MITSUBISHI ELECTRIC

General-Purpose AC Servo

MITSUBISHI SERVO AMPLIFIERS & MOTORS

MELSERVO-JE

Ethernet Interface
MODEL

MR-JE-_C
SERVO AMPLIFIER
INSTRUCTION MANUAL
(Modbus/TCP)

● 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. 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.
● 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 power supply (L1/L2/L3) of the servo amplifier, in order to configure a circuit that shuts down the power supply on the side of the servo amplifier's power supply. If a magnetic contactor is not connected, continuous flow of a large current may cause smoke or a fire when the servo amplifier malfunctions.
● Always connect a molded-case circuit breaker, or a fuse to each servo amplifier between the power supply and the power supply (L1/L2/L3) of the servo amplifier, in order to configure a circuit that shuts down the power supply on the side of the servo amplifier's power supply. If a molded-case circuit breaker or fuse is not connected, continuous flow of a large current may cause smoke or a fire when the servo amplifier malfunctions.
● When using the regenerative resistor, switch power off with the alarm signal. Otherwise, a regenerative transistor malfunction or the like may overheat the regenerative resistor, causing smoke or a fire.
● When you use a regenerative option with an MR-JE-40C to MR-JE-100C, remove the built-in regenerative resistor and wiring from the servo amplifier.
● Provide adequate protection to prevent screws and other conductive matter, oil and other combustible matter from entering the servo amplifier and servo motor.

3. To prevent injury, note the following

⚠ CAUTION

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

4. Additional instructions

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

(1) Transportation and installation

| ⚠ CAUTION |
|---|
| ●Transport the products correctly according to their mass.
●Stacking in excess of the specified number of product packages is not allowed.
●Do not hold the lead of the built-in regenerative resistor, cables, or connectors when carrying the servo amplifier. Otherwise, it may drop.
●Install the servo amplifier and the servo motor in a load-bearing place in accordance with the Instruction Manual.
●Do not get on or put heavy load on the equipment. Otherwise, it may cause injury.
●The equipment must be installed in the specified direction.
●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 apply heavy impact on the servo amplifiers and the servo motors. Otherwise, injury, malfunction, etc. may occur.
●Do not strike the connector. Otherwise, a connection failure, malfunction, etc. may occur.
●When you keep or use the equipment, please fulfill the following environment. |

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

●When the product 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 a 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.
●To prevent a fire or injury from occurring in case of an earthquake or other natural disasters, securely install, mount, and wire the servo motor in accordance with the Instruction Manual.

(2) Wiring

⚠ CAUTION

● Before removing the CNP1 connector of MR-JE-40C to MR-JE-100C, disconnect the lead wires of the regenerative resistor from the CNP1 connector.
● Wire the equipment correctly and securely. Otherwise, the servo motor may operate unexpectedly.
● Make sure to connect the cables and connectors by using the fixing screws and the locking mechanism. Otherwise, the cables and connectors may be disconnected during operation.
● Do not install a power capacitor, surge killer, or radio noise filter (optional FR-BIF) on the servo amplifier output side.
● To avoid a malfunction, connect the wires to the correct phase terminals (U/V/W) of the servo amplifier and servo motor.
● Connect the servo amplifier power output (U/V/W) to the servo motor power input (U/V/W) directly. Do not let a magnetic contactor, etc. intervene. Otherwise, it may cause a malfunction.
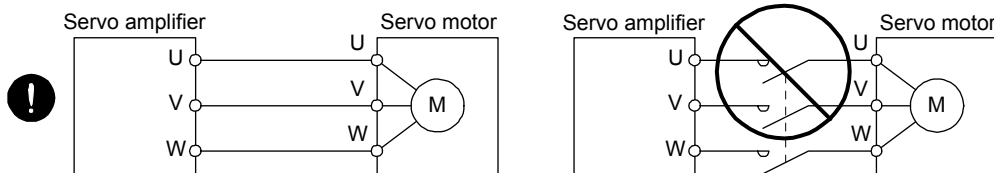
● The connection diagrams in this instruction manual are shown for sink interfaces, unless stated otherwise.
● The surge absorbing diode installed to the DC relay for control output should be fitted in the specified direction. Otherwise, the emergency stop and other protective circuits may not operate.
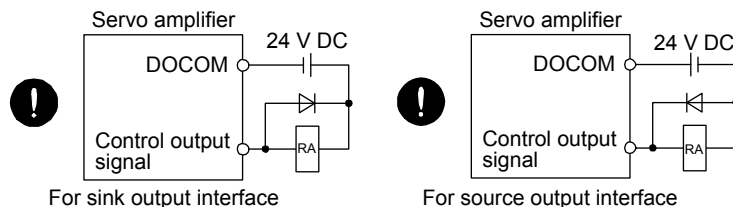
● When the cable is not tightened enough to the terminal block, the cable or terminal block may generate heat because of the poor contact. Be sure to tighten the cable with specified torque.
● Connecting a servo motor of the wrong axis to U, V, W, or CN2 of the servo amplifier may cause a malfunction.
● Configure a circuit to turn off EM2 or EM1 when the power supply is turned off to prevent an unexpected restart of the servo amplifier.
● To prevent malfunction, avoid bundling power lines (input/output) and signal cables together or running them in parallel to each other. Separate the power lines from the signal cables.

(3) Test run and adjustment

⚠ CAUTION

● When executing a test run, follow the notice and procedures in this instruction manual. Otherwise, it may cause a malfunction, damage to the machine, or injury.
● Before operation, check the parameter settings. Improper settings may cause some machines to operate unexpectedly.

⚠ CAUTION

● Never adjust or change the parameter values extremely as it will make operation unstable.
● Do not get close to moving parts during the servo-on status.

(4) Usage

⚠ CAUTION

● When it is assumed that a hazardous condition may occur due to a power failure or product malfunction, use a servo motor with an external brake to prevent the condition.
● For equipment in which the moving part of the machine may collide against the load side, install a limit switch or stopper to the end of the moving part. The machine may be damaged due to a collision.
● Do not disassemble, repair, or modify the product. Otherwise, an electric shock, fire, injury, etc. may occur. Disassembled, repaired, and/or modified products are not covered under warranty.
● Before resetting an alarm, make sure that the run signal of the servo amplifier is off in order to prevent a sudden restart. Otherwise, it may cause an accident.
● Use a noise filter, etc. to minimize the influence of electromagnetic interference. Electromagnetic interference may 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.
● Correctly wire options and peripheral equipment, etc. in the correct combination. Otherwise, an electric shock, fire, injury, etc. may occur.
● The electromagnetic brake on the servo motor is designed to hold the motor shaft and should not be used for ordinary braking.
● For such reasons as incorrect wiring, service life, and mechanical structure (e.g. where a ball screw and the servo motor are coupled via a timing belt), the electromagnetic brake may not hold the motor shaft. To ensure safety, install a stopper on the machine side.
● If the dynamic brake is activated at power-off, alarm occurrence, etc., do not rotate the servo motor by an external force. Otherwise, it may cause a fire.

(5) Corrective actions

⚠ CAUTION

● Ensure safety by confirming the power off, etc. before performing corrective actions. Otherwise, it may cause an accident.
● If it is assumed that a power failure, machine stoppage, or product malfunction may result in a hazardous situation, use a servo motor with an electromagnetic brake or provide an external brake system for holding purpose to prevent such hazard.
● When any alarm has occurred, eliminate its cause, ensure safety, and deactivate the alarm before restarting operation.
● If the molded-case circuit breaker or fuse is activated, be sure to remove the cause and secure safety before switching the power on. If necessary, replace the servo amplifier and recheck the wiring. Otherwise, it may cause smoke, fire, or an electric shock.
● Provide an adequate protection to prevent unexpected restart after an instantaneous power failure.

⚠ CAUTION

● Configure an electromagnetic brake circuit which is interlocked with an external emergency stop switch.

Contacts must be opened when ALM (Malfunction) or MBR (Electromagnetic brake interlock) turns off.

Contacts must be opened with the emergency stop switch.

Servo motor

RA

24 V DC

Electromagnetic brake
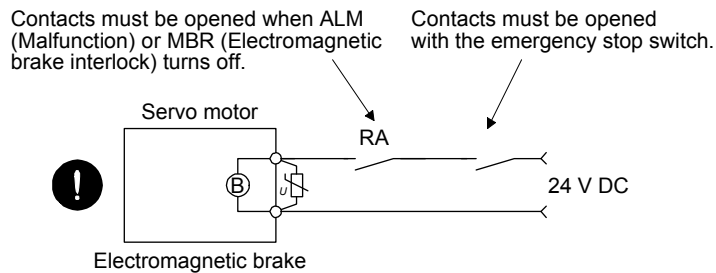
● To prevent an electric shock, injury, or fire from occurring after an earthquake or other natural disasters, ensure safety by checking conditions, such as the installation, mounting, wiring, and equipment before switching the power on.

(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 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

Compliance with global standards

For the compliance with global standards, refer to app. 3 of "MR-JE-_C Servo Amplifier Instruction Manual".

«About the manual»

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

Relevant manuals

Manual name	Manual No.
MELSERVO MR-JE-_C Servo Amplifier Instruction Manual	SH(NA)030257ENG
MELSERVO-JE Servo Amplifier Instruction Manual (Troubleshooting)	SH(NA)030166ENG
MELSERVO MR-JE-_C Servo Amplifier Instruction Manual (Profile Mode)	SH(NA)030254ENG
MELSERVO HG-KN/HG-SN Servo Motor Instruction Manual	SH(NA)030135ENG
MELSERVO EMC Installation Guidelines	IB(NA)67310ENG

«Cables used for 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

1. FUNCTIONS AND CONFIGURATION

1.1 Summary of Modbus-TCP

The Modbus protocol, developed for programmable controllers by Modicon Inc., has evolved into the Modbus/TCP protocol for use over TCP/IP.

The Modbus master acts as a TCP client, and the Modbus slave acts as a TCP server for client-server communication. Using the functions in the message frames enables to read or write data from/to parameters, write input commands, and check operation status of servo amplifiers.

For MR-JE-_C servo amplifier, Modbus registers are assigned like the address assignment of CiA 402 drive profile.

A Modbus-compatible controller, the client, can communicate with the MR-JE-_C servo amplifiers that are servers by accessing assigned holding registers.

1.2 Function List

The following table lists the functions of this servo. For details of the functions, refer to each section indicated in the detailed explanation field.

Function	Description	Detailed explanation
Position control mode (P) (pulse train input)	This servo amplifier is used as a position control servo.	"MR-JE-_C Servo Amplifier Instruction Manual"
Speed control mode (S) (Analog input/DI input)	This servo amplifier is used as a speed control servo.	
Torque control mode (T) (Analog input)	This servo amplifier is used as a torque control servo.	
Position/speed control switching mode (P/S)	Using an input device, control can be switched between position control and speed control.	
Speed/torque control switch mode (S/T)	Using an input device, control can be switched between speed control and torque control.	
Torque/position control switch mode (T/P)	Using an input device, control can be switched between torque control and position control.	
Profile position mode (pp)	The servo amplifier operates in the profile position mode.	"MR-JE-_C Servo Amplifier Instruction Manual (Profile Mode)"
Profile velocity mode (pv)	The servo amplifier operates in the profile velocity mode.	
Profile torque mode (tq)	The servo amplifier operates in the profile torque mode.	
Homing mode (hm)	The servo amplifier operates in the home position return mode.	
Absolute position detection system	Setting a home position once makes home position return unnecessary at every power-on.	"MR-JE-_C Servo Amplifier Instruction Manual" / "MR-JE-_C Servo Amplifier Instruction Manual (Profile Mode)"
Model adaptive control	This function achieves a high response and stable control following the ideal model. The two-degrees-of-freedom model adaptive control enables you to set a response to the command and a response to the disturbance separately. Additionally, this function can be disabled. To disable this function, refer to section 7.4 of "MR-JE-C_ Servo Amplifier Instruction Manual".	
Touch probe function	The touch probe function is available only in the profile mode. When the touch probe 1 signal turns on, the current position latch function will latch the current position. The latched data can be read with communication commands.	Section 6.4.8
Command pulse selection	Command pulse train form can be selected from among three different types.	"MR-JE-_C Servo Amplifier Instruction Manual"
High-resolution encoder	High-resolution encoder of 131072 pulses/rev is used for the encoder of the servo motor compatible with the MELSERVO-JE series.	

Function	Description	Detailed explanation
Gain switching function	You can switch gains during rotation and during stop, and can use an input device to switch gains during operation.	"MR-JE-_C Servo Amplifier Instruction Manual"
Advanced vibration suppression control II	This function suppresses vibration or residual vibration at an arm end.	
Machine resonance suppression filter	This filter function (notch filter) decreases the gain of the specific frequency to suppress the resonance of the mechanical system.	
Shaft resonance suppression filter	When a load is mounted to the servo motor shaft, resonance by shaft torsion during driving may generate a mechanical vibration of high frequency. The shaft resonance suppression filter suppresses the vibration.	
Adaptive filter II	The servo amplifier detects mechanical resonance and sets filter characteristics automatically to suppress mechanical vibration.	
Low-pass filter	Suppresses high-frequency resonance which occurs as the servo system response is increased.	
Machine analyzer function	Analyzes the frequency characteristic of the mechanical system by simply connecting an MR Configurator2 installed personal computer and the servo amplifier. MR Configurator2 is necessary for this function.	
Robust filter	Improves a disturbance response when a response performance cannot be increased because of a large load to motor inertia ratio, such as a roll feed axis.	"MR-JE-_C Servo Amplifier Instruction Manual"
Slight vibration suppression control	Suppresses vibration of ±1 pulse generated at a servo motor stop.	
Electronic gear	The position control is performed based on a value obtained by multiplying the position command from the controller by the set electronic gear ratio. When the position control mode is used, the input pulses can be multiplied by 1/10 to 4000. When the profile position mode is used, the position commands can be multiplied by 1/27649 to 8484.	
S-pattern acceleration/deceleration time constant	Enables smooth acceleration and deceleration. Set S-pattern acceleration/deceleration time constants with [Pr. PC03]. As compared with linear acceleration/deceleration, the acceleration/deceleration time will be longer for the S-pattern acceleration/deceleration time constants regardless of command speed.	
Auto tuning	Automatically adjusts the gain to optimum value if load applied to the servo motor shaft varies.	
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.	
Alarm history clear	Clears alarm histories.	
Input signal selection (device settings)	ST1 (Forward rotation start), ST2 (Reverse rotation start), and SON (Servo-on) and other input device can be assigned to certain pins of the CN3 connector.	
Output signal selection (device settings)	The output devices including MBR (Electromagnetic brake interlock) can be assigned to certain pins of the CN3 connector.	
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.	
Torque limit	Limits the servo motor torque.	
Speed limit	Servo motor speed can be limited to any value.	
Automatic VC offset	Voltage is automatically offset to stop the servo motor if it does not come to a stop when VC (Analog speed command) is 0 V. MR Configurator2 is necessary for this function.	
Alarm code output	If an alarm has occurred, the corresponding alarm number is outputted in 3-bit code.	
Test operation mode	Jog operation, positioning operation, motor-less operation, DO forced output, and program operation MR Configurator2 is necessary for this function.	"MR-JE-_C Servo Amplifier Instruction Manual"
MR Configurator2	Using a personal computer, you can perform the parameter setting, test operation, monitoring, and others.	
One-touch tuning	Gain adjustment is performed just by one click on MR Configurator2. This function is available with MR Configurator2 or via a network.	Section 5.2 "MR-JE-_C Servo Amplifier Instruction Manual"

1. FUNCTIONS AND CONFIGURATION

Function	Description	Detailed explanation
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-JE-_C Servo Amplifier Instruction Manual"
Drive recorder function	This function continuously monitors the servo status and records the status transition before and after an alarm for a fixed period of time. You can check the recorded data by clicking the Waveform-Display button in the drive recorder window of MR Configurator2. However, the drive recorder is not available when: 1. You are using the graph function of MR Configurator2. 2. You are using the machine analyzer function. 3. [Pr. PF21] is set to "-1".	
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. (Refer to section 6.4.)	
Power monitoring function	This function calculates the power running energy and the regenerative power from the data in the servo amplifier such as speed and current. Power consumption and others are displayed on MR Configurator2.	
Machine diagnosis function	From the data in the servo amplifier, this function estimates the friction and vibrational component of the drive system in the equipment and recognizes an error in the machine parts, including a ball screw and bearing. This function is available with MR Configurator2 or via a network. (Refer to section 6.3.)	
Modbus/TCP	The Modbus/TCP uses dedicated message frames for the Ethernet communication between a client (master) and servers (slaves). The dedicated message frames have functions for reading and writing data, you can set the parameters of servo amplifiers and monitor it by using this function. In the profile mode, driving the servo motor is also possible.	Chapter 2
CC-Link IE Field Network Basic	CC-Link IE Field Network Basic enables fixed cycle communication between the master and slave stations using a general-purpose Ethernet connector. The parameters of servo amplifiers can be set (read/written) and monitored. In the profile mode, driving the servo motor is also possible.	"MR-JE-_C Servo Amplifier Instruction Manual (CC-Link IE Field Network Basic)"
SLMP	SLMP (SeamLess Message Protocol) is a protocol to access SLMP-compatible devices from external devices (such as a personal computer and an HMI) or programmable controller CPU via Ethernet. The parameters of servo amplifiers can be set (read/written) and monitored. In the profile mode, driving the servo motor is also possible.	
IP address filtering function	Register the range of IP addresses in advance to limit the network devices allowed to be connected to the servo amplifier.	Chapter 4 "MR-JE-_C Servo Amplifier Instruction Manual (CC-Link IE Field Network Basic)"
Operation specification IP address function	In Ethernet communication (CC-Link IE Field Network Basic, SLMP, or Modbus/TCP), to limit the network devices to which the operation right is given, set the range of the device IP addresses. Monitoring/parameter reading can be performed with the network devices having no operation right.	
Lost motion compensation function	This function improves the response delay generated when the machine moving direction is reversed.	"MR-JE-_C Servo Amplifier Instruction Manual"
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. Enables the same function with the limit switch by setting parameters.	Section 6.4.5

1. FUNCTIONS AND CONFIGURATION

1.3 Communication specifications

The following table lists the Modbus/TCP communication specifications.

Function		Description
Communication protocol		Modbus/TCP protocol
Conformed standard		OPEN Modbus/TCP SPECIFICATION
Port No.		No. 502
IP address		IPv4 range: 0.0.0.0 to 255.255.255.255 Use the same network address for both a client and servers. Default value: 192.168.3.0
Subnet mask		Default value (recommended): 255.255.255.0
Message format		Refer to section 2.
Physical layer		1000BASE-T
Communication connector		RJ45, 1 port (CN1)
Communication cable		CAT5e, shielded twisted pair (4 pair) straight cable
Network topology		Star
Variable communication speed		100 Mbps
Transmission speed between stations		Max. 100 m
Waiting time setting		None
Maximum number of connections		3
Server function	Number of request messages that are receivable simultaneously	1

2. MODBUS/TCP PROTOCOL

```
┌─────────────────────────────────────────────────────────────────────┐
│  ┌──────────────┐                                                     │
│  │   POINT      │                                                     │
│  └──────────────┘                                                     │
│ ●If connection with a client disconnects during establishment, the    │
│   connection may not close and this may cause reconnection failure.    │
│   In case you cannot reconnect, cycle the power of the servo amplifier.│
└─────────────────────────────────────────────────────────────────────┘
```

2.1 Summary

In Modbus/TCP communication, a command that a client (controller) sends to servers (servo amplifiers) is called "Query Message", and a command that the servers return to the client is called "Response Message". When a servo amplifier receives a Query Message, it returns a Response Message to the client after the servo amplifier response time.
In Modbus/TCP communication, as in the case of TCP/IP, make sure to establish the connection before sending and receiving commands. Check that the connection has been established, and then send a Query Message.

| Client (controller) | Query Message | | Query Message | |
| Server (servo amplifier) | Response Message | | Response Message |

Servo amplifier response time (Note)
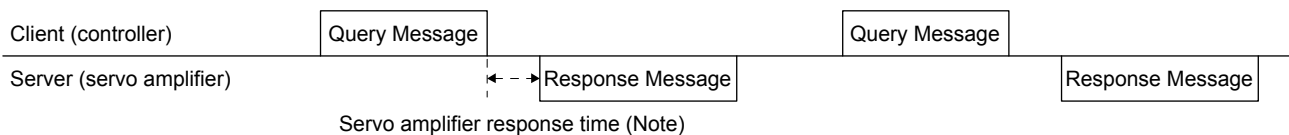
Note. The servo amplifier response time differs depending on the command to send.

2.2 Modbus/TCP Communication Message Frame

Query Messages sent from the client (controller) and Response Messages sent from the servers (servo amplifiers) are both sent in the following message frame format. Messages are sent by using TCP/IP.

```
                          ┌────────────────┐
                          │ Unit Identifier│
                          ├────────────────┤
                          │   Function     │
                          ├────────────────┤
                          │     Data       │
 ┌──────────┐             └────────────────┘             ┌──────────────┐
 │          │═══════════════ Query Message ═══════════════▶│              │
 │  Client  │                                             │   Server     │
 │(controller)│◀═══════════ Response Message ════════════│(servo amplifier)│
 │          │             ┌────────────────┐             │              │
 └──────────┘             │ Unit Identifier│             └──────────────┘
                          ├────────────────┤
                          │   Function     │
                          ├────────────────┤
                          │     Data       │
                          └────────────────┘
```
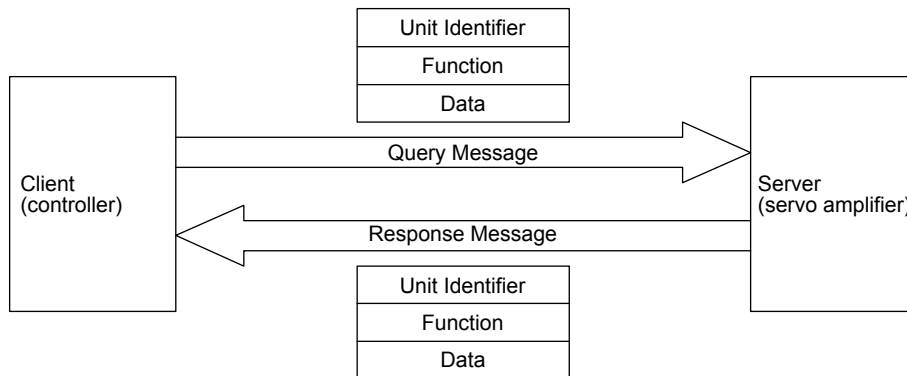
A message frame is composed of six message fields.
When a server (servo amplifier) received a Query Message sent from the client (controller) without errors, the function code in the Query Message is copied into the Function in a Response Message. When a server (servo amplifier) received a Query Message with an error, the server returns a value obtained by adding "80h" to the function code value in the Query Message to the client. Judge the occurrence of an error by checking the function code in the Response Message on the controller side.

2. MODBUS/TCP PROTOCOL

Message frame

Transaction Identifier	Protocol Identifier	Length Field	Unit Identifier	Function	Data
2 × 8 bits	2 × 8 bits	2 × 8 bits	8 bits	8 bits	n × 8 bits

Message field	Size	Communication path	Description
Transaction Identifier (Transaction identifier)	2 × 8 bits	Client → Server	This is the data to be added by the client for transaction management. Set a value available for transaction management.
		Server → Client	Transaction Identifier received from the client (controller) is copied and returned.
Protocol Identifier (Protocol identifier)	2 × 8 bits	Client → Server	The value is fixed to "0". If the server receives a value other than "0", the received value is discarded and no value is returned.
		Server → Client	The value "0" is returned.
Length Field (Message length)	2 × 8 bits	Client → Server	Set the byte length from Unit Identifier to Data.
		Server → Client	The byte length from Unit Identifier to Data is returned.
Unit Identifier (Unit identifier)	8 bits	Client → Server	The value is fixed to "255". If the server receives a value other than "255", the received value is discarded and no value is returned.
		Server → Client	Unit Identifier received from the client (controller) is copied and returned.
Function (Function field)	8 bits	Client → Server	Set a function code to request to the server.
		Server → Client	Send the function code requested by the client. When a communication error has occurred, send a value obtained by adding "80h" to the function code requested by the client.
Data (Data field)	n × 8 bits	Client → Server	The format changes depending on the function code selected. Refer to section 2.3 for details.
		Server → Client	

2.3 Function Codes

2.3.1 List of function codes

The MR-JE-_C servo amplifier supports the following function codes.

Code	Function name	Description
03h	Read Holding Registers	Reading data in holding registers The data in the registered holding registers can be read from the client.
08h	Diagnostics	Function diagnostics When this function code is sent from the client to a server, the server returns the received data to the client without any changes. Communication checks can be performed.
10h	Preset Multiple Registers	Writing data in multiple holding registers Consecutive multiple data sets can be written in the registered holding registers from the client.

2.3.2 Read Holding Registers (Reading data in holding registers: 03h)

Data in consecutive registers is read for the specified number of data points starting from the specified register address.

(1) Message frame
   Query Message

Transaction Identifier	Protocol Identifier	Length Field	Unit Identifier	Function	Starting Address		No. of Points	
					H	L	H	L
16 bits	0000h	0006h	FFh	03h	8 bits	8 bits	8 bits	8 bits

Message field	Size	Description
Transaction Identifier (Transaction identifier)	16 bits	Set any value.
Protocol Identifier (Protocol identifier)	16 bits	Set "0000h".
Length Field (Message length)	16 bits	Set "0006h".
Unit Identifier (Unit identifier)	8 bits	Set "FFh".
Function (Function field)	8 bits	Set "03h".
Starting Address (Start address) (Note 1)	16 bits	Set a start address of the holding registers to read.
No. of Points (Number of read points)	16 bits	Set the number of points of data to read starting from the start address of the holding registers from which data is read. Set the number of read points described in the list of holding registers. To read the data in continuous registers, set a value obtained by adding the number of read points of the target registers to this number.

Response Message

Transaction Identifier	Protocol Identifier	Length Field	Unit Identifier	Function	Byte Count	Data				
						H	L	to	H	L
16 bits	0000h	16 bits	FFh	03h	8 bits	8 bits	8 bits	to	8 bits	8 bits

Message field	Size	Description
Transaction Identifier (Transaction identifier)	16 bits	Transaction Identifier received from the client (controller) is copied and returned.
Protocol Identifier (Protocol identifier)	16 bits	The value "0000h" is returned.
Length Field (Message length)	16 bits	The byte length from Unit Identifier to Data is returned.
Unit Identifier (Unit identifier)	8 bits	Unit Identifier received from the client (controller) is copied and returned.
Function (Function field)	8 bits	When the message was received without errors, "03h" is returned.
Byte Count (Byte count)	16 bits	The Data frame size (in units of bytes) is returned. A value obtained by multiplying the value set for No. of Points in the Query Message by 2 is returned.
Data (Read data) (Note 2)	16 bits × n	Data starting from the start address specified in the Query Message is returned. Data is read in order of H (higher bits) and L (lower bits). Data is read in order starting from the start address.

Note 1. Registers can be classified into two types: registers that can be continuously accessed and particular registers that cannot be continuously accessed.
  To read particular registers, read only the target registers.
  For the details on whether the target registers can be continuously accessed or not, refer to chapter 6.
2. Higher 8 bits of 1-byte data are set to "00h" when this data is returned.
  To use the signed 1-byte data as 2-byte data, perform sign extension on the client (controller) side.

(2) Usage example
  The following shows a setting example of when Modbus registers 2B05h (Command pulse frequency) to 2B07h (Analog torque limit voltage) are read.

Index	Name	Data type	Read/write	No. of Points (Number of read points)	Continuous read/write	Register value (Read data)
2B05h	Command pulse frequency (Command pulse frequency)	4 bytes	Read	2	○	12345678h
2B06h	Analog speed command voltage (Analog speed command voltage) Analog speed limit voltage (Analog speed limit voltage)	2 bytes	Read	1	○	1000h
2B07h	Analog torque limit voltage (Analog torque limit voltage) Analog torque command voltage (Analog torque command voltage)	2 bytes	Read	1	○	2000h

Query Message

Transaction Identifier	Protocol Identifier	Length Field	Unit Identifier	Function	Starting Address		No. of Points	
					H	L	H	L
16 bits	0000h	0006h	FFh	03h	2Bh	05h	00h	04h

Set the following values to each Query Message.

Message field	Description
Transaction Identifier (Transaction identifier)	Set any value.
Protocol Identifier (Protocol identifier)	Set "0000h".
Length Field (Message length)	Set "0006h".
Unit Identifier (Unit identifier)	Set "FFh".
Function (Function field)	Set "03h".
Starting Address (Start address)	Set "2B05h", the start address to read.
No. of Points (Number of read points)	Set "04h", because the total number of read points from Modbus registers 2B05h to 2B07h is 4.

Response Message

Transaction Identifier	Protocol Identifier	Length Field	Unit Identifier	Function	Byte Count	Data							
						H	L	H	L	H	L	H	L
16 bits	0000h	000Bh	FFh	03h	08h	56h	78h	12h	34h	10h	00h	20h	00h

The following shows the information in each Response Message.

Message field	Description
Transaction Identifier (Transaction identifier)	Transaction Identifier received from the client (controller) is copied and returned.
Protocol Identifier (Protocol identifier)	The value "0000h" is returned.
Length Field (Message length)	The byte length from Unit Identifier to Data is returned.
Unit Identifier (Unit identifier)	Unit Identifier received from the client (controller) is copied and returned.
Function (Function field)	When the message was received without errors, "03h" is returned.
Byte Count (Byte count)	The value "08h" is returned. This means that data of 8 frames is returned.
Data (Read data)	Data starting from the start address is returned. Lower-bit value of the register 2B05h: "5678h" Higher-bit value of the register 2B05h: "1234h" Value of the register 2B06h: "1000h" Value of the register 2B07h: "2000h"

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2.3.3 Diagnostics (Function diagnostics: 08h)

Use this register when performing the communication check from the client (controller). When a server (servo amplifier) receives a Query Message, it sends the received data as a Response Message without any changes to the client (controller).

(1) Message frame
    Query Message

Transaction Identifier	Protocol Identifier	Length Field	Unit Identifier	Function	Sub Function		Data	
					H	L	H	L
16 bits	0000h	0006h	FFh	08h	00h	00h	8 bits	8 bits

Message field	Size	Description
Transaction Identifier (Transaction identifier)	16 bits	Set any value.
Protocol Identifier (Protocol identifier)	16 bits	Set "0000h".
Length Field (Message length)	16 bits	Set "0006h".
Unit Identifier (Unit identifier)	8 bits	Set "FFh".
Function (Function field)	8 bits	Set "08h".
Sub Function (Sub function)	16 bits	Set "0000h". When a value other than "0000h" is set, a communication error occurs.
Data (Data)	16 bits	Set 2-byte length data.

Response Message

Transaction Identifier	Protocol Identifier	Length Field	Unit Identifier	Function	Sub Function		Data	
					H	L	H	L
16 bits	0000h	0006h	FFh	08h	00h	00h	8 bits	8 bits

Message field	Size	Description
Transaction Identifier (Transaction identifier)	16 bits	Transaction Identifier received from the client (controller) is copied and returned.
Protocol Identifier (Protocol identifier)	16 bits	The value "0000h" is returned.
Length Field (Message length)	16 bits	The byte length from Unit Identifier to Data is returned.
Unit Identifier (Unit identifier)	8 bits	Unit Identifier received from the client (controller) is copied and returned.
Function (Function field)	8 bits	When the message was received without errors, "08h" is returned.
Sub Function (Sub function)	16 bits	The value "0000h" is returned.
Data (Data)	16 bits	The data set in the Query Message is returned.

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(2) Usage example

The following shows a setting example of when the diagnosis function is used.

Query Message

Transaction Identifier	Protocol Identifier	Length Field	Unit Identifier	Function	Sub Function		Data	
					H	L	H	L
16 bits	0000h	0006h	FFh	08h	00h	00h	12h	34h

Set the following values to each Query Message.

Message field	Description
Transaction Identifier (Transaction identifier)	Set any value.
Protocol Identifier (Protocol identifier)	Set "0000h".
Length Field (Message length)	Set "0006h".
Unit Identifier (Unit identifier)	Set "FFh".
Function (Function field)	Set "08h".
Sub Function (Sub function)	Set "0000h".
Data (Data)	When setting 1234h, set values as follows: H: "12h" L: "34h"

Response Message

Transaction Identifier	Protocol Identifier	Length Field	Unit Identifier	Function	Sub Function		Data	
					H	L	H	L
16 bits	0000h	0006h	FFh	08h	00h	00h	12h	34h

The following shows the information in each Response Message.

Message field	Description
Transaction Identifier (Transaction identifier)	Transaction Identifier received from the client (controller) is copied and returned.
Protocol Identifier (Protocol identifier)	The value "0000h" is returned.
Length Field (Message length)	The byte length from Unit Identifier to Data is returned.
Unit Identifier (Unit identifier)	Unit Identifier received from the client (controller) is copied and returned.
Function (Function field)	When the message was received without errors, "08h" is returned.
Sub Function (Sub function)	The value "0000h" is returned.
Data (Data)	The value "1234h" set in the Query Message is returned. H: "12h" L: "34h"

2.3.4 Preset Multiple Registers (Writing data in multiple holding registers: 10h)

Data is written to consecutive holding registers for the specified number of data points starting from the specified register address.

(1) Message frame
  Query Message

Transaction Identifier	Protocol Identifier	Length Field	Unit Identifier	Function	Starting Address		No. of Registers		Byte Count	Data				
					H	L	H	L		H	L	to	H	L
16 bits	0000h	16 bits	FFh	10h	8 Bit	8 Bit	8 Bit	8 Bit	8 Bit	8 Bit	8 Bit	to	8 Bit	8 Bit

Message field	Size	Description
Transaction Identifier (Transaction identifier)	16 bits	Set any value.
Protocol Identifier (Protocol identifier)	16 bits	Set "0000h".
Length Field (Message length)	16 bits	Set the byte length from Unit Identifier to Data.
Unit Identifier (Unit identifier)	8 bits	Set "FFh".
Function (Function field)	8 bits	Set "10h".
Starting Address (Start address) (Note)	16 bits	Set the start address of the holding registers to which data is written.
No. of Registers (Number of registers to write)	16 bits	Set the number of points of data to write starting from the start address of the holding registers to which data is written. Set the number of write points described in the list of holding registers. To write data in continuous registers, set a value obtained by adding the number of write points of the target registers to this number.
Byte Count (Byte count)	16 bits	Set the size of the data to write.
Data (Writing data) (Note)	16 bits × n	Set the data to write.

  Response Message

Transaction Identifier	Protocol Identifier	Length Field	Unit Identifier	Function	Starting Address		No. of Points	
					H	L	H	L
16 bits	0000h	0006h	FFh	10h	8 bits	8 bits	8 bits	8 bits

Message field	Size	Description
Transaction Identifier (Transaction identifier)	16 bits	Transaction Identifier received from the client (controller) is copied and returned.
Protocol Identifier (Protocol identifier)	16 bits	The value "0000h" is returned.
Length Field (Message length)	16 bits	The byte length from Unit Identifier to Data is returned.
Unit Identifier (Unit identifier)	8 bits	Unit Identifier received from the client (controller) is copied and returned.
Function (Function field)	8 bits	When the message was received without errors, "10h" is returned.
Starting Address (Start address)	16 bits	The start address of the holding registers to which the data was written is returned.
No. of Registers (Number of registers to write)	16 bits	The number of points of written data starting from the start address of the holding registers to which the data was written is returned.

Note. Registers can be classified into two types: registers to which data can be continuously written and particular registers to which data cannot be continuously written.
 To write data in particular registers, write data in the target registers one by one.
 For the details on whether the target registers can be continuously accessed or not, refer to chapter 6.

(2) Usage example

The following shows a setting example for writing "0100h" in the Modbus register 2102h ([Pr. PC02]).

Index	Name	Data type	Read/write	No. of Registers (Number of registers to write)	Continuous read/write	Setting value
2102h	PC02	4 bytes	Read/write	2	○	00000100h

Query Message

Transaction Identifier	Protocol Identifier	Length Field	Unit Identifier	Function	Starting Address		No. of Registers		Byte Count	Data			
					H	L	H	L		H	L	H	L
16 bits	0000h	000Ah	FFh	10h	21h	02h	00h	02h	04h	01h	00h	00h	00h

Set the following values to each Query Message.

Message field	Description
Transaction Identifier (Transaction identifier)	Set any value.
Protocol Identifier (Protocol identifier)	Set "0000h".
Length Field (Message length)	Set the byte length from Unit Identifier to Data.
Unit Identifier (Unit identifier)	Set "FFh".
Function (Function field)	Set "10h".
Starting Address (Start address)	Set "2102h", the start address of the registers to which data is written.
No. of Registers (Number of registers to write)	Set "02h", because the total number of write points of the Modbus register 2102h is 2.
Byte Count (Byte count)	Set "04h". This means that data of 4 frames is sent.
Data (Writing data)	Set values in order starting from the start address. Lower-bit value of the register 2102h: "0100h" Higher-bit value of the register 2102h: "0000h"

Response Message

Transaction Identifier	Protocol Identifier	Length Field	Unit Identifier	Function	Starting Address		No. of Points	
					H	L	H	L
2 × 8 bits	0000h	0006h	FFh	10h	21h	02h	00h	02h

The following shows the information in each Response Message.

Message field	Size	Description
Transaction Identifier (Transaction identifier)	16 bits	Transaction Identifier received from the client (controller) is copied and returned.
Protocol Identifier (Protocol identifier)	16 bits	The value "0000h" is returned.
Length Field (Message length)	16 bits	The byte length from Unit Identifier to Data is returned.
Unit Identifier (Unit identifier)	8 bits	Unit Identifier received from the client (controller) is copied and returned.
Function (Function field)	8 bits	When the message was received without errors, "10h" is returned.
Starting Address (Start address)	16 bits	The value "2102h", the start address of the holding registers to which the data was written is returned. H: "21h" L: "02h"
No. of Registers (Number of registers to write)	16 bits	The number of registers to write "02h" is returned.

2.3.5 Processing at occurrence of an error

In Modbus/TCP communication, when the Query Message sent from the client (controller) includes an incorrect value, the server (servo amplifier) returns an exception response to the client (controller).
If an error is detected in the TCP/IP layer, the server (servo amplifier) returns no message to the client (controller).
When an exception response occurs, a value obtained by adding "80h" to the function code sent in the Query Message is returned with an exception code.
However, no exception response occurs in the following cases.
・Function code "03h" (Read Holding Registers)
  When data can be read from even one of consecutive registers, no exception response occurs. In this case, "0" is returned to the register data that cannot be read.
・Function code "10h" (Preset Multiple Registers)
  When data can be written into even one of consecutive registers, no exception response occurs.

Response Message

Transaction Identifier	Protocol Identifier	Length Field	Unit Identifier	Function	Exception Code
16 bits	0000h	0003h	FFh	8 bits	8 bits

Message field	Size	Description
Transaction Identifier (Transaction identifier)	16 bits	Transaction Identifier received from the client (controller) is copied and returned.
Protocol Identifier (Protocol identifier)	16 bits	The value "0000h" is returned.
Length Field (Message length)	16 bits	The byte length from Unit Identifier to Data is returned.
Unit Identifier (Unit identifier)	8 bits	Unit Identifier received from the client (controller) is copied and returned.
Function (Function field)	8 bits	A value obtained by adding "80h" to the function code of the Query Message is returned. When Function is "03h": "83h" When Function is "08h": "88h" When Function is "10h": "90h" When an unsupported Function (example: "01h") is used, "Function + 80h" (example: "81h") is returned.
Exception Code (Exception code)	8 bits	An exception code is set. For details of exception codes, refer to the following "List of exception codes".

List of exception codes

Code	Error name	Description
01h	ILLEGAL FUNCTION (Illegal function code)	The Query Message sent from the client set a function code that the server does not support.
02h	ILLEGAL DATA ADDRESS (Illegal address)	The Query Message sent from the client set a register address that the server does not support. (Ex: No register address is set, or reading or writing data from/to registers is not available.)
03h	ILLEGAL DATA VALUE (Illegal data)	The Query Message sent from the client set data that the register cannot handle. (Ex: A value out of the setting range is set, or "0" is set to No. of Registers.)

3. STARTUP

POINT	
●When using Modbus/TCP communication, set [Pr. PN10 Ethernet communication time-out selection] before driving the servo motor. The servo motor may continue to operate after the communication is disabled due to a communication shut-off or other causes.	
●Setting [Pr. PN10 Ethernet communication time-out selection] to several milliseconds may trigger [AL. 86.4] in the following condition. The power of the servo amplifier is cycled, or an instantaneous power failure occurs during Modbus/TCP communication.	

This chapter describes the network setting of the MR-JE-_C servo amplifier. Refer to "MR-JE-_C Servo Amplifier Instruction Manual" and "MR-JE-_C Servo Amplifier Instruction Manual (Profile Mode)" for other startup settings.

3.1 Modbus/TCP initial communication setting

Make the initial communication settings in the following procedure.

Network setting	IP address setting	[IP address setting] The initial value is 192.168.3.0. To change the initial value, set it with either of the following (1) or (2). (Refer to section 3.2.) (1) Identification number setting rotary switch (SW1/SW2) (2) Parameter ([Pr. PN11] to [Pr. PN14])
	Subnet mask setting	[Subnet mask setting] The initial value is 255.255.255.0. Set it with the parameters ([Pr. PN15] to [Pr. PN18]). (Refer to chapter 4.)
	Default gateway setting	[Default gateway setting] The initial value is 192.168.3.1. Set it with the parameters ([Pr. PN19] to [Pr. PN22]). (Refer to chapter 4.)
	Server (servo amplifier) power cycling	[Server (servo amplifier) power cycling] The settings of the IP address, subnet mask, and default gateway are reflected.
Communication start	Client (controller) Modbus/TCP communication start	[Modbus/TCP communication start] Start Modbus/TCP communication of the client (controller).

3.2 IP address setting

> ┌─────────┐
> │ POINT │
> └─────────┘
> ● Use a twisted pair cable with Ethernet Category 5e (1000BASE-T) or higher as an Ethernet cable. The maximum cable length between nodes is 100 m.
> ● Use a hub with a transmission speed of 100 Mbps or faster when branching the Ethernet communication using a switching hub.
> ● For the switching hub without the auto-negotiation function, set it to the transmission speed 100 Mbps and half duplex.
> ● The initial value of the IP address is 192.168.3.0.
> ● The 4th octet can be set to 1 to 255 by using the identification number setting rotary switch (SW1/SW2).
> ● Cycle the power of the servo amplifier after changing the parameter setting of the IP address or identification number setting rotary switch (SW1/SW2).
> ● The IP address range for Modbus/TCP communication is between 0.0.0.0 and 255.255.255.255. Set the IP address within the range.

Set the IP address with the identification number setting rotary switch (SW1/SW2) on the display of the servo amplifier or MR Configurator2.
When the IP address is changed with the identification number setting rotary switch (SW1/SW2), change it before powering on the servo amplifier.
The IP address you set can be checked in the system configuration window of MR Configurator 2.
The IP address can be set as follows.

Identification number setting rotary switch (SW1/SW2)	IP address	
00h	1st octet	The setting value of [Pr. PN11] is used.
	2nd octet	The setting value of [Pr. PN12] is used.
	3rd octet	The setting value of [Pr. PN13] is used.
	4th octet	The setting value of [Pr. PN14] is used.
01h to FFh	1st octet	The setting value of [Pr. PN11] is used.
	2nd octet	The setting value of [Pr. PN12] is used.
	3rd octet	The setting value of [Pr. PN13] is used.
	4th octet	The setting value of the identification number setting rotary switch (SW1/SW2) is used.

4. PARAMETERS

⚠CAUTION	●Never make a drastic adjustment or change to the parameter values as doing so will make the operation unstable. ●Do not change the parameter settings as described below. Doing so may cause an unexpected condition, such as failing to start up the servo amplifier. 　・Changing the values of the parameters for manufacturer setting 　・Setting a value out of the range 　・Changing the fixed values in the digits of a parameter ●When you write parameters with the controller, make sure that the identification No. of the servo amplifier is set correctly. Otherwise, the parameter settings of another identification No. may be written, possibly causing the servo amplifier to be an unexpected condition.

4.1 List of communication-related parameters

POINT
●To enable a parameter whose symbol is preceded by *, cycle the power after setting it. However, the time will be longer depending on a setting value of [Pr. PF25 Instantaneous power failure tough drive - Detection time] when "instantaneous power failure tough drive selection" is enabled in [Pr. PA20]. ●In Modbus/TCP communication, the following parameter cannot be used. [Pr. PN02 Communication error detection time]

No.	Symbol	Name	Initial value	Unit
PN01		For manufacturer setting	0h	
PN02	CERT	Communication error detection time	1000 ms	[ms]
PN03		For manufacturer setting	0000h	
PN04			0000h	
PN05			0000h	
PN06			0000h	
PN07			0000h	
PN08			0000h	
PN09			1	
PN10	EIC	Ethernet communication time-out selection	0	[s]
PN11	*IPAD1	IP address setting 1	192	
PN12	*IPAD2	IP address setting 2	168	
PN13	*IPAD3	IP address setting 3	3	
PN14	*IPAD4	IP address setting 4	0	
PN15	*SNMK1	Subnet mask setting 1	255	
PN16	*SNMK2	Subnet mask setting 2	255	
PN17	*SNMK3	Subnet mask setting 3	255	
PN18	*SNMK4	Subnet mask setting 4	0	
PN19	*DGW1	Default gateway setting 1	192	
PN20	*DGW2	Default gateway setting 2	168	
PN21	*DGW3	Default gateway setting 3	3	
PN22	*DGW4	Default gateway setting 4	1	
PN23	*KAA	KeepAlive time	3600	[s]
PN24	*IPAF1	IP address filter 1	0	
PN25	*IPAF2	IP address filter 2	0	
PN26	*IPAF3	IP address filter 3	0	

4. PARAMETERS

No.	Symbol	Name	Initial value	Unit
PN27	*IPAF4	IP address filter 4	0	
PN28	*IPFR2	IP address filter 2 range setting	256	
PN29	*IPFR3	IP address filter 3 range setting	256	
PN30	*IPFR4	IP address filter 4 range setting	256	
PN31	*IPOA1	Operation specification IP address 1	0	
PN32	*IPOA2	Operation specification IP address 2	0	
PN33	*IPOA3	Operation specification IP address 3	0	
PN34	*IPOA4	Operation specification IP address 4	0	
PN35	*IPOR3	Operation specification IP address 3 range specification	256	
PN36	*IPOR4	Operation specification IP address 4 range specification	256	
PN37		For manufacturer setting	0000h	
PN38			0000h	
PN39			0000h	
PN40			0000h	
PN41			0000h	
PN42			0000h	
PN43			0000h	
PN44			0000h	
PN45			0000h	
PN46			0000h	
PN47			0000h	
PN48			0000h	

4. PARAMETERS

4.2 Detailed list of communication-related parameters

> POINT
> ●Set a value to each "x" in the "Setting digit" columns.

No./symbol/ name	Setting digit	Function	Initial value [unit]
PN10 *CONN Ethernet communica-tion time-out selection		Set the network number of the servo amplifier. Set the time until [AL. 86.4 Network communication error 4] is detected. Setting "0" will disable the detection of [AL. 86.4 Network communication error 4]. This parameter is enabled with SLMP. Setting range: 0 to 60	0 [s]
PN11 *IPAD1 IP address setting 1		Set the 1st octet of the IP address in decimal. Set the IP address assigned by the network administrator. When SLMP command (IPAdressSet) is received, the setting of the first octet will be written to this parameter. Refer to table 5.1 for the relation between the setting value of the identification number setting rotary switch and the parameter setting value. Setting range: 0 to 255	192

Table 4.1 Relation between IP address setting and identification number setting rotary switch

Identification number setting rotary switch (SW1/SW2)	IP address	
00h	1st octet	The setting value of [Pr. PN11] is used.
	2nd octet	The setting value of [Pr. PN12] is used.
	3rd octet	The setting value of [Pr. PN13] is used.
	4th octet	The setting value of [Pr. PN14] is used.
01h to FFh	1st octet	The setting value of [Pr. PN11] is used.
	2nd octet	The setting value of [Pr. PN12] is used.
	3rd octet	The setting value of [Pr. PN13] is used.
	4th octet	The setting value of the identification number setting rotary switch (SW1/SW2) is used.

No./symbol/ name	Setting digit	Function	Initial value [unit]
PN12 *IPAD2 IP address setting 2		Set the 2nd octet of the IP address in decimal. Set the IP address assigned by the network administrator. When SLMP command (IPAdressSet) is received, the setting of the second octet will be written to this parameter. Refer to table 5.1 for the relation between the setting value of the identification number setting rotary switch and the parameter setting value. Setting range: 0 to 255	168
PN13 *IPAD3 IP address setting 3		Set the 3rd octet of the IP address in decimal. Set the IP address assigned by the network administrator. When SLMP command (IPAdressSet) is received, the setting of the third octet will be written to this parameter. Refer to table 5.1 for the relation between the setting value of the identification number setting rotary switch and the parameter setting value. Setting range: 0 to 255	3

No./symbol/name	Setting digit	Function	Initial value [unit]
PN14 *IPAD4 IP address setting 4		Set the 4th octet of the IP address in decimal. Set the IP address assigned by the network administrator. When SLMP command (IPAdressSet) is received, the setting of the fourth octet will be written to this parameter. Refer to table 5.1 for the relation between the setting value of the identification number setting rotary switch and the parameter setting value. Setting range: 0 to 255	0
PN15 *SNMK1 Subnet mask setting 1		Set the 1st octet of the subnet mask in decimal. Set the subnet mask assigned by the network administrator. Setting range: 0 to 255	255
PN16 *SNMK2 Subnet mask setting 2		Set the 2nd octet of the subnet mask in decimal. Set the subnet mask assigned by the network administrator. Setting range: 0 to 255	255
PN17 *SNMK3 Subnet mask setting 3		Set the 3rd octet of the subnet mask in decimal. Set the subnet mask assigned by the network administrator. Setting range: 0 to 255	255
PN18 *SNMK4 Subnet mask setting 4		Set the 4th octet of the subnet mask in decimal. Set the subnet mask assigned by the network administrator. Setting range: 0 to 255	0
PN19 *DGW1 Default gateway setting 1		Set the 1st octet of the default gateway in decimal. Set the default gateway assigned by the network administrator. Setting range: 0 to 255	192
PN20 *DGW2 Default gateway setting 2		Set the 2nd octet of the default gateway in decimal. Set the default gateway assigned by the network administrator. Setting range: 0 to 255	168
PN21 *DGW3 Default gateway setting 3		Set the 3rd octet of the default gateway in decimal. Set the default gateway assigned by the network administrator. The default gateway can also be changed simultaneously by the SLMP command (IPAdressSet). Setting range: 0 to 255	3
PN22 *DGW4 Default gateway setting 4		Set the 4th octet of the default gateway in decimal. Set the default gateway assigned by the network administrator. The default gateway can also be changed simultaneously by the SLMP command (IPAdressSet). Setting range: 0 to 255	1
PN23 *KAA KeepAlive time		Set the time interval between the transmissions of the alive check message (Keep Alive ACK) for TCP communication. If no response to the alive check message is received, the connection is forcibly closed after the time (setting value × 8 times) has elapsed. In the initial setting, the connection is closed after 8 hours (3600 [s] × 8 times = 28800 [s]) have elapsed. Setting range: 1 to 7200	3600 [s]
PN24 *IPAF1 IP address filter 1		Set the 1st octet of the IP address of the network device allowed to be connected in decimal. When [Pr. PN24] to [Pr. PN27] are all set to "0", the function is disabled. Setting range: 0 to 255	0

No./symbol/ name	Setting digit	Function	Initial value [unit]
PN25 *IPAF2 IP address filter 2		Set the 2nd octet of the IP address of the network device allowed to be connected in decimal. When [Pr. PN24] to [Pr. PN27] are all set to "0", the function is disabled. Setting range: 0 to 255	0
PN26 *IPAF3 IP address filter 3		Set the 3rd octet of the IP address of the network device allowed to be connected in decimal. When [Pr. PN24] to [Pr. PN27] are all set to "0", the function is disabled. Setting range: 0 to 255	0
PN27 *IPAF4 IP address filter 4		Set the 4th octet of the IP address of the network device allowed to be connected in decimal. When [Pr. PN24] to [Pr. PN27] are all set to "0", the function is disabled. Setting range: 0 to 255	0
PN28 *IPAF2 IP address filter 2 range specification		Set a value for the 2nd octet range of the IP address of the network device allowed to be connected. The range for the IP address of the network device allowed to be connected is between [Pr. PN25] and [Pr. PN28]. Set a value in decimal. Setting "256" will disable the function. Setting range: 0 to 256	256
PN29 *IPAF3 IP address filter 3 range specification		Set a value for the 3rd octet range of the IP address of the network device allowed to be connected. The range for the IP address of the network device allowed to be connected is between [Pr. PN26] and [Pr. PN29]. Set a value in decimal. Setting "256" will disable the function. Setting range: 0 to 256	256
PN30 *IPAF4 IP address filter 4 range specification		Set a value for the 4th octet range of the IP address of the network device allowed to be connected. The range for the IP address of the network device allowed to be connected is between [Pr. PN27] and [Pr. PN30]. Set a value in decimal. Setting "256" will disable the function. Setting range: 0 to 256	256
PN31 *IPOA1 Operation specification IP address 1		Set the 1st octet of the IP address of the network device allowed to be connected in decimal. When [Pr. PN31] to [Pr. PN34] are set to all "0", the function is disabled. When the function is enabled, the servo amplifier allows the following data 1) to be imported only if the IP address of the client (external device) matches with the operation specification IP address. If they are mismatched, the data is discarded. 1) Modbus/TCP function code 10h Monitoring, parameter setting, and test operation can be executed via Ethernet when the IP addresses of a personal computer (MR Configurator2) and GOT are within the range of the operation specification IP address. When out of the range, communication to the servo amplifier cannot be established. Setting range: 0 to 255	0

No./symbol/name	Setting digit	Function	Initial value [unit]
PN32 *IPOA2 Operation specification IP address 2		Set the 2nd octet of the IP address of the network device allowed to be connected in decimal. When [Pr. PN31] to [Pr. PN34] are all set to "0", the function is disabled. When the function is enabled, the servo amplifier allows the following data 1) to be imported only if the IP address of the client (external device) matches with the operation specification IP address. If they are mismatched, the data is discarded. 1) Modbus/TCP function code 10h Monitoring, parameter setting, and test operation can be executed via Ethernet when the IP addresses of a personal computer (MR Configurator2) and GOT are within the range of the operation specification IP address. When out of the range, communication to the servo amplifier cannot be established. Setting range: 0 to 255	0
PN33 *IPOA3 Operation specification IP address 3		Set the 3rd octet of the IP address of the network device allowed to be connected in decimal. When [Pr. PN31] to [Pr. PN34] are all set to "0", the function is disabled. When the function is enabled, the servo amplifier allows the following data 1) to be imported only if the IP address of the client (external device) matches with the operation specification IP address. If they are mismatched, the data is discarded. 1) Modbus/TCP function code 10h Monitoring, parameter setting, and test operation can be executed via Ethernet when the IP addresses of a personal computer (MR Configurator2) and GOT are within the range of the operation specification IP address. When out of the range, communication to the servo amplifier cannot be established. Setting range: 0 to 255	0
PN34 *IPOA4 Operation specification IP address 4		Set the 4th octet of the IP address of the network device allowed to be connected in decimal. When [Pr. PN31] to [Pr. PN34] are all set to "0", the function is disabled. When the function is enabled, the servo amplifier allows the following data 1) to be imported only if the IP address of the client (external device) matches with the operation specification IP address. If they are mismatched, the data is discarded. 1) Modbus/TCP function code 10h Monitoring, parameter setting, and test operation can be executed via Ethernet when the IP addresses of a personal computer (MR Configurator2) and GOT are within the range of the operation specification IP address. When out of the range, communication to the servo amplifier cannot be established. Setting range: 0 to 255	0
PN35 *IPOR3 Operation specification IP address 3 range specification		Set a value for the 3rd octet range of the IP address of the network device allowed to be connected. The range for the IP address of the network device allowed to be connected is between [Pr. PN33] and [Pr. PN35]. Set a value in decimal. Setting "256" will disable the function. Setting range: 0 to 256	256
PN36 *IPOA4 Operation specification IP address 4 range specification		Set a value for the 4th octet range of the IP address of the network device allowed to be connected. The range for the IP address of the network device allowed to be connected is between [Pr. PN34] and [Pr. PN36]. Set a value in decimal. Setting "256" will disable the function. Setting range: 0 to 256	256

5. MANUFACTURER FUNCTIONS

5.1 Stroke end

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

Operation status		Remark
During rotation at constant speed	During deceleration to a stop	
		Travels for the droop pulses 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).

5. MANUFACTURER FUNCTIONS

5.2 One-touch tuning

Refer to "MR-JE-_C Servo Amplifier Instruction Manual" for one-touch tuning. Using One-touch tuning mode (2D50h) allows one-touch tuning from the client (controller).

(1) Related resister

Address	Read/write	Name	Data type	Initial value	Description
2D50h	Read/write	One-touch tuning mode	1 bytes	0	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	Reading	One-touch tuning status	1 bytes	0	Regardless of whether one-touch tuning is properly completed or not, the setting value changes to 100% at the completion. Unit: %
2D52h	Writing	One-touch tuning Stop	2 bytes	0	Writing "1EA5h" stops one-touch tuning. Writing a value other than "1EA5h" sets 0609 0030h Value range of parameter exceeded in SDO Abort Code.
2D53h	Writing	One-touch tuning Clear	2 bytes	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	Reading	One-touch tuning Error Code	2 bytes	0	The following shows the details of the one-touch tuning error codes. 0000h: Finished normally C000h: Tuning canceled C001h: Overshoot exceeded C002h: Servo-off during tuning C003h: Control mode error C004h: Time-out C005h: Load to motor inertia ratio misestimated C00Fh: One-touch tuning disabled

5. MANUFACTURER FUNCTIONS

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

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

Start

| Startup of the system | Refer to "MR-JE-_C Servo Amplifier Instruction Manual" and "MR-JE-_C Servo Amplifier Instruction Manual (Profile Mode)" to start the system. |

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

| One-touch tuning execution | Write a value corresponding to the response mode (High mode, basic mode, or Low mode) to perform in One-touch tuning mode (2D50h) during servo motor driving to perform one-touch tuning. |

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

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

| Tuning result check | 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 (2D53h). |

End

5. MANUFACTURER FUNCTIONS

5.3 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 resisters.
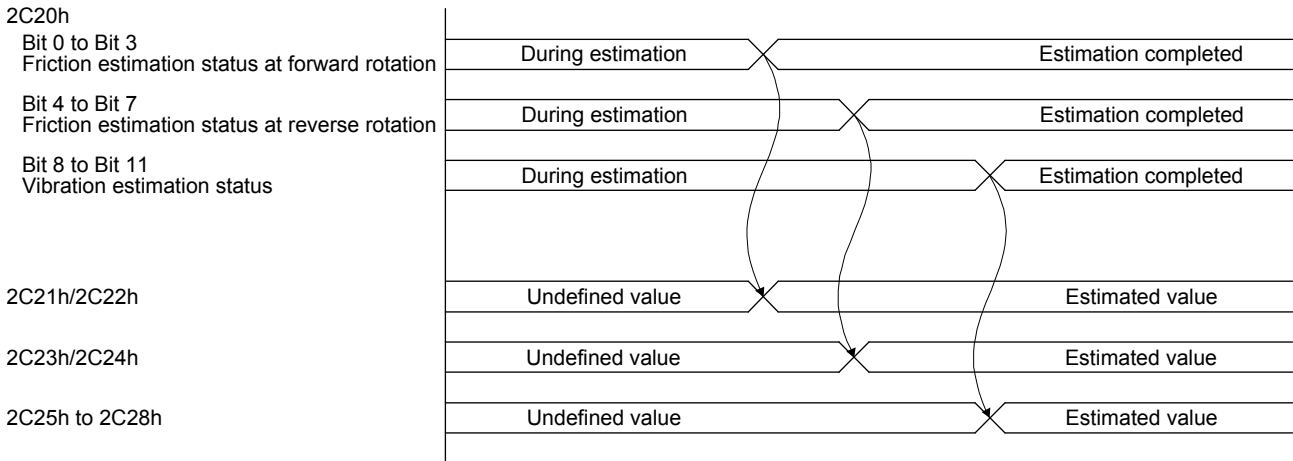
Address	Read/write	Name	Data type	Initial value	Description
2C20h	Reading	Machine diagnostic status	2 bytes		Refer to section 6.1.
2C21h	Reading	Static friction torque at forward rotation	2 bytes		Static friction at forward rotation torque is displayed in increments of 0.1%.
2C22h	Reading	Dynamic friction torque at forward rotation (at rated speed)	2 bytes		Kinetic friction at forward rotation torque at the rated speed is displayed in increments of 0.1%.
2C23h	Reading	Static friction torque at reverse rotation	2 bytes		Static friction at reverse rotation torque is displayed in increments of 0.1%.
2C24h	Reading	Dynamic friction torque at reverse rotation (at rated speed)	2 bytes		Kinetic friction at reverse rotation torque at the rated speed is displayed in increments of 0.1%.
2C25h	Reading	Oscillation frequency during motor stop	2 bytes		Vibration frequency during stop/servo-lock is displayed in increments of 1 Hz.
2C26h	Reading	Vibration level during motor stop	2 bytes		Vibration level during stop/servo-lock is displayed in increments of 0.1%.
2C27h	Reading	Oscillation frequency during motor operating	2 bytes		Vibration frequency during operation is displayed in increments of 1 Hz.
2C28h	Reading	Vibration level during motor operating	2 bytes		Vibration level during operation is displayed in increments of 0.1%.

5.4 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 resisters.

Address	Read/write	Name	Data type	Initial value	Description
2C18h	Reading	Power ON cumulative time	4 bytes		The cumulative energization time of the servo amplifier is returned.
2C19h	Reading	Inrush relay ON/OFF number	4 bytes		The number of on/off times of the inrush relay of the servo amplifier is returned.

6. MODBUS REGISTERS

Each data such as control parameters, command values, and feedback values is handled as an object composed of an address, object name, data type, access rule, and other elements. The object data can be exchanged between the client (controller) and the servers (servo amplifiers).

6.1 List of registers

Address	Name and function	Data type	Read/ write	Initial value	Range	Unit	Saved to EEP-ROM	Para-meter	No. of Points/ No. of Registers	Continuous read/ continuous write
1000	Supported profile information (Device Type) The servo drive defined with the CiA 402 profile is indicated.	4 bytes	Reading	00020192h	00020192h (fixed)				2	Impossible
1001	Alarm information (Error Register) The error occurrence is returned. Bit 0: Turns on when an alarm has occurred. Bit 1 to Bit 7: Unused	1 bytes	Reading		00h to 01h				1	Impossible
1010	Writing command to EEP-ROM (Store parameters) The number of entries is returned.	1 bytes	Reading	1	01h				3	Impossible
	Saving all parameters (Save all parameters) [Writing] Writing "save" (= 65766173h) saves all the objects which can be stored in the EEP-ROM. [Reading] Bit 0: 0: The parameter cannot be saved with the command. (A parameter is being saved.) 1: The parameter can be saved with the command. (No parameter is being saved.) Bit 1: 0: The parameter is not automatically saved.	4 bytes	Read/ write	00000001h						
1011	Restoring default EEP-ROM parameters (Restore default parameters) The number of entries is returned.	1 bytes	Reading	1	01h (fixed)				3	Impossible
	Restoring all default parameters (Restore all default parameters) The parameter of the servo amplifier can be rewritten with the factory setting. When "64616F6Ch" (= reverse order of ASCII code of "load") is written to Restore all default parameters (1011h: 1) and the power is cycled, the parameter is initialized.	4 bytes	Read/ write	00000001h						
1018	Device information (Identity Object) The number of entries is returned.	1 bytes	Reading	4	04h (fixed)				9	Impossible
	Vendor ID (Vendor ID) The vendor ID of a servo amplifier is returned.	4 bytes	Reading	00000002h	00000002h (fixed)					
	Product number (Product Code) The servo amplifier serial number is returned.	4 bytes	Reading	00001003h	00001003h (fixed)					
	Revision number (Revision Number) The revision number of a servo amplifier is returned.	4 bytes	Reading		00000000h to FFFFFFFFh					
	Serial number (Serial Number) The serial number of the network module is returned.	4 bytes	Reading	00000000h	00000000h to FFFFFFFFh					
2001 to 2021	PA01 to PA32 The values of the basic setting parameters ([Pr. PA_ _]) can be obtained and set. For details, refer to "MR-JE-_C Servo Amplifier Instruction Manual".	4 bytes	Read/ write				O	PA01 to PA32	2	Possible

Address	Name and function	Data type	Read/ write	Initial value	Range	Unit	Saved to EEP-ROM	Para-meter	No. of Points/ No. of Registers	Continuous read/ continuous write
2081 to 20C0	PB01 to PB64 The values of the gain/filter setting parameters ([Pr. PB_ _]) can be obtained and set. For details, refer to "MR-JE-_C Servo Amplifier Instruction Manual".	4 bytes	Read/ write				○	PB01 to PB64	2	Possible
2101 to 2150	PC01 to PC80 The values of the extension setting parameters ([Pr. PC_ _]) can be obtained and set. For details, refer to "MR-JE-_C Servo Amplifier Instruction Manual".	4 bytes	Read/ write				○	PC01 to PC80	2	Possible
2181 to 21B0	PD01 to PD48 The values of the I/O setting parameters ([Pr. PD_ _]) can be obtained and set. For details, refer to "MR-JE-_C Servo Amplifier Instruction Manual".	4 bytes	Read/ write				○	PD01 to PD48	2	Possible
2201 to 2240	PE01 to PE64 The values of the extension setting 2 parameters ([Pr. PE_ _]) can be obtained and set. For details, refer to "MR-JE-_C Servo Amplifier Instruction Manual".	4 bytes	Read/ write				○	PE01 to PE64	2	Possible
2281 to 22B0	PF01 to PF48 The values of the extension setting 3 parameters ([Pr. PF_ _]) can be obtained and set. For details, refer to "MR-JE-_C Servo Amplifier Instruction Manual".	4 bytes	Read/ write				○	PF01 to PF48	2	Possible
2481 to 24D0	PT01 to PT80 The values of the positioning control parameters ([Pr. PT_ _]) can be obtained and set. For details, refer to "MR-JE-_C Servo Amplifier Instruction Manual (Profile Mode)."	4 bytes	Read/ write				○	PT01 to PT80	2	Possible
2581 to 25B0	PN01 to PN48 The values of the network setting parameters ([Pr. PN_ _]) can be obtained and set. Refer to chapter 5 for details.	4 bytes	Read/ write				○	PN01 to PN48	2	Possible
2A00 to 2A0F	Alarm history 0 to Alarm history 15 (Alarm history newest) The number of entries in the latest alarm of the alarm history is returned.	1 bytes	Read	3	03h (fixed)		○		6	Impossible
	Alarm No. (Alarm No.) The number of the alarm that has occurred is returned. The description is as follows. Bit 0 to Bit 15: Alarm detail number Bit 16 to Bit 31: Alarm number When no history exists, "0" is returned.	4 bytes	Reading	0	00000000h to FFFFFFFFh		○			
	Alarm occurrence time (Alarm time (Hour)) Alarm occurrence time is returned. When no history exists, "0" is returned.	4 bytes	Reading	0	00000000h to FFFFFFFFh	hour	○			
	Alarm 2 No. (Alarm2 No.) The number of the alarm that has occurred is returned. The description is as follows. Bit 0 to Bit 7: Alarm detail number Bit 8 to Bit 15: Alarm number When no history exists, "0" is returned.	2 bytes	Reading	0	0000h to FFFFh		○			
2A40	Alarm history clear (Clear alarm history) Writing "1EA5h" clears the alarm history.	2 bytes	Writing						1	Impossible
2A41	Current alarm (Current alarm) The number of the current alarm is returned. When no alarm has occurred, "00000000h" is returned. Bit 0 to Bit 15: Alarm detail number Bit 16 to Bit 31: Alarm number	4 bytes	Reading		00000000h to FFFFFFFFh				2	Impossible

Address	Name and function	Data type	Read/write	Initial value	Range	Unit	Saved to EEP-ROM	Para-meter	No. of Points/ No. of Registers	Continuous read/ continuous write
2A42	Current alarm 2 (Current alarm 2) The number of the current alarm is returned. When no alarm has occurred, "0000h" is returned. Bit 0 to Bit 7: Alarm detail number Bit 8 to Bit 15: Alarm number	2 bytes	Reading		0000h to FFFFh				1	Impossible
2A44	Number of parameter errors (Parameter error number) When [AL. 37 Parameter error] has occurred, the number of the parameters which cause the error is returned. Refer to Parameter error list (2A45h) for the number of each parameter which causes the error.	2 bytes	Reading		0000h to 01F4h (500)				1	Impossible
2A45	Parameter error No. (Parameter error list) When [AL. 37 Parameter error] has occurred, the number of entries of the parameter which causes the error is returned.	1 bytes	Reading	20h (32)	20h (32) (fixed)				1 + number of read points	Impossible
	Parameter error No. 1 to 32 (Parameter error list 1 to 32) When [AL. 37 Parameter error] has occurred, the 1st to 32nd numbers of the parameter which causes the alarm is returned. Bit 0 to Bit 7: Parameter number Bit 8 to Bit 15: Parameter group number 00: [Pr. PA _ _] 01: [Pr. PB _ _] 02: [Pr. PC _ _] 03: [Pr. PD _ _] 04: [Pr. PE _ _] 05: [Pr. PF _ _] 06: Parameter for manufacturer setting 07: Parameter for manufacturer setting 08: Parameter for manufacturer setting 09: Parameter for manufacturer setting 0A: Parameter for manufacturer setting 0B: Parameter for manufacturer setting 0C: [Pr. PT _ _] 0E: [Pr. PN _ _]	2 bytes	Reading	0	0000h to FFFFh					
2A46	Alarm reset (Reset alarm) Writing the value "1EA5h" resets an alarm. Any value other than "1EA5h" is ignored.	2 bytes	Writing	0	0000h to FFFFh				1	Impossible
2A60	SDO abort code (SDO abort code) The latest SDO Abort Code is returned.	4 bytes	Read		00000000h to FFFFFFFFh				2	Impossible
2A64	Access log 1 (Access log 1) The latest address that was accessed successfully in the Modbus communication is returned. Bit 0 to Bit15: Address Bit 16 to Bit 31: For manufacturer setting	4 bytes	Read		00000000h to FFFFFFFFh				2	Impossible
2A65	Access log 2 (Access log 2) The numbers of the addresses that were accessed successfully in the Modbus communication before a disconnection are returned. In addition, when an address containing multiple elements is accessed, the number of the elements is returned.	2 bytes	Read		0000h to FFFFh				1	Impossible
2B01	Cumulative feedback pulses (Cumulative feedback pulses) The cumulative feedback pulses are returned. Writing "00001EA5h" clears the cumulative feedback pulses.	4 bytes	Read/write		80000000h to 7FFFFFFFh	pulse			2	Possible
2B02	Servo motor speed (Servo motor speed) The servo motor speed is returned.	4 bytes	Reading		80000000h to 7FFFFFFFh	r/min			2	Possible
2B03	Droop pulses (Droop pulses) The droop pulses (encoder unit) are returned.	4 bytes	Reading		80000000h to 7FFFFFFFh	pulse			2	Possible

Address	Name and function	Data type	Read/ write	Initial value	Range	Unit	Saved to EEP-ROM	Para-meter	No. of Points/ No. of Registers	Continuous read/ continuous write
2B04	Cumulative command pulses (Cumulative command pulses) The cumulative command pulses are returned.	4 bytes	Reading		80000000h to 7FFFFFFFh	pulse			2	Possible
2B05	Command pulse frequency (Command pulse frequency) The command pulse frequency is returned.	4 bytes	Reading		80000000h to 7FFFFFFFh	kpulse/s			2	Possible
2B06	Analog speed command voltage (Analog speed command voltage) The analog speed command voltage is returned.	2 bytes	Read		8000h to 7FFFh	V			1	Possible
2B07	Analog torque limit voltage/Analog torque command voltage (Analog torque limit voltage/Analog torque command voltage) The analog torque limit voltage/analog torque command voltage is returned.	2 bytes	Reading		8000h to 7FFFh	V			1	Possible
2B08	Regenerative load ratio (Regenerative load ratio) The regenerative load ratio is returned.	2 bytes	Reading		0000h to FFFFh	%			1	Possible
2B09	Effective load ratio (Effective load ratio) The effective load ratio is returned.	2 bytes	Reading		0000h to FFFFh	%			1	Possible
2B0A	Peak load ratio (Peak load ratio) The peak load ratio is returned.	2 bytes	Reading		0000h to FFFFh	%			1	Possible
2B0B	Instantaneous torque (Instantaneous torque) The instantaneous torque is returned.	2 bytes	Reading		8000h to 7FFFh	%			1	Possible
2B0C	Position within one-revolution (Within one-revolution position) The position within one-revolution is returned.	4 bytes	Reading		80000000h to 7FFFFFFFh	pulse			2	Possible
2B0D	Multi-revolution counter (ABS counter) Returns the multi-revolution counter.	4 bytes	Reading		80000000h to 7FFFFFFFh	rev			2	Possible
2B0E	Load to motor inertia ratio (Load to motor inertia ratio) The load to motor inertia ratio is returned.	2 bytes	Reading		0000h to FFFFh	0.01 times			1	Possible
2B0F	Bus voltage (Bus voltage) The bus voltage is returned.	2 bytes	Reading		0000h to FFFFh	V			1	Possible
2B16	F/B cumulative value of A/B-phase output pulse (Cumulative encoder out pulses) The feedback cumulative value of A/B-phase output pulse is returned.	4 bytes	Read		80000000h to 7FFFFFFFh	pulse			2	Impossible
2B25	Internal temperature of encoder (Internal temperature of encoder) The internal temperature of encoder is returned.	2 bytes	Reading		8000h to 7FFFh	°C			1	Impossible
2B26	Settling time (Settling time) The settling time is returned.	2 1 bytes	Reading		8000h to 7FFFh	ms			1	Impossible
2B27	Oscillation detection frequency (Oscillation detection frequency) The oscillation detection frequency is returned.	2 bytes	Reading		8000h to 7FFFh	Hz			1	Impossible
2B28	Number of tough drive operations (Number of tough drive operations) The number of tough drive operations is returned.	2 bytes	Reading		0000h to FFFFh	times			1	Impossible
2B2A	Internal temperature of amplifier (Internal temperature of amplifier) The internal temperature of amplifier is returned.	2 bytes	Reading		8000h to 7FFFh	°C			1	Impossible
2B2D	Unit power consumption (Unit power consumption) The unit power consumption is returned.	2 bytes	Reading		8000h to 7FFFh	W			1	Possible
2B2E	Unit total power consumption (Unit total power consumption) The unit total power consumption is returned.	4 bytes	Reading		80000000h to 7FFFFFFFh	Wh			2	Possible
2B2F	Current position (Current position) The current position is returned.	4 bytes	Reading		80000000h to 7FFFFFFFh				2	Possible

Address	Name and function	Data type	Read/ write	Initial value	Range	Unit	Saved to EEP-ROM	Para-meter	No. of Points/ No. of Registers	Continuous read/ continuous write
2B30	Command position (Command position) The command position is returned.	4 bytes	Reading		80000000h to 7FFFFFFFh				2	Possible
2B31	Command remaining distance (Command remaining distance) The command remaining distance is returned.	4 bytes	Read		80000000h to 7FFFFFFFh				2	Possible
2B81	Cumulative feedback pulses at alarm occurrence (Alarm Monitor 1 Cumulative feedback pulses) The cumulative feedback pulses at alarm occurrence are returned.	4 bytes	Reading		80000000h to 7FFFFFFFh	pulse			2	Possible
2B82	Servo motor speed at alarm occurrence (Alarm Monitor 2 Servo motor speed) The servo motor speed at alarm occurrence is returned.	4 bytes	Reading		80000000h to 7FFFFFFFh	r/min			2	Possible
2B83	Droop pulses at alarm occurrence (Alarm Monitor 3 Droop pulses) The droop pulses at alarm occurrence are returned.	4 bytes	Reading		80000000h to 7FFFFFFFh	pulse			2	Possible
2B84	Cumulative command pulses at alarm occurrence (Alarm Monitor 4 Cumulative command pulses) The cumulative command pulses (encoder unit) at alarm occurrence are returned.	4 bytes	Reading		80000000h to 7FFFFFFFh	pulse			2	Possible
2B85	Command pulse frequency at alarm occurrence (Alarm Monitor 5 Command pulse frequency) The command pulse frequency at alarm occurrence is returned.	4 bytes	Reading		80000000h to 7FFFFFFFh	kpulse/s			2	Possible
2B86	Analog speed command voltage at alarm occurrence (Alarm Monitor 6 Analog speed command voltage) The analog speed command voltage at alarm occurrence is returned.	2 bytes	Reading		8000h to 7FFFh	V			1	Possible
2B87	Analog torque limit voltage/ Analog torque command voltage at alarm occurrence (Alarm Monitor 7 Analog torque limit voltage/ Analog torque command voltage) The analog torque limit voltage/analog torque command voltage at alarm occurrence is returned.	2 bytes	Reading		8000h to 7FFFh	V			1	Possible
2B88	Regenerative load ratio at alarm occurrence (Alarm Monitor 8 Regenerative load ratio) The regenerative load ratio at alarm occurrence is returned.	2 bytes	Reading		0000h to FFFFh	%			1	Possible
2B89	Effective load ratio at alarm occurrence (Alarm Monitor 9 Effective load ratio) The effective load ratio at alarm occurrence is returned.	2 bytes	Reading		0000h to FFFFh	%			1	Possible
2B8A	Peak load ratio at alarm occurrence (Alarm Monitor 10 Peak load ratio) The peak load ratio at alarm occurrence is returned.	2 bytes	Reading		0000h to FFFFh	%			1	Possible
2B8B	Instantaneous torque at alarm occurrence (Alarm Monitor 11 Instantaneous torque) The instantaneous torque at alarm occurrence is returned.	2 bytes	Reading		8000h to 7FFFh	%			1	Possible
2B8C	Position within one-revolution at alarm occurrence (Alarm Monitor 12 Within one-revolution position) The position within one-revolution at alarm occurrence is returned.	4 bytes	Reading		80000000h to 7FFFFFFFh	pulse			2	Possible
2B8D	Multi-revolution counter at alarm occurrence (Alarm Monitor 13 ABS counter) The ABS counter at alarm occurrence is returned.	4 bytes	Reading		80000000h to 7FFFFFFFh	rev			2	Possible

Address	Name and function	Data type	Read/ write	Initial value	Range	Unit	Saved to EEP-ROM	Para-meter	No. of Points/ No. of Registers	Continuous read/ continuous write
2B8E	Load to motor inertia ratio at alarm occurrence (Alarm Monitor 14 Load to motor inertia ratio) The load to motor inertia ratio at alarm occurrence is returned.	2 bytes	Reading		0000h to FFFFh	0.01 times			1	Possible
2B8F	Bus voltage at alarm occurrence (Alarm Monitor 15 Bus voltage) The bus voltage at alarm occurrence is returned.	2 bytes	Reading		0000h to FFFFh	V			1	Possible
2B96	F/B cumulative value of A/B-phase output pulse at alarm occurrence (Alarm Monitor 22 Cumulative encoder out pulses) The feedback cumulative value of A/B-phase output pulse at alarm occurrence is returned.	4 bytes	Reading		80000000h to 7FFFFFFFh	pulse			2	Possible
2BA5	Internal temperature of encoder at alarm occurrence (Alarm Monitor 37 Internal temperature of encoder) The internal temperature of encoder at alarm occurrence is returned.	2 bytes	Reading		8000h to 7FFFh	°C			1	Possible
2BA6	Settling time at alarm occurrence (Alarm Monitor 38 Settling time) The settling time at alarm occurrence is returned.	2 bytes	Reading		8000h to 7FFFh	ms			1	Possible
2BA7	Oscillation detection frequency at alarm occurrence (Alarm Monitor 39 Oscillation detection frequency) The oscillation detection frequency at alarm occurrence is returned.	2 bytes	Reading		8000h to 7FFFh	Hz			1	Possible
2BA8	Number of tough drive operations at alarm occurrence (Alarm Monitor 40 Number of tough drive operations) The number of tough drive operations at alarm occurrence is returned.	2 bytes	Reading		0000h to FFFFh	times			1	Possible
2BAA	Internal temperature of amplifier at alarm occurrence (Alarm Monitor 42 Internal temperature of amplifier) The internal temperature of amplifier at alarm occurrence is returned.	2 bytes	Reading		8000h to 7FFFh	°C			1	Possible
2BAD	Unit power consumption at alarm occurrence (Alarm Monitor 45 Unit power consumption) The unit power consumption at alarm occurrence is returned.	2 bytes	Reading		8000h to 7FFFh	W			1	Possible
2BAE	Unit total power consumption at alarm occurrence (Alarm Monitor 46 Unit total power consumption) The unit total power consumption at alarm occurrence is returned.	4 bytes	Reading		80000000h to 7FFFFFFFh	Wh			2	Possible
2BAF	Current position at alarm occurrence (Alarm Monitor 47 Current position) The current position at alarm occurrence is returned.	4 bytes	Reading		80000000h to 7FFFFFFFh				2	Possible
2BB0	Command position at alarm occurrence (Alarm Monitor 48 Command position) The command position at alarm occurrence is returned.	4 bytes	Reading		80000000h to 7FFFFFFFh				2	Possible
2BB1	Command remaining distance at alarm occurrence (Alarm Monitor 49 Command remaining distance) The command remaining distance at alarm occurrence is returned.	4 bytes	Reading		80000000h to 7FFFFFFFh				2	Possible
2C10	External input pin status (External Input pin display) The number of entries in external input pin status is returned.	1 bytes	Reading	1	01h (fixed)				3	Impossible
	External input pin status 1 (External Input pin display1) The external input pin status is returned.	4 bytes	Reading		00000000h to FFFFFFFFh					

6. MODBUS REGISTERS

Address	Name and function	Data type	Read/write	Initial value	Range	Unit	Saved to EEP-ROM	Para-meter	No. of Points/ No. of Registers	Continuous read/ continuous write
2C11	External output pin status (External Output pin display) The number of entries in external output pin status is returned.	1 bytes	Read	1	01h (fixed)				3	Impossible
	External output pin status 1 (External Output pin display1) The external input pin status is returned.	4 bytes	Reading		00000000h to FFFFFFFFh					
2C12	Input device status (External Input signal display) The number of entries in input device status is returned.	1 bytes	Reading	4	04h (fixed)				9	Impossible
	Input device status 1 (External Input signal display1) The input device status 1 is returned.	4 bytes	Reading		00000000h to FFFFFFFFh					
	Input device status 2 (External Input signal display2) The input device status 2 is returned.	4 bytes	Reading		00000000h to FFFFFFFFh					
	Input device status 3 (External Input signal display3) The input device status 3 is returned.	4 bytes	Reading		00000000h to FFFFFFFFh					
	Input device status 4 (External Input signal display4) The input device status 4 is returned.	4 bytes	Reading		00000000h to FFFFFFFFh					
2C18	Power ON cumulative time (Power ON cumulative time) The cumulative time after power on of the servo amplifier is returned.	4 bytes	Reading	0	00000000h to FFFFFFFFh	hour			2	Impossible
2C19	Number of inrush relay ON/OFF times (Number of inrush relay on/off times) The number of on/off times of the inrush relay of the servo amplifier is returned.	4 bytes	Reading	0	00000000h to FFFFFFFFh	times			2	Impossible

Address	Name and function	Data type	Read/ write	Initial value	Range	Unit	Saved to EEP-ROM	Para-meter	No. of Points/ No. of Registers	Continuous read/ continuous write
2C20	Machine diagnostic status (Machine diagnostic status) [Bit 0 to Bit 3: Friction estimation status at forward rotation] 0: Normal (Friction is being estimated.) 1: Normal (Estimation is completed.) 2: Warning (The servo motor may rotate in one direction too frequently.) 3: Warning (The servo motor speed may too slow for friction estimation.) 4: Warning (The change in the servo motor speed may be small for friction estimation.) 5: Warning (The acceleration/deceleration time constants may be too short for friction estimation.) 6: Warning (The operation time may not be enough.) When warning conditions for 2 to 6 are met at the same time, the smaller number is returned. When an estimation is completed even though a warning has once occurred, the status changes to Estimation is completed. [Bit 4 to Bit 7: Friction estimation status at reverse rotation] 0: Normal (Friction is being estimated.) 1: Normal (Estimation is completed.) 2: Warning (The servo motor may rotate in one direction too frequently.) 3: Warning (The servo motor speed may too slow for friction estimation.) 4: Warning (The change in the servo motor speed may be small for friction estimation.) 5: Warning (The acceleration/deceleration time constants may be too short for friction estimation.) 6: Warning (The operation time may not be enough.) When warning conditions for 2 to 6 are met at the same time, the smaller number is returned. When an estimation is completed even though a warning has once occurred, the status changes to Estimation is completed. [Bit 8 to Bit 11: Vibration estimation status] 0: During estimation 1: Estimation is completed. [Bit 12 to Bit 15: reserved] The value at reading is undefined.	2 bytes	Reading	0	0000h to FFFFh					1	Possible
2C21	Static friction torque at forward rotation (Static friction torque at forward rotation) Coulomb friction at forward rotation torque is returned in increments of 0.1%.	2 bytes	Reading	0	8000h to 7FFFh	0.1 %			1	Possible
2C22	Dynamic friction torque at forward rotation (at rated speed) (Dynamic friction torque at forward rotation (at rated speed)) Friction torque at forward rotation torque at rated speed is returned in increments of 0.1%.	2 bytes	Reading	0	8000h to 7FFFh	0.1 %			1	Possible
2C23	Static friction torque at reverse rotation (Static friction torque at reverse rotation) Coulomb friction at reverse rotation torque is returned in increments of 0.1%.	2 bytes	Reading	0	8000h to 7FFFh	0.1 %			1	Possible

Address	Name and function	Data type	Read/write	Initial value	Range	Unit	Saved to EEP-ROM	Para-meter	No. of Points/ No. of Registers	Continuous read/ continuous write
2C24	Dynamic friction torque at reverse rotation (at rated speed) (Dynamic friction torque at reverse rotation (at rated speed)) Friction torque at reverse rotation torque at rated speed is returned in increments of 0.1%.	2 bytes	Reading	0	8000h to 7FFFh	0.1 %			1	Possible
2C25	Vibration frequency during stop/servo-lock (Oscillation frequency during motor stop) Vibration frequency during stop/servo-lock is returned in increments of 1 Hz.	2 bytes	Reading	0	8000h to 7FFFh	Hz			1	Possible
2C26	Vibration level during stop/servo-lock (Vibration level during motor stop) Vibration level during stop/servo-lock is returned in increments of 0.1%.	2 bytes	Reading	0	8000h to 7FFFh	0.1 %			1	Possible
2C27	Vibration frequency during operation (Oscillation frequency during motor operating) Vibration frequency during operation is returned in increments of 1 Hz.	2 bytes	Reading	0	8000h to 7FFFh	Hz			1	Possible
2C28	Vibration level during operation (Vibration level during motor operating) Vibration level during operation is returned in increments of 0.1%.	2 bytes	Reading	0	8000h to 7FFFh	0.1 %			1	Possible
2D01 to 2D0A	Control input 1 to Control input 10 (Control DI 1 to Control DI 10) The on/off status of input device can be read. The on/off status of input device can also be set.	2 bytes	Read/write	0	0000h to FFFFh				1	Possible
2D11 to 2D1A	Control output 1 to Control output 10 (Status DO 1 to Status DO 10) The on/off status of output device can be read.	2 bytes	Reading		0000h to FFFFh				1	Possible
2D20	Speed limit value (Velocity limit value) The speed limit value is set.	4 bytes	Read/write	50000	00000000h to permissible instantane-ous speed	0.01 r/min	○	PT52	2	Impossible
2D28	Servo motor rated speed (Motor rated speed) The servo motor rated speed is returned.	4 bytes	Reading		00000000h to FFFFFFFFh	r/min			2	Impossible
2D29	Servo motor maximum speed (Motor max speed) The servo motor maximum speed is returned.	4 bytes	Reading		00000000h to FFFFFFFFh	r/min			2	Impossible
2D35	Encoder status display (Encoder status) The number of entries is returned.	1 bytes	Reading	1	01h (fixed)				3	Impossible
	Encoder status 1 (Encoder status1) The encoder status is returned. Bit 0: Whether the servo amplifier is used in an absolute position detection system or not is returned. 0 = Incremental system 1 = Absolute position detection system Bit 1 to Bit 31: Reserved	4 bytes	Reading		00000000h to 00000001h					
2D42	Maximum value of multi-revolution counter (Max ABS counter) The maximum value of the multi-revolution counter is displayed.	4 bytes	Reading		00000000h to FFFFFFFFh	rev			2	Impossible
2D50	One-touch tuning command (One-touch tuning mode) Setting a value of "1" to "3" starts one-touch tuning. After one-touch tuning is completed, the setting value automatically changes to "0". 1: Basic setting 2: High setting 3: Low setting	1 bytes	Read/write	0	00h to 03h				1	Impossible
2D51	One-touch tuning status (One-touch tuning status) The one-touch tuning progress is returned.	1 bytes	Read	0	00h to 64h	%			1	Impossible

Address	Name and function	Data type	Read/ write	Initial value	Range	Unit	Saved to EEP-ROM	Para-meter	No. of Points/ No. of Registers	Continuous read/ continuous write
2D52	Stop of one-touch tuning (One-touch tuning Stop) Writing "1EA5h" can stop one-touch tuning. Any value other than "1EA5h" is ignored.	2 bytes	Writing	0	0000h/ 1EA5h				1	Impossible
2D53	Returning parameters changed in one-touch tuning (One-touch tuning Clear) The parameter changed in one-touch tuning can be returned to the value before the change. The description of the setting values is as follows. 0000: Restores the default value 0001: Restores the value before one-touch tuning.	2 bytes	Writing	0	0000h to 0001h				1	Impossible
2D54	One-touch tuning error code (One-touch tuning Error Code) An error code of the one-touch tuning is returned. The description of the error codes is as follows. 0000: Finished normally C000: Tuning canceled C001: Overshoot exceeded C002: Servo-off during tuning C003: Control mode error C004: Time-out C005: Load to motor inertia ratio misestimated C00F: One-touch tuning disabled	2 bytes	Reading	0	0000h to C00Fh				1	Impossible
603F	Latest error No. display (Error code) The latest error No. that occurred after the power on is returned. The error number is as follows. 1000h: Generic error	2 bytes	Reading	0	0000h to FFFFh				1	Impossible
6040	Control command (Controlword) Set control commands to control the servo amplifier. Bit 0: switch on Bit 1: enable voltage Bit 2: quick stop Bit 3: enable operation Bit 4 to Bit 6: operation mode specific Bit 7: fault reset Bit 8: halt Bit 9: operation mode specific Bit 10 to Bit 14: reserved Bit 15: operation mode specific	2 bytes	Read/ write	0	0000h to FFFFh				1	Impossible
6041	Control status (Statusword) The current control status can be checked. Bit 0: ready to switch on Bit 1: switched on Bit 2: operation enabled Bit 3: fault Bit 4: voltage enabled Bit 5: quick stop Bit 6: switch disabled Bit 7: warning Bit 8: reserved Bit 9: remote Bit 10: target reached Bit 11: internal limit active Bit 12 to Bit 13: operation mode specific Bit 14 to Bit 15: reserved	2 bytes	Reading		0000h to FFFFh				1	Impossible
605A	Quick stop option code The operation method of deceleration to a stop can be specified.	2 bytes	Read/ write	2	0002h (fixed)		○	PT69	1	Impossible
605D	Halt option code Set how to decelerate the servo motor to a stop at Halt reception.	2 bytes	Read/ write	1	0001h (fixed)		○	PT69	1	Impossible

Address	Name and function	Data type	Read/ write	Initial value	Range	Unit	Saved to EEP-ROM	Para-meter	No. of Points/ No. of Registers	Continuous read/ continuous write
6060	Control mode (Modes of operation) Set the control mode. 0: No mode assigned 1: Profile position mode (pp) 3: Profile velocity mode (pv) 4: Profile torque mode (tq) 6: Homing mode (hm) -20: Position control mode -21: Speed control mode -22: Torque control mode	1 bytes	Read/ write	0	80h to 7Fh				1	Impossible
6061	Control mode display (Modes of operation display) The current control mode is returned. 0: No mode assigned 1: Profile position mode (pp) 3: Profile velocity mode (pv) 4: Profile torque mode (tq) 6: Homing mode (hm) -20: Position control mode -21: Speed control mode -22: Torque control mode	1 bytes	Reading	-20	80h to 7Fh				1	Impossible
6063	Current position (absolute position) [ENC unit] (Position actual internal value) The current position is returned.	4 bytes	Reading		80000000h to 7FFFFFFFh	pulse			2	Impossible
6064	Current position (Position actual value) The current position in the command unit on the basis of the home position is returned. When the home position is not set, the current position in the command unit on the basis of the zero point of the encoder is returned.	4 bytes	Reading		80000000h to 7FFFFFFFh	pos units			2	Impossible
6065	Error excessive width (Following error window) In the profile position mode (pp), when the time set with Following error time out (6066h) has elapsed with the number of droop pulses exceeding the setting value of this object, bit 13 of Statusword (6041h) is turned on. When "FFFFFFFFh" is set, Bit 13 of Statusword (6041h) is always off.	4 bytes	Read/ write	12582912	00000000h to FFFFFFFFh	pos units	○	PC75/ PC76	2	Impossible
6066	Error excessive detection time (Following error time out) Refer to Following error window (6065h).	2 bytes	Read/ write	10	0000h to FFFFh	ms	○	PC77	1	Impossible
6067	Permissible error range (Position window) In the profile position mode (pp), when the time set with Position windows time (6068h) has elapsed with the number of droop pulses equal to or lower than the setting value of this object, Bit 10 of Statusword (6041h) is turned on. [Setting range] This setting value is limited to the range of 00000000h to 0000FFFEh. When "FFFFFFFFh" is set, Position window is disabled as an exception.	4 bytes	Read/ write	100	00000000h to 0000FFFEh/ FFFFFFFFh	pos units	○	PT65	2	Impossible
6068	Permissible error judgment time (Position window time) Refer to Position window (6067h).	2 bytes	Read/ write	10	0000h to FFFFh	ms	○	PT66	1	Impossible
606B	Command speed (Velocity demand value) The speed command is returned.	4 bytes	Reading	0	80000000h to 7FFFFFFFh	0.01 r/min			2	Impossible
606C	Current speed (Velocity actual value) The current speed is returned.	4 bytes	Reading		80000000h to 7FFFFFFFh	0.01 r/min			2	Impossible

Address	Name and function	Data type	Read/ write	Initial value	Range	Unit	Saved to EEP-ROM	Para-meter	No. of Points/ No. of Registers	Continuous read/ continuous write
606D	Speed reached judgment width (Velocity window) In the profile velocity mode (pv), when the time set with Velocity window time (606Eh) has elapsed with the current speed equal to or lower than the setting value of this object, Bit 10 of Statusword (6041h) is turned on.	2 bytes	Read/ write	2000	0000h to FFFFh	0.01 r/min	○	PT67	1	Impossible
606E	Speed reached judgment time (Velocity window time) Refer to Velocity window (606Dh).	2 bytes	Read/ write	10	0000h to FFFFh	ms	○	PT68	1	Impossible
606F	Zero speed (Velocity threshold) In the profile velocity mode (pv), when the time set with Velocity threshold time (6070h) has elapsed with the current speed exceeding the setting value of this object, Bit 12 of Statusword (6041h) is turned off.	2 bytes	Read/ write	5000	0000h to FFFFh	0.01 r/min	○	PT63	1	Impossible
6070	Zero speed judgment time (Velocity threshold time) Refer to Velocity threshold (606Fh).	2 bytes	Read/ write	10	0000h to FFFFh	ms	○	PT64	1	Impossible
6071	Command torque (Target torque) Set the torque command used in the profile torque mode (tq).	2 bytes	Read/ write	0	8000h to 7FFFh	0.1 %			1	Impossible
6072	Maximum torque (nominal value) (Max torque) The maximum torque of the servo motor is returned. The value matches with the maximum torque listed in "HG-KN_/HG-SN_ Servo Motor Instruction Manual".	2 bytes	Read/ write		0000h to FFFFh	0.1 %			1	Impossible
6074	Internal torque command (Torque demand value) The torque command is returned.	2 bytes	Read	0	8000h to 7FFFh	0.1 %			1	Impossible
6077	Current torque (Torque actual value) The current torque is returned. The read data is in the unit of 0.1%.	2 bytes	Reading		8000h to 7FFFh	0.1 %			1	Impossible
607A	Position command (absolute/incremental) (Target position) In the profile position mode (pp), the range is limited depending on the unit. [Setting range] degree: -360000 to 360000 Other than degree: -999999 to 999999	4 bytes	Read/ write	0	80000000h to 7FFFFFFFh	pos units			2	Impossible
607B	Command value limit (Position range limit) The number of entries is returned.	1 bytes	Reading	2	00h to 02h				5	Impossible
	Command value limit (lower limit) (Min position range limit) Set the range for limiting the command position (lower limit value). The settable values vary depending on the setting of [Pr. PT01]. [Pr. PT01] = _ 2 _ _ (degree): 00000000h to 00057E3Fh (0 to 359999) [Pr. PT01] = _ 3 _ _ (pulse): 80000000h to 7FFFFFFFh (-2147483648 to 2147483647)	4 bytes	Read/ write	00000000h (degree) 80000000h (pulse)	80000000h to 7FFFFFFFh	pos units				
	Command value limit (upper limit) (Max position range limit) Set the range for limiting the command position (upper limit value). The settable values vary depending on the setting of [Pr. PT01]. [Pr. PT01] = _ 2 _ _ (degree): 00000000h to 00057E3Fh (0 to 359999) [Pr. PT01] = _ 3 _ _ (pulse): 80000000h to 7FFFFFFFh (-2147483648 to 2147483647)	4 bytes	Read/ write	00057E3Fh (degree) 7FFFFFFFh (pulse)	80000000h to 7FFFFFFFh	pos units				
607C	Home position (Home offset) The home position is returned. Only reading the value is available. Do not perform writing because doing so causes an error.	4 bytes	Read/ write	0	80000000h to 7FFFFFFFh	pos units	○		2	Impossible

Address	Name and function	Data type	Read/ write	Initial value	Range	Unit	Saved to EEP-ROM	Para-meter	No. of Points/ No. of Registers	Continuous read/ continuous write
607D	Software limit (Software position limit) Set the range for limiting the command position. Target position (607Ah) is limited within the range between Min position limit (607Dh: 1) and Max position limit (607Dh: 2). When the set value of Min position limit (607Dh: 1) is equal to or greater than the set value of Max position limit (607Dh: 2), the function of Software position limit (607Dh) is disabled.	1 bytes	Reading	2	02h (fixed)				5	Impossible
	Stroke limit - (Min position limit) The stroke limit value in the reverse direction is returned in units of commands.	4 bytes	Read/ write	0	80000000h to 7FFFFFFFh	pos units	○	PT17/ PT18		
	Stroke limit + (Max position limit) The stroke limit value in the forward direction is returned in units of commands.	4 bytes	Read/ write	0	80000000h to 7FFFFFFFh	pos units	○	PT15/ PT16		
607E	Rotation direction selection (Polarity) The rotation direction selection can be set. Bit 7: position polarity Bit 6: velocity polarity Bit 5: torque polarity Turn on or off both bit 6 and bit 7 to set the rotation direction to position commands and speed commands. Turn on or off all of bit 5 to bit 7 to set the rotation direction to torque commands.	1 bytes	Read/ write	00h	00h to FFh		○	PA14/ PC29	1	Impossible
607F	Maximum speed command (Max profile velocity) Set the maximum speed command for the profile position mode (pp) and profile velocity mode (pv). When a value exceeding this object is set to Target velocity (60FFh) or Profile velocity (6081h), the speed is limited with the value of this object.	4 bytes	Read/ write	2000000	00000000h to 001E8480h (2000000)	0.01 r/min	○	PT51	2	Impossible
6080	Servo motor maximum speed (Max motor speed) The maximum speed of the servo motor is returned. Operation cannot be performed at a speed exceeding the speed set with this object.	4 bytes	Read/ write		00000000h to FFFFFFFFh	r/min			2	Impossible
6081	Command speed (Profile velocity) The current speed command value can be read. The speed command value can also be set. Set a value in units of 0.01 r/min.	4 bytes	Read/ write	10000	00000000h to permissible instantane- ous speed	0.01 r/min	○	PT50	2	Impossible
6083	Acceleration time constant (Profile acceleration) The current acceleration time constant can be read. The acceleration time constant can also be set. Set the length of time until the servo motor accelerates to the rated speed in units of ms.	4 bytes	Read/ write	0	00000000h to FFFFFFFFh	ms	○	PC01	2	Impossible
6084	Deceleration time constant (Profile deceleration) The current deceleration time constant can be read. The deceleration time constant can also be set. Set the length of time until the servo motor decelerates from the rated speed to a stop in units of ms.	4 bytes	Read/ write	0	00000000h to FFFFFFFFh	ms	○	PC02	2	Impossible

Address	Name and function	Data type	Read/ write	Initial value	Range	Unit	Saved to EEP-ROM	Para-meter	No. of Points/ No. of Registers	Continuous read/ continuous write
6085	Deceleration time constant at Quick stop command (Quick stop deceleration) Set a deceleration time constant for the Quick stop function. Set a time for the servo motor to stop from the rated speed. When "0" is set, the operation is performed with 100 ms. [Range] Limited within the range of 0 to 20000. When "0" is set, the operation is performed with 100 ms. The operation depends on the specification of [Pr. PC51].	4 bytes	Read/ write	100	00000000h to FFFFFFFFh	ms	○	PC51	2	Impossible
6086	Acceleration/deceleration pattern (Motion profile type) Set the acceleration/deceleration pattern in the profile position mode (pp). The description is as follows. -1: S-pattern For this object, "-1" is always returned. Values other than "-1" cannot be set.	2 bytes	Read/ write	-1	FFFFh (-1) (fixed)				1	Impossible
6087	Torque slope 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. [Range] Limited within the range of 0 to 10000000. When "0" is set, the setting value is invalid (step input).	4 bytes	Read/ write	0	00000000h to 00989680h	0.1%	○	PT49	2	Impossible
6088	Torque command pattern (Torque profile type) Set the torque command pattern. 0: Linear interpolation method Values other than 0 cannot be set.	2 bytes	Read/ write	0	0000h (fixed)				1	Impossible
608F	Encoder information (Position encoder resolution) The number of entries is returned.	1 bytes	Reading	2	02h (fixed)	pulse/ rev			5	Impossible
	Encoder resolution (Encoder increments) The encoder resolution is returned.	4 bytes	Read/ write		00000000h to FFFFFFFFh	pulse				
	Number of revolutions of the servo motor (fixed to 1 rev) (Motor revolutions) The fixed value "1" is returned.	4 bytes	Read/ write	1	00000001h to 00000001h	rev				
6091	Servo motor shaft gear ratio (Gear ratio) The number of entries is returned.	1 bytes	Reading	2	02h (fixed)				5	Impossible
	Number of revolutions of the servo motor axis (electronic gear numerator) (Motor revolutions) Set the numerator of the electronic gear. Refer to [Pr. PA06] for the settable values.	4 bytes	Read/ write	1	00000001h to 00FFFFFFh (16777215)	rev	○	PA06		
	Number of revolutions of the drive axis (electronic gear denominator) (Shaft revolutions) Set the numerator of the electronic gear. Refer to [Pr. PA07] for the settable values.	4 bytes	Read/ write	1	00000001h to 00FFFFFFh (16777215)	rev	○	PA07		
6092	Travel distance per revolution of the drive axis (Feed constant) The number of entries is returned. Electronic gear expression: Travel distance/Number of revolutions of the drive axis	1 bytes	Reading	2	02h (fixed)				5	Impossible
	Travel distance (Feed) The value is set automatically according to the [Pr. PT01] setting. Setting in [Pr. PT01]: _ 2 _ _ (degree) 360000 _ 3 _ _ (pulse) Encoder resolution	4 bytes	Read/ write	360000 (degree)/ Encoder resolution (pulse)	00000001h to FFFFFFFFh	pos units				
	Number of revolutions of the drive axis (fixed to 1 rev) (Shaft revolutions) No value can be written as it is automatically set with [Pr. PT01]. If a value is written, this setting is disabled.	4 bytes	Read/ write	1	00000001h to 00000001h	rev	○	PT01		

Address	Name and function	Data type	Read/ write	Initial value	Range	Unit	Saved to EEP-ROM	Para-meter	No. of Points/ No. of Registers	Continuous read/ continuous write
6098	Home position return types (Homing method) Set a home position return type.	1 bytes	Read/ write	37	D5h (-43) to 27h (39)		○	PT45	1	Impossible
6099	Home position return speed (Homing speeds) The number of entries is returned.	1 bytes	Reading	2	02h (fixed)				5	Impossible
	Home position return speed (Speed during search for switch) Set the servo motor speed at home position return.	4 bytes	Read/ write	10000	0 to permissible instantane-ous speed	0.01 r/min	○	PT05		
	Creep speed (Speed during search for zero) Set a creep speed after proximity dog at home position return.	4 bytes	Read/ write	1000	0 to permissible instantane-ous speed	0.01 r/min	○	PT06		
609A	Set acceleration/deceleration time constant at home position return. (Homing acceleration) Set the acceleration/deceleration time constants at home position return. Set a time for the servo motor to reach the rated speed.	4 bytes	Read/ write	0	00000000h to 00004E20h (20000)	ms	○	PT61/ PT62	2	Impossible
60A8	SI unit position SI unit position (60A8h) is set automatically with [Pr. PT01]. The following shows the data structure. [Bit 0 to Bit 7: Reserved] [Bit 8 to Bit 15: Denominator] "00" means "Dimensionless". [Bit 16 to Bit 23: Numerator] "41" means "degree", and "00" means "Dimensionless". [Bit 24 to Bit 31: Prefix] "FD" means "milli", and "00" means "none".	4 bytes	Read/ write	FD410000h (degree) 00000000h (pulse)	00000000h to FFFFFFFFh				2	Impossible
60A9	SI unit velocity (SI unit velocity) The SI unit velocity is returned. FEB44700h: 0.01 r/min	4 bytes	Read/ write	FEB44700h	FEB44700h (0.01 r/min)				2	Impossible
60B8	Touch probe function setting (Touch probe function) Set the command for the touch probe function.	2 bytes	Read/ write	0	0000h to FFFFh				1	Possible
60B9	Status of the touch probe function (Touch probe status) The status of the touch probe function is returned.	2 bytes	Reading	0	0000h to FFFFh				1	Possible
60BA	Rising edge position of touch probe (Touch probe pos1 pos value) The position latched at the rising edge of touch probe 1 is returned.	4 bytes	Reading	0	80000000h to 7FFFFFFFh	pos units			2	Possible
60BB	Falling edge position of touch probe (Touch probe pos1 neg value) The position latched at the falling edge of touch probe 1 is returned.	4 bytes	Reading	0	80000000h to 7FFFFFFFh	pos units			2	Possible
60E0	Forward rotation torque limit (Positive torque limit value) The forward rotation torque limit can be read. The forward rotation torque limit can also be set. Set a forward torque limit value in units of 0.1%.	2 bytes	Read/ write	10000	0000h to 2710h (10000)	0.1%	○	PA11/ (PA12)	1	Impossible
60E1	Reverse rotation torque limit (Negative torque limit value) The reverse rotation torque limit can be read. The reverse rotation torque limit can also be set. Set a reverse torque limit value in units of 0.1%.	2 bytes	Read/ write	10000	0000h to 2710h (10000)	0.1%	○	PA12/ (PA11)	1	Impossible

Address	Name and function	Data type	Read/ write	Initial value	Range	Unit	Saved to EEP-ROM	Para-meter	No. of Points/ No. of Registers	Continuous read/ continuous write
60E3	Supported homing method (Supported homing method) The number of supported homing methods is returned.	1 bytes	Reading	39	00h to FFh				1 + number of read points	Impossible
	Number specification of supported homing methods (1st to 39th) (1st supported homing method) Set the number of the supported home position return type.	1 bytes	Reading	37	80h to 7Fh					
60F2	Profile position mode setting (Positioning option code) Set the profile position mode. Bit 1 to Bit 3 always notify "0". Setting a value other than "0" will cause an error. [Bit 1/Bit 0: relative option] How to handle the relative position command during pp is specified. 00: The positioning is performed with the relative position from the internal absolute target position. [Bit 3/Bit 2: change immediately option] The operation of when change set immediately (control word Bit 5) is 1 during pp is specified. 00: Normal pp mode operation (New Target position, profile velocity, acceleration, and others are reflected immediately.) [Bit 7/Bit 6: rotary axis direction option] Specify the operation of the rotation axis during pp and pt. 00: The servo motor rotates to the target position in a direction specified with a sign of the position data. 01: The servo motor rotates in the address decreasing direction regardless of the sign of the position data. 10: The servo motor rotates in the address increasing direction regardless of the sign of the position data. 11: 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.	2 bytes	Read/ write	0000h	0000h to 00C0h				1	Impossible
60F4	Droop pulses [command unit] (Following error actual value) The droop pulses are returned.	4 bytes	Read		80000000h to 7FFFFFFFh	pos units			2	Impossible
60FA	Speed command (Control effort) The speed command is returned.	4 bytes	Read	0	80000000h to 7FFFFFFFh	0.01 r/min			2	Impossible
60FF	Command speed (Target velocity) Set the speed command used in the profile velocity mode (pv).	4 bytes	Read/ write	0	80000000h to 7FFFFFFFh	0.01 r/min			2	Impossible
6502	Supported control mode (Supported drive modes) The supported control mode is returned. Bit 0: Profile position mode (pp) Bit 2: Profile velocity mode (pv) Bit 3: Profile torque mode (tq) Bit 5: Homing mode (hm)	4 bytes	Reading	0000002Dh	0000002Dh to 0000002Dh				2	Impossible

6.2 Object library details (objects in the 1000s)

> **POINT**
> ●This section describes the objects in the 1000s. Refer to section 6.1 for details on the objects not listed here.

6.2.1 Writing command to EEP-ROM (1010h)

> **POINT**
> ●Before shutting off the power after executing the writing command to EEP-ROM (Store Parameters), always check that parameters are not being saved (Bit 0 is on).

For the objects that can be saved, write "65766173h" (= reverse order of the ASCII code of "save") to the corresponding sub object of the writing command to EEP-ROM (Store Parameters) (1010h) to store the object in the EEP-ROM of the servo amplifier.
The value saved in the EEP-ROM is set to the object at the next power-on. Servo parameters can also be modified through the object library. However, the new setting is not automatically written to the EEP-ROM. To write the new setting, use the writing command to EEP-ROM (Store Parameters) (1010h).
Executing the writing command to EEP-ROM (Store Parameters) (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.

Address	Name		Data type	Read/ write	No. of Points/ No. of Registers	Continuous read/ continuous write
1010h	Writing command to EEP-ROM (Store parameters)	Number of entries (Number of entries)	1 bytes	Reading	3	Impossible
		Restoring all default parameters (Restore all default parameters)	4 bytes	Read/ write		

Parameter setting values can be saved in EEP-ROM.

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(1) Usage

This object can read the availability of each Sub Index. The following table shows the returned values of each item.

Item	Saved parameter	Returned value
Number of entries (Number of entries)		01h
Saving all parameters (Save all parameters)	Index: 2001h to 27FFh	00000001h (available)

Select the items to be saved in EEP-ROM using this object. At this time, set "00h" or "01h" for Number of entries.

To save servo amplifier parameters in EEP-ROM, configure required settings following the table below.

When bit 1 (EEP-ROM write completed) of the control output (2D11h) is "1", saving data in EEP-ROM has been completed.

Writing a value other than "65766173h" and "00000000h" to each item results in an error.

Item	Setting value	Write to EEP-ROM Parameter
Number of entries (Number of entries)	01h	
Saving all parameters (Save all parameters)	00000000h	Disabled
	65766173h ("save")	Enabled
	Other than above	Error

6.2.2 Restore default EEP-ROM parameters (1011h)

Address	Name		Data type	Read/ write	No. of Points/ No. of Registers	Continuous read/ continuous write
1011h	Restoring default EEP-ROM parameters (Restore default parameters)	Number of entries (Number of entries)	1 bytes	Reading	3	Impossible
		Restoring all default parameters (Restore all default parameters)	4 bytes	Read/ write		

The parameter of the servo amplifier can be rewritten with the factory setting.

When "64616F6Ch" (= reverse order of ASCII code of "load") is written to Restore all default parameters (1011h: 1) and the power in cycled, the parameter is initialized.

6. MODBUS REGISTERS

6.3 Object library details (objects in the 2000s)

> **POINT**
> ●This section describes the objects in the 2000s. Refer to section 6.1 for details on the objects not listed here.

6.3.1 External input pin status (2C10h)

Address	Name		Data type	Read/ write	No. of Points/ No. of Registers	Continuous read/ continuous write
2C10h	External input pin status (External Input pin display)	Number of entries (Number of entries)	1 bytes	Reading	3	Impossible
		External input pin status 1 (External Input pin display1)	4 bytes	Reading		

The ON/OFF state of the external input pins input to the servo amplifier can be read.

(1) Usage

Read the ON/OFF state of external input pins using this object. At this time, "02h" is returned to Number of entries.

External Input pin display1 displays the input pin status of the MR-JE-_C servo amplifier. The following table shows the details. When the input of the target pin is on, "1" is returned. When the input of the target pin is off, "0" is returned. The values in the areas marked with diagonal lines are indefinite.

Bit	CN3 connector pin		Bit	CN3 connector pin		Bit	CN3 connector pin		Bit	CN3 connector pin
0	3		8			16			24	
1	4		9			17			25	
2	1		10			18			26	
3	2		11			19			27	
4	8		12			20			28	
5	21		13			21			29	
6	6		14			22			30	
7	19		15			23			31	

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6.3.2 External output pin status (2C11h)

Address	Name		Data type	Read/ write	No. of Points/ No. of Registers	Continuous read/ continuous write
2C11h	External output pin status (External Output pin display)	Number of entries (Number of entries)	1 bytes	Reading	3	Impossible
		External output pin status 1 (External Output pin display1)	4 bytes	Reading		

The ON/OFF state of external output pins output from the servo amplifier can be read.

(1) Usage

Read the ON/OFF state of external output pins using this object. At this time, "02h" is returned to Number of entries.

External Output pin display1 displays the output pin status of the MR-JE-_C servo amplifier. The following table shows the details. When the output of the target pin is on, "1" is returned. When the output of the target pin is off, "0" is returned. The values in the areas marked with diagonal lines are indefinite.

Bit	CN3 connector pin
0	14
1	22
2	16
3	
4	
5	15
6	
7	

Bit	CN3 connector pin
8	
9	
10	
11	
12	
13	
14	
15	

Bit	CN3 connector pin
16	
17	
18	
19	
20	
21	
22	
23	

Bit	CN3 connector pin
24	
25	
26	
27	
28	
29	
30	
31	

6.3.3 Input device status (2C12h)

Address	Name		Data type	Read/ write	No. of Points/ No. of Registers	Continuous read/ continuous write
2C12h	Input device status (External Input signal display)	Number of entries (Number of entries)	1 bytes	Reading	9	Impossible
		Input device status 1 (External Input signal display1)	4 bytes			
		Input device status 2 (External Input signal display2)	4 bytes			
		Input device status 3 (External Input signal display3)	4 bytes			
		Input device status 4 (External Input signal display4)	4 bytes			

The current input device status can be read.

6. MODBUS REGISTERS

(1) Usage

External Input signal display1 (Input device status 1) to External Input signal display4 (Input device status 4) display the ON/OFF state of each input device of the MR-JE-_C servo amplifier. The following table shows the details. When the input of the target device is on, "1" is returned. When the input of the target device is off, "0" is returned. The values in the areas marked with diagonal lines are indefinite.

Bit	Input device abbreviation (Note)			
	Input device status 1	Input device status 2	Input device status 3	Input device status 4
0	SON (Servo-on)			
1	LSP (Forward rotation stroke end)			
2	LSN (Reverse rotation stroke end)			
3	TL (External torque limit selection)			
4	TL1 (Internal torque limit selection)			
5	PC (Proportional control)			
6	RES (Reset)			
7	CR (Clear)			
8	SP1 (Speed selection 1)			
9	SP2 (Speed selection 2)		DOG (Proximity dog)	
10	SP3 (Speed selection 3)			
11	ST1/RS2 (Forward rotation start/reverse rotation selection)			
12	ST2/RS1 (Reverse rotation start/forward rotation selection)			
13	CM1 (Electronic gear setting 1)			
14	CM2 (Electronic gear setting 2)			
15	LOP (Control switching)			
16				
17				
18	EM2/EM1 (Forced stop 2/1)			
19				
20	STAB2 (Second acceleration/deceleration selection)			
21				
22				
23				
24				
25				
26				
27	CDP (Gain switching)			
28				
29				
30				
31				

Note. For details on the symbols, refer to section 3.5 in "MR-JE-_C Servo Amplifier Instruction Manual".

6.3.4 Control input (2D01h to 2D0Ah)

Address	Name	Data type	Read/write	No. of Points/ No. of Registers	Continuous read/ continuous write
2D01h to 2D0Ah	Control input (Control DI1 to Control DI10)	2 bytes	Read/write	1	Possible

The on/off status of input device can be read.
The on/off status of input device can also be set.

The following table lists readable and writable input devices.

(1) Bit definition of control DI1

Bit	Symbol	Description
0	C_EM2	This device can be used by setting "2 _ _ _" (initial value) in [Pr. PA04]. When C_EM2 is turned on, the command decelerates the servo motor to a stop. Turn C_EM2 off in the forced stop state to reset that state. In the torque control mode, C_EM2 functions the same as C_EM1.
	C_EM1	This device can be used by setting "0 _ _ _" in [Pr. PA04]. When C_EM1 is turned on, the base circuit shuts off, and the dynamic brake operates to decelerate the servo motor to a stop. Turn C_EM1 off in the forced stop state to reset that state.
1		The value at reading is undefined. Set "0" when writing.
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" when writing.
6		
7		
8	C_TL1	When C_TL1 is turned on, [Pr. PC35 Internal torque limit 2] can be selected. However, if the value of [Pr. PA11] (60E0h) or [Pr. PA12] (60E1h) is less than the limit value selected by [Pr. PC35], the value of [Pr. PA11] (60E0h) or [Pr. PA12] (60E1h) will be enabled.
9		The value at reading is undefined. Set "0" when writing.
10		
11		
12		
13		
14		
15		

(2) Bit definition of control DI2

Bit	Symbol	Description
0		The value at reading is undefined. Set "0" when 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 is stopped and then rotated by even one pulse due to any external factor, it generates torque to compensate for the droop pulses and returns to the original position. 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, switch on the C_PC and TL (External torque limit selection) at the same time to make the torque less than the rated by TLA (Analog torque limit). Do not use C_PC in the torque control. When C_PC is used in the torque control, operation may be performed at a speed exceeding the speed limit value.
9		The value at reading is undefined. Set "0" when 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) Bit definition of control DI3

Bit	Symbol	Description
0		The value at reading is undefined. Set "0" when writing.
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13	C_STAB2	Second acceleration/deceleration selection The device allows selection of the acceleration/deceleration time constant at servo motor rotation in the speed control mode or torque control mode. The S-pattern acceleration/deceleration time constant is always uniform.
14		The value at reading is undefined. Set "0" when writing.
15		

Bit 13	Acceleration time constant	Deceleration time constant
0	Pr. PC01	Pr. PC02
1	Pr. PC30	Pr. PC31

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(4) Bit definition of control DI4

Bit	Symbol	Description
0		The value at reading is undefined. Set "0" when writing.
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

(5) Bit definition of control DI5

Bit	Symbol	Description
0		The value at reading is undefined. Set "0" when writing.
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11	C_DOG	Proximity dog input When C_DOG is turned on, a proximity dog will be detected. The polarity for dog detection can be changed with [Pr. PT29].
12		The value at reading is undefined. Set "0" when writing.
13		
14		
15		

(6) Bit definition of control DI6

Bit	Symbol	Description
0		The value at reading is undefined. Set "0" when writing.
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

(7) Bit definition of control DI7

Bit	Symbol	Description
0		The value at reading is undefined. Set "0" when writing.
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

(8) Bit definition of control DI8

Bit	Symbol	Description
0		The value at reading is undefined. Set "0" when writing.
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

6. MODBUS REGISTERS

(9) Bit definition of control DI9

Bit	Symbol	Description
0		The value at reading is undefined. Set "0" when writing.
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

(10) Bit definition of control DI10

Bit	Symbol	Description
0		The value at reading is undefined. Set "0" when writing.
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

6.3.5 Control output (2D11h to 2D1Ah)

Address	Name	Data type	Read/ write	No. of Points/ No. of Registers	Continuous read/ continuous write
2D11h to 2D1Ah	Control output (Status DO1 to Status DO10)	2 bytes	Reading	1	Possible

The on/off status of output device can be read. The following table lists readable output devices.

(1) Bit definition of Status DO 1

Bit	Symbol	Description
0		The value at reading is undefined.
1	S_ERF	EEP-ROM write completed When a value is not written to EEP-ROM, S_ERF turns on. While a value is being written to EEP-ROM, S_ERF turns off.
2	S_SA	Speed reached When the servo motor speed reaches the following range, S_SA turns on. Set speed ± ((Set speed × 0.05) + 20) r/min When the preset speed is 20 r/min or less, SA always turns on. SA does not turn on even when the SON (Servo-on) is turned off or the servo motor speed by the external force reaches the preset speed while both ST1 (Forward rotation start) and ST2 (reverse rotation start) are off.
3	S_MBR	Electromagnetic brake interlock When a servo-off status or alarm occurs, S_MBR will turn off.
4	S_CDPS	Variable gain selection S_CDPS turns on during gain switching.
5		The value at reading is undefined.
6		
7	S_TL	Analog torque limit selection When TL (External torque limit selection) is turned on, S_TL turns on.
8	S_TL1	Torque limit selection When C_TL1 or TL1 (Internal torque limit selection) is turned on, S_TL1 turns on.
9		The value at reading is undefined.
10		
11		
12	S_INP	In-position When the number of droop pulses is in the in-position range, S_INP will turn on. The in-position range can be changed with [Pr. PA10]. When the in-position range is increased, INP may be always on during low-speed rotation.
13	S_TLC	Limiting torque S_TLC turns on when a generated torque reaches a value set with any of [Pr. PA11 Forward torque limit], [Pr. PA12 Reverse torque limit], or TLA (Analog torque limit).
14	S_ABSV	Absolute position undetermined S_ABSV turns on when the absolute position is undetermined.
15	S_BWNG	Battery warning When [AL. 92 Battery cable disconnection warning] or [AL. 9F Battery warning] has occurred, S_BWNG turns on. When the battery warning is not occurring, S_BWNG will turn off in 2.5 s to 3.5 s after power-on.

(2) Bit definition of Status DO 2

Bit	Symbol	Description
0	S_ZPASS	Z-phase already passed 0: Z-phase unpassed after start-up 1: Z-phase passed once or more after start-up
1 2		The value at reading is undefined.
3	S_ZSP	Zero speed state S_ZSP turns on when the servo motor speed is zero speed or less. Zero speed can be changed with [Pr. PC17].
4	S_VLC	Limiting speed S_VLC turns on when speed reaches a value limited with any of [Pr. PC05 Internal speed limit 1] to [Pr. PC11 Internal speed limit 7]. This turns off when SON (Servo-on) turns off.
5 6 7		The value at reading is undefined.
8	S_PC	Under proportional control S_PC turns on under proportional control.
9 10 11 12 13 14		The value at reading is undefined.
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. This bit will be enabled in the profile mode.

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(3) Bit definition of Status DO 3

Bit	Symbol	Description
0		The value at reading is undefined.
1		
2		
3		
4		
5		
6		
7		
8		
9	S_RSTP	Forced stop deceleration S_RSTP turns on during a forced stop deceleration.
10		The value at reading is undefined.
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) Bit definition of Status DO 4

Bit	Symbol	Description
0		The value at reading is undefined.
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

6. MODBUS REGISTERS

(5) Bit definition of Status DO 5

Bit	Symbol	Description
0		The value at reading is undefined.
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

(6) Bit definition of 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		
15		

(7) Bit definition of Status DO 7

Bit	Symbol	Description
0		The value at reading is undefined.
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

(8) Bit definition of Status DO 8

Bit	Symbol	Description
0		The value at reading is undefined.
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

(9) Bit definition of Status DO 9

Bit	Symbol	Description
0		The value at reading is undefined.
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

(10) Bit definition of Status DO 10

Bit	Symbol	Description
0		The value at reading is undefined.
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

6.3.6 SDO Abort Code (2A60h)

(1) List of registers

Address	Name	Data type	Read/ write	No. of Points/ No. of Registers	Continuous read/ continuous write
2A60h	SDO Abort Code (SDO Abort Code)	4 bytes	Read	2	Impossible

The latest SDO Abort Code generated in Modbus communication can be read.

The access to registers can be checked by reading the latest SDO Abort Code.

When an error is found by reading SDO Abort Codes, change the method to access registers.

(2) Usage

Read SDO Abort Codes using this register.

The following table lists the SDO Abort Codes.

SDO Abort Code	Description
0000 0000h	No problem found.
0504 0001h	Client/server command specifier not valid or unknown.
0601 0000h	Unsupported access to a register.
0601 0001h	Attempt to read a write only register.
0601 0002h	Attempt to write a read only register.
0602 0000h	Register does not exist in the Modbus resisters.
0604 0041h	Resister cannot be mapped to the PDO
0604 0042h	The number and length of the resisters to be mapped would exceed PDO length
0607 0010h	Data type does not match, length of service parameter does not match
0609 0011h	Element of resister does not exist.
0609 0030h	Value range of parameter exceeded (only for write access).
0609 0031h	Value of parameter written too high.
0609 0032h	Value of parameter written too low.
0800 0000h	Generic error.
0800 0020h	Data cannot be transferred or stored to the application
0800 0021h	Data cannot be transferred or stored to the application because of local control.
0800 0022h	Data cannot be transferred or stored to the application because of the present device state.
0800 0024h	No data available.

6.3.7 Access log 1 (2A64h)

Address	Name	Data type	Read/write	No. of Points/ No. of Registers	Continuous read/ continuous write
2A64h	Access log 1 (Access log 1)	4 bytes	Read	2	Impossible

The access log 1 can be read.

(1) Usage

Read the access log 1 using this register.

The access log 1 displays the address that was last accessed successfully in Modbus communication.

Access log 1	Response data
Higher 2 bytes	Address: xxxxh
Lower 2 bytes	For manufacturer setting: 00yyh

For example, when the input device status (Address: 2C12h) is accessed successfully, "2C120004h" is read from the access log 1.

6.3.8 Access log 2 (2A65h)

Address	Name	Data type	Read/write	No. of Points/ No. of Registers	Continuous read/ continuous write
2A65h	Access log 2 (Access log 2)	2 bytes	Read	1	Impossible

The access log 2 can be read.

(1) Usage

Read the access log 2 using this register.

The access log 2 displays the number of addresses that were accessed successfully in Modbus communication.

Use this register when an access error has occurred in the continuous read/write.

For example, when an error has occurred while the registers for monitoring (address: 2B01h to 2B0Ah) are continuously read, the error has occurred at the address 2B07h because the read value of the access log 2 is "0006h".

6.4 Object library details (objects in the 6000s)

```
┌─────────────────────────────────────────────────────────────────────────┐
│  POINT                                                                    │
│ ●This section describes the objects in the 6000s. Refer to section 6.1    │
│   for details on the objects not listed here.                             │
└─────────────────────────────────────────────────────────────────────────┘
```

6.4.1 Control status (6041h)

Address	Name	Data type	Read/write	No. of Points/No. of Registers	Continuous read/continuous write
6041h	Control status (Statusword)	2 bytes	Reading	1	Impossible

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

Bit	Description
0	Ready To Switch On
1	Switched On
2	Operation Enabled
3	Fault
4	Voltage Enabled
5	Quick Stop
6	Switch On Disabled
7	Warning
8	Reserved (Note 2)
9	Reserved (Note 2)
10	Target reached (Note 1)
11	Internal Limit Active
12 to 13	Operation Mode Specific (Note 1)
14 to 15	Reserved (Note 2)

Note 1. The description changes depending on the control mode.
     2. The value at reading is undefined.

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

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

Note. Not supported in the position control mode, speed control mode, and torque control mode.

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

6.4.2 Quick stop option code (605Ah)

Address	Name	Data type	Read/ write	No. of Points/ No. of Registers	Continuous read/ continuous write
605Ah	Quick stop option code (Quick stop option code)	2 bytes	Read/ write	1	Impossible

The operation method of deceleration to a stop can be specified. The following table shows the supported methods and the operations.

Setting value	Description
1	For manufacturer setting
2	In the profile mode (pp/pv) and homing mode (hm), the servo motor decelerates to a stop with Quick stop deceleration (6085h) and the state shifts to the Switch On Disabled state. The new setting of Quick stop deceleration is reflected at all times. 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	For manufacturer setting
4	
5	
6	
7	
8	

6.4.3 Halt option code (605Dh)

(1) Object list

Address	Name	Data type	Read/write	No. of Points/ No. of Registers	Continuous read/ continuous write
605Dh	Halt option code (Halt option code)	2 bytes	Read/write	1	Impossible

The following table shows descriptions of Halt option code (605Dh).

Setting value	Description
1	The description varies depending on the control mode. Refer to the following table.
2	For manufacturer setting
3	
4	

The following shows the meaning of Halt Bit (Bit 8 of Controlword (6040h)) and the reflecting timing of the deceleration time setting.

Control mode	Halt Bit is set to "1"	Halt Bit is set to "0"	Reflecting timing of deceleration time setting
Profile position mode (pp)	The servo motor decelerates to a stop according to Profile deceleration (6084h).	The operation restarts after the servo motor decelerates to a stop.	The new setting of Profile deceleration (6084h) is reflected when New set-point (Bit 4 of Controlword (6040h)) is set to "1".
Profile velocity mode (pv)	The servo motor decelerates to a stop according to Profile deceleration (6084h).	The operation restarts after the servo motor decelerates to a stop.	The new setting of Profile deceleration (6084h) is reflected at all times.
Profile torque mode (tq)	Torque demand value (6074h) becomes "0" with the amount of torque change set in Torque slope (6087h) regardless of the setting of Halt option code (605Dh).	The operation restarts after Torque demand value (6074h) becomes "0".	The new setting of Torque slope (6087h) is reflected at all times.
Homing mode (hm)	When Halt Bit is set to "1", the servo motor decelerates to a stop with Homing acceleration (609Ah) and the state does not change from Operation Enabled (servo-on). After that, when Halt Bit is set to "0" and Homing Operation Start (Bit 4 of Controlword (6040h)) is set to "0" and then "1", home position return is performed again.		The new setting of Homing acceleration (609Ah) is reflected when Homing Operation Start (Bit 4 of Controlword (6040h)) is set to "1".

6.4.4 Control mode display (6061h)

Address	Name	Data type	Read/ write	No. of Points/ No. of Registers	Continuous read/ continuous write
6061h	Control mode display (Modes of operation Display)	1 bytes	Reading	1	Impossible

The current control mode can be read.
The following table shows the correspondence between control modes and setting values.

Control mode	Setting value
Position control mode	-20
Speed control mode	-21
Torque control mode	-22
Profile position mode (pp)	1
Profile velocity mode (pv)	3
Profile torque mode (tq)	4
Homing mode (hm)	6
Test mode: JOG operation	-1
Test mode: Positioning operation	-2
Test mode: DO forced output	-4
Test mode: Machine analyzer	-6

6.4.5 Software limit (607Dh)

Address	Name		Data type	Read/ write	No. of Points/ No. of Registers	Continuous read/ continuous write
607Dh	Software limit (Software Position Limit)	Number of entries (Number of entries)	1 bytes	Reading	5	Impossible
		Min Position Limit (Stroke limit -)	4 bytes	Read/ write		
		Max Position Limit (Stroke limit +)	4 bytes			

The current software limit setting can be read.
At this time, "02h" is returned to Number of entries.
The stroke limit value in the reverse direction is returned to Min Position Limit (stroke limit -) in units of commands.
The stroke limit value in the forward direction is returned to Max Position Limit (stroke limit +) in units of commands.
The current software limit setting can also be written.
At this time, set "02h" for Number of entries.
Set the stroke limit value in the reverse direction in Min Position Limit (stroke limit -) in units of commands.
Set the stroke limit value in the forward direction in Max Position Limit (stroke limit +) in units of commands.
If Min Position Limit (stroke limit -) and Max Position Limit (stroke limit +) are set to the same value, the software limit function is disabled.

6.4.6 Polarity (607Eh)

Address	Name	Data type	Read/ write	No. of Points/ No. of Registers	Continuous read/ continuous write
607Eh	Rotation direction selection (Polarity)	1 bytes	Read/ write	1	Impossible

The rotation direction selection can be set.

To set the rotation direction to position commands and speed commands, turn on or off both bit 6 and bit 7 of Polarity (607Eh) or use [Pr. PA14]. To set the rotation direction to torque commands, turn on or off all of bit 5 to bit 7 of Polarity (607Eh) or use [Pr. PA14] and "POL reflection selection at torque mode" of [Pr. PC29].

The following table shows the descriptions of Polarity (607Eh).

Bit	Description
0	Reserved
1	The value at reading is undefined. Set "0" when writing.
2	
3	
4	
5	Torque POL The polarity is reversed when this bit is turned on. Select a rotation direction by setting bit 5 to bit 7 in combination.
6	Velocity POL The polarity is reversed when this bit is turned on. Select a rotation direction by setting bit 5 to bit 7 in combination.
7	Position POL The polarity is reversed when this bit is turned on. Select a rotation direction by setting bit 5 to bit 7 in combination.

6.4.7 Degree (60F2h)

Address	Name	Data type	Read/ write	No. of Points/ No. of Registers	Continuous read/ continuous write
60F2h	Profile position mode setting (Positioning option code)	2 bytes	Read/ write	1	Impossible

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 (Index, Sub Index)	Description
Target position (607Ah, 0)	The range will be between -360.000° and 360.000°.
Position actual value (6064h, 0)	The range will be between 0° and 359.999°.
Software position limit (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 (607Bh, 0)	The range will be between 0° and 359.999°.
Touch probe pos1 pos value (60BAh, 0)	The range will be between 0° and 359.999°.
Touch probe pos1 neg value (60BBh, 0)	The range will be between 0° and 359.999°.
Touch probe pos2 pos value (60BCh, 0)	The range will be between 0° and 359.999°.
Touch probe pos2 neg value (60BDh, 0)	The range will be between 0° and 359.999°.
Home offset (607Ch, 0)	The range will be between 0° and 359.999°.

Positioning operation patterns can be changed with Positioning option code (60F2h). 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 bits and settings of Positioning option code (60F2h).

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.

The following shows the operation patterns corresponding to the settings of Positioning option code (60F2h).

(a) When POL is disabled ([Pr. PA14] = 0)
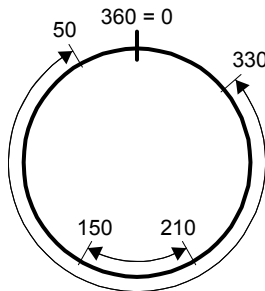
Bit 7: 0
Bit 6: 0
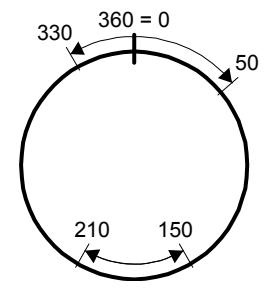The servo motor rotates in a direction specified with a sign of the position data.
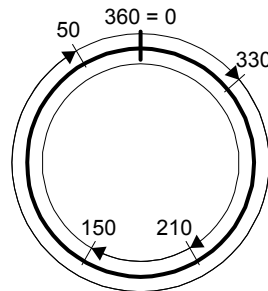
Bit 7: 0
Bit 6: 1
The servo motor rotates only in the address decreasing direction.
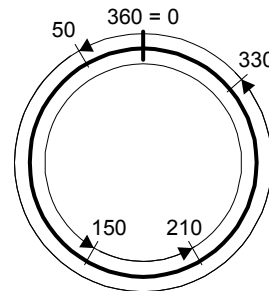
Bit 7: 1
Bit 6: 0
The servo motor rotates only in the address increasing direction.
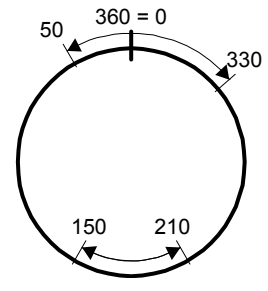
Bit 7: 1
Bit 6: 1
The servo motor rotates in the shorter direction.

(b) When POL is enabled ([Pr. PA14] = 1)
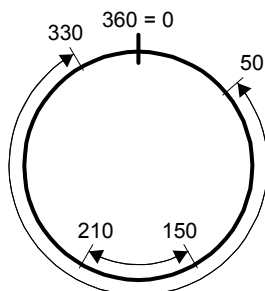
Bit 7: 0
Bit 6: 0
The servo motor rotates in a direction specified with a sign of the position data.
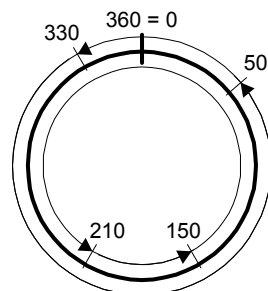
Bit 7: 0
Bit 6: 1
The servo motor rotates only in the address decreasing direction.
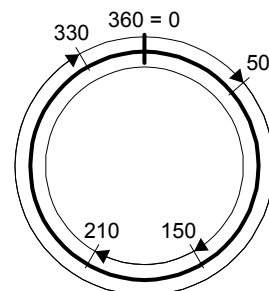
Bit 7: 1
Bit 6: 0
The servo motor rotates only in the address increasing direction.

Bit 7: 1
Bit 6: 1
The servo motor rotates in the shorter direction.

6.4.8 Touch probe (60B8h to 60BBh)

The current position latch data at the time of TPR1 (Touch probe 1) input can be read.

(1) Object list

Address	Name	Data type	Read/ write	No. of Points/ No. of Registers	Continuous read/ continuous write
60B8h	Touch probe function setting (Touch probe function)	2 bytes	Read/ write	1	Possible
60B9h	Status of the touch probe function (Touch probe status)	2 bytes	Reading	1	Possible
60BAh	Rising edge position of touch probe (Touch probe position positive value)	4 bytes	Reading	2	Possible
60BBh	Falling edge position of touch probe (Touch probe position negative value)	4 bytes	Reading	2	Possible

When the touch probe function (60B8h) is set, and TPR1 (touch probe1), an external signal, is turned on/off, the current position of the rising and falling edges are latched.
The latch status of the current position data can be checked with the touch probe status (60B9h). The latched current data can be read with the touch probe position positive value (60BAh) and the touch probe position negative value (60BBh). For details of each object, refer to sections 6.4.9 to 6.4.12.

(2) Usage
The following explains for latching the current position at the rising edge of TPR1 (Touch probe 1).

(a) Set "0013h" to the touch probe function setting (Touch probe function: 60B8h) to store data at rising edge of TPR1 (Touch probe 1).

(b) At this time, the touch probe status (Touch probe status: 60B9h) is set to "0001h", and the latched data has not been stored yet.

(c) Use an external signal to turn on TPR1 (Touch probe 1).

(d) The touch probe status (Touch probe status: 60B9h) changes to "0003h", and the current position at the time of TPR1 (touch probe1) on will be stored to the rising edge position of touch probe (Touch probe position positive value: 60BAh).

(e) Use an external signal to turn off TPR1 (Touch probe 1).

(f) The touch probe status (Touch probe status: 60B9h) remains "0003h", and the current position at the time that TPR1 (Touch probe 1) turns off will not be stored as the touch probe falling edge position (Touch probe position negative value: 60BBh).

(g) Latching can be continued from (c).

The following shows a timing chart.
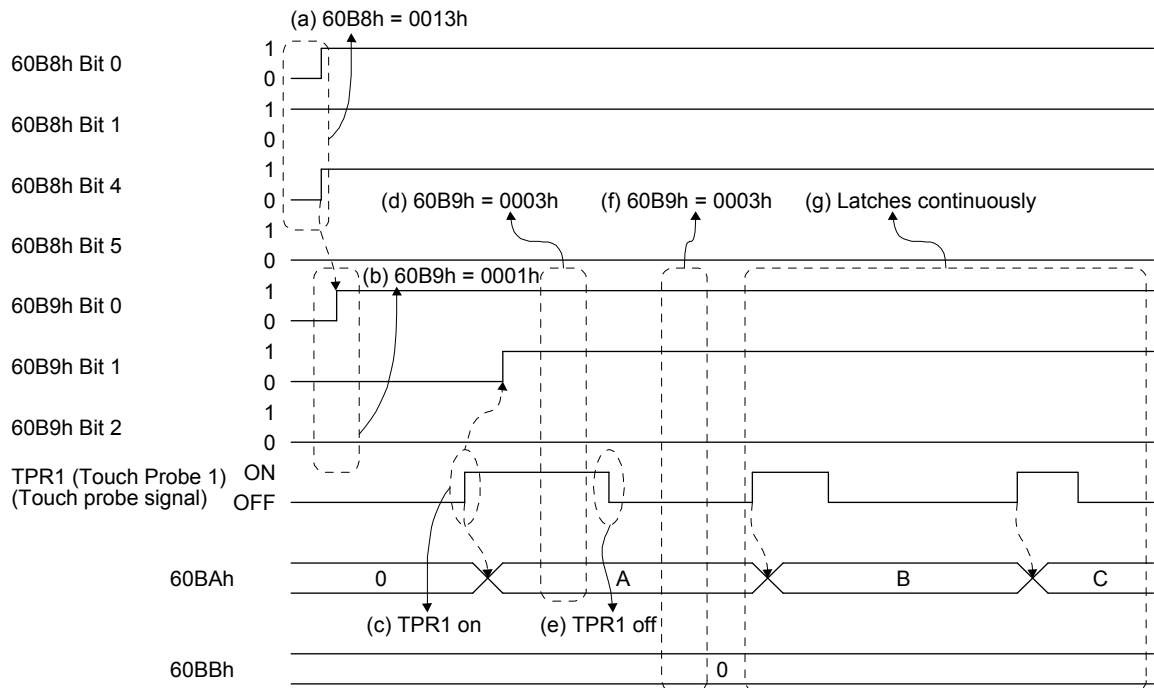
6.4.9 Touch probe function setting (60B8h)

Address	Name	Data type	Read/ write	No. of Points/ No. of Registers	Continuous read/ continuous write
60B8h	Touch probe function setting (Touch probe function)	2 bytes	Read/ write	1	Possible

The current setting of the touch probe function can be checked.
Each setting of the touch probe function can also be set. The settings of this object are as follows.

Bit	Description
0	0: Latch function disabled 1: Latch function enabled
1	0: Latch with the first trigger 1: Continuously latch with trigger inputs
2	The value at reading is undefined. Set "0" when writing.
3	
4	0: Stop sampling at the rising edge of touch probe 1: Start sampling at the rising edge of touch probe
5	0: Stop sampling at the falling edge of touch probe 1: Start sampling at the falling edge of touch probe
6 to 15	The value at reading is undefined. Set "0" when writing.

Select enable/disable for the latch function with bit 0. Select "1" when using the touch probe function.
Select a trigger condition for the touch probe function with bit 1. Set "0" to latch just once when TPR1 (Touch probe 1) is inputted. Set "1" to latch every time TPR1 (Touch probe 1) is inputted.
Set a condition for the rising edge of TPR1 (Touch probe 1) with bit 4. Set "1" to latch at the rising edge.
Set a condition for the falling edge of TPR1 (Touch probe 1) with bit 5. Set "1" to latch at the falling edge.

6.4.10 Touch probe function status (60B9h)

Address	Name	Data type	Read/ write	No. of Points/ No. of Registers	Continuous read/ continuous write
60B9h	Status of the touch probe function (Touch probe status)	2 bytes	Reading	1	Possible

The current status of the touch probe function can be checked. The description of this object is as follows.

Bit	Description
0	0: Latch function of touch probe is disabled 1: Latch function of touch probe is enabled.
1	0: Latch is incomplete at the rising edge with the latch function of the touch probe. 1: Latch is complete at the rising edge with the latch function of the touch probe.
2	0: Latch is incomplete at the falling edge with the latch function of the touch probe. 1: Latch is complete at the falling edge with the latch function of the touch probe.
3 to 15	The value at reading is undefined.

Bit 0 indicates the status of the touch probe function. 0 indicates disabled, and 1 enabled.
With bit 1, if the data is latched at the rising edge of the touch probe can be checked. Latched data can be read when this bit is set to "1". When this bit turns on, it remains on until bit 4 of the touch probe setting (60B8h) is set to "0".
With bit 2, if the data is latched at the falling edge of the touch probe can be checked. Latched data can be read when this bit is set to "1". When this bit turns on, it remains on until bit 5 of the touch probe setting (60B8h) is set to "0".

6.4.11 Rising edge position of touch probe (60BAh)

Address	Name	Data type	Read/ write	No. of Points/ No. of Registers	Continuous read/ continuous write
60BAh	Rising edge position of touch probe (Touch probe position positive value)	4 bytes	Reading	2	Possible

The current rising edge position of touch probe can be checked.

6.4.12 Falling edge position of touch probe (60BBh)

Address	Name	Data type	Read/ write	No. of Points/ No. of Registers	Continuous read/ continuous write
60BBh	Falling edge position of touch probe (Touch probe position negative value)	4 bytes	Reading	2	Possible

The current falling edge position of touch probe can be checked.

6.4.13 Supported control mode (6502h)

Address	Name	Data type	Read/ write	No. of Points/ No. of Registers	Continuous read/ continuous write
6502h	Supported control mode (Supported Drive Modes)	4 bytes	Reading	2	Impossible

The supported control mode can be read.
The returned value is "0000002Dh". The following table shows the details.

Bit	Supported Modes	Defined value
0	Profile position mode (pp)	1: Supported
2	Profile velocity mode (pv)	1: Supported
3	Profile torque mode (tq)	1: Supported
5	Homing mode (hm)	1: Supported

REVISIONS

Revision Date	*Manual Number	Revision
Aug. 2017	SH(NA)030269ENG-A	First edition

MEMO

Warranty

1. Warranty period and coverage

We will repair any failure or defect hereinafter referred to as "failure" in our FA equipment hereinafter referred to as the "Product" arisen during warranty period at no charge due to causes for which we are responsible through the distributor from which you purchased the Product or our service provider. However, we will charge the actual cost of dispatching our engineer for an on-site repair work on request by customer in Japan or overseas countries. We are not responsible for any on-site readjustment and/or trial run that may be required after a defective unit are repaired or replaced.

[Term]

The term of warranty for Product is twelve (12) months after your purchase or delivery of the Product to a place designated by you or eighteen (18) months from the date of manufacture whichever comes first ("Warranty Period"). Warranty period for repaired Product cannot exceed beyond the original warranty period before any repair work.

[Limitations]

(1) You are requested to conduct an initial failure diagnosis by yourself, as a general rule.
   It can also be carried out by us or our service company upon your request and the actual cost will be charged. However, it will not be charged if we are responsible for the cause of the failure.

(2) This limited warranty applies only when the condition, method, environment, etc. of use are in compliance with the terms and conditions and instructions that are set forth in the instruction manual and user manual for the Product and the caution label affixed to the Product.

(3) Even during the term of warranty, the repair cost will be charged on you in the following cases;
   (i)   a failure caused by your improper storing or handling, carelessness or negligence, etc., and a failure caused by your hardware or software problem
   (ii)   a failure caused by any alteration, etc. to the Product made on your side without our approval
   (iii) a failure which may be regarded as avoidable, if your equipment in which the Product is incorporated is equipped with a safety device required by applicable laws and has any function or structure considered to be indispensable according to a common sense in the industry
   (iv)   a failure which may be regarded as avoidable if consumable parts designated in the instruction manual, etc. are duly maintained and replaced
   (v)   any replacement of consumable parts (battery, fan, smoothing capacitor, etc.)
   (vi)   a failure caused by external factors such as inevitable accidents, including without limitation fire and abnormal fluctuation of voltage, and acts of God, including without limitation earthquake, lightning and natural disasters
   (vii) a failure generated by an unforeseeable cause with a scientific technology that was not available at the time of the shipment of the Product from our company
   (viii) any other failures which we are not responsible for or which you acknowledge we are not responsible for

2. Term of warranty after the stop of production

(1) We may accept the repair at charge for another seven (7) years after the production of the product is discontinued. The announcement of the stop of production for each model can be seen in our Sales and Service, etc.

(2) Please note that the Product (including its spare parts) cannot be ordered after its stop of production.

3. Service in overseas countries

Our regional FA Center in overseas countries will accept the repair work of the Product. However, the terms and conditions of the repair work may differ depending on each FA Center. Please ask your local FA center for details.

4. Exclusion of loss in opportunity and secondary loss from warranty liability

Regardless of the gratis warranty term, Mitsubishi shall not be liable for compensation to:

(1) Damages caused by any cause found not to be the responsibility of Mitsubishi.

(2) Loss in opportunity, lost profits incurred to the user by Failures of Mitsubishi products.

(3) Special damages and secondary damages whether foreseeable or not, compensation for accidents, and compensation for damages to products other than Mitsubishi products.

(4) Replacement by the user, maintenance of on-site equipment, start-up test run and other tasks.

5. Change of Product specifications

Specifications listed in our catalogs, manuals or technical documents may be changed without notice.

6. Application and use of the Product

(1) For the use of our General-Purpose AC Servo, its applications should be those that may not result in a serious damage even if any failure or malfunction occurs in General-Purpose AC Servo, and a backup or fail-safe function should operate on an external system to General-Purpose AC Servo when any failure or malfunction occurs.

(2) Our General-Purpose AC Servo is designed and manufactured as a general purpose product for use at general industries. Therefore, applications substantially influential on the public interest for such as atomic power plants and other power plants of electric power companies, and also which require a special quality assurance system, including applications for railway companies and government or public offices are not recommended, and we assume no responsibility for any failure caused by these applications when used
   In addition, applications which may be substantially influential to human lives or properties for such as airlines, medical treatments, railway service, incineration and fuel systems, man-operated material handling equipment, entertainment machines, safety machines, etc. are not recommended, and we assume no responsibility for any failure caused by these applications when used. We will review the acceptability of the abovementioned applications, if you agree not to require a specific quality for a specific application. Please contact us for consultation.

MODEL	
MODEL CODE	

MITSUBISHI ELECTRIC CORPORATION

HEAD OFFICE: TOKYO BLDG MARUNOUCHI TOKYO 100-8310

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Specifications are subject to change without notice.