MITSUBISHI ELECTRIC

General-Purpose AC Servo

MITSUBISHI SERVO AMPLIFIERS & MOTORS
MELSERVO-J4

CC-Link IE Field Network Interface
MODEL

MR-J4-_GF_(-RJ)

SERVO AMPLIFIER
INSTRUCTION MANUAL
(CC-Link IE Field Network Basic)

● Safety Instructions ●

Please read the instructions carefully before using the equipment.

To use the equipment correctly, do not attempt to install, operate, maintain, or inspect the equipment until you have read through this Instruction Manual, Installation guide, and appended documents carefully. Do not use the equipment until you have a full knowledge of the equipment, safety information and instructions.
In this Instruction Manual, the safety instruction levels are classified into "WARNING" and "CAUTION".

⚠WARNING	Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.
⚠CAUTION	Indicates that incorrect handling may cause hazardous conditions, resulting in medium or slight injury to personnel or may cause physical damage.

Note that the CAUTION level may lead to a serious consequence according to conditions.
Please follow the instructions of both levels because they are important to personnel safety.
What must not be done and what must be done are indicated by the following diagrammatic symbols.

⃠	Indicates what must not be done. For example, "No Fire" is indicated by ⃠ .
●	Indicates what must be done. For example, grounding is indicated by ⏚ .

In this Instruction Manual, instructions at a lower level than the above, instructions for other functions, and so on are classified into "POINT".
After reading this Instruction Manual, keep it accessible to the operator.

1. To prevent electric shock, note the following

⚠ WARNING

- Before wiring and inspections, turn off the power and wait for 15 minutes or more until the charge lamp turns off. Then, confirm that the voltage between P+ and N- is safe with a voltage tester and others. Otherwise, an electric shock may occur. In addition, when confirming whether the charge lamp is off or not, always confirm it from the front of the servo amplifier.
- Ground the servo amplifier and servo motor securely.
- Any person who is involved in wiring and inspection should be fully competent to do the work.
- Do not attempt to wire the servo amplifier and servo motor until they have been installed. Otherwise, it may cause an electric shock.
- Do not operate switches with wet hands. Otherwise, it may cause an electric shock.
- The cables should not be damaged, stressed, loaded, or pinched. Otherwise, it may cause an electric shock.
- During power-on or operation, do not open the front cover of the servo amplifier. Otherwise, it may cause an electric shock.
- Do not operate the servo amplifier with the front cover removed. High-voltage terminals and charging area are exposed and you may get an electric shock.
- Except for wiring and periodic inspection, do not remove the front cover of the servo amplifier even if the power is off. The servo amplifier is charged and you may get an electric shock.
- To prevent an electric shock, always connect the protective earth (PE) terminal (marked ⏚) of the servo amplifier to the protective earth (PE) of the cabinet.
- To avoid an electric shock, insulate the connections of the power supply terminals.

2. To prevent fire, note the following

⚠ CAUTION

- Install the servo amplifier, servo motor, and regenerative resistor on incombustible material. Installing them directly or close to combustibles will lead to smoke or a fire.
- Always connect a magnetic contactor between the power supply and the main circuit power supply (L1/L2/L3) of the servo amplifier, in order to configure a circuit that shuts down the power supply on the side of the servo amplifier's power supply. If a magnetic contactor is not connected, continuous flow of a large current may cause smoke or a fire when the servo amplifier malfunctions.
- Always connect a molded-case circuit breaker, or a fuse to each servo amplifier between the power supply and the main circuit power supply (L1/L2/L3) of the servo amplifier, in order to configure a circuit that shuts down the power supply on the side of the servo amplifier's power supply. If a molded-case circuit breaker or fuse is not connected, continuous flow of a large current may cause smoke or a fire when the servo amplifier malfunctions.
- When using the regenerative resistor, switch power off with the alarm signal. Otherwise, a regenerative transistor malfunction or the like may overheat the regenerative resistor, causing smoke or a fire.
- Provide adequate protection to prevent screws and other conductive matter, oil and other combustible matter from entering the servo amplifier and servo motor.

3. To prevent injury, note the following

⚠ CAUTION

- ●Only the power/signal specified in the Instruction Manual should be applied to each terminal. Otherwise, it may cause an electric shock, fire, injury, etc.
- ●Connect cables to the correct terminals. Otherwise, a burst, damage, etc., may occur.
- ●Ensure that polarity (+/-) is correct. Otherwise, a burst, damage, etc., may occur.
- ●The servo amplifier heat sink, regenerative resistor, servo motor, etc., may be hot while the power is on and for some time after power-off. Take safety measures such as providing covers to avoid accidentally touching them by hands and parts such as cables.

4. Additional instructions

The following instructions should also be fully noted. Incorrect handling may cause a malfunction, injury, electric shock, fire, etc.

(1) Transportation and installation

⚠ CAUTION

- ●Transport the products correctly according to their mass.
- ●Stacking in excess of the specified number of product packages is not allowed.
- ●Do not hold the front cover, cables, or connectors when carrying the servo amplifier. Otherwise, it may drop.
- ●Install the servo amplifier and the servo motor in a load-bearing place in accordance with the Instruction Manual.
- ●Do not get on or put heavy load on the equipment. Otherwise, it may cause injury.
- ●The equipment must be installed in the specified direction.
- ●Maintain specified clearances between the servo amplifier and the inner surfaces of a control cabinet or other equipment.
- ●Do not install or operate the servo amplifier and servo motor which have been damaged or have any parts missing.
- ●Do not block the intake and exhaust areas of the servo amplifier. Otherwise, it may cause a malfunction.
- ●Do not drop or apply heavy impact on the servo amplifiers and the servo motors. Otherwise, it may cause injury, malfunction, etc.
- ●Do not strike the connector. Otherwise, it may cause a connection failure, malfunction, etc.
- ●When you keep or use the equipment, please fulfill the following environment.

Item		Environment
Ambient temperature	Operation	0 °C to 55 °C (non-freezing)
	Storage	-20 °C to 65 °C (non-freezing)
Ambient humidity	Operation	5 %RH to 90 %RH (non-condensing)
	Storage	
Ambience		Indoors (no direct sunlight), free from corrosive gas, flammable gas, oil mist, dust, and dirt
Altitude		2000 m or less above sea level (Contact your local sales office for the altitude for options.)
Vibration resistance		5.9 m/s^2, at 10 Hz to 55 Hz (X, Y, Z axes)

- ●When the product has been stored for an extended period of time, contact your local sales office.
- ●When handling the servo motor, be careful with the sharp edges of the servo motor.
- ●The servo amplifier must be installed in a metal cabinet.

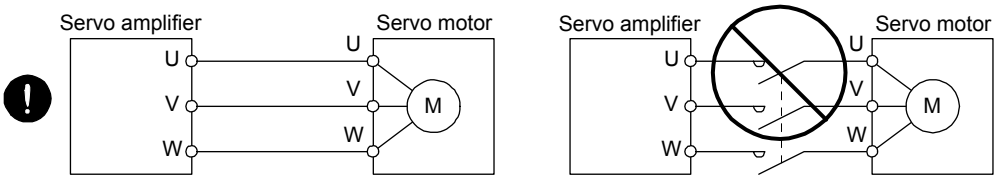
⚠ CAUTION

- When fumigants that contain halogen materials, such as fluorine, chlorine, bromine, and iodine, are used for disinfecting and protecting wooden packaging from insects, they cause a malfunction when entering our products. Please take necessary precautions to ensure that remaining materials from fumigant do not enter our products, or treat packaging with methods other than fumigation, such as heat treatment. Additionally, disinfect and protect wood from insects before packing the products.
- To prevent a fire or injury in case of an earthquake or other natural disasters, securely install, mount, and wire the servo motor in accordance with the Instruction Manual.

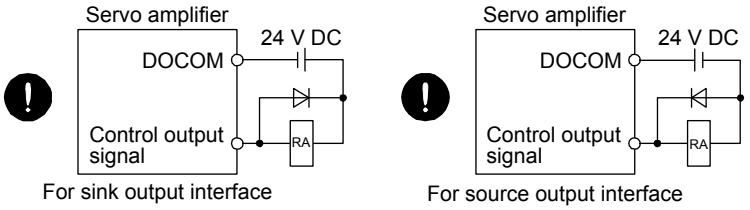
(2) Wiring

⚠ CAUTION

- Wire the equipment correctly and securely. Otherwise, the servo motor may operate unexpectedly.
- Make sure to connect the cables and connectors by using the fixing screws and the locking mechanism. Otherwise, the cables and connectors may be disconnected during operation.
- Do not install a power capacitor, surge killer, or radio noise filter (optional FR-BIF(-H)) on the servo amplifier output side.
- To avoid a malfunction, connect the wires to the correct phase terminals (U/V/W) of the servo amplifier and servo motor.
- Connect the servo amplifier power output (U/V/W) to the servo motor power input (U/V/W) directly. Do not connect a magnetic contactor and others between them. Otherwise, it may cause a malfunction.



- The connection diagrams in this Instruction Manual are shown for sink interfaces, unless stated otherwise.
- The surge absorbing diode installed to the DC relay for control output should be fitted in the specified direction. Otherwise, the converter unit and the drive unit will malfunction and will not output signals, disabling the emergency stop and other protective circuits.



- When the wires are not tightened enough to the terminal block, the wires or terminal block may generate heat because of the poor contact. Be sure to tighten the wires with specified torque.
- Connecting a servo motor of the wrong axis to U, V, W, or CN2 of the servo amplifier may cause a malfunction.
- Configure a circuit to turn off EM2 or EM1 when the main circuit power supply is turned off to prevent an unexpected restart of the servo amplifier.
- To prevent malfunction, avoid bundling power lines (input/output) and signal cables together or running them in parallel to each other. Separate the power lines from the signal cables.

(3) Test run and adjustment

⚠ CAUTION
●When executing a test run, follow the notice and procedures in this instruction manual. Otherwise, it may cause a malfunction, damage to the machine, or injury. ●Before operation, check and adjust the parameter settings. Improper settings may cause some machines to operate unexpectedly. ●Never make a drastic adjustment or change to the parameter values as doing so will make the operation unstable. ●Do not get close to moving parts during the servo-on status.

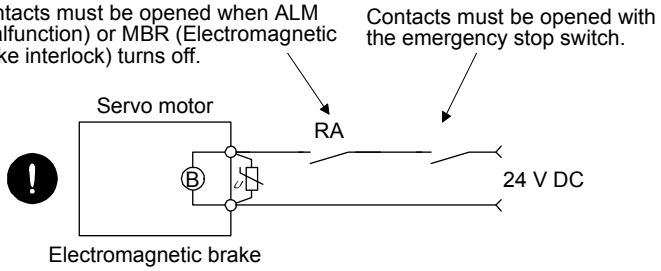
(4) Usage

⚠ CAUTION
●Provide an external emergency stop circuit to stop the operation and shut the power off immediately. ●For equipment in which the moving part of the machine may collide against the load side, install a limit switch or stopper to the end of the moving part. The machine may be damaged due to a collision. ●Do not disassemble, repair, or modify the product. Otherwise, it may cause an electric shock, fire, injury, etc. Disassembled, repaired, and/or modified products are not covered under warranty. ●Before resetting an alarm, make sure that the run signal of the servo amplifier is off in order to prevent a sudden restart. Otherwise, it may cause an accident. ●Use a noise filter, etc., to minimize the influence of electromagnetic interference. Electromagnetic interference may affect the electronic equipment used near the servo amplifier. ●Do not burn or destroy the servo amplifier. Doing so may generate a toxic gas. ●Use the servo amplifier with the specified servo motor. ●Wire options and peripheral equipment, etc. correctly in the specified combination. Otherwise, it may cause an electric shock, fire, injury, etc. ●The electromagnetic brake on the servo motor is designed to hold the motor shaft and should not be used for ordinary braking. ●For such reasons as incorrect wiring, service life, and mechanical structure (e.g. where a ball screw and the servo motor are coupled via a timing belt), the electromagnetic brake may not hold the motor shaft. To ensure safety, install a stopper on the machine side. ●If the dynamic brake is activated at power-off, alarm occurrence, etc., do not rotate the servo motor by an external force. Otherwise, it may cause a fire.

(5) Corrective actions

⚠ CAUTION

- Ensure safety by confirming the power off, etc. before performing corrective actions. Otherwise, it may cause an accident.
- If it is assumed that a power failure, machine stoppage, or product malfunction may result in a hazardous situation, use a servo motor with an electromagnetic brake or provide an external brake system for holding purpose to prevent such hazard.
- Configure an electromagnetic brake circuit which is interlocked with an external emergency stop switch.



- When an alarm occurs, eliminate its cause, ensure safety, and deactivate the alarm to restart operation.
- If the molded-case circuit breaker or fuse is activated, be sure to remove the cause and secure safety before switching the power on. If necessary, replace the servo amplifier and recheck the wiring. Otherwise, it may cause smoke, fire, or an electric shock.
- Provide an adequate protection to prevent unexpected restart after an instantaneous power failure.
- After an earthquake or other natural disasters, ensure safety by checking the conditions of the installation, mounting, wiring, and equipment before switching the power on to prevent an electric shock, injury, or fire.

(6) Maintenance, inspection and parts replacement

⚠ CAUTION

- Make sure that the emergency stop circuit operates properly such that an operation can be stopped immediately and a power is shut off by the emergency stop switch.
- It is recommended that the servo amplifier be replaced every 10 years when it is used in general environment.
- When using the servo amplifier that has not been energized for an extended period of time, contact your local sales office.

(7) General instruction

- To illustrate details, the equipment in the diagrams of this Instruction Manual may have been drawn without covers and safety guards. When the equipment is operated, the covers and safety guards must be installed as specified. Operation must be performed in accordance with this Instruction Manual.

● DISPOSAL OF WASTE ●

Please dispose a servo amplifier, battery (primary battery) and other options according to your local laws and regulations.

⚠ EEP-ROM life

The number of write times to the EEP-ROM, which stores parameter settings, etc., is limited to 100,000. If the total number of the following operations exceeds 100,000, the servo amplifier may malfunction when the EEP-ROM reaches the end of its useful life.

- Write to the EEP-ROM due to parameter setting changes
- Write to the EEP-ROM due to device changes
- Write to the EEP-ROM due to point table changes

STO function of the servo amplifier

When using the STO function of the servo amplifier, refer to chapter 13 of "MR-J4-_GF_(-RJ) Servo Amplifier Instruction Manual (Motion Mode)".
For the MR-J3-D05 safety logic unit, refer to app. 5 of "MR-J4-_GF_(-RJ) Servo Amplifier Instruction Manual (Motion Mode)".

Compliance with global standards

For the compliance with global standards, refer to app. 4 of "MR-J4-_GF_(-RJ) Servo Amplifier Instruction Manual (Motion Mode)".

«About the manual»

You must have this Instruction Manual and the following manuals to use this servo. Ensure to prepare them to use the servo safely.

Relevant manuals

Manual name	Manual No.
MELSERVO MR-J4-_GF_(-RJ) Servo Amplifier Instruction Manual (Motion Mode)	SH(NA)030218ENG
MELSERVO-J4 MR-J4 Servo Amplifier Instruction Manual (Troubleshooting)	SH(NA)030109ENG
MELSERVO Servo Motor Instruction Manual (Vol. 3) (Note 1)	SH(NA)030113ENG
MELSERVO Linear Servo Motor Instruction Manual (Note 2)	SH(NA)030110ENG
MELSERVO Direct Drive Motor Instruction Manual (Note 3)	SH(NA)030112ENG
MELSERVO Linear Encoder Instruction Manual (Note 2, 4)	SH(NA)030111ENG
MELSERVO EMC Installation Guidelines	IB(NA)67310ENG

Note 1. It is necessary for using a rotary servo motor.
2. It is necessary for using a linear servo motor.
3. It is necessary for using a direct drive motor.
4. It is necessary for using a fully closed loop system.

This Instruction Manual does not describe the following items. For details of the items, refer to each chapter/section of the detailed explanation field. "MR-J4-_GF_" means "MELSERVO MR-J4-_GF_(-RJ) Servo Amplifier Instruction Manual (Motion Mode)".

Item	Detailed explanation
Installation	MR-J4-_GF_ Chapter 2
Signals and wiring	MR-J4-_GF_ Chapter 3
Normal gain adjustment	MR-J4-_GF_ Chapter 6
Special adjustment functions	MR-J4-_GF_ Chapter 7
Troubleshooting (Note)	MR-J4-_GF_ Chapter 8
Outline drawings	MR-J4-_GF_ Chapter 9
Characteristics	MR-J4-_GF_ Chapter 10
Options and auxiliary equipment	MR-J4-_GF_ Chapter 11
Absolute position detection system	MR-J4-_GF_ Chapter 12
Using STO Function	MR-J4-_GF_ Chapter 13
Using a Linear servo motor	MR-J4-_GF_ Chapter 14
Using a direct drive motor	MR-J4-_GF_ Chapter 15
Fully closed loop system	MR-J4-_GF_ Chapter 16
Application of functions	MR-J4-_GF_ Chapter 17

Note. For troubleshooting, refer to each chapter indicated in the detailed explanation field and chapter 8 in this Instruction Manual.

«U.S. customary units»

U.S. customary units are not shown in this manual. Convert the values if necessary according to the following table.

Quantity	SI (metric) unit	U.S. customary unit
Mass	1 [kg]	2.2046 [lb]
Length	1 [mm]	0.03937 [inch]
Torque	1 [N•m]	141.6 [oz•inch]
Moment of inertia	1 [(× 10^{-4} kg•m^2)]	5.4675 [oz•$inch^2$]
Load (thrust load/axial load)	1 [N]	0.2248 [lbf]
Temperature	N [°C] × 9/5 + 32	N [°F]

CONTENTS

1. FUNCTIONS AND CONFIGURATION

The items shown in the following table are the same as those for the motion mode. For details, refer to each section indicated in the detailed explanation field. "MR-J4-_GF_" means "MR-J4-_GF_(-RJ) Servo Amplifier Instruction Manual (Motion Mode)".

Item	Detailed explanation
Function block diagram	MR-J4-_GF_ section 1.2
Combinations of servo amplifiers and servo motors	MR-J4-_GF_ section 1.4
Model designation	MR-J4-_GF_ section 1.6
Structure (parts identification)	MR-J4-_GF_ section 1.7

1.1 For proper use of CC-Link IE Field Network Basic

POINT

●To ensure safety of the system against unauthorized access via a network, take security measures such as using a firewall.

(1) Servo amplifier/MR Configurator2/GX Works

CC-Link IE Field Network Basic is available with the servo amplifier with the following software versions, MR Configurator2, and GX Works.

Product name	Model	Software version	
		Point table method	Indexer method
Servo amplifier	MR-J4-_GF_(-RJ)	A4 or later	A4 or later
MR Configurator2	SW1DNC-MRC2-_	1.70Y or later	1.70Y or later
GX Works2	SW1DNC-GXW2-J	1.570U	1.570U
GX Works3	SW1DND-GXW3-J	1.040S	1.040S

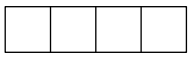
(2) Slide switch setting

Select CC-Link IE Field Network Basic communication by turning the slide switch 1 (SW1-1) "OFF" and the slide switch 2 (SW1-2) "ON". Refer to section 4.3.1 for details.

(3) Parameter setting

Select a positioning mode with [Pr. PA01 Operation mode].

[Pr. PA01]



Control mode selection
0: Positioning mode (point table method)
8: Positioning mode (indexer method)

1.2 Specifications for using CC-Link IE Field Network Basic

The following table lists the specifications only when CC-Link IE Field Network Basic is used. For other specifications, refer to section 1.3 of "MR-J4-_GF_(-RJ) Servo Amplifier Instruction Manual (Motion Mode)".

1.2.1 Point table method

Item			Description
Servo amplifier model			MR-J4-_GF_(-RJ)
Operational specifications			Positioning with specification of point table No. (255 points)
Position command input (Note 1)		Absolute value command method	Set in the point table. Setting range of feed length per point: -999999 to 999999 [×10^{STM} μm], -99.9999 to 99.9999 [×10^{STM} inch], -999999 to 999999 [pulse]
		Incremental value command method	Set in the point table. Setting range of feed length per point: 0 to 999999 [×10^{STM} μm], 0 to 99.9999 [×10^{STM} inch], 0 to 999999 [pulse]
Speed command input			Set the servo motor speed and acceleration/deceleration time constants in the point table. Set the S-pattern acceleration/deceleration time constants with [Pr. PT51].
System			Signed absolute value command method/incremental value command method
Torque limit			Limits the servo motor torque.
Control mode	Point table mode (pt)	Each positioning operation	Point table No. input method Operates each positioning based on position command and speed command.
		Automatic continuous positioning operation	Varying-speed operation (2 to 255 speeds)/automatic continuous positioning operation (2 to 255 points)/Automatic continuous operation to a point table selected at startup/automatic continuous operation to the point table No. 1
	Jog mode (jg)	Jog operation	Executes an inching operation via network based on speed command set in [Pr. PT65]
	Homing mode (hm)	Dog type (rear end detection, Z-phase reference)	For details of the home position return types, refer to section 6.1.
		Count type (front end detection, Z-phase reference)	
		Stopper type (Stopper position reference)	
		Dog type (rear end detection, rear end reference)	
		Count type (front end detection, front end reference)	
		Dog cradle type	
		Dog type last Z-phase reference (Note 2)	
		Dog type front end reference	
		Dogless Z-phase reference (Note 2)	
		Home position ignorance (servo-on position as home position)	
		Homing on positive home switch and index pulse (method 3)	
		Homing on positive home switch and index pulse (method 4)	
		Homing on negative home switch and index pulse (method 5)	

Item			Description
Control mode	Homing mode (hm)	Homing on negative home switch and index pulse (method 6)	For details of the home position return types, refer to section 6.1.
		Homing on home switch and index pulse (method 7)	
		Homing on home switch and index pulse (method 8)	
		Homing on home switch and index pulse (method 11)	
		Homing on home switch and index pulse (method 12)	
		Homing without index pulse (method 19)	
		Homing without index pulse (method 20)	
		Homing without index pulse (method 21)	
		Homing without index pulse (method 22)	
		Homing without index pulse (method 23)	
		Homing without index pulse (method 24)	
		Homing without index pulse (method 27)	
		Homing without index pulse (method 28)	
		Homing on index pulse (method 33)	
		Homing on index pulse (method 34)	
		Homing on current position (method 35)	
		Homing on current position (method 37)	
Automatic positioning to home position function			High-speed automatic positioning to a defined home position
Other functions			Absolute position detection/external limit switch/software stroke limit

Note 1. STM is the ratio to the setting value of the position data. STM can be changed with [Pr. PT03 Feeding function selection].
2. If a direct drive motor or incremental type linear encoder is used, the dog type last Z-phase reference home position return or dogless Z-phase reference home position return cannot be used.

1.2.2 Indexer method

Item			Description
Control mode	Indexer mode (idx)	Operational specifications	Positioning by specifying the station position The maximum number of divisions: 255
		Speed command input	Set the servo motor speed and acceleration/deceleration time constants in the point table. Set the servo motor speed and acceleration/deceleration time constants via network.
		System	Rotation direction specifying indexer/shortest rotating indexer
		Torque limit	Limits the servo motor torque.
		Rotation direction specifying indexer	Positioning to the specified station. Rotation direction settable
		Shortest rotating indexer	Positioning to the specified station. Rotates in the shorter direction from the current position.
	Jog mode (jg)	Jog operation	Executes an inching operation via network based on speed command set in [Pr. PT65] When the servo motor is stopping, deceleration to a stop is executed regardless of the station.
		Station Jog operation	Executes an inching operation via network based on speed command set in [Pr. PT65] When the servo motor is stopping, positioning is executed to the nearest station at which the servo motor can decelerate to a stop.
	Homing mode (hm)	Torque limit changing dog type (front end detection Z-phase reference)	For details of the home position return types, refer to section 6.1.
		Torque limit changing data set type	
		Homing on current position (method 35)	
		Homing on current position (method 37)	
Other functions			Absolute position detection/external limit switch

1.3 Outline of CC-Link IE Field Network Basic

CC-Link IE Field Network Basic is a standard Ethernet-based protocol used to perform cyclic communication by the installed software without using a dedicated ASIC. You can establish a highly flexible system because CC-Link IE Field Network Basic can be used together with TCP/IP communications.
Up to 64 servo amplifiers (up to 16 servo amplifiers per group) can be monitored by the controller.
In the point table mode (pt), you can perform positioning operation by specifying the pre-configured point table number (1 to 255) with a controller.

1.3.1 Features

(1) High-speed communication

High-speed communication can be established by cyclic transmission of not only bit data but also word data.

The maximum communication speed is 100 Mbps.

(2) General-purpose Ethernet supported

Dedicated control wiring is unnecessary, and a single Ethernet network can be established.

1.4 Function list

The following table lists the functions of this servo. For details of the functions, refer to each section indicated in the detailed explanation field. "MR-J4-_GF_" means "MR-J4-_GF_(-RJ) Servo Amplifier Instruction Manual (Motion Mode)".

Function	Description	Detailed explanation
Model adaptive control	This function achieves a high response and stable control following the ideal model. The two-degrees-of-freedom model adaptive control enables you to set a response to the command and a response to the disturbance separately. This function can be disabled. To disable this function, refer to section 7.5 of "MR-J4-_GF_(-RJ) Servo Amplifier Instruction Manual (Motion Mode)".	
Homing mode (hm)	The servo amplifier operates in the home position return mode.	Section 6.1
Jog mode (jg)	This is a control mode where the servo motor speed is set to drive the servo motor manually in the commutation with a controller. This control mode is not in CiA 402 standard (Mitsubishi Electric original).	Section 6.4
Point table mode (pt)	This is a control mode where the servo motor is driven according to the commands of the travel distance, speed and others stored in the specified point table No. in the commutation with a controller. This control mode is not in CiA 402 standard (Mitsubishi Electric original).	Section 6.2
Indexer mode (idx)	In this control mode, the servo motor is driven to the station specified in the communication with a controller. This control mode is not in CiA 402 standard (Mitsubishi Electric original).	Section 6.3
Touch probe function setting	When the touch probe signal turns on, the current position is latched. The latched data can be read with communication commands.	
High-resolution encoder	Rotary servo motors compatible with the MELSERVO-J4 series are equipped with a high-resolution encoder of 4194304 pulses/rev.	
Absolute position detection system	Home position return is required only once, and not required at every power-on.	MR-J4-_GF_ chapter 12
Gain switching function	You can switch gains during rotation/stop, and can use input devices to switch gains during operation.	MR-J4-_GF_ section 7.2
Advanced vibration suppression control II	This function suppresses vibration and residual vibration at an arm end.	MR-J4-_GF_ section 7.1
Machine resonance suppression filter	This filter function (notch filter) decreases the gain of the specific frequency to suppress the resonance of the mechanical system.	MR-J4-_GF_ section 7.1
Shaft resonance suppression filter	When a load is mounted to the servo motor shaft, resonance by shaft torsion during driving may generate a mechanical vibration at high frequency. The shaft resonance suppression filter suppresses the vibration.	MR-J4-_GF_ section 7.1
Adaptive filter II	The servo amplifier detects mechanical resonance and sets filter characteristics automatically to suppress mechanical vibration.	MR-J4-_GF_ section 7.1
Low-pass filter	Suppresses high-frequency resonance which occurs as the servo system response is increased.	MR-J4-_GF_ section 7.1
Machine analyzer function	Analyzes the frequency characteristic of the mechanical system by simply connecting an MR Configurator2 installed personal computer and the servo amplifier. MR Configurator2 is necessary for this function.	
Robust filter	Improves a disturbance response when a response performance cannot be increased because of a large load to motor inertia ratio, such as a roll feed axis.	[Pr. PE41]
Slight vibration suppression control	Suppresses vibration of ±1 pulse generated at a servo motor stop.	[Pr. PB24]
Electronic gear	Positioning control is performed with the position command from the controller multiplied by a set electronic gear ratio. In the point table mode, the position commands can be multiplied by 1/864 to 33935. In the indexer mode, the position commands can be multiplied by 1/9999 to 9999.	[Pr. PA06] [Pr. PA07]
Auto tuning	Automatically adjusts the gain to optimum value if load applied to the servo motor shaft varies.	MR-J4-_GF_ section 6.3
Brake unit	Used when the regenerative option cannot provide enough regenerative power. Can be used for the 5 kW or more servo amplifier.	MR-J4-_GF_ section 11.3
Power regeneration converter	Used when the regenerative option cannot provide enough regenerative power. Can be used for the 5 kW or more servo amplifier.	MR-J4-_GF_ section 11.4
Regenerative option	Use a regenerative option when the built-in regenerative resistor of the servo amplifier does not have sufficient regenerative capacity for a large regenerative power generated.	MR-J4-_GF_ section 11.2

Function	Description	Detailed explanation
Alarm history clear	Clears alarm histories.	[Pr. PC21]
Input signal selection (device settings)	The input devices including PC (proportional control) can be assigned to certain pins of the CN3 connector.	[Pr. PD03] to [Pr. PD05]
Output signal selection (device settings)	The output devices including MBR (Electromagnetic brake interlock) can be assigned to certain pins of the CN3 connector.	[Pr. PD07] to [Pr. PD09]
Output signal (DO) forced output	Turns on/off the output signals forcibly independently of the servo status. Use this function for checking output signal wiring, etc.	MR-J4-_GF_ section 4.5
Torque limit	Limits the servo motor torque.	[Pr. PA11] [Pr. PA12]
Test operation mode	JOG operation, positioning operation, motor-less operation, DO forced output, program operation and single-step feed can be used. Note that MR Configurator2 is necessary for positioning operation, program operation, and single-step feed.	Section 4.5.1 (1) (e) MR-J4-_GF_ section 4.5
Analog monitor output	Outputs servo status with voltage in real time.	[Pr. PC09] [Pr. PC10]
MR Configurator2	Using a personal computer, you can perform the parameter setting, test operation, monitoring, and others.	MR-J4-_GF_ section 11.7
Linear servo system	Linear servo systems can be configured using a linear servo motor and linear encoder.	MR-J4-_GF_ chapter 14
Direct drive servo system	Direct drive servo systems can be configured to drive a direct drive motor.	MR-J4-_GF_ chapter 15
Fully closed loop system	Fully closed loop system can be configured using the load-side encoder.	MR-J4-_GF_ chapter 16
One-touch tuning	Gain adjustment is performed just by one click on MR Configurator2.	MR-J4-_GF_ section 6.2
SEMI-F47 function	This servo amplifier complies with the SEMI-F47 standard. Thus, even when an instantaneous power failure occurs during operation, the electrical energy charged in the capacitor is used and [AL. 10 Undervoltage] is not triggered.	MR-J4-_GF_ section 7.4 [Pr. PA20] [Pr. PF25]
Tough drive function	This function makes the equipment continue operating even under the condition that an alarm occurs. The tough drive function includes two types: the vibration tough drive and the instantaneous power failure tough drive.	MR-J4-_GF_ section 7.3
Drive recorder function	This function continuously monitors the servo status and records the status transition before and after an alarm for a fixed period of time. You can check the recorded data by clicking the Waveform-Display button on the drive recorder window on MR Configurator2. However, the drive recorder is not available when: 1.The graph function of MR Configurator2 is being used. 2.The machine analyzer function is being used. 3.[Pr. PF21] is set to "-1".	[Pr. PA23]
STO function	This function is a functional safety that complies with IEC/EN 61800-5-2. You can create a safety system for the equipment easily.	MR-J4-_GF_ chapter 13
Servo amplifier life diagnosis function	You can check the cumulative energization time and the number of on/off times of the inrush relay. This function gives an indication of the replacement time for parts of the servo amplifier including a capacitor and a relay before they malfunction. This function is available with MR Configurator2 or via a network.	Section 9.4
Power monitoring function	This function calculates the power running energy and the regenerative power from the data in the servo amplifier such as speed and current. Power consumption and others are displayed on MR Configurator2.	
Machine diagnosis function	From the data in the servo amplifier, this function estimates the friction and vibrational component of the drive system in the equipment and recognizes an error in the machine parts, including a ball screw and bearing. This function is available with MR Configurator2 or via a network.	Section 9.3 MR-J4-_GF_ section 17.5
Scale measurement function	The function transmits position information of a scale measurement encoder to the controller by connecting the scale measurement encoder in semi closed loop control.	MR-J4-_GF_ section 17.1
Limit switch	External limit switches can be used to limit travel intervals of the servo motor.	

Function	Description	Detailed explanation
S-pattern acceleration/deceleration	Enables smooth acceleration and deceleration. Set S-pattern acceleration/deceleration time constants with [Pr. PT51]. As compared with linear acceleration/deceleration, the acceleration/deceleration time will be longer for the S-pattern acceleration/deceleration time constants regardless of command speed.	[Pr. PT51]
Software limit	Limits travel intervals by address using parameters. Enables the same function with the limit switch by setting parameters.	MR-J4-_GF_ section 5.3
Speed limit	The servo motor speed can be limited.	
Lost motion compensation function	This function improves the response delay generated when the machine moving direction is reversed.	MR-J4-_GF_ section 7.6
Super trace control	This function sets constant and uniform acceleration/deceleration droop pulses to almost 0.	MR-J4-_GF_ section 7.7
CC-Link IE Field Network Basic	CC-Link IE Field Network Basic enables fixed cycle communication between the master and slave stations using a general-purpose Ethernet connector. The parameters of servo amplifiers can be set (read/written) and monitored.	Chapter 2
SLMP	SLMP (SeamLess Message Protocol) is a protocol to access SLMP-compatible devices from external devices (such as a personal computer and an HMI) or programmable controller CPU via Ethernet. The parameters of servo amplifiers can be set (read or written) and monitored.	Chapter 3
IP address filtering function	You can limit the network devices to be connected to the servo amplifier by registering the range of IP addresses in advance.	Chapter 7
Operation specification IP address function	In Ethernet communication (CC-Link IE Field Network Basic or SLMP), to limit the network devices to which the operation right is given, set the range of the device IP addresses. Monitoring/parameter reading can be performed with the network devices having no operation right.	Chapter 7
Functional safety unit	MR-D30 can be used to expand the safety observation function. CC-Link IE Field Network Basic communication is not available. When CC-Link IE Field Network Basic is set, connecting an MR-D30 functional safety unit triggers [AL. 3E.8].	
Simple cam function	This function enables synchronous control by using software instead of controlling mechanically with cam. This function enables the encoder following function, simple cam position compensation function, and synchronous operation using positioning data.	Chapter 9

1.5 Communication specifications

1.5.1 Communication specifications of CC-Link IE Field Network Basic

Function	Description
Communication protocol	UDP
Port No.	No. 61450 (cyclic data) No. 61451 (NodeSearch and IPAddressSet dedicated for CC-Link IE Field Network Basic only)
Cyclic data	32 points (64 bytes)
IP address	IPv4 range: 0.0.0.1 to 223.255.255.254 Use the same network address for both the master and slave stations. Default value: 192.168.3.0
Subnet mask	Default value (recommended): 255.255.255.0
Message format	Refer to chapter 2.
Physical layer	100BASE-TX
Communication connector	RJ45, 1 port (CN1)
Communication cable	CAT5e, shielded twisted pair (4 pair) straight cable
Network topology	Star
Variable communication speed	100 Mbps
Transmission distance between stations	Max. 100 m
Number of nodes	Max. 64 stations (max. number of connections per group: 16 stations)
Standard response time (Note 1) (Link scan time/timeout time (Note 2, 3))	10 ms

Note 1. Reference response time refers to the time taken by the servo amplifier to return a response to the master station after receiving a command from the master station.

2. Calculate the link scan time as follows. Also, use the reference response time for Ns.
   MELSEC iQ-R/MELSEC-Q/L: Ls = Ns + Nm
   MELSEC iQ-F: Ls = SM + {(Ns + Nm)/SM}
   Ls: Link scan time, Ns: Response time of slave station, Nm: Request time of master station, SM: Sequence scan time

3. Check the current link scan time (when all the slave stations are in a normal state) using the CC-Link IE Field Network Basic diagnosis function. Then, set the timeout time approximately 5 times the link scan time (example: 50 ms when the current link scan time is 10 ms).

1.5.2 SLMP communication specifications

Function		Description
Communication protocol		UDP
Port No.	iQSS	No. 45237 (NodeSearch and IPAddressSet only)
	UDP	No. 5010
IP address		IPv4 range: 0.0.0.0 to 255.255.255.255 Use the same network address for both the master and slave stations. Default value: 192.168.3.0
Subnet mask		Default value (recommended): 255.255.255.0
Message format		Refer to chapter 3.
Physical layer		100BASE-TX
Communication connector		RJ45, 1 port (CN1)
Communication cable		CAT5e, shielded twisted pair (4 pair) straight cable
Network topology		Star
Variable communication speed		100 Mbps
Transmission distance between stations		Max. 100 m
Maximum number of connections		No limit

1.6 Configuration including peripheral equipment

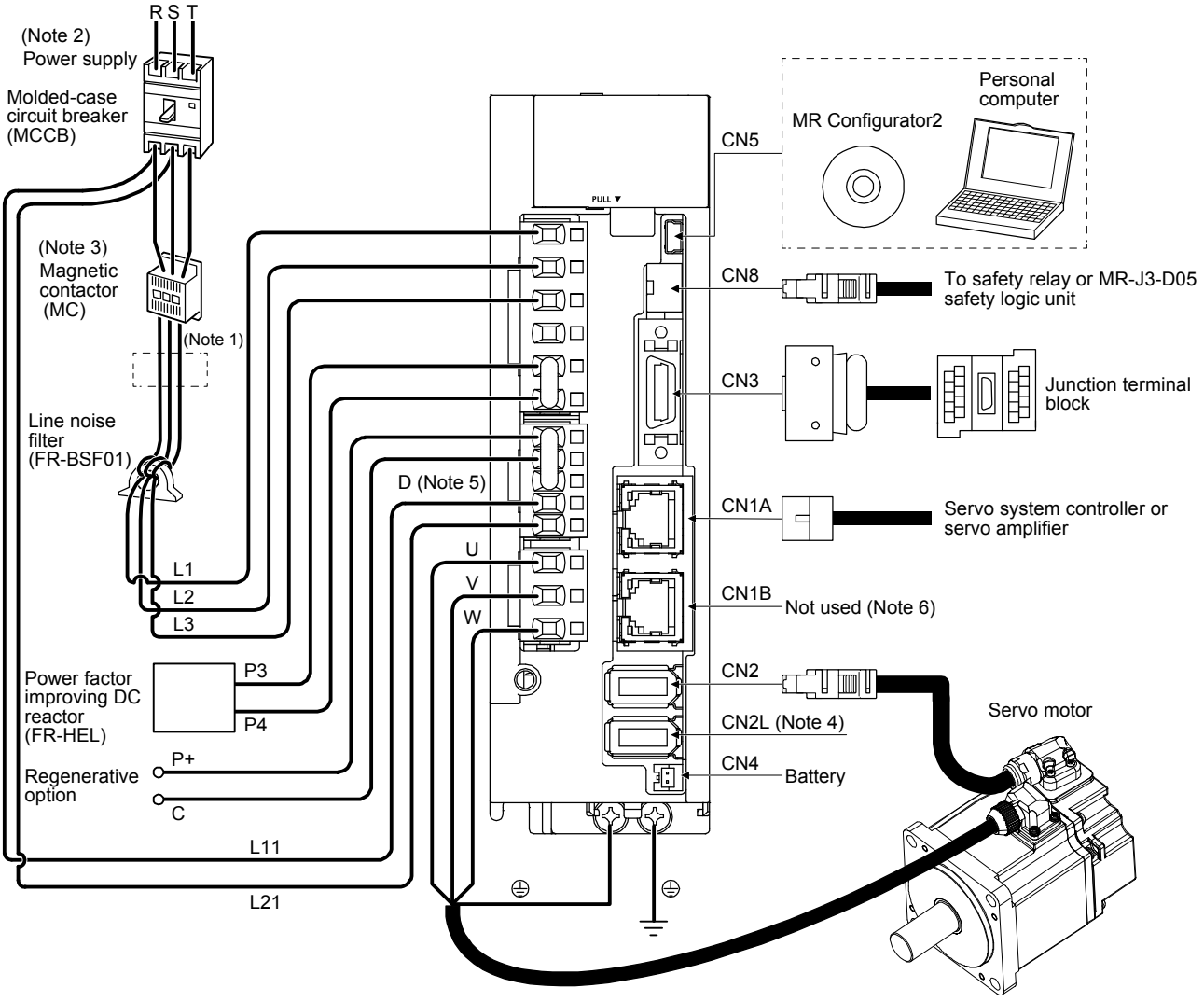
⚠CAUTION ●Connecting a servo motor of the wrong axis to U, V, W, or CN2 of the servo amplifier may cause a malfunction.

POINT

●Equipment other than the servo amplifier and servo motor are optional or recommended products.

●When using an MR-J4-_GF-RJ servo amplifier with the DC power supply input, refer to app. 1 of "MR-J4-_GF_(-RJ) Servo Amplifier Instruction Manual (Motion Mode)".

The diagram shows MR-J4-20GF-RJ.

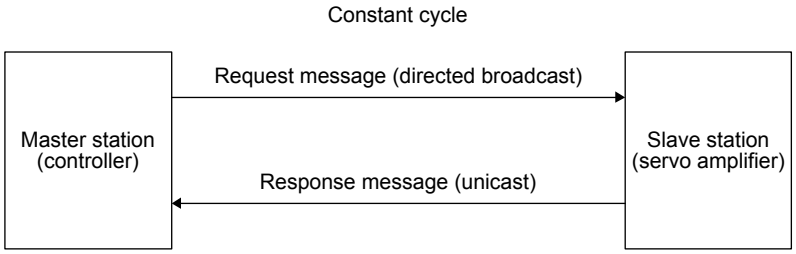


Note 1. The power factor improving AC reactor can also be used. In this case, the power factor improving DC reactor cannot be used. When not using the power factor improving DC reactor, short P3 and P4.
2. For 1-phase 200 V AC to 240 V AC, connect the power supply to L1 and L3. Leave L2 open. For power supply specifications, refer to section 1.3 of "MR-J4-_GF_(-RJ) Servo Amplifier Instruction Manual (Motion Mode)".
3. A bus voltage may drop, depending on the main circuit voltage and operation pattern, causing a dynamic brake deceleration during a forced stop deceleration. When dynamic brake deceleration is not required, delay the time to turn off the magnetic contactor.
4. This is for MR-J4-_GF-RJ servo amplifier. MR-J4-_GF servo amplifier does not have CN2L connector. When using MR-J4-_GF-RJ servo amplifier in the linear servo system or in the fully closed loop system, connect an external encoder to this connector. Refer to section 1.1 of "MR-J4-_GF_(-RJ) Servo Amplifier Instruction Manual (Motion Mode)" and "Linear Encoder Instruction Manual" for the connectable external encoders.
5. Be sure to connect between P+ and D terminals. When using a regenerative option, refer to section 11.2 of "MR-J4-_GF_(-RJ) Servo Amplifier Instruction Manual (Motion Mode)".
6. CN1B connector is not used during CC-Link IE Field Network Basic communication. Thus, the servo amplifier will not respond if connected to CN1B connector. Leave this open.

2. CC-Link IE FIELD NETWORK BASIC PROTOCOL

2.1 Summary

In CC-Link IE Field Network Basic, a command that a master station (controller) sends to slave stations (servo amplifiers) is called a request message, and a command that the slave stations (servo amplifiers) send back to the master station (controller) is called a response message.
The master station (controller) sends the request message using the directed broadcast to all slave stations (servo amplifiers). When the servo amplifier receives the request message, it acquires data for own station and returns the response message to the master station (controller) using the unicast after the servo amplifier response time. The servo amplifier response time differs depending on the command to be sent.
Link devices (RWr, RWw, RX, and RY) are used for data communication. The master station (controller) refreshes links by sending and receiving the request and response messages at a constant cycle.
The servo amplifier reads the received data as an object dictionary to drive a servo motor and return monitor data.



2.2 Message format

The following shows the request message format to be used when the master station (controller) sends a message, and the response message format to be used when the slave stations (servo amplifiers) return a message.
Messages are sent by using UDP/IP.

(1) Request message format

Ethernet header	IP header	UDP header	CCIEF Basic header	Command, etc.	Link device (for 16 stations) (RY, RWw)

(2) Response message format

Ethernet header	IP header	UDP header	CCIEF Basic header	Slave station notification information	Link device (RX, RWr)

2.3 Link device

In cyclic communication, communication data of the request message and response message is read as object data (RWwn, RWrn, RYn, and RXn) of the servo amplifier. Table 2.1 and 2.2 list initial settings.

Table 2.1 RYn/RXn mapping (pt/idx/jg/hm)

Master station → Servo amplifier (RYn)			
Device No. (Note)	Device	Symbol	Remark
RYn0 to RY (n + 3) E	Unavailable		
RY (n + 3) F	Cyclic communication ready command	CSR	

Servo amplifier → Master station (RXn)			
Device No. (Note)	Device	Symbol	Remark
RXn0 to RX (n + 3) E	Unavailable		
RX (n + 3) F	Cyclic communication ready	SSR	

Note. "n" depends on the station No. setting.

Table 2.2 RWwn/RWrn mapping (pt/idx/jg/hm)

Master station → Servo amplifier (RWwn)		
Device No. (Note)	Index	Device
RWwn00	6060	Modes of operation
RWwn01	6040	Controlword
RWwn02	2D01	Control DI 1
RWwn03	2D02	Control DI 2
RWwn04	2D03	Control DI 3
RWwn05	2D60	Target point table
RWwn06	6081	Profile velocity
RWwn07		
RWwn08	6083	Profile acceleration
RWwn09		
RWwn0A	6084	Profile deceleration
RWwn0B		
RWwn0C	60B8	Touch probe function
RWwn0D	2DD1	Target speed No.
RWwn0E		
RWwn0F		
RWwn10		
RWwn11		
RWwn12		
RWwn13		
RWwn14		
RWwn15		
RWwn16		
RWwn17		
RWwn18		
RWwn19		
RWwn1A		
RWwn1B		
RWwn1C		
RWwn1D		
RWwn1E		
RWwn1F		

Servo amplifier → Master station (RWrn)		
Device No. (Note)	Index	Device
RWrn00	6061	Modes of operation display
RWrn01	6041	Statusword
RWrn02	6064	Position actual value
RWrn03		
RWrn04	606C	Velocity actual value
RWrn05		
RWrn06	60F4	Following error actual value
RWrn07		
RWrn08	6077	Torque actual value
RWrn09	2D11	Status DO 1
RWrn0A	2D12	Status DO 2
RWrn0B	2D13	Status DO 3
RWrn0C	2D15	Status DO 5
RWrn0D	2D17	Status DO 7
RWrn0E	2D68	Point Demand value
RWrn0F	2D69	Point actual value
RWrn10		
RWrn11	2A42	Current alarm 2
RWrn12	60B9	Touch probe status
RWrn13	60BA	Touch probe pos1 pos value
RWrn14		
RWrn15	60BB	Touch probe pos1 neg value
RWrn16		
RWrn17		
RWrn18		
RWrn19		
RWrn1A		
RWrn1B		
RWrn1C		
RWrn1D		
RWrn1E		
RWrn1F		

Note. "n" depends on the station No. setting.

2.4 Mapping data details of link device

Refer to chapter 10.

MEMO

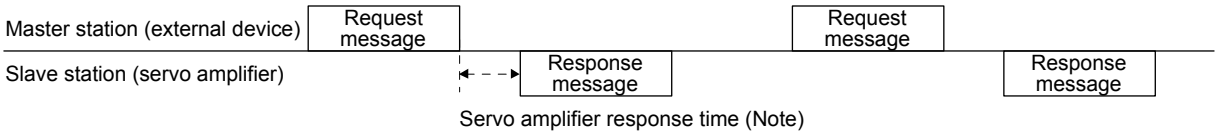
3. SLMP

3.1 Summary

POINT
●This servo amplifier does not support SLMP (TCP). ●When commands are sent from multiple master stations to a servo amplifier at short time intervals, the servo amplifier may fail to receive some of the commands. When the servo amplifier does not respond to commands, lengthen the interval of sending them.

SLMP (SeamLess Message Protocol) is a common protocol which enables seamless communication among applications across the network. SLMP communications can be performed for external devices, such as a programmable controller, a personal computer, and HMI, that can send and receive messages by using SLMP control procedures. The MR-J4-_GF_(-RJ) servo amplifier is compatible only with the binary code. It is not compatible with the ASCII code.
For the compatibility of SLMP with external devices, refer to manuals for external devices.

In SLMP, a command that a master station (external device) sends to slave stations (servo amplifiers) is called a request message, and a command that the slave stations (servo amplifiers) send back to the master station (external device) is called a response message.
When the servo amplifier receives the request message, it returns the response message to the external device after the servo amplifier response time.
The external device cannot send the next request message until it completes receiving the response message.



Note. The servo amplifier response time differs depending on the command to be sent.

3.2 Message format

The following shows the request message format to be used when the master station (external device) sends a message, and the response message formats to be used when the slave stations (servo amplifiers) return a message.

(1) Request message format

Ethernet header	IP header	UDP header	SLMP								Footer
			Subheader	Request destination network No.	Request destination station No.	Request destination module I/O No.	Request destination multi-drop station No.	Request data length	Monitoring timer	Request data	

(2) Response message format

The response message has two different formats for normal completion and abnormal completion.

(a) At normal completion

Ethernet header	IP header	UDP header	SLMP								Footer
			Subheader	Request destination network No.	Request destination station No.	Request destination module I/O No.	Request destination multi-drop station No.	Response data length	End code	Response data	

(b) At abnormal completion

Ethernet header	IP header	UDP header	SLMP											Footer
			Subheader	Request destination network No.	Request destination station No.	Request destination module I/O No.	Request destination multi-drop station No.	Response data length	End code	Network No. (responding station)	Station No. (responding station)	Request destination module I/O No.	Request destination multi-drop station No.	Command	Sub command	

Error information

Item	Size	Endian	Description
header			This header is for UDP/IP. The header is added on the external device side before being sent. TCP/IP is not supported.
Subheader (QnA compatible 3E frame)	2 bytes	Big	At a request: 5000h At a response: D000h
Subheader (QnA compatible 4E frame)	6 bytes	Big	At a request: 5400h + Serial number + 0000h At a response: D400h + Serial number + 0000h
Request destination network No.	1 byte		Specify the network No. of the access destination. Specify it in hexadecimal. Store a value of a request message.
Request destination station No.	1 byte		Specify the station number of the access destination. Specify it in hexadecimal. Store a value of a request message.
Request destination unit I/O No.	2 bytes	Little	03FFh (fixed)
Request destination multi-drop station No.	1 byte		00h (fixed)
Request data length	2 bytes	Little	Specify the data length from the monitoring timer to the request data in hexadecimal. Example) For 24 bytes: 1800h
Monitoring timer	2 bytes	Little	Set the waiting time until the servo amplifier that had received a request message from an external device completes read or write processing. When the servo amplifier cannot return a response message within the waiting time, the response message will be discarded. ・0000h: Waiting until the processing is completed ・0001h to FFFFh (1 to 65535): Waiting time (Unit: 0.25 s)
Request data	Variable	Little	Specify the command, sub command, and data that indicate the request content.
Command	2 bytes	Little	Refer to section 3.3.
Sub command	2 bytes	Little	Refer to section 3.3.
Response data length	2 bytes	Little	The data length from the end code to the response data (at normal completion) or to the error information (at abnormal completion) is stored in hexadecimal. (Unit: byte)
End code	2 bytes	Little	The command processing result is stored. "0" is stored at normal completion. An error code of the servo amplifier is stored at abnormal completion. Refer to section 3.5 for the error code.
Response data	Variable	Little	The read data and others corresponding to the command are stored at normal completion.
Error information	9 bytes		The network No. (responding station) (1 byte), station No. (responding station) (1 byte), request destination module I/O No. (2 bytes), and request destination multi-drop station No. (1 byte) of a station that responds an error are stored at abnormal completion. Numbers that do not correspond to the content of the request message may be stored because the information of the station that responds an error is stored at abnormal completion. The command (2 bytes) and sub command (2 bytes) in which an error occurs are also stored.
Footer			This footer is for UDP/IP. The footer is added on the external device side before being sent. TCP/IP is not supported.

3.3 Command

The following table lists applicable commands.

Name	Command	Sub command	Description	Detailed explanation
CiA 402 object read/write	4020h	0001h	Reads data specified by using the CiA 402 object from the servo amplifier to the external device.	Section 3.4.1
		0002h	Writes data specified by using the CiA 402 object from the external device to the servo amplifier.	Section 3.4.2
		0005h	Reads data of consecutive sub commands specified by using the CiA 402 object from the servo amplifier to the external device.	Section 3.4.3
		0006h	Writes data of consecutive sub commands specified by using the CiA 402 object from the external device to the servo amplifier.	Section 3.4.4
NodeSearch	0E30h	0000h	Detects the server device in the network.	
IPAddressSet	0E31h	0000h	Sets the IP address of the server device in the network.	
Model code read	0101h	0000h	Reads the servo amplifier model.	

3.4 CiA 402 read/write command

The MR-J4-_GF_(-RJ) servo amplifier supports the CiA 402 read/write command.

Service	SLMP		Description
	Command	Sub command	
SDO Upload	4020h	0001h	Reads data specified by using the CiA 402 object from the servo amplifier to the external device.
SDO Download	4020h	0002h	Writes data specified by using the CiA 402 object from the external device to the servo amplifier.
SDO Object SubID Block Upload	4020h	0005h	Reads data of consecutive sub commands specified by using the CiA 402 object from the servo amplifier to the external device.
SDO Object SubID Block Download	4020h	0006h	Writes data of consecutive sub commands specified by using the CiA 402 object from the external device to the servo amplifier.

3.4.1 SDO Upload (CiA 402 object read)

When the slave stations (servo amplifiers) receive the CiA 402 object read request from the master station (external device), they return a value of the object corresponding to the specified Index or Sub Index.

(1) Request message (command and the following)

Command		Sub command		Index		Sub Index	Reserved	Number of data value	
L	H	L	H	L	H	-	-	L	H
20h	40h	01h	00h	Refer to (3) in this section for details.					

(2) Response message

(a) At normal completion (end code and the following)

End code		Index		Sub Index	Reserved	Number of data value		Read data
L	H	L	H	-	-	L	H	L or H (variable)
00h	00h	Refer to (3) in this section for details.						

(b) At abnormal completion

The response message is the same as that of 3.2 (2) (b).

(3) Item list

Item	Size	Endian	Description
Command	2 bytes	Little	4020h
Sub command	2 bytes	Little	0001h
Index	2 bytes	Little	Specify Index of the object. (Refer to chapter 10.) For the response message, the value specified in the request message is stored.
Sub Index	1 byte	Little	Specify Sub Index of the object. (Refer to chapter 10.) For the response message, the value specified in the request message is stored.
Reserved	1 byte		00h (fixed)
Number of data value	2 bytes	Little	Read data: 00h (fixed)
Read data	Variable	Little	The response data of the object is stored.

3.4.2 SDO Download (CiA 402 object write)

When the slave stations (servo amplifiers) receive the CiA 402 object write request from the master station (external device), they write a specified value to the object corresponding to the specified Index or Sub Index.

(1) Request message (command and the following)

Command		Sub command		Index		Sub Index	Reserved	Number of data value		Write data
L	H	L	H	L	H	-	-	L	H	L or H (variable)
20h	40h	02h	00h	Refer to (3) in this section for details.						

(2) Response message

(a) At normal completion (end code and the following)

End code		Index		Sub Index	Reserved	Number of data value	
L	H	L	H	-	-	L	H
00h	00h	Refer to (3) in this section for details.					

(b) At abnormal completion

The response message is the same as that of 3.2 (2) (b).

(3) Item list

Item	Size	Endian	Description
Command	2 bytes	Little	4020h
Sub command	2 bytes	Little	0002h
Index	2 bytes	Little	Specify Index of the object. (Refer to chapter 10.) For the response message, the value specified in the request message is stored.
Sub Index	1 byte	Little	Specify Sub Index of the object. (Refer to chapter 10.) For the response message, the value specified in the request message is stored.
Reserved	1 byte		00h (fixed)
Number of data value	2 bytes	Little	Write data: Specify the size in hexadecimal.
Write data	Variable	Little	Specify the write data of the object.

3.4.3 SDO Object SubID Block Upload (CiA 402 object sub ID continuous read)

When the slave stations (servo amplifiers) receive the CiA 402 object sub ID continuous read request from the master station (external device), they return a value of the object corresponding to the specified Index or consecutive Sub Index.

(1) Request message (command and the following)

Command		Sub command		Index		Sub Index	Reserved	Number of data value	
L	H	L	H	L	H	-	-	L	H
20h	40h	05h	00h	Refer to (3) in this section for details.					

(2) Response message

(a) At normal completion (end code and the following)

End code		Index		Sub Index	Reserved	Number of data value		Read data
L	H	L	H	-	-	L	H	L or H (variable)
00h	00h	Refer to (3) in this section for details.						

(b) At abnormal completion

The response message is the same as that of 3.2 (2) (b).

(3) Item list

Item	Size	Endian	Description
Command	2 bytes	Little	4020h
Sub command	2 bytes	Little	0005h
Index	2 bytes	Little	Specify Index of the object. (Refer to chapter 10.) For the response message, the value specified in the request message is stored.
Sub Index	1 byte	Little	Specify Sub Index of the object. (Refer to chapter 10.) For the response message, the value specified in the request message is stored.
Reserved	1 byte		00h (fixed)
Number of data value	2 bytes	Little	Read data: 00h (fixed)
Read data	Variable	Little	The response data of the object is stored.

3.4.4 SDO Object SubID Block Download (CiA 402 object sub ID continuous write)

When the slave stations (servo amplifiers) receive the CiA 402 object sub ID continuous write request from the master station (external device), they write a specified value to the object corresponding to the specified Index or consecutive Sub Index.

(1) Request message (command and the following)

Command		Sub command		Index		Sub Index	Reserved	Number of data value		Write data
L	H	L	H	L	H	-	-	L	H	L or H (variable)
20h	40h	06h	00h	Refer to (3) in this section for details.						

(2) Response message

(a) At normal completion (end code and the following)

End code		Index		Sub Index	Reserved	Number of data value	
L	H	L	H	-	-	L	H
00h	00h	Refer to (3) in this section for details.					

(b) At abnormal completion

The response message is the same as that of 3.2 (2) (b).

(3) Item list

Item	Size	Endian	Description
Command	2 bytes	Little	4020h
Sub command	2 bytes	Little	0006h
Index	2 bytes	Little	Specify Index of the object. (Refer to chapter 10.) For the response message, the value specified in the request message is stored.
Sub Index	1 byte	Little	Specify Sub Index of the object. (Refer to chapter 10.) For the response message, the value specified in the request message is stored.
Reserved	1 byte		00h (fixed)
Number of data value	2 bytes	Little	Write data: Specify the size in hexadecimal.
Write data	Variable	Little	Specify the write data of the object.

3.5 Error codes

The following table lists error codes that are stored in the end code at abnormal completion in SLMP.

Error code	Cause
C059h	(1) The sub command is specified incorrectly. (2) A command that is not prescribed is received.
C05Ch	The request message is incorrect.
C061h	The request data length does not correspond to the number of data points.
CCCAh	A non-existent Index is specified.
CCD0h	Number of data value differs from the prescribed value.
CCD1h	Number of data value is greater than the prescribed value.
CCD2h	Number of data value is smaller than the prescribed value.
CCD3h	A non-existent Sub Index is specified.
CCC8h	The Write only object is read.
CCC9h	(1) A value is written to the Read only object. (2) A value is written to an object which is not the Read only object for all AL states but for the present AL state with Write disabled.
CCC7h	(1) A value is written to the object mapped to a response message. The following writings are performed when the object mapped to a response message is not allowed to be changed. ・A value other than "0" is written to Sub Index0. ・A value is written to the corresponding Sub Index 1 to 32.
CCCBh	The object that cannot be mapped to response message is written to the object mapped to a response message.
CCCCh	The total size of the object mapped to a response message exceeds 64 bytes.
CCD4h	A value outside the parameter range was written.
CCD5h	A value that is greater than the parameter range is written.
CCD6h	A value that is smaller than the parameter range is written.
CCDAh	A value is written to a parameter object outside the writing range set in the Parameter block setting.

4. STARTUP

⚠WARNING	●When executing a test run, follow the notice and procedures in this instruction manual. Otherwise, it may cause a malfunction, damage to the machine, or injury. ●Do not operate switches with wet hands. Otherwise, it may cause an electric shock.

⚠CAUTION	●Before starting operation, check the parameters. Improper settings may cause some machines to operate unexpectedly. ●The servo amplifier heat sink, regenerative resistor, servo motor, etc., may be hot while the power is on and for some time after power-off. Take safety measures such as providing covers to avoid accidentally touching them by hands and parts such as cables. ●During operation, never touch the rotor of the servo motor. Otherwise, it may cause injury. ●Before wiring, switch operation, etc., eliminate static electricity. Otherwise, it may cause a malfunction.

POINT

●When you use a linear servo motor, read as follows.
Load to motor inertia ratio → Load to motor mass ratio
Torque → Thrust

●When [Pr. PN02 Communication error detection time] is set to a few ms, power cycling of the servo amplifier or an instantaneous power failure during CC-Link IE Field Network Basic communication may trigger [AL. 86.1].

●When [Pr. PN10 Ethernet communication time-out selection] is set to a few ms, power cycling of the servo amplifier or an instantaneous power failure during SLMP communication may trigger [AL. 86.4].

●CC-Link IE Field Network Basic cannot be used with CC-Link IE Field Network. In wiring, isolate these networks with a gateway or other means.

The items shown in the following table are the same as those for the motion mode. For details, refer to the section indicated in the detailed explanation field. "MR-J4-_GF_" means "MR-J4-_GF_(-RJ) Servo Amplifier Instruction Manual (Motion Mode)".

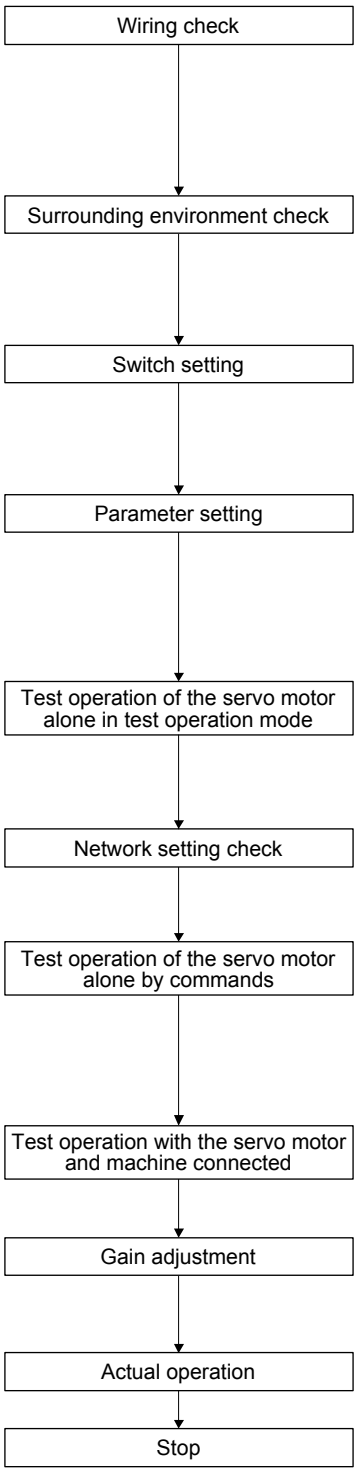
Item	Detailed explanation
Wiring check	MR-J4-_GF_ section 4.1
Surrounding environment	MR-J4-_GF_ section 4.1

4. STARTUP

4.1 Switching power on for the first time

When switching power on for the first time, follow this section to make a startup.

Startup procedure



Check whether the servo amplifier and servo motor are wired correctly using visual inspection, DO forced output function (section 4.7.1 (d)), etc. (Refer to section 4.1 of "MR-J4-_GF_(-RJ) Servo Amplifier Instruction Manual (Motion Mode)".)

Check the surrounding environment of the servo amplifier and servo motor. (Refer to section 4.1 of "MR-J4-_GF_(-RJ) Servo Amplifier Instruction Manual (Motion Mode)".)

Switch to CC-Link IE Field Network Basic communication with the slide switches (SW1). Set the identification number with the rotary switches (SW2/SW3). (Refer to section 4.3.)

Set the parameters as necessary, such as operation mode and regenerative option selection.
(Refer to chapter 7 of this document and chapter 5 of "MR-J4-_GF_(-RJ) Servo Amplifier Instruction Manual (Motion Mode)".)

In the test operation, operate the servo motor at the lowest speed possible, with the servo motor disconnected from the machine, and check whether the servo motor rotates correctly. (Refer to section 4.5.)

Check the network setting when connecting the servo amplifier to a master station (controller). (Refer to section 4.6.) (Refer to section 4.6.)

In the test operation, operate the servo motor at the lowest speed possible by giving commands to the servo amplifier, with the servo motor disconnected from the machine, and check whether the servo motor rotates correctly.

Connect the servo motor with the machine, and check machine motions by transmitting operation commands from the controller.

Make gain adjustment to optimize the machine motions. (Refer to chapter 6 of "MR-J4-_GF_(-RJ) Servo Amplifier Instruction Manual (Motion Mode)".)

Stop giving commands and stop operation.

4.2 Startup

Confirm that the servo motor operates properly alone before connecting the servo motor with a machine.

(1) Slide switch setting
To switch to CC-Link IE Field Network Basic communication, turn the slide switch 1 (SW1-1) "OFF (down)" and turn the slide switch 2 (SW1-2) "ON (up)".

(2) Power on
When the main and control circuit power supplies are turned on, "b01" (when the identification number is "01h") appears on the servo amplifier display.
When the absolute position detection system is used in a rotary servo motor, [AL. 25 Absolute position erased] occurs with first power on, and the servo-on status cannot be made. Cycle the power to deactivate the alarm.
If the power is switched on when the servo motor is rotated by an external force at a speed of 3000 r/min or higher, it may cause a position mismatch. Make sure that the servo motor is not rotated before switching the power on.

(3) IP address setting

POINT

- Use a twisted pair cable with Ethernet Category 5e (1000BASE-T) or higher as an Ethernet cable. The maximum cable length between nodes is 100 m.
- Use a hub with a transmission speed of 100 Mbps or faster when branching the Ethernet communication using a switching hub.
- For the switching hub without the auto-negotiation function, set it to the transmission speed of 100 Mbps and half duplex.
- The initial value of the IP address is 192.168.3.0.
- The 4th octet can be set to 1 to 255 by using rotary switches (SW2/SW3).
- Cycle the power of the servo amplifier after changing the parameter setting of the IP address or using the rotary switches (SW2/SW3).
- The IP address range of CC-Link IE Field Network Basic is between 0.0.0.0 and 223.255.255.254. Set the IP address within the range.

Set the IP address by using the SLMP command with the rotary switches (SW2/SW3) on the display of the servo amplifier, MR Configurator2, or a master station (controller). Refer to chapter 7 for IP address parameters and section 4.3.1 for details of the rotary switches.
Change the IP address with the rotary switches (SW2/SW3) before powering on the servo amplifier.
The IP address can be changed by specifying a MAC address when the SLMP command (IPAddressSet) is used. Refer to section 3.3 for details on the command.
The IP address you set can be checked in the system configuration window of MR Configurator 2.
The IP address can be set as follows.

Rotary switches (SW2/SW3)	IP address	
00h	1st octet	The setting value of [Pr. PN11 (x x _ _)] is used. When the parameter is set to "0 0 _ _", the 1st octet is "192".
	2nd octet	The setting value of [Pr. PN11 (_ _ x x)] is used. When the parameter is set to "_ _0 0", the 2nd octet is "168".
	3rd octet	The setting value of [Pr. PN12 (x x _ _)] is used. When the parameter is set to "0 0 _ _", the 3rd octet is "3".
	4th octet	The setting value of [Pr. PN12 (_ _ x x)] is used.
01h to FFh	1st octet	The setting value of [Pr. PN11 (x x _ _)] is used. When the parameter is set to "0 0 _ _", the 1st octet is "192".
	2nd octet	The setting value of [Pr. PN11 (_ _ x x)] is used. When the parameter is set to "_ _0 0", the 2nd octet is "168".
	3rd octet	The setting value of [Pr. PN12 (x x _ _)] is used. When the parameter is set to "0 0 _ _", the 3rd octet is "3".
	4th octet	The setting value of the rotary switches (SW2/SW3) is used.

(4) Parameter setting

POINT

●The following encoder cables are of four-wire type. When using any of these encoder cables, set [Pr. PC04] to "1 _ _ _" to select the four-wire type. Incorrect setting will result in [AL. 16 Encoder initial communication error 1].
MR-EKCBL30M-L
MR-EKCBL30M-H
MR-EKCBL40M-H
MR-EKCBL50M-H

Set the parameters according to the structure and specifications of the machine. For details, refer to chapter 7 of this document and chapter 5 of "MR-J4-_GF_(-RJ) Servo Amplifier Instruction Manual (Motion Mode)".
After setting the parameters, turn off the power as necessary. Then switch power on again to enable the parameter values.

(5) Connection with the controller
Set up the controller by following the manual of the controller used.

(6) Servo-on

Enable the servo-on with the following procedure.

(a) Switch on the main and control circuit power supplies.

(b) Transmit the servo-on command from the master station (controller).

When the servo-on status is enabled, the servo amplifier is ready to operate and the servo motor is locked.

(7) Home position return

Always perform home position return before starting positioning operation. (Refer to section 6.1.)

(8) Stop

Turn off the servo-on command after the servo motor has stopped, and then switch the power off.
If any of the following situations occurs, the servo amplifier suspends and stops the operation of the servo motor.
Refer to section 3.9 of "MR-J4-_GF_(-RJ) Servo Amplifier Instruction Manual (Motion Mode)" for the servo motor with an electromagnetic brake.

	Operation and command	Stopping condition
Master station (controller)	Servo-off command	The base circuit is shut off, and the servo motor coasts.
	Ready-off command	The base circuit is shut off and the dynamic brake operates to stop the servo motor.
	Quick stop command	The servo motor decelerates to a stop.
	Error occurrence (Note 2)	The servo motor decelerates to a stop.
	Cyclic communication ready command off	The servo motor decelerates to a stop.
Servo amplifier	Alarm occurrence	The servo motor decelerates to a stop. With some alarms; however, the dynamic brake operates to stop the servo motor. (Note 1)
	EM2 (Forced stop 2) off	The servo motor decelerates to a stop. [AL. E6 Servo forced stop warning] occurs. For EM1, refer to section 3.5 of "MR-J4-_GF_(-RJ) Servo Amplifier Instruction Manual (Motion Mode)".
	LSP (Forward rotation stroke end) off or LSN (Reverse rotation stroke end) off	The servo motor stops immediately and will be servo locked. Operation in the opposite direction is possible.
	STO (STO1, STO2) off	The base circuit is shut off and the dynamic brake operates to stop the servo motor.

Note 1. Refer to "MELSERVO-J4 Servo Amplifier Instruction Manual (Troubleshooting)" for details of alarms and warnings.
2. If an error occurs, RX (n + 3) F is set to "0".

4.3 Switch setting and display of the servo amplifier

Switching to CC-Link IE Field Network Basic communication or test operation mode, and setting identification number are enabled with switches on the servo amplifier.
On the servo amplifier display (three-digit, seven-segment LED), check the identification number, and diagnose a malfunction at occurrence of an alarm. The Ethernet communication status can be checked on the LED of the CN1A connector.

4.3.1 Switches

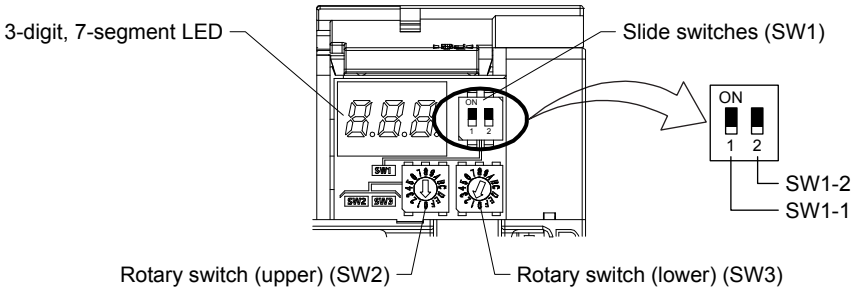
⚠WARNING

- When switching the rotary switches (SW2/SW3) and slide switches (SW1), use insulated screw driver. Do not use a metal screw driver. Touching patterns on electronic boards, lead of electronic parts, etc. may cause an electric shock.

POINT

- Turning "ON (up)" all the slide switches (SW1) enables an operation mode for manufacturer setting and displays "off". This mode is not available. Set the slide switches (SW1) correctly according to this section.
- The setting of the switches will be enabled after the main circuit power supply and control circuit power supply are cycled.

The following diagram explains the slide switches and rotary switches.



(1) Slide switches (SW1-1 and SW1-2)

The combination of SW1-1 and SW1-2 enables you to switch communication method and set the test operation mode (enabled/disabled). The following table lists the combinations of the switches.
In the test operation mode, the functions such as JOG operation, positioning operation, and machine analyzer are available with MR Configurator2.

Slide switches (SW1)	Communication	Test operation mode
	CC-Link IE Field Network	Disabled
	CC-Link IE Field Network Basic	Disabled
	Not available	Enabled
	For manufacturer setting	

(2) Rotary switches (SW2/SW3)

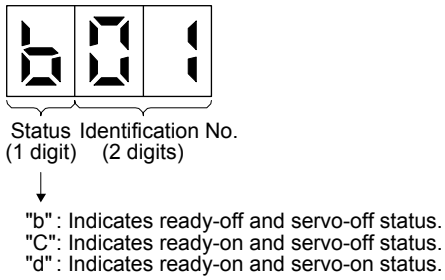
Set the identification number of the servo amplifier in hexadecimal. From "00h (0)" to "FFh (255)" can be set. The set value is used as the 4th octet of the IP address when the identification number is set between "01h (1)" and "FFh (255)".

4.3.2 Scrolling display

Axis number will be displayed in hexadecimal.

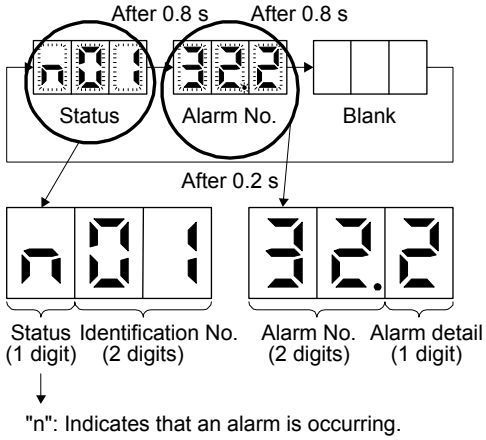
(1) Normal display

When there is no alarm, the identification number (2 digits) is displayed.

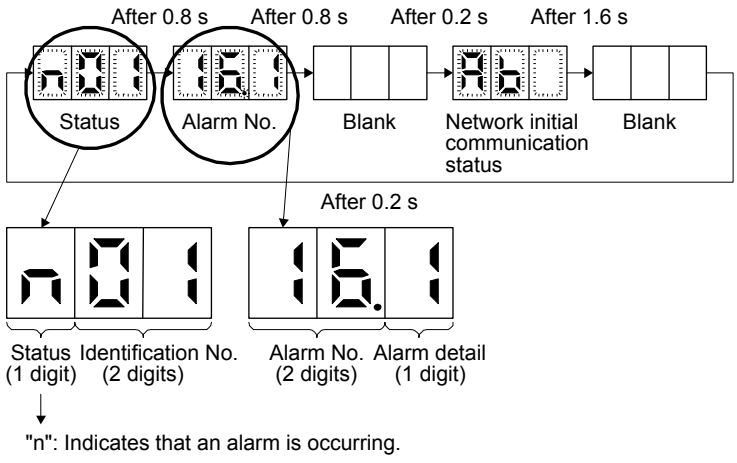


(2) Alarm display

When an alarm occurs, the alarm number (two digits) and the alarm detail (one digit) are displayed following the status display. For example, the following shows when [AL. 32 Overcurrent] is occurring.

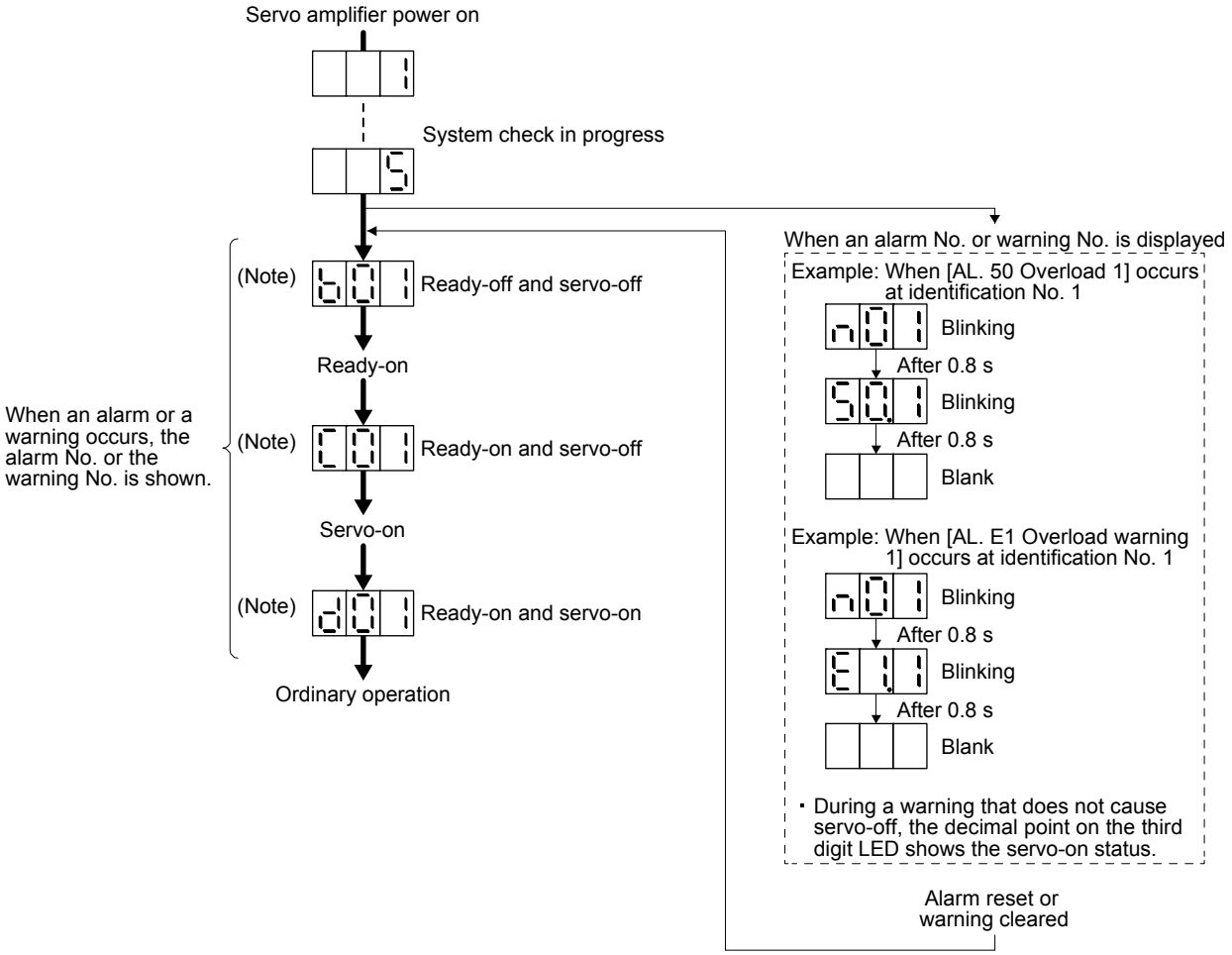


If an alarm occurs during initial communication through a network, the status, the alarm number (two digits) and alarm detail (one digit), and the network initial communication status are displayed, in that order. For example, the following shows when [AL. 16.1 Encoder initial communication - Receive data error 1] is occurring.



4.3.3 Status display

(1) Display sequence



Note. 01 Identification No. 1 02 Identification No. 2 ··· The segment of the last 2 digits shows the identification number.

(2) Indication list

Display	Status	Description
1 ⋮ 5	Initializing	System check in progress
(Note 1) b##	Ready-off	The ready-off command was received.
(Note 1) C##	Ready-on, servo-off	The servo-off command was received.
(Note 1) d##	Ready-on, servo-on	The servo-on command was received.
(Note 1) n##	Alarm occurring	An alarm or warning has occurred in the servo amplifier.
(Note 2) ***	Alarm and warning	The alarm No. and the warning No. that occurred are displayed. (Note 4)
888	CPU error	A CPU watchdog error has occurred.
(Note 1) b#. C#. d#.	(Note 3) Test operation mode	During test operation (JOG operation, positioning operation, program operation, output signal (DO) forced output, motor-less operation, machine analyzer function, or single-step feed was set.)

Note 1. ## is displayed in hexadecimal. The following table shows the description.

##	Description
01 ≀ FF	Identification number (4th octet of the IP address)

2. "***" indicates the alarm No. and the warning No.
3. Requires the MR Configurator2.
4. Refer to "MELSERVO-J4 Servo Amplifier Instruction Manual (Troubleshooting)" for details of alarms and warnings.

4.3.4 Ethernet status display LED

The following is the description of Ethernet status display LED. The CN1B connector is not used when CC-Link IE Field Network Basic is selected.

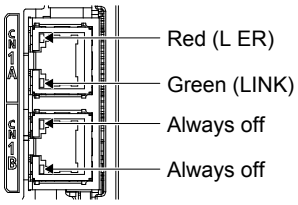


Table 4.1 LED indication list

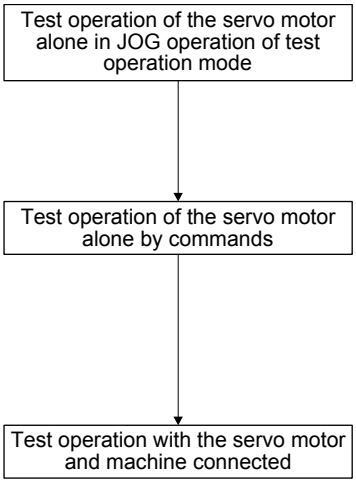
LED	Name	Lighting status	Description
L ER (CN1A)		Extinguished	Always off
LINK (CN1A)	Link status	Lit	Linking up

4.4 Test operation

Before starting an actual operation, perform a test operation to make sure that the machine operates normally.
Refer to section 4.2 for how to power on and off the servo amplifier.

POINT

●If necessary, verify master station (controller) programs by using motor-less operation. Refer to section 4.5.2 for the motor-less operation.



In this step, confirm that the servo amplifier and servo motor operate normally. With the servo motor disconnected from the machine, use the test operation mode and check whether the servo motor rotates correctly. Refer to section 4.5 for the test operation mode.

In this step, confirm that the servo motor rotates correctly with the commands from the master station (controller).
Give a low-speed command at first and check the rotation direction, etc. of the servo motor. If the servo motor does not operate in the intended direction, check the input signal.

In this step, connect the servo motor with the machine and confirm that the machine operates normally with the commands from the master station (controller).
Give a low-speed command at first and check the operation direction, etc. of the machine. If the servo motor does not operate in the intended direction, check the input signal.
Check any problems with the servo motor speed, load ratio, and other status display items with MR Configurator2.
Then, check automatic operation with the program of the master station (controller).

4.5 Test operation mode

⚠CAUTION

●The test operation mode is designed for checking servo operation. It is not for checking machine operation. Do not use this mode with the machine. Always use the servo motor alone.
●If the servo motor operates abnormally, use EM2 (Forced stop 2) to stop it.

POINT

●The content described in this section indicates that the servo amplifier and a personal computer are directly connected.

With a personal computer and MR Configurator2, you can execute JOG operation, positioning operation, output signal forced output, and program operation.

4.5.1 Test operation mode in MR Configurator2

POINT
●When the test operation mode is selected with the slide switches (SW1-1 and SW1-2), the servo amplifier will not receive commands from the master station (controller).

(1) Test operation mode

(a) Jog operation

Jog operation can be performed without the master station (controller). Use this operation with the forced stop reset. This operation may be used independently of whether servo-on or servo-off and whether a master station (controller) is connected or not.

Operate on the jog operation screen of MR Configurator2.

1) Operation pattern

Item	Initial value	Setting range
Servo motor speed [r/min]	200	0 to Maximum speed
Accel./decel. time constant [ms]	1000	0 to 50000

2) Operation method

a) The check box "Rotation only while the CCW or CW button is being pushed" is checked.

Operation	Screen operation
Forward rotation start	Keep pressing "Forward CCW".
Reverse rotation start	Keep pressing "Reverse CW".
Stop	Release "Forward CCW" or "Reverse CW".
Forced stop	Click "Forced Stop".

b) The check box "Rotation only while the CCW or CW button is being pushed" is unchecked.

Operation	Screen operation
Forward rotation start	Click "Forward CCW".
Reverse rotation start	Click "Reverse CW".
Stop	Click "Stop".
Forced stop	Click "Forced Stop".

(b) Positioning operation

Positioning operation can be performed without a master station (controller). Use this operation with the forced stop reset. This operation may be used independently of whether servo-on or servo-off and whether a master station (controller) is connected or not.

Perform on the positioning operation screen of MR Configurator2.

1) Operation pattern

Item	Initial value	Setting range
Travel distance [pulse]	4000	0 to 99999999
Servo motor speed [r/min]	200	0 to Maximum speed
Accel./decel. time constant [ms]	1000	0 to 50000
Repeat pattern	Fwd. rot. (CCW) to rev. rot. (CW)	Fwd. rot. (CCW) to rev. rot. (CW) Fwd. rot. (CCW) to fwd. rot. (CCW) Rev. rot. (CW) to fwd. rot. (CCW) Rev. rot. (CW) to rev. rot. (CW)
Dwell time [s]	2.0	0.1 to 50.0
Number of repeats [time]	1	1 to 9999

2) Operation method

Operation	Screen operation
Forward rotation start	Click "Forward CCW".
Reverse rotation start	Click "Reverse CW".
Temporary stop	Click "Pause".
Stop	Click "Stop".
Forced stop	Click "Forced Stop".

(c) Program operation

Positioning operation can be performed with two or more operation patterns combined, without using a master station (controller). Use this operation with the forced stop reset. This operation may be used independently of whether servo-on or servo-off and whether a master station (controller) is connected or not.

Perform on the program operation screen of MR Configurator2. For full information, refer to the MR Configurator2 Installation Guide.

Operation	Screen operation
Start	Click "Operation start".
Temporary stop	Click "Pause".
Stop	Click "Stop".
Forced stop	Click "Forced Stop".

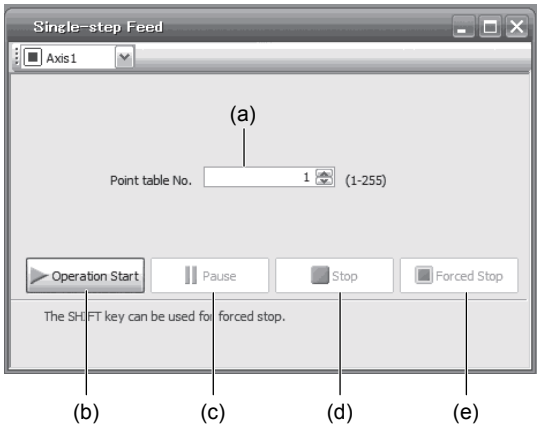
(d) Output signal (DO) forced output

Output signals can be switched on/off forcibly independently of the servo status. Use this function for checking output signal wiring, etc. Perform on the DO forced output screen of MR Configurator2.

(e) Single-step feed

The positioning operation can be performed in accordance with the point table No. set with MR Configurator2.

Select the test operation/single-step feed from the menu of MR Configurator2. When the single-step feed window is displayed, input the following items and operate.



Point table operation

1) Set the point table No.
   Enter a point table No. in the input box (a) "Point table No.".

2) Forward/reverse the servo motor
   Click "Operation Start" (b) to rotate the servo motor.

3) Pause the servo motor
   Click "Pause" (c) to temporarily stop the servo motor.
   Click "Operation Start" (b) during a temporary stop to restart the rotation of the remaining travel distance.
   In addition, click "Stop" (d) during a temporary stop to clear the remaining travel distance.

4) Stop the servo motor
   Click "Stop" (d) to stop the servo motor. At this time, the remaining travel distance will be cleared.
   Click "Operation Start" (b) to restart the rotation.

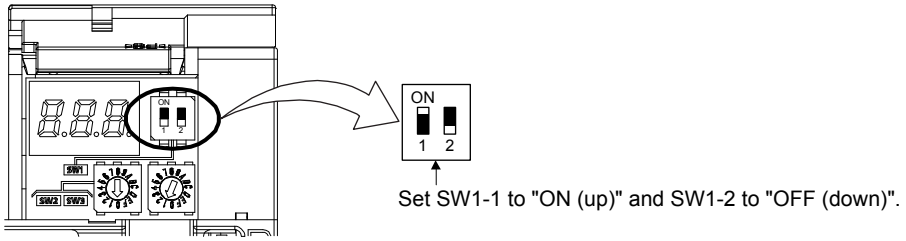
5) Execute the servo motor forced stop
   Click "Forced Stop" (e) to make an instantaneous stop. When "Forced Stop" is enabled, "Operation Start" cannot be used. Click "Forced Stop" again to enable "Operation Start".

6) Switch to the normal operation mode
   Turn off the servo amplifier to switch from the test operation mode to the normal operation mode.

(2) Operation procedure

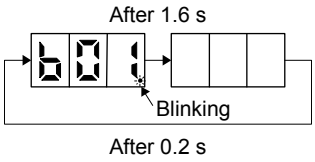
1) Turn off the power.

2) Set SW1-1 to "ON (up)" and SW1-2 to "OFF (down)".

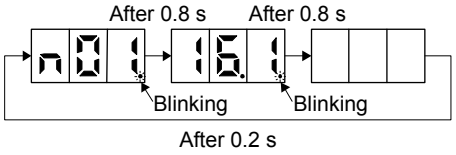


The test operation mode is not enabled when switches SW1-1and SW1-2 are set during power-on.

3) Turn on the servo amplifier.
When initialization is completed, the decimal point on the first digit blinks as follows.



If an alarm or warning occurs during the test operation, the decimal point on the first digit also blinks as follows.



4) Start operation with the personal computer.

4.5.2 Motor-less operation with a controller

POINT
●The servo amplifier need to be connected to the master station (controller) for motor-less operation. ●The motor-less operation cannot be used in the fully closed loop control mode, linear servo motor control mode, or DD motor control mode.

(1) Motor-less operation

Without a servo motor connected to the servo amplifier, signals are outputted and status is displayed as if the servo motor is actually running in response to the master station. This operation can be used to check the sequence of a master station (controller). Use this operation with the forced stop reset. Use this operation with the servo amplifier connected to the master station (controller).

To terminate the motor-less operation, set "Disabled (_ _ _ 0)" of "Motor-less operation selection" in [Pr. PC05]. The motor-less operation will be disabled from the next power-on.

(a) Load conditions

Load item	Condition
Load torque	0
Load to motor inertia ratio	[Pr. PB06 Load to motor inertia ratio/load to motor mass ratio]

(b) Alarms

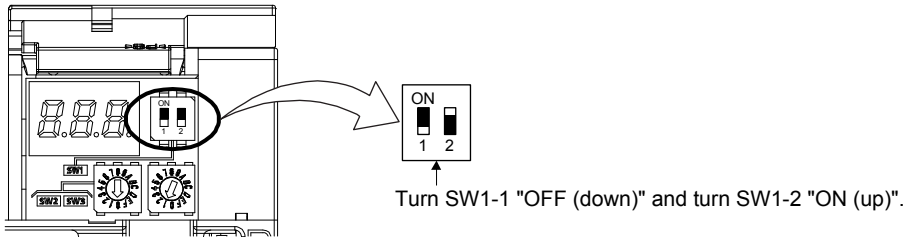
The following alarms and warnings do not occur. However, the other alarms and warnings occur as when the servo motor is connected.

- [AL. 16 Encoder initial communication error 1]
- [AL. 1E Encoder initial communication error 2]
- [AL. 1F Encoder initial communication error 3]
- [AL. 20 Encoder normal communication error 1]
- [AL. 21 Encoder normal communication error 2]
- [AL. 25 Absolute position erased]
- [AL. 92 Battery cable disconnection warning]
- [AL. 9F Battery warning]

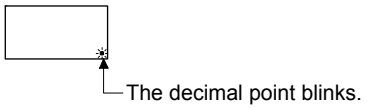
(2) Operation procedure

1) Set the servo amplifier to the servo-off status.

2) Set [Pr. PC05] to "_ _ _ 1", turn SW1-1 "OFF (down)", and then turn SW1-2 "ON (up)".



3) Start the motor-less operation with the master station (controller).
The display shows the following screen.



4.6 Network setting

4.6.1 Settings of GX Works

POINT
●When using GX Works3, use software version 1.040S or later. ●When using GX Works2. use software version 1.570U or later.

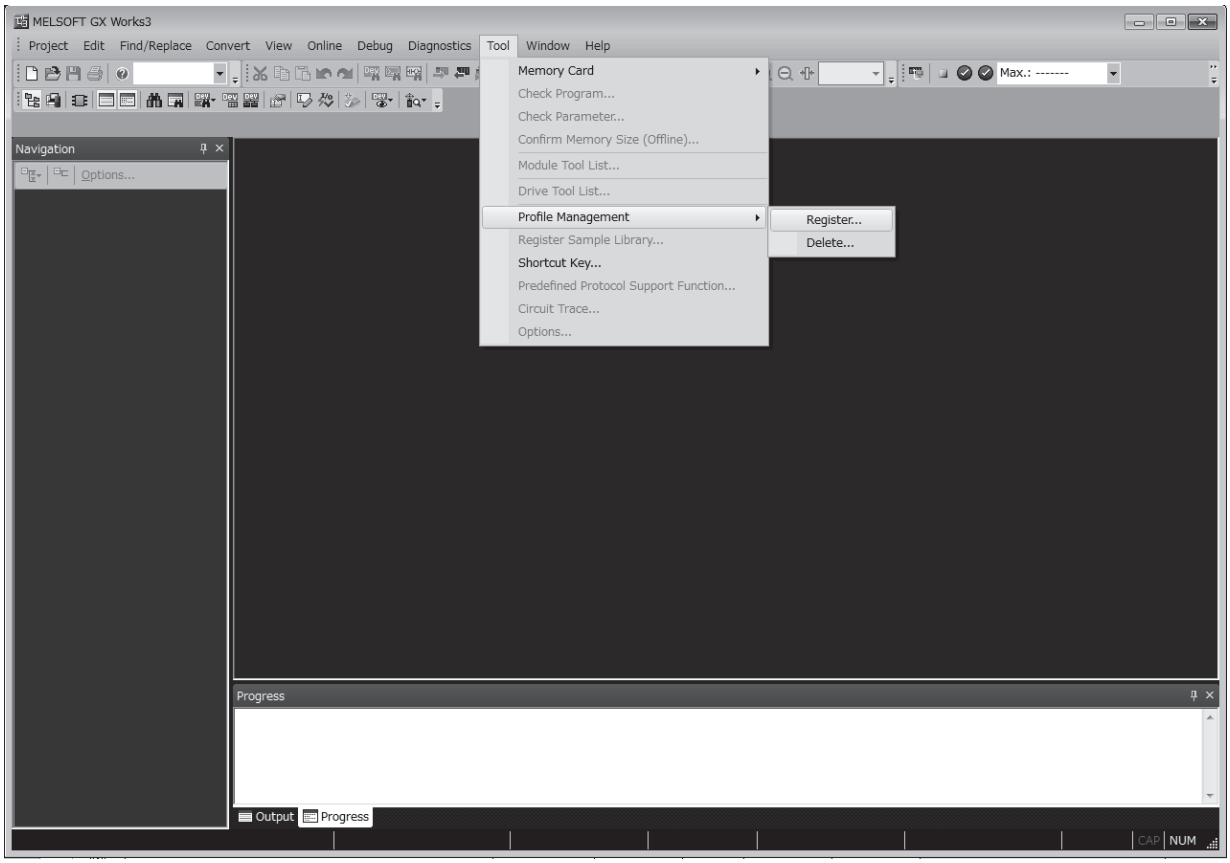
(1) System profile

MR-J4-GF system profile needs to be read into GX Works to set network configuration on GX Works. Obtain the latest system profile (CSP+) from the Mitsubishi Electric FA site (http://www.mitsubishielectric.co.jp/fa/), and register the profile from the Profile Management in the menu.

System profile for CC-Link IE Field Network Basic

System profile name	Description
0x0002_MR-J4-GF(E_CCIEFBasic)_n_en.CSPP.zip (Note)	This is the MR-J4-GF system profile for CC-Link IE Field Network Basic.

Note. "n" designates a system profile version number.



Refer to "GX Works3 Operating Manual" or "GX Works2 Version 1 Operating Manual (Common)" for how to set GX Works.

(2) Setting of CC-Link IE Field Network Basic

Refer to "CC-Link IE Field Network Basic Reference Manual" for setting.

4.6.2 Cyclic communication start

Start the cyclic communication in the following procedure.

Network setting	IP address setting ↓ Subnet mask setting ↓ Slave station (servo amplifier) power cycling	[IP address setting] The initial value is 192.168.3.0. To change the initial value, set it with any of the following (1) to (3). (Refer to section 4.2 (3).) (1) Rotary switches (SW2/SW3) (2) Parameters ([Pr. PN11] to [Pr. PN12]) (3) SLMP communication (IP Address Set command) [Subnet mask setting] The initial value is 255.255.255.0. To change the initial value, set it with either of the following (1) or (2). (Refer to chapter 7.) (1) Parameters ([Pr. PN13] to [Pr. PN14]) (2) SLMP communication (IP Address Set command) [Slave station (servo amplifier) power cycling] The settings of the IP address and subnet mask are reflected.
Communication start procedure	Master station (controller) cyclic communication start ↓ Cyclic communication ready	[Cyclic communication start] Start the cyclic communication of the master station (controller). [Cyclic communication ready] Set RY (n + 3) F of the master station (controller) to "01h". For the slave stations (servo amplifiers), start importing the word device (RWw) and set RX (n + 3) F to "01h". For the master station (controller), check that RX (n + 3) F is "01h" and read the word device (RWr).

5. CiA 402 DRIVE PROFILE

POINT
●Do not give operation commands from two or more master stations to one servo amplifier. Otherwise, the servo motor may operate unexpectedly.

This chapter describes how to drive a servo motor in the communication. For MR-J4-_GF_(-RJ) servo amplifier, objects are assigned according to Index of the CiA 402 drive profile. The master station (controller) can drive the servo motor by accessing the assigned objects.
Refer to chapter 10 for details of the objects.

5.1 State machine control of the servo amplifier

5.1.1 Function description

The servo amplifier status is controlled based on the state machine below. Setting the control command (6040h) from the master station (controller) changes the status of the slave stations (servo amplifiers). The current servo amplifier status can be read with the control status (6041h).

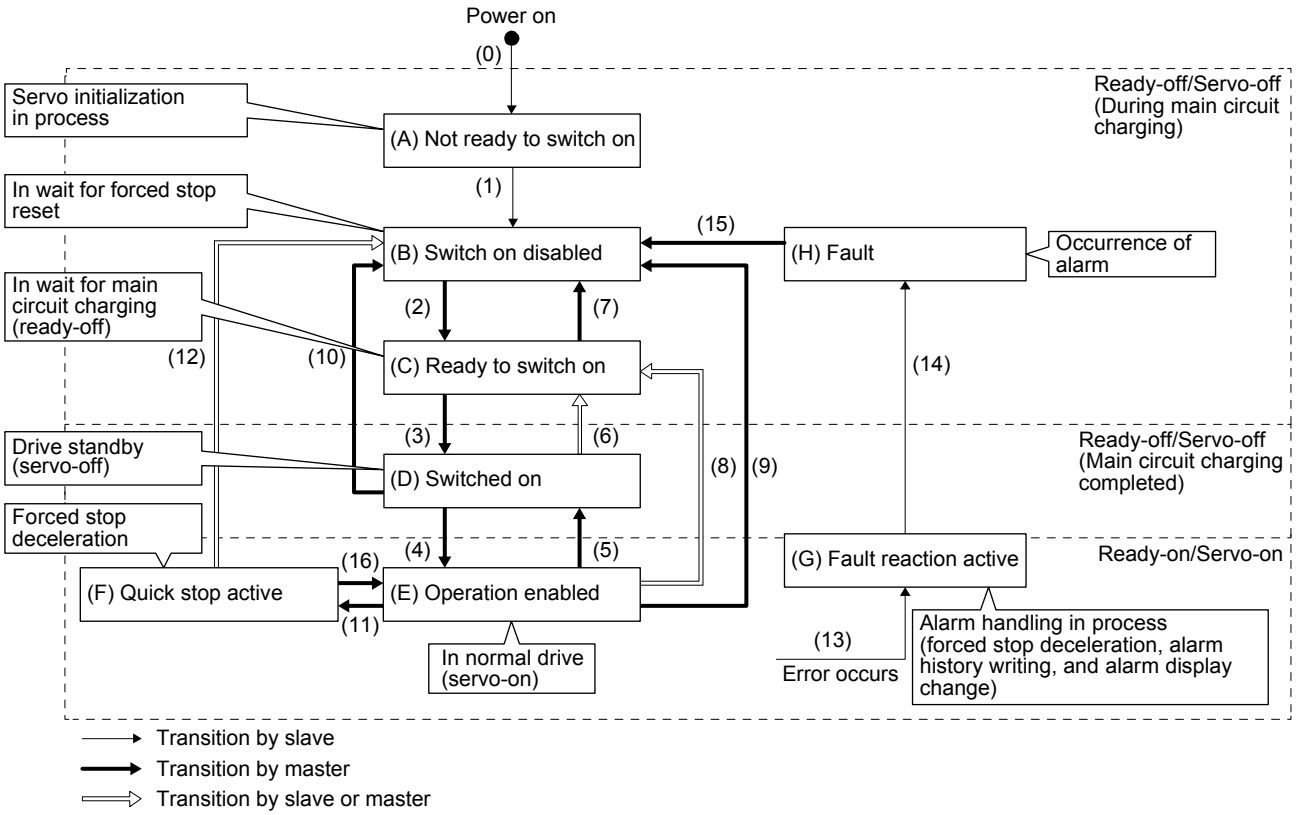


Table 5.1 State transition

Transition No.	Event	Remark
(0)	The control circuit power supply is turned on.	Initialization
(1)	The state automatically transitions when the control circuit power supply is turned on.	Communication setting
(2)	The state transitions with the Shutdown command from the master.	
(3)	The state transitions with the Switch on command from the master.	RA turns on.
(4)	The state transitions with the Enable operation command from the master.	The operation becomes ready after servo-on.
(5)	The state transitions with the Disable operation command from the master.	The operation is disabled after servo-off.
(6)	The state transitions with the Shutdown command from the master.	RA turns off.
(7)	The state transitions with the Disable Voltage command or Quick Stop command from the master.	
(8)	(a) The state transitions with the Shutdown command from the master. (b) The state transitions when the main circuit power supply is turned off.	Operation is disabled after servo-off or RA-off.
(9)	The state transitions with the Disable Voltage command from the master.	Operation is disabled after servo-off or RA-off.
(10)	The state transitions with the Disable Voltage command or Quick Stop command from the master.	RA turns off.
(11)	The state transitions with the Quick Stop command from the master.	Quick Stop starts.
(12)	(a) The state automatically transitions after Quick Stop is completed. (If the Quick Stop option code is 1, 2, 3, or 4) (b) The state transitions with the Disable Voltage command from the master.	Operation is disabled after servo-off or RA-off.
(13)	Alarm occurrence	Processing against the alarm is executed.
(14)	Automatic transition	After processing against the alarm has been completed, servo-off or RA-off is performed and the operation is disabled.
(15)	The state transitions with the Fault Reset command from the master.	Alarms are reset. Resettable alarms can be reset.
(16) (Not compatible) (Note)	The state transitions with the Enable Operation command from the master. (If the Quick Stop option code is 5, 6, 7, or 8)	The operation becomes ready.

Note. This is not available with MR-J4-_GF_(-RJ) servo amplifier.

5.1.2 Related object

Index	Sub Index	Access	Name	Data Type	Default
6040h	0	rw	Controlword	U16	
6041h	0	ro	Statusword	U16	

(1) Controlword (6040h)

This object issues a command from the master station (controller) to the slave stations (servo amplifiers).

Index	Sub Index	Access	Name	Data Type	Default
6040h	0	rw	Controlword	U16	

The current control command status can be checked.
In addition, control commands can be written.
The following table lists the bits of this object. The slave can be controlled with bit 0 to bit 3 and bit 7.

Bit	Symbol	Description
0	SO	Switch On
1	EV	Enable Voltage
2	QS	Quick Stop
3	EO	Enable Operation
4 to 6	OMS	Operation Mode Specific Differs depending on Modes of operation (6060h). (Refer to chapter 6.)
7	FR	Fault Reset
8	HALT	Halt 0: Operation ready 1: Temporary stop
9		Operation Mode Specific Differs depending on Modes of operation (6060h). (Refer to chapter 6.)
10 to 15		Reserved The value at reading is undefined. Set "0" when writing.

The following table lists the commands issued to the servo amplifier. Turn on the bit that corresponds to the command.

Command	Command bit setting of Controlword					Transition No.
	Bit 7: Fault Reset	Bit 3: Enable Operation	Bit 2: Quick Stop	Bit 1: Enable Voltage	Bit 0: Switch On	
Shutdown	0		1	1	0	(2)/(6)/(8)
Switch On	0	0	1	1	1	(3)
Disable Voltage	0			0		(7)/(9)/(10)/(12)
Quick Stop	0		0	1		(7)/(10)/(11)
Disable Operation	0	0	1	1	1	(5)
Enable Operation	0	1	1	1	1	(4)
Fault Reset	0 → 1 (Note)					(15)

Note. To prevent the command from failing to be recognized in faulty communication, hold the state in which Bit 7 is "1" for at least 10 ms for the Fault Reset command. When Bit 7 is turned on, be sure to turn it off.

(2) Statusword (6041h)

Index	Sub Index	Access	Name	Data Type	Default
6041h	0	ro	Statusword	U16	

The current control status can be checked.
The following table lists the bits of this object. The status can be checked with bit 0 to bit 7.

Bit	Symbol	Description
0	RTSO	Ready To Switch On
1	SO	Switched On
2	OE	Operation Enabled
3	F	Fault
4	VE	Voltage-enabled 0: The bus voltage is lower than the certain (RA) level. 1: The bus voltage is equal to or higher than the certain level.
5	QS	Quick stop 0: During a quick stop 1: Not during a quick stop (including in the test mode)
6	SOD	Switch On Disabled
7	W	Warning 0: No warning has occurred. 1: A warning is occurring.
8		Reserved The value at reading is undefined.
9	RM	Reserved The value at reading is undefined.
10	TR	Target reached Differs depending on Modes of operation (6060h). (Refer to chapter 6.)
11	ILA	Internal limit active 0: The forward rotation stroke end, reverse rotation stroke end, and software position limit have not been reached. 1: The forward rotation stroke end, reverse rotation stroke end, or software position limit has been reached (Enabled in the pt, idx, jg, or hm mode).
12 to 13	OMS	Operation Mode Specific Differs depending on Modes of operation (6060h). (Refer to chapter 6.)
14 to 15		Reserved The value at reading is undefined.

The following table lists the servo amplifier statuses that can be read with bit 0 to bit 7.

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Status
	0			0	0	0	0	Not ready to switch on
	1			0	0	0	0	Switch on disable
	0	1		0	0	0	1	Ready to switch on
	0	1		0	0	1	1	Switch on
	0	1		0	1	1	1	Operation enabled
	0	0		0	1	1	1	Quick stop active
	0			1	1	1	1	Fault reaction active
	0			1	0	0	0	Fault
			1					Main power on (power input on)
1								Warning (warning occurrence)

Bit 11 turns on when the stroke limit, software limit, or positioning command is outside the range.

Bit 0 to Bit 3, Bit 5, and Bit 6 are switched depending on the state machine (internal state of the MR-J4-_GF_(-RJ) servo amplifier). Refer to the following table for details.

Statusword (bin)	State machine
x0xx xxx0 x0xx 0000	Not ready to switch on (Note)
x0xx xxx0 x1xx 0000	Switch on disabled
x0xx xxx0 x01x 0001	Ready to switch on
x0xx xxx0 x01x 0011	Switched on
x0xx xxx0 x01x 0111	Operation enabled
x0xx xxx0 x00x 0111	Quick stop active
x0xx xxx0 x0xx 1111	Fault reaction active
x0xx xxx0 x0xx 1000	Fault

Note. Statusword is not sent in the Not ready to switch on state.

5.1.3 Directions for use

A command of Controlword allows a transition to the target status, skipping the statuses in between.
The statuses can transition as shown in the following table, for example. (Refer to the figure in section 5.1.1.)

Current status	Command	Status after transition
(B) Switch on disabled	Switch on	(D) Switched on
(B) Switch on disabled	Enable operation	(E) Operation enabled
(C) Ready to switch on	Enable operation	(E) Operation enabled

5.2 Control mode

This section describes the control modes of the MR-J4-_GF_(-RJ) servo amplifier.

5.2.1 Function description

A control mode of the MR-J4-_GF_(-RJ) servo amplifier can be selected with the control mode (Modes of operation: 6060h). Use [Pr. PA01] to switch the method between the point table method and the indexer method.
The following is the chart of control modes switchable from the current mode.

		Control mode after switching			
		Point table mode (pt)	Indexer mode (idx)	Homing mode (hm)	Jog mode (jg)
Control mode before switching Control mode	Point table mode (pt)		×	○	○
	Indexer mode (idx)	×		○	○
	Homing mode (hm)	○	○		○
	Jog mode (jg)	○	○	○	

○: Switchable ×: Non-switchable

5.2.2 Related object

Index	Sub Index	Access	Name	Data Type	Default
6060h	0	rw	Modes of operation	I8	0
6061h	0	ro	Modes of operation Display	I8	Refer to (1) in this section.

To switch the control mode, the master station (controller) sends the designated command value to the servo amplifier. The master station must keep sending the command value until the mode is completely switched because there is a delay in switching from one mode to another. When the master station confirms that the mode has been switched by using Modes of operation display (6061h), the master station can stop sending the command value.
Make sure that the servo motor is at zero speed before switching to another mode. Zero speed state can be checked with Bit 3 (S_ZSP) of Status DO 2 (2D12h).
When the current mode is in the indexer mode (idx) or station jog operation mode, turn off Controlword bit4 (New set-point) before switching to another mode. If Controlword bit4 (New set-point) is on, the control mode will not switch, and thus Modes of operation display (6061h) will not change.

(1) Initial value of Modes of operation display (6061h)
The initial value of Modes of operation display (6061h) varies depending on the setting value of [Pr. PA01].

[Pr. PA01] setting	Initial value
_ _ _ 0	-101 (pt)
_ _ _ 8	-103 (idx)

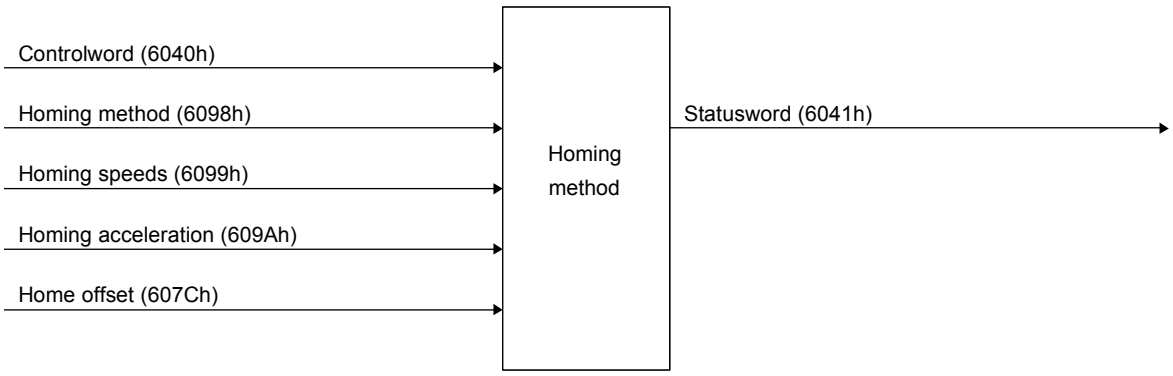
6. SERVO MOTOR DRIVING

6.1 Homing mode (hm)

This section describes how to perform a home position return operation in the communication.

6.1.1 Function description

For specified home position return operation, set Homing method (6098h), Homing speed (6099h), and Homing acceleration (609Ah), and then start the operation with Controlword (6040h). The completion of the home position return operation can be checked with Statusword (6041h).



6.1.2 Related object

Index	Sub Index	Access	Name	Data Type	Default	Description
607Ch	0	ro	Home offset	I32		The home position saved in EEP-ROM is stored at power-on. If a home position return is executed in the homing mode (hm), the home position will be updated. If [Pr. PA03 Absolute position detection system] is disabled, 0 is always stored.
6098h	0	rw	Homing Method	I8	37	Specify a home position return method. Refer to (2) in this section for supported home position return methods.
6099h	0	rw	Homing Speeds	U8	2	Number of entries of the home position return speed
	1	rw	Speed during search for switch	U32	10000	Specify the travel speed from home position return start to dog detection. Unit: Vel unit (0.01 r/min or 0.01 mm/s) Range: 0 to servo motor maximum speed
	2	rw	Speed during search for zero	U32	1000	Specify the travel speed to the home position after dog detection. (Note) Unit: Vel unit (0.01 r/min or 0.01 mm/s) Range: 0 to servo motor maximum speed
609Ah	0	rw	Homing acceleration	U32	0	Acceleration/deceleration time constant at home position return Unit: ms
60E3h	0	ro	Supported Homing Method	U8	38	Number of entries of the supported home position return method
	1	ro	1st supported homing method	I8	37	This object supports the home position return method that uses the current position as a home position.
	to					
	38	ro	38th supported homing method	I8	-43	This object supports the dogless Z-phase reference home position return method (reverse rotation).

Note. In the homing mode (hm), the servo motor is brought to a sudden stop according to the deceleration time constant when the stroke end is detected. Set the home position return speed carefully.

(1) Controlword (6040h)

Index	Sub Index	Access	Name	Data Type	Default
6040h	0	rw	Controlword	U16	

The current control command status can be checked.
In addition, control commands can be written.
The following table lists the bits of this object that relate to the home position return operation.

Bit	Description
0 to 3	Refer to section 5.1.2.
4	Homing Operation Start 0: Do not start homing procedure 1: Start or continue homing procedure
5 to 6	Reserved The value at reading is undefined. Set "0" when writing.
7	Refer to section 5.1.2.
8	Halt 0: Bit 4 enable 1: Stop axis according to halt option code (605Dh)
9	Reserved The value at reading is undefined. Set "0" when writing.
10 to 14	Refer to section 5.1.2.
15	Reserved The value at reading is undefined. Set "0" when writing.

To start a home position return operation, turn bit 4 from "0" to "1". When the home position return operation is completed or an alarm is issued during the return operation, turn bit 4 from "1" to "0".
When bit 8 (Halt) of Controlword (6040h) is set to "1", the servo motor decelerates to a stop. After that, when bit 8 (Halt) is set to "0" and bit 4 is turned to "0" and then to "1", the home position return operation is performed again.

(2) Homing method (6098h)

Index	Sub Index	Access	Name	Data Type	Default
6098h	0	rw	Homing method	I8	37

The current home position return method can be read.
In addition, a home position return method can be set. To enable the written home position return method after turning the power back on, execute Store Parameters (1010h). After the execution of Store Parameters, the setting value of [Pr. PT45] is changed.

The following table lists selectable home position return methods.

Setting value	Home position return types	Rotation direction	Description
0	No homing method assigned		Starting home position return causes "Homing error". Home position return cannot be executed.
3	Homing on positive home switch and index pulse	Forward rotation	Same as the dog type last Z-phase reference home position return. Note that if the stroke end is detected during home position return, [AL. 90 Home position return incomplete warning] occurs.
4	Homing on positive home switch and index pulse	Forward rotation	Same as the dog cradle type home position return. Note that if the stroke end is detected during home position return, [AL. 90 Home position return incomplete warning] occurs.
5	Homing on negative home switch and index pulse	Reverse rotation	Same as the dog type last Z-phase reference home position return. Note that if the stroke end is detected during home position return, [AL. 90 Home position return incomplete warning] occurs.
6	Homing on negative home switch and index pulse	Reverse rotation	Same as the dog cradle type home position return. Note that if the stroke end is detected during home position return, [AL. 90 Home position return incomplete warning] occurs.
7	Homing on home switch and index pulse	Forward rotation	Same as the dog type last Z-phase reference home position return.
8	Homing on home switch and index pulse	Forward rotation	Same as the dog cradle type home position return.
11	Homing on home switch and index pulse	Reverse rotation	Same as the dog type last Z-phase reference home position return. The direction of rotation is opposite to that of the method 7.
12	Homing on home switch and index pulse	Reverse rotation	Same as the dog cradle type home position return. The direction of rotation is opposite to that of the method 8.
19	Homing without index pulse	Forward rotation	Same as the dog type front end reference home position return. Note that if the stroke end is detected during home position return, [AL. 90 Home position return incomplete warning] occurs.
20	Homing without index pulse	Forward rotation	Although this type is the same as the dog cradle type home position return, the stop position is not on the Z-phase. Starting from the front end of the dog, the position is shifted by the travel distance after proximity dog and the home position shift distance. The position after the shifts is set as the home position. If the stroke end is detected during home position return, [AL. 90 Home position return incomplete warning] occurs.
21	Homing without index pulse	Reverse rotation	Same as the dog type front end reference home position return. Note that if the stroke end is detected during home position return, [AL. 90 Home position return incomplete warning] occurs.
22	Homing without index pulse	Reverse rotation	Although this type is the same as the dog cradle type home position return, the stop position is not on the Z-phase. Starting from the front end of the dog, the position is shifted by the travel distance after proximity dog and the home position shift distance. The position after the shifts is set as the home position. If the stroke end is detected during home position return, [AL. 90 Home position return incomplete warning] occurs.
23	Homing without index pulse	Forward rotation	Same as the dog type front end reference home position return.
24	Homing without index pulse	Forward rotation	Although this type is the same as the dog cradle type home position return, the stop position is not on the Z-phase. Starting from the front end of the dog, the position is shifted by the travel distance after proximity dog and the home position shift distance. The position after the shifts is set as the home position.

Setting value	Home position return types	Rotation direction	Description
27	Homing without index pulse	Reverse rotation	Same as the dog type front end reference home position return.
28	Homing without index pulse	Reverse rotation	Although this type is the same as the dog cradle type home position return, the stop position is not on the Z-phase. Starting from the front end of the dog, the position is shifted by the travel distance after proximity dog and the home position shift distance. The position after the shifts is set as the home position.
33	Homing on index pulse	Reverse rotation	Although this type is the same as the dogless Z-phase reference home position return, the creep speed is applied as the movement start speed.
34	Homing on index pulse	Forward rotation	Although this type is the same as the dogless Z-phase reference home position return, the creep speed is applied as the movement start speed.
35	Homing on current position		The current position is set as the home position. This type can be executed even when the servo amplifier is not in the Operational enabled state.
37	Homing on current position		The current position is set as the home position. This type can be executed even when the servo amplifier is not in the Operational enabled state.

Setting value	Home position return types	Rotation direction	Description
-1	Dog type (Rear end detection Z-phase reference)/torque limit changing dog type (Front end detection, Z-phase reference)	Forward rotation	Deceleration starts at the front end of the proximity dog. After the rear end is passed, the position specified by the first Z-phase signal, or the position of the first Z-phase signal shifted by the specified home position shift distance is used as the home position. In the indexer method, deceleration starts at the front end of the proximity dog, and then the first Z-phase signal at which a deceleration to a stop is possible or the position of the Z-phase signal shifted by the specified home position shift distance is used as the home position. The torque limit values in Positive torque limit value (60E0h) and Negative torque limit value (60E1h) are enabled during execution of home position return, and the torque limit value in [Pr. PC77] is enabled when the home position return is stopped.
-33		Reverse rotation	
-3	Data set type home position return/torque limit changing data set type		The current position is set as the home position. In the indexer method, the current position is set as the home position. The torque limit value becomes 0 when switched to the homing mode (hm).
-4	Stopper type (Stopper position reference)	Forward rotation	A workpiece is pressed against a mechanical stopper, and the position where it is stopped is set as the home position. If the stroke end is detected during home position return, [AL. 90 Home position return incomplete warning] occurs.
-36		Reverse rotation	
-2	Count type (Front end detection, Z-phase reference)	Forward rotation	At the front end of the proximity dog, deceleration starts. After the front end is passed, the position specified by the first Z-phase signal after the set distance or the position of the Z-phase signal shifted by the set home position shift distance is set as a home position. If the stroke end is detected during home position return, the travel direction is reversed.
-34		Reverse rotation	
-6	Dog type (Rear end detection, rear end reference)	Forward rotation	Deceleration starts from the front end of the proximity dog. After the rear end is passed, the position is shifted by the travel distance after proximity dog and the home position shift distance. The position after the shifts is set as the home position. If the stroke end is detected during home position return, the travel direction is reversed.
-38		Reverse rotation	
-7	Count type (Front end detection, front end reference)	Forward rotation	Deceleration starts from the front end of the proximity dog. The position is shifted by the travel distance after proximity dog and the home position shift distance. The position after the shifts is set as the home position. If the stroke end is detected during home position return, the travel direction is reversed.
-39		Reverse rotation	
-8	Dog cradle type	Forward rotation	A position, which is specified by the first Z-phase signal after the front end of the proximity dog is detected, is set as the home position. If the stroke end is detected during home position return, the travel direction is reversed.
-40		Reverse rotation	
-9	Dog type last Z-phase reference	Forward rotation	After the front end of the proximity dog is detected, the position is shifted away from the proximity dog in the reverse direction. Then, the position specified by the first Z-phase signal or the position of the first Z-phase signal shifted by the home position shift distance is used as the home position. If the stroke end is detected during home position return, the travel direction is reversed.
-41		Reverse rotation	
-10	Dog type front end reference	Forward rotation	Starting from the front end of the proximity dog, the position is shifted by the travel distance after proximity dog and the home position shift distance. The position after the shifts is set as the home position. If the stroke end is detected during home position return, the travel direction is reversed.
-42		Reverse rotation	
-11	Dogless Z-phase reference	Forward rotation	The position specified by the first Z-phase signal, or the position of the first Z-phase signal shifted by the home position shift distance is used as the home position. If the stroke end is detected during home position return, [AL. 90 Home position return incomplete warning] occurs.
-43		Reverse rotation	

(3) Homing speed (6099h)

Index	Sub Index	Access	Name		Data Type	Default
6099h	0	rw	Homing speed	Number of entries	U8	2
	1			Speed during search for switch	U32	10000
	2			Speed during search for zero	U32	1000

The current home position return speed can be read. At this time, "02h" is returned to Number of entries.
The current home position return speed is returned to Speed during search for switch in a unit of r/min or mm/s.
The current creep speed is returned to Speed during search for zero in a unit of r/min or mm/s.

Set a home position return speed. At this time, write "02h" in Number of entries.
Set a home position return speed in Speed during search for switch in a unit of r/min or mm/s.
Set a creep speed in Speed during search for zero in a unit of r/min or mm/s.

(4) Statusword (6041h)

POINT

●When the mode is switched to the hm mode after home position return completion, Statusword (6041h) is "Homing procedure is completed successfully" unless "0" is set in Bit 12. The following shows the conditions when "0" is set in Bit 12.
For incremental system
・At power-on
・At communication shut-off by master station (controller) reset
・At home position return start
・At home position erasure
For absolute position detection system
・At home position return start
・At home position erasure

●To check the home position return status with Statusword (6041h), note the following.
・When the mode is switched to the hm mode, Modes of operation display (6061h) is changed to 6 (hm) and Statusword (6041h) changes at the same time.
・The transition of Statusword (6041h) may take 50 ms at a maximum after Bit 4 (Homing operation start) of Controlword (6040h) is set. To obtain the status of Statusword without any fault, wait 50 ms or more before obtaining Statusword (6041h).

●Before updating the position after a home position return completion, check that both Bit 12 and Bit 10 of Statusword (6041h) are changed to "1" and then wait 8 ms. It may take approximately 8 ms for the position information to be correctly updated.

Index	Sub Index	Access	Name	Data Type	Default
6041h	0	ro	Statusword	U16	

The current control status can be checked.
The following table lists the bits of this object that relate to the home position return operation.

Bit	Description
0 to 9	Refer to section 5.1.2.
10	Target reached Refer to (a) and the following table for the definition.
11	Refer to section 5.1.2.
12	Homing attained Refer to (b) and the following table for the definition.
13	Homing error Refer to (c) and the following table for the definition.
14 to 15	Refer to section 5.1.2.

(a) Bit 10 (Target reached) of Statusword (6041h)
Bit 10 turns on (1) when the command position is reached. If bit 8 (Halt) of Controlword (6040h) is set to "1", bit 10 turns on (1) when a deceleration stop is completed.
If a command is input again, bit 10 turns off (0).

(b) Bit 12 (Homing attained) of Statusword (6041h)
Bit 12 turns off (0) when a home position return operation is started and turns on (1) when the operation is completed. For absolute position detection system, bit 12 turns on (1) after the power supply is turned on.

(c) Bit 13 (Homing error) of Statusword (6041h)
Bit 13 turns on (1) when an alarm or warning ([AL 90.2], [AL 90.3], [AL 90.5], [AL 96.1], [AL 96.2], or [AL 96.3]) occurs during a home position return operation.

The following shows the definition of Bit 10, Bit 12, and Bit 13 of Statusword (6041h) in the hm mode.

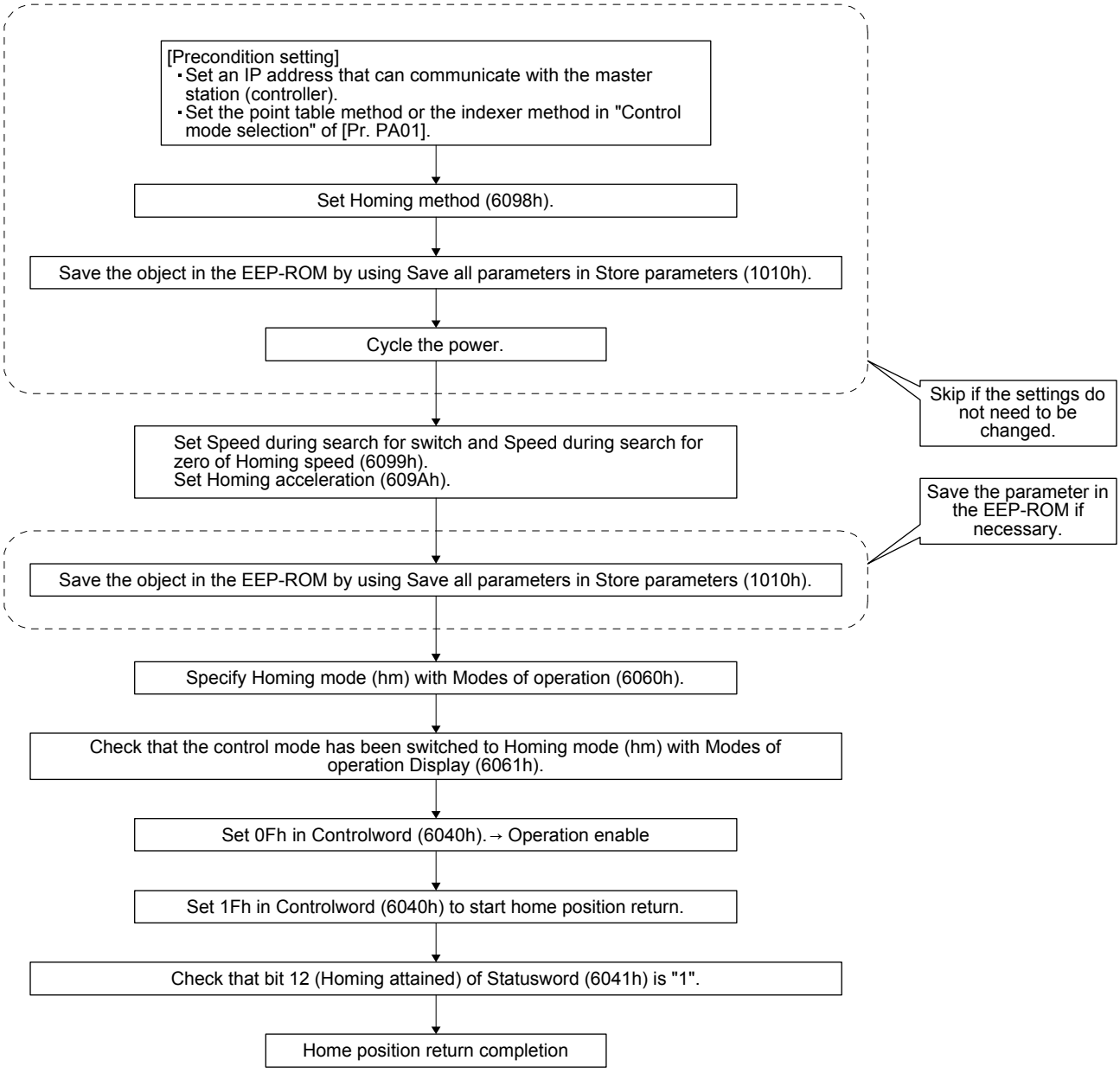
Bit 13	Bit 12	Bit 10	Definition
0	0	0	Homing procedure is in progress
0	0	1	Homing procedure is interrupted or not started
0	1	0	Homing is attained, but target is not reached
0	1	1	Homing procedure is completed successfully
1	0	0	Homing error occurred, velocity is not 0
1	0	1	Homing error occurred, velocity is 0
1	1		reserved

6.1.3 Directions for use

POINT

- To execute a home position return securely, move the servo motor to the opposite stroke end with jog operation (jg) from the master station (controller) or by using other means before starting a home position return.
- When changing the mode after the home position return completion, set Target position (607Ah) to "0", and change the control mode.

(1) Home position return method



(2) CiA 402-type Homing method

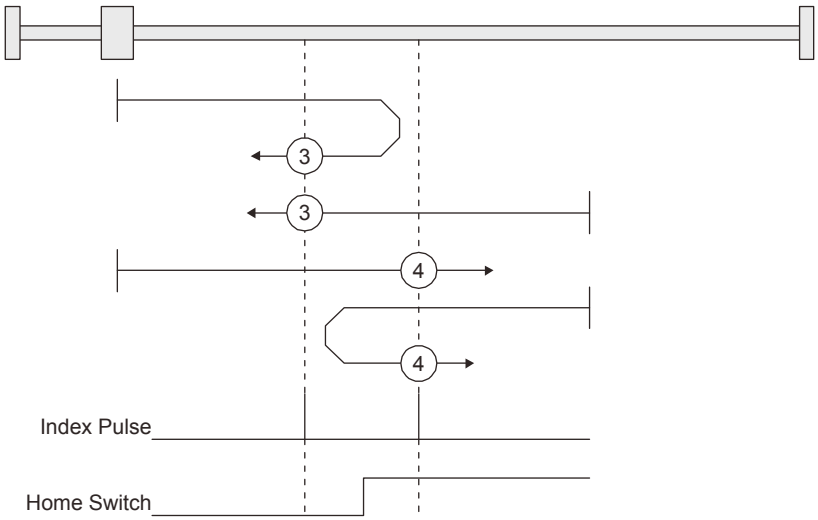
(a) Home position return type in CiA 402 type

The following shows the CiA 402-type home position return.

1) Method 3 and 4: Homing on positive home switch and index pulse

These home position return types use the front end of the proximity dog as reference and set the Z-phase right before and right after the dog as a home position.

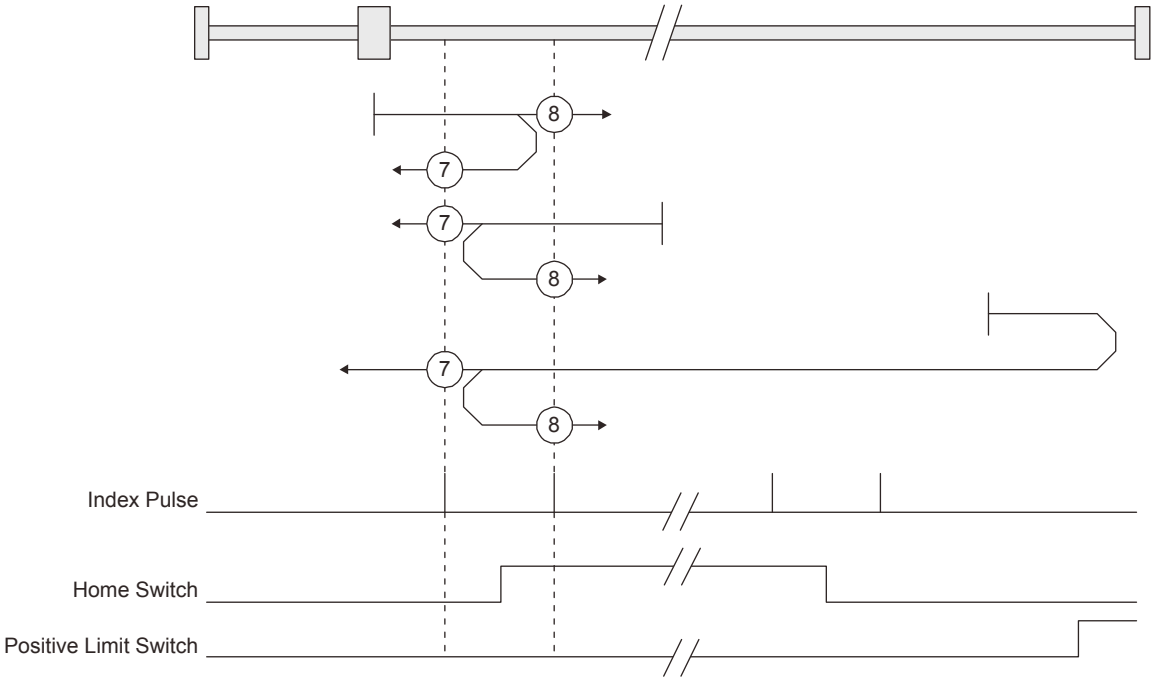
Method 3 has the operation of the dog type last Z-phase reference home position return, and Method 4 has the operation of the dog cradle type home position return at a forward rotation start. However, if the stroke end is detected during home position return, [AL. 90] occurs.



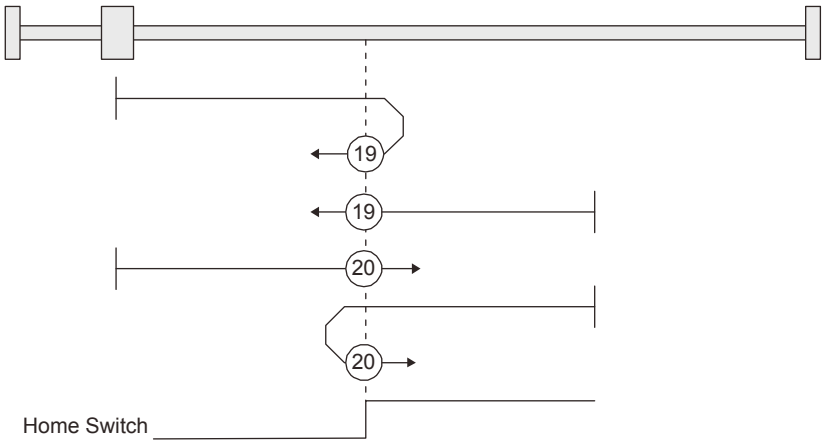
2) Method 5 and 6: Homing on negative home switch and index pulse

These home position return types use the front end of the proximity dog as reference and set the Z-phase right before and right after the dog as a home position. Method 5 and 6 are the same as Method 3 and 4 except that the starting direction is forward in Method 3 and 4, and reverse in Method 5 and 6.

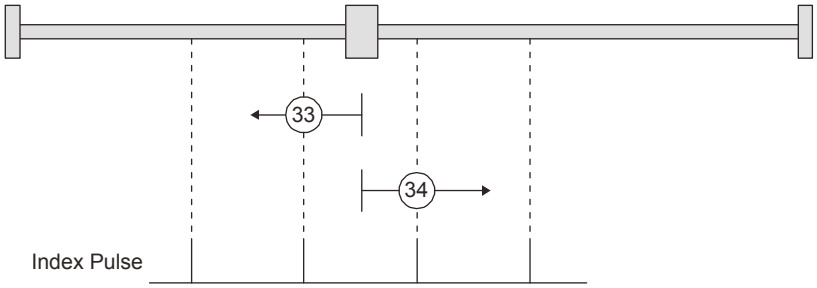
3) Method 7, 8, 11, 12: Homing on home switch and index pulse
These types include the operation at stroke end detection in addition to the operation of Method 3 to Method 6. Thus, the home position is the same as that of Method 3 to Method 6. Method 7 has the operation of the dog type last Z-phase reference home position return. Method 8 has the operation of the dog cradle type home position return at a forward rotation start. Method 11 and 12 are the same as Method 7 and 8 except that the starting direction is forward in Method 7 and 8, and reverse in Method 11 and 12.



4) Method 17 to 30: Homing without index pulse
Method 17 to 30 have the operation of Method 1 to Method 14; however, these types set the home position on the dog but not on the Z-phase. The following figure shows the operation of the home position return type of Method 19 and Method 20. Method 19 and Method 20 have the operation of Method 3 and Method 4; however, these types set the home position on the dog but not on the Z-phase. Method 19 has the operation of the dog type front end reference home position return. Method 20 has the operation of the dog cradle type home position return; however, the stop position is on the dog but not on the Z-phase.



5) Method 33 and 34: Homing on index pulse
These home position return types set the Z-phase detected first as a home position. The operation is the same as that of the dogless Z-phase reference home position return except that the creep speed is applied at the start.



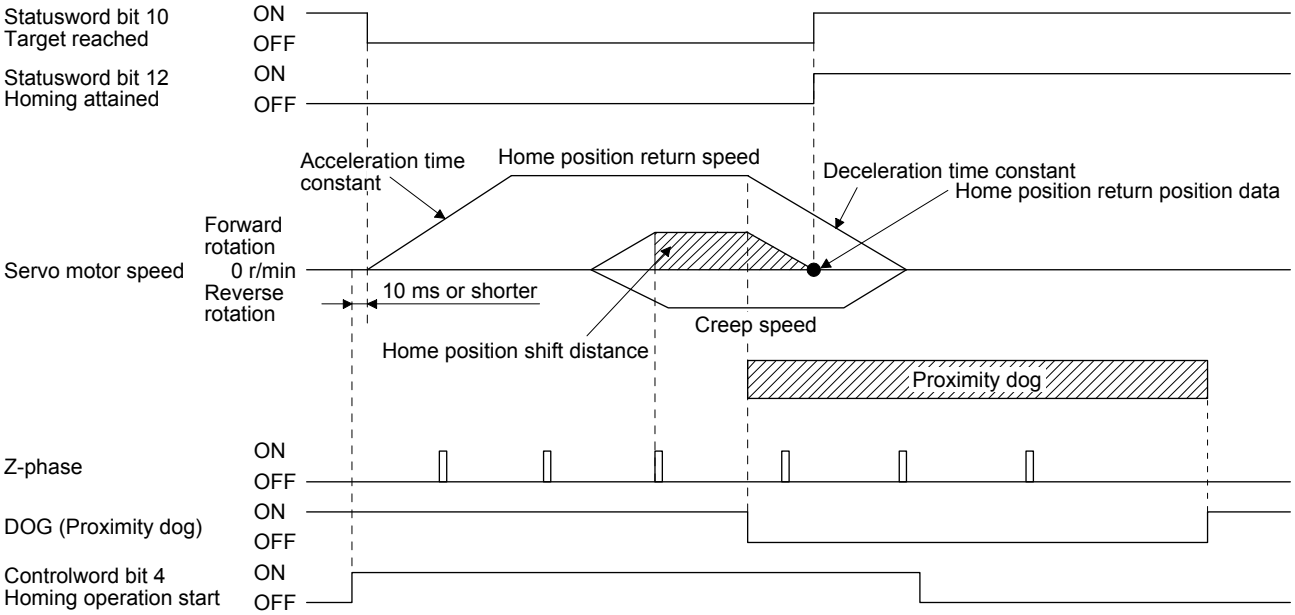
6) Method 35 and 37: Homing on current position
These home position return types set the current position as a home position. The operation is the same as that of the data set type home position return; however, these types can be executed even during servo-off.

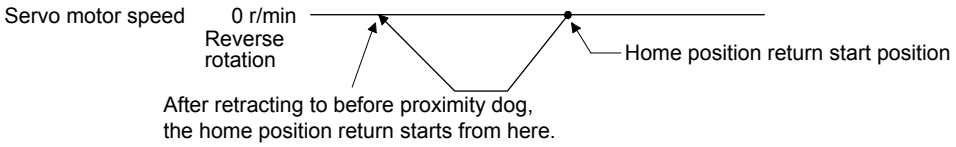
(b) Operation example of the CiA 402-type Homing method

The following shows an operation example of the home position return in the CiA 402-type Homing method.

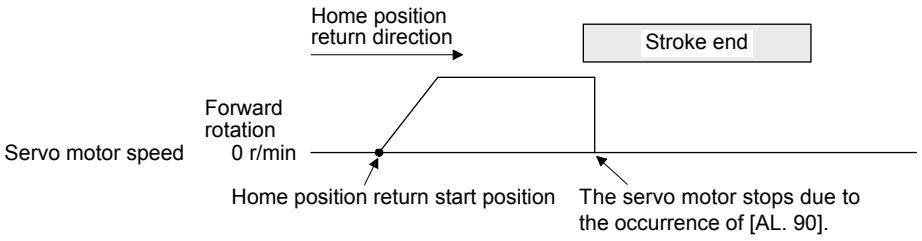
1) Method 3 (Homing on positive home switch and index pulse) and Method 5 (Homing on negative home switch and index pulse)

The following figure shows the operation of Homing method 3. The operation direction of Homing method 5 is opposite to that of Homing method 3.



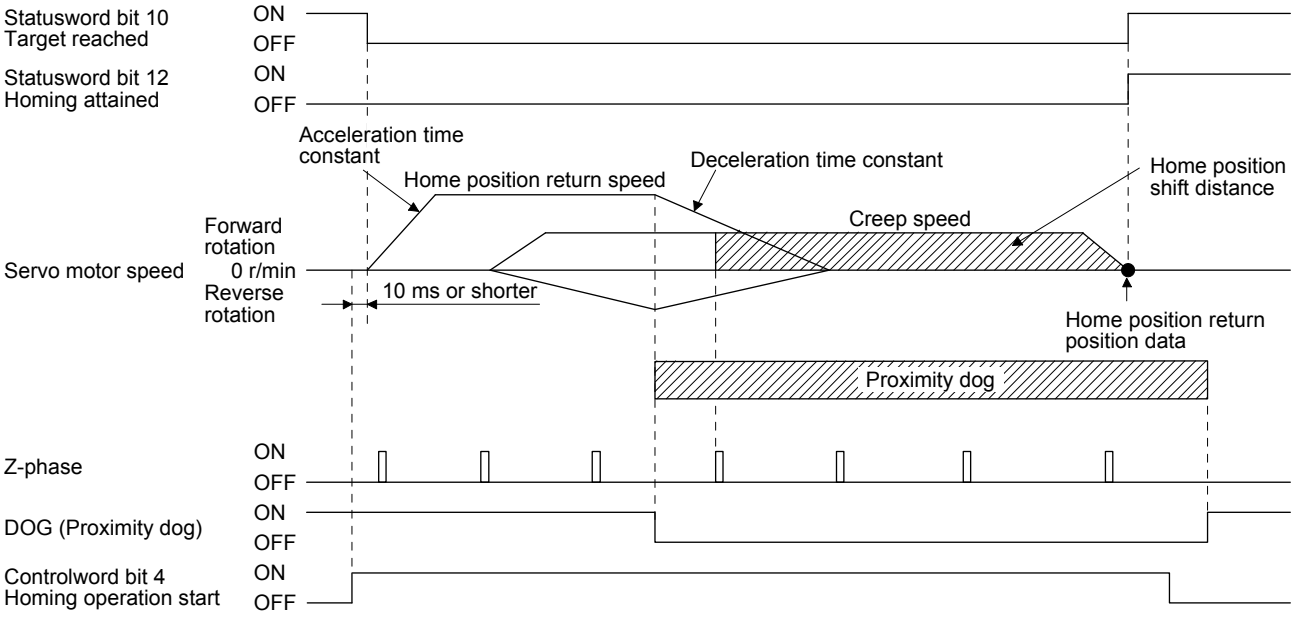


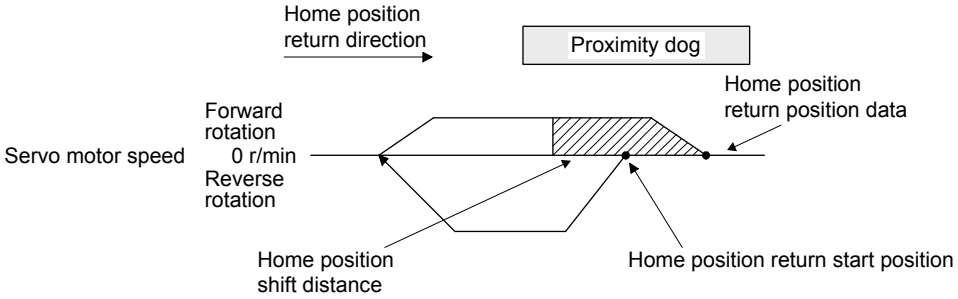
When a home position return is started from the proximity dog



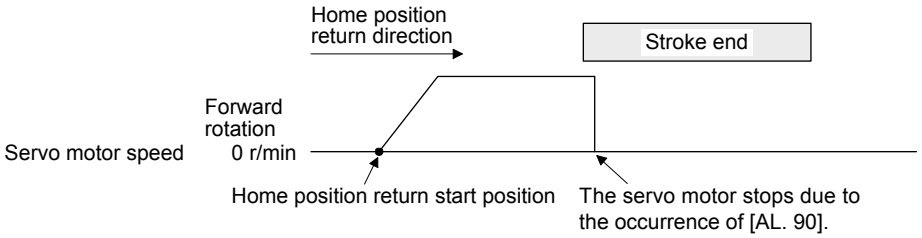
When the stroke end is detected

2) Method 4 (Homing on positive home switch and index pulse) and Method 6 (Homing on negative home switch and index pulse)
The following figure shows the operation of Homing method 4. The operation direction of Homing method 6 is opposite to that of Homing method 4.



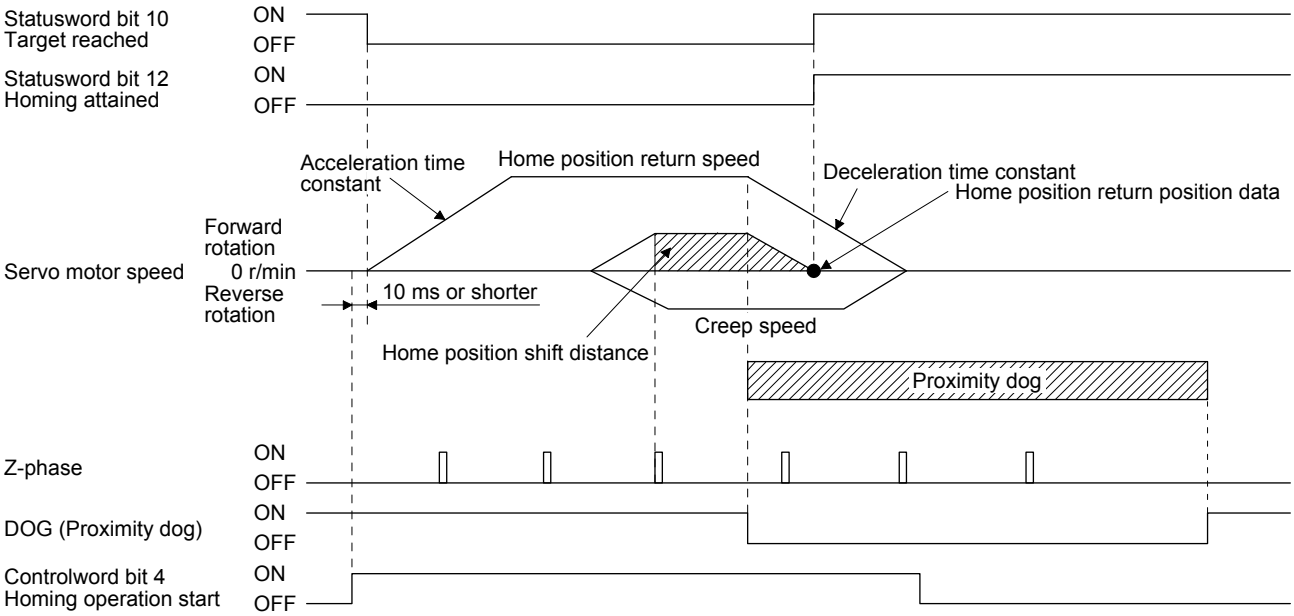


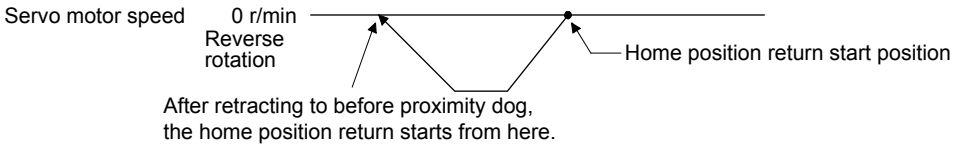
When a home position return is started from the proximity dog



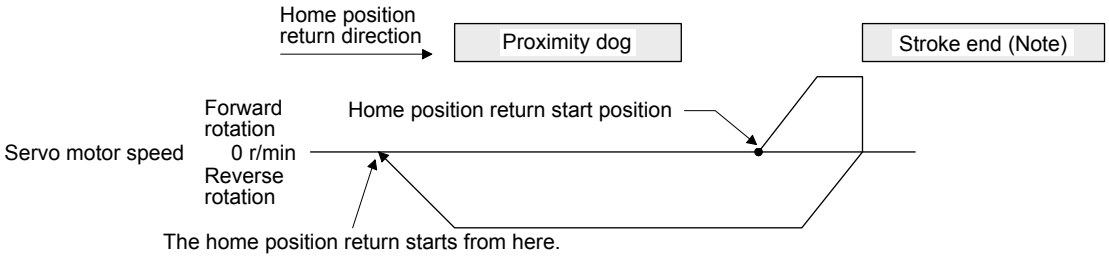
When the stroke end is detected

3) Method 7 and Method 11 (Homing on home switch and index pulse)
The following figure shows the operation of Homing method 7. The operation direction of Homing method 11 is opposite to that of Homing method 7.





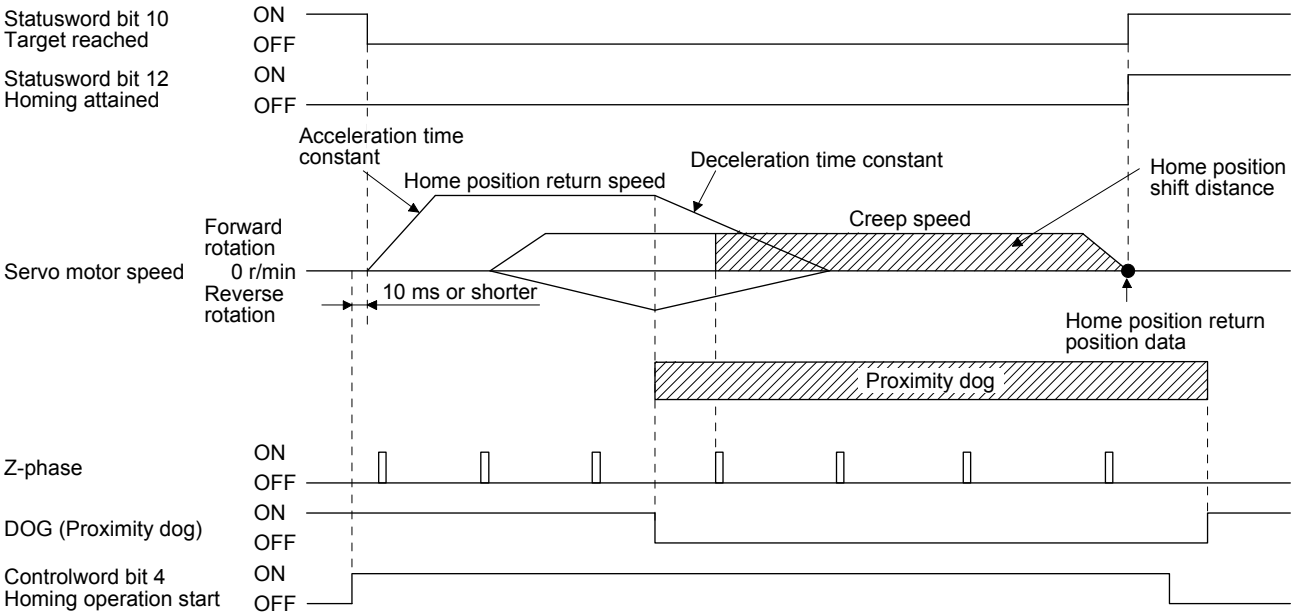
When a home position return is started from the proximity dog

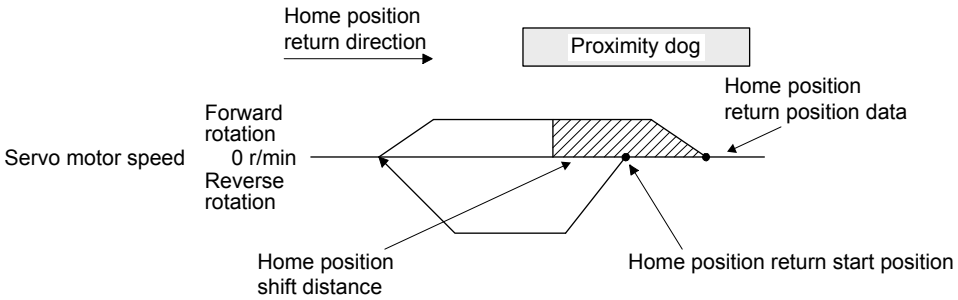


Note. This is not available with the software limit.

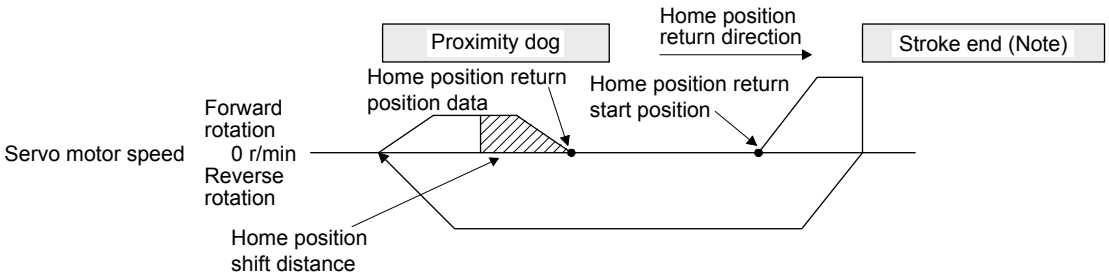
When the servo motor returns at the stroke end

4) Method 8 and Method 12 (Homing on home switch and index pulse)
The following figure shows the operation of Homing method 8. The operation direction of Homing method 12 is opposite to that of Homing method 8.





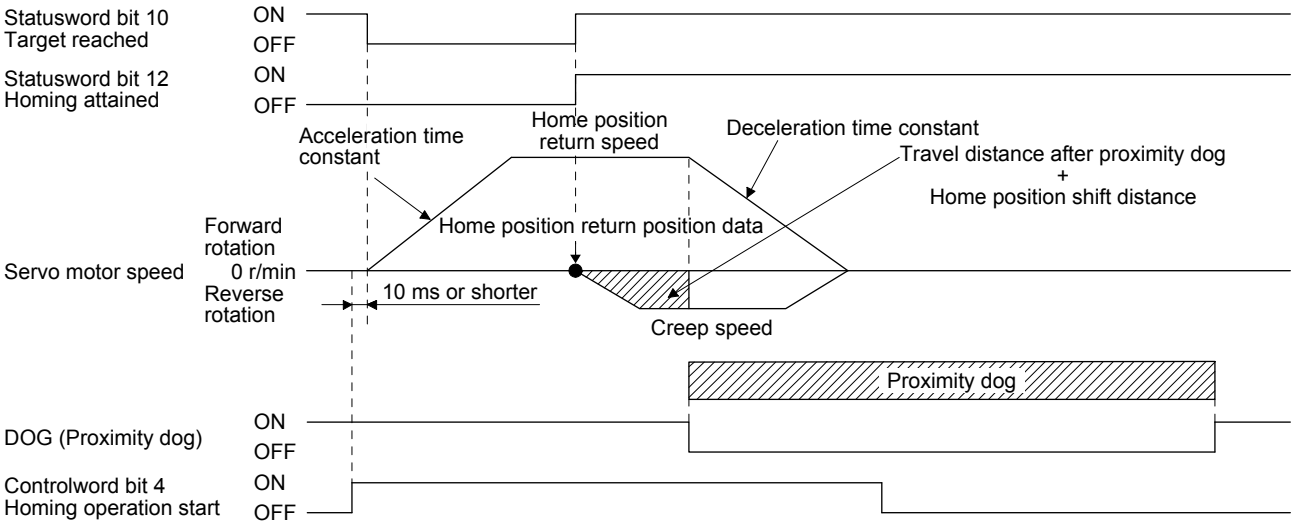
When a home position return is started from the proximity dog

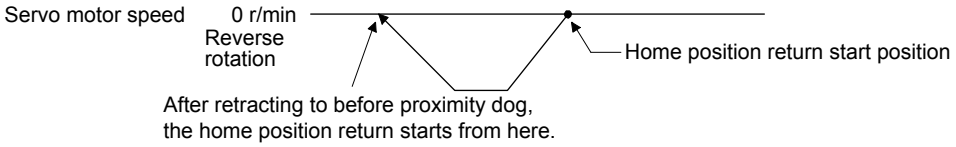


Note. This is not available with the software limit.

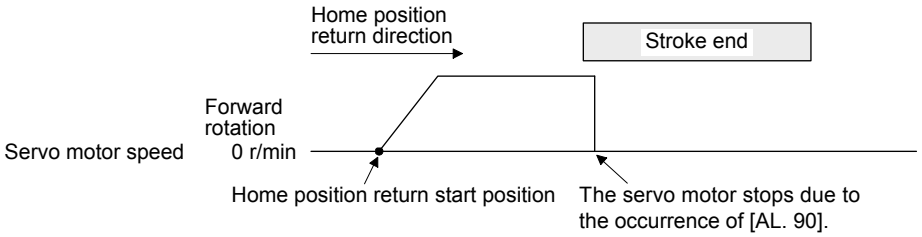
When the servo motor returns at the stroke end

5) Method 19 and Method 21 (Homing without index pulse)
The following figure shows the operation of Homing method 19. The operation direction of Homing method 21 is opposite to that of Homing method 19.



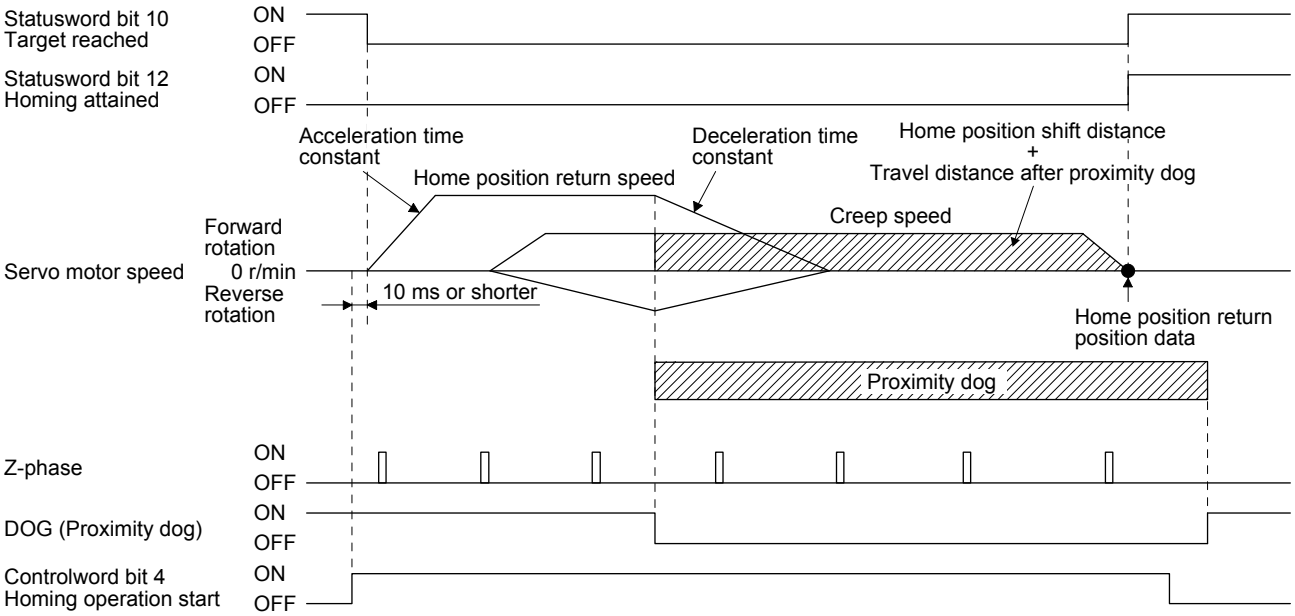


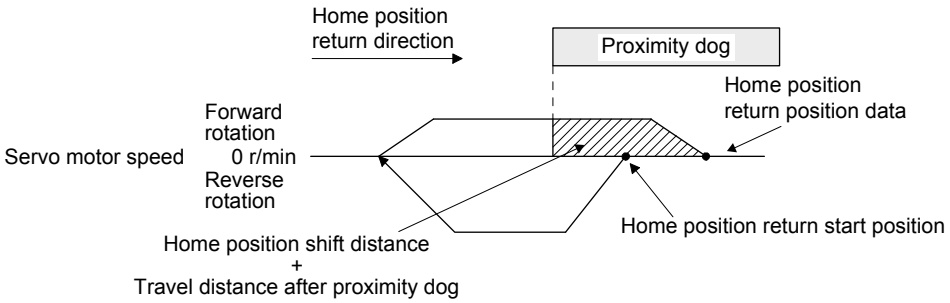
When a home position return is started from the proximity dog



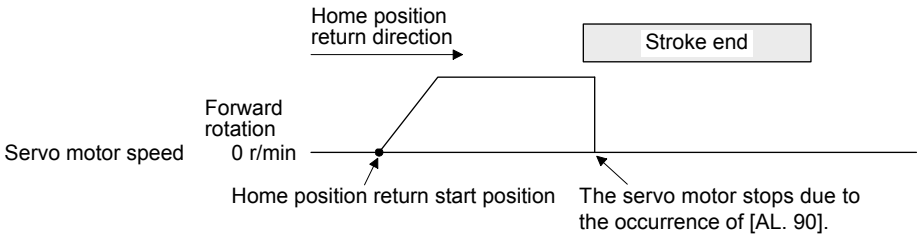
When the stroke end is detected

6) Method 20 and Method 22 (Homing without index pulse)
The following figure shows the operation of Homing method 20. The operation direction of Homing method 22 is opposite to that of Homing method 20.



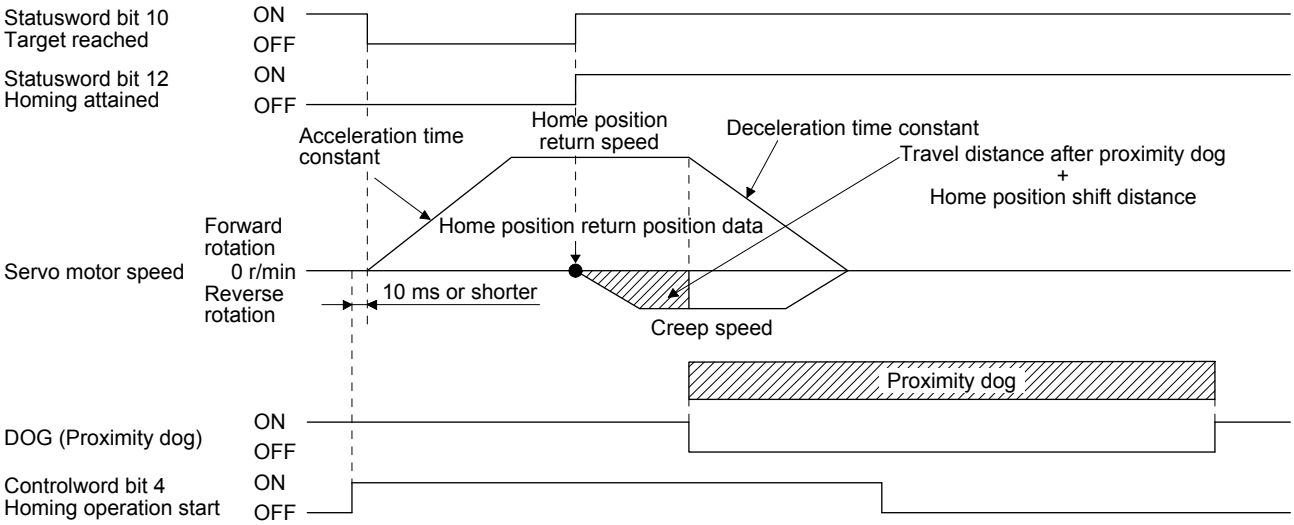


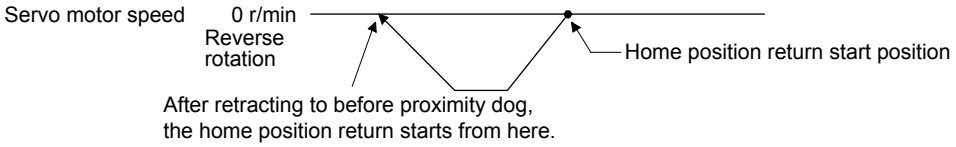
When a home position return is started from the proximity dog



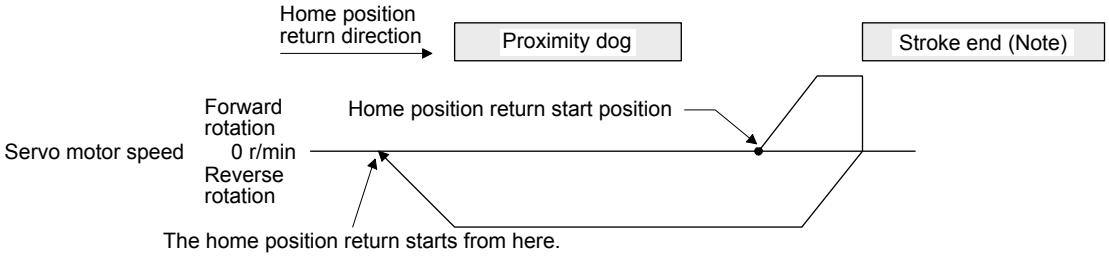
When the stroke end is detected

7) Method 23 and Method 27 (Homing without index pulse)
The following figure shows the operation of Homing method 23. The operation direction of Homing method 27 is opposite to that of Homing method 23.





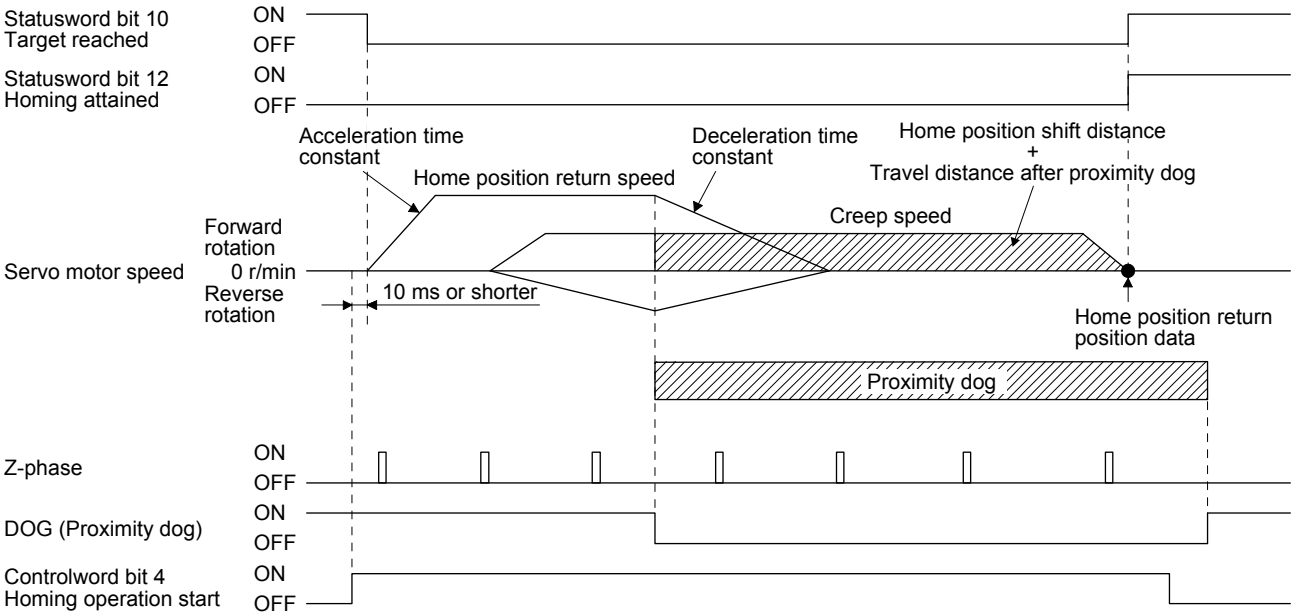
When a home position return is started from the proximity dog

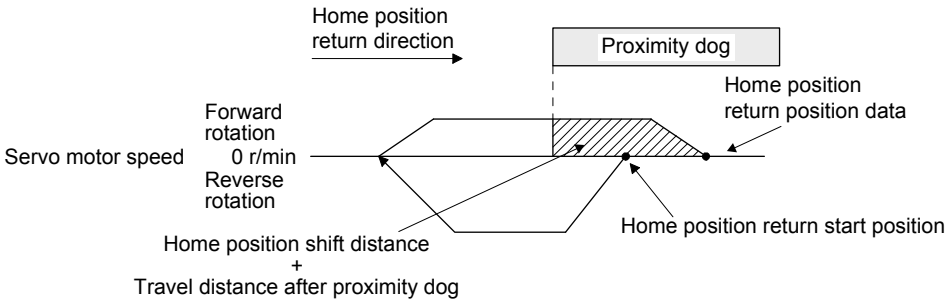


Note. This is not available with the software limit.

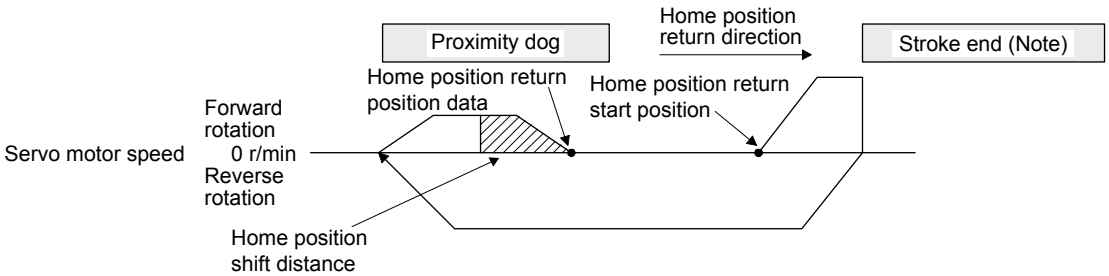
When the servo motor returns at the stroke end

8) Method 24 and Method 28 (Homing without index pulse)
The following figure shows the operation of Homing method 24. The operation direction of Homing method 28 is opposite to that of Homing method 24.





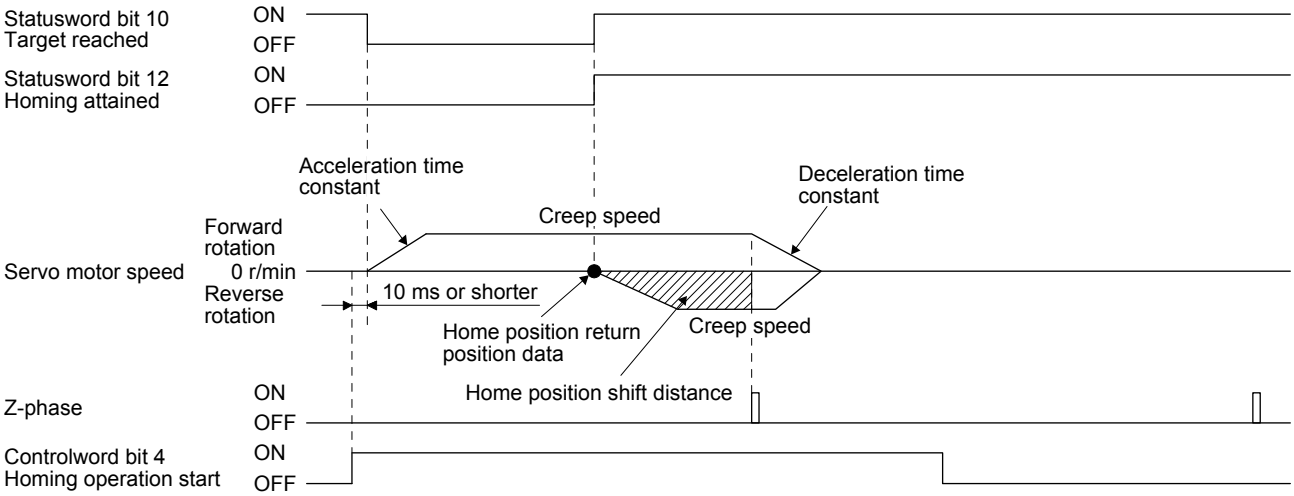
When a home position return is started from the proximity dog

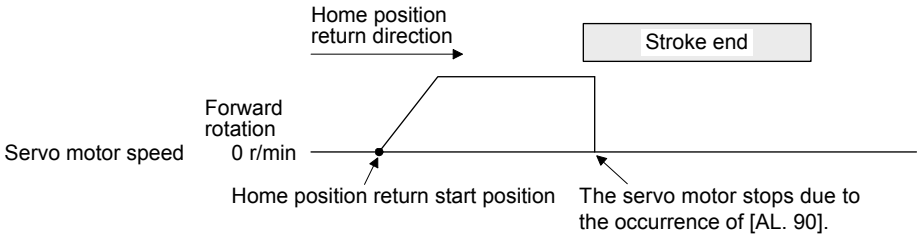


Note. This is not available with the software limit.

When the servo motor returns at the stroke end

9) Method 33 and Method 34 (Homing on index pulse)
The following figure shows the operation of Homing method 34. The operation direction of Homing method 33 is opposite to that of Homing method 34.





When the stroke end is detected

10) Method 35 and Method 37 (Homing on current position)
The following figure shows the operation of Homing method 35 and Homing method 37. These methods can be performed in the servo-off status.

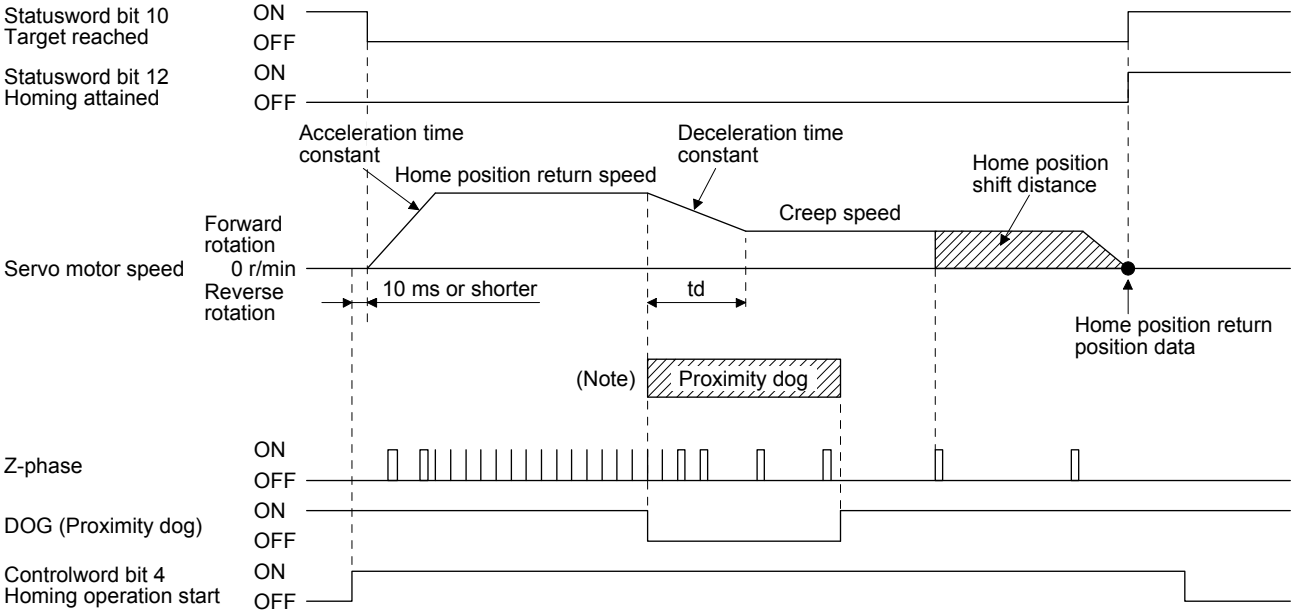
(3) Operation example of Manufacturer-specific Homing method

The following shows an operation example of the Manufacturer-specific home position return.

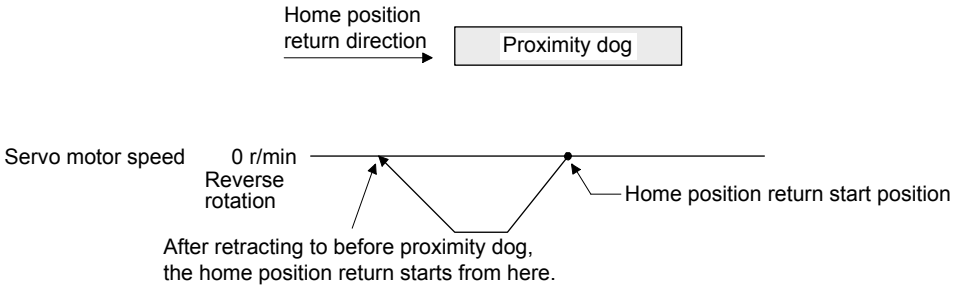
(a) Method -1 and -33

(1) Dog type home position return

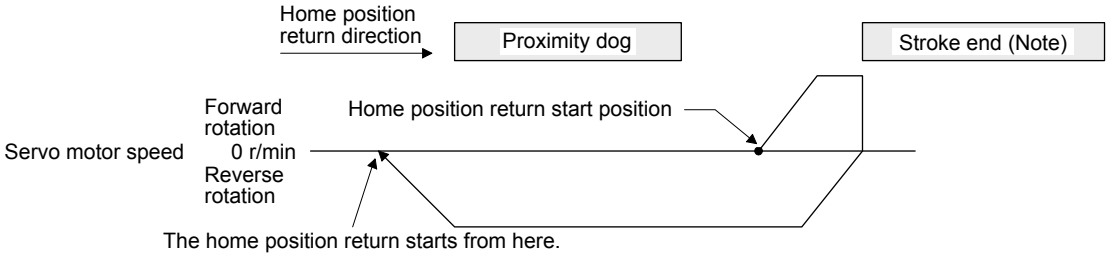
The following figure shows the operation of Homing method -1. The operation direction of Homing method -33 is opposite to that of Homing method -1.



Note. After the front end of the proximity dog is detected, if the distance after proximity dog is traveled without reaching the creep speed, [AL. 90] occurs. Set the travel distance after proximity dog enough for the servo motor to decelerate from the home position return speed to the creep speed.



When a home position return is started from the proximity dog



Note. This is not available with the software limit.

When the servo motor returns at the stroke end

a) Length of the proximity dog

To generate the Z-phase signal of the servo motor during the detection of DOG (Proximity dog), set the length of the proximity dog that satisfies equations (6.1) and (6.2).

$$L_1 \geq \frac{V}{60} \bullet \frac{td}{2} \quad \cdots\cdots (6.1)$$

L_1: Length of the proximity dog [mm]
V: Home position return speed [mm/min]
td: Deceleration time [s]

$$L_2 \geq 2 \bullet \Delta S \quad \cdots\cdots (6.2)$$

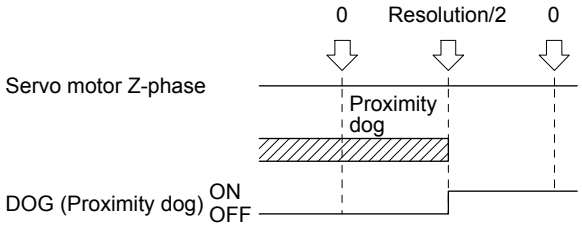
L_2: Length of the proximity dog [mm]
ΔS: Travel distance per servo motor revolution [mm] (Note)

Note. For linear servo motor: travel distance per stop interval selection at the home position return of [Pr. PL01]

b) Adjustment

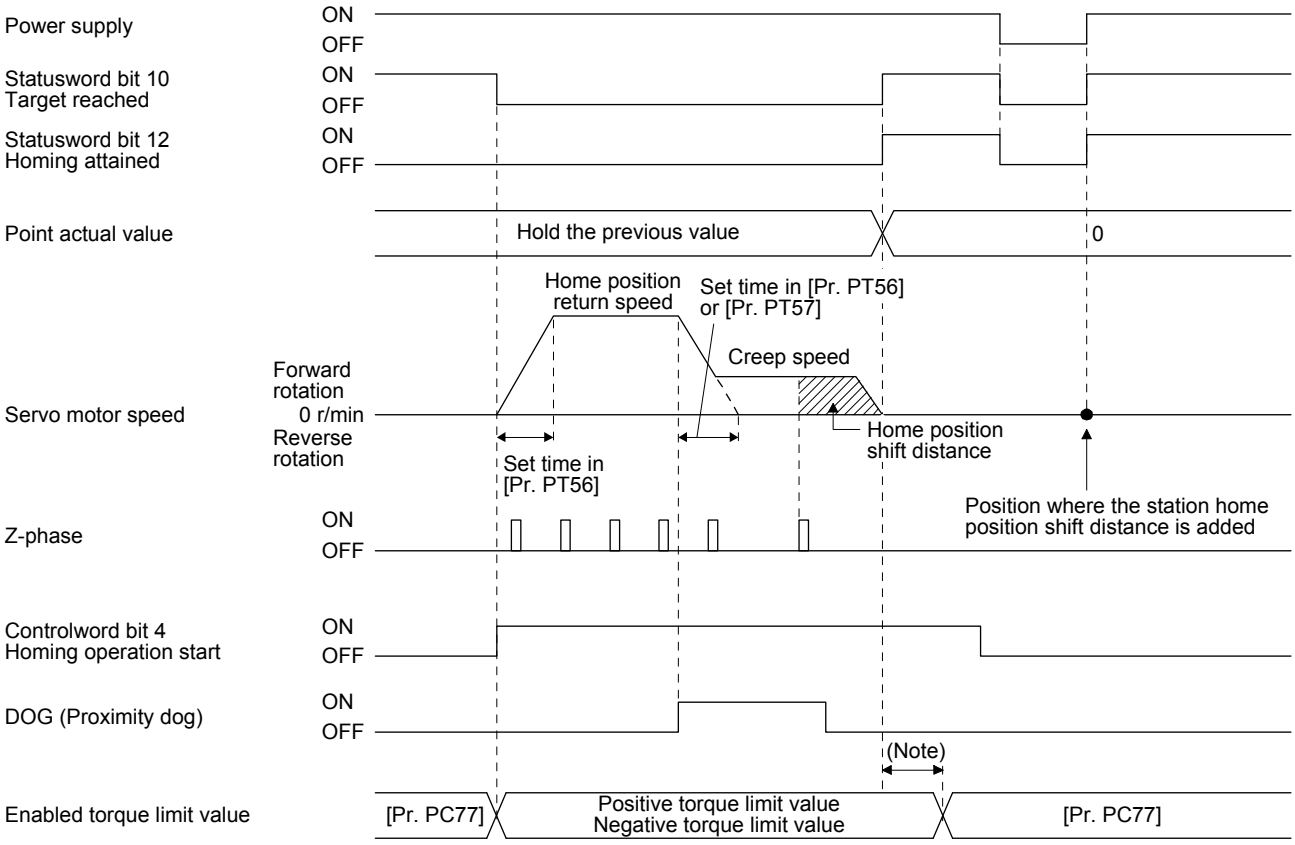
For the dog type home position return, adjust the setting so that the Z-phase signal is always generated during the detection of a dog. Make an adjustment so that the rear end of DOG (Proximity dog) is positioned almost at the center between the positions specified by a Z-phase signal and the next Z-phase signal.

The generation position of the Z-phase signal can be checked with "Position within one-revolution" of "Status Display" on MR Configurator2.



2) Torque limit changing dog type home position return

The following figure shows the operation of Homing method -1 in the indexer method. The operation direction of Homing method -33 is opposite to that of Homing method -1.



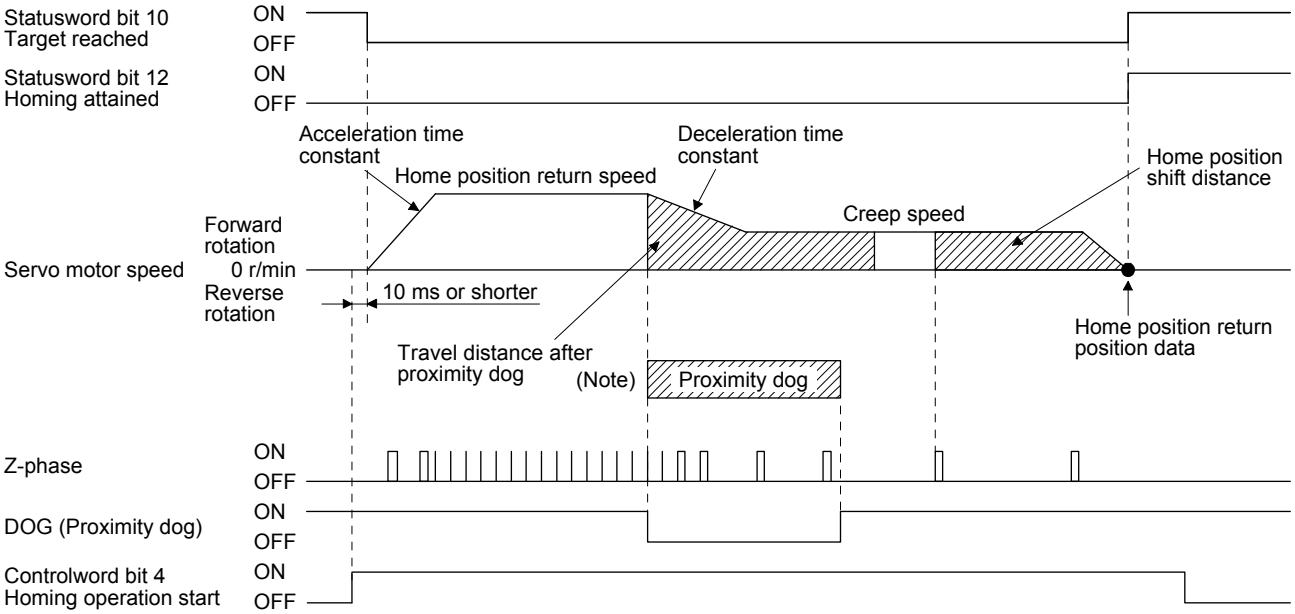
Note. A delay time can be set with [Pr. PT39].

(b) Method -2 and -34 (Count type home position return)

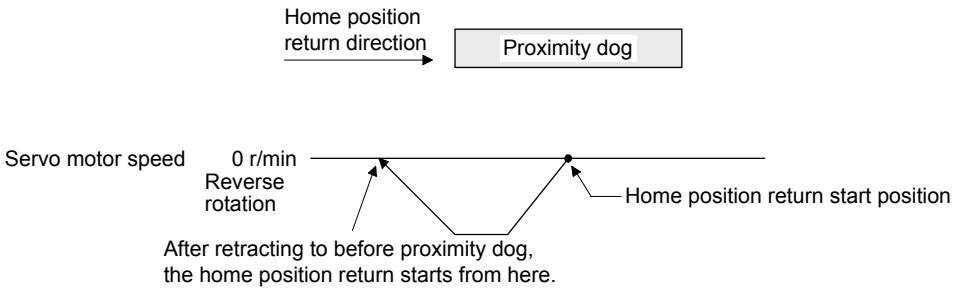
POINT

●For the count type home position return, after the front end of the proximity dog is detected, the position is shifted by the distance set in the travel distance after proximity dog. Then, the first Z-phase is set as the home position. Therefore, when the on-time of the proximity dog is 10 ms or more, the length of the proximity dog has no restrictions. Use this home position return type when the dog type home position return cannot be used because the length of the proximity dog cannot be reserved or other cases.

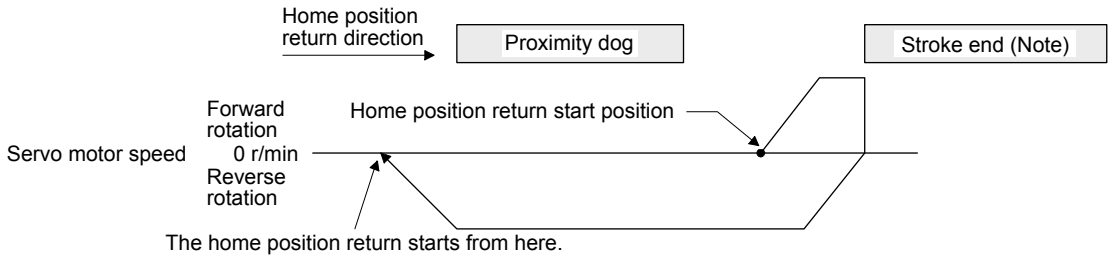
The following figure shows the operation of Homing method -2. The operation direction of Homing method -34 is opposite to that of Homing method -2.



Note. After the front end of the proximity dog is detected, if the distance after proximity dog is traveled without reaching the creep speed, [AL. 90] occurs. Set the travel distance after proximity dog enough for the servo motor to decelerate from the home position return speed to the creep speed.



When a home position return is started from the proximity dog



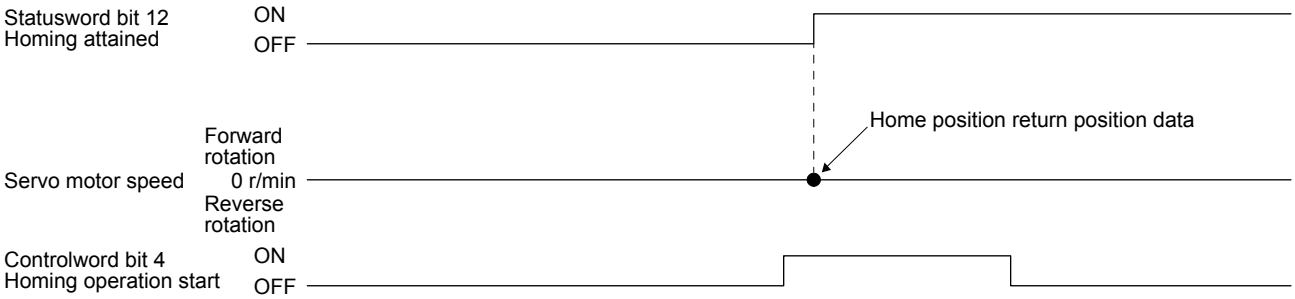
Note. This is not available with the software limit.

When the servo motor returns at the stroke end

(c) Method -3

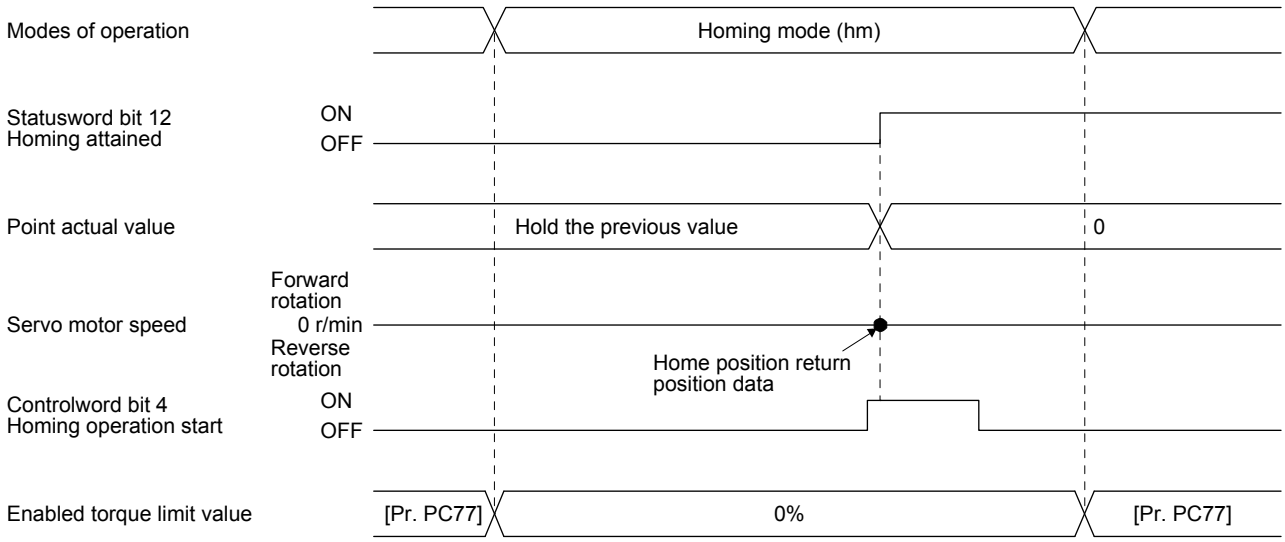
1) Data set type home position return

The following figure shows the operation of Homing method -3. This type cannot be executed during servo-off.



2) Torque limit changing data set type home position return

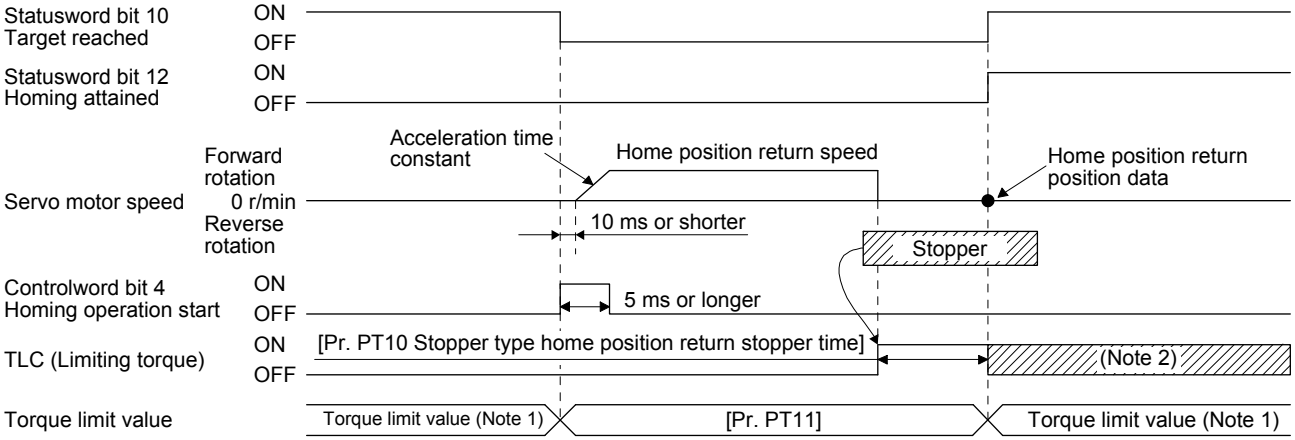
The following figure shows the operation of Homing method -3 in the indexer mode. This type cannot be executed during servo-off.



(d) Method -4 and -36 (stopper type home position return)

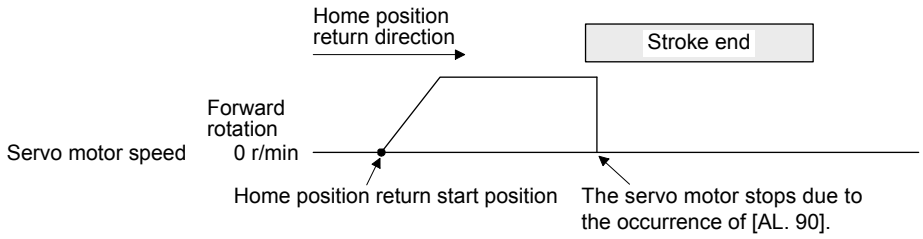
POINT
●Since the workpiece collides with the mechanical stopper, the home position return speed must be low enough.

The following figure shows the operation of Homing method -4. The operation direction of Homing method -36 is opposite to that of Homing method -4.



Note 1. When Method -4 is set, the torque limit value of 60E0h (Positive torque limit value) is applied. When Method -36 is set, the torque limit value of 60E1h (Negative torque limit value) is applied.

2. If the torque limit value is reached, TLC remains on after the home position return is completed.



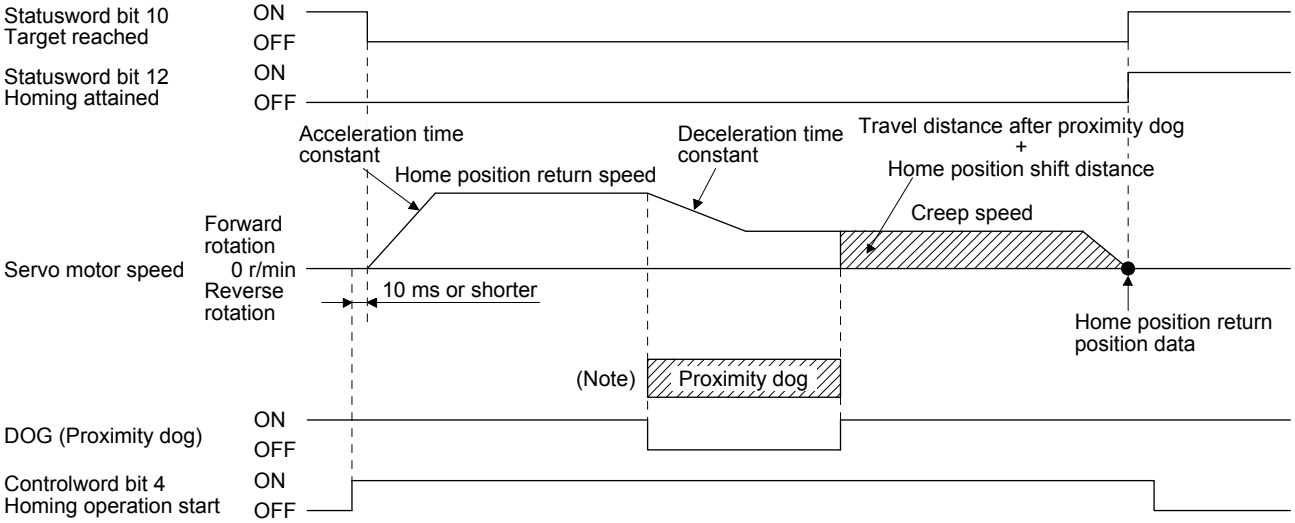
When the stroke end is detected

(e) Method -6 and -38 (dog type rear end reference home position return)

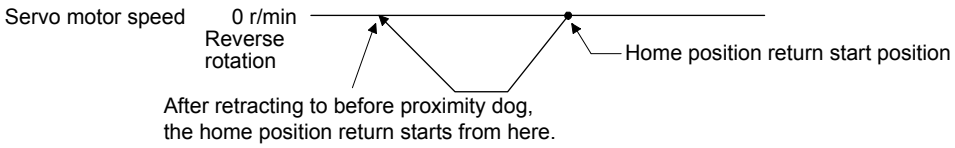
POINT

●This home position return type depends on the timing of reading DOG (Proximity dog) that has detected the rear end of the proximity dog. Therefore, when the creep speed is set to 100 r/min and a home position return is performed, the home position has an error of ± (Encoder resolution) × 100/65536 [pulse]. The higher the creep speed, the greater the error of the home position.

The following figure shows the operation of Homing method -6. The operation direction of Homing method -38 is opposite to that of Homing method -6.

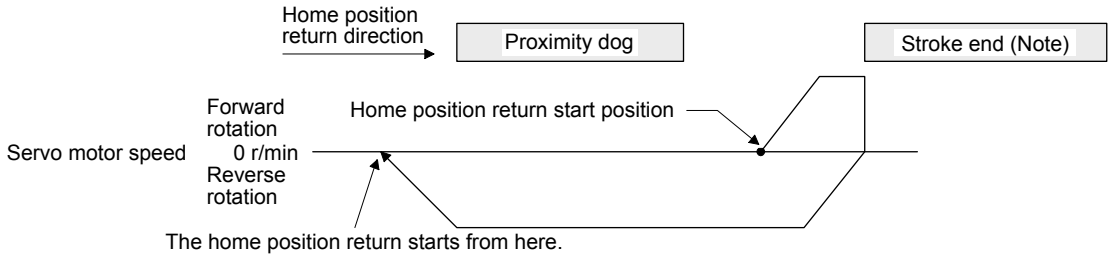


Note. After the front end of the proximity dog is detected, if the rear end of the proximity dog is detected without reaching the creep speed, [AL. 90] occurs. Revise the length of the proximity dog or revise both the home position return speed and creep speed.



After retracting to before proximity dog, the home position return starts from here.

When a home position return is started from the proximity dog



Note. This is not available with the software limit.

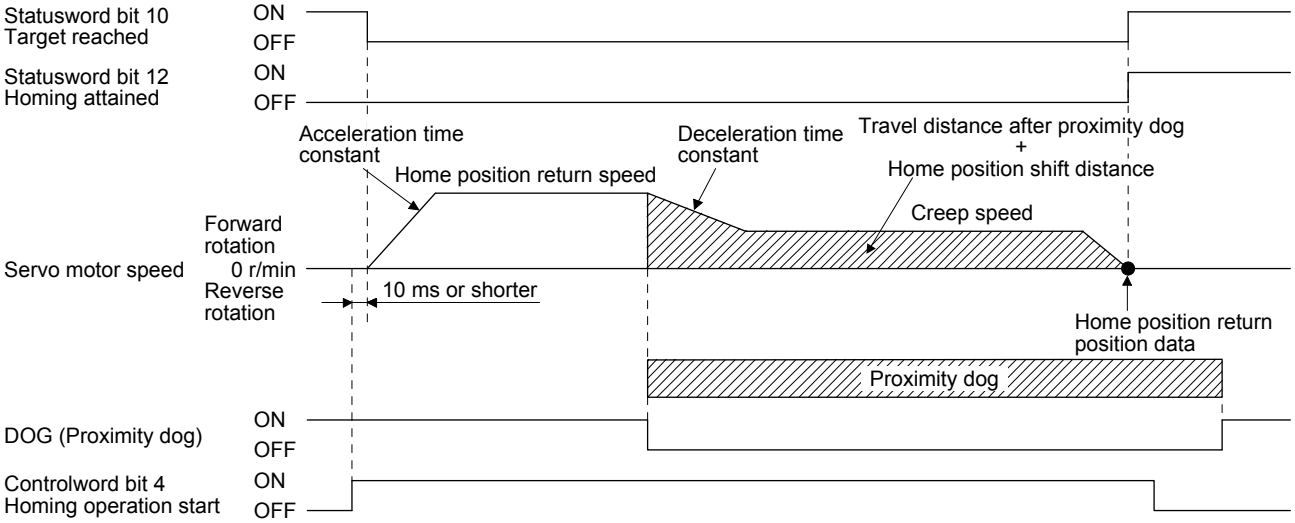
When the servo motor returns at the stroke end

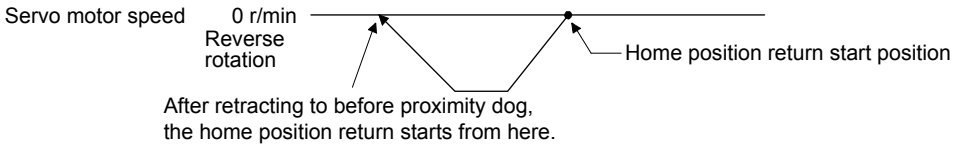
(f) Method -7 and -39 (count type front end reference home position return)

POINT

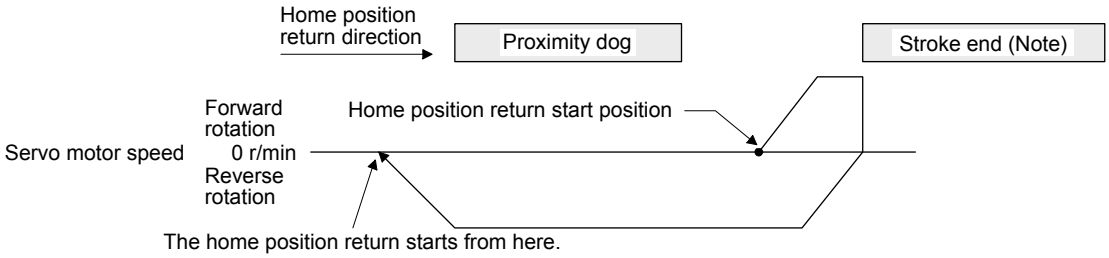
●This home position return type depends on the timing of reading DOG (Proximity dog) that has detected the front end of the proximity dog. Therefore, when the creep speed is set to 100 r/min and a home position return is performed, the home position has an error of ± (Encoder resolution) × 100/65536 [pulse]. The faster home position return speed sets a larger error in the home position.

The following figure shows the operation of Homing method -7. The operation direction of Homing method -39 is opposite to that of Homing method -7.





When a home position return is started from the proximity dog

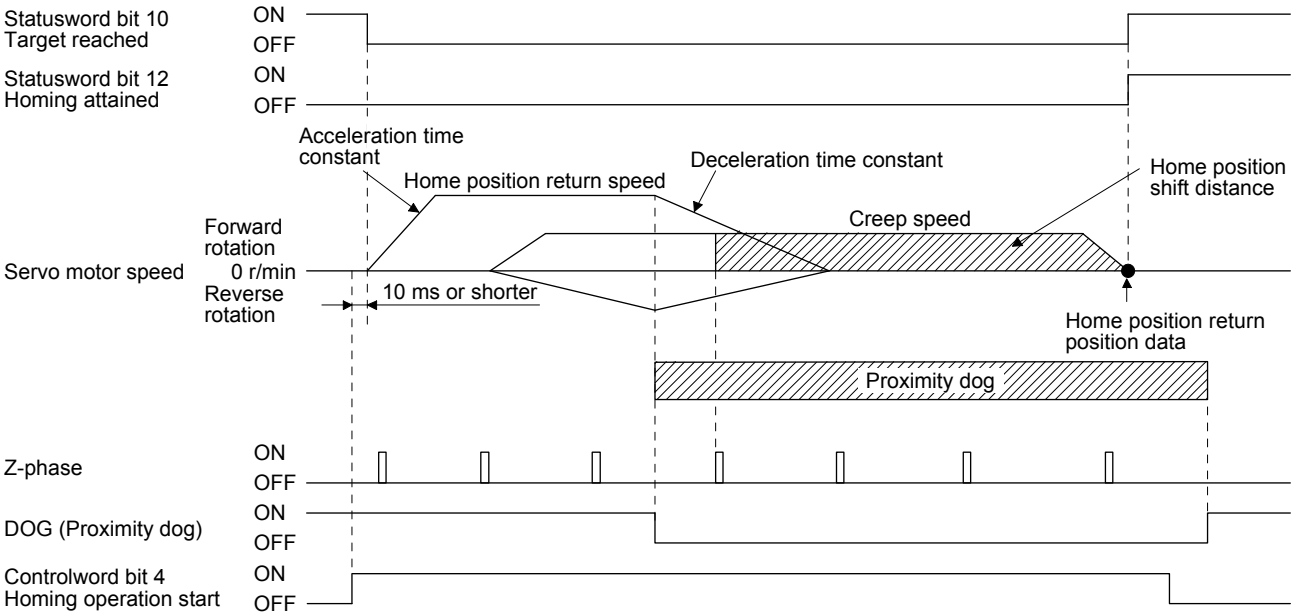


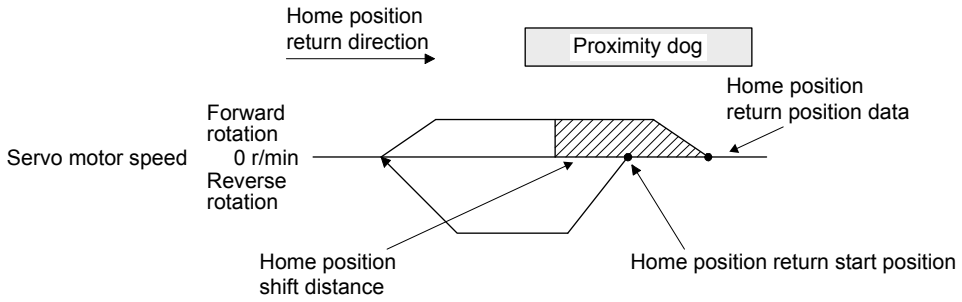
Note. This is not available with the software limit.

When the servo motor returns at the stroke end

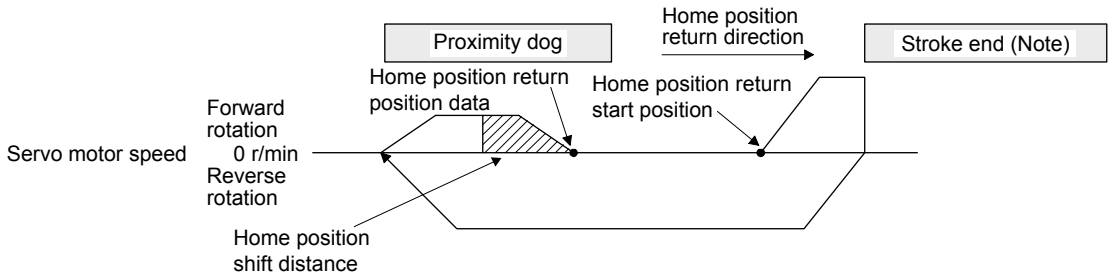
(g) Method -8 and -40 (dog cradle type home position return)

The following figure shows the operation of Homing method -8. The operation direction of Homing method -40 is opposite to that of Homing method -8.





When a home position return is started from the proximity dog

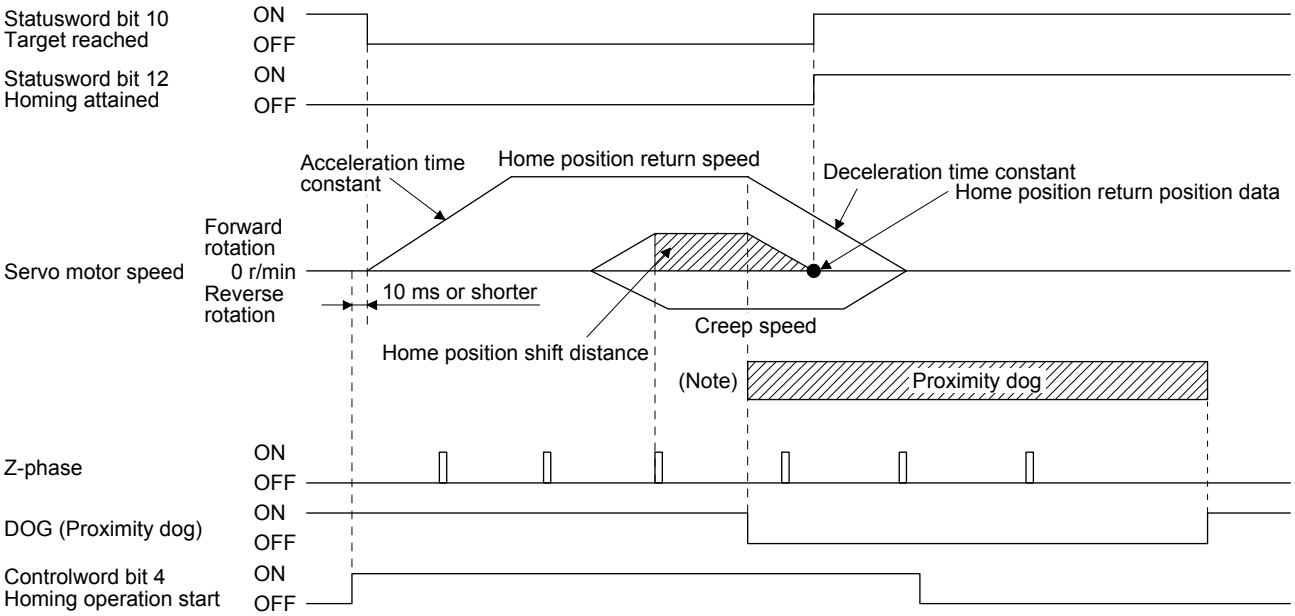


Note. This is not available with the software limit.

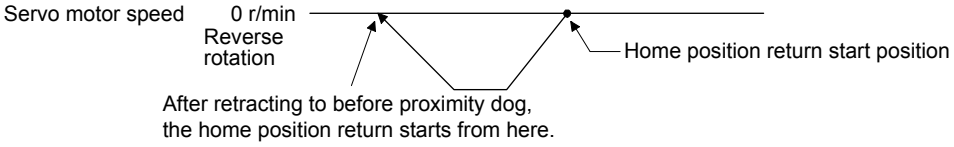
When the servo motor returns at the stroke end

(h) Method -9 and -41 (dog type last Z-phase reference home position return)

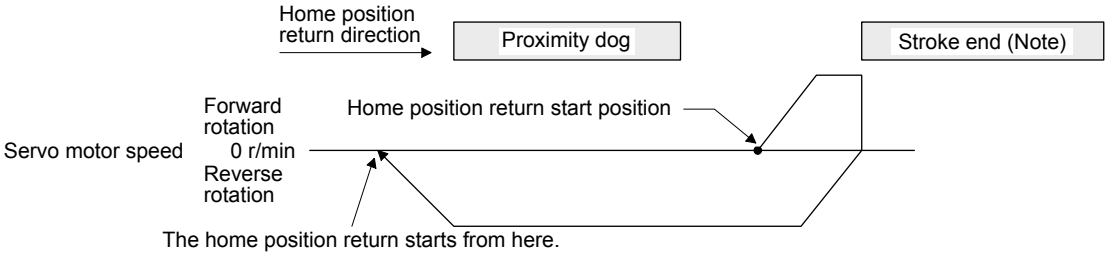
The following figure shows the operation of Homing method -9. The operation direction of Homing method -41 is opposite to that of Homing method -9.



Note. After the front end of the proximity dog is detected, if the rear end of the proximity dog is detected without stop, [AL. 90] occurs. Revise the length of the proximity dog or revise both the home position return speed and creep speed.



When a home position return is started from the proximity dog

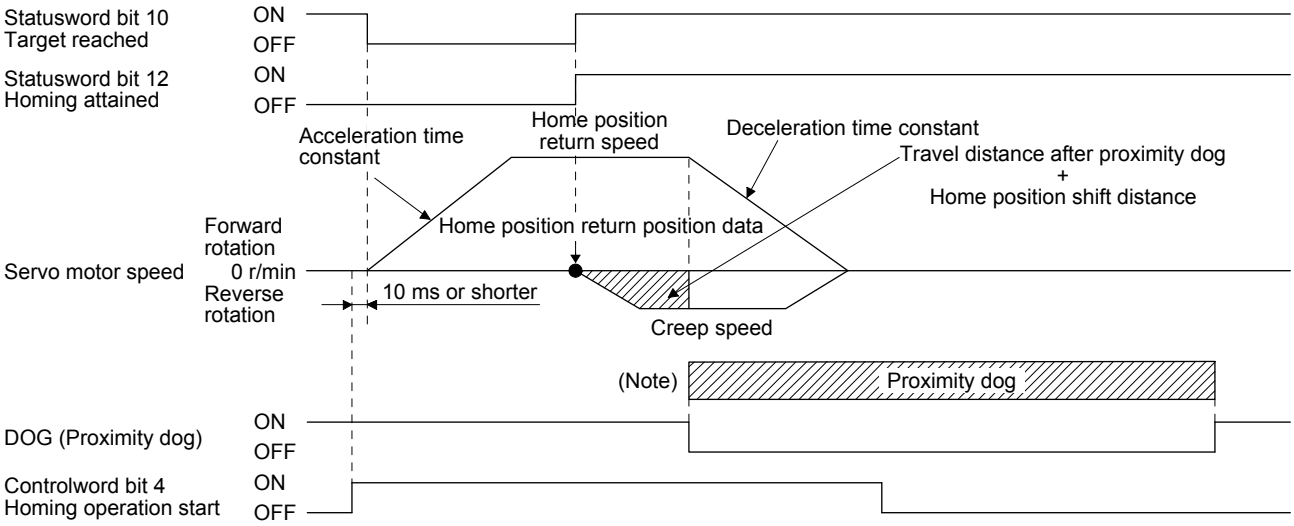


Note. This is not available with the software limit.

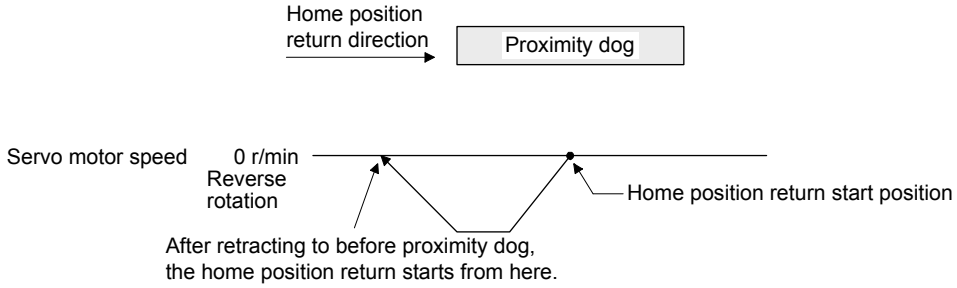
When the servo motor returns at the stroke end

(i) Method -10 and -42 (dog type front end reference home position return)

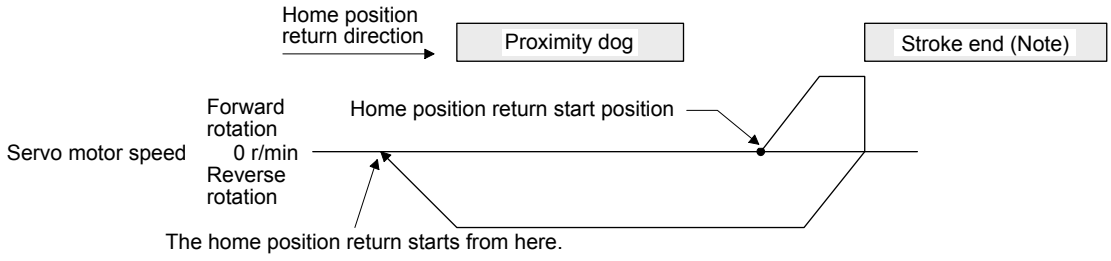
The following figure shows the operation of Homing method -10. The operation direction of Homing method -42 is opposite to that of Homing method -10.



Note. After the front end of the proximity dog is detected, if the rear end of the proximity dog is detected without reaching the creep speed, [AL. 90] occurs. Revise the length of the proximity dog or revise both the home position return speed and creep speed.



When a home position return is started from the proximity dog

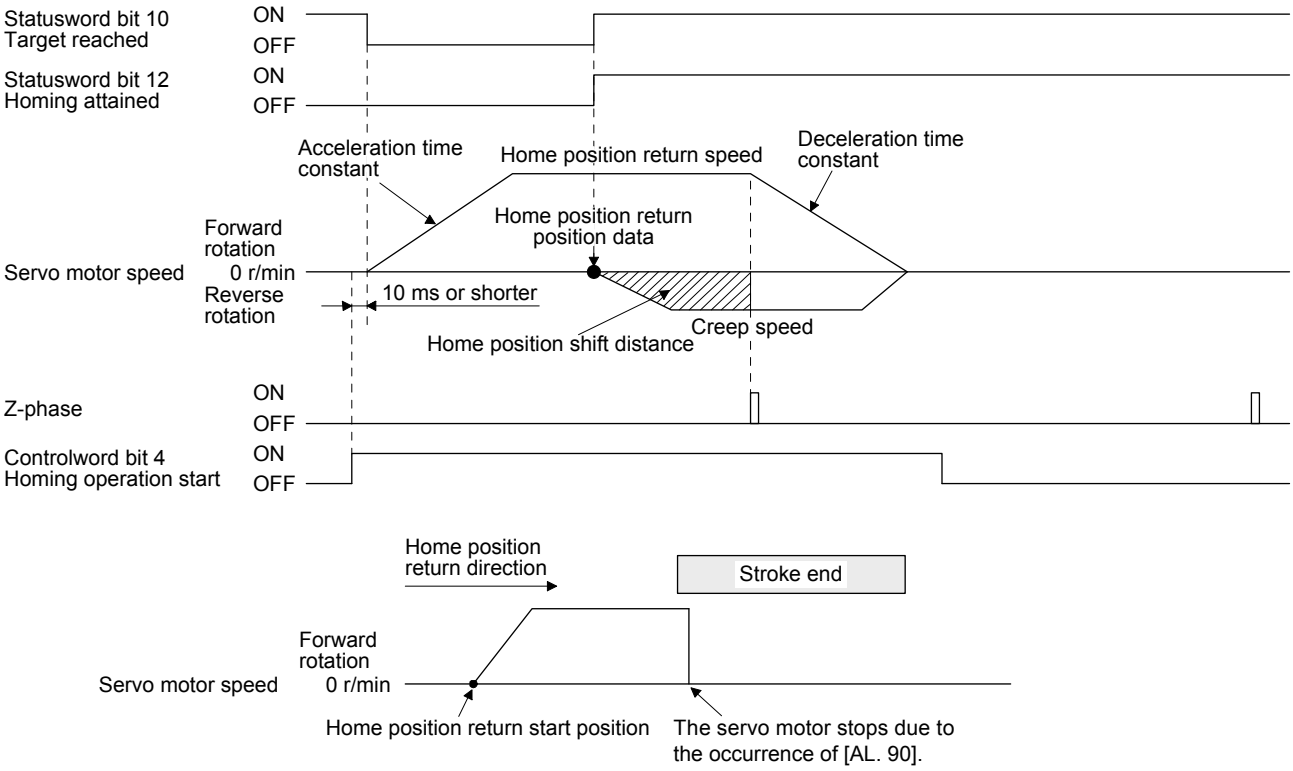


Note. This is not available with the software limit.

When the servo motor returns at the stroke end

(j) Method -11 and -43 (dogless Z-phase reference home position return)

The following figure shows the operation of Homing method -11. The operation direction of Homing method -43 is opposite to that of Homing method -11.



When the stroke end is detected

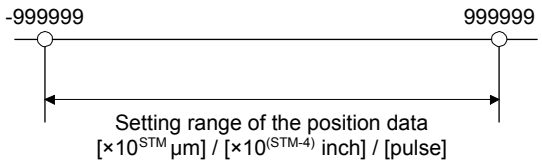
6.2 Point table mode (pt)

6.2.1 Point table mode (pt)

In this mode, you can arrange point tables in advance, select any point tables in "Target point table" , and start the operation with "Controlword bit 4 (New set-point)". You can select either absolute value command method or incremental value command method with [Pr. PT01] and the auxiliary function of the point table.

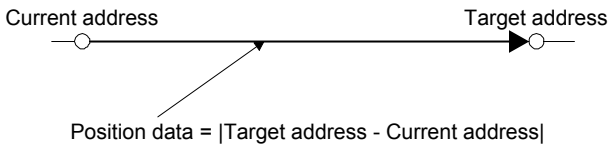
(1) Absolute value command method
As position data, set the target address to be reached.

Setting range: -999999 to 999999 [$\times 10^{STM}$ μm] (STM = Feed length multiplication [Pr. PT03])
-999999 to 999999 [$\times 10^{(STM-4)}$ inch] (STM = Feed length multiplication [Pr. PT03])
-999999 to 999999 [pulse]



(2) Incremental value command method
As position data, set the travel distance from the current address to the target address.

Setting range: 0 to 999999 [$\times 10^{STM}$ μm] (STM = Feed length multiplication [Pr. PT03])
0 to 999999 [$\times 10^{(STM-4)}$ inch] (STM = Feed length multiplication [Pr. PT03])
0 to 999999 [pulse]



6.2.2 Automatic operation using point table

(1) Absolute value command method

This function is enabled by selecting either absolute position command method or incremental value command method with the auxiliary function of the point table.

(a) Point table

Set the point table values using MR Configurator2 or "Point table 001 to 255".

Set the position data, servo motor speed, acceleration time constant, deceleration time constant, dwell time, and auxiliary function to the point table.

To use the point table with the absolute position command method, set "0", "1", "8", or "9" to the auxiliary function. To use the point table with the incremental value command method, set "2", "3", "10", or "11" to the auxiliary function.

When you set a value outside the setting range to the point table, the setting value will be clamped with the maximum or minimum value. If the value becomes out of the range because of the changes in the command unit or the connected servo motor, [AL. 37] will occur.

Item	Setting range	Unit	Description
Position data	-999999 to 999999 (Note 1)	$\times 10^{STM}$ μm $\times 10^{(STM-4)}$ inch pulse	(1) When using this point table with the absolute value command method Set the target address (absolute value). (2) When using this point table with the incremental value command method Set the travel distance. A "-" sign indicates a reverse rotation command.
Servo motor speed	0 to permissible speed	0.01 r/min 0.01 mm/s (Note 2)	Set the command speed of the servo motor for execution of positioning. The setting value must be equal to or less than the instantaneous permissible speed of the servo motor used. If a value smaller than "1" is set for the servo motor speed, the servo motor may not rotate.
Acceleration time constant	0 to 20000	ms	Set a time for the servo motor to reach the rated speed.
Deceleration time constant	0 to 20000	ms	Set a time for the servo motor to stop from the rated speed.
Dwell	0 to 20000	ms	Set the dwell. To disable the dwell, set "0" or "2" to the auxiliary function. To perform a continuous operation, set "1", "3", "8", "9", "10", or "11" to the auxiliary function and "0" to the dwell. When the dwell is set, a positioning of the next point table will be started after the positioning of the selected data is completed, and the set dwell has elapsed.
Auxiliary function	0 to 3, 8 to 11		Set the auxiliary function. (1) When using the point table with the absolute value command method 0: Automatic operation for a selected point table is performed. 1: Automatic operation for the next point table is performed. 8: Automatic operation for a point table selected at start-up is performed. 9: Automatic operation for point table No. 1 is performed. (2) When using this point table with the incremental value command method 2: Automatic operation for a selected point table is performed. 3: Automatic operation for the next point table is performed. 10: Automatic operation for a point table selected at start-up is performed. 11: Automatic operation for point table No. 1 is performed. When an opposite rotation direction is set, the servo motor rotates in the opposite direction after smoothing zero (command output) is confirmed. Setting "1" or "3" to point table No. 255 results in an error. Refer to section 6.2.6 (1) (b) for details.

Note 1. When the unit of the position data is μm or inch, the location of the decimal point is changed according to the STM setting.

2. The unit will be mm/s in the linear servo motor control mode.

(b) Parameter setting

Set the following parameters to perform automatic operation.

1) Command method selection ([Pr. PT01])

Select the absolute value command method as shown below.

[Pr. PT01]

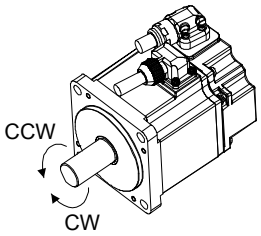
			0

└ Absolute value command method

2) Rotation direction selection ([Pr. PA14])

Select the servo motor rotation direction when "Controlword bit 4 (New set-point)" is switched on.

[Pr. PA14] setting	Servo motor rotation direction "Controlword bit 4 (New set-point)" on
0	CCW rotation with + position data CW rotation with - position data
1	CW rotation with + position data CCW rotation with - position data



3) Position data unit ([Pr. PT01])

Set the unit of the position data.

[Pr. PT01] setting	Position data unit
_ 0 _ _	mm
_ 1 _ _	inch
_ 3 _ _	pulse

4) Feed length multiplication ([Pr. PT03])

Set the feed length multiplication factor (STM) of the position data.

[Pr. PT03] setting	Position data input range (Note 1)		
	[mm]	[inch]	[pulse] (Note 2)
_ _ _ 0	- 999.999 to + 999.999	- 99.9999 to + 99.9999	- 999999 to + 999999
_ _ _ 1	- 9999.99 to + 9999.99	- 999.999 to + 999.999	
_ _ _ 2	- 99999.9 to + 99999.9	- 9999.99 to + 9999.99	
_ _ _ 3	- 999999 to + 999999	- 99999.9 to + 99999.9	

Note 1. The "-" sign has different meanings under the absolute value command method and the incremental value command method. Refer to section 6.2.1 for details.

2. The feed length multiplication setting ([Pr. PT03]) is not applied to the unit multiplication factor. Adjust the unit multiplication factor in the electronic gear setting ([Pr. PA06] and [Pr. PA07]).

(c) Operation

Selecting the point table with "Target point table" and switching on "Controlword bit 4 (New set-point)" starts positioning to the position data at the set speed, acceleration time constant and deceleration time constant.

Item	Object to be used	Setting
Point table mode (pt) selection	Modes of operation	Set "-101".
Point table selection	Target point table	Set the point table No. to use.
Start	Controlword	Switch on "Controlword bit 4 (New set-point)".

(2) Incremental value command method

POINT

●The incremental value command method ([Pr. PT01] = _ _ _ 1) is not available in the absolute position detection system. When using the absolute position detection system, select the absolute value command method ([Pr. PT01] = _ _ _ 0).

(a) Point table

Set the point table values using MR Configurator2 or "Point table 001 to 255".

Set the position data, servo motor speed, acceleration time constant, deceleration time constant, dwell time, and auxiliary function to the point table.

When you set a value outside the setting range to the point table, the setting value will be clamped with the maximum or minimum value. If the value becomes out of the range because of the changes in the command unit or the connected servo motor, [AL. 37] will occur.

Item	Setting range	Unit	Description
Position data	0 to 999999 (Note 1)	$\times 10^{STM}$ μm $\times 10^{(STM-4)}$ inch pulse	Set the travel distance. The unit can be changed by [Pr. PT03] (Feed length multiplication).
Servo motor speed	0 to permissible speed	0.01 r/min 0.01 mm/s (Note 2)	Set the command speed of the servo motor for execution of positioning. The setting value must be equal to or less than the instantaneous permissible speed of the servo motor used.
Acceleration time constant	0 to 20000	ms	Set a time for the servo motor to reach the rated speed.
Deceleration time constant	0 to 20000	ms	Set a time for the servo motor to stop from the rated speed.
Dwell	0 to 20000	ms	Set the dwell. To disable the dwell, set "0" to the auxiliary function. To perform a continuous operation, set "1", "8" or "9" to the auxiliary function and "0" to the dwell. When the dwell is set, a positioning of the next point table will be started after the positioning of the selected data is completed, and the set dwell has elapsed.
Auxiliary function	0, 1, 8, or 9		Set the auxiliary function. 0: Automatic operation for a selected point table is performed. 1: Automatic operation for the next point table is performed. 8: Automatic operation for a point table selected at start-up is performed. 9: Automatic operation for point table No. 1 is performed. Setting "1" to point table No. 255 results in an error. Refer to section 6.2.6 (1) (b) for details.

Note 1. When the unit of the position data is μm or inch, the location of the decimal point is changed according to the STM setting.

2. The unit will be mm/s in the linear servo motor control mode.

(b) Parameter setting

Set the following parameters to perform automatic operation.

1) Command method selection ([Pr. PT01])

Select the incremental value command method as shown below.

[Pr. PT01]

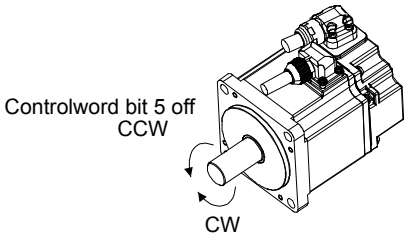
			1

1: Incremental value command method

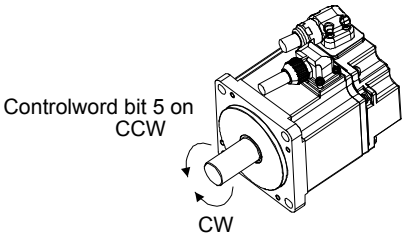
2) Rotation direction selection ([Pr. PA14])

Select the servo motor rotation direction when "Controlword bit 4 (New set-point)" is switched on.

[Pr. PA14] setting	Servo motor rotation direction	
	Forward rotation start (Controlword bit 4 (New set-point): on Controlword bit 5 (Direction): off)	Reverse rotation start (Controlword bit 4 (New set-point): on Controlword bit 5 (Direction): on)
0	CCW rotation (address increase)	CW rotation (address decrease)
1	CW rotation (address increase)	CCW rotation (address decrease)



[Pr. PA14]: 0



[Pr. PA14]: 1

3) Position data unit ([Pr. PT01])

Set the unit of the position data.

[Pr. PT01] setting	Position data unit
_ 0 _ _	mm
_ 1 _ _	inch
_ 3 _ _	pulse

4) Feed length multiplication ([Pr. PT03])

Set the feed length multiplication factor (STM) of the position data.

[Pr. PT03] setting	Position data input range		
	[mm]	[inch]	[pulse] (Note)
_ _ _ 0	0 to + 999.999	0 to + 99.9999	0 to + 999999
_ _ _ 1	0 to + 9999.99	0 to + 999.999	
_ _ _ 2	0 to + 99999.9	0 to + 9999.99	
_ _ _ 3	0 to + 999999	0 to + 99999.9	

Note. The feed length multiplication setting ([Pr. PT03]) is not applied to the unit multiplication factor. Adjust the unit multiplication factor in the electronic gear setting ([Pr. PA06] and [Pr. PA07]).

(c) Operation

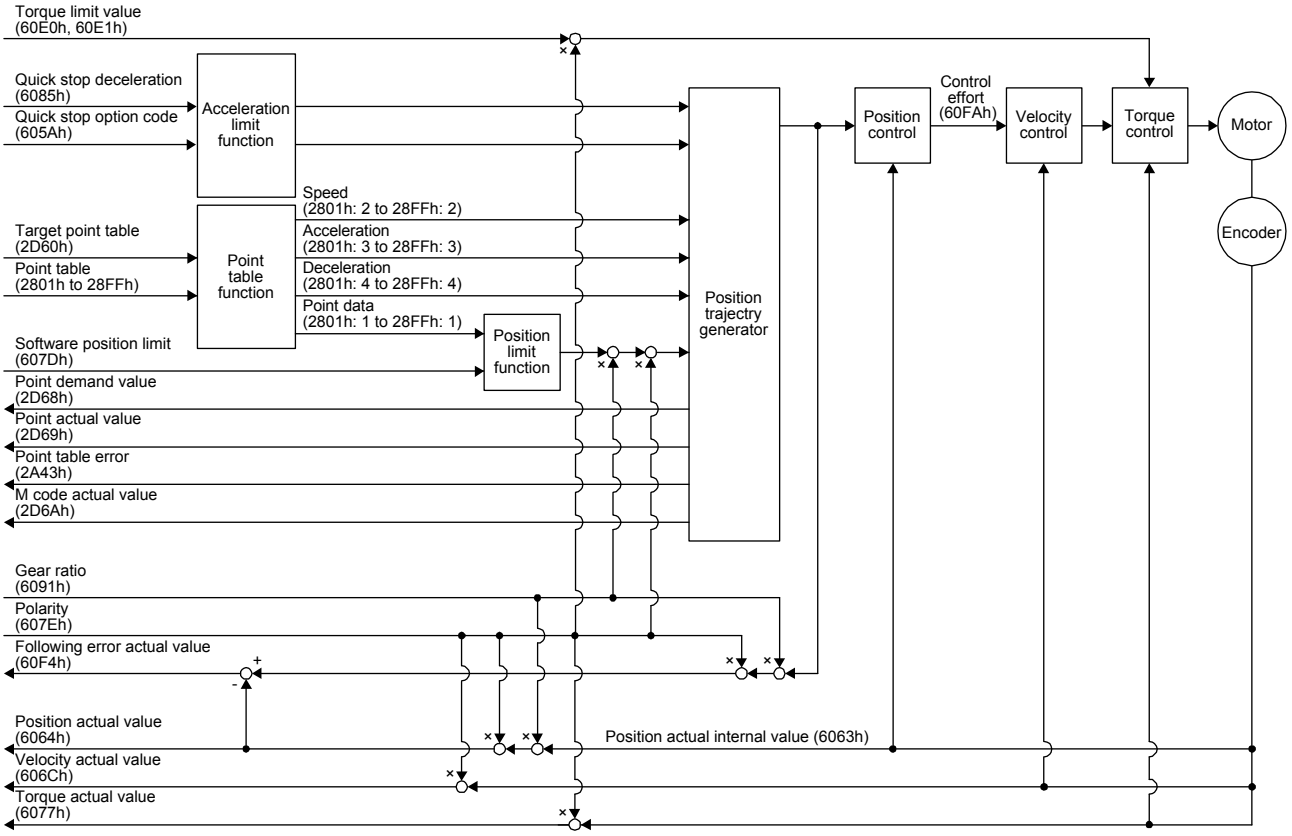
Selecting the point table with "Target point table" and switching on "Controlword bit 4 (New set-point)" starts positioning to the position data at the set speed, acceleration time constant and deceleration time constant.

Switching on "Controlword bit 5 (Direction)" starts a reverse rotation of the motor in accordance with the values set to the selected point table.

Item	Object to be used	Setting
Point table mode (pt) selection	Modes of operation	Set "-101".
Point table selection	Target point table	Set the point table No. to use.
Rotation direction	Controlword	Forward rotation direction when "Controlword bit 5 (Direction)" is off. Reverse rotation direction when "Controlword bit 5 (Direction)" is on.
Start	Controlword	Switch on "Controlword bit 4 (New set-point)".

6.2.3 Related object

The following shows the functions and related objects of the point table mode (pt).



(1) Related object

Index	Sub	Name	Data Type	Access	Default	Description
607Dh	0	Software position limit	U8	ro	2	Number of entries
	1	Min position limit	I32	rw	0	Minimum position address (Pos units)
	2	Max position limit	I32	rw	0	Maximum position address (Pos units)
6085h		Quick stop deceleration	U32	rw	100	Deceleration time constant for Quick stop Unit: ms
605Ah		Quick stop option code	I16	rw	2	Operation setting for Quick stop Refer to chapter 10.
6063h		Position actual internal value	I32	ro		Current position (Enc inc)
6064h		Position actual value	I32	ro		Current position (Pos units)
606Ch		Velocity actual value	I32	ro		Current speed Unit: Vel unit (0.01 r/min or 0.01 mm/s)
6077h		Torque actual value	I32	ro		Current torque Unit: 0.1% (rated torque of 100%)
6092h	0	Feed constant	U8	ro	2	Travel distance per revolution of an output shaft Refer to chapter 10.
	1	Feed	U32	rw		Travel distance setting
	2	Shaft revolutions				Number of servo motor shaft revolutions
60F4h		Following error actual value	I32	ro		Droop pulses (Pos units)
60FAh		Control effort	I32	ro		Position control loop output (speed command) Unit: Vel unit (0.01 r/min or 0.01 mm/s)
60E0h		Positive torque limit value	U16	rw	10000	Torque limit value (forward) Unit: 0.1% (rated torque of 100%)
60E1h		Negative torque limit value	U16	rw	10000	Torque limit value (reverse) Unit: 0.1% (rated torque of 100%)
6091h	0	Gear ratio	U8	ro	2	Gear ratio
	1	Motor revolutions	U32	rw	1	Number of revolutions of the servo motor axis (numerator)
	2	Shaft revolutions			1	Number of revolutions of the drive axis (denominator)
607Eh		Polarity	U8	rw	0	Polarity selection Bit 7: Position POL Bit 6: Velocity POL Bit 5: Torque POL Refer to chapter 10.
60A8h		SI unit position	U32	rw	0	SI unit position The value is automatically set according to the setting of "Position data unit" of [Pr. PT01]. Refer to chapter 10.
60A9h		SI unit velocity	U32	rw	0	SI unit velocity 0.01 r/min or 0.01 mm/s FB010300h (0.01 mm/s) FEB44700h (0.01 r/min)

Index	Sub	Name	Data Type	Access	Default	Description
2D60h		Target point table	I16	rw	0	Point table command 0: Not operate 1 to 255: Execute the specified point table -1: High-speed home position return
2D68h		Point demand value	I16	ro		Point table demand The currently specified point table No. is returned. While the servo motor is stopped, the value becomes the setting value of the Target point table (2D60h).
2D69h		Point actual value	I16	ro		Current point table The completed point table is returned.
2801h to 28FFh	0	Point table 001 to 255	U8	ro	7	Number of entries Point table
	1	Point data	I32	rw		Position data Unit: pos units
	2	Speed	I32	rw		Speed Unit: 0.01 r/min or 0.01 mm/s
	3	Acceleration	I32	rw		Acceleration time constant Unit: ms
	4	Deceleration	I32	rw		Deceleration time constant Unit: ms
	5	Dwell	I32	rw		Dwell Unit: ms
	6	Auxiliary	I32	rw		Auxiliary function
2A43h	0	Point table error	U8	ro	2	Number of entries Point table error
	1	Point table error No.	I32	ro		Point table error No.
	2	Point table error factor	I32	ro		Point table error factor The error status is indicated when this bit is turned on. Refer to chapter 10.

(2) Details on the OMS bit of Controlword (pt mode)

Bit	Symbol	Description
4	New set-point	The operation starts from the point table specified with the Target point table (2D60h) when the Bit turns on.
5	Direction	Specify the servo motor rotation direction. If the direction of the rotation is reversed while the servo motor is rotating, the servo motor once stops and then starts rotating in the opposite direction. The operations are performed when [Pr. PT01] is set to "_ _ _ 1 (incremental value command method)". 0: Forward rotation direction 1: Reverse rotation direction
6	(reserved)	The value at reading is undefined. Set "0" when writing.
8	HALT	0: Positioning is executed. 1: The servo motor stops according to Halt option code (605Dh).
9	(reserved)	The value at reading is undefined. Set "0" when writing.

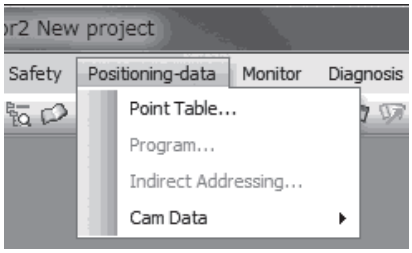
(3) Details on the OMS bit of Statusword (pt mode)

Bit	Symbol	Description
10	(reserved)	The value at reading is undefined.
12	Set-point acknowledge	0: Positioning completed (wait for next command) 1: Positioning being executed
13	Following error	0: No following error 1: Following error Judgment condition for Following error When the time set with [Pr. PC69 Following error output filtering time] has elapsed with the number of droop pulses exceeding the setting value of the [Pr. PC67/Pr. PC68 Following error output level], this bit becomes "1".

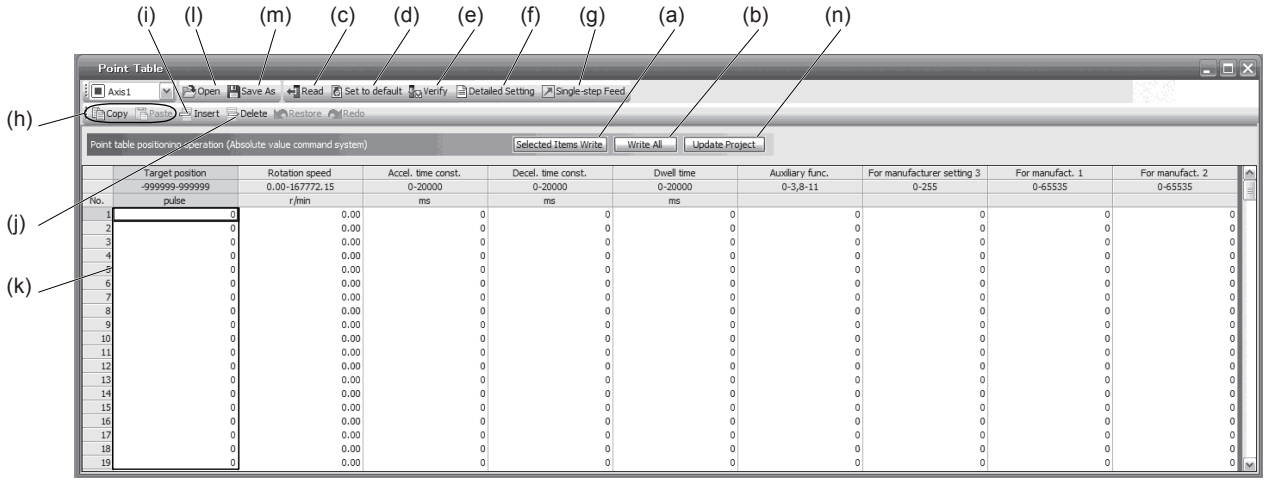
6.2.4 Point table setting method with MR Configurator2

(1) Setting procedure

Click "Positioning-data" in the menu bar, and click "Point Table" in the menu.



The following window will be displayed.



(a) Writing point table data (a)
Select changed point table data, and click "Selected Items Write" to write the changed point table data to the servo amplifier.

(b) Writing all point table data (b)
Click "Write All" to write all the point table data to the servo amplifier.

(c) Reading all point table data (c)
Click "Read" to read all the point table data from the servo amplifier and display them.

(d) Initial setting of point table data (d)
Click "Set to default" to initialize all the data of point table No. 1 to 255. This function also initializes data currently being edited.

(e) Verifying point table data (e)
Click "Verify" to verify all the data displayed and data of the servo amplifier.

(f) Detailed setting of point table data (f)
Click "Detailed Setting" to change position data range and unit in the point table window. Refer to (2) in this section for details.

(g) Single-step feed (g)
Click "Single-step Feed" to perform the single-step feed test operation. Refer to section 4.5.1 (1) (e) for details.

(h) Copy and paste of point table data (h)
Click "Copy" to copy the selected point table data. Click "Paste" to paste the copied point table data.

(i) Inserting point table data (i)
Click "Insert" to insert a block before the selected point table No. The selected block and later will be shifted down by one.

(j) Deleting point table data (j)
Click "Delete" to delete the selected block of the point table No. The selected block and later will be shifted up by one.

(k) Changing point table data (k)
After selecting the data to be changed, enter a new value, and press the Enter key. You can change the displayed range and unit with (1) (f) "Detailed setting of point table data" in this section.

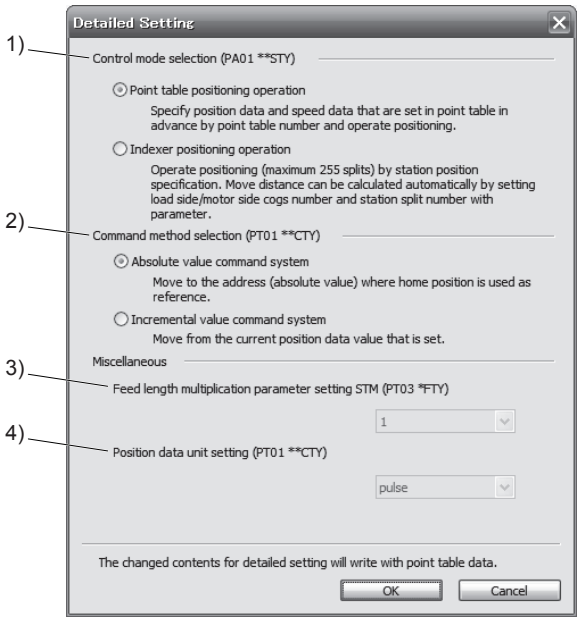
(l) Reading point table data (l)
Click "Open" to read the point table data.

(m) Saving point table data (m)
Click "Save As" to save the point table data.

(n) Updating project (n)
Click "Update Project" to update the point table data to a project.

(2) Detailed setting window

The position data range and unit can be changed with the detailed setting in the point table window. For the position data range and unit in [Pr. PT01] setting, refer to section 6.2.2. To reflect the setting for the corresponding parameter, click the "Update Project" button in the point table window.



(a) Selection of control mode (PA01 **STY): 1)

Select either the point table positioning operation or the indexer positioning operation.

(b) Command method selection (PT01 *CTY): 2)

Select either the absolute position command method or the incremental value command method.

(c) Others

1) Feed length multiplication parameter setting STM (PT03 *FTY): 3)

Select a feed length multiplication from 1/10/100/1000.

2) Position data unit setting (PT01 *CTY): 4)

Select a unit of position data from mm/inch/pulse. When pulse is selected for the unit, the setting of feed length multiplication will be disabled.

6.2.5 Point table setting method with objects

To change the point table of the servo amplifier on the master station (controller), write values to the following objects in the SDO communication. However, once the power supply is shut off, the changed setting is not held at the next startup. To hold the changed setting even after the power supply is shut-off, save the point table setting value to EEP-ROM using Store Parameters (1010h).

Index	Sub Index	Name	Data Type	Access	Default	Description
2801h	0	Point table001	U8	ro	7	Number of entries
	1	Point data	I32	rw		Set the position data of the point table No. 1.
	2	Speed	I32	rw		Set the servo motor speed of the point table No. 1.
	3	Acceleration	I32	rw		Set the acceleration time constant of the point table No. 1.
	4	Deceleration	I32	rw		Set the deceleration time constant of the point table No. 1.
	5	Dwell	I32	rw		Set the dwell of the point table No. 1.
	6	Auxiliary	I32	rw		Set the auxiliary function of the point table No. 1.
⋮	⋮	⋮	⋮	⋮		⋮
28FFh	0	Point table255	U8	ro	7	Number of entries
	1	Point data	I32	rw		Set the position data of the point table No. 255.
	2	Speed	I32	rw		Set the servo motor speed of the point table No. 255.
	3	Acceleration	I32	rw		Set the acceleration time constant of the point table No. 255.
	4	Deceleration	I32	rw		Set the deceleration time constant of the point table No. 255.
	5	Dwell	I32	rw		Set the dwell of the point table No. 255.
	6	Auxiliary	I32	rw		Set the auxiliary function of the point table No. 255.

6.2.6 Directions for use

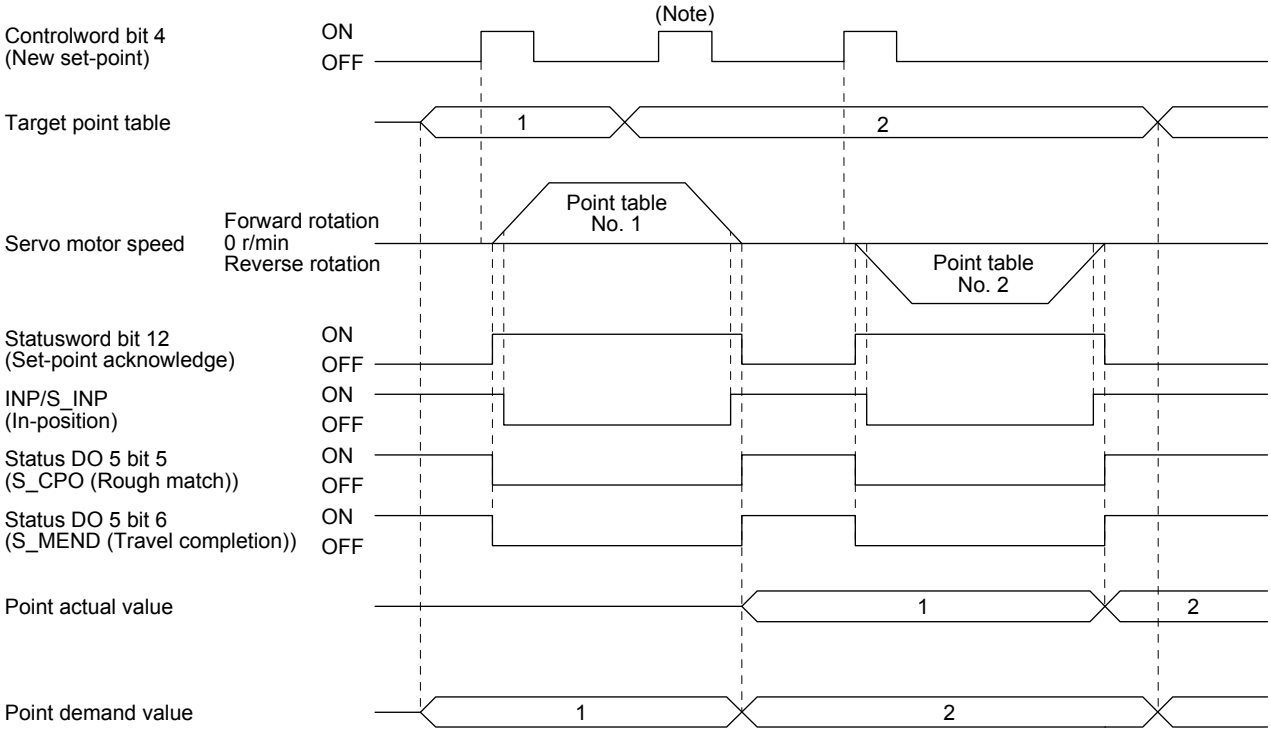
(1) pt mode operation sequence

(a) Automatic individual positioning operation

1) Absolute value command method ([Pr. PT01] = _ _ _ 0)

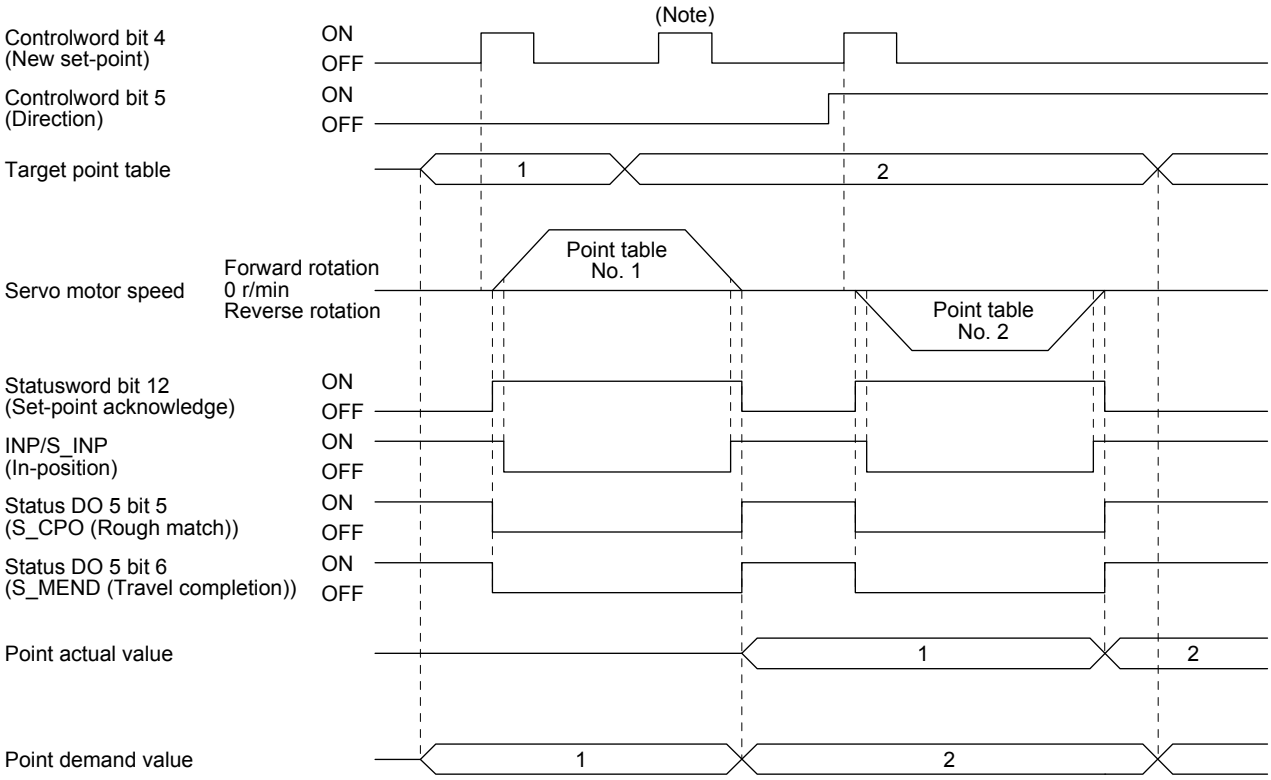
While the servo motor is stopped under servo-on state, switching on "Controlword bit 4 (New set-point)" starts the automatic positioning operation.

The following shows the timing chart.



Note. Switching on "Controlword bit 4 (New set-point)" is invalid during the servo motor rotation.

2) Incremental value command method ([Pr. PT01] = _ _ _ 1)
While the servo motor is stopped under servo-on state, selecting a rotation direction with "Controlword bit 5 (Direction)" and switching on "Controlword bit 4 (New set-point)" starts the automatic positioning operation.
The following shows the timing chart.



Note. Switching on "Controlword bit 4 (New set-point)" is invalid during the servo motor rotation.

(b) Automatic continuous positioning operation

By merely selecting a point table and switching on "Controlword bit 4 (New set-point)", the operation can be performed in accordance with the point tables having consecutive numbers.

1) Absolute value command method ([Pr. PT01] = _ _ _ 0)

By specifying the absolute value command or the incremental value command in the auxiliary function of the point table, the automatic continuous operation can be performed.

The following shows how to set.

Point table setting		
Dwell	Auxiliary function	
	When the position data is absolute value	When the position data is incremental value
1 or more	1	3

a) Positioning in a single direction

The following shows an operation example with the set values listed in the table below.

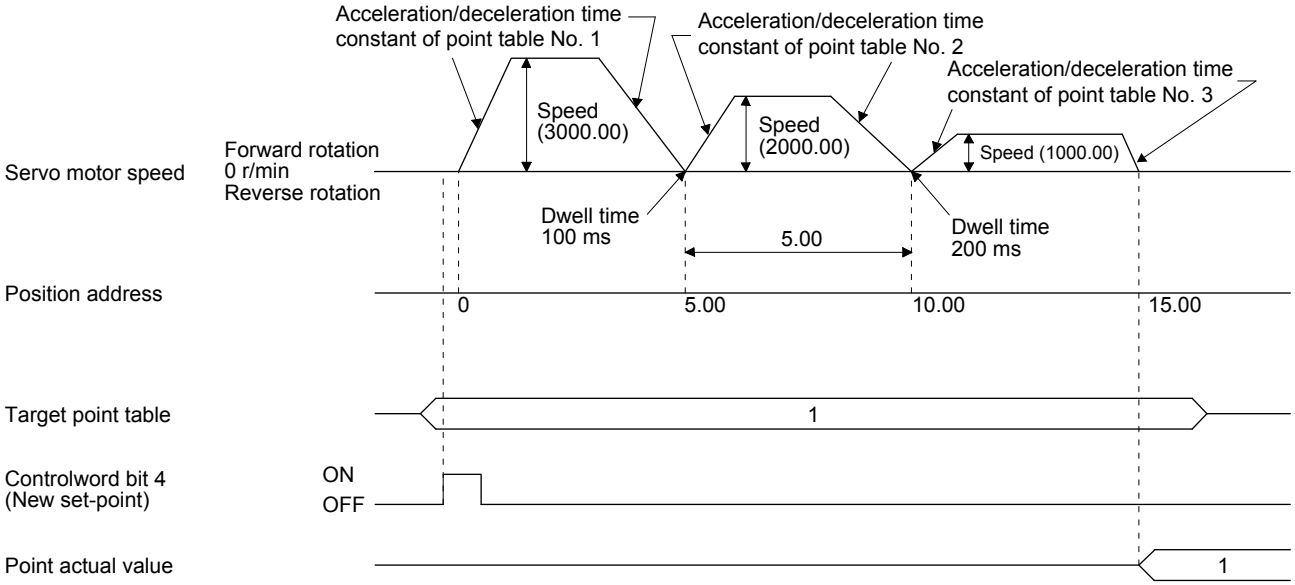
In this example, point table No. 1 and No. 3 are set to the absolute value command method, and point table No. 2 to the incremental value command method.

Point table No.	Position data [10^{STM} μm]	Servo motor speed [r/min]	Acceleration time constant [ms]	Deceleration time constant [ms]	Dwell [ms]	Auxiliary function
1	5.00	3000.00	100	150	100	1
2	5.00	2000.00	150	200	200	3
3	15.00	1000.00	300	100	Disabled	0 (Note)

Note. Be sure to set "0" or "2" to the auxiliary function of the last point table of the consecutive point tables.

0: When using the point table with the absolute value command method

2: When using the point table with the incremental value command method

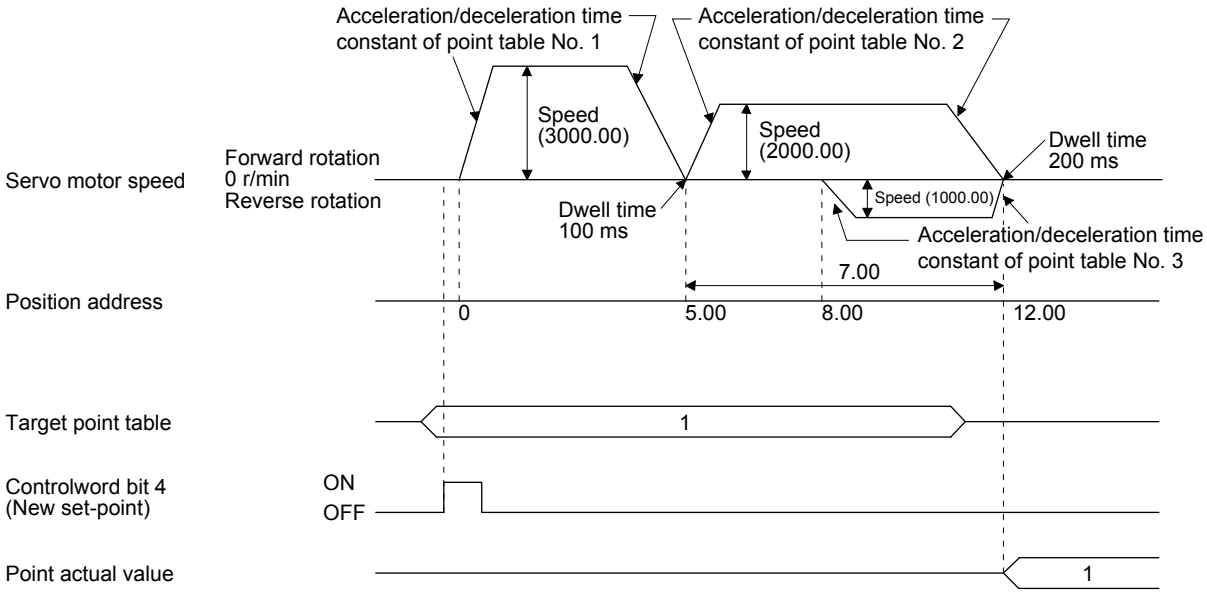


b) Positioning in the reverse direction during a series of point-table operation

The following shows an operation example with the set values listed in the table below.
In this example, point table No. 1 and No. 3 are set to the absolute value command method, and point table No. 2 to the incremental value command method.

Point table No.	Position data [10^{STM} µm]	Servo motor speed [r/min]	Acceleration time constant [ms]	Deceleration time constant [ms]	Dwell [ms]	Auxiliary function
1	5.00	3000.00	100	150	100	1
2	7.00	2000.00	150	200	200	3
3	8.00	1000.00	300	100	Disabled	0 (Note)

Note. Be sure to set "0" or "2" to the auxiliary function of the last point table of the consecutive point tables.
0: When using the point table with the absolute value command method
2: When using the point table with the incremental value command method



2) Incremental value command method ([Pr. PT01] = _ _ _ 1)

The position data of the incremental value command method is the sum of the position data of consecutive point tables.

The following shows how to set.

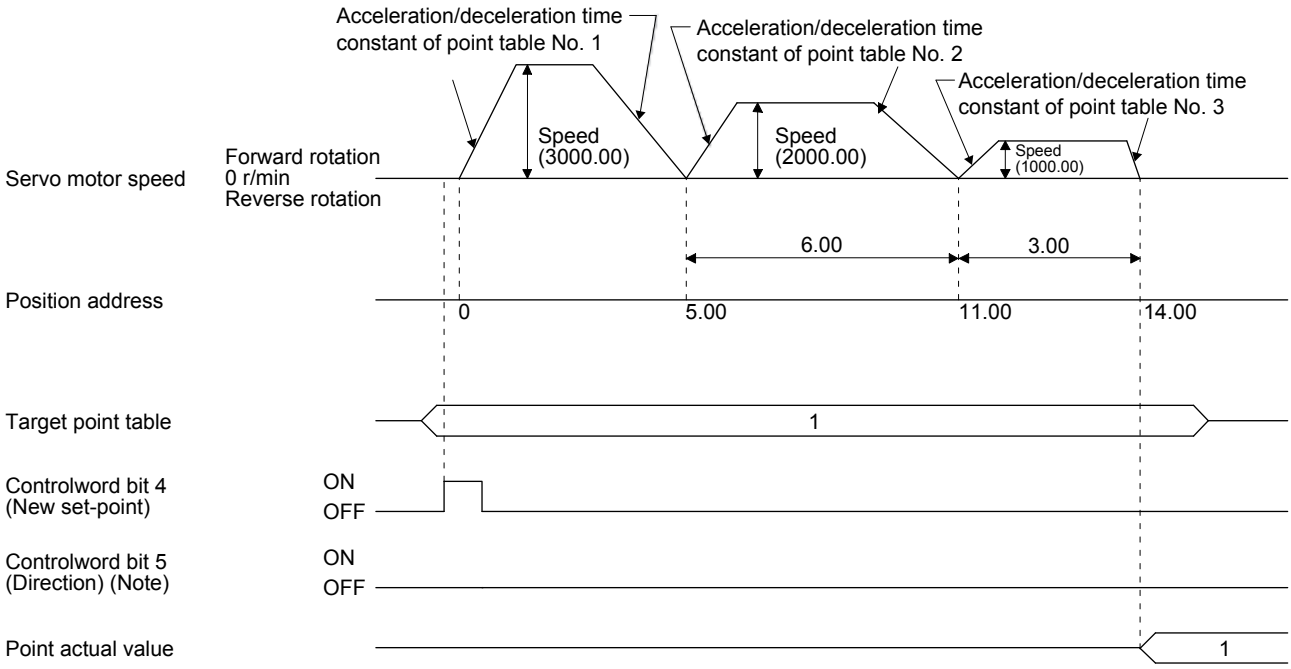
Point table setting	
Dwell	Auxiliary function
1 or more	1

a) Positioning in a single direction

The following shows an operation example with the set values listed in the table below.

Point table No.	Position data [10^{STM} μm]	Servo motor speed [r/min]	Acceleration time constant [ms]	Deceleration time constant [ms]	Dwell [ms]	Auxiliary function
1	5.00	3000.00	100	150	100	1
2	6.00	2000.00	150	200	200	1
3	3.00	1000.00	300	100	Disabled	0 (Note)

Note. Be sure to set "0" to the auxiliary function of the last point table of the consecutive point tables.



Note. To reverse rotation direction, turn the "Controlword bit 5 (Direction)" on.

(c) Varying-speed operation

By setting the auxiliary function of the point table, the servo motor speed during positioning can be changed. Point tables are prepared as many as the number of the set speeds.

1) Absolute value command method ([Pr. PT01] = _ _ _ 0)

Set "1" or "3" to the auxiliary function to execute the positioning at the speed set in the following point table.

At this time, the position data selected at start is enabled, and the acceleration/deceleration time constant set in the next and subsequent point tables is disabled.

By setting "1" or "3" to auxiliary functions until point table No. 254, the operation can be performed at maximum 255 speeds.

Be sure to set "0" or "2" to the auxiliary function of the last point table.

To perform varying-speed operation, be sure to set "0" to the dwell.

Setting "1" or more enables the automatic continuous positioning operation.

The following table shows an example of setting.

Point table No.	Dwell [ms] (Note 1)	Auxiliary function	Varying-speed operation
1	0	1	Consecutive point table data
2	0	3	
3	Disabled	0 (Note 2)	
4	0	3	Consecutive point table data
5	0	1	
6	Disabled	2 (Note 2)	

Note 1. Be sure to set "0".

2. Be sure to set "0" or "2" to the auxiliary function of the last point table of the consecutive point tables.

a) Positioning in a single direction

The following shows an operation example with the set values listed in the table below. In this example, point table No. 1 and No. 3 are set to the absolute value command method, and point table No. 2 and No. 4 to the incremental value command method.

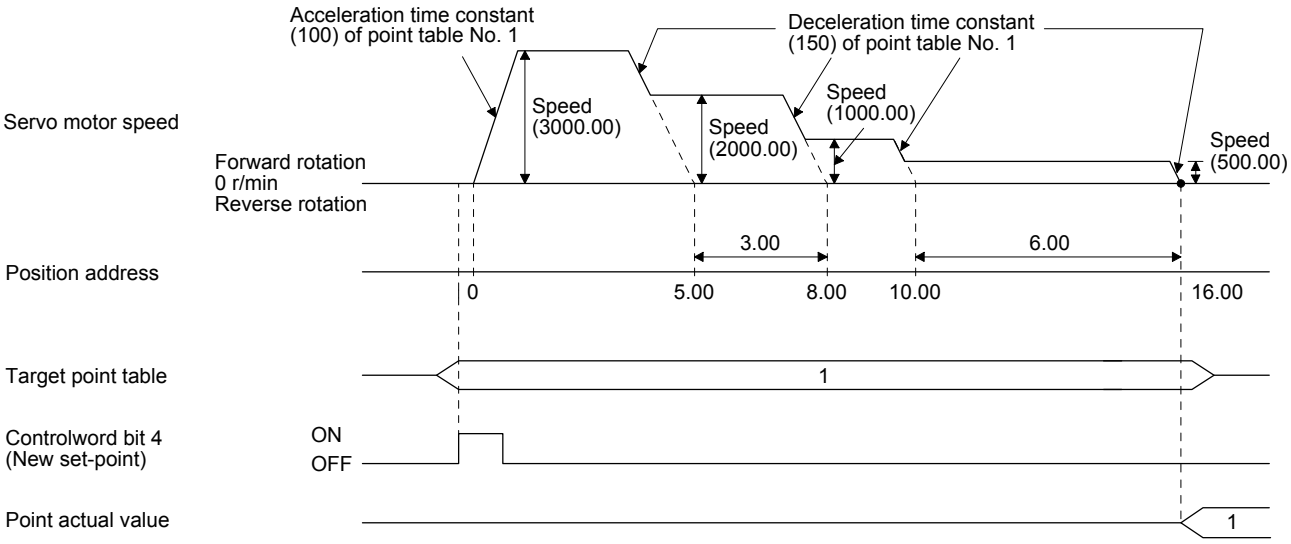
Point table No.	Position data [10^{STM} µm]	Servo motor speed [r/min]	Acceleration time constant [ms]	Deceleration time constant [ms]	Dwell [ms] (Note 1)	Auxiliary function
1	5.00	3000.00	100	150	0	1
2	3.00	2000.00	Disabled	Disabled	0	3
3	10.00	1000.00	Disabled	Disabled	0	1
4	6.00	500.00	Disabled	Disabled	0	2 (Note 2)

Note 1. Be sure to set "0".

2. Be sure to set "0" or "2" to the auxiliary function of the last point table of the consecutive point tables.

0: When using the point table with the absolute value command method

2: When using the point table with the incremental value command method

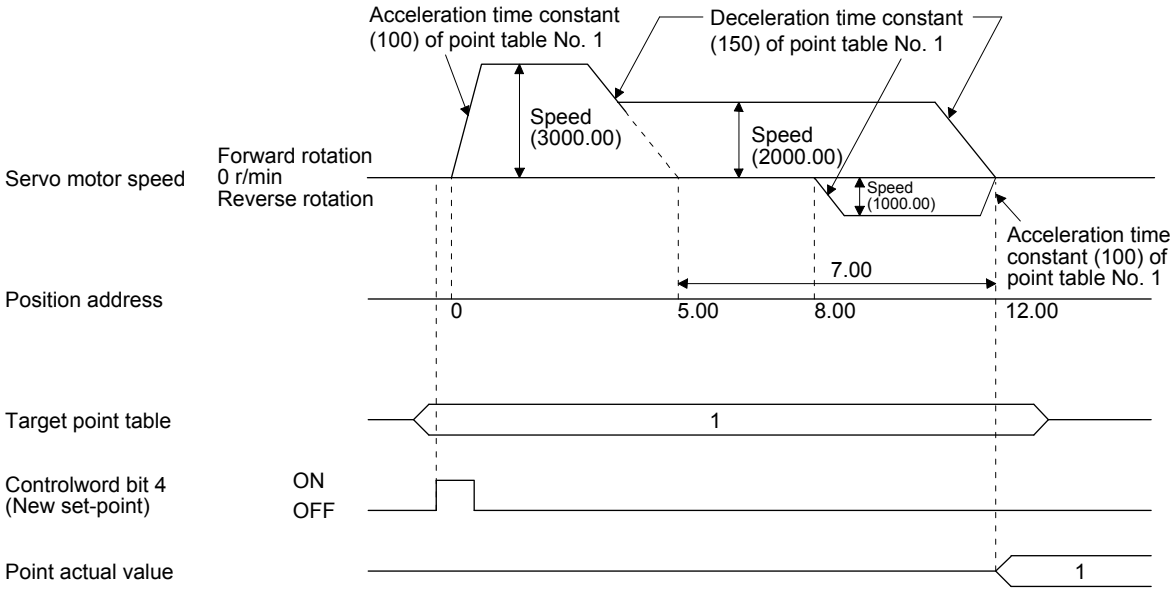


b) Positioning in the reverse direction during a series of point-table operation

The following shows an operation example with the set values listed in the table below.
In this example, point table No. 1 and No. 3 are set to the absolute value command method, and point table No. 2 to the incremental value command method.

Point table No.	Position data [10^{STM} µm]	Servo motor speed [r/min]	Acceleration time constant [ms]	Deceleration time constant [ms]	Dwell [ms] (Note 1)	Auxiliary function
1	5.00	3000.00	100	150	0	1
2	7.00	2000.00	Disabled	Disabled	0	3
3	8.00	1000.00	Disabled	Disabled	Disabled	0 (Note 2)

Note 1. Be sure to set "0".
2. Be sure to set "0" or "2" to the auxiliary function of the last point table of the consecutive point tables.
0: When using the point table with the absolute value command method
2: When using the point table with the incremental value command method



2) Incremental value command method ([Pr. PT01] = _ _ _ 1)

Setting "1" to the auxiliary function executes positioning at the speed set in the subsequent point table.

At this time, the position data selected at start is enabled, and the acceleration/deceleration time constant set in the next and subsequent point tables is disabled.

By setting "1" to auxiliary functions until point table No. 254, the operation can be performed at maximum 255 speeds.

Be sure to set "0" to the auxiliary function of the last point table.

To perform varying-speed operation, be sure to set "0" to the dwell.

Setting "1" or more enables the automatic continuous positioning operation.

The following table shows an example of setting.

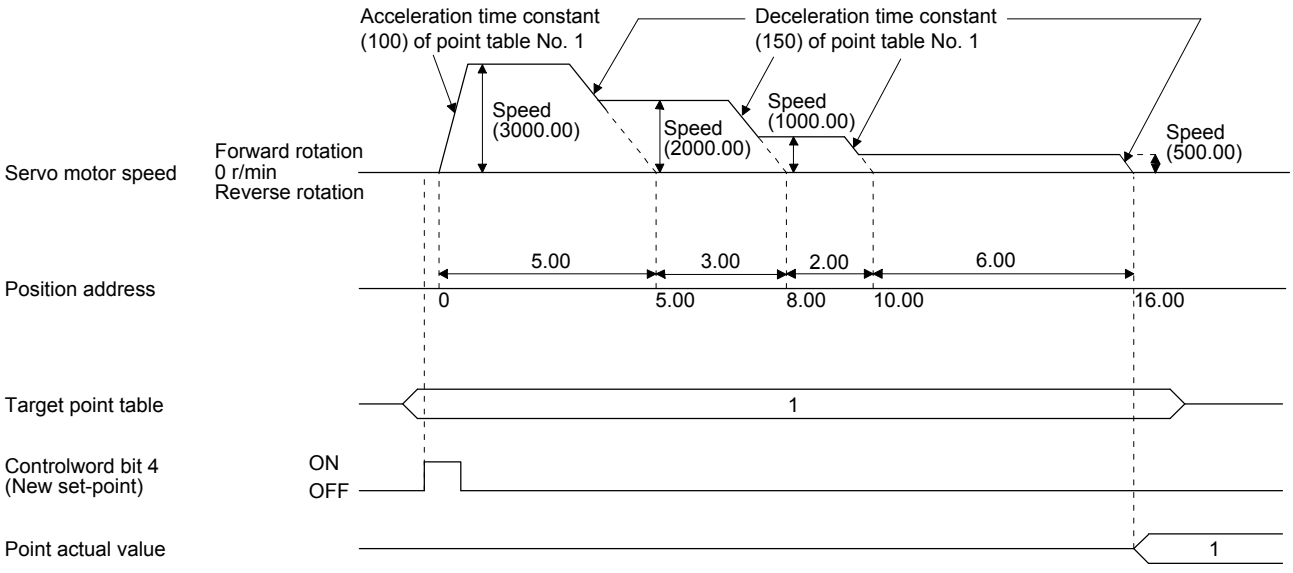
Point table No.	Dwell [ms] (Note 1)	Auxiliary function	Varying-speed operation
1	0	1	Consecutive point table data
2	0	1	
3	Disabled	0 (Note 2)	
4	0	1	Consecutive point table data
5	0	1	
6	Disabled	0 (Note 2)	

Note 1. Be sure to set "0".
2. Be sure to set "0" to the auxiliary function of the last point table of the consecutive point tables.

The following shows an operation example with the set values listed in the table below.

Point table No.	Position data [10^{STM} µm]	Servo motor speed [r/min]	Acceleration time constant [ms]	Deceleration time constant [ms]	Dwell [ms] (Note 1)	Auxiliary function
1	5.00	3000.00	100	150	0	1
2	3.00	2000.00	Disabled	Disabled	0	1
3	2.00	1000.00	Disabled	Disabled	0	1
4	6.00	500.00	Disabled	Disabled	Disabled	0 (Note 2)

Note 1. Be sure to set "0".
2. Be sure to set "0" to the auxiliary function of the last point table of the consecutive point tables.



(d) Automatic repeat positioning operation

By setting the auxiliary function of the point table, the sequence of operation patterns arranged on the point table can be restarted, enabling repetitive positioning operation.

1) Absolute value command method ([Pr. PT01] = _ _ _ 0)

Setting "8" or "10" to the auxiliary function performs an automatic continuous operation or a varying-speed operation until that point table, and after the completion of positioning, performs the operation again from the operation pattern of the point table No. used at start-up.

Setting "9" or "11" to the auxiliary function performs an automatic continuous operation or a varying-speed operation until that point table, and after the completion of positioning, performs the operation again from the operation pattern of point table No. 1.

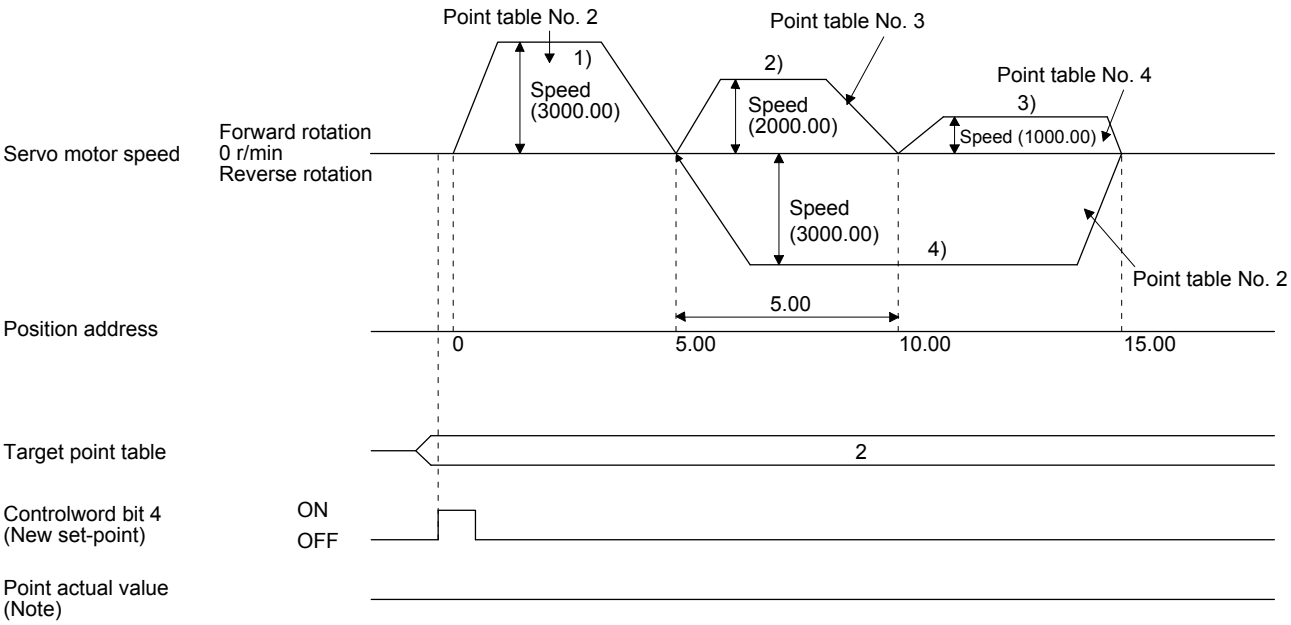
a) Automatic repeat positioning operation by absolute value command method

Example 1. Operations when "8" is set to the auxiliary function of point table No. 4

Point table No.	Position data [10^{STM} μm]	Servo motor speed [r/min]	Acceleration time constant [ms]	Deceleration time constant [ms]	Dwell [ms]	Auxiliary function
1	4.00	1500.00	200	100	150	1
2	5.00	3000.00	100	150	100	1
3	5.00	2000.00	150	200	200	3
4	15.00	1000.00	300	100	150	8

Operation sequence

1) Starting with point table No. 2
2) Executing point table No. 3
3) Executing point table No. 4
4) Executing again point table No. 2 used at start-up when "8" is set to the auxiliary function of point table No. 4
5) Repeating the above execution in the sequence of 2) to 3) to 4) to 2) to 3) to 4)



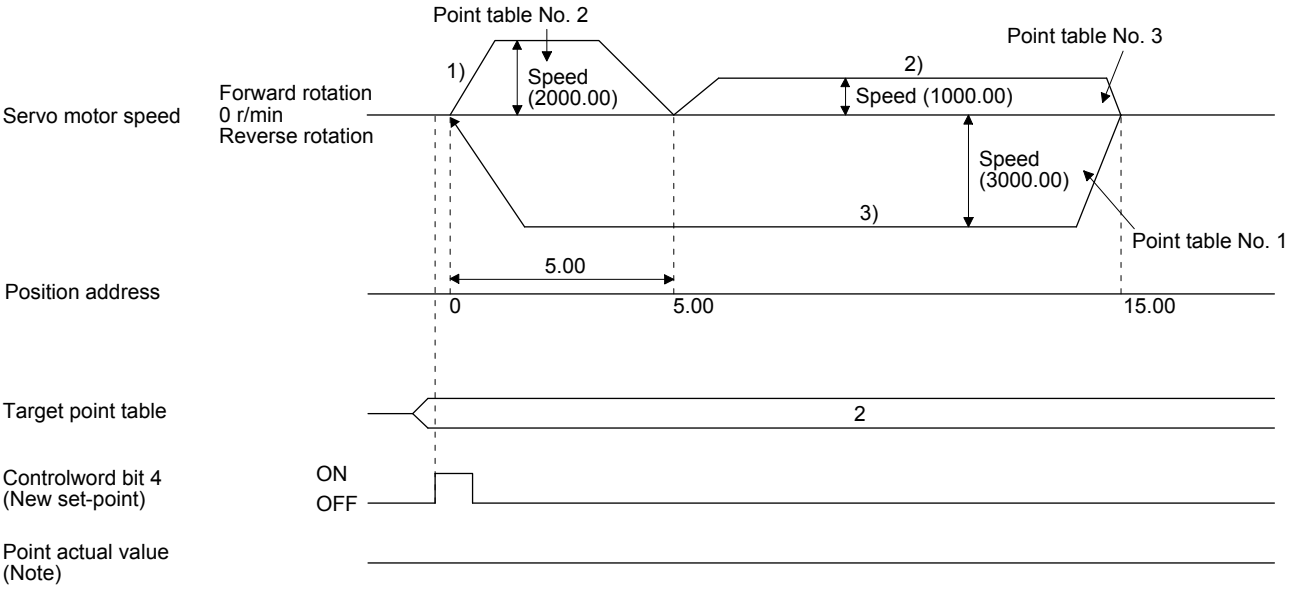
Note. "Point actual value" is not outputted in an automatic continuous operation.

Example 2. Operations when "9" is set to the auxiliary function of point table No. 3

Point table No.	Position data [10^{STM} µm]	Servo motor speed [r/min]	Acceleration time constant [ms]	Deceleration time constant [ms]	Dwell [ms]	Auxiliary function
1	0.00	3000.00	100	150	100	1
2	5.00	2000.00	150	200	200	1
3	15.00	1000.00	300	100	150	9

Operation sequence

1) Starting with point table No. 2
2) Executing point table No. 3
3) Executing point table No. 1 when "9" is set to the auxiliary function of point table No. 3
4) Repeating the above execution in the sequence of 1), 2), 3), 1), 2), 3)

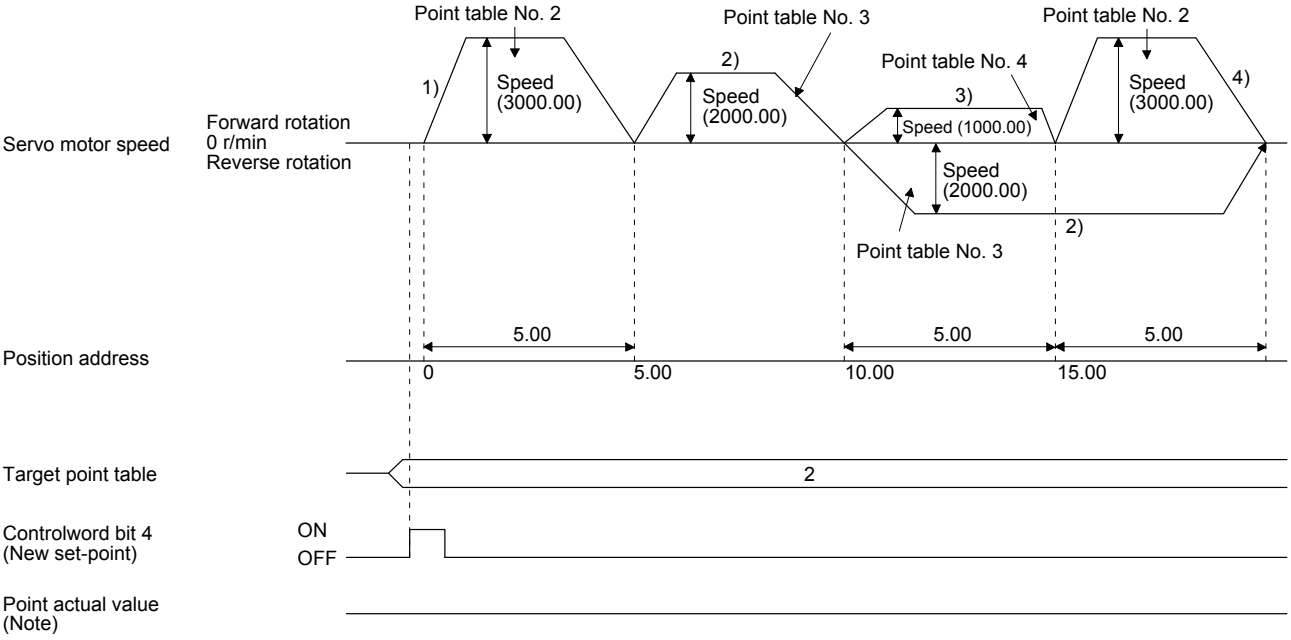


Note. "Point actual value" is not outputted in an automatic continuous operation.

b) Automatic repeat positioning operation by incremental value command method
Example 1. Operations when "10" is set to the auxiliary function of point table No. 4

Point table No.	Position data [10^{STM} µm]	Servo motor speed [r/min]	Acceleration time constant [ms]	Deceleration time constant [ms]	Dwell [ms]	Auxiliary function
1	4.00	1500.00	200	100	150	1
2	5.00	3000.00	100	150	100	3
3	10.00	2000.00	150	200	200	1
4	5.00	1000.00	300	100	150	10

Operation sequence
1) Starting with point table No. 2
2) Executing point table No. 3
3) Executing point table No. 4
4) Executing again point table No. 2 used at start-up when "10" is set to the auxiliary function of point table No. 4
5) Repeating the above execution in the sequence of 1), 2), 3), 4), 2), 3), 4)



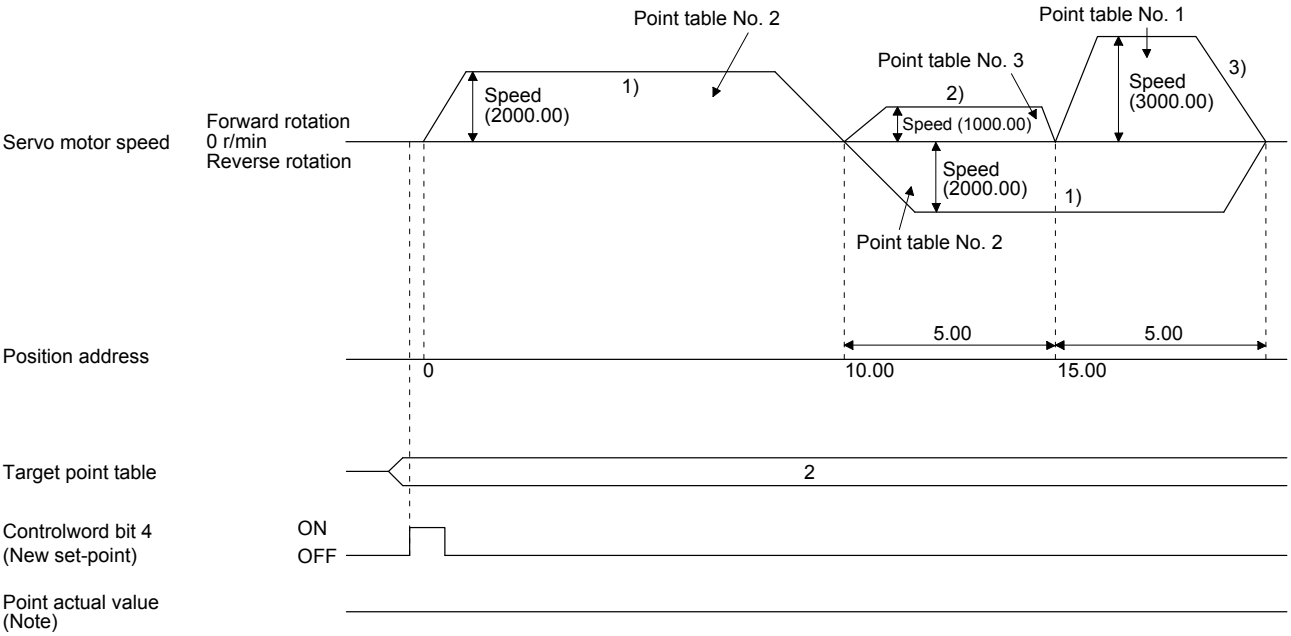
Note. "Point actual value" is not outputted in an automatic continuous operation.

Example 2. Operations when "11" is set to the auxiliary function of point table No. 3

Point table No.	Position data [10^{STM} µm]	Servo motor speed [r/min]	Acceleration time constant [ms]	Deceleration time constant [ms]	Dwell [ms]	Auxiliary function
1	5.00	3000.00	100	150	100	3
2	10.00	2000.00	150	200	200	1
3	5.00	1000.00	300	100	150	11

Operation sequence

1) Starting with point table No. 2
2) Executing point table No. 3
3) Executing point table No. 1 when "11" is set to the auxiliary function of point table No. 3
4) Repeating the above execution in the sequence of 1), 2), 3), 1), 2), 3)

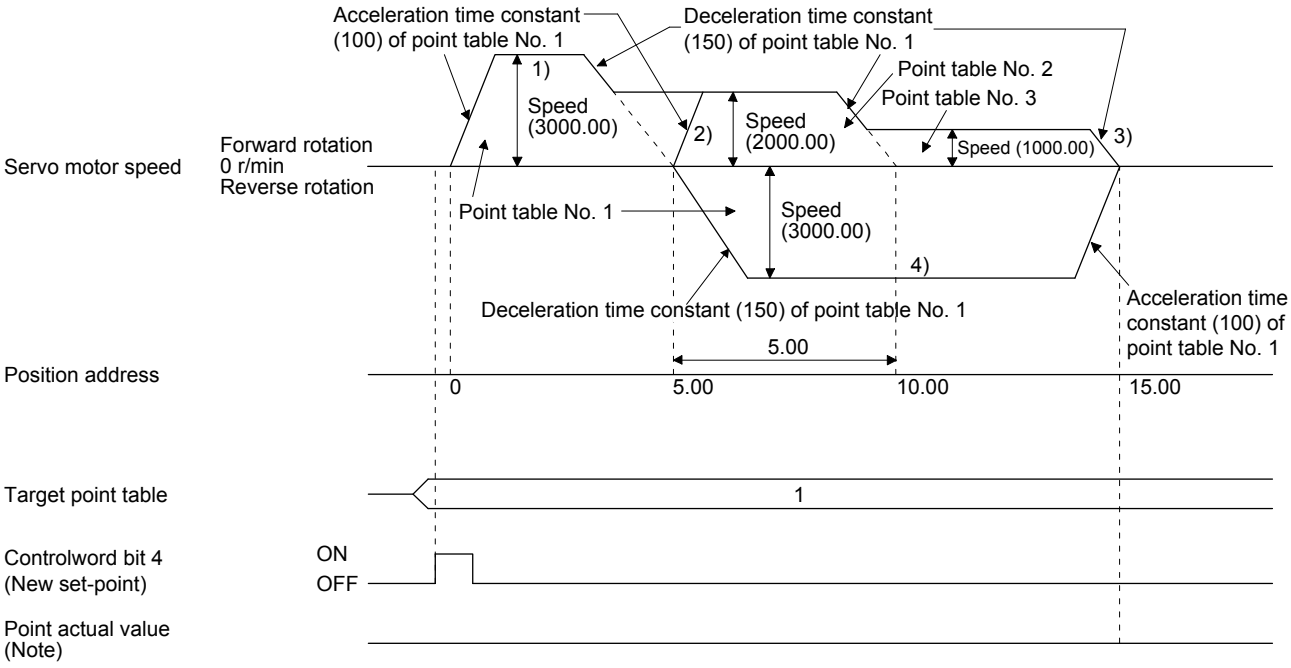


Note. "Point actual value" is not outputted in an automatic continuous operation.

c) Varying-speed operation by absolute value command method
Example. Operations when "8" is set to the auxiliary function of point table No. 3

Point table No.	Position data [10^{STM} μm]	Servo motor speed [r/min]	Acceleration time constant [ms]	Deceleration time constant [ms]	Dwell [ms]	Auxiliary function
1	5.00	3000.00	100	150	0	1
2	5.00	2000.00	Disabled	Disabled	0	3
3	15.00	1000.00	Disabled	Disabled	0	8

Operation sequence
1) Starting with point table No. 1
2) Varying the speed and executing point table No. 2
3) Varying the speed and executing point table No. 3
4) Executing point table No. 1 used at start-up in CW direction when "8" is set to the auxiliary function of point table No. 3
5) Repeating the above execution in the sequence of 1), 2), 3), 4), 2), 3), 4)



Note. "Point actual value" is not outputted in an automatic continuous operation.

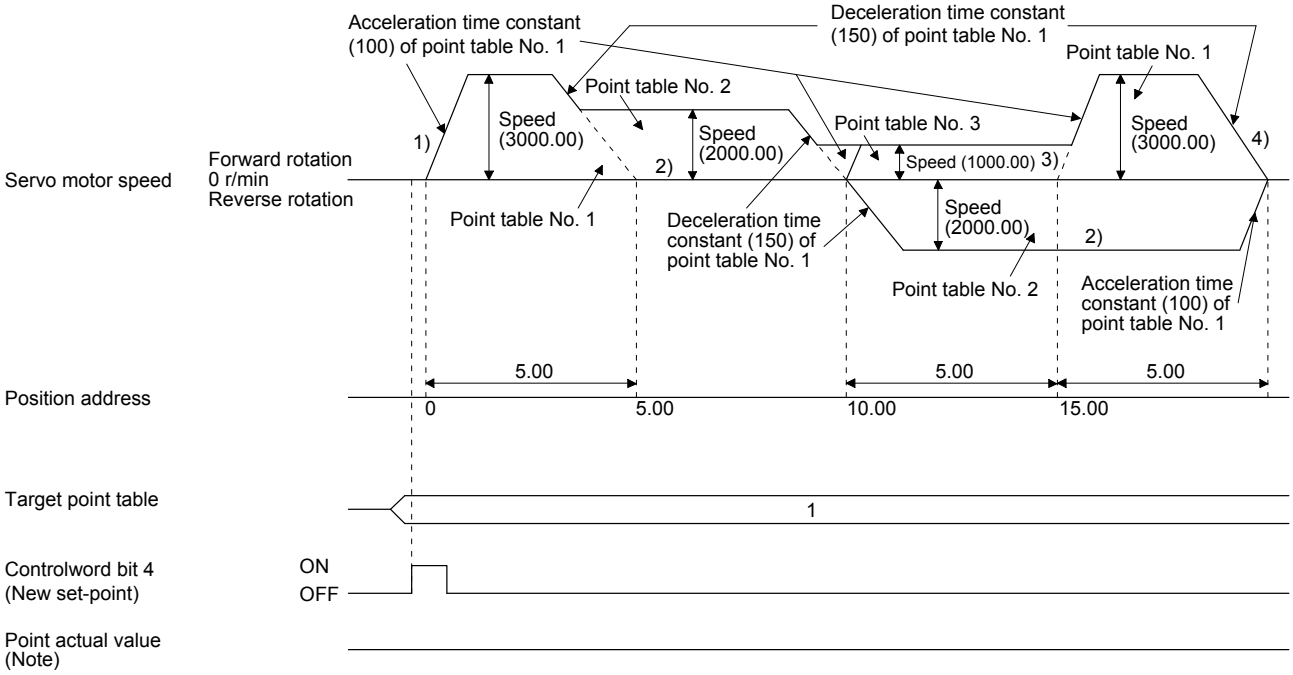
d) Varying-speed operation by incremental value command method

Example. Operations when "10" is set to the auxiliary function of point table No. 3

Point table No.	Position data [10^{STM} μm]	Servo motor speed [r/min]	Acceleration time constant [ms]	Deceleration time constant [ms]	Dwell [ms]	Auxiliary function
1	5.00	3000.00	100	150	0	3
2	10.00	2000.00	150	200	0	1
3	5.00	1000.00	300	100	0	10

Operation sequence

1) Starting with point table No. 1
2) Varying the speed and executing point table No. 2
3) Varying the speed and executing point table No. 3
4) Varying the speed, and executing point table No. 1 when "10" is set to the auxiliary function of point table No. 3
5) Repeating the above execution in the sequence of 1), 2), 3), 4), 2), 3), 4)



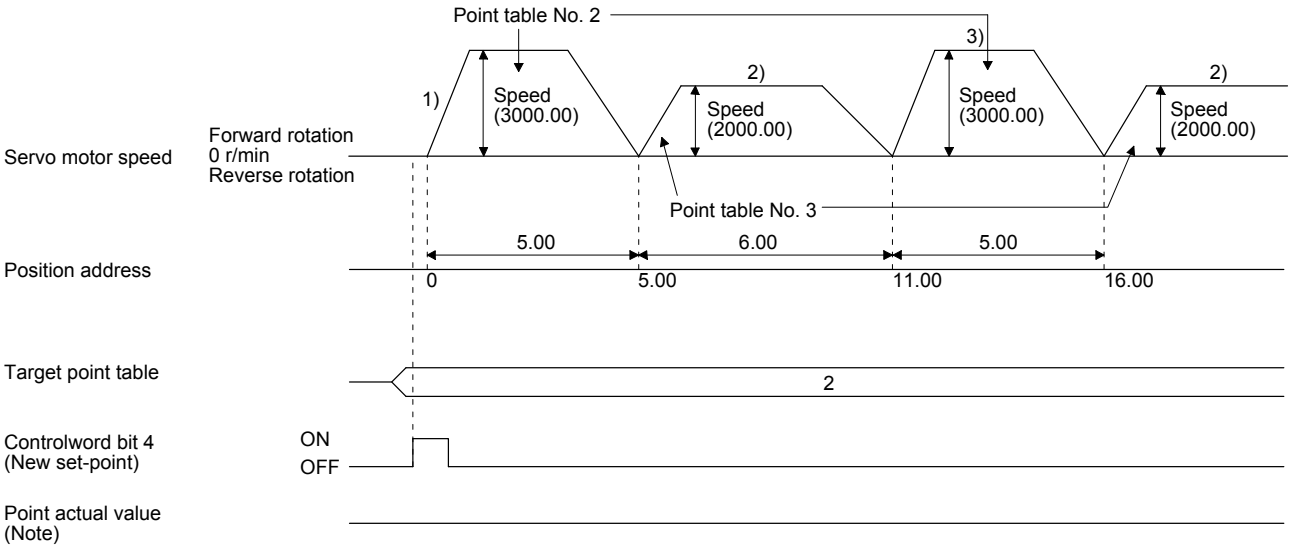
Note. "Point actual value" is not outputted in an automatic continuous operation.

2) Incremental value command method ([Pr. PT01] = _ _ _ 1)
Setting "8" to the auxiliary function performs automatic continuous operation or varying-speed operation until that point table, and after the completion of positioning, performs the operation again from the operation pattern of the set point table.
Setting "9" to the auxiliary function performs an automatic continuous operation or a varying-speed operation until that point table, and after the completion of positioning, performs the operation again from the operation pattern of point table No. 1.

b) Automatic repeat positioning operation by incremental value command method
Example 1. Operations when "8" is set to the auxiliary function of point table No. 3

Point table No.	Position data [10^{STM} µm]	Servo motor speed [r/min]	Acceleration time constant [ms]	Deceleration time constant [ms]	Dwell [ms]	Auxiliary function
1	4.00	1500.00	200	100	150	1
2	5.00	3000.00	100	150	100	1
3	6.00	2000.00	150	200	200	8

Operation sequence
1) Starting with point table No. 2
2) Executing point table No. 3
3) Executing again point table No. 2 used at start-up when "8" is set to the auxiliary function of point table No. 3
4) Repeating the above execution in the sequence of 1), 2), 3), 2), 3)



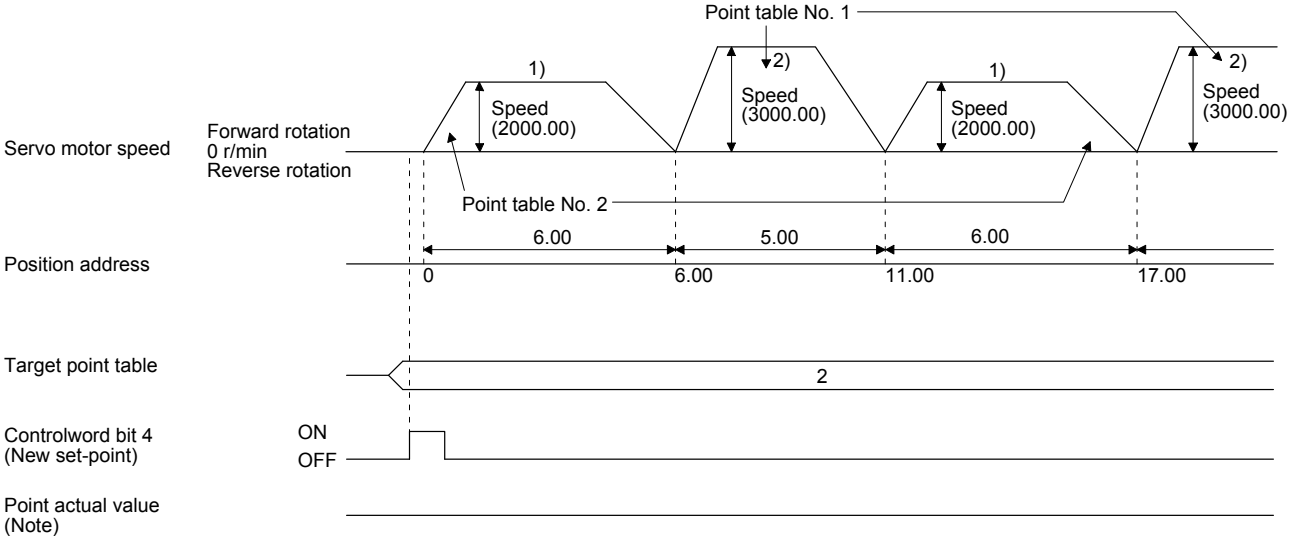
Note. "Point actual value" is not outputted in an automatic continuous operation.

Example 2. Operations when "9" is set to the auxiliary function of point table No. 2

Point table No.	Position data [10^{STM} µm]	Servo motor speed [r/min]	Acceleration time constant [ms]	Deceleration time constant [ms]	Dwell [ms]	Auxiliary function
1	5.00	3000.00	100	150	100	1
2	6.00	2000.00	150	200	200	9

Operation sequence

1) Starting with point table No. 2
2) Executing point table No. 1 when "9" is set to the auxiliary function of point table No. 2
3) Repeating the above execution in the sequence of 1), 2), 1), 2)



Note. "Point actual value" is not outputted in an automatic continuous operation.

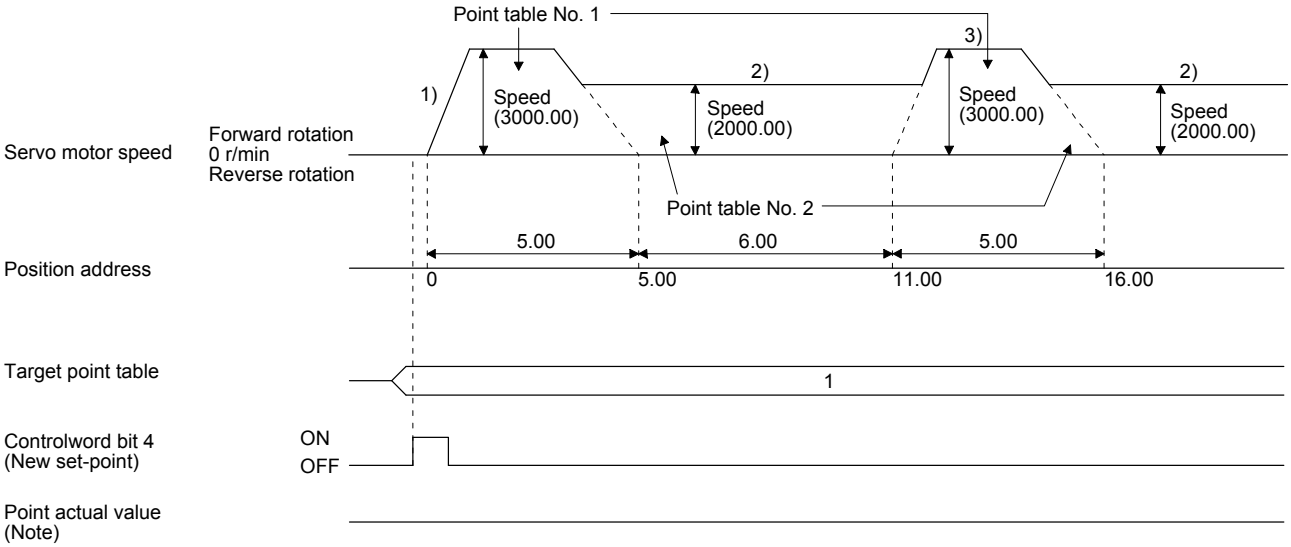
b) Varying-speed operation by incremental value command method

Example. Operations when "8" is set to the auxiliary function of point table No. 2

Point table No.	Position data [10^{STM} µm]	Servo motor speed [r/min]	Acceleration time constant [ms]	Deceleration time constant [ms]	Dwell [ms]	Auxiliary function
1	5.00	3000.00	100	150	0	1
2	6.00	2000.00	Disabled	Disabled	0	8

Operation sequence

1) Starting with point table No. 1
2) Varying the speed and executing point table No. 2
3) Executing again point table No. 1 used at start-up when "8" is set to the auxiliary function of point table No. 2
4) Repeating the above execution in the sequence of 1), 2), 3), 2), 3)



Note. "Point actual value" is not outputted in an automatic continuous operation.

(e) Temporary stop/restart

When "Controlword bit 8 (HALT)" is switched on during automatic operation, the servo motor decelerates with the deceleration time constant of the point table being executed, and then stops temporarily. When "Controlword bit 8 (HALT)" is switched off during a temporary stop, the servo motor starts to travel for the remaining travel distance.

"Controlword bit 4 (New set-point)" does not function even it is switched on during a temporary stop.

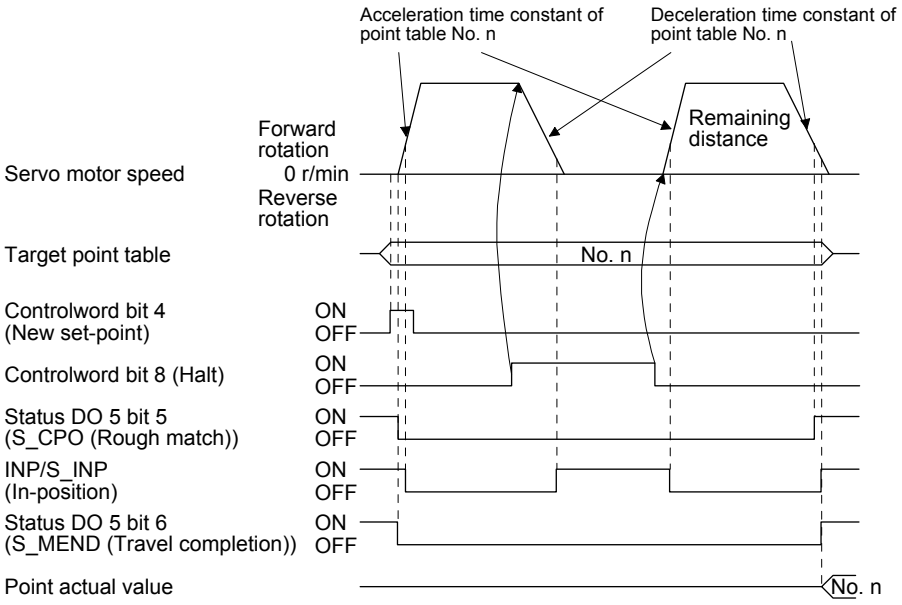
When any of the following conditions is satisfied during a temporary stop, the remaining travel distance is cleared.

- The control mode is changed from the point table mode (pt) to the Jog mode (jg).
- The servo motor enters the servo-off status.

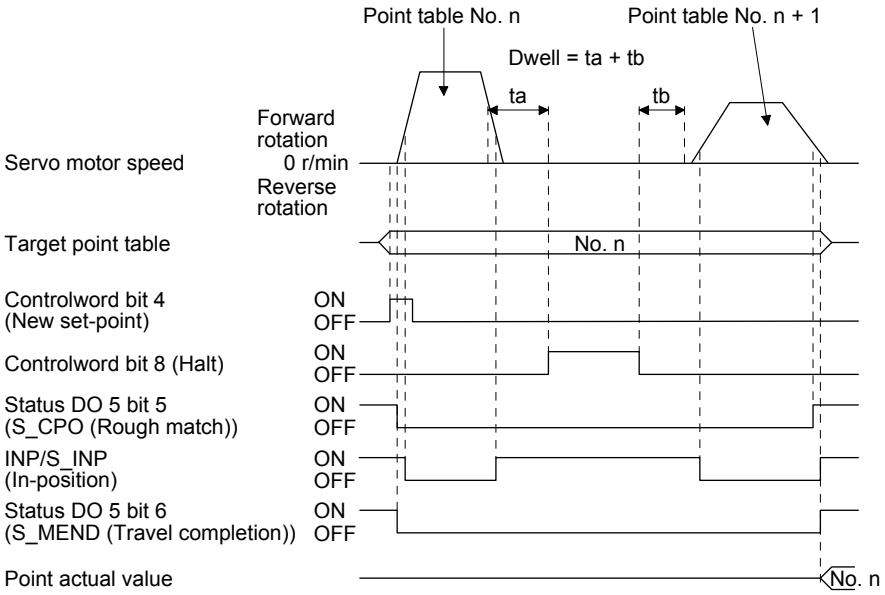
The temporary stop/restart input functions in the following status.

Operation status	Point table mode (pt)	Jog mode (jg)	Homing mode (hm)
During a stop		Temporary stop	Temporary stop
During acceleration	Temporary stop	Temporary stop	Temporary stop
At a constant speed	Temporary stop	Temporary stop	Temporary stop
During deceleration		Temporary stop	Temporary stop
During a temporary stop	Restart	Restart	Stop

1) When the servo motor is rotating

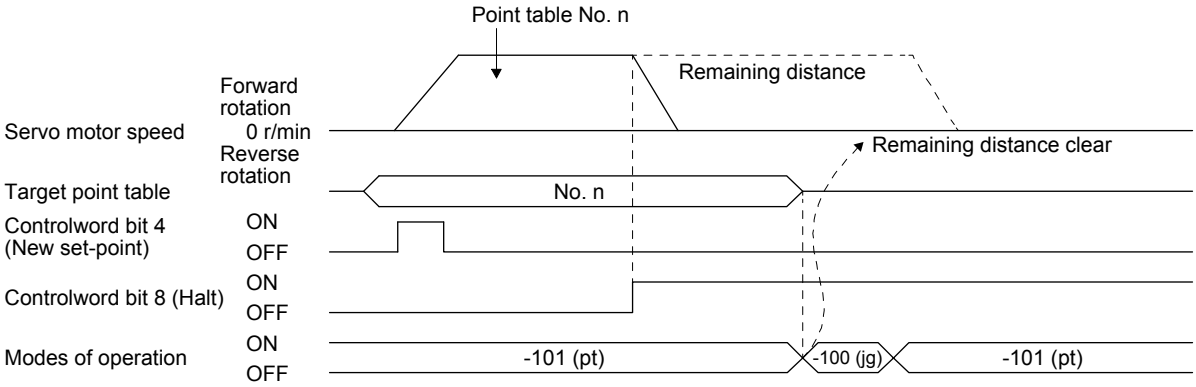


2) During dwell



(f) Suspension of point table operation

To suspend the point table operation or change the operation pattern, stop the servo motor with "Controlword bit 8 (HALT)" and switch the control mode to Jog operation (jg) with "Modes of operation". The remaining travel distance is cleared.



6.3 Indexer mode (idx)

POINT

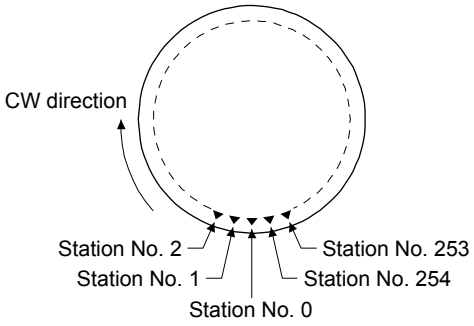
- In the absolute position detection system, rotating the shaft one revolution or more during power-off may erase the home position. Therefore, do not rotate the shaft one revolution or more during power-off. When the home position is erased, [AL. 90 Home position return incomplete warning] will occur. In that case, execute the home position return again.
- The indexer method cannot be used in the fully closed loop system and linear servo system. The combination of the indexer method and fully closed loop system/linear servo system triggers [AL. 37 Parameter error].
- There are the following restrictions on [Pr. PA06 Number of gear teeth on machine side] and the servo motor speed (N).
  - When CMX ≤ 2000, N < 3076.7 r/min
  - When CMX > 2000, N < (3276.7 - CMX)/10 r/min

  When the servo motor is operated at a servo motor speed higher than the limit value, [AL. E3 Absolute position counter warning] will occur.
- When the same next station No. is specified as station No. of the current position and a positioning operation is executed, the motor does not start because the travel distance is determined as "0".
- In the indexer method, "Touch probe function" is disabled.
- In the indexer method, "Position actual value", "Touch probe status", "Touch probe pos1 pos value", "Touch probe pos1 neg value", "Touch probe pos2 pos value" and "Touch probe pos2 neg value" will be always 0.
- The setting value of [Pr. PC77 Internal torque limit 2] is automatically enabled depending on the operation status. The initial value of [Pr. PC77] is 0.0%. When you use indexer operation, change the value. If the value remains unchanged, the servo motor coasts.

6.3.1 Indexer mode (idx)

(1) Logic of indexer

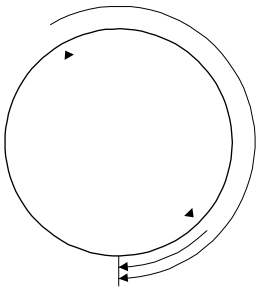
The circumference of the load side (360 degrees) can be divided into a maximum of 255 stations. Positioning is executed to a station selected with "Target point table". The following diagram is an example for when [Pr. PA14] is set to "0".



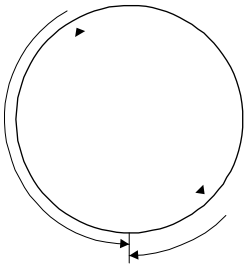
The station No. 0 is set as a home position. Set the number of stations with [Pr. PT28].

(2) Rotation direction

There are two operation methods: Rotation direction specifying indexer, which always rotates in a fixed direction and executes positioning to a station; Shortest rotating indexer, which automatically changes a rotation direction to the shortest distance and executes positioning to a station.



Rotation direction specifying indexer



Shortest rotating indexer

6.3.2 Rotation direction specifying indexer

In this operation mode, the servo motor rotates in a fixed direction to execute positioning to a station. Select a station No. with "Target point table" to execute positioning. The values set in the object are used for the servo motor speed, acceleration time constant, and deceleration time constant during operation.

(1) Setting

Set objects and parameters as shown below.

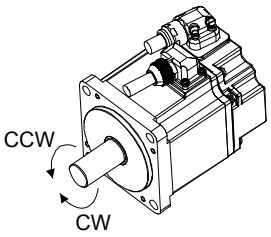
Item	Object/parameter to be used	Setting
Indexer mode (idx) selection	Modes of operation	Set "-103".
Next station position	Target point table	Set any next station No.
Rotation direction specifying indexer selection	Controlword	Turn off "Controlword bit 6 (Operation mode)".
Servo motor speed	Profile velocity	Set the servo motor speed.
	Target speed No.	Set the command speed to the next station to be executed. When "Profile velocity", "Profile Acceleration", and "Profile deceleration" are all set to values other than 0, the set value of "Target speed No." is disabled.
Acceleration time constant	Profile Acceleration	Set the acceleration time constant.
	Target speed No.	Set the acceleration time constant to the next station to be executed. When "Profile velocity", "Profile Acceleration", and "Profile deceleration" are all set to values other than 0, the set value of "Target speed No." is disabled.
Deceleration time constant	Profile deceleration	Set the deceleration time constant.
	Target speed No.	Set the deceleration time constant to the next station to be executed. When "Profile velocity", "Profile Acceleration", and "Profile deceleration" are all set to values other than 0, the set value of "Target speed No." is disabled.
Speed limit	Max profile velocity	Set a limit value of operation speed.
Torque limit (Note)	Positive torque limit value Negative torque limit value	Set a torque limit value in operation.
	[Pr. PC77]	Set a torque limit value in stop.
	[Pr. PT39]	Set a time period for switching from the torque limit value in operation to that in stop.

Note. The torque limit will change from the setting value of [Pr. PC77] to the setting value of "Positive torque limit value" or "Negative torque limit value" when "Controlword bit 4 (New set-point)" is inputted. After the output of S_MEND (Travel completion) and the time set with [Pr. PT39] has passed, the torque limit will be switched from the setting value of "Positive torque limit value" or "Negative torque limit value" to the setting value of [Pr. PC77].

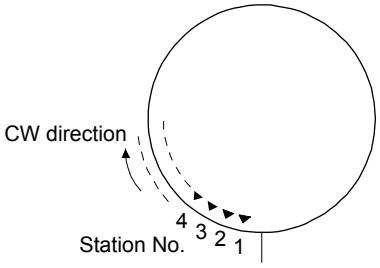
(2) Other parameter settings

(a) Setting assignment direction of station No.

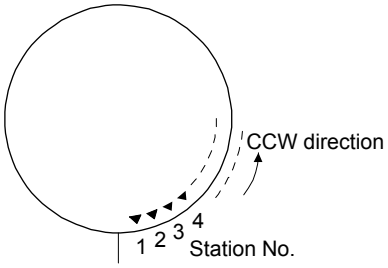
Select an assignment direction of station No. with [Pr. PA14].



[Pr. PA14] setting	Assignment direction of station No.
0	Next station No. will be assigned in CW direction in order of 1, 2, 3…
1	Next station No. will be assigned in CCW direction in order of 1, 2, 3…



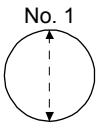
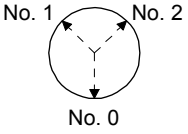
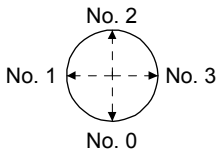
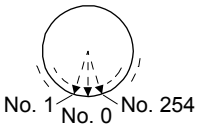
[Pr. PA14]: 0 (initial value)



[Pr. PA14]: 1

(b) Setting number of stations

Set a number of stations to [Pr. PT28].

	[Pr. PT28] setting value				
Number of stations	2	3	4	. . .	255
Station No.				. . .	

(3) Operation

Selecting the next station with "Target point table" and switching on "Controlword bit 4 (New set-point)" starts positioning to the selected next station at the set speed, acceleration time constant and deceleration time constant.

Item	Object to be used	Setting
Rotation direction selection	Controlword	Set the rotation direction in "Controlword bit 5 (Direction)". The setting is shown as follows: Off: Station No. decreasing direction On: Station No. increasing direction
Station No. selection	Target point table	Set a station No. at which positioning starts.
Start	Controlword	Switch on "Controlword bit 4 (New set-point)".

6.3.3 Shortest rotating indexer

This operation mode automatically changes a rotation direction to the shortest distance to execute positioning to a station.
Select a station No. with "Target point table" to execute positioning. The values set in the object are used for the servo motor speed, acceleration time constant, and deceleration time constant during operation.

(1) Setting

Set objects and parameters as shown below.

Item	Object/parameter to be used	Setting
Indexer mode (idx) selection	Modes of operation	Set "-103".
Next station position	Target point table	Set any next station No.
Shortest rotating indexer selection	Controlword	Switch on "Controlword bit 6 (Operation mode)".
Servo motor speed	Profile velocity	Set the servo motor speed.
	Target speed No.	Set the command speed to the next station to be executed. When "Profile velocity", "Profile Acceleration", and "Profile deceleration" are all set to values other than 0, the set value of "Target speed No." is disabled.
Acceleration time constant	Profile Acceleration	Set the acceleration time constant.
	Target speed No.	Set the acceleration time constant to the next station to be executed. When "Profile velocity", "Profile Acceleration", and "Profile deceleration" are all set to values other than 0, the set value of "Target speed No." is disabled.
Deceleration time constant	Profile deceleration	Set the deceleration time constant.
	Target speed No.	Set the deceleration time constant to the next station to be executed. When "Profile velocity", "Profile Acceleration", and "Profile deceleration" are all set to values other than 0, the set value of "Target speed No." is disabled.
Speed limit	Max profile velocity	Set a limit value of operation speed.
Torque limit (Note)	Positive torque limit value Negative torque limit value	Set a torque limit value in operation.
	[Pr. PC77]	Set a torque limit value in stop.
	[Pr. PT39]	Set a time period for switching from the torque limit value in operation to that in stop.

Note. The torque limit will change from the setting value of [Pr. PC77] to the setting value of "Positive torque limit value" or "Negative torque limit value" when "Controlword bit 4 (New set-point)" is inputted. After the output of S_MEND (Travel completion) and the time set with [Pr. PT39] has passed, the torque limit will be switched from the setting value of "Positive torque limit value" or "Negative torque limit value" to the setting value of [Pr. PC77].

(2) Other parameter settings

The setting is the same as in the rotation direction specifying indexer. Refer to section 6.3.2.

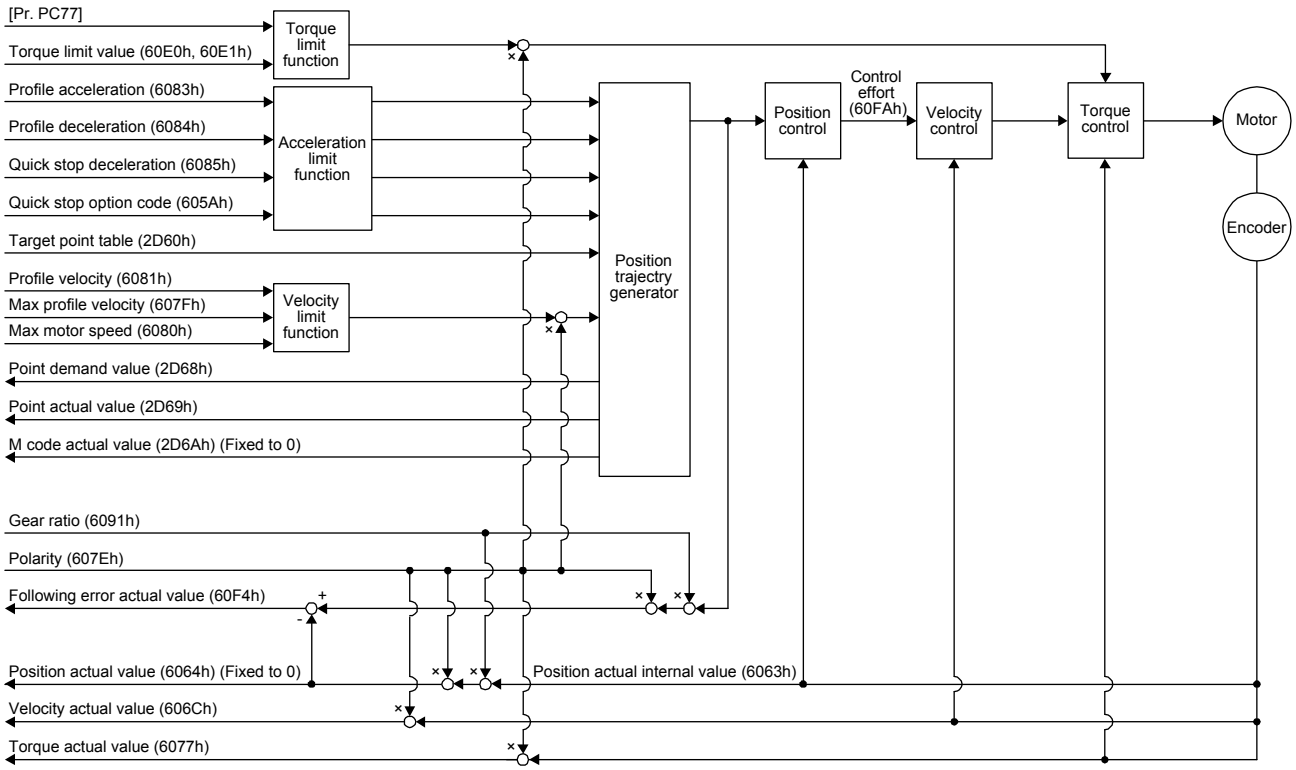
(3) Operation

Selecting the next station with "Target point table" and switching on "Controlword bit 4 (New set-point)" starts positioning to the selected next station at the set speed, acceleration time constant and deceleration time constant.

Item	Object to be used	Setting
Station No. selection	Target point table	Set a station No. at which positioning starts.
Start	Controlword	Switch on "Controlword bit 4 (New set-point)".

6.3.4 Related object

The following shows the functions and related objects of the indexer mode (idx).



(1) Related object

Index	Sub	Name	Data Type	Access	Default	Description
607Fh		Max profile velocity	U32	rw	2000000	maximum speed Unit: Vel unit (0.01 r/min)
6080h		Max motor speed	U32	rw		Servo motor maximum speed Unit: r/min
6081h		Profile velocity	U32	rw	10000	Speed after acceleration completed Unit: Vel unit (0.01 r/min)
6083h		Profile acceleration	U32	rw	0	Acceleration at start of movement to target position Unit: ms
6084h		Profile deceleration	U32	rw	0	Deceleration at arrival at target position Unit: ms
6085h		Quick stop deceleration	U32	rw	100	Deceleration time constant for Quick stop Unit: ms
605Ah		Quick stop option code	I16	rw	2	Operation setting for Quick stop Refer to chapter 10.
6063h		Position actual internal value	I32	ro		Current position (Enc inc)
6064h		Position actual value	I32	ro		Current position (Pos units) Fixed to 0

Index	Sub	Name	Data Type	Access	Default	Description
606Ch		Velocity actual value	I32	ro		Current speed Unit: Vel unit (0.01 r/min)
6077h		Torque actual value	I32	ro		Current torque Unit: 0.1% (rated torque of 100%)
6092h	0	Feed constant	U8	ro	2	Travel distance per revolution of an output shaft Refer to chapter 10.
	1	Feed	U32	rw		Travel distance setting
	2	Shaft revolutions				Number of servo motor shaft revolutions
60F4h		Following error actual value	I32	ro		Droop pulses (Pos units) (Note)
60FAh		Control effort	I32	ro		Position control loop output (speed command) Unit: Vel unit (0.01 r/min)
60E0h		Positive torque limit value	U16	rw	10000	Torque limit value (forward) Unit: 0.1% (rated torque of 100%)
60E1h		Negative torque limit value	U16	rw	10000	Torque limit value (reverse) Unit: 0.1% (rated torque of 100%)
6091h	0	Gear ratio	U8	ro	2	Gear ratio
	1	Motor revolutions	U32	rw	1	Number of gear teeth on machine side
	2	Shaft revolutions			1	Number of gear teeth on servo motor side
607Eh		Polarity	U8	rw	0	Polarity selection Bit 7: Position POL Bit 6: Velocity POL Bit 5: Torque POL Refer to chapter 10.
60A8h		SI unit position	U32	rw	0	SI unit position 00000000h (no unit) Refer to chapter 10.
60A9h		SI unit velocity	U32	rw	0	SI unit velocity FEB44700h (0.01 r/min)
2D60h		Target point table	I16	rw	0	Point table command Set next station No. 0 to 254: Positioning operation to specified stations
2D68h		Point demand value	I16	ro		Point table demand The currently specified next station No. is returned. While the servo motor is stopped, the value becomes the setting value of the Target point table (2D60h).
2D69h		Point actual value	I16	ro		Current point table The completed point table is returned. The previous value is held until the operation completes.
2DD1h		Target speed No.	I16	rw		Target speed No. Specify the point table No. in which the command speed, acceleration time constant, and deceleration time constant of the next station to execute are set. When "Profile velocity (6081h)", "Profile acceleration (6083h)", and "Profile deceleration (6084h)" are all set to values other than 0, the set value of this Index is disabled.

Note. In the indexer method, the unit is the command unit [pulse] (a load-side rotation expressed by the number of servo motor resolution pulses).

(2) Details on the OMS bit of Controlword (idx mode)

Bit	Symbol	Description
4	New set-point	The operation starts toward the point table specified with the Target point table (2D60h) when the bit turns on.
5	Direction	0: Station No. decreasing direction 1: Station No. increasing direction
6	Operation mode	0: Rotation direction specifying indexer operation 1: Shortest rotating indexer operation
8	(reserved)	The value at reading is undefined. Set "0" when writing.
9	(reserved)	

(3) Details on the OMS bit of Statusword (idx mode)

Bit	Symbol	Description
10	(reserved)	The value at reading is undefined.
12	Set-point acknowledge	0: Positioning completed (wait for next command) 1: Positioning being executed
13	Following error	0: No following error 1: Following error Judgment condition for Following error When the time set with [Pr. PC69 Following error output filtering time] has elapsed with the number of droop pulses exceeding the setting value of the [Pr. PC67/Pr. PC68 Following error output level], this bit becomes "1".

6.3.5 Directions for use

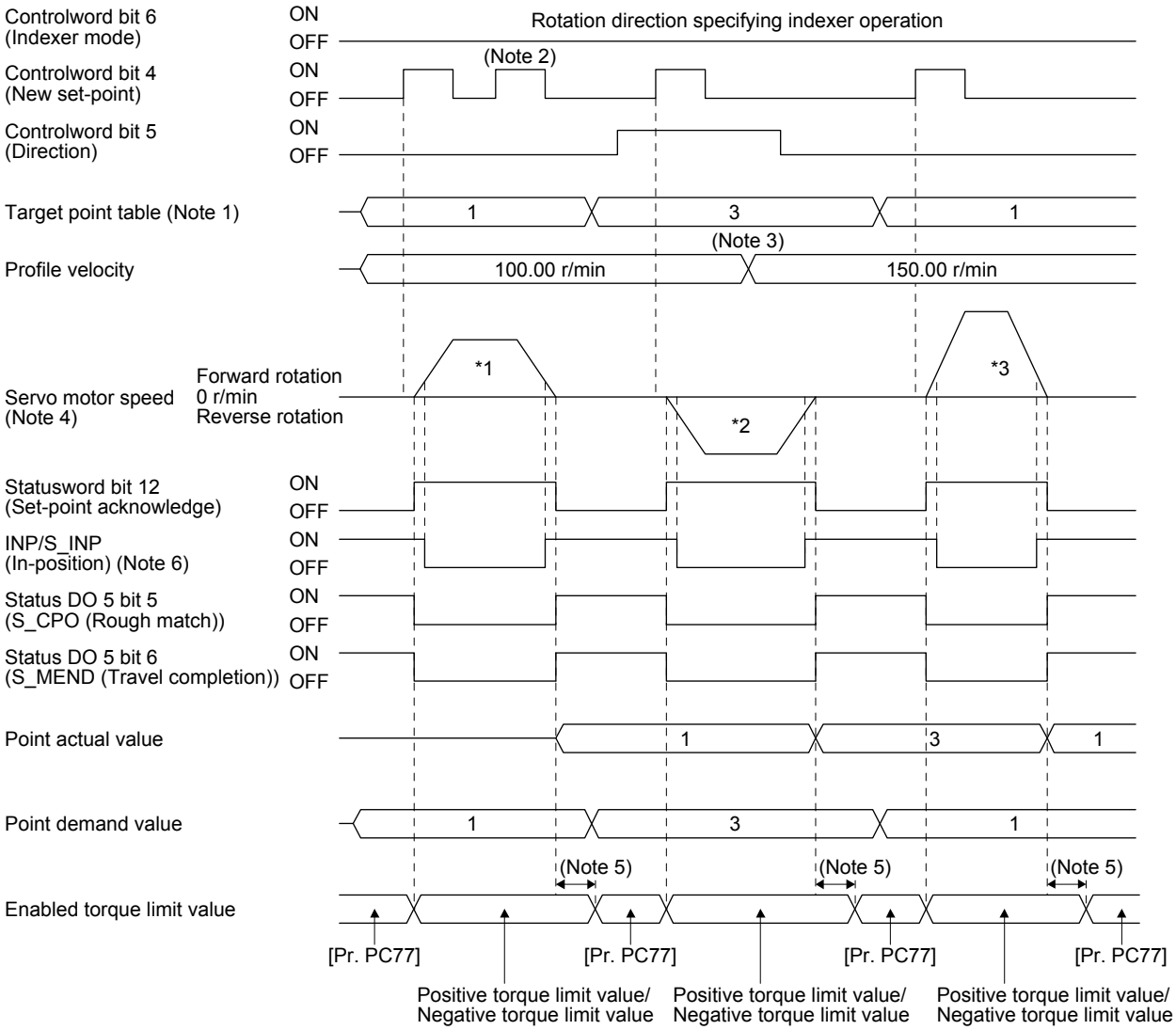
(1) idx mode operation sequence

(a) Rotation direction specifying indexer

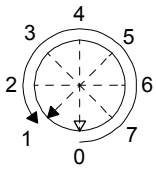
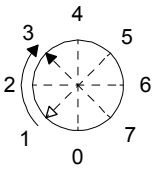
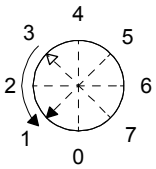
POINT
●Be sure to perform a home position return. Executing positioning operation without home position return will trigger [AL. 90 Home position return incomplete warning] and "Controlword bit 4 (New set-point)" will be disabled.

The servo motor rotates in a fixed direction to execute positioning to a station.
The following timing chart shows that an operation is started from being stopped at the station No. 0 at servo-on.

1) When using Profile velocity (6081h), Profile Acceleration (6083h), Profile deceleration (6084h)
For the servo motor speed, acceleration time constant and deceleration time constant during operation, the values set in Profile velocity (6081h), Profile acceleration (6083h), and Profile deceleration (6084h) are used.



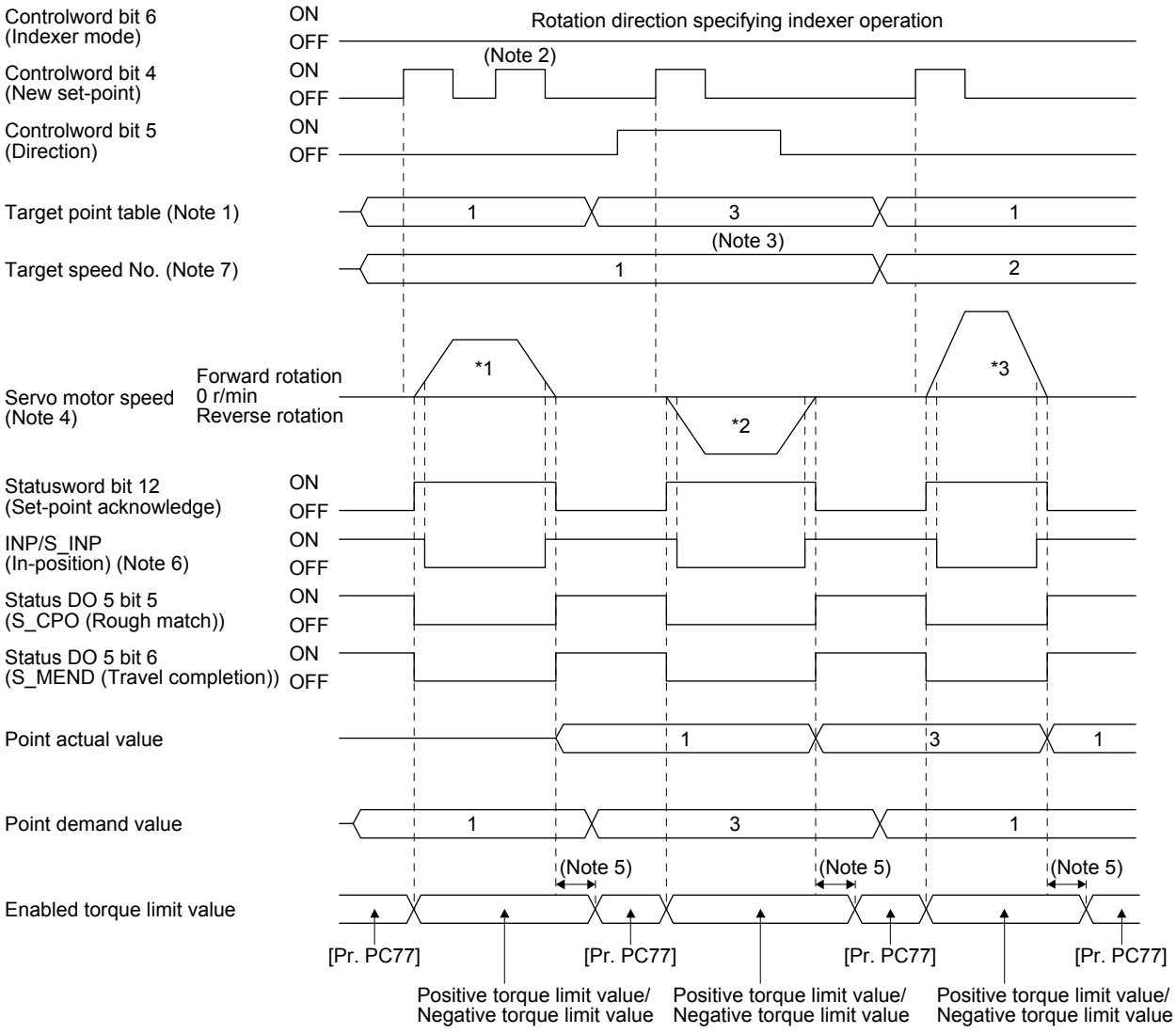
Note 1. When the specified station No. exceeds the value set in [Pr. PT28 Number of stations per rotation] -1, the servo motor does not operate.
2. "Controlword bit 4 (New set-point)" is not received when the remaining command travel distance is other than "0".
3. Switching "Profile velocity" during the servo motor rotation does not enable this.
4. The following shows the operations to be executed.

Operation	*1	*2	*3
Next station No.	No. 1	No. 3	No. 1
Servo motor speed	100.00 r/min	100.00 r/min	150.00 r/min
Positioning			

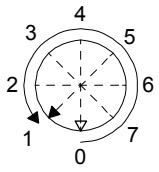
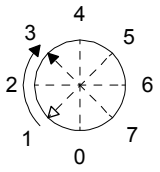
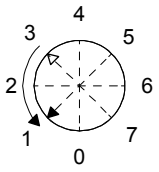
5. A delay time can be set with [Pr. PT39].
6. After power-on, this turns on if the value is within the in-position range of the corresponding station position.

2) When using Target speed No. (2DD1h)
For the servo motor speed, acceleration time constant and deceleration time constant during operation, the values set in the point table are used. Set the point table No. to be used in Target speed No. (2DD1h)

Point table No.	Servo motor speed [r/min]	Acceleration time constant [ms]	Deceleration time constant [ms]
1	100.00	200	200
2	150.00	150	150



Note 1. When the specified station No. exceeds the value set in [Pr. PT28 Number of stations per rotation] -1, the servo motor does not operate.
2. "Controlword bit 4 (New set-point)" is not received when the remaining command travel distance is other than "0".
3. Switching "Profile velocity" during the servo motor rotation does not enable this.
4. The following shows the operations to be executed.

Operation	*1	*2	*3
Next station No.	No. 1	No. 3	No. 1
Servo motor speed	100.00 r/min	100.00 r/min	150.00 r/min
Positioning			

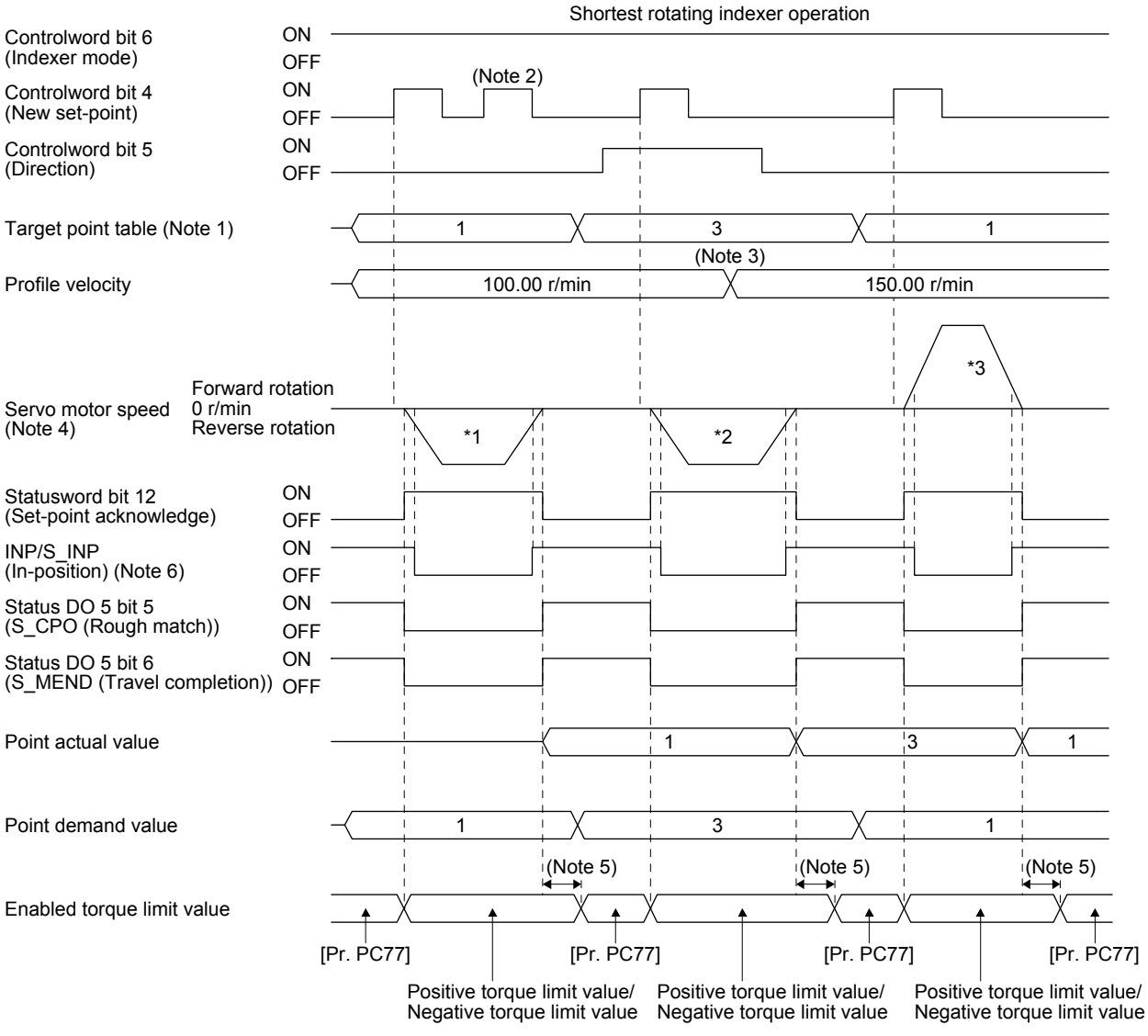
5. A delay time can be set with [Pr. PT39].
6. After power-on, this turns on if the value is within the in-position range of the corresponding station position.
7. This is enabled when any of Profile velocity (6081h), Profile Acceleration (6083h), or Profile deceleration (6084h) is set to 0.

(b) Shortest rotating indexer

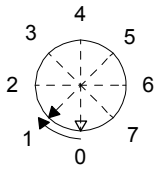
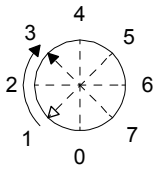
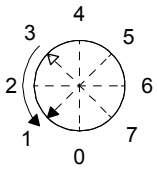
POINT
●Be sure to perform a home position return. Executing positioning operation without home position return will trigger [AL. 90 Home position return incomplete warning] and "Controlword bit 4 (New set-point)" will be disabled. ●When travel distances to a target station position from CCW and from CW are the same, the shaft will rotate to the increasing direction of the station No.

This operation mode automatically changes a rotation direction to the shortest distance to execute positioning to a station. When Controlword bit6 (Indexer mode) is on, the shortest rotating indexer operation is enabled.
This disables "Controlword bit 5 (Direction)". The following timing chart shows that an operation is performed at a stop of the station No. 0 when servo-on.

1) When using Profile velocity (6081h), Profile Acceleration (6083h), Profile deceleration (6084h)
For the servo motor speed, acceleration time constant and deceleration time constant during operation, the values set in Profile velocity (6081h), Profile acceleration (6083h), and Profile deceleration (6084h) are used.



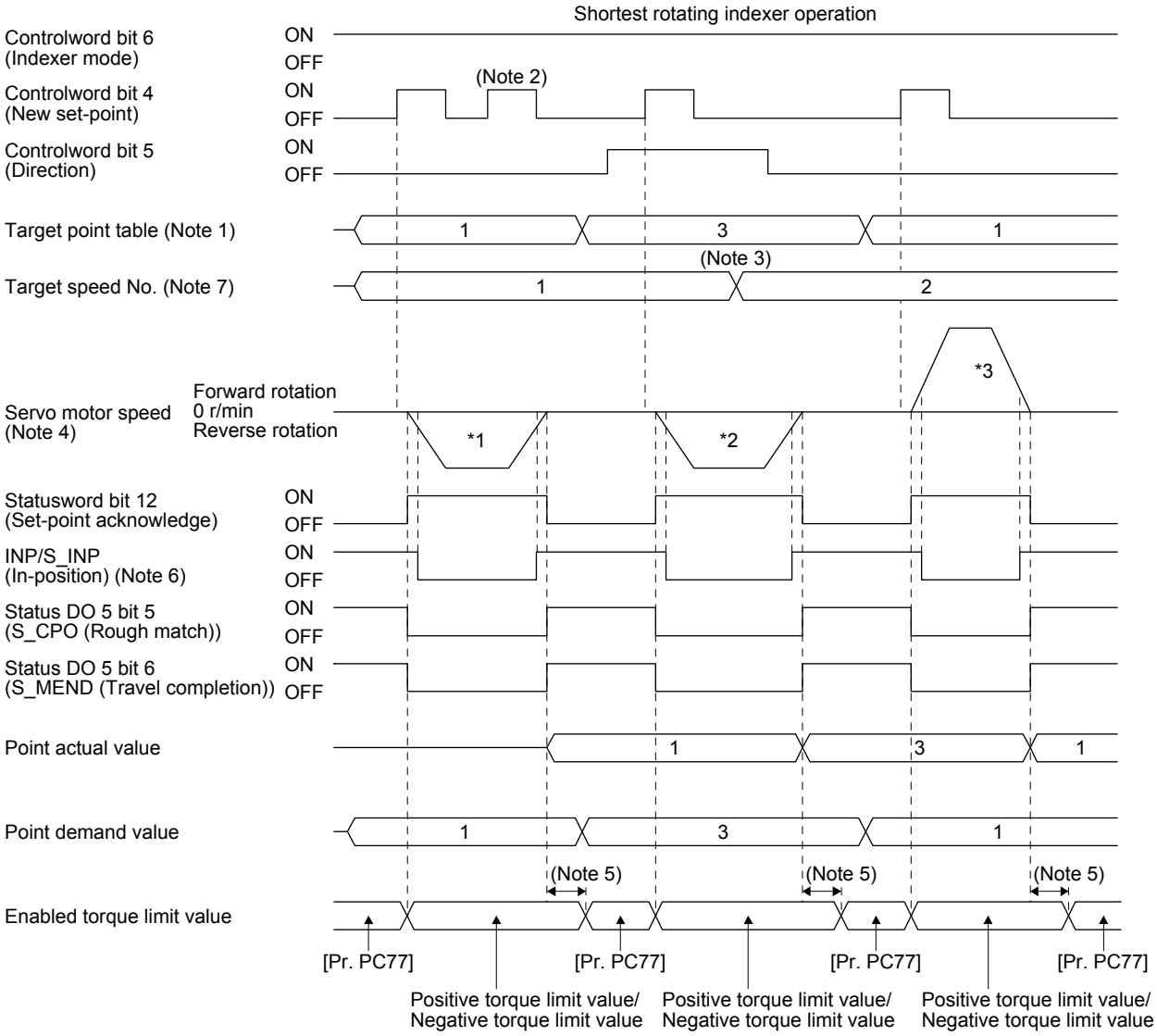
Note 1. When the specified station No. exceeds the value set in [Pr. PT28 Number of stations per rotation] -1, the servo motor does not operate.
2. "Controlword bit 4 (New set-point)" is not received when the remaining command travel distance is other than "0".
3. Switching "Profile velocity" during the servo motor rotation does not enable this.
4. The following shows the operations to be executed.

Operation	*1	*2	*3
Next station No.	No. 1	No. 3	No. 1
Servo motor speed	100.00 r/min	100.00 r/min	150.00 r/min
Positioning			

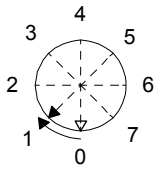
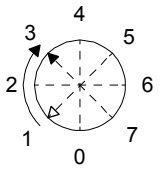
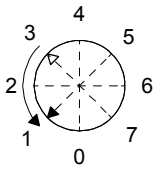
5. A delay time can be set with [Pr. PT39].
6. After power-on, this turns on if the value is within the in-position range of the corresponding station position.

2) When using Target speed No. (2DD1h)
For the servo motor speed, acceleration time constant and deceleration time constant during operation, the values set in the point table are used. Set the point table No. to be used in Target speed No. (2DD1h)

Point table No.	Servo motor speed [r/min]	Acceleration time constant [ms]	Deceleration time constant [ms]
1	100.00	200	200
2	150.00	150	150



Note 1. When the specified station No. exceeds the value set in [Pr. PT28 Number of stations per rotation] -1, the servo motor does not operate.
2. "Controlword bit 4 (New set-point)" is not received when the remaining command travel distance is other than "0".
3. Switching "Profile velocity" during the servo motor rotation does not enable this.
4. The following shows the operations to be executed.

Operation	*1	*2	*3
Next station No.	No. 1	No. 3	No. 1
Servo motor speed	100.00 r/min	100.00 r/min	150.00 r/min
Positioning			

5. A delay time can be set with [Pr. PT39].
6. After power-on, this turns on if the value is within the in-position range of the corresponding station position.
7. This is enabled when any of Profile velocity (6081h), Profile Acceleration (6083h), or Profile deceleration (6084h) is set to 0.

6.4 Jog mode (jg)

6.4.1 Function description

For the machine adjustment, home position adjustment, and others, positioning to any point is possible with the jog mode (jg).
Jog operation is available in the point table method, and station jog operation and jog operation are available in the indexer method.

(1) Jog operation in the point table method

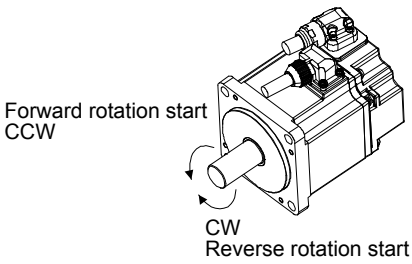
(a) Setting

Set objects and parameters as shown below depending on the intended application. In this operation, "Target point table" is disabled.

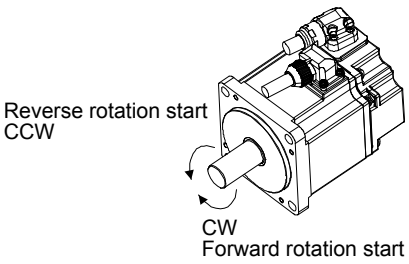
Item	Object/parameter to be used	Setting
Jog mode (jg) selection	Modes of operation	Set "-100".
Servo motor rotation direction	[Pr. PA14]	Refer to (1) (b) in this section.
JOG speed	Profile velocity	Set the servo motor speed.
Acceleration time constant	Profile Acceleration	Set the acceleration time constant.
Deceleration time constant	Profile deceleration	Set the deceleration time constant.
Speed limit	Max profile velocity	Set a limit value of operation speed.

(b) Servo motor rotation direction

[Pr. PA14] setting	Servo motor rotation direction	
	Forward rotation start (Controlword bit 4 (Rotation start): on Controlword bit 5 (Direction): off)	Reverse rotation start (Controlword bit 4 (Rotation start): on Controlword bit 5 (Direction): on)
0	CCW rotation	CW rotation
1	CW rotation	CCW rotation



[Pr. PA14]: 0



[Pr. PA14]: 1

(c) Operation

Switching on "Controlword bit 4 (Rotation start)" starts the operation with the set speed, acceleration time constant and deceleration time constant. Switching off "Controlword bit 4 (Rotation start)" makes deceleration to a stop. Refer to (1) (b) in this section for rotation direction.

Item	Object to be used	Setting
Start/stop	Controlword	Set start/stop in "Controlword bit 4 (Rotation start)". The setting is shown as follows: On: start Off: deceleration to a stop

(2) Station jog operation in the indexer method

(a) Setting

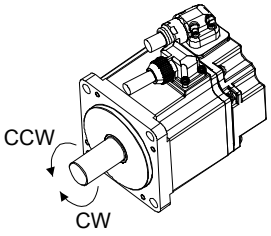
Set objects and parameters as shown below depending on the intended application. In this operation, "Target point table" is disabled.

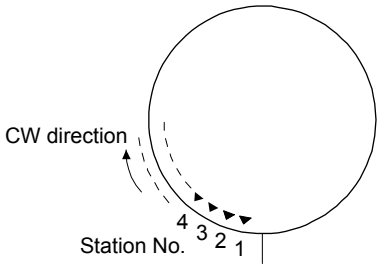
Item	Object/parameter to be used	Setting
Jog mode (jg) selection	Modes of operation	Set "-100".
Station Jog operation selection	[Pr. PT27]	Select "_ _ 0 _" (Station Jog operation).
Servo motor speed	Profile velocity	Set the servo motor speed.
Acceleration time constant	Profile Acceleration	Set the acceleration time constant.
Deceleration time constant	Profile deceleration	Set the deceleration time constant.
Speed limit	Max profile velocity	Set a limit value of operation speed.

(b) Setting an assignment direction of station No.

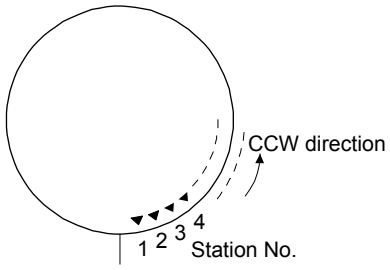
Select an assignment direction of station No. with [Pr. PA14].

[Pr. PA14] setting	Assignment direction of station No.
0	Next station No. will be assigned in CW direction in order of 1, 2, 3…
1	Next station No. will be assigned in CCW direction in order of 1, 2, 3…





[Pr. PA14]: 0 (initial value)



[Pr. PA14]: 1

(c) Operation

Switching on "Controlword bit 4 (Rotation start)" starts rotation to a direction specified with "Controlword bit 5 (Direction)", and switching off "Controlword bit 4 (Rotation start)" executes a positioning to the closest station position where the servo motor can decelerate to a stop. Note that the speed may not reach the specified speed because the shaft stops with the set time constant, depending on the setting value of deceleration time constant.

Item	Object to be used	Setting
Rotation direction selection	Controlword	Set the rotation direction in "Controlword bit 5 (Direction)". The setting is shown as follows: Off: Station No. decreasing direction On: Station No. increasing direction
Start/stop	Controlword	Set start/stop in "Controlword bit 4 (Rotation start)". The setting is shown as follows: On: start Off: stop at a station which is the closest and possible to decelerate to a stop

(3) Jog operation in the indexer method

(a) Setting

Set objects and parameters as shown below depending on the intended application. In this operation, "Target point table" is disabled.

Item	Object/parameter to be used	Setting
Jog mode (jg) selection	Modes of operation	Set "-100".
JOG operation selection	[Pr. PT27]	Select "_ _ 1 _" (Jog operation).
Servo motor speed	Profile velocity	Set the servo motor speed.
Acceleration time constant	Profile Acceleration	Set the acceleration time constant.
Deceleration time constant	Profile deceleration	Set the deceleration time constant.
Speed limit	Max profile velocity	Set a limit value of operation speed.

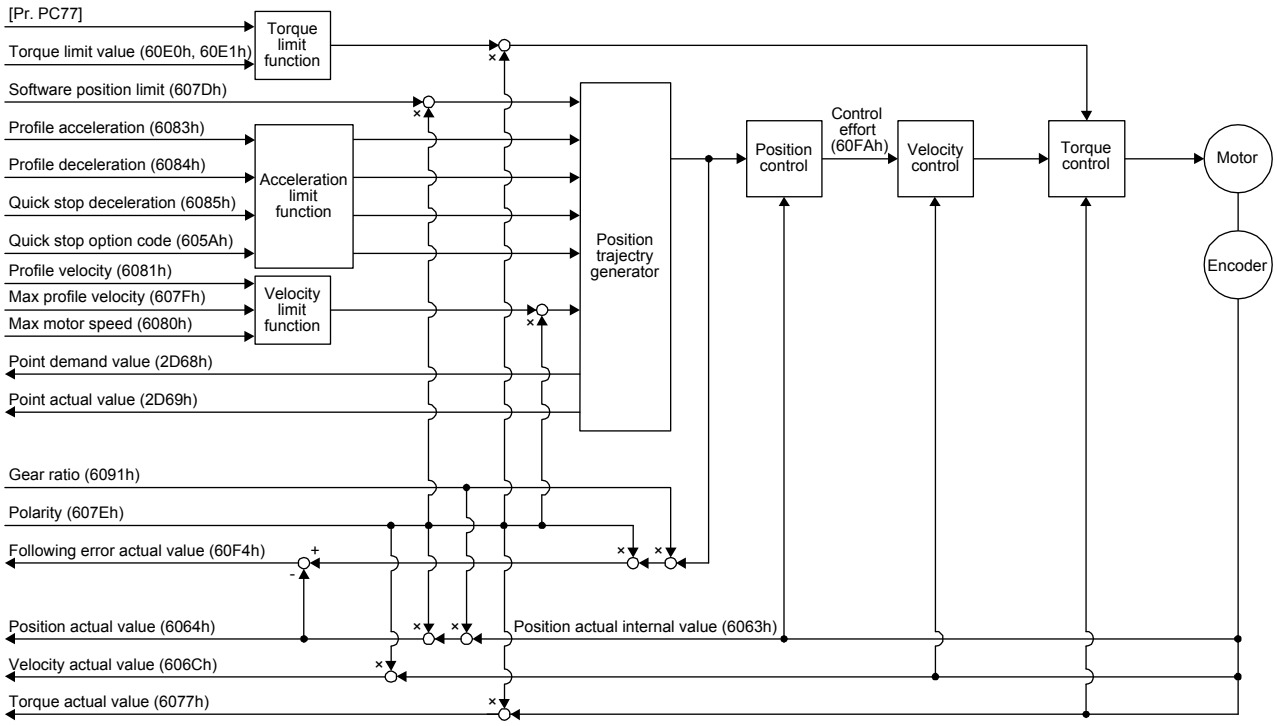
(b) Operation

Switching on "Controlword bit 4 (Rotation start)" starts rotation to a direction specified with "Controlword bit 5 (Direction)", and switching off "Controlword bit 4 (Rotation start)" makes deceleration to a stop regardless of the station position.

Item	Object to be used	Setting
Rotation direction selection	Controlword	Set the rotation direction in "Controlword bit 5 (Direction)". The setting is shown as follows: Off: Station No. decreasing direction On: Station No. increasing direction
Start/stop	Controlword	Set start/stop in "Controlword bit 4 (Rotation start)". The setting is shown as follows: On: start Off: decelerate to a stop regardless of the station position

6.4.2 Related object

The following shows the function and related objects of the jog mode (jg).



(1) Related object

Index	Sub	Name	Data Type	Access	Default	Description
607Dh	0	Software position limit	U8	ro	2	Number of entries
	1	Min position limit	I32	rw	0	Minimum position address (Pos units) This cannot be used in the indexer method.
	2	Max position limit	I32	rw	0	Maximum position address (Pos units) This cannot be used in the indexer method.
607Fh		Max profile velocity	U32	rw	2000000	maximum speed Unit: Vel unit (0.01 r/min or 0.01 mm/s)
6080h		Max motor speed	U32	rw		Servo motor maximum speed Unit: r/min
6081h		Profile velocity	U32	rw	10000	Speed after acceleration completed Unit: Vel unit (0.01 r/min or 0.01 mm/s)
6083h		Profile Acceleration	U32	rw	0	Acceleration at start of movement to target position Unit: ms
6084h		Profile deceleration	U32	rw	0	Deceleration at arrival at target position Unit: ms

Index	Sub	Name	Data Type	Access	Default	Description
6085h		Quick stop deceleration	U32	rw	100	Deceleration time constant for Quick stop Unit: ms
605Ah		Quick stop option code	I16	rw	2	Operation setting for Quick stop Refer to chapter 10.
6063h		Position actual internal value	I32	ro		Current position (Enc inc)
6064h		Position actual value	I32	ro		Current position (Pos units) In the indexer method, the value is fixed to 0.
606Ch		Velocity actual value	I32	ro		Current speed Unit: Vel unit (0.01 r/min or 0.01 mm/s) In the indexer method, this is available only in 0.01 r/min.
6077h		Torque actual value	I32	ro		Current torque Unit: 0.1% (rated torque of 100%)
6092h	0	Feed constant	U8	ro	2	Travel distance per revolution of an output shaft Refer to chapter 10.
	1	Feed	U32	rw		Travel distance setting
	2	Shaft revolutions				Number of servo motor shaft revolutions
60F4h		Following error actual value	I32	ro		Droop pulses (Pos units) (Note)
60FAh		Control effort	I32	ro		Position control loop output (speed command) Unit: Vel unit (0.01 r/min or 0.01 mm/s)
60E0h		Positive torque limit value	U16	rw	10000	Torque limit value (forward) Unit: 0.1% (rated torque of 100%)
60E1h		Negative torque limit value	U16	rw	10000	Torque limit value (reverse) Unit: 0.1% (rated torque of 100%)
6091h	0	Gear ratio	U8	ro	2	Gear ratio
	1	Motor revolutions	U32	rw	1	Number of revolutions of the servo motor axis (numerator) In the indexer method, this means the number of gear teeth on machine side.
	2	Shaft revolutions			1	Number of revolutions of the drive axis (denominator) In the indexer method, this means the number of gear teeth on servo motor side.
607Eh		Polarity	U8	rw	0	Polarity selection Bit 7: Position POL Bit 6: Velocity POL Bit 5: Torque POL Refer to chapter 10.
60A8h		SI unit position	U32	rw	0	SI unit position The value is automatically set according to the setting of "Position data unit" of [Pr. PT01]. Refer to chapter 10.
60A9h		SI unit velocity	U32	rw	0	SI unit velocity 0.01 r/min or 0.01 mm/s FB010300h (0.01 mm/s) FEB44700h (0.01 r/min) In the indexer method, this is available only in 0.01 r/min.
2D68h		Point demand value	I16	ro		Point table demand In the point table method, the value is 0. In the indexer method, the next station No. is set.
2D69h		Point actual value	I16	ro		Current point table In the point table method, the previous value is held. In the indexer method, the station No. at which the servo motor has stopped is set. However, the previous value is held when S_MEND is off.

Note. In the indexer method, the unit is the command unit [pulse] (a load-side rotation expressed by the number of servo motor resolution pulses).

(2) Details on the OMS bit of Controlword (jg mode)

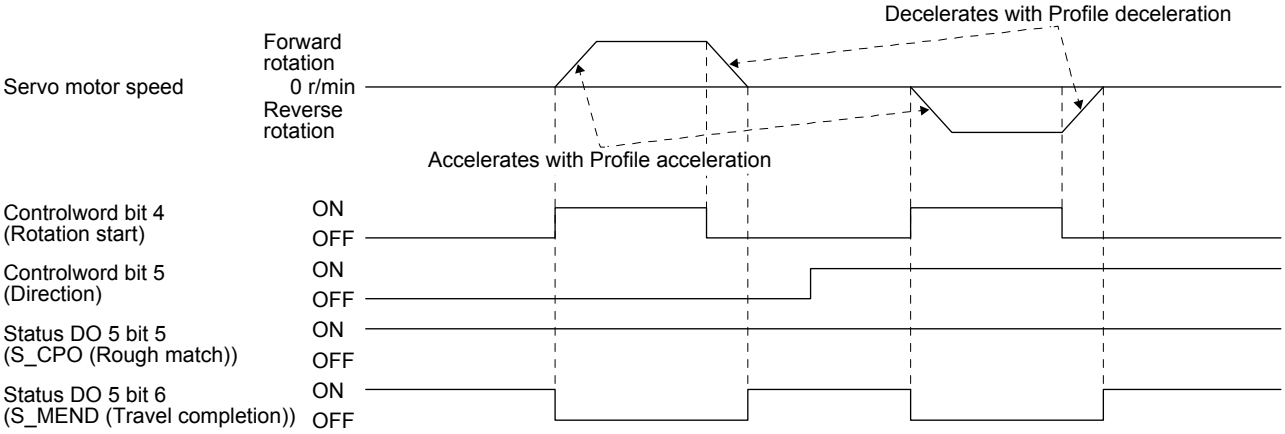
Bit	Symbol	Description
4	Rotation start	0: Stop the servo motor 1: Start the servo motor
5	Direction	0: Forward rotation (address increase) 1: Reverse rotation (address decrease)
6	(reserved)	The value at reading is undefined. Set "0" when writing.
8	HALT	0: Positioning is executed. 1: The servo motor stops according to Halt option code (605Dh). In the indexer method, this bit is disabled.
9	(reserved)	The value at reading is undefined. Set "0" when writing.

(3) Details on the OMS bit of Statusword (jg mode)

Bit	Symbol	Description
10	(reserved)	The value at reading is undefined.
12	(reserved)	The value at reading is undefined.
13	(reserved)	The value at reading is undefined.

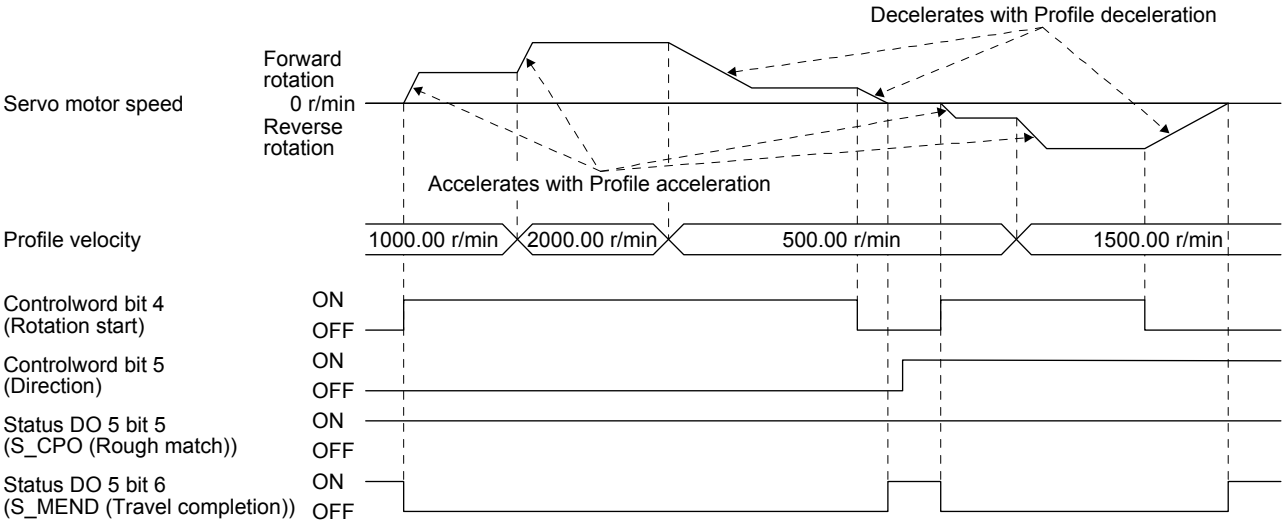
(4) jg mode operation sequence in the point table method

(a) When operating at a constant speed



(b) When changing the speed during operation

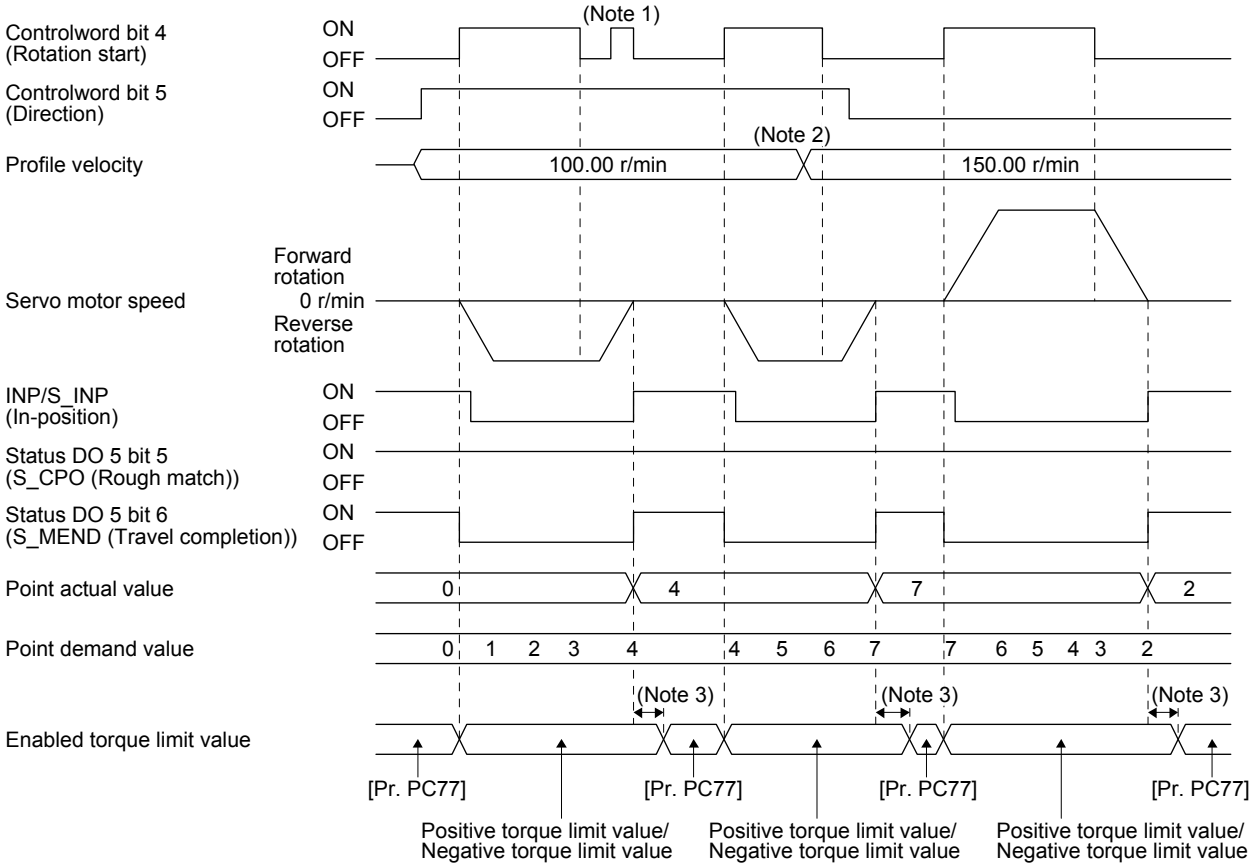
You can change the servo motor speed by changing the "Profile velocity" during operation. However, the servo motor speed cannot be changed during deceleration. The acceleration time constant and the deceleration time constant can be changed only while the servo motor is stopped.



(5) jg mode operation sequence in the indexer method

(a) Station jog operation

The following timing chart shows that a jog operation is started from being stopped at the station No. 0 at servo-on.



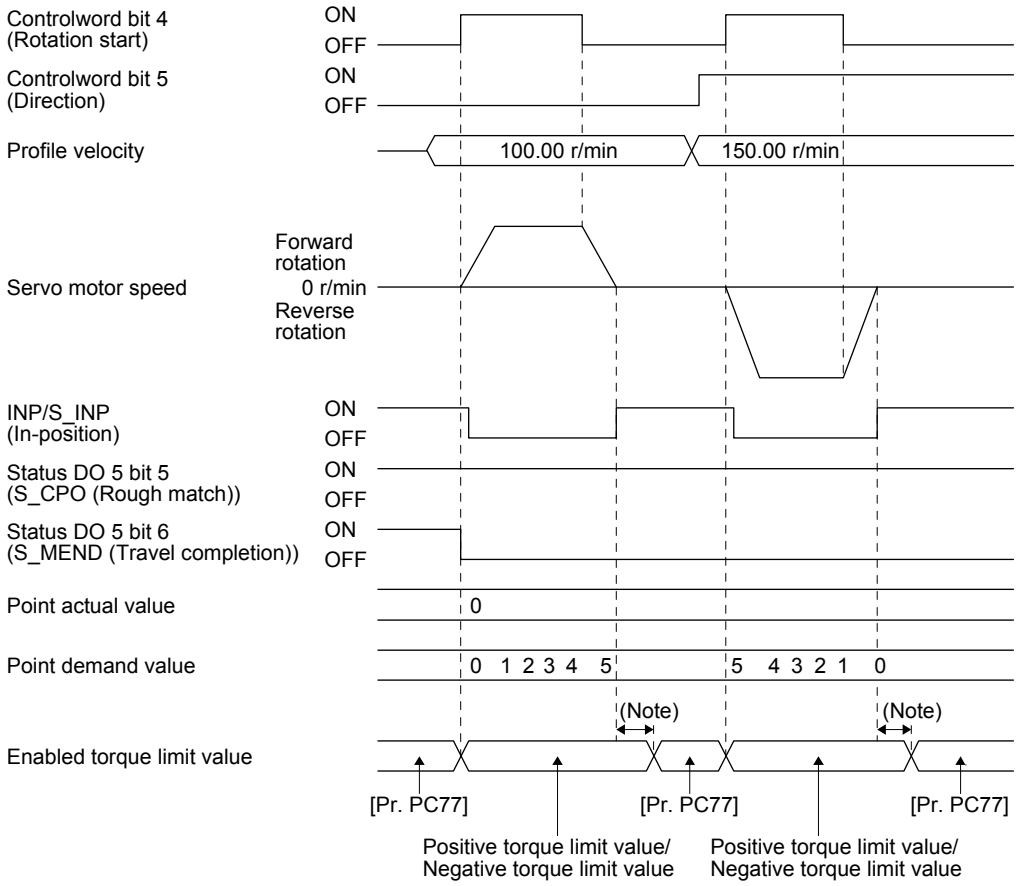
Note 1. "Controlword bit 4 (Rotation start)" is not received when the rest of command travel distance is other than "0".

2. Switching "Profile velocity" during the servo motor rotation does not enable this.

3. A delay time can be set with [Pr. PT39].

(b) Jog operation

The following timing chart shows that a jog operation is started from being stopped at the station No. 0 at servo-on.



Note. A delay time can be set with [Pr. PT39].

7. PARAMETERS

⚠CAUTION	●Never make a drastic adjustment or change to the parameter values as doing so will make the operation unstable. ●Do not change the parameter settings as described below. Doing so may cause an unexpected condition, such as failing to start up the servo amplifier. ・Changing the values of the parameters for manufacturer setting ・Setting a value out of the range ・Changing the fixed values in the digits of a parameter ●When you write parameters with the controller, make sure that the identification number of the servo amplifier is set correctly. Otherwise, the parameter settings of another identification number may be written, possibly causing the servo amplifier to be an unexpected condition.

7.1 Parameter list

POINT

●The parameter whose symbol is preceded by * is enabled with the following conditions:
*: After setting the parameter, cycle the power or reset the controller.
**: After setting the parameter, cycle the power.
●The following parameters cannot be used with CC-Link IE Field Network Basic communication.
[Pr. PN03 Communication mode setting for CC-Link IE communication]
[Pr. PN04 CC-Link IE communication network number]
[Pr. PN05 Communication error detection frequency setting]
[Pr. PN06 Function selection N-1]

Refer to chapter 5 of "MR-J4-_GF_(-RJ) Servo Amplifier Instruction Manual (Motion Mode)" for the parameters with "Motion mode" in the detailed explanation field.

7.1.1 Basic setting parameters ([Pr. PA_ _])

No.	Symbol	Name	Initial value	Unit	Detailed explanation
PA01	**STY	Operation mode	1000h		Section 7.2.1
PA02	**REG	Regenerative option	0000h		Motion mode
PA03	*ABS	Absolute position detection system	0000h		
PA04	*AOP1	Function selection A-1	2000h		
PA05		For manufacturer setting	10000		
PA06	*CMX	Electronic gear numerator	1		Section 7.2.1
		Number of gear teeth on machine side	1		
PA07	*CDV	Electronic gear denominator	1		
		Number of gear teeth on servo motor side	1		
PA08	ATU	Auto tuning mode	0001h		Motion mode
PA09	RSP	Auto tuning response	16		
PA10	INP	In-position range	1600	[μm]/ 10^{-4} [inch]/ [pulse]	Section 7.2.1
PA11	TLP	Forward rotation torque limit/positive direction thrust limit	1000.0	[%]	Motion mode
PA12	TLN	Reverse rotation torque limit/negative direction thrust limit	1000.0	[%]	
PA13		For manufacturer setting	0000h		
PA14	*POL	Rotation direction selection/travel direction selection	0		Motion mode
PA15	*ENR	Encoder output pulses	4000	[pulse/rev]	
PA16	*ENR2	Encoder output pulses 2	1		
PA17	**MSR	Servo motor series setting	0000h		
PA18	**MTY	Servo motor type setting	0000h		
PA19	*BLK	Parameter writing inhibit	00ABh		
PA20	*TDS	Tough drive setting	0000h		
PA21	*AOP3	Function selection A-3	0001h		
PA22	**PCS	Position control composition selection	0000h		
PA23	DRAT	Drive recorder arbitrary alarm trigger setting	0000h		
PA24	AOP4	Function selection A-4	0000h		
PA25	OTHOV	One-touch tuning - Overshoot permissible level	0	[%]	
PA26	*AOP5	Function selection A-5	0000h		
PA27		For manufacturer setting	0000h		
PA28			0000h		
PA29			0000h		
PA30			0000h		
PA31			0000h		
PA32			0000h		

7.1.2 Gain/filter setting parameters ([Pr. PB_ _])

No.	Symbol	Name	Initial value	Unit	Detailed explanation
PB01	FILT	Adaptive tuning mode (adaptive filter II)	0000h		Motion mode
PB02	VRFT	Vibration suppression control tuning mode (advanced vibration suppression control II)	0000h		
PB03		For manufacturer setting	18000		
PB04	FFC	Feed forward gain	0	[%]	Motion mode
PB05		For manufacturer setting	500		
PB06	GD2	Load to motor inertia ratio/load to motor mass ratio	7.00	[Multiplier]	Motion mode
PB07	PG1	Model loop gain	15.0	[rad/s]	
PB08	PG2	Position loop gain	37.0	[rad/s]	
PB09	VG2	Speed loop gain	823	[rad/s]	
PB10	VIC	Speed integral compensation	33.7	[ms]	
PB11	VDC	Speed differential compensation	980		
PB12	OVA	Overshoot amount compensation	0	[%]	
PB13	NH1	Machine resonance suppression filter 1	4500	[Hz]	
PB14	NHQ1	Notch shape selection 1	0000h		
PB15	NH2	Machine resonance suppression filter 2	4500	[Hz]	
PB16	NHQ2	Notch shape selection 2	0000h		
PB17	NHF	Shaft resonance suppression filter	0000h		
PB18	LPF	Low-pass filter setting	3141	[rad/s]	
PB19	VRF11	Vibration suppression control 1 - Vibration frequency	100.0	[Hz]	
PB20	VRF12	Vibration suppression control 1 - Resonance frequency	100.0	[Hz]	
PB21	VRF13	Vibration suppression control 1 - Vibration frequency damping	0.00		
PB22	VRF14	Vibration suppression control 1 - Resonance frequency damping	0.00		
PB23	VFBF	Low-pass filter selection	0000h		
PB24	*MVS	Slight vibration suppression control	0000h		
PB25	*BOP1	Function selection B-1	0000h		
PB26	*CDP	Gain switching function	0000h		
PB27	CDL	Gain switching condition	10	[kpulse/s]/ [pulse]/[r/min]	
PB28	CDT	Gain switching time constant	1	[ms]	
PB29	GD2B	Load to motor inertia ratio/load to motor mass ratio after gain switching	7.00	[Multiplier]	
PB30	PG2B	Position loop gain after gain switching	0.0	[rad/s]	
PB31	VG2B	Speed loop gain after gain switching	0	[rad/s]	
PB32	VICB	Speed integral compensation after gain switching	0.0	[ms]	
PB33	VRF11B	Vibration suppression control 1 - Vibration frequency after gain switching	0.0	[Hz]	
PB34	VRF12B	Vibration suppression control 1 - Resonance frequency after gain switching	0.0	[Hz]	
PB35	VRF13B	Vibration suppression control 1 - Vibration frequency damping after gain switching	0.00		
PB36	VRF14B	Vibration suppression control 1 - Resonance frequency damping after gain switching	0.00		
PB37		For manufacturer setting	1600		
PB38			0.00		
PB39			0.00		
PB40			0.00		
PB41			0000h		
PB42			0000h		
PB43			0000h		
PB44			0.00		
PB45	CNHF	Command notch filter	0000h		Motion mode
PB46	NH3	Machine resonance suppression filter 3	4500	[Hz]	

No.	Symbol	Name	Initial value	Unit	Detailed explanation
PB47	NHQ3	Notch shape selection 3	0000h		Motion mode
PB48	NH4	Machine resonance suppression filter 4	4500	[Hz]	
PB49	NHQ4	Notch shape selection 4	0000h		
PB50	NH5	Machine resonance suppression filter 5	4500	[Hz]	
PB51	NHQ5	Notch shape selection 5	0000h		
PB52	VRF21	Vibration suppression control 2 - Vibration frequency	100.0	[Hz]	
PB53	VRF22	Vibration suppression control 2 - Resonance frequency	100.0	[Hz]	
PB54	VRF23	Vibration suppression control 2 - Vibration frequency damping	0.00		
PB55	VRF24	Vibration suppression control 2 - Resonance frequency damping	0.00		
PB56	VRF21B	Vibration suppression control 2 - Vibration frequency after gain switching	0.0	[Hz]	
PB57	VRF22B	Vibration suppression control 2 - Resonance frequency after gain switching	0.0	[Hz]	
PB58	VRF23B	Vibration suppression control 2 - Vibration frequency damping after gain switching	0.00		
PB59	VRF24B	Vibration suppression control 2 - Resonance frequency damping after gain switching	0.00		
PB60	PG1B	Model loop gain after gain switching	0.0	[rad/s]	
PB61		For manufacturer setting	0.0		
PB62			0000h		
PB63			0000h		
PB64			0000h		

7.1.3 Extension setting parameters ([Pr. PC_ _])

No.	Symbol	Name	Initial value	Unit	Detailed explanation
PC01	ERZ	Error excessive alarm level	0	[rev]/[mm]	Motion mode
PC02	MBR	Electromagnetic brake sequence output	0	[ms]	
PC03	*ENRS	Encoder output pulse selection	0000h		
PC04	**COP1	Function selection C-1	0000h		
PC05	**COP2	Function selection C-2	0000h		
PC06	*COP3	Function selection C-3	0000h		
PC07	ZSP	Zero speed	50	[r/min]/[mm/s]	
PC08	OSL	Overspeed alarm detection level	0	[r/min]/[mm/s]	
PC09	MOD1	Analog monitor 1 output	0000h		
PC10	MOD2	Analog monitor 2 output	0001h		
PC11	MO1	Analog monitor 1 offset	0	[mV]	
PC12	MO2	Analog monitor 2 offset	0	[mV]	
PC13		For manufacturer setting	0		
PC14			0		
PC15			0		
PC16			0000h		
PC17	**COP4	Function selection C-4	0000h		Motion mode
PC18	*COP5	Function selection C-5	0010h		
PC19	*COP6	Function selection C-6	0000h		
PC20	*COP7	Function selection C-7	0000h		
PC21	*BPS	Alarm history clear	0000h		
PC22		For manufacturer setting	0		
PC23			0000h		
PC24	RSBR	Forced stop deceleration time constant	100	[ms]	Motion mode
PC25		For manufacturer setting	0		
PC26	**COP8	Function selection C-8	0000h		Motion mode
PC27	**COP9	Function selection C-9	0000h		
PC28		For manufacturer setting	0000h		
PC29	*COPB	Function selection C-B	1000h		Motion mode
PC30		For manufacturer setting	0		
PC31	RSUP1	Vertical axis freefall prevention compensation amount	0	[0.0001 rev]/ [0.01 mm]	Motion mode
PC32		For manufacturer setting	0000h		
PC33			0		
PC34			100		
PC35			0000h		
PC36			0000h		
PC37			0000h		
PC38	ERW	Error excessive warning level	0	[rev]/[mm]	Motion mode
PC39		For manufacturer setting	0000h		
PC40			0000h		
PC41			0000h		
PC42			0000h		
PC43			0000h		
PC44			0000h		
PC45			0000h		
PC46			0000h		
PC47			0000h		
PC48			0000h		
PC49			0000h		
PC50			0000h		

No.	Symbol	Name	Initial value	Unit	Detailed explanation
PC51		For manufacturer setting	0000h		
PC52			0000h		
PC53			0000h		
PC54			0000h		
PC55			0000h		
PC56			0000h		
PC57			0000h		
PC58			0000h		
PC59			0000h		
PC60			0000h		
PC61			0000h		
PC62			0000h		
PC63			0000h		
PC64			0000h		
PC65			50.00		
PC66			10		
PC67	FEWL	Following error output level	0000h	[pulse]	Motion mode
PC68	FEWH		00C0h		
PC69	FEWF	Following error output filtering time	10	[ms]	
PC70		For manufacturer setting	100		
PC71			10		
PC72			20.00		
PC73			10		
PC74			10.0		
PC75			10		
PC76	*COPE	Function selection C-E	0001h		Motion mode
PC77	TL2	Internal torque limit 2	0.0	[%]	Section 7.2.2
PC78		For manufacturer setting	0000h		
PC79			0000h		
PC80			0000h		

7.1.4 I/O setting parameters ([Pr. PD_ _])

No.	Symbol	Name	Initial value	Unit	Detailed explanation
PD01	*DIA1	Input signal automatic on selection 1	0000h		Motion mode
PD02		For manufacturer setting	0000h		
PD03	*DI1	Input device selection 1	000Ah		Motion mode
PD04	*DI2	Input device selection 2	000Bh		
PD05	*DI3	Input device selection 3	0022h		
PD06		For manufacturer setting	0000h		
PD07	*DO1	Output device selection 1	0005h		Motion mode
PD08	*DO2	Output device selection 2	0004h		
PD09	*DO3	Output device selection 3	0003h		
PD10		For manufacturer setting	0000h		
PD11	*DIF	Input filter setting	0004h		Motion mode
PD12	*DOP1	Function selection D-1	0101h		Section 7.2.3
PD13	*DOP2	Function selection D-2	0000h		Motion mode
PD14	*DOP3	Function selection D-3	0000h		
PD15		For manufacturer setting	0000h		
PD16			0000h		
PD17			0000h		
PD18			0000h		
PD19			0000h		
PD20			0		
PD21			0		
PD22			0		
PD23			0		
PD24			0000h		
PD25			0000h		
PD26			0000h		
PD27			0000h		
PD28			0000h		
PD29			0000h		
PD30			0		
PD31			0		
PD32			0		
PD33			0000h		
PD34			0000h		
PD35			0000h		
PD36			0000h		
PD37	*TPOP	Touch probe function selection	0000h		Motion mode
PD38		For manufacturer setting	002Ch		
PD39			002Dh		
PD40			0		
PD41	*DOP4	Function selection D-4	0000h		Motion mode
PD42		For manufacturer setting	0000h		
PD43			0000h		
PD44			0000h		
PD45			0000h		
PD46			0000h		
PD47			0000h		
PD48			0000h		

7.1.5 Extension setting 2 parameters ([Pr. PE_ _])

No.	Symbol	Name	Initial value	Unit	Detailed explanation
PE01	**FCT1	Fully closed loop function selection 1	0000h		Motion mode
PE02		For manufacturer setting	0000h		
PE03	*FCT2	Fully closed loop function selection 2	0003h		Motion mode
PE04	**FBN	Fully closed loop control - Feedback pulse electronic gear 1 - Numerator	1		
PE05	**FBD	Fully closed loop control - Feedback pulse electronic gear 1 - Denominator	1		
PE06	BC1	Fully closed loop control - Speed deviation error detection level	400	[r/min]	
PE07	BC2	Fully closed loop control - Position deviation error detection level	100	[kpulse]	
PE08	DUF	Fully closed loop dual feedback filter	10	[rad/s]	
PE09		For manufacturer setting	0000h		
PE10	FCT3	Fully closed loop function selection 3	0000h		Motion mode
PE11		For manufacturer setting	0000h		
PE12			0000h		
PE13			0000h		
PE14			0111h		
PE15			20		
PE16			0000h		
PE17			0000h		
PE18			0000h		
PE19			0000h		
PE20			0000h		
PE21			0000h		
PE22			0000h		
PE23			0000h		
PE24			0000h		
PE25			0000h		
PE26			0000h		
PE27			0000h		
PE28			0000h		
PE29			0000h		
PE30			0000h		
PE31			0000h		
PE32			0000h		
PE33			0000h		
PE34	**FBN2	Fully closed loop control - Feedback pulse electronic gear 2 - Numerator	1		Motion mode
PE35	**FBD2	Fully closed loop control - Feedback pulse electronic gear 2 - Denominator	1		
PE36		For manufacturer setting	0.0		
PE37			0.00		
PE38			0.00		
PE39			20		
PE40			0000h		
PE41	EOP3	Function selection E-3	0000h		Motion mode
PE42		For manufacturer setting	0		
PE43			0.0		
PE44	LMCP	Lost motion compensation positive-side compensation value selection	0	[0.01%]	Motion mode
PE45	LMCN	Lost motion compensation negative-side compensation value selection	0	[0.01%]	
PE46	LMFLT	Lost motion filter setting	0	[0.1 ms]	
PE47	TOF	Torque offset	0	[0.01%]	

No.	Symbol	Name	Initial value	Unit	Detailed explanation
PE48	*LMOP	Lost motion compensation function selection	0000h		Motion mode
PE49	LMCD	Lost motion compensation timing	0	[0.1 ms]	
PE50	LMCT	Lost motion compensation non-sensitive band	0	[pulse]/ [kpulse]	
PE51		For manufacturer setting	0000h		
PE52			0000h		
PE53			0000h		
PE54			0000h		
PE55			0000h		
PE56			0000h		
PE57			0000h		
PE58			0000h		
PE59			0000h		
PE60			0000h		
PE61			0.00		
PE62			0.00		
PE63			0.00		
PE64			0.00		

7.1.6 Extension setting 3 parameters ([Pr. PF_ _])

No.	Symbol	Name	Initial value	Unit	Detailed explanation
PF01		For manufacturer setting	0000h		
PF02			0000h		
PF03			0000h		
PF04			0		
PF05			0000h		
PF06	*FOP5	Function selection F-5	0000h		Motion mode
PF07		For manufacturer setting	0000h		
PF08			0000h		
PF09			0		
PF10			0		
PF11			0		
PF12	DBT	Electronic dynamic brake operating time	2000	[ms]	Motion mode
PF13		For manufacturer setting	0000h		
PF14			10		
PF15			0000h		
PF16			0000h		
PF17			0000h		
PF18	**STOD	STO diagnosis error detection time	10	[s]	Motion mode
PF19	TSL	Friction failure prediction - Compensation coefficient 1	0	[0.001%/°C]	
PF20	TIC	Friction failure prediction - Compensation coefficient 2	0	[0.1%]	
PF21	DRT	Drive recorder switching time setting	0	[s]	
PF22		For manufacturer setting	200		
PF23	OSCL1	Vibration tough drive - Oscillation detection level	50	[%]	Motion mode
PF24	*OSCL2	Vibration tough drive function selection	0000h		
PF25	CVAT	SEMI-F47 function - Instantaneous power failure detection time	200	[ms]	
PF26		For manufacturer setting	0		
PF27			0		
PF28			0		
PF29			0000h		
PF30			0		

No.	Symbol	Name	Initial value	Unit	Detailed explanation
PF31	FRIC	Machine diagnosis function - Friction judgment speed	0	[r/min]/[mm/s]	Motion mode
PF32		For manufacturer setting	50		
PF33			0000h		
PF34	*MFP	Machine diagnosis function selection	0000h		Motion mode
PF35		For manufacturer setting	0000h		
PF36			0000h		
PF37			0000h		
PF38			0000h		
PF39			0000h		
PF40	MFPP	Machine failure prediction parameter	0000h		Motion mode
PF41	FPMT	Failure prediction - Motor travel distance	0	[rev]/[m]	
PF42	PAV	Friction failure prediction - Average characteristic	0	[0.1%]	
PF43	PSD	Friction failure prediction - Standard deviation	0	[0.1%]	
PF44		For manufacturer setting	0		
PF45	VAV	Vibration failure prediction - Average characteristic	0	[0.1%]	Motion mode
PF46	VSD	Vibration failure prediction - Standard deviation	0	[0.1%]	
PF47		For manufacturer setting	0000h		
PF48			0000h		
PF49			100		
PF50			100		
PF51			0000h		
PF52			0000h		
PF53			0		
PF54			0		
PF55			0		
PF56			0		
PF57			0000h		
PF58			0000h		
PF59			0000h		
PF60			0000h		
PF61			0000h		
PF62			0000h		
PF63			0000h		
PF64			0000h		

7.1.7 Linear servo motor/DD motor setting parameters ([Pr. PL_ _])

No.	Symbol	Name	Initial value	Unit	Detailed explanation
PL01	**LIT1	Linear servo motor/DD motor function selection 1	0301h		Motion mode
PL02	**LIM	Linear encoder resolution - Numerator	1000	[μm]	
PL03	**LID	Linear encoder resolution - Denominator	1000	[μm]	
PL04	*LIT2	Linear servo motor/DD motor function selection 2	0003h		
PL05	LB1	Position deviation error detection level	0	[mm]/ [0.01 rev]	
PL06	LB2	Speed deviation error detection level	0	[mm/s]/[r/min]	
PL07	LB3	Torque/thrust deviation error detection level	100	[%]	
PL08	*LIT3	Linear servo motor/DD motor function selection 3	0010h		
PL09	LPWM	Magnetic pole detection voltage level	30	[%]	
PL10		For manufacturer setting	5		
PL11			100		
PL12			500		
PL13			0000h		
PL14			0000h		
PL15			20		
PL16			0		
PL17	LTSTS	Magnetic pole detection - Minute position detection method - Function selection	0000h		Motion mode
PL18	IDLV	Magnetic pole detection - Minute position detection method - Identification signal amplitude	0	[%]	
PL19		For manufacturer setting	0		
PL20			0		
PL21			0		
PL22			0		
PL23			0000h		
PL24			0		
PL25			0000h		
PL26			0000h		
PL27			0000h		
PL28			0000h		
PL29			0000h		
PL30			0000h		
PL31			0000h		
PL32			0000h		
PL33			0000h		
PL34			0000h		
PL35			0000h		
PL36			0000h		
PL37			0000h		
PL38			0000h		
PL39			0000h		
PL40			0000h		
PL41			0000h		
PL42			0000h		
PL43			0000h		
PL44			0000h		
PL45			0000h		
PL46			0000h		
PL47			0000h		
PL48			0000h		

7.1.8 Positioning control parameters ([Pr. PT_ _])

No.	Symbol	Name	Initial value	Unit	Detailed explanation
PT01	**CTY	Command mode selection	0300h		Section 7.2.4
PT02		For manufacturer setting	0001h		
PT03	*FTY	Feeding function selection	0000h		Section 7.2.4
PT04		For manufacturer setting	0000h		
PT05	ZRF	Home position return speed	100.00	[r/min]/[mm/s]	Motion mode
PT06	CRF	Creep speed	10.00	[r/min]/[mm/s]	
PT07	ZST	Home position shift distance	0	[μm]/ 10^{-4} [inch]/ [pulse]	Section 7.2.4
PT08		For manufacturer setting	0		
PT09	DCT	Travel distance after proximity dog	0	10^{STM} [μm]/$10^{(STM-4)}$ [inch]/[pulse]	Section 7.2.4
PT10	ZTM	Stopper type home position return - Stopper time	100	[ms]	Motion mode
PT11	ZTT	Stopper type home position return - Torque limit value	15.0	[%]	
PT12	CRP	Rough match output range	0	10^{STM} [μm]/$10^{(STM-4)}$ [inch]/[pulse]	Section 7.2.4
PT13		For manufacturer setting	100		
PT14			0		
PT15	LMPL	Software limit +	0000h	10^{STM} [μm]/$10^{(STM-4)}$ [inch]/[pulse]	Section 7.2.4
PT16	LMPH		0000h		
PT17	LMNL	Software limit -	0000h	10^{STM} [μm]/$10^{(STM-4)}$ [inch]/[pulse]	
PT18	LMNH		0000h		
PT19	*LPPL	Position range output address +	0000h	10^{STM} [μm]/$10^{(STM-4)}$ [inch]/[pulse]	
PT20	*LPPH		0000h		
PT21	*LNPL	Position range output address -	0000h	10^{STM} [μm]/$10^{(STM-4)}$ [inch]/[pulse]	
PT22	*LNPH		0000h		
PT23		For manufacturer setting	0		
PT24			0		
PT25			0		
PT26			0000h		
PT27	*ODM	Indexer method - Operation mode selection	0000h		Section 7.2.4
PT28	*STN	Number of stations per rotation	8	[stations]	
PT29	*TOP3	Function selection T-3	0000h		
PT30		For manufacturer setting	0000h		
PT31			0000h		
PT32			0000h		
PT33			0000h		
PT34	*PDEF	Point table default	0000h		Section 7.2.4
PT35	*TOP5	Function selection T-5	0000h		
PT36		For manufacturer setting	0000h		
PT37			10		
PT38			0000h		
PT39	INT	Torque limit delay time	100	[ms]	Section 7.2.4
PT40	*SZS	Station home position shift distance	0	[pulse]	

No.	Symbol	Name	Initial value	Unit	Detailed explanation
PT41	ORP	Home position return inhibit function selection	0000h		Motion mode
PT42		For manufacturer setting	0		
PT43			0		
PT44			0000h		
PT45	HMM	Home position return types	37		Motion mode
PT46		For manufacturer setting	0000h		
PT47			0000h		
PT48			0000h		
PT49	STA	Acceleration time constant	0	[ms]	Section 7.2.4
PT50	STB	Deceleration time constant	0	[ms]	
PT51	STC	S-pattern acceleration/deceleration time constant	0	[ms]	
PT52		For manufacturer setting	0		
PT53			0.0		
PT54			0		
PT55	*TOP8	Function selection T-8	0000h		Motion mode
PT56	HMA	Home position return acceleration time constant	0	[ms]	
PT57	HMB	Home position return deceleration time constant	0	[ms]	
PT58		For manufacturer setting	100.00		
PT59			500.00		
PT60			1000.00		
PT61			200.00		
PT62	*DSS	Remote register-based position/speed specifying method selection	0000h		
PT63		For manufacturer setting	0000h		
PT64			0000h		
PT65	PVC	Jog speed command	100.00	[r/min]/[mm/s]	Section 7.2.4
PT66		For manufacturer setting	20000.00		
PT67	VLMT	Speed limit	500.00	[r/min]/[mm/s]	Motion mode
PT68		For manufacturer setting	0102h		
PT69	ZSTH	Home position shift distance (extension parameter)	0	[μm]/ 10^{-4} [inch]/ [pulse]	Section 7.2.4
PT70		For manufacturer setting	0000h		
PT71	DCTH	Travel distance after proximity dog (extension parameter)	0	10^{STM} [μm]/ $10^{(STM-4)}$ [inch]/ [pulse]	Section 7.2.4
PT72		For manufacturer setting	0000h		
PT73			0000h		
PT74			0000h		
PT75			0000h		
PT76			0000h		
PT77			0000h		
PT78			0000h		
PT79			0000h		
PT80			0000h		

7.1.9 Network setting parameters ([Pr. PN_ _])

No.	Symbol	Name	Initial value	Unit	Detailed explanation
PN01		For manufacturer setting	0		
PN02	CERT	Communication error detection time	0	[ms]	Section 7.2.5
PN03	**NWMD	Communication mode setting for CC-Link IE communication	0000h		
PN04	**NWNO	CC-Link IE communication network number	0		
PN05	CERI	Communication error detection frequency setting	0	[%]	
PN06	NOP1	Function selection N-1	0000h		
PN07		For manufacturer setting	0000h		
PN08			0000h		
PN09			0000h		
PN10	EIC	Ethernet communication time-out selection	0	[s]	Section 7.2.5
PN11	**IPADA	IP address setting A	0000h		
PN12	**IPADB	IP address setting B	0000h		
PN13	**SNMKA	Subnet mask setting A	0000h		
PN14	**SNMKB	Subnet mask setting B	0000h		
PN15		For manufacturer setting	0000h		
PN16			0000h		
PN17			0000h		
PN18	**IPAFA	IP address filter A	0000h		Section 7.2.5
PN19	**IPAFB	IP address filter B	0000h		
PN20	**IPFRA	IP address filter A range setting	0000h		
PN21	**IPFRB	IP address filter B range setting	0000h		
PN22	**IPOAA	Operation specification IP address A	0000h		
PN23	**IPOAB	Operation specification IP address B	0000h		
PN24	**IPOR	Operation specification IP address range specification	0000h		
PN25		For manufacturer setting	0000h		
PN26			0000h		
PN27			0000h		
PN28			0000h		
PN29			0000h		
PN30			0000h		
PN31			0000h		
PN32			0000h		

7.2 Detailed list of parameters

POINT

- For parameters which are not described in this section, refer to chapter 5 of "MR-J4-_GF_(-RJ) Servo Amplifier Instruction Manual (Motion Mode)".
- Set a value to each "x" in the "Setting digit" columns.
- The symbols in the control mode column mean as follows:
  CP: Point table method
  PS: Indexer method

7.2.1 Basic setting parameters ([Pr. PA_ _])

No./symbol/ name	Setting digit	Function	Initial value [unit]	Control mode	
				C P	P S
PA01 **STY Operation mode	_ _ _ x	Control mode selection Select a control mode. 0: Positioning mode (point table method) 8: Positioning mode (indexer method)	0h	○	○
	_ _ x _	Operation mode selection 0: Standard control mode 1: Fully closed loop control mode 4. Linear servo motor control mode 6: DD motor control mode The following settings will trigger [AL. 37 Parameter error]. ・A value other than "0", "1", "4", and "6" is set in this digit. ・A value other than "0" and "6" is set in this digit in the positioning mode (indexer method).	0h	○	○
	_ x _ _	For manufacturer setting	0h		
	x _ _ _		1h		
PA06 *CMX Electronic gear numerator		Set an electronic gear numerator. (Refer to section 7.2.6.) Set the electronic gear within the following range. Setting out of the range will trigger [AL. 37 Parameter error]. 1/865 < CMX/CDV < 271471 Setting range: 1 to 16777215	1	○	

No./symbol/ name	Setting digit	Function	Initial value [unit]	Control mode	
				C P	P S
PA06 *CMX Number of gear teeth on machine side		Set the number of gear teeth on machine side. (Refer to section 7.2.6.) Set the electronic gear within the following range. Setting out of the range will trigger [AL. 37 Parameter error]. (1) 1 ≤ CMX ≤ 16384, 1 ≤ CDV ≤ 16384 (2) $\frac{1}{9999} \leq \frac{CMX}{CDV} \leq 9999$ (3) CDV × STN ≤ 32767 (STN: Number of stations per rotation [Pr. PT28]) (4) CMX × CDV ≤ 100000 When a small value is set to the electronic gear ratio with the manual operation mode, the servo motor may not operate at the set servo motor speed. Travel distance of one station = Pt (servo motor resolution) × $\frac{1}{STN} \times \frac{CMX}{CDV}$ Setting range: 1 to 16777215	1		○
PA07 *CDV Electronic gear denominator		Set an electronic gear denominator. (Refer to section 7.2.6.) Set the electronic gear within the range of [Pr. PA06]. Setting out of the range will trigger [AL. 37 Parameter error]. Setting range: 1 to 16777215	1	○	
PA07 *CDV Number of gear teeth on servo motor side		Set the number of gear teeth on servo motor side. (Refer to section 7.2.6.) Set the electronic gear within the range of [Pr. PA06]. Setting out of the range will trigger [AL. 37 Parameter error]. Setting range: 1 to 16777215	1		○
PA10 INP In-position range		Set an in-position range per command pulse. To change it to the servo motor encoder pulse unit, set [Pr. PC06]. In the I/O mode, the in-position range is the range where Index 2D15h Status DO5 bit5 (Travel completion) and Index 2D11h Status DO1 bit12 (In-position) are outputted. The unit will be as follows depending on the positioning mode. ・ In the point table method When [Pr. PC06] is set to "_ _ _ 0", the unit can be changed to [μm], 10^{-4} [inch], or [pulse] with the setting of [Pr. PT01]. When [Pr. PC06] is set to "_ _ _ 1", the unit is fixed to [pulse]. ・ In the indexer method It will be command unit [pulse]. (A load-side rotation expressed by the number of servo motor resolution pulses) For example, when making an in-position range "± 1 degree" for the rotation angle on the load side, set 4194304 × (1/360) = 11650 pulses. Setting range: 0 to 65535	1600 Refer to Function column for unit.	○	○

7.2.2 Extension setting parameters ([Pr. PC_ _])

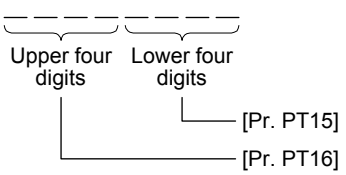
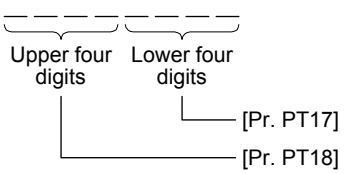
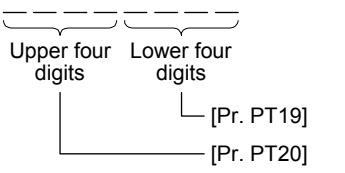
No./symbol/ name	Setting digit	Function	Initial value [unit]	Control mode	
				C P	P S
PC77 TL2 Internal torque limit 2		The parameter is for limiting the torque of the servo motor. Set this on the assumption that the rated torque is 100.0 %. When this parameter is set to "0.0", torque is not generated. This parameter setting is enabled when automatic operation, manual operation, or homing operation is stopped. During operation, the setting values of [Pr. PA11] and [Pr. PA12] are enabled. Setting range: 0.0 to 1000.0	0.0 [%]		○

7.2.3 I/O setting parameters ([Pr. PD_ _])

No./symbol/ name	Setting digit	Function	Initial value [unit]	Control mode	
				C P	P S
PD12 *DOP1 Function selection D-1	_ _ _ x	Stop method selection at stroke limit detection This is disabled during CC-Link IE Field Network Basic communication.	1h		
	_ _ x _	For manufacturer setting	0h		
	_ x _ _	Stop method selection at software limit detection Select a stop method at software limit detection. (Refer to section 7.2.7.) 1: Slow stop 2: Slow stop (deceleration to a stop with deceleration time constant) 3: Quick stop (stop by clearing remaining distance) Setting "0" will trigger [AL. 37].	1h	○	
	x _ _ _	Servo motor thermistor enabled/disabled selection 0: Enabled 1: Disabled This digit is enabled only when a servo motor with a built-in thermistor is used. The setting in this digit is disabled when a servo motor without a thermistor is used.	0h	○	○

7.2.4 Positioning control parameters ([Pr. PT_ _])

No./symbol/ name	Setting digit	Function	Initial value [unit]	Control mode	
				C P	P S
PT01 **CTY Command mode selection	_ _ _ x	Positioning command method selection 0: Absolute value command method 1: Incremental value command method	0h	○	
	_ _ x _	For manufacturer setting	0h		
	_ x _ _	Position data unit 0: mm 1: inch 3: pulse	3h	○	
	x _ _ _	For manufacturer setting	0h		
PT03 *FTY Feeding function selection	_ _ _ x	Feed length multiplication (STM) 0: × 1 1: × 10 2: × 100 3: × 1000 This digit is disabled when [pulse] is set for "Position data unit" in [Pr. PT01].	0h	○	
	_ _ x _	For manufacturer setting	0h		
	_ x _ _		0h		
	x _ _ _		0h		
PT07 ZST Home position shift distance		Set a shift distance from the Z-phase pulse detection position in the encoder. Up to 2^{31} can be set with [Pr. PT69]. The unit will be as follows depending on the positioning mode. - In the point table method The unit can be changed to [μm], 10^{-4} [inch], or [pulse] with the setting of [Pr. PT01]. - In the indexer method It will be command unit [pulse]. (A load-side rotation expressed by the number of servo motor resolution pulses) Refer to the Function column of [Pr. PA10] for the command unit. Setting range: 0 to 65535	0 Refer to Function column for unit.	○	○
PT09 DCT Travel distance after proximity dog		Set a travel distance after proximity dog at home position return for the count type (front end detection, Z-phase reference) (Homing method -2, -34) and dog reference. Up to 2^{31} can be set with [Pr. PT71]. The following shows the home position return of the dog reference. - Dog type rear end reference home position return (Homing method -6, -38) - Count type front end reference home position return (Homing method -7, -39) - Dog type front end reference home position return (Homing method -10, -42) - Homing without index pulse (Homing method 19, 20, 21, 22, 23, 24, 27, 28) The unit can be changed to 10^{STM} [μm], $10^{(STM-4)}$ [inch], or [pulse] with the setting of [Pr. PT01]. Setting range: 0 to 65535	0 Refer to Function column for unit.	○	
PT12 CRP Rough match output range		Set a range of the command remaining distance which outputs rough match. The unit will be as follows depending on the positioning mode. - In the point table method The unit can be changed to 10^{STM} [μm], $10^{(STM-4)}$ [inch], or [pulse] with the setting of [Pr. PT01]. - In the indexer method It will be command unit [pulse]. (A load-side rotation expressed by the number of servo motor resolution pulses) Refer to the Function column of [Pr. PA10] for the command unit. Setting range: 0 to 65535	0 Refer to Function column for unit.	○	○

No./symbol/ name	Setting digit	Function	Initial value [unit]	Control mode	
				C P	P S
PT15 LMPL Software limit + (lower four digits)		Set an address increasing side of the software stroke limit. The combination of the upper and lower digits makes one address. Set an address in hexadecimal. Setting address: 	0000h Refer to Function column for unit.	○	
PT16 LMPH Software limit + (upper four digits)		Setting the same value in "Software limit -" disables the software limit. When setting this parameter with MR Configurator2, change the status to servo-off or the mode to the home position return mode. The unit can be changed to 10^{STM} [μm], $10^{(STM-4)}$ [inch], or [pulse] with the setting of [Pr. PT01]. Setting range: 0000h 0000h to FFFFh FFFFh	0000h Refer to Function column for unit.		
PT17 LMNL Software limit - (lower four digits)		Set an address decreasing side of the software stroke limit. The combination of the upper and lower digits makes one address. Set an address in hexadecimal. Setting address: 	0000h Refer to Function column for unit.	○	
PT18 LMNH Software limit - (upper four digits)		Setting the same value in "Software limit +" will disable the software stroke limit. When setting this parameter with MR Configurator2, change the status to servo-off or the mode to the home position return mode. The unit can be changed to 10^{STM} [μm], $10^{(STM-4)}$ [inch], or [pulse] with the setting of [Pr. PT01]. Setting range: 0000h 0000h to FFFFh FFFFh	0000h Refer to Function column for unit.		
PT19 *LPPL Position range output address + (lower four digits)		Set an address increasing side of the position range output address. The combination of the upper and lower digits makes one address. Using [Pr. PT19] to [Pr. PT22], set a range in which Index 2D17h Status DO7 bit2 (Position range) turns on. Setting address: 	0000h Refer to Function column for unit.	○	
PT20 *LPPH Position range output address + (upper four digits)		The unit can be changed to 10^{STM} [μm], $10^{(STM-4)}$ [inch], or [pulse] with the setting of [Pr. PT01]. Setting range: 0000h 0000h to FFFFh FFFFh	0000h Refer to Function column for unit.		

No./symbol/ name	Setting digit	Function	Initial value [unit]	Control mode C P	Control mode P S
PT21 *LNPL Position range output address - (lower four digits)		Set an address decreasing side of the position range output address. The combination of the upper and lower digits makes one address. Using [Pr. PT19] to [Pr. PT22], set a range in which Index 2D17h Status DO7 bit2 (Position range) turns on. Setting address: _ _ _ _ _ _ _ _ Upper four digits Lower four digits [Pr. PT21] [Pr. PT22] The unit can be changed to 10^{STM} [μm], $10^{(STM-4)}$ [inch], or [pulse] with the setting of [Pr. PT01]. Setting range: 0000h 0000h to FFFFh FFFFh	0000h Refer to Function column for unit.	○	
PT22 *LNPH Position range output address - (upper four digits)			0000h Refer to Function column for unit.		
PT27 *ODM Indexer method - Operation mode selection	_ _ _ x	For manufacturer setting	0h		
	_ _ x _	Manual operation method selection 0: Station JOG operation 1: JOG operation	0h		○
	_ x _ _	For manufacturer setting	0h		
	x _ _ _		0h		
PT28 *STN Number of stations per rotation		Set the number of stations per rotation (number of indexer stations). Setting "0" or "1" will be "2". Setting range: 0 to 255	8 [Stations]		○
PT34 **PDEF Point table default		Use this parameter when initializing point tables and cam data. When the point table tables and cam data are initialized, they will be as follows: Point table: All "0" Cam data: Erased Initialize the point tables with the following procedures: 1) Set "5001h" to this parameter. 2) Cycle the power of the servo amplifier. After the servo amplifier power is on, the initialization completes in about 20 s. "dF" will be displayed on the seven-segment LED of the display during the initialization. After the initialization, the setting of this parameter will be "0000h" automatically. Initialize the cam data with the following procedures: 1) Set "5010h" to this parameter. 2) Cycle the power of the servo amplifier. After the initialization, the setting of this parameter will be "0000h" automatically. Initialize both the point tables and the cam data with the following procedures: 1) Set "5011h" to this parameter. 2) Cycle the power of the servo amplifier. After the servo amplifier power is on, the initialization completes in about 20 s. "dF" will be displayed on the seven-segment LED of the display during the initialization. After the initialization, the setting of this parameter will be "0000h" automatically.	0000h	○	

No./symbol/ name	Setting digit	Function	Initial value [unit]	Control mode	
				C P	P S
PT35 *TOP5 Function selection T-5	_ _ _ x	For manufacturer setting	0h		
	_ _ x _		0h		
	_ x _ _	Simple cam function selection 0: Disabled 1: Enabled (cam position compensation disabled) 2: Enabled (cam position compensation enabled by touch probe 1 (TPR1)) 3: Enabled (cam position compensation enabled by touch probe 2 (TPR2)) Simple cam function is enabled when the control mode is in the point table method. Enabling this in other control modes will trigger [AL. 37 Parameter error].	0h	○	
	x _ _ _	For manufacturer setting	0h		
PT39 INT Torque limit delay time		Set the delay time from outputting Index 2D15h Status DO5 bit5 (travel completion) to enabling [Pr. PC77 Internal torque limit 2]. Setting range: 0 to 1000	100 [ms]		○
PT40 *SZS Station home position shift distance		Set a station home position shift distance with encoder pulse unit at home position return. Setting this parameter enables to shift the station home position (station No. 0) to the position for home position return. The following shows cautions for the setting. ▪ The setting of the station home position shift is disabled at home position return. Cycling the power will enable the setting. ▪ When the station home position shift distance is longer than the in-position range, Index 2D11h Status DO1 bit12 (In-position) will not be on regardless of cycle of the power after home position return. Setting range: -32000 to 32000	0 [pulse]		○

No./symbol/ name	Setting digit	Function	Initial value [unit]	Control mode	
				C P	P S
PT45 HMM Home position return types		Set a home position return type. Refer to the following table for details. Setting a value other than the setting values in the following tables (other than "-1", "-3", "-33", "35", and "37" in the indexer method) triggers [AL. F4]. At this time, home position return cannot be executed.	37	○	○

Setting value	Home position return direction	Home position return method
-1	Address increasing direction	Dog type (rear end detection, Z-phase reference)/torque limit changing dog type (Note)
-2		Count type (front end detection, Z-phase reference)
-3		Torque limit changing data set type (Note)
-4	Address increasing direction	Stopper type (Stopper position reference)
-5		Home position ignorance (servo-on position as home position)
-6	Address increasing direction	Dog type (rear end detection, rear end reference)
-7		Count type (front end detection, front end reference)
-8		Dog cradle type
-9		Dog type last Z-phase reference
-10		Dog type front end reference
-11		Dogless Z-phase reference

Setting value	Home position return direction	Home position return method
-33	Address decreasing direction	Dog type (rear end detection, Z-phase reference)/torque limit changing dog type (Note)
-34		Count type (front end detection, Z-phase reference)
-36		Stopper type (Stopper position reference)
-38		Dog type (rear end detection, rear end reference)
-39		Count type (front end detection, front end reference)
-40		Dog cradle type
-41		Dog type last Z-phase reference
-42		Dog type front end reference
-43		Dogless Z-phase reference

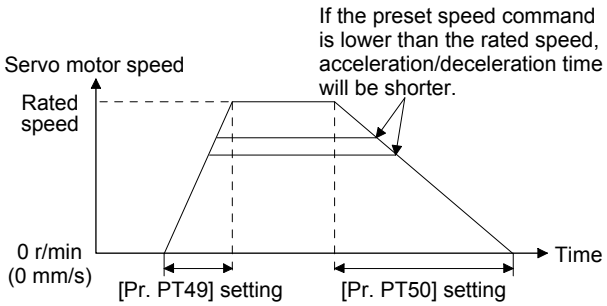
No./symbol/ name	Setting digit	Function	Initial value [unit]	Control mode	
				C P	P S

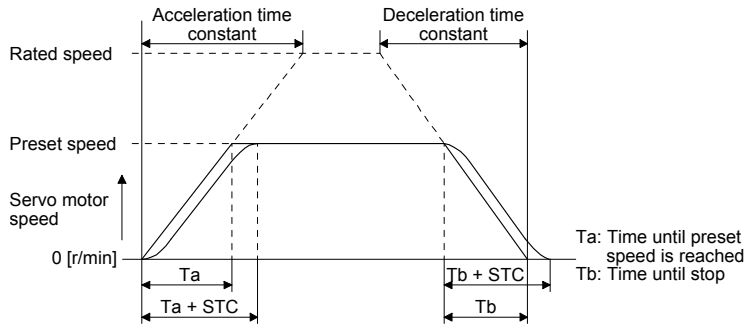
PT45
HMM
Home position return types

Setting value	Home position return direction	Home position return method
3	Address increasing direction	Method 3
4	Address increasing direction	Method 4
5	Address decreasing direction	Method 5
6	Address decreasing direction	Method 6
7	Address increasing direction	Method 7
8	Address increasing direction	Method 8
11	Address decreasing direction	Method 11
12	Address decreasing direction	Method 12
19	Address increasing direction	Method 19
20	Address increasing direction	Method 20

Setting value	Home position return direction	Home position return method
21	Address decreasing direction	Method 21
22	Address decreasing direction	Method 22
23	Address increasing direction	Method 23
24	Address increasing direction	Method 24
27	Address decreasing direction	Method 27
28	Address decreasing direction	Method 28
33	Address decreasing direction	Method 33
34	Address increasing direction	Method 34
35		Method 35
37		Method 37

Note. Torque limit changing dog type and torque limit changing data set type are available only in the indexer method.

No./symbol/ name	Setting digit	Function	Initial value [unit]	Control mode	
				C P	P S
PT49 STA Acceleration time constant		Set the acceleration time taken from 0 r/min (0 mm/s) to the rated speed for the command. If the servo motor is started with a value exceeding 20000 ms, [AL. F4] will occur, and the servo motor will not operate.  For example for the servo motor of 3000 r/min rated speed, set 3000 (3 s) to increase speed from 0 r/min to 1000 r/min in 1 s. Setting range: 0 to 50000	0 [ms]	○	○
PT50 STB Deceleration time constant		Set the deceleration time taken from the rated speed to 0 r/min (0 mm/s) for the command. If the servo motor is started with a value exceeding 20000 ms, [AL. F4] will occur, and the servo motor will not operate. When the servo motor is started with a value exceeding 2000 ms in the indexer mode, the deceleration time constant is clamped to 20000 ms. Setting range: 0 to 50000	0 [ms]	○	○

No./symbol/ name	Setting digit	Function	Initial value [unit]	Control mode	
				C P	P S
PT51 STC S-pattern acceleration/deceleration time constant		This parameter is used to smooth start/stop of the servo motor or linear servo motor. Set the time of the arc part for S-pattern acceleration/deceleration. Setting "0" will make it linear acceleration/deceleration.  The actual operation time for the arc part is limited as shown by the following calculations. Thus, if a large value is set to STA (acceleration time constant) or STB (deceleration time constant), the actual operation time for the arc part may differ from the setting value of the S-pattern acceleration deceleration time constant. The setting will be disabled during home position return. When a value exceeding 1000 ms is set, the parameter value will be clamped to 1000 ms. The upper limit value of the actual time for the arc part is limited by $\frac{2000000}{STA}$ for acceleration and by $\frac{2000000}{STB}$ for deceleration. (Example) At the setting of STA = 20000, STB = 5000 and STC = 200, the actual times for the arc part are as follows: During acceleration: 100 ms $\frac{2000000}{20000}$ = 100 [ms] < 200 [ms] Therefore, it will be limited to 100 [ms]. During deceleration: 200 ms $\frac{2000000}{5000}$ = 400 [ms] > 200 [ms] Therefore, it will be 200 [ms] as you set. Setting range: 0 to 5000	0 [ms]	○	
PT65 PVC Jog speed command		Set the Jog speed command. If a value smaller than "1.00" is set, the servo motor may not rotate. Setting range: 0.00 to instantaneous permissible speed	100.00 [r/min]/ [mm/s]	○	○

No./symbol/ name	Setting digit	Function	Initial value [unit]	Control mode	
				C P	P S
PT69 ZSTH Home position shift distance (extension parameter)		Set the extension parameter of [Pr. PT07]. When [Pr. PT69] is used, the home position shift distance is calculated as follows. Home position shift distance = [Pr. PT07] + ([Pr. PT69] × 65536) The unit will be as follows depending on the positioning mode. ▪ In the point table method The unit can be changed to [μm], 10^{-4} [inch], or [pulse] with the setting of [Pr. PT01]. ▪ In the indexer method It will be command unit [pulse]. (A load-side rotation expressed by the number of servo motor resolution pulses) Refer to the Function column of [Pr. PA10] for the command unit. Additionally, when a value equal to or more than "1001" is set, the value will be clamped to "1000". Setting range: 0 to 32767	0 Refer to Function column for unit.	○	○
PT71 DCTH Travel distance after proximity dog (extension parameter)		Set the extension parameter of [Pr. PT09]. When [Pr. PT71] is used, the travel distance after proximity dog is calculated as follows. Travel distance after proximity dog = [Pr. PT09] + ([Pr. PT71] × 65536) The unit can be changed to 10^{STM} [μm], $10^{(STM-4)}$ [inch], or [pulse] with the setting of [Pr. PT01]. Setting range: 0 to 32767	0 Refer to Function column for unit.	○	

7.2.5 Network setting parameters ([Pr. PN_ _])

No./symbol/ name	Setting digit	Function	Initial value [unit]	Control mode	
				C P	P S
PN02 CERT Communication error detection time		Set the time until [AL. 86.1 Network communication error 1] is detected. When "0" is set, the detection time becomes 1000 [ms]. Setting range: 0 to 1000	0 [ms]	○	○
PN10 EIC Ethernet communication time-out selection		Set the time until [AL. 86.4 Network communication error 4] is detected. Setting "0" will disable the detection of [AL. 86.4 Network communication error 4]. This parameter is enabled with SLMP. Detection of [AL. 86.4] starts when SLMP is received for the first time. When an alarm is detected and then reset, the detection stops and will restart upon receipt of the next SLMP. Setting range: 0 to 60	0 [s]	○	○
PN11 **IPADA IP address setting A	_ _ x x	IP address setting 2 Set the 2nd octet of the IP address in hexadecimal. Set the IP address assigned by the network administrator. When the parameter is set to "_ _ 0 0", the 2nd octet is "168". When SLMP command (IPAddressSet) is received, the setting of the 2nd octet will be written to this digit. Refer to table 7.1 for the relation between the setting value of the rotary switch and the parameter setting value. Setting range: 00h to FFh	00h	○	○
	x x _ _	IP address setting 1 Set the 1st octet of the IP address in hexadecimal. Set the IP address assigned by the network administrator. When the parameter is set to "0 0 _ _", the 1st octet is "192". When SLMP command (IPAddressSet) is received, the setting of the 1st octet will be written to this digit. Refer to table 7.1 for the relation between the setting value of the rotary switch and the parameter setting value. Setting range: 00h to FFh	00h	○	○

Table 7.1 Relation between IP address setting and rotary switch

Rotary switches (SW2/SW3)	IP address	
00h	1st octet	The setting value of [Pr. PN11 (x x _ _)] is used.
	2nd octet	The setting value of [Pr. PN11 (_ _ x x)] is used.
	3rd octet	The setting value of [Pr. PN12 (x x _ _)] is used.
	4th octet	The setting value of [Pr. PN12 (_ _ x x)] is used.
01h to FFh	1st octet	The setting value of [Pr. PN11 (x x _ _)] is used.
	2nd octet	The setting value of [Pr. PN11 (_ _ x x)] is used.
	3rd octet	The setting value of [Pr. PN12 (x x _ _)] is used.
	4th octet	The setting value of the rotary switches (SW2/SW3) is used.

No./symbol/ name	Setting digit	Function	Initial value [unit]	Control mode	
				C P	P S
PN12 **IPADB IP address setting B	_ _ x x	IP address setting 4 Set the 4th octet of the IP address in hexadecimal. Set the IP address assigned by the network administrator. When SLMP command (IPAddressSet) is received, the setting of the 4th octet will be written to this digit. Refer to table 7.1 for the relation between the setting value of the rotary switch and the parameter setting value. Setting range: 00h to FFh	00h	○	○
	x x _ _	IP address setting 3 Set the 3rd octet of the IP address in hexadecimal. Set the IP address assigned by the network administrator. When the parameter is set to "0 0 _ _", the 3rd octet is "3". When SLMP command (IPAddressSet) is received, the setting of the 3rd octet will be written to this digit. Refer to table 7.1 for the relation between the setting value of the rotary switch and the parameter setting value. Setting range: 00h to FFh	00h	○	○
PN13 **SNMKA Subnet mask setting A	_ _ x x	Subnet mask setting 2 Set the 2nd octet of the subnet mask in hexadecimal. Set the subnet mask assigned by the network administrator. When both [Pr. PN13] and [Pr. PN14] are set to "0000h", the 2nd octet is "255". The subnet mask can also be changed simultaneously by the SLMP command (IPAddressSet). Setting range: 00h to FFh	00h	○	○
	x x _ _	Subnet mask setting 1 Set the 1st octet of the subnet mask in hexadecimal. Set the subnet mask assigned by the network administrator. When both [Pr. PN13] and [Pr. PN14] are set to "0000h", the 1st octet is "255". The subnet mask can also be changed simultaneously by the SLMP command (IPAddressSet). Setting range: 00h to FFh	00h	○	○
PN14 **SNMKB Subnet mask setting B	_ _ x x	Subnet mask setting 4 Set the 4th octet of the subnet mask in hexadecimal. Set the subnet mask assigned by the network administrator. The subnet mask can also be changed simultaneously by the SLMP command (IPAddressSet). Setting range: 00h to FFh	00h	○	○
	x x _ _	Subnet mask setting 3 Set the 3rd octet of the subnet mask in hexadecimal. Set the subnet mask assigned by the network administrator. When both [Pr. PN13] and [Pr. PN14] are set to "0000h", the 3rd octet is "255". The subnet mask can also be changed simultaneously by the SLMP command (IPAddressSet). Setting range: 00h to FFh	00h	○	○

No./symbol/ name	Setting digit	Function	Initial value [unit]	Control mode	
				C P	P S
PN18 **IPAFA IP address filter A	_ _ x x	IP address filter 2 Set the 2nd octet of the IP address of the network device allowed to be connected in hexadecimal. When both [Pr. PN18] and [Pr. PN19] are set to "0000h", the function is disabled. Setting range: 00h to FFh	00h	○	○
	x x _ _	IP address filter 1 Set the 1st octet of the IP address of the network device allowed to be connected in hexadecimal. When both [Pr. PN18] and [Pr. PN19] are set to "0000h", the function is disabled. Setting range: 00h to FFh	00h	○	○
PN19 **IPAFB IP address filter B	_ _ x x	IP address filter 4 Set the 4th octet of the IP address of the network device allowed to be connected in hexadecimal. When both [Pr. PN18] and [Pr. PN19] are set to "0000h", the function is disabled. Setting range: 00h to FFh	00h	○	○
	x x _ _	IP address filter 3 Set the 3rd octet of the IP address of the network device allowed to be connected in hexadecimal. When both [Pr. PN18] and [Pr. PN19] are set to "0000h", the function is disabled. Setting range: 00h to FFh	00h	○	○
PN20 **IPFRA IP address filter A range setting	_ _ x x	IP address filter 2 range specification Set a value for the 2nd octet range of the IP address of the network device allowed to be connected in hexadecimal. The range for the IP address of the network device allowed to be connected is between [Pr. PN18 (_ _ x x)] and [Pr. PN20 (_ _ x x)]. Setting "00h" disables the function. Setting range: 00h to FFh	00h	○	○
	_ x _ _	For manufacturer setting	0h		
	x _ _ _		0h		
PN21 **IPFRB IP address filter B range setting	_ _ x x	IP address filter 4 range specification Set a value for the 4th octet range of the IP address of the network device allowed to be connected in hexadecimal. The range for the IP address of the network device allowed to be connected is between [Pr. PN19 (_ _ x x)] and [Pr. PN21 (_ _ x x)]. Setting "00h" disables the function. Setting range: 00h to FFh	00h	○	○
	x x _ _	IP address filter 3 range specification Set a value for the 3rd octet range of the IP address of the network device allowed to be connected in hexadecimal. The range for the IP address of the network device allowed to be connected is between [Pr. PN19 (x x _ _)] and [Pr. PN21 (x x _ _)]. Setting "00h" disables the function. Setting range: 00h to FFh	00h	○	○

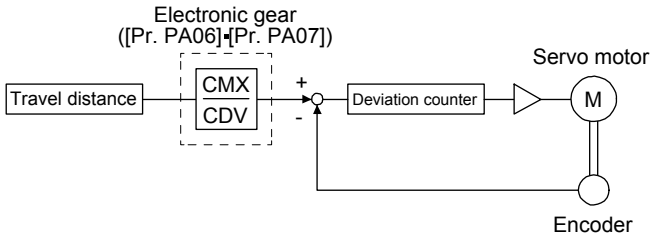
No./symbol/ name	Setting digit	Function	Initial value [unit]	Control mode	
				C P	P S
PN22 **IPOAA Operation specification IP address A	_ _ x x	Operation specification IP address 2 Set the 2nd octet of the IP address of the network device allowed to be connected in hexadecimal. When both [Pr. PN22] and [Pr. PN23] are set to "0000h", the function is disabled. When the function is enabled, the servo amplifier allows the following data 1) to 3) to be imported only if the IP address of the master station (external device) matches with the operation specification IP address. If they are mismatched, the data is discarded. 1) SDO Download (command: 4020h, sub command: 0002h) 2) SDO Object SubID Block Download (command: 4020h, sub command: 0006h) 3) CC-Link IE Field Network Basic request message (RWwn) Setting range: 00h to FFh	00h	○	○
	x x _ _	Operation specification IP address 1 Set the 1st octet of the IP address of the network device allowed to be connected in hexadecimal. When both [Pr. PN22] and [Pr. PN23] are set to "0000h", the function is disabled. When the function is enabled, the servo amplifier allows the following data 1) to 3) to be imported only if the IP address of the master station (external device) matches with the operation specification IP address. If they are mismatched, the data is discarded. 1) SDO Download (command: 4020h, sub command: 0002h) 2) SDO Object SubID Block Download (command: 4020h, sub command: 0006h) 3) CC-Link IE Field Network Basic request message (RWwn) Setting range: 00h to FFh	00h	○	○
PN23 **IPOAB Operation specification IP address B	_ _ x x	Operation specification IP address 4 Set the 4th octet of the IP address of the network device allowed to be connected in hexadecimal. When both [Pr. PN22] and [Pr. PN23] are set to "0000h", the function is disabled. When the function is enabled, the servo amplifier allows the following data 1) to 3) to be imported only if the IP address of the master station (external device) matches with the operation specification IP address. If they are mismatched, the data is discarded. 1) SDO Download (command: 4020h, sub command: 0002h) 2) SDO Object SubID Block Download (command: 4020h, sub command: 0006h) 3) CC-Link IE Field Network Basic request message (RWwn) Setting range: 00h to FFh	00h	○	○
	x x _ _	Operation specification IP address 3 Set the 3rd octet of the IP address of the network device allowed to be connected in hexadecimal. When both [Pr. PN22] and [Pr. PN23] are set to "0000h", the function is disabled. When the function is enabled, the servo amplifier allows the following data 1) to 3) to be imported only if the IP address of the master station (external device) matches with the operation specification IP address. If they are mismatched, the data is discarded. 1) SDO Download (command: 4020h, sub command: 0002h) 2) SDO Object SubID Block Download (command: 4020h, sub command: 0006h) 3) CC-Link IE Field Network Basic request message (RWwn) Setting range: 00h to FFh	00h	○	○

No./symbol/ name	Setting digit	Function	Initial value [unit]	Control mode	
				C P	P S
PN24 **IPOR Operation specification IP address range specification	_ _ x x	Operation specification IP address 4 range specification Set a value for the 4th octet range of the IP address of the network device allowed to be connected in hexadecimal. The range for the IP address of the network device allowed to be connected is between [Pr. PN23 (_ _ x x)] and [Pr. PN24 (_ _ x x)]. Setting "00h" disables the function. Setting range: 00h to FFh	00h	○	○
	x x _ _	Operation specification IP address 3 range specification Set a value for the 3rd octet range of the IP address of the network device allowed to be connected in hexadecimal. The range for the IP address of the network device allowed to be connected is between [Pr. PN23 (x x _ _)] and [Pr. PN24 (x x _ _)]. Setting "00h" disables the function. Setting range: 00h to FFh	00h	○	○

7.2.6 How to set the electronic gear

(1) Electronic gear settings in the point table method

Adjust [Pr. PA06] and [Pr. PA07] to match the servo amplifier setting with the travel distance of the machine.



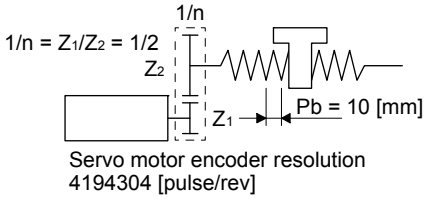
Pt: Servo motor encoder resolution: 4194304 [pulse/rev]
ΔS: Travel distance per servo motor revolution [mm/rev]/[inch/rev]/[pulse/rev]
CMX/CDV = Pt/ΔS

The following setting example shows how to calculate the electronic gear.

POINT
●To calculate the electronic gear, the following specifications are required. Pb: Ball screw lead [mm] 1/n: Reduction ratio Pt: Servo motor encoder resolution [pulse/rev] ΔS: Travel distance per servo motor revolution [mm/rev]

(a) Setting example of a ball screw

Machine specifications



Ball screw lead Pb = 10 [mm]
Reduction ratio: 1/n = Z_1/Z_2 = 1/2
Z_1: Number of gear teeth on servo motor side
Z_2: Number of gear teeth on load side
Servo motor encoder resolution: P_t = 4194304 [pulse/rev]

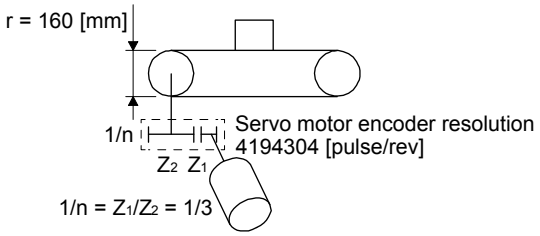
$$\frac{CMX}{CDV} = \frac{P_t}{\Delta S} = \frac{P_t}{n \cdot Pb \cdot \alpha\ (Note)} = \frac{4194304}{1/2 \cdot 10 \cdot 1000} = \frac{4194304}{5000} = \frac{524288}{625}$$

Note. Because the command unit is "mm", α is 1000. When the unit is "inch", α is 10000. When the unit is "pulse", α is 1.

Therefore, set CMX = 524288 and CDV = 625.

(b) Setting example of a conveyor

Machine specifications



Pulley diameter: r = 160 [mm]
Reduction ratio: $1/n = Z_1/Z_2 = 1/3$
Z_1: Number of gear teeth on servo motor side
Z_2: Number of gear teeth on load side

Servo motor encoder resolution: $P_t = 4194304$ [pulse/rev]

$$\frac{CMX}{CDV} = \frac{P_t}{\Delta S} = \frac{P_t}{n \cdot r \cdot \pi \cdot \alpha \text{ (Note)}} = \frac{4194304}{1/3 \cdot 160 \cdot \pi \cdot 1000} = \frac{4194304}{167551.61} \approx \frac{524288}{20944}$$

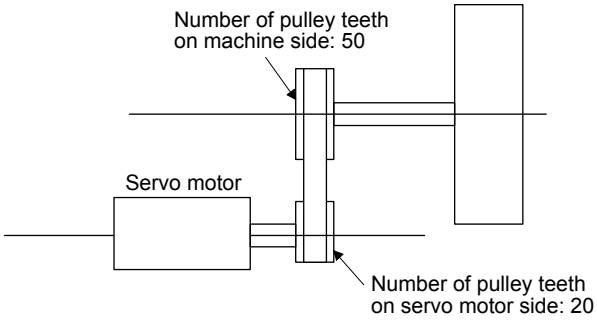
Note. Because the command unit is "mm", α is 1000. When the unit is "inch", α is 10000. When the unit is "pulse", α is 1.

Reduce CMX and CDV to within the setting range or lower, and round off each value to the closest whole number.
Therefore, set CMX = 524288 and CDV = 20944.

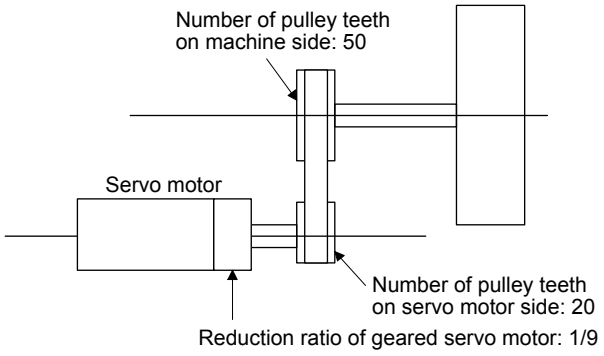
(2) Electronic gear setting in the indexer method

Using [Pr. PA06] and [Pr. PA07], adjust the rotation amount "m" of the servo motor shaft which is required to rotate the load side for "n" times. The following shows a setting example of the electronic gear.

(a) Number of pulley teeth on machine side: 50, number of pulley teeth on servo motor side: 20
Set [Pr. PA06] = 50 and [Pr. PA07] = 20.



(b) Number of pulley teeth on machine side: 50, number of pulley teeth on servo motor side: 20, with geared servo motor of 1/9
Set [Pr. PA06] = 450 and [Pr. PA07] = 20.

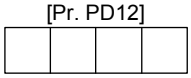


$$\frac{50}{20} \times \frac{9}{1} = \frac{450}{20}$$

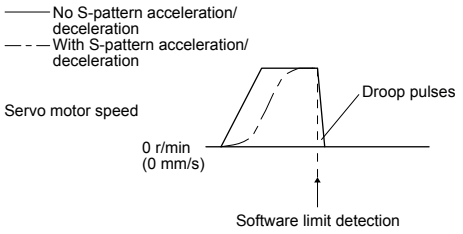
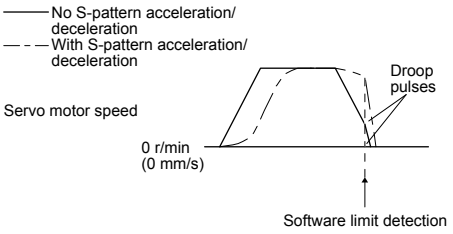
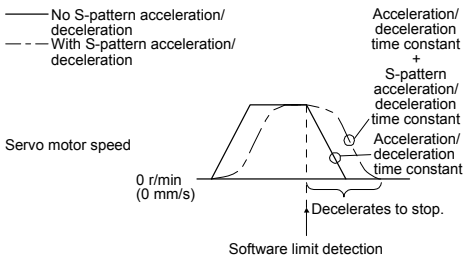
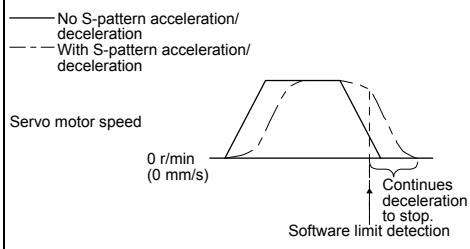
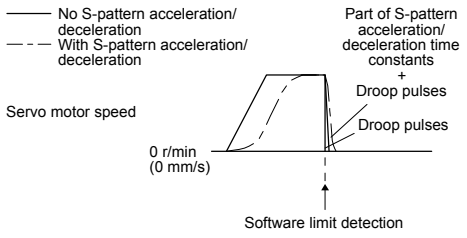
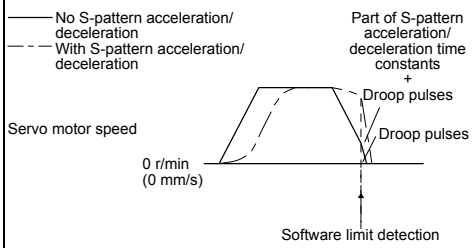
7.2.7 Stop method at software limit detection

By setting the third digit in [Pr. PD12], select a stop method of the servo motor for when a software limit ([Pr. PT15] to [Pr. PT18]) is detected. With the software limit, a command position controlled in the servo amplifier is limited. Therefore, actual stop position will not reach the set position of the software limit.

[Pr. PD12]



Stop method selection at software limit detection
1: Slow stop
2: Slow stop (deceleration to a stop by deceleration time constant)
3: Quick stop (stop by clearing remaining distance)

[Pr. PD12] setting	Operation status		Remark
	During rotation at constant speed	During deceleration to a stop	
_ 1 _ _ (initial value)			The servo motor stops after having traveled for the droop pulses. The home position is maintained; however, there is a difference between the command and current positions. Perform a home position return again.
_ 2 _ _			The servo motor decelerates to a stop with the deceleration time constant currently selected with the point table. The operation is continued for the delay of the S-pattern acceleration/deceleration time constants. The home position is maintained. There is no difference between the command and current positions.
_ 3 _ _			The servo motor stops after having traveled for the droop pulses. Operation is continued for the delay of the S-pattern acceleration/deceleration time constants. The home position is maintained. There is no difference between the command and current positions.

8. TROUBLESHOOTING AT POWER ON

To remove the cause of the troubles, refer to the troubleshooting at power on described in this chapter and in "MELSERVO-J4 Servo Amplifier Instruction Manual (Troubleshooting)".

Display	Description	Cause	Checkpoint	Action
b##. C##. d##. (Note)	The system has been in the test operation mode.	The test operation mode is enabled.	Check if SW1-1 is "ON (up)" and SW1-2 is "OFF (down)".	Turn SW1-1 "OFF (down)" and turn SW1-2 "ON (up)".
off	Operation mode for manufacturer setting is set.	Operation mode for manufacturer setting is enabled.	Check if both the slide switches (SW1-1 and SW1-2) are on.	Set the slide switches (SW1-1 and SW1-2) correctly. For how to set the slide switches, refer to section 4.3.

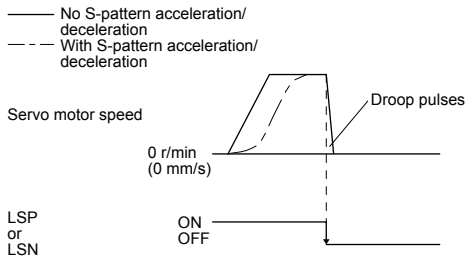
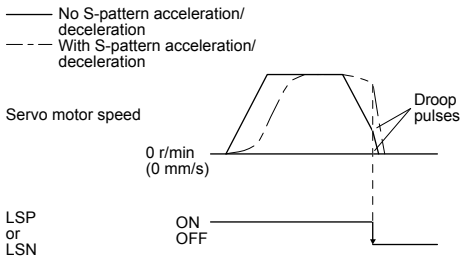
Note. ## indicates identification number.

MEMO

9. MANUFACTURER FUNCTIONS

9.1 Stroke end

When LSP (Forward rotation stroke end) or LSN (Reverse rotation stroke end) is turned off, a slow stop is performed by either of the following stop methods.

Operation status		Remark
During rotation at constant speed	During deceleration to a stop	
		The servo motor stops after having traveled for the droop pulses. There is a difference between the command and current positions. Perform a home position return again.

Perform a return as follows when the stroke end is detected.

Mode	Return method
Point table mode (pt)	Perform operation opposite to the limit with the Jog mode (jg).
Jog mode (jg)	Perform operation opposite to the limit.
Indexer mode (idx)	Perform operation opposite to the limit with the Jog mode (jg).

9.2 One-touch tuning

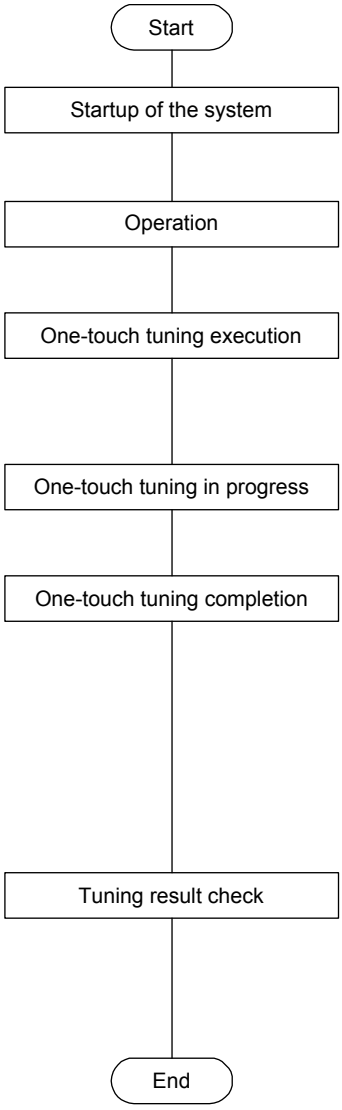
For one-touch tuning, refer to "MR-J4-_GF_(-RJ) Servo Amplifier Instruction Manual (Motion Mode)". Using One-touch tuning mode (2D50h) allows one-touch tuning from the master station (controller).

(1) Related object

Index	Sub	Access	Name	Data Type	Default	Description
2D50h	0	rw	One-touch tuning mode	U8	0	Setting "1" to "3" starts one-touch tuning. After one-touch tuning is completed, the setting value automatically changes to "0". 0: During one-touch tuning stop 1: Basic mode 2: High mode 3: Low mode
2D51h	0	ro	One-touch tuning status	I8	0	Regardless of whether one-touch tuning is properly completed or not, the setting value changes to 100% at the completion. Unit: %
2D52h	0	wo	One-touch tuning Stop	U16	0	Writing "1EA5h" stops one-touch tuning. Writing a value other than "1EA5h" will trigger the error code "CCD4h".
2D53h	0	wo	One-touch tuning Clear	U16	0	The parameter changed in one-touch tuning can be returned to the value before the change. 0000h: Restores the initial value 0001h: Restores the value before one-touch tuning The setting value of the restored parameter is stored to the EEP-ROM.
2D54h	0	ro	One-touch tuning Error Code	U16	0	The following shows the details of the one-touch tuning error codes. 0000h: Finished normally C000h: Tuning canceled C001h: Overshoot exceeded C002h: Servo-off during tuning C003h: Control mode error C004h: Time-out C005h: Load to motor inertia ratio misestimated C00Fh: One-touch tuning disabled

(2) Procedure of one-touch tuning via a network

Perform one-touch tuning via a network in the following procedure.



Refer to "MR-J4-_GF_(-RJ) Servo Amplifier Instruction Manual (Motion Mode)" to start the system.

Rotate the servo motor by a master station (controller). (One-touch tuning cannot be executed if the servo motor is not operating.)

To perform one-touch tuning, write a value of the response mode (high mode, basic mode, or low mode) in One-touch tuning mode (2D50h) while the servo motor is in operation.

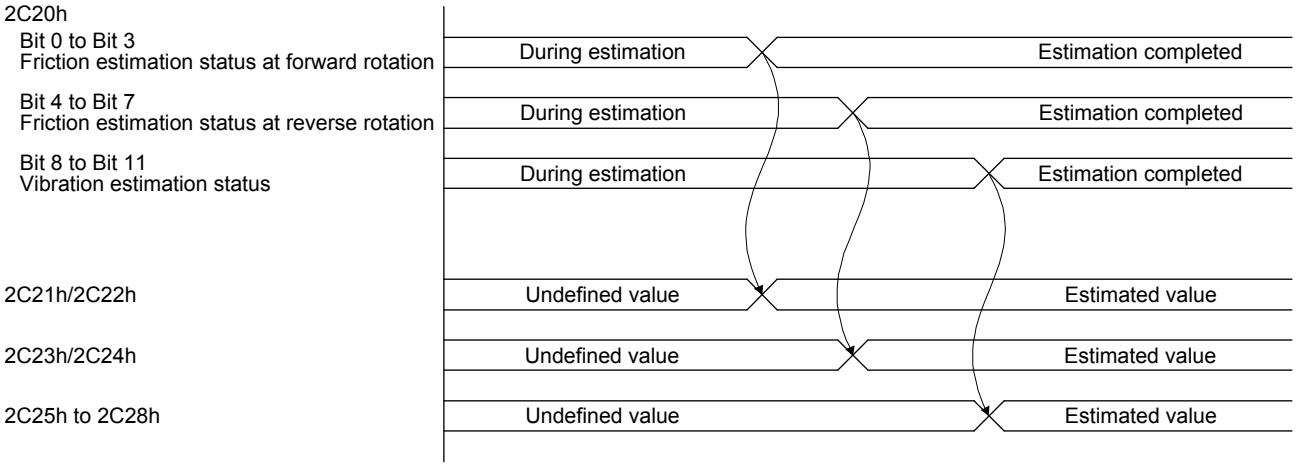
Gains and filters are adjusted automatically. During one-touch tuning, the progress can be checked with One-touch tuning status (2D51h).

Check whether one-touch tuning is completed normally with One-touch tuning Error Code (2D54h). When one-touch tuning is completed normally, the parameters will be set automatically. Refer to "MR-J4-_GF_(-RJ) Servo Amplifier Instruction Manual (Motion Mode)" for the parameters that are set automatically.
After a tuning error is returned, take the appropriate action according to "MR-J4-_GF_(-RJ) Servo Amplifier Instruction Manual (Motion Mode)".

Check the tuning result.
If the tuning result is not satisfactory, you can return the parameter to the value before the one-touch tuning or to the initial value by using One-touch tuning Clear (2D53h).

9.3 Machine diagnosis function

From the data in the servo amplifier, this function estimates the friction and vibrational component of the drive system in the equipment, and recognizes an error in the machine parts, including a ball screw and bearing. The information of the machine diagnosis function can be obtained with the following objects.



Index	Sub	Access	Name	Data Type	Default	Description
2C20h	0	ro	Machine diagnostic status	U16		Refer to section 10.1.
2C21h	0	ro	Static friction torque at forward rotation	I16		Static friction at forward rotation torque is displayed in increments of 0.1%.
2C22h	0	ro	Dynamic friction torque at forward rotation (at rated speed)	I16		Dynamic friction at forward rotation torque at the rated speed is displayed in increments of 0.1%.
2C23h	0	ro	Static friction torque at reverse rotation	I16		Static friction at reverse rotation torque is displayed in increments of 0.1%.
2C24h	0	ro	Dynamic friction torque at reverse rotation (at rated speed)	I16		Dynamic friction at reverse rotation torque at the rated speed is displayed in increments of 0.1%.
2C25h	0	ro	Oscillation frequency during motor stop	I16		Vibration frequency during stop and servo-lock is displayed in increments of 1 Hz.
2C26h	0	ro	Vibration level during motor stop	I16		Vibration level during stop and servo-lock is displayed in increments of 0.1%.
2C27h	0	ro	Oscillation frequency during motor operating	I16		Vibration frequency during operation is displayed in increments of 1 Hz.
2C28h	0	ro	Vibration level during motor operating	I16		Vibration level during operation is displayed in increments of 0.1%.

9.4 Servo amplifier life diagnosis function

You can check the cumulative energization time and the number of on/off times of the inrush relay from the data in the servo amplifier.
This function gives an indication of the replacement time for parts of the servo amplifier including a capacitor and a relay before they malfunction.
The information of the servo amplifier life diagnosis function can be obtained with the following objects.

Index	Sub	Access	Name	Data Type	Default	Description
2C18h	0	ro	Power ON cumulative time	U32		The cumulative energization time of the servo amplifier is returned.
2C19h	0	ro	Number of inrush relay on/ off times	U32		The number of on/off times of the inrush relay of the servo amplifier is returned.

9.5 Simple cam function

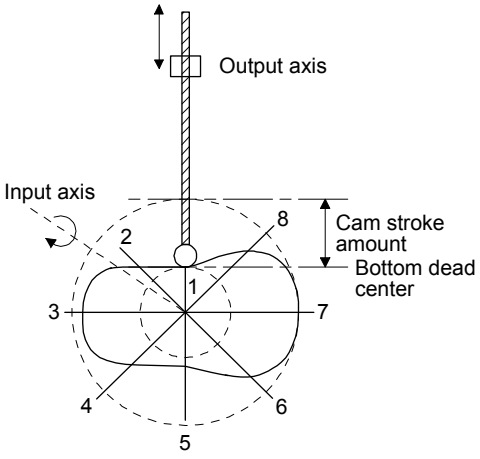
CAUTION	●The number of write times to the Flash-ROM where the cam data is stored is limited to 10000. If the total number of write times exceeds 10000, the servo amplifier may malfunction when the Flash-ROM reaches the end of its useful life.

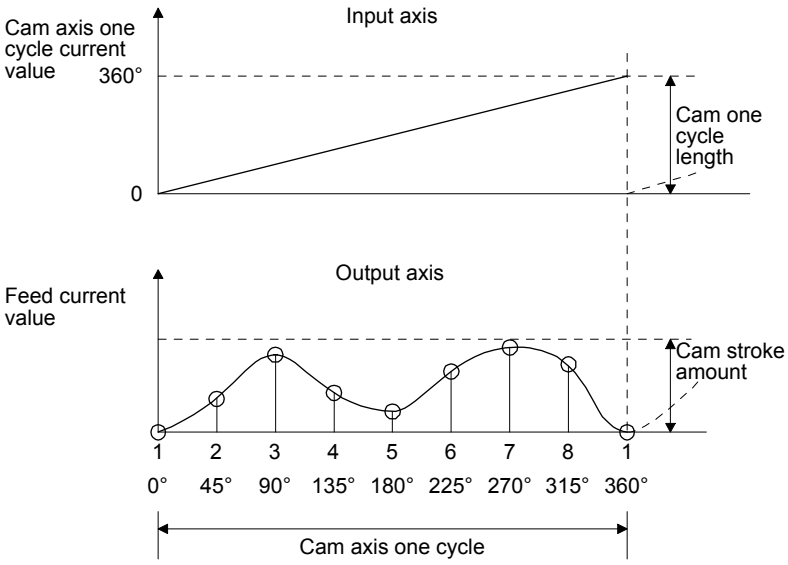
POINT

●The simple cam function can be used with the point table method.
●When [AL. F5.2 Cam data miswriting warning] occurs during cam data writing, set [Pr. PT34] to "5010" to initialize the cam data.
●Simple cam function is not compatible with infinite feed function. When using the infinite feed function, configure the incremental system.
●When using simple cam function, execute operation so that the machine speed of the input axis is equal to or less than "[Cam control data No. 48 - Cam axis length per cycle] × 1/2 × 1000 [command unit/s]".
●When [Cam control data No. 30] is set to "1", the unit of the cam axis length per cycle will be changed to [mm], [inch], or [pulse] with the setting of [Pr. PT01]. When [Cam control data No. 30] is set to "2", the unit of the cam axis length per cycle will be changed to [mm], [inch], [degree], or [pulse] with the setting of [Cam control data No. 14].

9.5.1 Outline of simple cam function

Simple cam function enables synchronous control by using software instead of controlling mechanically with cam.
The following shows a path when the cam as follows is used and the input axis is rotated once.

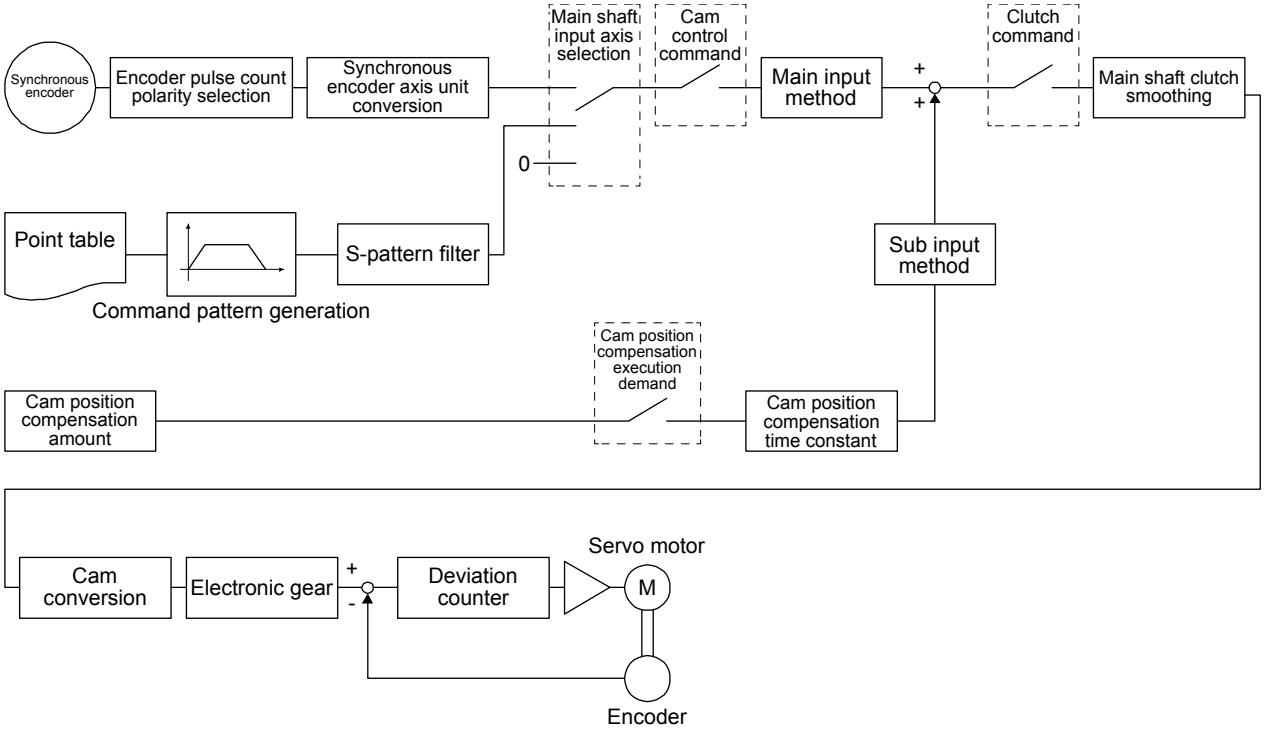




In the simple cam function, setting cam data and cam control data enables synchronous control with an input axis (synchronous encoder input or point table command) with a start of positioning.

9.5.2 Simple cam function block diagram

The following shows the function block diagram of the simple cam. Use MR Configurator2 to set the cam data and the cam control data.



9.5.3 Simple cam specification list

(1) Specification list

Item			MR-J4-_GF_-RJ
Memory capacity (Note)		Storage area for cam data	8 Kbytes (Flash-ROM)
		Working area for cam data	8 Kbytes (RAM)
Number of registration			Max. 8
Comment			Max. 32 single-byte characters for each cam data and cam control data
Cam data and cam control data	Stroke ratio data type	Cam resolution	256/512/1024/2048
		Stroke ratio [%]	-100.000 to 100.000
	Coordinate data type	Number of coordinate	2 to 1024
		Coordinate data	Input value: 0 to 999999 Output value: -999999 to 999999
Cam curve			12 types (constant speed/constant acceleration/5th curve/single hypotenuse/cycloid/distorted trapezoid/distorted sine/distorted constant speed/trapecloid/reverse trapecloid/double hypotenuse/reverse double hypotenuse)

Note. The memory capacity includes a use area (storage area for cam data) for storing in the servo amplifier and an actual operation area (working area for cam data).

(2) Cam resolution

(a) Stroke ratio data type

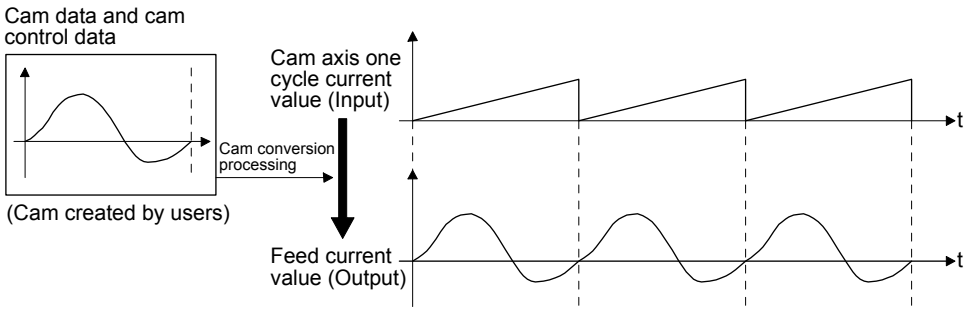
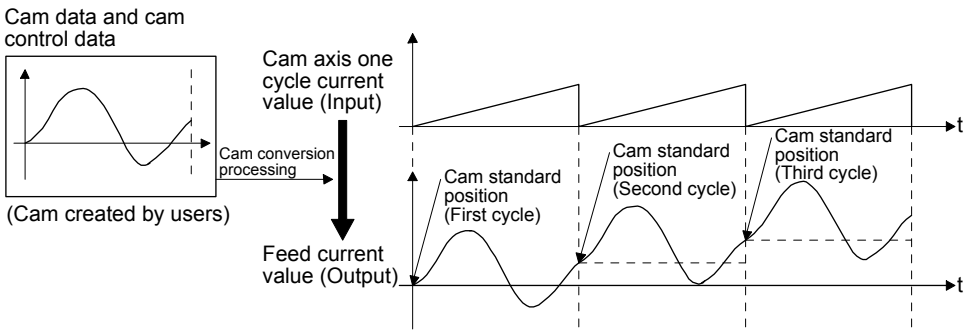
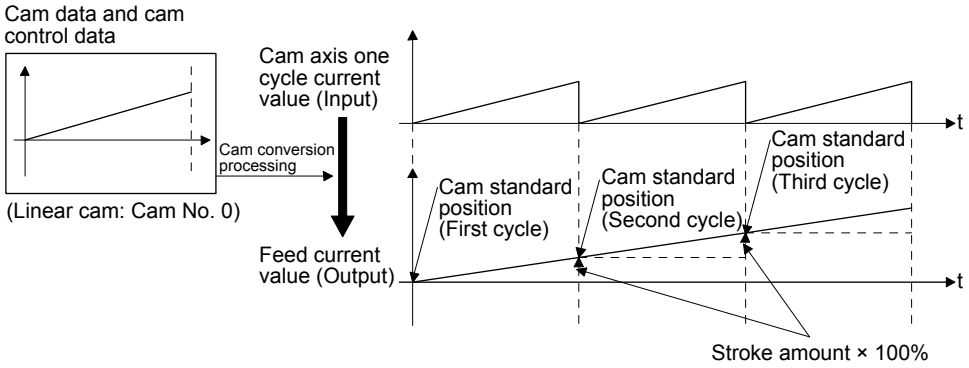
Cam resolution	Max. number of registration
256	8
512	4
1024	2
2048	1

(b) Coordinate data type

Number of coordinate	Max. number of registration
128	8
256	4
512	2
1024	1

9.5.4 Control of simple cam function

Setting the cam data and the cam control data with MR Configurator2 enables the following three cam controls.

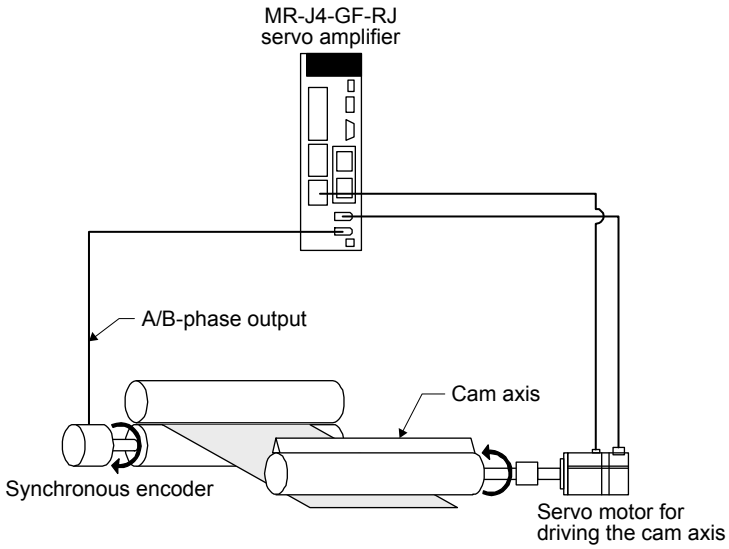
Cam control method	Description	Actual motion
To-and-fro control	Reciprocates within a specified cam stroke.	
Feed control	Updates a cam standard position per cycle.	
Straight-line control	Performs straight-line control to keep the one-cycle stroke ratio as 100%.	

9.5.5 Operation in combination with the simple cam

(1) Encoder following function

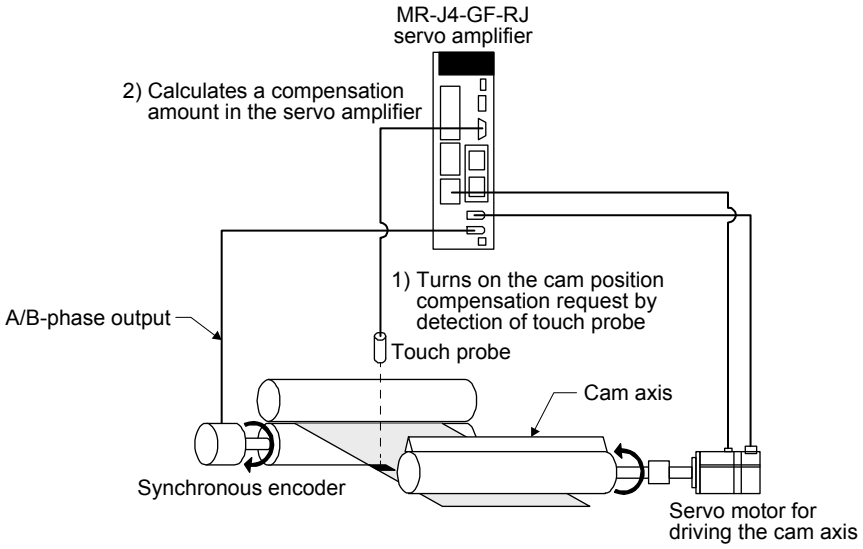
The servo amplifier receives A/B-phase output signal from a synchronous encoder and starts the servo motor with the signal.

Up to 4 Mpulses/s can be inputted from the synchronous encoder to use with the servo amplifier.



(2) Simple cam position compensation function

The servo amplifier receives input signals from the touch probe, calculates compensation, and compensates the position of the cam axis.



9.5.6 Setting list

(1) List of items set with MR Configurator2

Set the following on the cam setting window of MR Configurator2.

Setting item		Setting
Cam control data	Main shaft input axis selection	Select a command input method for the cam axis. Select "synchronous encoder axis" or "servo input axis".
	Cam No. selection	Select the number to create the cam control data.
	Resolution setting	Set the cam resolution. Select from 256/512/1024/2048.
	Cam axis length per cycle	Set a travel distance of cam one cycle. Command unit is used as an input unit.
	Cam stroke amount	Set a cam stroke amount for the stroke ratio of 100% when using the stroke ratio data type cam control.
Cam data		Create the cam data on the cam creating window of MR Configurator2. After the data is created, write the cam data to the servo amplifier.

(2) List of items set with parameters of the servo amplifier

Set the following with the parameters of the servo amplifier.

Setting item	Setting
Operation mode selection	Select "Positioning mode (point table method)" with [Pr. PA01 Operation mode].
Cam function setting	Enable the cam function with [Pr. PT35 Function selection T-5].
Cam data selection	Select the cam data to be executed with Target CAM No. (2D80h). [Cam control data No. 49 - Cam No.] can also be used for selecting the cam data for execution.

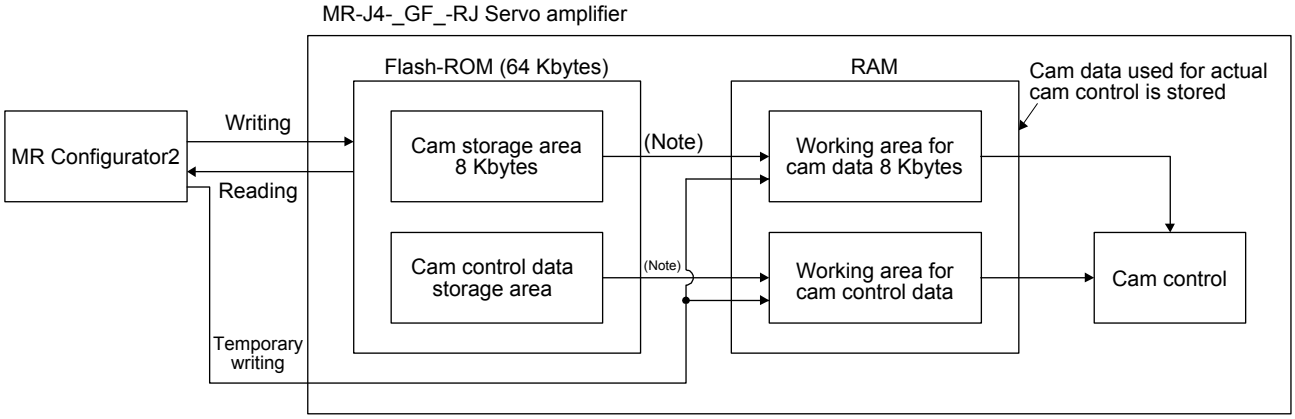
9.5.7 Data to be used with simple cam function

⚠CAUTION	●The number of write times to the Flash-ROM where the cam control data and cam data are stored is limited to 10000. If the total number of write times exceeds 10000, the servo amplifier may malfunction when the Flash-ROM reaches the end of its useful life. If data needs to be changed very frequently, use the temporal writing function and write the data to the RAM, not to the Flash-ROM.

(1) Memory configuration of cam control data and cam data

POINT
●When [AL. F5.2 Cam data miswriting warning] occurs during cam data writing, set [Pr. PT34] to "5010" to initialize the cam data.

The cam control data and the cam data used for the simple cam are stored in Flash-ROM inside the servo amplifier. When the power is turned on, the cam data and the cam control data are copied from the Flash-ROM to the RAM inside the servo amplifier, and then cam control will be executed.



Note. When the power is turned on, the cam data and the cam control data are copied from the Flash-ROM to the RAM.

Use MR Configurator2 to write the cam data and cam control data.
Be sure to write the cam data and the cam control data in servo-off state.

Two writing methods are available.

Writing method	Description
Temporary writing	Write the cam control data and the cam data to the RAM of the servo amplifier. After writing, the cam control data and the cam data will be reflected. The written data will be disabled after the power turns off. Use this when creating and adjusting the cam control data and the cam data.
Writing	Write the cam control data and the cam data to the Flash-ROM. The data will be enabled when the power is cycled after writing. After cycling the power, control is performed based on the written data. Conduct this after the cam control data and the cam data are finalized.

(2) Cam data

> POINT
>
> ●If the cam data is set incorrectly, the position command and speed command may increase and may cause machine interference or [AL. 31 Overspeed]. When you have created and changed cam data, make sure to perform test operations and make appropriate adjustments.

The following two types are available for the cam data.

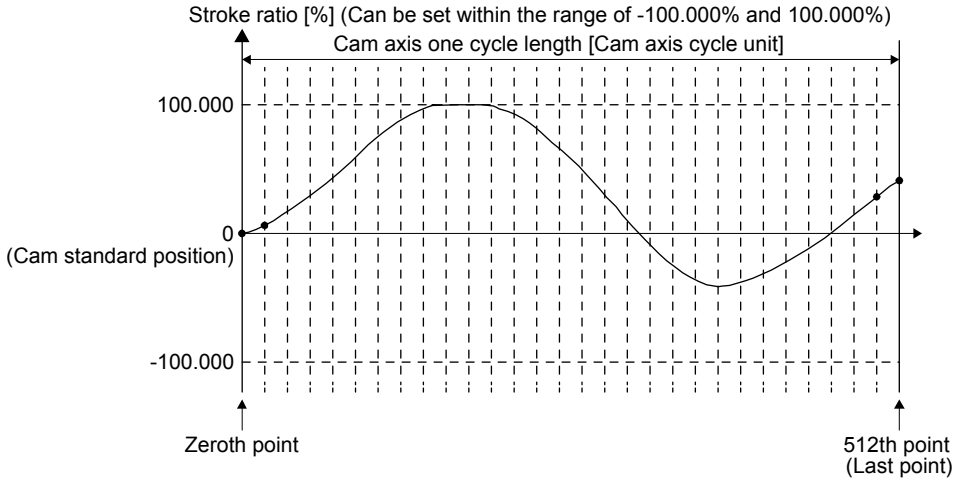
Cam data type	Description
Stroke ratio data type	Cam curve of one cycle is divided equally by the number of cam resolution and defined. The cam curve will be created according to the stroke ratio data of the number of cam resolution.
Coordinate data type	Data in which cam curve of one cycle is defined with two or more points. The coordinate data is defined as (input value, output value). The input value will be the cam axis current value per cycle, and the output value will be the stroke value from the cam standard position.

(a) Stroke ratio data type

The following are set in the stroke ratio data type. Set these in the cam setting window of MR Configurator2. When "Cam No." is set to "0", straight-line control is performed so that the stroke ratio at the last point of the cam data becomes 100%.

Setting item	Setting	Setting range
Cam No.	Set a Cam No.	0: Linear cam 1 to 8: User-created cam
Setting method	Set "1: Stroke ratio data type".	
Cam resolution	Set the number of divisions for the cam curve of one cycle.	Select from 256/512/1024/2048.
Cam data start position	Set the positions of the cam data and cam control data to the position of when "Cam axis current value per cycle" is "0".	0 to "Cam resolution - 1"
Stroke ratio data	Set the stroke ratio from the first to the last point.	-100.000 to 100.000

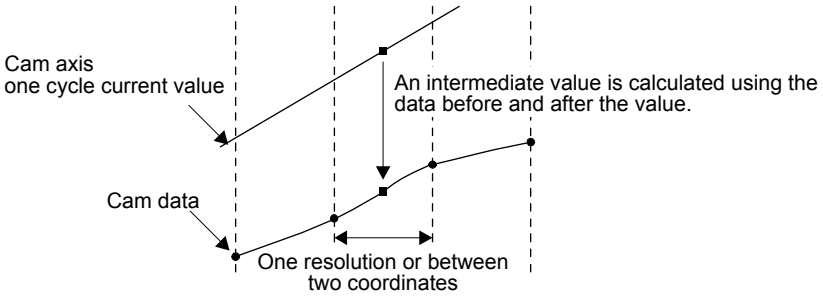
The following is a setting example for "cam resolution = 512" in the stroke ratio data type.



1) Feed current value
The feed current value of the cam axis is calculated as follows:

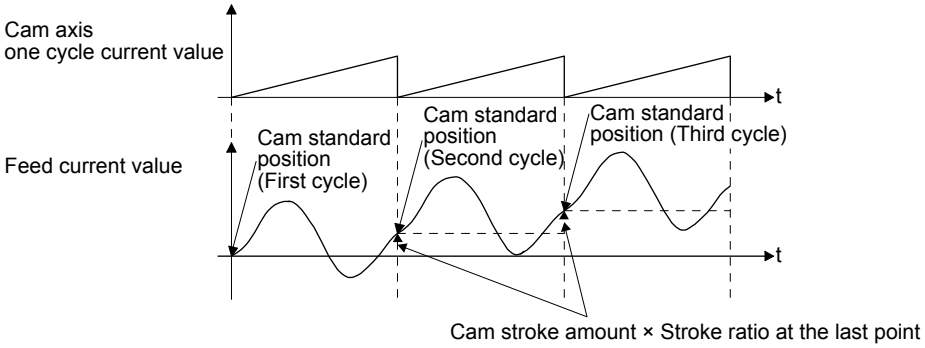
Feed current value = Cam standard position + (Cam stroke amount × Stroke ratio to cam axis current value per cycle)

When the cam axis current value per cycle is in the middle of the specified stroke ratio data, the intermediate value is calculated from the cam data before and after the value.

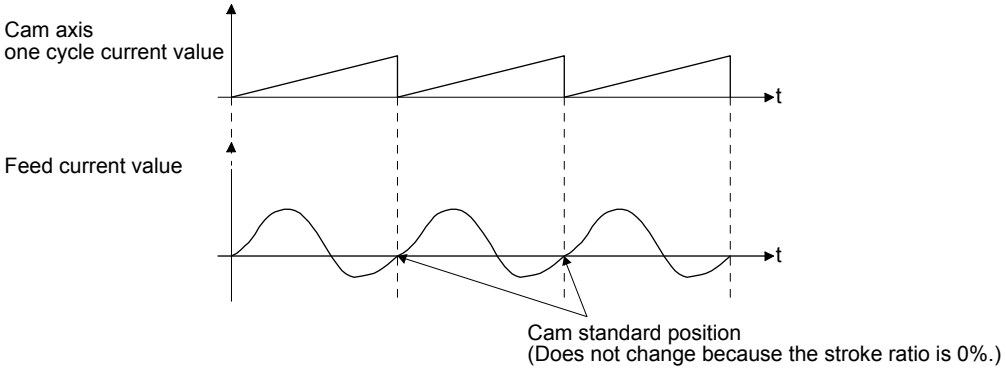


2) Cam standard position
The cam standard position is calculated as follows:

Cam standard position = The preceding cam standard position + (Cam stroke amount × Stroke ratio at the last point)



For to-and-fro control, create the cam data in which the stroke ratio at the last point is 0%.



3) Cam data start position

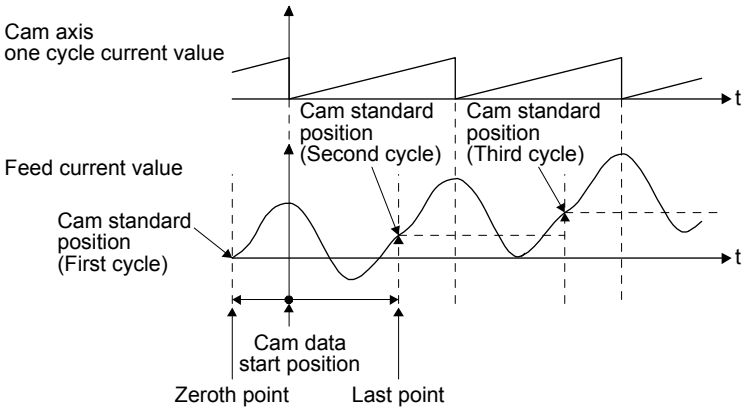
This setting is available only for the stroke ratio data type cam data.

The cam data position where the "cam axis current value per cycle" becomes "0" can be set as the cam data start position.

The initial value of the cam data start position is "0". The cam axis is controlled with the cam data from the 0th point (stroke ratio = 0%).

When a value other than "0" is set as the cam data start position, cam control is started from the point where the stroke ratio is not 0%.

Set the cam data start position for each cam data within the setting range of "0 to (Cam resolution - 1)".



4) Timing of applying cam control data

New values are applied to "Cam No." and "Cam stroke amount" when bit 5 of Control DI2 (2D02h) turns on.

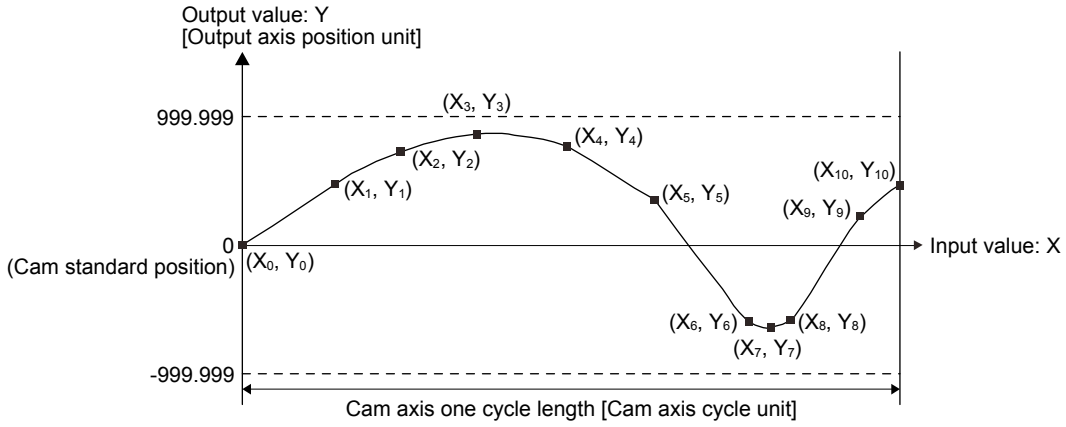
"Cam standard position" is updated when Cam axis current value per cycle passes through the 0th point of the cam data.

(b) Coordinate data type

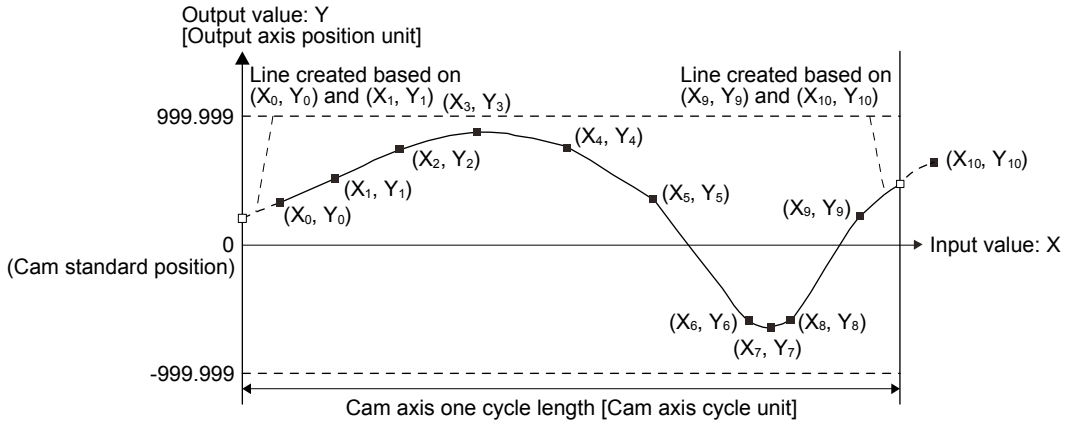
The following are set in the coordinate data type. Set these in the cam setting window of MR Configurator2. When "Cam No." is set to "0", straight-line control is performed so that the stroke ratio at the last point of the cam data becomes 100%.

Setting item	Setting	Setting range
Cam No.	Set a Cam No.	0: Linear cam 1 to 8: User-created cam
Setting method	Set "2: Coordinate data type".	
Number of coordinate	Set the number of coordinates for the cam curve of one cycle. The number of coordinates includes 0th point.	2 to 1024
Cam data start position	Setting is not necessary.	
Coordinate data	Set the coordinate data (input value Xn and output value Yn) for the number of coordinates. Set from the 0th coordinate data (X0 and Y0). Set an input value larger than that of the coordinate data.	-999.999 to 999.999

The following is a setting example for the coordinate data type.



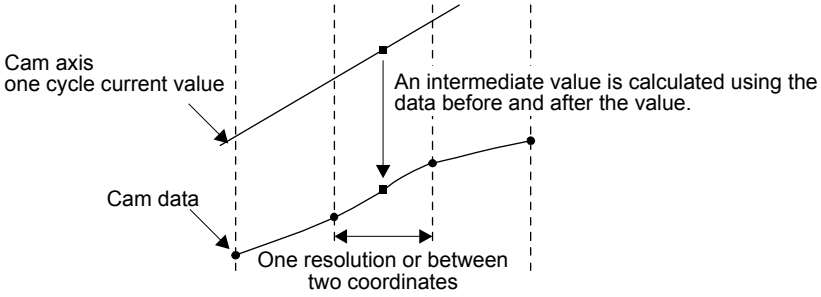
If "input value = 0" and "input value = cam axis length per cycle" are not set in the coordinate data, a control is executed by the line created from the closest two points.



1) Feed current value
The feed current value of the cam axis is calculated as follows:

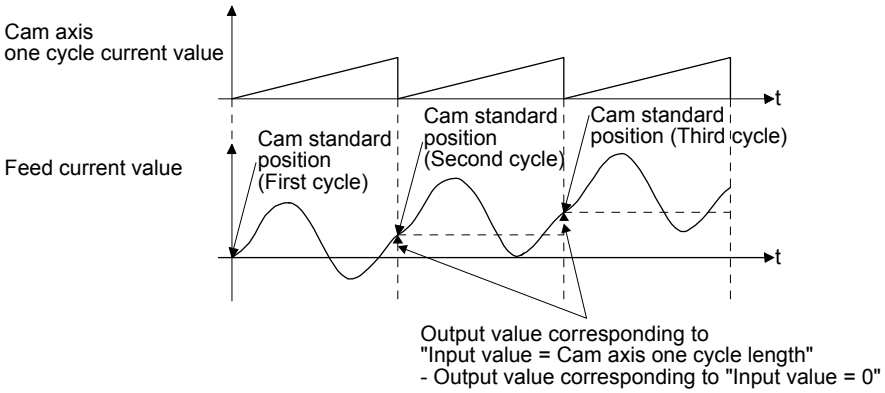
Feed current value = Cam standard position + Output value to cam axis current value per cycle

When the cam axis current value per cycle is in the middle of the specified stroke ratio data, the intermediate value is calculated from the cam data before and after the value.

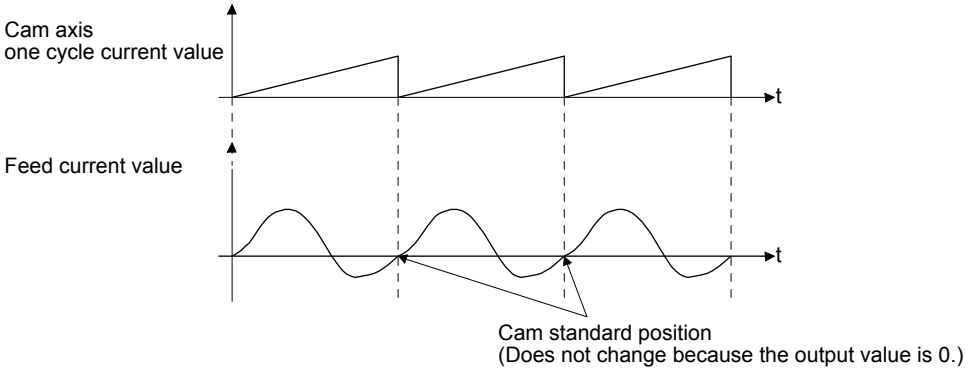


2) Cam standard position
The cam standard position is calculated as follows:

Cam standard position =
The preceding cam standard position + Output value corresponding to "Input value = Cam axis length per cycle" - Output value corresponding to "Input value = 0"



For to-and-fro control, use the output value corresponding to "Input value = Cam axis length per cycle" that is equal to output value corresponding to "Input value = 0".



3) Cam data start position
This is not used in the coordinate data type.

4) Timing of applying cam control data
New values are applied to "Cam No." when bit 5 of Control DI2 (2D02h) turns on.
"Cam standard position" is updated when the cam axis current value per cycle passes through "0".

(3) List of cam control data
The following table lists the cam control data added for the simple cam function.
Set the cam control data in the cam data creation window of MR Configurator2.

POINT

●Once the servo amplifier is powered off, the temporarily written data will be deleted. To store the temporarily written data, be sure to write it to the Flash-ROM before powering off the servo amplifier.

●To enable the cam control data whose symbol is preceded by *, cycle the power after setting. The cam control data is not applied by the temporal writing of MR Configurator2.

No.	Symbol	Name	Initial value	Unit	Operation mode				Control mode	
					Standard	Full.	Lin.	DD	pt	idx
1	MCYSM (Note)	Main shaft current value per cycle setting method	0		○	○	○	○	○	
2	CPRO (Note)	Cam axis position restoration target	0		○	○	○	○	○	
3	CBSSM (Note)	Cam standard position setting method	0		○	○	○	○	○	
4	CCYSM (Note)	Cam axis current value per cycle setting method	0		○	○	○	○	○	
5	MICYS (Note)	Main shaft current value per cycle initial setting value	0	[μm]/ 10^{-4} [inch]/ 10^{-3} [degree]/ [pulse]	○	○	○	○	○	
6	CIBSS (Note)	Cam standard position initial setting value	0	[μm]/ 10^{-4} [inch]/ [pulse]	○	○	○	○	○	
7	CICYS (Note)	Cam axis current value per cycle initial setting value	0	[μm]/ 10^{-4} [inch]/ 10^{-3} [degree]/ [pulse]	○	○	○	○	○	
8		For manufacturer setting	0							
9			0							
10			0							
11			0							
12			0							
13			0							
14	*ETYP	Synchronous encoder axis unit	0000h		○				○	
15	*ECMX	Synchronous encoder axis unit conversion numerator	0		○				○	
16	*ECDV	Synchronous encoder axis unit conversion denominator	0		○				○	

No.	Symbol	Name	Initial value	Unit	Operation mode				Control mode	
					Standard	Full.	Lin.	DD	pt	idx
17		For manufacturer setting	0							
18			0							
19			0							
20			0							
21			0							
22			0							
23			0							
24			0							
25			0							
26			0							
27			0							
28			0							
29			0							
30	*MAX	Main shaft input axis selection	0		○	○	○	○	○	
31		For manufacturer setting	0							
32	MMIX	Main shaft input method	0000h		○	○	○	○	○	○
33		For manufacturer setting	0							
34			0							
35			0							
36	CLTMD	Main shaft clutch control setting	0000h		○	○	○	○	○	
37		For manufacturer setting	0							
38			0							
39			0							
40			0							
41			0							
42	CLTSMM (Note)	Main shaft clutch smoothing system	0		○	○	○	○	○	
43	CLTSMT (Note)	Main shaft clutch smoothing time constant	0	[ms]	○	○	○	○	○	
44		For manufacturer setting	0							
45			0							
46			0000h							
47			0							
48	CCYL (Note)	Cam axis length per cycle	0	[μm]/ 10^{-4} [inch]/ 10^{-3} [degree]/ [pulse]	○	○	○	○	○	
49	CNO (Note)	Cam No.	0		○	○	○	○	○	
50		For manufacturer setting	0							
51	CSTK (Note)	Cam stroke amount	0	[μm]/ 10^{-4} [inch]/ [pulse]	○	○	○	○	○	
52		For manufacturer setting	0							
53			0							
54			0							
55			0							
56			0							
57			0							
58			0							
59			0							

No.	Symbol	Name	Initial value	Unit	Operation mode				Control mode	
					Standard	Full.	Lin.	DD	pt	idx
60	CPHV	Cam position compensation target position	0	[μm]/ 10^{-4} [inch]/ 10^{-3} [degree]/ [pulse]	○	○	○	○	○	
61	CPHT	Cam position compensation time constant	0	[ms]	○	○	○	○	○	

Note. The data is updated at cam control switching.

(4) Detailed list of cam control data

No./symbol/ name	Setting digit	Function	Initial value [unit]	Control mode	
				pt	idx
1 *MCYSM Main shaft current value per cycle setting method		Select a setting method for the main shaft current value per cycle. 0: Previous value 1: Main shaft current value per cycle initial setting value 2: Calculated from input axis	0	○	
2 *CPRO Cam axis position restoration target		Select the object of restoring the cam axis position. 0: Cam axis one cycle current value restoration 1: Cam standard position restoration 2: Cam axis feed current value restoration	0	○	
3 *CBSSM Cam standard position setting method		Select the setting method of the cam standard position for the restoration of cam axis current value per cycle. 0: Feed current value 1: Cam standard position initial setting value 2: Previous value The cam standard position of the last cam control is stored in the previous value. The feed current value is stored when the cam standard position of the last cam control has not been saved. Turning off the power clears the previous value.	0	○	
4 *CCYSM Cam axis current value per cycle setting method		Select a setting method for the cam axis current value per cycle used for restoration when "Cam standard position restoration" and "Cam axis feed current value restoration" have been set as the cam axis position restoration targets. 0: Previous value 1: Cam axis current value per cycle initial setting value 2: Main axis current value per cycle The cam axis current value per cycle of the last cam control is stored in the previous value. Turning off the power clears the previous value.	0	○	
5 *MICYS Main shaft current value per cycle initial setting value		Set the initial value of the main shaft current value per cycle. ・When [Cam control data No. 30] is set to "1" The unit will be changed to [μm], 10^{-4} [inch], or [pulse] with the setting of [Pr. PT01]. ・When [Cam control data No. 30] is set to "2" The unit will be changed to [μm], 10^{-4} [inch], 10^{-3} [degree], or [pulse] with the setting of [Cam control data No. 14]. Setting range: 0 to [Cam control data No. 48] - 1	0 Refer to Function column for unit.	○	

No./symbol/ name	Setting digit	Function	Initial value [unit]	Control mode	
				pt	idx
6 *CIBSS Cam standard position initial setting value		This is enabled when [Cam control data No. 3] is set to "1". Set the initial value of the cam standard position in the output axis position unit. The unit will be changed to [μm], 10^{-4} [inch], or [pulse] with the setting of [Pr. PT01]. Setting range: -999999 to 999999	0 Refer to Function column for unit.	○	
7 *CICYS Cam axis current value per cycle initial setting value		Set the position to start the search processing to restore the cam axis current value per cycle. Set this item when restoring the position of the return path with the to-and-fro control cam pattern. ・When [Cam control data No. 30] is set to "1" The unit will be changed to [μm], 10^{-4} [inch], or [pulse] with the setting of [Pr. PT01]. ・When [Cam control data No. 30] is set to "2" The unit will be changed to [μm], 10^{-4} [inch], 10^{-3} [degree], or [pulse] with the setting of [Cam control data No. 14]. Setting range: 0 to [Cam control data No. 48] - 1	0 Refer to Function column for unit.	○	
14 *ETYP Synchronous encoder axis unit	_ _ _ x	Control unit 0: mm 1: inch 2: degree 3: pulse	0h	○	
	_ _ x _	Feed length multiplication 0: × 1 1: × 10 2: × 100 3: × 1000 This digit is disabled when [Cam control data No. 14] is set to "_ _ _ 2" or "_ _ _ 3".	0h	○	
	_ x _ _	For manufacturer setting	0h		
	x _ _ _		0h		

No./symbol/ name	Setting digit	Function	Initial value [unit]	Control mode	
				pt	idx
15 *ECMX Synchronous encoder axis unit conversion numerator		Set a numerator used to convert encoder pulses of the synchronous encoder axis into the synchronous encoder axis unit. Set the numerator within the following range. $\frac{1}{16000} \leq \frac{ECMX}{ECDV} \leq 6000$ Setting a value out of the range will trigger [AL. F6 Simple cam function - Cam control warning]. When "0" is set, the numerator works in the same way as when "1" is set. Setting range: 0 to 16777215	0	○	
16 *ECDV Synchronous encoder axis unit conversion denominator		Set a denominator used to convert encoder pulses of the synchronous encoder axis into the synchronous encoder axis unit. Set the electric gear within the range of [Cam control data No. 15]. Setting a value out of the range will trigger [AL. F6 Simple cam function - Cam control warning]. When "0" is set, the denominator works in the same way as when "1" is set. Setting range: 0 to 16777215	0	○	
30 *MAX Main shaft input axis selection		Select an input axis of the main shaft input. 0: Disabled 1: Servo input axis 2: Synchronous encoder axis Synchronous encoder axis is enabled only in standard control mode. [AL. 37] will occur when this parameter is set to "2" in the following state. ・When scale measurement mode is disabled ・When an encoder other than A/B-phase differential output encoder or A/B/Z-phase differential output encoder is connected	0	○	
32 *MMIX Main shaft input method	_ _ _ x	Main input method 0: Input + 1: Input - 2: No input	0h	○	
	_ _ x _	Sub input method Set the composition method of cam position compensation amount. 0: Input + (add up cam position compensation amount) 1: Input - (add up the cam position compensation amount with opposite sign) 2: No input (add up cam position compensation amount as 0)	0h	○	
	_ x _ _	For manufacturer setting	0h		
	x _ _ _		0h		
36 *CLTMD Main shaft clutch control setting	_ _ _ x	ON control mode 0: No clutch 1: Clutch command ON/OFF	0h	○	
	_ _ x _	For manufacturer setting	0h		
	_ x _ _		0h		
	x _ _ _		0h		
42 *CLTSMM Main shaft clutch smoothing system		Select the clutch smoothing system. 0: Direct 1: Time constant system (Exponent)	0	○	
43 *CLTSMT Main shaft clutch smoothing time constant		This is enabled when [Cam control data 42] is set to "1". Set the smoothing time constant. Setting range: 0 to 5000	0 [ms]	○	

No./symbol/ name	Setting digit	Function	Initial value [unit]	Control mode	
				pt	idx
48 *CCYL Cam axis length per cycle		Set an input amount required per cam cycle. ・When [Cam control data No. 30] is set to "0" or "1" The unit will be changed to [μm], 10^{-4} [inch], or [pulse] with the setting of [Pr. PT01]. ・When [Cam control data No. 30] is set to "2" The unit will be changed to [μm], 10^{-4} [inch], 10^{-3} [degree], or [pulse] with the setting of [Cam control data No. 14]. Setting range: 0 to 999999	0 Refer to Function column for unit.	○	
49 *CNO Cam No.		Set the cam No. of the cam to be executed. When "0" is set, the selection of Target CAM No. (2D80h) will be prioritized. When a value other than "0" is set, the selection of Target CAM No. (2D80h) will be disabled. Setting range: 0 to 8	0	○	
51 *CSTK Cam stroke amount		Set a cam stroke amount for the stroke ratio of 100% when using the stroke ratio data type cam. The unit will be changed to [μm], 10^{-4} [inch], or [pulse] with the setting of [Pr. PT01]. Setting range: -999999 to 999999	0 Refer to Function column for unit.	○	
60 *CPHV Cam position compensation target position		Set a compensation target position to the input axis of the cam axis. Set the position of the touch probe with the cam axis current value per cycle. ・When [Cam control data No. 30] is set to "1" The unit will be changed to [μm], 10^{-4} [inch], or [pulse] with the setting of [Pr. PT01]. ・When [Cam control data No. 30] is set to "2" The unit will be changed to [μm], 10^{-4} [inch], 10^{-3} [degree], or [pulse] with the setting of [Cam control data No. 14]. Setting range: 0 to [Cam control data No. 48] - 1	0 Refer to Function column for unit.	○	
61 *CPHT Cam position compensation time constant		Set the time to apply the position compensation for the input axis of the cam axis. Setting range: 0 to 65535	0 [ms]	○	

(a) Relation among the main shaft input axis, position data unit, and feed length multiplication setting
The parameters used to set the position data unit and feed length multiplication differ depending on the setting of [Cam control data No. 30 Main shaft input axis selection].

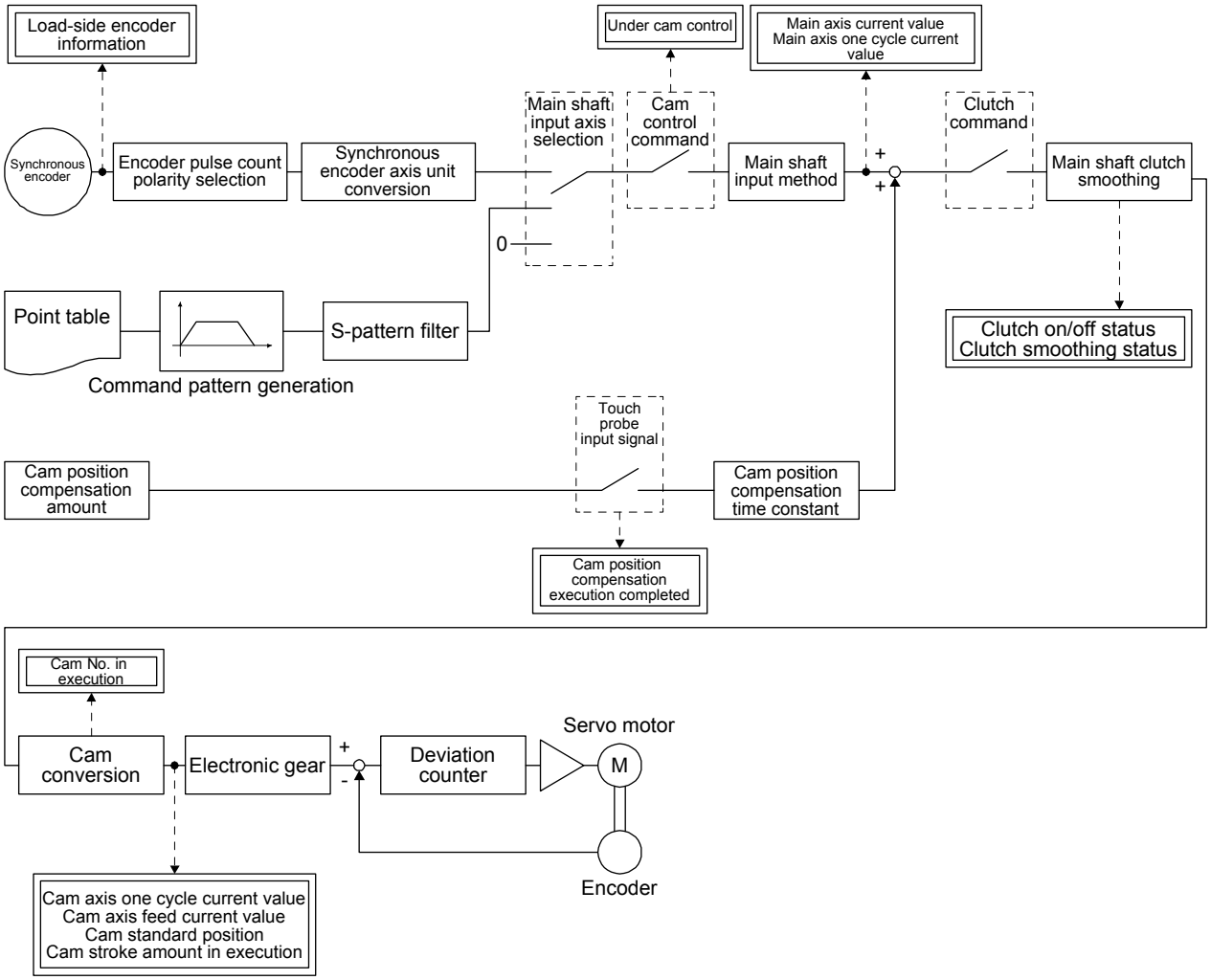
Item		Main shaft input axis selection ([Cam control data No. 30])		
		0 (Disabled)	1 (Servo input axis)	2 (Synchronous encoder axis)
Main shaft current value per cycle setting method ([Cam control data No. 5])	Unit	[Pr. PT01]	[Pr. PT01]	[Cam control data No. 14]
	Multiplication	[Pr. PT03]	[Pr. PT03]	
Cam standard position initial setting value ([Cam control data No. 6])	Unit	[Pr. PT01]	[Pr. PT01]	[Pr. PT01]
	Multiplication	[Pr. PT03]	[Pr. PT03]	[Pr. PT03]
Cam axis current value per cycle initial setting value ([Cam control data No. 7])	Unit	[Pr. PT01]	[Pr. PT01]	[Cam control data No. 14]
	Multiplication	[Pr. PT03]	[Pr. PT03]	
Synchronous encoder axis unit conversion numerator ([Cam control data No. 15])	Unit	[Pr. PT01]	[Pr. PT01]	
	Multiplication	[Pr. PT03]	[Pr. PT03]	
Synchronous encoder axis unit conversion denominator ([Cam control data No. 16])	Unit	[Pr. PT01]	[Pr. PT01]	
	Multiplication	[Pr. PT03]	[Pr. PT03]	
Cam axis length per cycle ([Cam control data No. 48])	Unit	[Pr. PT01]	[Pr. PT01]	
	Multiplication	[Pr. PT03]	[Pr. PT03]	
Cam stroke amount ([Cam control data No. 51])	Unit	[Pr. PT01]	[Pr. PT01]	[Pr. PT01]
	Multiplication	[Pr. PT03]	[Pr. PT03]	[Pr. PT03]
Cam position compensation amount ([Cam control data No. 60])	Unit	[Pr. PT01]	[Pr. PT01]	[Cam control data No. 14]
	Multiplication	[Pr. PT03]	[Pr. PT03]	

(b) Synchronous encoder axis unit conversion gear setting
The input travel distance of the synchronous encoder is in encoder pulse units. You can convert the unit into a desired unit by setting [Cam control data No. 15 Synchronous encoder axis unit conversion: Numerator] and [Cam control data No. 16 Synchronous encoder axis unit conversion: Denominator].
Set [Cam control data No. 15] and [Cam control data No. 16] according to the machine to be controlled.

$$\text{Synchronous encoder axis travel distance (after unit conversion)} = \text{Synchronous encoder input travel distance (encoder pulse unit)} \times \frac{\text{[Cam control data No. 15]}}{\text{[Cam control data No. 16]}}$$

The travel distance in numbers of pulses set in [Cam control data No. 16] is set in [Cam control data No. 15] in synchronous encoder axis position units.
Set [Cam control data No. 16] in encoder pulse units of the synchronous encoder.

9.5.8 Function block diagram for displaying state of simple cam control



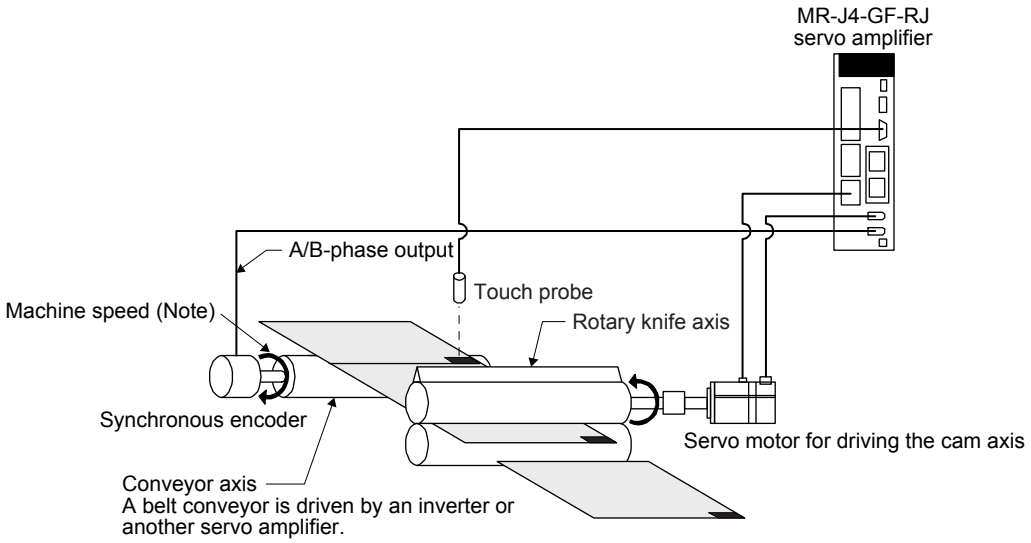
9.5.9 Operation

POINT
●When using simple cam function, execute operation so that the machine speed of the input axis is equal to or less than "[Cam control data No. 48 - Cam axis length per cycle] × 1/2 × 1000 [command unit/s]". When [Cam control data No. 30] is set to "1", the unit of the cam axis length per cycle will be changed to [mm], [inch], or [pulse] with the setting of [Pr. PT01]. When [Cam control data No. 30] is set to "2", the unit of the cam axis length per cycle will be changed to [mm], [inch], [degree], or [pulse] with the setting of [Cam control data No. 14].

A rotary knife system is shown as an example of the operation of the simple cam function.

(1) Configuration example

The rotary knife cuts the sheet conveyed by the conveyor at a constant speed into a desired length. The cutting positions are compensated based on detection of the registration marks printed on the sheet to prevent variations in the sheet length and deviations in cutting position.



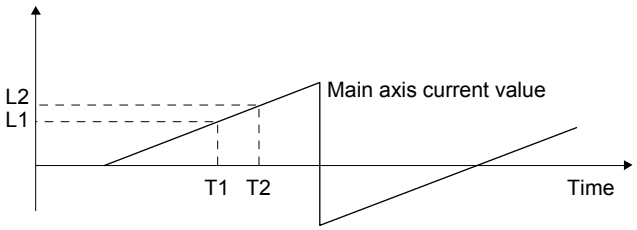
Note. Set the machine speed of the input axis to a value that satisfies the following equation.

Machine speed ≤ [Cam control data No. 48 - Cam axis length per cycle] × 1/2 × 1000 [command unit/s]

To check the machine speed, monitor the main axis current value with the graph function of MR Configurator2.

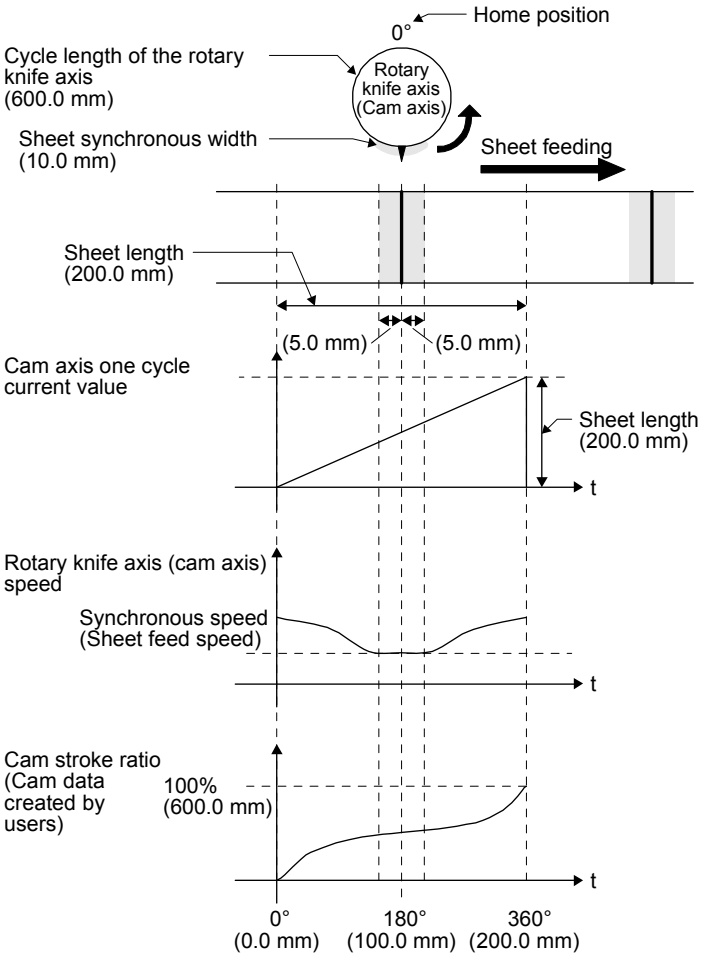
The machine speed is calculated as follows:

Machine speed = (L2 - L1)/(T2 - T1)



(2) Setting example

When the sheet length is 200.0 mm, the circumferential length of the rotary knife axis (synchronous axis length) is 600.0 mm, and the sheet synchronous width is 10.0 mm, set the following items as follows.



Basic settings required to use the simple cam function

Item	Setting	Setting value
Operation mode selection ([Pr. PA01])	Select "Point table method".	"1000"
Simple cam function setting ([Pr. PT35])	Enable the simple cam function.	"_ 1 _ _"

When the conveyor axis (main axis) feeds a sheet by the set length, the rotary knife makes one rotation (600 mm) to cut the sheet. Set the following items as follows.

Item	Setting	Setting value
Cam axis length per cycle ([Cam control data No. 48])	Set the sheet length.	200.000
Cam stroke amount ([Cam control data No. 51])	Set the rotation amount per rotation in "μm".	600000
Synchronous encoder axis unit ([Cam control data No. 14])	Set the unit of the sheet length.	0 (mm)
Unit of rotary knife axis ([Pr. PT01])	Set "mm" as the unit of position data.	"_ 0 _ _"
Cam data	Create the cam data with the operation pattern shown in the left figure.	

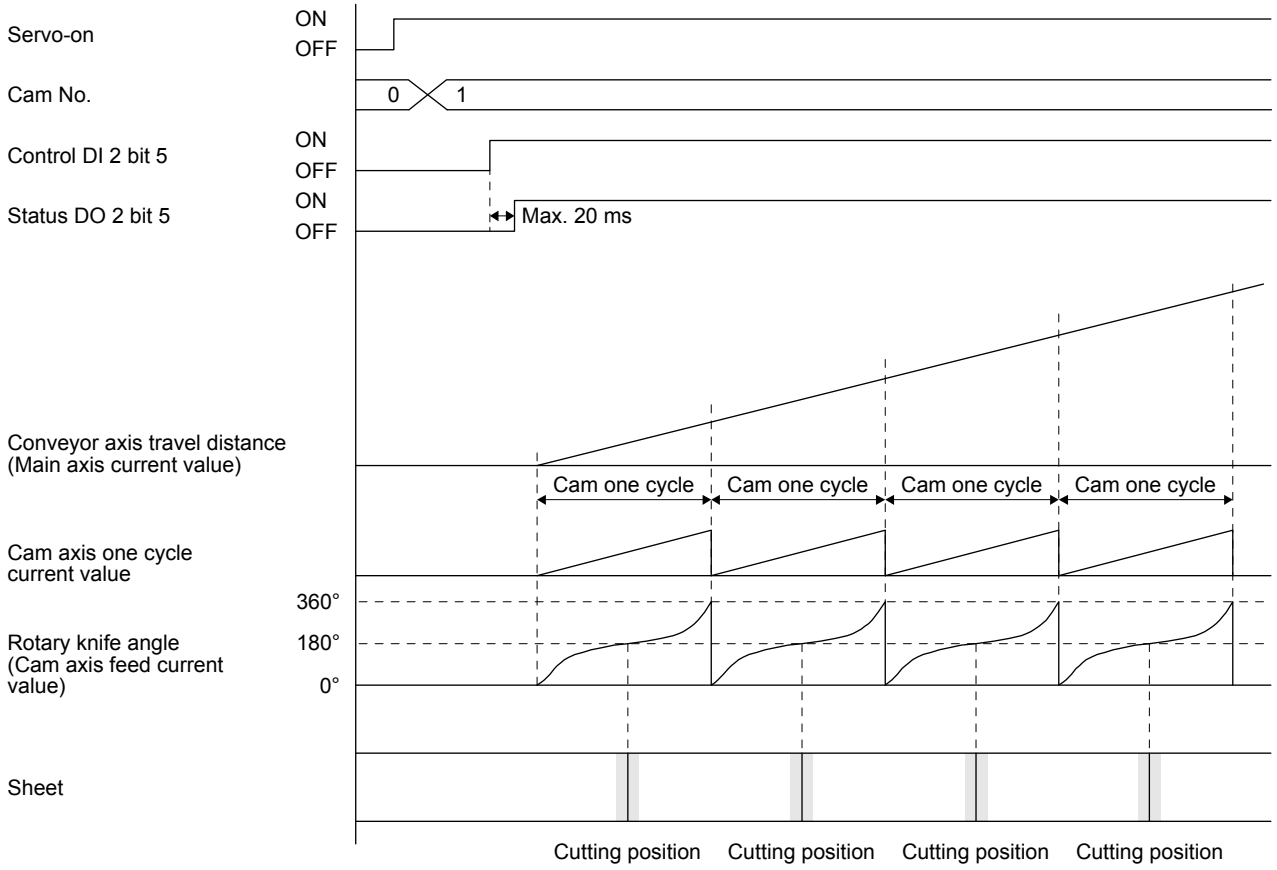
Set the following items as follows to use the encoder following function.

Item	Setting	Setting value
Main shaft input axis selection ([Cam control data No. 30])	Select the synchronous encoder axis.	2
Synchronous encoder axis unit multiplication numerator ([Cam control data No. 15])	Refer to the synchronous encoder axis unit conversion gear setting in section 9.5.7 (4) (b).	Refer to section 9.5.7 (4) (b).
Synchronous encoder axis unit multiplication denominator ([Cam control data No. 16])		

(3) Operation

The following shows an example of the procedure before operation.

Step	Setting and operation
1. Data setting	Set this referring to (2) in this section.
2. Initial position adjustment	Adjust the synchronous positions of the conveyor axis and rotary knife axis. ・ Adjust the machine so that the position of the rotary knife axis (feed current value) is "0" when the position of the conveyor axis (main axis current value) is "0". ・ Since the position at power-on is "0", the home position return of the conveyor axis is not required. ・ Perform the home position return on the rotary knife axis so that the blade comes to the highest position. Adjust the conveyor axis and rotary knife axis so that the 0 position of both axes are located at the center of the sheet length.
3. Cam data selection	Select the cam data to be executed with Target CAM No. (2D80h). [Cam control data No. 49 - Cam No.] can also be used for selecting the cam data for execution.
4. Servo-on	Turn on "Enable Operation" with Controlword (6040h) to switch to "Operation enabled".
5. Switching cam control	Turn on bit 5 of Control DI2 (2D02h) to switch to the cam control.
6. Starting the conveyor axis	After confirming that bit 5 of Status DO2 (2D12h) is on, start the conveyor axis. The rotary knife axis is driven in synchronization with the conveyor axis.



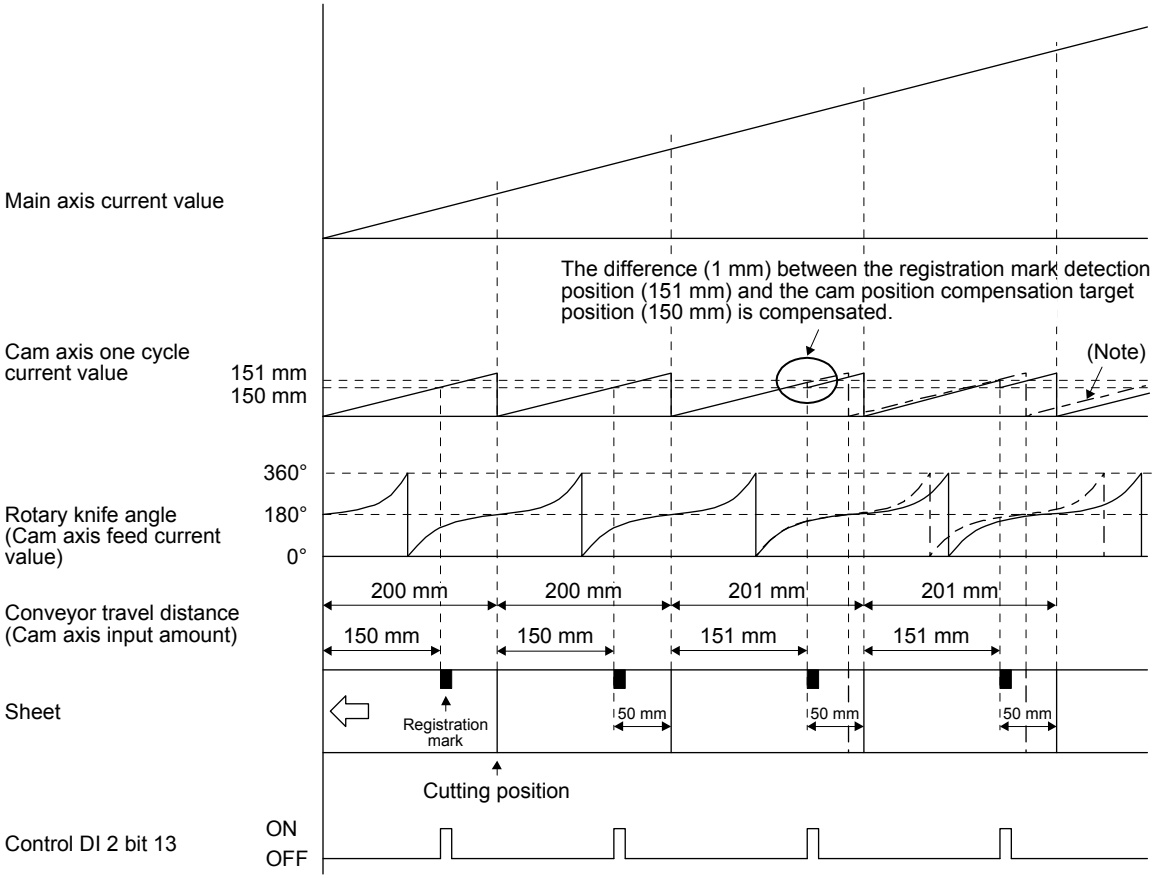
(4) Compensation by touch probe

This system detects registration marks printed on the sheet in equal intervals, and compensates the difference between the actual cam axis current value per cycle and the ideal cam axis current value per cycle (set value of the cam position compensation target position) by shifting the synchronous phase of the rotary knife axis and the conveyor axis.

Setting example: When the ideal detection position of the registration mark is 150 mm, the distance between the detection position and the cutting position is 50 mm but the mark is not detected unless the conveyor feeds the sheet by 151 mm due to expansion of the sheet

The cutting position is compensated to keep a distance of 50 mm from the registration mark detection position.

Item	Setting and operation
Cam position compensation target position ([Cam control data No. 60])	In this example, the ideal detection position of the registration mark is at 150 mm of the cam axis current value per cycle. Set "150" in the cam position compensation target position.
Cam position compensation time constant ([Cam control data No. 61])	In this example, the position compensation is executed by one-shot. Set "0" in the cam position compensation time constant.



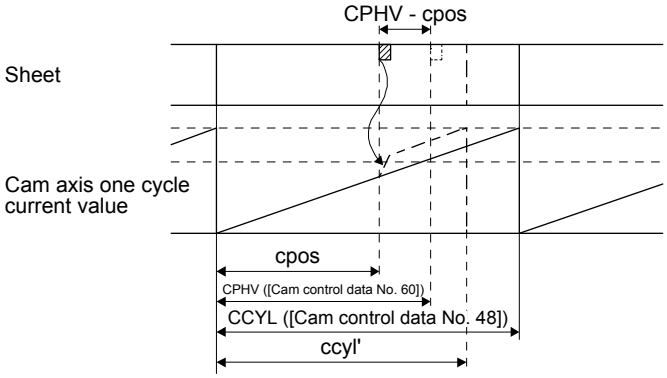
Note. The dot-and-dash line in the figure shows a waveform of when compensation is not executed.

(5) Details of cam position compensation

This function compensates the difference between the target and actual sensor detection positions by shifting the cam axis current value per cycle. The cam axis length per cycle (sheet length) after compensation (ccyl') is calculated as follows:

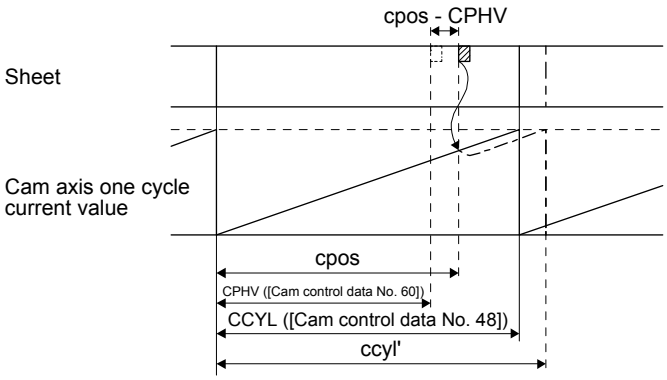
CCYL: Cam axis length per cycle ([Cam control data No. 48])
CPHV: Cam position compensation target position ([Cam control data No. 60])
ccyl': Cam axis length per cycle (after compensation)
cpos: Cam axis current value per cycle at sensor detection
CPHV - cpos: Distance between the target and actual sensor detection positions

- When the sensor detection position is before the target position (CPHV ≥ cpos): ccyl' = CCYL - (CPHV - cpos)



The difference (CPHV - cpos) is added to the cam axis current value per cycle to increase the conveyor travel distance. The filter time constant for acceleration/deceleration at compensation can be adjusted with [Cam control data No. 61 Cam position compensation time constant].

- When the sensor detection position is after the target position (CPHV < cpos): ccyl' = CCYL + (cpos - CPHV)



The difference (cpos - CPHV) is subtracted from the cam axis current value per cycle to decrease the conveyor travel distance. The filter time constant for acceleration/deceleration at compensation can be adjusted with [Cam control data No. 61 Cam position compensation time constant].

9.5.10 Cam No. setting method

POINT
●When the cam No. is set to a value other than "0" to "8", [AL. F6.5 Cam No. external error] occurs. If the cam data of a specified cam No. does not exist, [AL. F6.3 Cam unregistered error] occurs. At this time, the cam control is not executed and the servo motor does not start. Turning off the cam control command clears [AL. F6.3] and [AL. F6.5].

The cam No. can be set and changed with Target CAM No. (2D80h) in the same method as setting with [Cam control data No. 49] or selecting the point table No.

The priority level of cam control parameter and Target CAM No. (2D80h) is as follows.

[Pr. PT35] setting	[Cam control data No. 49] setting	2D80h	Setting
_ 0 _ _ (Simple cam function disabling setting)	×	×	The cam function is disabled with the setting of [Pr. PT35].
_ 1 _ _ (Simple cam function enabling setting)	"0" (initial value)	○	The cam No. is set with Target CAM No. (2D80h).
	Other than "0"	×	The cam No. is set with [Cam control data No. 49]. The cam No. set with Target CAM No. (2D80h) is disabled.

○: Enable, ×: Disable

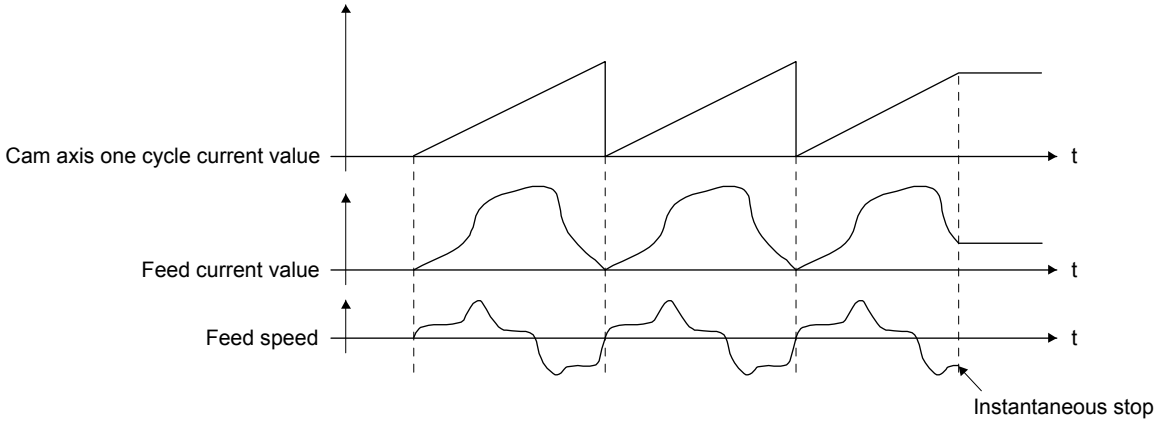
9.5.11 Stop operation of cam control

If one of the following stop causes occurs on the output axis during cam control, the cam control stops after the output axis is stopped. (Bit 5 of Status DO2 (2D12h) turns off.)
To restart the cam control, adjust the synchronous position of the output axis.

Stop cause	Command stop processing	Remark
Software stroke limit detection	Instantaneous stop	Refer to (1) in this section.
Stroke limit detection	Instantaneous stop	Refer to (1) in this section.
Stop due to forced stop 1 or 2, or alarm occurrence	Instantaneous stop or deceleration to a stop	Stop due to base circuit shut-off. Refer to (1) in this section. Stop by the forced stop deceleration function. Refer to (2) in this section.
Bit 5 of Control DI2 (2D02h) is off.	Instantaneous stop	Refer to (1) in this section.
Servo-off	Instantaneous stop	Coasting state

(1) Instantaneous stop

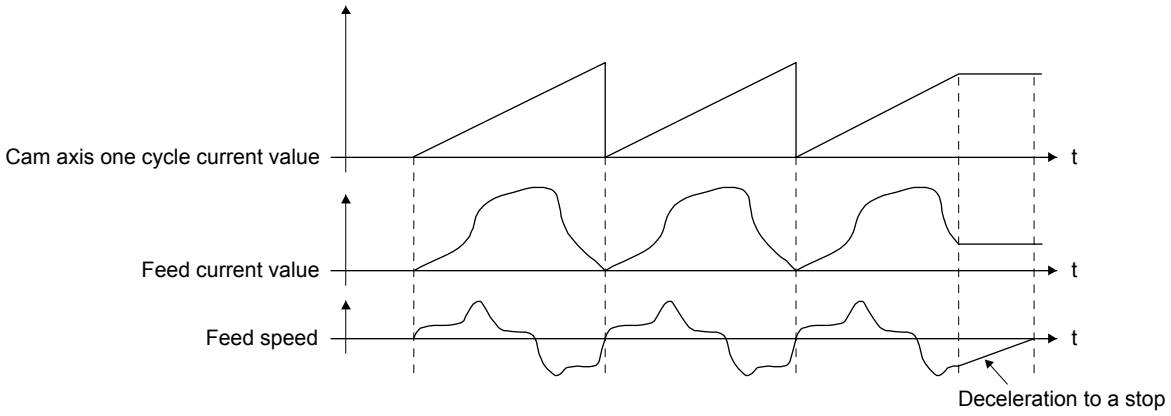
The operation stops without deceleration. The servo amplifier immediately stops the command.



(2) Deceleration stop

The output axis decelerates to stop according to [Pr. PC51 Forced stop deceleration time constant]. After a deceleration stop starts, the cam axis current value per cycle and feed current value are not updated. The path of the feed current value is drawn regardless of the cam control and the servo motor stops.

Decelerate the input axis to stop when decelerating the output axis to stop in synchronization with the input axis.

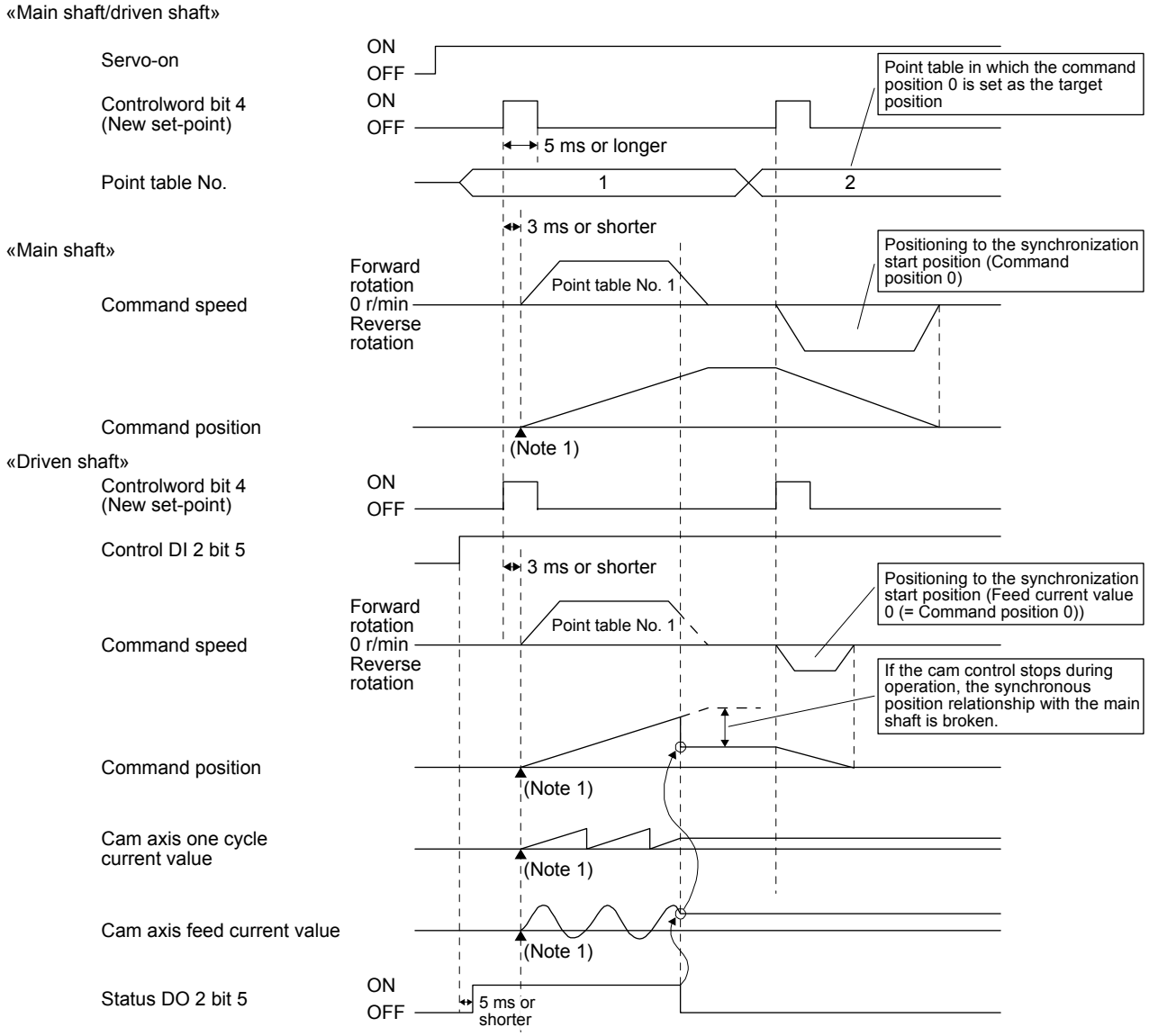


When a positioning command (internal command) is used for the input axis, inputting a temporary stop or switching the operation mode decelerates the input axis to stop. The output axis stops in synchronization with the input axis. Therefore, the synchronous relation between the input and output axes are maintained and the cam control does not stop.

When the control mode is switched to the home position return mode (hm), the cam control stops.

9.5.12 Restart operation of cam control

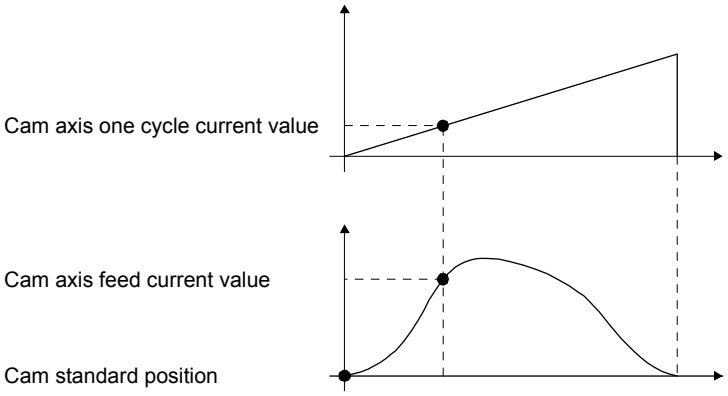
When the cam control is stopped during operation, a gap may be generated in the synchronous position relationship between the main shaft and the driven shaft. To solve the gap, return the main shaft and the driven shaft to the synchronization starting point and then start the synchronous operation.



The above shows an example for when the synchronization starting point is the point where both command position and feed current value are "0".

9.5.13 Cam axis position at cam control switching

The cam axis position is determined by the positional relationship of three values of "Cam axis current value per cycle", "Cam axis standard position", and "Cam axis feed current value". When the control has been switched to the cam control (bit 5 of Control DI2 (2D02h) is on), defining the positions of two of these values restores the position of the remaining one value.



The following table lists the parameters required to be set for the cam axis position restoration. Refer to section 9.5.7 (4) for the settings.

Cam axis position restoration target ([Cam control data No. 2])	Cam standard position setting method ([Cam control data No. 3])	Cam standard position initial setting value ([Cam control data No. 6])	Cam axis current value per cycle setting method ([Cam control data No. 4])	Cam axis current value per cycle initial setting value ([Cam control data No. 7])	Restoration processing details
0: Cam axis one cycle current value restoration	○	○ (Note)		○ (Used as the search starting point of cam pattern.)	"Cam axis current value per cycle" is restored based on "Cam standard position" and "Cam axis feed current value".
1: Cam standard position restoration			○	○ (Note)	"Cam standard position" is restored based on "Cam axis current value per cycle" and "Cam axis feed current value".
2: Cam axis feed current value restoration	○	○ (Note)	○	○ (Note)	"Cam axis feed current value" is restored based on "Cam axis current value per cycle" and "Cam standard position".

○: Setting is required.

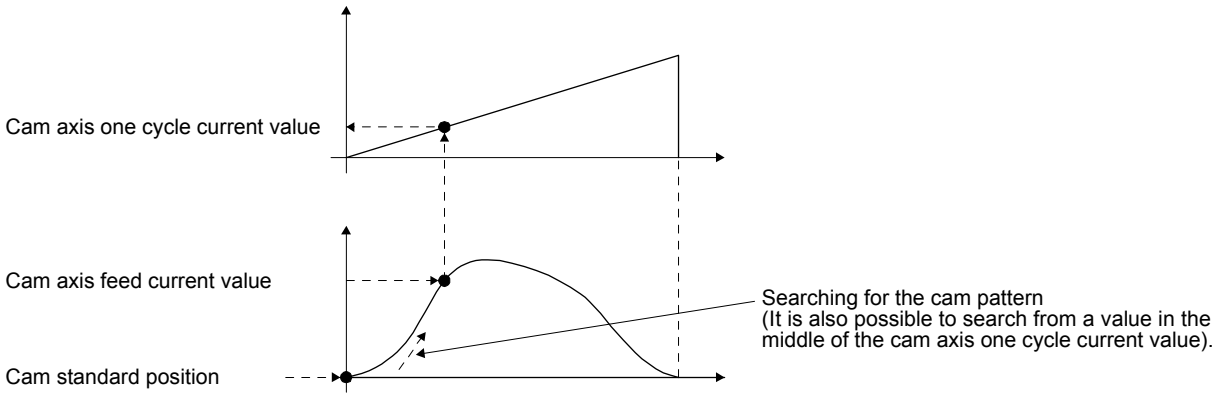
Note. Set this parameter when [Cam control data No. 3] is set to "1".

(1) Cam axis one cycle current value restoration

POINT

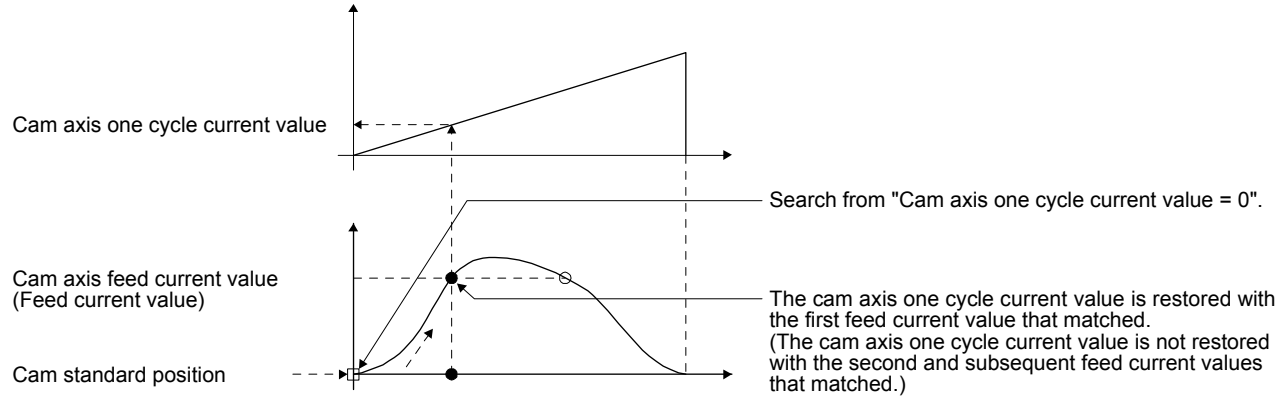
- For the cam pattern of to-and-fro control, if no corresponding cam axis current value per cycle is found, [AL. F6.1 Cam axis one cycle current value restoration failed] will occur and cam control cannot be executed.
- For the cam pattern of feed control, if no corresponding cam axis current value per cycle is found, the cam standard position will automatically change and the value will be searched again.
- If the cam resolution of the cam used is large, search processing at cam control switching may take a long time.

When bit 5 of Control DI2 (2D02h) turns on, the control is switched to the cam control, restoring the "Cam axis current value per cycle" based on the "Cam standard position" and the "Cam axis feed current value". Set the "Cam standard position" used for the restoration with cam control data. The feed current value at cam control switching is used as "Cam axis feed current value".
To restore the cam axis current value per cycle, search for a corresponding value "Cam axis current value per cycle" from the beginning to the end of the cam pattern.
Set the starting point for searching the cam pattern with "[Cam control data No. 7 Cam axis current value per cycle initial setting value]". (It is also possible to search from the return path in the cam pattern of to-and-fro control.)

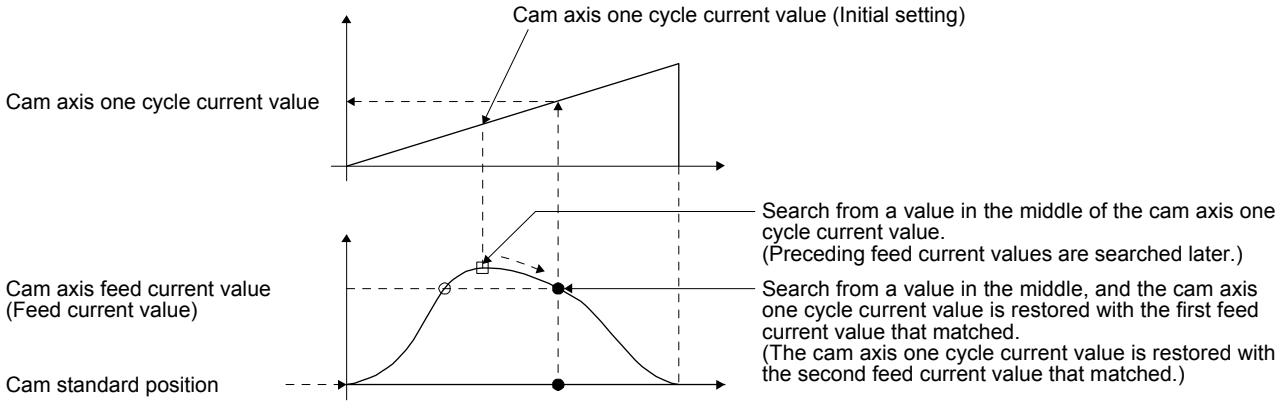


(a) Cam pattern of to-and-fro control

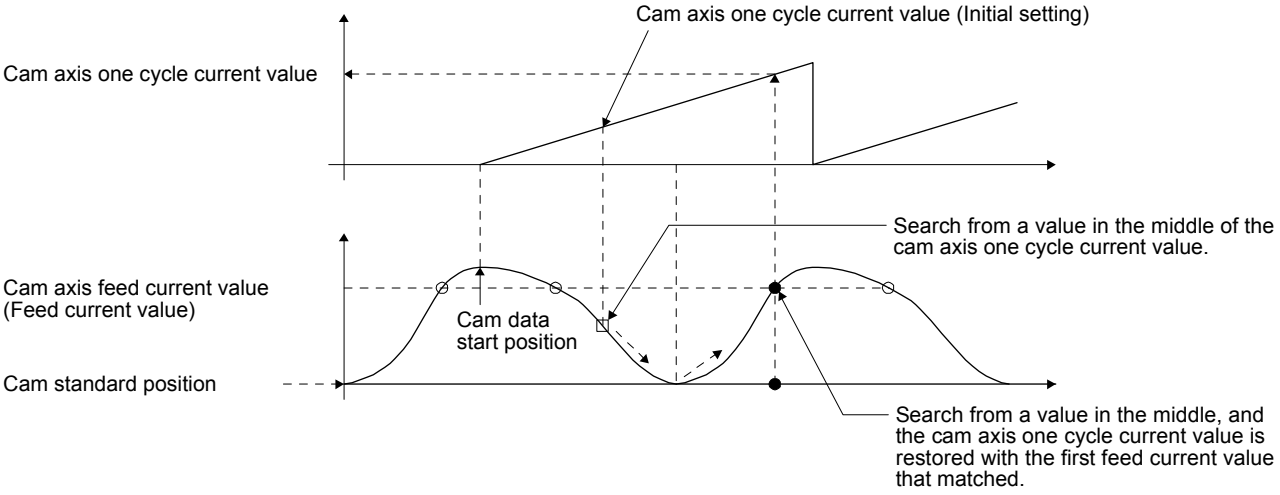
1) Searching from "Cam axis current value per cycle = 0" (Cam data start position = 0)



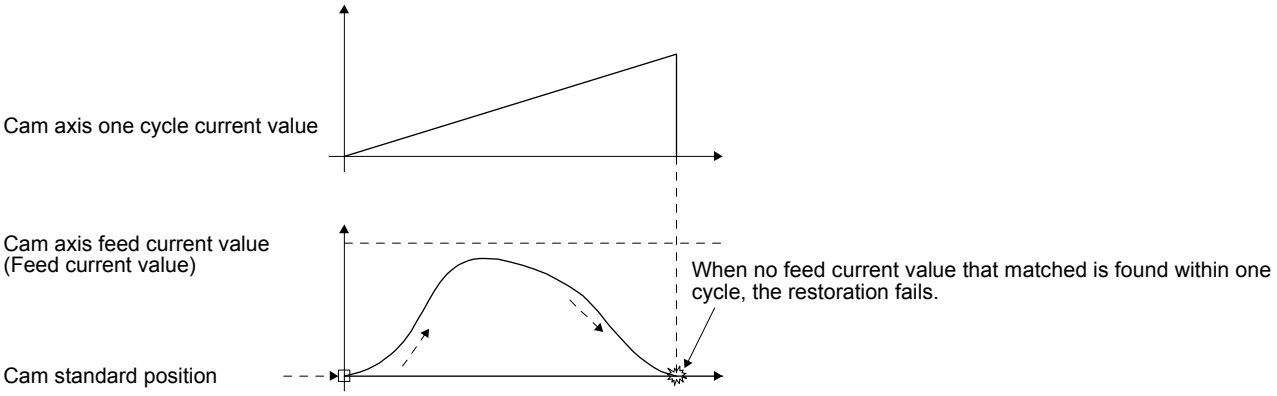
2) Searching from a value in the middle of the cam axis current value per cycle (Cam data start position = 0)



3) Searching from a value in the middle of the cam axis current value per cycle (Cam data start position ≠ 0)

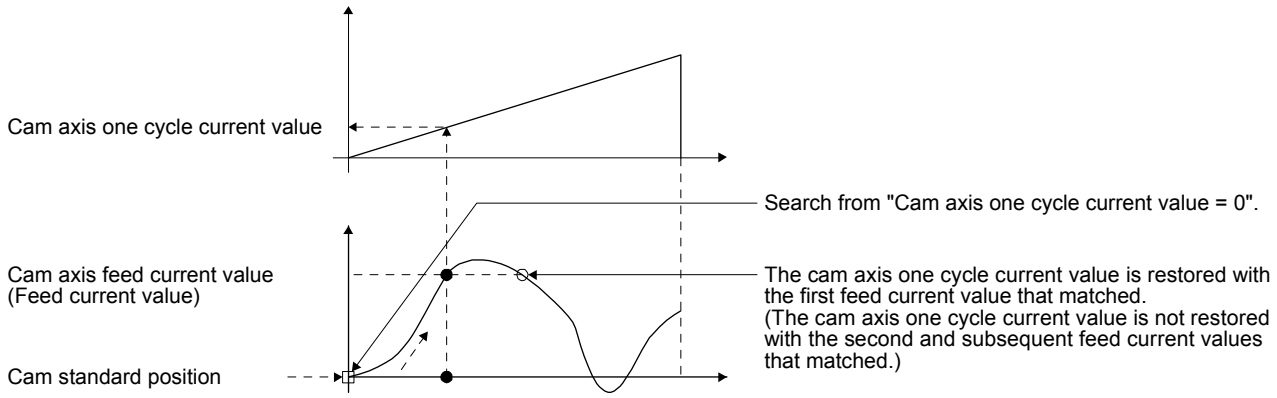


4) Searching fails

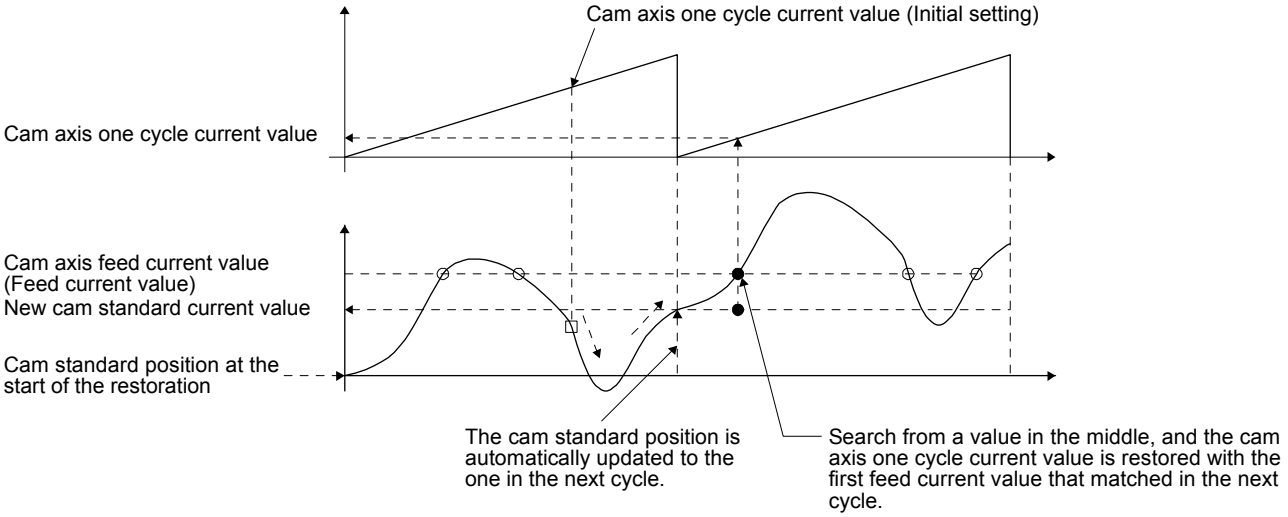


(b) Cam pattern of feed control

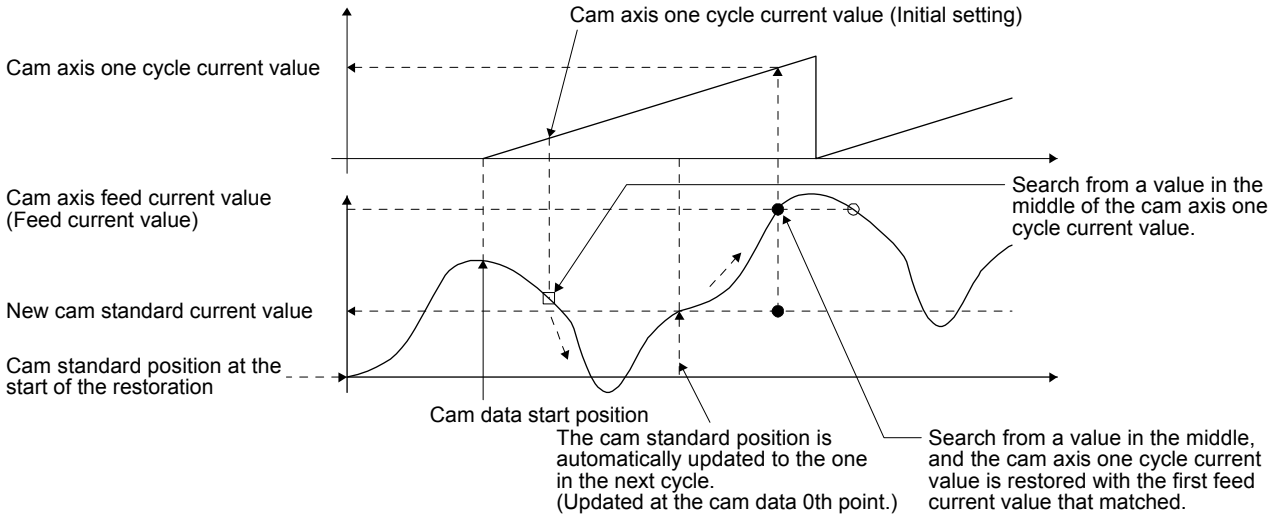
1) Searching from "Cam axis current value per cycle = 0" (Cam data start position = 0)



2) Searching from a value in the middle of the cam axis current value per cycle (Cam data start position = 0)



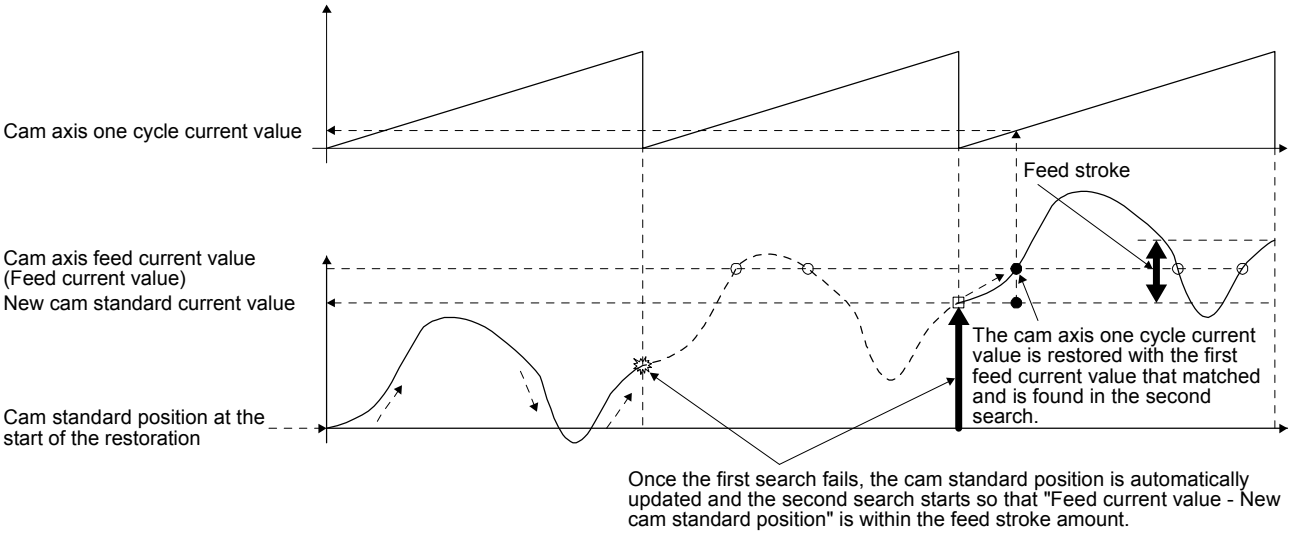
3) Searching from a value in the middle of the cam axis current value per cycle (Cam data start position ≠ 0)



4) The first searching has failed and the second searching starts

POINT

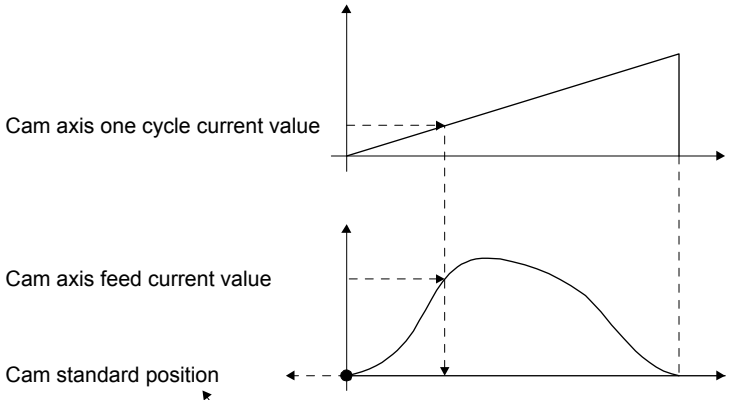
●In a cam pattern with a feed stroke smaller than 100%, the second searching may not be processed in the next cycle if the first searching has failed. To find an intended cam axis current value per cycle in the first searching, set a cam standard position or execute positioning in advance.



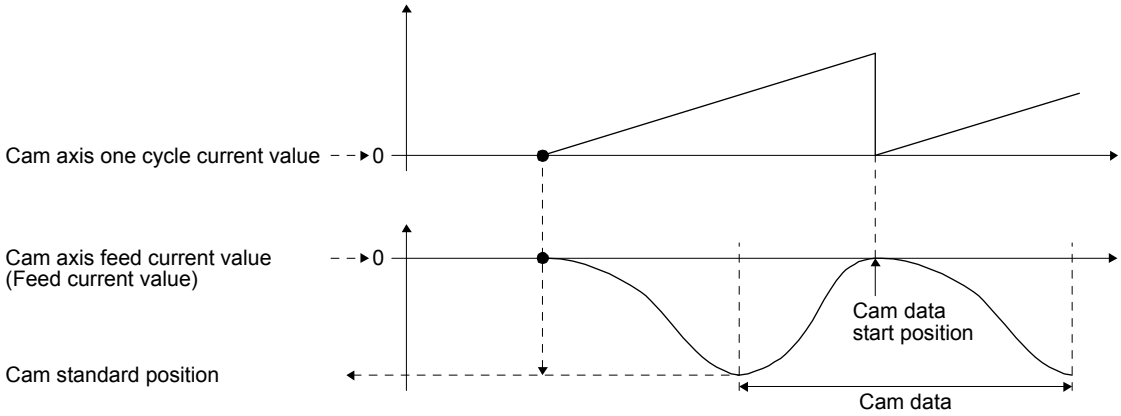
(2) Cam standard position restoration

When the cam axis position restoration target is set to "Cam standard position restoration", and then bit 5 of Control DI2 (2D02h) turns on, the control is switched to the cam control, restoring the "Cam standard position" based on the "Cam axis current value per cycle" and the "Cam axis feed current value".

Set the "Cam axis current value per cycle" used for the restoration with cam control data. The feed current value of when bit 5 of Control DI2 (2D02h) is on is used as "Cam axis feed current value".



The following is an example of when restoring the cam standard position to start an operation from a point where both the feed current value and the cam axis current value per cycle are "0" in the cam whose cam data start position is not "0".

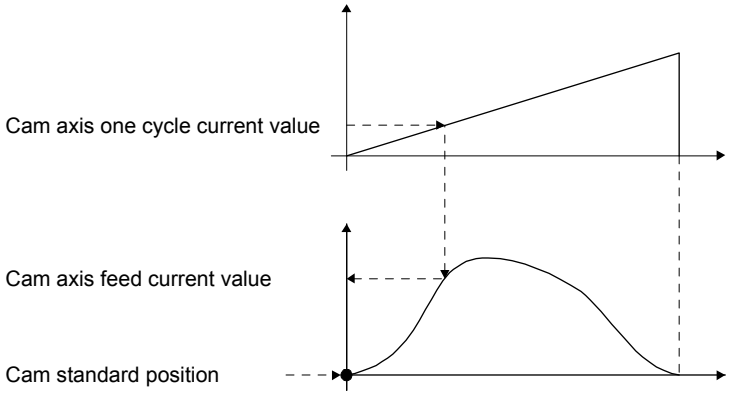


(3) Cam axis feed current value restoration

POINT

- When the restored cam axis feed current value differs from the feed current value at cam control switching, the cam axis feed current value moves to the value restored just after the cam control switching.
- If the difference between the restored cam axis feed current value and the feed current value is larger than the value set in [Pr. PA10 In-position range], [AL. F6.2 Cam axis feed current value restoration failed] occurs, and the control cannot be switched to the cam control. Note that increasing the value of the in-position range may lead to a rapid cam switching.

When the cam axis position restoration target is set to "Cam axis feed current value restoration", and then bit 5 of Control DI2 (2D02h) turns on, the control is switched to the cam control, restoring the "Cam axis feed current value" based on the "Cam axis current value per cycle" and the "Cam standard position".
Set the "Cam axis current value per cycle" and "Cam standard position" used for the restoration with cam control data.



9.5.14 Clutch

Use the clutch when starting or stopping the servo motor by transmitting or shutting commands from the main shaft to the output axis module side with the clutch on/off.
Set whether or not to use the clutch control with [Cam control data No. 36 - Main shaft clutch control setting]. Although the clutch ON/OFF can be changed during cam control, the setting of [Cam control data No. 36] cannot be changed from "1 (Clutch command ON/OFF)" to "0 (No clutch)" during cam control.

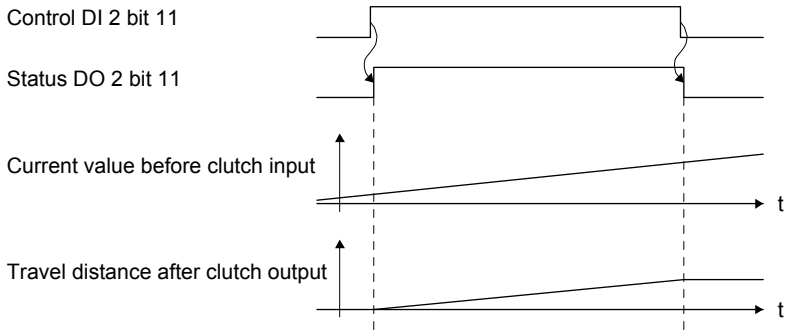
(1) ON control mode

(a) "No clutch"

When [Cam control data No. 36 - Main shaft clutch control setting] is set to "0 (No clutch)", direct coupled operation is set, and other clutch parameters are not used.

(b) Clutch command ON/OFF

The clutch is turned on/off by turning on/off bit 11 of Control DI2 (2D02h).
(Settings in the OFF control mode are not used in the clutch command ON/OFF mode.)

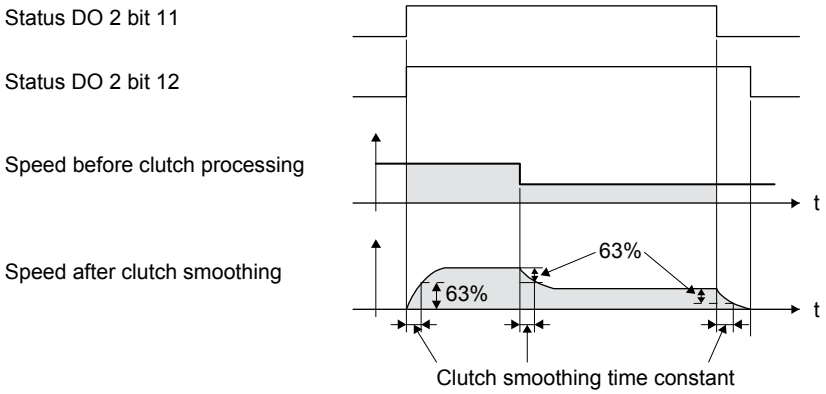


(2) Clutch smoothing system

Smoothing is processed with the time constant set in [Cam control data No. 43 Main shaft clutch smoothing time constant] at clutch ON/OFF. Even after clutch ON smoothing is completed, smoothing is processed with the set time constant if the speed of the input values changes.
The travel distance from turning on to off of the clutch does not change with smoothing.

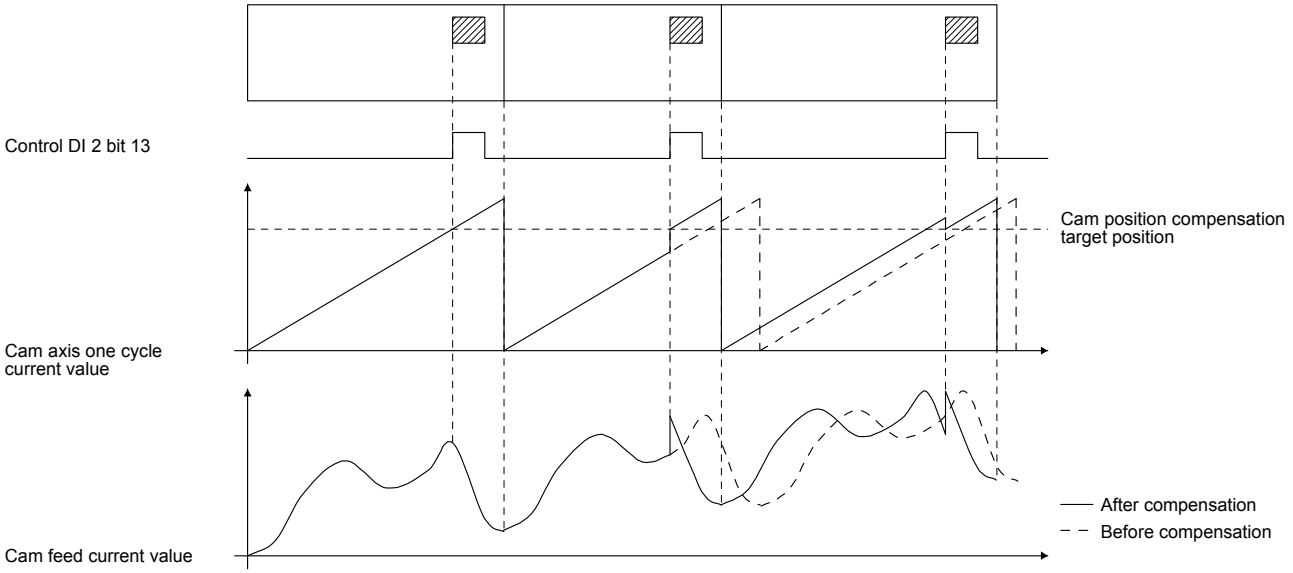
Time constant system exponential curve smoothing

Set [Cam control data No. 42 - Main shaft clutch smoothing system] to "1 (Time constant system (Exponent))".



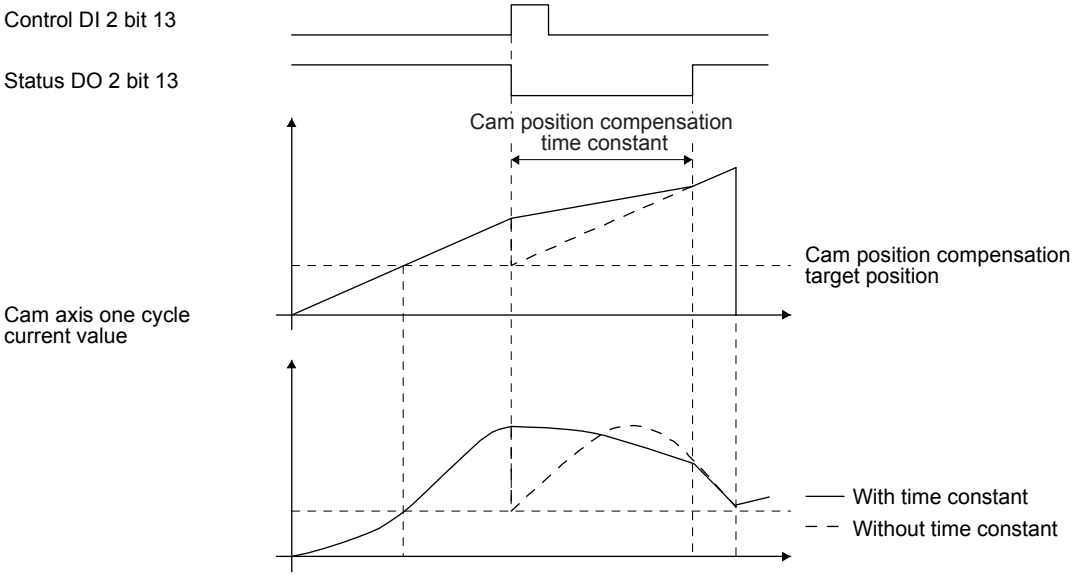
9.5.15 Cam position compensation target position

Perform compensation to match the cam axis current value per cycle with the cam position compensation target position ([Cam control parameter No. 60]) by inputting a cam position compensation request.



9.5.16 Cam position compensation time constant

The compensation amount calculated when cam position compensation is requested is divided into the time set in [Cam control data No. 61 Cam position compensation time constant] and used for compensation.



MEMO

10. OBJECT DICTIONARY

Each data such as control parameters, command values, and feedback values is handled as an object composed of an address, object name, data type, access rule, and other elements. The object data can be exchanged between the master station (controller) and the slave stations (servo amplifiers). The aggregate of these objects is called object dictionary.
The following is shown in the "Access" column.
"ro": Only reading is available.
"wo": Only writing is available.
"rw": Reading and writing are available.

10.1 Object dictionary list

Index	Sub Index	Name and function	Data Type	Access	Variable mapping	Default	Range	Units	EEP-ROM	Parameter
1000	0	Device Type This displays the servo drive defined with the CiA 402 profile.	U32	ro	Impossible	00020192h	00020192h (fixed)			
1008	0	Manufacturer Device Name The model name of the servo amplifier is returned.	VISIBLE STRING	ro	Impossible					
1009	0	Manufacturer Hardware Version The hardware version of the network module is returned.	VISIBLE STRING	ro	Impossible					
100A	0	Manufacturer Software Version The software version of the servo amplifier is returned.	VISIBLE STRING	ro	Impossible					
1010	0	Store parameters The number of entries is returned.	U8	ro	Impossible	1	01h			
	1	Save all parameters [Writing] Writing "save" (= 65766173h) saves all the objects which can be stored in the EEP-ROM. [Reading] Bit 0: 0: The parameter cannot be saved with the command. (A parameter is being saved.) 1: The parameter can be saved with the command. (No parameter is being saved.) Bit 1: 0: The parameter is not automatically saved.	U32	rw	Impossible	00000001h				
1011	0	Restore default parameters The number of entries is returned.	U8	ro	Impossible	1	01h (fixed)			
	1	Restore all default parameters The servo amplifier parameters can be rewritten to the factory setting. To initialize the parameters, write "64616F6Ch" (= reverse order of ASCII code of "load") to Restore all default parameters (1011h: 1), and then cycle the power.	U32	rw	Impossible	00000001h				

Index	Sub Index	Name and function	Data Type	Access	Variable mapping	Default	Range	Units	EEP-ROM	Parameter
2001 to 2020	0	PA01 to PA32 The values of the basic setting parameters ([Pr. PA_ _]) can be obtained and set. Refer to chapter 7 for details.	I32	rw	Impossible				○	PA01 to PA32
2081 to 20C0	0	PB01 to PB64 The values of the gain/filter setting parameters ([Pr. PB_ _]) can be obtained and set. Refer to chapter 7 for details.	I32	rw	Impossible				○	PB01 to PB64
2101 to 2150	0	PC01 to PC80 The values of the extension setting parameters ([Pr. PC_ _]) can be obtained and set. Refer to chapter 7 for details.	I32	rw	Impossible				○	PC01 to PC80
2181 to 21B0	0	PD01 to PD48 The values of the I/O setting parameters ([Pr. PD_ _]) can be obtained and set. Refer to chapter 7 for details.	I32	rw	Impossible				○	PD01 to PD48
2201 to 2240	0	PE01 to PE64 The values of the extension setting 2 parameters ([Pr. PE_ _]) can be obtained and set. Refer to chapter 7 for details.	I32	rw	Impossible				○	PE01 to PE64
2281 to 22C0	0	PF01 to PF64 The values of the extension setting 3 parameters ([Pr. PF_ _]) can be obtained and set. Refer to chapter 7 for details.	I32	rw	Impossible				○	PF01 to PF64
2401 to 2430	0	PL01 to PL48 The values of the linear servo motor/DD motor setting parameters ([Pr. PL_ _]) can be obtained and set. Refer to chapter 7 for details.	I32	rw	Impossible				○	PL01 to PL48
2481 to 24D0	0	PT01 to PT80 The values of the positioning control parameters ([Pr. PT_ _]) can be obtained and set. Refer to chapter 7 for details.	I32	rw	Impossible				○	PT01 to PT80
2581 to 25A0	0	PN01 to PN32 The values of the network setting parameters ([Pr. PN_ _]) can be obtained and set. Refer to chapter 7 for details.	I32	rw	Impossible				○	PN01 to PN32

Index	Sub Index	Name and function	Data Type	Access	Variable mapping	Default	Range	Units	EEP-ROM	Parameter
2801 to 28FF	0	Point table 001 to Point table 255 Point table	U8	ro	Possible	7	07h (fixed)		○	
	1	Point data Unit: pos units	I32	rw	Possible	0	FFF0BDC1h to 000F423Fh	pos units	○	
	2	Speed Unit: 0.01 r/min or 0.01 mm/s	U32	rw	Possible	0	00000000h to instantaneous permissible speed	0.01 r/min 0.01 mm/s	○	
	3	Acceleration Unit: ms	U16	rw	Possible	0	00000000h to 00004E20h	ms	○	
	4	Deceleration Unit: ms	U16	rw	Possible	0	00000000h to 00004E20h	ms	○	
	5	Dwell Unit: ms	U16	rw	Possible	0	00000000h to 00004E20h	ms	○	
	6	Auxiliary [Absolute value command method] 0: Automatic operation for a selected point table is performed. 1: Automatic operation for the next point table is performed. 8: Automatic operation for a point table selected at start-up is performed. 9: Automatic operation for point table No. 1 is performed. [Incremental value command method] 2: Automatic operation for a selected point table is performed. 3: Automatic operation for the next point table is performed. 10: Automatic operation for a point table selected at start-up is performed. 11: Automatic operation for point table No. 1 is performed. When "1"or "3" is set in the auxiliary function of the point table No. 255, bit 6 in the Point table error factor (2A43h) turns on and an error occurs.	U8	rw	Possible	0	00000000h to 00000003h, 00000008h to 0000000Bh		○	
2A00 to 2A0F	0	Alarm history newest The number of entries in the latest alarm of the alarm history is returned.	U8	ro	Impossible	3	03h (fixed)		○	
	1	Alarm No. The number of the alarm that has occurred is returned. The description is as follows. Bit 0 to Bit 15: Alarm detail number Bit 16 to Bit 31: Alarm number When no history exists, 0 is returned.	U32	ro	Impossible	0	00000000h to FFFFFFFFh		○	
	2	Alarm time (Hour) Alarm occurrence time is returned. When no history exists, "0" is returned.	U32	ro	Impossible	0	00000000h to FFFFFFFFh	hour	○	
	3	Alarm2 No. The number of the alarm that has occurred is returned. The description is as follows. Bit 0 to Bit 7: Alarm detail number Bit 8 to Bit 15: Alarm number When no history exists, "0" is returned.	U16	ro	Impossible	0	0000h to FFFFh		○	

Index	Sub Index	Name and function	Data Type	Access	Variable mapping	Default	Range	Units	EEP-ROM	Parameter
2A40	0	Clear alarm history Writing "1EA5h" clears the alarm history.	U16	wo	Impossible					
2A41	0	Current alarm The number of the current alarm is returned. When no alarm has occurred, "00000000h" is returned. Bit 0 to Bit 15: Alarm detail number Bit 16 to Bit 31: Alarm number	U32	ro	Possible		00000000h to FFFFFFFFh			
2A42	0	Current alarm 2 The number of the current alarm is returned. When no alarm has occurred, "0000h" is returned. Bit 0 to Bit 7: Alarm detail number Bit 8 to Bit 15: Alarm number	U16	ro	Possible		0000h to FFFFh			
2A43	0	Point table error Point table error	U8	ro	Impossible	2	02h (fixed)		○	
	1	Point table error No. The point table No. in which a point table error has occurred is returned.	U16	ro	Impossible	0	00000000h to 000000FFh		○	
	2	Point table error factor The error factor of the corresponding point table in which a point table error has occurred is returned. Bit 0: Target position error Bit 1: reserved Bit 2: Speed error Bit 3: Acceleration time constant error Bit 4: Deceleration time constant error Bit 5: Dwell error Bit 6: Auxiliary function error Bit 7 to Bit 31: reserved	U32	ro	Impossible	0	00000000h to 000000FDh		○	
2A44	0	Parameter error number When [AL. 37 Parameter error] has occurred, the number of the parameters which cause the error is returned. Refer to Parameter error list (2A45h) for the number of each parameter which causes the error.	U16	ro	Impossible		0000h to 01F4h (500)			
2A45	0	Parameter error list When [AL. 37 Parameter error] has occurred, the number of entries of the parameter which causes the error is returned.	U8	ro	Impossible	20h (32)	20h (32) (fixed)			
	1 to 32	Parameter error list 1 to 32 When [AL. 37 Parameter error] has occurred, the 1st to 32nd numbers of the parameter which causes the alarm is returned. Bit 0 to Bit 7: Parameter number Bit 8 to Bit 15: Parameter group number 00: [Pr. PA _ _] 01: [Pr. PB _ _] 02: [Pr. PC _ _] 03: [Pr. PD _ _] 04: [Pr. PE _ _] 05: [Pr. PF _ _] 06: Parameter for manufacturer setting 07: Parameter for manufacturer setting 08: Parameter for manufacturer setting 09: Parameter for manufacturer setting 0A: Parameter for manufacturer setting 0B: [Pr. PL _ _] 0C: [Pr. PT _ _] 0E: [Pr. PN _ _] 0F: Parameter for manufacturer setting	U16	ro	Impossible	0	0000h to FFFFh			

Index	Sub Index	Name and function	Data Type	Access	Variable mapping	Default	Range	Units	EEP-ROM	Parameter
2A46	0	Reset alarm Writing the value "1EA5h" resets an alarm. Any value other than "1EA5h" is invalid.	U16	wo	Impossible		0000h to FFFFh			
2B01	0	Cumulative feedback pulses The cumulative feedback pulses are returned. Writing "00001EA5h" clears the cumulative feedback pulses.	I32	rw	Possible		80000000h to 7FFFFFFFh	pulse		
2B02	0	Servo motor speed The servo motor speed is returned.	I32	ro	Possible		80000000h to 7FFFFFFFh	0.01 r/min 0.01 mm/s		
2B03	0	Droop pulses The droop pulses (encoder unit) are returned.	I32	ro	Possible		80000000h to 7FFFFFFFh	pulse		
2B04	0	Cumulative command pulses The cumulative command pulses are returned.	I32	ro	Possible		80000000h to 7FFFFFFFh	pulse		
2B05	0	Command pulse frequency The command pulse frequency is returned.	I32	ro	Possible		80000000h to 7FFFFFFFh	kpulse/s		
2B08	0	Regenerative load ratio The regenerative load ratio is returned.	U16	ro	Possible		0000h to FFFFh	%		
2B09	0	Effective load ratio The effective load ratio is returned.	U16	ro	Possible		0000h to FFFFh	%		
2B0A	0	Peak load ratio The peak load ratio is returned.	U16	ro	Possible		0000h to FFFFh	%		
2B0B	0	Instantaneous torque The instantaneous torque is returned.	I16	ro	Possible		8000h to 7FFFh	%		
2B0C	0	Within one-revolution position The position within one-revolution is returned.	I32	ro	Possible		80000000h to 7FFFFFFFh	pulse		
2B0D	0	ABS counter The multi-revolution counter value is returned.	I32	ro	Possible		80000000h to 7FFFFFFFh	rev		
2B0E	0	Load to motor inertia ratio The load to motor inertia ratio is returned.	U16	ro	Possible		0000h to FFFFh	0.01 times		
2B0F	0	Bus voltage The bus voltage is returned.	U16	ro	Possible		0000h to FFFFh	V		
2B10	0	Load-side cumulative feedback pulses The load-side cumulative feedback pulses (load-side encoder unit) are returned.	I32	ro	Possible		80000000h to 7FFFFFFFh	pulse		
2B11	0	Load-side droop pulses The load-side droop pulses are returned.	I32	ro	Possible		80000000h to 7FFFFFFFh	pulse		
2B12	0	Load-side encoder information 1 Z-phase counter The load-side encoder information 1 is returned.	I32	ro	Possible		80000000h to 7FFFFFFFh	pulse		
2B13	0	Load-side encoder information 2 The load-side encoder information 2 is returned.	I32	ro	Possible		80000000h to 7FFFFFFFh	pulse		
2B17	0	Temperature of motor thermistor The temperature of motor thermistor is returned.	I16	ro	Possible		8000h to 7FFFh	°C		
2B18	0	Motor-side cumu. feedback pulses (before gear) The cumulative feedback pulses are returned.	I32	ro	Possible		80000000h to 7FFFFFFFh	pulse		
2B23	0	Motor-side/load-side position deviation The servo motor-side/load-side position deviation is returned.	I32	ro	Possible		80000000h to 7FFFFFFFh	pulse		
2B24	0	Motor-side/load-side speed deviation The servo motor-side/load-side speed deviation is returned.	I32	ro	Possible		80000000h to 7FFFFFFFh	pulse		
2B25	0	Internal temperature of encoder The internal temperature of encoder is returned.	I16	ro	Possible		8000h to 7FFFh	°C		
2B26	0	Settling time The settling time is returned.	I16	ro	Possible		8000h to 7FFFh	ms		
2B27	0	Oscillation detection frequency The oscillation detection frequency is returned.	I16	ro	Possible		8000h to 7FFFh	Hz		
2B28	0	Number of tough drive operations The number of tough drive operations is returned.	I16	ro	Possible		0000h to FFFFh	times		
2B2D	0	Unit power consumption The unit power consumption is returned.	I16	ro	Possible		8000h to 7FFFh	W		

Index	Sub Index	Name and function	Data Type	Access	Variable mapping	Default	Range	Units	EEP-ROM	Parameter
2B2E	0	Unit total power consumption The unit total power consumption is returned.	I32	ro	Possible		80000000h to 7FFFFFFFh	Wh		
2B2F	0	Current position The current position is returned. In the indexer method, the value is fixed to 0.	I32	ro	Possible		80000000h to 7FFFFFFFh	pos units		
2B30	0	Command position The command position is returned. In the indexer method, the value is fixed to 0.	I32	ro	Possible		80000000h to 7FFFFFFFh	pos units		
2B31	0	Command remaining distance The command remaining distance is returned.	I32	ro	Possible		80000000h to 7FFFFFFFh	pos units		
2B32	0	Point table No./Station position No Point table No. or station position No. is returned.	I16	ro	Possible		0000h to 00FFh			
2B81	0	Alarm Monitor 1 Cumulative feedback pulses The cumulative feedback pulses at alarm occurrence are returned.	I32	ro	Possible		80000000h to 7FFFFFFFh	pulse		
2B82	0	Alarm Monitor 2 Servo motor speed The servo motor speed at alarm occurrence is returned.	I32	ro	Possible		80000000h to 7FFFFFFFh	r/min mm/s		
2B83	0	Alarm Monitor 3 Droop pulses The droop pulses at alarm occurrence are returned.	I32	ro	Possible		80000000h to 7FFFFFFFh	pulse		
2B84	0	Alarm Monitor 4 Cumulative command pulses The cumulative command pulses (encoder unit) at alarm occurrence are returned.	I32	ro	Possible		80000000h to 7FFFFFFFh	pulse		
2B85	0	Alarm Monitor 5 Command pulse frequency The command pulse frequency at alarm occurrence is returned.	I32	ro	Possible		80000000h to 7FFFFFFFh	kpulse/s		
2B88	0	Alarm Monitor 8 Regenerative load ratio The regenerative load ratio at alarm occurrence is returned.	U16	ro	Possible		0000h to FFFFh	%		
2B89	0	Alarm Monitor 9 Effective load ratio The effective load ratio at alarm occurrence is returned.	U16	ro	Possible		0000h to FFFFh	%		
2B8A	0	Alarm Monitor 10 Peak load ratio The peak load ratio at alarm occurrence is returned.	U16	ro	Possible		0000h to FFFFh	%		
2B8B	0	Alarm Monitor 11 Instantaneous torque The instantaneous torque at alarm occurrence is returned.	I16	ro	Possible		8000h to 7FFFh	%		
2B8C	0	Alarm Monitor 12 Within one-revolution position The position within one-revolution at alarm occurrence is returned.	I32	ro	Possible		80000000h to 7FFFFFFFh	pulse		
2B8D	0	Alarm Monitor 13 ABS counter The ABS counter at alarm occurrence is returned.	I32	ro	Possible		80000000h to 7FFFFFFFh	rev		
2B8E	0	Alarm Monitor 14 Load to motor inertia ratio The load to motor inertia ratio at alarm occurrence is returned.	U16	ro	Possible		0000h to FFFFh	0.01 times		
2B8F	0	Alarm Monitor 15 Bus voltage The bus voltage at alarm occurrence is returned.	I32	ro	Possible		0000h to FFFFh	V		
2B90	0	Alarm Monitor 16 Load-side cumulative feedback pulses The load-side cumulative feedback pulses at alarm occurrence are returned.	I32	ro	Possible		80000000h to 7FFFFFFFh	pulse		
2B91	0	Alarm Monitor 17 Load-side droop pulses The load-side droop pulses at alarm occurrence are returned.	I32	ro	Possible		80000000h to 7FFFFFFFh	pulse		
2B92	0	Alarm Monitor 18 Load-side encoder information 1 Z-phase counter The load-side encoder information 1 at alarm occurrence is returned.	I32	ro	Possible		80000000h to 7FFFFFFFh	pulse		

Index	Sub Index	Name and function	Data Type	Access	Variable mapping	Default	Range	Units	EEP-ROM	Parameter
2B93	0	Alarm Monitor 19 Load-side encoder information 2 The load-side encoder information 2 at alarm occurrence is returned.	I32	ro	Possible		80000000h to 7FFFFFFFh	pulse		
2B97	0	Alarm Monitor 23 Temperature of motor thermistor The temperature of motor thermistor at alarm occurrence is returned.	I32	ro	Possible		8000h to 7FFFh	°C		
2B98	0	Alarm Monitor 24 Motor-side cumu. feedback pulses (before gear) The cumulative feedback pulses (servo motor-side unit) at alarm occurrence are returned.	I32	ro	Possible		80000000h to 7FFFFFFFh	pulse		
2BA3	0	Alarm Monitor 35 Motor-side/load-side position deviation The motor-side/load-side position deviation at alarm occurrence is returned.	I32	ro	Possible		80000000h to 7FFFFFFFh	pulse		
2BA4	0	Alarm Monitor 36 Motor-side/load-side speed deviation The servo motor-side/load-side speed deviation at alarm occurrence is returned.	I32	ro	Possible		80000000h to 7FFFFFFFh	pulse		
2BA5	0	Alarm Monitor 37 Internal temperature of encoder The internal temperature of encoder at alarm occurrence is returned.	I32	ro	Possible		8000h to 7FFFh	°C		
2BA6	0	Alarm Monitor 38 Settling time The settling time at alarm occurrence is returned.	I32	ro	Possible		8000h to 7FFFh	ms		
2BA7	0	Alarm Monitor 39 Oscillation detection frequency The oscillation detection frequency at alarm occurrence is returned.	I32	ro	Possible		8000h to 7FFFh	Hz		
2BA8	0	Alarm Monitor 40 Number of tough drive operations The number of tough drive operations at alarm occurrence is returned.	I32	ro	Possible		0000h to FFFFh	times		
2BAA	0	Alarm Monitor 42 Internal temperature of amplifier The internal temperature of amplifier at alarm occurrence is returned.	I32	ro	Possible		8000h to 7FFFh	°C		
2BAD	0	Alarm Monitor 45 Unit power consumption The unit power consumption at alarm occurrence is returned.	I32	ro	Possible		8000h to 7FFFh	W		
2BAE	0	Alarm Monitor 46 Unit total power consumption The unit total power consumption at alarm occurrence is returned.	I32	ro	Possible		80000000h to 7FFFFFFFh	Wh		
2BAF	0	Alarm Monitor 47 Current position The current position at alarm occurrence is returned. In the indexer method, the value is fixed to 0.	I32	ro	Possible		80000000h to 7FFFFFFFh			
2BB0	0	Alarm Monitor 48 Command position The command position at alarm occurrence is returned. In the indexer method, the value is fixed to 0.	I32	ro	Possible		80000000h to 7FFFFFFFh			
2BB1	0	Alarm Monitor 49 Command remaining distance The command remaining distance at alarm occurrence is returned.	I32	ro	Possible		80000000h to 7FFFFFFFh			
2BB2	0	Alarm Monitor 50 Point table No./Station position No. Point table No. or station position No. at alarm occurrence is returned.	I32	ro	Possible		0000h to 00FFh			
2C18	0	Power ON cumulative time The cumulative time after power on of the servo amplifier is returned.	U32	ro	Impossible	0	00000000h to FFFFFFFFh	hour		
2C19	0	Number of inrush relay on/off times The number of on/off times of the inrush relay of the servo amplifier is returned.	U32	ro	Impossible	0	00000000h to FFFFFFFFh	times		

Index	Sub Index	Name and function	Data Type	Access	Variable mapping	Default	Range	Units	EEP-ROM	Parameter
2C20	0	Machine diagnostic status [Bit 0 to Bit 3: Friction estimation status at forward rotation] 0: Normal (During estimation) 1: Normal (Estimation is completed) 2: Warning (the servo motor may rotate in one direction too frequently.) 3: Warning (the servo motor speed may be too slow for friction estimation.) 4: Warning (the change in the servo motor speed may be small for friction estimation.) 5: Warning (the acceleration/deceleration time constants may be too short for friction estimation.) 6: Warning (the operation time may not be enough.) When warning conditions for 2 to 6 are met at the same time, the smaller number is returned. When an estimation is completed even though a warning has once occurred, the status changes to "Estimation is completed". [Bit 4 to Bit 7: Friction estimation status at reverse rotation] 0: Normal (During estimation) 1: Normal (Estimation is completed) 2: Warning (the servo motor may rotate in one direction too frequently.) 3: Warning (the servo motor speed may be too slow for friction estimation.) 4: Warning (the change in the servo motor speed may be small for friction estimation.) 5: Warning (the acceleration/deceleration time constants may be too short for friction estimation.) 6: Warning (the operation time may not be enough.) When warning conditions for 2 to 6 are met at the same time, the smaller number is returned. When an estimation is completed even though a warning has once occurred, the status changes to "Estimation is completed". [Bit 8 to Bit 11: Vibration estimation status] 0: During estimation 1: Estimation is completed. [Bit 12 to Bit 15: reserved] The value at reading is undefined.	U16	ro	Impossible	0	0000h to FFFFh			
2C21	0	Static friction torque at forward rotation) Coulomb friction at forward rotation torque is returned in increments of 0.1%.	I16	ro	Impossible	0	8000h to 7FFFh	0.1 %		
2C22	0	Dynamic friction torque at forward rotation (at rated speed) Friction torque at forward rotation torque at rated speed is returned in increments of 0.1%.	I16	ro	Impossible	0	8000h to 7FFFh	0.1 %		
2C23	0	Static friction torque at reverse rotation Coulomb friction at reverse rotation torque is returned in increments of 0.1%.	I16	ro	Impossible	0	8000h to 7FFFh	0.1 %		
2C24	0	Dynamic friction torque at reverse rotation (at rated speed) Friction torque at reverse rotation torque at rated speed is returned in increments of 0.1%.	I16	ro	Impossible	0	8000h to 7FFFh	0.1 %		
2C25	0	Oscillation frequency during motor stop Vibration frequency during stop/servo-lock is returned in increments of 1 Hz.	I16	ro	Impossible	0	8000h to 7FFFh	Hz		

Index	Sub Index	Name and function	Data Type	Access	Variable mapping	Default	Range	Units	EEP-ROM	Parameter
2C26	0	Vibration level during motor stop Vibration level during stop/servo-lock is returned in increments of 0.1%.	I16	ro	Impossible	0	8000h to 7FFFh	0.1 %		
2C27	0	Oscillation frequency during motor operating Vibration frequency during operation is returned in increments of 1 Hz.	I16	ro	Impossible	0	8000h to 7FFFh	Hz		
2C28	0	Vibration level during motor operating Vibration level during operation is returned in increments of 0.1%.	I16	ro	Impossible	0	8000h to 7FFFh	0.1 %		
2C29	0	Fault prediction status [Bit 0 to 3: Friction failure prediction status] 0: Friction failure prediction disabled 1: During preparation for friction failure prediction 2: During execution of friction failure prediction 3: During friction failure prediction warning [Bit 4 to 7: Vibration failure prediction status] 0: Vibration failure prediction disabled 1: During preparation for vibration failure prediction 2: During execution of vibration failure prediction 3: During vibration failure prediction warning [Bit 8 to 11: Total travel distance failure prediction status] 0: Total revolution failure prediction disabled 1: During execution of total revolution failure prediction 2: During total revolution failure prediction warning [Bit 12 to 15: Motor total travel distance calculation status] 0: During stop of motor total travel distance calculation 1: During calculation of motor total travel distance [Bit 16 to 31: reserved]	U32	ro	Impossible	0	00000000h to FFFFFFFFh			
2C2A	0	Friction based fault prediction upper Threshold The upper limit threshold used for friction failure prediction is displayed in increments of 0.1% assuming the rated torque as 100%.	I32	ro	Impossible	0	80000000h to 7FFFFFFFh	0.1%		
2C2B	0	Friction based fault prediction lower Threshold The lower limit threshold used for friction failure prediction is displayed in increments of 0.1% assuming the rated torque as 100%.	I32	ro	Impossible	0	80000000h to 7FFFFFFFh	0.1%		
2C2C	0	Friction based fault prediction prepare status The threshold creation progress used for friction failure prediction is displayed in percentage unit. The creation of an upper and a lower limit threshold for friction failure prediction will be completed at 100%.	I16	ro	Impossible		8000h to 7FFFh	%		
2C2D	0	Vibration based fault prediction Threshold The threshold used for vibration failure prediction is displayed in increments of 0.1% assuming the rated torque as 100%.	I32	ro	Impossible		80000000h to 7FFFFFFFh	0.1%		
2C2E	0	Vibration based fault prediction prepare status The threshold creation progress used for vibration failure prediction is displayed in %. The creation of a threshold for vibration failure prediction will be completed at 100%.	I16	ro	Impossible		8000h to 7FFFh	%		
2C2F	0	Motor total distance The motor total travel distance is displayed in units of rev or m.	I32	ro	Impossible		80000000h to 7FFFFFFFh	rev m		

Index	Sub Index	Name and function	Data Type	Access	Variable mapping	Default	Range	Units	EEP-ROM	Parameter
2D01 to 2D0A	0	Control DI 1 to Control DI 10 The on/off status of input device can be read. The on/off status of input device can also be set.	U16	rw	Possible	0	0000h to FFFFh			
2D11 to 2D1A	0	Status DO 1 to Status DO 10 The on/off status of output device can be read.	U16	ro	Possible		0000h to FFFFh			
2D20	0	Velocity limit value The speed limit value is set.	U32	rw	Possible	50000	00000000h to instantaneous permissible speed	0.01 r/min 0.01 mm/s	○	PT52
2D28	0	Motor rated speed The servo motor rated speed is returned.	U32	ro	Impossible		00000000h to FFFFFFFFh	r/min mm/s		
2D35	0	Encoder status The number of entries is returned.	U8	ro	Impossible	1	01h (fixed)			
	1	Encoder status1 The encoder status is returned. Bit 0: Whether the servo amplifier is used in an absolute position detection system or not is returned. 0 = Incremental system 1 = Absolute position detection system Bit 1 to Bit 31: Reserved	U32	ro	Impossible		00000000h to 00000001h			
	2	Encoder status2 The status of the scale measurement encoder is returned. Bit 0: Whether the servo amplifier is used in an absolute position detection system or not is returned. 0 = Incremental system 1 = Absolute position detection system Bit 1: Whether the scale measurement function is enabled or disabled is returned. 0 = Disabled 1 = Enabled Bit 2: Whether the connected scale measurement encoder is the absolute position type or not is returned. 0 = Incremental type 1 = Absolute position type Bit 3 to Bit 31: Reserved	U32	ro	Impossible		00000000h to 00000111h			
2D42	0	Max ABS counter The maximum value of the multi-revolution counter is displayed.	U32	ro	Impossible		00000000h to FFFFFFFFh	rev		
2D50	0	One-touch tuning mode Setting "1" to "3" starts one-touch tuning. After one-touch tuning is completed, the setting value automatically changes to "0". 1: Basic setting 2: High setting 3: Low setting	U8	rw	Impossible	0	00h to 03h			
2D51	0	One-touch tuning status The one-touch tuning progress is returned.	I8	ro	Impossible	0	00h to 64h	%		
2D52	0	One-touch tuning Stop Writing "1EA5h" can stop one-touch tuning. Any value other than "1EA5h" is invalid.	U16	wo	Impossible		0000h/ 1EA5h			
2D53	0	One-touch tuning Clear The parameter changed in one-touch tuning can be returned to the value before the change. The description of the setting values is as follows. 0000: Restores the default value 0001: Restores the value before one-touch tuning.	U16	wo	Impossible		0000h to 0001h			

Index	Sub Index	Name and function	Data Type	Access	Variable mapping	Default	Range	Units	EEP-ROM	Parameter
2D54	0	One-touch tuning Error Code An error code of the one-touch tuning is returned. The description of the error codes is as follows. 0000: Finished normally C000: Tuning canceled C001: Overshoot exceeded C002: Servo-off during tuning C003: Control mode error C004: Time-out C005: Load to motor inertia ratio misestimated C00F: One-touch tuning disabled	U16	ro	Impossible	0	0000h to C00Fh			
2D60	0	Target point table In the point table mode (pt) Specify a point table No. 0: Not operate 1 to 255: Execute the specified point table -1: High-speed home position return In the indexer mode (idx) Specify the next station No. 0 to 254: Positioning operation to specified stations	I16	rw	Possible	0	pt: FFFFh to 00FFh idx: 0000h to 00FEh			
2D68	0	Point demand value The currently specified point table error No. can be read. The returned values vary depending on the control mode.	I16	ro	Possible		pt: FFFFh to 00FFh idx: 0000h to 00FEh			
2D69	0	Point actual value In the point table mode (pt), the completed point table No. is returned. After homing completed, "0" is set. In the indexer mode (idx), the completed station No. is returned. The previous value is held until completion.	I16	ro	Possible		pt: FFFFh to 00FFh idx: 0000h to 00FEh			
2D80	0	Target CAM No. Set a cam No. When [Cam control data No. 49 - Cam No.] is "0", the cam number set with Target CAM No. (2D80h) is enabled. If the cam number is not "0", the setting of [Cam control data No. 49] is enabled, and this object is disabled.	U8	rw	Possible		00h to 08h			
2DD1	0	Target speed No. The command speed, acceleration time constant, and deceleration time constant of the next station to execute in the indexer mode (idx) is specified with the point table No. When Profile velocity (6081h), Profile acceleration (6083h), and Profile deceleration (6084h) are all set to values other than "0", the setting value of 2DD1h is disabled.	I16	rw	Possible	0	0000h to FFFFh			
603F	0	Error code The latest error No. that occurred after the power on is returned. The error number is as follows. 1000h: Generic error	U16	ro	Possible	0	0000h to FFFFh			

Index	Sub Index	Name and function	Data Type	Access	Variable mapping	Default	Range	Units	EEP-ROM	Parameter
6040	0	Controlword Set control commands to control the servo amplifier. Bit 0: switch on Bit 1: enable voltage Bit 2: quick stop Bit 3: enable operation Bit 4 to Bit 6: operation mode specific Bit 7: fault reset Bit 8: halt Bit 9: operation mode specific Bit 10 to Bit 14: reserved Bit 15: operation mode specific	U16	rw	Possible	0	0000h to FFFFh			
6041	0	Statusword The current control status can be checked. Bit 0: ready to switch on Bit 1: switched on Bit 2: operation enabled Bit 3: fault Bit 4: voltage enabled Bit 5: quick stop Bit 6: switch disabled Bit 7: warning Bit 8: reserved Bit 9: remote Bit 10: target reached Bit 11: internal limit active Bit 12 to Bit 13: operation mode specific Bit 14 to Bit 15: reserved	U16	ro	Possible		0000h to FFFFh			
605A	0	Quick stop option code The operation method of deceleration to a stop can be specified.	I16	rw	Impossible	2	0002h (fixed)		○	PT69
605D	0	Halt option code Set how to decelerate the servo motor to a stop at Halt reception.	I16	rw	Impossible	1	0001h (fixed)		○	PT69
6060	0	Modes of operation Set the control mode. 0: No mode assigned 6: Homing mode (hm) -100: Jog mode (jg) -101: Point table mode (pt) -103: Indexer mode (idx)	I8	rw	Possible	0	80h to 7Fh			
6061	0	Modes of operation display The current control mode is returned. 0: No mode assigned 6: Homing mode (hm) -100: Jog mode (jg) -101: Point table mode (pt) -103: Indexer mode (idx)	I8	ro	Possible	-101	80h to 7Fh			
6063	0	Position actual internal value The current position is returned.	I32	ro	Possible		80000000h to 7FFFFFFFh	pulse		
6064	0	Position actual value The current position in the command unit on the basis of the home position is returned. When the home position is not set, the current position in the command unit on the basis of the zero point of the encoder is returned. In the indexer method, "0" is returned.	I32	ro	Possible		80000000h to 7FFFFFFFh	pos units		

Index	Sub Index	Name and function	Data Type	Access	Variable mapping	Default	Range	Units	EEP-ROM	Parameter
606B	0	Velocity demand value The speed command is returned.	I32	ro	Possible	0	80000000h to 7FFFFFFFh	0.01 r/min 0.01 mm/s		
606C	0	Velocity actual value The current speed is returned.	I32	ro	Possible		80000000h to 7FFFFFFFh	0.01 r/min 0.01 mm/s		
6072	0	Max torque The maximum torque of the servo motor is returned. The value matches with the maximum torque listed in "Servo Motor Instruction Manual (Vol. 3)".	U16	rw	Possible		0000h to FFFFh	0.1 %		
6074	0	Torque demand value The torque command is returned.	I16	ro	Possible	0	8000h to 7FFFh	0.1 %		
6077	0	Torque actual value The current torque is returned. The read data is in the unit of 0.1%.	I16	ro	Possible		8000h to 7FFFh	0.1 %		
607C	0	Home offset The home position is returned. Only reading the value is available. Do not write because doing so causes an error.	I32	rw	Possible	0	80000000h to 7FFFFFFFh	pos units	○	
607D	0	Software position limit Set the range for limiting the command position. Target position (607Ah) is limited within the range between Min position limit (607Dh: 1) and Max position limit (607Dh: 2). When the set value of Min position limit (607Dh: 1) is equal to or greater than the set value of Max position limit (607Dh: 2), the function of Software position limit (607Dh) is disabled. In the indexer method, this function is disabled.	U8	ro	Impossible	2	02h (fixed)			
	1	Min position limit The stroke limit value in the reverse direction is returned in units of commands.	I32	rw	Possible	0	80000000h to 7FFFFFFFh	pos units	○	PT17, PT18
	2	Max position limit The stroke limit value in the forward direction is returned in units of commands.	I32	rw	Possible	0	80000000h to 7FFFFFFFh	pos units	○	PT15, PT16
607E	0	Polarity The rotation direction selection can be set. Bit 7: position polarity Bit 6: velocity polarity Bit 5: torque polarity Turn on or off both bits 6 and 7 to set the rotation direction to position commands and speed commands. Turn on or off all of bits 5 to 7 to set the rotation direction to torque commands.	U8	rw	Possible	00h	00h to FFh		○	PA14, PC29
607F	0	Max profile velocity Set the maximum speed commands in the Jog mode (jg) and indexer mode (idx). When a value exceeding this object is set to Target velocity (60FFh) or Profile velocity (6081h), the speed is limited with the value of this object.	U32	rw	Possible	2000000	00000000h to 001E8480h (2000000)	0.01 r/min 0.01 mm/s	○	PT51
6080	0	Max motor speed The maximum speed of the servo motor is returned. Operation cannot be performed at a speed exceeding the speed set with this object.	U32	rw	Possible		00000000h to FFFFFFFFh	r/min mm/s		
6081	0	Profile velocity The current speed command value can be read. The speed command values in the Jog mode (jg) and indexer mode (idx) can be set. Set a value in 0.01 r/min unit.	U32	rw	Possible	10000	00000000h to instantaneous permissible speed	0.01 r/min 0.01 mm/s	○	PT50

Index	Sub Index	Name and function	Data Type	Access	Variable mapping	Default	Range	Units	EEP-ROM	Parameter
6083	0	Profile acceleration The current acceleration time constant can be read. The values of the acceleration time constant in the Jog mode (jg) and indexer mode (idx) can be set. Set the acceleration time for the servo motor to reach the rated speed in units of ms.	U32	rw	Possible	0	00000000h to FFFFFFFFh	ms	○	PC01
6084	0	Profile deceleration The current deceleration time constant can be read. The values of the deceleration time constant in the Jog mode (jg) and indexer mode (idx) can be set. Set the deceleration time for the servo motor to stop from the rated speed in units of ms.	U32	rw	Possible	0	00000000h to FFFFFFFFh	ms	○	PC02
6085	0	Quick stop deceleration Set a deceleration time constant for the Quick stop function. Set a time for the servo motor to stop from the rated speed. When "0" is set, the operation is performed with 100 ms. [Range] Limited within the range of 0 to 20000. When "0" is set, the operation is performed with 100 ms. The operation depends on the specification of [Pr. PC51].	U32	rw	Possible	100	00000000h to FFFFFFFFh	ms	○	PC51
608F	0	Position encoder resolution The number of entries is returned.	U8	ro	Impossible	2	02h (fixed)	pulse/ rev		
	1	Encoder increments The encoder resolution is returned.	U32	rw	Possible		00000000h to FFFFFFFFh	pulse		
	2	Motor revolutions The fixed value "1" is returned.	U32	rw	Possible	1	00000001h to 00000001h	rev		
6091	0	Gear ratio The number of entries is returned.	U8	ro	Impossible	2	02h (fixed)			
	1	Motor revolutions Set the denominator of the electronic gear. Refer to [Pr. PA06] for the range of the settable values.	U32	rw	Possible	1	00000001h to 00FFFFFFh (16777215)	rev	○	PA06
	2	Shaft revolutions Set the denominator of the electronic gear. Refer to [Pr. PA07] for the range of the settable values.	U32	rw	Possible	1	00000001h to 00FFFFFFh (16777215)	rev	○	PA07
6092	0	Feed constant The number of entries is returned. Electronic gear expression: Travel distance/Number of revolutions of the drive axis	U8	ro	Impossible	2	02h (fixed)			
	1	Feed The value is set automatically according to the [Pr. PT01] setting. Point table method: encoder resolution Indexer method : [Pr. PT28] setting	U32	rw	Possible	Encoder resolution (pulse)	00000001h to FFFFFFFFh	pos units		
	2	Shaft revolutions No value can be written as it is automatically set with [Pr. PT01]. If a value is written, this setting is disabled.	U32	rw	Possible	1	00000001h to 00000001h	rev	○	PT01
6098	0	Homing method Set a home position return type.	I8	rw	Possible	37	D5h (-43) to 27h (39)		○	PT45
6099	0	Homing speeds The number of entries is returned.	U8	ro	Impossible	2	02h (fixed)			
	1	Speed during search for switch Set the servo motor speed at home position return.	U32	rw	Possible	10000	0 to instantaneous permissible speed	0.01 r/min	○	PT05
	2	Speed during search for zero Set a creep speed after proximity dog at home position return.	U32	rw	Possible	1000	0 to instantaneous permissible speed	0.01 r/min	○	PT06

Index	Sub Index	Name and function	Data Type	Access	Variable mapping	Default	Range	Units	EEP-ROM	Parameter
609A	0	Homing acceleration Set the acceleration/deceleration time constants at home position return. Set a time for the servo motor to reach the rated speed.	U32	rw	Possible	0	00000000h to 00004E20h (20000)	ms	○	PT61, PT62
60A8	0	SI unit position SI unit position (60A8h) is set automatically with [Pr. PT01]. The following shows the data structure. [Bit 0 to Bit 7: Reserved] [Bit 8 to Bit 15: Denominator] "00" means "Dimensionless". [Bit 16 to Bit 23: Numerator] "41" means "degree", and "00" means "Dimensionless". [Bit 24 to Bit 31: Prefix] "FD" means "milli", and "00" means "none".	U32	rw	Impossible	FD410000h (degree) 00000000h (pulse)	00000000h to FFFFFFFFh			
60A9	0	SI unit velocity The SI unit velocity is returned. FEB44700h: 0.01 r/min	U32	rw	Impossible	FEB44700h	FEB44700h			
60B8	0	Touch probe function Set the command for the touch probe function.	U16	rw	Possible	0	0000h to FFFFh			
60B9	0	Touch probe status The status of the touch probe function is returned.	U16	ro	Possible	0	0000h to FFFFh			
60BA	0	Touch probe pos1 pos value The position latched at the rising edge of touch probe 1 is returned.	I32	ro	Possible	0	80000000h to 7FFFFFFFh	pos units		
60BB	0	Touch probe pos1 neg value The position latched at the falling edge of touch probe 1 is returned.	I32	ro	Possible	0	80000000h to 7FFFFFFFh	pos units		
60BC	0	Touch probe pos2 pos value The position latched at the rising edge of touch probe 2 is returned.	I32	ro	Possible	0	80000000h to 7FFFFFFFh	pos units		
60BD	0	Touch probe pos2 neg value The position latched at the falling edge of touch probe 2 is returned.	I32	ro	Possible	0	80000000h to 7FFFFFFFh	pos units		
60E0	0	Positive torque limit value The forward rotation torque limit can be read. The forward rotation torque limit can also be set. Set a forward torque limit value in units of 0.1%.	U16	rw	Possible	10000	0000h to 2710h (10000)	0.1%	○	PA11/ (PA12)
60E1	0	Negative torque limit value The reverse rotation torque limit can be read. The reverse rotation torque limit can also be set. Set a reverse torque limit value in units of 0.1%.	U16	rw	Possible	10000	0000h to 2710h (10000)	0.1%	○	PA12/ (PA11)
60E3	0	Supported homing method The number of supported homing methods is returned.	U8	ro	Impossible	38	00h to FFh			
	1 to 38	1st supported homing method Set the number of the supported home position return type.	I8	ro	Impossible	37	80h to 7Fh			
60F4	0	Following error actual value The position deviation is returned. In the point table method, the unit is [um], 10^{-4} [inch], or [pulse], depending on the setting of [Pr. PT01]. In the indexer method, command unit is used as the input unit.	I32	ro	Possible		80000000h to 7FFFFFFFh	pos units		
60FA	0	Control effort The speed command is returned.	I32	ro	Possible	0	80000000h to 7FFFFFFFh	0.01 r/min		
60FF	0	Target velocity Set the speed command used in the profile velocity mode (pv).	I32	rw	Possible	0	80000000h to 7FFFFFFFh	0.01 r/min		

10.2 Detail object dictionary (in the 1000s)

POINT
●This section describes the objects in the 1000s. Refer to section 10.1 for details on the objects not listed here.

10.2.1 Store Parameters (1010h)

POINT
●Before shutting off the power after executing Store Parameters, always check that parameters are not being saved (bit 0 is on).

For the objects that can be saved, write "65766173h" (= reverse order of the ASCII code of "save") to the corresponding sub object of Store parameters (1010h) to save the object in the EEP-ROM of the servo amplifier.
The value saved in the EEP-ROM is set to the object at the next power-on. Servo parameters can also be modified through the object dictionary. However, the new setting is not automatically written to the EEP-ROM. To write the new setting, use Store parameters (1010h).
Executing Store parameters (1010h) takes about a maximum of 10 s because all parameters are written at the same time. Do not shut off the power during writing.

Index	Sub Index	Name		Data Type	Access
1010h	0	Store parameters	Number of entries	I8	ro
	1		Save all parameters	U32	rw
	2		For manufacturer setting		
	3				
	4				
	5				

Parameter setting values can be saved in EEP-ROM.

(1) Usage

This object can read the availability of each Sub Index. The following table shows the returned values of each item.

Sub Index	Item	Saved parameter	Returned value
0	Number of entries		04h
1	Save all parameters	Index: 2001h to 27FFh	00000001h (available)
2	For manufacturer setting		
3			
4			
5			

Select the items to be saved in EEP-ROM using this object. At this time, set "00h" or "04h" for Number of entries.

To save servo amplifier parameters in EEP-ROM, set the required items as shown in the following table. When bit 1 (EEP-ROM write completed) of Status DO1 (2D11h) is "1", saving data in EEP-ROM has been completed.

Writing a value other than "65766173h" or "00000000h" to each item results in an error.

Sub Index	Item	Setting value	Write to EEP-ROM Parameter
0	Number of entries	04h	
1	Save all parameters	00000000h	Disabled
		65766173h ("save")	Enabled
		Other than above	Error
2	For manufacturer setting		
3			
4			
5			

10.2.2 Restore default parameters (1011h)

Index	Sub Index	Name		Data Type	Access
1011h	0	Restore default parameters	Number of entries	U8	ro
	1		Restore all default parameters	U32	rw
	2		For manufacturer setting		
	3				
	4				
	5				

The servo amplifier parameters can be rewritten to the factory setting.

To initialize the parameters, write "64616F6Ch" (= reverse order of ASCII code of "load") to Restore all default parameters (1011h: 1), and then cycle the power.

10.3 Detail object dictionary (in the 2000s)

POINT
●This section describes the objects in the 2000s. Refer to section 10.1 for details on the objects not listed here.

10.3.1 Point table (2801h to 28FFh)

Index	Sub Index	Name		Data Type	Access
2801h to 28FFh	0	Point Table No. 1 to No. 255	Number of entries	U8	rw
	1		Point data	I32	rw
	2		Speed	U32	rw
	3		Acceleration	U16	rw
	4		Deceleration	U16	rw
	5		Dwell	U16	rw
	6		Auxiliary	U8	rw

Point table data can be read and written.
The settable values in Point data vary depending on the setting of [Pr. PT01].

Setting of [Pr. PT01 (_ x _ _)]	Range
0 (mm)	FFF0BDC1h to 000F423Fh (-999999 to 999999)
1 (inch)	FFF0BDC1h to 000F423Fh (-999999 to 999999)
3 (pulse)	FFF0BDC1h to 000F423Fh (-999999 to 999999)

When "1"or "3" is set in Auxiliary (bit 6) of the point table No. 255 (28FFh), bit 6 in the Point table error factor (2A43h) turns on and an error occurs. The following shows the description of the values to be set in Auxiliary.

Setting value	Point table command method	Description
0	Absolute value command method	Automatic operation for a selected point table is performed.
1		Automatic operation for the next point table is performed.
8		Automatic operation for a point table selected at start-up is performed.
9		Automatic operation for point table No. 1 is performed.
2	Incremental value command method	Automatic operation for a selected point table is performed.
3		Automatic operation for the next point table is performed.
10		Automatic operation for a point table selected at start-up is performed.
11		Automatic operation for point table No. 1 is performed.

10.3.2 Point table error (2A43h)

Index	Sub Index	Name		Data Type	Access
2A43h	0	Point table error	Number of entries	U8	ro
	1		Point Table Error No	U16	ro
	2		Point Table Error Factor	U32	ro

When a point table error [AL. 37] has occurred, the detail of the point table where the point table error has occurred can be read.

Bit	Description
0	0: No error 1: Target position error
1	reserved
2	0: No error 1: Speed error
3	0: No error 1: Acceleration time constant error
4	0: No error 1: Deceleration time constant error
5	0: No error 1: Dwell error
6	0: No error 1: Auxiliary function error
7 to 31	reserved

10.3.3 Control DI (2D01h to 2D0Ah)

Index	Sub Index	Name	Data Type	Access
2D01h to 2D0Ah	0	Control DI1 to Control DI10	U16	rw

The on/off status of input device can be read.
The on/off status of input device can also be set.

The following table lists readable and writable input devices.

Bit definition of control DI1

Bit	Symbol	Description
0		The value at reading is undefined. Set "0" when writing.
1		
2		
3		
4	C_CDP	Gain switching Turning C_CDP on switches the values of [Pr. PB29] to [Pr. PB36] and [Pr. PB56] to [Pr. PB60] as the load to motor inertia ratio and gain values.
5	C_CLD	Fully closed loop control switching Use this bit when the semi closed loop control/fully closed loop control switching is enabled with [Pr. PE01]. Turn off C_CLD to select the semi closed loop control, and turn on C_CLD to select the fully closed loop control.
6		The value at reading is undefined. Set "0" when writing.
7		
8		
9		
10		
11		
12		
13		
14		
15		

Bit definition of control DI2

Bit	Symbol	Description
0		The value at reading is undefined. Set "0" when writing.
1		
2		
3		
4		
5	C_CAMC	Cam control command Turn CAMC on to switch the control from the normal positioning control to the cam control.
6		The value at reading is undefined. Set "0" when writing.
7		
8	C_PC	Proportional control Turn C_PC on to switch the speed amplifier from the proportional integral type to the proportional type. If the servo motor at a stop is rotated even for a pulse due to any external factor, it generates torque to compensate for a position mismatch. When the servo motor shaft is to be locked mechanically after positioning completion (stop), switching on the C_PC upon positioning completion will suppress the unnecessary torque generated to compensate for a position mismatch. When the shaft is to be locked for a long time, use the C_PC and torque limit at the same time to make the torque less than the rated torque.
9		The value at reading is undefined. Set "0" when writing.
10		
11	C_CLTC	Clutch command This is used to turning on/off the main shaft clutch command. This is used when [Cam control data No. 36 - Main shaft clutch control setting] is set to "_ _ _ 1".
12		The value at reading is undefined. Set "0" when writing.
13	C_CPCD	Cam position compensation request Turn C_CPCD on to compensate the cam axis current value per cycle to be in the position set in [Cam control data No. 60 - Cam position compensation target position].
14		The value at reading is undefined. Set "0" when writing.
15	C_ORST	Operation alarm reset Turn C_ORST on from off to reset [AL. F4 Positioning warning].

Bit definition of control DI3

Bit	Symbol	Description
0		The value at reading is undefined. Set "0" when writing.
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

Bit definition of control DI4

Bit	Symbol	Description
0		The value at reading is undefined. Set "0" when writing.
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

Bit definition of control DI5

Bit	Symbol	Description
0		The value at reading is undefined. Set "0" when writing.
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11	C_DOG	Proximity dog input
12		The value at reading is undefined. Set "0" when writing.
13		
14		
15		

Bit definition of control DI6

Bit	Symbol	Description
0		The value at reading is undefined. Set "0" when writing.
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

Bit definition of control DI7

Bit	Symbol	Description
0		The value at reading is undefined. Set "0" when writing.
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

Bit definition of control DI8

Bit	Symbol	Description
0		The value at reading is undefined. Set "0" when writing.
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

Bit definition of control DI9

Bit	Symbol	Description
0		The value at reading is undefined. Set "0" when writing.
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

Bit definition of control DI10

Bit	Symbol	Description
0		The value at reading is undefined. Set "0" when writing.
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

10.3.4 Status DO (2D11h to 2D1Ah)

Index	Sub Index	Name	Data Type	Access
2D11h to 2D1Ah	0	Status DO1 to Status DO10	U16	ro

The on/off status of output device can be read. The following table lists readable output devices.

Bit definition of status DO1

Bit	Symbol	Description
0		The value at reading is undefined.
1	S_ERF	EEP-ROM write completed 0: EEP-ROM write in process 1: EEP-ROM write completed
2	S_SA	Speed reached SA turns off during servo-off. When the servo motor speed reaches the following range, S_SA turns on. Set speed ± ((Set speed × 0.05) + 20) r/min When the preset speed is 20 r/min or less, SA always turns on.
3	S_MBR	Electromagnetic brake interlock When a servo-off status or alarm occurs, S_MBR turns off.
4	S_CDPS	Variable gain selection S_CDPS turns on during variable gain.
5	S_CLD	During fully closed loop control switching S_CLD turns on during fully closed loop control.
6		The value at reading is undefined.
7		
8		
9		
10		
11		
12	S_INP	In-position When the number of droop pulses is in the in-position range, S_INP turns on. The in-position range can be changed with [Pr. PA10]. When the in-position range is increased, INP may be always on during low-speed rotation.
13	S_TLC	Limiting torque When the torque reaches the torque limit value during torque generation, S_TLC turns on. When the servo is off, this turns off.
14	S_ABSV	Absolute position undetermined S_ABSV turns on when the absolute position is undetermined.
15	S_BWNG	Battery warning When [AL. 92 Battery cable disconnection warning] or [AL. 9F Battery warning] has occurred, S_BWNG turns on. When the battery warning is not occurring, S_BWNG will turn off in 2.5 s to 3.5 s after power-on.

Bit definition of status DO2

Bit	Symbol	Description
0	S_ZPASS	Z-phase already passed 0: Z-phase unpassed after start-up 1: Z-phase passed once or more after start-up
1		The value at reading is undefined.
2		
3	S_ZSP	Zero speed detection S_ZSP turns on when the servo motor speed is zero speed or less. Zero speed can be changed with [Pr. PC07].
4	S_VLC	Limiting speed When the speed reaches the speed limit value in the torque mode, S_VLC turns on. When the servo is off, this turns off. The Status DO cannot be used in the position mode or velocity mode.
5	S_CAMS	Under cam control It turns on when the control switches to the cam control. It turns off when the control switches to the normal positioning control.
6		The value at reading is undefined.
7		
8	S_PC	Under proportional control S_PC turns on under proportional control.
9		The value at reading is undefined.
10	S_DB	External dynamic brake output When the dynamic brake needs to operate, S_DB turns off.
11	S_CLTS	Clutch on/off status It turns on with clutch-on. It is always off when [Cam control data No. 36 - Main shaft clutch control setting] is set to "_ _ _ 0".
12	S_CLTSM	Clutch smoothing status The output depends on the setting in [Cam control data No. 42 - Main shaft clutch smoothing system] as follows: 0: Direct Always off 1: Time constant system (Exponent) Always on in clutch-on status It turns off when the clutch is off and the smoothing is completed.
13	S_CPCC	Cam position compensation execution completed It outputs clutch smoothing status. The output depends on the setting in [Cam control data No. 42 - Main shaft clutch smoothing system] as follows: 0: Direct Always off 1: Time constant system (Exponent) Always on in clutch-on status It turns off when the clutch is off and the smoothing is completed.
14		The value at reading is undefined.
15	S_ZP2	Home position return completion 2 When a home position return completes normally, this turns on. This is always on unless the home position is erased. In the incremental system, it turns off with one of the following conditions. 1) [AL. 69 Command error] occurs. 2) Home position return is not being executed. 3) Home position return is in progress. If a home position return completes once in the absolute position detection system, this is always on. However, it will be off with one of the conditions 1) to 3) or the following conditions 4) to 8). 4) The home position return is not performed after [AL. 25 Absolute position erased] and [AL. E3 Absolute position counter warning] occurred. 5) The home position return is not performed after the electronic gear ([Pr. PA06] and [Pr. PA07]) was changed. 6) The home position return is not performed after the setting of [Pr. PA03 Absolute position detection system selection] was changed from "Disabled" to "Enabled". 7) [Pr. PA14 Rotation direction selection/travel direction selection] was changed. 8) [Pr. PA01 Operation mode] was changed.

Bit definition of status DO3

Bit	Symbol	Description
0		The value at reading is undefined.
1		
2		
3		
4		
5	S_STO	During STO S_STO turns on during STO.
6		The value at reading is undefined.
7		
8		
9		
10		
11	S_MTTR	During tough drive
12		The value at reading is undefined.
13		
14		
15		

Bit definition of status DO4

Bit	Symbol	Description
0		The value at reading is undefined.
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

Bit definition of status DO5

Bit	Symbol	Description
0		The value at reading is undefined.
1		
2		
3		
4		
5	S_CPO	Rough match When a command remaining distance is lower than the rough match output range set with [Pr. PT12], S_CPO turns on.
6	S_MEND	Travel completion When the droop pulses are within the in-position output range set with [Pr. PA10] and the command remaining distance is "0", S_MEND turns on. S_MEND turns on with servo-on. S_MEND is off at servo-off status. However, S_MEND does not turn off in the indexer method even at servo-off status.
7		The value at reading is undefined.
8		
9		
10		
11		
12		
13		
14		
15		

Bit definition of status DO6

Bit	Symbol	Description
0		The value at reading is undefined.
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

Bit definition of status DO7

Bit	Symbol	Description
0		The value at reading is undefined.
1		
2	S_POT	Position range When an actual current position is within the range set with [Pr. PT19] to [Pr. PT22], S_POT turns on. This will be off when a home position return is not completed or base circuit shut-off is in progress.
3		The value at reading is undefined.
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

Bit definition of status DO8

Bit	Symbol	Description
0		The value at reading is undefined.
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

Bit definition of status DO9

Bit	Symbol	Description
0		The value at reading is undefined.
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

Bit definition of status DO10

Bit	Symbol	Description
0		The value at reading is undefined.
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

10.3.5 Target Point Table (2D60h)

Index	Sub Index	Name	Data Type	Access
2D60h	0	Target Point Table	I16	rw

Point table specification No. can be read and written.
In the point table mode (pt), specify the point table No. to execute. In the indexer mode (idx), set the next station No. to execute. The settable values vary depending on the control mode.

Control mode	Setting value
Point table mode (pt)	0: Not operate 1 to 255: Execute the specified point table -1: High-speed home position return
Indexer mode (idx)	0 to 254: Positioning operation to specified stations

10.3.6 Point Demand Value (2D68h)

Index	Sub Index	Name	Data Type	Access
2D68h	0	Point Demand Value	I16	ro

The currently specified point table error No. can be read. The returned values vary depending on the control mode.

[Pr. PA01]	Control mode	Setting value
_ _ _ 0	Point table mode (pt)	The currently specified point table No. is returned. While the servo motor is stopped, the value becomes the set value of the Target point Table (2D60h).
	Jog mode (jg)	0 is returned.
_ _ _ 8	Indexer mode (idx)	The currently specified next station No. is returned. While the servo motor is stopped, the value becomes the set value of the Target point Table (2D60h).
	Jog mode (jg)	The next station No. is returned.

10.3.7 Point Actual Value (2D69h)

Index	Sub Index	Name	Data Type	Access
2D69h	0	Point Actual Value	I16	ro

The completed point table is returned. The returned values vary depending on the control mode.

Control mode	Setting value
Point table mode (pt)	The completed point table is returned. After homing completed, "0" is set.
Indexer mode (idx)	The completed station No. is returned. The previous value is held until completion.

10.3.8 Target speed No. (2DD1h)

Index	Sub Index	Name	Data Type	Access
2DD1h	0	Target speed No.	I16	rw

The command speed, acceleration time constant, and deceleration time constant of the next station to execute in the indexer mode (idx) is specified with the point table No.
When Profile velocity (6081h), Profile acceleration (6083h), and Profile deceleration (6084h) are all set to values other than 0, the setting value of 2DD1h is disabled.

10.4 Detail object dictionary (in the 6000s)

POINT
●This section describes the objects in the 6000s. Refer to section 10.1 for details on the objects not listed here.

10.4.1 Quick stop option code (605Ah)

Index	Sub Index	Name	Data Type	Access
605Ah	0	Quick stop option code	I16	rw

The operation method of deceleration to a stop can be specified. The following table shows the supported methods and the operations.

Setting value	Description
1	For manufacturer setting
2	In the homing mode (hm), point table mode (pt), Jog mode (jg), and indexer mode (idx), the servo motor decelerates to a stop with Quick stop deceleration (6085h), and the state shifts to the Switch On Disabled.
3 to 8	For manufacturer setting

10.4.2 Halt option code (605Dh)

When Halt Bit (Bit 8 of Controlword) is set to 1, the servo motor decelerates to a stop with the deceleration time constant of Homing acceleration (609Ah), Profile deceleration (6084h), or the point table according to the setting of Halt option code (605Dh). This function can be used in the homing mode (hm) and point table method (pt/jg). Operation in other modes can be performed regardless of the Halt Bit status. When Halt Bit is set to 0 at deceleration stop operation, the servo motor decelerates to a stop and returns to the operable state.

(1) Object list

Index	Sub Index	Name	Data Type	Access
605Dh	0	Halt option code	I16	rw

The following table shows descriptions of Halt option code (605Dh).

Setting value	Description
1	jg: The servo motor decelerates to a stop with Profile deceleration (6084h), and the state does not change from Operation Enabled (servo-on). hm: The servo motor decelerates to a stop with Homing acceleration (609Ah), and the state does not change from Operation Enabled (servo-on). pt: The servo motor decelerates to a stop with the deceleration time constant set in the point tables, and the state does not change from Operation Enabled (servo-on).
2 to 4	For manufacturer setting

10.4.3 Control mode display (6061h)

Index	Sub Index	Name	Data Type	Access
6061h	0	Modes of operation Display	I8	ro

The current control mode can be read.
The setting value of each control mode is as follows.

Control mode	Setting value
Homing mode	6
Jog mode	-100
Point table mode	-101
Indexer mode	-103

10.4.4 Software Position Limit (607Dh)

Index	Sub Index	Name		Data Type	Access
607Dh	0	Software Position Limit	Number of entries	U8	ro
	1		Min Position Limit	I32	rw
	2		Max Position Limit	I32	

The current software limit setting can be read.
At this time, "02h" is returned to Number of entries.
The stroke limit value in the reverse direction is returned to Min Position Limit in units of commands.
The stroke limit value in the forward direction is returned to Max Position Limit in units of commands.
The current software limit setting can also be written.
At this time, set "02h" for Number of entries.
Set the stroke limit value in the reverse direction in Min Position Limit in units of commands.
Set the stroke limit value in the forward direction in Max Position Limit in units of commands.
Setting the same value in Min Position Limit and Max Position Limit disables the software limit.

10.4.5 Polarity (607Eh)

Index	Sub Index	Name	Data Type	Access
607Eh	0	Polarity	U8	rw

The rotation direction selection can be set.
The rotation direction of a servo motor to position commands, speed commands, and torque commands can be set. To set the rotation direction to position commands and speed commands, turn on or off both bits 6 and 7 of Polarity (607Eh) or use [Pr. PA14]. To set the rotation direction to torque commands, turn on or off all of bits 5 to 7 of Polarity (607Eh), or use [Pr. PA14] and "POL reflection selection at torque mode" of [Pr. PC29]. The following table shows the descriptions of Polarity (607Eh).

Bit	Description
0	Reserved The value at reading is undefined. Set "0" when writing.
1	
2	
3	
4	
5	Torque POL The polarity is reversed when this bit is turned on. Select a rotation direction by setting bits 5 to 7 in combination.
6	Velocity POL The polarity is reversed when this bit is turned on. Select a rotation direction by setting bits 5 to 7 in combination.
7	Position POL The polarity is reversed when this bit is turned on. Select a rotation direction by setting bits 5 to 7 in combination.

10.4.6 Feed constant (6092h)

Index	Sub Index	Name		Data Type	Access
2A43h	0	Feed constant	Feed constant	U8	ro
	1		Feed	U32	rw
	2		Shaft revolutions	U32	rw

No value can be written because Feed (6092h: 1) and Shaft revolutions (6092h: 2) are set automatically with the control mode, [Pr. PT01] and [Pr. PT03]. Writing a value will trigger the error code "CCD4h".

Control mode	[Pr. PT01] setting	[Pr. PT03] setting	Range	
			Feed	Shaft revolutions
Point table method	_ 0 _ _ (mm) _ 1 _ _ (inch)	_ _ _ 0	Encoder resolution of the servo motor	1
		_ _ _ 1		10
		_ _ _ 2		100
		_ _ _ 3		1000
	_ 3 _ _ (pulse)	_ _ _ 0 to _ _ _ 3		1
Indexer method		_ _ _ 0 to _ _ _ 3	[Pr. PT28] setting value	1

Position actual value (6064h) is calculated from Gear ratio (6091h) and Feed constant (6092h) as follows.

$$\text{Position actual value (6064h)} = \frac{\text{Position actual internal value (6063h)} \times \text{Feed constant (6092h)}}{\text{Position encoder resolution (608Fh)} \times \text{Gear ratio (6091h)}}$$

10.4.7 SI unit position (60A8h)

Index	Sub Index	Name	Data Type	Access
60A8h	0	SI unit position	U32	rw

SI unit position (60A8h) is set automatically with the control mode, [Pr. PT01] and [Pr. PT03].

Control mode	[Pr. PT01] setting	[Pr. PT03] setting	Range
Point table method	_ 0 _ _ (mm)	_ _ _ 0 (× 1)	FA010000h (0.001 mm)
		_ _ _ 1 (× 10)	FB010000h (0.01 mm)
		_ _ _ 2 (× 100)	FC010000h (0.1 mm)
		_ _ _ 3 (× 1000)	FD010000h (1 mm)
	_ 1 _ _ (inch)	_ _ _ 0 (× 1)	FCC00000h (0.0001 inch)
		_ _ _ 1 (× 10)	FDC00000h (0.001 inch)
		_ _ _ 2 (× 100)	FEC00000h (0.01 inch)
		_ _ _ 3 (× 1000)	FFC00000h (0.1 inch)
	_ 3 _ _ (pulse)	_ _ _ 0 to _ _ _ 3	00000000h (1 pulse)
Indexer method		_ _ _ 0 to _ _ _ 3	00000000h (no unit)

10.4.8 Touch probe (60B8h to 60BBh)

POINT
●The touch probe function cannot be used in the indexer method.

The current position latch data at the time of TPR1 (Touch probe 1) and TPR2 (Touch probe 2) input can be read.

(1) Object list

Index	Sub Index	Name	Data Type	Access
60B8h	0	Touch probe function	U16	rw
60B9h	0	Touch probe status	U16	ro
60BAh	0	Touch probe pos1 pos value	I32	ro
60BBh	0	Touch probe pos1 neg value	I32	ro
60BCh	0	Touch probe pos2 pos value	I32	ro
60BDh	0	Touch probe pos2 neg value	I32	ro

When the touch probe function (60B8h) is set, and TPR1 (Touch probe 1) and TRP2 (Touch probe 2), external signals, are turned on/off, the current position of the rising and falling edges are latched. The latch status of the current position data can be checked with Touch probe status (60B9h). The latched current data can be read with Touch probe pos1 pos value (60BAh) and Touch probe pos1 neg value (60BBh). The following shows the touch probe detection resolution. Enabling the high precision touch probe disables the encoder output pulses. For details of each object, refer to sections 10.4.9 to 10.4.14.

		Touch probe1	Touch probe2
Input terminal		TPR1	TPR2
Encoder resolution	[Pr. PD37] = _ _ _ 0 (Selection of high-precision touch probe is disabled)	55 μs	55 μs
	[Pr. PD37] = _ _ _ 1 (Selection of high-precision touch probe is enabled)	55 μs	Rising edge: 2 μs Falling edge: 55 μs

(2) Usage

The following explains for latching the current position at the rising edge of TPR1 (Touch probe 1).

(a) Set "0013h" in Touch probe function (60B8h) to store data at rising edge of TPR1 (Touch probe 1).

(b) At this time, Touch probe status (60B9h) is set to "0001h", and the latched data has not been stored yet.

(c) Use an external signal to turn on TPR1 (Touch probe 1).

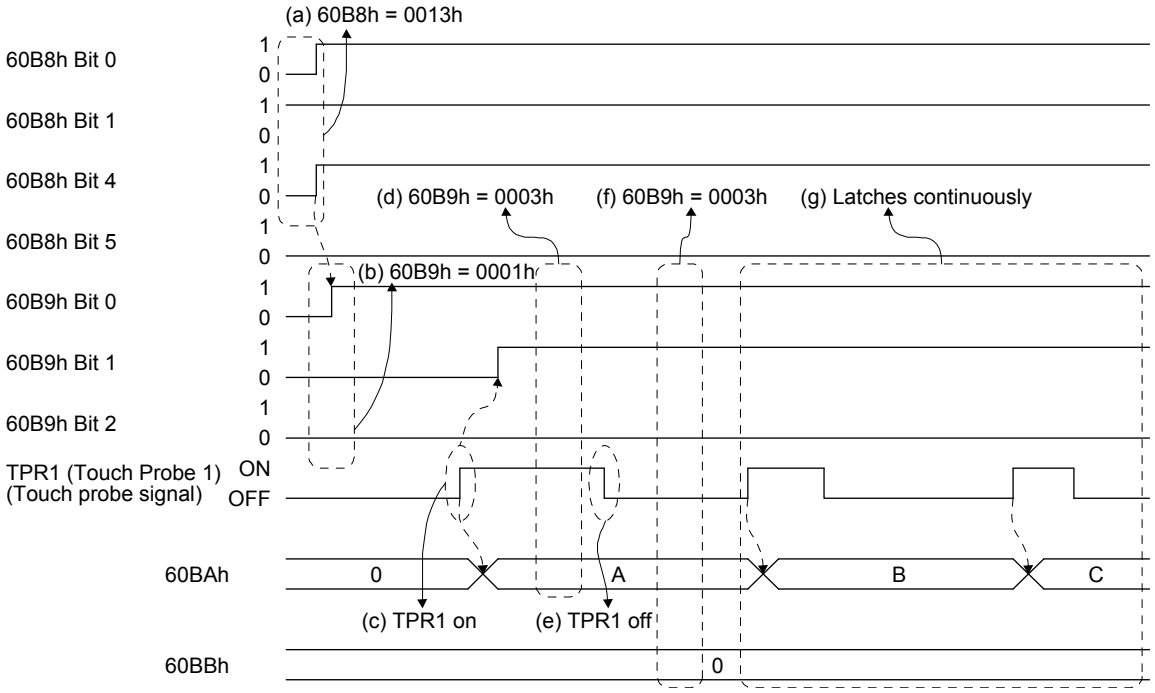
(d) Touch probe status (60B9h) changes to "0003h", and the current position at the time of TPR1 (Touch probe 1) on will be stored to Touch probe position positive value (60BAh).

(e) Use an external signal to turn off TPR1 (Touch probe 1).

(f) Touch probe status (60B9h) remains "0003h", and the current position at the time of TPR1 (Touch probe 1) off will not be stored to Touch probe position negative value (60BBh).

(g) Latching can be continued from (c).

The following shows a timing chart.



(3) High-precision touch probe

TPR2 (touch probe 2) supports high-precision touch probe. The normal touch probe has the latch function with precision of 55 µs. On the other hand, the high-precision touch probe latches startup of TPR2 (touch probe 2) precisely with precision of 2 µs. To use the high-precision touch probe, set [Pr. PD37] to "_ _ _ 1". While the high-precision touch probe is being used, the encoder pulse output function cannot be used. The precision of falling edge is 55 µs in this case as well.

10.4.9 Touch probe function (60B8h)

Index	Sub Index	Name	Data Type	Access
60B8h	0	Touch probe function	U16	rw

The current setting of the touch probe function can be checked.
Each setting of the touch probe function can also be set. The settings of this object are as follows.

Bit	Description
0	0: Touch probe 1 disabled 1: Touch probe 1 enabled
1	0: Latch with the first trigger (single trigger mode) 1: Latch continuously with trigger inputs (continuous trigger mode)
2	0: Set input of touch probe 1 as a trigger 1: Set 0 point of the encoder as a trigger (not compatible) (Note)
3	The value at reading is undefined. Set "0" when writing.
4	0: Stop sampling at the rising edge of touch probe 1 1: Start sampling at the rising edge of touch probe 1 When the input of touch probe 1 is set as a trigger (Bit 2 = 0), the position feedback latched at rising edge of touch probe 1 is stored in Touch probe pos1 pos value (60BAh).
5	0: Stop sampling at the falling edge of touch probe 1 1: Start sampling at the falling edge of touch probe 1 When the input of touch probe 1 is set as a trigger (Bit 2 = 0), the position feedback latched at falling edge of touch probe 1 is stored in Touch probe pos1 neg value (60BBh).
6	The value at reading is undefined. Set "0" when writing.
7	
8	0: Touch probe 2 disabled 1: Touch probe 2 enabled
9	0: Latch with the first trigger (single trigger mode) 1: Latch continuously with trigger inputs (continuous trigger mode)
10	0: Set input of touch probe 2 as a trigger 1: Set 0 point of the encoder as a trigger (not compatible) (Note)
11	The value at reading is undefined. Set "0" when writing.
12	0: Stop sampling at the rising edge of touch probe 2 1: Start sampling at the rising edge of touch probe 2 When the input of touch probe 2 is set as a trigger (Bit 10 = 0), the position feedback latched at rising edge of touch probe 2 is stored in Touch probe pos2 pos value (60BCh).
13	0: Stop sampling at the falling edge of touch probe 2 1: Start sampling at the falling edge of touch probe 2 When the input of touch probe 2 is set as a trigger (Bit 10 = 0), the position feedback latched at falling edge of touch probe 2 is stored in Touch probe pos2 neg value (60BDh).
14	The value at reading is undefined. Set "0" when writing.
15	

Note. This is not available with MR-J4-_GF_ servo amplifier.

The following explains TPR1 (Touch probe 1). For TPR2 (Touch probe 2), replace each bit with bit 8 and later.
Select enable/disable for the latch function with bit 0. Select "1" when using the touch probe function.
Select a trigger condition for the touch probe function with bit 1. Set "0" to latch just once when TPR1 (Touch probe 1) is inputted. Set "1" to latch every time TPR1 (Touch probe 1) is inputted.
Set a condition for the rising edge of TPR1 (Touch probe 1) with bit 4. Set "1" to latch at the rising edge.
Set a condition for the falling edge of TPR1 (Touch probe 1) with bit 5. Set "1" to latch at the falling edge.

10.4.10 Touch probe status (60B9h)

Index	Sub Index	Name	Data Type	Access
60B9h	0	Touch probe status	U16	ro

The current status of the touch probe function can be checked. The description of this object is as follows.

Bit	Description
0	0: Touch probe 1 disabled 1: Touch probe 1 enabled
1	0: The rising edge position of touch probe 1 has not been stored. 1: The rising edge position of touch probe 1 has been stored. When the position feedback is stored in Touch probe pos1 pos value (60BAh), this bit becomes "1". When "0" is set in the bit 4 of Touch probe function (60B8h), this bit becomes "0".
2	0: The falling edge position of touch probe 1 has not been stored. 1: The falling edge position of touch probe 1 has been stored. When the position feedback is stored in Touch probe pos1 neg value (60BBh), this bit becomes "1". When "0" is set in the bit 5 of Touch probe function (60B8h), this bit becomes "0".
3 to 7	The value at reading is undefined.
8	0: Touch probe 2 disabled 1: Touch probe 2 enabled
9	0: The rising edge position of touch probe 2 has not been stored. 1: The rising edge position of touch probe 2 has been stored. When the position feedback is stored in Touch probe pos2 pos value (60BCh), this bit becomes "1". When "0" is set in the bit 12 of Touch probe function (60B8h), this bit becomes "0".
10	0: The falling edge position of touch probe 2 has not been stored. 1: The falling edge position of touch probe 2 has been stored. When the position feedback is stored in Touch probe pos2 neg value (60BDh), this bit becomes "1". When "0" is set in the bit 13 of Touch probe function (60B8h), this bit becomes "0".
11 to 15	The value at reading is undefined.

The following explains TPR1 (Touch probe 1). For TPR2 (Touch probe 2), replace each bit with bit 8 and later.
Bit 0 indicates the status of the touch probe function. 0 indicates disabled, and 1 enabled.
With bit 1, if the data is latched at the rising edge of the touch probe 1 can be checked. Latched data can be read when this bit is set to "1". When this bit once turns on, it remains on until bit 4 of Touch probe function (60B8h) is set to "0".
With bit 2, if the data is latched at the falling edge of the touch probe 1 can be checked. Latched data can be read when this bit is set to "1". When this bit once turns on, it remains on until bit 5 of Touch probe function (60B8h) is set to "0".

10.4.11 Touch probe pos1 pos value (60BAh)

Index	Sub Index	Name	Data Type	Access
60BAh	0	Touch probe pos1 pos value	I32	ro

The current rising edge position of touch probe can be checked.

10.4.12 Touch probe pos1 neg value (60BBh)

Index	Sub Index	Name	Data Type	Access
60BBh	0	Touch probe pos1 neg value	I32	ro

The current falling edge position of touch probe can be checked.

10.4.13 Touch probe pos2 pos value (60BCh)

Index	Sub Index	Name	Data Type	Access
60BAh	0	Touch probe pos2 pos value	I32	ro

The current rising edge position of touch probe 2 can be checked.

10.4.14 Touch probe pos2 neg value (60BDh)

Index	Sub Index	Name	Data Type	Access
60BBh	0	Touch probe pos2 neg value	I32	ro

The current falling edge position of touch probe 2 can be checked.

MEMO

REVISIONS

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

Revision Date	*Manual Number	Revision
Apr. 2018	SH(NA)030273ENG-A	First edition

MEMO

Warranty

1. Warranty period and coverage

We will repair any failure or defect hereinafter referred to as "failure" in our FA equipment hereinafter referred to as the "Product" arisen during warranty period at no charge due to causes for which we are responsible through the distributor from which you purchased the Product or our service provider. However, we will charge the actual cost of dispatching our engineer for an on-site repair work on request by customer in Japan or overseas countries. We are not responsible for any on-site readjustment and/or trial run that may be required after a defective unit are repaired or replaced.

[Term]

The term of warranty for Product is twelve (12) months after your purchase or delivery of the Product to a place designated by you or eighteen (18) months from the date of manufacture whichever comes first ("Warranty Period"). Warranty period for repaired Product cannot exceed beyond the original warranty period before any repair work.

[Limitations]

(1) You are requested to conduct an initial failure diagnosis by yourself, as a general rule.
It can also be carried out by us or our service company upon your request and the actual cost will be charged. However, it will not be charged if we are responsible for the cause of the failure.

(2) This limited warranty applies only when the condition, method, environment, etc. of use are in compliance with the terms and conditions and instructions that are set forth in the instruction manual and user manual for the Product and the caution label affixed to the Product.

(3) Even during the term of warranty, the repair cost will be charged on you in the following cases;
(i) a failure caused by your improper storing or handling, carelessness or negligence, etc., and a failure caused by your hardware or software problem
(ii) a failure caused by any alteration, etc. to the Product made on your side without our approval
(iii) a failure which may be regarded as avoidable, if your equipment in which the Product is incorporated is equipped with a safety device required by applicable laws and has any function or structure considered to be indispensable according to a common sense in the industry
(iv) a failure which may be regarded as avoidable if consumable parts designated in the instruction manual, etc. are duly maintained and replaced
(v) any replacement of consumable parts (battery, fan, smoothing capacitor, etc.)
(vi) a failure caused by external factors such as inevitable accidents, including without limitation fire and abnormal fluctuation of voltage, and acts of God, including without limitation earthquake, lightning and natural disasters
(vii) a failure generated by an unforeseeable cause with a scientific technology that was not available at the time of the shipment of the Product from our company
(viii) any other failures which we are not responsible for or which you acknowledge we are not responsible for

2. Term of warranty after the stop of production

(1) We may accept the repair at charge for another seven (7) years after the production of the product is discontinued. The announcement of the stop of production for each model can be seen in our Sales and Service, etc.

(2) Please note that the Product (including its spare parts) cannot be ordered after its stop of production.

3. Service in overseas countries

Our regional FA Center in overseas countries will accept the repair work of the Product. However, the terms and conditions of the repair work may differ depending on each FA Center. Please ask your local FA center for details.

4. Exclusion of loss in opportunity and secondary loss from warranty liability

Regardless of the gratis warranty term, Mitsubishi shall not be liable for compensation to:

(1) Damages caused by any cause found not to be the responsibility of Mitsubishi.

(2) Loss in opportunity, lost profits incurred to the user by Failures of Mitsubishi products.

(3) Special damages and secondary damages whether foreseeable or not, compensation for accidents, and compensation for damages to products other than Mitsubishi products.

(4) Replacement by the user, maintenance of on-site equipment, start-up test run and other tasks.

5. Change of Product specifications

Specifications listed in our catalogs, manuals or technical documents may be changed without notice.

6. Application and use of the Product

(1) For the use of our General-Purpose AC Servo, its applications should be those that may not result in a serious damage even if any failure or malfunction occurs in General-Purpose AC Servo, and a backup or fail-safe function should operate on an external system to General-Purpose AC Servo when any failure or malfunction occurs.

(2) Our General-Purpose AC Servo is designed and manufactured as a general purpose product for use at general industries.
Therefore, applications substantially influential on the public interest for such as atomic power plants and other power plants of electric power companies, and also which require a special quality assurance system, including applications for railway companies and government or public offices are not recommended, and we assume no responsibility for any failure caused by these applications when used
In addition, applications which may be substantially influential to human lives or properties for such as airlines, medical treatments, railway service, incineration and fuel systems, man-operated material handling equipment, entertainment machines, safety machines, etc. are not recommended, and we assume no responsibility for any failure caused by these applications when used.
We will review the acceptability of the abovementioned applications, if you agree not to require a specific quality for a specific application. Please contact us for consultation.

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MITSUBISHI ELECTRIC CORPORATION

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