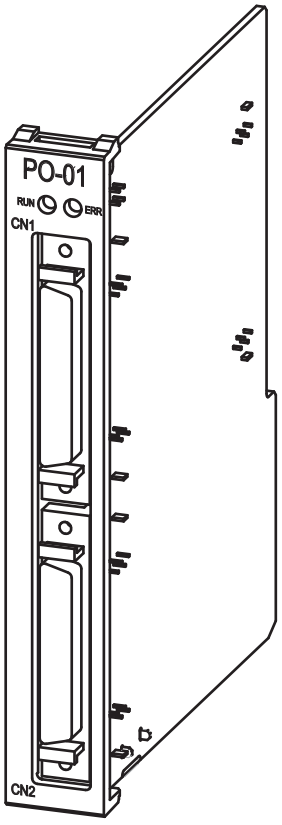
YASKAWA

Machine Controller MP2000 Series

Pulse Output Motion Module
PO-01 USER'S MANUAL

Model: JAPMC-PL2310-E



MANUAL NO. SIEP C880700 28B

Using this Manual

PO-01 indicates the Pulse Output Motion Module for the MP2000 series Machine Controllers.
Please read this manual to ensure correct usage of the PO-01. Keep this manual in a safe place for future reference.

■ Graphic Symbols Used in this Manual

The graphic symbols used in this manual indicate the following type of information.

- This symbol is used to indicate important information that should be memorized or minor precautions, such as precautions that will result in alarms if not heeded.

■ Terms Used to Describe “Torque”

Although the term “Torque” is commonly used when describing rotary servomotors and “force” or “thrust” are used when describing linear servomotors, this manual uses “torque” when describing both (excluding parameters).

■ Indication of Reverse Signals

In this manual, the names of reverse signals (ones that are valid when low) are written with a forward slash (/) before the signal name, as shown in the following example:

Notation Examples

- $\overline{\text{S-ON}}$ = /S-ON
- $\overline{\text{P-CON}}$ = /P-CON

■ Copyrights

- Microsoft, Windows, Windows NT, and Internet Explorer are registered trademarks of the Microsoft Corporation.
- Pentium is a registered trademark of the Intel 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.

■ Related Manuals

Refer to the following related manuals as required.

Thoroughly check the specifications, restrictions, and other conditions of the product before attempting to use it.

Manual Name	Manual Number	Contents
Machine Controller MP2000 Series Communication Module User's Manual	SIEP C880700 04	Describes the functions, specifications, and application methods of the MP2□00 Communication Modules (217IF, 218IF, 260IF, 261IF).
Machine Controller MP2000 Series User's Manual Ladder Programming	SIEZ-C887-1.2	Describes the instructions used in MP900/MP2000 ladder programming.
Machine Controller MP900/MP2000 Series User's Manual Motion Programming	SIEZ-C887-1.3	Describes the instructions used in MP900/MP2000 motion programming.
Machine Controller MP900/MP2000 Series MPE720 Software for Programming Device User's Manual	SIEP C880700 05	Describes how to install and operate the MP900/MP2000 Series programming system (MPE720).
Σ Series SGM□/SGD User's Manual	SIE-S800-26.3	Describes the Σ-I Series SERVOPACK models, specifications and capacity selection methods.
AC Servo Drives Σ-II Series SGM□□/SGDH User's Manual Rotational Motor Analog Voltage and Pulse Train Reference	SIEP S800000 05	Describes the installation, wiring, trial operation, function applications methods, maintenance, and inspection of the Σ-II Series SERVOPACKs.
AC Servo Drives Σ-II Series SGM□□/SGDM User's Manual	SIEP S800000 15	Describes the installation, wiring, trial operation, function applications methods, maintenance, and inspection of the Σ-II Series SERVOPACKs.
AC Servo Drives Σ-III Series SGM□□/SGDS User's Manual	SIEP S800000 00	Describes the models, capacities, selection methods, ratings, characteristics, diagrams, cables, peripheral devices, wiring, panel installation, trial operation, adjustment, function application methods, maintenance, and inspection of the Σ-III Series SERVOPACKs and Servomotors.
AC Servo Drives Σ-III Series Instructions Digital Operator	TOBP S800000 01	Describes the operation methods of the JUSP-OP05A Digital Operator.
Machine Controller MP900/MP2000 Series Linear Servomotor Manual	SIEP C880700 06	Describes the connection methods, setting methods, and other information for Linear Servomotors.
Machine Controller MP900/MP2000 Series New Ladder Editor Programming Manual	SIE-C887-13.1	Describes the programming instructions of the New Ladder Editor, which assists MP900/MP2000 Series design and maintenance.
Machine Controller MP900/MP2000 Series New Ladder Editor User's Manual	SIE-C887-13.2	Describes the operating methods of the New Ladder Editor, which assists MP900/MP2000 Series design and maintenance.

Safety Information

The following conventions are used to indicate precautions in this manual. These precautions are provided to ensure the safe operation of the MP2000 series and connected devices. Information marked as shown below is important for the safety of the user. Always read this information and heed the precautions that are provided.
The conventions are as follows:

⚠ WARNING

Indicates precautions that, if not heeded, could possibly result in loss of life, serious injury, or property damage.

⚠ CAUTION

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

If not heeded, even precautions classified under ⚠ CAUTION can lead to serious results depending on circumstances.

⃠ PROHIBITED

Indicates prohibited actions. Specific prohibitions are indicated inside ⃠ .

For example,  indicates prohibition of open flame.

MANDATORY

Indicates mandatory actions. Specific actions are indicated inside ● .

For example,  indicates mandatory grounding.

Safety Precautions

The following precautions are for checking products on delivery, storage, transportation, installation, wiring, operation, maintenance, inspection, and disposal. These precautions are important and must be observed.

■ General Precautions

⚠ WARNING

- Before starting operation in combination with the machine, ensure that an emergency stop procedure has been provided and is working correctly.
  There is a risk of injury.
- Do not touch anything inside the MP2000 series.
  There is a risk of electrical shock.
- Always keep the front cover attached when power is being supplied.
  There is a risk of electrical shock.
- Observe all procedures and precautions given in this manual for trial operation.
  Operating mistakes while the servomotor and machine are connected can cause damage to the machine or even accidents resulting in injury or death.
- Do not remove the Module, front cover, cables, connector while power is being supplied.
  There is a risk of electrical shock.
- Do not damage, pull on, apply excessive force to, place heavy objects on, or pinch cables.
  There is a risk of electrical shock, operational failure or burning of the MP2000 series.
- Do not attempt to modify the MP2000 series in any way.
  There is a risk of injury or device damage.
- Do not approach the machine when there is a momentary interruption to the power supply. When power is restored, the machine controller and the connecting devices may start operation suddenly. Provide suitable safety measures to protect people when operation restarts.
  There is a risk of injury.
- Do not allow installation, disassembly, or repairs to be performed by anyone other than specified personnel.
  There is a risk of electrical shock or injury.

■ Storage and Transportation

⚠ CAUTION

- Do not store or install the MP2000 series in the following locations.
  - Direct sunlight
  - Ambient temperature exceeds the storage or operating conditions
  - Ambient humidity exceeds the storage or operating conditions
  - Rapid changes in temperature or locations subject to condensation
  - Corrosive or flammable gas
  - Excessive dust, dirt, salt, or metallic powder
  - Water, oil, or chemicals
  - Vibration or shock
- Do not subject the MP2000 series to halogen gases, such as fluorine, chlorine, bromine, and iodine, at any time even during transportation or installation.
  There is a risk of device damage or injury.
- Do not overload the MP2000 series during transportation.
  There is a risk of injury or an accident.

⚠ CAUTION

- 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.

■ Installation

⚠ CAUTION

- Never use the MP2000 series in locations subject to water, corrosive atmospheres, or flammable gas, or near burnable objects.
  There is a risk of electrical shock or fire.
- Do not step on the MP2000 series or place heavy objects on the MP2000 series.
  There is a risk of injury.
- Do not allow foreign objects to enter the MP2000 series.
  There is a risk of element deterioration inside, an accident, or fire.
- Always mount the MP2000 series in the specified orientation.
  There is a risk of an accident.
- Do not subject the MP2000 series to strong shock.
  There is a risk of an accident.

■ Wiring

⚠ CAUTION

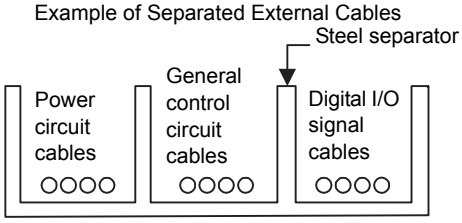
- Check the wiring to be sure it has been performed correctly.
  There is a risk of motor run-away, injury, or an accident.
- Always use a power supply of the specified voltage.
  There is a risk of burning.
- In places with poor power supply conditions, take all steps necessary to ensure that the input power supply is within the specified voltage range.
  There is a risk of device damage.
- Install breakers and other safety measure to provide protection against shorts in external wiring.
  There is a risk of fire.
- Provide sufficient shielding when using the MP2000 series in the following locations.
  There is a risk of device damage.
  - Noise, such as from static electricity
  - Strong electromagnetic or magnetic fields
  - Radiation
  - Near to power lines

■ Selecting, Separating, and Laying External Cables

⚠ CAUTION

- Consider the following items when selecting the I/O signal lines (external cables) to connect the MP2000 series to external devices.
  - Mechanical strength
  - Noise interference
  - Wiring distance
  - Signal voltage, etc.
- Separate the I/O signal lines from the power lines both inside and outside the control box to reduce the influence of noise from the power lines.
  If the I/O signal lines and power lines are not separated properly, malfunctioning may result.

Example of Separated External Cables



■ Maintenance and Inspection Precautions

⚠ CAUTION

- Do not attempt to disassemble the MP2000 series.
  There is a risk of electrical shock or injury.
- Do not change wiring while power is being supplied.
  There is a risk of electrical shock or injury.

■ Disposal Precautions

⚠ CAUTION

- Dispose of the MP2000 series as general industrial waste.

■ General Precautions

Observe the following general precautions to ensure safe application.

- The products shown in illustrations in this manual are sometimes shown without covers or protective guards. Always replace the cover or protective guard as specified first, and then operate the products in accordance with the manual.
- The drawings presented in this manual are typical examples and may not match the product you received.
- If the manual must be ordered due to loss or damage, inform your nearest Yaskawa representative or one of the offices listed on the back of this manual.

Warranty

(1) Details of Warranty

■ Warranty Period

The warranty period for a product that was purchased (hereinafter called “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 warranty period above. 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.

1. 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
2. Causes not attributable to the delivered product itself
3. Modifications or repairs not performed by Yaskawa
4. Abuse of the delivered product in a manner in which it was not originally intended
5. Causes that were not foreseeable with the scientific and technological understanding at the time of shipment from Yaskawa
6. Events for which Yaskawa is not responsible, such as natural or human-made disasters

(2) Limitations of Liability

1. 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.
2. 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.
3. 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.
4. 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.

(3) Suitability for Use

1. 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.
2. The customer must confirm that the Yaskawa product is suitable for the systems, machines, and equipment used by the customer.
3. 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
4. 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.
5. 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.
6. Read and understand all use prohibitions and precautions, and operate the Yaskawa product correctly to prevent accidental harm to third parties.

(4) 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.

CONTENTS

1

Mounting Optional Modules on Machine Controller

This chapter explains the MP2000 series Machine Controllers on which the PO-01 Module can be mounted, and the mounting/removing procedures of the optional Modules.

1.1 Applicable Machine Controllers for PO-01 Modules

The table below lists the MP2000-series Machine Controllers on which the PO-01 Module can be mounted.

<table>
<tr><th colspan="2" rowspan="2">Name</th><th rowspan="2">Model</th><th rowspan="2">Max. No. of Connectable Modules</th><th colspan="2">Applicable Version</th><th rowspan="2">Remarks</th></tr>
<tr><th>CPU Module</th><th>MPE720</th></tr>
<tr><td colspan="2">MP2300</td><td>JEPMC-MP2300 (-E)</td><td>2 modules</td><td>Ver. 2.44 or later</td><td rowspan="8">Ver. 5.33
Ver. 6.01
Ver. 7.10
or later</td><td>–</td></tr>
<tr><td colspan="2">MP2310</td><td>JEPMC-MP2310 (-E)</td><td>3 modules</td><td rowspan="2">All versions</td><td>–</td></tr>
<tr><td colspan="2">MP2300S</td><td>JEPMC-MP2300S (-E)</td><td>1 module</td><td>–</td></tr>
<tr><td rowspan="4">MP 2200 *1</td><td>CPU-01</td><td>JAPMC-CP2200 (-E)</td><td rowspan="4">16 modules</td><td>Ver. 2.44 or later</td><td rowspan="3">The maximum number of connectable Modules is the total for the maximum expansion to four racks. *2</td></tr>
<tr><td>CPU-02</td><td>JAPMC-CP2210 (-E)</td><td rowspan="3">All versions</td></tr>
<tr><td>CPU-03</td><td>JAPMC-CP2220-E</td></tr>
<tr><td>CPU-04</td><td>JAPMC-CP2230-E</td></tr>
<tr><td colspan="2">MP2100M</td><td>JAPMC-MC2140 (-E)</td><td rowspan="3">14 modules</td><td>Ver. 2.44 or later</td><td rowspan="3">The maximum number of connectable Modules is the total for the maximum expansion to three racks. *2</td></tr>
<tr><td colspan="2">MP2101M</td><td>JAPMC-MC2142-E</td><td rowspan="2">All versions</td><td rowspan="2">Ver. 5.54
Ver. 6.24
Ver. 7.10
or later</td></tr>
<tr><td colspan="2">MP2101TM</td><td>JAPMC-MC2142T-E</td></tr>
</table>

* 1. Mount a CPU module on the following base units.

Name	Model	Remarks
MBU-01	JEPMC-BU2200 (-E)	100/200-VAC input base unit (9 slots)
MBU-02	JEPMC-BU2210 (-E)	24-VDC input base unit (9 slots)
MBU-03	JEPMC-BU2220-E	24-VDC input base unit (4 slots)

* 2. The following module or board is required between racks.

Name	Model	Remarks
EXIOIF	JAPMC-EX2200 (-E)	Inter-rack connection module
MP2100MEX	JAPMC-EX2100 (-E)	I/F board for MP2100M, MP2101M, and MP2101TM

1.2 Mounting/Removing Optional Modules on Machine Controller

Use the following procedure to mount or remove Optional Modules.

- In the photos given here to explain the procedure, a Machine Controller MP2200 and an Optional Module 217IF-01 are used. The procedure to mount a Pulse Output Motion Module PO-01 on a Machine Controller MP2300 or MP2100M is the same as that to mount 217IF-01 on MP2200.

1.2.1 Mounting Optional Modules

Use the following procedure to mount an Optional Module.

- For the replacement of Optional Module, refer to *1.2.2 Removing Optional Modules for Replacement* on page 18 to remove the Optional Module to be replaced.

(1) Preparation

1. Backup the Programs

Save the programs written to the Machine Controller in the personal computer using the MPE720. (Right-click the Counter Folder, and select ***Transfer*** - ***All Files*** - ***Dump*** from the pop-up menu.)

2. Remove the Machine Controller and Expansion Racks

a) For Machine Controller MP2300

Turn OFF the power supply and disconnect all cables from the MP2300. Then, remove the MP2300 from the panel or rack, and place it on a clean surface with sufficient space, such as a working table.

b) For Machine Controller MP2100M, MP2200, and MP2500MD

Turn OFF the power supply and disconnect all cables from the expansion rack in the MP2200 base unit which contains the Optional Module to be replaced. Then, remove the expansion rack and place it on a clean surface such as a working table.

(2) Removing a Optional Cover

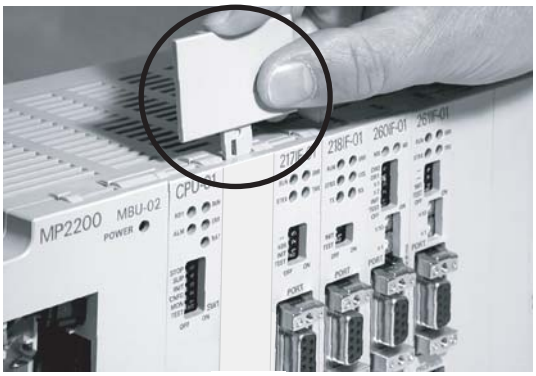
Use the following procedure if the slot has an optional cover installed.

1. Remove the battery cover.

Insert a coin in the notch on the side of the Machine Controller and pry the battery cover off.

2. Remove the cover of the Optional Module.

Insert the tab of the battery cover into the slot on the top of the cover of the Optional Module to release it, as shown in the diagram. Turn the front of the battery cover towards you for this operation.



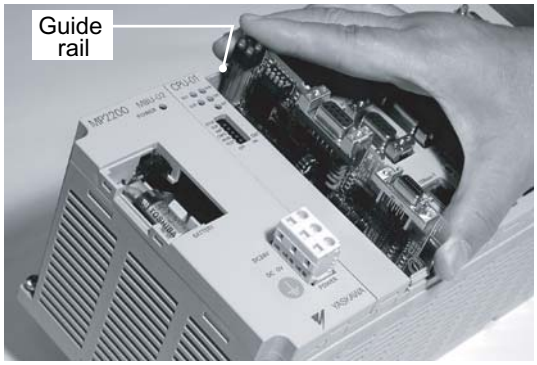
Release the bottom in the same way.

(3) Mounting Optional Modules

1. Insert Optional Modules.

Guide rails can be seen or are located at the top and bottom of the option slot, as shown in the following diagram. While holding both the top and bottom of the Module, line up the Module with the guide rails inside the option slot, make sure the Module is straight and insert it.

- If the Module is not lined up with the guide rails, the FG bar on the bottom inside the slot may become damaged.

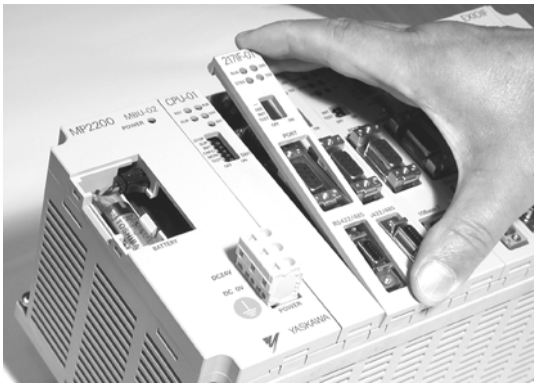


2. Mount onto the mounting base.

After the Optional Module has been completely inserted, firmly push the front of the Module into the mounting-base connectors. If the Optional Module has been installed correctly, the front of the Optional Module and the hook will be aligned.

3. Mount the panel of the Optional Module.

Line up the notch on the bottom of the panel with the tab on the bottom of the Machine Controller.



This completes the installation procedure.

1.2.2 Removing Optional Modules for Replacement

Use the following procedure to remove an Optional Module.

(1) Preparation

1. Back up the Programs

Save the programs written to the Machine Controller in the personal computer using the MPE720. Right-click the Controller Folder and select ***Transfer – All Files – Dump*** from the pop-up menu.

2. Remove the Machine Controller and Expansion Racks

a) For Machine Controller MP2300

Turn OFF the power supply and disconnect all cables from the MP2300. Then, remove the MP2300 from the panel or rack, and place it on a clean surface with sufficient space, such as a working table.

b) For Machine Controller MP2100M and MP2200

Turn OFF the power supply and disconnect all the cables from the expansion rack in the MP2200 base unit which contains the Optional Module to be replaced. Then remove the expansion rack and place it on a clean surface with sufficient space such as a working table.

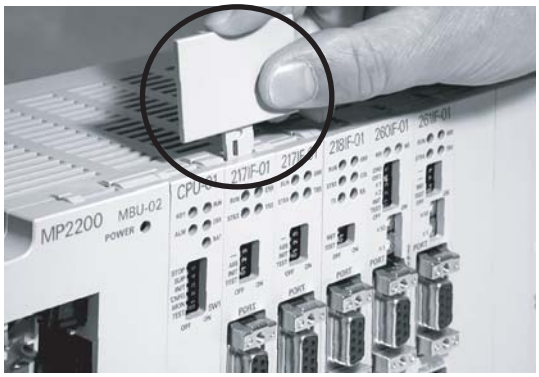
(2) Removing Optional Modules

1. Remove the battery cover.

Insert a coin in the notch on the side of the Machine Controller and pry the battery cover off.

2. Remove the cover of the Optional Module.

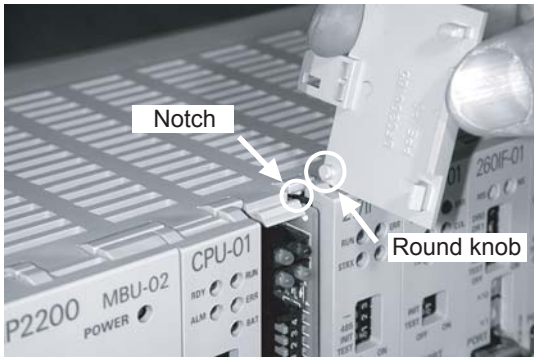
Insert the tab of the battery cover into the slot on the top of the cover of the Optional Module to release it, as shown in the diagram. Turn the front of the battery cover towards you for this operation.



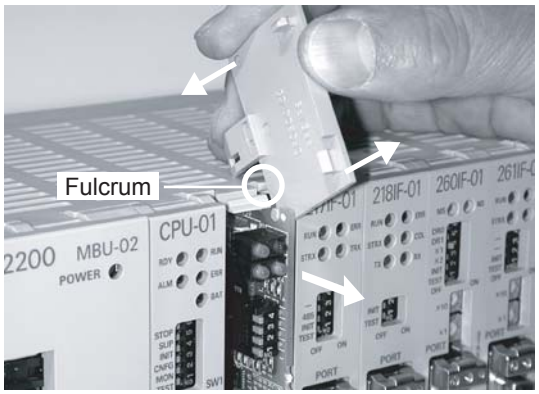
Release the bottom in the same way.

3. Remove the Optional Module from the mounting base.

Pull the top of the panel of the Optional Module towards you to remove it. A notch on the Optional Module will be visible from the gap in the cover. Hook the round knob on the battery cover, shown in the diagram, into the notch in the Optional Module.

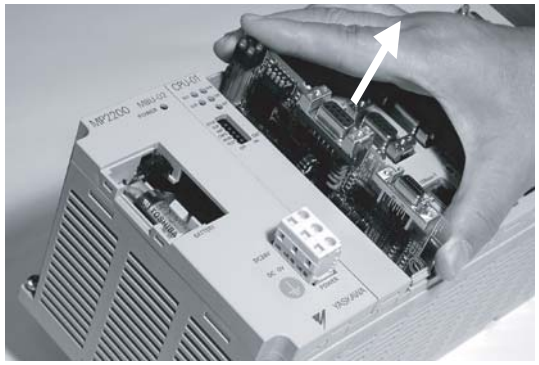


While holding the battery cover as shown in the photograph, tilt the cover back with the knob as the pivot point to disconnect the Module. The Module should move forward out of the case.



4. Pull out the Optional Module.

While holding both the top and bottom of the Module, pull the Module out straight towards you. Hold the Module by its edges and do not touch any components on the Module.



Place the Module in the bag provided with the initial shipment and store it in this bag.
Refer to *1.2.1 (3) Mounting Optional Modules* for information on how to install a new Module.

- A optional cover (JEPMC-OP2300) must be installed on the empty slot.

2

Specifications and Connection Example for PO-01 Module

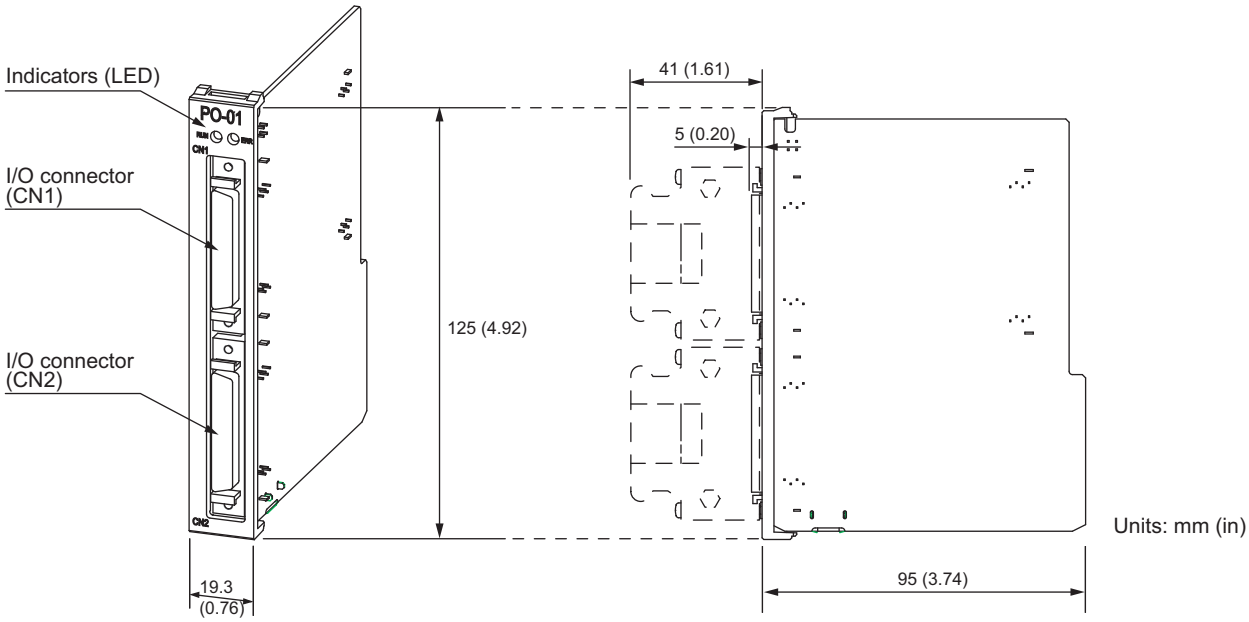
This chapter explains the specifications and connection example of the PO-01 Module.

2.1 PO-01 Module Outline

The PO-01 Module is a Motion Module with pulse output and has interfaces for implementing control on four axes. It can be used to connect a Machine Controller in the MP2000 series with stepping motors or SERVOPACKs.
Two PO-01 Modules can be mounted in MP2300 option slots, 16 on an MP2200 with four base units connected, and 16 on an MP2100M with an MP2100MEX I/F board with three expansion racks connected.

2.1.1 Appearance and External Dimensions

The following diagram shows the appearance of the PO-01 Module, and the external dimensions with the cable connectors inserted.



PO-01 Module Appearance

External Dimensions with Cable Connectors Inserted (Side View)

2.1.2 Specifications

The following table shows the general and hardware specifications, and the LED indicators of PO-01 Module.

(1) General Specifications

Item		Specifications
Environmental Conditions	Ambient Operating Temperature	0°C to + 50°C
	Ambient Storage Temperature	-25°C to + 85°C
	Ambient Operating Humidity	30% to 95% relative humidity (with no condensation)
	Ambient Storage Humidity	5% to 95% relative humidity (with no condensation)
	Pollution Level	Pollution level 2 (conforming to JIS B 3502)
	Corrosive Gas	There must be no combustible or corrosive gas.
	Operating Altitude	2,000 m above sea level or lower
Mechanical Operating Conditions	Vibration Resistance	Conforming to JIS B3502 10 Hz to 57 Hz with single-amplitude of 0.075 mm 57 Hz to 150 Hz with fixed acceleration of 9.8 m/s^2 10 sweeps each in X, Y, and Z directions (sweep time: 1 octave/min.)
	Shock Resistance	Conforming to JIS B3502 Peak acceleration 147 m/s^2 (15 G) twice for 11 ms each in X, Y, and Z directions
Electrical Operating Conditions	Noise Resistance	Conforming to EN 61000-6-2, EN 61000-6-4, EN 55011 (Group 1 Class A)
Installation Requirements	Grounding	Ground to 100 Ω max.
	Cooling Method	Natural cooling

(2) Hardware Specifications

Item	Specifications	
Description	Motion Module	
Name	PO-01	
Model Number	JAPMC-PL2310-E	
Number of Controlled Axes	4	
Pulse Output	Methods	CW/CCW, Sign + pulse, and phases A/B
	Max. Frequency	4 Mbps when using CW/CCW or Sign + pulse method 1 Mbps when using Phases A/B (before multiplication)
	Interface	5-V differential output
	Other Functions	Can be switched between positive and negative logic by using MPE720
Digital Inputs	5-points × 4 channels, source mode input DI_0: Independent input (individual power supply) 24 V±10%/4.1 mA, 12 V±10%/10.9 mA, 5 V±10% / 3.9 mA DI_1 to 4: Common power supply 24 V±10%/4.1 mA <Assignment Example> DI_0: Zero point/general-purpose • When using DI_0 as the zero-point return signal, the pulse width of 2 ms or more is required. DI_1: Dog signal/general-purpose DI_2: Limit 1/general-purpose DI_3: Limit 2/general-purpose DI_4: General-purpose	
Digital Outputs *	4-points × 4 channels, open collector (sink mode output) (24 V/100 mA) <Assignment Example> DO_0: Excitation ON DO_1: General-purpose DO_2: General-purpose DO_3: General-purpose	
Connectors	CN1: I/O connector CN2: I/O connector	
Indicators	RUN (green) ERR (red)	
Current Consumption	750 mA at 5 V	
Dimensions (mm)	125 × 95 (H × D)	
Mass	Approx 100 g	

(3) LED Indicators

Name	Color	Status when Lit	Status when Unlit
RUN	Green	Normally operating	Being stopped
ERR	Red	Malfunction occurs	Normally operating

(4) Operation Status Indication by LEDs

The following table shows the LED patterns to indicate the operation status of PO-01 Module and troubleshooting.

Status	LEDs		Meaning	Troubleshooting
	RUN	ERR		
Initial Status	Not lit	Lit	Power ON	Indicates the PO-01 Module status when the power turns ON. The ERR LED goes out when the initialization process starts. If this state remains unchanged, a booting error is occurring. The PO-01 firmware must be overwritten.
Normal Status	Not lit	Not lit	The PO-01 Module not defined	Indicates that the PO-01 Module is not registered in the Module Configuration Definition. Execute the self-configuration or register Modules in the Module Configuration Definition window of MPE720 when using Modules.
	Lit	Not lit	Normally operating	The PO-01 Module is operating normally to output pulses.
	Blinking	Not lit	CPU STOP	The CPU in stop status. Execute CPU RUN operation.
Erroneous Status	Not lit	Blinking	Occurrence of Hardware Error No. of blinkings 2: RAM diagnosis error 3: ROM diagnosis error 4: CPU function diagnosis error 5: FPU function diagnosis error 6: Shared memory diagnosis error	PO-01 Module hardware error. Replace the Module.
	Blinking	Blinking	Occurrence of Software Error No. of blinkings 2: Watchdog timeout 3: Address error (read) exception 4: Address error (write) exception 5: FPU exception 6: Illegal general command exception 7: Illegal slot command exception 8: General FPU inhibit exception 9: Slot FPU inhibit exception	If the watchdog timeout error occurs, the processing time of the user program may exceed the set value of the scan time. Check the user program and the setting of scan time.
Alarm			An alarm or warning has occurred.	Check the contents of the following monitor parameters. IL□□02: Warning IL□□04: Alarm IW□□09 Bit 3: Command error occurrence IW□□0B Bit 3: Command error occurrence

2.2 PO-01 Module Reference Pulse Forms

The PO-01 Module supports three reference pulse output methods, all of which are 5-V differential output.

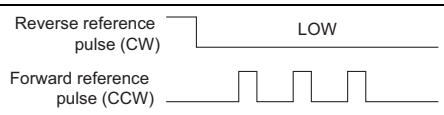
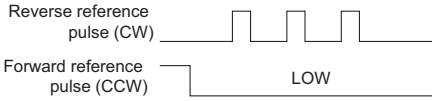
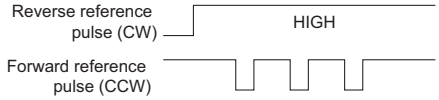
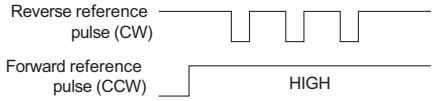
- CW/CCW
- Sign
- Pulse A/B

The details on each method are described below.

- Select the method and the polarity with fixed parameters. Refer to *3.3.1 (7) Hardware Signal Selection 1* on page 50 for details.

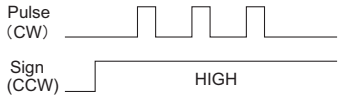
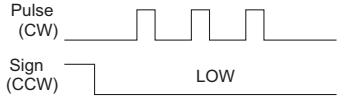
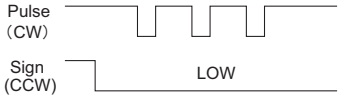
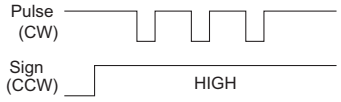
2.2.1 CW/CCW Method

CW pulse: Reverse rotation reference pulse for the motor
CCW pulse: Forward rotation reference pulse for the motor
The table below shows the reference pulse output forms with different polarities.

Polarity	Forward Rotation Reference for Motor (CCW)	Reverse Rotation Reference for Motor (CW)
Positive Logic		
Negative Logic		

2.2.2 Sign Method

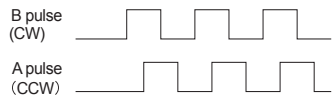
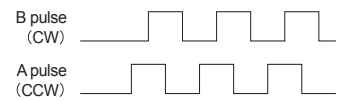
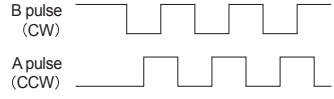
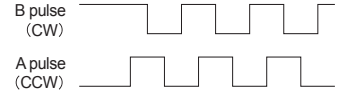
CW pulse: Reference pulse
CCW pulse: Sign (Forward rotation at High level, and reverse rotation at Low level)
The table below shows the reference pulse output forms with different polarities.

Polarity	Forward Rotation Reference for Motor (CCW)	Reverse Rotation Reference for Motor (CW)
Positive Logic		
Negative Logic		

2.2.3 Pulses A/B Method

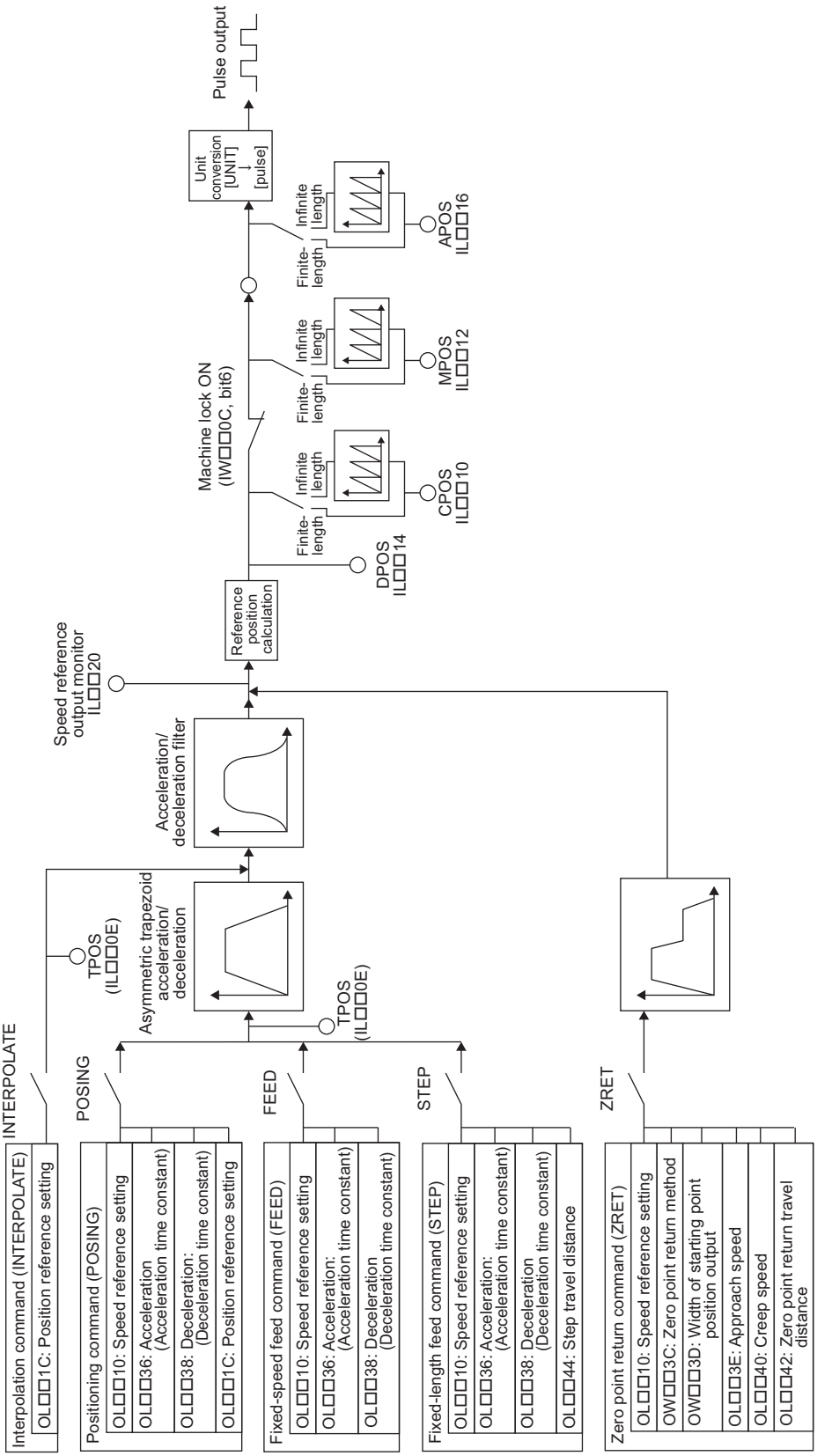
CW pulse: Pulse B
CCW pulse: Pulse A
When the phase of the pulse B is advanced from pulse A: Forward rotation reference pulse
When the phase of the pulse B is lagged behind pulse A: Reverse rotation reference pulse

The table below shows the reference pulse output forms with different polarities.

Polarity	Forward Rotation Reference for Motor (CCW)	Reverse Rotation Reference for Motor (CW)
Positive Logic		
Negative Logic		

2.3 PO-01 Module Position Control Block Diagram

The block diagram below shows the position control using a PO-01 Module.



2.4 PO-01 Module Connections

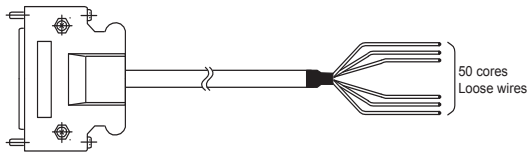
2.4.1 Connector Specifications

The table below shows the specifications of the connectors CN1 and CN2.

Name	Connector Name	No. of Pins	Connector Model		Manufacturer
			Module	Cable	
External I/O Connectors	CN1, CN2	50	10250-52A3PL	・Connector: 10150-3000PE ・Shell: : 10350-52A0-008 (Screw lock) : 10350-52F0-008 (One-touch-lock)	3M Japan Limited

2.4.2 Standard Cables

(1) Model and Appearance

Name	Model	Length	Appearance (JEPMC-W6060-□□-E)
Cable for PO-01 Module	JEPMC-W6060-05-E	0.5 m	
	JEPMC-W6060-10-E	1.0 m	
	JEPMC-W6060-30-E	3.0 m	

(2) Standard Cable Wiring

The following table shows the loose wires for the JEPMC-W6060-□□-E cable.

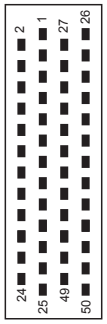
Terminal No.	Dot Mark	Wire Color	Dot Mark	Terminal No.
1	-	Orange	—	26
2	-	Gray	—	27
3	-	White	—	28
4	-	Yellow	—	29
5	-	Pink	—	30
6	- -	Orange	— —	31
7	- -	Gray	— —	32
8	- -	White	— —	33
9	- -	Yellow	— —	34
10	- -	Pink	— —	35
11	- - -	Orange	— — —	36
12	- - -	Gray	— — —	37
13	- - -	White	— — —	38
14	- - -	Yellow	— — —	39
15	- - -	Pink	— — —	40
16	- - - -	Orange	Sequence number — — —	41
17	- - - -	Gray	Sequence number — — —	42
18	- - - -	White	Sequence number — — —	43
19	- - - -	Yellow	Sequence number — — —	44
20	- - - -	Pink	Sequence number — — —	45
21	Sequence number - - - -	Orange	————	46
22	Sequence number- - - -	Gray	————	47
23	Sequence number- - - -	White	————	48
24	Sequence number- - - -	Yellow	————	49
25	Sequence number- - - -	Pink	————	50

2.4.3 Connector Pin Arrangement

The following tables show the pin arrangement and terminal assignment of the connectors CN1 and CN2.

(1) CN1 Pin Arrangement

Pin Arrangement on Connection Side



2	CW1+	1		27	CCW1+	26	
4	SG	3	CW1-	29	SG	28	CCW1-
6	DI1_0-(24V)	5	DI1_0+	31	DO1_0	30	
8	DI1_1	7	DI1_0-(5/12V)	33	DO1_1	32	DO1_0R
10	DI1_3	9	DI1_2	35	DO1_2	34	DO1_1R
12		11	DI1_4	37		36	DO1_3
14	CW2-	13	CW2+	39	CCW2-	38	CCW2+
16	DI2_0+	15	SG	41		40	SG
18	DI2_0-(5/12V)	17	DI2_0-(24V)	43	DO2_0R	42	DO2_0
20	DI2_2	19	DI2_1	45	DO2_1R	44	DO2_1
22	DI2_4	21	DI2_3	47	DO2_3	46	DO2_2
24	0V_1	23	24V_1	49	0V_1	48	24V_1
		25				50	

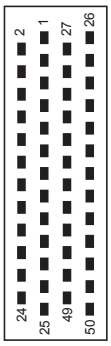
(2) CN1 Terminal Assignment

No.	Signal Name*	I/O	Function	No.	Signal Name*	I/O	Function
1	—	—	—	26	—	—	—
2	CW1+	O	CH1 CW output (+)	27	CCW1+	O	CH1 CCW output (+)
3	CW1-	O	CH1 CW output (–)	28	CCW1-	O	CH1 CCW output (–)
4	SG	—	A ground (Shared with GND in the board)	29	SG	—	A ground (Shared with GND in the board)
5	DI1_0+	I	CH1 input _0 (+)	30	—	—	—
6	DI1_0-(24V)	I	CH1 input _0 (–) 24 V	31	DO1_0	O	CH1 DO output _0
7	DI1_0-(5/12V)	I	CH1 input _0 (–) 5 V/12 V	32	DO1_0R	O	CH1 DO output _0 (with 1.5 kΩ)
8	DI1_1	I	CH1 input _1	33	DO1_1	O	CH1 DO output _1
9	DI1_2	I	CH1 input _2	34	DO1_1R	O	CH1 DO output _1 (with 1.5 kΩ)
10	DI1_3	I	CH1 input _3	35	DO1_2	O	CH1 DO output _2
11	DI1_4	I	CH1 input _4	36	DO1_3	O	CH1 DO output _3
12	—	—	—	37	—	—	—
13	CW2+	O	CH2 CW output (+)	38	CCW2+	O	CH2 CCW output (+)
14	CW2-	O	CH2 CW output (–)	39	CCW2-	O	CH2 CCW output (–)
15	SG	—	A ground (Shared with GND in the board)	40	SG	—	A ground (Shared with GND in the board)
16	DI2_0+	I	CH2 input _0 (+)	41	—	—	—
17	DI2_0-(24V)	I	CH2 input _0 (–) 24 V	42	DO2_0	O	CH2 DO output _0
18	DI2_0-(5/12V)	I	CH2 input _0 (–) 5 V/12 V	43	DO2_0R	O	CH2 DO output _0 (with 1.5 kΩ)
19	DI2_1	I	CH2 input _1	44	DO2_1	O	CH2 DO output _1
20	DI2_2	I	CH2 input _2	45	DO2_1R	O	CH2 DO output _1 (with 1.5 kΩ)
21	DI2_3	I	CH2 input _3	46	DO2_2	O	CH2 DO output _2
22	DI2_4	I	CH2 input _4	47	DO2_3	O	CH2 DO output _3
23	24V_1	I	I/O power supply input (24 V)	48	24V_1	I	I/O power supply input (24 V)
24	0V_1	I	I/O power supply input (0 V)	49	0V_1	I	I/O power supply input (0 V)
25	—	—	—	50	—	—	—

* Depending on the output mode, the signal name (pulse output signal name) CCW in the above tables can be Sign or Phase-A, and CW can be Pulse or Phase-B.
Refer to *2.2 PO-01 Module Reference Pulse Forms* on page 26 for the relation between each output mode and the signals.

(3) CN2 Pin Arrangement

Pin Arrangement on Connection Side



2	CW3+	1		27	CCW3+	26	
4	SG	3	CW3-	29	SG	28	CCW3-
6	DI3_0-(24V)	5	DI3_0+	31	DO3_0	30	
8	DI3_1	7	DI3_0-(5/12V)	33	DO3_1	32	DO3_0R
10	DI3_3	9	DI3_2	35	DO3_2	34	DO3_1R
12		11	DI3_4	37		36	DO3_3
14	CW4-	13	CW4+	39	CCW4-	38	CCW4+
16	DI4_0+	15	SG	41		40	SG
18	DI4_0-(5/12V)	17	DI4_0-(24V)	43	DO4_0R	42	DO4_0
20	DI4_2	19	DI4_1	45	DO4_1R	44	DO4_1
22	DI4_4	21	DI4_3	47	DO4_3	46	DO4_2
24	0V_2	23	24V_2	49	0V_2	48	24V_2
		25				50	

(4) CN2 Terminal Assignment

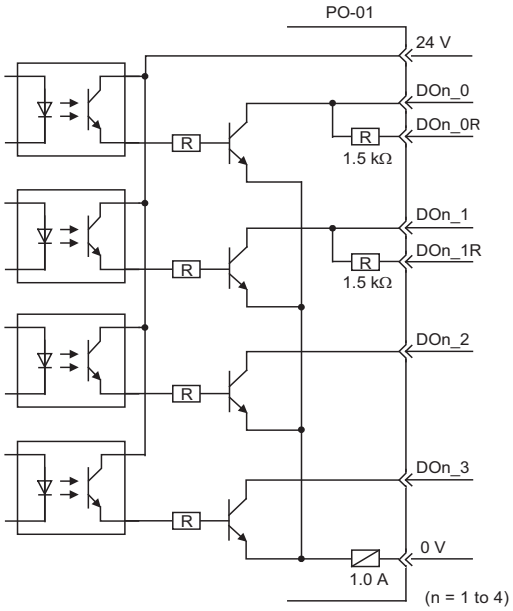
No.	Signal Name*	I/O	Function	No.	Signal Name*	I/O	Function
1	—	—	—	26	—	—	—
2	CW3+	O	CH3 CW output (+)	27	CCW3+	O	CH3 CCW output (+)
3	CW3-	O	CH3 CW output (–)	28	CCW3-	O	CH3 CCW output (–)
4	SG	—	A ground (Shared with GND in the board)	29	SG	—	A ground (Shared with GND in the board)
5	DI3_0+	I	CH3 input _0 (+)	30	—	—	—
6	DI3_0-(24V)	I	CH3 input _0 (–) 24 V	31	DO3_0	O	CH3 DO output _0
7	DI3_0-(5/12V)	I	CH3 input _0 (–) 5 V/12 V	32	DO3_0R	O	CH3 DO output _0 (with 1.5 kΩ)
8	DI3_1	I	CH3 input _1	33	DO3_1	O	CH3 DO output _1
9	DI3_2	I	CH3 input _2	34	DO3_1R	O	CH3 DO output_1 (with 1.5 kΩ)
10	DI3_3	I	CH3 input _3	35	DO3_2	O	CH3 DO output _2
11	DI3_4	I	CH input _4	36	DO3_3	O	CH3 DO output _3
12	—	—	—	37	—	—	—
13	CW4+	O	CH4 CW output (+)	38	CCW4+	O	CH4 CCW output (+)
14	CW4-	O	CH4 CW output (–)	39	CCW4-	O	CH4 CCW output (–)
15	SG	—	A ground (Shared with GND in the board)	40	SG	—	A ground (Shared with GND in the board)
16	DI4_0+	I	CH4 input _0 (+)	41	—	—	—
17	DI4_0-(24V)	I	CH4 input _0 (–) 24 V	42	DO4_0	O	CH4 DO output _0
18	DI4_0-(5/12V)	I	CH4 input _0 ((–) 5 V/12 V	43	DO4_0R	O	CH4 DO output _0 (with 1.5 kΩ)
19	DI4_1	I	CH4 input _1	44	DO4_1	O	CH4 DO output _1
20	DI4_2	I	CH4 input _2	45	DO4_1R	O	CH4 DO output _1 (with 1.5 kΩ)
21	DI4_3	I	CH4 input _3	46	DO4_2	O	CH4 DO output _2
22	DI4_4	I	CH4 input _4	47	DO4_3	O	CH4 DO output _3
23	24V_1	I	I/O power supply input (24 V)	48	24V_1	I	I/O power supply input (24 V)
24	0V_1	I	I/O power supply input (0 V)	49	0V_1	I	I/O power supply input (0 V)
25	—	—	—	50	—	—	—

* Depending on the output mode, the signal name (pulse output signal name) CCW in the above tables can be Sign or Phase-A, and CW can be Pulse or Phase-B.
Refer to *2.2 PO-01 Module Reference Pulse Forms* on page 26 for the relation between each output mode and the signals.

2.4.4 Digital I/O Circuit Specifications

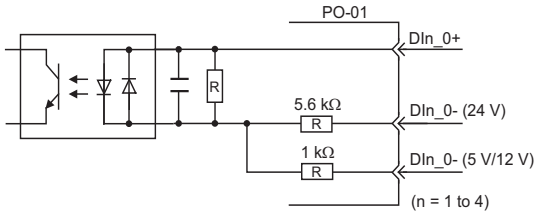
The digital I/O circuit specifications of the PO-01 Module are shown below.

(1) Digital Output Circuit (DOn_0 to 3)

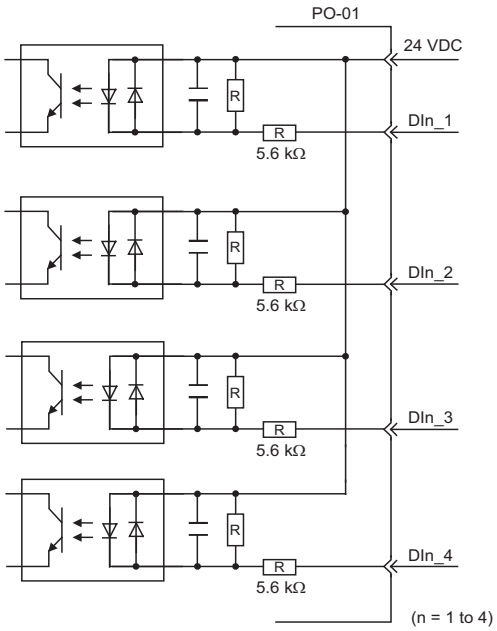


- The eight digital output signals of CH1 and CH2 for CN1 share one 0V power terminal as the reference potential (0V) inside CN1. The eight digital output signals of CH3 and CH4 for CN2 also share one 0V power terminal inside CN2. However, the terminals of CN1 and CN2 are not connected internally.

(2) Digital Input Circuit (DIn_0)



(3) Digital Input Circuit (DIn_1 to 4)



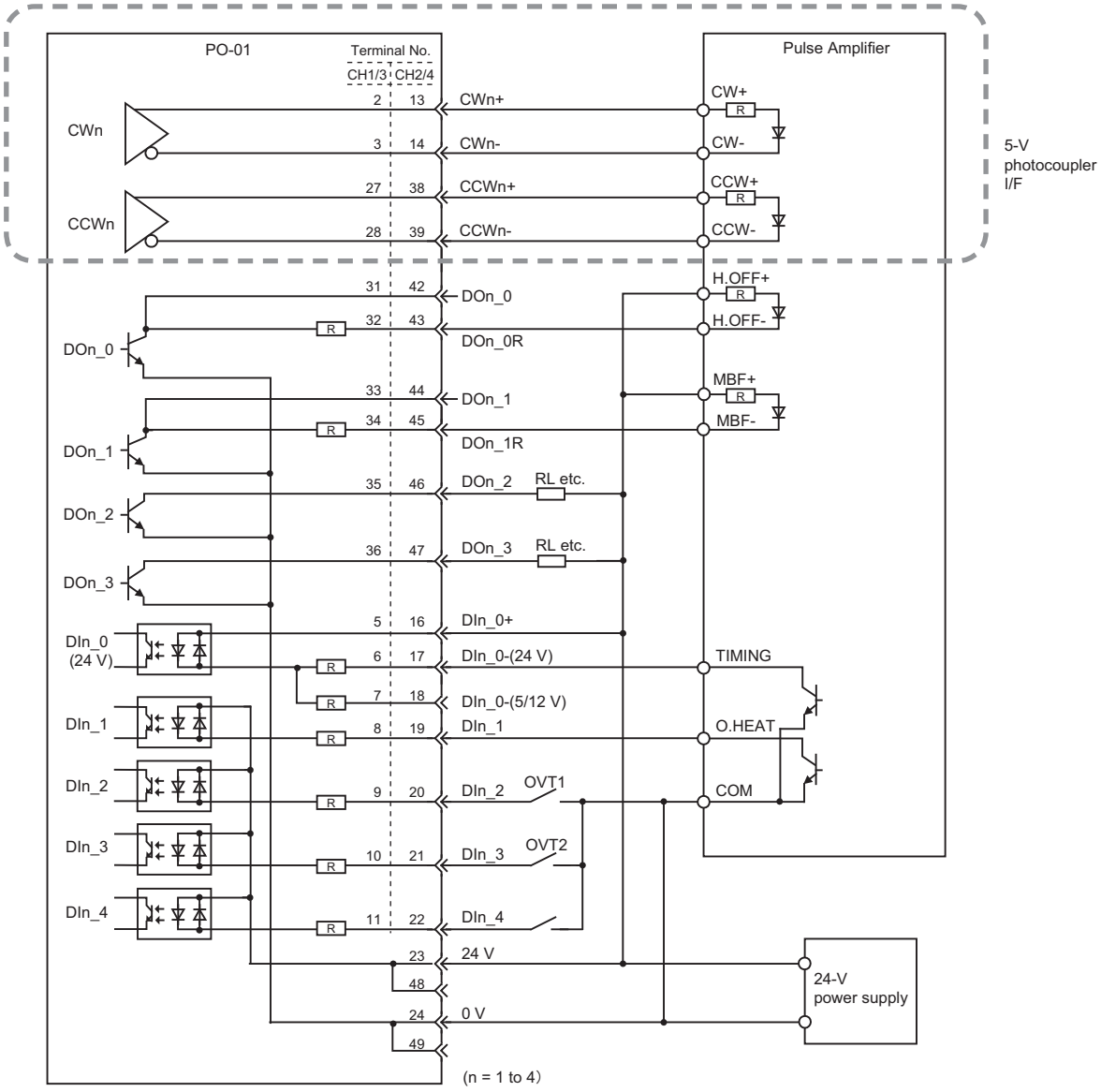
- The eight digital output signals of CH1 and CH2 for CN1 share one 0V power terminal as the reference potential (0V) inside CN1. The eight digital output signals of CH3 and CH4 for CN2 also share one 0V power terminal inside CN2. However, the terminals of CN1 and CN2 are not connected internally.

2.5 PO-01 Module Connection Example

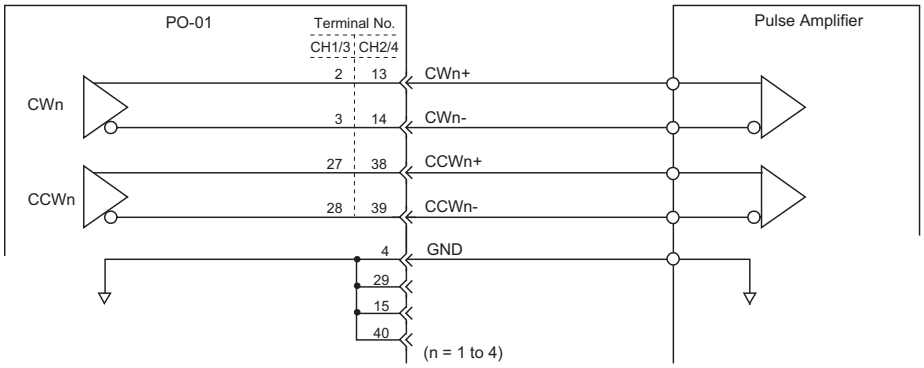
The connection examples of the PO-01 Module and DIn_0 are shown below.

2.5.1 Connection Example

- The area enclosed with a broken line will be changed as shown in ■ Example of Connection to Line Receiver I/F when using a line receiver I/F.



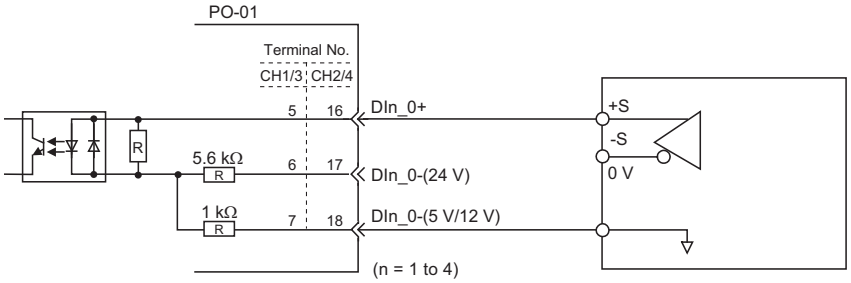
■ Example of Connection to Line Receiver I/F



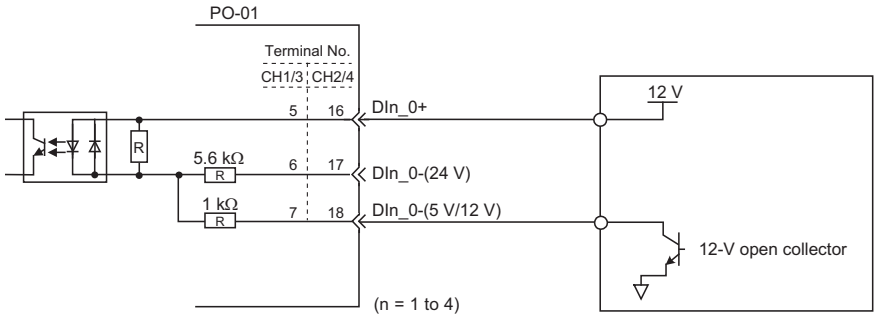
2.5.2 DIn_0 Connection Example

The DIn_0 can be connected to not only a 24 V power supply but also 5 V differential input and 12 V open collector.

(1) Example of Connection to 5 V Differential Input



(2) Example of Connection to 12 V Open Collector Input



2.5.2 DIn_0 Connection Example

3

Motion Parameters

This chapter explains each of the PO-01 Module motion parameters.

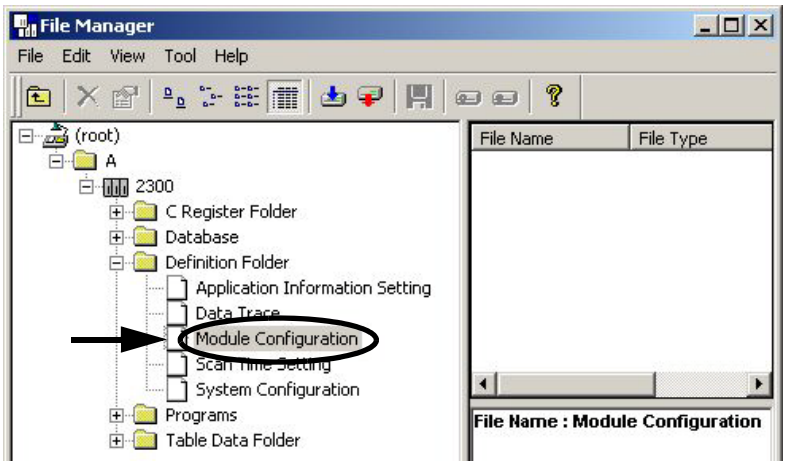
3.1 PO-01 Motion Parameters

Three types of parameters are provided for the PO-01 Module: Motion fixed parameters and Motion setting parameters for controlling the motions setting the parameters and Motion monitoring parameters for monitoring the parameters. This section describes how to set these parameters and the functions of each parameter.

3.1.1 Opening the Motion Parameters Setting Window

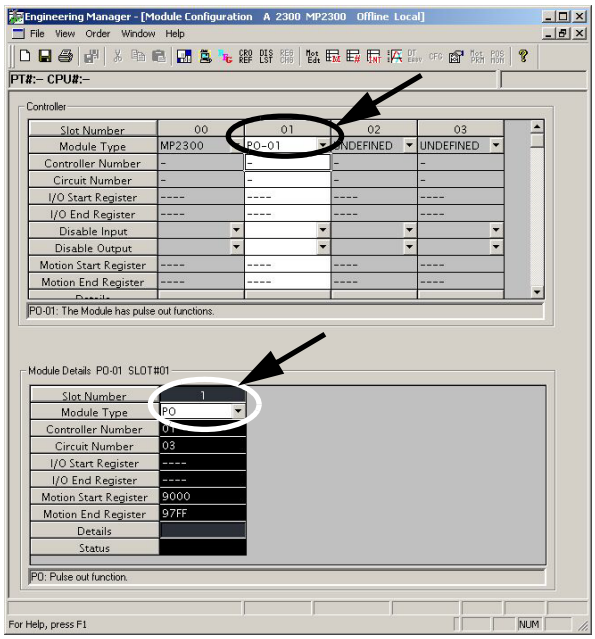
The motion parameters can be set in the **Fixed Parameters** Tab Page and the **Setup Parameters** Tab Page of PO-01 Module Window.
Use the following procedure to open the PO-01 Module Window.

1. Double-click the **Module Configuration** Folder under the **Definition** Folder in the **File Manager** Window.



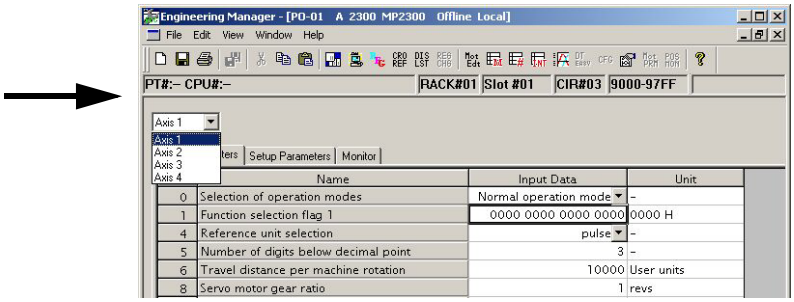
The Engineering Manager will start and the **Module Configuration** Window will open.

2. Select the **PO-01** in the **Module Type** field of the **Controller** area in the **Module Configuration** Window. Select the **PO** in the **Module Details**. Then double-click the slot number for the selected **PO**.



The PO-01 (Engineering Manger – [PO-01 A 2300 Offline Local]) Window will open.

3. Select the axis to be set from the **Axis** Box.



4. Click each of the **Fixed Parameters**, **Setup Parameters**, and **Monitor** Tab Page to switch between the tab pages and make or browse the settings.

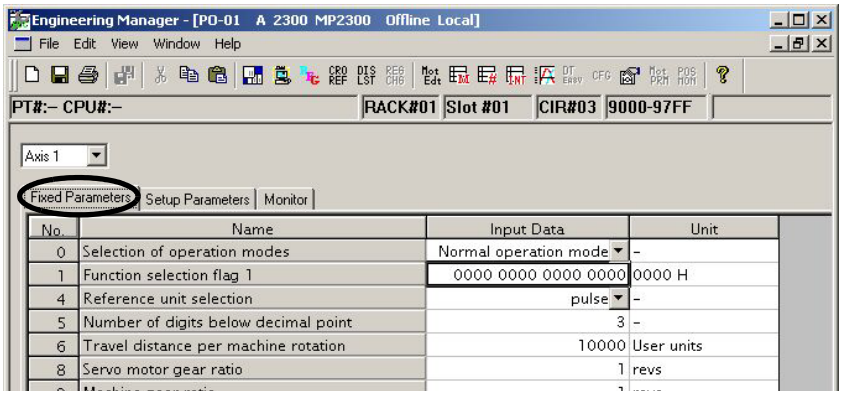


Fig. 3.1 Fixed Parameters Tab Page

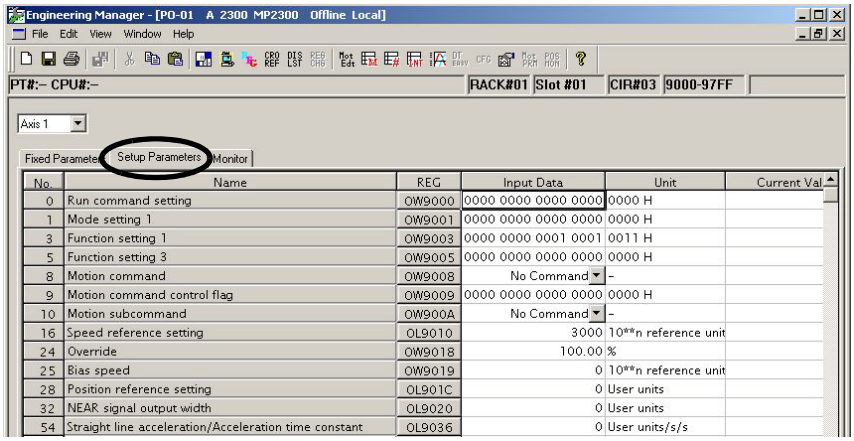


Fig. 3.2 Setup Parameters Tab Page

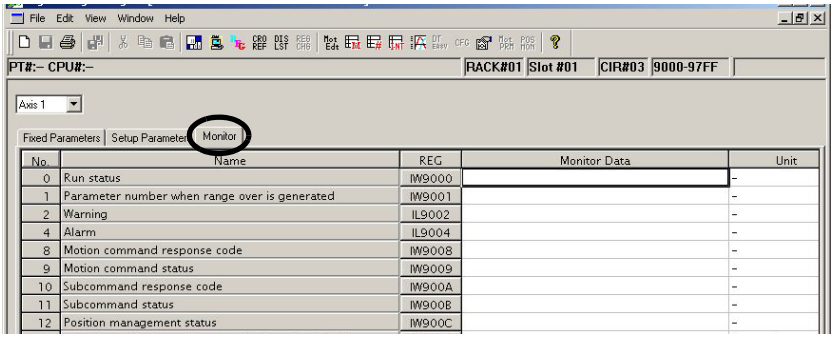


Fig. 3.3 Monitor Tab Page (Read-Only)

3.2 List of Motion Parameters

- The operations of the parameters, bits, and registers other than these listed below are not guaranteed. Do not set the parameters, bits, or registers other than these listed below.

3.2.1 Fixed Parameter List

The table below lists the motion fixed parameters for the PO-01 Module.

- Refer to the sections in the Reference column for details on each fixed parameter.

No.	Name	Description	Default	Reference
0	Selection of operation modes	0: Normal operation mode	1	3.3.1 (1) on page 46
		1: Axis unused		
1	Function selection flag 1	Bit 0: Axis type selection (0: Finite length axis, 1: Infinite length axis	0	3.3.1 (2) on page 46
		Bit 1: Forward software limit (0: Disabled, 1: Enabled)	0	
		Bit 2: Reverse software limit (0: Disabled, 1: Enabled)	0	
		Bits 3 and 4: Reserved for system use	–	
		Bit 5: Deceleration limit switch (LS) reversal selection (0: Not reverse, 1: Reverse)	0	
		Bits 6 to F: Reserved for system use	–	
3	Function selection flag 3*	Bits 0 to 3: Zero point return reverse limit signal (DI) allocation (0: Fixed (DI_2 signal), 1: User selected)	3020 [H]	3.3.1 (3) on page 47
		Bits 4 to 7: Zero point return reverse limit signal (DI) selection (1: Use DI_1 signal, 2: Use DI_2 signal, 3: Use DI_3 signal, 4: Use DI_4 signal)		
		Bits 8 to B: Zero point return forward limit signal (DI) allocation (0: Fixed (DI_3 signal), 1: User selected)		
		Bits C to F: Zero point return forward limit signal (DI) selection (1: Use DI_1 signal, 2: Use DI_2 signal, 3: Use DI_3 signal, 4: Use DI_4 signal)		
4	Reference unit selection	0: pulse 1: mm 2: deg 3: inch	0	3.3.1 (4) on page 48
5	Number of digits below decimal point	1 = 1 digit	3	
6	Travel distance per machine rotation	1 = 1 reference unit	10000	
8	Servo motor gear ratio	1 = 1 rotation	1	
9	Machine gear ratio	1 = 1 rotation	1	
10	Infinite length axis reset position (POSMAX)	1 = 1 reference unit	360000	3.3.1 (5) on page 48
12	Positive software limit value	1 = 1 reference unit	2^{31}-1	3.3.1 (6) on page 49
14	Negative software limit value	1 = 1 reference unit	-2^{31}	
20	Hardware signal selection 1	Bit 0: Reserved for system use	–	3.3.1 (7) on page 50
		Bit 1: C pulse input signal polarity selection* (0: Positive logic, 1: Negative logic)	0	
		Bits 2 to 7: Reserved for system use	–	
		Bit 8: Pulse output signal polarity selection (0: Positive logic, 1: Negative logic)	0	
		Bit 9 and A: Pulse output method selection (00: CW/CCW, 01: Sign, 10: A/B pulses)	00	
		Bits B to F: Reserved for system use	–	

(cont'd)

No.	Name	Description	Default	Reference
21	Hardware signal selection 2	Bit 0: Deceleration limit switch (LS) signal selection (0: Use the setting parameter, 1: Use DI_1 signal)	0	3.3.1 (8) on page 52
		Bit 1: Zero point return reverse limit signal selection (0: Use the setting parameter, 1: Use DI_2 signal)	0	
		Bit 2: Zero point return forward limit signal selection (0: Use the setting parameter, 1: Use DI_3 signal)	0	
		Bit 3: Reserved for system use	–	
		Bit 4: Excitation ON output signal polarity selection (0: Positive logic, 1: Negative logic)	0	
		Bits 5 to F: Reserved for system use	–	
25	Pulse output maximum frequency	1 = 10 kHz	400	3.3.1 (9) on page 53
34	Rated motor speed	1 = 1 min^{-1}	3000	3.3.1 (10) on page 53
36	Number of pulses per motor rotation	1 = 1 pulse/rev Set a value after multiplication.	200	

* All of the following are required to use Function selection flag 3 (fixed parameter 3) and C pulse input signal polarity selection (fixed parameter 20 bit 1).
PO-01 software version: Version 1.08 or later
MPE720 version: Version 6.35 or later or version 7.21 or later
Board revision: Revision A18 or later

3.2.2 PO-01 Motion Parameter Register Numbers

The leading motion parameter register numbers (I and O register numbers) are determined by the circuit number[*1] and the axis number [*2].

* 1. Circuit Number: Displayed in the **PO-01** field and **PO** field in the **Module Configuration** Window (see 3.1.1 on page 38).

* 2. Axis Number: Select an axis number from **Axis** Box in the **PO-01** Window (see 3.1.1 on page 38).

The leading register number for each axis's motion parameter can be obtained using the following equation.

Leading register number of motion parameter
= I (or O) W 8000 + (circuit number −1) × 800h + (axis number −1) × 80h

3.2.3 Setting Parameter List

The table below lists the motion setting parameters for the PO-01 Module.

- Refer to the sections in the Reference column for details on each setting parameter.
- The register numbers OW□□00 and OL□□00 in the table indicate the leading output register number + 00.
- Refer to *3.2.2 PO-01 Motion Parameter Register Numbers* on page 41 for information on how to find the leading number of the output register.

No.	Register No.	Name	Description	Default	Reference
0	OW□□00	Run command setting	Bit 0: Servo ON (0: OFF, 1: ON)	0	3.3.2 (1) on page 53
			Bit 1: Machine lock (0: Normal operation, 1: Machine lock)	0	
			Bits 2 to 5: Reserved for system use	−	
			Bit 6: POSMAX preset (0: OFF, 1:ON)	0	
			Bits 7 to E: Reserved for system use	−	
			Bit F: Alarm clear (0: OFF, 1: ON)	0	
3	OW□□03	Function setting 1	Bits 0 to 3: Speed unit 0: Reference units/sec 1: 10^n reference units/min 2: Percentage (%) of rated speed (1 = 0.01 %)	1	3.3.2 (2) on page 54
			Bits 4 to 7: Acceleration unit 0: Reference units/sec^2 1 : ms	1	
			Bits 8 to B: Filter type 0: No filter 1: Exponential acceleration/deceleration filter 2: Moving average filter	0	
			Bits C to F: Reserved for system use		
5	OW□□05	Function setting 3	Bits 0 to 7: Reserved for system use	−	3.3.2 (3) on page 54
			Bit 8: Zero point return deceleration LS signal (0: OFF, 1: ON)	0	
			Bit 9: Reverse limit signal for zero point return (0: OFF, 1: ON)	0	
			Bit A: Forward limit signal for zero point return (0: OFF, 1: ON)	0	
			Bit B: Zero point return input signal (0: OFF, 1: ON)*1	0	
			Bits C to F: Reserved for system use	−	
8	OW□□08	Motion command	0: NOP (No command) 1: POSING (positioning) 3: ZRET (zero point return) 4: INTERPOLATE (interpolation) 5: ENDOF_INTERPOLATE (Reserved for system use) 7: FEED (JOG operation) 8: STEP (STEP operation) 9: ZSET (zero point setting) 10: ACC (Reserved for system use) 11: DCC (Reserved for system use) 12: SCC (Reserved for system use)	0	3.3.2 (4) on page 55
9	OW□□09	Motion command control flag	Bit 0: Command pause (0: OFF, 1: ON)	0	3.3.2 (5) on page 55
			Bit 1: Command abort (0: OFF, 1:ON)	0	
			Bit 2: JOG/STEP direction (0: Forward rotation, 1: Reverse rotation)	0	
			Bit 3: Zero point return direction (0: Reverse rotation, 1: Forward rotation)	0	
			Bit 4: Reserved for system use	0	
			Bit 5: Position reference type (0: Incremental addition mode, 1: Absolute mode)	0	
			Bits 6 to F: Reserved for system use	−	
10	OW□□0A	Motion subcommand	0: NOP (No command) 5: FIXPRM_RD (read fixed parameter)	0	3.3.2 (6) on page 55

(cont'd)

No.	Register No.	Name	Description	Default	Reference
16	OL□□10	Speed reference setting	The setting unit depends on the settings of OW□□03, bits 0 to 3.	3000	3.3.2 (7) on page 56
24	OW□□18	Override	1 = 0.01 %	10000	3.3.2 (8) on page 56
25	OW□□19	Bias speed	The setting unit depends on the settings of OW□□03, bits 0 to 3.	0	3.3.2 (9) on page 56
28	OL□□1C	Position reference setting	1 = 1 reference unit	0	3.3.2 (10) on page 57
32	OL□□20	NEAR signal output width	1 = 1 reference unit	0	3.3.2 (11) on page 57
54	OL□□36	Straight line acceleration/ Acceleration time constant	The setting unit depends on the settings of OW□□03, bits 0 to 3.	0	3.3.2 (12) on page 57
56	OL□□38	Straight line deceleration/ Deceleration time constant	The setting unit depends on the settings of OW□□03, bits 0 to 3.	0	
58	OW□□3A	Filter time constant	1 = 0.1 ms	0	3.3.2 (13) on page 58
59	OW□□3B	Bias speed for index deceleration/ acceleration filter	The setting unit depends on the settings of OW□□03, bits 0 to 3.	0	
60	OW□□3C	Zero point return method	0: DEC1 + C-phase pulse*2	2	3.3.2 (14) on page 59
			1: ZERO signal*2		
			2: DEC1 + ZERO signal		
			3: C-phase pulse*2		
			4: DEC2 + ZERO signal		
			5: DEC1 + LMT + ZERO signal		
			6: DEC2 + C-phase pulse*2		
			7: DEC1 + LMT + C-phase pulse*2		
			11: C Pulse Only*2		
			12: P-OT & C-phase pulse*2		
			13: P-OT Only*2		
			14: HOME LS & C-phase pulse*2		
			16: N-OT & C-phase pulse*2		
			17: N-OT Only*2		
			18: INPUT & C-phase pulse*2		
			19: INPUT Only*2		
61	OW□□3D	Width of starting point position output	1 = 1 reference unit	100	
62	OL□□3E	Approach speed	The setting unit depends on the settings of OW□□03, bits 0 to 3.	1000	
64	OL□□40	Creep speed	The setting unit depends on the settings of OW□□03, bits 0 to 3.	500	
66	OL□□42	Zero point return travel distance	1 = 1 reference unit	0	
68	OL□□44	Step travel distance	1 = 1 reference unit	1000	3.3.2 (15) on page 60
72	OL□□48	Zero point position in machine coordinate system offset	1 = 1 reference unit	0	3.3.2 (16) on page 60
74	OL□□4A	Work coordinate system offset	1 = 1 reference unit	0	
76	OL□□4C	Number of POSMAX turns presetting data	1 = 1 reference unit	0	

(cont'd)

No.	Register No.	Name	Description	Default	Reference
92	OW□□5C	Fixed parameter number	Set the number of the fixed parameter to be read using the motion command FIXPRM_RD.	0	3.3.2 (17) on page 60
93	OW□□5D	General-purpose DO	Bit 0: Reserved for system use Bit 1: DO_1 Bit 2: DO_2 Bit 3: DO_3	0	3.3.2 (18) on page 60

* 1. All of the following are required to use Zero point return input signal (bit B).
PO-01 software version: Version 1.08 or later
MPE720 version: Version 7.21 or later
Board revision: Revision A18 or later
* 2. All of the following are required to use these functions.
PO-01 software version: Version 1.08 or later
MPE720 version: Version 7.21 or later
Board revision: Revision A18 or later

3.2.4 Monitoring Parameter List

The table below shows the motion monitoring parameters for the PO-01 Module.

- Refer to the pages listed in the Reference column for details on each monitoring parameter.
- The register numbers IW□□00 and IL□□00 in the table indicate the leading output register number + 00.
- Refer to *3.2.2 PO-01 Motion Parameter Register Numbers* on page 41 for information on how to find the leading input register number.

No.	Register No.	Name	Description	Reference
0	IW□□00	Run status	Bit 0: Run ready	3.3.3 (1) on page 61
			Bit 1: Running (Servo ON)	
1	IW□□01	Parameter number when range over is generated	Setting parameters: 0 or higher Fixed parameter: 1000 or higher	3.3.3 (2) on page 61
2	IL□□02	Warning	Bit 1: Setting parameter error	3.3.3 (3) on page 61
			Bit 2: Fixed parameter error	
			Bit 4: Motion command setting error	
4	IL□□04	Alarm	Bit 1: Positive direction overtravel	3.3.3 (4) on page 62
			Bit 2: Negative direction overtravel	
			Bit 3: Positive direction software limit	
			Bit 4: Negative direction software limit	
			Bit 5: Servo OFF	
			Bit 8: Excessive speed	
			Bit E: Zero point not defined	
8	IW□□08	Motion command response code	Same as OW□□08: Motion command	3.3.3 (5) on page 62
9	IW□□09	Motion command status	Bit 0: Command executing (BUSY) flag	3.3.3 (6) on page 63
			Bit 1: Command hold completed (HOLD)	
			Bit 3: Command error occurrence (FAIL)	
			Bit 8: Command execution completed (COMPLETE)	
10	IW□□0A	Subcommand response code	Same as OW□□0A: Motion subcommand	3.3.3 (7) on page 63
11	IW□□0B	Subcommand status	Bit 0: Command executing flag	3.3.3 (8) on page 63
			Bit 3: Command error occurrence	
			Bit 8: Command execution completed	

(cont'd)

No.	Register No.	Name	Description	Reference
12	IW□□0C	Position management status	Bit 0: Distribution completed (DEN)	3.3.3 (9) on page 64
			Bit 1: Positioning completed (POSCOMP)	
			Bit 3: Positioning proximity (NEAR)	
			Bit 4: Zero point position (ZERO)	
			Bit 5: Zero point return (setting) completed (ZRNC)	
			Bit 6: Machine lock ON (MLKL)	
			Bit 9: POSMAX turn number presetting completed (TPRSE)	
14	IL□□0E	Target position in machine coordinate system (TPOS)	1 = 1 reference unit	3.3.3 (10) on page 65
16	IL□□10	Calculated position in machine coordinate system (CPOS)	1 = 1 reference unit	
18	IL□□12	Machine coordinate system reference position (MPOS)	1 = 1 reference unit	
20	IL□□14	32-bit coordinate system position (DPOS)	1 = 1 reference unit	
22	IL□□16	Machine coordinate system feedback position (APOS)	1 = 1 reference unit	
30	IL□□1E	Number of POSMAX turns	1 = 1 turn	
32	IL□□20	Speed reference output monitor	1 = 1 reference unit/H (high) scan	3.3.3 (11) on page 65
86	IL□□56	Fixed parameter monitor	Stores the data of the fixed parameter when FIXPRM_RD has been specified in the motion subcommand.	3.3.3 (12) on page 66
88	IW□□58	General-purpose DI monitor	Bit 0: General-purpose DI_0	3.3.3 (13) on page 66
			Bit 1: General-purpose DI_1	
			Bit 2: General-purpose DI_2	
			Bit 3: General-purpose DI_3	
			Bit 4: General-purpose DI_4	

3.3 Motion Parameter Details

This section provides details on each motion parameter (fixed parameters, setting parameters, and monitoring parameters).

- The operations of the parameters, bits, and registers other than these listed below are not guaranteed. Do not set the parameters, bits, or registers other than these listed below.

3.3.1 Fixed Parameter Details

The following tables provide details on the motion fixed parameters.

- The motion fixed parameters are listed in *3.2.1 Fixed Parameter List* on page 40.

(1) Selection of Operation Mode

No. 0 Selection of operation modes		Setting Range	Setting Unit	Default Value
		0 and 1	–	0
Description	Specify the application method of the axis. 0: Normal operation mode (default) Use this setting when actually using an axis. 1: Axis unused No control will be performed for an axis set to this mode, and monitoring parameters will not be updated. If an axis is changed from normal running mode to this mode, the monitoring parameters will be held at the current status except for the Run status (monitoring parameter IW□□00), which will be cleared to zeros. Set any axis that is not being used to this mode (Axis Unused) to reduce the processing time.			

(2) Function Selection Flag 1

No. 1 Function selection flag 1		Setting Range	Setting Unit	Default Value
		–	–	0000H
Description	Bit 0	Axis type selection Set whether or not there is a limit on controlled axis travel. 0: Finite length axis (default); The axis will have limited movement. The software limit function is enabled. 1: Infinite length axis; The axis will have unlimited movement. The software limit function is disabled. If an infinite length axis is set, the position information will be reset each time the position exceeds the value set for the Infinite length axis reset position (POSMAX) (fixed parameter 10).		
	Bit 1	Forward software limit enabled/disabled Set whether or not to use the software limit function in the positive direction. 0: Disabled (default) 1: Enabled Set the software limit as the Forward Software Limit (fixed parameter 12). This setting is disabled if the axis is set as an infinite length axis. The software limit function is enabled only after completing a zero point return or zero point setting operation (IB□□0C5 is ON).		
	Bit 2	Reverse software limit enabled/disabled Set whether or not to use the software limit function in the negative direction. 0: Disabled (default) 1: Enabled Set the software limit as the Reverse software limit (fixed parameter 12). This setting is disabled if the axis is set as an infinite length axis. The software limit function is enabled only after completing a zero point return or zero point setting operation (IB□□0C, bit 5 is ON).		
	Bit 5	Deceleration limit switch (LS) reversal selection Set whether or not to reverse the polarity of DI_1 signal used as DEC1. 0: Not reverse (default) 1: Reverse (The zero point return deceleration LS signal (OW□□05, bit 8) will not be reversed.)		

- Refer to *3.4.2 Axis Type Selection* on page 67 for the axis types.
- Refer to *3.5 Software Limit Function* on page 75 for information on software limits.

(3) Function Selection Flag 3

- All of the following are required to use these parameters.
  PO-01 software version: Version 1.08 or later
  MPE720 version: Version 6.35 or later or version 7.21 or later
  Board revision: Revision A18 or later

No.3 Function selection flag 3		Setting Range	Setting Unit	Default Value
		–	–	0000H
Description	Bits 0 to 3	Zero point return reverse limit signal (DI) allocation Specify whether to enable assigning a reverse limit signal for zero point returns. 0: Fixed (DI_2 signal) 1: User selected If 1 (User selected) is set, the signal selected with Zero point return reverse limit signal (DI) selection (bits 4 to 7) is used for the reverse limit signal. If 0 (Fixed (DI_2 signal)) is set, DI_2 is used as the reverse limit signal. • These bits are valid only when 1 (Use the DI_2 signal) is set for Zero point return reverse limit signal selection (bit 1) of Hardware signal selection 2 (fixed parameter 21).		
	Bits 4 to 7	Zero point return reverse limit signal (DI) selection Select the reverse limit signal to use for zero point returns. 1: Use DI_1 signal 2: Use DI_2 signal 3: Use DI_3 signal 4: Use DI_4 signal These bits are valid only when 1 (User selected) is set for Zero point return reverse limit signal (DI) assignment (bits 0 to 3). • These bits are valid only when 1 (Use the DI_2 signal) is set for Zero point return reverse limit signal selection (bit 1) of Hardware signal selection 2 (fixed parameter 21) and 1 (User selected) is set for Zero point return reverse limit signal (DI) assignment (bits 0 to 3).		
	Bits 8 to B	Zero point return forward limit signal (DI) assignment Specify whether to enable assigning a forward limit signal for zero point returns. 0: Fixed (DI_3 signal) 1: User selected If 1 (User selected) is set, the signal selected with Zero point return forward limit signal (DI) selection (bits C to F) is used for the forward limit signal. If 0 (Fixed (DI_3 signal)) is set, DI_3 is used as the forward limit signal. • These bits are valid only when 1 (Use the DI_2 signal) is set for Zero point return forward limit signal selection (bit 2) of Hardware signal selection 2 (fixed parameter 21).		
	Bits C to F	Zero point return forward limit signal (DI) selection Select the forward limit signal to use for zero point returns. 1: Use DI_1 signal 2: Use DI_2 signal 3: Use DI_3 signal 4: Use DI_4 signal These bits are valid only when 1 (User selected) is set for Zero point return forward limit signal (DI) assignment (bits 8 to B). • These bits are valid only when 1 (Use the DI_3 signal) is set for Zero point return forward limit signal selection (bit 2) of Hardware signal selection 2 (fixed parameter 21) and 1 (User selected) is set for Zero point return forward limit signal (DI) assignment (bits 8 to B).		

(4) Reference Unit Selection

No. 4 Reference unit selection	Setting Range	Setting Unit	Default Value
	0 to 3	–	0
Description	Set the unit for the reference. 0: pulse (electronic gear disabled) 1: mm 2: deg 3: inch The minimum reference unit is determined by this parameter and the Number of digits below decimal point (fixed parameter 5). If pulse is selected, the electronic gear ratio (fixed parameters 8 and 9) will be disabled. • Refer to *3.4.1 Reference Unit* on page 67 for details.		

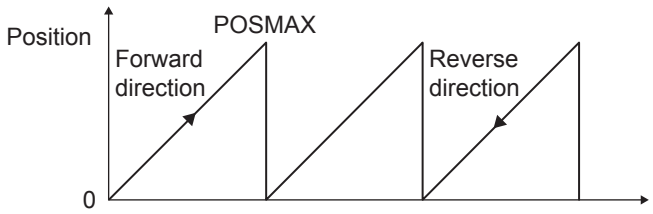
No. 5 Number of digits below decimal point	Setting Range	Setting Unit	Default Value
	0 to 5	–	3
Description	Set the number of digits below the decimal point in the reference unit. The minimum reference unit is determined by this parameter and the Reference unit selection (fixed parameter 4). Example: When the Reference unit is set to mm and the Number of digits below decimal point is set to 3, a reference unit of 1 will be 0.001 mm. The setting of this parameter is disabled if the Reference unit is set to pulse in fixed parameter 4. • Refer to *3.4.1 Reference Unit* on page 67 for details.		

No. 6 Travel distance per machine rotation	Setting Range	Setting Unit	Default Value
	1 to 2^{31}-1	Reference unit	10000
Description	Specify the load travel amount per load axis rotation in reference units. • Refer to *3.4.3 Electronic Gear* on page 68 for details.		

No. 8 Servo motor gear ratio	Setting Range	Setting Unit	Default Value
	1 to 65535	rev (revolutions)	1
Description	Set the gear ratio between the motor and the load. The following two values are set for a configuration in which the load shaft will turn n times in response to m turns of the motor shaft. • Gear ratio at Servomotor: m • Gear ratio at load: n The setting of this parameter is disabled if the Reference unit selection is set to pulse in fixed parameter 4. • Refer to *3.4.3 Electronic Gear* on page 68 for details.		

No. 9 Machine gear ratio	Setting Range	Setting Unit	Default Value
	1 to 65535	rev (revolutions)	1
Description	Same as for No. 8.		

(5) Infinite Length Axis Reset Position (POSMAX)

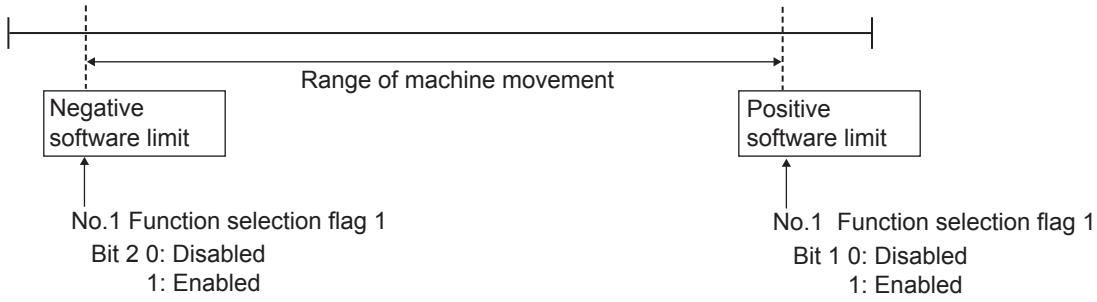
No. 10 Infinite length axis reset position (POSMAX)	Setting Range	Setting Unit	Default Value
	1 to 2^{31}-1	Reference unit	360000
Description	Set the reset position when an infinite length axis is set. Enabled when bit 0 of the Function selection flag 1 (fixed parameter 1) is set to infinite axis. The position data for infinite axes is controlled in the range from 0 to POSMAX.  • Refer to *3.4.2 Axis Type Selection* on page 67 for details.		

(6) Software Limits

No. 12 Positive software limit value		Setting Range	Setting Unit	Default Value
		-2^{31} to $2^{31}-1$	Reference unit	$2^{31}-1$
Description	Set the position to be detected for the software limit in the positive direction. If an axis attempts to move in the positive direction past the position set here, a positive software limit alarm (IB□□043) will occur. Enabled when bit 1 of the Forward software limit enabled (fixed parameter No. 1) is set to 1 (enabled).			

No. 14 Negative software limit value		Setting Range	Setting Unit	Default Value
		-2^{31} to $2^{31}-1$	Reference unit	-2^{31}
Description	Set the position to be detected for the software limit in the negative direction. If an axis attempts to move in the negative direction past the position set here, a negative software limit alarm (IB□□044) will occur. Enabled when bit 2 of the Reverse software limit enabled (fixed parameter No. 1) is set to 1 (enabled).			

Outline of Software Limit



- The software limit function is enabled only after completing a Zero point return or Zero point setting completed (bit 5 of IW□□0C is ON).
- Refer to *3.5 Software Limit Function* on page 75 for details.

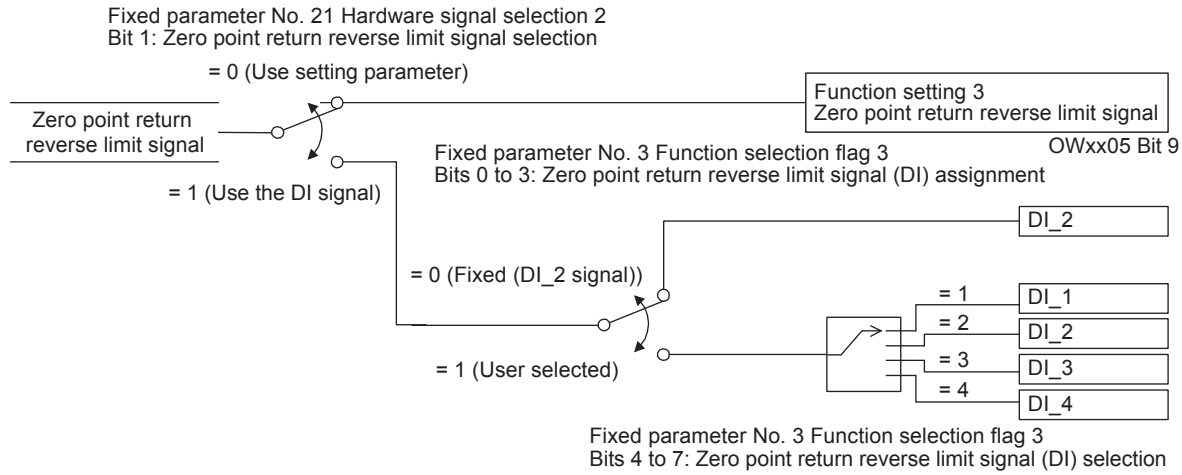
(7) Hardware Signal Selection 1

No. 20 Hardware signal selection 1		Setting Range	Setting Unit	Default Value
		–	–	0000H
Description	Bit 1*	C pulse input signal polarity selection Select the polarity of the phase-C pulse. 0: Positive logic 1: Negative logic The time required for the PO-01 Module to detect the C pulse input (DI_0) depends on the polarity that is set with this bit as follows: Positive logic: 50 µs max. Negative logic: 600 µs max. If you select 0 (Positive logic), the PO-01 Module will detect DI_0 in less time than if you select 1 (Negative logic). Therefore, if you use the C pulse input signal as a zero point return signal, selecting positive logic will produce higher positioning accuracy in zero point returns.		
	Bit 8	Pulse output signal polarity selection Select the reference pulse polarity. 0: Positive logic (default) 1: Negative logic The reference pulse form to be used is determined by the combination with the pulse output method selection (bits 9 and A). ♦ Refer to *2.2 PO-01 Module Reference Pulse Forms* on page 26 for details.		
	Bits 9 and A	Pulse output method selection Select the reference pulse output method. 00: Up/Down Counter 01: Pulse and Direction 10: 90-degree phase difference 1-phase pulse The reference pulse form to be used is determined by the combination with the pulse output signal polarity selection (bit 8). ♦ Refer to *2.2 PO-01 Module Reference Pulse Forms* on page 26 for details.		

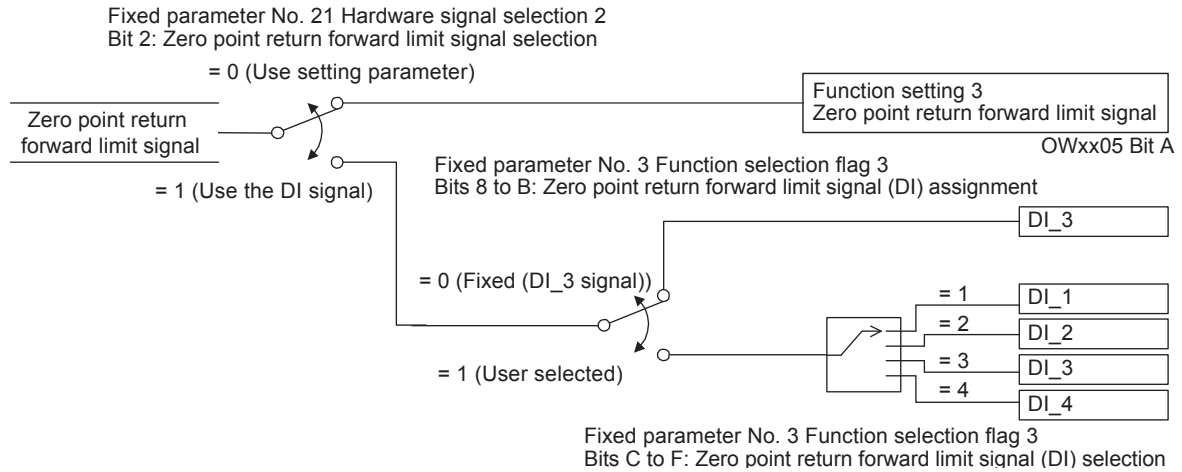
* All of the following are required to use C pulse input signal polarity selection (bit 1).
PO-01 software version: Version 1.08 or later
MPE720 version: Version 7.21 or later
Board revision: Revision A18 or later

■ Setting the Zero Point Return Limit Signals

■ Reverse Side



■ Forward Side



- If connecting the PO-01 module to a Yaskawa SERVOPACK, set either the fixed parameter or the SERVOPACK parameter as follows.
  - Fixed parameter No.20 (Hardware signal selection 1): 1 (Negative logic)
  - SERVOPACK parameter 1st digit of Pn000: 1 (CW for reverse rotation: reverse rotation mode)

(8) Hardware Signal Selection 2

No. 21 Hardware signal selection 2		Setting Range	Setting Unit	Default Value
		–	–	0000H
Description	Bit 0	Deceleration LS signal selection Select the signal to be used as DEC1. 0: Use the setting parameter No. 5 (OWoo05, bit 8: Zero point return deceleration LS signal (default). 1: Use DI_1 signal.		
	Bit 1	Zero point return reverse limit signal selection Select the signal to be used as the reverse rotation zone limit signal for zero point return. 0: Use the setting parameter No. 5 (OW□□05, bit 9: Zero point return reverse LS signal (default) 1: Use the DI_2 signal		
	Bit 2	Zero point return forward limit signal selection Select the signal to be used as the reverse rotation zone limit signal for zero point return. 0: Use the setting parameter No. 5 (OW□□05, bit A: Zero point return forward LS signal (default) 1: Use the DI_3 signal		
	Bit 4	Excitation ON output signal polarity selection 0: Positive logic (default) 1: Negative logic ♦ PO-01 Module version 1.07 or later is required to use the Excitation ON output signal polarity selection.		

■ Precautions in Using the Excitation ON Output Signal Polarity Selection

Observe the following procedures to use the Excitation ON output signal polarity selection.

- Turning the Power Supply ON and OFF for a Setting of 1 (Negative Logic)

  Turning ON the Power Supply

  After you turn ON the power supply to the MP2000-series Machine Controller, confirm that the Motion Controller is ready to operation (IW□□00, bit 0 = 1) before you turn ON the power supply to the pulse motor drive.

  - The Excitation ON output signal polarity selection for Negative logic is not valid until the MP2000-series Machine Controller has completed initialization. During initialization, there will be an excitation ON output for a pulse motor drive with negative logic. Therefore, the machine may perform unexpected operation.

  Turning OFF the Power Supply

  Turn OFF the power supply to the pulse motor drive before you turn OFF the power supply to the MP2000-series Machine Controller.

  - The Excitation ON output signal polarity selection for Negative logic is not valid if you turn OFF the power supply to the MP2000-series Machine Controller first. There will be an excitation ON output for a pulse motor drive with negative logic. Therefore, the machine may perform unexpected operation.

- Turn OFF the power supply to the pulse motor driver before you save the fixed parameters, transfer the Module configuration definitions to the MP2000-series Machine Controllers, or change the setting of the Excitation ON output signal polarity selection.

  If you change the setting of the Excitation ON output signal polarity selection, the polarity of the excitation ON output signal reverses as soon as the operation is performed.

  - As a result, the pulse motor drive will switch the excitation status as soon as the setting is changed, possibly causing the machine to perform unexpected operation.

(9) Pulse Output Maximum Frequency

No. 25 Pulse output maximum frequency		Setting Range	Setting Unit	Default Value
		1 to 400	10 kHz	400
Description	Set the maximum output frequency of reference pulse in units of 10 kHz. <Example> Set 400 for the maximum frequency 4000 kHz.			

(10) Encoder Settings

No. 34 Rated motor speed		Setting Range	Setting Unit	Default Value
		1 to 32000	min^{-1}	3000
Description	Set the rated motor speed in 1 min^{-1} units. Set this parameter based on the specifications of the motor that is used. • Refer to *3.4.5 Speed Reference* on page 70 for details.			
No. 36 Number of pulses per motor rotation		Setting Range	Setting Unit	Default Value
		1 to 2^{31}-1	pulse	200
Description	Set the number of pulses per motor rotation. Set the value according to the specifications of the motor so the the set value is actual number of pulses needed for the motor to rotate once. (For example, if a motor rotates once per 1000 pulses, set the number of pulses to 1000.) • Refer to *3.4.5 Speed Reference* on page 70 for details.			

3.3.2 Setting Parameter Details

- The motion setting parameters are listed in *3.2.3 Setting Parameter List* on page 42.
- Register number OW□□00 indicates the leading output register number + 00. Other register numbers listed below indicate output register numbers in the same way.
- Refer to *3.2.2 PO-01 Motion Parameter Register Numbers* on page 41 for information on how to find the leading output register number.

(1) Run Commands

OW□□00 Run command setting			Setting Range	Setting Unit	Default Value
			–	–	0000H
Description	Bit 0	Servo ON Sends a SERVO ON command to the SERVOPACK. (DO_0 turns ON.) 0: Servo OFF (default) 1: Servo ON			
	Bit 1	Machine lock Sets or releases the machine lock mode. 0: Normal operation (default) 1: Machine lock During the machine lock mode, the Target position (CPOS) (monitoring parameter IL□□10) will be updated but no movement will occur on the axis. A change in the machine lock mode is valid after all pulses have been distributed.			
	Bit 6	POSMAX preset Resets the Number of POSMAX turns (monitoring parameter IL□□1E) to the value set for the Number of POSMAX turns presetting data (setting parameter OL□□4C). 0: POSMAX Preset OFF (default) 1: POSMAX Preset ON			
	Bit F	Alarm clear Clear alarms at rising edge of this bit. 0: Alarm clear OFF (default) 1: Alarm clear ON • Do not execute Alarm clear during axis movement using motion commands. Using Alarm clear may affect axis movement.			

(2) Function Setting 1

OW□□03 Function setting 1			Setting Range	Setting Unit	Default Value
			–	–	0011H
Description	Bit 0 to Bit 3	Speed unit Set the unit for speed references. 0: Reference units/sec 1: 10^n reference units/min (default) (n = number of decimal places/fixed parameter 5) 2: Percentage (%) of rated speed (1 = 0.01%) • Refer to *3.4.5 Speed Reference* on page 70 for details.			
	Bit 4 to Bit 7	Acceleration unit Set whether to specify acceleration/deceleration rates or acceleration/deceleration time constants for acceleration/deceleration commands. 0: Acceleration/deceleration rate (reference units/s^2) 1: Acceleration/deceleration time constant (ms) (default) • Refer to *3.4.6 Acceleration/Deceleration Settings* on page 72 for details.			
	Bit 8 to Bit B	Filter type Set the acceleration/deceleration filter type. 0: No filter (default) 1: Exponential acceleration/deceleration filter 2: Moving average filter • Refer to *3.4.7 Acceleration/Deceleration Filter Settings* on page 74 for details.			

(3) Function Setting 3

OW□□05 Function setting 3			Setting Range	Setting Unit	Default Value
			–	–	0000H
Description	Bit 8	Zero point return deceleration LS signal Set the zero point return deceleration LS signal (DEC1) to ON or OFF. 0: OFF (default) 1: ON • This bit is valid when the fixed parameter No. 21, bit 0 (Deceleration LS Signal Selection) is set to 0 (Use the setting parameter).			
	Bit 9	Reverse limit signal for zero point return Set the zero point return reverse zone signal output to ON or OFF. 0: OFF (default) 1: ON • This bit is valid when the fixed parameter No. 21, bit 1 (Zero point return reverse limit signal) is set 0 (Use the setting parameter).			
	Bit A	Forward limit signal for zero point return Set the zero point return forward zone signal output to ON or OFF. 0: OFF (default) 1: ON • This bit is valid when the fixed parameter No. 21, bit 2 (Zero point return forward limit signal) is set to 0 (Use the setting parameter).			
	Bit B	Zero point return INPUT signal This bit functions as the INPUT signal when INPUT or INPUT + phase-C signal is used as the zero point return method. 0: INPUT signal OFF (default) 1: INPUT signal ON • All of the following are required to use this bit. Refer to *Appendix Confirming the Software Version and Board Revision* for the confirmation methods for the PO-01 Module's software version and board revision. PO-01 software version: Ver. 1.08 or later MPE720 version: Version 7.21 or later Board revision: Revision A18 or later			

(4) Motion Command

OW□□08 Motion command					Setting Range	Setting Unit	Default Value
					0 to 65535	–	0
Description	Set a motion command. 0: NOP — No command 1: POSING — Positioning 3: ZRET — Zero point return 4: INTERPOLATE — Interpolation 5: ENDOF_INTERPOLATE — Reserved for system use 7: FEED — JOG operation 8: STEP — STEP operation 9: ZSET — Zero point setting 10: ACC — Reserved for system use 11: DCC — Reserved for system use 12: SCC — Reserved for system use ◆ Refer to *Chapter 4 Motion Commands* on page 77 for details.						

(5) Motion Command Control Flag

OW□□09 Motion command control flag		Setting Range	Setting Unit	Default Value
		–	–	0000H
Description	Bit 0	Command pause The axis will decelerate to a stop if this bit is changed to 1 while an axis is moving for the positioning or the STEP operation. 0: Command Pause OFF (default) 1: Command Pause ON While this bit is 1, the command is held. When this bit is changed to 0, the hold is canceled and positioning restarts. After the axis has been stopped, the Command hold completed bit will turn ON in the Motion Command Status (monitoring parameter IW□□09, bit 1).		
	Bit 1	Command abort 0: Command Abort OFF (default) 1: Command Abort ON The axis will decelerate to a stop if this bit is changed to 1 while an axis is moving during positioning, zero point return, JOG operation, or STEP operation, and the remaining movement will be canceled.		
	Bit 2	JOG/STEP direction Set the movement direction for JOG or STEP. 0: Forward (default) 1: Reverse		
	Bit 3	Zero point return direction Set the direction to move for zero point return. This setting is valid for zero point return using DEC1 + ZERO method. 0: Reverse (default) 1: Forward		
	Bit 5	Position reference type Specify whether the value set for the Position reference setting (setting parameter OL□□1C) is an Incremental Addition Mode value (calculated by adding the movement amount to the current position) or an Absolute Mode value (an absolute position). 0: Incremental addition mode (default) 1: Absolute mode Always set this parameter to Incremental Addition Mode when using motion programs or infinite axes.		

(6) Motion Subcommands

OW□□0A Motion subcommand		Setting Range	Setting Unit	Default Value
		0 to 5	–	0
Description	Set the motion subcommand that can be used with the motion command. 0: NOP — No command 5: FIXPRM_RD — Read fixed parameters ◆ Refer to *4.3 Motion Subcommands* on page 150 for details.			

(7) Speed Reference Setting

OL□□10 Speed reference setting	Setting Range	Setting Unit	Default Value
	-2^{31} to $2^{31}-1$	Depends on the Speed unit selection (OW□□03, bits 0 to 3)	3000

Description

Set the speed reference.

This parameter is used by the following commands. Refer to *Chapter 4 Motion Commands* on page 77 for details.

- 1: POSING Positioning
- 3: ZRET Zero point return
- 7: FEED JOG operation
- 8: STEP STEP operation

- The setting unit for this parameter depends on the Speed unit selection (OW□□03, bits 0 to 3), but the result of applying the speed unit setting is not shown here.
- Refer to *3.4.5 Speed Reference* on page 70 for details.

(8) Override

OW□□18 Override	Setting Range	Setting Unit	Default Value
	0 to 32767	0.01 %	10000

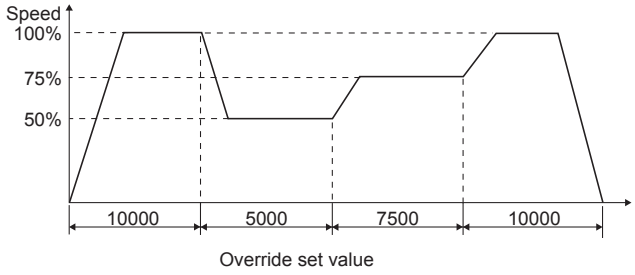
Description

Set the percentage of the Speed reference setting (OL□□10) to output in units of 0.01 %.

- The override value is always enabled. Set to 10000 (fixed) when not using the override function.

Speed reference setting (OL□□10) × Override (OW□□18) = Output speed

This parameter can be changed at any time to any value during execution of speed reference, and acceleration/deceleration is performed immediately according to the set value.



When the override is set to 0, the output speed is 0 and the motor will not operate.

- Refer to *3.4.5 Speed Reference* on page 70 for details.

(9) Bias Speed

OW□□19 Bias speed	Setting Range	Setting Unit	Default Value
	0 to 32767	Depends on the Speed unit selection (OW□□03, bits 0 to 3)	0

Description

Set the speed reference offset value.

This parameter is used by the following commands. Refer to *Chapter 4 Motion Commands* on page 77 for details.

- 1: POSING Positioning
- 3: ZRET Zero point return
- 7: FEED JOG operation
- 8: STEP STEP operation

- If feed speed × override < bias speed (OW□□19), the feed speed will be increased to the bias speed.
- The setting unit for this parameter depends on the Speed unit selection (OW□□03, bits 0 to 3), but the result of applying the speed unit setting is not shown here.

(10) Position Reference Setting

OL□□1C Position reference setting		Setting Range	Setting Unit	Default Value
		-2^{31} to $2^{31}-1$	Reference unit	0
Description	Set the position reference. This parameter is used for the following command. 1: POSING Positioning 4: INTERPOLATE Interpolation ■ Related Parameters OW□□09, bit 5 Position reference type ♦ Refer to *3.4.4 Position Reference* on page 69 for details.			

(11) NEAR Signal Output Width

OL□□20 NEAR signal output width		Setting Range	Setting Unit	Default Value
		0 to 65535	Reference unit	0
Description	Position proximity (IW□□0C, bit 3) will be turned ON when the absolute value of the difference between the Machine coordinate system reference position (MPOS) and the Machine coordinate system feedback position (APOS) is within the range set here. ♦ Be aware that the machine coordinate system feedback position (APOS) of the PO-01 Module will be the turnaround position for the reference position from the previous scan.			

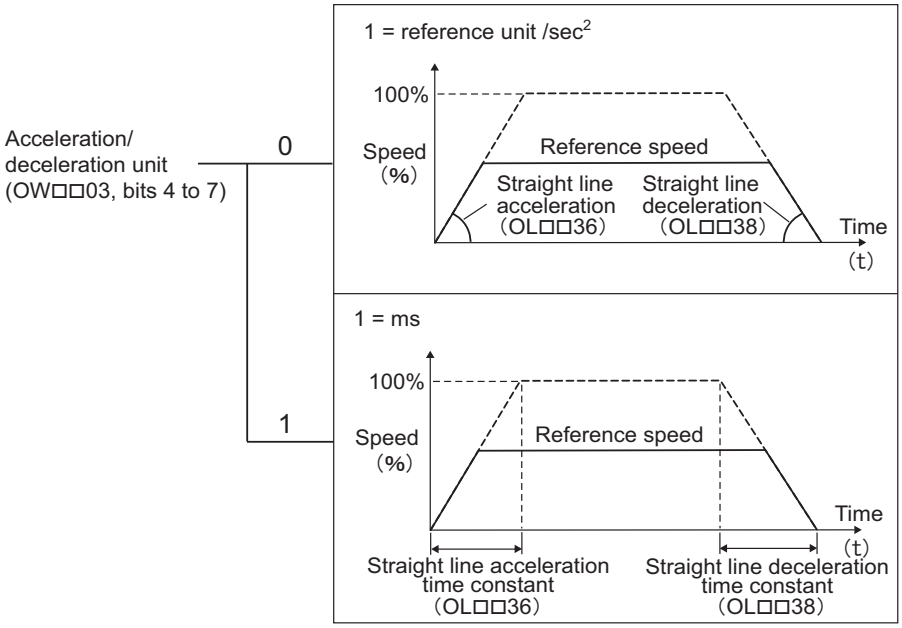
(12) Acceleration/Deceleration Settings

OL□□36 Straight-line acceleration/Acceleration time constant		Setting Range	Setting Unit	Default Value
		0 to $2^{31}-1$	Acceleration/deceleration units (setting parameter OW□□03, bits 4 to 7)	0
Description	Set the linear acceleration rate or linear acceleration time constant. ♦ The setting unit for this parameter depends on the Acceleration/deceleration units (OW□□03, bits 4 to 7), but the result of applying the acceleration/deceleration unit setting is not shown here.			
OL□□38 Straight-line deceleration/Deceleration time constant		Setting Range	Setting Unit	Default Value
		0 to $2^{31}-1$	Acceleration/deceleration units (setting parameter OW□□03, bits 4 to 7)	0
Description	Set the linear deceleration rate or linear deceleration time constant. ♦ The setting unit for this parameter depends on the Acceleration/deceleration unit (OW□□03, bits 4 to 7), but the result of applying the acceleration/deceleration unit setting is not shown here.			

The following two methods can be used to specify the acceleration/deceleration speed.

1. Setting the acceleration/deceleration speed
2. Setting the time to reach the rated speed from zero speed.

   For this method, the setting range is 0 to 32,767 ms. A setting parameter error will occur if the setting exceeds 32,767.



- Refer to *3.4.6 Acceleration/Deceleration Settings* on page 72 for details.

(13) Filter

OW□□3A Filter time constant		Setting Range	Setting Unit	Default Value
		0 to 65535	0.1 ms	0
Description	Set the acceleration/deceleration filter time constant. Always make sure that pulse distribution has been completed (i.e., that monitoring parameter IB□□0C0 is ON) before changing the time constant.			

OW□□3B Bias speed for index deceleration/acceleration filter		Setting Range	Setting Unit	Default Value
		0 to 32767	Depends on the Speed Units	100
Description	Set the bias speed for the exponential acceleration/deceleration filter. • The setting unit for this parameter depends on the Speed units (OW□□03, bits 4 to 7), but the result of applying the speed unit setting is not shown here.			

- There are two types of acceleration/deceleration filter: an exponential acceleration/deceleration filter and a moving average filter.
- Refer to *3.4.7 Acceleration/Deceleration Filter Settings* on page 74 for details.

(14) Zero Point Return

OW□□3C Zero point return method	Setting Range	Setting Unit	Default Value
	0 to 19	–	2
Description	Set the operation method when the Zero Point Return (ZRET) motion command is executed. The following 16 methods are available. 0: DEC1 + C-phase pulse* 1: ZERO signal* 2: DEC1 + ZERO signal 3: C-phase pulse* 4: DEC2 + ZERO signal 5: DEC1 + LMT + ZERO signal 6: DEC2 + C-phase pulse* 7: DEC1 + LMT + C-phase pulse* 11: C Pulse Only* 12: P-OT & C-phase pulse* 13: P-OT Only* 14: HOME LS & C-phase pulse* 16: N-OT & C-phase pulse* 17: N-OT Only* 18: INPUT & C-phase pulse* 19: INPUT Only* * All of the following are required to use these methods. Refer to *Appendix Confirming the Software Version and Board Revision* for the confirmation methods for the PO-01 Module's software version and board revision. PO-01 software version: Version 1.08 or later MPE720 version: Version 7.21 or later Board revision: Revision A18 or later Refer to *4.2.2 Zero Point Return (ZRET)* on page 84 for details on each zero point return method.		

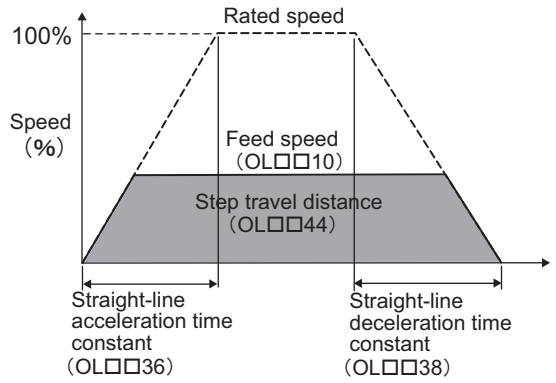
OW□□3D Width of starting point position output	Setting Range	Setting Unit	Default Value
	0 to 65535	Reference unit	100
Description	Set the width in which the Zero point position (monitoring parameter IW□□0C, bit 4) will be ON.		

OL□□3E Approach speed	Setting Range	Setting Unit	Default Value
	-2^{31} to $2^{31}-1$	Depends on the Speed Units	1000
Description	Set the approach speed for a zero point return operation after the deceleration LS is passed. • The setting unit for this parameter depends on the Speed units (OW□□03, bits 0 to 3), but the result of applying the speed unit setting is not shown here.		

OL□□40 Creep speed	Setting Range	Setting Unit	Default Value
	-2^{31} to $2^{31}-1$	Depends on the Speed Units	500
Description	Set the creep speed for a zero point return operation after the ZERO signal is detected. • The setting unit for this parameter depends on the Speed units (OW□□03, bits 0 to 3), but the result of applying the speed unit setting is not shown here.		

OL□□42 Zero point return travel distance	Setting Range	Setting Unit	Default Value
	-2^{31} to $2^{31}-1$	Reference unit	0
Description	Set the distance from where the ZERO signal is detected to the zero point position.		

(15) STEP Travel Distance

OL□□44 Step travel distance	Setting Range	Setting Unit	Default Value
	0 to 2^{31}-1	Reference unit	1000
Description	Set the moving amount for STEP commands.  • Refer to *4.2.5 STEP Operation (STEP)* on page 144 for details on STEP commands.		

(16) Coordinate System Settings

OL□□48 Zero point position in machine coordinate system offset	Setting Range	Setting Unit	Default Value
	-2^{31} to 2^{31}-1	Reference unit	0
Description	Set the offset to shift the machine coordinate system. • This parameter is always enabled, so be sure that the setting is correct.		
OL□□4A Work coordinate system offset	Setting Range	Setting Unit	Default Value
	-2^{31} to 2^{31}-1	Reference unit	0
Description	Set the offset to shift the work coordinate system. • This parameter is always enabled, so be sure that the setting is correct.		
OL□□4C Number of POSMAX turns presetting data	Setting Range	Setting Unit	Default Value
	-2^{31} to 2^{31}-1	Rev	0
Description	When the POSMAX preset (setting parameter OW□□00, bit 6) is set to 1 (ON), the value set here will be preset as the Number of POSMAX turns (monitoring parameter IL□□1E).		

(17) Supplemental Information

OW□□5C Fixed parameter number	Setting Range	Setting Unit	Default Value
	-2^{31} to 2^{31}-1	Reference unit	0
Description	Set the number of the fixed parameter whose set value to be displayed in the monitoring parameter IL□□56 (Fixed parameter monitor). • This parameter is valid when OW□□0A (Motion subcommand) is set to 5 (Read fixed parameter).		

(18) General-purpose DOs

OW□□5D General-purpose DO	Setting Range	Setting Unit	Default Value
	–	–	–
Description	Set the general-purpose DO_1 to DO_3 to ON or OFF. Bit 0: Reserved for system use Bit 1: Set the DO_1 to ON or OFF. 0: OFF (default) 1: ON Bit 2: Set the DO_2 to ON or OFF. 0: OFF (default) 1: ON Bit 3: Set the DO_3 to ON or OFF. 0: OFF (default) 1: ON		

3.3.3 Motion Monitoring Parameter Details

The motion monitoring parameter details are listed in the following tables.

- The motion monitoring parameters are listed in *3.2.4 Monitoring Parameter List* on page 44.
- Register number IW□□00 indicates the leading number of the input register + 00. Other register numbers listed below indicate input register numbers in the same way.
- Refer to *3.2.2 PO-01 Motion Parameter Register Numbers* on page 41 for information on how to find the leading input register number.

(1) Run Status

IW□□00 Run status		Setting Range	Setting Unit
		–	–
Description	Bit 0	Run ready 0: Operation not ready 1: Operation ready This bit turns ON when RUN preparations for the Motion Module have been completed. This bit will be OFF under the following conditions: ・Major damage has occurred. ・Axis that is not used was selected. ・Motion fixed parameter setting error ・Motion fixed parameters are being changed. ・The Motion Parameter Window (PO-01 Definitions Window) is being opened using the MPE720.
	Bit 1	Running (Servo ON) This bit is ON while the axis is in Servo ON status. OFF: Stopped ON: Running (Servo ON)

(2) Over Range Parameter Number

IW□□01 Parameter number when range over is generated	Setting Range	Setting Unit
	0 to 65535	–
Description	Stores the number of a parameter set outside the setting range. ・Setting parameters: 0 or higher ・Fixed Parameters: 1000 or higher This parameter stores the number of the setting or fixed parameter that exceeds the setting range either individually or in combination with the settings of other parameters. When motion fixed parameters are used, the parameter stores the parameter number plus 1000.	

(3) Warning

IL□□02 Warning		Setting Range	Setting Unit
		–	–
Description	Bit 1	Setting parameter error 0: In setting range 1: Outside setting range This bit turns ON when one or more motion setting parameters is set outside the setting range. The number of the parameter for which the value is out of range is stored as the Parameter number when range over is generated (monitoring parameter IW□□01).	
	Bit 2	Fixed parameter error 0: In setting range 1: Outside setting range This bit turns ON when one or more motion setting parameters is set outside the motion fixed parameter setting range. The number of the most recent out-of-range parameter is stored as the Parameter number when range over is generated (monitoring parameter IW□□01).	
	Bit 4	Motion command setting error 0: Command setting normal 1: Command setting error This bit turns ON when a motion command that cannot be used is set.	

(4) Alarm

IL□□04 Alarm		Setting Range	Setting Unit
		–	–
Description	Bit 1	Positive overtravel 0: No positive overtravel 1: Positive overtravel occurred This bit turns ON when the positive overtravel signal has been input and a move command is executed in the positive direction. • It occurs for some of the zero point return methods. For details, refer to *4.2.2 Zero Point Return (ZRET)* on page 84.	
	Bit 2	Negative overtravel 0: No negative overtravel 1: Negative overtravel occurred This bit turns ON when the negative overtravel signal has been input and a move command is executed in the negative direction. • It occurs for some of the zero point return methods. For details, refer to *4.2.2 Zero Point Return (ZRET)* on page 84.	
	Bit 3	Positive soft limit (positive software limit) 0: In positive software limit range 1: Not in positive software limit range This bit turns ON if a move command that exceeds the positive software limit is executed with the following conditions: A finite axis is selected, the positive software limit is enabled, and a zero point return operation has been completed. • Refer to *3.5 Software Limit Function* on page 75 for details.	
	Bit 4	Negative soft limit (negative software limit) 0: In negative software limit range 1: Not in negative software limit range This bit turns ON if a move command that exceeds the negative software limit is executed with the following conditions: A finite axis is selected, the negative software limit is enabled, and a zero point return operation has been completed. • Refer to *3.5 Software Limit Function* on page 75 for details.	
	Bit 5	Servo OFF 0: Servo ON 1: Servo OFF This bit turns ON when a move command is executed during Servo OFF status.	
	Bit 8	Excessive speed 0: Speed normal 1: Excessive speed This bit turns ON when the output exceeds the value set for the fixed parameter No. 25 (Pulse output maximum frequency).	
	Bit E	Zero point not set 0: Zero point already set 1: Zero point not set This bit turns ON if a move command other than JOG and STEP is executed without setting the zero point for the axis defined as an infinite length axis.	

(5) Motion Command Response Code

IW□□08 Motion command response code	Setting Range	Setting Unit
	0 to 65535	–
Description	Stores the motion command code for the command that is currently being executed. This is the motion command code that is currently being executed and is not necessarily the same as the Motion command (setting parameter OW□□08).	

(6) Motion Command Status

IW□□09 Motion command status		Setting Range	Setting Unit
		–	–
Description	Bit 0	Command executing flag (BUSY) 0: READY (completed) 1: BUSY (processing) This bit indicates the motion command status. Refer to *Chapter 4 Motion Commands* on page 77 for details on command timing charts. This bit turns ON during execution of commands that have been completed or during abort processing.	
	Bit 1	Command hold completed (HOLD) 0: Command hold processing not completed 1: Command hold completed This bit turns ON when command hold processing has been completed. Refer to *Chapter 4 Motion Commands* on page 77 for details on command timing charts.	
	Bit 3	Command error occurrence (FAIL) 0: Normal completion 1: Abnormal completion This bit turns ON if motion command processing does not complete normally. If motion command execution ends in an error, the axis will stop any motion. Refer to *Chapter 4 Motion Commands* on page 77 for details on command timing charts.	
	Bit 8	Command execution completed (COMPLETE) 0: Normal execution not completed 1: Normal execution completed This bit turns ON when motion command processing was completed normally. Refer to *Chapter 4 Motion Commands* on page 77 for details on command timing charts.	

(7) Subcommand Response Code

IW□□0A Subcommand response code	Setting Range	Setting Unit
	0 to 65535	–
Description	Stores the motion subcommand code for the command that is being executed. This is the motion subcommand code that is currently being executed and is not necessarily the same as the Motion subcommand (setting parameter OW□□0A).	

(8) Subcommand Status

IW□□0B Subcommand status		Setting Range	Setting Unit
		–	–
Description	Bit 0	Command executing flag (BUSY) 0: READY (completed) 1: BUSY (processing) This bit indicates the motion subcommand status. This bit turns ON during execution of commands that have been completed or during abort processing.	
	Bit 3	Command error occurrence (FAIL) 0: Normal completion 1: Abnormal completion This bit turns ON if motion subcommand processing does not complete normally.	
	Bit 8	Command execution completed (COMPLETE) 0: Normal execution not completed 1: Normal execution completed This bit turns ON when motion subcommand processing was completed normally.	

(9) Position Management Status

IW□□0C Position management status		Setting Range	Setting Unit
		–	–
Description	Bit 0	Distribution completed (DEN) 0: Distributing pulses. 1: Distribution completed. This bit turns ON when pulse distribution has been completed for a move command.	
	Bit 1	Positioning completed (POSCOMP) 0: Outside Positioning Completed Width. 1: In Positioning Completed Width. This bit turns ON when pulse distribution has been completed and the current position is within the Positioning Completed Width.	
	Bit 3	Position proximity (NEAR) 0: Outside position proximity range. 1: In position proximity range. The operation of this bit depends on the setting of NEAR signal output width (setting parameter OL□□20). ・OL□□20 = 0: This bit turns ON when pulse distribution has been completed (monitoring parameter IB□□0C0, bit 0). ・OL□□20 ≠ 0: This bit turns ON when the current position is within the setting of NEAR signal output width even if pulse distribution has not been completed.	
	Bit 4	Zero point position (ZERO) 0: Outside zero point position range 1: In zero point position range. This bit turns ON when the Machine coordinate system reference position (MPOS) (monitoring parameter IL□□12) is within the range of the Width of starting point position output (setting parameter OW□□3D) from the zero point position.	
	Bit 5	Zero point return (setting) completed (ZRNC) 0: Zero point return (setting) not completed. 1: Zero point return (setting) completed. This bit turns ON when a zero point return (setting) has been completed. This bit turns OFF when a new zero point return (setting) operation is started.	
	Bit 6	Machine lock ON (MLKL) 0: Machine lock mode released. 1: Machine lock mode. This bit turns ON when the Machine Lock bit is set to 1 in the RUN command setting (setting parameter OW□□00, bit 1) and the axis has actually entered machine lock mode.	
	Bit 9	POSMAX turn number presetting completed (TPRSE) 0: Preset not completed. 1: Preset completed. This bit turns ON when the POSMAX preset bit in the Run command setting (setting parameter OW□□00, bit 6) is set to 1 and the Number of POSMAX turns has been preset with the Number of POSMAX turns presetting data (setting parameter OL□□4C).	

(10) Position Information

IL□□0E Target position in machine coordinate system (TPOS)	Setting Range	Setting Unit
	-2^{31} to $2^{31}-1$	Reference unit
Description	Stores the target position in the machine coordinate system managed by the Motion Module. This is the target position per scan for INTERPOLATE command. ・This parameter will be set to 0 when the power supply is turned ON. ・The data is updated even when the machine lock mode is enabled. ・ This parameter will not be reset even when an infinite length axis type is selected.	

IL□□10 Calculated position in machine coordinate system (CPOS)	Setting Range	Setting Unit
	-2^{31} to $2^{31}-1$	Reference unit
Description	Stores the calculated position in the machine coordinate system managed by the Motion Module. The position data stored in this parameter is the target position for each scan. ・This parameter will be set to 0 when the power supply is turned ON. ・The data is updated even when the machine lock mode is enabled. ・When an infinite length axis type is selected, a range of 0 to (Infinite length axis reset position (POSMAX) (fixed parameter 10) – 1) is stored.	

IL□□12 Machine coordinate system reference position (MPOS)	Setting Range	Setting Unit
	-2^{31} to $2^{31}-1$	Reference unit
Description	Stores the reference position in the machine coordinate system managed by the Motion Module. ・This parameter will be set to 0 when the power supply is turned ON. ・This data is not updated when the machine lock mode is enabled. (When the machine lock mode is enabled, the position reference data is not output externally.) ・When the machine lock mode function is not used, this position is the same as that in IL□□10.	

IL□□14 32-bit coordinate system position (DPOS)	Setting Range	Setting Unit
	-2^{31} to $2^{31}-1$	Reference unit
Description	Stores the reference position in the machine coordinate system managed by the Motion Module. ・When a finite length axis type is selected, this position is the same as that in IL□□10 (CPOS). ・For both finite and infinite length axes, the value is updated between -2^{31} and $2^{31}-1$.	

IL□□16 Machine coordinate system feedback position (APOS)	Setting Range	Setting Unit
	-2^{31} to $2^{31}-1$	Reference unit
Description	Stores the feedback position in the machine coordinate system managed by the Motion Module. The PO-01 Module has no interface to acquire the feedback position. To keep the compatibility with the PO-01 Module and the other Motion Modules, the PO-01 Module uses the reference position from the previous scan instead of the feedback position data. ・This parameter will be set to 0 when a Zero Point Return (ZRET) is executed. ・When an infinite length axis type is selected, a range of 0 to (Infinite length axis reset position (POSMAX) (fixed parameter 10) – 1) is stored.	

IW□□1E Number of POSMAX turns	Setting Range	Setting Unit
	-2^{31} to $2^{31}-1$	rev
Description	This parameter is valid for an infinite length axis. The count stored in this parameter goes up and down every time the current position exceeds the Infinite length axis reset Position (fixed parameter 10).	

(11) Reference Monitor

IL□□20 Speed reference output monitor	Setting Range	Setting Unit
	-2^{31} to $2^{31}-1$	Reference unit/High scan
Description	Stores the speed reference that is being output.	

(12) Supplemental Information

IL□□56 Fixed parameter monitor		Setting Range	Setting Unit
		-2^{31} to $2^{31}-1$	–
Description	Stores the data of the specified fixed parameter number. This parameter stores the data of the fixed parameter when the Read Fixed Parameter (FIXPRM-RD) is selected in the Motion subcommand (setting parameter OW□□0A).		

(13) General-Purpose DI Monitor

IW□□58 General-purpose DI monitor			Setting Range	Setting Unit
			–	–
Description	Bit 0	General-purpose DI_0 This bit turns ON when the general-purpose DI_0 is being input. 0: General-purpose DI_0 not input 1: General-purpose DI_0 being input		
	Bit 1	General-purpose DI_1 This bit turns ON when the general-purpose DI_1 is being input. 0: General-purpose DI_1 not input 1: General-purpose DI_1 being input		
	Bit 2	General-purpose DI_2 This bit turns ON when the general-purpose DI_2 is being input. 0: General-purpose DI_2 not input 1: General-purpose DI_2 being input		
	Bit 3	General-purpose DI_3 This bit turns ON when the general-purpose DI_3 is being input. 0: General-purpose DI_3 not input 1: General-purpose DI_3 being input		
	Bit 4	General-purpose DI_4 This bit turns ON when the general-purpose DI_4 is being input. 0: General-purpose DI_4 not input 1: General-purpose DI_4 being input		

3.4 Setting Examples of Motion Parameters for the Machine

Set the following seven motion parameters to enable motion control that suits the machine's specifications.

- Reference unit
- Axis Type (Finite length axis/Infinite length axis)
- Electronic Gear
- Position Reference
- Speed Reference
- Acceleration/Deceleration Settings
- Acceleration/Deceleration Filter Settings

The following tables provide details of setting examples for the above items.

3.4.1 Reference Unit

Pulses, millimeters, degrees, or inches can be used as the reference unit for motion control. The reference unit is specified in Reference unit selection (motion fixed parameter 4).
The minimum reference unit that can be specified is determined by the setting of Number of digits below decimal point (motion fixed parameter 5).
The following table shows the smallest reference unit determined by the Number of digits below decimal point and by the Reference unit selection.

Motion Fixed Parameter 5: Number of Digits Below Decimal Point	Motion Fixed Parameter 4: Reference Unit Selection			
	0: pulse	1: mm	2: deg	3: inch
0: 0 digits	1 pulse	1 mm	1 deg	1 inch
1: 1 digits	1 pulse	0.1 mm	0.1 deg	0.1 inch
2: 2 digits	1 pulse	0.01 mm	0.01 deg	0.01 inch
3: 3 digits	1 pulse	0.001 mm	0.001 deg	0.001 inch
4: 4 digits	1 pulse	0.0001 mm	0.0001 deg	0.0001 inch
5: 5 digits	1 pulse	0.00001 mm	0.00001 deg	0.00001 inch

Minimum reference unit

3.4.2 Axis Type Selection

There are two types of position control: Finite Length Position Control that is performed within a specified range, and Infinite Length Position Control that is performed without a specified range. Infinite length position control can reset the position to 0 after one rotation, e.g, belt conveyors, or move in one direction only, without resetting position after one rotation. The Axis type selection (motion fixed parameter 1, bit 0) sets which of these types of position control is to be used. When the axis type is set to infinite length axis, set the reset position of the infinite length axis in the fixed parameter No. 10 (Infinite length axis reset position (POSMAX)).
The details of the Axis type selection are listed in the following table.

Parameter No. (Register No.)	Name	Description	Default Value
No. 1, bit 0	Function selection flag 1, Axis type selection	Specify the position control method for the controlled axis. 0: Finite Length Axis Set a finite length axis if control is performed within a limited length or for an axis that uses infinite length control in one moving direction only without resetting the position every rotation. 1: Infinite Length Axis Set an infinite length axis for an axis that uses infinite length control while resetting the position every rotation.	0
No. 10	Infinite length axis reset position (POSMAX)	Set the reset position of the position data when an infinite length axis has been set for the axis type using the reference unit.	360000

3.4.3 Electronic Gear

In contrast to the reference unit input to the Machine Controller, the moving unit in the mechanical system is called the "output unit." The electronic gear converts position or speed units from reference units to output units for the mechanical system without going through an actual mechanism, such as a gear.
When the axis at the motor has rotated m times and the mechanical configuration allows the axis at the load to rotate n times, this electronic gear function can be used to make the reference unit equal to the output unit.
The electronic gear function is enabled when the following settings are made:

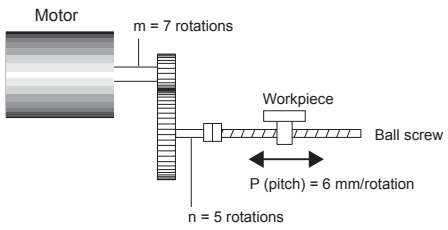
- Fixed Parameter 6: Travel distance per machine rotation
- Fixed Parameter 8: Servo motor gear ratio
- Fixed Parameter 9: Machine gear ratio

- The electronic gear is disabled when pulse is specified as the Reference Unit.

The following setting example uses ball screw and rotating table workpieces.

(1) Parameter Setting Example When Using a Ball Screw

- Machine specifications: Ball screw axis rotates 5 times for each 7 rotations of the motor shaft (see the figure on the right).
- Reference unit: 0.001 mm

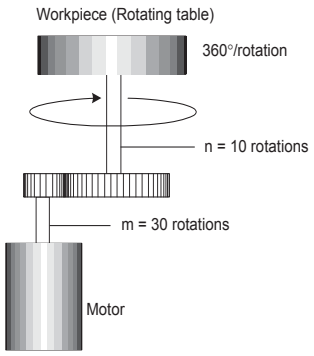


To move the workpiece 0.001 mm for 1 reference unit input under the conditions outlined above, i.e., for 1 reference unit = 1 output unit, make the following settings for fixed parameters 6, 8, and 9.

- Fixed Parameter 6: Travel distance per machine rotation = 6 mm/0.001 mm = 6000 (reference units)
- Fixed Parameter 8: Servo motor gear ratio = m = 7
- Fixed Parameter 9: Machine gear ratio = n = 5
  - Set the SERVOPACK gear ratio to 1:1.

(2) Parameter Setting Example When Using a Rotating Table

- Machine specifications: Rotating table axis rotates 10 times for each 30 rotations of the motor shaft (see the figure on the right).
- Reference unit: 0.1°



To rotate the table 0.1° for 1 reference unit input under the conditions outlined above, i.e., for 1 reference unit = 1 output unit, make the following settings for fixed parameters 6, 8, and 9.

- Fixed Parameter 6: Travel distance per machine rotation = 360°/0.1° = 3600 (reference units)
- Fixed Parameter 8: Servo motor gear ratio = m = 30
- Fixed Parameter 9: Machine gear ratio = n = 10
  - The gear ratio for fixed parameters 8 and 9 (m/n) may be constant, e.g., m = 3 and n = 1.
  - Set the SERVOPACK gear ratio to 1:1.

3.4.4 Position Reference

The target position value for position control is set for the Position reference setting (motion setting parameter OL□□1C). There are two methods that can be set for using the Position Reference Setting: Absolute Mode to set directly the coordinate of the target position value as an absolute value or Incremental Addition Mode to add the moving amount from the previous position reference value as a incremental value.
The following table lists the parameter details relating to position references.

Setting Parameter Register No.	Name	Description	Default Value
OW□□09, Bit 5	Position reference type	Specify the type of position data. 0: Incremental Addition Mode Adds the present moving amount value to the previous value of OL□□1C and sets the result in OL□□1C. 1: Absolute Mode Sets the coordinate of the target position in OL□□1C. ♦ Always set to 0 when using a motion program. ♦ Always set to 0 when using an infinite length axis.	0
OL□□1C	Position reference setting	Set the position data. • Incremental Addition Mode (OB□□09, bit 5 = 0) The moving amount (incremental distance) specified this time will be added to the previous value of OL□□1C. OL□□1C = Previous OL□□1C + Incremental distance Example: If a travel distance of 500 is specified and the previous value of OL□□1C is 1000, the following will occur: OL□□1C = 1000 + 500 = 1500 • Absolute Mode (OB□□095 = 1) The coordinate value of the target position is set. Example: Set 10000 to move to a coordinate value of 10000. OL□□1C = 10000	0

The following table compares the advantage and disadvantage of incremental addition mode and absolute mode.

Position Reference Type	Advantage	Disadvantage
Incremental Addition Mode	It is not necessary to consider the relationship between OL□□1C and the current position when canceling a move. Incremental addition mode can be used both for finite or infinite length axis type.	OL□□1C does not necessarily equal the coordinate value of the target position, so the position reference can be difficult to understand intuitively.
Absolute Mode	The coordinate of the target position is specified directly, making it easy to understand intuitively.	The current position must be set in OL□□1C whenever the power supply is turned ON or a move is canceled. If this is not done, the axis may move suddenly when a move command is started. Absolute mode cannot be used for an infinite length axis type.

3.4.5 Speed Reference

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 following table shows the parameters relating to speed references.

Parameter Type	Parameter No. (Register No.)	Name	Description	Default Value
Fixed Parameters	No. 5	Number of digits below decimal point	Set the number of digits below the decimal point in the reference unit to be input. The minimum reference unit is determined by this parameter and the Reference unit selection (fixed parameter 4). Example: Reference unit = mm, Number of digits below decimal point = 3 1 reference unit = 0.001 mm	3
	No. 34	Rated motor speed	Set the number of rotations when the motor is rotated at the rated speed (100% speed). Confirm the motor specifications before setting this parameter.	3000
	No. 36	Number of pulses per motor rotation	Set the number of pulses (the value after multiplication) per motor rotation. Example: If a motor rotates once per 1000 pulses, set the number of pulses to 1000.	200
Setting Parameters	OW□□03 Bits 0 to 3	Speed unit	Set the unit for reference speeds. 0: Reference units/sec 1: 10^n reference units/min (n: Number of digits below decimal point) 2: Percentage (%) of rated speed (1 = 0.01%)	1
	OL□□10	Speed reference setting	Set the feed speed. The unit for this parameter is set in OW□□03, bits 0 to 3. Example: When the number of digits below decimal point = 3 Units are as follows for the setting of the Reference unit selection: • Speed Unit Set to 0: Reference units/sec Pulse unit: 1 = 1 pulse/sec mm unit: 1 = 0.001 mm/sec Deg unit: 1 = 0.001 deg/sec Inch unit: 1 = 0.001 inch/sec • Speed Unit Set to 1: 10^n reference units/min Pulse unit: 1 = 1000 pulse/min mm unit: 1 = 1 mm/min Deg unit: 1 = 1 deg/min Inch unit: 1 = 1 inch/min • Speed Unit Set to 2: 0.01% Set as a percentage of the rated speed (1 = 0.01%) unrelated to the reference unit setting.	3000
	OW□□18	Override	Setting an output ratio (%) for the setting allows the positioning speed to be changed without changing the Speed reference setting. Setting unit: 1 = 0.01%	10000

(1) Speed Reference (OL□□10) Setting Example

- No. 5: Number of digits below decimal point = 3
- No. 34: Rated motor speed = 3000 min^{-1}
- No. 36 = Number of pulses per motor rotation = 65536 pulses/rev

The following table shows the setting example for Speed reference setting (OL□□10) to obtain the target feed speed (reference speed).

OW□□, bits 0 to 3 Speed Unit Setting	Fixed Parameter No. 4: Reference Unit Selection	Reference Speed (Target Feed Speed)	Setting Method for Speed Reference Setting (OL□□10)
0 Reference unit/sec	pulse	• 500 sec^{-1}	500 (sec^{-1}) × 65536 (pulse/R) = 37268000 (pulse/sec)
		• 1500 min^{-1}	1500 (min^{-1}) × 65536 (pulse/R) ÷ 60 (sec/min) = 1638400 (pulse/sec)
	mm	• Feed speed of 500 mm/sec with a machine that travels 10 mm for each rotation	500 (mm/sec)÷ 0.001 = 500000 (mm/sec) • Determined by feed speed and number of digits below decimal point (0.001 in the above equation), regardless of machine configuration.
		• Feed speed of 900 mm/min with a machine that travels 10 mm for each rotation	900 (mm/min) ÷ 0.001 ÷ 60 (sec/min) = 15000 (mm/sec) • Determined by feed speed and number of digits below decimal point (0.001 in the above equation), regardless of machine configuration.
1 10^n reference units/min (n: Number of digits below decimal point) (= 3)	pulse	• 500 sec^{-1}	500 (sec^{-1}) × 65536 (pulse/R) ÷ 1000* × 60 (sec/min) = 1966080 (1000 pulse/min) • "1000" = 10^n
		• 1500 min^{-1}	1500 (min^{-1}) × 65536 (pulse/R) ÷ 1000* = 98304 (1000 pulse/min) • "1000"= 10^n
	mm	• Feed speed of 500 mm/sec with a machine that travels 10 mm for each rotation	500 (mm/sec) ÷ 0.001 × 1000 × 60 (sec/min) = 30000 (1000 mm/sec) • Determined by feed speed and number of digits below decimal point (0.001 in the above equation), regardless of machine configuration.
		• Feed speed of 900 mm/min with a machine that travels 10 mm for each rotation	900 (mm/min) ÷ 0.001 × 1000 = 900 (1000 mm/min) • Determined by feed speed, regardless of machine configuration.
2 0.01%	—	• 1500 min^{-1}	1500 (min^{-1}) ÷ 3000 (min^{-1}) × 100(%) ÷ 0.01 = 5000 (0.01%) • Determined by what percentage the feed speed is of the rated speed.

(2) Override (OW□□18) Setting Example

The Override (OW□□18) can set the speed as a percentage (output ratio) of the target feed speed, in 0.01% units. The Override is set independently of Reference unit, Number of digits below decimal point, and other parameters.
A typical example of Override setting is shown below.

Setting Example

Output ratio 25%: 25 ÷ 0.01 = 2500
50%: 50÷0.01 = 5000
75%: 75÷0.01 = 7500
100%: 100÷0.01 = 10000

3.4.6 Acceleration/Deceleration Settings

The acceleration/deceleration can be set to either the rate of acceleration/deceleration or the time required to reach the rated speed from 0. The settings method used depends on the related parameter settings.
The parameters related to acceleration/deceleration settings are listed in the following table.

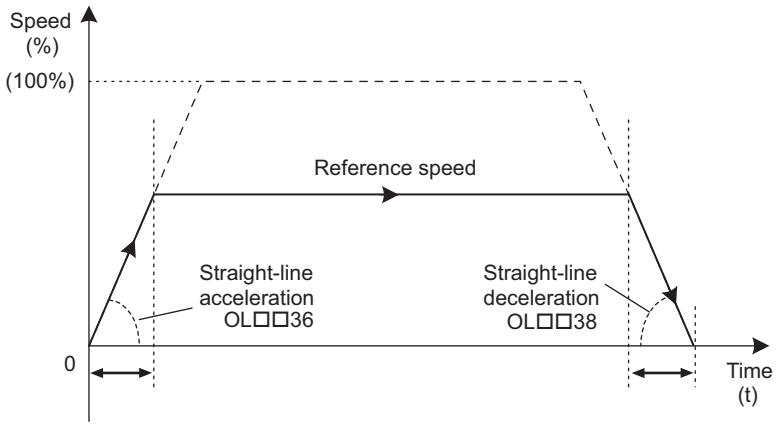
Parameter Type	Parameter No. (Register No.)	Name	Description	Default Value
Fixed Parameters	No. 5	Number of digits below decimal point	Set the number of digits below the decimal point in the input reference unit. The minimum reference unit is determined by this parameter and the Reference unit selection (fixed parameter 4). Example: Reference unit selection = mm, Number of digits below decimal point = 3 1 reference unit = 0.001 mm	3
	No. 34	Rated motor speed	Set the number of rotations when the motor is rotated at the rated speed (100% speed). Confirm the motor specifications before setting this parameter.	3000
	No. 36	Number of pulses per motor rotation	Set the number of pulses (the value after multiplication) per motor rotation.	200
Setting Parameters	OW□□03 Bits 4 to 7	Acceleration unit	Set the unit for acceleration/deceleration. 0: Reference units/sec^2 1: ms	1
	OL□□36	Straight-line acceleration/ Acceleration time constant	Set the rate of acceleration or acceleration time constant according to the setting of OW□□03, bits 4 to 7. • Acceleration Unit is set to 0 (Reference units/sec^2), set the rate of acceleration. Pulse unit: 1 = 1 pulse/sec^2 mm unit: 1 = 1 reference unit/sec^2 deg unit: 1 = 1 reference unit/sec^2 Inch unit: 1 = 1 reference unit/sec^2 Example: Number of Decimal Places = 3 mm unit: 1 = 0.001 mm/sec^2 deg unit: 1 = 0.001 deg/sec^2 Inch unit: 1 = 0.001 inch/sec^2 • When Acceleration Unit is set to 1 (ms), set the time constant to go from 0 to the rated speed without relation to the reference unit.	0
	OL□□38	Straight-line deceleration/ Deceleration time constant	Set the rate of deceleration or deceleration time constant according to the setting of OW□□03, bits 4 to 7. • Acceleration Unit is set to 0 (Reference units/sec^2), set the rate of deceleration. Pulse unit: 1 = 1 pulse/sec^2 mm unit: 1 = 1 reference unit/sec^2 deg unit: 1 = 1 reference unit/sec^2 Inch unit: 1 = 1 reference unit/sec^2 • When Acceleration Unit is set to 1 (ms), set the time constant to go from 0 to the rated speed without relation to the reference unit.	0

(1) Acceleration Unit and Speed Changes Over Time

The Straight-line acceleration/Acceleration time constant (OL□□36) and Straight-line deceleration/Deceleration time constant (OL□□38) settings change depending on the Acceleration Unit (OW□□03, Bits 4 to 7) setting as shown in the following figure.

■ When the Acceleration Unit (OW□□03, Bits 4 to 7) Set to 0: Reference Unit/sec^2

Linear Acceleration and Linear Deceleration Time settings are handled as the linear acceleration rate and linear deceleration rate.

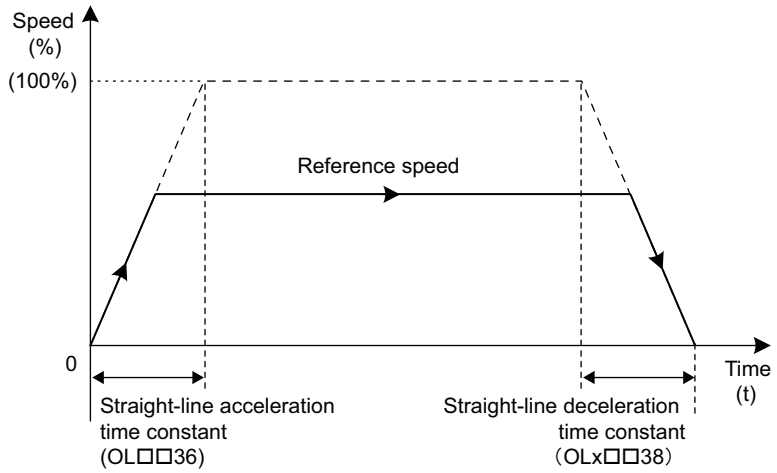


Time required to reach reference speed
= Reference speed ÷ Straight-line acceleration time constant

Time required to reach reference speed
= Reference speed ÷ Straight-line deceleration time constant

■ When the Acceleration Unit (OW□□03, Bits 4 to 7) Set to 1: ms

The setting of OL□□36 is handled as the straight-line acceleration time constant required to reach rated speed from zero using linear acceleration. The setting of OL□□38 is handled as the straight line deceleration time constant required to reach zero from the rated speed using linear deceleration.

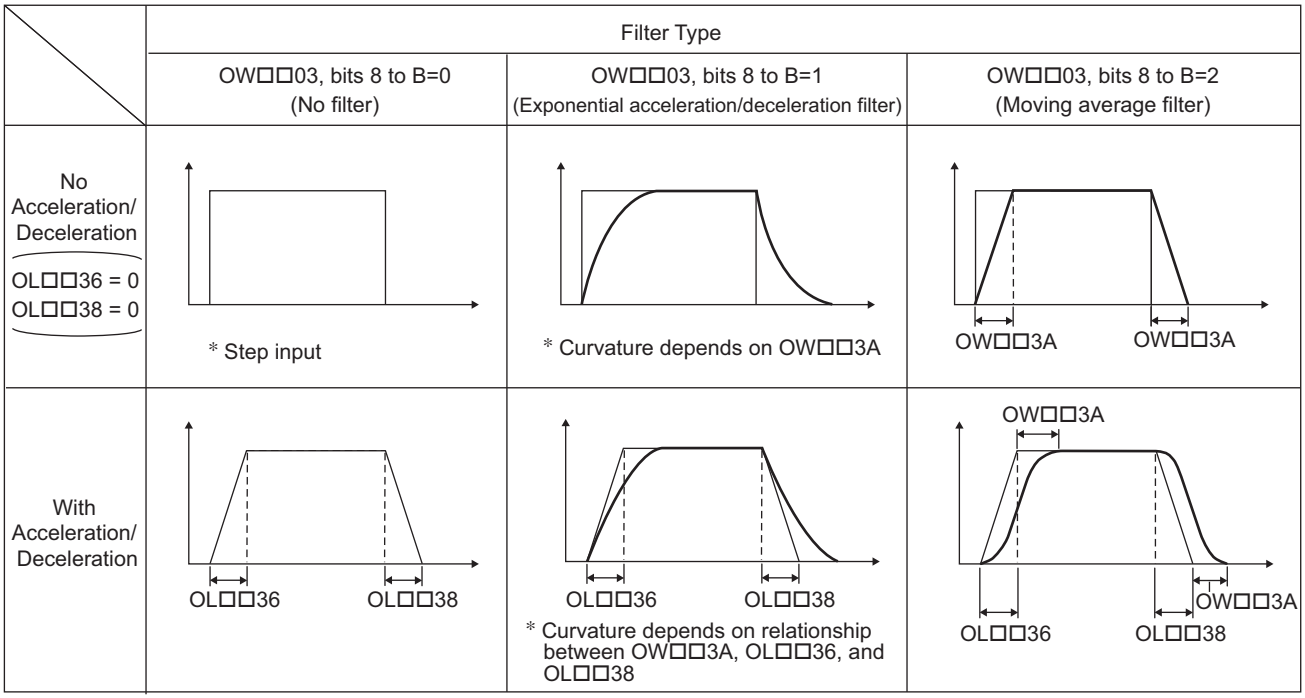


3.4.7 Acceleration/Deceleration Filter Settings

There are two types of acceleration/deceleration filter: **The exponential acceleration/deceleration filter** and **the moving average filter**. These filter settings can be used to set non-linear acceleration/deceleration curves. The parameters related to the acceleration/deceleration filter settings are listed in the following table.

Setting Parameter No. (Register No.)	Name	Description	Default Value
OW□□03 Bit 8 to B	Filter type	Set the acceleration/deceleration filter type. 0: No filter 1: Exponential acceleration/deceleration filter 2: Moving average filter	0
OW□□3A	Filter time constant	Sets the acceleration/deceleration filter time constant. Always make sure that pulse distribution has been completed (i.e., that monitoring parameter IW□□0C, bit 0 is ON (1)) before changing the time constant.	0

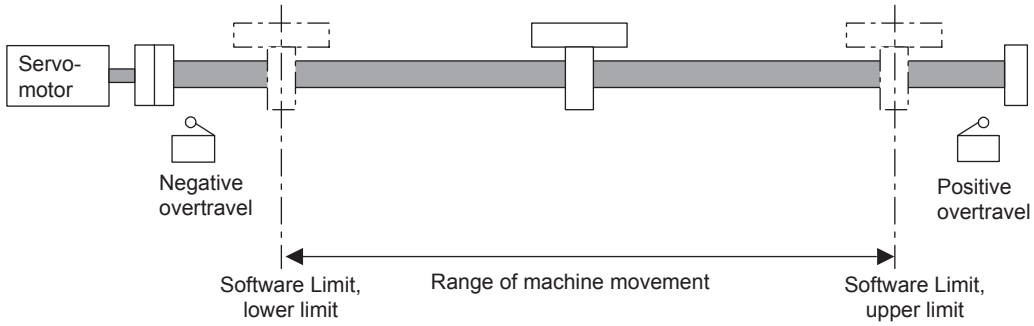
The following figure shows the relationship between acceleration/deceleration patterns and each parameter.



3.5 Software Limit Function

The software limit function is used to set upper and lower limits for the range of machine movement in fixed parameters so the Machine Controller can constantly monitor the operating range of the machine. The function can be used to help prevent machine runaway or damage due to incorrect operation as well as incorrect references in a motion program.
Disable the software limits in the SERVOPACK to use the Machine Controller for position control in the machine coordinate system.

- Refer to your SERVOPACK manual for the procedure on disabling software limits.



3.5.1 Fixed Parameter Settings

The following fixed parameters must be set in order to use the software limit function.

Fixed Parameter Number	Name	Unit	Setting/Range
1	Function selection flag 1 Bit 1:Forward software limit Bit 2:Reverse software limit	–	0: Disable, 1: Enable 0: Disable, 1: Enable
12	Positive software limit value	Reference unit	-2147483648 to 2147483647
14	Negative software limit value	Reference unit	-2147483648 to 2147483647

- The software limit function is enabled only after completing a Zero Point Return or Zero Point Setting operation. Therefore, the zero point return operation or the zero point setting operation must be performed again after the following operations.
  - The power is turned ON
  - Any fixed parameters are changed and saved.

3.5.2 Effects of the Software Limit Function

If a position reference that exceeds the positive and negative software limit is executed with the software limit function enabled, an alarm will occur and the Machine Controller will stop the axis. The axis stopping method depends on the motion command as shown below.

Motion command	Axis Stopping Method
POSING FEED STEP	The axis will start decelerating before the software limit position and stop at the software limit position.
INTERPOLATE ENDOF_INTERPOLATE	The pulse distribution command will stop executing at the software limit position. The Servo will perform an emergency stop.

- The software limits cannot be set for the command ZRET.

3.5.3 Monitoring and Clearing Alarms

(1) Monitoring Alarms

If an axis exceeds a software limit, a Positive/Negative Soft Limit (Positive/Negative Software Limit) alarm will occur. This alarm can be monitored in the Alarm (IL□□04).

Name	Register Number	Meaning	
Alarm	IL□□04	Bit 3: ON	Positive Software Limit
		Bit 4: ON	Negative Software Limit

(2) Clearing Software Limit Alarms

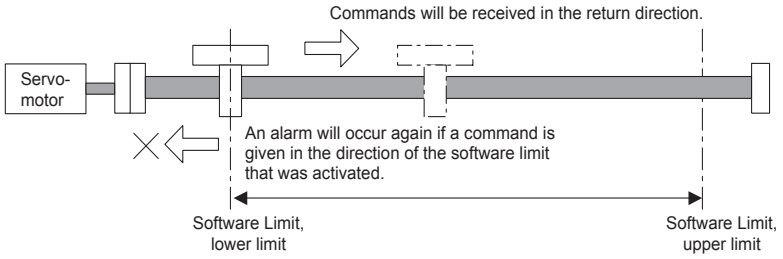
Clear software limit alarms using the procedure below.

1. Set the Alarm clear bit to 1 in the RUN command setting (OW□□00, bit F) to clear the alarm.

   The Alarm (IL□□04) will be cleared.

Name	Register Number	Meaning	
Run command setting	OW□□00	Bit F: ON	Alarm clear

2. Use the FEED or STEP command to return the workpiece in the opposite direction of the software limit.



4

Motion Commands

This chapter explains the operation, related parameters, and timing charts of each motion command and motion subcommand.

4.1 PO-01 Motion Commands

4.1.1 List of Motion Commands

The motion commands that can be used for the PO-01 Module are listed below. Refer to the page in the Reference for details on each command.

Command Code	Command	Name	Description	Reference
0	NOP	No command	—	—
1	POSING	Positioning	Moves to the specified position using the specified acceleration/deceleration times and the specified speed.	4.2.1 on page 79
3	ZRET	Zero point return	Returns to the zero point in the machine coordinate system. There are 3 different zero point return methods that can be used.	4.2.2 on page 84
4	INTERPOLATE	Interpolation	Performs interpolation feeding using positioning data distributed consecutively from the CPU Module.	4.2.3 on page 137
5	ENDOF_ INTERPOLATE	Reserved for system use	Used by motion program system	–
7	FEED	JOG operation	Moves the axis at the specified speed in the specified direction until the command is canceled.	4.2.4 on page 140
8	STEP	STEP operation	Moves the specified travel distance in the specified direction at the specified speed.	4.2.5 on page 144
9	ZSET	Zero point setting	Sets the zero point in the machine coordinate system and enables the software limit function.	4.2.6 on page 148
10	ACC	Reserved for system use	Used by motion program system	–
11	DCC			
12	SCC			

■ Terminology: Pulse distribution

Pulse distribution means that pulses are distributed to a pulse circuit.
Used in describing motion command operation.

4.2 Motion Command Details

The following describes the procedure for executing motion commands.

4.2.1 Positioning (POSING)

The POSING command positions the axis to the target position using the specified target position and speed. Parameters related to acceleration and deceleration are set in advance.

(1) Executing/Operating Procedure

1. Check to see if all the following conditions are satisfied.

No.	Execution Conditions	Confirmation Method
1	There are no alarms.	Both IL□□02 and IL□□04 are 0.
2	The Servo ON condition.	IW□□00 Bit1 is ON.
3	Motion command execution has been completed.	IW□□08 is 0 and IW□□09 Bit0 is OFF.

2. Set the following motion setting parameters.

OW□□03, bits 0 to 3: Speed unit*
OW□□03, bits 4 to 7: Acceleration unit*
OW□□03, bits 8 to B: Filter type
OW□□09, bit 5: Position reference type
OL□□10: Speed reference setting*
OW□□18: Override*
OW□□19: Bias speed*
OL□□20: NEAR signal output width
OL□□36: Straight line acceleration/Acceleration time constant*
OL□□38: Straight line deceleration/Deceleration time constant*
OW□□3A: Filter time constant

* The settings of these parameters can be changed during positioning operation.
- An override between 0% to 327.67% can be set for the speed reference.

3. Set the positioning motion command and the target position.

a) The position reference type (OW□□09, bit 5) is set to 0 (Incremental addition mode)

Set the motion command (OW□□08) to 1, and then add the incremental value to the position reference setting (OL□□1C) to set the target position.
The positioning operation will starts. IW□□08 will be 1 during the positioning.
The bit 3 of IW□□0C will turn ON when the axis approaches the target position.
The bit 1 of IW□□0C will turn ON when the axis reaches the target position and the positioning will complete.

- The target position can be changed during positioning operation.
- When the target position is changed so that there is no sufficient deceleration distance or after the new target position has already been passed, the PO-01 Module decelerates the system to a stop and then repositions according to the new target position.

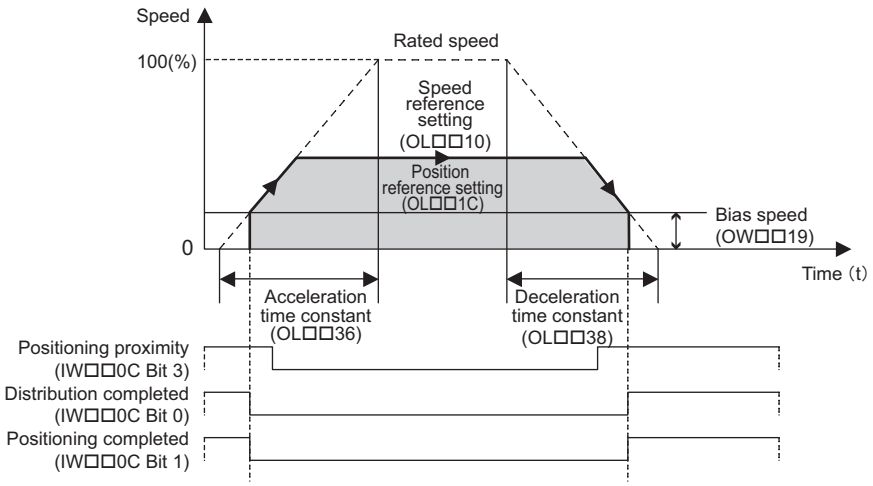
b) The position reference type (OW□□09, bit 5) is set to 1 (Absolute mode)

Set the target position in Position reference setting (OL□□1C), and then set the Motion command (OW□□08) to 1.
Positioning will start. IW□□08 will be 1 during the positioning.
The bit 3 of IW□□0C will turn ON when the axis approaches the target position.
The bit 1 of IW□□0C will turn ON when the axis reaches the target position, and the positioning will complete.

- The target position can be changed during positioning operation.
- When the target position is changed so that there is no sufficient deceleration distance or after the new target position has already been passed, the PO-01 Module decelerates the system to a stop and then repositions according to the new target position.

4. Set OW□□08 to 0 to execute the NOP motion command to complete the positioning operation.

POSING Operation Pattern



■ Terminology: Command execution

When a command code is stored in the Motion command (OW□□08), execution of the motion command corresponding to that code is started. Used in describing motion command operations.

(2) Holding

Axis travel can be stopped during command execution and then the remaining travel can be restarted. A command is held by setting the Command pause (OW□□09, bit 0) to 1.

- Set the Command pause (OW□□09, bit 0) to 1 (ON). The axis will decelerate to a stop.
- When the axis has stopped, the Command hold completed (IW□□09, bit 1) will turn ON.
- Reset the Command pause (OW□□09, bit 0) to 0 (OFF). The command hold status will be cleared and the remaining portion of the positioning will be restarted.

(3) Aborting

Axis travel can be stopped during command execution and the remaining travel will be canceled by aborting execution of a command. A command is aborted by setting the Command abort (OW□□09, bit 1) to 1 (ON).

- Set the Command abort (OW□□09, bit 1) to 1. The axis will decelerate to a stop.
- When the axis is stopped, the remaining travel will be canceled and the Positioning completed (IW□□0C, bit 1) will turn ON.
- The positioning will restart if the Command abort (OW□□09, bit 1) is reset to 0 (OFF) during abort processing.
- This type of operation will also be performed if the motion command is changed during axis movement.

(4) Related Parameters

[a] Setting Parameters

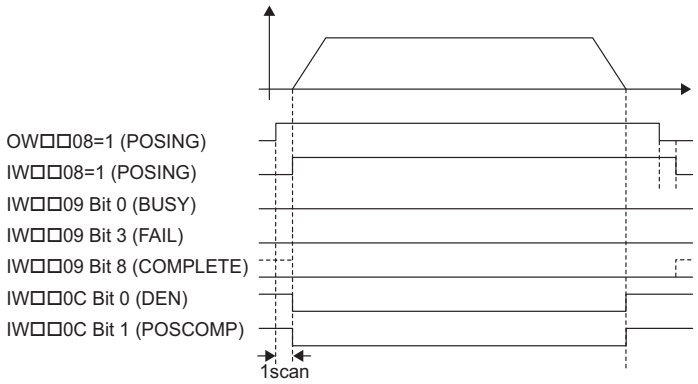
Parameter	Name	Setting	Default Setting
OW□□03, Bits 0 to 3	Function setting 1 Speed unit	Select the setting unit for OL□□10 (Speed reference setting). 0: Reference units/sec 1: 10^n reference units/min [n = Number of digits below decimal point (fixed parameter No. 5)] 2: Percentage (%) of rated speed (1 = 0.01%)	1: 10^n reference units/min
OW□□03, Bits 4 to 7	Function setting 1 Acceleration unit	Select the setting unit for OL□□36 (Straight line acceleration/Acceleration time constant) and OL□□38 (Straight line deceleration/Deceleration time constant). 0: Reference units/s^2, 1: ms	1: ms
OW□□03, Bits 8 to B	Function setting 1 Filter type	Set the acceleration/deceleration filter type. 0: No filter 1: Exponential acceleration/deceleration filter 2: Moving average filter	0: No filter
OW□□08	Motion command	Set to 1 for positioning operation. Setting to 0 will abort the operation.	0
OW□□09, Bit 0	Command pause	The axis will decelerate to a stop if this bit is set to 1 (ON) during positioning. The positioning will restart if this bit is set to 0 (OFF) while the axis is in hold status. 0: Cancel Hold, 1: Hold	0: Cancel Hold
OW□□09, Bit 1	Command abort	The axis will decelerated to a stop if this bit is set to 1 (ON) during positioning. 0: Cancel Abort, 1: Abort When this bit is reset to 0 (OFF) after deceleration to a stop, the operation depends on the setting of the Position reference type (OW□□09, bit 5). (0: Remains stopped, 1: Restarts positioning to the target position)	0: Cancel Abort
OW□□09, Bit 5	Position reference type	Switch the type of position reference. 0: Incremental addition mode, 1: Absolute mode • Set this bit before setting the Motion command (OW□□08) to 1.	0: Incremental addition mode
OL□□10	Speed reference setting	Specify the speed for the positioning. Set a positive value only. If a negative value is set, an error will occur.	3000
OW□□18	Override	Use this parameter to change the positioning speed without changing the Speed reference setting (OL□□10). This setting can be changed during operation. Setting range: 0 to 32767 (0% to 327.67%) Setting unit: 1 = 0.01% Example: Setting for 50% = 5000	10000 (100%)
OW□□19	Bias speed	Set the offset value of speed reference.	0
OL□□1C	Position reference setting	Set the target position for positioning. This setting can be changed during operation. The meaning of the setting depends on the status of the Position reference type (OW□□09, bit 5)	0
OL□□20	NEAR signal output width	Set the range in which the Position proximity (IW□□0C, bit 3) turns ON. The Position proximity bit will turn ON when the absolute value of the difference between the reference position and the feedback position is less than the value set here.	0
OL□□36	Straight line acceleration/ Acceleration time constant	Set the acceleration rate or acceleration time constant for positioning.	0
OL□□38	Straight line deceleration/ Deceleration time constant	Set the deceleration rate or deceleration time constant for positioning.	0
OW□□3A	Filter time constant	Set the acceleration/deceleration filter time constant. Either exponential acceleration/ deceleration filter or averaging move filter can be selected in the Function setting 1 (OW□□03). This parameter is valid when the Positioning completed (IW□□0C, bit 0) is ON (1).	0

[b] Monitoring Parameters

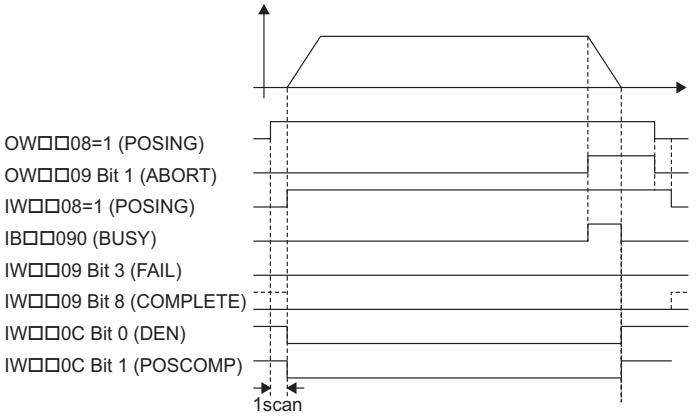
Parameter	Name	Monitor Contents
IL□□02	Warning	Stores the most current warning. (bit setting)
IL□□04	Alarm	Stores the most current alarm. (bit setting)
IW□□08	Motion command response code	Indicates the motion command that is being executed. The response code will be 1 during POSING command execution.
IW□□09, Bit 0	Command executing flag	Turns ON when abort processing is being performed for POSING command. Turns OFF when abort processing has been completed.
IW□□09, Bit 1	Command hold completed	Turns ON when a deceleration to a stop has been completed as the result of setting the Command pause (OW□□09, bit 0) to 1 during POSING command execution (IW□□08 = 1).
IW□□09, Bit 3	Command error occurrence	Turns ON if an error occurs during command execution. The axis will decelerate to a stop if it is moving. Turns OFF when another command is executed.
IW□□09, Bit 8	Command execution completed	Always OFF for POSING command. Use the Positioning completed (IW□□0C, bit 1) to confirm completion of this command.
IW□□0C, Bit 0	Distribution completed	Turns ON when pulse distribution has been completed for the move command. Turns OFF during execution of the move command.
IW□□0C, Bit 1	Positioning completed	Turns ON when the Distribution completed (IW□□0C, bit 0) turns ON.
IW□□0C, Bit 3	Positioning proximity	The operation depends on the setting of the NEAR signal output width (setting parameter OL□□20). OL□□20 = 0: Turns ON when Distribution completed (IW□□0C, bit 0) turns ON. OL□□20 ≠ 0: Turns ON when the current position is in the range of NEAR signal output width even if pulse distribution has not been completed.

(5) Timing Charts

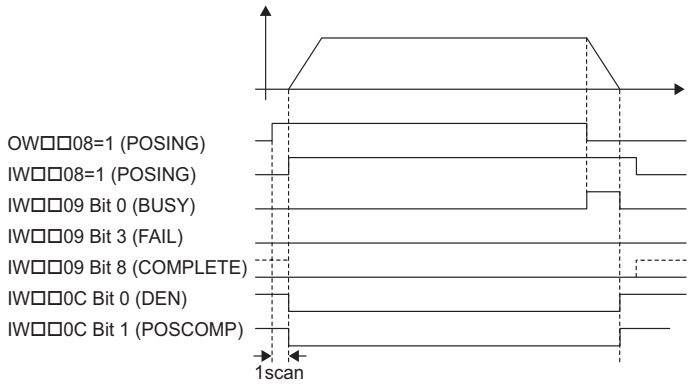
[a] Normal Execution



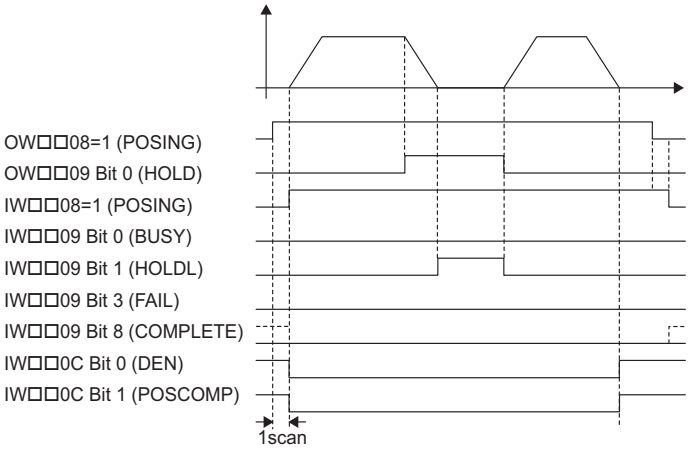
[b] Execution when Aborted



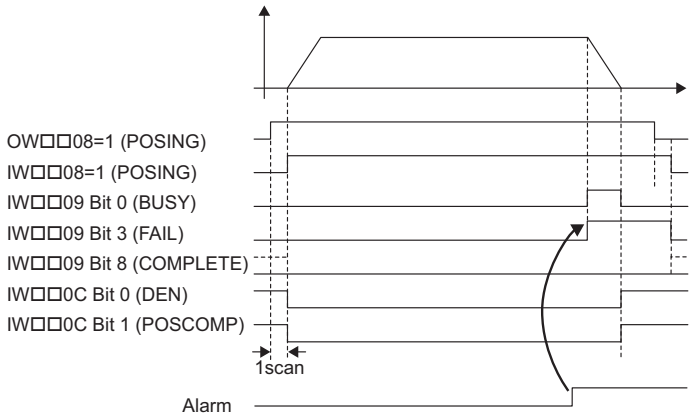
[c] Execution when Aborting by Changing the Command



[d] Command Hold



[e] Execution when an Alarm Occurs



4.2.2 Zero Point Return (ZRET)

When the Zero Point Return command (ZRET) is executed, the axis will return to the zero point of the machine coordinate system.

The zero point return command is executed using the method selected from 16 methods listed below.

- The PO-01 Module is not provided with the function to latch* feedback pulses. It is necessary to latch feedback pulses externally for the applications that require repetitive accuracy.
- For the zero point return operation that is implemented using the PO-01 Module, the ZERO signal is detected using the polling software. Therefore, design the circuit to turn ON the ZERO signal for 2 ms or more so that the PO-01 Module can detect the ZERO signal without fail.
- Phase-C pulse detection for the zero point return operations supported by the PO-01 Module is implemented with hardware. The PO-01 Module requires between 30 μs and 1 ms to detect the phase-C pulse after it is input. Therefore, the positioning accuracy of zero point returns depends on the speed during the zero point return.
- When the PO-01 Module detects the phase-C pulse, the hardware will force pulse output to stop if it is in progress.
- The range check for the approach speed and creep speed that are used for the zero point return operation is performed only at the start of zero point return operation. Do not change the approach speed and creep speed after the zero point return operation starts.

* In this manual, “latch” means to hold the reference position when a signal is detected.

(1) Zero Point Return Methods

The following table lists 16 zero point return methods that are supported by the PO-01 Module. Select the best method for the machine according to the setting parameters.
Refer to the page in the Reference column for details on each method.

Setting Parameter OW□□3C	Name	Description	Signals	Reference
0	DEC1 + C-phase pulse*1	Applies a 3-step deceleration method using the deceleration limit switch and C-phase pulse.	DEC1 signal: DI_1 or OW□□05, bit 8*2 C-phase pulse: DI_0	P.88
1	ZERO signal*1	Uses the ZERO signal.	ZERO signal: DI_0 (Latched on ZERO signal.)	P.90
2	DEC1+ ZERO signal	Applies a 3-step deceleration method using deceleration limit switch and ZERO signal.	DEC1 signal: DI_1 or bit 8 of OW□□05 ZERO signal: DI_0 (Latches by ZERO signal)	P.88
3	C-phase pulse*1	Uses the C-phase pulse.	C-phase pulse: DI_0	P.94
4	DEC2+ ZERO signal	Uses the deceleration limit switch as the zone signals and the ZERO signal as the zero-point signal.	DEC1 signal: DI_1 or bit 8 of OW□□05*2 ZERO signal: DI_0 (Latches by ZERO signal)	P.95
5	DEC1+ LMT+ ZERO signal	Uses the deceleration limit switch and two limit signals for zero point return as the zone signals and the ZERO signal as the zero-point signal.	DEC1 signal: DI_1 or bit 8 of OW□□05*2 Reverse LMT: DI_2 or bit 9 of OW□□05*3 Forward LMT: DI_3 or bit A of OW□□05*4 ZERO signal: DI_0 (Latches by ZERO signal)	P.98
6	DEC2 + C-phase pulse*1	Uses the deceleration limit switch as a limit signal and the C-phase pulse as the zero point signal.	DEC1 signal: DI_1 or OW□□05, bit 8*2 C-phase pulse: DI_0	P.103
7	DEC1 + LMT + C-phase pulse*1	Uses the deceleration limit switch and the two zero point return limit signals as limit signals and the C-phase pulse as the zero point signal.	DEC1 signal: DI_1 or OW□□05, bit 8*2 Reverse LMT: DI_2 or OW□□05, bit 9*3 Forward LMT: DI_3 or OW□□05, bit A*4 C-phase pulse: DI_0	P.106

(cont'd)

Setting Parameter OW□□3C	Name	Description	Signals	Reference
11	C Pulse Only*1	Uses the C-phase pulse and reverses operation when an OT signal is detected.	P-OT: DI_3 (Forward LMT is used.) N-OT: DI_2 (Reverse LMT is used.) C-phase pulse: DI_0	P.112
12	P-OT & C-phase pulse*1	Uses the C-phase pulse and reverses operation on the P-OT signal.	P-OT: DI_3 (Forward LMT is used.) C-phase pulse: DI_0	P.114
13	P-OT Only*1	A simple method that uses only the P-OT signal.	P-OT: DI_3 (Forward LMT is used.)	P.117
14	HOME LS & C-phase pulse*1	Uses the HOME limit switch and the C-phase pulse, and reverses operation when an OT signal is detected.	P-OT: DI_3 (Forward LMT is used.) N-OT: DI_2 (Reverse LMT is used.) HOME LS: DI_0 C-phase pulse: DI_0	P.119
16	N-OT & C-phase pulse*1	Uses the C-phase pulse and reverses operation on the N-OT signal.	N-OT: DI_2 (Reverse LMT is used.) C-phase pulse: DI_0	P.123
17	N-OT Only*1	A simple method that uses only the N-OT signal.	N-OT: DI_2 (Reverse LMT is used.)	P.126
18	INPUT & C-phase pulse*1	Uses the INPUT signal and C-phase pulse.	INPUT: OW□□05, bit B C-phase pulse: DI_0	P.128
19	INPUT Only*1	A simple method that uses only the INPUT signal.	INPUT: OW□□05, bit B	P.133

* 1. All of the following are required to use this parameter.
PO-01 software version: Version 1.08 or later
MPE720 version: Version 7.21 or later
Board revision: Revision A18 or later
* 2. Make the selection with bit 0 of fixed parameter No. 21 Hardware signal selection 2.
* 3. Make the selection with bit 1 of fixed parameter No. 21 Hardware signal selection 2.
* 4. Make the selection with bit 2 of fixed parameter No. 21 Hardware signal selection 2.

(2) Signals Used in the Zero Point Return Methods

The following table provides details on the signals that are used for zero point returns.

Signal Name	Signal Allocation	Polarity Reversal	Description	Zero Point Return Methods (OW□□3C) That Use the Signal
Phase C	General-purpose DI_0	Supported *1	Used as the zero point signal in a zero point return.	0, 3, 6, 7, 11, 12, 14, 16, and 18
ZERO		–	Used as the zero point signal in a zero point return.	1, 2, 4, and 5
HOME LS		Supported *2	Used as the deceleration limit switch signal in a zero point return.	14
P-OT	General-purpose DI_3 or OW□□05, bit A	–	Used as the deceleration limit switch signal in a zero point return.	12
			Used as the deceleration limit switch signal and zero point signal in a zero point return.	13
N-OT	General-purpose DI_2 or OW□□05, bit 9	–	Used as the deceleration limit switch signal in a zero point return.	16
			Used as the deceleration limit switch signal and zero point signal in a zero point return.	17
DEC1	General-purpose DI_1 or OW□□05, bit 8	Supported *2	Used as the deceleration limit switch signal in a zero point return.	0, 2, 5, and 7
DEC2			Used as a limit signal and deceleration limit switch signal in a zero point return.	4 and 6
Reverse LMT	General-purpose DI_2 or OW□□05, bit 9	–	Used as a limit signal in a zero point return.	5 and 7
Forward LMT	General-purpose DI_3 or OW□□05, bit A	–	Used as a limit signal in a zero point return.	5 and 7
INPUT	OW□□05, bit B	–	Used as the deceleration limit switch signal in a zero point return.	18
			Used as the zero point signal in a zero point return.	19

* 1. The polarity can be reversed with the C pulse input signal polarity selection (fixed parameter 20, bit 1).
* 2. The polarity can be reversed with the Deceleration LS reversal (fixed parameter 1, bit 5).

(3) Execution/Operating Procedure

1. Check to see if all the following conditions are satisfied.

No.	Execution Conditions	Confirmation Method
1	There are no alarms.	Both IL□□02 and IL□□04 are 0.
2	The Servo ON condition.	The bit 1 of IB□□00 is ON.

2. Refer to *4.2.2 (7) Zero Point Return Methods and Related Parameters* on page 88 and set the required parameters.

3. Set OW□□08 to 3 to execute the ZRET motion command.

The zero point return operation will start. IW□□08 will be 3 during the operation.
The bit 5 of IW□□0C will turn ON when the axis reaches the zero point and zero point return has been completed.

4. Set OW□□08 to 0 to execute the NOP motion command and then complete the zero point return operation.

(4) Holding

Holding execution is not possible during zero point return operation. The bit 0 of OW□□09 (Command pause) is ignored.

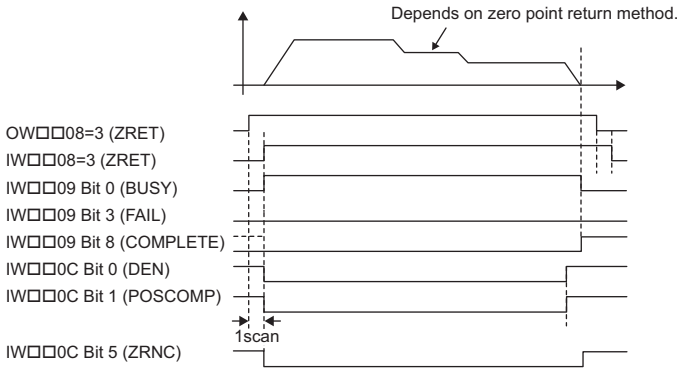
(5) Aborting

The zero point return can be canceled by aborting execution of a command. A command is aborted by setting the Command abort (OW□□09, bit 1) to 1.

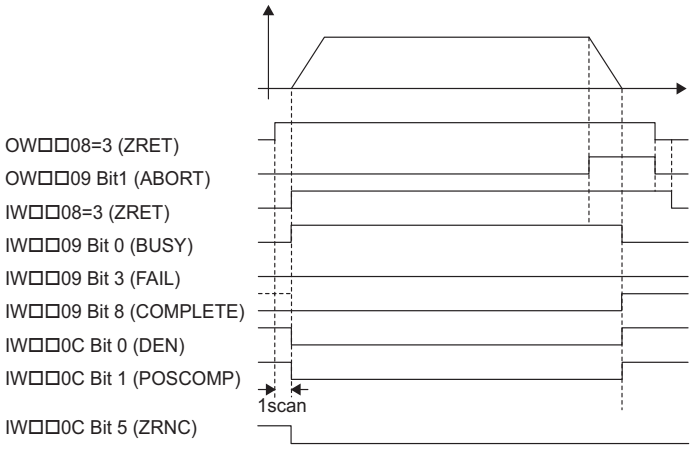
- Set the Command abort (OW□□09, bit 1) to 1. The axis will decelerate to a stop.
- When the axis has decelerated to a stop the remain travel will be canceled and the Positioning completed (IW□□0C, bit 1) will turn ON.
- This type of operation will also be performed if the motion command is changed during axis movement.

(6) Timing Charts

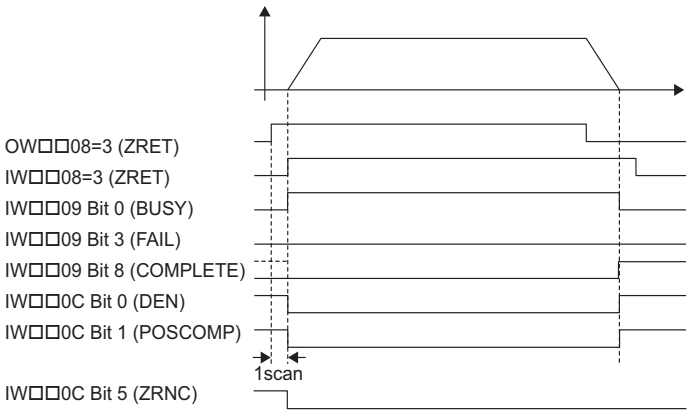
[a] Normal Execution



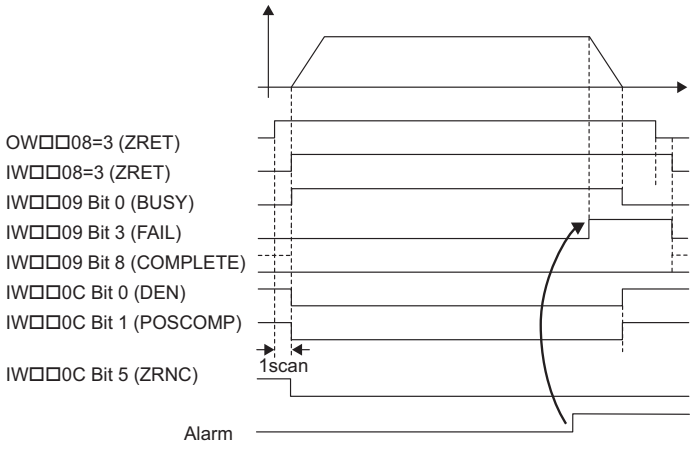
[b] Execution when Aborted



[c] Execution when Aborting by Changing the Command



[d] Execution when an Alarm Occurs



(7) Zero Point Return Methods and Related Parameters

This section explains the operation that occurs after starting a zero point return and the parameters that need to be set before executing the command for each zero point return method.

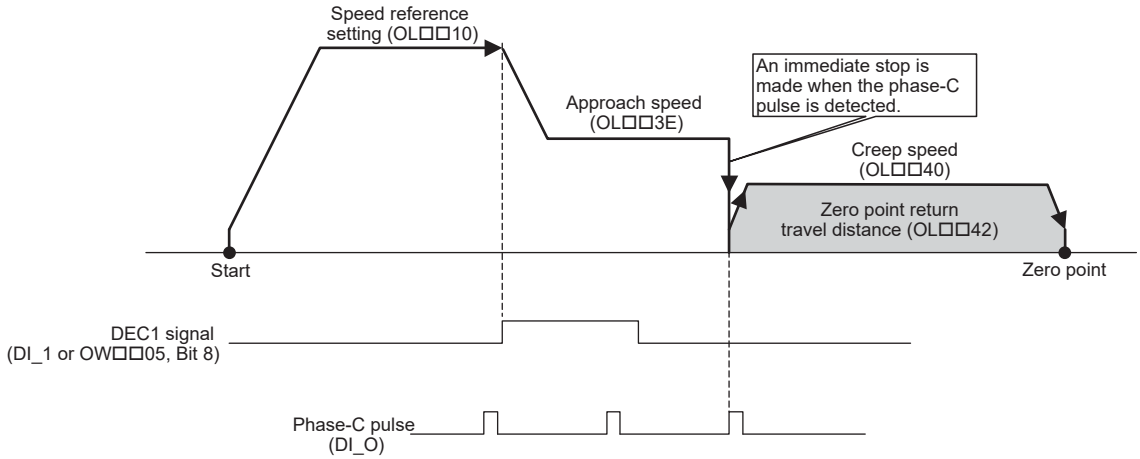
[a] DEC1 + C-phase Pulse Method (OW□□3C = 0)

- All of the following are required to use this zero point return method.
  PO-01 software version: Ver. 1.08 or later
  Board revision: Revision A18 or later
  If you attempt to use this method when the above conditions are not met, the following bits will turn ON and a zero point return will not be executed.
  - IL□□02 Warning, bit 1 Setting parameter error
  - IW□□09 Motion command status, bit 3 Command error occurrence

■ Operation after Zero Point Return Starts

1. The axis starts moving at the speed specified by OL□□10 (Speed reference setting) in the direction specified by the bit 3 of OW□□09 (Zero point return direction).
2. When the rising edge of DEC1 signal is detected, the axis will decelerate to the speed specified by OL□□3E (Approach speed).
3. When the rising edge of the first phase-C pulse after passing the DEC1 signal is detected, the axis will decelerate to OL□□40 (Creep speed).

4. The axis will move for the distance specified by OL□□42 (Zero point return travel distance) from the reference position where the rising edge of the phase-C pulse was detected and stop. A machine coordinate system will be established with the final stop position as the zero point.



■ Parameters to be Set

Parameter	Name	Setting	Default Setting
OW□□3C	Zero point return method	0: DEC1 + C-phase pulse	0
OW□□09, bit 3	Zero point return direction	Set the zero point return direction.	0: Reverse rotation
OL□□10	Speed reference setting	Set the speed to use when starting a zero point return. Only a positive value can be set. A negative value will result in an error and bit 3 in IW□□09 (Motion command status) will change to 1 (Command error occurrence).	3000
OL□□3E	Approach speed	Set the approach speed. Only a positive value can be set. Zero or a negative value will result in an error and bit 3 in IW□□09 (Motion command status) will change to 1 (Command error occurrence).	1000
OL□□40	Creep speed	Set the creep speed. Only a positive value can be set. Zero or a negative value will result in an error and bit 3 in IW□□09 (Motion command status) will change to 1 (Command error occurrence).	500
OL□□42	Zero point return travel distance	Set the zero point return final travel distance. If the sign is positive, the axis will move in the zero point return direction. If the sign is negative, the axis will move in direction opposite to the zero point return direction.	0
Fixed parameter No. 1, bit 5	Deceleration LS reversal selection	Set whether to reverse or not to reverse the polarity of DI_1 signal that is used as DEC1 signal. 0: Do not reverse. 1: Reverse Even if you set 1 (Reverse), the Zero point return deceleration limit switch signal (OW□□05, bit 8) will not be reversed.	0: Do not reverse
Fixed parameter No. 20, bit 1	C pulse input signal polarity selection	Select the polarity of the phase-C pulse. 0: Positive logic 1: Negative logic	0: Positive logic
Fixed parameter No. 21, bit 0	Deceleration LS signal selection	Select the signal to be used as DEC1 signal. 0: Use the setting parameter OW□□05, bit 8 1: Use DI_1 signal	0: Use the setting parameter OW□□05 bit 8
OW□□05, bit 8	Zero point return deceleration LS signal (DEC1)	When the fixed parameter No. 21, bit 0 (Deceleration LS signal selection) is set to 0, the DEC1 signal is input using a ladder program. 0: OFF 1: ON	0: OFF

(cont'd)

Parameter	Name	Setting	Default Setting
OW□□03, bits 0 to 3	Speed unit	Select the unit for the settings of OL□□10 (Speed unit setting), OL□□3E (Approach speed), and OL□□40 (Creep speed). 0: Reference units/sec 1: 10^n reference units/min 2: Percentage (%) of rated speed	1: 10^n reference units/min
OL□□18	Override	Use this parameter to change the zero point return speed without changing the Speed reference setting (OL□□10). Set the speed as a percentage of the Speed reference setting. This setting can be changed during operation. Setting range: 0 to 32767 (0% to 327.67%) Setting unit: = 0.01% Example: Setting for 50%: 5000 • This parameter is invalid for OL□□3E (Approach speed) and OL□□40 (Creep speed).	10000 (100 %)
OW□□19	Bias speed	Set the offset value of speed reference.	0

[b] ZERO Signal Method (OW□□3C = 1)

- All of the following are required to use this zero point return method.
  PO-01 software version: Version 1.08 or later
  Board revision: Revision A18 or later
  If you attempt to use this method when the above conditions are not met, the following bits will turn ON and a zero point return will not be executed.
  - IL□□02 Warning, bit 1 Setting parameter error
  - IW□□09 Motion command status, bit 3 Command error occurrence

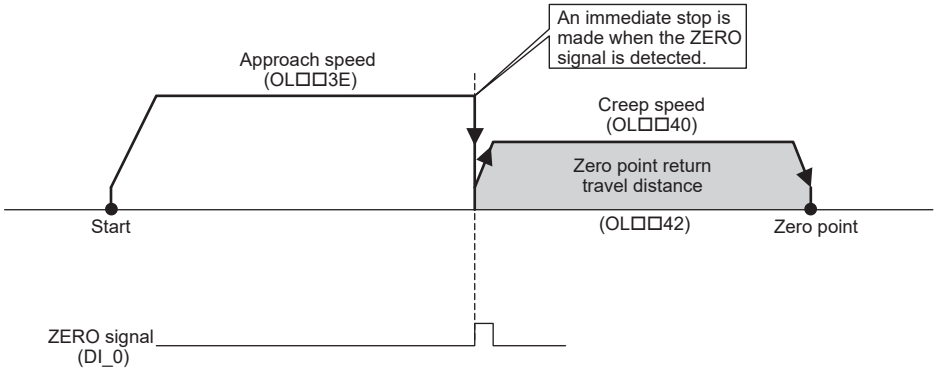
■ Operation after Zero Point Return Starts

1. The axis starts moving at the speed specified by OL□□3E (Approach speed) in the direction specified by bit 3 of OW□□09 (Zero point return direction).

2. When the rising edge of the ZERO signal is detected, the axis will decelerate to the speed specified by OL□□40 (Creep speed).

3. The axis will move for the distance specified by OL□□42 (Zero point return travel distance) from the reference position where the rising edge of the ZERO signal was detected and stop. A machine coordinate system will be established with the final stop position as the zero point.

- If a zero point return limit signal is detected during the zero point return operation, either bit 1 (Positive overtravel) or bit 2 (Negative overtravel) in IL□□04 (Alarm) will turn ON depending on the travel direction.
  The zero point return limit signals are selected in Function selection flag 3 (fixed parameter 3) and Hardware signal selection 2 (fixed parameter 21).



■ Parameters to be Set

Parameter	Name	Setting	Default Setting
OW□□3C	Zero point return method	1: ZERO signal	0
OW□□09 Bit 3	Zero point return direction	Set the zero point return direction.	0: Reverse rotation
OL□□3E	Approach speed	Set the approach speed. Only a positive value can be set. Zero or a negative value will result in an error and bit 3 in IW□□09 (Motion command status) will change to 1 (Command error occurrence).	1000
OL□□40	Creep speed	Set the creep speed. Only a positive value can be set. Zero or a negative value will result in an error and bit 3 in IW□□09 (Motion command status) will change to 1 (Command error occurrence).	500
OL□□42	Zero point return travel distance	Set the zero point return final travel distance. If the sign is positive, the axis will move in the zero point return direction. If the sign is negative, the axis will move in direction opposite to the zero point return direction.	0
OW□□03, bits 0 to 3	Speed unit	Select the speed unit for OL□□10 (Speed reference setting), OL□□3E (Approach speed), and OL□□40 (Creep speed). 0: Reference units/s 1: 10^n reference units/min 2: Percentage of rated speed	1: 10^n reference units/min
OW□□19	Bias speed	Set the offset to the speed reference.	0

[c] DEC1 + ZERO Signal Method (OW□□3C = 2)

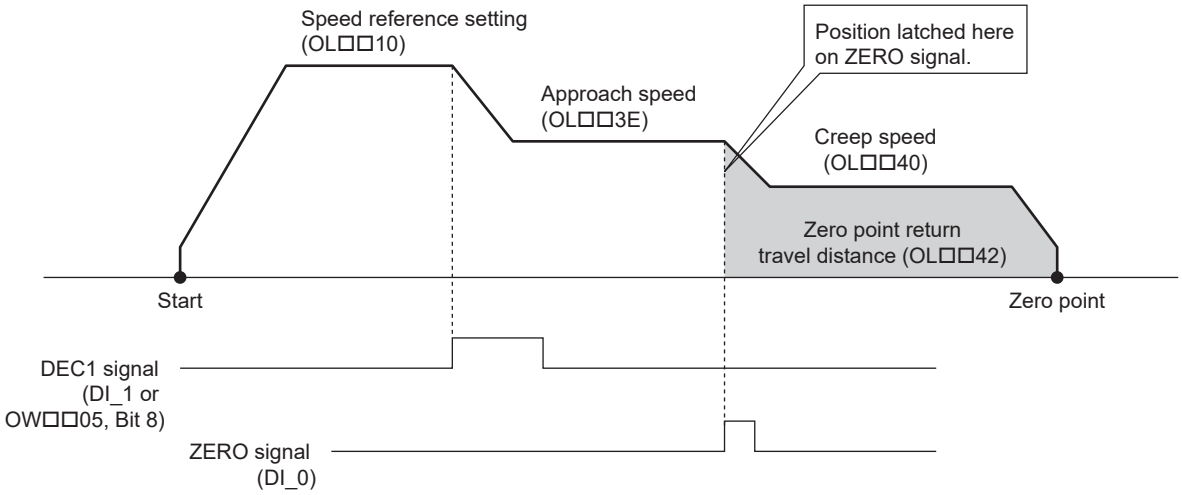
■ Operation after Zero Point Return Starts

1. The axis starts moving at the speed specified by OL□□10 (Speed reference setting) in the direction specified by bit 3 of OW□□09 (Zero point return direction).

2. When the rising edge of the DEC1 signal is detected, the axis will decelerate to the speed specified by OL□□3E (Approach speed).

3. When the rising edge of the ZERO signal is detected after passing the DEC1 signal at the approach speed, the position will be latched and the axis will decelerate to the speed specified by OL□□40 (Creep speed).

4. The axis will move for the distance specified by OL□□42 (Zero point return travel distance) from the latched position and stop. A machine coordinate system will be established with the final stop position as the zero point.



■ Parameters to be Set

Parameter	Name	Setting	Default Setting
OW□□3C	Zero point return method	2: DEC1 + ZERO signal	0
OW□□09 Bit 3	Zero point return direction	Set the zero point return direction.	0: Reverse rotation
OL□□10	Speed reference setting	Set the speed to use when starting a zero point return. Only a positive value can be set. A negative value will result in an error and bit 3 in IW□□09 (Motion command status) will change to 1 (Command error occurrence).	3000
OL□□3E	Approach speed	Set the approach speed shown in the above figure. Only a positive value can be set. Zero or a negative value will result in an error and bit 3 in IW□□09 (Motion command status) will change to 1 (Command error occurrence).	1000
OL□□40	Creep speed	Set the creep speed shown in the above figure. Only a positive value can be set. Zero or a negative value will result in an error and bit 3 in IW□□09 (Motion command status) will change to 1 (Command error occurrence).	500
OL□□42	Zero point return travel distance	Set the zero point return final travel distance. If the sign is positive, the axis will move in the zero point return direction. If the sign is negative, the axis will move in direction opposite to the zero point return direction.	0
Fixed parameter No. 1, bit 5	Deceleration LS reversal selection	Set whether to reverse the polarity of the DI_1 signal that is used as the DEC1 signal. 0: Do not reverse. 1: Reverse Even if you set 1 (Reverse), the Zero point return deceleration limit switch signal (OW□□05, bit 8) will not be reversed.	0: Do not reverse.
Fixed parameter No. 21, bit 0	Deceleration LS signal selection	Select the signal to be used as the DEC1 signal. 0: Use setting parameter OW□□05, bit 8 1: Use DI_1	0: Use OW□□05, bit 8
OW□□05 bit 8	Zero point return deceleration LS signal (DEC1)	When fixed parameter 21 bit 0 (Deceleration LS signal selection) is set to 0, the DEC1 signal is input using a ladder program. 0 : OFF 1 : ON	0 : OFF
OW□□03, bits 0 to 3	Speed unit	Select the speed unit for OL□□10 (Speed reference setting), OL□□3E (Approach speed), and OL□□40 (Creep speed). 0: Reference units/s 1: 10^n reference units/min 2: Percentage of rated speed	1: 10^n reference units/min
OL□□18	Override	Use this parameter to change the travel speed without changing OL□□10 (Speed reference setting). Set the speed as a percentage of the speed reference setting to output in units of 0.01%. This setting can be changed during operation. Setting range: 0 to 32,767 (0% to 327.67%) Setting unit: 0.01% Example: Setting to output 50% of speed reference = 5000 • This parameter is invalid for OL□□3E (Approach speed) and OL□□40 (Creep speed).	10000 (100%)
OW□□19	Bias speed	Set the offset to the speed reference.	0

[d] C-phase Pulse Method (OW□□3C = 3)

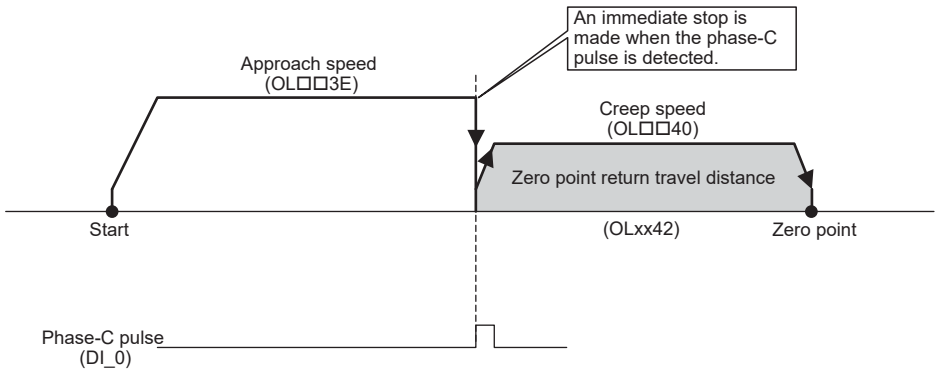
- All of the following are required to use this zero point return method.
  PO-01 software version: Version 1.08 or later
  Board revision: Revision A18 or later
  If you attempt to use this method when the above conditions are not met, the following bits will turn ON and a zero point return will not be executed.
  - IL□□02 Warning, bit 1 Setting parameter error
  - IW□□09 Motion command status, bit 3 Command error occurrence

1. The axis starts moving at the speed specified by OL□□3E (Approach speed) in the direction specified by bit 3 of OW□□09 (Zero point return direction).

2. When the rising edge of the phase-C pulse is detected, the reference position will be latched and the axis will decelerate to the speed specified by OL□□40 (Creep speed).

3. The axis will move for the distance specified by OL□□42 (Zero point return travel distance) from the latched position and stop. A machine coordinate system will be established with the final stop position as the zero point.

- If a zero point return limit signal is detected during the zero point return operation, either bit 1 (Positive overtravel) or bit 2 (Negative overtravel) in IL□□04 (Alarm) will turn ON depending on the travel direction.
  The zero point return limit signals are selected in Function selection flag 3 (fixed parameter 3) and Hardware signal selection 2 (fixed parameter 21).



■ Parameters to be Sett

Parameter	Name	Setting	Default Setting
OW□□3C	Zero point return method	3: C-phase pulse	0
OW□□09 Bit 3	Zero point return direction	Set the zero point return direction.	0: Reverse rotation
OL□□3E	Approach speed	Set the approach speed. Only a positive value can be set. Zero or a negative value will result in an error and bit 3 in IW□□09 (Motion command status) will change to 1 (Command error occurrence).	1000
OL□□40	Creep speed	Set the creep speed. Zero or a negative value will result in an error and bit 3 in IW□□09 (Motion command status) will change to 1 (Command error occurrence).	500
OL□□42	Zero point return travel distance	Set the zero point return final travel distance. If the sign is positive, the axis will move in the zero point return direction. If the sign is negative, the axis will move in direction opposite to the zero point return direction.	0
Fixed parameter No. 20, bit 1	C pulse input signal polarity selection	Select the polarity of the phase-C pulse. 0: Positive logic 1: Negative logic	0: Positive logic
OW□□03, bits 0 to 3	Speed unit	Select the speed unit for OL□□3E (Approach speed) and OL□□40 (Creep speed). 0: Reference units/s 1: 10^n reference units/min 2: Percentage of rated speed	1: 10^n reference units/min
OW□□19	Bias speed	Set the offset to the speed reference.	0

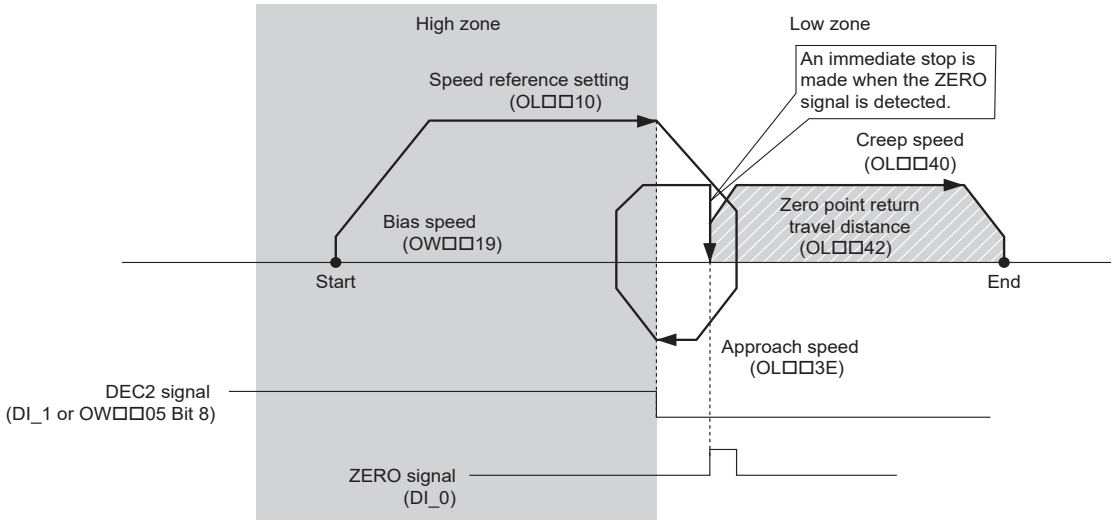
[e] DEC2+ ZERO Signal (OW□□3C = 4)

- With this method, the machine position is detected by ON/OFF status of DEC2 signal to return the machine automatically. The zero point return operation is always performed under the same condition.

■ Operation after Zero Point Return Starts When the Zero Point Return Start Position is in the High Zone

1. The axis starts moving in forward direction at the speed specified by OL□□10 (Speed reference setting)
2. When the falling edge of DEC2 signal is detected, the axis will decelerate to a stop.
3. After deceleration to a stop, the axis will start moving in reverse direction at the speed specified by OL□□3E (Approach speed).
4. When the rising edge of DEC2 signal is detected, the axis will decelerate to a stop.
5. After deceleration to a stop, the axis will start moving in forward direction at the speed specified by OL□□40 (Creep speed).
6. After the falling edge of DEC2 signal is detected, the axis position will be latched at the rising edge of ZERO signal.

7. The axis will move for the distance specified by OL□□42 (Zero point return travel distance) from the latched position and stop. When the positioning is completed, a machine coordinate system will be established with the final stop position as the zero point.



■ Operation after Zero Point Return Starts When the Zero Point Return Start Position is in the Low Zone

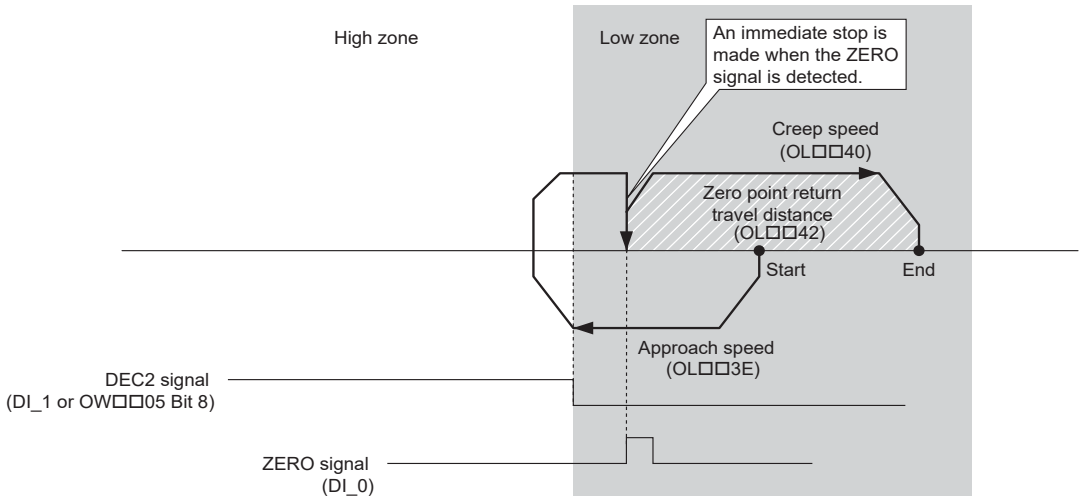
1. The axis starts moving in reverse direction at the speed specified by OL□□3E.

2. When the rising edge of DEC2 signal is detected, the axis will decelerate to a stop.

3. After deceleration to a stop, the axis will move in forward direction at the speed specified by OL□□40 (Creep speed).

4. When the falling edge of DEC2 signal is detected, the axis position will be latched at the rising edge of ZERO signal.

5. The axis will move for the distance specified by OL□□42 (Zero point return travel distance) from the latched position and stop. When the positioning is completed, a machine coordinate system will be established with the final stop position as the zero point.



■ Parameters to be Set

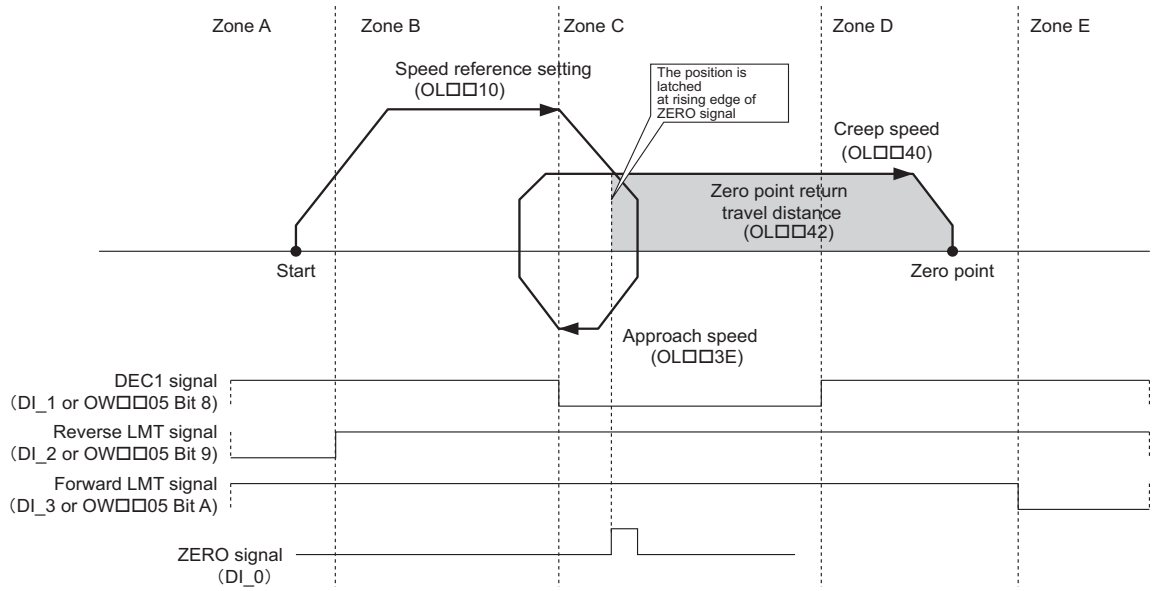
Parameter	Name	Setting	Default Setting
OW□□3C	Zero point return method	4: DEC2 + ZERO signal	0
OL□□10	Speed reference setting	Set the speed to use when starting a zero point return. Only a positive value can be set. A negative value will result in an error and bit 3 in IW□□09 (Motion command status) will change to 1 (Command error occurrence).	3000
OL□□3E	Approach speed	Set the approach speed. Only a positive value can be set. Zero or a negative value will result in an error and bit 3 in IW□□09 (Motion command status) will change to 1 (Command error occurrence).	1000
OL□□40	Creep speed	Set the creep speed. Only a positive value can be set. Zero or a negative value will result in an error and bit 3 in IW□□09 (Motion command status) will change to 1 (Command error occurrence).	500
OL□□42	Zero point return travel distance	Set the zero point return final travel distance. If the sign is positive, the axis will move in the zero point return direction. If the sign is negative, the axis will move in direction opposite to the zero point return direction.	0
Fixed parameter No. 1, bit 5	Deceleration LS reversal selection	Set whether to reverse the polarity of the DI_1 signal that is used as the DEC2 signal. 0: Do not reverse. 1: Reverse Even if you set 1 (Reverse), the Zero point return deceleration limit switch signal (OW□05, bit 8) will not be reversed.	0: Do not reverse
Fixed parameter No. 21, bit 0	Deceleration LS signal selection	Select the signal to be used as DEC2 signal. 0: Use setting parameter OW□□05, bit 8 1: DI_1 signal	0: Use OW□□05, bit 8
OW□□05, bit 8	Zero point return deceleration LS signal (DEC1)	When the fixed parameter No. 21 bit 0 (Deceleration LS signal selection) is set to 0, the DEC1 signal is input using a ladder program. 0: OFF 1: ON	0: OFF
OW□□03, bits 0 to 3	Speed unit	Select the unit for the settings of OL□□10 (Speed reference setting), OL□□3E (Approach speed), and OL□□40 (Creep speed). 0: Reference unis/sec 1: 10^n reference units/min 2: Percentage (%) of rated speed	1: 10^n reference units/min
OL□□18	Override	Use this parameter to change the zero point return speed without changing the Speed reference setting (OL□□10). Set the speed as a percentage of the Speed Reference Setting. This setting can be changed during operation. Setting range: 0 to 32767 (0% to 327.67%) Setting unit: 0.01% Example: Setting for 50%: 5000 • This parameter is invalid for OL□□3E (Approach speed) and OL□□40 (Creep speed).	10000 (100 %)
OW□□19	Bias speed	Set the offset value of speed reference.	0

[f] DEC1+ LMT+ZERO Signal (OW□□3C = 5)

- With this method, the machine position is detected by ON/OFF status of DEC1, reverse LMT, and forward LMT signals to return the machine automatically. The zero point return operation is always performed under the same condition.
- Set the start position for the zero point return to one of the zones shown below (zone A to zone E). If you attempt to use this method when the starting position is in any other area, the following bits will turn ON and a zero point return will not be executed.
  - IL□□02 Warning, bit 1 Setting parameter error
  - IW□□09 Motion command status, bit 3 Command error occurrence

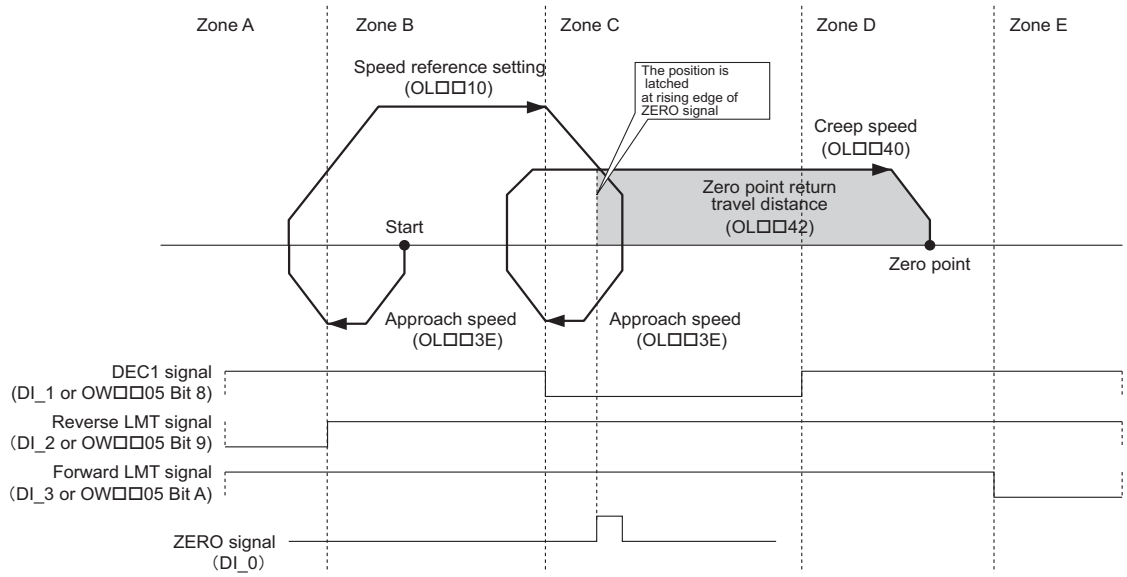
■ Operation after Zero Point Return Starts When the Zero Point Return Start Position is in Zone A

1. The axis starts moving in forward direction at the speed specified by OL□□10 (Speed reference setting).
2. When the falling edge of DEC1 signal is detected, the axis will decelerate to a stop.
3. After deceleration to a stop, the axis will move in reverse direction at the speed specified by OL□□3E (Approach speed).
4. When the rising edge of DEC1 signal is detected, the axis will decelerate to a stop.
5. After deceleration to a stop, the axis will move in forward direction at the speed specified by OL□□40 (Creep speed).
6. After detecting the falling edge of DEC1, the axis position will be latched at the rising edge of ZERO signal.
7. The axis will move for the distance specified by OL□□42 (Zero point return travel distance) from the latched position and stop. After positioning is completed, a machine coordinate system will be established with the final stop position as the zero point



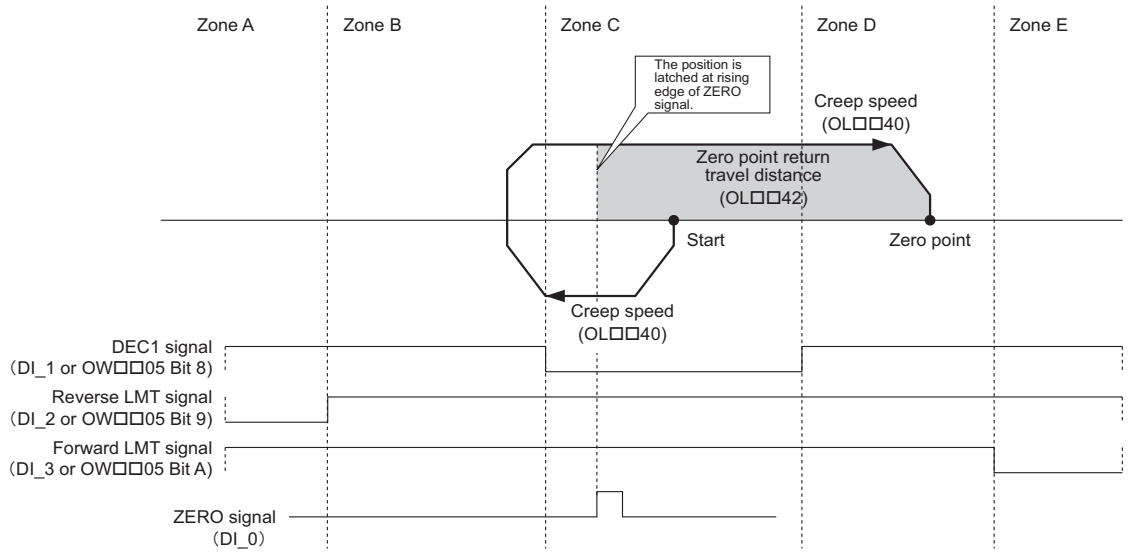
■ Operation after Zero Point Return Starts When the Zero Point Return Start Position is in Zone B

1. The axis starts moving in reverse direction at the speed specified by OL□□3E (Approach speed).
2. When the falling edge of reverse LMT signal is detected, the axis will decelerate to a stop.
3. After deceleration to a stop, the axis will move in forward direction at the speed specified by OL□□10 (Speed reference setting).
4. When the falling edge of DEC1 is detected, the axis will decelerate to a stop.
5. After deceleration to a stop, the axis will move in reverse direction at the speed specified by OL□□3E (Approach speed).
6. When the rising edge of DEC1 signal is detected, the axis will decelerate to a stop.
7. After deceleration to a stop, the axis will move in forward direction at the speed specified by OL□□40 (Creep speed).
8. After detecting the falling edge of DEC1 signal, the axis position will be latched at the rising edge of ZERO signal.
9. The axis will move for the distance specified by OL□□42 (Zero point return travel distance) from the latched position and stop. After positioning is completed, a machine coordinate system will be established with the final stop position as the zero point.



■ Operation after Zero Point Return Starts When the Zero Point Return Start Position is in Zone C

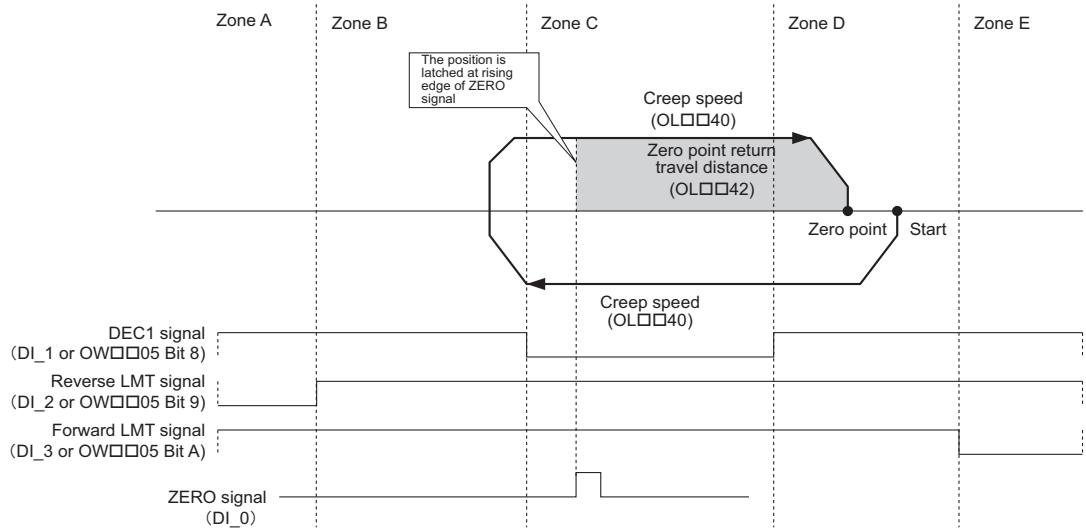
1. The axis starts moving in reverse direction at the speed specified by OL□□40 (Creep speed).
2. When the rising edge of DEC1 signal is detected, the axis will decelerate to a stop.
3. When the falling edge of reserve LMT signal is detected, the axis will decelerate to a stop.
4. After deceleration to a stop, the axis will move in forward direction at the speed specified by OL□□40 (Creep speed).
5. After detecting the falling edge of DEC1 signal, the axis position will be latched at the rising edge of ZERO signal.
6. The axis will move for the distance specified by OL□□42 (Zero point return travel distance) from the latched position and stop. After positioning is completed, a machine coordinate system will be established with the final stop position as the zero point.



■ Operation after Zero Point Return Starts When the Zero Point Return Start Position is in Zone D

1. The axis starts moving in reverse direction at the speed specified by OL□□3E (Approach speed).
2. When the rising edge of DEC1 signal is detected, the axis will decelerate to a stop.
3. After deceleration to a stop, the axis will move in forward direction at the speed specified by OL□□40 (Creep speed).
4. After detection the falling edge of DEC1 signal, the position will be latched at the rising edge of ZERO signal.

5. The axis will move for the distance specified by OL□□42 (Zero point return travel distance) from the latched position and stop. After positioning is completed, a machine coordinate system will be established with the final stop position as the zero point.



■ Operation after Zero Point Return Starts When the Zero Point Return Start Position is in Zone E

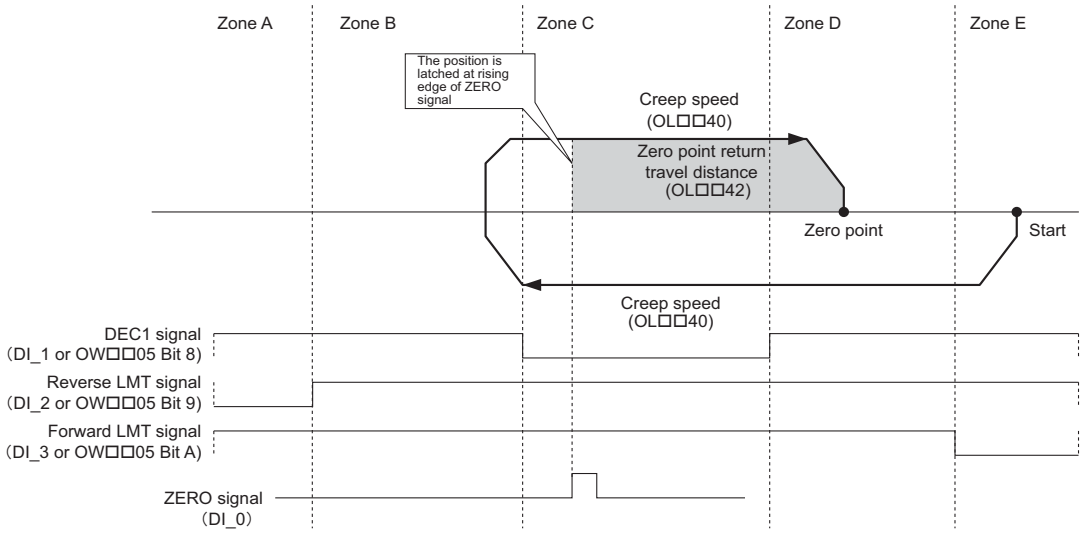
1. The axis starts moving in reverse direction at the speed specified by OL□□3E (Approach speed).

2. When the rising edge of DEC1 signal is detected, the axis will decelerate to a stop.

3. After deceleration to a stop, the axis will move in forward direction at the speed specified by OL□□40 (Creep speed).

4. After detecting the falling edge of DEC1 signal, the axis position will be latched at the rising edge of ZERO signal.

5. The axis will move for the distance specified by OL□□42 (Zero point return travel distance) from the latched position and stop. After positioning is completed, a machine coordinate system will be established with the final stop position as the zero point.



■ Parameters to be Set

Parameter	Name	Setting	Default Setting
OW□□3C	Zero point return method	5: DEC1 + LMT + ZERO signal	0
OL□□10	Speed reference setting	Set the speed to use when starting a zero point return. Only a positive value can be set. A negative value will result in an error and bit 3 in IW□□09 (Motion command status) will change to 1 (Command error occurrence).	3000
OL□□3E	Approach speed	Set the approach speed. Only a positive value can be set. A negative value will result in an error and bit 3 in IW□□09 (Motion command status) will change to 1 (Command error occurrence).	1000
OL□□40	Creep speed	Set the creep speed. Only a positive value can be set. A negative value will result in an error and bit 3 in IW□□09 (Motion command status) will change to 1 (Command error occurrence).	500
OL□□42	Zero point return travel distance	Set the zero point return final travel distance. If the sign is positive, the axis will move in the zero point return direction. If the sign is negative, the axis will move in direction opposite to the zero point return direction.	0
Fixed parameter No. 1, bit 5	Deceleration LS reversal selection	Set whether to reverse the polarity of the DI_1 signal that is used as the DEC1 signal. 0: Do not reverse. 1: Reverse Even if you set 1 (Reverse), the Zero point return deceleration limit switch signal (OW□□05, bit 8) will not be reversed.	0: Do not reverse
Fixed parameter No. 21, bit 0	Deceleration LS signal selection	Select the signal to be used as DEC1 signal. 0: Use setting parameter OW□□05, bit 8 1: DI_1 signal	0: Use OW□□05, bit 8
Fixed parameter No. 21, bit 1	Zero point return reverse limit signal selection	Select the signal to be used as the reverse LMT. 0: Use setting parameter OW□□05, bit 9 1: Use DI_2	0: Use OW□□05, bit 9
Fixed parameter No. 21, bit 2	Zero point return forward limit signal selection	Select the signal to be used as the forward LMT. 0: Use setting parameter OW□□05, bit A 1: Use DI_3	0: Use OW□□05, bit A
OW□□05, bit 8	Zero point return deceleration LS signal (DEC1)	When the fixed parameter No. 21 bit 0 (Deceleration LS signal selection) is set to 0, the DEC1 signal is input using a ladder program. 0: OFF, 1: ON	0: OFF
OW□□03, bits 0 to 3	Speed unit	Select the unit for the settings of OL□□10 (Speed reference setting), OL□□3E (Approach speed), and OL□□40 (Creep speed). 0: Reference units/sec 1: 10^n reference units/min 2: Percentage (%) of rated speed	1: 10^n reference units/min
OL□□18	Override	Use this parameter to changed the zero point return speed without changing the Speed reference setting (OL□□10). Set the speed as a percentage of the Speed Reference Setting. This setting can be changed during operation. Setting range: 0 to 32767 (0% to 327.67%) Setting unit: 0.01% Example: Setting for 50%: 5000 • This parameter is invalid for OL□□3E (Approach speed) and OL□□40 (Creep speed).	10000 (100 %)
OW□□19	Bias speed	Set the offset value of speed reference.	0

[g] DEC2 + C-phase Pulse Method (OW□□3C = 6)

- All of the following are required to use this zero point return method.
  PO-01 software version: Version 1.08 or later
  Board revision: Revision A18 or later
  If you attempt to use this method when the above conditions are not met, the following bits will turn ON and a zero point return will not be executed.
  - IL□□02 Warning, bit 1 Setting parameter error
  - IW□□09 Motion command status, bit 3 Command error occurrence
- With this method, the machine position is detected from the ON/OFF status of the DEC2 signal and then the axis is automatically returned to perform a zero point return under the same conditions each time.

■ Operation after Zero Point Return Starts When the Zero Point Return Start Position is in the High Zone

1. The axis starts moving in the positive direction at the speed specified by OL□□10 (Speed reference setting).

2. When the falling edge of the DEC2 signal is detected, the axis will decelerate to a stop.

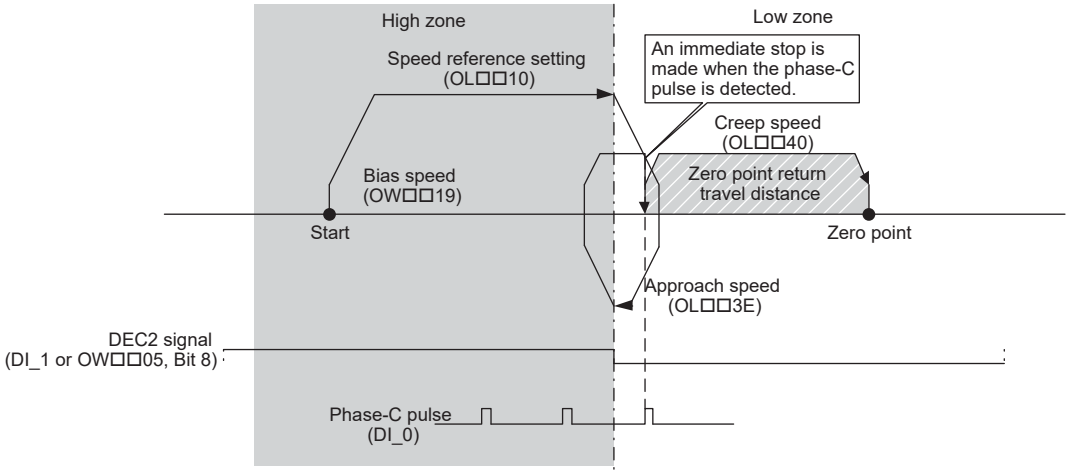
3. After decelerating to a stop, the axis will start moving in the negative direction at the speed specified by OL□□3E (Approach speed).

4. When the rising edge of the DEC2 signal is detected, the axis will decelerate to a stop.

5. After decelerating to a stop, the axis will start moving in the negative direction at the speed specified by OL□□40 (Creep speed).

6. After the falling edge of the DEC2 signal is detected, the axis position will be latched on the first rising edge of phase-C pulse.

7. The axis will move for the distance specified by OL□□42 (Zero point return travel distance) from the latched position and stop. A machine coordinate system will be established with the final stop position as the zero point.



■ Operation after Zero Point Return Starts When the Zero Point Return Start Position is in the Low Zone

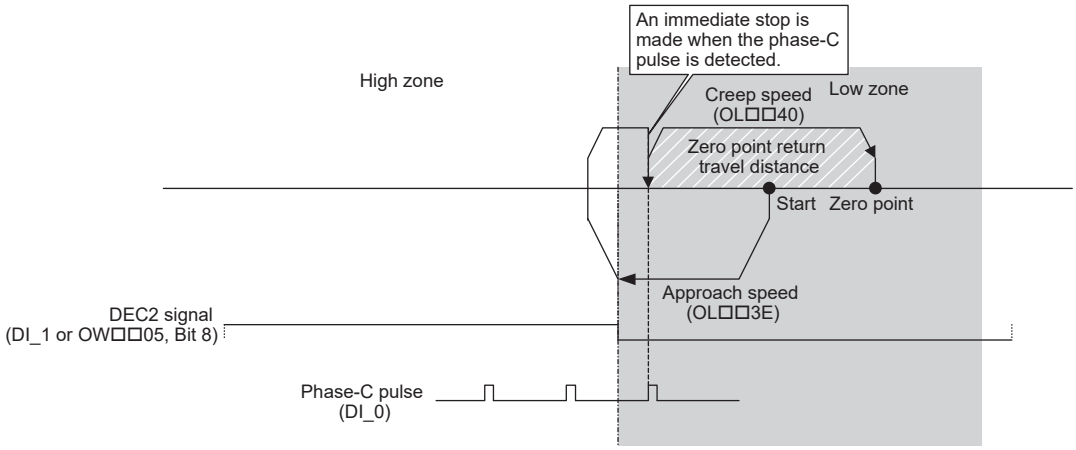
1. The axis starts moving in the negative direction at the speed specified by OL□□3E (Approach speed).

2. When the rising edge of the DEC2 signal is detected, the axis will decelerate to a stop.

3. After decelerating to a stop, the axis will start moving in the negative direction at the speed specified by OL□□40 (Creep speed).

4. After the falling edge of the DEC2 signal is detected, the axis position will be latched on the first rising edge of phase-C pulse.

5. The axis will move for the distance specified by OL□□42 (Zero point return travel distance) from the latched position and stop. A machine coordinate system will be established with the final stop position as the zero point.



■ Parameters to be Set

Parameter	Name	Setting	Default Setting
OW□□3C	Zero point return method	6: DEC2 + C-phase pulse	0
OL□□10	Speed reference setting	Set the speed to use when starting a zero point return. Only a positive value can be set. A negative value will result in an error and bit 3 in IW□□09 (Motion command status) will change to 1 (Command error occurrence).	3000
OL□□3E	Approach speed	Set the approach speed. Only a positive value can be set. Zero or a negative value will result in an error and bit 3 in IW□□09 (Motion command status) will change to 1 (Command error occurrence).	1000
OL□□40	Creep speed	Set the creep speed. Only a positive value can be set. Zero or a negative value will result in an error and bit 3 in IW□□09 (Motion command status) will change to 1 (Command error occurrence).	500
OL□□42	Zero point return travel distance	Set the zero point return final travel distance. If the sign is positive, the axis will move in the zero point return direction. If the sign is negative, the axis will move in direction opposite to the zero point return direction.	0
Fixed parameter No. 20, bit 1	C pulse input signal polarity selection	Select the polarity of the phase-C pulse. 0: Positive logic 1: Negative logic	0: Positive logic
Fixed parameter No. 21, bit 0	Deceleration LS signal selection	Select the signal to be used as the DEC2 signal. 0: Use setting parameter OW□□05, bit 8 1: Use DI_1	0: Use OW□□05, bit 8
Fixed parameter No. 1, bit 5	Deceleration LS reversal selection	Set whether to reverse the polarity of the DI_1 signal that is used as the DEC2 signal. 0: Do not reverse. 1: Reverse Even if you set 1 (Reverse), the Zero point return deceleration limit switch signal (OW□□05, bit 8) will not be reversed.	0: Do not reverse.
OW□□05, bit 8	Zero point return deceleration LS signal (DEC2)	When fixed parameter 21 bit 0 (Deceleration LS signal selection) is set to 0, the DEC1 signal is input using a ladder program. 0: OFF 1: ON	0: OFF
OW□□03, bits 0 to 3	Speed unit	Select the speed unit for OL□□10 (Speed reference setting), OL□□3E (Approach speed), and OL□□40 (Creep speed). 0: Reference units/s 1: 10^n reference units/min 2: Percentage of rated speed	1: 10^n reference units/min
OW□□18	Override	Use this parameter to change the travel speed without changing OL□□10 (Speed reference setting). Set the speed as a percentage of the speed reference setting to output in units of 0.01%. This setting can be changed during operation. Setting range: 0 to 32,767 (0% to 327.67%) Setting unit: 0.01% Example: Setting to output 50% of speed reference = 5000 • This parameter is invalid for OL□□3E (Approach speed) and OL□□40 (Creep speed).	10000 (100%)
OW□□19	Bias speed	Set the offset to the speed reference.	0

[h] DEC1 + LMT + C-phase Pulse Method (OW□□3C = 7)

- All of the following are required to use this zero point return method.
  PO-01 software version: Version 1.08 or later
  Board revision: Revision A18 or later
  If you attempt to use this method when the above conditions are not met, the following bits will turn ON and a zero point return will not be executed.
  - IL□□02 Warning, bit 1 Setting parameter error
  - IW□□09 Motion command status, bit 3 Command error occurrence
- With this method, the machine position is detected from the ON/OFF status of the DEC1 signal, reverse LMT signal, and forward LMT signal, and then the axis is automatically returned to perform a zero point return under the same conditions each time.
- Set the start position for the zero point return to one of the zones shown below (zone A to zone E). If you attempt to use this method when the starting position is in any other area, the following bits will turn ON and a zero point return will not be executed.
  - IL□□02 Warning, bit 1 Setting parameter error
  - IW□□09 Motion command status, bit 3 Command error occurrence

■ Operation after Zero Point Return Starts When the Zero Point Return Start Position is in Zone A

1. The axis starts moving in the positive direction at the speed specified by OL□□10 (Speed reference setting).

2. When the falling edge of the DEC1 signal is detected, the axis will decelerate to a stop.

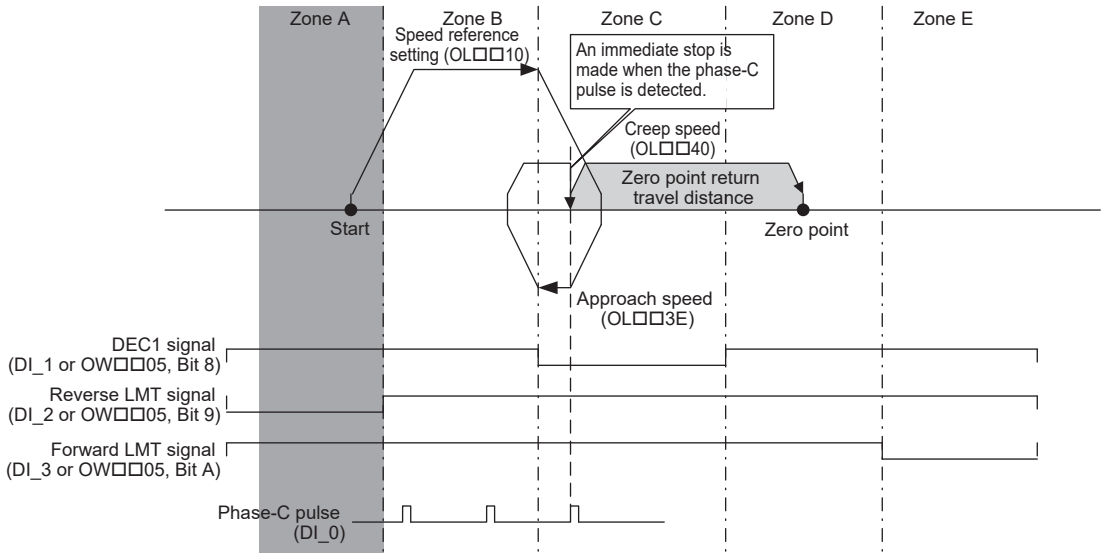
3. After decelerating to a stop, the axis will start moving in the negative direction at the speed specified by OL□□3E (Approach speed).

4. When the rising edge of the DEC1 signal is detected, the axis will decelerate to a stop.

5. After decelerating to a stop, the axis will start moving in the negative direction at the speed specified by OL□□40 (Creep speed).

6. After the falling edge of the DEC1 signal is detected, the axis position will be latched on the first rising edge of phase-C pulse.

7. The axis will move for the distance specified by OL□□42 (Zero point return travel distance) from the latched position and stop. A machine coordinate system will be established with the final stop position as the zero point.



■ Operation after Zero Point Return Starts When the Zero Point Return Start Position is in Zone B

1. The axis starts moving in the negative direction at the speed specified by OL□□3E (Approach speed).

2. When the falling edge of the reverse LMT signal is detected, the axis will decelerate to a stop.

3. After decelerating to a stop, the axis will start moving in the positive direction at the speed specified by OL□□10 (Speed reference setting).

4. When the falling edge of the DEC1 signal is detected, the axis will decelerate to a stop.

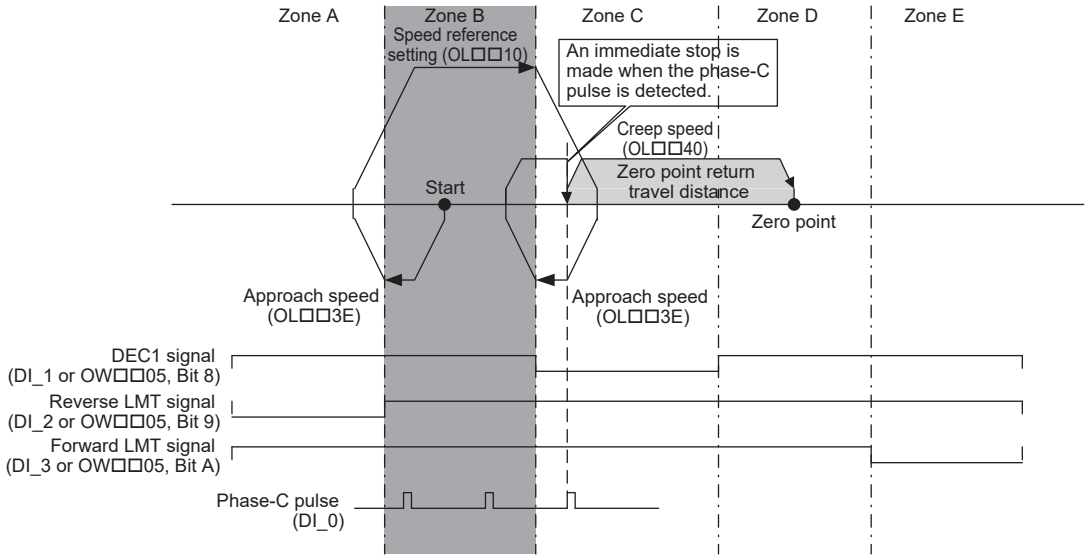
5. After decelerating to a stop, the axis will start moving in the negative direction at the speed specified by OL□□3E (Approach speed).

6. When the rising edge of the DEC1 signal is detected, the axis will decelerate to a stop.

7. After decelerating to a stop, the axis will start moving in the negative direction at the speed specified by OL□□40 (Creep speed).

8. After the falling edge of the DEC1 signal is detected, the axis position will be latched on the first rising edge of phase-C pulse.

9. The axis will move for the distance specified by OL□□42 (Zero point return travel distance) from the latched position and stops. A machine coordinate system will be established with the final stop position as the zero point.



■ Operation after Zero Point Return Starts When the Zero Point Return Start Position is in Zone C

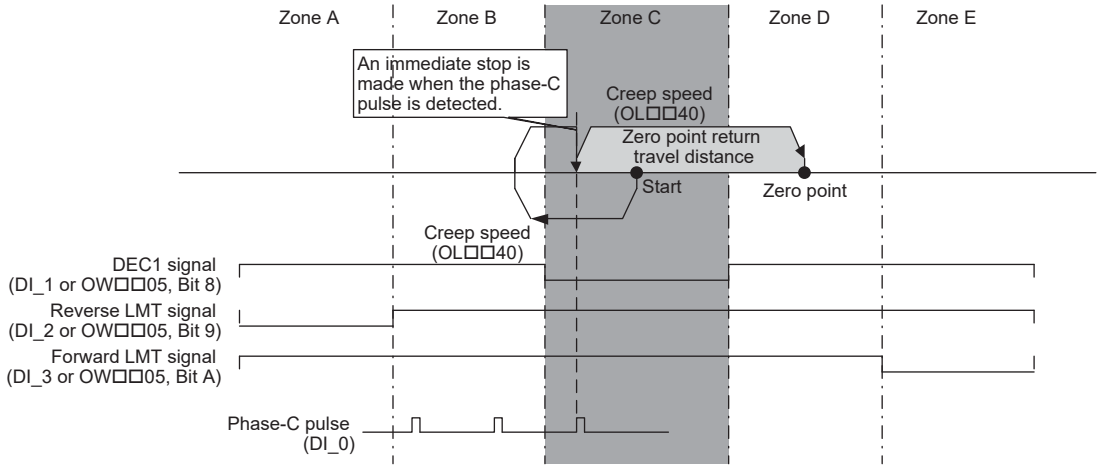
1. The axis starts moving in the negative direction at the speed specified by OL□□40 (Creep speed).

2. When the rising edge of the DEC1 signal is detected, the axis will decelerate to a stop.

3. After decelerating to a stop, the axis will start moving in the negative direction at the speed specified by OL□□40 (Creep speed).

4. After the falling edge of the DEC1 signal is detected, the axis position will be latched on the first rising edge of phase-C pulse.

5. The axis will move for the distance specified by OL□□42 (Zero point return travel distance) from the latched position and stop. A machine coordinate system will be established with the final stop position as the zero point.



■ Operation after Zero Point Return Starts When the Zero Point Return Start Position is in Zone D

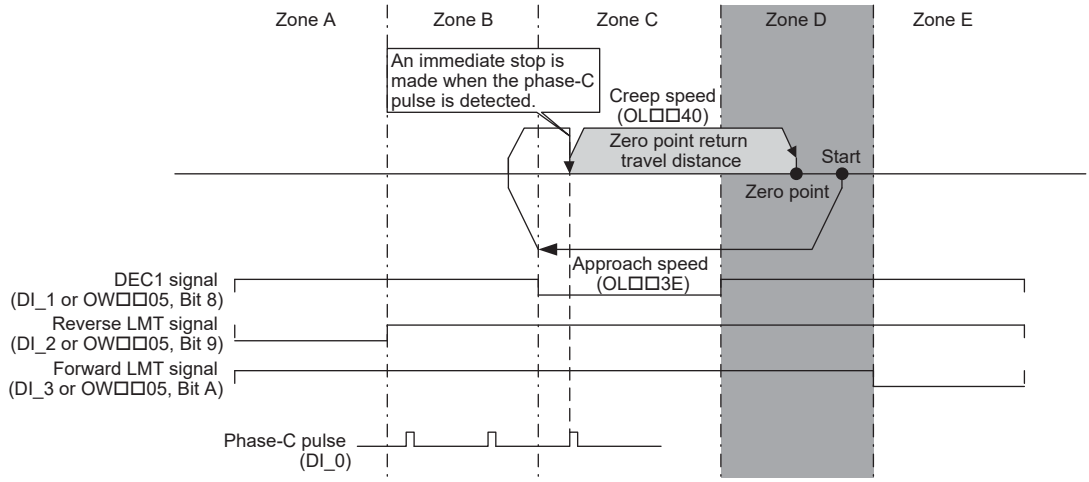
1. The axis starts moving in the negative direction at the speed specified by OL□□3E (Approach speed).

2. When the rising edge of the DEC1 signal is detected, the axis will decelerate to a stop.

3. After decelerating to a stop, the axis will start moving in the negative direction at the speed specified by OL□□40 (Creep speed).

4. After the falling edge of the DEC1 signal is detected, the axis position will be latched on the first rising edge of phase-C pulse.

5. The axis will move for the distance specified by OL□□42 (Zero point return travel distance) from the latched position and stop. A machine coordinate system will be established with the final stop position as the zero point.



■ Operation after Zero Point Return Starts When the Zero Point Return Start Position is in Zone E

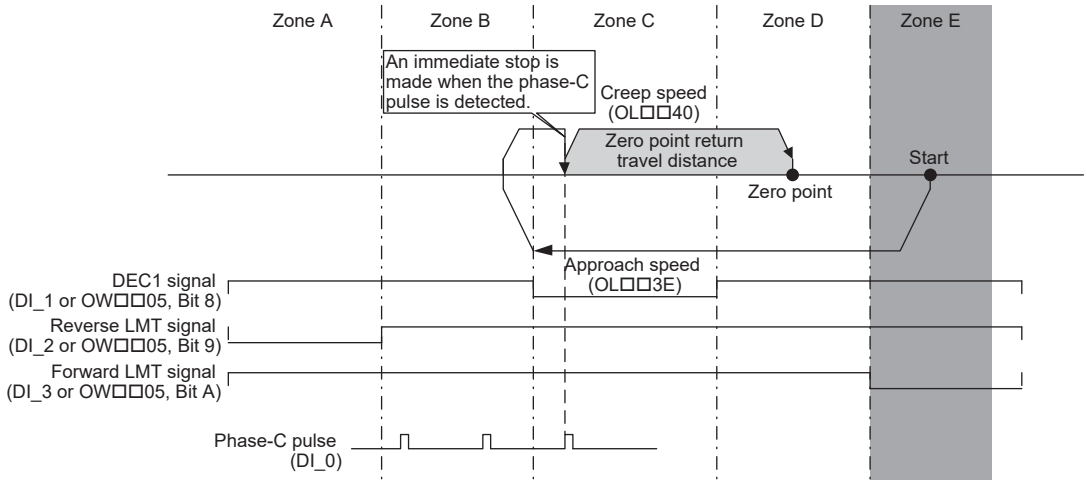
1. The axis starts moving in the negative direction at the speed specified by OL□□3E (Approach speed).

2. When the rising edge of the DEC1 signal is detected, the axis will decelerate to a stop.

3. After decelerating to a stop, the axis will start moving in the negative direction at the speed specified by OL□□40 (Creep speed).

4. After the falling edge of the DEC1 signal is detected, the axis position will be latched on the first rising edge of phase-C pulse.

5. The axis will move for the distance specified by OL□□42 (Zero point return travel distance) from the latched position and stop. A machine coordinate system will be established with the final stop position as the zero point.



■ Parameters to be Set

Parameter	Name	Setting	Default Setting
OW□□3C	Zero point return method	7: DEC1 + LMT + C-phase pulse	0
OL□□10	Speed reference setting	Set the speed to use when starting a zero point return. Only a positive value can be set. A negative value will result in an error and bit 3 in IW□□09 (Motion command status) will change to 1 (Command error occurrence).	3000
OL□□3E	Approach speed	Set the approach speed. Only a positive value can be set. Zero or a negative value will result in an error and bit 3 in IW□□09 (Motion command status) will change to 1 (Command error occurrence).	1000
OL□□40	Creep speed	Set the creep speed. Only a positive value can be set. Zero or a negative value will result in an error and bit 3 in IW□□09 (Motion command status) will change to 1 (Command error occurrence).	500
OL□□42	Zero point return travel distance	Set the zero point return final travel distance. If the sign is positive, the axis will move in the zero point return direction. If the sign is negative, the axis will move in direction opposite to the zero point return direction.	0
Fixed parameter No. 1, bit 5	Deceleration LS reversal selection	Set whether to reverse the polarity of the DI_1 signal that is used as the DEC1 signal. 0: Do not reverse. 1: Reverse Even if you set 1 (Reverse), the Zero point return deceleration limit switch signal (OW□□05, bit 8) will not be reversed.	0: Do not reverse.
Fixed parameter No. 20, bit 1	C pulse input signal polarity selection	Select the polarity of the phase-C pulse. 0: Positive logic 1: Negative logic	0: Positive logic
Fixed parameter No. 21, bit 0	Deceleration LS signal selection	Select the signal to be used as the DEC1 signal. 0: Use setting parameter OW□□05, bit 8 1: Use DI_1	0: Use OW□□05, bit 8
Fixed parameter No. 21, bit 1	Zero point return reverse limit signal selection	Select the signal to be used as the reverse LMT. 0: Use setting parameter OW□□05, bit 9 1: Use DI_2	0: Use OW□□05, bit 9
Fixed parameter No. 21, bit 2	Zero point return forward limit signal selection	Select the signal to be used as the forward LMT. 0: Use setting parameter OW□□05, bit A 1: Use DI_3	0: Use OW□□05, bit A
OW□□05 bit, 8	Zero point return deceleration LS signal (DEC1)	When fixed parameter 21 bit 0 (Deceleration LS signal selection) is set to 0, the DEC1 signal is input using a ladder program. 0 : OFF 1 : ON	0 : OFF
OW□□03, bits 0 to 3	Speed unit	Select the speed unit for OL□□10 (Speed reference setting), OL□□3E (Approach speed), and OL□□40 (Creep speed). 0: Reference units/s 1: 10^n reference units/min 2: Percentage of rated speed	1: 10^n reference units/min
OW□□18	Override	Use this parameter to change the travel speed without changing OL□□10 (Speed reference setting). Set the speed as a percentage of the speed reference setting to output in units of 0.01%. This setting can be changed during operation. Setting range: 0 to 32,767 (0% to 327.67%) Setting unit: 0.01% Example: Setting to output 50% of speed reference = 5000 • This parameter is invalid for OL□□3E (Approach speed) and OL□□40 (Creep speed).	10000 (100 %)
OW□□19	Bias speed	Set the offset to the speed reference.	0

[i] C Pulse Only Method (OW□□3C = 11)

- All of the following are required to use this zero point return method.
  PO-01 software version: Version 1.08 or later
  Board revision: Revision A18 or later
  If you attempt to use this method when the above conditions are not met, the following bits will turn ON and a zero point return will not be executed.
  - IL□□02 Warning, bit 1 Setting parameter error
  - IW□□09 Motion command status, bit 3 Command error occurrence

■ Operation after Zero Point Return Starts When Creep Speed Is Positive

1. The axis starts moving in the positive direction at the speed specified by OL□□40 (Creep speed).

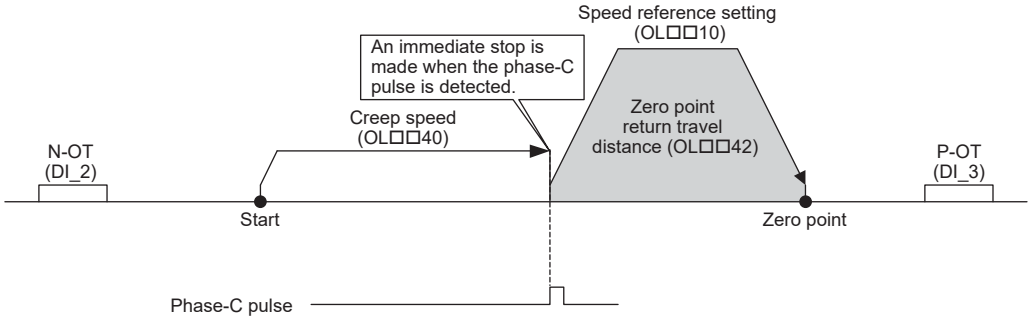
Note: If an OT signal is detected during travel, movement will be started in the opposite direction.

2. When the rising edge of the phase-C pulse is detected, the position will be latched and the axis accelerates or decelerates to the speed specified by OL□□10 (Speed reference setting). The travel direction at this time depends on the sign of the Zero point return travel distance parameter.

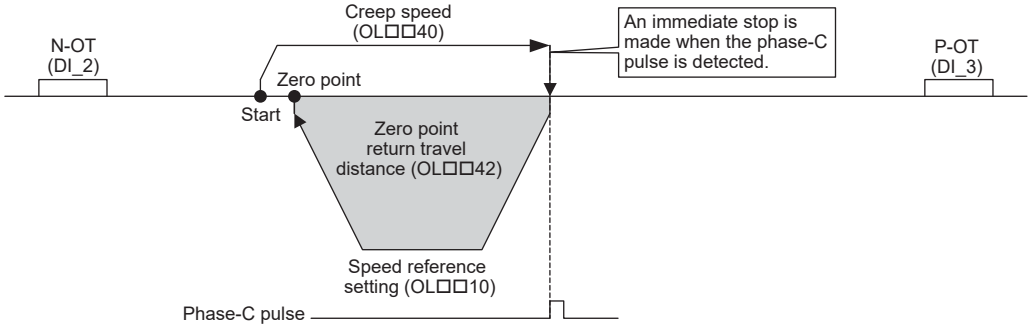
3. The axis will move for the distance specified by OL□□42 (Zero point return travel distance) from the latched position and stop. A machine coordinate system will be established with the final stop position as the zero point.

- If a zero point return limit signal is detected during travel at OL□□10 (Speed reference setting), either bit 1 (Positive overtravel) or bit 2 (Negative overtravel) in IL□□04 (Alarm) will turn ON depending on the travel direction. The zero point return limit signals are selected in Function selection flag 3 (fixed parameter 3) and Hardware signal selection 2 (fixed parameter 21).

When the Zero Point Return Final Travel Distance Is Positive

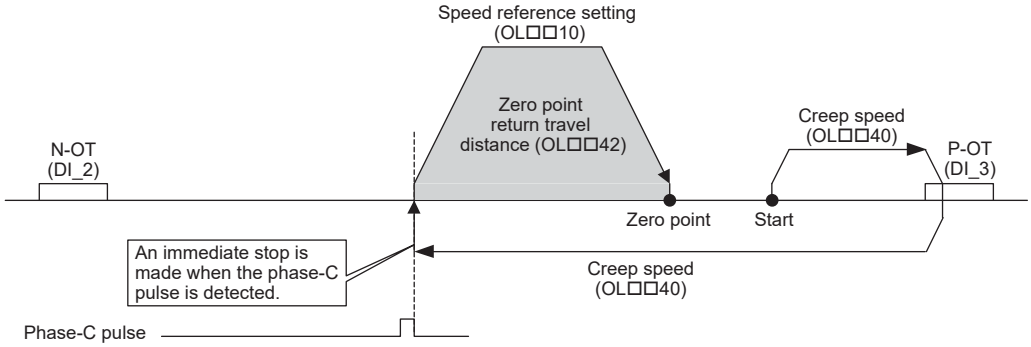


When the Zero Point Return Final Travel Distance Is Negative



Overtravel Signal Detected during Travel at the Creep Speed

The following example is for when the zero point return final travel distance is positive.



■ Operation after Zero Point Return Starts When Creep Speed Is Negative

1. The axis starts moving in the negative direction at the speed specified by OL□□40 (Creep speed).

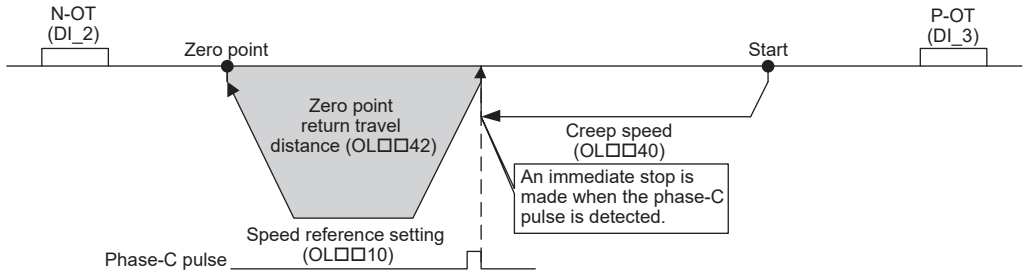
Note: If an OT signal is detected during travel, movement will be started in the opposite direction.

2. When the rising edge of the phase-C pulse is detected, the position will be latched and the axis accelerates or decelerates to the speed specified by OL□□10 (Speed reference setting). The travel direction at this time depends on the sign of the Zero point return final travel distance parameter.

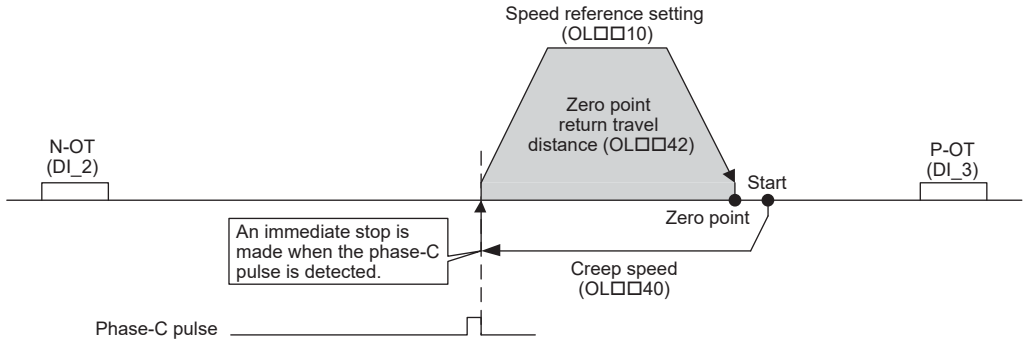
3. The axis will move for the distance specified by OL□□42 (Zero point return travel distance) from the latched position and stop. A machine coordinate system will be established with the final stop position as the zero point.

- If a zero point return limit signal is detected during travel at OL□□10 (Speed reference setting), either bit 1 (Positive overtravel) or bit 2 (Negative overtravel) in IL□□04 (Alarm) will turn ON depending on the travel direction.
  The zero point return limit signals are selected in Function selection flag 3 (fixed parameter 3) and Hardware signal selection 2 (fixed parameter 21).

When the Zero Point Return Final Travel Distance Is Negative

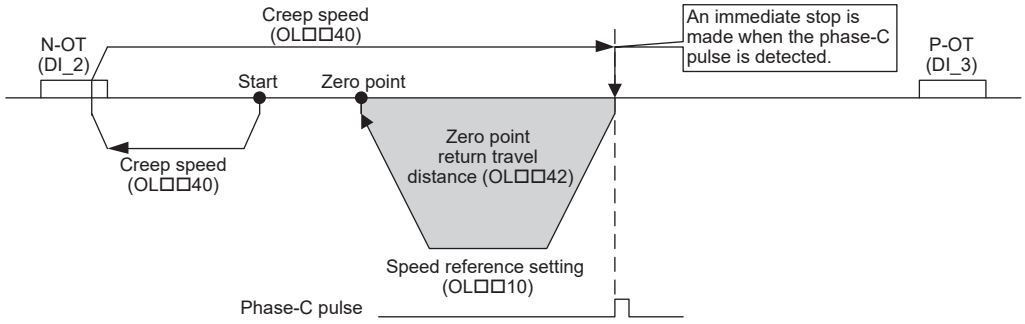


When the Zero Point Return Final Travel Distance Is Positive



Overtravel Signal Detected during Travel at the Creep Speed

The following example is for when the zero point return final travel distance is negative.



■ Parameters to be Set

Parameter	Name	Setting	Default Setting
OW□□3C	Zero point return method	11: C pulse only	11
OL□□10	Speed reference setting	Set the speed to use when starting a zero point return. Only a positive value can be set. Zero or a negative value will result in an error and bit 3 in IW□□09 (Motion command status) will change to 1 (Command error occurrence).	3000
OL□□40	Creep speed	Set the creep speed and the travel direction (sign). The setting cannot be changed during operation. The speed and travel direction (sign) at the start of operation are used. Zero will result in an error and bit 3 in IW□□09 (Motion command status) will change to 1 (Command error occurrence).	500
OL□□42	Zero point return travel distance	Set the zero point return final travel distance. If the sign is positive, the axis will move in the zero point return direction. If the sign is negative, the axis will move in direction opposite to the zero point return direction.	0
Fixed parameter No. 20, bit 1	C pulse input signal polarity selection	Select the polarity of the phase-C pulse. 0: Positive logic 1: Negative logic	0: Positive logic
OW□□03, bits 0 to 3	Speed unit	Select the speed unit for OL□□10 (Speed reference setting) and OL□□40 (Creep speed). 0: Reference units/s 1: 10^n reference units/min 2: Percentage of rated speed	1: 10^n reference units/min
OW□□18	Override	Use this parameter to change the travel speed without changing OL□□10 (Speed reference setting). Set the speed as a percentage of the speed reference setting to output in units of 0.01%. This setting can be changed during operation. Setting range: 0 to 32,767 (0% to 327.67%) Setting unit: 0.01% Example: Setting to output 50% of speed reference = 5000 • This parameter is invalid for OL□□40 (Creep speed).	10000 (100%)
OW□□19	Bias speed	Set the offset to the speed reference.	0

[j] P-OT & C-phase Pulse Method (OW□□3C = 12)

■ Operation after Zero Point Return Starts

- All of the following are required to use this zero point return method.
  PO-01 software version: Version 1.08 or later
  Board revision: Revision A18 or later
  If you attempt to use this method when the above conditions are not met, the following bits will turn ON and a zero point return will not be executed.
  - IL□□02 Warning, bit 1 Setting parameter error
  - IW□□09 Motion command status, bit 3 Command error occurrence

1. The axis starts moving in the positive direction at the speed specified by OL□□3E (Approach speed).

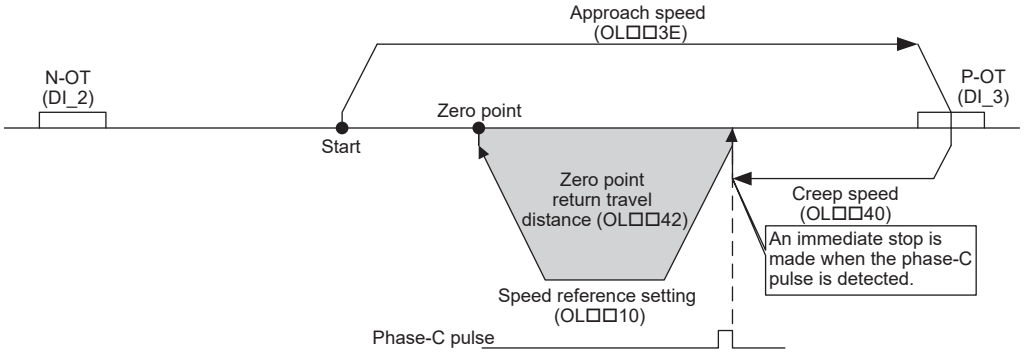
2. When the P-OT signal is detected, the direction will be reversed and the axis will return at OL□□40 (Creep speed).

3. When the rising edge of the phase-C pulse is detected, the position will be latched and the axis will accelerate or decelerate to the speed specified by OL□□10 (Speed reference setting). The travel direction at this time depends on the sign of the Zero point return final travel distance parameter.

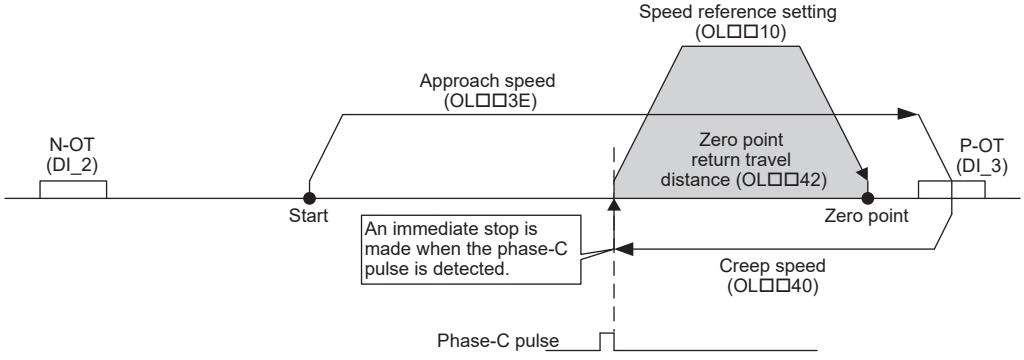
4. The axis will move for the distance specified by OL□□42 (Zero point return travel distance) from the latched position and stop. A machine coordinate system will be established with the final stop position as the zero point.

- If a zero point return limit signal is detected during travel at OL□□10 (Speed reference setting), either bit 1 (Positive overtravel) or bit 2 (Negative overtravel) in IL□□04 (Alarm) will turn ON depending on the travel direction.
  The zero point return limit signals are selected in Function selection flag 3 (fixed parameter 3) and Hardware signal selection 2 (fixed parameter 21).

When the Zero Point Return Final Travel Distance Is Negative



When the Zero Point Return Final Travel Distance Is Positive



■ Parameters to be Set

Parameter	Name	Setting	Default Setting
OW□□3C	Zero point return method	12: P-OT + phase-C pulse	0
OL□□10	Speed reference setting	Set the speed to use when starting a zero point return. Only a positive value can be set. Zero or a negative value will result in an error and bit 3 in IW□□09 (Motion command status) will change to 1 (Command error occurrence).	3000
OL□□3E	Approach speed	Set the approach speed. Only a positive value can be set. Zero or a negative value will result in an error and bit 3 in IW□□09 (Motion command status) will change to 1 (Command error occurrence).	1000
OL□□40	Creep speed	Set the creep speed. The axis moves in the return direction from the P-OT signal regardless of the sign. Zero will result in an error and bit 3 in IW□□09 (Motion command status) will change to 1 (Command error occurrence).	500
OL□□42	Zero point return travel distance	Set the zero point return final travel distance. If the sign is positive, the axis will move in the zero point return direction. If the sign is negative, the axis will move in direction opposite to the zero point return direction.	0
Fixed parameter No. 20, bit 1	C pulse input signal polarity selection	Select the polarity of the phase-C pulse. 0: Positive logic 1: Negative logic	0: Positive logic
OW□□03, bits 0 to 3	Speed unit	Select the speed unit for OL□□10 (Speed reference setting), OL□□3E (Approach speed), and OL□□40 (Creep speed). 0: Reference units/s 1: 10^n reference units/min 2: Percentage of rated speed	1: 10^n reference units/min
OW□□18	Override	Use this parameter to change the travel speed without changing OL□□10 (Speed reference setting). Set the speed as a percentage of the speed reference setting to output in units of 0.01%. This setting can be changed during operation. Setting range: 0 to 32,767 (0% to 327.67%) Setting unit: 0.01% Example: Setting to output 50% of speed reference = 5000 • This parameter is invalid for OL□□3E (Approach speed) and OL□□40 (Creep speed).	10000 (100%)
OW□□19	Bias speed	Set the offset to the speed reference.	0

[k] P-OT Only Method (OW□□3C = 13)

■ Operation after Zero Point Return Starts

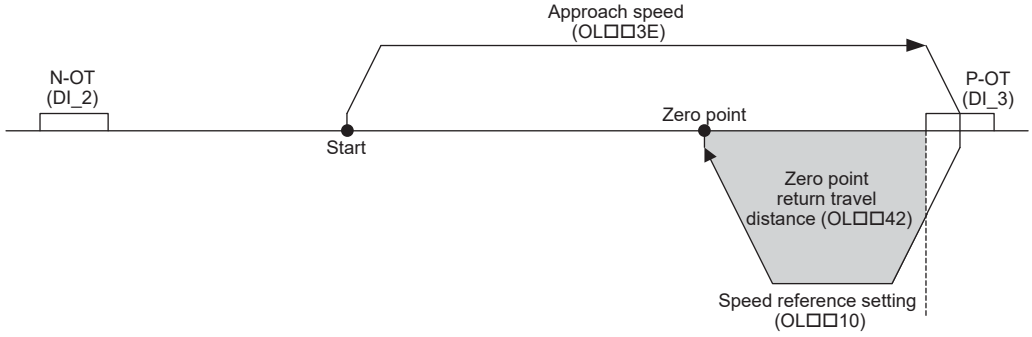
- All of the following are required to use this zero point return method.
  PO-01 software version: Version 1.08 or later
  Board revision: Revision A18 or later
  If you attempt to use this method when the above conditions are not met, the following bits will turn ON and a zero point return will not be executed.
  - IL□□02 Warning, bit 1 Setting parameter error
  - IW□□09 Motion command status, bit 3 Command error occurrence

1. The axis starts moving in the positive direction at the speed specified by OL□□3E (Approach speed).

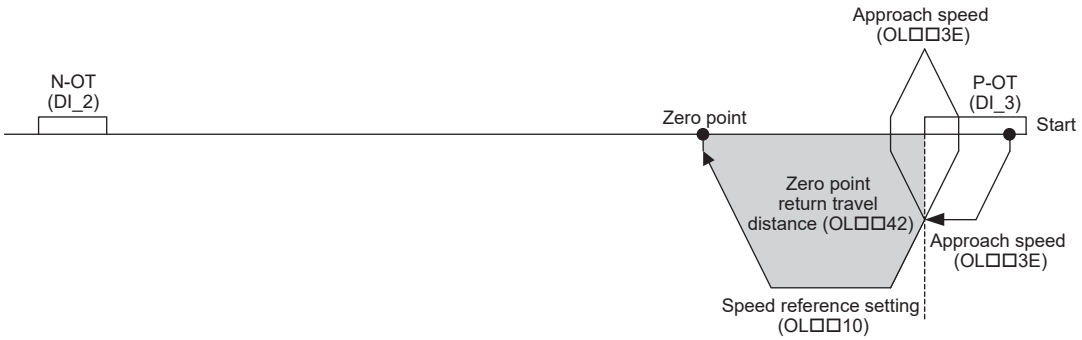
2. When the P-OT signal is detected, the direction will be reversed and the axis will return at OL□□10 (Speed reference setting).

3. When the Module detects that the P-OT signal has turned OFF, the axis will move for the distance specified by OL□□42 (Zero point return travel distance) from that position and stop. A machine coordinate system will be established with the final stop position as the zero point.

- If a zero point return limit signal is detected during travel at OL□□10 (Speed reference setting), either bit 1 (Positive overtravel) or bit 2 (Negative overtravel) in IL□□04 (Alarm) will turn ON depending on the travel direction.
  The zero point return limit signals are selected in Function selection flag 3 (fixed parameter 3) and Hardware signal selection 2 (fixed parameter 21).
- Detecting changes in the P-OT signal status is performed with software processing. Therefore, the position where positioning is completed depends on the high-speed scan setting and OL□□10 (Speed reference setting). Do not use this method if repeat accuracy is required for the position where the zero point return operation is completed.



Starting a Zero Point Return Operation from P-OT



■ Parameters to be Set

Parameter	Name	Setting	Default Setting
OW□□3C	Zero point return method	13: P-OT Only	0
OL□□10	Speed reference setting	Set the speed to use when starting a zero point return. Only a positive value can be set. Zero or a negative value will result in an error and bit 3 in IW□□09 (Motion command status) will change to 1 (Command error occurrence).	3000
OL□□3E	Approach speed	Set the approach speed. Only a positive value can be set. Zero or a negative value will result in an error and bit 3 in IW□□09 (Motion command status) will change to 1 (Command error occurrence).	1000
OL□□42	Zero point return travel distance	Set the zero point return final travel distance. Always set a negative value for this zero point return method.	0
OW□□03, bits 0 to 3	Speed unit	Select the speed unit for OL□□10 (Speed reference setting) and OL□□3E (Approach speed). 0: Reference units/s 1: 10^n reference units/min 2: Percentage of rated speed	1: 10^n reference units/min
OW□□18	Override	Use this parameter to change the travel speed without changing OL□□10 (Speed reference setting). Set the speed as a percentage of the speed reference setting to output in units of 0.01%. This setting can be changed during operation. Setting range: 0 to 32,767 (0% to 327.67%) Setting unit: 0.01% Example: Setting to output 50% of speed reference = 5000 • This parameter is invalid for OL□□3E (Approach speed) and OL□□40 (Creep speed).	10000 (100%)
OW□□19	Bias speed	Set the offset to the speed reference.	0

[I] HOME LS & C-phase Pulse Method (OW□□3C = 14)

- All of the following are required to use this zero point return method.
  PO-01 software version: Version 1.08 or later
  Board revision: Revision A18 or later
  If you attempt to use this method when the above conditions are not met, the following bits will turn ON and a zero point return will not be executed.
  - IL□□02 Warning, bit 1 Setting parameter error
  - IW□□09 Motion command status, bit 3 Command error occurrence

■ Operation after Zero Point Return Starts with a Positive Approach Speed (Rising Edge of HOME LS Signal Detected Only in Positive Direction)

1. The axis starts moving in the positive direction at the speed specified by OL□□3E (Approach speed).

Note: If an OT signal is detected during travel, movement will be started in the opposite direction. At this time, the rising edge of the HOME LS signal is detected only in the positive direction, so the axis will move past the HOME LS signal, will reverse again, and then the rising edge of the HOME LS signal will be detected.

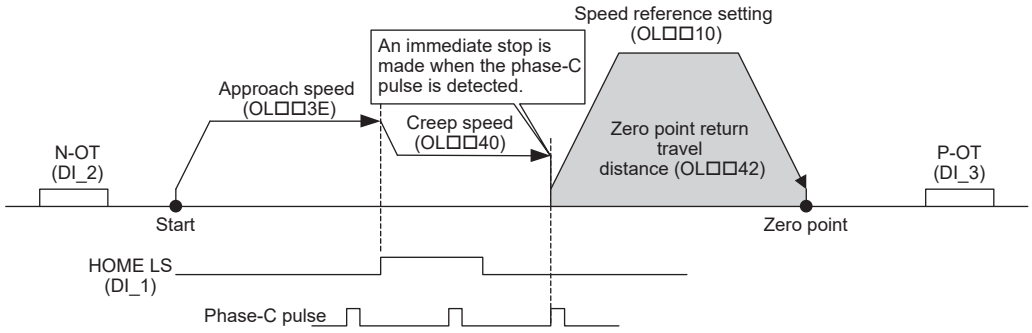
2. When the rising edge of the HOME LS signal is detected, the axis will decelerate to the speed specified by OL□□40 (Creep speed). The travel direction at this time depends on the sign of the creep speed.

3. When the first rising edge of the phase-C pulse is detected after passing the HOME LS signal, the position will be latched and the axis will accelerate or decelerate to the speed specified by OL□□10 (Speed reference setting). The travel direction at this time depends on the sign of the Zero point return final travel distance parameter.

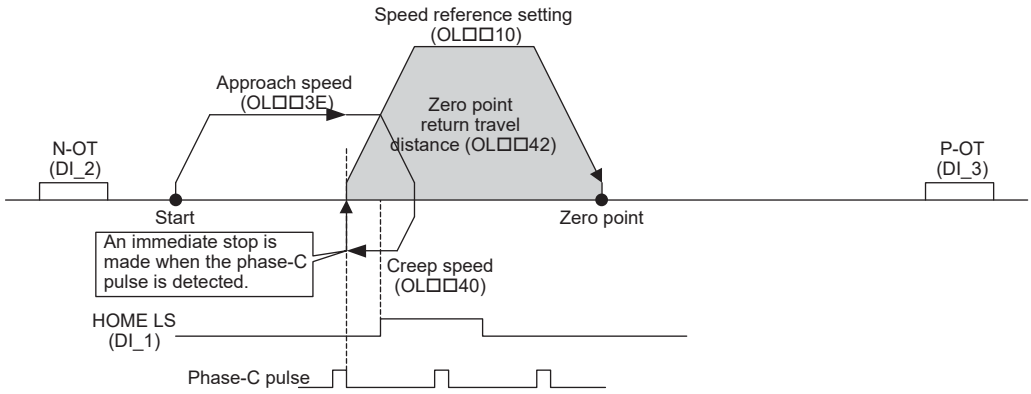
4. The axis will move for the distance specified by OL□□42 (Zero point return travel distance) from the latched position and stop. A machine coordinate system will be established with the final stop position as the zero point.

- If a zero point return limit signal is detected during travel at OL□□40 (Creep speed) or OL□□10 (Speed reference setting), either bit 1 (Positive overtravel) or bit 2 (Negative overtravel) in IL□□04 (Alarm) will turn ON depending on the travel direction.
  The zero point return limit signals are selected in Function selection flag 3 (fixed parameter 3) and Hardware signal selection 2 (fixed parameter 21).

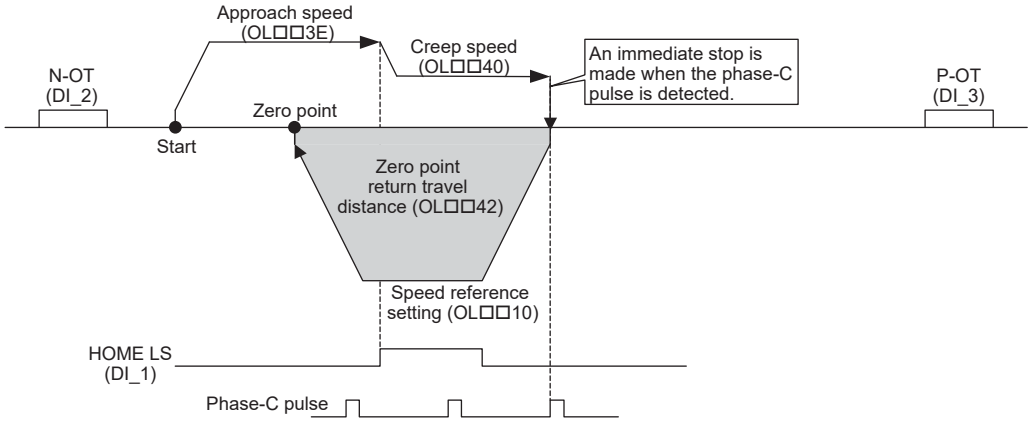
When the Creep Speed and Zero Point Return Final Travel Distance Are Positive



When the Creep Speed Is Negative

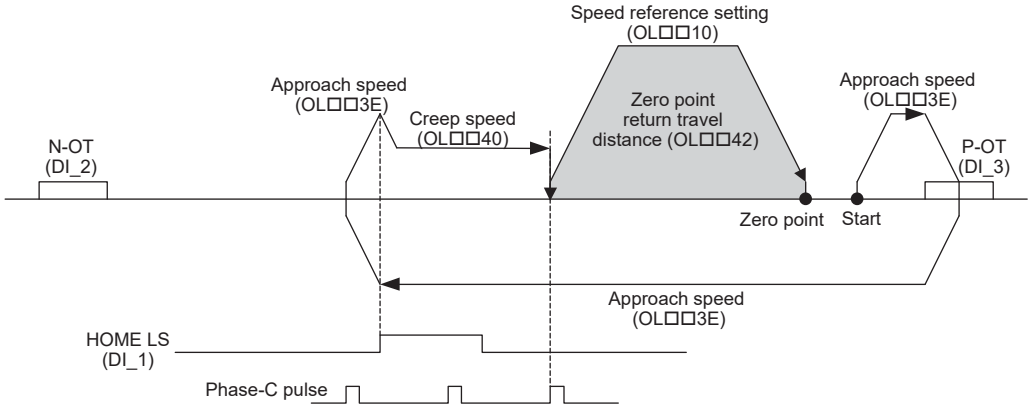


When the Zero Point Return Final Travel Distance Is Negative



Overtravel Signal Detected during Travel at the Approach Speed

The following example is for when the creep speed and zero point return final travel distance are positive.



■ Operation after Zero Point Return Starts with a Negative Approach Speed (Rising Edge of HOME LS Signal Detected Only in Negative Direction)

1. The axis starts moving in the negative direction at the speed specified by OL□□3E (Approach speed).

Note: If an OT signal is detected during travel, movement will be started in the opposite direction. At this time, the rising edge of the HOME LS signal is detected only in the negative direction, so the axis will move past the HOME LS signal, will reverse again, and then the rising edge of the HOME LS signal will be detected.

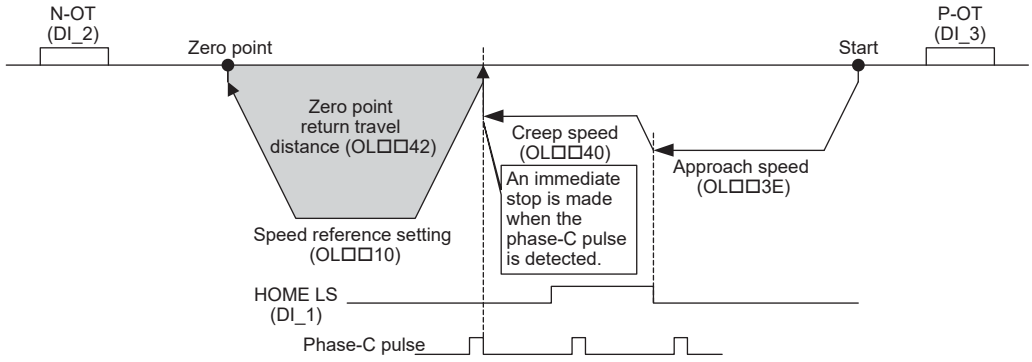
2. When the rising edge of the HOME LS signal is detected, the axis will decelerate to the speed specified by OL□□40 (Creep speed). The travel direction at this time depends on the sign of the creep speed.

3. When the first rising edge of the phase-C pulse is detected after passing the HOME LS signal, the position will be latched and the axis will accelerate or decelerate to the speed specified by OL□□10 (Speed reference setting). The travel direction at this time depends on the sign of the Zero point return travel distance parameter.

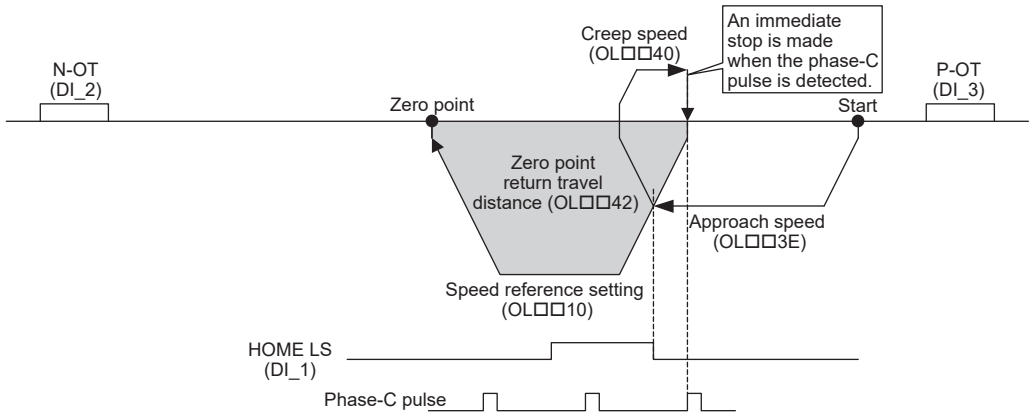
4. The axis will move for the distance specified by OL□□42 (Zero point return travel distance) from the latched position and stop. A machine coordinate system is established with the final stop position as the zero point.

- If a zero point return limit signal is detected during travel at OL□□40 (Creep speed) or OL□□10 (Speed reference setting), either bit 1 (Positive overtravel) or bit 2 (Negative overtravel) in IL□□04 (Alarm) will turn ON depending on the travel direction.
  The zero point return limit signals are selected in Function selection flag 3 (fixed parameter 3) and Hardware signal selection 2 (fixed parameter 21).

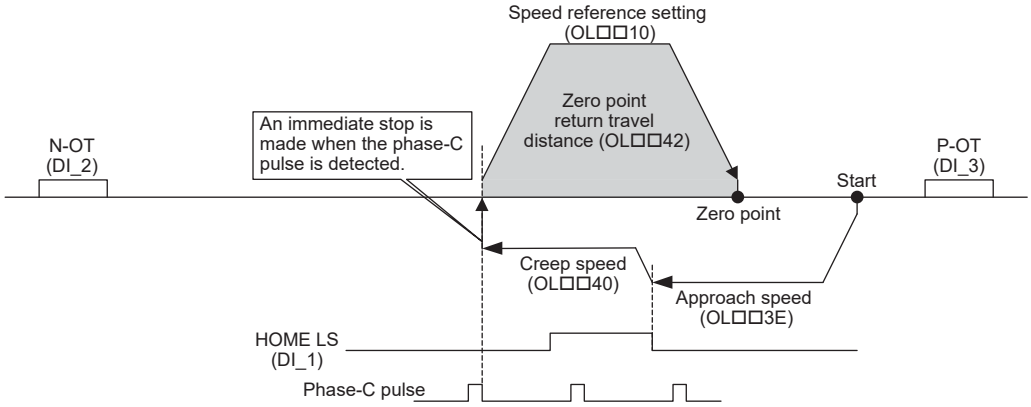
When the Creep Speed and Zero Point Return Final Travel Distance Are Negative



When the Creep Speed Is Positive

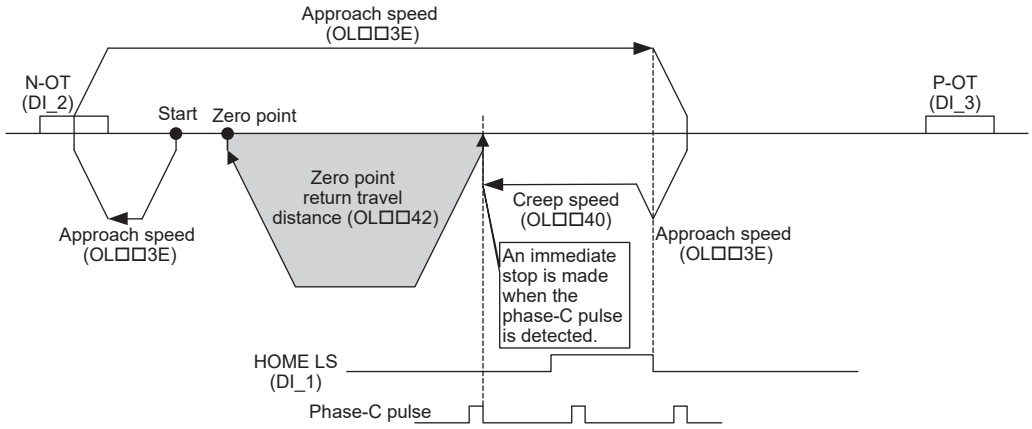


When the Zero Point Return Final Travel Distance Is Positive



Overtravel Signal Detected during Travel at the Approach Speed

The following example is for when the creep speed and zero point return final travel distance are negative.



■ Parameters to be Set

Parameter	Name	Setting	Default Setting
OW□□3C	Zero point return method	14: HOME LS & C-phase pulse	0
OL□□10	Speed reference setting	Set the speed to use when starting a zero point return. Only a positive value can be set. Zero or a negative value will result in an error and bit 3 in IW□□09 (Motion command status) will change to 1 (Command error occurrence).	3000
OL□□3E	Approach speed	Set the approach speed and the travel direction (sign). The setting cannot be changed during operation. The speed and travel direction (sign) at the start of operation are used. Zero will result in an error and bit 3 in IW□□09 (Motion command status) will change to 1 (Command error occurrence).	1000
OL□□40	Creep speed	Set the creep speed and the travel direction (sign). The setting cannot be changed during operation. The speed and travel direction (sign) at the start of operation are used. Zero will result in an error and bit 3 in IW□□09 (Motion command status) will change to 1 (Command error occurrence).	500
OL□□42	Zero point return travel distance	Set the zero point return final travel distance. If the sign is positive, the axis will move in the zero point return direction. If the sign is negative, the axis will move in direction opposite to the zero point return direction.	0
Fixed parameter No. 1, bit 5	Deceleration LS reversal selection	Set whether to reverse the polarity of the DI_2 signal that is used as the HOME signal. 0: Do not reverse. 1: Reverse Even if you set 1 (Reverse), the Zero point return deceleration limit switch signal (OW□□05, bit 8) will not be reversed.	0: Do not reverse.
Fixed parameter No. 20, bit 1	C pulse input signal polarity selection	Select the polarity of the phase-C pulse. 0: Positive logic 1: Negative logic	0: Positive logic
OW□□03, bits 0 to 3	Speed unit	Select the speed unit for OL□□10 (Speed reference setting), OL□□3E (Approach speed), and OL□□40 (Creep speed). 0: Reference units/s 1: 10^n reference units/min 2: Percentage of rated speed	1: 10^n reference units/min
OW□□18	Override	Use this parameter to change the travel speed without changing OL□□10 (Speed reference setting). Set the speed as a percentage of the speed reference setting to output in units of 0.01%. This setting can be changed during operation. Setting range: 0 to 32,767 (0% to 327.67%) Setting unit: 0.01% Example: Setting to output 50% of speed reference = 5000 • This parameter is invalid for OL□□3E (Approach speed) and OL□□40 (Creep speed).	10000 (100%)
OW□□19	Bias speed	Set the offset to the speed reference.	0

[m] N-OT & C-phase Pulse Method (OW□□3C = 16)

- All of the following are required to use this zero point return method.
  PO-01 software version: Version 1.08 or later
  Board revision: Revision A18 or later
  If you attempt to use this method when the above conditions are not met, the following bits will turn ON and a zero point return will not be executed.
  - IL□□02 Warning, bit 1 Setting parameter error
  - IW□□09 Motion command status, bit 3 Command error occurrence

■ Operation after Zero Point Return Starts

1. The axis starts moving in the negative direction at the speed specified by OL□□3E (Approach speed).

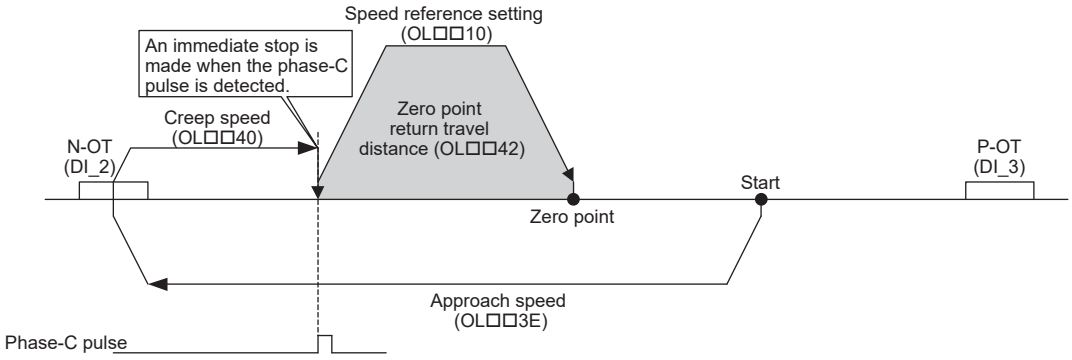
2. When the N-OT signal is detected, the direction will be reversed and the axis will return at OL□□40 (Creep speed).

3. When the rising edge of the phase-C pulse is detected, the position will be latched and the axis will accelerate or decelerate to the speed specified by OL□□10 (Speed reference setting). The travel direction at this time depends on the sign of the Zero point return final travel distance parameter.

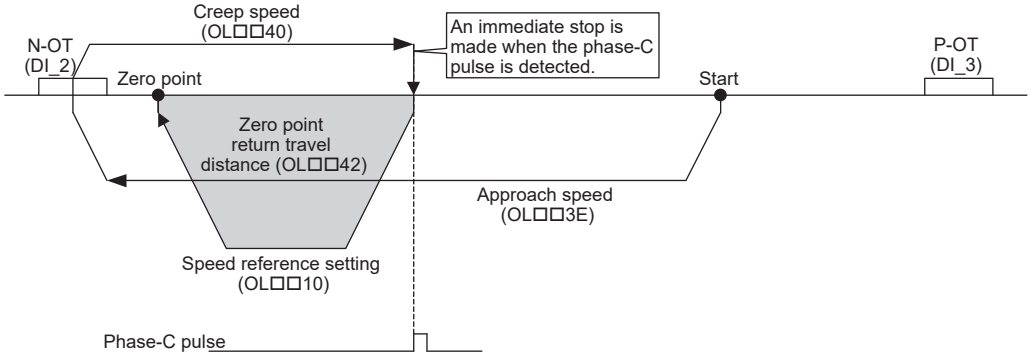
4. The axis will move for the distance specified by OL□□42 (Zero point return travel distance) from the latched position and stop. A machine coordinate system will be established with the final stop position as the zero point.

- If a zero point return limit signal is detected during travel at OL□□10 (Speed reference setting), either bit 1 (Positive overtravel) or bit 2 (Negative overtravel) in IL□□04 (Alarm) will turn ON depending on the travel direction.
  The zero point return limit signals are selected in Function selection flag 3 (fixed parameter 3) and Hardware signal selection 2 (fixed parameter 21).

When the Zero Point Return Final Travel Distance Is Positive



When the Zero Point Return Final Travel Distance Is Negative



■ Parameters to be Set

Parameter	Name	Setting	Default Setting
OW□□3C	Zero point return method	16: N-OT + C-phase pulse	0
OL□□10	Speed reference setting	Set the speed to use when starting a zero point return. Only a positive value can be set. Zero or a negative value will result in an error and bit 3 in IW□□09 (Motion command status) will change to 1 (Command error occurrence).	3000
OL□□3E	Approach speed	Set the approach speed. Only a negative value can be set. Zero or a positive value will result in an error and bit 3 in IW□□09 (Motion command status) will change to 1 (Command error occurrence).	1000
OL□□40	Creep speed	Set the creep speed. The axis moves in the return direction from the N-OT signal regardless of the sign. Zero will result in an error and bit 3 in IW□□09 (Motion command status) will change to 1 (Command error occurrence).	500
Fixed parameter No. 20, bit 1	C pulse input signal polarity selection	Select the polarity of the phase-C pulse. 0: Positive logic 1: Negative logic	0: Positive logic
OL□□42	Zero point return travel distance	Set the zero point return final travel distance. If the sign is positive, the axis will move in the zero point return direction. If the sign is negative, the axis will move in direction opposite to the zero point return direction.	0
OW□□03, bits 0 to 3	Speed unit	Select the speed unit for OL□□10 (Speed reference setting), OL□□3E (Approach speed), and OL□□40 (Creep speed). 0: Reference units/s 1: 10^n reference units/min 2: Percentage of rated speed	1: 10^n reference units/min
OW□□18	Override	Use this parameter to change the travel speed without changing OL□□10 (Speed reference setting). Set the speed as a percentage of the speed reference setting to output in units of 0.01%. This setting can be changed during operation. Setting range: 0 to 32,767 (0% to 327.67%) Setting unit: 0.01% Example: Setting to output 50% of speed reference = 5000 • This parameter is invalid for OL□□3E (Approach speed) and OL□□40 (Creep speed).	10000 (100%)
OW□□19	Bias speed	Set the offset to the speed reference.	0

[n] N-OT Only Method (OW□□3C = 17)

- All of the following are required to use this zero point return method.
  PO-01 software version: Version 1.08 or later
  Board revision: Revision A18 or later
  If you attempt to use this method when the above conditions are not met, the following bits will turn ON and a zero point return will not be executed.
  - IL□□02 Warning, bit 1 Setting parameter error
  - IW□□09 Motion command status, bit 3 Command error occurrence

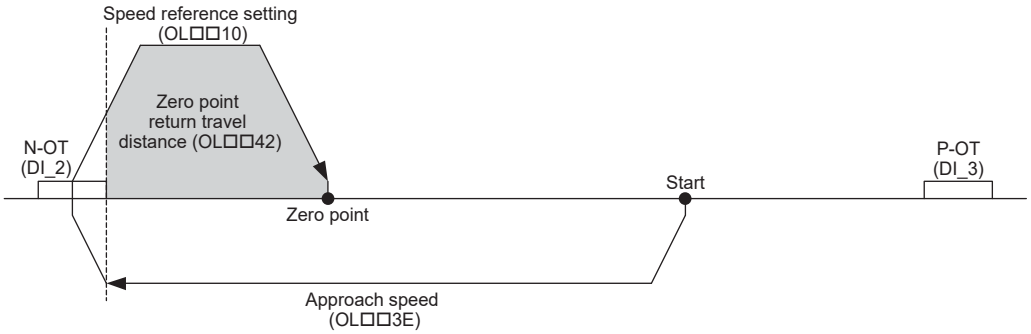
■ Operation after Zero Point Return Starts

1. The axis starts moving in the negative direction at the speed specified by OL□□3E (Approach speed).

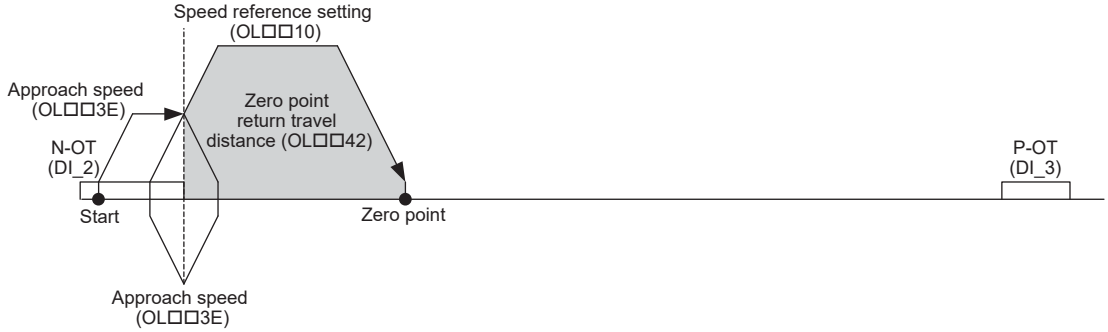
2. When the N-OT signal is detected, the direction will be reversed and the axis will return at OL□□10 (Speed reference setting).

3. When the Module detects that the N-OT signal has turned OFF, the axis will move for the distance specified by OL□□42 (Zero point return travel distance) from that position and stop. A machine coordinate system will be established with the final stop position as the zero point.

- If a zero point return limit signal is detected during travel at OL□□10 (Speed reference setting), either bit 1 (Positive overtravel) or bit 2 (Negative overtravel) in IL□□04 (Alarm) will turn ON depending on the travel direction.
  The zero point return limit signals are selected in Function selection flag 3 (fixed parameter 3) and Hardware signal selection 2 (fixed parameter 21).
- Detecting changes in the N-OT signal status is performed with software processing. Therefore, the position where positioning is completed depends on the high-speed scan setting and OL□□10 (Speed reference setting). Do not use this method if repeat accuracy is required for the position where the zero point return operation is completed.



Starting a Zero Point Return Operation from P-OT



■ Parameters to be Set

Parameter	Name	Setting	Default Setting
OW□□3C	Zero point return method	17 : N-OT Only	0
OL□□10	Speed reference setting	Set the speed to use when starting a zero point return. Only a positive value can be set. Zero or a negative value will result in an error and bit 3 in IW□□09 (Motion command status) will change to 1 (Command error occurrence).	3000
OL□□3E	Approach speed	Set the approach speed. Only a negative value can be set. Zero or a positive value will result in an error and bit 3 in IW□□09 (Motion command status) will change to 1 (Command error occurrence).	1000
OL□□42	Zero point return travel distance	Set the zero point return final travel distance. Always set a positive value for this zero point return method.	0
OW□□03, bits 0 to 3	Speed unit	Select the speed unit for OL□□10 (Speed reference setting) and OL□□3E (Approach speed). 0: Reference units/s 1: 10^n reference units/min 2: Percentage of rated speed	1: 10^n reference units/min
OW□□18	Override	Use this parameter to change the travel speed without changing OL□□10 (Speed reference setting). Set the speed as a percentage of the speed reference setting to output in units of 0.01%. This setting can be changed during operation. Setting range: 0 to 32,767 (0% to 327.67%) Setting unit: 0.01% Example: Setting to output 50% of speed reference = 5000 • This parameter is invalid for OL□□3E (Approach speed) and OL□□40 (Creep speed).	10000 (100%)
OW□□19	Bias speed	Set the offset to the speed reference.	0

[o] INPUT & C-phase Pulse Method (OW□□3C = 18)

- All of the following are required to use this zero point return method.
  PO-01 software version: Version 1.08 or later
  Board revision: Revision A18 or later
  If you attempt to use this method when the above conditions are not met, the following bits will turn ON and a zero point return will not be executed.
  - IL□□02 Warning, bit 1 Setting parameter error
  - IW□□09 Motion command status, bit 3 Command error occurrence

■ Operation after Zero Point Return Starts with a Positive Approach Speed (Rising Edge of INPUT Signal Detected Only in Positive Direction)

1. The axis starts moving in the positive direction at the speed specified by OL□□3E (Approach speed).

Note: If an OT signal is detected during travel, movement will be started in the opposite direction. At this time, the rising edge of the INPUT signal is detected only in the positive direction, so the axis will move past the INPUT signal, will reverse again, and then the rising edge of the INPUT signal will be detected.

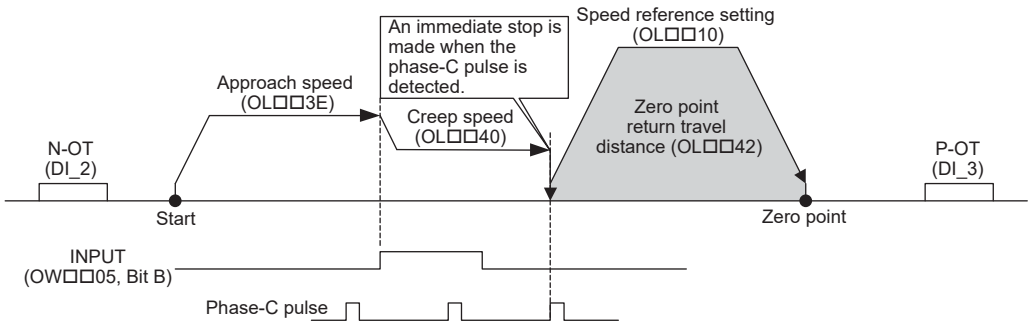
2. When the rising edge of the INPUT signal is detected, the axis will decelerate to the speed specified by OL□□40 (Creep speed). The travel direction at this time depends on the sign of the creep speed.

3. When the first rising edge of the phase-C pulse is detected after passing the INPUT signal, the position will be latched and the axis will accelerate or decelerate to the speed specified by OL□□10 (Speed reference setting). The travel direction at this time depends on the sign of the Zero point return final travel distance parameter.

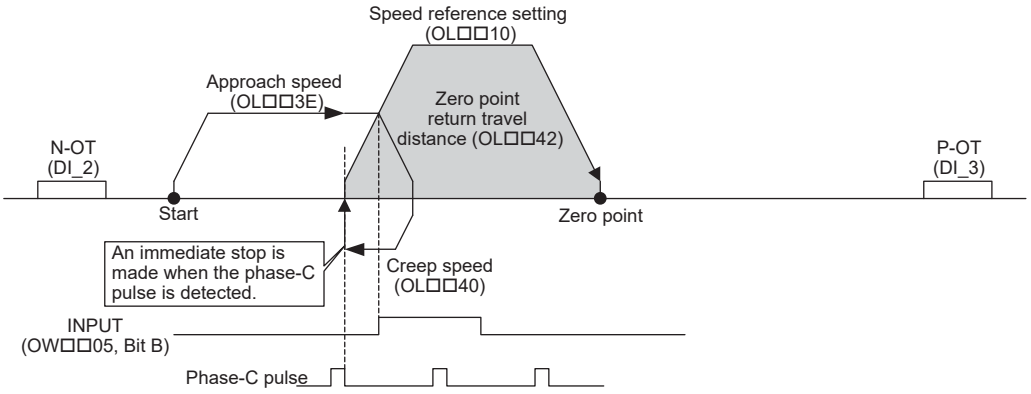
4. The axis will move for the distance specified by OL□□42 (Zero point return travel distance) from the latched position and stop. A machine coordinate system will be established with the final stop position as the zero point.

- If a zero point return limit signal is detected during travel at OL□□40 (Creep speed) or OL□□10 (Speed reference setting), either bit 1 (Positive overtravel) or bit 2 (Negative overtravel) in IL□□04 (Alarm) will turn ON depending on the travel direction.
  The zero point return limit signals are selected in Function selection flag 3 (fixed parameter 3) and Hardware signal selection 2 (fixed parameter 21).

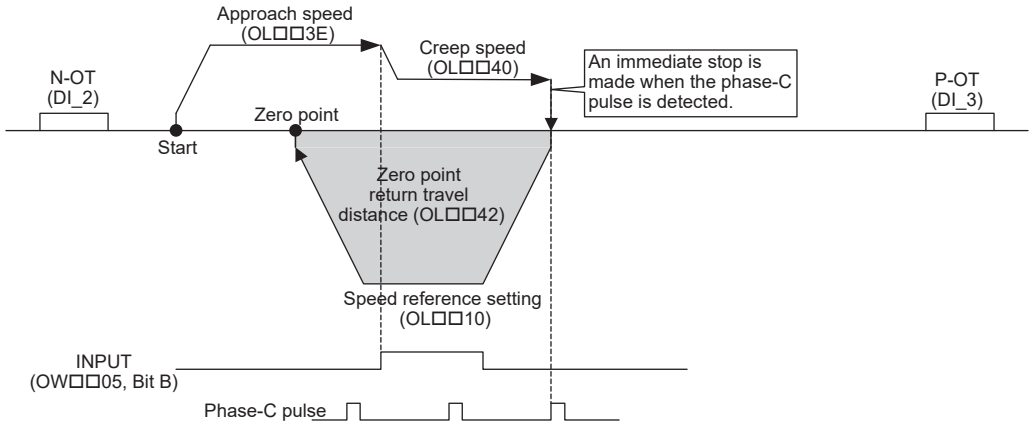
When the Creep Speed and Zero Point Return Final Travel Distance Are Positive



When the Creep Speed Is Negative

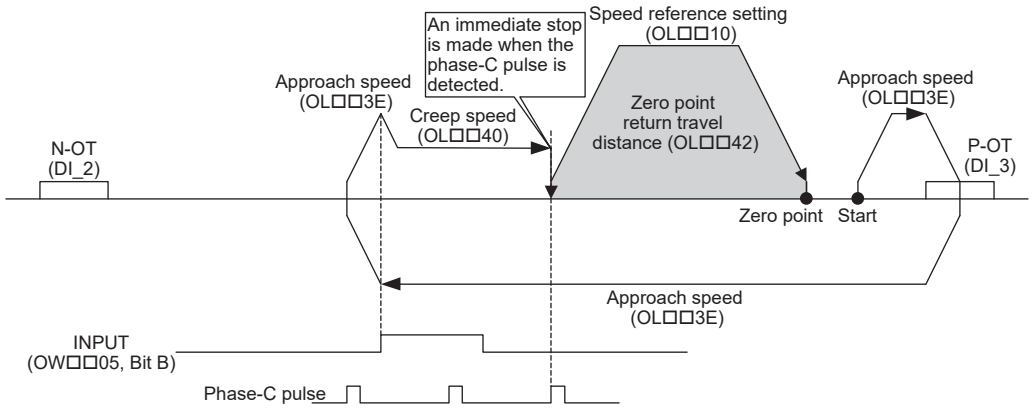


When the Zero Point Return Final Travel Distance Is Negative



Overtravel Signal Detected during Travel at the Approach Speed

The following example is for when the creep speed and zero point return final travel distance are positive.



■ Operation after Zero Point Return Starts with a Negative Approach Speed (Rising Edge of INPUT Signal Detected Only in Negative Direction)

1. The axis starts moving in the negative direction at the speed specified by OL□□3E (Approach speed).

Note: If an OT signal is detected during travel, movement will be started in the opposite direction. At this time, the rising edge of the INPUT signal is detected only in the negative direction, so the axis will move past the INPUT signal, will reverse again, and then the rising edge of the INPUT signal will be detected.

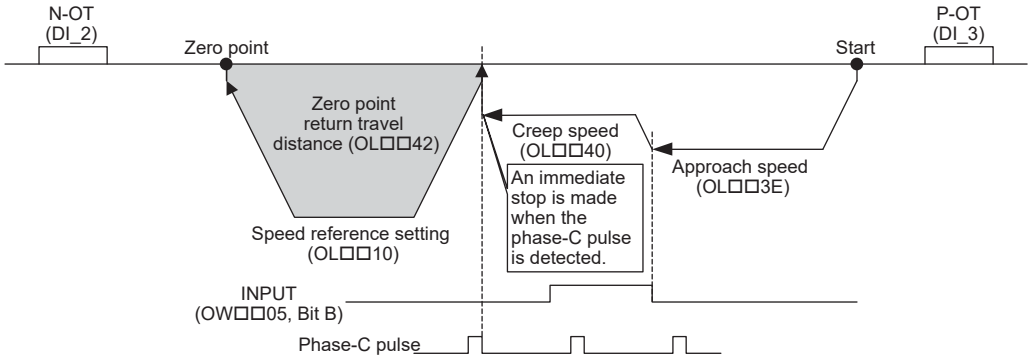
2. When the rising edge of the INPUT signal is detected, the axis will decelerate to the speed specified by OL□□40 (Creep speed). The travel direction at this time depends on the sign of the creep speed.

3. When the first rising edge of the phase-C signal is detected after passing the INPUT signal, the position will be latched and the axis will accelerate or decelerate to the speed specified by OL□□10 (Speed reference setting). The travel direction at this time depends on the sign of the Zero point return final travel distance parameter.

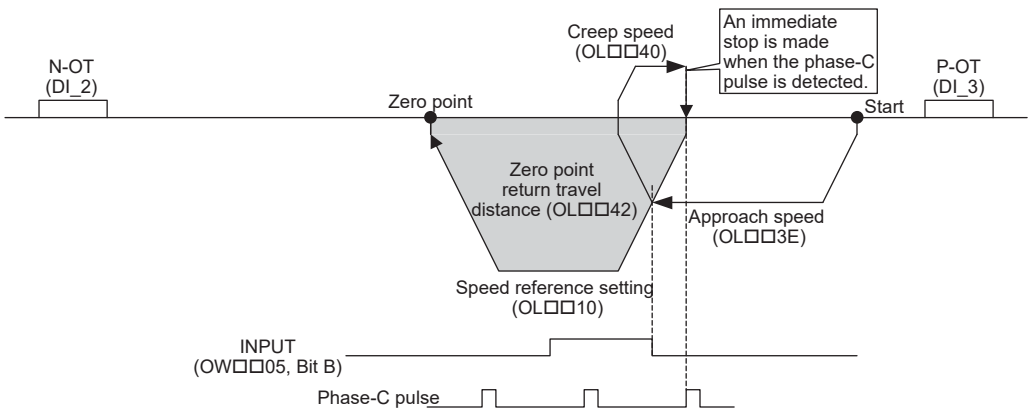
4. The axis will move for the distance specified by OL□□42 (Zero point return travel distance) from the latched position and stop. A machine coordinate system will be established with the final stop position as the zero point.

- If a zero point return limit signal is detected during travel at OL□□40 (Creep speed) or OL□□10 (Speed reference setting), either bit 1 (Positive overtravel) or bit 2 (Negative overtravel) in IL□□04 (Alarm) will turn ON depending on the travel direction.
  The zero point return limit signals are selected in Function selection flag 3 (fixed parameter 3) and Hardware signal selection 2 (fixed parameter 21).

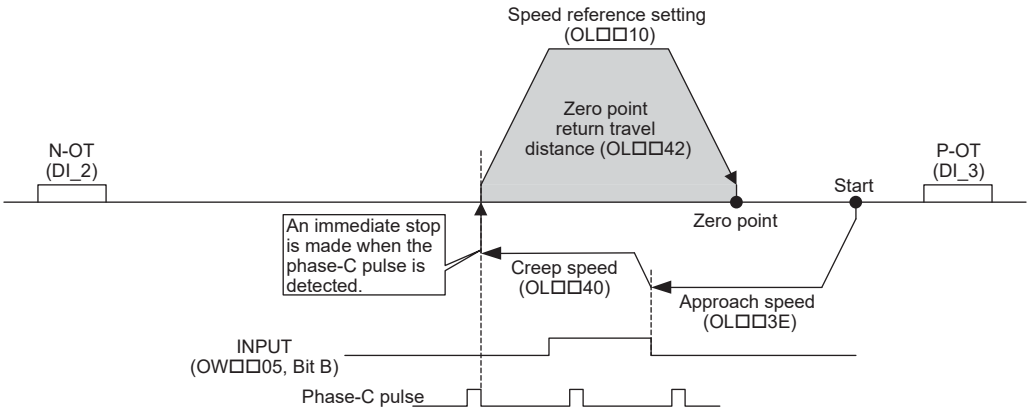
When the Creep Speed and Zero Point Return Final Travel Distance Are Negative



When the Creep Speed Is Positive

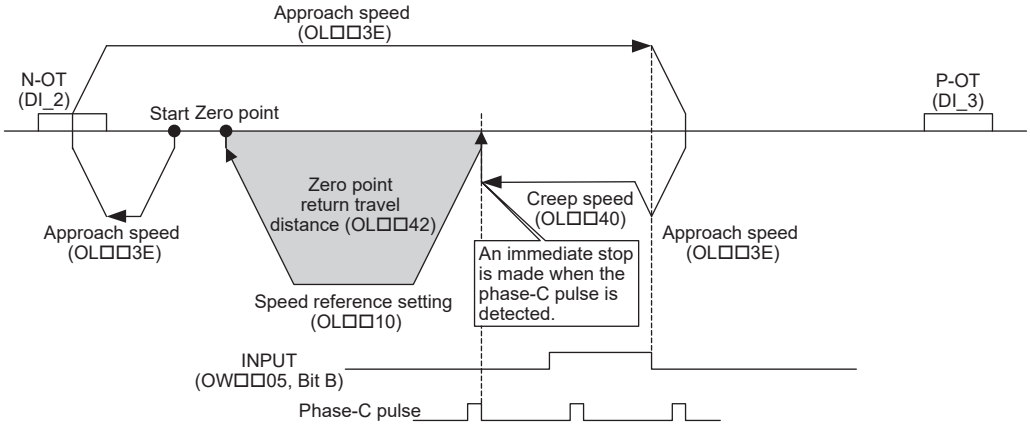


When the Zero Point Return Final Travel Distance Is Positive



Overtravel Signal Detected during Travel at the Approach Speed

The following example is for when the creep speed and zero point return final travel distance are negative.



■ Parameters to be Set

Parameter	Name	Setting	Default Setting
OW□□3C	Zero point return method	18: INPUT & C-phase pulse	0
OL□□10	Speed reference setting	Set the speed to use when starting a zero point return. Only a positive value can be set. A negative value will result in an error and bit 3 in IW□□09 (Motion command status) will change to 1 (Command error occurrence).	3000
OL□□3E	Approach speed	Set the approach speed and the travel direction (sign).	1000
OL□□40	Creep speed	Set the creep speed and the travel direction (sign).	500
Fixed parameter No. 20, bit 1	C pulse input signal polarity selection	Select the polarity of the phase-C pulse. 0: Positive logic 1: Negative logic	0: Positive logic
OL□□42	Zero point return travel distance	Set the zero point return final travel distance. If the sign is positive, the axis will move in the zero point return direction. If the sign is negative, the axis will move in direction opposite to the zero point return direction.	0
OW□□03, bits 0 to 3	Speed unit	Select the speed unit for OL□□10 (Speed reference setting), OL□□3E (Approach speed), and OL□□40 (Creep speed). 0: Reference units/s 1: 10^n reference units/min 2: Percentage of rated speed	1: 10^n reference units/min
OW□□05, bit B	Zero point return INPUT signal	This bit turns the zero point return INPUT signal ON and OFF. 0: OFF 1: ON	0: OFF
OW□□18	Override	Use this parameter to change the travel speed without changing OL□□10 (Speed reference setting). Set the speed as a percentage of the speed reference setting to output in units of 0.01%. This setting can be changed during operation. Setting range: 0 to 32,767 (0% to 327.67%) Setting unit: 0.01% Example: Setting to output 50% of speed reference = 5000 • This parameter is invalid for OL□□3E (Approach speed) and OL□□40 (Creep speed).	10000 (100%)
OW□□19	Bias speed	Set the offset to the speed reference.	0

[p] INPUT Only Method (OW□□3C = 19)

- All of the following are required to use this zero point return method.
  PO-01 software version: Version 1.08 or later
  Board revision: Revision A18 or later
  If you attempt to use this method when the above conditions are not met, the following bits will turn ON and a zero point return will not be executed.
  - IL□□02 Warning, bit 1 Setting parameter error
  - IW□□09 Motion command status, bit 3 Command error occurrence

■ Operation after Zero Point Return Starts When Creep Speed Is Positive

1. The axis starts moving in the positive direction at the speed specified by OL□□40 (Creep speed).

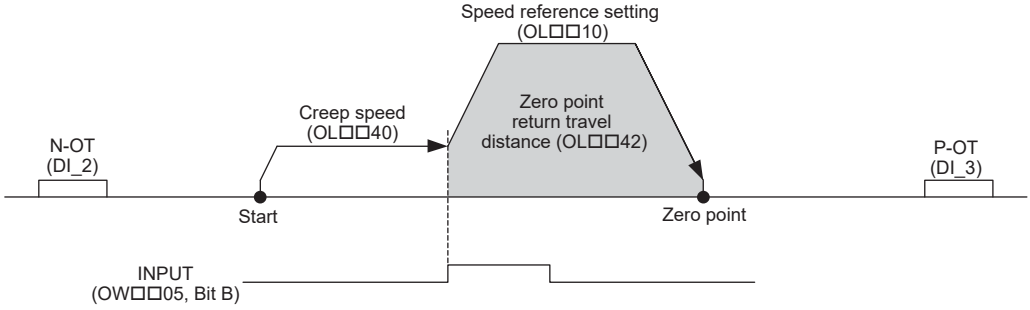
Note:If an OT signal is detected during travel, movement will be started in the opposite direction.

2. When the Module detects that the INPUT signal has turned ON, the position will be latched and the axis will accelerate or decelerate to the speed specified by OL□□10 (Speed reference setting). The travel direction at this time depends on the sign of the Zero point return final travel distance parameter.

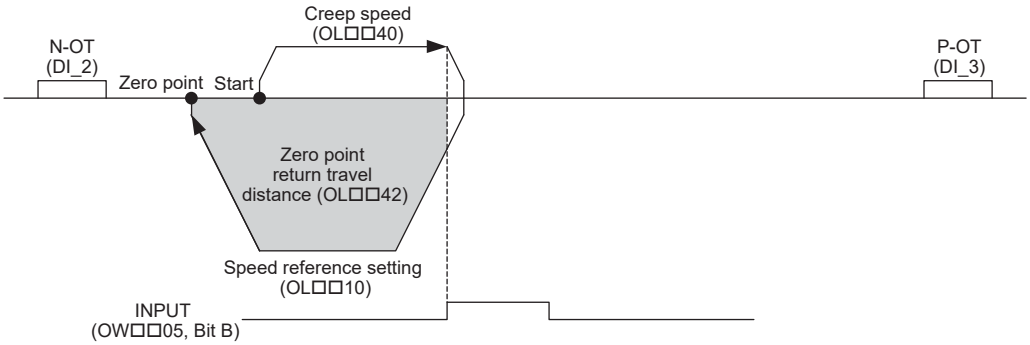
3. When the Module detects that the INPUT signal has turned ON, the axis will move for the distance specified by OL□□42 (Zero point return travel distance) from that position and stop. A machine coordinate system will be established with the final stop position as the zero point.

- If a zero point return limit signal is detected during travel at OL□□10 (Speed reference setting), either bit 1 (Positive overtravel) or bit 2 (Negative overtravel) in IL□□04 (Alarm) will turn ON depending on the travel direction.
  The zero point return limit signals are selected in Function selection flag 3 (fixed parameter 3) and Hardware signal selection 2 (fixed parameter 21).
- The rising edge of the INPUT signal is performed with software processing. The position where positioning is completed depends on the high-speed scan setting, OL□□40 (Creep speed), and other settings. Do not use this method if repeat accuracy is required for the position where the zero point return operation is completed.

When the Zero Point Return Final Travel Distance Is Positive

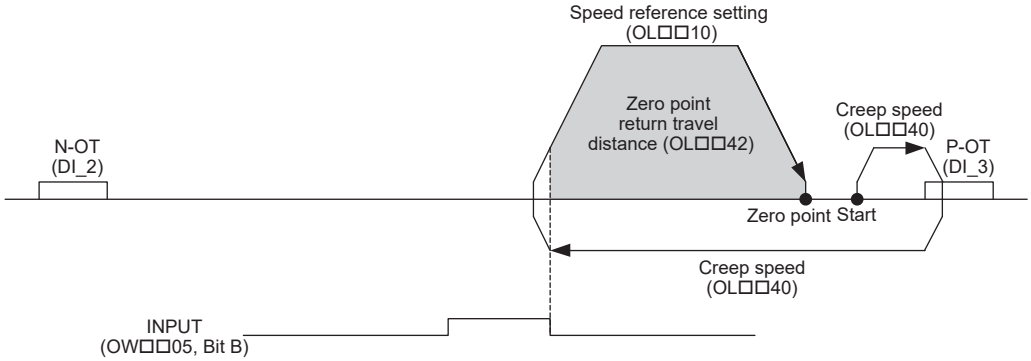


When the Zero Point Return Final Travel Distance Is Negative



Overtravel Signal Detected during Travel at the Creep Speed

The following example is for when the zero point return final travel distance is positive.



■ Operation after Zero Point Return Starts When Creep Speed Is Negative

1. The axis starts moving in the negative direction at the speed specified by OL□□40 (Creep speed).

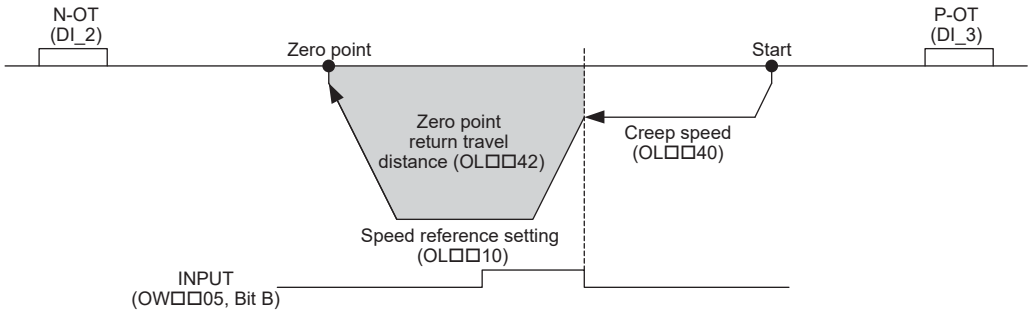
Note:If an OT signal is detected during travel, movement will be started in the opposite direction.

2. When the Module detects that the INPUT signal has turned ON, the position will be latched and the axis will accelerate or decelerate to the speed specified by OL□□10 (Speed reference setting). The travel direction at this time depends on the sign of the Zero point return final travel distance parameter.

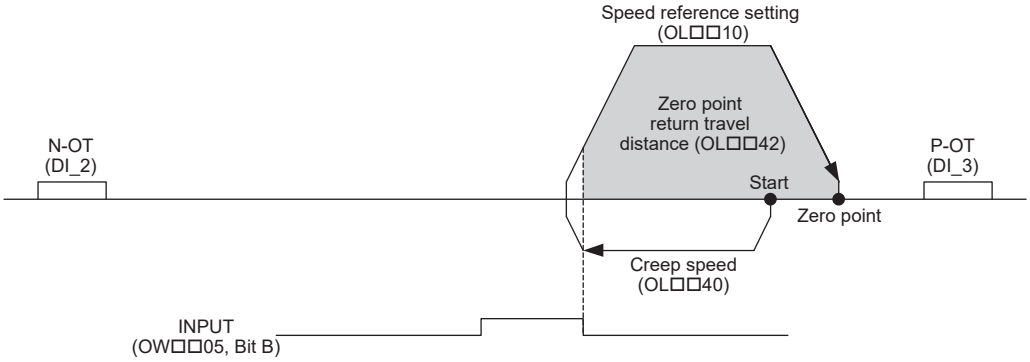
3. When the Module detects that the INPUT signal has turned ON, the axis will move for the distance specified by OL□□42 (Zero point return travel distance) from that position and stop. A machine coordinate system will be established with the final stop position as the zero point.

- If a zero point return limit signal is detected during travel at OL□□10 (Speed reference setting), either bit 1 (Positive overtravel) or bit 2 (Negative overtravel) in IL□□04 (Alarm) will turn ON depending on the travel direction.
  The zero point return limit signals are selected in Function selection flag 3 (fixed parameter 3) and Hardware signal selection 2 (fixed parameter 21).
- Detecting changes from OFF to ON in the INPUT signal is performed with software processing. The position where positioning is completed depends on the high-speed scan setting, OL□□40 (Creep speed), and other settings. Do not use this method if repeat accuracy is required for the position where the zero point return operation is completed.

When the Zero Point Return Final Travel Distance Is Negative

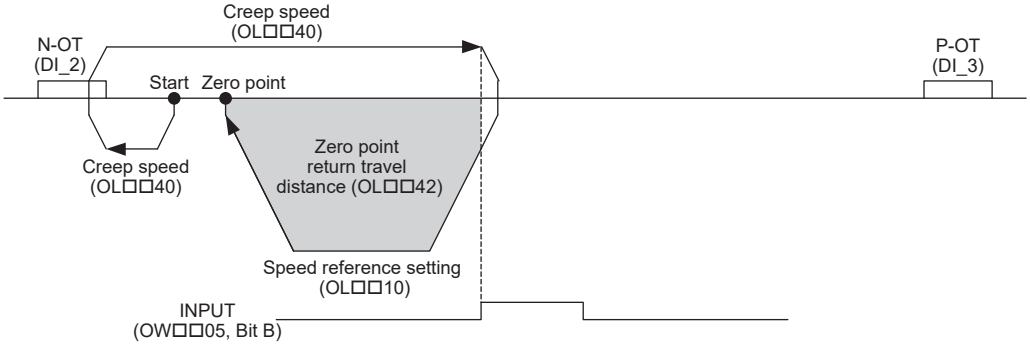


When the Zero Point Return Final Travel Distance Is Positive



Overtravel Signal Detected during Travel at the Creep Speed

The following example is for when the zero point return final travel distance is negative.



■ Parameters to be Set

Parameter	Name	Setting	Default Setting
OW□□3C	Zero point return method	19: INPUT Only	0
OL□□10	Speed reference setting	Set the speed to use when starting a zero point return. Only a positive value can be set. Zero or a negative value will result in an error and bit 3 in IW□□09 (Motion command status) will change to 1 (Command error occurrence).	3000
OL□□40	Creep speed	Set the creep speed and the travel direction (sign). Zero will result in an error and bit 3 in IW□□09 (Motion command status) will change to 1 (Command error occurrence).	500
OL□□42	Zero point return travel distance	Set the zero point return final travel distance. If the sign is positive, the axis will move in the zero point return direction. If the sign is negative, the axis will move in direction opposite to the zero point return direction.	0
OW□□03, Bits 0 to 3	Speed unit	Select the speed unit for OL□□10 (Speed reference setting), OL□□3E (Approach speed), and OL□□40 (Creep speed). 0: Reference units/s 1: 10^n reference units/min 2: Percentage of rated speed	1: 10^n reference units/min
OW□□05, Bit B	Zero point return INPUT signal	This bit turns the zero point return INPUT signal ON and OFF. 0: OFF 1: ON	0: OFF
OW□□18	Override	Use this parameter to change the travel speed without changing OL□□10 (Speed reference setting). Set the speed as a percentage of the speed reference setting to output in units of 0.01%. This setting can be changed during operation. Setting range: 0 to 32,767 (0% to 327.67%) Setting unit: 0.01% Example: Setting to output 50% of speed reference = 5000 • This parameter is invalid for OL□□3E (Approach speed) and OL□□40 (Creep speed).	10000 (100%)
OW□□19	Bias speed	Set the offset to the speed reference.	0

4.2.3 Interpolation (INTERPOLATE)

The INTERPOLATE command positions the axis according to the target position that changes in synchronization with the high-speed scan. The positioning data is generated by a ladder program.

(1) Executing/Operating Procedure

1. Check to see if all the following conditions are satisfied.

No.	Execution Conditions	Confirmation Method
1	There are no alarms.	Both IL□□02 and IL□□04 are 0.
2	The Servo ON condition.	IB□□001 is ON.

2. Set the following motion setting parameters.

OW□□03, bits 8 to B: Filter type
OW□□09, bit 5: Position reference type
OL□□20: NEAR signal output width
OW□□3A: Filter time constant

3. Set the interpolation motion command and the target position.

a) The position reference type (OW□□09, bit 5) is set to incremental addition mode (0)

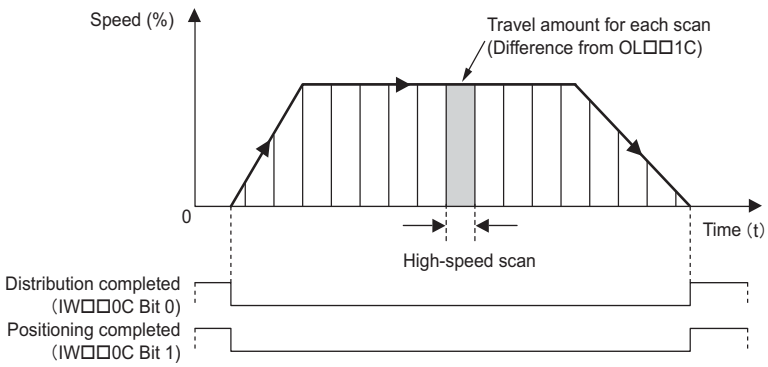
Set the motion command (OW□□08) to 4, and then add the incremental value to the position reference setting (OL□□1C) to set the target position.
The positioning operation will starts. IW□□08 will be 4 during the positioning.
The bit 3 of IW□□0C will turn ON when the axis approaches the target position.

b) The position reference type (OW□□09, bit 5) is set to absolute mode (1)

Set the target position in Position reference setting (OL□□1C), and then set the Motion command (OW□□08) to 4.
Positioning will start. IW□□08 will be 4 during the positioning.
The bit 3 of IW□□0C will turn ON when the axis approaches the target position.
The bit 1 of IW□□0C will turn ON when the axis reaches the target position, and the positioning will complete.

4. Set OW□□08 to 0 to execute the NOP motion command and the complete the positioning operation.

INTERPOLATE Operation Pattern



(2) Holding and Aborting

The Command pause (OW□□09, bit 0) and the Command abort (OW□□09, bit 1) cannot be used.
If 0 is set for the Motion command (OW□□08) while the axis is moving, the interpolation operation will immediately stops.

(3) Related Parameters

[a] Setting Parameters

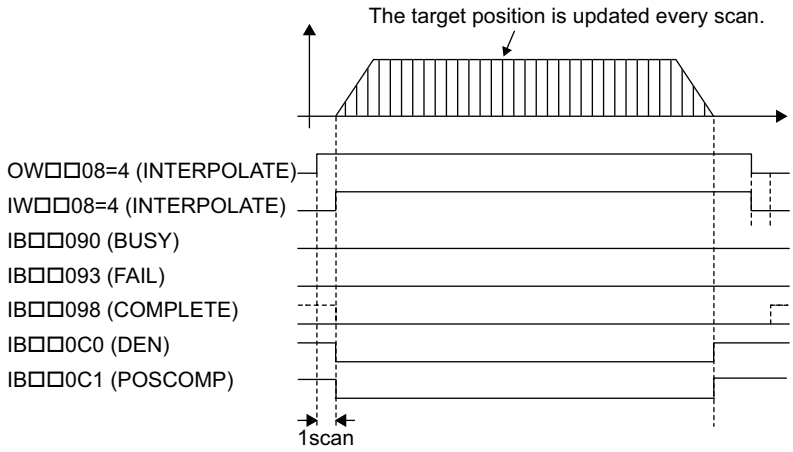
Parameter	Name	Setting	Default Setting
OW□□03, Bits 8 to B	Function setting 1 Filter type	Set the acceleration/deceleration filter type. 0: No filter 1: Exponential acceleration/deceleration filter 2: Move average filter	0: No filter
OW□□08	Motion command	Set to 4 to execute interpolation. If 0 is set during interpolation operation, the operation will stop.	0
OW□□09, Bit 5	Position reference type	Set the type of position reference. 0: Incremental addition mode, 1: Absolute mode • Set Position parameter before setting the motion command (OW□□08) to 4.	0: Incremental addition mode
OL□□1C	Position reference type	Set the target position for every high-speed scan.	0
OL□□20	NEAR signal output width	Set the range in which the Position proximity (IW□□0C, bit 3) will turn ON. The Position proximity bit will turn ON when the absolute value of the difference between the reference position and the feedback position is less than the value set here.	0
OW□□3A	Filter time constant	Set the acceleration/deceleration filter time constant. Either exponential or move average filter can be selected by setting the Function setting 1 (OW□□03). This parameter is valid when the Positioning completed (IW□□0C, bit 1) is set to ON (1).	0

[b] Monitoring Parameters

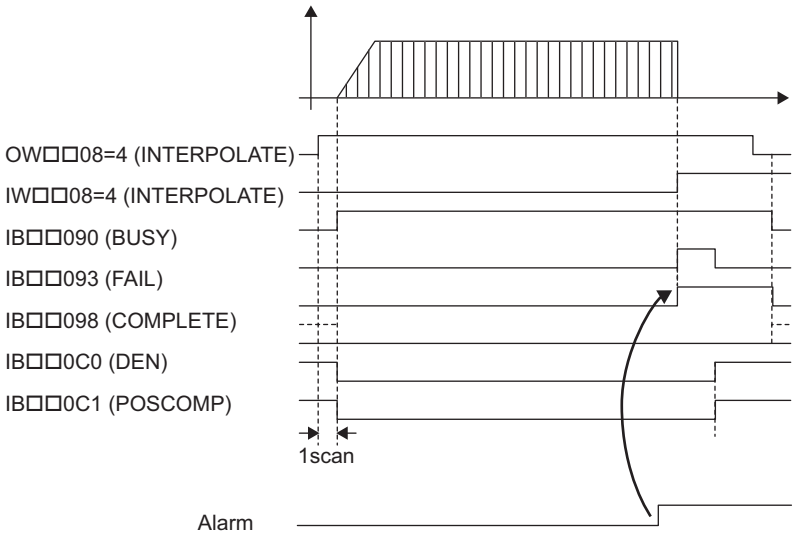
Parameter	Name	Monitor Contents
IL□□02	Warning	Stores the most current warning. (bit setting)
IL□□04	Alarm	Stores the most current alarm. (bit setting)
IW□□08	Motion command response code	Indicates the motion command that is being executed. The response code is 4 during INTERPOLATE command execution.
IW□□09, Bit 0	Command executing flag	Always OFF for INTERPOLATE command.
IW□□09, Bit 1	Command hold completed	Always OFF for INTERPOLATE command.
IW□□09, Bit 3	Command error occurrence	Turns ON if an error occurs during INTERPOLATE command execution. The axis will decelerate to a stop if it is moving. Turns OFF when another command is executed.
IW□□09, Bit 8	Command execution completed	This parameter is not used for INTERPOLATE command. Always OFF for INTERPOLATE command. Use the bit 1 of IW□□0C (Positioning completed) to confirm the completion of command execution.
IW□□0C, Bit 0	Distribution completed	Turns ON when the distribution of move command has been completed. This bit is OFF while a move command is being executed.
IW□□0C, Bit 1	Positioning completed	Turns ON when the bit 0 of IW□□0C (Distribution completed) turns ON.
IW□□0C, Bit 3	Positioning proximity	The operation depends on the setting of the NEAR signal output width (setting parameter OL□□20). OL□□20 = 0: Turns ON when pulse distribution has been completed (IW□□0C, bit 0 = ON). OL□□20 ≠ 0: Turns ON when the current position is in the range specified by the NEAR signal output width even if pulse distribution has not been completed.

(4) Timing Charts

[a] Normal Execution



[b] Execution when an Alarm Occurs



4.2.4 JOG Operation (FEED)

The FEED command starts movement in the specified travel direction at the specified travel speed. Execute the NOP motion command to stop the operation.
Parameters related to acceleration and deceleration are set in advance.

(1) Executing/Operating Procedure

1. Check to see if all the following conditions are satisfied.

No.	Execution Conditions	Confirmation Method
1	There are no alarms.	Both IL□□02 and IL□□04 are 0.
2	The Servo ON condition.	IB□□001 is ON.

2. Set the following motion setting parameters.

OW□□03, bits 0 to 3: Speed unit *
OW□□03, bits 4 to 7: Acceleration unit *
OW□□03, bits 8 to B: Filter type
OL□□10: Speed reference setting*
OW□□18: Override*
OW□□19: Bias speed*
OL□□20: NEAR signal output width
OL□□36: Straight-line acceleration/acceleration time constant*
OL□□38: Straight-line deceleration/deceleration time constant*
OL□□3A: Filter time constant

* The settings of these parameters can be changed during JOG operation.
- An override between 0% to 327.67% can be set for the speed reference.

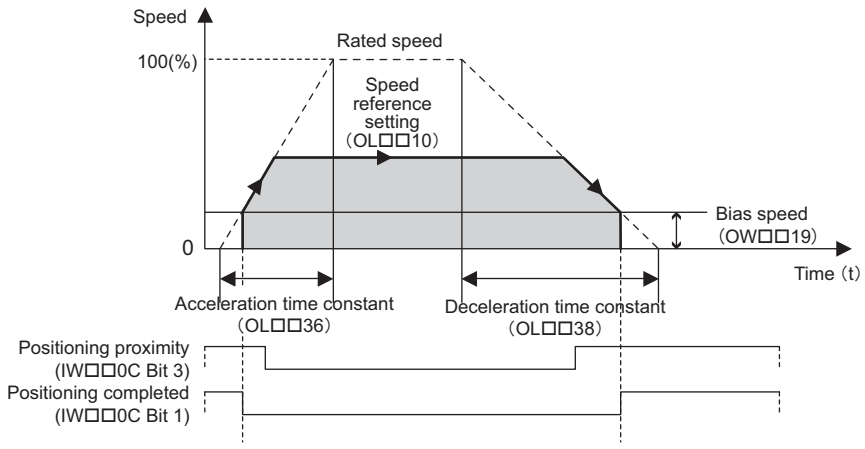
3. Set OW□□08 to 7 to execute the FEED motion command.

JOG operation will start. IW□□08 will be 7 during the execution.

4. Set OW□□08 to 0 to execute the NOP motion command.

The bit 1 of IW□□0C turns ON and the JOG operation has been completed.

FEED Operation Pattern



(2) Holding

Holding execution is not possible during FEED command execution. The Command pause (OW□□09, bit 0) is ignored.

(3) Aborting

Axis travel can be stopped during FEED command execution by aborting execution of a command. A command is aborted by setting the Command abort (OW□□09, bit 1) to 1 (ON).

- Set the Command abort (OW□□09, bit 1) to 1 (ON). The axis will decelerate to a stop.
- When the axis has stopped, the Positioning completed (IW□□0C, bit 1) will turn ON.
- The JOG operation will restart if the Command abort (OW□□09, bit 1) is reset to 0 during abort processing.
- This type of operation will also be performed if Motion command (OW□□08) is changed during axis movement.

(4) Related Parameters

[a] Setting Parameters

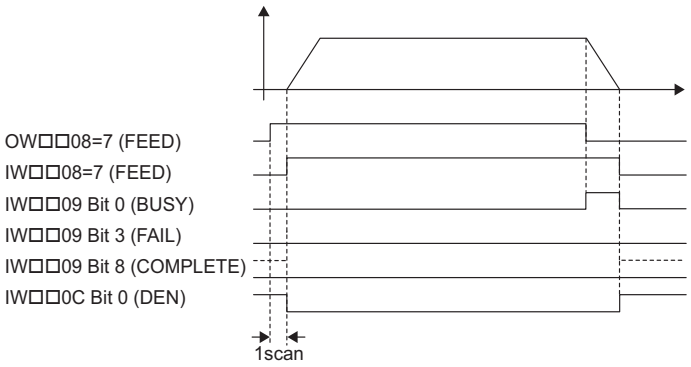
Parameter	Name	Setting	Default Setting
OW□□03, Bits 0 to 3	Function setting 1 Speed unit	Select the setting unit for OL□□10 (Speed reference setting). 0: Reference units/sec 1: 10^n reference units/min [n = Number of digits below decimal point (fixed parameter No. 5)] 2: 0.01% 3: 0.0001%	1: 10^n reference units/min
OW□□03, Bits 4 to 7	Function setting 1 Acceleration unit	Select the setting unit for OL□□36 (Straight line acceleration/Acceleration time constant) and OL□□38 (Straight line deceleration/Deceleration time constant). 0: Reference units/sec^2, 1: ms	1: ms
OW□□03, Bits 8 to B	Function setting 1 Filter type	Set the acceleration/deceleration filter type. 0: No filter 1: Exponential acceleration/deceleration filter 2: Moving average filter	0: No filter
OW□□08	Motion command	Set to 7 for JOG operation. Setting to 0 will abort the operation.	0
OW□□09, Bit 1	Command abort	The axis will decelerate to a stop if this bit is set to 1 (ON) during positioning. 0: Cancel Abort, 1: Abort When this bit is reset to 0 (OFF) after decelerating to a stop, the operation depends on the setting of the Position reference type (OW□□09, bit 5). (0: Remains stopped, 1: Restarts positioning to the target position)	0: Cancel Abort
OL□□10	Speed reference setting	Specify the speed for the JOG operation. Set a positive value only. If a negative value is set, an error will occur.	3000
OW□□18	Override	Use this parameter to change the positioning speed without changing the Speed reference setting (OL□□10). This setting can be changed during operation. Setting range: 0 to 32767 (0% to 327.67%) Setting unit: 1 = 0.01% Example: Setting for 50% = 5000	10000 (100%)
OW□□19	Bias speed	Set the offset value of speed reference.	0
OL□□20	NEAR signal output width	Set the range in which the Position proximity (IW□□0C, bit 3) turns ON. The Position proximity bit will turn ON when the absolute value of the difference between the reference position and the feedback position is less than the value set here.	0
OL□□36	Straight line acceleration/ Acceleration time constant	Set the acceleration rate or acceleration time constant for positioning.	0
OL□□38	Straight line deceleration/ Deceleration time constant	Set the deceleration rate or deceleration time constant for positioning.	0
OW□□3A	Filter time constant	Set the acceleration/deceleration filter time constant. Either exponential acceleration/ deceleration filter or averaging move filter can be selected in the Function setting 1 (OW□□03). This parameter is valid when the Positioning completed (IW□□0C, bit 1) is ON (1).	0

[b] Monitoring Parameters

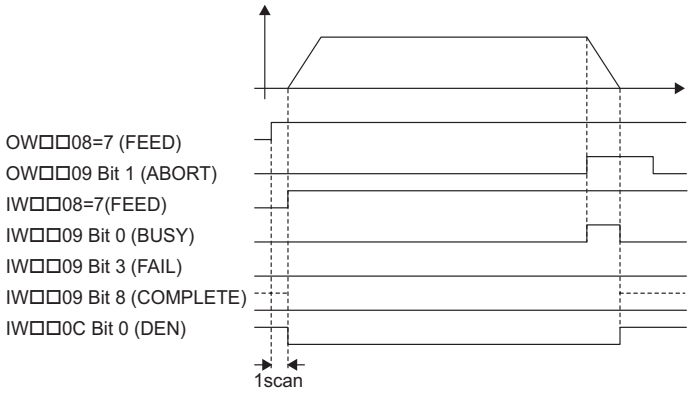
Parameter	Name	Monitor Contents
IL□□02	Warning	Stores the most current warning. (bit setting)
IL□□04	Alarm	Stores the most current alarm. (bit setting)
IW□□08	Motion command response code	Indicates the motion command that is being executed. The response code will be 7 during FEED command execution.
IW□□09, Bit 0	Command executing flag	Turns ON when abort processing is being performed for FEED command. Turns OFF when abort processing has been completed.
IW□□09, Bit 1	Command hold completed	Always OFF for FEED command.
IW□□09, Bit 3	Command error occurrence	Turns ON if an error occurs during command execution. The axis will decelerate to a stop if it is moving. Turns OFF when another command is executed.
IW□□09, Bit 8	Command execution completed	Always OFF for FEED command. Use the Positioning completed (IW□□0C, bit 1) to confirm completion of this command.
IW□□0C, Bit 0	Distribution completed	Turns ON when pulse distribution has been completed for the move command. Turns OFF during execution of the move command.
IW□□0C, Bit 1	Positioning completed	Turns ON when pulse distribution has been completed.
IW□□0C, Bit 3	Positioning proximity	The operation depends on the setting of the NEAR signal output width (setting parameter OL□□20). OL□□20 = 0: Turns ON when pulse distribution has been completed. OL□□20 ≠ 0: Turns ON when the current position is in the range of NEAR signal output width even if pulse distribution has not been completed.

(5) Timing Charts

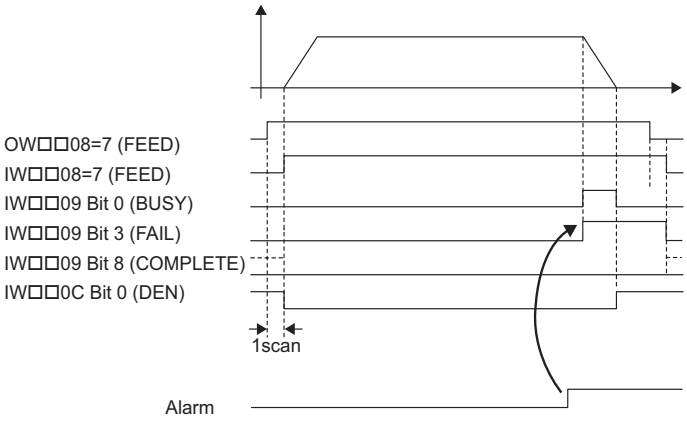
[a] Normal Execution



[b] Execution when Aborted



[c] Execution when an Alarm Occurs



4.2.5 STEP Operation (STEP)

The STEP command executes a positioning for the specified travel direction, travel amount, and travel speed. Parameters related to acceleration and deceleration are set in advance.

(1) Executing/Operating Procedure

1. Check to see if all the following conditions are satisfied.

No.	Execution Conditions	Confirmation Method
1	There are no alarms.	Both IL□□02 and IL□□04 are 0.
2	The Servo ON condition.	IB□□001 is ON.

2. Set the following motion setting parameters.

OW□□03, bits 0 to 3: Speed unit*
OW□□03, bits 4 to 7: Acceleration unit*
OW□□03, bits 8 to B: Filter type
OL□□10: Speed reference setting*
OW□□18: Override*
OW□□19: Bias speed*
OL□□20: NEAR signal output width
OL□□36: Straight-line acceleration/acceleration time constant*
OL□□38: Straight-line deceleration/deceleration time constant*
OL□□3A: Filter time constant
OL□□44: Step travel distance

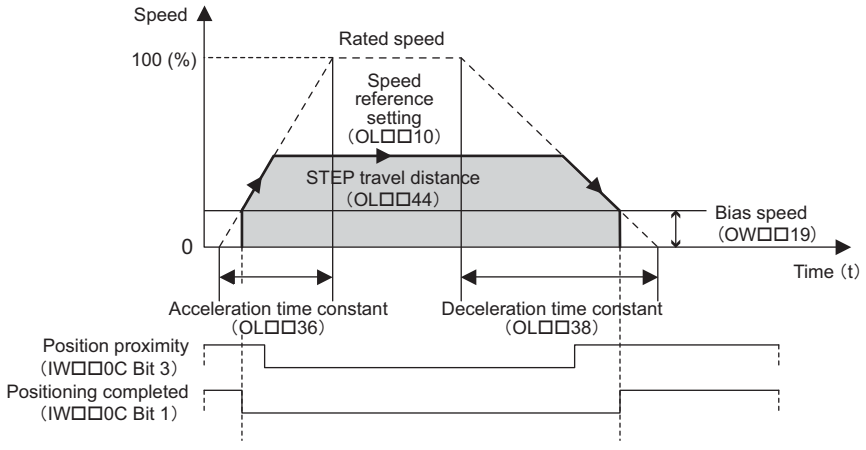
* The settings of these parameters can be changed during STEP operation.
- An override between 0% to 327.67% can be set for the speed reference.

3. Set OW□□08 to 8 to execute the STEP motion command.

STEP operation will start. IW□□08 will be 8 during the execution.
The bit 3 of IW□□0C turns ON when the axis approaches the target position.
The bit 1 of IW□□0C turns ON when the axis reaches the target position.

4. Set OW□□08 to 0 to execute the NOP motion command. The STEP operation has been completed.

STEP Operation Pattern



(2) Holding

Axis travel can be stopped during command execution and then the remaining travel can be restarted. A command is held by setting the Command pause (OW□□09, bit 0) to 1 (ON).

- Set the Command pause (OW□□09, bit 0) to 1. The axis will decelerate to a stop.
- When the axis has stopped, the Command hold completed (IW□□09, bit 1) will turn ON.
- Turn OFF the Command pause (OW□□09, bit 0).
  The command hold status will be cleared and the remaining portion of the positioning will be restarted.

(3) Aborting

Axis travel can be stopped during command execution and the remaining travel will be cancelled by aborting execution of a command. A command is aborted by setting the Command abort (OW□□09, bit 1) to 1 (ON).

- Set the Command abort (OW□□09, bit 1) to 1 (ON). The axis will decelerate to a stop.
- When the axis has stopped, the remaining portion of the positioning will be calcelled and the Positioning completed (IW□□0C, bit 1) will turn ON.
- This type of operation will also be performed if the motion command is changed during axis movement.

(4) Related Parameters

[a] Setting Parameters

Parameter	Name	Setting	Default Setting
OW□□03, Bits 0 to 3	Function setting 1 Speed unit	Select the setting unit for OL□□10 (Speed reference setting). 0: Reference units/sec 1: 10^n reference units/min [n = Number of digits below decimal point (fixed parameter No. 5)] 2: 0.01% 3: 0.0001%	1: 10^n reference units/min
OW□□03, Bits 4 to 7	Function setting 1 Acceleration unit	Select the setting unit for OL□□36 (Straight-line acceleration/Acceleration time constant) and OL□□38 (Straight-line deceleration/Deceleration time constant). 0: Reference units/sec^2, 1: ms	1: ms
OW□□03, Bits 8 to B	Function setting 1 Filter type	Set the acceleration/deceleration filter type. 0: No filter 1: Exponential acceleration/deceleration filter 2: Moving average filter	0: No filter
OW□□08	Motion command	Set to 8 for STEP operation. Setting to 0 will abort the operation.	0
OW□□09, Bit 0	Command pause	The axis will decelerated to a stop if this bit is set to 1 (ON) during positioning operation. When this bit is set to 0 (OFF), the positioning will restart. 0: Cancel Hold, 1: Hold	0: Cancel Hold
OW□□09, Bit 1	Command abort	The axis will decelerated to a stop if this bit is set to 1 (ON) during positioning. 0: Cancel Abort, 1: Abort When this bit is reset to 0 (OFF) after decelerating to a stop, the operation depends on the setting of the Position reference type (OW□□09, bit 5). (0: Remains stopped, 1: Restart positioning toward the target position)	0: Cancel Abort
OW□□09, Bit 5	Position reference type	Switch the position reference type. 0: Incremental addition mode, 1: Absolute mode • Set this bit before setting the Motion command (OW□□08) to 8.	0: Incremental addition mode
OL□□10	Speed reference setting	Specify the speed for the positioning. Set a positive value only. If a negative value is set, an error will occur.	3000
OW□□18	Override	Use this parameter to change the positioning speed without changing the Speed reference setting (OL□□10). This setting can be changed during operation. Setting range: 0 to 32767 (0% to 327.67%) Setting unit: 1 = 0.01% Example: Setting for 50% = 5000	10000 (100%)
OW□□19	Bias speed	Set the offset value of speed reference.	0
OL□□20	NEAR signal output width	Set the range in which the Position proximity (IW□□0C, bit 3) turns ON. The Position proximity bit will turn ON when the absolute value of the difference between the reference position and the feedback position is less than the value set here.	0
OL□□36	Straight line acceleration/ Acceleration time constant	Set the acceleration rate or acceleration time constant for positioning.	0

(cont'd)

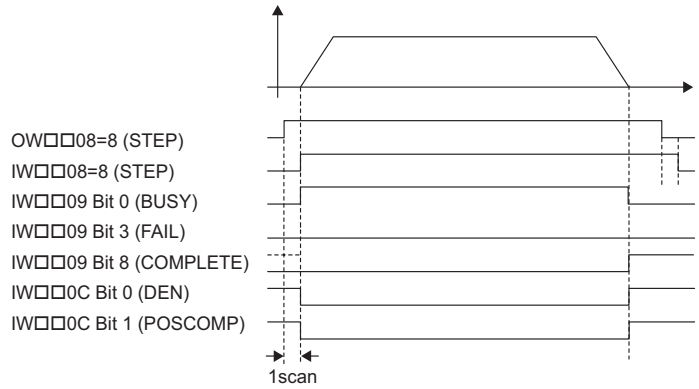
Parameter	Name	Setting	Default Setting
OL□□38	Straight line deceleration/ Deceleration time constant	Set the deceleration rate or deceleration time constant for positioning.	0
OW□□3A	Filter time constant	Set the acceleration/deceleration filter time constant. Either exponential acceleration/deceleration filter or averaging move filter can be selected in the Function setting 1 (OW□□03). This parameter is valid when the Positioning completed (IW□□0C, bit 1) is ON (1).	0
OW□□44	Step travel distance	Set the travel amount of STEP operation.	1000

[b] Monitoring Parameters

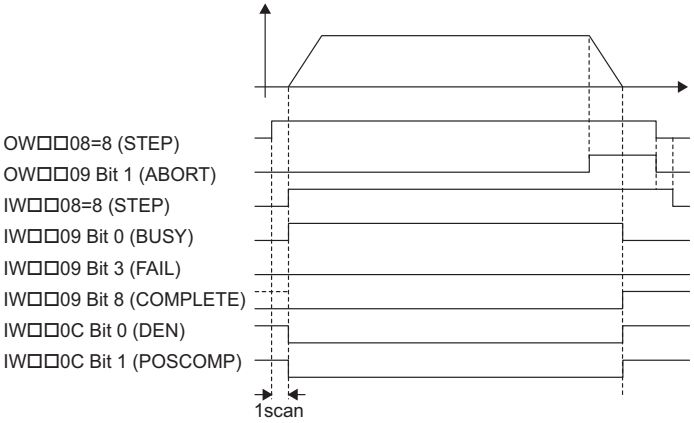
Parameter	Name	Monitor Contents
IL□□02	Warning	Stores the most current warning. (bit setting)
IL□□04	Alarm	Stores the most current alarm. (bit setting)
IW□□08	Motion command response code	Indicates the motion command that is being executed. The response code will be 8 during STEP command execution.
IW□□09, Bit 0	Command executing flag	Turns ON when abort processing is being performed for STEP command. Turns OFF when the execution completes.
IW□□09, Bit 1	Command hold completed	Turns ON when the Command pause (OW□□09, bit 0) is set to 1 (ON) and the axis deceleration to a stop completes.
IW□□09, Bit 3	Command error occurrence	Turns ON if an error occurs during command execution. The axis will decelerate to a stop if it is moving. Turns OFF when another command is executed.
IW□□09, Bit 8	Command execution completed	Turns ON when the STEP command execution completes.
IW□□0C, Bit 0	Distribution completed	Turns ON when pulse distribution has been completed for the move command. Turns OFF during execution of the move command.
IW□□0C, Bit 1	Positioning completed	Turns ON when the Distribution completed (IW□□0C, bit 0) .
IW□□0C, Bit 3	Positioning proximity	The operation depends on the setting of the NEAR signal output width (setting parameter OL□□20). OL□□20 = 0: Turns ON when pulse distribution has been completed. OL□□20 ≠ 0: Turns ON when the current position is in the range of NEAR signal output width even if pulse distribution has not been completed.

(5) Timing Charts

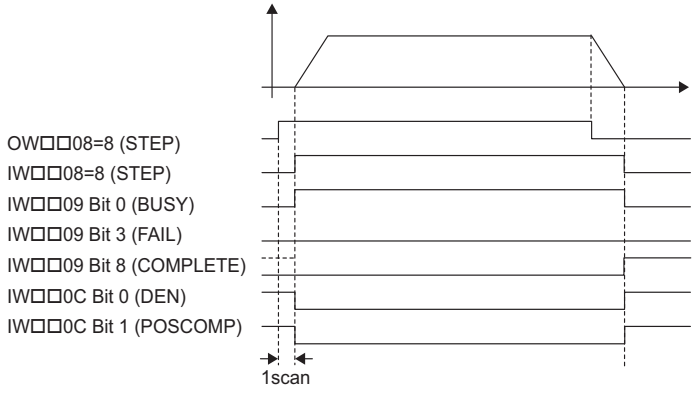
[a] Normal Execution



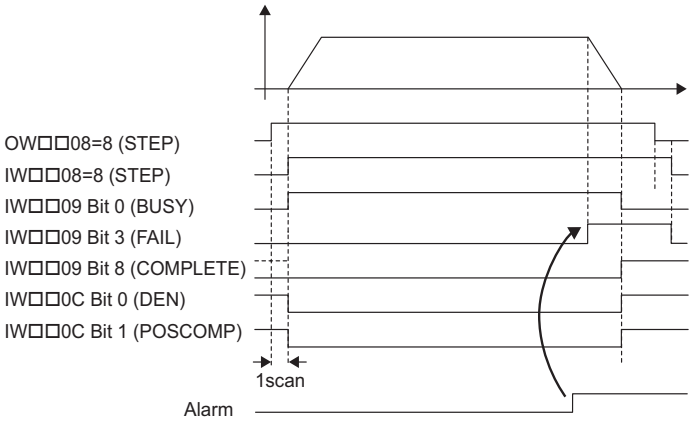
[b] Execution when Aborted



[c] Execution when Aborting by Changing the Command



[d] Execution when an Alarm Occurs



4.2.6 Zero Point Setting (ZSET)

The ZSET command sets the current position as the zero point of the machine coordinate system. This enables setting the zero point without performing a zero point return operation.

- When using software limits, always execute the zero point setting or zero point return operation. The software limit function will be enabled after the zero point setting operation has been completed.

(1) Executing/Operating Procedure

1. Check to see if all the following conditions are satisfied.

No.	Execution Conditions	Confirmation Method
1	There are no alarms.	Both IL□□02 and IL□□04 are 0.

2. Set the motion setting parameter OL□□48 (Zero point position in machine coordinate system offset).

3. Set OW□□08 to 9 to execute the ZSET motion command.

A new machine coordinate system will be established with the current position as the zero point. IW□□08 will be 9 during the zero point setting operation. The bit 5 of IW□□0C will turn ON when zero point setting has been completed.

4. Set OW□□08 to 0 to execute the NOP motion command. The zero point setting operation completes.

(2) Holding/Aborting

The Command pause (OW□□09, bit 0) and the Command abort (OW□□09, bit 1) cannot be used.

(3) Related Parameters

[a] Setting Parameters

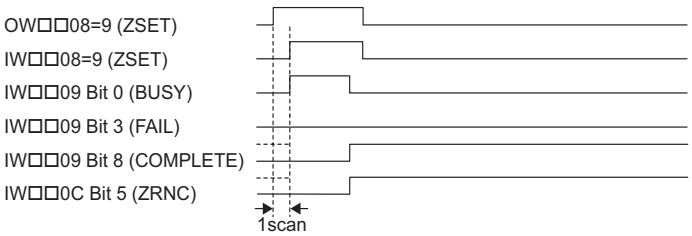
Parameter	Name	Setting	Default Setting
OW□□08	Motion command	Set to 9 for ZSET operation.	0
OL□□48	Zero point position in machine coordinate system offset	Set the position offset from the machine coordinate system zero point after completing the zero point setting operation.	0

[b] Monitoring Parameters

Parameter	Name	Monitor Contents
IL□□02	Warning	Stores the most current warning. (bit setting)
IL□□04	Alarm	Stores the most current alarm. (bit setting)
IW□□08	Motion command response code	Indicates the motion command that is being executed. The response code will be 9 during ZSET command execution.
IW□□09, Bit 0	Command executing flag	Turns ON when abort processing is being performed. Turns OFF when the execution completes.
IW□□09, Bit 1	Command hold completed	This parameter is not used for ZSET command. Always OFF for ZSET command.
IW□□09, Bit 3	Command error occurrence	Turns ON if an error occurs during command execution. The axis will decelerate to a stop if it is moving. Turns OFF when another command is executed.
IW□□09, Bit 8	Command execution completed	Turns ON when the ZSET command execution completes.

(4) Timing Chart

[a] Normal Execution



4.3 Motion Subcommands

4.3.1 List of Motion Subcommands

The following two subcommands are available for the PO-01 Module.

Command Code	Command	Name	Function
0	NOP	No command	This is a null command. When a subcommand is not being specified, set this "no command" code.
5	FIXPRM_RD	Read fixed parameter	Reads the current value of the specified fixed parameter and stores in the monitoring parameter.

The details on the PO-01 Module motion subcommands are described below.

4.3.2 No Command (NOP)

Set this command when a subcommand is not being specified.

(1) Related Parameters

[a] Setting Parameter

Parameter	Name	Setting
OW□□0A	Motion subcommand	Set to 0 to specify "no command (NOP)".

[b] Monitoring Parameters

Parameter	Name	Monitor Contents
IW□□0A	Motion subcommand response code	Indicates the motion subcommand that is being executed. The response code is 0 during NOP command execution.
IW□□0B, Bit 0	Command executing flag	Turns OFF during NOP command execution.
IW□□0B, Bit 3	Command error occurrence	Turns OFF during NOP command execution.
IW□□0B, Bit 8	Command execution completed	Turns OFF during NOP command execution.

4.3.3 Read Fixed Parameters (FIXPRM_RD)

The FIXPRM_RD command reads the current value of the fixed parameter specified by OW□□5C (Fixed parameter number), and stores the read data in the monitoring parameter IL□□56 (Fixed parameter monitor).

(1) Executing/Operating Procedure

1. Check to see if all the following conditions are satisfied.

No.	Execution Conditions	Confirmation Method
1	Motion subcommand execution has been completed.	IW□□0A is 0 and IW□□0B, bit 0 is OFF.

2. Set OW□□0A to 5 to execute the FIXPRM_RD motion subcommand.
The FIXPRM_RD command will read the specified fixed parameter's current value and store it in the monitoring parameter.
IW□□0A will be 5 during command execution.
The bit 0 of IW□□0B will turn ON during the command processing and will turn OFF when the command processing has been completed.

3. Set OW□□0A to 0 to execute the NOP motion command and then complete the reading operation.

(2) Related Parameters

[a] Setting Parameters

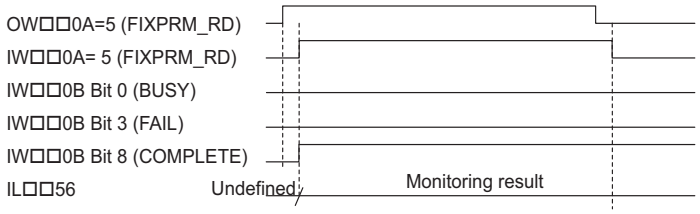
Parameter	Name	Setting
OW□□0A	Motion subcommand	The status monitoring is executed when this parameter is set to 5.
OW□□5C	Fixed parameter number	Set the number of the fixed parameter to be read.

[b] Monitoring Parameters

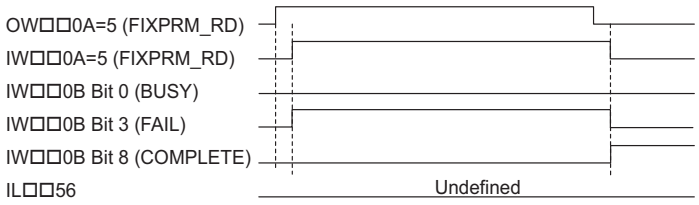
Parameter	Name	Monitor Contents
IW□□0A	Subcommand response code	Indicates the motion subcommand that is being executed. The response code is 5 during FIXPRM_RD command execution.
IW□□0B, Bit 0	Command executing flag	Turns ON during FIXPRM_RD command execution and turns OFF when execution has been completed.
IW□□0B, Bit 3	Command error occurrence	Turns ON if an error occurs during FIXPRM_RD command execution. Turns OFF when another command is executed.
IW□□0B, Bit 8	Command execution completed	Turns ON when FIXPRM_RD command execution has been completed.
IL□□56	Fixed parameter monitor	Stores the fixed parameter data that was read.

(3) Timing Charts

[a] Normal End



[b] Error End



Appendix

Confirming the Software Version and Board Revision

You can confirm the software version and board revision of the PO-01 Module in the following locations.

- Software Version
  - Attached to the PO-01 Module board: V□□.□□
  - System register
  - The system register address depends on the Expansion Rack and option slot where the PO-01 Module is mounted. Refer to the manual for your Machine Controller for details.
- Board Revision
  Attached to the PO-01 Module board: REV.□□□

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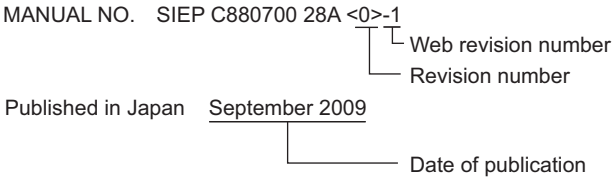
Revision History

The date of publication, revision number, and web revision number are given at the bottom right of the back cover. Refer to the following example.



Date of Publication	Rev. No.	Web Rev. No.	Section	Revised Content
April 2020	<2>	2	2.4.2	Partly revised.
			Back cover	Revision: Address
July 2018		1	2.4.1	Revision: Connector Specifications
February 2018		0	1.1	Revision: Applicable Machine Controllers for PO-01 Modules
			2.1.2 (1)	Revision: Pollution Level, Noise Resistance
			Back cover	Revision: Address
June 2016	<1>	0	Front cover	Revision: Format
			–	Based on Japanese user's manual, SIJP C880700 28C, printed in November 2015.
			Back cover	Revision: Address and format
May 2012	<0>	6	Preface	Addition: PL on fumigation
			3.2.4	Revision: Register no. IW□□5B → IW□□58
			Back cover	Revision: Address
December 2011		5	1.1	Revision: Description of applicable machine controllers for PO-01 modules
June 2011		4	4.2.1 (3)	Revision: Position completed IW□□01, bit C → IW□□0C, bit 1
December 2010		3	Front cover	Revision: Format
			3.3.1 (6)	Addition: Description of parameter setting
			Back cover	Revision: Address and format
September 2010		2	Preface	Addition: ■Terms Used to Describe "Torque"
			Chapter1 to 4	Partly revised
			3.3.3 (10)	Revision: Description of IL□□14
			Back cover	Revision: Address
September 2009		1	Preface	Addition: Warranty
			Back cover	Revision: Address
February 2006		0	–	First edition: Based on Japanese user's manual, SIJP C880700 28A, printed in August 2005.

Machine Controller MP2000 Series

Pulse Output Motion Module

PO-01 USER'S MANUAL

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