bit 1D: Detected SERVOPACK Model Error SVC

0: Match.

1: Mismatch.

This bit changes to 1 when the SERVOPACK model assigned in the SVC definition does not match the SERVOPACK model that is actually connected.

■ Bit 1E: Motor Type Setting Error SVC

0: Match.

1: Mismatch.

This bit changes to 1 when the motor type in the SVC definition does not match the motor type set for the SERVOPACK.

■ Bit 1F: Connected Encoder Model Error SVC

0: Match.

1: Mismatch.

This bit changes to 1 when the encoder type set in the SVC definition does not match the connected encoder type.

Motion Command Response Code

◆ Motion Command Response Code SVC SVR

This parameter reports the motion command code for the command that is currently being executed.

Response codes are also reported when the following processes are executed.

- Servo ON: 29
- Servo OFF: 30
- Clear Alarm: 31

Register Address	Name	Range	Unit
IW□□□08	Motion Command Response Code	0 to 38	–

Precautions

This parameter reports the command that is currently being executed. Therefore, it may not match the set value for the OW□□□08 setting parameter (Motion Commands).

Motion Command Status

◆ Motion Command Status

Register Address	Name	Range	Unit
IW□□□09	Motion Command Status	–	–

■ Bit 0: Command Execution Flag (BUSY) SVC SVR

This bit indicates the motion command execution status.

Refer to the timing charts for the individual commands in the following chapter for details.

☞ *Chapter 4 Motion Control Program Commands and Instructions*

0: READY (Completed).

1: BUSY (Processing).

This bit changes to 1 when a command that can be completed is currently being executed or processed.

■ Bit 1: Command Hold Completed (HOLDL) SVC SVR

0: Command hold not completed.

1: Command hold completed.

This bit changes to 1 when the command hold is completed.

Refer to the timing charts for the individual commands in the following chapter for details.

☞ *Chapter 4 Motion Control Program Commands and Instructions*

■ Bit 3: Command Error End (FAIL) SVC SVR

0: Completed normally.

1: Completed with an error.

This bit changes to 1 if motion command processing is not completed normally.

If a command ends in an error, the axis will stop any movement.

Refer to the timing charts for the individual commands in the following chapter for details.

☞ *Chapter 4 Motion Control Program Commands and Instructions*

■ Bit 7: Absolute Encoder Reset Completed SVC

0: Initialization not completed.

1: Initialization completed.

This bit changes to 1 after execution of the ABS_RST (Reset Absolute Encoder) motion command is completed.

Refer to the timing charts for the individual commands in the following chapter for details.

☞ *Chapter 4 Motion Control Program Commands and Instructions*

■ Bit 8: Command Execution Completed (COMPLETE) SVC SVR

0: Normal execution not completed.

1: Normal execution completed.

This bit changes to 1 when execution of a motion command is completed normally.

Refer to the timing charts for the individual commands in the following chapter for details.

☞ *Chapter 4 Motion Control Program Commands and Instructions*

Motion Subcommand Response Code

◆ Motion Subcommand Response Code SVC SVR

This parameter reports the code for the motion subcommand that is currently being executed.

Motion subcommands are used by the system for latch commands and reading/writing parameters.

Register Address	Name	Range	Unit
IW☐☐☐0A	Motion Subcommand Response Code	0 to 65,535	–

Precautions

This parameter reports the motion subcommand that is currently being executed. Therefore, it may not match the set value for the OW☐☐☐0A setting parameter (Motion Subcommands).

Motion Subcommand Status

◆ Motion Subcommand Status

Register Address	Name	Range	Unit
IW☐☐☐0B	Motion Subcommand Status	–	–

■ Bit 0: Command Execution Flag (BUSY) SVC SVR

This bit indicates the motion subcommand execution status.

0: READY (Completed).

1: BUSY (Processing).

This bit changes to 1 when a command is currently being executed or processed.

■ Bit 3: Command Error End (FAIL) SVC SVR

0: Completed normally.

1: Completed with an error.

This bit changes to 1 if motion subcommand processing is not completed normally.

■ Bit 8: Command Execution Completed (COMPLETE) SVC SVR

0: Normal execution not completed.

1: Normal execution completed.

This bit changes to 1 when execution of a motion subcommand is completed normally.

Position Management Status

◆ Position Management Status

Register Address	Name	Range	Unit
IW□□□0C	Position Management Status	–	–

■ Bit 0: Distribution Completed (DEN) SVC SVR

0: Distributing pulses.

1: Distribution completed.

This bit changes to 1 when distribution is completed for a travel motion command. This bit changes to 1 when the SERVOPACK finishes distribution (bit C in IL□□□28 is set to 1), and all Motion Control Function Module internal processing related to distribution is completed.

■ Bit 1: Positioning Completed (POSCOMP) SVC SVR

0: Outside positioning completed range.

1: Within positioning completed range.

This bit changes to 1 when distribution is completed and the current position is within the positioning completed range (i.e., when bit E of IL□□□28 is 1).

■ Bit 2: Latch Completed (LCOMP) SVC

0: Latch not complete.

1: Latch completed.

This bit changes to 0 when a new latch command is executed and changes to 1 when the latch is completed. The latched position is reported in the IL□□□18 monitor parameter (Machine Coordinate System Latch Position (LPOS)).

■ Bit 3: Near Position (NEAR) SVC SVR

0: Outside near position range.

1: Within near position range.

Operation depends on the value of OL□□□20 setting parameter (NEAR Signal Output Width).

- When OL□□□20 is 0: This bit changes to 1 when distribution is completed (bit 0 in IW□□□0C).
- When OL□□□20 is not 0: This bit changes to 1 if within the range calculated by the following formula, regardless of the Distribution Completed Flag.

|(IL□□□12) – (IL□□□16)| ≤ OL□□□20

IL□□□12: Machine Coordinate System Reference Position

IL□□□16: Machine Coordinate System Feedback Position

OL□□□20: NEAR Signal Output Width

■ Bit 4: Zero Point Position (ZERO) SVC SVR

0: Outside zero point position range.

1: Within zero point position range.

This bit changes to 1 when an origin return/setting is completed and the IL□□□12 monitor parameter (Machine Coordinate System Reference Position (MPOS)) is within the range of the OW□□□3D setting parameter (Zero Point Position Output Width) from the origin position.

■ Bit 5: Zero Point Return/Setting Completed (ZRNC) SVC SVR

0: Zero point return/setting not completed.

1: Zero point return/setting completed.

This bit changes to 1 after the completion of an origin return/setting.

This bit changes to 0 when, during an origin return/setting operation, communications with the Servo Section or a slave SERVOPACK are stopped and reestablished.

■ Bit 6: Machine Locked (MLKL) SVC

0: Machine Lock Mode released.

1: Machine locked.

This bit changes to 1 when bit 1 in OW□□□00 setting parameter (Machine Lock) is set to 1 and the axis has actually entered Machine Lock Mode.

■ Bit 8: Absolute Infinite-length Position Information Load Completed (ABSLDE) SVC

0: Load not complete.

1: Load completed.

This bit changes to 1 when bit 7 in the OW□□□00 setting parameter (Absolute Infinite-length Position Information Load Request) is set to 1 and the absolute infinite-length axis position information setup is completed.

Precautions

This parameter is not valid for linear motors.

■ Bit 9: POSMAX Turn Preset Completed (TPRSE) SVC SVR

0: Preset not completed.

1: Preset completed.

This bit changes to 1 when bit 6 (Number of POSMAX Turns Preset Request) in the OW□□□00 setting parameter changes to 1 and the number of POSMAX turns are preset for the OL□□□4C setting parameter (Number of POSMAX Turns Preset Data).

Precautions

This parameter is not valid for linear motors.

Position Information

◆ Machine Coordinate System Target Position (TPOS) SVC SVR

This parameter reports the target position in the machine coordinate system managed by the Motion Control Function Module.

Register Address	Name	Range	Unit
IL□□□0E	Machine Coordinate System Target Position (TPOS)	-2^{31} to $2^{31}-1$	Reference units

Precautions

- This is the target position for each scan for the INTERPOLATE (Interpolation) or LATCH (Latch) motion command.
- This parameter changes to 0 when the power supply is turned ON.
- The data is updated even when the machine is locked.
- This parameter is not reset, even if bit 0 (Axis Selection) in fixed parameter No. 1 is set to 1 (Infinite-length axis).

◆ Machine Coordinate System Calculated Position (CPOS) SVC SVR

This parameter reports the calculated position in the machine coordinate system managed by the Motion Control Function Module.

Register Address	Name	Range	Unit
IL□□□10	Machine Coordinate System Calculated Position (CPOS)	-2^{31} to $2^{31}-1$	Reference units

Precautions

- The position data that is stored in this parameter is the target position for each scan.
- This parameter changes to 0 when the power supply is turned ON.
- The data is updated even when the machine is locked.
- When bit 0 (Axis Selection) in fixed parameter No. 1 is set to 1 (Infinite-length axis), the range for this parameter is 0 to (infinite-length axis reset position – 1).

Information Refer to the following section when using an absolute encoder.
☞ *5.2 Absolute Encoders* on page 5-17

◆ Machine Coordinate System Reference Position (MPOS) SVC SVR

This parameter reports the reference position in the machine coordinate system managed by the Motion Control Function Module.

Register Address	Name	Range	Unit
IL□□□12	Machine Coordinate System Reference Position (MPOS)	-2^{31} to $2^{31}-1$	Reference units

Precautions

- This parameter changes to 0 when the power supply is turned ON.
- This data is not updated when the machine is locked. (When the machine is locked, the position reference data is not output externally.)
- When the machine is not locked, this parameter has the same value as the IL□□□10 monitor parameter (Machine Coordinate System Calculated Position (CPOS)).

Information Refer to the following section when using an absolute encoder.
☞ *5.2 Absolute Encoders* on page 5-17

◆ 32-bit DPOS (DPOS) SVC SVR

This parameter reports the reference position in the machine coordinate system managed by the Motion Control Function Module.

Register Address	Name	Range	Unit
IL□□□14	32-bit DPOS (DPOS)	-2^{31} to $2^{31}-1$	Reference units

Precautions

- When bit 0 (Axis Selection) in fixed parameter No. 1 is set to 0 (Finite-length axis), this parameter has the same value as the IL□□□10 monitor parameter (Machine Coordinate System Calculated Position (CPOS)).
- The value of this parameter is in the range of -2^{31} to $2^{31}-1$ regardless of the setting of bit 0 (Axis Selection) in fixed parameter No. 1.

◆ Machine Coordinate System Feedback Position (APOS)

SVC SVR

This parameter reports the feedback position in the machine coordinate system managed by the Motion Control Function Module.

Register Address	Name	Range	Unit
IL□□□16	Machine Coordinate System Feedback Position (APOS)	-2^{31} to $2^{31}-1$	Reference units

Precautions

- This parameter changes to 0 when the ZRET (Zero Point Return) motion command is executed.
- The range for this parameter is 0 to (infinite-length axis reset position – 1) when bit 0 (Axis Selection) in fixed parameter No. 1 is set to 1 (Infinite-length axis).

Information Refer to the following section when using an absolute encoder.
☞ *5.2 Absolute Encoders* on page 5-17

◆ Machine Coordinate System Latch Position (LPOS) SVC

This parameter reports the latch position when the latch is completed.

Register Address	Name	Range	Unit
IL□□□18	Machine Coordinate System Latch Position (LPOS)	-2^{31} to $2^{31}-1$	Reference units

Information Refer to the following section when using an absolute encoder.
☞ *5.2 Absolute Encoders* on page 5-17

◆ Position Deviation (PERR) SVC

This parameter reports the following deviation (internal Servo reference position – feedback position, converted to reference units) managed by the SVC Function Module.

Register Address	Name	Range	Unit
IL□□□1A	Position Deviation (PERR)	-2^{31} to $2^{31}-1$	Reference units

◆ Target Position Increment Monitor (PDV) SVR

This parameter reports the distribution amount for each scan.

Register Address	Name	Range	Unit
IL□□□1C	Target Position Increment Monitor (PDV)	-2^{31} to $2^{31}-1$	Reference units

◆ Number of POSMAX Turns SVC SVR

The count stored in this parameter goes up or down each time the current position exceeds the set value of fixed parameter No. 10 (Infinite-length Axis Reset Position).

Register Address	Name	Range	Unit
IL□□□1E	Number of POSMAX Turns	-2^{31} to $2^{31}-1$	turn

Precautions

- This parameter is valid for infinite-length axes.
- This parameter is not valid for linear motors.

Term

Machine Coordinate System
This is the basic coordinate system that is set based on the execution of the ZRET (Zero Point Return) or ZSET (Set Zero Point) command. The MP3000 manages positions using this machine coordinate system.

Reference Monitors

◆ Speed Reference Output Monitor SVC

This parameter reports the speed reference value that is currently being output. This parameter monitors the speed that is output to the servo.

Register Address	Name	Range	Unit
IL□□□20	Speed Reference Output Monitor	-2^{31} to $2^{31}-1$	pulse/s

Precautions

This parameter is 0 for interpolation or phase control.

◆ M-III Servo Command Input Signal Monitor SVC

This parameter reports the signal information that was input to the MECHATROLINK-III. The meanings of the bits depend on the Servo profile.

Register Address	Name	Range	Unit
IL□□□28	M-III Servo Command Input Signal Monitor	–	–

Bits for the Standard Servo Profile

Bit 0: Reserved.
Bit 1: DEC
Bit 2: P-OT
Bit 3: N-OT
Bit 4: EXT1
Bit 5: EXT2
Bit 6: EXT3
Bit 7: ESTP
Bit 8: Reserved.
Bit 9: BRK_ON
Bit A: P-SOT
Bit B: N-SOT
Bit C: DEN
Bit D: NEAR
Bit E: PSET
Bit F: ZPOINT
Bit 10: T_LIM
Bit 11: V_LIM
Bit 12: V_CMP
Bit 13: ZSPD
Bits 14 to 16: Reserved.
Bits 17 to 1F: Vendor Specific

◆ M-III Servo Command Status SVC

This parameter reports the Servo command information that was input to the MECHATROLINK-III. The meanings of the bits depend on the Servo profile.

Register Address	Name	Range	Unit
IL□□□2A	M-III Servo Command Status	–	–

Bits for the Standard Servo Profile

Bit 0: CMD_PAUSE_CMP
Bit 1: CMD_CANCEL_CMP
Bits 2 and 3: Reserved.
Bits 4 and 5: ACCFIL
Bits 6 and 7: Reserved.
Bit 8: L_CMP1
Bit 9: L_CMP2
Bit A: POS_RDY
Bit B: PON
Bit C: M_RDY
Bit D: SV_ON
Bits E and F: Reserved.
Bits 10 to 13: SEL_MON1
Bits 14 to 17: SEL_MON2
Bits 18 to 1B: SEL_MON3
Bit: 1C to 1F: Vendor Specific

SERVOPACK Status

◆ M-III Command Status SVC

Register Address	Name	Range	Unit
IW□□□2C	M-III Command Status	–	–

■ Bit 0: Drive Alarm (D_ALM)

0: No drive alarm.

1: Drive alarm occurred.

■ Bit 1: Drive Warning (D_WAR)

0: No drive warning.

1: Drive warning occurred.

■ Bit 2: Command Ready (CMDRDY)

0: Commands cannot be received.

1: Commands can be received.

■ Bit 3: Alarm Clear Execution Completed (ALM_CLR_CMP)

0: Alarms cleared.

1: Alarms not cleared.

■ Bits 6 and 7: Echo-back of Command ID (RCMD_ID)

These bits report the echo-back value of the command ID of a MECHATROLINK command.

■ Bits 8 to B Command Error (CMD_ALM)

These bits show the MECHATROLINK command error status.

Code		Meaning
–	0	No alarm
Warnings	1	Outside data range
	2	–
	3	–
	4	–
	5	–
	6	–
	7	–
Alarms	8	Unsupported command received.
	9	Outside data range
	A	Command execution condition error
	B	Subcommand combination error
	C	Phase error
	D	–
	E	–
	F	–

■ Bits C to F Communication Error (COMM_ALM)

These bits show the MECHATROLINK communications error status.

Code		Meaning
–	0	No alarm
Warnings	1	FCS error
	2	Reference data not received.
	3	Synchronous frame not received.
	4	–
	5	–
	6	–
	7	–
Alarms	8	FCS error
	9	Reference data not received.
	A	Synchronous frame not received.
	B	Synchronization interval error
	C	WDT error
	D	–
	E	–
	F	–

◆ SERVOPACK Alarm Code SVC

This parameter reports the alarm code from the SERVOPACK in BCD.

Refer to the relevant SERVOPACK manual for details on alarm.

Register Address	Name	Range	Unit
IW□□□2D	SERVOPACK Alarm Code	-32,768 to 32,767	–

SERVOPACK User Monitor Information

◆ SERVOPACK User Monitor Information SVC

This parameter reports the monitor selection that was made by the user when using a SERVOPACK with MECHATROLINK Communications.

Register Address	Name	Range	Unit
IW□□□2F	SERVOPACK User Monitor Information	–	–

- Bits 0 to 3: Monitor 1 (Cannot be set.)
- Bits 4 to 7: Monitor 2
- Bits 8 to B: Monitor 3 (Cannot be set.)
- Bits C to F: Monitor 4

SERVOPACK Information

◆ SERVOPACK User Monitor 2 SVC

This parameter reports the monitor results selected in bits 4 to 7 (Monitor 2) in the OW□□□4E setting parameter.

Register Address	Name	Range	Unit
IL□□□30	SERVOPACK User Monitor 2	-2^{31} to $2^{31}-1$	–

◆ SERVOPACK User Monitor 4 SVC

This parameter reports the monitor results selected in bits C to F (Monitor 4) in the OW□□□4E setting parameter.

Register Address	Name	Range	Unit
IW□□□34	SERVOPACK User Monitor 4	-2^{31} to $2^{31}-1$	–

◆ SERVOPACK Parameter Number SVC

This parameter reports the number of the SERVOPACK parameter that is being read or written using the MECHATROLINK command area.

Refer to the following chapter for details.

☞ *Chapter 4 Motion Control Program Commands and Instructions*

Register Address	Name	Range	Unit
IW□□□36	SERVOPACK Parameter Number	0 to 65,535	–

◆ Auxiliary SERVOPACK Parameter Number SVC

This parameter reports the number of the SERVOPACK parameter that is being read or written using the MECHATROLINK subcommand area.

Refer to the following chapter for details.

☞ *Chapter 4 Motion Control Program Commands and Instructions*

Register Address	Name	Range	Unit
IW□□□37	Auxiliary SERVOPACK Parameter Number	0 to 65,535	–

◆ SERVOPACK Parameter Read Data SVC

This parameter reports the contents of the SERVOPACK parameter that was read using the MECHATROLINK command area.

Refer to the following chapter for details.

☞ *Chapter 4 Motion Control Program Commands and Instructions*

Register Address	Name	Range	Unit
IL□□□38	SERVOPACK Parameter Read Data	-2^{31} to $2^{31}-1$	–

◆ Auxiliary SERVOPACK Parameter Read Data SVC

This parameter reports the contents of the SERVOPACK parameter that was read using the MECHATROLINK subcommand area.

Refer to the following chapter for details.

☞ *Chapter 4 Motion Control Program Commands and Instructions*

Register Address	Name	Range	Unit
IL□□□3A	Auxiliary SERVOPACK Parameter Read Data	-2^{31} to $2^{31}-1$	–

◆ Motor Type SVC

This parameter reports the type of the motor that is actually connected.

Register Address	Name	Range	Unit
IW□□□3F	Motor Type	0 or 1	–

0: Rotary motor

1: Linear motor

◆ Feedback Speed SVC SVR

This parameter reports the feedback speed.

The IL□□□40 monitor parameter (Feedback Speed) contains the value that is determined by the moving average of fixed parameter No. 42 (Feedback Speed Movement Averaging Time Constant) and the unit-converted difference between the value of IL□□□16 (Machine Coordinate System Feedback Position (APOS)) for each scan.

Register Address	Name	Range	Unit
IL□□□40	Feedback Speed	-2^{31} to $2^{31}-1$	The unit that is set in the Speed Unit Selection bits is used.

Precautions

The unit that is set in the Speed Unit Selection bits (bits 0 to 3 in the OW□□□03 setting parameter) is used for this parameter.

◆ Torque/Force Reference Monitor SVC SVR

This parameter reports the value of the torque reference.

Register Address	Name	Range	Unit
IL□□□42	Torque/Force Reference Monitor	-2^{31} to $2^{31}-1$	The unit that is set in the Torque Unit Selection bits is used.

The setting unit selected in bits C to F (Torque Unit Selection) of the OW□□□03 setting parameter is used for this parameter. In order to execute control correctly, it is necessary to set bits C to F (Torque Unit Selection) in the OW□□□03 setting parameter and the resolution of the torque reference of the slave SERVOPACK. The following sections give the setting methods.

<Common Parameter No. 48 Setting>

Common parameter No. 48 (Torque Base Unit) can be set in one of two ways: either manually or automatically. Both of these methods are described below.

- Manual Setting

If you set bit D (Torque Base Unit of SERVOPACK) in fixed parameter No. 1 (Function Selection Flag 1) to 0 (Set by user), you must set common parameter No. 48 manually.

Common Parameter No.	Name	Setting Range	Default	When Enabled
48	Torque Base Unit	-5 to 0	0	After restart

Note: 1. If you use a servo amplifier from another company, set the value of n in the following formula.
Setting unit for Torque Unit (servo common parameter No. 47) × 10^n
2. To control appropriately, set common parameter No. 48 so that the following relationship holds.
OW□□□03 bit C to F setting ≥ Common parameter No. 48 setting

The factory setting of the Torque Base Unit parameter is 0, so 1 in the Torque/Force Reference Monitor parameter indicates 1% (resolution: 1%). For example, to make 1 in the Torque/Force Reference Monitor parameter indicate 0.01%, set common parameter No. 48 to -2.

- Automatic Setting

Set bit D (Torque Base Unit of SERVOPACK) of fixed parameter No. 1 (Function Selection Flag 1) to 1 (Set by system). The MP3000 will automatically set common parameter No. 48 (Torque Base Unit) to -4.

Refer to the following section for details.

☞ *3.4 Motion Parameter Details– ◆ Function Selection Flags 1– ■ Bit B: User-specified SERVOPACK Parameter Auto-Write* on page 3-30

Auxiliary Information

◆ Fixed Parameter Monitor SVC SVR

This parameter reports the data of the specified fixed parameter number when bit 5 (Read Fixed Parameter) is specified for the OW☐☐☐0A setting parameter (Motion Subcommands).

Register Address	Name	Range	Unit
IL☐☐☐56	Fixed Parameter Monitor	-2^{31} to $2^{31}-1$	–

◆ Device Information Monitor Code SVC

This parameter reports the code for the information that was read with the INF_RD (Read Device Information) motion subcommand.

Register Address	Name	Range	Unit
IW☐☐☐5B	Device Information Monitor Code	0 to 65,535	–

00 hex: Disabled
01 hex: Vendor ID code
02 hex: Device code
03 hex: Device version
04 hex: Device information file version
05 hex: Serial number

Absolute Infinite-length Position Management Information

◆ Power OFF Encoder Position (Lower 2 Words) and Power OFF Encoder Position (Upper 2 Words) SVC

These parameters store information for infinite-length position management when an absolute encoder is used.

The encoder position is stored in 4 words.

Register Address	Name	Range	Unit
IL☐☐☐5E	Power OFF Encoder Position (Lower 2 Words)	-2^{31} to $2^{31}-1$	pulse
IL☐☐☐60	Power OFF Encoder Position (Upper 2 Words)	-2^{31} to $2^{31}-1$	pulse

◆ Power OFF Pulse Position (Lower 2 Words) and Power OFF Pulse Position (Upper 2 Words) SVC

These parameters store information for infinite-length position management when an absolute encoder is used.

The axis pulse position that is managed internally by the MP3000 is always stored in 4 words.

Register Address	Name	Range	Unit
IL☐☐☐62	Power OFF Pulse Position (Lower 2 Words)	-2^{31} to $2^{31}-1$	pulse
IL☐☐☐64	Power OFF Pulse Position (Upper 2 Words)	-2^{31} to $2^{31}-1$	pulse

Reserved for Future Use

◆ Device Information Monitor Data SVC

This data is the information that was read with the INF_RD (Read Device Information) motion subcommand.

Register Address	Name	Range	Unit
IW□□□70 to IW□□□7F	Device Information Monitor Data	–	–

SERVOPACK Transmission Reference Mode

◆ Response Buffers for SERVOPACK Transmission Reference Mode SVC

This area stores MECHATROLINK Servo responses.

These parameters are used in SERVOPACK Transmission Reference Mode only. Set fixed parameter No. 0 (Operation Mode Selection) to 3 (SERVOPACK Transmission Reference Mode).

Refer to the following section for details.

☞ *3.4.1 Fixed Parameter Details* on page 3-27 – *Operation Mode Selection* on page 3-27

Register Address	Name	Range	Unit
IW□□□68 to IW□□□7F	Response Buffers for SERVOPACK Transmission Reference Mode	–	–

3.5 Automatically Updated Parameters

Some of the parameters that are stored in SERVOPACK RAM may be overwritten automatically under certain conditions or as a result of self configuration. This includes setting parameters, fixed parameters, and fixed value SERVOPACK parameters provided in the MP3000. Some of the SERVOPACK parameters are automatically written to the MP3000 setting parameters when self configuration is performed. The parameters that are modified under these conditions are listed in the following tables.

Refer to the following chapter for details on MP3000 parameters.

☞ *Chapter 3 Parameters for Motion Control*

Refer to the manual for your SERVOPACK for details on the SERVOPACK parameters.

3.5.1 Automatically Updated Parameters When a MECHATROLINK Connection Is Established

Some setting parameters are automatically written to the Servo common parameters of the SERVOPACK when a connection is established between the MP3000 and the SERVOPACK, such as after the power supply is turned ON or when alarms are cleared following a communications interruption.

Automatically Updated Parameters That Are Not Affected by the Parameter Auto-write Setting

The MP3000 parameter settings shown in the following table on the left are automatically written to the SERVOPACK Servo common parameters shown in the following table on the right when a MECHATROLINK connection is established.

MP3000			SERVOPACK	
Fixed Values			Servo Common Parameters	
Name	Value		No.	Name
Speed Unit Selection	Reference units/s	→	41	Speed Unit
Acceleration Unit Selection	Reference units/s^2	→	45	Acceleration Unit
Torque Unit Selection	Percentage of rated torque	→	47	Torque Unit

Important

This write operation occurs regardless of the setting of bit A (SERVOPACK Parameter Auto-Write) in fixed parameter No. 1.

Automatically Updated Parameters When the Auto-write Setting Is Enabled

When bit A (SERVOPACK Parameter Auto-Write) in fixed parameter No. 1 is set to 0 (Enabled), the MP3000 parameter settings shown in the following table on the left are automatically written to the SERVOPACK Servo common parameters shown in the following table on the right when a MECHATROLINK connection is established.

MP3000			SERVOPACK	
Setting Parameters			Servo Common Parameters	
Name	Register Address		No.	Name/Description
Positioning Completion Width	OL□□□1E	→	66	In-position Range
Position Loop Gain	OW□□□2E	→	63	Position Loop Gain
Speed Loop Gain	OW□□□2F	→	61	Speed Loop Gain
Speed Feedforward Compensation	OW□□□30	→	64	Feed Forward Compensation
Position Loop Integral Time Constant	OW□□□32	→	65	Position Loop Integral Time Constant
Speed Loop Integral Time Constant	OW□□□34	→	62	Speed Loop Integral Time Constant
Filter Time Constant	OW□□□3A	→	81/82	Depends on the set value of bits 8 to B (Filter Type Selection) in the OW□□□03 setting parameter. When Set to 1 (Exponential acceleration/deceleration filter) ... 81 (Exponential Function Acceleration/Deceleration Time Constant) When Set to 0 (None) or 2 (Moving average filter) ... 82 (Movement Average Time)

3.5.2 Automatically Updated Parameters When a Setting Parameter Is Changed

When bit A (SERVOPACK Parameter Auto-Write) in fixed parameter No. 1 is set to 0 (Enabled), the MP3000 setting parameter values shown in the following table on the left are automatically written to the SERVOPACK Servo common parameters shown in the following table on the right whenever any change is made to those setting parameters.

MP3000			SERVOPACK	
Setting Parameters			Servo Common Parameters	
Name	Register Address		No.	Name/Description
Positioning Completion Width	OL□□□1E	→	66	In-position Range
Position Loop Gain	OW□□□2E	→	63	Position Loop Gain
Speed Loop Gain	OW□□□2F	→	61	Speed Loop Gain
Speed Feedforward Compensation	OW□□□30	→	64	Feed Forward Compensation
Position Loop Integral Time Constant	OW□□□32	→	65	Position Loop Integral Time Constant
Speed Loop Integral Time Constant	OW□□□34	→	62	Speed Loop Integral Time Constant
Filter Time Constant	OW□□□3A	→	81/82	Depends on the set value of bits 8 to B (Filter Type Selection) in the OW□□□03 setting parameter. When Set to 1 (Exponential acceleration/deceleration filter) ... 81 (Exponential Function Acceleration/Deceleration Time Constant) When Set to 0 (None) or 2 (Moving average filter) ... 82 (Movement Average Time)

When any of the above setting parameters are changed when an alarm has occurred (i.e., when IL□□□04 ≠ 0), the following monitor parameters are also changed.

Register Address	Name	Before Change	After Change
IW□□□0B Bit 3	Command Error End	0: Completed normally	1: Completed with an error
IL□□□02 Bit 1*	Setting Parameter Error	0: In setting range	1: Outside setting range

* The number of the setting parameter that was changed is reported in the IW□□□01 monitor parameter (Out-of-range Parameter Number).

3.5.3 Automatically Updated Parameters When a Motion Command Is Executed

Some setting parameters are automatically written to the SERVOPACK Servo common parameters when the MP3000 starts the execution of a motion command.

Automatically Updated Parameters That Are Not Affected by the Parameter Auto-write Setting

The MP3000 parameter settings shown in the following table on the left are automatically written to the SERVOPACK Servo common parameters shown in the following table on the right when the MP3000 starts the execution of motion commands.

MP3000			SERVOPACK		
Setting Parameters			Servo Common Parameters		
Name	Register Address		No.	Name	Description
Approach Speed	OL□□□3E	→	84	Zero Point Return Approach Speed	Automatically updated when the ZRET command is executed for DEC1 + phase-C pulse or DEC1 + ZERO signal.
Creep Speed	OL□□□40	→	85	Zero Point Return Creep Speed	Automatically updated when the ZRET command is executed for DEC1 + phase-C pulse or DEC1 + ZERO signal.
Zero Point Return Travel Distance	OL□□□42	→	86	Final Travel for Zero Point Return	Automatically updated when the ZRET command is executed for DEC1 + phase-C pulse, DEC1 + ZERO signal, ZERO signal, phase-C pulse, C pulse only, P-OT + C pulse, HOME LS + C pulse, or INPUT + C pulse.
External Positioning Final Travel Distance	OL□□□46	→	83	Final Travel for External Input Positioning	Automatically updated when the EXPOSING or EX_FEED command is executed.

Important

This write operation occurs regardless of the setting of bit A (SERVOPACK Parameter Auto-Write) in MP3000 fixed parameter No. 1.

Automatically Updated Parameters When the Auto-write Setting Is Enabled

When bit A (SERVOPACK Parameter Auto-Write) in fixed parameter No. 1 on the MP3000 is set to 0 (Enabled), the MP3000 parameter settings shown in the following table on the left are automatically written to the SERVOPACK Servo common parameters shown in the following table on the right when the MP3000 begins execution of a motion command.

MP3000			SERVOPACK	
Setting Parameters			Servo Common Parameters	
Name	Register Address		No.	Description
Filter Time Constant	OW□□□3A	→	81/82	Depends on the set value of bits 8 to B (Filter Type Selection) in the OW□□□03 setting parameter. When Set to 1 (Exponential Acceleration/Deceleration Filter) ... 81 (Exponential Function Acceleration/Deceleration Time Constant) When Set to 0 (None) or 2 (Moving Average Filter) ... 82 (Movement Average Time)

3.5.4 Parameters Automatically Updated during Self Configuration

The fixed values in the MP3000 are written to the SERVOPACK EEPROM or RAM during self-configuration as shown below. The SERVOPACK parameters are also written to the MP3000's setting parameters.

Important SERVOPACK and MP3000 parameters may be overwritten when self configuration is performed.

Writing Parameters from the MP3000 to the SERVOPACK

The following settings are written regardless of the setting of bit A (SERVOPACK Parameter Auto-Write) in fixed parameter No. 1.

MP3000			SERVOPACK	
Fixed Values			Servo Common Parameters	
Name	Set Value		No.	Name/Description
P-OT Signal Mapping	Disable	→	25. Bit 0	Limit Setting, P-OT
N-OT Signal Mapping	Disable	→	25. Bit 1	Limit Setting, N-OT
Positive Servo Software Limit	Disable	→	25. Bit 4	Limit Setting, P-SOT
Negative Servo Software Limit	Disable	→	25. Bit 5	Limit Setting, N-SOT
Servo Electronic Gear Ratio Numerator	1*	→	21	Electronic Gear Ratio (Numerator)
Servo Electronic Gear Ratio Denominator	1	→	22	Electronic Gear Ratio (Denominator)
Fixed Monitor Selection	1	→	87	Monitor Select 1
Fixed Monitor Selection	0	→	88	Monitor Select 2

* When using a 24-bit encoder, the set value is 16.

Information The above settings are not written for axes that are already defined.

Writing Parameters from the SERVOPACK to the MP3000

The following settings are written when bit A (SERVOPACK Parameter Auto-Write) in fixed parameter No. 1 is set to 0 (Enabled).

MP3000			SERVOPACK	
Setting Parameters			Servo Common Parameters	
Name	Register Address		No.	Name
Position Loop Gain	OW□□□2E	←	63	Position Loop Gain
Speed Loop Gain	OW□□□2F	←	61	Speed Loop Gain
Speed Feedforward Compensation	OW□□□30	←	64	Feed Forward Compensation
Position Loop Integral Time Constant	OW□□□32	←	65	Position Loop Integral Time Constant
Speed Loop Integral Time Constant	OW□□□34	←	62	Speed Loop Integral Time Constant
Filter Time Constant	OW□□□3A	←	82	Movement Average Time

Motion Control Program Commands and Instructions

4

This chapter describes the motion commands required to write ladder programs and the motion language instructions required to write motion programs.

4.1 Commands

4.1.1 Motion Commands

Motion commands are used to perform motion control for machine operation. They are used to write motion control programs as ladder programs.

A distinct command code is assigned to each motion command. Machine operation is started by setting the OW□□□08 setting parameter to the command code of the motion command to be used. This section describes motion commands.

The following table lists the motion commands.

Refer to the reference pages for details on these commands.

Command Code	Command	Name	Introduction	SVC Function Modules	SVR Function Modules	Reference Page
0	NOP	No Operation (No command)	Nothing is executed. If you change to this command during execution of another command, the current command process is canceled.	✓	✓	–
1	POSING	Positioning	Performs positioning to the specified position at the specified acceleration/deceleration time constant and velocity.	✓	✓	page 4-7
2	EX_POSING	External Positioning	Moves the axis by the external positioning travel distance from the current position when an external positioning signal is input during positioning.	✓	✓	page 4-13
3	ZRET	Zero Point Return	Returns to the origin in the machine coordinate system. When an incremental encoder is used, there are 13 different methods that you can use for the origin return operation.	✓	✓	page 4-20
4	INTERPOLATE	Interpolation	Performs interpolation feeding using positioning data that is distributed from the CPU.	✓	✓	page 4-42
5	–	Reserved.	–	–	–	–
6	LATCH	Latch (Interpolation mode with latch input)	Stores the current position when a latch signal is input during interpolation feeding.	✓	✓	page 4-46
7	FEED	Jog (Jog mode)	Moves the axis at the specified speed in the specified direction until the command is canceled.	✓	✓	page 4-50
8	STEP	STEP Operation (Relative position mode)	Performs positioning in the specified direction at the specified speed for the specified travel distance.	✓	✓	page 4-55
9	ZSET	Set Zero Point	Sets the origin in machine coordinates and enables the software limits.	✓	✓	page 4-60
10	ACC	Change Acceleration Time	Changes the acceleration time for linear acceleration and deceleration.	✓	✓	page 4-62
11	DCC	Change Deceleration Time	Changes the deceleration time for linear acceleration and deceleration.	✓	✓	page 4-64

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Command Code	Command	Name	Introduction	SVC Function Modules	SVR Function Modules	Reference Page
12	SCC	Change Filter Time Constant	Changes the acceleration/deceleration filter time constant.	✓	✓	page 4-66
13	CHG_FILTER	Change Filter Type	Changes the acceleration/deceleration filter type.	✓	✓	page 4-68
14	KVS	Change Speed Loop Gain	Changes the speed loop gain.	✓	–	page 4-70
15	KPS	Change Position Loop Gain	Changes the position loop gain.	✓	–	page 4-72
16	KFS	Change Feedforward	Changes the feedforward control gain.	✓	–	page 4-74
17	PRM_RD	Read SERVOPACK Parameter (Read user constant)	Reads a SERVOPACK parameter.	✓	–	page 4-76
18	PRM_WR	Write SERVOPACK Parameter (Write user constant)	Writes a SERVOPACK parameter.	✓	–	page 4-78
19	ALM_MON	Motion Alarms (Alarm monitor)	Monitors SERVOPACK alarms.	✓	–	page 4-80
20	ALM_HIST	Monitor Alarm History (Alarm history monitor)	Monitors the SERVOPACK alarm history.	✓	–	page 4-82
21	ALMHIST_-CLR	Clear Alarm History	Clears the SERVOPACK alarm history data.	✓	–	page 4-84
22	ABS_RST	Reset Absolute Encoder	Resets the absolute encoder.	✓	–	page 4-86
23	VELO	Issue Speed Reference (Speed reference)	Performs operation in Speed Control Mode.	✓	✓	page 4-89
24	TRQ	Issue Torque/Force Reference (Torque/Thrust reference)	Performs operation in Torque/Force Control Mode.	✓	✓	page 4-94
25	PHASE	Issue Phase Reference (Phase reference)	Performs operation in Phase Control Mode.	✓	✓	page 4-99
26	KIS	Change Position Loop Integral Time Constant	Changes the position loop integral time constant.	✓	–	page 4-103
27	PPRM_WR	Write Non-volatile Parameter (Stored parameter write)	Changes a SERVOPACK parameter in non-volatile memory.	✓	–	page 4-105
28 to 33	–	Reserved.	–	–	–	–
34	EX_FEED	Jog with External Positioning (Jog mode with external positioning)	Moves the axis by the external positioning travel distance from the current position when an external positioning signal is input during jogging.	✓	–	page 4-107
35	MEM_RD	Read Memory	Reads data from the SERVOPACK memory.	✓	–	page 4-113
36	MEM_WR	Write Memory	Writes data to the SERVOPACK memory.	✓	–	page 4-115

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Command Code	Command	Name	Introduction	SVC Function Modules	SVR Function Modules	Reference Page
37	PMEM_RD	Read Non-volatile Memory	Reads data from the SERVOPACK non-volatile memory.	✓	–	page 4-117
38	PMEM_WR	Write Non-volatile Memory	Writes data to the SERVOPACK non-volatile memory.	✓	–	page 4-119
39	MLTTRN_SET	Multiturn Limit Setting	Sets the multiturn limit.	✓	–	page 4-121

4.1.2 Motion Subcommands

Motion subcommands are used to make settings related to the handling of status information in motion control. They can be executed at the same time as motion commands.

A distinct command code exists for each motion subcommand. Motion subcommands are executed by setting the OW□□□0A setting parameter to the command code of the subcommand to be used. This section describes motion subcommands.

The following table lists the motion subcommands.

Refer to the pages given in the *Reference Page* Column for details on individual subcommands.

Command Code	Command	Name	Introduction	SVC Function Module	SVR Function Module	Reference Page
0	NOP	No Command	This is a null command. When you do not want to execute a subcommand, set this command code.	✓	✓	page 4-124
1	PRM_RD	Read SERVOPACK Parameter	This command reads the specified SERVOPACK parameter and reports contents of the parameter to the monitor parameters.	✓	–	page 4-125
2	PRM_WR	Write SERVOPACK Parameter	This command changes the set value of the specified SERVOPACK parameter.	✓	–	page 4-127
3	INF_RD	Read Device Information	This command reads information on the specified device.	✓	–	page 4-129
4	SMON	Monitor Status	This command reports the status of the SERVOPACK to the monitor parameters.	✓	–	page 4-131
5	FIXPRM_RD	Read Fixed Parameter	This command reads the current value of the specified fixed parameter and reports the contents of the parameter to the monitor parameters.	✓	✓	page 4-133
6	FIXPRM_CHG	Change Fixed Parameter	This command changes the set value of a specific fixed parameter.	✓	–	page 4-135

4.2 Motion Command Details

This section describes motion commands in detail.

4.2.1 POSING (Positioning)

The POSING command positions the axis to the target position according to the specified target position and speed.

Execution and Operating Procedures

1. Make sure that all of the following conditions are met.

No.	Execution Condition	Confirmation Method
1	There must be no alarms.	Both IL□□□02 and IL□□□04 must be 0.
2	The Servomotor’s power must be ON.	Bit 1 in IW□□□00 must be 1.
3	Motion command execution for the target axis must be completed.*	IW□□□08 must be 0 and bit 0 in IW□□□09 must be 0.

* Before you change to this command during the execution of another command, you must check whether the command can be changed and how operation changes when the command is changed. Refer to the following section for details on changing from another command.
☞ *4.4 Changing the Command* on page 4-137

2. Set the following setting parameters.
- OW□□□01, Bit 3 (Speed Loop P/PI Switch)
- OW□□□03, Bits 8 to B (Filter Type Selection)
- OL□□□10 (Speed Reference Setting)
- OW□□□12 (Speed Limit)
- OL□□□14 (Torque/Force Limit)
- OL□□□36 (Linear Acceleration Rate/Acceleration Time Constant)
- OL□□□38 (Linear Deceleration Rate/Deceleration Time Constant)

Information
- OL□□□10 can be changed during positioning.
- An override of between 0% and 327.67% can be set for OL□□□10.
- OL□□□14 can be changed at any time. The intended operation may not be achieved if the set value is too small.
- If OL□□□36 and OL□□□38 are changed during operation, the specifications of the SERVOPACK determine whether these changes are applied to acceleration and deceleration.

3. Set the OW□□□08 setting parameter (Motion Commands) to 1 to execute the POSING motion command.

4. Set the OL□□□1C setting parameter (Position Reference Setting).

This starts the positioning operation. During positioning, the IW□□□08 monitor parameter (Motion Command Response Code) will be 1.
When the axis reaches the target near position, bit 3 (Near Position) in the IW□□□0C monitor parameter will change to 1 (Within near position range).
Then, when the axis reaches the target position, bit 1 (Positioning Completed) in the IW□□□0C monitor parameter will change to 1 (Within positioning completed range) and positioning will end.

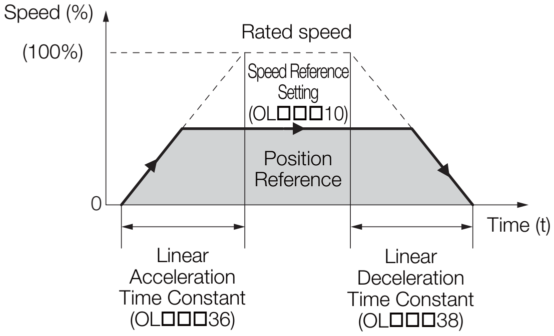
Information
- If bit 5 (Position Reference Type) in the OW□□□09 setting parameter is set to 1 (Absolute value specification method), the target position can be set before executing the command.
- The OL□□□1C setting parameter (Position Reference Setting) can be changed during positioning.
- If the target position (OL□□□1C) is changed during positioning and there is not sufficient distance for deceleration or if it is changed and the new target position has already been passed, the system will first decelerate to a stop, and then positioning to the target position will be performed.

5. **Set OW□□□08 to 0 to execute the NOP motion command.**

This concludes positioning.

Operating Patterns

The following figure shows the operating pattern when the POSING command is executed.



Term

Command Execution
A motion command is executed when a command code is set to the Motion Command parameter register (OW□□□08).

Holding

- To hold an axis in place during motion and resume operation at a later time, set bit 0 (Hold Command) in the OW□□□09 setting parameter to 1 (Hold Command ON).
  When bit 0 in OW□□□09 is set to 1, the axis will decelerate to a stop.
  The deceleration operation depends on the setting of bits 8 to F (Stop Mode Selection) in the OW□□□02 setting parameter.
  When the axis completely decelerates to a stop, bit 1 (Command Hold Completed) in the IW□□□09 monitor parameter will change to 1 (Completed).
- To release the hold, set bit 0 (Hold Command) in OW□□□09 to 0 (Hold Command OFF).
  This clears the command hold status and the remaining portion of the positioning operation is restarted.

Canceling

- To stop an axis during motion and cancel the remaining motion, set bit 1 (Cancel Command) in the OW□□□09 setting parameter to 1 (Cancel Command ON).
  When bit 1 in OW□□□09 is set to 1, the axis will decelerate to a stop.
  The deceleration operation depends on the setting of bits 8 to F (Stop Mode Selection) in the OW□□□02 setting parameter.
  When the axis completely decelerates to a stop, the remaining motion will be canceled and bit 1 (Positioning Completed) in the IW□□□0C monitor parameter will change to 1 (Within positioning completed range).
- The positioning operation resumes if bit 1 (Cancel Command) in the OW□□□09 setting parameter is set to 0 (Cancel Command OFF) during processing of the cancel operation.
  When the absolute value specification method is used and bit 1 in OW□□□09 is set to 0 (Cancel Command OFF) after decelerating to a stop, motion is resumed in the direction of the position reference value set in the OL□□□1C setting parameter (Position Reference Setting).
- The same operation as the Cancel Command operation will be performed if the motion command code is changed during axis motion.

Related Parameters

The parameters that are related to this command are listed in the following table.

◆ Setting Parameters

Register Address	Name	Setting Details
OW☐☐☐00 Bit 0	Servo ON	Use this bit to turn the power to the Servomotor ON or OFF. Set this parameter to 1 before setting OW☐☐☐08 to 1 (POSING). 0: Servo OFF, 1: Servo ON
OW☐☐☐01 Bit 3	Speed Loop P/PI Switch	Use this bit to change the speed control loop between PI control and P control. 0: PI control, 1: P control
OW☐☐☐02 Bits 8 to F	Stop Mode Selection	Select the stop method to use when a command is canceled. 0: Stop according to the Linear Deceleration Rate/Deceleration Time Constant parameter 1: Stop immediately
OW☐☐☐03	Function Settings 1	Select the speed unit, acceleration/deceleration unit, and filter type.
OW☐☐☐08	Motion Commands	Positioning is started when this parameter is set to 1 (POSING). Set this parameter to 0 (NOP) during positioning to cancel the positioning operation.
OW☐☐☐09 Bit 0	Hold Command	If this bit is set to 1 (ON) during positioning, the axis will decelerate to a stop. The positioning operation is resumed if this bit is set to 0 (OFF) when the axis is being held.
OW☐☐☐09 Bit 1	Cancel Command	If this bit is set to 1 (ON) during positioning, the axis will decelerate to a stop. If this bit is set to 0 (OFF) after decelerating to a stop, the operation will depend on the setting of bit 5 in OW☐☐☐09.
OW☐☐☐09 Bit 5	Position Reference Type	Set the position reference type. Set this bit before setting OW☐☐☐08 to 1 (POSING). 0: Incremental value addition method 1: Absolute value specification method
OL☐☐☐10	Speed Reference Setting	Specify the positioning speed. This parameter can be changed during operation. The unit depends on the set value of bits 0 to 3 in OW☐☐☐03.
OW☐☐☐12	Speed Limit	Set the upper speed limit as a percentage of the rated motor speed (rotary motor) or rated speed (linear motor). This value is an absolute value. It is used in both the forward and reverse directions.
OL☐☐☐14	Torque/Force Limit	Set the torque limit for positioning.
OW☐☐☐18	Override	This parameter allows the positioning speed to be changed without changing the value of OL☐☐☐10. Set the value as a percentage of the Speed Reference Setting. This parameter can be changed during operation. Setting range: 0 to 32,767 (0% to 327.67%) Setting unit: 1 = 0.01% Example: Setting for 50% = 5,000
OL☐☐☐1C	Position Reference Setting	Set the target position for positioning. This parameter can be changed during operation. The meaning of the set value depends on the status of bit 5 in OW☐☐☐09.
OL☐☐☐1E	Positioning Completion Width	Set this parameter to the value for which bit 1 in IW☐☐☐0C will change to 1 (Within positioning completed range).
OL☐☐☐20	NEAR Signal Output Width	Set this parameter to the value for which bit 3 in IW☐☐☐0C will change to 1 (Within near position range). Bit 3 changes to 1 when the absolute value of the difference between the reference position and the feedback position is within the range that is specified here.

Continued on next page.

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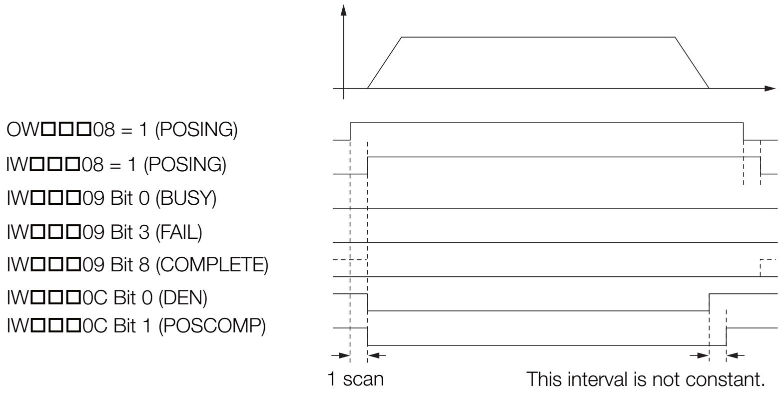
Register Address	Name	Setting Details
OL□□□36	Linear Acceleration Rate/Acceleration Time Constant	Set the positioning acceleration rate with the acceleration rate or the acceleration time.
OL□□□38	Linear Deceleration Rate/Deceleration Time Constant	Set the positioning deceleration rate with the deceleration rate or the deceleration time.
OW□□□3A	Filter Time Constant	Set the acceleration/deceleration filter time constant. Exponential acceleration/deceleration or a moving average filter can be selected in bits 8 to B in OW□□□03. This setting can be changed only when distribution has been completed (i.e., when bit 0 in IW□□□0C is 1).

◆ Monitor Parameters

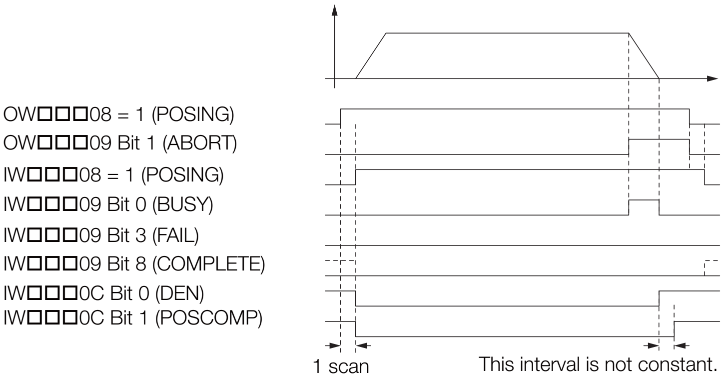
Register Address	Name	Monitored Contents
IW□□□00 Bit 1	Running with Servo ON	This bit shows the Servo status for the axis. 0: Stopped, 1: Running with Servo ON
IL□□□02	Warnings	This parameter reports the current warning status.
IL□□□04	Alarms	This parameter reports the current alarm status.
IW□□□08	Motion Command Response Code	This parameter shows the motion command currently in execution. This parameter is 1 during execution of the POSING command.
IW□□□09 Bit 0	Command Execution Flag	This bit changes to 1 (Processing) when cancel processing is being performed for the POSING command. This bit changes to 0 (Completed) when cancel processing has been completed.
IW□□□09 Bit 1	Command Hold Completed	This bit changes to 1 (Completed) when IW□□□08 is 1 (execution of the POSING command is in progress), bit 0 (Hold Command) in OW□□□09 is 1, and the axis completely decelerates to a stop.
IW□□□09 Bit 3	Command Error End	This bit changes to 1 (Completed with an error) when an error occurs during execution of the POSING command. The axis will decelerate to a stop if it is moving. This bit changes to 0 (Completed normally) when another command is executed.
IW□□□09 Bit 8	Command Execution Completed	This bit is always 0 (Normal execution not completed) for the POSING command. Check bit 1 in IW□□□0C to see if the POSING command has been completed.
IW□□□0C Bit 0	Distribution Completed	This bit changes to 1 (Distribution completed) when the distribution for the travel motion command is completed. This bit is 0 (Distributing pulses) when the execution of a travel motion command is in progress.
IW□□□0C Bit 1	Positioning Completed	This bit is 1 (Within positioning completed range) when distribution is completed and the current position is within the positioning completed range. This bit is 0 (Outside positioning completed range) in all other cases.
IW□□□0C Bit 3	Near Position	The operation of this bit depends on the set value of OL□□□20. If OL□□□20 is 0, this bit is 1 (Within near position range) when distribution is completed (i.e., when DEN is 1), and it is 0 (Outside near position range) when distribution is not completed. When OL□□□20 is not 0, this bit is 1 when within the range of the following formula, regardless of the state of distribution, and 0 in all other cases. |(IL□□□12) – (IL□□□16)| ≤ OL□□□20 IL□□□12: Machine Coordinate System Reference Position IL□□□16: Machine Coordinate System Feedback Position OL□□□20: NEAR Signal Output Width

Timing Charts

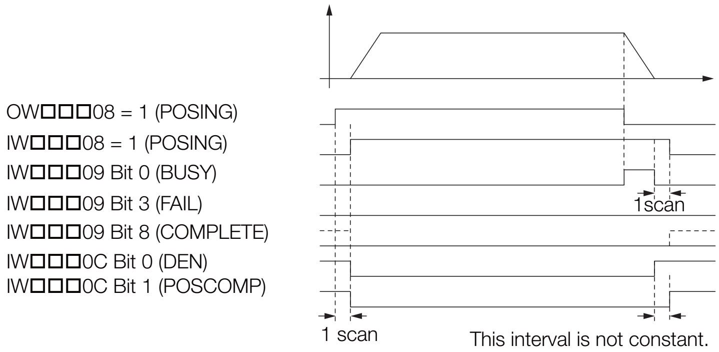
◆ Normal Execution



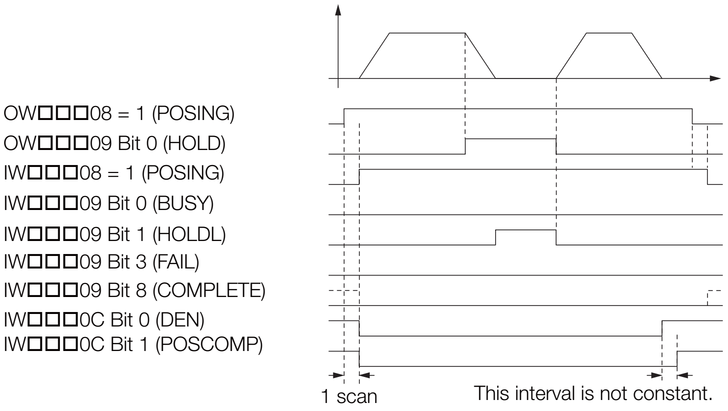
◆ Execution When Canceled



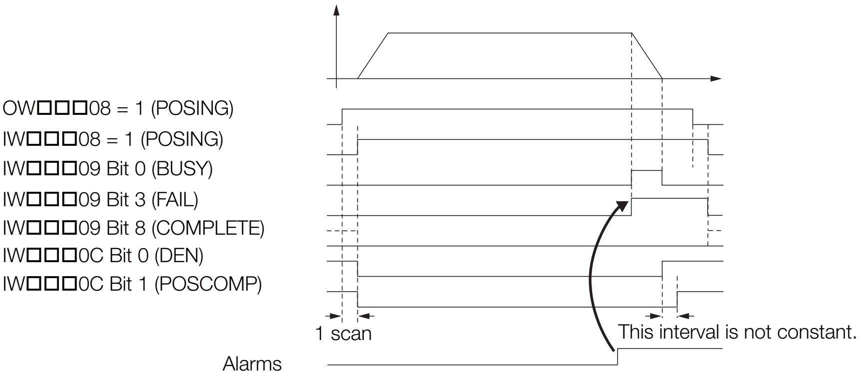
◆ Execution When Command Is Changed



◆ Holding



◆ Execution When an Alarm Occurs



4.2.2 EX_POSING (External Positioning)

The EX_POSING command begins positioning the axis towards the target position according to the specified target position and speed. Parameters related to acceleration and deceleration are set in advance.

When the external positioning signal is turned ON during motion, the axis is moved by the external positioning final travel distance from the current position. If the external positioning signal does not turn ON, positioning is completed to the original target position.

Information The SVR Function Module does not support external positioning for an external signal input.
The operation will be the same as for the POSING command.

Execution and Operating Procedures

1. **Make sure that all of the following conditions are met.**

No.	Execution Condition	Confirmation Method
1	There must be no alarms.	Both IL□□□02 and IL□□□04 must be 0.
2	The Servomotor's power must be ON.	Bit 1 in IW□□□00 must be 1.
3	Motion command execution for the target axis must be completed.*	IW□□□08 must be 0 and bit 0 in IW□□□09 must be 0.

* Before you change to this command during the execution of another command, you must check whether the command can be changed and how operation changes when the command is changed. Refer to the following section for details on changing from another command.
☞ *4.4 Changing the Command* on page 4-137

2. **Set the following setting parameters.**
- OW□□□01, Bit 3 (Speed Loop P/PI Switch)
- OW□□□03, Bits 8 to B (Filter Type Selection)
- OW□□□04, Bits 4 to 7 (External Positioning Signal Setting)
- OL□□□10 (Speed Reference Setting)
- OW□□□12 (Speed Limit)
- OL□□□14 (Torque/Force Limit)
- OL□□□46 (External Positioning Final Travel Distance)
- OL□□□36 (Linear Acceleration Rate/Acceleration Time Constant)
- OL□□□38 (Linear Deceleration Rate/Deceleration Time Constant)

Information
- OL□□□10 can be changed during positioning.
- An override of between 0% and 327.67% can be set for OL□□□10.
- OL□□□14 can be changed at any time. The intended operation may not be achieved if the set value is too small.
- If OL□□□36 and OL□□□38 are changed during operation, the specifications of the SERVOPACK determine whether these changes are applied to acceleration and deceleration.

3. **Set the OW□□□08 setting parameter (Motion Commands) to 2 to execute the EX_POSING motion command.**

4. **Set the OL□□□1C setting parameter (Position Reference Setting) in the same scan as the setting parameters in step 2.**
After the parameter is set, positioning will start for the axis to the position set in OL□□□1C.
When the external positioning signal turns ON during positioning, the axis is moved by the external positioning final travel distance from the current position.
When the axis stops, bit 8 (Command Execution Completed) in the IW□□□09 monitor parameter will change to 1 (Normal execution completed) and external positioning will end.

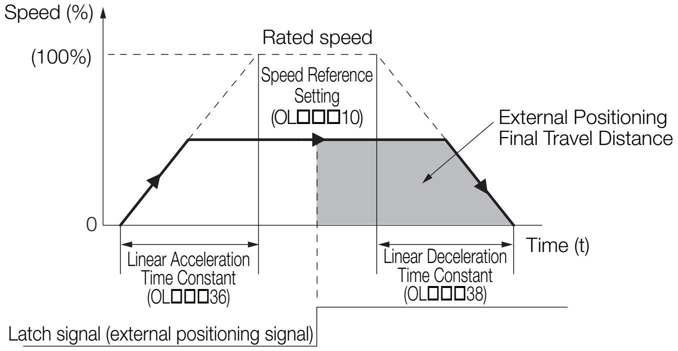
Information If bit 5 (Position Reference Type) in the OW□□□09 setting parameter is set to 1 (Absolute value specification method), the target position can be set before executing the command.

5. **Set OW□□□08 to 0 to execute the NOP motion command.**

This concludes external positioning.

Operating Patterns

The following figure shows the operating pattern when the EX_POSING command is executed.



Holding

- To hold an axis in place during motion and resume operation at a later time, set bit 0 (Hold Command) in the OW□□□09 setting parameter to 1 (Hold Command ON).
  When bit 0 in OW□□□09 is set to 1, the axis will decelerate to a stop.
  The motor will always decelerate to a stop, regardless of the setting of bits 8 to F (Stop Mode Selection) in the OW□□□02 setting parameter.
  When the axis completely decelerates to a stop, bit 1 (Command Hold Completed) in the IW□□□09 monitor parameter will change to 1 (Completed).
- To release the hold, set bit 0 (Hold Command) in OW□□□09 to 0 (Hold Command OFF). This clears the command hold status and the remaining portion of the positioning operation is restarted.

Canceling

- To stop an axis during motion and cancel the remaining motion, set bit 1 (Cancel Command) in the OW□□□09 setting parameter to 1 (Cancel Command ON).
  When bit 1 in OW□□□09 is set to 1, the axis will decelerate to a stop.
  The deceleration operation depends on the setting of bits 8 to F (Stop Mode Selection) in the OW□□□02 setting parameter.
  When the axis completely decelerates to a stop, the remaining motion will be canceled and bit 1 (Positioning Completed) in the IW□□□0C monitor parameter will change to 1 (Within positioning completed range).
- The same operation as the Cancel Command operation will be performed if the motion command code is changed during axis motion.

Related Parameters

The parameters that are related to this command are listed in the following table.

◆ Setting Parameters

Register Address	Name	Setting Details
OW□□□00 Bit 0	Servo ON	Use this bit to turn the power to the Servomotor ON or OFF. Set this parameter to 1 before setting OW□□□08 to 2 (EX_POSING). 0: Servo OFF, 1: Servo ON
OW□□□01 Bit 3	Speed Loop P/PI Switch	Use this bit to change the speed control loop between PI control and P control. 0: PI control, 1: P control
OW□□□02 Bit 8 to F	Stop Mode Selection	Select the stop method to use when a command is canceled. 0: Stop according to the Linear Deceleration Rate/Deceleration Time Constant parameter 1: Stop immediately

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Register Address	Name	Setting Details
OW□□□03	Function Settings 1	Select the speed unit, acceleration/deceleration unit, and filter type.
OW□□□04 Bit 4 to 7	External Positioning Signal Setting	Set the external positioning signal. 2: Phase-C pulse, 3: /EXT1, 4: /EXT2, 5: /EXT3
OW□□□08	Motion Commands	Positioning is started when this parameter is set to 2 (EX_POSING). Set this parameter to 0 (NOP) during positioning to cancel the positioning operation.
OW□□□09 Bit 0	Hold Command	If this bit is set to 1 (ON) during positioning, the axis will decelerate to a stop. The positioning operation is resumed if this bit is set to 0 (OFF) when the axis is being held.
OW□□□09 Bit 1	Cancel Command	If this bit is set to 1 (ON) during positioning, the axis will decelerate to a stop.
OW□□□09 Bit 4	Latch Zone Enable	Use this bit to enable or disable the valid zone for the external positioning signal. If the latch zone is enabled, the external positioning signal is ignored if it is input outside of the latch zone. 0: Disabled, 1: Enabled
OW□□□09 Bit 5	Position Reference Type	Set the position reference type. Set this bit before setting OW□□□08 to 2 (EX_POSING). 0: Incremental value addition method 1: Absolute value specification method
OL□□□10	Speed Reference Setting	Specify the positioning speed. This parameter can be changed during operation. The unit depends on the set value of bits 0 to 3 in OW□□□03.
OW□□□12	Speed Limit	Set the upper speed limit as a percentage of the rated motor speed (rotary motor) or rated speed (linear motor). This value is an absolute value. It is used in both the forward and reverse directions.
OL□□□14	Torque/Force Limit	Set the torque limit for positioning.
OW□□□18	Override	This parameter allows the positioning speed to be changed without changing the value of OL□□□10. Set the value as a percentage of the Speed Reference Setting. This parameter can be changed during operation. Setting range: 0 to 32,767 (0% to 327.67%) Setting unit: 1 = 0.01% Example: Setting for 50% = 5,000
OL□□□1C	Position Reference Setting	Set the target position for positioning. This parameter can be changed during operation. The meaning of the set value depends on the status of bit 5 in OW□□□09.
OL□□□1E	Positioning Completion Width	Set this parameter to the value for which bit 1 in IW□□□0C will change to 1 (Within positioning completed range).
OL□□□20	NEAR Signal Output Width	Set this parameter to the value for which bit 3 in IW□□□0C will change to 1 (Within near position range). Bit 3 changes to 1 when the absolute value of the difference between the reference position and the feedback position is within the range that is specified here.
OL□□□2A	Latch Zone Lower Limit Setting	Set the boundary in the reverse direction of the area in which the external positioning signal is valid.
OL□□□2C	Latch Zone Upper Limit Setting	Set the boundary in the forward direction of the area in which the external positioning signal is valid.
OL□□□36	Linear Acceleration Rate/Acceleration Time Constant	Set the positioning acceleration rate with the acceleration rate or the acceleration time.
OL□□□38	Linear Deceleration Rate/Deceleration Time Constant	Set the positioning deceleration rate with the deceleration rate or the deceleration time.

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Register Address	Name	Setting Details
OW□□□3A	Filter Time Constant	Set the acceleration/deceleration filter time constant. Exponential acceleration/deceleration or a moving average filter can be selected in bits 8 to B in OW□□□03. This setting can be changed only when distribution has been completed (i.e., when bit 0 in IW□□□0C is 1).
OL□□□46	External Positioning Final Travel Distance	Set the travel distance after the external positioning signal is input.

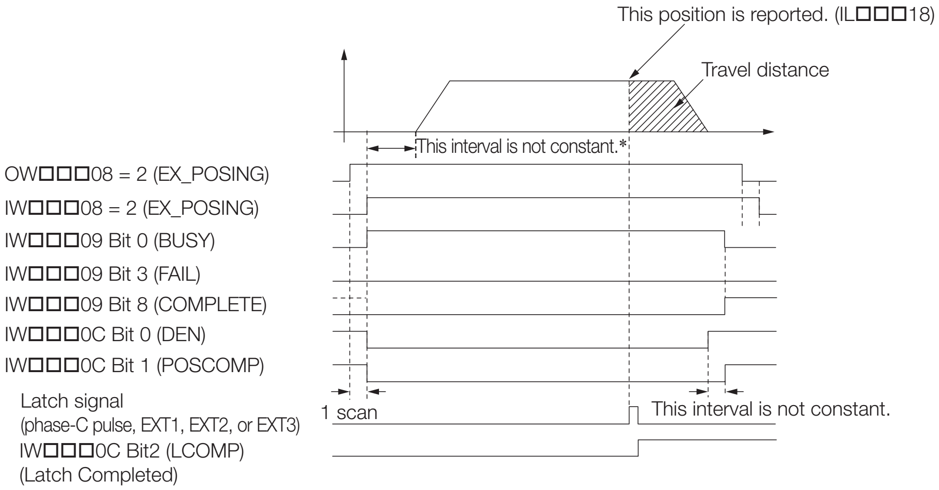
◆ Monitor Parameters

Register Address	Name	Monitored Contents
IW□□□00 Bit 1	Running with Servo ON	This bit shows the Servo status for the axis. 0: Stopped, 1: Running with Servo ON
IL□□□02	Warnings	This parameter reports the current warning status.
IL□□□04	Alarms	This parameter reports the current alarm status.
IW□□□08	Motion Command Response Code	This parameter shows the motion command currently in execution. This parameter is 2 during execution of the EX_POSING command.
IW□□□09 Bit 0	Command Execution Flag	This bit is 1 (Processing) during execution of the EX_POSING command. The bit changes to 0 (Completed) when execution ends.
IW□□□09 Bit 1	Command Hold Completed	This bit changes to 1 (Completed) after the axis decelerates to a complete stop when bit 1 (Hold Command) in OW□□□09 changes to 1 during execution of the EX_POSING command (i.e., when IW□□□08 is 2).
IW□□□09 Bit 3	Command Error End	This bit changes to 1 (Completed with an error) when an error occurs during execution of the EX_POSING command. The axis will decelerate to a stop if it is moving. This bit changes to 0 (Completed normally) when another command is executed.
IW□□□09 Bit 8	Command Execution Completed	This bit changes to 1 (Completed) when execution of the EX_POSING command ends.
IW□□□0C Bit 0	Distribution Completed	This bit changes to 1 (Distribution completed) when the distribution for the travel motion command is completed. This bit is 0 (Distributing pulses) when the execution of a travel motion command is in progress.
IW□□□0C Bit 1	Positioning Completed	This bit is 1 (Within positioning completed range) when distribution is completed and the current position is within the positioning completed range. This bit is 0 (Outside positioning completed range) in all other cases.
IW□□□0C Bit 2	Latch Completed	This bit changes to 0 (Latch not complete) when a new latch command is executed and it changes to 1 (Latch completed) when the latch is completed. The latched position is reported in IL□□□18.
IW□□□0C Bit 3	Near Position	The operation of this bit depends on the set value of OL□□□20. If OL□□□20 is 0, this bit is 1 (Within near position range) when distribution is completed (i.e., when DEN is 1), and it is 0 (Outside near position range) when distribution is not completed. When OL□□□20 is not 0, this bit is 1 when within the range of the following formula, regardless of the state of distribution, and 0 in all other cases. |(IL□□□12) – (IL□□□16)| ≤ OL□□□20 IL□□□12: Machine Coordinate System Reference Position IL□□□16: Machine Coordinate System Feedback Position OL□□□20: NEAR Signal Output Width
IL□□□18	Machine Coordinate System Latch Position	This parameter stores the current position in the machine coordinate system when the latch signal turned ON.

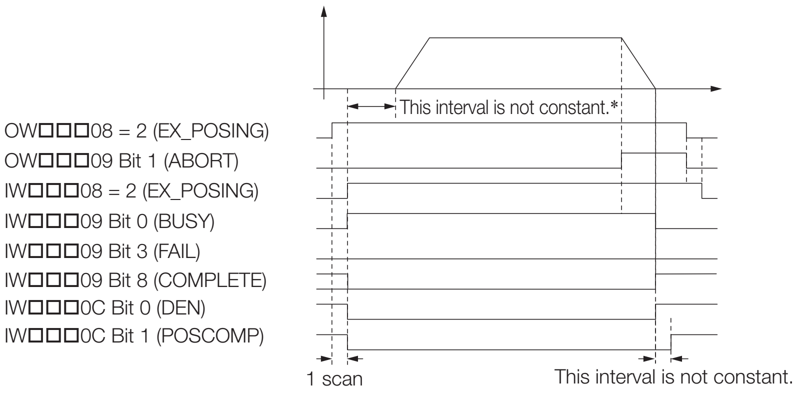
Timing Charts

Information For EX_POSING, the value of the OL□□□46 setting parameter (External Positioning Final Travel Distance) is written to SERVOPACK common parameter No. 83 (Final Travel for External Input Positioning). Therefore, there is a slight time lag before the axis starts moving (refer to the items with asterisks (*) in the following figure).

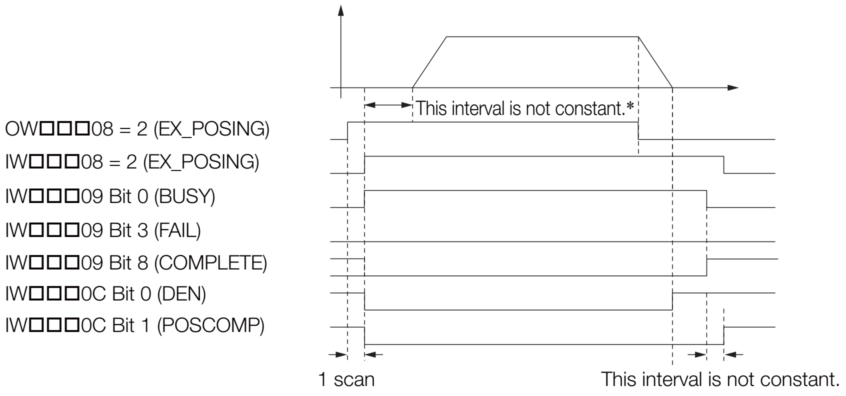
◆ Normal Execution



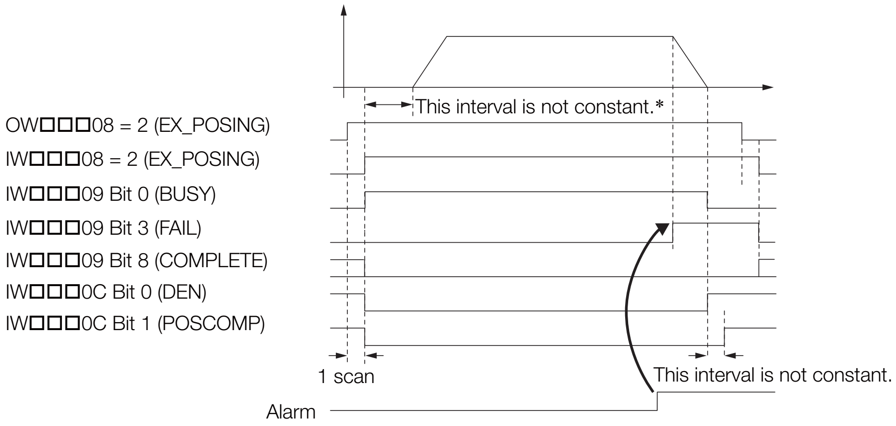
◆ Execution When Canceled



◆ Execution When Command Is Changed



◆ Execution When an Alarm Occurs



External Positioning Final Travel Distance Write Selection

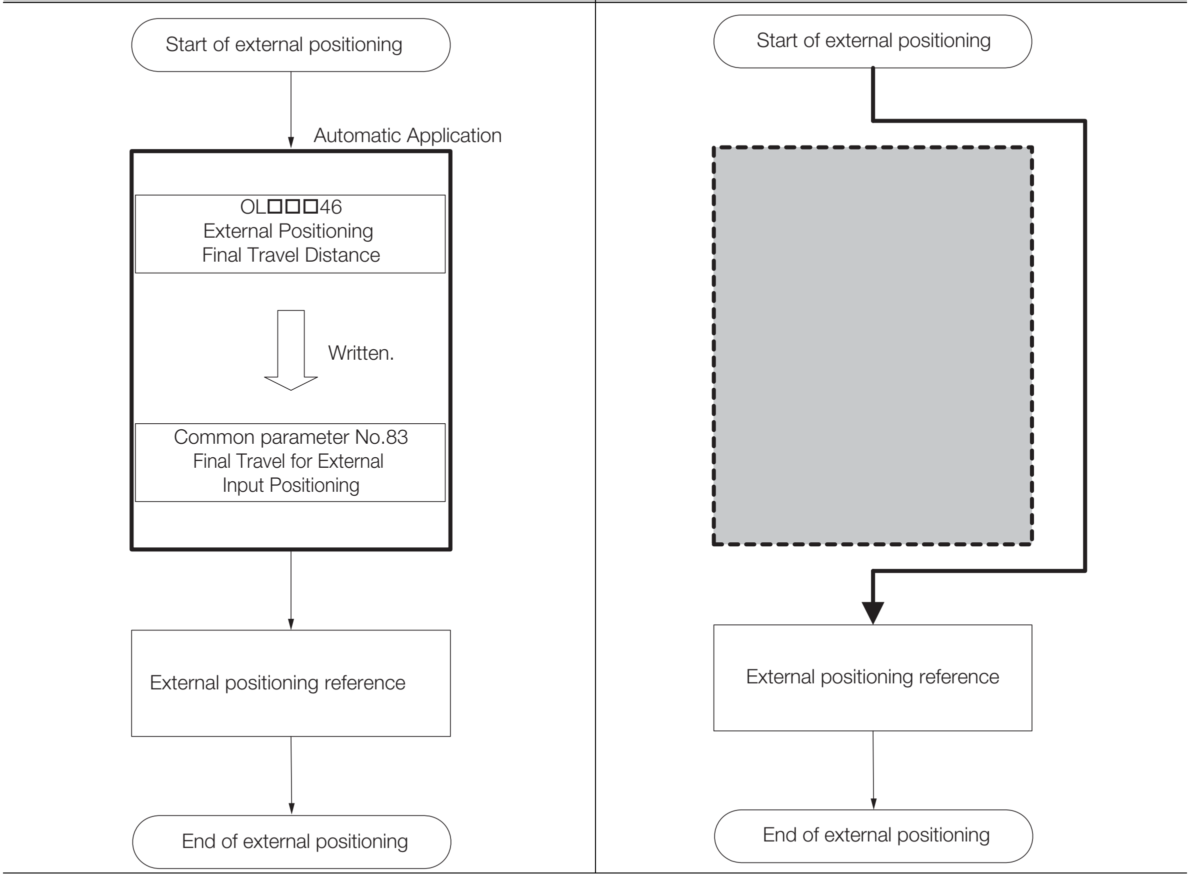
◆ Overview

The External Positioning Final Travel Distance Write Selection parameter is used to specify whether or not to automatically apply OL□□□46 (External Positioning Final Travel Distance) to the SERVOPACK at the start of execution of the EX_POSING (External Positioning) and EX_-FEED (Jog with External Positioning) motion commands. When the parameter is set so that the external positioning final travel distance is not applied, positioning may start sooner because no parameters are written to the SERVOPACK at the start of EX_POSING and EX_FEED execution.

◆ Operation

Operation of Automatic Application Selection Parameter during External Positioning

Automatically Apply	Do Not Automatically Apply



◆ Related Parameters

Register Address	Name	Description
OW□□□05 Bit 2	External Positioning Final Travel Distance Write Selection	This bit sets whether or not to automatically apply OL□□□46 to the SERVOPACK. The setting is applied at the start of motion command execution. 0: Automatically apply, 1: Do not automatically apply

◆ Procedure

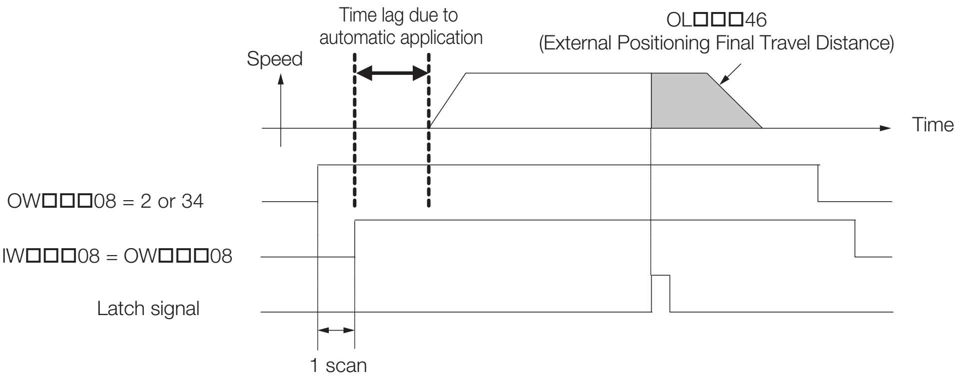
Use the following procedure to perform external positioning without automatically applying the external positioning final travel distance.

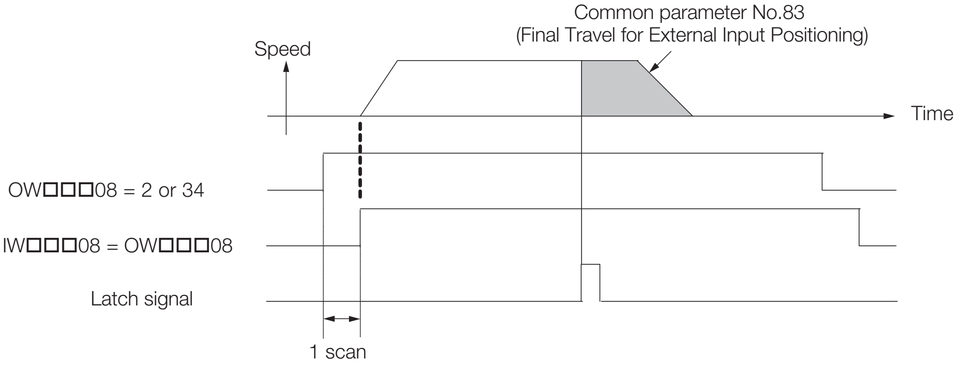
1. **Confirm that a value has been set for common parameter No.83 (Final Travel for External Input Positioning).**
2. **Set OW□□□05 bit 2 (External Positioning Final Travel Distance Write Selection) to 1 (Automatically apply).**
3. **Set the EX_POSING (External Positioning) or EX_FEED (Jog with External Positioning) motion command.**
4. **Input the external positioning signal to the SERVOPACK.**

This concludes the procedure.

◆ Timing Charts

The following timing charts show the operation of the external positioning final travel distance write selection parameter.

<table>
<tr><th>OW□□□05 Bit 2</th><th>Timing Chart</th></tr>
<tr><td>0: Automatically apply (default)</td><td>


</td></tr>
<tr><td>1: Do not automatically apply</td><td>


</td></tr>
</table>

4.2.3 ZRET (Zero Point Return)

When the ZRET command is executed, the axis returns to the origin of the machine coordinate system.

The operation to detect the position of the origin is different for an absolute encoder and for an incremental encoder.

With an absolute encoder, the axis is returned to the origin of the machine coordinate system. This concludes the execution of the command.

With an incremental encoder, you can select from 13 different methods for performing the origin return operation. (Refer to the next section for details.)

Information If the SVR Function Module is used, the only operations that are performed are the resetting of the machine coordinate system and setting of the Zero Point Return completion status.
The origin return operation itself is not performed.

Selecting the Origin Return Method (with an Incremental Encoder)

When fixed parameter No. 30 (Encoder Selection) is set to 0 (Incremental encoder), the coordinate system data is lost when the power supply is turned OFF. Therefore, this command must be executed when the power supply is turned ON again to establish a new coordinate system.

The following table gives the origin return methods. Set the optimum origin return method for the machine in the OW☐☐☐3C setting parameter.

Refer to the following section for details on each of the methods listed in the following table.

☞ *Origin Return Methods and Parameters* on page 4-25

OW☐☐☐3C Setting Parameter	Name	Method	Signal Details
0	DEC1 + C pulse	Applies a 3-step deceleration method using the deceleration limit switch and phase-C pulse.	DEC1 signal: SERVOPACK DEC signal
1	ZERO signal	Uses the ZERO signal.	ZERO signal: SERVOPACK EXT1 signal
2	DEC1 + ZERO signal	Applies a 3-step deceleration method using the deceleration limit switch and ZERO signal.	DEC1 signal: SERVOPACK DEC signal ZERO signal: SERVOPACK EXT1 signal
3	C pulse	Uses the phase-C pulse.	–
4 to 10	Reserved.	–	–
11	C pulse only	Uses only the phase-C pulse.	–
12	P-OT + C pulse	Uses the positive overtravel signal and phase-C pulse.	P-OT: SERVOPACK P-OT signal
13	P-OT only	Uses only the positive overtravel signal.	P-OT: SERVOPACK P-OT signal*
14	HOME LS + C pulse	Uses the HOME signal and phase-C pulse.	HOME: SERVOPACK EXT1 signal
15	HOME only	Uses only the HOME signal.	HOME: SERVOPACK EXT1 signal
16	N-OT + C pulse	Uses the negative overtravel signal and phase-C pulse.	N-OT: SERVOPACK N-OT signal
17	N-OT only	Uses only the negative overtravel signal.	N-OT: SERVOPACK N-OT signal*
18	INPUT + C pulse	Uses the input signal and phase-C pulse.	INPUT: Bit B in the OW☐☐☐05 setting parameter
19	INPUT only	Uses only the input signal.	Allows the origin return to be performed without controlling bit B in the OW☐☐☐05 setting parameter from an external signal.*

* Do not use this method if repeat accuracy is required.

Execution and Operating Procedures

1. Make sure that all of the following conditions are met.

No.	Execution Condition	Confirmation Method
1	There must be no alarms.	Both IL□□□02 and IL□□□04 must be 0.
2	The Servomotor's power must be ON.	Bit 1 in IW□□□00 must be 1.
3	Motion command execution for the target axis must be completed.*	IW□□□08 must be 0 and bit 0 in IW□□□09 must be 0.

* Before you change to this command during the execution of another command, you must check whether the command can be changed and how operation changes when the command is changed. Refer to the following section for details on changing from another command.
☞ *4.4 Changing the Command* on page 4-137

2. If an incremental encoder is used (i.e., if fixed parameter No. 30 (Encoder Selection) is set to 0), refer to the table on the previous page and set the origin return method to use in motion setting parameter OW□□□3C (Zero Point Return Method).

Information Software limits are enabled when the origin return operation is completed.

3. Refer to the following section and set the required parameters.
☞ *Origin Return Methods and Parameters* on page 4-25

4. Set the OW□□□08 setting parameter (Motion Commands) to 3 to execute the ZRET motion command.
The origin return operation will start. During the origin return operation, the IW□□□08 monitor parameter (Motion Command Response Code) is 3.
When the axis returns to the origin, bit 5 (Zero Point Return/Setting Completed) in the IW□□□0C monitor parameter will change to 1 (Completed) and the origin return operation will end.

5. Set OW□□□08 to 0 to execute the NOP motion command.

This concludes the origin return operation.

Holding

Holding execution of the ZRET command is not possible. Bit 0 (Hold Command) in the OW□□□09 setting parameter will be ignored.

Canceling

- To cancel an origin return operation, set bit 1 (Cancel Command) in the OW□□□09 setting parameter to 1 (Cancel Command ON).
  When bit 1 in OW□□□09 is set to 1, the axis will decelerate to a stop.
  The deceleration operation depends on the setting of bits 8 to F (Stop Mode Selection) in the OW□□□02 setting parameter.
  When the axis completely decelerates to a stop, the remaining motion will be canceled and bit 1 (Positioning Completed) in the IW□□□0C monitor parameter will change to 1 (Within positioning completed range).
- The same operation as the Cancel Command operation will be performed if the motion command code is changed during axis motion.

Related Parameters

The parameters that are related to this command are listed in the following table.

■ Setting Parameters

Register Address	Name	Setting Details
OW□□□00 Bit 0	Servo ON	Use this bit to turn the power to the Servomotor ON or OFF. Set this parameter to 1 before setting OW□□□08 to 3 (ZRET). 0: Servo OFF, 1: Servo ON
OW□□□01 Bit 3	Speed Loop P/PI Switch	Use this bit to change the speed control loop between PI control and P control. 0: PI control, 1: P control
OW□□□02 Bit 8 to F	Stop Mode Selection	Select the stop method to use when a command is canceled. 0: Stop according to the Linear Deceleration Rate/Deceleration Time Constant parameter 1: Stop immediately
OW□□□03	Function Settings 1	Select the speed unit, acceleration/deceleration unit, and filter type.
OW□□□08	Motion Commands	The origin return operation is started when this parameter is set to 3 (ZRET). Set this parameter to 0 (NOP) during the origin return operation to cancel the operation.
OW□□□09 Bit 1	Cancel Command	When this bit is set to 1 (ON) during an origin return operation, the axis will decelerate to a stop.
OW□□□12	Speed Limit	Set the upper speed limit as a percentage of the rated motor speed (rotary motor) or rated speed (linear motor). This value is an absolute value. It is used in both the forward and reverse directions.
OL□□□14	Torque/Force Limit	Set the torque limit for positioning.
OL□□□36	Linear Acceleration Rate/Acceleration Time Constant	Set the positioning acceleration rate with the acceleration time.
OL□□□38	Linear Deceleration Rate/Deceleration Time Constant	Set the positioning deceleration rate with the deceleration time.
OW□□□3A	Filter Time Constant	Set the acceleration/deceleration filter time constant. Exponential acceleration/deceleration or a moving average filter can be selected in bits 8 to B in OW□□□03. This setting can be changed only when distribution has been completed (i.e., when bit 0 in IW□□□0C is 1).
OW□□□3D	Zero Point Position Output Width	Set this parameter to the value for which bit 4 in IW□□□0C will change to 1 (Within zero point position range).

◆ Monitor Parameters

Register Address	Name	Monitored Contents
IW□□□00 Bit 1	Running with Servo ON	This bit shows the Servo status for the axis. 0: Stopped, 1: Running with Servo ON
IL□□□02	Warnings	This parameter reports the current warning status.
IL□□□04	Alarms	This parameter reports the current alarm status.
IW□□□08	Motion Command Response Code	This parameter shows the motion command currently in execution. This parameter is 3 during execution of the ZRET command.
IW□□□09 Bit 0	Command Execution Flag	This bit is 1 (Processing) during execution of the ZRET command. The bit changes to 0 (Completed) when execution ends.
IW□□□09 Bit 1	Command Hold Completed	This bit is always 0 (Command hold not completed) for the ZRET command.
IW□□□09 Bit 3	Command Error End	This bit changes to 1 (Completed with an error) when an error occurs during execution of the ZRET command. The axis will decelerate to a stop if it is moving. This bit changes to 0 (Completed normally) when another command is executed.

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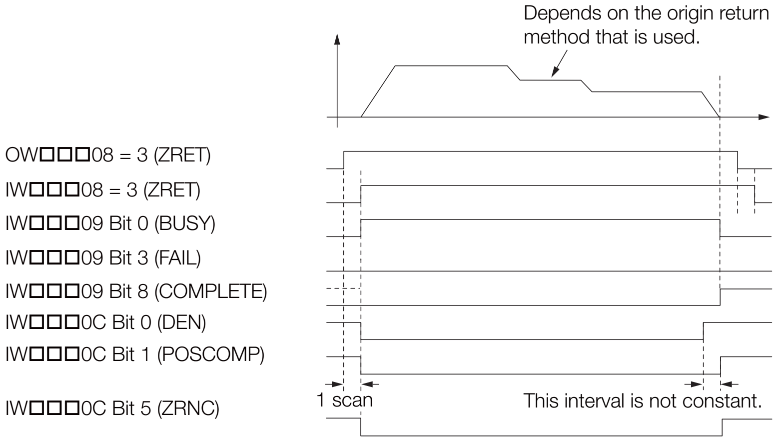
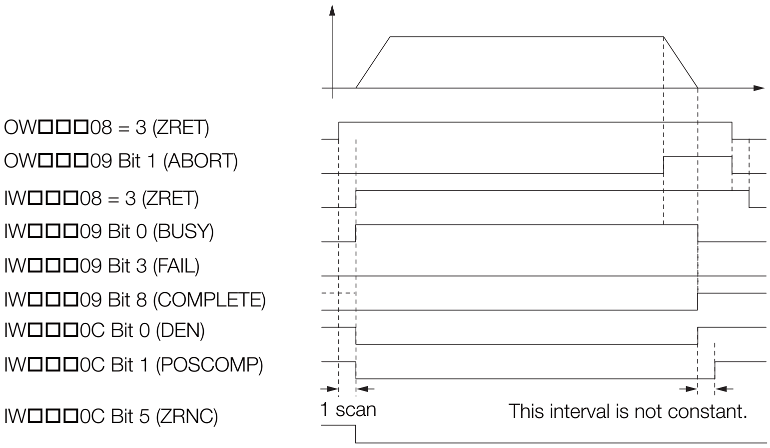
Register Address	Name	Monitored Contents
IW□□□09 Bit 8	Command Execution Completed	This bit changes to 1 (Normal execution completed) when execution of the ZRET command ends.
IW□□□0C Bit 0	Distribution Completed	This bit changes to 1 (Distribution completed) when the distribution for the travel motion command is completed. This bit is 0 (Distributing pulses) when the execution of a travel motion command is in progress.
IW□□□0C Bit 3	Near Position	The operation of this bit depends on the set value of OL□□□20. If OL□□□20 is 0, this bit is 1 (Within near position range) when distribution is completed (i.e., when DEN is 1), and it is 0 (Outside near position range) when distribution is not completed. When OL□□□20 is not 0, this bit is 1 when within the range of the following formula, regardless of the state of distribution, and 0 in all other cases. |(IL□□□12) – (IL□□□16)| ≤ OL□□□20 IL□□□12: Machine Coordinate System Reference Position IL□□□16: Machine Coordinate System Feedback Position OL□□□20: NEAR Signal Output Width
IW□□□0C Bit 4	Zero Point Position	This bit is 1 (Within zero point position range) if, after the origin return operation is completed, the current position is within the zero point position output width from the origin. It is 0 (Outside zero point position range) if the current position is outside of this range.
IW□□□0C Bit 5	Zero Point Return Completed	This bit changes to 1 (Zero point return/setting completed) when the origin return operation is completed.

Timing Charts

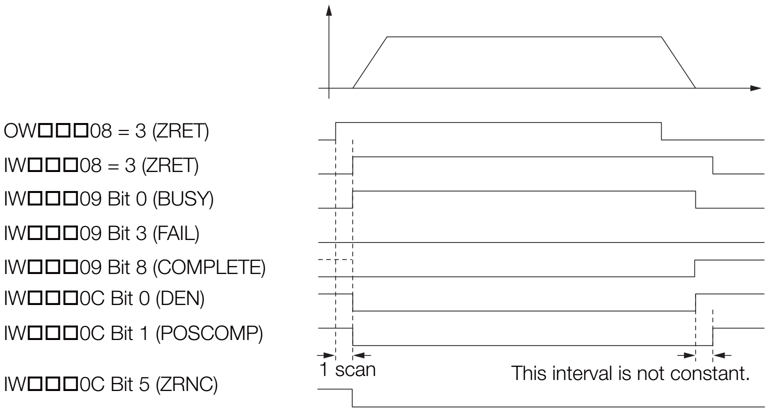
◆ Normal Execution



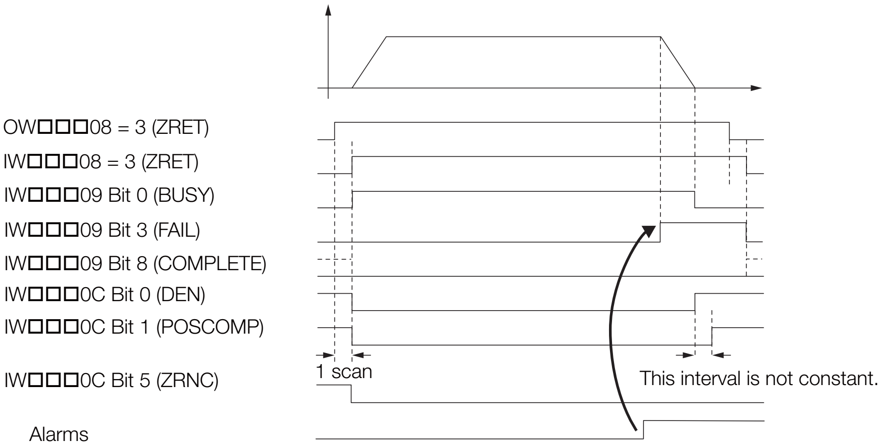
◆ Execution When Canceled



◆ Execution When Command Is Changed



◆ Execution When an Alarm Occurs



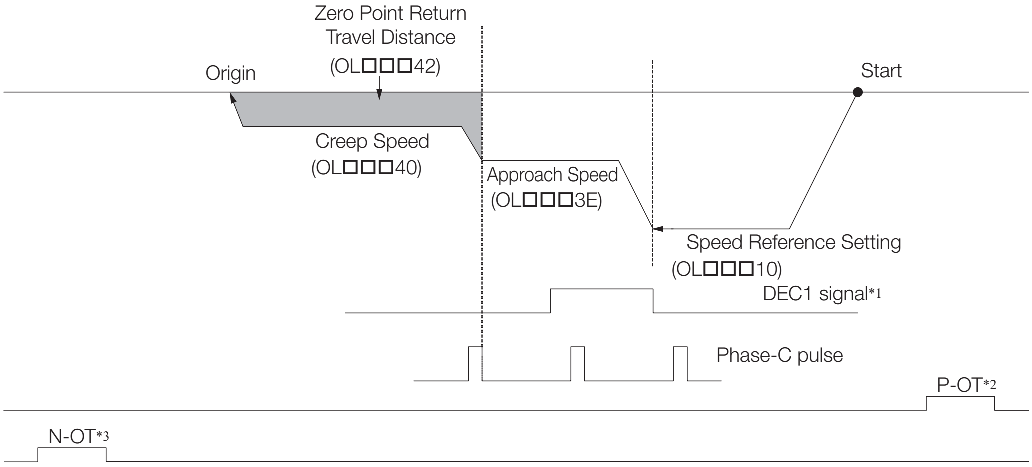
Origin Return Methods and Parameters

With an incremental encoder, there are 13 different methods that you can use for the origin return operation. This section explains the operations that occur after starting an origin return operation and the parameters that must be set before issuing the command.

◆ DEC1 + C Pulse (OW□□□3C = 0)

■ Operation after Origin Return Starts

1. Motion is started at the origin return speed in the direction that is specified in the parameters.
2. When the rising edge of the DEC1 signal is detected, the axis will decelerate to the approach speed.
3. When the first phase-C pulse is detected after passing the DEC1 signal at the approach speed, the speed will be reduced to the creep speed and positioning will be performed.
4. When the positioning operation has been completed, the machine coordinate system is established with the position at the end of the positioning operation as the origin.



*1. SERVOPACK DEC signal.
*2. SERVOPACK P-OT signal.
*3. SERVOPACK N-OT signal.

Important

The travel distance after the phase-C pulse is detected is set in the OL□□□42 setting parameter (Zero Point Return Travel Distance).
If an overtravel signal is detected during the origin return operation, an overtravel alarm will occur.

■ Setting Parameters

Register Address	Name	Setting Details
OW□□□3C	Zero Point Return Method	0: DEC1 + C pulse
OW□□□09 Bit 3	Zero Point Return Direction Selection	Set the origin return direction.
OL□□□10	Speed Reference Setting	Set the speed at which to begin the origin return operation. Only a positive value can be set. A negative value will result in an error.

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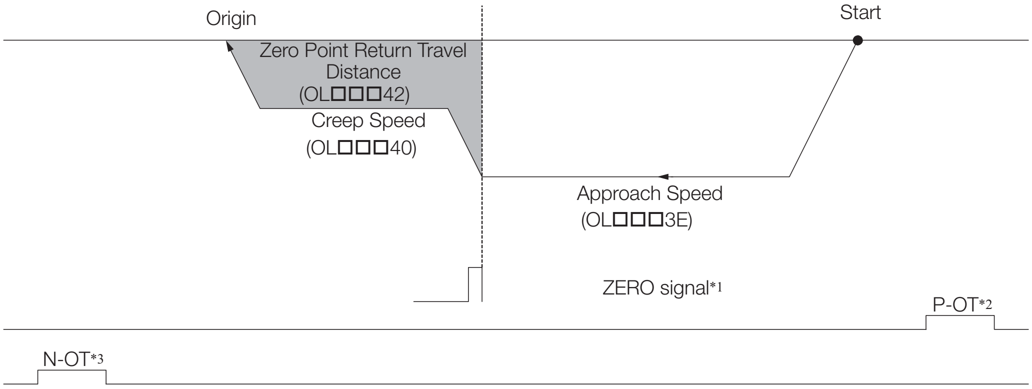
Register Address	Name	Setting Details
OW□□□18	Override	This parameter allows the travel speed to be changed without changing the value of OL□□□10. Set the value as a percentage of the Speed Reference Setting. This parameter can be changed during operation. Setting range: 0 to 32,767 (0% to 327.67%) Setting unit: 1 = 0.01% Example: Setting for 50% = 5,000
OL□□□3E	Approach Speed	Set the speed to use after detecting the DEC1 signal. Only a positive value can be set. A negative value will result in an error.
OL□□□40	Creep Speed	Set the speed to use after detecting the first phase-C pulse after the DEC1 signal is passed. Only a positive value can be set. A negative value will result in an error.
OL□□□42	Zero Point Return Travel Distance	Set the travel distance from the point where the first phase-C pulse is detected after passing the DEC1 signal. If the sign is positive, the axis will move towards the origin return direction for the zero point return travel distance. If the sign is negative, the axis will move away from the origin return direction.

◆ ZERO Signal (OW□□□3C = 1)

■ Operation after Origin Return Starts

1. Travel is started at the approach speed in the direction that is specified in the parameters.
2. When the rising edge of the ZERO signal is detected, the speed will be reduced to the creep speed and positioning will be performed.
3. When the positioning operation has been completed, the machine coordinate system is established with the position at the end of the positioning operation as the origin.



*1. SERVOPACK EXT1 signal.
*2. SERVOPACK P-OT signal.
*3. SERVOPACK N-OT signal.

Important

The travel distance after detecting the ZERO signal is set in the OL□□□42 setting parameter (Zero Point Return Travel Distance).
If an overtravel signal is detected during the origin return operation, an overtravel alarm will occur.

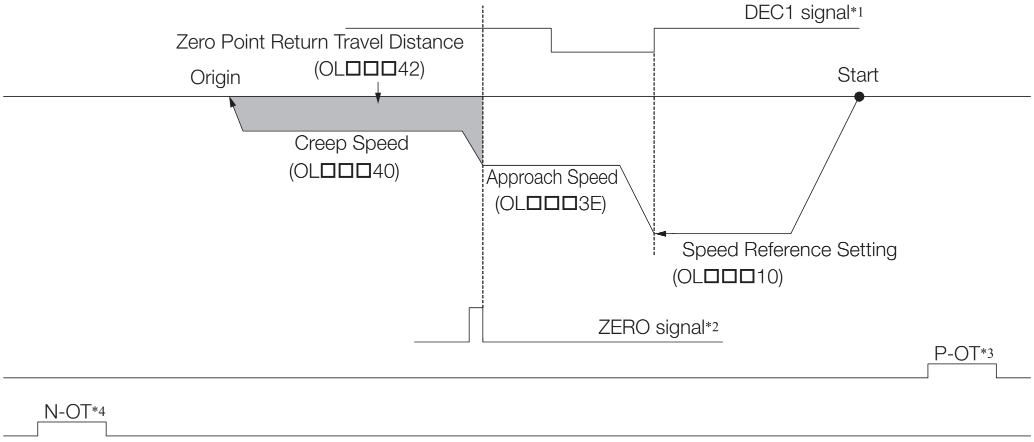
■ Setting Parameters

Register Address	Name	Setting Details
OW□□□3C	Zero Point Return Method	1: ZERO signal
OW□□□09 Bit 3	Zero Point Return Direction Selection	Set the origin return direction.
OL□□□3E	Approach Speed	Set the speed to use after passing the DEC1 signal. Only a positive value can be set. A negative value will result in an error.
OL□□□40	Creep Speed	Set the speed to use after detecting the ZERO signal. Only a positive value can be set. A negative value will result in an error.
OL□□□42	Zero Point Return Travel Distance	Set the travel distance from the point where the ZERO signal is detected. If the sign is positive, the axis will move in the origin return direction. If the sign is negative, the axis will move away from the origin return direction.

◆ DEC1 + ZERO Signal (OW□□□3C = 2)

■ Operation after Origin Return Starts

1. Travel is started at the origin return speed in the direction that is specified in the parameters.
2. When the rising edge of the DEC1 signal is detected, the axis will decelerate to the approach speed.
3. When the rising edge of the ZERO signal is detected after passing the DEC1 signal during movement at the approach speed, the speed will be reduced to the creep speed and positioning will be performed.
4. When the positioning operation has been completed, the machine coordinate system is established with the position at the end of the positioning operation as the origin.



*1. SERVOPACK DEC1 signal.
*2. SERVOPACK EXT1 signal.
*3. SERVOPACK P-OT signal.
*4. SERVOPACK N-OT signal.

Important

The travel distance after detecting the ZERO signal is set in the OL□□□42 setting parameter (Zero Point Return Travel Distance).
If an overtravel signal is detected during the origin return operation, an overtravel alarm will occur.

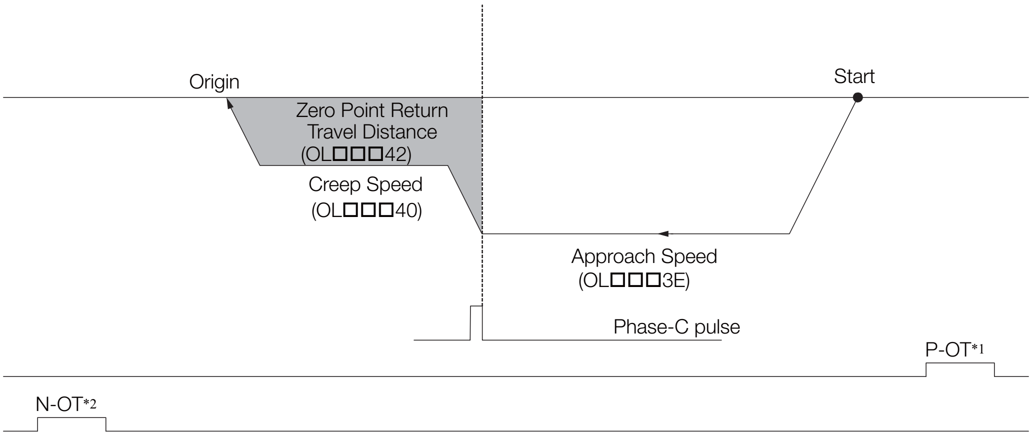
■ Setting Parameters

Register Address	Name	Setting Details
OW□□□3C	Zero Point Return Method	2: DEC1 + ZERO signal
OW□□□09 Bit 3	Zero Point Return Direction Selection	Set the origin return direction.
OL□□□10	Speed Reference Setting	Set the speed at which to begin the origin return operation. Only a positive value can be set. A negative value will result in an error.
OW□□□18	Override	This parameter allows the travel speed to be changed without changing the value of OL□□□10. Set the value as a percentage of the Speed Reference Setting. This parameter can be changed during operation. Setting range: 0 to 32,767 (0% to 327.67%) Setting unit: 1 = 0.01% Example: Setting for 50% = 5,000
OL□□□3E	Approach Speed	Set the speed to use after passing the DEC1 signal. Only a positive value can be set. A negative value will result in an error.
OL□□□40	Creep Speed	Set the speed to use after detecting the ZERO signal after the DEC1 signal is detected. Only a positive value can be set. A negative value will result in an error.
OL□□□42	Zero Point Return Travel Distance	Set the travel distance from the point where the ZERO signal is detected after passing the DEC1 signal. If the sign is positive, the axis will move in the origin return direction. If the sign is negative, the axis will move away from the origin return direction.

◆ C Pulse (OW□□□3C = 3)

■ Operation after Origin Return Starts

1. Travel is started at the approach speed in the direction that is specified in the parameters.
2. When the rising edge of the phase-C pulse is detected, the speed will be reduced to the creep speed and positioning will be performed.
3. When the positioning operation has been completed, the machine coordinate system is established with the position at the end of the positioning operation as the origin.



*1. SERVOPACK P-OT signal.
*2. SERVOPACK N-OT signal.

Important The travel distance after the phase-C pulse is detected is set in the OL☐☐☐42 setting parameter (Zero Point Return Travel Distance).
If an overtravel signal is detected during the origin return operation, an overtravel alarm will occur.

■ Setting Parameters

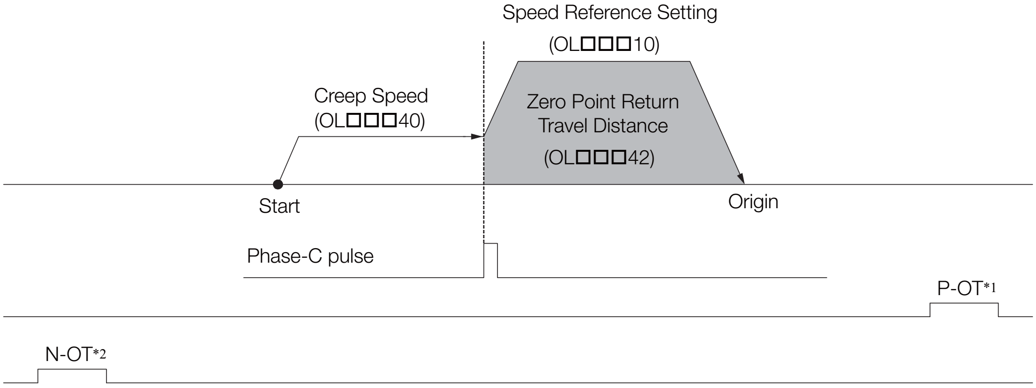
Register Address	Name	Setting Details
OW☐☐☐3C	Zero Point Return Method	3: C pulse
OW☐☐☐09 Bit 3	Zero Point Return Direction Selection	Set the origin return direction.
OL☐☐☐3E	Approach Speed	Set the speed at which to begin the origin return operation. Only a positive value can be set. A negative value will result in an error.
OL☐☐☐40	Creep Speed	Set the speed to use after the phase-C pulse is detected. Only a positive value can be set. A negative value will result in an error.
OL☐☐☐42	Zero Point Return Travel Distance	Set the travel distance after the phase-C pulse is detected. If the sign is positive, the axis will move in the origin return direction. If the sign is negative, the axis will move away from the origin return direction.

◆ C Pulse Only (OW☐☐☐3C = 11)

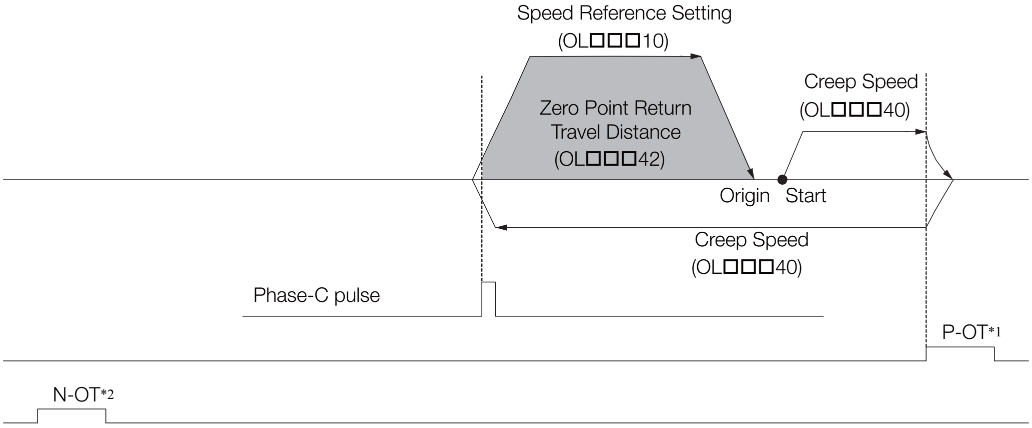
■ Operation after Origin Return Starts

1. Travel is started at the creep speed in the direction determined by the sign of the creep speed.
2. When the rising edge of the phase-C pulse is detected, positioning will be performed at the positioning speed.
3. When the positioning operation has been completed, the machine coordinate system is established with the position at the end of the positioning operation as the origin.

- Normal Operation (No Overtravel Signal Detected)



- Overtravel Signal Detected during Travel at the Creep Speed



*1. SERVOPACK P-OT signal.
*2. SERVOPACK N-OT signal.

Information

1. The travel distance after the phase-C pulse is detected is the value of the OL□□□42 setting parameter (Zero Point Return Travel Distance). The positioning speed is the value of the Speed Reference Setting parameter.
2. If an overtravel signal is detected during motion at the creep speed, an overtravel alarm will not occur. The direction will be reversed, and a search will be performed for the phase-C pulse.
3. If an overtravel signal is detected when the axis is moving at the positioning speed, an overtravel alarm will occur.
4. The stop method when an overtravel signal is detected depends on the SERVOPACK parameter settings.

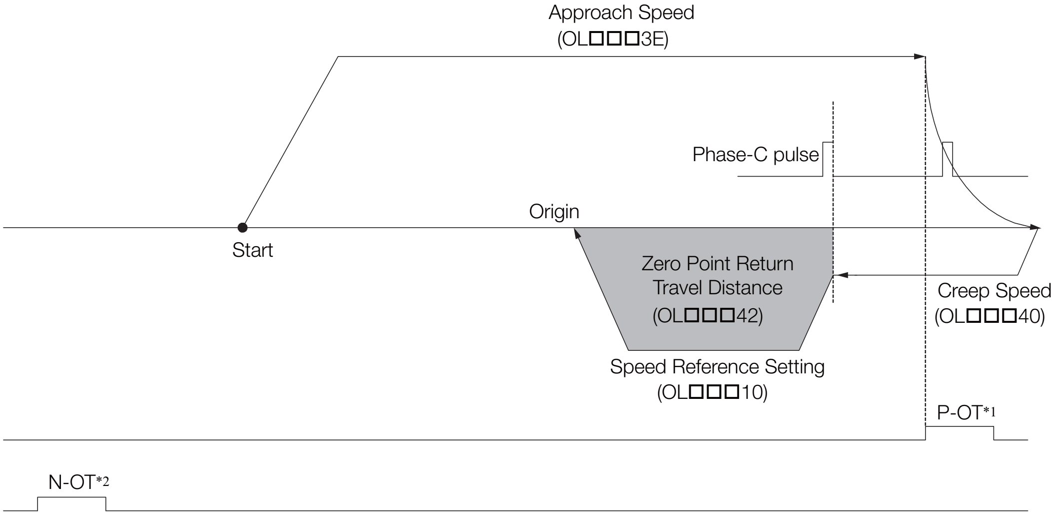
■ Setting Parameters

Register Address	Name	Setting Details
OW□□□3C	Zero Point Return Method	11: C pulse only
OL□□□10	Speed Reference Setting	Set the positioning speed to use after the phase-C pulse is detected. The sign is ignored. The travel direction depends on the sign of the Zero Point Return Travel Distance parameter.
OL□□□40	Creep Speed	Set the speed and direction (based on the sign) to begin the origin return operation.
OL□□□42	Zero Point Return Travel Distance	Set the travel distance after the phase-C pulse is detected. The travel direction depends on the sign.

◆ P-OT + C Pulse (OW□□□3C = 12)

■ Operation after Origin Return Starts

1. Travel is started at the approach speed until the P-OT signal is detected.
2. When the P-OT signal is detected, the direction will be reversed and the axis will return at the creep speed.
3. Positioning is performed when the phase-C pulse is detected after passing the P-OT signal during the origin return operation.
4. When the positioning operation has been completed, the machine coordinate system is established with the position at the end of the positioning operation as the origin.



*1. SERVOPACK P-OT signal.
*2. SERVOPACK N-OT signal.

Information

1. The travel distance after the phase-C pulse is detected is the value of the Zero Point Return Travel Distance parameter. The positioning speed is the value of the Speed Reference Setting parameter.
2. If a negative value is set for the approach speed, the command will end in an error.
3. If an overtravel signal is detected when the axis is moving at the positioning speed, an overtravel alarm will occur.
4. The stop method when an overtravel signal is detected depends on the SERVOPACK parameter settings.

■ Setting Parameters

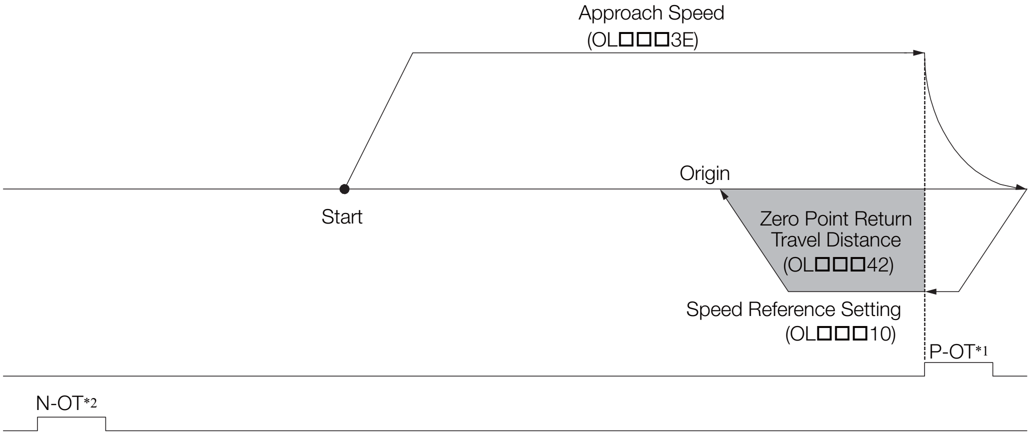
Register Address	Name	Setting Details
OW□□□3C	Zero Point Return Method	12: P-OT + C pulse
OL□□□10	Speed Reference Setting	Set the positioning speed to use after the phase-C pulse is detected. The sign is ignored. The travel direction depends on the sign of the Zero Point Return Travel Distance parameter.
OL□□□3E	Approach Speed	Set the speed at which to begin the origin return operation. Add a sign to this setting so that the travel direction will be positive.
OL□□□40	Creep Speed	Set the reversal speed to use after the P-OT signal is detected. The sign is ignored. The travel direction is negative.
OL□□□42	Zero Point Return Travel Distance	Set the travel distance after the phase-C pulse is detected. The travel direction depends on the sign.

◆ P-OT Only (OW□□□3C = 13)

■ Operation after Origin Return Starts

1. Travel is started at the approach speed until the P-OT signal is detected.
2. When the P-OT signal is detected, the direction will be reversed and the axis will return at the positioning speed.
3. Positioning is performed when the status of the P-OT signal changes from ON to OFF during the origin return operation.
4. When the positioning operation has been completed, the machine coordinate system is established with the position at the end of the positioning operation as the origin.

- Normal Execution



- Starting from the P-OT Signal

[*1] SERVOPACK P-OT signal.
[*2] SERVOPACK N-OT signal.

Information

1. The travel distance after detecting a change in the status of the P-OT signal is the value of the Zero Point Return Travel Distance parameter. The positioning speed is the value of the Speed Reference Setting parameter.
2. If a negative value is set for the approach speed, the command will end in an error.
3. If an overtravel signal is detected when the axis is moving at the positioning speed, an overtravel alarm will occur.
4. Detecting changes in the overtravel signal status is performed with software processing. Therefore, the position where positioning is completed depends on the high-speed scan setting and positioning speed setting. Do not use this method if repeat accuracy is required for the position where the origin return operation is completed.
5. The stop method when an overtravel signal is detected depends on the SERVOPACK parameter settings.

■ Setting Parameters

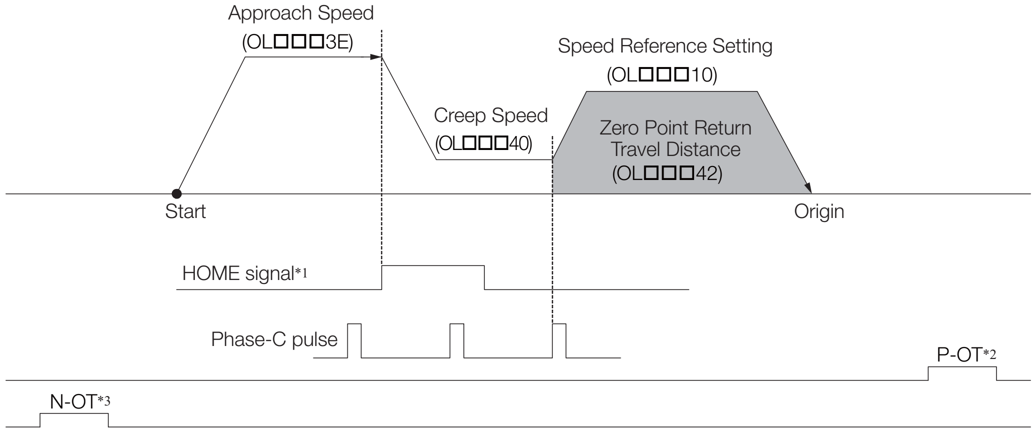
Register Address	Name	Setting Details
OW□□□3C	Zero Point Return Method	13: P-OT only
OL□□□10	Speed Reference Setting	Set the positioning speed to use after the P-OT signal is detected. The sign is ignored. The travel direction depends on the sign of the Zero Point Return Travel Distance parameter.
OL□□□3E	Approach Speed	Set the speed at which to begin the origin return operation. Add a sign to this setting so that the travel direction will be positive.
OL□□□42	Zero Point Return Travel Distance	Set the travel distance after detecting the P-OT signal. The travel direction depends on the sign.

◆ HOME LS + C Pulse (OW□□□3C = 14)

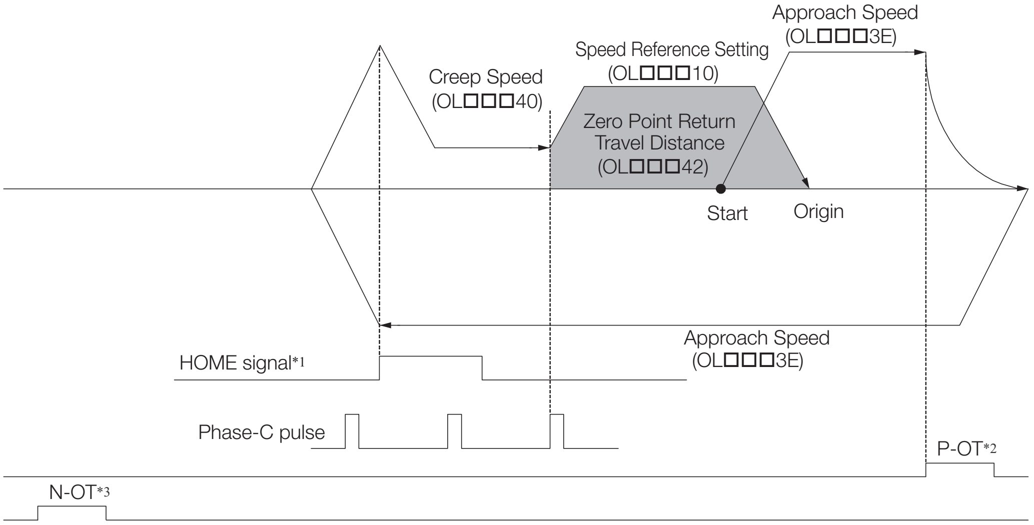
■ Operation after Origin Return Starts

1. Travel is started at the approach speed in the direction that is specified by the sign of the approach speed.
2. When the rising edge of the HOME signal is detected, the speed will be reduced to creep speed.
3. Positioning is performed at the positioning speed when the first phase-C pulse is detected after the falling edge of the HOME signal.
4. When the positioning operation has been completed, the machine coordinate system is established with the position at the end of the positioning operation as the origin.

- Normal Execution



- Overtravel Signal Detected during Travel at the Approach Speed



*1. SERVOPACK EXT1 signal.
*2. SERVOPACK P-OT signal.
*3. SERVOPACK N-OT signal.

Information

1. The travel distance after the phase-C pulse is detected is the value of the Zero Point Return Travel Distance parameter. The positioning speed is the value of the Speed Reference Setting parameter.
2. If an overtravel signal is detected during motion at the approach speed, an overtravel alarm will not occur. The direction will be reversed, and a search will be performed for the HOME signal.
3. If an overtravel signal is detected when the axis is moving at the positioning speed, an overtravel alarm will occur.
4. The stop method when an overtravel signal is detected depends on the SERVOPACK parameter settings.

■ Setting Parameters

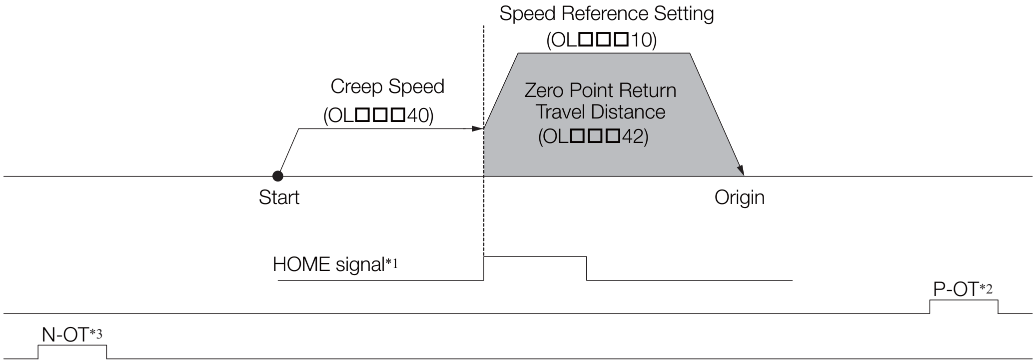
Register Address	Name	Setting Details
OW□□□3C	Zero Point Return Method	14: HOME LS + C pulse
OL□□□10	Speed Reference Setting	Set the positioning speed to use after the phase-C pulse is detected. The sign is ignored. The travel direction depends on the sign of the Zero Point Return Travel Distance parameter.
OL□□□3E	Approach Speed	Set the speed at which to begin the origin return operation. The travel direction depends on the sign of the approach speed.
OL□□□40	Creep Speed	Set the speed and direction (based on the sign) after the HOME signal is detected.
OL□□□42	Zero Point Return Travel Distance	Set the travel distance after the phase-C pulse is detected. The travel direction depends on the sign.

◆ HOME Only (OW□□□3C = 15)

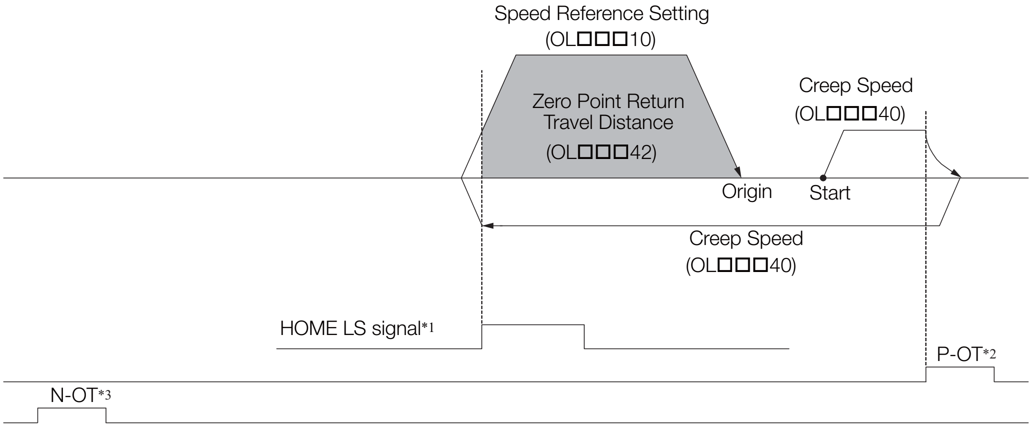
■ Operation after Origin Return Starts

1. Travel is started at the creep speed in the direction determined by the sign of the creep speed.
2. When the rising edge of the HOME signal is detected, positioning will be performed at the positioning speed.
3. When the positioning operation has been completed, the machine coordinate system is established with the position at the end of the positioning operation as the origin.

- Normal Execution



- Overtravel Signal Detected during Travel at the Creep Speed



*1. SERVOPACK EXT1 signal.
*2. SERVOPACK P-OT signal.
*3. SERVOPACK N-OT signal.

Information

1. The travel distance after the HOME signal is detected is the value of the Zero Point Return Travel Distance parameter. The positioning speed is the value of the Speed Reference Setting parameter.
2. If an overtravel signal is detected during motion at the creep speed, an overtravel alarm will not occur. The direction will be reversed, and a search will be performed for the HOME signal.
3. If an overtravel signal is detected when the axis is moving at the positioning speed, an overtravel alarm will occur.
4. The stop method when an overtravel signal is detected depends on the SERVOPACK parameter settings.

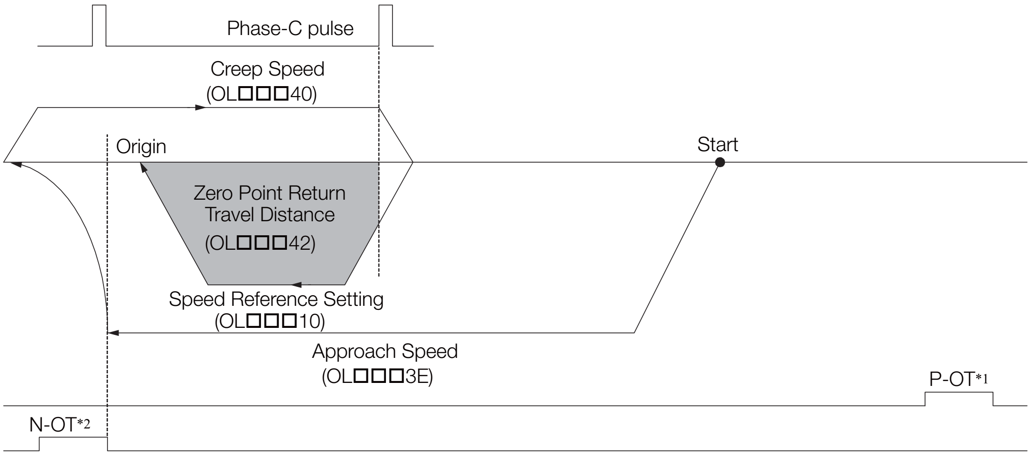
■ Setting Parameters

Register Address	Name	Setting Details
OW□□□3C	Zero Point Return Method	15: HOME only
OL□□□10	Speed Reference Setting	Set the positioning speed to use after the HOME signal is detected. The sign is ignored. The travel direction depends on the sign of the Zero Point Return Travel Distance parameter.
OL□□□40	Creep Speed	Set the speed and direction (based on the sign) to begin the origin return operation.
OL□□□42	Zero Point Return Travel Distance	Set the travel distance after detecting the HOME signal. The travel direction depends on the sign.

◆ N-OT + C Pulse (OW□□□3C = 16)

■ Operation after Origin Return Starts

1. Travel is started at the approach speed until the N-OT signal is detected.
2. When the N-OT signal is detected, the direction will be reversed and the axis will return at the creep speed.
3. Positioning is performed when the phase-C pulse is detected after passing the N-OT signal during the origin return operation.
4. When the positioning operation has been completed, the machine coordinate system is established with the position at the end of the positioning operation as the origin.



*1. SERVOPACK P-OT signal.
*2. SERVOPACK N-OT signal.

Information
1. The travel distance after the phase-C pulse is detected is the value of the Zero Point Return Travel Distance parameter. The positioning speed is the value of the Speed Reference Setting parameter.
2. If a positive value is set for the approach speed, the command will end in an error.
3. If an overtravel signal is detected when the axis is moving at the positioning speed, an overtravel alarm will occur.
4. The stop method when an overtravel signal is detected depends on the SERVOPACK parameter settings.

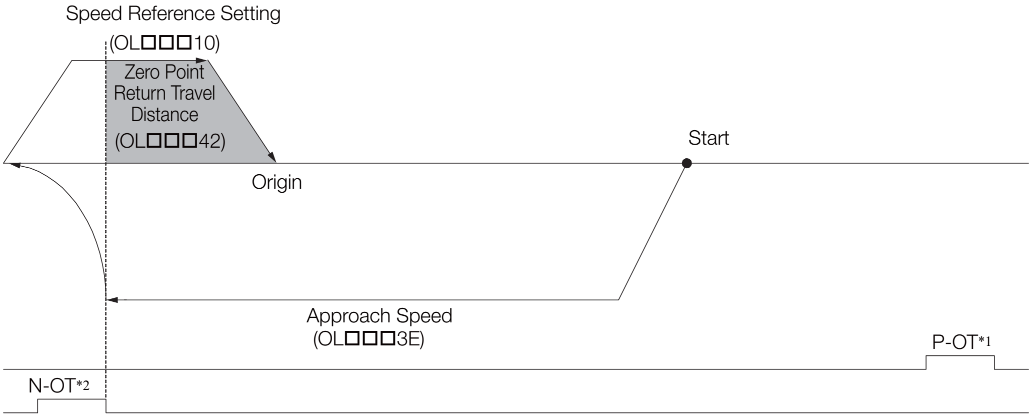
■ Setting Parameters

Register Address	Name	Setting Details
OW□□□3C	Zero Point Return Method	16: N-OT + C pulse
OL□□□10	Speed Reference Setting	Set the positioning speed to use after the phase-C pulse is detected. The sign is ignored. The travel direction depends on the sign of the Zero Point Return Travel Distance parameter.
OL□□□3E	Approach Speed	Set the speed at which to begin the origin return operation. Add a sign to this setting so that the travel direction will be negative.
OL□□□40	Creep Speed	Set the speed to use after the N-OT signal is detected. The travel direction is positive.
OL□□□42	Zero Point Return Travel Distance	Set the travel distance after the phase-C pulse is detected. The travel direction depends on the sign.

◆ N-OT Only (OW□□□3C = 17)

■ Operation after Origin Return Starts

1. Travel is started at the approach speed until the N-OT signal is detected.
2. When the N-OT signal is detected, the direction will be reversed and the axis will return at the positioning speed.
3. Positioning is performed when the status of the N-OT signal changes from ON to OFF during the origin return operation.
4. When the positioning operation has been completed, the machine coordinate system is established with the position at the end of the positioning operation as the origin.



*1. SERVOPACK P-OT signal.
*2. SERVOPACK N-OT signal.

Information

1. The travel distance after detecting a change in the status of the N-OT signal is the value of the Zero Point Return Travel Distance parameter. The positioning speed is the value of the Speed Reference Setting parameter.
2. If a positive value is set for the approach speed, the command will end in an error.
3. If an overtravel signal is detected when the axis is moving at the positioning speed, an overtravel alarm will occur.
4. Detecting changes in the overtravel signal status is performed with software processing. Therefore, the position where positioning is completed depends on the high-speed scan setting and positioning speed setting. Do not use this method if repeat accuracy is required for the position where the origin return operation is completed.
5. The stop method when an overtravel signal is detected depends on the SERVOPACK parameter settings.

■ Setting Parameters

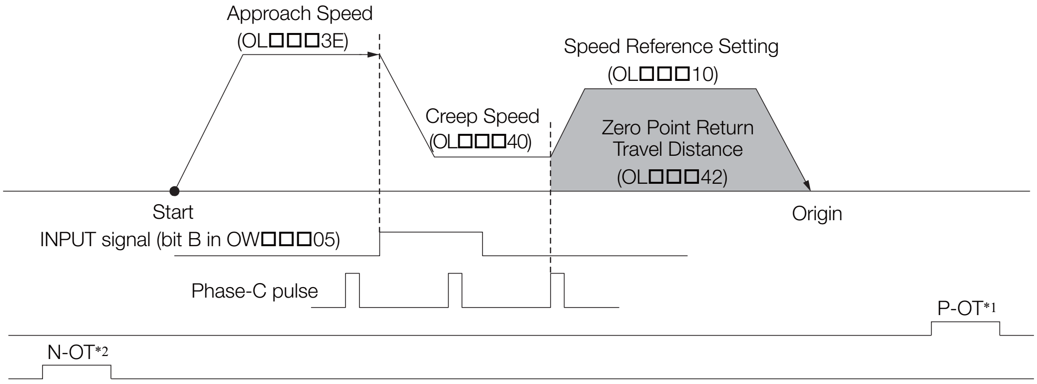
Register Address	Name	Setting Details
OW□□□3C	Zero Point Return Method	17: N-OT only
OL□□□10	Speed Reference Setting	Set the positioning speed to use after the N-OT signal is detected. The sign is ignored. The travel direction depends on the sign of the Zero Point Return Travel Distance parameter.
OL□□□3E	Approach Speed	Set the speed at which to begin the origin return operation. Add a sign to this setting so that the travel direction will be negative.
OL□□□42	Zero Point Return Travel Distance	Set the travel distance after detecting the N-OT signal. The travel direction depends on the sign.

◆ INPUT + C Pulse (OW□□□3C = 18)

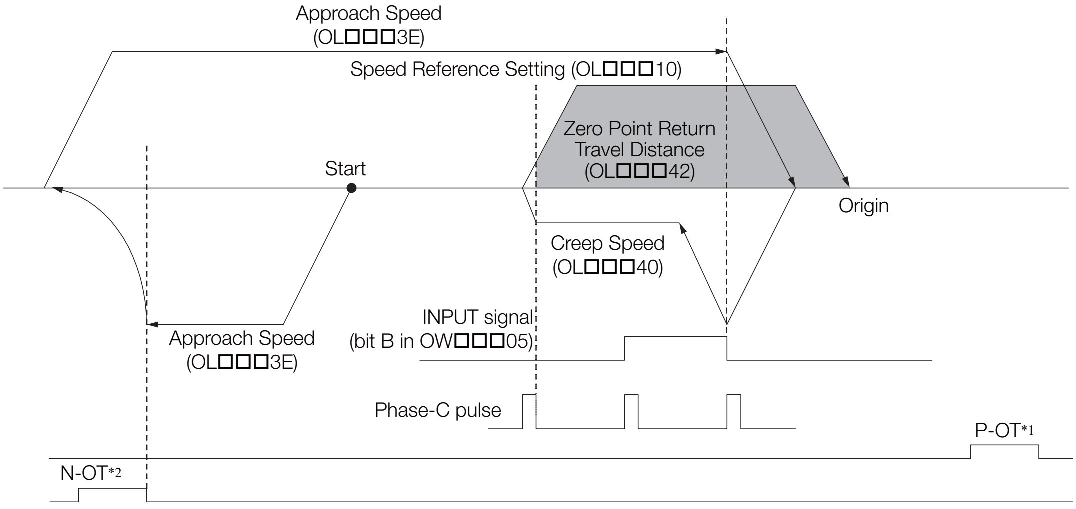
■ Operation after Origin Return Starts

1. Travel is started at the approach speed in the direction that is specified by the sign of the approach speed.
2. When the rising edge of the INPUT signal is detected, the speed will be reduced to creep speed.
3. Positioning is performed at the positioning speed when the first phase-C pulse is detected after the falling edge of the INPUT signal.
4. When the positioning operation has been completed, the machine coordinate system is established with the position at the end of the positioning operation as the origin.

- Normal Execution



- Overtravel Signal Detected during Travel at the Approach Speed



*1. SERVOPACK P-OT signal.
*2. SERVOPACK N-OT signal.

Information

1. The travel distance after the phase-C pulse is detected is the value of the Zero Point Return Travel Distance parameter. The positioning speed is the value of the Speed Reference Setting parameter.
2. If an overtravel signal is detected during motion at the approach speed, an overtravel alarm will not occur. The direction will be reversed, and a search will be performed for the INPUT signal.
3. If an overtravel signal is detected when the axis is moving at the positioning speed, an overtravel alarm will occur.
4. The stop method when an overtravel signal is detected depends on the SERVOPACK parameter settings.

■ Setting Parameters

Register Address	Name	Setting Details
OW□□□3C	Zero Point Return Method	18: INPUT + C pulse
OL□□□10	Speed Reference Setting	Set the positioning speed to use after the phase-C pulse is detected. The sign is ignored. The travel direction depends on the sign of the Zero Point Return Travel Distance parameter.
OL□□□3E	Approach Speed	Set the speed at which to begin the origin return operation. The travel direction depends on the sign of the approach speed.
OL□□□40	Creep Speed	Set the speed and direction (based on the sign) after the INPUT signal is detected.
OL□□□42	Zero Point Return Travel Distance	Set the travel distance after the phase-C pulse is detected. The travel direction depends on the sign.
OW□□□05 Bit B	Zero Point Return Input Signal	This signal must be turned ON from a ladder program.

◆ INPUT Only (OW□□□3C = 19)

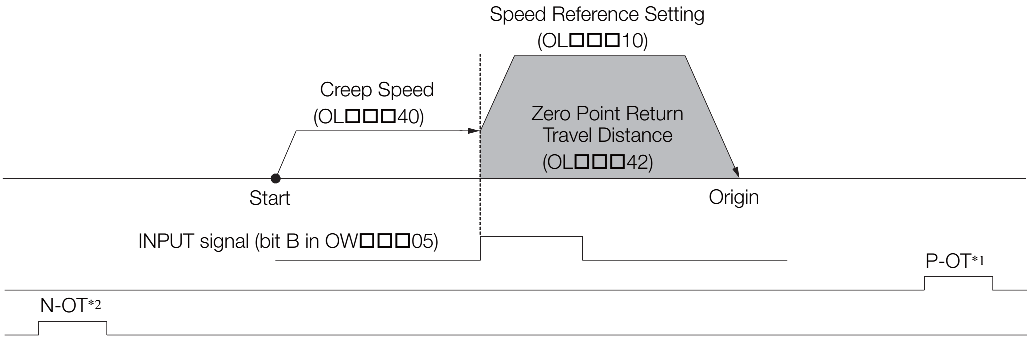
■ Operation after Origin Return Starts

1. Travel is started at the creep speed in the direction determined by the sign of the creep speed.
2. When the rising edge of the INPUT signal is detected, positioning will be performed at the positioning speed.
3. When the positioning operation has been completed, the machine coordinate system is established with the position at the end of the positioning operation as the origin.

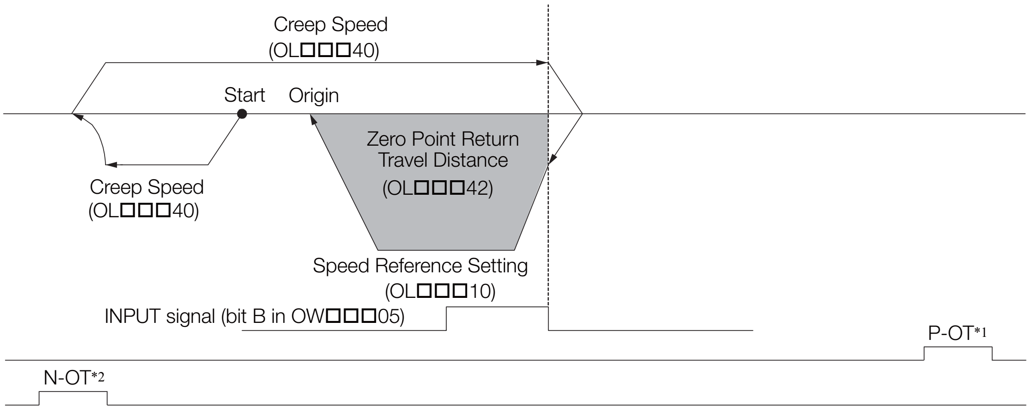
Information

1. The travel distance after the INPUT signal is detected is the value of the Zero Point Return Travel Distance parameter. The positioning speed is the value of the Speed Reference Setting parameter.
2. If an overtravel signal is detected during motion at the creep speed, an overtravel alarm will not occur. The direction will be reversed, and a search will be performed for the INPUT signal.
3. If an overtravel signal is detected when the axis is moving at the positioning speed, an overtravel alarm will occur.
4. The INPUT signal is assigned to bit B in OW□□□05. This allows the origin return operation to be performed without actually wiring a signal. This method can therefore be used to temporarily set the origin for test run adjustments.
5. Detection of the rising edge of the INPUT signal is performed with software processing. Therefore, the position where positioning is completed depends on the high-speed scan setting and positioning speed setting. Do not use this method if repeat accuracy is required for the position where the origin return operation is completed.
6. The stop method when an overtravel signal is detected depends on the SERVOPACK parameter settings.

- Normal Execution



- Overtravel Signal Detected during Travel at the Creep Speed



*1. SERVOPACK P-OT signal.
*2. SERVOPACK N-OT signal.

■ Setting Parameters

Register Address	Name	Setting Details
OW□□□3C	Zero Point Return Method	19: INPUT only
OL□□□10	Speed Reference Setting	Set the positioning speed to use after the INPUT signal is detected. The sign is ignored. The travel direction depends on the sign of the Zero Point Return Travel Distance parameter.
OL□□□40	Creep Speed	Set the speed and direction (based on the sign) to begin the origin return operation.
OL□□□42	Zero Point Return Travel Distance	Set the travel distance after detecting the INPUT signal. The travel direction depends on the sign.
OW□□□05 Bit B	Zero Point Return Input Signal	This signal must be turned ON from a ladder program.

4.2.4 INTERPOLATE (Interpolation)

The INTERPOLATE command positions the axis according to target position data that changes in sync with the high-speed scan. The positioning data is created by a ladder program.

Information

- Speed feedforward compensation can be applied.
- Torque feedforward compensation can be used with the INTERPOLATE command. The torque feedforward compensation is set in the OL□□□0C setting parameter (Torque/Force Reference Setting or Torque Feedforward Compensation). If torque feedforward compensation is not necessary, set OL□□□0C to 0.
- The torque can be limited with the OL□□□14 setting parameter (Torque/Force Limit). OL□□□14 can be changed at any time. The intended operation may not be achieved if the set value is too small.

Execution and Operating Procedures

1. Make sure that all of the following conditions are met.

No.	Execution Condition	Confirmation Method
1	There must be no alarms.	Both IL□□□02 and IL□□□04 must be 0.
2	The Servomotor's power must be ON.	Bit 1 in IW□□□00 must be 1.
3	Motion command execution for the target axis must be completed.*	IW□□□08 must be 0 and bit 0 in IW□□□09 must be 0.

* Before you change to this command during the execution of another command, you must check whether the command can be changed and how operation changes when the command is changed. Refer to the following section for details on changing from another command.
☞ *4.4 Changing the Command* on page 4-137

2. Set the following setting parameters.
   - OW□□□01, Bit 3 (Speed Loop P/PI Switch)
   - OW□□□03, Bits 8 to B (Filter Type Selection)
   - OL□□□0C (Torque/Force Reference Setting or Torque Feedforward Compensation)
   - OW□□□12 (Speed Limit)
   - OL□□□14 (Torque/Force Limit)
   - OL□□□1C (Position Reference Setting)
   - OW□□□30 (Speed Feedforward Compensation)

3. Set the OW□□□08 setting parameter (Motion Commands) to 4 to execute the INTERPOLATE motion command.
   During positioning, the IW□□□08 monitor parameter (Motion Command Response Code) will be 4.

4. The value of OL□□□1C is updated every high-speed scan.
   The target position is updated to the updated value of OL□□□1C.
   The difference between the target position of one high-speed scan and that of the next high-speed scan determines the travel speed.
   When the target position is reached, bit 1 (Positioning Completed) in the IW□□□0C monitor parameter will change to 1 (Within positioning completed range) and positioning will end.

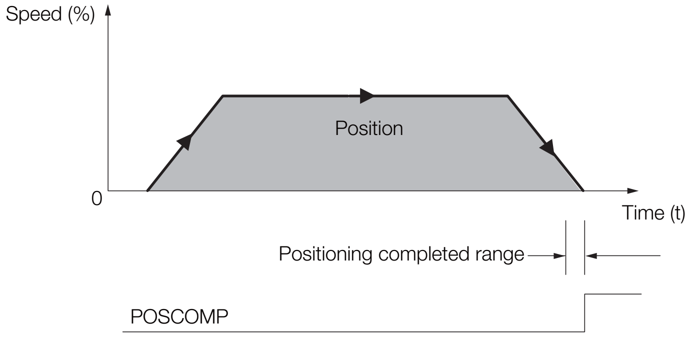
   Information When bit 5 (Position Reference Type) in the OW□□□09 setting parameter is set to the incremental addition method, the previous target position is added to the difference between the current value and the previous value of OL□□□1C to find the target position.

5. Set OW□□□08 to 0 to execute the NOP motion command.

This concludes interpolation positioning.

Operating Patterns

The following figure shows the operating pattern when the INTERPOLATE command is executed.



Holding and Canceling Commands

The axis stops if there is no change in the target position each high-speed scan.

Bit 0 (Hold Command) and bit 1 (Cancel Command) in the OW□□□09 setting parameter cannot be used to stop the axis.

Change the motion command to stop an interpolation operation.

Related Parameters

The parameters that are related to this command are listed in the following table.

◆ Setting Parameters

Register Address	Name	Setting Details
OW□□□00 Bit 0	Servo ON	Use this bit to turn the power to the Servomotor ON or OFF. Set this parameter to 1 before setting OW□□□08 to 4 (INTERPOLATE). 0: Servo OFF, 1: Servo ON
OW□□□02 Bit 8 to F	Stop Mode Selection	Select the stop method to use when a command is canceled. 0: Stop according to the Linear Deceleration Rate/Deceleration Time Constant parameter 1: Stop immediately
OW□□□03	Function Settings 1	Select the speed unit, acceleration/deceleration unit, and filter type.
OW□□□08	Motion Commands	Positioning is started when this parameter is set to 4 (INTERPOLATE).
OW□□□09 Bit 5	Position Reference Type	Set the position reference type. Set this bit before setting OW□□□08 to 4 (INTERPOLATE). 0: Incremental value addition method 1: Absolute value specification method
OL□□□0C	Torque/Force Reference Setting or Torque Feedforward Compensation	Set the torque feedforward amount during interpolation.
OW□□□12	Speed Limit	Set the upper speed limit as a percentage of the rated motor speed (rotary motor) or rated speed (linear motor). This value is an absolute value. It is used in both the forward and reverse directions.
OL□□□14	Torque/Force Limit	Set the torque limit during interpolation.
OL□□□1C	Position Reference Setting	Set the target position for positioning. This parameter is updated every high-speed scan.
OL□□□1E	Positioning Completion Width	Set this parameter to the value for which bit 1 in IW□□□0C will change to 1 (Within positioning completed range).

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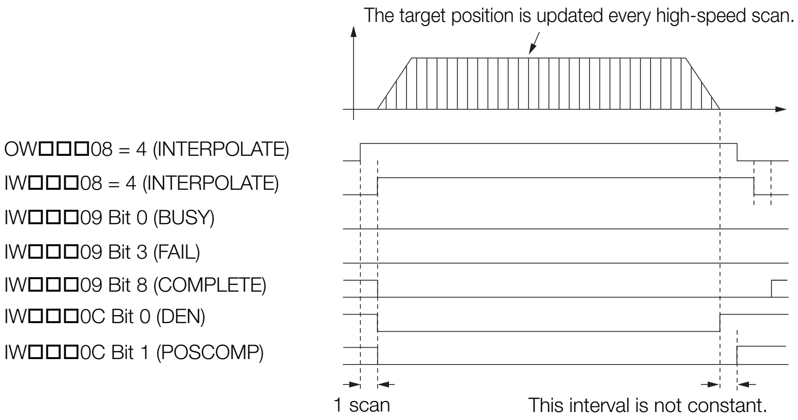
Register Address	Name	Setting Details
OL□□□20	NEAR Signal Output Width	Set this parameter to the value for which bit 3 in IW□□□0C will change to 1 (Within near position range). Bit 3 changes to 1 when the absolute value of the difference between the reference position and the feedback position is within the range that is specified here.
OW□□□31	Speed Compensation	Set the speed feedforward amount as a percentage of the rated speed. The setting unit for this parameter is always 0.01%.
OL□□□38	Linear Deceleration Rate/Deceleration Time Constant	Set the positioning deceleration rate with the deceleration time. This parameter is used for decelerating to a stop when an alarm occurs.
OW□□□3A	Filter Time Constant	Set the acceleration/deceleration filter time constant. Exponential acceleration/deceleration or a moving average filter can be selected in bits 8 to B in OW□□□03. This setting can be changed only when distribution has been completed (i.e., when bit 0 in IW□□□0C is 1).

◆ Monitor Parameters

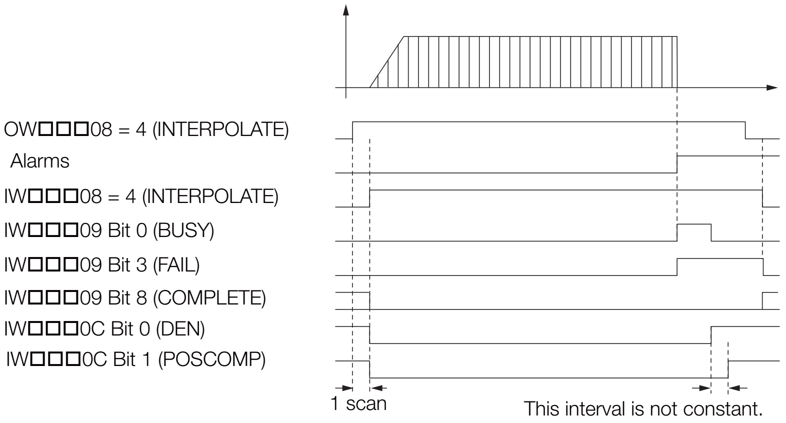
Register Address	Name	Monitored Contents
IW□□□00 Bit 1	Running with Servo ON	This bit shows the Servo status for the axis. 0: Stopped, 1: Running with Servo ON
IL□□□02	Warnings	This parameter reports the current warning status.
IL□□□04	Alarms	This parameter reports the current alarm status.
IW□□□08	Motion Command Response Code	This parameter shows the motion command currently in execution. This parameter is 4 during execution of the INTERPOLATE command.
IW□□□09 Bit 0	Command Execution Flag	This bit is always 0 (Completed) for the INTERPOLATE command.
IW□□□09 Bit 1	Command Hold Completed	This bit is always 0 (Command hold not completed) for the INTERPOLATE command.
IW□□□09 Bit 3	Command Error End	This bit changes to 1 (Completed with an error) when an error occurs during execution of the INTERPOLATE command. The axis will decelerate to a stop if it is moving. This bit changes to 0 (Completed normally) when another command is executed.
IW□□□09 Bit 8	Command Execution Completed	This bit is always 0 (Normal execution not completed) for the INTERPOLATE command.
IW□□□0C Bit 0	Distribution Completed	This bit changes to 1 (Distribution completed) when the distribution for the travel motion command is completed. This bit is 0 (Distributing pulses) when the execution of a travel motion command is in progress.
IW□□□0C Bit 1	Positioning Completed	This bit is 1 (Within positioning completed range) when distribution is completed and the current position is within the positioning completed range. This bit is 0 (Outside positioning completed range) in all other cases.
IW□□□0C Bit 3	Near Position	The operation of this bit depends on the set value of OL□□□20. If OL□□□20 is 0, this bit is 1 (Within near position range) when distribution is completed (i.e., when DEN is 1), and it is 0 (Outside near position range) when distribution is not completed. When OL□□□20 is not 0, this bit is 1 when within the range of the following formula, regardless of the state of distribution, and 0 in all other cases. |(IL□□□12) – (IL□□□16)| ≤ OL□□□20 IL□□□12: Machine Coordinate System Reference Position IL□□□16: Machine Coordinate System Feedback Position OL□□□20: NEAR Signal Output Width

Timing Charts

◆ Normal Execution



◆ Execution When an Alarm Occurs



4.2.5 LATCH (Latch)

The LATCH command saves the current position to a register when the latch signal is detected during interpolation feeding.

Set bits 0 to 3 (Latch Signal Selection) in the OW□□□04 setting parameter to select either phase-C pulse, /EXT1, /EXT2, or /EXT3 for the latch signal.

Information

- Speed feedforward compensation can be applied.
- If you want to execute the LATCH command again after you have already latched the current position with the LATCH command, change the motion command code to NOP for at least one scan before issuing the LATCH command again.
- Torque feedforward compensation can be used with the LATCH command. The torque feedforward compensation is set in the OL□□□0C setting parameter (Torque/Force Reference Setting or Torque Feedforward Compensation). If torque feedforward compensation is not necessary, set OL□□□0C to 0.
- The torque can be limited with the OL□□□14 setting parameter (Torque/Force Limit). OL□□□14 can be changed at any time. The intended operation may not be achieved if the set value is too small.

Execution and Operating Procedures

1. **Make sure that all of the following conditions are met.**

No.	Execution Condition	Confirmation Method
1	There must be no alarms.	Both IL□□□02 and IL□□□04 must be 0.
2	The Servomotor's power must be ON.	Bit 1 in IW□□□00 must be 1.
3	Motion command execution for the target axis must be completed.*	IW□□□08 must be 0 and bit 0 in IW□□□09 must be 0.

* Before you change to this command during the execution of another command, you must check whether the command can be changed and how operation changes when the command is changed. Refer to the following section for details on changing from another command.
☞ *4.4 Changing the Command* on page 4-137

2. **Set the following setting parameters.**

- OW□□□01, Bit 3 (Speed Loop P/PI Switch)
- OW□□□03, Bits 8 to B (Filter Type Selection)
- OW□□□04, Bits 0 to 3 (Latch Signal Selection)
- OL□□□0C (Torque/Force Reference Setting or Torque Feedforward Compensation)
- OW□□□12 (Speed Limit)
- OL□□□14 (Torque/Force Limit)
- OL□□□1C (Position Reference Setting)
- OW□□□30 (Speed Feedforward Compensation)

3. **Set the OW□□□08 setting parameter (Motion Commands) to 6 to execute the LATCH motion command.**
During positioning, the IW□□□08 monitor parameter (Motion Command Response Code) will be 6.

4. **The value of OL□□□1C is updated every high-speed scan.**
The target position is updated to the updated value of OL□□□1C.
The difference between the target position of one high-speed scan and that of the next high-speed scan determines the travel speed.
When the target position is reached, bit 1 (Positioning Completed) in the IW□□□0C monitor parameter will change to 1 (Within positioning completed range) and positioning will end.

Information

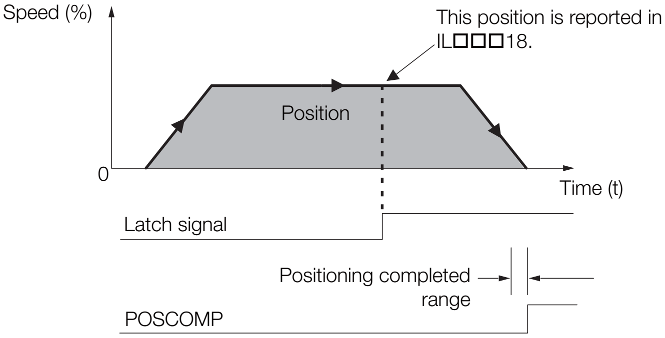
- When bit 5 (Position Reference Type) of the OW□□□09 setting parameter is set to the incremental addition method, the previous target position is added to the difference between the current value and the previous value of OL□□□1C to find the target position.
- Always consider the latch processing time that is obtained with the following equation when executing the LATCH command.
  Latch processing time = 1 scan + MECHATROLINK transmission cycle + SERVOPACK processing time (250 µs max.)

5. **Set OW☐☐☐08 to 0 to execute the NOP motion command.**

This concludes interpolation positioning.

Operating Patterns

The following figure shows the operating pattern when the LATCH command is executed.



Holding and Canceling Commands

The axis stops if there is no change in the target position each high-speed scan.

Bit 0 (Hold Command) and bit 1 (Cancel Command) in the OW☐☐☐09 setting parameter cannot be used to stop the axis.

Change the motion command to stop an interpolation operation.

Related Parameters

The parameters that are related to this command are listed in the following table.

◆ Setting Parameters

Register Address	Name	Setting Details
OW☐☐☐00 Bit 0	Servo ON	Use this bit to turn the power to the Servomotor ON or OFF. Set this parameter to 1 before setting OW☐☐☐08 to 6 (LATCH). 0: Servo OFF, 1: Servo ON
OW☐☐☐02 Bit 8 to F	Stop Mode Selection	Select the stop method to use when a command is canceled. 0: Stop according to the Linear Deceleration Rate/Deceleration Time Constant parameter 1: Stop immediately
OW☐☐☐03	Function Settings 1	Select the speed unit, acceleration/deceleration unit, and filter type.
OW☐☐☐04 Bit 0 to 3	Latch Signal Selection	Select the latch signal.
OW☐☐☐08	Motion Commands	Positioning is started when this parameter is set to 6 (LATCH).
OW☐☐☐09 Bit 5	Position Reference Type	Set the position reference type. Set this bit before setting OW☐☐☐08 to 6 (LATCH). 0: Incremental value addition method 1: Absolute value specification method
OL☐☐☐0C	Torque/Force Reference Setting or Torque Feedforward Compensation	Set the torque feedforward amount during interpolation positioning.
OW☐☐☐12	Speed Limit	Set the upper speed limit as a percentage of the rated motor speed (rotary motor) or rated speed (linear motor). This value is an absolute value. It is used in both the forward and reverse directions.
OL☐☐☐14	Torque/Force Limit	Set the torque limit for interpolation positioning.
OL☐☐☐1C	Position Reference Setting	Set the target position for positioning. This parameter is updated every high-speed scan.

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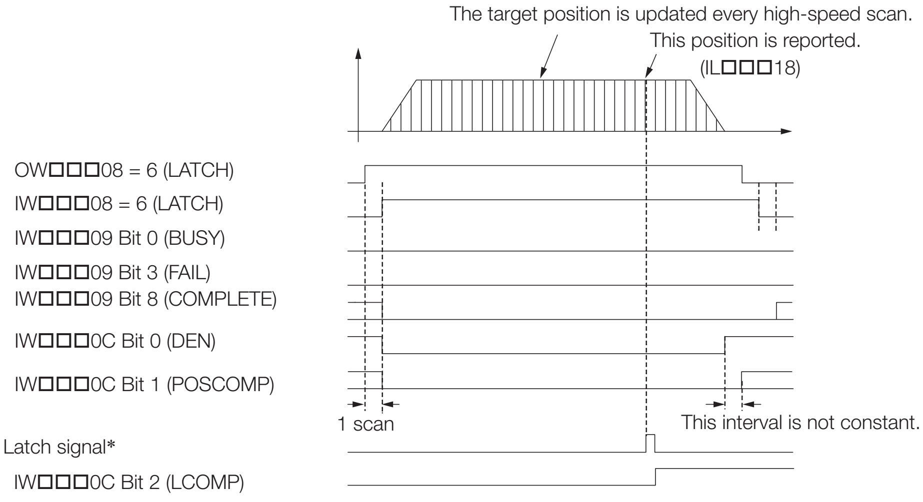
Register Address	Name	Setting Details
OL□□□1E	Positioning Completion Width	Set this parameter to the value for which bit 1 in IW□□□0C will change to 1 (Within positioning completed range).
OL□□□20	NEAR Signal Output Width	Set this parameter to the value for which bit 3 in IW□□□0C will change to 1 (Within near position range). Bit 3 changes to 1 when the absolute value of the difference between the reference position and the feedback position is within the range that is specified here.
OW□□□31	Speed Compensation	Set the speed feedforward amount as a percentage of the rated speed. The setting unit for this parameter is always 0.01%.
OL□□□38	Linear Deceleration Rate/Deceleration Time Constant	Set the positioning deceleration rate with the deceleration time. This parameter is used for decelerating to a stop when an alarm occurs.
OW□□□3A	Filter Time Constant	Set the acceleration/deceleration filter time constant. Exponential acceleration/deceleration or a moving average filter can be selected in bits 8 to B in OW□□□03. This setting can be changed only when distribution has been completed (i.e., when bit 0 in IW□□□0C is 1).

◆ Monitor Parameters

Register Address	Name	Monitored Contents
IW□□□00 Bit 1	Running with Servo ON	This bit shows the Servo status for the axis. 0: Stopped, 1: Running with Servo ON
IL□□□02	Warnings	This parameter reports the current warning status.
IL□□□04	Alarms	This parameter reports the current alarm status.
IW□□□08	Motion Command Response Code	This parameter shows the motion command currently in execution. This parameter is 6 during execution of the LATCH command.
IW□□□09 Bit 0	Command Execution Flag	This bit is always 0 (Completed) for the LATCH command.
IW□□□09 Bit 1	Command Hold Completed	This bit is always 0 (Command hold not completed) for the LATCH command.
IW□□□09 Bit 3	Command Error End	This bit changes to 1 (Completed with an error) when an error occurs during execution of the LATCH command. The axis will decelerate to a stop if it is moving. This bit changes to 0 (Completed normally) when another command is executed.
IW□□□09 Bit 8	Command Execution Completed	This bit is always 0 (Normal execution not completed) for the LATCH command.
IW□□□0C Bit 0	Distribution Completed	This bit changes to 1 (Distribution completed) when the distribution for the travel motion command is completed. This bit is 0 (Distributing pulses) when the execution of a travel motion command is in progress.
IW□□□0C Bit 1	Positioning Completed	This bit is 1 (Within positioning completed range) when distribution is completed and the current position is within the positioning completed range. This bit is 0 (Outside positioning completed range) in all other cases.
IW□□□0C Bit 2	Latch Completed	This bit changes to 0 (Latch not complete) when a new latch command is executed and it changes to 1 (Latch completed) when the latch is completed. The latched position is reported in IL□□□18.

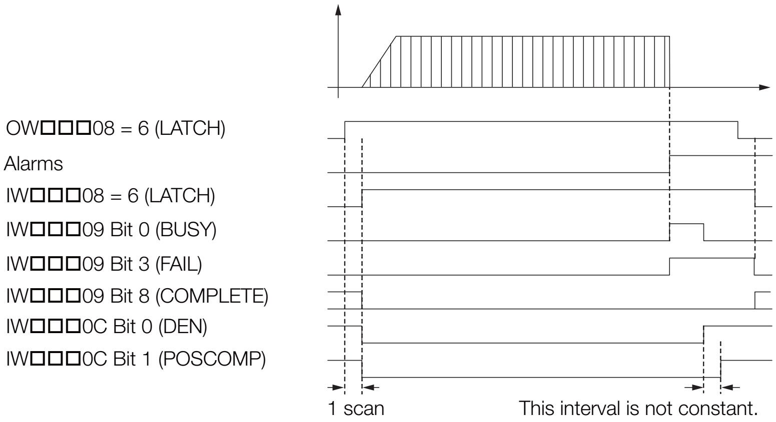
Timing Charts

◆ Normal Execution



* Latch signal: Phase-C pulse, /EXT1, EXT2, or /EXT3

◆ Execution When an Alarm Occurs



4.2.6 FEED (Jog)

The FEED command starts movement in the specified travel direction at the specified travel speed. Execute the NOP command to stop the operation.

Execution and Operating Procedures

1. Make sure that all of the following conditions are met.

No.	Execution Condition	Confirmation Method
1	There must be no alarms.	Both IL□□□02 and IL□□□04 must be 0.
2	The Servomotor's power must be ON.	Bit 1 in IW□□□00 must be 1.
3	Motion command execution for the target axis must be completed.*	IW□□□08 must be 0 and bit 0 in IW□□□09 must be 0.

* Before you change to this command during the execution of another command, you must check whether the command can be changed and how operation changes when the command is changed. Refer to the following section for details on changing from another command.
☞ *4.4 Changing the Command* on page 4-137

2. Set the following setting parameters.
- OW□□□01, Bit 3 (Speed Loop P/PI Switch)
- OW□□□03, Bits 8 to B (Filter Type Selection)
- OW□□□09, Bit 2 (Travel Direction for JOG/STEP)
- OL□□□10 (Speed Reference Setting)
- OW□□□12 (Speed Limit)
- OL□□□14 (Torque/Force Limit)
- OL□□□36 (Linear Acceleration Rate/Acceleration Time Constant)
- OL□□□38 (Linear Deceleration Rate/Deceleration Time Constant)

Information
- OL□□□10 can be changed during motion.
- OL□□□14 can be changed at any time. The intended operation may not be achieved if the set value is too small.
- If OL□□□36 and OL□□□38 are changed during operation, the specifications of the SERVOPACK determine whether these changes are applied to acceleration and deceleration.

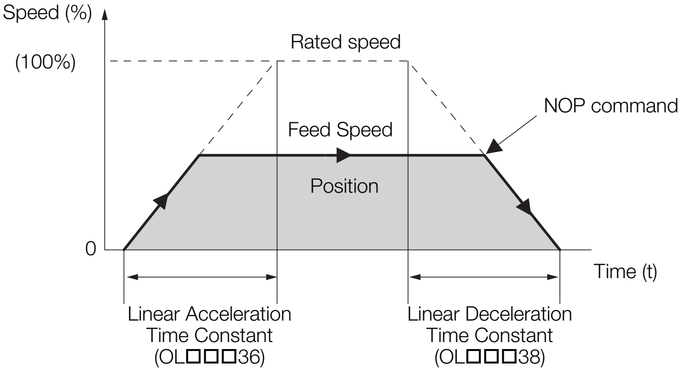
3. Set the OW□□□08 setting parameter (Motion Commands) to 7 to execute the FEED motion command.
The jogging operation starts. During the jogging operation, the IW□□□08 monitor parameter (Motion Command Response Code) is 7.

4. Set OW□□□08 to 0 to execute the NOP motion command.
Bit 1 (Positioning Completed) in the IW□□□0C monitor parameter changes to 1 (Within positioning completed range).

This concludes the jogging operation.

Operating Patterns

The following figure shows the operating pattern when the FEED command is executed.



Holding

Holding execution of the FEED command is not possible. Bit 0 (Hold Command) in the OW□□□09 setting parameter will be ignored.

Canceling

- To cancel a jogging operation, set bit 1 (Cancel Command) in the OW□□□09 setting parameter to 1 (Cancel Command ON).
  When bit 1 in OW□□□09 is set to 1, the axis will decelerate to a stop.
  The deceleration operation depends on the setting of bits 8 to F (Stop Mode Selection) in the OW□□□02 setting parameter.
  After the axis decelerates to a stop, bit 1 (Positioning Completed) in the IW□□□0C monitor parameter will change to 1 (Within positioning completed range).
- The jogging operation resumes if bit 1 (Cancel Command) in the OW□□□09 setting parameter is set to 0 (Cancel Command OFF) during processing of the cancel operation.
- The same operation as the Cancel Command operation will be performed if the motion command code is changed during axis motion.

Important

1. Due to the delay that occurs when sending or receiving commands and responses between the CPU and the Motion Control Function Module, the cancel processing may have been completed (IW□□□08 is 7 and bit 8 in IW□□□09 is 1), even though an attempt was made to restart the operation. In this case, operation cannot be resumed. Set OW□□□08 to any command other than FEED (e.g., NOP), and then start the operation again.
2. If an operation is to be frequently canceled and restarted within a short interval, remember to consider this delay.

Related Parameters

The parameters that are related to this command are listed in the following table.

◆ Setting Parameters

Register Address	Name	Setting Details
OW□□□00 Bit 0	Servo ON	Use this bit to turn the power to the Servomotor ON or OFF. Set this parameter to 1 before setting OW□□□08 to 7 (FEED). 0: Servo OFF, 1: Servo ON
OW□□□01 Bit 3	Speed Loop P/PI Switch	Use this bit to change the speed control loop between PI control and P control. 0: PI control, 1: P control

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Register Address	Name	Setting Details
OW□□□02 Bit 8 to F	Stop Mode Selection	Select the stop method to use when a command is canceled. 0: Stop according to the Linear Deceleration Rate/Deceleration Time Constant parameter 1: Stop immediately
OW□□□03	Function Settings 1	Select the speed unit, acceleration/deceleration unit, and filter type.
OW□□□08	Motion Commands	The jogging operation starts when this parameter is set to 7 (FEED). The axis will decelerate to a stop and the jogging operation will be completed if this parameter is set to 0 (NOP) during the jogging operation.
OW□□□09 Bit 1	Cancel Command	When this bit is set to 1 (ON) during jogging, the axis will decelerate to a stop.
OW□□□09 Bit 2	Travel Direction for JOG/STEP	Set the travel direction for jogging. 0: Forward, 1: Reverse
OL□□□10	Speed Reference Setting	Specify the positioning speed. This parameter can be changed during operation. The unit depends on the set value of bits 0 to 3 in OW□□□03.
OW□□□12	Speed Limit	Set the upper speed limit as a percentage of the rated motor speed (rotary motor) or rated speed (linear motor). This value is an absolute value. It is used in both the forward and reverse directions.
OL□□□14	Torque/Force Limit	Set the torque limit for jogging.
OW□□□18	Override	This parameter allows the feed speed to be changed without changing the value of OL□□□10. Set the value as a percentage of the Speed Reference Setting. This parameter can be changed during operation. Setting range: 0 to 32,767 (0% to 327.67%) Setting unit: 1 = 0.01% Example: Setting for 50% = 5,000
OL□□□1E	Positioning Completion Width	Set this parameter to the value for which bit 1 in IW□□□0C will change to 1 (Within positioning completed range).
OL□□□20	NEAR Signal Output Width	Set this parameter to the value for which bit 3 in IW□□□0C will change to 1 (Within near position range). Bit 3 changes to 1 when the absolute value of the difference between the reference position and the feedback position is within the range that is specified here.
OL□□□36	Linear Acceleration Rate/Acceleration Time Constant	Set the jogging acceleration rate with the acceleration rate or the acceleration time.
OL□□□38	Linear Deceleration Rate/Deceleration Time Constant	Set the jogging deceleration rate with the deceleration rate or the deceleration time.
OW□□□3A	Filter Time Constant	Set the acceleration/deceleration filter time constant. Exponential acceleration/deceleration or a moving average filter can be selected in bits 8 to B in OW□□□03. This setting can be changed only when distribution has been completed (i.e., when bit 0 in IW□□□0C is 1).

◆ Monitor Parameters

Register Address	Name	Monitored Contents
IW□□□00 Bit 1	Running with Servo ON	This bit shows the Servo status for the axis. 0: Stopped, 1: Running with Servo ON
IL□□□02	Warnings	This parameter reports the current warning status.
IL□□□04	Alarms	This parameter reports the current alarm status.
IW□□□08	Motion Command Response Code	This parameter shows the motion command currently in execution. This parameter is 7 during execution of the FEED command.
IW□□□09 Bit 0	Command Execution Flag	This bit changes to 1 (Processing) when cancel processing is being performed for the FEED command. This bit changes to 0 (Completed) when cancel processing has been completed.

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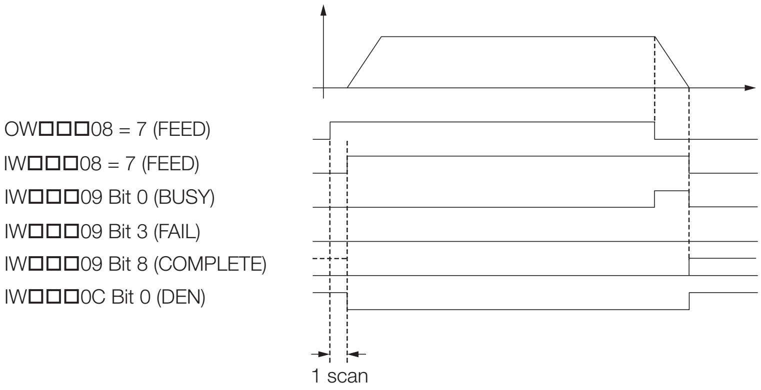
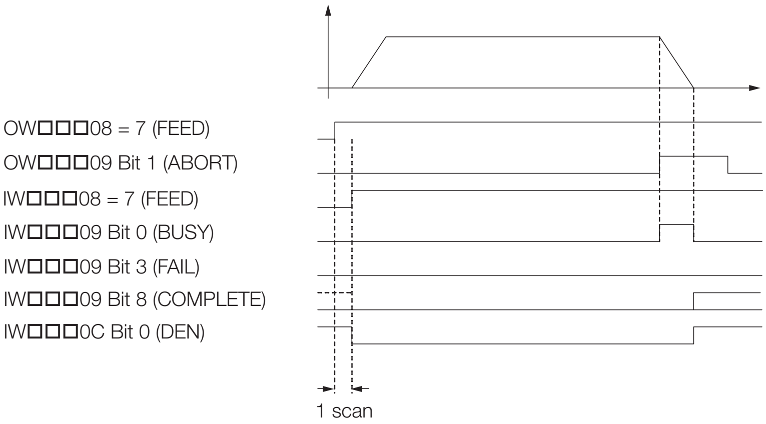
Register Address	Name	Monitored Contents
IW□□□09 Bit 1	Command Hold Completed	This bit is always 0 (Command hold not completed) for the FEED command.
IW□□□09 Bit 3	Command Error End	This bit changes to 1 (Completed with an error) when an error occurs during execution of the FEED command. The axis will decelerate to a stop if it is moving. This bit changes to 0 (Completed normally) when another command is executed.
IW□□□09 Bit 8	Command Execution Completed	This bit is always 0 (Normal execution not completed) for the FEED command.
IW□□□0C Bit 0	Distribution Completed	This bit changes to 1 (Distribution completed) when the distribution for the travel motion command is completed. This bit is 0 (Distributing pulses) when the execution of a travel motion command is in progress.
IW□□□0C Bit 1	Positioning Completed	This bit is 1 (Within positioning completed range) when distribution is completed and the current position is within the positioning completed range. This bit is 0 (Outside positioning completed range) in all other cases.

Timing Charts

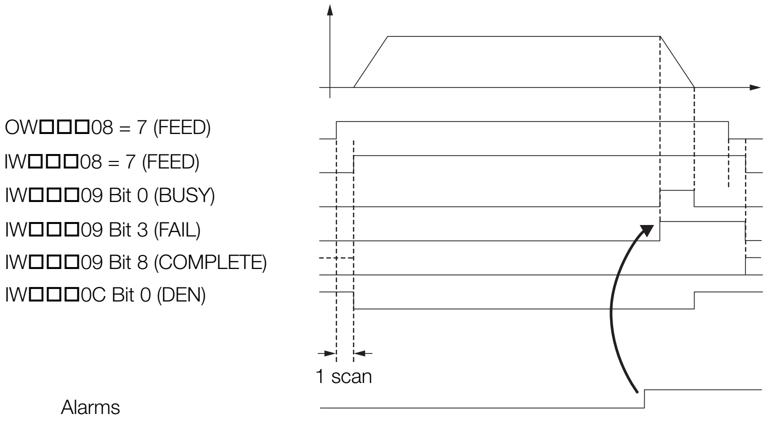
◆ Normal Execution



◆ Execution When Canceled



◆ Execution When an Alarm Occurs



4.2.7 STEP (STEP Operation)

The STEP command performs positioning for the specified travel distance based on the specified travel direction, travel distance, and travel speed.

Execution and Operating Procedures

1. Make sure that all of the following conditions are met.

No.	Execution Condition	Confirmation Method
1	There must be no alarms.	Both IL□□□02 and IL□□□04 must be 0.
2	The Servomotor's power must be ON.	Bit 1 in IW□□□00 must be 1.
3	Motion command execution for the target axis must be completed.*	IW□□□08 must be 0 and bit 0 in IW□□□09 must be 0.

* Before you change to this command during the execution of another command, you must check whether the command can be changed and how operation changes when the command is changed. Refer to the following section for details on changing from another command.

☞ *4.4 Changing the Command* on page 4-137

2. Set the following setting parameters.

- OW□□□01, Bit 3 (Speed Loop P/PI Switch)
- OW□□□03, Bits 8 to B (Filter Type Selection)
- OW□□□09, Bit 2 (Travel Direction for JOG/STEP)
- OL□□□10 (Speed Reference Setting)
- OW□□□12 (Speed Limit)
- OL□□□14 (Torque/Force Limit)
- OL□□□36 (Linear Acceleration Rate/Acceleration Time Constant)
- OL□□□38 (Linear Deceleration Rate/Deceleration Time Constant)
- OL□□□44 (STEP Travel Distance)

Information

- OL□□□10 can be changed during motion.
- An override of between 0% and 327.67% can be set for OL□□□10.
- OL□□□14 can be changed at any time. The intended operation may not be achieved if the set value is too small.
- If OL□□□36 and OL□□□38 are changed during operation, the specifications of the SERVOPACK determine whether these changes are applied to acceleration and deceleration.

3. Set the OW□□□08 setting parameter (Motion Commands) to 8 to execute the STEP motion command.

The STEP operation starts. During the jogging operation, the IW□□□08 monitor parameter (Motion Command Response Code) is 8.

When the target near position is reached, bit 3 (Near Position) in the IW□□□0C monitor parameter will change to 1 (Within near position range).

Then, when the target position is reached, bit 1 in the IW□□□0C monitor parameter will change to 1 (Within positioning completed range) and positioning will end.

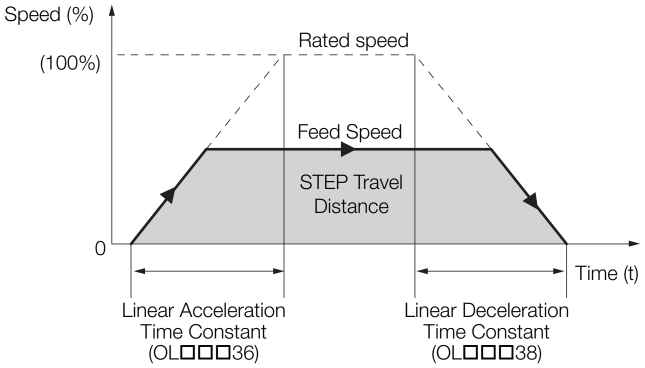
4. Set OW□□□08 to 0 to execute the NOP motion command.

This concludes the STEP operation.

Operating Patterns

The following figure shows the operating pattern when the STEP command is executed.

STEP Operating Pattern



Holding

- To hold an axis in place during motion and resume operation at a later time, set bit 0 (Hold Command) in the OW□□□09 setting parameter to 1 (Hold Command ON).
  When bit 0 in OW□□□09 is set to 1, the axis will decelerate to a stop.
  The deceleration operation depends on the setting of bits 8 to F (Stop Mode Selection) in the OW□□□02 setting parameter.
  When the axis completely decelerates to a stop, bit 1 (Command Hold Completed) in the IW□□□09 monitor parameter will change to 1 (Completed).
- To release the hold, set bit 0 (Hold Command) in OW□□□09 to 0 (Hold Command OFF).
  This clears the command hold status and the remaining portion of the positioning operation is restarted.

Canceling

- To stop an axis during motion and cancel the remaining motion, set bit 1 (Cancel Command) in the OW□□□09 setting parameter to 1 (Cancel Command ON).
  When bit 1 in OW□□□09 is set to 1, the axis will decelerate to a stop.
  The deceleration operation depends on the setting of bits 8 to F (Stop Mode Selection) in the OW□□□02 setting parameter.
  When the axis completely decelerates to a stop, the remaining motion will be canceled and bit 1 (Positioning Completed) in the IW□□□0C monitor parameter will change to 1 (Within positioning completed range).
- The same operation as the Cancel Command operation will be performed if the motion command code is changed during axis motion.

Related Parameters

The parameters that are related to this command are listed in the following table.

◆ Setting Parameters

Register Address	Name	Setting Details
OW□□□00 Bit 0	Servo ON	Use this bit to turn the power to the Servomotor ON or OFF. Set this parameter to 1 before setting OW□□□08 to 8 (STEP). 0: Servo OFF, 1: Servo ON
OW□□□01 Bit 3	Speed Loop P/PI Switch	Use this bit to change the speed control loop between PI control and P control. 0: PI control, 1: P control

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Register Address	Name	Setting Details
OW☐☐☐02 Bit 8 to F	Stop Mode Selection	Select the stop method to use when a command is canceled. 0: Stop according to the Linear Deceleration Rate/Deceleration Time Constant parameter 1: Stop immediately
OW☐☐☐03	Function Settings 1	Select the speed unit, acceleration/deceleration unit, and filter type.
OW☐☐☐08	Motion Commands	The STEP operation is started when this parameter is set to 8 (STEP). Set this parameter to 0 (NOP) during a STEP operation to cancel the STEP operation.
OW☐☐☐09 Bit 0	Hold Command	When this bit is set to 1 (ON) during a STEP operation, the axis will decelerate to a stop. The STEP operation is resumed if this bit is set to 0 (OFF) when the axis is being held.
OW☐☐☐09 Bit 1	Cancel Command	If this bit is set to 1 (ON) during positioning, the axis will decelerate to a stop. If this bit is set to 0 (OFF) after decelerating to a stop, the operation will depend on the setting of bit 5 in OW☐☐☐09.
OW☐☐☐09 Bit 2	Travel Direction for JOG/STEP	Set the travel direction for the STEP operation. 0: Forward, 1: Reverse
OL☐☐☐10	Speed Reference Setting	Specify the positioning speed. This parameter can be changed during operation. The unit depends on the set value of bits 0 to 3 in OW☐☐☐03.
OW☐☐☐12	Speed Limit	Set the upper speed limit as a percentage of the rated motor speed (rotary motor) or rated speed (linear motor). This value is an absolute value. It is used in both the forward and reverse directions.
OL☐☐☐14	Torque/Force Limit	Set the torque limit for interpolation positioning.
OW☐☐☐18	Override	This parameter allows the positioning speed to be changed without changing the value of OL☐☐☐10. Set the value as a percentage of the Speed Reference Setting. This parameter can be changed during operation. Setting range: 0 to 32,767 (0% to 327.67%) Setting unit: 1 = 0.01% Example: Setting for 50% = 5,000
OL☐☐☐1E	Positioning Completion Width	Set this parameter to the value for which bit 1 in IW☐☐☐0C will change to 1 (Within positioning completed range).
OL☐☐☐20	NEAR Signal Output Width	Set this parameter to the value for which bit 3 in IW☐☐☐0C will change to 1 (Within near position range). Bit 3 changes to 1 when the absolute value of the difference between the reference position and the feedback position is within the range that is specified here.
OL☐☐☐36	Linear Acceleration Rate/Acceleration Time Constant	Set the positioning acceleration rate with the acceleration rate or the acceleration time.
OL☐☐☐38	Linear Deceleration Rate/Deceleration Time Constant	Set the positioning deceleration rate with the deceleration rate or the deceleration time.
OW☐☐☐3A	Filter Time Constant	Set the acceleration/deceleration filter time constant. Exponential acceleration/deceleration or a moving average filter can be selected in bits 8 to B in OW☐☐☐03. This setting can be changed only when distribution has been completed (i.e., when bit 0 in IW☐☐☐0C is 1).
OL☐☐☐44	STEP Travel Distance	Set the travel distance for the STEP operation.

◆ Monitor Parameters

Register Address	Name	Monitored Contents
IW☐☐☐00 Bit 1	Running with Servo ON	This bit shows the Servo status for the axis. 0: Stopped, 1: Running with Servo ON
IL☐☐☐02	Warnings	This parameter reports the current warning status.

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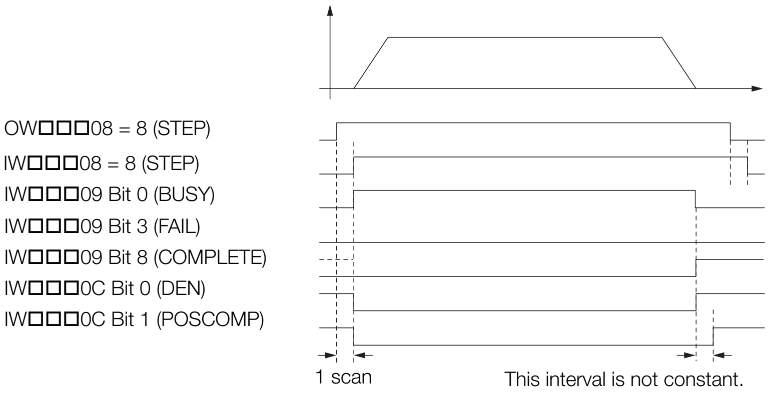
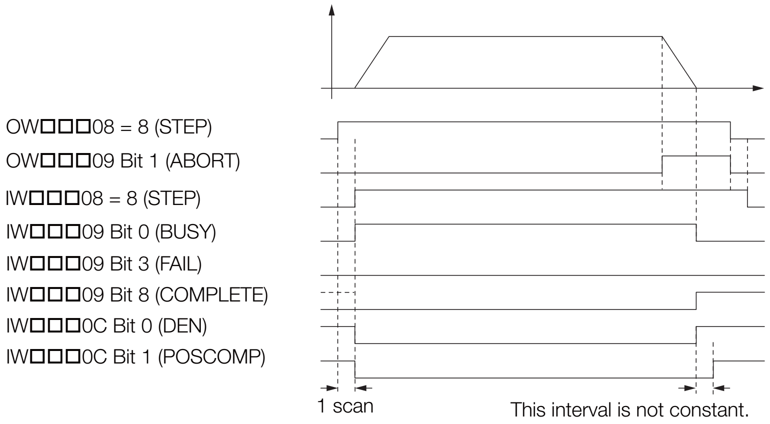
Register Address	Name	Monitored Contents
IL□□□04	Alarms	This parameter reports the current alarm status.
IW□□□08	Motion Command Response Code	This parameter shows the motion command currently in execution. This parameter is 8 during execution of the STEP command.
IW□□□09 Bit 0	Command Execution Flag	This bit is 1 (Processing) during execution of the STEP command. The bit changes to 0 (Completed) when execution ends.
IW□□□09 Bit 1	Command Hold Completed	This bit changes to 1 (Completed) when IW□□□08 is 8 (execution of the STEP command is in progress), bit 1 (Hold Command) in OW□□□09 is 1, and the axis completely decelerates to a stop.
IW□□□09 Bit 3	Command Error End	This bit changes to 1 (Completed with an error) when an error occurs during execution of the STEP command. The axis will decelerate to a stop if it is moving. This bit changes to 0 (Completed normally) when another command is executed.
IW□□□09 Bit 8	Command Execution Completed	This bit changes to 1 (Normal execution completed) when execution of the STEP command ends.
IW□□□0C Bit 0	Distribution Completed	This bit changes to 1 (Distribution completed) when the distribution for the travel motion command is completed. This bit is 0 (Distributing pulses) when the execution of a travel motion command is in progress.
IW□□□0C Bit 1	Positioning Completed	This bit is 1 (Within positioning completed range) when distribution is completed and the current position is within the positioning completed range. This bit is 0 (Outside positioning completed range) in all other cases.
IW□□□0C Bit 3	Near Position	The operation of this bit depends on the set value of OL□□□20. If OL□□□20 is 0, this bit is 1 (Within near position range) when distribution is completed (i.e., when DEN is 1), and it is 0 (Outside near position range) when distribution is not completed. When OL□□□20 is not 0, this bit is 1 when within the range of the following formula, regardless of the state of distribution, and 0 in all other cases. |(IL□□□12) – (IL□□□16)| ≤ OL□□□20 IL□□□12: Machine Coordinate System Reference Position IL□□□16: Machine Coordinate System Feedback Position OL□□□20: NEAR Signal Output Width

Timing Charts

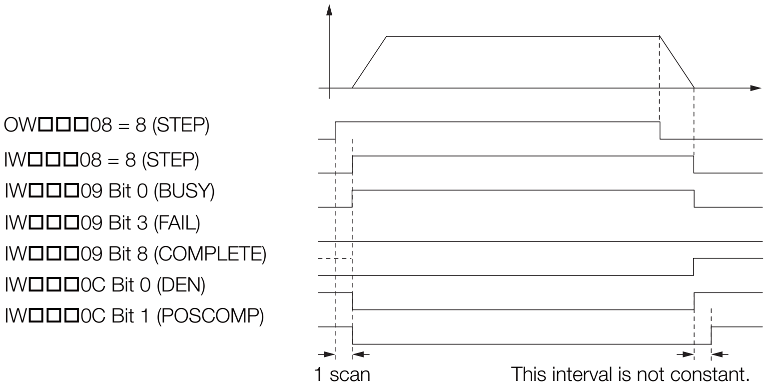
◆ Normal Execution



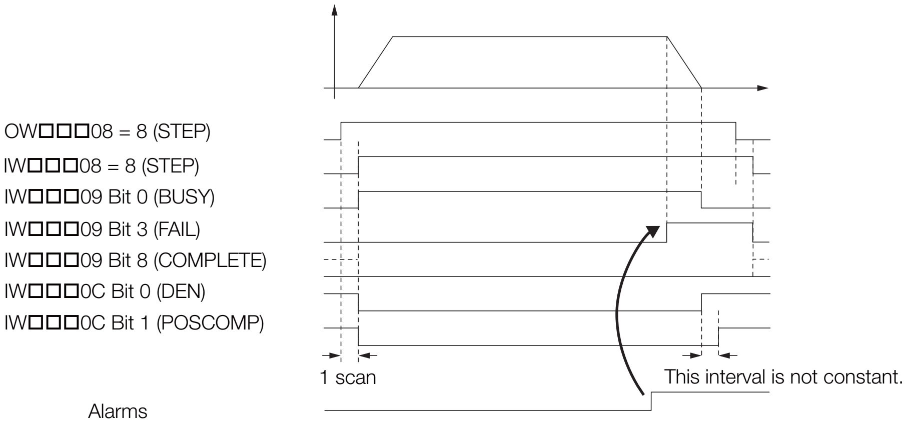
◆ Execution When Canceled



◆ Execution When Command Is Changed



◆ Execution When an Alarm Occurs



4.2.8 ZSET (Set Zero Point)

Execute the ZSET command to set the origin in the machine coordinate system. This enables the origin to be set without performing an origin return operation.

> **Important**
>
> When using software limits, always execute this command or an origin return operation. Software limits are enabled after this command is completed.

Execution and Operating Procedures

1. Make sure that all of the following conditions are met.

No.	Execution Condition	Confirmation Method
1	There must be no alarms.	Both IL□□□02 and IL□□□04 must be 0.
2	Motion command execution for the target axis must be completed.*	IW□□□08 must be 0 and bit 0 in IW□□□09 must be 0.

* Before you change to this command during the execution of another command, you must check whether the command can be changed and how operation changes when the command is changed. Refer to the following section for details on changing from another command.
☞ *4.4 Changing the Command* on page 4-137

2. **Set the OW□□□08 setting parameter (Motion Commands) to 9 to execute the ZSET motion command.**

A new machine coordinate system is established with the current position as the origin.
During the operation, the IW□□□08 monitor parameter (Motion Command Response Code) is 9.
When the operation is completed, bit 5 (Zero Point Return/Setting Completed) in the IW□□□0C monitor parameter will change to 1 (Zero point return/setting completed).
The position information when the operation is completed will depend on the axis setting, as shown in the following table.

Axis Setting	Position Information When the Operation Is Completed
Finite-length or infinite-length axis with an incremental encoder	The position information is initialized with the origin offset in the machine coordinate system.
Finite-length axis with an absolute encoder	The position information is unchanged.
Simple absolute infinite-length axis with an absolute encoder	The position information is unchanged.
Infinite-length axis with an absolute encoder	The position information is initialized with the origin offset in the machine coordinate system.

3. **Set OW□□□08 to 0 to execute the NOP motion command.**

This concludes the set zero point operation.

Holding and Canceling Commands

Bit 0 (Hold Command) and bit 1 (Cancel Command) in the OW□□□09 setting parameter cannot be used to stop the axis.

Related Parameters

The parameters that are related to this command are listed in the following table.

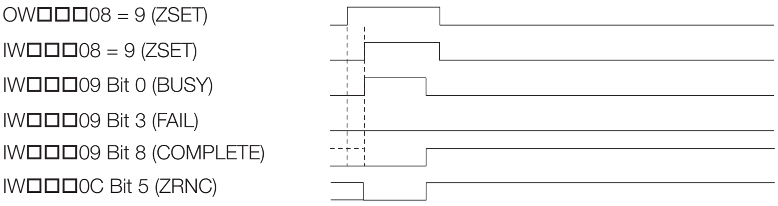
◆ Setting Parameters

Register Address	Name	Setting Details
OW□□□08	Motion Commands	The operation starts when this parameter is set to 9 (ZSET).
OW□□□09 Bit 0	Hold Command	This bit is ignored for the ZSET command.
OW□□□09 Bit 1	Cancel Command	This bit is ignored for the ZSET command.
OL□□□48	Zero Point Position Offset in Machine Coordinate System	Set the position offset from the origin in the machine coordinate system after the operation has been completed.

◆ Monitor Parameters

Register Address	Name	Monitored Contents
IL□□□02	Warnings	This parameter reports the current warning status.
IL□□□04	Alarms	This parameter reports the current alarm status.
IW□□□08	Motion Command Response Code	This parameter shows the motion command currently in execution. This parameter is 9 during execution of the ZSET command.
IW□□□09 Bit 0	Command Execution Flag	This bit is 1 (Processing) during execution of the ZSET command. The bit changes to 0 (Completed) when execution ends.
IW□□□09 Bit 1	Command Hold Completed	This bit is always 0 (Command hold not completed) for the ZSET command.
IW□□□09 Bit 3	Command Error End	This bit changes to 1 (Completed with an error) when an error occurs during execution of the ZSET command. The axis will decelerate to a stop if it is moving. This bit changes to 0 (Completed normally) when another command is executed.
IW□□□09 Bit 8	Command Execution Completed	This bit changes to 1 (Normal execution completed) when execution of the ZSET command ends.
IW□□□0C Bit 5	Zero Point Return/ Setting Completed	This bit changes to 1 (Zero point return/setting completed) when the operation is completed.

Timing Charts



4.2.9 ACC (Change Acceleration Time)

Set the OL□□□36 setting parameter (Linear Acceleration Rate/Acceleration Time Constant) to change the linear acceleration time constant. This command is not required when an SVC Function Module is used.

Information

- When this command is executed, bit 0 (Command Execution Flag) in the IW□□□09 monitor parameter will not change to 1 (Processing).
- The set value for the OL□□□36 setting parameter (Linear Acceleration Rate/Acceleration Time Constant) is issued to the Servo Selection or a slave SERVOPACK as soon as a travel motion command is executed.
- This command is not required when an SVC Function Module is used, but it can still be set. Setting this command will not cause an error. The parameter settings that you have used until now can still be used with an SVC Function Module, including the settings for this command.

Execution and Operating Procedures

1. **Make sure that all of the following conditions are met.**

No.	Execution Condition	Confirmation Method
1	There must be no alarms.	Both IL□□□02 and IL□□□04 must be 0.
2	Distribution has been completed.	Bit 0 in IW□□□0C must be 1.
3	Motion command execution for the target axis must be completed.*	IW□□□08 must be 0 and bit 0 in IW□□□09 must be 0.

* Before you change to this command during the execution of another command, you must check whether the command can be changed and how operation changes when the command is changed. Refer to the following section for details on changing from another command.

☞ *4.4 Changing the Command* on page 4-137

2. **Set the OW□□□08 setting parameter (Motion Commands) to 10 to execute the ACC motion command.**
   The IW□□□08 monitor parameter (Motion Command Response Code) is 10 during execution of this command.
   Bit 8 (Command Execution Completed) in the IW□□□09 monitor parameter changes to 1 (Normal execution completed) when IW□□□08 changes to 10.

3. **Set OW□□□08 to 0 to execute the NOP motion command.**

This concludes the process for changing the linear acceleration time constant.

Holding and Canceling Commands

Bit 0 (Hold Command) and bit 1 (Cancel Command) in the OW□□□09 setting parameter cannot be used to stop the axis.

Related Parameters

The parameters that are related to this command are listed in the following table.

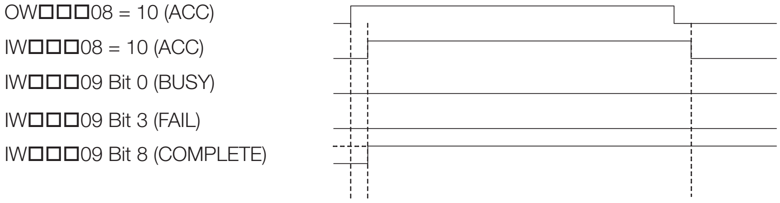
◆ Setting Parameters

Register Address	Name	Setting Details
OW□□□08	Motion Commands	Set this parameter to 10 (ACC) to change the linear acceleration time constant.
OW□□□09 Bit 0	Hold Command	This bit is ignored for the ACC command.
OW□□□09 Bit 1	Cancel Command	This bit is ignored for the ACC command.

◆ Monitor Parameters

Register Address	Name	Monitored Contents
IL□□□02	Warnings	This parameter reports the current warning status.
IL□□□04	Alarms	This parameter reports the current alarm status.
IW□□□08	Motion Command Response Code	This parameter shows the motion command currently in execution. This parameter is 10 during execution of the ACC command.
IW□□□09 Bit 0	Command Execution Flag	This bit is always 0 (Completed) for the ACC command.
IW□□□09 Bit 1	Command Hold Completed	This bit is always 0 (Command hold not completed) for the ACC command.
IW□□□09 Bit 3	Command Error End	This bit is always 0 (Completed normally) for the ACC command.
IW□□□09 Bit 8	Command Execution Completed	This bit changes to 1 (Normal execution completed) when execution of the ACC command ends.

Timing Charts



4.2.10 DCC (Change Deceleration Time)

Set the OL□□□38 setting parameter (Linear Deceleration Rate/Deceleration Time Constant) to change the linear deceleration time constant. This command is not required when an SVC Function Module is used.

Information
- When this command is executed, bit 0 (Command Execution Flag) in the IW□□□09 monitor parameter will not change to 1 (Processing).
- The set value for the OL□□□38 setting parameter (Linear Deceleration Rate/Deceleration Time Constant) is issued to the Servo Selection or a slave SERVOPACK as soon as a travel motion command is executed.
- This command is not required when an SVC Function Module is used, but it can still be set. Setting this command will not cause an error. The parameter settings that you have used until now can still be used with an SVC Function Module, including the settings for this command.

Execution and Operating Procedures

1. Make sure that all of the following conditions are met.

No.	Execution Condition	Confirmation Method
1	There must be no alarms.	Both IL□□□02 and IL□□□04 must be 0.
2	Distribution has been completed.	Bit 0 in IW□□□0C must be 1.
3	Motion command execution for the target axis must be completed.*	IW□□□08 must be 0 and bit 0 in IW□□□09 must be 0.

* Before you change to this command during the execution of another command, you must check whether the command can be changed and how operation changes when the command is changed. Refer to the following section for details on changing from another command.
☞ *4.4 Changing the Command* on page 4-137

2. Set the OW□□□08 setting parameter (Motion Commands) to 11 to execute the DCC motion command.

The IW□□□08 monitor parameter (Motion Command Response Code) is 11 during execution of this command.

Bit 8 (Command Execution Completed) in the IW□□□09 monitor parameter changes to 1 (Normal execution completed) when IW□□□08 changes to 11.

3. Set OW□□□08 to 0 to execute the NOP motion command.

This concludes the process for changing the linear deceleration time constant.

Holding and Canceling Commands

Bit 0 (Hold Command) and bit 1 (Cancel Command) in the OW□□□09 setting parameter cannot be used to stop the axis.

Related Parameters

The parameters that are related to this command are listed in the following table.

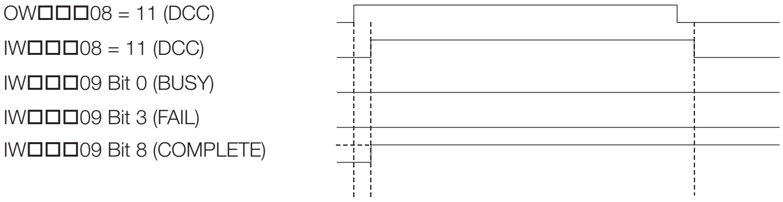
◆ Setting Parameters

Register Address	Name	Setting Details
OW□□□08	Motion Commands	Set this parameter to 11 (DCC) to change the linear deceleration time constant.
OW□□□09 Bit 0	Hold Command	This bit is ignored for the DCC command.
OW□□□09 Bit 1	Cancel Command	This bit is ignored for the DCC command.

◆ Monitor Parameters

Register Address	Name	Monitored Contents
IL□□□02	Warnings	This parameter reports the current warning status.
IL□□□04	Alarms	This parameter reports the current alarm status.
IW□□□08	Motion Command Response Code	This parameter shows the motion command currently in execution. This parameter is 11 during execution of the DCC command.
IW□□□09 Bit 0	Command Execution Flag	This bit is always 0 (Completed) for the DCC command.
IW□□□09 Bit 1	Command Hold Completed	This bit is always 0 (Command hold not completed) for the DCC command.
IW□□□09 Bit 3	Command Error End	This bit is always 0 (Completed normally) for the DCC command.
IW□□□09 Bit 8	Command Execution Completed	This bit changes to 1 (Normal execution completed) when execution of the DCC command ends.

Timing Charts



4.2.11 SCC (Change Filter Time Constant)

The SCC command transfers the set value of the OW□□□3A setting parameter (Filter Time Constant) to the Moving Average Time or Exponential Acceleration/Deceleration Time Constant SERVOPACK parameter and enables the setting.

> **Important**
>
> An SVC Function Module can automatically transfer setting parameters to SERVOPACK parameters when they are overwritten. The SCC command is not required if this function is used. Refer to the following section for details.
>
> ☞ *3.4 Motion Parameter Details – ◆ Function Selection Flags 1–■ Bit A: SERVOPACK Parameter Auto-Write* on page 3-29

Execution and Operating Procedures

1. Make sure that all of the following conditions are met.

No.	Execution Condition	Confirmation Method
1	There must be no alarms.	Both IL□□□02 and IL□□□04 must be 0.
2	Distribution has been completed.	Bit 0 in IW□□□0C must be 1.
3	Motion command execution for the target axis must be completed.*	IW□□□08 must be 0 and bit 0 in IW□□□09 must be 0.

* Before you change to this command during the execution of another command, you must check whether the command can be changed and how operation changes when the command is changed. Refer to the following section for details on changing from another command.

☞ *4.4 Changing the Command* on page 4-137

2. Set the OW□□□08 setting parameter (Motion Commands) to 12 to execute the SCC motion command.

The SERVOPACK parameter to which the value of OW□□□3A is transferred will depend on the filter type that has been set.

No filter or moving average filter: Moving Average Time
Exponential acceleration/deceleration filter: Exponential Acceleration/Deceleration Time Constant

The IW□□□08 monitor parameter (Motion Command Response Code) is 12 during execution of this command.

During command processing, bit 0 (Command Execution Flag) in the IW□□□09 monitor parameter will change to 1 (Processing). When processing is completed, this bit will change to 0 (Completed).

3. Set OW□□□08 to 0 to execute the NOP motion command.

This concludes the process for changing the filter time constant.

Holding and Canceling Commands

Bit 0 (Hold Command) and bit 1 (Cancel Command) in the OW□□□09 setting parameter cannot be used to stop the axis.

Related Parameters

The parameters that are related to this command are listed in the following table.

◆ Setting Parameters

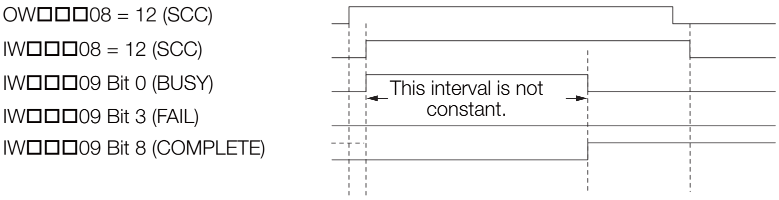
Register Address	Name	Setting Details
OW□□□03	Function Settings 1	Select the speed unit, acceleration/deceleration unit, and filter type.
OW□□□08	Motion Commands	Set this parameter to 12 (SCC) to change the filter time constant.
OW□□□09 Bit 0	Hold Command	This bit is ignored for the SCC command.
OW□□□09 Bit 1	Cancel Command	This bit is ignored for the SCC command.
OW□□□3A	Filter Time Constant	Set the acceleration/deceleration filter time constant.

◆ Monitor Parameters

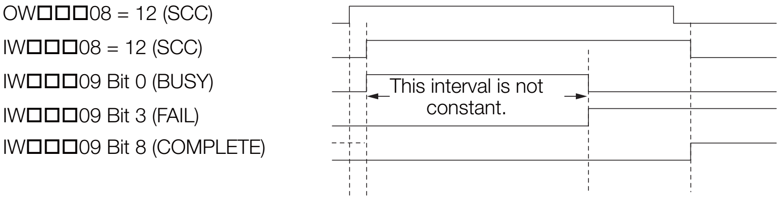
Register Address	Name	Monitored Contents
IL□□□02	Warnings	This parameter reports the current warning status.
IL□□□04	Alarms	This parameter reports the current alarm status.
IW□□□08	Motion Command Response Code	This parameter shows the motion command currently in execution. This parameter is 12 during execution of the SCC command.
IW□□□09 Bit 0	Command Execution Flag	This bit is 1 (Processing) during execution of the SCC command. The bit changes to 0 (Completed) when execution ends.
IW□□□09 Bit 1	Command Hold Completed	This bit is always 0 (Command hold not completed) for the SCC command.
IW□□□09 Bit 3	Command Error End	This bit changes to 1 (Completed with an error) when an error occurs during execution of the SCC command. The axis will decelerate to a stop if it is moving. This bit changes to 0 (Completed normally) when another command is executed.
IW□□□09 Bit 8	Command Execution Completed	This bit changes to 1 (Normal execution completed) when execution of the SCC command ends.

Timing Charts

◆ Normal Completion



◆ Error Completion



4.2.12 CHG_FILTER (Change Filter Type)

This command enables the set value of bits 8 to B (Filter Type Selection) in the OW□□□03 setting parameter.

Information When bit A (SERVOPACK Parameter Auto-Write) in fixed parameter No. 1 is 0 (Enabled), the filter type is changed when distribution is completed, even if this command is not executed.

Execution and Operating Procedures

1. **Make sure that all of the following conditions are met.**

No.	Execution Condition	Confirmation Method
1	There must be no alarms.	Both IL□□□02 and IL□□□04 must be 0.
2	Distribution has been completed.	Bit 0 in IW□□□0C must be 1.
3	Motion command execution for the target axis must be completed.*	IW□□□08 must be 0 and bit 0 in IW□□□09 must be 0.

* Before you change to this command during the execution of another command, you must check whether the command can be changed and how operation changes when the command is changed. Refer to the following section for details on changing from another command.
☞ *4.4 Changing the Command* on page 4-137

2. **Set the OW□□□08 setting parameter (Motion Commands) to 13 to execute the CHG_-FILTER motion command.**
The value of bits 8 to B in OW□□□03 is enabled.
The IW□□□08 monitor parameter changes to 13 during execution of the command.
During command processing, bit 0 (Command Execution Flag) in the IW□□□09 monitor parameter will change to 1 (Processing). When processing is completed, this bit will change to 0 (Completed).

3. **Set OW□□□08 to 0 to execute the NOP motion command.**

This concludes the process for changing the filter type.

Holding and Canceling Commands

Bit 0 (Hold Command) and bit 1 (Cancel Command) in the OW□□□09 setting parameter cannot be used to stop the axis.

Related Parameters

The parameters that are related to this command are listed in the following table.

◆ Setting Parameters

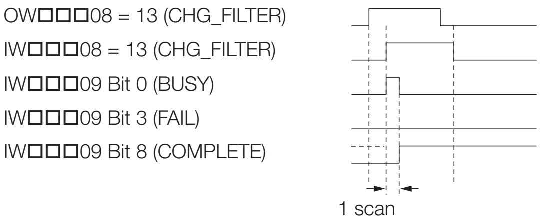
Register Address	Name	Setting Details
OW□□□03	Function Settings 1	Select the speed unit, acceleration/deceleration unit, and filter type.
OW□□□08	Motion Commands	Set this parameter to 13 (CHG_FILTER) to change the filter type.
OW□□□09 Bit 0	Hold Command	This bit is ignored for the CHG_FILTER command.
OW□□□09 Bit 1	Cancel Command	This bit is ignored for the CHG_FILTER command.

◆ Monitor Parameters

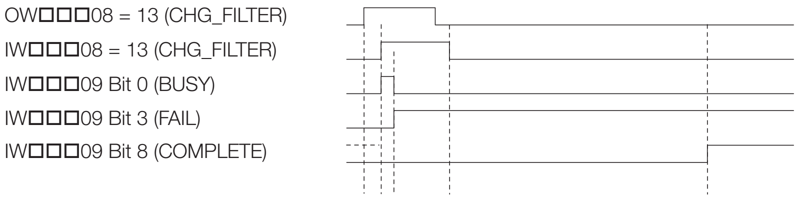
Register Address	Name	Monitored Contents
IL□□□02	Warnings	This parameter reports the current warning status.
IL□□□04	Alarms	This parameter reports the current alarm status.
IW□□□08	Motion Command Response Code	This parameter shows the motion command currently in execution. This parameter is 13 during execution of the CHG_FILTER command.
IW□□□09 Bit 0	Command Execution Flag	This bit is 1 (Processing) during execution of the CHG_FILTER command. The bit changes to 0 (Completed) when execution ends.
IW□□□09 Bit 1	Command Hold Completed	This bit is always 0 (Command hold not completed) for the CHG_FILTER command.
IW□□□09 Bit 3	Command Error End	This bit changes to 1 (Completed with an error) when an error occurs during execution of the CHG_FILTER command. The axis will decelerate to a stop if it is moving. This bit changes to 0 (Completed normally) when another command is executed.
IW□□□09 Bit 8	Command Execution Completed	This bit changes to 1 (Normal execution completed) when execution of the CHG_FILTER command ends.

Timing Charts

◆ Normal Completion



◆ Error Completion



4.2.13 KVS (Change Speed Loop Gain)

The KVS command transfers the set value of the OW□□□2F setting parameter (Speed Loop Gain) to the Speed Loop Gain SERVOPACK parameter and enables the setting.

Important

An SVC Function Module can automatically transfer setting parameters to SERVOPACK parameters when they are overwritten. The KVS command is not required if this function is used. Refer to the following section for details.

☞ *3.4 Motion Parameter Details – ◆ Function Selection Flags 1–■ Bit A: SERVOPACK Parameter Auto-Write* on page 3-29

Execution and Operating Procedures

1. Make sure that all of the following conditions are met.

No.	Execution Condition	Confirmation Method
1	There must be no alarms.	Both IL□□□02 and IL□□□04 must be 0.
2	Motion command execution for the target axis must be completed.*	IW□□□08 must be 0 and bit 0 in IW□□□09 must be 0.

* Before you change to this command during the execution of another command, you must check whether the command can be changed and how operation changes when the command is changed. Refer to the following section for details on changing from another command.

☞ *4.4 Changing the Command* on page 4-137

2. **Set the OW□□□08 setting parameter (Motion Commands) to 14 to execute the KVS motion command.**

The value of OW□□□2F is transferred to the Speed Loop Gain SERVOPACK parameter and is enabled.

The IW□□□08 monitor parameter (Motion Command Response Code) is 14 during execution of this command.

During command processing, bit 0 (Command Execution Flag) in the IW□□□09 monitor parameter will change to 1 (Processing). When processing is completed, this bit will change to 0 (Completed).

3. **Set OW□□□08 to 0 to execute the NOP motion command.**

This concludes the process for changing the speed loop gain.

Holding and Canceling Commands

Bit 0 (Hold Command) and bit 1 (Cancel Command) in the OW□□□09 setting parameter cannot be used to stop the axis.

Related Parameters

The parameters that are related to this command are listed in the following table.

◆ Setting Parameters

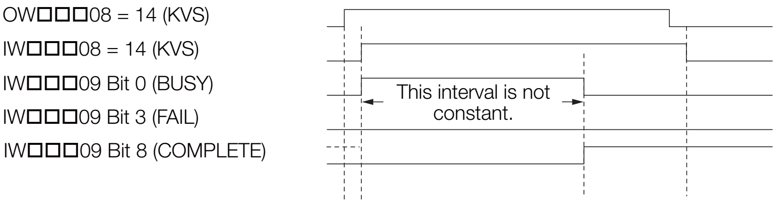
Register Address	Name	Setting Details
OW□□□08	Motion Commands	Set this parameter to 14 (KVS) to change the speed loop gain.
OW□□□09 Bit 0	Hold Command	This bit is ignored for the KVS command.
OW□□□09 Bit 1	Cancel Command	This bit is ignored for the KVS command.
OW□□□2F	Speed Loop Gain	Set the speed control loop gain for the SERVOPACK.

◆ Monitor Parameters

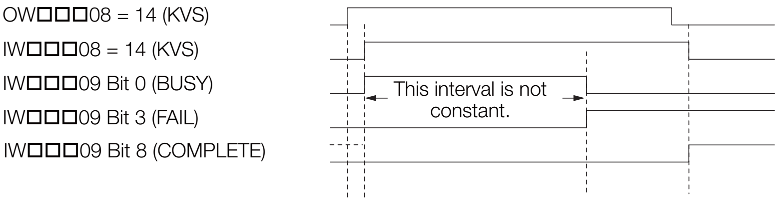
Register Address	Name	Monitored Contents
IL□□□02	Warnings	This parameter reports the current warning status.
IL□□□04	Alarms	This parameter reports the current alarm status.
IW□□□08	Motion Command Response Code	This parameter shows the motion command currently in execution. This parameter is 14 during execution of the KVS command.
IW□□□09 Bit 0	Command Execution Flag	This bit is 1 (Processing) during execution of the KVS command. The bit changes to 0 (Completed) when execution ends.
IW□□□09 Bit 1	Command Hold Completed	This bit is always 0 (Command hold not completed) for the KVS command.
IW□□□09 Bit 3	Command Error End	This bit changes to 1 (Completed with an error) when an error occurs during execution of the KVS command. The axis will decelerate to a stop if it is moving. This bit changes to 0 (Completed normally) when another command is executed.
IW□□□09 Bit 8	Command Execution Completed	This bit changes to 1 (Normal execution completed) when execution of the KVS command ends.

Timing Charts

◆ Normal Completion



◆ Error Completion



4.2.14 KPS (Change Position Loop Gain)

The KPS command transfers the set value of the OW□□□2E setting parameter (Position Loop Gain) to the Position Loop Gain SERVOPACK parameter and enables the setting.

Important

An SVC Function Module can automatically transfer setting parameters to SERVOPACK parameters when they are overwritten. The KPS command is not required if this function is used. Refer to the following section for details.

☞ *3.4 Motion Parameter Details – ◆ Function Selection Flags 1– ■ Bit A: SERVOPACK Parameter Auto-Write* on page 3-29

Execution and Operating Procedures

1. Make sure that all of the following conditions are met.

No.	Execution Condition	Confirmation Method
1	There must be no alarms.	Both IL□□□02 and IL□□□04 must be 0.
2	Motion command execution for the target axis must be completed.*	IW□□□08 must be 0 and bit 0 in IW□□□09 must be 0.

* Before you change to this command during the execution of another command, you must check whether the command can be changed and how operation changes when the command is changed. Refer to the following section for details on changing from another command.

☞ *4.4 Changing the Command* on page 4-137

2. Set the OW□□□08 setting parameter (Motion Commands) to 15 to execute the KPS motion command.

The value of OW□□□2E is transferred to the Position Loop Gain SERVOPACK parameter and is enabled.

The IW□□□08 monitor parameter (Motion Command Response Code) is 15 during execution of this command.

During command processing, bit 0 (Command Execution Flag) in the IW□□□09 monitor parameter will change to 1 (Processing). When processing is completed, this bit will change to 0 (Completed).

3. Set OW□□□08 to 0 to execute the NOP motion command.

This concludes the process for changing the position loop gain.

Holding and Canceling Commands

Bit 0 (Hold Command) and bit 1 (Cancel Command) in the OW□□□09 setting parameter cannot be used to stop the axis.

Related Parameters

The parameters that are related to this command are listed in the following table.

◆ Setting Parameters

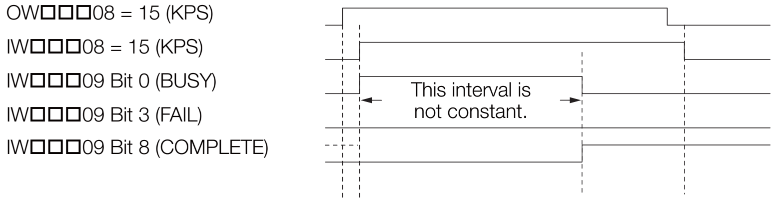
Register Address	Name	Setting Details
OW□□□08	Motion Commands	Set this parameter to 15 (KPS) to change the position loop gain.
OW□□□09 Bit 0	Hold Command	This bit is ignored for the KPS command.
OW□□□09 Bit 1	Cancel Command	This bit is ignored for the KPS command.
OW□□□2E	Position Loop Gain	Set the position control loop gain for the SERVOPACK.

◆ Monitor Parameters

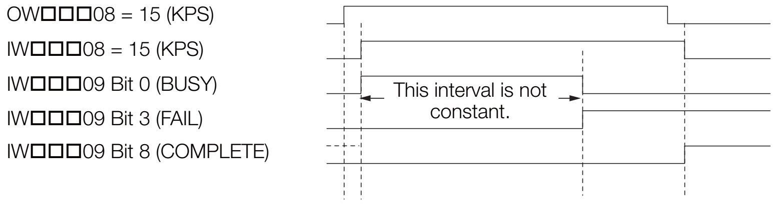
Register Address	Name	Monitored Contents
IL□□□02	Warnings	This parameter reports the current warning status.
IL□□□04	Alarms	This parameter reports the current alarm status.
IW□□□08	Motion Command Response Code	This parameter shows the motion command currently in execution. This parameter is 15 during execution of the KPS command.
IW□□□09 Bit 0	Command Execution Flag	This bit is 1 (Processing) during execution of the KPS command. The bit changes to 0 (Completed) when execution ends.
IW□□□09 Bit 1	Command Hold Completed	This bit is always 0 (Command hold not completed) for the KPS command.
IW□□□09 Bit 3	Command Error End	This bit changes to 1 (Completed with an error) when an error occurs during execution of the KPS command. The axis will decelerate to a stop if it is moving. This bit changes to 0 (Completed normally) when another command is executed.
IW□□□09 Bit 8	Command Execution Completed	This bit changes to 1 (Normal execution completed) when execution of the KPS command ends.

Timing Charts

◆ Normal Completion



◆ Error Completion



4.2.15 KFS (Change Feedforward)

The KFS command transfers the set value of the OW□□□30 setting parameter (Speed Feedforward Compensation) to the Feedforward SERVOPACK parameter and enables the setting.

> Important
>
> An SVC Function Module can automatically transfer setting parameters to SERVOPACK parameters when they are overwritten. The KFS command is not required if this function is used. Refer to the following section for details.
>
> ☞ *3.4 Motion Parameter Details – ◆ Function Selection Flags 1–■ Bit A: SERVOPACK Parameter Auto-Write* on page 3-29

Execution and Operating Procedures

1. Make sure that all of the following conditions are met.

No.	Execution Condition	Confirmation Method
1	There must be no alarms.	Both IL□□□02 and IL□□□04 must be 0.
2	Motion command execution for the target axis must be completed.*	IW□□□08 must be 0 and bit 0 in IW□□□09 must be 0.

* Before you change to this command during the execution of another command, you must check whether the command can be changed and how operation changes when the command is changed. Refer to the following section for details on changing from another command.
☞ *4.4 Changing the Command* on page 4-137

2. **Set the OW□□□08 setting parameter (Motion Commands) to 16 to execute the KFS motion command.**
The value of OW□□□30 is transferred to the Feedforward SERVOPACK parameter and is enabled.
The IW□□□08 monitor parameter (Motion Command Response Code) is 16 during execution of this command.
During command processing, bit 0 (Command Execution Flag) in the IW□□□09 monitor parameter will change to 1 (Processing). When processing is completed, this bit will change to 0 (Completed).

3. **Set OW□□□08 to 0 to execute the NOP motion command.**

This concludes the process for changing the feedforward compensation.

Holding and Canceling Commands

Bit 0 (Hold Command) and bit 1 (Cancel Command) in the OW□□□09 setting parameter cannot be used to stop the axis.

Related Parameters

The parameters that are related to this command are listed in the following table.

◆ Setting Parameters

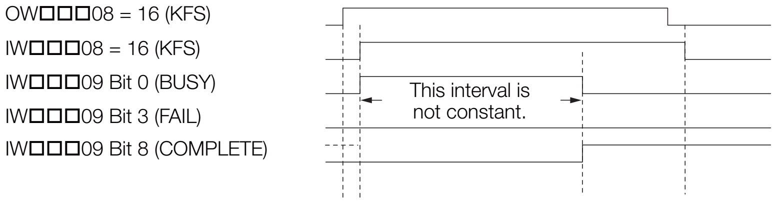
Register Address	Name	Setting Details
OW□□□08	Motion Commands	Set this parameter to 16 (KFS) to change the feedforward compensation.
OW□□□09 Bit 0	Hold Command	This bit is ignored for the KFS command.
OW□□□09 Bit 1	Cancel Command	This bit is ignored for the KFS command.
OW□□□30	Speed Feedforward Compensation	Set the feedforward amount for the SERVOPACK as a percentage.

◆ Monitor Parameters

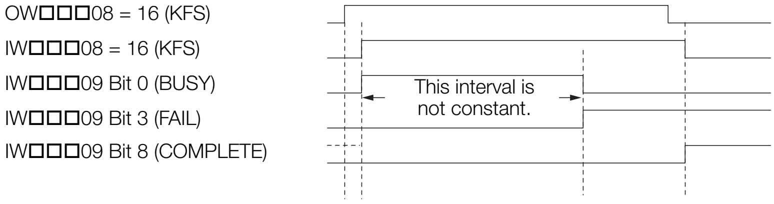
Register Address	Name	Monitored Contents
IL□□□02	Warnings	This parameter reports the current warning status.
IL□□□04	Alarms	This parameter reports the current alarm status.
IW□□□08	Motion Command Response Code	This parameter shows the motion command currently in execution. This parameter is 16 during execution of the KFS command.
IW□□□09 Bit 0	Command Execution Flag	This bit is 1 (Processing) during execution of the KFS command. The bit changes to 0 (Completed) when execution ends.
IW□□□09 Bit 1	Command Hold Completed	This bit is always 0 (Command hold not completed) for the KFS command.
IW□□□09 Bit 3	Command Error End	This bit changes to 1 (Completed with an error) when an error occurs during execution of the KFS command. The axis will decelerate to a stop if it is moving. This bit changes to 0 (Completed normally) when another command is executed.
IW□□□09 Bit 8	Command Execution Completed	This bit changes to 1 (Normal execution completed) when execution of the KFS command ends.

Timing Charts

◆ Normal Completion



◆ Error Completion



4.2.16 PRM_RD (Read SERVOPACK Parameter)

The PRM_RD command reads the set value of the SERVOPACK parameter that corresponds to the specified parameter number and parameter size. The read value is then stored in the IW□□□36 (SERVOPACK Parameter Number) and IL□□□38 (SERVOPACK Parameter Read Data) monitor parameters.

Two types of SERVOPACK parameters can be read with this command: vendor-specific parameters, which are vendor-specific specifications for the particular Servo product used, and Servo common parameters, which are defined in the MECHATROLINK-III communications specifications. Set bit 8 (SERVOPACK Parameter Access Selection) in the OW□□□09 setting parameter to select which type of SERVOPACK parameter to read.

Execution and Operating Procedures

1. Make sure that all of the following conditions are met.

No.	Execution Condition	Confirmation Method
1	There must be no alarms.	Both IL□□□02 and IL□□□04 must be 0.
2	Motion command execution for the target axis must be completed.*	IW□□□08 must be 0 and bit 0 in IW□□□09 must be 0.

* Before you change to this command during the execution of another command, you must check whether the command can be changed and how operation changes when the command is changed. Refer to the following section for details on changing from another command.
☞ *4.4 Changing the Command* on page 4-137

2. Set the following setting parameters.
- OW□□□09, Bit 8 (SERVOPACK Parameter Access Selection)
- OW□□□50 (SERVOPACK Parameter Number)
- OW□□□51 (SERVOPACK Parameter Size)

3. Set the OW□□□08 setting parameter (Motion Commands) to 17 to execute the PRM_RD motion command.
The set value of the target parameter is stored in the IW□□□36 and IL□□□38 monitor parameters.
The IW□□□08 monitor parameter (Motion Command Response Code) is 17 during execution of this command.
During command processing, bit 0 (Command Execution Flag) in the IW□□□09 monitor parameter will change to 1 (Processing). When processing is completed, this bit will change to 0 (Completed).

4. Set OW□□□08 to 0 to execute the NOP motion command.

This concludes the process for reading SERVOPACK parameters.

Holding and Canceling Commands

Bit 0 (Hold Command) and bit 1 (Cancel Command) in the OW□□□09 setting parameter cannot be used to stop the axis.

Related Parameters

The parameters that are related to this command are listed in the following table.

◆ Setting Parameters

Register Address	Name	Setting Details
OW□□□08	Motion Commands	Set this parameter to 17 (PRM_RD) to read a SERVOPACK parameter.
OW□□□09 Bit 0	Hold Command	This bit is ignored for the PRM_RD command.
OW□□□09 Bit 1	Cancel Command	This bit is ignored for the PRM_RD command.

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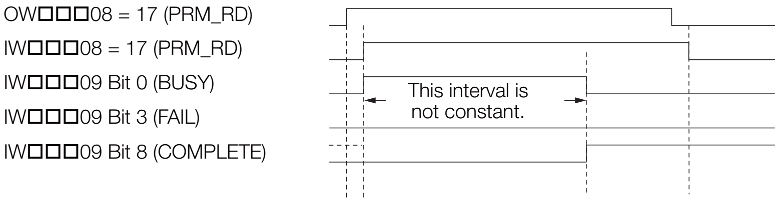
Register Address	Name	Setting Details
OW□□□09 Bit 8	SERVOPACK Parameter Access Selection	Use this bit to select the parameter to read. 0: Vendor-specific parameters 1: Common parameters
OW□□□50	SERVOPACK Parameter Number	Set the number of the SERVOPACK parameter to read.
OW□□□51	SERVOPACK Parameter Size	Set the size of the SERVOPACK parameter to read. Set the size in words. Example: For 4 bytes, set this parameter to 2.

◆ Monitor Parameters

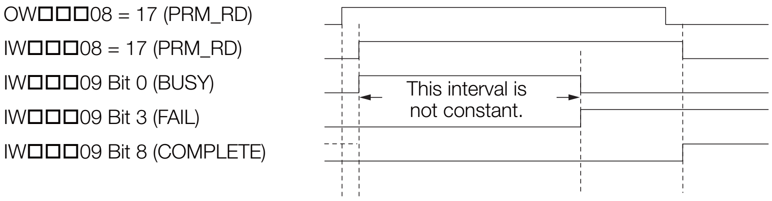
Register Address	Name	Monitored Contents
IL□□□02	Warnings	This parameter reports the current warning status.
IL□□□04	Alarms	This parameter reports the current alarm status.
IW□□□08	Motion Command Response Code	This parameter shows the motion command currently in execution. This parameter is 17 during execution of the PRM_RD command.
IW□□□09 Bit 0	Command Execution Flag	This bit is 1 (Processing) during execution of the PRM_RD command. The bit changes to 0 (Completed) when execution ends.
IW□□□09 Bit 1	Command Hold Completed	This bit is always 0 (Command hold not completed) for the PRM_RD command.
IW□□□09 Bit 3	Command Error End	This bit changes to 1 (Completed with an error) when an error occurs during execution of the PRM_RD command. The axis will decelerate to a stop if it is moving. This bit changes to 0 (Completed normally) when another command is executed.
IW□□□09 Bit 8	Command Execution Completed	This bit changes to 1 (Normal execution completed) when execution of the PRM_RD command ends.
IW□□□36	SERVOPACK Parameter Number	This parameter stores the number of the SERVOPACK parameter that was read.
IL□□□38	SERVOPACK Parameter Read Data	This parameter stores the data of the SERVOPACK parameter that was read.

Timing Charts

◆ Normal Completion



◆ Error Completion



4.2.17 PRM_WR (Write SERVOPACK Parameter)

The PRM_WR command overwrites the setting of a SERVOPACK parameter using the specified parameter number, parameter size, and set value data.

Two types of SERVOPACK parameters can be written with this command: vendor-specific parameters, which are vendor-specific specifications for the particular Servo product used, and Servo common parameters, which are defined in the MECHATROLINK-III communications specifications. Set bit 8 (SERVOPACK Parameter Access Selection) in the OW□□□09 setting parameter to select which type of SERVOPACK parameter to write.

Execution and Operating Procedures

1. **Make sure that all of the following conditions are met.**

No.	Execution Condition	Confirmation Method
1	There must be no alarms.	Both IL□□□02 and IL□□□04 must be 0.
2	Motion command execution for the target axis must be completed.*	IW□□□08 must be 0 and bit 0 in IW□□□09 must be 0.

* Before you change to this command during the execution of another command, you must check whether the command can be changed and how operation changes when the command is changed. Refer to the following section for details on changing from another command.
☞ *4.4 Changing the Command* on page 4-137

2. **Set the following setting parameters.**
   - OW□□□09, Bit 8 (SERVOPACK Parameter Access Selection)
   - OW□□□50 (SERVOPACK Parameter Number)
   - OW□□□51 (SERVOPACK Parameter Size)
   - OL□□□52 (SERVOPACK Parameter Set Value)

3. **Set the OW□□□08 setting parameter (Motion Commands) to 18 to execute the PRM_WR motion command.**
   The SERVOPACK parameter is overwritten.
   The IW□□□08 monitor parameter (Motion Command Response Code) is 18 during execution of this command.
   During command processing, bit 0 (Command Execution Flag) in the IW□□□09 monitor parameter will change to 1 (Processing). When processing is completed, this bit will change to 0 (Completed).

4. **Set OW□□□08 to 0 to execute the NOP motion command.**

This concludes the process for writing SERVOPACK parameters.

Holding and Canceling Commands

Bit 0 (Hold Command) and bit 1 (Cancel Command) in the OW□□□09 setting parameter cannot be used to stop the axis.

Related Parameters

The parameters that are related to this command are listed in the following table.

◆ Setting Parameters

Register Address	Name	Setting Details
OW□□□08	Motion Commands	Set this parameter to 18 (PRM_WR) to write a SERVOPACK parameter.
OW□□□09 Bit 0	Hold Command	This bit is ignored for the PRM_WR command.
OW□□□09 Bit 1	Cancel Command	This bit is ignored for the PRM_WR command.

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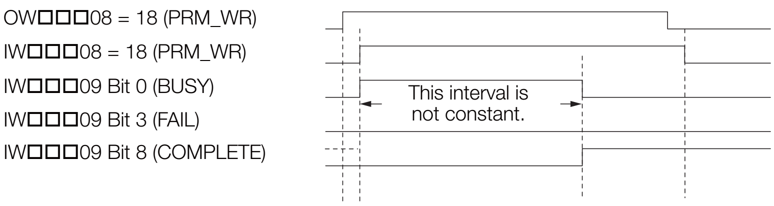
Register Address	Name	Setting Details
OW□□□09 Bit 8	SERVOPACK Parameter Access Selection	Use this bit to select the parameter to write. 0: Vendor-specific parameters 1: Common parameters
OW□□□50	SERVOPACK Parameter Number	Set the number of the SERVOPACK parameter to write.
OW□□□51	SERVOPACK Parameter Size	Set the size of the SERVOPACK parameter to write. Set the size in words. Example: For 4 bytes, set this parameter to 2.
OL□□□52	SERVOPACK Parameter Set Value	Set the set value data to write to the target SERVOPACK parameter.

◆ Monitor Parameters

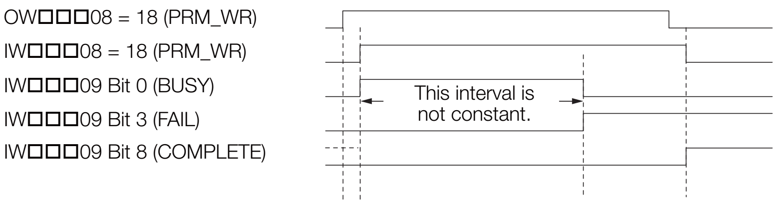
Register Address	Name	Monitored Contents
IL□□□02	Warnings	This parameter reports the current warning status.
IL□□□04	Alarms	This parameter reports the current alarm status.
IW□□□08	Motion Command Response Code	This parameter shows the motion command currently in execution. This parameter is 18 during execution of the PRM_WR command.
IW□□□09 Bit 0	Command Execution Flag	This bit is 1 (Processing) during execution of the PRM_WR command. The bit changes to 0 (Completed) when execution ends.
IW□□□09 Bit 1	Command Hold Completed	This bit is always 0 (Command hold not completed) for the PRM_WR command.
IW□□□09 Bit 3	Command Error End	This bit changes to 1 (Completed with an error) when an error occurs during execution of the PRM_WR command. The axis will decelerate to a stop if it is moving. This bit changes to 0 (Completed normally) when another command is executed.
IW□□□09 Bit 8	Command Execution Completed	This bit changes to 1 (Normal execution completed) when execution of the PRM_WR command ends.

Timing Charts

◆ Normal Completion



◆ Error Completion



4.2.18 ALM_MON (Monitor Alarms)

The ALM_MON command reads the alarm or warning that is current in the SERVOPACK and stores it in the IW☐☐☐2D monitor parameter (SERVOPACK Alarm Code). You can use this command to check all alarms that have occurred, even if multiple alarms occurred at the same time.

Execution and Operating Procedures

1. **Make sure that the following condition is met.**

No.	Execution Condition	Confirmation Method
1	Motion command execution for the target axis must be completed.*	IW☐☐☐08 must be 0 and bit 0 in IW☐☐☐09 must be 0.

* Before you change to this command during the execution of another command, you must check whether the command can be changed and how operation changes when the command is changed. Refer to the following section for details on changing from another command.
☞ *4.4 Changing the Command* on page 4-137

2. **Set the OW☐☐☐4F setting parameter (SERVOPACK Alarm Monitor Number).**

3. **Set the OW☐☐☐08 setting parameter (Motion Commands) to 19 to execute the ALM_MON motion command.**
The alarm or warning that is current in the SERVOPACK is read, and is then stored in IW☐☐☐2D.
The IW☐☐☐08 monitor parameter (Motion Command Response Code) is 19 during execution of this command.
During command processing, bit 0 (Command Execution Flag) in the IW☐☐☐09 monitor parameter will change to 1 (Processing). When processing is completed, this bit will change to 0 (Completed).

4. **Set OW☐☐☐08 to 0 to execute the NOP motion command.**

This concludes the alarm monitor operation.

Holding and Canceling Commands

Bit 0 (Hold Command) and bit 1 (Cancel Command) in the OW☐☐☐09 setting parameter cannot be used to stop the axis.

Related Parameters

The parameters that are related to this command are listed in the following table.

◆ Setting Parameters

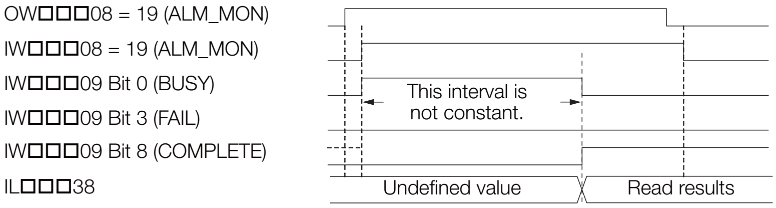
Register Address	Name	Setting Details
OW☐☐☐08	Motion Commands	Set this parameter to 19 (ALM_MON) to execute the alarm monitor.
OW☐☐☐09 Bit 0	Hold Command	This bit is ignored for the ALM_MON command.
OW☐☐☐09 Bit 1	Cancel Command	This bit is ignored for the ALM_MON command.
OW☐☐☐4F	SERVOPACK Alarm Monitor Number	Set the number of the alarm to monitor.

◆ Monitor Parameters

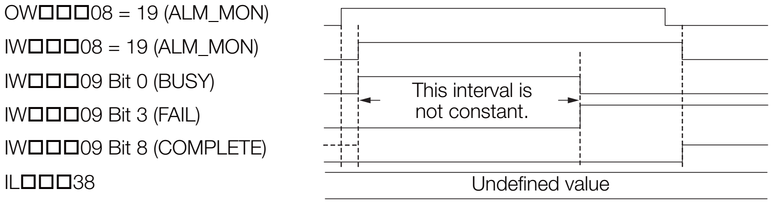
Register Address	Name	Monitored Contents
IL□□□02	Warnings	This parameter reports the current warning status.
IL□□□04	Alarms	This parameter reports the current alarm status.
IW□□□08	Motion Command Response Code	This parameter shows the motion command currently in execution. This parameter is 19 during execution of the ALM_MON command.
IW□□□09 Bit 0	Command Execution Flag	This bit changes to 1 (Processing) during execution of the ALM_MON command. The bit changes to 0 (Completed) when execution ends.
IW□□□09 Bit 1	Command Hold Completed	This bit is always 0 (Command hold not completed) for the ALM_MON command.
IW□□□09 Bit 3	Command Error End	This bit changes to 1 (Completed with an error) when an error occurs during execution of the ALM_MON command. The axis will decelerate to a stop if it is moving. This bit changes to 0 (Completed normally) when another command is executed.
IW□□□09 Bit 8	Command Execution Completed	This bit changes to 1 (Normal execution completed) when execution of the ALM_MON command ends.
IW□□□2D	SERVOPACK Alarm Code	This parameter stores the SERVOPACK alarm or warning code that was read.

Timing Charts

◆ Normal Completion



◆ Error Completion



4.2.19 ALM_HIST (Monitor Alarm History)

The ALM_HIST command reads the alarm history stored in the SERVOPACK and stores it in the IW☐☐☐2D monitor parameter (SERVOPACK Alarm Code).

Execution and Operating Procedures

1. **Make sure that the following condition is met.**

No.	Execution Condition	Confirmation Method
1	Motion command execution for the target axis must be completed.*	IW☐☐☐08 must be 0 and bit 0 in IW☐☐☐09 must be 0.

* Before you change to this command during the execution of another command, you must check whether the command can be changed and how operation changes when the command is changed. Refer to the following section for details on changing from another command.
☞ *4.4 Changing the Command* on page 4-137

2. **Set the OW☐☐☐4F setting parameter (SERVOPACK Alarm Monitor Number).**

3. **Set the OW☐☐☐08 setting parameter (Motion Commands) to 20 to execute the ALM_HIST motion command.**
The alarm history that is stored in the SERVOPACK is read and stored in IW☐☐☐2D.
The IW☐☐☐08 monitor parameter (Motion Command Response Code) is 20 during execution of this command.
During command processing, bit 0 (Command Execution Flag) in the IW☐☐☐09 monitor parameter will change to 1 (Processing). When processing is completed, this bit will change to 0 (Completed).

4. **Set OW☐☐☐08 to 0 to execute the NOP motion command.**

This concludes the alarm history monitor operation.

Holding and Canceling Commands

Bit 0 (Hold Command) and bit 1 (Cancel Command) in the OW☐☐☐09 setting parameter cannot be used to stop the axis.

Related Parameters

The parameters that are related to this command are listed in the following table.

◆ Setting Parameters

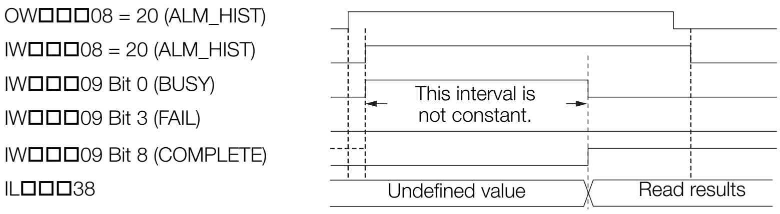
Register Address	Name	Setting Details
OW☐☐☐08	Motion Commands	Set this parameter to 20 (ALM_HIST) to execute the alarm history monitor operation.
OW☐☐☐09 Bit 0	Hold Command	This bit is ignored for the ALM_HIST command.
OW☐☐☐09 Bit 1	Cancel Command	This bit is ignored for the ALM_HIST command.
OW☐☐☐4F	SERVOPACK Alarm Monitor Number	Set the number of the alarm to monitor.

◆ Monitor Parameters

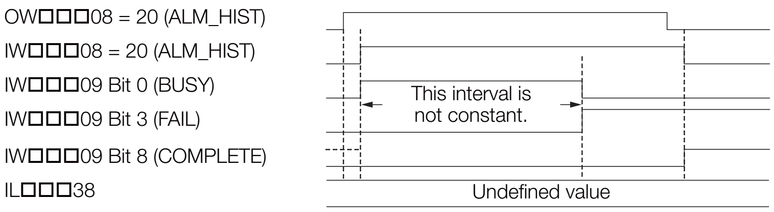
Register Address	Name	Monitored Contents
IL□□□02	Warnings	This parameter reports the current warning status.
IL□□□04	Alarms	This parameter reports the current alarm status.
IW□□□08	Motion Command Response Code	This parameter shows the motion command currently in execution. This parameter is 20 during execution of the ALM_HIST command.
IW□□□09 Bit 0	Command Execution Flag	This bit changes to 1 (Processing) during execution of the ALM_HIST command. The bit changes to 0 (Completed) when execution ends.
IW□□□09 Bit 1	Command Hold Completed	This bit is always 0 (Command hold not completed) for the ALM_HIST command.
IW□□□09 Bit 3	Command Error End	This bit changes to 1 (Completed with an error) when an error occurs during execution of the ALM_HIST command. The axis will decelerate to a stop if it is moving. This bit changes to 0 (Completed normally) when another command is executed.
IW□□□09 Bit 8	Command Execution Completed	This bit changes to 1 (Normal execution completed) when operation of the ALM_HIST command ends.
IW□□□2D	SERVOPACK Alarm Code	This parameter stores the SERVOPACK alarm code that was read.

Timing Charts

◆ Normal Completion



◆ Error Completion



4.2.20 ALMHIST_CLR (Clear Alarm History)

When the ALMHIST_CLR command is executed, the alarm history data that is stored in the SERVOPACK is cleared.

Execution and Operating Procedures

1. **Make sure that the following condition is met.**

No.	Execution Condition	Confirmation Method
1	Motion command execution for the target axis must be completed.*	IW□□□08 must be 0 and bit 0 in IW□□□09 must be 0.

* Before you change to this command during the execution of another command, you must check whether the command can be changed and how operation changes when the command is changed. Refer to the following section for details on changing from another command.

☞ *4.4 Changing the Command* on page 4-137

2. **Set the OW□□□08 setting parameter (Motion Commands) to 21 to execute the ALMHIST_CLR motion command.**

The alarm history data that is stored in the SERVOPACK is cleared.

The IW□□□08 monitor parameter (Motion Command Response Code) is 21 during execution of this command.

During command processing, bit 0 (Command Execution Flag) in the IW□□□09 monitor parameter will change to 1 (Processing). When processing is completed, this bit will change to 0 (Completed).

3. **Set OW□□□08 to 0 to execute the NOP motion command.**

This concludes the clear alarm history operation.

Holding and Canceling Commands

Bit 0 (Hold Command) and bit 1 (Cancel Command) in the OW□□□09 setting parameter cannot be used to stop the axis.

Related Parameters

The parameters that are related to this command are listed in the following table.

◆ Setting Parameters

Register Address	Name	Setting Details
OW□□□08	Motion Commands	Set this parameter to 21 (ALMHIST_CLR) to clear the alarm history.
OW□□□09 Bit 0	Hold Command	This bit is ignored for the ALMHIST_CLR command.
OW□□□09 Bit 1	Cancel Command	This bit is ignored for the ALMHIST_CLR command.

◆ Monitor Parameters

Register Address	Name	Monitored Contents
IL□□□02	Warnings	This parameter reports the current warning status.
IL□□□04	Alarms	This parameter reports the current alarm status.
IW□□□08	Motion Command Response Code	This parameter shows the motion command currently in execution. This parameter is 21 during execution of the ALMHIST_CLR command.
IW□□□09 Bit 0	Command Execution Flag	This bit changes to 1 (Processing) during execution of the ALMHIST_CLR command. The bit changes to 0 (Completed) when execution ends.
IW□□□09 Bit 1	Command Hold Completed	This bit is always 0 (Command hold not completed) for the ALMHIST_CLR command.

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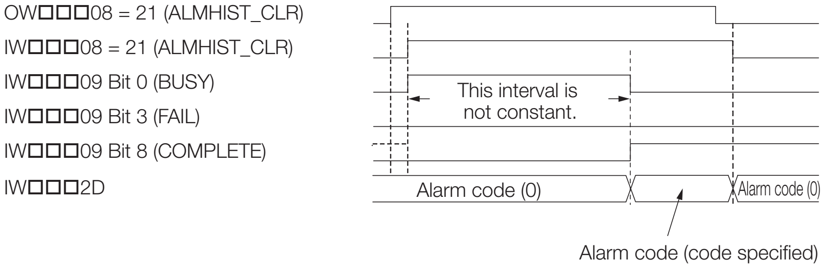
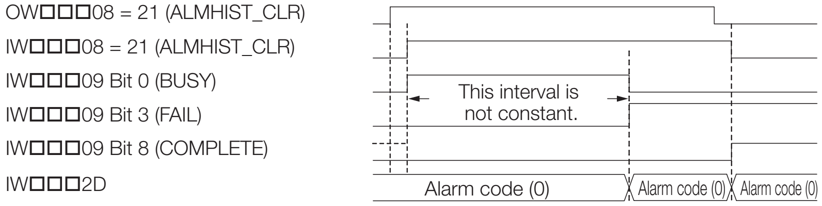
Register Address	Name	Monitored Contents
IW□□□09 Bit 3	Command Error End	This bit changes to 1 (Completed with an error) when an error occurs during execution of the ALMHIST_CLR command. The axis will decelerate to a stop if it is moving. This bit changes to 0 (Completed normally) when another command is executed.
IW□□□09 Bit 8	Command Execution Completed	This bit changes to 1 (Normal execution completed) when execution of the ALMHIST_CLR command ends.

Timing Charts

◆ Normal Completion



◆ Error Completion



4.2.21 ABS_RST (Reset Absolute Encoder)

You can reset the absolute encoder by executing the ABS_RST command.

The absolute encoder must be reset in the following cases:

- When the machine is initially started
- When an A.810 alarm (Encoder Backup Alarm) occurs
- When an A.820 alarm (Encoder Checksum Alarm) occurs

The ABS_RST command is enabled for an axis that uses an absolute encoder.

> Important
>
> The ABS_RST command is valid for SERVOPACKs with absolute encoders. The command will end in an error if the ABS_RST command is executed when an incremental encoder is used (even if it is used as an absolute encoder) or if a servo amplifier from another company is used.

Refer to the following section for the procedure to reset an absolute encoder for a MECHATROLINK-III slave axis without using this command.

☞ *5.2.3 Resetting the Absolute Encoder* on page 5-20

Execution and Operating Procedures

1. **Make sure that all of the following conditions are met.**

No.	Execution Condition	Confirmation Method
1	Synchronous communications must be established with the SERVOPACK.*	Bit 0 in IW□□□00 must be 1.
2	The servo must be OFF.	Bit 1 in IW□□□00 must be 0.
3	Motion command execution must be completed.	IW□□□08 must be 0 and bit 0 in IW□□□09 must be 0.

* If an A.810 alarm (Encoder Backup Alarm) or an A.820 alarm (Encoder Checksum Alarm) occurs, communications cannot be synchronized by simply turning ON the power supplies to the MP3000. To synchronize communications, set bit F in the OW□□□00 setting parameter (Run Command Settings) to 1 (ON).

2. **Set the OW□□□08 setting parameter (Motion Commands) to 22 to execute the ABS_RST motion command.**

   If an alarm occurs, the alarm will be reset and the multiturn data of the absolute encoder will be reset to 0.

   During command processing, IW□□□08 changes to 22 during command execution, and bit 0 (Command Execution Flag) in IW□□□09 changes to 1 (Processing). When processing is completed, bit 0 in IW□□□09 changes to 0 (Completed), bit 3 (Command Error End (FAIL)) in IW□□□09 changes to 0 (Completed normally), bit 0 in IW□□□00 changes to 0 (Operation not ready), and bit 7 (Absolute Encoder Reset Completed) in IW□□□09 changes to 1 (Reset completed).

3. **Set OW□□□08 (Motion Commands) to 0 to execute the NOP motion command.**

4. **Turn the power supply to the SERVOPACK OFF and ON again**

This concludes the procedure to reset the absolute encoder.

Holding and Canceling Commands

Bit 0 (Hold Command) and bit 1 (Cancel Command) in the OW□□□09 setting parameter cannot be used to stop the axis. If a communications error occurs during command execution, command processing will be canceled and the command will end in an error.

Related Parameters

The parameters that are related to this command are listed in the following table.

◆ Setting Parameters

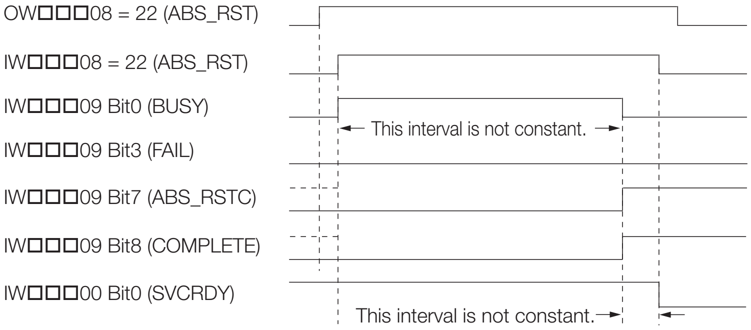
Register Address	Name	Setting Details
OW□□□00 Bit 0	Servo ON	Use this bit to turn the power to the Servomotor ON or OFF. Set this parameter to 0 before setting OW□□□08 to 22 (ABS_RST). 0: Servo OFF, 1: Servo ON
OW□□□08	Motion Command	When OW□□□08 is set to 22 (ABS_RST), the process to reset the absolute encoder starts. Even if it is set to 0 during processing, this setting will be ignored and the operation will continue.
OW□□□09 Bit 0	Hold Command	This bit is ignored for the ABS_RST command.
OW□□□09 Bit 1	Cancel Command	This bit is ignored for the ABS_RST command.

◆ Monitor Parameters

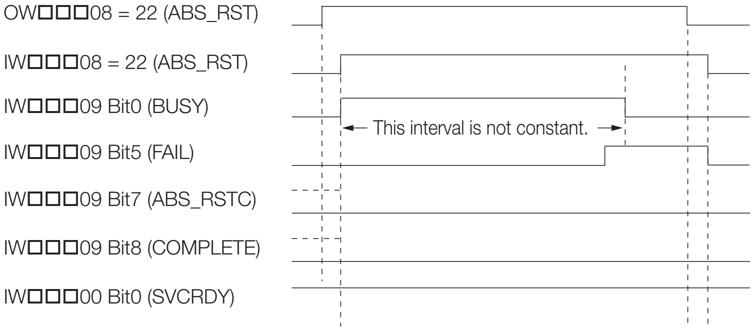
Register Address	Name	Monitored Contents
IW□□□00 Bit 0	Motion Operation Ready	This bit shows whether or not communications are synchronized between the MP3000 and the slave SERVOPACK. For the ABS_RST command, this bit is 1 (Motion operation ready) if communications are synchronized between the MP3000 and the slave SERVOPACK. This bit is 0 (Motion operation not ready) if communications are disconnected.
IW□□□00 Bit 1	Running with Servo ON	This bit shows the servo status for the axis. 0: Stopped, 1: Running with servo ON
IL□□□02	Warning	This parameter reports the current warning status.
IL□□□04	Alarm	This parameter reports the current alarm status.
IW□□□08	Motion Command Response Code	This parameter shows the motion command currently in execution. This parameter is 22 during execution of the ABS_RST command.
IW□□□09 Bit 0	Command Execution Flag	This bit is 1 (Processing) during execution of the ABS_RST command. The bit changes to 0 (Completed) when command execution ends.
IW□□□09 Bit 1	Command Hold Completed	This bit is always 0 (Command hold not completed) for the ABS_RST command.
IW□□□09 Bit 3	Command Error End	This bit changes to 1 (Completed with an error) when an error occurs during execution of the ABS_RST command. Command execution processing is canceled.
IW□□□09 Bit 7	Absolute Encoder Reset Completed	This bit changes to 1 (Reset completed) when absolute encoder reset is completed.
IW□□□09 Bit 8	Command Execution Completed	This bit changes to 1 (Normal execution completed) when execution of the ABS_RST command ends.

Timing Charts

◆ Normal Completion



◆ Error Completion



4.2.22 VELO (Issue Speed Reference)

Execute the VELO command to operate in Speed Control Mode.

This enables the same operation as when the SERVOPACK analog speed reference input is used.

Important

1. Position information and feedback speed are not updated when the SVR Function Module is used.
2. Torque feedforward compensation can be used with the VELO command. The torque feedforward compensation is set in the OL□□□0C setting parameter (Torque/Force Reference Setting or Torque Feedforward Compensation). If torque feedforward compensation is not necessary, set OL□□□0C to 0.
3. The torque can be limited with the OL□□□14 setting parameter (Torque/Force Limit). OL□□□14 can be changed at any time. The intended operation may not be achieved if the set value is too small.

Execution and Operating Procedures

1. Make sure that all of the following conditions are met.

No.	Execution Condition	Confirmation Method
1	There must be no alarms.	Both IL□□□02 and IL□□□04 must be 0.
2	Motion command execution for the target axis must be completed.*	IW□□□08 must be 0 and bit 0 in IW□□□09 must be 0.

* Before you change to this command during the execution of another command, you must check whether the command can be changed and how operation changes when the command is changed. Refer to the following section for details on changing from another command.

☞ *4.4 Changing the Command* on page 4-137

2. Set the following setting parameters.

- OW□□□01, Bit 3 (Speed Loop P/PI Switch)
- OW□□□03, Bits 8 to B (Filter Type Selection)
- OL□□□0C (Torque/Force Reference Setting or Torque Feedforward Compensation)
- OL□□□10 (Speed Reference Setting)
- OW□□□12 (Speed Limit)
- OL□□□14 (Torque/Force Limit)

Information

- OL□□□10 can be changed during operation.
- An override of between 0% and 327.67% can be set for OL□□□10.

3. Set the OW□□□08 setting parameter (Motion Commands) to 23 to execute the VELO motion command.

The control mode is changed to speed control for the SERVOPACK.

The IW□□□08 monitor parameter (Motion Command Response Code) is 23 during execution of this command.

Information

- Commands can be executed even when the Servomotor's power is OFF (Servo OFF).
- Position management with position feedback is enabled when operation is performed in Speed Control Mode.

4. Set OW□□□08 to any code other than 23.

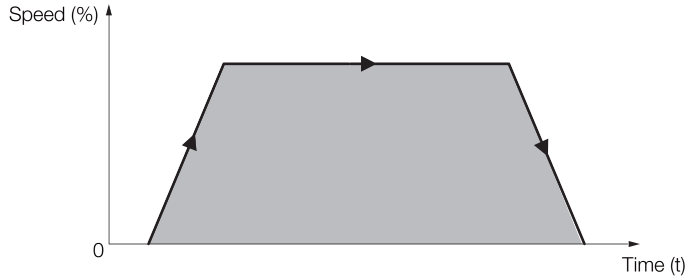
Speed Control Mode is turned OFF.

This concludes the issue speed reference operation.

Operating Patterns

The following figure shows the operating pattern when the VELO command is executed.

VELO Operating Pattern



Holding

- To hold an axis in place during motion and resume operation at a later time, set bit 0 (Hold Command) in the OW☐☐☐09 setting parameter to 1 (Hold Command ON).
  When bit 0 in OW☐☐☐09 is set to 1, the axis will decelerate to a stop.
  The deceleration operation depends on the setting of bits 8 to F (Stop Mode Selection) in the OW☐☐☐02 setting parameter.
  When the axis completely decelerates to a stop, bit 1 (Command Hold Completed) in the IW☐☐☐09 monitor parameter will change to 1 (Completed).
- To release the hold, set bit 0 (Hold Command) in OW☐☐☐09 to 0 (Hold Command OFF).
  This clears the command hold status and the remaining portion of the positioning operation is restarted.

Canceling

- To cancel Speed Control Mode, set bit 1 (Cancel Command) in the OW☐☐☐09 setting parameter to 1 (Cancel Command ON).
  When bit 1 in OW☐☐☐09 is set to 1, the axis will decelerate to a stop.
  The deceleration operation depends on the setting of bits 8 to F (Stop Mode Selection) in the OW☐☐☐02 setting parameter.
  When the axis completely decelerates to a stop, the remaining motion will be canceled and bit 1 (Positioning Completed) in the IW☐☐☐0C monitor parameter will change to 1 (Within positioning completed range).
- Speed Control Mode resumes if bit 1 (Cancel Command) in the OW☐☐☐09 setting parameter is set to 0 (Cancel Command OFF) during processing of the cancel operation.
- The same operation as the Cancel Command operation will be performed if the motion command code is changed during operation in Speed Control Mode.

Important

Due to the delay that occurs when sending or receiving commands and responses between the CPU and the Motion Control Function Module, the cancel processing may have been completed (IW☐☐☐08 is 23 and bit 8 in IW☐☐☐09 is 1), even though an attempt was made to restart the operation. Set OW☐☐☐08 to any command other than VELO (e.g., NOP), and then start the operation again.
If an operation is to be frequently canceled and restarted within a short interval, remember to consider this delay.

Related Parameters

The parameters that are related to this command are listed in the following table.

◆ Setting Parameters

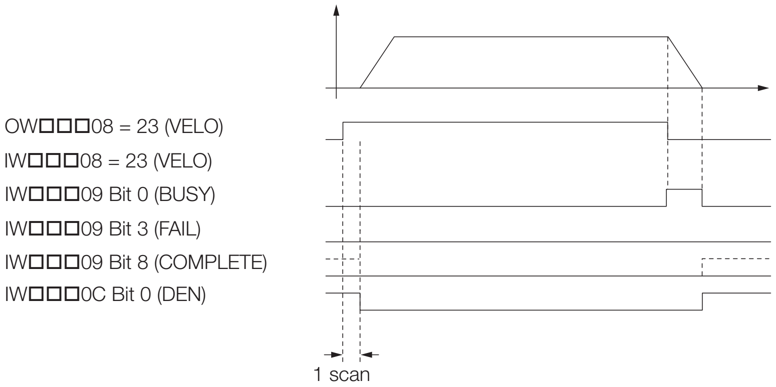
Register Address	Name	Setting Details
OW☐☐☐00 Bit 0	Servo ON	Use this bit to turn the power to the Servomotor ON or OFF. After the mode is changed to Speed Control Mode, set this bit to 1 to start operation. 0: Servo OFF, 1: Servo ON
OW☐☐☐01 Bit 3	Speed Loop P/PI Switch	Use this bit to change the speed control loop between PI control and P control. 0: PI control, 1: P control
OW☐☐☐02 Bit 8 to F	Stop Mode Selection	Select the stop method to use when a command is canceled. 0: Stop according to the Linear Deceleration Rate/Deceleration Time Constant parameter 1: Stop immediately
OW☐☐☐03	Function Settings 1	Select the speed unit, acceleration/deceleration unit, and filter type.
OW☐☐☐08	Motion Commands	Set this parameter to 23 (VELO) to change operation to Speed Control Mode.
OW☐☐☐09 Bit 0	Hold Command	When this bit is set to 1 (ON) during an issue speed reference operation, the axis will decelerate to a stop. Operation is resumed when this bit is set to 0 (OFF) when the axis is being held.
OW☐☐☐09 Bit 1	Cancel Command	When this bit is set to 1 (ON) during operation, the axis will decelerate to a stop.
OL☐☐☐0C	Torque/Force Reference Setting or Torque Feedforward Compensation	Set the torque feedforward amount during speed control.
OL☐☐☐10	Speed Reference Setting	Set the speed. This parameter can be changed during operation. The unit depends on the set value of bits 0 to 3 in OW☐☐☐03.
OW☐☐☐12	Speed Limit	Set the upper speed limit as a percentage of the rated motor speed (rotary motor) or rated speed (linear motor). This value is an absolute value. It is used in both the forward and reverse directions.
OL☐☐☐14	Torque/Force Limit	Set the torque limit for the speed reference. The same value is used in both the forward and reverse directions.
OW☐☐☐18	Override	This parameter allows the speed to be changed without changing the value of OL☐☐☐10. Set the value as a percentage of the Speed Reference Setting. This parameter can be changed during operation. Setting range: 0 to 32,767 (0% to 327.67%) Setting unit: 1 = 0.01% Example: Setting for 50% = 5,000
OL☐☐☐36	Linear Acceleration Rate/Acceleration Time Constant	Set the acceleration rate or acceleration time.
OL☐☐☐38	Linear Deceleration Rate/Deceleration Time Constant	Set the deceleration rate or deceleration time.
OW☐☐☐3A	Filter Time Constant	Set the acceleration/deceleration filter time constant. Exponential acceleration/deceleration or a moving average filter can be selected in bits 8 to B in OW☐☐☐03. This setting can be changed only when distribution has been completed (i.e., when bit 0 in IW☐☐☐0C is 1).

◆ Monitor Parameters

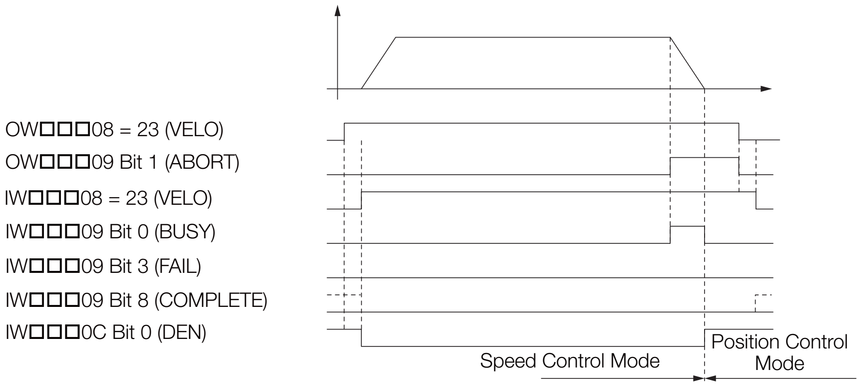
Register Address	Name	Monitored Contents
IW□□□00 Bit 1	Running with Servo ON	This bit shows the Servo status for the axis. 0: Stopped, 1: Running with Servo ON
IL□□□02	Warnings	This parameter reports the current warning status.
IL□□□04	Alarms	This parameter reports the current alarm status.
IW□□□08	Motion Command Response Code	This parameter shows the motion command currently in execution. This parameter is 23 during execution of the VELO command.
IW□□□09 Bit 0	Command Execution Flag	This bit changes to 1 (Processing) when cancel processing is being performed for the VELO command. This bit changes to 0 (Completed) when cancel processing has been completed.
IW□□□09 Bit 1	Command Hold Completed	This bit is always 0 (Command hold not completed) for the VELO command.
IW□□□09 Bit 3	Command Error End	This bit changes to 1 (Completed with an error) when an error occurs during execution of the VELO command. The axis will decelerate to a stop if it is in operation. This bit changes to 0 (Completed normally) when another command is executed.
IW□□□09 Bit 8	Command Execution Completed	This bit is always 0 (Normal execution not completed) for the VELO command.
IW□□□0C Bit 0	Distribution Completed	This bit changes to 1 (Distribution completed) when the distribution for the travel motion command is completed. This bit is 0 (Distributing pulses) when the execution of a travel motion command is in progress.
IW□□□0C Bit 1	Positioning Completed	This bit is 1 (Within positioning completed range) when distribution is completed and the current position is within the positioning completed range. This bit is 0 (Outside positioning completed range) in all other cases.
IW□□□0C Bit 3	Near Position	The operation of this bit depends on the set value of OL□□□20. If OL□□□20 is 0, this bit is 1 (Within near position range) when distribution is completed (i.e., when DEN is 1), and it is 0 (Outside near position range) when distribution is not completed. When OL□□□20 is not 0, this bit is 1 when within the range of the following formula, regardless of the state of distribution, and 0 in all other cases. |(IL□□□12) – (IL□□□16)| ≤ OL□□□20 IL□□□12: Machine Coordinate System Reference Position IL□□□16: Machine Coordinate System Feedback Position OL□□□20: NEAR Signal Output Width

Timing Charts

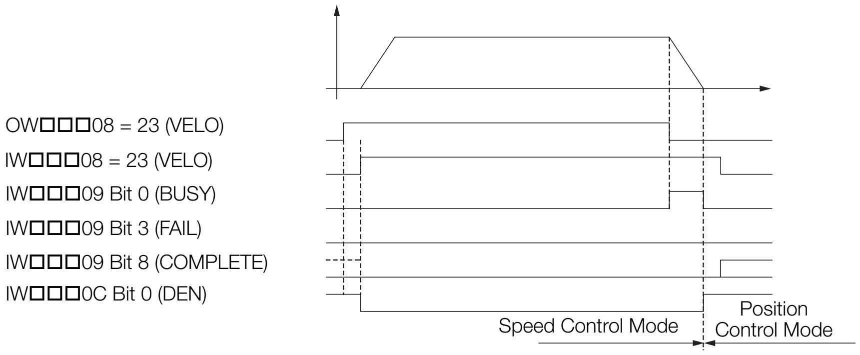
◆ Normal Execution



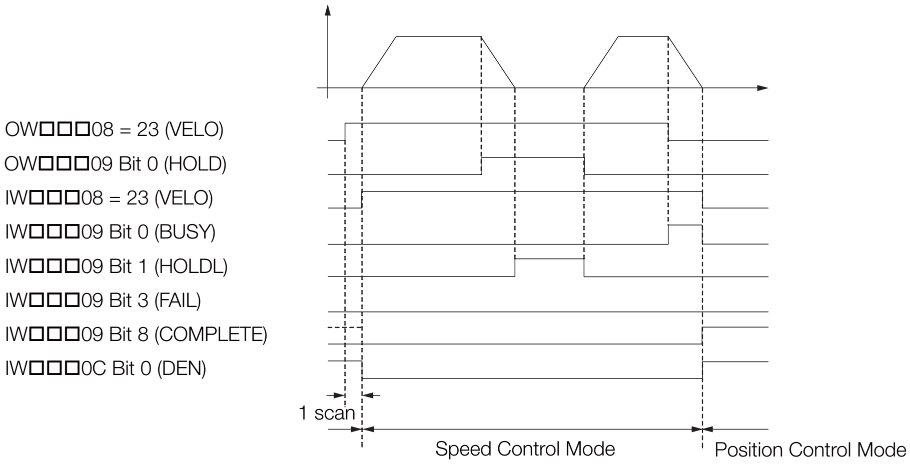
◆ Execution When Canceled



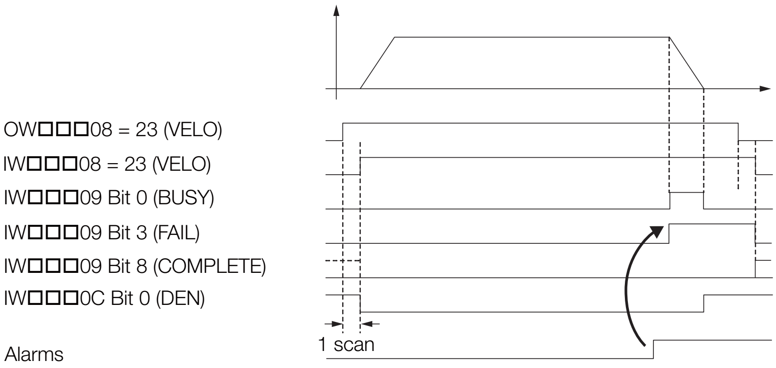
◆ Execution When Command Is Changed



◆ Execution When Holding



◆ Execution When an Alarm Occurs



4.2.23 TRQ (Issue Torque/Force Reference)

Execute the TRQ command to operate in Torque/Force Control Mode.

This enables the same operation as when the SERVOPACK analog torque reference input is used.

Information Position information and speed feedback values are not updated when the SVR Function Module is used.

Execution and Operating Procedures

1. **Make sure that all of the following conditions are met.**

No.	Execution Condition	Confirmation Method
1	There must be no alarms.	Both IL☐☐☐02 and IL☐☐☐04 must be 0.
2	Motion command execution for the target axis must be completed.*	IW☐☐☐08 must be 0 and bit 0 in IW☐☐☐09 must be 0.

* Before you change to this command during the execution of another command, you must check whether the command can be changed and how operation changes when the command is changed. Refer to the following section for details on changing from another command.
☞ *4.4 Changing the Command* on page 4-137

2. **Set the following setting parameters.**
- OW☐☐☐03, Bits C to F (Torque Unit Selection)
- OL☐☐☐0C (Torque/Force Reference Setting or Torque Feedforward Compensation)
- OW☐☐☐0E (Speed Limit)

Information OL☐☐☐0C can be changed during operation.

3. **Set the OW☐☐☐08 setting parameter (Motion Commands) to 24 to execute the TRQ motion command.**
The control mode is changed to torque control for the SERVOPACK.
The IW☐☐☐08 monitor parameter (Motion Command Response Code) is 24 during execution of this command.

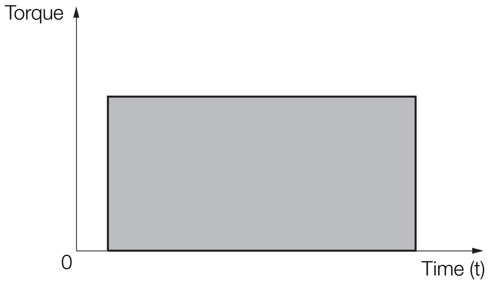
Information
- Commands can be executed even when the Servomotor's power is OFF (Servo OFF).
- Position management with position feedback is enabled when operating in Torque Control Mode.

4. **Set OW☐☐☐08 to any code other than 24.**
Torque Control Mode is turned OFF.

This concludes the torque control operation.

Operating Patterns

The following figure shows the operating pattern when the TRQ command is executed.



Holding

- To hold an axis in place during motion and resume operation at a later time, set bit 0 (Hold Command) in the OW□□□09 setting parameter to 1 (Hold Command ON).
  When bit 0 in OW□□□09 is set to 1, the axis will decelerate to a stop.
  The deceleration operation depends on the setting of bits 8 to F (Stop Mode Selection) in the OW□□□02 setting parameter.
  When the axis completely decelerates to a stop, bit 1 (Command Hold Completed) in the IW□□□09 monitor parameter will change to 1 (Completed).
- To release the hold, set bit 0 (Hold Command) in OW□□□09 to 0 (Hold Command OFF).
  This clears the command hold status and the remaining portion of the positioning operation is restarted.

Canceling

- Set bit 1 (Cancel Command) in the OW□□□09 setting parameter to 1 (Cancel Command ON).
  When bit 1 in OW□□□09 is set to 1, the axis will decelerate to a stop.
  The deceleration operation depends on the setting of bits 8 to F (Stop Mode Selection) in the OW□□□02 setting parameter.
  When the axis completely decelerates to a stop, the remaining motion will be canceled and bit 1 (Positioning Completed) in the IW□□□0C monitor parameter will change to 1 (Within positioning completed range).
- Torque Control Mode resumes if bit 1 (Cancel Command) in the OW□□□09 setting parameter is set to 0 (Cancel Command OFF) during processing of the cancel operation.
- The same operation as the Cancel Command operation will be performed if the motion command code is changed during operation in Torque Control Mode.

Important

The OL□□□0C (Torque/Force Reference Setting or Torque Feedforward Compensation) is used as the torque feedforward reference value when any of the following motion commands are executed.

- INTERPOLATE
- LATCH
- VELO
- PHASE

If any of the above motion commands are used in combination with other motion commands, set the Torque/Force Reference Setting to 0 when the command cancel processing is completed so that the Torque/Force Reference Setting will not cause any unintended effects.

Related Parameters

The parameters that are related to this command are listed in the following table.

◆ Setting Parameters

Register Address	Name	Setting Details
OW□□□00 Bit 0	Servo ON	Use this bit to turn the power to the Servomotor ON or OFF. After the mode is changed to Torque Control Mode, set this bit to 1 to start operation. 0: Servo OFF, 1: Servo ON
OW□□□02 Bit 8 to F	Stop Mode Selection	Select the stop method to use when torque control is canceled. 0: Stop according to the Linear Deceleration Rate/Deceleration Time Constant parameter 1: Stop immediately
OW□□□03	Function Settings 1	Select the torque unit.
OW□□□08	Motion Commands	Set this parameter to 24 (TRQ) to change operation to Torque/Force Control Mode.

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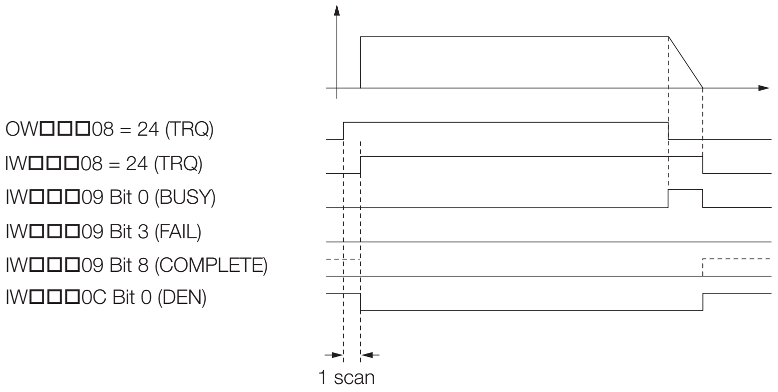
Register Address	Name	Setting Details
OW□□□09 Bit 0	Hold Command	When this bit is set to 1 (ON) during an issue torque reference operation, the axis stops. Operation is resumed when this bit is set to 0 (OFF) when the axis is being held.
OW□□□09 Bit 1	Cancel Command	When this bit is set to 1 (ON) during operation, the axis will decelerate to a stop.
OL□□□0C	Torque/Force Reference Setting or Torque Feedforward Compensation	Set the value of the torque reference. This parameter can be changed during operation. The unit depends on the set value of bits C to F in OW□□□03.
OW□□□0E	Speed Limit for Torque/ Force Reference	Set the speed limit for torque references. Set this value as a percentage of the rated speed.
OL□□□38	Linear Deceleration Rate/Deceleration Time Constant	Specify the deceleration rate when torque control is canceled as the deceleration time.
OW□□□3A	Filter Time Constant	Set the acceleration/deceleration filter time constant. Exponential acceleration/deceleration or a moving average filter can be selected in bits 8 to B in OW□□□03. This setting can be changed only when distribution has been completed (i.e., when bit 0 in IW□□□0C is 1).

◆ Monitor Parameters

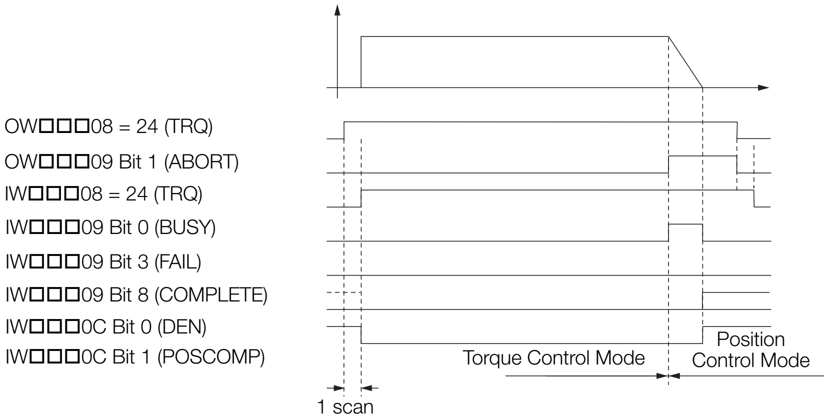
Register Address	Name	Monitored Contents
IW□□□00 Bit 1	Running with Servo ON	This bit shows the Servo status for the axis. 0: Stopped, 1: Running with Servo ON
IL□□□02	Warnings	This parameter reports the current warning status.
IL□□□04	Alarms	This parameter reports the current alarm status.
IW□□□08	Motion Command Response Code	This parameter shows the motion command currently in execution. This parameter is 24 during execution of the TRQ command.
IW□□□09 Bit 0	Command Execution Flag	This bit changes to 1 (Processing) when cancel processing is being performed for the TRQ command. This bit changes to 0 (Completed) when cancel processing has been completed.
IW□□□09 Bit 1	Command Hold Completed	This bit is always 0 (Command hold not completed) for the TRQ command.
IW□□□09 Bit 3	Command Error End	This bit changes to 1 (Completed with an error) when an error occurs during execution of the TRQ command. The axis will decelerate to a stop if it is in operation. This bit changes to 0 (Completed normally) when another command is executed.
IW□□□09 Bit 8	Command Execution Completed	This bit is always 0 (Normal execution not completed) for the TRQ command.
IW□□□0C Bit 0	Distribution Completed	This bit changes to 1 (Distribution completed) when the distribution for the travel motion command is completed. This bit is 0 (Distributing pulses) when the execution of a travel motion command is in progress.
IW□□□0C Bit 1	Positioning Completed	This bit is 1 (Within positioning completed range) when distribution is completed and the current position is within the positioning completed range. This bit is 0 (Outside positioning completed range) in all other cases.
IW□□□0C Bit 3	Near Position	The operation of this bit depends on the set value of OL□□□20. If OL□□□20 is 0, this bit is 1 (Within near position range) when distribution is completed (i.e., when DEN is 1), and it is 0 (Outside near position range) when distribution is not completed. When OL□□□20 is not 0, this bit is 1 when within the range of the following formula, regardless of the state of distribution, and 0 in all other cases. |(IL□□□12) – (IL□□□16)| ≤ OL□□□20 IL□□□12: Machine Coordinate System Reference Position IL□□□16: Machine Coordinate System Feedback Position OL□□□20: NEAR Signal Output Width

Timing Charts

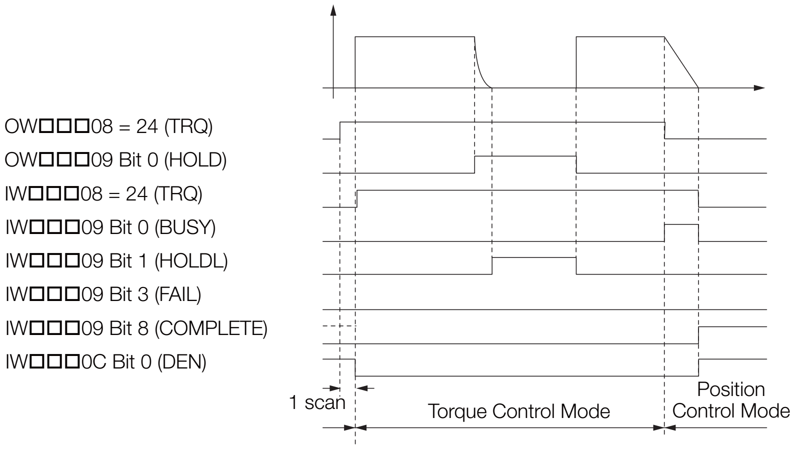
◆ Normal Execution



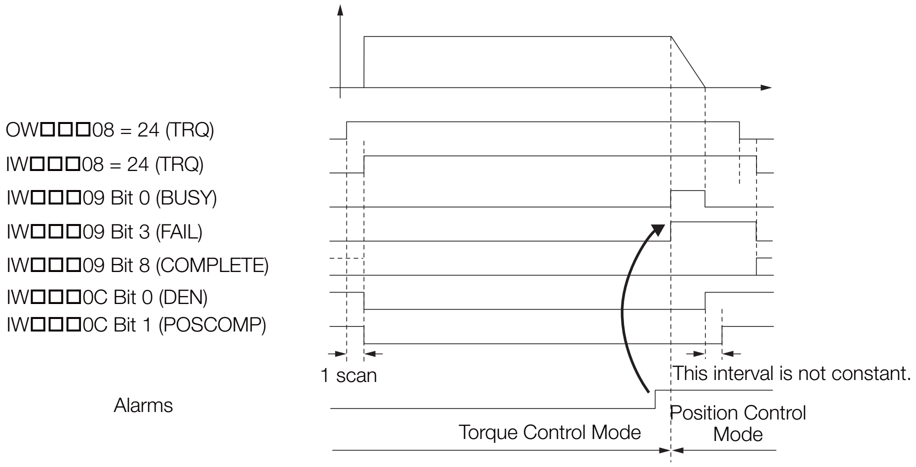
◆ Execution When Canceled



◆ Execution When Holding



◆ Execution When an Alarm Occurs



4.2.24 PHASE (Issue Phase Reference)

The PHASE command is used for the synchronized operation of multiple axes in Phase Control Mode, using the specified speed, phase bias, and speed compensation.

Important

1. Torque feedforward compensation can be used with the PHASE command. The torque feedforward compensation is set in the OL□□□0C setting parameter (Torque/Force Reference Setting or Torque Feedforward Compensation). If torque feedforward compensation is not necessary, set OL□□□0C to 0.
2. The torque can be limited with the OL□□□14 setting parameter (Torque/Force Limit). OL□□□14 can be changed at any time. The intended operation may not be achieved if the set value is too small.

Execution and Operating Procedures

1. Make sure that all of the following conditions are met.

No.	Execution Condition	Confirmation Method
1	There must be no alarms.	Both IL□□□02 and IL□□□04 must be 0.
2	The Servomotor's power must be ON.	Bit 1 in IW□□□00 must be 1.
3	Motion command execution for the target axis must be completed.*	IW□□□08 must be 0 and bit 0 in IW□□□09 must be 0.

* Before you change to this command during the execution of another command, you must check whether the command can be changed and how operation changes when the command is changed. Refer to the following section for details on changing from another command.

☞ *4.4 Changing the Command* on page 4-137

2. Set the following setting parameters.

- OW□□□01, Bit 3 (Speed Loop P/PI Switch)
- OW□□□03, Bits 8 to B (Filter Type Selection)
- OL□□□0C (Torque/Force Reference Setting or Torque Feedforward Compensation)
- OL□□□10 (Speed Reference Setting)
- OW□□□12 (Speed Limit)
- OL□□□14 (Torque/Force Limit)
- OL□□□28 (Phase Compensation Setting)
- OW□□□31 (Speed Compensation)

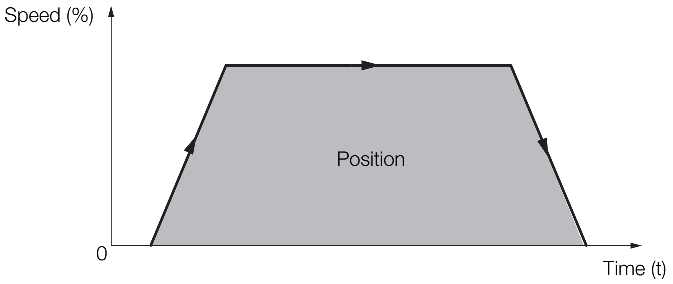
3. Set the OW□□□08 setting parameter (Motion Commands) to 25 to execute the PHASE motion command.
Synchronized operation through phase control is started.
The IW□□□08 monitor parameter (Motion Command Response Code) is 25 during execution of this command.

4. Set OW□□□08 to any code other than 25.
Phase control is turned OFF.

This concludes the phase control operation.

Operating Patterns

The following figure shows the operating pattern when the PHASE command is executed.



Holding and Canceling Commands

Bit 0 (Hold Command) and bit 1 (Cancel Command) in the OW□□□09 setting parameter cannot be used to stop the axis.

Related Parameters

The parameters that are related to this command are listed in the following table.

◆ Setting Parameters

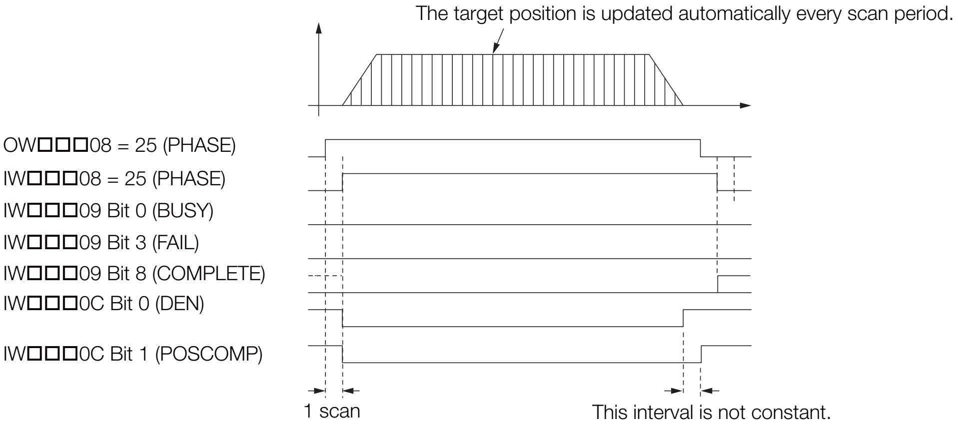
Register Address	Name	Setting Details
OW□□□00 Bit 0	Servo ON	Use this bit to turn the power to the Servomotor ON or OFF. Set this parameter to 1 before setting OW□□□08 to 25 (PHASE). 0: OFF, 1: ON
OW□□□02 Bit 8 to F	Stop Mode Selection	Select the stop method to use when a command is canceled. 0: Stop according to the Linear Deceleration Rate/Deceleration Time Constant parameter 1: Stop immediately
OW□□□03	Function Settings 1	Select the speed unit, acceleration/deceleration unit, and filter type.
OW□□□05 Bit 1	Disable Phase Reference Calculation	Use this bit to enable or disable phase reference calculations when the PHASE command is executed. This setting determines if processing is optimized for electronic shafts or electronic cams. **Setting Precautions** • Phase reference calculation must be enabled when an electronic shaft application is used. • If you use an electronic cam applications, disable it.
OW□□□08	Motion Commands	Phase control operation is started when this parameter is set to 25 (PHASE).
OW□□□09 Bit 6	Electronic Cam Phase Compensation Type	If a system with an electronic cam is used, set this parameter to select the method for setting the phase compensation for the reference value of the cam pattern. 0: Incremental value addition method, 1: Absolute value specification method
OL□□□0C	Torque/Force Reference Setting or Torque Feedforward Compensation	Set the torque feedforward amount during the issue phase reference operation.
OL□□□10	Speed Reference Setting	Set the speed reference. This parameter can be changed during operation. The unit depends on the set value of bits 0 to 3 in OW□□□03.
OW□□□12	Speed Limit	Set the upper speed limit as a percentage of the rated motor speed (rotary motor) or rated speed (linear motor). This value is an absolute value. It is used in both the forward and reverse directions.
OL□□□14	Torque/Force Limit	Set the torque limit for the issue phase reference operation.
OL□□□16	Second Speed Compensation	Set the speed feedforward amount during execution of the PHASE command. The setting unit for the OW□□□31 setting parameter is always 0.01%. However, the unit for this parameter can be selected. When this parameter is used at the same time as OW□□□31, speed compensation is performed twice.
OL□□□28	Phase Compensation Setting	Set the phase bias in reference units. **Setting Precautions** • When an electronic shaft application is used, set the control bias. • When an electronic cam application is used, this parameter specifies the target position for the cam pattern.
OW□□□31	Speed Compensation	Set the speed feedforward amount as a percentage of the rated speed. The setting unit for this parameter is always 0.01%.
OW□□□3A	Filter Time Constant	Set the acceleration/deceleration filter time constant. Exponential acceleration/deceleration or a moving average filter can be selected in bits 8 to B in OW□□□03. This setting can be changed only when distribution has been completed (i.e., when bit 0 in IW□□□0C is 1).

◆ Monitor Parameters

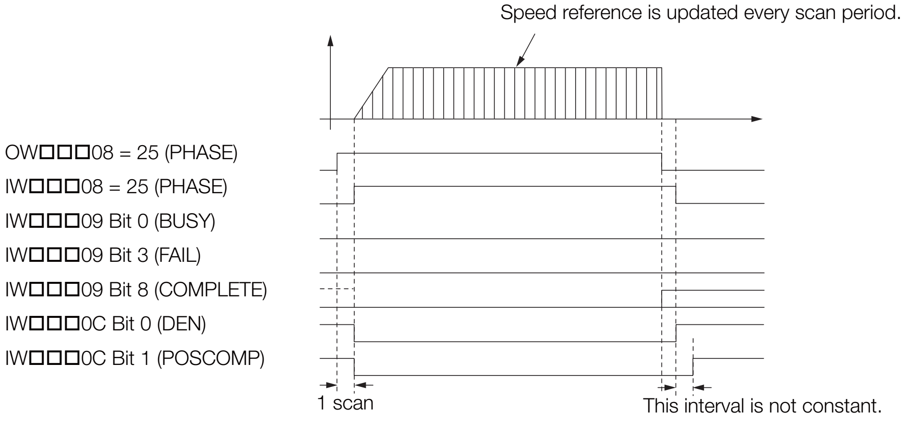
Register Address	Name	Monitored Contents
IW□□□00 Bit 1	Running with Servo ON	This bit shows the Servo status for the axis. 0: Stopped, 1: Running with Servo ON
IL□□□02	Warnings	This parameter reports the current warning status.
IL□□□04	Alarms	This parameter reports the current alarm status.
IW□□□08	Motion Command Response Code	This parameter shows the motion command currently in execution. This parameter is 25 during execution of the PHASE command.
IW□□□09 Bit 0	Command Execution Flag	This bit is always 0 (Completed) for the PHASE command.
IW□□□09 Bit 1	Command Hold Completed	This bit is always 0 (Command hold not completed) for the PHASE command.
IW□□□09 Bit 3	Command Error End	This bit changes to 1 (Completed with an error) when an error occurs during execution of the PHASE command. The axis will decelerate to a stop if it is moving. This bit changes to 0 (Completed normally) when another command is executed.
IW□□□09 Bit 8	Command Execution Completed	This bit is always 0 (Normal execution not completed) for the PHASE command.
IW□□□0C Bit 0	Distribution Completed	This bit changes to 1 (Distribution completed) when the distribution for the travel motion command is completed. This bit is 0 (Distributing pulses) when the execution of a travel motion command is in progress.
IW□□□0C Bit 1	Positioning Completed	This bit is 1 (Within positioning completed range) when distribution is completed and the current position is within the positioning completed range. This bit is 0 (Outside positioning completed range) in all other cases.
IW□□□0C Bit 3	Near Position	The operation of this bit depends on the set value of OL□□□20. If OL□□□20 is 0, this bit is 1 (Within near position range) when distribution is completed (i.e., when DEN is 1), and it is 0 (Outside near position range) when distribution is not completed. When OL□□□20 is not 0, this bit is 1 when within the range of the following formula, regardless of the state of distribution, and 0 in all other cases. |(IL□□□12) – (IL□□□16)| ≤ OL□□□20 IL□□□12: Machine Coordinate System Reference Position IL□□□16: Machine Coordinate System Feedback Position OL□□□20: NEAR Signal Output Width

Timing Charts

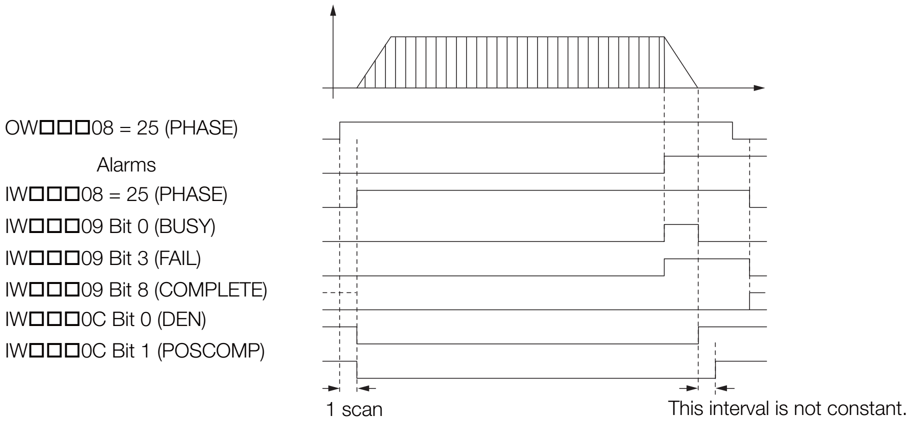
◆ Normal Execution



◆ Execution When Canceled



◆ Execution When an Alarm Occurs



4.2.25 KIS (Change Position Loop Integral Time Constant)

The KIS command transfers the set value of the OW□□□32 setting parameter (Position Loop Integral Time Constant) to the Position Loop Integral Time Constant SERVOPACK parameter and enables the setting.

Important

An SVC Function Module can automatically transfer setting parameters to SERVOPACK parameters when they are overwritten. The KIS command is not required if this function is used. Refer to the following section for details.
☞ *3.4 Motion Parameter Details – ◆ Function Selection Flags 1–■ Bit A: SERVOPACK Parameter Auto-Write* on page 3-29

Execution and Operating Procedures

1. Make sure that all of the following conditions are met.

No.	Execution Condition	Confirmation Method
1	There must be no alarms.	Both IL□□□02 and IL□□□04 must be 0.
2	Motion command execution for the target axis must be completed.*	IW□□□08 must be 0 and bit 0 in IW□□□09 must be 0.

* Before you change to this command during the execution of another command, you must check whether the command can be changed and how operation changes when the command is changed. Refer to the following section for details on changing from another command.
☞ *4.4 Changing the Command* on page 4-137

2. Set the OW□□□08 setting parameter (Motion Commands) to 26 to execute the KIS motion command.
The value of OW□□□32 is transferred to the Position Loop Integral Time Constant SERVOPACK parameter and is enabled.
The IW□□□08 monitor parameter (Motion Command Response Code) is 26 during execution of this command.
During command processing, bit 0 (Command Execution Flag) in the IW□□□09 monitor parameter will change to 1 (Processing). When processing is completed, this bit will change to 0 (Completed).

3. Set OW□□□08 to 0 to execute the NOP motion command.

This concludes the process for changing the position loop integral time constant.

Holding and Canceling Commands

Bit 0 (Hold Command) and bit 1 (Cancel Command) in the OW□□□09 setting parameter cannot be used to stop the axis.

Related Parameters

The parameters that are related to this command are listed in the following table.

◆ Setting Parameters

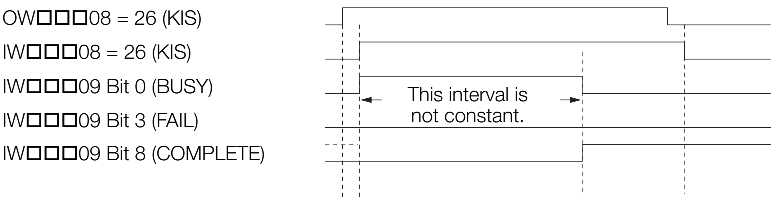
Register Address	Name	Setting Details
OW□□□08	Motion Commands	Set this parameter to 26 (KIS) to change the position loop integral time constant.
OW□□□09 Bit 0	Hold Command	This bit is ignored for the KIS command.
OW□□□09 Bit 1	Cancel Command	This bit is ignored for the KIS command.
OW□□□32	Position Loop Integral Time Constant	Set the position loop integral time constant in milliseconds.

◆ Monitor Parameters

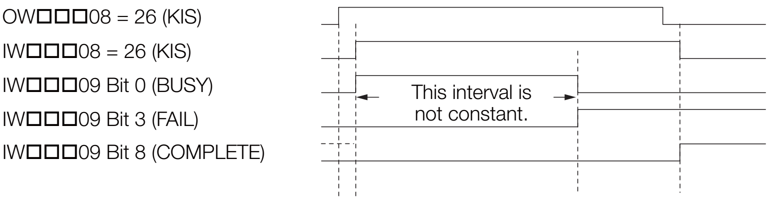
Register Address	Name	Monitored Contents
IL□□□02	Warnings	This parameter reports the current warning status.
IL□□□04	Alarms	This parameter reports the current alarm status.
IW□□□08	Motion Command Response Code	This parameter shows the motion command currently in execution. This parameter is 26 during execution of the KIS command.
IW□□□09 Bit 0	Command Execution Flag	This bit is 1 (Processing) during execution of the KIS command. The bit changes to 0 (Completed) when execution ends.
IW□□□09 Bit 1	Command Hold Completed	This bit is always 0 (Command hold not completed) for the KIS command.
IW□□□09 Bit 3	Command Error End	This bit changes to 1 (Completed with an error) when an error occurs during execution of the KIS command. The axis will decelerate to a stop if it is moving. This bit changes to 0 (Completed normally) when another command is executed.
IW□□□09 Bit 8	Command Execution Completed	This bit changes to 1 (Normal execution completed) when execution of the KIS command ends.

Timing Charts

◆ Normal Completion



◆ Error Completion



4.2.26 PPRM_WR (Write Non-volatile Parameter)

The PPRM_WR command overwrites the setting of the specified SERVOPACK parameter in non-volatile memory given with the parameter number, parameter size, and set value data, and then simultaneously applies the result of that operation to the parameter in RAM.

Two types of SERVOPACK parameters can be written with this command: vendor-specific parameters, which are vendor-specific specifications for the particular Servo product used, and Servo common parameters, which are defined in the MECHATROLINK-III communications specifications. Set bit 8 (SERVOPACK Parameter Access Selection) in the OW□□□09 setting parameter to select which type of SERVOPACK parameter to write.

Important

1. The number of times that the non-volatile memory of the SERVOPACK can be written to depends on the specifications of the device. Use the PPRM_WR command only when absolutely necessary. You should normally write parameters with the PRM_WR (Write SERVOPACK Parameter) command.
2. Be careful when setting the OW□□□50 setting parameter (SERVOPACK Parameter Number). If the wrong number is specified for this parameter, it could cause errors in later operations.
3. For some parameters, the power must be turned OFF and ON again to enable a change in the parameter. Always turn the power to the SERVOPACK OFF and ON again when changes are made to these parameters. Refer to the relevant SERVOPACK manual for details on parameters.

Execution and Operating Procedures

1. Make sure that all of the following conditions are met.

No.	Execution Condition	Confirmation Method
1	Motion command execution for the target axis must be completed.*	IW□□□08 must be 0 and bit 0 in IW□□□09 must be 0.
2	Must be ready for motion operation.	Bit 0 in IW□□□00 must be 1.

* Before you change to this command during the execution of another command, you must check whether the command can be changed and how operation changes when the command is changed. Refer to the following section for details on changing from another command.

☞ *4.4 Changing the Command* on page 4-137

2. Set the following setting parameters.

- OW□□□09, Bit 8 (SERVOPACK Parameter Access Selection)
- OW□□□50 (SERVOPACK Parameter Number)
- OW□□□51 (SERVOPACK Parameter Size)
- OL□□□52 (SERVOPACK Parameter Set Value)

3. Set the OW□□□08 setting parameter (Motion Commands) to 27 to execute the PPRM_WR motion command.

The SERVOPACK parameter is overwritten.

The IW□□□08 monitor parameter (Motion Command Response Code) is 27 during execution of this command.

During command processing, bit 0 (Command Execution Flag) in the IW□□□09 monitor parameter will change to 1 (Processing). When processing is completed, this bit will change to 0 (Completed).

4. Set OW□□□08 to 0 to execute the NOP motion command.

This concludes the process for writing to non-volatile parameters.

Holding and Canceling Commands

Bit 0 (Hold Command) and bit 1 (Cancel Command) in the OW□□□09 setting parameter cannot be used to stop the axis.

Related Parameters

The parameters that are related to this command are listed in the following table.

◆ Setting Parameters

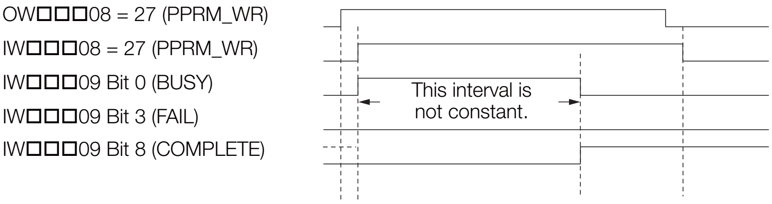
Register Address	Name	Setting Details
OW□□□08	Motion Commands	Set this parameter to 27 (PPRM_WR) to write a non-volatile parameter.
OW□□□09 Bit 0	Hold Command	This bit is ignored for the PPRM_WR command.
OW□□□09 Bit 1	Cancel Command	This bit is ignored for the PPRM_WR command.
OW□□□09 Bit 8	SERVOPACK Parameter Access Selection	Use this bit to select the parameter to write. 0: Vendor-specific parameters 1: Common parameters
OW□□□50	SERVOPACK Parameter Number	Set the number of the SERVOPACK parameter to write.
OW□□□51	SERVOPACK Parameter Size	Set the size of the SERVOPACK parameter to write. Set the size in words. Example: For 4 bytes, set this parameter to 2.
OL□□□52	SERVOPACK Parameter Set Value	Set the set value data to write to the target SERVOPACK parameter.

◆ Monitor Parameters

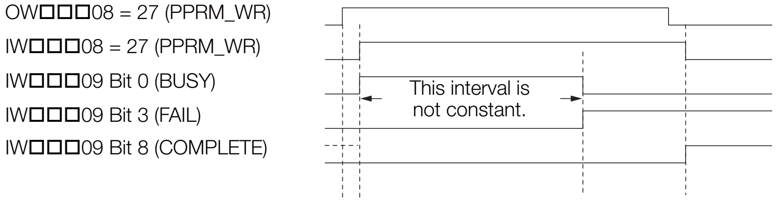
Register Address	Name	Monitored Contents
IL□□□02	Warnings	This parameter reports the current warning status.
IL□□□04	Alarms	This parameter reports the current alarm status.
IW□□□08	Motion Command Response Code	This parameter shows the motion command currently in execution. This parameter is 27 during execution of the PPRM_WR command.
IW□□□09 Bit 0	Command Execution Flag	This bit is 1 (Processing) during execution of the PPRM_WR command. The bit changes to 0 (Completed) when execution ends.
IW□□□09 Bit 1	Command Hold Completed	This bit is always 0 (Command hold not completed) for the PPRM_WR command.
IW□□□09 Bit 3	Command Error End	This bit changes to 1 (Completed with an error) when an error occurs during execution of the PPRM_WR command. The axis will decelerate to a stop if it is moving. This bit changes to 0 (Completed normally) when another command is executed.
IW□□□09 Bit 8	Command Execution Completed	This bit changes to 1 (Normal execution completed) when execution of the PPRM_WR command ends.

Timing Charts

◆ Normal Completion



◆ Error Completion



4.2.27 EX_FEED (Jog with External Positioning)

The EX_FEED command starts movement in the specified travel direction at the specified travel speed. Execute the NOP command to stop the operation.

When the external positioning signal is turned ON during motion, the axis is moved by the external positioning final travel distance from the current position. If the external positioning signal does not turn ON, jogging is continued.

Execution and Operating Procedures

1. **Make sure that all of the following conditions are met.**

No.	Execution Condition	Confirmation Method
1	There must be no alarms.	Both IL□□□02 and IL□□□04 must be 0.
2	The Servomotor's power must be ON.	Bit 1 in IW□□□00 must be 1.
3	Motion command execution for the target axis must be completed.*	IW□□□08 must be 0 and bit 0 in IW□□□09 must be 0.

* Before you change to this command during the execution of another command, you must check whether the command can be changed and how operation changes when the command is changed. Refer to the following section for details on changing from another command.
☞ *4.4 Changing the Command* on page 4-137

2. **Set the following setting parameters.**

- OL□□□46 (External Positioning Final Travel Distance)
- OW□□□04, Bits 4 to 7 (External Positioning Signal Setting)
- OL□□□10 (Speed Reference Setting)
- OW□□□12 (Speed Limit)
- OL□□□14 (Torque/Force Limit)
- OW□□□03, Bits 8 to B (Filter Type Selection)
- OL□□□36 (Linear Acceleration Rate/Acceleration Time Constant)
- OL□□□38 (Linear Deceleration Rate/Deceleration Time Constant)

Information

- OL□□□10 can be changed during motion.
- An override of between 0% and 327.67% can be set for OL□□□10.
- If OL□□□36 and OL□□□38 are changed during operation, the specifications of the SERVOPACK determine whether these changes are applied to acceleration and deceleration.
- OL□□□14 can be changed at any time. The intended operation may not be achieved if the set value is too small.

3. **Set the OW□□□08 setting parameter (Motion Commands) to 34 to execute the EX_FEED motion command.**

4. **Turn the external positioning signal ON.**
The axis will move the external positioning final travel distance from the position where the signal was detected and then it will decelerate to a stop.
When the axis stops, bit 8 (Command Execution Completed) in the IW□□□09 monitor parameter will change to 1 (Normal execution completed) and external positioning will end.

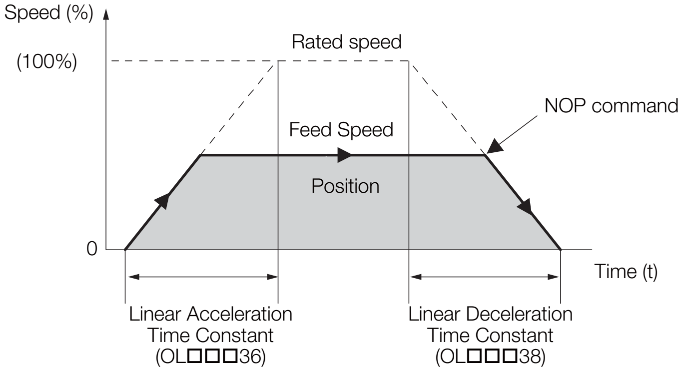
5. **Set OW□□□08 to 0 to execute the NOP motion command.**

This concludes the jog with external positioning operation.

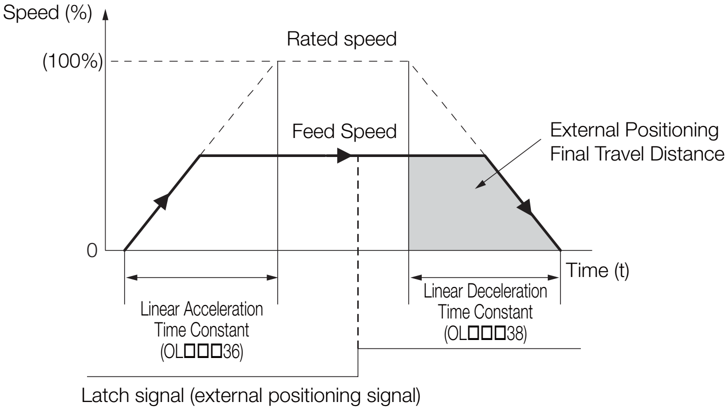
Operating Patterns

The following figure shows the operating pattern when the EX_FEED command is executed.

◆ Operating Pattern without External Positioning



◆ Operating Pattern with External Positioning



Holding

Holding execution of the EX_FEED command is not possible. Bit 0 (Hold Command) in the OW□□□09 setting parameter will be ignored.

Canceling

- To cancel a jogging or external positioning operation, set bit 1 (Cancel Command) in the OW□□□09 setting parameter to 1 (Cancel Command ON).
  When bit 1 in OW□□□09 is set to 1, the axis will decelerate to a stop.
  The deceleration operation depends on the setting of bits 8 to F (Stop Mode Selection) in the OW□□□02 setting parameter.
  When the axis completely decelerates to a stop, the remaining motion will be canceled and bit 1 (Positioning Completed) in the IW□□□0C monitor parameter will change to 1 (Within positioning completed range).
- The jogging operation resumes if bit 1 (Cancel Command) in the OW□□□09 setting parameter is set to 0 (Cancel Command OFF) during processing of the cancel operation.
- The same operation as the Cancel Command operation will be performed if the motion command code is changed before external positioning is performed.

Related Parameters

The parameters that are related to this command are listed in the following table.

◆ Setting Parameters

Register Address	Name	Setting Details
OW□□□00 Bit 0	Servo ON	Use this bit to turn the power to the Servomotor ON or OFF. Set this bit to 1 before setting OW□□□08 to 34 (EX_FEED). 0: Servo OFF, 1: Servo ON
OW□□□01 Bit 3	Speed Loop P/PI Switch	Use this bit to change the speed control loop between PI control and P control. 0: PI control, 1: P control
OW□□□02 Bit 8 to F	Stop Mode Selection	Select the stop method to use when a command is canceled. 0: Stop according to the Linear Deceleration Rate/Deceleration Time Constant parameter 1: Stop immediately
OW□□□03	Function Settings 1	Select the speed unit, acceleration/deceleration unit, and filter type.
OW□□□04 Bit 4 to 7	External Positioning Signal Setting	Set the signal to use for external positioning. 2: Phase-C pulse, 3: /EXT1, 4: /EXT2, 5: /EXT3
OW□□□08	Motion Commands	External positioning with jogging is started when this parameter is set to 34 (EX_FEED). External positioning with jogging stops and the axis decelerates to a stop when this parameter is set to 0.
OW□□□09 Bit 1	Cancel Command	When this bit is set to 1 (Cancel command ON) during external positioning with jogging, the axis will decelerate to a stop.
OW□□□09 Bit 2	Travel Direction for JOG/STEP	Set the travel direction for external positioning with jogging. 0: Forward, 1: Reverse
OL□□□10	Speed Reference Setting	Set the speed for external positioning with jogging. This parameter can be changed during operation. The unit depends on the set value of bits 0 to 3 in OW□□□03.
OW□□□12	Speed Limit	Set the upper speed limit as a percentage of the rated motor speed (rotary motor) or rated speed (linear motor). This value is an absolute value. It is used in both the forward and reverse directions.
OL□□□14	Torque/Force Limit	Set the torque limit for external positioning with jogging. This parameter can be changed during operation. The unit depends on the set value of bits C to F in OW□□□03.
OW□□□18	Override	This parameter allows the feed speed to be changed without changing the value of OL□□□10. Set the value as a percentage of the Speed Reference Setting. This parameter can be changed during operation. Setting range: 0 to 32,767 (0% to 327.67%) Setting unit: 1 = 0.01% Example: Setting for 50% = 5,000
OL□□□1E	Positioning Completion Width	Set this parameter to the value for which bit 1 in IW□□□0C will change to 1 (Within positioning completed range).
OL□□□20	NEAR Signal Output Width	Set this parameter to the value for which bit 3 in IW□□□0C will change to 1 (Within near position range). Bit 3 changes to 1 when the absolute value of the difference between the reference position and the feedback position is within the range that is specified here.
OL□□□36	Linear Acceleration Rate/Acceleration Time Constant	Set the jogging acceleration rate with the acceleration rate or the acceleration time.
OL□□□38	Linear Deceleration Rate/Deceleration Time Constant	Set the jogging deceleration rate with the deceleration rate or the deceleration time.
OW□□□3A	Filter Time Constant	Set the acceleration/deceleration filter time constant. Exponential acceleration/deceleration or a moving average filter can be selected in bits 8 to B in OW□□□03. This setting can be changed only when distribution has been completed (i.e., when bit 0 in IW□□□0C is 1).
OL□□□46	External Positioning Final Travel Distance	Set the travel distance after the external positioning signal is input.

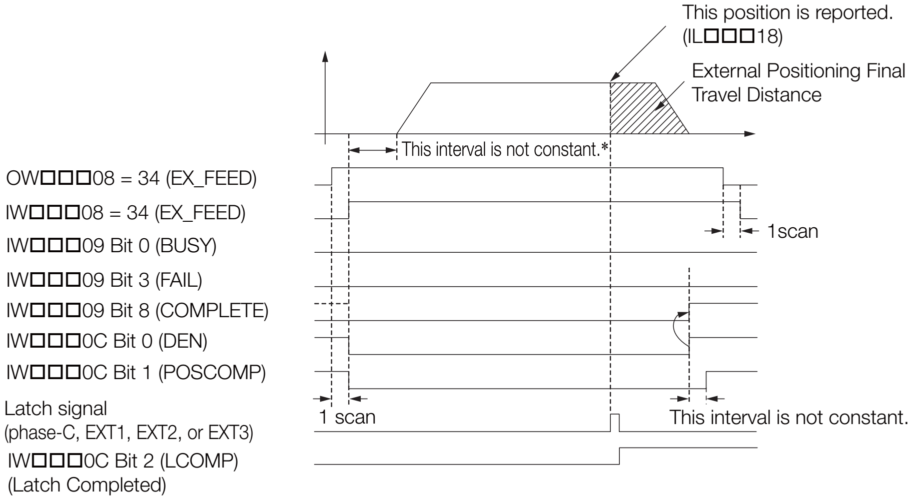
◆ Monitor Parameters

Register Address	Name	Monitored Contents
IW□□□00 Bit 1	Running with Servo ON	This bit shows the Servo status for the axis. 0: Stopped, 1: Running with Servo ON
IL□□□02	Warnings	This parameter reports the current warning status.
IL□□□04	Alarms	This parameter reports the current alarm status.
IW□□□08	Motion Command Response Code	This parameter shows the motion command currently in execution. This parameter is 34 during execution of the EX_FEED command.
IW□□□09 Bit 0	Command Execution Flag	This bit changes to 1 (Processing) when cancel processing is being performed for the EX_FEED command. This bit changes to 0 (Completed) when cancel processing has been completed.
IW□□□09 Bit 1	Command Hold Completed	This bit is always 0 (Command hold not completed) for the EX_FEED command.
IW□□□09 Bit 3	Command Error End	This bit changes to 1 (Completed with an error) when an error occurs during execution of the EX_FEED command. The axis will decelerate to a stop if it is moving. This bit changes to 0 (Completed normally) when another command is executed.
IW□□□09 Bit 8	Command Execution Completed	This bit is always 0 (Normal execution not completed) for the EX_FEED command.
IW□□□0C Bit 0	Distribution Completed	This bit changes to 1 (Distribution completed) when the distribution for the travel motion command is completed. This bit is 0 (Distributing pulses) when the execution of a travel motion command is in progress.
IW□□□0C Bit 1	Positioning Completed	This bit is 1 (Within positioning completed range) when distribution is completed and the current position is within the positioning completed range. This bit is 0 (Outside positioning completed range) in all other cases.
IW□□□0C Bit 2	Latch Completed	This bit changes to 0 (Latch not complete) when a new latch command is executed and it changes to 1 (Latch completed) when the latch is completed. The latched position is reported in IL□□□18.
IW□□□0C Bit 3	Near Position	The operation of this bit depends on the set value of OL□□□20. If OL□□□20 is 0, this bit is 1 (Within near position range) when distribution is completed (i.e., when DEN is 1), and it is 0 (Outside near position range) when distribution is not completed. When OL□□□20 is not 0, this bit is 1 when within the range of the following formula, regardless of the state of distribution, and 0 in all other cases. $\lvert(\text{IL□□□12}) - (\text{IL□□□16})\rvert \le \text{OL□□□20}$ IL□□□12: Machine Coordinate System Reference Position IL□□□16: Machine Coordinate System Feedback Position OL□□□20: NEAR Signal Output Width
IL□□□18	Machine Coordinate System Latch Position	This parameter stores the current position in the machine coordinate system when the latch signal turned ON.

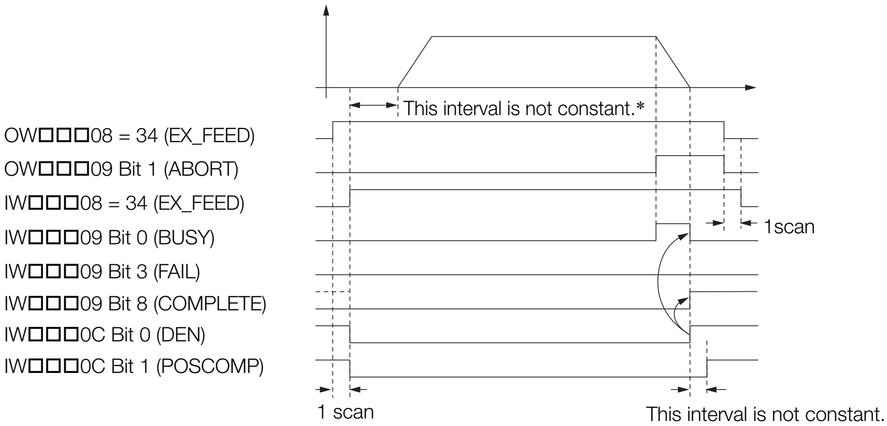
Timing Charts

Information For EX_FEED, the value of the OL□□□46 setting parameter (External Positioning Final Travel Distance) is written to the SERVOPACK parameters before movement. Therefore, there is a slight time lag before the axis starts moving (refer to the items with asterisks (*) in the following figure).

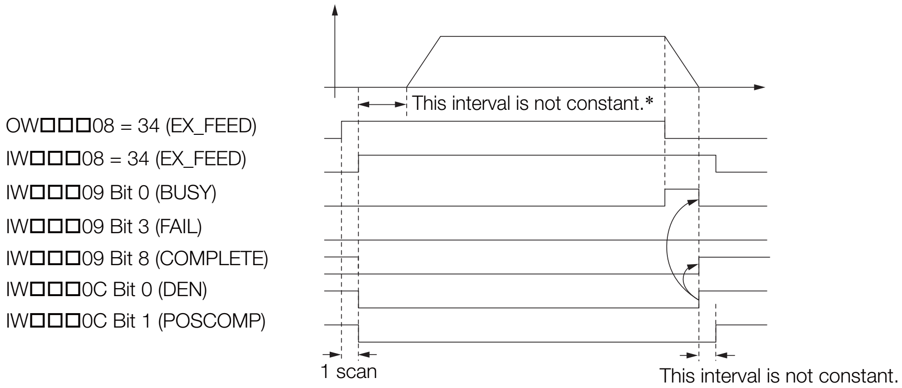
◆ Normal Execution



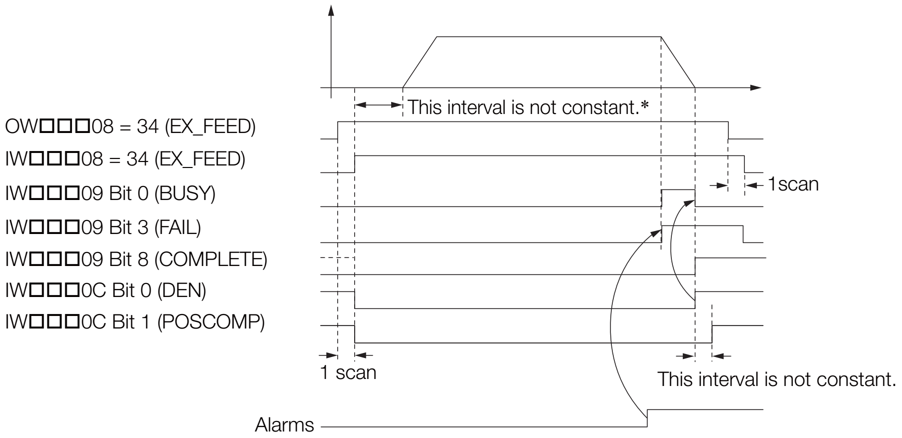
◆ Execution When Canceled



◆ Execution When Command Is Changed



◆ Execution When an Alarm Occurs



External Positioning Final Travel Distance Write Selection

This selection is the same as for External Positioning (EX_POSING). Refer to the following section for details.

☞ *External Positioning Final Travel Distance Write Selection* on page 4-18

4.2.28 MEM_RD (Read Memory)

The MEM_RD command reads the data in SERVOPACK memory at the specified memory address and size. The read data is then stored in the IL☐☐☐38 monitor parameter (SERVOPACK Parameter Read Data). Whether data can be read from memory depends on the product specifications of the SERVOPACK. Refer to the relevant SERVOPACK manual for details.

Execution and Operating Procedures

1. Make sure that all of the following conditions are met.

No.	Execution Condition	Confirmation Method
1	Must be ready for motion operation.	Bit 0 in IW☐☐☐00 must be 1.
2	Motion command execution for the target axis must be completed.*	IW☐☐☐08 must be 0 and bit 0 in IW☐☐☐09 must be 0.

* Before you change to this command during the execution of another command, you must check whether the command can be changed and how operation changes when the command is changed. Refer to the following section for details on changing from another command.
☞ *4.4 Changing the Command* on page 4-137

2. Set the following setting parameters.
- OW☐☐☐51 (SERVOPACK Parameter Size)
- OL☐☐☐58 (Address Setting)

Information Make any necessary change to OW☐☐☐51 and OL☐☐☐58 before the MEM_RD command is executed, or during the same scan that OW☐☐☐08 is set to 35. Do not make these changes during execution of the MEM_RD command.

3. Set the OW☐☐☐08 setting parameter (Motion Commands) to 35 to execute the MEM_RD motion command.

4. Set OW☐☐☐08 to 0 to execute the NOP motion command.

This concludes the read memory operation.

Holding and Canceling Commands

Bit 0 (Hold Command) and bit 1 (Cancel Command) in the OW☐☐☐09 setting parameter cannot be used to stop the axis.

Related Parameters

The parameters that are related to this command are listed in the following table.

◆ Setting Parameters

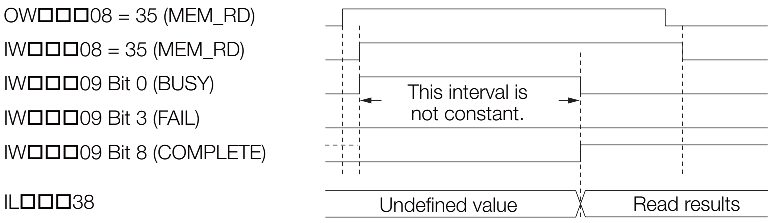
Register Address	Name	Setting Details
OW☐☐☐08	Motion Commands	Set this parameter to 35 (MEM_RD) to read from memory.
OW☐☐☐09 Bit 0	Hold Command	This bit is ignored for the MEM_RD command.
OW☐☐☐09 Bit 1	Cancel Command	This bit is ignored for the MEM_RD command.
OW☐☐☐51	SERVOPACK Parameter Size	Set the size of the data to read from the specified address in words. The valid settings for this parameter are 1 and 2.
OL☐☐☐58	Address Setting	Set the first address to read in the SERVOPACK memory. The valid address range depends on the product specifications of the SERVOPACK. Refer to the relevant SERVOPACK manual for details.

◆ Monitor Parameters

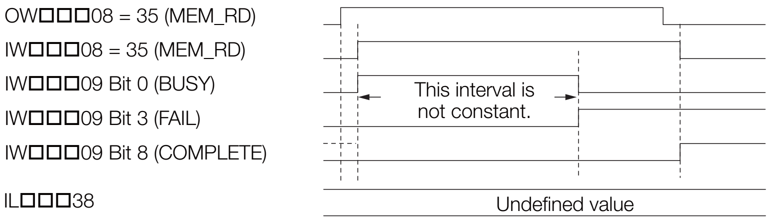
Register Address	Name	Monitored Contents
IL□□□02	Warnings	This parameter reports the current warning status.
IL□□□04	Alarms	This parameter reports the current alarm status.
IW□□□08	Motion Command Response Code	This parameter shows the motion command currently in execution. This parameter is 35 during execution of the MEM_RD command.
IW□□□09 Bit 0	Command Execution Flag	This bit is 1 (Processing) during execution of the MEM_RD command. The bit changes to 0 (Completed) when execution ends.
IW□□□09 Bit 1	Command Hold Completed	This bit is always 0 (Command hold not completed) for the MEM_RD command.
IW□□□09 Bit 3	Command Error End	This bit changes to 1 (Completed with an error) when an error occurs during execution of the MEM_RD command. The axis will decelerate to a stop if it is moving. This bit changes to 0 (Completed normally) when another command is executed.
IW□□□09 Bit 8	Command Execution Completed	This bit changes to 1 (Normal execution completed) when execution of the MEM_RD command ends.
IL□□□38	SERVOPACK Parameter Read Data	This parameter stores the data of the SERVOPACK parameter that was read.

Timing Charts

◆ Normal Completion



◆ Error Completion



4.2.29 MEM_WR (Write Memory)

The MEM_WR command writes the specified setting data to SERVOPACK memory at the specified memory address and size.

Whether data can be written to memory depends on the product specifications of the SERVOPACK. Refer to the relevant SERVOPACK manual for details.

Execution and Operating Procedures

1. Make sure that all of the following conditions are met.

No.	Execution Condition	Confirmation Method
1	Must be ready for motion operation.	Bit 0 in IW☐☐☐00 must be 1.
2	Motion command execution for the target axis must be completed.*	IW☐☐☐08 must be 0 and bit 0 in IW☐☐☐09 must be 0.

* Before you change to this command during the execution of another command, you must check whether the command can be changed and how operation changes when the command is changed. Refer to the following section for details on changing from another command.
☞ *4.4 Changing the Command* on page 4-137

2. Set the following setting parameters.
- OW☐☐☐51 (SERVOPACK Parameter Size)
- OL☐☐☐52 (SERVOPACK Parameter Set Value)
- OL☐☐☐58 (Address Setting)

Information Make any necessary change to OW☐☐☐51, OL☐☐☐52, and OL☐☐☐58 before the MEM_WR command is executed, or during the same scan that OW☐☐☐08 is set to 36. Do not make these changes during execution of the MEM_WR command.

3. Set the OW☐☐☐08 setting parameter (Motion Commands) to 36 to execute the MEM_WR motion command.

4. Set OW☐☐☐08 to 0 to execute the NOP motion command.

This concludes the write memory operation.

Holding and Canceling Commands

Bit 0 (Hold Command) and bit 1 (Cancel Command) in the OW☐☐☐09 setting parameter cannot be used to stop the axis.

Related Parameters

The parameters that are related to this command are listed in the following table.

◆ Setting Parameters

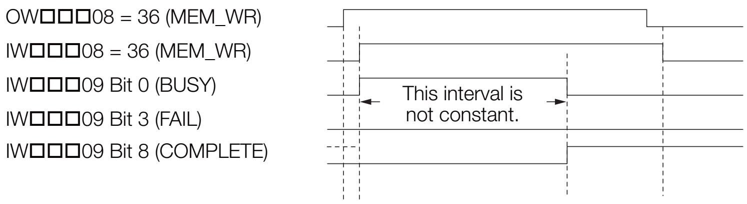
Register Address	Name	Setting Details
OW☐☐☐08	Motion Commands	Set this parameter to 36 (MEM_WR) to write to memory.
OW☐☐☐09 Bit 0	Hold Command	This bit is ignored for the MEM_WR command.
OW☐☐☐09 Bit 1	Cancel Command	This bit is ignored for the MEM_WR command.
OW☐☐☐51	SERVOPACK Parameter Size	Set the size of the data to write to the specified address in words. The valid settings for this parameter are 1 and 2.
OL☐☐☐52	SERVOPACK Parameter Set Value	Set the data to write to the specified address.
OL☐☐☐58	Address Setting	Set the first address to write in the SERVOPACK memory. The valid address range depends on the product specifications of the SERVOPACK. Refer to the relevant SERVOPACK manual for details.

◆ Monitor Parameters

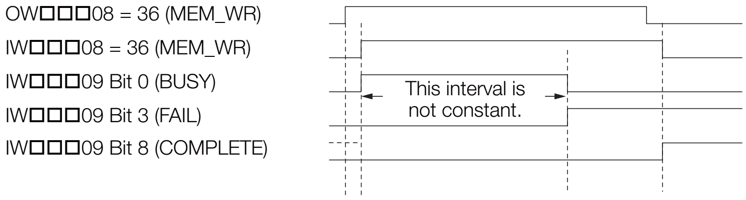
Register Address	Name	Monitored Contents
IL□□□02	Warnings	This parameter reports the current warning status.
IL□□□04	Alarms	This parameter reports the current alarm status.
IW□□□08	Motion Command Response Code	This parameter shows the motion command currently in execution. This parameter is 36 during execution of the MEM_WR command.
IW□□□09 Bit 0	Command Execution Flag	This bit is 1 (Processing) during execution of the MEM_WR command. The bit changes to 0 (Completed) when execution ends.
IW□□□09 Bit 1	Command Hold Completed	This bit is always 0 (Command hold not completed) for the MEM_WR command.
IW□□□09 Bit 3	Command Error End	This bit changes to 1 (Completed with an error) when an error occurs during execution of the MEM_WR command. The axis will decelerate to a stop if it is moving. This bit changes to 0 (Completed normally) when another command is executed.
IW□□□09 Bit 8	Command Execution Completed	This bit changes to 1 (Normal execution completed) when execution of the MEM_WR command ends.

Timing Charts

◆ Normal Completion



◆ Error Completion



4.2.30 PMEM_RD (Read Non-volatile Memory)

The PMEM_RD command reads the data in SERVOPACK non-volatile memory at the specified memory address and size. The read data is then stored in the IL□□□38 monitor parameter (SERVOPACK Parameter Read Data).

Information Whether data can be read from non-volatile memory depends on the product specifications of the SERVOPACK. Refer to the relevant SERVOPACK manual for details.

Execution and Operating Procedures

1. **Make sure that all of the following conditions are met.**

No.	Execution Condition	Confirmation Method
1	Must be ready for motion operation.	Bit 0 in IW□□□00 must be 1.
2	Motion command execution for the target axis must be completed.*	IW□□□08 must be 0 and bit 0 in IW□□□09 must be 0.

* Before you change to this command during the execution of another command, you must check whether the command can be changed and how operation changes when the command is changed. Refer to the following section for details on changing from another command.
☞ *4.4 Changing the Command* on page 4-137

2. **Set the following setting parameters.**
- OW□□□51 (SERVOPACK Parameter Size)
- OL□□□58 (Address Setting)

Information Make any necessary change to OW□□□51 and OL□□□58 before the PMEM_RD command is executed, or during the same scan that OW□□□08 is set to 37. Do not make these changes during execution of the PMEM_RD command.

3. **Set the OW□□□08 setting parameter (Motion Commands) to 37 to execute the PMEM_RD motion command.**

4. **Set OW□□□08 to 0 to execute the NOP motion command.**

This concludes the read from non-volatile memory operation.

Holding and Canceling Commands

Bit 0 (Hold Command) and bit 1 (Cancel Command) in the OW□□□09 setting parameter cannot be used to stop the axis.

Related Parameters

The parameters that are related to this command are listed in the following table.

◆ Setting Parameters

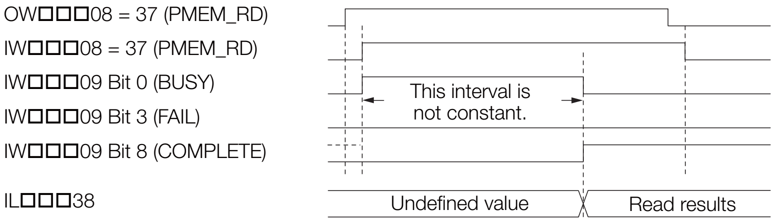
Register Address	Name	Setting Details
OW□□□08	Motion Commands	Set this parameter to 37 (PMEM_RD) to read from non-volatile memory.
OW□□□09 Bit 0	Hold Command	This bit is ignored for the PMEM_RD command.
OW□□□09 Bit 1	Cancel Command	This bit is ignored for the PMEM_RD command.
OW□□□51	SERVOPACK Parameter Size	Set the size of the data to read from the specified address in words. The valid settings for this parameter are 1 and 2.
OL□□□58	Address Setting	Set the first address to read in the SERVOPACK memory. The valid address range depends on the product specifications of the SERVOPACK. Refer to the relevant SERVOPACK manual for details.

◆ Monitor Parameters

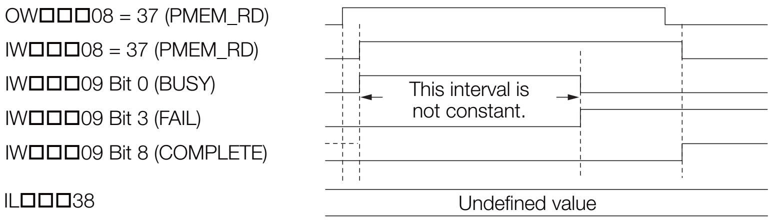
Register Address	Name	Monitored Contents
IL□□□02	Warnings	This parameter reports the current warning status.
IL□□□04	Alarms	This parameter reports the current alarm status.
IW□□□08	Motion Command Response Code	This parameter shows the motion command currently in execution. This parameter is 37 during execution of the PMEM_RD command.
IW□□□09 Bit 0	Command Execution Flag	This bit is 1 (Processing) during execution of the PMEM_RD command. The bit changes to 0 (Completed) when execution ends.
IW□□□09 Bit 1	Command Hold Completed	This bit is always 0 (Command hold not completed) for the PMEM_RD command.
IW□□□09 Bit 3	Command Error End	This bit changes to 1 (Completed with an error) when an error occurs during execution of the PMEM_RD command. The axis will decelerate to a stop if it is moving. This bit changes to 0 (Completed normally) when another command is executed.
IW□□□09 Bit 8	Command Execution Completed	This bit changes to 1 (Normal execution completed) when execution of the PMEM_RD command ends.
IL□□□38	SERVOPACK Parameter Read Data	This parameter stores the data read from the specified address.

Timing Charts

◆ Normal Completion



◆ Error Completion



4.2.31 PMEM_WR (Write Non-volatile Memory)

The PMEM_WR command writes the specified setting data to SERVOPACK non-volatile memory at the specified memory address and size.

Information Whether data can be written to non-volatile memory depends on the product specifications of the SERVOPACK. Refer to the relevant SERVOPACK manual for details.

Execution and Operating Procedures

1. **Make sure that all of the following conditions are met.**

No.	Execution Condition	Confirmation Method
1	Must be ready for motion operation.	Bit 0 in IW□□□00 must be 1.
2	Motion command execution for the target axis must be completed.*	IW□□□08 must be 0 and bit 0 in IW□□□09 must be 0.

* Before you change to this command during the execution of another command, you must check whether the command can be changed and how operation changes when the command is changed. Refer to the following section for details on changing from another command.
☞ *4.4 Changing the Command* on page 4-137

2. **Set the following setting parameters.**
- OW□□□51 (SERVOPACK Parameter Size)
- OL□□□52 (SERVOPACK Parameter Set Value)
- OL□□□58 (Address Setting)

Information Make any necessary change to OW□□□51, OL□□□52, and OL□□□58 before the PMEM_WR command is executed, or during the same scan that OW□□□08 is set to 38. Do not make these changes during execution of the PMEM_WR command.

3. **Set the OW□□□08 setting parameter (Motion Commands) to 38 to execute the PMEM_WR motion command.**

4. **Set OW□□□08 to 0 to execute the NOP motion command.**

This concludes the process for writing to non-volatile memory.

Holding and Canceling Commands

Bit 0 (Hold Command) and bit 1 (Cancel Command) in the OW□□□09 setting parameter cannot be used to stop the axis.

Related Parameters

The parameters that are related to this command are listed in the following table.

◆ Setting Parameters

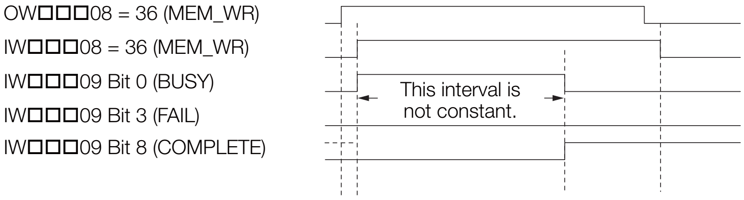
Register Address	Name	Setting Details
OW□□□08	Motion Commands	Set this parameter to 38 (PMEM_WR) to write to memory.
OW□□□09 Bit 0	Hold Command	This bit is ignored for the PMEM_WR command.
OW□□□09 Bit 1	Cancel Command	This bit is ignored for the PMEM_WR command.
OW□□□51	SERVOPACK Parameter Size	Set the size of the data to write to the specified address in words. The valid settings for this parameter are 1 and 2.
OL□□□52	SERVOPACK Parameter Set Value	Set the data to write to the specified address.
OL□□□58	Address Setting	Set the first address to write in the SERVOPACK memory. The valid address range depends on the product specifications of the SERVOPACK. Refer to the relevant SERVOPACK manual for details.

◆ Monitor Parameters

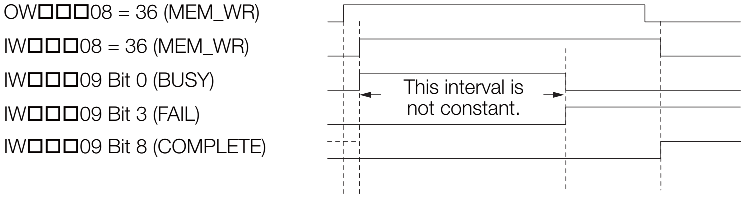
Register Address	Name	Monitored Contents
IL□□□02	Warnings	This parameter reports the current warning status.
IL□□□04	Alarms	This parameter reports the current alarm status.
IW□□□08	Motion Command Response Code	This parameter shows the motion command currently in execution. This parameter is 38 during execution of the PMEM_WR command.
IW□□□09 Bit 0	Command Execution Flag	This bit is 1 (Processing) during execution of the PMEM_WR command. The bit changes to 0 (Completed) when execution ends.
IW□□□09 Bit 1	Command Hold Completed	This bit is always 0 (Command hold not completed) for the PMEM_WR command.
IW□□□09 Bit 3	Command Error End	This bit changes to 1 (Completed with an error) when an error occurs during execution of the PMEM_WR command. The axis will decelerate to a stop if it is moving. This bit changes to 0 (Completed normally) when another command is executed.
IW□□□09 Bit 8	Command Execution Completed	This bit changes to 1 (Normal execution completed) when execution of the PMEM_WR command ends.

Timing Charts

◆ Normal Completion



◆ Error Completion



4.2.32 MLTTRN_SET (Multiturn Limit Setting)

Execute the MLTTRN_SET command to set the multiturn limit of the absolute encoder to the value set in Pn205 (Multiturn Limit) SERVOPACK parameter. Execute the MLTTRN_SET command when an A.CC0 alarm (Multiturn Limit Disagreement) has occurred on the SERVOPACK.

> **Important** The MLTTRN_SET command is valid for SERVOPACKs with absolute encoders. The command will end in an error if the MLTTRN_SET command is executed when an incremental encoder is used (even if it is used as an absolute encoder) or if a servo amplifier from another company is used.

Refer to the following section for the procedure to set the multiturn limit for a MECHATROLINK-III slave axis without using this command.

☞ *5.3 Multiturn Limit* on page 5-47

Execution and Operating Procedures

1. **Make sure that all of the following conditions are met.**

No.	Execution Condition	Confirmation Method
1	Communications with the SERVOPACK must be synchronized.[*1]	Bit 0 in IW□□□00 must be ON.
2	The servo must be OFF.	Bit 1 in IW□□□00 must be OFF.
3	Motion command execution for the target axis must be completed.[*2]	IW□□□08 must be 0 and bit 0 in IW□□□09 must be OFF.

*1. If there is an A.CC0 alarm (Multiturn Limit Disagreement), communications cannot be synchronized just by turning ON the power supplies to the MP3000. Clear the alarm by setting bit F in OW□□□00 to 1 (ON) to synchronize communications.

*2. Before you change to this command during the execution of another command, you must check whether the command can be changed and how operation changes when the command is changed. Refer to the following section for details on changing from another command.
☞ *4.4 Changing the Command* on page 4-137

2. **Set the OW□□□08 setting parameter (Motion Commands) to 39 to execute the MLTTRN_SET motion command.**
The A.CC0 alarm (Multiturn Limit Disagreement) in the SERVOPACK will be cleared, and the multiturn limit of the absolute encoder will be set to the value set in the Pn205 (Multiturn Limit) SERVOPACK parameter.
During command execution, IW□□□08 (Motion Command Response Code) changes to 39 and bit 0 (BUSY) in IW□□□09 turns ON.
When command execution is completed, bit 0 (BUSY) in IW□□□09, bit 3 (FAIL) in IW□□□09, and bit 0 (Motion Operation Ready) in IW□□□00 turn OFF, and bit 8 (COMPLETE) in IW□□□09 turn ON.

3. **Set OW□□□08 (Motion Commands) to 0 to execute the NOP motion command and complete the multiturn limit settings.**

4. **Turn the power supply to the SERVOPACK OFF and ON again**

5. **Execute an origin setting or origin return operation.**
Refer to the following section for details on the origin setting operation.
☞ *ZSET (Set Zero Point)* on page 4-60

Refer to the following section for details on the origin return operation.
☞ *ZRET (Zero Point Return)* on page 4-20

Holding and Canceling Commands

Bit 0 (Hold Command) and bit 1 (Cancel Command) in the OW□□□09 setting parameter cannot be used to stop the axis.

If a communications error occurs during command execution, command processing will be canceled, and the command will end in an error (bit 3 in IW□□□09 will turn ON).

Related Parameters

The parameters that are related to this command are listed in the following table.

◆ Setting Parameters

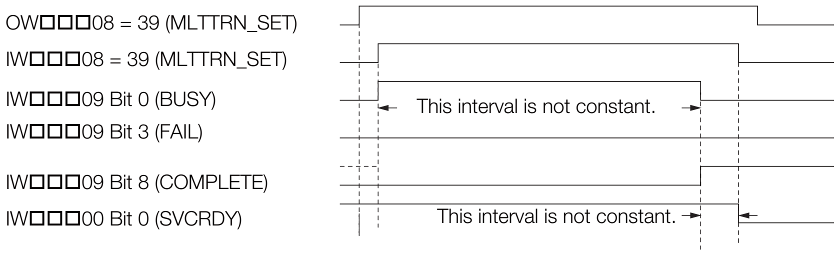
Register Address	Name	Setting Details
OW□□□00 Bit 0	Servo ON	Use this bit to turn the power to the Servomotor ON or OFF. Set this parameter to 1 before setting OW□□□08 to 39 (MLTTRN_SET). 0: Servo OFF, 1: Servo ON
OW□□□08	Motion Commands	The multiturn limit setting operation will begin when 39 (MLTTRN_SET) is set. Even if the command is set to 0 (NOP) during processing, this setting will be ignored, and the operation will continue.
OW□□□09 Bit 0	Hold Command	This bit is ignored for the MLTTRN_SET command.
OW□□□09 Bit 1	Cancel Command	This bit is ignored for the MLTTRN_SET command.

◆ Monitor Parameters

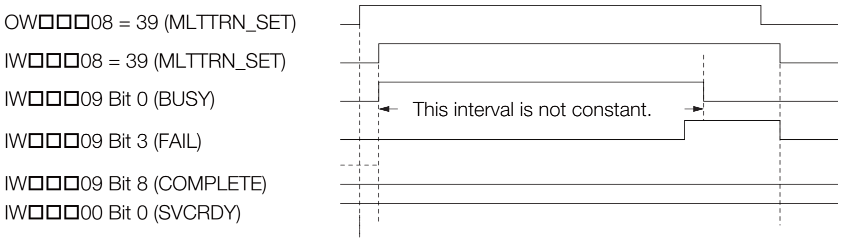
Register Address	Name	Monitored Contents
IW□□□00 Bit 0	Motion Operation Ready	This bit shows whether or not communications are synchronized between the MP3000 and the slave SERVOPACK. For the MLTTRN_SET command, this bit is 1 (Motion operation ready) if communications are synchronized between the MP3000 and the slave SERVOPACK. This bit is 0 (Motion operation not ready) if communications are disconnected.
IW□□□00 Bit 1	Running with Servo ON	This bit shows the servo status for the axis. 0: Stopped, 1: Running with servo ON
IL□□□02	Warning	This parameter reports the current warning status.
IL□□□04	Alarm	This parameter reports the current alarm status.
IW□□□08	Motion Command Response Code	This parameter shows the motion command currently in execution. This parameter is 39 during execution of the MLTTRN_SET command.
IW□□□09 Bit 0	Command Execution Flag	This bit changes to 1 (Processing) when cancel processing is being performed for the MLTTRN_SET command. This bit changes to 0 (Completed) when cancel processing has been completed.
IW□□□09 Bit 3	Command Error End	This bit changes to 1 (Completed with an error) when an error occurs during execution of the MLTTRN_SET command. This bit changes to 0 (Completed normally) when another command is executed.
IW□□□09 Bit 8	Command Execution Completed	This bit changes to 1 (Completed) when execution of the MLTTRN_SET command ends.

Timing Charts

◆ Normal Completion



◆ Error Completion



4.3 Motion Subcommand Details

This section describes motion subcommands in detail.

4.3.1 NOP (No Command)

Set this subcommand when you do not want to specify a subcommand.

The User Monitor 4 parameter can be used with this subcommand just as with the SMON (Status Monitor) subcommand. Refer to the following section for details.

☞ *SMON (Monitor Status)* on page 4-131

Related Parameters

The parameters that are related to this subcommand are listed in the following table.

◆ Setting Parameters

Register Address	Name	Setting Details
OW☐☐☐0A	Motion Subcommands	Set this parameter to 0 for the NOP command.
OW☐☐☐4E	SERVOPACK User Monitor Setting	Set the information managed by the SERVOPACK to monitor.

◆ Monitor Parameters

Register Address	Name	Monitored Contents
IW☐☐☐0A	Motion Subcommand Response Code	This parameter shows the motion subcommand that is currently in execution. This parameter is 0 during execution of the NOP command.
IW☐☐☐0B Bit 0	Command Execution Flag	This bit is 1 (Processing) during execution of the NOP command. The bit changes to 0 (Completed) when execution ends.
IW☐☐☐0B Bit 3	Command Error End	This bit changes to 1 (Completed with an error) when an error occurs during execution of the NOP command. This bit changes to 0 (Completed normally) when another command is executed.
IW☐☐☐0B Bit 8	Command Execution Completed*	This bit changes to 1 (Normal execution completed) when execution of the NOP command ends.
IW☐☐☐2F	SERVOPACK User Monitor Information	This parameter reports which data the user is actually monitoring.
IL☐☐☐34	SERVOPACK User Monitor 4	This parameter reports the result of the selected monitor.

* The subcommand status of the NOP command (Command Execution Completed) is invalid.

4.3.2 PRM_RD (Read SERVOPACK Parameter)

The PRM_RD subcommand reads the set value from the SERVOPACK RAM of the SERVOPACK parameter that corresponds to the specified parameter number and parameter size. The read value is then stored in the IW☐☐☐37 (Auxiliary SERVOPACK Parameter Number) and IL☐☐☐3A (Auxiliary SERVOPACK Parameter Read Data) monitor parameters.

Two types of SERVOPACK parameters can be read with this command: vendor-specific parameters, which are vendor-specific specifications for the particular Servo product used, and Servo common parameters, which are defined in the MECHATROLINK-III communications specifications. Set bit 8 (SERVOPACK Parameter Access Selection) in the OW☐☐☐09 setting parameter to select which type of SERVOPACK parameter to read.

Execution and Operating Procedures

1. **Make sure that the following condition is met.**

No.	Execution Condition	Confirmation Method
1	Execution of motion subcommands must be completed.*	IW☐☐☐0A must be 0 and bit 0 in IW☐☐☐0B must be 0.

* This subcommand cannot be executed until the execution of other motion subcommands is completed.

2. **Set the following setting parameters.**
   - OW☐☐☐09, Bit 8 (SERVOPACK Parameter Access Selection)
   - OW☐☐☐54 (Auxiliary SERVOPACK Parameter Number)
   - OW☐☐☐55 (Auxiliary SERVOPACK Parameter Size)

3. **Set the OW☐☐☐0A setting parameter (Motion Subcommands) to 1 to execute the PRM_RD motion subcommand.**
   The PRM_RD command reads the SERVOPACK parameter and stores the contents in the monitor parameters.
   The IW☐☐☐0A monitor parameter (Motion Subcommand Response Code) is 1 during execution of this command.
   During command processing, bit 0 (Command Execution Flag) in the IW☐☐☐0B monitor parameter will change to 1 (Processing). When processing is completed, this bit will change to 0 (Completed).

4. **Set OW☐☐☐0A to 0 to execute the NOP motion subcommand.**

This concludes the process for reading SERVOPACK parameters.

Related Parameters

The parameters that are related to this subcommand are listed in the following table.

◆ Setting Parameters

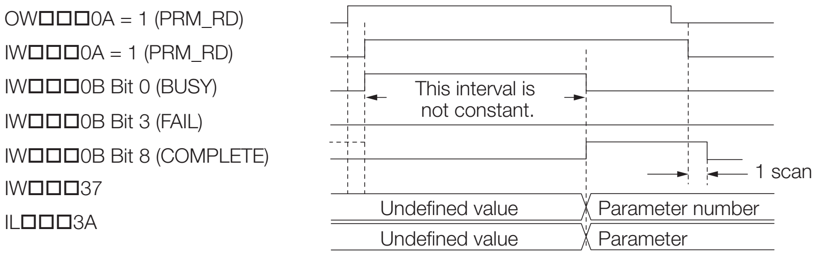
Register Address	Name	Setting Details
OW☐☐☐09 Bit 8	SERVOPACK Parameter Access Selection	Use this bit to select the parameter to read. 0: Vendor-specific parameters 1: Common parameters
OW☐☐☐0A	Motion Subcommands	Set this parameter to 1 (PRM_RD) to read a SERVOPACK parameter.
OW☐☐☐54	Auxiliary SERVOPACK Parameter Number	Set the number of the SERVOPACK parameter to read.
OW☐☐☐55	Auxiliary SERVOPACK Parameter Size	Set the size of the SERVOPACK parameter to read. Set the size in words. **Setting Precautions** The SERVOPACK user manual lists the sizes in bytes, so those values must be converted to words.

◆ Monitor Parameters

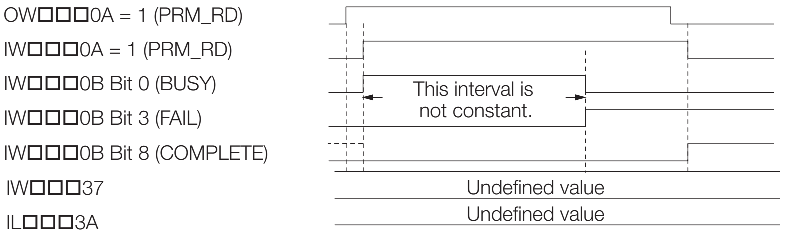
Register Address	Name	Monitored Contents
IW□□□0A	Motion Subcommand Response Code	This parameter shows the motion subcommand that is currently in execution. This parameter is 1 during execution of the PRM_RD command.
IW□□□0B Bit 0	Command Execution Flag	This bit is 1 (Processing) during execution of the PRM_RD command. The bit changes to 0 (Completed) when execution ends.
IW□□□0B Bit 3	Command Error End	This bit changes to 1 (Completed with an error) when an error occurs during execution of the PRM_RD command. This bit changes to 0 (Completed normally) when another command is executed.
IW□□□0B Bit 8	Command Execution Completed	This bit changes to 1 (Normal execution completed) when execution of the PRM_RD command ends.
IW□□□37	Auxiliary SERVOPACK Parameter Number	This parameter stores the number of the SERVOPACK parameter that was read.
IL□□□3A	Auxiliary SERVOPACK Parameter Read Data	This parameter stores the data of the SERVOPACK parameter that was read.

Timing Charts

◆ Normal Completion



◆ Error Completion



4.3.3 PRM_WR (Write SERVOPACK Parameter)

The PRM_WR subcommand overwrites the setting of a SERVOPACK parameter using the specified parameter number, parameter size, and set value data. The data is written to the SERVOPACK RAM.

Two types of SERVOPACK parameters can be written with this command: vendor-specific parameters, which are vendor-specific specifications for the particular Servo product used, and Servo common parameters, which are defined in the MECHATROLINK-III communications specifications. Set bit 8 (SERVOPACK Parameter Access Selection) in the OW□□□09 setting parameter to select which type of SERVOPACK parameter to write.

Execution and Operating Procedures

1. Make sure that all of the following conditions are met.

No.	Execution Condition	Confirmation Method
1	Execution of motion subcommands must be completed.*	IW□□□0A must be 0 and bit 0 in IW□□□0B must be 0.
2	OW□□□54, OW□□□55, and OL□□□56 must all be set.	Refer to the list of setting parameters below.

* This subcommand cannot be executed until the execution of other motion subcommands is completed.

2. Set the following setting parameters.
- OW□□□09, Bit 8 (SERVOPACK Parameter Access Selection)
- OW□□□54 (Auxiliary SERVOPACK Parameter Number)
- OW□□□55 (Auxiliary SERVOPACK Parameter Size)
- OL□□□56 (Auxiliary SERVOPACK Parameter Set Value)

3. Set the OW□□□0A setting parameter (Motion Subcommands) to 2 to execute the PRM_WR motion subcommand.
The SERVOPACK parameter is overwritten.
The IW□□□0A monitor parameter (Motion Subcommand Response Code) is 2 during execution of this command.
During command processing, bit 0 (Command Execution Flag) in the IW□□□0B monitor parameter will change to 1 (Processing). When processing is completed, this bit will change to 0 (Completed).

4. Set OW□□□0A to 0 to execute the NOP motion subcommand.

This concludes the process for writing SERVOPACK parameters.

Related Parameters

The parameters that are related to this subcommand are listed in the following table.

◆ Setting Parameters

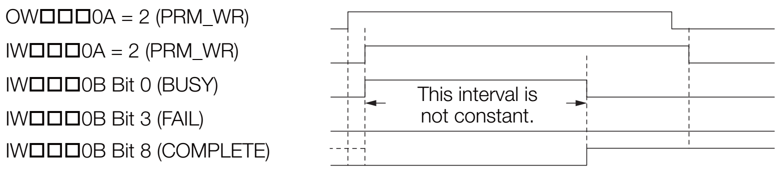
Register Address	Name	Setting Details
OW□□□09 Bit 8	SERVOPACK Parameter Access Selection	Use this bit to select the parameter to write. 0: Vendor-specific parameters 1: Common parameters
OW□□□0A	Motion Subcommands	Set this parameter to 2 (PRM_WR) to write a SERVOPACK parameter.
OW□□□54	Auxiliary SERVOPACK Parameter Number	Set the number of the SERVOPACK parameter to write.
OW□□□55	Auxiliary SERVOPACK Parameter Size	Set the size of the SERVOPACK parameter to write. Set the size in words. **Setting Precautions** The SERVOPACK user manual lists the parameter sizes in bytes, so those values must be converted to words.
OL□□□56	Auxiliary SERVOPACK Parameter Set Value	Set the set value data to write to the target SERVOPACK parameter.

◆ Monitor Parameters

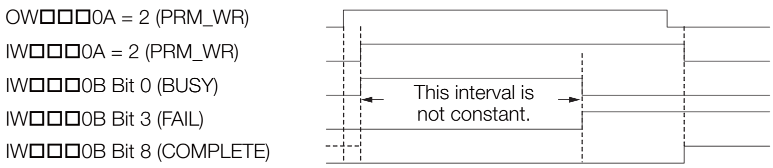
Register Address	Name	Monitored Contents
IW□□□0A	Motion Subcommand Response Code	This parameter shows the motion subcommand that is currently in execution. This parameter is 2 during execution of the PRM_WR command.
IW□□□0B Bit 0	Command Execution Flag	This bit is 1 (Processing) during execution of the PRM_WR command. The bit changes to 0 (Completed) when execution ends.
IW□□□0B Bit 3	Command Error End	This bit changes to 1 (Completed with an error) when an error occurs during execution of the PRM_WR command. This bit changes to 0 (Completed normally) when another command is executed.
IW□□□0B Bit 8	Command Execution Completed	This bit changes to 1 (Normal execution completed) when execution of the PRM_WR command ends.
IW□□□37	Auxiliary SERVOPACK Parameter Number	This parameter reports the number of the SERVOPACK parameter that was written.

Timing Charts

◆ Normal Completion



◆ Error Completion



4.3.4 INF_RD (Read Device Information)

The INF_RD subcommand reports the device information of the connected MECHATROLINK-III Servo Drive to the monitor parameters.

The target information is specified in the OW☐☐☐5B setting parameter (Device Information Selection Code).

Execution and Operating Procedures

1. Make sure that all of the following conditions are met.

No.	Execution Condition	Confirmation Method
1	Must be ready for motion operation.	Bit 0 in IW☐☐☐00 must be 1.
2	Motion command execution must be completed.	IW☐☐☐08 must be 0 and bit 0 in IW☐☐☐09 must be 0.

2. Set the OW☐☐☐5B setting parameter (Device Information Selection Code).

3. Set the OW☐☐☐0A setting parameter (Motion Subcommands) to 3 to execute the INF_RD motion subcommand.
The device information is reported in the monitor parameters.

4. Set OW☐☐☐0A to 0 to execute the NOP motion subcommand.

This concludes the read device information operation.

Related Parameters

The parameters that are related to this subcommand are listed in the following table.

◆ Setting Parameters

Register Address	Name	Setting Details
OW☐☐☐0A	Motion Subcommands	Set this parameter to 3 (INF_RD) to read device information.
OW☐☐☐5B	Device Information Selection Code	Select the device information to read. You can select the following devices. 00 hex: Disabled 01 hex: Vendor ID code 02 hex: Device code 03 hex: Device version 04 hex: Device information file version 05 hex: Serial number

◆ Monitor Parameters

Register Address	Name	Monitored Contents
IW☐☐☐0A	Motion Subcommand Response Code	This parameter shows the motion subcommand currently in execution. This parameter is 3 during execution of the INF_RD command.
IW☐☐☐0B Bit 0	Command Execution Flag	This bit changes to 0 (Completed) when the INF_RD operation will end.
IW☐☐☐0B Bit 3	Command Error End	This bit changes to 1 (Completed with an error) when an error occurs during execution of the INF_RD command. This bit changes to 0 (Completed normally) when another command is executed.
IW☐☐☐0B Bit 8	Command Execution Completed	This bit changes to 1 (Normal execution completed) when execution of the INF_RD command ends.

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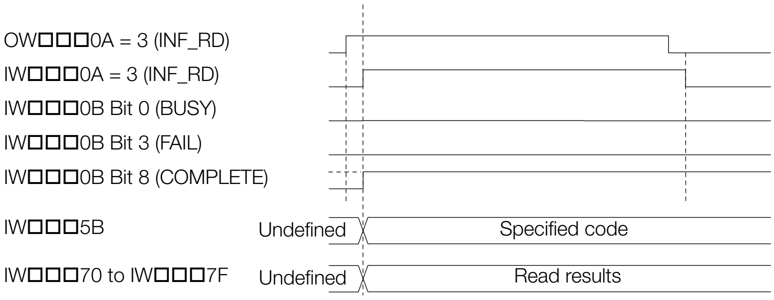
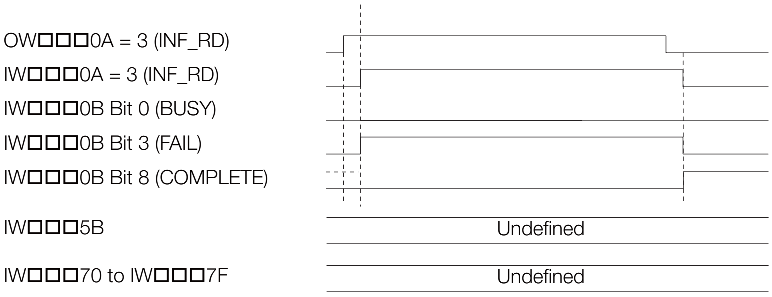
Register Address	Name	Monitored Contents
IW□□□5B	Device Information Monitor Code	This parameter reports the code that was read. 00 hex: Disabled 01 hex: Vendor ID code 02 hex: Device code 03 hex: Device version 04 hex: Device information file version 05 hex: Serial number
IW□□□70 to IW□□□7F	Device Information Monitor Data 1 to 16	Information that is read is reported in these registers. 01 hex: Vendor ID code (2 words) 02 hex: Device code (2 words) 03 hex: Device version (2 words) 04 hex: Device information file version (2 words) 05 hex: Serial number (16 words)

Timing Charts

◆ Normal Completion



◆ Error Completion



4.3.5 SMON (Monitor Status)

The SMON subcommand reports the data specified in Monitor 4 of the OW□□□4E setting parameter (SERVOPACK User Monitor Setting) in the IL□□□34 monitor parameter (SERVOPACK User Monitor 4).

The following table lists the data that can be specified in the User Monitor Setting parameter.

Set Value	Name	Description
0	APOS	Feedback position
1	MPOS	Reference position
2	PERR	Position deviation
3	LPOS1	Latch position 1
4	LPOS2	Latch position 2
5	FSPD	Feedback Speed
6	CSPD	Reference Speed
7	TRQ	Torque/force reference
8	ALARM	Detailed information on the first alarm
9	–	Reserved.
A	–	Reserved.
B	–	Reserved.
C	CMN1	Common monitor 1
D	CMN2	Common monitor 2
E	OMN1	Optional monitor 1 (Depends on the specifications of the product used.)
F	OMN2	Optional monitor 2 (Depends on the specifications of the product used.)

Important

1. Refer to the manual for your SERVOPACK for details on the content that you can monitor.
2. Some settings cannot be monitored for some SERVOPACK models.

Execution and Operating Procedures

1. Make sure that the following condition is met.

No.	Execution Condition	Confirmation Method
1	Execution of motion subcommands must be completed.*	IW□□□0A must be 0 and bit 0 in IW□□□0B must be 0.

* This subcommand cannot be executed until the execution of other motion subcommands is completed.

2. Set the OW□□□0A setting parameter (Motion Subcommands) to 4 to execute the SMON motion subcommand.

The information managed by the SERVOPACK is read and the code is stored in the monitor parameter.

The IW□□□0A monitor parameter (Motion Subcommand Response Code) is 4 during execution of this command.

During command processing, bit 0 (Command Execution Flag) in the IW□□□0B monitor parameter will change to 1 (Processing). When processing is completed, this bit will change to 0 (Completed).

3. Set OW□□□0A to 0 to execute the NOP motion subcommand.

This concludes the monitor status operation.

Related Parameters

The parameters that are related to this subcommand are listed in the following table.

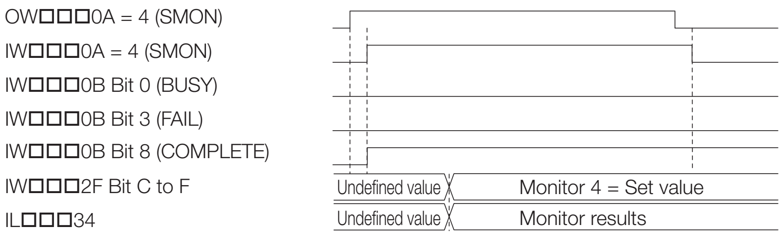
◆ Setting Parameters

Register Address	Name	Setting Details
OW□□□0A	Motion Subcommands	Set this parameter to 4 (SMON) to execute the monitor status subcommand.
OW□□□4E	SERVOPACK User Monitor Setting	Set the information managed by the SERVOPACK to monitor.

◆ Monitor Parameters

Register Address	Name	Monitored Contents
IW□□□0A	Motion Subcommand Response Code	This parameter shows the motion subcommand that is currently in execution. This parameter is 4 during execution of the SMON command.
IW□□□0B Bit 0	Command Execution Flag	This bit is 1 (Processing) during execution of the SMON command. The bit changes to 0 (Completed) when execution ends.
IW□□□0B Bit 3	Command Error End	This bit changes to 1 (Completed with an error) when an error occurs during execution of the SMON command. This bit changes to 0 (Completed normally) when another command is executed.
IW□□□0B Bit 8	Command Execution Completed	This bit changes to 1 (Normal execution completed) when execution of the SMON command ends.
IW□□□2F	SERVOPACK User Monitor Information	This parameter reports which data the user is actually monitoring.
IL□□□34	SERVOPACK User Monitor 4	This parameter reports the result of the selected monitor.

Timing Charts



4.3.6 FIXPRM_RD (Read Fixed Parameter)

The current value of the fixed parameter that is specified in the OW☐☐☐5C setting parameter (Fixed Parameter Number) is reported in the IL☐☐☐56 monitor parameter (Fixed Parameter Monitor).

Execution and Operating Procedures

1. **Make sure that the following condition is met.**

No.	Execution Condition	Confirmation Method
1	Execution of motion subcommands must be completed.*	IW☐☐☐0A must be 0 and bit 0 in IW☐☐☐0B must be 0.

* This subcommand cannot be executed until the execution of other motion subcommands is completed.

2. **Set the OW☐☐☐5C setting parameter (Fixed Parameter Number).**

3. **Set the OW☐☐☐0A setting parameter (Motion Subcommands) to 5 to execute the FIXPRM_RD motion subcommand.**
The current value of the specified fixed parameter is read, and the code is stored in the monitor parameter.
The IW☐☐☐0A monitor parameter (Motion Subcommand Response Code) is 5 during execution of this command.
During command processing, bit 0 in the IW☐☐☐0B monitor parameter will change to 1 (Processing). When processing is completed, this bit will change to 0 (Completed).

4. **Set OW☐☐☐0A to 0 to execute the NOP motion subcommand.**

This concludes the read fixed parameter operation.

Related Parameters

The parameters that are related to this subcommand are listed in the following table.

◆ Setting Parameters

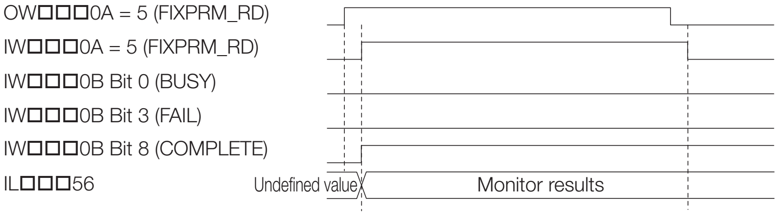
Register Address	Name	Setting Details
OW☐☐☐0A	Motion Subcommands	Set this parameter to 5 (FIXPRM_RD) to read a fixed parameter.
OW☐☐☐5C	Fixed Parameter Number	Set the number of the fixed parameter to read.

◆ Monitor Parameters

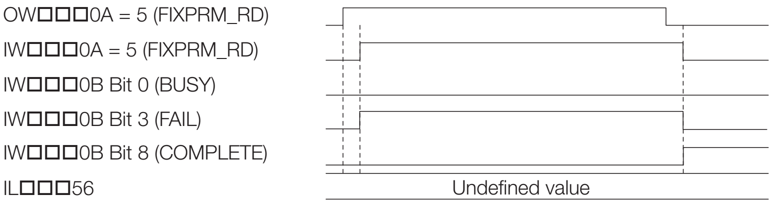
Register Address	Name	Monitored Contents
IW☐☐☐0A	Motion Subcommand Response Code	This parameter shows the motion subcommand that is currently in execution. This parameter is 5 during execution of the FIXPRM_RD command.
IW☐☐☐0B Bit 0	Command Execution Flag	This bit is 1 (Processing) during execution of the FIXPRM_RD command. The bit changes to 0 (Completed) when execution ends.
IW☐☐☐0B Bit 3	Command Error End	This bit changes to 1 (Completed with an error) when an error occurs during execution of the FIXPRM_RD command. This bit changes to 0 (Completed normally) when another command is executed.
IW☐☐☐0B Bit 8	Command Execution Completed	This bit changes to 1 (Normal execution completed) when execution of the FIXPRM_RD command ends.
IL☐☐☐56	Fixed Parameter Monitor	This parameter reports the fixed parameter data for the specified fixed parameter number.

Timing Charts

◆ Normal Completion



◆ Error Completion



4.3.7 FIXPRM_CHG (Change Fixed Parameter)

You can use FIXPRM_CHG subcommand to change the value of some of the fixed parameters from a user application. The results of the change are immediately applied when execution of the command ends.

The FIXPRM_CHG subcommand changes only the values in RAM. Therefore, any changes made are lost when the power supply to the MP3000 is turned OFF and ON again, or when data is saved on the Fixed Parameters Tab Page.

Furthermore, any changes that are made cannot be viewed on the MPE720. Use the FIXPRM_RD (Read Fixed Parameter) motion subcommand to confirm any changes that are made to fixed parameters with this motion subcommand.

The FIXPRM_CHG command can be used to change the following fixed parameters:

No.	Name	Setting Range	Setting Unit	Default
12	Positive Software Limit	-2^{31} to $2^{31}-1$	Reference units	$2^{31}-1$
14	Negative Software Limit	-2^{31} to $2^{31}-1$	Reference units	-2^{31}

Execution and Operating Procedures

1. **Make sure that the following condition is met.**

No.	Execution Condition	Confirmation Method
1	Execution of motion subcommands must be completed.*	IW□□□0A must be 0 and bit 0 in IW□□□0B must be 0.

* This subcommand cannot be executed until the execution of other motion subcommands is completed.

2. **Set the following setting parameters.**
   - OW□□□54 (Auxiliary SERVOPACK Parameter Number)
   - OL□□□56 (Auxiliary SERVOPACK Parameter Set Value)

Information
- OW□□□54 and OL□□□56 are normally used to set SERVOPACK parameter information, but for the FIXPRM_CHG subcommand, these parameters are used to set the fixed parameter information.
- An attempt to use this command to change any fixed parameters other than those listed in the above table will result in a Command Error End (i.e., bit 3 in IW□□□09 will change to 1).

3. **Set the OW□□□0A setting parameter (Motion Subcommands) to 6 to execute the FIXPRM_CHG motion subcommand.**
   The IW□□□0A monitor parameter (Motion Subcommand Response Code) is 6 during execution of this command.

4. **Set OW□□□0A to 0 to execute the NOP motion subcommand.**

This concludes the change fixed parameter operation.

Related Parameters

The parameters that are related to this subcommand are listed in the following tables.

◆ Setting Parameters

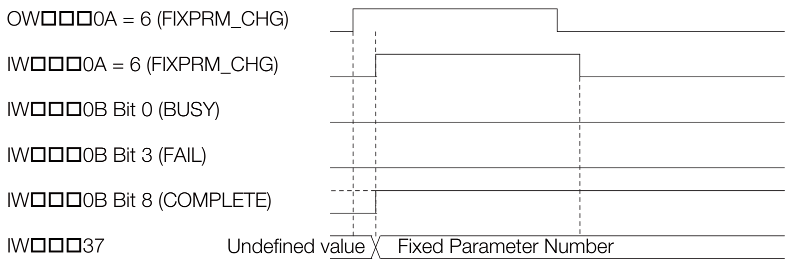
Register Address	Name	Setting Details
OW□□□0A	Motion Subcommands	Set this parameter to 6 (FIXPRM_CHG) to read a fixed parameter.
OW□□□54	Auxiliary SERVOPACK Parameter Number	Set the number of the fixed parameter to change.
OL□□□56	Auxiliary SERVOPACK Parameter Set Value	Set the new value for the target fixed parameter.

◆ Monitor Parameters

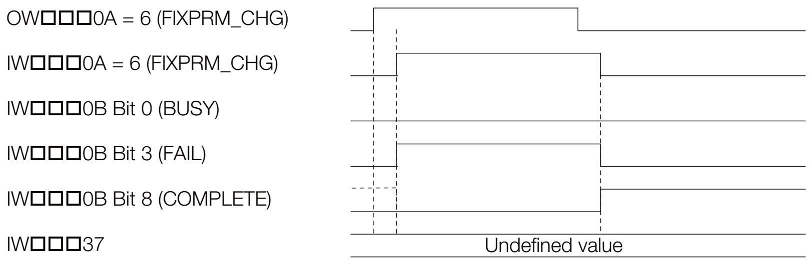
Register Address	Name	Monitored Contents
IW□□□0A	Motion Subcommand Response Code	This parameter shows the motion subcommand that is currently in execution. This parameter is 6 during execution of the FIXPRM_CHG command.
IW□□□0B Bit 0	Command Execution Flag	This bit is always 0 (Completed) for the FIXPRM_CHG command.
IW□□□0B Bit 3	Command Error End	This bit changes to 1 (Completed with an error) when an error occurs during execution of the FIXPRM_CHG command. This bit changes to 0 (Completed normally) when another command is executed.
IW□□□0B Bit 8	Command Execution Completed	This bit changes to 1 (Normal execution completed) when execution of the FIXPRM_CHG command ends.
IW□□□37	Auxiliary SERVOPACK Parameter Number	This parameter reports the number of the fixed parameter to change.

Timing Charts

◆ Normal Completion



◆ Error Completion



4.4 Changing the Command

This section provides tables that indicate whether changing to other commands is possible during motion command execution and whether subcommands can be executed. This section also describes operation changes that occur after the motion command is changed.

4.4.1 Motion Command and Subcommand Execution Judgment Table

SVC Function Module Motion Command Execution Judgment Table

The following table indicates whether changing to another command is possible during motion command execution.

Code	Current Command	New Command															
		0	1	2	3	4	6	7	8	9	10	11	12	13	14	15	16
		NOP	POS	EX_P	ZRET	INTE	LATC	FEED	STEP	ZSET	ACC	DCC	SCC	CHG	KVS	KPS	KFS
0	NOP	–	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
1	POSING	×	–	○	○	×	×	○	×	○	×	×	×	×	○	○	○
2	EX_POSING	×	Δ	–	○	×	×	○	×	Δ	×	×	×	×	Δ	Δ	Δ
3	ZRET	×	×	×	–	×	×	×	×	×	×	×	×	×	×	×	×
4	INTERPOLATE	○	○	○	○	–	○	○	○	○	○	○	○	○	○	○	○
6	LATCH	○	○	○	○	○	–	○	○	○	○	○	○	○	○	○	○
7	FEED	×	Δ	Δ	○	×	×	–	×	○	×	×	×	×	×	×	×
8	STEP	×	○	○	○	×	×	○	–	○	×	×	×	×	○	○	○
9	ZSET	○	○	○	○	○	○	○	○	–	○	○	○	○	○	○	○
10	ACC	●	●	●	●	●	●	●	●	●	–	●	●	●	●	●	●
11	DCC	●	●	●	●	●	●	●	●	●	●	–	●	●	●	●	●
12	SCC	●	●	●	●	●	●	●	●	●	●	●	–	●	●	●	●
13	CHG_FILTER	○	○	○	○	○	○	○	○	○	○	○	○	–	○	○	○
14	KVS	●	●	●	●	●	●	●	●	●	●	●	●	●	–	●	●
15	KPS	●	●	●	●	●	●	●	●	●	●	●	●	●	●	–	●
16	KFS	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	–
17	PRM_RD	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
18	PRM_WR	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
19	ALM_MON	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
20	ALM_HIST	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
21	ALMHIST_CLR	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
22	ABS_RST	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
23	VELO	×	○	○	×	×	×	○	○	×	×	×	×	×	×	×	×
24	TRQ	×	○	○	×	×	×	○	○	×	×	×	×	×	×	×	×
25	PHASE	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
26	KIS	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
27	PPRM_WR	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
34	EX_FEED	×	Δ	Δ	○	×	×	○	×	○	×	×	×	×	×	×	×
35	MEM_RD	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

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Code	Current Command	New Command															
		0	1	2	3	4	6	7	8	9	10	11	12	13	14	15	16
		NOP	POS	EX_P	ZRET	INTE	LATC	FEED	STEP	ZSET	ACC	DCC	SCC	CHG	KVS	KPS	KFS
36	MEM_WR	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
37	PMEM_RD	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
38	PMEM_WR	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
39	MLTTRN_SET	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

Code	Current Command	New Command																
		17	18	19	20	21	22	23	24	25	26	27	34	35	36	37	38	39
		PRM_	PRM_	ALM_	ALM_	ALMH	ABS_	VELO	TRQ	PHAS	KIS	PPR	EX_F	MEM_	MEM_	PMEM	PMEM	MLTT
0	NOP	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
1	POSING	○	○	○	○	○	○	○	○	○	○	×	○	○	○	○	○	○
2	EX_POSING	Δ	Δ	Δ	Δ	Δ	Δ	×	×	×	Δ	×	○	Δ	Δ	Δ	Δ	Δ
3	ZRET	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
4	INTERPOLATE	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
6	LATCH	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
7	FEED	×	×	×	×	×	×	○	○	○	×	×	○	×	×	×	×	×
8	STEP	○	○	○	○	○	○	○	○	○	○	×	○	○	○	○	○	○
9	ZSET	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
10	ACC	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
11	DCC	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
12	SCC	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
13	CHG_FILTER	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
14	KVS	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
15	KPS	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
16	KFS	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
17	PRM_RD	–	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
18	PRM_WR	●	–	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
19	ALM_MON	●	●	–	●	●	●	●	●	●	●	●	●	●	●	●	●	●
20	ALM_HIST	●	●	●	–	●	●	●	●	●	●	●	●	●	●	●	●	●
21	ALMHIST_CLR	●	●	●	●	–	●	●	●	●	●	●	●	●	●	●	●	●
22	ABS_RST	●	●	●	●	●	–	●	●	●	●	●	●	●	●	●	●	●
23	VELO	×	×	×	×	×	×	–	○	○	×	×	○	×	×	×	×	×
24	TRQ	×	×	×	×	×	×	○	–	○	×	×	○	×	×	×	×	×
25	PHASE	○	○	○	○	○	○	○	○	–	○	○	○	○	○	○	○	○
26	KIS	●	●	●	●	●	●	●	●	●	–	●	●	●	●	●	●	●
27	PPRM_WR	●	●	●	●	●	●	●	●	●	●	–	●	●	●	●	●	●
34	EX_FEED	×	×	×	×	×	×	○	○	○	×	×	–	×	×	×	×	×
35	MEM_RD	●	●	●	●	●	●	●	●	●	●	●	●	–	●	●	●	●
36	MEM_WR	●	●	●	●	●	–	●	●	●	●	●	●	●	–	●	●	–
37	PMEM_RD	●	●	●	●	●	●	●	●	●	●	●	●	●	●	–	●	●
38	PMEM_WR	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	–	●
39	MLTTRN_SET	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	–

Note: ○: Indicates commands that can be changed to.

Δ: Indicates commands that can be executed only when the absolute value specification method is selected for the position reference type. If the incremental addition method is selected, the axis stops when the command is changed.

× : Indicates when the current command is canceled and the axis decelerates to a stop.

●: Indicates commands that are ignored. Processing for the current command will continue.

Changing from the INTERPOLATE, LATCH, or PHASE command to the SCC or CHG_FILTER command before distribution is completed will cause a command error.

SVC Function Module Motion Subcommand Execution Judgment Table

The following table shows which subcommands can be executed during execution of motion commands.

Code	Current Motion Command	New Subcommand						
		0	1	2	3	4	5	6
		NOP	PRM_RD	PRM_WR	INF_RD	SMON	FIXPRM_RD	FIXPRM_CHG
0	NOP	○	○	○	○	○	○	○
1	POSING	○	○	○	○	○	○	○
2	EX_POSING	○	×	×	○	○	○	○
3	ZRET	○	×	×	○	○	○	○
4	INTERPOLATE	○	○	○	○	○	○	○
6	LATCH	○	○	○	○	○	○	○
7	FEED	○	○	○	○	○	○	○
8	STEP	○	○	○	○	○	○	○
9	ZSET	○	○	○	○	○	○	○
10	ACC	○	×	×	○	○	○	○
11	DCC	○	×	×	○	○	○	○
12	SCC	○	×	×	○	○	○	○
13	CHG_FILTER	○	○	○	○	○	○	○
14	KVS	○	×	×	○	○	○	○
15	KPS	○	×	×	○	○	○	○
16	KFS	○	×	×	○	○	○	○
17	PRM_RD	○	×	×	○	○	○	○
18	PRM_WR	○	×	×	○	○	○	○
19	ALM_MON	○	×	×	○	○	○	○
20	ALM_HIST	○	×	×	○	○	○	○
21	ALMHIST_CLR	○	×	×	○	○	○	○
22	ABS_RST	○	×	×	×	○	×	×
23	VELO	○	○	○	○	○	○	○
24	TRQ	○	○	○	○	○	○	○
25	PHASE	○	○	○	○	○	○	○
26	KIS	○	×	×	○	○	○	○
27	PPRM_WR	○	×	×	○	○	○	○
34	EX_FEED	○	×	×	○	○	○	○
35	MEM_RD	○	×	×	○	○	○	○
36	MEM_WR	○	×	×	○	○	○	○
37	PMEM_RD	○	×	×	○	○	○	○
38	PMEM_WR	○	×	×	○	○	○	○
39	MLTTRN_SET	○	×	×	×	○	×	×

Note: ○: Indicates subcommands that can be executed.
×: Indicates subcommands that cannot be executed.

SVR Function Module Motion Command Execution Judgment Table

Code	Current Command	New Command															
		0	1	2	3	4	6	7	8	9	10	11	12	13	23	24	25
		NOP	POS	EX_P	ZRET	INTE	LATC	FEED	STEP	ZSET	ACC	DCC	SCC	CHG	VELO	TRQ	PHAS
0	NOP	–	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
1	POSING	×	–	○	○	×	×	○	×	○	×	×	×	×	○	○	○
2	EX_POSING	×	Δ	–	○	×	×	○	×	○	×	×	×	×	Δ	Δ	Δ
3	ZRET	×	×	×	–	×	×	×	×	×	×	×	×	×	×	×	×
4	INTERPOLATE	○	○	○	○	–	○	○	○	○	○	○	○	○	○	○	○
6	LATCH	○	○	○	○	○	–	○	○	○	○	○	○	○	○	○	○
7	FEED	×	Δ	Δ	×	×	×	–	×	×	×	×	×	×	×	×	×
8	STEP	×	○	○	×	×	×	○	–	×	×	×	×	×	○	○	○
9	ZSET	○	○	○	×	○	○	○	○	–	○	×	○	○	○	○	○
10	ACC	×	×	×	×	×	×	×	×	×	–	×	×	×	×	×	×
11	DCC	×	×	×	×	×	×	×	×	×	×	–	×	×	×	×	×
12	SCC	×	×	×	×	×	×	×	×	×	×	×	–	×	×	×	×
13	CHG_FILTER	○	○	○	×	○	○	○	○	×	○	×	○	–	○	○	○
23	VELO	×	○	○	×	×	×	○	○	×	×	×	×	×	–	×	×
24	TRQ	×	○	○	×	×	×	○	○	×	×	×	×	×	×	–	×
25	PHASE	×	Δ	Δ	×	×	×	×	×	×	×	×	×	×	×	×	–

Note: ○ : Indicates commands that can be changed to.

Δ : Indicates commands that can be executed only when the absolute value specification method is selected for the position reference type. If the incremental addition method is selected, the axis stops when the command is changed.

×: Indicates when the current command is canceled and the axis decelerates to a stop.

4.4.2 Operation after Changing the Motion Command

The 13 motion commands related to axis motion that are listed below are extracted from the following table: *SVC Function Module Motion Command Execution Judgment Table*.

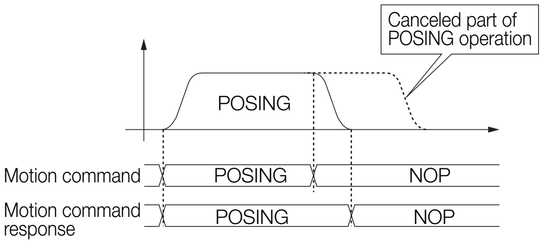
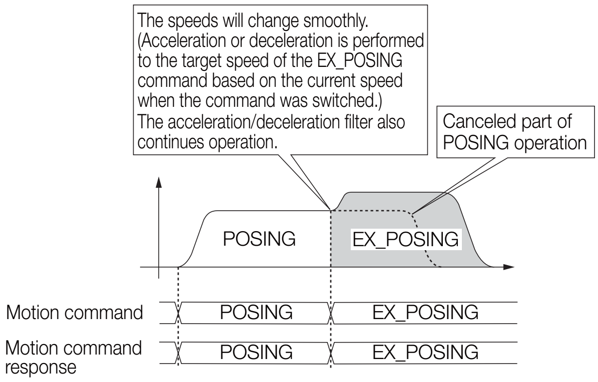
Code	Current Command	New Command												
		0	1	2	3	4	6	7	8	9	23	24	25	34
		NOP	POS	EX_P	ZRET	INTE	LAT	FEED	STEP	ZSET	VELO	TRQ	PHAS	EX_FE
0	NOP	–	○	○	○	○	○	○	○	○	○	○	○	○
1	POSING	×	–	○	○	×	×	○	×	○	○	○	○	○
2	EX_POSING	×	○	–	○	×	×	○	×	○	○	○	○	○
3	ZRET	×	×	×	–	×	×	×	×	×	×	×	×	×
4	INTERPOLATE	○	○	○	○	–	○	○	○	○	○	○	○	○
6	LATCH	○	○	○	○	○	–	○	○	○	○	○	○	○
7	FEED	×	○	○	○	×	×	–	×	○	○	○	○	○
8	STEP	×	○	○	○	×	×	○	–	○	○	○	○	○
9	ZSET	○	○	○	○	○	○	○	×	–	○	○	○	○
23	VELO	×	○	○	×	×	×	○	○	×	–	○	○	○
24	TRQ	×	○	○	×	×	×	○	○	×	○	–	○	○
25	PHASE	○	○	○	○	○	○	○	○	○	○	○	–	○
34	EX_FEED	×	○	○	○	×	×	○	×	○	○	○	○	–

Note: ○: Indicates commands that can be changed to.
×: Indicates commands for which the current command is canceled and the axis decelerates to a stop. Then, the new command is executed.

Detailed descriptions of the changes in axis motion when any of the above 13 commands are changed to another command during execution are provided below.

Switching from the POSING Motion Command

This section describes the operation when switching to another command during execution of the POSING command.

Command before Switching	Command after Switching	Operation
POSING	NOP	The motion command switches to the NOP command after the axis decelerates to a complete stop.  Canceled part of POSING operation
	POSING	The POSING operation continues.
	EX_POSING	The motion command immediately switches to the EX_POSING command. When this occurs, the travel distance that is stored in the acceleration/deceleration filter is distributed. When execution of the EX_POSING command is started, the related SERVOPACK parameters are written, and then the positioning operation starts.  The speeds will change smoothly. (Acceleration or deceleration is performed to the target speed of the EX_POSING command based on the current speed when the command was switched.) The acceleration/deceleration filter also continues operation. Canceled part of POSING operation **Changing OL□□□1C (Position Reference Setting) during Deceleration** • Using the Incremental Value Addition Method (When Bit 5 in OW□□□09 Is Set to 0) The setting of OL□□□1C (Position Reference Setting) is ignored. • Using the Absolute Value Specification Method (When Bit 5 in OW□□□09 Is Set To 1) The target position is the value of OL□□□1C (Position Reference Setting) when execution of the EX_POSING command is started. **Precautions** Do not change the Position Reference Setting parameter during deceleration. Doing so may cause a decrease in speed because the related parameters are written at the start of EX_POSING execution.

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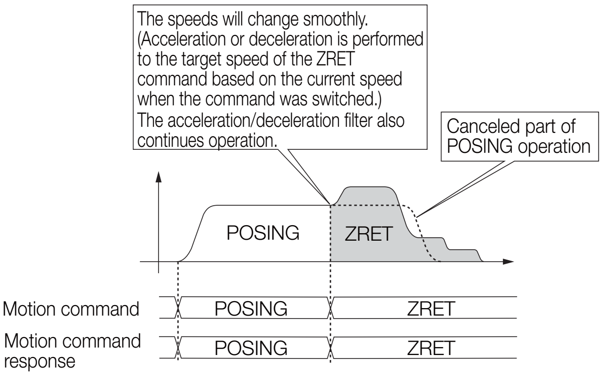
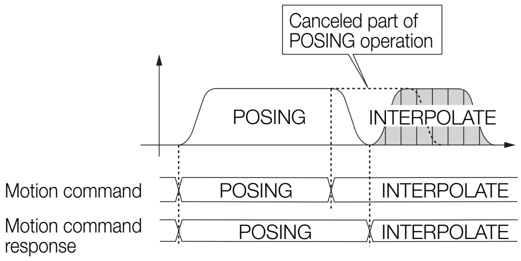
Command before Switching	Command after Switching	Operation
POSING	ZRET	The motion command immediately switches to the ZRET command. When this occurs, the travel distance that is stored in the acceleration/deceleration filter is distributed. When execution of ZRET is started, the related SERVOPACK parameters are written, and then the origin return operation starts.  **Precautions** The speed may decrease because the related parameters are written at the start of ZRET execution.
	INTERPOLATE	The motion command switches to the INTERPOLATE command after the axis decelerates to a complete stop.  **Changing OL□□□1C (Position Reference Setting) during Deceleration** • Using the Incremental Value Addition Method (When Bit 5 in OW□□□09 Is Set to 0) Any change to OL□□□1C (Position Reference Setting) is ignored. • Using the Absolute Value Specification Method (When Bit 5 in OW□□□09 Is Set to 1) The change to OL□□□1C (Position Reference Setting) is output in the first high-speed scan after execution of the INTERPOLATE command is started. **Precautions** Do not change the Position Reference Setting parameter during deceleration.
	LATCH	Same as the INTERPOLATE command.

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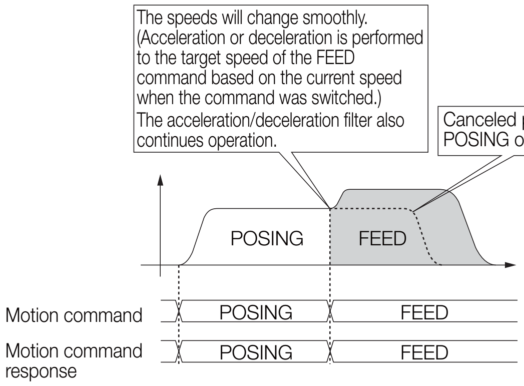
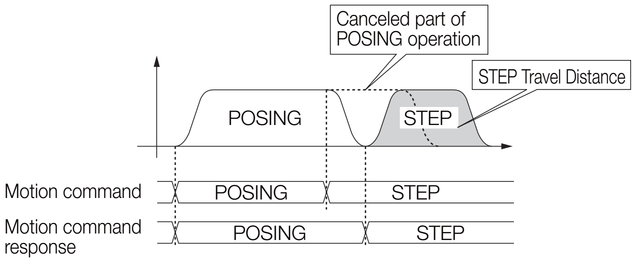
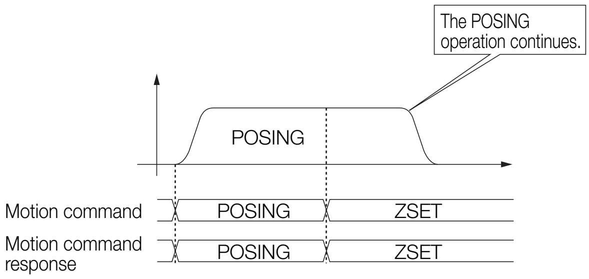
Command before Switching	Command after Switching	Operation
POSING	FEED	The motion command immediately switches to the FEED command, and the travel distance that is stored in the acceleration/deceleration filter is continued. 
	STEP	The motion command switches to the STEP command after the axis decelerates to a complete stop. 
	ZSET	The motion command immediately switches to the ZSET command, and the positioning operation continues.  **Precautions** In actual operation, set the origin by executing ZSET when positioning has been completed.

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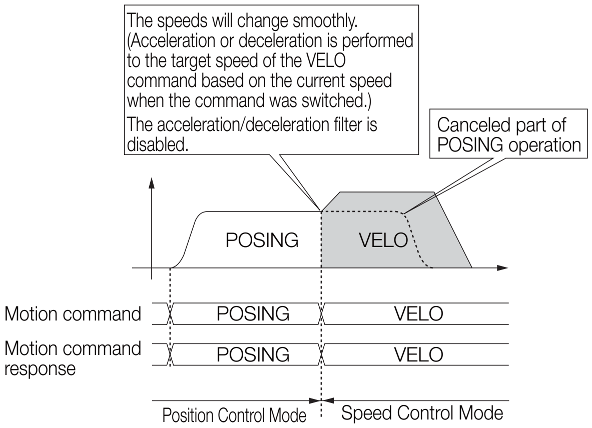
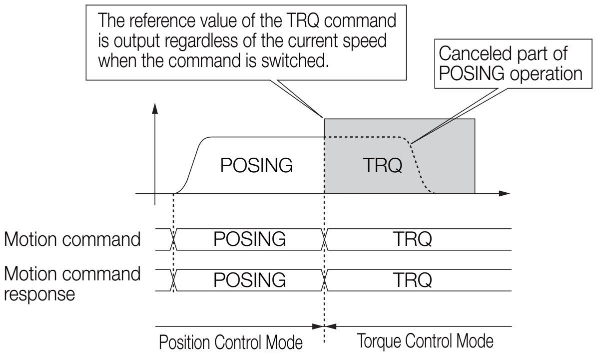
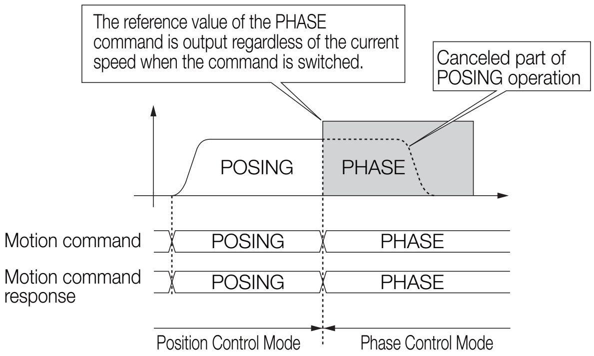
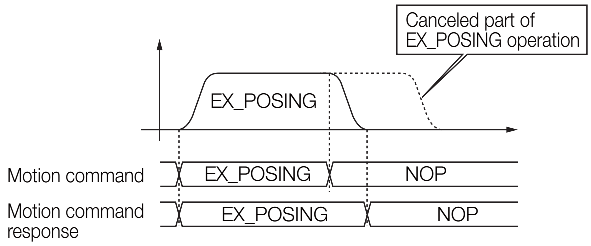
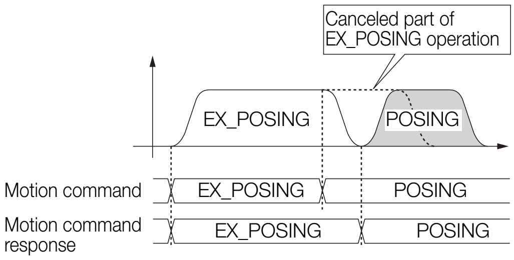
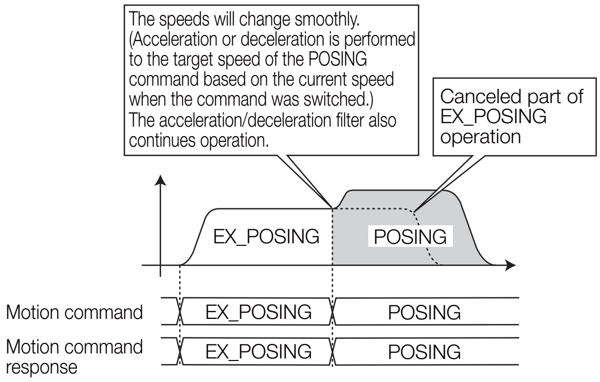
Command before Switching	Command after Switching	Operation
POSING	VELO	The motion command immediately switches to the VELO command, and the control mode switches from position control to speed control. The travel distance that is stored in the acceleration/deceleration filter is canceled.  The speeds will change smoothly. (Acceleration or deceleration is performed to the target speed of the VELO command based on the current speed when the command was switched.) The acceleration/deceleration filter is disabled. Canceled part of POSING operation **Precautions** After switching to VELO, the VELO command operates without the acceleration/deceleration filter. To enable the acceleration/deceleration filter, hold the POSING operation by executing the NOP command. Then, check that bit 0 (Distribution Completed) in IW□□□0C is 1 (Completed) before you execute the VELO command.
	TRQ	The motion command immediately switches to the TRQ command, and the control mode switches from position control to torque control. The travel distance that is stored in the acceleration/deceleration filter is canceled.  The reference value of the TRQ command is output regardless of the current speed when the command is switched. Canceled part of POSING operation **Precautions** After switching the command, the TRQ command operates without the acceleration/deceleration filter because the acceleration/deceleration filter is disabled for the TRQ command.
	PHASE	The motion command immediately switches to the PHASE command, and the control mode switches from position control to phase control.  The reference value of the PHASE command is output regardless of the current speed when the command is switched. Canceled part of POSING operation
	EX_FEED	Same as for the FEED command.

Switching from the EX_POSING Motion Command

This section describes the operation when switching to another command during execution of the EX_POSING command.

Command before Switching	Command after Switching	Operation
EX_POSING	NOP	The motion command switches to the NOP command after the axis decelerates to a complete stop. 
	POSING	• Using the Incremental Value Addition Method (When Bit 5 in OW□□□09 Is Set to 0) The motion command switches to the POSING command after the axis decelerates to a complete stop.  Incremental value = Target position - IL□□□14 (DPOS) OL□□□1C = OL□□□1C + Incremental value **Precautions** Any change to OL□□□1C (Position Reference Setting) during deceleration is ignored. • Using the Absolute Value Specification Method (When Bit 5 in OW□□□09 Is Set to 1) The motion command immediately switches to the POSING command, and the travel distance that is stored in the acceleration/deceleration filter is continued.  The set value for OL□□□1C (Position Reference Setting) is as follows: OL□□□1C = Target position
	EX_POSING	The EX_POSING operation continues.

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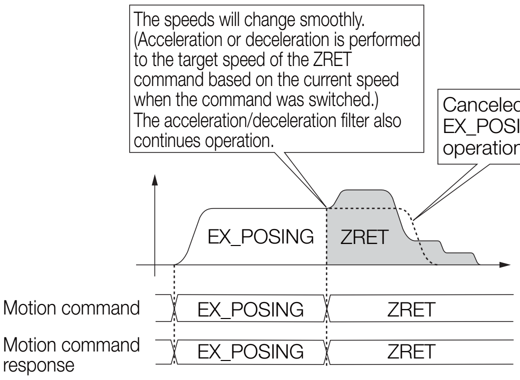
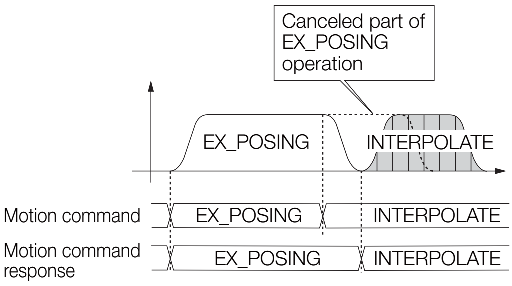
Command before Switching	Command after Switching	Operation
EX_POSING	ZRET	The motion command immediately switches to the ZRET command, and the travel distance that is stored in the acceleration/deceleration filter is continued.  **Precautions** The speed may decrease because the related parameters are written at the start of ZRET execution.
	INTERPOLATE	The motion command switches to the INTERPOLATE command after the axis decelerates to a complete stop.  **Changing OL□□□1C (Position Reference Setting) during Deceleration** • Using the Incremental Value Addition Method (When Bit 5 in OW□□□09 Is Set to 0) Any change to OL□□□1C (Position Reference Setting) is ignored. • Using the Absolute Value Specification Method (When Bit 5 in OW□□□09 Is Set to 1) The change to OL□□□1C (Position Reference Setting) is output in the first high-speed scan after execution of the INTERPOLATE command is started. **Precautions** Do not change the Position Reference Setting parameter during deceleration.
	LATCH	Same as the INTERPOLATE command.

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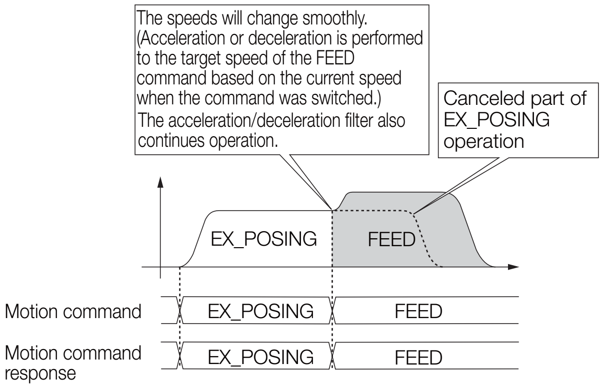
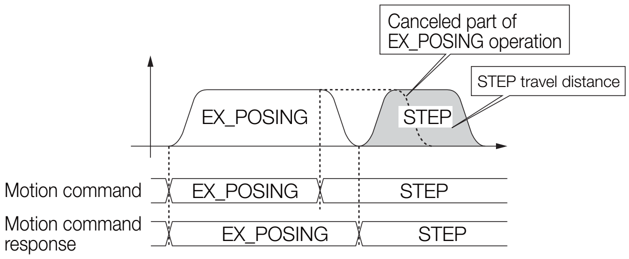
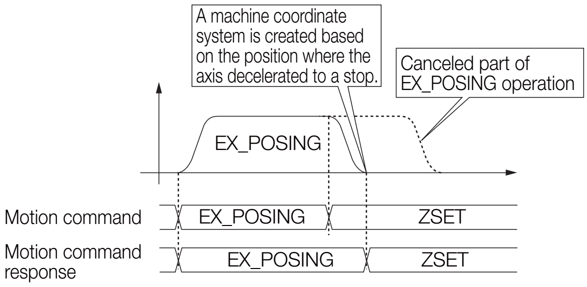
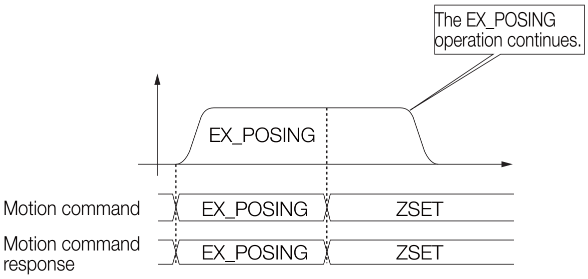
Command before Switching	Command after Switching	Operation
EX_POSING	FEED	The motion command immediately switches to the FEED command, and the travel distance that is stored in the acceleration/deceleration filter is continued.  The speeds will change smoothly. (Acceleration or deceleration is performed to the target speed of the FEED command based on the current speed when the command was switched.) The acceleration/deceleration filter also continues operation. Canceled part of EX_POSING operation
	STEP	The motion command switches to the STEP command after the axis decelerates to a complete stop.  Canceled part of EX_POSING operation STEP travel distance
	ZSET	• Using the Incremental Value Addition Method (When Bit 5 in OW□□□09 Is Set to 0) The motion command switches to the ZSET command after the axis decelerates to a complete stop.  A machine coordinate system is created based on the position where the axis decelerated to a stop. Canceled part of EX_POSING operation • Using the Absolute Value Specification Method (When Bit 5 in OW□□□09 Is Set to 1) The motion command immediately switches to the ZSET command, and the positioning operation continues.  The EX_POSING operation continues. **Precautions** In actual operation, set the origin by executing ZSET when positioning has been completed.

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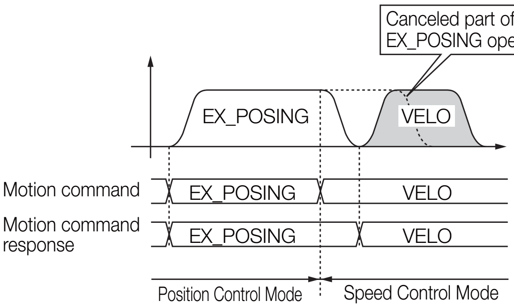
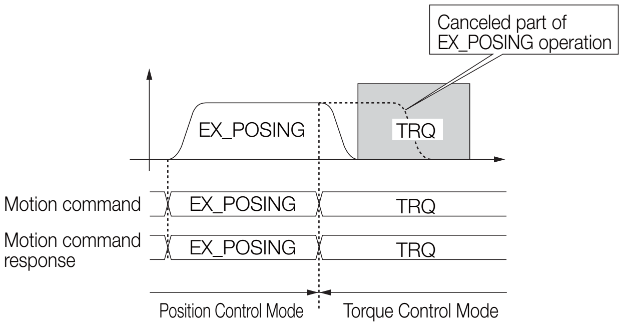
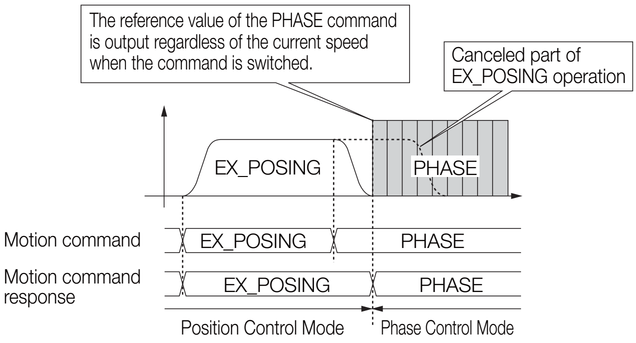
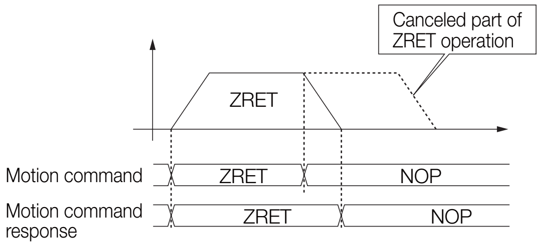
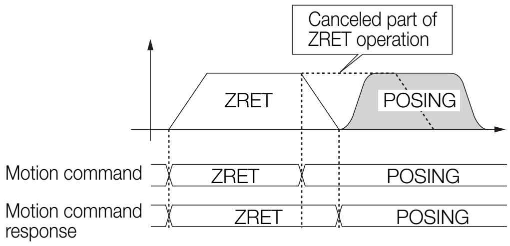
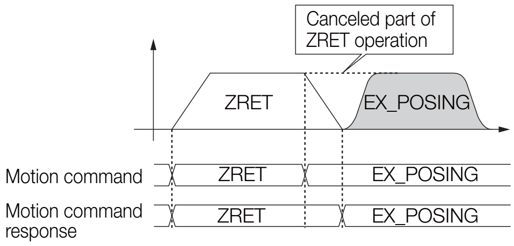
Command before Switching	Command after Switching	Operation
EX_POSING	VELO	The motion command switches to the VELO command after the axis decelerates to a complete stop, and the control mode switches from position control to speed control. 
	TRQ	The motion command switches to the TRQ command after the axis decelerates to a complete stop, and the control mode switches from position control to torque control.  **Precautions** After switching the command, the TRQ command operates without the acceleration/deceleration filter because the acceleration/deceleration filter is disabled for the TRQ command.
	PHASE	The motion command switches to the PHASE command after the axis decelerates to a complete stop, and the control mode switches from position control to phase control. 
	EX_FEED	Same as for the FEED command.

Switching from the ZRET Motion Command

This section describes the operation when switching to another command during execution of the ZRET command.

Command before Switching	Command after Switching	Operation
ZRET	NOP	The motion command switches to the NOP command after the axis decelerates to a complete stop. 
	POSING	The motion command switches to the POSING command after the axis decelerates to a complete stop.  **Changing OL□□□1C (Position Reference Setting) during Deceleration** • Using the Incremental Value Addition Method (When Bit 5 in OW□□□09 Is Set to 0) Any change to OL□□□1C (Position Reference Setting) is ignored. • Using the Absolute Value Specification Method (When Bit 5 in OW□□□09 Is Set to 1) The target position is the value of OL□□□1C (Position Reference Setting) when execution of the POSING command is started. **Precautions** Do not change the Position Reference Setting parameter during deceleration.
	EX_POSING	The motion command switches to the EX_POSING command after the axis decelerates to a complete stop. When execution of the EX_POSING command is started, the related SERVOPACK parameters are written, and then the positioning operation starts.  **Changing OL□□□1C (Position Reference Setting) during Deceleration** • Using the Incremental Value Addition Method (When Bit 5 in OW□□□09 Is Set to 0) Any change to OL□□□1C (Position Reference Setting) is ignored. • Using the Absolute Value Specification Method (When Bit 5 in OW□□□09 Is Set to 1) The target position is the value of OL□□□1C (Position Reference Setting) when execution of the EX_POSING command is started. **Precautions** Do not change the Position Reference Setting parameter during deceleration.

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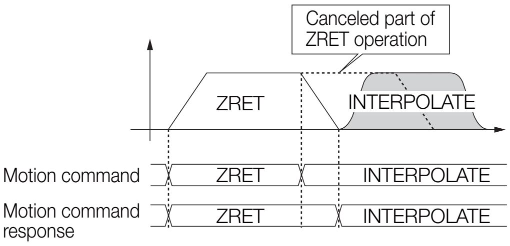
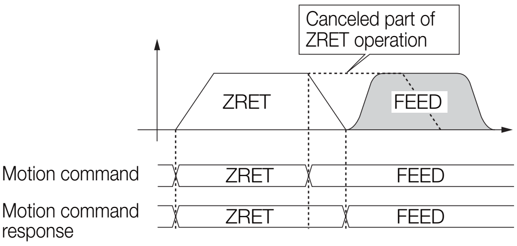
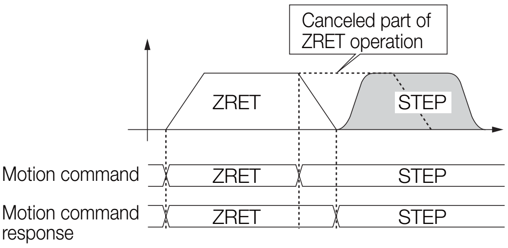
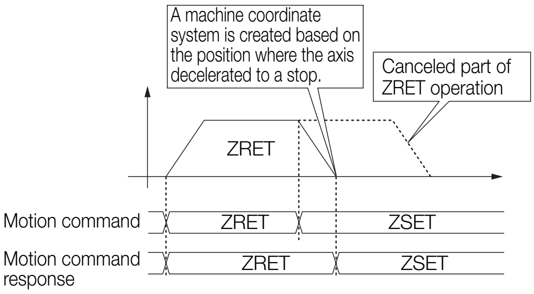
Command before Switching	Command after Switching	Operation
ZRET	ZRET	The ZRET operation continues.
	INTERPOLATE	The motion command switches to the INTERPOLATE command after the axis decelerates to a complete stop.  **Changing OL□□□1C (Position Reference Setting) during Deceleration** • Using the Incremental Value Addition Method (When Bit 5 in OW□□□09 Is Set to 0) Any change to OL□□□1C (Position Reference Setting) is ignored. • Using the Absolute Value Specification Method (When Bit 5 in OW□□□09 Is Set to 1) The change to OL□□□1C (Position Reference Setting) is output in the first high-speed scan after execution of the INTERPOLATE command is started. **Precautions** Do not change the Position Reference Setting parameter during deceleration.
	LATCH	Same as the INTERPOLATE command.
	FEED	The motion command switches to the FEED command after the axis decelerates to a complete stop. 
	STEP	The motion command switches to the STEP command after the axis decelerates to a complete stop. 
	ZSET	The ZSET command is executed when the axis has decelerated to a complete stop. 

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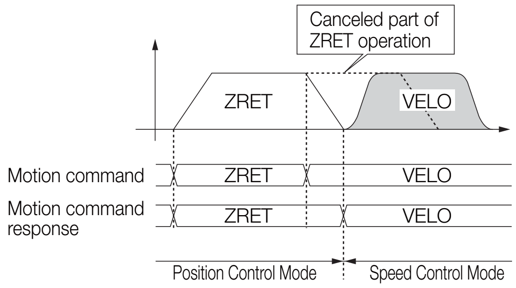
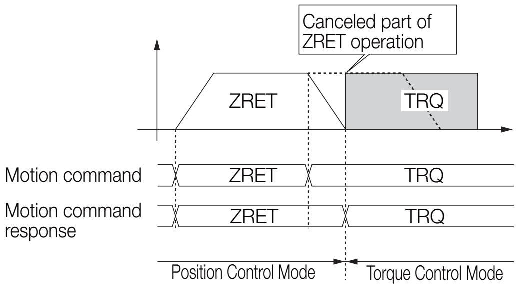
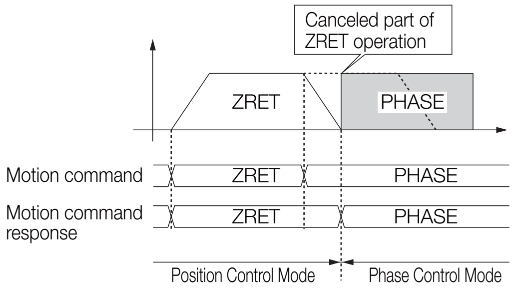
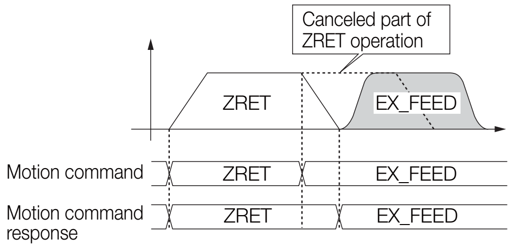
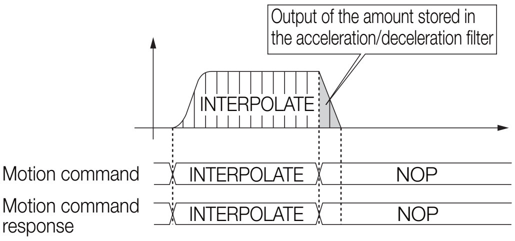
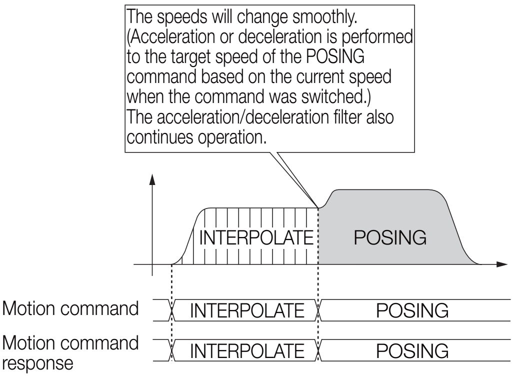
Command before Switching	Command after Switching	Operation
ZRET	VELO	The motion command switches to the VELO command after the axis decelerates to a complete stop. 
	TRQ	The motion command switches to the TRQ command after the axis decelerates to a complete stop. 
	PHASE	The motion command switches to the PHASE command after the axis decelerates to a complete stop. 
	EX_FEED	The motion command switches to the EX_FEED command after the axis decelerates to a complete stop. When execution of the EX_FEED command is started, the related SERVOPACK parameters are written, and then the jogging operation starts. 

Switching from the INTERPOLATE Motion Command

This section describes the operation when switching to another command during execution of the INTERPOLATE command.

Command before Switching	Command after Switching	Operation
INTERPOLATE	NOP	The motion command immediately switches to the NOP command, and the travel distance that is stored in the acceleration/deceleration filter is distributed. 
	POSING	The motion command immediately switches to the POSING command, and the travel distance that is stored in the acceleration/deceleration filter is continued.  The value of OL□□□1C (Position Reference Setting) when the motion command is switched is as follows: • Using the Incremental Value Addition Method (When Bit 5 in OW□□□09 Is Set to 0) Incremental value = Target position – IL□□□14 (DPOS) OL□□□1C = OL□□□1C + Incremental value • Using the Absolute Value Specification Method (When Bit 5 in OW□□□09 Is Set to 1) OL□□□1C = Target position

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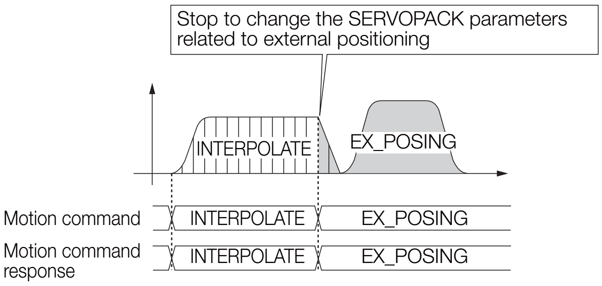
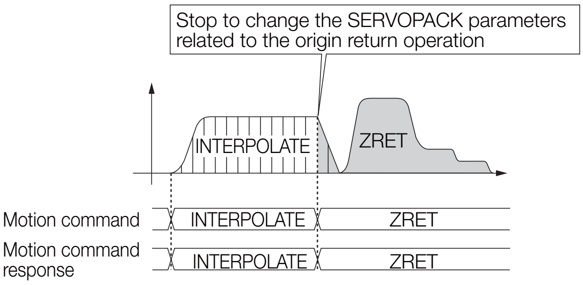
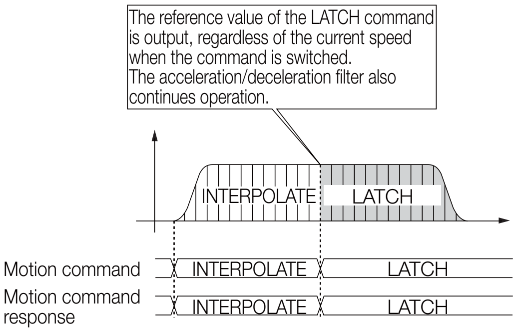
Command before Switching	Command after Switching	Operation
INTERPOLATE	EX_POSING	The motion command immediately switches to the EX_POSING command, and the travel distance that is stored in the acceleration/deceleration filter is distributed. When execution of the EX_POSING command is started, the related SERVOPACK parameters are written, and then the positioning operation starts.  Stop to change the SERVOPACK parameters related to external positioning The value of OL□□□1C (Position Reference Setting) when the motion command is switched is as follows: • Using the Incremental Value Addition Method (When Bit 5 in OW□□□09 Is Set to 0) Incremental value = Target position – IL□□□14 (DPOS) OL□□□1C = OL□□□1C + Incremental value • Using the Absolute Value Specification Method (When Bit 5 in OW□□□09 Is Set to 1) OL□□□1C = Target position
	ZRET	The motion command immediately switches to the ZRET command, and the travel distance that is stored in the acceleration/deceleration filter is distributed. When execution of ZRET is started, the related SERVOPACK parameters are written, and then the origin return operation starts.  Stop to change the SERVOPACK parameters related to the origin return operation
	INTERPOLATE	The INTERPOLATE operation continues.
	LATCH	The motion command immediately switches to the LATCH command, and the travel distance that is stored in the acceleration/deceleration filter is continued.  The reference value of the LATCH command is output, regardless of the current speed when the command is switched. The acceleration/deceleration filter also continues operation.

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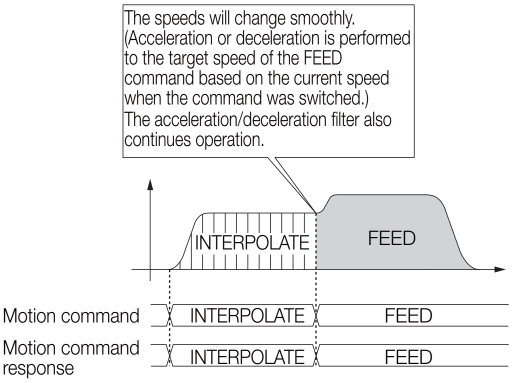
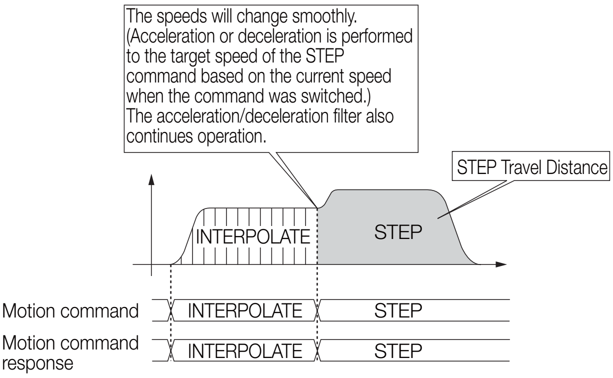
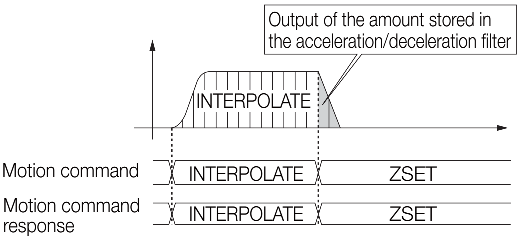
Command before Switching	Command after Switching	Operation
INTERPOLATE	FEED	The motion command immediately switches to the FEED command, and the travel distance that is stored in the acceleration/deceleration filter is continued.  The speeds will change smoothly. (Acceleration or deceleration is performed to the target speed of the FEED command based on the current speed when the command was switched.) The acceleration/deceleration filter also continues operation.
	STEP	The motion command immediately switches to the STEP command, and the travel distance that is stored in the acceleration/deceleration filter is continued.  The speeds will change smoothly. (Acceleration or deceleration is performed to the target speed of the STEP command based on the current speed when the command was switched.) The acceleration/deceleration filter also continues operation.
	ZSET	The motion command immediately switches to the ZSET command, and the travel distance that is stored in the acceleration/deceleration filter is distributed.  Output of the amount stored in the acceleration/deceleration filter **Precautions** In actual operation, set the origin by executing ZSET when positioning has been completed.

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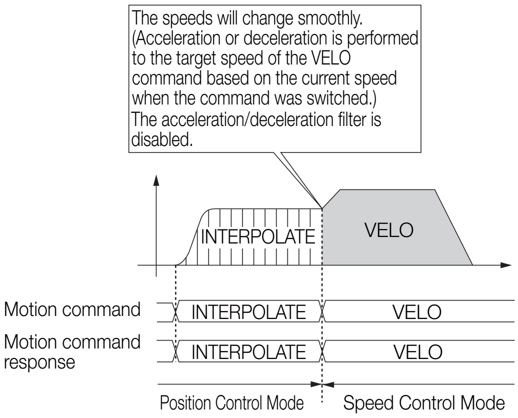
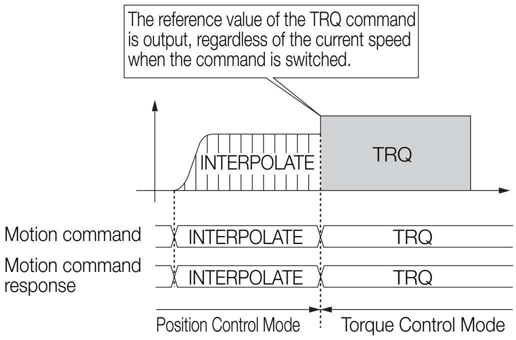
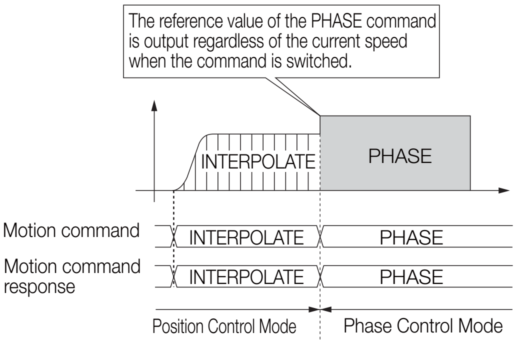
Command before Switching	Command after Switching	Operation
INTERPOLATE	VELO	The motion command immediately switches to the VELO command, and the control mode switches from position control to speed control. The travel distance that is stored in the acceleration/deceleration filter is canceled.  The speeds will change smoothly. (Acceleration or deceleration is performed to the target speed of the VELO command based on the current speed when the command was switched.) The acceleration/deceleration filter is disabled. **Precautions** After switching to VELO, the VELO command operates without the acceleration/deceleration filter. To enable the acceleration/deceleration filter, hold the INTERPOLATE operation by executing the NOP command. Then, check that bit 0 (Distribution Completed) in IW□□□0C is 1 (Completed) before you execute the VELO command.
	TRQ	The motion command immediately switches to the TRQ command, and the control mode switches from position control to torque control. At this time, the travel distance that is stored in the acceleration/deceleration filter is canceled.  The reference value of the TRQ command is output, regardless of the current speed when the command is switched. **Precautions** After switching the command, the TRQ command operates without the acceleration/deceleration filter because the acceleration/deceleration filter is disabled for the TRQ command.
	PHASE	The motion command immediately switches to the PHASE command, and the control mode switches from position control to phase control.  The reference value of the PHASE command is output regardless of the current speed when the command is switched.

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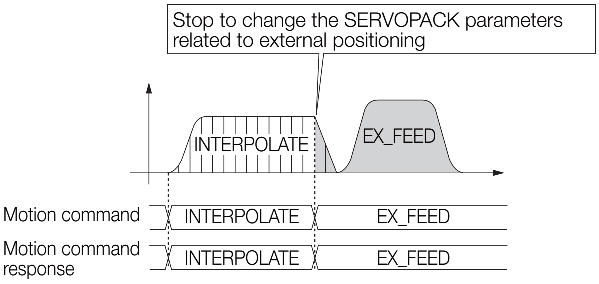
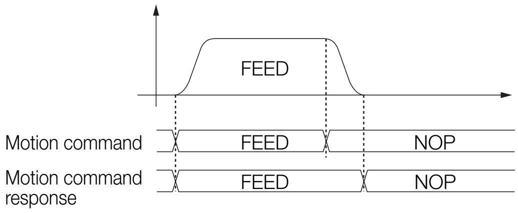
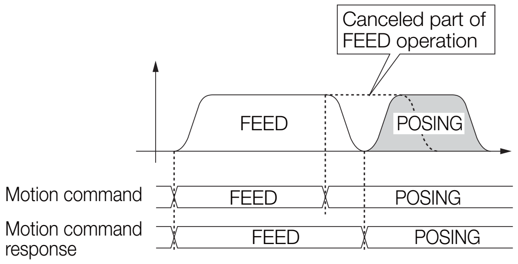
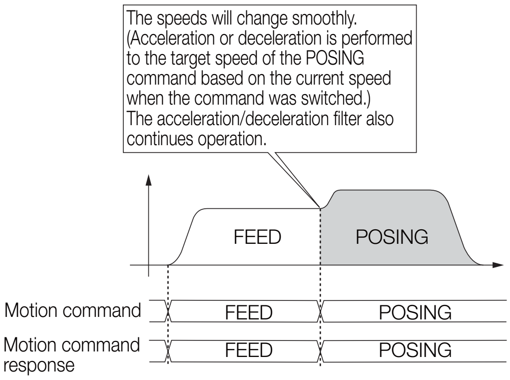
Command before Switching	Command after Switching	Operation
INTERPOLATE	EX_FEED	The motion command immediately switches to the EX_FEED command, and the travel distance that is stored in the acceleration/deceleration filter is distributed. When execution of the EX_FEED command is started, the related SERVOPACK parameters are written, and then the jogging operation starts. 

Switching from the FEED Motion Command

This section describes the operation when switching to another command during execution of the FEED command.

Command before Switching	Command after Switching	Operation
FEED	NOP	The motion command switches to the NOP command after the axis decelerates to a complete stop. 
	POSING	• Using the Incremental Value Addition Method (When Bit 5 in OW□□□09 Is Set to 0) The motion command switches to the POSING command after the axis decelerates to a complete stop.  Canceled part of FEED operation Incremental value = Target position – IL□□□14 (DPOS) OL□□□1C = OL□□□1C + Incremental value **Precautions** Any change to OL□□□1C (Position Reference Setting) during deceleration is ignored. • Using the Absolute Value Specification Method (When Bit 5 in OW□□□09 Is Set to 1) The motion command immediately switches to the POSING command, and the travel distance that is stored in the acceleration/deceleration filter is continued.  The speeds will change smoothly. (Acceleration or deceleration is performed to the target speed of the POSING command based on the current speed when the command was switched.) The acceleration/deceleration filter also continues operation. The set value for OL□□□1C (Position Reference Setting) is as follows: OL□□□1C = Target position

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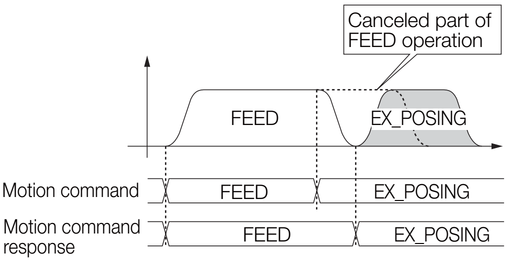
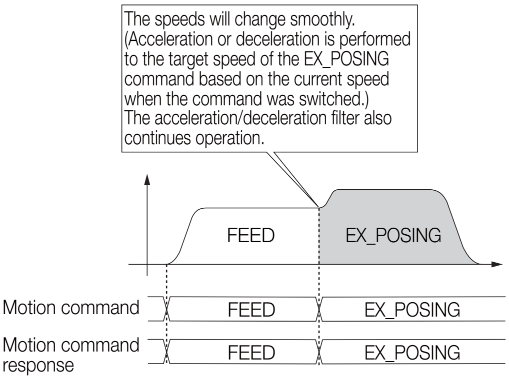
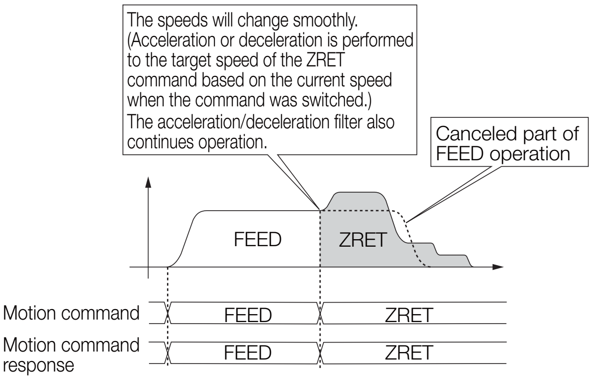
Command before Switching	Command after Switching	Operation
FEED	EX_POSING	• Using the Incremental Value Addition Method (When Bit 5 in OW□□□09 Is Set to 0) The motion command switches to the EX_POSING command after the axis decelerates to a complete stop. When execution of the EX_POSING command is started, the related SERVOPACK parameters are written, and then the positioning operation starts.  Incremental value = Target position – IL□□□14 (DPOS) OL□□□1C = OL□□□1C + Incremental value **Precautions** Any change to OL□□□1C (Position Reference Setting) during deceleration is ignored. • Using the Absolute Value Specification Method (When Bit 5 in OW□□□09 Is Set to 1) The motion command immediately switches to the EX_POSING command, and the travel distance that is stored in the acceleration/deceleration filter is continued.  The set value for OL□□□1C (Position Reference Setting) is as follows: OL□□□1C = Target position
	ZRET	The motion command immediately switches to the ZRET command, and the travel distance that is stored in the acceleration/deceleration filter is continued. 

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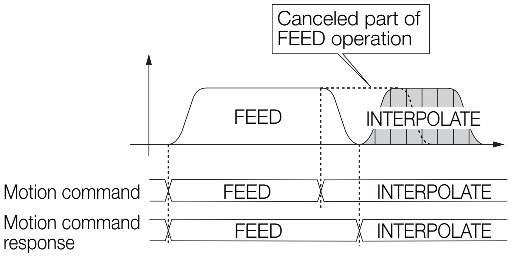
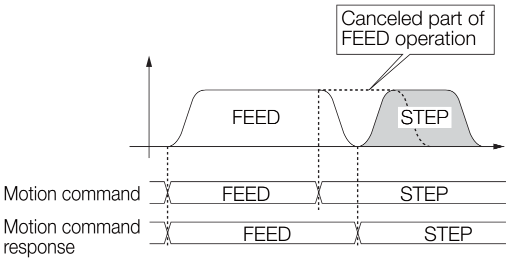
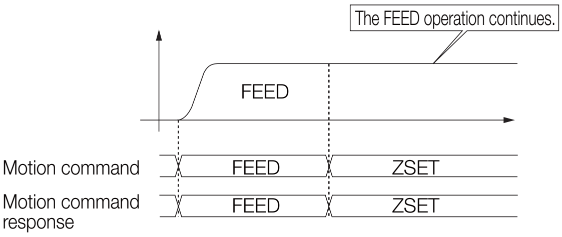
Command before Switching	Command after Switching	Operation
FEED	INTERPOLATE	The motion command switches to the INTERPOLATE command after the axis decelerates to a complete stop.  **Changing OL□□□1C (Position Reference Setting) during Deceleration** • Using the Incremental Value Addition Method (When Bit 5 in OW□□□09 Is Set to 0) Any change to OL□□□1C (Position Reference Setting) is ignored. • Using the Absolute Value Specification Method (When Bit 5 in OW□□□09 Is Set to 1) The change to OL□□□1C (Position Reference Setting) is output in the first high-speed scan after execution of the INTERPOLATE command is started. **Precautions** Do not change the Position Reference Setting parameter during deceleration.
	LATCH	Same as the INTERPOLATE command.
	FEED	The FEED operation continues.
	STEP	The motion command switches to the STEP command after the axis decelerates to a complete stop. 
	ZSET	The motion command immediately switches to the ZSET command, and the jogging operation continues.  **Precautions** In actual operation, set the origin by executing ZSET when positioning has been completed.

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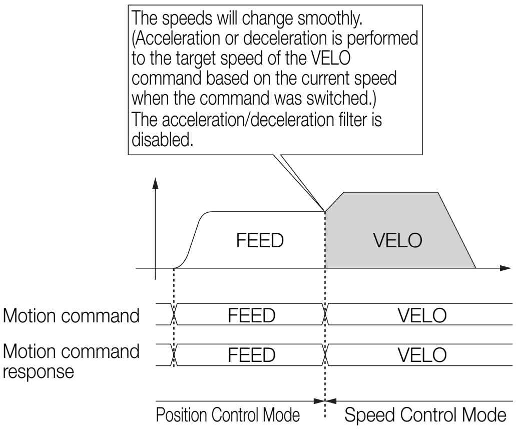
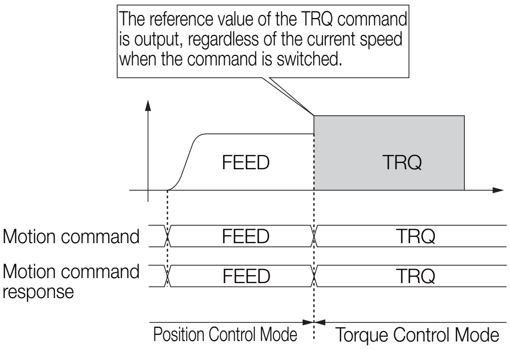
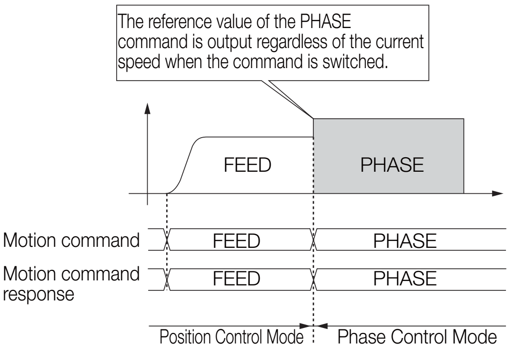
<table>
<tr><th>Command before Switching</th><th>Command after Switching</th><th>Operation</th></tr>
<tr><td rowspan="3">FEED</td><td>VELO</td><td>The motion command immediately switches to the VELO command, and the control mode switches from position control to speed control. The travel distance that is stored in the acceleration/deceleration filter is canceled.



Precautions
After switching to VELO, the VELO command operates without the acceleration/deceleration filter. To enable the acceleration/deceleration filter, hold the FEED operation by executing the NOP command. Then, check that bit 0 (Distribution Completed) in IW□□□0C is 1 (Completed) before you execute the VELO command.</td></tr>
<tr><td>TRQ</td><td>The motion command immediately switches to the TRQ command. The control mode changes from position control to torque control.
At this time, the travel distance that is stored in the acceleration/deceleration filter is canceled.



Precautions
After switching the command, the TRQ command operates without the acceleration/deceleration filter because the acceleration/deceleration filter is disabled for the TRQ command.</td></tr>
<tr><td>PHASE</td><td>The motion command immediately switches to the PHASE command, and the control mode switches from position control to phase control.


</td></tr>
</table>

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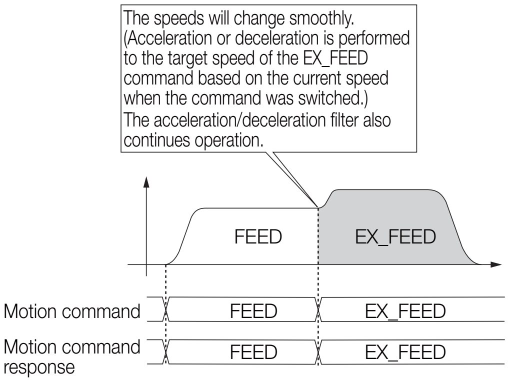
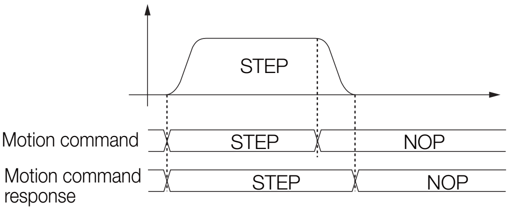
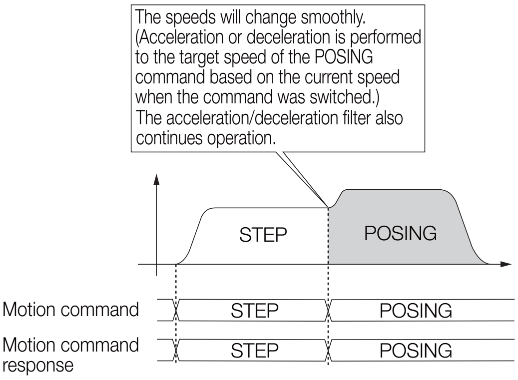
Command before Switching	Command after Switching	Operation
FEED	EX_FEED	The motion command immediately switches to the EX_FEED command, and the travel distance that is stored in the acceleration/deceleration filter is continued. 

Switching from the STEP Motion Command

This section describes the operation when switching to another command during execution of the STEP command.

Command before Switching	Command after Switching	Operation
STEP	NOP	The motion command switches to the NOP command after the axis decelerates to a complete stop. 
	POSING	The motion command immediately switches to the POSING command, and the travel distance that is stored in the acceleration/deceleration filter is continued.  The speeds will change smoothly. (Acceleration or deceleration is performed to the target speed of the POSING command based on the current speed when the command was switched.) The acceleration/deceleration filter also continues operation. The value of OL□□□1C (Position Reference Setting) when the motion command is switched is as follows: • Using the Incremental Value Addition Method (When Bit 5 in OW□□□09 Is Set to 0) Incremental value = Target position – IL□□□14 (DPOS) OL□□□1C = OL□□□1C + Incremental value • Using the Absolute Value Specification Method (When Bit 5 in OW□□□09 Is Set to 1) OL□□□1C = Target position

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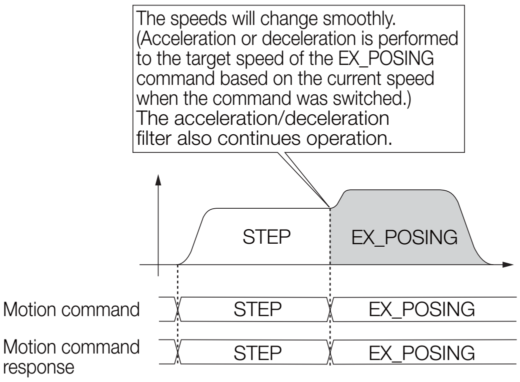
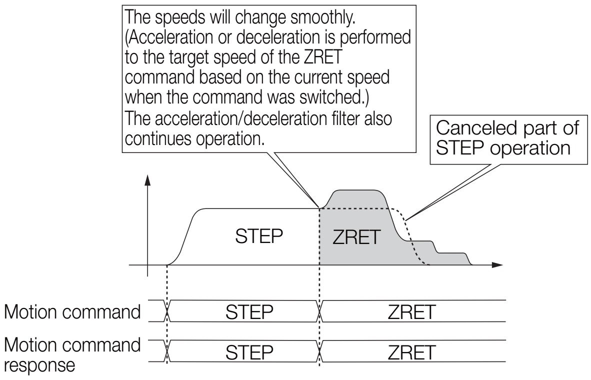
Command before Switching	Command after Switching	Operation
STEP	EX_POSING	The motion command immediately switches to the EX_POSING command, and the travel distance that is stored in the acceleration/deceleration filter is continued.  The value of OL□□□1C (Position Reference Setting) when the motion command is switched is as follows: • Using the Incremental Value Addition Method (When Bit 5 in OW□□□09 Is Set to 0) Incremental value = Target position – IL□□□14 (DPOS) OL□□□1C = OL□□□1C + Incremental value • Using the Absolute Value Specification Method (When Bit 5 in OW□□□09 Is Set to 1) OL□□□1C = Target position **Precautions** The speed may decrease because the related parameters are written at the start of EX_POSING execution.
	ZRET	The motion command immediately switches to the ZRET command, and the travel distance that is stored in the acceleration/deceleration filter is continued.  **Precautions** The speed may decrease because the related parameters are written at the start of ZRET execution.

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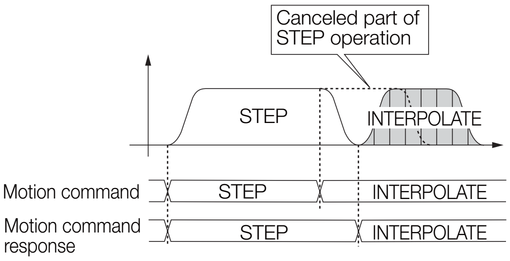
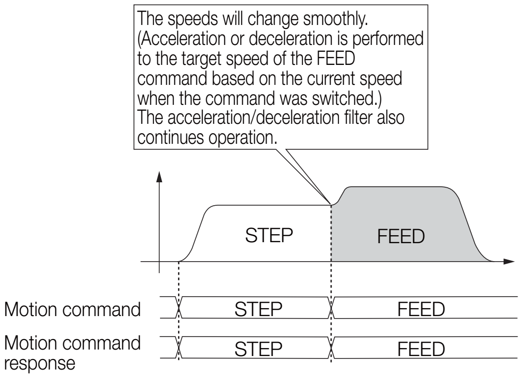
<table>
<tr><th>Command before Switching</th><th>Command after Switching</th><th>Operation</th></tr>
<tr><td rowspan="3">STEP</td><td>INTERPOLATE</td><td>The motion command switches to the INTERPOLATE command after the axis decelerates to a complete stop.


Changing OL□□□1C (Position Reference Setting) during Deceleration
• Using the Incremental Value Addition Method (When Bit 5 in OW□□□09 Is Set to 0)
Any change to OL□□□1C (Position Reference Setting) is ignored.
• Using the Absolute Value Specification Method (When Bit 5 in OW□□□09 Is Set to 1)
The change to OL□□□1C (Position Reference Setting) is output in the first high-speed scan after execution of the INTERPOLATE command is started.
Precautions
Do not change the Position Reference Setting parameter during deceleration.</td></tr>
<tr><td>LATCH</td><td>Same as the INTERPOLATE command.</td></tr>
<tr><td>FEED</td><td>The motion command immediately switches to the FEED command, and the travel distance that is stored in the acceleration/deceleration filter is continued.

 </td></tr>
</table>

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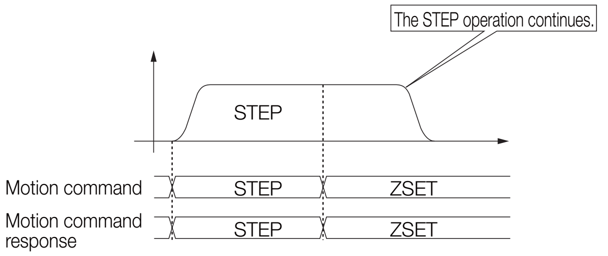
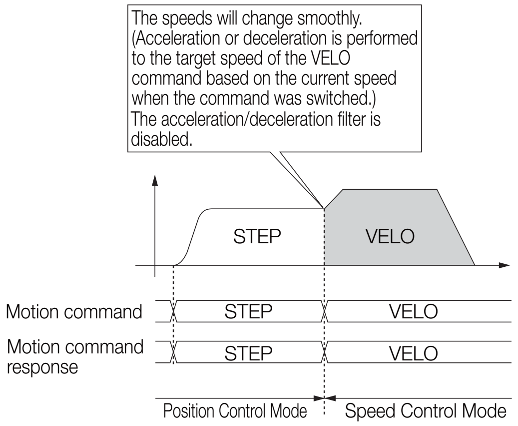
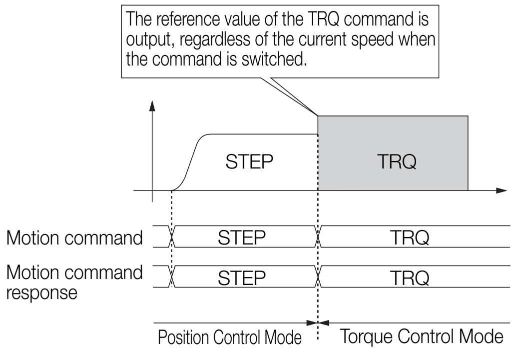
Command before Switching	Command after Switching	Operation
STEP	STEP	The STEP operation continues.
	ZSET	The motion command immediately switches to the ZSET command, and the positioning operation continues.  The STEP operation continues. **Precautions** In actual operation, set the origin by executing ZSET when positioning has been completed.
	VELO	The motion command immediately switches to the VELO command, and the control mode switches from position control to speed control. The travel distance that is stored in the acceleration/deceleration filter is canceled.  The speeds will change smoothly. (Acceleration or deceleration is performed to the target speed of the VELO command based on the current speed when the command was switched.) The acceleration/deceleration filter is disabled. **Precautions** After switching to VELO, the VELO command operates without the acceleration/deceleration filter. To enable the acceleration/deceleration filter, hold the STEP operation by executing the NOP command. Then, check that bit 0 (Distribution Completed) in IW□□□0C is 1 (Completed) before you execute the VELO command.
	TRQ	The motion command immediately switches to the TRQ command, and the control mode switches from position control to torque control. The travel distance that is stored in the acceleration/deceleration filter is canceled.  The reference value of the TRQ command is output, regardless of the current speed when the command is switched. **Precautions** After switching the command, the TRQ command operates without the acceleration/deceleration filter because the acceleration/deceleration filter is disabled for the TRQ command.

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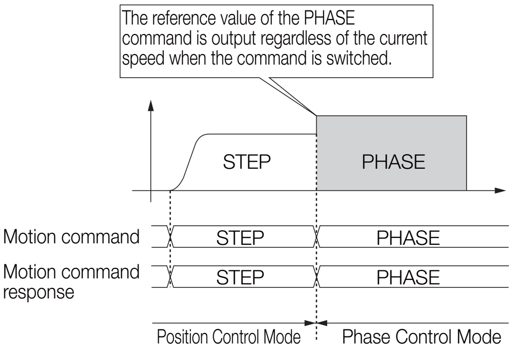
Command before Switching	Command after Switching	Operation
STEP	PHASE	The motion command immediately switches to the PHASE command, and the control mode switches from position control to phase control. 
	EX_FEED	Same as for the FEED command.

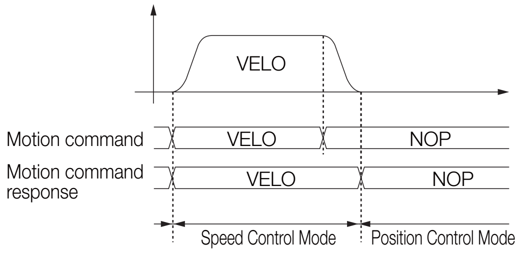
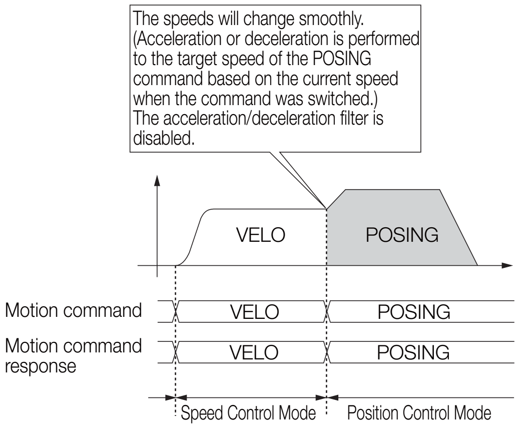
Switching from the ZSET Motion Command

The ZSET command completes in one scan as long as an infinite-length axis is not used with an absolute encoder.

Any other motion command is started immediately if it is switched to while execution of the ZSET command is in progress.

Switching from the VELO Motion Command

This section describes the operation when switching to another command during execution of the VELO command.

<table>
<tr><th>Command before Switching</th><th>Command after Switching</th><th>Operation</th></tr>
<tr><td rowspan="2">VELO</td><td>NOP</td><td>The motion command switches to the NOP command after the axis decelerates to a complete stop, and the control mode switches from speed control to position control.
 </td></tr>
<tr><td>POSING</td><td>The motion command immediately switches to the POSING command, and the control mode switches from speed control to position control. The travel distance that is stored in the acceleration/deceleration filter is canceled.
The speeds will change smoothly. (Acceleration or deceleration is performed to the target speed of the POSING command based on the current speed when the command was switched.) The acceleration/deceleration filter is disabled.
Precautions
After switching to POSING, the POSING command operates without the acceleration/deceleration filter. To enable the acceleration/deceleration filter, hold the VELO operation by executing the NOP command. Then, check that bit 0 (Distribution Completed) in IW□□□0C is 1 (Completed) before you execute the POSING command.
The value of OL□□□1C (Position Reference Setting) when the motion command is switched is as follows:
• Using the Incremental Value Addition Method (When Bit 5 in OW□□□09 Is Set to 0)
Incremental value = Target position – IL□□□14 (DPOS)
OL□□□1C = OL□□□1C + Incremental value
• Using the Absolute Value Specification Method (When Bit 5 in OW□□□09 Is Set to 1)
OL□□□1C = Target position</td></tr>
</table>

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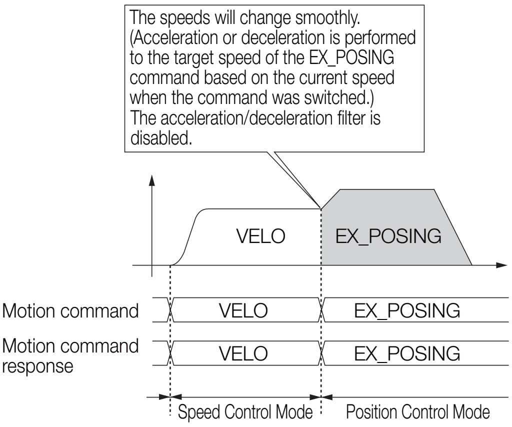
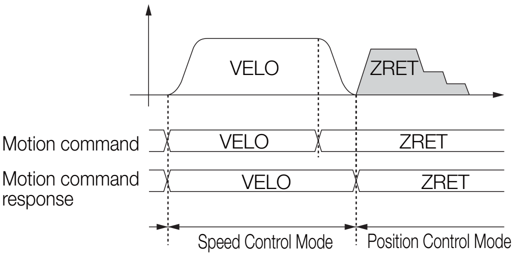
Command before Switching	Command after Switching	Operation
VELO	EX_POSING	The motion command immediately switches to the EX_POSING command, and the control mode switches from speed control to position control. The travel distance that is stored in the acceleration/deceleration filter is canceled.  The speeds will change smoothly. (Acceleration or deceleration is performed to the target speed of the EX_POSING command based on the current speed when the command was switched.) The acceleration/deceleration filter is disabled. **Precautions** After switching to EX_POSING, the EX_POSING command operates without the acceleration/deceleration filter. To enable the acceleration/deceleration filter, hold the VELO operation by executing the NOP command. Then, check that bit 0 (Distribution Completed) in IW□□□0C is 1 (Completed) before you execute the EX_POSING command. The value of OL□□□1C (Position Reference Setting) when the motion command is switched is as follows: • Using the Incremental Value Addition Method (When Bit 5 in OW□□□09 Is Set to 0) Incremental value = Target position – IL□□□14 (DPOS) OL□□□1C = OL□□□1C + Incremental value • Using the Absolute Value Specification Method (When Bit 5 in OW□□□09 Is Set to 1) OL□□□1C = Target position
	ZRET	The motion command switches to the ZRET command after the axis decelerates to a complete stop, and the control mode switches from speed control to position control. 

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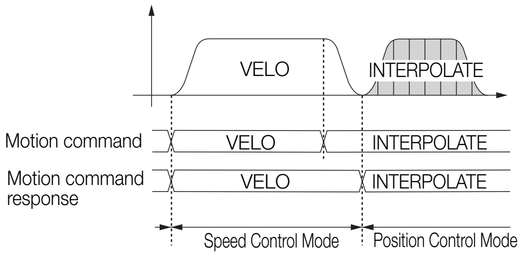
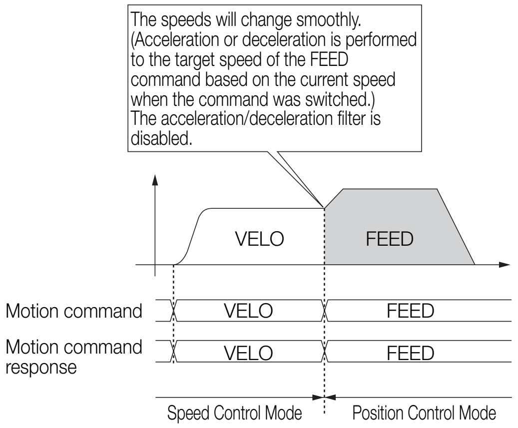
<table>
<tr><th>Command before Switching</th><th>Command after Switching</th><th>Operation</th></tr>
<tr><td rowspan="3">VELO</td><td>INTERPOLATE</td><td>The motion command switches to the INTERPOLATE command after the axis decelerates to a complete stop, and the control mode switches from speed control to position control.

Changing OL□□□1C (Position Reference Setting) during Deceleration
• Using the Incremental Value Addition Method (When Bit 5 in OW□□□09 Is Set to 0)
Any change to OL□□□1C (Position Reference Setting) is ignored.
• Using the Absolute Value Specification Method (When Bit 5 in OW□□□09 Is Set to 1)
The change to OL□□□1C (Position Reference Setting) is output in the first high-speed scan after execution of the INTERPOLATE command is started.
Precautions
Do not change the Position Reference Setting parameter during deceleration.</td></tr>
<tr><td>LATCH</td><td>Same as the INTERPOLATE command.</td></tr>
<tr><td>FEED</td><td>The motion command immediately switches to the FEED command, and the control mode switches from speed control to position control. The travel distance that is stored in the acceleration/deceleration filter is canceled.

The speeds will change smoothly. (Acceleration or deceleration is performed to the target speed of the FEED command based on the current speed when the command was switched.) The acceleration/deceleration filter is disabled. </td></tr>
</table>

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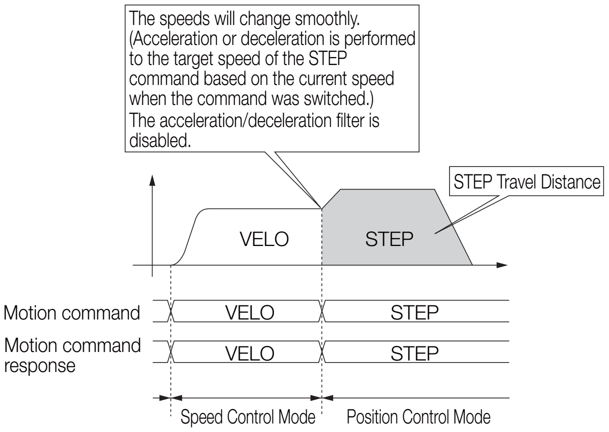
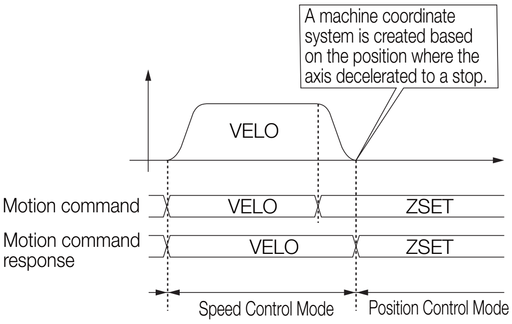
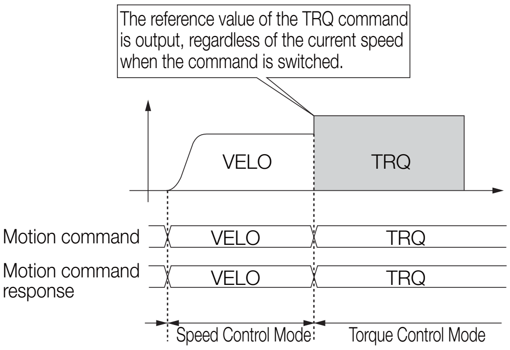
Command before Switching	Command after Switching	Operation
VELO	STEP	The motion command immediately switches to the STEP command, and the control mode switches from speed control to position control. The travel distance that is stored in the acceleration/deceleration filter is canceled. 
	ZSET	The ZSET command is executed when the axis has decelerated to a complete stop. 
	VELO	The VELO operation continues.
	TRQ	The motion command immediately switches to the TRQ command, and the control mode switches from speed control to torque control. The travel distance that is stored in the acceleration/deceleration filter is canceled.  **Precautions** After switching the command, the TRQ command operates without the acceleration/deceleration filter because the acceleration/deceleration filter is disabled for the TRQ command.

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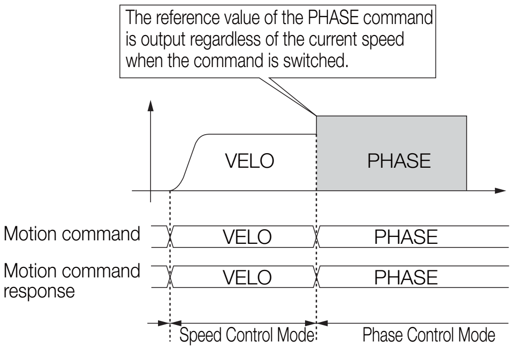
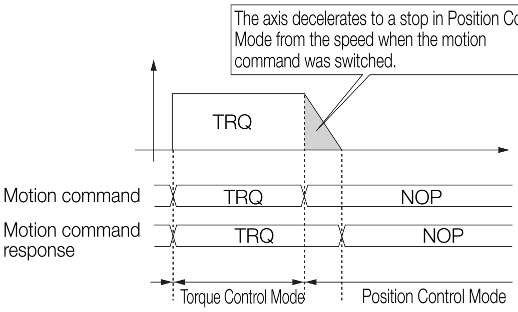
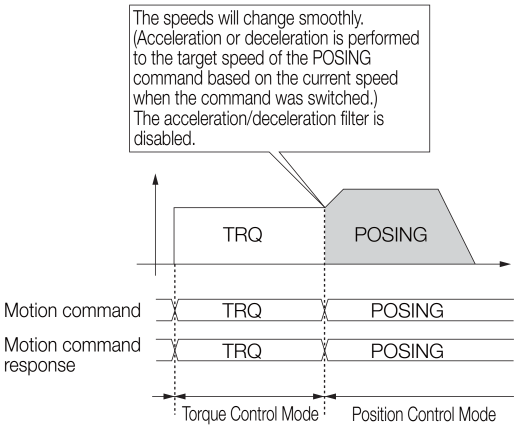
Command before Switching	Command after Switching	Operation
VELO	PHASE	The motion command immediately switches to the PHASE command, and the control mode switches from speed control to phase control. The travel distance that is stored in the acceleration/deceleration filter is canceled.  The reference value of the PHASE command is output regardless of the current speed when the command is switched.
	EX_FEED	Same as for the FEED command.

Switching from the TRQ Motion Command

This section describes the operation when switching to another command during execution of the TRQ command.

Command before Switching	Command after Switching	Operation
TRQ	NOP	The axis decelerates to a stop in Position Control Mode from the speed when the motion command was switched. TRQ switches to the NOP command after the axis completely decelerates.  The axis decelerates to a stop in Position Control Mode from the speed when the motion command was switched.
	POSING	The motion command immediately switches to the POSING command, and the control mode switches from torque control to position control.  The speeds will change smoothly. (Acceleration or deceleration is performed to the target speed of the POSING command based on the current speed when the command was switched.) The acceleration/deceleration filter is disabled. The value of OL□□□1C (Position Reference Setting) when the motion command is switched is as follows: • Using the Incremental Value Addition Method (When Bit 5 in OW□□□09 Is Set to 0) Incremental value = Target position – IL□□□14 (DPOS) OL□□□1C = OL□□□1C + Incremental value • Using the Absolute Value Specification Method (When Bit 5 in OW□□□09 Is Set to 1) OL□□□1C = Target position

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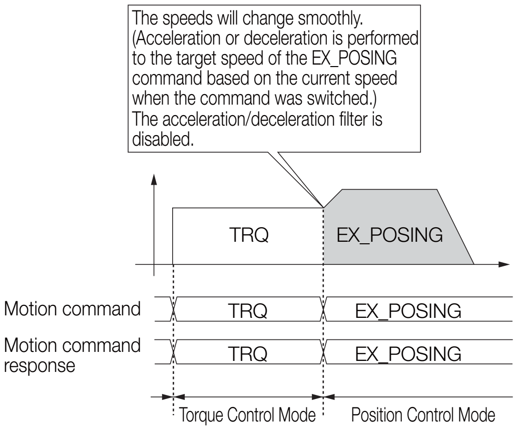
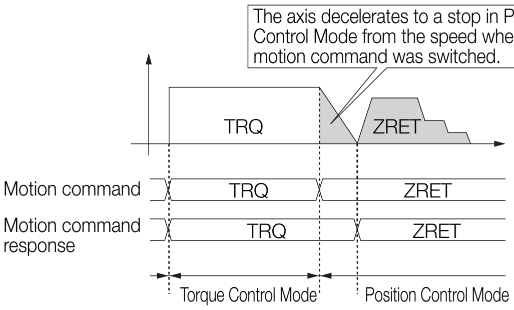
Command before Switching	Command after Switching	Operation
TRQ	EX_POSING	The motion command immediately switches to the EX_POSING command, and the control mode switches from torque control to position control.  **Precautions** After switching to EX_POSING, the EX_POSING command operates without the acceleration/deceleration filter. To enable the acceleration/deceleration filter, hold the TRQ operation by executing the NOP command. Then, check that bit 0 (Distribution Completed) in IW□□□0C is 1 (Completed) before you execute the EX_POSING command. The value of OL□□□1C (Position Reference Setting) when the motion command is switched is as follows: • Using the Incremental Value Addition Method (When Bit 5 in OW□□□09 Is Set to 0) Incremental value = Target position – IL□□□14 (DPOS) OL□□□1C = OL□□□1C + Incremental value • Using the Absolute Value Specification Method (When Bit 5 in OW□□□09 Is Set to 1) OL□□□1C = Target position
	ZRET	The axis decelerates to a stop in Position Control Mode, and then the motion command switches to the ZRET command. 

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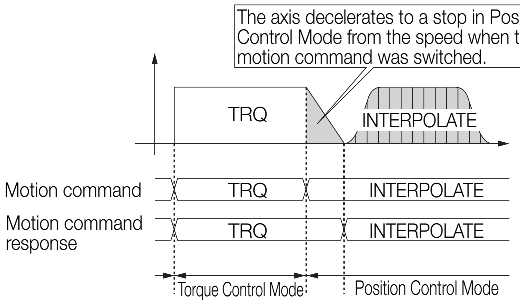
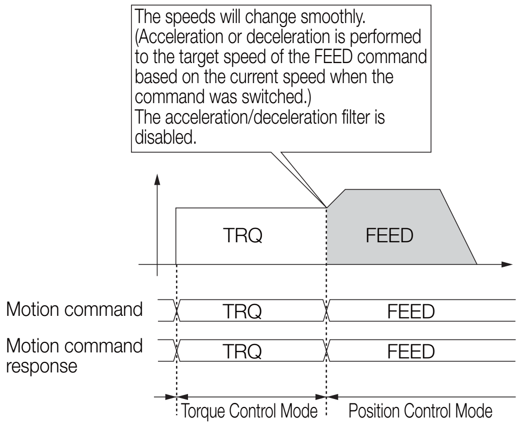
Command before Switching	Command after Switching	Operation
TRQ	INTERPOLATE	The axis decelerates to a stop in Position Control Mode, and then the motion command switches to the INTERPOLATE command.  The axis decelerates to a stop in Position Control Mode from the speed when the motion command was switched. **Changing OL□□□1C (Position Reference Setting) during Deceleration** • Using the Incremental Value Addition Method (When Bit 5 in OW□□□09 Is Set to 0) Any change to OL□□□1C (Position Reference Setting) is ignored. • Using the Absolute Value Specification Method (When Bit 5 in OW□□□09 Is Set to 1) The change to OL□□□1C (Position Reference Setting) is output in the first high-speed scan after execution of the INTERPOLATE command is started. **Precautions** Do not change the Position Reference Setting parameter during deceleration.
	LATCH	Same as the INTERPOLATE command.
	FEED	The motion command immediately switches to the FEED command, and the control mode switches from torque control to position control. The travel distance that is stored in the acceleration/deceleration filter is canceled.  The speeds will change smoothly. (Acceleration or deceleration is performed to the target speed of the FEED command based on the current speed when the command was switched.) The acceleration/deceleration filter is disabled. **Precautions** After switching to FEED, the FEED command operates without the acceleration/deceleration filter. To enable the acceleration/deceleration filter, hold the TRQ operation by executing the NOP command. Then, check that bit 0 (Distribution Completed) in IW□□□0C is 1 (Completed) before you execute the FEED command.

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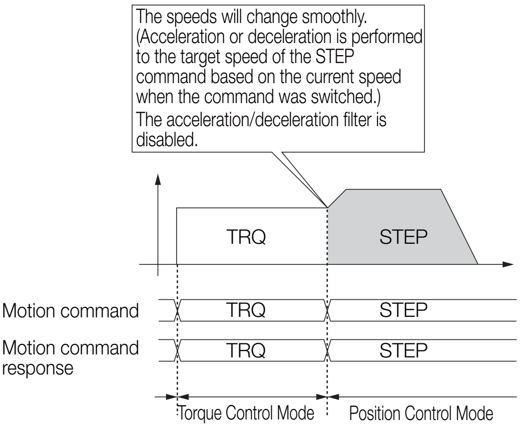
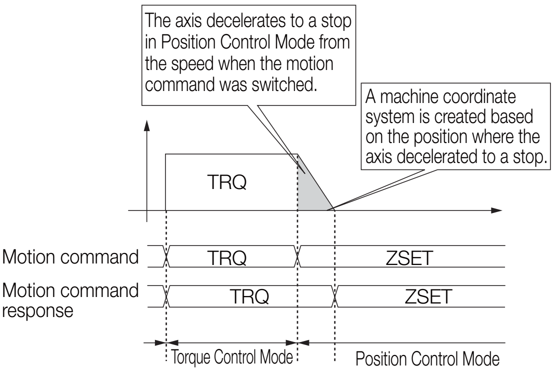
Command before Switching	Command after Switching	Operation
TRQ	STEP	The motion command immediately switches to the STEP command, and the control mode switches from torque control to position control. The travel distance that is stored in the acceleration/deceleration filter is canceled.  The speeds will change smoothly. (Acceleration or deceleration is performed to the target speed of the STEP command based on the current speed when the command was switched.) The acceleration/deceleration filter is disabled. **Precautions** After switching to STEP, the STEP command operates without the acceleration/deceleration filter. To enable the acceleration/deceleration filter, hold the TRQ operation by executing the NOP command. Then, check that bit 0 (Distribution Completed) in IW□□□0C is 1 (Completed) before you execute the STEP command.
	ZSET	The axis decelerates to a stop in Position Control Mode, and then the ZSET command is executed.  The axis decelerates to a stop in Position Control Mode from the speed when the motion command was switched. A machine coordinate system is created based on the position where the axis decelerated to a stop.

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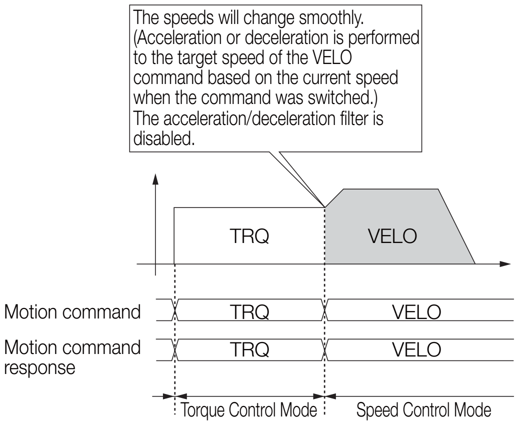
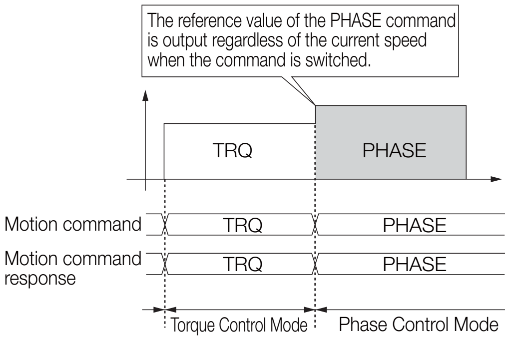
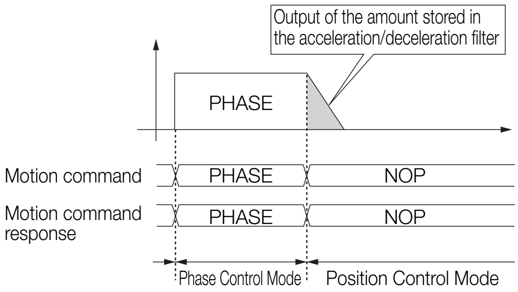
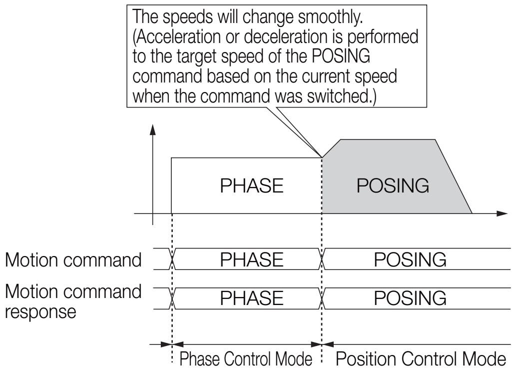
Command before Switching	Command after Switching	Operation
TRQ	VELO	The motion command immediately switches to the VELO command, and the control mode switches from torque control to speed control. The travel distance that is stored in the acceleration/deceleration filter is canceled.  The speeds will change smoothly. (Acceleration or deceleration is performed to the target speed of the VELO command based on the current speed when the command was switched.) The acceleration/deceleration filter is disabled. **Precautions** After switching to VELO, the VELO command operates without the acceleration/deceleration filter. To enable the acceleration/deceleration filter, hold the TRQ operation by executing the NOP command. Then, check that bit 0 (Distribution Completed) in IW□□□0C is 1 (Completed) before you execute the VELO command.
	TRQ	The TRQ operation continues.
	PHASE	The motion command immediately switches to the PHASE command, and the control mode switches from torque control to phase control. The travel distance that is stored in the acceleration/deceleration filter is canceled.  The reference value of the PHASE command is output regardless of the current speed when the command is switched. **Precautions** After switching the command, the PHASE command operates without the acceleration/deceleration filter because the acceleration/deceleration filter is disabled for the PHASE command.
	EX_FEED	Same as for the FEED command.

Switching from the PHASE Motion Command

This section describes the operation when switching to another command during execution of the PHASE command.

Command before Switching	Command after Switching	Operation
PHASE	NOP	The motion command immediately switches to the NOP command, and the travel distance that is stored in the acceleration/deceleration filter is distributed. 
	POSING	The motion command immediately switches to the POSING command, and the control mode switches from phase control to position control.  The value of OL□□□1C (Position Reference Setting) when the motion command is switched is as follows: • Using the Incremental Value Addition Method (When Bit 5 in OW□□□09 Is Set to 0) Incremental value = Target position – IL□□□14 (DPOS) OL□□□1C = OL□□□1C + Incremental value • Using the Absolute Value Specification Method (When Bit 5 in OW□□□09 Is Set to 1) OL□□□1C = Target position

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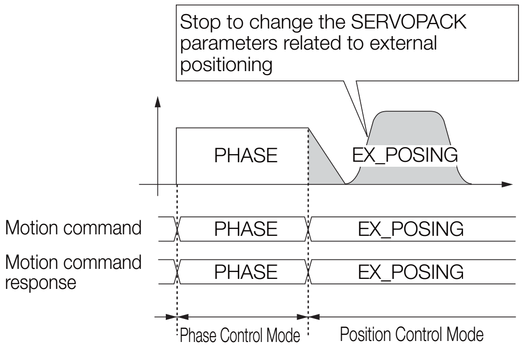
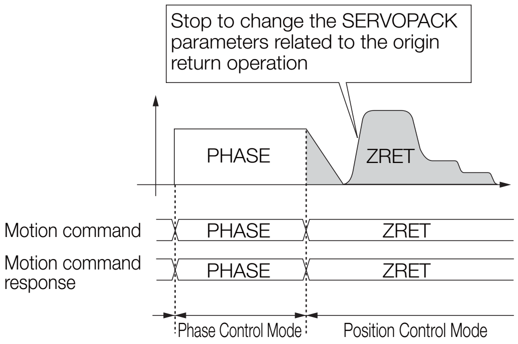
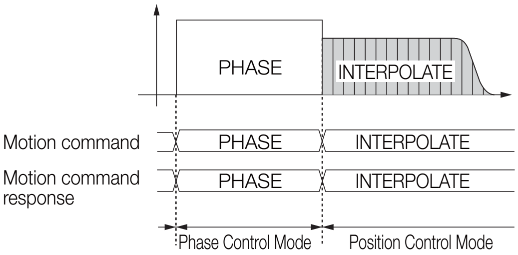
Command before Switching	Command after Switching	Operation
PHASE	EX_POSING	The motion command immediately switches to the EX_POSING command, and the control mode switches from phase control to position control. At this time, the travel distance that is stored in the acceleration/deceleration filter is distributed. When execution of the EX_POSING command is started, the related SERVOPACK parameters are written, and then the positioning operation starts.  The value of OL□□□1C (Position Reference Setting) when the motion command is switched is as follows: • Using the Incremental Value Addition Method (When Bit 5 in OW□□□09 Is Set to 0) Incremental value = Target position – IL□□□14 (DPOS) OL□□□1C = OL□□□1C + Incremental value • Using the Absolute Value Specification Method (When Bit 5 in OW□□□09 Is Set to 1) OL□□□1C = Target position
	ZRET	The motion command immediately switches to the ZRET command, and the control mode switches from phase control to position control. At this time, the travel distance that is stored in the acceleration/deceleration filter is distributed. When execution of ZRET is started, the related SERVOPACK parameters are written, and then the origin return operation starts. 
	INTERPOLATE	The motion command immediately switches to the INTERPOLATE command, and the control mode switches from phase control to position control. 
	LATCH	Same as the INTERPOLATE command.

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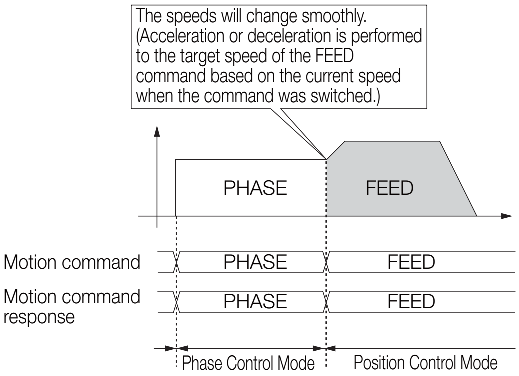
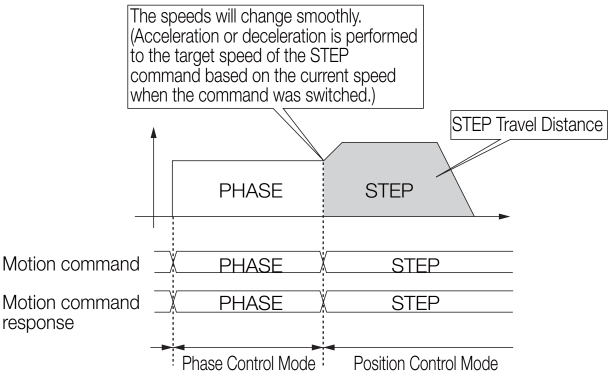
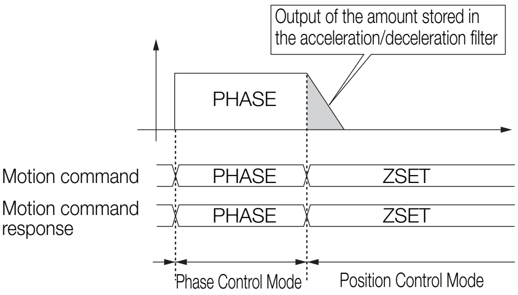
Command before Switching	Command after Switching	Operation
PHASE	FEED	The motion command immediately switches to the FEED command, and the control mode switches from phase control to position control. 
	STEP	The motion command immediately switches to the STEP command, and the control mode switches from phase control to position control. 
	ZSET	The motion command immediately switches to the ZSET command, and the control mode switches from phase control to position control.  **Precautions** In actual operation, set the origin by executing ZSET when positioning has been completed.

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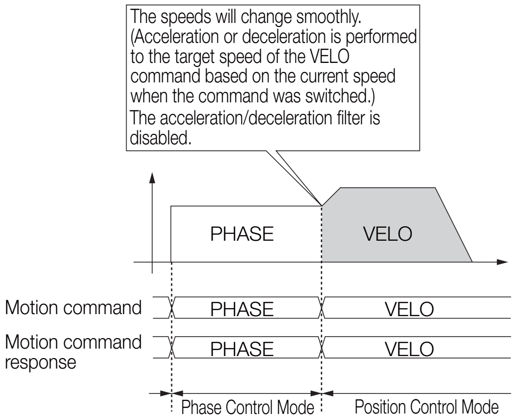
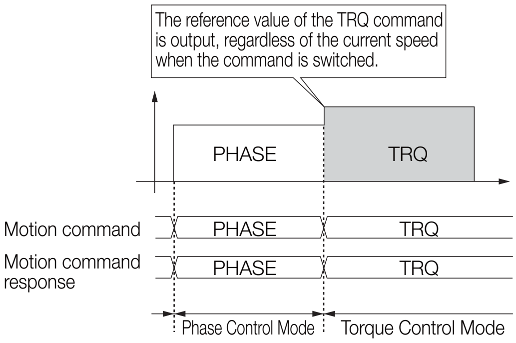
<table>
<tr><th>Command before Switching</th><th>Command after Switching</th><th>Operation</th></tr>
<tr><td rowspan="4">PHASE</td><td>VELO</td><td>The motion command immediately switches to the VELO command, and the control mode switches from phase control to speed control. The travel distance that is stored in the acceleration/deceleration filter is canceled.

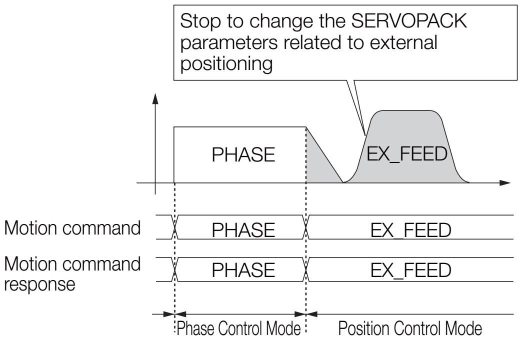


The speeds will change smoothly. (Acceleration or deceleration is performed to the target speed of the VELO command based on the current speed when the command was switched.) The acceleration/deceleration filter is disabled.

Precautions
After switching to VELO, the VELO command operates without the acceleration/deceleration filter. To enable the acceleration/deceleration filter, hold the PHASE operation by executing the NOP command. Then, check that bit 0 (Distribution Completed) in IW□□□0C is 1 (Completed) before you execute the VELO command.</td></tr>
<tr><td>TRQ</td><td>The motion command immediately switches to the TRQ command, and the control mode switches from phase control to torque control.



The reference value of the TRQ command is output, regardless of the current speed when the command is switched.</td></tr>
<tr><td>PHASE</td><td>The PHASE operation continues.</td></tr>
<tr><td>EX_FEED</td><td>The motion command immediately switches to the EX_FEED command, and the control mode switches from phase control to position control. At this time, the travel distance that is stored in the acceleration/deceleration filter is distributed.
When execution of the EX_FEED command is started, the related SERVOPACK parameters are written, and then the jogging operation starts.

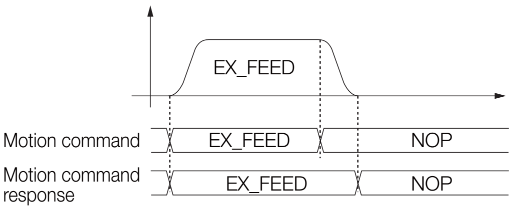


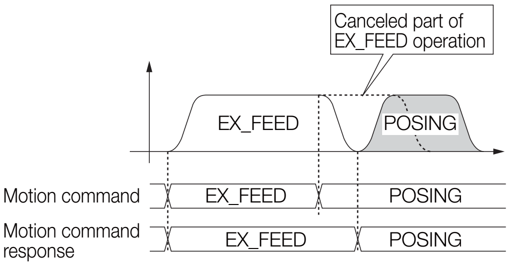
Stop to change the SERVOPACK parameters related to external positioning</td></tr>
</table>

Switching from the EX_FEED Motion Command

This section describes the operation when switching to another command during execution of the EX_FEED command.

<table>
<tr><th>Command before Switching</th><th>Command after Switching</th><th>Operation</th></tr>
<tr><td rowspan="2">EX_FEED</td><td>NOP</td><td>The motion command switches to the NOP command after the axis decelerates to a complete stop.

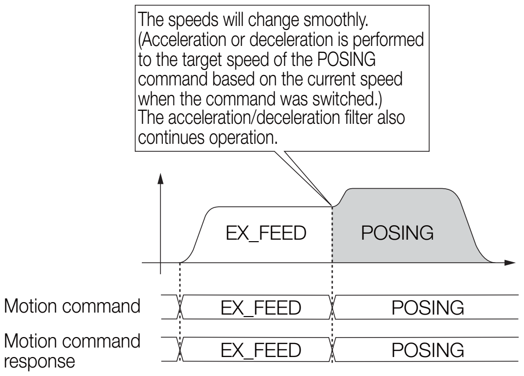

</td></tr>
<tr><td>POSING</td><td>• Using the Incremental Value Addition Method (When Bit 5 in OW□□□09 Is Set to 0)
The motion command switches to the POSING command after the axis decelerates to a complete stop.



Incremental value = Target position – IL□□□14 (DPOS)
OL□□□1C = OL□□□1C + Incremental value

Precautions
Any change to OL□□□1C (Position Reference Setting) during deceleration is ignored.

• Using the Absolute Value Specification Method (When Bit 5 in OW□□□09 Is Set to 1)
The motion command immediately switches to the POSING command, and the travel distance that is stored in the acceleration/deceleration filter is continued.


The speeds will change smoothly. (Acceleration or deceleration is performed to the target speed of the POSING command based on the current speed when the command was switched.) The acceleration/deceleration filter also continues operation.

The set value for OL□□□1C (Position Reference Setting) is as follows:
OL□□□1C = Target position</td></tr>
</table>

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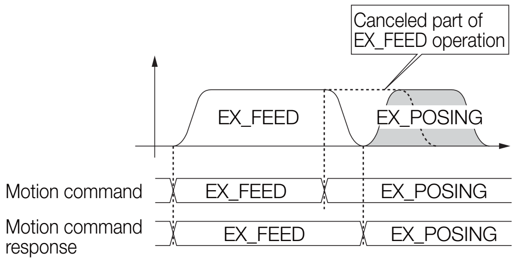
<table>
<tr><th>Command before Switching</th><th>Command after Switching</th><th>Operation</th></tr>
<tr><td rowspan="2">EX_FEED</td><td>EX_POSING</td><td>

- Using the Incremental Value Addition Method (When Bit 5 in OW□□□09 Is Set to 0)
  The motion command switches to the EX_POSING command after the axis decelerates to a complete stop.
  When execution of the EX_POSING command is started, the related SERVOPACK parameters are written, and then the positioning operation starts.

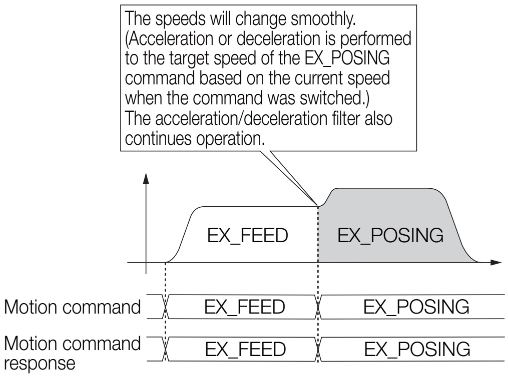


Incremental value = Target position – IL□□□14 (DPOS)
OL□□□1C = OL□□□1C + Incremental value

Precautions

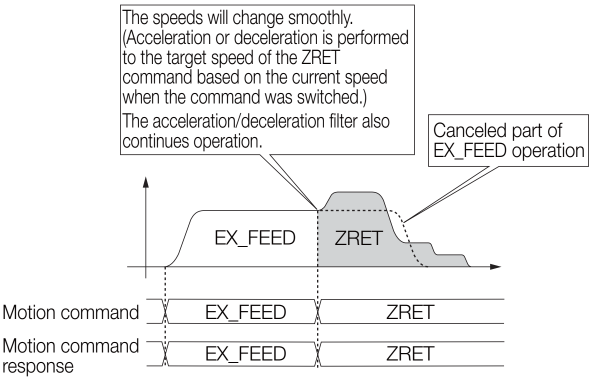
Any change to OL□□□1C (Position Reference Setting) during deceleration is ignored.

- Using the Absolute Value Specification Method (When Bit 5 in OW□□□09 Is Set to 1)
  The motion command immediately switches to the EX_POSING command, and the travel distance that is stored in the acceleration/deceleration filter is continued.


The speeds will change smoothly. (Acceleration or deceleration is performed to the target speed of the EX_POSING command based on the current speed when the command was switched.) The acceleration/deceleration filter also continues operation.

The set value for OL□□□1C (Position Reference Setting) is as follows:
OL□□□1C = Target position
</td></tr>
<tr><td>ZRET</td><td>

The motion command immediately switches to the ZRET command, and the travel distance that is stored in the acceleration/deceleration filter is continued.


The speeds will change smoothly. (Acceleration or deceleration is performed to the target speed of the ZRET command based on the current speed when the command was switched.) The acceleration/deceleration filter also continues operation.

</td></tr>
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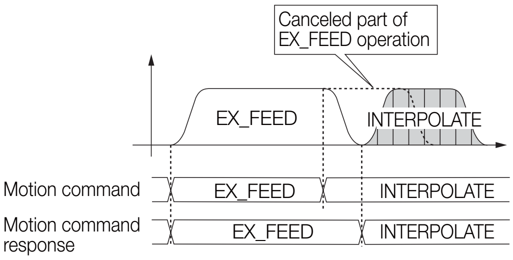
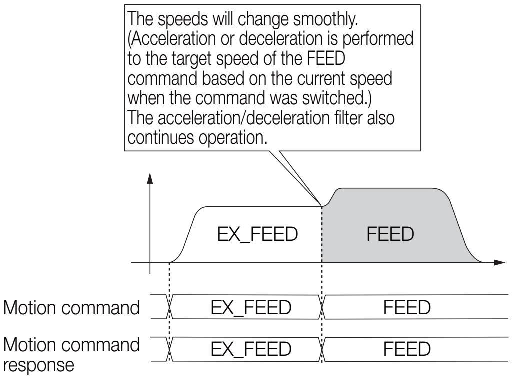
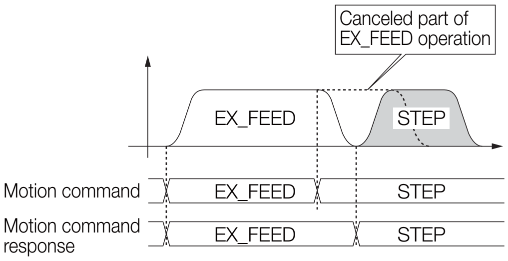
Command before Switching	Command after Switching	Operation
EX_FEED	INTERPOLATE	The motion command switches to the INTERPOLATE command after the axis decelerates to a complete stop.  **Changing OL□□□1C (Position Reference Setting) during Deceleration** • Using the Incremental Value Addition Method (When Bit 5 in OW□□□09 Is Set to 0) Any change to OL□□□1C (Position Reference Setting) is ignored. • Using the Absolute Value Specification Method (When Bit 5 in OW□□□09 Is Set to 1) The change to OL□□□1C (Position Reference Setting) is output in the first high-speed scan after execution of the INTERPOLATE command is started. **Precautions** Do not change the Position Reference Setting parameter during deceleration.
	LATCH	Same as the INTERPOLATE command.
	FEED	The motion command immediately switches to the FEED command, and the travel distance that is stored in the acceleration/deceleration filter is continued. 
	STEP	The motion command switches to the STEP command after the axis decelerates to a complete stop. 

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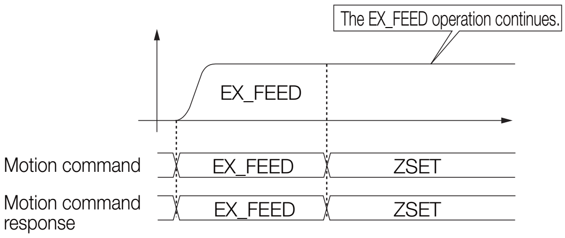
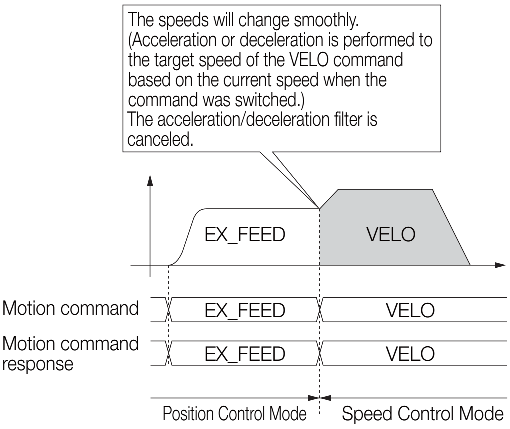
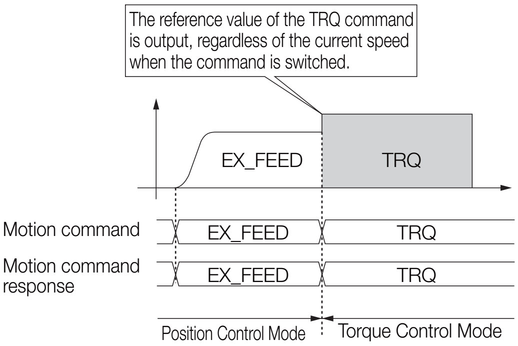
Command before Switching	Command after Switching	Operation
EX_FEED	ZSET	The motion command immediately switches to the ZSET command, and the jogging operation continues.  **Precautions** In actual operation, set the origin by executing ZSET when positioning has been completed.
	VELO	The motion command immediately switches to the VELO command, and the control mode switches from position control to speed control. The travel distance that is stored in the acceleration/deceleration filter is canceled.  **Precautions** After switching to VELO, the VELO command operates without the acceleration/deceleration filter. To enable the acceleration/deceleration filter, hold the EX_FEED operation by executing the NOP command. Then, check that bit 0 (Distribution Completed) in IW□□□0C is 1 (Completed) before you execute the VELO command.
	TRQ	The motion command immediately switches to the TRQ command, and the control mode switches from position control to torque control. At this time, the travel distance that is stored in the acceleration/deceleration filter is canceled.  **Precautions** After switching the command, the TRQ command operates without the acceleration/deceleration filter because the acceleration/deceleration filter is disabled for the TRQ command.

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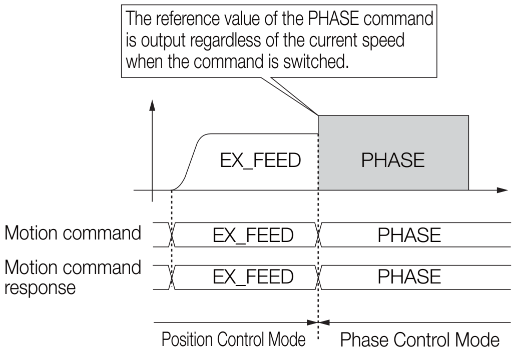
Command before Switching	Command after Switching	Operation
EX_FEED	PHASE	The motion command immediately switches to the PHASE command, and the control mode switches from position control to phase control.  The reference value of the PHASE command is output regardless of the current speed when the command is switched.
	EX_FEED	The EX_FEED operation continues.

4.5 Motion Language Instructions

Motion language instructions are used to write text-based motion control programs. This section provides a list of motion language instructions required for motion programs. Refer to the following manual for details on each language instruction.

Machine Controller MP3000 Series Motion Programming Manual (Manual No.: SIEP C880725 14)

Instruction Type	Instruction	Name	Format	Description
Axis Setting	ABS	Absolute Mode	ABS; or ABS MOV [*Logical_axis_name_1*] – [*Logical_axis_name_2*] – ;	Causes all subsequent coordinates to be treated as absolute values.
	INC	Incremental Mode	INC; or INC MOV [*Logical_axis_name_1*] – [*Logical_axis_name_2*] – ;	Causes all subsequent coordinates to be treated as incremental values.
	ACC	Change Acceleration Time	ACC [*Logical_axis_name_1*] *Acceleration_time* [*Logical_axis_name_2*] *Acceleration_time* [*Logical_axis_name_3*] *Acceleration_time* ... ;	Sets the acceleration times for positioning instructions. A maximum of 32 axes can be designated in one instruction block.
	DCC	Change Deceleration Time	DCC [*Logical_axis_name_1*] *Deceleration_time* [*Logical_axis_name_2*] *Deceleration_time* [*Logical_axis_name_3*] *Deceleration_time* ... ;	Sets the deceleration times for positioning instructions. A maximum of 32 axes can be designated in one instruction block.
	SCC	Change S-curve Time Constant	SCC [*Logical_axis_name_1*] *S-curve_time_constant* [*Logical_axis_name_2*] *S-curve_time_constant* ... ;	Sets the time constants for the moving average filters. A maximum of 32 axes can be designated in one instruction block. The filters are valid for both positioning instructions and interpolation instructions.
	VEL	Set Speed	VEL [*Logical_axis_name_1*] *Feed_speed* [*Logical_axis_name_2*] *Feed_speed* [*Logical_axis_name_3*] *Feed_speed* ... ;	Sets the speeds for positioning instructions. A maximum of 32 axes can be designated in one instruction block.
	FMX	Set Maximum Interpolation Feed Speed	FMX T*maximum_interpolation_feed_speed*;	Sets the maximum speed for interpolation instructions. The interpolation acceleration time is the time from a speed of zero to this speed. The interpolation deceleration time is the time from this speed to a speed of zero.
	IFMX	Set Maximum Individual Axis Speeds for Interpolation	IFMX [*Logical_axis_name_1*]*Maximum_individual_axis_speed_for_interpolation* [*Logical_axis_name_2*]*Maximum_individual_axis_speed_for_interpolation*	Sets the maximum speeds for the individual axes that are specified for interpolation instructions. You can set a different speed limit for each axis.
	FUT	Change Interpolation Feed Speed Unit	FUT U*interpolation_feed_speed_unit_number;*	Changes the speed unit for interpolation instructions.

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Instruction Type	Instruction	Name	Format	Description
Axis Setting	IFP	Set Interpolation Feed Speed Ratio	IFP P*interpolation_feeding_speed_ratio*;	Sets the speed for interpolation instructions. Specify the speed as a percentage of the maximum speed.
	IAC	Change Interpolation Acceleration Time	IAC T*interpolation_acceleration_time*;	Sets the acceleration time for interpolation instructions. Specify the time required to reach the maximum speed from a speed of 0.
	IDC	Change Interpolation Deceleration Time	IDC T*interpolation_deceleration_time*;	Sets the deceleration time for interpolation instructions. Specify the time required to decelerate to a speed of 0 from the maximum speed.
	IDH	Change Interpolation Deceleration Time for Temporary Stop	IDH T*interpolation_deceleration_time_for_temporary_stop*;	Sets the deceleration time for interpolation instructions when the axis is temporarily stopped. Specify the time required to decelerate to a speed of 0 from the maximum speed.
	IUT	Change Interpolation Acceleration/ Deceleration Unit	IUT U*interpolation_acceleration/deceleration_unit_number;*	Changes the acceleration/ deceleration unit for interpolation instructions (MVS, SKP, MCW, and MCC).
	(+ or -)	Set Interpolation Feed Speed Axes	MVS [+ *Logical_axis_name_1*] *Reference_position* [+ *Logical_axis_name_2*] *Reference_position* [- *Logical_axis_name_3*] *Reference_position ...;*	Specifies the axes to use as component axes for the interpolation feed speed. If "+" or nothing is given before the logical axis name, the axis is used as one of the component axes for the interpolation feed speed. If "-" is given before the logical axis name, the axis operates at a speed that is synchronized with the interpolation feed speed.
	ACCMODE	Set Interpolation Acceleration/ Deceleration Mode	ACCMODE M*mode_number*;	Sets the acceleration/deceleration mode for interpolation instructions. This allows you to specify processing multiple interpolation instructions in succession.

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Instruction Type	Instruction	Name	Format		Description
Axis Movement	MOV	Positioning	MOV [*Logical_axis_name_1*] *Reference_position* [*Logical_axis_name_2*] *Reference_position* [*Logical_axis_name_3*] *Reference_position* ...;		Performs positioning using the positioning speed. Up to 32 axes can be specified simultaneously.
	MVS	Linear Interpolation	MVS [*Logical_axis_name_1*] *Reference_position* [*Logical_axis_name_2*] *Reference_position* [*Logical_axis_name_3*] *Reference_position* ... F*interpolation_feed_speed*;		Performs linear movement using the interpolation feeding speed F. Up to 32 axes can be specified simultaneously.
	MCW	Clockwise Circular Interpolation	Center Position Designation	MCW [*Logical_axis_name_1*] *End_position* [*Logical_axis_name_2*] *End_position* U*center_point_position* V*center_point_position* T*number_of_turns* F*interpolation_feed_speed*;	Executes circular interpolation at tangential speed F for two axes simultaneously following radius R or designated center point coordinates. Multiple circles can be specified after “T” if the center point coordinate is specified. (“T” can be omitted.)
			Radius Designation	MCW [*Logical_axis_name_1*] *End_position* [*Logical_axis_name_2*] *End_position* R*radius* F*interpolation_feed_speed*;	
	MCC	Counterclockwise Circular Interpolation	Center Position Designation	MCC [*Logical_axis_name_1*] *End_position* [*Logical_axis_name_2*] *End_position* U*center_point_position* V*center_point_position* T*number_of_turns* F*interpolation_feed_speed*;	
			Radius Designation	MCC [*Logical_axis_name_1*] *End_position* [*Logical_axis_name_2*] *End_position* R*radius* F*interpolation_feed_speed*;	

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Instruction Type	Instruction	Name	Format		Description
Axis Movement	MCW	Clockwise Helical Interpolation	Center Position Designation	MCW [*Logical_axis_name_1*] *End_position* [*Logical_axis_name_2*] *End_position* U*center_point_position* V*center_point_position* [*Logical_axis_name_3*] *End_position_for_linear_interpolation* T*number_of_turns* F*interpolation_feed_speed*;	Moves three axes simultaneously with a combination of circular interpolation and linear interpolation outside the circular interpolation plane. Speed F is the circular interpolation tangential speed. The number of turns can be specified after "T" if the center point coordinate is specified. ("T" can be omitted.)
			Radius Designation	MCW [*Logical_axis_name_1*] *End_position* [*Logical_axis_name_2*] *End_position* R*radius* [*Logical_axis_name_3*] *End_position_for_linear_interpolation* F*interpolation_feed_speed*;	
	MCC	Counterclockwise Helical Interpolation	Center Position Designation	MCC [*Logical_axis_name_1*] *End_position* [*Logical_axis_name_2*] *End_position* U*center_point_position* V*center_point_position* [*Logical_axis_name_3*] *End_position_for_linear_interpolation* T*number_of_turns* F*interpolation_feed_speed*;	
			Radius Designation	MCC [*Logical_axis_name_1*] *End_position* [*Logical_axis_name_2*] *End_position* R*radius* [*Logical_axis_name_3*] *End_position_for_linear_interpolation* F*interpolation_feed_speed*;	
	ZRN	Zero Point Return	ZRN [*Logical_axis_name_1*]0 [*Logical_axis_name_2*]0 [*Logical_axis_name_3*]0 ...;		Returns each axis to its origin.
	DEN	Position after Distribution	MOV [*Logical_axis_name_1*] *Reference_position* [*Logical_axis_name_2*] *Reference_position* [*Logical_axis_name_3*] *Reference_position* ... DEN;		Performs positioning to the next block after distribution is completed without waiting for a Positioning Completed signal.
	SKP	Skip Function	SKP [*Logical_axis_name_1*] *Reference_position* [*Logical_axis_name_2*] *Reference_position* [*Logical_axis_name_3*] *Reference_position* ... F*interpolation_feed_speed* SS*skip_input_signal_selection*;		If the SKIP signal turns ON during a linear interpolation operation, the remaining movement is skipped and operation proceeds to the next block.

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Instruction Type	Instruction	Name	Format	Description
Axis Movement	MVT	Set-time Positioning	MVT [*Logical_axis_name_1*] *Reference_position* [*Logical_axis_name_2*] *Reference_position* [*Logical_axis_name_3*] *Reference_position* ... T*positioning_time*(ms);	Executes positioning by adjusting the feed speed so that travel can be completed at the designated time.
	EXM	External Positioning	EXM [*Logical_axis_name_1*] *Reference_position* D*travel_distance_from_external_positioning_signal_input*;	If an external positioning signal is input during external positioning, the axis is moved only by the travel distance designated after "D" as an incremental value, and then the next instruction is executed.
Axis Control	POS	Set Current Position	POS [*Logical_axis_name_1*] *New_coordinate_values* [*Logical_axis_name_2*] *New_coordinate_values* ...;	Changes the current values to the desired coordinate values. Subsequent travel commands use this new coordinate system. Up to 32 axes can be specified simultaneously.
	MVM	Move on Machine Coordinates	MVM MOV [*Logical_axis_name_1*] *Reference_position* [*Logical_axis_name_2*] *Reference_position* [*Logical_axis_name_3*] *Reference_position* ...;	Moves to the target position in the machine coordinate system. The coordinate system that is set automatically on completion of the origin return is called the machine coordinate system. This coordinate system is not affected by the POS instruction.
	PLD	Update Program Current Position	PLD [*Logical_axis_name_1*] [*Logical_axis_name_2*] ... ;	Updates the program current position for axes that were moved manually. Up to 32 axes can be specified simultaneously.
	PFN	In-Position Check	MVS [*Logical_axis_name_1*] - [*Logical_axis_name_2*] - ... PFN; Or MVS [*Logical_axis_name_1*] - [*Logical_axis_name_2*] - ...; PFN [*Logical_axis_name_1*] [*Logical_axis_name_2*]; MVS [*Logical_axis_name_1*] - [*Logical_axis_name_2*] - ...;	Causes interpolation movement instructions in the same block or in the previous block to proceed to the next block only after the in-position range has been entered.
	INP	In-Position Range	INP [*Logical_axis_name_1*] *NEAR_signal_output_width* [*Logical_axis_name_2*] *NEAR_signal_output_width* ...;	Sets the NEAR signal output widths (i.e., the in-position ranges). The execution of subsequent interpolation movement instructions that are used with a PFN instruction proceed to the next block only after the NEAR signal output width is entered.

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Instruction Type	Instruction	Name	Format	Description
Axis Control	PFP	Positioning Completed Check	MVS [*Logical_axis_name_1*] - [*Logical_axis_name_2*] - ... PFP; Or MVS [*Logical_axis_name_1*] - [*Logical_axis_name_2*] - ...; PFP [*Logical_axis_name_1*] [*Logical_axis_name_2*]; MVS [*Logical_axis_name_1*] - [*Logical_axis_name_2*] - ...;	Causes interpolation movement instructions in the same block or in the previous block to proceed to the next block only after positioning has been completed.
	PLN	Coordinate Plane Setting	PLN [*Logical_axis_name_1 (vertical axis)*] [*Logical_axis_name_2 (horizontal axis)*];	Designates the coordinate plane to be used for an instruction that requires a plane designation.

Program Control	IF
	ELSE
	IEND
		Branching	IF (*Conditional_expression*);
			(*Process_1*);
			ELSE;
			(*Process_2*);
			IEND;
				Executes process 1 if the conditional expression is satisfied, or executes process 2 if the conditional expression is not satisfied.

	WHILE WEND	Repetition	WHILE (*Conditional_expression*); ...; WEND;	Repeatedly executes the processes between WHILE and WEND as long as the conditional expression is satisfied.
	WHILE WENDX	Repetition with One Scan Wait	WHILE (*Conditional_expression*); ...; WENDX;	Repeatedly executes the processes between WHILE and WENDX as long as the conditional expression is satisfied. Executes one loop process per scan.
	PFORK JOINTO PJOINT	Parallel Execution	PFORK *Label_1*, *Label_2*, *Label_3*...; *Label_1*: *Process_1*; JOINTO *Label_X*; *Label_2*: *Process_2;* JOINTO *Label_X*; *Label_3*: *Process_3;* JOINTO *Label_X*; *Label_X*: PJOINT;	Executes the blocks (forks) that are designated by the labels in parallel. The END and RET instructions cannot be used in parallel execution processing.
	SFORK JOINTO SJOINT	Selective Execution	SFORK *Conditional_expression_1*? *Label_1*, *Conditional_expression_2*? *Label_2*, *Conditional_expression_3*? *Label_3*, *Conditional_expression_4*? *Label_4*; *Label_1*: *Process_1*; JOINTO *Label_X*; *Label_2*: *Process_2;* JOINTO *Label_X*; *Label_3*: *Process_3;* JOINTO *Label_X*; *Label_4*: *Process_4;* JOINTO *Label_X*; ...; *Label_X*: SJOINT;	Executes process 1 if conditional expression 1 is satisfied, or executes process 2 if conditional expression 2 is satisfied.
	MSEE	Call Subprogram	MSEE MPS□□□;	Executes the MPS□□□ subprogram.
	SSEE	Call Sequence Subprogram	SSEE SPS□□□;	Executes the SPS□□□ subprogram.

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Instruction Type	Instruction	Name	Format	Description
Program Control	UFC	Call User Function	UFC *User_function_name* *Input_data*, *Input_address*, *Output_data*;	Calls a user-created function from the motion program.
	FUNC	User Function	FUNC *User_function_name* *Input_data*, *Input_address*, *Output_data*;	Calls a user-created function from the sequence program.
	END	Program End	END;	Ends the program.
	RET	Subprogram Return	RET;	Ends the subprogram.
	TIM	Dwell Time	TIM T – ;	Waits for the period of time specified by T, and then proceeds to the next block.
	TIM1MS	One-ms Dwell Time	TIM1MS T – ;	Waits for the period of time specified by T, and then proceeds to the next block.
	IOW	I/O Variable Wait	IOW MB – = =...;	Stops execution of the motion program until the conditional expression is satisfied.
	EOX	One Scan Wait	EOX;	Divides the execution of consecutive sequence instructions. The instruction block after EOX is executed in the next scan.
	SNGD/ SNGE	Disable Single-block Signal (SNGD) and Enable Single-block Signal (SNGE)	SNGD; ...; SNGE;	Specifies whether to enable or disable single step operation during debugging.

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Instruction Type	Instruction	Name	Format	Description
Numeric Operations	=	Substitute	*Result = Math_expression*	Substitutes the results of an operation. Calculations are performed from left to right with no order of priority.
	+	Add	MW☐ = MW☐ + MW☐;	Performs integer and real number addition. If both integers and real numbers are included, calculations are performed with real numbers.
	-	Subtract	MW☐ = MW☐ - MW☐;	Performs integer and real number subtraction. If both integers and real numbers are included, calculations are performed with real numbers.
	+ +	Extended Add	MW☐ = MW☐ + + MW☐;	Performs extended addition of integers.
	- -	Extended Subtract	MW☐ = MW☐ - - MW☐;	Performs extended subtraction of integers.
	*	Multiply	MW☐ = MW☐ * MW☐;	Performs integer and real number multiplication. If both integers and real numbers are included, calculations are performed with real numbers.
	/	Divide	MW☐ = MW☐ / MW☐;	Performs integer and real number division. If both integers and real numbers are included, calculations are performed with real numbers.
	MOD	Modulo	MW☐ = MW☐ / MW☐; MW☐ = MOD;	When programmed in the next block after a division, MOD stores the remainder in the designated register.

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Instruction Type	Instruction	Name	Format	Description
Logic Operations	|	OR (Inclusive OR)	MB□ = MB□ | MB□; MB□ = MB□ | 1; MW□ = MW□ | MW□; MW□ = MW□ | 00FFH; ML□ = ML□ | ML□; ML□ = ML□ | 00FF00FFH; MQ□ = MQ□ | MQ□; MQ□ = MQ□ | 00FF00FF 00FF00FFH;	Performs a bit or integer inclusive OR operation.
	&	AND (AND)	MB□ = MB□ & MB□; MB□ = MB□ & 1; MW□ = MW□ & MW□; MW□ = MW□ & 00FFH; ML□ = ML□ & ML□; ML□ = ML□ & 00FF00FFH; MQ□ = MQ□ & MQ□; MQ□ = MQ□ & 00FF00FF 00FF00FFH;	Performs a bit or integer AND operation.
	^	XOR (Exclusive OR)	MW□ = MW□ ^ MW□; MW□ = MW□ ^ 00FFH; ML□ = ML□ ^ ML□; ML□ = ML□ ^ 00FF00FFH; MQ□ = MQ□ ^ MQ□; MQ□ = MWQ□ ^ 00FF00FF 00FF00FFH;	Performs an integer exclusive OR operation.
	!	NOT (Logical Complement)	MB□ = !MB□; MB□ = !1; MW□ = !MW□; MW□ = !00FFH; ML□ = !ML□; ML□ = !00FF00FFH; MQ□ = !MQ□; MQ□ = !00FF00FF 00FF00FFH;	Returns the inverse of the specified bit.
Numeric Comparison	= =	Equal	IF MB□ = = MB□; WHILE MB□ = = MB□; IF MW□ = = MW□; WHILE MW□ = = MW□; IF ML□ = = ML□; WHILE ML□ = = ML□; IF MF□ = = MF□; WHILE MF□ = = MF□; IF MQ□ = = MQ□; WHILE MQ□ = = MQ□; IF MD□ = = MD□; WHILE MD□ = = MD□;	Used in an IF or WHILE conditional expression. If the left side and right side are the same, the condition is TRUE.
	<>	Mismatch	IF MW□ < > MW□; WHILE MW□ < > MW□; IF ML□ < > ML□; WHILE ML□ < > ML□; IF MF□ < > MF□; WHILE MF□ < > MF□; IF MQ□ < > MQ□; WHILE MQ□ < > MQ□; IF MD□ < > MD□; WHILE MD□ < > MD□;	Used in an IF or WHILE conditional expression. If the left side and the right side do not match, the condition is TRUE.

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Instruction Type	Instruction	Name	Format	Description
Numeric Comparison	>	Greater Than	IF MW□ > MW□; WHILE MW□ > MW□; IF ML□ > ML□; WHILE ML□ > ML□; IF MF□ > MF□; WHILE MF□ > MF□; IF MQ□ > MQ□; WHILE MQ□ > MQ□; IF MD□ > MD□; WHILE MD□ > MD□;	Used in an IF or WHILE conditional expression. If the left side is greater than the right side, the condition is TRUE.
	<	Less Than	IF MW□ < MW□; WHILE MW□ < MW□; IF ML□ < ML□; WHILE ML□ < ML□; IF MF□ < MF□; WHILE MF□ < MF□; IF MQ□ < MQ□; WHILE MQ□ < MQ□; IF MD□ < MD□; WHILE MD□ < MD□;	Used in an IF or WHILE conditional expression. If the left side is less than the right side, the condition is TRUE.
	>=	Greater Than or Equal To	IF MW□ >= MW□; WHILE MW□ >= MW□; IF ML□ >= ML□; WHILE ML□ >= ML□; IF MF□ >= MF□; WHILE MF□ >= MF□; IF MQ□ >= MQ□; WHILE MQ□ >= MQ□; IF MD□ >= MD□; WHILE MD□ >= MD□;	Used in an IF or WHILE conditional expression. If the left side is greater than or equal to the right side, the condition is TRUE.
	<=	Less Than or Equal To	IF MW□ <= MW□; WHILE MW□ <= MW□; IF ML□ <= ML□; WHILE ML□ <= ML□; IF MF□ <= MF□; WHILE MF□ <= MF□; IF MQ□ <= MQ□; WHILE MQ□ <= MQ□; IF MD□ <= MD□; WHILE MD□ <= MD□;	Used in an IF or WHILE conditional expression. If the left side is less than or equal to the right side, the condition is TRUE.
Data Manipulations	SFR	Right Shift	SFR MB□ N□ W□;	Shifts the bit variable by the specified number of bits to the right.
	SFL	Left Shift	SFL MB□ N□ W□;	Shifts the bit variable by the specified number of bits to the left.
	BLK	Move Block	BLK MW□ MW□ W□;	Copies the areas of specified blocks beginning with the specified transfer source to the specified transfer destination.
	CLR	Clear	CLR MW□ W□;	Clears the desired area to 0's (zeros) beginning with the specified register.
	SETW	Table Initialization	SETW MW□ DW□; W□;	Stores the specified data in all registers starting from the target register to the specified number of registers thereafter.
	ASCII	ASCII Conversion 1	ASCII '*Text_string*' MW□;	Converts the specified characters to ASCII text, and stores the results of that operation in the specified registers.

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Instruction Type	Instruction	Name	Format	Description
Basic Functions	SIN	Sine	SIN (MW□); SIN (90);	Calculates the sine. The specifications depend on whether the data type is integer or real number.
	COS	Cosine	COS (MW□); COS (90);	Calculates the cosine. The specifications depend on whether the data type is integer or real number.
	TAN	Tangent	TAN (MF□); TAN (45.0);	Calculates the tangent. Only a real number register can be specified.
	ASN	Arc Sine	ASN (MF□); ASN (90.0);	Calculates the arc sine. Only a real number register can be specified.
	ACS	Arc Cosine	ACS (MF□); ACS (90.0);	Calculates the arc cosine. Only a real number register can be specified.
	ATN	Arc Tangent	ATN (MW□); ATN (45);	Calculates the arc tangent. The specifications depend on whether the data type is integer or real number.
	SQT	Square Root	SQT (MW□); SQT (100);	Calculates the square root. The specifications depend on whether the data type is integer or real number.
	BIN	BCD→BIN	BIN (MW□);	Converts BCD data to binary data.
	BCD	BIN→BCD	BCD (MW□);	Converts binary data to BCD data.
	S { }	Set Bit	S {MB□} = MB□ & MB□;	If the logic operation result is TRUE, the specified bit turns ON. However, the specified bit is not turned OFF even if the result of the logic operation is FALSE.
	R { }	Reset Bit	R {MB□} = MB□ & MB□;	If the logic operation result is TRUE, the specified bit turns OFF. However, the specified bit is not turned ON even if the result of the logic operation is FALSE.
	PON	Rising-edge Pulse	MB□ = PON (MB□ MB□); Or IF PON (MB□ MB□) = = 1; · · ·; IEND;	The bit output turns ON for one scan when the bit input status changes from OFF to ON.
	NON	Falling-edge Pulse	MB□ = NON (MB□ MB□); Or IF NON (MB□ MB□) = = 1; · · ·; IEND;	The bit output turns ON for one scan when the bit input status changes from ON to OFF.
	TON	On-Delay Timer	MB□ = MB□ & TON (□ MB□);	Counts the time whenever the bit input is ON. The bit output turns ON when the counted value is equal to the set value. Counting unit: 10 ms

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Instruction Type	Instruction	Name	Format	Description
Basic Functions	TON1MS	1-ms ON-Delay Timer	DB□ = DB□ & TON1MS (□ DB□);	Counts the time whenever the bit input is ON. The bit output turns ON when the counted value is equal to the set value. Counting unit: 1 ms
	TOF	Off-Delay Timer	MB□ = MB□ & TOF (□ MB□);	Counts the time whenever the bit input is OFF. The bit output turns OFF when the counted value is equal to the set value. Counting unit: 10 ms
	TOF1MS	1-ms OFF-Delay Timer	DB□ = DB□ & TOF1MS (□ DW□);	Counts the time whenever the bit input is OFF. The bit output turns OFF when the counted value is equal to the set value. Counting unit: 1 ms

Machine-Specific Motion Control

5

This chapter provides information and describes settings that are necessary to perform machine-specific motion control.

5.1 Motion Parameters

Set the following eight motion parameters according to the machine's specifications to ensure correct motion control.

- Reference Unit
- Electronic Gear
- Axis Selection
- Position Reference
- Speed Reference
- Acceleration/Deceleration Settings
- Acceleration/Deceleration Filter Settings
- Linear Scale Pitch/Rated Speed (when using a linear motor)

This section describes settings for the eight items listed above.

5.1.1 Reference Unit

The motion control reference unit can be set to pulses, millimeters, degrees, inches, or micrometers. The reference unit is set in fixed parameter No. 4 (Reference Unit Selection). The minimum reference unit is determined by the setting in fixed parameter No. 5 (Number of Digits Below Decimal Point).

Fixed parameter No. 5 (Number of Digits Below Decimal Point)	Fixed parameter No. 4 (Reference Unit Selection)				
	0: pulse	1: mm	2: deg	3: inch	4: µm
0: 0 digits	1 pulse	1 mm	1 deg	1 inch	1 µm
1: 1 digit	1 pulse	0.1 mm	0.1 deg	0.1 inch	0.1 µm
2: 2 digits	1 pulse	0.01 mm	0.01 deg	0.01 inch	0.01 µm
3: 3 digits	1 pulse	0.001 mm	0.001 deg	0.001 inch	0.001 µm
4: 4 digits	1 pulse	0.0001 mm	0.0001 deg	0.0001 inch	0.0001 µm
5: 5 digits	1 pulse	0.00001 mm	0.00001 deg	0.00001 inch	0.00001 µm

5.1.2 Electronic Gear

The amount of change in the mechanical system (i.e., the travel distance) for the input of 1 reference unit is called the output unit. The electronic gear converts positions or speeds from reference units to output units for the mechanical system without going through an input mechanism, such as a gear.

If the mechanical configuration is such that rotating the Servomotor axis m times results in rotating the load axis n times, this electronic gear can be used to make the output units equivalent to the reference units.

The electronic gear is set with the following fixed parameters.

- No. 6 (Travel Distance per Machine Rotation)
- No. 8 (Servomotor Gear Ratio Term)
- No. 9 (Machine Gear Ratio Term)

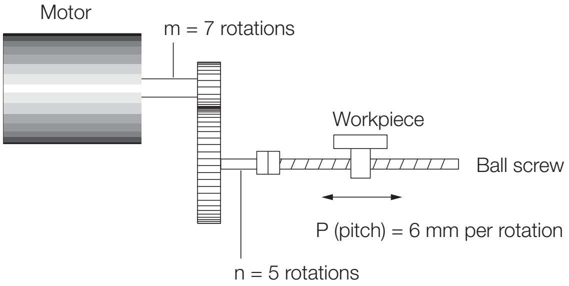
Important

The electronic gear cannot be used if fixed parameter No. 4 (Reference Unit Selection) is set to 0 (Pulses).

The following examples show the settings for a ball screw and rotary table.

Example Parameter Settings for a Ball Screw

- Machine specifications: The ball screw axis rotates 5 times for every 7 rotations of the motor axis. (Refer to the following figure.)
- Reference unit: 0.001 mm



To move the workpiece 0.001 mm for 1 reference unit input under the above conditions, i.e., for 1 reference unit to equal 1 output unit, make the following settings for fixed parameters No. 6, No. 8, and No. 9.

- No. 6 (Travel Distance per Machine Rotation): 6 mm/0.001 mm = 6,000 (reference units)
- No. 8 (Servomotor Gear Ratio Term): m = 7
- No. 9 (Machine Gear Ratio Term): n = 5

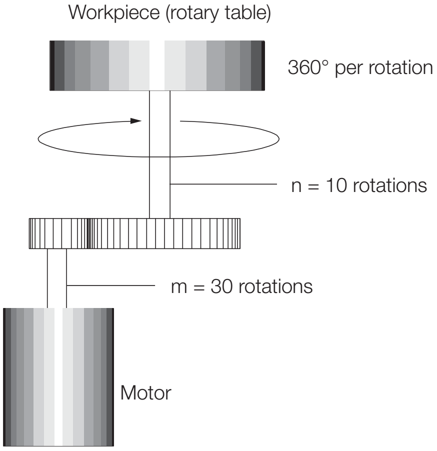
Important

To use the electronic gear by setting the motion parameters, set the electronic gear ratio in the SERVOPACK parameters to 1:1. However, to use a 24-bit resolution encoder, refer to the following section and set the electronic gear ratio in the SERVOPACK parameters.

☞ *5.4 Absolute Encoders with 24-Bit Resolution* on page 5-53

Example Parameter Settings for a Rotary Table

- Machine specifications: The rotary table axis rotates 10 times for every 30 rotations of the motor axis. (Refer to the following figure.)
- Reference unit: 0.1°



To rotate the rotary table 0.1° for 1 reference unit input under the above conditions, i.e., for 1 reference unit to equal 1 output unit, make the following settings for fixed parameters No. 6, No. 8, and No. 9.

- No. 6 (Travel Distance per Machine Rotation): 360°/0.1° = 3,600 (reference units)
- No. 8 (Servomotor Gear Ratio Term): m = 30
- No. 9 (Machine Gear Ratio Term): n = 10

Important

To use the electronic gear by setting the motion parameters, set the electronic gear ratio in the SERVOPACK parameters to 1:1. However, to use a 24-bit resolution encoder, refer to the following section and set the electronic gear ratio in the SERVOPACK parameters.

☞ *5.4 Absolute Encoders with 24-Bit Resolution* on page 5-53

Information The result will be the same as long as the ratio between the settings for fixed parameters No. 8 and No. 9 (m/n) is constant, e.g., m = 3 and n = 1.

Electronic Gear Conversion

The formulas for electronic gear conversion are as follows:

◆ Reference Units to Pulses

$$\text{Travel distance (pulses)} = \text{Travel distance (reference units)} \times \frac{\text{No. 36 (Number of Pulses per Motor Rotation)} \times \text{No. 8 (Servomotor Gear Ratio Term)}}{\text{No. 6 (Travel Distance per Machine Rotation)} \times \text{No. 9 (Machine Gear Ratio Term)}}$$

◆ Pulses to Reference Units

$$\text{Travel distance (reference units)} = \text{Travel distance (pulses)} \times \frac{\text{No. 6 (Travel Distance per Machine Rotation)} \times \text{No. 9 (Machine Gear Ratio Term)}}{\text{No. 36 (Number of Pulses per Motor Rotation)} \times \text{No. 8 (Servomotor Gear Ratio Term)}}$$

5.1.3 Axis Selection

There are two types of position control: finite-length axis position control for round-trip operation and other tasks that are performed only within a specified range, and infinite-length axis position control that is used for rotation in one direction only. Infinite-length axis position control can work in one of two ways: It can be used to reset the position data to 0 after one rotation, e.g, for belt conveyors, or to simply rotate in one direction only, without resetting the position after one rotation. The Axis Selection parameter sets which of these types of position control to use.

The parameters that are related to axis selection are listed in the following table.

Parameter Type	No.	Name	Description	Default
Fixed Parameters	No.1 Bit 0	Function Selection Flags 1, Axis Selection	This parameter specifies the position control method for the controlled axis. 0: Finite-length axis This is an axis that uses finite-length axis position control or an axis that uses infinite-length axis position control that rotates in one direction only and does not reset its position data after every rotation. 1: Infinite-length axis This is an axis that uses infinite-length axis position control that resets position data after every rotation.	0
	No. 10	Infinite-length Axis Reset Position (POSMAX)	This parameter sets the reset position of the position data when the Axis Selection parameter is set to 1 (Infinite-length axis).	360000

5.1.4 Position References

The target position for position control is set in the OL□□□1C setting parameter (Position Reference Setting). There are two different methods of setting the position reference: the absolute value specification method, which sets the coordinate data for the target position directly, and the incremental addition method, which adds the current travel amount to the previous position reference value.

The parameters that are related to setting the position reference are listed in the following table.

Parameter Type	Register Address	Name	Description	Default
Setting Parameters	OW□□□09 Bit 5	Position Reference Type	This parameter specifies the type of position reference data. 0: Incremental value addition method This method sets OL□□□1C to the current value of OL□□□1C plus the current travel distance. 1: Absolute value specification method This method sets OL□□□1C to the coordinate value of the target position.	0
	OL□□□1C	Position Reference Setting	This parameter sets the position data. • If the incremental value addition method is used (i.e., if bit 5 in OW□□□09 is set to 0), the current travel distance (incremental amount) is added to the current value of OL□□□1C. OL□□□1C = OL□□□1C + Incremental travel distance Example: If the current travel distance is 500 and the previous value of OL□□□1C is 1,000, OL□□□1C will equal 1,000 + 500 or 1,500. • If the absolute value specification method is used (i.e., if bit 5 in OW□□□09 is set to 1), this parameter is set to the coordinate value of the target position. Example: Set OL□□□1C to 10,000 to move to the position 10,000. OL□□□1C = 10000	0

The following table compares the merits and demerits of the incremental value addition and absolute value specification methods.

Position Reference Type	Merit	Demerit
Incremental value addition method	It is not necessary to consider the relationship between OL□□□1C and the current position when a move is canceled.	OL□□□1C does not equal the target position, so the position reference can be difficult to understand intuitively.
Absolute value specification method	The coordinate of the target position is specified directly, making it easy to understand.	The current position must be set in OL□□□1C whenever the power supply is turned ON or a move is canceled. If this operation is not performed, the axis may move suddenly when a movement motion command is started. This method also makes the target position difficult to manage for infinite-length axes.

Setting the Target Position for an Infinite-length Axis

There are two methods that you can use to set the target position when an infinite-length axis is used.

In the following cases, use setting method 1 to set the target position.

- When executing a POSING command when no command (NOP) is being executed

- When changing the target position based on the current position when a POSING command is being executed
- When changing to a POSING command when a non-POSING command is being executed

In the following cases, use setting method 2 to set the target position.

- When changing the target position based on the original target position when a POSING command is being executed

◆ Setting Method 1

■ Using the Incremental Value Addition Method (When Bit 5 in OW□□□09 Is Set to 0)

Important Issue the reference only when distribution has been completed (i.e., when bit 0 in IW□□□0C is 1).

Incremental value = Target position (a value between 0 and POSMAX) - IL□□□10 (CPOS) + POSMAX × n

OL□□□1C = OL□□□1C + Incremental value

n is the number of POSMAX turns needed to move from the current position (CPOS) to the target position. When the distance between the target position and the current position is within the first turn, *n* is 0.

■ Using the Absolute Value Specification Method (When Bit 5 in OW□□□09 Is Set to 1)

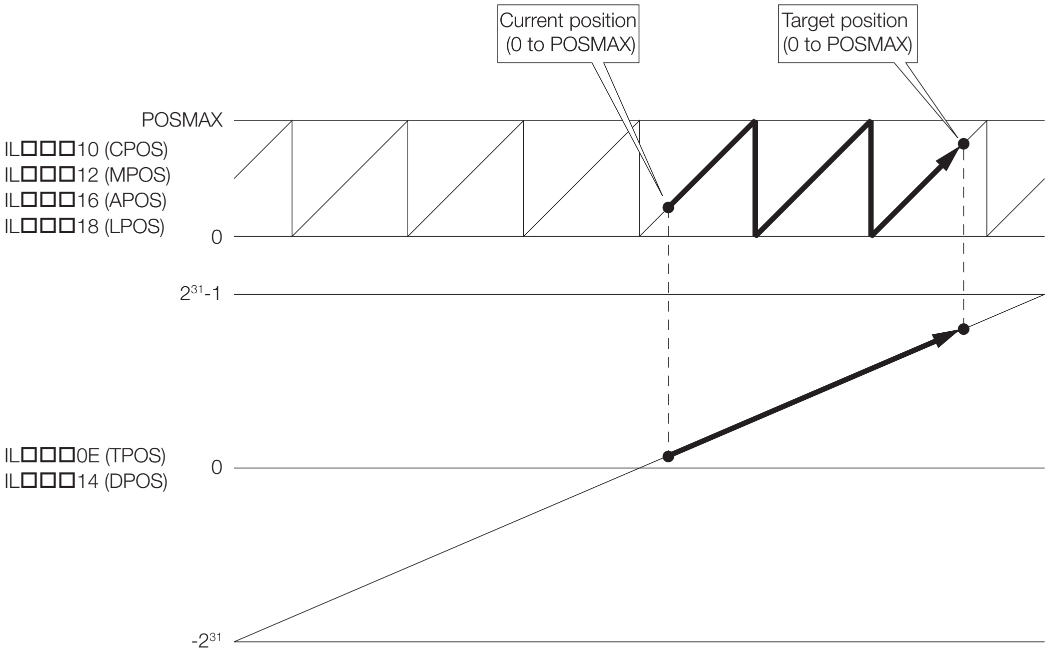
In this case, the reference can be issued even when distribution has not been completed (i.e., even when bit 0 in IW□□□0C is 0).

Incremental value = Target position (a value between 0 and POSMAX) - IL□□□10 (CPOS) + POSMAX × n

OL□□□1C = IL□□□14 (DPOS) + Incremental value

n is the number of POSMAX turns needed to move from the current position (CPOS) to the target position. When the distance between the target position and the current position is within the first turn, *n* is 0.

Example When *n* = 2



◆ Setting Method 2

■ Using the Incremental Value Addition Method (When Bit 5 in OW□□□09 Is Set to 0)

Incremental value = Target position (a value between 0 and POSMAX) - Previous target position (a value between 0 and POSMAX) + POSMAX × n

OL□□□1C = OL□□□1C + Incremental value

Previous target position: The directly specified value or the value that was stored in a location such as an M register.

n is the number of POSMAX turns needed to move from the current position (CPOS) to the target position. When the distance between the target position and the current position is within the first turn, *n* is 0.

■ Using the Absolute Value Specification Method (When Bit 5 in OW□□□09 Is Set to 1)

Important

Make sure that the absolute value specification method setting is retained after the target position is changed.

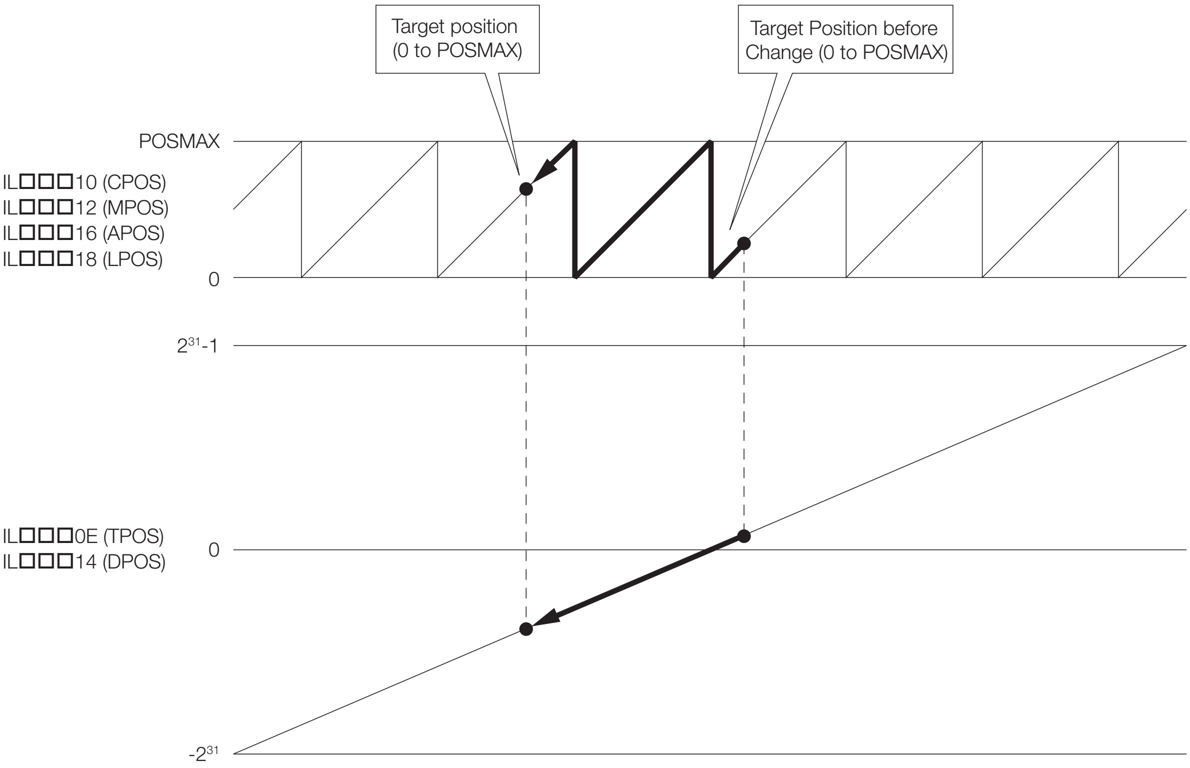
Incremental value = Target position (a value between 0 and POSMAX) - Previous target position (a value between 0 and POSMAX) + POSMAX × n

OL□□□1C = IL□□□14 (DPOS) + Incremental value

Previous target position: The directly specified value or the value that was stored in a location such as an M register.

n is the number of POSMAX turns needed to move from the current position (CPOS) to the target position. When the distance between the target position and the current position is within the first turn, *n* is 0.

Example When *n* = -2



5.1.5 Speed References

There are two methods of setting the speed reference for the feed speed or other speeds. One method involves using reference units and the other method involves setting the percentage (%) of the rated speed. The setting method depends on the settings of the related parameters.

The parameters that are related to the speed reference are listed in the following table.

Parameter Type	Parameter/ Register Address	Name	Description	Default
Fixed Parameters	No.5	Number of Digits Below Decimal Point	This parameter sets the number of digits below the decimal point in the reference unit. The minimum reference unit is determined by this parameter and fixed parameter No. 4 (Reference Unit Selection). Example: When the Reference Unit Selection parameter is set to mm and the Number of Digits Below Decimal Point parameter is set to 3, a reference unit of 1 will be 0.001 mm.	3
	No.34	Rated Motor Speed	This parameter sets the number of rotations when the motor is rotated at the rated speed (100% speed). Set this parameter according to the specifications of the motor.	3,000
	No.36	Number of Pulses Per Motor Rotation	This parameter sets the number of pulses per Servomotor rotation. Example: For a 16-bit encoder, set this parameter to 2^{16} = 65,536.	65,536
Setting Parameters	OW□□□03 Bit 0 to 3	Speed Unit Selection	This parameter sets the unit for the reference speed. 0: Reference units/s 1: 10^n reference units/min (n: Number of digits below the decimal point) 2: 0.01% 3: 0.0001%	1
	OL□□□10	Speed Reference Setting	This parameter sets the feed speed. The unit for the speed is set in bits 0 to 3 (Speed Unit Selection) of OW□□□03. Example: When the number of digits below the decimal point is set to 3, the settings are as follows: • When the Speed Unit Selection Is Set to 0 (Reference Unit/s): Pulse unit: 1 = 1 pulse/s mm unit: 1 = 0.001 mm/s Degree unit: 1 = 0.001 deg/s Inch unit: 1 = 0.001 inches/s µm unit: 1= 0.001 µm/s • When the Speed Unit Selection Is Set to 1 (10^n reference unit/min): Pulse unit: 1 = 1,000 pulses/min mm unit: 1 = 1 mm/min Degree unit: 1 = 1 deg/min Inch unit: 1 = 1 inch/min µm unit: 1 = 1 µm/min • When the Speed Unit Selection Is Set to 2 (0.01%): Set a percentage of the rated motor speed (1 = 0.01%), regardless of the reference unit.	3,000
	OW□□□18	Override	You can set an output ratio (%) for the setting of this parameter to change the feed speed without changing the Speed Reference Setting. Setting unit: 1 = 0.01%	10,000

Example Settings for the OL□□□10 Setting Parameter (Speed Reference Setting)

Given the following fixed parameter settings, the following table lists examples of the OL□□□10 settings that are required to achieve the target feed speed (reference speed).

- No. 5 (Number of Digits Below Decimal Point) = 3
- No. 34 (Rated Motor Speed) = 3,000 min^{-1}
- No. 36 (Number of Pulses per Motor Rotation) = 65,536 P/R

OW□□□03 Setting Parameter (Speed Unit Selection)	Fixed parameter No. 4 (Reference Unit Selection)	Reference Speed	Example OL□□□10 Setting
0 (Reference units/s)	pulse	500 R/s	500 (R/s) × 65,536 (pulse/R) = 37,268,000 (pulse/s)
		1500 min^{-1}	1,500 (min^{-1}) × 65,536 (pulse/R) ÷ 60 (s) = 1,638,400 (pulse/s)
	mm	Feed speed of 500 mm/s with a machine that travels 10 mm for each rotation	500 (mm/s) ÷ 0.001= 500,000 (0.001 mm/s) The speed is determined by the feed speed and the number of digits below the decimal point (0.001 in the above equation), regardless of the machine configuration.
		Feed speed of 900 mm/min with a machine that travels 10 mm for each rotation	900 (mm/min) ÷ 0.001 ÷ 60 (s) = 15,000 (0.001 mm/s) The speed is determined by the feed speed and the number of digits below the decimal point (0.001 in the above equation), regardless of the machine configuration.
1 (10^n reference units/ min) n: Number of digits below the decimal point	pulse	500 R/s	(500 (R/s) × 65536 (pulse/R) ÷ 1,000) × 60 (s) = 1966080 (1,000 pulse/min) 1,000 = 10^n (n = 3)
		1500 min^{-1}	1,500 (min^{-1}) × 65,536 (pulse/R) ÷ 1,000 = 98,304 (1,000 pulse/min) 1,000 = 10^n (n = 3)
	mm (n = 3)	Feed speed of 500 mm/s with a machine that travels 10 mm for each rotation	(500 (mm/s) × 0.001) × 1,000 × 60 (s) = 30,000 (mm/min) The speed is determined by the feed speed and the number of digits below the decimal point (0.001 in the above equation), regardless of the machine configuration.
		Feed speed of 900 mm/min with a machine that travels 10 mm for each rotation	(900 (mm/min) × 0.001) × 1,000 = 900 (mm/min) The speed is determined by the feed speed, regardless of the machine configuration.
2 (0.01%)	–	1500 min^{-1}	(1,500 (min^{-1}) ÷ 3,000 (min^{-1})) × 100 (%) ÷ 0.01 = 5,000 (0.01%) The speed is determined by the ratio (percentage) of the feed speed to the rated speed.

Example Settings for the OW□□□18 Setting Parameter (Override)

The OW□□□18 setting parameter sets the speed as a percentage (output ratio) of the target feed speed in 0.01% increments. OW□□□18 is set independently of the Reference Unit Selection, Number of Digits Below Decimal Point, and other parameters.

Setting Example
If the output ratio is 25% … 25 ÷ 0.01 = 2,500
If the output ratio is 50% … 50 ÷ 0.01 = 5,000
If the output ratio is 75% … 75 ÷ 0.01 = 7,500
If the output ratio is 100% … 100 ÷ 0.01 = 10,000

5.1.6 Acceleration/Deceleration Settings

There are two methods that you can use to set the acceleration and deceleration rate: One sets the acceleration and deceleration directly, and the other sets the time required to reach the rated speed from a speed of zero. The setting method depends on the settings of the related parameters.

Related Parameters

The parameters that are related to acceleration and deceleration rate settings are listed in the following table.

Parameter Type	Parameter/ Register Address	Name	Description	Default
Fixed Parameters	No.5	Number of Digits Below Decimal Point	This parameter sets the number of digits below the decimal point in the reference unit. The minimum reference unit is determined by this parameter and fixed parameter No. 4 (Reference Unit Selection). Example: When the Reference Unit Selection parameter is set to mm and the Number of Digits Below Decimal Point parameter is set to 3, a reference unit of 1 will be 0.001 mm.	3
	No.34	Rated Motor Speed	This parameter sets the number of rotations when the motor is rotated at the rated speed (100% speed). Set this parameter according to the specifications of the motor.	3,000
	No.36	Number of Pulses Per Motor Rotation	This parameter sets the number of pulses per Servomotor rotation. Example: For a 16-bit encoder, set this parameter to 2^{16} = 65,536.	65,536

Continued on next page.

Continued from previous page.

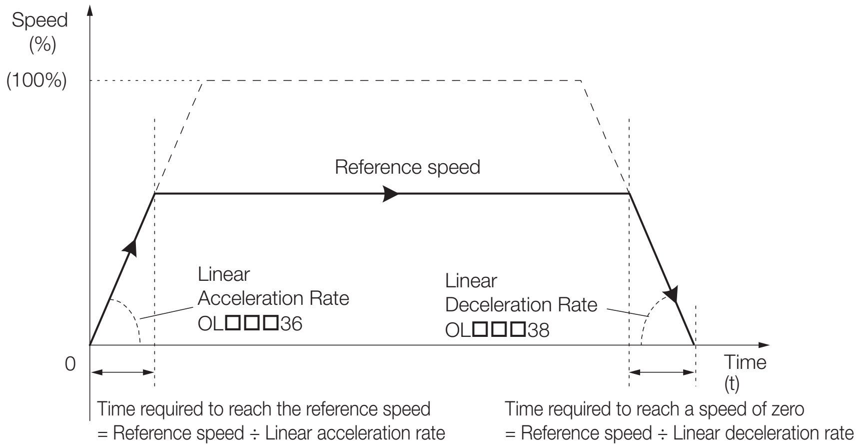
Parameter Type	Parameter/ Register Address	Name	Description	Default
Setting Parameters	OW□□□03 Bit 4 to 7	Acceleration/ Deceleration Rate Unit Selection	This parameter sets the unit for the acceleration/ deceleration rate. 0: Reference units/s^2 1: ms	1
	OL□□□36	Linear Acceleration Rate/Acceleration Time Constant	This parameter sets the acceleration rate or the acceleration time constant based on the setting in bits 4 through 7 in OW□□□03. • When the Acceleration/Deceleration Rate Unit Selection is set to 0 (Reference units/s^2), this parameter sets the acceleration rate. Pulse unit: 1 = 1 pulse/s^2 mm unit: 1 = 1 reference unit/s^2 Degree unit: 1 = 1 reference unit/s^2 Inch unit: 1 = 1 reference unit/s^2 µm unit: 1 = 1 reference unit/s^2 Example: When the number of digits below the decimal point is set to 3: mm unit: 1 = 0.001 mm/s^2 Degree unit: 1 = 0.001 deg/s^2 Inch unit: 1 = 0.001 inches/s^2 µm unit: 1= 0.001 µm/s^2 • When the Acceleration/Deceleration Rate Unit Selection is set to 1 (ms), this parameter sets the time constant from 0 to the rated speed, regardless of the reference unit.	0
	OL□□□38	Linear Deceleration Rate/Deceleration Time Constant	This parameter sets the deceleration rate or the deceleration time constant based on the setting in bits 4 through 7 in OW□□□03. • When the Acceleration/Deceleration Rate Unit Selection is set to 0 (Reference units/s^2), this parameter sets the deceleration rate. Pulse unit: 1 = 1 pulse/s^2 mm unit: 1 = 1 reference unit/s^2 Degree unit: 1 = 1 reference unit/s^2 Inch unit: 1 = 1 reference unit/s^2 µm unit: 1 = 1 reference unit/s^2 • When the Acceleration/Deceleration Rate Unit Selection is set to 1 (ms), this parameter sets the time constant from the rated speed to 0, regardless of the reference unit.	0

Acceleration/Deceleration Rate Unit Selection and Speed Changes Over Time

The settings for the OL□□□36 setting parameter (Linear Acceleration Rate/Acceleration Time Constant) and OL□□□38 (Linear Deceleration Rate/Deceleration Time Constant) are handled differently based on the setting in bits 4 through 7 in OW□□□03 (Acceleration/Deceleration Rate Unit Selection).

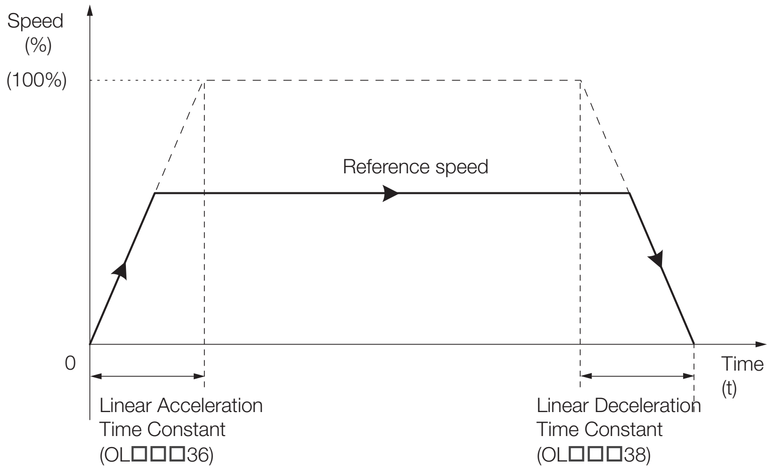
◆ When Bits 4 to 7 in OW□□□03 Are Set to 0 (Reference Units/s^2)

The settings of OL□□□36 and OL□□□38 are treated as the linear acceleration rate and linear deceleration rate, respectively.



◆ When Bits 4 to 7 in OW□□□03 Are Set to 1 (ms)

The setting of OL□□□36 is treated as the linear acceleration time constant, or the time required to reach the rated speed from a speed of zero using linear acceleration. The setting of OL□□□38 is treated as the linear deceleration time constant, or the time required to reach a speed of zero from the rated speed using linear deceleration.



For the following commands, acceleration/deceleration processing is performed by the SERVOPACK.

1: POSING
2: EX_POSING
3: ZRET
7: FEED
8: STEP
34: EX_FEED

5.1.7 Acceleration/Deceleration Filter Settings

There are two types of acceleration/deceleration filters: an exponential acceleration/deceleration filter and an average movement filter. These filter settings can be used to set non-linear acceleration/deceleration curves.

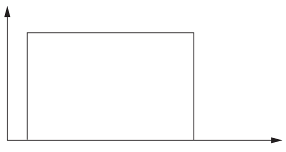
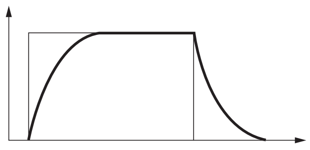
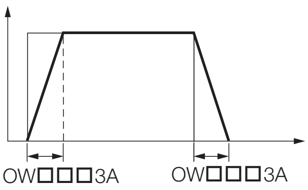
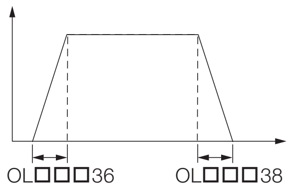
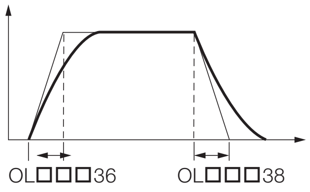
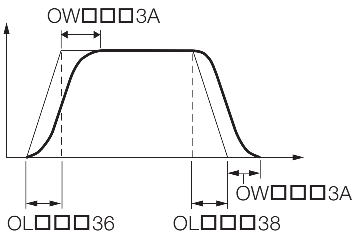
Related Parameters

The parameters that are related to acceleration/deceleration filter settings are listed in the following table.

Parameter Type	Register Addresses	Name	Description	Default
Setting Parameters	OW□□□03 Bit 8 to B	Filter Type Selection	This parameter sets the acceleration/deceleration filter type. 0: No filter (Filter none) 1: Exponential acceleration/deceleration filter 2: Average movement filter When a filter is used, set the filter type in this parameter and execute the CHG_FILTER motion command to apply the change. Refer to the following section for details. ☞ *4.2.12 CHG_FILTER (Change Filter Type)* on page 4-68 However, when bit A (SERVOPACK Parameter Auto-Write) in fixed parameter No. 1 is 0 (Enabled), the filter type is changed to the set filter type when reference pulse distribution is completed, even if the CHG_FILTER command is not executed.	0
	OW□□□3A	Filter Time Constant	This parameter sets the acceleration/deceleration filter time constant. Always make sure that distribution has been completed (i.e., that bit 0 in IW□□□0C is 1) before you change the filter time constant.	0

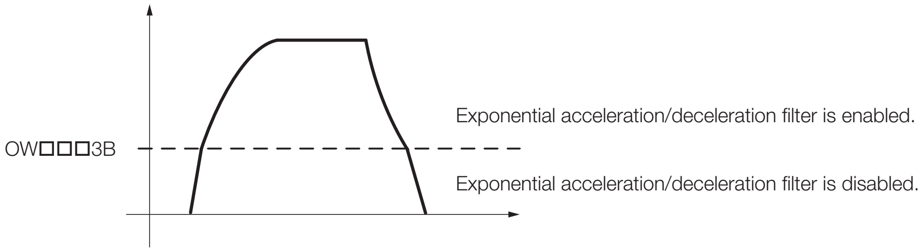
Acceleration/Deceleration Patterns

The following figures show the relationship between acceleration/deceleration patterns and each parameter setting.

	Filter Type Selection		
	OW□□□03 Bits 8 to B = 0 No Filter	OW□□□03 Bits 8 to B = 1 Exponential Acceleration/Deceleration Filter	OW□□□03 Bits 8 to B = 2 Average Movement Filter
No Acceleration /Deceleration OL□□□36 = 0 OL□□□38 = 0	 * STEP input	 * The curve depends on the setting of OW□□□3A.	
With Acceleration /Deceleration		 * The curve depends on the relationship between the settings of OW□□□3A, OL□□□36, and OL□□□38.	

Important

If an exponential acceleration/deceleration filter is used with the SVR Function Module, you can use the setting for the OW□□□3B setting parameter (Bias Speed for Indexed Deceleration/Acceleration Filter).
If the speed goes higher than the value of OW□□□3B, the exponential acceleration/deceleration filter is enabled.



5.1.8 Linear Scale Pitch and Rated Speed

When a linear motor is used, set the following fixed parameters according to the specifications of the linear motor.

- No. 6 (Linear Scale Pitch)
- No. 34 (Rated Speed)
- No. 36 (Number of Pulses per Linear Scale Pitch)

Example Settings Based on the Linear Motor Specifications

◆ Example Settings 1

The following table lists example settings for the following linear motor specifications.

- Linear scale pitch: 20 (μm)
- Serial converter resolution: 8 (bits)
- Rated speed: 1.5 (m/s)

Fixed parameter No. 4 (Reference Unit Selection)	Unit and Number of Digits below the Decimal Point for the Linear Scale Pitch and Rated Speed	Example Settings
pulse	Linear scale pitch: μm Rated speed: 0.1 m/s	Linear scale pitch: 20 (μm) Rated speed: 15 (0.1 m/s) Number of pulses per linear scale pitch: 256 (pulses) = 2^8
mm	Number of digits below the decimal point: 3	Linear scale pitch: 20 (μm) Rated speed: 15 (0.1 m/s) Number of pulses per linear scale pitch: 256 (pulses) = 2^8
μm	Number of digits below the decimal point: 0	Linear scale pitch: 20 (μm) Rated speed: 15,000 (0.1 mm/s) Number of pulses per linear scale pitch: 256 (pulses) = 2^8

Important

1. In the following case, set fixed parameter No. 34 (Rated Speed) in units of 0.1 m/s.
   - When fixed parameter No. 4 (Reference Unit Selection) is set to 0 (Pulses)
   - When fixed parameter No. 6 (Linear Scale Pitch) is set in μm
2. In the following case, set fixed parameter No. 34 (Rated Speed) in units of 0.1 mm/s.
   - When fixed parameter No. 6 (Linear Scale Pitch) is set in nm

◆ Example Settings 2

The following table lists example settings for the following linear motor specifications.

- Linear scale pitch: 400 (nm)
- Serial converter resolution: 9 (bits)
- Rated speed: 1.5 (m/s)

Fixed parameter No. 4 (Reference Unit Selection)	Unit and Number of Digits below the Decimal Point for the Linear Scale Pitch and Rated Speed	Example Settings
pulse	Linear scale pitch: nm Rated speed: 0.1 m/s	Linear scale pitch: 400 (nm) Rated speed: 15,000 (0.1 mm/s) Number of pulses per linear scale pitch: 512 (pulses) = 2^9
mm	Number of digits below the decimal point: 5	Linear scale pitch: 40 (reference units) 400(nm)=40 (0.00001 mm) Rated speed: 15 (0.1 m/s) Number of pulses per linear scale pitch: 512 (pulses) = 2^9
μm	Number of digits below the decimal point: 3	Linear scale pitch: 400 (reference units) 400(nm)=400 (0.001 μm) Rated speed: 15,000 (0.1 mm/s) Number of pulses per linear scale pitch: 512 (pulses) = 2^9

Important

1. In the following case, set fixed parameter No. 34 (Rated Speed) in units of 0.1 m/s.
   - When fixed parameter No. 4 (Reference Unit Selection) is set to 0 (Pulses)
   - When fixed parameter No. 6 (Linear Scale Pitch) is set in μm
2. In the following case, set fixed parameter No. 34 (Rated Speed) in units of 0.1 mm/s.
   - When fixed parameter No. 6 (Linear Scale Pitch) is set in nm

5.2 Absolute Encoders

This section provides information and describes settings that are necessary to perform motion control with a machine that uses an absolute encoder.

5.2.1 Absolute Position Detection

To detect the absolute position of the machine (axis), the MP3000 constantly reads the current value of the absolute encoder attached to the Servomotor. As a result, automatic operation can be immediately performed because the machine coordinate system is automatically detected as soon as the power supply is turned ON.

Systems that use absolute position detection do not need to perform an origin return operation after the power supply is turned ON.

Term

Absolute Encoders

An absolute encoder outputs the absolute position (position data for the rotational angle) from a reference position (origin of the encoder).

The absolute encoder uses a battery connected to the battery terminals of the SERVOPACK to maintain the absolute position data (called the absolute value data) at all times, even when the power supply is turned OFF. The absolute value data is also updated if the position changes while the power supply is OFF.

The absolute encoder consists of a detector that is used to detect the absolute position within one rotation and a counter that is used to count the number of rotations. After automatic operation starts, the absolute encoder operates in the same way as an incremental encoder.

5.2.2 Absolute Encoder System Startup

An absolute encoder system is a system that uses an absolute encoder.

With an absolute encoder system, the origin must be set during the initial setup procedure when the system is commissioned. There are two origins, the absolute encoder's origin and the machine's origin. These are called the origin of the encoder coordinate system and the origin of the machine coordinate system.
The absolute encoder system establishes the positional relationship between the origin of the machine coordinate system and the origin of the absolute encoder.

When the origin is established, positions are then managed based on the origin of the machine coordinate system. This reference position will not change even if the power supply is turned OFF. Therefore, it is not necessary to return to the origin after turning ON the power supply.

The following table gives the setup procedure for an absolute encoder system.

Step	Item	Description
1	Confirming the Machine Configuration and Wiring	Confirm that the components and cable connections are correct.
2	Setting Up the Absolute Encoder (Initialization)	The absolute encoder is initialized to initialize the multiturn data. ☞ *Setting Up the Absolute Encoder (Initialization)* on page 5-18
3	Setting Parameters Related to Absolute Position Detection	There are two types of machine operation. One type is finite-length operation, where round-trip operation is performed within a defined travel interval, and the other type is infinite-length operation, where movement is performed in one direction, such as for a conveyor belt. Set the related parameters according to the operation method. ☞ *Finite-length Operation* on page 5-26-*Parameter Settings* on page 5-26 ☞ *Infinite-length Operation with Simple Absolute Infinite Axis Position Management* on page 5-32-*Parameter Settings* on page 5-32 ☞ *Infinite-length Operation with Non-simple Absolute Infinite Axis Position Management* on page 5-36-*Parameter Settings* on page 5-36
4	Setting the Origin of the Machine Coordinate System	–

The following pages give detailed explanations of setting up the absolute encoder, setting the origin of the machine coordinate system, and the current value of the machine coordinate system.

Setting Up the Absolute Encoder (Initialization)

The multiturn data for the absolute encoder system must be initialized the first time the system is started. When the absolute encoder is set up (initialized), the multiturn data is initialized and any alarms related to the absolute encoder are reset.

Absolute encoder setup (initialization) is required in the following situations.

- When the system is first started
- When an Encoder Backup Alarm (A.810) occurs
- When an Encoder Checksum Alarm (A.820) occurs
- When you want to reset the multiturn data in the absolute encoder

Information The position data of the absolute encoder is the position coordinate from the origin of the absolute encoder.
The absolute encoder position data consists of the following two types of information.

- The amount of rotation from the origin of the encoder coordinate system (multiturn data)
- Position within one rotation (number of pulses): Initial incremental pulses

The following formula is used to calculate the absolute encoder position data.
Absolute encoder position data = Multiturn data × Number of encoder pulses per rotation + Position within one rotation (number of pulses)

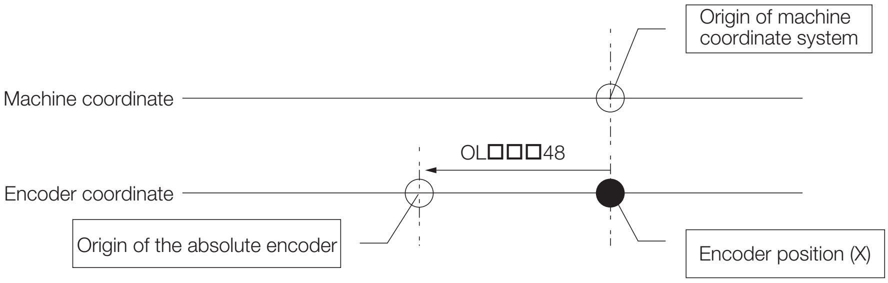
Refer to the following section for information on how to reset an absolute encoder.
☞ *5.2.3 Resetting the Absolute Encoder* on page 5-20

Setting the Origin of the Machine Coordinate System

After the absolute encoder is initialized, the reference position to operate the machine with the MP3000 must be set.

The origin of the absolute encoder and the origin of the machine coordinate system will not match, so they must be corrected. The reference for the origin of the machine coordinate system is the origin of the absolute encoder. The deviation from the origin of the absolute encoder is the correction value (offset), and this establishes the origin position of the machine coordinate system.

Example When encoder position X is set as the origin of the machine coordinate system (0), OL☐☐☐48 is set to -X.



Each machine axis moves to the reference position for operation, and that position is the origin in the machine coordinate system.

The negative of the value of IL☐☐☐16 (APOS) is written to OL☐☐☐48 (OL☐☐☐48 = -IL☐☐☐16).

If the zero point of the machine coordinate system is set, the MP3000 will recognize the current position when the power supply is next turned ON, as shown in the next section *5.2.5 Reading Position Data When the Power Supply Is Turned ON*. The zero point will not need to be set again.

Current Value in the Machine Coordinate System

If an absolute encoder is used, the MP3000 calculates the axis position (i.e., the current position in the machine coordinate system) as follows when the power supply is turned ON.

Current position in machine coordinate system (IL☐☐☐10 or IL☐☐☐16) = Position when the Servo power supply is turned ON + Value of OL☐☐☐48 setting parameter (Zero Point Position Offset in Machine Coordinate System)

Example When IL☐☐☐10 is 10,000 and OL☐☐☐48 is 100, the negative value of the position when the Servo power supply is turned ON is as follows:
OL☐☐☐48 - IL☐☐☐10 = 100 - 10000 = -9900
You can set this value of -9,900 in OL☐☐☐48 to set the current position in the machine coordinate system as the machine coordinate origin.

Important

1. Use IL☐☐☐10 to make the machine coordinate reference position the reference, or use IL☐☐☐16 to make the current position in the machine coordinate system the reference.
2. The position when the servo power supply is turned ON is the value that is calculated with the following formula and then converted to reference units:
   Multiturn data × Number of encoder pulses + Initial incremental pulses (position within one rotation)
   Refer to your SERVOPACK manual for details on initial incremental pulses (position within one rotation).

5.2.3 Resetting the Absolute Encoder

This section describes how to reset the absolute encoder from the MP3000.

Preparations

Before you reset the absolute encoder, check the following items:

- Synchronous communications are established with the SERVOPACK (bit 0 in IW□□□00 is 1).
- The Servomotor is OFF (Servo OFF) (bit 1 in IW□□□00 is 0).
- An absolute encoder is used.
- The Pn002 = n.□x□□ SERVOPACK parameter (Encoder Usage in Application Function Selections 2) is set to 0 (Use the encoder according to the encoder specifications).

Information If there is an A.810 alarm (Encoder Backup Alarm) or A.820 alarm (Encoder Checksum Alarm) in the SERVOPACK, communications cannot be synchronized just by turning ON the power supply to the MP3000. Use the Alarm Clear bit (OW□□00, bit F) to synchronize communications.

Procedure from the MP3000

Use the following procedure to reset the absolute encoder from the MP3000.

1. Writing the Absolute Encoder Reset Request
Use the following parameter settings to write to memory.

Register Addresses	Name	Setting	Description
OW□□□51	SERVOPACK Parameter Size	1	Number of words
OL□□□52	SERVOPACK Parameter Setting	1008 hex	Absolute encoder reset request code
OL□□□58	Address Setting	80004000 hex	Virtual memory address in the SERVOPACK

2. Preparing for Execution
Use the following parameter settings to write to memory.

Register Addresses	Name	Setting	Description
OW□□□51	SERVOPACK Parameter Size	1	Number of words
OL□□□52	SERVOPACK Parameter Setting	2	The code required for the preliminary processing
OL□□□58	Address Setting	80004002 hex	Virtual memory address in the SERVOPACK

3. Resetting the Absolute Encoder
Use the following parameter settings to write to memory.

Register Addresses	Name	Setting	Description
OW□□□51	SERVOPACK Parameter Size	1	Number of words
OL□□□52	SERVOPACK Parameter Setting	1	The code required to send the data and perform the calibration operation
OL□□□58	Address Setting	80004002 hex	Virtual memory address in the SERVOPACK

4. Completing Absolute Encoder Initialization

Use the following parameter settings to write to memory.

Register Addresses	Name	Setting	Description
OW□□□51	SERVOPACK Parameter Size	1	Number of words
OL□□□52	SERVOPACK Parameter Setting	0	The code required to send the data and end the calibration operation
OL□□□58	Address Setting	80004000 hex	Virtual memory address in the SERVOPACK

5. Turn the power supply to the SERVOPACK OFF and ON again

This concludes the procedure to reset the absolute encoder.

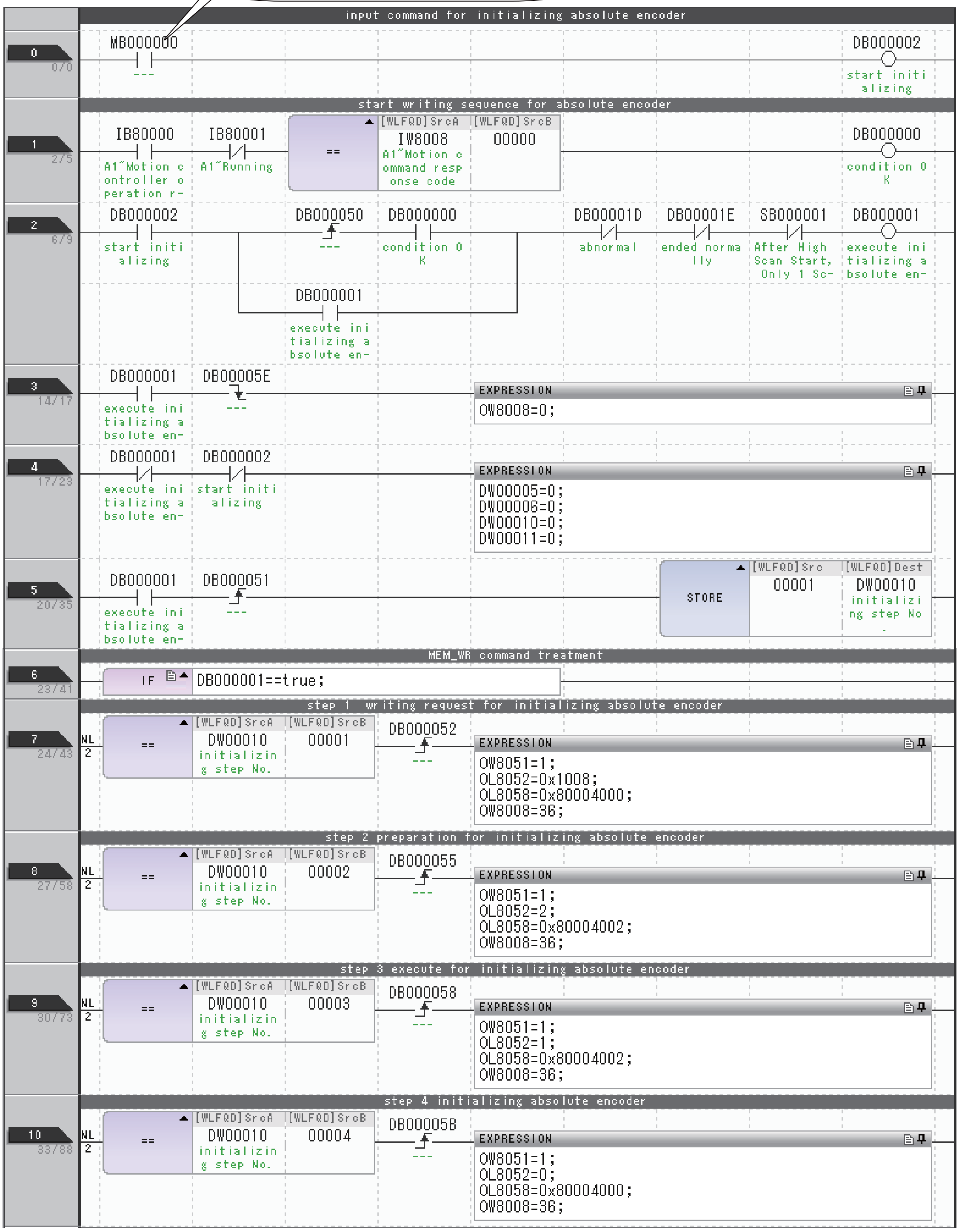
■ Handling Errors

If writing to memory ends in an error during steps 1 to 3, perform step 4.

Programming Example

The following example ladder program resets the absolute encoder. Axis 1 of circuit number 1 is used here. Change the motion parameter register address if the circuit and/or axis numbers are different.

When MB000000 turns ON, the process to reset the absolute encoder starts.



```
OW8008=0;
```

```
DW00005=0;
DW00006=0;
DW00010=0;
DW00011=0;
```

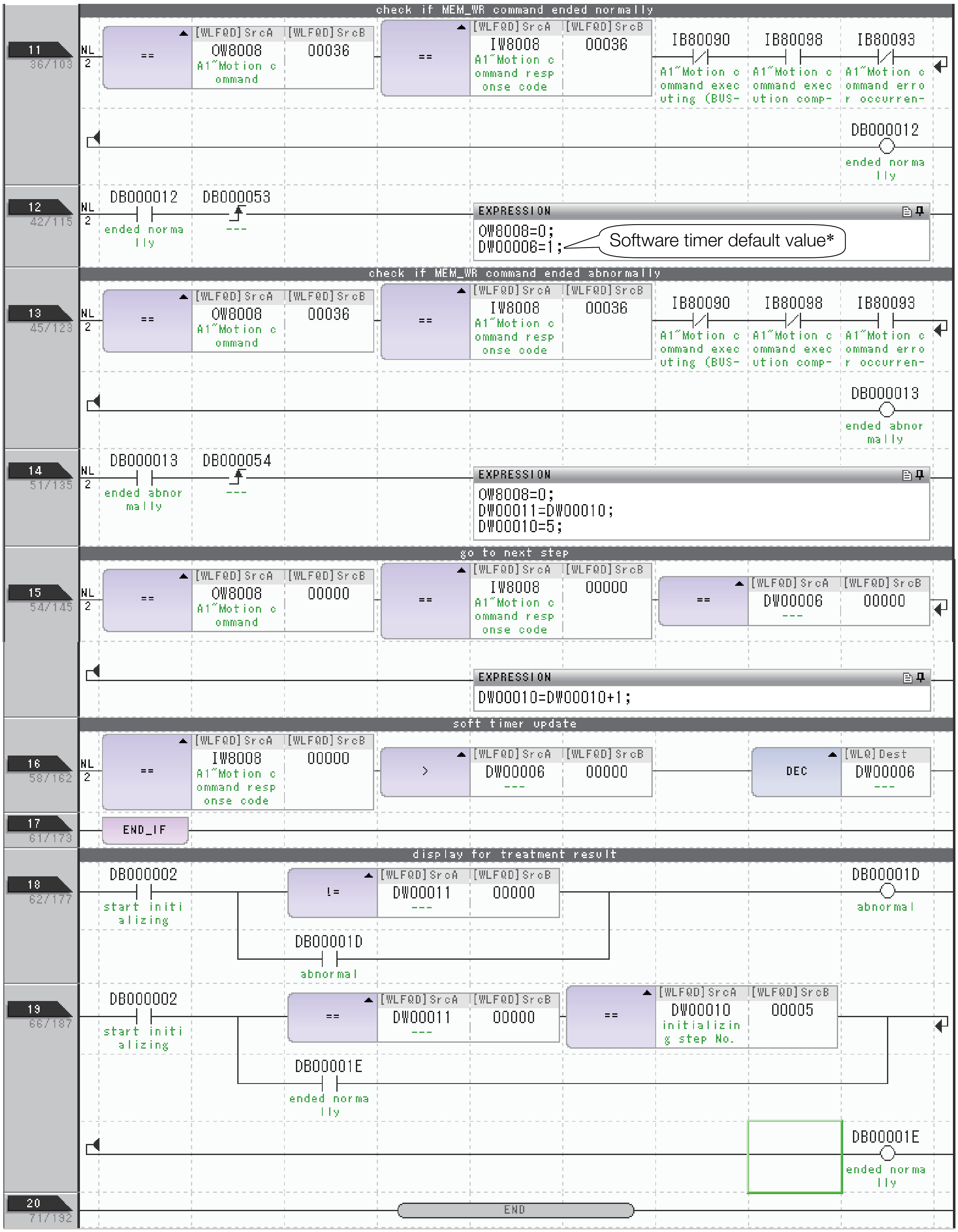
```
DB000001==true;
```

```
OW8051=1;
OL8052=0x1008;
OL8058=0x80004000;
OW8008=36;
```

```
OW8051=1;
OL8052=2;
OL8058=0x80004002;
OW8008=36;
```

```
OW8051=1;
OL8052=1;
OL8058=0x80004002;
OW8008=36;
```

```
OW8051=1;
OL8052=0;
OL8058=0x80004000;
OW8008=36;
```



```
OW8008=0;
DW00006=1;
```

Software timer default value*

```
OW8008=0;
DW00011=DW00010;
DW00010=5;
```

```
DW00010=DW00010+1;
```

* The value set in DW00006 is determined as given in the following table.

Condition	Setting
High-speed scan setting ≥ MECHATROLINK-III transmission cycle setting	1
High-speed scan setting < MECHATROLINK-III transmission cycle setting	(MECHATROLINK-III transmission cycle setting/High-speed scan setting - 1) × 4 + 1

Example

When High-speed Scan Setting = 1 ms and MECHATROLINK-III Transmission Cycle Setting = 250 μs
- Software timer default value = 1

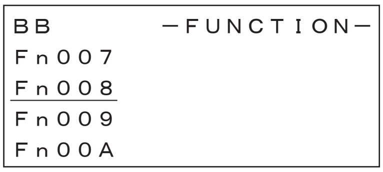
When High-speed Scan Setting = 0.5 ms and MECHATROLINK-III Transmission Cycle Setting = 1 ms
- Software timer default value = (1 ms / 0.5 ms – 1) × 4 + 1 = 5

5.2.4 Using the SERVOPACK to Reset the Absolute Encoder

Use the following procedure to reset the absolute encoder with a Digital Operator from a Σ-V SERVOPACK.

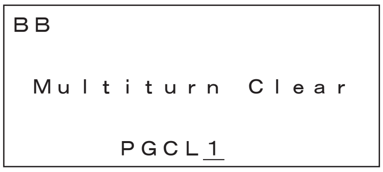
> **Important**
>
> When the absolute encoder is reset, the number of turns is reset to 0, which changes the mechanical reference position. If the machine is operated in this state, unintended operation could occur resulting in injuries or damage to the machine. Be careful when starting the machine to ensure that this does not occur.
> Refer to the following manual for details.
>
> 📖 *Σ*-V Series User's Manual, Design and Maintenance, Rotational Motor/MECHATROLINK-III Communications Reference (Manual No.: SIEP S8000000 64)

1. **Press the MODE/SET Key to display the Utility Function Mode main menu. Use the ∧ (UP) or ∨ (DOWN) keys to select Fn008.**



```
BB        －FUNCTION－
Fn007
Fn008
Fn009
Fn00A
```

2. **Press the DATA Key.**
The display will change to the execution display for Fn008 (absolute encoder setup (initialize) and encoder alarm reset).
If the display does not change and NO-OP is displayed in the status area, a password has been set prohibiting write operations with Fn010. Check the status and clear the Write Prohibited setting.

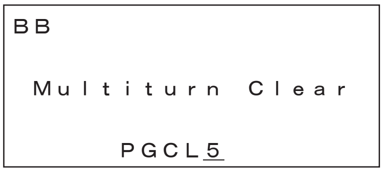


```
BB

 Multiturn Clear

      PGCL1
```

3. **Keep pressing the ∧ (UP) key until PGCL1 changes to PGCL5.**

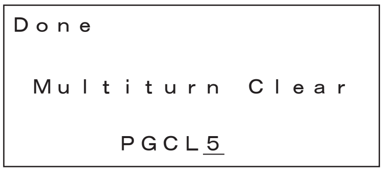


```
BB

 Multiturn Clear

      PGCL5
```

4. **Press the DATA Key.**
BB in the status display will change to "Done."



```
Done

 Multiturn Clear

      PGCL5
```

5. **Press the MODE/SET Key. The display returns to the Utility Function Mode main menu.**

This concludes the operation for setting up the absolute encoder. Turn the power supply OFF and ON again to reset the SERVOPACK.

5.2.5 Reading Position Data When the Power Supply Is Turned ON

This section describes reading the position data from an absolute encoder.

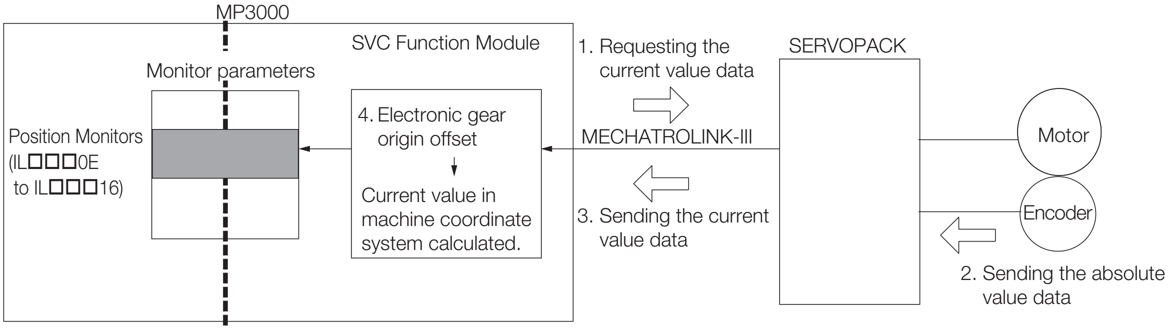
Reading the Position Data from the Absolute Encoder

When the power supply to the MP3000 is turned ON, the MP3000 reads the absolute encoder position data from the slave SERVOPACK through MECHATROLINK-III communications.

The MP3000 system automatically reads the position data, so no programming is required.

Turn ON the power supply to the slave SERVOPACK first, or simultaneously turn ON the power supplies to the MP3000 and slave SERVOPACK.

The flow of the procedure from turning ON the power supply to obtaining the position data is illustrated in the following figure.



Process Order	Description
1	After the power supply is turned ON, the MP3000 sends a request to the slave SERVOPACK to send the current value when MECHATROLINK communications are established.
2	The slave SERVOPACK gets the current value data from the absolute encoder when it receives the current value request.
3	The slave SERVOPACK sends the current value data position information to the MP3000.
4	The MP3000 calculates the current value in the machine coordinate system from the electronic gear and machine coordinate system zero point offset (in the OL□□□48 setting parameter) data and places it in the position monitor registers.

5.2.6 Position Management Method for Each Machine Operation Type

Machine operation methods can be broadly classified into the following two types.

- Finite-length Operation
  Finite-length operation is machine operation that performs round-trip operations within a defined travel range.
  This method is used when the travel range is within the absolute encoder's counting range. No special management of the current value is required.
- Infinite-length Operation
  Infinite-length operation is machine operation where movement is performed in only one direction, such as for a conveyor belt.
  Because the travel range exceeds the absolute encoder's counting range, special position management is required, such as resetting the current value at a specific count value and then starting the count again.

Finite-length Operation

Finite-length operation is machine operation that performs round-trip operations within a defined travel range. This section describes parameter settings required with finite-length operation, precautions for parameter settings, setting the origin, and precautions for when the power supply is turned OFF and ON.

◆ Parameter Settings

This section describes the parameter settings for each axis when performing finite-length operation.

■ Fixed Parameter Settings Required for Finite Axis Position Management

Set bit 0 (Axis Selection) in fixed parameter No. 1 to 0 (Finite-length axis) to use the axis as a finite-length axis.

No.	Bit	Name	Setting (Meaning)	Reference
1	0	Axis Selection	0 (Finite-length axis)	◆ *Function Selection Flags 1* on page 3-28
	9	Simple Absolute Infinite Axis Position Management	0* (Disabled)	

* When a finite-length axis is selected, the setting of bit 9 is ignored.

■ Fixed Parameter Settings Required for an Absolute Encoder System

The fixed parameters that must be set for an absolute encoder system are listed in the following table.

No.	Name	Setting	Setting Unit	Reference
4	Reference Unit Selection	0: pulse 1: mm 2: deg 3: inch 4: μm	–	◆ *Reference Unit Selection* on page 3-31
30	Encoder Selection	1: Absolute encoder	–	◆ *Encoder Selection* on page 3-33
36	Number of Pulses Per Motor Rotation	2^N *	pulse	■ *Number of Pulses Per Motor Rotation* on page 5-27
38	Maximum Number of Absolute Encoder Rotations	0 to 2^{31} - 1	Rotations	◆ *Maximum Number of Absolute Encoder Rotations* on page 3-35

* N is the number of encoder bits.

■ SERVOPACK Parameter Settings

The SERVOPACK parameters that must be set for an absolute encoder system are listed in the following table.

Parameter		Name	Description	Reference
Pn000	n.□□□X	Rotation/ Movement Direction Selection	0: Use CCW as the forward direction. (Rotary Servomotor) Use the direction in which the linear encoder counts up as the forward direction. (Linear Servomotor) 1: Use CW as the forward direction. (Rotary Servomotor) Use the direction in which the linear encoder counts down as the forward direction. (Linear Servomotor)	–
Pn205	–	Multiturn Limit	0 to 65,535	*■ Maximum Number of Absolute Encoder Rotations* on page 5-28
Pn002	n.□X□□	Encoder Usage	0: Use the encoder according to encoder specifications. 2: Use the encoder as a single-turn absolute encoder.	*■ Encoder Selection* on page 5-27

Note: These are parameters for Σ-7-Series SERVOPACKs. Refer to the manual for your SERVOPACK for details on parameters for SERVOPACKs in other series.

◆ Precautions for Parameter Settings

The names of some of the motion parameters and SERVOPACK parameters are different even though they have the same meaning. Set the values of these motion parameters and SERVOPACK parameters so that they are consistent with each other. The following tables list information on the settings.

■ Encoder Selection

Set the parameters as listed in the following table for an axis that performs absolute position detection.

Type	Parameter	Setting
Motion Parameter	Fixed Parameter No. 30 (Encoder Selection)	1: Absolute encoder
SERVOPACK Parameter	Pn002 = n.□X□□ (Encoder Usage)	0: Use the encoder according to encoder specifications. 2: Use the encoder as a single-turn absolute encoder.

■ Number of Pulses Per Motor Rotation

Refer to the following table and set fixed parameter No. 36 (Number of Pulses Per Motor Rotation) according to the number of encoder bits (resolution).

Encoder Resolution (Number of Bits)	Fixed Parameter No. 36 (Number of Pulses Per Motor Rotation)
12	4096
13	8192
15	32768
16	65536
17	131072
20	1048576
22	4194304
24	16777216

The setting of the Pn212 (Number of Encoder Pulses) SERVOPACK parameter is not used for control with the MP3000. It is not necessary to change the setting of Pn212.

■ Maximum Number of Absolute Encoder Rotations

Set the maximum number of absolute encoder rotations.

For a finite-length axis, set the SERVOPACK multiturn limit (Pn205) to the maximum value that can be set. Set the Machine Controller's maximum number of absolute encoder rotations (fixed parameter No. 38) to the same value as Pn205 in the SERVOPACK.

The set value when the system is used with the Σ-V- or Σ-7-series SERVOPACK is given in the following table.

Type	Parameter	Set Value
Machine Controller	Fixed parameter No. 38 (Maximum Number of Absolute Encoder Rotations)	65,535
Σ-V-series or Σ-7-series SERVOPACK	Parameter: Pn205 (Multiturn Limit Setting)	65,535

Important

Set fixed parameter No. 38 and SERVOPACK parameter Pn205 to the same values to ensure that correct motion control is performed and to prevent position variation.
Multiturn limit setting mismatch detection can be used to determine whether both values match. Refer to the following section for details.

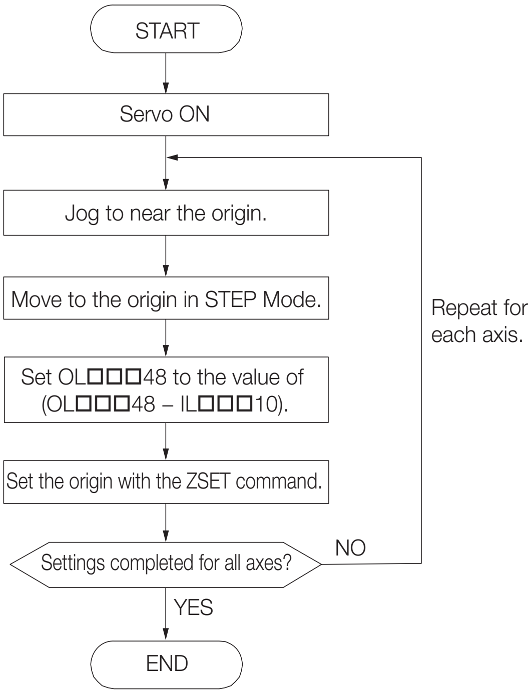
☞ *6.7 Multiturn Limit Setting Disagreement Detection* on page 6-31

■ Setting the Origin

⚠ CAUTION

- **OL□□□48 (Zero Point Position Offset in Machine Coordinate System) is always valid when the axis type is set to a finite-length axis. Do not change the setting of OL□□□48 while the machine is operating.**
  There is a risk of machine damage or an accident.

Set the origin after you reset the absolute encoder to set the origin of the machine coordinate system and to create the machine coordinate system. Use the following procedure to do so. Perform this procedure only once when the machine is initially started. This procedure is not necessary at any other time.



- Saving the Value of OL□□□48 before the Power Supply Is Turned OFF

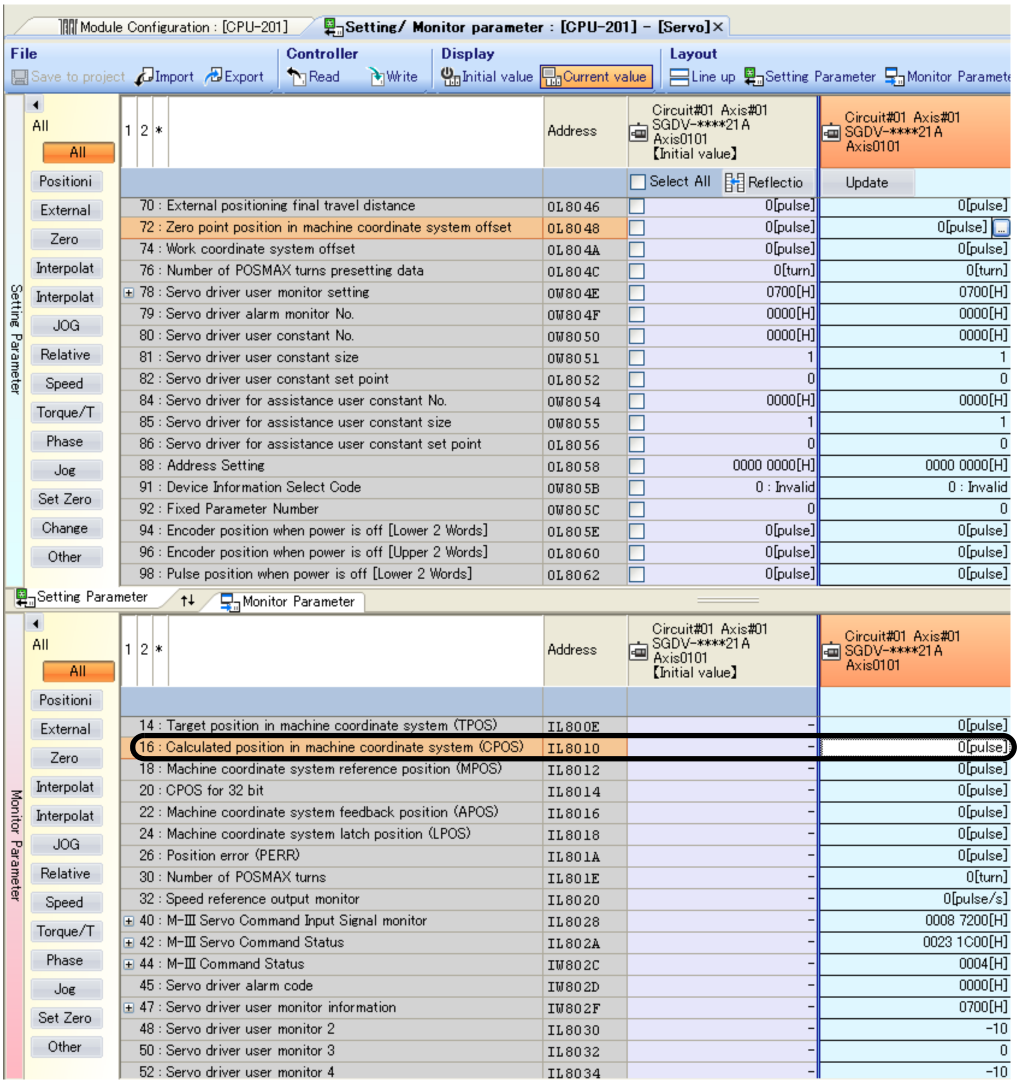
After the origin is set, save the value of the OL□□□48 setting parameter (Zero Point Position Offset in Machine Coordinate System) before you turn OFF the control power supply to the SERVOPACK so that the value will be written in OL□□□48 again the next time the power supply is turned ON.

There are two methods to save the value of OL□□□48: from the MPE720 Parameters Tab Page or from a ladder program to an M register. Both of these methods are described below.

- Saving the Value of OL□□□48 from the MPE720 Parameters Tab Page

Open the Setting/Monitor parameter Tab Page for the axis to set on the MPE720 and use the following procedure to save the value.

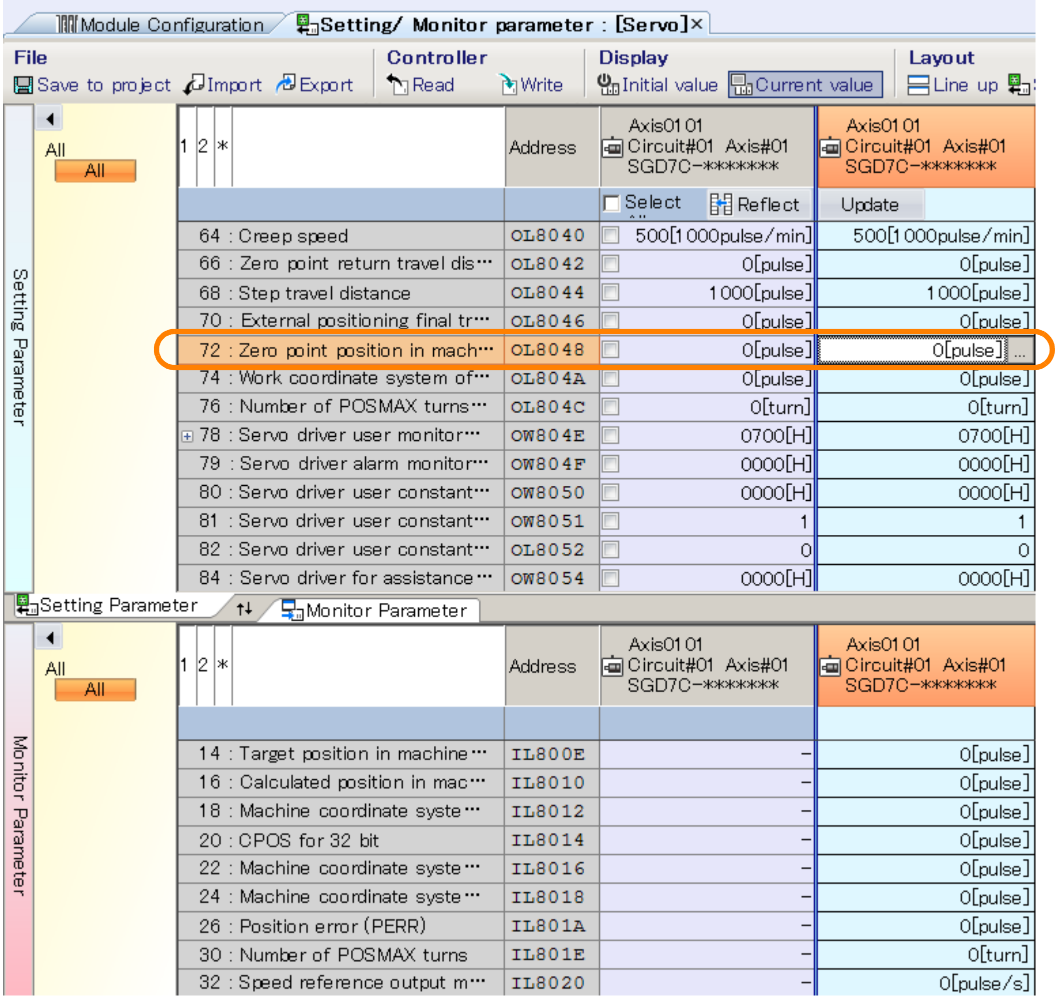
1. Check the value of IL□□□10 in the Monitor Parameters Area.



1 2 *	Address	Circuit#01 Axis#01 SGDV-****21A Axis0101 【Initial value】	Circuit#01 Axis#01 SGDV-****21A Axis0101
70 : External positioning final travel distance	OL8046	☐ 0[pulse]	0[pulse]
72 : Zero point position in machine coordinate system offset	OL8048	☐ 0[pulse]	0[pulse]
74 : Work coordinate system offset	OL804A	☐ 0[pulse]	0[pulse]
76 : Number of POSMAX turns presetting data	OL804C	☐ 0[turn]	0[turn]
⊞ 78 : Servo driver user monitor setting	OW804E	☐ 0700[H]	0700[H]
79 : Servo driver alarm monitor No.	OW804F	☐ 0000[H]	0000[H]
80 : Servo driver user constant No.	OW8050	☐ 0000[H]	0000[H]
81 : Servo driver user constant size	OW8051	☐ 1	1
82 : Servo driver user constant set point	OL8052	☐ 0	0
84 : Servo driver for assistance user constant No.	OW8054	☐ 0000[H]	0000[H]
85 : Servo driver for assistance user constant size	OW8055	☐ 1	1
86 : Servo driver for assistance user constant set point	OL8056	☐ 0	0
88 : Address Setting	OL8058	☐ 0000 0000[H]	0000 0000[H]
91 : Device Information Select Code	OW805B	☐ 0 : Invalid	0 : Invalid
92 : Fixed Parameter Number	OW805C	☐ 0	0
94 : Encoder position when power is off [Lower 2 Words]	OL805E	☐ 0[pulse]	0[pulse]
96 : Encoder position when power is off [Upper 2 Words]	OL8060	☐ 0[pulse]	0[pulse]
98 : Pulse position when power is off [Lower 2 Words]	OL8062	☐ 0[pulse]	0[pulse]

1 2 *	Address	Circuit#01 Axis#01 SGDV-****21A Axis0101 【Initial value】	Circuit#01 Axis#01 SGDV-****21A Axis0101
14 : Target position in machine coordinate system (TPOS)	IL800E	-	0[pulse]
16 : Calculated position in machine coordinate system (CPOS)	IL8010	-	0[pulse]
18 : Machine coordinate system reference position (MPOS)	IL8012	-	0[pulse]
20 : CPOS for 32 bit	IL8014	-	0[pulse]
22 : Machine coordinate system feedback position (APOS)	IL8016	-	0[pulse]
24 : Machine coordinate system latch position (LPOS)	IL8018	-	0[pulse]
26 : Position error (PERR)	IL801A	-	0[pulse]
30 : Number of POSMAX turns	IL801E	-	0[turn]
32 : Speed reference output monitor	IL8020	-	0[pulse/s]
⊞ 40 : M-Ⅲ Servo Command Input Signal monitor	IL8028	-	0008 7200[H]
⊞ 42 : M-Ⅲ Servo Command Status	IL802A	-	0023 1C00[H]
⊞ 44 : M-Ⅲ Command Status	IW802C	-	0004[H]
45 : Servo driver alarm code	IW802D	-	0000[H]
⊞ 47 : Servo driver user monitor information	IW802F	-	0700[H]
48 : Servo driver user monitor 2	IL8030	-	-10
50 : Servo driver user monitor 3	IL8032	-	0
52 : Servo driver user monitor 4	IL8034	-	-10

2. Check the current value of OL☐☐☐48 in the Setting Parameter Area, and then calculate value with the following formula and set that value in OL☐☐☐48. (OL☐☐☐48: Zero Point Position Offset in Machine Coordinate System) - (IL☐☐☐10: Machine Coordinate System Calculated Position (CPOS))



1 2 *	Address	Axis01 01 Circuit#01 Axis#01 SGD7C-*******	Axis01 01 Circuit#01 Axis#01 SGD7C-*******
		☐ Select All / Reflect	Update
64 : Creep speed	OL8040	☐ 500[1000pulse/min]	500[1000pulse/min]
66 : Zero point return travel dis…	OL8042	☐ 0[pulse]	0[pulse]
68 : Step travel distance	OL8044	☐ 1000[pulse]	1000[pulse]
70 : External positioning final tr…	OL8046	☐ 0[pulse]	0[pulse]
72 : Zero point position in mach…	OL8048	☐ 0[pulse]	0[pulse]
74 : Work coordinate system of…	OL804A	☐ 0[pulse]	0[pulse]
76 : Number of POSMAX turns…	OL804C	☐ 0[turn]	0[turn]
⊞ 78 : Servo driver user monitor…	OW804E	☐ 0700[H]	0700[H]
79 : Servo driver alarm monitor…	OW804F	☐ 0000[H]	0000[H]
80 : Servo driver user constant…	OW8050	☐ 0000[H]	0000[H]
81 : Servo driver user constant…	OW8051	☐ 1	1
82 : Servo driver user constant…	OL8052	☐ 0	0
84 : Servo driver for assistance…	OW8054	☐ 0000[H]	0000[H]

1 2 *	Address	Axis01 01 Circuit#01 Axis#01 SGD7C-*******	Axis01 01 Circuit#01 Axis#01 SGD7C-*******
14 : Target position in machine…	IL800E	–	0[pulse]
16 : Calculated position in mac…	IL8010	–	0[pulse]
18 : Machine coordinate syste…	IL8012	–	0[pulse]
20 : CPOS for 32 bit	IL8014	–	0[pulse]
22 : Machine coordinate syste…	IL8016	–	0[pulse]
24 : Machine coordinate syste…	IL8018	–	0[pulse]
26 : Position error (PERR)	IL801A	–	0[pulse]
30 : Number of POSMAX turns	IL801E	–	0[turn]
32 : Speed reference output m…	IL8020	–	0[pulse/s]

3. Check that the current value and setting data value are the same for OL☐☐☐48.

4. Click the **Write** Button.
   The set value is saved to the MP3000.

5. Select *Online – Save to Flash* from the menu bar of the MPE 720 Ver.7 window.
   The setting is saved to flash memory.

6. Set the origin with the ZSET command.

After performing the above procedure, the saved value is stored automatically in OL☐☐☐48 when the power supply is turned OFF and ON again.

- Saving in M Registers from a Ladder Program

This method saves the value of the zero point position offset in the machine coordinate system in M registers when the zero point is set. When the power supply for the MP3000 is turned ON again, the value of the M registers is stored in the OL□□□48 setting parameter (Zero Point Position Offset in Machine Coordinate System).

In a ladder program, program instructions that automatically execute the following sequence.

Programming Examples

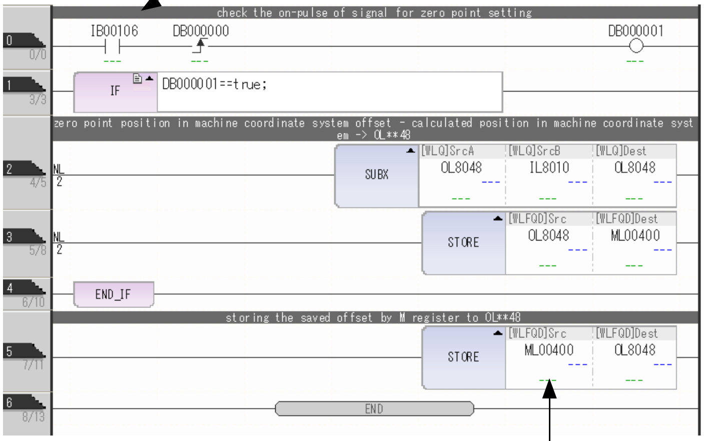
The following diagram shows an example of the ladder programming to use to store the offsetting of axis 1 of circuit number 1.

In the ladder program for an actual application, change the register address for each axis.

The ladder programming that is shown here is used to perform the following processing.

- After the origin is set, the program subtracts the value of the IL□□□10 monitor parameter (Machine Coordinate System Calculated Position (CPOS)) from the OL□□□48 setting parameter (Zero Point Position Offset in Machine Coordinate System), and stores that value in OL□□□48. This value is also saved in M registers at the same time.
- After the origin is set, the value that is saved in the M registers is stored in OL□□□48.

Signal that turns ON only when setting the machine coordinate system origin (The diagram below shows an example of external signal. The register address here has no special meaning.)



```
check the on-pulse of signal for zero point setting
0    IB00106   DB000000                                  DB000001
0/0
1    IF   DB000001==true;
3/3
zero point position in machine coordinate system offset - calculated position in machine coordinate syst
em -> OL**48
2    NL        SUBX   [WLQ]SrcA   [WLQ]SrcB   [WLQ]Dest
4/5  2                OL8048      IL8010      OL8048
3    NL        STORE  [WLFQD]Src  [WLFQD]Dest
5/8  2                OL8048      ML00400
4    END_IF
6/10
storing the saved offset by M register to OL**48
5              STORE  [WLFQD]Src  [WLFQD]Dest
7/11                  ML00400     OL8048
6              END
8/13
```

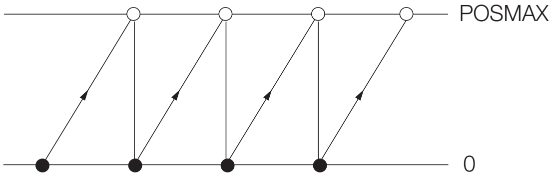
Execute this every scan in a high-speed drawing.

Important Save the value of OL□□□48 (Zero Point Position Offset in Machine Coordinate System) to the M registers only when the value of OL□□□48 is updated, such as when the origin is set. Processing that constantly saves the value of OL□□□48 to the M registers may cause position variations.

Infinite-length Operation

Infinite-length axis positioning automatically resets the machine position, the program position (absolute value in the program coordinate system), and the current position at regular intervals according to the value set in fixed parameter No. 10 (Infinite-length Axis Reset Position (POSMAX)). With this function, the system can operate the axis as an infinite-length axis that performs repeated positioning in the same direction.

This concept is shown below.



◆ Infinite-length Operation Position Management Methods

There are two methods for infinite-length operation position management: a position management method that does not require ladder programming (simple absolute infinite axis position management) and a method that manages the position with ladder programming (non-simple absolute infinite axis position management).

To perform simple absolute infinite axis position management, set fixed parameters No. 36, 38, 10, 6, 8, and 9 so they satisfy the following conditions.

Condition 1:

(No. 38: Maximum Number of Absolute Encoder Rotations + 1) / Reset rotations = Integer (Remainder = 0)

The reset number of rotations depends on whether the pulse, or whether the mm, degree, inch, or μm is selected for the reference unit.

- When the Reference Unit Is Pulse

Reset number of rotations = No. 10: Infinite-length Axis Reset Position (POSMAX) / No. 36: Numbers of Pulses Per Motor Rotation

- When the Reference Unit Is mm, degree, inch, or μm

Reset number of rotations = No. 10: Infinite-length Axis Reset Position (POSMAX) × No. 8: Servomotor Gear Ratio / (No. 6: Travel Distance per Machine Rotation (Rotary Motor) × No. 9: Machine Gear Ratio)

Condition 2:

No. 36: Number of Pulses per Motor Rotation (Rotary Motor) × (No. 38: Maximum Number of Absolute Encoder Rotations + 1) < 2^{31} (= 2,147,483,648)

Information Condition 2 is only applicable for MP3200 CPU201 Version 1.07 or earlier.

If the above conditions cannot be satisfied, non-simple absolute infinite axis position management must be used to manage the position with ladder programming.

Infinite-length Operation with Simple Absolute Infinite Axis Position Management

Infinite-length operation is operation where movement is performed in one direction, such as is required for a conveyor belt. This section describes parameter settings required with infinite-length operation using simple absolute infinite axis position management, precautions for parameter settings, setting the origin, and precautions for when the power supply is turned ON and OFF.

◆ Parameter Settings

This section describes the parameter settings required for each axis when performing infinite-length operation using simple absolute infinite axis position management.

■ Fixed Parameter Settings Required for Infinite Axis Position Management

To perform simple absolute infinite axis position management using the axis as an infinite-length axis, set fixed parameter No. 1 bit 0 (Axis Selection) to 1 (Infinite-length axis) and fixed parameter No. 1 bit 9 (Simple Absolute Infinite Axis Position Management) to 1 (Enabled).

No.	Bit	Name	Setting (Meaning)	Reference
1	0	Axis Selection	1: Infinite-length axis	◆ *Function Selection Flags 1* on page 3-28
	9	Simple Absolute Infinite Axis Position Management	1: Enabled	

■ Fixed Parameter Settings Required for an Absolute Encoder System

The following table lists the fixed parameters that must be set to perform infinite-length operation using simple absolute infinite axis position management.

No.	Name	Setting	Setting Unit	Reference
4	Reference Unit Selection	0: pulse[*1] 1: mm 2: deg 3: inch 4: μm	–	◆ *Reference Unit Selection* on page 3-31
30	Encoder Selection	1: Absolute encoder	–	◆ *Encoder Selection* on page 3-33
6	Travel Distance per Machine Rotation	1 to 2^{31} – 1	Reference units	–
8	Servomotor Gear Ratio Term	1 to 65,535	Rotations	–
9	Machine Gear Ratio Term	1 to 65,535	Rotations	–
10	Infinite-length Axis Reset Position (POSMAX)	1 to 2^{31} – 1	Reference units	–
36	Number of Pulses Per Motor Rotation	2^N [*2]	pulse	■ *Number of Pulses Per Motor Rotation* on page 5-34
38	Maximum Number of Absolute Encoder Rotations	0 to 2^{31} – 1	Rotations	◆ *Maximum Number of Absolute Encoder Rotations* on page 3-35

[*1] Electronic gear settings are invalid when the pulse is selected as the reference unit.

[*2] N is the number of encoder bits.

- Fixed Parameter Setting Example

The following table gives a fixed parameter setting example for infinite-length operation using simple absolute infinite axis position management.

No.	Name	Setting	Unit
4	Reference Unit Selection	2	deg
30	Encoder Selection	1	Absolute encoder
6	Travel Distance per Machine Rotation	360000	Reference unit = Degrees
8	Servomotor Gear Ratio Term	6	Rotations
9	Machine Gear Ratio Term	5	Rotations
10	Infinite-length Axis Reset Position (POSMAX)	360000	Reference unit = Degrees
36	Number of Pulses Per Motor Rotation	16384	pulse
38	Maximum Number of Absolute Encoder Rotations	59705	Rotations

Reset number of turns = (360,000 × 6)/(360,000 × 5) = 6/5

Formula for determining if simple infinite axis position management can be used: (59,705 + 1)/(6/5) = 49,755

Because the above formula results in an integer with a remainder of 0, simple absolute infinite-length position management can be used.

■ SERVOPACK Parameter Settings

The SERVOPACK parameters that must be set for an absolute encoder system are listed in the following table.

Parameter		Name	Description	Reference
Pn000	n.□□□X	Rotation/ Movement Direction Selection	0: Use CCW as the forward direction. (Rotary Servomotor) Use the direction in which the linear encoder counts up as the forward direction. (Linear Servomotor) 1: Use CW as the forward direction. (Rotary Servomotor) Use the direction in which the linear encoder counts down as the forward direction. (Linear Servomotor)	–
Pn205	–	Multiturn Limit	0 to 65,535	*■ Maximum Number of Absolute Encoder Rotations* on page 5-28
Pn002	n.□X□□	Encoder Usage	0: Use the encoder according to encoder specifications. 2: Use the encoder as a single-turn absolute encoder.	*■ Encoder Selection* on page 5-27

Note: These are parameters for Σ-7-Series SERVOPACKs. Refer to the manual for your SERVOPACK for details on parameters for SERVOPACKs in other series.

◆ Precautions for Parameter Settings

The names of some of the motion parameters and SERVOPACK parameters are different even though they have the same meaning. Set the values of these motion parameters and SERVOPACK parameters so that they are consistent with each other.

■ Encoder Selection

Set the parameters as shown in the following table for an axis that performs absolute position detection.

Type	Parameter	Setting
Motion Parameter	Fixed Parameter No. 30 (Encoder Selection)	1: Absolute encoder
SERVOPACK Parameter	Pn002 = n.□X□□ (Encoder Usage)	0: Use the encoder according to encoder specifications. 2: Use the encoder as a single-turn absolute encoder.

■ Number of Pulses Per Motor Rotation

Refer to the following table and set fixed parameter No. 36 (Number of Pulses Per Motor Rotation) according to the number of encoder bits (resolution). This setting can be used for all SERVOPACK models.

Encoder Resolution (Number of Bits)	Fixed Parameter No. 36 (Number of Pulses Per Motor Rotation)
12	4,096
13	8,192
15	32,768
16	65,536
17	131,072
20	1,048,576
22	4,194,304
24	16,777,216

The setting of the Pn212 (Number of Encoder Pulses) SERVOPACK parameter is not used for control with the MP3000. It is not necessary to change the set value of Pn212.

■ Maximum Number of Absolute Encoder Rotations

Set the maximum number of absolute encoder rotations.

Set fixed parameter No. 38 (Maximum Number of Absolute Encoder Rotations) to the same value as the Pn205 SERVOPACK parameter.

Important

Set fixed parameter No. 38 and SERVOPACK parameter Pn205 to the same values to ensure that correct motion control is performed and to prevent position variation.
Multiturn limit setting mismatch detection can be used to determine whether both values match. Refer to the following section for details.

☞ *6.7 Multiturn Limit Setting Disagreement Detection* on page 6-31

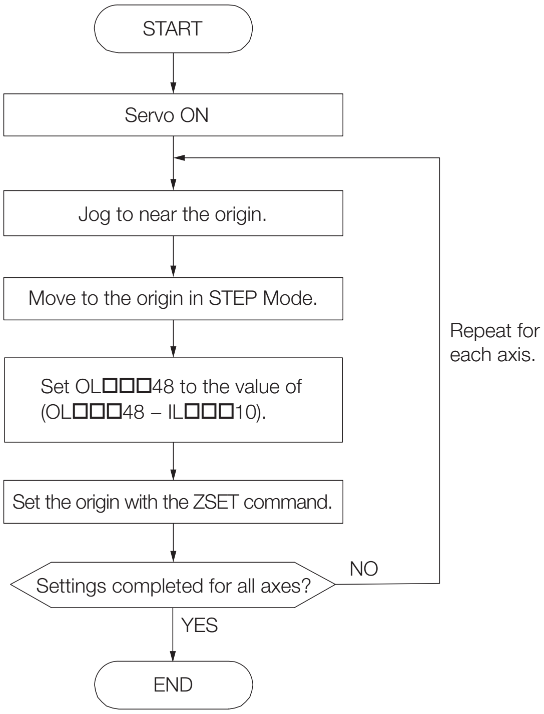
■ Setting the Origin

⚠ **CAUTION**

- **OL□□□48 (Zero Point Position Offset in Machine Coordinate System) is always valid when the axis type is set to a finite-length axis. Do not change the setting of OL□□□48 while the machine is operating.**
  There is a risk of machine damage or an accident.

Set the origin after you reset the absolute encoder to set the origin of the machine coordinate system and to create the machine coordinate system. Use the following procedure to do so.

Perform this procedure only once when the machine is initially started. This procedure is not necessary at any other time.



◆ Saving the Value of OL□□□48 before the Power Supply Is Turned OFF

After the zero point is set, save the value of the OL□□□48 setting parameter (Zero Point Position Offset in Machine Coordinate System) before you turn OFF the power supply to the MP3000 so that the value will be written in OL□□□48 again the next time the power supply is turned ON.

There are two methods to save the value of OL□□□48: from the MPE720 Parameters Tab Page or from a ladder program to an M register.

Refer to the following sections for details on these methods.

☞ • *Saving the Value of OL□□□48 from the MPE720 Parameters Tab Page* on page 5-29

☞ • *Saving in M Registers from a Ladder Program* on page 5-31

◆ Turning ON the Power after Setting the Origin in the Machine Coordinate System

Bit 5 (Zero Point Return/Setting Completed) in the IW□□□0C monitor parameter changes to 0 (Zero point return/setting not completed) when the power supply to the MP3000 is turned OFF and ON again or communications are restarted by turning the power supply to the slave SERVOPACK OFF and ON again after the zero point has been set. Therefore, you must use the following procedure to change bit 5 in IW□□□0C back to 1 (Zero point return/setting completed) after the power supply is turned back ON and communications are restored.

1. **Turn ON the power supply to the MP3000. Or, clear alarms to restart communications.**
   The saved offset is stored in OL□□□48.

2. **Check that communications are synchronized.**
   Check to make sure that bit 0 (Motion Operation Ready) in the IW□□□00 monitor parameter is 0 (Motion operation not ready) at this time.

3. **Set the OW□□□08 setting parameter (Motion Commands) to 9 to execute the ZSET motion command.**

Information This process is performed to set bit 5 in IW□□□0C to 1 (Zero point return/setting completed). This is not the same as the process to set the origin in the machine coordinate system (i.e., the process to set OL□□□48).

Infinite-length Operation with Non-simple Absolute Infinite Axis Position Management

If the conditions to perform simple absolute infinite axis position management cannot be satisfied, non-simple absolute infinite axis position management must be used to manage the position with ladder programming in order to perform infinite-length operation.

If simple absolute infinite axis position management is not used, special ladder programming is required for operation and for when the power supply to the system is turned ON.

The origin must also be set when the machine (system) first starts.

◆ Parameter Settings

This section describes the parameter settings required for each axis when performing infinite-length operation using non-simple absolute infinite axis position management.

■ Fixed Parameter Settings Required for Infinite Axis Position Management

To perform non-simple absolute infinite axis position management using the axis as an infinite-length axis, set fixed parameter No. 1 bit 0 (Axis Selection) to 1: Infinite-length axis and fixed parameter No. 1 bit 9 (Simple Absolute Infinite Axis Position Management) to 0 (Disabled).

No.	Bit	Name	Setting (Meaning)	Reference
1	0	Axis Selection	1: Infinite-length axis	◆ *Function Selection Flags 1* on page 3-28
	9	Simple Absolute Infinite Axis Position Management	0: Disabled	

■ Fixed Parameter Settings Required for an Absolute Encoder System

The following table lists the fixed parameters that must be set to perform infinite-length operation using non-simple absolute infinite axis position management.

No.	Name	Setting	Setting Unit	Reference
4	Reference Unit Selection	0: pulse[*1] 1: mm 2: deg 3: inch 4: μm	–	◆ *Reference Unit Selection* on page 3-31
30	Encoder Selection	1: Absolute encoder	–	◆ *Encoder Selection* on page 3-33
6	Travel Distance per Machine Rotation	1 to 2^{31} – 1	Reference units	–
8	Servomotor Gear Ratio Term	1 to 65,535	Rotations	–
9	Machine Gear Ratio Term	1 to 65,535	Rotations	–
10	Infinite-length Axis Reset Position (POSMAX)	1 to 2^{31} – 1	Reference units	–
36	Number of Pulses Per Motor Rotation	2^N [*2]	pulse	■ *Number of Pulses Per Motor Rotation* on page 5-39
38	Maximum Number of Absolute Encoder Rotations	0 to 2^{31} – 1	Rotations	◆ *Maximum Number of Absolute Encoder Rotations* on page 3-35

[*1] Electronic gear settings are invalid when the pulse is selected as the reference unit.

[*2] N is the number of encoder bits.

■ SERVOPACK Parameter Settings

The SERVOPACK parameters that must be set for an absolute encoder system are listed in the following table.

Parameter		Name	Description	Reference
Pn000	n.□□□X	Rotation/ Movement Direction Selection	0: Use CCW as the forward direction. (Rotary Servomotor) Use the direction in which the linear encoder counts up as the forward direction. (Linear Servomotor) 1: Use CW as the forward direction. (Rotary Servomotor) Use the direction in which the linear encoder counts down as the forward direction. (Linear Servomotor)	–
Pn205	–	Multiturn Limit	0 to 65,535	■ *Maximum Number of Absolute Encoder Rotations* on page 5-28
Pn002	n.□X□□	Encoder Usage	0: Use the encoder according to encoder specifications. 2: Use the encoder as a single-turn absolute encoder.	■ *Encoder Selection* on page 5-27

Note: These are parameters for Σ-7-Series SERVOPACKs. Refer to the manual for your SERVOPACK for details on parameters for SERVOPACKs in other series.

◆ Setting the Machine Coordinate Origin

The following procedure sets the origin for non-simple absolute infinite axis position management.

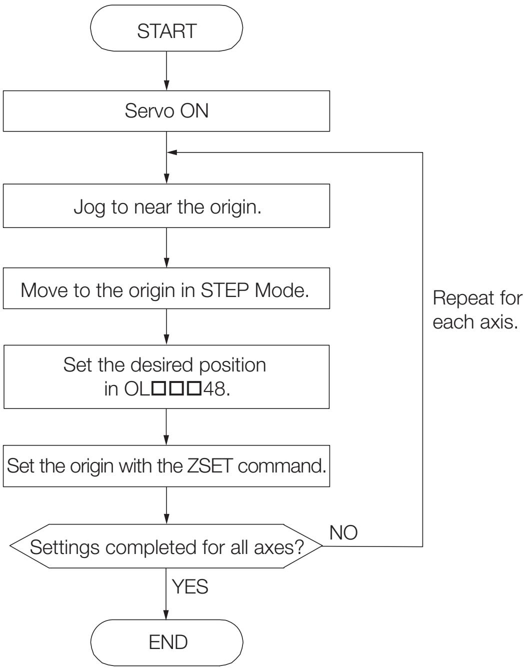
When the origin is set, the position where the axis stops is specified by using the distance from the origin of the machine coordinate system. In other words, the position of the origin of the machine coordinate system is determined by setting the offset from the origin of the encoder.

When the OL□□□48 (Zero Point Position Offset in Machine Coordinate System) setting parameter is set to the value of the desired position to set the origin, the setting will be set as the current position in the machine coordinate system.

Therefore, to set the origin of the machine coordinate system as the stop position when setting the origin, set OL□□□48 = 0.

The setting of OL□□□48 is valid only when the ZSET command is executed.

The following flowchart shows the procedure.



◆ Position Management

For non-simple absolute infinite axis position management, the MP3000 performs position management in the following manner after the zero point is set.

1. **The pulse position and encoder position are always stored as paired information in memory.**
2. **The data in step 1 above is used as the power OFF pulse position and the power OFF encoder position when the power supply is turned ON again.**
3. **The pulse position is calculated from the relative position of the encoder with the following formula:**
   Pulse position = Power OFF pulse position + (Encoder position − Power OFF encoder position)*

* The portion in parentheses ( ) represents the travel distance (relative encoder position) while the power supply is OFF.

Term

- Encoder Position
  The encoder position is the absolute encoder position information (Multiturn data × Number of encoder pulses + Initial incremental pulses (position within one rotation)).
  The unit for this position information is pulses.
  The actual position management is performed in the set reference units, so you do not need to be concerned about it.
- Pulse Position
  The pulse position is the position information managed by the MP3000 converted into pulses.
  The unit for this position information is pulses.
  The actual position management is performed in the set reference units, so you do not need to be concerned about it.

◆ Precautions for Parameter Settings

The names of some of the motion parameters and SERVOPACK parameters are different even though they have the same meaning. Set the values of these motion parameters and SERVOPACK parameters so that they are consistent with each other.

■ Encoder Selection

Set the parameters as shown in the following table for an axis that performs absolute position detection.

Type	Parameter	Setting
Motion Parameter	Fixed Parameter No. 30 (Encoder Selection)	1: Absolute encoder
SERVOPACK Parameter	Pn002 = n.□X□□ (Encoder Usage)	0: Use the encoder according to encoder specifications. 2: Use the encoder as a single-turn absolute encoder.

■ Number of Pulses Per Motor Rotation

Refer to the following table and set fixed parameter No. 36 (Number of Pulses Per Motor Rotation) according to the number of encoder bits (resolution). This setting can be used for all SERVOPACK models.

Encoder Resolution (Number of Bits)	Fixed Parameter No. 36 (Number of Pulses Per Motor Rotation)
12	4,096
13	8,192
15	32,768
16	65,536
17	131,072
20	1,048,576
22	4,194,304
24	16,777,216

The setting of the Pn212 (Number of Encoder Pulses) SERVOPACK parameter is not used for control with the MP3000. It is not necessary to change the setting of Pn212.

■ Maximum Number of Absolute Encoder Rotations

Set the maximum number of absolute encoder rotations.

Set fixed parameter No. 38 (Maximum Number of Absolute Encoder Rotations) to the same value as the Pn205 SERVOPACK parameter.

> **Important**
>
> Set fixed parameter No. 38 and SERVOPACK parameter Pn205 to the same values to ensure that correct motion control is performed and to prevent position variation.
> Multiturn limit setting mismatch detection can be used to determine whether both values match. Refer to the following section for details.
> ☞ *6.7 Multiturn Limit Setting Disagreement Detection* on page 6-31

Creating Ladder Programs for Infinite Axis Position Management

If simple absolute infinite axis position management is not used, special ladder programming is required for operation and for when the power supply to the system is turned ON.

◆ During Operation

If simple absolute infinite axis position management is not used, special ladder programming is required for normal operation and for when the power supply to the system is turned OFF and ON again.

1. **Check to make sure that bit 5 (Zero Point Return/Setting Completed) in the IW□□□0C monitor parameter is 1 (Zero point return/setting completed).**
   If it is not, it means that the power OFF pulse position, power OFF encoder position, and all position data have not been set. In this case, refer to the following section and either set up the position information again or execute the ZSET motion command to establish new position information.
   ☞ *5.2.5 Reading Position Data When the Power Supply Is Turned ON* on page 5-25

2. **Use the ladder program to save the following monitor parameters in the high-speed scan to M registers.**
   - All four words of the IL□□□5E/IL□□□60 monitor parameters (Power OFF Encoder Position)
   - All four words of the IL□□□62/IL□□□64 monitor parameters (Power OFF Pulse Position)

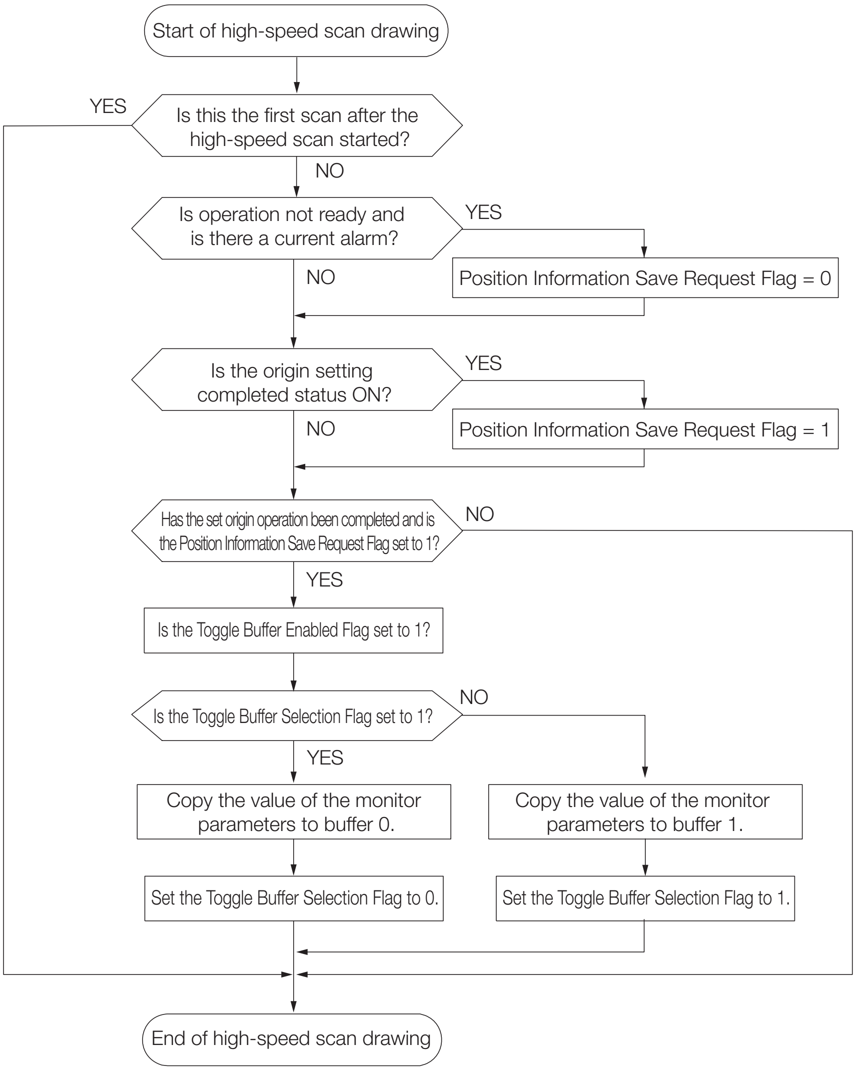
   The M registers that are used to save the above monitor parameters are structured as shown below.

MW□□□□□	Bit 0	Toggle Buffer Enabled Flag (0: Disabled, 1: Enabled)	
	Bit 1	Toggle Buffer Selection Flag (0: Buffer 0, 1: Buffer 1)	
	Bit 2	Position Information Re-setup Request Flag (0: Completed, 1: Request)	
	Bit 3	Position Information Save Request Flag (0: Prohibited, 1: Request)	
MW□□□□□+1	Not used.		
ML□□□□□+2 ML□□□□□+4	Buffer 0	Monitor Parameter: Encoder position when the power is OFF	Lower 2 words (IL□□□5E)
			Upper 2 words (IL□□□60)
ML□□□□□+6 ML□□□□□+8		Monitor Parameter: Pulse position when the power is OFF	Lower 2 words (IL□□□62)
			Upper 2 words (IL□□□64)
ML□□□□□+10 ML□□□□□+12	Buffer 1	Monitor Parameter: Encoder position when the power is OFF	Lower 2 words (IL□□□5E)
			Upper 2 words (IL□□□60)
ML□□□□□+14 ML□□□□□+16		Monitor Parameter: Pulse position when the power is OFF	Lower 2 words (IL□□□62)
			Upper 2 words (IL□□□64)

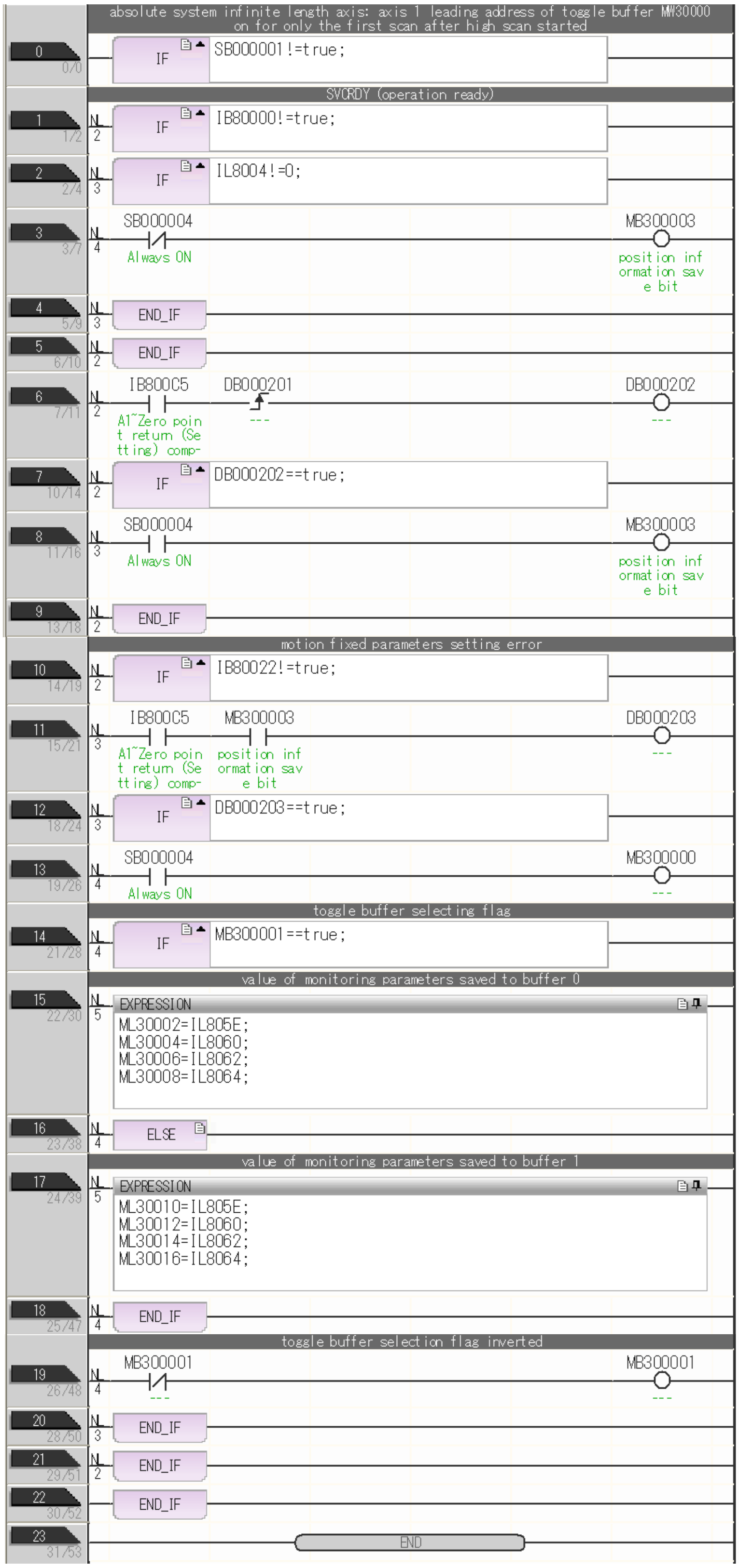
Important

Two sets of buffers are needed to save the power OFF encoder position and the power OFF pulse position because the program may end without setting all four words of the position information if the power supply is turned OFF during the high-speed scan.

The following flowchart shows the procedure for storing this information to these buffers.



The example of ladder programming on the next page is for the above flowchart. Axis 1 of circuit number 1 is used here. Change the motion parameter register address if the circuit and/or axis numbers are different.



```
absolute system infinite length axis: axis 1 leading address of toggle buffer MW30000
on for only the first scan after high scan started
0     0/0         IF SB000001!=true;
SVCRDY (operation ready)
1     1/2    N 2  IF IB80000!=true;
2     2/4    N 3  IF IL8004!=0;
3     3/7    N 4  SB000004 (Always ON)  -|/|-                  MB300003 (position information save bit)  -( )-
4     5/9    N 3  END_IF
5     6/10   N 2  END_IF
6     7/11   N 2  IB800C5 (A1~Zero point return (Setting) comp-)  -| |-   DB000201 (---)  -|↑|-   DB000202 (---)  -( )-
7     10/14  N 2  IF DB000202==true;
8     11/16  N 3  SB000004 (Always ON)  -| |-                   MB300003 (position information save bit)  -( )-
9     13/18  N 2  END_IF
motion fixed parameters setting error
10    14/19  N 2  IF IB80022!=true;
11    15/21  N 3  IB800C5 (A1~Zero point return (Setting) comp-)  -| |-   MB300003 (position information save bit)  -| |-   DB000203 (---)  -( )-
12    18/24  N 3  IF DB000203==true;
13    19/26  N 4  SB000004 (Always ON)  -| |-                   MB300000 (---)  -( )-
toggle buffer selecting flag
14    21/28  N 4  IF MB300001==true;
value of monitoring parameters saved to buffer 0
15    22/30  N 5  EXPRESSION
                  ML30002=IL805E;
                  ML30004=IL8060;
                  ML30006=IL8062;
                  ML30008=IL8064;
16    23/38  N 4  ELSE
value of monitoring parameters saved to buffer 1
17    24/39  N 5  EXPRESSION
                  ML30010=IL805E;
                  ML30012=IL8060;
                  ML30014=IL8062;
                  ML30016=IL8064;
18    25/47  N 4  END_IF
toggle buffer selection flag inverted
19    26/48  N 4  MB300001 (---)  -|/|-                        MB300001 (---)  -( )-
20    28/50  N 3  END_IF
21    29/51  N 2  END_IF
22    30/52       END_IF
23    31/53       END
```

◆ When the Power Supply Is Turned ON

Set the position information again from a ladder program in the high-speed scan as shown below when the system power supply is turned OFF and ON again. This operation must be performed when the power supply to the MP3000 or to the slave SERVOPACK is turned OFF and ON again.

1. **Store the Power OFF Pulse Position and Power OFF Encoder Position values that are saved in the M registers to the following setting parameters.**
   - All four words of the OL□□□5E/OL□□□60 setting parameters (Power OFF Encoder Position)
   - All four words of the OL□□□62/OL□□□64 setting parameters (Power OFF Pulse Position)

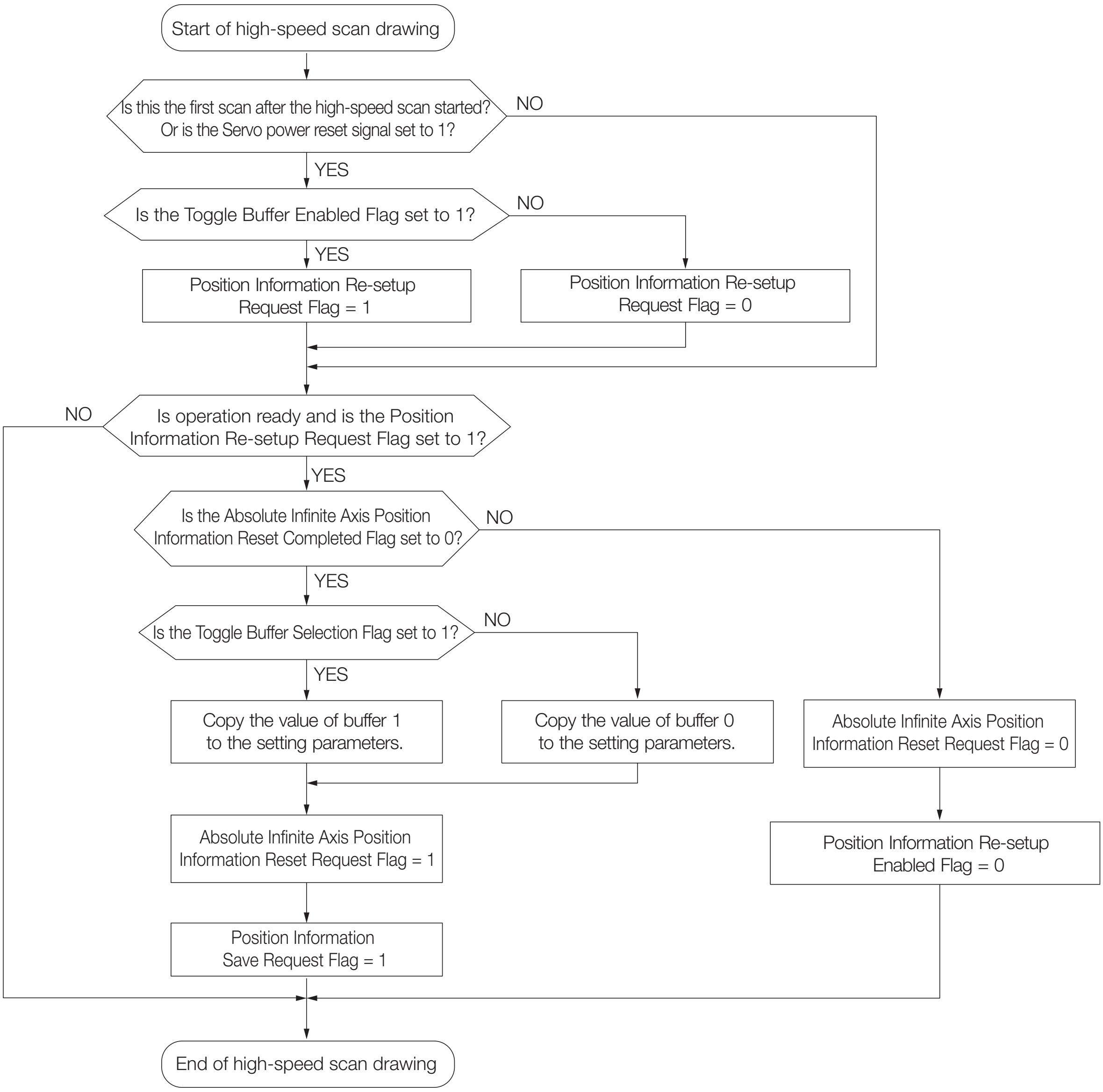
   Store the contents of the buffers selected by the Toggle Buffer Selection Flag.

2. **Set bit 7 (Absolute Infinite-length Position Information Load Request) in the OW□□□00 setting parameter to 0 (OFF), 1 (ON), and then 0 (OFF) again.**
   This allows all position information to be set. Bit 5 (Zero Point Return/Setting Completed) in the IW□□□0C monitor parameter changes to 1 (Zero point return/setting completed) and the following monitor parameters are enabled.
   - All four words of the IL□□□5E/IL□□□60 monitor parameters (Power OFF Encoder Position)
   - All four words of the IL□□□62/IL□□□64 monitor parameters (Power OFF Pulse Position)

   The system creates position information using the following formula when the Absolute Infinite-length Position Information Load Request bit changes to 1.
   - Pulse position = Power OFF pulse position + (Encoder position - Power OFF encoder position)*

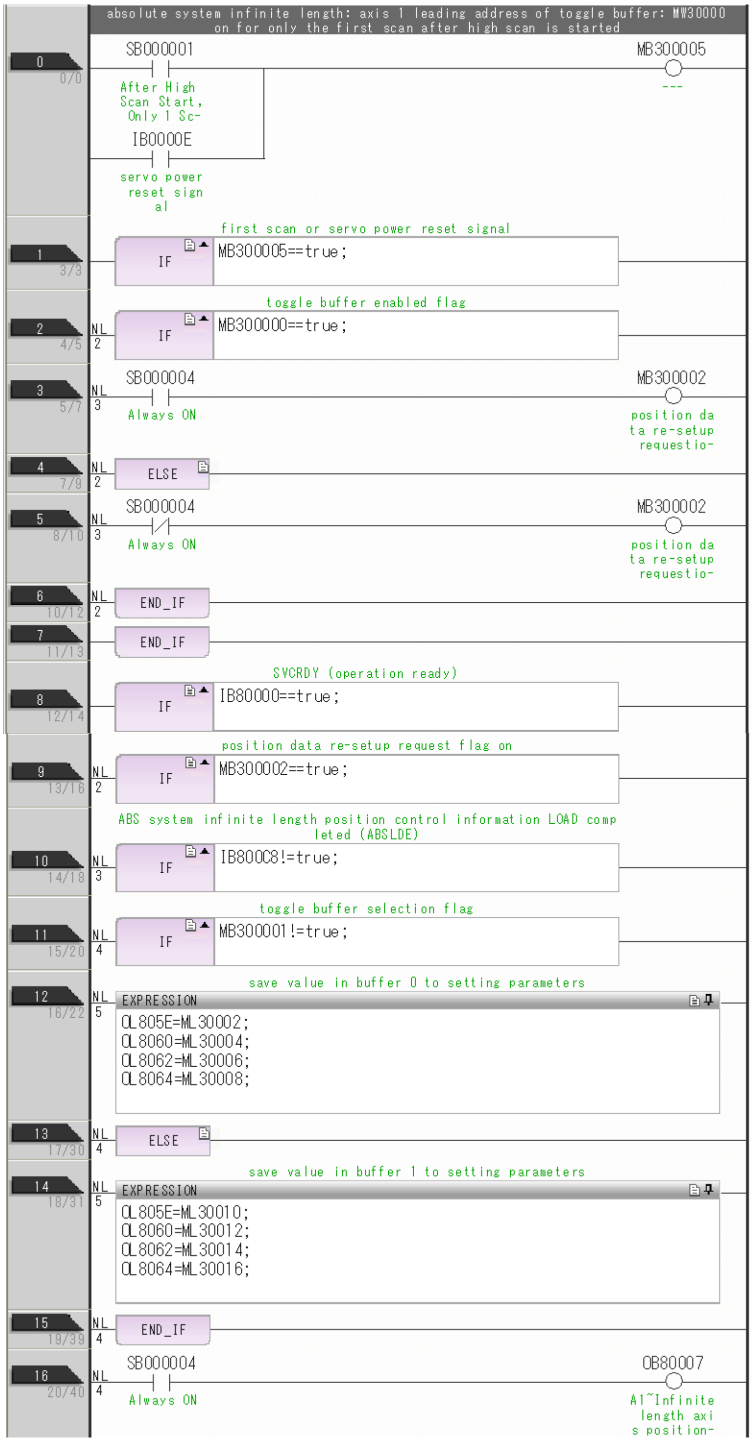
   * The portion in parentheses ( ) represents the travel distance while the power supply is OFF.

The following flowchart shows the procedure for storing the position information in the setting parameters and for requesting to load the absolute infinite axis position information.



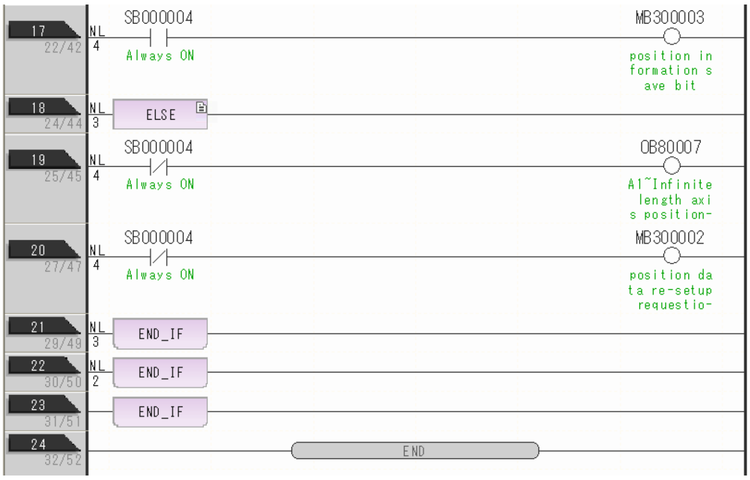
The following example of ladder programming is for the flowchart on the previous page. Axis 1 of circuit number 1 is used here. Change the motion parameter register address if the circuit and/or axis numbers are different.

Information There are no restrictions in the execution order for ladder programs H10 and H11 when an absolute encoder is used as an infinite-length axis.



absolute system infinite length: axis 1 leading address of toggle buffer: MW30000
on for only the first scan after high scan is started

```
0   0/0    SB000001 (After High Scan Start, Only 1 Sc-)
           IB0000E (servo power reset signal)
           -> MB300005 (---)
1   3/3    first scan or servo power reset signal
           IF MB300005==true;
2   4/5    NL 2  toggle buffer enabled flag
           IF MB300000==true;
3   5/7    NL 3  SB000004 (Always ON) -> MB300002 (position data re-setup requestio-)
4   7/9    NL 2  ELSE
5   8/10   NL 3  SB000004 (Always ON) -> MB300002 (position data re-setup requestio-)
6   10/12  NL 2  END_IF
7   11/13  END_IF
8   12/14  SVCRDY (operation ready)
           IF IB80000==true;
9   13/16  NL 2  position data re-setup request flag on
           IF MB300002==true;
10  14/18  NL 3  ABS system infinite length position control information LOAD completed (ABSLDE)
           IF IB800C8!=true;
11  15/20  NL 4  toggle buffer selection flag
           IF MB300001!=true;
12  16/22  NL 5  save value in buffer 0 to setting parameters
           EXPRESSION
           OL805E=ML30002;
           OL8060=ML30004;
           OL8062=ML30006;
           OL8064=ML30008;
13  17/30  NL 4  ELSE
14  18/31  NL 5  save value in buffer 1 to setting parameters
           EXPRESSION
           OL805E=ML30010;
           OL8060=ML30012;
           OL8062=ML30014;
           OL8064=ML30016;
15  19/39  NL 4  END_IF
16  20/40  NL 4  SB000004 (Always ON) -> OB80007 (A1~Infinite length axis position-)
```


17
22/42
NL
4
SB000004
Always ON
MB300003
position in
formation s
ave bit
18
24/44
NL
3
ELSE
19
25/45
NL
4
SB000004
Always ON
OB80007
A1~Infinite
length axi
s position-
20
27/47
NL
4
SB000004
Always ON
MB300002
position da
ta re-setup
requestio-
21
29/49
NL
3
END_IF
22
30/50
NL
2
END_IF
23
31/51
END_IF
24
32/52
END

5.3 Multiturn Limit

This section describes how to set the multiturn limit from the MP3000 or SERVOPACK.

5.3.1 Check Items before Setup

Check the following items before setting the multiturn limit.

- Synchronous communications are established with the SERVOPACK (bit 0 in IW□□□00 is 1).
- The Servomotor is OFF (Servo OFF) (bit 1 in IW□□□00 is 0).
- An absolute encoder is used.
- The Pn002 = n.□x□□ SERVOPACK parameter (Encoder Usage in Application Function Selections 2) is set to 0 (Use the encoder according to the encoder specifications).
- A multiturn limit disagreement alarm (A.CC0) has occurred on the SERVOPACK.*

* A multiturn limit disagreement alarm (A.CC0) is displayed when the multiturn limit setting is changed with parameter Pn205, because the value will differ from the value that is set for the encoder.

Information If there is a A.CC0 alarm (Multiturm Limit Mismatch) in the SERVOPACK, communications cannot be synchronized just by turning ON the power supply to the MP3000. Use the Alarm Clear bit (OW□□00, bit F) to synchronize communications.

5.3.2 Setting Procedure

Use the following procedure to set the multiturn limit from the MP3000.

1. Writing the Multiturn Limit Setting Request
   Use the following parameter settings to write to memory.

Register Addresses	Name	Setting	Description
OW□□□51	SERVOPACK Parameter Size	1	Number of words
OL□□□52	SERVOPACK Parameter Setting	1013 hex	The multiturn limit setting request code
OL□□□58	Address Setting	80004000 hex	Virtual memory address in the SERVOPACK

2. Preparing for Execution
   Use the following parameter settings to write to memory.

Register Addresses	Name	Setting	Description
OW□□□51	SERVOPACK Parameter Size	1	Number of words
OL□□□52	SERVOPACK Parameter Setting	2	The code required for the preliminary processing
OL□□□58	Address Setting	80004002 hex	Virtual memory address in the SERVOPACK

3. Setting the Multiturn Limit
   Use the following parameter settings to write to memory.

Register Addresses	Name	Setting	Description
OW□□□51	SERVOPACK Parameter Size	1	Number of words
OL□□□52	SERVOPACK Parameter Setting	1	The code required to send the data and perform the calibration operation
OL□□□58	Address Setting	80004002 hex	Virtual memory address in the SERVOPACK

4. Completing the Setting of the Multiturn Limit

Use the following parameter settings to write to memory.

Register Addresses	Name	Setting	Description
OW□□□51	SERVOPACK Parameter Size	1	Number of words
OL□□□52	SERVOPACK Parameter Setting	0	The code required to send the data and end the calibration operation
OL□□□58	Address Setting	80004000 hex	Virtual memory address in the SERVOPACK

5. Turning the Power Supply to the SERVOPACK OFF and ON Again

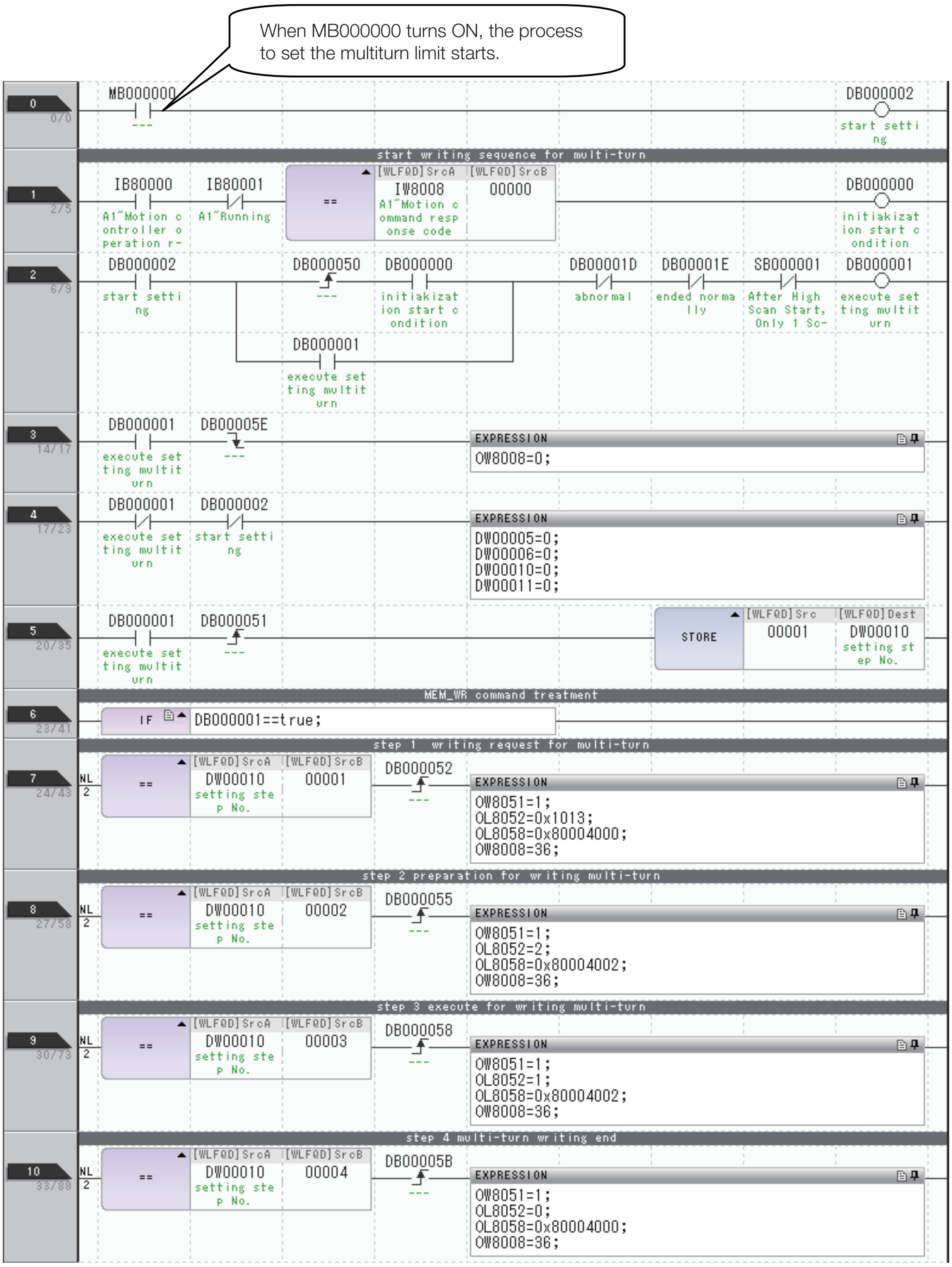
This concludes the process for setting the multiturn limit.

■ Handling Errors

If writing to memory ends in an error during steps 1 to 3, perform step 4.

5.3.3 Programming Example

The following example of ladder programming sets the multiturn limit. Axis 1 of circuit number 1 is used here. Change the motion parameter register address if the circuit and/or axis numbers are different.



When MB000000 turns ON, the process to set the multiturn limit starts.

```
OW8008=0;
```

```
DW00005=0;
DW00006=0;
DW00010=0;
DW00011=0;
```

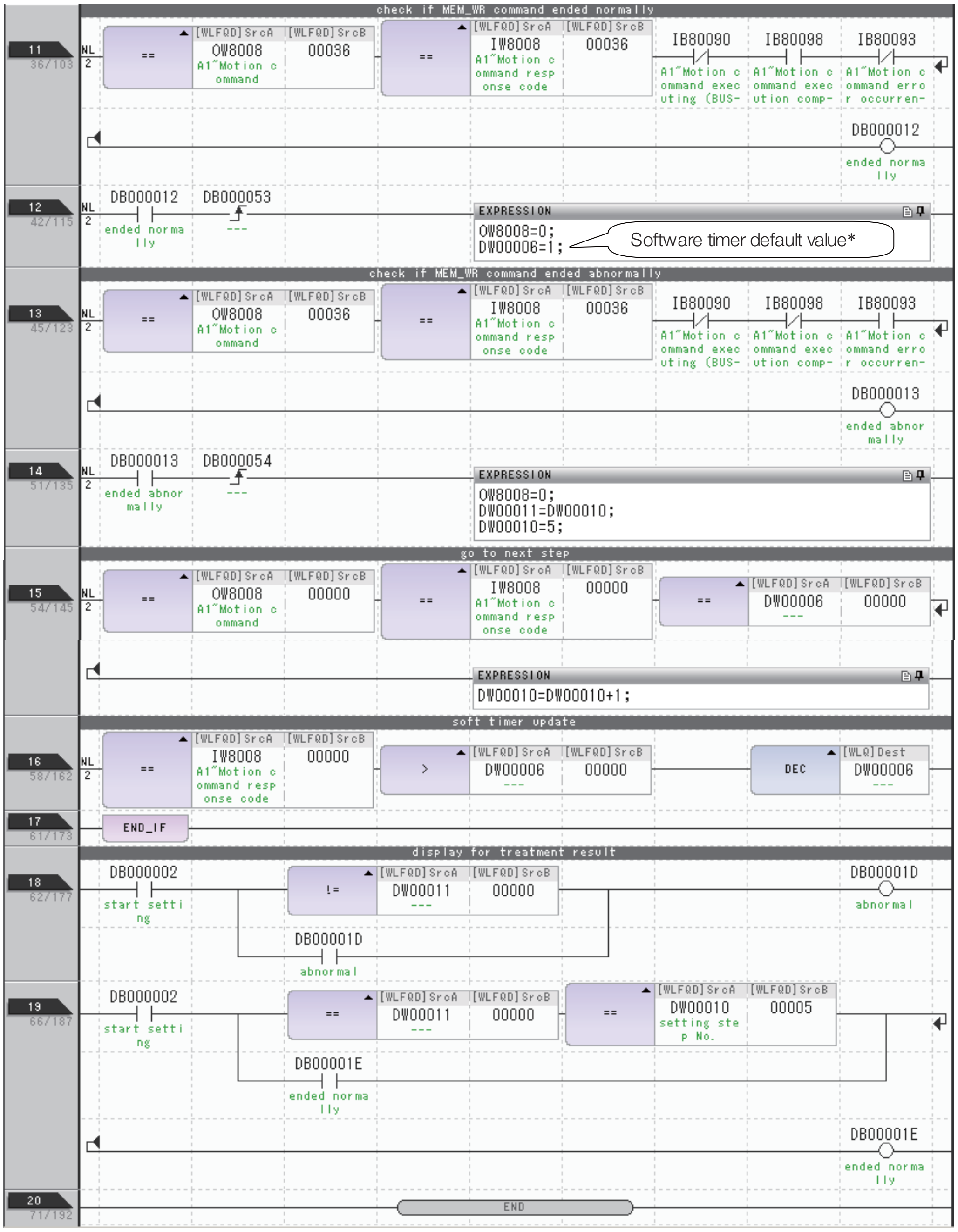
```
DB000001==true;
```

```
OW8051=1;
OL8052=0x1013;
OL8058=0x80004000;
OW8008=36;
```

```
OW8051=1;
OL8052=2;
OL8058=0x80004002;
OW8008=36;
```

```
OW8051=1;
OL8052=1;
OL8058=0x80004002;
OW8008=36;
```

```
OW8051=1;
OL8052=0;
OL8058=0x80004000;
OW8008=36;
```



Software timer default value*

* The value set in DW00006 is determined as given in the following table.

Condition	Setting
High-speed scan setting ≥ MECHATROLINK-III transmission cycle setting	1
High-speed scan setting < MECHATROLINK-III transmission cycle setting	(MECHATROLINK-III transmission cycle setting/High-speed scan setting - 1) × 4 + 1

Example

When High-speed Scan Setting = 1 ms and MECHATROLINK-III Transmission Cycle Setting = 250 μs
- Software timer default value = 1

When High-speed Scan Setting = 0.5 ms and MECHATROLINK-III Transmission Cycle Setting = 1 ms
- Software timer default value = (1 ms / 0.5 ms – 1) × 4 + 1 = 5

5.3.4 Related Parameters

For a finite-length axis, set this parameter as shown below. This parameter does not need to be set for an infinite-length axis. A check will always be performed to see if there is a multiturn limit setting disagreement regardless of the setting of this parameter.

Fixed Parameter	Name	Description
No.2 Bit 5	Finite-length Multiturn Limit Setting Disagreement Detection Mask	Use this bit to specify whether or not to detect a multiturn limit setting disagreement during finite-length operation. 0: Do not detect, 1: Detect

5.3.5 Multiturn Limit Setting Disagreement Detection Timing

A check will be made for a multiturn limit setting disagreement when the operations in the following table are performed.

No.	Operation	Condition
1	Starting from flash memory	None
2	Writing fixed parameters	
3	Saving MECHATROLINK definitions	
4	Transferring module configuration definitions	
5	Turning ON OW□□□00 bit C (Reset Network)	
6	Turning ON OW□□□00 bit E (Reset Communications)	IL□□□02 bit 2 (Fixed Parameter Error) is OFF.
7	Turning ON OW□□□00 bit F (Clear Alarm)	A communications error has occurred and IL□□□02 bit 2 (Fixed Parameter Error) is OFF.

5.3.6 Checking for a Multiturn Limit Setting Disagreement

A warning will occur when a multiturn limit setting disagreement is detected. The parameters will have the following values.

Register	Parameter Name	Value
IL□□□02 Bit 2	Fixed Parameter Setting Error	1: ON (Outside setting range)
IW□□□01	Out-of-range Parameter Number	1038 (fixed parameter No. 38 (Maximum Number of Absolute Encoder Rotations))
IW□□□00 Bit 0	Motion Operation Ready (Motion controller operation ready)	0: OFF (Motion operation not ready)

5.3.7 Clearing the Warning

Change the set value of either fixed parameter No. 38 (Maximum Number of Absolute Encoder Rotations) or common parameter 24 (Multiturn Limit Setting), and clear the warning in IL☐☐☐02 bit 02 (Fixed Parameter Error).

Changing the Set Value of Fixed Parameter No. 38

The warning will be cleared when the fixed parameters are written.

1. **Set fixed parameter No. 38 in the SERVOPACK where the warning occurred to the value of common parameter 24.**
2. **Write the fixed parameters.**

This concludes the procedure.

Changing the Set Value of Common Parameter 24 (Multiturn Limit Setting)

The warning will be cleared when the power supply to the MP3000 is turned OFF and ON again. The following procedure describes how to clear the warning when a Σ-V-series SERVOPACK is connected.

1. **Set common parameter 24 to the value of fixed parameter No. 38 using the Digital Operator.**
2. **Turn the power supply to the SERVOPACK OFF and ON again**
   A multiturn limit disagreement alarm (A.CC0) will occur in the SERVOPACK.
3. **Execute Fn013 (Multiturn Limit Setting) from the Digital Operator.**
4. **Turn the power supply to the SERVOPACK OFF and ON again**
   The A.CC0 alarm in the SERVOPACK will be cleared.
5. **Turn the power supply to the MP3000 OFF and ON again.**

This concludes the procedure.

5.4 Absolute Encoders with 24-Bit Resolution

Encoders with 24-bit resolutions can be used with Σ-7-Series SERVOPACKs. However, if you use an encoder with a 24-bit resolution, it may not be possible to specify correct travel distances and deceleration times with the MP3000.

This section describes settings and precautions when using a 24-bit encoder.

Also, if you write any fixed parameters after turning ON the power supply, save the settings to flash memory and then turn the power supply OFF and ON again.

5.4.1 Encoder with 24-Bit Resolution and Electronic Gear Ratio Settings

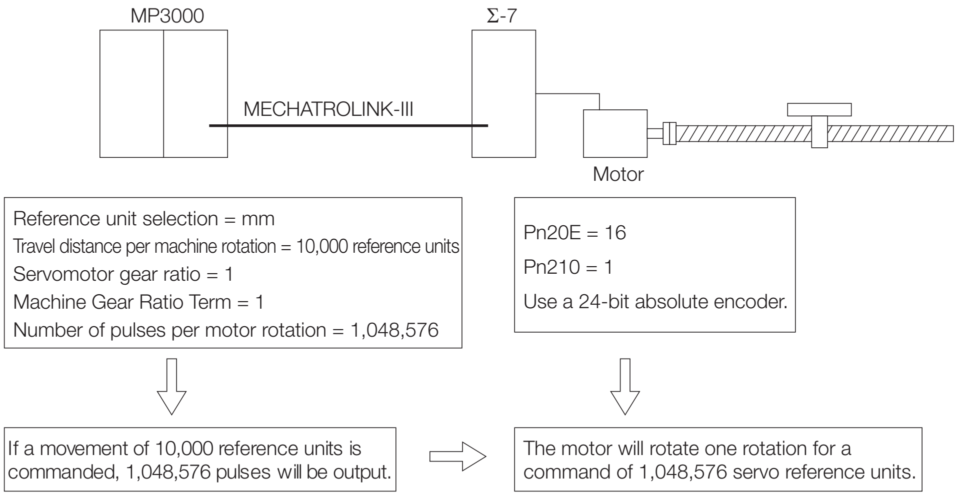
The setting of OL□□□1C (Position Reference Setting) in the MP3000 is two words. Therefore, the travel distance that you can specify from the MP3000 can be from -2,147,483,648 to +2,147,483,647 reference units.

There are 16,777,216 pulses per motor rotation of the 24-bit resolution absolute encoder. Therefore, depending on the machine, the distance that can be traveled may not be sufficient. The deceleration time during deceleration may also be restricted. Refer to the following section for details.

☞ *5.4.3 Possible Travel Distances and Deceleration Times for the MP3000* on page 5-55

To eliminate this problem, set the electronic gear ratio in the SERVOPACK parameters to 16:1 to use the 24-bit resolution encoder as a 20-bit resolution encoder.

The relation between the electronic gear ratio in the SERVOPACK parameters and the number of reference pulses in the MP3000 is shown in the following figure.

Electronic Gear Ratio in the SERVOPACK Parameters	Operation
16:1 (Equivalent to 20 bits.)	 Reference unit selection = mm Travel distance per machine rotation = 10,000 reference units Servomotor gear ratio = 1 Machine Gear Ratio Term = 1 Number of pulses per motor rotation = 1,048,576 Pn20E = 16 Pn210 = 1 Use a 24-bit absolute encoder. If a movement of 10,000 reference units is commanded, 1,048,576 pulses will be output. The motor will rotate one rotation for a command of 1,048,576 servo reference units.

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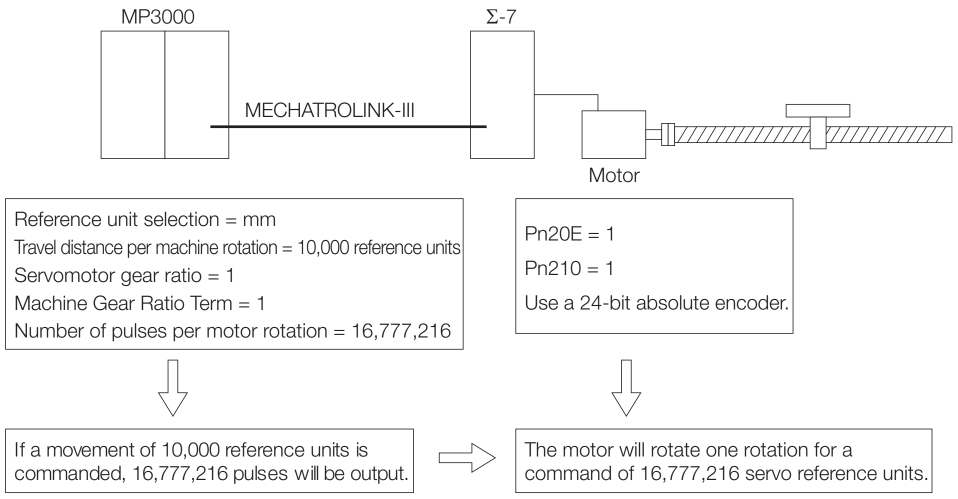
Electronic Gear Ratio in the SERVOPACK Parameters	Operation
1:1 (24 bits)	 Reference unit selection = mm Travel distance per machine rotation = 10,000 reference units Servomotor gear ratio = 1 Machine Gear Ratio Term = 1 Number of pulses per motor rotation = 16,777,216 Pn20E = 1 Pn210 = 1 Use a 24-bit absolute encoder. If a movement of 10,000 reference units is commanded, 16,777,216 pulses will be output. The motor will rotate one rotation for a command of 16,777,216 servo reference units.

Important

If the electronic gear ratio in the SERVOPACK parameters is set to 16:1, the reference unit increment in the MP3000 will be 16 times its size when the electronic gear ratio in the SERVOPACK parameters is set to 1:1. In other words, a 24-bit resolution encoder will be used as a 20-bit resolution encoder.
If high resolution is required, set the electronic gear ratio in the SERVOPACK parameters to 1:1 and set fixed parameter No. 36 (Number of Pulses per Motor Rotation) to 16,777,216.

5.4.2 Self Configuration and Encoder Resolution

When you execute self-configuration, the link assignment is set automatically according to the encoder information of the connected SERVOPACK.

If the resolution of the encoder exceeds 20 bits at this time, the number of pulses per encoder rotation will automatically be set as follows so that the resolution of the encoder is equivalent to 20 bits:

- Fixed parameter No.36: 1,048,576
- SERVOPACK electronic gear ratio of 16:1 (Pn20E = 16 and Pn210 = 1)

The electronic gear ratio in the SERVOPACK parameters and the number of pulses per motor rotation is automatically set as follows based on the resolution of the encoder:

Encoder Resolution	Electronic Gear Ratio in the SERVOPACK Parameters	Fixed Parameter 36: Number of Pulses Per Motor Rotation
20 bits or lower	1:1	1,048,576
24 bits	16:1	

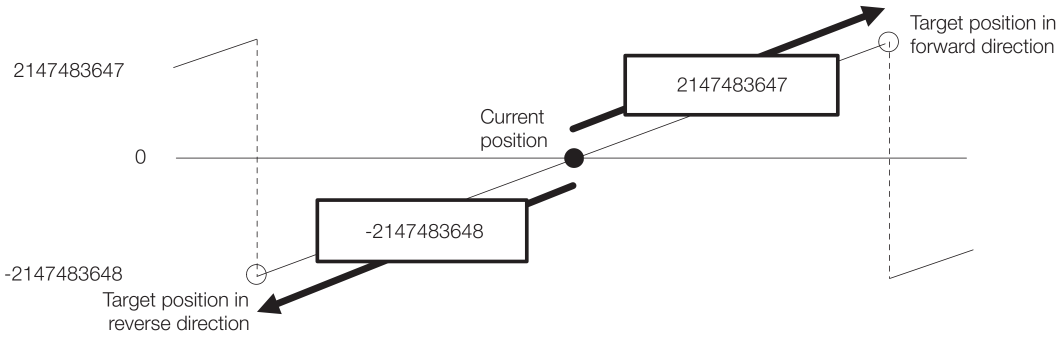
5.4.3 Possible Travel Distances and Deceleration Times for the MP3000

Possible Travel Distance for One Command

The range that you can move with one motion command for which a target position is specified (POSING, EX_POSING, and STEP) is given below.

-2,147,483,648 to 2,147,483,647 MP3000 reference units

◆ Operation



Important If the target position is changed while the axis is moving and the travel distance from the current position exceeds the above range, IL□□□04 bit 7 (Excessive Positioning Travel Distance) will turn ON.

OL□□□42 (Zero Point Return Travel Distance) and OL□□□46 (External Positioning Final Travel Distance)

The maximum travel distances that can be used for OL□□□42 (Zero Point Return Travel Distance), which is used for ZRET (Zero Point Return), and OL□□□46 (External Positioning Final Travel Distance), which is used for EX_POSING (Latch Target Positioning) and EX_FEED (Jog Mode with External Positioning), depend on the electronic gear ratio setting, as given in the following table.

Electronic Gear Ratio	Reverse Direction	Forward Direction
16:1 (Equivalent to 20 bits.)	-1,023.99 rotations	1,023.99 rotations
1:1 (24 bits)	-63.99 rotations	63.99 rotations

The values of OL□□□42 and OL□□□46 depend on the setting of fixed parameter No. 4 (Reference Unit Selection) as given below.

Setting of Fixed Parameter No. 4	0	1	2	3	4
Reference Unit	pulse	mm	deg	inch	μm
Maximum Value of OL□□□42 and OL□□□46	2,147,483,647	2,147,483,647 × $\frac{\text{No. 6 (Travel Distance per Machine Rotation)} \times \text{No. 9 (Machine Gear Ratio Term)}}{\text{No. 36 (Number of Pulses per Motor Rotation)} \times \text{No. 8 (Servo Motor Gear Ratio Term)}}$			

Important If a value that exceeds the above maximum value is set, IL□□□02 bit 1 (Setting Parameter Error) will turn ON and operation will be performed with OL□□□42 or OL□□□46 set to 0.

Deceleration Time during Positioning

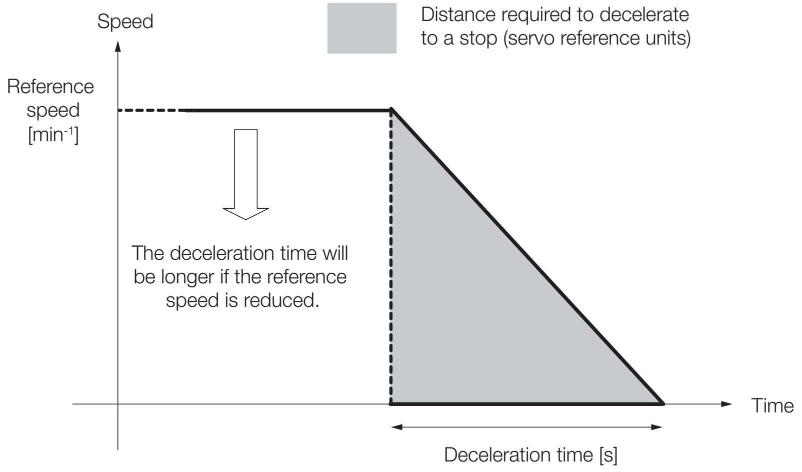
The maximum setting of the deceleration time for positioning motion commands (POSING, EX_POSING, ZRET, FEED, STEP, and EX_FEED) depends on the setting of the electronic gear ratio as given below.

Reference speed [min^{-1}]	Maximum Deceleration Time	
	Electronic Gear Ratio of 16:1 (Equivalent to 20 Bits)	Electronic Gear Ratio of 1:1 (24 Bits)
6000	13.65	0.85
3000	27.30	1.70
1500	54.61	3.41
750	109.22	6.82

Important

Operation will not be performed with the specified speed or deceleration time if a value that exceeds the maximum value is set.

◆ Operation



Other Useful Functions

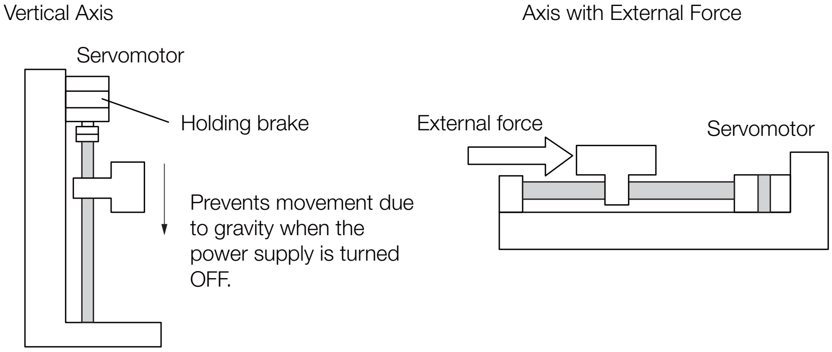
This chapter describes useful functions related to motion control that are provided by the MP3000.

6.1 Controlling Vertical Axes

This section describes the connection methods and parameter settings that are required to use the SERVOPACK to control a vertical axis.

6.1.1 SERVOPACK Holding Brake

When a SERVOPACK is used to control a vertical axis or an axis to which an external force is being applied, a Servomotor with a brake must be used to prevent the work load from dropping or moving due to gravity or the external force when the system power supply is turned OFF.



The holding brake of the Servomotor is controlled through the brake output (/BK) signal from the SERVOPACK. MP3000 brake control is not performed.

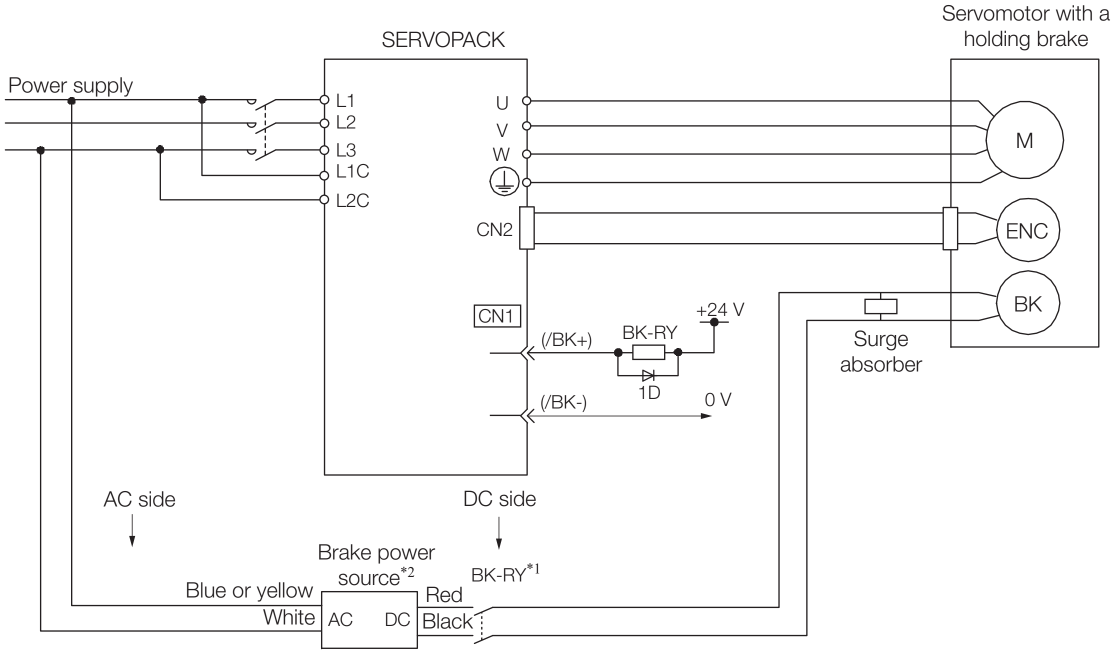
Important The brake that is built into the Servomotor uses non-excitation operation. It is for use as a holding brake only. It cannot be used to control or stop axis movement. Use the holding brake only to hold the axis in a stopped state after the motor has stopped. The torque of the brake is 100% or higher of the rated torque of the motor.

6.1.2 Connecting to a Σ-V or Σ-7 Servo Drive

This section describes how to connect to a Σ-V or Σ-7 Series Servo Drive.

Brake ON/OFF Circuit Example

A circuit is configured to turn the brake ON and OFF using the /BK contact output signal from the SERVOPACK and a brake power supply. The following diagram shows a standard connection example.



*1. BK-RY: Brake control relay

*2. 90-V brake power source 200-V input voltage: LPSE-2H01-E
100-V input voltage: LPDE-1H01-E
A 24-VDC power supply must be supplied if a 24-V brake is used.

Note: Refer to the relevant SERVOPACK manual for connection details.

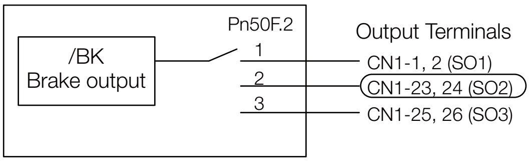
Parameter Settings

The SERVOPACK parameters that are related to controlling the holding brake are listed in the following table.

Parameter	Name	Unit	Set Value/Setting Range	Default	Valid Control Modes
Pn50F.2	Output Signal Selection 2	–	0: Brake is not used. 1: Terminals 1 and 2 2: Terminals 23 and 24 3: Terminals 25 and 26	1	Speed, torque, or position control

Details

This parameter determines (0 to 3 above) which CN1 pins are used to output the /BK signal.

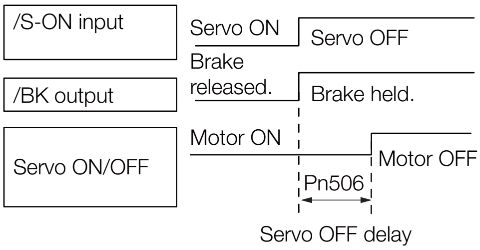


Parameter	Name	Unit	Set Value/Setting Range	Default	Valid Control Modes
Pn506	Brake Reference - Servo OFF Delay Time	10 ms	0 to 50	0	Speed, torque, or position control

Details

This parameter adjusts the delay time from when the /BK signal is output until the Servomotor turns OFF.

Set this parameter when the machine moves slightly due to gravity or other forces after the brake is turned ON.



Setting Precautions

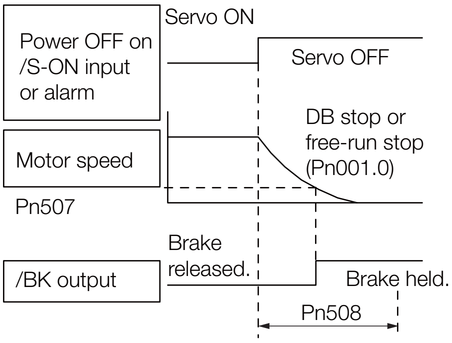
- This parameter is used to set when the motor stops. Set Pn507 and Pn508 to operate the brake while the motor is running.
- Under the standard settings, the Servomotor turns OFF simultaneously with the /BK output (brake operation). If gravity causes the machine to move slightly at this time due to the machine configuration or the brake characteristics, you can delay when the Servomotor is turned OFF to reduce the movement.

Parameter	Name	Unit	Set Value/Setting Range	Default	Valid Control Modes
Pn507	Brake Reference Output Speed Level	min^{-1}	0 to 10,000	100	Speed, torque, or position control
Pn508	Servo OFF - Brake Reference Waiting Time	10 ms	0 to 100	50	Speed, torque, or position control

Details

These parameters are used to set the timing for applying the brake when the Servomotor turns OFF due to an /S-ON input signal or when an alarm occurs.

- Conditions for Brake Operation during Servomotor Operation
  The brake will operate when one of the following conditions is met.
  - When the motor speed is equal to or less than the setting of Pn507 after power to the motor is turned OFF
  - When the time set in Pn508 has elapsed after power to the motor is turned OFF



Setting Precautions

The brake on the Servomotor is designed as a holding brake and it must be applied only after the motor has stopped. Adjust this parameter while observing the operation of the machine.

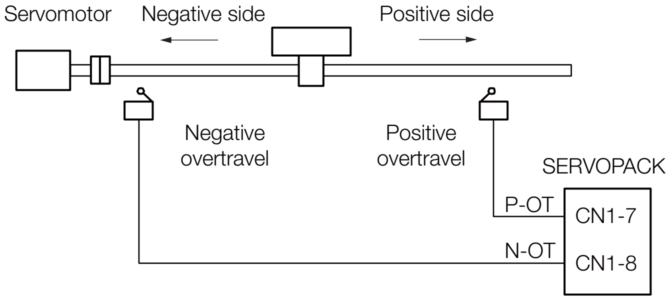
6.2 Overtravel

Overtravel forces the machine to stop when any moving part of the machine exceeds the range of movement. With the MP3000, the process for stopping as a result of overtravel is achieved through the use of SERVOPACK functions.

Set the required parameters and ensure that the overtravel input signals are connected correctly for overtravel. The required parameter settings and how to connect to a Σ-V or Σ-7 Servo Drive are described below.

6.2.1 Overtravel Input Signal Connections

Connect the input signals for the overtravel limit switches correctly as shown below to the corresponding pins on the SERVOPACK's CN1 connector.



P-OT	When ON CN1-7 is low.	Forward drive is enabled. Normal operation
	When OFF CN1-7 is high.	Forward drive is disabled. (Movement is in the negative direction.)
N-OT	When ON CN1-8 is low.	Reverse drive is enabled. Normal operation
	When OFF CN1-8 is high.	Reverse drive is disabled. (Movement is in the positive direction.)

6.2.2 Parameter Settings

This section describes the parameter settings for overtravel.

Enabling or Disabling Overtravel Input Signals

The following parameters are used to enable or disable the overtravel input signals.

Parameter	Description	Setting	Item	Default
Pn50A.3	P-OT Signal Mapping	1 (recommended)	This setting enables the use of the Forward Run Prohibited signal (P-OT). (Positive rotation prohibited when open or allowed at 0 V.)	1
		8	This setting disables the P-OT signal.	
Pn50B.0	N-OT Signal Mapping	2 (recommended)	This setting enables the use of the Reverse Run Prohibited signal (N-OT). (Negative rotation prohibited when open or allowed at 0 V.)	2
		8	This setting disables the N-OT signal.	

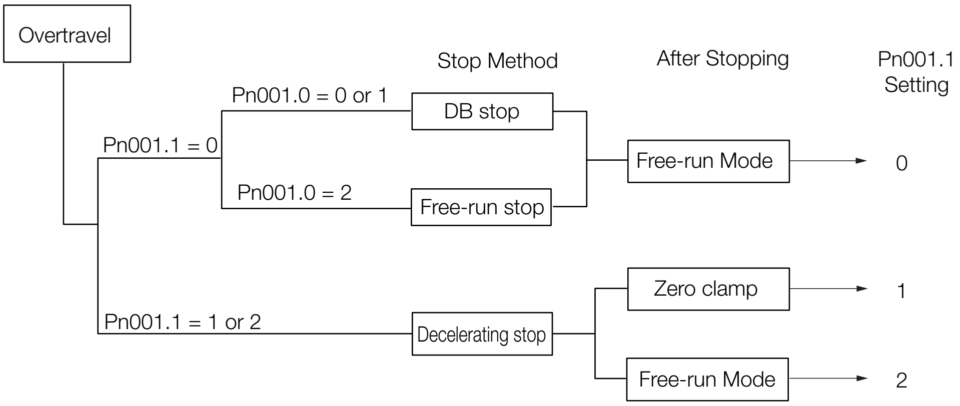
Setting Precautions

- These parameters are disabled when self configuration is performed.

Selecting Motor Stopping Methods for Overtravel

When overtravel is used, the following parameters are used to set the method for stopping the motor. Select the method for stopping when the P-OT or N-OT is input while the Servomotor is running.

Parameter	Description	Settings	Item	Default
Pn001.1	Overtravel Stop Mode	0 (recommended)	This setting stops the Servomotor with the same stop method that is used when the Servomotor is turned OFF (based on the setting of Pn001.0).	0
		1	This setting decelerates the Servomotor to a stop by applying the specified torque when overtravel is detected, and then sets it to Zero Clamp (Servo Lock) Mode. (Specified torque: Pn406 (Emergency Stop Torque))	
		2	This setting decelerates the Servomotor to a stop by applying the specified torque when overtravel is detected, and then sets it to free-run mode. (Specified torque: Pn406 (Emergency Stop Torque))	
Pn001.0	Servomotor Power OFF Stop Mode	0 (recommended)	This setting stops the Servomotor by applying the dynamic brake (DB). The DB is held after stopping.	0
		1	Stops the Servomotor by applying the dynamic brake (DB), and then releases the DB and puts the Servomotor into Free-run Mode.	
		2	This setting makes the Servomotor free-run to a stop. The Servomotor is turned OFF. The machine stops due to friction.	


Overtravel
Stop Method
After Stopping
Pn001.1 Setting
Pn001.1 = 0
Pn001.0 = 0 or 1
DB stop
Pn001.0 = 2
Free-run stop
Free-run Mode
0
Pn001.1 = 1 or 2
Decelerating stop
Zero clamp
1
Free-run Mode
2

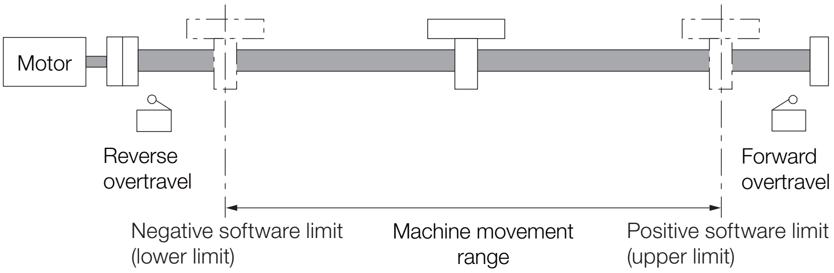
6.3 Software Limits

Software limits are used to set upper and lower limits for the range of machine movement in fixed or setting parameters so that the MP3000 can constantly monitor the operating range of the machine. Software limits can be used to help prevent machine runaway or damage due to incorrect operation or incorrect references in a motion program.

Software limits can be used under the following conditions:

- When software limits are enabled (i.e., bits 1 and 2 in fixed parameter No. 1 are both set to 1)
- When a finite-length axis is used (i.e., bit 0 in fixed parameter No. 1 is set to 0)
- When the origin return/setting has completed (i.e., bit 5 in the IW□□□0C monitor parameter is set to 1)

Disable the software limits in the SERVOPACK to use the MP3000 for position management in the machine coordinate system. Refer to the manual for your SERVOPACK for setting details.

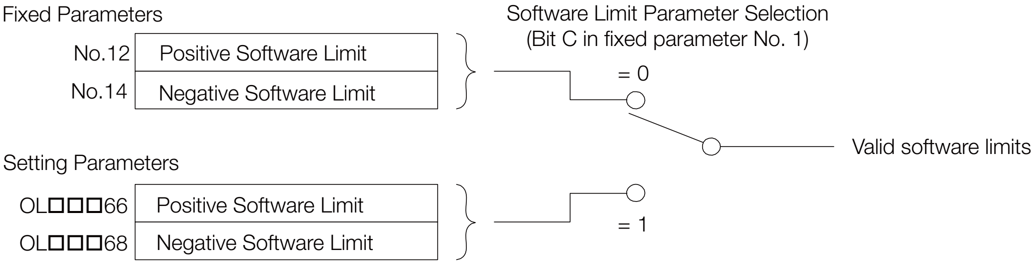


6.3.1 Software Limit Parameter Selection

Software limits can be set in either of the following sets of motion parameters.

- Fixed parameters No. 12 (Positive Software Limit) and No. 14 (Negative Software Limit)
  Use these parameters if you do not need to change the software limits after setting them.
- OL□□□66 setting parameter (Positive Software Limit) and OL□□□68 setting parameter (Negative Software Limit)
  Use these parameters if you need to change the software limits based on the workpieces that are processed.

Bit C (Software Limit Parameter Selection) in fixed parameter No. 1 is used to select between the use of the setting parameters or the fixed parameters for software limits.



Important

1. Only one set of software limit values can be valid at any given time (either those set in the relevant fixed parameters or those in the relevant setting parameters). Both sets cannot be used together at the same time.
2. If bit C (Software Limit Parameter Selection) in fixed parameter No. 1 is set to 1 (Setting parameter), software limits can be changed even during axis operation. Therefore, a software limit alarm may be detected due to a change in the software limits. Refer to the following section for details.
   ☞ *6.3.5 Processing after an Alarm Occurs* on page 6-11

6.3.2 Related Parameters

Set and check the following parameters when using software limits.

◆ Fixed Parameters

No.	Name	Setting Range	Setting Unit	Default
No.1 Bit 0	Axis Selection	0: Finite-length axis 1: Infinite-length axis	–	0: Finite-length axis
No.1 Bit 1	Enable Positive Software Limit	0: Disabled 1: Enabled	–	0: Disabled
No.1 Bit 2	Enable Negative Software Limit	0: Disabled 1: Enabled	–	0: Disabled
No.1 Bit C	Software Limit Parameter Selection	0: Fixed parameters 1: Setting parameters	–	0: Fixed parameters
No.12	Positive Software Limit	-2^{31} to $2^{31}-1$	Reference units	$2^{31}-1$
No.14	Negative Software Limit	-2^{31} to $2^{31}-1$	Reference units	-2^{31}

◆ Setting Parameters

Register Address	Name	Setting Range	Setting Unit	Default
OL□□□66	Positive Software Limit	-2^{31} to $2^{31}-1$	Reference units	$2^{31}-1$
OL□□□68	Negative Software Limit	-2^{31} to $2^{31}-1$	Reference units	-2^{31}

◆ Monitor Parameters

Register Address	Name	Setting Range	Default
IW□□□0C Bit 5	Zero Point Return/Setting Completed	0: Zero point return/ setting not completed 1: Zero point return/ setting completed	–

Important

The software limits are enabled only after the origin return or origin setting operation has been completed. Perform an origin return or set the origin again in the following cases:
- When the power supply is turned ON
- When a fixed parameter is changed and saved

6.3.3 Comparison with the MP2000-series SVC-01 Module

Software limits are different for the MP3000-series SVC Function Module and the MP2000-series SVC-01 Module.

The following table shows the differences.

Item	MP3000 SVC or SVC32	MP2000 SVC-01 Module
Software Limits	○	○
Changing software limits via the FIX-PRM_CHG (Change Fixed Parameter) motion subcommand	○	○
Software Limit Parameter Selection	○	×

Note: ○: Supported, ×: Not supported.

6.3.4 The Effects of Software Limits

If a position command that exceeds the positive or negative software limit is executed with software limits enabled, an alarm occurs and the MP3000 stops the axis. The way in which the axis stops depends on the motion command, as shown in the following table.

Motion Commands	Axis Stop Operation
POSING EX_POSING FEED STEP EX_FEED	The axis starts decelerating before the software limit position and stops at the software limit position.
INTERPOLATE LATCH	Distribution stops at the software limit position. The Servomotor performs an emergency stop.
VELO TRQ PHASE	The axis starts decelerating at the software limit position and stops beyond the software limit position.

Setting Precautions

- Software limit settings are not valid for the ZRET command.
- If a software limit is detected after an external positioning signal is detected and during the external positioning travel distance for an EX_POSING or EX_FEED operation, the axis starts decelerating at the software limit position and stops beyond the software limit position.

6.3.5 Processing after an Alarm Occurs

This section describes the processing that occurs after an alarm.

Monitoring Alarms

If a position command that moves to or exceeds the positive and negative software limit is received, the axis will be moved to the software limit position, and a Positive/Negative Software Limit alarm will occur. This alarm can be monitored via the IL□□□04 monitor parameter (Alarms).

Register Address	Name	Description	
IL□□□04	Alarms	Bit 3	Positive Software Limit
		Bit 4	Negative Software Limit

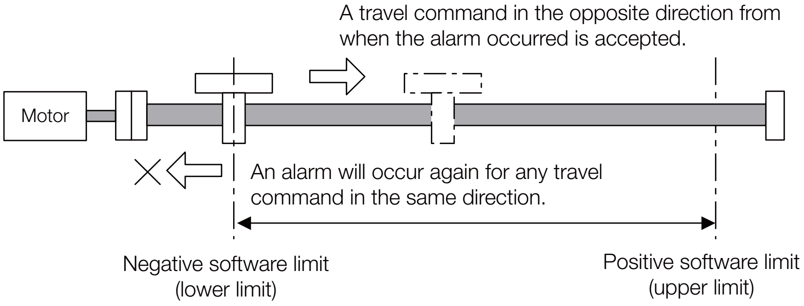
Clearing a Software Limit Alarm

Use the following procedure to clear a software limit alarm.

1. **Set bit F (Clear Alarm) in the OW□□□00 setting parameter to 1 (Clear Alarm ON).**
   This clears the alarm in IL□□□04.

Register Address	Name	Description	
OW□□□00	Run Command Settings	Bit F	Clear Alarm

2. **Use a FEED or STEP command to move in the opposite direction from the direction that was used when the alarm occurred.**



6.4 Modal Latching

A modal latch can be used to latch a position independently from the motion command being executed as long as the motion command being executed is not a motion command with a latch function, such as EX_POSING, ZRET, LATCH, or EX_FEED.

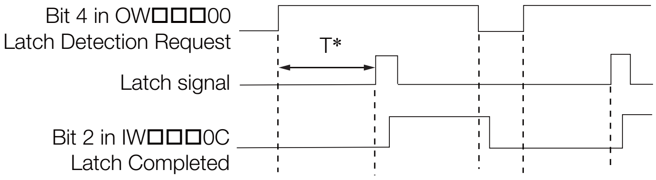
Information If a motion command with a latch function, such as EX_POSING, ZRET, LATCH, or EX_FEED, is executed while a modal latch is in use, the motion command takes priority over the modal latch and is executed first.

6.4.1 Latch Request

A latch request is sent when bit 4 (Latch Detection Request) in the OW□□□00 setting parameter changes from 0 (OFF) to 1 (ON).

When the latch is completed, bit 2 (Latch Completed) in the IW□□□0C monitor parameter changes to 1 (Latch completed).

The latch position is reported in the IL□□□18 monitor parameter (Machine Coordinate System Latch Position (LPOS)).



* T ≥ t1 + t2 + t3 where T = Latch processing time

t1 = Communications cycle

t2 = 2 scans

t3 = Standard SERVOPACK latch processing time (≤ 4 ms)

6.4.2 Canceling a Latch Request

Set bit 4 (Latch Detection Request) in the OW□□□00 setting parameter to 0 (OFF) to cancel the latch request.

6.4.3 Latch Signals

Phase-C pulse, /EXT1, /EXT2, and /EXT3 signals can be used for latches. Select the latch signal to use via bits 0 to 3 (Latch Detection Signal Selection) in OW□□□04.

6.4.4 Related Parameters

The parameters that are related to the modal latch function are listed in the following table.

Parameter Type	Register Address	Name	Description
Setting Parameters	OW□□□00 Bit 4	Latch Detection Request	A latch request is made when this bit changes from 0 to 1. The latch request is canceled when this bit changes from 1 to 0.
	OW□□□04 Bits 0 to 3	Latch Detection Signal Selection	2: Phase-C pulse 3: /EXT1 4: /EXT2 5: /EXT3

Continued on next page.

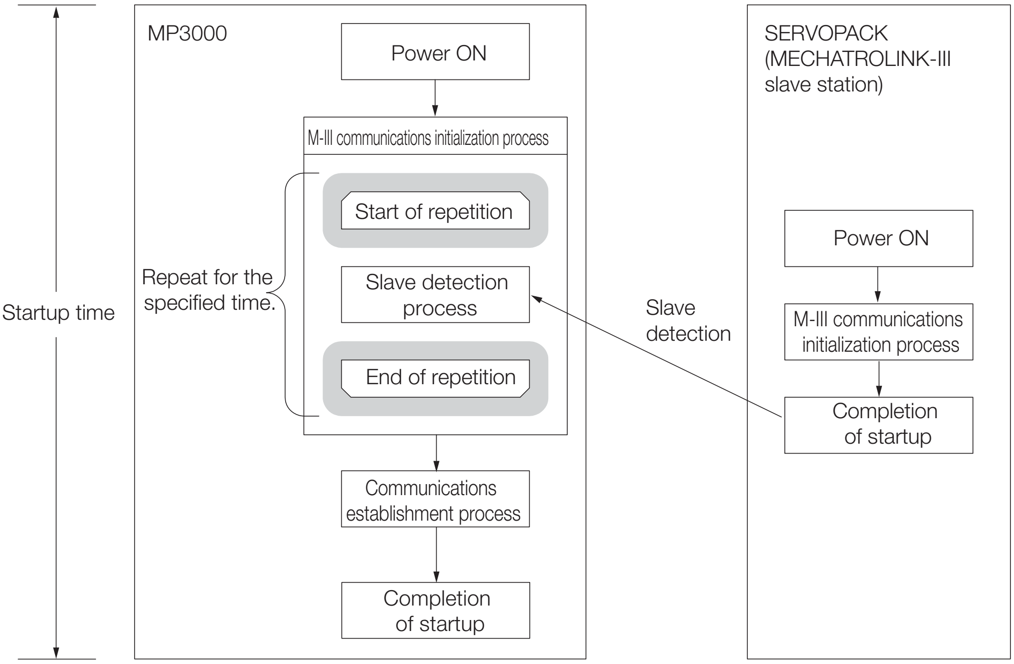
Continued from previous page.

Parameter Type	Register Address	Name	Description
Monitor Parameters	IW□□□00 Bit 4	Latch Mode	0: Latch detection request not received 1: Latch detection request received
	IW□□□0C Bit 2	Latch Completed	0: Latch not completed 1: Latch completed
	IL□□□18	Machine Coordinate System Latch Position	1 = 1 reference unit

6.5 Waiting for Slave Detection with the SVC Function Module

6.5.1 Overview

Waiting for slave detection is used to repeatedly search for MECHATROLINK-III slave stations for a user-specified time when the power supply to the MP3000 is turned ON. Even if MECHATROLINK-III communications for slave stations start later than communications for the MP3000, the MP3000 will detect the slave stations so that normal communications can be established without setting up external interlocks.



6.5.2 Applicable Versions

The following tables list the firmware and Engineering Tool versions that support waiting for slave detection.

■ MP3000-series Machine Controllers

CPU Unit/CPU Module	Model	Version
CPU-201	JEPMC-CP3201-E	Version 1.17 or later
CPU-202	JEPMC-CP3202-E	
CPU-301	JAPMC-CP3301-1-E	
	JAPMC-CP3301-2-E	
CPU-302	JAPMC-CP3302-1-E	All versions
	JAPMC-CP3302-2-E	
MP3100	JAPMC-MC3100-1-E	
	JAPMC-MC3100-2-E	

■ Engineering Tool

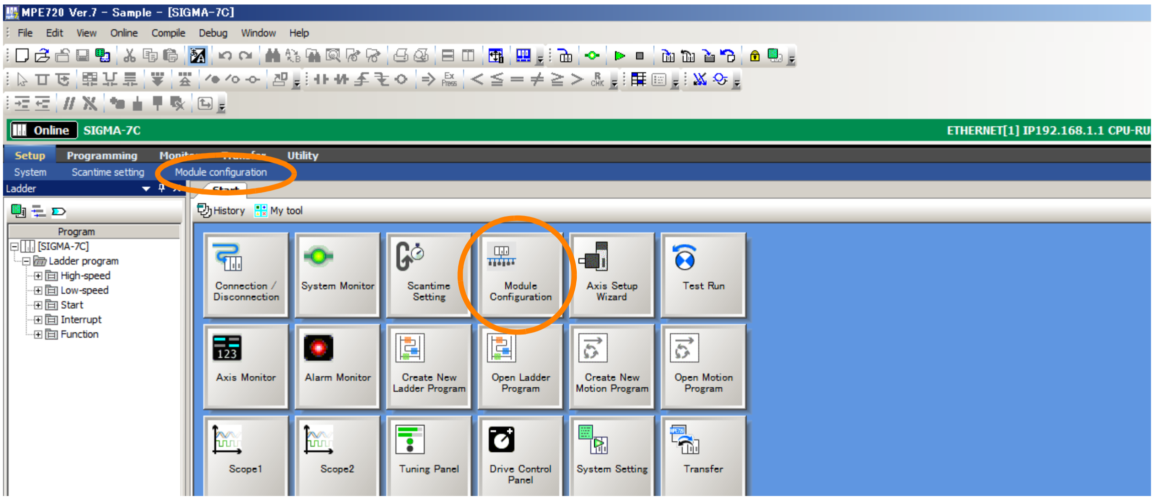
Product	Model	Version
MPE720 Version 7	CPMC-MPE780	Version 7.31 or later

6.5.3 Operating Procedure

Use the following procedure to enable waiting for slave detection.

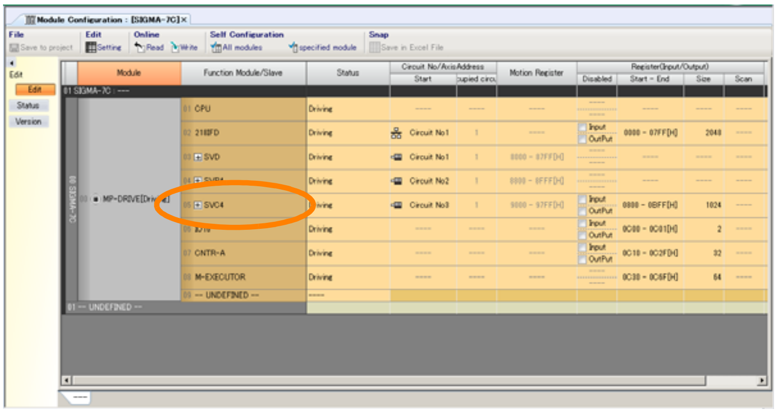
1. Start the MPE720 on a computer that is connected to the MP3000.

2. In the Main Window of the MPE720, click ***Setup*** – ***Module configuration*** from the Launcher, or **Module Configuration** from the Start Menu.



The Module Configuration Definition Tab Page will be displayed.

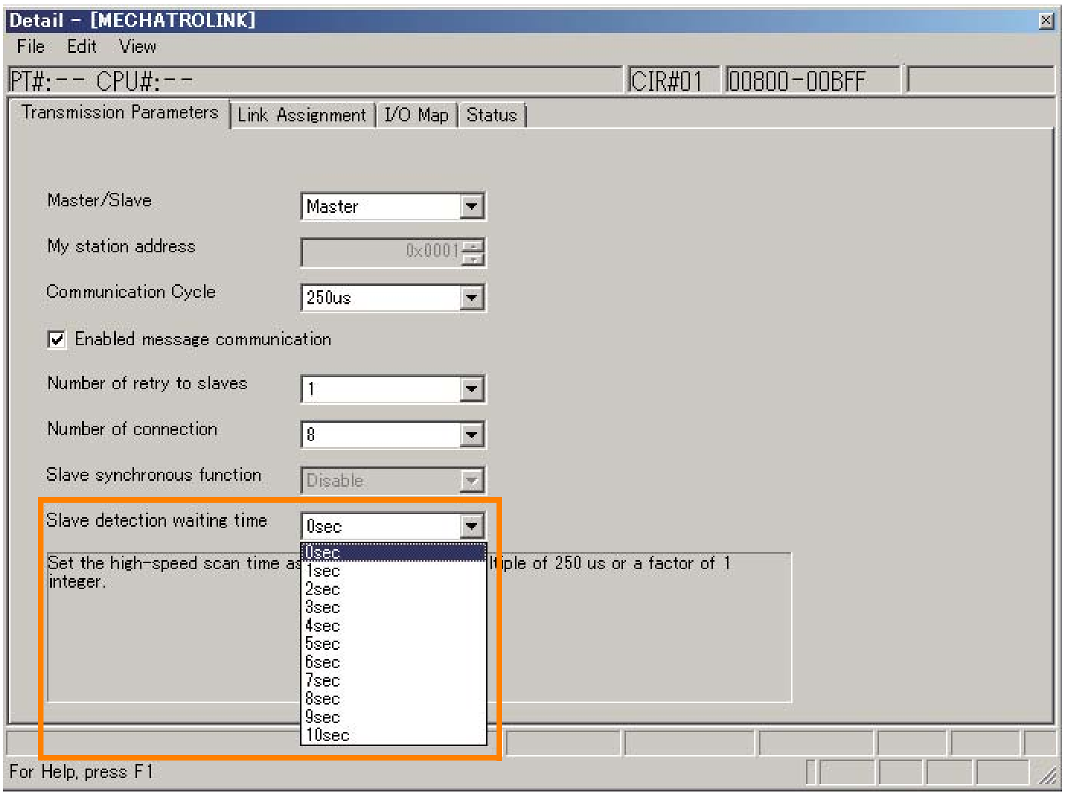
3. Double-click the **SVC4** cell in the Module Configuration Definition Tab Page.



The MECHATROLINK Detail Definition Dialog Box will be displayed.

4. Click the **Transmission Parameters** Tab.
The Transmission Parameters Tab Page will be displayed.

5. Set the slave detection waiting time.



Master/Slave: Master
My station address: 0x0001
Communication Cycle: 250us
☑ Enabled message communication
Number of retry to slaves: 1
Number of connection: 8
Slave synchronous function: Disable
Slave detection waiting time: 0sec

Set the high-speed scan time as ...iple of 250 us or a factor of 1 integer.

Item	Description	Default	Setting Range
Slave Detection Waiting Time	Sets the maximum time to continuously perform detection processing for slave stations.	0 s	0 s to 10 s (in 1-s increments)

6. Save the settings to flash memory.

7. Turn ON the power supplies to the MP3000.
   The MP3000 will wait for slave detection for the slave detection wait time.

This concludes the procedure.

6.5.4 Timing to Complete Slave Detection

■ When All Slave Stations Can Communicate before the Start of Slave Detection

All slave stations are detected immediately after the start of slave detection processing, and slave detection processing is completed.

■ When All Slave Stations Can Communicate during the Slave Detection Wait Time

Waiting for slave detection is ended when all slave stations can communicate, and slave detection processing is completed.

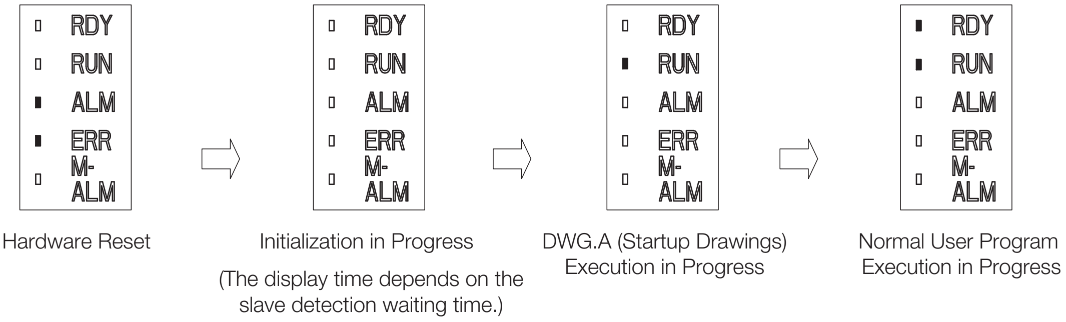
■ When There Are Slave Stations That Cannot Communicate during the Slave Detection Wait Time

Slave detection processing is completed after it has been repeated for the set slave detection wait time.

Communications are established with only the detected slave stations.

6.5.5 Indicators When the Power Is Turned ON

The indicators change as shown below when the MP3000 is waiting for slave detection.



6.5.6 Precautions

When There Are Unconnected Stations

When there are unconnected stations, the time for the MP3000 to complete startup will increase by the length of the slave detection waiting time. Therefore, the use of this function may affect Modules other than the SVC Function Module for which waiting for slave detection is performed.

Example When the MP3000 is connected via Ethernet to a PLC, touch panel, or other host device.

When Waiting for Slave Detection Will Not Be Executed

The MP3000 will not wait for slave detection in the following cases, even when a slave detection wait time has been set.

No.	Case	Description
1	Startup has been completed for the MP3000.	The MP3000 will not wait for slave detection even if the setting of the slave detection waiting time is changed after the MP3000 has been started.
2	No stations have been assigned links.	The MP3000 will not wait for slave detection because there are no slave stations to detect.

When the Slave Detection Wait Time Is Initialized

The slave detection wait time is initialized to 0 s in the following cases.

No.	Case	Description
1	DIP switch pins SW3 (CNFG) and SW4 (INIT) were both turned ON, and the power supply to the MP3000 was turned ON.	The set value will be initialized to 0 s because the MECHATROLINK definitions will be initialized.

6.6 Slave CPU Synchronization

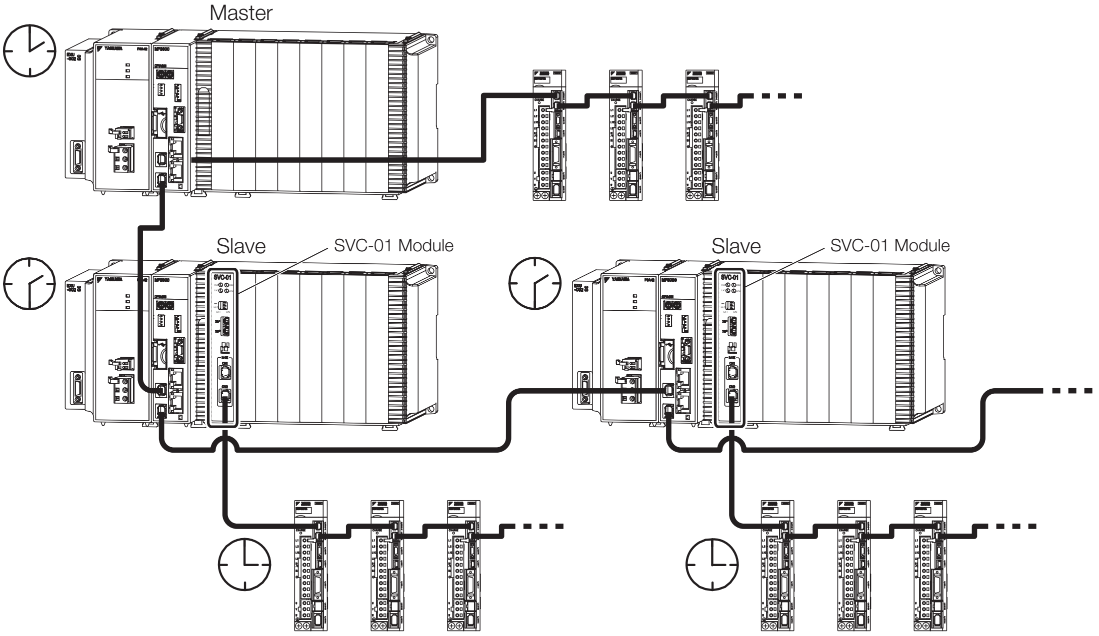
6.6.1 Overview

Slave CPU synchronization is used for configurations with master and slave MP3000 Controllers that have CPU Units/CPU Modules with a built-in SVC Function Module in order to synchronize the high-speed scan cycles of the master and slave MP3000 Controllers.

When multiple MP3000 Controllers are connected as slaves, the high-speed scans in all of the MP3000 Controllers connected as slaves will be synchronized. The references sent from the application program in the master will be transmitted to all of the MP3000 Controllers connected as slaves at the same time. If you mount Option Modules in the slaves MP3000 Controllers, you can synchronize the operation of the axes connected to the Option Modules.

With slave CPU synchronization, you can distribute the application programming in the MP3000 Controllers to distribute the application loads on the CPUs and expand memory.

The following figure shows a system configuration example.



Important A delay will occur in MECHATROLINK-III communications until the references from the application program in the master reach the slaves. Therefore, the operation of the SERVOPACKs connected to the master will not be synchronized with the operation of the SERVOPACKs connected to the slaves.

6.6.2 Applicable Versions and Execution Conditions

Applicable Versions

To use slave CPU synchronization, the SVC Function Module in both the master and slave must support slave CPU synchronization. The applicable versions are given in the following tables.

◆ Master

CPU Unit/ CPU Module	Model	Versions
CPU-201	JEPMC-CP3201-E	Version 1.06 or later
CPU-202	JEPMC-CP3202-E	All versions
CPU-301	JAPMC-CP3301-1-E	
	JAPMC-CP3301-2-E	
CPU-302	JAPMC-CP3302-1-E	
	JAPMC-CP3302-2-E	
MP3100	JAPMC-MC3100-1-E	
	JAPMC-MC3100-2-E	

◆ Slave

CPU Unit/ CPU Module	Model	Versions
CPU-201	JEPMC-CP3201-E	Version 1.06 or later
CPU-202	JEPMC-CP3202-E	All versions
CPU-301	JAPMC-CP3301-1-E	
	JAPMC-CP3301-2-E	
CPU-302	JAPMC-CP3302-1-E	
	JAPMC-CP3302-2-E	
MP3100	JAPMC-MC3100-1-E	
	JAPMC-MC3100-2-E	

Execution Conditions

To use slave CPU synchronization, the execution conditions must be met in both the master and slave. If the conditions are not met, the MP3000 Controllers will operate without synchronizing the high-speed scan cycles between the master and slave.

◆ Master

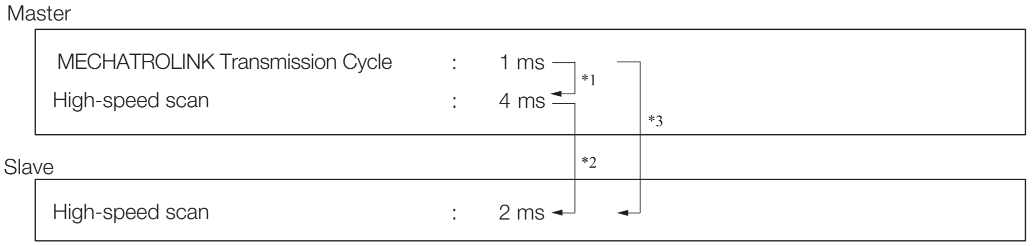
- The CPU Unit/CPU Module must be the applicable versions listed above.
- The high-speed scan setting must be an integer multiple of or an integer fraction of 1 of the MECHATROLINK transmission cycle setting.

◆ Slave

- The CPU Unit/CPU Module must be the applicable versions listed above.
- For CPU-201, the CPU Unit/CPU Module hardware must support slave CPU synchronization.*
- The high-speed scan setting must be an integer multiple of or an integer fraction of 1 of the MECHATROLINK transmission cycle setting.
- The high-speed scan setting must be an integer multiple of or an integer fraction of 1 of the high-speed scan setting in the master.
- Slave synchronization must be enabled in the MECHATROLINK Communications Definition Dialog Box.
- The SLVSC (Slave CPU Synchronization Restart Control) command control bit in the output registers must be set to OFF.

* You can check the hardware subversion in the SW00639 system register.
SW00639 ≥ 2

◆ Setting Example



*1. The high-speed scan setting on the master is an integer multiple of the MECHATROLINK transmission cycle setting.

*2. The high-speed scan setting on the slave is an integer fraction of 1 of the master high-speed scan setting.

*3. The high-speed scan setting on the slave is an integer multiple of the MECHATROLINK transmission cycle setting.

6.6.3 Setting Procedure

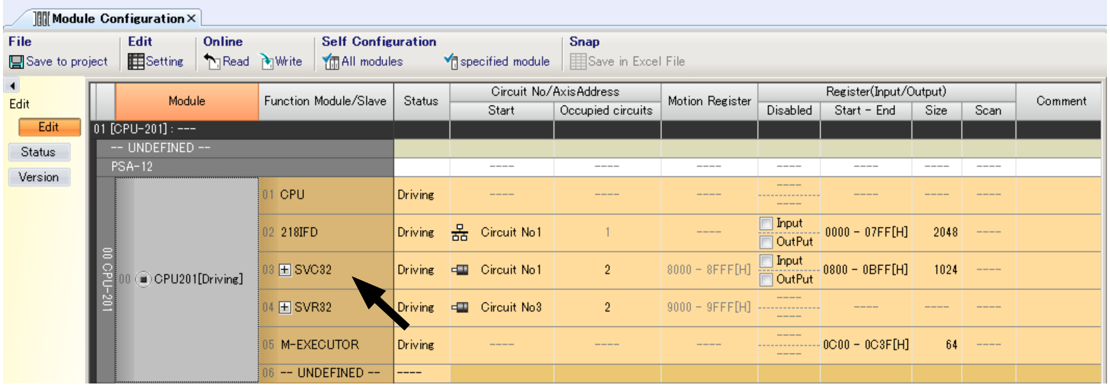
The MPE720 is used to make the settings to use slave CPU synchronization. Use the following procedure to set the MECHATROLINK communications definitions on the master and slave.

Important

- To use slave CPU synchronization, you cannot use a PO-01 or MPU-01 Option Module on the slave. If the PO-01 or MPU-01 is used, disable slave CPU synchronization.
- If you change the SVC Function Module settings from a slave to a master, save the settings to flash memory, and then turn the power supply OFF and ON again.

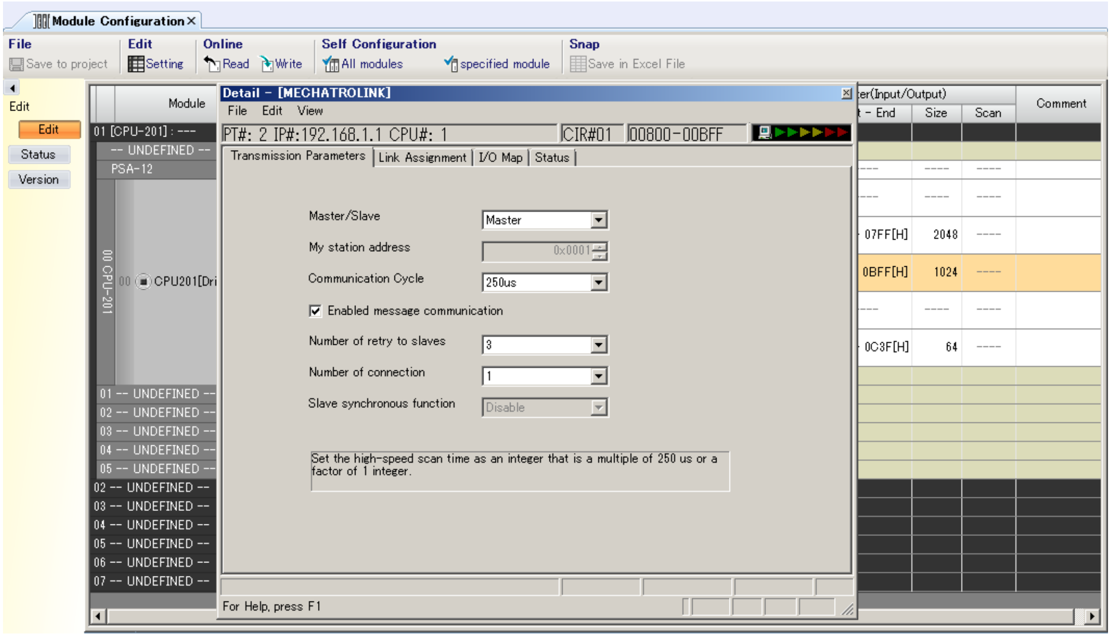
Master Settings

1. Double-click the **SVC32** cell in the Module Configuration Definition Tab Page.



Module	Function Module/Slave	Status	Circuit No/AxisAddress		Motion Register	Register(Input/Output)				Comment
			Start	Occupied circuits		Disabled	Start - End	Size	Scan	
01 [CPU-201] : ---										
-- UNDEFINED --										
PSA-12			----	----	----	----	----	----	----	
00 CPU-201 00 CPU201[Driving]	01 CPU	Driving	----	----	----	---- ----	----	----	----	
	02 218IFD	Driving	Circuit No1	1	----	☐ Input ☐ OutPut	0000 - 07FF[H]	2048	----	
	03 ⊞ SVC32	Driving	Circuit No1	2	8000 - 8FFF[H]	☐ Input ☐ OutPut	0800 - 0BFF[H]	1024	----	
	04 ⊞ SVR32	Driving	Circuit No3	2	9000 - 9FFF[H]	---- ----	----	----	----	
	05 M-EXECUTOR	Driving	----	----	----	---- ----	0C00 - 0C3F[H]	64	----	
	06 -- UNDEFINED --	----								

The MECHATROLINK Communications Definition Dialog Box is displayed.



PT#: 2 IP#:192.168.1.1 CPU#: 1 CIR#01 00800-00BFF

Master/Slave: Master
My station address: 0x0001
Communication Cycle: 250us
☑ Enabled message communication
Number of retry to slaves: 3
Number of connection: 1
Slave synchronous function: Disable

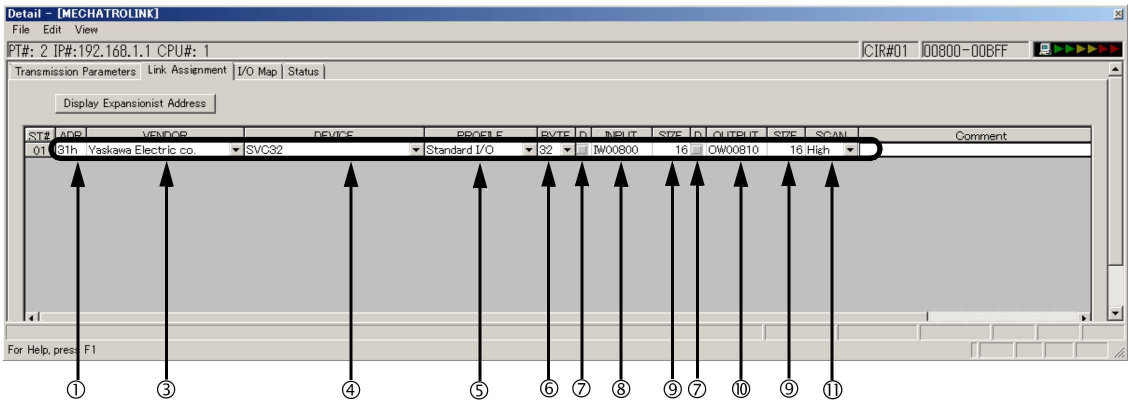
Set the high-speed scan time as an integer that is a multiple of 250 us or a factor of 1 integer.

2. Click the **Transmission Parameters** Tab.

3. Select **Master** from the **Master/Slave** Box.

4. Click the **Link Assignment** Tab.

5. Make the following settings.



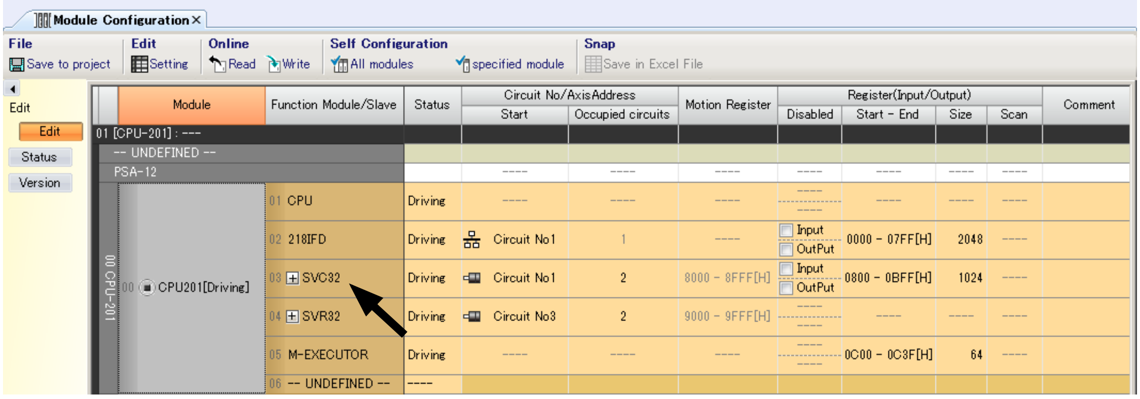
PT#: 2 IP#:192.168.1.1 CPU#: 1 CIR#01 00800-00BFF

ST#	ADR	VENDOR	DEVICE	PROFILE	BYTE	D	INPUT	SIZE	D	OUTPUT	SIZE	SCAN	Comment
01	31h	Yaskawa Electric co.	SVC32	Standard I/O	32	☐	IW00800	16	☐	OW00810	16	High	

No.	Item	Description
①	ADR	Slave station address
②	ExADR	0
③	VENDOR	Yaskawa Electric co.
④	DEVICE	SVC32
⑤	PROFILE	Standard I/O
⑥	BYTE	16, 32, 48, or 64
⑦	D	Not selected (I/O enabled).
⑧	INPUT	First register address in input area
⑨	SIZE	8, 16, 24, or 32
⑩	OUTPUT	First register address in output area
⑪	SCAN	High

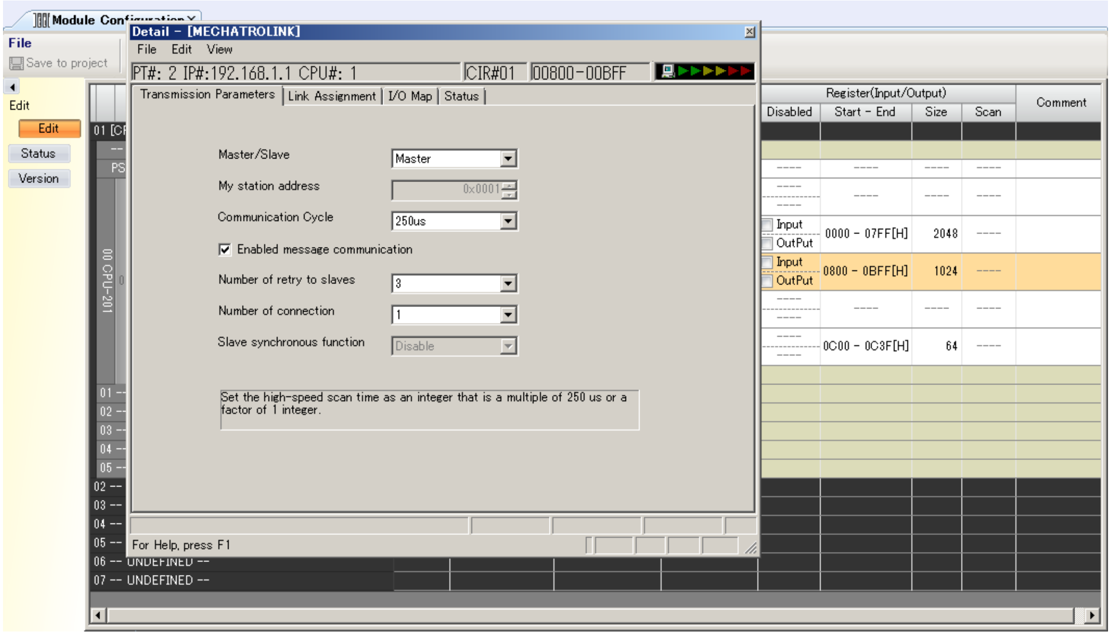
Slave Settings

1. Double-click the **SVC32** cell in the Module Configuration Definition Tab Page.



Module	Function Module/Slave	Status	Circuit No/Axis Address Start	Occupied circuits	Motion Register	Register(Input/Output) Disabled	Start - End	Size	Scan	Comment
01 CPU	Driving	----	----	----	----	----	----	----	----	
02 218IFD	Driving	Circuit No1	1	----	☐ Input ☐ OutPut	0000 - 07FF[H]	2048	----		
03 SVC32	Driving	Circuit No1	2	8000 - 8FFF[H]	☐ Input ☐ OutPut	0800 - 0BFF[H]	1024	----		
04 SVR32	Driving	Circuit No3	2	9000 - 9FFF[H]	----	----	----	----		
05 M-EXECUTOR	Driving	----	----	----	----	0C00 - 0C3F[H]	64	----		
06 -- UNDEFINED --	----									

The MECHATROLINK Communications Definition Dialog Box is displayed.



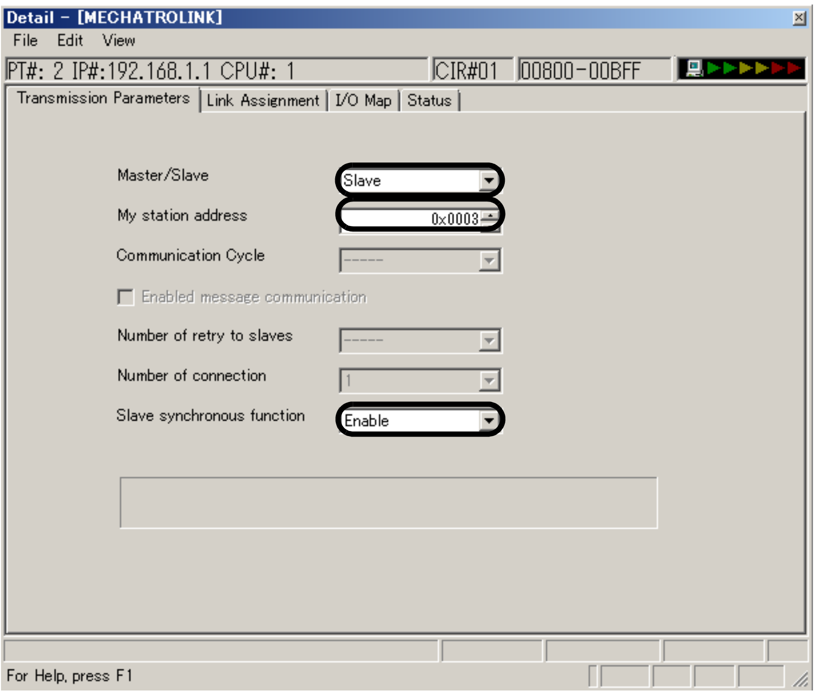
PT#: 2 IP#:192.168.1.1 CPU#: 1 CIR#01 00800-00BFF

Master/Slave: Master
My station address: 0x0001
Communication Cycle: 250us
☑ Enabled message communication
Number of retry to slaves: 3
Number of connection: 1
Slave synchronous function: Disable

Set the high-speed scan time as an integer that is a multiple of 250 us or a factor of 1 integer.

2. Click the **Transmission Parameters** Tab.
3. Select **Slave** from the **Master/Slave** Box.
4. Set the local station address in the **My station address** Box.

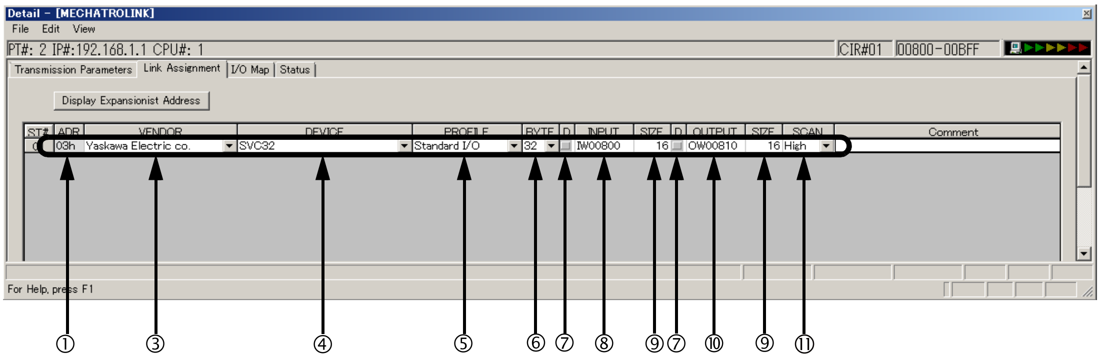
5. Select **Enable** from the **Slave synchronous function** Box.
   Note: You cannot enable this function on a sub CPU.



Master/Slave: Slave
My station address: 0x0003
Communication Cycle: ------
☐ Enabled message communication
Number of retry to slaves: ------
Number of connection: 1
Slave synchronous function: Enable

6. Click the **Link Assignment** Tab.

7. Make the following settings.



ST#	ADR	VENDOR	DEVICE	PROFILE	BYTE	D	INPUT	SIZE	D	OUTPUT	SIZE	SCAN	Comment
0	03h	Yaskawa Electric co.	SVC32	Standard I/O	32	☐	IW00800	16	☐	OW00810	16	High	

No.	Item	Description
①	ADR	Station address (fixed)
②	ExADR	0
③	VENDOR	Yaskawa Electric co.
④	DEVICE	SVC32
⑤	PROFILE	Standard I/O
⑥	BYTE	16, 32, 48, or 64 (Set the same value as you set for the master station.)
⑦	D	Not selected (I/O enabled).
⑧	INPUT	First register address in input area
⑨	SIZE	8, 16, 24, or 32 (Set the same value as you set for the master station.)
⑩	OUTPUT	First register address in output area
⑪	SCAN	High (fixed)

6.6.4 I/O Registers

This section gives the configurations of the I/O registers on the master and slave.

Important

The first addresses and sizes of the I/O register areas are set on the Link Assignment Tab Page in the MECHATROLINK Communications Definition Dialog Box.

Master I/O Register Configuration

Information Refer to the following section for details on register areas.
☞ *11.3 MECHATROLINK-III I/O Module Settings* on page 11-13

	Output Registers 7 6 5 3 2 1 0	
OW□□□□□	I/O Command	
	Reserved for system.	
OW□□□□□+1	Command Control	
OW□□□□□+2	Output Data 1	Low
		High
OW□□□□□+3	Output Data 2	Low
		High
OW□□□□□+4	Output Data 3	Low
		High
OW□□□□□+5	Output Data 4	Low
		High
OW□□□□□+6	Output Data 5	Low
		High
OW□□□□□+7	Output Data 6	Low
		High
	⋮	

	Input Registers 7 6 5 3 2 1 0	
IW□□□□□	I/O Command Response	
	Master Status	
IW□□□□□+1	Command Status	
IW□□□□□+2	Input Data 1	Low
		High
IW□□□□□+3	Input Data 2	Low
		High
IW□□□□□+4	Input Data 3	Low
		High
IW□□□□□+5	Input Data 4	Low
		High
IW□□□□□+6	Input Data 5	Low
		High
IW□□□□□+7	Input Data 6	Low
		High
	⋮	

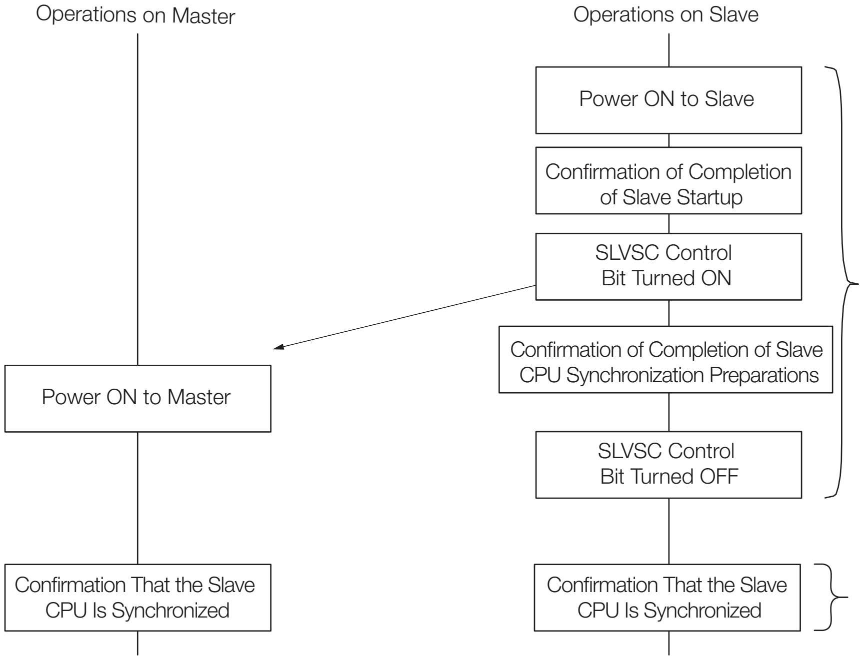
Slave I/O Register Configuration

Information Refer to the following section for details on register areas.
☞ *Detailed Information When an SVC Function Module Is Set as a Slave (page 7-16)*

	Output Registers	
	7 6 5 4 3 2 1 0	
OW□□□□□	Reserved for system.	
OW□□□□□+1	Command Control	
OW□□□□□+2	Output Data 1	Low High
OW□□□□□+3	Output Data 2	Low High
OW□□□□□+4	Output Data 3	Low High
OW□□□□□+5	Output Data 4	Low High
OW□□□□□+6	Output Data 5	Low High
OW□□□□□+7	Output Data 6	Low High
	⋮	

	Input Registers	
	7 6 5 4 3 2 1 0	
IW□□□□□	Reserved for system.	
IW□□□□□+1	Command Status	
IW□□□□□+2	Input Data 1	Low High
IW□□□□□+3	Input Data 2	Low High
IW□□□□□+4	Input Data 3	Low High
IW□□□□□+5	Input Data 4	Low High
IW□□□□□+6	Input Data 5	Low High
IW□□□□□+7	Input Data 6	Low High
	⋮	

6.6.5 Execution Flow for Slave CPU Synchronization



☞ *Procedure to Turn ON Powe (page 6-26)*

☞ *Confirmation That the Slave CPU Is Synchronized (page 6-26)*

6.6.6 Procedure to Turn ON Power

Use the following procedure to turn the power supply to the MP3000 OFF and ON again.

1. **Turn ON the power supply to the slave MP3000.**
2. **Confirm that the SB000401 system register is 1 (RUN).**
3. **Use the application program to set the SLVSC command control bit to 1.**
4. **Turn ON the power supply to the master MP3000.**
5. **Confirm that the servo axes that are connected to the SVC Function Module at the slave are stopped.**
   Note: Confirm that there is no motion command for servo axis movement being executed and check the servo axis status.
6. **Set the SLVC command control bit to 0.**

This concludes the procedure.

If the execution conditions are met, synchronization of the high-speed scan cycles will start automatically.

6.6.7 Confirmation That the Slave CPU Is Synchronized

Use the application program to check the status of slave CPU synchronization.

Confirmation Method on the Master

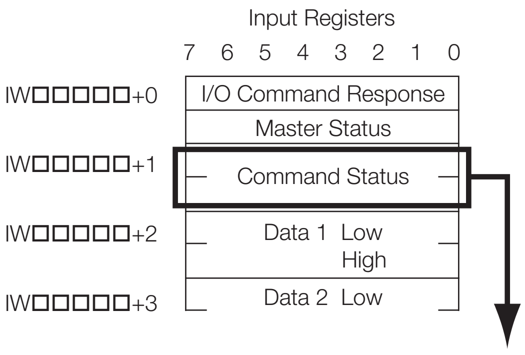
Check bit 7 (SYNC) in the Command Status parameter (IW□□□□□+1) in the second word of the input registers that were assigned to the master station.

SYNC = 1: Slave CPU is synchronized.

SYNC = 0: Slave CPU is not synchronized.

Refer to the following sections for details on the command status.

☞ *11.3.7 Command Status* on page 11-33



Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
SYNC	SYNCRDY	SBUSY	Not used.	ALM_CLR _CMP	CMDRDY	D_WAR	D_ALM

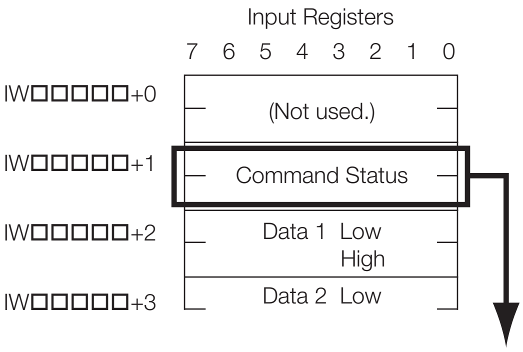
Confirmation Method on the Slave

Check bit 7 (SYNC) in the Command Status parameter (IW□□□□□+1) in the second word of the input registers that were assigned to the slave station.

SYNC = 1: Slave CPU is synchronized.

SYNC = 0: Slave CPU is not synchronized.

Refer to the following sections for details on the command status.
☞ *11.3.7 Command Status* on page 11-33



Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
SYNC	SYNCRDY	SBUSY	Not used.	ALM_CLR_CMP	CMDRDY	D_WAR	D_ALM

Important

If synchronization is lost, e.g., due to a communications error, during slave CPU synchronization, slave CPU synchronization will be automatically restarted if SLVSC (Slave CPU Synchronization Restart Control) is set to 0 (restarting allowed). However, the input data starting from the third word in the input registers (IW□□□□□ + 2) that is input before SNYC changes to 1 (slave CPU synchronized) will not be reliable, so do not use it.

6.6.8 Handling Input Errors

Write the application program so that input data is not used while there is an input error.
You can use the following procedure to check for input errors from the application programs in the master and slave.

1. **Check the Input Error Status system registers (SW00213 to SW00215).**
   Master: Bit status of station assigned to the slave
   Slave: Bit status of local station number
      1: I/O error
      0: No I/O error
   If there is an I/O error, the I/O data will be cleared to zeros. Refer to the following manual for details on errors.
   📖 MP3000 Series MP3200/MP3300 Troubleshooting Manual (Manual No.: SIEP C880725 01)

2. Check the Command Status input register (second word from the start).

Bit 0	D_ALM = 0
Bit 1	D_WAR = 0
Bit 2	CMDRDY = 1
Bit 7	SYNC = 1 (Only when slave CPU is synchronized.)
Bits 8 to 11	CMD_ALM = 0
Bits 12 to 15	COMM_ALM = 0

If any bit status is shown other than the above status, there is an error in the slave. Refer to the following section for specific errors.

☞ *11.3.7 Command Status* on page 11-33

> Important
>
> For the slave MP3000 to detect an error, the input from the master MP3000 must be completed normally at least once. For example, if the power supply to the slave MP3000 is turned ON when it is not connected to the master, the bit for the local station in the I/O Error Status will remain at 0 (no error).

Recovering from Input Errors

Even if an input error occurs, processing in the MP3000 will automatically switch to normal reception, so no specific operation is required for recovery. However, if input errors occur frequently, check the following items.

- Is the same station address set for more than one station?
- Has the count reached the value set in SW00044 (H Scan Exceeded Count)?
  Note: If the count has reached the set value, set a longer scan time.
- Is there a problem with the MECHATROLINK cable (e.g., is it broken or disconnected)?

6.6.9 Effect on Application Program

This section describes the effect of the system on the application when the communications cycles between the master and slave change from asynchronous status to slave CPU synchronized status. The setting to restart slave CPU synchronization is also described. Refer to the following section for countermeasures of the system's effect on the application.

☞ *6.6.11 Precautions* on page 6-30

Overview

The slave CPU synchronization function synchronizes the slave cycle with the master cycle. When the status is changing from asynchronous status to slave CPU synchronized status, the processing that is performed by the system at the slave may affect the application at the slave as described in the following table.

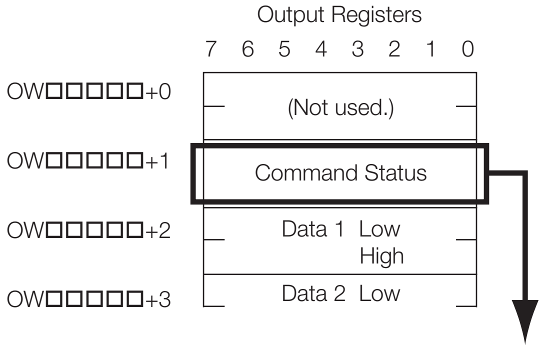
System Processing at Slave	Effect on Application
Adjustment of the start of the high-speed scan cycle	• The high-speed scan cycle may temporarily be disturbed.
	• Shock may occur for an axis being controlled by the SVA-01.
	• An axis being control by the SVB-01 or SVC-01 may suddenly stop.
	• The counter values for LIO-01, LIO-02, LIO-06, and CNTR-01 may be disturbed.
Resetting MECHATROLINK communications (SVC, SVC32, SVC-01, and SVB-01)	• Position information may be lost.
	• Zero point return information may be lost.
	• The software limits may be disabled.
	• Controlled axes may stop suddenly.

Setting the Restarting Method for Slave CPU Synchronization

You can set the SLVSC (Slave CPU Synchronization Restart Control) command control bit in the slave application to specify whether to restart slave CPU synchronization automatically when synchronization is lost.

ON (SLVSC = 1): When slave CPU synchronization is lost, the system operates asynchronously. In this case, use the application programming to control the timing of changing back to slave CPU synchronization.

OFF (SLVSC = 0): When slave CPU synchronization is lost, it is automatically restarted.



Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Not used.							SLVSC

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Not used.							

Name	Definition		Description
SLVSC	1	Restarting prohibited.	If slave CPU synchronization is lost, operation continues asynchronously.
	0	Restarting allowed.	If slave CPU synchronization is lost, it is automatically restarted.

6.6.10 Operation of Slave MP3000

The following table gives the slave MP3000 operation when the following operations are performed during slave CPU synchronization or when an error occurs.

Item	Operation
The power supply to the master is turned OFF.	Operation will continue asynchronously. An input error will occur, but the scan operation is not affected.
The MECHATROLINK communications cable is disconnected.	
The master assignment is deleted.	
A watchdog timer timeout occurs at the master.	
A transmission error occurs. (For example, the transmission cycle is disrupted by a MECHATROLINK communications error.)	High-speed scan processing may be disrupted.
The high-speed scan setting is changed at the master or slave.	Asynchronous operation will be used. (This is because MECHATROLINK communications are reset.) Note: If the SLVSC control bit is set to 0, slave CPU synchronization will be restarted after MECHATROLINK communications are restarted.
The MECHATROLINK definitions are saved at the master.	
MP3000 self configuration is performed for the master or slave.	
The master or slave is switched between CPU RUN and CPU STOP.	Operation with slave CPU synchronization will continue.

6.6.11 Precautions

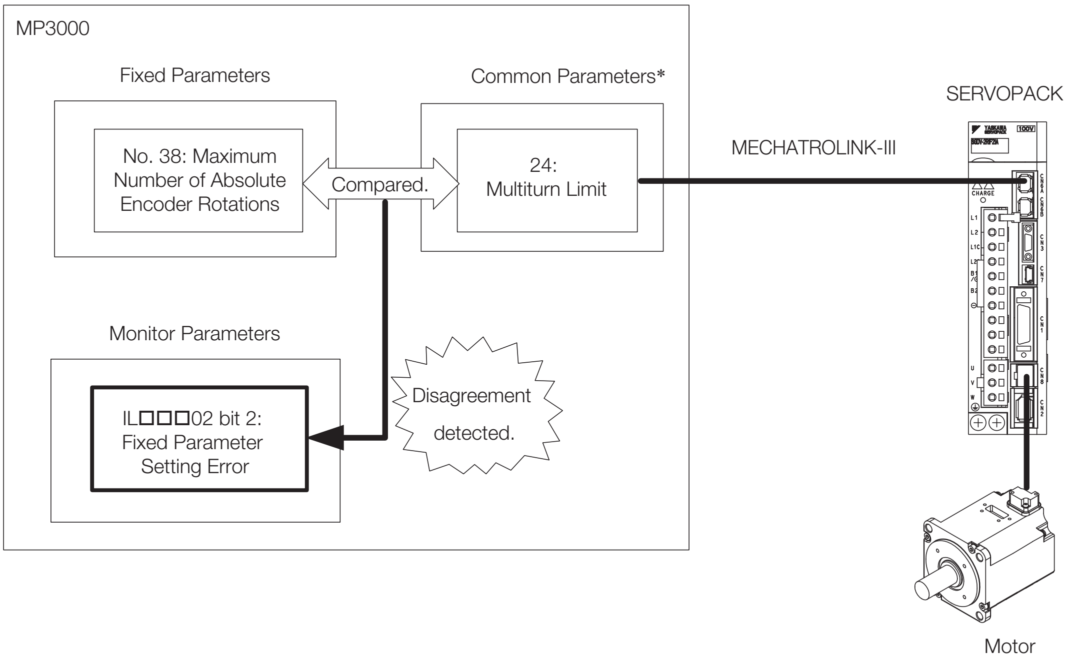
Observe the following precautions when you use slave CPU synchronization.

- To use slave CPU synchronization, you cannot use a PO-01 or MPU-01 Option Module on the slave. If a PO-01 or MPU-01 is used, disable slave CPU synchronization.
- If you change the SVC Function Module settings from a slave to a master, save the settings to flash memory, and then turn the power supply OFF and ON again.
- When the status changes between asynchronous to synchronous for the slave CPU synchronization, there may be a delay of up to one scan cycle (i.e., the scan cycles may be disturbed) for the high-speed and low-speed scans on the slave. For applications that require regularity or periodicity, do not use the data while switching to slave CPU synchronized status.
- If the SVA-01 is mounted in a slot on the slave's Base Unit, operation may be affected when changing to slave CPU synchronized status, e.g., the axis may be subjected to shock. In this case, stop operation in advance.
- If the SVB-01 or SVC-01 is mounted in a slot on the slave's Base Unit, communications with the slave connected to the SVB-01 or SVC-01 are disconnected and then reconnected when changing to slave CPU synchronized status. If a servo, inverter, or similar slave device is connected, stop operation in advance. The disconnection of communications may cause the axes to stop suddenly or subject the machine to shock.
- If the LIO-01, LIO-02, LIO-06, or CNTR-01 is mounted in a slot on the slave's Base Unit, the counter value may be disrupted when changing to slave CPU synchronized status. Do not use the counter value while this change is being made.
- If the version of the CPU Unit/CPU Module of the master or slave MP3000 is lower than version 1.06, the MP3000 Controllers will operate asynchronously.

6.7 Multiturn Limit Setting Disagreement Detection

Multiturn limit setting disagreement detection is used to compare the setting of fixed parameter No. 38 (Maximum Number of Absolute Encoder Rotations) with the Multiturn Limit Setting. If there is a disagreement between the set values, a warning will be reported.

Conceptual diagrams of this function are given below.



* The common parameters are set in the slave SERVOPACK from the MP3000 through MECHATROLINK-III communications.

6.7.1 Applicable Versions

The following tables list the firmware and Engineering Tool versions that support multiturn limit setting disagreement detection.

■ MP3000-series Machine Controllers

CPU Unit/CPU Module	Model	Version
CPU-201	JEPMC-CP3201-E	Version 1.10 or later
CPU-202	JEPMC-CP3202-E	
CPU-301	JAPMC-CP3301-1-E	
	JAPMC-CP3301-2-E	All versions
CPU-302	JAPMC-CP3302-1-E	
	JAPMC-CP3302-2-E	
MP3100	JAPMC-MC3100-1-E	
	JAPMC-MC3100-2-E	

■ Engineering Tool

Product	Model	Version
MPE720 Ver.7	CPMC-MPE780	Version 7.26 or later

6.7.2 Related Parameters

You do not need to set any parameters for an infinite-length axis. The settings of fixed parameter No. 38 and the Pn205 SERVOPACK parameter are constantly compared.
For a finite-length axis, set the following parameter.

Fixed Parameter	Name	Description
No.2 Bit 5	Finite-length Multiturn Limit Setting Disagreement Detection Mask	Use this bit to specify whether or not to detect a multiturn limit setting disagreement during finite-length operation. 0: Do not detect, 1: Detect

6.7.3 Multiturn Limit Setting Disagreement Detection Timing

A check will be made for a multiturn limit setting disagreement when the operations in the following table are performed.

Operation	Condition
Starting from flash memory	None
Writing fixed parameters	
Saving MECHATROLINK definitions	
Transferring module configuration definitions	
Turning ON OW□□□00 bit C (Reset Network)	
Turning ON OW□□□00 bit E (Reset Communications)	IL□□□02 bit 2 (Fixed Parameter Setting Error) is 0.
Turning ON OW□□□00 bit F (Clear Alarm)	A communications error has occurred and IL□□□02 bit 2 (Fixed Parameter Setting Error) is 0.

6.7.4 Checking for a Multiturn Limit Setting Disagreement

A warning will occur when a multiturn limit setting disagreement is detected. The parameters will have the following values.

Register	Parameter Name	Value
IL□□□02 Bit 2	Fixed Parameter Setting Error	1: Outside setting range
IW□□□01	Out-of-range Parameter Number	1038 (fixed parameter No. 38 (Maximum Number of Absolute Encoder Rotations))
IW□□□00 Bit 0	Motion Operation Ready	0: Motion operation not ready

6.7.5 Clearing the Warning

Change the setting of either fixed parameter No. 38 (Maximum Number of Absolute Encoder Rotations) or the Multiturn Limit Setting, and clear the warning in IL□□□02 bit 02 (Fixed Parameter Setting Error).

Changing the Setting of Fixed Parameter No. 38

The warning will be cleared when the fixed parameters are written.

1. Set fixed parameter No. 38 in the SERVOPACK where the warning occurred to the same value as common parameter 24.
2. Write the fixed parameters.

This concludes the procedure.

Changing the Setting of Common Parameter 24 (Multiturn Limit)

The warning will be cleared when the control power supply to the MP3000 is turned OFF and ON again.

1. Use the Digital Operator to set common parameter 24 to the value of fixed parameter No. 38.
2. Turn the power supply to the slave SERVOPACK OFF and ON again.
   A multiturn limit disagreement alarm (A.CC0) will occur in the slave SERVOPACK.
3. Execute Fn013 (Multiturn Limit Setting) from the Digital Operator.
4. Turn the power supply to the slave SERVOPACK OFF and ON again.
   The A.CC0 alarm in the slave SERVOPACK will be cleared.
5. Turn the control power supply to the slave SERVOPACK OFF and ON again.

This concludes the procedure.

6.8 Precautions When Using Σ-7-series SERVOPACKs

NTΛΠΣ-7-series AC SERVOPACKs with MECHATROLINK-III Communications References (SGD7S-□□□□20□ and SGD7W-□□□□20□) support encoders with 24-bit resolution. However, if you set an SGD7S-□□□□20□ or SGD7W-□□□□20□ to 24-bit resolution and connect it to and MP3000, the travel distances and deceleration times that can be specified will be restricted.

This section provides precautions for using the above SERVOPACKs and describes the combinations of the above SERVOPACKs with the MP3000.

Important

For details on the SGD7S-□□□□20□ and SGD7W-□□□□20□, refer to the following manuals.

📖 *Σ*-7-series AC Servo Drive *Σ*-7S SERVOPACK with MECHATROLINK-III Communications References Product Manual (manual number: SIEP S800001 28)

📖 *Σ*-7-series AC Servo Drive *Σ*-7W SERVOPACK with MECHATROLINK-III Communications References Product Manual (manual number: SIEP S800001 29)

■ Definition of Terms

Term	Meaning
Electronic gear ratio	The Σ-7 electronic gear ratio (Pn20E:Pn210).
Servo reference unit	The reference unit in the servo coordinates.
MP3000 Command Unit	The reference unit in the Controller coordinates

■ Applicable SERVOPACKs

Model Number	Interface
SGD7S-□□□□20□	SERVOPACKs with MECHATROLINK-III Communications References
SGD7W-□□□□20□	

The default setting of the electronic gear ratio for the above SERVOPACKs is given in the following table.

Pn20E Electronic Gear Ratio (Numerator)	Pn210 Electronic Gear Ratio (Denominator)
16	1

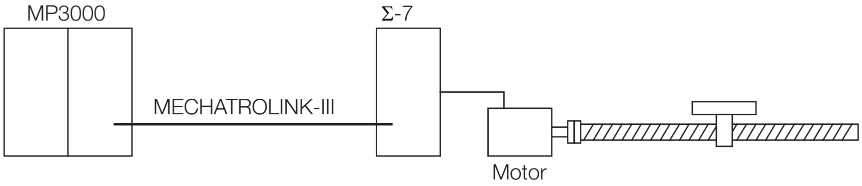
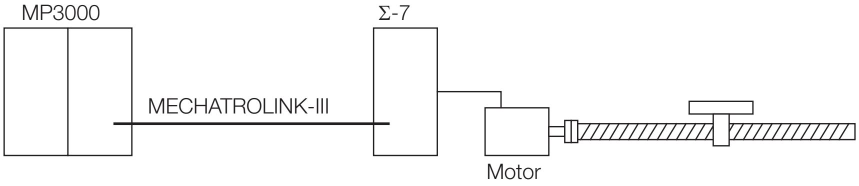
6.8.1 MP3000 Versions That Support the Σ-7-series SERVOPACKs

The models and versions of the MP3000 that support Σ-7-series SERVOPACKs are given in the following table.

CPU Unit/CPU Module	Model Number	Version
CPU-201	JEPMC-CP3201-E	Version 1.12 or later
CPU-202	JEPMC-CP3202-E	
CPU-301	JAPMC-CP3301-1-E	Version 1.10 or later
	JAPMC-CP3301-2-E	All versions
CPU-302	JAPMC-CP3302-1-E	
	JAPMC-CP3302-2-E	
MP3100	JAPMC-MC3100-1-E	
	JAPMC-MC3100-2-E	

6.8.2 Σ-7-series SERVOPACK Electronic Gear Ratio and MP3000 Settings

We recommend that you set the electronic gear ratio in the SERVOPACK to 1:1 when you use the MP3000. However, if you use a Σ-7-series SERVOPACK that supports an encoder with 24-bit resolution, the travel distances and deceleration times that you can specify will be restricted. You can solve this problem by setting the electronic gear ratio in the Σ-7-series SERVOPACK to 16:1.

Σ-7 Electronic Gear Ratio	Operation
16:1 (equivalent to 20 bits)	 Reference unit selection = mm Travel distance per machine rotation = 10,000 reference units Motor gear ratio = 1 Machine gear ratio = 1 Number of pulses per motor rotation = 1,048,576 Pn20E = 16 Pn210 = 1 A 24-bit encoder is used. ⇩ ⇩ If a movement of 10,000 reference units is commanded, 1,048,576 pulses will be output. ⇨ The motor will rotate one rotation for a reference of 1,048,576 servo reference units.
1:1 (24 bits)	 Reference unit selection = mm Travel distance per machine rotation = 10,000 reference units Motor gear ratio = 1 Machine gear ratio = 1 Number of pulses per motor rotation = 16,777,216 Pn20E = 1 Pn210 = 1 A 24-bit encoder is used. ⇩ ⇩ If a movement of 10,000 reference units is commanded, 16,777,216 pulses will be output. ⇨ The motor will rotate one rotation for a reference of 16,777,216 servo reference units.

If the electronic gear ratio of the Σ-7-series SERVOPACK is set to 16:1, the motor will rotate one rotation for 1,048,576 servo reference units (equivalent to 20 bits). To do this, set fixed parameter No. 36 (Number of Pulses per Motor Rotation) to 1,048,576.

If greater resolution is required, set the electronic gear ratio of the Σ-7-series SERVOPACK to 1:1 and set fixed parameter No. 36 (Number of Pulses per Motor Rotation) to 16,777,216.

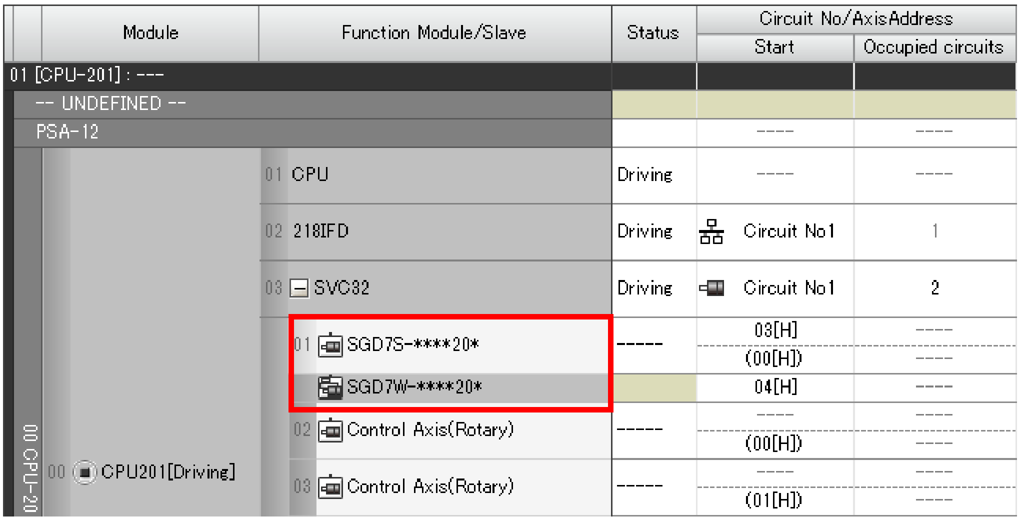
Information If you set the electric gear ratio of a Σ-7-series SERVOPACK to 16:1, you will be able to use an absolute encoder with an infinite-length setting only with the MP3000 with a version that supports the Σ-7-series SERVOPACKs.

6.8.3 Link Assignments

You can manually assign links as shown below according to the model of the ?-7-series SERVOPACK.

Model	Link Assignment
Σ-7S	SGD7S-****20*
Σ-7W	SGD7W-****20*

An example of the on-screen settings is shown below.



Module	Function Module/Slave	Status	Circuit No/AxisAddress	
			Start	Occupied circuits
01 [CPU-201] : ---				
-- UNDEFINED --				
PSA-12			----	----
00 CPU201[Driving]	01 CPU	Driving	----	----
	02 218IFD	Driving	Circuit No1	1
	03 SVC32	Driving	Circuit No1	2
	01 SGD7S-****20*	-----	03[H] (00[H])	---- ----
	SGD7W-****20*		04[H]	----
	02 Control Axis(Rotary)	-----	---- (00[H])	---- ----
	03 Control Axis(Rotary)	-----	---- (01[H])	---- ----

6.8.4 Number of Pulses Per Motor Rotation

Set fixed parameter No. 36 (Number of Pulses per Motor Rotation) according to setting of the electronic gear ratio as given below.

■ Electronic Gear Ratio of 16:1 (Equivalent to 20 Bits)

36: Number of Pulses Per Motor Rotation	1,048,576: 20 bits

■ Electronic Gear Ratio of 1:1 (Equivalent to 24 Bits)

36: Number of Pulses Per Motor Rotation	16,777,216: 24 bits

6.8.5 Self Configuration

When you execute self-configuration, the link assignment is set automatically according to the model of the connected Σ-7-series SERVOPACK.

However, the electronic gear ratio in the SERVOPACK and fixed parameter No. 36 (Number of Pulses Per Motor Rotation) are automatically set according to the version of the MP3000 as given below.

MP3000 Version	Electronic Gear Ratio	Fixed Parameter 36: Number of Pulses Per Motor Rotation
Version 1.10 or 1.11	1:1 (Pn20E = 1, Pn210 = 1)	16,777,216: 24 bits
Version 1.12 or later	16:1 (Pn20E = 16, Pn210 = 1)	1,048,576: 20 bits

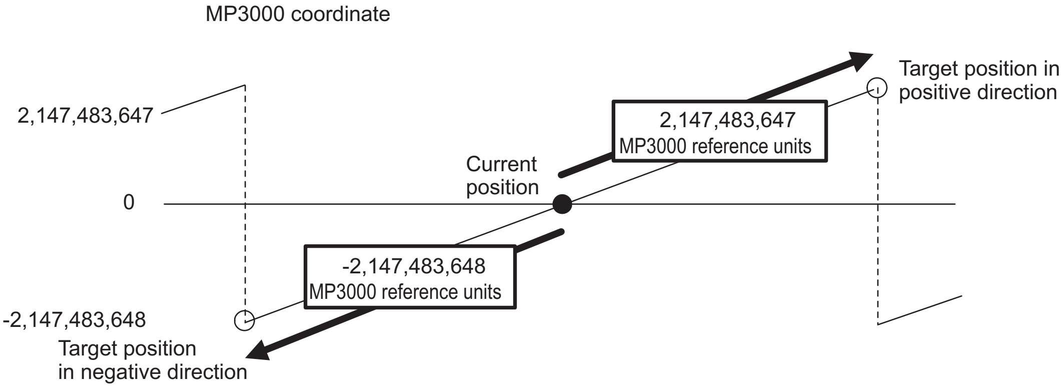
6.8.6 Operating Specifications When Using an MP3000 Controller That Supports the Σ-7-series SERVOPACKs

The operating specifications for combining the MP3000 with a Σ-7-series SERVOPACK are given in the following sections 1 to 4.

1. Possible Travel Distance for One Command

The range that you can move with one motion command for which a target position is specified (POSING,
EX_POSING, and STEP) is given below.
-2,147,483,648 to 2,147,483,647 MP3000 reference units

■ Operation



Important

If the target position is changed while the axis is moving and the travel distance from the current position exceeds the above range, IL□□□04 bit 7 (Excessive Positioning Moving Amount) will turn ON.

2. Restrictions in Deceleration Time during Positioning

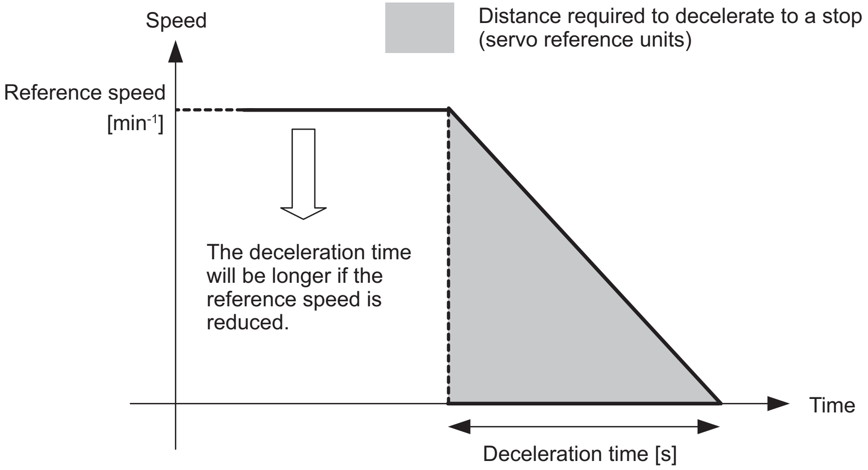
The maximum setting of the deceleration time for positioning motion commands (POSING, EX_POSING, ZRET, FEED, STEP, and EX_FEED) depends on the setting of the electronic gear ratio as given below.

Reference Speed [min^{-1}]	Maximum Deceleration Time [s]	
	Electronic Gear Ratio of 16:1 (Equivalent to 20 Bits)	Electronic Gear Ratio of 1:1 (24 Bits)
6,000	13.65	0.85
3,000	27.30	1.70
1,500	54.61	3.41
750	109.22	6.82

Important

Operation will not be performed with the specified speed or deceleration time if a value that exceeds the maximum value is set.

■ Operation



3. Restrictions to OL□□□42 (Zero Point Return Travel Distance) and OL□□□46 (External Positioning Final Travel Distance)

The maximum travel distances that can be used for OL□□□42 (Zero Point Return Travel Distance), which is used for ZRET (Zero Point Return), and OL□□□46 (External Positioning Final Travel Distance), which is used for EX_POSING (Latch Target Positioning) and EX_FEED (Jog Mode with External Positioning), are given in the following table.

Electronic Gear Ratio	Negative Direction	Positive Direction
16:1 (equivalent to 20 bits)	-1,023.99 rotations	1,023.99 rotations
1:1 (24 bits)	-63.99 rotations	63.99 rotations

The restrictions on OL□□□42 and OL□□□46 depend on the setting of fixed parameter No. 4 (Reference Unit Selection) as given below.

Setting of Fixed Parameter No. 4	0	1	2	3	4
Reference Unit	pulse	mm	deg	inch	μm
Maximum Value of OL□□□42 and OL□□□46	2,147,483,647	$2{,}147{,}483{,}647 \times \frac{\text{No. 6 (Travel Distance per Machine Rotation)} \times \text{No. 9 (Machine Gear Ratio Term)}}{\text{No. 36 (Number of Pulses per Motor Rotation)} \times \text{No. 8 (Servo Motor Gear Ratio Term)}}$			

Important

If a value that exceeds the above maximum value is set, IL□□□02 bit 1 (Setting Parameter Error) will turn ON and operation will be performed with OL□□□42 or OL□□□46 set to 0.

4. Restrictions When Writing Fixed Parameters

If you write any fixed parameters after turning ON the power supply, save the settings to flash memory and then turn the power supply OFF and ON again.

6.8.7 Operating Specifications When Using an MP3000 Controller That Does Not Support the Σ-7-series SERVOPACKs

You can connect an MP3000 that does not support Σ-7-series SERVOPACKs to a Σ-7-series SERVOPACK and still control the SERVOPACK, but the following restrictions will apply.

1. You must set the electronic gear ratio in the Σ-7-series SERVOPACK to 16:1 (Pn20E = 16 and Pn210 = 1) to use a reference resolution equivalent to a 20-bit encoder.
2. If you manually assign the link, you must assign the link according to the model of the Σ-7-series SERVOPACK that is connected.
3. Because a reference resolution equivalent to a 20-bit encoder is used, you must set fixed parameter No. 36 (Number of Pulses Per Motor Rotation) as follows:
   Number of pulses per motor rotation: 1,048,576 (20 bits)
4. If you execute self-configuration, the link assignment is set automatically according to the model of the connected Σ-7-series SERVOPACK.
   However, the electronic gear ratio of the SERVOPACK will be automatically set to 1:1, so you must reset items 1 and 3, above.
5. If you use an absolute encoder, you cannot use the infinite-length setting. Doing so will cause the position to be offset when the power supply is turned ON.
6. The range that you can move with one motion command for which a target position is specified (POSING, EX_POSING, and STEP) is restricted to the following range (MP3000 reference units is converted to server reference units).
   -2,147,483,648 to 2,147,483,647 Servo reference units
7. The maximum setting of the deceleration time for positioning motion commands (POSING, EX_POSING, ZRET, FEED, STEP, and EX_FEED) will be as given in the following table.

Reference Speed [min^{-1}]	Maximum Deceleration Time [s]
6,000	4.09
3,000	8.19
1,500	16.38
750	32.76

8. The maximum travel distances that can be used for OL☐☐☐42 (Zero Point Return Travel Distance), which is used for ZRET (Zero Point Return), and OL☐☐☐46 (External Positioning Final Travel Distance), which is used for EX_POSING (Latch Target Positioning) and EX_FEED (Jog Mode with External Positioning), are given in the following table.

Electronic Gear Ratio	Negative Direction	Positive Direction
16:1 (equivalent to 20 bits)	-1,023.99 rotations	1,023.99 rotations

Making Settings for Motion Control with the MPE720

7

This chapter describes how to confirm information and make settings for the Motion Control Function Module.

7.1 Module Configuration Settings

You must confirm information and make settings for the Motion Control Function Module before you perform motion control.

This section describes how to use the MPE720 Version 7 Engineering Tool to confirm information and make settings for the Motion Control Function Module.

7.1.1 Settings for Motion Control Function Modules

You can confirm information for your Motion Control Function Module on the Module Configuration Definition Tab Page of the MPE720.

This section describes how to display the Module Configuration Definition Tab Page and describes its contents.

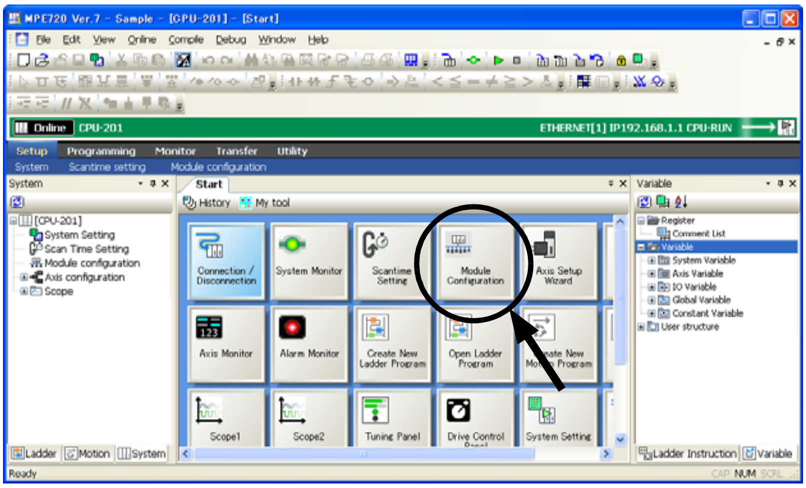
Displaying the Module Configuration Definition Tab Page

Use the following procedure to display the Module Configuration Definition Tab Page.

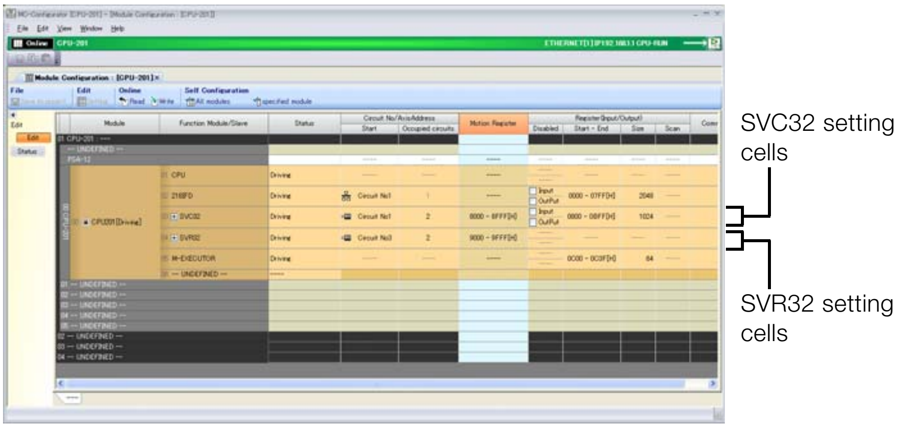
1. Connect the MP3000 to the computer, and start the MPE720.
   Refer to the following manual for details on how to start the MPE720.
   📖 MP3000 Series Machine Controller Setup Manual (Manual No.: SIEP C880725 00)

2. Open the required project file.

3. Click the **Module Configuration** Icon on the Start Tab Page.



The following Module Configuration Definition Tab Page is displayed.

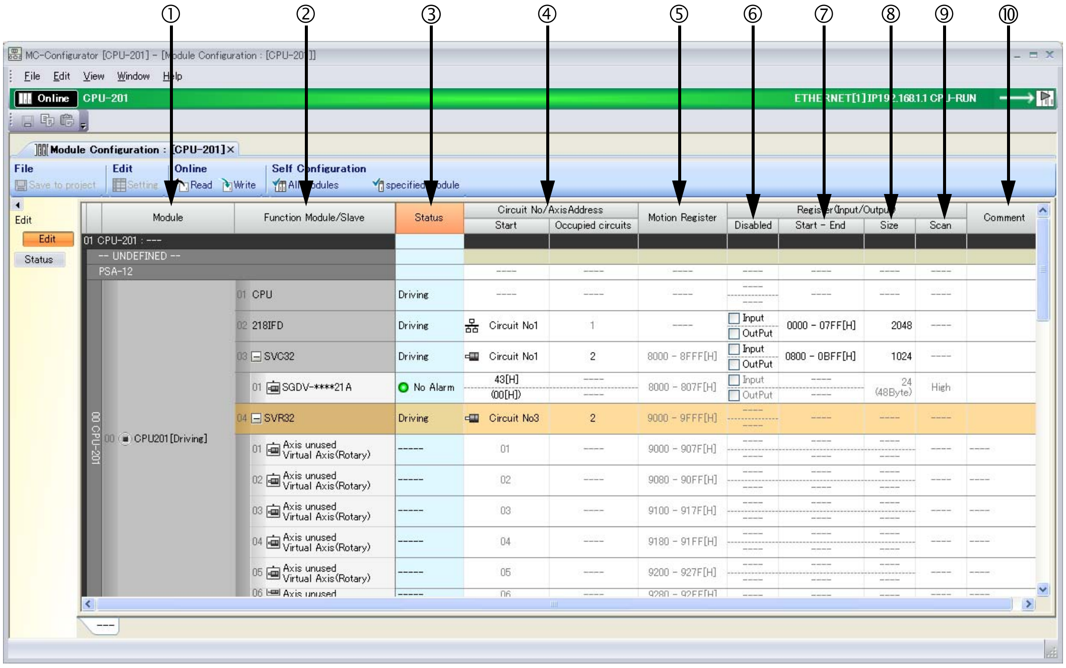

SVC32 setting cells

SVR32 setting cells

This concludes the procedure for displaying the Module Configuration Definition Tab Page.

Module Configuration Definition Tab Page Details

The following table describes the items that are displayed in the Module Configuration Definition Tab Page.



Module	Function Module/Slave	Status	Circuit No/Axis Address Start	Occupied circuits	Motion Register	Register (Input/Output) Disabled	Start - End	Size	Scan	Comment
01 CPU-201 : ---										
-- UNDEFINED --										
PSA-12			----	----	----	----	----	----	----	
00 CPU201 [Driving]	01 CPU	Driving	----	----	----	---- ----	----	----	----	
	02 218IFD	Driving	Circuit No1	1	----	☐ Input ☐ OutPut	0000 - 07FF[H]	2048	----	
	03 SVC32	Driving	Circuit No1	2	8000 - 8FFF[H]	☐ Input ☐ OutPut	0800 - 0BFF[H]	1024	----	
	01 SGDV-****21A	● No Alarm	43[H] (00[H])	---- ----	8000 - 807F[H]	☐ Input ☐ OutPut	---- ----	24 (48Byte)	High	
	04 SVR32	Driving	Circuit No3	2	9000 - 9FFF[H]	---- ----	----	----	----	
	01 Axis unused Virtual Axis(Rotary)	-----	01	----	9000 - 907F[H]	---- ----	---- ----	---- ----	----	----
	02 Axis unused Virtual Axis(Rotary)	-----	02	----	9080 - 90FF[H]	---- ----	---- ----	---- ----	----	----
	03 Axis unused Virtual Axis(Rotary)	-----	03	----	9100 - 917F[H]	---- ----	---- ----	---- ----	----	----
	04 Axis unused Virtual Axis(Rotary)	-----	04	----	9180 - 91FF[H]	---- ----	---- ----	---- ----	----	----
	05 Axis unused Virtual Axis(Rotary)	-----	05	----	9200 - 927F[H]	---- ----	---- ----	---- ----	----	----
	06 Axis unused	-----	06	----	9280 - 92FF[H]	----	----	----	----	----

No.	Item		Display/Setting Item	Setting Range/Settings	Changing
①	Module		Displays the Module that is set for the slot.	Any Module	Possible
②	Function Module/Slave		Displays the Function Modules and slaves that are used by the Module.	Any Function Module or slave	Possible
③	Status		In Online Mode, displays the status of the Function Modules and the communications status of MECHATROLINK slave devices.	Refer to the following section. ☞ ◆ *Status Display Contents* on page 7-4	Not possible
④	Circuit No./ Axis Address	Start	Displays the first circuit number that is assigned to the Function Module.	Circuit No. 1 to 16	Possible
		Occupied circuits	Displays the number of circuits that are assigned to the Function Module.	1 or 2	Possible
⑤	Motion Register		Displays the first and last register addresses of the motion parameters.	The parameter is automatically set based on the circuit numbers.	Not possible
⑥	Register (Input/Output)	Disabled	Used to disable inputs or outputs by selecting the check boxes.	Selected or not selected	Possible
⑦		Start - End	Displays the range of registers that is used as an I/O area by the Function Module. For the SVC or SVC32, the first and last registers of the I/O Modules that are connected to MECHATROLINK are displayed.	Start: 0000 to 7FFF hex End: 10000 to 17FFFF hex, 800 hex words max.*	Possible
⑧		Size	Displays the number of words in the I/O area.	1 to 1024	Possible
⑨		Scan	Displays the scan in which the I/O service is performed for the I/O device.	High/Low	Possible

Continued on next page.

Continued from previous page.

No.	Item	Display/Setting Item	Setting Range/Settings	Changing
⑩	Comment	Displays the user comment.	You can enter up to 16 characters for a Function Module. You can enter up to 32 characters for a MECHATROLINK slave.	Possible

* Set I/O registers so that the same registers are not used by more than one Function Module.

Important

1. Always save all settings to the flash memory after changing them.
2. When changing the settings, be careful not to set register addresses that overlap with other Function Modules.
3. I/O first and last register defaults will be automatically set, even if an I/O Module is not connected to the MECHATROLINK network. It is not necessary to change these settings from their defaults.

◆ Status Display Contents

The items displayed in the **Status** Column are listed below.

■ Status of the CPU, Communications Function Modules, Motion Control Function Modules, and Option Modules

The following will be displayed as the status of the CPU, Communications Function Modules, Motion Control Function Modules, and Option Modules.

Display	Description
-----	Undefined.
Empty	Defined but not connected.
Driving	Operating normally.
Failure	Error detected.
×	The connected Module has a different name from the Module defined on the Module Configuration Definition Tab Page.
Initializing	The Module is connected but the Module configuration is not defined.
Driving Stop	The CPU is stopped (The user programs are stopped).
Duplicate Address	The same station address is used for more than one connected MECHATROLINK-III slave device.

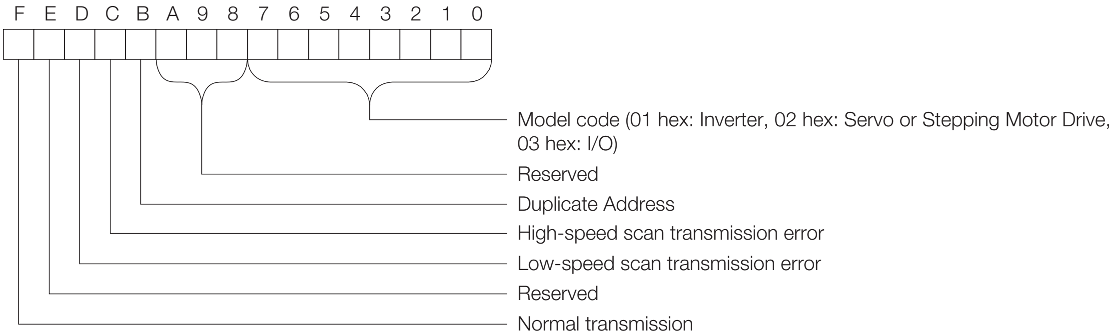
■ Transmission Status for the SVC Function Module

The following status is displayed for the SVC Function Module.

Display	Description
No Alarm	Transmission is normal.
High Speed Scan Transmission Error	A transmission error has occurred. (The high-speed scan is set for the I/O scan for the station.)
Low Speed Scan Transmission Error	A transmission error has occurred. (The low-speed scan is set for the I/O scan for the station.)
Duplicate Address	The same station address is set for more than one slave device.

■ Hexadecimal Code

The hexadecimal code displayed in the **Status** Column is described below.

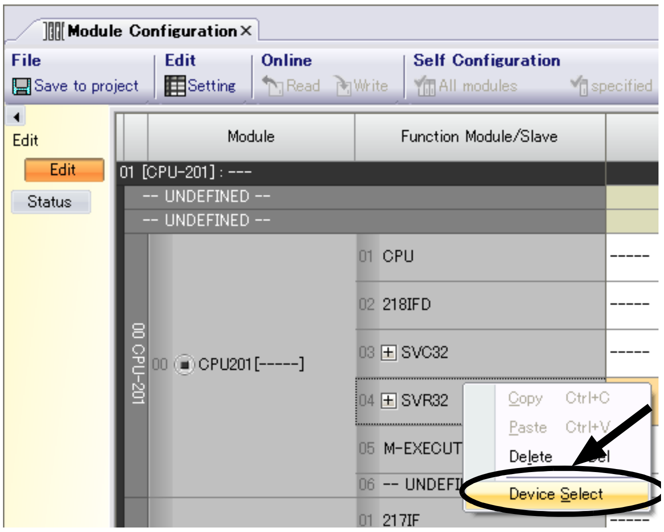


7.1.2 Deleting Unused Motion Control Function Modules

You can delete (disable) unused Motion Control Function Modules to reduce the processing time of the MP3000.

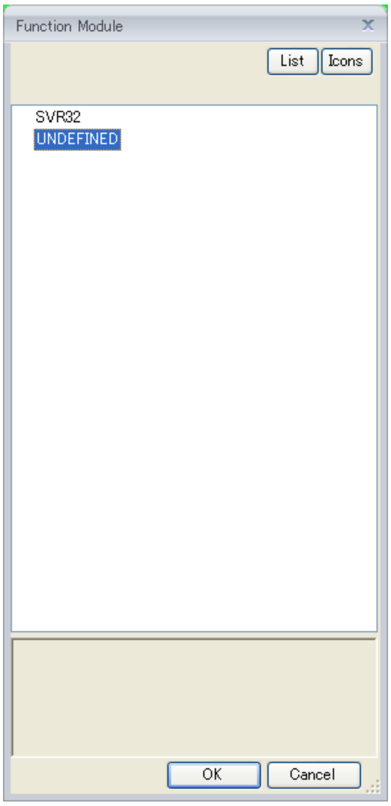
Use the following procedure to delete unused Function Modules from the Motion Control Function Modules that are built into the MP3000.

1. Right-click the cell of the Function Module to delete and select **Device Select** from the pop-up menu.

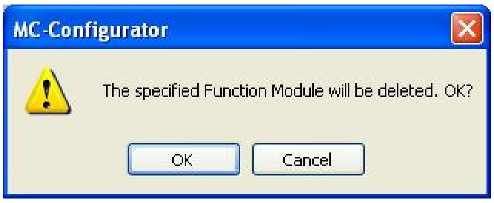


The Function Module Dialog Box is displayed.

2. Select **UNDEFINED** in the Function Module Dialog Box, and then click the **OK** Button.

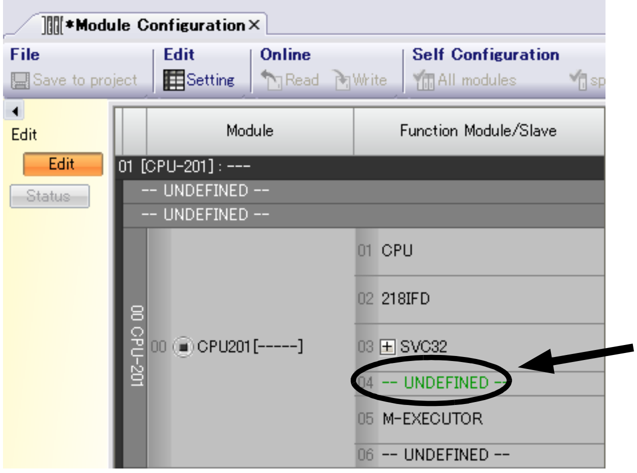


The following message is displayed.



The specified Function Module will be deleted. OK?

3. Click the **OK** Button.
The cell of the deleted Function Module changes to **UNDEFINED**.



This concludes the procedure.

7.2 MECHATROLINK Communications Settings

To perform motion control using the SVC Function Module, you must first make settings for MECHATROLINK communications.

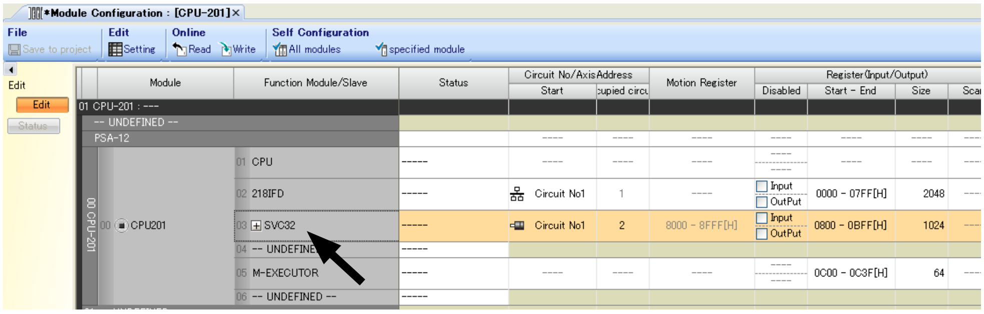
Use the MECHATROLINK Detail Definition Dialog Box to make settings for MECHATROLINK communications.

The section describes how to open the MECHATROLINK Detail Definition Dialog Box, its contents, and how to use it to make settings.

7.2.1 Displaying the MECHATROLINK Detail Definition Dialog Box

Use the following procedure to display the MECHATROLINK Detail Definition Dialog Box.

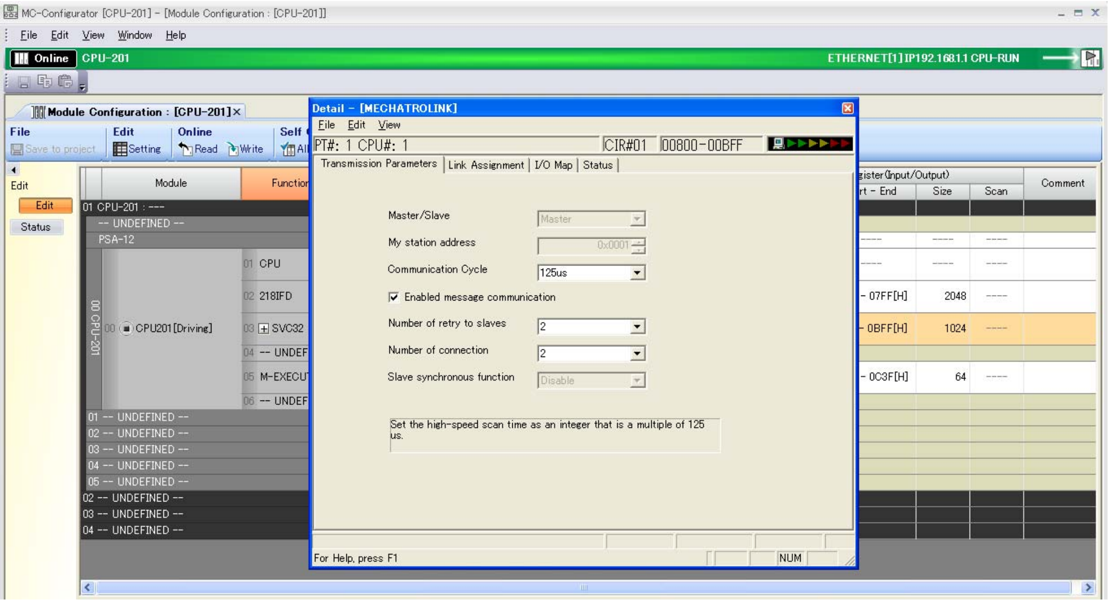
1. Open the Module Configuration Definition Tab Page.
2. Double-click the **SVC32** cell on the Module Configuration Definition Tab Page.



Module	Function Module/Slave	Status	Circuit No/Axis Address Start	cupied circu	Motion Register	Disabled	Register (Input/Output) Start – End	Size	Scan
01 CPU-201 : ---									
-- UNDEFINED --									
PSA-12			----	----	----	----	----	----	----
00 CPU-201 00 CPU201	01 CPU	-----	----	----	----	----	----	----	----
	02 218IFD	-----	Circuit No1	1	----	☐ Input ☐ OutPut	0000 – 07FF[H]	2048	----
	03 ⊞ SVC32	-----	Circuit No1	2	8000 – 8FFF[H]	☐ Input ☐ OutPut	0800 – 0BFF[H]	1024	----
	04 -- UNDEFINED --	-----							
	05 M-EXECUTOR	-----	----	----	----	----	0C00 – 0C3F[H]	64	----
	06 -- UNDEFINED --	-----							

The MECHATROLINK Communications Definition Dialog Box is displayed.

Information If more than one Module is mounted, select the Module to be checked or set.



PT#: 1 CPU#: 1 CIR#01 00800-00BFF

Master/Slave: Master

My station address: 0x0001

Communication Cycle: 125us

☑ Enabled message communication

Number of retry to slaves: 2

Number of connection: 2

Slave synchronous function: Disable

Set the high-speed scan time as an integer that is a multiple of 125 us.

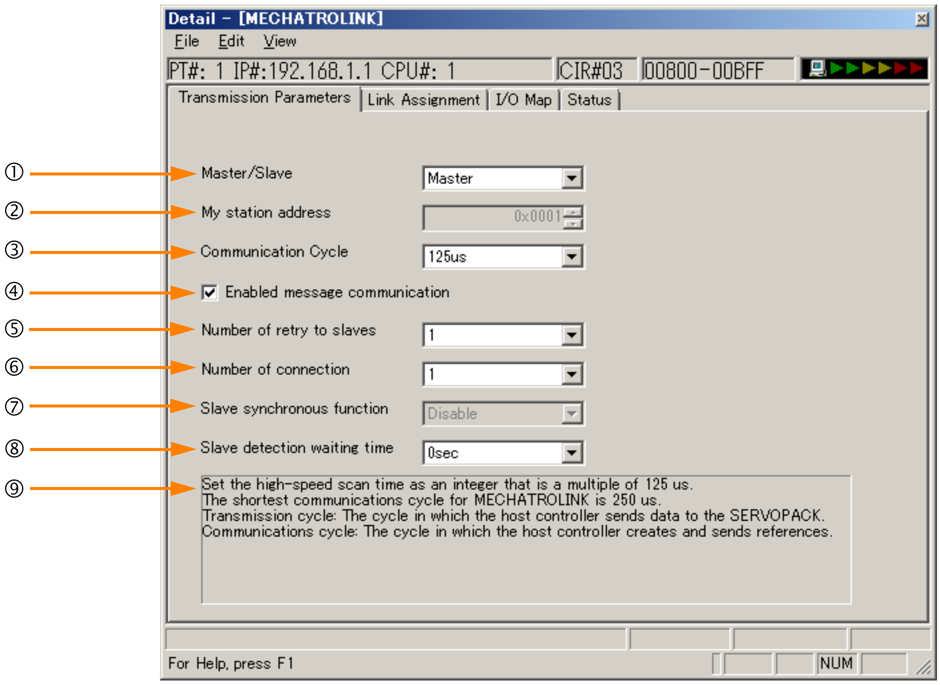
This concludes the procedure to display the MECHATROLINK Detail Definition Dialog Box.

7.2.2 MECHATROLINK Detail Definition Dialog Box Details

The MECHATROLINK Detail Definition Dialog Box has four tab pages: Transmission Parameters, Link Assignment, I/O Map, and Status. Click the tab to view each tab page.

Transmission Parameters Tab Page

The items on the Transmission Parameters Tab Page are described in the following table.



Master/Slave: Master
My station address: 0x0001
Communication Cycle: 125us
☑ Enabled message communication
Number of retry to slaves: 1
Number of connection: 1
Slave synchronous function: Disable
Slave detection waiting time: 0sec

Set the high-speed scan time as an integer that is a multiple of 125 us.
The shortest communications cycle for MECHATROLINK is 250 us.
Transmission cycle: The cycle in which the host controller sends data to the SERVOPACK.
Communications cycle: The cycle in which the host controller creates and sends references.

No.	Item	Description	Default
①	Master/Slave	Set whether to use the SVC Function Module as a master or a slave station.	Master
②	My station address	Sets the local station address.	01 hex
③	Communication Cycle	Sets the transmission cycle.	250 µs
④	Enabled message communication	Enables or disables message communications.	Enable
⑤	Number of retry to slaves	Sets the maximum number of retries to execute within one transmission cycle.	1
⑥	Number of connection	Sets the number of connected slave stations.	8
⑦	Slave synchronous function	Enables or disables slave CPU synchronization.	Disabled
⑧	Slave Detection Waiting Time	Sets the maximum time to continuously perform detection processing for slave stations.	0 s
⑨	Message Box	Displays precautions on the high-speed scan time setting.	–

Refer to the following section for details on each item.

☞ ◆ *Item Details* on page 7-8

◆ Item Details

This section provides details on the items that are displayed on the Transmission Parameters Tab Page.

Important Always save all settings to the flash memory after you change them.

■ Master/Slave

Set whether to use the SVC or SVC32 as a master or a slave station.

Refer to the following section for details on device definition information and I/O data when the SVC or SVC32 is set as a slave station.

☞ *Detailed Information When an SVC Function Module Is Set as a Slave* on page 7-16

■ Communication Cycle

Set the transmission cycle.

Selection: 125 μs, 250 μs, 500 μs, 1 ms, 1.5 ms, 2 ms, or 3 ms

■ Enabled message communication

Enable or disable message communications.

This check box is linked to the retry count. If the retry count is 0, the retry count automatically changes to 1 when you select this check box.

If a value higher than 1 is set for the retry count, this check box is automatically selected.

■ Number of retry to slaves

Set the maximum number of retries to execute within one transmission cycle.

Transmission Cycle	Number of Slave Stations	Setting Range
125 μs	1 to 4	0 to (5 - Number of slave stations)
250 μs	1 to 8	0 to (9 - Number of slave stations)
500 μs	1 to 14	0 to (15 - Number of slave stations)
1 ms	1 to 29	0 to (30 - Number of slave stations)
1.5 ms	1 to 42	0 to (43 - Number of slave stations)
2 ms	1 to 42	0 to (43 - Number of slave stations)
3 ms	1 to 42	0 to (43 - Number of slave stations)

■ Number of Connection

Set the number of connected slave stations.

Transmission Cycle	Number of Connected Stations	
	Star Connections	Cascade Connections
125 μs	1 to 4	1 to 3
250 μs	1 to 8	1 to 7
500 μs	1 to 14	1 to 12
1 ms	1 to 29	1 to 21
1.5 ms	1 to 42	1 to 27
2 ms	1 to 42	1 to 32
3 ms	1 to 42	1 to 38

Important

If the SigmaWin+ is connected to the MP3000, the SigmaWin+ may not be usable if there are too many SERVOPACK stations connected. If this occurs, either connect the SigmaWin+ to the SERVOPACK (CN7) directly, or lengthen the transmission cycle.

■ Slave Detection Waiting Time

Set the maximum time to continuously perform detection processing for MECHATROLINK-III slave stations when the power supply of the MP3000 is turned ON.

- Selections: 0 s to 10 s (in 1-s increments)

Note: The following firmware and Engineering Tool versions support this function.
- MP3000: Version 1.17 or later
- MPE720 Ver. 7: Version 7.31 or later

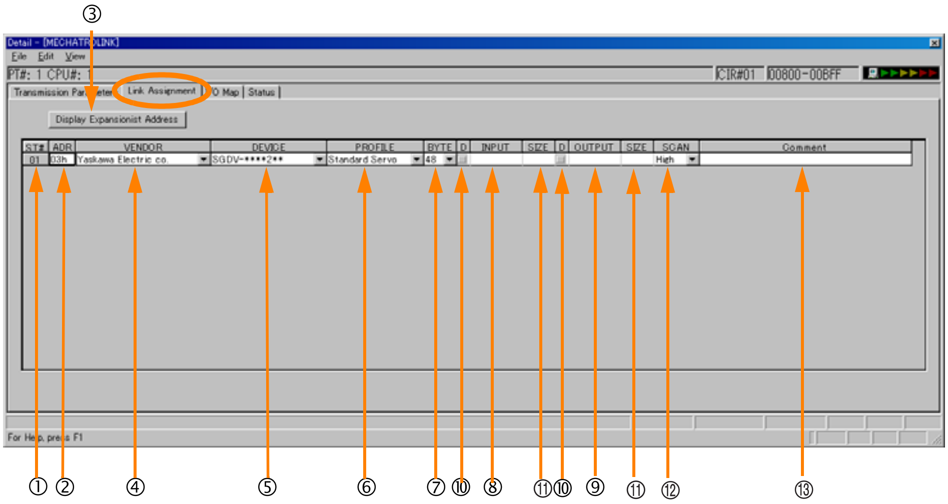
■ Message Box

This box displays precautions on the high-speed scan cycle setting.

Transmission Cycle	Message
125 µs	Set the high-speed scan cycle as an integer that is greater than or equal to 500 µs and is a multiple of 250 µs.
250 µs	Set the high-speed scan cycle as an integer that is greater than or equal to 500 µs and is a multiple of 250 µs.
500 µs	Set the high-speed scan cycle as an integer that is a multiple of 500 µs.
1 ms	Set the high-speed scan cycle as an integer that is a multiple of 1 ms or a factor of 1 integer.

Link Assignment Tab Page

The Link Assignment Tab Page displays the assignment settings for all slave devices that were detected during self-configuration (MECHATROLINK-III-connected devices, such as SERVOPACKs or distributed I/O).



ST#	ADR	VENDOR	DEVICE	PROFILE	BYTE	D	INPUT	SIZE	D	OUTPUT	SIZE	SCAN	Comment
01	03h	Yaskawa Electric co.	SGDV-****2**	Standard Servo	48							High	

No.	Item	Description
①	ST #	Displays the station number.
②	ADR	Sets the station address of the slave station.
③	ExADR	Sets the individual extended addresses when multi-station modules (multi-slaves) are grouped together as a single node.
④	VENDOR	Sets the vendor name of the device.
⑤	DEVICE	Sets the slave model.
⑥	PROFILE	Sets the profile to use.
⑦	BYTE	Sets the number of transmission bytes.
⑧	INPUT	Sets the first register address of the input area.
⑨	OUTPUT	Sets the first register address of the output area.
⑩	D	Enables or disables the I/O registers.
⑪	SIZE	Sets the input or output size in words.
⑫	SCAN	Sets the scan in which the input or output is performed.
⑬	Comment	Enter a comment of up to 32 characters if required.

Refer to the following section for details on each item.

☞ ◆ *Item Details* on page 7-10

◆ Item Details

This section provides details on the items that are displayed on the Link Assignment Tab Page.

Important

Always save all settings to the flash memory after you change them.

■ ST

This is the station number.

The number of rows that is displayed corresponds to the number of slave stations that is set on the Transmission Parameters Tab Page.

This number is automatically assigned.

■ ADR

Set the station address of the slave station.

When the local station is set as a slave station, the address specified on the Transmission Parameters Tab Page is displayed.

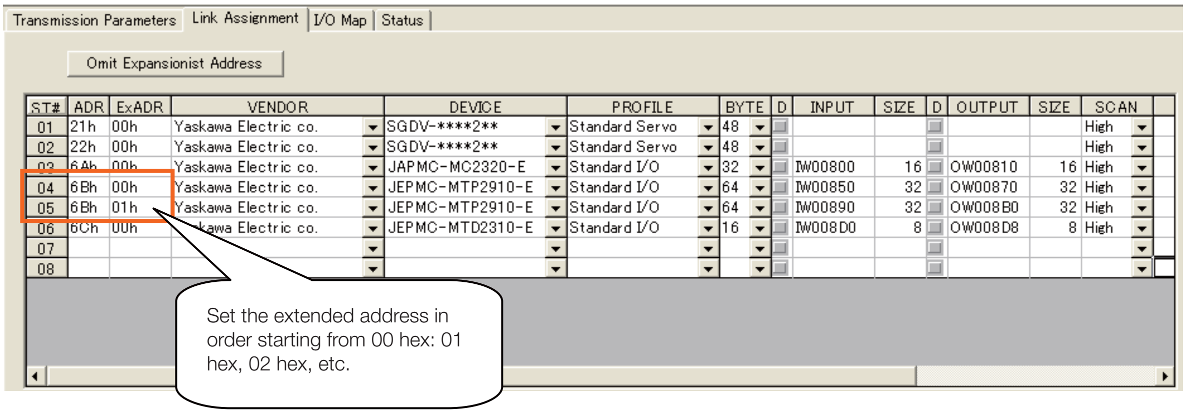
- Setting range: 03 hex to EF hex

■ ExADR

Set the individual extended addresses when multi-station modules (multi-slaves) are grouped together as a single node.

This box is displayed when the **Display Expansionist Address** Button is clicked, and is hidden when the **Omit Expansionist Address** Button is clicked.

- Setting range: 03 hex to EF hex
- Setting the Extended Address
  Extended addresses are set in succession from extended address 00 hex.
  The following figure shows an example of how to set extended addresses.



ST#	ADR	ExADR	VENDOR	DEVICE	PROFILE	BYTE	D	INPUT	SIZE	D	OUTPUT	SIZE	SCAN
01	21h	00h	Yaskawa Electric co.	SGDV-****2**	Standard Servo	48	☐			☐			High
02	22h	00h	Yaskawa Electric co.	SGDV-****2**	Standard Servo	48	☐			☐			High
03	6Ah	00h	Yaskawa Electric co.	JAPMC-MC2320-E	Standard I/O	32	☐	IW00800	16	☐	OW00810	16	High
04	6Bh	00h	Yaskawa Electric co.	JEPMC-MTP2910-E	Standard I/O	64	☐	IW00850	32	☐	OW00870	32	High
05	6Bh	01h	Yaskawa Electric co.	JEPMC-MTP2910-E	Standard I/O	64	☐	IW00890	32	☐	OW008B0	32	High
06	6Ch	00h	kawa Electric co.	JEPMC-MTD2310-E	Standard I/O	16	☐	IW008D0	8	☐	OW008D8	8	High
07							☐			☐			
08							☐			☐			

Set the extended address in order starting from 00 hex: 01 hex, 02 hex, etc.

■ VENDOR

Set the vendor name of the device.

- Selections: Yaskawa Electric co.,****Vendor

■ DEVICE

Set the slave model.

- Link Assignment Model Details
  The relationship between the model displayed under DEVICE and its corresponding profile is shown below.
  If you manually assign a link, be sure that the actual device connected to the SVC Function Module is the same as the one that is displayed under **DEVICE** on the Link Assignment Tab Page.

DEVICE	Communications Specifications			
	Supported Profiles	Number of Transmission Bytes	Minimum Transmission Cycle	Maximum Transmission Cycle
SGD7S-□□□□20□□□□□□□□	Standard Servo	32, 48	125 µs	4 ms
SGD7W-□□□□20□□□□□□□□				
SGDV-□□□□2□□				
1000Series INVERTER	Standard Inverter	32, 64	250 µs	8 ms
JAPMC-MC2320-E	Standard I/O	16, 32, 48, 64	250 µs	32 ms
SVC32	Standard I/O	16, 32, 48, 64	125 µs	32 ms
JEPMC-MTD2310-E	Standard I/O	16	250 µs	8 ms
JEPMC-MTA2900-E	Standard I/O	32	125 µs	8 ms
JEPMC-MTA2910-E	Standard I/O	16	125 µs	8 ms
JEPMC-MTP2900-E	Standard I/O	64	125 µs	8 ms
JEPMC-MTP2910-E	Standard I/O	64	125 µs	8 ms
WildCard Device	Standard Servo	48	Depends on the actual device.	Depends on the actual device.
	Standard I/O	16, 32, 48, 64	Depends on the actual device.	Depends on the actual device.

Important

- The SERVOPACK parameters can no longer be set if the SERVOPACK is set as “WildCard Device”.
- If you are using an SGD7S or SGD7W, confirm the setting methods for fixed parameters and the precautions. Refer to the following section for details.
  ☞ *6.8 Precautions When Using Σ-7-series SERVOPACKs* on page 6-34

■ PROFILE

Set the profile to use.

- Settings: Depends on the device.

■ BYTE

Set the number of transmission bytes.

- Settings: Depends on the profile.

■ INPUT

Set the first register address of the input area.

These settings are disabled if the profile is set to **Standard Servo**.

- Setting range: The range of the Module’s I/O registers

■ OUTPUT

Set the first register address of the output area.

These settings are disabled if the profile is set to Standard Servo.

- Setting range: The range of the Module’s I/O registers

■ D

Enable or disable the I/O registers.

- Settings: Enable or Disable
  ☐ : Enabled
  ☑ : Disabled

■ SIZE

Set the input or output size in words.

These settings are disabled if the profile is set to Standard Servo.

- Setting range: 0 to 32

■ SCAN

Set the scan in which the input or output is performed.

These settings are always set to **High** if the profile is set to **Standard Servo**.

- Settings: High or Low
- Comment

Enter a comment of up to 32 characters if required.

◆ Deleting Station Assignments

You can delete the items on the Link Assignment Tab Page for a station.

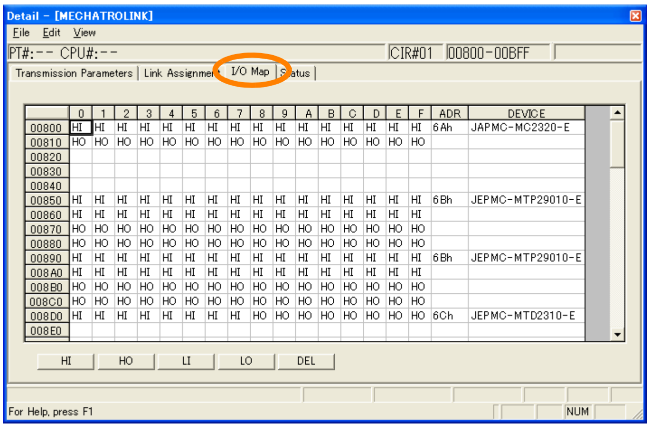
Click any cell in the row for the station to delete, and then select ***Edit – Assignment Delete*** from the menu bar.

Important

Deleted station assignments cannot be restored.

I/O Map Tab Page

This tab page displays the assignments to I/O registers.



PT#:-- CPU#:--
CIR#01
00800-00BFF

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	ADR	DEVICE
00800	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	6Ah	JAPMC-MC2320-E
00810	HO	HO	HO	HO	HO	HO	HO	HO	HO	HO	HO	HO	HO	HO	HO	HO		
00820																		
00830																		
00840																		
00850	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	6Bh	JEPMC-MTP29010-E
00860	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI		
00870	HO	HO	HO	HO	HO	HO	HO	HO	HO	HO	HO	HO	HO	HO	HO	HO		
00880	HO	HO	HO	HO	HO	HO	HO	HO	HO	HO	HO	HO	HO	HO	HO	HO		
00890	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	6Bh	JEPMC-MTP29010-E
008A0	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI		
008B0	HO	HO	HO	HO	HO	HO	HO	HO	HO	HO	HO	HO	HO	HO	HO	HO		
008C0	HO	HO	HO	HO	HO	HO	HO	HO	HO	HO	HO	HO	HO	HO	HO	HO		
008D0	HI	HI	HI	HI	HI	HI	HI	HI	HO	HO	HO	HO	HO	HO	HO	HO	6Ch	JEPMC-MTD2310-E
008E0																		

◆ Displayed Items

HI: High-speed scan input

HO: High-speed scan output

LI: Low-speed scan input

LO: Low-speed scan output

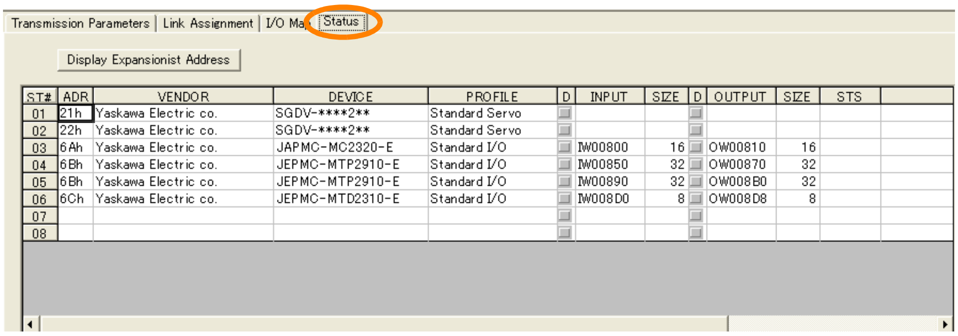
Important

The I/O Map Tab Page is for reference only. Do not change any of the displayed settings.

Status Tab Page

This tab page displays the MECHATROLINK transmission status. The displayed settings cannot be changed.

Information The items displayed on the Status Tab Page are the same as those on the Link Assignment Tab Page except for STS.



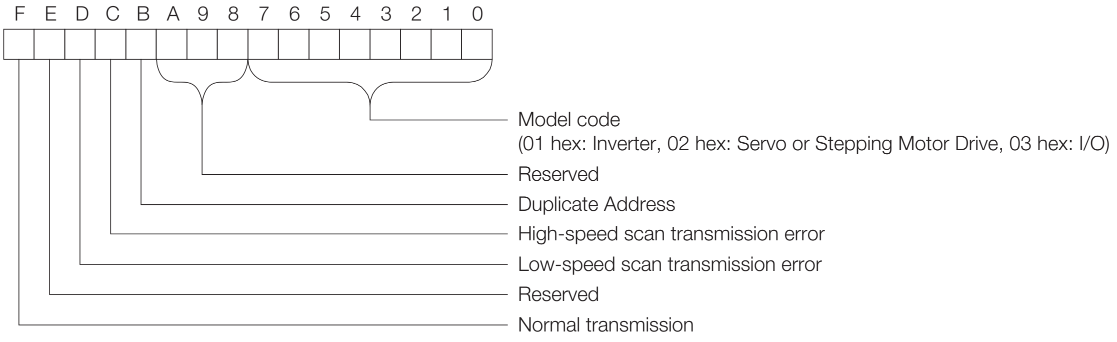
ST#	ADR	VENDOR	DEVICE	PROFILE	D	INPUT	SIZE	D	OUTPUT	SIZE	STS
01	21h	Yaskawa Electric co.	SGDV-****2**	Standard Servo	☐			☐			
02	22h	Yaskawa Electric co.	SGDV-****2**	Standard Servo	☐			☐			
03	6Ah	Yaskawa Electric co.	JAPMC-MC2320-E	Standard I/O	☐	IW00800	16	☐	OW00810	16	
04	6Bh	Yaskawa Electric co.	JEPMC-MTP2910-E	Standard I/O	☐	IW00850	32	☐	OW00870	32	
05	6Bh	Yaskawa Electric co.	JEPMC-MTP2910-E	Standard I/O	☐	IW00890	32	☐	OW008B0	32	
06	6Ch	Yaskawa Electric co.	JEPMC-MTD2310-E	Standard I/O	☐	IW008D0	8	☐	OW008D8	8	
07					☐			☐			
08					☐			☐			

◆ STS

In Online Mode, MECHATROLINK transmission status is displayed in hexadecimal.

Information In Offline Mode, nothing is displayed.

The meaning of each bit is given below.



Environment for Using Σ-7-series SERVOPACKs

◆ Supported Versions

Details on SERVOPACKs: Σ-7-series SERVOPACKs with MECHATROLINK-III Communications References

SERVOPACK models: SGD7S-□□□20□, SGD7W-□□□20□

■ Using a Rotary Servomotor

CPU Unit/CPU Module	Model Number	Version
CPU-201	JEPMC-CP3201-E	Version 1.12 or later
CPU-202	JEPMC-CP3202-E	
CPU-301	JAPMC-CP3301-1-E	Version 1.10 or later
	JAPMC-CP3301-2-E	All versions
CPU-302	JAPMC-CP3302-1-E	
	JAPMC-CP3302-2-E	
MP3100	JAPMC-MC3100-1-E	
	JAPMC-MC3100-2-E	

MP3000	Model Number	Version
MPE720 Version 7	CPMC-MPE780	Version 7.28 or later

■ Using a Linear Servomotor

CPU Unit/CPU Module	Model Number	Version
CPU-201	JEPMC-CP3201-E	Version 1.14 or later
CPU-202	JEPMC-CP3202-E	
CPU-301	JAPMC-CP3301-1-E	
	JAPMC-CP3301-2-E	
CPU-302	JAPMC-CP3302-1-E	All versions
	JAPMC-CP3302-2-E	
MP3100	JAPMC-MC3100-1-E	
	JAPMC-MC3100-2-E	

Engineering Tool	Model Number	Version
MPE720 Version 7	CPMC-MPE780	Version 7.30 or later

◆ Allocations

Click the Link Assignment tab in the MECHATROLINK Communications Definition Dialog Box, make the following slave device settings for the desired station number (ST#), and save the settings to flash memory.

VENDOR	DEVICE	PROFILE	BYTE	SIZE		SCAN
				INPUT	OUTPUT	
Yaskawa Electric co.	SGD7S-□□□□20□	Standard Servo	48 (fixed)	No setting is required.	No setting is required.	High (fixed)
	SGD7W-□□□□20□					

Note: 1. Assignment Mistakes
If you make a mistake in the assignments (for example, set SGD7S-□□□□20□ when an SGD7W-□□□□20□ is connected), a Detected Servo Driver Type Error alarm (monitor parameter IL□□□04 bit 1D) will occur. Synchronous communications will not start and the Motion Controller Operation Ready bit (monitor parameter IW□□□00 bit 0) will be 0 (Operation not ready).

2. Using a Linear Servomotor
If you make the above assignments and save the settings to flash memory when a Linear Servomotor is connected to an SGD7S-□□□□20□ or SGD7W-□□□□20□ and you are using a version of MPE720 that does not support Linear Servomotors, a Connected Encoder Type Error alarm (monitor parameter IL□□□04 bit 1F) will occur. To use a Linear Servomotor, set the assignment to WildCard Device (Linear).

Important

- The SERVOPACK parameters can no longer be set if the SERVOPACK is set as “WildCard Device”.
- If you are using an SGD7S or SGD7W, confirm the setting methods for fixed parameters and the precautions. Refer to the following section for details.
  ☞ *6.8 Precautions When Using Σ-7-series SERVOPACKs* on page 6-34

Detailed Information When an SVC Function Module Is Set as a Slave

This section describes the device information and I/O data when an SVC Function Module is set as a slave.

◆ Device Definition Information

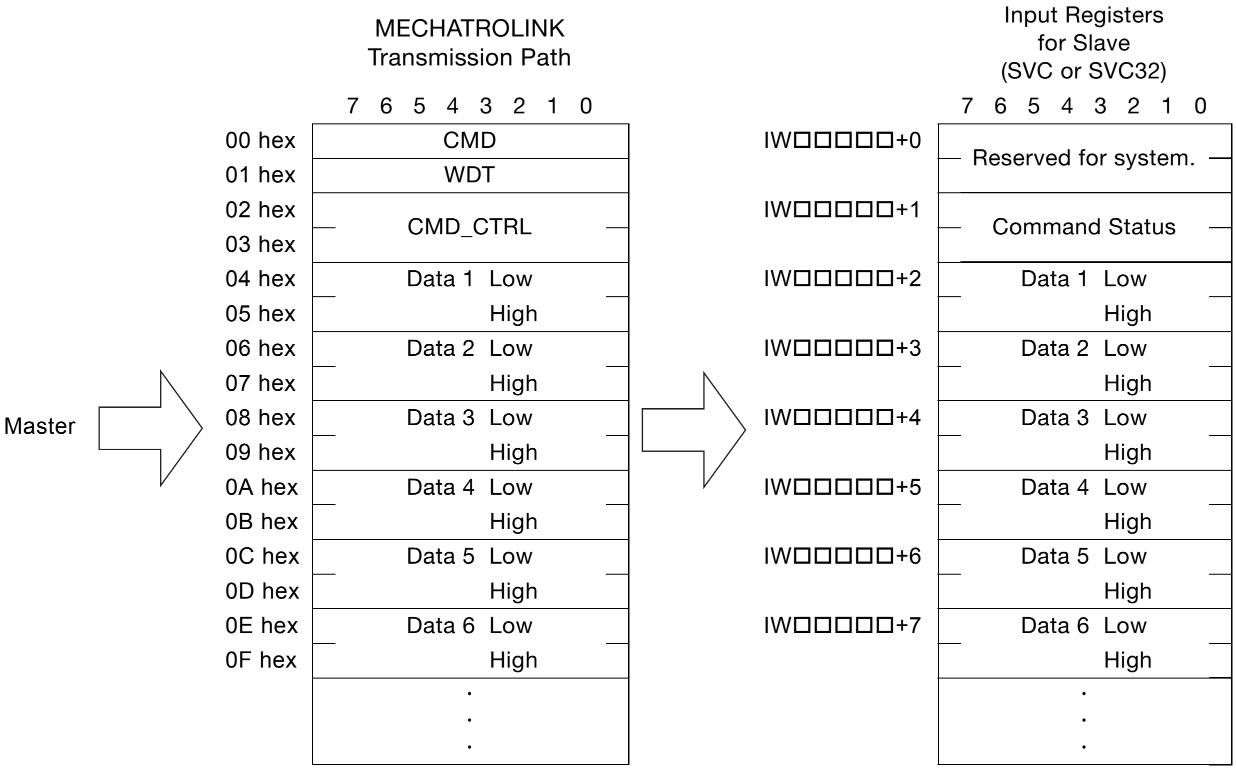
The following table gives the device definition information when the MP3000 is set as a slave.

Item	Specification
Vendor ID Code	0
Device Code	02000002 hex
Device Definition File Version	1000 hex
Serial Number	Not defined
Profile Type 1 (Primary)	30 hex
Profile Version 1 (Primary)	0100 hex
Profile Type 2	Not defined
Profile Version 2	Not defined
Profile Type 3	0
Profile Version 3	0
Minimum transmission Cycle	125 μs
Maximum transmission Cycle	32 ms
Transmission Cycle Increment (Granularity)	03 hex
Maximum Communications Cycle	32 ms
Number of Transmission Bytes	16, 32, 48, or 64
Supported Communications Modes	Event-driven communications and cyclic communications
List of Main Commands	Supported Commands NOP, ID_RD, CONFIG, ALM_RD, ALM_CLR, SYNC_SET, CONNECT, DISCONNECT, DATA_RWA, and DATA_RWS
Main Device Name	SVC or SVC32

◆ I/O Data

The relationship between the I/O data and the data on the MECHATROLINK transmission line when I/O processing is performed normally is shown below.

■ Input Register Configuration



00 hex	CMD
01 hex	WDT
02 hex	CMD_CTRL
03 hex	
04 hex	Data 1 Low
05 hex	High
06 hex	Data 2 Low
07 hex	High
08 hex	Data 3 Low
09 hex	High
0A hex	Data 4 Low
0B hex	High
0C hex	Data 5 Low
0D hex	High
0E hex	Data 6 Low
0F hex	High
	. . .

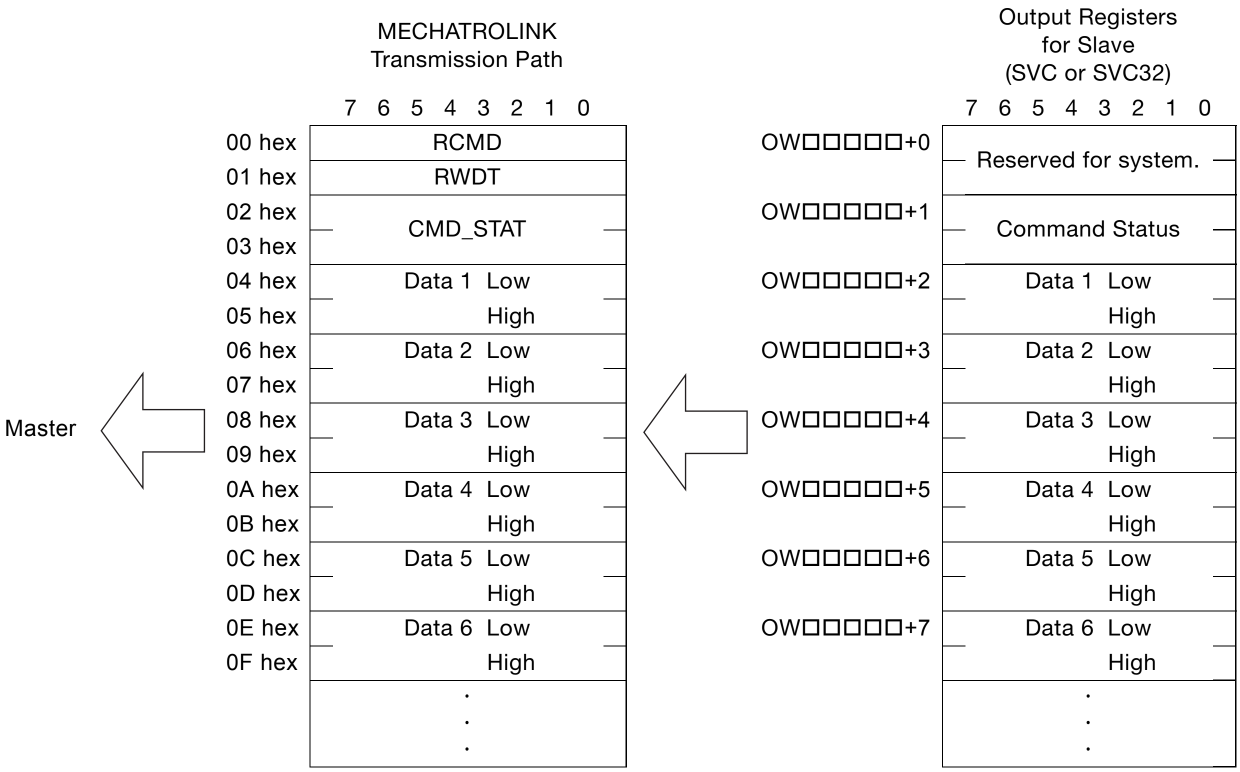
IW□□□□□+0	Reserved for system.
IW□□□□□+1	Command Status
IW□□□□□+2	Data 1 Low High
IW□□□□□+3	Data 2 Low High
IW□□□□□+4	Data 3 Low High
IW□□□□□+5	Data 4 Low High
IW□□□□□+6	Data 5 Low High
IW□□□□□+7	Data 6 Low High
	. . .

■ Command Status

Refer to the following section for details on the command status.

☞ *11.3.7 Command Status* on page 11-33

■ Output Register Configuration



■ Command Control

This section describes the details of the Command Control register.

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reserved							SLVSC

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Reserved							

- SLVSC
- Definition
  1: Restarting prohibited.
  0: Restarting allowed.
- Description
  Specify whether slave CPU synchronization is automatically restarted when the slave CPU changes from synchronized to asynchronized status.
  If SLVSC is set to 1, slave CPU synchronization will not be restarted when the slave CPU changes from synchronized to asynchronized status and operation will be continued in asynchronized status
  If SLVSC is set to 0, slave CPU synchronization is automatically restarted when the slave CPU changes from synchronized to asynchronized status.
  Refer to the following section for details on slave CPU synchronization.
  ☞ *6.6 Slave CPU Synchronization* on page 6-18

7.3 Setting Motion Parameters

The Definition Tab Page of each Motion Control Function Module displays the motion parameters (fixed parameters, setting parameters, and monitor parameters) that are used to control motion axes, such as SERVOPACKs, Inverters, and Stepping Motor Drives.

This section describes methods for checking and changing motion parameters.

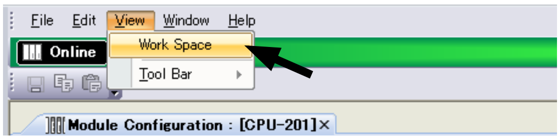
Refer to the following section for details on motion parameters.

☞ *3.4 Motion Parameter Details* on page 3-27

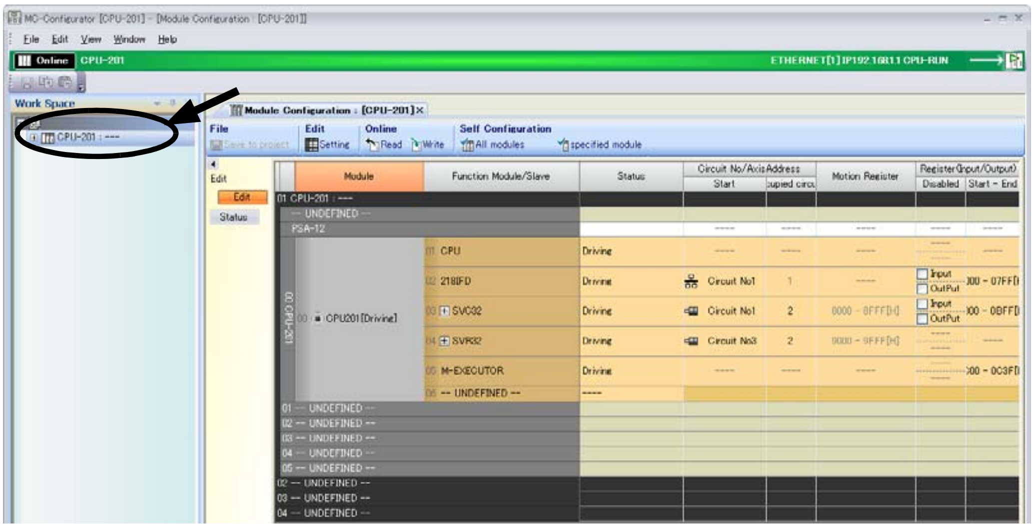
7.3.1 Displaying and Setting Motion Parameters

Use the following procedure to display and set motion parameters.

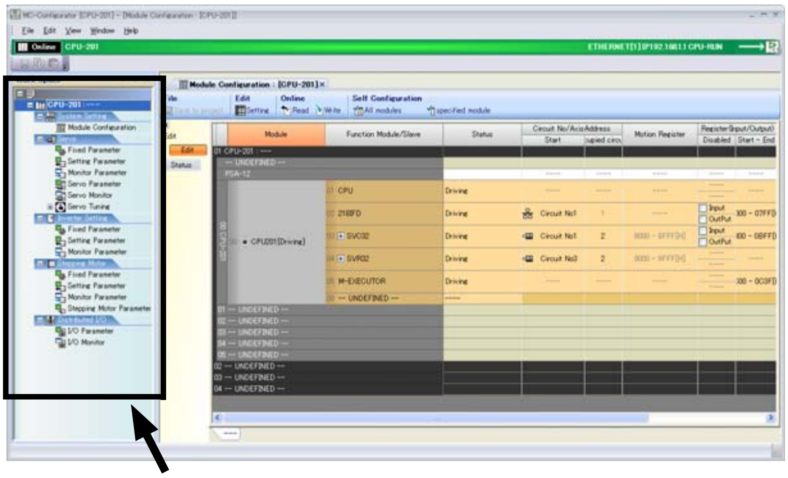
1. Select ***View*** – ***Work Space*** from the menu bar.



The Work Space Pane is displayed on the left side of the window.

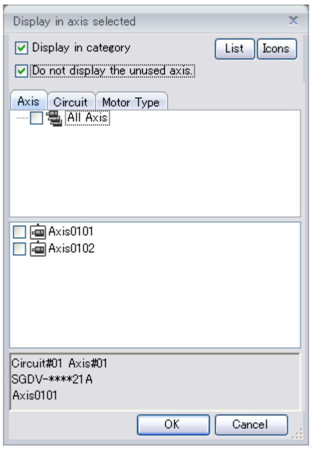


2. Click the **Expand [+]** Button beside each item in the Work Space Pane to display motion parameters as shown below.



3. Double-click the motion parameter to set or monitor.

The Display in axis selected Dialog Box will be displayed.



Display in axis selected

☑ Display in category

☑ Do not display the unused axis.

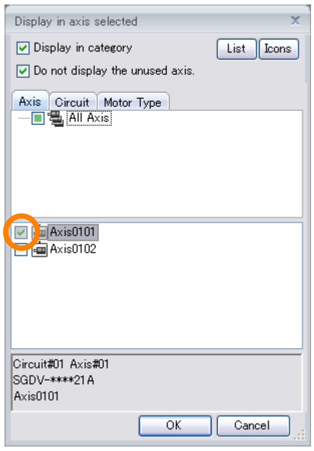
☐ All Axis

☐ Axis0101

☐ Axis0102

Circuit#01 Axis#01
SGDV-****21A
Axis0101

4. Select the axis to set or monitor, and then click the **OK** Button.



Display in axis selected

☑ Display in category

☑ Do not display the unused axis.

☐ All Axis

☑ Axis0101

☐ Axis0102

Circuit#01 Axis#01
SGDV-****21A
Axis0101

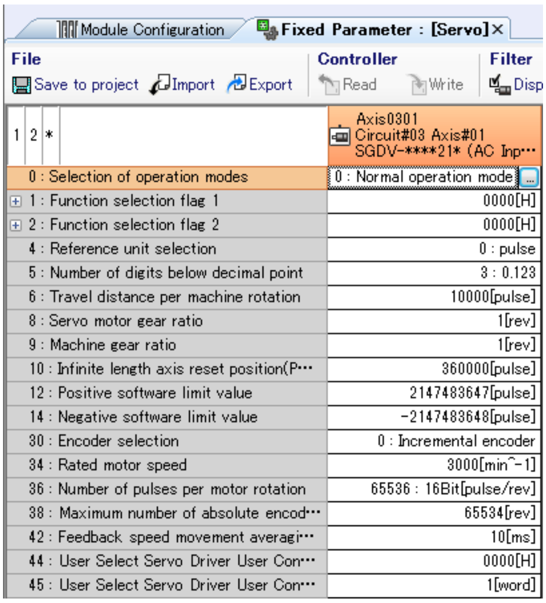
The tab page for the selected motion parameter will be displayed.

5. Check or change the settings of the motion parameters.

To change which motion parameters are displayed, double-click the required motion parameters in the Work Space Pane.

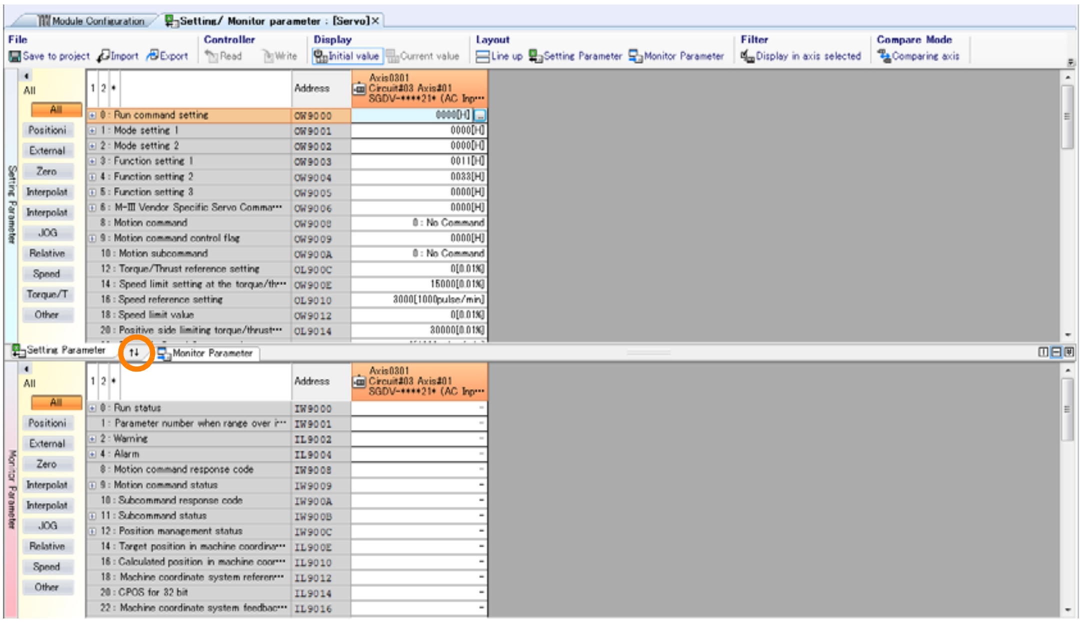
The following figures show examples of the tab pages for each group of motion parameters.

- Fixed Parameter Tab Page



1 2 *	Axis0301 Circuit#03 Axis#01 SGDV-****21* (AC Inp···
0 : Selection of operation modes	0 : Normal operation mode
⊞ 1 : Function selection flag 1	0000[H]
⊞ 2 : Function selection flag 2	0000[H]
4 : Reference unit selection	0 : pulse
5 : Number of digits below decimal point	3 : 0.123
6 : Travel distance per machine rotation	10000[pulse]
8 : Servo motor gear ratio	1[rev]
9 : Machine gear ratio	1[rev]
10 : Infinite length axis reset position(P···	360000[pulse]
12 : Positive software limit value	2147483647[pulse]
14 : Negative software limit value	-2147483648[pulse]
30 : Encoder selection	0 : Incremental encoder
34 : Rated motor speed	3000[min^-1]
36 : Number of pulses per motor rotation	65536 : 16Bit[pulse/rev]
38 : Maximum number of absolute encod···	65534[rev]
42 : Feedback speed movement averagi···	10[ms]
44 : User Select Servo Driver User Con···	0000[H]
45 : User Select Servo Driver User Con···	1[word]

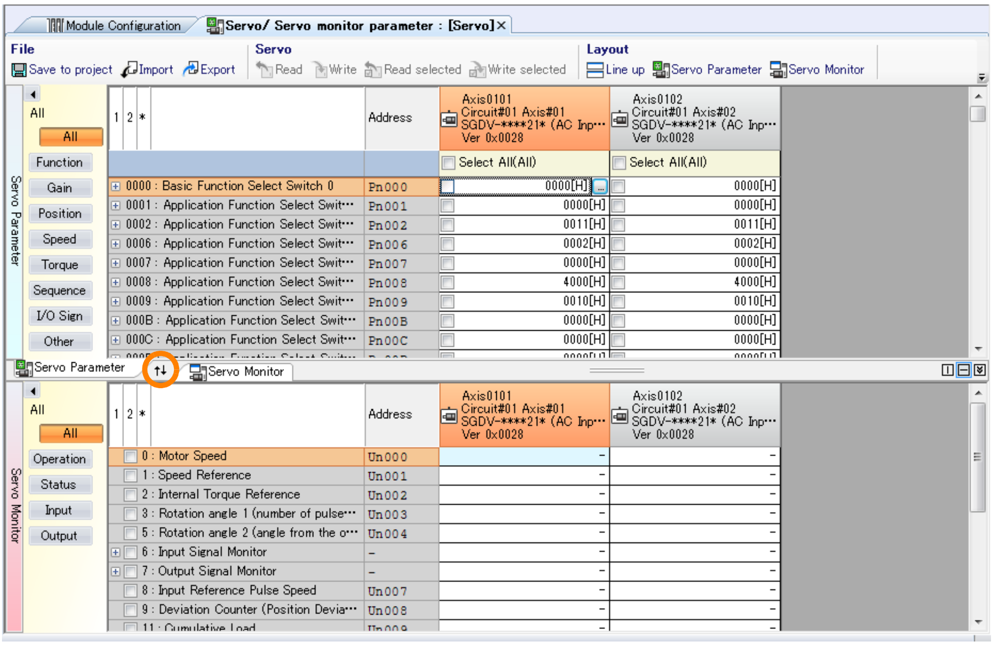
- Setting/Monitor Parameter Tab Page
  Setting and monitor parameters are displayed on the same tab page.
  Click the [↑↓] Button to change the top and bottom displays.



1 2 *	Address	Axis0301 Circuit#03 Axis#01 SGDV-****21* (AC Inp···
0 : Run command setting	OW9000	0000[H]
1 : Mode setting 1	OW9001	0000[H]
2 : Mode setting 2	OW9002	0000[H]
3 : Function setting 1	OW9003	0011[H]
4 : Function setting 2	OW9004	0033[H]
5 : Function setting 3	OW9005	0000[H]
6 : M-III Vendor Specific Servo Comma···	OW9006	0000[H]
8 : Motion command	OW9008	0 : No Command
9 : Motion command control flag	OW9009	0000[H]
10 : Motion subcommand	OW900A	0 : No Command
12 : Torque/Thrust reference setting	OL900C	0[0.01%]
14 : Speed limit setting at the torque/thr···	OW900E	15000[0.01%]
16 : Speed reference setting	OL9010	3000[1000pulse/min]
18 : Speed limit value	OW9012	0[0.01%]
20 : Positive side limiting torque/thrust···	OL9014	30000[0.01%]

1 2 *	Address	Axis0301 Circuit#03 Axis#01 SGDV-****21* (AC Inp···
0 : Run status	IW9000	-
1 : Parameter number when range over i···	IW9001	-
2 : Warning	IL9002	-
4 : Alarm	IL9004	-
8 : Motion command response code	IW9008	-
9 : Motion command status	IW9009	-
10 : Subcommand response code	IW900A	-
11 : Subcommand status	IW900B	-
12 : Position management status	IW900C	-
14 : Target position in machine coordina···	IL900E	-
16 : Calculated position in machine coor···	IL9010	-
18 : Machine coordinate system referen···	IL9012	-
20 : CPOS for 32 bit	IL9014	-
22 : Machine coordinate system feedbac···	IL9016	-

- Servo/Servo Monitor Parameter Tab Page
  SERVOPACK parameters and servo monitor information are displayed on the same tab page.
  Click the [↑↓] Button to change the top and bottom displays.



1 2 *	Address	Axis0101 Circuit#01 Axis#01 SGDV-****21* (AC Inp··· Ver 0x0028	Axis0102 Circuit#01 Axis#02 SGDV-****21* (AC Inp··· Ver 0x0028
		☐ Select All(All)	☐ Select All(All)
0000 : Basic Function Select Switch 0	Pn000	☐ 0000[H]	☐ 0000[H]
0001 : Application Function Select Swit···	Pn001	☐ 0000[H]	☐ 0000[H]
0002 : Application Function Select Swit···	Pn002	☐ 0011[H]	☐ 0011[H]
0006 : Application Function Select Swit···	Pn006	☐ 0002[H]	☐ 0002[H]
0007 : Application Function Select Swit···	Pn007	☐ 0000[H]	☐ 0000[H]
0008 : Application Function Select Swit···	Pn008	☐ 4000[H]	☐ 4000[H]
0009 : Application Function Select Swit···	Pn009	☐ 0010[H]	☐ 0010[H]
000B : Application Function Select Swit···	Pn00B	☐ 0000[H]	☐ 0000[H]
000C : Application Function Select Swit···	Pn00C	☐ 0000[H]	☐ 0000[H]

1 2 *	Address	Axis0101 Circuit#01 Axis#01 SGDV-****21* (AC Inp··· Ver 0x0028	Axis0102 Circuit#01 Axis#02 SGDV-****21* (AC Inp··· Ver 0x0028
☐ 0 : Motor Speed	Un000	-	-
☐ 1 : Speed Reference	Un001	-	-
☐ 2 : Internal Torque Reference	Un002	-	-
☐ 3 : Rotation angle 1 (number of pulse···	Un003	-	-
☐ 5 : Rotation angle 2 (angle from the o···	Un004	-	-
☐ 6 : Input Signal Monitor	-	-	-
☐ 7 : Output Signal Monitor	-	-	-
☐ 8 : Input Reference Pulse Speed	Un007	-	-
☐ 9 : Deviation Counter (Position Devia···	Un008	-	-
☐ 11 : Cumulative Load	Un009	-	-

Information

- Some parameters will change if the axis is changed in the Display in axis selected Dialog Box.
- Refer to the product manual for your SERVOPACK for details on the SERVOPACK parameters.

7.3.2 Precautions after Making Settings

The fixed values in the MP3000 are written to the slave SERVOPACK EEPROM or RAM during self-configuration as shown below. The SERVOPACK parameters are also written to the MP3000 setting parameters.

Important SERVOPACK parameters and MP3000 parameters may be overwritten when self-configuration is executed.

Writing from the MP3000 to the Slave SERVOPACK

The following settings are written regardless of the setting of bit A (SERVOPACK Parameter Auto-Write) in fixed parameter No. 1.

MP3000			Slave SERVOPACK	
Fixed Values			Servo Common Parameters	
Name	Setting		No.	Name/Description
P-OT Signal Mapping	Disable	→	25. Bit 0	Limit Setting, P-OT
N-OT Signal Mapping	Disable	→	25. Bit 1	Limit Setting, N-OT
Positive Servo Software Limit	Disable	→	25. Bit 4	Limit Setting, P-SOT
Negative Servo Software Limit	Disable	→	25. Bit 5	Limit Setting, N-SOT
Servo Electronic Gear Ratio Numerator	1*	→	21	Electronic Gear Ratio (Numerator)
Servo Electronic Gear Ratio Denominator	1	→	22	Electronic Gear Ratio (Denominator)
Fixed Monitor Selection	1	→	87	Monitor Select 1
Fixed Monitor Selection	0	→	88	Monitor Select 2

* When using a 24-bit encoder, the set value is 16.

Information The above settings are not written for axes that are already defined.

Writing from the Slave SERVOPACK to the MP3000

The following settings are written when bit A (SERVOPACK Parameter Auto-Write) in fixed parameter No. 1 is set to 0 (Enable).

MP3000			Slave SERVOPACK	
Setting Parameters			Servo Common Parameters	
Name	Register Number		No.	Name/Description
Position Loop Gain	OW□□□2E	←	63	Position Loop Gain
Speed Loop Gain	OW□□□2F	←	61	Speed Loop Gain
Speed Feedforward Compensation	OW□□□30	←	64	Feed Forward Compensation
Position Loop Integral Time Constant	OW□□□32	←	65	Position Loop Integral Time Constant
Speed Loop Integral Time Constant	OW□□□34	←	62	Speed Loop Integral Time Constant
Filter Time Constant	OW□□□3A	←	82	Movement Average Time

7.4 SERVOPACK Parameter Data Flow

When performing motion control, you can read and write SERVOPACK parameters from the MP3000.

☞ *3.5 Automatically Updated Parameters* on page 3-87

This means that the parameter settings are saved in both the MP3000 and in the slave SERVOPACK. Therefore, it is necessary to consider the relationship between the settings in both places.

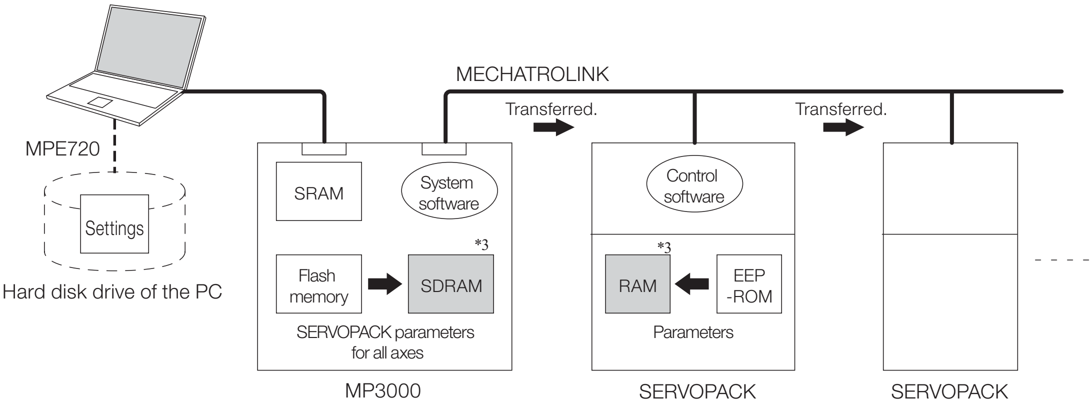
This section describes the flow of data for the SERVOPACK parameters under different conditions.

The following descriptions of procedures and conceptual diagrams are for the SVC Function Module.

7.4.1 When the Power Supply Is Turned ON

The flow of data for the SERVOPACK parameters when the power supply is turned ON is shown below.

1. The parameter data in the SERVOPACK's EEPROM[*1] is copied to RAM.
2. The MP3000 copies the parameter data for all axes from flash memory[*1] to SDRAM[*2].
3. Some gain settings are written from the MP3000 to the SERVOPACK RAM[*1].

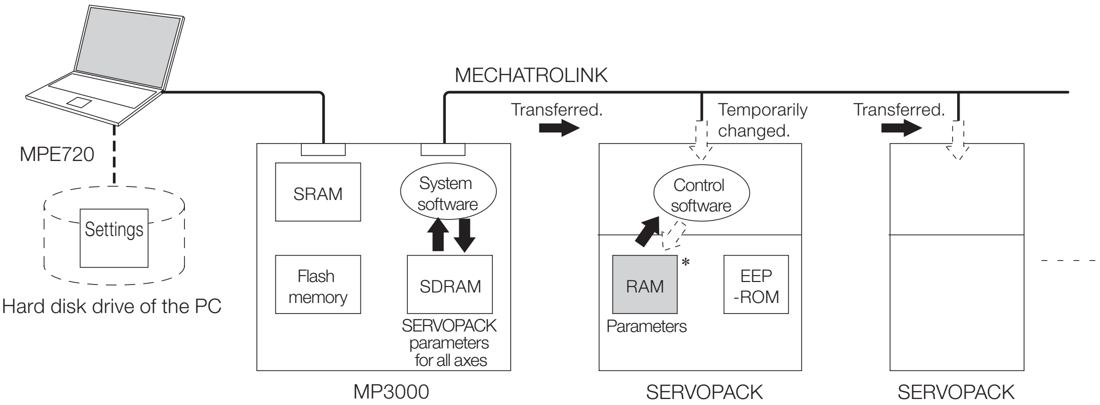


*1. EEPROM and flash memory: Memory that retains data even when the power supply is turned OFF.
*2. RAM, SRAM, and SDRAM: Memory that loses data when the power supply is turned OFF.
*3. ▨ indicates the data that is written.

7.4.2 Normal Operation

The flow of data for the SERVOPACK parameters under normal operation is shown below.

1. The SERVOPACK's control software operates according to the parameters that are stored in RAM.
2. Some setting parameters and commands of the MP3000 temporarily change SERVOPACK parameters. When this processing is executed, it also changes the contents of the RAM in the SERVOPACK.
   ☞ *Chapter 3 Parameters for Motion Control*



* ▨ indicates the data that is written.

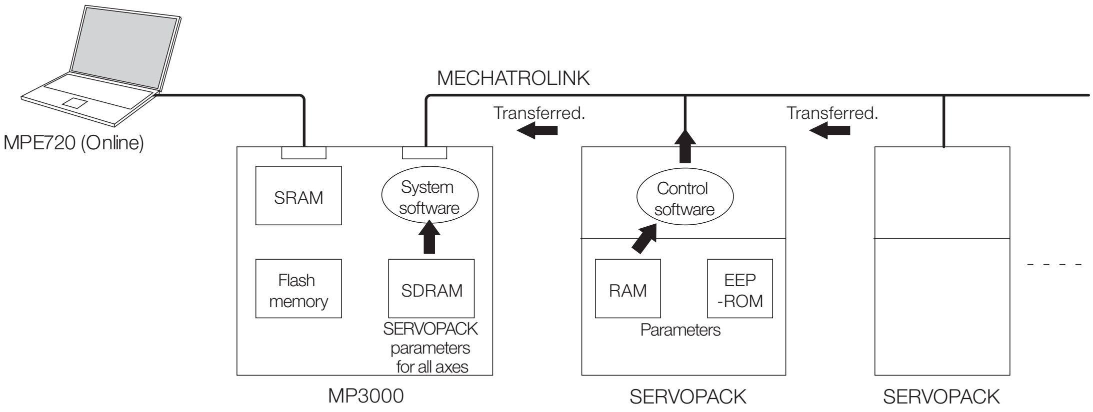
Information A Digital Operator that is connected to the SERVOPACK will display the parameters that are stored in the SERVOPACK's RAM. Press the **DATA/ENTER** Key to write the parameters to the EEPROM.

7.4.3 When the SERVOPACK Tab Page Is Opened

The flow of data for the SERVOPACK parameters when the SERVOPACK Tab Page is opened is shown below.

Refer to the following section for the procedure to display the SERVOPACK Tab Page.
☞ *7.3.1 Displaying and Setting Motion Parameters* on page 7-19

The MPE720 loads the parameter values in the SERVOPACK's RAM and displays them on the SERVOPACK Tab Page.



7.4.4 When SERVOPACK Parameters Are Saved

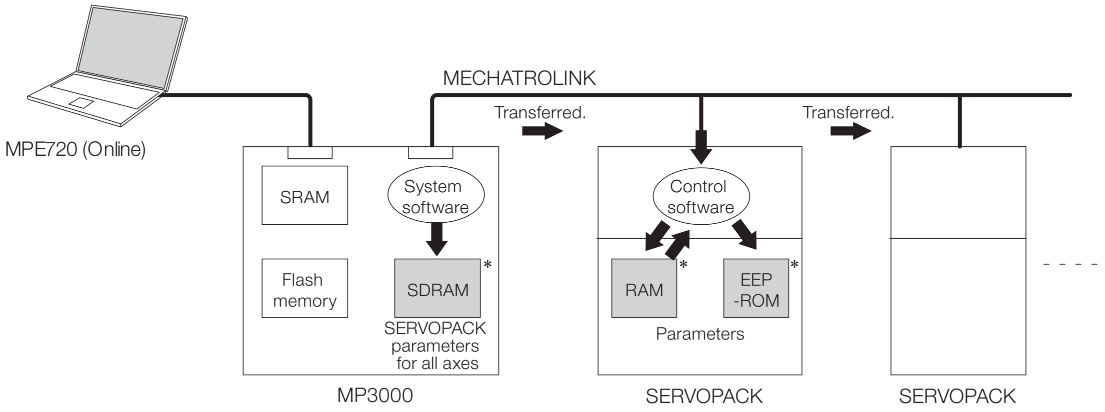
The flow of data for the SERVOPACK parameters when parameters are saved on the SERVOPACK Tab Page is shown below.

Refer to the following section for the procedure to display the SERVOPACK Tab Page.

☞ *7.3.1 Displaying and Setting Motion Parameters* on page 7-19

The MPE720 writes all of the parameters that are displayed on the SERVOPACK Tab Page for the relevant axes to the following locations.

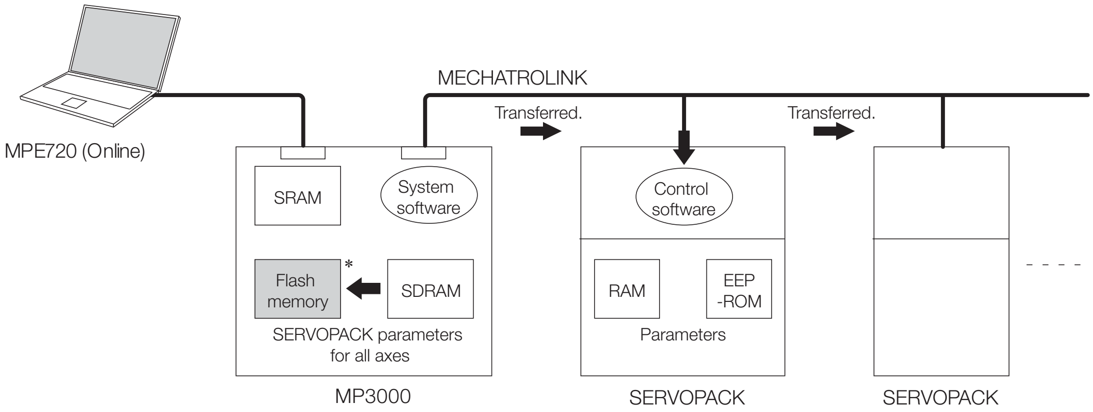
- Hard disk drive of the PC
- SDRAM in the MP3000
- RAM and EEPROM in the SERVOPACK



* ▨ indicates the data that is written.

7.4.5 When Saving Data to Flash Memory

When data is saved to flash memory, the MP3000 writes the settings of the parameters that are stored in SDRAM to flash memory.



* ▨ indicates the data that is written.

Note: Always save all of the SERVOPACK parameter settings to the flash memory after any changes are made.

Sample Programming

This chapter provides sample programming for a machine model with a simple structure to enable the user to better understand programming of motion control.

8.1 One Axis Positioning

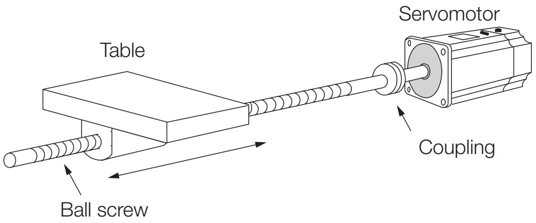
This section provides an example of positioning for a machine with a table mounted on a ball screw that is directly coupled to a motor.

Important

This section describes the basic programming necessary to move the machine. The example in this section does not include interlocks or other elements that must be included for an actual system.

8.1.1 Machine Configuration

The following figure shows the machine configuration used in this example, which moves a table horizontally with a ball screw that is directly driven by the Servomotor. The ball screw lead (i.e., the travel distance for one rotation) is 6 mm.



8.1.2 Related Parameters

The parameters that are related to the sample programming are listed in the following table.

Fixed Parameters

No.	Setting	Description
0	0	Normal operation mode
1	0000 hex	Finite length, software limits disabled, overtravel detection disabled, etc.
2	0000 hex	Masking disabled.
4	1	Selected reference unit: mm
5	3	Number of digits below decimal point: 3 (i.e., 1 reference unit = 0.001 mm)
6	6000	Travel distance per machine rotation: 6,000 reference units = 6 mm
8	1	Servomotor gear ratio term: 1 (This is because the ball screw is directly driven by the motor.)
9	1	Machine gear ratio term: 1 (This is because the ball screw is directly driven by the motor.)
29	0	Rotary motor
30	1	Absolute encoder
34	3000	Rated motor speed: 3,000 min^{-1}
36	1048576	Number of pulses per motor rotation: 1,048,576 P/R

Note: The default settings are used for the shaded parameters.

Setting Parameters

The SVC Function Module, circuit number 1, and axis number 1 are used. The motion register addresses of the setting parameters are OW08000 to OW0807F.

Information OB or OL may be used in some register addresses in place of OW, depending on the data size.

Monitor Parameters

The SVC Function Module, circuit number 1, and axis number 1 are used. The motion register addresses of the monitor parameters are IW08000 to IW0807F.

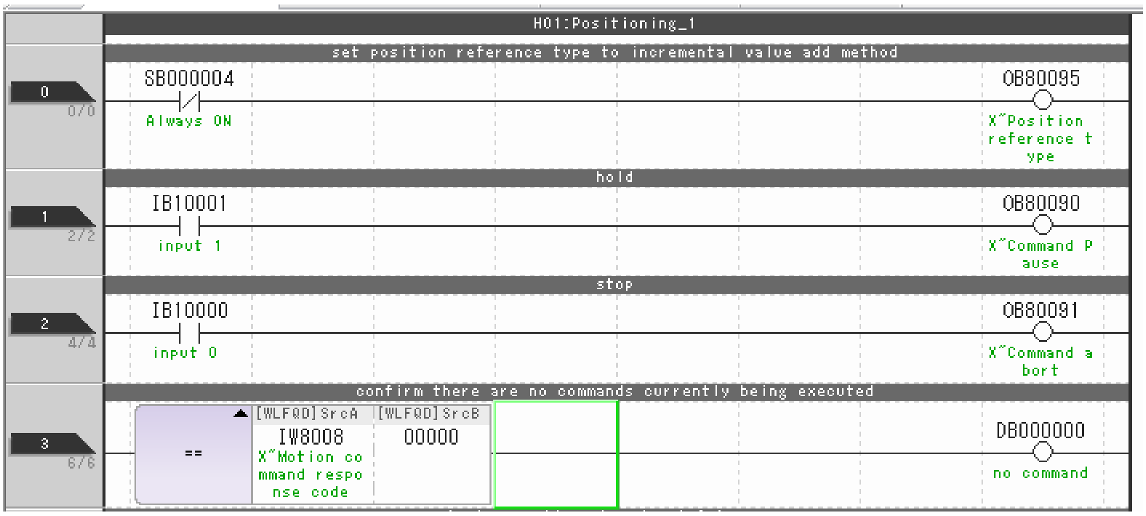
Information IB or IL may be used in some register addresses in place of IW, depending on the data size.

8.1.3 Sample Programming

Sample programming that can be used to position one axis is described below.

Positioning One Axis with a Ladder Program

An example of a ladder program that uses motion commands (positioning command code = 1) to position an axis is shown in the following figure.

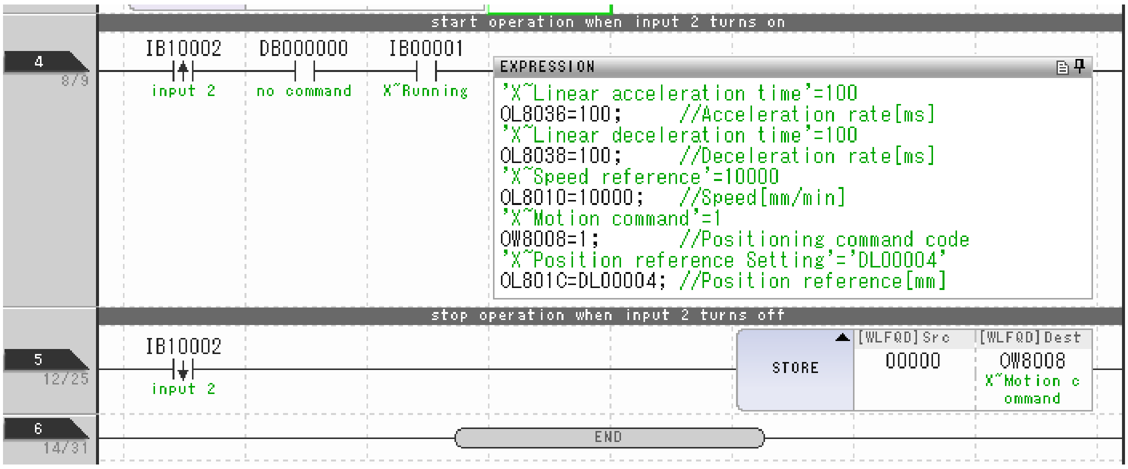


Line 0: The position reference type is set to the incremental value addition method.

Line 1: While input 1 (IB010001) is ON, the positioning operation is paused. When input 1 turns ON, the axis decelerates to a stop. When input 1 turns OFF, the axis moves the remaining distance required to complete the positioning operation.

Line 2: When input 0 (IB010000) turns ON, the axis decelerates to a stop and the positioning operation is interrupted.

Line 3: It is confirmed that target axis is not executing other commands.



```
start operation when input 2 turns on
4  8/9
IB10002        DB000000       IB00001
input 2        no command     X~Running
EXPRESSION
'X~Linear acceleration time'=100
OL8036=100;      //Acceleration rate[ms]
'X~Linear deceleration time'=100
OL8038=100;      //Deceleration rate[ms]
'X~Speed reference'=10000
OL8010=10000;    //Speed[mm/min]
'X~Motion command'=1
OW8008=1;        //Positioning command code
'X~Position reference Setting'='DL00004'
OL801C=DL00004; //Position reference[mm]

stop operation when input 2 turns off
5  12/25
IB10002
input 2
STORE   [WLFQD]Src   [WLFQD]Dest
        00000        OW8008
                     X~Motion command
6  14/31
END
```

Line 4: When input 2 (IB010002) turns ON, positioning is executed. Input 2 (IB010002) is left ON during positioning. The acceleration/deceleration time, speed, and motion command travel distance are set in setting parameters with the EXPRESSION instruction.

Line 5: When input 2 (IB010002) turns OFF, the motion command is set to NOP, and the positioning operation stops.

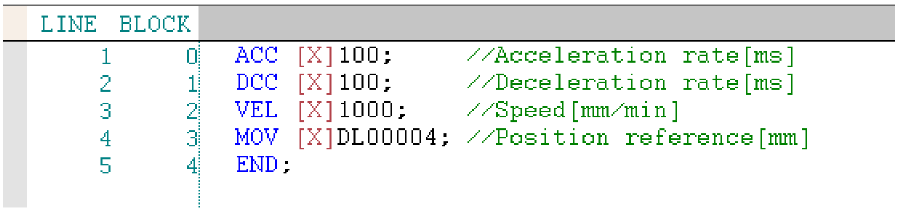
Positioning One Axis with a Motion Program

Motion programs are used to program the movements of axes, but to execute a motion program, it must be called with a ladder program. Motion programs are used in sets with ladder programs.

◆ Motion Program

An example of motion programming in which the target axis has been designated as Axis X is shown in the following figure.

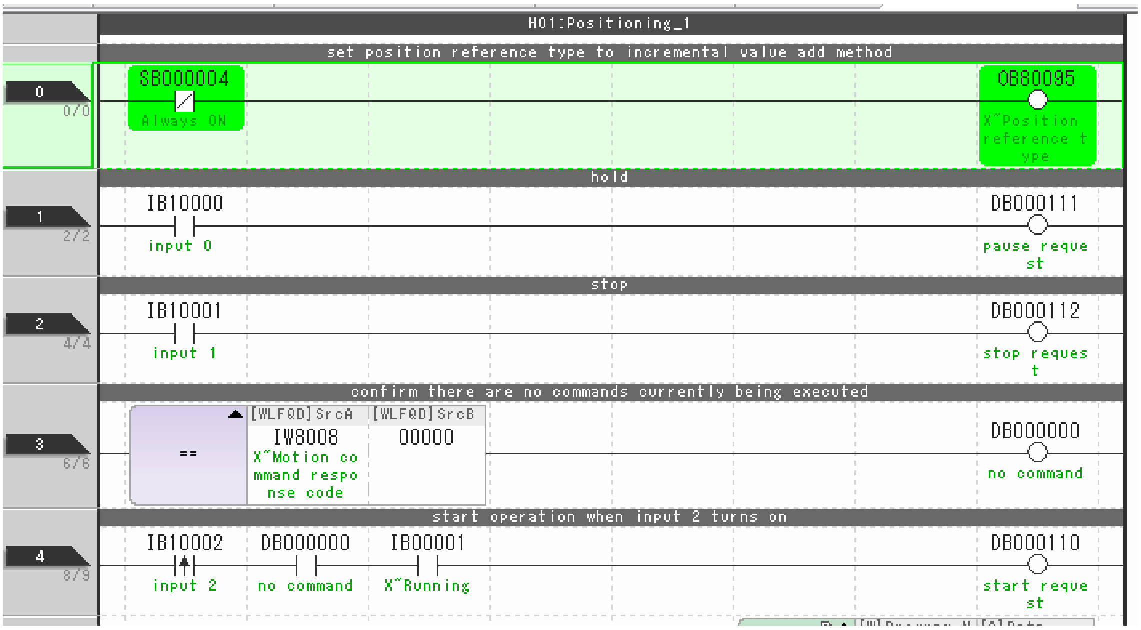
This motion program has been registered as MPM001.



```
ACC [X]100;      //Acceleration rate[ms]
DCC [X]100;      //Deceleration rate[ms]
VEL [X]1000;     //Speed[mm/min]
MOV [X]DL00004;  //Position reference[mm]
END;
```

◆ Calling Motion Programs with Ladder Programs

In the following figure, one axis is positioned by calling a motion program with a ladder program.



Line 0: The position reference type is set to the incremental value addition method.

Line 1: While input 1 (IB010000) is ON, the positioning operation is paused. When input 1 turns ON, the axis decelerates to a stop. When input 1 turns OFF, the axis moves the remaining distance required to complete the positioning operation.

Line 2: While input 1 (IB010001) is ON, the positioning operation is paused. When input 1 turns ON, the axis decelerates to a stop. When input 1 turns OFF, the axis moves the remaining distance required to complete the positioning operation.

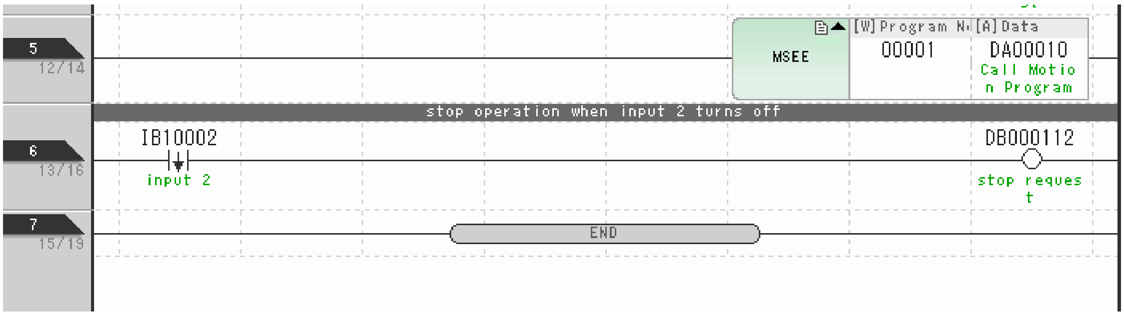
Line 3: It is confirmed that the target axis is not executing other motion commands.

Line 4: When input 2 (IB010002) turns ON, the motion program start request (DB0000110) will turn ON, and execution of the MPM001 motion program will start. The execution of the motion program is continued while input 2 is ON.

The operation start request signal is bit 0 of the second word in the work registers that are used by the MSEE instruction.

Refer to the following manual for details on the work registers.

📖 Machine Controller MP3000 Series Motion Programming Manual (Manual No.: SIEP C880725 14)



Line 5: The MPM001 motion program is called.

Lines 6 and 7: When input 2 (IB010002) turns OFF, the motion program stop request (DB0000112) will turn ON, and execution of the MPM001 motion program will stop. The axis decelerates to a stop.

The operation stop request signal is bit 2 of the second word in the work registers that are used with the MSEE instruction.

Refer to the following manual for details on the work registers.

📖 Machine Controller MP3000 Series Motion Programming Manual (Manual No.: SIEP C880725 14)

8.2 Interpolation of Two Axes

This section gives examples of linear interpolation and circular interpolation for a machine with two orthogonal axes that are mounted on ball screws directly driven by Servomotors. The machine is programmed with a motion program. Control with a ladder program that uses motion commands is also possible, but it requires complex programming. An example of a motion program is provided in this manual.

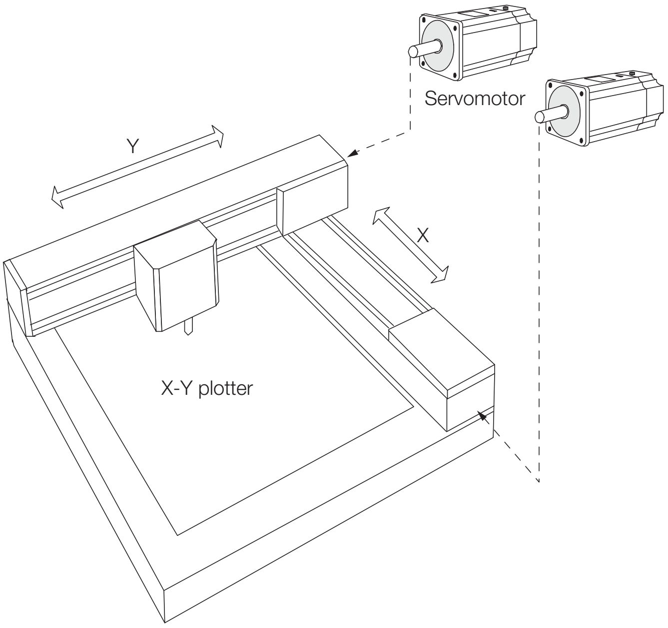
Important

This section describes the basic programming necessary to move the machine. The example in this section does not include interlocks or other elements that must be included for an actual system.

8.2.1 Machine Configuration

The machine configuration that is used in this example consists of an X-Y plotter that has two orthogonal axes as shown below.

The ball screw lead (i.e., the travel distance for one rotation) is 6 mm for each axis.



8.2.2 Related Parameters

The parameters that are related to the sample programming are listed in the following table.

Fixed Parameters

The following table gives the fixed parameter settings for both the axis X and axis Y in this example.

No.	Setting	Description
0	0	Normal operation mode
1	0001 hex	Finite length, software limits disabled, overtravel detection disabled, etc.
2	0000 hex	Masking disabled.
4	1	Selected reference unit: mm
5	3	Number of digits below decimal point: 3 (i.e., 1 reference unit = 0.001 mm)
6	6000	Travel distance per machine rotation: 6,000 reference units = 6 mm
8	1	Servomotor gear ratio term: 1 (This is because the ball screw is directly driven by the motor.)
9	1	Machine gear ratio term: 1 (This is because the ball screw is directly driven by the motor.)
29	0	Rotary motor
30	1	Absolute encoder
34	3000	Rated motor speed: 3,000 min^{-1}
36	1048576	Number of pulses per motor rotation: 1,048,576 P/R

Note: The default settings are used for the shaded parameters.

Setting Parameters

The SVC Function Module, circuit number 1, axis number 1 for axis X, and axis number 2 for axis Y are used. The motion register addresses of the setting parameters for axis X are OW08000 to OW0807F. The motion register addresses of the setting parameters for axis Y are OW08080 to OW080FF.

Information OB or OL may be used in some register addresses in place of OW, depending on the data size.

Monitor Parameters

The SVC Function Module, circuit number 1, axis number 1 for axis X, and axis number 2 for axis Y are used. The motion register addresses of the monitor parameters for axis X are IW08000 to IW0807F. The motion register addresses of the monitor parameters for axis Y are IW08080 to IW080FF.

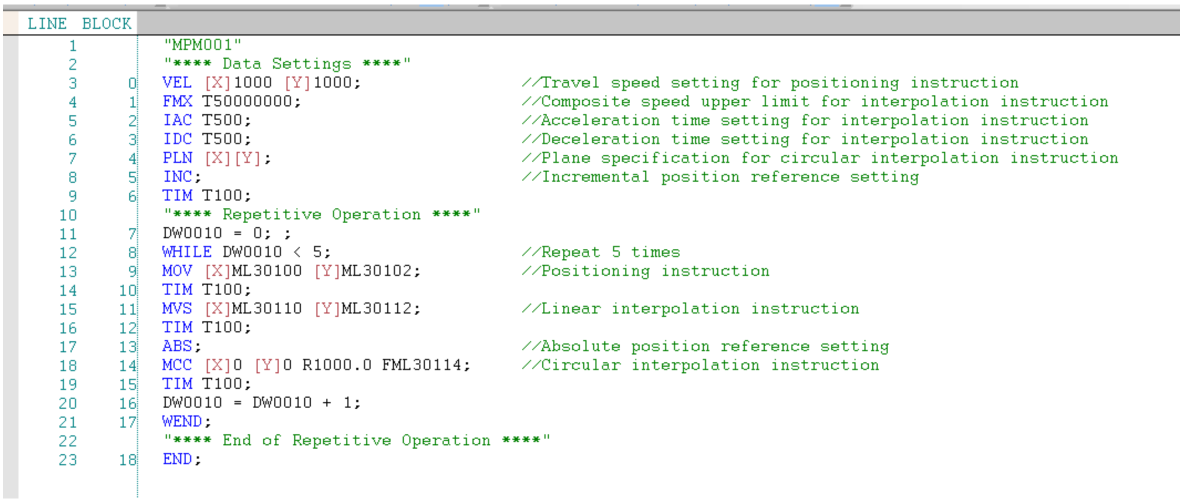
Information IB or IL may be used in some register addresses in place of IW, depending on the data size.

8.2.3 Sample Programming

This section provides sample programming in which linear interpolation and circular interpolation are programmed with a motion program.

Motion Program

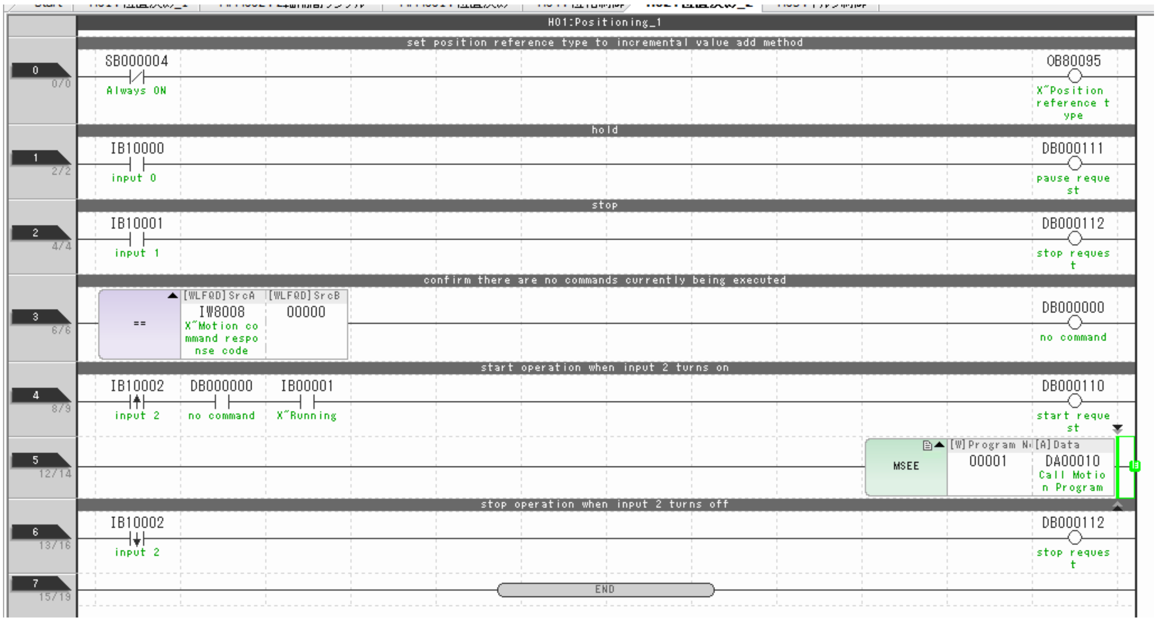
Linear interpolation and circular interpolation are programmed in one motion program. Position references are incremental values, and the interpolation operations are repeated five times. This motion program has been registered as MPM001.



```
"MPM001"
"**** Data Settings ****"
VEL [X]1000 [Y]1000;             //Travel speed setting for positioning instruction
FMX T50000000;                   //Composite speed upper limit for interpolation instruction
IAC T500;                        //Acceleration time setting for interpolation instruction
IDC T500;                        //Deceleration time setting for interpolation instruction
PLN [X][Y];                      //Plane specification for circular interpolation instruction
INC;                             //Incremental position reference setting
TIM T100;
"**** Repetitive Operation ****"
DW0010 = 0; ;
WHILE DW0010 < 5;                //Repeat 5 times
MOV [X]ML30100 [Y]ML30102;       //Positioning instruction
TIM T100;
MVS [X]ML30110 [Y]ML30112;       //Linear interpolation instruction
TIM T100;
ABS;                             //Absolute position reference setting
MCC [X]0 [Y]0 R1000.0 FML30114;  //Circular interpolation instruction
TIM T100;
DW0010 = DW0010 + 1;
WEND;
"**** End of Repetitive Operation ****"
END;
```

Calling Motion Programs with Ladder Programs

In the following ladder program, linear interpolation and circular interpolation are performed for two axes by calling an interpolation motion program.



8.3 Torque Control

This section provides an example of torque control. The torque control is programmed with a ladder program that uses motion commands.

Important This section describes the basic programming necessary to move the machine. The example in this section does not include interlocks or other elements that must be included for an actual system.

8.3.1 Machine Configuration

The machine configuration is the same as in *8.1 One Axis Positioning*.

Refer to the following section for details on the machine configuration.

☞ *8.1.1 Machine Configuration* on page 8-2

8.3.2 Related Parameters

The parameters that are related to the sample programming are listed in the following table.

Fixed Parameters

No.	Setting	Description
0	0	Normal operation mode
1	0001 hex	Finite length, software limits disabled, overtravel detection disabled, etc.
2	0000 hex	Masking disabled.
4	1	Selected reference unit: mm
5	3	Number of digits below decimal point: 3 (i.e., 1 reference unit = 0.001 mm)
6	6000	Travel distance per machine rotation: 6,000 reference units = 6 mm
8	1	Servomotor gear ratio term: 1 (This is because the ball screw is directly driven by the motor.)
9	1	Machine gear ratio term: 1 (This is because the ball screw is directly driven by the motor.)
29	0	Rotary motor
30	1	Absolute encoder
34	3000	Rated motor speed: 3,000 min^{-1}
36	1048576	Number of pulses per motor rotation: 1,048,576 P/R

Note: The default settings are used for the shaded parameters.

Setting Parameters

The SVC Function Module, circuit number 1, and axis number 1 are used. The motion register addresses of the setting parameters are OW08000 to OW0807F.

Information OB or OL may be used in some register addresses in place of OW, depending on the data size.

Monitor Parameters

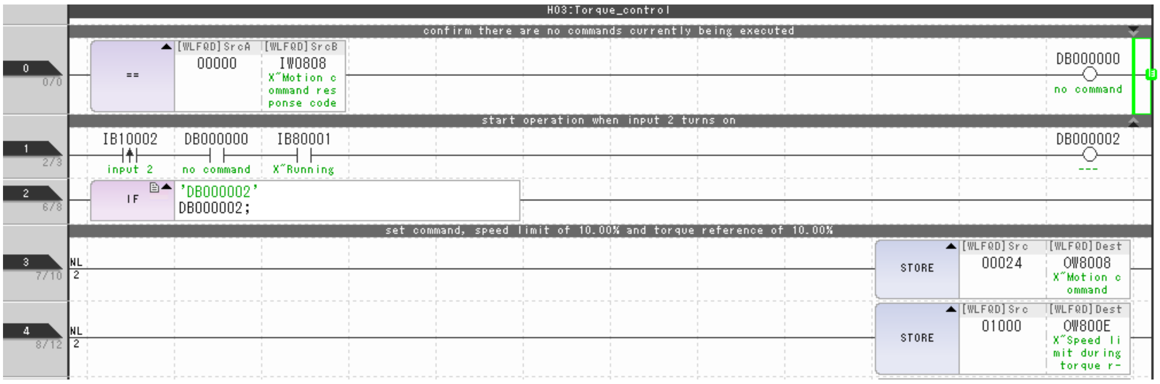
The SVC Function Module, circuit number 1, and axis number 1 are used. The motion register addresses of the monitor parameters are IW08000 to IW0807F.

Information IB or IL may be used in some register addresses in place of IW, depending on the data size.

8.3.3 Sample Programming

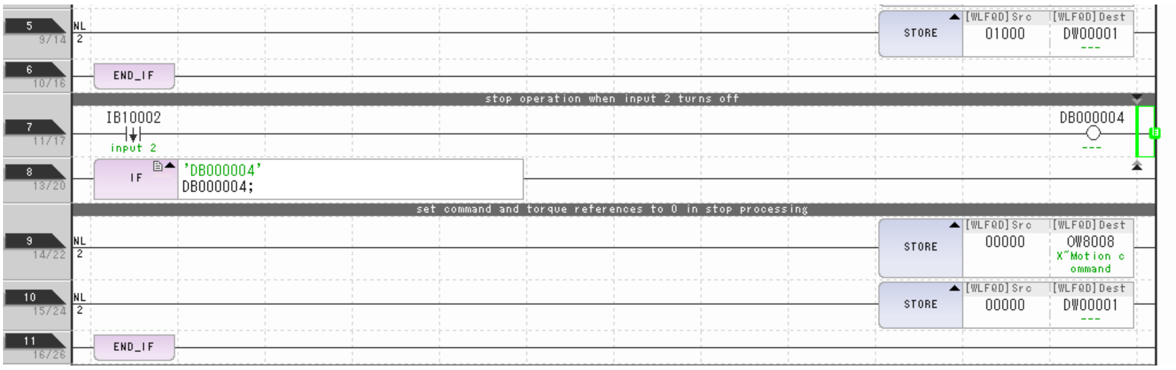
An example of ladder programming that uses a motion command (torque command code = 24) to perform torque control is shown in the following figures.

When torque control is performed, a speed limit is applied to keep the speed from accelerating more than necessary.

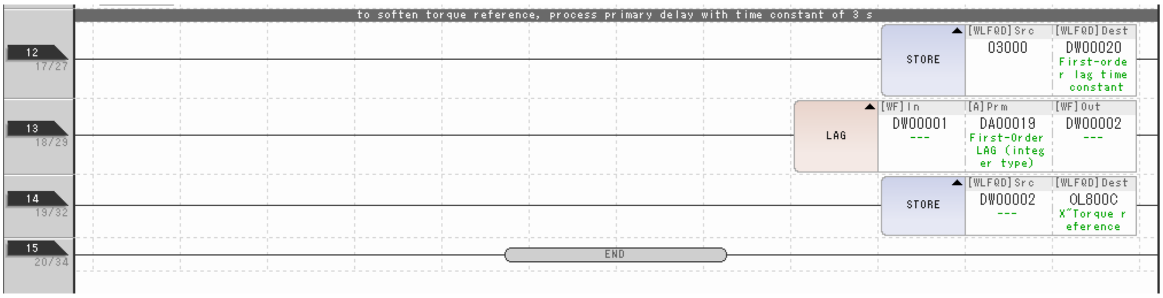


Line 3: The torque command code is set in the motion command register.

Line 4: The speed limit is specified.



Line 5: The torque reference value is set in DW00001. Lines 12 to 15 apply a filter to the reference value.



Lines 12 to 15: A first order lag filter is applied to the torque reference value. The first order lag time constant is three seconds.

8.4 Phase Control

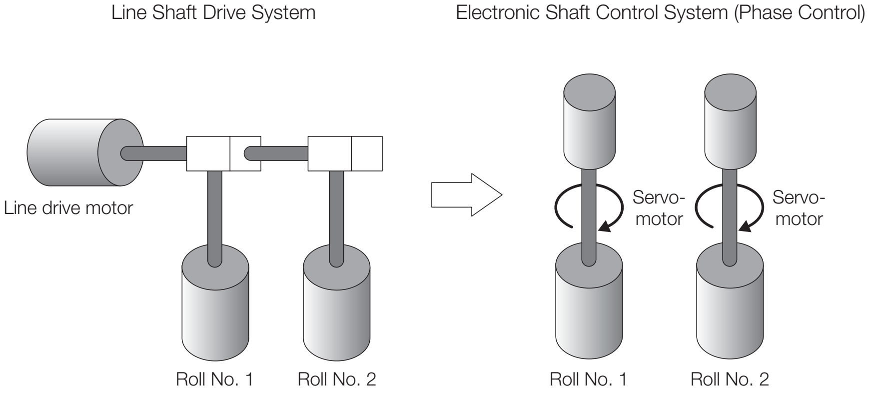
This section gives an example of programming an electronic shaft to replace the physical shaft of a mechanical line shaft.

Important

This section describes the basic programming necessary to move the machine. The example in this section does not include interlocks or other elements that must be included for an actual system.

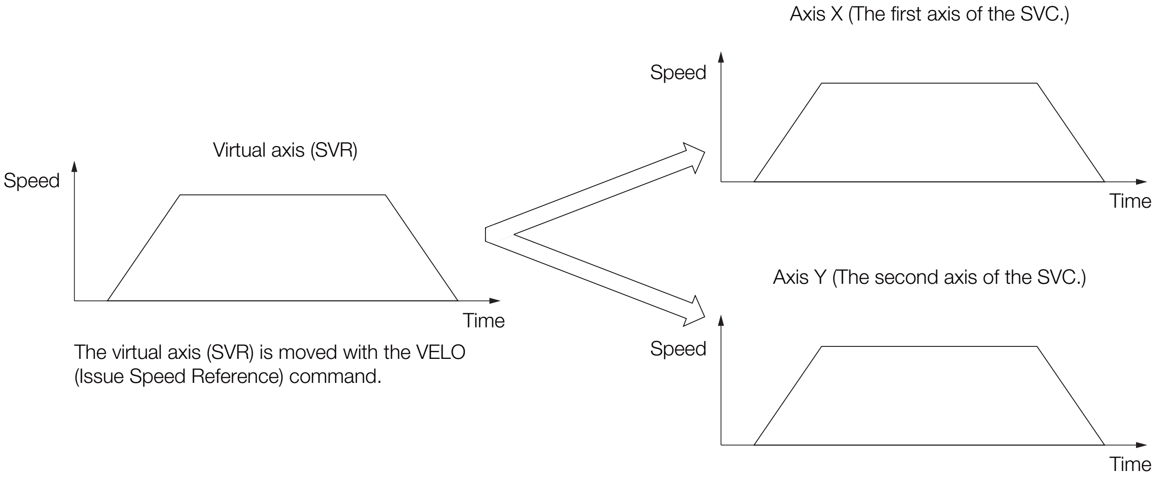
8.4.1 Machine Configuration

In this example, the line drive motor of a mechanical line shaft is replaced with a virtual axis using the SVR Function Module. The sectional drive axes (i.e., two axes of the SVC Function Module) are synchronized with the virtual axis in SVR Function Module.



The advantage of an electronic shaft is that by having no drive system (i.e., no gear), the variations in mechanical precision that occur in drive systems are eliminated, which allows the machine to operate with greater accuracy. The need for drive system maintenance is also eliminated. This continuous multi-axis synchronized control is implemented with phase control using the PHASE motion command. Motion programs are designed to perform positioning and cannot be used for this kind of control.

This example uses operational patterns like those shown in the following figures.



The virtual axis (SVR) is moved with the VELO (Issue Speed Reference) command.

The feedback position of the virtual axis (SVC) is copied to the position references for both axes, and synchronized operation of the two axes is performed with the PHASE command.

8.4.2 Related Parameters

The parameters that are related to the sample programming are listed in the following table.

The SVC Function Module, roll No. 1 (electronic shaft) for axis X, and roll No. 2 (electronic shaft) for axis Y are used.

Fixed Parameters

The following table gives the fixed parameter settings for both the axis X and axis Y in this example.

No.	Setting	Description
0	0	Normal operation mode
1	0001 hex	Finite length, software limits disabled, overtravel detection disabled, etc.
2	0000 hex	Masking disabled.
4	1	Selected reference unit: degrees
5	3	Number of digits below decimal point: 3 (i.e., 1 reference unit = 0.001 degrees)
6	360000	Travel distance per machine rotation: 360,000 reference units = 360.000 degrees
8	1	Servomotor gear ratio term: 1 (This is because the ball screw is directly driven by the motor.)
9	1	Machine gear ratio term: 1 (This is because the ball screw is directly driven by the motor.)
29	0	Rotary motor
30	1	Incremental encoder
34	3000	Rated motor speed: 3,000 min^{-1}
36	1048576	Number of pulses per motor rotation: 1,048,576 P/R

Note: The default settings are used for the shaded parameters.

Setting Parameters

Axis 1 of the SVR is used as the virtual axis. The motion register addresses of the setting parameters are OW08800 to OW0887F. Two axes of the SVC Function Module are used as physical axes. The motion register addresses of the setting parameters for axis X are OW08000 to OW0807F. The motion register addresses of the setting parameters for axis Y are OW08080 to OW080FF.

Information OB or OL may be used in some register addresses in place of OW, depending on the data size.

The SVR Function Module circuit number is set to 2 and the axis number is set to 1. The SVC Function Module circuit number is set to 1, the axis number for axis X is set to 1, and the axis number for axis Y is set to 2.

The setting parameters for the SVR Function Module are set as follows:

- OL08803 = 0011 hex: Speed unit selection (10^n reference units/min) and acceleration/deceleration rate unit selection (ms)
- OL08836 = 100: Acceleration rate (ms)
- OL08838 = 100: Deceleration rate (ms)
- OL08810 = NNNNN: Speed reference value (deg/min) --- Set from an input register.
- OW08808 = 23: Speed command code (VELO command)

Monitor Parameters

Axis 1 of the SVR Function Module is used as the virtual axis. The motion register addresses of the monitor parameters are IW08800 to IW0887F.

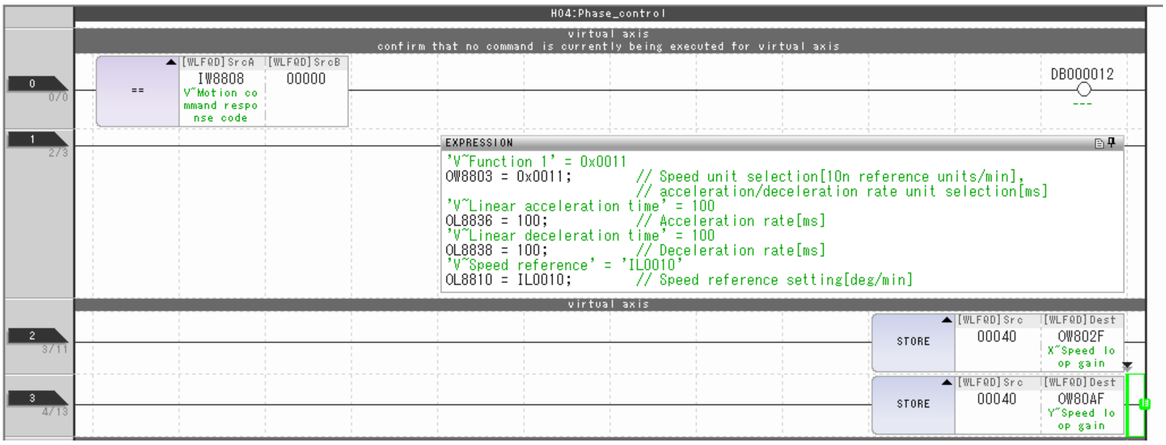
Two axes of the SVC Function Module are used as physical axes. The motion register addresses of the monitor parameters for axis X are IW08000 to IW0807F. The motion register addresses of the monitor parameters for axis Y are IW08080 to IW080FF.

Information IB or IL may be used in some register addresses in place of IW, depending on the data size.

The SVR Function Module circuit number is set to 2 and the axis number is set to 1. The SVC Function Module circuit number is set to 1, the axis number for axis X is set to 1, and the axis number for axis Y is set to 2.

8.4.3 Sample Programming

An example of a ladder programming that uses a motion command (PHASE command code = 25) to position an axis is shown the following figure.

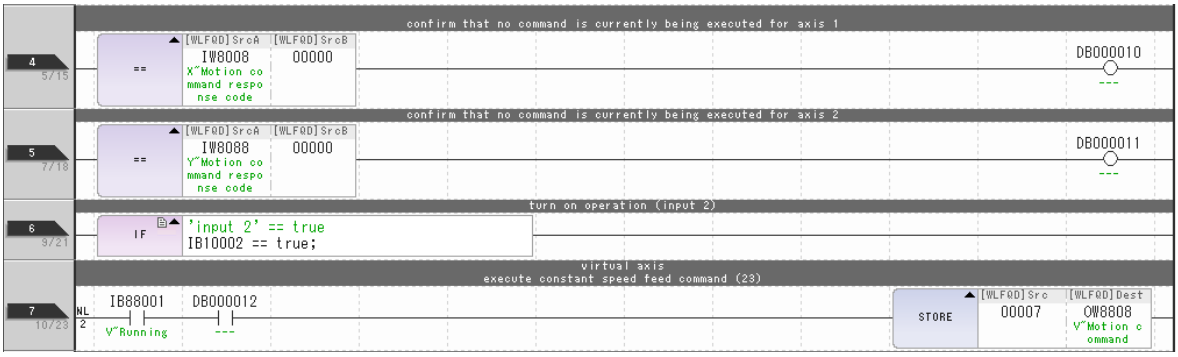


```
'V˜Function 1' = 0x0011
OW8803 = 0x0011;         // Speed unit selection[10n reference units/min],
                         // acceleration/deceleration rate unit selection[ms]
'V˜Linear acceleration time' = 100
OL8836 = 100;            // Acceleration rate[ms]
'V˜Linear deceleration time' = 100
OL8838 = 100;            // Deceleration rate[ms]
'V˜Speed reference' = 'IL0010'
OL8810 = IL0010;         // Speed reference setting[deg/min]
```

Line 0: It is confirmed that the virtual axis is not executing any command.

Line 1: Settings required for virtual axis operation are made. The speed reference is read from input register IL00010.

Lines 2 and 3: The speed loop gains are set for the two physical axes.

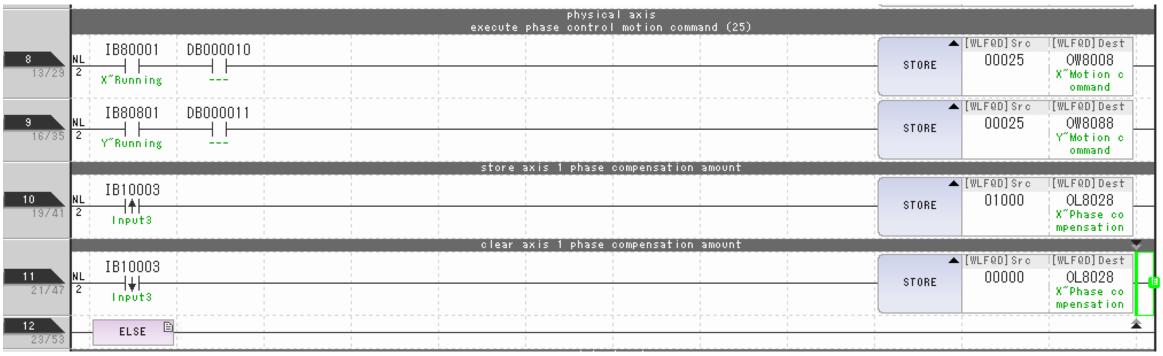


```
'input 2' == true
IB10002 == true;
```

Lines 4 and 5: It is confirmed that both SVC axes are not executing any command.

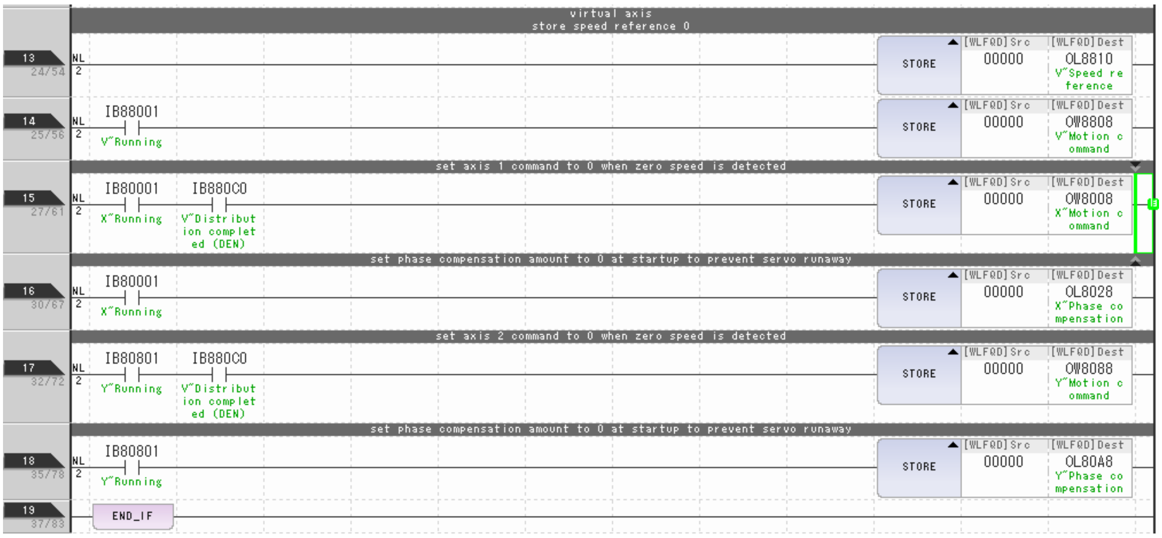
Line 6: If the operation command (IB010002) is ON, lines 7 to 11 are executed and then execution proceeds to line 20. If the operation command is OFF, lines 13 to 18 are executed and then execution proceeds to line 20.

Line 7: A jogging command (FEED command) is executed for the virtual axis.



Lines 8 and 9: The Issue Phase Reference (PHASE) is executed for both of the SVC physical axes.

Lines 10 and 11: Phase compensation is set and cleared for SVC axis 1 (axis X). Phase compensation is applied on the rising edge of input signal IB010003. Phase compensation is canceled on the falling edge of input signal IB010003.

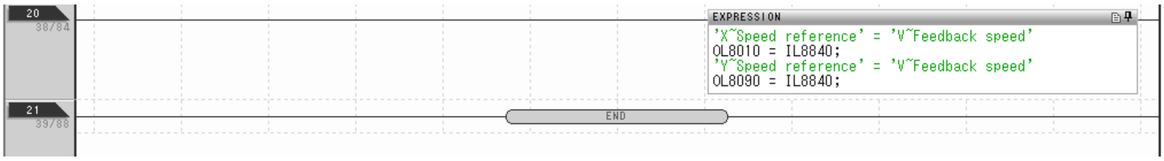


Lines 13 to 18: Processing is performed when the operation command (IB010002) is OFF and stopping processing is performed when the operation command changes from ON to OFF.

Lines 13 and 14: The speed reference value for the virtual axis is set to 0, and the motion command is set to NOP.

Lines 15 and 17: Virtual axis commands are completed, and NOP is sent to the SVC axes.

Lines 16 and 18: The phase bias of the SVC axes is set to 0. The phase bias is cleared in preparation for the start of operation.



```
'X~Speed reference' = 'V~Feedback speed'
OL8010 = IL8840;
'Y~Speed reference' = 'V~Feedback speed'
OL8090 = IL8840;
```

Line 20: The reference speed is set for the SVC axes. The reference speed is the feedback speed for the virtual axis.

Stepping Motor Drive Operation

9

Of the information that is necessary to use the SVC Function Module to perform motion control with a Stepping Motor Drive, this chapter provides only the information that is different from when a Servo Drive is connected.

9.1 Overview

A Stepping Motor Drive can be operated with the same commands as a SERVOPACK. Operate a Stepping Motor Drive according to the instructions in this manual.

This chapter provides only the information that is different from when a SERVOPACK is connected.

9.2 Connection Specifications

The following table lists the specifications for a Stepping Motor Drive connection.

Item		Description
Applicable models	SVC and SVC32 Function Modules	MP3200 SVC32: Version 1.18 or later MP3300 SVC/SVC32: Version 1.18 or later
	Engineering Tool	MPE720 Version 7: Version 7.33 or later
Number of Inverters that can be connected		SVC: 16 max. SVC32: 32 max.
Transmission cycle		SVC: 125 μs, 250 μs, 500 μs, or 1 ms SVC32: 125 μs, 250 μs, 500 μs, 1 ms, 1.5 ms, 2 ms, or 3 ms
Interface		Fixed parameters (usage condition settings) Setting parameters (updating references and output data) Monitor parameters (updating monitor and input data)
Self configuration		Supported.
Others		Compliant with the MECHATROLINK-III standard Stepping Motor Drive profile specifications.

9.3 Parameter Support Table

9.3.1 Fixed Parameter Table

The following table lists the fixed parameters.

Refer to the pages in the *Reference Page* column for details on the fixed parameters in the following table.

No.	Name	Description	Stepping Motor	Servomotor	Reference Page
0	Operation Mode Selection	0: Normal Operation Mode	✓	✓	page 3-27
		1: Unused Axis (Axis unused)	✓	✓	
		2: Simulation Mode	✓	✓	
		3: SERVOPACK Transmission Reference Mode	✓	✓	
		4 and 5: Reserved.	–	–	
1	Function Selection Flags 1	Bit 0: Axis Selection 0: Finite-length axis 1: Infinite-length axis	✓	✓	page 3-28
		Bit 1: Enable Positive Software Limit (Soft limit (positive direction) enable/disable) 0: Disabled, 1: Enabled	✓	✓	
		Bit 2: Enable Negative Software Limit (Soft limit (negative direction) enable/disable) 0: Disabled, 1: Enabled	✓	✓	
		Bit 3: Enable Positive Overtravel (Overtravel positive direction enable/disable) 0: Disabled, 1: Enabled	✓	✓	
		Bit 4: Enable Negative Overtravel (Overtravel negative direction enable/disable) 0: Disabled, 1: Enabled	✓	✓	
		Bits 5 to 7: Reserved.	–	–	
		Bit 8: Interpolation Segment Distribution Processing 0: Enabled, 1: Disabled	✓	✓	
		Bit 9: Simple Absolute Infinite Axis Position Management (Simple ABS rotary Pos. mode) 0: Disabled, 1: Enabled	✓	✓	
		Bit A: SERVOPACK Parameter Auto-Write (User constants self-writing function) 0: Enabled, 1: Disabled	✓	✓	
		Bit B: User-specified SERVOPACK Parameter Auto-Write (User select User constants self-writing function) 0: Disabled, 1: Enabled	✓	✓	
		Bit C: Software Limit Parameter Selection (Soft limit parameter selection) 0: Fixed parameter 1: Setting parameter	✓	✓	
		Bits D to F: Reserved.	–	–	

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No.	Name	Description	Stepping Motor	Servomotor	Reference Page
2	Function Selection Flags 2	Bit 0: Mask Communications Error Detection (Communication abnormality detection mask) 0: Disabled, 1: Enabled	✓	✓	page 3-30
		Bit 1: Mask Watchdog Error Detection (WDT abnormality detection mask) 0: Disabled, 1: Enabled	✓	✓	
		Bits 2 to 4: Reserved.	–	–	
		Bit 5: Finite-length Multiturn Limit Setting Mismatch Detection Mask (Multiturn Limit Setting Mismatch Detection Mask) 0: Disabled, 1: Enabled	✓	✓	
		Bits 6 to F: Reserved.	–	–	
3	–	Reserved.	–	–	–
4	Reference Unit Selection	0: Pulses 1: mm 2: Degrees 3: Inches 4: µm	✓	✓	page 3-31
5	Number of Digits Below Decimal Point	1 = 1 digit	✓	✓	page 3-31
6	Travel Distance per Machine Rotation (Rotary Motor)	1 = 1 reference unit	✓	✓	page 3-32
	Linear Scale Pitch (Linear Motor)	1 = 1 reference unit	–	✓	page 3-32
8	Servomotor Gear Ratio Term	1 = 1 revolution	✓	✓	page 3-32
9	Machine Gear Ratio Term	1 = 1 revolution	✓	✓	page 3-32
10	Infinite-length Axis Reset Position (POSMAX)	1 = 1 reference unit	✓	✓	page 3-32
12	Positive Software Limit	1 = 1 reference unit	✓	✓	page 3-33
14	Negative Software Limit	1 = 1 reference unit	✓	✓	page 3-33
16 to 28	–	Reserved.	–	–	–
29	Motor Type Selection	0: Rotary motor 1: Linear motor	–	✓	page 3-33
30	Encoder Selection	0: Incremental encoder 1: Absolute encoder 2: Absolute encoder used as incremental encoder (Absolute encoder (Incremental encoder is used)) 3: Reserved.	✓	✓	page 3-33
31 to 33	–	Reserved.	–	–	–
34	Rated Motor Speed (Rotary Motor)	1 = 1 min^{-1}	✓	✓	page 3-34
	Rated Speed (Linear Motor)	1 = 0.1 m/s	–	✓	page 3-34

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No.	Name	Description	Stepping Motor	Servomotor	Reference Page
36	Number of Pulses Per Motor Rotation (Rotary Motor)	1 = 1 pulse/rev	✓	✓	page 3-34
	Number of Pulses Per Linear Scale Pitch (Linear Motor)	1 = 1 pulse/scale pitch	–	✓	page 3-34
38	Maximum Number of Absolute Encoder Rotations	1 = 1 revolution	✓	✓	page 3-35
40 to 41	–	Reserved.	–	–	–
42	Feedback Speed Movement Averaging Time Constant	1 = 1 ms	✓	✓	page 3-35
43	–	Reserved.	–	–	–
44	User-specified SERVOPACK Parameter Number	The SERVOPACK parameter number to apply automatically.	✓	✓	page 3-35
45	User-specified SERVOPACK Parameter Size	The data size of the above SERVOPACK parameter. 1 = 1 W	✓	✓	page 3-35

9.3.2 Setting Parameter Table

The following table lists the setting parameters.

Refer to the pages in the *Reference Page* column for details on the setting parameters in the following table.

Information The box characters (□□□) in “OW□□□00” are determined by the circuit number and the axis number. Refer to the following section for details on register addresses.
☞ *3.2 Motion Parameter Registers* on page 3-3

Register Address	Name	Description	Stepping Motor	Servomotor	Reference Page
OW□□□00	Run Command Settings	Bit 0: Servo ON 0: OFF, 1: ON	✓	✓	page 3-36
		Bit 1: Machine Lock 0: Machine lock mode released 1: Machine lock mode	✓	✓	
		Bits 2 and 3: Reserved.	–	–	
		Bit 4: Latch Detection Request (Latch detection demand) 0: OFF, 1: ON	✓	✓	
		Bit 5: Reserved.	–	–	
		Bit 6: Number of POSMAX Turns Preset Request (POSMAX turn number presetting demand) 0: OFF, 1: ON	✓	✓	
		Bit 7: Absolute Infinite-length Position Information Load Request (Request ABS rotary pos. load) 0: OFF, 1: ON	✓	✓	
		Bit 8: Positive External Torque/Force Limit Input (Forward outside limiting torque/thrust input) 0: OFF, 1: ON	✓	✓	
		Bit 9: Negative External Torque/Force Limit Input (Reverse outside limiting torque/thrust input) 0: OFF, 1: ON	✓	✓	
		Bit A: Reserved.	–	–	
		Bit B: Reset Integration (Integration reset) 0: OFF, 1: ON	✓	✓	
		Bit C: Reset Network (Network reset) 0: OFF, 1: ON	✓	✓	
		Bit D: Latch Completed Status Clear Request (Latch completion status clear request) 0: OFF, 1: ON	✓	✓	
		Bit E: Reset Communications (Communication reset) 0: OFF, 1: ON	✓	✓	
		Bit F: Clear Alarm (Alarm clear) 0: OFF, 1: ON	✓	✓	

Continued on next page.

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Register Address	Name	Description	Stepping Motor	Servomotor	Reference Page
OW□□□01	Mode Settings 1	Bit 0: Excessive Deviation Error Level Setting 0: Alarm, 1: Warning	✓	✓	page 3-39
		Bits 1 and 2: Reserved.	–	–	
		Bit 3: Speed Loop P/PI Switch 0: PI control, 1: P control	✓	✓	
		Bit 4: Switch Gain (Gain switch) 0: OFF, 1: ON	✓	✓	
		Bit 5: Switch Gain 2 (Gain switch 2) 0: OFF, 1: ON	✓	✓	
		Bits 6 to F: Reserved.	–	–	
OW□□□02	Mode Settings 2	Bits 0 to 7: Reserved.	–	–	page 3-40
		Bits 8 to F: Stop Mode Selection 0: Stop according to the Linear Deceleration Rate/Deceleration Time Constant parameter (Decelerate to a stop according to the linear deceleration time constant). 1: Stop immediately. (Stop reference output.)	✓	✓	
OW□□□03	Function Settings 1	Bits 0 to 3: Speed Unit Selection 0: Reference units/s (Reference unit/sec) 1: 10^n reference units/min 2: Percentage of rated speed (1 = 0.01%) 3: Percentage of rated speed (1 = 0.0001%)	✓	✓	page 3-40
		Bits 4 to 7: Acceleration/Deceleration Rate Unit Selection 0: Reference units/s^2 1: ms	✓	✓	
		Bits 8 to B: Filter Type Selection 0: No filter (Filter none) 1: Exponential acceleration/deceleration filter 2: Moving average filter	✓	✓	
		Bits C to F: Torque Unit Selection 0: Percentage of rated torque (1 = 0.01%) 1: Percentage of rated torque (1 = 0.0001%)	✓	✓	
OW□□□04	Function Settings 2	Bits 0 to 3: Latch Detection Signal Selection 0: – 1: – 2: Phase-C pulse 3: /EXT1 4: /EXT2 5: /EXT3	✓	✓	page 3-41
		Bits 4 to 7: External Positioning Signal Setting 0: – 1: – 2: Phase-C pulse 3: /EXT1 4: /EXT2 5: /EXT3	✓	✓	
		Bits 8 to F: Reserved.	–	–	

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Register Address	Name	Description	Stepping Motor	Servomotor	Reference Page
OW□□□05	Function Settings 3	Bit 0: Reserved.	–	–	page 3-41
		Bit 1: Disable Phase Reference Calculation 0: Enabled, 1: Disabled	✓	✓	
		Bit 2: External Positioning Final Travel Distance Write Selection 0: Automatically apply 1: Do not automatically apply	✓	✓	
		Bits 3 to A: Reserved.	–	–	
		Bit B: Zero Point Return Input Signal 0: OFF, 1: ON	✓	✓	
		Bits C to F: Reserved.	–	–	
OW□□□06	M-III Vendor-specific Servo Command Output Signal	Used as the Servo I/O areas.	✓	✓	page 3-42
OW□□□07	–	Reserved.	–	–	–

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Register Address	Name	Description	Stepping Motor	Servomotor	Reference Page
OW□□□08	Motion Commands	0: NOP (No Operation) (No command)	✓	✓	page 3-43
		1: POSING (Positioning)	✓	✓	
		2: EX_POSING (External Positioning)	✓	✓	
		3: ZRET (Zero Point Return)	✓	✓	
		4: INTERPOLATE (Interpolation)	✓	✓	
		5: Reserved.	–	–	
		6: LATCH (Latch) (Interpolation mode with latch input)	✓	✓	
		7: FEED (Jog) (Jog mode)	✓	✓	
		8: STEP (STEP Operation) (Relative position mode)	✓	✓	
		9: ZSET (Set Zero Point)	✓	✓	
		10: ACC (Change Acceleration Time)	✓	✓	
		11: DCC (Change Deceleration Time)	✓	✓	
		12: SCC (Change Filter Time Constant)	✓	✓	
		13: CHG_FILTER (Change Filter Type)	✓	✓	
		14: KVS (Change Speed Loop Gain)	✓	✓	
		15: KPS (Change Position Loop Gain)	✓	✓	
		16: KFS (Change Feedforward)	✓	✓	
		17: PRM_RD (Read SERVOPACK Parameter) (Read user constant)	✓	✓	
		18: PRM_WR (Write SERVOPACK Parameter) (Write user constant)	✓	✓	
		19: ALM_MON (Monitor Alarms) (Alarm monitor)	✓	✓	
		20: ALM_HIST (Monitor Alarm History) (Alarm history monitor)	✓	✓	
		21: ALMHIST_CLR (Clear Alarm History)	✓	✓	
		22: ABS_RST (Reset Absolute Encoder)	–	✓	
		23: VELO (Issue Speed Reference) (Speed reference)	✓	✓	
		24: TRQ (Issue Torque/Force Reference) (Torque/Thrust reference)	✓	✓	
		25: PHASE (Issue Phase Reference) (Phase reference)	✓	✓	
		26: KIS (Change Position Loop Integral Time Constant)	✓	✓	
		27: PPRM_WR (Write Non-volatile Parameter) (Stored parameter write)	✓	✓	
		28 to 33: Reserved.	–	–	
		34: EX_FEED (Jog with External Positioning) (Jog mode with external positioning)	✓	✓	
		35: MEM_RD (Read Memory)	✓	✓	
		36: MEM_WR (Write Memory)	✓	✓	
		37: PMEM_RD (Read Non-volatile Memory)	✓	✓	
		38: PMEM_WR (Write Non-volatile Memory)	✓	✓	
		39: MLTTRN_SET (Multiturn Limit Setting)	–	✓	

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Register Address	Name	Description	Stepping Motor	Servomotor	Reference Page
OW□□□09	Motion Command Control Flags	Bit 0: Hold Command (Holds a command) 0: OFF, 1: ON	✓	✓	page 3-44
		Bit 1: Cancel Command (Interrupt a command) 0: OFF, 1: ON	✓	✓	
		Bit 2: Travel Direction (Moving direction (JOG/STEP)) 0: Forward, 1: Reverse	✓	✓	
		Bit 3: Zero Point Return Direction Selection 0: Reverse, 1: Forward	✓	✓	
		Bit 4: Latch Zone Enable (Latch zone effective selection) 0: Disabled, 1: Enabled	✓	✓	
		Bit 5: Position Reference Type 0: Incremental value addition method (Incremental value add method) 1: Absolute value specification method (Absolute value set method)	✓	✓	
		Bit 6: Electric Cam Phase Compensation Type (Phase Compensation Type) 0: Incremental addition method (Incremental value add method) 1: Absolute value specification method (Absolute value set method)	✓	✓	
		Bit 7: Reserved.	–	–	
		Bit 8: SERVOPACK Parameter Access Selection (Access target servo driver user constant) 0: Vendor-specific parameters 1: Common parameters	✓	✓	
		Bits 9 to F: Reserved.	–	–	
OW□□□0A	Motion Subcommands	0: NOP (No Operation)	✓	✓	page 3-45
		1: PRM_RD (Read SERVOPACK Parameter) (Read user constant)	✓	✓	
		2: PRM_WR (Write SERVOPACK Parameter) (Write user constant)	✓	✓	
		3: INF_RD (Read Device Information)	✓	✓	
		4: SMON (Monitor Status)	✓	✓	
		5: FIXPRM_RD (Read Fixed Parameter)	✓	✓	
		6: FIXPRM_CHG (Change Fixed Parameter) (Write fixed parameter)	✓	✓	
OW□□□0B	–	Reserved.	–	–	–
OL□□□0C	Torque/Force Reference Setting or Torque Feedforward Compensation	The unit is set in bits C to F (Torque Unit Selection) of OW□□□03.	✓	✓	page 3-46
OW□□□0E	Speed Limit for Torque/Force Reference	1 = 0.01% (percentage of rated speed)	✓	✓	page 3-46
OW□□□0F	–	Reserved.	–	–	–
OL□□□10	Speed Reference Setting	The unit is set in bits 0 to 3 (Speed Unit Selection) of OW□□□03.	✓	✓	page 3-47

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Register Address	Name	Description	Stepping Motor	Servomotor	Reference Page
OW□□□12	Speed Limit	1 = 0.01% (percentage of rated motor speed (rotary motor) or rated speed (linear motor))	✓	✓	page 3-47
OW□□□13	–	Reserved.	–	–	–
OL□□□14	Torque/Force Limit	The unit is set in bits C to F (Torque Unit Selection) of OW□□□03.	✓	✓	page 3-48
OL□□□16	Second Speed Compensation	The unit is set in bits 0 to 3 (Speed Unit Selection) of OW□□□03.	✓	✓	page 3-48
OW□□□18	Override	1 = 0.01%	✓	✓	page 3-49
OW□□□19 to OW□□□1B	–	Reserved.	–	–	–
OL□□□1C	Position Reference Setting	1 = 1 reference unit	✓	✓	page 3-49
OL□□□1E	Positioning Completion Width	1 = 1 reference unit	✓	✓	page 3-49
OL□□□20	NEAR Signal Output Width	1 = 1 reference unit	✓	✓	page 3-50
OL□□□22	Excessive Deviation Detection Value	1 = 1 reference unit	✓	✓	page 3-51
OL□□□24	–	Reserved.	–	–	–
OW□□□26	Positioning Completion Check Time	1 = 1 ms	✓	✓	page 3-51
OW□□□27	–	Reserved.	–	–	–
OL□□□28	Phase Compensation Setting	1 = 1 reference unit	✓	✓	page 3-52
OL□□□2A	Latch Zone Lower Limit Setting	1 = 1 reference unit	✓	✓	page 3-52
OL□□□2C	Latch Zone Upper Limit Setting	1 = 1 reference unit	✓	✓	
OW□□□2E	Position Loop Gain	1 = 0.1 /s	✓	✓	page 3-54
OW□□□2F	Speed Loop Gain	1 = 1 Hz	✓	✓	page 3-54
OW□□□30	Speed Feedforward Compensation	1 = 0.01% (percentage of distribution segment)	✓	✓	page 3-54
OW□□□31	Speed Compensation	1 = 0.01% (percentage of rated speed)	✓	✓	page 3-55
OW□□□32	Position Loop Integral Time Constant	1 = 1 ms	✓	✓	page 3-55
OW□□□33	–	Reserved.	–	–	–
OW□□□34	Speed Loop Integration Time Constant	1 = 0.01 ms	✓	✓	page 3-55
OW□□□35	–	Reserved.	–	–	–
OL□□□36	Linear Acceleration Rate/Acceleration Time Constant	The unit is set in bits 4 to 7 (Acceleration/Deceleration Rate Unit Selection) of OW□□□03.	✓	✓	page 3-56

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Register Address	Name	Description	Stepping Motor	Servomotor	Reference Page
OL□□□38	Linear Deceleration Rate/Deceleration Time Constant	The unit is set in bits 4 to 7 (Acceleration/Deceleration Rate Unit Selection) of OW□□□03.	✓	✓	page 3-56
OW□□□3A	Filter Time Constant	1 = 0.1 ms	✓	✓	page 3-57
OW□□□3B	Bias Speed for Indexed Deceleration/Acceleration Filter	The unit is set in bits 0 to 3 (Speed Unit Selection) of OW□□□03.	–	–	page 3-58
OW□□□3C	Zero Point Return Method	0: DEC1 + C pulse	✓	✓	page 3-58
		1: ZERO signal			
		2: DEC1 + ZERO signal			
		3: C pulse			
		4 to 10: Reserved.			
		11: C pulse only			
		12: P-OT + C pulse			
		13: P-OT only			
		14: HOME LS + C pulse			
		15: HOME only			
		16: N-OT + C pulse			
		17: N-OT only			
		18: INPUT + C pulse			
		19: INPUT only			
OW□□□3D	Zero Point Position Output Width	1 = 1 reference unit	✓	✓	page 3-59
OL□□□3E	Approach Speed	The unit is set in bits 0 to 3 (Speed Unit Selection) of OW□□□03.	✓	✓	page 3-59
OL□□□40	Creep Speed	The unit is set in bits 0 to 3 (Speed Unit Selection) of OW□□□03.	✓	✓	page 3-59
OL□□□42	Zero Point Return Travel Distance	1 = 1 reference unit	✓	✓	page 3-59
OL□□□44	STEP Travel Distance	1 = 1 reference unit	✓	✓	page 3-60
OL□□□46	External Positioning Final Travel Distance	1 = 1 reference unit	✓	✓	page 3-61
OL□□□48	Zero Point Position Offset in Machine Coordinate System	1 = 1 reference unit	✓	✓	page 3-61
OL□□□4A	Working Coordinate System Offset	1 = 1 reference unit	✓	✓	page 3-61
OL□□□4C	Number of POSMAX Turns Preset Data	1 = 1 revolution	✓	✓	page 3-62
OW□□□4E	SERVOPACK User Monitor Setting	Bits 0 to 3: Monitor 1 (Cannot be set.) Bits 4 to 7: Monitor 2 Bits 8 to B: Monitor 3 (Cannot be set.) Bits C to F: Monitor 4	✓	✓	page 3-62

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Register Address	Name	Description	Step-ping Motor	Servo-motor	Reference Page
OW□□□4F	SERVOPACK Alarm Monitor Number	Sets the number of the alarm to monitor.	✓	✓	page 3-63
OW□□□50	SERVOPACK Parameter Number	Sets the SERVOPACK parameter number.	✓	✓	page 3-63
OW□□□51	SERVOPACK Parameter Size	Sets the size of the SERVOPACK parameter in words.	✓	✓	page 3-63
OL□□□52	SERVOPACK Parameter Set Value	Sets the set value for the SERVOPACK parameter.	✓	✓	page 3-64
OW□□□54	Auxiliary SERVOPACK Parameter Number	Sets the SERVOPACK parameter number.	✓	✓	page 3-64
OW□□□55	Auxiliary SERVOPACK Parameter Size	Sets the size of the SERVOPACK parameter in words.	✓	✓	page 3-64
OL□□□56	Auxiliary SERVOPACK Parameter Set Value	Sets the set value for the SERVOPACK parameter.	✓	✓	page 3-64
OL□□□58	Address Setting	Sets the target address for the MEM_RD, MEM_WR, PMEM_RD, and PMEM_WR motion commands.	✓	✓	page 3-65
OW□□□5A	–	Reserved.	–	–	–
OW□□□5B	Device Information Selection Code	00 hex: Disabled 01 hex: Vendor ID code 02 hex: Device code 03 hex: Device version 04 hex: Device information file version 05 hex: Serial number	✓	✓	page 3-65
OW□□□5C	Fixed Parameter Number	Sets the number of the fixed parameter to read with the FIXPRM_RD motion subcommand.	✓	✓	page 3-65
OW□□□5D	–	Reserved.	–	–	–
OL□□□5E	Power OFF Encoder Position (Encoder position when power is off) (Lower 2 Words)	1 = 1 pulse	✓	✓	page 3-66
OL□□□60	Power OFF Encoder Position (Encoder position when power is off) (Upper 2 Words)	1 = 1 pulse	✓	✓	
OL□□□62	Power OFF Pulse Position (Pulse position when power is off) (Lower 2 Words)	1 = 1 pulse	✓	✓	page 3-66
OL□□□64	Power OFF Pulse Position (Pulse position when power is off) (Upper 2 Words)	1 = 1 pulse	✓	✓	
OL□□□66	Positive Software Limit	1 = 1 reference unit	✓	✓	page 3-66

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Register Address	Name	Description	Stepping Motor	Servomotor	Reference Page
OL□□□68	Negative Software Limit	1 = 1 reference unit	✓	✓	page 3-67
OL□□□6A	–	Reserved.	–	–	–
OL□□□6C	–	Reserved.	–	–	–
OL□□□6E	–	Reserved.	–	–	–
OL□□□70	User-specified SERVOPACK Parameter Set Value	Enter the value to set for the SERVOPACK parameter that is set with fixed parameter No. 44.	✓	✓	page 3-67
OW□□□68 to OW□□□7F	Command Buffers for SERVOPACK Transmission Reference Mode	This area is used for command data when MECHATROLINK Servo commands are specified directly.	–	✓	page 3-67

9.3.3 Monitor Parameter Table

The following table lists the monitor parameters.

Refer to the pages in the *Reference Page* column for details on the monitor parameters in the following table.

Information The box characters (☐☐☐) in “IW☐☐☐00” are determined by the circuit number and the axis number. Refer to the following section for details on register addresses.
☞ *3.2 Motion Parameter Registers* on page 3-3

Register Address	Name	Description	Stepping Motor	Servomotor	Reference Page
IW☐☐☐00	Run Status	Bit 0: Motion Operation Ready 0: Motion operation not ready 1: Motion operation ready	✓	✓	page 3-68
		Bit 1: Running with Servo ON (Running (At servo on)) 0: Stopped 1: Running with Servo ON	✓	✓	
		Bit 2: System Busy 0: System not busy 1: System busy	✓	✓	
		Bit 3: Servo Ready 0: Servo not ready 1: Servo ready	✓	✓	
		Bit 4: Latch Mode 0: Latch detection request not received 1: Latch detection request received	✓	✓	
		Bits 5 to F: Reserved.	–	–	
IW☐☐☐01	Out-of-range Parameter Number	Setting parameter: 0 and higher Fixed parameter: 1000 and higher	✓	✓	page 3-69

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Register Address	Name	Description	Step-ping Motor	Servo-motor	Reference Page
IL□□□02	Warnings	Bit 0: Excessive Deviation 0: In normal deviation range 1: Excessive deviation detected	✓	✓	page 3-69
		Bit 1: Setting Parameter Error (Set parameter error) 0: In setting range 1: Outside setting range	✓	✓	
		Bit 2: Fixed Parameter Error 0: In setting range 1: Outside setting range	✓	✓	
		Bit 3: Servo Driver Error 0: No warning 1: Warning	✓	✓	
		Bit 4: Motion Command Setting Error (Motion command set error) 0: No command setting error 1: Command setting error	✓	✓	
		Bit 5: Reserved.	–	–	
		Bit 6: Positive Overtravel (Positive direction overtravel) 0: No positive overtravel 1: Positive overtravel occurred	✓	✓	
		Bit 7: Negative Overtravel (Negative direction overtravel) 0: No negative overtravel 1: Negative overtravel occurred	✓	✓	
		Bit 8: Servo ON Incomplete 0: Servo ON 1: Servo ON incomplete	✓	✓	
		Bit 9: SERVOPACK Communications Warning 0: Communications normal 1: Communications error detected	✓	✓	
		Bit A: SERVOPACK Stop Signal Active 0: There is no stop signal input 1: There is a stop signal input	✓	✓	
		Bits B to 1F: Reserved.	–	–	

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Register Address	Name	Description	Stepping Motor	Servomotor	Reference Page
IL□□□04 (continued on next page.)	Alarms	Bit 0: SERVOPACK Error 0: No SERVOPACK alarm 1: SERVOPACK alarm occurred	✓	✓	page 3-71
		Bit 1: Positive Overtravel (Positive direction overtravel) 0: No positive overtravel 1: Positive overtravel occurred	✓	✓	
		Bit 2: Negative Overtravel (Negative direction overtravel) 0: No negative overtravel 1: Negative overtravel occurred	✓	✓	
		Bit 3: Positive Software Limit (Positive direction software limit) 0: Positive software limit not exceeded 1: Positive software limit exceeded	✓	✓	
		Bit 4: Negative Software Limit (Negative direction software limit) 0: Negative software limit not exceeded 1: Negative software limit exceeded	✓	✓	
		Bit 5: Servo OFF 0: Servo ON 1: Servo OFF	✓	✓	
		Bit 6: Positioning Time Exceeded (Positioning time over) 0: No timeout 1: Timeout occurred	✓	✓	
		Bit 7: Excessive Positioning Travel Distance (Excessive positioning moving amount) 0: Normal travel distance 1: Excessive travel distance	✓	✓	
		Bit 8: Excessive Speed 0: Normal speed 1: Excessive speed	✓	✓	
		Bit 9: Excessive Deviation 0: Normal following deviation 1: Excessive deviation	✓	✓	
		Bit A: Filter Type Change Error 0: No change error 1: Change error occurred	✓	✓	
		Bit B: Filter Time Constant Change Error 0: No change error 1: Change error occurred	✓	✓	
		Bit C: Reserved.	–	–	
		Bit D: Zero Point Unset (Zero point unsetting) 0: Zero point is set 1: Zero point unset error occurred	✓	✓	
		Bits E and F: Reserved.	–	–	

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Register Address	Name	Description	Stepping Motor	Servomotor	Reference Page
IL□□□04 (continued from previous page.)	Alarms	Bit 10: SERVOPACK Synchronized Communications Error (Servo Driver Synch. Comm. error) 0: No synchronized communications error 1: Synchronized communications error occurred	✓	✓	page 3-71
		Bit 11: SERVOPACK Communications Error 0: No consecutive synchronized communications errors 1: Consecutive synchronized communications errors occurred	✓	✓	
		Bit 12: SERVOPACK Communications Timeout Error 0: SERVOPACK command completed within the specified time 1: SERVOPACK command not completed within the specified time	✓	✓	
		Bit 13: Excessive Absolute Encoder Rotations (Excessive ABS encoder rotations) 0: In valid range 1: Outside valid range	✓	✓	
		Bits 14 and 15: Reserved.	–	–	
		Bit 16: Scan Setting Error 0: No scan setting error 1: Scan setting error occurred	✓	✓	
		Bits 17 to 1B: Reserved.	–	–	
		Bit 1C: Cyclic Communications Initialization Incomplete 0: Initialization completed (default) 1: Initialization not completed	✓	✓	
		Bit 1D: Detected SERVOPACK Model Error 0: Match 1: Mismatch	✓	✓	
		Bit 1E: Motor Type Setting Error 0: Match 1: Mismatch	✓	✓	
		Bit 1F: Connected Encoder Model Error 0: Match 1: Mismatch	✓	✓	
IL□□□06	–	Reserved.	–	–	–
IW□□□08	Motion Command Response Code	Same as OW□□□08 (Motion Commands).	✓	✓	page 3-74

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Register Address	Name	Description	Stepping Motor	Servomotor	Reference Page
IW□□□09	Motion Command Status	Bit 0: Command Execution Flag (BUSY) 0: READY (Completed) 1: BUSY (Processing)	✓	✓	page 3-74
		Bit 1: Command Hold Completed (HOLDL) 0: Command hold not completed 1: Command hold completed	✓	✓	
		Bit 2: Reserved.	–	–	
		Bit 3: Command Error End (FAIL) (Command error completed status) 0: Completed normally 1: Completed with an error	✓	✓	
		Bits 4 to 6: Reserved.	–	–	
		Bit 7: Absolute Encoder Reset Completed 0: Reset not completed 1: Reset completed	–	–	
		Bit 8: Command Execution Completed (COMPLETE) 0: Normal execution not completed 1: Normal execution completed	✓	✓	
		Bits 9 to F: Reserved.	–	–	
IW□□□0A	Motion Subcommand Response Code	Same as OW□□□0A (Motion Subcommands).	✓	✓	page 3-75
IW□□□0B	Motion Subcommand Status	Bit 0: Command Execution Flag 0: READY (Completed) 1: BUSY (Processing)	✓	✓	page 3-75
		Bits 1 and 2: Reserved.	–	–	
		Bit 3: Command Error End (Command error completed status) 0: Completed normally 1: Completed with an error	✓	✓	
		Bits 4 to 7: Reserved.	–	–	
		Bit 8: Command Execution Completed 0: Normal execution not completed 1: Normal execution completed	✓	✓	
		Bits 9 to F: Reserved.	–	–	

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Register Address	Name	Description	Stepping Motor	Servomotor	Reference Page
IW□□□0C	Position Management Status	Bit 0: Distribution Completed (DEN) (Discharging completed) 0: Distributing pulses 1: Distribution completed	✓	✓	page 3-76
		Bit 1: Positioning Completed (POSCOMP) 0: Outside positioning completed range 1: Within positioning completed range	✓	✓	
		Bit 2: Latch Completed (LCOMP) 0: Latch not complete 1: Latch completed	✓	✓	
		Bit 3: Near Position (NEAR) 0: Outside near position range 1: Within near position range	✓	✓	
		Bit 4: Zero Point Position (ZERO) 0: Outside zero point position range 1: Within zero point position range	✓	✓	
		Bit 5: Zero Point Return/Setting Completed (ZRNC) (Zero point return [setting] completed) 0: Zero point return/setting not completed 1: Zero point return/setting completed	✓	✓	
		Bit 6: Machine Locked (MLKL) (During machine lock) 0: Machine Lock Mode released 1: Machine locked	✓	✓	
		Bit 7: Reserved.	–	–	
		Bit 8: Absolute Infinite-length Position Information Load Completed (ABSLDE) (ABS rotary pos. LOAD complete) 0: Load not complete 1: Load completed	✓	✓	
		Bit 9: POSMAX Turn Preset Completed (TPRSE) (POSMAX turn preset complete) 0: Preset not completed 1: Preset completed	✓	✓	
		Bits A to F: Reserved.	–	–	
IW□□□0D	–	Reserved.	–	–	–
IL□□□0E	Machine Coordinate System Target Position (TPOS)	1 = 1 reference unit	✓	✓	page 3-77
IL□□□10	Machine Coordinate System Calculated Position (CPOS)	1 = 1 reference unit	✓	✓	page 3-78
IL□□□12	Machine Coordinate System Reference Position (MPOS)	1 = 1 reference unit	✓	✓	page 3-78
IL□□□14	32-bit DPOS (DPOS)	1 = 1 reference unit	✓	✓	page 3-78

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Register Address	Name	Description	Stepping Motor	Servomotor	Reference Page
IL□□□16	Machine Coordinate System Feedback Position (APOS)	1 = 1 reference unit	✓	✓	page 3-79
IL□□□18	Machine Coordinate System Latch Position (LPOS)	1 = 1 reference unit	✓	✓	page 3-79
IL□□□1A	Position Deviation (PERR)	1 = 1 reference unit	✓	✓	page 3-79
IL□□□1C	Target Position Increment Monitor (PDV) (Target position difference monitor)	1 = 1 reference unit	–	–	page 3-79
IL□□□1E	Number of POSMAX Turns	1 = 1 turn	✓	✓	page 3-79
IL□□□20	Speed Reference Output Monitor	pulse/s	✓	✓	page 3-80
IL□□□22 to IL□□□27	–	Reserved.	–	–	–
IL□□□28	M-III Servo Command Input Signal Monitor	Reports the signal information that is input to the MECHATROLINK-III.	✓	✓	page 3-80
IL□□□2A	M-III Servo Command Status	Reports the Servo command information that is input to MECHATROLINK-III.	✓	✓	page 3-80
IW□□□2C	M-III Command Status	Bit 0: Drive Alarm (D_ALM) (Drive Alarm Occurrence) Bit 1: Drive Warning (D_WAR) (Drive Warning Occurrence) Bit 2: Command Ready (CMDRDY) Bit 3: Alarm Clear Execution Completed (ALM_CLR_CMP) (Alarm Clear Execution Completion) Bits 4 and 5: Reserved. Bits 6 and 7: Echo-back of Command ID (RCMD_ID) Bits 8 to B: Command Error (CMD_ALM) Bits C to F: Communications Error (COMM_ALM)	✓	✓	page 3-81
IW□□□2D	SERVOPACK Alarm Code	Reports the alarm code from the SERVOPACK.	✓	✓	page 3-82
IW□□□2E	–	Reserved.	–	–	–
IW□□□2F	SERVOPACK User Monitor Information	Bits 0 to 3: Monitor 1 (Cannot be set.) Bits 4 to 7: Monitor 2 Bits 8 to B: Monitor 3 (Cannot be set.) Bits C to F: Monitor 4	✓	✓	page 3-82
IL□□□30	SERVOPACK User Monitor 2	Reports the result of the selected monitor item.	✓	✓	page 3-82
IL□□□32	–	Reserved.	–	–	–
IL□□□34	SERVOPACK User Monitor 4	Reports the result of the selected monitor item.	✓	✓	page 3-83
IW□□□36	SERVOPACK Parameter Number	Reports the number of the target parameter.	✓	✓	page 3-83
IW□□□37	Auxiliary SERVOPACK Parameter Number	Reports the number of the target parameter.	✓	✓	page 3-83

Continued on next page.

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Register Address	Name	Description	Step- ping Motor	Servo- motor	Reference Page
IL□□□38	SERVOPACK Parameter Read Data	The data of the SERVOPACK parameter that was read.	✓	✓	page 3-83
IL□□□3A	Auxiliary SERVOPACK Parameter Read Data	The data of the SERVOPACK parameter that was read.	✓	✓	page 3-83
IW□□□3C to IW□□□3E	–	Reserved.	–	–	–
IW□□□3F	Motor Type	Reports the type of the connected motor. 0: Rotary motor 1: Linear motor	✓	✓	page 3-83
IL□□□40	Feedback Speed	The unit is set in bits 0 to 3 (Speed Unit Selection) of OW□□□03.	✓	✓	page 3-84
IL□□□42	Torque/Force Reference Monitor	The unit is set in bits C to F (Torque Unit Selection) of OW□□□03.	✓	✓	page 3-84
IW□□□44	–	Reserved.	–	–	–
IW□□□45	–	Reserved.	–	–	–
IW□□□46 to IW□□□55	–	Reserved.	–	–	–
IL□□□56	Fixed Parameter Monitor	Stores the execution results of the FIXPRM_RD motion subcommand.	✓	✓	page 3-85
IW□□□58 to IW□□□5A	–	Reserved.	–	–	–
IW□□□5B	Device Information Monitor Code	00 hex: Disabled 01 hex: Vendor ID code 02 hex: Device code 03 hex: Device version 04 hex: Device information file version 05 hex: Serial number	✓	✓	page 3-85
IL□□□5C	–	Reserved.	–	–	–
IL□□□5E	Power OFF Encoder Position (Encoder position when power is off) (Lower 2 Words)	1 = 1 pulse	✓	✓	page 3-85
IL□□□60	Power OFF Encoder Position (Encoder position when power is off) (Upper 2 Words)	1 = 1 pulse	✓	✓	
IL□□□62	Power OFF Pulse Position (Pulse position when power is off) (Lower 2 Words)	1 = 1 pulse	✓	✓	page 3-85
IL□□□64	Power OFF Pulse Position (Pulse position when power is off) (Upper 2 Words)	1 = 1 pulse	✓	✓	
IW□□□66 to IW□□□6F	–	Reserved.	–	–	–

Continued on next page.

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Register Address	Name	Description	Stepping Motor	Servomotor	Reference Page
IW□□□70 to IW□□□7F	Device Information Monitor Data	Reports the information that was read with the INF_RD subcommand.	✓	✓	page 3-86
OW□□□68 to OW□□□7F*	Response Buffers for SERVOPACK Transmission Reference Mode	Stores MECHATROLINK Servo responses.	✓	✓	page 3-86

* These parameters are used in SERVOPACK Transmission Reference Mode only.

9.4 Link Assignments

Use the following method to create link assignments to define the Module configuration of the Stepping Motor Drive.

1. **Execute self configuration on the MP3000.**
The information of the Stepping Motor Drive connected to the MP3000 is recognized and displayed as shown below on the Link Assignment Tab Page in the MECHATROLINK Communications Definition Dialog Box. Refer to the following manual for the procedure to execute self configuration.

📖 MP3000 Series Machine Controller Setup Manual (Manual No.: SIEP C880725 00)

Refer to the following section for the procedure to display the Link Assignment Tab Page.

☞ *Displaying the Module Configuration Definition Tab Page* on page 7-2

VENDOR	DEVICE	PROFILE
UnKnown********[*1]	UnKnown********[*2]	Standard SteppingMotorDRV

[*1] VENDOR gives the vendor ID of the Stepping Motor Drive connected to the MP3000.

[*2] VENDOR gives the device ID of the Stepping Motor Drive connected to the MP3000.

2. **Manually set VENDOR and DEVICE.**
Select ****VENDOR and WildCardDevice as shown below.

VENDOR	DEVICE	PROFILE
****VENDOR	WildCardDevice	Standard SteppingMotorDRV

This concludes the procedure.

Information The ST#s that can be linked to a MECHATROLINK-III Standard Stepping Motor Drive profile are the same as those that can be linked to the MECHATROLINK-III standard servo profile.

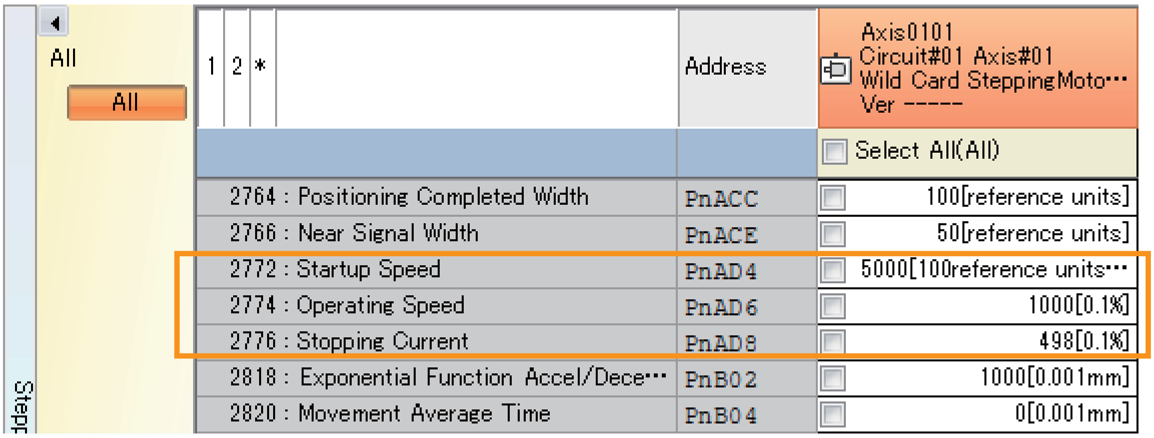
Number of Assigned SVC Function Module Circuits	Linkable ST#s
1 circuit	ST#1 to ST#16
2 circuits	ST#1 to ST#32

9.5 Common Parameters

The following common parameters in the MECHATROLINK-III Standard Stepping Motor Drive profile can be monitored.

Parameter No.	Item
6A	Starting speed
6B	Operating current
6C	Stopping current

When links have been assigned, the following common parameters will be displayed in the Stepping Motor Parameter Tab Page.



1 2 *	Address	Axis0101 Circuit#01 Axis#01 Wild Card SteppingMoto··· Ver -----
		☐ Select All(All)
2764 : Positioning Completed Width	PnACC	☐ 100[reference units]
2766 : Near Signal Width	PnACE	☐ 50[reference units]
2772 : Startup Speed	PnAD4	☐ 5000[100reference units···
2774 : Operating Speed	PnAD6	☐ 1000[0.1%]
2776 : Stopping Current	PnAD8	☐ 498[0.1%]
2818 : Exponential Function Accel/Dece···	PnB02	☐ 1000[0.001mm]
2820 : Movement Average Time	PnB04	☐ 0[0.001mm]

Inverter Operation

10

This chapter describes the operations, commands, and parameter settings that are necessary to use the SVC Function Module to perform motion control with an Inverter.

10.1 Connection Specifications

The following table provides the specifications required when connecting Inverters through MECHATROLINK.

Item		Specification
Applicable models	SVC and SVC32 Function Modules	MP3200 SVC32: Version 1.12 or later MP3300 SVC/SVC32: Version 1.10 or later
	Engineering Tool	MPE720 Version 7: Version 7.23 or later
	Inverter	A1000: S1018 or later using the SI-ET3 Communications Option Card V1000: S1022 or later using the SI-ET3/V Communications Option Card
Number of Inverters that can be connected		SVC: 16 max. SVC32: 32 max.
Transmission cycle		SVC: 125 μs, 250 μs, 500 μs, or 1 ms SVC32: 125 μs, 250 μs, 500 μs, 1 ms, 1.5 ms, 2 ms, or 3 ms
Interface		Fixed parameters (To set application conditions) Setting parameters (To update references and output data) Monitor parameters (To update monitored or input data)
Self-configuration Function		Available
Others		Conforms to the MECHATROLINK-III standard inverter profile specifications (64-byte*1 or 32-byte*2).

*1. Main commands and subcommands can be used.

*2. Only main commands can be used.

10.2 Setup Procedure

This section describes how to set up Inverters using the MPE720.

10.2.1 Check Items before Setup

Confirm the following items before you set up an Inverter.

- For information on how to set Inverter constants and user constants, refer to the relevant Inverter manual.
- The b1-01 Inverter parameter (Frequency Reference Selection 1) must be set to 3 (Option Card or Option Unit).
- Inverter parameter b1-02 (Run Command Selection 1) must be set to 3 (Option Card or Option Unit).
- The Inverter parameters shown in the following table must be correctly set.

Inverter Parameter No.	Name	Description	Default Setting
F6-20	MECHATROLINK Station Address	20 to 3F hex: For A1000 software version S1018 or S1019, or V1000 software version S1022 03 to EF hex: For A1000 software version S1020, or V1000 software version S1023	21 hex
F6-21	MECHATROLINK Frame Size	0: 64 bytes 1: 32 bytes	0
F6-23	MECHATROLINK Monitor Selection (Code 0EH)	0 to FFFF hex	0 hex
F6-24	MECHATROLINK Monitor Selection (Code 0FH)	0 to FFFF hex	0 hex
F6-25	Operation Selection at Watchdog Error (E5)	0: Decelerate to a stop (Decelerate to a stop with the deceleration time in C1- 02) 1: Coast to stop 2: Emergency stop (Decelerate to a stop with the emergency stop time in C1-09) 3: Continue operation	1
F6-26	MECHATROLINK BUS Errors Detected	Set the number of BUS errors detected by SI-ET3 or SI-ET3/V. Setting range: 2 to 10	2

10.2.2 Inverter Settings

Use the following flowchart to make the Inverter settings.

STEP 1: Define the Module Configuration of the Inverter

↓

STEP 2: Set the Required Fixed Parameters

↓

STEP 3: Confirm That the Inverter Is Ready for Operation

↓

STEP 4: Execute the Inverter Operation Control Command

↓

STEP 5: Set the Required Setting Parameters

The procedures for STEP 1 to STEP 5 are given below.

STEP 1: Define the Module Configuration of the Inverter

You can define the Module configuration of the Inverter either automatically or manually.

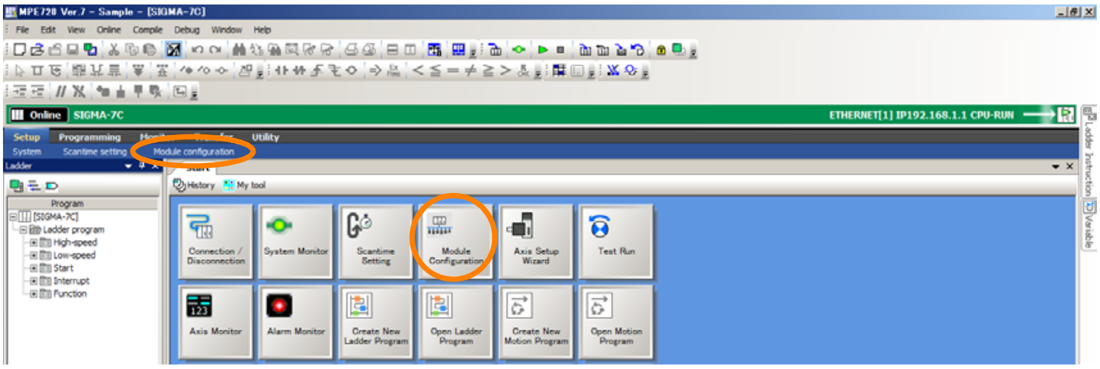
◆ Automatic Definition Method

1. Execute self configuration on the MP3000.
   When you execute self configuration, information on the Modules that are connected to the MP3000 is detected and the Inverter I/O registers are assigned in the SVC definition file. Refer to the following manual for the procedure to execute self configuration.
   📖 MP3000 Series Machine Controller Setup Manual (Manual No.: SIEP C880725 00)
2. Open the Module Configuration Tab Page. Refer to step 2 in ◆ *Manual Definition Method* for the procedure.
3. Confirm that communications have been established. Refer to steps 8 to 12 in the ◆ *Manual Definition Method* for the procedure.

This concludes the procedure.

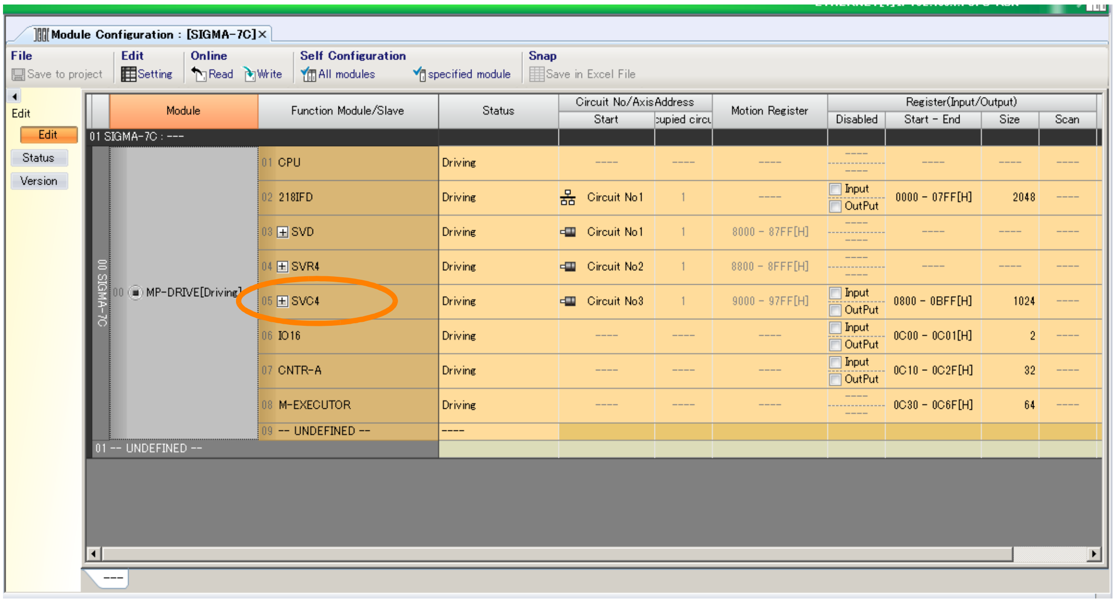
◆ Manual Definition Method

1. Start the MPE720 on a computer that is connected to the MP3000.
2. In the Main Window of the MPE720, click **Setup - Module configuration** from the Launcher, or the **Module Configuration** Icon on the My Tool View of the Start Tab Page.



The Module Configuration Definition Tab Page will be displayed.

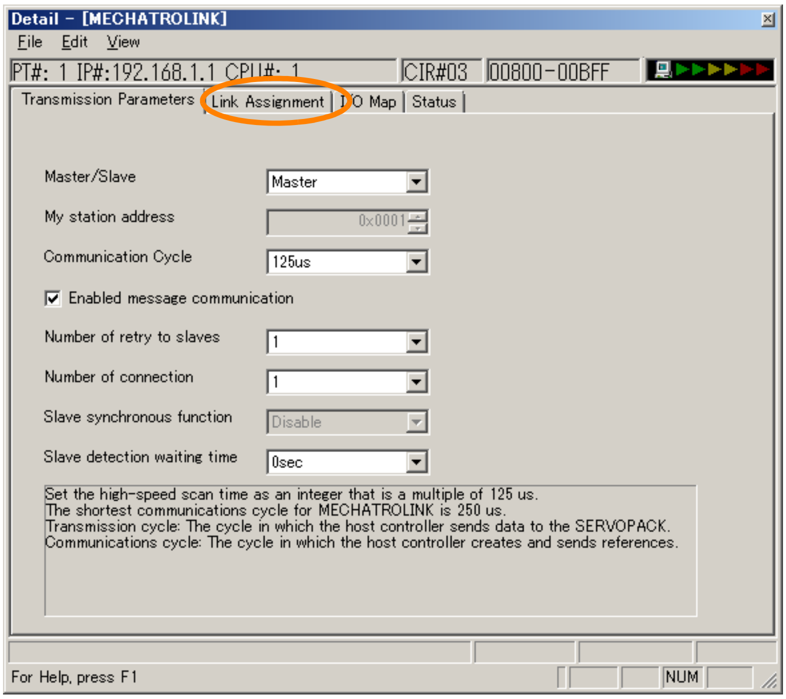
3. Double-click the **SVC4** cell in the Module Configuration Definition Tab Page.



Module	Function Module/Slave	Status	Circuit No/Axis Address Start	cupied circu	Motion Register	Register(Input/Output) Disabled	Start – End	Size	Scan
01 SIGMA-7C : ---									
00 MP-DRIVE[Driving]	01 CPU	Driving	----	----	----	----	----	----	----
	02 218IFD	Driving	Circuit No1	1	----	☐ Input ☐ OutPut	0000 – 07FF[H]	2048	----
	03 SVD	Driving	Circuit No1	1	8000 – 87FF[H]	----	----	----	----
	04 SVR4	Driving	Circuit No2	1	8800 – 8FFF[H]	----	----	----	----
	05 SVC4	Driving	Circuit No3	1	9000 – 97FF[H]	☐ Input ☐ OutPut	0800 – 0BFF[H]	1024	----
	06 IO16	Driving	----	----	----	☐ Input ☐ OutPut	0C00 – 0C01[H]	2	----
	07 CNTR-A	Driving	----	----	----	☐ Input ☐ OutPut	0C10 – 0C2F[H]	32	----
	08 M-EXECUTOR	Driving	----	----	----	----	0C30 – 0C6F[H]	64	----
	09 -- UNDEFINED --	----							
01 -- UNDEFINED --									

The MECHATROLINK Communications Definition Dialog Box will be displayed.

4. Click the **Link Assignment** Tab.



Master/Slave: Master

My station address: 0x0001

Communication Cycle: 125us

☑ Enabled message communication

Number of retry to slaves: 1

Number of connection: 1

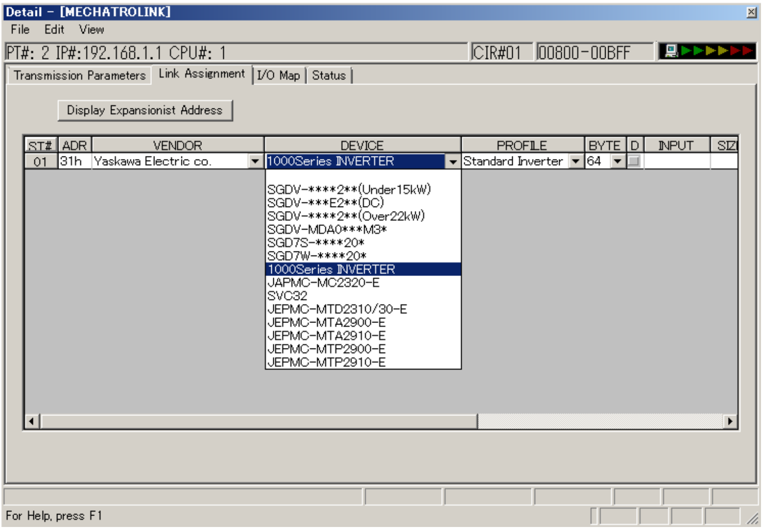
Slave synchronous function: Disable

Slave detection waiting time: 0sec

Set the high-speed scan time as an integer that is a multiple of 125 us.
The shortest communications cycle for MECHATROLINK is 250 us.
Transmission cycle: The cycle in which the host controller sends data to the SERVOPACK.
Communications cycle: The cycle in which the host controller creates and sends reference.

The Link Assignment Tab Page will be displayed.

5. Click the ▼ Button in the DEVICE Column and select **1000Series INVERTER** from the list.
   Note: Always select **1000Series INVERTER** regardless of the model of the Inverter.



PT#: 2 IP#:192.168.1.1 CPU#: 1 | CIR#01 | 00800-00BFF

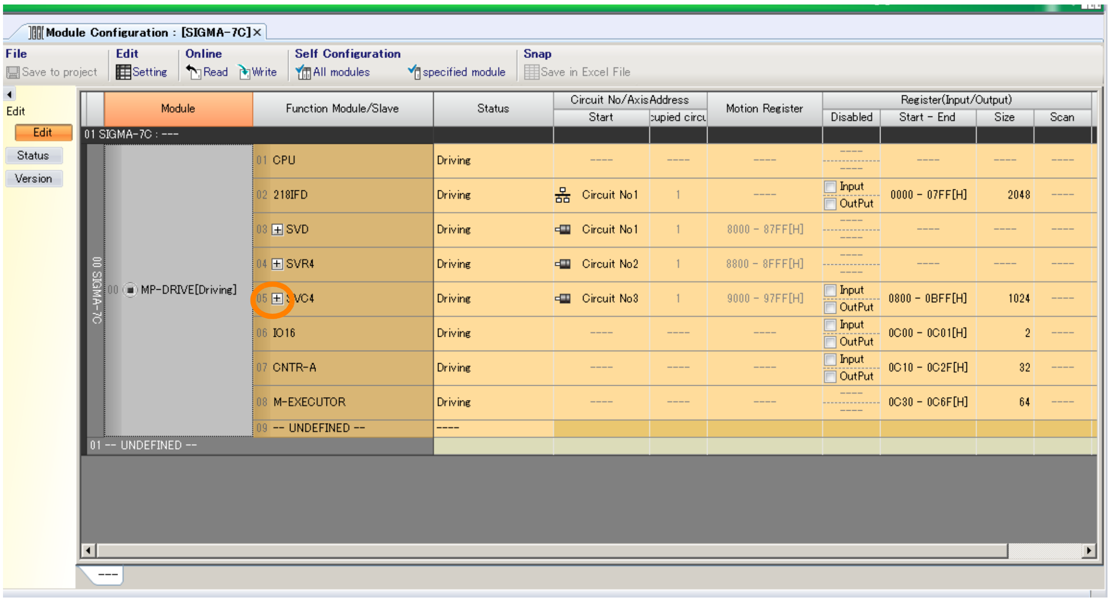
ST#	ADR	VENDOR	DEVICE	PROFILE	BYTE	D	INPUT	SIZ
01	31h	Yaskawa Electric co.	1000Series INVERTER	Standard Inverter	64	☐		

SGDV-****2**(Under15kW)
SGDV-***E2**(DC)
SGDV-****2**(Over22kW)
SGDV-MDA0***M3*
SGD7S-****20*
SGD7W-****20*
1000Series INVERTER
JAPMC-MC2320-E
SVC32
JEPMC-MTD2310/30-E
JEPMC-MTA2900-E
JEPMC-MTA2910-E
JEPMC-MTP2900-E
JEPMC-MTP2910-E

6. Select ***Save*** from the File Menu to save the settings.

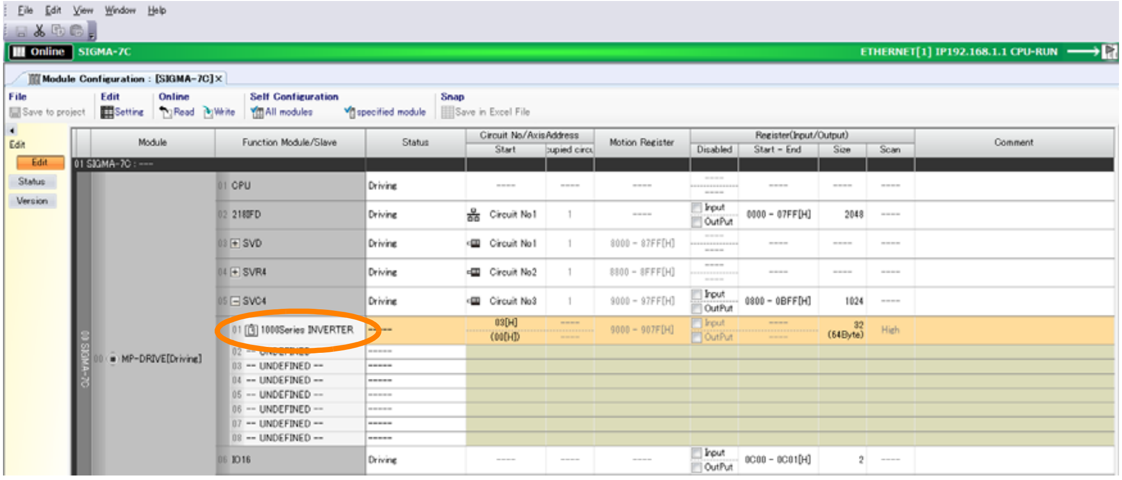
7. Click the **Close** Button to close the MECHATROLINK Communications Definition Dialog Box.
   You will return to the Module Configuration Definition Tab Page.

8. Click the **[+]** Expand Button in the **SVC4** cell on the Module Configuration Definition Tab Page.



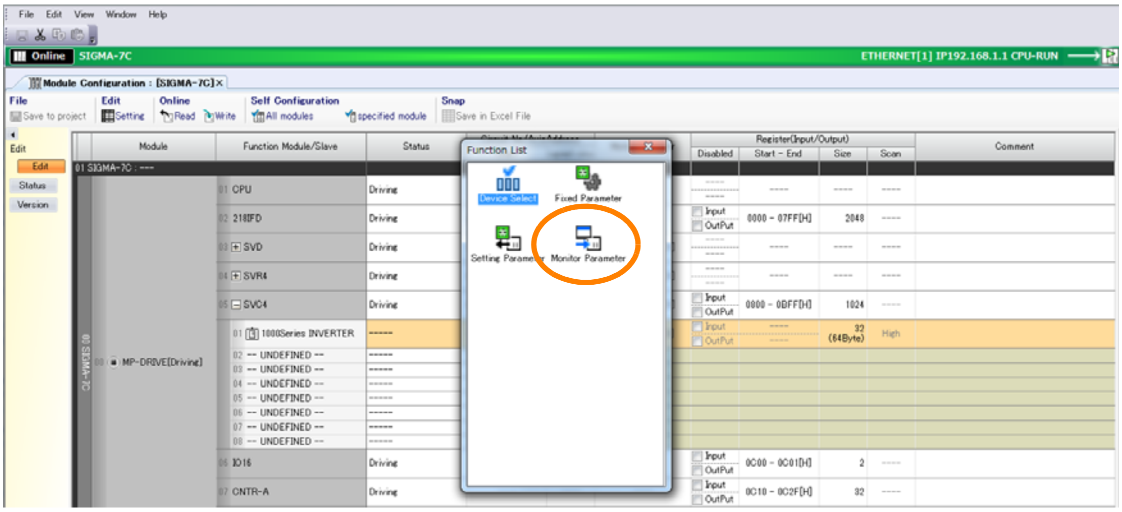
Module	Function Module/Slave	Status	Circuit No/Axis Address: Start	Circuit No/Axis Address: cupied circu	Motion Register	Register(Input/Output): Disabled	Register(Input/Output): Start – End	Register(Input/Output): Size	Register(Input/Output): Scan
01 SIGMA-7C : ---									
00 SIGMA-7C 00 MP-DRIVE[Driving]	01 CPU	Driving	----	----	----	----	----	----	----
	02 218IFD	Driving	Circuit No1	1	----	☐ Input ☐ OutPut	0000 – 07FF[H]	2048	----
	03 ⊞ SVD	Driving	Circuit No1	1	8000 – 87FF[H]	----	----	----	----
	04 ⊞ SVR4	Driving	Circuit No2	1	8800 – 8FFF[H]	----	----	----	----
	05 ⊞ SVC4	Driving	Circuit No3	1	9000 – 97FF[H]	☐ Input ☐ OutPut	0800 – 0BFF[H]	1024	----
	06 IO16	Driving	----	----	----	☐ Input ☐ OutPut	0C00 – 0C01[H]	2	----
	07 CNTR-A	Driving	----	----	----	☐ Input ☐ OutPut	0C10 – 0C2F[H]	32	----
	08 M-EXECUTOR	Driving	----	----	----	----	0C30 – 0C6F[H]	64	----
	09 -- UNDEFINED --	----							
01 -- UNDEFINED --									

9. Double-click the **1000Series INVERTER** cell.



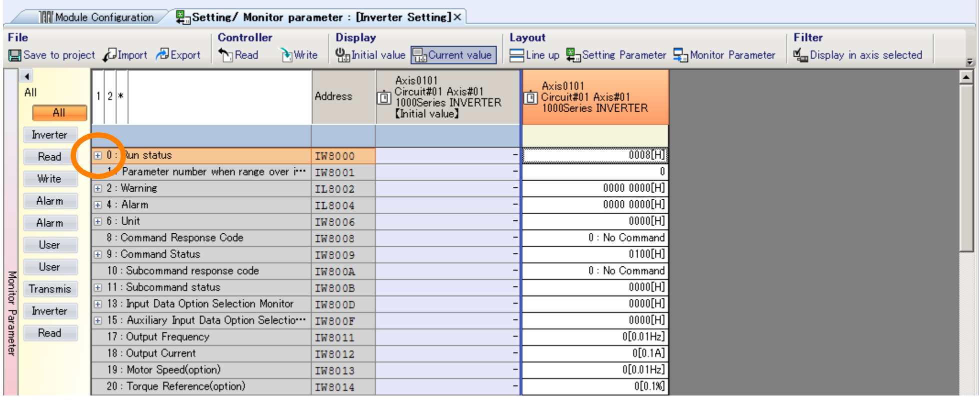
The Function List Dialog Box will be displayed.

10. Click the **Monitor Parameter** Icon.



The Setting/Monitor Parameter Tab Page will be displayed.

11. Click the **[+]** Expand Button for **Run status** (IW☐☐☐00).



1 2 *	Address	Axis0101 Circuit#01 Axis#01 1000Series INVERTER 【Initial value】	Axis0101 Circuit#01 Axis#01 1000Series INVERTER
0 : Run status	IW8000	-	0008[H]
1 : Parameter number when range over i···	IW8001	-	0
2 : Warning	IL8002	-	0000 0000[H]
4 : Alarm	IL8004	-	0000 0000[H]
6 : Unit	IW8006	-	0000[H]
8 : Command Response Code	IW8008	-	0 : No Command
9 : Command Status	IW8009	-	0100[H]
10 : Subcommand response code	IW800A	-	0 : No Command
11 : Subcommand status	IW800B	-	0000[H]
13 : Input Data Option Selection Monitor	IW800D	-	0000[H]
15 : Auxiliary Input Data Option Selectio···	IW800F	-	0000[H]
17 : Output Frequency	IW8011	-	0[0.01Hz]
18 : Output Current	IW8012	-	0[0.1A]
19 : Motor Speed(option)	IW8013	-	0[0.01Hz]
20 : Torque Reference(option)	IW8014	-	0[0.1%]

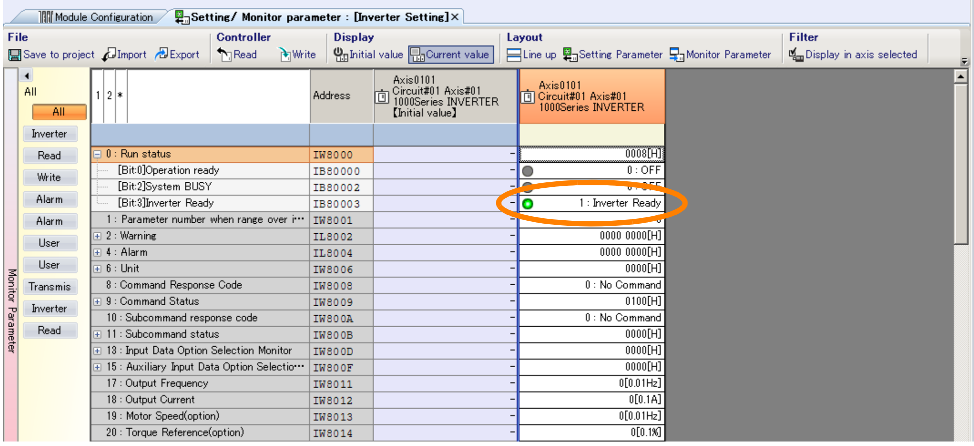
12. Confirm that bit 3 (Inverter Ready) is 1 (ON).

If it is 1 (ON), the Inverter is ready and communications were established successfully.

If it is 0 (OFF), communications have not been established between the MP3000 and Inverter. Check the connection of the MECHATROLINK-III communications cable and the settings on the MECHATROLINK Communications Definition Tab Page.

Refer to the following section for details on the MECHATROLINK communications definitions.

☞ *7.2 MECHATROLINK Communications Settings* on page 7-7



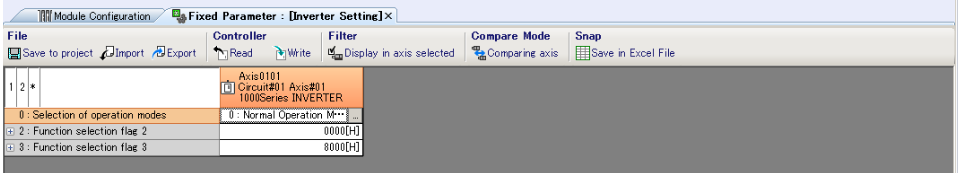
1 2 *	Address	Axis0101 Circuit#01 Axis#01 1000Series INVERTER 【Initial value】	Axis0101 Circuit#01 Axis#01 1000Series INVERTER
0 : Run status	IW8000	-	0008[H]
[Bit:0]Operation ready	IB80000	-	● 0 : OFF
[Bit:2]System BUSY	IB80002	-	● 0 : OFF
[Bit:3]Inverter Ready	IB80003	-	● 1 : Inverter Ready
1 : Parameter number when range over i···	IW8001	-	0
2 : Warning	IL8002	-	0000 0000[H]
4 : Alarm	IL8004	-	0000 0000[H]
6 : Unit	IW8006	-	0000[H]
8 : Command Response Code	IW8008	-	0 : No Command
9 : Command Status	IW8009	-	0100[H]
10 : Subcommand response code	IW800A	-	0 : No Command
11 : Subcommand status	IW800B	-	0000[H]
13 : Input Data Option Selection Monitor	IW800D	-	0000[H]
15 : Auxiliary Input Data Option Selectio···	IW800F	-	0000[H]
17 : Output Frequency	IW8011	-	0[0.01Hz]
18 : Output Current	IW8012	-	0[0.1A]
19 : Motor Speed(option)	IW8013	-	0[0.01Hz]
20 : Torque Reference(option)	IW8014	-	0[0.1%]

This concludes the procedure.

STEP 2: Set the Required Fixed Parameters

1. Display the Function List Dialog Box using steps 8 and 9 in the ◆ *Manual Definition Method* procedure for STEP 1.

2. Click the **Fixed Parameter** Icon.



1 2 *	Axis0101 Circuit#01 Axis#01 1000Series INVERTER
0 : Selection of operation modes	0 : Normal Operation M···
2 : Function selection flag 2	0000[H]
3 : Function selection flag 3	8000[H]

The Fixed Parameter Tab Page will be displayed.

3. Set the required parameters in the setting column.

> **Important**
>
> If you manually set the Module configuration definitions for an Inverter, always save the fixed parameters. If you do not save the fixed parameters, the current values of the setting parameters will be restored to the default values when you restart the Inverter.

This concludes the procedure.

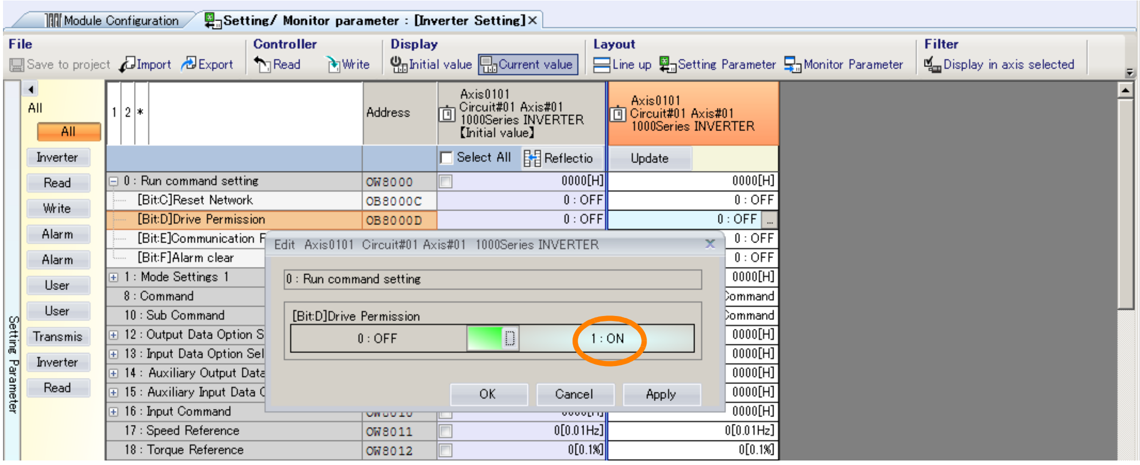
STEP 3: Confirm That the Inverter Is Ready for Operation

1. Display the Function List Dialog Box using steps 8 and 9 in the ◆ *Manual Definition Method* procedure for STEP 1.

2. Click the **Setting Parameter** Icon.
   The Setting/Monitor Parameter Tab Page will be displayed.

3. Double-click the setting column cell for **Run command setting** (OW☐☐☐00).
   The Edit Dialog Box will be displayed.

4. Set bit D (Drive Permission) of **Run command setting** (OW☐☐☐00) to 1 (ON).



	Address	Axis0101 Circuit#01 Axis#01 1000Series INVERTER 【Initial value】	Axis0101 Circuit#01 Axis#01 1000Series INVERTER
⊟ 0 : Run command setting	OW8000	☐ 0000[H]	0000[H]
[Bit:C]Reset Network	OB8000C	0 : OFF	0 : OFF
[Bit:D]Drive Permission	OB8000D	0 : OFF	0 : OFF
[Bit:E]Communication F			0 : OFF
[Bit:F]Alarm clear			0 : OFF
⊞ 1 : Mode Settings 1			0000[H]
8 : Command			ommand
10 : Sub Command			ommand
⊞ 12 : Output Data Option S			0000[H]
⊞ 13 : Input Data Option Sel			0000[H]
⊞ 14 : Auxiliary Output Data			0000[H]
⊞ 15 : Auxiliary Input Data C			0000[H]
⊞ 16 : Input Command		☐	0000[H]
17 : Speed Reference	OW8011	☐ 0[0.01Hz]	0[0.01Hz]
18 : Torque Reference	OW8012	☐ 0[0.1%]	0[0.1%]

Edit Axis0101 Circuit#01 Axis#01 1000Series INVERTER

0 : Run command setting

[Bit:D]Drive Permission

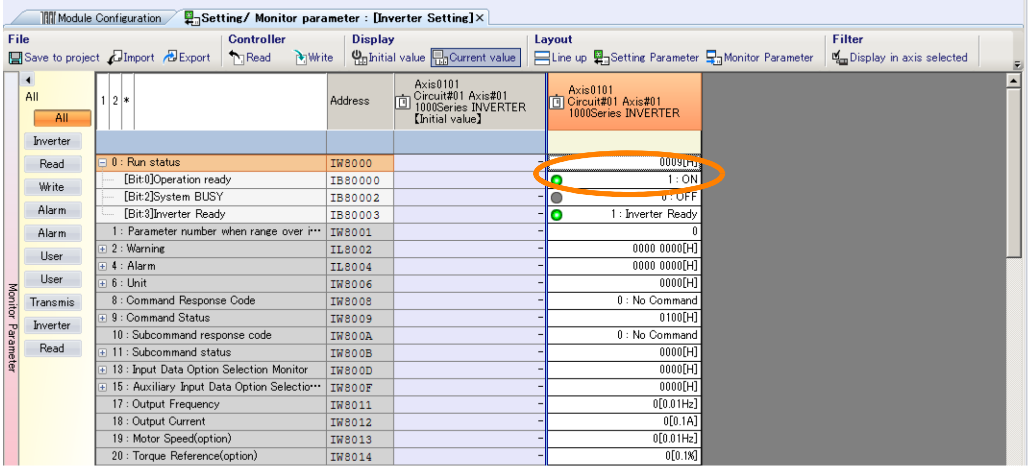
0 : OFF 1 : ON

OK Cancel Apply

5. Click the **Apply** Button.

6. In the monitor parameters on the same tab page, click the **[+]** Expand Button for **Run status** (IW☐☐☐00).

7. Confirm that bit 0 (Operation ready) is 1 (ON).



	Address	Axis0101 Circuit#01 Axis#01 1000Series INVERTER 【Initial value】	Axis0101 Circuit#01 Axis#01 1000Series INVERTER
⊟ 0 : Run status	IW8000	-	0009[H]
[Bit:0]Operation ready	IB80000	-	● 1 : ON
[Bit:2]System BUSY	IB80002	-	● 0 : OFF
[Bit:3]Inverter Ready	IB80003	-	● 1 : Inverter Ready
1 : Parameter number when range over i···	IW8001	-	0
⊞ 2 : Warning	IL8002	-	0000 0000[H]
⊞ 4 : Alarm	IL8004	-	0000 0000[H]
⊞ 6 : Unit	IW8006	-	0000[H]
8 : Command Response Code	IW8008	-	0 : No Command
⊞ 9 : Command Status	IW8009	-	0100[H]
10 : Subcommand response code	IW800A	-	0 : No Command
⊞ 11 : Subcommand status	IW800B	-	0000[H]
⊞ 13 : Input Data Option Selection Monitor	IW800D	-	0000[H]
⊞ 15 : Auxiliary Input Data Option Selectio···	IW800F	-	0000[H]
17 : Output Frequency	IW8011	-	0[0.01Hz]
18 : Output Current	IW8012	-	0[0.1A]
19 : Motor Speed(option)	IW8013	-	0[0.01Hz]
20 : Torque Reference(option)	IW8014	-	0[0.1%]

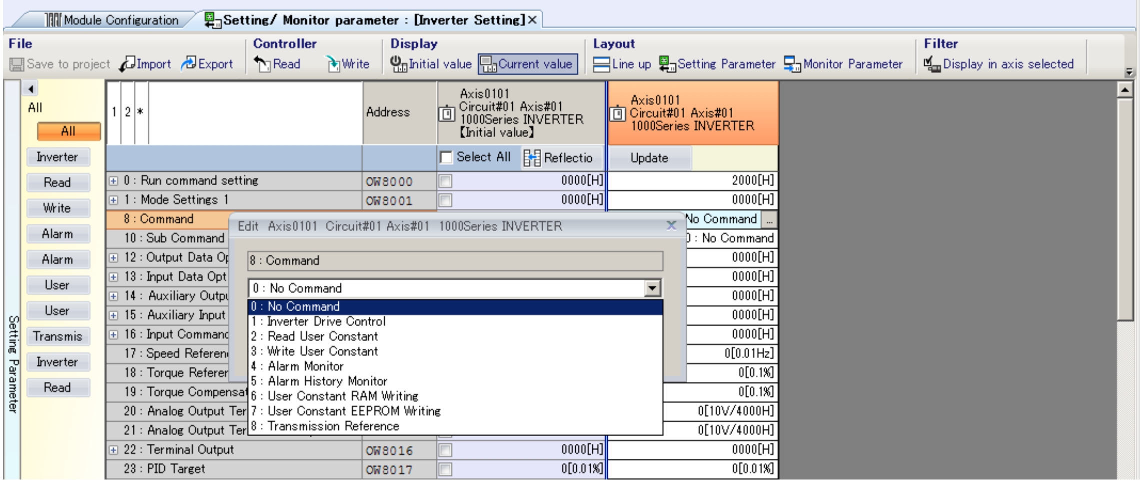
Note: If the status is 0 (OFF), confirm that a command is not being executed in the Command setting parameter (OW☐☐☐08).
If the current command is Inverter Drive Control, first select another command and then set bit D (Drive Permission) in **Run command setting** (OW☐☐☐00) to 0 (OFF) and then change it back to 1 (ON).

This concludes the procedure.

STEP 4: Execute the Inverter Operation Control Command

1. Double-click the setting column cell for **Command** (OW□□□08) in the setting parameters.
   The Edit Dialog Box will be displayed.

2. Click the ▼ Button and select **Inverter Drive Control** from the list.
   Note: Wait for at least one high-speed scan after you set bit D (Drive Permission) in **Run command setting** (OW□□□00) to 1 (ON) in step 4 of the STEP 3 procedure before you make this setting.



The following parameters will be enabled when you execute the Inverter Drive Control command.

<Inverter Output>	<Inverter Input>
Input Command (OW□□□10)	Output Frequency (IW□□□11)
Speed Reference (OW□□□11)	Output Current (IW□□□12)
Torque Reference (OW□□□12)	M-III Inverter Command Status (IL□□□2A)
	M-III Command Status (IW□□□2C)

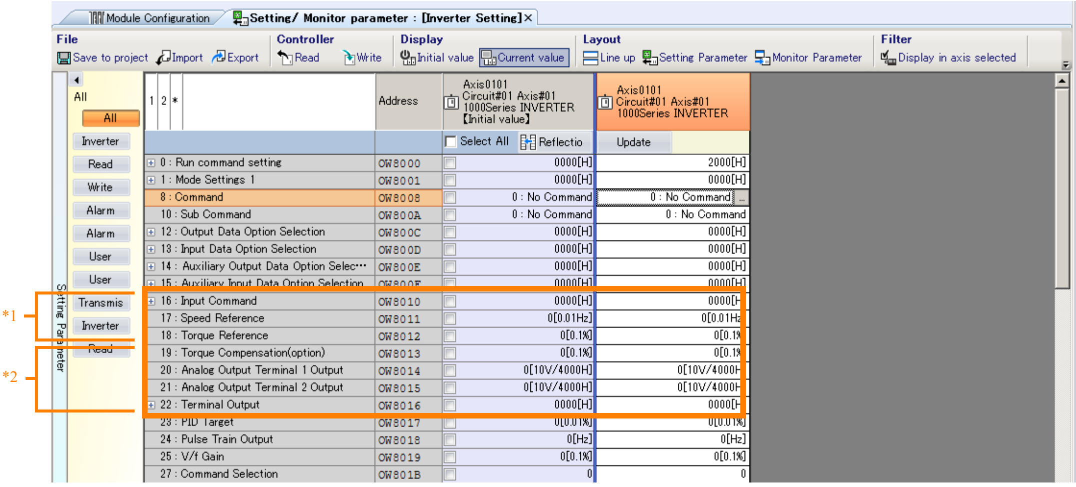
Set the Output Data Option Selection (OW□□□0C) and Input Data Option Selection (OW□□□0D) to enable the output data from OW□□□13 to OW□□□16 and the input data from IW□□□13 to IW□□□1D as required.
Refer to the following section for details on the Output Data Option Selection and Input Data Option Selection parameters.

☞ *10.2.3 I/O Options* on page 10-12

This concludes the procedure.

STEP 5: Set the Required Setting Parameters

1. Set the required parameters in the setting column on the Setting/Monitor Parameter Tab Page.



1 2 *	Address	Axis0101 Circuit#01 Axis#01 1000Series INVERTER 【Initial value】	Axis0101 Circuit#01 Axis#01 1000Series INVERTER
		☐ Select All Reflectio	Update
0 : Run command setting	OW8000	☐ 0000[H]	2000[H]
1 : Mode Settings 1	OW8001	☐ 0000[H]	0000[H]
8 : Command	OW8008	☐ 0 : No Command	0 : No Command
10 : Sub Command	OW800A	☐ 0 : No Command	0 : No Command
12 : Output Data Option Selection	OW800C	☐ 0000[H]	0000[H]
13 : Input Data Option Selection	OW800D	☐ 0000[H]	0000[H]
14 : Auxiliary Output Data Option Selec···	OW800E	☐ 0000[H]	0000[H]
15 : Auxiliary Input Data Option Selection	OW800F	☐ 0000[H]	0000[H]
16 : Input Command	OW8010	☐ 0000[H]	0000[H
17 : Speed Reference	OW8011	☐ 0[0.01Hz]	0[0.01Hz
18 : Torque Reference	OW8012	☐ 0[0.1%]	0[0.1%
19 : Torque Compensation(option)	OW8013	☐ 0[0.1%]	0[0.1%
20 : Analog Output Terminal 1 Output	OW8014	☐ 0[10V/4000H]	0[10V/4000H
21 : Analog Output Terminal 2 Output	OW8015	☐ 0[10V/4000H]	0[10V/4000H
22 : Terminal Output	OW8016	☐ 0000[H]	0000[H
23 : PID Target	OW8017	☐ 0[0.01%]	0[0.01%]
24 : Pulse Train Output	OW8018	☐ 0[Hz]	0[Hz]
25 : V/f Gain	OW8019	☐ 0[0.1%]	0[0.1%]
27 : Command Selection	OW801B	☐ 0	0

*1. This is the data that is output continually during execution of the Inverter Drive Control command.

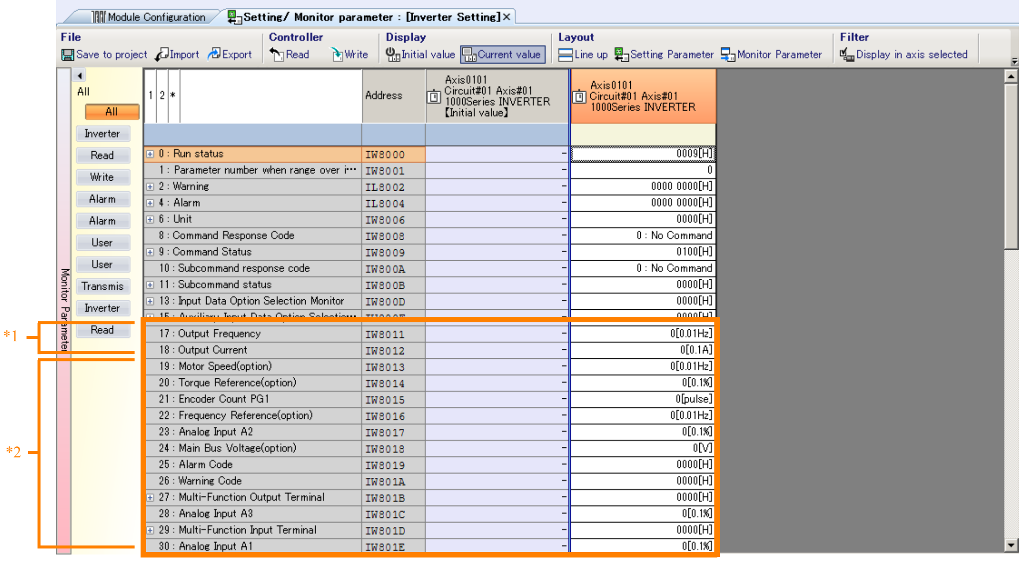
*2. This data is enabled when the Inverter Drive Control command is being executed and the Output Data Option Selection parameter (OW☐☐☐0C) is set to 1 (enable), or when the Inverter I/O Control subcommand is being executed and the Auxiliary Output Data Option Selection parameter (OW☐☐☐0E) is set to 1 (enable).

Note: The Inverter I/O Control subcommand is valid only for MECHATROLINK-III 64-byte Mode.

This concludes the procedure.

Information

Monitoring Method
You can monitor a parameter by double-clicking the monitor data column cell to monitor on the Monitor Parameter Tab Page.



1 2 *	Address	Axis0101 Circuit#01 Axis#01 1000Series INVERTER 【Initial value】	Axis0101 Circuit#01 Axis#01 1000Series INVERTER
0 : Run status	IW8000	-	0009[H]
1 : Parameter number when range over i···	IW8001	-	0
2 : Warning	IL8002	-	0000 0000[H]
4 : Alarm	IL8004	-	0000 0000[H]
6 : Unit	IW8006	-	0000[H]
8 : Command Response Code	IW8008	-	0 : No Command
9 : Command Status	IW8009	-	0100[H]
10 : Subcommand response code	IW800A	-	0 : No Command
11 : Subcommand status	IW800B	-	0000[H]
13 : Input Data Option Selection Monitor	IW800D	-	0000[H]
15 : Auxiliary Input Data Option Selection···	IW800F	-	0000[H]
17 : Output Frequency	IW8011	-	0[0.01Hz]
18 : Output Current	IW8012	-	0[0.1A]
19 : Motor Speed(option)	IW8013	-	0[0.01Hz]
20 : Torque Reference(option)	IW8014	-	0[0.1%]
21 : Encoder Count PG1	IW8015	-	0[pulse]
22 : Frequency Reference(option)	IW8016	-	0[0.01Hz]
23 : Analog Input A2	IW8017	-	0[0.1%]
24 : Main Bus Voltage(option)	IW8018	-	0[V]
25 : Alarm Code	IW8019	-	0000[H]
26 : Warning Code	IW801A	-	0000[H]
27 : Multi-Function Output Terminal	IW801B	-	0000[H]
28 : Analog Input A3	IW801C	-	0[0.1%]
29 : Multi-Function Input Terminal	IW801D	-	0000[H]
30 : Analog Input A1	IW801E	-	0[0.1%]

*1. This is the data that is input continually during execution of the Inverter Drive Control command.

*2. This data is enabled when the Inverter Drive Control command is being executed and the Input Data Option Selection parameter (OW☐☐☐0D) is set to 1 (enable), or when the Inverter I/O Control subcommand is being executed and the Auxiliary Input Data Option Selection parameter (OW☐☐☐0F) is set to 1 (enable).

Note: The Inverter I/O Control subcommand is valid only for MECHATROLINK-III 64-byte Mode.

10.2.3 I/O Options

Output Data Options

The OW□□□13 to OW□□□19, and OW□□□1B parameters contain the output data options.

The output data options are valid when the following conditions are met.

- The Output Data Option Selection (OW□□□0C) is set to 1 (enabled) during Inverter drive control.
- The Auxiliary Output Data Option Selection (OW□□□0E) is set to 1 (enabled) during Inverter I/O control for a subcommand.

Input Data Options

The IW□□□13 to IW□□□21 parameters contain the input data options.

The input data options are valid when the following conditions are met.

- The Input Data Option Selection (OW□□□0D) is set to 1 (enabled) during Inverter drive control.
- The Auxiliary Input Data Option Selection (OW□□□0F) is set to 1 (enabled) during Inverter I/O control for a subcommand.

Data of selected input options can be monitored by using the Input Data Option Selection Monitor (IW□□□0D) and Auxiliary Input Data Option Selection Monitor (IW□□□0F) of the monitoring parameters.

Response Speed of Selected Output and Input Data Options

The response speed for the data selected from Output Data Option Selection, Auxiliary Output Data Option Select, Input Data Option Selection, and auxiliary Input Data Option Selection depends on the amount of selected data. Normally, it will be eight times slower than that for standard I/O data (always available I/O data).

The response speed differs depending on the number of selected options, shown in the following tables.

- Number of Selected Output Data Options (OW□□□0C) and Time Required for Response

Number of Selected Output Data Options	Time Required for Response (Standard output data = 1)
1	1
2	1
3	2
4	2
5	3
6	3
7	4
8	4

- Number of Selected Auxiliary Output Data Options (OW□□□0E) and Time Required for Response

Number of Selected Auxiliary Output Data Options	Time Required for Response (Standard output data = 1)
1	1
2	1
3	1
4	1
5	2
6	2
7	2
8	2

- Number of Selected Input Data Options (OW☐☐☐0D) and Time Required for Response

Number of Selected Input Data Options	Time Required for Response (Standard input data = 1)
1	1
2	1
3	2
4	2
5	3
6	3
7	4
8	4
9	5
10	5
11	6
12	6
13	7
14	7
15	8

- Number of Selected Auxiliary Input Data Options (OW☐☐☐0F) and Time Required for Response

Number of Selected Auxiliary Input Data Options	Time Required for Response (Standard input data = 1)
1	1
2	1
3	1
4	1
5	2
6	2
7	2
8	2
9	3
10	3
11	3
12	3
13	4
14	4
15	4

10.3 Precautions for Inverter Operation

This section provides precautions for Inverter operation.

Term

Inverter operation in progress:Either of the following bits in the M-III Inverter Command Status (IL□□□2A) monitoring parameter is 1 (ON): Bit 0 (Forward Operation) or Bit 1 (Reverse Operation). Even if the motor is stopped, Inverter operation is considered to be in progress if either of these bits is ON.

Inverter operation stopped:Both of the following bits in the M-III Inverter Command Status (IL□□□2A) monitoring parameter are 0 (OFF): Bit 0 (Forward Operation) and Bit 1 (Reverse Operation).

Operation When the CPU Stops

If CPU STOP is executed from the MP3000 while Inverter operation is in progress, the SVC Function Module will force the Inverter to stop operation.

Even if the Forward RUN or Reverse RUN bit was set to 1 (ON) by the application, the bit will be forced to 0 (OFF).

Bit 0 (Operation Ready) in IW□□□00 (Run Status) will also change to 0 (OFF). To start the CPU when it has stopped, click the Setting Parameter Tab to change the tab page, set Command (OW□□□08) to No Command and then change bit D (Drive Permission) of Run Command Setting (OW□□□00) to 1 (ON).

Timing of Changes to MECHATROLINK Allocations

Changes to settings made in the MECHATROLINK Detail Definition Dialog Box for the SVC Function Module cannot be saved while Inverter operation is in progress. Save changes made on the MECHATROLINK Detail Definition Dialog Box while the Inverter is stopped.

Timing of Changes to Fixed Parameters

The fixed parameters cannot be saved while Inverter operation is in progress. Save the fixed parameters while the Inverter is stopped.

Switching between Motion Commands While the Command Control Inverter Drive is Being Executed

If the Inverter Drive Control command in Command (OW□□□08) is changed to another command while Inverter operation is in progress, the Inverter will maintain the last command status of the Inverter Drive Control command and motor operation will continue. Note that switching the command to NOP (No Command) also will not stop the motor.

Refer to the following section for the motor stopping methods.

☞ *Motor Stopping and Restarting Methods* on page 10-15

Also, if you change the command, I/O between the SVC Function Module and Inverter will stop. When that occurs, the monitor parameter data on the MPE720 will no longer be the most recent data. If you change to any command other than the Transmission Reference command, the Run status monitor information will be valid.

Motor Stopping and Restarting Methods

There are two ways to stop and restart the motor.

◆ Method 1

To stop the motor, set bit 0 (Forward RUN) and bit 1 (Reserve RUN) of Input Command (OW□□□10) to 0 (OFF) while the Inverter Drive Control command is being executed in Command (OW□□□08).

To restart the motor, set bit 0 or bit 1 of OW□□□10 to 1 (ON).

◆ Method 2

To stop the motor, set bit D (Drive Permission) of Run Command Setting (OW□□□00) to 0 (OFF).

To restart the motor, set parameters using the following procedure.

1. **Change Command (OW□□□08) to NOP (No Command).**
2. **Set bit D (Drive Permission) of Run Command Setting (OW□□□00) to 1 (ON).**
3. **Change Command (OW□□□08) to the Inverter Drive Control command.**

This concludes the procedure to restart the motor.

Inverter Modes

The Inverter has two modes.

Drive Mode: Drive Mode is used for normal operation and to monitor status. You can control operation from the MP3000 in this mode.

Program Mode: Program Mode is used to set and autotune parameters. In Program Mode, the Ready status in the Inverter is OFF and commands from the MP3000 are not acknowledged.

To confirm that the Inverter is ready, make sure that bit 6 (Inverter Ready) in M-III Inverter Command Status (IL□□□2A) is 1 (ON) on the Monitor Parameter Tab Page.

Note: Bit 6 (Inverter Ready) in M-III Inverter Command Status (IL□□□2A) can be monitored only during execution of the Inverter Drive Control command.

Inverter Emergency Stopping and Restarting Methods

This section provides the procedures to perform an emergency stop (turning OFF the main circuit and control circuit power supplies and stopping operation commands) during Inverter operation and the procedures for restarting the Inverter.

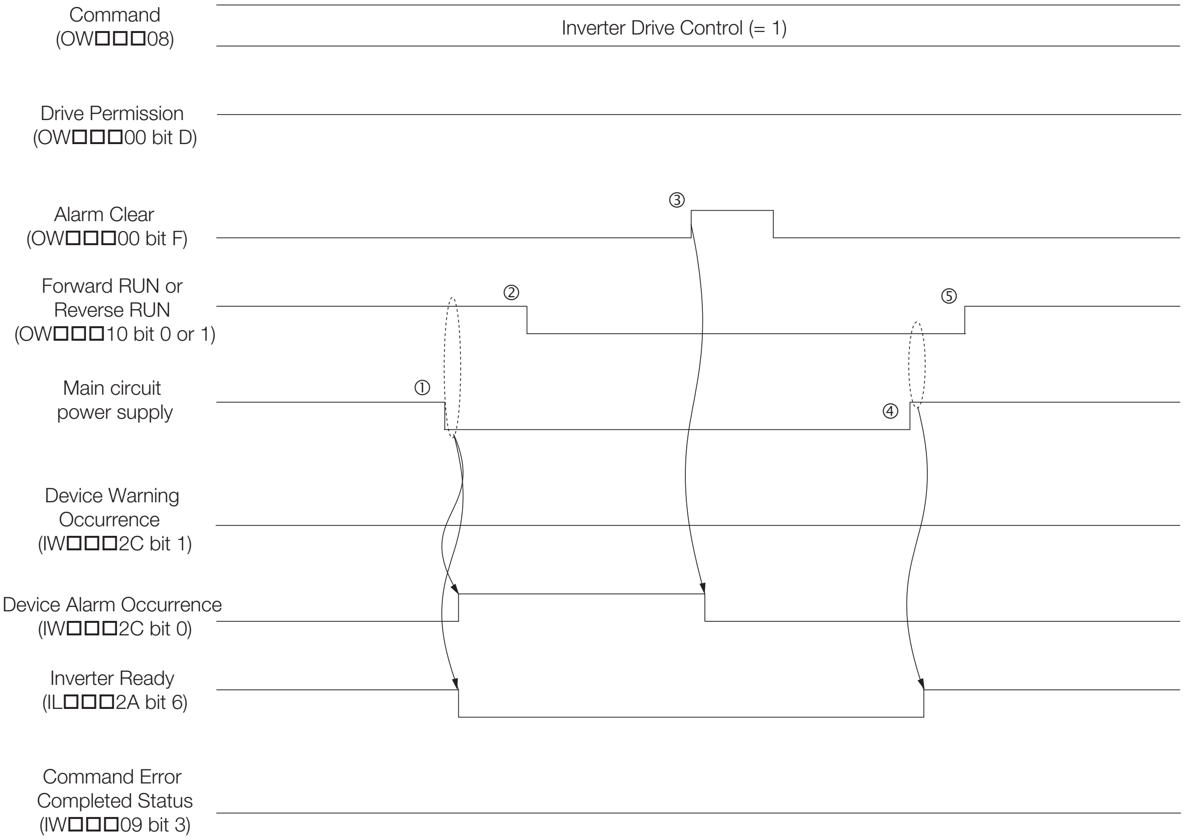
◆ Maintaining Drive Permission

1. Turn OFF the main circuit power supply.
2. To stop the operation command, turn OFF the Forward RUN and Reverse RUN commands.

The motor will perform an emergency stop.

Use the following steps to restart operation.

3. Execute an alarm clear operation to clear the device alarm.
4. Turn ON the main circuit power supply.
5. Start the operation command again.



◆ Turning OFF Drive Permission

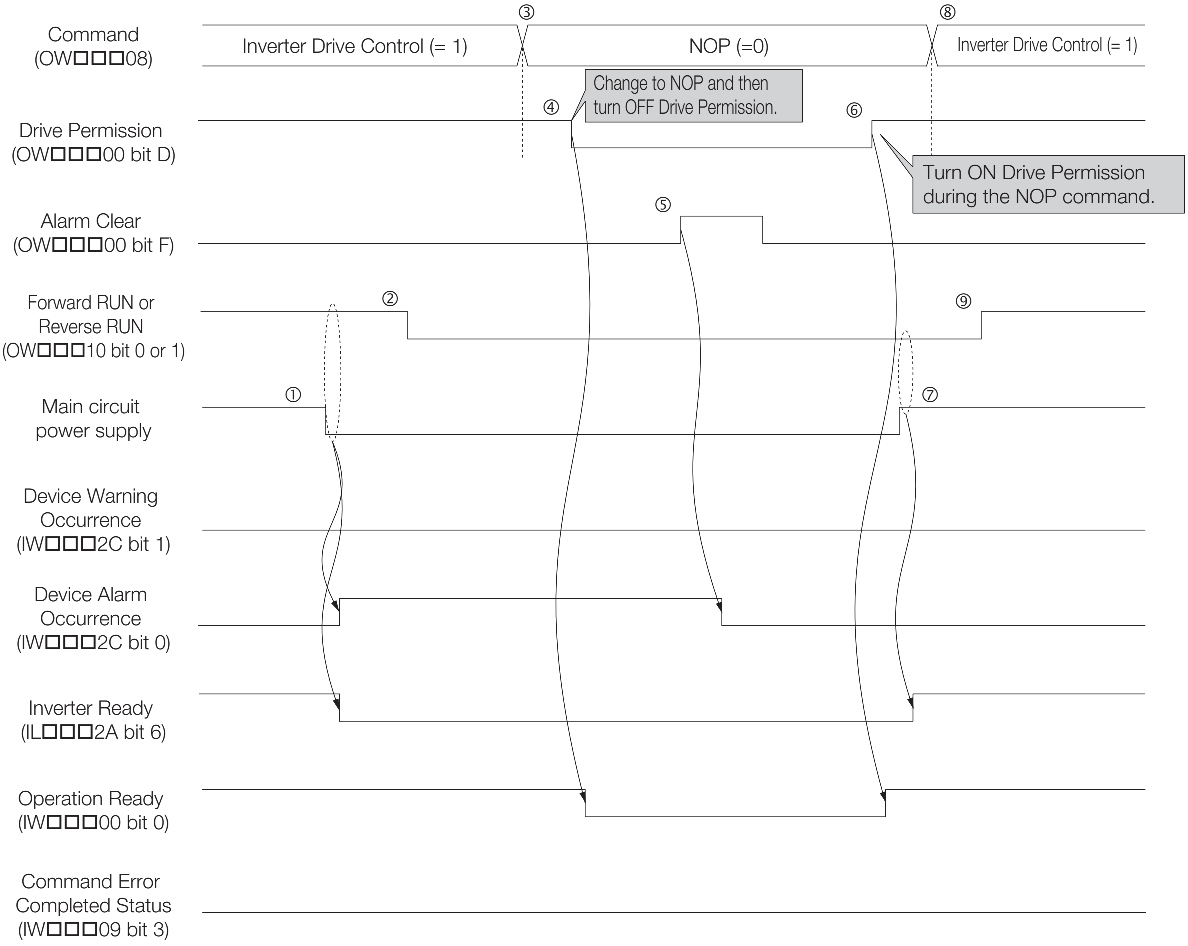
It is normally not necessary to turn OFF Drive Permission. However, if there is a reason to turn OFF Drive Permission in the application, use the following procedure.

1. Turn OFF the main circuit power supply.
2. The operation command will stop, so the Forward RUN and Reverse RUN commands will turn OFF.
3. Change the command from Inverter Drive Control to NOP.
4. Turn OFF Drive Permission.

The motor will perform an emergency stop.

Use the following steps to restart operation.

5. Execute an alarm clear operation to clear the device alarm.
6. Turn ON Drive Permission.
7. Turn ON the main circuit power supply.
8. Change the command from NOP to Inverter Drive Control.
9. Start the operation command again.

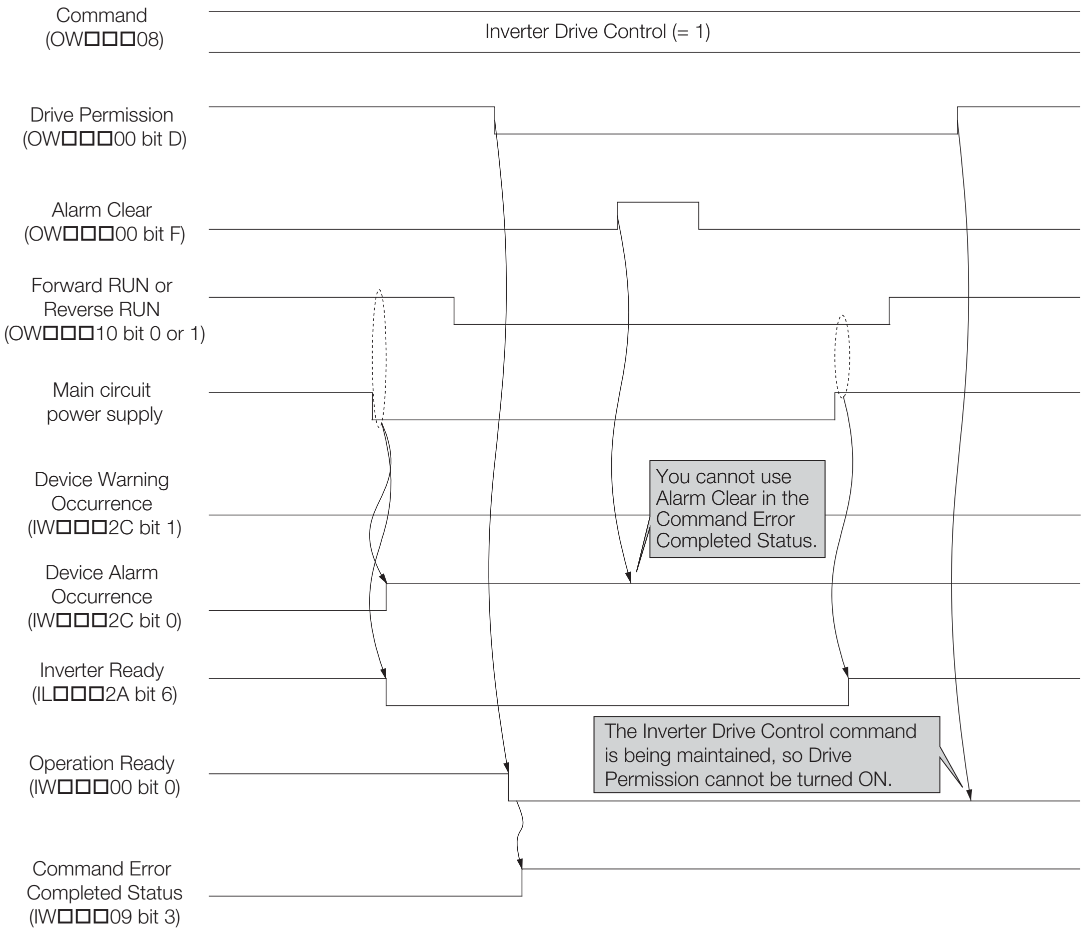


◆ Command Error Completed Status

If Drive Permission is turned OFF during execution of the Inverter Drive Control command, Command Error Completed Status (IW□□□09 bit 3) turns ON. To clear the Command Error Completed Status, change the command to NOP and perform the recovery operation.

The recovery procedure is the same as steps 5 to 9 of the procedure in ◆ *Turning OFF Drive Permission* on page 10-17, on the previous page.

Note: You cannot use Alarm Clear in the Command Error Completed Status.



You cannot use Alarm Clear in the Command Error Completed Status.

The Inverter Drive Control command is being maintained, so Drive Permission cannot be turned ON.

10.4 Main Commands and Subcommands

This section describes the main commands and subcommands that can be used when connecting Inverters.

10.4.1 List of Main Commands and Subcommands

The following table lists the main commands and subcommands that are available for each communication protocol.

	Name	MECHATROLINK-III (64-byte Mode)	MECHATROLINK-III (32-byte Mode)
Main Commands (OW□□08)	00: No Command	✓	✓
	01: Inverter Drive Control	✓	✓
	02: Read User Constant	✓	✓
	03: Write User Constant	✓	✓
	04: Alarm Monitor	✓	✓
	05: Alarm History Monitor	✓	✓
	06: User Constant RAM Writing	✓	✓
	07: User Constant EEPROM Writing	✓	✓
	08: Transmission Reference	✓	✓
Subcommands (OW□□0A)	00: No Command	✓	✓
	01: Inverter I/O Control	✓	–
	02: Read User Constant	✓	–
	03: Write User Constant	✓	–
	04: Alarm Monitor	✓	–
	05: Alarm History Monitor	✓	–
	08: Transmission Reference	✓	–
	09: Read Fixed Parameters*	✓	✓

* This is the subcommand to read out a fixed parameter in the SVC Function Module. This subcommand is not sent through the MECHATROLINK transmission line.

10.4.2 Applicable Combinations of Main Commands and Subcommands

The following table shows applicable combinations of commands and subcommands.

Subcommand / Main Command	No Command	Inverter I/O Control	Read User Constant	Write User Constant	Alarm Monitor	Alarm History Monitor	Transmission Reference	Read Fixed Parameters
00: No Command	✓	✓	✓	✓	✓	✓	✓	✓
01: Inverter Drive Control	✓	✓	✓	✓	✓	✓	✓	✓
02: Read User Constant	✓	✓	–	–	✓	✓	✓	✓
03: Write User Constant	✓	✓	–	–	✓	✓	✓	✓
04: Alarm Monitor	✓	✓	–	–	–	–	✓	✓
05: Alarm History Monitor	✓	✓	–	–	–	–	✓	✓
06: User Constant RAM Writing	✓	✓	–	–	–	–	✓	✓
07: User Constant EEPROM Writing	✓	✓	–	–	–	–	✓	✓
08: Transmission Reference	✓	✓	✓	✓	✓	✓	✓	✓

Note: 1. There are no restrictions on the combination of commands and subcommands for the SVC Function Module.
2. If the received main command and subcommand are incompatible, the Inverter will process the main command first.
3. If a command that is incompatible with the command being processed is received, the command being processed will have priority.
4. If the Inverter Drive Control main command is incompatible with the Inverter I/O Control subcommand, the main command processing will be overwritten by the subcommand processing.

10.4.3 Main Command Details

Each command and its parameters are described below.

No Command

◆ Description

No command to be executed

Important

If you change the command to No Command during operation, the motor will stop for a SERVOPACK but it will not stop for an Inverter.
Be aware that the operation for an Inverter is different from the operation for a SERVOPACK.

◆ Setting Parameters

Name	Register No.	Setting Range	Remarks
Command	OW□□□08	0 to 8	00: No Command

◆ Monitor Parameters

Name	Register No.	Setting Range	Remarks	
Command Response Code	IW□□□08	0 to 8	00: No Command	
Command Status	IW□□□09	Bit	Bit 0 (Command execution flag)	Always OFF
			Bit 3 (Command error completed status)	Always OFF
			Bit 8 (Command execution completed status)	Always ON
M-III Inverter Command Status	IL□□□2A	Bit	Inverter operating status	
M-III Command Status	IW□□□2C	Bit	Inverter command processing status	
Inverter Alarm Code	IW□□□32	0 to FFFFH	Inverter alarm code	

Inverter Drive Control

◆ Description

Sends commands to the Inverter and monitors the Inverter.

Note: If the Inverter Drive Control command is switched to another command during its execution, the Inverter retains the last data and continues operation. The MPE720 retains the last data for the monitor parameters because I/O between the SVC Function Module and Inverter are stopped. The Status monitor parameter, however, will be updated for any command being executed except Transmission Reference.

◆ Setting Parameters

Name	Register No.	Setting Range	Remarks
Mode Settings 1	OW□□□01	Bit	–
Command	OW□□□08	0 to 8	01: Inverter Drive Control
Output Data Option Selection	OW□□□0C	Bit	–
Input Data Option Selection	OW□□□0D	Bit	–
Input Command	OW□□□10	Bit	–
Speed Reference	OW□□□11	–	–
Torque Reference	OW□□□12	–	–
Torque Compensation (Option)	OW□□□13	–	Enabled when the Output Data Option Selection (OW□□□0C), bit 0 is ON.
Analog Output Terminal 1 Output	OW□□□14	–	Enabled when the Output Data Option Selection (OW□□□0C), bit 1 is ON.
Analog Output Terminal 2 Output	OW□□□15	–	Enabled when the Output Data Option Selection (OW□□□0C), bit 2 is ON.
Terminal Output	OW□□□16	–	Enabled when the Output Data Option Selection (OW□□□0C), bit 3 is ON.
PID Target	OW□□□17	–	Enabled when the Output Data Option Selection (OW□□□0C), bit 4 is ON.
Pulse Train Output	OW□□□18	–	Enabled when the Output Data Option Selection (OW□□□0C), bit 5 is ON.
V/f Gain	OW□□□19	–	Enabled when the Output Data Option Selection (OW□□□0C), bit 6 is ON.
Command Selection	OW□□□1B	–	Enabled when the Output Data Option Selection (OW□□□0C), bit 8 is ON.

◆ Monitor Parameters

Name	Register No.	Setting Range	Remarks	
Warning	IL□□□02	Bit	–	
Alarm	IL□□□04	Bit	–	
Command Response Code	IW□□□08	0 to 8	01: Inverter Drive Control	
Command Status	IW□□□09	Bit	Bit 0 (Command execution flag)	ON while the command is being executed
			Bit 3 (Command error completed status)	ON when an error occurs during command processing
			Bit 8 (Command execution completed)	OFF during command execution, and ON when command execution is completed.
Input Data Option Selection Monitor	IW□□□0D	Bit	–	
Output Frequency	IW□□□11	–	–	
Output Current	IW□□□12	–	–	
Motor Speed (Option)	IW□□□13	–	Enabled when Input Data Option Selection (OW□□□0D), bit 0 is ON.	
Torque Reference (Option)	IW□□□14	–	Enabled when Input Data Option Selection (OW□□□0D), bit 1 is ON.	
Encoder Count PG1	IW□□□15	–	Enabled when Input Data Option Selection (OW□□□0D), bit 2 is ON.	

Continued on next page.

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Name	Register No.	Setting Range	Remarks
Frequency Reference (Option)	IW□□□16	–	Enabled when Input Data Option Selection (OW□□□0D), bit 3 is ON.
Analog Input A2	IW□□□17	–	Enabled when Input Data Option Selection (OW□□□0D), bit 4 is ON.
Main Bus Voltage (Option)	IW□□□18	–	Enabled when Input Data Option Selection (OW□□□0D), bit 5 is ON.
Alarm Code	IW□□□19	–	Enabled when Input Data Option Selection (OW□□□0D), bit 6 is ON.
Warning Code	IW□□□1A	–	Enabled when Input Data Option Selection (OW□□□0D), bit 7 is ON.
Multi-Function Output Terminal	IW□□□1B	–	Enabled when Input Data Option Selection (OW□□□0D), bit 8 is ON.
Analog Input A3	IW□□□1C	–	Enabled when Input Data Option Selection (OW□□□0D), bit 9 is ON.
Multi-Function Input Terminal	IW□□□1D	–	Enabled when Input Data Option Selection (OW□□□0D), bit A is ON.
Analog Input A1	IW□□□1E	–	Enabled when Input Data Option Selection (OW□□□0D), bit B is ON.
Encoder Count PG2	IW□□□1F	–	Enabled when Input Data Option Selection (OW□□□0D), bit C is ON.
Monitor data set in F6-23	IW□□□20	–	Enabled when Input Data Option Selection (OW□□□0D), bit D is ON.
Monitor data set in F6-24	IW□□□21	–	Enabled when Input Data Option Selection (OW□□□0D), bit E is ON.
M-III Inverter Command Status	IL□□□2A	Bit	Inverter operating status
M-III Command Status	IW□□□2C	Bit	Inverter command processing status
Inverter Alarm Code	IW□□□32	0 to FFFFH	Inverter alarm code

Read User Constant

◆ Description

Reads the specified user constant from the Inverter.

◆ Setting Parameters

Name	Register No.	Setting Range	Remarks
Command	OW□□□08	0 to 8	02: Read User Constant
Inverter User Constant Number	OW□□□3C	0 to FFFFH	–
Inverter User Constant Number Size	OW□□□3D	1 to 4	–

◆ Monitor Parameters

Name	Register No.	Setting Range	Remarks	
Warning	IL□□□02	Bit	–	
Alarm	IL□□□04	Bit	–	
Command Response Code	IW□□□08	0 to 8	02: Read User Constant	
Command Status	IW□□□09	Bit	Bit 0 (Command execution flag)	ON during execution
			Bit 3 (Command error completed status)	ON when an error occurs during command processing
			Bit 8 (Command execution completed)	OFF during execution, and ON when execution is completed.
M-III Inverter Command Status	IL□□□2A	Bit	Inverter operating status	
M-III Command Status	IW□□□2C	Bit	Inverter command processing status	
Inverter Alarm Code	IW□□□32	0 to FFFFH	Inverter alarm code	
Inverter User Constant Number	IW□□□3C	0 to FFFFH	–	
User Constant Reading Data 1	IW□□□3E	0 to 65535	–	
User Constant Reading Data 2	IW□□□3F	0 to 65535	–	
User Constant Reading Data 3	IW□□□40	0 to 65535	–	
User Constant Reading Data 4	IW□□□41	0 to 65535	–	

Write User Constant

◆ Description

Writes the specified inverter user constant to a constant in the Inverter.

Note: You must execute the User Constant RAM Writing command to enable the data written by executing the Write User Constant command. Refer to the following section for details.
☞ *User Constant RAM Writing* on page 10-26

◆ Setting Parameters

Name	Register No.	Setting Range	Remarks
Command	OW□□□08	0 to 8	03: Write User Constant
Inverter User Constant Number	OW□□□3C	0 to FFFFH	–
Inverter User Constant Number Size	OW□□□3D	1 to 4	–
Inverter User Constant Set Point 1	OW□□□3E	0 to 65535	–
Inverter User Constant Set Point 2	OW□□□3F	0 to 65535	–
Inverter User Constant Set Point 3	OW□□□40	0 to 65535	–
Inverter User Constant Set Point 4	OW□□□41	0 to 65535	–

◆ Monitor Parameters

Name	Register No.	Setting Range	Remarks	
Warning	IL□□□02	Bit	–	
Alarm	IL□□□04	Bit	–	
Command Response Code	IW□□□08	0 to 8	03: Write User Constant	
Command Status	IW□□□09	Bit	Bit 0 (Command execution flag)	ON during execution
			Bit 3 (Command error completed status)	ON when an error occurs during command processing
			Bit 8 (Command execution completed)	OFF during execution, and ON when execution is completed.
M-III Inverter Command Status	IL□□□2A	Bit	Inverter operating status	
M-III Command Status	IW□□□2C	Bit	Inverter command processing status	
Inverter Alarm Code	IW□□□32	0 to FFFFH	Inverter alarm code	
Inverter User Constant Number	IW□□□3C	0 to FFFFH	–	

Alarm Monitor

◆ Description

Reads the alarm that is occurring in the Inverter.

◆ Setting Parameters

Name	Register No.	Setting Range	Remarks
Command	OW□□□08	0 to 8	04: Alarm Monitor
Inverter Alarm Monitor Number	OW□□□32	0	Alarm monitor number

◆ Monitor Parameters

Name	Register No.	Setting Range	Remarks	
Warning	IL□□□02	Bit	–	
Alarm	IL□□□04	Bit	–	
Command Response Code	IW□□□08	0 to 8	04: Alarm Monitor	
Command Status	IW□□□09	Bit	Bit 0 (Command execution flag)	ON during execution
			Bit 3 (Command error completed status)	ON when an error occurs during command processing
			Bit 8 (Command execution completed status)	OFF during execution, and ON when execution is completed.
M-III Inverter Command Status	IL□□□2A	Bit	Inverter operating status	
M-III Command Status	IW□□□2C	Bit	Inverter command processing status	
Inverter Alarm Code	IW□□□32	0 to FFFFH	The currently occurring alarm is read out.	

Alarm History Monitor

◆ Description

Reads the Inverter alarm history.

◆ Setting Parameters

Name	Register No.	Setting Range	Remarks
Command	OW□□□08	0 to 8	05: Alarm History Monitor
Inverter Alarm Monitor Number	OW□□□32	0 to 9	Alarm monitor number

◆ Monitor Parameters

Name	Register No.	Setting Range	Remarks	
Warning	IL□□□02	Bit	–	
Alarm	IL□□□04	Bit	–	
Command Response Code	IW□□□08	0 to 8	05: Alarm History Monitor	
Command Status	IW□□□09	Bit	Bit 0 (Command execution flag)	ON during execution
			Bit 3 (Command error completed status)	ON when an error occurs during command processing
			Bit 8 (Command execution completed)	OFF during execution, and ON when execution is completed.
M-III Inverter Command Status	IL□□□2A	Bit	Inverter operating status	
M-III Command Status	IW□□□2C	Bit	Inverter command processing status	
Inverter Alarm Code	IW□□□32	0 to FFFFH	The alarm history that is read out.	

User Constant RAM Writing

◆ Description

Saves the parameter data written by executing Write User Constant in the Inverter volatile memory to enable the data.

◆ Setting Parameters

Name	Register No.	Setting Range	Remarks
Command	OW□□□08	0 to 8	06: User Constant RAM Writing

◆ Monitor Parameters

Name	Register No.	Setting Range	Remarks	
Warning	IL□□□02	Bit	–	
Alarm	IL□□□04	Bit	–	
Command Response Code	IW□□□08	0 to 8	06: User Constant RAM Writing	
Command Status	IW□□□09	Bit	Bit 0 (Command execution flag)	ON during execution
			Bit 3 (Command error completed status)	ON when an error occurs during command processing
			Bit 8 (Command execution completed)	OFF during execution, and ON when execution is completed.
M-III Inverter Command Status	IL□□□2A	Bit	Inverter operating status	
M-III Command Status	IW□□□2C	Bit	Inverter command processing status	

User Constant EEPROM Writing

◆ Description

Saves the parameter data written by executing Write User Constant in the Inverter nonvolatile memory.

◆ Setting Parameters

Name	Register No.	Setting Range	Remarks
Command	OW□□□08	0 to 8	07: User Constant EEPROM Writing

◆ Monitor Parameters

Name	Register No.	Setting Range	Remarks	
Warning	IL□□□02	Bit	–	
Alarm	IL□□□04	Bit	–	
Command Response Code	IW□□□08	0 to 8	07: User Constant EEPROM Writing	
Command Status	IW□□□09	Bit	Bit 0 (Command execution flag)	ON during execution
			Bit 3 (Command error completed status)	ON when an error occurs during command processing
			Bit 8 (Command execution completed)	OFF during execution, and ON when execution is completed.
M-III Inverter Command Status	IL□□□2A	Bit	Inverter operating status	
M-III Command Status	IW□□□2C	Bit	Inverter command processing status	

Transmission Reference

◆ Description

You can use this command to freely set a MECHATROLINK-III command and send it through the transmission line.

◆ Setting Parameters

Name	Register No.	Setting Range	Remarks
Command	OW□□□08	0 to 8	08: Transmission Reference
Transmission Reference Output Data 0	OW□□□60	0 to FFFFH	The lower bytes contain the M-III command code.
· · ·	· · ·	–	–
Transmission Reference Output Data 15	OW□□□6F	0 to FFFFH	–

◆ Monitor Parameters

Name	Register No.	Setting Range	Remarks	
Warning	IL□□□02	Bit	–	
Alarm	IL□□□04	Bit	–	
Command Response Code	IW□□□08	0 to 8	08: Transmission Reference	
Command Status	IW□□□09	Bit	Bit 0 (Command execution flag)	ON during execution
			Bit 3 (Command error completed status)	Always OFF
			Bit 8 (Command execution completed)	Always OFF
Transmission Reference Input Data 0	IW□□□60	0 to FFFFH	The lower bytes contain the M-III command code.	
· · ·	· · ·	–	–	
Transmission Reference Input Data 15	IW□□□6F	0 to FFFFH	–	

10.4.4 Subcommand Details

Each subcommand and the related parameters are described below.

No Command

◆ Description

No command to be executed.

◆ Setting Parameters

Name	Register No.	Setting Range	Remarks
Sub Command	OW□□□0A	0 to 65535	00: No Command

◆ Monitor Parameters

Name	Register No.	Setting Range	Remarks	
Subcommand Response Code	IW□□□0A	0 to 65535	00: No Command	
Subcommand Status	IW□□□0B	Bit	Bit 0 (Command execution flag)	Always OFF
			Bit 3 (Command error completed status)	Always OFF
			Bit 8 (Command execution completed)	Always OFF
M-III Sub Command Status	IW□□□31	Bit	Inverter subcommand processing status	
Auxiliary Inverter Alarm Code	IW□□□33	0 to FFFFH	Inverter alarm code	

Inverter I/O Control

◆ Description

Sends a command to the Inverter and monitors the Inverter. This subcommand has an auxiliary function for the main command (OW□□□08). Only the data selected in Auxiliary Output Data Option Selection (OW□□□0E) can be output. Furthermore, only the data selected in the Auxiliary Input Data Option Selection (OW□□□0F) can be monitored.

Note: This command is enabled only when the number of transmission bytes is set to 64 bytes.

◆ Setting Parameters

Name	Register No.	Setting Range	Remarks
Sub Command	OW□□□0A	0 to 65535	01: Inverter I/O Control
Auxiliary Output Data Option Selection	OW□□□0E	Bit	–
Auxiliary Input Data Option Selection	OW□□□0F	Bit	–
Torque Compensation (Option)	OW□□□13	–	Enabled when bit 0 of Auxiliary Output Data Option Selection (OW□□□0E) is ON.
Analog Output Terminal 1 Output	OW□□□14	–	Enabled when bit 1 of Auxiliary Output Data Option Selection (OW□□□0E) is ON.
Analog Output Terminal 2 Output	OW□□□15	–	Enabled when bit 2 of Auxiliary Output Data Option Selection (OW□□□0E) is ON.
Terminal Output	OW□□□16	–	Enabled when bit 3 of Auxiliary Output Data Option Selection (OW□□□0E) is ON.
PID Target	OW□□□17	–	Enabled when bit 4 of Auxiliary Output Data Option Selection (OW□□□0E) is ON.
Pulse Train Output	OW□□□18	–	Enabled when bit 5 of Auxiliary Output Data Option Selection (OW□□□0E) is ON.
V/f Gain	OW□□□19	–	Enabled when bit 6 of Auxiliary Output Data Option Selection (OW□□□0E) is ON.
Command Selection	OW□□□1B	–	Enabled when bit 8 of Auxiliary Output Data Option Selection (OW□□□0E) is ON.

◆ Monitor Parameters

Name	Register No.	Setting Range	Remarks	
Subcommand Response Code	IW□□□0A	0 to 65535	01: Inverter I/O Control	
Subcommand Status	IW□□□0B	Bit	Bit 0 (Command execution flag)	ON during execution.
			Bit 3 (Command error completed status)	ON when an error occurs during the command processing
			Bit 8 (Command execution completed)	OFF during execution, and always ON after execution is completed.
Auxiliary Input Data Option Selection Monitor	IW□□□0F	Bit	–	
Motor Speed (Option)	IW□□□13	–	Enabled when bit 0 of Auxiliary Input Data Option Selection (OW□□□0F) is ON.	
Torque Reference (Option)	IW□□□14	–	Enabled when bit 1 of Auxiliary Input Data Option Selection (OW□□□0F) is ON.	
Encoder Count PG1	IW□□□15	–	Enabled when bit 2 of Auxiliary Input Data Option Selection (OW□□□0F) is ON.	
Frequency Reference (Option)	IW□□□16	–	Enabled when bit 3 of Auxiliary Input Data Option Selection (OW□□□0F) is ON.	
Analog Input A2	IW□□□17	–	Enabled when bit 4 of Auxiliary Input Data Option Selection (OW□□□0F) is ON.	
Main Bus Voltage (Option)	IW□□□18	–	Enabled when bit 5 of Auxiliary Input Data Option Selection (OW□□□0F) is ON.	
Alarm Code	IW□□□19	–	Enabled when bit 6 of Auxiliary Input Data Option Selection (OW□□□0F) is ON.	
Warning Code	IW□□□1A	–	Enabled when bit 7 of Auxiliary Input Data Option Selection (OW□□□0F) is ON.	
Multi-Function Output Terminal	IW□□□1B	–	Enabled when bit 8 of Auxiliary Input Data Option Selection (OW□□□0F) is ON.	
Analog Input A3	IW□□□1C	–	Enabled when bit 9 of Auxiliary Input Data Option Selection (OW□□□0F) is ON.	
Multi-Function Input Terminal	IW□□□1D	–	Enabled when bit A of Auxiliary Input Data Option Selection (OW□□□0F) is ON.	
Analog Input A1	IW□□□1E	–	Enabled when bit B of Auxiliary Input Data Option Selection (OW□□□0F) is ON.	
Encoder Count PG2	IW□□□1F	–	Enabled when bit C of Auxiliary Input Data Option Selection (OW□□□0F) is ON.	
Monitor data set in F6-23	IW□□□20	–	Enabled when bit D of Auxiliary Input Data Option Selection (OW□□□0F) is ON.	
Monitor data set in F6-24	IW□□□21	–	Enabled when bit E of Auxiliary Input Data Option Selection (OW□□□0F) is ON.	
M-III Sub Command Status	IW□□□31	Bit	Inverter subcommand processing status	
Auxiliary Inverter Alarm Code	IW□□□33	0 to FFFFH	Inverter alarm code	

Read User Constant

◆ Description

Reads the specified inverter user constant from the Inverter.

Note: This command is enabled only when the number of transmission bytes is set to 64 bytes.

◆ Setting Parameters

Name	Register No.	Setting Range	Remarks
Sub Command	OW□□□0A	0 to 65535	02: Read User Constant
Inverter User Constant Number	OW□□□42	0 to FFFFH	–
Inverter User Constant Number Size	OW□□□43	1 to 4	–

◆ Monitor Parameters

Name	Register No.	Setting Range	Remarks	
Subcommand Response Code	IW□□□0A	0 to 65535	02: Read User Constant	
Subcommand Status	IW□□□0B	Bit	Bit 0 (Command execution flag)	ON during execution
			Bit 3 (Command error completed status)	ON when an error occurs during command processing.
			Bit 8 (Command execution completed)	OFF during execution, and ON when execution is completed.
M-III Sub Command Status	IW□□□31	Bit	Inverter subcommand processing status	
Auxiliary Inverter Alarm Code	IW□□□33	0 to FFFFH	Inverter alarm code	
Auxiliary Inverter User Constant Number	IW□□□42	0 to FFFFH	–	
Auxiliary User Constant Reading Data 1	IW□□□44	0 to 65535	–	
Auxiliary User Constant Reading Data 2	IW□□□45	0 to 65535	–	
Auxiliary User Constant Reading Data 3	IW□□□46	0 to 65535	–	
Auxiliary User Constant Reading Data 4	IW□□□47	0 to 65535	–	

Write User Constant

◆ Description

Writes the specified inverter user constant in the Inverter internal constant.

Note: 1. This command is enabled only when the number of transmission bytes is set to 64 bytes.
2. You must execute the User Constant RAM Writing command to enable the data written by executing the Write User Constant command. Refer to the following section for details.
☞ *User Constant RAM Writing* on page 10-26

◆ Setting Parameters

Name	Register No.	Setting Range	Remarks
Sub Command	OW□□□0A	0 to 65535	03: Write User Constant
Auxiliary Inverter User Constant Number	OW□□□42	0 to FFFFH	–
Auxiliary Inverter User Constant Number Size	OW□□□43	1 to 4	–
Auxiliary Inverter User Constant Set Point 1	OW□□□44	0 to 65535	–
Auxiliary Inverter User Constant Set Point 2	OW□□□45	0 to 65535	–
Auxiliary Inverter User Constant Set Point 3	OW□□□46	0 to 65535	–
Auxiliary Inverter User Constant Set Point 4	OW□□□47	0 to 65535	–

◆ Monitor Parameters

Name	Register No.	Setting Range	Remarks	
Subcommand Response Code	IW□□□0A	0 to 65535	03: Write User Constant	
Subcommand Status	IW□□□0B	Bit	Bit 0 (Command execution flag)	ON during execution
			Bit 3 (Command error completed status)	ON when an error occurs during command processing.
			Bit 8 (Command execution completed)	OFF during execution, and ON when execution is completed.
M-III Sub Command Status	IW□□□31	Bit	Inverter subcommand processing status	
Auxiliary Inverter Alarm Code	IW□□□33	0 to FFFFH	Inverter alarm code	
Auxiliary Inverter User Constant Number	IW□□□42	0 to FFFFH	–	

Alarm Monitor

◆ Description

Reads out the alarm that is occurring in the Inverter.

Note: This command is enabled only when the number of transmission bytes is set to 64 bytes.

◆ Setting Parameters

Name	Register No.	Setting Range	Remarks
Sub Command	OW□□□0A	0 to 65535	04: Alarm Monitor
Auxiliary Inverter Alarm Monitor Number	OW□□□33	0	Record number specification

◆ Monitor Parameters

Name	Register No.	Setting Range	Remarks	
Subcommand Response Code	IW□□□0A	0 to 65535	04: Alarm Monitor	
Subcommand Status	IW□□□0B	Bit	Bit 0 (Command execution flag)	ON during execution
			Bit 3 (Command error completed status)	ON when an error occurs during command processing.
			Bit 8 (Command execution completed)	OFF during execution, and ON when execution is completed.
M-III Sub Command Status	IW□□□31	Bit	Inverter subcommand processing status	
Auxiliary Inverter Alarm Code	IW□□□33	0 to FFFFH	The currently occurring alarm that is read out.	

Alarm History Monitor

◆ Description

Reads out the Inverter alarm history.

Note: This command is enabled only when the number of transmission bytes is set to 64 bytes.

◆ Setting Parameters

Name	Register No.	Setting Range	Remarks
Sub Command	OW□□□0A	0 to 65535	05: Alarm History Monitor
Auxiliary Inverter Alarm Monitor Number	OW□□□33	0 to 9	Record number specification

◆ Monitor Parameters

Name	Register No.	Setting Range	Remarks	
Subcommand Response Code	IW□□□0A	0 to 65535	05: Alarm History Monitor	
Subcommand Status	IW□□□0B	Bit	Bit 0 (Command execution flag)	ON during execution
			Bit 3 (Command error completed status	ON when an error occurs during command processing.
			Bit 8 (Command execution completed)	OFF during execution, and ON when execution is completed.
M-III Sub Command Status	IW□□□31	Bit	Inverter subcommand processing status	
Auxiliary Inverter Alarm Code	IW□□□33	0 to FFFFH	The alarm history that is read out.	

Transmission Reference

◆ Description

You can use this subcommand to freely set a MECHATROLINK-III command and send it through the transmission line.

Note: This command is enabled only when the number of transmission bytes is set to 64 bytes.

◆ Setting Parameters

Name	Register No.	Setting Range	Remarks
Sub Command	OW□□□0A	0 to 65535	08: Transmission Reference
Transmission Reference Output Data 16	OW□□□70	0 to FFFFH	Subcommand output data bytes 0 and 1
. . .	. . .	–	–
Transmission Reference Output Data 31	OW□□□7F	0 to FFFFH	–

◆ Monitor Parameters

Name	Register No.	Setting Range	Remarks	
Subcommand Response Code	IW□□□0A	0 to 65535	08: Transmission Reference	
Subcommand Status	IW□□□0B	Bit	Bit 0 (Command execution flag)	ON during execution
			Bit 3 (Command error completed status)	Always OFF
			Bit 8 (Command execution completed)	Always OFF
Transmission Reference Input Data 16	IW□□□70	0 to FFFFH	Subcommand input data bytes 0 and 1	
. . .	. . .	0 to FFFFH	–	
Transmission Reference Input Data 31	IW□□□7F	0 to FFFFH	–	

Read Fixed Parameters

◆ Description

Reads out the set data of the specified fixed parameter.

◆ Setting Parameters

Name	Register No.	Setting Range	Remarks
Sub Command	OW□□□0A	0 to 65535	09: Read Fixed Parameters
Fixed Parameter Number	OW□□□48	0 to 63	Set the fixed parameter number.

◆ Monitor Parameters

Name	Register No.	Setting Range	Remarks	
Subcommand Response Code	IW□□□0A	0 to 65535	09: Read Fixed Parameters	
Subcommand Status	IW□□□0B	Bit	Bit 0 (Command execution flag)	ON during execution
			Bit 3 (Command error completed status)	ON when an error occurs during command processing.
			Bit 8 (Command execution completed)	OFF during execution, and ON when execution is completed.
Fixed Parameter Monitor	IL□□□48	-2^{31} to $2^{31}-1$	–	

10.5 Motion Parameter Details

This section describes the fixed parameters, setting parameters, and monitor parameters that can be set in the SVC Definition Tab Page for the connected Inverters.

10.5.1 Fixed Parameter List

<table>
<tr><th>No.</th><th colspan="2">Name and Contents</th><th>Setting Range</th><th>Default Setting</th></tr>
<tr><td rowspan="2">0</td><td colspan="2">Selection of Operation Mode</td><td>0 or 1</td><td>0</td></tr>
<tr><td colspan="4">Sets the run mode to send/receive commands to/from the Inverter through MECHATROLINK.
0: Normal Operation Mode (default)
Inverter operation is performed.
1: Axis Unused
Impossible to send/receive commands.</td></tr>
<tr><td>1</td><td colspan="2">Reserved</td><td>–</td><td>–</td></tr>
<tr><td rowspan="4">2</td><td colspan="2">Function Selection Flag 2</td><td>–</td><td>0</td></tr>
<tr><td>Bit 0: Communication Abnormality Detection Mask</td><td colspan="3">Specifies whether to mask an error to be reported to the monitor parameter when an error is detected in MECHATROLINK communications.
0: Disabled (default)
When a communication error occurs, the error will be reported in the Alarm or Warning monitor parameter.
1: Enabled
When a communication error occurs, the error will not be reported in the Alarm or Warning monitor parameter.</td></tr>
<tr><td>Bit 1: WDT Abnormality Detection Mask (Applicable only for synchronous communications supported inverters)</td><td colspan="3">Specifies whether to mask an error to be reported to the monitor parameter when a synchronization management error is detected in MECHATROLINK communications.
0: Disabled (default)
If a watchdog error occurs in communications with the Inverter, the error will be reported in the Alarm monitor parameter.
1: Enabled
If a watchdog error occurs in communications with the Inverter, the error will not be reported in the Alarm monitor parameter.</td></tr>
<tr><td>Bits 2 to F</td><td colspan="3">Reserved</td></tr>
<tr><td rowspan="4">3</td><td colspan="2">Function Selection Flag 3</td><td>–</td><td>8000H</td></tr>
<tr><td>Bit 0: Communication Selection Is Abnormal</td><td colspan="3">Valid when Communication Abnormality Detection Mask bit (bit 0) of Communications Selection Flag 2 is set to 0 (Disabled).
Specifies whether an Alarm or Warning is to be output when a communication errors occurs.
0: Alarm (default)
Outputs Alarm at occurrence of communication error.
The alarm must be reset to restart communications.
1: Warning
Outputs Warning at occurrence of communication error.
When communications is restored, the warning will be automatically cleared.</td></tr>
<tr><td>Bits 1 to E</td><td colspan="3">Reserved</td></tr>
<tr><td>Bit F: Parameter Discrimination Flag</td><td colspan="3">Reserved
1: Inverter parameter (always ON)</td></tr>
<tr><td>4 to 63</td><td colspan="2">Reserved</td><td>–</td><td>–</td></tr>
</table>

10.5.2 Setting Parameter List

Register No.	Name		Description
OW□□□00	RUN Command Setting	Bits 0 to B	Reserved
		Bit C: Reset Network	0: OFF, 1: ON Turn ON this bit to reset the entire MECHATROLINK network.
		Bit D: Drive Permission	0: OFF, 1: ON Enables (ON) or disables (OFF) the Inverter drive control. • This bit is captured at both rising and falling edges. • When set to 0 (OFF), the command Inverter Drive Control cannot be used. • When this bit turns ON from OFF, the request to prepare for inverter control operation is sent. However, this request will not be accepted while the command Inverter Drive Control is being executed. To allow the Inverter to get ready to run, turn OFF this bit and then turn it ON again after setting a command other than Inverter Drive Control. • When this bit turns OFF from ON while the command Inverter Drive Control is being executed, bit 3 (Command Error Completed Status) of the monitoring parameter Command Status will turn ON. Also, when this bit turns OFF from ON while the Inverter is operating, the system will execute Forced OFF (OFF both for forward RUN and reverse RUN).
		Bit E: Communication Reset	0: OFF, 1: ON Re-establishes the connection for MECHATROLINK communications with the Inverter, whether communications are stopped or in process. Also clears the Alarm monitor parameter. • This bit is captured at the rising edge. <Application Example> With the setting to continue communications after a communications error occurrence,* the SVC Function Module will continue communications whether or not the Inverter stops communications because of the error. In this case, the connection for communications can be re-established by executing the Communications Reset command. By resetting communications, you can re-establish communications with the Inverter.
		Bit F: Alarm Clear	0: OFF, 1: ON Clears the Alarm monitor parameter. • This bit is captured at the rising edge. • If communications are stopped after the MECHATROLINK communication errors, clear the alarm bit and re-establish communications by setting this bit to 1 (ON). Note: Alarm Clear is used to clear alarms in the SVC Function Module, but will not clear alarms and warnings in the Inverter. To clear alarms in the Inverter, use the Inverter Drive Control command and set the bit 9 (Fault Reset) of Input Command (OW□□□10) to 1 (ON).

Continued on next page.

Continued from previous page.

Register No.	Name		Description
OW□□□01	Mode Settings 1	Bit 0: Multi-function Input Terminal 3	0: Function OFF, 1: Function ON Specifies whether to use the multi-function input terminals. The status of the input terminals is reported in the Multi-Function Input Terminal monitor parameter.
		Bit 1: Multi-function Input Terminal 4	
		Bit 2: Multi-function Input Terminal 5	
		Bit 3: Multi-function Input Terminal 6	
		Bit 4: Multi-function Input Terminal 7	
		Bit 5: Multi-function Input Terminal 8	
		Bits 6 to F	Reserved
OW□□□02 to OW□□□05	–		Reserved
OL□□□06	(Inverter command output)		Reserved
OW□□□08	Command ☞ *10.4.3 Main Command Details* on page 10-21		00: No Command 01: Inverter Drive Control 02: Read User Constant 03: Write User Constant 04: Alarm Monitor 05: Alarm History Monitor 06: User Constant RAM Writing 07: User Constant EEPROM Writing 08: Transmission Reference
OW□□□09	–		Reserved
OW□□□0A	Sub Command ☞ *10.4.4 Subcommand Details* on page 10-28		00: No Command 01: Inverter I/O Control 02: Read User Constant 03: Write User Constant 04: Alarm Monitor 05: Alarm History Monitor 06: Reserved 07: Reserved 08: Transmission Reference 09: Read Fixed Parameters
OW□□□0B	–		Reserved

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Register No.	Name		Description
OW□□□0C	Output Data Option Selection	Bit 0: Torque Compensation (Option)	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the output data option Torque Compensation (OW□□□13) will be enabled when the Inverter Drive Control command is executed.
		Bit 1: Analog Output Terminal 1 Output	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the output data option Analog Output Terminal 1 Output (OW□□□14) will be enabled when the Inverter Drive Control command is executed.
		Bit 2: Analog Output Terminal 2 Output	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the output data option Analog Output Terminal 2 Output (OW□□□15) will be enabled when the Inverter Drive Control command is executed.
		Bit 3: Terminal Output	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the output data option Terminal Output (OW□□□16) will be enabled when the Inverter Drive Control command is executed.
		Bit 4: PID Target	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the output data option PID Target (OW□□□17) will be enabled when the Inverter Drive Control command is executed.
		Bit 5: Pulse Train Output	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the output data option Pulse Train Output (OW□□□18) will be enabled when the Inverter Drive Control command is executed.
		Bit 6: V/f Gain	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the output data option V/f Gain (OW□□□19) will be enabled when the Inverter Drive Control command is executed.
		Bit 7	Reserved
		Bit 8: Command Selection	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the output data option Command Selection (OW□□□1B) will be enabled when the Inverter Drive Control command is executed.
		Bits 9 to F	Reserved
OW□□□0D	Input Data Option Selection	Bit 0: Motor Speed (Option)	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the input data option Motor Speed (IW□□□13) will be monitored when the Inverter Drive Control command is executed.
		Bit 1: Torque Reference Setting	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the input data option Torque Reference (IW□□□14) will be monitored when the Inverter Drive Control command is executed.
		Bit 2: Encoder Count PG1	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the input data option Encoder Count PG1 (IW□□□15) will be monitored when the Inverter Drive Control command is executed.
		Bit 3: Frequency Reference (Option)	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the input data option Frequency Reference (IW□□□16) will be monitored when the Inverter Drive Control command is executed.

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Register No.	Name		Description
OW□□□0D	Input Data Option Selection (continued)	Bit 4: Analog Input A2	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the input data option Analog Input A2 (IW□□□17) will be monitored when the Inverter Drive Control command is executed.
		Bit 5: Main Bus Voltage (Option)	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the input data option Main Bus Voltage (IW□□□18) will be monitored when the Inverter Drive Control command is executed.
		Bit 6: Alarm Code	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the input data option Alarm Code (IW□□□19) will be monitored when the Inverter Drive Control command is executed.
		Bit 7: Warning Code	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the input data option Warning Code (IW□□□1A) will be monitored when the Inverter Drive Control command is executed.
		Bit 8: Multi-Function Output Terminal	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the input data option Multi-Function Output Terminal (IW□□□1B) will be monitored when the Inverter Drive Control command is executed.
		Bit 9: Analog Input A3	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the input data option Analog Input A3 (IW□□□1C) will be monitored when the Inverter Drive Control command is executed.
		Bit A: Multi-Function Input Terminal	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the input data option Multi-Function Input Terminal (IW□□□1D) will be monitored when the Inverter Drive Control command is executed.
		Bit B: Analog Input A1	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the input data option Analog Input A1 (IW□□□1E) will be monitored when the Inverter Drive Control command is executed.
		Bit C: Encoder Count PG2	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the input data option Encoder Count PG2 (IW□□□1F) will be monitored when the Inverter Drive Control command is executed.
		Bit D: Monitor data set in F6-23	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the input data option Monitor Data Set in F6-23 (IW□□□20) will be monitored when the Inverter Drive Control command is executed.
		Bit E: Monitor data set in F6-24	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the input data option Monitor Data Set in F6-24 (IW□□□21) will be monitored when the Inverter Drive Control command is executed.
		Bit F	Reserved

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Register No.	Name		Description
OW□□□0E	Auxiliary Output Data Option Selection	Bit 0: Torque Compensation (Option)	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the output data option Torque Compensation (OW□□□13) will be enabled when the Inverter I/O Control subcommand is executed.
		Bit 1: Analog Output Terminal 1 Output	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the output data option Analog Output Terminal 1 Output (OW□□□14) will be enabled when the Inverter I/O Control subcommand is executed.
		Bit 2: Analog Output Terminal 2 Output	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the output data option Analog Output Terminal 2 Output (OW□□□15) will be enabled when the Inverter I/O Control subcommand is executed.
		Bit 3: Terminal Output	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the output data option Terminal Output (OW□□□16) will be enabled when the Inverter I/O Control subcommand is executed.
		Bit 4: PID Target	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the output data option PID Target (OW□□□17) will be enabled when the Inverter I/O Control subcommand is executed.
		Bit 5: Pulse Train Output	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the output data option Pulse Train Output (OW□□□18) will be enabled when the Inverter I/O Control subcommand is executed.
		Bit 6: V/f Gain	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the output data option V/f Gain (OW□□□19) will be enabled when the Inverter I/O Control subcommand is executed.
		Bit 7	Reserved
		Bit 8: Command Selection	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the output data option Command Selection (OW□□□1B) will be enabled when the Inverter I/O Control subcommand is executed.
		Bits 9 to F	Reserved

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Register No.	Name		Description
OW□□□0F	Auxiliary Input Data Option Selection	Bit 0: Motor Speed (Option)	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the input data option Motor Speed (IW□□□13) will be monitored when the Inverter I/O Control subcommand is executed.
		Bit 1: Torque Reference Setting	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the input data option Torque Reference (IW□□□14) will be monitored when the Inverter I/O Control subcommand is executed.
		Bit 2: Encoder Count PG1	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the input data option Encoder Count PG1 (IW□□□15) will be monitored when the Inverter I/O Control subcommand is executed.
		Bit 3 Frequency Reference (Option)	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the input data option Frequency Reference (IW□□□16) will be monitored when the Inverter I/O Control subcommand is executed.
		Bit 4: Analog Input A2	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the input data option Analog Input A2 (IW□□□17) will be monitored when the Inverter I/O Control subcommand is executed.
		Bit 5: Main Bus Voltage (Option)	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the input data option Main Bus Voltage (IW□□□18) will be monitored when the Inverter I/O Control subcommand is executed.
		Bit 6: Alarm Code	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the input data option Alarm Code (IW□□□19) will be monitored when the Inverter I/O Control subcommand is executed.
		Bit 7: Warning Code	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the input data option Warning Code (IW□□□1A) will be monitored when the Inverter I/O Control subcommand is executed.
		Bit 8: Multi-Function Output Terminal	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the input data option Multi-Function Output Terminal (IW□□□1B) will be monitored when the Inverter I/O Control subcommand is executed.
		Bit 9: Analog Input A3	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the input data option Analog Input A3 (IW□□□1C) will be monitored when the Inverter I/O Control subcommand is executed.
		Bit A: Multi-Function Input Terminal	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the input data option Multi-Function Input Terminal (IW□□□1D) will be monitored when the Inverter I/O Control subcommand is executed.
		Bit B: Analog Input A1	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the input data option Analog Input A1 (IW□□□1E) will be monitored when the Inverter I/O Control subcommand is executed.

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Register No.	Name		Description
OW□□□0F	Auxiliary Input Data Option Selection (continued)	Bit C: Encoder Count PG2	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the input data option Encoder Count PG2 (IW□□□1F) will be monitored when the Inverter I/O Control subcommand is executed.
		Bit D: Monitor data set in F6-23	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the input data option Monitor Data Set in F6-23 (IW□□□20) will be monitored when the Inverter I/O Control subcommand is executed.
		Bit E: Monitor data set in F6-24	0: Disabled, 1: Enabled When this bit is set to 1 (enabled), the input data option Monitor Data Set in F6-24 (IW□□□21) will be monitored when the Inverter I/O Control subcommand is executed.
		Bit F	Reserved
OW□□□10	Input Command	Bit 0: Forward RUN	0: Stop, 1: Forward RUN This data is enabled when the Inverter Drive Control command is executed. A forward command is applied.
		Bit 1: Reverse RUN	0: Stop, 1: Reverse RUN This data is enabled when the Inverter Drive Control command is executed. A reverse command is applied.
		Bit 2 to 8	Reserved
		Bit 9: Fault Reset	0: Disabled, 1: Fault reset This data is enabled when the Inverter Drive Control command is executed. Clears an alarm or warning in the Inverter.
		Bit A: External Fault Input EF0	0: Disabled, 1: External error input (EF0) This data is enabled when the Inverter Drive Control command is executed. An error is reported to the Inverter. The operation of the Inverter after receiving the report is selected in an Inverter parameter.
		Bit B: Fault Trace Clear	0: Disabled, 1: Error history cleared This data is enabled when the Inverter Drive Control command is executed. Clears the error history trace.
		Bit C: External Base Block Command	0: Disabled, 1: External base block command ON This data is enabled when the Inverter Drive Control command is executed. A base block command is sent to the Inverter.
		Bits D to F	Reserved
OW□□□11	Speed Reference		This data is enabled when the Inverter Drive Control command is executed. Unit: According to the O1-03 Inverter parameter. (0.01 Hz, 0.01%, min^{-1}, or user-specified unit) You can check the current unit setting in the Unit monitor parameter (IW□□□06).
OW□□□12	Torque Reference		This data is enabled when the Inverter Drive Control command is executed. Unit: 0.1% Setting range: -3,000 to 3,000
OW□□□13	Torque Compensation (Option)		This data is enabled when the Inverter Drive Control command is executed. Unit: 0.1% Setting range: -3,000 to 3,000

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Register No.	Name		Description
OW□□□14	Analog Output Terminal 1 Output		This data is enabled when the Inverter Drive Control command is executed. Unit: 10 V/4000 hex Setting range: -16,384 (C000 hex) to 16,384 (4000 hex)
OW□□□15	Analog Output Terminal 2 Output		This data is enabled when the Inverter Drive Control command is executed. Unit: 10 V/4000 hex Setting range: -16,384 (C000 hex) to 16,384 (4000 hex)
OW□□□16	Terminal Output	Bit 0: Contact M1-M2	0: OFF, 1: ON Outputs to terminals M1-M2. This data is enabled when the Inverter Drive Control command is executed.
		Bit 1: Contact P1-PC	0: OFF, 1: ON Outputs to terminals P1-PC. This data is enabled when the Inverter Drive Control command is executed.
		Bit 2: Contact P2-PC	0: OFF, 1: ON Outputs to terminals P2-PC. This data is enabled when the Inverter Drive Control command is executed.
		Bits 3 to F	Reserved
OW□□□17	PID Target		Unit: 0.01% Setting range: -10,000 to 10,000
OW□□□18	Pulse Train Output		Unit: 1 Hz Setting range: 0 to 32,000
OW□□□19	V/f Gain		Unit: 0.1% Setting range: 20 to 2,000
OW□□□1A	–		Reserved
OW□□□1B	Command Selection	Bit 0	Reserved
		Bit 1: PID Target Enable	0: OFF, 1: ON Turn ON this bit to enable the PID target set in OW□□□17.
		Bit 2	Reserved
OW□□□1C to OW□□□31	–		Reserved
OW□□□32	Inverter Alarm Monitor Number		Setting range: 0 to 9 Set the alarm history number for the Alarm History Monitor command.
OW□□□33	Auxiliary Inverter Alarm Monitor Number		Setting range: 0 to 9 Set the alarm history number for the Alarm History Monitor subcommand.
OW□□□34 to OW□□□3B	–		Reserved
OW□□□3C	Inverter User Constant Number		Setting range: 0 to FFFFH Set the leading number of the user constants to read by executing the Read User Constant command, or set the leading number of the user constants to write by executing the Write User Constant command. Note: Set the register number used for MEMOBUS communications.

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Register No.	Name	Description
OW□□□3D	Inverter User Constant Number Size	Setting range: 1 to 4 (words) Set the size of the user constant to read by executing the Read User Constant command, or set the size of the user constant to write by executing the Write User Constant command, in words. Each inverter user constant is composed of one word. Therefore, setting the Inverter User Constant Number Size enables the reading or writing of data of 1 to 4 consecutive words at once.
OW□□□3E	Inverter User Constant Set Point 1	Setting range: 0 to 65,535 (FFFFH) Set the data to write for the Write User Constant command. Enabled when Inverter User Constant Number Size = 1 to 4
OW□□□3F	Inverter User Constant Set Point 2	Setting range: 0 to 65,535 (FFFFH) Set the data to write for the Write User Constant command. Enabled when Inverter User Constant Number Size = 2 to 4.
OW□□□40	Inverter User Constant Set Point 3	Setting range: 0 to 65,535 (FFFFH) Set the data to write for the Write User Constant command. Enabled when Inverter User Constant Number Size = 3 or 4.
OW□□□41	Inverter User Constant Set Point 4	Setting range: 0 to 65,535 (FFFFH) Set the data to write for the Write User Constant command. Enabled when Inverter User Constant Number Size = 4.
OW□□□42	Auxiliary Inverter User Constant Number	Setting range: 0 to FFFFH Set the leading number of user constants to read by executing the Read User Constant subcommand, or the leading number of user constants to write by executing the Write User Constant subcommand. Note: Set the register number used for MEMOBUS communications.
OW□□□43	Auxiliary Inverter User Constant Size	Setting range: 1 to 4 (words) Set the size of the user constant to read by executing the Read User Constant subcommand, or set the size of the user constant to write by executing the Write User Constant subcommand, in words. Each inverter constant is composed of one word. Therefore, setting the Inverter User Constant Number Size enables the reading or writing of data of 1 to 4 consecutive words at once.
OW□□□44	Auxiliary Inverter User Constant Set Point 1	Setting range: 0 to 65,535 (FFFFH) Set the data to write for the Write User Constant subcommand. Enabled when Auxiliary Inverter User Constant Number Size = 1 to 4.
OW□□□45	Auxiliary Inverter User Constant Set Point 2	Setting range: 0 to 65,535 (FFFFH) Set the data to write for the Write User Constant subcommand. Enabled when Auxiliary Inverter User Constant Number Size = 2 to 4.
OW□□□46	Auxiliary Inverter User Constant Set Point 3	Setting range: 0 to 65,535 (FFFFH) Set the data to write for the Write User Constant subcommand. Enabled when Auxiliary Inverter User Constant Number Size = 3 or 4.

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Register No.	Name	Description
OW□□□47	Auxiliary Inverter User Constant Set Point 4	Setting range: 0 to 65,535 (FFFFH) Set the data to write for the Write User Constant subcommand. Enabled when Auxiliary Inverter User Constant Number Size = 4.
OW□□□48	Fixed Parameter Number	Setting range: 0 to 65,535 Set the fixed parameter number to read for the Read Fixed Parameters subcommand.
OW□□□49 to OW□□□5F	–	Reserved
OW□□□60	Transmission Reference Output Data 0	Setting range: 0 to FFFFH This data is sent as the 1st word in the command (main command bytes 0 and 1) when the Transmission Reference command is executed.
OW□□□61	Transmission Reference Output Data 1	Setting range: 0 to FFFFH This data is sent as the 2nd word in the command (main command bytes 2 and 3) when the Transmission Reference command is executed.
OW□□□62	Transmission Reference Output Data 2	Setting range: 0 to FFFFH This data is sent as the 3rd word in the command (main command bytes 4 and 5) when the Transmission Reference command is executed.
OW□□□63	Transmission Reference Output Data 3	Setting range: 0 to FFFFH This data is sent as the 4th word in the command (main command bytes 6 and 7) when the Transmission Reference command is executed.
OW□□□64	Transmission Reference Output Data 4	Setting range: 0 to FFFFH This data is sent as the 5th word in the command (main command bytes 8 and 9) when the Transmission Reference command is executed.
OW□□□65	Transmission Reference Output Data 5	Setting range: 0 to FFFFH This data is sent as the 6th word in the command (main command bytes 10 and 11) when the Transmission Reference command is executed.
OW□□□66	Transmission Reference Output Data 6	Setting range: 0 to FFFFH This data is sent as the 7th word in the command (main command bytes 12 and 13) when the Transmission Reference command is executed.
OW□□□67	Transmission Reference Output Data 7	Setting range: 0 to FFFFH This data is sent as the 8th word in the command (main command bytes 14 and 15) when the Transmission Reference command is executed.
OW□□□68	Transmission Reference Output Data 8	Setting range: 0 to FFFFH This data is sent as the 9th word in the command (main command bytes 16 and 17) when the Transmission Reference command is executed.
OW□□□69	Transmission Reference Output Data 9	Setting range: 0 to FFFFH This data is sent as the 10th word in the command (main command bytes 18 and 19) when the Transmission Reference command is executed.
OW□□□6A	Transmission Reference Output Data 10	Setting range: 0 to FFFFH This data is sent as the 11th word in the command (main command bytes 20 and 21) when the Transmission Reference command is executed.
OW□□□6B	Transmission Reference Output Data 11	Setting range: 0 to FFFFH This data is sent as the 12th word in the command (main command bytes 22 and 23) when the Transmission Reference command is executed.

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Register No.	Name	Description
OW□□□6C	Transmission Reference Output Data 12	Setting range: 0 to FFFFH This data is sent as the 13th word in the command (main command bytes 24 and 25) when the Transmission Reference command is executed.
OW□□□6D	Transmission Reference Output Data 13	Setting range: 0 to FFFFH This data is sent as the 14th word in the command (main command bytes 26 and 27) when the Transmission Reference command is executed.
OW□□□6E	Transmission Reference Output Data 14	Setting range: 0 to FFFFH This data is sent as the 15th word in the command (main command bytes 28 and 29) when the Transmission Reference command is executed.
OW□□□6F	Transmission Reference Output Data 15	Setting range: 0 to FFFFH This data is sent as the 16th word in the command (main command bytes 30 and 31) when the Transmission Reference command is executed.
OW□□□70	Transmission Reference Output Data 16	Setting range: 0 to FFFFH This data is sent as the 1st word in the subcommand (subcommand bytes 0 and 1) when the Transmission Reference subcommand is executed. Note: Enabled only in 64-byte Mode.
OW□□□71	Transmission Reference Output Data 17	Setting range: 0 to FFFFH This data is sent as the 2nd word in the subcommand (subcommand bytes 2 and 3) when the Transmission Reference subcommand is executed. Note: Enabled only in 64-byte Mode.
OW□□□72	Transmission Reference Output Data 18	Setting range: 0 to FFFFH This data is sent as the 3rd word in the subcommand (subcommand bytes 4 and 5) when the Transmission Reference subcommand is executed. Note: Enabled only in 64-byte Mode.
OW□□□73	Transmission Reference Output Data 19	Setting range: 0 to FFFFH This data is sent as the 4th word in the subcommand (subcommand bytes 6 and 7) when the Transmission Reference subcommand is executed. Note: Enabled only in 64-byte Mode.
OW□□□74	Transmission Reference Output Data 20	Setting range: 0 to FFFFH This data is sent as the 5th word in the subcommand (subcommand bytes 8 and 9) when the Transmission Reference subcommand is executed. Note: Enabled only in 64-byte Mode.
OW□□□75	Transmission Reference Output Data 21	Setting range: 0 to FFFFH This data is sent as the 6th word in the subcommand (subcommand bytes 10 and 11) when the Transmission Reference subcommand is executed. Note: Enabled only in 64-byte Mode.
OW□□□76	Transmission Reference Output Data 22	Setting range: 0 to FFFFH This data is sent as the 7th word in the subcommand (subcommand bytes 12 and 13) when the Transmission Reference subcommand is executed. Note: Enabled only in 64-byte Mode.
OW□□□77	Transmission Reference Output Data 23	Setting range: 0 to FFFFH This data is sent as the 8th word in the subcommand (subcommand bytes 14 and 15) when the Transmission Reference subcommand is executed. Note: Enabled only in 64-byte Mode.

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Register No.	Name	Description
OW□□□78	Transmission Reference Output Data 24	Setting range: 0 to FFFFH This data is sent as the 9th word in the subcommand (subcommand bytes 16 and 17) when the Transmission Reference subcommand is executed. Note: Enabled only in 64-byte Mode.
OW□□□79	Transmission Reference Output Data 25	Setting range: 0 to FFFFH This data is sent as the 10th word in the subcommand (subcommand bytes 18 and 19) when the Transmission Reference subcommand is executed. Note: Enabled only in 64-byte Mode.
OW□□□7A	Transmission Reference Output Data 26	Setting range: 0 to FFFFH This data is sent as the 11th word in the subcommand (subcommand bytes 20 and 21) when the Transmission Reference subcommand is executed. Note: Enabled only in 64-byte Mode.
OW□□□7B	Transmission Reference Output Data 27	Setting range: 0 to FFFFH This data is sent as the 12th word in the subcommand (subcommand bytes 22 and 23) when the Transmission Reference subcommand is executed. Note: Enabled only in 64-byte Mode.
OW□□□7C	Transmission Reference Output Data 28	Setting range: 0 to FFFFH This data is sent as the 13th word in the subcommand (subcommand bytes 24 and 25) when the Transmission Reference subcommand is executed. Note: Enabled only in 64-byte Mode.
OW□□□7D	Transmission Reference Output Data 29	Setting range: 0 to FFFFH This data is sent as the 14th word in the subcommand (subcommand bytes 26 and 27) when the Transmission Reference subcommand is executed. Note: Enabled only in 64-byte Mode.
OW□□□7E	Transmission Reference Output Data 30	Setting range: 0 to FFFFH This data is sent as the 15th word in the subcommand (subcommand bytes 28 and 29) when the Transmission Reference subcommand is executed. Note: Valid only in 64-byte Mode.
OW□□□7F	Transmission Reference Output Data 31	Setting range: 0 to FFFFH This data is sent as the 16th word in the subcommand (subcommand bytes 30 and 31) when the Transmission Reference subcommand is executed. Note: Valid only in 64-byte Mode.

* Communications are continued when the fixed parameters in the SVC Function Module are set as follows:
- When Communication Abnormality Detection Mask is enabled in Function Selection Flag 2
- When Communication Abnormality Detection Mask is disabled in Function Selection Flag 2 and Warning is selected for Communication Selection Is Abnormal in Function Selection Flag 3

10.5.3 Monitor Parameter List

Register No.	Name		Description
IW□□□00	Run Status	Bit 0: Operation Ready	0: Inverter drive control disabled 1: Inverter drive control enabled Turns ON when communications (synchronous communication) with the Inverter are established, the Drive Permission bit of Run Command Setting (OW□□□00) is set to ON, and Inverter drive control is enabled. Turns OFF when a MECHATROLINK communications error occurs. Note: This bit provides different information from Inverter Operation Ready (READY) in the Inverter.
		Bit 1	Reserved
		Bit 2: System BUSY	Not used
		Bit 3: Inverter Ready	0: Inverter not ready 1: Inverter ready Turns ON when communications (synchronous communications) with the Inverter are established. Turns OFF when a MECHATROLINK communications error occurs. Note: This bit provides different information from Inverter Operation Ready (READY) in the Inverter.
		Bits 4 to F	Reserved
IW□□□01	Parameter Number when Range Over is Generated		Setting parameters: 0 and higher Fixed parameters: 1000 and higher Displays the parameter number whose setting is incorrect (out of the setting range). The parameter number offset by 1000 is displayed.
IL□□□02	Warning	Bit 0	Reserved
		Bit 1: Setting Parameter Error	Turns ON when setting parameter error occurs. Correct the setting parameter to clear the warning. This warning can be cleared by executing Alarm Clear.
		Bit 2: Fixed Parameter Error	Turns ON when fixed parameter error occurs. Correct the fixed parameter to clear the warning. This warning cannot be cleared by executing Alarm Clear.
		Bit 3	Reserved
		Bit 4: Command Set Warning	Turns ON when a command outside the allowable setting range is set. Correct the command to clear the warning.
		Bits 5 to 8	Reserved
		Bit 9: Communication Warning	Turns ON when MECHATROLINK communications errors are detected individually. Enabled when: Communication Abnormality Detection Mask bit of the Function Selection Flag 2 fixed parameter is disabled, and Communication Selection is Abnormal bit of the Function Selection Flag 3 fixed parameter is set to Warning. This warning will be cleared when communications are restored.
		Bit A: Sub Command Set Warning	Turns ON when a subcommand outside the allowable setting range is set. Correct the subcommand to clear the warning.
		Bits B to 1F	Reserved

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Register No.	Name		Description
IL□□□04	Alarm	Bits 0 to E	Reserved
		Bit F: User Constant Error	Not used
		Bit 10: Synchronization Communication Error	Turns ON when a MECHATROLINK communications watchdog timer timeout error is detected. Enabled when the WDT Abnormality Detection Mask bit of the Function Selection Flag 2 fixed parameter is set to Disabled. This alarm can be cleared by executing Alarm Clear.
		Bit 11: Communication Error	Turns ON when MECHATROLINK communications errors are detected continuously. Communication Abnormality Detection Mask bit of the Function Selection Flag 2 fixed parameter is set to Disabled, and Alarm is selected for Communication Selection Abnormal of the Function Selection Flag 3 fixed parameter. This alarm can be cleared by executing Alarm Clear.
		Bit 12: Communication Timeout Error	Turns ON when a response from the Inverter for a command or subcommand is not detected within five seconds. This alarm can be cleared by executing Alarm Clear.
		Bits 13 to 15	Reserved
		Bit 16: Scan Setting Error	Turns ON while the high-speed scan cycle setting and the MECHATROLINK communications cycle setting are asynchronous.
		Bits 17 to 1B	Reserved
		Bit 1C: Cyclic Communication Initialize incomplete	With MECHATROLINK-III, a node can join the network while communications are in progress. However, conditions such as the transmission cycle and the number of slave stations may prevent a node from joining the network. If that occurs, this bit turns ON. If this alarm occurs, turn the power supply to the MP3000 OFF and ON again or reset the network (OW□□□00 bit C).
		Bit 1D: Drive Type Error	Turns ON when the Inverter model assigned in the SVC definitions does not match the actual Inverter model that is connected.
		Bits 1E to 1F	Reserved

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Register No.	Name		Description
IW□□□06	Unit	Bits 0 to 3: Speed Reference	0: 0.01 Hz 1: 0.01% 2: min^{-1} 3: Unit in product specifications The information that is set in the Inverter is read and reported when communications are established. Note: Do not change the setting unit in the Inverter after communications have been established. If you change the setting in the Inverter after communications have been established, the parameter values will not match between the Inverter and monitors, and unexpected operation may occur.
		Bits 4 to 7: Torque Reference	0: 0.1% 1: Unit in product specifications 1000-series Inverter: 0.1% (fixed)
		Bits 8 to B: Output Current	0: 0.1A 1: Unit in product specifications 1000-series Inverter: Unit in product specifications (fixed)
		Bits C to F	Reserved
IW□□□07	–		Reserved
IW□□□08	Command Response Code	00: No Command	No command is selected.
		01: Inverter Drive Control	Inverter Drive Control is executed.
		02: Read User Constant	Read User Constant is executed.
		03: Write User Constant	Write User Constant is executed.
		04: Alarm Monitor	Alarm Monitor is executed.
		05: Alarm History Monitor	Alarm History Monitor is executed.
		06: User Constant RAM Writing	User Constant RAM Writing is executed.
		07: User Constant EEPROM Writing	User Constant EEPROM Writing is executed.
		08: Transmission Reference	Transmission Reference is executed.
IW□□□09	Command Status	Bit 0: Command Execution Flag	ON during command execution Always ON when Transmission Reference command is selected.
		Bits 1and 2	Reserved
		Bit 3: Command Error Completed Status	Turns ON when command execution ends in an error.
		Bits 4 to 7	Reserved
		Bit 8: Command Execution Completed	Turns ON when command execution is completed. With a Inverter Drive Control command, data input and output will continue after command execution is completed. Always ON when No Command is selected.
		Bits 9 to F	Reserved

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Register No.	Name		Description
IW□□□0A	Subcommand Response Code	00: No Command	No subcommand is selected.
		01: Inverter I/O Control	Inverter I/O Control is executed.
		02: Read User Constant	Read User Constant is executed.
		03: Write User Constant	Write User Constant is executed.
		04: Alarm Monitor	Alarm Monitor is executed.
		05: Alarm History Monitor	Alarm History Monitor is executed.
		08: Transmission Reference	Transmission Reference is executed.
		09: Read Fixed Parameters	Read Fixed Parameters is executed.
IW□□□0B	Subcommand Status	Bit 0: Command Execution Flag	ON during command execution. Always ON when Inverter I/O Control or Transmission Reference command is executed.
		Bits 1 and 2	Reserved
		Bit 3: Command Error Completed Status	Turns ON when command execution ends in an error.
		Bits 4 to 7	Reserved
		Bit 8: Command Execution Completed	Turns ON when command execution is completed. Always ON when No Command is selected.
		Bits 9 to F	Reserved
IW□□□0C	–		Reserved

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Register No.	Name		Description
IW□□□0D	Input Data Option Selection Monitor	Bit 0: Motor Speed	ON when Motor Speed is selected for Input Data Option Selection (OW□□□0D) and the data is being normally reported.
		Bit 1: Torque Reference	ON when Torque Reference is selected for Input Data Option Selection (OW□□□0D) and the data is being normally reported.
		Bit 2: Encoder Count PG1	ON when Encoder Count PG1 is selected for Input Data Option Selection (OW□□□0D) and the data is being normally reported.
		Bit 3: Frequency Reference	ON when Frequency Reference is selected for Input Data Option Selection (OW□□□0D) and the data is being normally reported.
		Bit 4: Analog Input A2	ON when Analog Input A2 is selected for Input Data Option Selection (OW□□□0D) and the data is being normally reported.
		Bit 5: Main Bus Voltage	ON when Main Bus Voltage is selected for Input Data Option Selection (OW□□□0D) and the data is being normally reported.
		Bit 6: Alarm Code	ON when Alarm Code is selected for Input Data Option Selection (OW□□□0D) and the data is being normally reported.
		Bit 7: Warning Code	ON when Warning Code is selected for Input Data Option Selection (OW□□□0D) and the data is being normally reported.
		Bit 8: Multi-Function Output Terminal	ON when Multi-Function Output Terminal is selected for Input Data Option Selection (OW□□□0D) and the data is being normally reported.
		Bit 9: Analog Input A3	ON when Analog Input A3 is selected for Input Data Option Selection (OW□□□0D) and the data is being normally reported.
		Bit A: Multi-Function Input Terminal	ON when Multi-Function Input Terminal is selected for Input Data Option Selection (OW□□□0D) and the data is being normally reported.
		Bit B: Analog Input A1	ON when Analog Input A1 is selected for Input Data Option Selection (OW□□□0D) and the data is being normally reported.
		Bit C: Encoder Count PG2	ON when Encoder Count PG2 is selected for Input Data Option Selection (OW□□□0D) and the data is being normally reported.
		Bit D: Monitor data set in F6-23	ON when Monitor Data Set in F6-23 is selected for Input Data Option Selection (OW□□□0D) and the data is being normally reported.
		Bit E: Monitor data set in F6-24	ON when Monitor Data Set in F6-24 is selected for Input Data Option Selection (OW□□□0D) and the data is being normally reported.
		Bit F	Reserved
IW□□□0E	–		Reserved

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Register No.	Name		Description
IW□□□0F	Auxiliary Input Data Option Selection Monitor	Bit 0: Motor Speed	ON when Motor Speed is selected for Auxiliary Input Data Option Selection (OW□□□0F) and the data is being normally reported.
		Bit 1: Torque Reference	ON when Torque Reference is selected for Auxiliary Input Data Option Selection (OW□□□0F) and the data is being normally reported.
		Bit 2: Encoder Count PG1	ON when Encoder Count PG1 is selected for Auxiliary Input Data Option Selection (OW□□□0F) and the data is being normally reported.
		Bit 3: Frequency Reference	ON when Frequency Reference is selected for Auxiliary Input Data Option Selection (OW□□□0F) and the data is being normally reported.
		Bit 4: Analog Input A2	ON when Analog Input A2 is selected for Auxiliary Input Data Option Selection (OW□□□0F) and the data is being normally reported.
		Bit 5: Main Bus Voltage	ON when Main Bus Voltage is selected for Auxiliary Input Data Option Selection (OW□□□0F) and the data is being normally reported.
		Bit 6: Alarm Code	ON when Alarm Code is selected for Auxiliary Input Data Option Selection (OW□□□0F) and the data is being normally reported.
		Bit 7: Warning Code	ON when Warning Code is selected for Auxiliary Input Data Option Selection (OW□□□0F) and the data is being normally reported.
		Bit 8: Multi-Function Output Terminal	ON when Multi-Function Output Terminal is selected for Auxiliary Input Data Option Selection (OW□□□0F) and the data is being normally reported.
		Bit 9: Analog Input A3	ON when Analog Input A3 is selected for Auxiliary Input Data Option Selection (OW□□□0F) and the data is being normally reported.
		Bit A: Multi-Function Input Terminal	ON when Multi-Function Input Terminal is selected for Auxiliary Input Data Option Selection (OW□□□0F) and the data is being normally reported.
		Bit B: Analog Input A1	ON when Analog Input A1 is selected for Auxiliary Input Data Option Selection (OW□□□0F) and the data is being normally reported.
		Bit C: Encoder Count PG2	ON when Encoder Count PG2 is selected for Auxiliary Input Data Option Selection (OW□□□0F) and the data is being normally reported.
		Bit D: Monitor data set in F6-23	ON when Monitor Data Set in F6-23 is selected for Auxiliary Input Data Option Selection (OW□□□0F) and the data is being normally reported.
		Bit E: Monitor data set in F6-24	ON when Monitor Data Set in F6-24 is selected for Auxiliary Input Data Option Selection (OW□□□0F) and the data is being normally reported.
		Bit F	Reserved
IW□□□10	–		Reserved
IW□□□11	Output Frequency		Reports the output frequency from the Inverter. Unit: According to the O1-03 Inverter parameter. You can check the current unit setting in the Unit monitor parameter (IW□□□06).

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Register No.	Name		Description
IW□□□12	Output Current		Reports the output current from the Inverter. Unit: Inverter rated current/8,192. You can check the current unit setting in the Unit monitor parameter (IW□□□06).
IW□□□13	Motor Speed (Option)		Reports the motor speed during operation. Unit: According to the O1-03 Inverter parameter. You can check the current unit setting in the Unit monitor parameter (IW□□□06).
IW□□□14	Torque Reference (Option)		Reports the torque reference. Unit: 0.1% You can check the current unit setting in the Unit monitor parameter (IW□□□06).
IW□□□15	Encoder Count PG1		Reports the counter value.
IW□□□16	Frequency Reference (Option)		Reports the frequency reference from the Inverter. Unit: According to the O1-03 Inverter parameter. You can check the current unit setting in the Unit monitor parameter (IW□□□06).
IW□□□17	Analog Input A2		Unit: 0.1%
IW□□□18	Main Bus Voltage (Option)		Unit: 1 VDC
IW□□□19	Alarm Code		Reports the Inverter alarm code.
IW□□□1A	Warning Code		Reports the Inverter warning code.
IW□□□1B	Multi-Function Output Terminal	Bit 0: Terminal 1 Status	0: OFF, 1: ON
		Bit 1: Terminal 2 Status	0: OFF, 1: ON
		Bit 2: Terminal 3 Status	0: OFF, 1: ON
		Bit 3: Terminal 4 Status	0: OFF, 1: ON
		Bit 4: Terminal 5 Status	0: OFF, 1: ON
		Bit 5: Terminal 6 Status	0: OFF, 1: ON
		Bit 6: Terminal 7 Status	0: OFF, 1: ON
		Bit 7: Terminal 8 Status	0: OFF, 1: ON
		Bit 8: Terminal 9 Status	0: OFF, 1: ON
		Bit 9: Terminal 10 Status	0: OFF, 1: ON
		Bit A: Terminal 11 Status	0: OFF, 1: ON
		Bit B: Terminal 12 Status	0: OFF, 1: ON
		Bits C to F	Reserved
IW□□□1C	Analog Input A3		Unit: 0.1%
IW□□□1D	Multi-Function Input Terminal	Bit 0: Terminal 1 Status	0: OFF, 1: ON
		Bit 1: Terminal 2 Status	0: OFF, 1: ON
		Bit 2: Terminal 3 Status	0: OFF, 1: ON
		Bit 3: Terminal 4 Status	0: OFF, 1: ON
		Bit 4: Terminal 5 Status	0: OFF, 1: ON
		Bit 5: Terminal 6 Status	0: OFF, 1: ON
		Bit 6: Terminal 7 Status	0: OFF, 1: ON
		Bit 7: Terminal 8 Status	0: OFF, 1: ON
		Bits 8 to F	Reserved
IW□□□1E	Analog Input A1		Unit: 0.1%
IW□□□1F	Encoder Count PG2		Reports the count value.
IW□□□20	Monitor data set in F6-23		Reports the result of the monitor set in the F6-23 Inverter parameter.
IW□□□21	Monitor data set in F6-24		Reports the result of the monitor set in the F6-24 Inverter parameter.

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Register No.	Name		Description
IW□□□22 to IW□□□27	–		Reserved
IL□□□28	M-III Inverter Command Input Status		Not used.
IL□□□2A	M-III Inverter Command Status	Bit 0: Forward Operation	ON during forward operation.
		Bit 1: Reverse Operation	ON during reverse operation.
		Bit 2: Base Block	ON while base block is released.
		Bit 3: Power ON	ON while main power supply is ON.
		Bit 4: Zero Speed	ON during zero speed.
		Bit 5: During Speed Coincident	ON during speed coincidence.
		Bit 6: Inverter Ready	ON when Inverter is ready. This indicates that the Inverter can be monitored. OFF while the Inverter is in Program Mode.
		Bit 7: oPE Error	ON when an oPE error has occurred.
		Bit 8	Reserved
		Bit 9: During Reset	ON while the fault reset signal is being input.
		Bit A: Momentary/Power Cut	ON after recovering from momentary power interruption.
		Bit B: Remote Operation	ON during remote (transmission) commands.
		Bit C: Motor Selection	ON when motor 2 is selected.
		Bit D: Set Zero Completed	ON when Zero Servo is completed.
		Bit E	Reserved
		Bit F	Reserved
		Bit 10 to Bit 17	Reserved
		Bit 18: SEL_MON1 Status	0: SEL_MON1 disabled. 1: Data specified with SEL_MON1 enabled
		Bit 19: SEL_MON2 Status	0: SEL_MON2 disabled. 1: Data specified with SEL_MON2 enabled.
		Bit 1A to Bit 1F	Reserved
IW□□□2C	M-III Command Status	Bit 0: Device Alarm Occurrence (D_ALM)	ON when a device alarm has occurred.
		Bit 1: Device Warning Occurrence (D_WAR)	ON when a device warning has occurred.
		Bit 2: Command Ready (CMDRDY)	ON when a command can be received.
		Bit 3: Alarm Clear Execution Completion (ALM_CLR_CMP)	ON when clearing the alarm is completed.
		Bits 4 to 5	Reserved
		Bits 6 to 7: Echo-back of the command ID (RCMD_ID)	Reports the echo-back value of the command ID of a MECHATROLINK command.
		Bits 8 to B: Command Error (CMD_ALM)	Reports the MECHATROLINK command error status.
		Bits C to F: Communication Error (COMM_ALM)	Reports the MECHATROLINK communications error status.
IW□□□2D to IW□□□30	–		Reserved

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Register No.	Name		Description
IW□□□31	M-III Sub Command Status	Bit 0	Reserved
		Bit 1	Reserved
		Bit 2: Command Ready (CMDRDY)	ON when a subcommand can be received.
		Bit 3	Reserved
		Bits 4 to 7	Reserved
		Bits 8 to B: Command Error (CMD_ALM)	Reports the MECHATROLINK subcommand error status.
		Bits C to F	Reserved
IW□□□32	Inverter Alarm Code		Range: 0 to FFFFH Displays the alarm codes returned in the response to the Alarm Monitor or Alarm History Monitor command.
IW□□□33	Auxiliary Inverter Alarm Code		Range: 0 to FFFFH Displays the alarm codes returned in the response to the Alarm Monitor or Alarm History Monitor subcommand.
IW□□□34 to IW□□□3B	–		Reserved
IW□□□3C	Inverter User Constant Number		Range: 0 to FFFFH Displays the inverter user constant number set for the Read User Constant or Write User Constant command.
IW□□□3D	–		Reserved
IW□□□3E	User Constant Reading Data 1		Range: 0 to FFFFH Displays the value read out by executing the Read User Constant command. Enabled when Inverter User Constant Number Size (OW□□□3D) = 1 to 4.
IW□□□3F	User Constant Reading Data 2		Range: 0 to FFFFH Displays the value read out by executing the Read User Constant command. Enabled when Inverter User Constant Number Size (OW□□□3D) = 2 to 4.
IW□□□40	User Constant Reading Data 3		Range: 0 to FFFFH Displays the value read out by executing the Read User Constant command. Enabled when Inverter User Constant Number Size (OW□□□3D) = 3 or 4.
IW□□□41	User Constant Reading Data 4		Range: 0 to FFFFH Displays the value read out by executing the Read User Constant command. Enabled when Inverter User Constant Number Size (OW□□□3D) = 4.
IW□□□42	Auxiliary Inverter User Constant Number		Range: 0 to FFFFH Displays the auxiliary inverter user constant number set for the Read User Constant or Write User Constant subcommand.
IW□□□43	–		Reserved
IW□□□44	Auxiliary User Constant Reading Data 1		Range: 0 to FFFFH Displays the value read out by executing the Read User Constant subcommand. Enabled when Auxiliary Inverter User Constant Number Size (OW□□□43) = 1 to 4.

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Register No.	Name	Description
IW☐☐☐45	Auxiliary User Constant Reading Data 2	Range: 0 to FFFFH Displays the value read out by executing the Read User Constant subcommand. Enabled when Auxiliary Inverter User Constant Number Size (OW☐☐☐43) = 2 to 4.
IW☐☐☐46	Auxiliary User Constant Reading Data 3	Range: 0 to FFFFH Displays the value read out by executing the Read User Constant subcommand. Enabled when Auxiliary Inverter User Constant Number Size (OW☐☐☐43) = 3 or 4.
IW☐☐☐47	Auxiliary User Constant Reading Data 4	Range: 0 to FFFFH Displays the value read out by executing the Read User Constant subcommand. Enabled when Auxiliary Inverter User Constant Number Size (OW☐☐☐43) = 4.
IL☐☐☐48	Fixed Parameter Monitor	Displays the fixed parameter value read out by executing the Read Fixed Parameters subcommand.
IW☐☐☐4A to IW☐☐☐5F	–	Reserved
IW☐☐☐60	Transmission Reference Input Data 0	Displays the 1st word in the response data (main command bytes 0 and 1) when the Transmission Reference command is executed.
IW☐☐☐61	Transmission Reference Input Data 1	Displays the 2nd word in the response data (main command bytes 2 and 3) when the Transmission Reference command is executed.
IW☐☐☐62	Transmission Reference Input Data 2	Displays the 3rd word in the response data (main command bytes 4 and 5) when the Transmission Reference command is executed.
IW☐☐☐63	Transmission Reference Input Data 3	Displays the 4th word in the response data (main command bytes 6 and 7) when the Transmission Reference command is executed.
IW☐☐☐64	Transmission Reference Input Data 4	Displays the 5th word in the response data (main command bytes 8 and 9) when the Transmission Reference command is executed.
IW☐☐☐65	Transmission Reference Input Data 5	Displays the 6th word in the response data (main command bytes 10 and 11) when the Transmission Reference command is executed.
IW☐☐☐66	Transmission Reference Input Data 6	Displays the 7th word in the response data (main command bytes 12 and 13) when the Transmission Reference command is executed.
IW☐☐☐67	Transmission Reference Input Data 7	Displays the 8th word in the response data (main command bytes 14 and 15) when the Transmission Reference command is executed.
IW☐☐☐68	Transmission Reference Input Data 8	Displays the 9th word in the response data (main command bytes 16 and 17) when the Transmission Reference command is executed.
IW☐☐☐69	Transmission Reference Input Data 9	Displays the 10th word in the response data (main command bytes 18 and 19) when the Transmission Reference command is executed.
IW☐☐☐6A	Transmission Reference Input Data 10	Displays the 11th word in the response data (main command bytes 20 and 21) when the Transmission Reference command is executed.
IW☐☐☐6B	Transmission Reference Input Data 11	Displays the 12th word in the response data (main command bytes 22 and 23) when the Transmission Reference command is executed.
IW☐☐☐6C	Transmission Reference Input Data 12	Displays the 13th word in the response data (main command bytes 24 and 25) when the Transmission Reference command is executed.

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Register No.	Name	Description
IW□□□6D	Transmission Reference Input Data 13	Displays the 14th word in the response data (main command bytes 26 and 27) when the Transmission Reference command is executed.
IW□□□6E	Transmission Reference Input Data 14	Displays the 15th word in the response data (main command bytes 28 and 29) when the Transmission Reference command is executed.
IW□□□6F	Transmission Reference Input Data 15	Displays the 16th word in the response data (main command bytes 30 and 31) when the Transmission Reference command is executed.
IW□□□70	Transmission Reference Input Data 16	Displays the 1st word in the subresponse data (subcommand bytes 0 and 1) when the Transmission Reference subcommand is executed. Note: Enabled only in 64-byte Mode.
IW□□□71	Transmission Reference Input Data 17	Displays the 2nd word in the subresponse data (subcommand bytes 2 and 3) when the Transmission Reference subcommand is executed. Note: Enabled only in 64-byte Mode.
IW□□□72	Transmission Reference Input Data 18	Displays the 3rd word in the subresponse data (subcommand bytes 4 and 5) when the Transmission Reference subcommand is executed. Note: Enabled only in 64-byte Mode.
IW□□□73	Transmission Reference Input Data 19	Displays the 4th word in the subresponse data (subcommand bytes 6 and 7) when the Transmission Reference subcommand is executed. Note: Enabled only in 64-byte Mode.
IW□□□74	Transmission Reference Input Data 20	Displays the 5th word in the subresponse data (subcommand bytes 8 and 9) when the Transmission Reference subcommand is executed. Note: Enabled only in 64-byte Mode.
IW□□□75	Transmission Reference Input Data 21	Displays the 6th word in the subresponse data (subcommand bytes 10 and 11) when the Transmission Reference subcommand is executed. Note: Enabled only in 64-byte Mode.
IW□□□76	Transmission Reference Input Data 22	Displays the 7th word in the subresponse data (subcommand bytes 12 and 13) when the Transmission Reference subcommand is executed. Note: Enabled only in 64-byte Mode.
IW□□□77	Transmission Reference Input Data 23	Displays the 8th word in the subresponse data (subcommand bytes 14 and 15) when the Transmission Reference subcommand is executed. Note: Enabled only in 64-byte Mode.
IW□□□78	Transmission Reference Input Data 24	Displays the 9th word in the subresponse data (subcommand bytes 16 and 17) when the Transmission Reference subcommand is executed. Note: Enabled only in 64-byte Mode.
IW□□□79	Transmission Reference Input Data 25	Displays the 10th word in the subresponse data (subcommand bytes 18 and 19) when the Transmission Reference subcommand is executed. Note: Enabled only in 64-byte Mode.
IW□□□7A	Transmission Reference Input Data 26	Displays the 11th word in the subresponse data (subcommand bytes 20 and 21) when the Transmission Reference subcommand is executed. Note: Enabled only in 64-byte Mode.

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Register No.	Name	Description
IW□□□7B	Transmission Reference Input Data 27	Displays the 12th word in the subresponse data (subcommand bytes 22 and 23) when the Transmission Reference subcommand is executed. Note: Enabled only in 64-byte Mode.
IW□□□7C	Transmission Reference Input Data 28	Displays the 13th word in the subresponse data (subcommand bytes 24 and 25) when the Transmission Reference subcommand is executed. Note: Enabled only in 64-byte Mode.
IW□□□7D	Transmission Reference Input Data 29	Displays the 14th word in the subresponse data (subcommand bytes 26 and 27) when the Transmission Reference subcommand is executed. Note: Enabled only in 64-byte Mode.
IW□□□7E	Transmission Reference Input Data 30	Displays the 15th word in the subresponse data (subcommand bytes 28 and 29) when the Transmission Reference subcommand is executed. Note: Enabled only in 64-byte Mode.
IW□□□7F	Transmission Reference Input Data 31	Displays the 16th word in the subresponse data (subcommand bytes 30 and 31) when the Transmission Reference subcommand is executed. Note: Enabled only in 64-byte Mode.

10.5.4 Inverter Output Data Details

The following table provides details on the data output from the A1000 and V1000 Inverters that support MECHATROLINK-III.

Register No.	Name		Description
OW□□□10	Input Command	Bit 0	Forward RUN
		Bit 1	Reverse RUN
		Bits 2 to 8	Reserved
		Bit 9	Fault Reset
		Bit A	External Fault Input EF0
		Bit B	Fault Trace Clear
		Bit C	External Base Block Command
		Bits D to F	Reserved
OW□□□11	Speed Reference		The unit is determined by the setting of the O1-03 Inverter parameter.
OW□□□12	Torque Reference		Unit: 0.1%
OW□□□13	Torque Compensation (Option)		Unit: 0.1%
OW□□□14	Analog Output Terminal 1 Output		Unit: 10 V/4000 hex
OW□□□15	Analog Output Terminal 2 Output		Unit: 10 V/4000 hex
OW□□□16	Terminal Output	Bit 0	Contact M1-M2
		Bit 1	Contact P1-PC
		Bit 2	Contact P2-PC
		Bits 3 to F	Reserved

10.5.5 Inverter Input Data Details

The following table provides details on the data input to the A1000 and V1000 Inverters that support MECHATROLINK-III.

Register No.	Name		Description
IW□□□11	Output Frequency		The unit is determined by the setting of the O1-03 Inverter parameter.
IW□□□12	Output Current		Unit: 0.1 A or 0.01 A
IW□□□13	Motor Speed (Option)		The unit is determined by the setting of the O1-03 Inverter parameter. (Invalid in V/f with PG control mode)
IW□□□14	Torque Reference (Option)		Unit: 0.1% (Invalid in V/f with PG and V/f control mode)
IW□□□15	Encoder Count PG1		Unit: pulse (Invalid when an optional PG is not connected.)
IW□□□16	Frequency Reference (Option)		The unit is determined by the setting of the O1-03 Inverter parameter.
IW□□□17	Analog Input A2		Unit: 0.1%
IW□□□18	Main Bus Voltage (Option)		Unit: 1 V
IW□□□19	Alarm Code		Inverter alarm code
IW□□□1A	Warning Code		Inverter warning code
IW□□□1B	Multi-Function Output Terminal	Bit 0: Terminal 1 Status	0: OFF, 1: ON
		Bit 1: Terminal 2 Status	0: OFF, 1: ON
		Bit 2: Terminal 3 Status	0: OFF, 1: ON
		Bit 3: Terminal 4 Status	0: OFF, 1: ON
		Bit 4: Terminal 5 Status	0: OFF, 1: ON
		Bit 5: Terminal 6 Status	0: OFF, 1: ON
		Bit 6: Terminal 7 Status	0: OFF, 1: ON
		Bit 7: Terminal 8 Status	0: OFF, 1: ON
		Bit 8: Terminal 9 Status	0: OFF, 1: ON
		Bit 9: Terminal 10 Status	0: OFF, 1: ON
		Bit A: Terminal 11 Status	0: OFF, 1: ON
		Bit B: Terminal 12 Status	0: OFF, 1: ON
		Bits C to F	Reserved
IW□□□1C	Analog Input A3		Unit: 0.1%

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Register No.	Name		Description
IW□□□1D	Multi-Function Input Terminal	Bit 0: Terminal 1 Status	0: OFF, 1: ON
		Bit 1: Terminal 2 Status	0: OFF, 1: ON
		Bit 2: Terminal 3 Status	0: OFF, 1: ON
		Bit 3: Terminal 4 Status	0: OFF, 1: ON
		Bit 4: Terminal 5 Status	0: OFF, 1: ON
		Bit 5: Terminal 6 Status	0: OFF, 1: ON
		Bit 6: Terminal 7 Status	0: OFF, 1: ON
		Bit 7: Terminal 8 Status	0: OFF, 1: ON
		Bits 8 to F	Reserved
IW□□□1E	Analog Input A1		Unit: 0.1%
IW□□□1F	Encoder Count PG2		Unit: pulse (Valid when a PG-Y2 is connected.)
IW□□□20	Monitor data set in F6-23		Reports the result of the monitoring set in the F6-23 Inverter parameter.
IW□□□21	Monitor data set in F6-24		Reports the result of the monitoring set in the F6-24 Inverter parameter.

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Register No.	Name		Description
IL□□□2A	M-III Inverter Command Status	Bit 0: Forward Operation	ON during forward operation.
		Bit 1: Reverse Operation	ON during reverse operation.
		Bit 2: Base Block	ON while base block is released.
		Bit 3: Power ON	ON while main power supply is ON.
		Bit 4: Zero Speed	ON during zero speed.
		Bit 5: During Speed Coincident	ON during speed coincidence.
		Bit 6: Inverter Ready	ON when Inverter is ready.
		Bit 7: oPE Error	ON when an oPE error has occurred.
		Bit 8	Reserved
		Bit 9: During Reset	ON while the fault reset signal is being input.
		Bit A: Momentary/Power Cut	ON after recovering from momentary power interruption.
		Bit B: Remote Operation	ON during remote (transmission) commands.
		Bit C: Motor Selection	ON when motor 2 is selected.
		Bit D: Set Zero Completed	ON when Zero Servo is completed.
		Bit E	Reserved
		Bit F	Reserved
		Bits 10 to 17	Reserved
		Bits 18: SEL_MON1 Status	0: SEL_MON1 disabled. 1: Data specified with SEL_MON1 enabled
		Bits 19: SEL_MON2 Status	0: SEL_MON2 disabled. 1: Data specified with SEL_MON2 enabled.
		Bits 1A to 1F	Reserved

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Register No.	Name		Description
IW□□□2C	M-III Command Status	Bit 0: Device Alarm Occurrence (D_ALM)	ON when a device alarm has occurred.
		Bit 1: Device Warning Occurrence (D_WAR)	ON when a device warning has occurred.
		Bit 2: Command Ready (CMDRDY)	ON when a command can be received.
		Bit 3: Alarm Clear Execution Completion (ALM_CLR_CMP)	ON when clearing the alarm is completed.
		Bits 4 to 5	Reserved
		Bits 6 to 7: Echo-back of the command ID (RCMD_ID)	Reports the echo-back value of the command ID of a MECHATROLINK command.
		Bits 8 to B: Command Error (CMD_ALM)	Reports the MECHATROLINK command error status.
		Bits C to F: Communication Error (COMM_ALM)	Reports the MECHATROLINK communications error status.

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10.6 Alarm and Warning Codes for Inverter

There are the following four types of inverter alarms and warnings for different detection locations and error contents.

Error Type		Description	Place the Error Occurred
Alarm	Inverter Alarm	Serious failure that can damage the inverter and machine	Inverter
	MECHATROLINK-III Command Error and MECHATROLINK-III Communications Error	MECHATROLINK communications failure	SI-ET3*
Warning	Inverter Warning	Incorrect operation or minor failure that will not likely result in a serious situation.	Inverter
	MECHATROLINK-III Command Error and MECHATROLINK-III Communications Error	MECHATROLINK communications error warning	SI-ET3*

* SI-ET3: MECHATROLINK Option Card for Inverter

Note: 1. If more than one error is detected at the same time, the SI-ET3 gives priority to the error with the lowest alarm code.
2. When an error is detected while another is being detected, the alarm code will not be refreshed.
3. If more than one minor failure (warning) is detected at the same time, the SI-ET3 gives priority to the error with the lowest warning code number.

Inverter alarms and warnings are described below.

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Inverter Alarms

Alarm Code (IW□□□19[*1]/IW□□□32[*2])	Digital Operator Display	Name
–	CPF00 or CPF01	Control Circuit Error
–	oFA03	Option Card Error Occurred at Option Port CN5-A
–	oFA04	Option Card Error Occurred at Option Port CN5-A
–	oFb03	Option Card Error Occurred at Option Port CN5-B
–	oFb04	Option Card Error Occurred at Option Port CN5-B
–	oFb07 to oFb09	Option Card Error Occurred at Option Port CN5-B
–	oFC03	Option Card Error Occurred at Option Port CN5-C
–	oFC04	Option Card Error Occurred at Option Port CN5-C
–	oFC07 to oFC09	Option Card Error Occurred at Option Port CN5-C
0002H	Uv1	DC Bus Undervoltage
0003H	Uv2	Control Power Supply Voltage Fault
0004H	Uv3	Undervoltage 3 (Soft-charge Bypass Circuit Fault)
0005H	SC	Output Short-Circuit or IGBT Fault
0006H	GF	Ground Fault
0007H	oC	Overcurrent
0008H	ov	Overvoltage
0009H	oH	Heatsink Overheat
000AH	oH1	Overheat 1 (Heat sink Overheat)
000BH	oL1	Motor Overload
000CH	oL2	Drive Overload
000DH	oL3	Overtorque Detection 1
000EH	oL4	Overtorque Detection 2
000FH	rr	Dynamic Braking Transistor

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Alarm Code (IW□□□19[*1]/IW□□□32[*2])	Digital Operator Display	Name
0010H	rH	Braking Resistor Overheat
0011H to 0016H	EF3 to EF8	External Fault (input terminal 3 to 8)
0017H	FAn	Internal Fan Fault
0018H	oS	Overspeed
0019H	dEv	Speed Deviation (for Control Mode with PG and PM Open Loop Vector Control Mode without PG)
001AH	PGo	PG Disconnect (for Control Mode with PG)
001BH	PF	Input Phase Loss
001CH	LF	Output Phase Loss
001DH	oH3	Motor Overheat Alarm (PTC Input)
001EH	oPr	External Digital Operator Connection Fault
001FH	Err	EEPROM Write Error
0020H	oH4	Motor Overheat Fault (PTC Input)
0021H	CE	MEMOBUS/Modbus Communication Error
0022H	bUS	Option Communication Error
0025H	CF	Control Fault
0026H	SvE	Zero Servo Fault
0027H	EF0	Option Card External Fault
0028H	FbL	PID Feedback Loss
0029H	UL3	Undertorque Detection 1
002BH	oL7	High Slip Braking oL
0030H	UL4	Undertorque Detection 2
0032H	dv1	Z Pulse Fault
0033H	dv2	Z Pulse Noise Fault Detection
0034H	dv3	Inversion Detection
0035H	dv4	Inversion Prevention Detection
0036H	LF2	Output Current Imbalance
0037H	STo	Pull-Out Detection
0038H	PGoH	PG Hardware Fault (when using PG-X3)
0039H	E5	MECHATROLINK Watchdog Timer Error
003BH	SEr	Too Many Speed Search Restarts
0041H	FbH	Excessive PID Feedback
0042H	EF1	External Fault (input terminal S1)
0043H	EF2	External Fault (input terminal S2)
0044H	oL5	Mechanical Weakening Detection 1
0045H	UL5	Mechanical Weakening Detection 2
0046H	CoF	Current Offset Fault
0049H	dWFL	DriveWorksEZ Fault
004AH	dWF1	EEPROM Memory DriveWorksEZ Data Error
004DH	voF	Output Voltage Detection Fault
004EH	rF	Braking Resistor Fault
004FH	boL	Braking Transistor Overload Fault
0050H	oH5	Motor Overheat (NTC Input)
0051H	LSo	LSo Fault
0052H	nSE	Node Setup Fault
0053H	THo	Thermistor Disconnect
005BH	dv7	Polarity Judge Timeout
005FH	LF3	Power Unit Output Phase Loss 3
0060H	UnbC	Current Unbalance

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Alarm Code (IW□□□19[*1]/IW□□□32[*2])	Digital Operator Display	Name
0061H	Uv4	Gate Drive Board Undervoltage
0083H	CPF02	A/D Conversion Error
0084H	CPF03	Control Board Connection Error
0087H	CPF06	EEPROM Memory Data Error
0088H, 0089H	CPF07 or CPF08	Terminal Board Connection Error
008CH	CPF11	RAM Fault
008DH	CPF12	FLASH Memory Fault
008EH	CPF13	Watchdog Circuit Exception
008FH	CPF14	Control Circuit Fault
0091H	CPF16	Clock Fault
0092H	CPF17	Timing Fault
0093H	CPF18	Control Circuit Fault
0094H	CPF19	
0095H, 0096H	CPF20 or CPF21	Control Circuit Error
0097H	CPF22	Hybrid IC Error
0098H	CPF23	Control Board Connection Error
0099H	CPF24	Drive Unit Signal Fault
009AH	CPF25	Terminal Board not Connected.
009BH to 00A4H	CPF26 to CPF35	Control Circuit Error
00A9H to 00AEH	CPF40 to CPF45	
0101H	oFA00	Option Card Connection Error at Option Port CN5-A
0102H	oFA01	Option Card Fault at Option Port CN5-A
0103H	oFA02	Same type of Option Card already connected
0106H	oFA05	Option Card Error Occurred at Option Port CN5-A
0107H	oFA06	
0111H, 0112H	oFA10 or oFA11	
0113H to 0118H	oFA12 to oFA17	Option Card Connection Error (CN5-A)
0131H to 013EH	oFA30 to oFA43	Comm. Option Card Connection Error (CN5-A)
0201H	oFb00	Option Card Fault at Option Port CN5-B
0202H	oFb01	Option Card Fault at Option Port CN5-B
0203H	oFb02	Same type of option card already connected
0206H	oFb05	Option Card Error Occurred at Option Port CN5-B
0207H	oFb06	
0211H	oFb10	
0212H	oFb11	
0213H to 0218H	oFb12 to oFb17	Option Card Error Occurred at Option Port CN5-B
0301H	oFC00	Option Card Connection Error at Option Port CN5-C
0302H	oFC01	Option Card Fault at Option Port CN5-C
0303H	oFC02	Option Card Fault at Option Port CN5-C
0306H	oFC05	Option Card Error Occurred at Option Port CN5-C
0307H	oFC06	
0311H	oFC10	
0312H	oFC11	
0313H to 0318H	oFC12 to oFC17	Option Card Error Occurred at Option Port CN5-C
0351H to 0356H	oFC50 to oFC55	Option Card Error Occurred at Option Port CN5-C

[*1] You can monitor in the following cases.
- When the Inverter Drive Control command is executed when bit 6 (Alarm code) of Input Data Option Selection (OW□□□0D) is ON.
- When the Inverter I/O Control subcommand is executed when bit 6 (Alarm code) of Auxiliary Input Data Option Selection (OW□□□0F) is ON.

[*2] You can monitor the current alarm codes when the Alarm Monitor or Alarm History Monitor command is executed.

Inverter Warnings

Warning Code (IW□□□1A[*1]/IW□□□32[*2])	Digital Operator Display	Name
–	PASS	MEMOBUS/Modbus Comm. Test Mode Complete
–	CrST	Cannot Reset
0001H	Uv	Undervoltage
0002H	ov	DC Bus Overvoltage
0003H	oH	Heatsink Overheat
0004H	oH2	Drive Overheat Warning
0005H	oL3	Overtorque 1
0006H	oL4	Overtorque 2
0007H	EF	Forward/Reverse Run Command Input Error
0008H	bb	Baseblock
0009H to 000EH	EF3 to EF8	External Fault (input terminal S3 to S8)
000FH	FAn	Internal Fan Fault
0010H	oS	Overspeed
0011H	dEv	Speed Deviation (when using a PG option card and PM Open Loop Vector Control Mode without PG)
0012H	PGo	PG Disconnect (for Control Mode with PG)
0014H	CE	MEMOBUS/Modbus Communication Error
0015H	bUS	Option Communication Error
001AH	EF0	Option Card External Fault
001BH	rUn	Motor Switch during Run
001DH	CALL	Serial Communication Transmission Error
001EH	UL3	Undertorque Detection 1
001FH	UL4	Undertorque Detection 2
0020H	SE	MEMOBUS/Modbus Communication Test Mode Error
0022H	oH3	Motor Overheat
0027H	FbL	PID Feedback Loss
0028H	FbH	Excessive PID Feedback
002AH	dnE	Drive Disabled
002BH	PGoH	PG Hardware Fault (when using PG-X3)
0031H	E5	MECHATROLINK Watchdog Timer Error
0032H	AEr	Station Address Setting Error (MECHATROLINK)
0033H	CyC	MECHATROLINK Trans. Cycle Setting Error
0034H	HCA	Current Alarm
0035H	LT-1	Cooling Fan Maintenance Time
0036H	LT-2	Capacitor Maintenance Time
0039H	EF1	External Fault (input terminal S1)
003AH	EF2	External Fault (input terminal S2)
003BH	HbbF	Safe Disable Signal Input
003CH	Hbb	
003DH	oL5	Mechanical Weakening Detection 1
003EH	UL5	Mechanical Weakening Detection 2
0041H	voF	Output Voltage Detection Fault
0042H	TrPC	IGBT Maintenance Time (90%)
0043H	LT-3	Soft Charge Bypass Relay Maintenance Time
0044H	LT-4	IGBT Maintenance Time (50%)
0045H	boL	Braking Transistor Overload Fault
0048H	oH5	Motor Overheat (NTC Input)
0049H	dWAL	DriveWorksEZ Fault
004DH	THo	Thermistor Disconnect

[1] You can monitor in the following cases.
- When the Inverter Drive Control command is executed when bit 7 (Warning code) of Input Data Option Selection (OW☐☐☐0D) is ON
- When the Inverter I/O Control subcommand is executed when bit 7 (Warning code) of Auxiliary Input Data Option Selection (OW☐☐☐0F) is ON

[2] You can monitor the current warning codes when the Alarm Monitor or Alarm History Monitor command is executed.

Errors Detected in MECHATROLINK-III Interface Cards

◆ MECHATROLINK-III Command Errors

Type	Code (IW☐☐☐2C Bits 8 to B)	Description
Warnings	1H	Invalid data
Alarms	8H	Unsupported command received
	9H	Invalid data
	AH	Command execution condition error
	BH	Sub-command combination error
	CH	Phase error

◆ MECHATROLINK-III Communications Errors

Type	Code (IW☐☐☐2C Bits C to F)	Description
Warnings	1H	Frame Check Sequence (FCS) error
	2H	Command data not received
	3H	Synchronous frame not received
Alarms	8H	Frame Check Sequence (FCS) error
	9H	Command data not received
	AH	Synchronous frame not received
	BH	Synchronization interval error
	CH	WDT error

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Inverter Alarms

Alarm Code (IW☐☐☐19[1]/IW☐☐☐32[2])	Digital Operator Display	Name
0002H	Uv1	Undervoltage
0003H	Uv2	Control Power Supply Undervoltage
0004H	Uv3	Soft Charge Circuit Fault
0005H	SC	IGBT Short Circuit
0006H	GF	Ground Fault
0007H	oC	Overcurrent
0008H	ov	Overvoltage
0009H	oH	Heatsink Overheat
000AH	oH1	
000BH	oL1	Motor Overload
000CH	oL2	Drive Overload
000DH	oL3	Overtorque Detection 1
000EH	oL4	Overtorque Detection 2
000FH	rr	Dynamic Braking Transistor

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Alarm Code (IW□□□19[*1]/IW□□□32[*2])	Digital Operator Display	Name
0010H	rH	Dynamic Braking Resistor
0011H to 0015H	EF3 to EF7	External Fault (input terminal S3 to S7)
0018H	oS	Overspeed (for simple V/f with PG)
0019H	dEv	Excessive Speed Deviation (for simple V/f with PG)
001AH	PGo	PG Disconnect (for simple V/f with PG)
001BH	PF	Input Phase Loss
001CH	LF	Output Phase Loss
001DH	oH3	Motor Overheat 1 (PTC input)
001EH	oPr	Operator Connection Fault
001FH	Err	EEPROM Write Error
0020H	oH4	Motor Overheat 2 (PTC input)
0021H	CE	MEMOBUS/Modbus Communication Error
0022H	bUS	Option Communication Error
0025H	CF	Control Fault
0027H	EF0	Option External Fault
0028H	FbL	PID Feedback Loss
0029H	UL3	Undertorque Detection 1
002AH	UL4	Undertorque Detection 2
002BH	oL7	High Slip Braking oL
0036H	LF2	Current Imbalance
0037H	STo	Pull-Out Detection
0039H	E5	MECHATROLINK Watchdog Timer Error
003BH	SEr	Too Many Speed Search Restarts
0041H	FbH	Excessive PID Feedback
0042H	EF1	External Fault (input terminal S1)
0043H	EF2	External Fault (input terminal S2)
0044H	oL5	Mechanical Weakening Detection 1
0045H	UL5	Mechanical Weakening Detection 2
0046H	CoF	Current Offset Fault
0049H	dWFL	DriveWorksEZ Fault
0052H	nSE	Node Setup Error
0083H	CPF02	A/D Conversion Error
0084H	CPF03	PWM Data Fault
0087H	CPF06	Drive specification mismatch during Terminal Board or Control Board replacement
0088H	CPF07	Terminal Board Communication Fault
0089H	CPF08	EEPROM Serial Communication Fault
008CH	CPF11	RAM Fault
008DH	CPF12	FLASH Memory Fault
008EH	CPF13	Watchdog Circuit Exception
008FH	CPF14	Control Circuit Fault
0091H	CPF16	Clock Fault
0092H	CPF17	Timing Fault
0093H	CPF18	Control Circuit Fault
0094H	CPF19	
0095H or 0096H	CPF20 or CPF21	RAM Fault
		FLASH Memory Fault
		Watchdog Circuit Exception
		Clock Fault

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Alarm Code (IW□□□19[*1]/IW□□□32[*2])	Digital Operator Display	Name
0097H	CPF22	A/D Conversion Fault
0098H	CPF23	PWM Feedback Data Fault
0099H	CPF24	Drive Capacity Signal Fault
009AH	CPF25	Terminal Board Not Connected
0101H	oFA00	Option Card Connection Error at Option Port CN5-A
0102H	oFA01	Option Card Fault (Port A)
0104H	oFA03	
0105H	oFA04	
0131H to 013EH	oFA30 to oFA43	Option Card Fault (Port A)

*1. You can monitor in the following cases.
- When the Inverter Drive Control command is executed when bit 6 (Alarm code) of Input Data Option Selection (OW□□□0D) is ON
- When the Inverter I/O Control subcommand is executed when bit 6 (Alarm code) of Auxiliary Input Data Option Selection (OW□□□0F) is ON

*2. You can monitor the current alarm codes when the Alarm Monitor or Alarm History Monitor command is executed.

Inverter Warnings

Warning Code (IW□□□1A[*1]/IW□□□32[*2])	Digital Operator Display	Name
–	CrST	Can Not Reset
–	PASS	MEMOBUS/Modbus Test Mode Complete
0001H	Uv	Undervoltage
0002H	ov	Overvoltage
0003H	oH	Heatsink Overheat
0004H	oH2	Drive Overheat
0005H	oL3	Overtorque 1
0006H	oL4	Overtorque 2
0007H	EF	Run Command Input Error
0008H	bb	Drive Baseblock
0009H to 000DH	EF3 to EF7	External Fault (input terminal S3 to S7)
0010H	oS	Overspeed (for Simple V/f with PG)
0011H	dEv	Excessive Speed Deviation (for Simple V/f with PG)
0012H	PGo	PG Disconnect (for Simple V/f with PG)
0014H	CE	MEMOBUS/Modbus Communication Error
0015H	bUS	Option Card Communications Error
001AH	EF0	Option Card External Fault
001BH	rUn	During Run 2, Motor Switch Command Input
001DH	CALL	Serial Communication Transmission Error
001EH	UL3	Undertorque 1
001FH	UL4	Undertorque 2
0020H	SE	MEMOBUS/Modbus Test Mode Fault
0022H	oH3	Motor Overheat
0027H	FbL	PID Feedback Loss
0028H	FbH	Excessive PID Feedback
002AH	dnE	Drive Disabled
0031H	E5	MECHATROLINK Watchdog Timer Error
0032H	AEr	Station Address Setting Error (MECHATROLINK)
0033H	CyC	MECHATROLINK Trans. Cycle Setting Error
0034H	HCA	Current Alarm

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Warning Code (IW☐☐☐1A[*1]/IW☐☐☐32[*2])	Digital Operator Display	Name
0035H	LT-1	Cooling Fan Maintenance Alarm
0036H	LT-2	Capacitor Maintenance Alarm
0039H	EF1	External Fault (input terminal S1)
003AH	EF2	External Fault (input terminal S2)
003BH	HbbF	Safe Disable Signal Input
003CH	Hbb	
003DH	oL5	Mechanical Weakening Detection 1
003EH	UL5	Mechanical Weakening Detection 2
0042H	TrPC	IGBT Maintenance Time (90%)
0043H	LT-3	Soft Charge Bypass Relay Maintenance Time
0044H	LT-4	IGBT Maintenance Time (50%)
0049H	dWAL	DriveWorksEZ Alarm

[*1] You can monitor in the following cases.
- When the Inverter Drive Control command is executed when bit 7 (Warning code) of Input Data Option Selection (OW☐☐☐0D) is ON
- When the Inverter I/O Control subcommand is executed when bit 7 (Warning code) of Auxiliary Input Data Option Selection (OW☐☐☐0F) is ON

[*2] You can monitor the current warning codes when the Alarm Monitor or Alarm History Monitor command is executed.

Errors Detected in MECHATROLINK-III Interface Cards

◆ MECHATROLINK-III Command Errors

Type	Code (IW☐☐☐2C Bits 8 to B)	Description
Warnings	1H	Invalid data
Alarms	8H	Unsupported command received
	9H	Invalid data
	AH	Command execution condition error
	BH	Sub-command combination error
	CH	Phase error

◆ MECHATROLINK-III Communications Errors

Type	Code (IW☐☐☐2C Bits C to F)	Description
Warnings	1H	Frame Check Sequence (FCS) error
	2H	Command data not received
	3H	Synchronous frame not received
Alarms	8H	Frame Check Sequence (FCS) error
	9H	Command data not received
	AH	Synchronous frame not received
	BH	Synchronization interval error
	CH	WDT error

Appendices

11

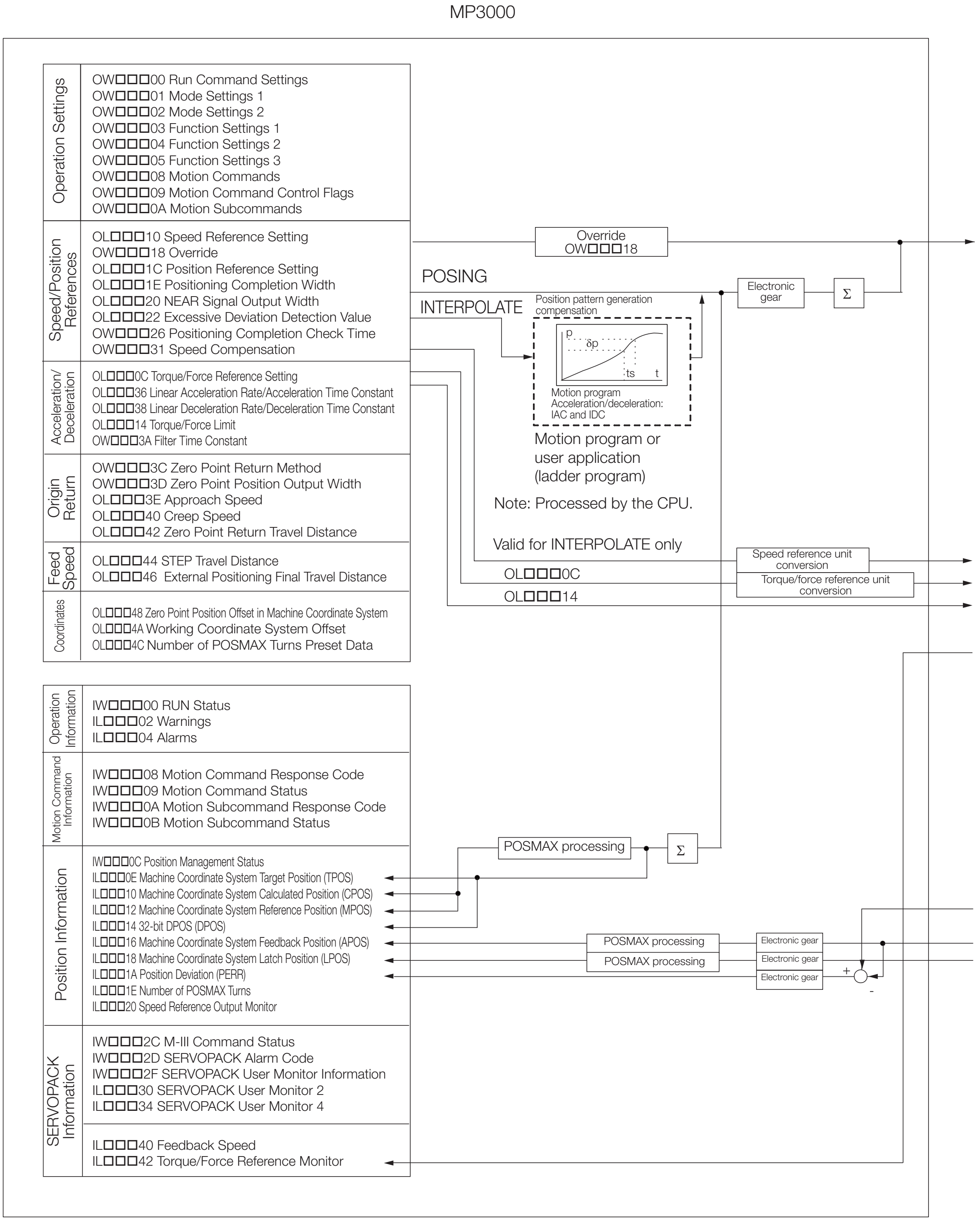
The appendices provide supplemental information related to motion control.

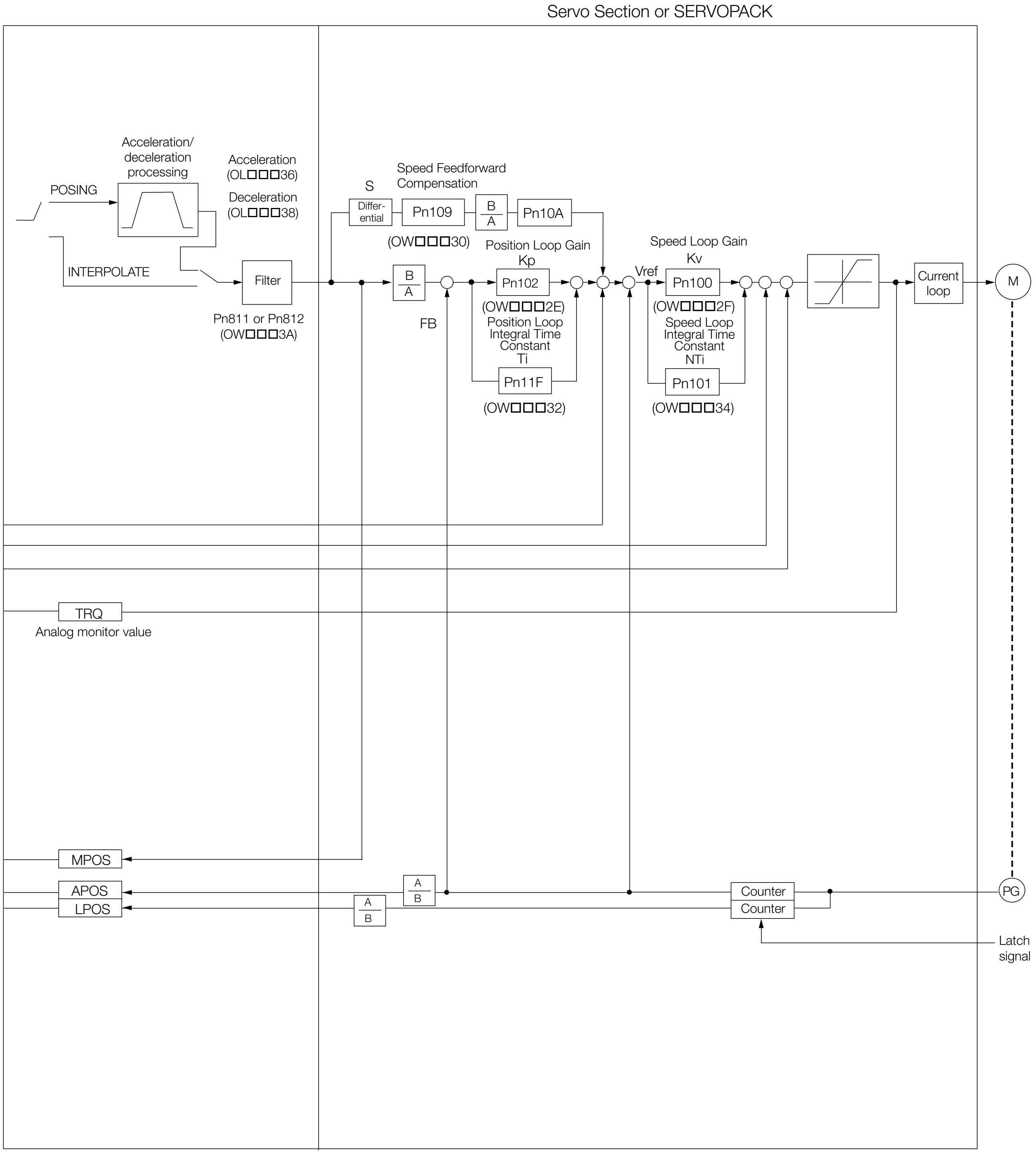
11.1 Control Block Diagrams

This section uses block diagrams to show the relation between motion control and motion parameters.

11.1.1 Control Block Diagram for Position Control

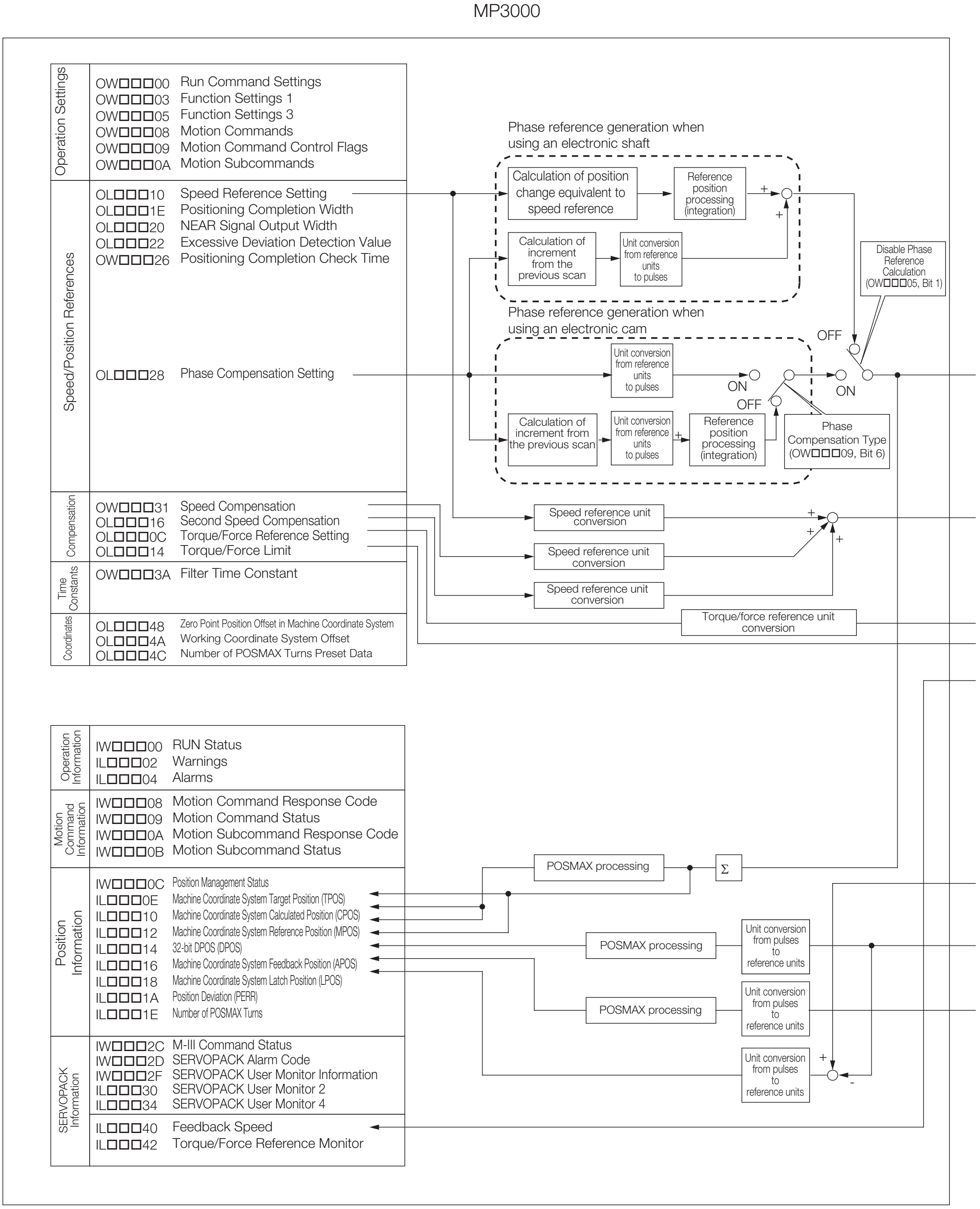
The following diagram shows the relationships between the control block and motion parameters for position control.

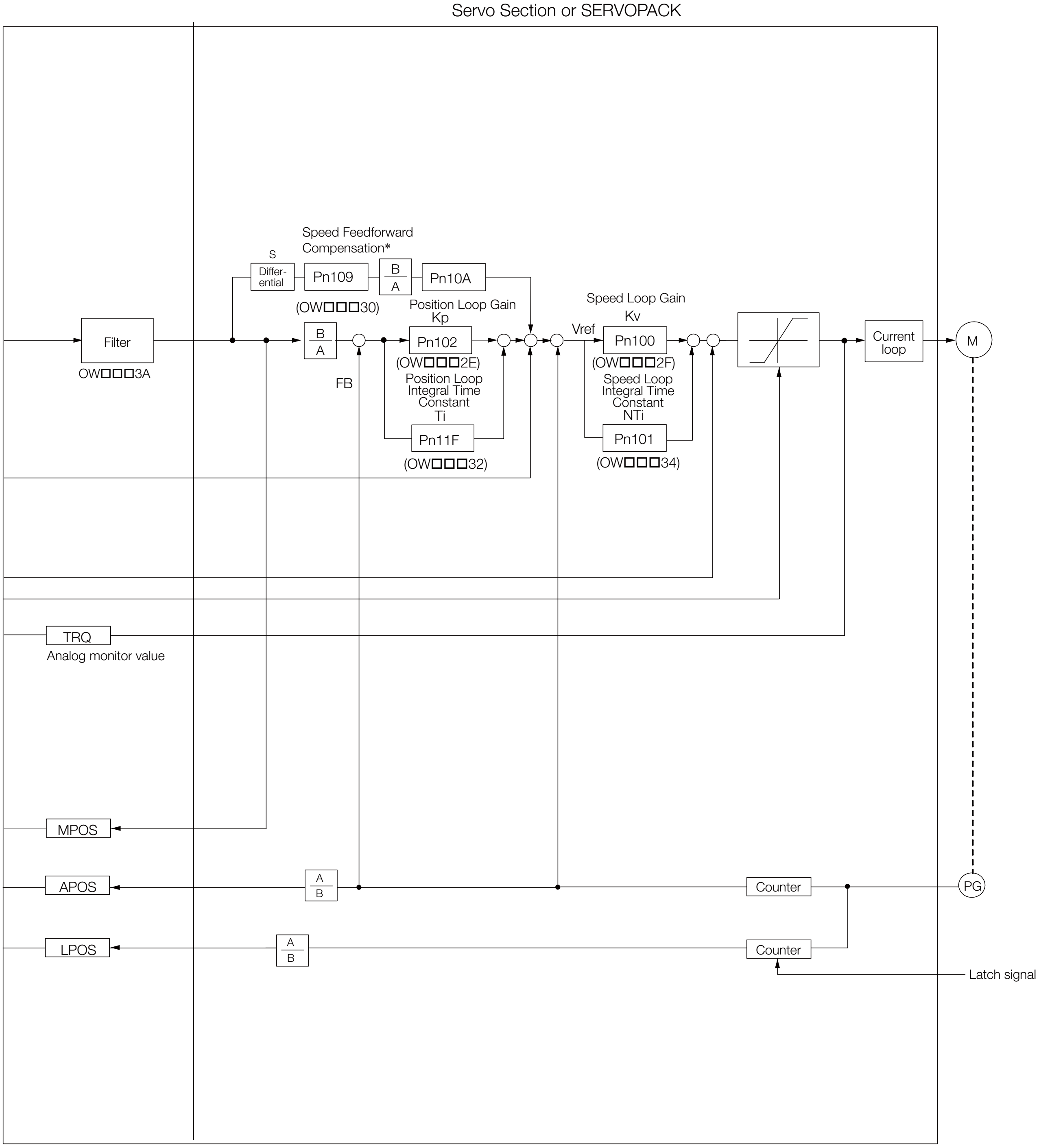



Servo Section or SERVOPACK
Acceleration/
deceleration
processing
Acceleration
(OL□□□36)
Deceleration
(OL□□□38)
POSING
INTERPOLATE
Filter
Pn811 or Pn812
(OW□□□3A)
S
Speed Feedforward
Compensation
Differ-
ential
Pn109
B
A
Pn10A
(OW□□□30)
Position Loop Gain
Kp
B
A
FB
Pn102
(OW□□□2E)
Position Loop
Integral Time
Constant
Ti
Pn11F
(OW□□□32)
Speed Loop Gain
Kv
Vref
Pn100
(OW□□□2F)
Speed Loop
Integral Time
Constant
NTi
Pn101
(OW□□□34)
Current
loop
M
TRQ
Analog monitor value
MPOS
APOS
LPOS
A
B
A
B
Counter
Counter
PG
Latch
signal

11.1.2 Control Block Diagram for Phase Control

The following diagram shows the relationships between the control block and motion parameters for phase control.

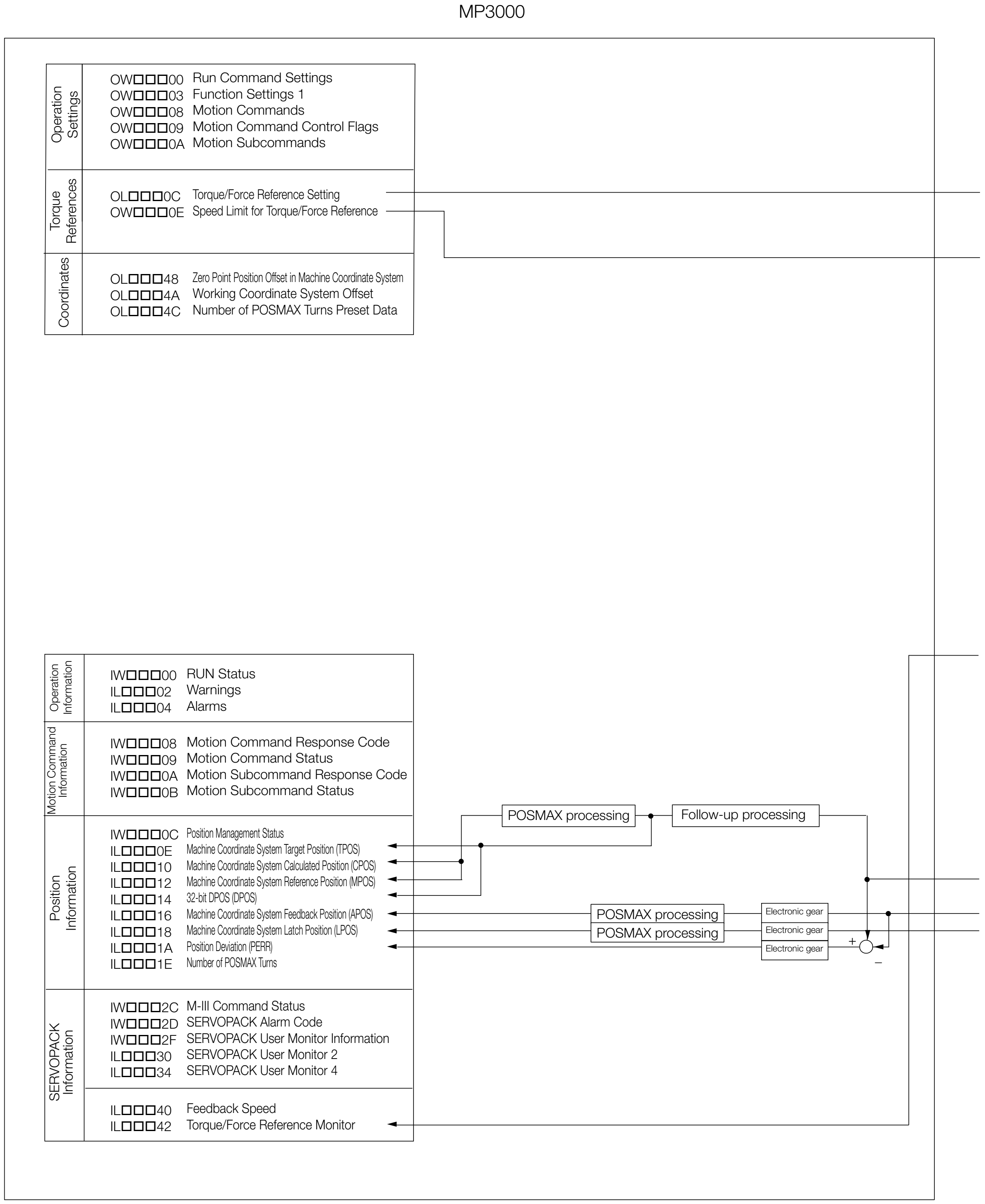


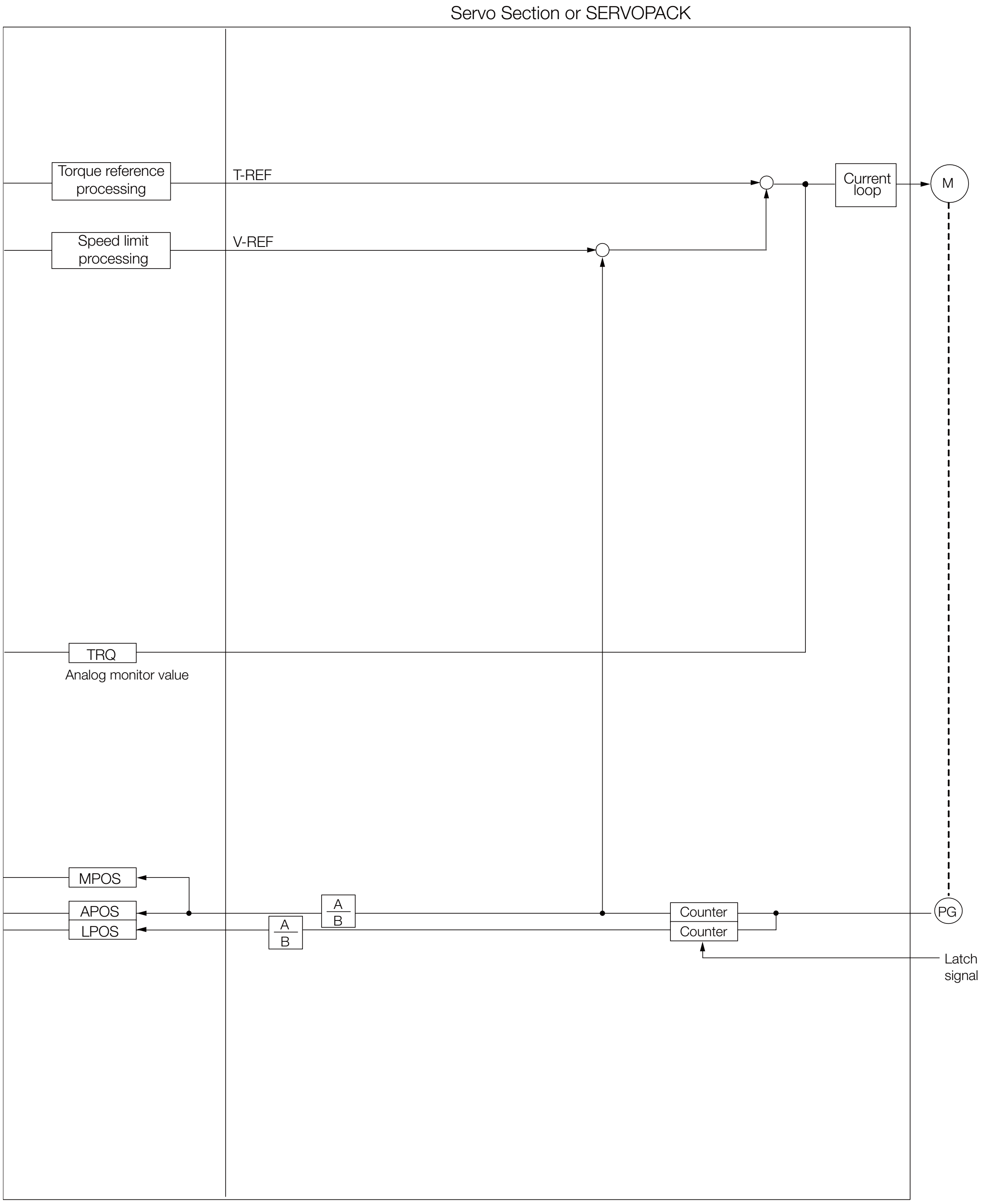


* Set 0 to use phase references.

11.1.3 Control Block Diagram for Torque Control

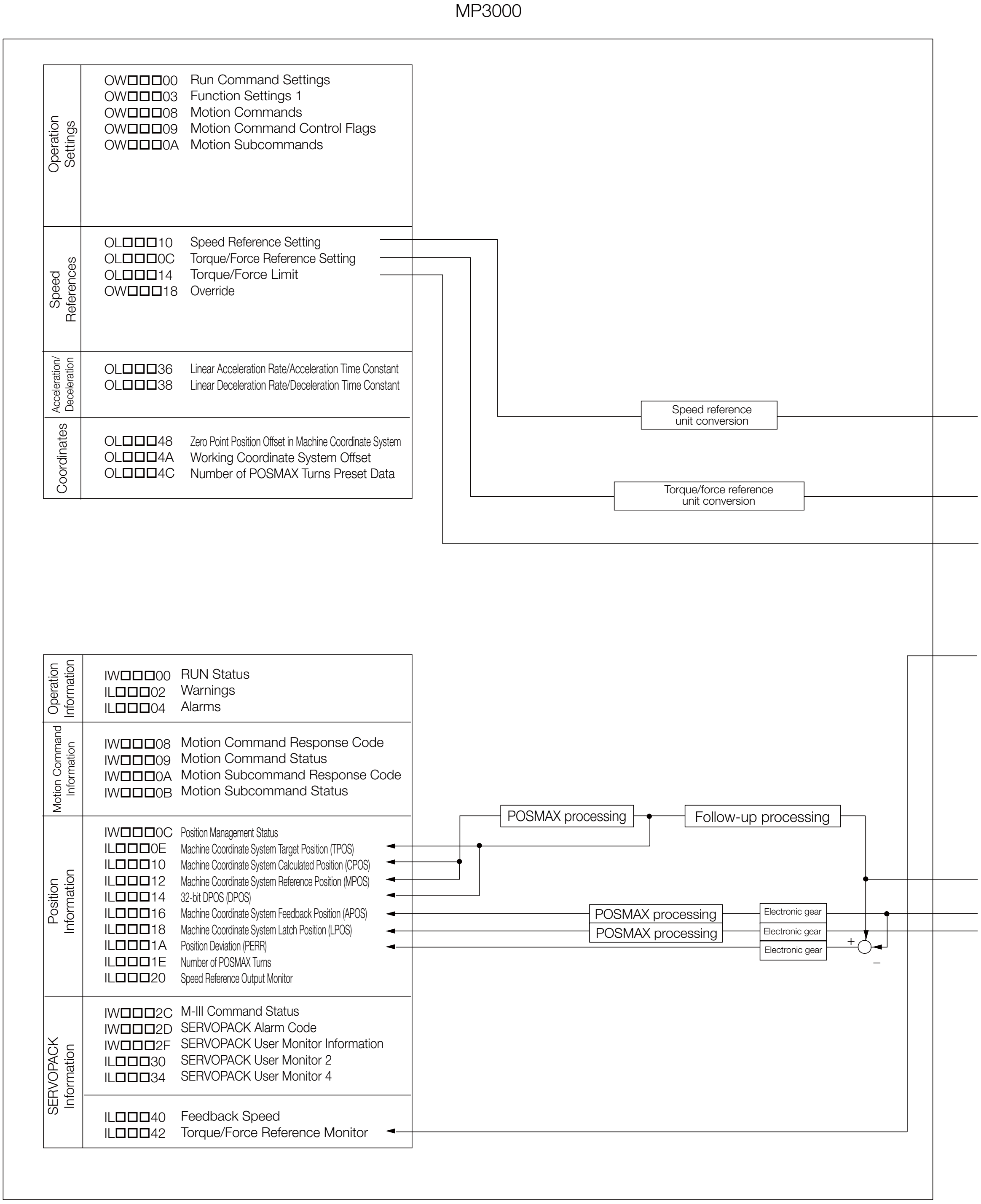
The following diagram shows the relationships between the control block and motion parameters for torque control.

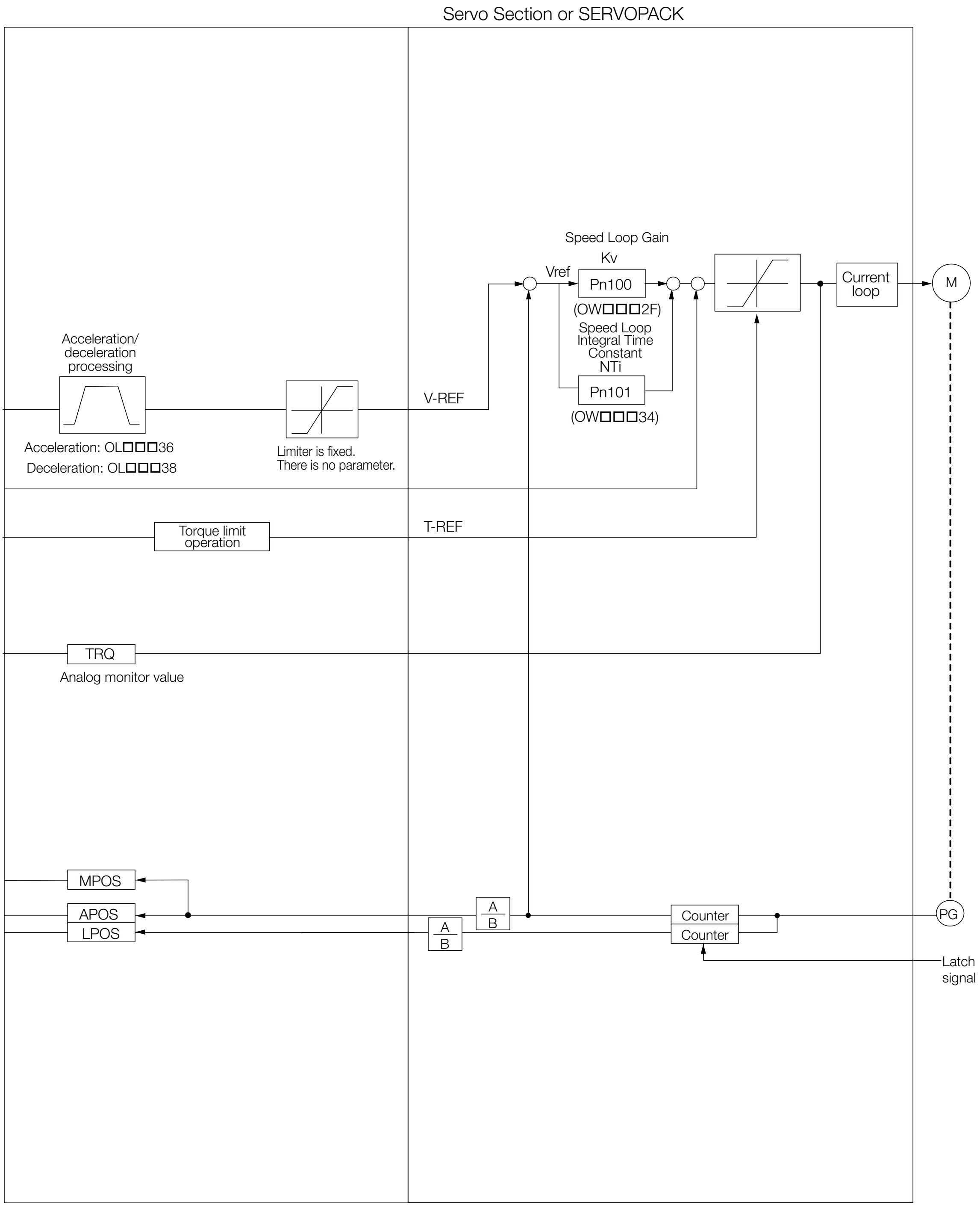



Servo Section or SERVOPACK
Torque reference processing
T-REF
Current loop
M
Speed limit processing
V-REF
TRQ
Analog monitor value
MPOS
APOS
LPOS
A
B
A
B
Counter
Counter
PG
Latch signal

11.1.4 Control Block Diagram for Speed Control

The following diagram shows the relationships between the control block and motion parameters for speed control.




Servo Section or SERVOPACK
Speed Loop Gain
Kv
Vref
Pn100
(OW□□□2F)
Speed Loop Integral Time Constant
NTi
Pn101
(OW□□□34)
Current loop
M
Acceleration/deceleration processing
Acceleration: OL□□□36
Deceleration: OL□□□38
Limiter is fixed.
There is no parameter.
V-REF
Torque limit operation
T-REF
TRQ
Analog monitor value
MPOS
APOS
LPOS
A
B
A
B
Counter
Counter
PG
Latch signal

11.2 System Registers

This section provides tables of the system registers.

11.2.1 System Service Registers

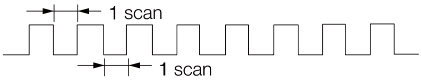
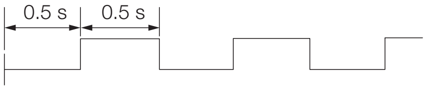
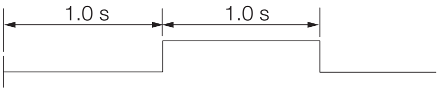
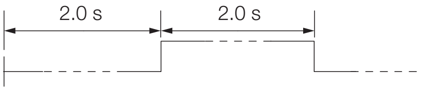
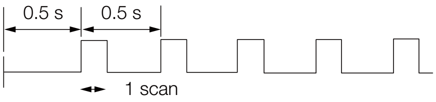
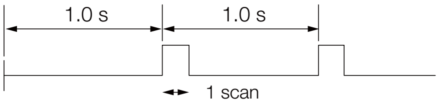
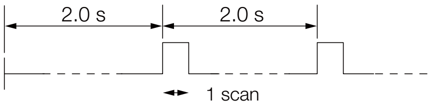
This section provides tables of the system service registers.

Shared by All Drawings

Name	Register Address	Description
Reserved	SB000000	Do not use.
First High-speed Scan	SB000001	This register is ON for only the first scan after the high-speed scan starts.
First Low-speed Scan	SB000003	This register is ON for only the first scan after the low-speed scan starts.
Always ON	SB000004	Always ON (= 1).
Reserved	SB000005 to SB00000F	Do not use.

DWG.H Only

Operation of the following relays starts when the high-speed scan starts.

Name	Register Address	Description
1-scan Flicker Relay	SB000010	
0.5-s Flicker Relay	SB000011	
1.0-s Flicker Relay	SB000012	
2.0-s Flicker Relay	SB000013	
0.5-s Sampling Relay	SB000014	
1.0-s Sampling Relay	SB000015	
2.0-s Sampling Relay	SB000016	

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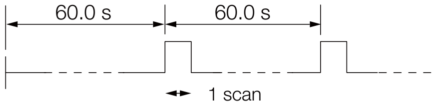
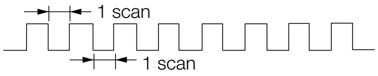
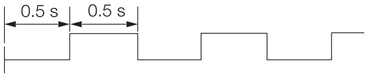
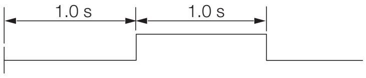
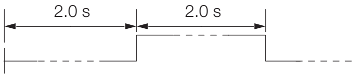
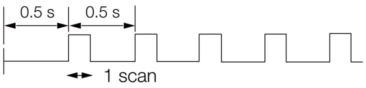
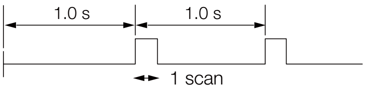
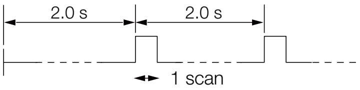
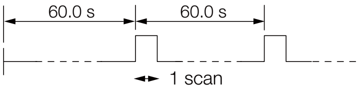
Name	Register Address	Description
60.0-s Sampling Relay	SB000017	
1.0-s After Start of Scan Relay	SB000018	
2.0-s After Start of Scan Relay	SB000019	
5.0-s After Start of Scan Relay	SB00001A	

DWG.L Only

Operation of the following relays starts when the low-speed scan starts.

Name	Register Address	Description
1-scan Flicker Relay	SB000030	
0.5-s Flicker Relay	SB000031	
1.0-s Flicker Relay	SB000032	
2.0-s Flicker Relay	SB000033	
0.5-s Sampling Relay	SB000034	
1.0-s Sampling Relay	SB000035	
2.0-s Sampling Relay	SB000036	
60.0-s Sampling Relay	SB000037	
1.0-s After Start of Scan Relay	SB000038	

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Name	Register Address	Description
2.0-s After Start of Scan Relay	SB000039	
5.0-s After Start of Scan Relay	SB00003A	

11.2.2 Scan Execution Status and Calendar

The following table lists the scan execution status and calendar registers.

Name	Register Address	Description
High-speed Scan Set Value	SW00004	This is the high-speed scan set value (0.1 ms).
High-speed Scan Current Value	SW00005	This is the current value of the high-speed scan (0.1 ms).
High-speed Scan Maximum Value	SW00006	This is the maximum value of the high-speed scan (0.1 ms).
Reserved for system.	SW00007 to SW00009	Not used.
Low-speed Scan Set Value	SW00010	This is the low-speed scan set value (0.1 ms).
Low-speed Scan Current Value	SW00011	This is the current value of the low-speed scan (0.1 ms).
Low-speed Scan Maximum Value	SW00012	This is the maximum value of the low-speed scan (0.1 ms).
Reserved for system.	SW00013	Not used.
Executing Scan Current Value	SW00014	This is the current value of the scan that is currently being executed (0.1 ms).
Calendar: Year	SW00015	1999: 0099 (BCD) (last two digits only)
Calendar: Month Day	SW00016	December 31: 1231 (BCD)
Calendar: Hours Minutes	SW00017	23 hours 59 minutes: 2359 (BCD)
Calendar: Seconds	SW00018	59 seconds: 59 (BCD)
Calendar: Day of Week	SW00019	0 to 6: Sun. to Sat.

11.2.3 System Program Software Numbers and Remaining Program Memory Capacity

The following table lists the registers that give the system program software numbers and remaining program memory capacity.

Name	Register Address	Description
System Program Software Number	SW00020	S□□□□ (□□□□ is replaced with the BCD value.)
System Number	SW00021 to SW00025	Not used.
Remaining Program Memory Capacity	SL00026	Bytes
Total Memory Capacity	SL00028	Bytes

11.3 MECHATROLINK-III I/O Module Settings

This section describes the settings for MECHATROLINK-III I/O Modules.

Important

You must use IOWin to set the parameters of the I/O Modules with MECHATROLINK-III Communications (JEPMC-MTA2900-E, JEPMC-MTA2910-E, JEPMC-MTP2900-E, and JEPMC-MTP2910-E).
Refer to the following manual for details.
📖 MECHATROLINK-III Compatible I/O Module User's Manual (Manual No.: SIEP C880781 04)

11.3.1 Link Assignment Tab Page Settings

When connecting a MECHATROLINK-III I/O Module, set up the slave device on the Link Assignment Tab Page as given in the following table and save those settings.

✓: Can be set.

VENDOR	DEVICE	PROFILE	BYTE	SIZE		SCAN
				INPUT	OUTPUT	
Yaskawa Electric co.	JAPMC-MC2320-E	Standard I/O	16, 32, 48, 64	8, 16, 24, 32	8, 16, 24, 32	✓
	SVC32		16, 32, 48, 64	8, 16, 24, 32	8, 16, 24, 32	✓
	JEPMC-MTD2310-E		16	8	8	✓
	JEPMC-MTA2900-E		32	16	16	✓
	JEPMC-MTA2910-E		16	8	8	✓
	JEPMC-MTP2900-E		64	32	32	✓
	JEPMC-MTP2910-E		64	32	32	✓

11.3.2 I/O Register Configuration

The following figure shows the I/O register configuration when a MECHATROLINK-III I/O Module is connected.

Output Registers

	7 6 5 4 3 2 1 0
OW□□□□□	I/O Command
	Not used.
OW□□□□□ + 1	Command Control
OW□□□□□ + 2	Output Data 1 Low
	High
OW□□□□□ + 3	Output Data 2 Low
	High
OW□□□□□ + 4	Output Data 3 Low
	High
OW□□□□□ + 5	Output Data 4 Low
	High
OW□□□□□ + 6	Output Data 5 Low
	High
OW□□□□□ + 7	Output Data 6 Low
	High
	⋮

Input Registers

	7 6 5 4 3 2 1 0
IW□□□□□	I/O Command Response
	Master Status
IW□□□□□ + 1	Command Status
IW□□□□□ + 2	Input Data 1 Low
	High
IW□□□□□ + 3	Input Data 2 Low
	High
IW□□□□□ + 4	Input Data 3 Low
	High
IW□□□□□ + 5	Input Data 4 Low
	High
IW□□□□□ + 6	Input Data 5 Low
	High
IW□□□□□ + 7	Input Data 6 Low
	High
	⋮

Important

Set the I/O Command, Command Control, and Output Data output registers during the same scan.

11.3.3 I/O Commands

The following table lists the I/O commands. Refer to the pages given in the *Reference* Column for details on individual commands.

Code	Name	Description	Reference
0	Data I/O	Performs data I/O operations with the I/O Module.	*Data I/O Command (page 11-16)*
1	Read Alarms/Warnings	Reads the alarm/warning information from the I/O Module.	*Read Alarms/Warnings Command (page 11-17)*
2	Clear Alarms/Warnings	Clears an alarm or warning from the I/O Module.	*Clear Alarms/Warnings Command (page 11-19)*
3	Read Parameter	Reads an I/O Module parameter.	*Read Parameter Command (page 11-20)*
4	Write Parameter	Changes an I/O Module parameter.	*Write Parameter Command (page 11-21)*
5	Read Non-volatile Parameter	Reads an I/O Module parameter from non-volatile memory.	*Read Non-volatile Parameter Command (page 11-23)*
6	Write Non-volatile Parameter	Changes an I/O Module parameter in non-volatile memory.	*Write Non-volatile Parameter Command (page 11-24)*
7	Read Memory	Reads data in the internal memory of the I/O Module.	*Read Memory Command (page 11-26)*
8	Write Memory	Changes data in the internal memory of the I/O Module.	*Write Memory Command (page 11-28)*
9 to 14	Reserved.	Do not set these codes.	–
15	Reset Communications	Re-establishes communications with the I/O Module. Communications are disconnected, and a new connection is established.	*Reset Communications Command (page 11-30)*
16	Reset Network	Resets the communications for the entire network. Execute this command to ensure that proper cyclic communications are performed if entering an active network fails. This affects communications with all slave stations on the network. Stop all commands from the application before you reset the network.	*Reset Network Command (page 11-31)*

11.3.4 I/O Command Details

This section describes how to use the I/O commands.

Data I/O Command

Performs data I/O operations with the I/O Module.

◆ Command Format

Output Registers

	7 6 5 4 3 2 1 0
OW□□□□□	Data I/O (= 0)
	Not used.
OW□□□□□ + 1	Command Control
OW□□□□□ + 2	Output Data 1 Low
	High
OW□□□□□ + 3	Output Data 2 Low
	High
OW□□□□□ + 4	Output Data 3 Low
	High
OW□□□□□ + 5	Output Data 4 Low
	High
OW□□□□□ + 6	Output Data 5 Low
	High
OW□□□□□ + 7	Output Data 6 Low
	High
	• • •

Input Registers

	7 6 5 4 3 2 1 0
IW□□□□□	Data I/O (= 0)
	Master Status
IW□□□□□ + 1	Command Status
IW□□□□□ + 2	Input Data 1 Low
	High
IW□□□□□ + 3	Input Data 2 Low
	High
IW□□□□□ + 4	Input Data 3 Low
	High
IW□□□□□ + 5	Input Data 4 Low
	High
IW□□□□□ + 6	Input Data 5 Low
	High
IW□□□□□ + 7	Input Data 6 Low
	High
	• • •

◆ Execution and Operating Procedure

1. **Make sure that the following condition is met.**

No.	Execution Condition	Confirmation Method
1	I/O command execution must be completed.	Command Status bit 2 (CMDRDY) = 1

2. **Set the I/O Command register to 0 to execute the Data I/O command.**

◆ Confirming Completion of the Command

Use the following information to confirm that the command has been completed.

No.	Confirmation Method
1	I/O Command Response register = 0 (Data I/O)
2	Command Status bit 2 (CMDRDY) = 1

Information

- If the command is not completed within 5 seconds after it is executed, bit 0 in the Master Status register changes to 1 (TIMEOUT).
- When bit 0 (D_ALM) or bit 1 (D_WAR) in the Command Status register is 1, check the error details with the application and perform the stop processing. The system will not perform stop processing.

Read Alarms/Warnings Command

Reads the alarm/warning information from the I/O Module.

◆ Command Format

	Output Registers 7 6 5 4 3 2 1 0
OW□□□□□	Read Alarms/Warnings (= 1)
	Not used.
OW□□□□□ + 1	Command Control
OW□□□□□ + 2	ALM_RD_MOD
OW□□□□□ + 3	ALM_INDEX
OW□□□□□ + 4	
OW□□□□□ + 5	
OW□□□□□ + 6	
OW□□□□□ + 7	
	• • •

	Input Registers 7 6 5 4 3 2 1 0
IW□□□□□	Read Alarms/Warnings (= 1)
	Master Status
IW□□□□□ + 1	Command Status
IW□□□□□ + 2	ALM_RD_MOD
IW□□□□□ + 3	ALM_INDEX
IW□□□□□ + 4	ALM_DATA1 Low High
IW□□□□□ + 5	ALM_DATA2 Low High
IW□□□□□ + 6	ALM_DATA3 Low High
IW□□□□□ + 7	ALM_DATA4 Low High
	• • •

■ ALM_RD_MOD: Read Mode

0: Reads the current alarms or warnings
Reads up to 12 alarms or warnings (one word per alarm/warning, read to ALM_DATA).
If there are less than 12 current alarms or warnings, the remaining portion of ALM_DATA is filled with zeroes.
1: Reads alarm/warning history
Reads up to 12 alarms or warnings (one word per alarm/warning, read to ALM_DATA).
If there are less than 12 current alarms or warnings, the remaining portion of ALM_DATA is filled with zeroes.
2: Reads details on a current alarm or warning
3: Reads details on an alarm/warning history item
All other bits: Reserved for system.

■ ALM_INDEX: Alarm Index

0 to 11: Specifies the order of occurrence.
Specify 0 to read the latest alarm information.
All other bits: Reserved for system.

Information This register is valid only when ALM_RD_MOD is 2 or 3.

■ ALM_DATA: Alarm/Warning Code

This gives the code of the alarm or warning.

Information This is a vendor-specific register when ALM_RD_MOD is 2 or 3.
If an ALM_INDEX is specified for which no alarm or warning has occurred, the contents of ALM_DATA will be all 0.

◆ Execution and Operating Procedure

1. Make sure that the following condition is met.

No.	Execution Condition	Confirmation Method
1	I/O command execution must be completed.	Command Status bit 2 (CMDRDY) = 1

2. Set the I/O Command register to 1 to execute the Read Alarms/Warnings command.

◆ Confirming Completion of the Command

Use the following information to confirm that the command has been completed.

No.	Confirmation Method
1	I/O Command Response register = 1 (Read Alarms/Warnings)
2	Command Status bit 2 (CMDRDY) = 1
3	ALM_RD_MOD is the same in the command and response.
4	ALM_INDEX is the same in the command and response.

Information

- If the command is not completed within 5 seconds after it is executed, bit 0 in the Master Status register changes to 1 (TIMEOUT).
- When bit 0 (D_ALM) or bit 1 (D_WAR) in the Command Status register is 1, check the error details with the application and perform the stop processing. The system will not perform stop processing.

Clear Alarms/Warnings Command

Clears an alarm or warning from the I/O Module.

◆ Command Format

Output Registers

	7 6 5 4 3 2 1 0
OW□□□□□	Clear Alarms/Warnings (= 2)
	Not used.
OW□□□□□ + 1	Command Control
OW□□□□□ + 2	ALM_CLR_MOD
OW□□□□□ + 3	
OW□□□□□ + 4	
OW□□□□□ + 5	
OW□□□□□ + 6	
OW□□□□□ + 7	
	⋮

Input Registers

	7 6 5 4 3 2 1 0
IW□□□□□	Clear Alarms/Warnings (= 2)
	Master Status
IW□□□□□ + 1	Command Status
IW□□□□□ + 2	ALM_CLR_MOD
IW□□□□□ + 3	
IW□□□□□ + 4	
IW□□□□□ + 5	
IW□□□□□ + 6	
IW□□□□□ + 7	
	⋮

■ ALM_CLR_MOD: Clear Alarm Mode

0: Clears the current alarm or warning.
1: Clears the alarm history.
All other bits: Reserved for system.

◆ Execution and Operating Procedure

1. Make sure that the following condition is met.

No.	Execution Condition	Confirmation Method
1	I/O command execution must be completed.	Command Status bit 2 (CMDRDY) = 1

2. Set the I/O Command register to 2 to execute the Clear Alarms/Warnings command.

◆ Confirming Completion of the Command

Use the following information to confirm that the command has been completed.

No.	Confirmation Method
1	I/O Command Response register = 2 (Clear Alarms/Warnings)
2	Command Status bit 2 (CMDRDY) = 1
3	ALM_CLR_MOD is the same in the command and response.

Important

1. If the command is not completed within 5 seconds after it is executed, bit 0 in the Master Status register changes to 1 (TIMEOUT).
2. When bit 0 (D_ALM) or bit 1 (D_WAR) in the Command Status register is 1, check the error details with the application and perform the stop processing. The system will not perform stop processing.

Read Parameter Command

Reads an I/O Module parameter.

Important

Some I/O Module devices do not support the Read Parameter command. Refer to the product specifications of the I/O Module for details.

◆ Command Format

	Output Registers 7 6 5 4 3 2 1 0
OW□□□□□	Read Parameter (= 3)
	Not used.
OW□□□□□ + 1	Command Control
OW□□□□□ + 2	NO
OW□□□□□ + 3	SIZE
	Not used.
OW□□□□□ + 4	
OW□□□□□ + 5	
OW□□□□□ + 6	
OW□□□□□ + 7	
	• • •

	Input Registers 7 6 5 4 3 2 1 0
IW□□□□□	Read Parameter (= 3)
	Master Status
IW□□□□□ + 1	Command Status
IW□□□□□ + 2	NO
IW□□□□□ + 3	SIZE
	Not used.
IW□□□□□ + 4	PARAMETER Low High
IW□□□□□ + 5	
IW□□□□□ + 6	
IW□□□□□ + 7	
	• • •

- ■ NO: Parameter Number
- ■ SIZE: Parameter Size (Bytes)
- ■ PARAMETER: Parameter Data

◆ Execution and Operating Procedure

1. Make sure that the following condition is met.

No.	Execution Condition	Confirmation Method
1	I/O command execution must be completed.	Command Status bit 2 (CMDRDY) = 1

2. Set the following parameters.
   - NO (Parameter Number)
   - SIZE (Parameter Size)

   Setting Precautions

   Make any necessary changes to NO (Parameter Number) or SIZE (Parameter Size) before executing the Read Parameter command or during the same scan that the I/O Command register is set to 3. Do not change these settings during execution of the Read Parameter command.

3. Set the I/O Command register to 3 to execute the Read Parameter command.

◆ Confirming Completion of the Command

Use the following information to confirm that the command has been completed.

No.	Confirmation Method
1	I/O Command Response register = 3 (Read Parameter)
2	Command Status bit 2 (CMDRDY) = 1
3	NO must be the same in the command and response.
4	SIZE must be the same in the command and response.

Important

1. If the command is not completed within 5 seconds after it is executed, bit 0 in the Master Status register changes to 1 (TIMEOUT).
2. When bit 0 (D_ALM) or bit 1 (D_WAR) in the Command Status register is 1, check the error details with the application and perform the stop processing. The system will not perform stop processing.

Write Parameter Command

Changes an I/O Module parameter.

Important

Some I/O Module devices do not support the Write Parameter command. Refer to the product specifications of the I/O Module for details.

◆ Command Format

	Output Registers 7 6 5 4 3 2 1 0		Input Registers 7 6 5 4 3 2 1 0
OW□□□□□	Write Parameter (= 4)	IW□□□□□	Write Parameter (= 4)
	Not used.		Master Status
OW□□□□□ + 1	Command Control	IW□□□□□ + 1	Command Status
OW□□□□□ + 2	NO	IW□□□□□ + 2	NO
OW□□□□□ + 3	SIZE	IW□□□□□ + 3	SIZE
	Not used.		Not used.
OW□□□□□ + 4	PARAMETER Low	IW□□□□□ + 4	PARAMETER Low
	High		High
OW□□□□□ + 5		IW□□□□□ + 5	
OW□□□□□ + 6		IW□□□□□ + 6	
OW□□□□□ + 7		IW□□□□□ + 7	
	• • •		• • •

■ NO: Parameter Number

■ SIZE: Parameter Size (Bytes)

■ PARAMETER: Parameter Data

◆ Execution and Operating Procedure

1. Make sure that the following condition is met.

No.	Execution Condition	Confirmation Method
1	I/O command execution must be completed.	Command Status bit 2 (CMDRDY) = 1

2. Set the following parameters.
- NO (Parameter Number)
- SIZE (Parameter Size)
- PARAMETER (Parameter Data)

Setting Precautions
Make any necessary changes to NO (Parameter Number), SIZE (Parameter Size), or PARAMETER (Parameter Data) before executing the Write Parameter command or during the same scan that the I/O Command register is set to 4. Do not change these settings during execution of the Write Parameter command.

3. Set the I/O Command register to 4 to execute the Write Parameter command.

◆ Confirming Completion of the Command

Use the following information to confirm that the command has been completed.

No.	Confirmation Method
1	I/O Command Response register = 4 (Write Parameter)
2	Command Status bit 2 (CMDRDY) = 1
3	NO must be the same in the command and response.
4	SIZE must be the same in the command and response.
5	PARAMETER must be the same in the command and response.

Important

1. If the command is not completed within 5 seconds after it is executed, bit 0 in the Master Status register changes to 1 (TIMEOUT).
2. When bit 0 (D_ALM) or bit 1 (D_WAR) in the Command Status register is 1, check the error details with the application and perform the stop processing. The system will not perform stop processing.

Read Non-volatile Parameter Command

Reads an I/O Module parameter from non-volatile memory.

Important

Some I/O Module devices do not support the Read Non-volatile Parameter command. Refer to the product specifications of the I/O Module for details.

◆ Command Format

	Output Registers 7 6 5 4 3 2 1 0		Input Registers 7 6 5 4 3 2 1 0
OW□□□□□	Read Non-volatile Parameter (= 5)	IW□□□□□	Read Non-volatile Parameter (= 5)
	Not used.		Master Status
OW□□□□□ + 1	Command Control	IW□□□□□ + 1	Command Status
OW□□□□□ + 2	NO	IW□□□□□ + 2	NO
OW□□□□□ + 3	SIZE	IW□□□□□ + 3	SIZE
	Not used.		Not used.
OW□□□□□ + 4		IW□□□□□ + 4	PARAMETER Low High
OW□□□□□ + 5		IW□□□□□ + 5	
OW□□□□□ + 6		IW□□□□□ + 6	
OW□□□□□ + 7		IW□□□□□ + 7	
	⋮		⋮

- ■ NO: Parameter Number
- ■ SIZE: Parameter Size (Bytes)
- ■ PARAMETER: Parameter Data

◆ Execution and Operating Procedure

1. Make sure that the following condition is met.

No.	Execution Condition	Confirmation Method
1	I/O command execution must be completed.	Command Status bit 2 (CMDRDY) = 1

2. Set the following parameters.

- NO (Parameter Number)
- SIZE (Parameter Size)

Setting Precautions

Make any necessary changes to NO (Parameter Number) or SIZE (Parameter Size) before executing the Read Non-volatile Parameter command or during the same scan that the I/O Command register is set to 5. Do not change these settings during execution of the Read Non-volatile Parameter command.

3. Set the I/O Command register to 5 to execute the Read Non-volatile Parameter command.

◆ Confirming Completion of the Command

Use the following information to confirm that the command has been completed.

No.	Confirmation Method
1	I/O Command Response register = 5 (Read Non-volatile Parameter)
2	Command Status bit 2 (CMDRDY) = 1
3	NO must be the same in the command and response.
4	SIZE must be the same in the command and response.

Important

1. If the command is not completed within 5 seconds after it is executed, bit 0 in the Master Status register changes to 1 (TIMEOUT).
2. When bit 0 (D_ALM) or bit 1 (D_WAR) in the Command Status register is 1, check the error details with the application and perform the stop processing. The system will not perform stop processing.

Write Non-volatile Parameter Command

Changes an I/O Module parameter in non-volatile memory.

Important

Some I/O Module devices do not support the Write Non-volatile Parameter command. Refer to the product specifications of the I/O Module for details.

◆ Command Format

	Output Registers 7 6 5 4 3 2 1 0		Input Registers 7 6 5 4 3 2 1 0
OW□□□□□□	Write Non-volatile Parameter (= 6)	IW□□□□□□	Write Non-volatile Parameter (= 6)
	Not used.		Master Status
OW□□□□□□ + 1	Command Control	IW□□□□□□ + 1	Command Status
OW□□□□□□ + 2	NO	IW□□□□□□ + 2	NO
OW□□□□□□ + 3	SIZE	IW□□□□□□ + 3	SIZE
	Not used.		Not used.
OW□□□□□□ + 4	PARAMETER Low High	IW□□□□□□ + 4	PARAMETER Low High
OW□□□□□□ + 5		IW□□□□□□ + 5	
OW□□□□□□ + 6		IW□□□□□□ + 6	
OW□□□□□□ + 7		IW□□□□□□ + 7	
	• • •		• • •

- NO: Parameter Number
- SIZE: Parameter Size (Bytes)
- PARAMETER: Parameter Data

◆ Execution and Operating Procedure

1. Make sure that the following condition is met.

No.	Execution Condition	Confirmation Method
1	I/O command execution must be completed.	Command Status bit 2 (CMDRDY) = 1

2. Set the following parameters.
- NO (Parameter Number)
- SIZE (Parameter Size)
- PARAMETER (Parameter Data)

Setting Precautions
Make any necessary changes to NO (Parameter Number), SIZE (Parameter Size), or PARAMETER (Parameter Data) before executing the Write Non-volatile Parameter command or during the same scan that the I/O Command register is set to 6. Do not change these settings during execution of the Write Non-volatile Parameter command.

3. Set the I/O Command register to 6 to execute the Write Non-volatile Parameter command.

◆ Confirming Completion of the Command

Use the following information to confirm that the command has been completed.

No.	Confirmation Method
1	I/O Command Response register = 6 (Write Non-volatile Parameter)
2	Command Status bit 2 (CMDRDY) = 1
3	NO must be the same in the command and response.
4	SIZE must be the same in the command and response.
5	PARAMETER must be the same in the command and response.

Information
- If the command is not completed within 5 seconds after it is executed, bit 0 in the Master Status register changes to 1 (TIMEOUT).
- When bit 0 (D_ALM) or bit 1 (D_WAR) in the Command Status register is 1, check the error details with the application and perform the stop processing. The system will not perform stop processing.

Read Memory Command

Reads data in the internal memory of the I/O Module.

Important

Some I/O Module devices do not support the Read Memory command. Refer to the product specifications of the I/O Module for details.

◆ Command Format

	Output Registers 7 6 5 4 3 2 1 0
OW□□□□□	Read Memory (= 7)
	Not used.
OW□□□□□ + 1	Command Control
OW□□□□□ + 2	Not used.
	MODE/DATA_TYPE
OW□□□□□ + 3	SIZE
OW□□□□□ + 4	ADDRESS Low High
OW□□□□□ + 5	ADDRESS Low High
OW□□□□□ + 6	
OW□□□□□ + 7	
	• • •

	Input Registers 7 6 5 4 3 2 1 0
IW□□□□□	Read Memory (= 7)
	Master Status
IW□□□□□ + 1	Command Status
IW□□□□□ + 2	Not used.
	MODE/DATA_TYPE
IW□□□□□ + 3	SIZE
IW□□□□□ + 4	ADDRESS Low High
IW□□□□□ + 5	ADDRESS Low High
IW□□□□□ + 6	DATA Low High
IW□□□□□ + 7	DATA Low High
	• • •

■ MODE/DATA_TYPE: Mode/Data Type

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
MODE				DATA_TYPE			

- MODE: Read Mode
  0: Reserved for system.
  1: Volatile memory
  Reads data from volatile memory such as the SRAM.
  2: Non-volatile memory
  Reads data from non-volatile memory such as the EEPROM.
  All other bits: Reserved for system.
- DATA_TYPE: Data Type
  0: Reserved for system.
  1: Byte data
  2: Short data
  3: Long data
  4: Longlong data
  All other bits: Reserved for system.

■ SIZE: Read Data Size

■ ADDRESS: First Read Address

■ DATA: Data

◆ Execution and Operating Procedure

1. **Make sure that the following condition is met.**

No.	Execution Condition	Confirmation Method
1	I/O command execution must be completed.	Command Status bit 2 (CMDRDY) = 1

2. **Set the following parameters.**
- MODE/DATA_TYPE (Mode/Data Type)
- SIZE (Read Data Size)
- ADDRESS (First Read Address)

Setting Precautions

Make any necessary changes to MODE/DATA_TYPE (Mode/Data Type), SIZE (Read Data Size), or ADDRESS (First Read Address) before executing the Read Memory command or during the same scan that the I/O Command register is set to 7. Do not change these settings during execution of the Read Memory command.

3. **Set the I/O Command register to 7 to execute the Read Memory command.**

◆ Confirming Completion of the Command

Use the following information to confirm that the command has been completed.

No.	Confirmation Method
1	I/O Command Response register = 7 (Read Memory)
2	Command Status bit 2 (CMDRDY) = 1
3	MODE/DATA_TYPE must be the same in the command and response.
4	SIZE must be the same in the command and response.
5	ADDRESS is the same in the command and response.

Important

1. If the command is not completed within 5 seconds after it is executed, bit 0 in the Master Status register changes to 1 (TIMEOUT).
2. When bit 0 (D_ALM) or bit 1 (D_WAR) in the Command Status register is 1, check the error details with the application and perform the stop processing. The system will not perform stop processing.

Write Memory Command

Changes data in the internal memory of the I/O Module.

Important

Some I/O Module devices do not support the Write Memory command. Refer to the product specifications of the I/O Module for details.

◆ Command Format

	Output Registers 7 6 5 4 3 2 1 0		Input Registers 7 6 5 4 3 2 1 0
OW□□□□□	Write Memory (= 8)	IW□□□□□	Write Memory (= 8)
	Not used.		Master Status
OW□□□□□ + 1	Command Control	IW□□□□□ + 1	Command Status
OW□□□□□ + 2	Not used.	IW□□□□□ + 2	Not used.
	MODE/DATA_TYPE		MODE/DATA_TYPE
OW□□□□□ + 3	SIZE	IW□□□□□ + 3	SIZE
OW□□□□□ + 4	ADDRESS Low High	IW□□□□□ + 4	ADDRESS Low High
OW□□□□□ + 5	ADDRESS Low High	IW□□□□□ + 5	ADDRESS Low High
OW□□□□□ + 6	DATA Low High	IW□□□□□ + 6	DATA Low High
OW□□□□□ + 7	DATA Low High	IW□□□□□ + 7	DATA Low High
	• • •		• • •

■ MODE/DATA_TYPE: Mode/Data Type

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
MODE				DATA_TYPE			

- MODE: Write Mode
  0: Reserved for system.
  1: Volatile memory
  Writes data from volatile memory such as the SRAM.
  2: Non-volatile memory
  Writes data from non-volatile memory such as the EEPROM.
  All other bits: Reserved for system.
- DATA_TYPE: Data Type
  0: Reserved for system.
  1: Byte data
  2: Short data
  3: Long data
  4: Longlong data
  All other bits: Reserved for system.

■ SIZE: Write Data Size

■ ADDRESS: First Write Address

■ DATA: Data

◆ Execution and Operating Procedure

1. **Make sure that the following condition is met.**

No.	Execution Condition	Confirmation Method
1	I/O command execution must be completed.	Command Status bit 2 (CMDRDY) = 1

2. **Set the following parameters.**

- MODE/DATA_TYPE (Mode/Data Type)
- SIZE (Write Data Size)
- ADDRESS (First Write Address)
- DATA (Data)

Setting Precautions
Make any necessary changes to MODE/DATA_TYPE (Mode/Data Type), SIZE (Write Data Size), ADDRESS (First Write Address), or DATA (data) before executing the Write Memory command or during the same scan that the I/O Command register is set to 8. Do not change these settings during execution of the Write Memory command.

3. **Set the I/O Command register to 8 to execute the Write Memory command.**

◆ Confirming Completion of the Command

Use the following information to confirm that the command has been completed.

No.	Confirmation Method
1	I/O Command Response register = 8 (Write Memory)
2	Command Status bit 2 (CMDRDY) = 1
3	NO must be the same in the command and response.
4	SIZE must be the same in the command and response.
5	PARAMETER must be the same in the command and response.
6	DATA must be the same in the command and response.

Important

1. If the command is not completed within 5 seconds after it is executed, bit 0 in the Master Status register changes to 1 (TIMEOUT).
2. When bit 0 (D_ALM) or bit 1 (D_WAR) in the Command Status register is 1, check the error details with the application and perform the stop processing. The system will not perform stop processing.

Reset Communications Command

Re-establishes communications with the I/O Module. Communications are disconnected, and a new connection is established.

◆ Command Format

	Output Registers
	7 6 5 4 3 2 1 0
OW□□□□□	Reset Communications (= 15)
	Not used.
OW□□□□□ + 1	Command Control
OW□□□□□ + 2	
OW□□□□□ + 3	
OW□□□□□ + 4	
OW□□□□□ + 5	
OW□□□□□ + 6	
OW□□□□□ + 7	
	• • •

	Input Registers
	7 6 5 4 3 2 1 0
IW□□□□□	Reset Communications (= 15)
	Master Status
IW□□□□□ + 1	Command Status
IW□□□□□ + 2	
IW□□□□□ + 3	
IW□□□□□ + 4	
IW□□□□□ + 5	
IW□□□□□ + 6	
IW□□□□□ + 7	
	• • •

◆ Execution and Operating Procedure

Set the I/O Command register to 15 to execute the Reset Communications command.

◆ Confirming Completion of the Command

Use the following information to confirm that the command has been completed.

No.	Confirmation Method
1	I/O Command Response register = 15 (Reset Communications)
2	Command Status bit 2 (CMDRDY) = 1

Important

1. If the command is not completed within 5 seconds after it is executed, bit 0 in the Master Status register changes to 1 (TIMEOUT).
2. When bit 0 (D_ALM) or bit 1 (D_WAR) in the Command Status register is 1, check the error details with the application and perform the stop processing. The system will not perform stop processing.

Reset Network Command

Resets the communications for the entire network. Execute this command to ensure that proper cyclic communications are performed if entering an active network fails. This affects communications with all slave stations on the network. Stop all commands from the application before you reset the network.

◆ Command Format

	Output Registers 7 6 5 4 3 2 1 0		Input Registers 7 6 5 4 3 2 1 0
OW□□□□□	Reset Network (= 16)	IW□□□□□	Reset Network (= 16)
	Not used.		Master Status
OW□□□□□ + 1	Command Control	IW□□□□□ + 1	Command Status
OW□□□□□ + 2		IW□□□□□ + 2	
OW□□□□□ + 3		IW□□□□□ + 3	
OW□□□□□ + 4		IW□□□□□ + 4	
OW□□□□□ + 5		IW□□□□□ + 5	
OW□□□□□ + 6		IW□□□□□ + 6	
OW□□□□□ + 7		IW□□□□□ + 7	
	⋮		⋮

◆ Execution and Operating Procedure

1. Confirm that all application commands are stopped.
2. Set the I/O Command register to 16 to execute the Reset Network command.

◆ Confirming Completion of the Command

Use the following information to confirm that the command has been completed.

No.	Confirmation Method
1	I/O Command Response register = 16 (Reset Network)
2	Command Status bit 2 (CMDRDY) = 1

Important

1. If the command is not completed within 5 seconds after it is executed, bit 0 in the Master Status register changes to 1 (TIMEOUT).
2. When bit 0 (D_ALM) or bit 1 (D_WAR) in the Command Status register is 1, check the error details with the application and perform the stop processing. The system will not perform stop processing.

11.3.5 Command Control

This section describes the details of the Command Control register.

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reserve				ALM_CLR	Reserve		

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Reserve							

■ ALM_CLR: Clear Communications Alarm/Warning

- Definition
  1: Clear alarms/warnings.
  0: Disable clearing alarms/warnings.
- Description
  The current alarms/warnings are cleared on the rising edge of this bit.
  The same processing is performed for as the Clear Alarms/Warnings I/O command.

11.3.6 Master Status

This section describes the details of the Master Status register.

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
STATUS				CYCLIC_ INIT_ERR	Reserve		TIMEOUT

■ TIMEOUT

- Definition
  1: Command timeout detected.
  0: Any state other than the above
- Description
  This bit shows when execution of an I/O command is not completed within a specific period of time (5 s).
  Clear the alarm to restore operation.

■ CYCLIC_INIT_ERR

- Definition
  1: Cyclic communications initialization incomplete state detected.
  0: Any state other than the above
- Description
  This bit shows when the I/O Module fails to initialize cyclic communications.
  Clear the alarm to restore operation.

■ STATUS

- Definition

Value	Meaning
0 hex	Phase 0: The power supply is ON.
1 hex	Phase 1: Status is initialized.
2 hex	Phase 2: Communications are not synchronized.
3 hex	Phase 3: Communications are synchronized.
4 hex	Phase 4: Communications are stopped.
5 hex	Phase 5: The power supply is OFF.

- Description
  These bits show the internal state of the I/O communications driver.

11.3.7 Command Status

This section describes the details of the Command Status register.

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
SYNC	SYNCRDY	SBUSY	Reserved	ALM_CLR_CMP	CMDRDY	D_WAR	D_ALM

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
COMM_ALM				CMD_ALM			

■ D_ALM

- Definition
  1: Device alarm
  0: Any state other than the above
- Description
  This bit shows when there is a device alarm in the I/O Module.
  D_ALM changes to 1 when any device-specific alarm other than COMM_ALM or CMD_ALM occurs.
  When the Clear Alarms/Warnings command is executed or bit 3 (ALM_CLR) in the Command Control register is set to 1, the I/O Module is restored to normal operation and D_ALM changes back to 0.

■ D_WAR

- Definition
  1: Device warning
  0: Any state other than the above
- Description
  This bit shows when there is a device warning in the I/O Module.
  D_WAR changes to 1 when any device-specific warning other than COMM_ALM or CMD_ALM occurs.
  When the Clear Alarms/Warnings command is executed or bit 3 (ALM_CLR) in the Command Control register is set to 1, the I/O Module is restored to normal operation and D_WAR changes back to 0.

■ CMDRDY

- Definition
  1: Commands can be received.
  0: Any state other than the above
- Description
  This bit shows when the I/O Module can receive I/O commands.
  The I/O Module continues processing the current I/O command as long as the CMDRDY status is 0. During this time, no new I/O commands can be executed. However, the Reset Communications and Reset Network I/O commands are executed immediately, regardless of the value of CMDRDY.
  The amount of time that CMDRDY remains 0 depends on the product specifications of the I/O Module. If the specified time is exceeded, bit 0 (TIMEOUT) in the Master Status register changes to 1.
  CMDRDY is 1 whenever a new I/O command can be executed, even if there is a current alarm or warning.

■ ALM_CLR_CMP

- Definition
  1: ALM_CLR completed.
  0: Any state other than the above
- Description
  A value of 1 in ALM_CLR_CMP shows that the clear alarm process started via bit 3 (ALM_CLR) in the Command Control register has been completed.
  To clear the status of ALM_CLR_CMP, set bit 3 (ALM_CLR) in the Command Control register to 0.

SBUSY

- Definition
  1: Transient state
  0: Steady state
- Description
  The status of SBUSY will be 1 while changing from an asynchronous status to slave CPU synchronized status.
  SBUSY changes to 0 when slave CPU synchronized status is reached.

SYNCRDY

- Definition
  1: Slave CPU synchronization preparations completed.
  0: Slave CPU synchronization preparations not completed.
- Description
  SYNCRDY changes to 1 when the execution conditions for slave CPU synchronization are met.
  SYNCRDY will be 0 if the execution conditions for slave CPU synchronization are not met or if the SLVSC command control bit in the slave is ON (SLVSC = 1).

SYNC

- Definition
  1: Slave is synchronized.
  0: Slave is asynchronized.
- Description
  SYNC changes to 1 when slave CPU synchronized status is reached. At that time, SBUSY will change to 0.

CMD_ALM

- Definition
  These bits show the command error status.
- Description
  These bits show the I/O command error status. This status is independent from COMM_ALM, D_ALM, and D_WAR.
  CMD_ALM automatically changes to 0 (normal) when a defined command is received after a command error has occurred.
  Communications are not affected even if a command error occurs.
  The alarm/warning classification of CMD_ALM depends on the product specifications of the I/O Module.

Code		Meaning	Description
–	0	No alarm	–
Warnings	1	Outside data range	Indicates that a warning has occurred. Operation continues under the specified value or it is clamped to the maximum/minimum value.
	2	–	
	3	–	
	4	–	
	5	–	
	6	–	
	7	–	
Alarms	8	Unsupported command received.	Indicates that an alarm has occurred. The I/O command is not executed.
	9	Outside data range	
	A	Command execution condition error	
	B	Subcommand combination error	
	C	Phase error	
	D	–	
	E	–	
	F	–	

■ COMM_ALM

- Definition
  These bits show the communications error status.
- Description
  These bits show the MECHATROLINK communications error status. This status is independent from CMD_ALM, D_ALM, and D_WAR.
  COMM_ALM is cleared when bit 3 (ALM_CLR) in the Command Control register changes to 1, or when the Clear Alarms/Warnings command is executed.

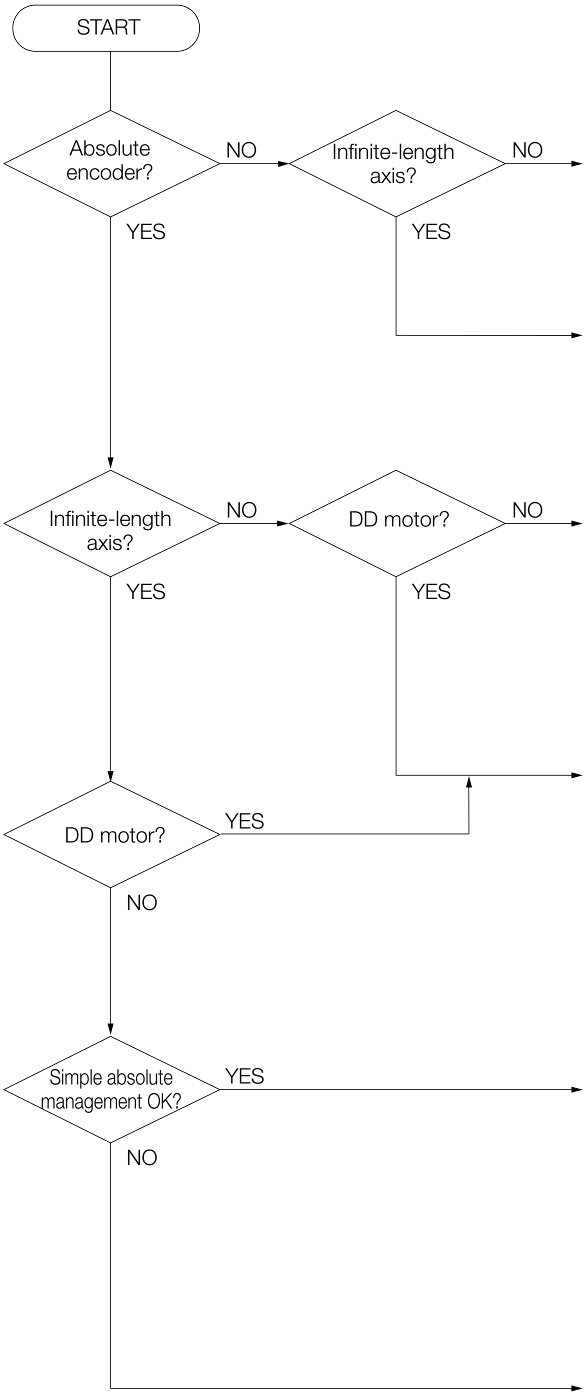
Code		Meaning	Description
–	0	No alarm	–
Warnings	1	FCS error	These warnings occur when even one error is detected.
	2	Reference data not received.	
	3	Synchronous frame not received.	
	4	–	
	5	–	
	6	–	
	7	–	
Alarms	8	FCS error	These alarms occur when an error is detected the specified number of times in a row. When this occurs, communications are no longer synchronized.
	9	Reference data not received.	
	A	Synchronous frame not received.	
	B	Synchronization interval error	
	C	WDT error	
	D	–	
	E	–	
	F	–	

11.3.8 CPU STOP Operation

When a CPU STOP occurs, all output data is cleared to zeroes and input data is not updated.

11.4 Setting Fixed Parameters According to Encoder Type and Axis Type

The method for setting or changing the coordinate system origin depends on the encoder type, motor type, and axis type (infinite-length axis or finite-length axis). Use the following flowchart to correctly set the parameter for your application.



Encoder Type	Motor Type	Fixed Parameter Set Value
Incremental encoder	Any	No. 1: Bit 0 = 0 (finite-length)
Incremental encoder	Any	No. 1: Bit 0 = 1 (infinite-length)
Absolute encoder	Rotary motor	No. 1: Bit 0 = 0 (finite-length)
Absolute encoder	Direct drive motor	No. 1: Bit 0 = 1 (infinite-length) + No. 1: Bit 9 = 1 (Enable Simple Absolute Infinite Axis Position Management)
Absolute encoder	Rotary motor	No. 1: Bit 0 = 1 (infinite-length) + No. 1: Bit 9 = 1 (Enable Simple Absolute Infinite Axis Position Management)
Absolute encoder	Rotary motor	No. 1: Bit 0 = 1 (infinite-length) + No. 1: Bit 9 = 0 (Disable Simple Absolute Infinite Axis Position Management)

	Setting Method for the Coordinate System Origin	Precautions When Turning the Power Supply OFF and ON Again	Specification Method	Method for Changing the Coordinate System Origin
	The coordinate system origin is set by the origin return operation and the Zero Point Position Offset (OL□□□48). How the origin is determined during the origin return operation depends on the operating pattern. (Refer to the relevant SERVOPACK manual for details.)	An origin return operation must be performed after the power supply is turned ON. If an origin return operation is not performed after the power supply is turned ON, the position when the power supply is turned ON becomes the origin. In this case, software limits are not enabled until the Set Zero Point command is executed.	Both absolute value specifications and relative value specifications (incremental addition method) can be used. Which method is used depends on the setting of bit 5 in OW□□□1C. Setting range: -2^{31} to 2^{31} – 1	If OL□□□48 is changed, the coordinate system origin is also changed because the origin offset value for OL□□□48 is always calculated automatically. To set the current position as the origin, calculate OL□□□48 - IL□□□10 and set that value for OL□□□48.
			Relative value specifications (incremental addition method) are used.	
	The origin is set according to the OL□□□48 setting parameter (Zero Point Position Offset in Machine Coordinate System) of the MP3000 and the origin of the encoder (incremental pulses). The origin of the encoder is set by resetting the encoder.	No particular processing is necessary because the encoder stores the position information even when the power supply to the MP3000 is turned OFF. However, the Set Zero Point command must be executed to use software limits.	Both absolute value specification and relative value specification (incremental addition method) can be used. Which method is used depends on the setting of bit 5 in OW□□□1C. Setting range: -2^{31} to 2^{31} – 1	
	The origin is set according to the OL□□□48 setting parameter (Zero Point Position Offset in Machine Coordinate System) of the MP3000 and the origin of the encoder (incremental pulses). The origin of the encoder is set by resetting the encoder.	The encoder stores the position information for within one revolution (initial incremental pulse) even when the power supply to the MP3000 is turned OFF, but does not store the rotational data (multiturn data). The Set Zero Point command must be executed after the power supply is turned ON.	Relative value specifications (incremental addition method) are used.	
	The origin is set according to the OL□□□48 setting parameter (Zero Point Position Offset in Machine Coordinate System) of the MP3000 and the origin of the encoder (incremental pulses). The origin of the encoder is set by resetting the encoder.	No particular processing is necessary because the encoder stores the position information even when the power supply to the MP3000 is turned OFF. However, the Set Zero Point command must be executed after the power supply is turned ON. (An alarm occurs if this operation is not performed.)	Relative value specifications (incremental addition method) are used.	
	The coordinate system origin is set based on the origin of the encoder (incremental pulse) and the execution of the Set Zero Point command.	When the power supply is turned ON, a request must be made to set up the coordinate system (set bit 7 in OW□□□00 to 1 (ON)). The current coordinate system must also be backed up during normal operation. Both of these operations are performed in a ladder program. Refer to the following section for details. ☞ *Creating Ladder Programs for Infinite Axis Position Management (page 5-40)*	Relative value specifications (incremental addition method) are used.	The coordinate system is reset when the ZSET (Set Zero Point) command is executed. Set the coordinate value you want in OL□□□48, then execute the Set Zero Point command.

11.5 Common Parameters and SERVOPACK Parameters

Common Parameter No.	Common Parameter No. for SERVOPACK	Name
01	PnA02	Encoder Type (read only)
02	PnA04	Motor Type (read only)
03	PnA06	Semi-closed/Fully-closed Type (read only)
04	PnA08	Rated Speed (read only)
05	PnA0A	Maximum Output Speed (read only)
06	PnA0C	Speed Multiplier (read only)
07	PnA0E	Rated Torque (read only)
08	PnA10	Maximum Output Torque (read only)
09	PnA12	Torque Multiplier (read only)
0A	PnA14	Resolution (read only)
0B	PnA16	Linear Scale Pitch
0C	PnA18	Pulses per Scale Pitch (read only)
21	PnA42	Electronic Gear Ratio (Numerator)
22	PnA44	Electronic Gear Ratio (Denominator)
23	PnA46	Absolute Encoder Origin Offset
24	PnA48	Multiturn Limit
25	PnA4A	Limit Setting
26	PnA4C	Forward Software Limit
27	PnA4E	Reserved (Do not change.)
28	PnA50	Reverse Software Limit
29	PnA52	Reserved (Do not change.)
41	PnA82	Speed Unit
42	PnA84	Speed Base Unit (Set the value of n from the following formula: Speed unit selection (41 PnA82) × 10^n)
43	PnA86	Position Unit
44	PnA88	Position Base Unit (Set the value of n from the following formula: Position unit selection (43 PnA86) × 10^n)
45	PnA8A	Acceleration Unit
46	PnA8C	Acceleration Base Unit (Set the value of n from the following formula: Acceleration unit selection (45 PnA8A) × 10^n)
47	PnA8E	Torque Unit
48	PnA90	Torque Base Unit (Set the value of n from the following formula: Torque unit selection (47 PnA8E) × 10^n)
49	PnA92	Supported Unit (read only)
61	PnAC2	Speed Loop Gain
62	PnAC4	Speed Loop Integral Time Constant
63	PnAC6	Position Loop Gain
64	PnAC8	Feed Forward Compensation
65	PnACA	Position Loop Integral Time Constant
66	PnACC	In-position Range
67	PnACE	Near-position Range
81	PnB02	Exponential Acceleration/Deceleration Time Constant
82	PnB04	Movement Average Time
83	PnB06	Final Travel for External Input Positioning

Continued on next page.

Continued from previous page.

Common Parameter No.	Common Parameter No. for SERVOPACK	Name
84	PnB08	Zero Point Return Approach Speed
85	PnB0A	Zero Point Return Creep Speed
86	PnB0C	Final Travel for Zero Point Return
87	PnB0E	Monitor Select 1
88	PnB10	Monitor Select 2
89	PnB12	Monitor Select for SEL_MON1
8A	PnB14	Monitor Select for SEL_MON2
8B	PnB16	Zero Point Detection Range
8C	PnB18	Forward Torque Limit
8D	PnB1A	Reverse Torque Limit
8E	PnB1C	Zero Speed Detection Range
8F	PnB1E	Speed Match Signal Detection Range
90	PnB20	SVCMD_CTRL bit Enabled/Disabled (read only)
91	PnB22	SVCMD_STAT bit Enabled/Disabled (read only)
92	PnB24	I/O Bit Enabled/Disabled (Output) (read only)
93	PnB26	I/O Bit Enabled/Disabled (Input) (read only)

11.6 Terminology

■ Phase-C pulse

The encoders on Yaskawa Servomotors output three types of pulses: phase A, phase B, and phase C. A phase-C pulse is a signal that reverses once every motor rotation. It is also called the origin pulse. Some manufactures may also call this type of signal phase Z or the reference.

■ POSMAX

This is the infinite-length axis reset position.

Refer to the following section for details.

☞ *Fixed Parameter Details (page 3-27)*

■ Encoder Position

The encoder position is the absolute encoder position information (Multiturn data × Number of encoder pulses + Initial incremental pulses (position within one rotation)).

■ Override

For the MP3000, this term is used to mean changing the setting to use a new one.

■ Machine Coordinate System

This is the basic coordinate system that is set by the execution of the ZRET (Zero Point Return) or ZSET (Set Zero Point) command. The MP3000 manages positions in the machine coordinate system.

For systems that use an incremental encoder or that use an absolute encoder as the incremental encoder, the machine coordinate system is automatically set by the first origin return operation after the power supply is turned ON.

For systems that use an absolute encoder, the machine coordinate system is set automatically after the power supply is turned ON.

■ Deceleration Limit Switch

This is the limit switch for deceleration.

For SERVOPACKs, the deceleration limit switch for origin return is connected to the Origin Return Deceleration Switch Signal (/DEC).

■ Command Execution

A motion command is executed when a command code is set to the Motion Command parameter register (OW□□□08).

■ Absolute Position Calculation

You can use the following formula to find the absolute position.

Absolute position (P) = N × RP + PO

N: Number of rotations from the absolute reference position (multi-turn data) ⎤
PO: Absolute reference position (initial incremental pulses) ⎦ Data maintained by the absolute encoder

RP: Number of feedback pulses per motor rotation — Constant determined by the number of bits supported by the Servomotor

■ Absolute Encoders

An absolute encoder outputs the absolute position (position data for the rotational angle) from a reference position (origin of the encoder).

The absolute encoder uses a battery connected to the battery terminals of the SERVOPACK to maintain the absolute position data (called the absolute value data) at all times, even when the power supply is turned OFF. The absolute value data is also updated if the position changes while the power supply is OFF.

The absolute encoder consists of a detector that is used to detect the absolute position within one rotation and a counter that is used to count the number of rotations. After automatic operation starts, the absolute encoder operates in the same way as an incremental encoder.

■ Incremental Encoders

Incremental encoders output pulses while the control object is in motion. Position data is not retained.

■ Absolute Value Set Method

This is one of the target position coordinate data setting methods for position control. With this method, the target position coordinate data is set directly.

Refer to the following section for details.

☞ *5.1.4 Position References* on page 5-6

■ Absolute Value Data

There are two types of absolute value data stored in the absolute encoder: the absolute reference position (initial incremental pulses, or PO), and the number of rotations from an absolute reference position (multi-turn data, or N).

The absolute reference position (initial incremental pulses, or PO) is the phase-C position when the absolute encoder is reset and is the reference position for absolute position detection.

When the absolute encoder is reset, only the number of rotations from the absolute reference position (N) is cleared. The initial incremental pulses (PO) is not changed.

■ Incremental Addition Method

This is one of the target position coordinate data setting methods for position control. When this method is used, target position coordinate data is set by adding the travel distance to the previous position reference value.

Refer to the following section for details.

☞ *5.1.4 Position References* on page 5-6

■ Distribution

Distribution is the process in which a slave SERVOPACK outputs a reference from the MP3000 to a Servomotor.

■ Pulse Position

The pulse position is the position information managed by the MP3000 converted into pulses.

■ Report

“Report” is used for details that are automatically transferred by the system in the CPU without any action by the user.

■ Infinite-length Axis

This is an axis that uses infinite-length position control and resets position data every revolution.

Refer to the following section for details.

☞ *5.1.3 Axis Selection* on page 5-5

■ Infinite-length Axis Position Control

This control method is used to perform position control without limiting the movement range, such as for rotation in only one direction.

Refer to the following section for details.

☞ *5.1.3 Axis Selection* on page 5-5

■ Finite-length Axis

This is an axis that uses finite-length axis position control or an axis that uses infinite-length axis position control that rotates in one direction only and does not reset its position data after every rotation.

Refer to the following section for details.

☞ *5.1.3 Axis Selection* on page 5-5

■ Finite-length Axis Position Control

This control method is used to perform position control within a specified range of movement, such as round-trip operations.

Refer to the following section for details.

☞ *5.1.3 Axis Selection* on page 5-5

■ Working Coordinate System

This is the coordinate system that is used in motion programs. It is called the working coordinate system to distinguish it from the machine coordinate system. The working coordinate system can be set by executing the POS (Set Current Position) instruction in a motion program.

Refer to the following manual for details.

📖 MP3000 Series Motion Programming Manual (Manual No.: SIEP C880725 14)

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