MITSUBISHI ELECTRIC

General-Purpose AC Servo

MITSUBISHI SERVO AMPLIFIERS & MOTORS

MELSERVO-J4

Multi-network Interface AC Servo

MODEL

MR-J4-_TM_

SERVO AMPLIFIER
INSTRUCTION MANUAL
(EtherNet/IP)

● 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, and 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, and 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 voltage specified in the Instruction Manual should be applied to each terminal. Otherwise, a burst, damage, etc. may occur.
- Connect cables to the correct terminals. Otherwise, a burst, damage, etc. may occur.

⚠ CAUTION

- ●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 power is on or for some time after power-off. Take safety measures, e.g. provide covers, to prevent accidental contact of hands and parts (cables, etc.) with them.

4. Additional instructions

The following instructions should also be fully noted. Incorrect handling may cause a fault, 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 when transporting 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.
- ●The equipment must be installed in the specified direction.
- ●Leave specified clearances between the servo amplifier and the cabinet walls 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 strike the servo amplifier and servo motor. Isolate them from all impact loads.
- ●When you keep or use the equipment, please fulfill the following environment.

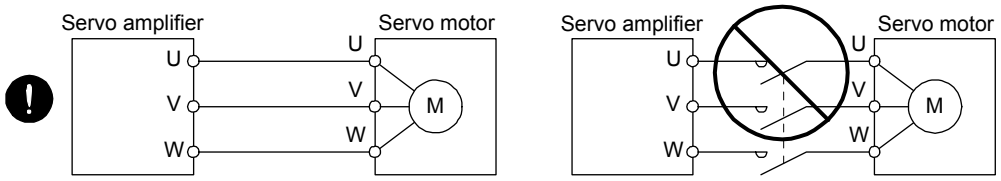
Items		Environment
Ambient temperature	Operation	0 °C to 55 °C (non-freezing)
	Storage	-20 °C to 65 °C (non-freezing)
Ambient humidity	Operation	90 %RH or less (non-condensing)
	Storage	
Ambience		Indoors (no direct sunlight), free from corrosive gas, flammable gas, oil mist, dust, and dirt
Altitude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

- ●When the equipment has been stored for an extended period of time, contact your local sales office.
- ●When handling the servo amplifier, be careful about the edged parts such as corners of the servo amplifier.
- ●The servo amplifier must be installed in the metal cabinet.
- ●When fumigants that contain halogen materials such as fluorine, chlorine, bromine, and iodine are used for disinfecting and protecting wooden packaging from insects, they cause malfunction when entering our products. Please take necessary precautions to ensure that remaining materials from fumigant do not enter our products, or treat packaging with methods other than fumigation (heat method).Additionally, disinfect and protect wood from insects before packing products.

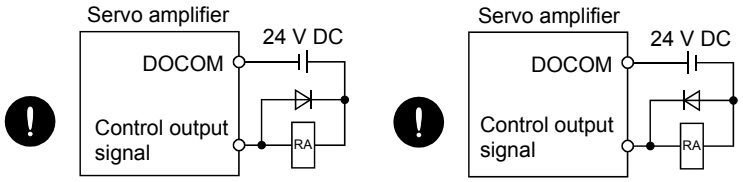
(2) Wiring

⚠ CAUTION

- Wire the equipment correctly and securely. Otherwise, the servo motor may operate unexpectedly.
- Do not install a power capacitor, surge killer, or radio noise filter (FR-BIF(-H) option) on the servo amplifier output side.
- To avoid a malfunction, connect the wires to the correct phase terminals (U, V, and W) of the servo amplifier and servo motor.
- Connect the servo amplifier power output (U, V, and W) to the servo motor power input (U, V, and W) directly. Do not let a magnetic contactor, etc. intervene. 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 emergency stop and other protective circuits may not operate.



- When the cable is not tightened enough to the terminal block, the cable or terminal block may generate heat because of the poor contact. Be sure to tighten the cable with specified torque.
- Connecting a servo motor for different axis to the U, V, W, or CN2 may cause a malfunction.
- Configure a circuit to turn off EM2 or EM1 when the main circuit power is turned off to prevent an unexpected restart of the servo amplifier.

(3) Test run and adjustment

⚠ CAUTION

- Before operation, check the parameter settings. Improper settings may cause some machines to perform unexpected operation.
- Never adjust or change the parameter values extremely as it will make operation unstable.
- Do not close to moving parts at servo-on status.

(4) Usage

⚠ CAUTION

- Provide an external emergency stop circuit to ensure that operation can be stopped and power switched off immediately.
- Do not disassemble, repair, or modify the equipment.

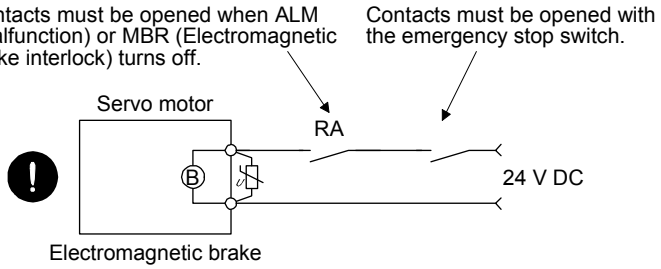
⚠ CAUTION

- 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 be given to the electronic equipment used near the servo amplifier.
- Burning or breaking a servo amplifier may cause a toxic gas. Do not burn or break it.
- Use the servo amplifier with the specified servo motor.
- 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 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.

(5) Corrective actions

⚠ CAUTION

- Ensure safety by confirming the power off, etc. before performing corrective actions. Otherwise, it may cause an accident.
- When it is assumed that a hazardous condition may occur due to a power failure or product malfunction, use a servo motor with an electromagnetic brake or external brake to prevent the condition.
- Configure an electromagnetic brake circuit so that it is activated also by an external emergency stop switch.



- When any alarm has occurred, eliminate its cause, ensure safety, and deactivate the alarm before restarting operation.
- Provide an adequate protection to prevent unexpected restart after an instantaneous power failure.

(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 a servo amplifier whose power has not been turned on for a long 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 Specifications and 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

STO function of the servo amplifier

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

Compliance with global standards

For the compliance with global standards, refer to app. 4 of "MR-J4-_TM_ Servo Amplifier Instruction Manual".

«About the manuals»

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-_TM_ SERVO AMPLIFIER INSTRUCTION MANUAL	SH(NA)030193
MELSERVO-J4 SERVO AMPLIFIER INSTRUCTION MANUAL (TROUBLESHOOTING)	SH(NA)030109
MELSERVO MR-D30 INSTRUCTION MANUAL (Note 5)	SH(NA)030132
MELSERVO Servo Motor Instruction Manual (Vol. 3) (Note 1)	SH(NA)030113
MELSERVO Linear Servo Motor Instruction Manual (Note 2)	SH(NA)030110
MELSERVO Direct Drive Motor Instruction Manual (Note 3)	SH(NA)030112
MELSERVO Linear Encoder Instruction Manual (Note 2, 4)	SH(NA)030111
EMC Installation Guidelines	IB(NA)67310

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.
5. It is necessary for using an MR-D30 functional safety unit.

«Wiring»

Wires mentioned in this Instruction Manual are selected based on the ambient temperature of 40 °C.

«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]

MEMO

CONTENTS

MEMO

1. EtherNet/IP COMMUNICATION

1.1 Summary

EtherNet/IP is the abbreviation of Ethernet Industrial Protocol. It is an industrial open network in which the TCP/IP protocol has been adopted and the CIP (Common Industrial Protocol) has been used in the application layer as the communication protocol. EtherNet/IP is controlled by ODVA (Open DeviceNet Vendor Association, Inc.).
The EtherNet/IP communication is available when the EtherNet/IP network module (ABCC-M40-EIP manufactured by HMS Industrial Networks) is connected to the MR-J4-_TM_ servo amplifier. The MR-J4-_TM_ servo amplifier to which the EtherNet/IP network module is connected is a Generic device type.

(1) Various control modes supported
The MR-J4-_TM_ servo amplifier supports the following control modes.

Control mode	Symbol	Description
Profile position mode	pp	This is a positioning control mode where an end position command is received to drive the servo motor in the commutation with a controller. Use an absolute position address or relative position address for a command.
Profile velocity mode	pv	This is a control mode where a target speed command is received to drive the servo motor in the communication with a controller.
Profile torque mode	tq	This is a control mode where a target torque command is received to drive the servo motor in the communication with a controller.
Homing mode	hm	This is a control mode where the servo amplifier performs a home position return using the method directed by the controller.

(2) Compliance with standards
MR-J4-_TM_ servo amplifiers comply with the following standards. Refer to the following standards for the description not written in this Instruction Manual.

Standards	Version
THE CIP NETWORKS LIBRARY Volume 1 Common Industrial Protocol (CIP™)	Edition 3.15
THE CIP NETWORKS LIBRARY Volume 2 EtherNet/IP Adaptation of CIP	Edition 1.16
CANopen Device Profile Drives and Motion Control	Version 2.0

1.2 Function list

The following table lists the functions available with the MR-J4-_TM_ servo amplifier to which the EtherNet/IP network module is connected. "MR-J4-_TM_" means "MR-J4-_TM_ Servo Amplifier Instruction Manual".

Function	Description	Reference
Profile position mode (pp)	The positioning operation performed by an asynchronous end position command through network is supported.	Section 5.4
Profile velocity mode (pv)	The speed control operation performed by an asynchronous speed command through network is supported.	
Profile torque mode (tq)	The torque control operation performed by an asynchronous torque command through network is supported.	
Homing mode (hm)	The home position return operation specified in each network is supported.	
High-resolution encoder	High-resolution encoder of 4194304 pulses/rev is used for the encoder of the rotary servo motor compatible with the MELSERVO-J4 series.	
Absolute position detection system	Setting a home position once makes home position return unnecessary at every power-on.	MR-J4-_TM_ Chapter 12
Gain switching function	You can switch gains during rotation/stop, and can use input devices to switch gains during operation.	MR-J4-_TM_ Section 7.2
Advanced vibration suppression control II	This function suppresses vibration at an arm end or residual vibration.	MR-J4-_TM_ Section 7.1.5
Adaptive filter II	The servo amplifier detects mechanical resonance and sets filter characteristics automatically to suppress mechanical vibration.	MR-J4-_TM_ Section 7.1.2
Low-pass filter	Suppresses high-frequency resonance which occurs as the servo system response is increased.	MR-J4-_TM_ Section 7.1.4
Machine analyzer function	This 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	For roll feed axis, etc. of which a response level cannot be increased because of the large load to motor inertia ratio, this function improves a disturbance response.	[Pr. PE41]
Slight vibration suppression control	This function suppresses vibration of ±1 pulse generated at a servo motor stop.	[Pr. PB24]
Electronic gear	Positioning control is performed with the value obtained by multiplying the position command from the controller by a set electronic gear ratio.	[Pr. PA06] [Pr. PA07]
S-pattern acceleration/deceleration time constant	Speed can be increased and decreased smoothly.	[Pr. PT51]
Auto tuning	Automatically adjusts the gain to optimum value if load applied to the servo motor shaft varies.	MR-J4-_TM_ Section 6.3
Brake unit	Use the brake unit when the regenerative option cannot provide sufficient regenerative capability. Can be used for the 5 kW or more servo amplifier.	MR-J4-_TM_ Section 11.3
Power regeneration converter	Use the power regeneration converter when the regenerative option cannot provide sufficient regenerative capacity. Can be used for the 5 kW or more servo amplifier.	MR-J4-_TM_ 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-_TM_ Section 11.2
Alarm history clear	This function clears alarm histories.	[Pr. PC21]
Torque limit	Limits the servo motor torque.	[Pr. PA11] [Pr. PA12]
Speed limit	The servo motor speed can be limited.	[Pr. PT67]
Status display	Shows servo status on the 3-digit, 7-segment LED display	MR-J4-_TM_ Section 4.3
Input signal selection (device settings)	The input devices including LSP (forward rotation stroke end) and LSN (reverse rotation stroke end) can be assigned to certain pins of the CN3 connector.	[Pr. PD03] to [Pr. PD05]
Output signal selection (device settings)	The output devices including ALM (Malfunction) can be assigned to specified pins of the CN3 connector.	[Pr. PD07] to [Pr. PD09]

Function	Description	Reference
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-_TM_ Section 4.5.1 (1) (d)
Test operation mode	Jog operation, positioning operation, motor-less operation, DO forced output, and program operation MR Configurator2 is necessary for this function.	MR-J4-_TM_ Section 4.5
Analog monitor output	This function 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-_TM_ Section 11.7
Linear servo system	Linear servo systems can be configured using a linear servo motor and linear encoder.	MR-J4-_TM_ Chapter 14
Direct drive servo system	Direct drive servo systems can be configured to drive a direct drive motor.	MR-J4-_TM_ Chapter 15
Fully closed loop system	Fully closed loop system can be configured using the load-side encoder.	MR-J4-_TM_ Chapter 16
Latch function (Touch probe)	This function latches the current position at the rising edge of the external latch input signal.	Section 5.5 MR-J4-_TM_ Section 3.5 [Pr. PD37]
One-touch tuning	Gain adjustment is performed just by one click a certain button on MR Configurator2. Also, one-touch tuning can be performed via a network.	Section 6.7 MR-J4-_TM_ Section 6.2
SEMI-F47 function	This function enables to avoid triggering [AL. 10 Undervoltage] using the electrical energy charged in the capacitor in case that an instantaneous power failure occurs during operation. Use a 3-phase for the input power supply of the servo amplifier. Using a 1-phase 100 V AC/200 V AC for the input power supply will not comply with SEMI-F47 standard.	MR-J4-_TM_ 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-_TM_ 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 on the drive recorder window on MR Configurator2 by clicking the "Graph" button.	[Pr. PA23]
STO function	This amplifier complies with the STO function as functional safety of IEC/EN 61800-5-2. You can create a safety system for the equipment easily.	MR-J4-_TM_ 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 6.9
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. Also, the power monitoring function can be used via a network.	Section 6.1
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 6.8
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.	Section 6.6 MR-J4-_TM_ Section 17.1
Model adaptive control disabled	This function drives the servo motor with PID control without using the model adaptive control.	
Lost motion compensation function	This function improves the response delay generated when the machine moving direction is reversed.	MR-J4-_TM_ Section 7.6
Super trace control	This function sets constant and uniform acceleration/deceleration droop pulses to almost 0.	MR-J4-_TM_ Section 7.7

Function	Description	Reference
Limit switch	Limits travel intervals using LSP (Forward rotation stroke end) and LSN (Reverse rotation stroke end).	
Software limit	Limits travel intervals by address using parameters. The same function with the limit switch is enabled by setting parameters.	Section 5.8 MR-J4-_TM_ Section 5.3 [Pr. PT15] to [Pr. PT18]
Web server	You can configure various settings and monitor the servo amplifier in a web browser. Refer to the website of Mitsubishi Electric Automation, Inc. for details.	
Superimposed synchronous control function	This function drives the servo motor by using externally input pulses as the master.	Section 6.10
Positioning function by operation start-up signal	This function starts positioning with an input signal.	Section 6.11

1.3 Communication specifications

The following table shows the communication specifications.

Item	Description	Remark
EtherNet/IP communication specifications	THE CIP NETWORKS LIBRARY Volume 1 Common Industrial Protocol (CIP™) THE CIP NETWORKS LIBRARY Volume 2 EtherNet/IP Adaptation of CIP	
Physical layer	10BASE-T/100BASE-TX	
Communication connector	RJ45, 2 ports (port 1 and port 2)	
Communication cable	CAT5e, shielded twisted pair (4 pair) straight cable	Double-shielded type recommended
Network topology	Line, Star, Ring, or a connection topology where the topologies are used together	
Variable communication speed	10 Mbps/100 Mbps (half duplex/full duplex)	
Transmission speed between stations	Max. 100 m	
Number of nodes	Compliant with the specifications of the standard Ethernet	
Explicit message communication	Asynchronous Sending/Receiving: 1 channel each	
I/O message communication	Cycle time: Select from 1 ms to 100 ms	
LED display	Network Status, Module Status, LINK/Activity (port1, port2)	

1.4 Establishing and disconnecting the communication

1.4.1 Communication status

The following shows the classification of the communication status. Two communication types are provided: One is the I/O communication where command data and feedback data are sent and received at a constant period. Another is the Explicit Message communication where object data is sent and received asynchronously. Refer to chapter 3 for details of the I/O communication. Refer to chapter 4 for details of the Explicit Message communication.
Establishing the I/O connection and switching the mode to the Run mode make the servo amplifier ready for driving the servo motor.
The communication status can be checked with Class 01h, Instance 1h, and Attribute 5 Status. Refer to chapter 7 for details.

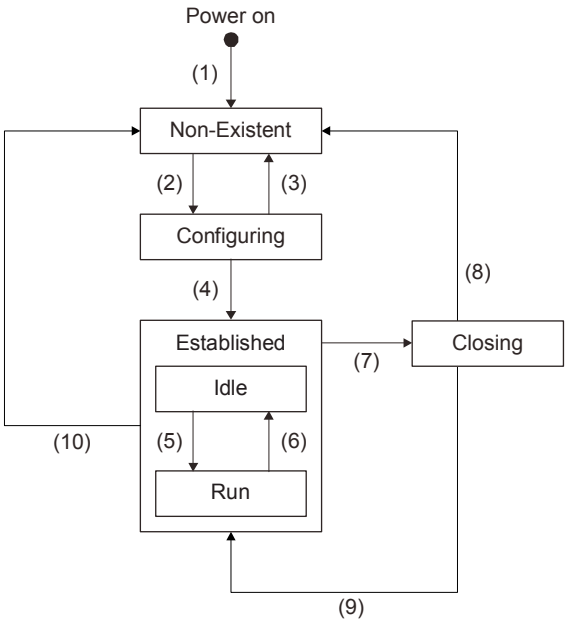


Fig. 1.1

Table 1.1 EtherNet/IP state transition

Transition No.	Description
(1)	Power on
(2)	When Connection Manager Object receives a Forward_Open request or a Large_Forward_Open request, the state shifts to the Configuring state.
(3)	When Connection Manager Object fails to establish a connection requested by Forward_Open or Large_Forward_Open, the state shifts to the Non-Existent state.
(4)	When a connection requested by Forward_Open or Large_Forward_Open is established, the state shifts to the Established state. Just after the connection is established, the connection goes in the Idle state. In this state, the servo motor cannot be driven through the communication.
(5)	When the slave receives a Run notification from the master, the state of the slave shifts from the Idle state to the Run state. In this state, the servo motor can be driven through the communication.
(6)	When the slave receives an Idle notification from the master, the state of the slave shifts from the Run state to the Idle state. When the state shifts from the Run state to the Idle state, a hot start is given to the servo amplifier.
(7)	When the slave receives a Forward_Close request from the master, the state of the slave shifts to the Closing state.
(8)	When a connection is disconnected by a Forword_Close request, the state shifts to the Non-Existent state. When a communication is disconnected while the connection is in the Run state, a hot start is given to the servo amplifier.
(9)	When a disconnection requested by Forward_Close fails, the state shifts from the Closing state to the Establish state.
(10)	When a connection timeout occurs, the state shifts to the Non-Existent state. When a connection timeout occurs while the connection is in the Run state, a hot start is given to the servo amplifier.

1.4.2 Startup

The following describes the settings and startup of the EtherNet/IP communication. Refer to section 4.1 of "MR-J4-_TM_ Servo Amplifier Instruction Manual" for the startup procedure other than the network setting.

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

(2) Parameter setting
Set the control mode with [Pr. PA01 Operation mode]. Refer to section 5.2.1 of "MR-J4-_TM_ Servo Amplifier Instruction Manual" for the parameter setting.

(3) IP address setting
Set an IP address using the AnybusIPconfig tool offered by HMS Industrial Networks and the axis selection rotary switch (SW2/SW3) on the display of the servo amplifier. Change the IP address with the axis selection rotary switch (SW2/SW3) before powering on the servo amplifier. The IP address you set can be checked with the "AnybusIPconfig" tool or system configuration window of MR Configurator 2. You can set an IP address as follows.

Axis selection rotary switch (SW2/SW3)	IP address setting value
00h	An IP address set by the AnybusIPconfig tool is used.
01h to FEh	Although an IP address set by the AnybusIPconfig tool is used, the forth octet value is replaced with a value set with the axis selection rotary switch (SW2/SW3). The DHCP function is disabled. Set a hexadecimal value with the axis selection rotary switch (SW2/SW3). The hexadecimal value is converted into a decimal value and set as the fourth octet of the IP address.
FFh	The DHCP function is enabled.

(4) Setting tool
The following table lists the tools used for starting up the EtherNet/IP communication and tool manufacturers.

Tool	Explanation	Manufacturer
MR Configurator 2 (software version 1.52E or later)	This software is used to configure various settings of the servo amplifier and helps maintenance works.	You can purchase this software from Mitsubishi Electric Corporation.
AnybusIPconfig	This tool is used to set an IP address to the EtherNet/IP network module (ABCC-M40-EIP).	You can get this tool from the website of HMS Industrial Networks.

(5) AOI (Add-On Instruction)
Users can shorten the startup period of the MR-J4-_TM_ servo amplifier by using AOI. AOI has been developed and provided by Mitsubishi Electric Automation, Inc. Refer to the website of Mitsubishi Electric Automation, Inc. for details of AOI.

1.4.3 Network disconnection procedure

To disconnect the network by stopping device operation or other means, follow the procedure shown below.

(1) Stop the servo motor.

(2) Set the shutdown command for Controlword (Class 64h, Instance 6040h, Attribute 0) to establish the servo-off status.

(3) Issue the Forward_Close service from the controller and disconnect the I/O communication.

(4) Shut off the power of the servo amplifier and controller.

1.5 Summary of object library

POINT
●Refer to chapter 7 for details of the object library.

Each data set that EtherNet/IP devices have such as control parameters, command values, and feedback values is handled as an object composed of a Class ID, object name, data type, access rule, and other elements. The object data can be exchanged between the master and slave devices. The aggregate of these objects is called object library.
The MR-J4-_TM_ servo amplifiers support the following objects. Refer to the Reference column for the section where the details of each object are described.

Class ID	Object name	Reference
01h	Identity Object	Section 7.3.1 (1)
02h	Message Router Object	Section 7.3.2 (1)
04h	Assembly Object	Section 7.3.3
06h	Connection Manager Object	Section 7.3.2 (2)
47h	Device Level Ring(DLR) Object	Section 7.3.2 (3)
48h	QoS Object	Section 7.3.2 (4)
F5h	TCP/IP Interface Object	Section 7.3.2 (5)
F6h	Ethernet Link Object	Section 7.3.2 (6)
64h	Drive Configuration Object	Section 7.3.1 (2) Section 7.3.4 to 7.3.16

1.5.1 Section definition of Drive Configuration Object (64h)

The master can control the slave by sending and receiving commands/feedback data via Drive Configuration Object. Instances of Drive Configuration Object are categorized as follows according to the CiA 402 standard.

Class ID	Ins ID	Description	Reference
64h	1000h to 1FFFh	CoE communication area	Chapter 7
	2000h to 25FFh	Parameter area (Vendor-specific)	Section 6.5, Chapter 7
	2A00h to 2FFFh	Servo control command/monitor area (Vendor-specific)	Chapter 6, Chapter 7
	6000h to 6FFFh	CiA 402 Drive profile area	Chapter 5, Chapter 7

MEMO

2. EtherNet/IP NETWORK MODULE (ABCC-M40-EIP)

POINT

- For the EtherNet/IP Network module, be sure to use ABCC-M40-EIP which is a dedicated model for Mitsubishi MELSERVO. For purchasing, contact your local sales office.
- Refer to "MR-J4-_TM_ Servo Amplifier Instruction Manual" for how to mount the EtherNet/IP Network module (ABCC-M40-EIP) to the MR-J4-_TM_ servo amplifier.
- For the quality assurance on the EtherNet/IP Network module (ABCC-M40-EIP), contact HMS Industrial Networks.

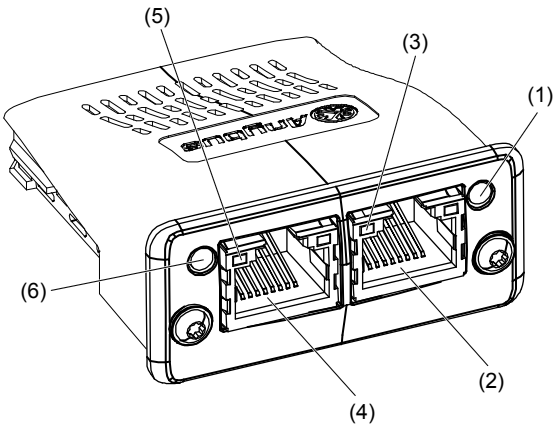
The EtherNet/IP communication with an MR-J4-_TM_ servo amplifier requires the EtherNet/IP Network module (ABCC-M40-EIP). The following shows the details.

2.1 Specifications

Item	Description
Product name	ABCC-M40-EIP (Anybus Compact Com M40 EIP)
Model	AB6927-C
Manufacturer	HMS Industrial Networks
External interface	MR-J4-_TM_ servo amplifier connecting interface: Compact flash connector with standard 50 pins EtherNet/IP communication port interface: RJ45 connector
Dimensions	52 (W) × 50 (D) × 20 (H) (Except the protrusion of the EtherNet/IP communication port connector)
Mass	Approx. 30 g

2.2 Parts identification

This section describes the EtherNet/IP Network module (ABCC-M40-EIP) only. Refer to section 1.7 of "MR-J4-_TM_ Servo Amplifier Instruction Manual" for the MR-J4-_TM_ servo amplifier.



No.	Name/Application	Detailed explanation
(1)	Module Status LED Indicates the module status.	Section 2.3.2 (2)
(2)	RJ45 EtherNet/IP communication port (port 2) Connect an EtherNet/IP master controller or a servo amplifier.	Section 2.4
(3)	Link/Activity LED (port 2) Indicates the link status of each EtherNet/IP communication port.	Section 2.3.2 (3)
(4)	RJ45 EtherNet/IP communication port (port 1) Connect an EtherNet/IP master controller or a servo amplifier.	Section 2.4
(5)	Link/Activity LED (port 1) Indicates the link status of each EtherNet/IP communication port.	Section 2.3.2 (3)
(6)	Network Status LED Indicates the communication status.	Section 2.3.2 (1)

2.3 LED indication

The LEDs of the EtherNet/IP Network module (ABCC-M40-EIP) function according to the regulations of the EtherNet/IP standard (THE CIP NETWORKS LIBRARY Volume 2: EtherNet/IP Adaptation of CIP). Under certain conditions, the EtherNet/IP Network module (ABCC-M40-EIP) indicates its status by its own specifications.

2.3.1 LED indication definition

The following shows the LED indication definitions.

LED status	Definition
Lit	An LED remains lit.
Extinguished	An LED remains extinguished.
Flickering 1	An LED is switching between lit and extinguished at 1 Hz cycles (every 500 ms).
Flickering 2	An LED flickers at an inconstant cycle. The cycle varies depending on the packet amount of Ethernet.

2.3.2 LED indication list

(1) Network Status LED

The Network Status LED indicates the EtherNet/IP communication status.

LED status	Description
Extinguished	Indicates that the power is shut off or no IP address has been assigned.
Flickering 1 in green	Indicates that an IP address has been assigned and the EtherNet/IP Network module has not been connected to the network.
Lit in green	Indicates that a network connection has been established.
Flickering 1 in red	Indicates that a network connection timeout has occurred.
Lit in red	Indicates that duplication of an IP address has been detected. Indicates that a fatal error has occurred. This indication is specific to the EtherNet/IP Network module (ABCC-M40-EIP).
Flickering 1 alternately in green and red	Indicates that the servo amplifier and the network module are diagnosing themselves.

(2) Module Status LED

The Module Status LED indicates each status of the servo amplifier and the network module and an error in the EtherNet/IP communication.

LED status	Description
Extinguished	Indicates that the power is shut off.
Lit in green	Indicates that the servo amplifier and the network module operate normally.
Flickering 1 in green	Indicates that the settings of the servo amplifier and the network module are not completed.
Flickering 1 in red	Indicates that the self-diagnoses of the servo amplifier and the network module have detected minor malfunctions that can be solved.
Lit in red	Indicates that the self-diagnoses of the servo amplifier and the network module have detected major malfunctions that cannot be solved.
Flickering 1 alternately in green and red	Indicates that the servo amplifier and the network module are diagnosing themselves.

(3) Link/Activity LED

The Link/Activity LEDs indicate the link status of each EtherNet/IP communication port.

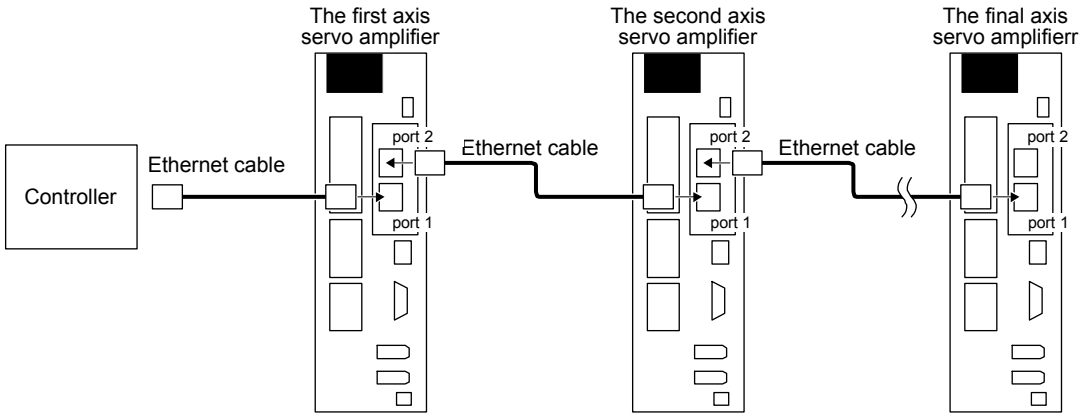
LED status	Description
Extinguished	Indicates that the power supply is shut off or the link-unestablished state.
Lit in green	Indicates that the link is established without traffic. (100 Mbit/s)
Flickering 2 in green	Indicates that the link is established with traffic. (100 Mbit/s)
Lit in yellow	Indicates that the link is established without traffic. (10 Mbit/s)
Flickering 2 in yellow	Indicates that the link is established with traffic. (10 Mbit/s)

2.4 Connecting Ethernet cables

POINT

●Use a twisted pair cable (double shielded) compliant with Ethernet Category 5e (100BASE-TX) or higher as an Ethernet cable. The maximum cable length between nodes is 100 m.

When the RJ45 EtherNet/IP communication ports (port 1 and port 2) are not used, leave these ports open.



MEMO

3. I/O COMMUNICATION

The I/O communication can send and receive command data/feedback data between a master (controller) and slaves (servo amplifier) at a constant cycle.

3.1 I/O communication cycle

Specify an I/O communication cycle by using the Forward_Open or Large_Forward_Open service of Class 06h Connection Manager Object through the Explicit message communication. Refer to (1) in this section for details.

(1) Communication cycle-related object

Establish the Explicit Message connection and the I/O Message connection by using the Forward_Open or Large_Forward_Open service for Class 06h - Connection Manager Object.

Use Transport Class 1 for the I/O connection and Transport Class 3 for the Explicit Messaging connection. Refer to "THE CIP NETWORKS LIBRARY Volume 1 Common Industrial Protocol (CIP^{TM})" for details of Transport Class.

For the EtherNet/IP master, set the following parameters using the Forward_Open or Large_Forward_Open service.

If you need to frequently transfer data through the Explicit Message connection, establish the connection using the Forward_Open or Large_Forward_Open service. If you do not need to transfer data often through the Explicit Message communication, establishment of the connection is an option.

No.	Parameter	Data type	Description	I/O connection	Explicit Messaging connection
1	Priority/Time_tick	BYTE	Used to calculate request timeout information.		
	Details of setting values				
	Tick Time	BIT 0 to BIT 3	Unit of the time specified by the Time-out_ticks parameter	0 to 15	0 to 15
	Priority	BIT 4	Priority of non-connection type messages	0: Normal	0: Normal
	Reserved	BIT 5 to BIT 7		0	0
2	Time-out_ticks	USINT	Used to calculate request timeout information.	0 to 255	0 to 255
3	O->T Network Connection ID	UDINT	Network Connection ID to be used for the local link, originator to target. This is the originator's CIP send connection ID.	00000000h to FFFFFFFFh	00000000h to FFFFFFFFh
4	T->O Network Connection ID	UDINT	Network Connection ID to be used for the local link, target to originator. This is the originator's CIP receive connection ID.	00000000h to FFFFFFFFh	00000000h to FFFFFFFFh
5	Connection Serial Number	UINT	A unique 16-bit value selected by the Connection Manager object in the connection originator	0000h to FFFFh	0000h to FFFFh
6	Originator Vendor ID	UINT	Vendor ID of an originator node	A value of Identity object instance attribute 1	A value of Identity object instance attribute 1
7	Originator Serial Number	UDINT	Serial number of an originator node	A value of Identity object instance attribute 6	A value of Identity object instance attribute 6

No.	Parameter	Data type	Description	I/O connection	Explicit Messaging connection
8	Connection Timeout Multiplier	USINT	Used to specify the multiplier applied to the RPI to obtain the connection timeout value.	0 to 7	0 to 7
9	Reserved	Octet		0	0
		Octet		0	0
		Octet		0	0
10	O->T RPI	UDINT	Requested packet transmission speed, originator to target. [µs]	1000 to 100000	100000 to 10000000
11	O->T Network Connection Parameters	WORD/ DWORD (Note 1)	Connection size Set a fixed size or a variable size.	0046h to 4C46h/ 00000046h to 2C000046h (Note 2)	0040h to 4040h/ 00000040h to 20000040h (Note 2)
12	T->O RPI	UDINT	Requested packet transmission speed, target to originator [µs]	1000 to 100000	100000 to 10000000
13	T->O Network Connection Parameters	WORD/ DWORD (Note 1)	Connection size Set a fixed size or a variable size.	0046h to 4C46h/ 00000046h to 2C000046h	0040h to 4040h/ 00000040h to 20000040h (Note 2)
14	Transport Type/Trigger	BYTE			
	Details of setting values				
	Transport Class	BIT 0 to BIT 3	Set a Transport Class to be used in data communication.	1	3
	Production Trigger	BIT 4 to BIT 6	Set a trigger condition of data transmission.	0: Cyclic 1: Change of state	2: Application object
	Direction	BIT 7	Indicates that an end point works on the connection as a client or server.	0: Client 1: Server	0: Client 1: Server
15	Connection_Path_Size	USINT	The number of 16-bit words in the Connection_Path field.	0 to 255	0 to 255
16	Connection_Path	Padded EPATH	Indicates the route to the Remote Target Device.	Set the IP address or the host name of the connection destination.	Set the IP address or the host name of the connection destination.

Note 1. The data type of this parameter is a WORD for the Forward_Open service, and a DWORD for the Large_Forward_Open service.

2. Multicast connections are not supported.

(2) Network Connection Parameters format

(a) Forward_Open service

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Redundant Owner	Connection Type		Reserved	Priority		Fixed/ Variable	Connection Size (in bytes)								

(b) Large_Forward_Open service

31	30	29	28	27	26	25	24-16	15-0
Redundant Owner	Connection Type		Reserved	Priority		Fixed/ Variable	Reserved	Connection Size (in bytes)

3.2 I/O communication mapping

(1) I/O communication format (input)

The following table lists the communication data formats from the master (controller) to slaves (servo amplifier).

Instance numbers in the table correspond to the instance numbers of Assembly object.

Map number	Mapping initial setting	Expected application of the initial map
1st Output data (Instance 150)	1 Byte: Modes of operation (6060h) 1 Byte: Reserved 2 Byte: Controlword (6040h) 4 Byte: Target position (607Ah) 4 Byte: Target velocity (60FFh) 2 Byte: Target torque (6071h) 2 Byte: Reserved 4 Byte: Profile velocity (6081h) 4 Byte: Profile acceleration (6083h) 4 Byte: Profile deceleration (6084h) 4 Byte: Torque slope (6087h) 4 Byte: Instruction code 4 Byte: Writing data 2 Byte: Control DI 10 (2D0Ah) 2 Byte: User defined data 0 (Initial value: Control DI 1 (2D01h)) (Note) 2 Byte: User defined data 1 (Initial value: Control DI 2 (2D02h)) (Note) 2 Byte: User defined data 2 (Initial value: Control DI 3 (2D03h)) (Note) 4 Byte: User defined data 3 (Initial value: Velocity limit value (2D20h)) (Note) 4 Byte: User defined data 4 (Initial value: Not assigned) (Note) 4 Byte: User defined data 5 (Initial value: Not assigned) (Note) 4 Byte: User defined data 6 (Initial value: Not assigned) (Note)	Profile position mode (pp) Profile velocity mode (pv) Profile torque mode (tq) Homing mode (hm) Mapping for an application in which the modes above are switched Map size: 64 bytes

Note. User defined data 0 to User defined data 6 are variable objects.

(2) I/O communication format (output)

The following table lists the communication data formats from slaves (servo amplifier) to the master (controller).

Instance numbers in the table correspond to the instance numbers of Assembly object.

Map number	Mapping initial setting	Expected application of the initial map
1st Input map (Instance 100)	1 Byte: Modes of operation display (6061h) 1 Byte: Reserved 2 Byte: Statusword (6041h) 4 Byte: Position actual value (6064h) 4 Byte: Velocity actual value (606Ch) 2 Byte: Torque actual value (6077h) 2 Byte: Reserved 4 Byte: Reading data 2 Byte: Respond code 2 Byte: Status DO 10 (2D1Ah) 2 Byte: User defined data 0 (Initial value: Status DO 1 (2D11h)) (Note) 2 Byte: User defined data 1 (Initial value: Status DO 2 (2D12h)) (Note) 2 Byte: User defined data 2 (Initial value: Status DO 3 (2D13h)) (Note) 2 Byte: Reserved 4 Byte: User defined data 3 (Initial value: Following error actual value (60F4h)) (Note) 4 Byte: User defined data 4 (Initial value: Digital Input (60FDh)) (Note) 4 Byte: User defined data 5 (Initial value: Not assigned) (Note) 4 Byte: User defined data 6 (Initial value: Not assigned) (Note) 16 Byte: Reserved	Profile position mode (pp) Profile velocity mode (pv) Profile torque mode (tq) Homing mode (hm) Mapping for an application in which the modes above are switched Map size: 64 bytes

Note. User defined data 0 to User defined data 6 are variable objects.

(3) Variable mapping function

The instances defined by User defined data_ can be dynamically switched to any send instance or receive instance. Use instruction codes for switching instances. Refer to section 6.2 for details.

4. Explicit Message COMMUNICATION

The Explicit Message communication transfers object data between a master (controller) and slaves (servo amplifier) asynchronously.
Services that can be used through the Explicit Message communication depend on their classes and instances. Refer to chapter 7 for the services that are supported by each class and instance. Refer to "THE CIP NETWORKS LIBRARY Volume 1 Common Industrial Protocol (CIP^{TM}) Appendix A" for details of each service.

4.1 Explicit Message communication-related service

The MR-J4-_TM_ servo amplifier supports the following common services and object-specific services that are related to the Explicit Message communication. Refer to chapter 7 for the object-specific services. Refer to section 4.2 for the common services.

(1) Common service

Service	Description
Set_Attribute_Single	Writes a value to the specified attribute.
Get_Attribute_Single	Reads the value of the specified attribute.
Get_Attributes_All	Reads the values of all the attributes.
Reset	Calls the Reset service of the specified class/object.

(2) Object-specific service

Service	Description
Large_Forward_Open	Used in the Connection Manager Object.
Forward_Open	Used in the Connection Manager Object.
Forward_Close	Used in the Connection Manager Object.
Get_And_Clear	Used in the Ethernet Link Object.

4.2 Common service

The general status codes of this section are codes MR-J4-_TM_ servo amplifiers respond. The codes network modules respond are not included. Refer to "General Status Codes" of "THE CIP NETWORKS LIBRARY Volume 1 Common Industrial Protocol (CIP™) Appendix A" for all the general status codes.

4.2.1 Set_Attribute_Single

When a Set_Attribute_Single request is sent from the master (controller), the Set_Attribute_Single service writes a specified value to the attribute with the Class ID, Instance ID, and Attribute ID specified at the timing of the request.
This service returns either of the following general status codes depending on conditions.

General status code	Meaning	Cause
05h	Path destination unknown	A non-existent object or instance has been specified.
14h	Attribute not supported	A non-existent attribute has been specified.
0Eh	Attribute not settable	A value was written to a non-modifiable attribute.
09h	Invalid attribute value	A value outside the parameter range was written.
1Eh	Embedded service error	A value was written to a parameter outside the writing range set in the parameter block setting.
08h	Service not supported	A request was issued to a class and an instance that do not support the Set_Attribute_Single service.

4.2.2 Get_Attribute_Single

When a Get_Attribute_Single request is sent from the master (controller), the Get_Attribute_Single service returns the value of the attribute with the Class ID, Instance ID, and Attribute ID specified at the timing of the request.
This service returns either of the following general status codes depending on conditions.

General status code	Meaning	Cause
05h	Path destination unknown	A non-existent object or instance has been specified.
14h	Attribute not supported	A non-existent attribute has been specified.
2Ch	Attribute not gettable	Reading an unreadable attribute was attempted.
1Eh	Embedded service error	Reading a parameter object outside the reference range set in the parameter block setting was attempted.
08h	Service not supported	A request was issued to a class and an instance that do not support the Get_Attribute_Single service.

4.2.3 Get_Attributes_All

When a Get_Attributes_All request is sent from the master (controller), the Get_Attributes_All service returns the values of all the attributes with the Class IDs and Instance IDs specified at the timing of the request.
This service returns either of the following general status codes depending on conditions.

General status code	Meaning	Cause
05h	Path destination unknown	A non-existent object or instance has been specified.
2Ch	Attribute not gettable	Reading an unreadable attribute was attempted.
1Eh	Embedded service error	Reading a parameter object outside the reference range set in the parameter block setting was attempted.
08h	Service not supported	A request was issued to a class and an instance that do not support the Get_Attributes_All service.

4.2.4 Reset

When a Reset request is sent from the master (controller), the Reset service performs the reset processing that was specified by the Class ID, Instance ID, and object-specific parameter that were specified at the timing of the request. The processing to be performed when a Reset request is received depends on the object. Refer to section 7.3.1 (1) for details.
This service returns either of the following general status codes depending on conditions.

General status code	Meaning	Cause
20h	Invalid parameter	An unsupported reset type was specified.
08h	Service not supported	A request was issued to a class and an instance that do not support the Reset service.

MEMO

5. DRIVE PROFILE

5.1 FSA state

The inside state of the MR-J4-_TM_ servo amplifier is controlled based on the FSA state, defined in the CiA 402 drive profile standard. Figure 5.1 and Table 5.1 show the transition conditions between the FSA states. The states are switched when the master sends a command following the table (sets Controlword) after the I/O communication was established. When the state has transitioned from Not ready to switch on, which is right after the power on, to Operation enabled with the predetermined procedure, the servo motor becomes ready to operate.

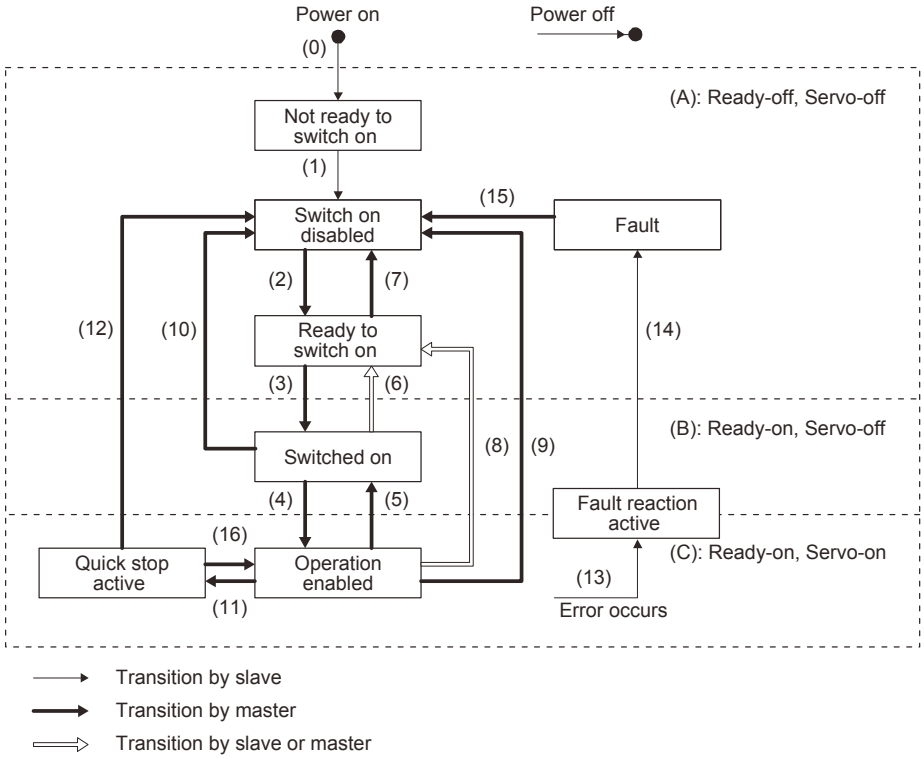


Figure 5.1 Transition between the FSA states

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.

Transition No.	Event	Remark
(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. Alarms that can be reset are reset.
(16) (Not supported) (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 supported by the MR-J4-_TM_ servo amplifier.

The following table lists the commands issued to the servo amplifier. Turn on the bits according 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)/(16)
Fault Reset	0 → 1 (Note)					(15)

Note. In faulty communication, hold the state of Bit 7 = 1 according to the communication cycle for the Fault Reset command to prevent the command from failing to be recognized.
When the time determined by doubling the communication cycle is 10 ms or shorter: Hold the state for 10 ms.
When the time determined by doubling the communication cycle is longer than 10 ms: Hold the state for the time determined by doubling the communication cycle.
The above time has been defined to prevent the Fault Reset command from failing to be recognized when a communication loss occurs. A communication loss occurs frequently depending on the operating environment of the device. Adjust the time according to the environment.

Figure 5.1 and Table 5.1 show the FSA state transition conditions. The transition from the Switch on disabled state to the Operation enabled state requires Shutdown, Switch on, and Enable operation to be issued in this order. However, with the MR-J4-_TM_ servo amplifier, transition to the target state skipping the states in between is possible.

Current state	Command	State after transition
Switch on disabled	Switch on	Switched on
Switch on disabled	Enable operation	Operation enabled
Ready to switch on	Enable operation	Operation enabled

5.2 Controlword/Control DI

The FSA state can be switched and control commands for the functions of the drive can be issued by rewriting the objects of the following Controlword and Control DI _ from the master (controller).

Class ID	Ins ID	Attr ID	Access	Name	Data Type	Description
64h	6040h	0	Get/Set	Controlword	UINT	
	2D01h	0	Get/Set	Control DI 1	UINT	Control commands to control the servo amplifier can be set.
	2D02h			Control DI 2		
	2D03h			Control DI 3		
	2D07h			Control DI 7		
	2D0Ah			Control DI 10		

5.2.1 Bit definition of Controlword

Controlword can control the FSA state and issue control commands. Use Bit 0 to Bit 3 and Bit 7 for the FSA state. The following table shows the bit definition of Controlword.

Bit	Symbol	Description
0	SO	Switch-on
1	EV	Enable voltage
2	QS	Quick stop
3	EO	Enable operation
4	OMS	Differs depending on Modes of operation (Class ID: 64h, Ins ID: 6060h, Attr ID: 0). (Refer to section 5.4.)
5		
6		
7	FR	Fault reset
8	HALT	0: Operation ready 1: Temporary stop
9	OMS	Differs depending on Modes of operation (Class ID: 64h, Ins ID: 6060h, Attr ID: 0). (Refer to section 5.4.)
10		The value at reading is undefined. Set "0" at writing.
11		
12		
13		
14		
15		

5.2.2 Bit definition of Control DI

Control DI can control the FSA state and issue control commands. The following table shows the bit definition of Control DI.

(1) Control DI 1

Bit	Symbol	Description
0		The value at reading is undefined. Set "0" at writing.
1		
2		
3		
4	C_CDP	Gain switching Turn on C_CDP to use 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		The value at reading is undefined. Set "0" at writing.
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

(2) Control DI 2

Bit	Symbol	Description
0		The value at reading is undefined. Set "0" at writing.
1		
2		
3		
4		
5		
6		
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 one 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" at writing.
10		
11		
12		
13		
14		
15	C_ORST	Operation alarm reset Turn on C_ORST from off to reset [AL. F4 Positioning warning].

(3) Control DI 3

Bit	Symbol	Description
0		The value at reading is undefined. Set "0" at writing.
1		
2		
3		
4		
5		
6		
7		
8	C_ABS2	Home position return completion (for scale measurement) When C_ABS2 is turned on with the scale measurement function, the absolute position erased status of a scale measurement encoder can be canceled. S_ABSV2 turns off.
9		The value at reading is undefined. Set "0" at writing.
10		
11		
12		
13		
14		
15		

(4) Control DI 7

Bit	Symbol	Description
0		The value at reading is undefined. Set "0" at writing.
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12	C_STS	Synchronous control command (Note) 0: Synchronous control termination 1: Synchronous control start Turn on C_STS with the network communication to start the synchronous control. When a value of the synchronous encoder electronic gear was changed with the network communication, turn on Synchronous control command (C_STS) after Analysis completed (S_CEG) is turned on.
13	C_POL	Synchronous encoder polarity selection (Note) 0: Rotating the synchronous encoder in the CCW direction or the positive direction increases the command address. 1: Rotating the synchronous encoder in the CW direction or the negative direction increases the command address. Set a synchronous encoder polarity according to the specifications of an encoder used. A setting value when Synchronous control command (C_STS) is turned on will be applied.
14	C_CEG	Analysis command (Note) 0: Synchronous encoder electronic gear change termination 1: Synchronous encoder electronic gear change start After changing the synchronous encoder electronic gear, turn on Analysis command (C_CEG). After Analysis completed (S_CEG) is turned on, the change of the synchronous encoder electronic gear will be applied and it will be used by the synchronous control.
15		The value at reading is undefined. Set "0" at writing.

Note. Refer to section 6.10 for details.

(5) Control DI 10

Bit	Symbol	Description
0		The value at reading is undefined. Set "0" at writing.
1	C_SPR	Instruction code request (Note 1) Turning on C_SPR executes the set instruction code.
2	C_OSSA	Operation start-up signal activation (Note 2) Turning on C_OSSA enables the positioning start by the operation start-up signal.
3		The value at reading is undefined. Set "0" at writing.
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

Note 1. Refer to section 6.2 for details.
2. Refer to section 6.11 for details.

5.3 Statusword/Status DO

The objects of the following Statusword or Status DO _ notify the master (controller) of the FSA state of the MR-J4-_TM_ servo amplifier and other drive status.

Class ID	Ins ID	Attr ID	Access	Name	Data Type	Description
64h	6041h	0	Get	Statusword	UINT	
	2D11h	0	Get	Status DO 1	UINT	The servo status is returned.
	2D12h			Status DO 2		
	2D13h			Status DO 3		
	2D15h			Status DO 5		
	2D16h			Status DO 6		
	2D17h			Status DO 7		
	2D1Ah			Status DO 10		

5.3.1 Bit definition of Statusword

The following table shows the bit definition of Statusword.

Bit	Symbol	Description
0	RTSO	Ready-to-switch-on
1	SO	Switch-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: No during a quick stop (including during the test mode)
6	SOD	Switch on disabled
7	W	Warning 0: No warning has been occurred. 1: A warning has occurred.
8		The value at reading is undefined.
9	RM	Remote 0: Not following the Controlword command 1: In operation following the Controlword command
10	TR	Target reached Differs depending on Modes of operation (Class ID: 64h, Ins ID: 6060h, Attr ID: 0). (Refer to section 5.4.)
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 pp, pv, or hm mode)
12	OMS	Differs depending on Modes of operation (Class ID: 64h, Ins ID: 6060h, Attr ID: 0). (Refer to section 5.4.)
13		
14		The value at reading is undefined.
15		

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

Statusword (bin)	FSA state
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.

5.3.2 Bit definition of Status DO

The following table shows the bit definition of Status DO.

(1) Status DO 1

Bit	Symbol	Description
0		The value at reading is undefined.
1		
2	S_SA	Speed reached S_SA turns off during servo-off. When the servo motor speed reaches the following range, S_SA turns on. Preset speed ± ((Preset speed × 0.05) + 20) r/min When the preset speed is 20 r/min or slower, S_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 will turn 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, S_INP may be always on during low-speed rotation. The Status DO cannot be used in the velocity mode or torque mode.
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, S_TLC will be turned off. This Status DO cannot be used in the torque mode.
14	S_ABSV	Absolute position undetermined When the absolute position is erased, S_ABSV turns on. The Status DO cannot be used in the velocity mode or torque mode.
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, turning on the power will turn off S_BWNG after 2.5 s to 3.5 s.

(2) Status DO 2

Bit	Symbol	Description
0	S_ZPAS	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	Under zero speed When the servo motor speed is at zero speed or slower, S_ZSP turns on. 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, S_TLC will be turned off. The Status DO cannot be used in the position mode or velocity mode.
5		The value at reading is undefined.
6	S_IPF	During IPF S_IPF turns on during an instantaneous power failure.
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		The value at reading is undefined.
12		
13		
14		
15	S_ZP2	Home position return completion 2 When a home position return completes normally, S_ZP2 turns on. S_ZP2 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, S_ZP2 is always on. However, it will be off with one of the conditions 1) to 3) or the following. 4) The home position return is not performed after [AL. 25 Absolute position erased] or [AL. E3 Absolute position counter warning] occurred. 5) The home position return is not performed after the electronic gear ([Pr. PA06] or [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.

(3) Status DO 3

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	S_ABSV2	Absolute position undetermined 2 (for scale measurement) When the absolute position is erased from a scale measurement encoder with the scale measurement function, S_ABSV2 turns on.
9		The value at reading is undefined.
10		
11	S_MTTR	Transition to tough drive mode in process When a tough drive is "Enabled" in [Pr. PA20], activating the instantaneous power failure tough drive will turn on S_MTTR.
12		The value at reading is undefined.
13		
14		
15		

(4) Status DO 5

Bit	Symbol	Description
0		The value at reading is undefined.
1		
2		
3		
4		
5		
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 will be on. S_MEND turns on with servo-on. S_MEND is off at servo-off status.
7		The value at reading is undefined.
8		
9		
10		
11		
12		
13		
14		
15		

(5) Status DO 6

Bit	Symbol	Description
0		The value at reading is undefined.
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14	S_CEG	Analysis completed (Note) 0: Synchronous encoder electronic gear change not completed 1: Synchronous encoder electronic gear change completed Indicates that the synchronous encoder electronic gear change has been completed.
15	S_SYCREV	Synchronous control start-up completed (Note) 0: Synchronous control command not received 1: Synchronous control command received Indicates that Synchronous control command has been received properly.

Note. Refer to section 6.10 for details.

(6) Status DO 7

Bit	Symbol	Description
0		The value at reading is undefined.
1		
2		
3		
4		
5		
6		
7		
8		
9	S_SRUN	Synchronous control in progress (Note) 0: Synchronous control not in progress 1: Synchronous control in progress Indicates that the synchronous control is in progress.
10	S_SERR	Synchronous control error (Note) 0: Synchronous control properly in progress 1: Synchronous control error Indicates that an error has occurred in the synchronous control.
11	S_YRUN	Superimposed control in progress (Note) 0: Superimposed control not in progress 1: Superimposed control in progress Indicates that the superimposed control is in progress.
12	S_YERR	Superimposed control error (Note) 0: Superimposed control properly in progress 1: Superimposed control error Indicates that an error has occurred in the superimposed control.
13		The value at reading is undefined.
14	S_SYC	Synchronization completed (Note) 0: Synchronous control not completed 1: Synchronous control completed Indicates that the rotation position of the synchronous encoder has synchronized with that of the servo motor.
15	S_SYF	Superposition completed (Note) 0: Superimposed control not completed 1: Superimposed control completed Indicates that the superimposed control has been completed.

Note. Refer to section 6.10 for details.

(7) Status DO 10

Bit	Symbol	Description
0		The value at reading is undefined.
1	S_COF	Instruction code execution completion (Note 1) S_COF turns on when an instruction code is executed.
2	S_OERR	Operation error (Note 2) S_OERR turns on when an error occurs in the positioning operation started by the operation start-up signal.
3		The value at reading is undefined.
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

Note 1. Refer to section 6.2 for details.
2. Refer to section 6.11 for details.

5.4 Control mode

5.4.1 Selecting control mode (Modes of operation)

Specify a control mode with Modes of operation (Class ID: 64h, Ins ID: 6060h, Attr ID: 0). Modes of operation (Class ID: 64h, Ins ID: 6060h, Attr ID: 0) can be rewritten with the I/O communication or the Explicit Message communication.

Pr. PA01 setting value	pp	pv	tq	hm	6060h/6061h Default value
_ _ _ 0: Automatic selection by each network _ _ _ 2: Profile mode	○	○	○	○	1 (pp)

The following table shows the objects selected for control modes.

Class ID	Ins ID	Attr ID	Access	Name	Data Type	Default	Description
64h	6060h	0	Get/Set	Modes of operation	SINT	Differs depending on [Pr. PA01].	Refer to section 7.3.8 (6).
	6061h	0	Get	Modes of operation display	SINT	Differs depending on [Pr. PA01].	Refer to section 7.3.8 (7).
	6502h	0	Get	Supported drive mode	UDINT	0000002Dh	Refer to section 7.3.8 (8).

5.4.2 Control switching

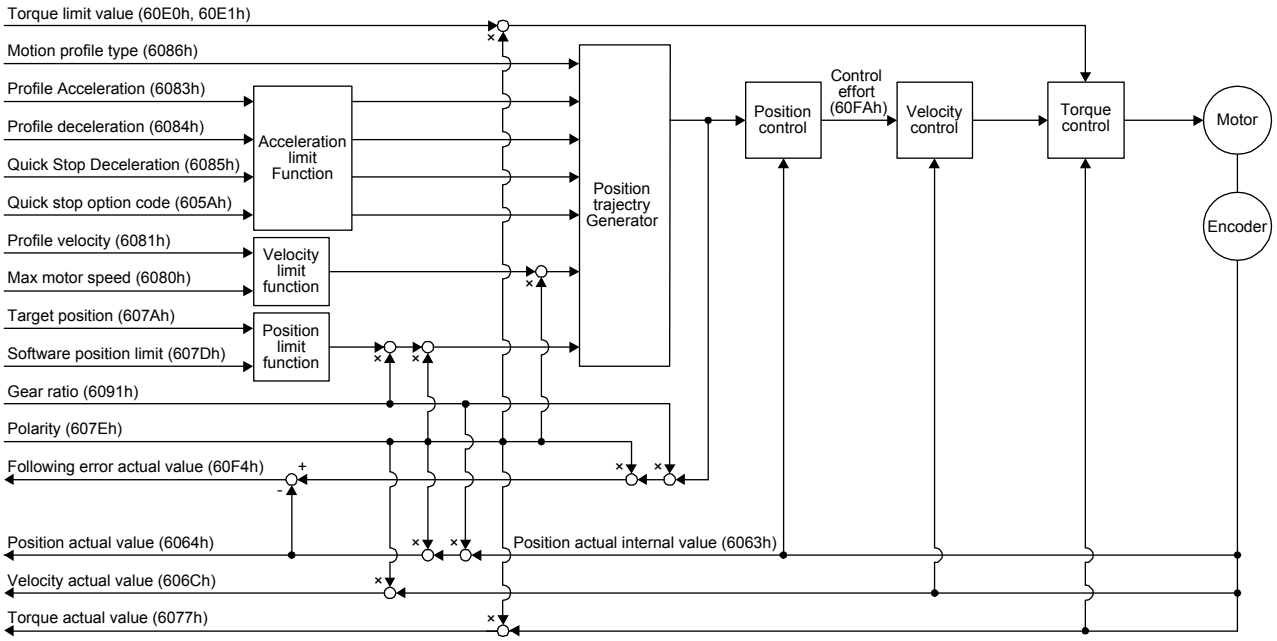
POINT

●Changes to the OMS bit of Controlword (Class ID: 64h, Ins ID: 6040h, Attr ID: 0) are not accepted until control switching is completed. Before inputting commands, check that the control mode has been switched referring to Modes of operation display (Class ID: 64h, Ins ID: 6061h, Attr ID: 0).

Because control switching has a delay, the controller must keep sending command values corresponding to the control mode before and after the switching. After the completion of control switching has been checked with Modes of operation display (Class ID: 64h, Ins ID: 6061h, Attr ID: 0), update of the command value before the switching can be stopped.
Before switching the mode from or to the position mode, check that the servo motor speed is zero speed. Zero speed can be obtained with Bit 3 (S_ZSP) of Status DO 2 (Class ID: 64h, Ins ID: 2D12h, Attr ID: 0). If the servo motor speed is not zero speed, the control will not be switched and Modes of operation display (Class ID: 64h, Ins ID: 6061h, Attr ID: 0) will not change.

5.4.3 Profile position mode (pp)

The following shows the functions and related objects of the profile position mode (pp).



(1) Related object

Class ID	Ins ID	Attr ID	Access	Name	Data Type	Default	Description
64h	607Ah	0	Get/Set	Target position	DINT		Command position (Pos units)
	607Bh	0	Get	Position range limit	USINT	2	Number of entries
		1	Get/Set	Min position range limit	DINT		Minimum value of the position range limit The value is automatically set according to the setting of "Position data unit" in [Pr. PT01]. pulse: -2147483648 degree: 0
		2	Get/Set	Max position range limit	DINT		Maximum value of the position range limit The value is automatically set according to the setting of "Position data unit" in [Pr. PT01]. pulse: 2147483647 degree: 359999
	607Dh	0	Get	Software position limit	USINT	2	Number of entries
		1	Get/Set	Min position limit	DINT	0	Minimum position address (Pos units)
		2	Get/Set	Max position limit	DINT	0	Maximum position address (Pos units)
	607Fh	0	Get/Set	Max profile velocity	UDINT	2000000	maximum speed Unit: Vel unit (0.01 r/min or 0.01 mm/s)
	6080h	0	Get/Set	Max motor speed	UDINT		Servo motor maximum speed Unit: r/min
	6081h	0	Get/Set	Profile velocity	UDINT		Speed after acceleration completed Unit: Vel unit (0.01 r/min or 0.01 mm/s)

Class ID	Ins ID	Attr ID	Access	Name	Data Type	Default	Description
64h	6083h	0	Get/Set	Profile Acceleration	UDINT	0	Acceleration at start of movement to target position Unit: ms
	6084h	0	Get/Set	Profile deceleration	UDINT	0	Deceleration at arrival at target position Unit: ms
	6085h	0	Get/Set	Quick stop deceleration	UDINT	100	Deceleration at deceleration to a stop by Quick stop Unit: ms
	6086h	0	Get/Set	Motion profile type	INT	0	Acceleration/deceleration type selection -1: S-pattern 0: Linear ramp (not supported) (Note) 1: Sin^2 ramp (not supported) (Note) 2: Jerk-free ramp (not supported) (Note) 3: Jerk-limited ramp (not supported) (Note)
	605Ah	0	Get/Set	Quick stop option code	INT	2	Operation setting for Quick stop Refer to section 5.6.
	6063h	0	Get	Position actual internal value	DINT		Current position (Enc inc)
	6064h	0	Get	Position actual value	DINT		Current position (Pos units)
	606Ch	0	Get	Velocity actual value	DINT		Current speed Unit: Vel unit (0.01 r/min or 0.01 mm/s)
	6077h	0	Get	Torque actual value	DINT		Current torque Unit: 0.1% (rated torque of 100%)
	6092h	0	Get	Feed constant	USINT	2	Travel distance per revolution of an output shaft
		1	Get/Set	Feed	UDINT		Travel distance Refer to section 7.3.14 (4).
		2		Shaft revolutions			Number of servo motor shaft revolutions Refer to section 7.3.14 (4).
	60F4h	0	Get	Following error actual value	DINT		Droop pulses (Pos units)
	60FAh	0	Get	Control effort	DINT		Position control loop output (speed command) Unit: Vel unit (0.01 r/min or 0.01 mm/s)
	60E0h	0	Get/Set	Positive torque limit value	UINT	10000	Torque limit value (forward) Unit: 0.1% (rated torque of 100%)
	60E1h	0	Get/Set	Negative torque limit value	UINT	10000	Torque limit value (reverse) Unit: 0.1% (rated torque of 100%)
	6091h	0	Get	Gear ratio	USINT	2	Gear ratio
		1	Get/Set	Motor revolutions	UDINT	1	Number of revolutions of the servo motor axis (numerator)
		2		Shaft revolutions		1	Number of revolutions of the drive axis (denominator)
	607Eh	0	Get/Set	Polarity	USINT	0	Polarity selection Bit 7: Position POL Bit 6: Velocity POL Bit 5: Torque POL Refer to section 5.10.

Class ID	Ins ID	Attr ID	Access	Name	Data Type	Default	Description
64h	60A8h	0	Get/Set	SI unit position	UDINT	0	SI unit position The value is automatically set according to the setting of "Position data unit" of [Pr. PT01]. Refer to section 7.3.14 (5).
	60A9h	0	Get/Set	SI unit velocity	UDINT	0	SI unit velocity 0.01 r/min or 0.01 mm/s FB010300h (0.01 mm/s) FEB44700h (0.01 r/min)

Note. This is not supported by the MR-J4-_TM_ servo amplifier.

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

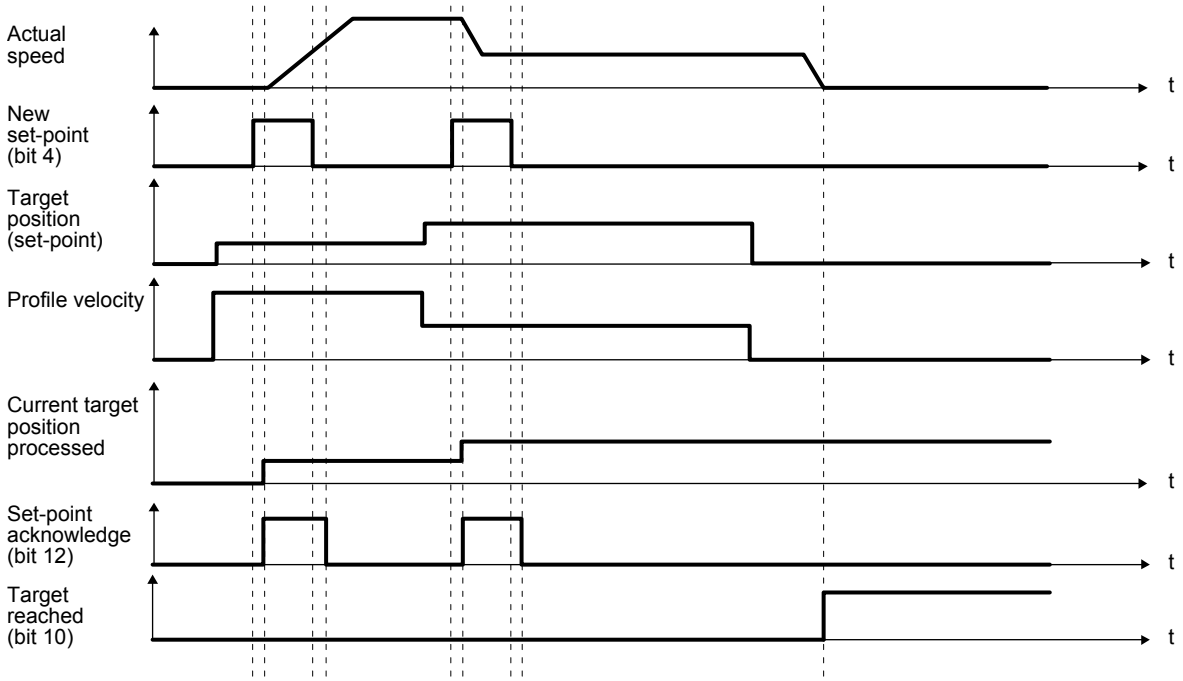
Bit	Symbol	Description
4	New set-point	New positioning parameters are obtained when this bit turns on. Turning on this will start the superimposed synchronous control when the superimposed synchronous control is used.
5	Change set immediately	0: Set of set-points 1: Single set-point
6	abs/rel	0: Absolute position command 1: Relative position command When the unit is set to degree, relative position commands are disabled. When the relative position command is specified and positioning is started, [AL. F4.8] occurs and positioning cannot be started.
8	HALT	0: Positioning is executed. 1: The servo motor stops according to Halt option code (Class ID: 64h, Ins ID: 605Dh, Attr ID: 0).
9	Change on set-point	Enabled only for Set of set-points (Bit 5 = 0). 0: The next positioning starts after the current positioning is completed (stopped). (black line (Refer to (5) of this section.)). 1: The next positioning starts after positioning is executed with Profile velocity (Class ID: 64h, Ins ID: 6081h, Attr ID: 0) held up to the current set-point. (gray line (Refer to (5) of this section.)).

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

Bit	Symbol	Description
10	Target reached	0 (Halt (Bit 8) = 0): Target position not reached. 0 (Halt (Bit 8) = 1): Axis decelerates 1 (Halt (Bit 8) = 0): Target position reached. 1 (Halt (Bit 8) = 1): Velocity of axis is 0 Judgement condition for Target position reached If the error between Actual position and Target position (Class ID: 64h, Ins ID: 607Ah, Attr ID: 0) has stayed within Position window (Class ID: 64h, Ins ID: 6067h, Attr ID: 0) for Position window time (Class ID: 64h, Ins ID: 6068h, Attr ID: 0) or more, Target position reached is stored.
12	Set-point acknowledge	0: Positioning completed (wait for next command) 1: Positioning being executed (The set-point can be overwritten.)
13	Following error	0: No following error 1: Following error

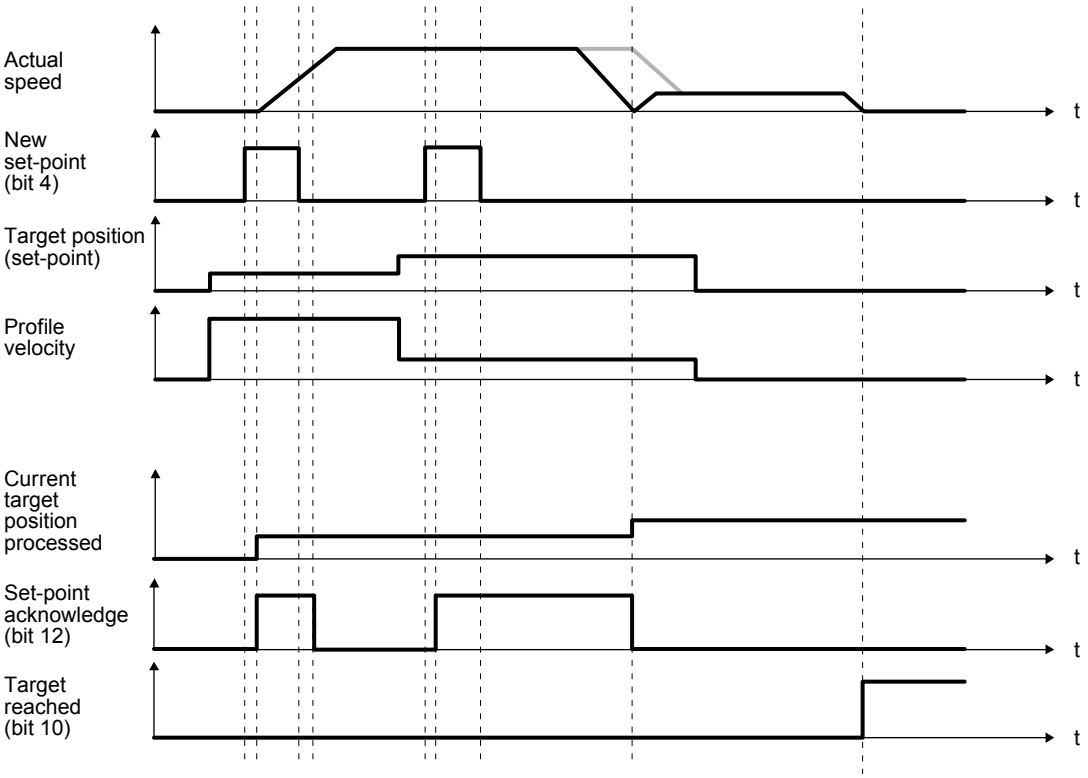
(4) Single Set-point

Update of positioning parameters during a positioning operation is immediately accepted. (The current positioning operation is cancelled and the next positioning is started.)



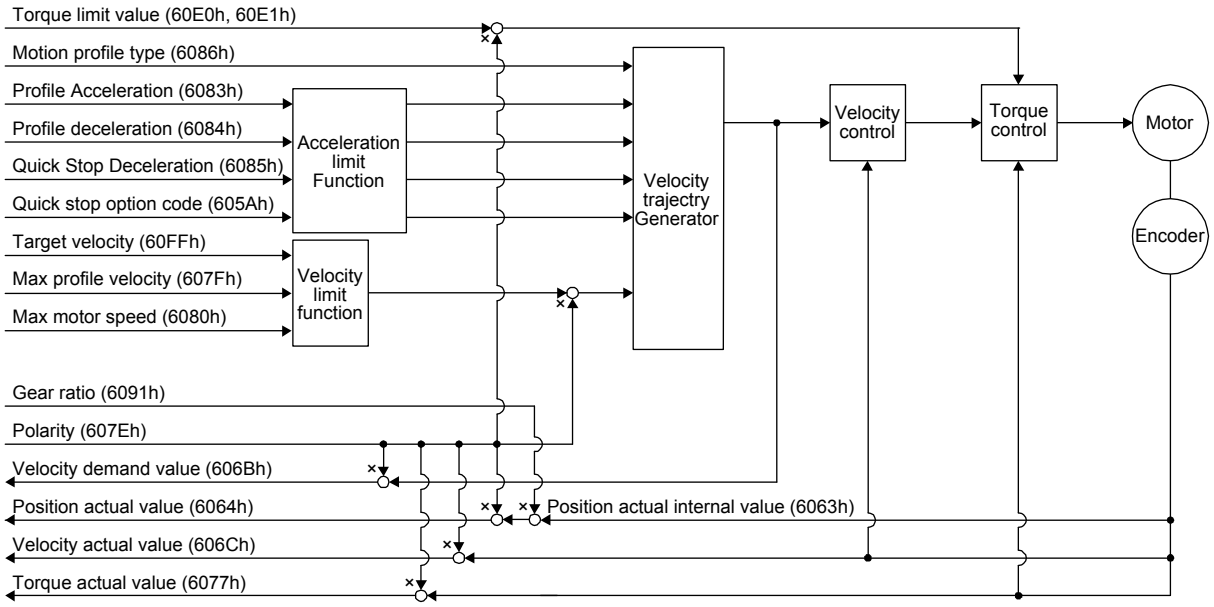
(5) Set of set-points

After the current positioning operation is completed, the next positioning is started. Whether positioning is stopped at the first positioning point when at an update of the positioning parameter before completion of the positioning can be switched. To switch the setting, use Change on set-point (Bit 9 of Controlword).



5.4.4 Profile velocity mode (pv)

The following shows the functions and related objects of the profile velocity mode (pv).



(1) Related object

Class ID	Ins ID	Attr ID	Access	Name	Data Type	Default	Description
64h	60FFh	0	Get/Set	Target velocity	DINT		Command speed Unit: Vel unit (0.01 r/min or 0.01 mm/s)
	607Fh	0	Get/Set	Max profile velocity	UDINT	2000000	maximum speed Unit: Vel unit (0.01 r/min or 0.01 mm/s)
	6080h	0	Get/Set	Max motor speed	UDINT		Servo motor maximum speed Unit: r/min
	6083h	0	Get/Set	Profile Acceleration	UDINT	0	Acceleration at start of movement to target position Unit: ms
	6084h	0	Get/Set	Profile deceleration	UDINT	0	Deceleration at arrival at target position Unit: ms
	6085h	0	Get/Set	Quick stop deceleration	UDINT	100	Deceleration at deceleration to a stop by Quick stop Unit: ms
	6086h	0	Get/Set	Motion profile type	INT	0	Acceleration/deceleration type selection -1: S-pattern 0: Linear ramp (not supported) (Note) 1: Sin^2 ramp (not supported) (Note) 2: Jerk-free ramp (not supported) (Note) 3: Jerk-limited ramp (not supported) (Note)
	605Ah	0	Get/Set	Quick stop option code	INT	2	Operation setting for Quick stop Refer to section 5.6.
	6063h	0	Get	Position actual internal value	DINT		Current position (Enc inc)
	6064h	0	Get	Position actual value	DINT		Current position (Pos units)

Class ID	Ins ID	Attr ID	Access	Name	Data Type	Default	Description
64h	606Bh	0	Get	Velocity demand value	DINT		Speed command (after trajectory generation)
	606Ch	0	Get	Velocity actual value	DINT		Current speed Unit: Vel unit (0.01 r/min or 0.01 mm/s)
	6077h	0	Get	Torque actual value	DINT		Current torque Unit: 0.1% (rated torque of 100%)
	6092h	0	Get	Feed constant	USINT	2	Travel distance per revolution of an output shaft
		1	Get/Set	Feed	UDINT		Travel distance Refer to section 7.3.14 (4).
		2		Shaft revolutions			Number of servo motor shaft revolutions Refer to section 7.3.14 (4).
	60E0h	0	Get/Set	Positive torque limit value	UINT	10000	Torque limit value (forward) Unit: 0.1% (rated torque of 100%)
	60E1h	0	Get/Set	Negative torque limit value	UINT	10000	Torque limit value (reverse) Unit: 0.1% (rated torque of 100%)
	6091h	0	Get	Gear ratio	USINT	2	Gear ratio
		1	Get/Set	Motor revolutions	UDINT	1	Number of revolutions of the servo motor axis (numerator)
		2		Shaft revolutions		1	Number of revolutions of the drive axis (denominator)
	607Eh	0	Get/Set	Polarity	USINT	0	Polarity selection Bit 7: Position POL Bit 6: Velocity POL Bit 5: Torque POL Refer to section 5.10.
	606Dh	0	Get/Set	Velocity window	UINT	2000	Speed error threshold for judging Target reached Unit: 0.01 r/min or 0.01 mm/s
	606Eh	0	Get/Set	Velocity window time	UINT	0	Target reached judgement time Unit: ms
	606Fh	0	Get/Set	Velocity threshold	UINT	5000	Zero speed threshold for judging Speed Unit: 0.01 r/min or 0.01 mm/s
	6070h	0	Get/Set	Velocity threshold time	UINT	10	Speed judgement time Unit: ms
	60A8h (Note 2)	0	Get/Set	SI unit position	UDINT	0	SI unit position The value is automatically set according to the setting of "Position data unit" of [Pr. PT01]. Refer to section 7.3.14 (5).
	60A9h (Note 2)	0	Get/Set	SI unit velocity	UDINT	0	SI unit velocity 0.01 r/min or 0.01 mm/s FB010300h (0.01 mm/s) FEB44700h (0.01 r/min)

Note. This is not supported by the MR-J4-_TM_ servo amplifier.

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

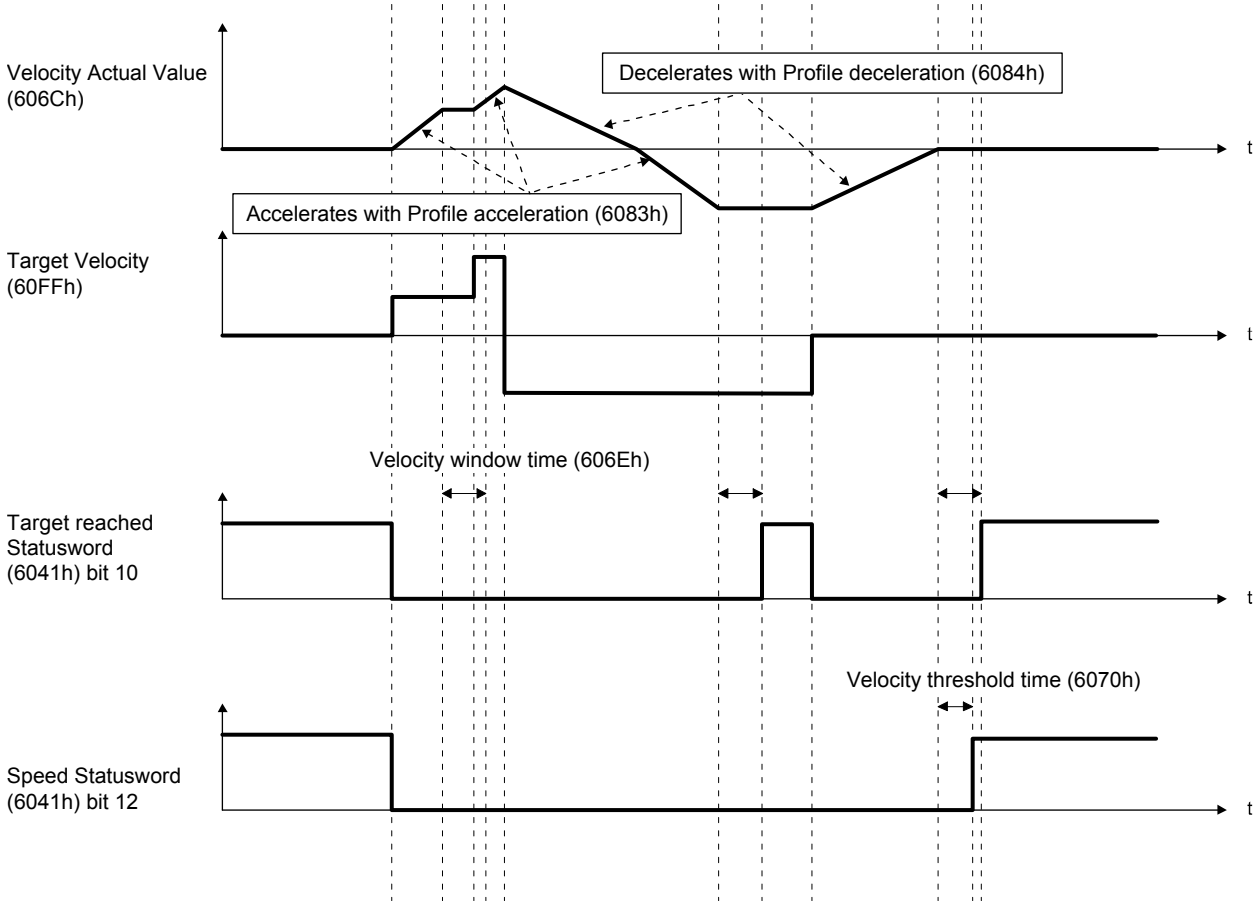
Bit	Symbol	Description
4	(reserved)	The value at reading is undefined. Set "0" at writing.
5	(reserved)	
6	(reserved)	
8	HALT	0: The servo motor is driven. 1: The servo motor is stopped according to Halt option code (Class ID: 64h, Ins ID: 605Dh, Attr ID: 0).
9	(reserved)	The value at reading is undefined. Set "0" at writing.

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

Bit	Symbol	Description
10	Target reached	0 (Halt (Bit 8) = 0): Target velocity not reached. 0 (Halt (Bit 8) = 1): Axis decelerates 1 (Halt (Bit 8) = 0): Target velocity reached. 1 (Halt (Bit 8) = 1): Velocity of axis is 0 Judgement condition for Target velocity reached If the error between Actual velocity and Target velocity (Class ID: 64h, Ins ID: 60FFh, Attr ID: 0) has stayed within Velocity window (Class ID: 64h, Ins ID: 606Dh, Attr ID: 0) for Velocity window time (Class ID: 64h, Ins ID: 606Eh, Attr ID: 0) or more, Target velocity reached is stored.
12	Speed	0: Speed is not equal 0 1: Speed is equal 0 Judgement condition for Speed is not equal 0 If the absolute value of Actual velocity has exceeded Velocity threshold (Class ID: 64h, Ins ID: 606Fh, Attr ID: 0) for Velocity threshold time (Class ID: 64h, Ins ID: 6070h, Attr ID: 0) or more, Speed is not equal 0 is stored.
13	Max slippage error	0: Maximum slippage not reached 1: Maximum slippage reached (not supported) (Note) Max slippage is a maximum slippage of the asynchronous servo motor.

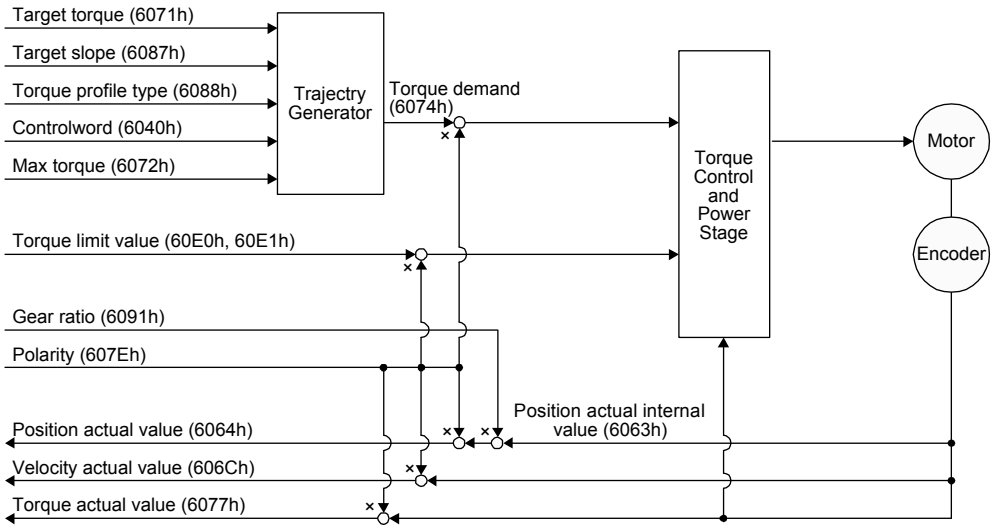
Note. This is not supported by the MR-J4-_TM_ servo amplifier.

(4) pv mode operation sequence



5.4.5 Profile torque mode (tq)

The following shows the functions and related objects of the profile torque mode (tq).



(1) Related object

Class ID	Ins ID	Attr ID	Access	Name	Data Type	Default	Description
64h	6040h	0	Get/Set	Controlword	UINT		Common control command
	6071h	0	Get/Set	Target torque	INT		Command torque Unit: 0.1% (rated torque of 100%)
	6072h	0	Get/Set	Max torque	UINT		Maximum torque Unit: 0.1% (rated torque of 100%)
	6074h	0	Get	Torque demand	INT		Command torque (after limit) Unit: 0.1% (rated torque of 100%)
	6087h	0	Get/Set	Torque slope	UDINT	0	Torque variation Unit: 0.1%/s (rated torque of 100%)
	6088h	0	Get/Set	Torque profile type	UDINT	0	Torque variation pattern 0000h: Linear ramp 0001h: Sin^2 ramp (not supported) (Note) 0002h to 7FFFh: reserved 8000h to FFFFh: Manufacturer specific
	6063h	0	Get	Position actual internal value	DINT		Current position (Enc inc)
	6064h	0	Get	Position actual value	DINT		Current position (Pos units)
	606Ch	0	Get	Velocity actual value	DINT		Current speed Unit: Vel unit (0.01 r/min or 0.01 mm/s)
	6077h	0	Get	Torque actual value	DINT		Current torque Unit: 0.1% (rated torque of 100%)
	6092h	0	Get	Feed constant	USINT	2	Travel distance per revolution of an output shaft
		1	Get/Set	Feed	UDINT		Travel distance Refer to section 7.3.14 (4).
		2		Shaft revolutions			Number of servo motor shaft revolutions Refer to section 7.3.14 (4).

Class ID	Ins ID	Attr ID	Access	Name	Data Type	Default	Description
64h	60E0h	0	Get/Set	Positive torque limit value	UINT	10000	Torque limit value (forward) Unit: 0.1% (rated torque of 100%)
	60E1h	0	Get/Set	Negative torque limit value	UINT	10000	Torque limit value (reverse) Unit: 0.1% (rated torque of 100%)
	6091h	0	Get	Gear ratio	USINT	2	Gear ratio
		1	Get/Set	Motor revolutions	UDINT	1	Number of revolutions of the servo motor axis (numerator)
		2		Shaft revolutions		1	Number of revolutions of the drive axis (denominator)
	607Eh	0	Get/Set	Polarity	USINT	0	Polarity selection Bit 7: Position POL Bit 6: Velocity POL Bit 5: Torque POL Refer to section 5.10.
	2D20h	0	Get/Set	Velocity limit value	DINT	5000	Speed limit value Unit: Vel unit (0.01 r/min or 0.01 mm/s)
	60A8h	0	Get/Set	SI unit position	UDINT	0	SI unit position The value is automatically set according to the setting of "Position data unit" of [Pr. PT01]. Refer to section 7.3.14 (5).
	60A9h	0	Get/Set	SI unit velocity	UDINT	0	SI unit velocity 0.01 r/min or 0.01 mm/s FB010300h (0.01 mm/s) FEB44700h (0.01 r/min)

Note. This is not supported by the MR-J4-_TM_ servo amplifier.

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

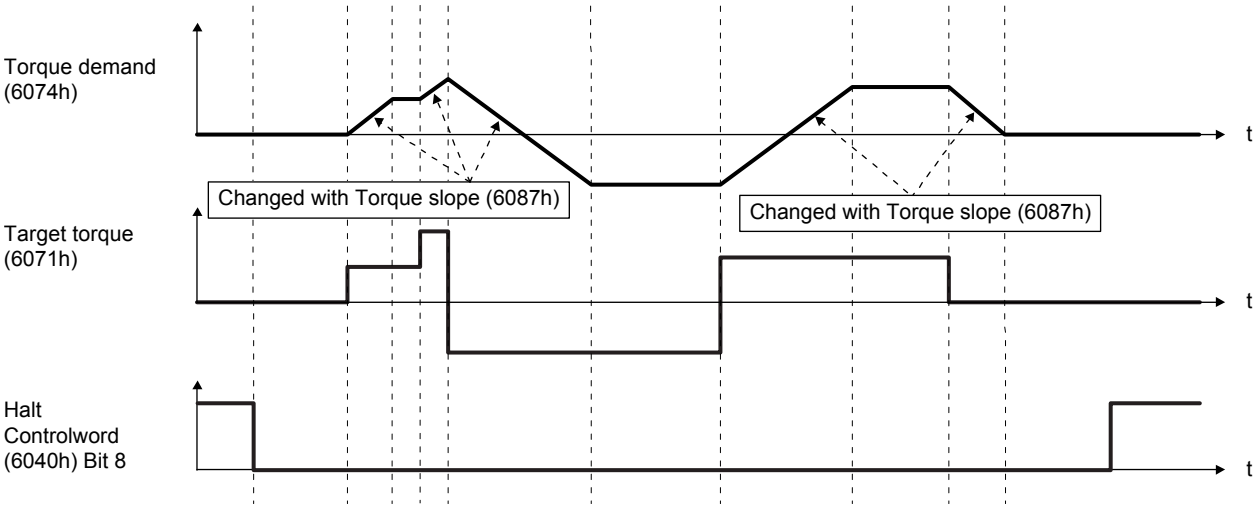
Bit	Symbol	Description
4	(reserved)	The value at reading is undefined. Set "0" at writing.
5	(reserved)	
6	(reserved)	
8	HALT	0: The servo motor is driven. 1: The servo motor is stopped according to Halt option code (Class ID: 64h, Ins ID: 605Dh, Attr ID: 0).
9	(reserved)	The value at reading is undefined.

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

Bit	Symbol	Description
10	Target reached (not supported) (Note)	0 (Halt (Bit 8) = 0): Target torque not reached. 0 (Halt (Bit 8) = 1): Axis decelerates 1 (Halt (Bit 8) = 0): Target torque reached. 1 (Halt (Bit 8) = 1): Velocity of axis is 0 Judgement condition for Target torque reached If the error between Auctual torque and Target torque (Class ID: 64h, Ins ID: 6071h, Attr ID: 0) has stayed within Torque window for Torque window time or more, Target torque reached is stored.
12	(reserved)	The value at reading is undefined.
13	(reserved)	

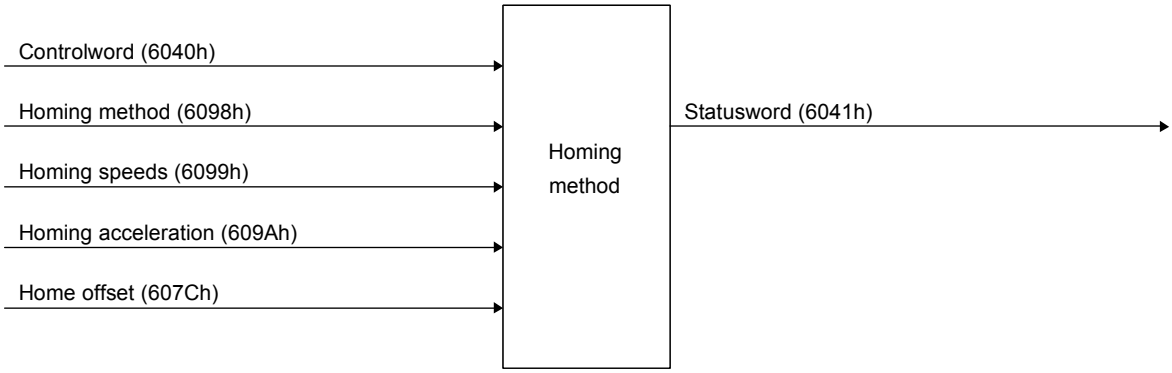
Note. This is not supported by the MR-J4-_TM_ servo amplifier.

(4) tq mode operation sequence



5.4.6 Homing mode (hm)

The following shows the function and related objects of the homing mode (hm).



(1) Related object

Class ID	Ins ID	Attr ID	Access	Name	Data Type	Default	Description
64h	607Ch	0	Get	Home offset	DINT		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	Get/Set	Homing Method	SINT	-1	Specify a home position return type. Refer to (4) in this section for supported home position return types.
	6099h	0	Get/Set	Homing Speeds	USINT	2	Number of entries of the home position return speed
		1	Get/Set	Speed during search for switch	UDINT	10000	Specify the travel speed until dog detection. Unit: Vel unit (0.01 r/min or 0.01 mm/s) Range: 0 to servo motor maximum speed
		2	Get/Set	Speed during search for zero	UDINT	1000	Specify the travel speed up 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	Get/Set	Homing acceleration	UDINT	0	Acceleration/deceleration time constant at home position return Unit: ms
	60E3h	0	Get	Supported Homing Method	USINT	39	Number of entries of the supported home position return type
		1	Get	1st supported homing method	SINT	37	The home position return type that uses the current position as a home position is supported.
		to					
		39	Get	39th supported homing method	SINT	-43	The dogless Z-phase reference home position return type (reverse rotation) is supported.

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.

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

Bit	Symbol	Description
4	HOS	Homing operation start 0: Do not start homing procedure 1: Start or continue homing procedure
5	(reserved)	The value at reading is undefined. Set "0" at writing.
6	(reserved)	
8	HALT	Halt 0: Bit 4 enable 1: Stop axis according to halt option code (Class ID: 64h, Ins ID: 605Dh, Attr ID: 0)
9	(reserved)	The value at reading is undefined. Set "0" at writing.

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

POINT

●When the mode is switched to the hm mode after home position return completion, Statusword 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 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, note the following. (when the communication cycle of 4 ms or less is set)
・When the mode is switched to the hm mode, Modes of operation display is changed to 6 (hm) and Statusword changes at the same time.
・The status change of Statusword may take 50 ms at a maximum after Bit 4 of Controlword (Homing operation start) is set. To obtain the status of Statusword without any fault, wait 50 ms or more.

●Before updating the position after a home position return completion, check that both Bit 12 and Bit 10 of Statusword are changed to "1" and then wait 8 ms.
If 8 ms has not elapsed, the position information may not be updated correctly depending on the communication cycle setting.

Bit	Symbol	Description
10	Target reached	Refer to the following table for the definition.
12	Homing attained	
13	Homing error	

The following shows the definition of Bit 10, Bit 12, and Bit 13 of Statusword 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

(4) List of Homing method

POINT

●In the following cases, make sure that the Z-phase has been passed through once before the home position return.
- When using an incremental linear encoder in the linear servo motor control mode
- When using an incremental external encoder in the fully closed loop control mode
- For the use in the DD motor control mode

Z-phase unpassed will trigger [AL. 90.5 Z-phase unpassed].

●To execute a home position return securely, start a home position return after moving the servo motor to the opposite stroke end with pv from the controller and others. Whether the servo motor has reached the stroke end can be checked with Digital inputs (Class ID: 64h, Ins ID: 60FDh, Attr ID: 0).

●When changing the mode after the home position return completion, set 0 to the Target position (Class ID: 64h, Ins ID: 607Ah, Attr ID: 0) and change the control mode.

To specify the home position return type in the homing mode (hm), use Homing Method (Class ID: 64h, Ins ID: 6098h, Attr ID: 0). The MR-J4-_TM_ servo amplifier supports Homing method in the following table.

Method No.	Home position return type	Rotation direction	Description
-1	Dog type (Rear 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.
-33		Reverse rotation	
-3	Data set type home position return		The current position is set as the home position.
-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.
-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.
-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.
-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.
-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.
-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.
-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.
-42		Reverse rotation	

Method No.	Home position return type	Rotation direction	Description
-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.
-43		Reverse rotation	
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.
12	Homing on home switch and index pulse	Reverse rotation	Same as the dog cradle type home position return.
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.
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.

Method No.	Home position return type	Rotation direction	Description
35	Homing on current position		The current position is set as the home position. This type can be executed 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 not in the Operational enabled state.

(5) CiA 402-type homing method

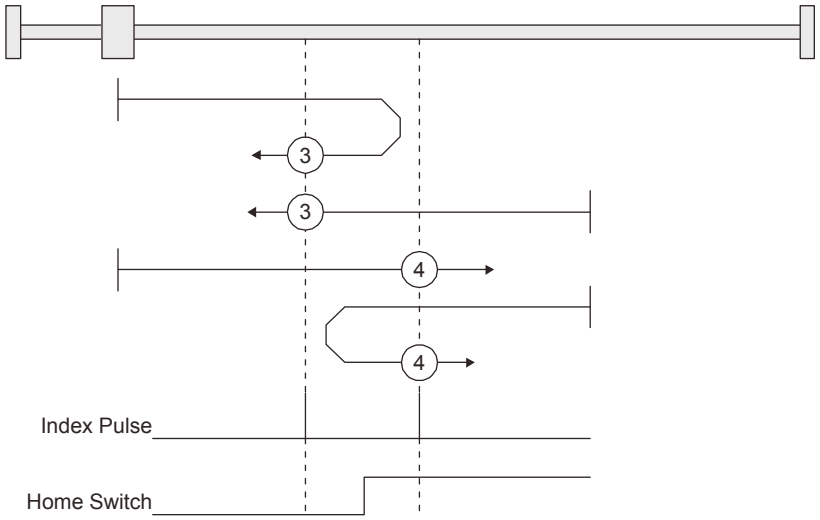
(a) Home position return type in CiA 402 type

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.

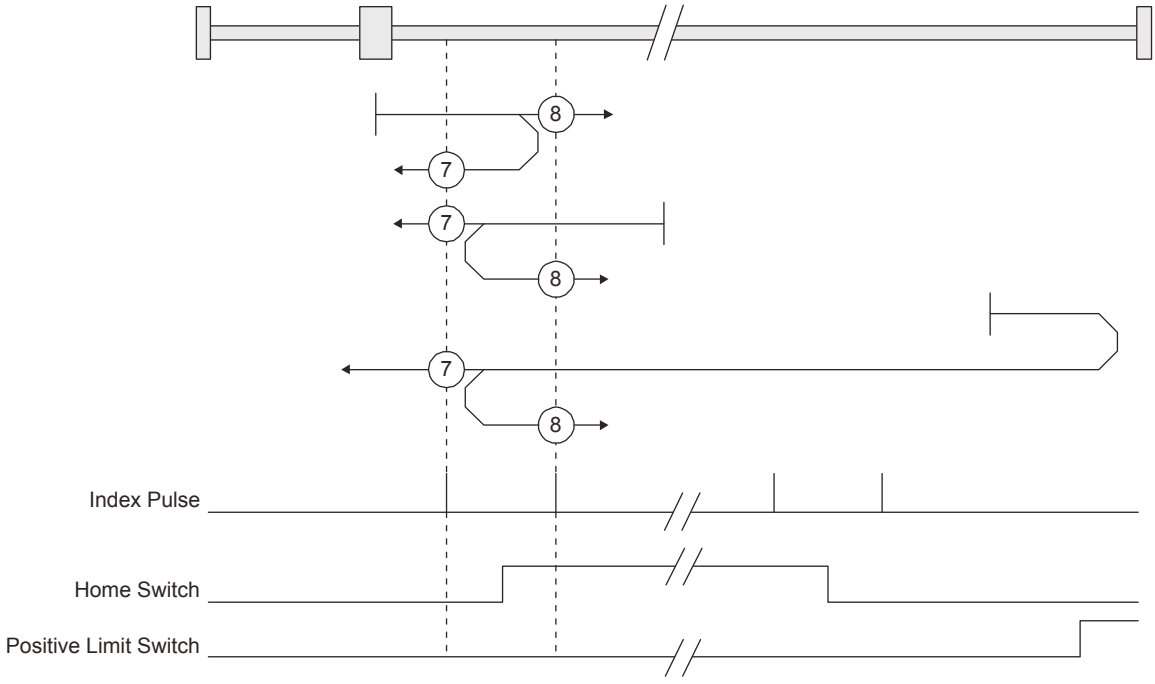
Method 3 has the operation of the dog type last Z-phase reference home position return, and Method 4 has the operation of the dog cradle type home position return at a forward rotation start. However, if the stroke end is detected during home position return, [AL. 90] occurs.



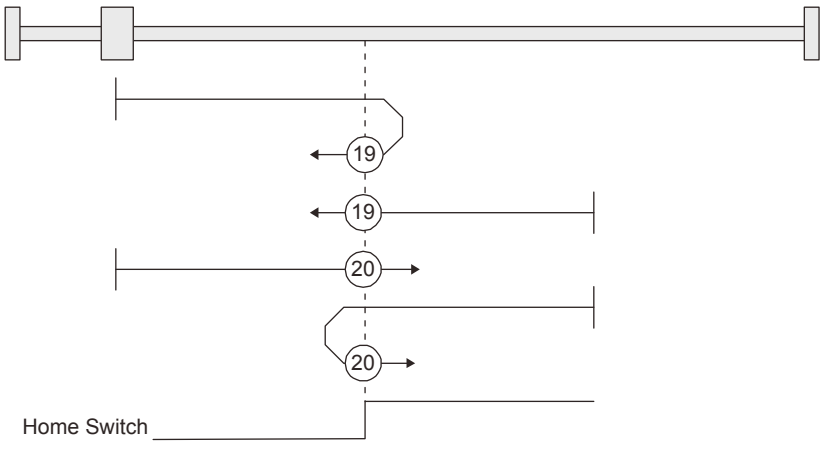
2) Method 5 and 6: Homing on negative home switch and index pulse

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 differ from Method 3 and Method 4 in the starting direction: the starting direction of Method 5 and 6 is the reversed direction.

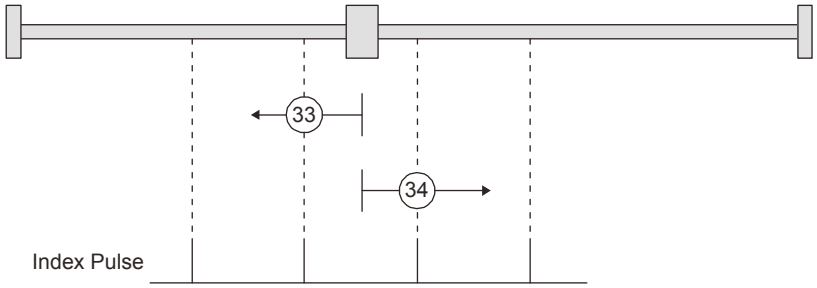
3) Method 7, 8, 11, 12: Homing on home switch and index pulse
These types include the operation at stroke end detection in addition to the operation of Method 3 to Method 6. Thus, the home position is the same as that of Method 3 to Method 6. Method 7 has the operation of the dog type last Z-phase reference 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 differ from Method 7 and Method 8 only in the starting direction: the starting direction of Method 11 and 12 is the reversed direction.



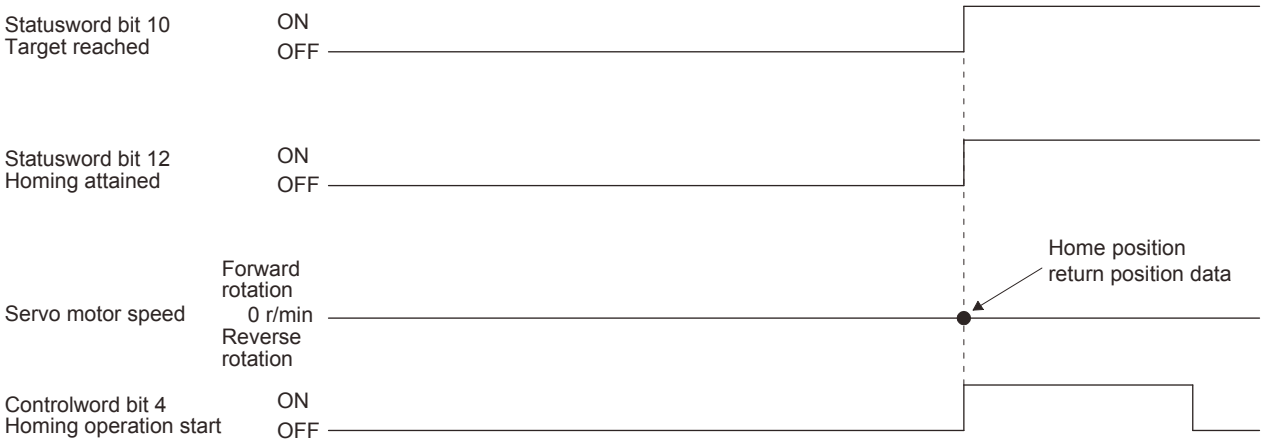
4) Method 17 to 30: Homing without index pulse
Method 17 to 30 have the operation of Method 1 to Method 14; however, these types set the home position not on the Z-phase but on the dog. Method 17 to 30 have the operation of Method 1 to Method 14; however, these types set the home position not on the Z-phase but on the dog. 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 not on the Z-phase but on the dog 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 not on the Z-phase but on the dog.



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.

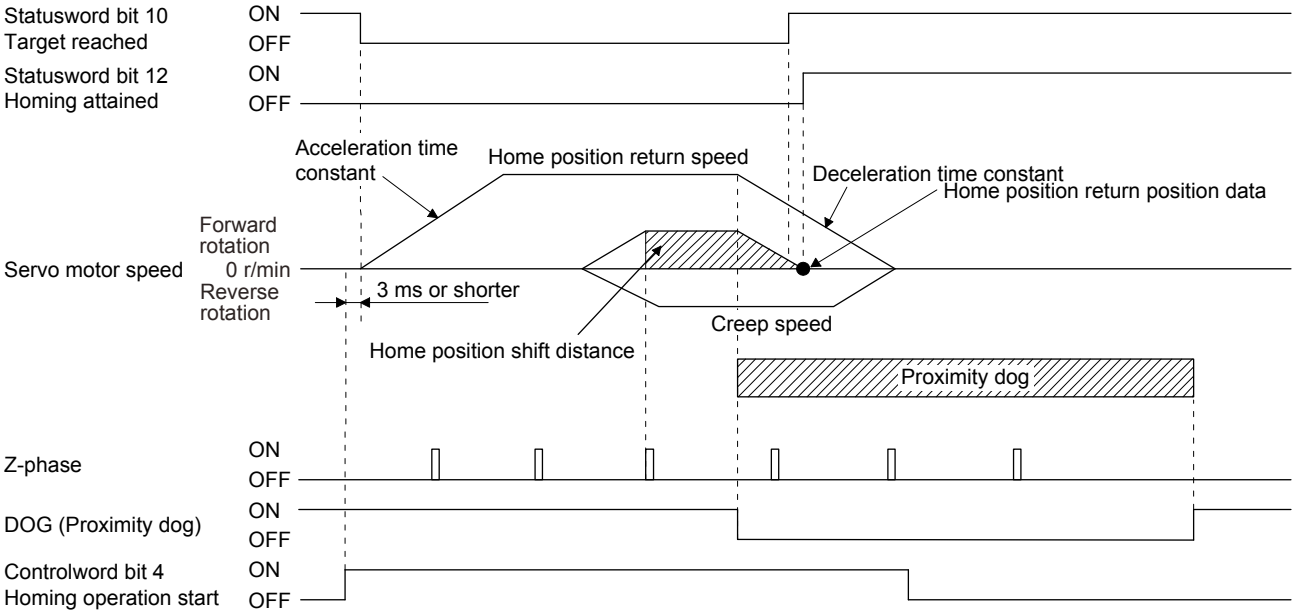


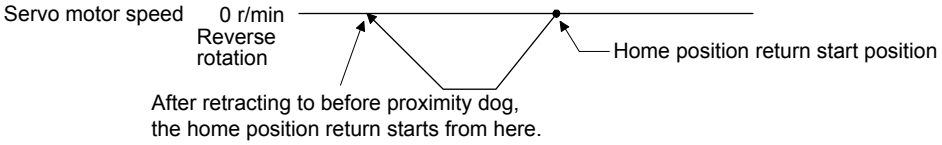
(b) Operation example of the CiA 402-type Homing method

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

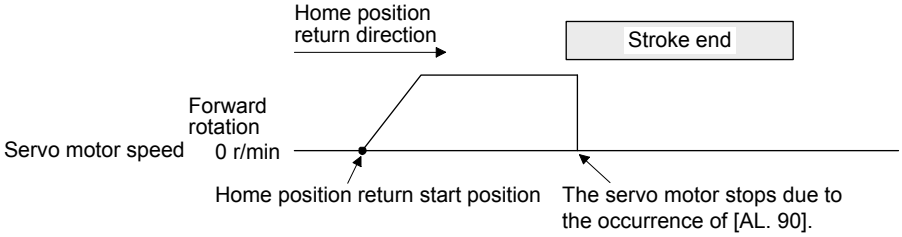
1) Method 3 (Homing on positive home switch and index pulse) and Method 5 (Homing on negative home switch and index pulse)

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.



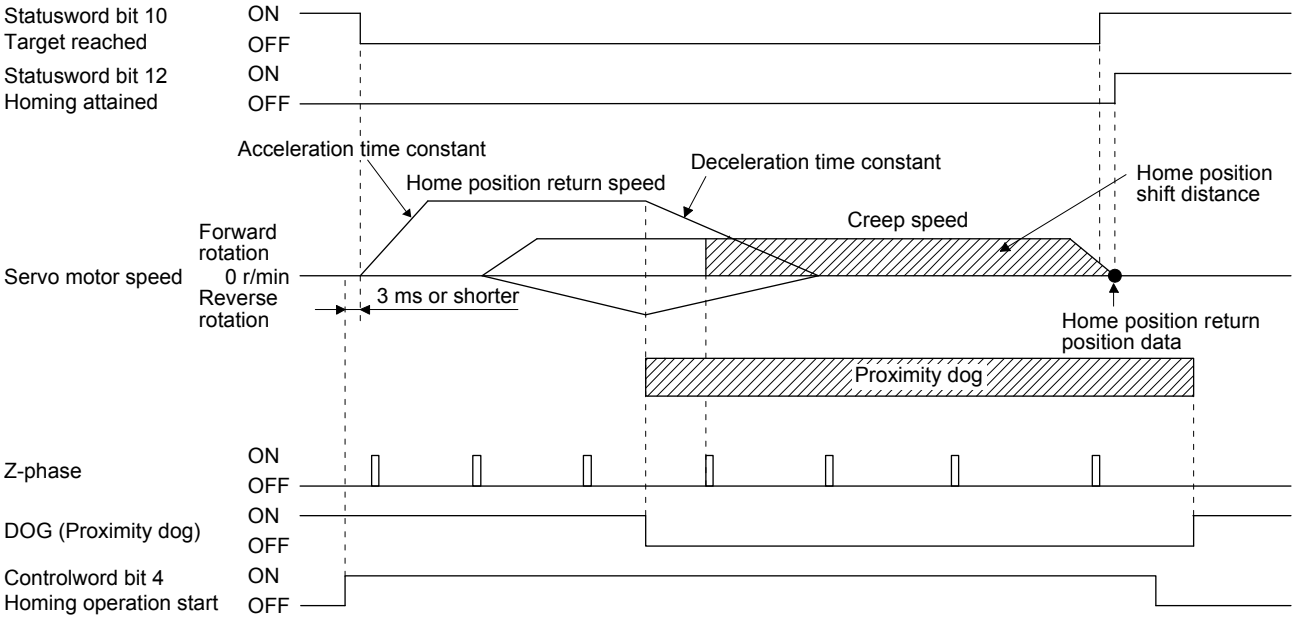


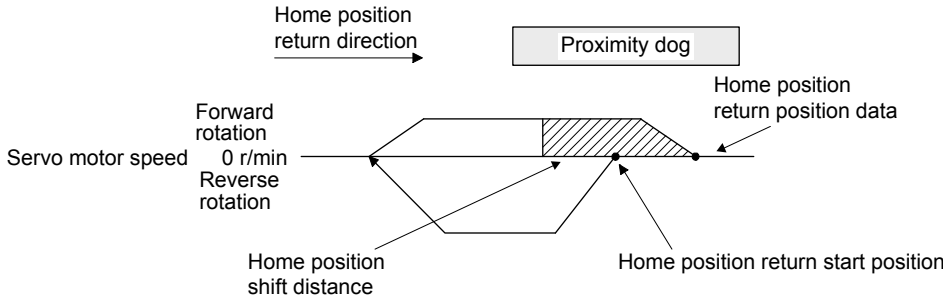
When a home position return is started from the proximity dog



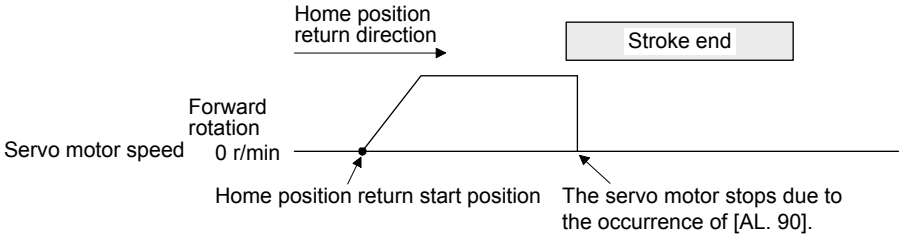
When the stroke end is detected

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.



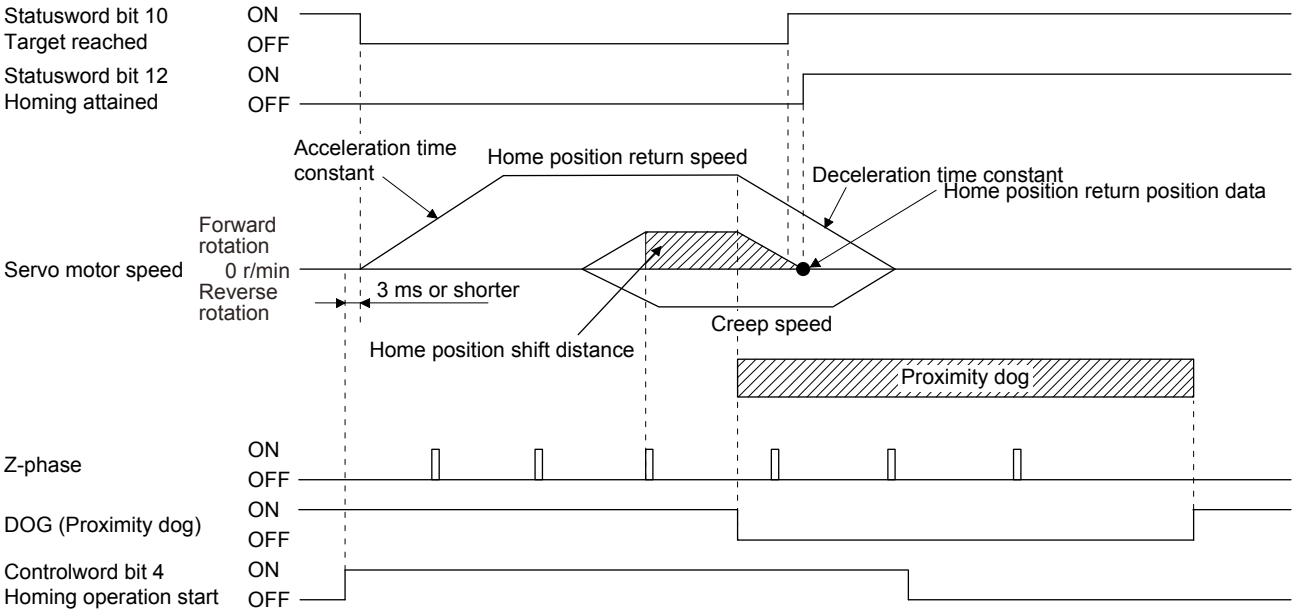


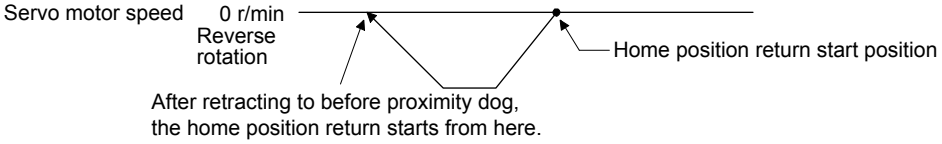
When a home position return is started from the proximity dog



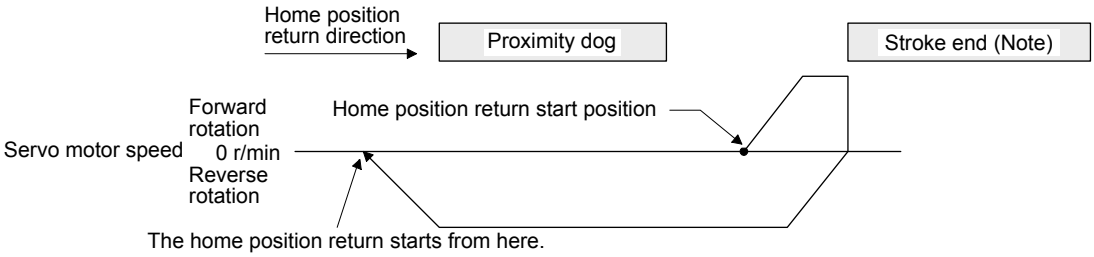
When the stroke end is detected

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.





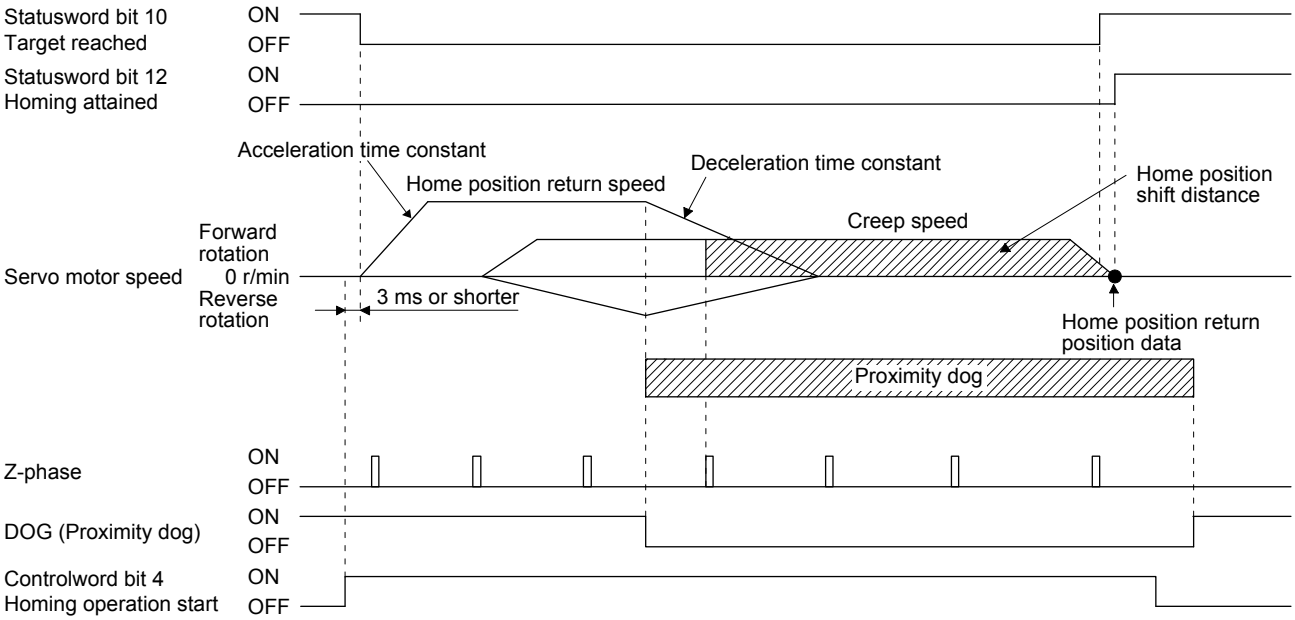
When a home position return is started from the proximity dog

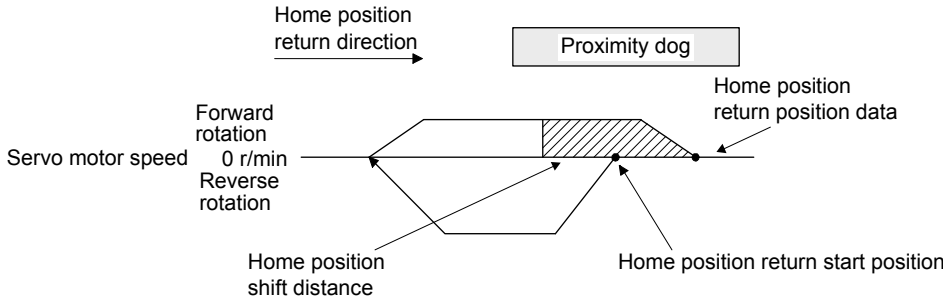


Note. The software limit cannot be used with these functions.

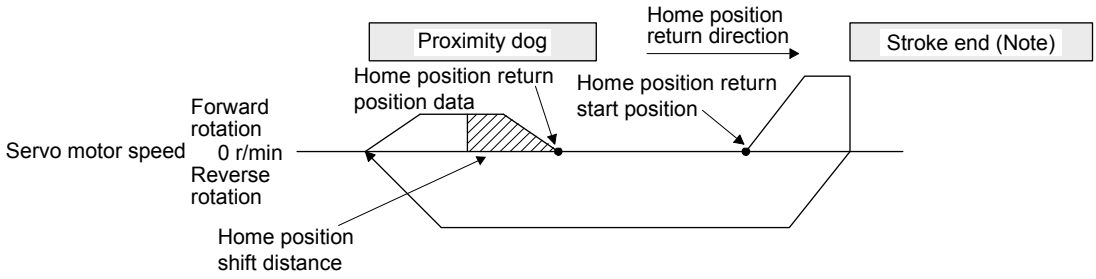
When the movement is returned at the stroke end

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.





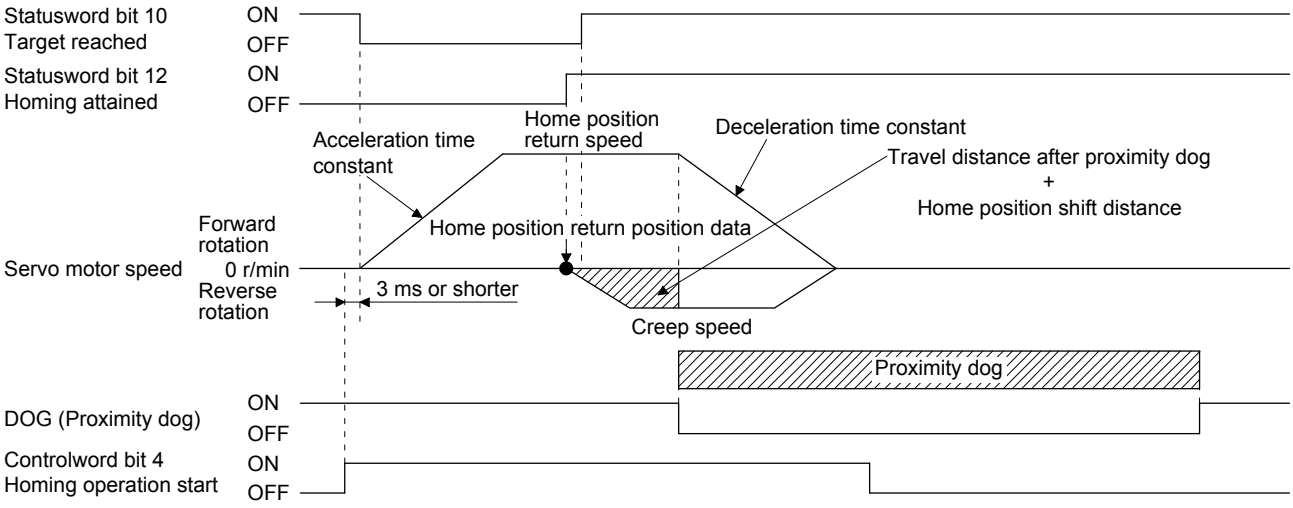
When a home position return is started from the proximity dog

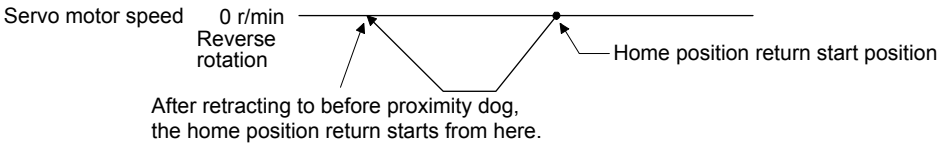


Note. The software limit cannot be used with these functions.

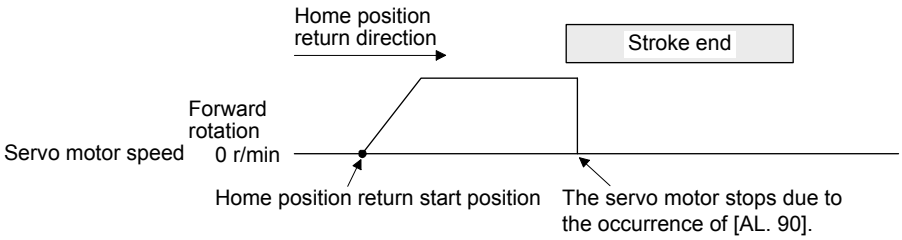
When the movement is returned at the stroke end

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.



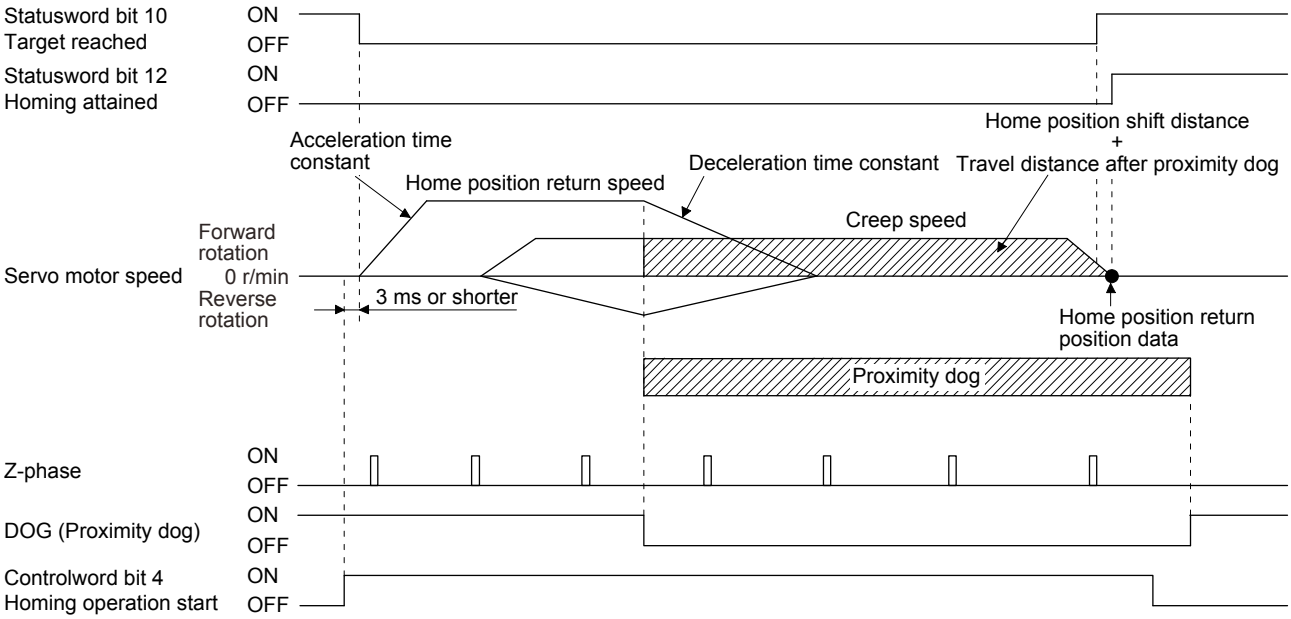


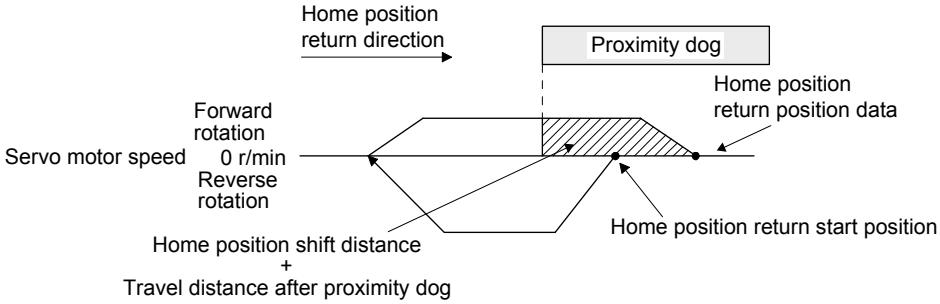
When a home position return is started from the proximity dog



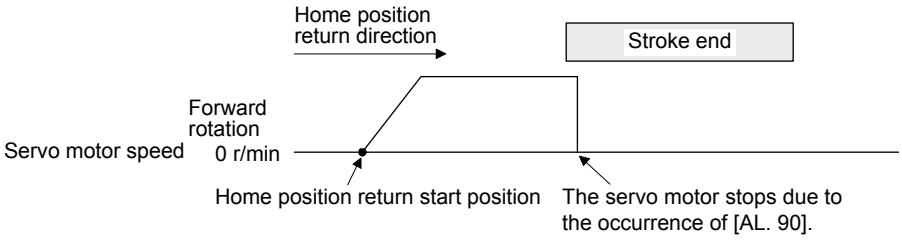
When the stroke end is detected

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.



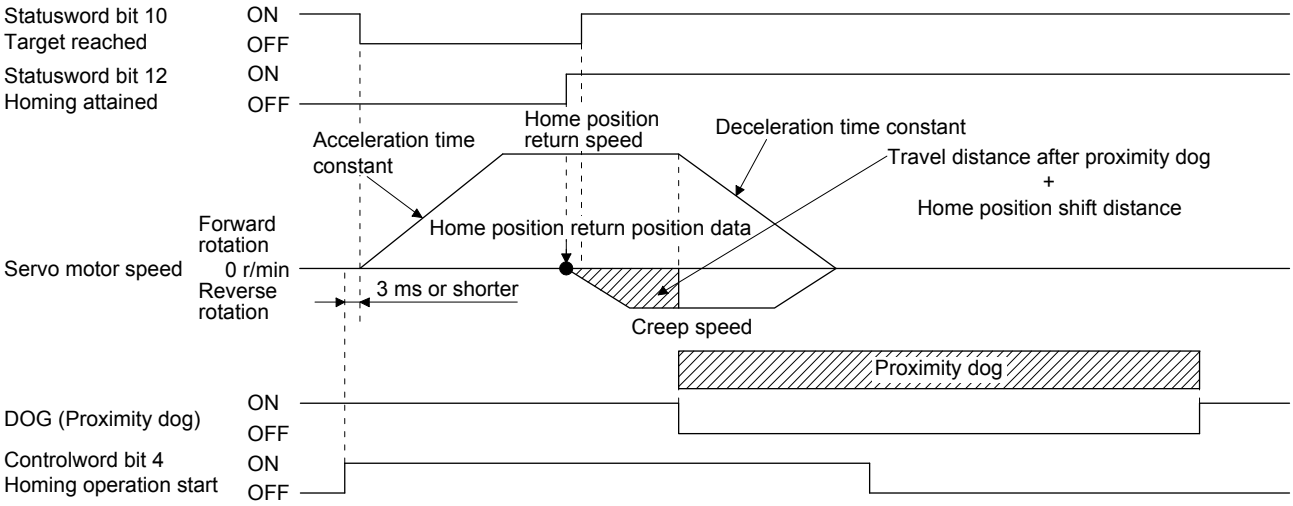


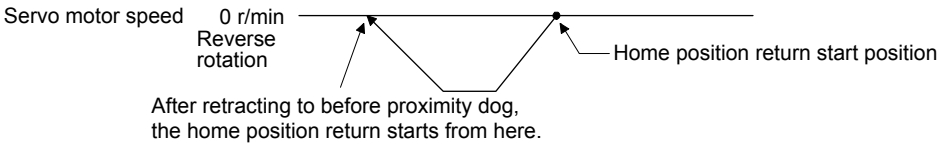
When a home position return is started from the proximity dog



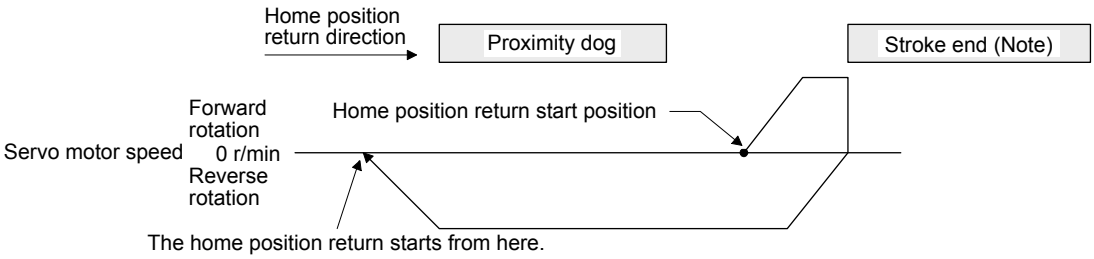
When the stroke end is detected

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.





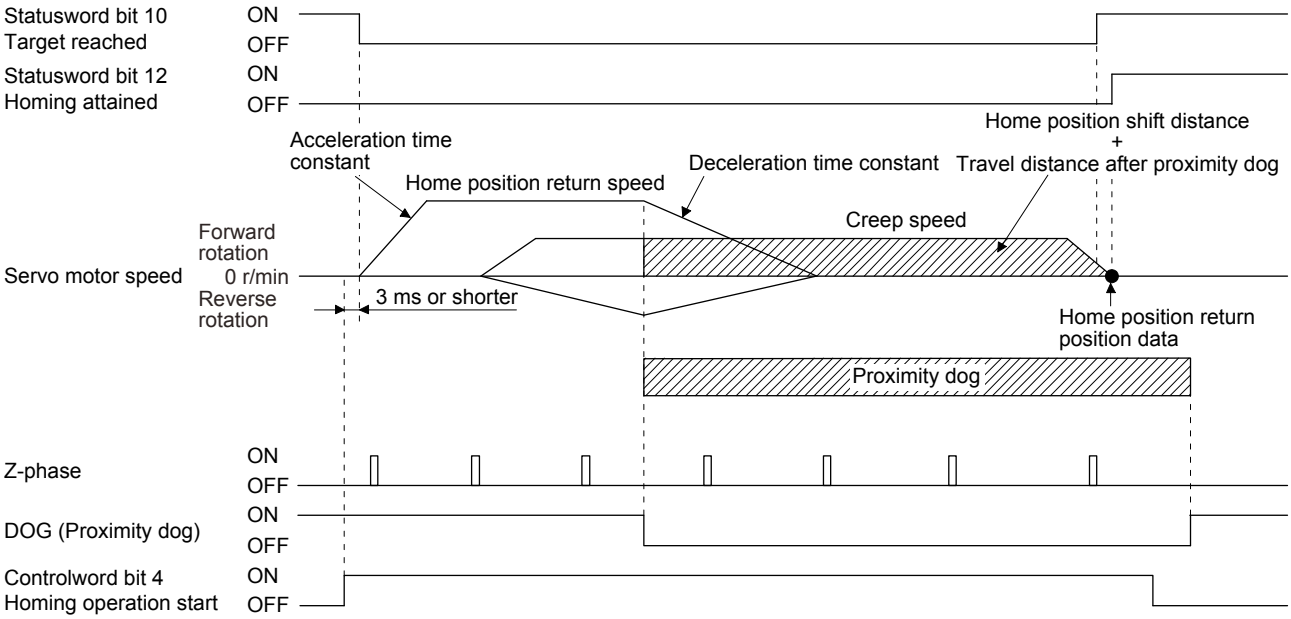
When a home position return is started from the proximity dog

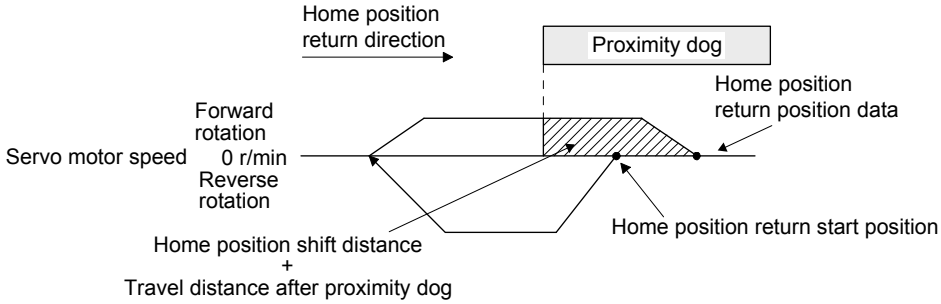


Note. The software limit cannot be used with these functions.

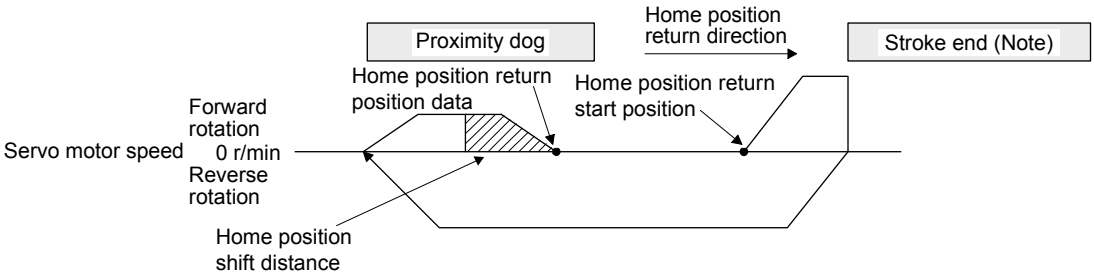
When the movement is returned at the stroke end

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.





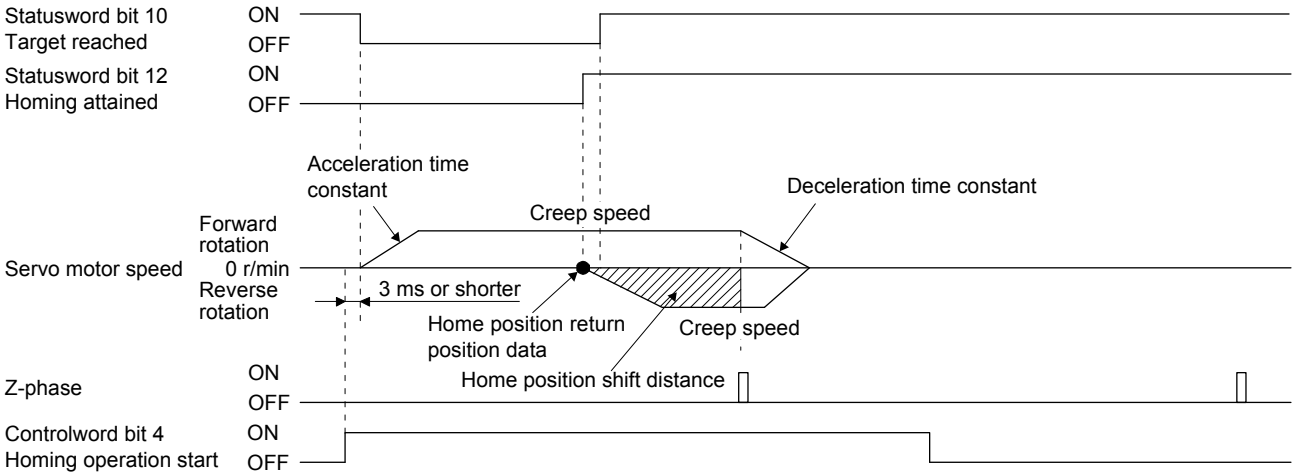
When a home position return is started from the proximity dog

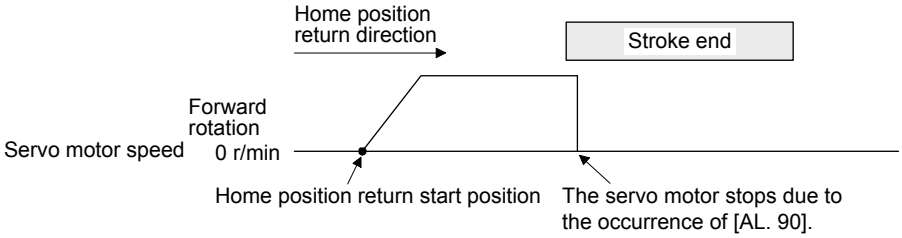


Note. The software limit cannot be used with these functions.

When the movement is returned at the stroke end

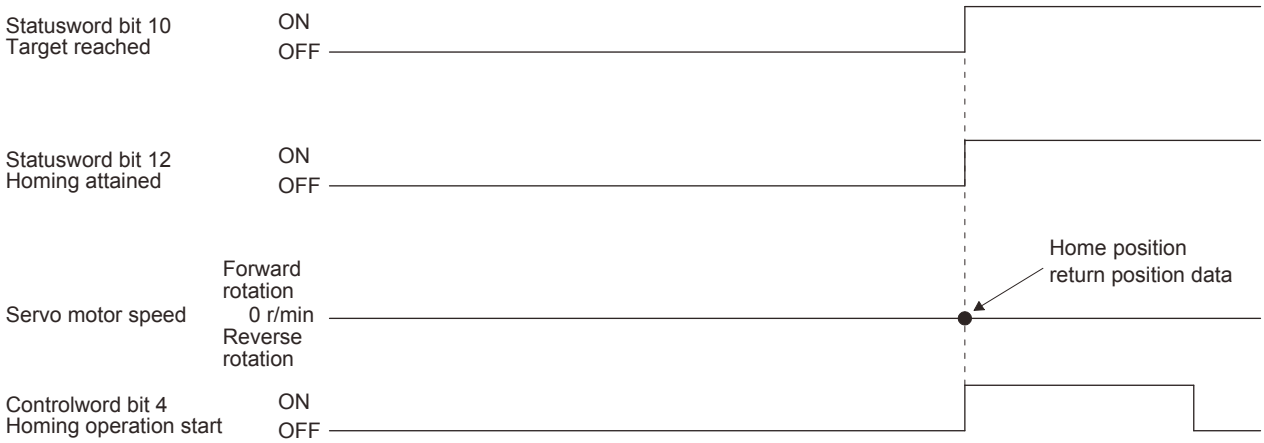
9) Method 33 and Method 34 (Homing on index pulse)
The following figure shows the operation of Homing method 34. The operation direction of Homing method 33 is opposite to that of Homing method 34.





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.

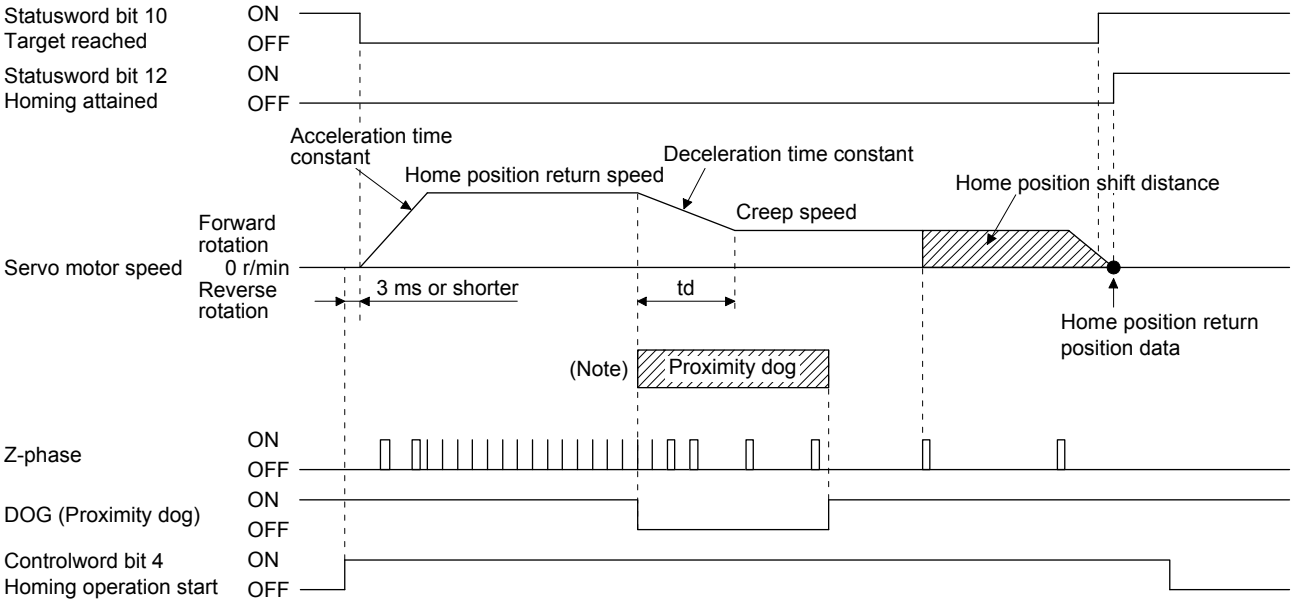


(6) Operation example of Manufacturer-specific Homing method

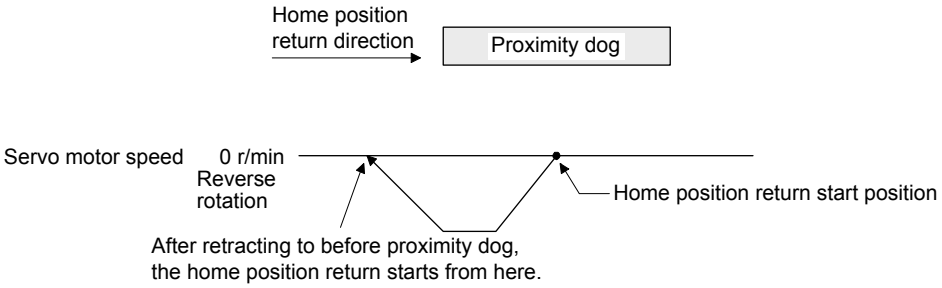
The following shows an operation example of the Manufacturer-specific home return.

(a) Method -1 and -33 (Dog type home position return)

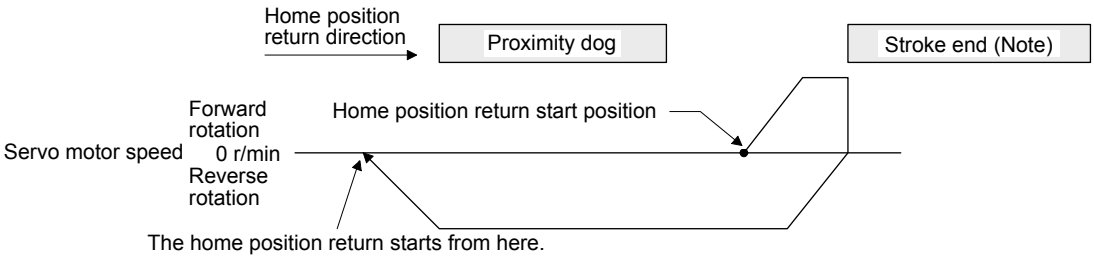
The following figure shows the operation of Homing method -1. The operation direction of Homing method -33 is opposite to that of Homing method -1.



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 deceleration from the home position return speed to the creep speed.



When a home position return is started from the proximity dog



Note. The software limit cannot be used with these functions.

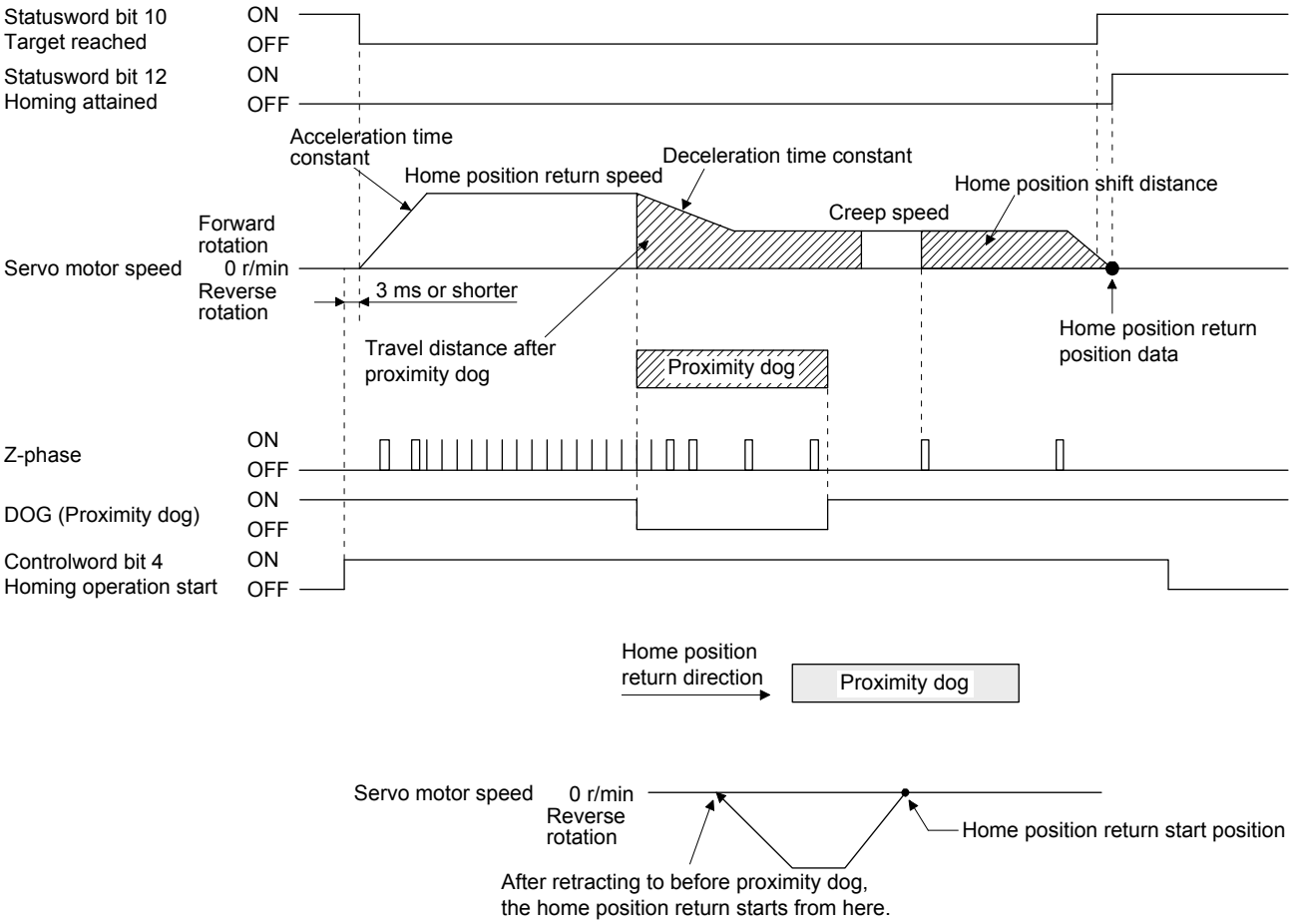
When the movement is returned at the stroke end

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

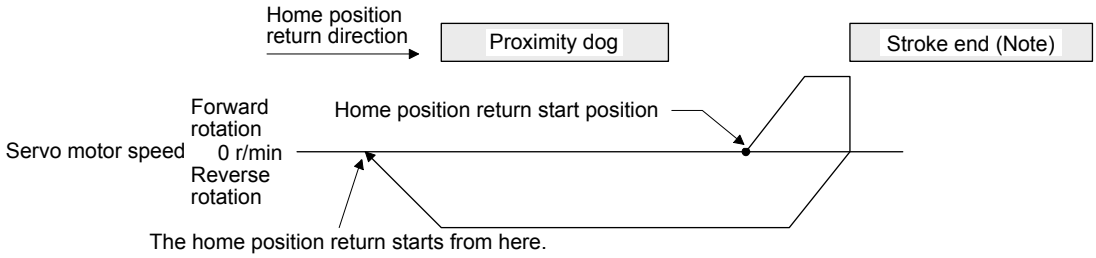
POINT

●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. 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 deceleration from the home position return speed to the creep speed.



When a home position return is started from the proximity dog

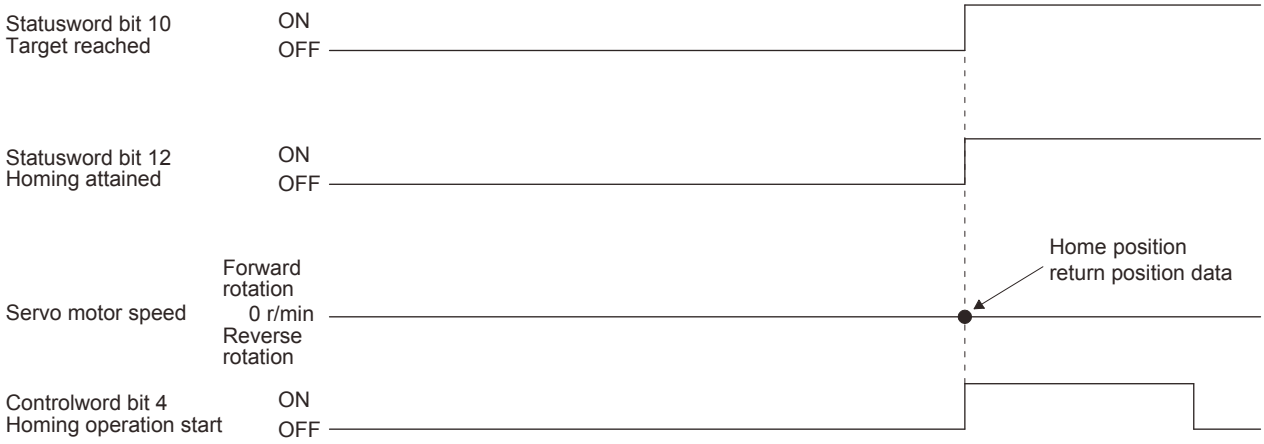


Note. The software limit cannot be used with these functions.

When the movement is returned at the stroke end

(c) Method -3 (Data set type home position return)

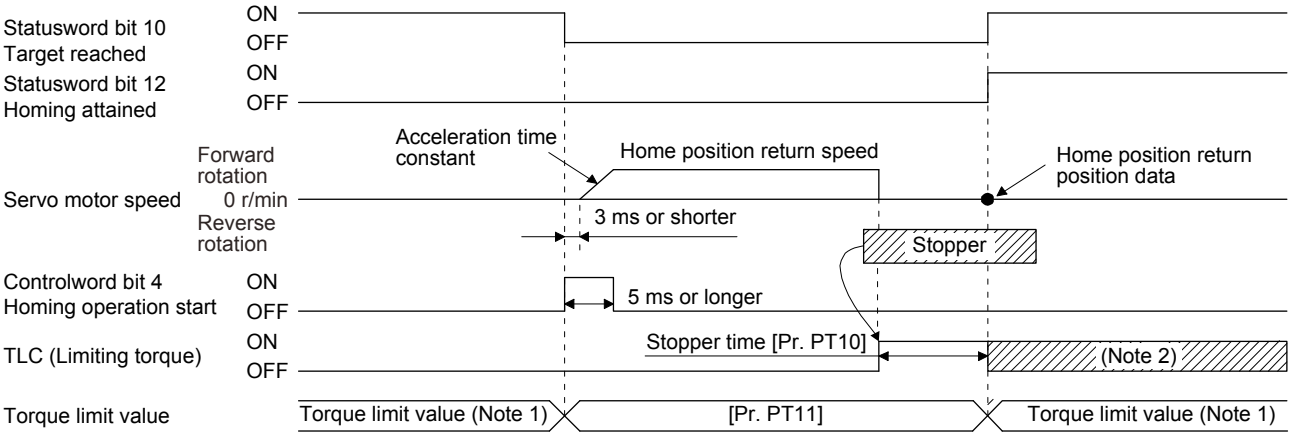
The following figure shows the operation of Homing method -3. This type cannot be executed during servo-off.



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

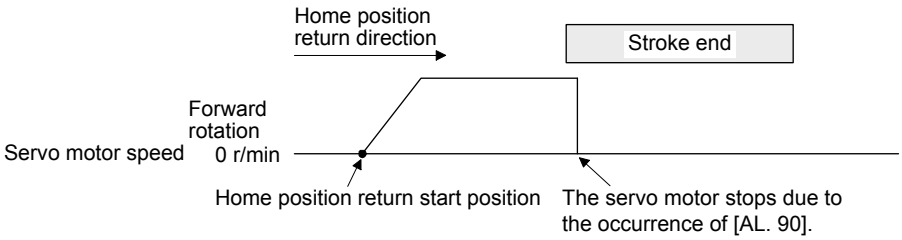
POINT
●Since the workpiece collides with the mechanical stopper, the home position return speed must be low enough.

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

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



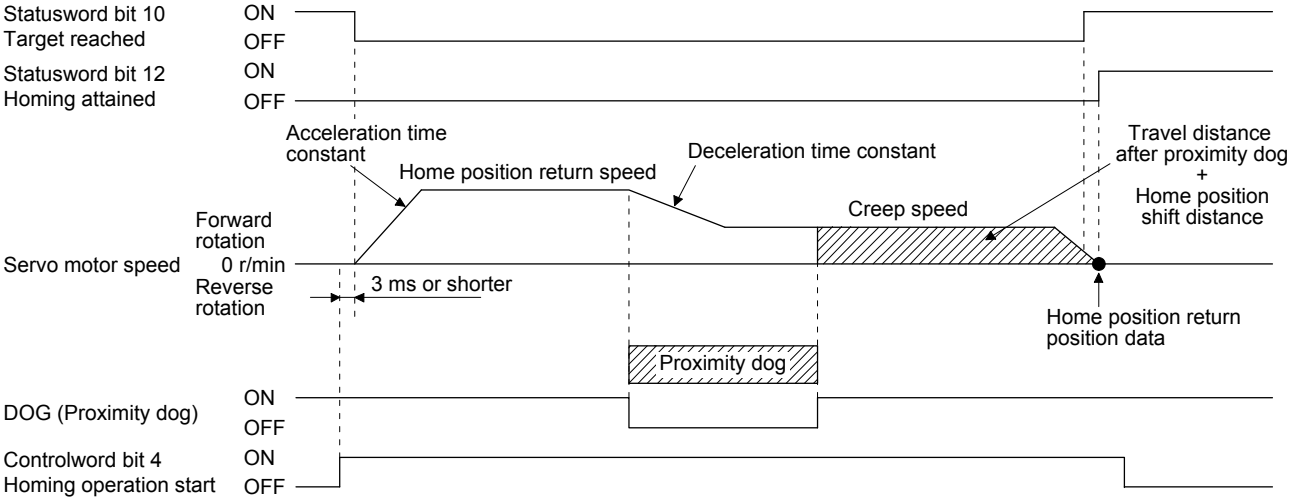
When the stroke end is detected

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

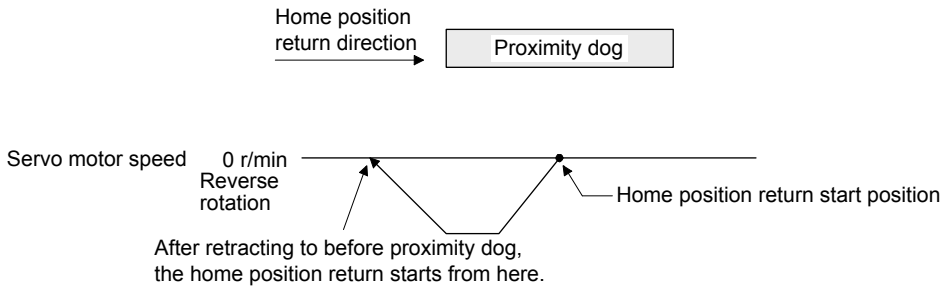
POINT

●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.

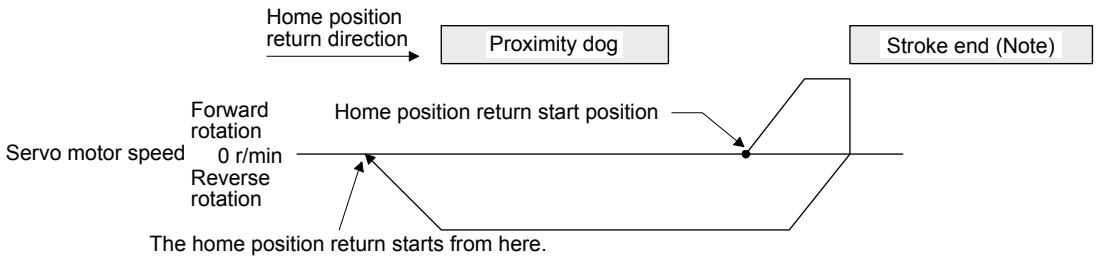
The following figure shows the operation of Homing method -6. The operation direction of Homing method -38 is opposite to that of Homing method -6.



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. Check the length of the proximity dog or check the home position return speed and creep speed.



When a home position return is started from the proximity dog



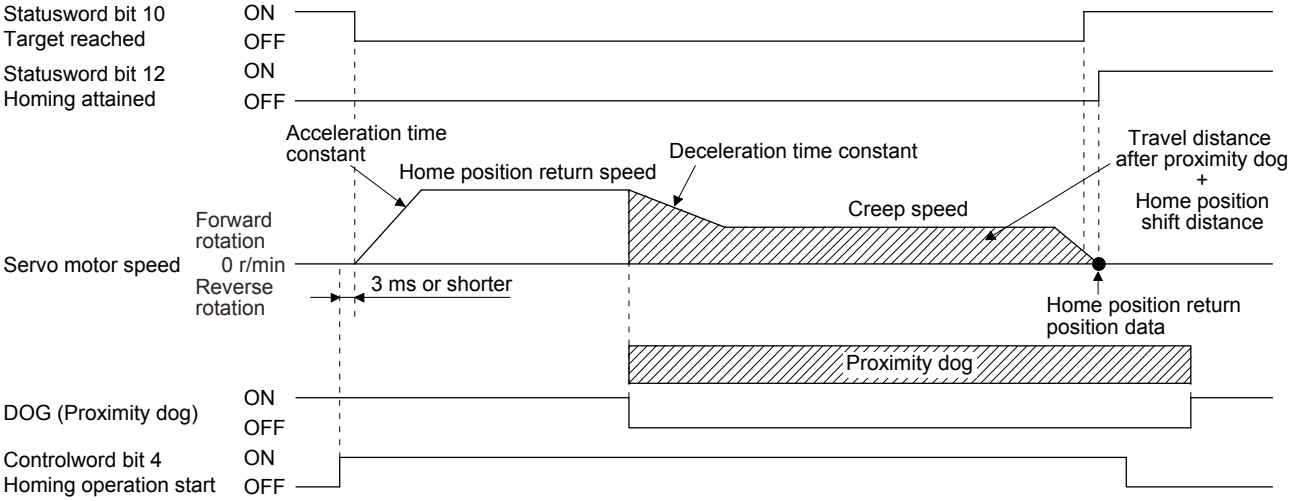
Note. The software limit cannot be used with these functions.

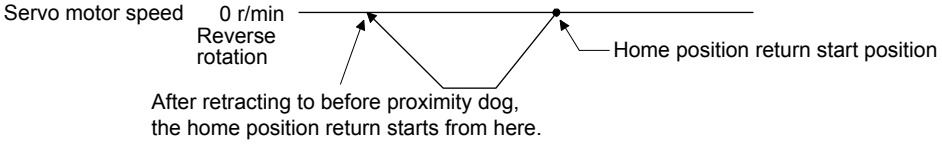
When the movement is returned at the stroke end

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

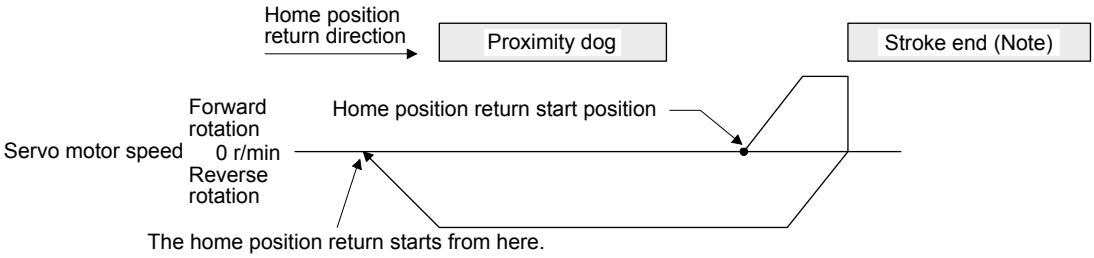
> POINT
>
> ●This home position return type depends on the timing of reading DOG (Proximity dog) that has detected the front end of the proximity dog. Therefore, when the creep speed is set to 100 r/min and a home position return is performed, the home position has an error of ± (Encoder resolution)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

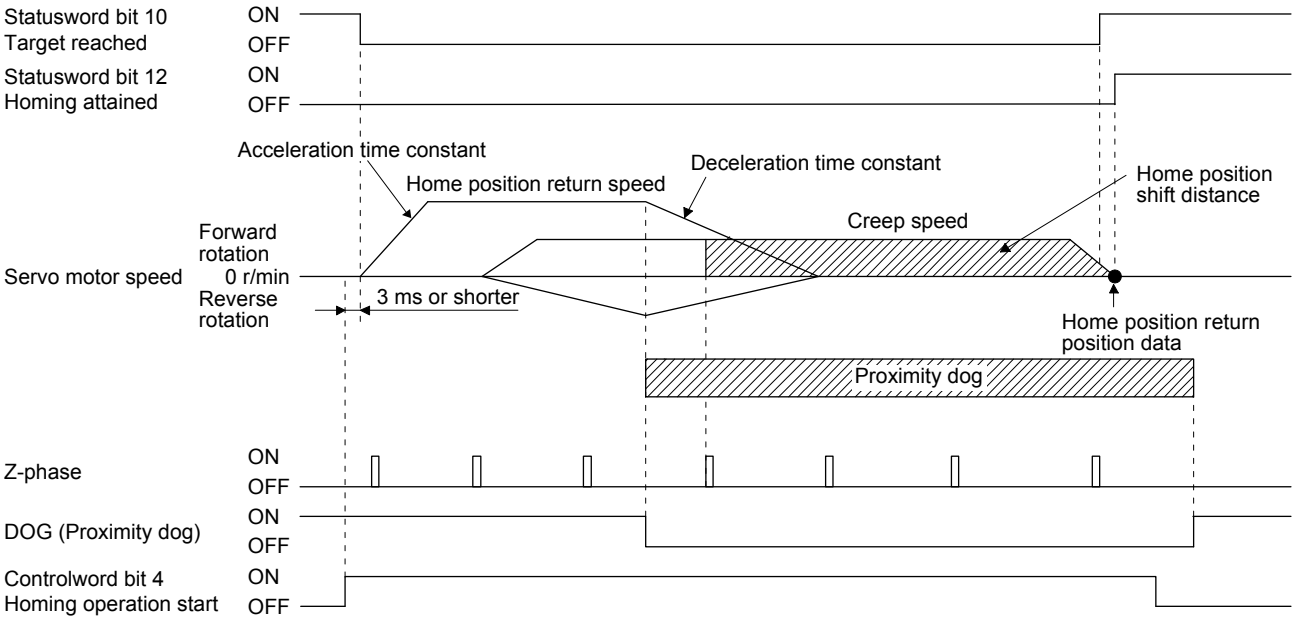


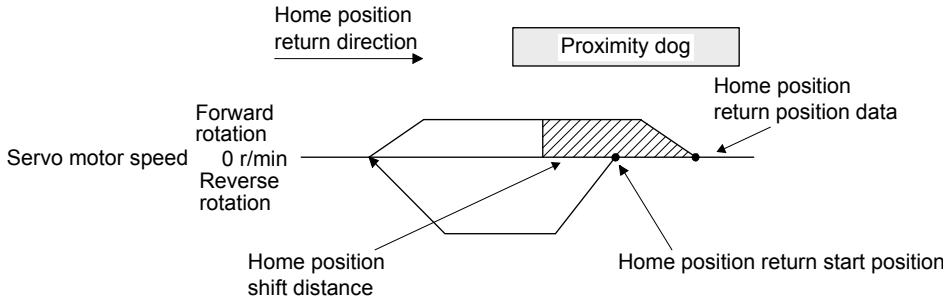
Note. The software limit cannot be used with these functions.

When the movement is returned at the stroke end

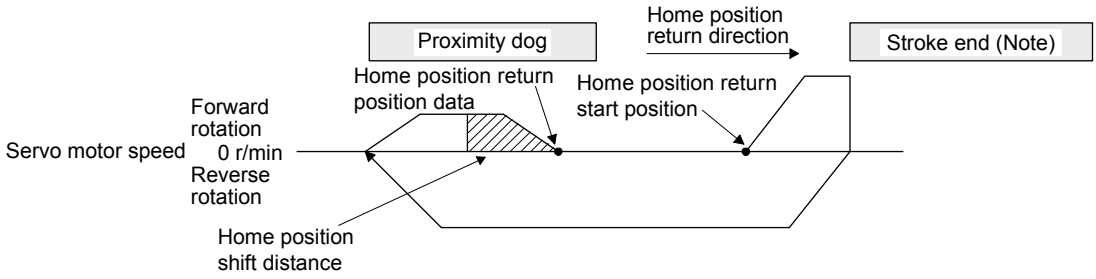
(g) Method -8 and -40 (dog cradle type home position return)

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

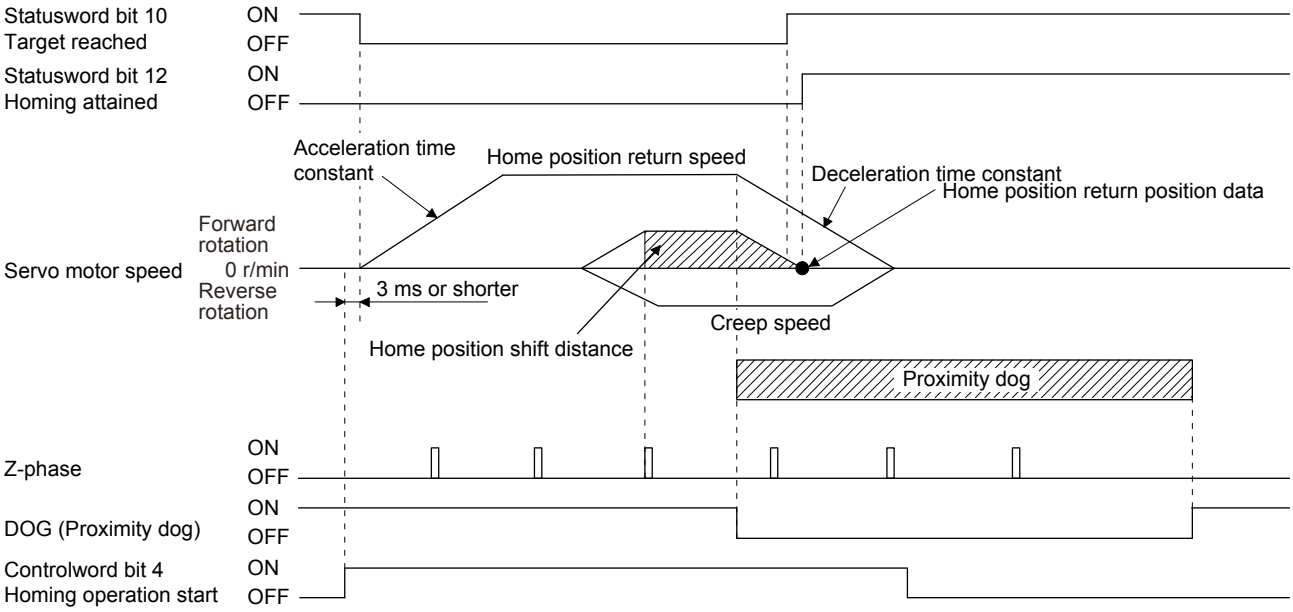


Note. The software limit cannot be used with these functions.

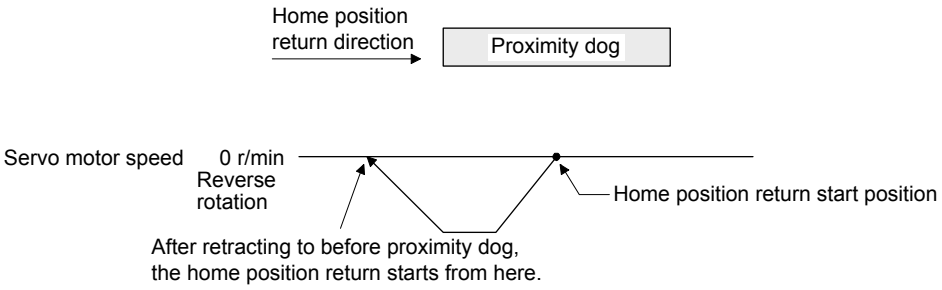
When the movement is returned at the stroke end

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

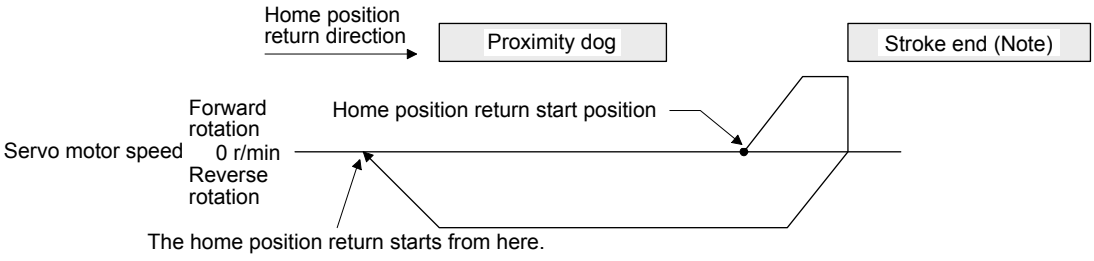
The following figure shows the operation of Homing method -9. The operation direction of Homing method -41 is opposite to that of Homing method -9.



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. Check the length of the proximity dog or check the home position return speed and creep speed.



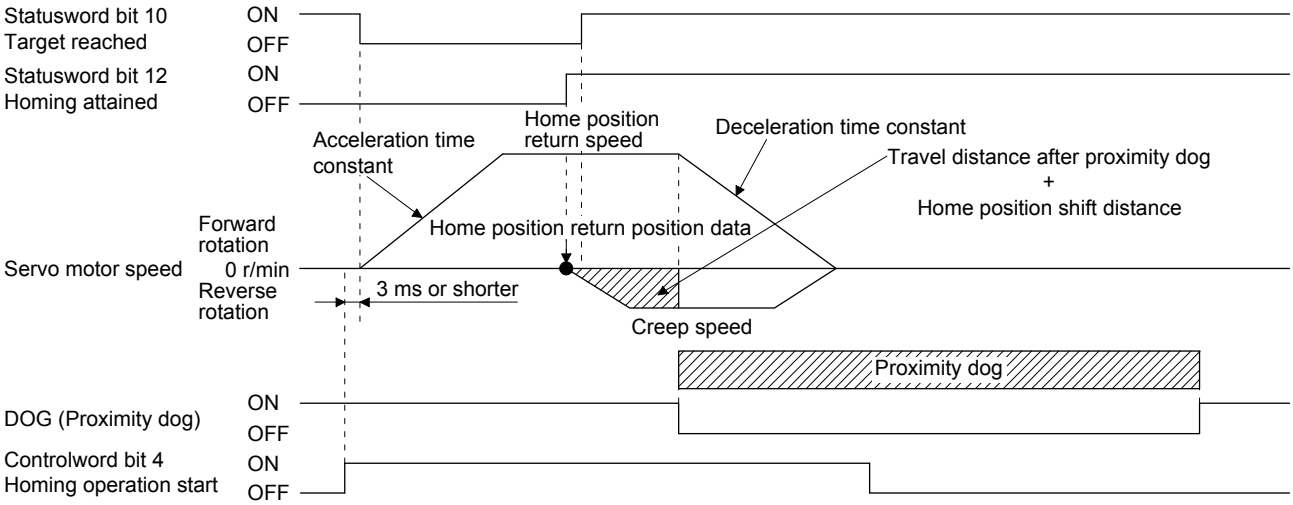
When a home position return is started from the proximity dog



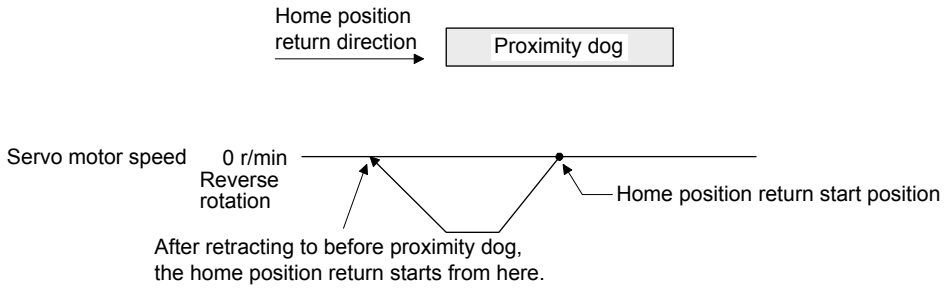
Note. The software limit cannot be used with these functions.

When the movement is returned at the stroke end

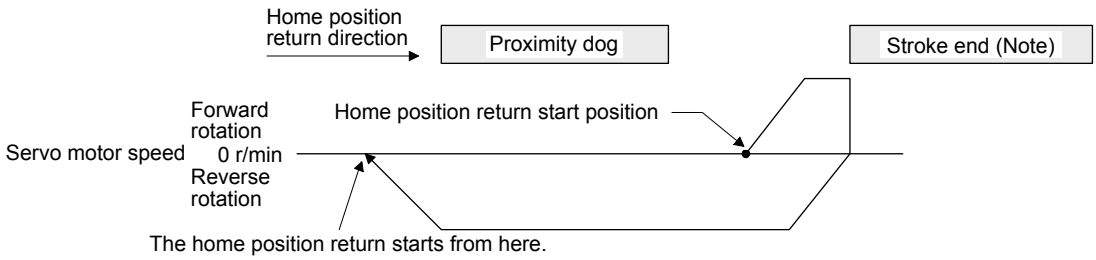
(i) Method -10 and -42 (dog type front end reference home position return)
The following figure shows the operation of Homing method -10. The operation direction of Homing method -42 is opposite to that of Homing method -10.



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. Check the length of the proximity dog or check the home position return speed and creep speed.



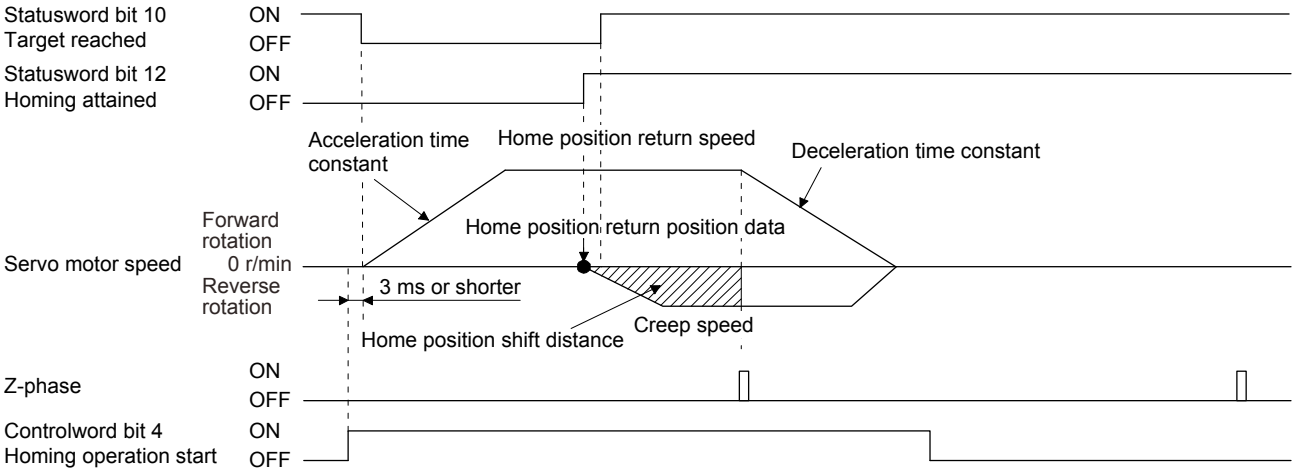
When a home position return is started from the proximity dog

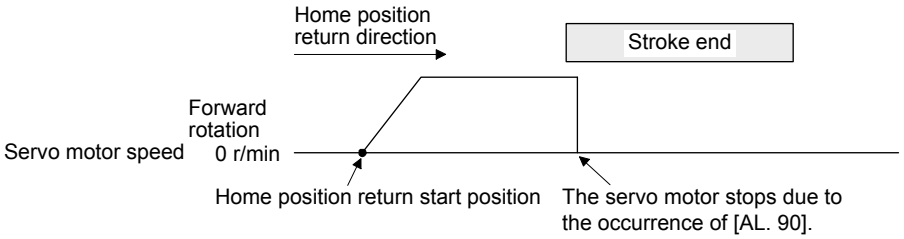


Note. The software limit cannot be used with these functions.

When the movement is returned 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

5.5 Touch probe

The touch probe function that executes current position latch by sensor input can be used.
With this function, the position feedbacks at the rising edge and falling edge of TPR1 (touch probe 1) and TPR2 (touch probe 2) can be memorized and stored into each Ins ID of 60BAh to 60BDh according to the conditions specified in Touch probe function (Class ID: 64h, Ins ID: 60B8h, Attr ID: 0).
The following shows the touch probe detection resolution. Enabling the high precision touch probe will disable the encoder output pulses.

		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: 2 µs Falling: 55 µs

(1) Related object

Class ID	Ins ID	Attr ID	Access	Name	Data Type	Default	Description
64h	60B8h	0	Get/Set	Touch probe function	UINT		Settings such as enabling/disabling of the touch probe function and trigger conditions
	60B9h	0	Get	Touch probe status	UINT	0	Status information of the touch probe function
	60BAh	0	Get	Touch probe pos1 pos value	DINT	0	Shows the rising edge position of TPR1 (touch probe 1). (Pos units)
	60BBh	0	Get	Touch probe pos1 neg value	DINT	0	Shows the falling edge position of TPR1 (touch probe 1). (Pos units)
	60BCh	0	Get	Touch probe pos2 pos value	DINT	0	Shows the rising edge position of TPR2 (touch probe 2). (Pos units)
	60BDh	0	Get	Touch probe pos2 neg value	DINT	0	Shows the falling edge position of TPR2 (touch probe 2). (Pos units)

(a) Details of Touch probe function (Class ID: 64h, Ins ID: 60B8h, Attr ID: 0)

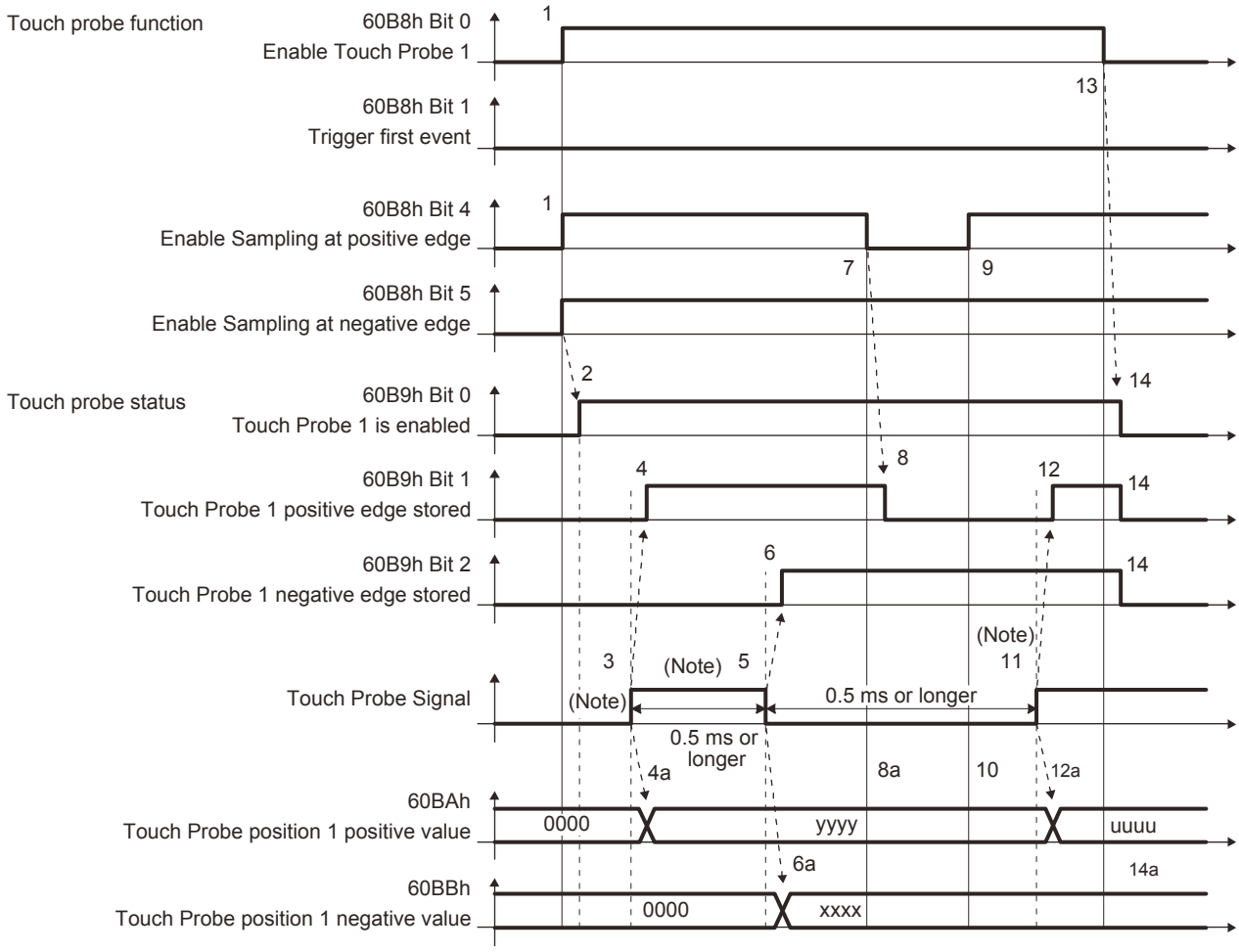
Bit	Definition
0	0: Touch probe 1 disabled 1: Touch probe 1 enabled
1	0: Single trigger mode 1: Continuous trigger mode
2	0: Set input of touch probe 1 as a trigger 1: Set 0 point of the encoder as a trigger (Unsupported) (Note)
3	(Reserved) The value at reading is undefined. Set "0" at writing.
4	0: Stop sampling at the rising edge of touch probe 1 1: Start sampling at the rising edge of touch probe 1
5	0: Stop sampling at the falling edge of touch probe 1 1: Start sampling at the falling edge of touch probe 1
6	(Reserved) The value at reading is undefined. Set "0" at writing.
7	
8	0: Touch probe 2 disabled 1: Touch probe 2 enabled
9	0: Single trigger mode 1: Continuous trigger mode
10	0: Set input of touch probe 2 as a trigger 1: Set 0 point of the encoder as a trigger (Unsupported) (Note)
11	(Reserved) The value at reading is undefined. Set "0" at writing.
12	0: Stop sampling at the rising edge of touch probe 2 1: Start sampling at the rising edge of touch probe 2
13	0: Stop sampling at the falling edge of touch probe 2 1: Start sampling at the falling edge of touch probe 2
14	(Reserved) The value at reading is undefined. Set "0" at writing.
15	

Note. This is not supported by the MR-J4-_TM_ servo amplifier.

(b) Details of Touch probe status (Class ID: 64h, Ins ID: 60B9h, Attr ID: 0)

Bit	Definition
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.
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.
3	(Reserved) The value at reading is undefined. Set "0" at writing.
4	
5	
6	
7	
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.
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.
11	(Reserved) The value at reading is undefined. Set "0" at writing.
12	
13	
14	
15	

(2) Timing chart



Note. Turn on and off Touch Probe Signal so that both the on time and off time are 0.5 ms or longer.

Transition No.	Object	Description
1	60B8h Bit 0, 4, 5 = 1	Enables Touch Probe1. The rising edge and falling edge are enabled.
2	→ 60B9h Bit 0 = 1	Turns on the Touch Probe1 enable status.
3		Turns on Touch Probe Signal (TPR1).
4	→ 60B9h Bit 1 = 1	Turns on the Touch Probe1 positive edge stored status.
4a	→ 60BAh	Sets the latched position feedback for Touch probe position1 positive value.
5		Turns off Touch Probe Signal (TPR1).
6	→ 60B9h Bit 2 = 1	Turns on the Touch Probe1 negative edge stored status.
6a	→ 60BBh	Sets the latched position feedback for Touch probe position1 negative value.
7	60B8h Bit 4 = 0	Turns off Sample positive edge. Rising edge detection is disabled.
8	→ 60B9h Bit 1 = 0	Turns off Touch Probe1 positive edge stored status.
8a	→ 60BAh	Touch probe position1 positive value does not change.
9	60B8h Bit 4 = 1	Turns on Sample positive edge. Rising edge detection is enabled.
10	→ 60BAh	Touch probe position1 positive value does not change.
11		Turns on Touch Probe Signal (TPR1).
12	→ 60B9h Bit 1 = 1	Turns on the Touch Probe1 negative edge stored status.
12a	→ 60BAh	Sets the latched position feedback for Touch probe position1 negative value.
13	60B8h Bit 0 = 0	Disables Touch Probe1.
14	→ 60B9h Bit 0, 1, 2 = 0	Clears all the status Bit.
14a	→ 60BAh, 60BBh	Touch probe position1 positive/negative value does not change.

(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 precisely startup of TPR2 (touch probe 2) 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 rising edge is 55 μs in this case as well.

5.6 Quick stop

Decelerate the servo motor to a stop with the Quick stop command of Controlword (Class ID: 64h, Ins ID: 6040h, Attr ID: 0). The following table shows the related objects.

Class ID	Ins ID	Attr ID	Access	Name	Data Type	Default	Description
64h	6085h	0	Get/Set	Quick stop deceleration	UDINT	100	Deceleration at deceleration to a stop by Quick stop Unit: ms
	605Ah	0	Get/Set	Quick stop option code	INT	2	Refer to table 5.2 for details.

The operation method of deceleration to a stop can be specified with Quick stop option code (Class ID: 64h, Ins ID: 605Ah, Attr ID: 0). The following table shows the supported methods and the operations.

Table 5.2 Quick stop option code

Setting value	Description
1 (Not supported) (Note)	tq: The state shifts to the Switch on disabled state and the servo motor is stopped with the dynamic brake. pp/pv: The servo motor decelerates to a stop with Profile deceleration (Class ID: 64h, Ins ID: 6084h, Attr ID: 0) and the state immediately shifts to the Switch On Disabled state. hm: The servo motor decelerates to a stop with Homing acceleration (Class ID: 64h, Ins ID: 609Ah, Attr ID: 0) and the state shifts to the Switch On Disabled state.
2	In the profile mode (pp/pv), and homing mode (hm), the servo motor decelerates to a stop with Quick stop deceleration (Class ID: 64h, Ins ID: 6085h, Attr ID: 0) and the state shifts to the Switch On Disabled state. In the profile torque mode (tq), the state immediately shifts to the Switch On Disabled state and the servo motor stops with the dynamic brake.
3 (Not supported) (Note)	The current is limited and the servo motor decelerates to a stop. Then, the state shifts to the Switch On Disabled state.
4 (Not supported) (Note)	The voltage is limited and the servo motor decelerates to a stop. Then, the state shifts to the Switch On Disabled state.
5 (Not supported) (Note)	The servo motor decelerates to a stop. The state does not change from the Quick Stop Active state (servo-on).
6 (Not supported) (Note)	The servo motor decelerates to a stop with Quick stop deceleration (Class ID: 64h, Ins ID: 6085h, Attr ID: 0). The state does not change from the Quick Stop Active state (servo-on).
7 (Not supported) (Note)	The current is limited and the servo motor decelerates to a stop. The state does not change from the Quick Stop Active state (servo-on).
8 (Not supported) (Note)	The voltage is limited and the servo motor decelerates to a stop. The state does not change from the Quick Stop Active state (servo-on).

Note. This is not supported by the MR-J4-_TM_ servo amplifier.

5.7 Halt

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 (Class ID: 64h, Ins ID: 609Ah, Attr ID: 0) or Profile deceleration (Class ID: 64h, Ins ID: 6084h, Attr ID: 0) according to the setting of Halt option code (Class ID: 64h, Ins ID: 605Dh, Attr ID: 0). The halt function can be used in the profile mode (pp/pv/tq) and homing mode (hm). When Halt Bit is set to 0 at deceleration stop operation, the servo motor decelerates to a stop and returns to the operable state. The following table shows the related object.

Class ID	Ins ID	Attr ID	Access	Name	Data Type	Default	Description
64h	605Dh	0	Get/Set	Halt option code	INT	1	Setting for executing the Halt function Refer to table 5.3 for details.

The following table shows descriptions of Halt option code (Class ID: 64h, Ins ID: 605Dh, Attr ID: 0). However, in the profile torque mode (tq), Torque demand value (Class ID: 64h, Ins ID: 6074h, Attr ID: 0) is set to 0 regardless of Halt option code (Class ID: 64h, Ins ID: 605Dh, Attr ID: 0). The amount of torque change at this time can be set using Torque slope (Class ID: 64h, Ins ID: 6087h, Attr ID: 0).

Table 5.3 Halt option code

Setting value	Description
1	For Profile deceleration (Class ID: 64h, Ins ID: 6084h, Attr ID: 0) and the homing mode (hm), the servo motor decelerates to a stop according to Homing acceleration (Class ID: 64h, Ins ID: 609Ah, Attr ID: 0) and the state does not change from the Operation Enabled state (servo-on).
2 (Not supported) (Note)	The servo motor decelerates to a stop with Quick stop deceleration (Class ID: 64h, Ins ID: 6085h, Attr ID: 0). The state does not change from the Operation Enabled state (servo-on).
3 (Not supported) (Note)	The current is limited and the servo motor decelerates to a stop. The state does not change from the Operation Enabled (servo-on).
4 (Not supported) (Note)	The voltage is limited and the servo motor decelerates to a stop. The state does not change from the Operation Enabled (servo-on).

Note. This is not supported by the MR-J4-_TM_ servo amplifier.

5.8 Software position limit

Specify the upper and lower limits of the command position and current position. If a command position exceeding the limit position is specified, the command position is clamped at the limit position. Specify a relative position from the machine home point (position address = 0) as the limit position.
This function is enabled when the home position is not erased in the profile position mode (pp). While the clamp processing is being performed with the command position exceeding the limit value, [AL. 98 Software limit warning] occurs and not cleared. When the position command of the direction opposite to reached Software position limit (Class ID: 64h, Ins ID: 607Dh, Attr ID: 0) is given, the operation can be restarted.

Class ID	Ins ID	Attr ID	Access	Name	Data Type	Default	Description
64h	607Dh	0	Get	Software position limit	USINT	2	Number of entries
		1	Get/Set	Min position limit (Note)	DINT	0	Specify a relative position from the machine home point (position address = 0) as the minimum value of the command position and current position. When the value falls below the minimum value, it is clamped and processed as the minimum value.
		2	Get/Set	Max position limit (Note)	DINT	0	Specify a relative position from the machine home point (position address = 0) as the maximum value of the command position and current position. When the value exceeds the maximum value, it is clamped and processed as the maximum value.

Note. When the set value of Min position limit is equal to or greater than the set value of Max position limit, the function of Software position limit (607Dh) is disabled.

5.9 Torque limit

Generated torque can be limited with the values of Positive torque limit value (60E0h) and Negative torque limit value (60E1h). When "0" is set, torque (thrust) is not generated. The following table lists the related objects.

Class ID	Ins ID	Attr ID	Access	Name	Data Type	Default	Description
64h	60E0h	0	Get/Set	Positive torque limit value	UINT	10000	[Pr. PA11 Forward rotation torque limit/positive direction thrust limit] Torque limit value in CCW power running/CW regeneration Unit: 0.1% (rated torque of 100%) Range: 0 to 10000
	60E1h	0	Get/Set	Negative torque limit value	UINT	10000	[Pr. PA12 Reverse rotation torque limit/negative direction thrust limit] Torque limit value in CW power running/CCW regeneration Unit: 0.1% (rated torque of 100%) Range: 0 to 10000

5.10 Polarity

The rotation direction of a servo motor to position commands, speed commands, and torque commands can be set with Polarity (Class ID: 64h, Ins ID: 607Eh, Attr ID: 0). For the Polarity (Class ID: 64h, Ins ID: 607Eh, Attr ID: 0) setting to position commands and speed commands, use [Pr. PA14]. For the Polarity (Class ID: 64h, Ins ID: 607Eh, Attr ID: 0) setting to torque commands, use [Pr. PA14] and "POL reflection selection at torque mode" of [Pr. PC29]. A change in the setting of Polarity (Class ID: 64h, Ins ID: 607Eh, Attr ID: 0) is not applied without enabling the change. Refer to section 6.5.2 for the procedure of enabling parameters.

(1) Object definition

Bit	Description
0	(reserved) The value at reading is undefined. Set "0" at writing.
1	
2	
3	
4	
5	Torque POL The polarity is reversed when this bit is turned on.
6	Velocity POL The polarity is reversed when this bit is turned on.
7	Position POL The polarity is reversed when this bit is turned on.

(2) Target object

The following shows objects whose polarity is reversed according to the setting of Polarity (Class ID: 64h, Ins ID: 607Eh, Attr ID: 0).

Object name (Class ID, Ins ID, Attr ID)	Remark
Target position (64h, 607Ah, 0)	
Target velocity (64h, 60FFh, 0)	
Target torque (64h, 6071h, 0)	
Position actual value (64h, 6064h, 0)	
Velocity demand value (64h, 606Bh, 0)	Whether to reverse the polarity using Polarity (607Eh) can be switched with "Internal command speed POL reflection selection" of [Pr. PC76]. [Pr. PC76] = _ 0 _ _ (Automatic setting): Automatically set depending on the type of the network in use. [Pr. PC76] = _ 1 _ _ (POL setting enabled): The polarity is reversed using Polarity. [Pr. PC76] = _ 2 _ _ (POL setting disabled): The polarity is not reversed using Polarity.
Velocity actual value (64h, 606Ch, 0)	
Torque demand (64h, 6074h, 0)	
Torque actual value (64h, 6077h, 0)	
Positive torque limit value (64h, 60E0h, 0)	The corresponding parameters are changed according to "POL reflection selection at torque mode" in [Pr. PA14] and [Pr. PC29] as follows. [Pr. PA14] = 0, [Pr. PC29] = 1 _ _ _ (Disabled): Written to [Pr. PA11 Forward rotation torque limit/positive direction thrust limit]. [Pr. PA14] = 1, [Pr. PC29] = 1 _ _ _ (Disabled): Written to [Pr. PA11 Forward rotation torque limit/positive direction thrust limit]. [Pr. PA14] = 0, [Pr. PC29] = 0 _ _ _ (Enabled): Written to [Pr. PA11 Forward rotation torque limit/positive direction thrust limit]. [Pr. PA14] = 1, [Pr. PC29] = 0 _ _ _ (Enabled): Written to [Pr. PA12 Reverse rotation torque limit/negative direction thrust limit].
Negative torque limit value (64h, 60E1h, 0)	The corresponding parameters are changed according to "POL reflection selection at torque mode" in [Pr. PA14] and [Pr. PC29] as follows. [Pr. PA14] = 0, [Pr. PC29] = 1 _ _ _ (Disabled): Written to [Pr. PA12 Reverse rotation torque limit/negative direction thrust limit]. [Pr. PA14] = 1, [Pr. PC29] = 1 _ _ _ (Disabled): Written to [Pr. PA12 Reverse rotation torque limit/negative direction thrust limit]. [Pr. PA14] = 0, [Pr. PC29] = 0 _ _ _ (Enabled): Written to [Pr. PA12 Reverse rotation torque limit/negative direction thrust limit]. [Pr. PA14] = 1, [Pr. PC29] = 0 _ _ _ (Enabled): Written to [Pr. PA11 Forward rotation torque limit/positive direction thrust limit].
Digital inputs (64h, 60FDh, 0)	The corresponding status is changed according to the setting of [Pr. PA14] as follows. [Pr. PA14] = 0: The status of LSN (reverse rotation stroke end) is applied to Negative limit switch (bit 0). The status of LSP (forward rotation stroke end) is applied to Positive limit switch (bit 1). [Pr. PA14] = 1: The status of LSP (forward rotation stroke end) is applied to Negative limit switch (bit 0). The status of LSN (reverse rotation stroke end) is applied to Positive limit switch (bit 1).

5.11 degree function

(1) Summary

Selecting "degree (_ 2 _ _)" in "Position data unit" of [Pr. PT01] allows for positioning with module coordinates (axis of rotation). The following shows the differences when "degree" is selected.

Item (Class ID, Ins ID, Attr ID)	Description
Target position (64h, 607Ah, 0)	The range will be between -360.000° and 360.000°.
Position actual value (64h, 6064h, 0)	The range will be between 0° and 359.999°.
Software position limit (64h, 607Dh, 0)	The range will be between 0° and 359.999°. A value outside the range is clamped within the range 0° to 359.999°.
Position range limit (64h, 607Bh, 0)	The range will be between 0° and 359.999°.
Touch probe pos1 pos value (64h, 60BAh, 0)	The range will be between 0° and 359.999°.
Touch probe pos1 neg value (64h, 60BBh, 0)	The range will be between 0° and 359.999°.
Touch probe pos2 pos value (64h, 60BCh, 0)	The range will be between 0° and 359.999°.
Touch probe pos2 neg value (64h, 60BDh, 0)	The range will be between 0° and 359.999°.
Home offset (64h, 607Ch, 0)	The range will be between 0° and 359.999°.

(2) Setting of the operation pattern

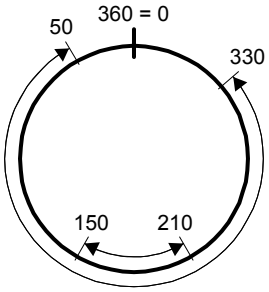
Positioning operation patterns can be changed with Positioning option code (Class ID: 64h, Ins ID: 60F2h, Attr ID: 0) or [Pr. PT03]. Change the setting while the servo motor is stopped (Target reached is on). If the setting is changed while the servo motor is rotating (Target reached is off), the setting value is not applied immediately. The new value is applied at a positioning start (Bit 4 of Controlword is turned on) after Target reached is once turned on. The following table shows the bit of Positioning option code (Class ID: 64h, Ins ID: 60F2h, Attr ID: 0) and the setting of [Pr. PT03].

Bit 7	Bit 6	[Pr. PT03]	Rotation direction definition for the axis of rotation
0	0	_ 0 _ _	The servo motor rotates to the target position in a direction specified with a sign of the position data.
0	1	_ 2 _ _	The servo motor rotates in the address decreasing direction regardless of the sign of the position data.
1	0	_ 3 _ _	The servo motor rotates in the address increasing direction regardless of the sign of the position data.
1	1	_ 1 _ _	The servo motor rotates from the current position to the target position in the shorter direction. If the distances from the current position to the target position are the same for CCW and CW, the servo motor rotates in the CCW direction.

(3) Sequence

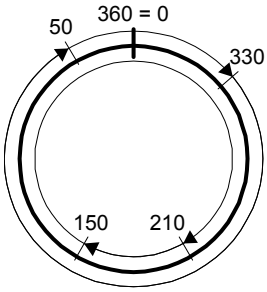
The following shows the operation patterns corresponding to the settings of Positioning option code (Class ID: 64h, Ins ID: 60F2h, Attr ID: 0).

(a) When POL is disabled ([Pr. PA14] = 0)



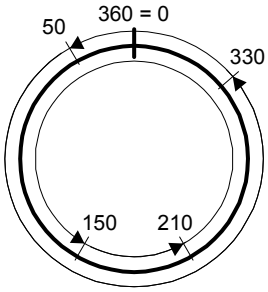
Bit 7: 0
Bit 6: 0

The servo motor rotates in a direction specified with a sign of the position data.



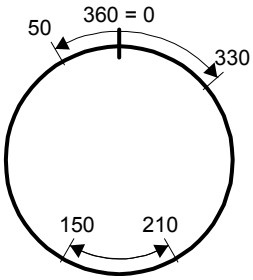
Bit 7: 0
Bit 6: 1

The servo motor rotates only in the address decreasing direction.



Bit 7: 1
Bit 6: 0

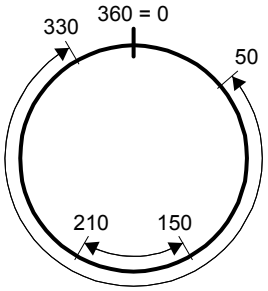
The servo motor rotates only in the address increasing direction.



Bit 7: 1
Bit 6: 1

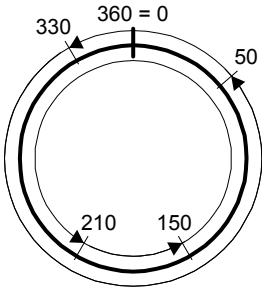
The servo motor rotates in the shorter direction.

(b) When POL is enabled ([Pr. PA14] = 1)



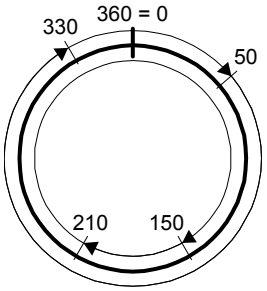
Bit 7: 0
Bit 6: 0

The servo motor rotates in a direction specified with a sign of the position data.



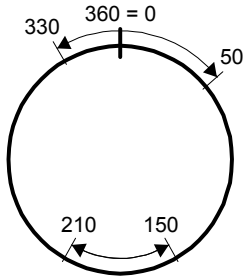
Bit 7: 0
Bit 6: 1

The servo motor rotates only in the address decreasing direction.



Bit 7: 1
Bit 6: 0

The servo motor rotates only in the address increasing direction.



Bit 7: 1
Bit 6: 1

The servo motor rotates in the shorter direction.

MEMO

6. MANUFACTURER FUNCTIONS

6.1 Object for status monitor

The monitor data as the manufacturer functions can be checked with the objects in the following table.

Class ID	Ins ID	Attr ID	Access	Name	Data Type	Default	Description
64h	2B01h	0	Get/Set	Monitor 1 Cumulative feedback pulses	DINT		Cumulative feedback pulses (Unit: pulse) Cleared by writing "00001EA5h".
	2B02h	0	Get	Monitor 2 Servo motor speed	DINT		Servo motor speed (Unit: r/min)
	2B03h	0	Get	Monitor 3 Droop pulse	DINT		Droop pulses (Unit: pulse)
	2B04h	0	Get	Monitor 4 Cumulative command pulses	DINT		Cumulative command pulses (Unit: pulse) Cleared by writing "00001EA5h".
	2B05h	0	Get	Monitor 5 Command pulse frequency	DINT		Command pulse frequency (Unit: kpulse/s)
	2B08h	0	Get	Monitor 8 Regenerative load ratio	UINT		Regenerative load ratio (Unit: %)
	2B09h	0	Get	Monitor 9 Effective load ratio	UINT		Effective load ratio (Unit: %)
	2B0Ah	0	Get	Monitor 10 Peak load ratio	UINT		Peak load ratio (Unit: %)
	2B0Bh	0	Get	Monitor 11 Instantaneous torque	INT		Instantaneous torque (Unit: %)
	2B0Ch	0	Get	Monitor 12 Within one-revolution position	DINT		Position within one-revolution (Unit: pulse)
	2B0Dh	0	Get	Monitor 13 ABS counter	DINT		ABS counter (Unit: rev)
	2B0Eh	0	Get	Monitor 14 Load to motor inertia ratio	UINT		Load to motor inertia ratio (Unit: 0.1 times)
	2B0Fh	0	Get	Monitor 15 Bus voltage	UINT		Bus voltage (Unit: V)
	2B10h	0	Get	Monitor 16 Load side encoder cumulative feedback pulses	DINT		Load-side encoder cumulative feedback pulses (Unit: pulse)
	2B11h	0	Get	Monitor 17 Load side encoder droop pulses	DINT		Load-side encoder droop pulses (Unit: pulse)
	2B12h	0	Get	Monitor 18 Load side encoder information 1	DINT		Load-side encoder information 1 (Unit: pulse)
	2B13h	0	Get	Monitor 19 Load side encoder information 2	DINT		Load-side encoder information 2 (Unit: rev)
	2B17h	0	Get	Monitor 23 Temperature of motor thermistor	INT		Temperature of servo motor thermistor (Unit: °C)
	2B18h	0	Get	Monitor 24 Motor side cumulative F/B pulses (Before Gear)	DINT		Servo motor-side cumulative feedback pulses (before gear) (Unit: pulse)
	2B19h	0	Get	Monitor 25 Electrical angle	DINT		Electrical angle (Unit: pulse)
	2B23h	0	Get	Monitor 35 Motor/load side position deviation	DINT		Servo motor-side/load-side position deviation (Unit: pulse)
	2B24h	0	Get	Monitor 36 Motor/load side speed deviation	DINT		Servo motor-side/load-side speed deviation (Unit: r/min)

Class ID	Ins ID	Attr ID	Access	Name	Data Type	Default	Description
64h	2B25h	0	Get	Monitor 37 Internal temperature of encoder	INT		Internal temperature of encoder (Unit: °C)
	2B26h	0	Get	Monitor 38 Settling time	INT		Settling time (Unit: ms)
	2B27h	0	Get	Monitor 39 Oscillation detection frequency	INT		Oscillation detection frequency (Unit: Hz)
	2B28h	0	Get	Monitor 40 Number of tough drive operations	UDINT		Number of tough drive operations (Unit: time)
	2B2Dh	0	Get	Monitor 45 Unit power consumption	INT		Unit power consumption (Unit: W)
	2B2Eh	0	Get	Monitor 46 Unit total power consumption	DINT		Unit total power consumption (Unit: Wh)

6.2 Instruction code

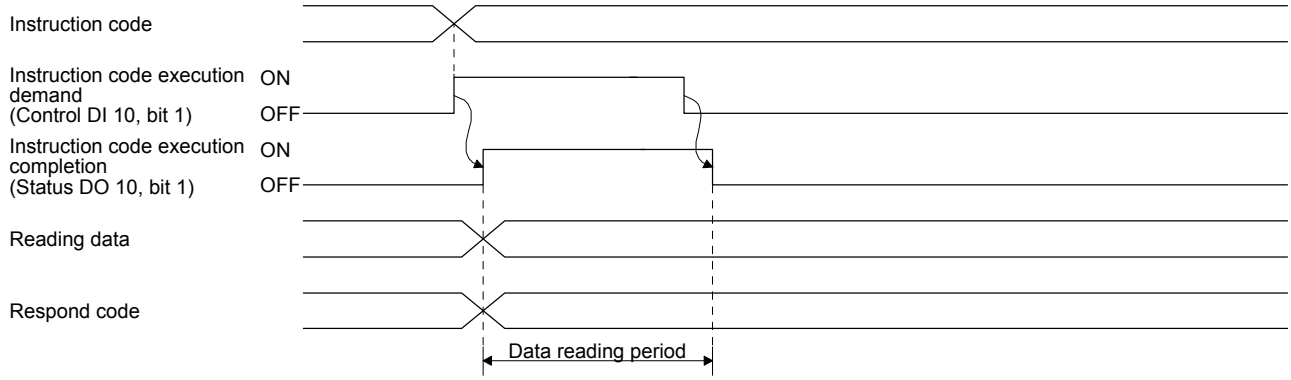
6.2.1 Summary

If you set the code corresponding to an item to be read/written from/to the Instruction code object through the cyclic communication, the master can change or read parameter values and object values of a servo amplifier. The following table lists the instruction code objects.

Name	Data Type	Access	Description
Instruction code	UDINT	Get/Set	Instruction code
Writing data	DINT	Get/Set	Writing data
Respond code	UINT	Get	Respond code
Reading data	DINT	Get	Reading data

6.2.2 Reading instruction codes

(1) Timing chart



Set the reading instruction code (refer to (2) in this section) in Instruction code and turn on Instruction code execution demand (Control DI 10, bit 1). Turning on Instruction code execution demand (Control DI 10, bit 1) sets the data corresponding to the set reading code in Reading data. Data is all hexadecimal. At this time, Instruction code execution completion (Status DO 10, bit 1) also turns on. Read the reading data to be set in Reading data while Instruction code execution demand (Control DI 10, bit 1) is on. The data set in Reading data is held until Instruction code execution demand (Control DI 10, bit 1) turns on with the next reading instruction code set.

If an instruction code out of the specifications is set in Instruction code, an error code (_ _ 1 _) is set in Respond code. At this time, "00000000" is stored in Reading data. Refer to section 6.2.5 for details of the respond code.

Turn off Instruction code execution demand (Control DI 10, bit 1) after the data reading is completed. Until Instruction code execution completion turns on after Instruction code execution demand is turned on, do not change the instruction code. Turn off Instruction code execution demand after the data reading is completed.

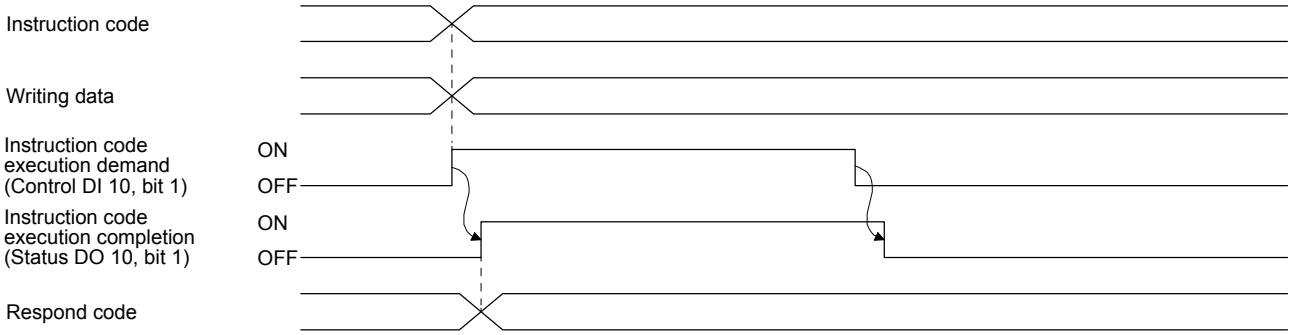
(2) Instruction code

Code No.	Item/function	Reading data content (Servo amplifier → Master station)	
		Lower 16 bits	Upper 16 bits
10XXXXYYh	Reading an object library Reads the value of an object library that can be read when the object library is set as follows: Ins ID is set to XXXX and Attr ID is set to YY. An error code is returned if an object library that cannot be read is specified.	The read value of the requested object library is stored. (Note)	The upper 16 bits of the value is stored. (Note)

Note. If the size of an object to be read is smaller than 32 bits, 0 is stored in the remaining areas.

6.2.3 Writing instruction code

(1) Timing chart



Set a writing instruction code (refer to (2) in this section) in Instruction code, set the data to be written (data to be executed) in Writing data in hexadecimal, and turn on Instruction code execution demand (Control DI 10, bit 1).

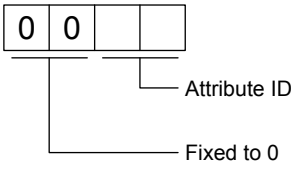
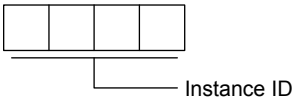
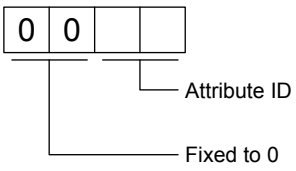
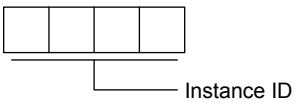
Turning on Instruction code execution demand (Control DI 10, bit 1) writes the data set with Writing data to the item corresponding to the writing instruction code. After the writing is completed, Instruction code execution completion (Status DO 10, bit 1) turns on.

If an instruction code out of the specifications is set in Instruction code, an error code (_ _ 1 _) is set in Respond code.

Turn off Instruction code execution demand (Control DI 10, bit 1) after Instruction code execution completion (Status DO 10, bit 1) has turned on.

Until Instruction code execution completion turns on after Instruction code execution demand is turned on, do not change the values set in Instruction code and Writing data. Turn off Instruction code execution demand while Instruction code execution completion is on.

(2) Instruction code

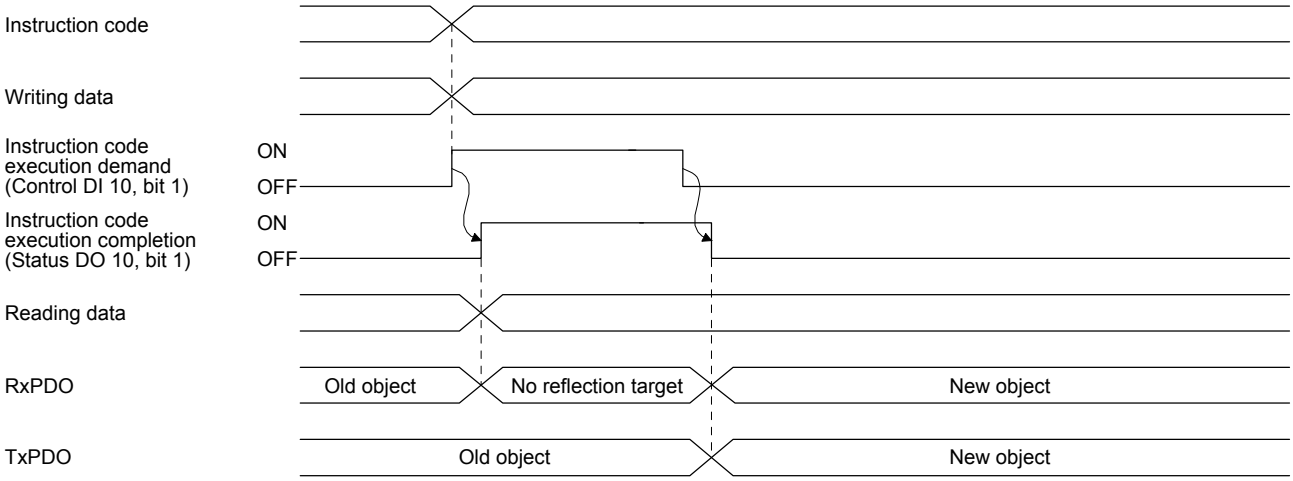
Code No.	Item/function	Writing data content (Master station → Servo amplifier)	
		Lower 16 bits	Upper 16 bits
A0XXXXYYh	Writing an object library Writes the value of an object library that can be written when the object library is set as follows: Ins ID is set to XXXX and Attr ID is set to YY. An error code is returned if an object library that cannot be read is specified.	Set the write value for the object library. (Note)	Set the upper 16 bits. (Note)
B0XX0000h	Variable mapping instruction code Changes the reference object of User defined data defined in the variable mapping for the 1st Output data (Instance 150). The characters XX in the instruction code indicate the object to be changed. Refer to section 6.2.4 (2) for details.	WritingData format 	WritingData format 
B1XX0000h	Variable mapping instruction code Changes the reference object of User defined data defined in the variable mapping for the 1st Input map (Instance 100). The characters XX in the instruction code indicate the object to be changed. Refer to section 6.2.4 (2) for details.	WritingData format 	WritingData format 

Note. If the size of an object to be written is smaller than 32 bits, nothing is written to the remaining areas.

6.2.4 Variable mapping

(1) Timing chart of when variable mapping is used

Set the writing instruction code corresponding to an object to be changed in Instruction code. At this time, set Ins ID and Attr ID of the object in Writing data in hexadecimal. After that, turn on Instruction code execution demand (Control DI 10, bit 1).
When Instruction code execution demand (Control DI 10, bit 1) is turned on, the mapping position for which the object corresponding to the writing instruction code has been defined is handled as the object set in Writing data. After the writing is completed, Instruction code execution completion (Status DO 10, bit 1) turns on.
The following figure shows the reflection timing in the mapping with the variable mapping.



In consideration of the timing above, for data sent by the controller, the controller sets new object data in User defined data when the controller receives the on state of Instruction code execution completion from the servo amplifier. After the setting is completed, turn off Instruction code execution demand. When the controller receives the off state of Instruction code execution completion from the servo amplifier, the new object data is applied to User defined data.
User defined data retains the old object data until the controller receives the off state of Instruction code execution completion. When the controller receives the off state, the new object data is set in User defined data.

(2) Variable mapping instruction code

The following table lists the instruction codes and the corresponding instance names in an I/O communication mapping file.

No.	Send direction	Instruction code	Size	Default	Definition in the mapping file
1	Output	B0000000h	2 bytes	Control DI 1 (2D01h)	User defined data 0 (2 bytes)
2	Output	B0010000h	2 bytes	Control DI 2 (2D02h)	User defined data 1 (2 bytes)
3	Output	B0020000h	2 bytes	Control DI 3 (2D03h)	User defined data 2 (2 bytes)
4	Output	B0030000h	4 bytes	Velocity limit value (2D20h)	User defined data 3 (4 bytes)
5	Output	B0040000h	4 bytes		User defined data 4 (4 bytes)
6	Output	B0050000h	4 bytes		User defined data 5 (4 bytes)
7	Output	B0060000h	4 bytes		User defined data 6 (4 bytes)
8	Input	B1000000h	2 bytes	Status DO 1 (2D11h)	User defined data 0 (2 bytes)
9	Input	B1010000h	2 bytes	Status DO 2 (2D12h)	User defined data 1 (2 bytes)
10	Input	B1020000h	2 bytes	Status DO 3 (2D13h)	User defined data 2 (2 bytes)
11	Input	B1030000h	4 bytes	Following error actual value (60F4h)	User defined data 3 (4 bytes)
12	Input	B1040000h	4 bytes	Digital inputs (60FDh)	User defined data 4 (4 bytes)
13	Input	B1050000h	4 bytes		User defined data 5 (4 bytes)
14	Input	B1060000h	4 bytes		User defined data 6 (4 bytes)

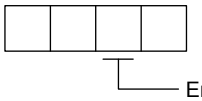
(3) Error conditions

The following table lists the conditions for normal completion and errors. The code numbers correspond to the respond codes in section 6.2.5.

Error name	Cause	Code No.
Finished normally	An instance in User defined data has been successfully switched.	0: Normal result
Instruction code error	The instruction code corresponds to High but does not correspond to Low.	1: Code error
Non-existent mapping definition	The specified mapping definition does not exist in the default mapping file definitions.	1: Code error
User defined data error	The specified instance does not exist.	3: Writing data out of range
Send/receive error	The send directions of the instruction code and User defined data are different.	3: Writing data out of range
Data size error	The data size of User defined data has exceeded the data size allowed by the instruction code.	3: Writing data out of range
Assignment error of User defined data 0 to 6	User defined data 0 to 6 have been assigned.	3: Writing data out of range

6.2.5 Respond code

When an instruction code set in Instruction code is outside the setting range, an error code is set in Respond code. When the set instruction code is within the setting range, "_ _ 0 _" is set. The value in _ at reading is undefined.

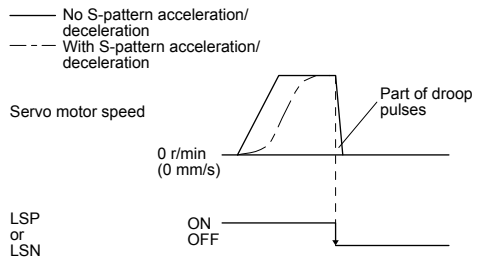
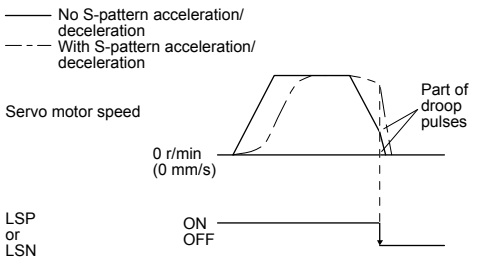


Error of the reading instruction code and writing instruction code

Code No.	Error detail	Details
0	Normal result	The instruction has been completed normally.
1	Code error	An incorrect code No. is specified.
2		
3	Writing data out of range	A value out of the range is set.

6.3 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	
		Travels for the droop pulse portion and stops the servo motor. A difference will be generated between the command position and the current position. Perform a home position return again.

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

Mode	Return method
Profile position mode (pp)	Input the position command of the direction opposite to the limit to Target position (607Ah).
Profile velocity mode (pv)	Input the speed command of the direction opposite to the limit to Target velocity (60FFh).

6.4 Definition of alarm-related objects

Whether an alarm occurs or not in the slave (servo amplifier) can be detected on the master (controller) with Bit 3 and Bit 7 of Statusword in the I/O communication. The alarm history of the latest alarm and 15 alarms that have occurred can be referred to by acquiring the following related object values in the Explicit Message communication.

Class ID	Ins ID	Attr ID	Access	Name	Data Type	Description
64h	2A00h	0	Get	Alarm history newest	USINT	Refer to section 7.3.5 (1).
		1	Get	Alarm No.	UDINT	
		2	Get	Alarm time (Hour)	UDINT	
	2A01h	0	Get	Alarm history 1	USINT	Refer to section 7.3.5 (2).
		1	Get	Alarm No.	UDINT	
		2	Get	Alarm time (Hour)	UDINT	
	:	:	:	:	:	
	2A0Fh	0	Get	Alarm history 15	USINT	
		1	Get	Alarm No.	UDINT	
		2	Get	Alarm time (Hour)	UDINT	
	2A40h	0	Set	Clear alarm history	UINT	Refer to section 7.3.5 (3).
	2A41h	0	Get	Current alarm	UDINT	Refer to section 7.3.5 (4).
	2A44h	0	Get	Parameter error number	UINT	Refer to section 7.3.5 (5).
	2A45h	0	Get	Parameter error list	USINT	Refer to section 7.3.5 (6).
		1	Get	(No.1)	UINT	
		:	:	:	:	
		254	Get	(No.254)	UINT	

6.5 Parameter object

6.5.1 Definition of parameter objects

The parameter of the servo amplifier can be changed on the master (controller) by writing values to the following objects in the Explicit Message 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 parameter setting value to EEP-ROM using Store Parameters (Class ID: 64h, Ins ID: 1010h).
To change the setting of the parameters where the changes are reflected by cycling the power (parameters whose symbols are preceded by **), change the value of the corresponding object and execute Store Parameters (Class ID: 64h, Ins ID: 1010h) before cycling the power. Refer to chapter 5 of "MR-J4-_TM_ Servo Amplifier Instruction Manual" for "**" of the parameter symbol. The following table lists the related objects.

Class ID	Ins ID	Attr ID	Access	Name	Data Type	Description
64h	2001h	0	Get/Set	PA01	DINT	[Pr. PA_ _] group
	:	:	:	:	:	
	2020h	0	Get/Set	PA32	DINT	
	2081h	0	Get/Set	PB01	DINT	[Pr. PB_ _] group
	:	:	:	:	:	
	20C0h	0	Get/Set	PB64	DINT	
	2101h	0	Get/Set	PC01	DINT	[Pr. PC_ _] group
	:	:	:	:	:	
	2150h	0	Get/Set	PC80	DINT	
	2181h	0	Get/Set	PD01	DINT	[Pr. PD_ _] group
	:	:	:	:	:	
	21B0h	0	Get/Set	PD48	DINT	
	2201h	0	Get/Set	PE01	DINT	[Pr. PE_ _] group
	:	:	:	:	:	
	2240h	0	Get/Set	PE64	DINT	
	2281h	0	Get/Set	PF01	DINT	[Pr. PF_ _] group
	:	:	:	:	:	
	22C0h	0	Get/Set	PF48	DINT	
	2401h	0	Get/Set	PL01	DINT	[Pr. PL_ _] group
	:	:	:	:	:	
	2430h	0	Get/Set	PL48	DINT	
	2481h	0	Get/Set	PT01	DINT	[Pr. PT_ _] group
	:	:	:	:	:	
	24D0h	0	Get/Set	PT80	DINT	
	2581h	0	Get/Set	PN01	DINT	[Pr. PN_ _] group
	:	:	:	:	:	
	25A0h	0	Get/Set	PN32	DINT	

6.5.2 Enabling parameters

The parameters whose symbols are preceded by "*" are enabled by the following operations. Refer to chapter 5 in "MR-J4-_TM_ Servo Amplifier Instruction Manual" for the parameters with "*". Refer to chapter 5 of "MR-J4-_TM_ Servo Amplifier Instruction Manual" for "*" of the parameter symbol.

(1) Network disconnection
A parameter is enabled when a network disconnection switches the servo amplifier state to the state in which it waits for the controller to be connected. Refer to section 1.4.3 for the procedure of network disconnection.

(2) State transition
A parameter is enabled when the I/O connection shifts from the Run mode to another mode.

(3) Enabling a parameter with a parameter enabling object
A parameter is enabled by writing "1EA5h" in User parameter configuration (Class ID: 64h, Ins ID: 2D34h, Attr ID: 0). This operation can be performed only when the I/O connection is not in the Run mode. The parameter enabling processing requires a maximum of about 100 ms. The following table shows the read values of User parameter configuration (Class ID: 64h, Ins ID: 2D34h, Attr ID: 0). By checking the read value, the completion of the parameter enabling processing can be checked.

Value	Description
0	Parameter enabling processing is being executed.
1	Parameter enabling processing is not being executed. (The processing is completed.)

6.6 Scale measurement function

Refer to section 17.1 of "MR-J4-_TM_ Servo Amplifier Instruction Manual" for the scale measurement function. Position information of a scale measurement encoder can be obtained with the following objects.

(1) Related object

Class ID	Ins ID	Attr ID	Access	Name	Data Type	Default	Description
64h	2D38h	0	Get	Scale measurement encoder resolution	UDINT		Refer to section 7.3.7 (34).
	2D36h	0	Get	Scale cycle counter	UDINT		Refer to section 7.3.7 (32).
	2D37h	0	Get	Scale ABS counter	DINT		Refer to section 7.3.7 (33).
	2D3Ch	0	Get	Scale measurement encoder alarm	UDINT		Refer to section 7.3.7 (35).
	2D35h	0	Get	Encoder status	USINT	2	Refer to section 7.3.7 (31).
		1	Get	Encoder status1	UDINT		
		2		Encoder status2			

(2) Method for calculating a scale measurement encoder position
Calculate the position of a scale measurement encoder in the following formula.

Scale position = (2D37h (Scale ABS counter) × 2D38h (Scale measurement encoder resolution)) + 2D36h (Scale cycle counter)

6.7 One-touch tuning

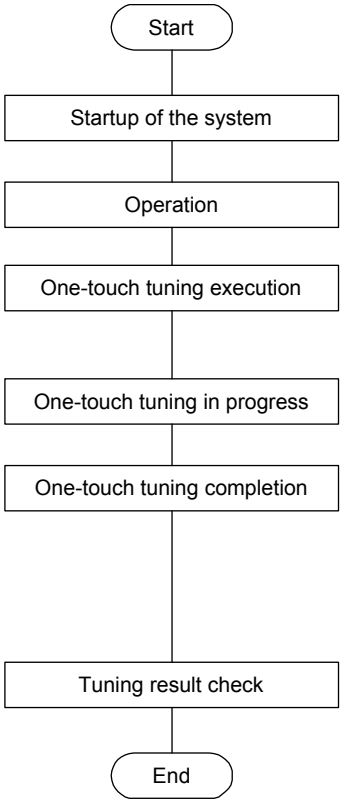
Refer to section 6.2 of "MR-J4-_TM_ Servo Amplifier Instruction Manual" for one-touch tuning. Using One-touch tuning mode (Class ID: 64h, Ins ID: 2D50h, Attr ID: 0) allows one-touch tuning from a controller.

(1) Related object

Class ID	Ins ID	Attr ID	Access	Name	Data Type	Default	Description
64h	2D50h	0	Get/Set	One-touch tuning mode	USINT	0	One-touch tuning command Setting a value of "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	Get	One-touch tuning status	SINT	0	One-touch tuning status Regardless of whether one-touch tuning is properly completed or not, the setting value changes to 100% at the completion. Unit: %
	2D52h	0	Set	One-touch tuning Stop	UINT	0	One-touch tuning stop command Writing "1EA5h" stops one-touch tuning. Writing a value other than "1EA5h" sets General status code 09h Invalid attribute value.
	2D53h	0	Set	One-touch tuning Clear	UINT	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	Get	One-touch tuning Error Code	UINT	0	One-touch tuning error code 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 chapter 4 of "MR-J4-_TM_ Servo Amplifier Instruction Manual" to start the system.

Rotate the servo motor with a controller. (One-touch tuning cannot be performed if the servo motor is not operating.)

Write a value corresponding to the response mode (High mode, basic mode, or Low mode) to perform in One-touch tuning mode (Class ID: 64h, Ins ID: 2D50h, Attr ID: 0) during servo motor driving to perform one-touch tuning.

Gains and filters will be adjusted automatically. During one-touch tuning, the progress can be checked with One-touch tuning status (Class ID: 64h, Ins ID: 2D51h, Attr ID: 0).

Check whether one-touch tuning is completed normally with One-touch tuning Error Code (Class ID: 64h, Ins ID: 2D54h, Attr ID: 0). When one-touch tuning is completed normally, the parameters will be set automatically. Refer to section 6.2 of "MR-J4-_TM_ Servo Amplifier Instruction Manual" for the parameters that are set automatically.

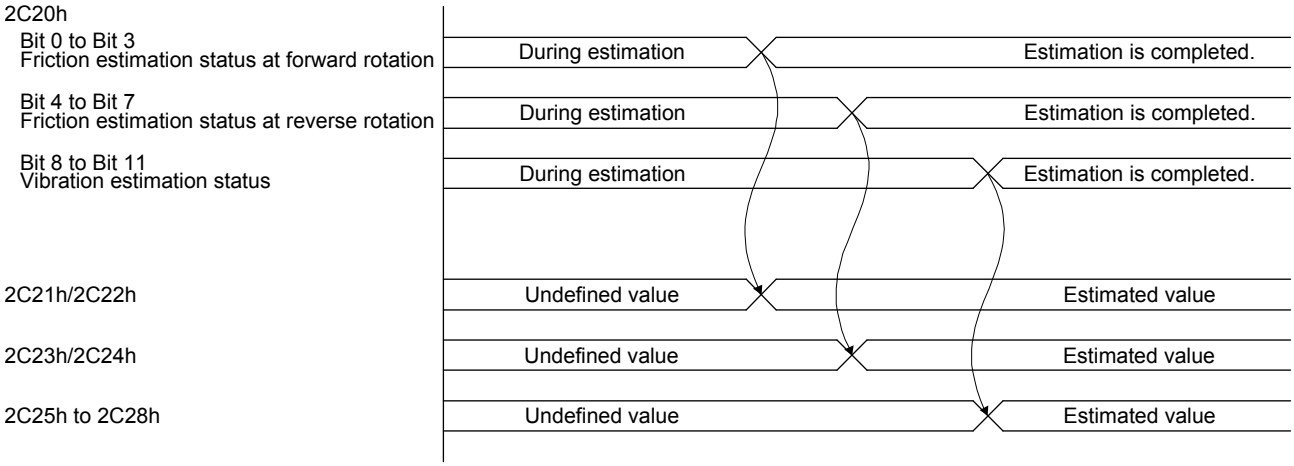
After a tuning error is returned, take the appropriate action according to section 6.2.2 (4) of "MR-J4-_TM_ Servo Amplifier Instruction Manual".

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 the initial value using One-touch tuning Clear (Class ID: 64h, Ins ID: 2D53h, Attr ID: 0).

6.8 Machine diagnosis function

This function estimates the friction and vibrational component of the drive system in the equipment based on the data in the servo amplifier, 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.



Class ID	Ins ID	Attr ID	Access	Name	Data Type	Default	Description
64h	2C20h	0	Get	Machine diagnostic status	UINT		Machine diagnostic status Refer to section 7.3.7 (3).
	2C21h	0	Get	Coulomb friction torque in positive direction	INT		Static friction at forward rotation torque Static friction at forward rotation torque is displayed in increments of 0.1%.
	2C22h	0	Get	Friction torque at rated speed in positive direction	INT		Kinetic friction at forward rotation torque (at rated speed) Kinetic friction at forward rotation torque at the rated speed is displayed in increments of 0.1%.
	2C23h	0	Get	Coulomb friction torque in negative direction	INT		Static friction at reverse rotation torque Static friction at reverse rotation torque is displayed in increments of 0.1%.
	2C24h	0	Get	Friction torque at rated speed in negative direction	INT		Kinetic friction at reverse rotation torque (at rated speed) Kinetic friction at reverse rotation torque at the rated speed is displayed in increments of 0.1%.
	2C25h	0	Get	Oscillation frequency during motor stop	INT		Vibration frequency at stop/servo-lock Vibration frequency during stop/servo-lock is displayed in increments of 1 Hz.
	2C26h	0	Get	Vibration level during motor stop	INT		Vibration level at stop/servo-lock Vibration level during stop/servo-lock is displayed in increments of 0.1%.
	2C27h	0	Get	Oscillation frequency during motor operating	INT		Vibration frequency during operation Vibration frequency during operation is displayed in increments of 1 Hz.
	2C28h	0	Get	Vibration level during motor operating	INT		Vibration level during operation Vibration level during operation is displayed in increments of 0.1%.

6.9 Servo amplifier life diagnosis function

You can check the cumulative energization time and the number of on/off times of the inrush relay based on 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.

Class ID	Ins ID	Attr ID	Access	Name	Data Type	Default	Description
64h	2C18h	0	Get	Power ON cumulative time	UDINT		The cumulative energization time of the servo amplifier is returned.
	2C19h	0	Get	Inrush relay ON/OFF number	UDINT		The number of on/off times of the inrush relay of the servo amplifier is returned.

6.10 Superimposed synchronous control function

POINT

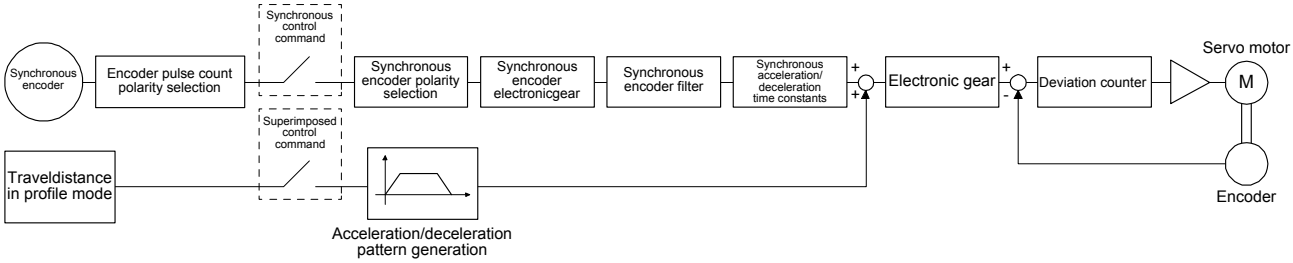
- The superimposed synchronous control function can be used in the profile position mode. Do not use the function in another mode.
- The superimposed synchronous control function cannot be used with a servo amplifier to which an MR-D30 functional safety unit has been installed.
- If the control unit is set to "degree", the superimposed synchronous control function is disabled.
- The superimposed synchronous control function cannot be used in the fully closed loop control mode, linear servo motor control mode, or DD motor control mode.
- When the superimposed synchronous control function is enabled, the position at power-on or when the communication is reset is used as the home position.

6.10.1 Summary

The superimposed synchronous control function adds the compensation amount to the synchronous encoder rotation position to correct the servo motor rotation position during synchronous control. The synchronous control function sends an output signal from the synchronous encoder to the servo amplifier to make the servo motor rotation position follow the synchronous encoder rotation position.
This control function helps users configure equipment in which a rotary cutter cuts sheets conveyed by conveyers at a constant speed into a requited length. Users can correct the position at which the rotary cutter cuts a sheet by using an external sensor.
Refer to the AOI (Add-On Instruction) specifications for details.

6.10.2 Function block diagram

The following figure shows the function block diagram of the superimposed synchronous control.

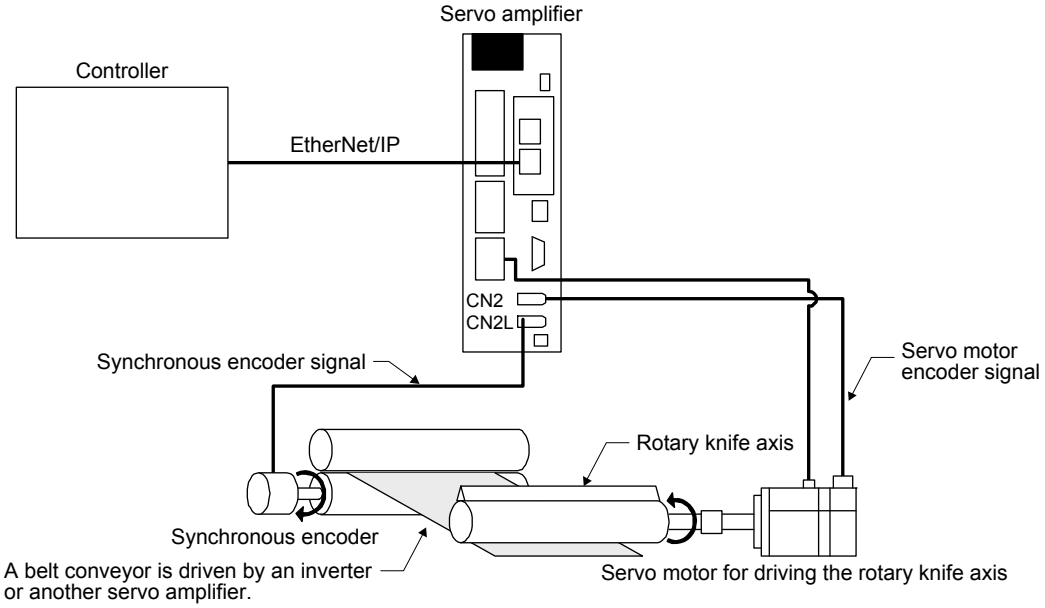


6.10.3 Specification list

Item	Description
Supported control mode	Profile position mode
Supported operation mode	Standard control mode
Encoder that can be used as a synchronous encoder	Linear encoder (Refer to "Linear Encoder Instruction Manual" for usable linear encoders.) Rotary encoder (HG-KR motor, HG-MR motor, and synchronous encoder Q171ENC-W8) A/B-phase differential output type encoder (Note) A/B/Z-phase differential output type encoder (Note)
Supported communication	EtherNet/IP

Note. For how to connect the encoders, contact your local sales office.

6.10.4 System configuration



6.10.5 Synchronous encoder

POINT
●Always use the synchronous encoder cable introduced in this section. Using other products may cause a malfunction. ●For details of the synchronous encoder specifications, performance and assurance, contact each encoder manufacturer. ●When the superimposed synchronous control function is enabled, the position at power-on or when the communication is reset is used as the home position. ●For how to connect A/B-phase differential output type encoders and A/B/Z-phase differential output type encoders, contact your local sales office.

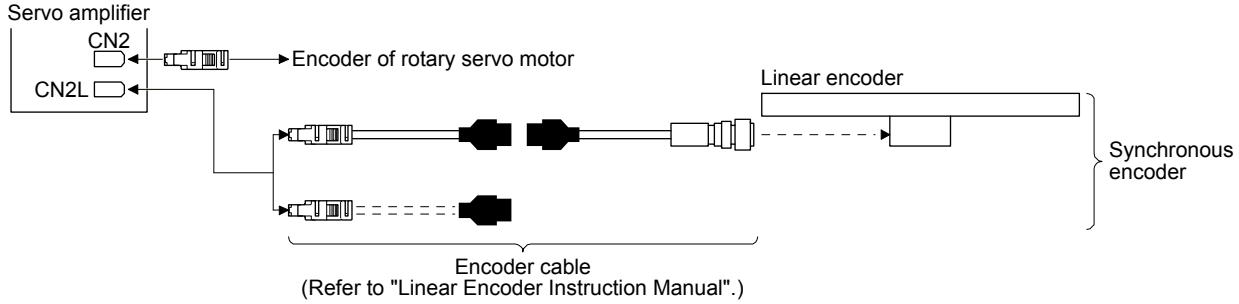
(1) Linear encoder
Refer to "Linear Encoder Instruction Manual" for usable linear encoders.

(2) Rotary encoder
When a rotary encoder is used as a synchronous encoder, use either of the following servo motors or the synchronous encoder as the encoder.

	HG-KR	HG-MR	Synchronous encoder Q171ENC-W8
MR-J4-_TM_	○	○	○

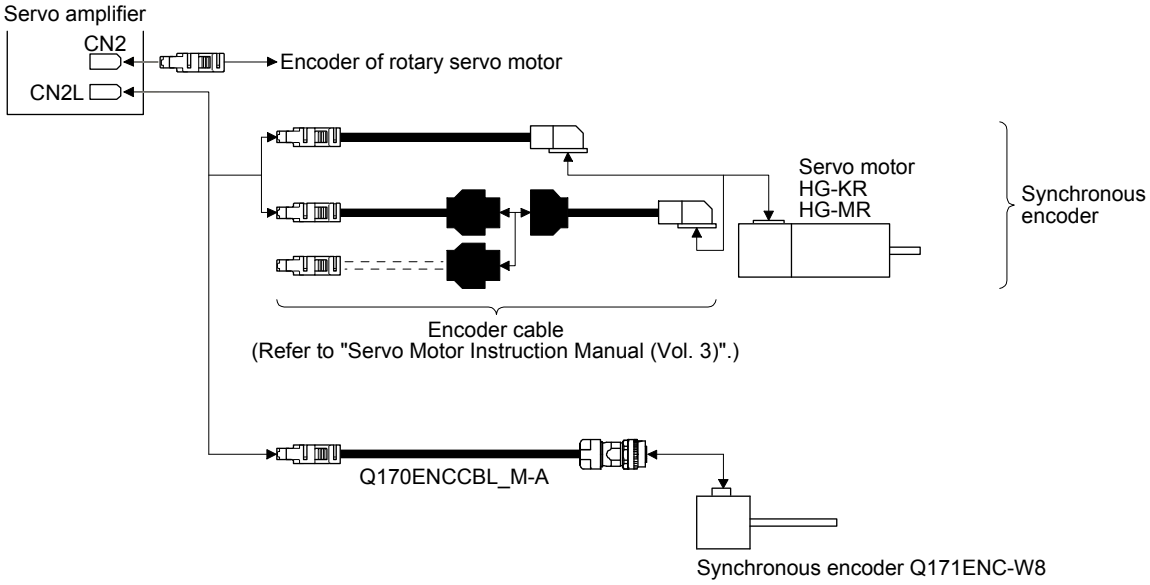
(3) Configuration diagram of encoder cable
The following figure shows the configuration diagram of a servo amplifier and synchronous encoder. Cables used vary, depending on the synchronous encoder.

(a) Linear encoder
Refer to "Linear Encoder Instruction Manual" for encoder cables for linear encoders.



(b) Rotary encoder

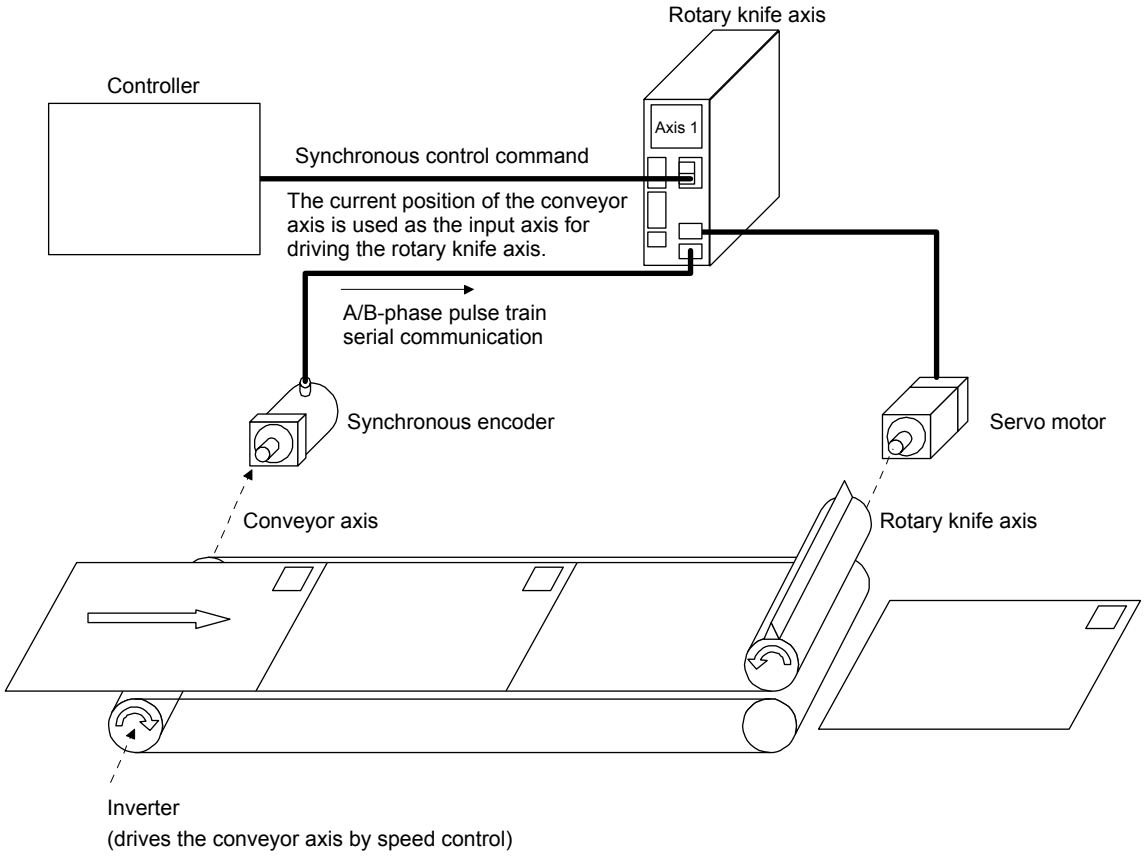
Refer to "Servo Motor Instruction Manual (Vol. 3)" for encoder cables for rotary encoders.



6.10.6 Functions usable in the superimposed synchronous control

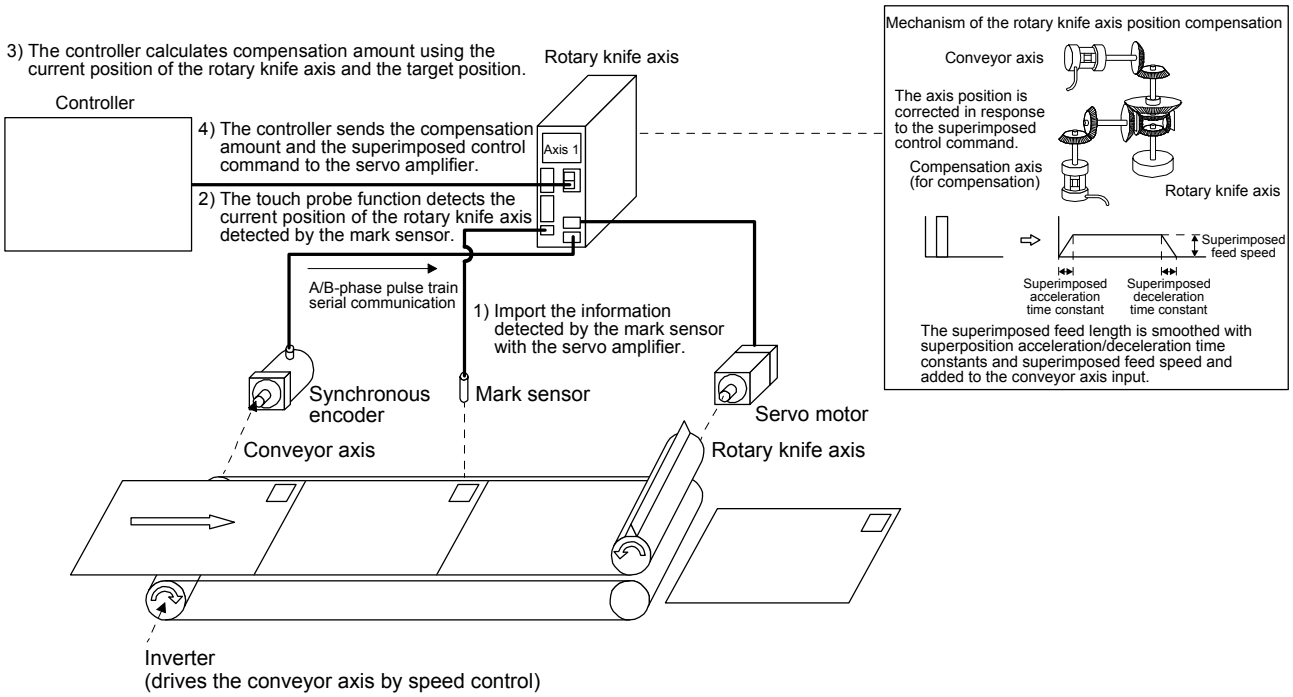
(1) Encoder following function

The servo amplifier receives position information from a synchronous encoder and starts the servo motor with the signal. To use this function, use the servo amplifier in an incremental system.



(2) Mark sensor input compensation function

The controller receives input signals from external sensors, calculates compensation amount, and corrects position errors of the rotary knife axis.



6.10.7 How to use the superimposed synchronous control

(1) Selection for superimposed synchronous control
Set the superimposed synchronous control with a combination of the basic setting parameter [Pr. PA22] and the positioning control parameter [Pr. PT35].

(a) Scale measurement function selection
Select "2 _ _ _" (Used in the incremental system) in [Pr. PA22].

[Pr. PA22]

2	0	0	0

Scale measurement function selection
0: Disabled
1: Used in absolute position detection system
2: Used in incremental system

(b) Superimposed synchronous control selection
Set "_ _ _ 1" in [Pr. PT35] to enable the superimposed synchronous control.

[Pr. PT35]

0	0	0	1

Superimposed synchronous control selection
0: Enabled
1: Disabled

(2) Selection of synchronous encoder communication method
The communication method to be used depends on the synchronous encoder type. For the communication method for using a linear encoder as a synchronous encoder, refer to "Linear Encoder Instruction Manual". Select "Four-wire type" because there is only four-wire type for the synchronous encoder Q171ENC-W8.
Select the cable to be connected to CN2L connector in [Pr. PC26].

[Pr. PC26]

	0	0	0

Load-side encoder cable communication method selection
0: Two-wire type
1: Four-wire type
When using an encoder of A/B/Z-phase differential output method, set "0".
Incorrect setting will trigger [AL. 70] and [AL. 71].

(3) Selection of synchronous encoder polarity

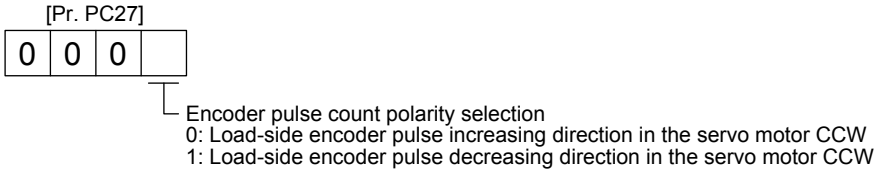
Select a polarity of the synchronous encoder with the following "Encoder pulse count polarity selection" and "Selection of A/B/Z-phase input interface encoder Z-phase connection judgement function" of [Pr. PC27] as necessary.

POINT
●"Encoder pulse count polarity selection" of [Pr. PC27] is not related to [Pr. PA14 Rotation direction selection]. Make sure to set the parameter according to the relationships between the servo motor and linear encoder/rotary encoder.

(a) How to set the parameter

1) Selecting an encoder pulse count polarity

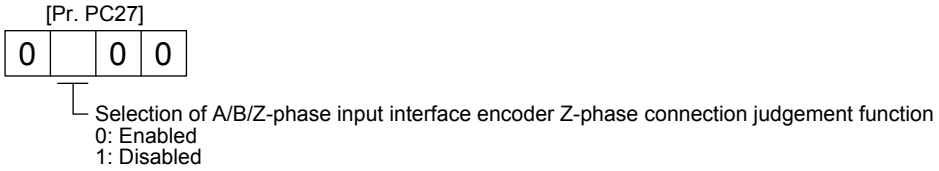
This parameter is used to set the polarity of the load-side encoder to be connected to the CN2L connector in order to match the CCW direction of the servo motor and the increasing direction of the load-side encoder feedback. Set this as necessary.



2) A/B/Z-phase input interface encoder Z-phase connection judgement function

This function can trigger an alarm by detecting non-signal for Z phase.

The Z-phase connection judgement function is enabled by default. To disable the Z-phase connection judgement function, set [Pr. PC27].



(b) How to confirm the synchronous encoder feedback direction

You can confirm that the directions of the cumulative feedback pulses of the servo motor encoder and the load-side cumulative feedback pulses match by manually moving the device (synchronous encoder) in the servo-off status. If mismatched, reverse the polarity.

(4) Confirmation of synchronous encoder position data

Check the synchronous encoder mounting and parameter settings for any problems.

Operate the device (synchronous encoder) to check the data of the synchronous encoder is renewed correctly. If the data is not renewed correctly, check the mounting, wiring, and parameter settings. Change the scale polarity as necessary.

(5) Synchronous encoder electronic gear setting

Set the numerator ([Pr. PT72] and [Pr. PT73]) and denominator ([Pr. PT74] and [Pr. PT75]) of the synchronous electronic gear to the synchronous encoder pulse. Set the synchronous encoder electronic gear so that the number of synchronous encoder pulses per synchronous encoder revolution is converted into the number of command pulses. The relational expression is shown below.

$$\frac{\text{Synchronous encoder electronic gear - Numerator ([Pr. PT72] [Pr. PT73])}}{\text{Synchronous encoder electronic gear - Denominator ([Pr. PT74] [Pr. PT75])}} \times \frac{\text{Electronic gear numerator ([Pr. PA06])}}{\text{Electronic gear denominator ([Pr. PA07])}} = \frac{\text{Number of servo motor encoder pulses}}{\text{Number of synchronous encoder pulses per synchronous encoder revolution}}$$

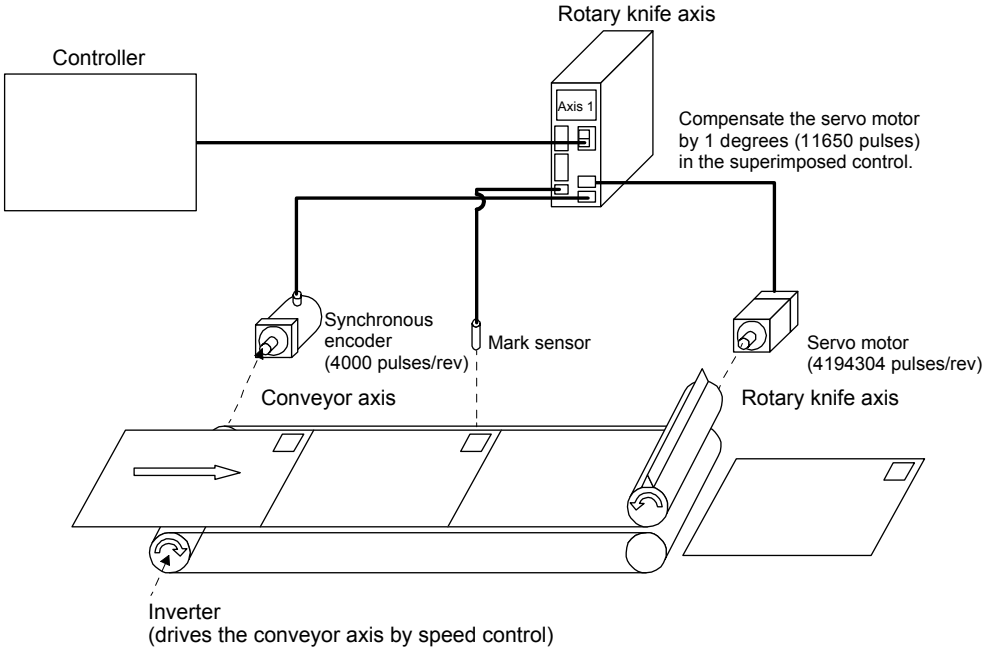
Setting example of a rotary cutter device

Condition

Servo motor resolution: 4194304 pulses/rev

Synchronous encoder resolution: 4000 pulses/rev

Superimposed feed length during superimposed control: 11650 pulses (1 degrees)



(a) Setting example 1

Rotating the servo motor once per one revolution of the synchronous encoder when a superimposed feed length of 11650 pulses is input from the controller

$$\frac{\text{Electronic gear numerator ([Pr. PA06])}}{\text{Electronic gear denominator ([Pr. PA07])}} = \frac{\text{Superimposed feed length during superimposed control}}{\text{Superimposed feed length from controller}} = \frac{11650}{11650} = \frac{1}{1}$$

$$\frac{\text{Synchronous encoder electronic gear - Numerator ([Pr. PT72] [Pr. PT73])}}{\text{Synchronous encoder electronic gear - Denominator ([Pr. PT74] [Pr. PT75])}} = \frac{\text{Number of servo motor encoder pulses}}{\text{Number of synchronous encoder pulses per synchronous encoder revolution}} \times \frac{\text{Electronic gear denominator}}{\text{Electronic gear numerator}}$$

$$= \frac{4194304}{4000} \times \frac{1}{1} = \frac{4194304}{4000} = \frac{131072}{125}$$

(b) Setting example 2

Rotating the servo motor once per two revolutions of the synchronous encoder when a superimposed feed length of 1165 pulses is input from the controller

$$\frac{\text{Electronic gear numerator ([Pr. PA06])}}{\text{Electronic gear denominator ([Pr. PA07])}} = \frac{\text{Superimposed feed length during superimposed control}}{\text{Superimposed feed length from controller}} = \frac{11650}{1165} = \frac{10}{1}$$

$$\frac{\text{Synchronous encoder electronic gear - Numerator ([Pr. PT72] [Pr. PT73])}}{\text{Synchronous encoder electronic gear - Denominator ([Pr. PT74] [Pr. PT75])}} = \frac{\text{Number of servo motor encoder pulses}}{\text{Number of synchronous encoder pulses per synchronous encoder revolution}} \times \frac{\text{Electronic gear denominator}}{\text{Electronic gear numerator}}$$

$$= \frac{2097152}{4000} \times \frac{1}{10} = \frac{2097152}{4000} = \frac{65536}{625}$$

(6) Synchronous encoder filter time constant setting

Set a primary delay filter time constant in [Pr. PT46] to the synchronous encoder command. Setting [Pr. PT46 Synchronous encoder filter time constant] reduces vibration. However, a delay in response to the synchronous encoder is generated.

(7) Network communication setting

Set the following items in the network communication. Items that have been set with parameters do not need to be set in the network communication. For the setting items mentioned as Mapping in the Communication method column, you can assign corresponding objects with variable mapping. For the setting items mentioned as Instruction code, you can rewrite corresponding parameters with Instruction code. Refer to section 6.2 for the variable mapping assignment and how to use Instruction code.

Setting item	Object (Class ID, Ins ID, Attr ID)	Bit	Number of bits	Communication method	Setting
Synchronous control command (C_STS)	Control DI 7 (64h, 2D07h, 0)	Bit 12	1 bit	Mapping	Turn on C_STS in the network communication to start the synchronous control. When the value of the synchronous encoder electronic gear was changed in the network communication, turn on Synchronous control command (C_STS) after Analysis completed (S_CEG) is turned on.
Analysis command (C_CEG)	Control DI 7 (64h, 2D07h, 0)	Bit 14	1 bit	Mapping	When the synchronous encoder electronic gear was changed, turn on Analysis command (C_CEG). After Analysis completed (S_CEG) is turned on, the change of the synchronous encoder electronic gear will be applied and the new setting will be used by the synchronous control.
Synchronous acceleration time constant	External encode acceleration (64h, 2DF1h, 0)		32 bits	Mapping	Set a time for the servo motor to reach the rated speed to a synchronous encoder command when Synchronous control command (C_STS) is turned on. A setting value when Synchronous control command (C_STS) is turned on will be applied.
Synchronous deceleration time constant	External encoder deceleration (64h, 2DF2h, 0)		32 bits	Mapping	Set a time for the servo motor to stop from the rated speed to a synchronous encoder command when Synchronous control command (C_STS) is turned off. A setting value when Synchronous control command (C_STS) is turned on will be applied.
Synchronous encoder polarity selection (C_POL)	Control DI 7 (64h, 2D07h, 0)	Bit 13	1 bit	Mapping	Set the synchronous encoder polarity according to the specifications of an encoder used. A setting value when Synchronous control command (C_STS) is turned on will be applied.
Synchronous encoder electronic gear - Numerator	External encoder gear numerator (64h, 2DF0h, 1)		32 bits	Mapping	Set a synchronous encoder electronic gear for converting a synchronous encoder command into a command unit. A value written to this object is not immediately applied to the synchronous encoder electronic gear. To apply the value written in this object to the synchronous encoder electronic gear, turn on Analysis command (C_CEG).
Synchronous encoder electronic gear - Denominator	External encoder gear denominator (64h, 2DF0h, 2)		32 bits	Mapping	
Synchronous encoder filter time constant			16 bits	Instruction code	Set the time constant of the primary filter to be applied to a synchronous encoder command.
Superimposed control command (New set-point)	Control word (64h, 6040h, 0)	Bit 4	1 bit	Mapping	Turn on Superimposed control command (New set-point) in the network communication when using the superimposed synchronous control.
Superimposed feed length	Target position (64h, 607Ah, 0)		32 bits	Mapping	Set the compensation amount for the servo motor rotation position in the superimposed synchronous control. A positive superimposed feed length adds compensation to superimposed control in the command address increasing direction, and a negative superimposed feed length adds compensation in the command address decreasing direction.
Superimposed feed speed	Profile velocity (64h, 6081h, 0)		32 bits	Mapping	Set the increment of the servo motor speed at a start of the superimposed control.

Setting item	Object (Class ID, Ins ID, Attr ID)	Bit	Number of bits	Communication method	Setting
Superimposed acceleration time constant	Profile Acceleration (64h, 6083h, 0)		32 bits	Mapping	Set the acceleration time constant at superimposed synchronous control.
Superimposed deceleration time constant	Profile deceleration (64h, 6084h, 0)		32 bits	Mapping	Set the deceleration time constant at superimposed synchronous control.

6.10.8 How to perform synchronous control

To start the synchronous control, turn on Synchronous control command in the servo-on status. Note that synchronous control is not started under either of the following conditions even if Synchronous control command is turned on. Synchronous control error turns on.

Item	Synchronous control error condition
Synchronous encoder electronic gear	The value of the synchronous encoder electronic gear is smaller than 1/16000 or greater than 6000.
Analysis command	Synchronous control command has been turned on between when Analysis command turned on and when Analysis completed turned on.
Synchronous acceleration	The synchronous acceleration time constant has exceeded 20000 ms.
Synchronous deceleration	The synchronous deceleration time constant has exceeded 20000 ms.
Communication reset	A communication reset occurred during synchronous control.

6.10.9 How to perform superimposed control

When the superimposed synchronous control function is enabled, the position at power-on or when the communication is reset is used as the home position. A home position return is not required to start the superimposed control. To start the superimposed synchronous control, turn on Synchronous control command while Superimposed control command is on. Note that the superimposed control is not started under either of the following conditions even if Superimposed control command is turned on. Superimposed control error turns on.

Item	Superimposed control error condition
Synchronous control command	Synchronous control command is off.
Superimposed feed speed	The superimposed feed speed is 0 r/min.

Set each of the superimposed feed length, superimposed feed speed, superimposed acceleration time constant, and superimposed deceleration time constant within each of the following setting ranges for the superimposed synchronous control. If Superimposed control command is turned on with either of the items outside the setting ranges, [AL. F4 Positioning warning] may occur.

Item	Setting range
Superimposed feed length	Refer to the setting range of Target position.
Superimposed feed speed	0 to permissible instantaneous speed
Superimposed acceleration time constant	0 to 20000 ms
Superimposed deceleration time constant	0 to 20000 ms

6.10.10 How to stop superimposed synchronous control

If an alarm has occurred or the EtherNet/IP communication is shut off during superimposed synchronous control, the superimposed synchronous control will stop. For details of the stop method, refer to "MR-J4-_TM_ Servo Amplifier Instruction Manual". When the following stop cause occurs, the superimposed synchronous control will stop. The superimposed synchronous control does not stop if Superimposed control command is turned off between when Superimposed control command was turned on and when the superimposed synchronous control was completed.

Stop cause	Command stop processing
Superimposed control command off	The servo motor decelerates to a stop from the speed of when Synchronous control command is turned off with the set synchronous deceleration time constant.

6.10.11 Remedies for stroke limits

When LSP (Forward rotation stroke end) or LSN (Reverse rotation stroke end) turns off, the home position is not erased. However, the synchronous encoder will not be synchronized with the servo motor. In this case, perform the following operations.

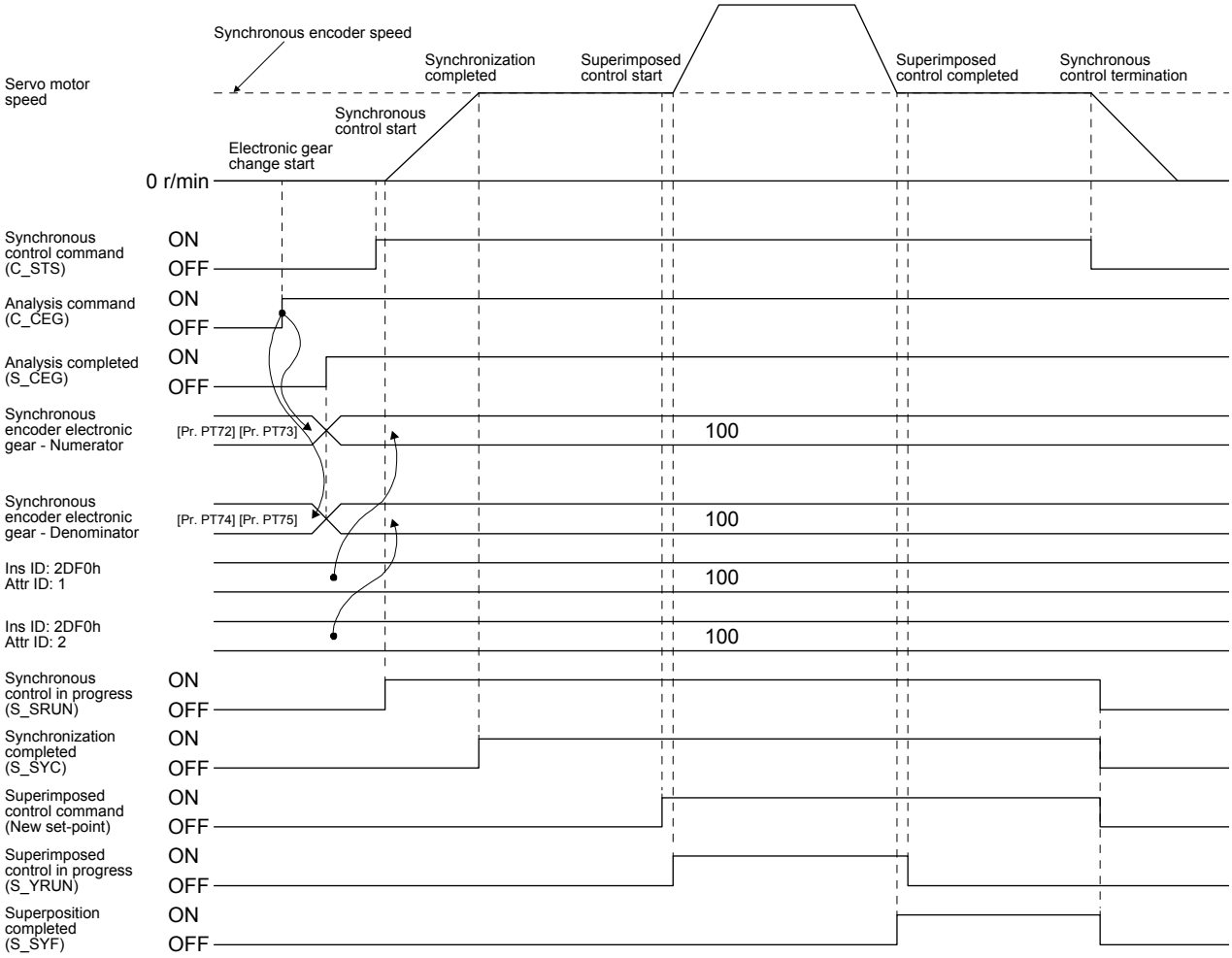
(1) Turn off Synchronous control command.

(2) Move the moving part of the device to a safe position in the velocity mode.

(3) Execute servo-off or home position return.

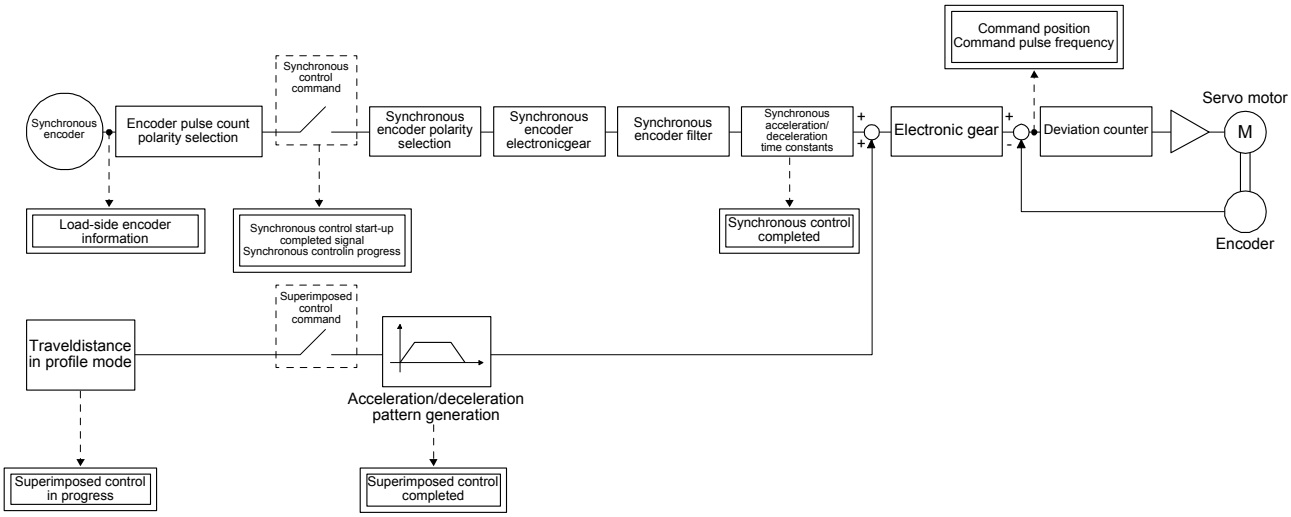
(4) After servo-on or home position return completion, turn on Synchronous control command to start the synchronous control.

6.10.12 Superimposed synchronous control timing chart



6.10.13 Block diagram of the superimposed synchronous control status display

(1) Block diagram



(2) Status display that can be monitored in the network communication

The following status display items can be monitored in the network communication during superimposed synchronous control. For the setting items mentioned as Mapping in the Communication method column, you can assign corresponding objects with variable mapping. For the setting items mentioned as Instruction code, you can read corresponding parameters with Instruction code. Refer to section 6.2 for the variable mapping assignment and how to use Instruction code.

Status display	Object (Class ID, Ins ID, Attr ID)	Bit	Number of bits	Communication method	Description
Synchronous control start-up completed (S_SYCREV)	Status DO 6 (64h, 2016h, 0)	Bit 15	1 bit	Mapping	0: Synchronous control command not received 1: Synchronous control command received Indicates that Synchronous control command has been received properly.
Synchronization completed (S_SYC)	Status DO 7 (64h, 2017h, 0)	Bit 14	1 bit	Mapping	0: Synchronous control not completed 1: Synchronous control completed Indicates that the rotation position of the synchronous encoder has synchronized with that of the servo motor.
Synchronous control in progress (S_SRUN)	Status DO 7 (64h, 2017h, 0)	Bit 9	1 bit	Mapping	0: Synchronous control not in progress 1: Synchronous control in progress Indicates that the synchronous control is in progress.
Synchronous control error (S_SERR)	Status DO 7 (64h, 2017h, 0)	Bit 10	1 bit	Mapping	0: Synchronous control properly in progress 1: Synchronous control error Indicates that an error has occurred in the synchronous control.
Superposition completed (S_SYF)	Status DO 7 (64h, 2017h, 0)	Bit 15	1 bit	Mapping	0: Superimposed control not completed 1: Superimposed control completed Indicates that the superimposed control has been completed.
Superimposed control in progress (S_YRUN)	Status DO 7 (64h, 2017h, 0)	Bit 11	1 bit	Mapping	0: Superimposed control not in progress 1: Superimposed control in progress Indicates that the superimposed control is in progress.
Superimposed control error (S_YERR)	Status DO 7 (64h, 2017h, 0)	Bit 12	1 bit	Mapping	0: Superimposed control properly in progress 1: Superimposed control error Indicates that an error has occurred in the superimposed control.
Analysis completed (S_CEG)	Status DO 6 (64h, 2016h, 0)	Bit 14	1 bit	Mapping	0: It will be 0 for either of the followings. 1) Analysis command (C_CEG) is turned off. 2) The calculation of synchronous encoder electronic gear is in progress after Analysis command (C_CEG) was turned on. 3) The change of synchronous encoder electronic gear was completed after Analysis command (C_CEG) was turned on. However, the setting of synchronous encoder electronic gear is out of range. 1: The change of synchronous encoder electronic gear was completed and the setting of synchronous encoder electronic gear is in the range. When Analysis completed (S_CEG) is not turned on after Analysis command (C_CEG) was turned on and after communication cycle + 100 ms, the communication can be shut-off or the setting of synchronous encoder electronic gear can be out of range.

Status display	Object (Class ID, Ins ID, Attr ID)	Bit	Number of bits	Communication method	Description
Synchronous encoder electronic gear - Numerator	External encoder gear numerator (64h, 2DF0h, 1)		32 bits	Mapping	Returns the value of Synchronous encoder electronic gear - Numerator used for synchronous control.
Synchronous encoder electronic gear - Denominator	External encoder gear denominator (64h, 2DF0h, 2)		32 bits	Mapping	Returns the value of Synchronous encoder electronic gear - Denominator used for synchronous control.
Synchronous encoder filter time constant			16 bits	Instruction code	Returns the primary filter time constant set for a synchronous encoder command.

6.11 Positioning function by operation start-up signal

POINT
●The positioning function by the operation start-up signal can be used in the profile position mode.

6.11.1 Summary

The positioning function by the operation start-up signal performs positioning operations using external input signals. Turning on Operation start-up signal activation (C_OSSA) in the profile position mode (pp) starts positioning operations using external input signals.
Because positioning operations start using external input signals of the servo amplifier, an operation can be started without delay at the start due to a communication delay.

6.11.2 Specification list

Item	Description
Supported control mode	Profile position mode
Supported operation mode	Standard control mode, fully closed loop control mode, linear servo motor control mode, DD motor control mode
Operation pattern	Single (A positioning operation is performed at the rising edge of an external input signal.)
Command generation pattern	A command pattern is calculated from the acceleration time and deceleration time.
Supported communication	EtherNet/IP

6.11.3 Settings

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

Setting item	Setting parameter	Setting
Operation start-up signal assignment	PD38	Set [Pr. PD38] to "_ _ 2 E" and assign ST (operation start-up) to an external input signal. If Operation start-up signal activation (C_OSSA) is turned on without ST assigned, Operation error (S_OERR) turns on.
S-pattern acceleration/deceleration time constant	PT51	Set the time of the arc part for S-pattern acceleration/deceleration. Setting "0" will make it linear acceleration/deceleration.
Maximum profile speed	PT66	Set the maximum value of the target speed for the positioning operation. This parameter can be set by inputting a value in Max profile velocity (Class ID: 64h, Ins ID: 607Fh, Attr ID: 0).
Profile speed command	PT65	Set the target speed for the positioning operation. This parameter can be set by inputting a value in Profile velocity (Class ID: 64h, Ins ID: 6081h, Attr ID: 0).
Acceleration time constant	PT49	Set the acceleration time taken for the servo motor that has stopped to reach the rated speed in the positioning operation. This parameter can be set by inputting a value in Profile acceleration (Class ID: 64h, Ins ID: 6083h, Attr ID: 0).
Deceleration time constant	PT50	Set the deceleration time taken for the servo motor that is operating at the rated speed to stop in the positioning operation. This parameter can be set by inputting a value in Profile deceleration (Class ID: 64h, Ins ID: 6084h, Attr ID: 0).

(2) List of items set in the network communication

Setting item	Object (Class ID, Ins ID, Attr ID)	Bit	Setting
Control mode	Modes of operation (64h, 6060h, 0)		Set "1" in Modes of operation to change the control mode to the profile position mode.
Positioning mode setting	Controlword (64h, 6040h, 0)	Bit 5 Bit 9	Set the positioning mode. The positioning mode is determined by a combination of values of bit 5 and bit 9 of Controlword. Refer to section 5.4.3 for details.
Target position	Target position (64h, 607Ah, 0)		Set a target position. The command used for the target position can be changed between the absolute position command and relative position command using bit 6 of Controlword. When the unit is set to degree, relative position commands are disabled. When the relative position command is specified and positioning is started, [AL. F4.8] occurs and positioning cannot be started. If positioning is attempted with a set target position outside the following setting range, [AL. F4.4] occurs and the positioning cannot be started. pulse: -999999 to 999999 degree: -360000 to 360000
Target speed	Profile velocity (64h, 6081h, 0)		Set a target speed. This value is clamped at the speed set with Max profile velocity (64h, 607Fh, 0) or the permissible instantaneous speed of the servo motor used.
Acceleration time constant	Profile acceleration (64h, 6083h, 0)		Set the acceleration time taken for the servo motor that has stopped to reach the rated speed. If positioning is attempted with a time longer than 20000 ms set, [AL. F4.6] occurs and the positioning cannot be started.
Deceleration time constant	Profile deceleration (64h, 6084h, 0)		Set the deceleration time for the servo motor to stop from the rated speed. If positioning is attempted with a time longer than 20000 ms set, [AL. F4.7] occurs and the positioning cannot be started.
Operation start-up signal activation (C_OSSA)	Control DI 10 (64h, 2D0Ah, 0)	Bit 2	Turn on Operation start-up signal activation (C_OSSA). If Operation start-up signal activation (C_OSSA) is turned on without ST (operation start-up) assigned to an external input signal, Operation error (S_OERR) turns on.

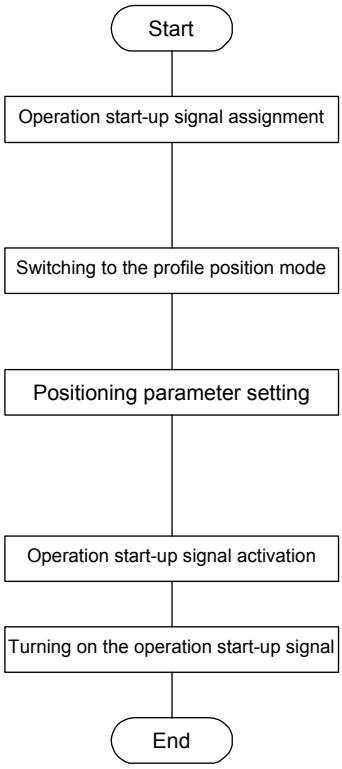
6.11.4 Status obtainable in the network communication

The following table shows the specific status that can be obtained in the network communication during positioning operation by an operation start-up signal. The status that can be obtained in the profile position mode can be obtained. Refer to section 5.3 for details.

Status	Description
Operation error (S_OERR)	Indicates that an error has occurred in a positioning operation started by the operation start-up signal. The status can be obtained with bit 2 of Status DO 10. Off: Normal On: Error

6.11.5 Operation method

(1) Procedure



Set [Pr. PD38] to "_ _ 2 E" and select ST (operation start-up).
After setting the parameter, cycle the power or reset the network communication to enable the setting.

Set 1 in Modes of operation (Class ID: 64h, Ins ID: 6060h, Attr ID: 0) to change the control mode to the profile position mode.

Set the parameters. (Refer to section 6.11.3.)
Set a value within the permissible range in each parameter. If a value outside the range is set, [AL. F4 Positioning warning] occurs and positioning cannot be started.

Turn on bit 2 of Control DI 10 to enable the operation start-up signal.

Turn on ST (operation start-up) to start positioning.

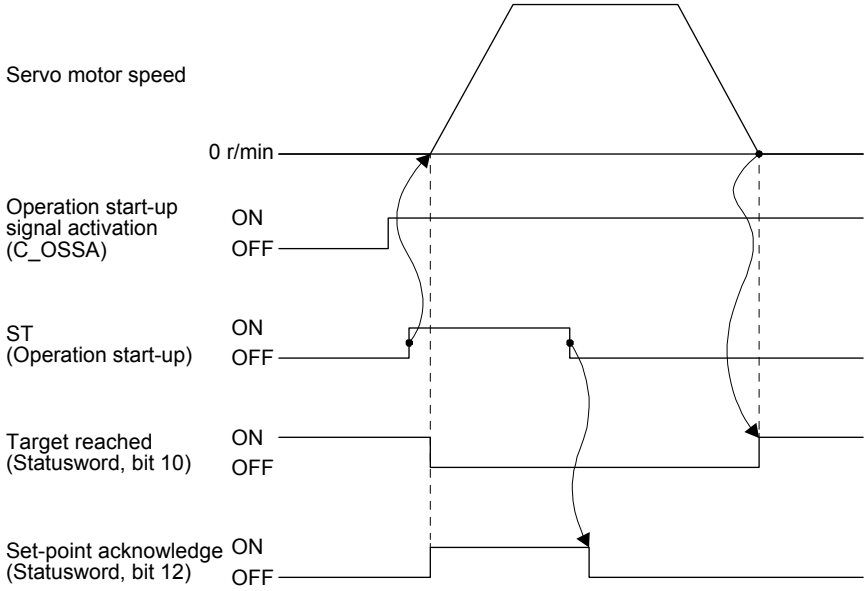
(2) Timing chart

The following shows a timing chart of the positioning function by the operation start-up signal. The positioning operation can be started by enabling the operation start-up signal and turning on ST (operation start-up).

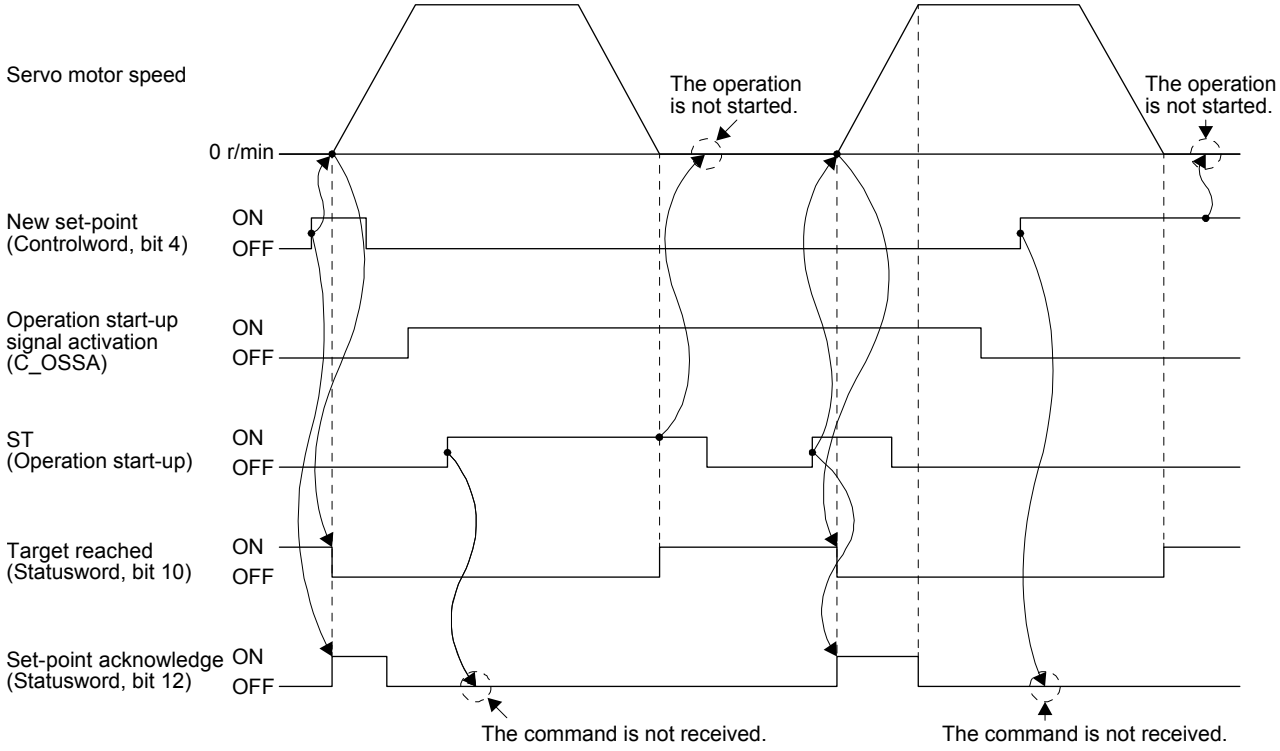
Note that the positioning operation by the operation start-up signal cannot be started even though the operation start-up signal is enabled during positioning operation with the network communication. The positioning operation with the network communication cannot be started even though the operation start-up signal is disabled and the start-up signal is input with the network communication during positioning operation by the operation start-up signal.

Switching of the network communication and the operation start-up signal can be executed only when a positioning is completed. Completion of a positioning can be checked with Target reached (Statusword bit 10).

(a) Positioning by operation start-up signal



(b) Switching of positioning by the network communication and positioning by the operation start-up signal



7. OBJECT LIBRARY

7.1 Store Parameters

POINT
●Before shutting off the power after executing Store Parameters, always check that parameters are not being saved (bit 0 is on).

Writing "65766173h" (= reverse order of the ASCII code of "save") to the corresponding sub object of Store Parameters (Class ID: 64h, Ins ID: 1010h) stores objects 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 library. However, the new setting is not automatically written to the EEP-ROM. To write the new setting, use Store Parameters (Class ID: 64h, Ins ID: 1010h).
Executing Store Parameters (Class ID: 64h, Ins ID: 1010h) takes about a maximum of 10 s because all parameters are written at the same time. Be careful not to shut off the power during writing.

Class ID	Ins ID	Attr ID	Access	Name	Data Type	Description
64h	1010h	0	Get	Store Parameters	USINT	Number of entries
		1	Get/Set	Save all parameters	UDINT	Saves all parameters. Writing "save" (= 65766173h) saves all the objects which can be stored in the EEP-ROM.
		2 (Not supported) (Note)	Get/Set	Save communication parameters	UDINT	Saves communication parameters. Writing "save" (= 65766173h) saves the communication objects (except Class ID 64h) in the EEP-ROM.
		3 (Not supported) (Note)	Get/Set	Save application parameters	UDINT	Saves application parameters. Writing "save" (= 65766173h) saves the Class ID 64h objects which can be stored in the EEP-ROM.

Note. This is not supported by the MR-J4-_TM_ servo amplifier.

The following values are read from this object. When a parameter is being saved, "0" is read. When no parameter is being saved, "1" is read.

Bit	Description
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.)
1	0: The parameter is not automatically saved.

7.2 Supported object library list

Group	Name	Class ID	Instance ID
General Objects	Identity Object	01h	
	Store parameters	64h	1010h
Communication Setting Objects	Message Router Object	02h	
	Connetion Manager Object	06h	
	Device Level Ring(DLR) Object	47h	
	QoS Object	48h	
	TCP/IP Interface Object	F5h	
	Ethernet Link Object	F6h	
Assembly Objects	Assembly Object	04h	
Parameter Objects	PA_ _	64h	2001h to 2020h
	PB_ _		2081h to 20C0h
	PC_ _		2101h to 2150h
	PD_ _		2181h to 21B0h
	PE_ _		2201h to 2240h
	PF_ _		2281h to 22C0h
	PL_ _		2401h to 2430h
	PT_ _		2481h to 24D0h
	PN_ _		2581h to 25A0h
Alarm Objects	Alarm history newest	64h	2A00h
	Alarm history _		2A01h to 2A0Fh
	Clear alarm history		2A40h
	Current alarm		2A41h
	Parameter error number		2A44h
	Parameter error list		2A45h
Monitor Objects	Cumulative feedback pulses	64h	2B01h
	Servo motor speed		2B02h
	Droop pulses		2B03h
	Cumulative command pulses		2B04h
	Command pulse frequency		2B05h
	Regenerative load ratio		2B08h
	Effective load ratio		2B09h
	Peak load ratio		2B0Ah
	Instantaneous torque		2B0Bh
	Within one-revolution position		2B0Ch
	ABS counter		2B0Dh
	Load inertia moment ratio		2B0Eh
	Bus voltage		2B0Fh
	Load-side cumulative feedback pulses		2B10h
	Load-side droop pulses		2B11h
	Load-side encoder information 1 Z-phase counter		2B12h
	Load-side encoder information 2		2B13h
	Temperature of motor thermistor		2B17h
	Motor-side cumu. feedback pulses (before gear)		2B18h
	Electrical angle		2B19h
	Motor-side/load-side position deviation		2B23h
	Motor-side/load-side speed deviation		2B24h
	Internal temperature of encoder		2B25h
	Settling time		2B26h
	Oscillation detection frequency		2B27h
	Number of tough drive operations		2B28h
	Unit power consumption		2B2Dh
	Unit total power consumption		2B2Eh
	Alarm Monitor 1 Cumulative feedback pulses		2B81h

Group	Name	Class ID	Instance ID
Monitor Objects	Alarm Monitor 2 Servo motor speed	64h	2B82h
	Alarm Monitor 3 Droop pulses		2B83h
	Alarm Monitor 4 Cumulative command pulses		2B84h
	Alarm Monitor 5 Command pulse frequency		2B85h
	Alarm Monitor 8 Regenerative load ratio		2B88h
	Alarm Monitor 9 Effective load ratio		2B89h
	Alarm Monitor 10 Peak load ratio		2B8Ah
	Alarm Monitor 11 Instantaneous torque		2B8Bh
	Alarm Monitor 12 Within one-revolution position		2B8Ch
	Alarm Monitor 13 ABS counter		2B8Dh
	Alarm Monitor 14 Load inertia moment ratio		2B8Eh
	Alarm Monitor 15 Bus voltage		2B8Fh
	Alarm Monitor 16 Load-side cumulative feedback pulses		2B90h
	Alarm Monitor 17 Load-side droop pulses		2B91h
	Alarm Monitor 18 Load-side encoder information 1 Z-phase counter		2B92h
	Alarm Monitor 19 Load-side encoder information 2		2B93h
	Alarm Monitor 23 Temperature of motor thermistor		2B97h
	Alarm Monitor 24 Motor-side cumu. feedback pulses (before gear)		2B98h
	Alarm Monitor 25 Electrical angle		2B99h
	Alarm Monitor 35 Motor-side/load-side position deviation		2BA3h
	Alarm Monitor 36 Motor-side/load-side speed deviation		2BA4h
	Alarm Monitor 37 Internal temperature of encoder		2BA5h
	Alarm Monitor 38 Settling time		2BA6h
	Alarm Monitor 39 Oscillation detection frequency		2BA7h
	Alarm Monitor 40 Number of tough drive operations		2BA8h
	Alarm Monitor 45 Unit power consumption		2BADh
	Alarm Monitor 46 Unit total power consumption		2BAEh
Manufacturer Specific Control Objects	Power ON cumulative time	64h	2C18h
	Inrush relay ON/OFF number		2C19h
	Machine diagnostic status		2C20h
	Coulomb friction torque in positive direction		2C21h
	Friction torque at rated speed in positive direction		2C22h
	Coulomb friction torque in negative direction		2C23h
	Friction torque at rated speed in negative direction		2C24h
	Oscillation frequency during motor stop		2C25h
	Vibration level during motor stop		2C26h
	Oscillation frequency during motor operating		2C27h
	Vibration level during motor operating		2C28h
	Control DI 1		2D01h
	Control DI 2		2D02h
	Control DI 3		2D03h
	Control DI 7		2D07h
	Control DI 10		2D0Ah
	Status DO 1		2D11h
	Status DO 2		2D12h
	Status DO 3		2D13h
	Status DO 5		2D15h
	Status DO 6		2D16h
	Status DO 7		2D17h
	Status DO 10		2D1Ah
	Velocity limit value		2D20h
	Motor rated speed		2D28h

Group	Name	Class ID	Instance ID
Manufacturer Specific Control Objects	Manufacturer Device Name 2	64h	2D30h
	Manufacturer Hardware Version 2		2D31h
	Manufacturer Software Version 2		2D32h
	Serial Number 2		2D33h
	User parameter configuration		2D34h
	Encoder status		2D35h
	Scale cycle counter		2D36h
	Scale ABS counter		2D37h
	Scale measurement encoder resolution		2D38h
	Scale measurement encoder alarm		2D3Ch
	One-touch tuning mode		2D50h
	One-touch tuning status		2D51h
	One-touch tuning Stop		2D52h
	One-touch tuning Clear		2D53h
	One-touch tuning Error Code		2D54h
PDS Control Objects	Error code	64h	603Fh
	Controlword		6040h
	Statusword		6041h
	Quick stop option code		605Ah
	Halt option code		605Dh
	Modes of operation		6060h
	Modes of operation display		6061h
	Supported drive modes		6502h
Position Control Function Objects	Position actual internal value	64h	6063h
	Position actual value		6064h
	Following error window		6065h
	Following error time out		6066h
	Position window		6067h
	Position window time		6068h
	Positioning option code		60F2h
	Following error actual value		60F4h
	Control effort		60FAh
Profile Velocity Mode Objects	Velocity demand value	64h	606Bh
	Velocity actual value		606Ch
	Velocity window		606Dh
	Velocity window time		606Eh
	Velocity threshold		606Fh
	Velocity threshold time		6070h
	Target velocity		60FFh
Profile Torque Mode Objects	Target torque	64h	6071h
	Max torque		6072h
	Torque demand value		6074h
	Torque actual value		6077h
	Torque slope		6087h
	Torque profile type		6088h
	Positive torque limit value		60E0h
	Negative torque limit value		60E1h
Profile Position Mode Objects	Target position	64h	607Ah
	Position range limit		607Bh
	Software position limit		607Dh
	Max profile velocity		607Fh
	Max motor speed		6080h
	Profile velocity		6081h
	Profile acceleration		6083h
	Profile deceleration		6084h
	Quick stop deceleration		6085h

Group	Name	Class ID	Instance ID
Profile Position Mode Objects	Motion profile type	64h	6086h
	External encoder gear ratio		2DF0h
	External encoder acceleration		2DF1h
	External encoder deceleration		2DF2h
Homing Mode Objects	Home offset	64h	607Ch
	Homing method		6098h
	Homing speeds		6099h
	Homing acceleration		609Ah
	Supported homing method		60E3h
Factor Group Objects	Polarity	64h	607Eh
	Position encoder resolution		608Fh
	Gear ratio		6091h
	Feed constant		6092h
	SI unit position		60A8h
	SI unit velocity		60A9h
Touch Probe Function Objects	Touch probe function	64h	60B8h
	Touch probe status		60B9h
	Touch probe pos1 pos value		60BAh
	Touch probe pos1 neg value		60BBh
	Touch probe pos2 pos value		60BCh
	Touch probe pos2 neg value		60BDh
Optional application FE Objects	Digital inputs	64h	60FDh

7.3 Object library

This section describes the details of the object library for each group.
The following is shown in the "Access" column.
"Get": Only reading is available.
"Set": Only writing is available.
"Get/Set": Reading and writing are available.
The following is shown in the "EEP-ROM" column.
"Impossible": The data is not saved to the EEP-ROM. The value of the data written from the controller returns to the value of "Default" when the power is shut off.
"Possible": The data can be saved to the EEP-ROM with Store Parameters (Class ID: 64h, Ins ID: 1010h). The data is saved in the parameter corresponding to the object. For the corresponding parameters, refer to "Parameter".

7.3.1 General Objects

(1) Identity Object (Class ID: 01h)

Ins ID	Attr ID	Access	Name	Data Type
0	1	Get	Revision	UINT
	2	Get	Max Instance	UINT
	3	Get	Number of Instances	UINT
1	1	Get	Vendor ID	UINT
	2	Get	Device Type	UINT
	3	Get	Product Code	UINT
	4	Get	Revision	Structure including the following
			Major Revision	USINT
			Minor Revision	USINT
	5	Get	Status	WORD
	6	Get	Serial Number	UDINT
	7	Get	Product Name	SHORT_STRING
	11	Set	Active Language	Structure including the following
				USINT
				USINT
				USINT
	12	Get	Supported Language List	Structure array including the following
				USINT
				USINT
				USINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
0	1	0001	0001h to 0001h		Impossible	
	2	1	0001h to 0001h			
	3	1	0001h to 0001h			
1	1	A1h (161)	00A1h to 00A1h			
	2	002Bh (Generic)	002Bh to 002Bh			
	3	0012h	0012h to 0012h			
	4	_ _ _ _h	0000h to FFFFh			
	5		0000h to 0F75h			
	6	_ _ _ _ _ _ _ _h	00000000h to FFFFFFFFh			
	7	MR-J4-○TM				
	11	eng (English)				
	12	eng (English)				

General-purpose information, such as device identification information including Vendor ID and device status, is returned. The description of each Attribute is as follows.

Ins ID	Attr ID	Description
0	1	Revision of this object
	2	Maximum Instance number
	3	Number of Instances
1	1	Identification number of each vendor
	2	Device type of the product
	3	Product code assigned by each vendor
	4	Revision of the item indicated by Identity Object
		Major revision number (lower 8 bits)
		Minor revision number (upper 8 bits)
	5	Summary of the device status Refer to the following table for details.
	6	Serial number of the device (The serial number of the EtherNet/IP network module is returned.)
	7	Product name
	11	Language currently used in the device The language to be used and supported language are stored as follows. For eng (English): language1: 65h(e), language2: 6Eh(n), language3: 67h(g)
		language1 field of the STRINGI data type
		language2 field of the STRINGI data type
		language3 field of the STRINGI data type
	12	List of languages supported by the STRINGI data type character string in the device The language to be used and supported language are stored as follows. For eng (English): language1: 65h (e), language2: 6Eh (n), language3: 67h (g)
		language1 field of the STRINGI data type
		language2 field of the STRINGI data type
		language3 field of the STRINGI data type

The following table describes Attribute5 (Status) of Class 01h Instance 1.

bit	Name
0	Module Owned
1	Reserved
2	Configured
3	Reserved
4 to 7	Extended Device Status 0000b: Unknown 0010b: Faulted I/O Connection 0011b: No I/O connection establish 0100b: Non volatile configuration bad 0101b: Major fault 0110b: Connection in Run mode 0111b: Connection in Idle mode
8	Minor Recoverable Fault (Note)
9	Minor Unrecoverable Fault (Note)
10	Major Recoverable Fault (Note)
11	Major Unrecoverable Fault (Note)
12 to 15	Reserved

Note. If an alarm occurs, Major Recoverable Fault is returned. If a warning occurs, the status does not change.

This instance supports the following services.

(a) When Ins ID is 0

Service Code	Name	Description
01h	Get_Attributes_All	Reads the values of all the attributes.
0Eh	Get_Attribute_Single	Reads the value of the specified attribute.

(b) When Ins ID is not 0

Service Code	Name	Description
01h	Get_Attributes_All	Reads the values of all the attributes.
05h	Reset	Calls the Reset service of the specified class/object.
0Eh	Get_Attribute_Single	Reads the value of the specified attribute.
10h	Set_Attribute_Single	Writes a value to the specified attribute.

(c) Reset

POINT

- If the value of the reset type is set to "0" in the Reset service, parameter settings, etc. are still written to the EEP-ROM.Note that the number of write times to the EEP-ROM is limited to 100,000. If the total number of write times exceeds 100,000, the servo amplifier may malfunction when the EEP-ROM reaches the end of its useful life.
- The Reset service is not available for the servo amplifier on which an MR-D30 functional safety unit is mounted.

The following table lists the reset types that can be used with the Reset service.

Value	Reset type
0	Emulate as closely as possible cycling power on the item the Identity Object represents. This value is the default if this parameter is omitted. Either the network module or servo amplifier does not restore the default values of each parameter.
1	Return as closely as possible to the factory default configuration, then emulate cycling power as closely as possible. The network module restores the default values of communication setting, such as an IP address. The parameters of the servo amplifier are reset to the factory setting.

(2) Store parameters (Instance ID: 1010h) (Class ID 64h: Drive Configuration Object)

Ins ID	Attr ID	Access	Name	Data Type
1010h	0	Get	Store parameters	USINT
	1	Get/Set	Save all parameters	UDINT
	2 (Not supported) (Note)		Save communication parameters	
	3 (Not supported) (Note)		Save application parameters	

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
1010h	0	3	03h		Impossible	
	1	00000001h	Refer to the following table.			
	2 (Not supported) (Note)					
	3 (Not supported) (Note)					

Note. This is not supported by the MR-J4-_TM_ servo amplifier.

Writing "65766173h" (= reverse order of ASCII code of "save") to the corresponding sub object saves an object value in EEP-ROM. The relationship between Attribute ID and the saved object is shown below.

Attr ID	Saved object
1	All objects

Whether saving a parameter has been completed can be checked by reading this object. The read values are as follows.

bit	Description
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.)
1	0: The parameter is not automatically saved.
2 to 31	Unused

This instance supports the following services.

Service Code	Name	Description
0Eh	Get_Attribute_Single	Reads the value of the specified attribute.
10h	Set_Attribute_Single	Writes a value to the specified attribute.

7.3.2 Communication Setting Objects

(1) Message Router object (Class ID: 02h)

This object distributes messages to object classes or object instances in a servo amplifier. No attribute or service can be used with this object.

(2) Connection Manager Object (Class ID: 06h)

Ins ID	Attr ID	Access	Name	Data Type
1	1	Set	Open Requests	UINT
	2		Open Format Rejects	
	3		Open Resource Rejects	
	4		Open Other Rejects	
	5		Close Requests	
	6		Close Format Rejects	
	7		Close Other Rejects	
	8		Connection Timeouts	

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
1	1	0	0000h to FFFFh	number of times	Impossible	
	2	0				
	3	0				
	4	0				
	5	0				
	6	0				
	7	0				
	8	0				

This object is used to establish an I/O connection or a dedicated connection when Explicit Message is frequently used. The description of each Attribute is as follows.

Ins ID	Attr ID	Description
1	1	Number of Forward_Open service requests received
	2	Number of Forward_Open service requests that have been rejected due to the incorrect format
	3	Number of Forward_Open service requests that have been rejected due to insufficient resource
	4	Number of Forward_Open service requests that have been rejected due to a reason other than the incorrect format or insufficient resource
	5	Number of Forward_Close service requests received
	6	Number of Forward_Close service requests that have been rejected due to the incorrect format
	7	Number of Forward_Close service requests that have been rejected due to a reason other than the incorrect format
	8	Total number of connection time-outs that have occurred in the connection controlled by this Connection Manager

This instance supports the following services.

Service Code	Name	Description
01h	Get_Attributes_All	Reads the values of all the attributes.
0Eh	Get_Attribute_Single	Reads the value of the specified attribute.
10h	Set_Attribute_Single	Writes a value to the specified attribute.
4Eh	Forward_Close	Closes the connection.
54h	Forward_Open	Opens a connection with data size of up to input 509 bytes and output 505 bytes.
5Bh	Large_Forward_Open	Opens a connection with data size of up to 1448 bytes.

(3) Device Level Ring(DLR) Object (Class ID: 47h)

Ins ID	Attr ID	Access	Name	Data Type
0	1	Get	Revision	UINT
1	1		Network Topology	USINT
	2		Network Status	
	10		Active Supervisor Address	Following structure
			Supervisor IP Address	UDINT
			Supervisor MAC Address	USINT array
	12		Capability Flags	DWORD

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
0	1	0003h	0003h to 0003h		Impossible	
1	1	0: Linear 1: Ring	00h to 01h			
	2	0	00h to 1Fh			
	10					
	12	82h (Beacon-based Ring Node, Flush_Table frame capable)	00000000h to 000000E3h			

This object provides an interface of the DLR protocol setting or status information. The description of each Attribute is as follows.

Ins ID	Attr ID	Description
0	1	Revision of this object
1	1	Current network topology
	2	Current network status
	10	Either or both of the IP address (IPv4) or/and MAC address of an active ring supervisor
		IP address (IPv4) of an active ring supervisor
		MAC address of an active ring supervisor
	12	Description of the DLR function of a device Refer to the following table for details.

Network Status

Network Status value	Description
0	Indicates a normal communication in the Ring or Linear network topology mode.
1	Ring Fault (only when the Ring network topology mode is used)
2	Indicates that an unexpected loop has been detected in the network (only when the Linear network topology mode is used).
3	Partial Network Fault (only when the Ring network topology mode is used and the node is a Ring supervisor)
4	Rapid Fault/Restore Cycle

Capability Flags

bit	Called	Definition
0	Announce-based Ring Node	Set when the ring node of the device is based on the Announce frame.
1	Beacon-based Ring Node	Set when the ring node of the device is based on the Beacon frame.
2 to 4	Reserved	Reserved
5	Supervisor Capable	Set when the device can provide a supervisor function.
6	Redundant Gateway Capable	Set when the device can provide a redundant gateway function.
7	Flush_Table frame Capable	Set when Flush Tables flames can be supported.
8 to 31	Reserved	Reserved

This instance supports the following services.

(a) When Ins ID is 0

Service Code	Name	Description
01h	Get_Attributes_All	Reads the values of all the attributes.
0Eh	Get_Attribute_Single	Reads the value of the specified attribute.

(b) When Ins ID is not 0

Service Code	Name	Description
0Eh	Get_Attribute_Single	Reads the value of the specified attribute.

(4) QoS Object (Class ID: 48h)

Ins ID	Attr ID	Access	Name	Data Type
0	1	Get	Revision	UINT
1	1	Set	802.1Q Tag Enable	USINT
	4		DSCP Urgent	
	5		DSCP Scheduled	
	6		DSCP High	
	7		DSCP Low	
	8		DSCP Explicit	

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
0	1	0001h	00h to FFh		Impossible	
1	1	0				
	4	55				
	5	47				
	6	43				
	7	31				
	8	27				

This object sets priority on communication basis to prevent a communication delay or stop due to a heavy band. The description of each Attribute is as follows.

Ins ID	Attr ID	Description
0	1	Revision of this object
1	1	Enable or disable 802.1Q frame transmission on CIP and IEEE1588.
	4	DSCP value for urgent messages of the CIP transport class 0/1
	5	DSCP value for scheduled messages of the CIP transport class 0/1
	6	DSCP value for high-priority messages of the CIP transport class 0/1
	7	DSCP value for low-priority messages of the CIP transport class 0/1
	8	DSCP value for CIP explicit messages (transport class 2/3 and UCMM) and all other EtherNet/IP encapsulation messages

This instance supports the following services.

(a) When Ins ID is 0

Service Code	Name	Description
0Eh	Get_Attribute_Single	Reads the value of the specified attribute.

(b) When Ins ID is not 0

Service Code	Name	Description
0Eh	Get_Attribute_Single	Reads the value of the specified attribute.
10h	Set_Attribute_Single	Writes a value to the specified attribute.

(5) TCP/IP Interface Object (Class ID: F5h)

Ins ID	Attr ID	Access	Name	Data Type
0	1	Get	Revision	UINT
	2		Max Instance	
	3		Number of Instance	
	6		Maximum ID Number Class Attributes	
	7		Maximum ID Number Instance Attributes	
1	1	Get	Status	DWORD
	2		Configuration Capability	
	3	Get/Set	Configuration Control	
	4	Get	Port Object	Following structure
				UINT
				Padded EPATH
	5	Get/Set	Interface Configuration	Following structure
				UDINT
				STRING
	6		Host Name	STRING
	8		TTL Value	USINT
	9		Mcast Config	Following structure
			Alloc Control	USINT
			Reserved	
			Num Mcast	UINT
			Mcast Start Addr	UDINT
	10	Set	SelectAcd	Bool
	11		Last ConflictDetected	Following structure
			AcdActivity	USINT
			RemoteMAC	USINT array
			ArpPdu	
	12		EIP QuickConnect	Bool

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
0	1	0003h	0003h to 0003h		Impossible	
	2	1	0001h to 0001h			
	3	1	0001h to 0001h			
	6	7	0007h to 0007h			
	7	12	000Ch to 000Ch			
1	1		0000h to 00D8h			
	2		0000h to 00F4h			
	3		0000h to 0005h			
	4	0002h 20 F6 24 03h				
	5					
	6					
	8	1	01h to FFh			
	9	0				
	10		00h to FFh			
	11					
	12	0: Disabled 1: Enabled	00h to 01h			

The network module provides a mechanism that sets a TCP/IP network interface (such as an IP address and network mask) of the device. The description of each Attribute is as follows.

Ins ID	Attr ID	Description
0	1	Revision of this object
	2	Maximum Instance number
	3	Number of Instances
	6	Last attribute ID of the class attribute
	7	Last attribute ID of the instance attribute
1	1	Interface status
	2	Interface capability flag
	3	Interface control flag
	4	
		Size of Path
		Path to Instance #3 of Ethernet Link Object
	5	
		IP address
		Subnet mask
		Default gateway
		Primary DNS
		Secondary DNS
		Default domain
	6	Host name of the Anybus module
	8	TTL value for EtherNet/IP multicast packets
	9	IP multicast address configuration
		Multicast address allocation control word
		Number of IP multicast addresses to allocate for EtherNet/IP
		Starting multicast address from which to begin allocation
	10	Enable the use of ACD
	11	Last collision information
		ACD status at the last collision
		MAC address of the remote node from an ARP PDU at collision detection
		Copy of the ARP PDU at collision detection
	12	Enable or disable QuickConnect

Status

bit	Name	Definition
0 to 3	Interface Configuration Status	Indicates the attribute status of Interface Configuration. 0: No Interface Configuration attribute has been set. 1: The Interface Configuration attribute includes an effective setting acquired from BOOTP, DHCP, or a non-volatile memory device. 2: The Interface Configuration attribute includes an effective setting acquired from a hardware setting. 3 to 15: Reserved
4	Mcast Pending	Undetermined setting changes in the TTL Value and Mcast Config attributes are returned. If the TTL Value or Mcast Config attribute has been set, this bit is cleared at the start of the next device.
5	Reserved	Reserved (Always 0)
6	AcdStatus	Indicates that the ACD has detected a duplication of an IP address. When the ACD has been supported and enabled, this bit turns to 1 at a detection of IP address duplication.
7	AcdFault	Indicates that the ACD has detected a collision of an IP address or has failed in protection. When this collision has disabled the current interface setting, this bit turns to 1.
8 to 31	Reserved	Reserved (Always 0)

Configuration Capability

bit	Name	Definition
0	BOOTP Client (Note)	1 shall indicate the device is capable of obtaining its network configuration via BOOTP.
1	DNS Client (Note)	1 shall indicate the device is capable of resolving host names by querying a DNS server.
2	DHCP Client	1 shall indicate the device is capable of obtaining its network configuration via DHCP.
3	DHCP-DNS Update (Note)	1 shall indicate the device is capable of sending its host name in the DHCP request as documented in Internet draft (draft-ietf-dhcdhcp-dns-12.txt).
4	Configuration Settable	1 shall indicate the Interface Configuration attribute is settable.
5	Hardware Configurable	When this bit is 1, the IP address setting can be obtained from the hardware setting. (pushwheel switch, thumbwheel switch)
6	Interface Configuration Change Requires Reset	When this bit is 1, it indicates that resetting the device is required to apply the Interface Configuration attribute setting.
7	AcdCapable	When this bit is 1, it indicates that the device can use the ACD.
8 to 31	Reserved	Reserved (Always 0)

Note. This is not supported by the MR-J4-_TM_ servo amplifier.

Configuration Control

bit	Name	Definition
0 to 3	Configuration Method	Determines how to obtain an IP address. 0: The device obtains an IP address from a value saved in the non-volatile memory. 1: The device obtains an interface setting via BOOTP. (Not supported) 2: The device obtains an interface setting via DHCP. 3 to 15: Reserved
4	DNS Enable	1 shall indicate the device is capable of resolving names by querying a DNS server. (Not supported)
5 to 31	Reserved	Reserved (Always 0)

This instance supports the following services.

(a) When Ins ID is 0

Service Code	Name	Description
01h	Get_Attributes_All	Reads the values of all the attributes.
0Eh	Get_Attribute_Single	Reads the value of the specified attribute.

(b) When Ins ID is not 0

Service Code	Name	Description
01h	Get_Attributes_All	Reads the values of all the attributes.
0Eh	Get_Attribute_Single	Reads the value of the specified attribute.
10h	Set_Attribute_Single	Writes a value to the specified attribute.

(6) Ethernet Link Object (Class ID: F6h)

Ins ID	Attr ID	Access	Name	Data Type
0	1	Get	Revision	UINT
	2		Max Instance	
	3		Number of Instance	
	6		Maximum ID Number Class Attributes	
	7		Maximum ID Number Instance Attributes	
1	1		Interface Speed	UDINT
	2		Interface Flags	DWORD
	3		Physical Address	USINT array
	4		Interface Counters	Following structure
			In Octets	UDINT
			In Ucast Packets	
			In NUcast Packets	
			In Discards	
			In Errors	
			In Unknown Protos	
			Out Octets	
			Out Ucast Packets	
			Out NUcast Packets	
			Out Discards	
			Out Errors	
	5		Media Counters	Following structure
			Alignment Errors	UDINT
			FCS Errors	
			Single Collisions	
			Multiple Collisions	
			SQE Test Errors	
			Deferred Transmission	
			Late collisions	
			Excessive Collisions	
			MAC Transmit Errors	
			Carrier Sense Errors	
			Frame Too Long	
			MAC Receive Errors	
	6	Get/Set	Interface Control	Following structure
			Control Bits	WORD
			Forced Interface Speed	UINT
	7	Get	Interface Type	USINT
	8		Interface State	
	9		Admin State	
	10		Interface Label	SHORT_STRING

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
0	1	0003h	0003h to 0003h		Impossible	
	2	3	0003h to 0003h			
	3	3	0003h to 0003h			
	6	7	0007h to 0007h			
	7	10	000Ah to 000Ah			
1	1		00000000h to 00000064h	Mbps		
	2		00000000h to 0000007Fh			
	3					
	4					
	5					
	6					
	7		01h to 02h			
	8		00h to 03h			
	9		00h to 02h			
	10					

This object holds a link-specific counter and the status information of the IEEE802.3 communication interface. The description of each Attribute is as follows.

Ins ID	Attr ID	Description
0	1	Revision of this object
	2	Maximum Instance number
	3	Number of Instances
	6	Last attribute ID of the class attribute
	7	Last attribute ID of the instance attribute
1	1	Interface speed currently in use (10 Mbps or 100 Mbps)
	2	Interface status flags (Refer to the following for details.)
	3	MAC address
	4	
		Octets received on the interface
		Unicast packets received on the interface
		Non-unicast packets received on the interface
		Inbound packets received on the interface but discarded
		Inbound packets that contain errors (does not include In Discards)
		Inbound packets with unknown protocol
		Octets sent on the interface
		Unicast packets sent on the interface
		Non-unicast packets sent on the interface
		Outbound packets discarded
		Outbound packets that contain errors
	5	Media-specific counters
		Frames received that are not an integral number of octets in length
		Frames received that do not pass the FCS check
		Successfully transmitted frames which experienced exactly one collision
		Successfully transmitted frames which experienced more than one collision
		Number of times SQE test error message is generated
		Frames for which first transmission attempt is delayed because the medium is busy
		Number of times a collision is detected later than 512 bit-times into the transmission of a packet
		Frames for which transmission fails due to an internal MAC sublayer transmission error
		Times that the carrier sense condition was lost or never asserted when attempting to transmit a frame
		Frames received that exceed the maximum permitted frame size
		Frames for which reception on an interface fails due to an internal MAC sublayer receive error
	6	Configuration for physical interface
		Interface Control Bits
		Speed at which the interface shall be forced to operate
	7	Type of interface: twisted pair, fiber, internal, etc
	8	Current state of the interface: Operational, disabled, and etc
	9	Administrative state: enable, disable
	10	Human readable identification

Interface Flags

bit	Name	Definition
0	Link Status	Indicates whether or not the IEEE802.3 communication interface is connected to an active network. 0 indicates an inactive link; 1 indicates an active link.
1	Half/Full Duplex	Indicates the duplex mode currently in use. 0 indicates the interface is running half duplex; 1 indicates full duplex. Note that if the Link Status flag is 0, this bit is indeterminate.
2 to 4	Negotiation Status	0: Auto-negotiation in progress. 1: Auto-negotiation and speed detection using default values for speed and duplex failed. 2: Auto negotiation failed but detected speed using default values for duplex. 3: Successfully negotiated speed and duplex. 4: Auto-negotiation not attempted. Use the values of Forced Duplex Mode and Forced Interface Speed.
5	Manual Setting Requires Speed	0 indicates the interface can activate changes to link parameters (auto negotiation, duplex mode, and interface speed) automatically. 1 indicates the device requires a Reset service be issued to its Identity Object in order for the changes to take effect.
6	Local Hardware Fault	0 indicates the interface detects no local hardware fault; 1 indicates a local hardware fault is detected.
7 to 31	Reserved	Reserved (Always 0)

This instance supports the following services.

(a) When Ins ID is 0

Service Code	Name	Description
01h	Get_Attributes_All	Reads the values of all the attributes.
0Eh	Get_Attribute_Single	Reads the value of the specified attribute.

(b) When Ins ID is not 0

Service Code	Name	Description
01h	Get_Attributes_All	Reads the values of all the attributes.
0Eh	Get_Attribute_Single	Reads the value of the specified attribute.
10h	Set_Attribute_Single	Writes a value to the specified attribute.
4Ch	Get_And_Clear	Only the Interface Counters and Media Counters attributes are supported. This service reads the value of the specified attribute and clears to 0. All the processing of this service is executed by the network module. For error information, refer to the specifications of the network module.

7.3.3 Assembly Objects

(1) Assembly Object (Class ID: 04h)

Ins ID	Attr ID	Access	Name	Data Type
0	1	Get	Revision	UINT
	2	Get	Max Instance	
3	3	Set	Data	
	4	Get	Size	UINT
4	3	Set	Data	
	4	Get	Size	UINT
5	3	Set	Data	
	4	Get	Size	UINT
6	3	Set	Data	
	4	Get	Size	UINT
7	3	Set	Data	
	4	Get	Size	UINT
100 to 106	3	Set	Data	BYTE array
	4	Get	Size	UINT
150 to 156	3	Set	Data	BYTE array
	4	Get	Size	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
0	1	0002h	0002h to 0002h		Impossible	
	2		0000h to 009Ch			
3	3	No data				
	4	0	0000h to 0000h			
4	3	No data				
	4	0	0000h to 0000h			
5	3					
	4		0000h to FFFFh			
6	3	No data				
	4	0	0000h to 0000h			
7	3	No data				
	4	0	0000h to 0000h			
100 to 106	3	Refer to section 3.2.				
	4	Refer to section 3.2.	0000h to 0040h			
150 to 156	3	Refer to section 3.2.				
	4	Refer to section 3.2.	0000h to 0040h			

This object defines a format of data transferred between the master and a slave through the I/O communication.
The MR-J4-_TM_ servo amplifier periodically transfers commands and feedbacks using the format defined in Instance 100 to 102 and 150 to 152. For communication formats, refer to section 3.2. The description of each Attribute is as follows.

Ins ID	Attr ID	Description
0	1	Revision of this object
	2	Maximum Instance number
3	3	
	4	Number of bytes of attribute 3
4	3	
	4	Number of bytes of attribute 3
5	3	
	4	Number of bytes of attribute 3
6	3	
	4	Number of bytes of attribute 3
7	3	
	4	Number of bytes of attribute 3
100 to 106	3	
	4	Number of bytes of attribute 3
150 to 156	3	
	4	Number of bytes of attribute 3

This instance supports the following services.

(a) When Ins ID is 0

Service Code	Name	Description
0Eh	Get_Attribute_Single	Reads the value of the specified attribute.

(b) When Ins ID is not 0

Service Code	Name	Description
0Eh	Get_Attribute_Single	Reads the value of the specified attribute.
10h	Set_Attribute_Single	Writes a value to the specified attribute.

7.3.4 Parameter Objects (Class ID: 64h)

The instances described in this section support the following service.

・When "Get" is in the "Access" field

Service Code	Name	Description
0Eh	Get_Attribute_Single	Reads the value of the specified attribute.

・When "Get/Set" is in the "Access" field

Service Code	Name	Description
0Eh	Get_Attribute_Single	Reads the value of the specified attribute.
10h	Set_Attribute_Single	Writes a value to the specified attribute.

(1) Parameter Objects PA (2001h to 2020h)

Ins ID	Attr ID	Access	Name	Data Type
2001h	0	Get/Set	PA01	DINT
・ ・ ・			・ ・ ・	
2020h			PA32	

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2001h	0		Refer to "MR-J4-_TM_ Servo Amplifier Instruction Manual".		Possible	PA01
・ ・ ・		・ ・ ・				・ ・ ・
2020h						PA32

The values of the basic setting parameters ([Pr. PA_ _]) can be obtained and set.

(2) Parameter Objects PB (2081h to 20C0h)

Ins ID	Attr ID	Access	Name	Data Type
2081h	0	Get/Set	PB01	DINT
・ ・ ・			・ ・ ・	
20C0h			PB64	

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2081h	0		Refer to "MR-J4-_TM_ Servo Amplifier Instruction Manual".		Possible	PB01
・ ・ ・		・ ・ ・				・ ・ ・
20C0h						PB64

The values of the gain/filter setting parameters ([Pr. PB_ _]) can be obtained and set.

(3) Parameter Objects PC (2101h to 2150h)

Ins ID	Attr ID	Access	Name	Data Type
2101h	0	Get/Set	PC01	DINT
⋮			⋮	
2150h			PC80	

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2101h	0		Refer to "MR-J4-_TM_ Servo Amplifier Instruction Manual".		Possible	PC01
⋮		⋮				⋮
2150h						PC80

The values of the extension setting parameters ([Pr. PC_ _]) can be obtained and set.

(4) Parameter Objects PD (2181h to 21B0h)

Ins ID	Attr ID	Access	Name	Data Type
2181h	0	Get/Set	PD01	DINT
⋮			⋮	
21B0h			PD48	

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2181h	0		Refer to "MR-J4-_TM_ Servo Amplifier Instruction Manual".		Possible	PD01
⋮		⋮				⋮
21B0h						PD48

The values of the I/O setting parameters ([Pr. PD_ _]) can be obtained and set.

(5) Parameter Objects PE (2201h to 2240h)

Ins ID	Attr ID	Access	Name	Data Type
2201h	0	Get/Set	PE01	DINT
⋮			⋮	
2240h			PE64	

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2201h	0		Refer to "MR-J4-_TM_ Servo Amplifier Instruction Manual".		Possible	PE01
⋮		⋮				⋮
2240h						PE64

The values of the extension setting 2 parameters ([Pr. PE_ _]) can be obtained and set.

(6) Parameter Objects PF (2281h to 22C0h)

Ins ID	Attr ID	Access	Name	Data Type
2281h	0	Get/Set	PF01	DINT
. . .			. . .	
22C0h			PF64	

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2281h	0		Refer to "MR-J4-_TM_ Servo Amplifier Instruction Manual".		Possible	PF01
. . .		. . .				. . .
22C0h						PF64

The values of the extension setting 3 parameters ([Pr. PF_ _]) can be obtained and set.

(7) Parameter Objects PL (2401h to 2430h)

Ins ID	Attr ID	Access	Name	Data Type
2401h	0	Get/Set	PL01	DINT
. . .			. . .	
2430h			PL48	

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2401h	0		Refer to "MR-J4-_TM_ Servo Amplifier Instruction Manual".		Possible	PL01
. . .		. . .				. . .
2430h						PL48

The values of the linear servo motor/DD motor setting parameters ([Pr. PL_ _]) can be obtained and set.

(8) Parameter Objects PT (2481h to 24D0h)

Ins ID	Attr ID	Access	Name	Data Type
2481h	0	Get/Set	PT01	DINT
. . .			. . .	
24D0h			PT80	

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2481h	0		Refer to "MR-J4-_TM_ Servo Amplifier Instruction Manual".		Possible	PT01
. . .		. . .				. . .
24D0h						PT80

The values of the positioning control parameters ([Pr. PT_ _]) can be obtained and set.

(9) Parameter Objects PN (2581h to 25A0h)

Ins ID	Attr ID	Access	Name	Data Type
2581h	0	Get/Set	PN01	DINT
▪ ▪ ▪			▪ ▪ ▪	
25A0h			PN32	

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2581h	0		Refer to "MR-J4-_TM_ Servo Amplifier Instruction Manual".		Possible	PN01
▪ ▪ ▪		▪ ▪ ▪				▪ ▪ ▪
25A0h						PN32

The values of the network setting parameters ([Pr. PN_ _]) can be obtained and set.

7.3.5 Alarm Objects (Class ID: 64h)

The instances described in this section support the following service.

- When "Get" is in the "Access" field

Service Code	Name	Description
0Eh	Get_Attribute_Single	Reads the value of the specified attribute.

- When "Set" is in the "Access" field

Service Code	Name	Description
10h	Set_Attribute_Single	Writes a value to the specified attribute.

(1) Alarm history newest (2A00h)

Ins ID	Attr ID	Access	Name	Data Type
2A00h	0	Get	Alarm history newest	USINT
	1		Alarm No.	UDINT
	2		Alarm time (Hour)	

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2A00h	0	2	02h to 02h		Possible	
	1	0	00000000h to FFFFFFFFh			
	2	0	00000000h to FFFFFFFFh	hour		

The latest alarm information of the alarm history is returned. The description of each Attribute ID is as follows.

Attr ID	Name	Description
0	Alarm history newest	The number of entries is returned.
1	Alarm No.	The number of the alarm that has occurred is returned. The description is as follows. When no history exists, 0 is returned. Bit 0 to Bit 15: Alarm detail No. Bit 16 to Bit 31: Alarm No. If [AL. 16.3] occurs, 00160003h is returned.
2	Alarm time (Hour)	Alarm occurrence time is returned. When no history exists, 0 is returned. Unit: [hour]

(2) Alarm history 1 (2A01h) to Alarm history 15 (2A0Fh)

Ins ID	Attr ID	Access	Name	Data Type
2A01h to 2A0Fh	0	Get	Alarm history 1 to Alarm history 15	USINT
	1		Alarm No.	UDINT
	2		Alarm time (Hour)	

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2A01h to 2A0Fh	0	2	02h to 02h		Possible	
	1	0	00000000h to FFFFFFFFh			
	2	0	00000000h to FFFFFFFFh	hour		

The second (2A01h) to 16th (2A0Fh) latest alarm information of the alarm history is returned. The description of each Attribute ID is the same as that of (1) of this section.

(3) Clear alarm history (2A40h)

Ins ID	Attr ID	Access	Name	Data Type
2A40h	0	Set	Clear alarm history	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2A40h	0		Refer to the text.		Impossible	

Writing "1EA5h" clears the alarm history.

(4) Current alarm (2A41h)

Ins ID	Attr ID	Access	Name	Data Type
2A41h	0	Get	Current alarm	UDINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2A41h	0		00000000h to FFFFFFFFh		Impossible	

The number of the current alarm is returned. When no alarm has occurred, "00000000h" is returned. The description of the values is as follows. If [AL. 16.3] occurs, "00160003h" is returned.

Bit	Description
0 to 15	Alarm detail No.
16 to 31	Alarm No.

(5) Parameter error number (2A44h)

Ins ID	Attr ID	Access	Name	Data Type
2A44h	0	Get	Parameter error number	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2A44h	0		0000h to 01F4h (500)		Impossible	

When [AL. 37 Parameter error] has occurred, the number of the parameters which cause the error is returned. Refer to Parameter error list (Class ID: 64h, Ins ID: 2A45h) for the number of each parameter which causes the error.

(6) Parameter error list (2A45h)

Ins ID	Attr ID	Access	Name	Data Type
2A45h	0	Get	Parameter error list	USINT
	1		No.1	UINT
	⋮		⋮	
	254		No.254	

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2A45h	0		FEh to FEh (254)		Impossible	
	1		0000h to FFFFh			
	⋮	⋮				
	254					

When [AL. 37 Parameter error] has occurred, the number of the parameter which causes the error is returned. The descriptions of No. 1 (2A45h: 1) to No. 254 (2A45h: 254) are as follows. If [Pr. PC01] is an error factor, 0201h is returned.

Bit	Description
0 to 7	Parameter number
8 to 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 _ _]

7.3.6 Monitor Objects (Class ID: 64h)

The instances described in this section support the following service.

・When "Get" is in the "Access" field

Service Code	Name	Description
0Eh	Get_Attribute_Single	Reads the value of the specified attribute.

・When "Get/Set" is in the "Access" field

Service Code	Name	Description
0Eh	Get_Attribute_Single	Reads the value of the specified attribute.
10h	Set_Attribute_Single	Writes a value to the specified attribute.

(1) Cumulative feedback pulses (2B01h)

Ins ID	Attr ID	Access	Name	Data Type
2B01h	0	Get/Set	Cumulative feedback pulses	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B01h	0		80000000h to FFFFFFFFh	pulse	Impossible	

The cumulative feedback pulses are returned. Writing "00001EA5h" clears the cumulative feedback pulses.

(2) Servo motor speed (2B02h)

Ins ID	Attr ID	Access	Name	Data Type
2B02h	0	Get	Servo motor speed	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B02h	0		80000000h to 7FFFFFFFh	Refer to the text.	Impossible	

The servo motor speed is returned.
Unit: [r/min] ([mm/s] when a linear servo motor is used)

(3) Droop pulses (2B03h)

Ins ID	Attr ID	Access	Name	Data Type
2B03h	0	Get	Droop pulses	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B03h	0		80000000h to 7FFFFFFFh	pulse	Impossible	

The droop pulses (encoder unit) are returned.

(4) Cumulative command pulses (2B04h)

Ins ID	Attr ID	Access	Name	Data Type
2B04h	0	Get	Cumulative command pulses	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B04h	0		80000000h to 7FFFFFFFh	pulse	Impossible	

The cumulative command pulses are returned.

(5) Command pulse frequency (2B05h)

Ins ID	Attr ID	Access	Name	Data Type
2B05h	0	Get	Command pulse frequency	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B05h	0		80000000h to 7FFFFFFFh	kpulse/s	Impossible	

The command pulse frequency is returned.

(6) Regenerative load ratio (2B08h)

Ins ID	Attr ID	Access	Name	Data Type
2B08h	0	Get	Regenerative load ratio	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B08h	0		0000h to FFFFh	%	Impossible	

The regenerative load ratio is returned.

(7) Effective load ratio (2B09h)

Ins ID	Attr ID	Access	Name	Data Type
2B09h	0	Get	Effective load ratio	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B09h	0		0000h to FFFFh	%	Impossible	

The effective load ratio is returned.

(8) Peak load ratio (2B0Ah)

Ins ID	Attr ID	Access	Name	Data Type
2B0Ah	0	Get	Peak load ratio	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B0Ah	0		0000h to FFFFh	%	Impossible	

The peak load ratio is returned.

(9) Instantaneous torque (2B0Bh)

Ins ID	Attr ID	Access	Name	Data Type
2B0Bh	0	Get	Instantaneous torque	INT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B0Bh	0		8000h to 7FFFh	%	Impossible	

The instantaneous torque is returned.

(10) Within one-revolution position (2B0Ch)

Ins ID	Attr ID	Access	Name	Data Type
2B0Ch	0	Get	Within one-revolution position	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B0Ch	0		80000000h to 7FFFFFFFh	pulse	Impossible	

The position within one-revolution is returned.

(11) ABS counter (2B0Dh)

Ins ID	Attr ID	Access	Name	Data Type
2B0Dh	0	Get	ABS counter	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B0Dh	0		80000000h to 7FFFFFFFh	rev	Impossible	

The ABS counter is returned.

(12) Load inertia moment ratio (2B0Eh)

Ins ID	Attr ID	Access	Name	Data Type
2B0Eh	0	Get	Load inertia moment ratio	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B0Eh	0		0000h to FFFFh	0.01 times	Impossible	

The load to motor inertia ratio is returned.

(13) Bus voltage (2B0Fh)

Ins ID	Attr ID	Access	Name	Data Type
2B0Fh	0	Get	Bus voltage	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B0Fh	0		0000h to FFFFh	V	Impossible	

The bus voltage is returned.

(14) Load-side cumulative feedback pulses (2B10h)

Ins ID	Attr ID	Access	Name	Data Type
2B10h	0	Get	Load-side cumulative feedback pulses	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B10h	0		80000000h to 7FFFFFFFh	pulse	Impossible	

The load-side cumulative feedback pulses (load-side encoder unit) are returned.

(15) Load-side droop pulses (2B11h)

Ins ID	Attr ID	Access	Name	Data Type
2B11h	0	Get	Load-side droop pulses	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B11h	0		80000000h to 7FFFFFFFh	pulse	Impossible	

The load-side droop pulses are returned.

(16) Load-side encoder information 1 Z-phase counter (2B12h)

Ins ID	Attr ID	Access	Name	Data Type
2B12h	0	Get	Load-side encoder information 1 Z-phase counter	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B12h	0		80000000h to 7FFFFFFFh	pulse	Impossible	

The load-side encoder information 1 is returned.

(17) Load-side encoder information 2 (2B13h)

Ins ID	Attr ID	Access	Name	Data Type
2B13h	0	Get	Load-side encoder information 2	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B13h	0		80000000h to 7FFFFFFFh	rev	Impossible	

The load-side encoder information 2 is returned.

(18) Temperature of motor thermistor (2B17h)

Ins ID	Attr ID	Access	Name	Data Type
2B17h	0	Get	Temperature of motor thermistor	INT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B17h	0		8000h to 7FFFh	°C	Impossible	

The temperature of servo motor thermistor is returned.

(19) Motor-side cumu. feedback pulses (before gear) (2B18h)

Ins ID	Attr ID	Access	Name	Data Type
2B18h	0	Get	Motor-side cumu. feedback pulses (before gear)	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B18h	0		80000000h to 7FFFFFFFh	pulse	Impossible	

The cumulative feedback pulses are returned.

(20) Electrical angle (2B19h)

Ins ID	Attr ID	Access	Name	Data Type
2B19h	0	Get	Electrical angle	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B19h	0		80000000h to 7FFFFFFFh	pulse	Impossible	

The electrical angle is returned.

(21) Motor-side/load-side position deviation (2B23h)

Ins ID	Attr ID	Access	Name	Data Type
2B23h	0	Get	Motor-side/load-side position deviation	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B23h	0		80000000h to 7FFFFFFFh	pulse	Impossible	

The servo motor-side/load-side position deviation is returned.

(22) Motor-side/load-side speed deviation (2B24h)

Ins ID	Attr ID	Access	Name	Data Type
2B24h	0	Get	Motor-side/load-side speed deviation	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B24h	0		80000000h to 7FFFFFFFh	r/min	Impossible	

The servo motor-side/load-side speed deviation is returned.

(23) Internal temperature of encoder (2B25h)

Ins ID	Attr ID	Access	Name	Data Type
2B25h	0	Get	Internal temperature of encoder	INT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B25h	0		8000h to 7FFFh	°C	Impossible	

The internal temperature of encoder is returned.

(24) Settling time (2B26h)

Ins ID	Attr ID	Access	Name	Data Type
2B26h	0	Get	Settling time	INT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B26h	0		8000h to 7FFFh	ms	Impossible	

The settling time is returned.

(25) Oscillation detection frequency (2B27h)

Ins ID	Attr ID	Access	Name	Data Type
2B27h	0	Get	Oscillation detection frequency	INT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B27h	0		8000h to 7FFFh	Hz	Impossible	

The oscillation detection frequency is returned.

(26) Number of tough drive operations (2B28h)

Ins ID	Attr ID	Access	Name	Data Type
2B28h	0	Get	Number of tough drive operations	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B28h	0		0000h to FFFFh	number of times	Impossible	

The number of tough drive operations is returned.

(27) Unit power consumption (2B2Dh)

Ins ID	Attr ID	Access	Name	Data Type
2B2Dh	0	Get	Unit power consumption	INT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B2Dh	0		8000h to 7FFFh	W	Impossible	

The unit power consumption is returned.

(28) Unit total power consumption (2B2Eh)

Ins ID	Attr ID	Access	Name	Data Type
2B2Eh	0	Get	Unit total power consumption	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B2Eh	0		80000000h to 7FFFFFFFh	Wh	Impossible	

The unit total power consumption is returned.

(29) Alarm Monitor 1 Cumulative feedback pulses (2B81h)

Ins ID	Attr ID	Access	Name	Data Type
2B81h	0	Get	Alarm Monitor 1 Cumulative feedback pulses	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B81h	0		80000000h to 7FFFFFFFh	pulse	Impossible	

The cumulative feedback pulses at alarm occurrence are returned.

(30) Alarm Monitor 2 Servo motor speed (2B82h)

Ins ID	Attr ID	Access	Name	Data Type
2B82h	0	Get	Alarm Monitor 2 Servo motor speed	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B82h	0		80000000h to 7FFFFFFFh	Refer to the text.	Impossible	

The servo motor speed at alarm occurrence is returned.
Unit: [r/min] ([mm/s] when a linear servo motor is used)

(31) Alarm Monitor 3 Droop pulses (2B83h)

Ins ID	Attr ID	Access	Name	Data Type
2B83h	0	Get	Alarm Monitor 3 Droop pulses	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B83h	0		80000000h to 7FFFFFFFh	pulse	Impossible	

The droop pulses at alarm occurrence are returned.

(32) Alarm Monitor 4 Cumulative command pulses (2B84h)

Ins ID	Attr ID	Access	Name	Data Type
2B84h	0	Get	Alarm Monitor 4 Cumulative command pulses	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B84h	0		80000000h to 7FFFFFFFh	pulse	Impossible	

The cumulative command pulses (encoder unit) at alarm occurrence are returned.

(33) Alarm Monitor 5 Command pulse frequency (2B85h)

Ins ID	Attr ID	Access	Name	Data Type
2B85h	0	Get	Alarm Monitor 5 Command pulse frequency	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B85h	0		80000000h to 7FFFFFFFh	kpulse/s	Impossible	

The command pulse frequency at alarm occurrence is returned.

(34) Alarm Monitor 8 Regenerative load ratio (2B88h)

Ins ID	Attr ID	Access	Name	Data Type
2B88h	0	Get	Alarm Monitor 8 Regenerative load ratio	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B88h	0		0000h to FFFFh	%	Impossible	

The regenerative load ratio at alarm occurrence is returned.

(35) Alarm Monitor 9 Effective load ratio (2B89h)

Ins ID	Attr ID	Access	Name	Data Type
2B89h	0	Get	Alarm Monitor 9 Effective load ratio	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B89h	0		0000h to FFFFh	%	Impossible	

The effective load ratio at alarm occurrence is returned.

(36) Alarm Monitor 10 Peak load ratio (2B8Ah)

Ins ID	Attr ID	Access	Name	Data Type
2B8Ah	0	Get	Alarm Monitor 10 Peak load ratio	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B8Ah	0		0000h to FFFFh	%	Impossible	

The peak load ratio at alarm occurrence is returned.

(37) Alarm Monitor 11 Instantaneous torque (2B8Bh)

Ins ID	Attr ID	Access	Name	Data Type
2B8Bh	0	Get	Alarm Monitor 11 Instantaneous torque	INT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B8Bh	0		8000h to 7FFFh	%	Impossible	

The instantaneous torque at alarm occurrence is returned.

(38) Alarm Monitor 12 Within one-revolution position (2B8Ch)

Ins ID	Attr ID	Access	Name	Data Type
2B8Ch	0	Get	Alarm Monitor 12 Within one-revolution position	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B8Ch	0		80000000h to 7FFFFFFFh	pulse	Impossible	

The position within one-revolution at alarm occurrence is returned.

(39) Alarm Monitor 13 ABS counter (2B8Dh)

Ins ID	Attr ID	Access	Name	Data Type
2B8Dh	0	Get	Alarm Monitor 13 ABS counter	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B8Dh	0		80000000h to 7FFFFFFFh	rev	Impossible	

The ABS counter at alarm occurrence is returned.

(40) Alarm Monitor 14 Load inertia moment ratio (2B8Eh)

Ins ID	Attr ID	Access	Name	Data Type
2B8Eh	0	Get	Alarm Monitor 14 Load inertia moment ratio	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B8Eh	0		0000h to FFFFh	0.1 times	Impossible	

The load to motor inertia ratio at alarm occurrence is returned.

(41) Alarm Monitor 15 Bus voltage (2B8Fh)

Ins ID	Attr ID	Access	Name	Data Type
2B8Fh	0	Get	Alarm Monitor 15 Bus voltage	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B8Fh	0		80000000h to 7FFFFFFFh	V	Impossible	

The bus voltage at alarm occurrence is returned.

(42) Alarm Monitor 16 Load-side cumulative feedback pulses (2B90h)

Ins ID	Attr ID	Access	Name	Data Type
2B90h	0	Get	Alarm Monitor 16 Load-side cumulative feedback pulses	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B90h	0		80000000h to 7FFFFFFFh	pulse	Impossible	

The load-side cumulative feedback pulses at alarm occurrence are returned.

(43) Alarm Monitor 17 Load-side droop pulses (2B91h)

Ins ID	Attr ID	Access	Name	Data Type
2B91h	0	Get	Alarm Monitor 17 Load-side droop pulses	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B91h	0		80000000h to 7FFFFFFFh	pulse	Impossible	

The load-side droop pulses (load-side encoder unit) at alarm occurrence are returned.

(44) Alarm Monitor 18 Load-side encoder information 1 Z-phase counter (2B92h)

Ins ID	Attr ID	Access	Name	Data Type
2B92h	0	Get	Alarm Monitor 18 Load-side encoder information 1 Z-phase counter	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B92h	0		80000000h to 7FFFFFFFh	pulse	Impossible	

The load-side encoder information 1 at alarm occurrence is returned.

(45) Alarm Monitor 19 Load-side encoder information 2 (2B93h)

Ins ID	Attr ID	Access	Name	Data Type
2B93h	0	Get	Alarm Monitor 19 Load-side encoder information 2	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B93h	0		80000000h to 7FFFFFFFh	rev	Impossible	

The load-side encoder information 2 at alarm occurrence is returned.

(46) Alarm Monitor 23 Temperature of motor thermistor (2B97h)

Ins ID	Attr ID	Access	Name	Data Type
2B97h	0	Get	Alarm Monitor 23 Temperature of motor thermistor	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B97h	0		80000000h to 7FFFFFFFh	°C	Impossible	

The temperature of servo motor thermistor at alarm occurrence is returned.

(47) Alarm Monitor 24 Motor-side cumu. feedback pulses (before gear) (2B98h)

Ins ID	Attr ID	Access	Name	Data Type
2B98h	0	Get	Alarm Monitor 24 Motor-side cumu. feedback pulses (before gear)	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B98h	0		80000000h to 7FFFFFFFh	pulse	Impossible	

The cumulative feedback pulses (servo motor-side unit) at alarm occurrence are returned.

(48) Alarm Monitor 25 Electrical angle (2B99h)

Ins ID	Attr ID	Access	Name	Data Type
2B99h	0	Get	Alarm Monitor 25 Electrical angle	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2B99h	0		80000000h to 7FFFFFFFh	pulse	Impossible	

The electrical angle at alarm occurrence is returned.

(49) Alarm Monitor 35 Motor-side/load-side position deviation (2BA3h)

Ins ID	Attr ID	Access	Name	Data Type
2BA3h	0	Get	Alarm Monitor 35 Motor-side/load-side position deviation	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2BA3h	0		80000000h to 7FFFFFFFh	pulse	Impossible	

The motor-side/load-side position deviation at alarm occurrence is returned.

(50) Alarm Monitor 36 Motor-side/load-side speed deviation (2BA4h)

Ins ID	Attr ID	Access	Name	Data Type
2BA4h	0	Get	Alarm Monitor 36 Motor-side/load-side speed deviation	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2BA4h	0		80000000h to 7FFFFFFFh	r/min	Impossible	

The servo motor-side/load-side speed deviation at alarm occurrence is returned.

(51) Alarm Monitor 37 Internal temperature of encoder (2BA5h)

Ins ID	Attr ID	Access	Name	Data Type
2BA5h	0	Get	Alarm Monitor 37 Internal temperature of encoder	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2BA5h	0		80000000h to 7FFFFFFFh	°C	Impossible	

The internal temperature of encoder at alarm occurrence is returned.

(52) Alarm Monitor 38 Settling time (2BA6h)

Ins ID	Attr ID	Access	Name	Data Type
2BA6h	0	Get	Alarm Monitor 38 Settling time	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2BA6h	0		80000000h to 7FFFFFFFh	ms	Impossible	

The settling time at alarm occurrence is returned.

(53) Alarm Monitor 39 Oscillation detection frequency (2BA7h)

Ins ID	Attr ID	Access	Name	Data Type
2BA7h	0	Get	Alarm Monitor 39 Oscillation detection frequency	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2BA7h	0		80000000h to 7FFFFFFFh	Hz	Impossible	

The oscillation detection frequency at alarm occurrence is returned.

(54) Alarm Monitor 40 Number of tough drive operations (2BA8h)

Ins ID	Attr ID	Access	Name	Data Type
2BA8h	0	Get	Alarm Monitor 40 Number of tough drive operations	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2BA8h	0		80000000h to 7FFFFFFFh	number of times	Impossible	

The number of tough drive operations at alarm occurrence is returned.

(55) Alarm Monitor 45 Unit power consumption (2BADh)

Ins ID	Attr ID	Access	Name	Data Type
2BADh	0	Get	Alarm Monitor 45 Unit power consumption	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2BADh	0		80000000h to 7FFFFFFFh	W	Impossible	

The unit power consumption at alarm occurrence is returned.

(56) Alarm Monitor 46 Unit total power consumption (2BAEh)

Ins ID	Attr ID	Access	Name	Data Type
2BAEh	0	Get	Alarm Monitor 46 Unit total power consumption	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2BAEh	0		80000000h to 7FFFFFFFh	Wh	Impossible	

The unit total power consumption at alarm occurrence is returned.

7.3.7 Manufacturer Specific Control Objects (Class ID: 64h)

The instances described in this section support the following service.

・When "Get" is in the "Access" field

Service Code	Name	Description
0Eh	Get_Attribute_Single	Reads the value of the specified attribute.

・When "Set" is in the "Access" field

Service Code	Name	Description
10h	Set_Attribute_Single	Writes a value to the specified attribute.

・When "Get/Set" is in the "Access" field

Service Code	Name	Description
0Eh	Get_Attribute_Single	Reads the value of the specified attribute.
10h	Set_Attribute_Single	Writes a value to the specified attribute.

(1) Power ON cumulative time (2C18h)

Ins ID	Attr ID	Access	Name	Data Type
2C18h	0	Get	Power ON cumulative time	UDINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2C18h	0		00000000h to FFFFFFFFh	hour	Impossible	

The cumulative energization time of the servo amplifier is returned.

(2) Inrush relay ON/OFF number (2C19h)

Ins ID	Attr ID	Access	Name	Data Type
2C19h	0	Get	Inrush relay ON/OFF number	UDINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2C19h	0		00000000h to FFFFFFFFh	number of times	Impossible	

The number of on/off times of the inrush relay of the servo amplifier is returned.

(3) Machine diagnostic status (2C20h)

Ins ID	Attr ID	Access	Name	Data Type
2C20h	0	Get	Machine diagnostic status	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2C20h	0		Refer to the text.		Impossible	

The machine diagnostic status is returned. The description is as follows.

Bit	Description
0 to 3	Friction estimation status at forward rotation 0: Friction is being estimated. (normal) 1: Estimation is completed. (normal) 2: The servo motor may rotate in one direction too frequently. (warning) 3: The servo motor speed may too slow for friction estimation. (warning) 4: The change in the servo motor speed may be small for friction estimation. (warning) 5: The acceleration/deceleration time constants may be too short for friction estimation. (warning) 6: The operation time may not be enough. (warning) 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.
4 to 7	Friction estimation status at reverse rotation 0: Friction is being estimated. (normal) 1: Estimation is completed. (normal) 2: The servo motor may rotate in one direction too frequently. (warning) 3: The servo motor speed may too slow for friction estimation. (warning) 4: The change in the servo motor speed may be small for friction estimation. (warning) 5: The acceleration/deceleration time constants may be too short for friction estimation. (warning) 6: The operation time may not be enough. (warning) 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.
8 to 11	Vibration estimation status 0: During estimation 1: Estimation is completed.
12 to 15	(reserved) The value at reading is undefined.

(4) Coulomb friction torque in positive direction (2C21h)

Ins ID	Attr ID	Access	Name	Data Type
2C21h	0	Get	Coulomb friction torque in positive direction	INT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2C21h	0		8000h to 7FFFh	0.1%	Impossible	

Static friction at forward rotation torque is returned in increments of 0.1%.

(5) Friction torque at rated speed in positive direction (2C22h)

Ins ID	Attr ID	Access	Name	Data Type
2C22h	0	Get	Friction torque at rated speed in positive direction	INT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2C22h	0		8000h to 7FFFh	0.1%	Impossible	

Kinetic friction at forward rotation torque at the rated speed is returned in increments of 0.1%.

(6) Coulomb friction torque in negative direction (2C23h)

Ins ID	Attr ID	Access	Name	Data Type
2C23h	0	Get	Coulomb friction torque in negative direction	INT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2C23h	0		8000h to 7FFFh	0.1%	Impossible	

Static friction at reverse rotation torque is returned in increments of 0.1%.

(7) Friction torque at rated speed in negative direction (2C24h)

Ins ID	Attr ID	Access	Name	Data Type
2C24h	0	Get	Friction torque at rated speed in negative direction	INT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2C24h	0		8000h to 7FFFh	0.1%	Impossible	

Kinetic friction at reverse rotation torque at the rated speed is returned in increments of 0.1%.

(8) Oscillation frequency during motor stop (2C25h)

Ins ID	Attr ID	Access	Name	Data Type
2C25h	0	Get	Oscillation frequency during motor stop	INT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2C25h	0		8000h to 7FFFh	Hz	Impossible	

Vibration frequency during stop/servo-lock is returned in increments of 1 Hz.

(9) Vibration level during motor stop (2C26h)

Ins ID	Attr ID	Access	Name	Data Type
2C26h	0	Get	Vibration level during motor stop	INT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2C26h	0		8000h to 7FFFh	0.1%	Impossible	

Vibration level during stop/servo-lock is returned in increments of 0.1%.

(10) Oscillation frequency during motor operating (2C27h)

Ins ID	Attr ID	Access	Name	Data Type
2C27h	0	Get	Oscillation frequency during motor operating	INT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2C27h	0		8000h to 7FFFh	Hz	Impossible	

Vibration frequency during operation is returned in increments of 1 Hz.

(11) Vibration level during motor operating (2C28h)

Ins ID	Attr ID	Access	Name	Data Type
2C28h	0	Get	Vibration level during motor operating	INT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2C28h	0		8000h to 7FFFh	0.1%	Impossible	

Vibration level during operation is returned in increments of 0.1%.

(12) Control DI 1 (2D01h)

Ins ID	Attr ID	Access	Name	Data Type
2D01h	0	Get/Set	Control DI 1	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2D01h	0	0	Refer to the text.		Impossible	

Set control commands to control the servo amplifier. Refer to section 5.2.2 (1) for details.

(13) Control DI 2 (2D02h)

Ins ID	Attr ID	Access	Name	Data Type
2D02h	0	Get/Set	Control DI 2	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2D02h	0	0	Refer to the text.		Impossible	

Set control commands to control the servo amplifier. Refer to section 5.2.2 (2) for details.

(14) Control DI 3 (2D03h)

Ins ID	Attr ID	Access	Name	Data Type
2D03h	0	Get/Set	Control DI 3	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2D03h	0	0	Refer to the text.		Impossible	

Set control commands to control the servo amplifier. Refer to section 5.2.2 (3) for details.

(15) Control DI 7 (2D07h)

Ins ID	Attr ID	Access	Name	Data Type
2D07h	0	Get/Set	Control DI 7	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2D07h	0	0	Refer to the text.		Impossible	

Set control commands to control the servo amplifier. Refer to section 5.2.2 (4) for details.

(16) Control DI 10 (2D0Ah)

Ins ID	Attr ID	Access	Name	Data Type
2D0Ah	0	Get/Set	Control DI 10	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2D0Ah	0	0	Refer to the text.		Impossible	

Set control commands to control the servo amplifier. Refer to section 5.2.2 (5) for details.

(17) Status DO 1 (2D11h)

Ins ID	Attr ID	Access	Name	Data Type
2D11h	0	Get	Status DO 1	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2D11h	0		Refer to the text.		Impossible	

The servo status is returned. Refer to section 5.3.2 (1) for details.

(18) Status DO 2 (2D12h)

Ins ID	Attr ID	Access	Name	Data Type
2D12h	0	Get	Status DO 2	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2D12h	0		Refer to the text.		Impossible	

The servo status is returned. Refer to section 5.3.2 (2) for details.

(19) Status DO 3 (2D13h)

Ins ID	Attr ID	Access	Name	Data Type
2D13h	0	Get	Status DO 3	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2D13h	0		Refer to the text.		Impossible	

The servo status is returned. Refer to section 5.3.2 (3) for details.

(20) Status DO 5 (2D15h)

Ins ID	Attr ID	Access	Name	Data Type
2D15h	0	Get	Status DO 5	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2D15h	0		Refer to the text.		Impossible	

The servo status is returned. Refer to section 5.3.2 (4) for details.

(21) Status DO 6 (2D16h)

Ins ID	Attr ID	Access	Name	Data Type
2D16h	0	Get	Status DO 6	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2D16h	0		Refer to the text.		Impossible	

The servo status is returned. Refer to section 5.3.2 (5) for details.

(22) Status DO 7 (2D17h)

Ins ID	Attr ID	Access	Name	Data Type
2D17h	0	Get	Status DO 7	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2D17h	0		Refer to the text.		Impossible	

The servo status is returned. Refer to section 5.3.2 (6) for details.

(23) Status DO 10 (2D1Ah)

Ins ID	Attr ID	Access	Name	Data Type
2D1Ah	0	Get	Status DO 10	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2D1Ah	0		Refer to the text.		Impossible	

The servo status is returned. Refer to section 5.3.2 (7) for details.

(24) Velocity limit value (2D20h)

Ins ID	Attr ID	Access	Name	Data Type
2D20h	0	Get/Set	Velocity limit value	UDINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2D20h	0	50000	00000000h to permissible instantaneous speed	vel units	Possible	PT67

Set the speed limit value for the profile torque mode (tq).
Unit: [0.01 r/min] ([0.01 mm/s] when a linear servo motor is used)

(25) Motor rated speed (2D28h)

Ins ID	Attr ID	Access	Name	Data Type
2D28h	0	Get	Motor rated speed	UDINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2D28h	0		00000000h to FFFFFFFFh	r/min	Impossible	

The servo motor rated speed is returned.
Unit: [r/min] ([mm/s] when a linear servo motor is used)

(26) Manufacturer Device Name 2 (2D30h)

Ins ID	Attr ID	Access	Name	Data Type
2D30h	0 to _	Get	Manufacturer Device Name 2	STRING

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2D30h	0 to _				Impossible	

The model name of the MR-J4-_TM_ servo amplifier is returned.
The number of character strings is set to Attribute ID 0 and ASCII code is registered to Attribute ID 1 or later.

(27) Manufacturer Hardware Version 2 (2D31h)

Ins ID	Attr ID	Access	Name	Data Type
2D31h	0 to _	Get	Manufacturer Hardware Version 2	STRING

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2D31h	0 to _				Impossible	

The hardware version of the MR-J4-_TM_ servo amplifier is returned.
The number of character strings is set to Attribute ID 0 and ASCII code is registered to Attribute ID 1 or later.

(28) Manufacturer Software Version 2 (2D32h)

Ins ID	Attr ID	Access	Name	Data Type
2D32h	0 to _	Get	Manufacturer Software Version 2	STRING

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2D32h	0 to _				Impossible	

The software version of the MR-J4-_TM_ servo amplifier is returned.
The number of character strings is set to Attribute ID 0 and ASCII code is registered to Attribute ID 1 or later.

(29) Serial Number 2 (2D33h)

Ins ID	Attr ID	Access	Name	Data Type
2D33h	0 to _	Get	Serial Number 2	STRING

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2D33h	0 to _				Impossible	

The serial number of the MR-J4-_TM_ servo amplifier is returned.
The number of character strings is set to Attribute ID 0 and ASCII code is registered to Attribute ID 1 or later.

(30) User parameter configuration (2D34h)

Ins ID	Attr ID	Access	Name	Data Type
2D34h	0	Get/Set	User parameter configuration	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2D34h	0	1	Refer to the text.		Impossible	

The parameters whose symbols are preceded by * are not automatically enabled. Writing "1EA5h" to this object enables the parameters. This operation can be performed only when I/O connection is not in the Run mode.

The read values of this object are as follows. The completion of the parameter enables processing can be checked.

Value	Description
0	Parameter enabling processing is being executed.
1	Parameter enabling processing is not being executed. (The processing is completed.)

(31) Encoder status (2D35h)

Ins ID	Attr ID	Access	Name	Data Type
2D35h	0	Get	Encoder status	USINT
	1		Encoder status1	UDINT
	2		Encoder status2	

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2D35h	0	2	02h to 02h		Impossible	
	1		00000000h to 00000001h			
	2		00000000h to 00000007h			

The status of the encoder is returned. The description of each Attribute ID is as follows.

Attr ID	Name	Description
0	Encoder status	Number of entries
1	Encoder status1	The status of the encoder is returned. For a fully closed loop system, the external 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
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

(32) Scale cycle counter (2D36h)

Ins ID	Attr ID	Access	Name	Data Type
2D36h	0	Get	Scale cycle counter	UDINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2D36h	0		00000000h to FFFFFFFFh	pulse	Impossible	

The position within one-revolution of the scale measurement encoder is returned. Returned values differ depending on the scale measurement encoder type.

Scale measurement encoder	Description
Rotary encoder	Cycle counter
Linear encoder Absolute position type	ABS counter
Linear encoder Incremental type	Scale coasting counter
Linear encoder A/B/Z-phase differential output type Incremental type	Scale coasting counter

(33) Scale ABS counter (2D37h)

Ins ID	Attr ID	Access	Name	Data Type
2D37h	0	Get	Scale ABS counter	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2D37h	0		80000000h to 7FFFFFFFh	rev	Impossible	

The ABS counter of the scale measurement encoder is returned. Returned values differ depending on the scale measurement encoder type.

Scale measurement encoder	Description
Rotary encoder	Multi-revolution ABS counter
Linear encoder Absolute position type	Fixed to 0
Linear encoder Incremental type	Fixed to 0
Linear encoder A/B/Z-phase differential output type Incremental type	Fixed to 0

(34) Scale measurement encoder resolution (2D38h)

Ins ID	Attr ID	Access	Name	Data Type
2D38h	0	Get	Scale measurement encoder resolution	UDINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2D38h	0		00000000h to FFFFFFFFh	inc / rev	Impossible	

The resolution of the scale measurement encoder is returned.

(35) Scale measurement encoder alarm (2D3Ch)

Ins ID	Attr ID	Access	Name	Data Type
2D3Ch	0	Get	Scale measurement encoder alarm	UDINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2D3Ch	0		00000000h to FFFFFFFFh		Impossible	

The alarm data of the scale measurement encoder is returned. The value "0" indicates that no error occurs. A value other than "0" indicates that an error occurs.

(36) One-touch tuning mode (2D50h)

Ins ID	Attr ID	Access	Name	Data Type
2D50h	0	Get/Set	One-touch tuning mode	USINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2D50h	0		00h to 03h		Impossible	

Setting a value of "1" to "3" starts one-touch tuning. After one-touch tuning is completed, the setting value automatically changes to "0". The description of the setting values is as follows.

Setting value	Description
0	During one-touch tuning stop
1	Basic setting
2	High setting
3	Low setting

(37) One-touch tuning status (2D51h)

Ins ID	Attr ID	Access	Name	Data Type
2D51h	0	Get	One-touch tuning status	SINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2D51h	0		00h to 64h	%	Impossible	

The one-touch tuning progress is returned.

(38) One-touch tuning Stop (2D52h)

Ins ID	Attr ID	Access	Name	Data Type
2D52h	0	Set	One-touch tuning Stop	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2D52h	0		0000h/1EA5h		Impossible	

Writing "1EA5h" can stop one-touch tuning. Writing a value other than "1EA5h" sets a general-purpose code 09h Invalid attribute value.

(39) One-touch tuning Clear (2D53h)

Ins ID	Attr ID	Access	Name	Data Type
2D53h	0	Set	One-touch tuning Clear	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2D53h	0		0000h to 0001h		Impossible	

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.

Setting value	Description
0000h	Restores the initial value.
0001h	Restores the value before one-touch tuning.

(40) One-touch tuning Error Code (2D54h)

Ins ID	Attr ID	Access	Name	Data Type
2D54h	0	Get	One-touch tuning Error Code	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2D54h	0		0000h to C00Fh		Impossible	

An error code of the one-touch tuning is returned. The description of the error codes is as follows.

Error code	Description
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

7.3.8 PDS Control Objects (Class ID: 64h)

The instances described in this section support the following service.

- When "Get" is in the "Access" field

Service Code	Name	Description
0Eh	Get_Attribute_Single	Reads the value of the specified attribute.

- When "Set" is in the "Access" field

Service Code	Name	Description
10h	Set_Attribute_Single	Writes a value to the specified attribute.

- When "Get/Set" is in the "Access" field

Service Code	Name	Description
0Eh	Get_Attribute_Single	Reads the value of the specified attribute.
10h	Set_Attribute_Single	Writes a value to the specified attribute.

(1) Error code (603Fh)

Ins ID	Attr ID	Access	Name	Data Type
603Fh	0	Get	Error code	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
603Fh	0	0	0000h to FFFFh		Impossible	

The number of the latest error that occurred after the power on is returned.

(2) Controlword (6040h)

Ins ID	Attr ID	Access	Name	Data Type
6040h	0	Get/Set	Controlword	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
6040h	0	0	Refer to the text.		Impossible	

Set control commands to control the servo amplifier. Refer to section 5.2.1 for details.

(3) Statusword (6041h)

Ins ID	Attr ID	Access	Name	Data Type
6041h	0	Get	Statusword	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
6041h	0		Refer to the text.		Impossible	

The servo status is returned. Refer to section 5.3.1 for details.

(4) Quick stop option code (605Ah)

Ins ID	Attr ID	Access	Name	Data Type
605Ah	0	Get/Set	Quick stop option code	INT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
605Ah	0	2	0002h to 0002h		Possible	PT68

Set how to decelerate the servo motor to a stop at QuickStop reception. The description of the setting values is as follows.

Setting value	Description
1	
2	In the profile mode (pp/pv) and homing mode (hm), the servo motor decelerates to a stop with Quick stop deceleration (Class ID: 64h, Ins ID: 6085h, Attr ID: 0) and the state shifts to the Switch On Disabled state. In the profile torque mode (tq), the state immediately shifts to the Switch On Disabled state and the servo motor stops with the dynamic brake.
3	
4	
5	
6	
7	
8	

(5) Halt option code (605Dh)

Ins ID	Attr ID	Access	Name	Data Type
605Dh	0	Get/Set	Halt option code	INT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
605Dh	0	1	0001h to 0001h		Possible	PT68

Set how to decelerate the servo motor to a stop at Halt reception. The description of the setting values is as follows.

Setting value	Description
1	For Profile deceleration (Class ID: 64h, Ins ID: 6084h, Attr ID: 0) and the homing mode (hm), the servo motor decelerates to a stop according to Homing acceleration (Class ID: 64h, Ins ID: 6094h, Attr ID: 0) and the state does not change from the Operation Enabled state (servo-on).
2	
3	
4	

(6) Modes of operation (6060h)

Ins ID	Attr ID	Access	Name	Data Type
6060h	0	Get/Set	Modes of operation	SINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
6060h	0	0	Refer to the text.		Impossible	

Set the control mode. The setting values are as follows.

Setting value	Description
0	No mode change/No mode assinged
1	Profile position mode (pp)
3	Profile velocity mode (pv)
4	Profile torque mode (tq)
6	Homing mode (hm)

The settable values are limited depending on the setting of [Pr. PA01]. Refer to section 5.4.1 for details.

(7) Modes of operation display (6061h)

Ins ID	Attr ID	Access	Name	Data Type
6061h	0	Get	Modes of operation display	SINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
6061h	0	1	Refer to the text.		Impossible	

The current control mode is returned. The description is as follows.

Setting value	Description
0	No mode assinged
1	Profile position mode (pp)
3	Profile velocity mode (pv)
4	Profile torque mode (tq)
6	Homing mode (hm)

(8) Supported drive modes (6502h)

Ins ID	Attr ID	Access	Name	Data Type
6502h	0	Get	Supported drive modes	UDINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
6502h	0	0000002Dh	0000002Dh to 0000002Dh		Impossible	

The supported control mode is returned. The description is as follows.

Bit	Description	Defined value
0	Profile position mode (pp)	1: Supported
1	Velocity mode (vl)	0
2	Profile velocity mode (pv)	1: Supported
3	Profile torque mode (tq)	1: Supported
4	Reserved	0
5	Homing mode (hm)	1: Supported
6	Interpolated position mode (ip)	0
7	Cyclic synchronous position mode (csp)	0
8	Cyclic synchronous velocity mode (csv)	0
9	Cyclic synchronous torque mode (cst)	0
10	Cyclic synchronous torque mode with communication angle (cstca)	0
11 to 31	Reserved	0

A fixed value "0000002Dh" is returned regardless of the [Pr. PA01] setting.

7.3.9 Position Control Function Objects (Class ID: 64h)

The instances described in this section support the following service.

・When "Get" is in the "Access" field

Service Code	Name	Description
0Eh	Get_Attribute_Single	Reads the value of the specified attribute.

・When "Set" is in the "Access" field

Service Code	Name	Description
10h	Set_Attribute_Single	Writes a value to the specified attribute.

・When "Get/Set" is in the "Access" field

Service Code	Name	Description
0Eh	Get_Attribute_Single	Reads the value of the specified attribute.
10h	Set_Attribute_Single	Writes a value to the specified attribute.

(1) Position actual internal value (6063h)

Ins ID	Attr ID	Access	Name	Data Type
6063h	0	Get	Position actual internal value	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
6063h	0		80000000h to 7FFFFFFFh	inc	Impossible	

The current position is returned.

(2) Position actual value (6064h)

Ins ID	Attr ID	Access	Name	Data Type
6064h	0	Get	Position actual value	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
6064h	0		80000000h to 7FFFFFFFh	pos units	Impossible	

The current position in the command unit is returned.

(3) Following error window (6065h)

Ins ID	Attr ID	Access	Name	Data Type
6065h	0	Get/Set	Following error window	UDINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
6065h	0	00C00000h	00000000h to FFFFFFFFh	pos units	Possible	PC67/PC68

In the profile position mode (pp), when the time set with Following error time out (Class ID: 64h, Ins ID: 6066h, Attr ID: 0) has elapsed with the number of droop pulses exceeding the setting value of this object, Bit 13 of Statusword (Class ID: 64h, Ins ID: 6041h, Attr ID: 0) is turned on. When "FFFFFFFFh" is set, Bit 13 of Statusword (Class ID: 64h, Ins ID: 6041h, Attr ID: 0) is always off.

(4) Following error time out (6066h)

Ins ID	Attr ID	Access	Name	Data Type
6066h	0	Get/Set	Following error time out	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
6066h	0	10	0000h to FFFFh	ms	Possible	PC69

Refer to Following error window (Class ID: 64h, Ins ID: 6065h, Attr ID: 0).

(5) Position window (6067h)

Ins ID	Attr ID	Access	Name	Data Type
6067h	0	Get/Set	Position window	UDINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
6067h	0	100	Refer to the text.	pos units	Possible	PC70

The description of this object is as follows.

Setting value	Description
00000000h to 0000FFFEh	In the profile position mode (pp), when the time set with Position windows time (Class ID: 64h, Ins ID: 6068h, Attr ID: 0) has elapsed with the number of droop pulses equal to or lower than the setting value of this object, Bit 10 of Statusword (Class ID: 64h, Ins ID: 6041h, Attr ID: 0) is turned on.
0000FFFFh to FFFFFFFEh	Unsettable
FFFFFFFFh	Bit 10 of Statusword (Class ID: 64h, Ins ID: 6041h, Attr ID: 0) is always on in the profile position mode (pp).

(6) Position window time (6068h)

Ins ID	Attr ID	Access	Name	Data Type
6068h	0	Get/Set	Position window time	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
6068h	0	10	0000h to FFFFh	ms	Possible	PC71

Refer to Position window (Class ID: 64h, Ins ID: 6067h, Attr ID: 0).

(7) Positioning option code (60F2h)

Ins ID	Attr ID	Access	Name	Data Type
60F2h	0	Get/Set	Positioning option code	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
60F2h	0	0000h	0000h to 00C0h		Possible	PT03

Set the profile position mode. The description of this object is as follows.

Bit	Description	Defined value
0 to 1	00b: The positioning is performed with the relative position from the internal absolute target position. 01b: The positioning is performed with the relative position from Position demand actual value (Class ID: 64h, Ins ID: 60FCh, Attr ID: 0). (Not supported) (Note) 10b: The positioning is performed with the relative position from Position actual value (Class ID: 64h, Ins ID: 6064h, Attr ID: 0). 11b: reserved	00b
1 to 2	00b: New values of Target position (Class ID: 64h, Ins ID: 607Ah, Attr ID: 0), Profile velocity (Class ID: 64h, Ins ID: 6081h, Attr ID: 0), and Acceleration are promptly applied. 01b: The current positioning continues to reach the target position. Then new values of Target position (Class ID: 64h, Ins ID: 607Ah, Attr ID: 0), Profile velocity (Class ID: 64h, Ins ID: 6081h, Attr ID: 0), and Acceleration are applied. 10b: reserved 11b: reserved	00b
3 to 5	Reserved	0
6 to 7	00b: The servo motor rotates to the target position in a direction specified with a sign of the position data. 01b: The servo motor rotates in the address decreasing direction regardless of the sign of the position data. 10b: The servo motor rotates in the address increasing direction regardless of the sign of the position data. 11b: The servo motor rotates from the current position to the target position in the shorter direction. If the distances from the current position to the target position are the same for CCW and CW, the servo motor rotates in the CCW direction.	00b
8 to 15	Reserved	0

Note. This is not supported by the MR-J4-_TM_ servo amplifier.

(8) Following error actual value (60F4h)

Ins ID	Attr ID	Access	Name	Data Type
60F4h	0	Get	Following error actual value	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
60F4h	0		80000000h to 7FFFFFFFh	pos units	Impossible	

The droop pulses are returned.

(9) Control effort (60FAh)

Ins ID	Attr ID	Access	Name	Data Type
60FAh	0	Get	Control effort	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
60FAh	0		80000000h to 7FFFFFFFh	vel units	Impossible	

The speed command is returned.
Unit: [0.01 r/min] ([0.01 mm/s] when a linear servo motor is used)

7.3.10 Profile Velocity Mode Objects (Class ID: 64h)

The instances described in this section support the following service.

- When "Get" is in the "Access" field

Service Code	Name	Description
0Eh	Get_Attribute_Single	Reads the value of the specified attribute.

- When "Set" is in the "Access" field

Service Code	Name	Description
10h	Set_Attribute_Single	Writes a value to the specified attribute.

- When "Get/Set" is in the "Access" field

Service Code	Name	Description
0Eh	Get_Attribute_Single	Reads the value of the specified attribute.
10h	Set_Attribute_Single	Writes a value to the specified attribute.

(1) Velocity demand value (606Bh)

Ins ID	Attr ID	Access	Name	Data Type
606Bh	0	Get	Velocity demand value	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
606Bh	0		80000000h to 7FFFFFFFh	vel units	Impossible	

The speed command is returned.
Unit: [0.01 r/min] ([0.01 mm/s] when a linear servo motor is used)

(2) Velocity actual value (606Ch)

Ins ID	Attr ID	Access	Name	Data Type
606Ch	0	Get	Velocity actual value	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
606Ch	0		80000000h to 7FFFFFFFh	vel units	Impossible	

The current speed is returned.
Unit: [0.01 r/min] ([0.01 mm/s] when a linear servo motor is used)

(3) Velocity window (606Dh)

Ins ID	Attr ID	Access	Name	Data Type
606Dh	0	Get/Set	Velocity window	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
606Dh	0	2000	0000h to FFFFh	vel units	Possible	PC72

In the profile velocity mode (pv), when the time set with Velocity window time (Class ID: 64h, Ins ID: 606Eh, Attr ID: 0) has elapsed with the current speed equal to or lower than the setting value of this object, Bit 10 of Statusword (Class ID: 64h, Ins ID: 6041h, Attr ID: 0) is turned on.
Unit: [0.01 r/min] ([0.01 mm/s] when a linear servo motor is used)

(4) Velocity window time (606Eh)

Ins ID	Attr ID	Access	Name	Data Type
606Eh	0	Get/Set	Velocity window time	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
606Eh	0	10	0000h to FFFFh	ms	Possible	PC73

Refer to Velocity window (Class ID: 64h, Ins ID: 606Dh, Attr ID: 0).

(5) Velocity threshold (606Fh)

Ins ID	Attr ID	Access	Name	Data Type
606Fh	0	Get/Set	Velocity threshold	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
606Fh	0	5000	0000h to FFFFh	vel units	Possible	PC65

In the profile velocity mode (pv), when the time set with Velocity threshold time (Class ID: 64h, Ins ID: 6070h, Attr ID: 0) has elapsed with the current speed higher than the setting value of this object, Bit 12 of Statusword (Class ID: 64h, Ins ID: 6041h, Attr ID: 0) is turned off.
Unit: [0.01 r/min] ([0.01 mm/s] when a linear servo motor is used)

(6) Velocity threshold time (6070h)

Ins ID	Attr ID	Access	Name	Data Type
6070h	0	Get/Set	Velocity threshold time	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
6070h	0	10	0000h to FFFFh	ms	Possible	PC66

Refer to Velocity threshold (Class ID: 64h, Ins ID: 606Fh, Attr ID: 0).

(7) Target velocity (60FFh)

Ins ID	Attr ID	Access	Name	Data Type
60FFh	0	Get/Set	Target velocity	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
60FFh	0	0	80000000h to 7FFFFFFFh	vel units	Impossible	

Set the speed command used in the profile velocity mode (pv).
Unit: [0.01 r/min] ([0.01 mm/s] when a linear servo motor is used)

7.3.11 Profile Torque Mode Objects (Class ID: 64h)

The instances described in this section support the following service.

・When "Get" is in the "Access" field

Service Code	Name	Description
0Eh	Get_Attribute_Single	Reads the value of the specified attribute.

・When "Set" is in the "Access" field

Service Code	Name	Description
10h	Set_Attribute_Single	Writes a value to the specified attribute.

・When "Get/Set" is in the "Access" field

Service Code	Name	Description
0Eh	Get_Attribute_Single	Reads the value of the specified attribute.
10h	Set_Attribute_Single	Writes a value to the specified attribute.

(1) Target torque (6071h)

Ins ID	Attr ID	Access	Name	Data Type
6071h	0	Get/Set	Target torque	INT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
6071h	0	0	8000h to 7FFFh	per thousand of rated torque	Impossible	

Set the torque command used in the profile torque mode (tq).

(2) Max torque (6072h)

Ins ID	Attr ID	Access	Name	Data Type
6072h	0	Get/Set	Max torque	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
6072h	0		0000h to FFFFh	per thousand of rated torque	Impossible	

The maximum torque of the servo motor is returned. The values notified by this object are the maximum current and feedback value and may not match the maximum torque mentioned in "Servo Motor Instruction Manual (Vol. 3)".

(3) Torque demand value (6074h)

Ins ID	Attr ID	Access	Name	Data Type
6074h	0	Get	Torque demand value	INT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
6074h	0		8000h to 7FFFh	per thousand of rated torque	Impossible	

The torque command is returned.

(4) Torque actual value (6077h)

Ins ID	Attr ID	Access	Name	Data Type
6077h	0	Get	Torque actual value	INT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
6077h	0		8000h to 7FFFh	per thousand of rated torque	Impossible	

The current torque is returned.

(5) Torque slope (6087h)

Ins ID	Attr ID	Access	Name	Data Type
6087h	0	Get/Set	Torque slope	UDINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
6087h	0	00000000h	00000000h to 00989680h (10000000)	per thousand of rated torque per second	Possible	PT53

Set the variation per second of the torque command used in the profile torque mode. When "0" is set, the setting value is invalid and the torque command is input with step input.

(6) Torque profile type (6088h)

Ins ID	Attr ID	Access	Name	Data Type
6088h	0	Get/Set	Torque profile type	INT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
6088h	0	0	0000h to 0000h		Impossible	

Set the torque command pattern. The description is as follows.

Setting value	Description
0	Linear ramp
1	$\sin^2$ ramp (Not supported) (Note)

Note. This is not supported by the MR-J4-_TM_ servo amplifier.

Values other than "0" cannot be set.

(7) Positive torque limit value (60E0h)

Ins ID	Attr ID	Access	Name	Data Type
60E0h	0	Get/Set	Positive torque limit value	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
60E0h	0	10000	0000h to 2710h (10000)	per thousand of rated torque	Possible	PA11 (POL disabled), PA12 (POL enabled)

You can limit the torque or thrust generated by the servo motor. Set the limit value of the torque of the servo motor in the CCW power running or CW regeneration, or the limit value of the thrust of the linear servo motor in the positive direction power running or negative direction regeneration. Set this object to "0" to generate no torque or thrust.

(8) Negative torque limit value (60E1h)

Ins ID	Attr ID	Access	Name	Data Type
60E1h	0	Get/Set	Negative torque limit value	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
60E1h	0	10000	0000h to 2710h (10000)	per thousand of rated torque	Possible	PA12 (POL disabled), PA11 (POL enabled)

You can limit the torque or thrust generated by the servo motor. Set the limit value of the torque of the servo motor in the CW power running or CCW regeneration, or the limit value of the thrust of the linear servo motor in the negative direction power running or positive direction regeneration. Set this object to "0" to generate no torque or thrust.

7.3.12 Profile Position Mode Objects (Class ID: 64h)

The instances described in this section support the following service.

・When "Get" is in the "Access" field

Service Code	Name	Description
0Eh	Get_Attribute_Single	Reads the value of the specified attribute.

・When "Set" is in the "Access" field

Service Code	Name	Description
10h	Set_Attribute_Single	Writes a value to the specified attribute.

・When "Get/Set" is in the "Access" field

Service Code	Name	Description
0Eh	Get_Attribute_Single	Reads the value of the specified attribute.
10h	Set_Attribute_Single	Writes a value to the specified attribute.

(1) Target position (607Ah)

Ins ID	Attr ID	Access	Name	Data Type
607Ah	0	Get/Set	Target position	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
607Ah	0	0	Refer to the text.	pos units	Impossible	

Set the position command used in the profile position mode (pp). The settable values vary depending on the setting of [Pr. PT01]. When using superimposed synchronous control, set compensation amounts for the servo motor rotation position. A positive superimposed feed length adds compensation to superimposed control in the command address increasing direction, and a negative superimposed feed length adds compensation in the command address decreasing direction.

[Pr. PT01] setting	Range
_ 2 _ _ (degree)	FFFA81C0h to 00057E40h (-360000 to 360000)
_ 3 _ _ (pulse)	FFF0BDC1h to 000F423Fh (-999999 to 999999)

Set also Gear ratio (Class ID: 64h, Ins ID: 6091h, Attr ID: 0) for the profile position mode (pp).

(2) Position range limit (607Bh)

Ins ID	Attr ID	Access	Name	Data Type
607Bh	0	Get	Position range limit	USINT
	1	Get/Set	Min position range limit	DINT
	2		Max position range limit	

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
607Bh	0	2	00h to 02h		Impossible	
	1		Refer to the text.	pos units		
	2					

Set the range for limiting the command position. The settable values vary depending on the setting of [Pr. PT01].

[Pr. PT01] setting	Range
_ 2 _ _ (degree)	00000000h to 00057E3Fh (0 to 359999)
_ 3 _ _ (pulse)	80000000h to 7FFFFFFFh (-2147483648 to 2147483647)

(3) Software position limit (607Dh)

Ins ID	Attr ID	Access	Name	Data Type
607Dh	0	Get	Software position limit	USINT
	1	Get/Set	Min position limit	DINT
	2		Max position limit	

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
607Dh	0	2	02h to 02h		Impossible	
	1	0	80000000h to 7FFFFFFFh	pos units	Possible	PT17/PT18
	2					PT15/PT16

Set the range for limiting the command position. Target position (Class ID: 64h, Ins ID: 607Ah, Attr ID: 0) is limited within the range between Min position limit (Class ID: 64h, Ins ID: 607Dh, Attr ID: 1) and Max position limit (Class ID: 64h, Ins ID: 607Dh, Attr ID: 2). When the set value of Min position limit (Class ID: 64h, Ins ID: 607Dh, Attr ID: 1) is equal to or greater than the set value of Max position limit (Class ID: 64h, Ins ID: 607Dh, Attr ID: 2), the function of Software position limit (Class ID: 64h, Ins ID: 607Dh, Attr ID: 0) is disabled.

(4) Max profile velocity (607Fh)

Ins ID	Attr ID	Access	Name	Data Type
607Fh	0	Get/Set	Max profile velocity	UDINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
607Fh	0	2000000	00000000h to 001E8480h (2000000)	vel units	Possible	PT66

Set the speed limit value for the profile position mode (pp) and profile velocity mode (pv). When a value exceeding this object is set to Target velocity (Class ID: 64h, Ins ID: 60FFh, Attr ID: 0) or Profile velocity (Class ID: 64h, Ins ID: 6081h, Attr ID: 0), the speed is limited with the value of this object.

(5) Max motor speed (6080h)

Ins ID	Attr ID	Access	Name	Data Type
6080h	0	Get/Set	Max motor speed	UDINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
6080h	0		00000000h to FFFFFFFFh	Refer to the text.	Impossible	

The maximum speed of the servo motor is returned. Operation cannot be performed at a speed exceeding the speed set with this object.
Unit: [r/min] ([mm/s] when a linear servo motor is used)

(6) Profile velocity (6081h)

Ins ID	Attr ID	Access	Name	Data Type
6081h	0	Get/Set	Profile velocity	UDINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
6081h	0	10000	00000000h to permissible instantaneous speed	vel units	Possible	PT65

Set the command speed in the profile position mode (pp). Set a value within the range between "0" and permissible speed. When using superimposed synchronous control, set a superimposed feed speed at a start of the superimposed control. Set a value within the range between "0" and permissible speed.
Unit: [0.01 r/min] ([0.01 mm/s] when a linear servo motor is used)

(7) Profile acceleration (6083h)

Ins ID	Attr ID	Access	Name	Data Type
6083h	0	Get/Set	Profile acceleration	UDINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
6083h	0	0	Refer to the text.	ms	Possible	PT49

Set the acceleration time constant in the profile position mode (pp) and the profile velocity mode (pv). Set a time for the servo motor to reach the rated speed. The settable values vary depending on the control mode. When using superimposed synchronous control, set an acceleration time constant for the superimposed control. Set a time for the servo motor to reach the rated speed.

Control mode	Range
Profile position mode (pp)	0 to 20000
Profile velocity mode (pv)	0 to 50000

(8) Profile deceleration (6084h)

Ins ID	Attr ID	Access	Name	Data Type
6084h	0	Get/Set	Profile deceleration	UDINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
6084h	0	0	Refer to the text.	ms	Possible	PT50

Set the deceleration time constant in the profile position mode (pp) and the profile velocity mode (pv). Set a time for the servo motor to stop from the rated speed. The settable values vary depending on the control mode. When using superimposed synchronous control, set a deceleration time constant for the superimposed control. Set a time for the servo motor to stop from the rated speed.

Control mode	Range
Profile position mode (pp)	0 to 20000
Profile velocity mode (pv)	0 to 50000

(9) Quick stop deceleration (6085h)

Ins ID	Attr ID	Access	Name	Data Type
6085h	0	Get/Set	Quick stop deceleration	UDINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
6085h	0	100	0 to 20000	ms	Possible	PC24

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.

(10) Motion profile type (6086h)

Ins ID	Attr ID	Access	Name	Data Type
6086h	0	Get/Set	Motion profile type	INT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
6086h	0	-1	FFFFh to FFFFh (-1)		Impossible	

Set the acceleration/deceleration pattern in the profile position mode (pp). The description is as follows.

Setting value	Description
-1	S-pattern
0	Linear ramp (Not supported) (Note)
1	sin^2 ramp (Not supported) (Note)
2	Jerk-free ramp (Not supported) (Note)
3	Jerk-limited ramp (Not supported) (Note)

Note. This is not supported by the MR-J4-_TM_ servo amplifier.

For this object, "-1" is always returned. Values other than "-1" cannot be set.

(11) External encoder gear ratio (2DF0h)

Ins ID	Attr ID	Access	Name	Data Type
2DF0h	0	Get	External encoder gear ratio	USINT
	1	Get/Set	External encoder gear numerator	DINT
	2		External encoder gear denominator	

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2DF0h	0	2	02h to 02h		Impossible	
	1	1	00000001h to 7FFFFFFFh (2147483647)	rev	Possible	PT72/PT73
	2					PT74/PT75

Set a synchronous encoder electronic gear for converting a synchronous encoder command into a command unit. A value written to this object is not immediately applied to the synchronous encoder electronic gear. To apply the value of this object to the synchronous encoder electronic gear, turn on Analysis command (C_CEG).

(12) External encoder acceleration (2DF1h)

Ins ID	Attr ID	Access	Name	Data Type
2DF1h	0	Get/Set	External encoder acceleration	UDINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2DF1h	0	0	00000000h to 00004E20h (20000)	ms	Impossible	

Set a time for the servo motor to reach the rated speed for a synchronous encoder command when Synchronous control command (C_STS) is turned on. A setting value when Synchronous control command (C_STS) is turned on will be applied.

(13) External encoder deceleration (2DF2h)

Ins ID	Attr ID	Access	Name	Data Type
2DF2h	0	Get/Set	External encoder deceleration	UDINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
2DF2h	0	0	00000000h to 00004E20h (20000)	ms	Impossible	

Set a time for the servo motor to stop from the rated speed for a synchronous encoder command when Synchronous control command (C_STS) is turned off. A setting value when Synchronous control command (C_STS) is turned on will be applied.

7.3.13 Homing Mode Objects (Class ID: 64h)

The instances described in this section support the following service.

・When "Get" is in the "Access" field

Service Code	Name	Description
0Eh	Get_Attribute_Single	Reads the value of the specified attribute.

・When "Set" is in the "Access" field

Service Code	Name	Description
10h	Set_Attribute_Single	Writes a value to the specified attribute.

・When "Get/Set" is in the "Access" field

Service Code	Name	Description
0Eh	Get_Attribute_Single	Reads the value of the specified attribute.
10h	Set_Attribute_Single	Writes a value to the specified attribute.

(1) Home offset (607Ch)

Ins ID	Attr ID	Access	Name	Data Type
607Ch	0	Get/Set	Home offset	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
607Ch	0	0	80000000h to 7FFFFFFFh	pos units	Possible	

The home position is returned. Only reading the value is available. Do not perform writing because doing so causes an error.

(2) Homing method (6098h)

Ins ID	Attr ID	Access	Name	Data Type
6098h	0	Get/Set	Homing method	SINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
6098h	0	37	D5h (-43) to 25h (37)		Possible	PT45

Set a home position return type. Refer to section 5.4.6 (4) for the settable values.

(3) Homing speeds (6099h)

Ins ID	Attr ID	Access	Name	Data Type
6099h	0	Get	Homing speeds	USINT
	1	Get/Set	Speed during search for switch	UDINT
	2		Speed during search for zero	

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
6099h	0	2	02h to 02h		Impossible	
	1	10000	0 to permissible instantaneous speed	vel units	Possible	PT05
	2	1000				PT06

Set the servo motor speed at home position return.

Set the servo motor speed at home position return for Speed during search for switch (Class ID: 64h, Ins ID: 6099h, Attr ID: 1).
Unit: [0.01 r/min] ([0.01 mm/s] when a linear servo motor is used)

Set the creep speed after proximity dog at home position return for Speed during search for zero (Class ID: 64h, Ins ID: 6099h, Attr ID: 2).
Unit: [0.01 r/min] ([0.01 mm/s] when a linear servo motor is used)

(4) Homing acceleration (609Ah)

Ins ID	Attr ID	Access	Name	Data Type
609Ah	0	Get/Set	Homing acceleration	UDINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
609Ah	0	0	00000000h to 00004E20h (20000)	ms	Possible	PT56

Set the acceleration/deceleration time constants at home position return. Set a time for the servo motor to reach the rated speed.

(5) Supported homing method (60E3h)

Ins ID	Attr ID	Access	Name	Data Type
60E3h	0	Get	Supported homing method	USINT
	1		1st supported homing method	SINT
	2		2nd supported homing method	
	3		3rd supported homing method	
	4		4th supported homing method	
	5		5th supported homing method	
	6		6th supported homing method	
	7		7th supported homing method	
	8		8th supported homing method	
	9		9th supported homing method	
	10		10th supported homing method	
	11		11th supported homing method	
	12		12th supported homing method	
	13		13th supported homing method	
	14		14th supported homing method	
	15		15th supported homing method	
	16		16th supported homing method	
	17		17th supported homing method	
	18		18th supported homing method	
	19		19th supported homing method	
	20		20th supported homing method	
	21		21st supported homing method	
	22		22nd supported homing method	
	23		23rd supported homing method	
	24		24th supported homing method	
	25		25th supported homing method	
	26		26th supported homing method	
	27		27th supported homing method	
	28		28th supported homing method	
	29		29th supported homing method	
	30		30th supported homing method	
	31		31st supported homing method	
	32		32nd supported homing method	
	33		33rd supported homing method	
	34		34th supported homing method	
	35		35th supported homing method	
	36		36th supported homing method	
	37		37th supported homing method	
	38		38th supported homing method	
	39		39th supported homing method	

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
60E3h	0	39	27h (39)		Impossible	
	1	37	25h (37)			
	2	35	23h (35)			
	3	34	22h (34)			
	4	33	21h (33)			
	5	28	1Ch (28)			
	6	27	1Bh (27)			
	7	24	18h (24)			
	8	23	17h (23)			
	9	22	16h (22)			
	10	21	15h (21)			
	11	20	14h (20)			
	12	19	13h (19)			
	13	12	0Ch (12)			
	14	11	0Bh (11)			
	15	8	08h (8)			
	16	7	07h (7)			
	17	6	06h (6)			
	18	5	05h (5)			
	19	4	04h (4)			
	20	3	03h (3)			
	21	-1	FFh (-1)			
	22	-2	FEh (-2)			
	23	-3	FDh (-3)			
	24	-4	FCh (-4)			
	25	-6	FAh (-6)			
	26	-7	F9h (-7)			
	27	-8	F8h (-8)			
	28	-9	F7h (-9)			
	29	-10	F6h (-10)			
	30	-11	F5h (-11)			
	31	-33	DFh (-33)			
	32	-34	DEh (-34)			
	33	-36	DCh (-36)			
	34	-38	DAh (-38)			
	35	-39	D9h (-39)			
	36	-40	D8h (-40)			
	37	-41	D7h (-41)			
	38	-42	D6h (-42)			
	39	-43	D5h (-43)			

The supported home position return type is returned.

7.3.14 Factor Group Objects

The instances described in this section support the following service.

・When "Get" is in the "Access" field

Service Code	Name	Description
0Eh	Get_Attribute_Single	Reads the value of the specified attribute.

・When "Get/Set" is in the "Access" field

Service Code	Name	Description
0Eh	Get_Attribute_Single	Reads the value of the specified attribute.
10h	Set_Attribute_Single	Writes a value to the specified attribute.

(1) Polarity (607Eh)

Ins ID	Attr ID	Access	Name	Data Type
607Eh	0	Get/Set	Polarity	USINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
607Eh	0	00h	Refer to the text.		Possible	PA14 PC29

The rotation direction selection can be set.

Bit	Description
0	reserved
1	reserved
2	reserved
3	reserved
4	reserved
5	0: Servo motor CCW rotation at positive torque 1: Servo motor CW rotation at positive torque
6	0: Servo motor CCW rotation at positive speed 1: Servo motor CW rotation at positive speed
7	0: Servo motor CCW rotation in positioning address increasing direction 1: Servo motor CW rotation in positioning address increasing direction

Only "00h", "C0h", and "E0h" can be set. Values other than 00h, C0h, and E0h cannot be set.

(2) Position encoder resolution (608Fh)

Ins ID	Attr ID	Access	Name	Data Type
608Fh	0	Get	Position encoder resolution	USINT
	1	Get/Set	Encoder increments	UDINT
	2		Motor revolutions	

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
608Fh	0	2	02h to 02h	inc / rev	Impossible	
	1		00000000h to FFFFFFFFh	inc		
	2	1	00000001h to 00000001h	rev		

Encoder resolution is returned with Encoder increments (Class ID: 64h, Ins ID: 608Fh, Attr ID: 1). When a linear servo motor is connected, the virtual resolution per revolution is returned. When a fully closed loop system is used, the number of load-side pulses per servo motor-side revolution is returned.

(3) Gear ratio (6091h)

Ins ID	Attr ID	Access	Name	Data Type
6091h	0	Get	Gear ratio	USINT
	1	Get/Set	Motor revolutions	UDINT
	2		Shaft revolutions	

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
6091h	0	2	02h to 02h		Impossible	
	1	1	00000001h to 00FFFFFFh (16777215)	rev	Possible	PA06
	2					PA07

Set the electronic gear. Refer to [Pr. PA06] for the settable values.

(4) Feed constant (6092h)

Ins ID	Attr ID	Access	Name	Data Type
6092h	0	Get	Feed constant	USINT
	1	Get/Set	Feed	UDINT
	2		Shaft revolutions	

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
6092h	0	2	02h to 02h		Impossible	
	1		Refer to the text.	pos units		
	2	1	00000001h to 00000001h	rev		

No value can be written to Feed (Class ID: 64h, Ins ID: 6092h, Attr ID: 1) because it is set automatically according to the [Pr. PT01] setting. Writing a value sets a general-purpose code 09h Invalid attribute value.

[Pr. PT01] setting	Range
_ 2 _ _ (degree)	360000
_ 3 _ _ (pulse)	Encoder resolution of the servo motor

Position actual value (Class ID: 64h, Ins ID: 6064h, Attr ID: 0) is calculated from Gear ratio (Class ID: 64h, Ins ID: 6091h) and Feed constant (Class ID: 64h, Ins ID: 6092h), as follows.

Position actual value (64h, 6064h, 0)

$$= \frac{\text{Position actual internal value (64h, 6063h, 0)} \times \text{Feed constant (64h, 6092h)}}{\text{Position encoder resolution (64h, 608Fh)} \times \text{Gear ratio (64h, 6091h)}}$$

Each value in ( ) of the formula indicates Class ID, Ins ID, and Attr ID from the left.
When the unit is degree, the operation result will be limited within 0 to 359999.

(5) SI unit position (60A8h)

Ins ID	Attr ID	Access	Name	Data Type
60A8h	0	Get/Set	SI unit position	UDINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
60A8h	0	0	Refer to the text.	pos units	Impossible	

SI unit position (Class ID: 64h, Ins ID: 60A8h, Attr ID: 0) is set automatically according to the [Pr. PT01] setting.

[Pr. PT01] setting	Range
_ 2 _ _ (degree)	FD410000h (0.001 degree)
_ 3 _ _ (pulse)	00000000h (1 pulse)

(6) SI unit velocity (60A9h)

Ins ID	Attr ID	Access	Name	Data Type
60A9h	0	Get/Set	SI unit velocity	UDINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
60A9h	0	0	FB010300h (0.01 mm/s) FEB44700h (0.01 r/min)	vel units	Impossible	

The SI unit velocity is returned.

7.3.15 Touch Probe Function Objects (Class ID: 64h)

The instances described in this section support the following service.

・When "Get" is in the "Access" field

Service Code	Name	Description
0Eh	Get_Attribute_Single	Reads the value of the specified attribute.

・When "Set" is in the "Access" field

Service Code	Name	Description
10h	Set_Attribute_Single	Writes a value to the specified attribute.

・When "Get/Set" is in the "Access" field

Service Code	Name	Description
0Eh	Get_Attribute_Single	Reads the value of the specified attribute.
10h	Set_Attribute_Single	Writes a value to the specified attribute.

(1) Touch probe function (60B8h)

Ins ID	Attr ID	Access	Name	Data Type
60B8h	0	Get/Set	Touch probe function	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
60B8h	0	0	0000h to FFFFh		Impossible	

Set the command for the touch probe function. Refer to section 5.5 (1) (a) for details.

(2) Touch probe status (60B9h)

Ins ID	Attr ID	Access	Name	Data Type
60B9h	0	Get	Touch probe status	UINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
60B9h	0		0000h to FFFFh		Impossible	

The status of the touch probe function is returned. Refer to section 5.5 (1) (b) for details.

(3) Touch probe pos1 pos value (60BAh)

Ins ID	Attr ID	Access	Name	Data Type
60BAh	0	Get	Touch probe pos1 pos value	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
60BAh	0	0	80000000h to 7FFFFFFFh	pos units	Impossible	

The position latched at the rising edge of touch probe 1 is returned.

(4) Touch probe pos1 neg value (60BBh)

Ins ID	Attr ID	Access	Name	Data Type
60BBh	0	Get	Touch probe pos1 neg value	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
60BBh	0	0	80000000h to 7FFFFFFFh	pos units	Impossible	

The position latched at the falling edge of touch probe 1 is returned.

(5) Touch probe pos2 pos value (60BCh)

Ins ID	Attr ID	Access	Name	Data Type
60BCh	0	Get	Touch probe pos2 pos value	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
60BCh	0	0	80000000h to 7FFFFFFFh	pos units	Impossible	

The position latched at the rising edge of touch probe 2 is returned.

(6) Touch probe pos2 neg value (60BDh)

Ins ID	Attr ID	Access	Name	Data Type
60BDh	0	Get	Touch probe pos2 neg value	DINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
60BDh	0	0	80000000h to 7FFFFFFFh	pos units	Impossible	

The position latched at the falling edge of touch probe 2 is returned.

7.3.16 Optional application FE Objects (Class ID: 64h)

The instances described in this section support the following service.

Service Code	Name	Description
0Eh	Get_Attribute_Single	Reads the value of the specified attribute.

(1) Digital inputs (60FDh)

Ins ID	Attr ID	Access	Name	Data Type
60FDh	0	Get	Digital inputs	UDINT

Ins ID	Attr ID	Default	Range	Units	EEP-ROM	Parameter
60FDh	0		00000000h to 03300007h		Impossible	

The on/off states of the input device connected to the servo amplifier are returned.

Bit	Description
0	Negative limit switch 0: LSN (reverse rotation stroke end) off 1: LSN (reverse rotation stroke end) on
1	Positive limit switch 0: LSP (forward rotation stroke end) off 1: LSP (forward rotation stroke end) on
2	home switch 0: DOG (proximity dog) off 1: DOG (proximity dog) on
3 to 19	(reserved) The value at reading is undefined.
20	DI4 The input device differs depending on the [Pr. PD38] setting, as follows. 0 ([Pr. PD38] = _ _ 2 C): TPR1 (touch probe 1) off 0 ([Pr. PD38] = _ _ 2 E): ST (operation start-up) off 1 ([Pr. PD38] = _ _ 2 C): TPR1 (touch probe 1) on 1 ([Pr. PD38] = _ _ 2 E): ST (operation start-up) on
21	DI5 0: TPR2 (touch probe 2) off 1: TPR2 (touch probe 2) on
22 to 23	(reserved) The value at reading is undefined.
24	Safe torque off 1 0: STO1 off 1: STO1 on
25	Safe torque off 2 0: STO2 off 1: STO2 on
26 to 31	(reserved) The value at reading is undefined.

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Sweden	Mitsubishi Electric Europe B.V. (Scandinavia) Fjelievagen 8, SE-22736 Lund, Sweden	Tel : +46-8-625-10-00 Fax : +46-46-39-70-18
Turkey	Mitsubishi Electric Turkey A.S. Umraniye Branch Serifali Mahallesi Nutuk Sokak No:5, TR-34775 Umraniye / Istanbul, Turkey	Tel : +90-216-526-3990 Fax : +90-216-526-3995
UAE	Mitsubishi Electric Europe B.V. Dubai Branch Dubai Silicon Oasis, P.O.BOX 341241, Dubai, U.A.E.	Tel : +971-4-3724716 Fax : +971-4-3724721
South Africa	Adroit Technologies 20 Waterford Office Park, 189 Witkoppen Road, Fourways, South Africa	Tel : +27-11-658-8100 Fax : +27-11-658-8101
China	Mitsubishi Electric Automation (China) Ltd. Mitsubishi Electric Automation Center, No.1386 Hongqiao Road, Shanghai, China	Tel : +86-21-2322-3030 Fax : +86-21-2322-3000
Taiwan	SETSUYO ENTERPRISE CO., LTD. 6F, No.105, Wugong 3rd Road, Wugu District, New Taipei City 24889, Taiwan	Tel : +886-2-2299-2499 Fax : +886-2-2299-2509
Korea	Mitsubishi Electric Automation Korea Co., Ltd. 7F-9F, Gangseo Hangang Xi-tower A, 401, Yangcheon-ro, Gangseo-Gu, Seoul 07528, Korea	Tel : +82-2-3660-9510 Fax : +82-2-3664-8372/8335
Singapore	Mitsubishi Electric Asia Pte. Ltd. 307 Alexandra Road, Mitsubishi Electric Building, Singapore 159943	Tel : +65-6473-2308 Fax : +65-6476-7439
Thailand	Mitsubishi Electric Factory Automation (Thailand) Co., Ltd. 12th Floor, SV.City Building, Office Tower 1, No. 896/19 and 20 Rama 3 Road, Kwaeng Bangpongpang, Khet Yannawa, Bangkok 10120, Thailand	Tel : +66-2682-6522 to 6531 Fax : +66-2682-6020
Indonesia	PT. Mitsubishi Electric Indonesia Gedung Jaya 11th Floor, JL. MH. Thamrin No.12, Jakarta Pusat 10340, Indonesia	Tel : +62-21-3192-6461 Fax : +62-21-3192-3942
Vietnam	Mitsubishi Electric Vietnam Company Limited Unit 01-04, 10th Floor, Vincom Center, 72 Le Thanh Ton Street, District 1, Ho Chi Minh City, Vietnam	Tel : +84-8-3910-5945 Fax : +84-8-3910-5947
India	Mitsubishi Electric India Pvt. Ltd. Pune Branch Emerald House, EL-3, J Block, M.I.D.C., Bhosari, Pune - 411026, Maharashtra, India	Tel : +91-20-2710-2000 Fax : +91-20-2710-2100
Australia	Mitsubishi Electric Australia Pty. Ltd. 348 Victoria Road, P.O. Box 11, Rydalmere, N.S.W 2116, Australia	Tel : +61-2-9684-7777 Fax : +61-2-9684-7245

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.

MODEL	
MODEL CODE	

MITSUBISHI ELECTRIC CORPORATION

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