

General-Purpose AC Servo

MELSERVO-J3 Series

Built-in Positioning Function

MODEL

MR-J3-□T

SERVO AMPLIFIER

INSTRUCTION MANUAL

(CC-Link)

● Safety Instructions ●

(Always read these instructions before using the equipment.)

Do not attempt to install, operate, maintain or inspect the servo amplifier and servo motor until you have read through this Instruction Manual, Installation guide, Servo motor Instruction Manual (Vol.2) and appended documents carefully and can use the equipment correctly. Do not use the servo amplifier and servo motor 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".





Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.





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 installation guide, always keep it accessible to the operator.

1. To prevent electric shock, note the following

 **WARNING**

- Before wiring or inspection, turn off the power and wait for 15 minutes or more until the charge lamp turns off. Then, confirm that the voltage between P(+) and N(–) is safe with a voltage tester and others. Otherwise, an electric shock may occur. In addition, always confirm from the front of the servo amplifier, whether the charge lamp is off or not.
- Connect the servo amplifier and servo motor to ground.
- 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, you may get an electric shock.
- Operate the switches with dry hand to prevent an electric shock.
- The cables should not be damaged, stressed, loaded, or pinched. Otherwise, you may get an electric shock.
- During power-on or operation, do not open the front cover of the servo amplifier. You may get an electric shock.
- Do not operate the servo amplifier with the front cover removed. High-voltage terminals and charging area are exposed and you may get an electric shock.
- Except for wiring or periodic inspection, do not remove the front cover even of the servo amplifier if the power is off. The servo amplifier is charged and you may get an electric shock.

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 a fire.
- Always connect a magnetic contactor (MC) between the main circuit power supply and L1, L2, and L3 of the servo amplifier, and configure the wiring to be able to shut down the power supply on the side of the servo amplifier's power supply. If a magnetic contactor (MC) is not connected, continuous flow of a large current may cause a fire when the servo amplifier malfunctions.
- When a regenerative resistor is used, use an alarm signal to switch main power off. Otherwise, a regenerative transistor fault or the like may overheat the regenerative resistor, causing a fire.

3. To prevent injury, note the follow

 **CAUTION**

- Only the voltage specified in the Instruction Manual should be applied to each terminal, Otherwise, a burst, damage, etc. may occur.
- Connect the terminals correctly to prevent a burst, damage, etc.
- Ensure that polarity (+, –) is correct. Otherwise, a burst, damage, etc. may occur.
- Take safety measures, e.g. provide covers, to prevent accidental contact of hands and parts (cables, etc.) with the servo amplifier heat sink, regenerative resistor, servo motor, etc. since they may be hot while power is on or for some time after power-off. Their temperatures may be high and you may get burnt or a parts may damaged.
- During operation, never touch the rotating parts of the servo motor. Doing so can cause injury.

4. Additional instructions

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

(1) Transportation and installation

⚠ CAUTION

- Transport the products correctly according to their weights.
- Stacking in excess of the specified number of products is not allowed.
- Do not carry the servo motor by the cables, shaft or encoder.
- Do not hold the front cover to transport the servo amplifier. The servo amplifier may drop.
- Install the servo amplifier in a load-bearing place in accordance with the Instruction Manual.
- Do not climb or stand on servo equipment. Do not put heavy objects on equipment.
- The servo amplifier and servo motor must be installed in the specified direction.
- Leave specified clearances between the servo amplifier and control enclosure walls or other equipment.
- Do not install or operate the servo amplifier and servo motor which has been damaged or has any parts missing.
- Provide adequate protection to prevent screws and other conductive matter, oil and other combustible matter from entering the servo amplifier and servo motor.
- Do not drop or strike servo amplifier or servo motor. Isolate from all impact loads.
- When you keep or use it, please fulfill the following environmental conditions.

Environment		Conditions			
		Servo amplifier		Servo motor	
Ambient temperature	In operation	[°C]	0 to +55 (non-freezing)	0 to +40 (non-freezing)	
		[°F]	32 to 131 (non-freezing)	32 to 104 (non-freezing)	
	In storage	[°C]	−20 to +65 (non-freezing)	−15 to +70 (non-freezing)	
		[°F]	−4 to 149 (non-freezing)	5 to 158 (non-freezing)	
Ambient humidity	In operation	90%RH or less (non-condensing)		80%RH or less (non-condensing)	
	In storage	90%RH or less (non-condensing)			
Ambience		Indoors (no direct sunlight) Free from corrosive gas, flammable gas, oil mist, dust and dirt			
Altitude		Max. 1000m (3280 ft) above sea level			
(Note) Vibration	[m/s ²]	5.9 or less	HF-MP series	HF-KP series	X • Y: 49
			HF-SP51 • 81	HF-SP52 to 152	X • Y: 24.5
			HF-SP524 to 1524	HC-RP Series	
			HC-UP72 • 152		
			HF-SP121 • 201	HF-SP202 • 352	X: 24.5 Y: 49
			HF-SP2024 • 3524	HC-UP202 to 502	
			HF-SP301 • 421	HF-SP502 • 702	X: 24.5 Y: 29.4
			HF-SP5024 • 7024		
			HC-LP52 to 152		X: 9.8 Y: 24.5
			HC-LP202 to 302		X: 19.6 Y: 49
HA-LP601 to 12K1		HA-LP701M to 15K1M	X: 11.7 Y: 29.4		
HA-LP502 to 22K2		HA-LP6014 to 12K14			
HA-LP701M4 to 15K1M4		HA-LP11K24 to 22K24			
HA-LP15K1 to 25K1		HA-LP37K1M	X • Y: 9.8		
HA-LP15K14 to 20K14		HA-LP22K1M4			

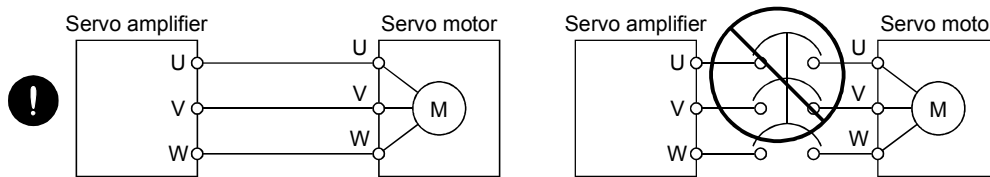
Note. Except the servo motor with a reduction gear.

- Securely attach the servo motor to the machine. If attach insecurely, the servo motor may come off during operation.
- The servo motor with a reduction gear must be installed in the specified direction to prevent oil leakage.
- Take safety measures, e.g. provide covers, to prevent accidental access to the rotating parts of the servo motor during operation.
- Never hit the servo motor or shaft, especially when coupling the servo motor to the machine. The encoder may become faulty.
- Do not subject the servo motor shaft to more than the permissible load. Otherwise, the shaft may break.
- When the equipment has been stored for an extended period of time, consult Mitsubishi.

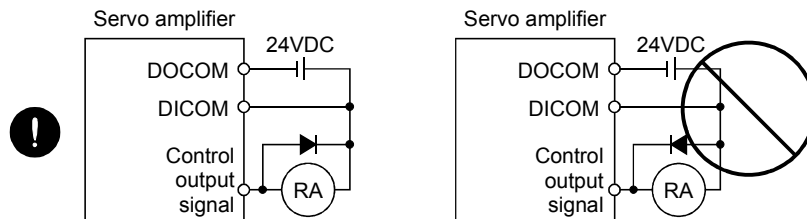
(2) Wiring

⚠ CAUTION

- Wire the equipment correctly and securely. Otherwise, the servo motor may operate unexpectedly.
- Do not install a power capacitor, surge absorber or radio noise filter (FR-BIF-(H) option) between the servo motor and servo amplifier.
- Connect the wires to the correct phase terminals (U, V, W) of the servo amplifier and servo motor. Not doing so may cause unexpected operation.
- Connect the servo motor power terminal (U, V, W) to the servo motor power input terminal (U, V, W) directly. Do not let a magnetic contactor, etc. intervene.



- Do not connect AC power directly to the servo motor. Otherwise, a fault may occur.
- The surge absorbing diode installed on the DC output signal relay of the servo amplifier must be wired in the specified direction. Otherwise, the forced stop (EMG) and other protective circuits may not operate.



- When the cable is not tightened enough to the terminal block (connector), the cable or terminal block (connector) may generate heat because of the poor contact. Be sure to tighten the cable with specified torque.

(3) Test run adjustment

⚠ CAUTION

- Before operation, check the parameter settings. Improper settings may cause some machines to perform unexpected operation.
- The parameter settings must not be changed excessively. Operation will be insatiable.

(4) Usage

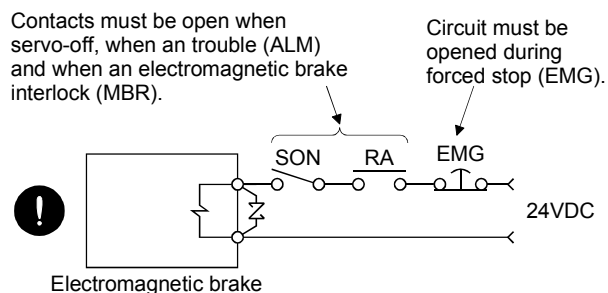
⚠ CAUTION

- Provide an external emergency stop circuit to ensure that operation can be stopped and power switched off immediately.
- Any person who is involved in disassembly and repair should be fully competent to do the work.
- Before resetting an alarm, make sure that the run signal of the servo amplifier is off to prevent an accident. A sudden restart is made if an alarm is reset with the run signal on.
- Do not modify the equipment.
- Use a noise filter, etc. to minimize the influence of electromagnetic interference, which may be caused by electronic equipment used near the servo amplifier.
- Burning or breaking a servo amplifier may cause a toxic gas. Do not burn or break a servo amplifier.
- Use the servo amplifier with the specified servo motor.
- The electromagnetic brake on the servo motor is designed to hold the motor shaft and should not be used for ordinary braking.
- For such reasons as service life and mechanical structure (e.g. where a ball screw and the servo motor are coupled via a timing belt), the electromagnetic brake may not hold the motor shaft. To ensure safety, install a stopper on the machine side.

(5) Corrective actions

⚠ CAUTION

- When it is assumed that a hazardous condition may take place at the occur due to a power failure or a product fault, use a servo motor with an electromagnetic brake or an external brake mechanism for the purpose of prevention.
- Configure the electromagnetic brake circuit so that it is activated not only by the servo amplifier signals but also by an external forced stop (EMG).



- When any alarm has occurred, eliminate its cause, ensure safety, and deactivate the alarm before restarting operation.
- When power is restored after an instantaneous power failure, keep away from the machine because the machine may be restarted suddenly (design the machine so that it is secured against hazard if restarted).

(6) Maintenance, inspection and parts replacement

⚠ CAUTION

- With age, the electrolytic capacitor of the servo amplifier will deteriorate. To prevent a secondary accident due to a fault, it is recommended to replace the electrolytic capacitor every 10 years when used in general environment. Please consult our sales representative.

(7) General instruction

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

● About processing of waste ●

When you discard servo amplifier, a battery (primary battery), and other option articles, please follow the law of each country (area).



FOR MAXIMUM SAFETY

- These products have been manufactured as a general-purpose part for general industries, and have not been designed or manufactured to be incorporated in a device or system used in purposes related to human life.
- Before using the products for special purposes such as nuclear power, electric power, aerospace, medicine, passenger movement vehicles or under water relays, contact Mitsubishi.
- These products have been manufactured under strict quality control. However, when installing the product where major accidents or losses could occur if the product fails, install appropriate backup or failsafe functions in the system.



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 and/or converter unit may fail when the EEP-ROM reaches the end of its useful life.

- Write to the EEP-ROM due to parameter setting changes
- Home position setting in the absolute position detection system
- Write to the EEP-ROM due to device changes
- Write to the EEP-ROM due to point table changes

Precautions for Choosing the Products

Mitsubishi will not be held liable for damage caused by factors found not to be the cause of Mitsubishi; machine damage or lost profits caused by faults in the Mitsubishi products; damage, secondary damage, accident compensation caused by special factors unpredictable by Mitsubishi; damages to products other than Mitsubishi products; and to other duties.

COMPLIANCE WITH EC DIRECTIVES

1. WHAT ARE EC DIRECTIVES?

The EC directives were issued to standardize the regulations of the EU countries and ensure smooth distribution of safety-guaranteed products. In the EU countries, the machinery directive (effective in January, 1995), EMC directive (effective in January, 1996) and low voltage directive (effective in January, 1997) of the EC directives require that products to be sold should meet their fundamental safety requirements and carry the CE marks (CE marking). CE marking applies to machines and equipment into which servo amplifiers have been installed.

(1) EMC directive

The EMC directive applies not to the servo units alone but to servo-incorporated machines and equipment. This requires the EMC filters to be used with the servo-incorporated machines and equipment to comply with the EMC directive. For specific EMC directive conforming methods, refer to the EMC Installation Guidelines (IB(NA)67310).

(2) Low voltage directive

The low voltage directive applies also to servo units alone. Hence, they are designed to comply with the low voltage directive.

This servo is certified by TUV, third-party assessment organization, to comply with the low voltage directive.

(3) Machine directive

Not being machines, the servo amplifiers need not comply with this directive.

2. PRECAUTIONS FOR COMPLIANCE

(1) Servo amplifiers and servo motors used

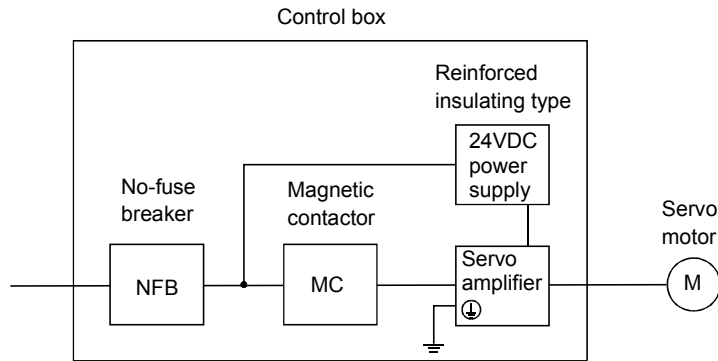
Use the servo amplifiers and servo motors which comply with the standard model.

Servo amplifier	:MR-J3-10T to MR-J3-22KT MR-J3-10T1 to MR-J3-40T1 MR-J3-60T4 to MR-J3-22KT4
Servo motor	:HF-MP □ HF-KP □ HF-SP □ (Note) HF-SP □ 4 (Note) HC-RP □ HC-UP □ HC-LP □ HA-LP □ (Note) HA-LP □ 4 (Note)

Note. For the latest information of compliance, contact Mitsubishi.

(2) Configuration

The control circuit provide safe separation to the main circuit in the servo amplifier.



(3) Environment

Operate the servo amplifier at or above the contamination level 2 set forth in IEC60664-1. For this purpose, install the servo amplifier in a control box which is protected against water, oil, carbon, dust, dirt, etc. (IP54).

(4) Power supply

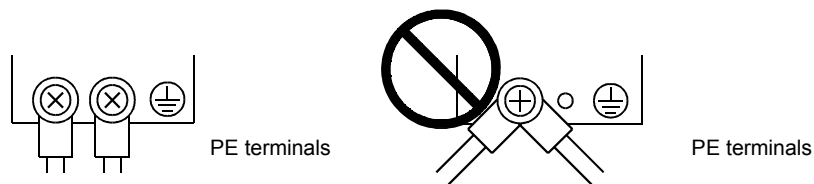
(a) This servo amplifier can be supplied from star-connected supply with earthed neutral point of overvoltage category III set forth in IEC60664-1. However, when using the neutral point of 400V class for single-phase supply, a reinforced insulating transformer is required in the power input section.

(b) When supplying interface power from external, use a 24VDC power supply which has been insulation-reinforced in I/O.

(5) Grounding

(a) To prevent an electric shock, always connect the protective earth (PE) terminals (marked ⊕) of the servo amplifier to the protective earth (PE) of the control box.

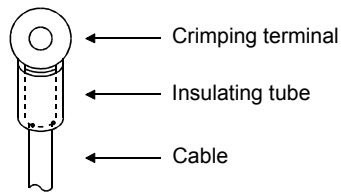
(b) Do not connect two ground cables to the same protective earth (PE) terminal (marked ⊕). Always connect the cables to the terminals one-to-one.



(c) If a leakage current breaker is used to prevent an electric shock, the protective earth (PE) terminals (marked ⊕) of the servo amplifier must be connected to the corresponding earth terminals.

(6) Wiring

- (a) The cables to be connected to the terminal block of the servo amplifier must have crimping terminals provided with insulating tubes to prevent contact with adjacent terminals.



- (b) Use the servo motor side power connector which complies with the EN Standard. The EN Standard compliant power connector sets are available from us as options. (Refer to section 14.1)

(7) Auxiliary equipment and options

- (a) The no-fuse breaker and magnetic contactor used should be the EN or IEC standard-compliant products of the models described in section 14.10.

Use a type B (Note) breaker. When it is not used, provide insulation between the servo amplifier and other device by double insulation or reinforced insulation, or install a transformer between the main power supply and servo amplifier.

Note. Type A: AC and pulse detectable

Type B: Both AC and DC detectable

- (b) The sizes of the cables described in section 14.9 meet the following requirements. To meet the other requirements, follow Table 5 and Appendix C in EN60204-1.

- Ambient temperature: 40 (104) [°C (°F)]
- Sheath: PVC (polyvinyl chloride)
- Installed on wall surface or open table tray

- (c) Use the EMC filter for noise reduction.

(8) Performing EMC tests

When EMC tests are run on a machine/device into which the servo amplifier has been installed, it must conform to the electromagnetic compatibility (immunity/emission) standards after it has satisfied the operating environment/electrical equipment specifications.

For the other EMC directive guidelines on the servo amplifier, refer to the EMC Installation Guidelines (IB(NA)67310).

CONFORMANCE WITH UL/C-UL STANDARD

(1) Servo amplifiers and servo motors used

Use the servo amplifiers and servo motors which comply with the standard model.

Servo amplifier	:MR-J3-10T to MR-J3-22KT MR-J3-10T1 to MR-J3-40T1 MR-J3-60T4 to MR-J3-22KT4
Servo motor	:HF-MP □ HF-KP □ HF-SP □ (Note) HF-SP □ 4 (Note) HC-RP □ HC-UP □ HC-LP □ HA-LP □ (Note) HA-LP □ 4 (Note)

Note. For the latest information of compliance, contact Mitsubishi.

(2) Installation

Install a fan of 100CFM (2.8m³/min) air flow 4[in] (10.16[cm]) above the servo amplifier or provide cooling of at least equivalent capability to ensure that the ambient temperature conforms to the environment conditions (55°C or less).

(3) Short circuit rating (SCCR: Short Circuit Current Rating)

Suitable For Use In A Circuit Capable Of Delivering Not More Than 100 kA rms Symmetrical Amperes, 500 Volts Maximum.

(4) Capacitor discharge time

The capacitor discharge time is as listed below. To ensure safety, do not touch the charging section for 15 minutes after power-off.

Servo amplifier	Discharge time [min]
MR-J3-10T · 20T	1
MR-J3-40T · 60T(4) · 10T1 · 20T1	2
MR-J3-70T	3
MR-J3-40T1	4
MR-J3-100T(4)	5
MR-J3-200T(4) · 350T	9
MR-J3-350T4 · 500T(4) · 700T(4)	10
MR-J3-11KT(4)	4
MR-J3-15KT(4)	6
MR-J3-22KT(4)	8

(5) Options and auxiliary equipment

Use UL/C-UL standard-compliant products.

(6) Attachment of a servo motor

For the flange size of the machine side where the servo motor is installed, refer to “CONFORMANCE WITH UL/C-UL STANDARD” in the Servo Motor Instruction Manual (Vol.2).

(7) About wiring protection

For installation in United States, branch circuit protection must be provided, in accordance with the National Electrical Code and any applicable local codes.

For installation in Canada, branch circuit protection must be provided, in accordance with the Canada Electrical Code and any applicable provincial codes.

<<About the manuals>>

This Instruction Manual and the MELSERVO Servo Motor Instruction Manual (Vol.2) are required if you use the General-Purpose AC servo MR-J3-T for the first time. Always purchase them and use the MR-J3-T safely.

Relevant manuals

Manual name	Manual No.
MELSERVO-J3 Series Instructions and Cautions for Safe Use of AC Servos	IB(NA)0300077
MELSERVO Servo Motor Instruction Manual (Vol.2)	SH(NA)030041
EMC Installation Guidelines	IB(NA)67310

<<About the wires used for wiring>>

Wiring wires mentioned in this instruction manual are selected based on the ambient temperature of 40°C (104°F).

CONTENTS

1. FUNCTIONS AND CONFIGURATION	1 - 1 to 1 -36
1.1 Introduction.....	1 - 1
1.1.1 Features of CC-Link communication functions	1 - 1
1.1.2 Function block diagram	1 - 2
1.1.3 System configuration.....	1 - 5
1.2 Servo amplifier standard specifications.....	1 - 7
1.3 Function list	1 -13
1.4 Model code definition	1 -15
1.5 Combination with servo motor	1 -16
1.6 Structure	1 -17
1.6.1 Parts identification	1 -17
1.6.2 Removal and reinstallation of the front cover	1 -23
1.7 Configuration including auxiliary equipment	1 -26
1.8 Selection of operation method	1 -34
2. INSTALLATION	2 - 1 to 2 - 4
2.1 Installation direction and clearances	2 - 1
2.2 Keep out foreign materials	2 - 3
2.3 Cable stress	2 - 3
2.4 Inspection items	2 - 4
2.5 Parts having service lives	2 - 4
3. CC-LINK COMMUNICATION FUNCTIONS	3 - 1 to 3 -60
3.1 Communication specifications	3 - 1
3.2 System configuration	3 - 2
3.2.1 Configuration example	3 - 2
3.2.2 Wiring method	3 - 3
3.2.3 Station number setting	3 - 5
3.2.4 Communication baud rate setting	3 - 6
3.2.5 Occupied station count setting.....	3 - 6
3.3 Functions	3 - 7
3.3.1 Function block diagram	3 - 7
3.3.2 Functions	3 - 7
3.4 Servo amplifier setting	3 - 8
3.5 I/O signals (I/O devices) transferred to/from the programmable controller CPU	3 - 9
3.5.1 I/O signals (I/O devices).....	3 - 9
3.5.2 Detailed explanation of I/O signals	3 -12
3.5.3 Monitor codes	3 -22
3.5.4 Instruction codes (RWwn+2 · RWwn+3)	3 -23
3.5.5 Respond codes (RWrn+2)	3 -31
3.5.6 Setting the CN6 external input signals	3 -32
3.6 Data communication timing charts	3 -34
3.6.1 Monitor codes	3 -34
3.6.2 Instruction codes	3 -36

3.6.3 Remote register-based position/speed setting.....	3 -38
3.7 Function-by-function programming examples.....	3 -41
3.7.1 System configuration example.....	3 -41
3.7.2 Reading the servo amplifier status	3 -44
3.7.3 Writing the operation commands.....	3 -45
3.7.4 Reading the data.....	3 -46
3.7.5 Writing the data	3 -49
3.7.6 Operation.....	3 -52
3.8 Continuous operation program example.....	3 -55
3.8.1 System configuration example when 1 station is occupied	3 -55
3.8.2 Program example when 1 station is occupied	3 -56
3.8.3 System configuration example when 2 stations are occupied.....	3 -58
3.8.4 Program example when 2 stations are occupied.....	3 -59

4. SIGNALS AND WIRING	4 - 1 to 4 -54
------------------------------	-----------------------

4.1 Input power supply circuit	4 - 2
4.2 I/O signal connection diagram	4 -10
4.3 Explanation of power supply system	4 -11
4.3.1 Signal explanations	4 -11
4.3.2 Power-on sequence	4 -12
4.3.3 CNP1, CNP2, CNP3 wiring method	4 -14
4.4 Connectors and signal arrangements	4 -22
4.5 Signal (device) explanation.....	4 -23
4.5.1 I/O devices.....	4 -23
4.5.2 Input signals	4 -26
4.5.3 Output signals.....	4 -26
4.5.4 Power supply.....	4 -27
4.6 Detailed description of signals (devices).....	4 -27
4.6.1 Forward rotation start * reverse rotation start * temporary stop/restart.....	4 -27
4.6.2 Movement completion * rough match * in position	4 -28
4.6.3 Torque limit.....	4 -30
4.7 Alarm occurrence timing chart.....	4 -31
4.8 Interface.....	4 -32
4.8.1 Internal connection diagram	4 -32
4.8.2 Detailed description of interfaces.....	4 -33
4.8.3 Source I/O interfaces	4 -35
4.9 Treatment of cable shield external conductor	4 -36
4.10 Connection of servo amplifier and servo motor	4 -37
4.10.1 Connection instructions.....	4 -37
4.10.2 Power supply cable wiring diagrams	4 -38
4.11 Servo motor with an electromagnetic brake.....	4 -48
4.11.1 Safety precautions	4 -48
4.11.2 Timing charts.....	4 -49
4.11.3 Wiring diagrams (HF-MP series * HF-KP series servo motor)	4 -52
4.12 Grounding.....	4 -53

5.1 Switching power on for the first time	5 - 1
5.1.1 Startup procedure.....	5 - 1
5.1.2 Wiring check	5 - 2
5.1.3 Surrounding environment.....	5 - 3
5.2 Startup	5 - 4
5.2.1 Power on and off procedures.....	5 - 4
5.2.2 Stop.....	5 - 4
5.2.3 Test operation.....	5 - 5
5.2.4 Parameter setting	5 - 6
5.2.5 Point table setting	5 - 7
5.2.6 Actual operation	5 - 7
5.3 Servo amplifier display.....	5 - 8
5.4 Automatic operation mode	5 -10
5.4.1 What is automatic operation mode?	5 -10
5.4.2 Automatic operation using point table	5 -12
5.4.3 Remote register-based position/speed setting.....	5 -22
5.5 Manual operation mode	5 -28
5.5.1 JOG operation	5 -28
5.5.2 Manual pulse generator	5 -29
5.6 Manual home position return mode.....	5 -31
5.6.1 Outline of home position return.....	5 -31
5.6.2 Dog type home position return.....	5 -34
5.6.3 Count type home position return	5 -36
5.6.4 Data setting type home position return.....	5 -38
5.6.5 Stopper type home position return	5 -39
5.6.6 Home position ignorance (servo-on position defined as home position)	5 -41
5.6.7 Dog type rear end reference home position return	5 -42
5.6.8 Count type front end reference home position return	5 -44
5.6.9 Dog cradle type home position return	5 -46
5.6.10 Dog type first Z-phase reference home position return	5 -48
5.6.11 Dog type front end reference home position return method.....	5 -50
5.6.12 Dogless Z-phase reference home position return method	5 -52
5.6.13 Home position return automatic return function	5 -54
5.6.14 Automatic positioning function to the home position.....	5 -55
5.7 Roll feed display function in roll feed mode.....	5 -56
5.8 Absolute position detection system	5 -57

6.1 Basic setting parameters (No.PA □□).....	6 - 1
6.1.1 Parameter list	6 - 1
6.1.2 Parameter write inhibit	6 - 2
6.1.3 Selection of command system.....	6 - 3
6.1.4 Selection of regenerative option	6 - 3
6.1.5 Using absolute position detection system	6 - 4
6.1.6 Follow-up for absolute value command system in incremental system	6 - 4
6.1.7 Feeding function selection	6 - 5

6.1.8 Electronic gear.....	6 - 6
6.1.9 Auto tuning	6 - 7
6.1.10 In-position range.....	6 - 8
6.1.11 Torque limit.....	6 - 9
6.1.12 Selection of servo motor rotation direction	6 -10
6.1.13 Encoder output pulse	6 -10
6.2 Gain/filter parameters (No. PB □□).....	6 -12
6.2.1 Parameter list	6 -12
6.2.2 Detail list	6 -13
6.3 Extension setting parameters (No. PC □□).....	6 -20
6.3.1 Parameter list	6 -20
6.3.2 Detail list	6 -21
6.3.3 S-pattern acceleration/deceleration.....	6 -27
6.3.4 Alarm history clear.....	6 -27
6.3.5 Rough match output.....	6 -27
6.3.6 Software limit.....	6 -28
6.4 I/O setting parameters (No. PD □□).....	6 -29
6.4.1 Parameter list	6 -29
6.4.2 Detail list	6 -30
6.4.3 Stopping method when the forward stroke end (LSP) or reverse stroke end (LSN) is valid	6 -38
6.4.4 Stopping method when a software limit is detected.....	6 -39

7. MR Configurator	7 - 1 to 7 -26
---------------------------	-----------------------

7.1 Specifications	7 - 1
7.2 System configuration	7 - 2
7.3 Station selection.....	7 - 4
7.4 Parameters.....	7 - 5
7.5 Point table.....	7 - 7
7.6 Device assignment method	7 - 9
7.7 Test operation	7 -13
7.7.1 Jog operation.....	7 -13
7.7.2 Positioning operation.....	7 -15
7.7.3 Motor-less operation	7 -18
7.7.4 Output signal (DO) forced output.....	7 -19
7.7.5 Single-step feed	7 -20
7.8 Alarm	7 -23
7.8.1 Alarm display.....	7 -23
7.8.2 Batch display of data at alarm occurrence	7 -24
7.8.3 Alarm history.....	7 -26

8. PARAMETER UNIT (MR-PRU03)	8 - 1 to 8 -20
-------------------------------------	-----------------------

8.1 External appearance and key explanations	8 - 2
8.2 Specifications	8 - 3
8.3 Outline dimension drawings.....	8 - 3
8.4 Connection with servo amplifier.....	8 - 4
8.4.1 Single axis	8 - 4
8.4.2 Multidrop connection	8 - 5

8.5 Display	8 - 7
8.5.1 Outline of screen transition	8 - 7
8.5.2 MR-PRU03 parameter unit setting	8 - 8
8.5.3 Monitor mode (status display).....	8 - 9
8.5.4 Alarm/diagnostic mode	8 -11
8.5.5 Parameter mode.....	8 -13
8.5.6 Point table mode	8 -14
8.5.7 Test operation mode	8 -15
8.6 Error message list	8 -19

9. GENERAL GAIN ADJUSTMENT	9 - 1 to 9 -12
-----------------------------------	-----------------------

9.1 Different adjustment methods.....	9 - 1
9.1.1 Adjustment on a single servo amplifier.....	9 - 1
9.1.2 Adjustment using MR Configurator.....	9 - 2
9.2 Auto tuning	9 - 3
9.2.1 Auto tuning mode	9 - 3
9.2.2 Auto tuning mode operation.....	9 - 4
9.2.3 Adjustment procedure by auto tuning.....	9 - 5
9.2.4 Response level setting in auto tuning mode	9 - 6
9.3 Manual mode 1 (simple manual adjustment).....	9 - 7
9.4 Interpolation mode	9 -11
9.5 Differences between MELSERVO-J2-Super and MELSERVO-J3 in auto tuning.....	9 -12

10. SPECIAL ADJUSTMENT FUNCTIONS	10- 1 to 10-16
---	-----------------------

10.1 Function block diagram.....	10- 1
10.2 Adaptive filter II.....	10- 1
10.3 Machine resonance suppression filter.....	10- 4
10.4 Advanced vibration suppression control	10- 6
10.5 Low-pass filter	10-10
10.6 Gain changing function	10-10
10.6.1 Applications	10-10
10.6.2 Function block diagram.....	10-11
10.6.3 Parameters.....	10-12
10.6.4 Gain changing operation.....	10-14

11. TROUBLESHOOTING	11- 1 to 11-14
----------------------------	-----------------------

11.1 Trouble at start-up.....	11- 1
11.2 Operation at error occurrence	11- 2
11.3 CC-Link communication error.....	11- 2
11.4 When alarm or warning has occurred	11- 3
11.4.1 Alarms and warning list.....	11- 3
11.4.2 Remedies for alarms	11- 4
11.4.3 Remedies for warnings	11-11
11.5 Point table error.....	11-13

12. OUTLINE DRAWINGS	12- 1 to 12-12
-----------------------------	-----------------------

12.1 Servo amplifier	12- 1
12.2 Connector	12-10

13. CHARACTERISTICS	13- 1 to 13-10
----------------------------	-----------------------

13.1 Overload protection characteristics	13- 1
13.2 Power supply equipment capacity and generated loss	13- 3
13.3 Dynamic brake characteristics	13- 6
13.3.1 Dynamic brake operation	13- 6
13.3.2 The dynamic brake at the load inertia moment	13- 9
13.4 Cable flexing life	13-10
13.5 Inrush currents at power-on of main circuit and control circuit	13-10

14. OPTIONS AND AUXILIARY EQUIPMENT	14- 1 to 14-90
--	-----------------------

14.1 Cable/connector sets	14- 1
14.1.1 Combinations of cable/connector sets	14- 2
14.1.2 Encoder cable/connector sets	14- 8
14.1.3 Motor power supply cables	14-17
14.1.4 Motor brake cables	14-18
14.2 Regenerative options	14-19
14.3 FR-BU2-(H) brake unit	14-32
14.3.1 Selection	14-33
14.3.2 Brake unit parameter setting	14-33
14.3.3 Connection example	14-34
14.3.4 Outline dimension drawings	14-41
14.4 Power regeneration converter	14-43
14.5 Power regeneration common converter	14-46
14.6 External dynamic brake	14-54
14.7 Battery MR-J3BAT	14-59
14.8 Heat sink outside mounting attachment (MR-J3ACN)	14-60
14.9 Selection example of wires	14-62
14.10 No-fuse breakers, fuses, magnetic contactors	14-68
14.11 Power factor improving DC reactor	14-69
14.12 Power factor improving reactors	14-71
14.13 Relays (recommended)	14-73
14.14 Surge absorbers (recommended)	14-73
14.15 Noise reduction techniques	14-74
14.16 Leakage current breaker	14-81
14.17 EMC filter (recommended)	14-83
14.18 MR-HDP01 manual pulse generator	14-88

15. COMMUNICATION FUNCTION	15- 1 to 15-46
-----------------------------------	-----------------------

15.1 Configuration	15- 1
15.2 Communication specifications	15- 3
15.2.1 Communication overview	15- 3
15.2.2 Parameter setting	15- 4

15.3 Protocol	15- 5
15.3.1 Transmission data configuration.....	15- 5
15.3.2 Character codes	15- 6
15.3.3 Error codes	15- 7
15.3.4 Checksum.....	15- 7
15.3.5 Time-out operation	15- 8
15.3.6 Retry operation	15- 8
15.3.7 Initialization	15- 9
15.3.8 Communication procedure example.....	15- 9
15.4 Command and data No. list.....	15-10
15.4.1 Read commands	15-10
15.4.2 Write commands	15-14
15.5 Detailed explanations of commands	15-17
15.5.1 Data processing	15-17
15.5.2 Status display	15-19
15.5.3 Parameters	15-20
15.5.4 External I/O signal statuses (DIO diagnosis)	15-23
15.5.5 Device ON/OFF.....	15-28
15.5.6 Disable/enable of I/O devices (DIO).....	15-29
15.5.7 Input devices ON/OFF (test operation)	15-30
15.5.8 Test operation mode	15-31
15.5.9 Alarm history.....	15-37
15.5.10 Current alarm	15-38
15.5.11 Point table.....	15-39
15.5.12 Servo amplifier group designation	15-45
15.5.13 Other commands.....	15-46

16. INDEXER POSITIONING OPERATION	16- 1 to 16-112
--	------------------------

16.1 Function.....	16- 1
16.1.1 Overview.....	16- 1
16.1.2 Servo amplifier standard specifications (functions only).....	16- 1
16.1.3 Function list	16- 2
16.2 I/O signals (I/O devices) transferred to/from the programmable controller CPU.....	16- 3
16.2.1 I/O signals (I/O devices).....	16- 3
16.2.2 Detailed explanation of I/O signals	16- 5
16.2.3 Monitor codes	16-14
16.2.4 Instruction codes ($RW_{wn}+2 \cdot RW_{wn}+3$).....	16-15
16.2.5 Respond codes ($RW_{rn}+2$)	16-22
16.3 Signal.....	16-23
16.3.1 Signal (device) explanation.....	16-23
16.3.2 Detailed description of signals (devices).....	16-26
16.4 Switching power on for the first time	16-29
16.4.1 Startup procedure	16-29
16.4.2 Wiring check	16-30
16.4.3 Surrounding environment	16-31
16.5 Startup	16-32
16.5.1 Power on and off procedures.....	16-32
16.5.2 Stop.....	16-32

16.5.3 Test operation	16-33
16.5.4 Parameter setting	16-34
16.5.5 Point table setting	16-35
16.5.6 Actual operation	16-35
16.6 Servo amplifier display	16-36
16.7 Automatic operation mode	16-38
16.7.1 What is automatic operation mode?	16-38
16.7.2 Automatic operation mode 1 (Rotation direction specifying indexer)	16-39
16.7.3 Automatic operation mode 2 (Shortest rotating indexer)	16-49
16.8 Manual operation mode	16-58
16.8.1 Indexer JOG operation	16-58
16.8.2 JOG operation	16-60
16.9 Home position return mode	16-61
16.9.1 Outline of home position return	16-61
16.9.2 Torque limit changing dog type home position return	16-63
16.9.3 Torque limit changing data setting type home position return	16-65
16.9.4 Home position return automatic return function	16-66
16.10 Absolute position detection system	16-67
16.11 Parameters	16-70
16.11.1 Basic setting parameters (No.PA□□)	16-70
16.11.2 Gain/filter parameters (No.PB□□)	16-79
16.11.3 Extension setting parameters (No.PC□□)	16-87
16.11.4 I/O setting parameters (No.PD□□□)	16-93
16.12 TROUBLESHOOTING	16-98
16.12.1 Trouble at start-up	16-98
16.12.2 Operation at error occurrence	16-99
16.12.3 CC-Link communication error	16-99
16.12.4 When alarm or warning has occurred	16-100
16.12.5 Point table error	16-112

APPENDIX

App.- 1 to App.-30

App. 1 Parameter list	App.- 1
App. 2 Signal layout recording paper	App.- 3
App. 3 Twin type connector: outline drawing for 721-2105/026-000(WAGO)	App.- 4
App. 4 Change of connector sets to the RoHS compatible products	App.- 5
App. 5 MR-J3-200T-RT servo amplifier	App.- 6
App. 6 Selection example of servo motor power cable	App.-10
App. 7 Parameter list	App.-11
App. 8 Program example with MELSEC-A series programmable controllers (point table positioning operation)	App.-13

1. FUNCTIONS AND CONFIGURATION

1. FUNCTIONS AND CONFIGURATION

1.1 Introduction

The MR-J3-□T CC-Link compatible servo amplifier can support the CC-Link communication functions. Up to 42 axes of servo amplifiers can be controlled/monitored from the programmable controller side.

As the servo, it has the function to perform positioning operation by merely setting the position data (target positions), servo motor speeds, acceleration and deceleration time constants, etc. to point tables as if setting them in parameters. The servo amplifier is the most appropriate to configure a program-free, simple positioning system or to simplify a system, for example.

There are 31 points of point tables to be used when 1 station is occupied and 255 points when 2 stations are occupied.

All servo motors are equipped with an absolute position encoder as standard. An absolute position detection system can be configured by merely adding a battery to the servo amplifier. Once the home position has been set, home position return is not required at power on, alarm occurrence, etc.

The MR-J3-T is made easier to use and higher in function by using it with the MR Configurator.

1.1.1 Features of CC-Link communication functions

(1) Fast communication

Fast communication can be made by cyclic transmission of not only bit data but also word data.

(a) The highest communication speed is 10Mbps.

(b) The broadcast polling system ensures as high as 3.9ms to 6.7ms even at the maximum link scan (10Mbps).

(2) Variable communication speed/distance system

Selection of speed/distance allows use in a wide range of areas from a system requiring high speed to a system requiring long distance.

(3) System fault prevention (station separating function)

Because of connection in the bus system, any remote or local station that has become faulty due to power-off or the like does not affect communications with normal remote and local stations.

In addition, use of the two-piece terminal block allows the unit to be changed during data link.

(4) Factory Automation compatible

As the remote device stations of CC-Link, the servo amplifiers share a link system and can be controlled/monitored with programmable controller user programs.

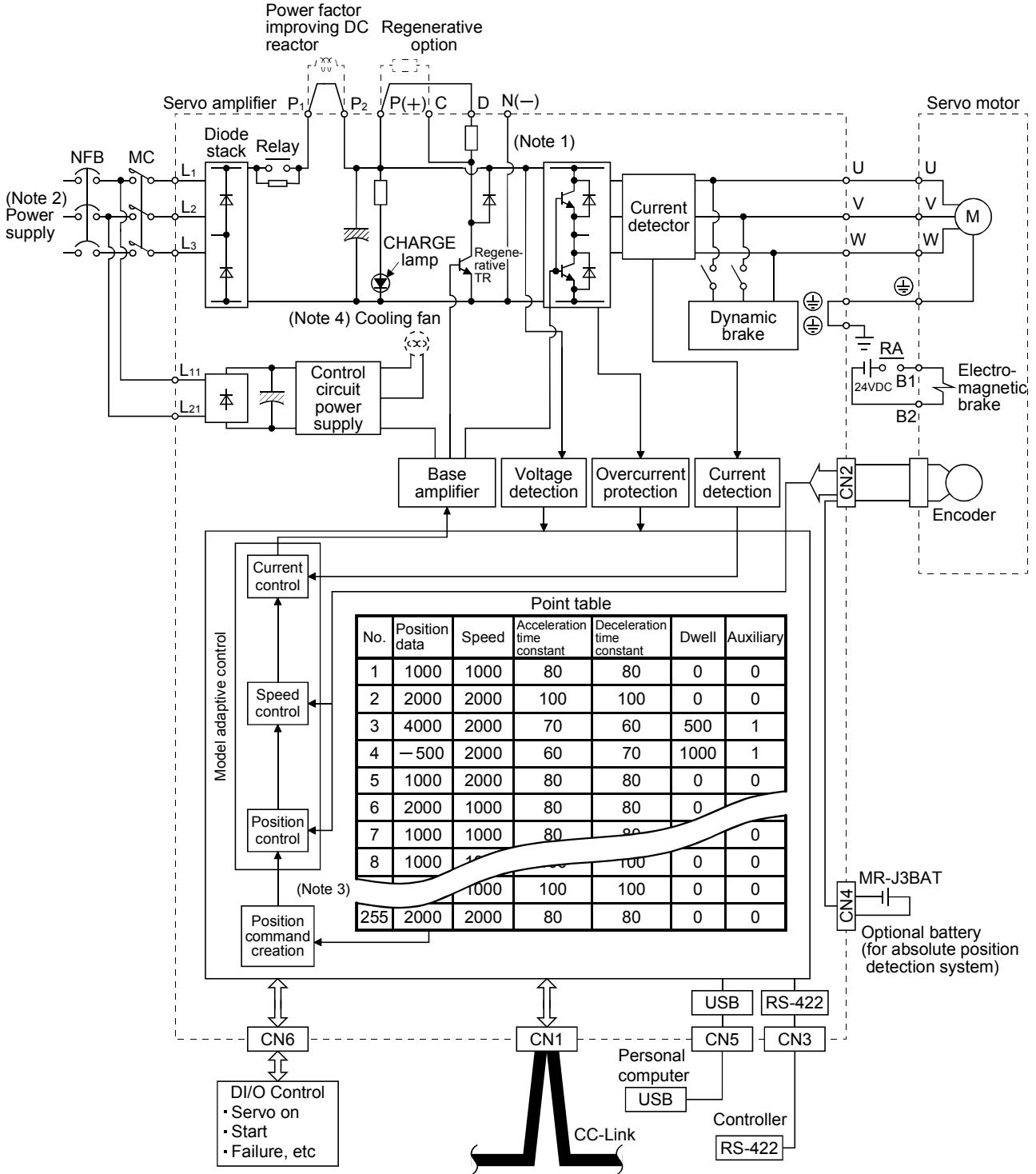
From the programmable controller side, the running speed, acceleration/deceleration time constant and other settings of servo motors can be changed/checked and the servo motors started and stopped.

1. FUNCTIONS AND CONFIGURATION

1.1.2 Function block diagram

The function block diagram of this servo is shown below.

(1) MR-J3-350T or less • MR-J3-200T4 or less



Note 1. The built-in regenerative resistor is not provided for the MR-J3-10T (1).

2. For 1-phase 200 to 230VAC, connect the power supply to L₁, L₂ and leave L₃ open.

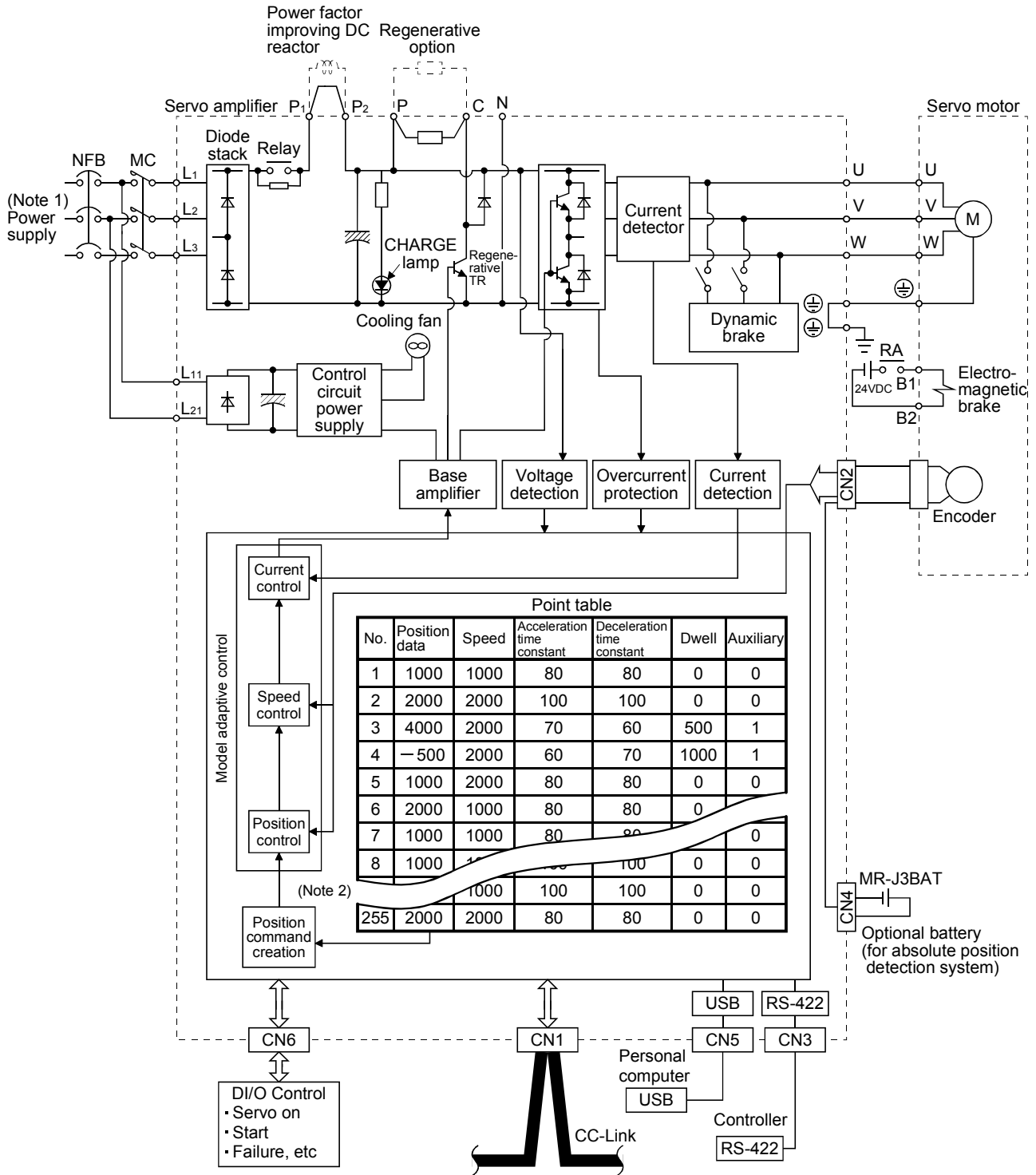
There is no L₃ for 1-phase 100 to 120VAC power supply. Refer to section 1.2 for the power supply specification.

3. For the case when 2 stations are occupied. When 1 station is occupied, the point table ends at No.31.

4. Servo amplifiers MR-J3-70T or greater have a cooling fan.

1. FUNCTIONS AND CONFIGURATION

(2) MR-J3-350T4 • MR-J3-500T(4) • MR-J3-700T(4)

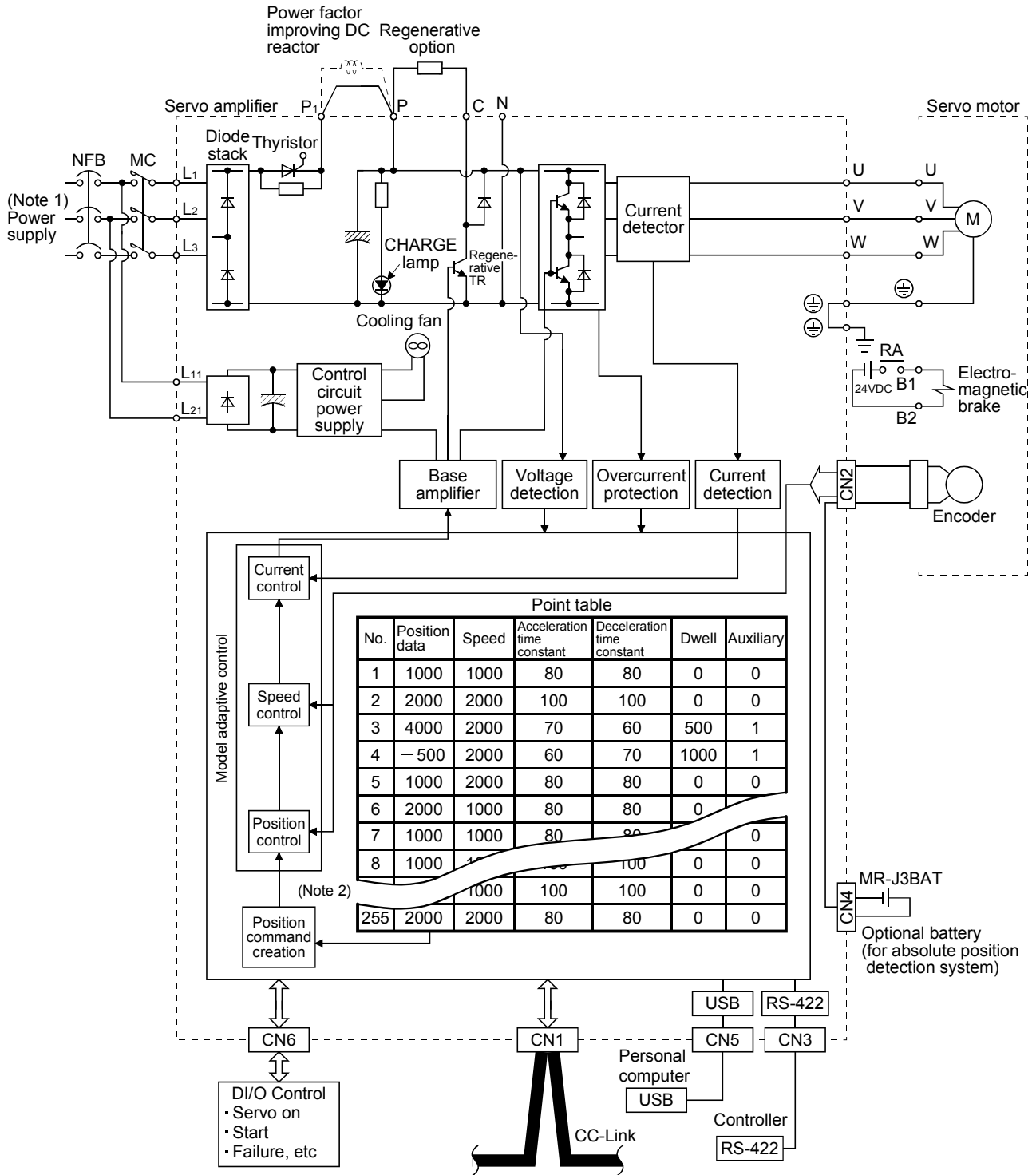


Note 1. Refer to section 1.2 for the power supply specification.

2. For the case when 2 stations are occupied. When 1 station is occupied, the point table ends at No.31.

1. FUNCTIONS AND CONFIGURATION

(3) MR-J3-11KT(4) to 22KT(4)



Note 1. Refer to section 1.2 for the power supply specification.

2. For the case when 2 stations are occupied. When 1 station is occupied, the point table ends at No.31.

1. FUNCTIONS AND CONFIGURATION

1.1.3 System configuration

This section provides operations using this servo.

Use of CC-Link enables you to freely configure any system from a single-axis system to an up to 42-axis system.

Set the following values to the point table.

Name	Setting range	Unit
Position data	-999999 to 999999	× 0.001[mm] × 0.01[mm] × 0.1[mm] × 1[mm]
Servo motor speed	0 to max. speed	[r/min]
Acceleration time constant	0 to 20000	[ms]
Deceleration time constant	0 to 20000	[ms]
Dwell	0 to 20000	[ms]
Auxiliary function	0 to 3 (Refer to section 4.2)	

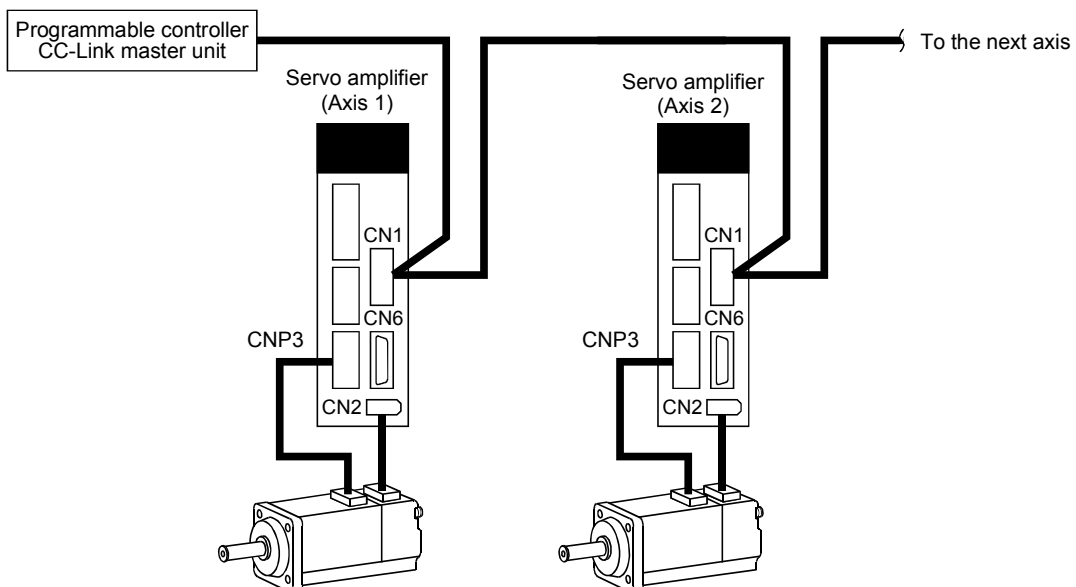
There are 31 points of point tables to be used when 1 station is occupied and 255 points when 2 stations are occupied.

(1) Operation using CC-Link communication functions

(a) Operation

All devices can be controlled by CC-Link communication. Also, each point table setting, point table selection, parameter value change, setting, monitor, servo motor operation and others can be performed.

(b) Configuration



1. FUNCTIONS AND CONFIGURATION

1.2 Servo amplifier standard specifications

(1) 200V class, 100V class

Item		Servo amplifier MR-J3-□															
		10T	20T	40T	60T	70T	100T	200T	350T	500T	700T	11KT	15KT	22KT	10T1	20T1	40T1
Power supply	Voltage/frequency	3-phase or 1-phase 200 to 230VAC, 50/60Hz					3-phase 200 to 230VAC, 50/60Hz					1-phase 100V to 120VAC, 50/60Hz					
	Permissible voltage fluctuation	3-phase or 1-phase 200 to 230VAC: 170 to 253VAC					3-phase 170 to 253VAC					1-phase 85 to 132VAC					
	Permissible frequency fluctuation	Within ±5%															
	Power supply capacity	Refer to section 13.2															
	Inrush current	Refer to section 13.5															
Control circuit power supply	Voltage, frequency	1-phase 200 to 230VAC, 50/60Hz										1-phase 100 to 120VAC, 50/60Hz					
	Permissible voltage fluctuation	1-phase 170 to 253VAC										1-phase 85 to 132VAC					
	Permissible frequency fluctuation	Within ±5%															
	Input	30W					45W					30W					
	Inrush current	Refer to section 13.5															
Interface power supply	Voltage	24VDC±10%															
	Power supply capacity	(Note 1) 150mA															
Control System	Sine-wave PWM control, current control system																
Dynamic brake	Built-in										External option			Built-in			
Protective functions	Overcurrent shut-off, regenerative overvoltage shut-off, overload shut-off (electronic thermal relay), servo motor overheat protection, encoder error protection, regenerative brake error protection, undervoltage, instantaneous power failure protection, overspeed protection, excessive error protection																
Command system	Point table number input	Operational specifications	Positioning by specifying the point table No. (255 points)														
		Position command input	Set in point table. 1-point feed length setting range: ±1[μm] to ±999.999[mm]														
		Speed command input	Set in point table. Acceleration/deceleration time is set in point table. S-pattern acceleration/deceleration time constant is set in parameter No.PC13.														
		System	Signed absolute value command system, incremental value command system, signed absolute value command/incremental value command specifying system														
	Position command data input (when 2 stations are occupied)	Operational specifications	Remote register setting is used for positioning.														
		Position command input	Remote register is used to set position command data. Feed length input setting range: ±1[μm] to ±999.999m														
		Speed command input	Remote register is used to make selection from point table. Remote register is used to set speed command data (speed). S-pattern acceleration/deceleration time constant is set in parameter No.PC13.														
		System	Signed absolute value command system, incremental value command system, signed absolute value command/incremental value command specifying system														
Operation mode	Automatic operation mode	Point table	Point table number input, position data input system Positioning operation is performed once in accordance with the position and speed commands.														
		Automatic continuous operation	Varied speed operation (2 to 255 speeds), automatic continuous positioning operation (2 to 255 points)														
	Manual operation mode	Jog	Jog operation is performed in accordance with the parameter-set speed command by contact input or through CC-Link communication function.														
		Manual pulse generator	Manual feed is made by manual pulse generator. Command pulse multiplication: ×1, ×10 or ×100 is selected using parameter.														

1. FUNCTIONS AND CONFIGURATION

Item		Servo amplifier MR-J3-□																
		10T	20T	40T	60T	70T	100T	200T	350T	500T	700T	11KT	15KT	22KT	10T1	20T1	40T1	
Operation mode	Home position return mode	Dog type	Home position return is made starting with Z-phase pulse after passage of proximity dog. Home position address may be set. Home position shift distance may be set. Home position return direction may be selected. Automatic at-dog home position return return/automatic stroke return function.															
		Count type	Home position return is made by counting encoder pulses after contact with proximity dog. Home position address may be set. Home position shift value may be set. Home position return direction may be set. Automatic at-dog home position return return/automatic stroke return function.															
		Data setting type	Home position return is made without dog. Home position may be set at any position by manual operation, etc. Home position address may be set.															
		Stopper type	Home position return is made by pressing machine part against stroke end. Home position address may be set. Home position return direction may be set.															
		Home position ignorance (Servo-on position as home position)	Position where servo-on (RYn0) is switched on is defined as home position. Home position address may be set.															
		Dog type rear end reference	Home position return is made with respect to the rear end of a proximity dog. Home position address may be set. Home position shift value may be set. Home position return direction may be set. Automatic at-dog home position return return/automatic stroke return function.															
		Count type front end reference	Home position return is made with respect to the front end of a proximity dog. Home position address may be set. Home position shift value may be set. Home position return direction may be set. Automatic at-dog home position return return/automatic stroke return function.															
		Dog cradle type	Home position return is made with respect to the front end of a proximity dog by the first Z-phase pulse. Home position address may be set. Home position shift value may be set. Home position return direction may be set. Automatic at-dog home position return return/automatic stroke return function.															
		Dog type last Z-phase reference	Home position return is made with respect to the front end of a proximity dog by the last Z-phase pulse. Home position address may be set. Home position shift value may be set. Home position return direction may be set. Automatic at-dog home position return return/automatic stroke return function.															
		Dog type front end reference	Home position return is made to the dog front end with respect to the front end of a proximity dog. Home position address may be set. Home position shift value may be set. Home position return direction may be set. Automatic at-dog home position return return/automatic stroke return function.															
		Dogless Z-phase reference	Home position return is made with respect to the first Z-phase to the Z-phase. Home position address may be set. Home position shift value may be set. Home position return direction may be set.															
Automatic positioning to home position		High-speed automatic return to a defined home position.																
Other functions		Absolute position detection, backlash function Overtravel prevention using external limit switch Software stroke limit																
Structure		Self-cooled, open (IP00)					Force-cooling, open (IP00)						Self-cooled, open (IP00)					

1. FUNCTIONS AND CONFIGURATION

Item		Servo amplifier MR-J3-□																
		10T	20T	40T	60T	70T	100T	200T	350T	500T	700T	11KT	15KT	22KT	10T1	20T1	40T1	
Environment	Ambient temperature	In operation	[°C]	(Note 2) 0 to +55 (non-freezing)														
			[°F]	(Note 2) 32 to +131 (non-freezing)														
		In storage	[°C]	-20 to +65 (non-freezing)														
			[°F]	-4 to +149 (non-freezing)														
	Ambient humidity	In operation	90%RH or less (non-condensing)															
		In storage																
	Ambient	Indoors (no direct sunlight) Free from corrosive gas, flammable gas, oil mist, dust and dirt																
Altitude	Max. 1000m above sea level																	
Vibration	5.9 [m/s ²] or less																	
Mass	[kg]	0.8	0.8	1.0	1.0	1.4	1.4	2.1	2.3	4.6	6.2	18	18	19	0.8	0.8	1.0	
	[lb]	1.76	1.76	2.21	2.21	3.09	3.09	4.63	5.07	10.1	13.7	39.7	39.7	41.9	1.76	1.76	2.21	

Note 1. 150mA is the value applicable when all I/O signals are used. The current capacity can be decreased by reducing the number of I/O points.

- When closely mounting the servo amplifier of 3.5kW or less, operate them at the ambient temperatures of 0 to 45°C (32 to 113°F) or at 75% or smaller effective load ratio.

1. FUNCTIONS AND CONFIGURATION

(2) 400V class

Item		Servo amplifier MR-J3-□									
		60T4	100T4	200T4	350T4	500T4	700T4	11KT4	15KT4	22KT4	
Power supply	Voltage/frequency	3-phase 380 to 480VAC, 50/60Hz									
	Permissible voltage fluctuation	3-phase 323 to 528VAC									
	Permissible frequency fluctuation	Within ±5%									
	Power supply capacity	Refer to section 13.2									
	Inrush current	Refer to section 13.5									
Control circuit power supply	Voltage, frequency	1-phase 380 to 480VAC, 50/60Hz									
	Permissible voltage fluctuation	1-phase 323 to 528VAC									
	Permissible frequency fluctuation	Within ±5%									
	Input	30W					45W				
	Inrush current	Refer to section 13.5									
Interface power supply	Voltage	24VDC ±10%									
	Power supply capacity	(Note) 150mA									
Control System		Sine-wave PWM control, current control system									
Dynamic brake		Built-in					External option				
Protective functions		Overcurrent shut-off, regenerative overvoltage shut-off, overload shut-off (electronic thermal relay), servo motor overheat protection, encoder error protection, regenerative brake error protection, undervoltage, instantaneous power failure protection, overspeed protection, excessive error protection									
Command system	Point table number input	Operational specifications	Positioning by specifying the point table No. (255 points)								
		Position command input	Set in point table. 1-point feed length setting range: ±1[μm] to ±999.999[mm]								
		Speed command input	Set in point table. Acceleration/deceleration time is set in point table. S-pattern acceleration/deceleration time constant is set in parameter No.PC13.								
		System	Signed absolute value command system, incremental value command system, signed absolute value command/incremental value command specifying system								
	Position command data input (when 2 stations are occupied)	Operational specifications	Remote register setting is used for positioning.								
		Position command input	Remote register is used to set position command data. Feed length input setting range: ±1[μm] to ±999.999m								
		Speed command input	Remote register is used to make selection from point table. Remote register is used to set speed command data (speed). S-pattern acceleration/deceleration time constant is set in parameter No.PC13.								
		System	Signed absolute value command system, incremental value command system, signed absolute value command/incremental value command specifying system								
Operation mode	Automatic operation mode	Point table	Point table number input, position data input system Positioning operation is performed once in accordance with the position and speed commands.								
		Automatic continuous operation	Varied speed operation (2 to 255 speeds), automatic continuous positioning operation (2 to 255 points)								
	Manual operation mode	Jog	Jog operation is performed in accordance with the parameter-set speed command by contact input or through CC-Link communication function.								
		Manual pulse generator	Manual feed is made by manual pulse generator. Command pulse multiplication: ×1, ×10 or ×100 is selected using parameter.								

1. FUNCTIONS AND CONFIGURATION

Item		Servo amplifier MR-J3-□									
		60T4	100T4	200T4	350T4	500T4	700T4	11KT4	15KT4	22KT4	
Operation mode	Home position return mode	Dog type	Home position return is made starting with Z-phase pulse after passage of proximity dog. Home position address may be set. Home position shift distance may be set. Home position return direction may be selected. Automatic at-dog home position return return/automatic stroke return function.								
		Count type	Home position return is made by counting encoder pulses after contact with proximity dog. Home position address may be set. Home position shift value may be set. Home position return direction may be set. Automatic at-dog home position return return/automatic stroke return function.								
		Data setting type	Home position return is made without dog. Home position may be set at any position by manual operation, etc. Home position address may be set.								
		Stopper type	Home position return is made by pressing machine part against stroke end. Home position address may be set. Home position return direction may be set.								
		Home position ignorance (Servo-on position as home position)	Position where servo-on (RYn0) is switched on is defined as home position. Home position address may be set.								
		Dog type rear end reference	Home position return is made with respect to the rear end of a proximity dog. Home position address may be set. Home position shift value may be set. Home position return direction may be set. Automatic at-dog home position return return/automatic stroke return function.								
		Count type front end reference	Home position return is made with respect to the front end of a proximity dog. Home position address may be set. Home position shift value may be set. Home position return direction may be set. Automatic at-dog home position return return/automatic stroke return function.								
		Dog cradle type	Home position return is made with respect to the front end of a proximity dog by the first Z-phase pulse. Home position address may be set. Home position shift value may be set. Home position return direction may be set. Automatic at-dog home position return return/automatic stroke return function.								
		Dog type last Z-phase reference	Home position return is made with respect to the front end of a proximity dog by the last Z-phase pulse. Home position address may be set. Home position shift value may be set. Home position return direction may be set. Automatic at-dog home position return return/automatic stroke return function.								
		Dog type front end reference	Home position return is made to the dog front end with respect to the front end of a proximity dog. Home position address may be set. Home position shift value may be set. Home position return direction may be set. Automatic at-dog home position return return/automatic stroke return function.								
		Dogless Z-phase reference	Home position return is made with respect to the first Z-phase to the Z-phase. Home position address may be set. Home position shift value may be set. Home position return direction may be set.								
Automatic positioning to home position		High-speed automatic return to a defined home position.									
Other functions		Absolute position detection, backlash function Overtravel prevention using external limit switch Software stroke limit									
Structure		Self-cooled, open (IP00)			Force-cooling, open (IP00)						

1. FUNCTIONS AND CONFIGURATION

Item		Servo amplifier MR-J3-□		60T4	100T4	200T4	350T4	500T4	700T4	11KT4	15KT4	22KT4
Environment	Ambient temperature	In operation	[°C]	0 to +55 (non-freezing)								
			[°F]	32 to +131 (non-freezing)								
		In storage	[°C]	-20 to +65 (non-freezing)								
			[°F]	-4 to +149 (non-freezing)								
	Ambient humidity	In operation	90%RH or less (non-condensing)									
		In storage										
	Ambient	Indoors (no direct sunlight) Free from corrosive gas, flammable gas, oil mist, dust and dirt										
	Altitude	Max. 1000m above sea level										
Vibration	5.9 [m/s ²] or less											
Mass			[kg]	1.7	1.7	2.1	4.6	4.6	6.2	18	18	19
			[lb]	3.75	3.75	4.63	10.1	10.1	13.7	39.7	39.7	41.9

Note. 150mA is the value applicable when all I/O signals are used. The current capacity can be decreased by reducing the number of I/O points.

1. FUNCTIONS AND CONFIGURATION

1.3 Function list

The following table lists the functions of this servo. For details of the functions, refer to the reference field.

Function	Description	Reference
Positioning by automatic operation	Select the required ones from among 31 preset point tables and perform operation in accordance with the set values. Use the external input signal or communication function to choose the point tables.	Section 5.4
Varied speed operation	Servo motor speed can be varied continuously until the preset moving distance is reached. (Max. set speeds: 255 speeds)	Section 5.4.2 (4)(b)
Automatic continuous positioning operation	By merely choosing one point table and starting operation, positioning can be executed continuously in accordance with several point tables.	Section 5.4.2 (4)
Home position return	Dog type, count type, data setting type, stopper type, home position ignorance, dog type rear end reference, count type front end reference, dog cradle type	Section 5.6
High-resolution encoder	High-resolution encoder of 262144 pulses/rev is used as a servo motor encoder.	
Absolute position detection system	By merely setting the home position once, home position return need not be done at each power on.	Section 5.7
Gain changing function	You can switch between gains during rotation and gains during stop or use an input device to change gains during operation.	Section 10.6
Advanced vibration suppression control	This function suppresses vibration at the arm end or residual vibration.	Section 10.4
Adaptive filter II	Servo amplifier detects mechanical resonance and sets filter characteristics automatically to suppress mechanical vibration.	Section 10.2
Low-pass filter	Suppresses high-frequency resonance which occurs as servo system response is increased.	Section 10.5
Machine analyzer function	Analyzes the frequency characteristic of the mechanical system by simply connecting a MR Configurator installed personal computer and servo amplifier. MR Configurator is necessary for this function.	
Machine simulation	Can simulate machine motions on a personal computer screen on the basis of the machine analyzer results. MR Configurator is necessary for this function.	
Gain search function	Personal computer changes gains automatically and searches for overshoot-free gains in a short time. MR Configurator is necessary for this function.	
Slight vibration suppression control	Suppresses vibration of ± 1 pulse produced at a servo motor stop.	Parameters No. PB24
Electronic gear	The electronic gear is used to make adjustment so that the servo amplifier setting matches the machine moving distance. Also, changing the electronic gear value allows the machine to be moved at any multiplication ratio to the moving distance using the servo amplifier.	Parameter No. PA06, PA07
Auto tuning	Automatically adjusts the gain to optimum value if load applied to the servo motor shaft varies.	Section 9.2
S-pattern acceleration/deceleration time constant	Acceleration/deceleration can be made smoothly.	Parameters No. PC13
Regenerative option	Used when the built-in regenerative resistor of the servo amplifier does not have sufficient regenerative capability for the regenerative power generated.	Section 14.2
Brake unit	Used when the regenerative option cannot provide enough regenerative power. Can be used with the servo amplifier of 5kW or more.	Section 14.3
Regeneration converter	Used when the regenerative option cannot provide enough regenerative power. Can be used with the servo amplifier of 5kW or more.	Section 14.4
Alarm history clear	Alarm history is cleared.	Parameter No. PC18

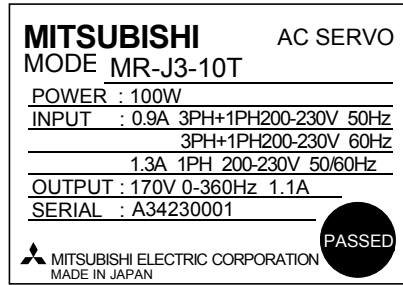
1. FUNCTIONS AND CONFIGURATION

Function	Description	Reference
I/O signal selection (Device setting)	Any input device such as servo-on (SON) can be assigned to any pin of CN6 connector.	Parameter No. PD06 to PD08 PD12 * PD14
Torque limit	Servo motor-torque is limited.	Section 4.6.3 Section 6.1.11
Output signal (DO) forced output	Output signal can be forced on/off independently of the servo status. Use this function for output signal wiring check, etc.	Section 7.7.4 Section 8.5.7(4)
Test operation mode	JOG operation * positioning operation * DO forced output * single - step feed. MR Configurator is necessary for this function.	Section 7.7 Section 8.5.7
Limit switch	The servo motor travel region can be limited using the forward rotation stroke end (LSP)/reverse rotation stroke end (LSN).	
Software limit	The travel region is limited using parameters in terms of address. The function similar to that of a limit switch is limited by parameter.	Section 6.3.6

1. FUNCTIONS AND CONFIGURATION

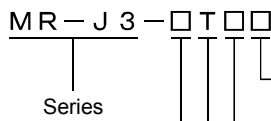
1.4 Model code definition

(1) Rating plate



- ← Model
- ← Capacity
- ← Applicable power supply
- ← Rated output current
- ← Serial number

(2) Model



With no regenerative resistor

Symbol	Description
-PX	Indicates a servo amplifier of 11k to 22kW that does not use a regenerative resistor as standard accessory.

Power supply

Symbol	Description
(Note 1)	3-phase or 1-phase 200 to 230VAC
None	
(Note 2) 1	1-phase 100 to 120VAC
4	3-phase 380 to 480VAC

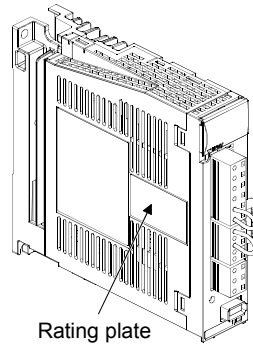
Note 1. 1-phase 200V to 230V is supported by 750W or less.
 Note 2. 1-phase 100V to 120V is supported by 400W or less.

Built-in positioning function

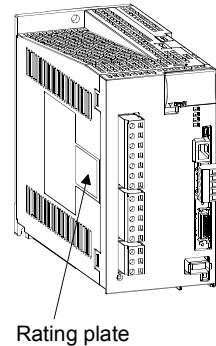
Rated output

Symbol	Rated output [kW]
10	0.1
20	0.2
40	0.4
60	0.6
70	0.75
100	1
200	2
350	3.5
500	5
700	7
11K	11
15K	15
22K	22

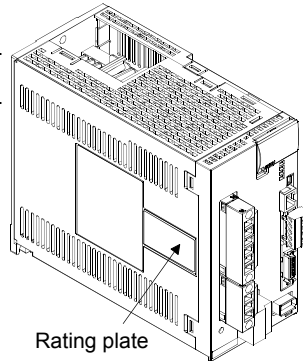
MR-J3-100T(4) or less



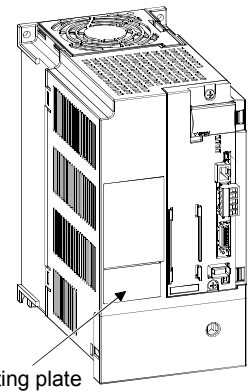
MR-J3-200T(4)



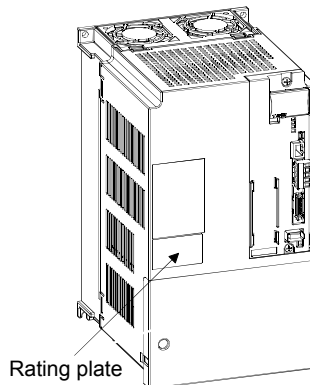
MR-J3-350T



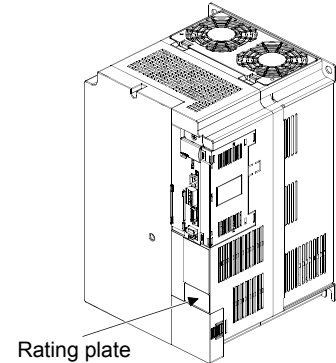
MR-J3-350T4 • 500T(4)



MR-J3-700T(4)



MR-J3-11KT(4) to 22KT(4)



1. FUNCTIONS AND CONFIGURATION

1.5 Combination with servo motor

The following table lists combinations of servo amplifiers and servo motors. The same combinations apply to the servo motors with an electromagnetic brakes and the servo motors with a reduction gear.

Servo amplifier	Servo motors						
	HF-MP□	HF-KP□	HF-SP□		HC-RP□	HC-UP□	HC-LP□
			1000r/min	2000r/min			
MR-J3-10T (1)	053 · 13	053 · 13					
MR-J3-20T (1)	23	23					
MR-J3-40T (1)	43	43					
MR-J3-60T			51	52			52
MR-J3-70T	73	73				72	
MR-J3-100T			81	102			102
MR-J3-200T			121 · 201	152 · 202	103 · 153	152	152
MR-J3-350T			301	352	203	202	202
MR-J3-500T			421	502	353 · 503	352 · 502	302
MR-J3-700T				702			
MR-J3-11KT							
MR-J3-15KT							
MR-J3-22KT							

Servo amplifier	Servo motors		
	HA-LP□		
	1000r/min	1500r/min	2000r/min
MR-J3-500T			502
MR-J3-700T	601	701M	702
MR-J3-11KT	801 · 12K1	11K1M	11K2
MR-J3-15KT	15K1	15K1M	15K2
MR-J3-22KT	20K1 · 25K1	22K1M	22K2

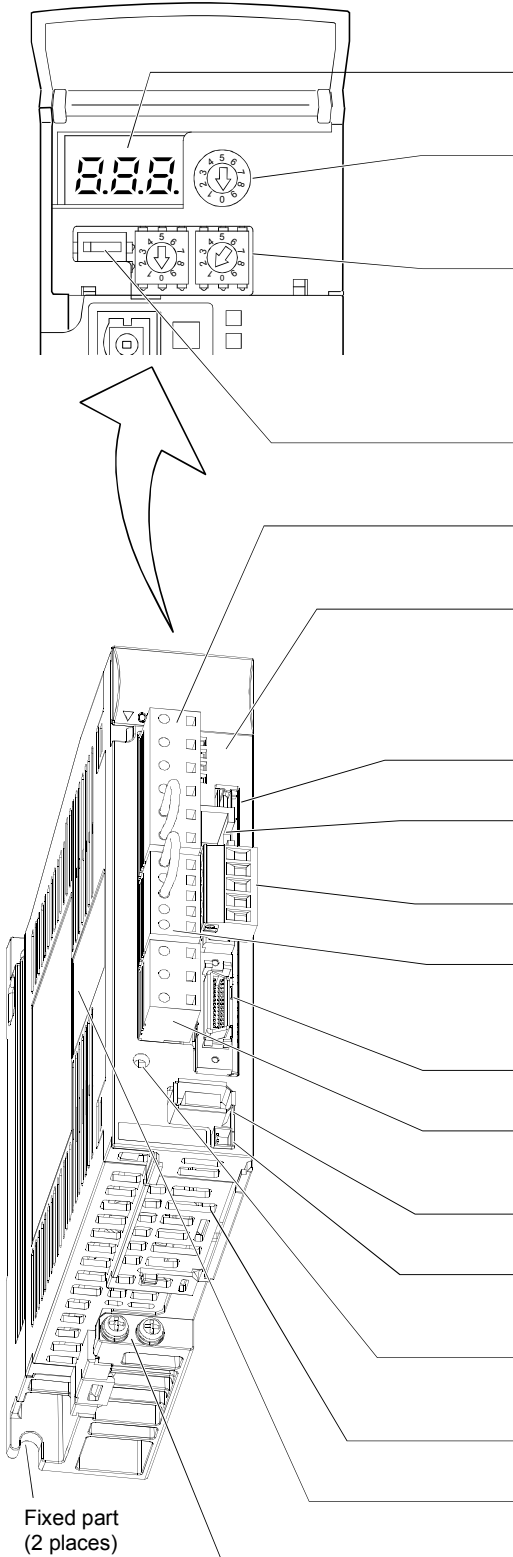
Servo amplifier	Servo motors			
	HF-SP	HA-LP□		
		1000r/min	1500r/min	2000r/min
MR-J3-60T4	524			
MR-J3-100T4	1024			
MR-J3-200T4	1524 · 2024			
MR-J3-350T4	3524			
MR-J3-500T4	5024			
MR-J3-700T4	7024	6014	701M4	
MR-J3-11KT4		8014 · 12K14	11K1M4	11K24
MR-J3-15KT4		15K14	15K1M4	15K24
MR-J3-22KT4		20K14	22K1M4	22K24


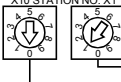

1. FUNCTIONS AND CONFIGURATION

1.6 Structure

1.6.1 Parts identification


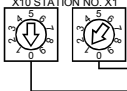

(1) MR-J3-100T or less



Name/Application	Detailed explanation
Display The 3-digit, seven-segment LED shows the servo status and alarm number.	Section 5.3 Chapter 11
Baud rate switch (MODE)  Select the CC-Link communication baud rate.	Section 3.2.4
Station number switches (STATION NO.) Set the station number of the servo amplifier.  Set the one place. Set the ten place.	Section 3.2.3
Occupied station count switch (SW1)  Set the number of occupied stations.	Section 3.2.5
Main circuit power supply connector (CNP1) Used to connect the input power supply.	Section 4.1 Section 4.3 Section 12.1
Communication alarm display section Indicates alarms in CC-Link communication. ■ L.RUN ■ SD ■ RD ■ L.ERR	Section 11.3
USB communication connector (CN5) Used to connect the personal computer.	Chapter 7
RS-422 communication connector (CN3) Used to connect the MR-PRU03 parameter unit or personal computer.	Chapter 7 Chapter 8 Chapter 15
CC-Link connector (CN1) Wire the CC-Link cable.	Section 3.2.2
Control circuit connector (CNP2) Used to connect the control circuit power supply/regenerative option.	Section 4.1 Section 4.3 Section 12.1 Section 14.2
I/O signal connector (CN6) Used to connect digital I/O signals.	Section 4.2 Section 4.4
Servo motor power connector (CNP3) Used to connect the servo motor.	Section 4.1 Section 4.3 Section 12.1
Encoder connector (CN2) Used to connect the servo motor encoder.	Section 4.10 Section 14.1
Battery connector (CN4) Used to connect the battery for absolute position data backup.	Section 5.8 Section 14.7
Charge lamp Lit to indicate that the main circuit is charged. While this lamp is lit, do not reconnect the cables.	
Battery holder Contains the battery for absolute position data backup.	Section 5.8
Rating plate	Section 1.4
Protective earth (PE) terminal (⊕) Ground terminal.	Section 4.1 Section 4.3 Section 12.1

1. FUNCTIONS AND CONFIGURATION

(2) MR-J3-200T(4) or less

Name/Application	Detailed explanation
Display The 3-digit, seven-segment LED shows the servo status and alarm number.	Section 5.3 Chapter 11
Baud rate switch (MODE)  Select the CC-Link communication baud rate.	Section 3.2.4
Station number switches (STATION NO.) Set the station number of the servo amplifier.  Set the one place. Set the ten place.	Section 3.2.3
Occupied station count switch (SW1)  Set the number of occupied stations.	Section 3.2.5
Main circuit power supply connector (CNP1) Used to connect the input power supply.	Section 4.1 Section 4.3 Section 12.1
Communication alarm display section Indicates alarms in CC-Link communication. ■ L.RUN ■ SD ■ RD ■ L.ERR	Section 11.3
USB communication connector (CN5) Used to connect the personal computer.	Chapter 7
RS-422 communication connector (CN3) Used to connect the MR-PRU03 parameter unit or personal computer.	Chapter 7 Chapter 8 Chapter 15
CC-Link connector (CN1) Wire the CC-Link cable.	Section 3.2.2
I/O signal connector (CN6) Used to connect digital I/O signals.	Section 4.2 Section 4.4
Encoder connector (CN2) Used to connect the servo motor encoder.	Section 4.10 Section 14.1
Battery connector (CN4) Used to connect the battery for absolute position data backup.	Section 5.8 Section 14.7
Control circuit connector (CNP2) Used to connect the control circuit power supply/regenerative option.	Section 4.1 Section 4.3 Section 12.1 Section 14.2
Servo motor power connector (CNP3) Used to connect the servo motor.	Section 4.1 Section 4.3 Section 12.1
Battery holder Contains the battery for absolute position data backup.	Section 5.8
Charge lamp Lit to indicate that the main circuit is charged. While this lamp is lit, do not reconnect the cables.	
Protective earth (PE) terminal (⊕) Ground terminal.	Section 4.1 Section 4.3 Section 12.1
Rating plate	Section 1.4

(Note)

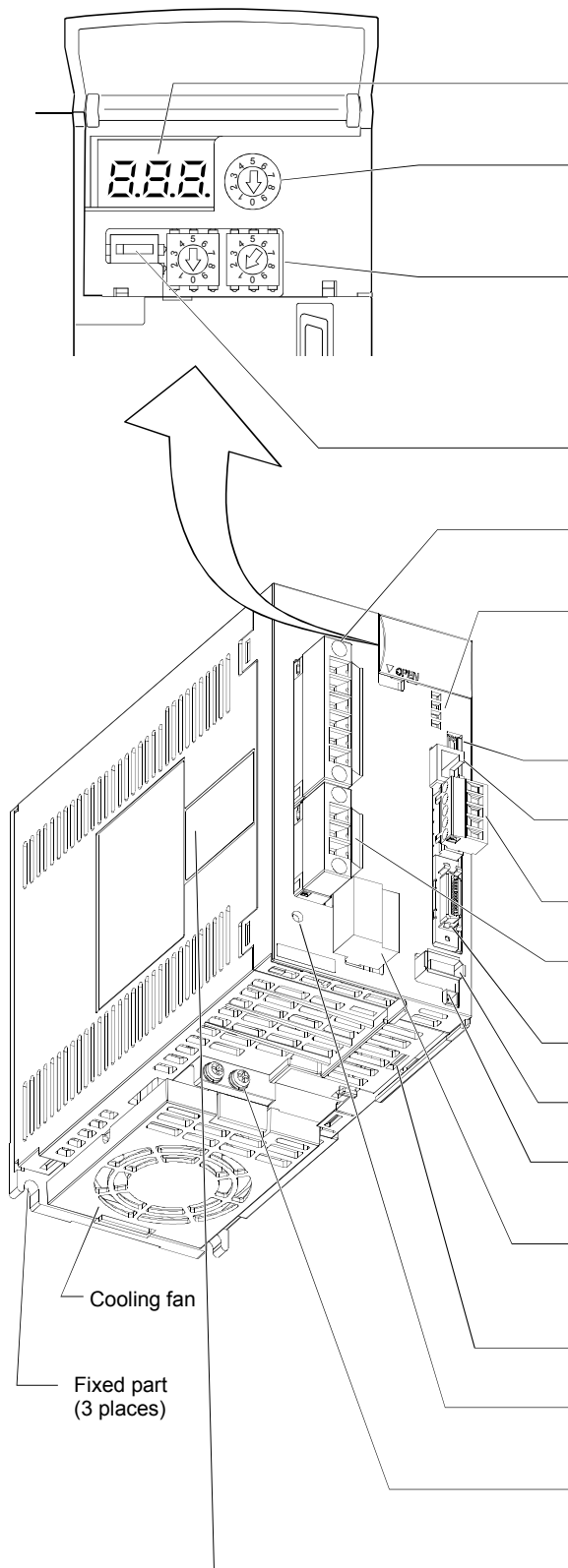
Cooling fan


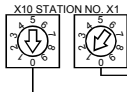

Fixed part (3 places)

Note. Connectors (CNP1, CNP2, and CNP3) and appearance of MR-J3-200T servo amplifier have been changed from January 2008 production. Model name of the existing servo amplifier is changed to MR-J3-200T-RT. For MR-J3-200T-RT, refer to appendix 5.

1. FUNCTIONS AND CONFIGURATION

(3) MR-J3-350T



Name/Application	Detailed explanation
Display The 3-digit, seven-segment LED shows the servo status and alarm number.	Section 5.3 Chapter 11
Baud rate switch (MODE)  Select the CC-Link communication baud rate.	Section 3.2.4
Station number switches (STATION NO.) Set the station number of the servo amplifier.  Set the one place. Set the ten place.	Section 3.2.3
Occupied station count switch (SW1)  Set the number of occupied stations.	Section 3.2.5
Main circuit power supply connector (CNP1) Used to connect the input power supply.	Section 4.1 Section 4.3 Section 12.1
Communication alarm display section Indicates alarms in CC-Link communication. ■ L.RUN ■ SD ■ RD ■ L.ERR	Section 11.3
USB communication connector (CN5) Used to connect the personal computer.	Chapter 7
RS-422 communication connector (CN3) Used to connect the MR-PRU03 parameter unit or personal computer.	Chapter 7 Chapter 8 Chapter 15
CC-Link connector (CN1) Wire the CC-Link cable.	Section 3.2.2
Servo motor power connector (CNP3) Used to connect the servo motor.	Section 4.1 Section 4.3 Section 12.1
I/O signal connector (CN6) Used to connect digital I/O signals.	Section 4.2 Section 4.4
Encoder connector (CN2) Used to connect the servo motor encoder.	Section 4.10 Section 14.1
Battery connector (CN4) Used to connect the battery for absolute position data backup.	Section 5.8 Section 14.7
Control circuit connector (CNP2) Used to connect the control circuit power supply/regenerative option.	Section 4.1 Section 4.3 Section 12.1 Section 14.2
Battery holder Contains the battery for absolute position data backup.	Section 5.8
Charge lamp Lit to indicate that the main circuit is charged. While this lamp is lit, do not reconnect the cables.	
Protective earth (PE) terminal (⊕) Ground terminal.	Section 4.1 Section 4.3 Section 12.1
Rating plate	Section 1.4

1. FUNCTIONS AND CONFIGURATION

(4) MR-J3-350T4 • MR-J3-500T(4)

POINT

• The servo amplifier is shown without the front cover. For removal of the front cover, refer to section 1.6.2.

Name/Application	Detailed explanation
Display The 3-digit, seven-segment LED shows the servo status and alarm number.	Section 5.3 Chapter 11
Baud rate switch (MODE) Select the CC-Link communication baud rate.	Section 3.2.4
Station number switches (STATION NO.) Set the station number of the servo amplifier. Set the one place. Set the ten place.	Section 3.2.3
Occupied station count switch (SW1) Set the number of occupied stations.	Section 3.2.5
Communication alarm display section Indicates alarms in CC-Link communication. ■ L.RUN ■ SD ■ RD ■ L.ERR	Section 11.3
USB communication connector (CN5) Used to connect the personal computer.	Chapter 7
RS-422 communication connector (CN3) Used to connect the MR-PRU03 parameter unit or personal computer.	Chapter 7 Chapter 8 Chapter 15
CC-Link connector (CN1) Wire the CC-Link cable.	Section 3.2.2
I/O signal connector (CN6) Used to connect digital I/O signals.	Section 4.2 Section 4.4
Battery holder Contains the battery for absolute position data backup.	Section 5.8
Encoder connector (CN2) Used to connect the servo motor encoder.	Section 4.10 Section 14.1
Battery connector (CN4) Used to connect the battery for absolute position data backup.	Section 5.8 Section 14.7
DC reactor terminal block (TE3) Used to connect the DC reactor.	Section 4.1 Section 4.3 Section 12.1 Section 14.11
Charge lamp Lit to indicate that the main circuit is charged. While this lamp is lit, do not reconnect the cables.	
Main circuit terminal block (TE1) Used to connect the input power supply and servo motor.	Section 4.1 Section 4.3 Section 12.1
Control circuit terminal block (TE2) Used to connect the control circuit power supply.	
Protective earth (PE) terminal (⊕) Ground terminal.	
Rating plate	Section 1.4

1. FUNCTIONS AND CONFIGURATION

(5) MR-J3-700T(4)

POINT

- The servo amplifier is shown without the front cover. For removal of the front cover, refer to section 1.6.2.

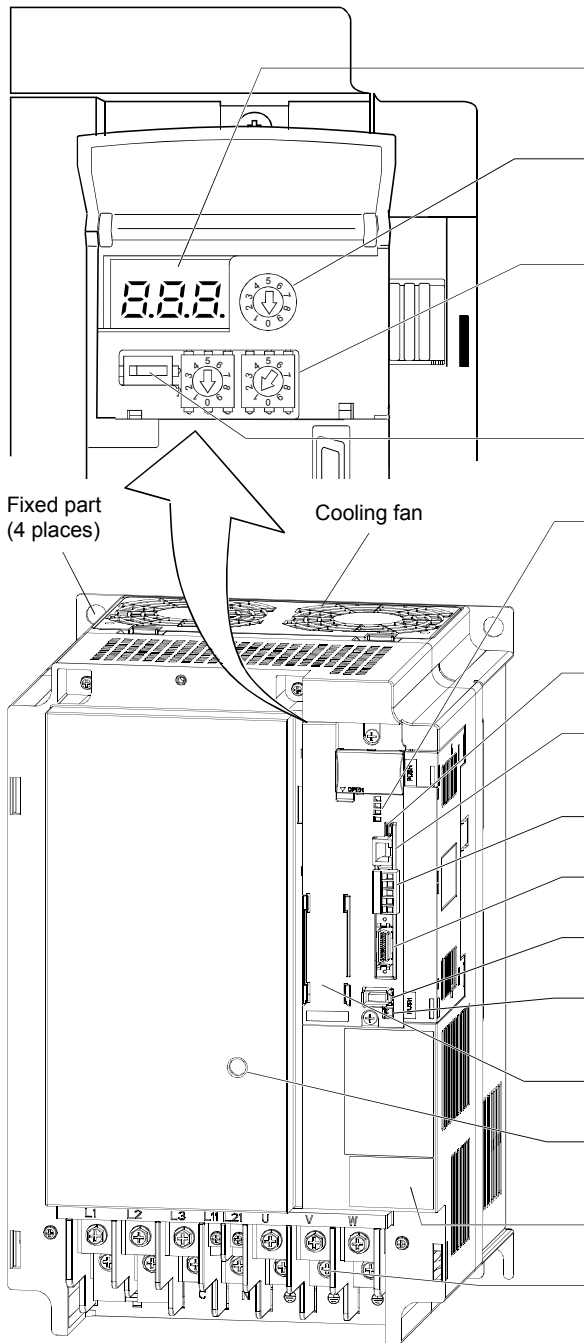
Name/Application	Detailed explanation
Display The 3-digit, seven-segment LED shows the servo status and alarm number.	Section 5.3 Chapter 11
Baud rate switch (MODE) Select the CC-Link communication baud rate.	Section 3.2.4
Station number switches (STATION NO.) Set the station number of the servo amplifier. Set the one place. Set the ten place.	Section 3.2.3
Occupied station count switch (SW1) Set the number of occupied stations.	Section 3.2.5
Communication alarm display section Indicates alarms in CC-Link communication. ■ L.RUN ■ SD ■ RD ■ L.ERR	Section 11.3
USB communication connector (CN5) Used to connect the personal computer.	Chapter 7
RS-422 communication connector (CN3) Used to connect the MR-PRU03 parameter unit or personal computer.	Chapter 7 Chapter 8 Chapter 15
CC-Link connector (CN1) Wire the CC-Link cable.	Section 3.2.2
I/O signal connector (CN6) Used to connect digital I/O signals.	Section 4.2 Section 4.4
Battery holder Contains the battery for absolute position data backup.	Section 5.8
Encoder connector (CN2) Used to connect the servo motor encoder.	Section 4.10 Section 14.1
Battery connector (CN4) Used to connect the battery for absolute position data backup.	Section 5.8 Section 14.7
DC reactor terminal block (TE3) Used to connect the DC reactor.	Section 4.1 Section 4.3 Section 12.1 Section 14.11
Charge lamp Lit to indicate that the main circuit is charged. While this lamp is lit, do not reconnect the cables.	
Control circuit terminal block (TE2) Used to connect the control circuit power supply.	Section 4.1 Section 4.3 Section 12.1
Main circuit terminal block (TE1) Used to connect the input power supply and servo motor.	
Protective earth (PE) terminal (⊕) Ground terminal.	
Rating plate	Section 1.4


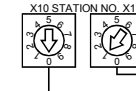

1. FUNCTIONS AND CONFIGURATION

(6) MR-J3-11KT(4) to MR-J3-22KT(4)

POINT

- The servo amplifier is shown without the front cover. For removal of the front cover, refer to section 1.6.2.



Name/Application	Detailed explanation
Display The 3-digit, seven-segment LED shows the servo status and alarm number.	Section 5.3 Chapter 11
Baud rate switch (MODE)  Select the CC-Link communication baud rate.	Section 3.2.4
Station number switches (STATION NO.) Set the station number of the servo amplifier.  Set the one place. Set the ten place.	Section 3.2.3
Occupied station count switch (SW1)  Set the number of occupied stations.	Section 3.2.5
Communication alarm display section Indicates alarms in CC-Link communication. ■ L.RUN ■ SD ■ RD ■ L.ERR	Section 11.3
USB communication connector (CN5) Used to connect the personal computer.	Chapter 7
RS-422 communication connector (CN3) Used to connect the MR-PRU03 parameter unit or personal computer.	Chapter 7 Chapter 8 Chapter 15
CC-Link connector (CN1) Wire the CC-Link cable.	Section 3.2.2
I/O signal connector (CN6) Used to connect digital I/O signals.	Section 4.2 Section 4.4
Encoder connector (CN2) Used to connect the servo motor encoder.	Section 4.10 Section 14.1
Battery connector (CN4) Used to connect the battery for absolute position data backup.	Section 5.8 Section 14.7
Battery holder Contains the battery for absolute position data backup.	Section 5.8
Charge lamp Lit to indicate that the main circuit is charged. While this lamp is lit, do not reconnect the cables.	
Rating plate	Section 1.4
Protective earth (PE) terminal (⊕) Ground terminal.	Section 4.1 Section 4.3 Section 12.1 Section 14.11

1. FUNCTIONS AND CONFIGURATION

1.6.2 Removal and reinstallation of the front cover

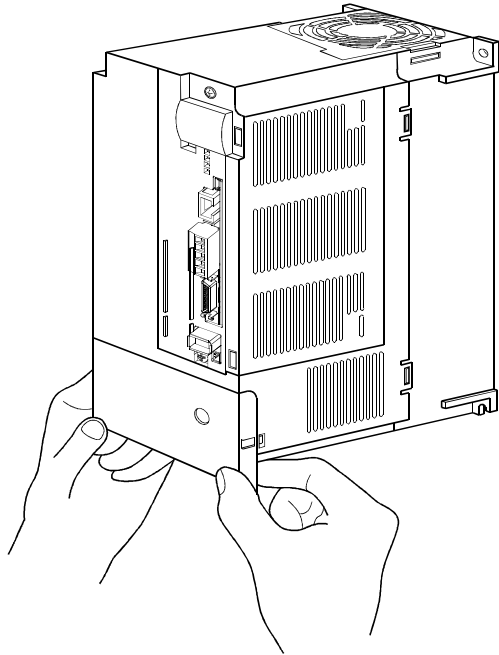


WARNING

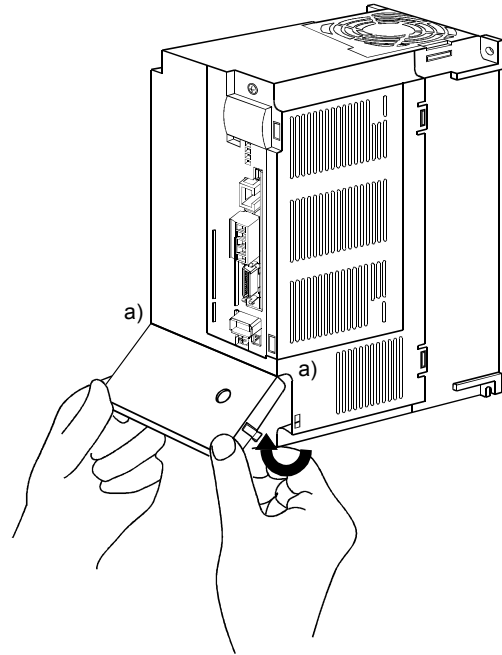
- Before removing or installing the front cover, turn off the power and wait for 15 minutes or more until the charge lamp turns off. Then, confirm that the voltage between P(+) and N(−) is safe with a voltage tester and others. Otherwise, an electric shock may occur. In addition, always confirm from the front of the servo amplifier whether the charge lamp is off or not.

(1) For MR-J3-350T4 • MR-J3-500T(4) • MR-J3-700T(4)

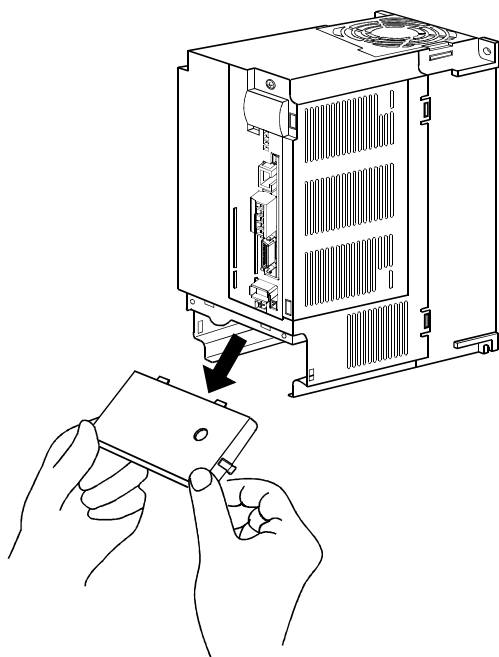
Removal of the front cover



Hold the ends of lower side of the front cover with both hands.



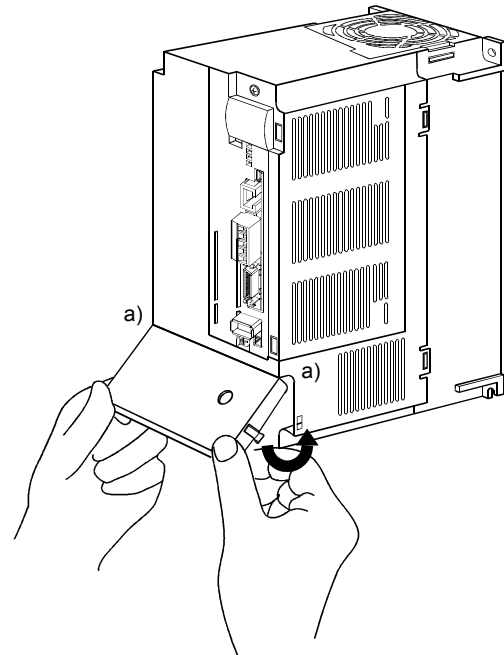
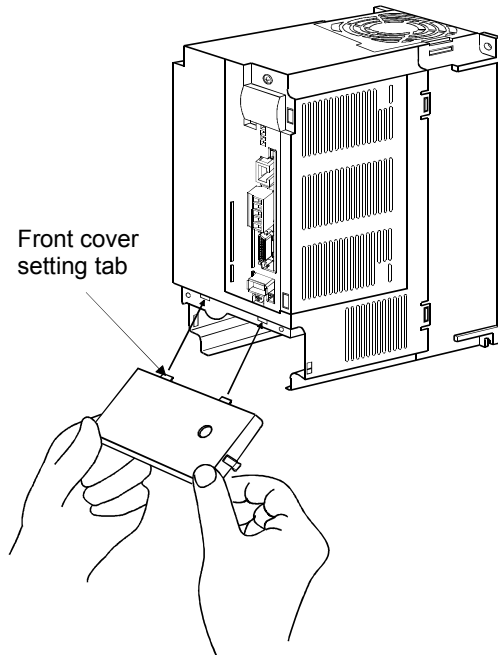
Pull up the cover, supporting at point a).



Pull out the front cover to remove.

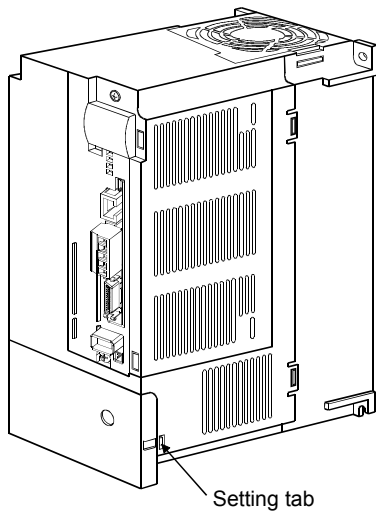
1. FUNCTIONS AND CONFIGURATION

Reinstallation of the front cover



Insert the front cover setting tabs into the sockets of servo amplifier (2 places).

Pull up the cover, supporting at point a).

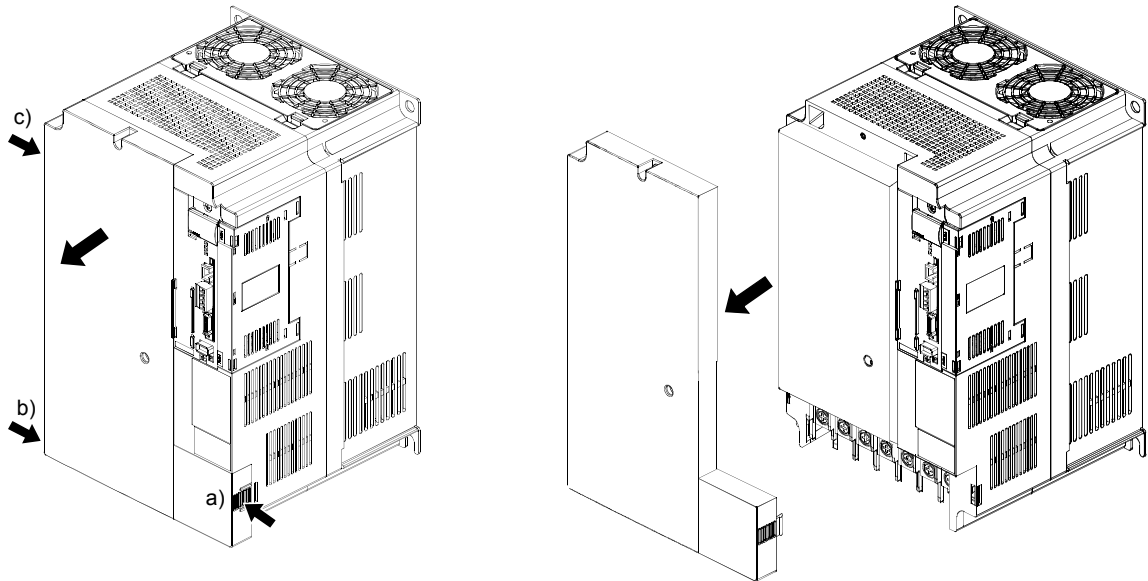


Push the setting tabs until they click.

1. FUNCTIONS AND CONFIGURATION

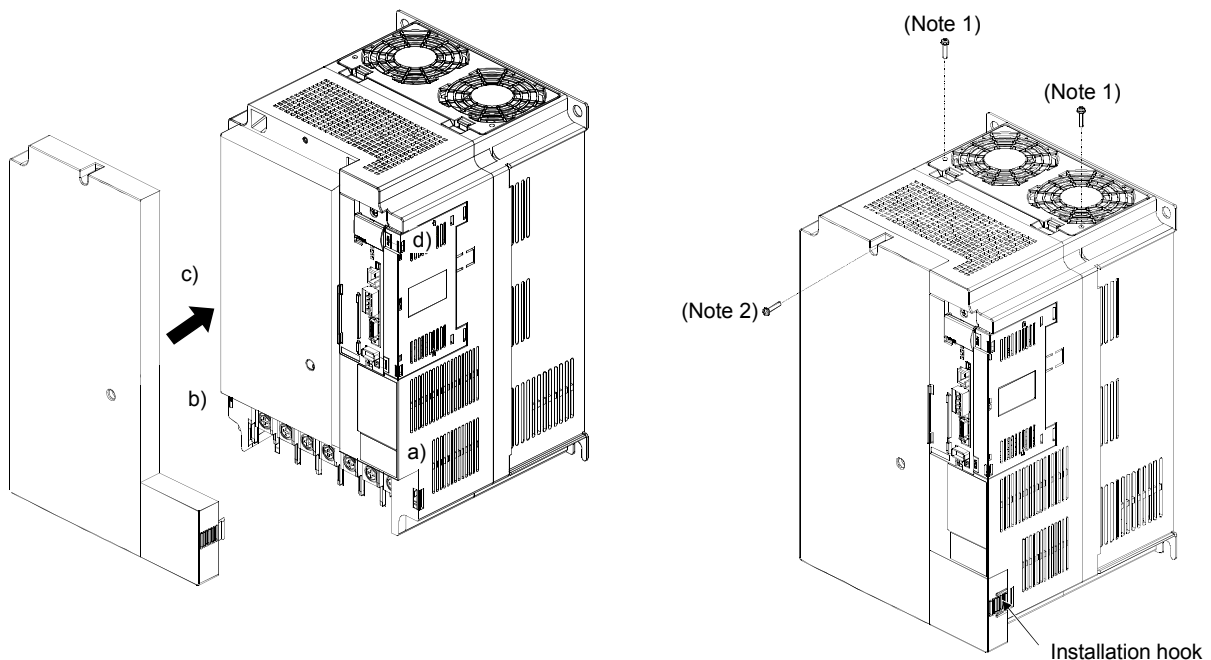
(2) For MR-J3-11KT(4) to MR-J3-22KT(4)

Removal of the front cover



- 1) Press the removing knob on the lower side of the front cover (a) and b) and release the installation hook.
- 2) Press the removing knob of c) and release the external hook.
- 3) Pull it to remove the front cover.

Reinstallation of the front cover



- 1) Fit the front cover installation hooks on the sockets of body cover (a) to d) to reinstall it.
- 2) Push the front cover until you hear the clicking noise of the installation hook.

Note 1. The cooling fan cover can be locked with enclosed screws (M4 × 40).

2. By drilling approximately $\phi 4$ of a hole on the front cover, the front cover can be locked on the body with an enclosed screw (M4 × 14).

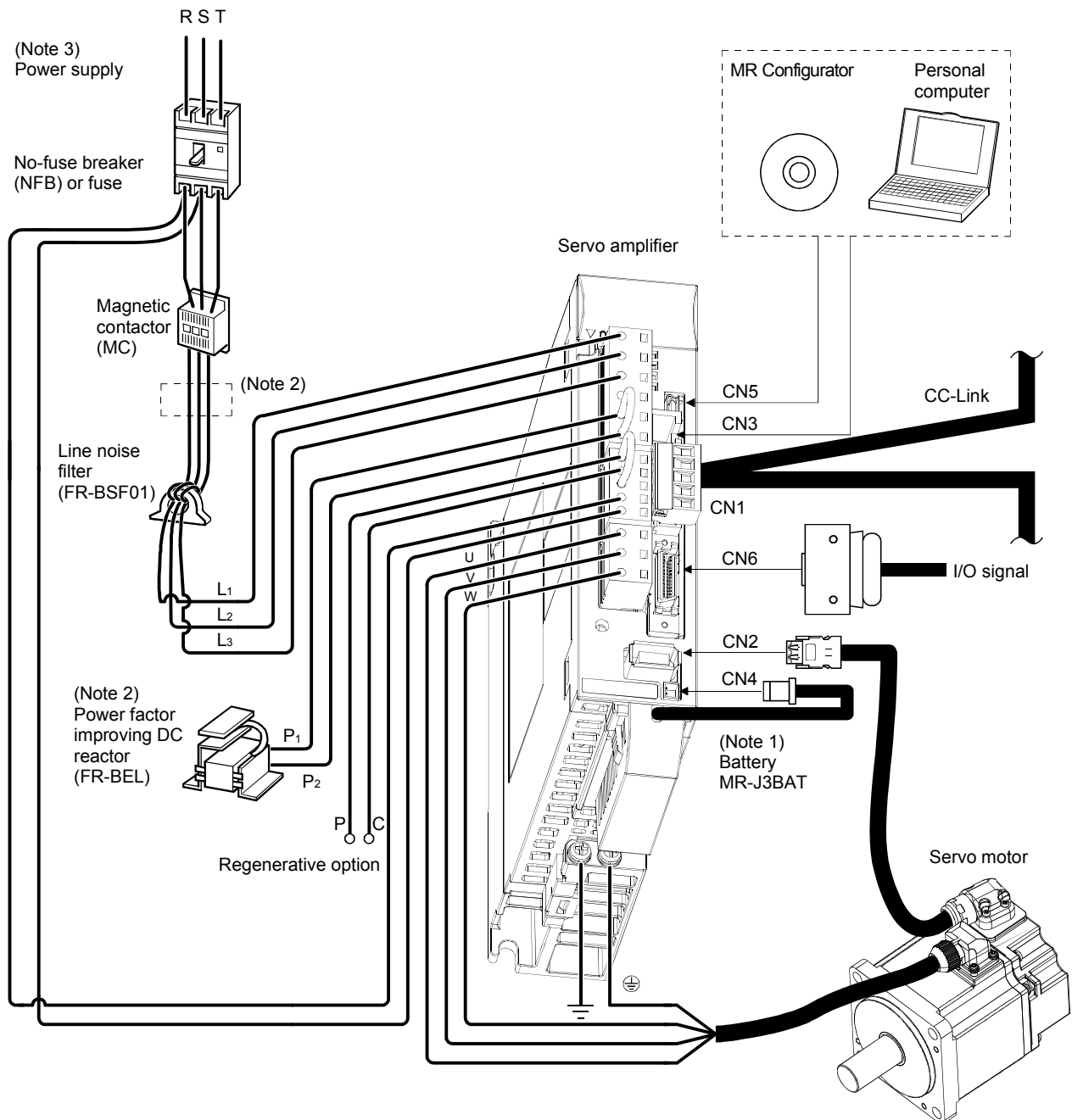
1. FUNCTIONS AND CONFIGURATION

1.7 Configuration including auxiliary equipment

POINT
<ul style="list-style-type: none"> Equipment other than the servo amplifier and servo motor are optional or recommended products.

(1) MR-J3-100T or less

(a) For 3-phase or 1-phase 200V to 230VAC



Note 1. The battery (option) is used for the absolute position detection system in the position control mode.

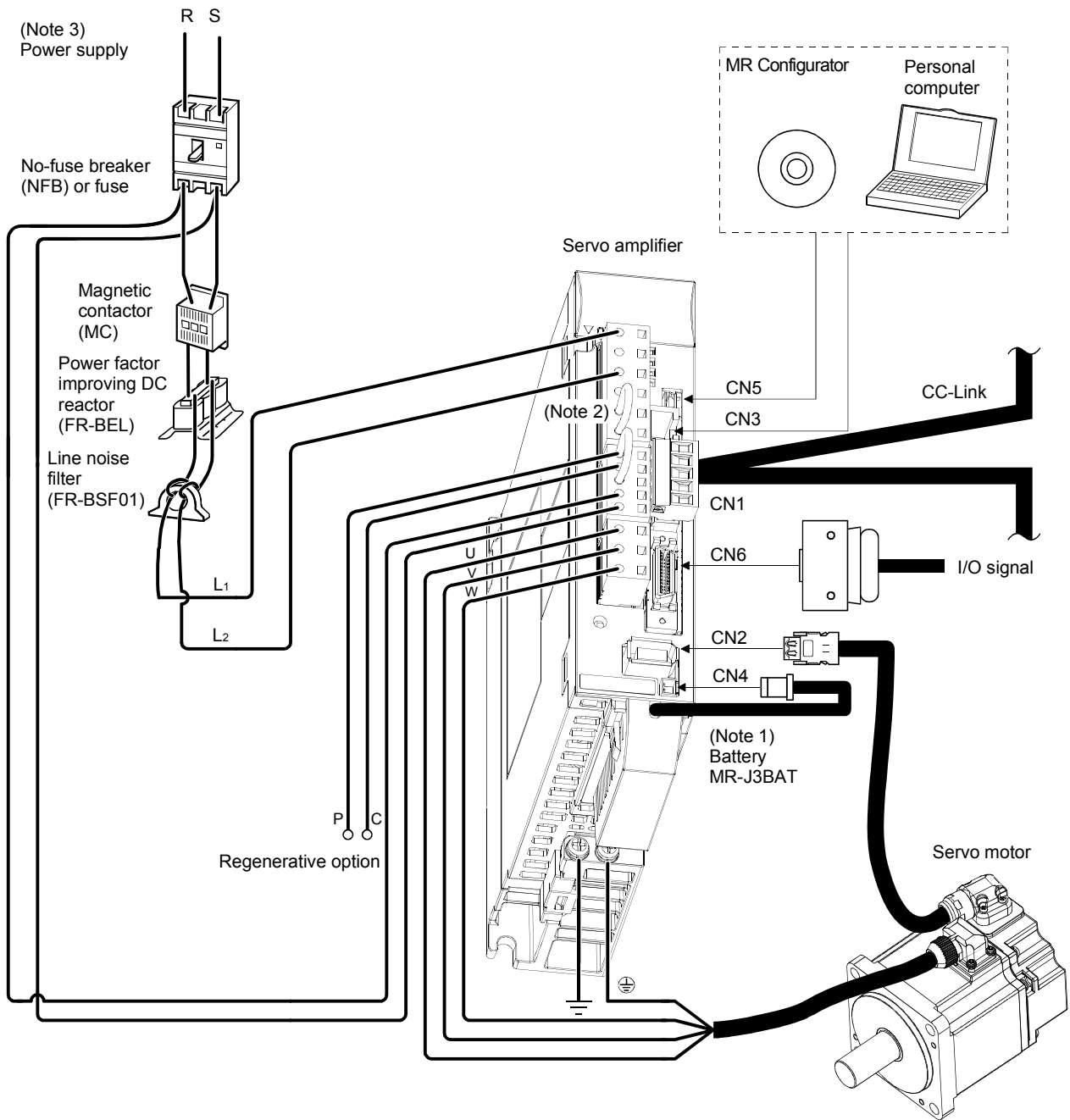
2. The AC reactor can also be used. In this case, the DC reactor cannot be used. When not using DC reactor, short P₁ and P₂.

3. A 1-phase 200V to 230VAC power supply may be used with the servo amplifier of MR-J3-70T or less.

For 1-phase 200V to 230VAC, connect the power supply to L₁ • L₂ and leave L₃ open. Refer to section 1.2 for the power supply specification.

1. FUNCTIONS AND CONFIGURATION

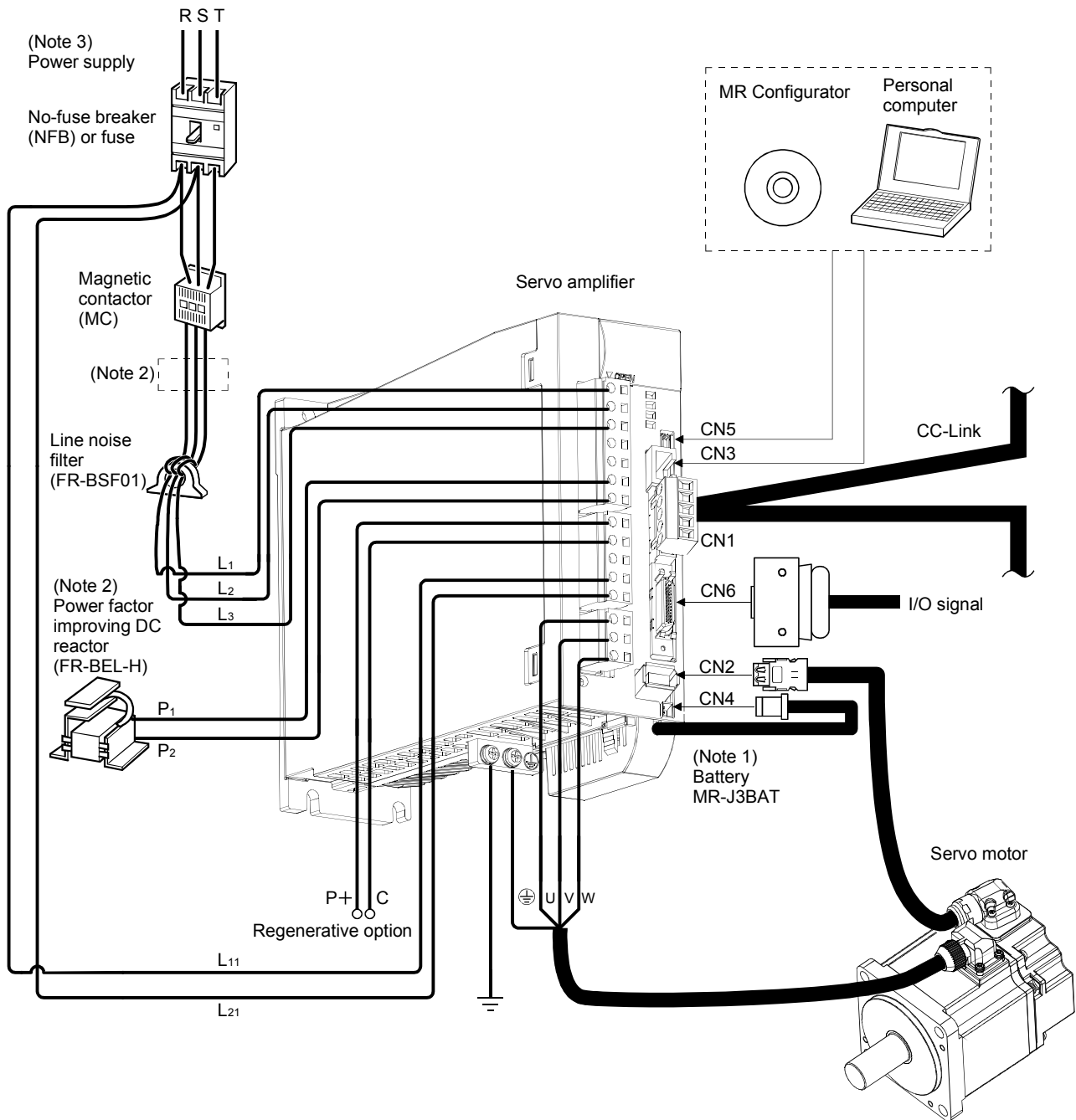
(b) For 1-phase 100V to 120VAC



- Note 1. The battery (option) is used for the absolute position detection system in the position control mode.
2. The power factor improving DC reactor cannot be used.
3. Refer to section 1.2 for the power supply specification.

1. FUNCTIONS AND CONFIGURATION

(2) MR-J3-60T4 • MR-J3-100T4



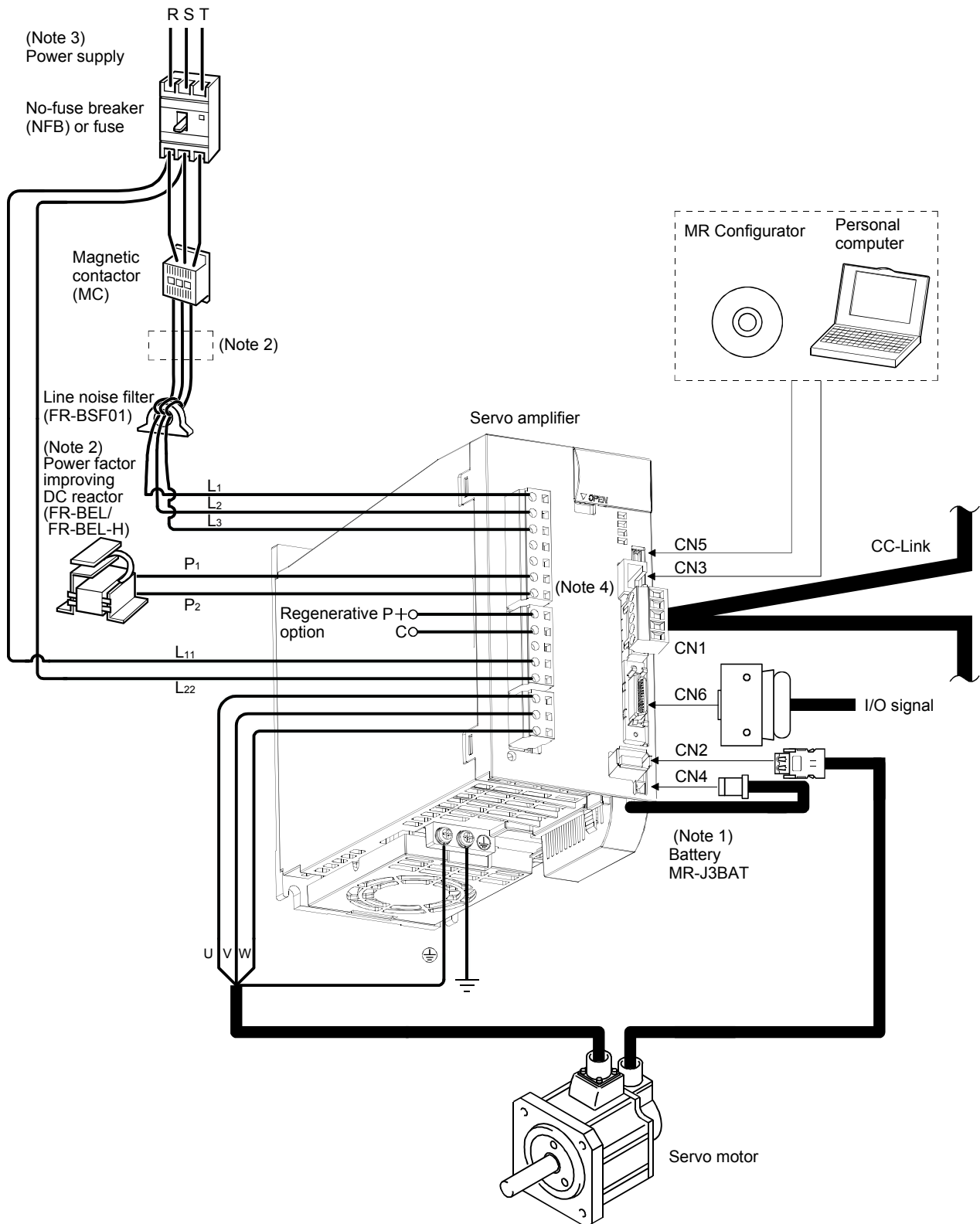
Note 1. The battery (option) is used for the absolute position detection system in the position control mode.

Note 2. The AC reactor can also be used. In this case, the DC reactor cannot be used. When not using DC reactor, short P₁ and P₂.

Note 3. Refer to section 1.2 for the power supply specification.

1. FUNCTIONS AND CONFIGURATION

(3) MR-J3-200T(4)



Note 1. The battery (option) is used for the absolute position detection system in the position control mode.

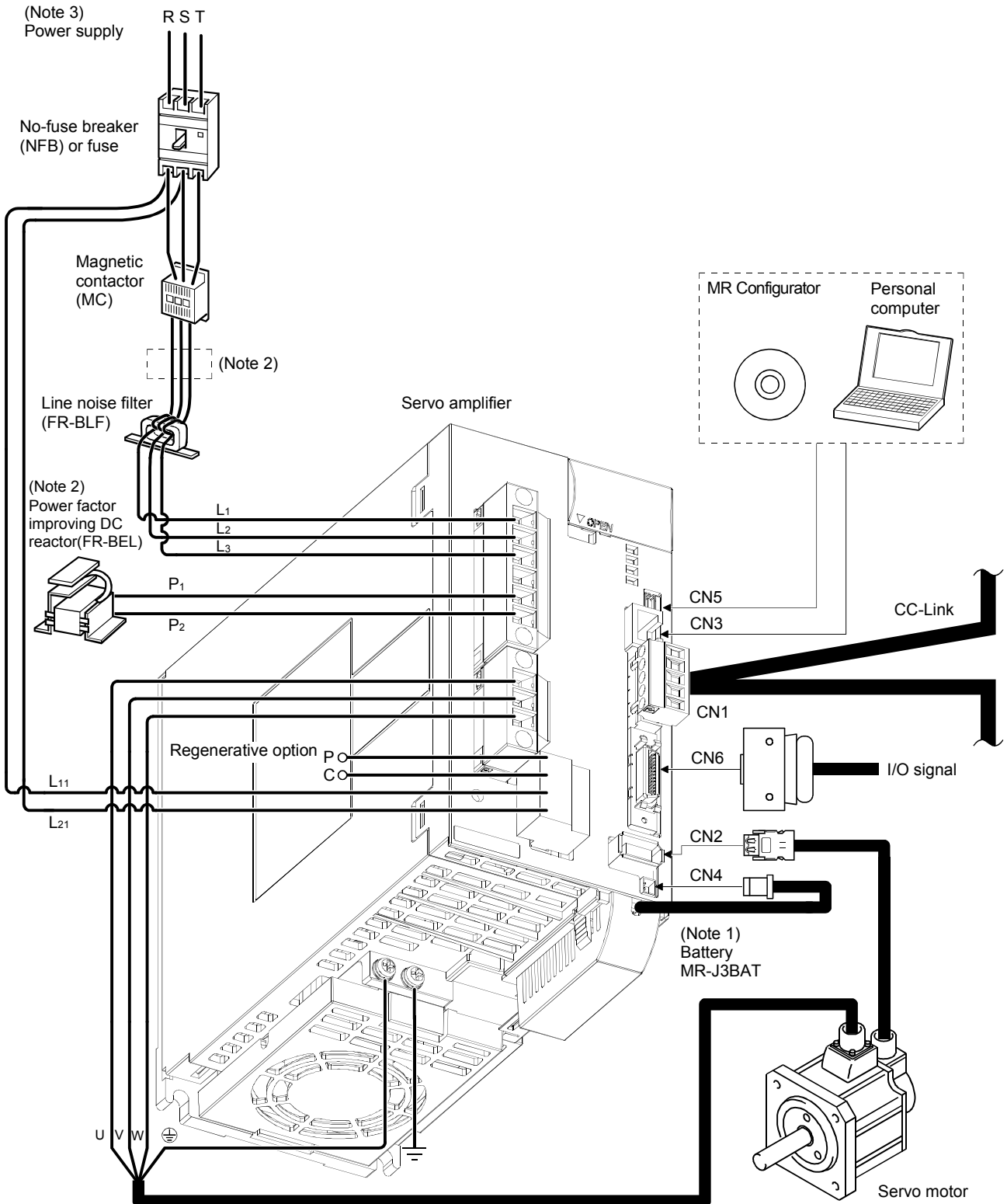
2. The AC reactor can also be used. In this case, the DC reactor cannot be used. When not using DC reactor, short P₁ and P₂.

3. Refer to section 1.2 for the power supply specification.

4. Connectors (CNP1, CNP2, and CNP3) and appearance of MR-J3-200T servo amplifier have been changed from January 2008 production. Model name of the existing servo amplifier is changed to MR-J3-200T-RT. For MR-J3-200T-RT, refer to appendix 5.

1. FUNCTIONS AND CONFIGURATION

(4) MR-J3-350T



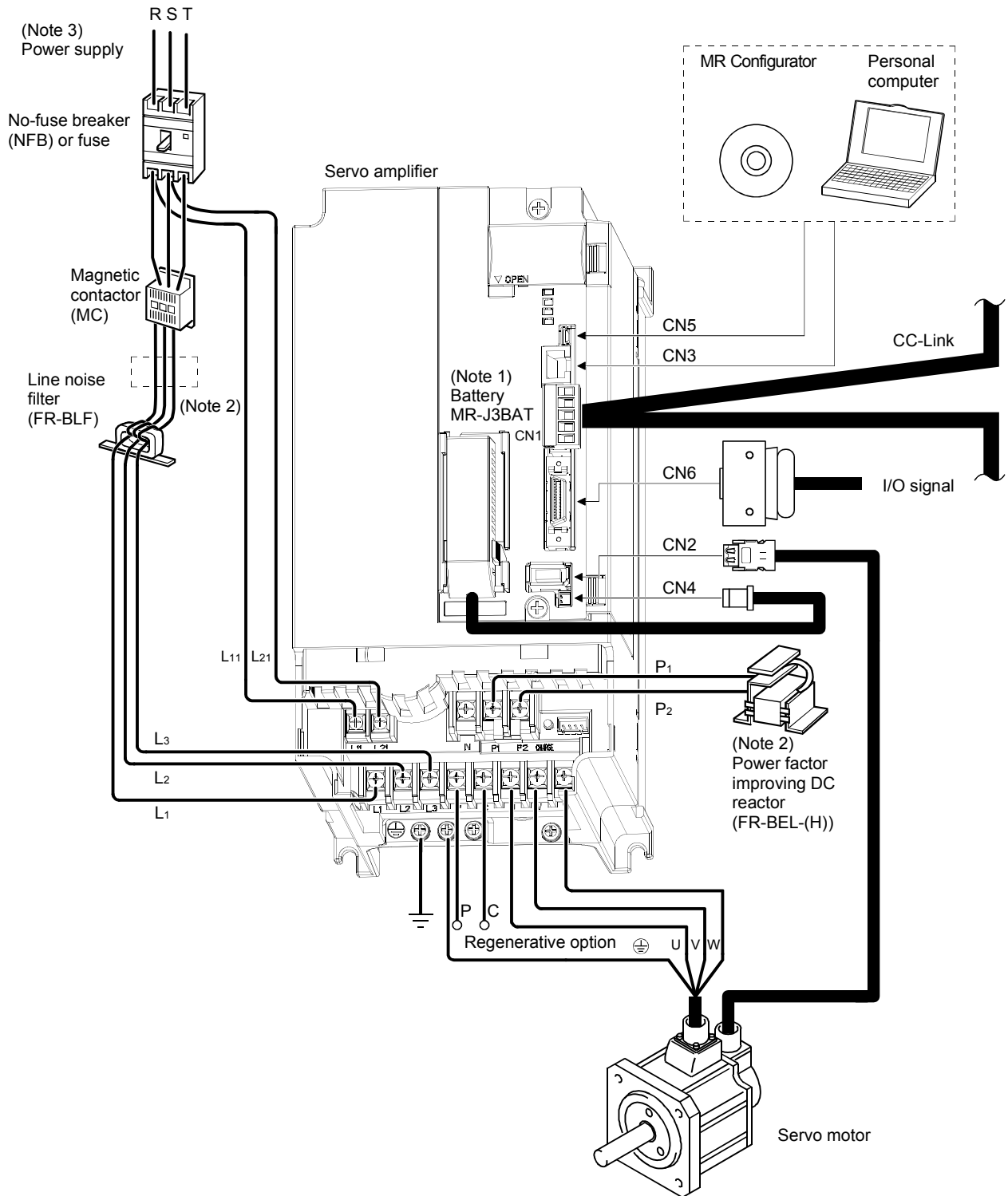
Note 1. The battery (option) is used for the absolute position detection system in the position control mode.

2. The AC reactor can also be used. In this case, the DC reactor cannot be used. When not using DC reactor, short P₁ and P₂.

3. Refer to section 1.2 for the power supply specification.

1. FUNCTIONS AND CONFIGURATION

(5) MR-J3-350T4 • MR-J3-500T(4)



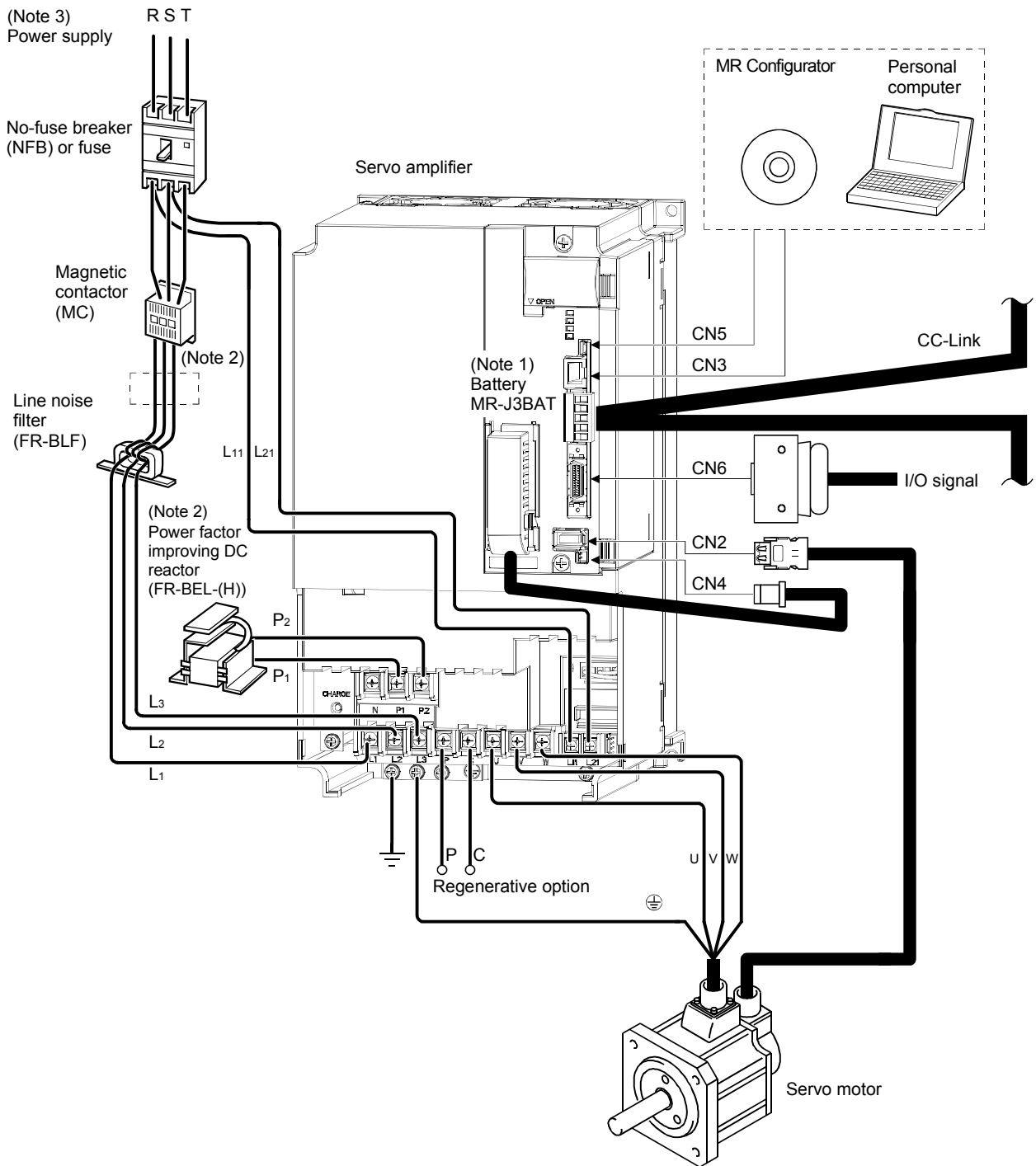
Note 1. The battery (option) is used for the absolute position detection system in the position control mode.

2. The AC reactor can also be used. In this case, the DC reactor cannot be used. When not using DC reactor, short P1 and P2.

3. Refer to section 1.2 for the power supply specification.

1. FUNCTIONS AND CONFIGURATION

(6) MR-J3-700T(4)



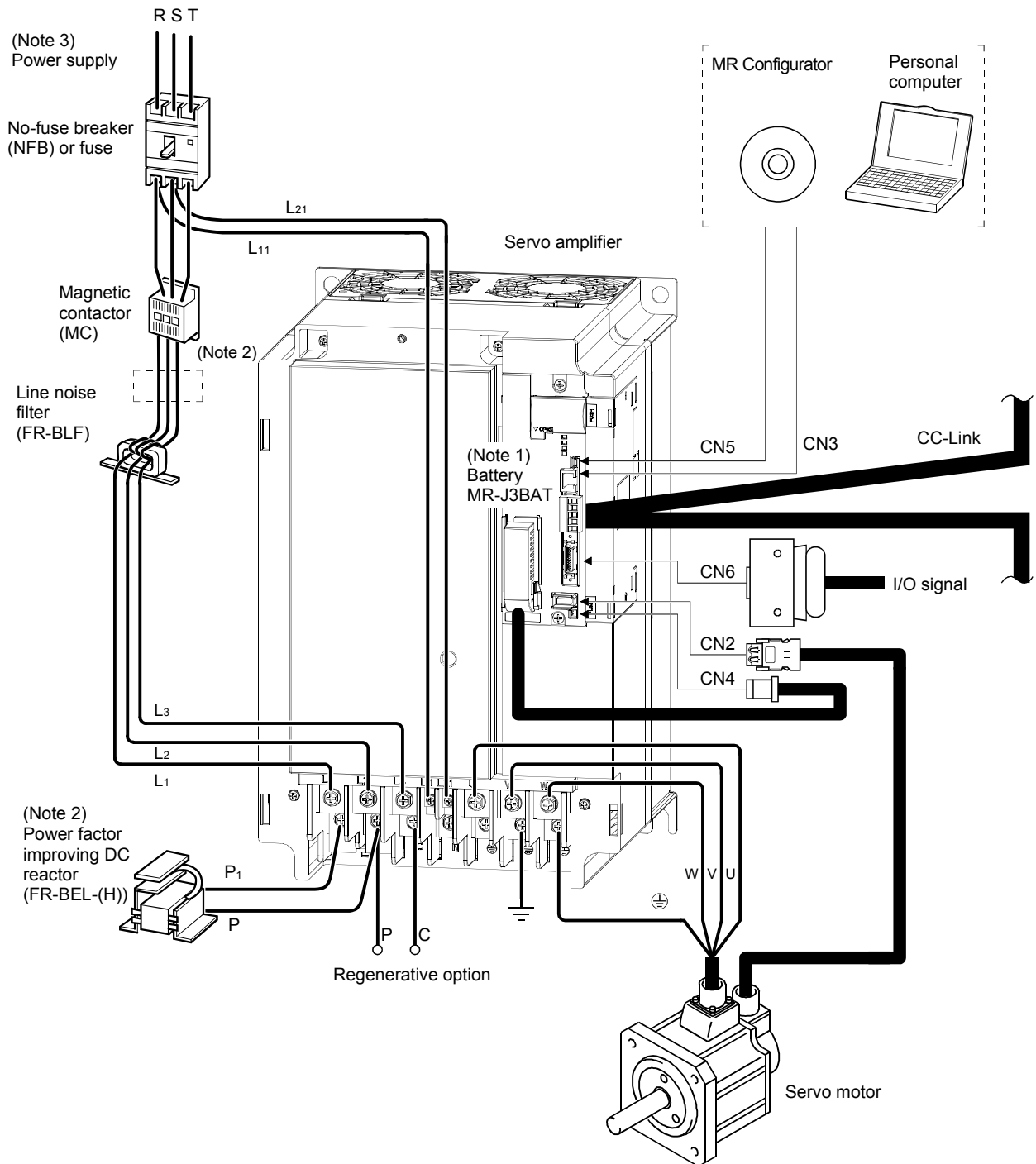
Note 1. The battery (option) is used for the absolute position detection system in the position control mode.

2. The AC reactor can also be used. In this case, the DC reactor cannot be used. When not using DC reactor, short P₁ and P₂.

3. Refer to section 1.2 for the power supply specification.

1. FUNCTIONS AND CONFIGURATION

(7) MR-J3-11KT(4) to MR-J3-22KT(4)



Note 1. The battery (option) is used for the absolute position detection system in the position control mode.

2. The AC reactor can also be used. In this case, the DC reactor cannot be used. When not using DC reactor, short P₁ and P.

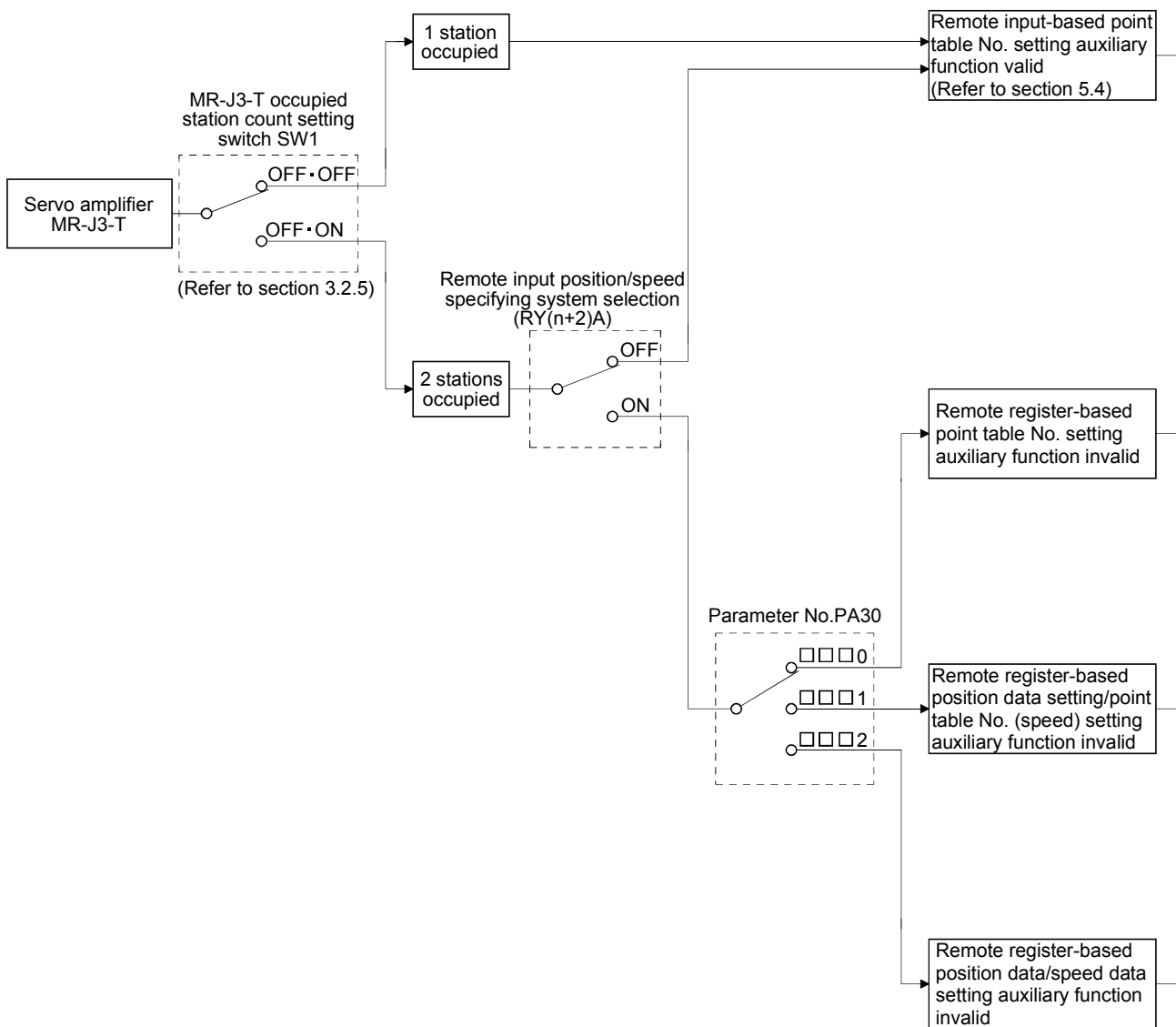
3. Refer to section 1.2 for the power supply specification.

1. FUNCTIONS AND CONFIGURATION

1.8 Selection of operation method

Using the CC-Link communication functions, this servo enables a wide variety of operation methods. The operation method changes depending on the input device, parameter and point table setting.

The flow of the operation method that changes depending on the device and parameter setting status is shown in the chart for your reference.



1. FUNCTIONS AND CONFIGURATION

Reference	Main description
<p>Parameter No. PA01</p> <p>Absolute value command specifying system</p> <p>Point table auxiliary function</p> <p>0</p> <p>1</p> <p>2</p> <p>3</p>	<p>Positioning operation is executed once with position data handled as absolute value.</p> <p>Continuous positioning operation is executed with position data handled as absolute values.</p> <p>Positioning operation is executed once with position data handled as incremental value.</p> <p>Continuous positioning operation is executed with position data handled as incremental values.</p>
<p>Parameter No. PA01</p> <p>Incremental value command specifying system</p> <p>Point table auxiliary function</p> <p>0</p> <p>1</p>	<p>Positioning operation is executed once in incremental value command system.</p> <p>Continuous positioning operation is executed in incremental value command system.</p>
<p>Parameter No. PA01</p> <p>Absolute value command specifying system</p> <p>Remote input absolute value/incremental value selection (RY(n+2)B)</p> <p>OFF</p> <p>ON</p>	<p>Positioning operation is executed once with position data handled as absolute value.</p> <p>Positioning operation is executed once with position data handled as incremental value.</p>
<p>Parameter No. PA01</p> <p>Incremental value command specifying system</p> <p>Remote input absolute value/incremental value selection (RY(n+2)B)</p> <p>OFF</p> <p>ON</p>	<p>Positioning operation is executed once in incremental value command system.</p>
<p>Parameter No. PA01</p> <p>Absolute value command specifying system</p> <p>Remote input absolute value/incremental value selection (RY(n+2)B)</p> <p>OFF</p> <p>ON</p>	<p>Positioning operation is executed once with position data handled as absolute value.</p> <p>Positioning operation is executed once with position data handled as incremental value.</p>
<p>Parameter No. PA01</p> <p>Incremental value command specifying system</p> <p>Remote input absolute value/incremental value selection (RY(n+2)B)</p> <p>OFF</p> <p>ON</p>	<p>Positioning operation is executed once in incremental value command system.</p>
<p>Parameter No. PA01</p> <p>Absolute value command specifying system</p> <p>Remote input absolute value/incremental value selection (RY(n+2)B)</p> <p>OFF</p> <p>ON</p>	<p>Positioning operation is executed once with position data handled as absolute value.</p> <p>Positioning operation is executed once with position data handled as incremental value.</p>
<p>Parameter No. PA01</p> <p>Incremental value command specifying system</p> <p>Remote input absolute value/incremental value selection (RY(n+2)B)</p> <p>OFF</p> <p>ON</p>	<p>Positioning operation is executed once in incremental value command system.</p>

2. INSTALLATION

2. INSTALLATION



CAUTION

- Stacking in excess of the limited number of products is not allowed.
- Install the equipment on incombustible material. Installing them directly or close to combustibles will lead to a fire.
- Install the equipment in a load-bearing place in accordance with this Instruction Manual.
- Do not get on or put heavy load on the equipment to prevent injury.
- Use the equipment within the specified environmental condition range. (For the environmental conditions, refer to section 1.2.)
- Provide an adequate protection to prevent screws, metallic detritus and other conductive matter or oil and other combustible matter from entering the servo amplifier.
- Do not block the intake/exhaust ports of the servo amplifier. Otherwise, a fault may occur.
- Do not subject the servo amplifier to drop impact or shock loads as they are precision equipment.
- Do not install or operate a faulty servo amplifier.
- When the product has been stored for an extended period of time, consult Mitsubishi.
- When treating the servo amplifier, be careful about the edged parts such as the corners of the servo amplifier.

2.1 Installation direction and clearances

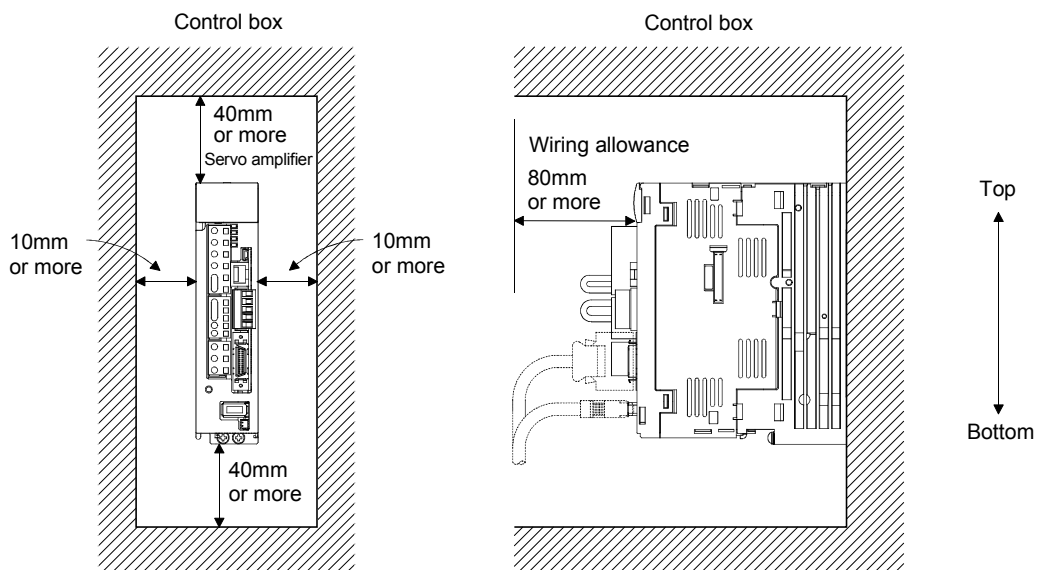


CAUTION

- The equipment must be installed in the specified direction. Otherwise, a fault may occur.
- Leave specified clearances between the servo amplifier and control box inside walls or other equipment.

(1) 7kW or less

(a) Installation of one servo amplifier



2. INSTALLATION

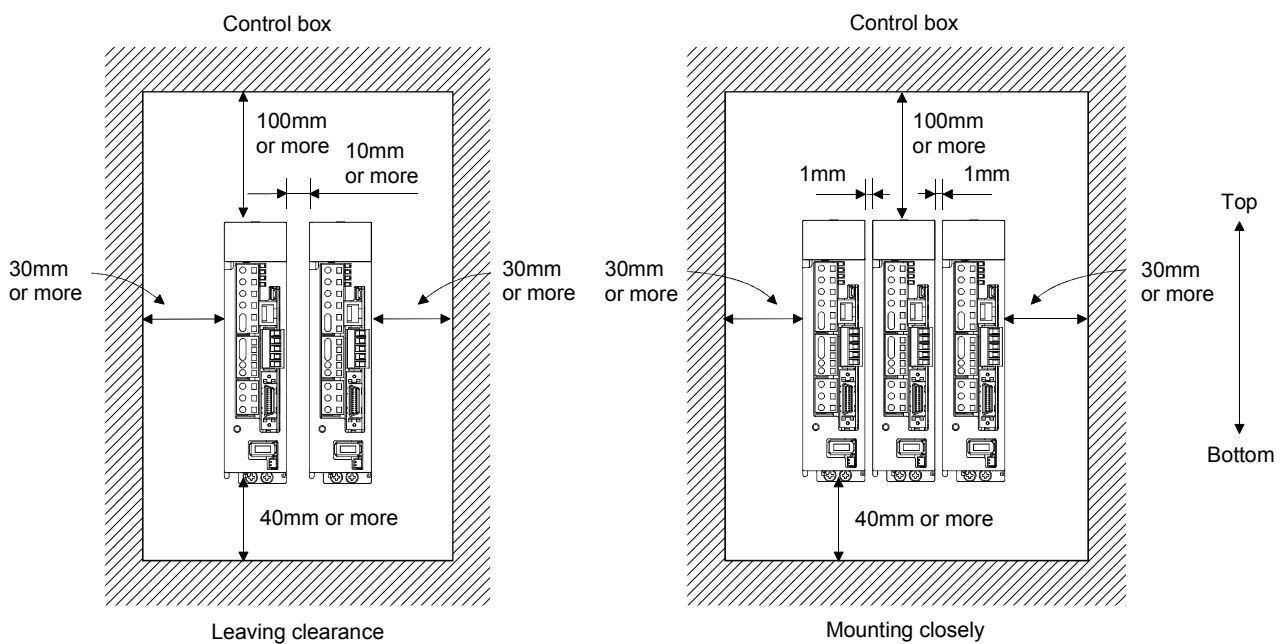
(b) Installation of two or more servo amplifiers

POINT
<ul style="list-style-type: none"> Close mounting is available for the servo amplifier of under 3.5kW for 200V class and 400W for 100V class.

Leave a large clearance between the top of the servo amplifier and the internal surface of the control box, and install a cooling fan to prevent the internal temperature of the control box from exceeding the environmental conditions.

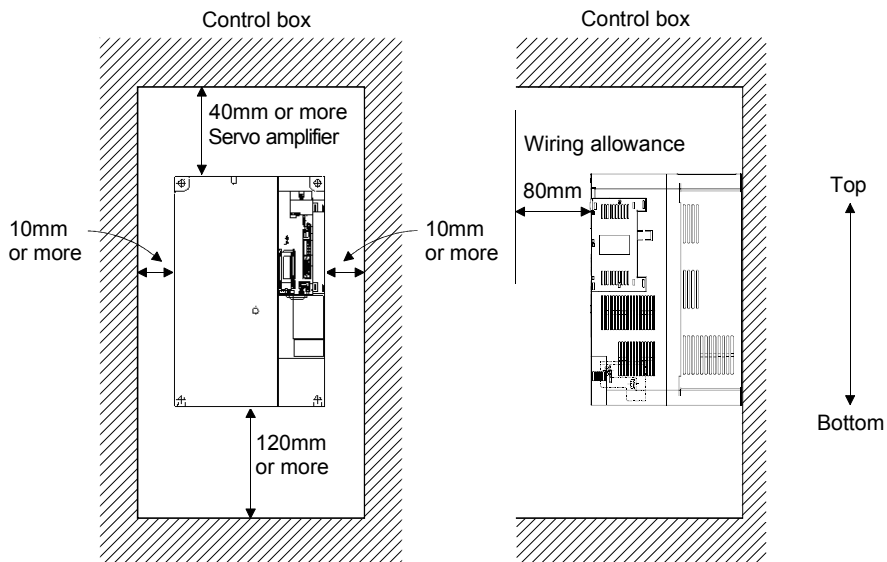
When installing the servo amplifiers closely, leave a clearance of 1mm between the adjacent servo amplifiers in consideration of mounting tolerances.

In this case, bring the ambient temperature within 0 to 45°C (32 to 113°F), or use it at 75% or a smaller effective load ratio.



(2) 11k to 22kW

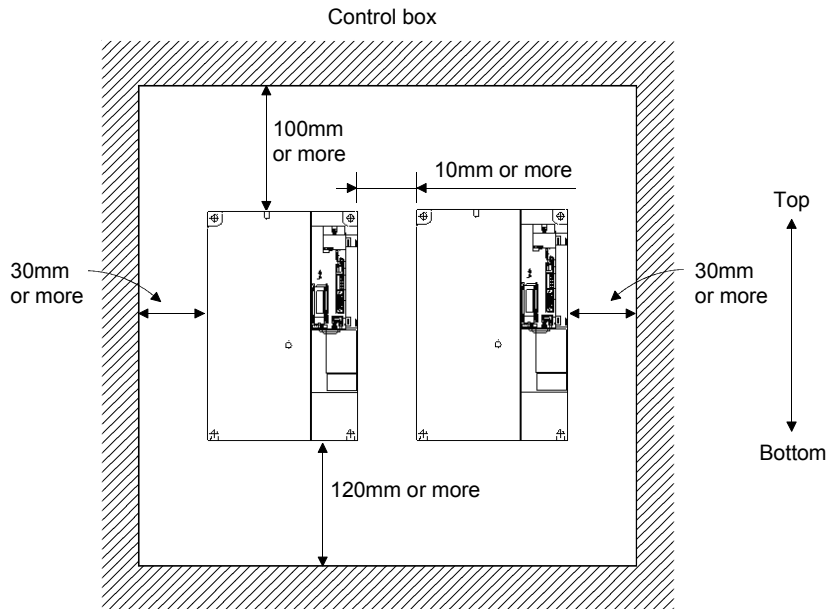
(a) Installation of one servo amplifier



2. INSTALLATION

(b) Installation of two or more servo amplifiers

Leave a large clearance between the top of the servo amplifier and the internal surface of the control box, and install a cooling fan to prevent the internal temperature of the control box from exceeding the environmental conditions.



(3) Others

When using heat generating equipment such as the regenerative option, install them with full consideration of heat generation so that the servo amplifier is not affected.

Install the servo amplifier on a perpendicular wall in the correct vertical direction.

2.2 Keep out foreign materials

- (1) When installing the unit in a control box, prevent drill chips and wire fragments from entering the servo amplifier.
- (2) Prevent oil, water, metallic dust, etc. from entering the servo amplifier through openings in the control box or a cooling fan installed on the ceiling.
- (3) When installing the control box in a place where there are much toxic gas, dirt and dust, conduct an air purge (force clean air into the control box from outside to make the internal pressure higher than the external pressure) to prevent such materials from entering the control box.

2.3 Cable stress

- (1) The way of clamping the cable must be fully examined so that flexing stress and cable's own weight stress are not applied to the cable connection.
- (2) For use in any application where the servo motor moves, fix the cables (encoder, power supply, brake) with having some slack from the connector connection part of the servo motor to avoid putting stress on the connector connection part. Use the optional encoder cable within the flexing life range. Use the power supply and brake wiring cables within the flexing life of the cables.
- (3) Avoid any probability that the cable sheath might be cut by sharp chips, rubbed by a machine corner or stamped by workers or vehicles.
- (4) For installation on a machine where the servo motor will move, the flexing radius should be made as large as possible. Refer to section 10.4 for the flexing life.

2. INSTALLATION

2.4 Inspection items



WARNING

- Before starting maintenance and/or inspection, turn off the power and wait for 15 minutes or more until the charge lamp turns off. Then, confirm that the voltage between P(+) and N(–) is safe with a voltage tester and others. Otherwise, an electric shock may occur. In addition, always confirm from the front of the servo amplifier whether the charge lamp is off or not.
- Any person who is involved in inspection should be fully competent to do the work. Otherwise, you may get an electric shock. For repair and parts replacement, contact your sales representative.

POINT

- Do not test the servo amplifier with a megger (measure insulation resistance), or it may become faulty.
- Do not disassemble and/or repair the equipment on customer side.

It is recommended to make the following checks periodically.

- (1) Check for loose terminal block screws. Retighten any loose screws.
- (2) Check the cables and the like for scratches and cracks. Perform periodic inspection according to operating conditions.

2.5 Parts having service lives

The following parts must be changed periodically as listed below. If any part is found faulty, it must be changed immediately even when it has not yet reached the end of its life, which depends on the operating method and environmental conditions. For parts replacement, please contact your sales representative.

Part name		Life guideline
Servo amplifier	Smoothing capacitor	10 years
	Relay	Number of power-on and number of emergency stop times : 100,000 times
	Cooling fan	10,000 to 30,000hours (2 to 3 years)
	Absolute position battery	Refer to section 5.8

(1) Smoothing capacitor

Affected by ripple currents, etc. and deteriorates in characteristic. The life of the capacitor greatly depends on ambient temperature and operating conditions. The capacitor will reach the end of its life in 10 years of continuous operation in normal air-conditioned environment.

(2) Relays

Their contacts will wear due to switching currents and contact faults occur. Relays reach the end of their life when the cumulative number of power-on and emergency stop times is 100,000, which depends on the power supply capacity.

(3) Servo amplifier cooling fan

The cooling fan bearings reach the end of their life in 10,000 to 30,000 hours. Normally, therefore, the cooling fan must be changed in a few years of continuous operation as a guideline.

It must also be changed if unusual noise or vibration is found during inspection.

3. CC-LINK COMMUNICATION FUNCTIONS

3. CC-LINK COMMUNICATION FUNCTIONS

3.1 Communication specifications

POINT
<ul style="list-style-type: none"> • This servo is equivalent to a remote device station.

For details of the programmable controller side specifications, refer to the CC-Link system master unit manual.

Item		Specifications				
Power supply		5VDC supplied from servo amplifier				
CC-Link	Applicable CC-Link version	Ver.1.10				
	Communication speed	10M/5M/2.5M/625k/156kbps				
	Communication system	Broadcast polling system				
	Synchronization system	Frame synchronization system				
	Encoding system	MRZI				
	Transmission path format	Bus format (conforming to EIA RS485)				
	Error control system	CRC ($X^{16}+X^{12}+X^5+1$)				
	Connection cable	CC-Link Ver.1.10-compliant cable (Shielded 3-core twisted pair cable)				
	Transmission format	Conforming to HDLC				
	Remote station number	1 to 64				
	(Note)	Communication speed	156Kbps	625Kbps	2.5Mbps	5Mbps	10Mbps
Cable length	Maximum overall cable length	1200m	900m	400m	160m	100m
	Inter-station cable length	0.2m or more				
Number of servo amplifiers connected		Max. 42 (when 1 station is occupied by 1 servo amplifier), (max. 32 when 2 stations are occupied by 1 servo amplifier), when there are only remote device stations. Can be used with other equipment.				

Note. If the system comprises of both CC-Link Ver.1.00- and Ver.1.10-compliant cables, Ver.1.00 specifications are applied to the overall cable length and the cable length between stations. For more information, refer to the CC-Link system master/local unit user's manual.

3. CC-LINK COMMUNICATION FUNCTIONS

3.2 System configuration

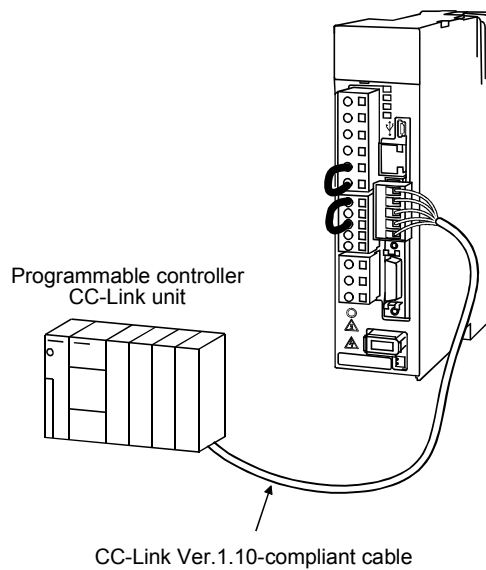
3.2.1 Configuration example

(1) Programmable controller side

Fit "Type QJ61BT11N", "Type A1SJ61BT11" or "Type A1SJ61QBT11" "Control & Communication Link system master/local module" to the main or extension base unit which is loaded with the programmable controller CPU used as the master station.

(2) Wiring

Connect the programmable controller CC-Link unit master station and the servo amplifier by a twisted pair cable (3-wire type).

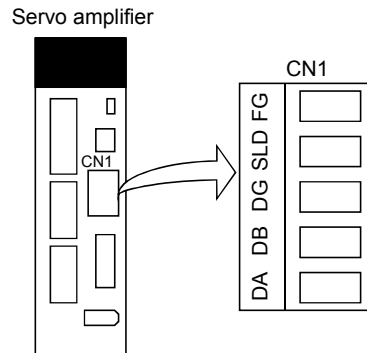


3. CC-LINK COMMUNICATION FUNCTIONS

3.2.2 Wiring method

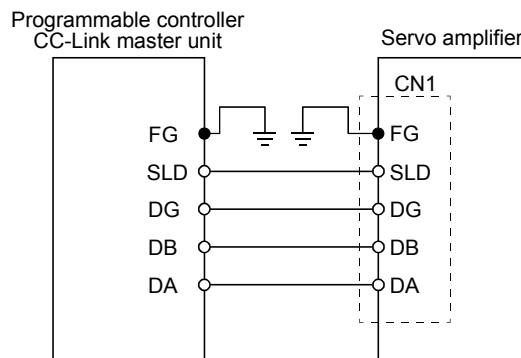
(1) Communication connector

The pin layout of the communication connector CN10 on the servo amplifier unit is shown below.



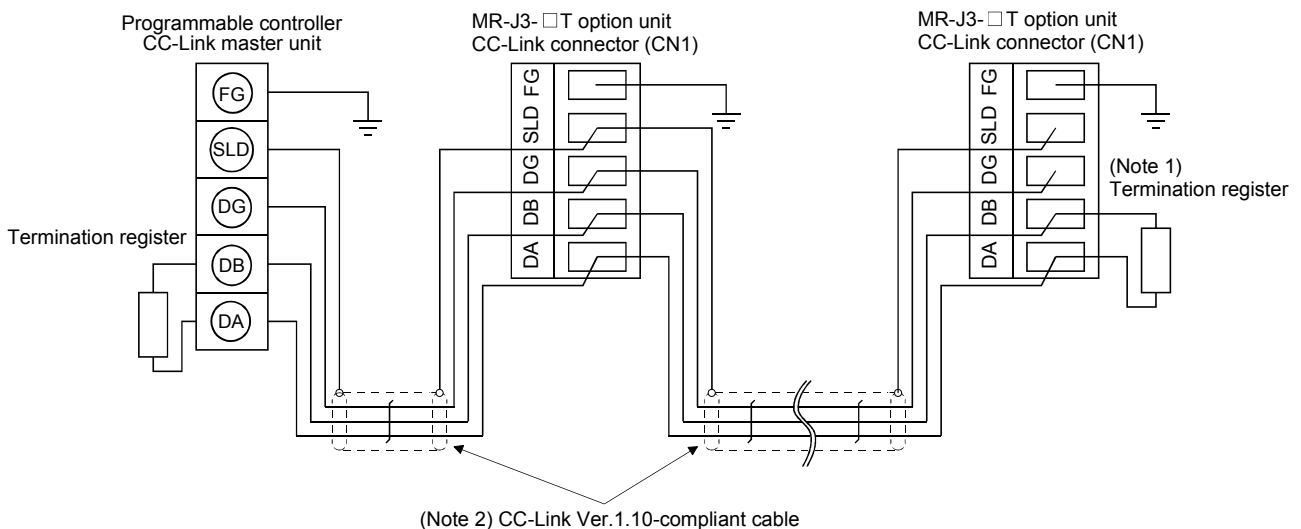
(2) Connection example

The servo amplifier and programmable controller CC-Link master unit are wired as shown below. Refer to section 14.9 (3) for the CC-Link Ver.1.10-compliant cable used for connection.



(3) Example of connecting multiple servo units

As the remote I/O stations of CC-Link, servo amplifiers share the link system and can be controlled/monitored using programmable controller user programs.



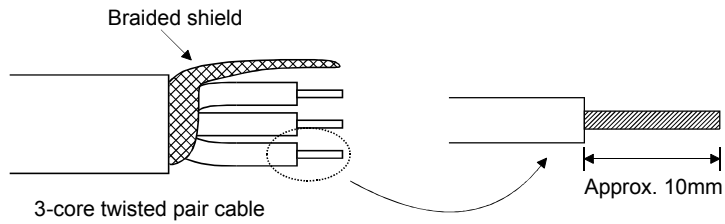
Note 1. Use the termination resistor supplied with the programmable controller. The resistance of the termination resistor depends on the cable used. For details, refer to the open field network CC-Link catalog (L(NA)74108143).

2. Refer to (4) in this section.

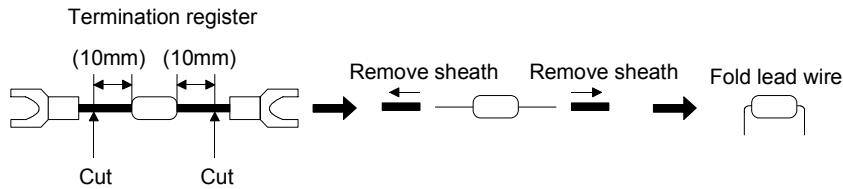
3. CC-LINK COMMUNICATION FUNCTIONS

(4) How to wire the CC-Link connector (CN1)

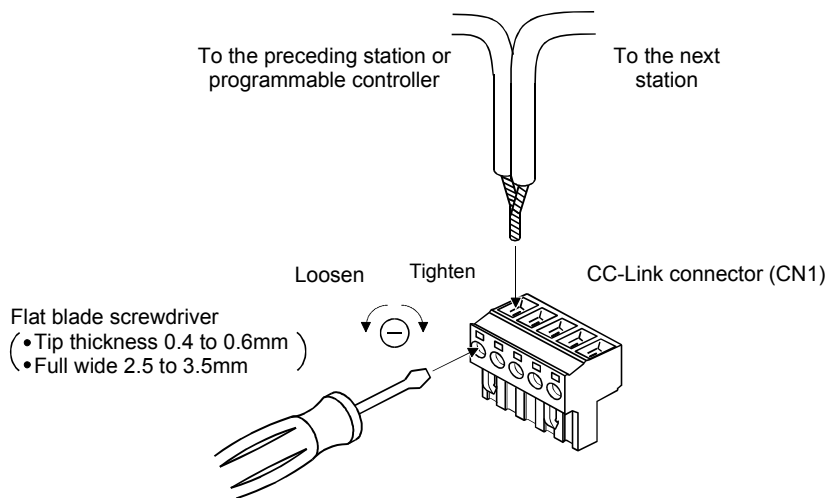
- (a) Strip the sheath of the cable and separate the internal wires and braided shield.
- (b) Strip the sheaths of the braided shield and internal wires and twist the cores.



- (c) Match and twist the wires and braided shield of the cable connected to the preceding axis or programmable controller and the corresponding wires and braided shield of the cable connected to the subsequent axis.
- (d) For the last axis, work the termination resistor supplied to the CC-Link master unit as shown below.



- (e) Insert the core of the cable into the opening and tighten it with a flat-blade screwdriver so that it will not come off. (Tightening torque: 0.5 to 0.6N · m) When inserting the wire into the opening, make sure that the terminal screw is fully loose.



POINT

- Do not solder the cores as it may cause a contact fault.

Use of a flat-blade torque screwdriver is recommended to manage the screw tightening torque. The following table indicates the recommended products of the torque screwdriver for tightening torque management and the flat-blade bit for torque screwdriver. When managing torque with a Phillips bit, please consult us.

Product	Model	Manufacturer/Representative
Torque screwdriver	N6L TDK	Nakamura Seisakusho
Bit for torque screwdriver	B-30, flat-blade, H3.5 X 73L	Shiro Sangyo

3. CC-LINK COMMUNICATION FUNCTIONS

3.2.3 Station number setting

POINT	<ul style="list-style-type: none"> Be sure to set the station numbers within the range of 1 to 64. Do not set the other values.
-------	--

(1) How to number the stations

Set the servo station numbers before powering on the servo amplifiers. Note the following points when setting the station numbers.

(a) Station numbers may be set within the range 1 to 64.

(b) One servo amplifier occupies 1 or 2 stations. (One station of programmable controller remote device station)

(c) Max. number of connected units: 42

Note that the following conditions must be satisfied.

$$\{(1 \times a) + (2 \times b) + (3 \times c) + (4 \times d)\} \leq 64$$

a: Number of 1-station occupying units

b: Number of 2-station occupying units

c: Number of 3-station occupying units (not available for MR-J3-T)

d: Number of 4-station occupying units (not available for MR-J3-T)

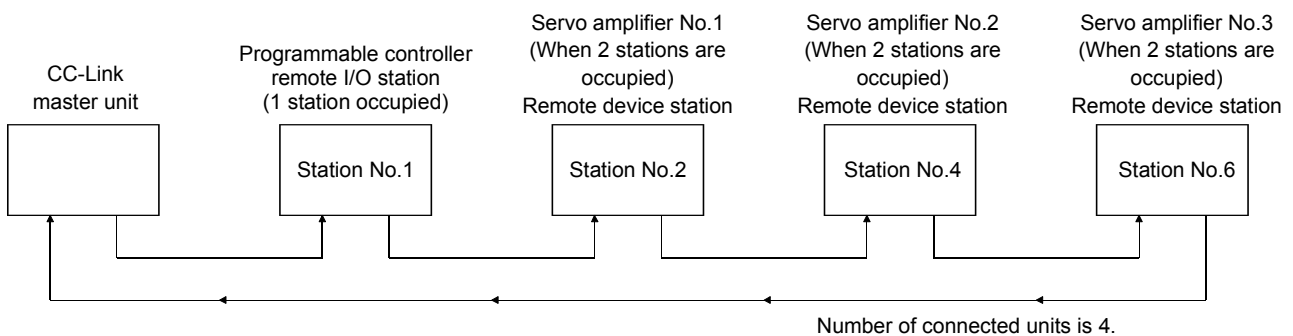
$$\{(16 \times A) + (54 \times B) + (88 \times C)\} \leq 2304$$

A: Number of remote I/O stations ≤ 64

B: Number of remote device stations ≤ 42

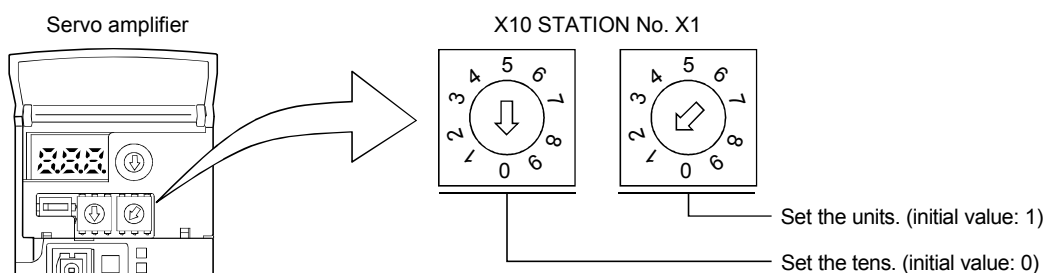
C: Number of local stations ≤ 26

(d) When the number of units connected is 4, station numbers can be set as shown below.



(2) Station number setting method

Set the station number with the station number switches (STATION NO.) on the servo amplifier front. The station number that may be set is any of 1 to 64 in decimal. In the initial status, the station number is set to station 1.



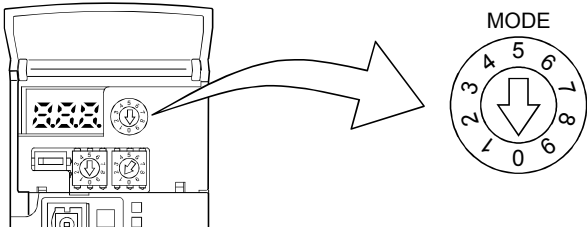
3. CC-LINK COMMUNICATION FUNCTIONS

3.2.4 Communication baud rate setting

Set the transfer baud rate of CC-Link with the transfer baud rate switch (MODE) on the servo amplifier front. The initial value is set to 156kbps.

The overall distance of the system changes with the transfer speed setting. For details, refer to the CC-Link system master/local unit user's manual.

Servo amplifier

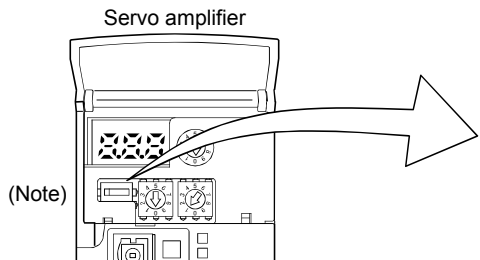




No.	Baud rate
0 (initial value)	156kbps
1	625kbps
2	2.5Mbps
3	5Mbps
4	10Mbps
5 to 9	Not used

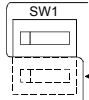
3.2.5 Occupied station count setting

Set the number of occupied stations with the occupied station count switch (SW1) on the servo amplifier front. The usable I/O device and the number of connectable units change with the set number of occupied stations. Refer to section 3.2.3. In the initial status, the number of stations occupied is set to 1.

Servo amplifier



SW1 setting	Number of occupied stations
 Initial value	1 station occupied
	2 station occupied

Note.  This switch hidden under the cover is for manufacturer setting. Do not change this setting by any means.

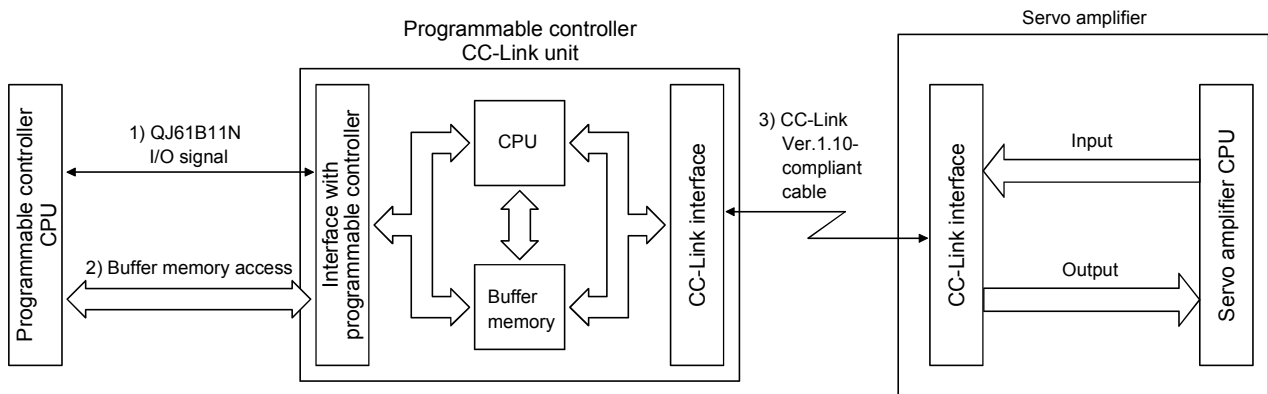
3. CC-LINK COMMUNICATION FUNCTIONS

3.3 Functions

3.3.1 Function block diagram

This section explains the transfer of I/O data to/from the servo amplifier in CC-Link, using function blocks.

- (1) Between the master station and servo amplifier in the CC-Link system, link refresh is normally performed at intervals of 3.5 to 18ms (512 points). The link scan time of link refresh changes with the communication speed. For details, refer to the CC-Link system master/local unit user's manual.
- (2) The I/O refresh and master station sequence program are executed asynchronously. Some programmable controllers allow link scans to be synchronized with programmable controller scans.
- (3) The FROM instruction from the buffer memory of the CC-Link system master/local unit is used to read data from the servo amplifier, and the TO instruction is used to write data. Some programmable controllers allow automatic refresh to be set to omit the FROM and TO instructions.



3.3.2 Functions

The following table lists the functions that may be performed from the programmable controller in the CC-Link system in the CC-Link operation mode or test operation mode.

Item	Operation mode	
	CC-Link operation mode	Test operation mode
Monitor	○	○
Operation	○	○
Parameter write	○	○
Parameter read	○	○
Point table data write	○	○
Point table data read	○	○

3. CC-LINK COMMUNICATION FUNCTIONS

3.4 Servo amplifier setting

(1) Servo amplifier side operation modes

This servo amplifier has the following operation modes.

Operation mode	Description
Test operation mode	Parameter unit or personal computer in which MR Configurator is installed is used to run the servo motor.
CC-Link operation mode	CC-Link communication functions are used to operate the servo with the programmable controller programs.

(2) Operation mode changing

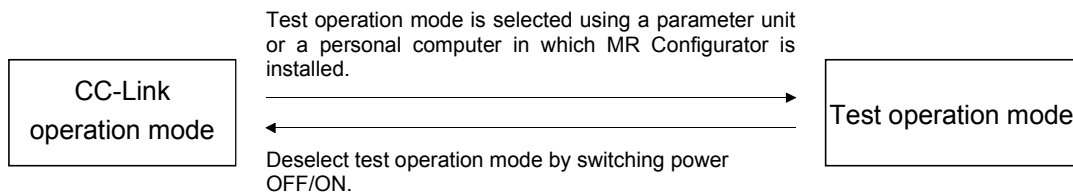
(a) Operation mode changing conditions

Change the operation mode after making sure that.

- 1) The servo motor is at a stop.
- 2) The forward rotation start (RYn1) or reverse rotation start (RYn2) is OFF.

(b) Operation mode changing method

When changing from test operation to CC-Link operation, deselect test operation by switching power OFF/ON.



3. CC-LINK COMMUNICATION FUNCTIONS

3.5 I/O signals (I/O devices) transferred to/from the programmable controller CPU

3.5.1 I/O signals (I/O devices)

The input signals (input devices) may be used as either the CC-Link or CN6 external input signals. Make selection in parameter No.PD06 to PD11, PD12 and PD14. The output signals (output devices) can be used as both the CC-Link • CN6 external output signals.

POINT
<ul style="list-style-type: none"> ▪ In the factory-shipped status, the forward rotation stroke end (LSP), reverse rotation stroke end (LSN) and proximity dog (DOG) are valid as the CN6 external input signals.

(1) When 1 station is occupied

RYn/RXn: 32 points each, RWrn/RWwn: 4 points each

Programmable controller → Servo amplifier (RYn)			
(Note) Device No.	Signal name	Signal abbreviation	CN6 connector pin No.
RYn0	Servo-on	SON	
RYn1	Forward rotation start	ST1	
RYn2	Reverse rotation start	ST2	
RYn3	Proximity dog	DOG	2
RYn4	Forward rotation stroke end	LSP	3
RYn5	Reverse rotation stroke end	LSN	4
RYn6	Automatic/manual selection	MDO	
RYn7	Temporary stop/Restart	TSTP	
RYn8	Monitor output execution demand	MOR	
RYn9	Instruction code execution demand	COR	
RYnA	Point table No. selection 1	DI0	
RYnB	Point table No. selection 2	DI1	
RYnC	Point table No. selection 3	DI2	
RYnD	Point table No. selection 4	DI3	
RYnE	Point table No. selection 5	DI4	
RYnF	Clear	CR	
RY(n+1)0 to RY(n+1)9	Reserved		
RY(n+1)A	Reset	RES	
RY(n+1)B to RY(n+1)F	Reserved		

Servo amplifier → Programmable controller (RXn)			
(Note) Device No.	Signal name	Signal abbreviation	CN6 connector pin No.
RXn0	Ready	RD	14
RXn1	In position	INP	
RXn2	Rough match	CPO	
RXn3	Home position return completion	ZP	16
RXn4	Limiting torque	TLC	
RXn5	Reserved		
RXn6	Electromagnetic brake interlock	MBR	
RXn7	Temporary stop	PUS	
RXn8	Monitoring	MOF	
RXn9	Instruction code execution completion	COF	
RXnA	Warning	WNG	
RXnB	Battery warning	BWNG	
RXnC	Movement completion	MEND	
RXnD	Dynamic brake interlock	DB	
RXnE	Position range output	POT	
RXnF	Reserved		
RX(n+1)1 to RX(n+1)9	Reserved		
RX(n+1)A	Trouble	ALM	15
RX(n+1)B	Remote station communication ready	CRD	
RX(n+1)C to RX(n+1)F	Reserved		

Programmable controller → Servo amplifier (RWwn)	
Address No.	Signal name
RWwn	Monitor 1
RWwn+1	Monitor 2
RWwn+2	Instruction code
RWwn+3	Writing data

Servo amplifier → Programmable controller (RWrn)	
Address No.	Signal name
RWrn	Monitor 1 data
RWrn+1	Monitor 2 data
RWrn+2	Respond code
RWrn+3	Reading data

Note. "n" depends on the station number setting.

3. CC-LINK COMMUNICATION FUNCTIONS

(2) When 2 stations are occupied

RXn/RYn: 64 points each, RWrn/RWwn: 8 points each

Programmable controller → Servo amplifier (RYn)			
(Note 1) Device No.	Signal name	Signal abbreviation	CN6 connector pin No.
RYn0	Servo-on	SON	
RYn1	Forward rotation start	ST1	
RYn2	Reverse rotation start	ST2	
RYn3	Proximity dog	DOG	2
RYn4	Forward rotation stroke end	LSP	3
RYn5	Reverse rotation stroke end	LSN	4
RYn6	Automatic/manual selection	MDO	
RYn7	Temporary stop/Restart	TSTP	
RYn8	Monitor output execution demand	MOR	
RYn9	Instruction code execution demand	COR	
RYnA	Point table No. selection 1	DI0	
RYnB	Point table No. selection 2	DI1	
RYnC	Point table No. selection 3	DI2	
RYnD	Point table No. selection 4	DI3	
RYnE	Point table No. selection 5	DI4	
RYnF	Clear	CR	
RY(n+1)0 to RY(n+1)F	Reserved		
RY(n+2)0	Position instruction execution demand (Note)		
RY(n+2)1	Speed instruction execution demand (Note)		
RY(n+2)2	Reserved		
RY(n+2)3	Point table No. selection 6	DI5	
RY(n+2)4	Point table No. selection 7	DI6	
RY(n+2)5	Point table No. selection 8	DI7	
RY(n+2)6	Internal torque limit selection	TL1	
RY(n+2)7	Proportion control	PC	
RY(n+2)8	Gain changing	CDP	
RY(n+2)9	Reserved		
RY(n+2)A	Position/speed specifying system selection		
RY(n+2)B	Absolute value/incremental value selection		
RY(n+2)C to RY(n+2)F	Reserved		
RY(n+3)0 to RY(n+3)9	Reserved		
RY(n+3)A	Reset	RES	
RY(n+3)B to RY(n+3)F	Reserved		

Servo amplifier → Programmable controller (RXn)			
(Note 1) Device No.	Signal name	Signal abbreviation	CN6 connector pin No.
RXn0	Ready	RD	14
RXn1	In position	INP	
RXn2	Rough match	CPO	
RXn3	Home position return completion	ZP	16
RXn4	Limiting torque	TLC	
RXn5	Reserved		
RXn6	Electromagnetic brake interlock	MBR	
RXn7	Temporary stop	PUS	
RXn8	Monitoring	MOF	
RXn9	Instruction code execution completion	COF	
RXnA	Warning	WNG	
RXnB	Battery warning	BWNG	
RXnC	Movement completion	MEND	
RXnD	Dynamic brake interlock	DB	
RXnE	Position range output	POT	
RXnF to RX(n+1)F	Reserved		
RX(n+2)0	Position instruction execution completion		
RX(n+2)1	Speed instruction execution completion		
RX(n+2)2	Point table No. output 1	PT0	
RX(n+2)3	Point table No. output 2	PT1	
RX(n+2)4	Point table No. output 3	PT2	
RX(n+2)5	Point table No. output 4	PT3	
RX(n+2)6	Point table No. output 5	PT4	
RX(n+2)7	Point table No. output 6	PT5	
RX(n+2)8	Point table No. output 7	PT6	
RX(n+2)9	Point table No. output 8	PT7	
RX(n+2)A to RX(n+2)F	Reserved		
RX(n+3)0 to RX(n+3)9	Reserved		
RX(n+3)A	Trouble	ALM	15
RX(n+3)B	Remote station communication ready	CRD	
RX(n+3)C to RX(n+3)F	Reserved		

Note. "n" depends on the station number setting.

3. CC-LINK COMMUNICATION FUNCTIONS

Programmable controller → Servo amplifier (RWwn)		Servo amplifier → Programmable controller (RWrn)	
(Note 1) Address No.	Signal name	(Note 1) Address No.	Signal name
RWwn	(Note 2) Monitor 1	RWrn	Monitor 1 data lower 16 bit
RWwn+1	(Note 2) Monitor 2	RWwn+1	Monitor 1 data upper 16 bit
RWwn+2	Instruction code	RWwn+2	Respond code
RWwn+3	Writing data	RWwn+3	Reading data
RWwn+4	(Note 3) Position command data lower 16 bit/Point table No.	RWwn+4	
RWwn+5	Position command data upper 16 bit	RWwn+5	Monitor 2 data lower 16 bit
RWwn+6	(Note 4) Speed command data/Point table No.	RWwn+6	Monitor 2 data upper 16 bit
RWwn+7	Reserved	RWwn+7	Reserved

Note 1. "n" depends on the station number setting.

2. Specify the code of the lower 16 bit as the monitor code of 32-bit data.
3. When the parameter No.PC30 setting is "□□□0", specify the point table No. in RWwn+4. When the parameter No.PC30 setting is "□□□1" or "□□□2", specify the position data in RWwn+4/RWwn+5 and turn ON Position instruction execution demand (RY(n+2)0).
4. When the parameter No.PC30 setting is "□□□1", specify the point table No. in RWwn+6. When the parameter No.PC30 setting is "□□□2", specify the speed data in RWwn+6, and turn ON Speed instruction execution demand (RY(n+2)1). When setting the parameter No.PC30 to "□□□2", always set the acceleration/deceleration time constant in the point table No.1. When the parameter No.PC30 setting is "□□□0", the RWwn+6 value is not used.

3. CC-LINK COMMUNICATION FUNCTIONS

3.5.2 Detailed explanation of I/O signals

(1) Input signals (Input devices)

The note signs in the remarks column indicates the following descriptions.

*1: Can be used as external input signals of CN6 connector by setting parameters No.PD06 to PD08 and parameter No.PD12 PD14.

*2: Can be automatic turned ON internally by setting parameters No.PD01 PD04.

The device whose Device No. field has an oblique line cannot be used in CC-Link.

Signal name (Device name)	Description	Device No.		Remarks
		1 station occupied	2 stations occupied	
Servo-on	Turning RYn0 ON powers on the base circuit, making operation ready to start. (Servo on status) Turning it OFF powers off the base circuit, coasting the servo motor. (Servo off status)	RYn0	RYn0	* 1
Forward rotation start	1. In absolute value command system Turning RYn1 ON for automatic operation executes positioning once on the basis of the position data set to the point table. Turning RYn1 ON for a home position return immediately starts a home position return. Keeping RYn1 ON for JOG operation performs rotation in the forward rotation direction. Forward rotation indicates the address increasing direction. 2. In incremental value command system Turning RYn1 ON for automatic operation executes positioning once in the forward rotation direction on the basis of the position data set to the point table. Turning RYn1 ON for a home position return immediately starts a home position return. Keeping RYn1 ON for JOG operation performs rotation in the forward rotation direction. Forward rotation indicates the address increasing direction.	RYn1	RYn1	* 1
Reverse rotation start	Use this device in the incremental value command system. Turning RYn2 ON for automatic operation executes positioning once in the reverse rotation direction on the basis of the position data set to the point table. Keeping RYn2 ON for JOG operation performs rotation in the reverse rotation direction. Reverse rotation indicates the address decreasing direction. Reverse rotation start (RYn2) is also used as the start signal of the high-speed automatic positioning function to the home position.	RYn2	RYn2	* 1

3. CC-LINK COMMUNICATION FUNCTIONS

Signal name	Description	Device No.		Remarks																								
		1 station occupied	2 stations occupied																									
Proximity dog	<p>In the shipment status, the proximity dog external input signal (CN6-2) is valid. For use in CC-Link, make it usable in parameter No.PD14. When RYn3 is turned OFF, the proximity dog is detected. The polarity of dog detection can be changed using parameter No.PD16.</p> <table border="1"> <thead> <tr> <th>Parameter No.PD16</th> <th>Proximity dog (RYn3) detection polarity</th> </tr> </thead> <tbody> <tr> <td><input type="checkbox"/>0<input type="checkbox"/><input type="checkbox"/><input type="checkbox"/> (initial value)</td> <td>OFF</td> </tr> <tr> <td><input type="checkbox"/>1<input type="checkbox"/><input type="checkbox"/></td> <td>ON</td> </tr> </tbody> </table>	Parameter No.PD16	Proximity dog (RYn3) detection polarity	<input type="checkbox"/> 0 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> (initial value)	OFF	<input type="checkbox"/> 1 <input type="checkbox"/> <input type="checkbox"/>	ON	RYn3	RYn3	* 1																		
Parameter No.PD16	Proximity dog (RYn3) detection polarity																											
<input type="checkbox"/> 0 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> (initial value)	OFF																											
<input type="checkbox"/> 1 <input type="checkbox"/> <input type="checkbox"/>	ON																											
Forward rotation stroke end	<p>In the factory-shipped status, the forward rotation stroke end is valid as the external input signal (CN6-3) and the reverse rotation stroke end is valid as the external input signal (CN6-4). Before operation, short between CN6-3 and DOCOM, and between CN6-4 and DOCOM. Opening them causes a sudden stop, resulting in servo lock.</p> <p>For use in CC-Link, make it usable in parameter No.PD12. When starting operation, turn RYn4/RYn5 to ON. Turning it to OFF causes a sudden stop, resulting in servo lock. A stopping method can be changed in parameter No.PD20. When not using the forward/reverse rotation stroke end, set "Automatic ON" in parameter No.PD01.</p> <table border="1"> <thead> <tr> <th colspan="2">(Note) Input signal</th> <th colspan="2">Operation</th> </tr> <tr> <th>RYn4</th> <th>RYn5</th> <th>CCW direction</th> <th>CW direction</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1</td> <td>○</td> <td>○</td> </tr> <tr> <td>0</td> <td>1</td> <td></td> <td>○</td> </tr> <tr> <td>1</td> <td>0</td> <td>○</td> <td></td> </tr> <tr> <td>0</td> <td>0</td> <td></td> <td></td> </tr> </tbody> </table> <p>Note. 0: OFF 1: ON</p>	(Note) Input signal		Operation		RYn4	RYn5	CCW direction	CW direction	1	1	○	○	0	1		○	1	0	○		0	0			RYn4	RYn4	* 1
(Note) Input signal		Operation																										
RYn4	RYn5	CCW direction	CW direction																									
1	1	○	○																									
0	1		○																									
1	0	○																										
0	0																											
Reverse rotation stroke end		RYn5	RYn5	* 2																								
Automatic/manual selection	Turning RYn6 ON selects the automatic operation mode, and turning it OFF selects the manual operation mode.	RYn6	RYn6	* 1																								
Temporary stop/Restart	<p>Turning RYn7 ON during automatic operation makes a temporary stop.</p> <p>Turning RYn7 ON again makes a restart.</p> <p>Forward rotation start (RYn1) or Reverse rotation start (RYn2) is ignored if it is turned ON during a temporary stop.</p> <p>When the automatic operation mode is changed to the manual operation mode during a temporary stop, the movement remaining distance is erased.</p> <p>During a home position return or during JOG operation, Temporary stop/Restart input is ignored.</p>	RYn7	RYn7																									

3. CC-LINK COMMUNICATION FUNCTIONS

Signal name	Description	Device No.		Remarks																																																																																																											
		1 station occupied	2 stations occupied																																																																																																												
Monitor output execution demand	<p>When RYn8 is turned ON, the following data and signals are set. At the same time, RXn8 turns ON. While RYn8 is ON, the monitor values are kept updated.</p> <p>1) When 1 station is occupied</p> <p>Remote register RWn: Data demanded by Monitor 1 (RWwn)</p> <p>Remote register RWn+1: Data demanded by Monitor 2 (RWwn+1)</p> <p>Remote register RWn+2: Respond code indicating normal or error</p> <p>2) When 2 stations are occupied</p> <p>Remote register RWn: Lower 16 bits of data demanded by Monitor 1 (RWwn)</p> <p>Remote register RWn+1: Upper 16 bits of data demanded by Monitor 1 (RWwn)</p> <p>Remote register RWn+5: Lower 16 bits of data demanded by Monitor 2 (RWwn+2)</p> <p>Remote register RWn+6: Upper 16 bits of data demanded by Monitor 2 (RWwn+2)</p> <p>Remote register RWn+2: Respond code indicating normal or error</p>	RYn8	RYn8																																																																																																												
Instruction code execution demand	<p>Turning RYn9 ON executes the processing corresponding to the instruction code stored in remote register RWn+2. After completion of instruction code execution, the respond code indicating normal or error is set to RWn+2. At the same time, RXn9 turns ON.</p> <p>Refer to section 16.2.4 for details.</p>	RYn9	RYn9																																																																																																												
Point table No. selection 1	<p>The point table No. and the home position return are selected by RYnA to RY(n+2)5.</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th rowspan="2">Point table No.</th> <th colspan="8">(Note 1) Remote input</th> </tr> <tr> <th>RY (n+2)5</th> <th>RY (n+2)4</th> <th>RY (n+2)3</th> <th>RYnE</th> <th>RYnD</th> <th>RYnC</th> <th>RYnB</th> <th>RYnA</th> </tr> </thead> <tbody> <tr> <td>(Note 2)</td> <td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td> </tr> <tr> <td>1</td> <td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td> </tr> <tr> <td>2</td> <td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td> </tr> <tr> <td>3</td> <td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td> </tr> <tr> <td>4</td> <td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td> </tr> <tr> <td>·</td> <td>·</td><td>·</td><td>·</td><td>·</td><td>·</td><td>·</td><td>·</td><td>·</td> </tr> <tr> <td>·</td> <td>·</td><td>·</td><td>·</td><td>·</td><td>·</td><td>·</td><td>·</td><td>·</td> </tr> <tr> <td>·</td> <td>·</td><td>·</td><td>·</td><td>·</td><td>·</td><td>·</td><td>·</td><td>·</td> </tr> <tr> <td>254</td> <td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td> </tr> <tr> <td>255</td> <td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td> </tr> </tbody> </table> <p>Note 1. 0: OFF 1: ON 2. Home position return is a setting</p>	Point table No.	(Note 1) Remote input								RY (n+2)5	RY (n+2)4	RY (n+2)3	RYnE	RYnD	RYnC	RYnB	RYnA	(Note 2)	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	1	0	3	0	0	0	0	0	0	1	1	4	0	0	0	0	0	1	0	0	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	254	1	1	1	1	1	1	1	0	255	1	1	1	1	1	1	1	1	RYnA	RYnA	*1 *2
Point table No.			(Note 1) Remote input																																																																																																												
		RY (n+2)5	RY (n+2)4	RY (n+2)3	RYnE	RYnD	RYnC	RYnB	RYnA																																																																																																						
(Note 2)		0	0	0	0	0	0	0	0																																																																																																						
1		0	0	0	0	0	0	0	1																																																																																																						
2		0	0	0	0	0	0	1	0																																																																																																						
3		0	0	0	0	0	0	1	1																																																																																																						
4		0	0	0	0	0	1	0	0																																																																																																						
·		·	·	·	·	·	·	·	·																																																																																																						
·	·	·	·	·	·	·	·	·																																																																																																							
·	·	·	·	·	·	·	·	·																																																																																																							
254	1	1	1	1	1	1	1	0																																																																																																							
255	1	1	1	1	1	1	1	1																																																																																																							
Point table No. selection 2	RYnB	RYnB																																																																																																													
Point table No. selection 3	RYnC	RYnC																																																																																																													
Point table No. selection 4	RYnD	RYnD																																																																																																													
Point table No. selection 5	RYnE	RYnE																																																																																																													
Point table No. selection 6		RY(n+2)3																																																																																																													
Point table No. selection 7		RY(n+2)4																																																																																																													
Point table No. selection 8		RY(n+2)5																																																																																																													
Clear	<p>When the parameter No.PD22 setting is "□□□1", the position control counter droop pulses is cleared at the leading edge of RYnF. The pulse width should be 10ms or more.</p> <p>When the parameter No.PD22 setting is "□□□2", the pulses are always cleared while RYnF is on.</p>	RYnF	RYnF	*1 *2																																																																																																											

3. CC-LINK COMMUNICATION FUNCTIONS

Signal name	Description	Device No.		Remarks
		1 station occupied	2 stations occupied	
Position instruction demand	When RY(n+2)0 is turned ON, the point table No. or position command data set to remote register RWwn+4/RWwn+5 is set. When it is set to the servo amplifier, the respond code indicating normal or error is set to RWrn+2. At the same time, RX(n+2)0 turns ON. Refer to section 3.6.3 for details.		RY(n+2)0	
Speed instruction demand	When RY(n+2)1 is turned ON, the point table No. or speed command data set to remote register RWwn+6 is set. When it is set to the servo amplifier, the respond code indicating normal or error is set to RWrn+2. At the same time, RX(n+2)1 turns ON. Refer to section 3.6.3 for details.		RY(n+2)1	
Internal torque limit selection	Turning RY(n+2)6 OFF makes the torque limit value of parameter No.PA11 (forward rotation torque limit) * parameter No.PA12 (reverse rotation torque limit) valid, and turning it ON makes that of parameter No.PC35 (internal torque limit). (Refer to section 4.6.3)		RY(n+2)6	* 1
Proportion control	When RY(n+2)7 is turned ON, the speed amplifier is switched from the proportional integral type to the proportional type. If the servo motor at a stop is rotated even one pulse by an external factor, it develops torque in an attempt to compensate for a position shift. When the shaft is locked mechanically after Movement completion (RXnC) is turned OFF, for example, turning Proportion control (RY(n+2)7) ON as soon as Movement completion (RXnC) turns OFF allows control of unnecessary torque developed in an attempt to compensate for a position shift. When the shaft is to be locked for an extended period of time, turn Internal torque limit selection (RY(n+2)6) ON simultaneously with Proportion control (RY(n+2)7) to make the torque not more than the rated torque using Internal torque limit (parameter No.PC35).		RY(n+2)7	* 1 * 2
Gain changing	When RY(n+2)8 is turned ON, the load inertia moment ratio and the corresponding gain values change to the values of parameter No.PB29 to PB32. To change the gain using RY(n+2)8, make the auto tuning invalid.		RY(n+2)8	* 1
Position/speed specifying system selection	Select how to give a position command/speed command. (Refer to section 3.6.3.) OFF: Remote input-based position/speed specifying system Specifying the point table No. with Point table No. selection (RYnA to RYnE) gives a position command/speed command. ON : Remote register-based position/speed specifying system Setting the instruction code to the remote register (RWwn+4 to RWwn+6) gives a position command/speed command. Set the parameter No.PC30 (direct specification selection) to "□□□2".		RY(n+2)A	

3. CC-LINK COMMUNICATION FUNCTIONS

Signal name	Description	Device No.		Remarks
		1 station occupied	2 stations occupied	
Absolute value/incremental value selection	<p>RY(n+2)B is made valid when the remote register-based position/speed specifying system is selected with Position/speed specifying system selection (RY(n+2)A) and the absolute value command system is selected in parameter No.PD10. Turn RY(n+2)B OFF or ON to select whether the set position data is in the absolute value command system or incremental value command system.</p> <p>OFF: Position data is handled as an absolute value. ON : Position data is handled as an incremental value.</p>	/	RY(n+2)B	/
Reset	<p>Keeping RY(n+1)A or RY(n+3)A ON for 50ms or longer allows an alarm to be deactivated.</p> <p>Some alarms cannot be deactivated by Reset RY(n+1)A or RY(n+3)A. (Refer to section 11.4.1.)</p> <p>If RY(n+1)A or RY(n+3)A is turned ON with no alarm occurring, the base circuit will not be shut off. When "□□1□" is set in parameter No.PD20 (function selection D-1), the base circuit is shut off.</p> <p>This device is not designed to make a stop. Do not turn it ON during operation.</p>	RY(n+1)A	RY(n+3)A	* 1
Forced stop	<p>This device is exclusively used as a CN6 external input signal. It cannot be used for CC-Link.</p> <p>Turn EMG off to bring the motor to an forced stop state, in which the base circuit is shut off and the dynamic brake is operated.</p> <p>Turn EMG on in the forced stop state to reset that state.</p>	/	/	/

3. CC-LINK COMMUNICATION FUNCTIONS

(2) Output signals (Output device)

POINT	
<ul style="list-style-type: none"> The output devices can be used for both the remote output and the external output signals of CN6 connector. 	

The signal whose Device No. field has an oblique line cannot be used in CC-Link.

Signal name	Description	Device No.	
		1 station occupied	2 stations occupied
Ready	In the factory-shipped status, a ready is assigned to the CN6-14 pin as an external output signal. RXn0 turns ON when the servo amplifier is ready to operate after servo-on.	RXn0	RXn0
In position	RXn1 turns ON when the droop pulse value is within the preset in-position range. The in-position range can be changed using parameter No.PA10. Increasing the in-position range may result in a continuous conduction status during low-speed rotation. RXn1 turns ON at servo-on.	RXn1	RXn1
Rough match	RXn2 turns ON when the command remaining distance becomes less than the rough match output range set in the parameter. RXn2 turns ON at servo-on.	RXn2	RXn2
Home position return completion	In the factory-shipped status, the home position return completion is assigned to the CN6-16 pin as an external output signal. RXn3 turns ON when a home position return is completed. RXn3 turns ON at completion of a home position return. In an absolute position detection system, RXn3 turns ON when operation is ready to start, but turns OFF in any of the following cases. 1) Servo-on (RYn0) is turned OFF. 2) Forced stop (EMG) is turned OFF. 3) Reset (RY(n+1)A or RY(n+3)A) is turned ON. 4) Alarm occurs. 5) Forward rotation stroke end (RYn4) or Reverse rotation stroke end (RYn5) is turned OFF. 6) Home position return has not been made after product purchase. 7) Home position return has not been made after occurrence of Absolute position erase (A25) or Absolute position counter warning (AE3). 8) Home position return has not been made after electronic gear change. 9) Home position return has not been made after the absolute position detection system was changed from invalid to valid. 10) Parameter No.PA14 (Rotation direction selection) has been changed. 11) Software limit is valid. 12) While a home position return is being made. When any of 1) to 12) has not occurred and a home position return is already completed at least once, Home position return completion (RXn3) turns to the same output status as Ready (RXn0).	RXn3	RXn3
Limiting torque	RXn4 turns ON when the torque is reached at the time of torque generation.	RXn4	RXn4
Electromagnetic brake interlock	RXn6 turns OFF at servo-off or alarm occurrence. At alarm occurrence, it turns OFF independently of the base circuit status.	RXn6	RXn6
Temporary stop	RXn7 turns ON when deceleration is started to make a stop by Temporary stop/Restart (RYn7). When Temporary stop/Restart (RYn7) is made valid again to resume operation, RXn7 turns OFF.	RXn7	RXn7
Monitoring	Refer to Monitor output execution demand (RYn8).	RXn8	RXn8

3. CC-LINK COMMUNICATION FUNCTIONS

Signal name	Description	Device No.																																																																																																			
		1 station occupied	2 stations occupied																																																																																																		
Instruction code execution completion	Refer to Instruction code execution demand (RYn9).	RXn9	RXn9																																																																																																		
Warning	RXnA turns ON when a warning occurs. When no warning has occurred, RXnA turns OFF within about 1s after power-on.	RXnA	RXnA																																																																																																		
Battery warning	RXnB turns ON when Open battery cable warning (A92) or Battery warning (A9F) occurs. When no battery warning has occurred, RXnB turns OFF within about 1s after power-on.	RXnB	RXnB																																																																																																		
Movement completion	RXnC turns ON when In position (RXn1) turns ON and the command remaining distance is "0". RXnC turns ON at servo-on.	RXnC	RXnC																																																																																																		
Dynamic brake interlock	RXnD turns off simultaneously when the dynamic brake is operated. When using the external dynamic brake on the servo amplifier of 11 kW or more, this device is required. (Refer to section 14.6.) For the servo amplifier of 7kw or less, it is not necessary to use this device.	RXnD	RXnD																																																																																																		
Position range	RXnE turns ON when the actual current position falls within the range set in the parameter. It is OFF when a home position return is not yet completed or while the base circuit is off.	RXnE	RXnE																																																																																																		
Position instruction execution completion	Refer to Speed instruction execution demand (RY(n+2)0).		RX(n+2)0																																																																																																		
Speed instruction execution completion	Refer to Position instruction execution demand (RY(n+2)1). This device is required when using the external dynamic brake with a servo amplifier of 11kW or more. (Refer to section 14.6.) This is not required with servo amplifiers of 7kW or less.		RX(n+2)1																																																																																																		
Point table No. output 1	As soon as Movement completion (RXnC) turns ON, the point table No. is output in 8-bit code.		RX(n+2)2																																																																																																		
Point table No. output 2	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">Point table No.</th> <th colspan="8">(Note) Remote output</th> </tr> <tr> <th>RX (n+2)9</th> <th>RX (n+2)8</th> <th>RX (n+2)7</th> <th>RX (n+2)6</th> <th>RX (n+2)5</th> <th>RX (n+2)4</th> <th>RX (n+2)3</th> <th>RX (n+2)2</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>1</td> </tr> <tr> <td>2</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>1</td> <td>0</td> </tr> <tr> <td>3</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>1</td> <td>1</td> </tr> <tr> <td>4</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>1</td> <td>0</td> <td>0</td> </tr> <tr> <td>.</td> <td>.</td> <td>.</td> <td>.</td> <td>.</td> <td>.</td> <td>.</td> <td>.</td> <td>.</td> </tr> <tr> <td>.</td> <td>.</td> <td>.</td> <td>.</td> <td>.</td> <td>.</td> <td>.</td> <td>.</td> <td>.</td> </tr> <tr> <td>.</td> <td>.</td> <td>.</td> <td>.</td> <td>.</td> <td>.</td> <td>.</td> <td>.</td> <td>.</td> </tr> <tr> <td>254</td> <td>1</td> <td>1</td> <td>1</td> <td>1</td> <td>1</td> <td>1</td> <td>1</td> <td>0</td> </tr> <tr> <td>255</td> <td>1</td> <td>1</td> <td>1</td> <td>1</td> <td>1</td> <td>1</td> <td>1</td> <td>1</td> </tr> </tbody> </table> <p>Note. 0: OFF 1: ON</p>	Point table No.	(Note) Remote output								RX (n+2)9	RX (n+2)8	RX (n+2)7	RX (n+2)6	RX (n+2)5	RX (n+2)4	RX (n+2)3	RX (n+2)2	1	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	1	0	3	0	0	0	0	0	0	1	1	4	0	0	0	0	0	1	0	0	254	1	1	1	1	1	1	1	0	255	1	1	1	1	1	1	1	1		RX(n+2)3
Point table No.			(Note) Remote output																																																																																																		
		RX (n+2)9	RX (n+2)8	RX (n+2)7	RX (n+2)6	RX (n+2)5	RX (n+2)4	RX (n+2)3	RX (n+2)2																																																																																												
1		0	0	0	0	0	0	0	1																																																																																												
2		0	0	0	0	0	0	1	0																																																																																												
3		0	0	0	0	0	0	1	1																																																																																												
4		0	0	0	0	0	1	0	0																																																																																												
.																																																																																													
.																																																																																													
.																																																																																													
254	1	1	1	1	1	1	1	0																																																																																													
255	1	1	1	1	1	1	1	1																																																																																													
Point table No. output 3			RX(n+2)4																																																																																																		
Point table No. output 4			RX(n+2)5																																																																																																		
Point table No. output 5			RX(n+2)6																																																																																																		
Point table No. output 6			RX(n+2)7																																																																																																		
Point table No. output 7			RX(n+2)8																																																																																																		
Point table No. output 8	RX(n+2)2 to RX(n+2)9 turn OFF in any of the following statuses. <ul style="list-style-type: none"> ▪ Power on ▪ Servo off ▪ During home position return ▪ Home position return completion In any of the following statuses, RX(n+2)2 to RX(n+2)9 maintain their pre-change status (ON/OFF). <ul style="list-style-type: none"> ▪ When operation mode is changed ▪ When Automatic/manual selection (RYn6) is turned from OFF to ON or from ON to OFF to change the operation mode. ▪ During manual operation ▪ During execution of automatic positioning to home position 		RX(n+2)9																																																																																																		

3. CC-LINK COMMUNICATION FUNCTIONS

Signal name	Description	Device No.	
		1 station occupied	2 stations occupied
Trouble	A trouble is assigned to the CN6-15 pin as an external output signal. RX(n+1)A or RX(n+3)A turns ON when the protective circuit is activated to shut off the base circuit. When no alarm has occurred, RX(n+1)A or RX(n+3)A turns OFF within about 1.5s after power is switched ON.	RX(n+1)A	RX(n+3)A
Remote station communication ready	This signal turns ON at power-on and turns off at a trouble occurrence or in the reset (RY(n+1)A or RY(n+3)A) ON status.	RX(n+1)B	RX(n+3)B

(3) Remote registers

The signal whose Remote Register field has an oblique line cannot be used.

(a) Input (Programmable controller → Servo amplifier)

Remote register		Signal name	Description	Setting range
1 station occupied	2 stations occupied			
RWwn	RWwn	Monitor 1	<p>Demands the status indication data of the servo amplifier.</p> <p>1) When 1 station is occupied Setting the monitor code of the status indication item to be monitored to RWwn and turning RYn8 to ON sets data to RWrn. RXn8 turns on at the same time.</p> <p>2) When 2 stations are occupied Setting the monitor code of the status indication item to be monitored to RWwn and turning RYn8 to ON sets data to RWrn. RXn8 turns on at the same time. When demanding 32-bit data, specifying the lower 16-bit code No. and turning RYn8 to ON sets the lower 16-bit data to RWwn and the upper 16-bit data to RWrn. Data is stored in the RXn8. RXn8 turns on at the same time. Refer to section 3.5.3 for the item of the monitor code of the status indication.</p>	Refer to section 3.5.3.
RWwn+1	RWwn+1	Monitor 2	<p>Demands the status indication data of the servo amplifier.</p> <p>1) When 1 station is occupied Setting the monitor code of the status indication item to be monitored to RWwn+1 and turning RYn8 to ON sets data to RWrn+1. RXn8 turns on at the same time.</p> <p>2) When 2 stations are occupied Setting the monitor code of the status indication item to be monitored to RWwn+1 and turning RYn8 to ON sets data to RWrn+5. RXn8 turns on at the same time. When demanding 32-bit data, specifying the lower 16-bit code No. and turning RYn8 to ON sets the lower 16-bit data to RWwn+5 and the upper 16-bit data to RWrn+6. Data is stored in the RXn8. RXn8 turns on at the same time. Refer to section 3.5.3 for the item of the monitor code of the status indication.</p>	Refer to section 3.5.3.

3. CC-LINK COMMUNICATION FUNCTIONS

Remote register		Signal name	Description	Setting range
1 station occupied	2 stations occupied			
RWwn+2	RWwn+2	Instruction code	Sets the instruction code used to perform parameter or point table data read and write, alarm reference or the like. Setting the instruction code No. to RWwn+2 and turning RYn9 to ON executes the instruction. RXn9 turns to ON on completion of instruction execution. Refer to section 3.5.4 (1) for instruction code No. definitions.	Refer to section 3.5.4 (1).
RWwn+3	RWwn+3	Writing data	Sets the written data used to perform parameter or point table data write, alarm history clear or the like. Setting the written data to RWwn+3 and turning RYn9 to ON writes the data to the servo amplifier. RXn9 turns to ON on completion of write. Refer to section 3.5.4 (2) for written data definitions.	Refer to section 3.5.4 (2).
	RWwn+4	Point table No./Position command data lower 16 bit	Set the point table No. to be executed in the automatic operation mode when 2 stations are occupied. When the point table No. is set to RWwn+4 and RY(n+2)0 is turned ON, the point table No. is set to the servo amplifier. On completion of setting, RX(n+2)0 turns ON. When the point table is not used, set the position command data. When the lower 16 bits are set to RWwn+4 and the upper 16 bits to RWwn+5, and RY(n+2)0 is turned ON, the position command data in the upper and lower 16 bits are written. On complete of write, RX(n+2)0 turns ON. Use parameter No.PC30 to select whether point table No. setting or position command data setting will be made. Refer to section 3.6.3 for details of Point table No./Position command data.	Point table No.: 0 to 255 Absolute value command: Position command data: -999999 to 999999 Incremental value command: Position command data: 0 to 999999
	RWwn+5	Position command data upper 16 bit		
	RWwn+6	Point table No./Speed command data	When the point table is not used, set the point table No. to be executed or the speed command data (servo motor speed [r/min]). When the point table No. is set to RWwn+6 and RY(n+2)1 is turned ON, the point table No. or speed command data is set to the servo amplifier. On completion of setting, RX(n+2)1 turns ON. Use parameter No.PC30 to select whether point table No. setting or speed command data setting will be made. Refer to section 3.6.3 for details of Point table No./Speed command data. When setting the servo motor speed in this remote register, always set the acceleration/deceleration time constant in the point table No.1.	Point table No.: 0 to 255 Speed command data: 0 to permissible speed

3. CC-LINK COMMUNICATION FUNCTIONS

(b) Output (Servo amplifier → Programmable controller)

Note that the data set to RWrn and RWrn+1 depends on whether 1 station or 2 stations are occupied.

If you set inappropriate code No. or data to the remote register input, the error code is set to respond code (RWrn+2). Refer to section 3.5.5 for the error code.

When 1 station is occupied

Remote register	Signal name	Description
RWrn	Monitor 1 data	The data of the monitor code set to RWwn is set.
RWrn+1	Monitor 2 data	The data of the monitor code set to RWwn+1 is set.
RWrn+2	Respond code	"0000" is set when the codes set to RWwn to RWwn+3 are executed normally.
RWrn+3	Reading data	Data corresponding to the read code set to RWwn+2 is set.

When 2 stations are occupied

Remote register	Signal name	Description
RWrn	Monitor 1 data lower 16bit	The lower 16 bits of the data of the monitor code set to RWwn are set.
RWrn+1	Monitor 1 data upper 16bit	The upper 16 bits of the data of the monitor code set to RWwn are set. A sign is set if there are no data in the upper 16 bits.
RWrn+2	Respond code	"0000" is set when the codes set to RWwn to RWwn+6 are executed normally.
RWrn+3	Reading data	Data corresponding to the read code set to RWwn+2 is set.
RWrn+4		
RWrn+5	Monitor 2 data lower 16bit	The lower 16 bits of the data of the monitor code set to RWwn+1 are set.
RWrn+6	Monitor 2 data upper 16bit	The upper 16 bits of the data of the monitor code set to RWwn+1 are set. A sign is set if there are no data in the upper 16 bits.
RWrn+7		

3. CC-LINK COMMUNICATION FUNCTIONS

3.5.3 Monitor codes

To demand 32-bit data when 2 stations are occupied, specify the lower 16-bit code No. Use any of the instruction codes 0101 to 011C to read the decimal point position (multiplying factor) of the status indication.

Setting any code No. that is not given in this section will set the error code (□□1□) to respond code (RWrn+2). At this time, "0000" is set to RWrn, RWrn+1, RWrn+5 and RWrn+6.

For monitor data, refer to section 8.5.3 (2).

Code No.		Monitored item	Answer data (Servo amplifier → Programmable controller)	
1 station occupied	2 stations occupied		Data length	Unit
0000h	0000h			
0001h	0001h	Current position lower 16bit	16bit	× 10 ^{STM} [mm] or × 10 ^{STM} [inch]
0002h		Current position upper 16bit	16bit	
0003h	0003h	Command position lower 16bit	16bit	
0004h		Command position upper 16bit	16bit	
0005h	0005h	Command remaining distance lower 16bit	16bit	
0006h		Command remaining distance upper 16bit	16bit	
0007h	0007h			
0008h	0008h	Point table No.	16bit	[No.]
0009h				
000Ah	000Ah	Feedback pulse value lower 16bit	16bit	[pulse]
000Bh		Feedback pulse value upper 16bit	16bit	[pulse]
000Ch				
000Dh				
000Eh	000Eh	Droop pulse value lower 16bit	16bit	[pulse]
000Fh		Droop pulse value upper 16bit	16bit	[pulse]
0010h	0010h			
0011h	0011h	Regenerative load factor	16bit	[%]
0012h	0012h	Effective load factor	16bit	[%]
0013h	0013h	Peak load factor	16bit	[%]
0014h		Instantaneously occurring torque	16bit	[%]
0015h	0015h	ABS counter	16bit	[rev]
0016h	0016h	Motor speed lower 16bit	16bit	× 0.1[rev/min]
0017h		Motor speed upper 16bit	16bit	× 0.1[rev/min]
0018h	0018h	Bus voltage	16bit	[V]
0019h	0019h	ABS position lower 16bit	16bit	[pulse]
001Ah		ABS position middle 16bit	16bit	[pulse]
001Bh	001Bh	ABS position upper 16bit	16bit	[pulse]
001Ch	001Ch	Within one-revolution position lower 16bit	16bit	[pulse]
001Dh		Within one-revolution position upper 16bit	16bit	[pulse]

3. CC-LINK COMMUNICATION FUNCTIONS

3.5.4 Instruction codes (RW_{wn}+2 · RW_{wn}+3)

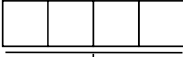
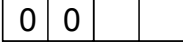
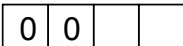

Refer to section 3.6.2 for the instruction code timing charts.

(1) Read instruction codes

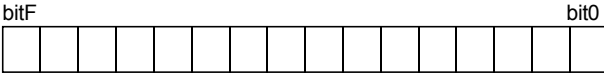
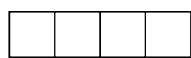

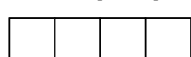
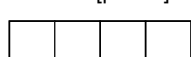
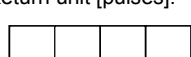
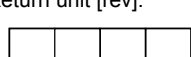
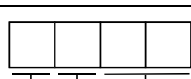
The word data requested to be read with the instruction code 0000h to 0AFFh is read by Read code (RW_{rn}+3).

Set the command code No. corresponding to the item to RW_{rn}+2. The codes and answer data are all 4-digit hexadecimal numbers.

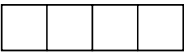
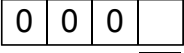

Setting any command code No. that is not given in this section will set the error code (□□1□) to respond code (RW_{rn}+2). At this time, "0000" is set to Reading data (RW_{rn}+3).

Code No.	Item/Function	Reading data (RW _{rn} +3) contents (Servo amplifier → Programmable controller)
0000h	Operation mode Reads the current operation mode.	0000: CC-Link operation mode 0001: Test operation mode
0002h	Travel multiplying factor Reads the multiplying factor of the position data in the point table set in parameter No. PA05.	 <p>Travel multiplying factor</p> <p>0300: ×1000 0200: ×100 0100: ×10 0000: ×1</p>
0010h	Current alarm (warning) reading Reads the alarm No. or warning No. occurring currently.	 <p>Occurring alarm No./warning No.</p>
0020h	Alarm number in alarm history (most recent alarm)	 <p>Alarm No. that occurred in past</p>
0021h	Alarm number in alarm history (first recent alarm)	
0022h	Alarm number in alarm history (second recent alarm)	
0023h	Alarm number in alarm history (third recent alarm)	
0024h	Alarm number in alarm history (fourth recent alarm)	
0025h	Alarm number in alarm history (fifth recent alarm)	
0030h	Alarm occurrence time in alarm history (most recent alarm)	 <p>Occurrence time of alarm that occurred in past</p>
0031h	Alarm occurrence time in alarm history (first recent alarm)	
0032h	Alarm occurrence time in alarm history (second recent alarm)	
0033h	Alarm occurrence time in alarm history (third recent alarm)	
0034h	Alarm occurrence time in alarm history (fourth recent alarm)	
0035h	Alarm occurrence time in alarm history (fifth recent alarm)	

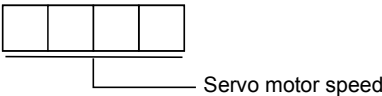
3. CC-LINK COMMUNICATION FUNCTIONS

Code No.	Item/Function	Reading data (RWn+3) contents (Servo amplifier → Programmable controller)
0052h	Output device status 2 Reads the statuses (OFF/ON) of the Output devices.	<p>bit 0 to bit F indicate the OFF/ON statuses of the corresponding output devices. Refer to section 3.5.1 for the meanings of the abbreviations.</p>  <p>bit0: ---- bit4: ---- bit8: ---- bitC: ---- bit1: ---- bit5: ---- bit9: ---- bitD: ---- bit2: ---- bit6: ---- bitA: ALM bitE: ---- bit3: ---- bit7: ---- bitB: CRD bitF: ----</p>
0081h	Energization time Reads the energization time from shipment.	<p>Returns the energization time [h].</p>  <p>Energization time</p>
0082h	Power ON frequency Reads the number of power-on times from shipment.	<p>Returns the number of power-on times.</p>  <p>Power ON frequency</p>
00A0h	Ratio of load inertia moment Reads the estimated ratio of load inertia moment to servo motor shaft inertia moment.	<p>Return unit [times].</p>  <p>Ratio of load inertia moment</p>
00B0h	Home position within-1-revolution position lower 16bit (CYC0) Reads the lower 16 bits of the cycle counter value of the absolute home position.	<p>Return unit [pulses].</p>  <p>Cycle counter value</p>
00B1h	Home position within-1-revolution position upper 16bit Reads the upper 16 bits of the cycle counter value of the absolute home position.	<p>Return unit [pulses].</p>  <p>Cycle counter value</p>
00B2h	Home position Multi-revolution data (ABS0) Multi-revolution counter value of absolute home position reading.	<p>Return unit [rev].</p>  <p>Multi-revolution counter value</p>
00C0h	Error parameter No./Point data No. reading Reads the parameter No./point table No. in error.	 <p>Parameter No. or point table No.</p> <p>Parameter group 0: Basic setting parameters (No.PA□□) 1: Gain/filter parameters (No.PB□□) 2: Extension setting parameters (No.PC□□) 3: I/O setting parameters (No.PD□□)</p> <p>Type 1: Parameter No. 2: Point table No.</p>

3. CC-LINK COMMUNICATION FUNCTIONS

Code No.	Item/Function	Reading data (RWn+3) contents (Servo amplifier → Programmable controller)
0100h to 011Dh	Monitor multiplying factor Reads the multiplying factor of the data to be read with the monitor code. The instruction codes 0100 to 011D correspond to the monitor codes 0000 to 001D. 0000 applies to the instruction code that does not correspond to the monitor code.	 <p>Monitor multiplying factor</p> <p>0003: ×1000 0002: ×100 0001: ×10 0000: ×1</p>
0200h	Parameter group reading Reads the parameter group to be read with code No.8200h to be written.	 <p>Parameter group</p> <p>0: Basic setting parameters (No.PA□□) 1: Gain/filter parameters (No.PB□□) 2: Extension setting parameters (No.PC□□) 3: I/O setting parameters (No.PD□□)</p>
0201h to 02FFh	Parameter data reading Reads the set value of each No. of the parameter group read with code No.0200h. The decimal value converted from the 2 lower digits of the code No. corresponds to the parameter No. If the instruction code is set outside the range set in parameter No.PA19, an error code is returned and the data cannot be read.	The value set in the parameter No. corresponding to the requested group name is stored.
0301h to 03FFh	Data form of parameter Reads the data format of each No. of the parameter group read with code No.0200h. The decimal value converted from the 2 lower digits of the code No. corresponds to the parameter No. If the instruction code is set outside the range set in parameter No.PA19, an error code is returned and the data cannot be read.	<p>The value set in the parameter No. corresponding to the requested group name is stored.</p>  <p>Decimal point position</p> <p>0: Without decimal point 1: First least significant digit (without decimal point) 2: Second least significant digit 3: Third least significant digit 4: Fourth least significant digit</p> <p>Data format</p> <p>0: Used unchanged as hexadecimal 1: Must be converted into decimal</p> <p>Parameter write type</p> <p>0: Valid after write 1: Valid when power is switched on again after write</p>
0401h to 04FFh 0501h to 05FFh	Position data of point table No.1 to 255 Reads the point table data of point table No.1 to 255. 0400 to 04FF: Position data in lower 16 bits of point table No.1 to 255 0500 to 05FF: Position data in upper 16 bits of point table No.1 to 255 Example Instruction code 0413: Lower 16 bits of point table No.19 Instruction code 0513: Upper 16 bits of point table No.19	The position data (upper 16 bits or lower 16 bits) set in the requested point table No. is returned.

3. CC-LINK COMMUNICATION FUNCTIONS

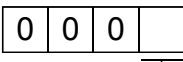
Code No.	Item/Function	Reading data (RWn+3) contents (Servo amplifier → Programmable controller)
0601h to 06FFh	Servo motor speed of point table No.1 to 255 The decimal value converted from the 2 lower digits of the code No. corresponds to the point table No.	The servo motor speed set to the requested point table No. is returned. 
0701h to 07FFh	Acceleration time constant of point table No.1 to 255 The decimal value converted from the 2 lower digits of the code No. corresponds to the point table No.	The acceleration time constant set to the requested point table No. is returned.
0801h to 08FFh	Deceleration time constant of point table No.1 to 255 The decimal value converted from the 2 lower digits of the code No. corresponds to the point table No.	The deceleration time constant set to the requested point table No. is returned.
0901h to 09FFh	Dwell of point table No.1 to 255 The decimal value converted from the 2 lower digits of the code No. corresponds to the point table No.	The dwell set to the requested point table No. is returned.
0A01h to 0AFFh	Auxiliary function of point table No.1 to 255 The decimal value converted from the 2 lower digits of the code No. corresponds to the point table No.	The Auxiliary function set to the requested point table No. is returned.

(2) Write instruction codes

Set the data, which was requested to be written with the instruction code 8010h to 91FFh.

Set the instruction code No. corresponding to the item to Instruction code (RWwn+2) and the written data to Writing data (RWwn+3). The codes and answer data are all 4-digit hexadecimal numbers.

When the instruction code which has not been described in this section is set, the error code (□□1□) is stored in respond code (RWrn+2).

Code No.	Item	Writing data (RWwn+3) contents (Programmable controller → Servo amplifier)
8010h	Alarm reset command Deactivates the alarm that occurred.	1EA5
8101h	Feedback pulse value display data is clear Resets the display data of the status indication "feedback pulse value" to 0.	1EA5
8200h	Parameter group write command Writes the group of parameters that are written to with codes No.8201h to 82FFh and 8301h to 83FFh. Writes the group of parameters that are read with codes No.0201h to 02FFh and 0301h to 03FFh.	 Parameter group 0: Basic setting parameters (No.PA□□) 1: Gain/filter parameters (No.PB□□) 2: Extension setting parameters (No.PC□□) 3: I/O setting parameters (No.PD□□)

3. CC-LINK COMMUNICATION FUNCTIONS

Code No.	Item	Writing data (RWwn+3) contents (Programmable controller → Servo amplifier)		
8201h to 82FFh	Data RAM instruction of parameter Writes the set value of each No. of the parameter group written by code No.8200h to RAM. These values are cleared when power is switched off. The decimal value converted from the 2 lower digits of the code No. corresponds to the parameter No. An error code is returned if an instruction code outside the range set in parameter No. PA19 or a value outside the setting range of the corresponding parameter is written.	Convert the decimal values into hexadecimal before setting.		
8301h to 83FFh	Data EEPROM instruction of parameter Writes the set value of each No. of the parameter group written with code No.8200h to EEPROM. Written to EEPROM, these values are held if power is switched off. The decimal value converted from the 2 lower digits of the code No. corresponds to the parameter No. An error code is returned if an instruction code outside the range set in parameter No. PA19 or a value outside the setting range of the corresponding parameter is written.	Convert the decimal values into hexadecimal before setting.		
8401h to 84FFh 8501h to 85FFh	Position data RAM command of point table Writes the position data of point table No. 1 to 255 to RAM. These values are cleared when power is switched off.	Convert the values into hexadecimal before setting.		
<table border="1" style="margin: auto;"> <thead> <tr> <th>Point</th> </tr> </thead> <tbody> <tr> <td> <ul style="list-style-type: none"> ▪ A set of the upper and lower bits makes position data. When changing the data, always set the data of both lower and upper bits in order of lower 16-bit data and upper 16-bit data. <p>8400h to 84FFh: Position data in lower 16 bits of point table No.1 to 255</p> <p>8500h to 85FFh: Position data in upper 16 bits of point table No.1 to 255</p> <p>Example</p> <p>Instruction code 8413h: Lower 16 bits of point table No.19</p> <p>Instruction code 8513h: Upper 16 bits of point table No.19</p> </td> </tr> </tbody> </table>			Point	<ul style="list-style-type: none"> ▪ A set of the upper and lower bits makes position data. When changing the data, always set the data of both lower and upper bits in order of lower 16-bit data and upper 16-bit data. <p>8400h to 84FFh: Position data in lower 16 bits of point table No.1 to 255</p> <p>8500h to 85FFh: Position data in upper 16 bits of point table No.1 to 255</p> <p>Example</p> <p>Instruction code 8413h: Lower 16 bits of point table No.19</p> <p>Instruction code 8513h: Upper 16 bits of point table No.19</p>
Point				
<ul style="list-style-type: none"> ▪ A set of the upper and lower bits makes position data. When changing the data, always set the data of both lower and upper bits in order of lower 16-bit data and upper 16-bit data. <p>8400h to 84FFh: Position data in lower 16 bits of point table No.1 to 255</p> <p>8500h to 85FFh: Position data in upper 16 bits of point table No.1 to 255</p> <p>Example</p> <p>Instruction code 8413h: Lower 16 bits of point table No.19</p> <p>Instruction code 8513h: Upper 16 bits of point table No.19</p>				
8601h to 86FFh	Motor speed of point table Writes the motor speeds of point table No.1 to 255 to RAM. These values are cleared when power is switched off. The decimal value converted from the 2 lower digits of the code No. corresponds to the point table No.	Convert the values into hexadecimal before setting.		
8701h to 87FFh	Acceleration time constant data RAM command of point table Writes the acceleration time constants of point table No.1 to 255 to RAM. These values are cleared when power is switched off. The decimal value converted from the 2 lower digits of the code No. corresponds to the point table No.	Convert the values into hexadecimal before setting.		

3. CC-LINK COMMUNICATION FUNCTIONS

Code No.	Item	Writing data (RWwn+3) contents (Programmable controller → Servo amplifier)		
8801h to 88FFh	Deceleration time constant data RAM command of point table Writes the deceleration time constants of point table No.1 to 255 to RAM. These values are cleared when power is switched off. The decimal value converted from the 2 lower digits of the code No. corresponds to the point table No.	Convert the values into hexadecimal before setting.		
8901h to 89FFh	Dwell data RAM command of point table Writes the dwell data of point table No.0 to 255 to RAM. These values are cleared when power is switched off. The decimal value converted from the 2 lower digits of the code No. corresponds to the point table No.	Convert the values into hexadecimal before setting.		
8A01h to 8AFFh	Auxiliary function data RAM command of point table Writes the auxiliary function data of point table No.0 to 31 to RAM. These values are cleared when power is switched off. The decimal value converted from the 2 lower digits of the code No. corresponds to the point table No.	Convert the values into hexadecimal before setting.		
8B01h to 8BFFh 8C01h to 8CFFh	Position data EEPROM-ROM command of point table Writes the position data of point table No.1 to 255 to EEPROM-ROM. Written to EEPROM, these values are held if power is switched off.	Convert the values into hexadecimal before setting.		
<table border="1" style="margin: auto;"> <thead> <tr> <th style="width: 100px;">Point</th> </tr> </thead> <tbody> <tr> <td> <ul style="list-style-type: none"> ▪ A set of the upper and lower bits makes position data. When changing the data, always set the data of both lower and upper bits in order of lower 16-bit data and upper 16-bit data. <p>8B01h to 8BFFh: Position data in lower 16 bits of point table No.1 to 255</p> <p>8C01h to 8CFFh: Position data in upper 16 bits of point table No.1 to 255</p> <p>Example</p> <p>Instruction code 8B13h: Lower 16 bits of point table No.19</p> <p>Instruction code 8C13h: Upper 16 bits of point table No.19</p> </td> </tr> </tbody> </table>			Point	<ul style="list-style-type: none"> ▪ A set of the upper and lower bits makes position data. When changing the data, always set the data of both lower and upper bits in order of lower 16-bit data and upper 16-bit data. <p>8B01h to 8BFFh: Position data in lower 16 bits of point table No.1 to 255</p> <p>8C01h to 8CFFh: Position data in upper 16 bits of point table No.1 to 255</p> <p>Example</p> <p>Instruction code 8B13h: Lower 16 bits of point table No.19</p> <p>Instruction code 8C13h: Upper 16 bits of point table No.19</p>
Point				
<ul style="list-style-type: none"> ▪ A set of the upper and lower bits makes position data. When changing the data, always set the data of both lower and upper bits in order of lower 16-bit data and upper 16-bit data. <p>8B01h to 8BFFh: Position data in lower 16 bits of point table No.1 to 255</p> <p>8C01h to 8CFFh: Position data in upper 16 bits of point table No.1 to 255</p> <p>Example</p> <p>Instruction code 8B13h: Lower 16 bits of point table No.19</p> <p>Instruction code 8C13h: Upper 16 bits of point table No.19</p>				
8D01h to 8DFFh	Servo motor speed data EEPROM-ROM command of point table Writes the servo motor speeds of point table No.1 to 255 to EEPROM-ROM. Written to EEPROM, these values are held if power is switched off. The decimal value converted from the 2 lower digits of the code No. corresponds to the point table No.	Convert the values into hexadecimal before setting.		

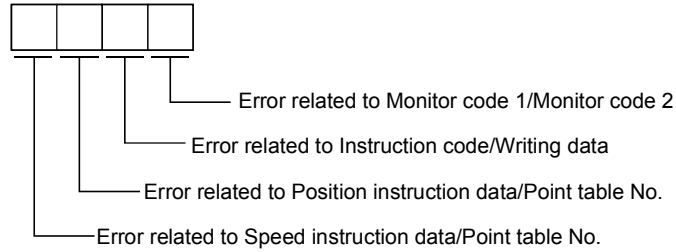
3. CC-LINK COMMUNICATION FUNCTIONS

Code No.	Item	Writing data (RWwn+3) contents (Programmable controller → Servo amplifier)
8E01h to 8EFFh	Acceleration time constant data EEPROM command of point table Writes the acceleration time constants of point table No.1 to 255 to EEPROM. Written to EEPROM, these values are held if power is switched off. The decimal value converted from the 2 lower digits of the code No. corresponds to the point table No.	Convert the values into hexadecimal before setting.
8F01h to 8FFFh	Deceleration time constant data EEPROM command of point table Writes the deceleration time constants of point table No.1 to 255 to EEPROM. Written to EEPROM, these values are held if power is switched off. The decimal value converted from the 2 lower digits of the code No. corresponds to the point table No.	Convert the values into hexadecimal before setting.
9001h to 90FFh	Dwell data EEPROM command of point table Writes the dwell data of point table No.1 to 255 to EEPROM. Written to EEPROM, these values are held if power is switched off. The decimal value converted from the 2 lower digits of the code No. corresponds to the point table No.	Convert the values into hexadecimal before setting.
9101h to 91FFh	Auxiliary function data EEPROM command of point table Writes the auxiliary function data of point table No.1 to 255 to EEPROM. Written to EEPROM, these values are held if power is switched off. The decimal value converted from the 2 lower digits of the code No. corresponds to the point table No.	Convert the values into hexadecimal before setting.

3. CC-LINK COMMUNICATION FUNCTIONS

3.5.5 Respond codes (RWrn+2)

If any of the monitor codes, instruction codes, position command data/point table Nos., speed command data/point table Nos. set to the remote register is outside the setting range, the corresponding error code is set to respond code (RWwn+2). "0000" is set if they are normal.



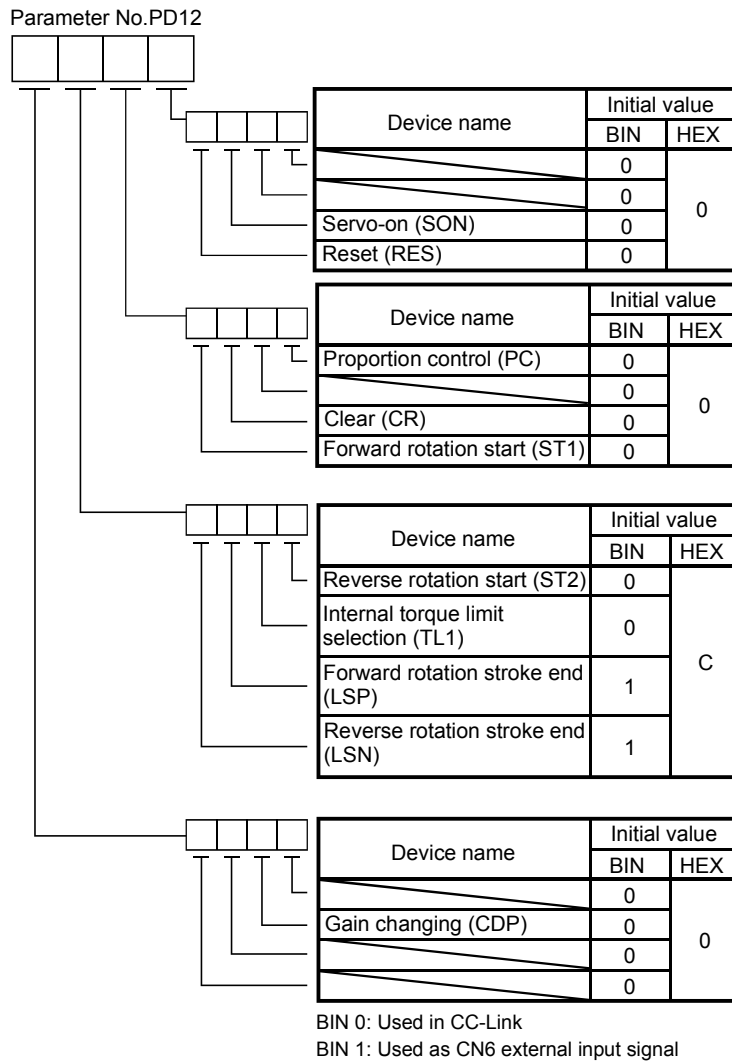
Code No.	Error	Details
0	Normal answer	Instruction was completed normally.
1	Code error	<ul style="list-style-type: none"> The monitor code not in the specifications was set. Read/write of the point table of No.255 or later was set.
2	Parameter ▪ point table selection error	<ul style="list-style-type: none"> The parameter No. disabled for reference was set.
3	Write range error	<ul style="list-style-type: none"> An attempt was made to write the parameter or point table data outside the setting range.

3. CC-LINK COMMUNICATION FUNCTIONS

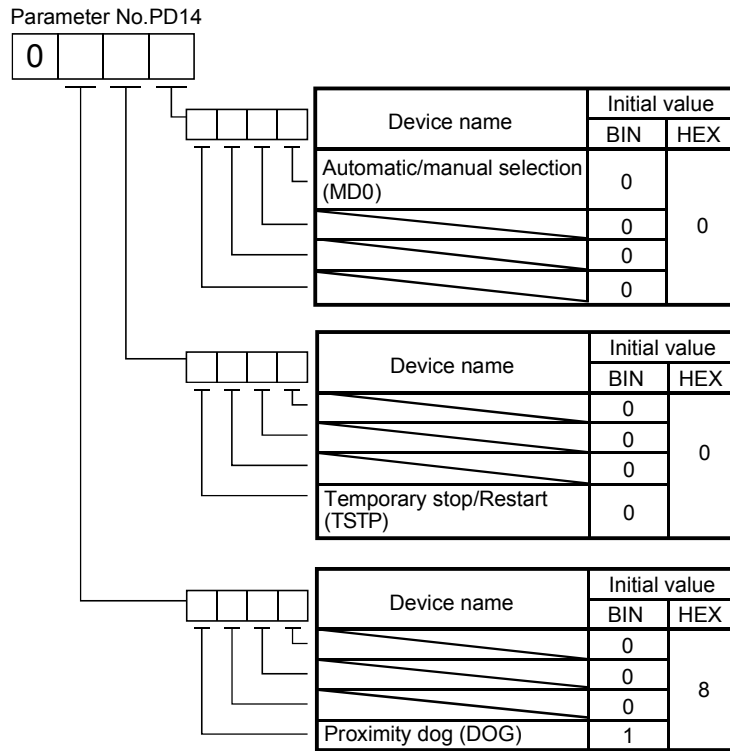
3.5.6 Setting the CN6 external input signals

Using parameter No.PD06 to PD08, PD12 and PD14, you can assign the input devices as the CN6 external input signals. The signals assigned as the CN6 external input devices cannot be used in CC-Link. Refer to section 4.5.1 for the pins to which signals can be assigned.

In the initial status, the forward rotation stroke end, reverse rotation stroke end and proximity dog are preset to be usable as the CN6 external input signals.



3. CC-LINK COMMUNICATION FUNCTIONS



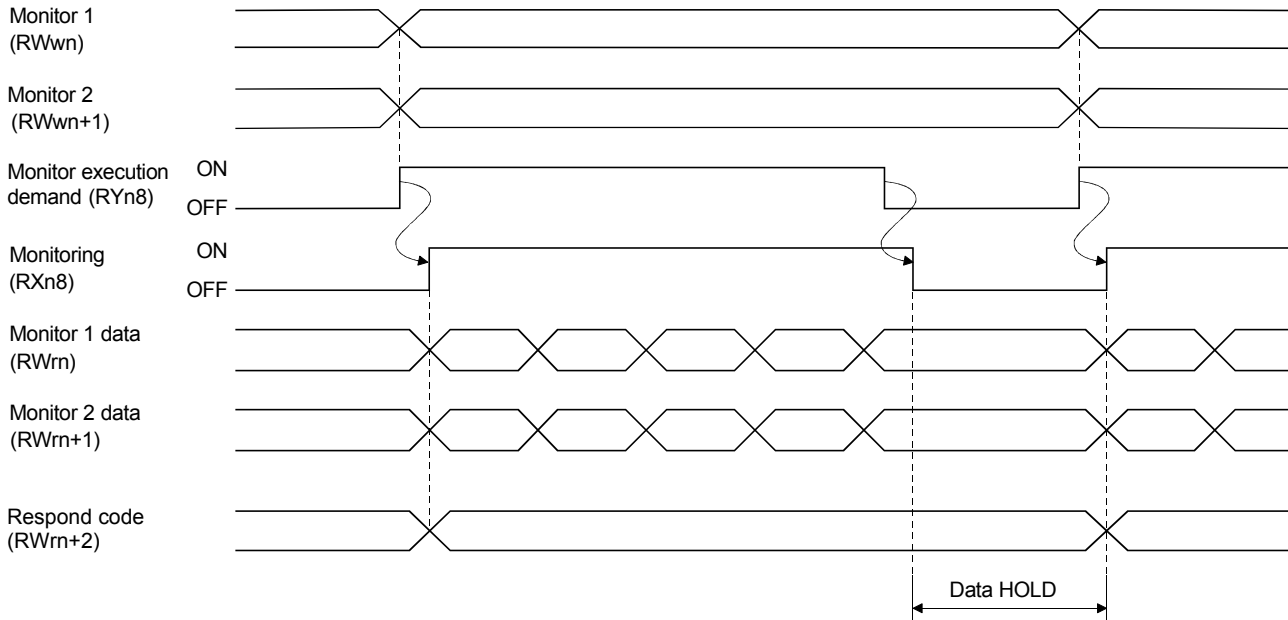
BIN 0: Used in CC-Link
 BIN 1: Used as CN6 external input signal

3. CC-LINK COMMUNICATION FUNCTIONS

3.6 Data communication timing charts

3.6.1 Monitor codes

(1) When 1 station is occupied



Set the monitor codes (refer to section 3.5.3) to Monitor 1 (RWwn) and Monitor 2 (RWwn+1) and turn Monitor output execution demand (RYn8) to ON. Turning Monitor execution demand (RYn8) to ON sets the next data. Data are all hexadecimal numbers. At this time, Monitoring (RXn8) turns to ON at the same time.

Monitor data 1 (RWrn): Data demanded by Monitor 1 (RWwn)

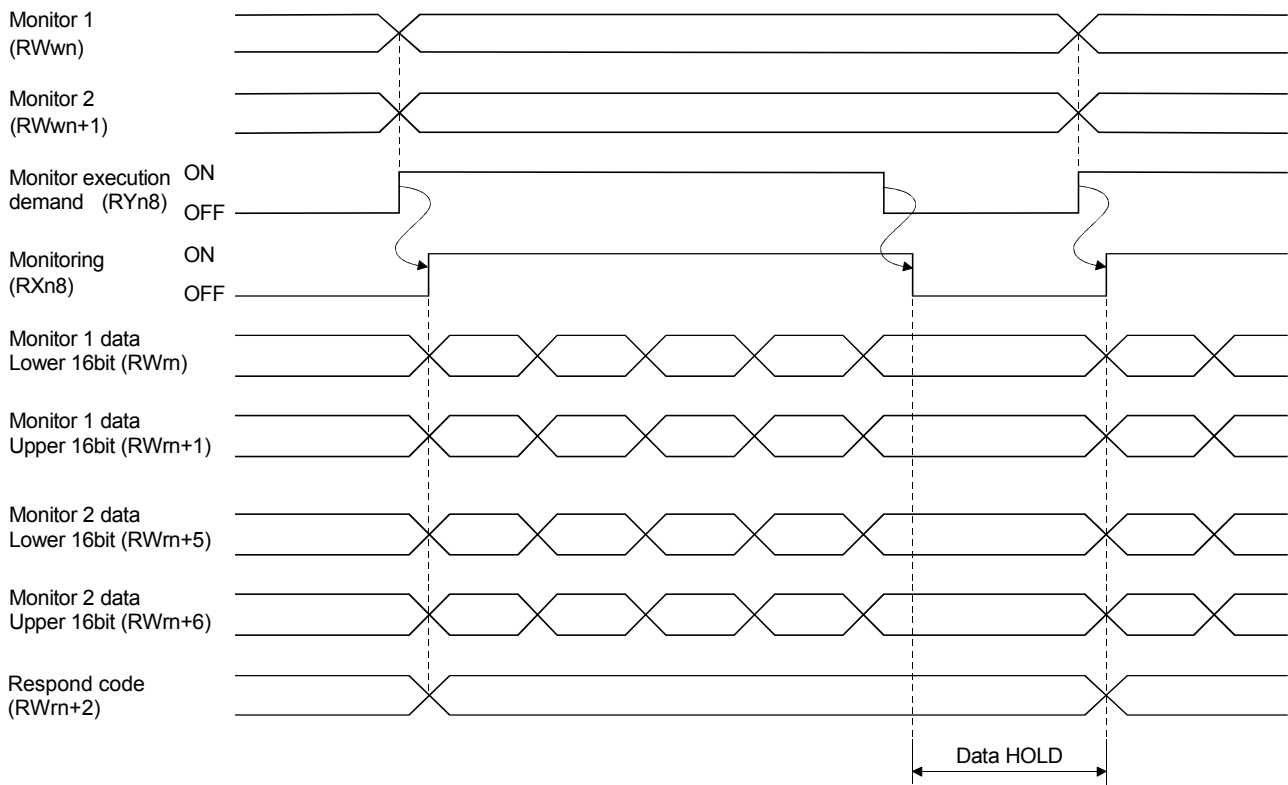
Monitor data 2 (RWrn+1): Data demanded by Monitor 2 (RWwn+1)

For 32-bit data, set the lower 16 bits of the monitor code to Monitor 1 (RWwn) and the upper 16 bits to Monitor 2 (RWwn+1) and read them simultaneously.

The monitor data set to the remote register are always updated while Monitor execution demand (RYn8) is ON. When Monitoring (RXn8) turns to OFF, the data set to Monitor data RWrn, RWrn+1 are held. If the monitor code not in the specifications is set to either Monitor 1 (RWwn) or Monitor 2 (RWwn+1), the corresponding error code (□□□1) is set to respond code.

3. CC-LINK COMMUNICATION FUNCTIONS

(2) When 2 stations are occupied



Set the monitor codes (refer to section 3.5.3) to Monitor 1 (RWwn) and Monitor 2 (RWwn+1) and turn Monitor output execution demand (RYn8) to ON. Turning Monitor execution demand (RYn8) to ON sets the next data. 32-bit data are all divided into the upper 16 bits and lower 16 bits, and set to the remote register. Data are all hexadecimal numbers. At this time, Monitoring (RXn8) turns to ON at the same time.

Monitor data 1 lower 16 bit (RWrn): Lower 16 bits of data demanded by Monitor 1 (RWwn)

Monitor data 1 upper 16 bit (RWrn+1): Upper 16 bits of data demanded by Monitor 1 (RWwn)

Monitor data 2 lower 16 bit (RWrn+5): Lower 16 bits of data demanded by Monitor 2 (RWwn+1)

Monitor data 2 upper 16 bit (RWrn+6): Upper 16 bits of data demanded by Monitor 2 (RWwn+1)

A sign is set if data does not exist in RWrn+1 · RWrn+6. A "+" sign is indicated by "0000", and "-" by "FFFF".

The monitor data set to the remote register are always updated while Monitoring (RXn8) is ON.

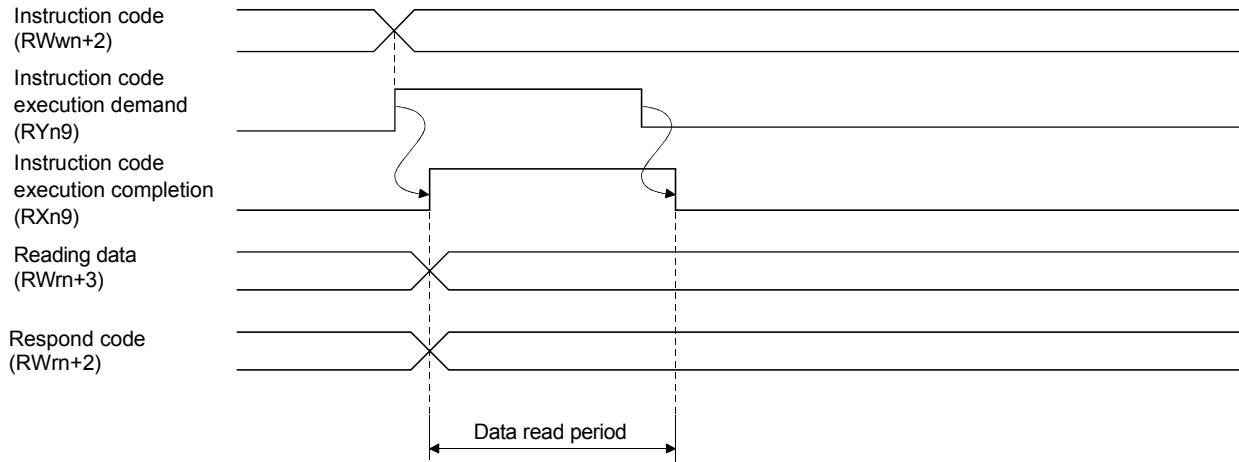
When Monitoring (RXn8) turns to OFF, the data set to Monitor data RWrn, RWrn+1, RWrn+5, RWrn+6 are held.

If the monitor code not in the specifications is set to either Monitor 1 (RWwn) or Monitor 2 (RWwn+1), the corresponding error code (□□□1) is set to respond code.

3. CC-LINK COMMUNICATION FUNCTIONS

3.6.2 Instruction codes

(1) Read instruction codes (0000h to 0A1Fh)



Set the read instruction code (refer to section 3.5.4 (1)) to Instruction code (RWwn+2) and turn Instruction code execution demand (RYn9) to ON. Turning Instruction code execution demand (RYn9) to ON sets the data corresponding to the preset read code to Reading data (RWrn+3). Data are all hexadecimal numbers. At this time, Instruction code execution completion (RXn9) turns to ON at the same time.

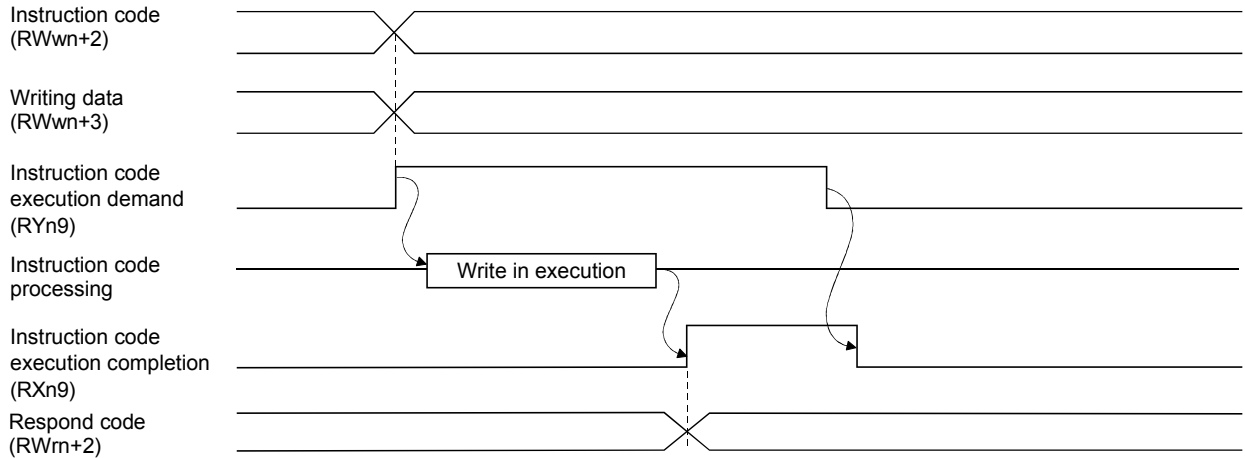
Read the read data set to Reading data (RWrn+3) while Instruction code execution completion (RXn9) is ON. The data set to Reading data (RWrn+3) is held until the next read instruction code is set and Instruction code execution demand (RYn9) is turned to ON.

If the instruction code not in the specifications is set to Instruction code (RWwn+2), the corresponding error code (□□1□) is set to respond code. If any unusable parameter, point table is read, the corresponding error code (□□2□) is set.

Turn Instruction code execution demand (RYn9) to OFF after completion of data read.

3. CC-LINK COMMUNICATION FUNCTIONS

(2) Write instruction codes (8000h to 911Fh)



Set the write instruction code (refer to section 3.5.4 (2)) to Instruction code (RWwn+2) and the data to be written (data to be executed) to Writing data (RWwn+3) in hexadecimal, and turn Instruction code execution demand (RYn9) to ON.

Turning instruction code execution completion to ON sets the data set in Writing data (RWwn+3) to the item corresponding to the write instruction code. When write is executed, Instruction code execution completion (RXn9) turns to ON.

If the instruction code not in the specifications is set to Instruction code (RWwn+2), the corresponding error code (□□1□) is set to respond code.

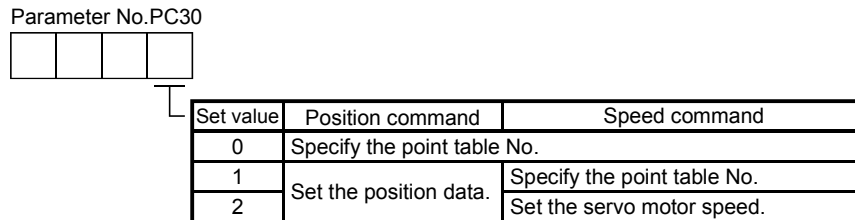
Turn Instruction code execution demand (RYn9) to OFF after Instruction code execution completion (RXn9) has turned to ON.

3. CC-LINK COMMUNICATION FUNCTIONS

3.6.3 Remote register-based position/speed setting

The functions in this section are usable when Position/speed specifying system selection (RY(n+2)A) is ON (remote register-based position/speed specifying system is selected) with 2 stations occupied.

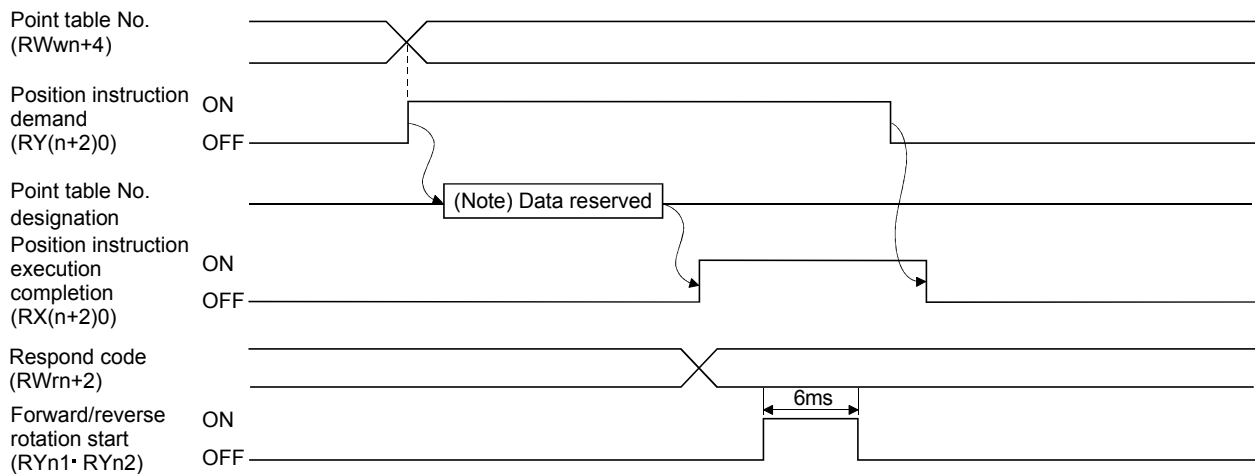
The position command/speed command necessary for positioning can be selected by parameter No.PC30 setting as indicated below.



(1) When setting the point table No.

Specify the point table No. stored in the servo amplifier and execute positioning.

Preset "□□□0" (initial value) in parameter No.PC30 to enable point table No.-setting operation.



Note. This data is stored into RAM of the servo amplifier. Hence, the data is cleared when power is switched off.

Set the point table No. to point table No. (RWwn+4) and turn Position instruction demand (RY(n+2)0) to ON.

Turning RY(n+2)0 to ON stores the position block No. into RAM of the servo amplifier.

When the data is stored, Position instruction execution completion (RX(n+2)0) turns to ON.

If data outside the setting range is set to Position block No. (RWwn+4), the error code (refer to section 3.5.5) is set to respond code.

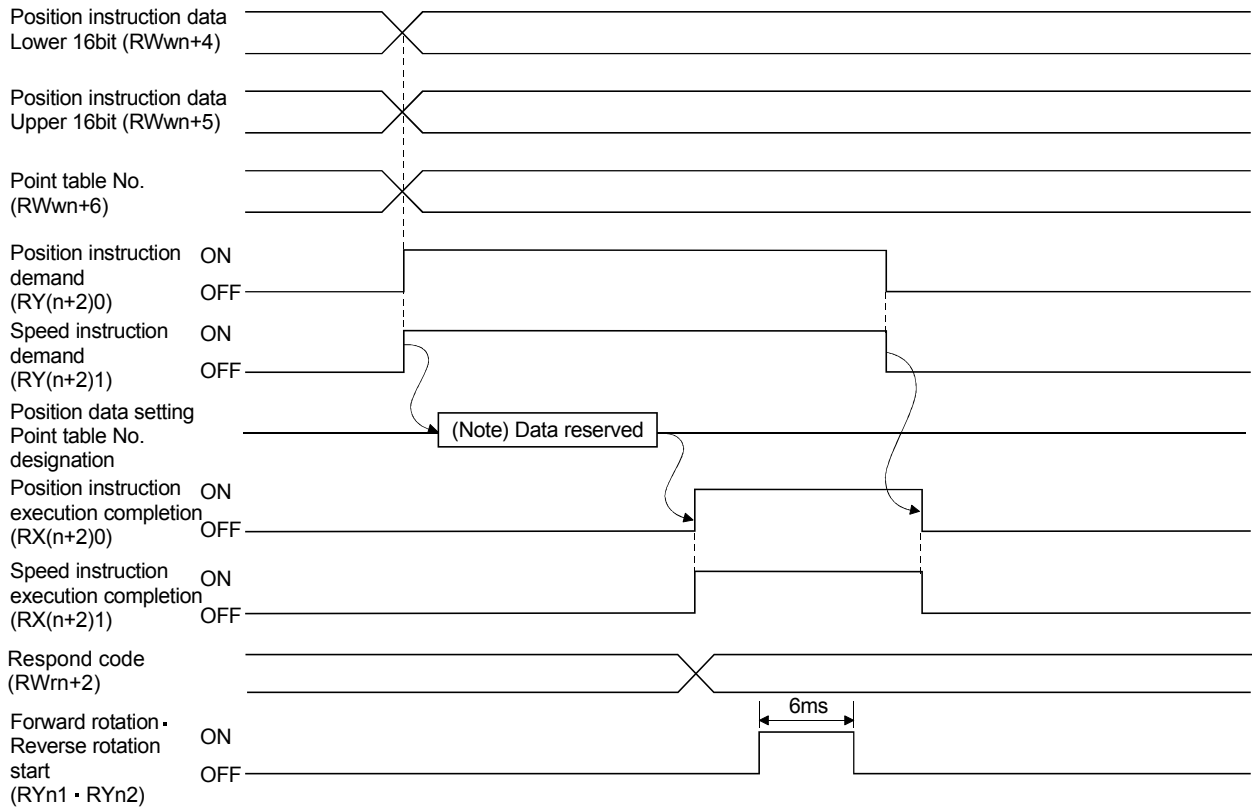
Turn Forward rotation start (RYn1)/Reverse rotation start (RYn2) to ON after Position instruction execution completion (RX(n+2)0) has turned to ON.

3. CC-LINK COMMUNICATION FUNCTIONS

(2) When setting the position command data/point table No. (speed command)

Specify the position address with the remote register, and specify the speed command data by specifying the point table No. to use the preset servo motor speed, acceleration time constant and deceleration time constant the speed command data, and execute positioning.

Preset "□□□1" in parameter No.PC30 to enable position command data-set and point table No. (speed instruction)-setting operation.



Note. This data is stored into RAM of the servo amplifier. Hence, the data is cleared when power is switched off.

Set the lower 16 bits of the position instruction data to Position instruction data lower 16 bit (RWwn+4), the upper 16 bits of the position instruction data to Position instruction data upper 16 bit (RWwn+5), and point table for speed command No. to point table No. (RWwn+6), and turn Position instruction demand (RY(n+2)0) and Speed instruction demand (RY(n+2)1) to ON.

Turning RY(n+2)0 and RY(n+2)1 to ON stores the position command data and point table No. into RAM of the servo amplifier.

When the data are stored, Position instruction execution completion (RX(n+2)0) and Speed instruction execution completion (RX(n+2)1) turn to ON.

If data outside the setting range is set to any of Position instruction data lower 16 bit (RWwn+4), Position instruction data upper 16 bit (RWwn+5) and point table No. (RWwn+6), the error code (refer to section 3.5.5) is set to respond code.

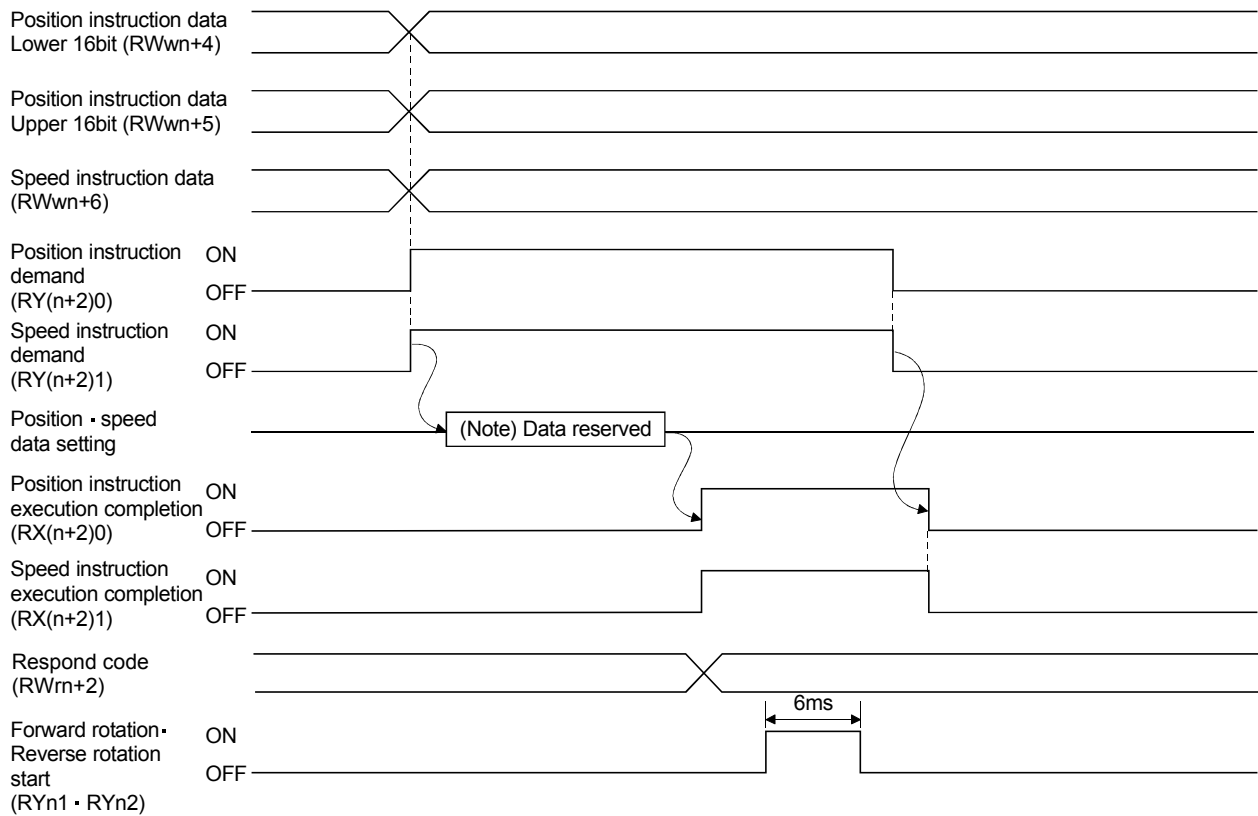
Turn Forward rotation start (RYn1) · Reverse rotation start (RYn2) to ON after Position instruction execution completion (RX(n+2)0) and Speed instruction execution completion (RX(n+2)1) have turned to ON.

3. CC-LINK COMMUNICATION FUNCTIONS

(3) When setting the position command data and speed command data

Specify the position address and servo motor speed with the remote register, and execute positioning. At this time, use the acceleration time constant and deceleration time constant set in point table No.1.

Preset "□□□2" in parameter No.PC30 to enable position command data- and speed command data-set operation.



Note. This data is stored into RAM of the servo amplifier. Hence, the data is cleared when power is switched off.

Set the lower 16 bits of the position instruction data to Position instruction data lower 16 bit (RWwn+4), the upper 16 bits of the position instruction data to Position instruction data upper 16 bit (RWwn+5), and speed instruction data to Speed instruction data (RWwn+6), and turn Position instruction demand (RY(n+2)0) and Speed instruction demand (RY(n+2)1) to ON.

Turning RY(n+2)0 and RY(n+2)1 to ON stores the position command data and speed command data into RAM of the servo amplifier.

When the data are stored, Position instruction execution completion (RX(n+2)0) and Speed instruction execution completion (RX(n+2)1) turn to ON.

If data outside the setting range is set to any of Position instruction data lower 16 bit (RWwn+4), Position instruction data upper 16 bit (RWwn+5) and Speed command data (RWwn+6), the error code (refer to section 3.5.5) is set to respond code.

Turn Forward rotation start (RYn1) · Reverse rotation start (RYn2) to ON after Position instruction execution completion (RX(n+2)0) and Speed instruction execution completion (RX(n+2)1) have turned to ON.

3. CC-LINK COMMUNICATION FUNCTIONS

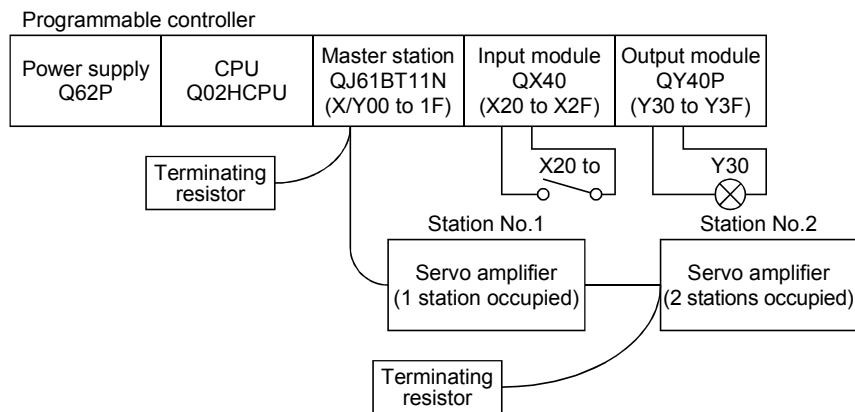
3.7 Function-by-function programming examples

This section explains specific programming examples for servo operation, monitor, parameter read and write, and others on the basis of the equipment makeup shown in section 3.7.1.

3.7.1 System configuration example

As shown below, the CC-Link system master-local unit is loaded to run two servo amplifiers (1 station occupied / 2 stations occupied).

(1) System configuration



(2) Master station network parameter setting

In the programming examples, network parameters are set as below.

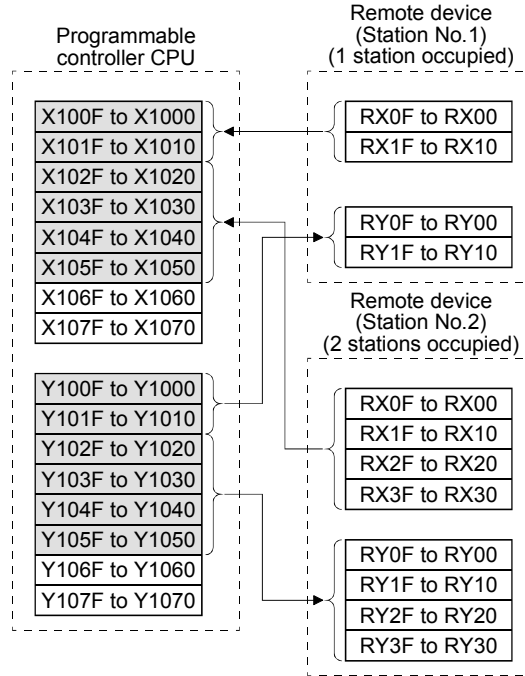
Item		Setting condition	Item		Setting condition
Start I/O No.		0000	Remote register (RW _r)		W0
Operational setting	Data link disorder station settings	Clear (No check on "Hold input data")	Refresh device		
	Case of CPU STOP setting	Refresh	Remote register (RW _w)		W100
Type		Master station	Special relay (SB)		SB0
Mode		Remote net (Ver.1 mode)	Refresh device		
All connect count		2	Special relay (SW)		SW0
Remote input (RX)		X1000	Refresh device		
Remote output (RY)		Y1000	Retry count		3
Refresh device			Automatic reconnection station count		1
Refresh device			CPU down select		Stop
			Scan mode setting		Asynchronous

3. CC-LINK COMMUNICATION FUNCTIONS

(3) Relationship of remote I/O (RX, RY)

The following shows a relationship between the devices of the programmable controller CPU and the remote I/Os (RX, RY) of the remote device stations.

Shaded area shows the devices actually used.

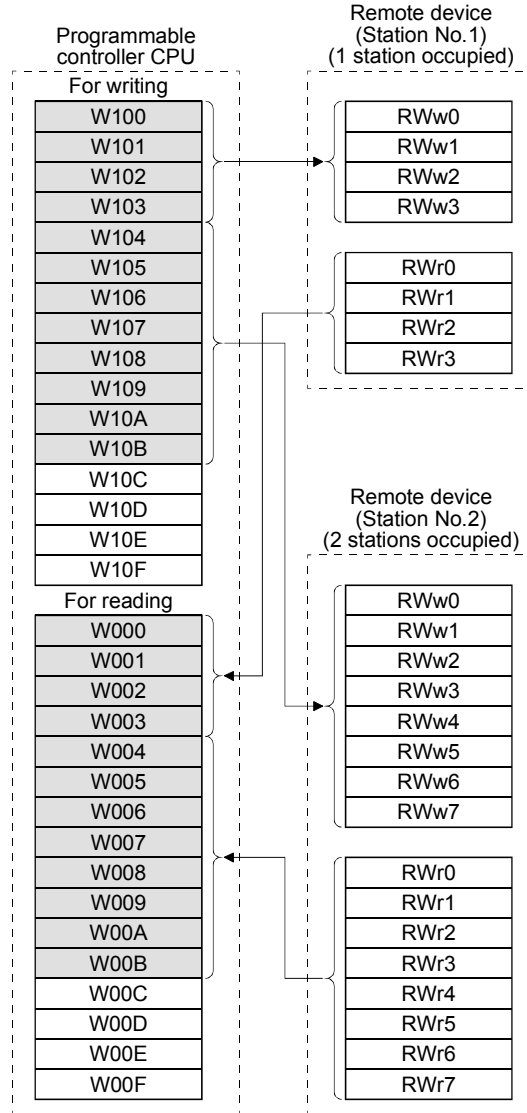


3. CC-LINK COMMUNICATION FUNCTIONS

(4) Relationship of remote register (RWw, RWr)

The following shows a relationship between the devices of the programmable controller CPU and the remote registers (RWw, RWr) of the remote device stations.

Shaded area shows the devices actually used.

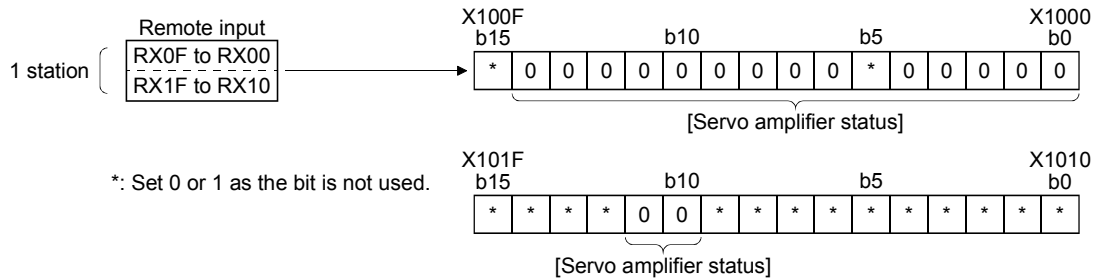
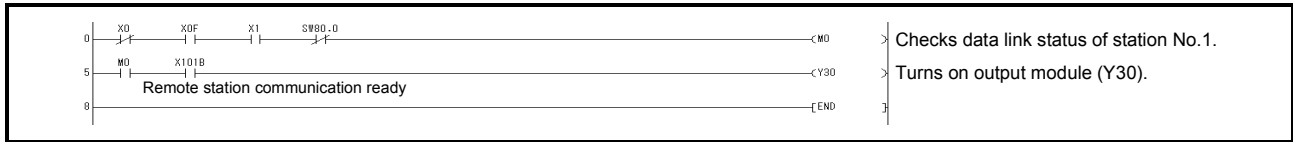


3. CC-LINK COMMUNICATION FUNCTIONS

3.7.2 Reading the servo amplifier status

When the servo amplifier on station number 1 becomes ready for the remote station communication, Y30 of the output module turns on.

The program is for turning on Y30 when CC-Link communication is normal.

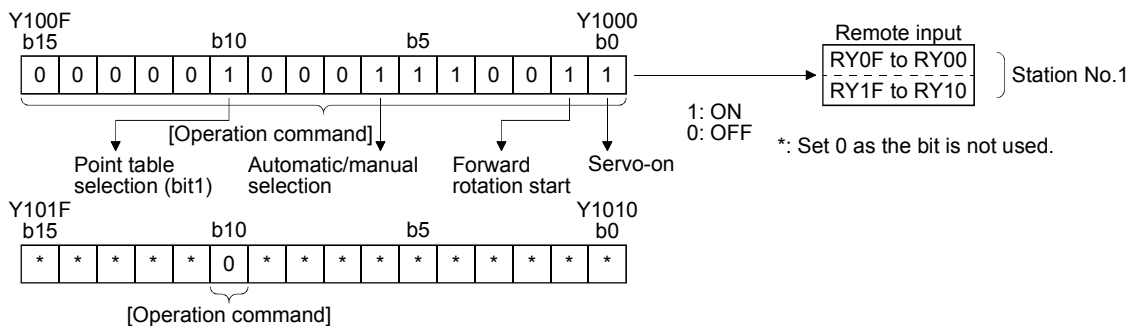
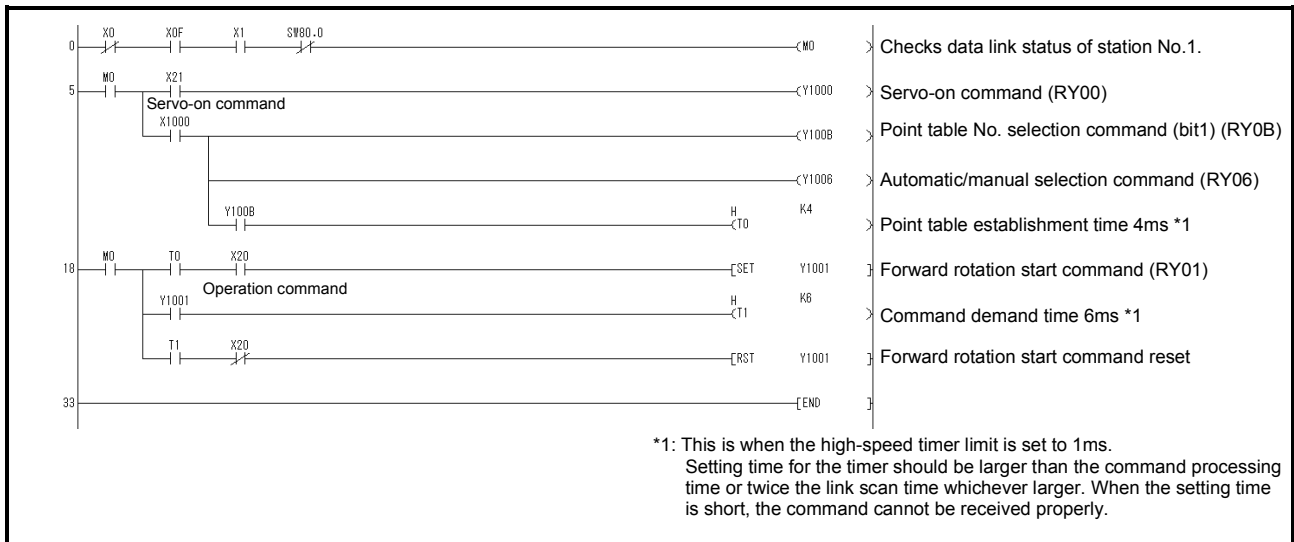


Servo amplifier status (1 station occupied)			
X1000: Ready (RD)	X1008: Monitoring (MOF)	X1010: ----	X1018: ----
X1001: In position (INP)	X1009: Instruction code execution completion (COF)	X1011: ----	X1019: ----
X1002: Rough match (CPO)	X100A: Warning (WNG)	X1012: ----	X101A: Trouble (ALM)
X1003: Home position return completion (ZP)	X100B: Battery warning (BWNG)	X1013: ----	X101B: Remote station communication ready (CRD)
X1004: Limiting torque (TLC)	X100C: Movement completion (MEND)	X1014: ----	X101C: ----
X1005: ----	X100D: Dynamic brake interlock (DB)	X1015: ----	X101D: ----
X1006: Electromagnetic brake interlock (MBR)	X100E: Position range (POT)	X1016: ----	X101E: ----
X1007: Temporary stop (PUS)	X100F: ----	X1017: ----	X101F: ----

3. CC-LINK COMMUNICATION FUNCTIONS

3.7.3 Writing the operation commands

Perform positioning operation of point table No.2 for the servo amplifier of station 2.
Start the operation by turning on X20.



Operation commands			
(1 station occupied)	Y1008: Monitor output execution demand (MOR)	Y1010: ---	Y1018: ---
Y1000: Servo-on (SON)	Y1009: Instruction code execution demand (COR)	Y1011: ---	Y1019: ---
Y1001: Forward rotation start (ST1)	Y100A: Point table No. selection 1 (DI0)	Y1012: ---	Y101A: Reset (RES)
Y1002: Reverse rotation start (ST2)	Y100B: Point table No. selection 2 (DI1)	Y1013: ---	Y101B: ---
Y1003: Proximity dog (DOG)	Y100C: Point table No. selection 3 (DI2)	Y1014: ---	Y101C: ---
Y1004: Forward rotation stroke end (LSP)	Y100D: Point table No. selection 4 (DI3)	Y1015: ---	Y101D: ---
Y1005: Reverse rotation stroke end (LSN)	Y100E: Point table No. selection 5 (DI4)	Y1016: ---	Y101E: ---
Y1006: Automatic/manual selection (MDO)	Y100F: Clear (CR)	Y1017: ---	Y101F: ---
Y1007: Temporary stop/Restart (TSTP)			

3. CC-LINK COMMUNICATION FUNCTIONS

3.7.4 Reading the data

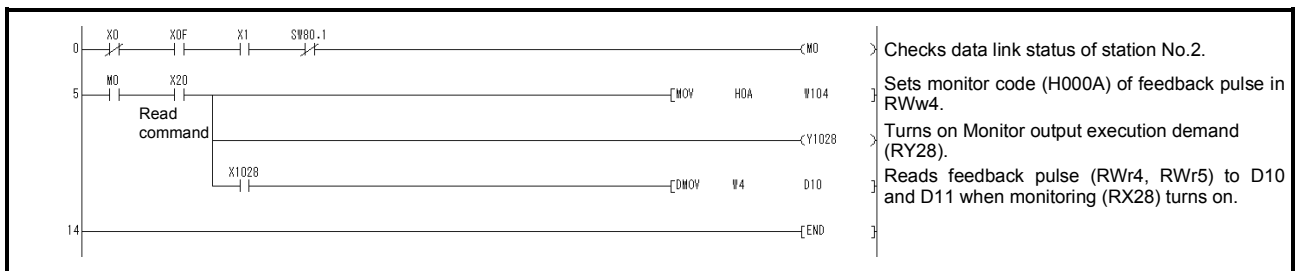
Read various data of the servo amplifier.

(1) Reading the monitor value

Read the (feedback pulse value) of the servo amplifier of station 2 to D1.

Data No.	Description
H000A	Cumulative feedback pulse data (hexadecimal)

Read the cumulative feedback pulse monitor by turning on X20.



3. CC-LINK COMMUNICATION FUNCTIONS

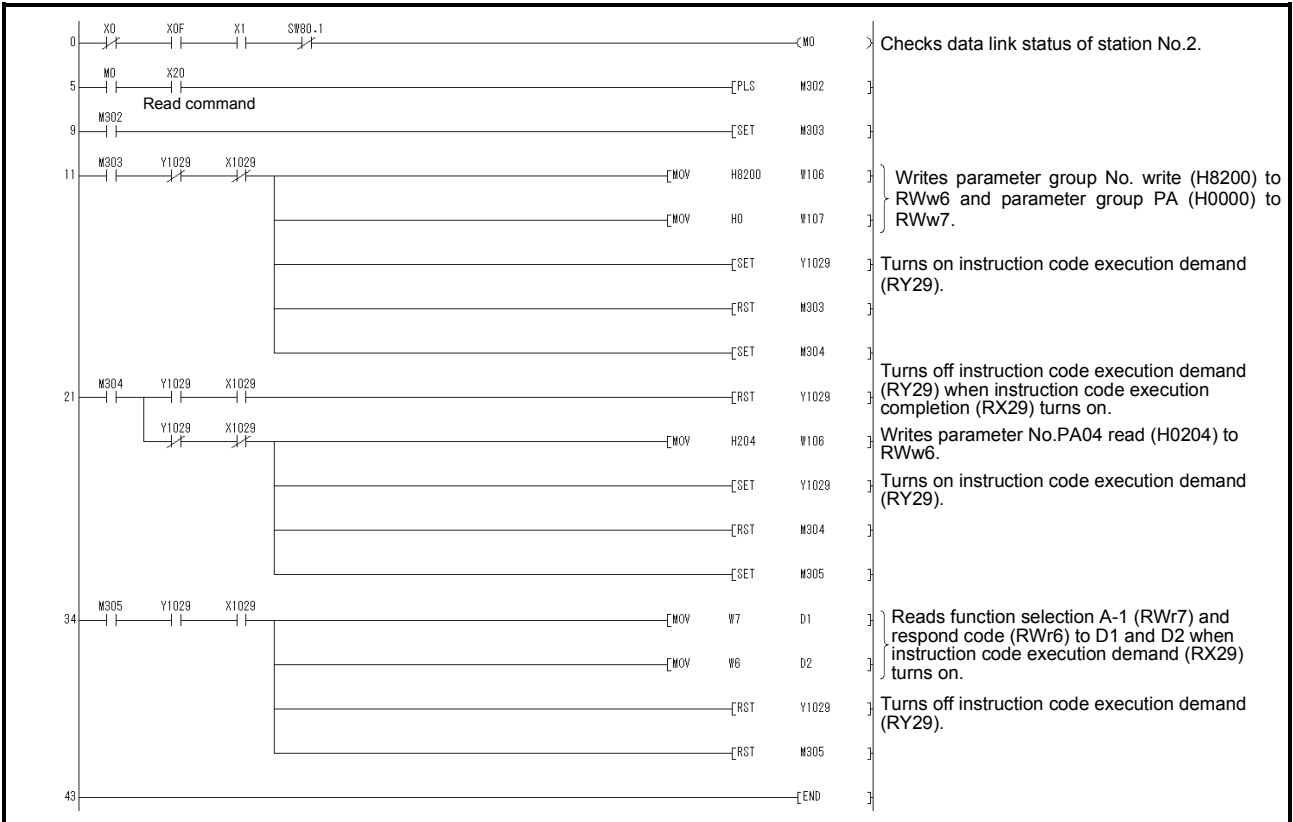
(2) Reading the parameter

Read parameter No.PA04 "Function selection A-1" of the servo amplifier of station 2 to D1.

Data No.	Description
H8200	Parameter group selection
H2024	Parameter No.PA04 setting (hexadecimal)

Read the parameter No.PA04 by turning on X20.

The respond code at instruction code execution is set to D2.



3. CC-LINK COMMUNICATION FUNCTIONS

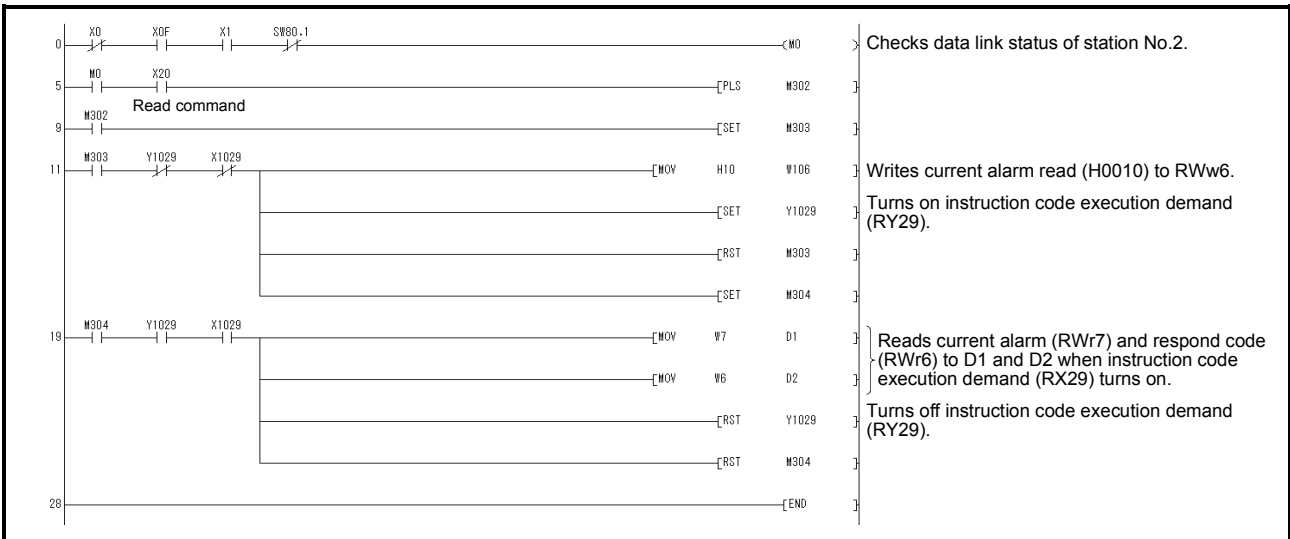
(3) Reading the alarm definition

Read the alarm definition of the servo amplifier of station 2 to D1.

Data No.	Description
H0010	Occurring alarm/warning No. (hexadecimal)

Read current alarms by turning on X20.

The respond code at instruction code execution is set to D2.



3. CC-LINK COMMUNICATION FUNCTIONS

3.7.5 Writing the data

This section explains the programs for writing various data to the servo amplifier.

(1) Writing the servo motor speed data of point table

Change the servo motor speed data in the point table No.1 of the servo amplifier of station 2 to "100".

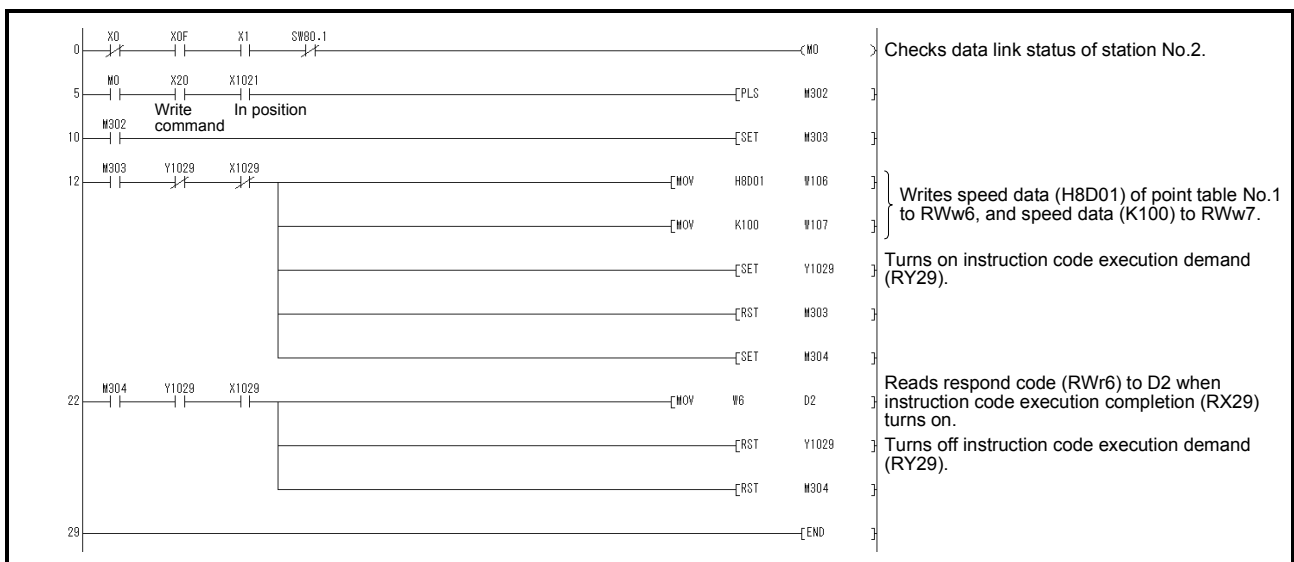
The following shows a program example for writing data to the servo amplifier when two stations are occupied. Writing is disabled for the servo amplifier when one station is occupied.

Code No.	Description
H8D01	Write of servo motor speed data of point table No.1 (hexadecimal)

Set data	Description
K100	Servo motor speed data of point table No.1 (decimal)

Write the data to the servo motor speed data of point table No.1 by turning on X20.

The respond code at instruction code execution is set to D2.



3. CC-LINK COMMUNICATION FUNCTIONS

(2) Writing the parameter

The following shows a program example when two stations are occupied.

Change parameter No.PC12 (JOG speed) of the servo amplifier of station 2 to "100".

The parameter group PC is specified as follows.

Code No.	Description
8200h	Parameter group selection

Set data	Description
H0002	Set data (hexadecimal)

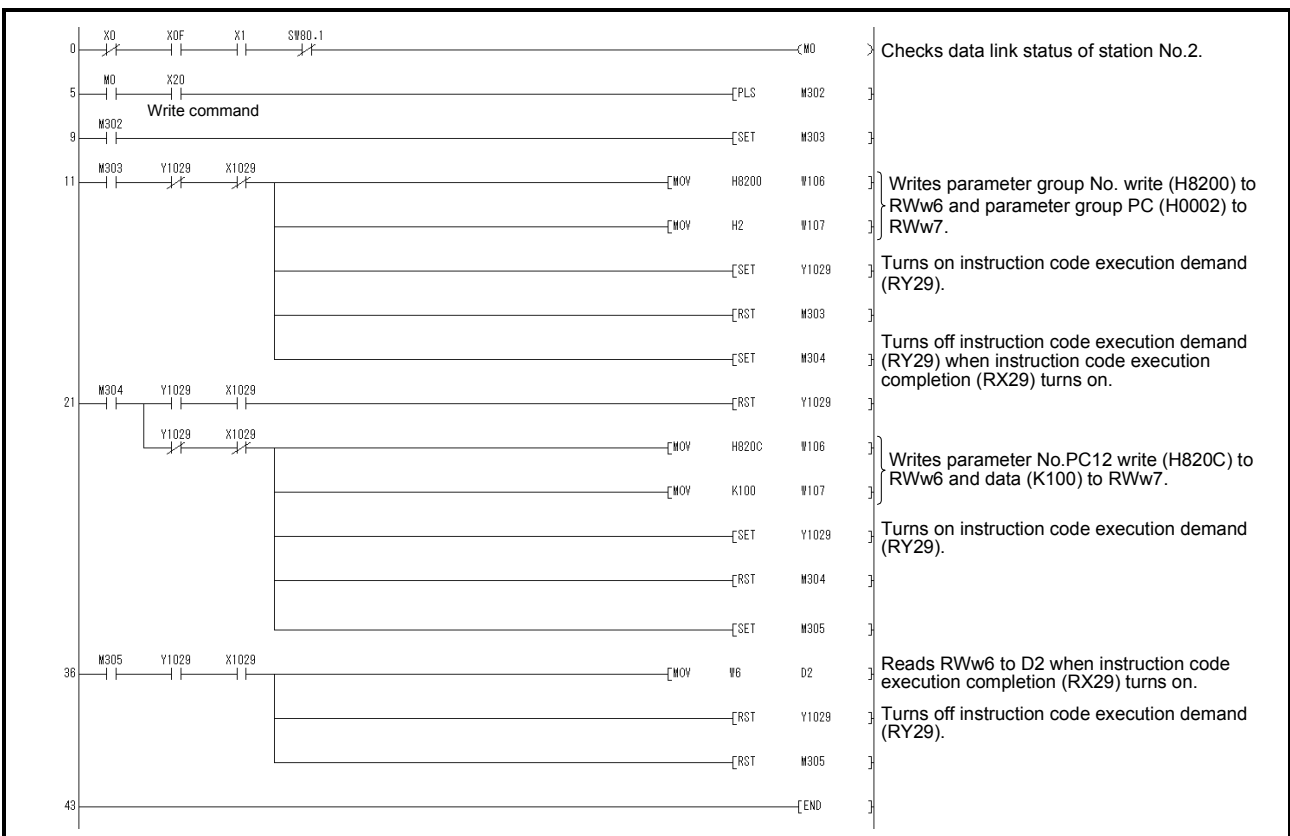
The parameter No.12 is changed to "100" as follows.

Code No.	Description
H820C	Parameter No.PC12 write (hexadecimal)

Set data	Description
K100	Set data (decimal)

Write the data to the parameter No.PC12 by turning on X20.

The respond code at instruction code execution is set to D2.

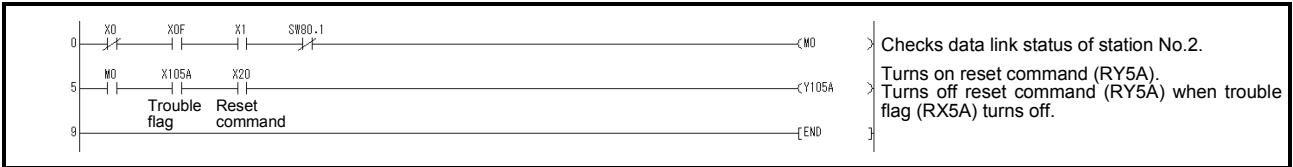


3. CC-LINK COMMUNICATION FUNCTIONS

(3) Servo amplifier alarm resetting program examples

(a) Deactivate the alarm of the servo amplifier of station 2 by issuing a command from the programmable controller.

Reset the servo amplifier on the occurrence of a servo alarm by turning on X20.



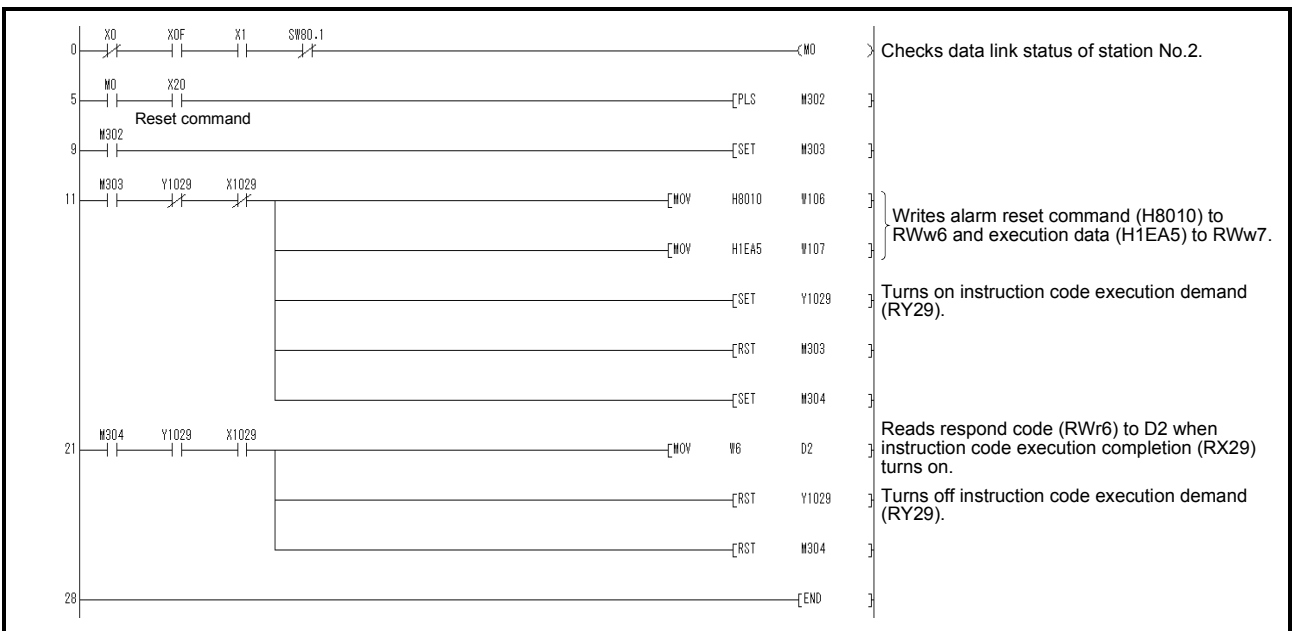
(b) Deactivate the alarm of the servo amplifier of station 2 using the instruction code.

Code No.	Description
H8010	Alarm reset command (hexadecimal)

Set data	Description
H1EA5	Execution data (hexadecimal)

Reset the servo amplifier by turning on X20.

The respond code at instruction code execution is set to D2.



3. CC-LINK COMMUNICATION FUNCTIONS

3.7.6 Operation

This section explains the operation programs of the servo amplifier.

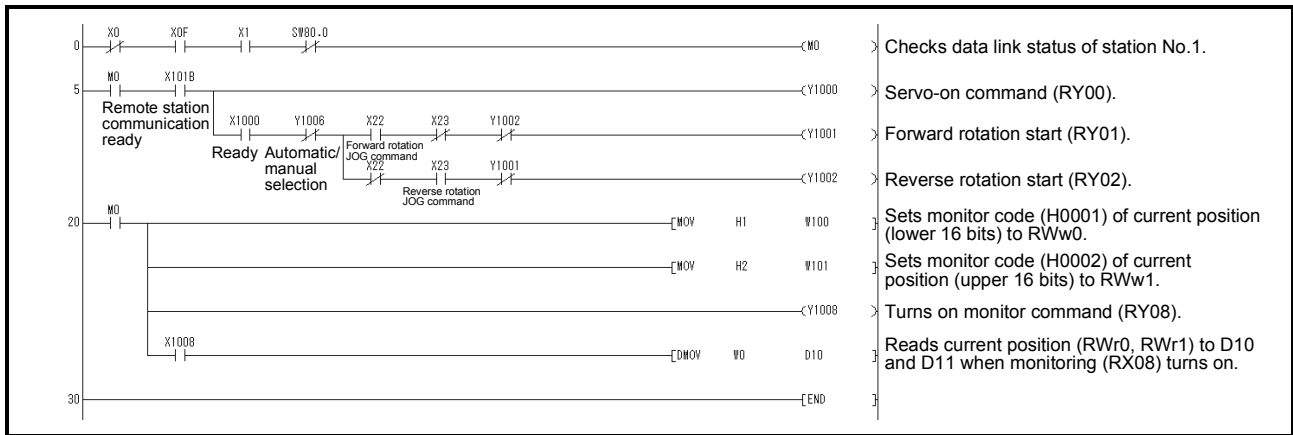
(1) JOG operation

Perform JOG operation of the servo amplifier of station 1 and read the "current position" data.

Code No.	Description
H0001	Lower 16-bit data of current position (hexadecimal)
H0002	Upper 16-bit data of current position (hexadecimal)

Start the forward rotation JOG operation by turning on X22.

Start the reverse rotation JOG operation by turning on X23.



3. CC-LINK COMMUNICATION FUNCTIONS

(2) Remote register-based position data/speed data setting

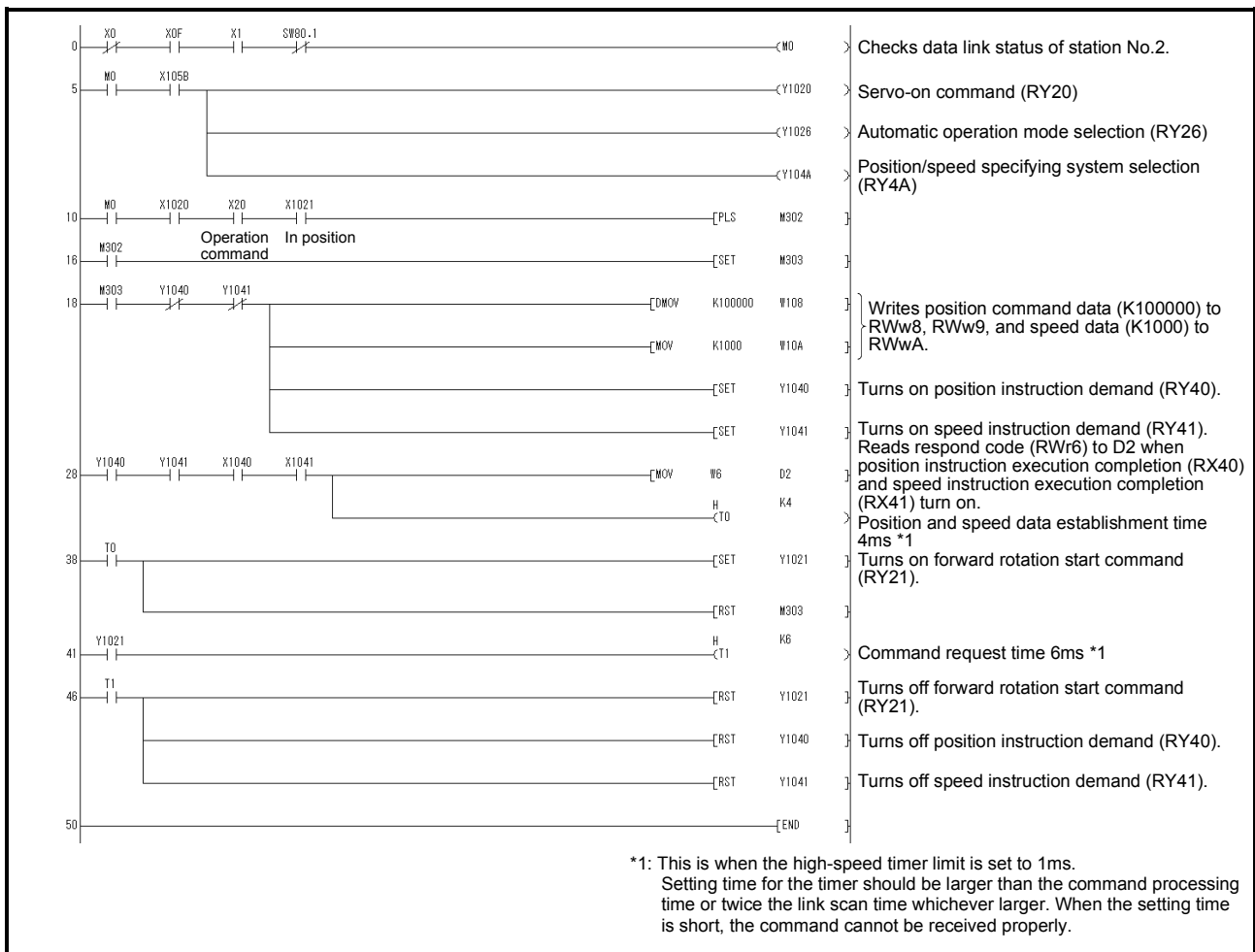
The following program example is only applicable when two stations are occupied.

Operate the servo amplifier of station 2 after specifying the position data as "100000" and the speed data as "1000" in the direct specification mode.

Preset "□□□2" in parameter No.PC30.

Set data	Description
K100000	Position command data (decimal)
K1000	Speed command data (decimal)

Execute positioning operation with position and speed settings specified in the remote register by turning on X20.



3. CC-LINK COMMUNICATION FUNCTIONS

(3) Remote register-based point table No. setting (incremental value command system)

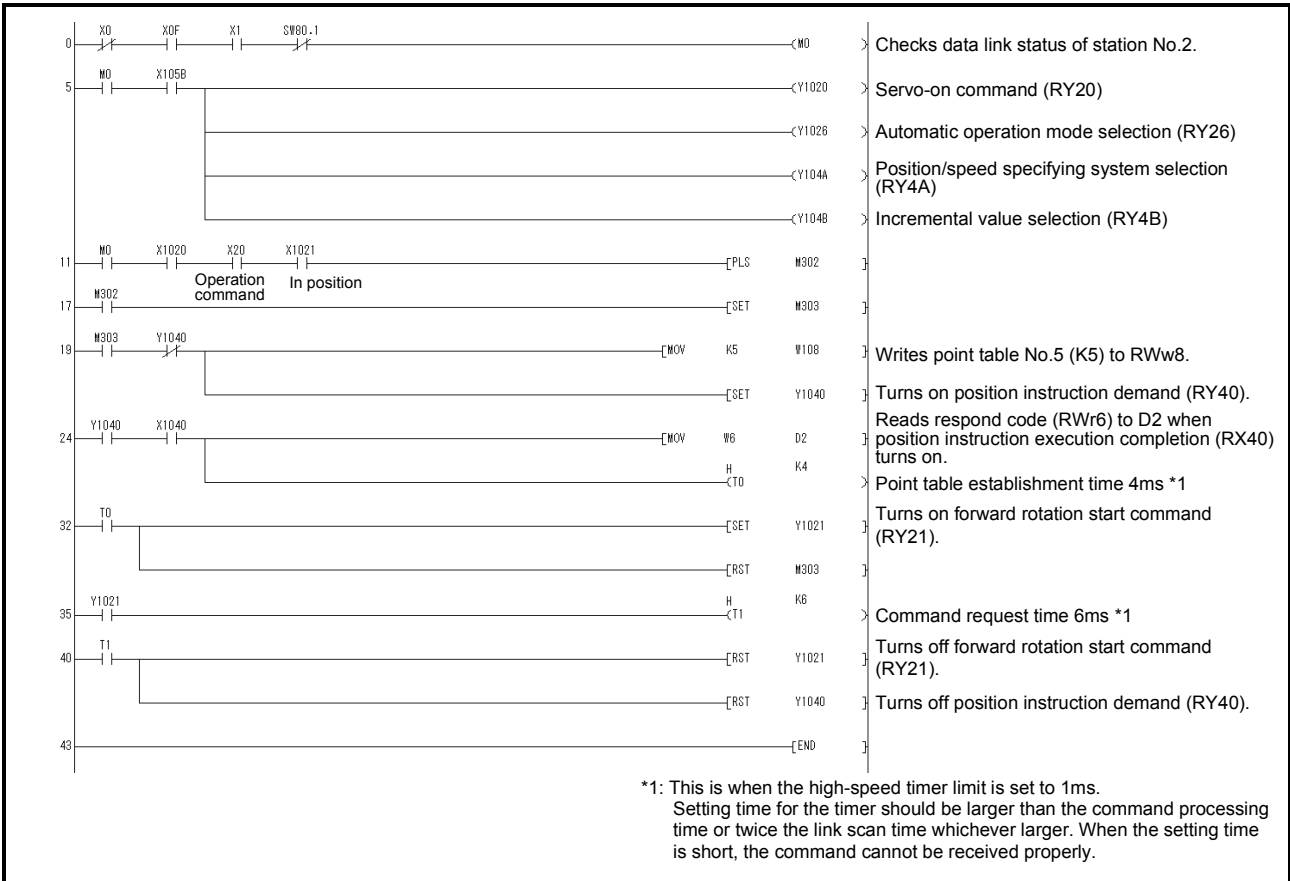
The following program example is only applicable when two stations are occupied.

Operate the servo amplifier of station 2 with incremental values after specifying the point table No.5 in the direct specification mode.

Preset "□□□0" in parameter No.PA01 and "□□□0" in parameter No.PA30.

Set data	Description
K5	Point table No. (decimal)

Execute positioning operation to the point table No.5 by turning on X20.



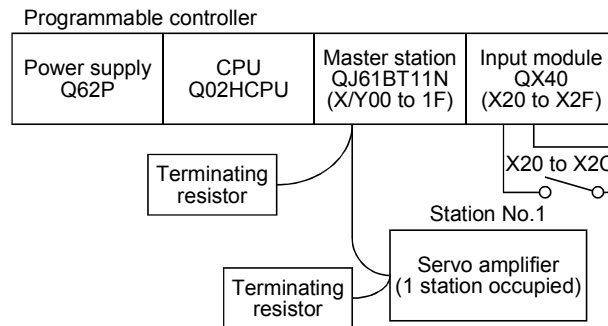
3. CC-LINK COMMUNICATION FUNCTIONS

3.8 Continuous operation program example

This section shows a program example which includes a series of communication operations from a servo start. The program will be described on the basis of the equipment makeup shown in section 3.8.1, 3.8.3.

3.8.1 System configuration example when 1 station is occupied

As shown below, the CC-Link system master • local unit is loaded to run one servo amplifier (1 station occupied).



Input signal assignment

Input signal	Signal name	General operation when the input is on
X20	Reset command	Resets the servo amplifier on an occurrence of a servo alarm.
X21	Servo-on command	Turns on the servo motor. (Servo-on status)
X22	Forward rotation JOG command	Executes a forward JOG operation in the manual operation mode.
X23	Reverse rotation JOG command	Executes a reverse JOG operation in the manual operation mode.
X24	Automatic/manual selection	OFF: Manual operation mode ON: Automatic operation mode
X25	Home position return command	Executes a dog type home position return when home position return is incomplete in the automatic operation mode.
X26	Proximity dog command	OFF: Proximity dog is on. (Note) ON: Proximity dog is off.
X27	Positioning start command	Executes a positioning operation to the point table number specified by X28 to X2C when home position return is incomplete in the automatic operation mode.
X28	No. selection 1	Specifies the position for the point table No. selection 1
X29	No. selection 2	Specifies the position for the point table No. selection 2
X2A	No. selection 3	Specifies the position for the point table No. selection 3
X2B	No. selection 4	Specifies the position for the point table No. selection 4
X2C	No. selection 5	Specifies the position for the point table No. selection 5

Note. This is when the parameter No.PD16 is set to "□□□0 (initial value)" (detects the dog at off).

3. CC-LINK COMMUNICATION FUNCTIONS

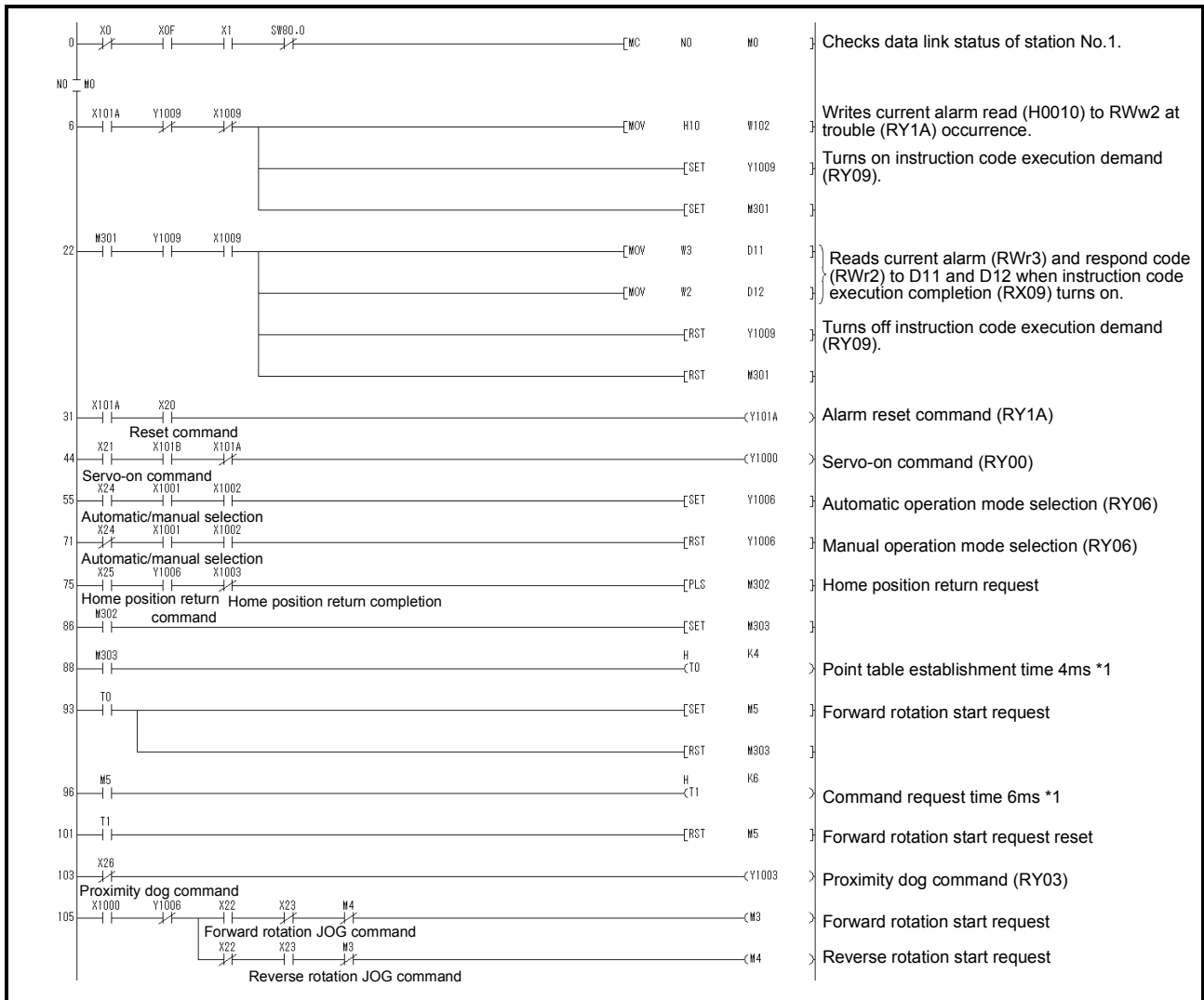
3.8.2 Program example when 1 station is occupied

POINT
<ul style="list-style-type: none"> To execute a dog type home position return with the CC-Link communication functions, set "□0□□" in parameter No.PD14 and use Proximity dog (DOG) with the remote input (RY03) in this example.

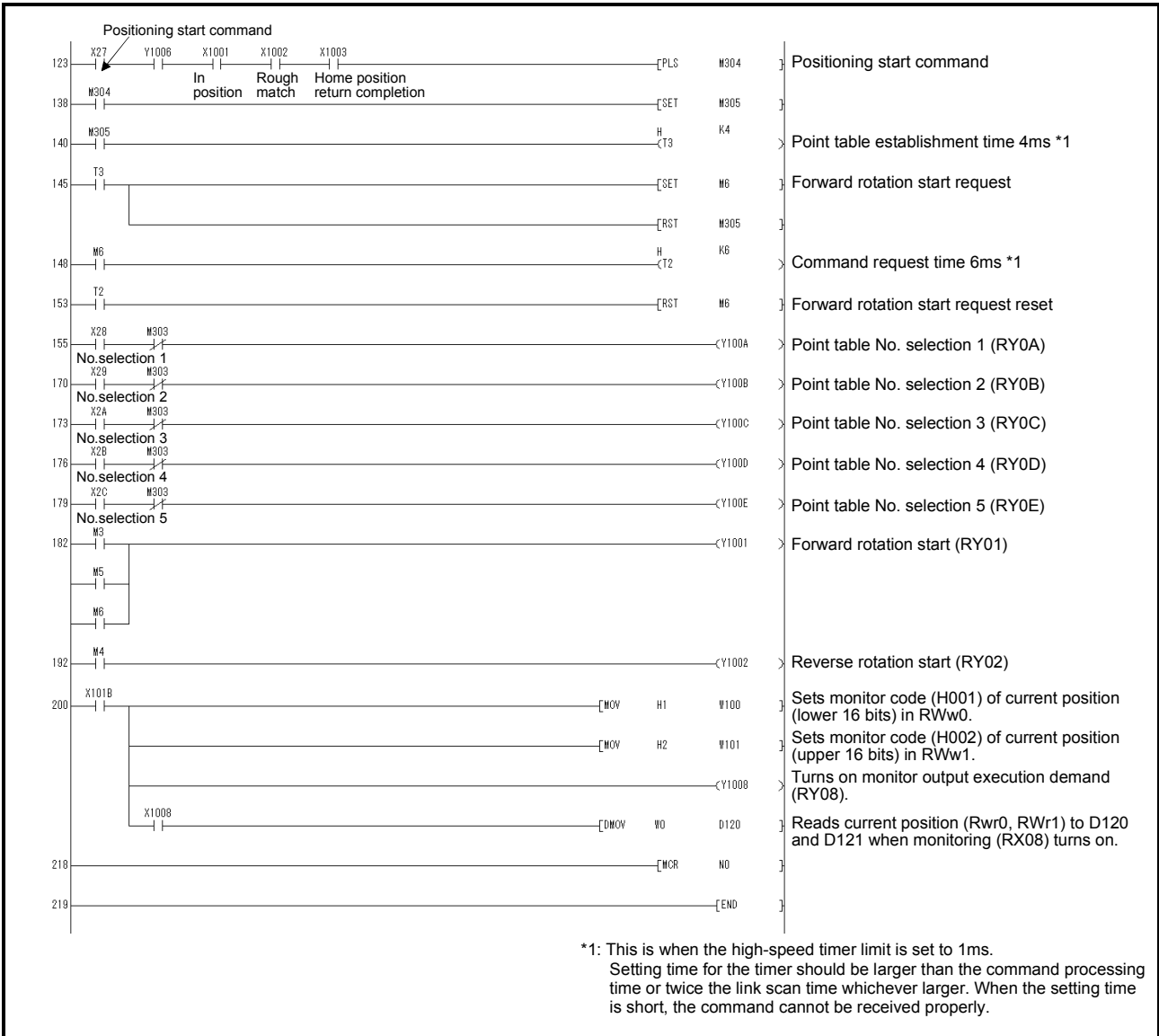
Operate the servo amplifier of station 1 in the positioning mode and read the "current position" data.

Operation: Alarm reset, dog type home position return, JOG operation, automatic operation under point table command

Code No.	Description
H0001	Lower 16-bit data of current position (hexadecimal)
H0002	Upper 16-bit data of current position (hexadecimal)



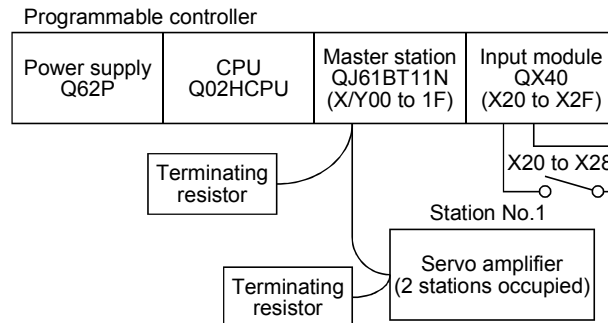
3. CC-LINK COMMUNICATION FUNCTIONS



3. CC-LINK COMMUNICATION FUNCTIONS

3.8.3 System configuration example when 2 stations are occupied

As shown below, the CC-Link system master • local unit is loaded to run one servo amplifiers (2 station occupied).



Input signal assignment

Input signal	Signal name	General operation when the input is on
X20	Reset command	Resets the servo amplifier on an occurrence of a servo alarm.
X21	Servo-on command	Turns on the servo motor. (Servo-on status)
X22	Forward rotation JOG command	Executes a forward JOG operation in the manual operation mode.
X23	Reverse rotation JOG command	Executes a reverse JOG operation in the manual operation mode.
X24	Automatic/manual selection	OFF: Manual operation mode ON: Automatic operation mode
X25	Home position return command	Executes a dog type home position return when home position return is incomplete in the automatic operation mode.
X26	Proximity dog command	OFF: Proximity dog is on. (Note) ON: Proximity dog is off.
X27	Positioning start command	Executes a positioning operation with position and speed settings specified in the remote register when home position return is completed in the automatic operation mode.
X28	Position/speed setting system changing command	Changes to position/speed specification by the remote register.

Note. This is when the parameter No.PD16 is set to "□□□0 (initial value)" (detects the dog at off).

3. CC-LINK COMMUNICATION FUNCTIONS

3.8.4 Program example when 2 stations are occupied

POINT

- To execute a dog type home position return with the CC-Link communication functions, set "□□□□" in parameter No.PD14 and use Proximity dog (DOG) with the remote input (RY03) in this example.

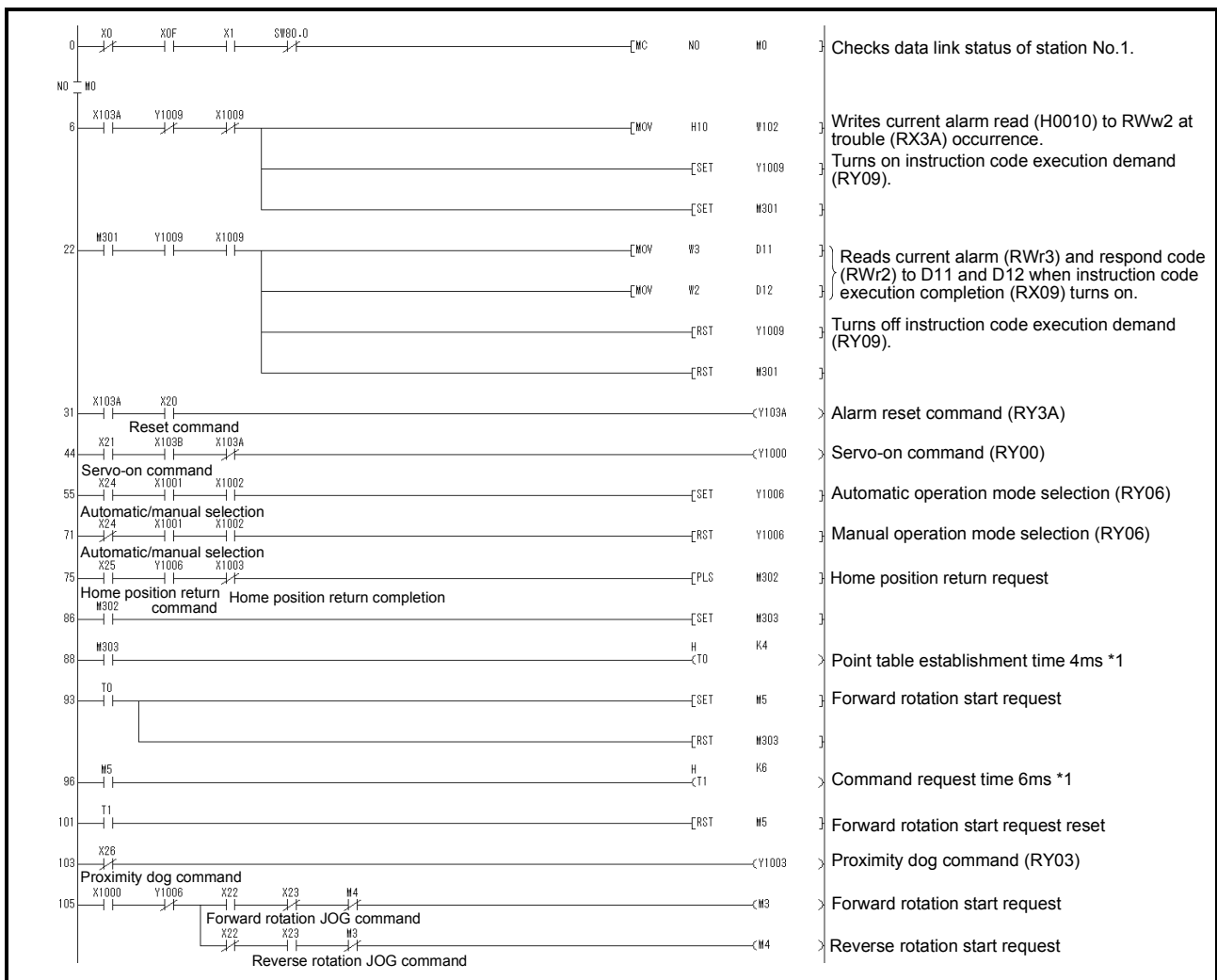
Operate the servo amplifier of station 1 in the positioning mode and read the "motor speed" data.

Preset the parameter No.PC30 to "□□□□2".

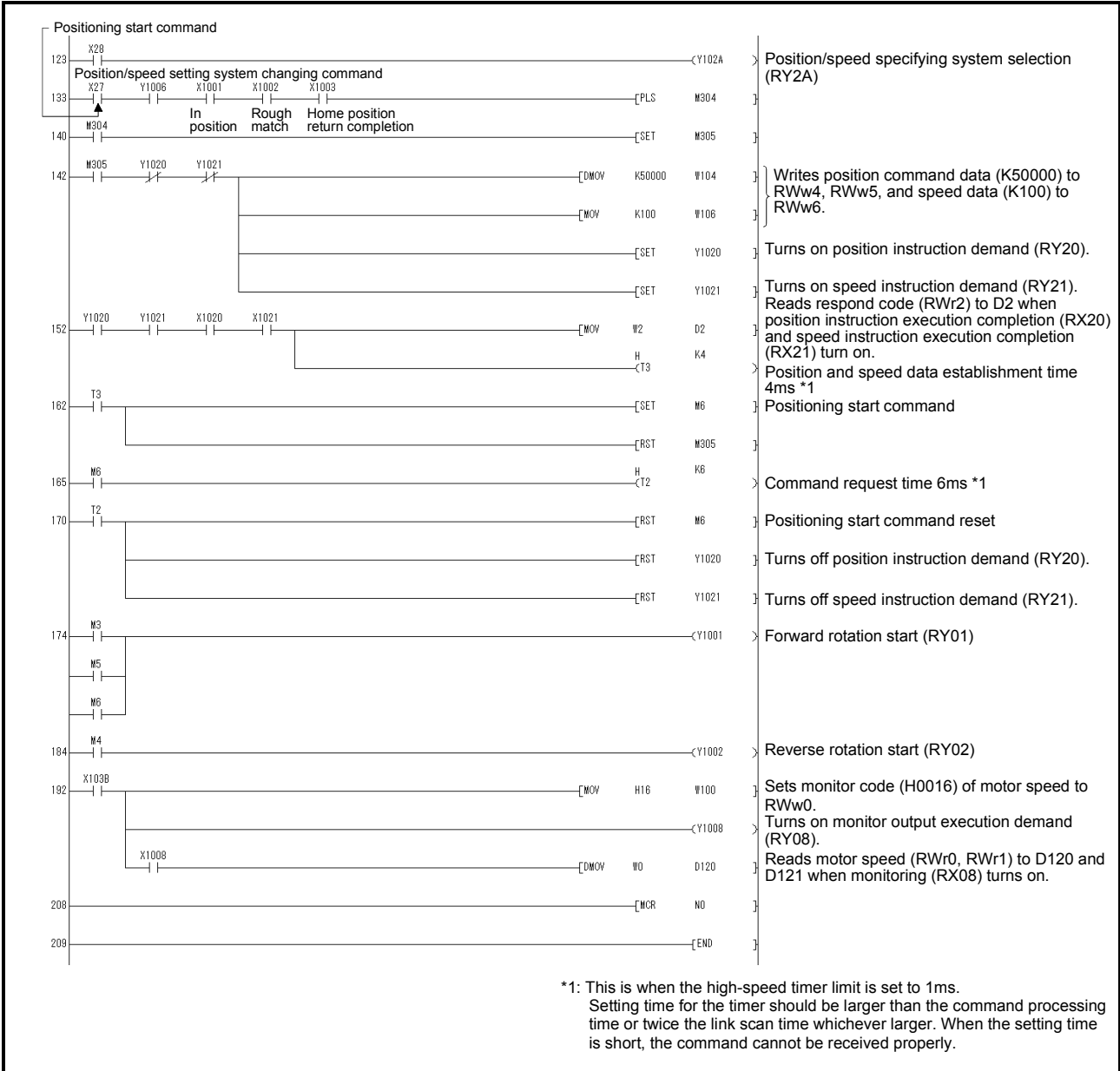
Operation: Alarm reset, dog type home position return, JOG operation, automatic operation under point table command

Code No.	Description
H0016	32-bit data of motor speed (hexadecimal)

Code No.	Description
K50000	Position command data (decimal)
K100	Speed command data (decimal)



3. CC-LINK COMMUNICATION FUNCTIONS



4. SIGNALS AND WIRING

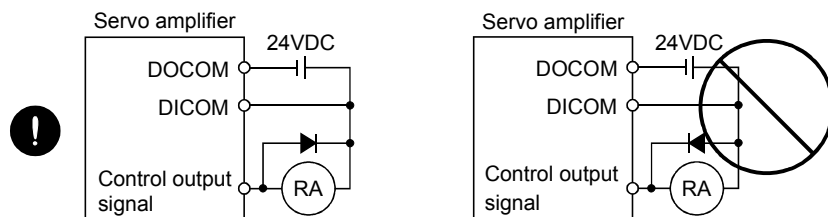
4. SIGNALS AND WIRING

WARNING

- Any person who is involved in wiring should be fully competent to do the work.
- Before wiring, turn off the power and wait for 15 minutes or more until the charge lamp turns off. Then, confirm that the voltage between P(+) and N(-) is safe with a voltage tester and others. Otherwise, an electric shock may occur. In addition, always confirm from the front of the servo amplifier whether the charge lamp is off or not.
- Ground the servo amplifier and the servo motor securely.
- Do not attempt to wire the servo amplifier and servo motor until they have been installed. Otherwise, you may get an electric shock.
- The cables should not be damaged, stressed excessively, loaded heavily, or pinched. Otherwise, you may get an electric shock.

CAUTION

- Wire the equipment correctly and securely. Otherwise, the servo motor may operate unexpectedly, resulting in injury.
- Connect cables to correct terminals to prevent a burst, fault, etc.
- Ensure that polarity (+, -) is correct. Otherwise, a burst, damage, etc. may occur.
- The surge absorbing diode installed to the DC relay designed for control output should be fitted in the specified direction. Otherwise, the signal is not output due to a fault, disabling the forced stop (EMG) and other protective circuits.



- Use a noise filter, etc. to minimize the influence of electromagnetic interference, which may be given to electronic equipment used near the servo amplifier.
- Do not install a power capacitor, surge suppressor or radio noise filter (FR-BIF-(H) option) with the power line of the servo motor.
- When using the regenerative resistor, switch power off with the alarm signal. Otherwise, a transistor fault or the like may overheat the regenerative resistor, causing a fire.
- Do not modify the equipment.
- During power-on, do not open or close the motor power line. Otherwise, a malfunction or faulty may occur.

4. SIGNALS AND WIRING

4.1 Input power supply circuit



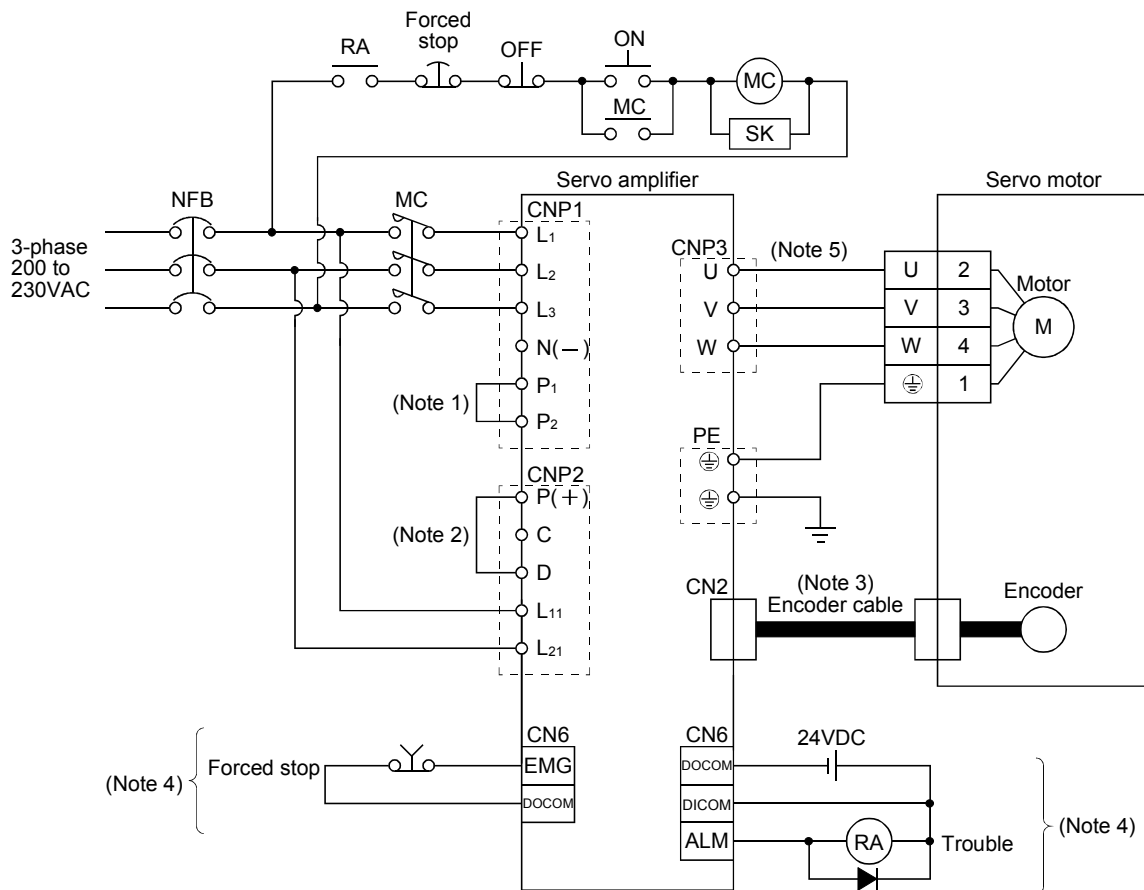
CAUTION

- Always connect a magnetic contactor (MC) between the main circuit power supply and L₁, L₂, and L₃ of the servo amplifier, and configure the wiring to be able to shut down the power supply on the side of the servo amplifier's power supply. If a magnetic contactor (MC) is not connected, continuous flow of a large current may cause a fire when the servo amplifier malfunctions.
- Use the trouble (ALM) to switch power off. Otherwise, a regenerative transistor fault or the like may overheat the regenerative resistor, causing a fire.

Wire the power supply and main circuit as shown below so that the servo-on (RYn0) turns off as soon as alarm occurrence is detected and power is shut off.

A no-fuse breaker (NFB) must be used with the input cables of the power supply.

(1) For 3-phase 200 to 230VAC power supply to MR-J3-10T to MR-J3-350T



Note 1. Always connect P₁ and P₂. (Factory-wired.) When using the power factor improving DC reactor, refer to section 14.11.

2. Always connect P(+) and D. (Factory-wired.) When using the regenerative option, refer to section 14.2.

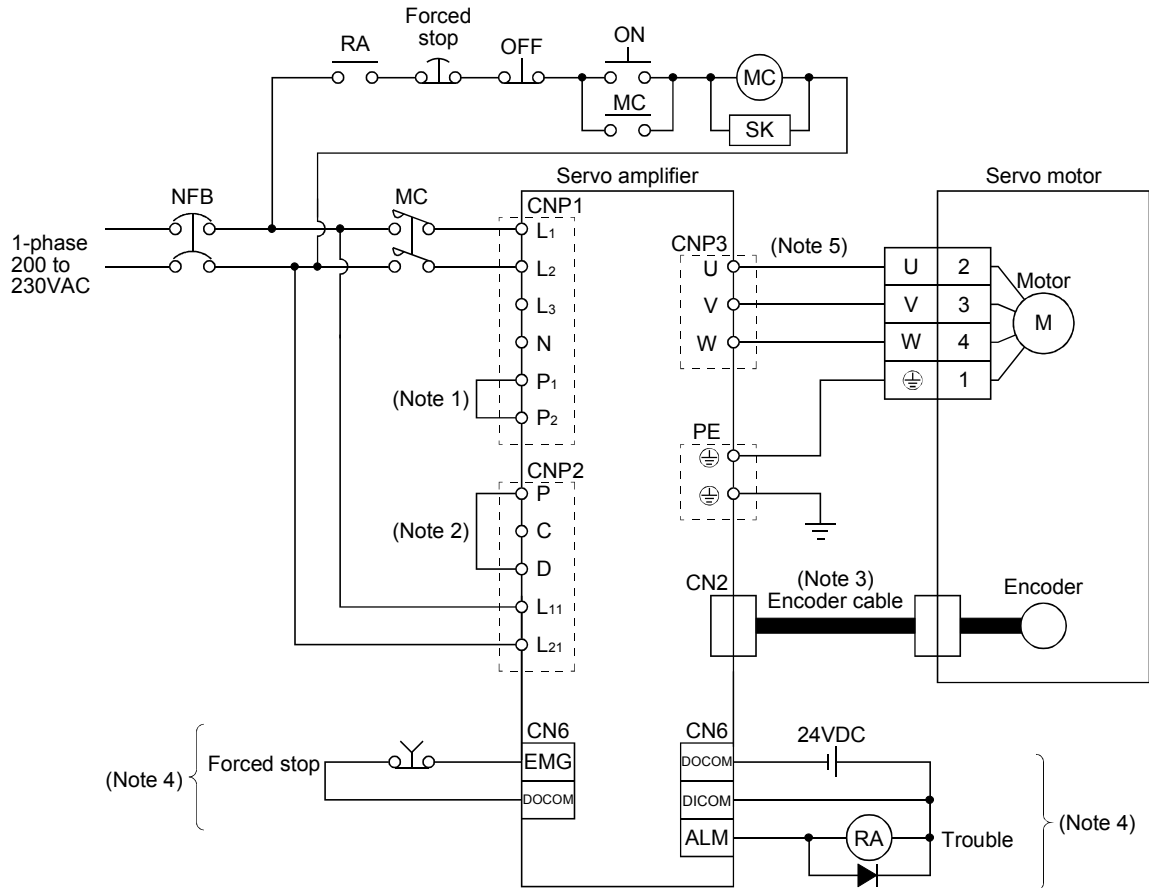
3. For encoder cable, use of the option cable is recommended. Refer to section 14.1 for selection of the cable.

4. For the sink I/O interface. For the source I/O interface, refer to section 4.8.3.

5. Refer to section 4.10.

4. SIGNALS AND WIRING

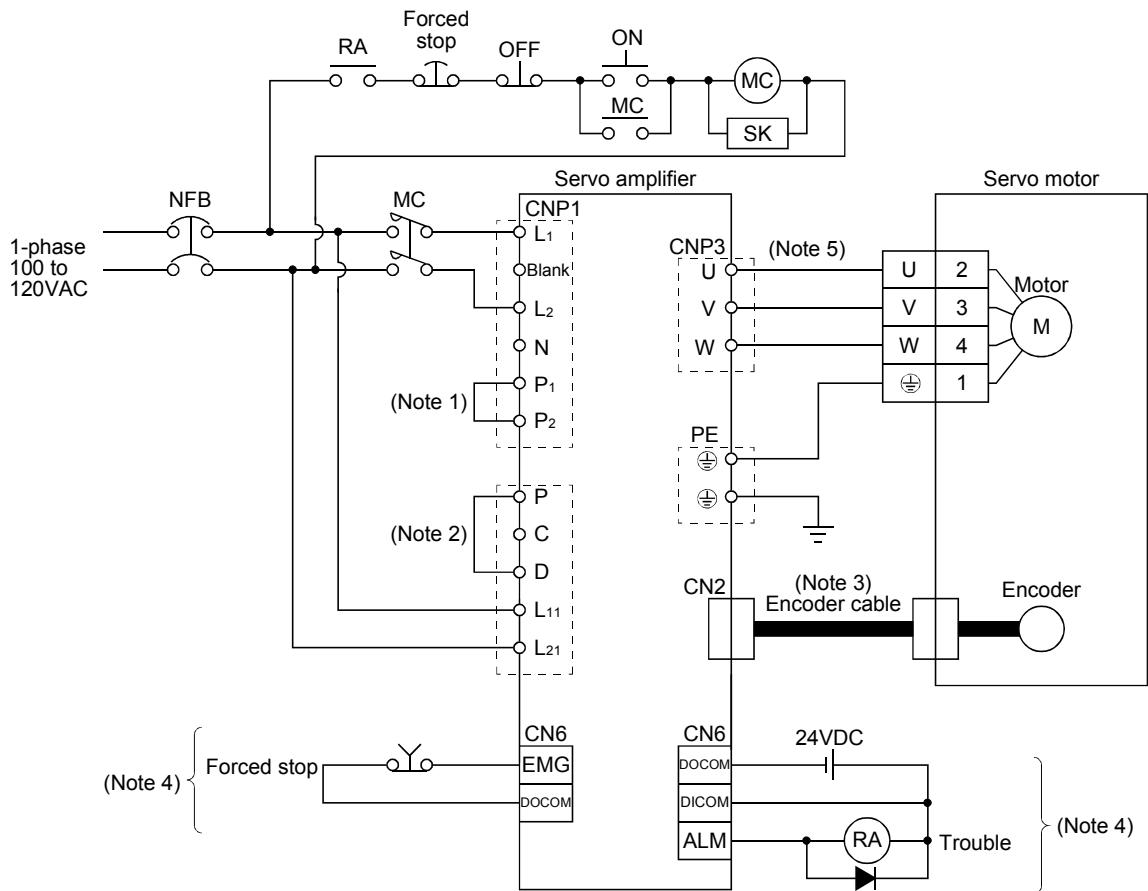
(2) For 1-phase 200 to 230VAC power supply to MR-J3-10T to MR-J3-70T



- Note 1. Always connect P₁ and P₂. (Factory-wired.) When using the power factor improving DC reactor, refer to section 14.11.
 Note 2. Always connect P and D. (Factory-wired.) When using the regenerative option, refer to section 14.2.
 Note 3. For encoder cable, use of the option cable is recommended. Refer to section 14.1 for selection of the cable.
 Note 4. For the sink I/O interface. For the source I/O interface, refer to section 4.8.3.
 Note 5. Refer to section 4.10.

4. SIGNALS AND WIRING

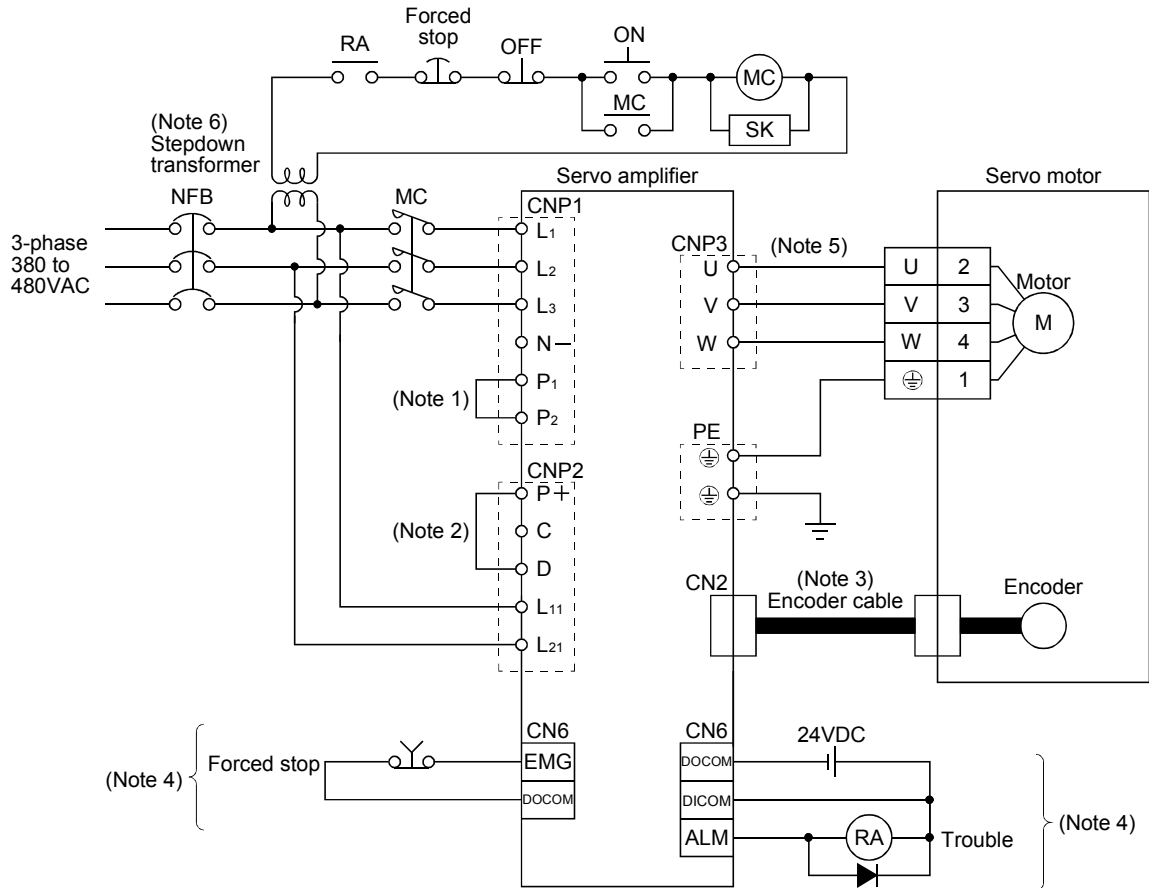
(3) MR-J3-10T1 to MR-J3-40T1



- Note 1. Always connect P₁ and P₂. (Factory-wired.) The power factor improving DC reactor cannot be used.
- Note 2. Always connect P and D. (Factory-wired.) When using the regenerative option, refer to section 14.2.
- Note 3. For encoder cable, use of the option cable is recommended. Refer to section 14.1 for selection of the cable.
- Note 4. For the sink I/O interface. For the source I/O interface, refer to section 4.8.3.
- Note 5. Refer to section 4.10.

4. SIGNALS AND WIRING

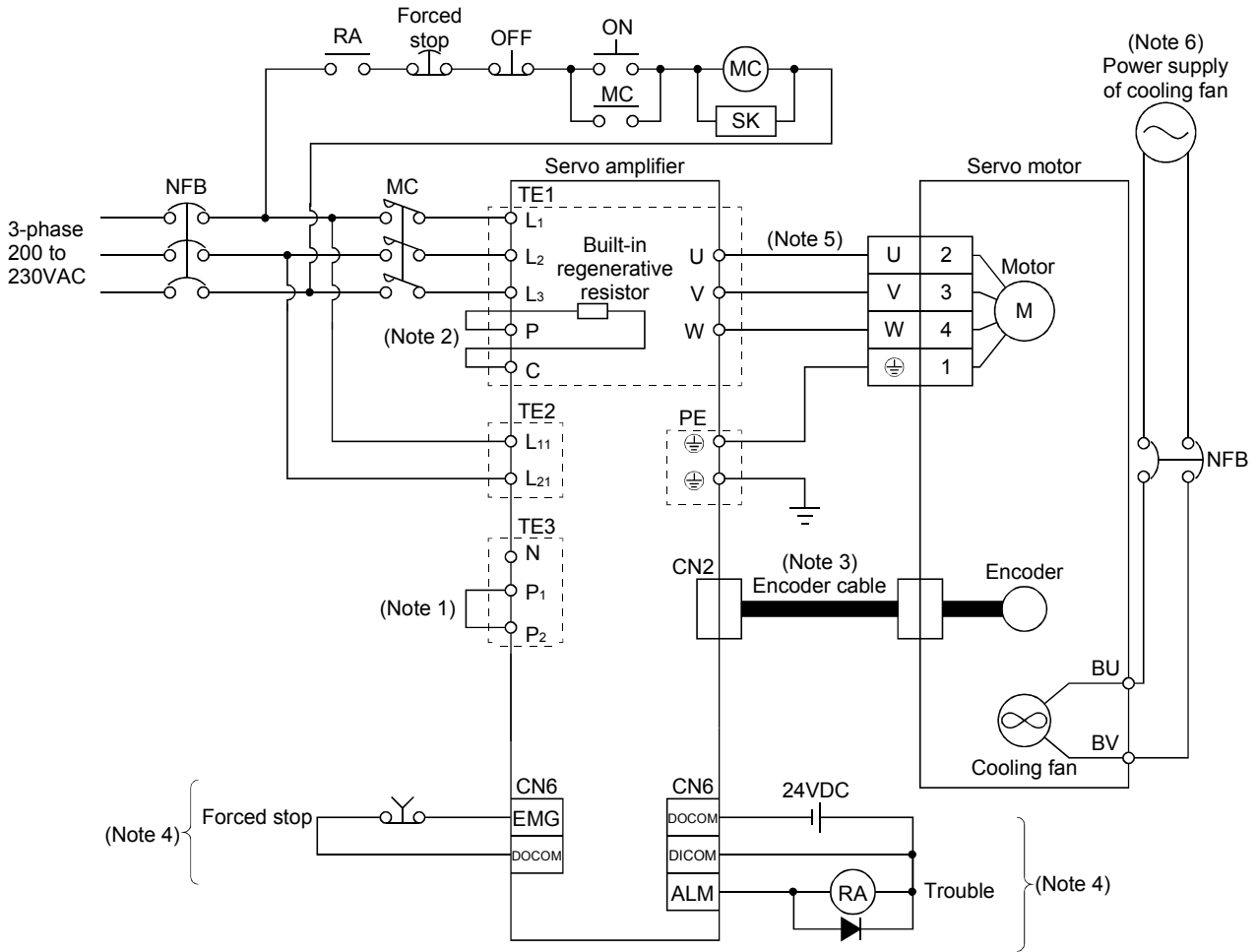
(4) MR-J3-60T4 to MR-J3-200T4



- Note 1. Always connect P₁ and P₂. (Factory-wired.) When using the power factor improving DC reactor, refer to section 14.11.
 Note 2. Always connect P and D. (Factory-wired.) When using the regenerative option, refer to section 14.2.
 Note 3. For encoder cable, use of the option cable is recommended. Refer to section 14.1 for selection of the cable.
 Note 4. For the sink I/O interface. For the source I/O interface, refer to section 4.8.3.
 Note 5. Refer to section 4.10.
 Note 6. Stepdown transformer is required for coil voltage of magnetic contactor more than 200V class.

4. SIGNALS AND WIRING

(5) MR-J3-500T • MR-J3-700T



Note 1. Always connect P₁ and P₂. (Factory-wired.) When using the power factor improving DC reactor, refer to section 14.11.

Note 2. Always connect P and D. (Factory-wired.) When using the regenerative option, refer to section 14.2.

Note 3. For encoder cable, use of the option cable is recommended. Refer to section 14.1 for selection of the cable.

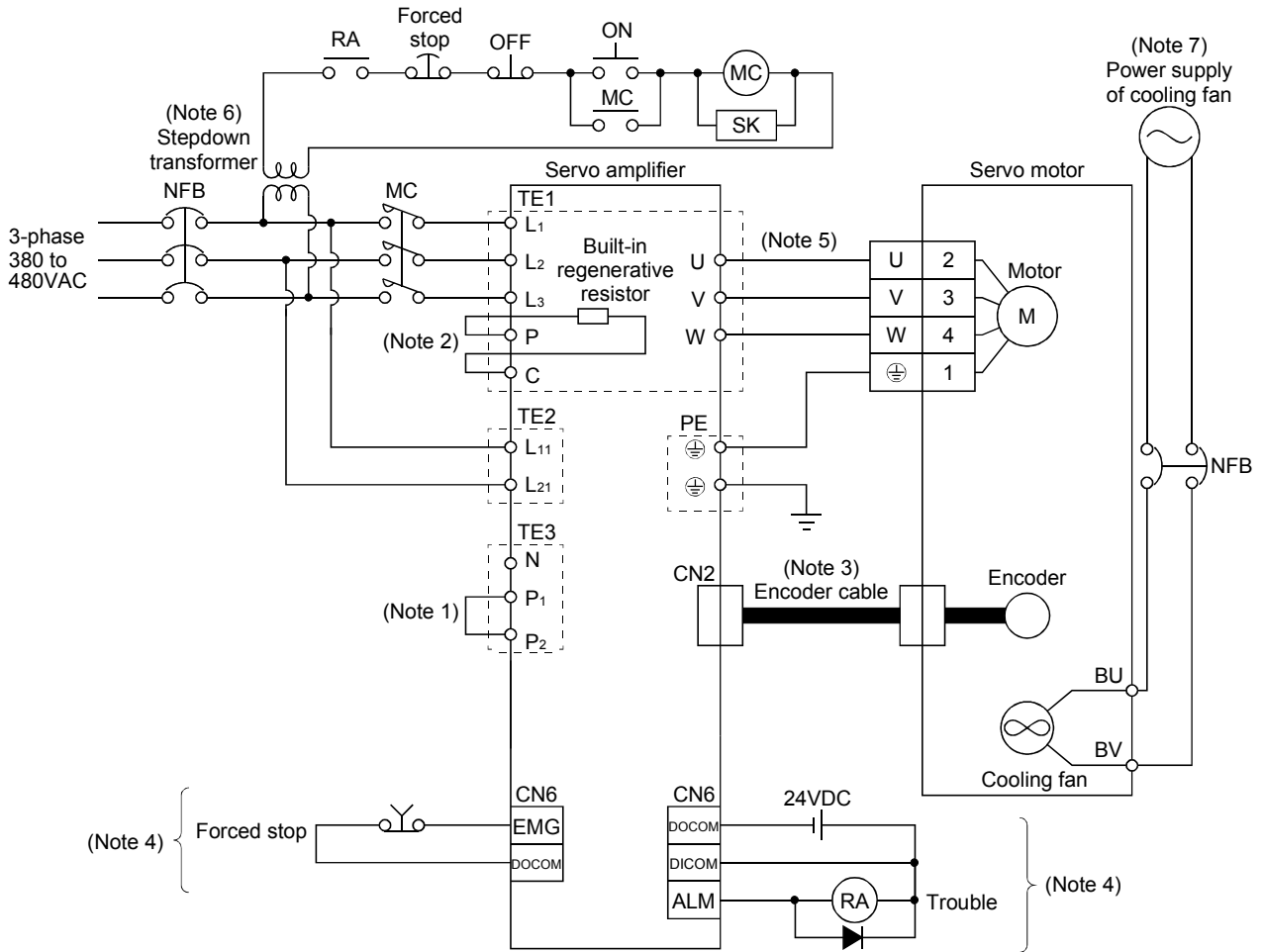
Note 4. For the sink I/O interface. For the source I/O interface, refer to section 4.8.3.

Note 5. Refer to section 4.10.

Note 6. A cooling fan is attached to the HA-LP601 and the HA-LP701M servo motors. For power supply specification of the cooling fan, refer to section 4.10.2 (3) (b).

4. SIGNALS AND WIRING

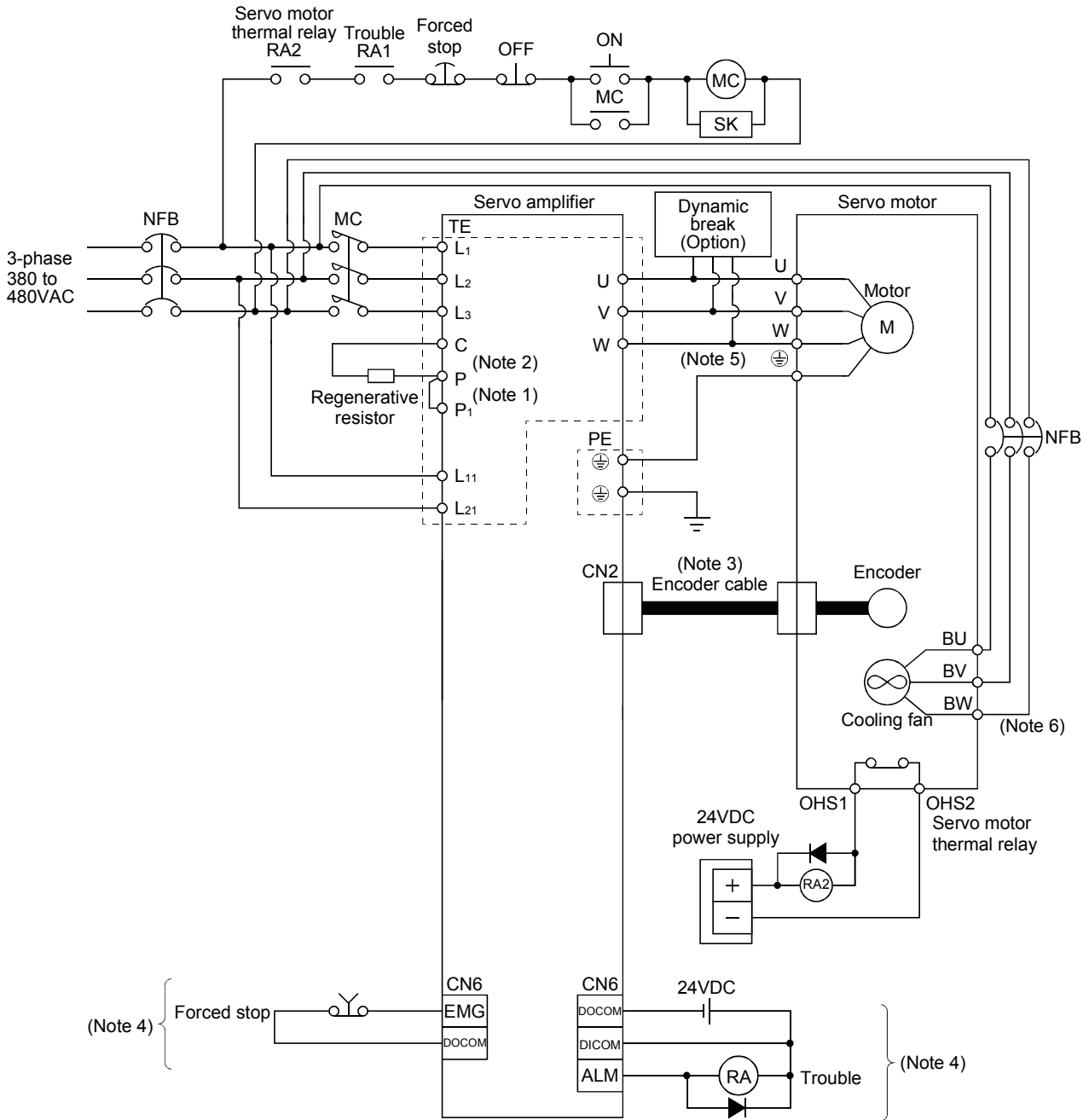
(6) MR-J3-350T4 to MR-J3-700T4



- Note 1. Always connect P₁ and P₂. (Factory-wired.) When using the power factor improving DC reactor, refer to section 14.11.
- Note 2. When using the regenerative option, refer to section 14.2.
- Note 3. For encoder cable, use of the option cable is recommended. Refer to section 14.1 for selection of the cable.
- Note 4. For the sink I/O interface. For the source I/O interface, refer to section 4.8.3.
- Note 5. Refer to section 4.10.
- Note 6. Stepdown transformer is required for coil voltage of magnetic contactor more than 200V class.
- Note 7. A cooling fan is attached to the HA-LP6014 and the HA-LP701M4 servo motors. For power supply specification of the cooling fan, refer to section 4.10.2 (3) (b).

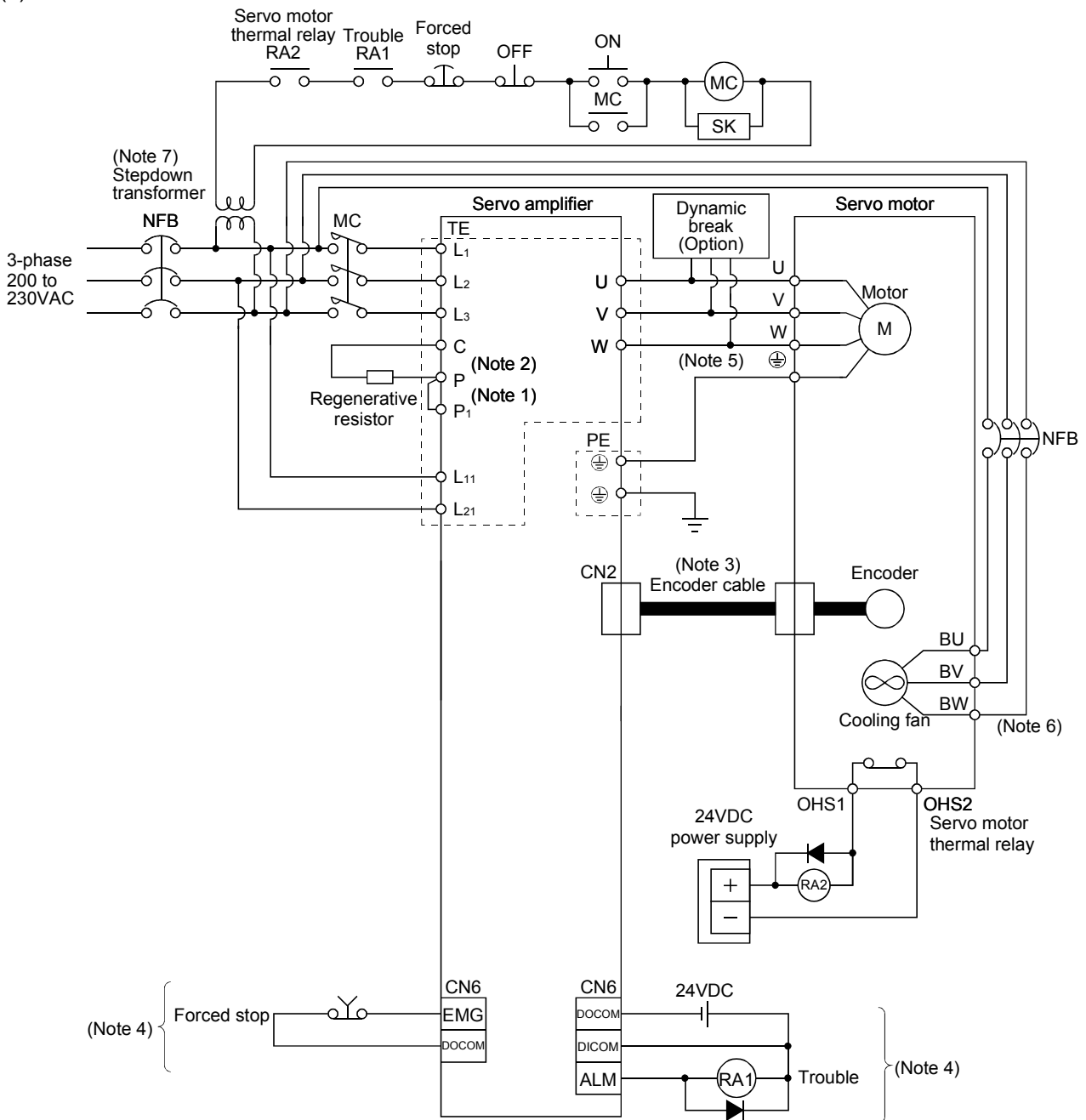
4. SIGNALS AND WIRING

(7) MR-J3-11KT to MR-J3-22KT



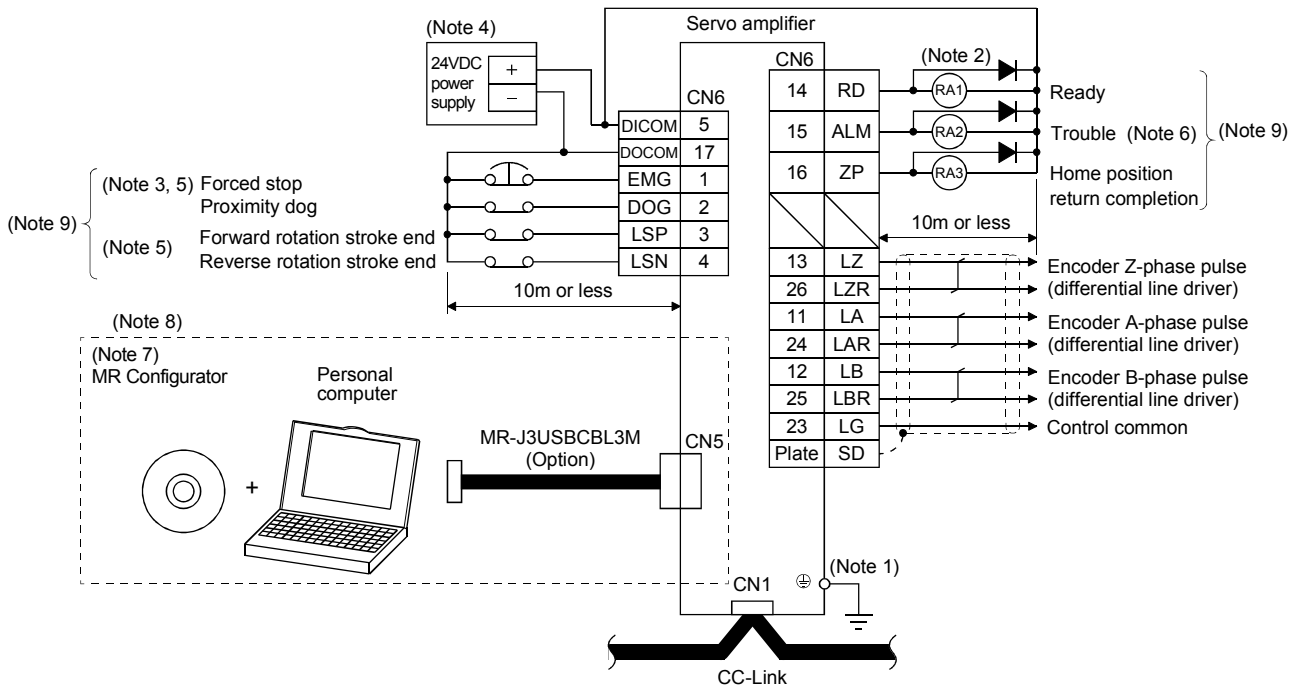
4. SIGNALS AND WIRING

(8) MR-J3-11KT4 to MR-J3-22KT4



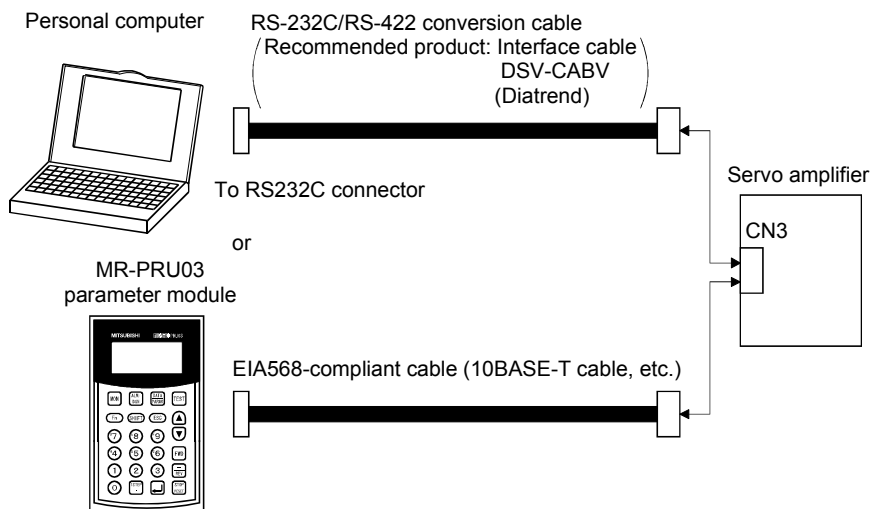
4. SIGNALS AND WIRING

4.2 I/O signal connection diagram



Note 1. To prevent an electric shock, always connect the protective earth (PE) terminal (terminal marked \oplus) of the servo amplifier to the protective earth (PE) of the control box.

2. Connect the diode in the correct direction. If it is connected reversely, the servo amplifier will be faulty and will not output signals, disabling the emergency stop (EMG) and other protective circuits.
3. The forced stop switch (normally closed contact) must be installed.
4. Supply 24VDC \pm 10% 150mA current for interfaces from the outside. 150mA is the value applicable when all I/O signals are used. The current capacity can be decreased by reducing the number of I/O points. Refer to section 4.8.2 (1) that gives the current value necessary for the interface.
5. When starting operation, always turn on forced stop (EMG) and Forward/Reverse rotation stroke end (LSP/LSN). (Normally closed contacts)
6. Trouble (ALM) turns on in normal alarm-free condition.
7. Use MRZJW3-SETUP 211E.
8. Personal computers or parameter modules can also be connected via the CN3 connector, enabling RS-422 communication. Note that using the USB communication function (CN5 connector) prevents the RS-422 communication function (CN3 connector) from being used, and vice versa. They cannot be used together.



9. For the sink I/O interface. For the source I/O interface, refer to section 4.8.3.

4. SIGNALS AND WIRING

4.3 Explanation of power supply system

4.3.1 Signal explanations

POINT
<ul style="list-style-type: none"> For the layout of connector and terminal block, refer to outline drawings in chapter 12.

Abbreviation	Connection target (Application)	Description																										
L ₁ L ₂ L ₃	Main circuit power supply	<p>Supply the following power to L₁, L₂, L₃. For the 1-phase 200V to 230VAC power supply, connect the power supply to L₁, L₂, and keep L₃ open.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">Servo amplifier</td> <td style="text-align: center;">MR-J3-10T to 70T</td> <td style="text-align: center;">MR-J3-100T to 22KT</td> <td style="text-align: center;">MR-J3-10T1 to 40T1</td> </tr> <tr> <td>Power supply</td> <td></td> <td></td> <td></td> </tr> <tr> <td>3-phase 200V to 230VAC, 50/60Hz</td> <td colspan="3" style="text-align: center;">L₁ · L₂ · L₃</td> </tr> <tr> <td>1-phase 200V to 230VAC, 50/60Hz</td> <td colspan="2" style="text-align: center;">L₁ · L₂</td> <td></td> </tr> <tr> <td>1-phase 100V to 120VAC, 50/60Hz</td> <td></td> <td></td> <td style="text-align: center;">L₁ · L₂</td> </tr> </table> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">Servo amplifier</td> <td style="text-align: center;">MR-J3-60T4 to 22KT4</td> </tr> <tr> <td>Power supply</td> <td></td> </tr> <tr> <td>3-phase 380V to 480VAC, 50/60Hz</td> <td style="text-align: center;">L₁ · L₂ · L₃</td> </tr> </table>	Servo amplifier	MR-J3-10T to 70T	MR-J3-100T to 22KT	MR-J3-10T1 to 40T1	Power supply				3-phase 200V to 230VAC, 50/60Hz	L ₁ · L ₂ · L ₃			1-phase 200V to 230VAC, 50/60Hz	L ₁ · L ₂			1-phase 100V to 120VAC, 50/60Hz			L ₁ · L ₂	Servo amplifier	MR-J3-60T4 to 22KT4	Power supply		3-phase 380V to 480VAC, 50/60Hz	L ₁ · L ₂ · L ₃
Servo amplifier	MR-J3-10T to 70T	MR-J3-100T to 22KT	MR-J3-10T1 to 40T1																									
Power supply																												
3-phase 200V to 230VAC, 50/60Hz	L ₁ · L ₂ · L ₃																											
1-phase 200V to 230VAC, 50/60Hz	L ₁ · L ₂																											
1-phase 100V to 120VAC, 50/60Hz			L ₁ · L ₂																									
Servo amplifier	MR-J3-60T4 to 22KT4																											
Power supply																												
3-phase 380V to 480VAC, 50/60Hz	L ₁ · L ₂ · L ₃																											
P ₁ P ₂	Power factor improving DC reactor	<p>1) MR-J3-700T(4) or less When not using the power factor improving DC reactor, connect P₁ and P₂. (Factory-wired.) When using the power factor improving DC reactor, disconnect P₁ and P₂, and connect the power factor improving DC reactor to P₁ and P₂.</p> <p>2) MR-J3-11KT(4) to 22KT(4) MR-J3-11KT(4) to 22KT(4) do not have P₂. When not using the power factor improving reactor, connect P₁ and P. (Factory-wired) When using the power factor improving reactor, connect it to P₁ and P. Refer to section 14.11.</p>																										
P C D	Regenerative option	<p>1) MR-J3-350T or less · MR-J3-200T4 or less When using servo amplifier built-in regenerative resistor, connect P(+) and D. (Factory-wired) When using regenerative option, disconnect P(+) and D, and connect regenerative option to P and C.</p> <p>2) MR-J3-350T4 · 500T(4) · 700T(4) MR-J3-350T4 · 500T(4) and 700T(4) do not have D. When using servo amplifier built-in regenerative resistor, connect P and C. (Factory-wired) When using regenerative option, disconnect P and C, and connect regenerative option to P and C.</p> <p>3) MR-J3-11KT(4) to 22KT(4) MR-J3-11KT(4) to 22KT(4) do not have D. When not using the power regenerative converter and the brake unit, make sure to connect the regenerative option to P and C. Refer to section 14.2 to 14.5.</p>																										
L ₁₁ L ₂₁	Control circuit power supply	<p>Supply the following power to L₁₁ · L₂₁.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">Servo amplifier</td> <td style="text-align: center;">MR-J3-10T to 22KT</td> <td style="text-align: center;">MR-J3-10T1 to 40T1</td> <td style="text-align: center;">MR-J3-60T4 to 22KT4</td> </tr> <tr> <td>Power supply</td> <td></td> <td></td> <td></td> </tr> <tr> <td>1-phase 200V to 230VAC, 50/60Hz</td> <td colspan="3" style="text-align: center;">L₁₁ · L₂₁</td> </tr> <tr> <td>1-phase 100V to 120VAC, 50/60Hz</td> <td></td> <td colspan="2" style="text-align: center;">L₁₁ · L₂₁</td> </tr> <tr> <td>1-phase 380V to 480VAC, 50/60Hz</td> <td></td> <td></td> <td style="text-align: center;">L₁₁ · L₂₁</td> </tr> </table>	Servo amplifier	MR-J3-10T to 22KT	MR-J3-10T1 to 40T1	MR-J3-60T4 to 22KT4	Power supply				1-phase 200V to 230VAC, 50/60Hz	L ₁₁ · L ₂₁			1-phase 100V to 120VAC, 50/60Hz		L ₁₁ · L ₂₁		1-phase 380V to 480VAC, 50/60Hz			L ₁₁ · L ₂₁						
Servo amplifier	MR-J3-10T to 22KT	MR-J3-10T1 to 40T1	MR-J3-60T4 to 22KT4																									
Power supply																												
1-phase 200V to 230VAC, 50/60Hz	L ₁₁ · L ₂₁																											
1-phase 100V to 120VAC, 50/60Hz		L ₁₁ · L ₂₁																										
1-phase 380V to 480VAC, 50/60Hz			L ₁₁ · L ₂₁																									
U V W	Servo motor power	Connect to the servo motor power supply terminals (U, V, W). During power-on, do not open or close the motor power line. Otherwise, a malfunction or faulty may occur.																										
N	Regenerative converter Brake unit	When using the power regenerative converter/brake unit, connect it to P and N. Do not connect to servo amplifier MR-J3-350T(4) or less. For details, refer to section 14.3 to 14.5.																										
⊕	Protective earth (PE)	Connect to the earth terminal of the servo motor and to the protective earth (PE) of the control box to perform grounding.																										

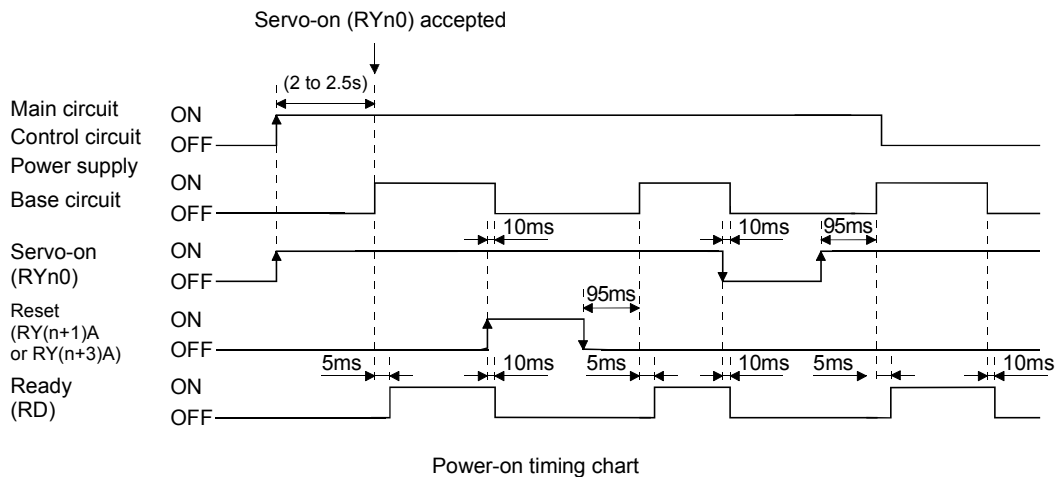
4. SIGNALS AND WIRING

4.3.2 Power-on sequence

(1) Power-on procedure

- 1) Always wire the power supply as shown in above section 4.1 using the magnetic contactor with the main circuit power supply (three-phase: L1, L2, L3, single-phase: L1, L2). Configure up an external sequence to switch off the magnetic contactor as soon as an alarm occurs.
- 2) Switch on the control circuit power supply L11, L21 simultaneously with the main circuit power supply or before switching on the main circuit power supply. If the main circuit power supply is not on, the display shows the corresponding warning. However, by switching on the main circuit power supply, the warning disappears and the servo amplifier will operate properly.
- 3) The servo amplifier can accept the servo-on (RYn0) about 1 to 2s after the main circuit power supply is switched on. Therefore, when servo-on (RYn0) is switched on simultaneously with the main circuit power supply, the base circuit will switch on in about 1 to 2s, and the ready (RD) will switch on in further about 5ms, making the servo amplifier ready to operate. (Refer to paragraph (2) in this section.)
- 4) When the reset (RY(n+1)A or RY(n+3)A) is switched on, the base circuit is shut off and the servo motor shaft coasts.

(2) Timing chart



4. SIGNALS AND WIRING

(3) Forced stop



CAUTION

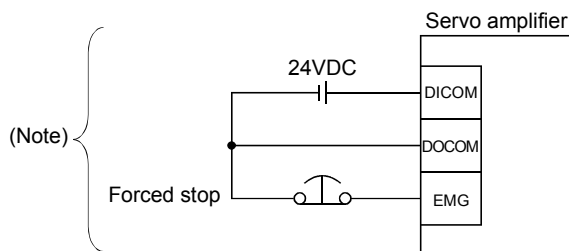
• Provide an external forced stop circuit to ensure that operation can be stopped and power switched off immediately.

Make up a circuit that shuts off main circuit power as soon as EMG is turned off at a forced stop. When EMG is turned off, the dynamic brake is operated to bring the servo motor to a sudden stop. At this time, the display shows the servo forced stop warning (AE6).

During ordinary operation, do not use the external forced stop (EMG) to alternate stop and run.

The servo amplifier life may be shortened.

Also, if the forward rotation start (RYn1) and reverse rotation start (RYn2) are on or a pulse train is input during a forced stop, the servo motor will rotate as soon as the warning is reset. During a forced stop, always shut off the run command. Note also that during a forced stop, RYn1 and RYn2 must be off.



Note. For the sink I/O interface. For the source I/O interface, refer to section 4.8.3.

4. SIGNALS AND WIRING

4.3.3 CNP1, CNP2, CNP3 wiring method

POINT
<ul style="list-style-type: none"> Refer to table 14.1 in section 14.9 for the wire sizes used for wiring. MR-J3-500T to more, MR-J3-350T4 or more does not have these connectors.

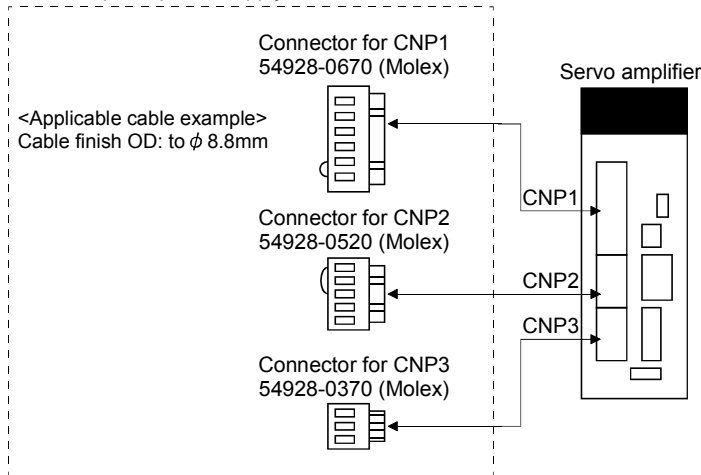
Use the supplied servo amplifier power supply connectors for wiring of CNP1, CNP2 and CNP3.

(1) MR-J3-10T to MR-J3-100T

(a) Servo amplifier power supply connectors

(Note)

Servo amplifier power supply connectors



Note. These connectors are of insert type. As the crimping type, the following connectors (Molex) are recommended.

For CNP1: 51241-0600 (connector), 56125-0118 (terminal)

For CNP2: 51240-0500 (connector), 56125-0118 (terminal)

For CNP3: 51241-0300 (connector), 56125-0118 (terminal)

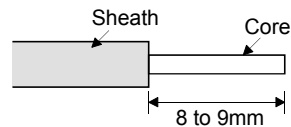
Crimping tool: CNP57349-5300

<Connector applicable cable example>

Cable finish OD: to $\phi 3.8\text{mm}$

(b) Termination of the cables

Solid wire: After the sheath has been stripped, the cable can be used as it is.



Twisted wire: Use the cable after stripping the sheath and twisting the core. At this time, take care to avoid a short caused by the loose wires of the core and the adjacent pole. Do not solder the core as it may cause a contact fault. Alternatively, a bar terminal may be used to put the wires together.

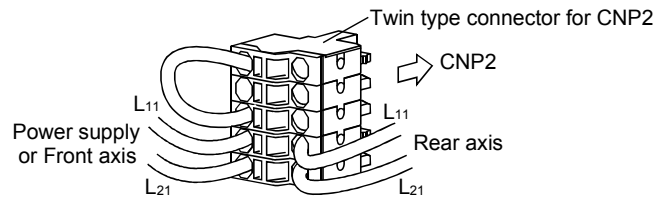
Cable size		Bar terminal type		Crimping tool (Note 2)
[mm ²]	AWG	For 1 cable (Note 1)	For 2 cable	
1.25/1.5	16	AI1.5-10BK	AI-TWIN2 × 1.5-10BK	Variocrimp 4 206-204
2/2.5	14	AI2.5-10BU		

Note 1. Manufacturer: Phoenix Contact

2. Manufacturer: WAGO

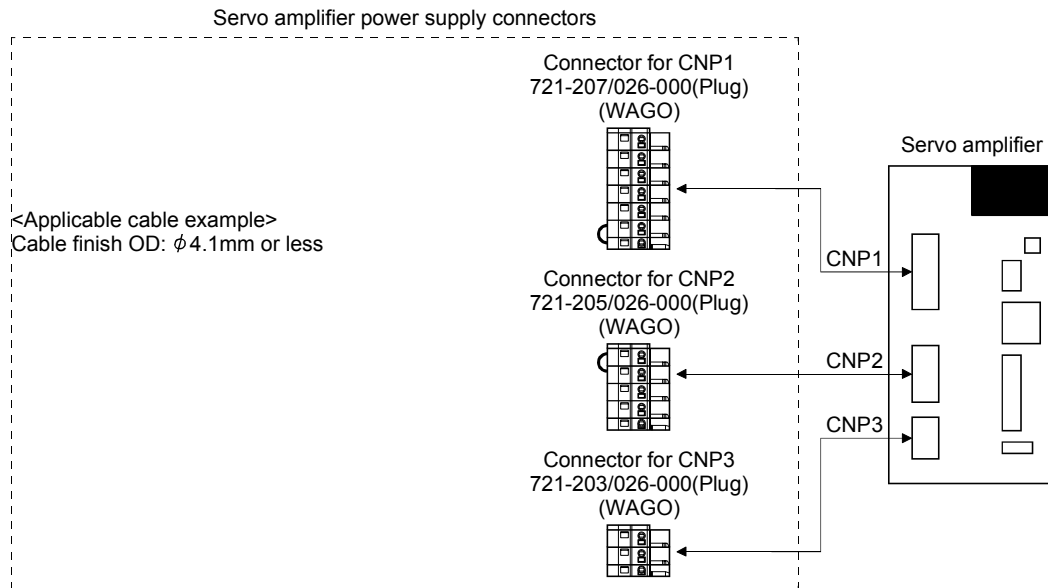
4. SIGNALS AND WIRING

- (c) The twin type connector for CNP2 (L₁₁ · L₂₁): 721-2105/026-000 (WAGO)
 Using this connector enables passing a wire of control circuit power supply.
 Refer to appendix 3 for details of connector.



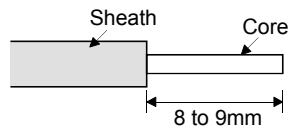
(2) MR-J3-200T · MR-J3-60T4 to MR-J3-200T4

- (a) Servo amplifier power supply connectors



- (b) Termination of the cables

Solid wire: After the sheath has been stripped, the cable can be used as it is.



Twisted wire: Use the cable after stripping the sheath and twisting the core. At this time, take care to avoid a short caused by the loose wires of the core and the adjacent pole. Do not solder the core as it may cause a contact fault. Alternatively, a bar terminal may be used to put the wires together.

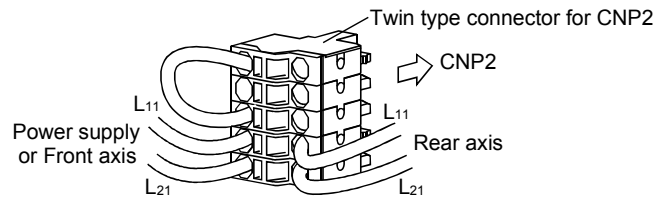
Cable size		Bar terminal type		Crimping tool (Note 2)
[mm ²]	AWG	For 1 cable (Note 1)	For 2 cable	
1.25/1.5	16	AI1.5-10BK	AI-TWIN2 × 1.5-10BK	Variocrimp 4 206-204
2/2.5	14	AI2.5-10BU		

Note 1. Manufacturer: Phoenix Contact

2. Manufacturer: WAGO

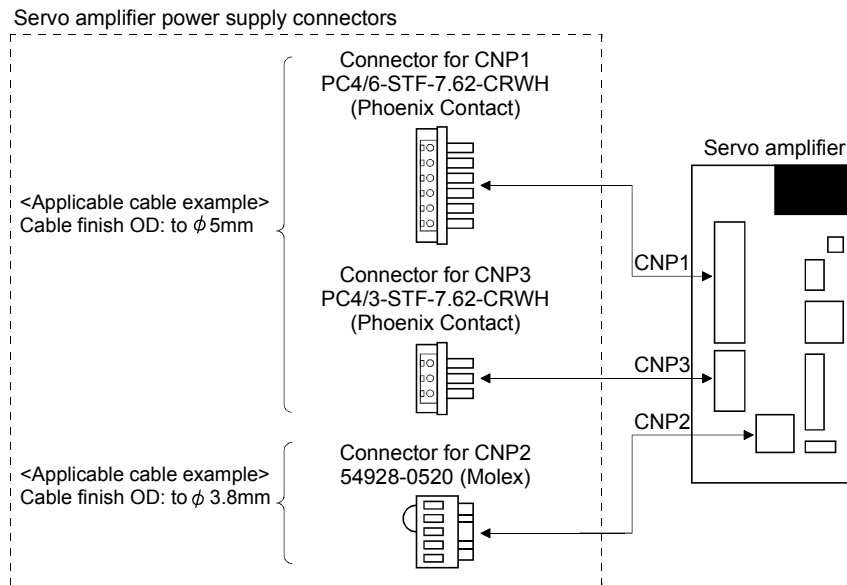
4. SIGNALS AND WIRING

- (c) The twin type connector for CNP2 (L₁₁ · L₂₁): 721-2105/026-000 (WAGO)
 Using this connector enables passing a wire of control circuit power supply.
 Refer to appendix 3 for details of connector.



(3) MR-J3-350T

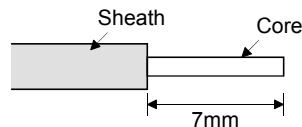
- (a) Servo amplifier power supply connectors



- (b) Termination of the cables

1) CNP1 · CNP3

Solid wire: After the sheath has been stripped, the cable can be used as it is.



Twisted wire: Use the cable after stripping the sheath and twisting the core. At this time, take care to avoid a short caused by the loose wires of the core and the adjacent pole. Do not solder the core as it may cause a contact fault. Alternatively, a bar terminal may be used to put the wires together.

Cable size		Bar terminal type		Crimping tool	Manufacturer
[mm ²]	AWG	For 1 cable	For 2 cables		
1.25/1.5	16	AI1.5-8BK	AI-TWIN2 × 1.5-8BK	CRIMPFOX-ZA3	Phoenix Contact
2.0/2.5	14	AI2.5-8BU	AI-TWIN2 × 2.5-10BU		
3.5	12	AI4-10Y			

2) CNP2

CNP2 is the same as MR-J3-100T or smaller capacities. Refer to (1) (b) in this section.

4. SIGNALS AND WIRING

(4) Insertion of cable into Molex and WAGO connectors

Insertion of cable into 54928-0670, 54928-0520, 54928-0370 (Molex) connectors and 721-207/026-000, 721-205/026-000 and 721-203/026-000 (WAGO) connectors are as follows.

The following explains for Molex, however use the same procedures for inserting WAGO connectors as well.

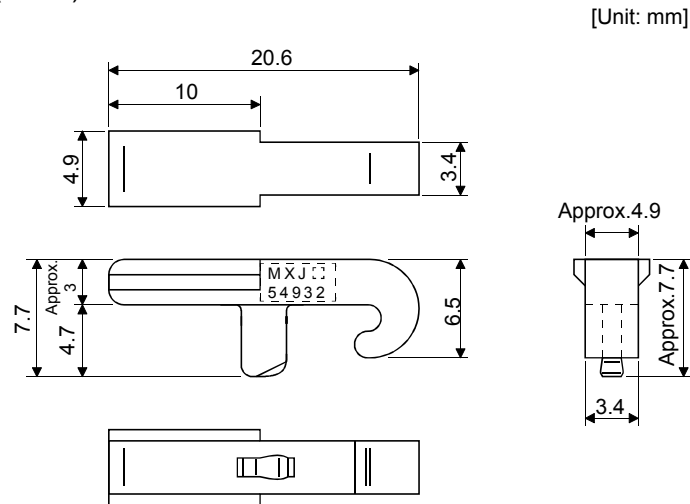
POINT
<ul style="list-style-type: none"> It may be difficult for a cable to be inserted to the connector depending on wire size or bar terminal configuration. In this case, change the wire type or correct it in order to prevent the end of bar terminal from widening, and then insert it.

How to connect a cable to the servo amplifier power supply connector is shown below.

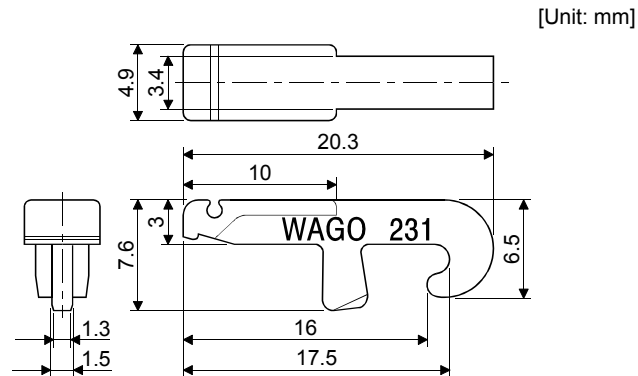
(a) When using the supplied cable connection lever

1) The servo amplifier is packed with the cable connection lever.

a) 54932-0000 (Molex)

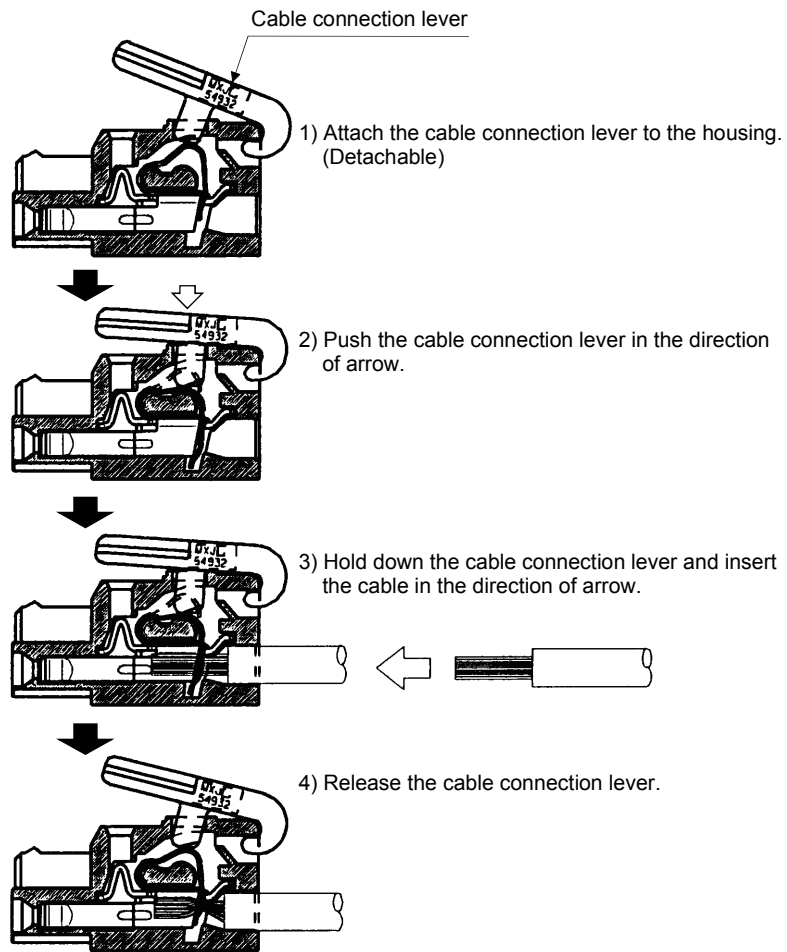


b) 231-131 (WAGO)



4. SIGNALS AND WIRING

2) Cable connection procedure

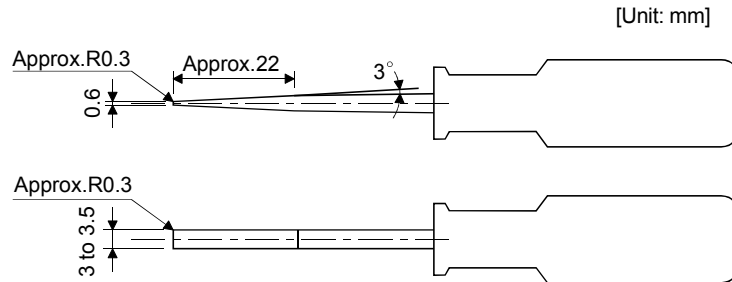


4. SIGNALS AND WIRING

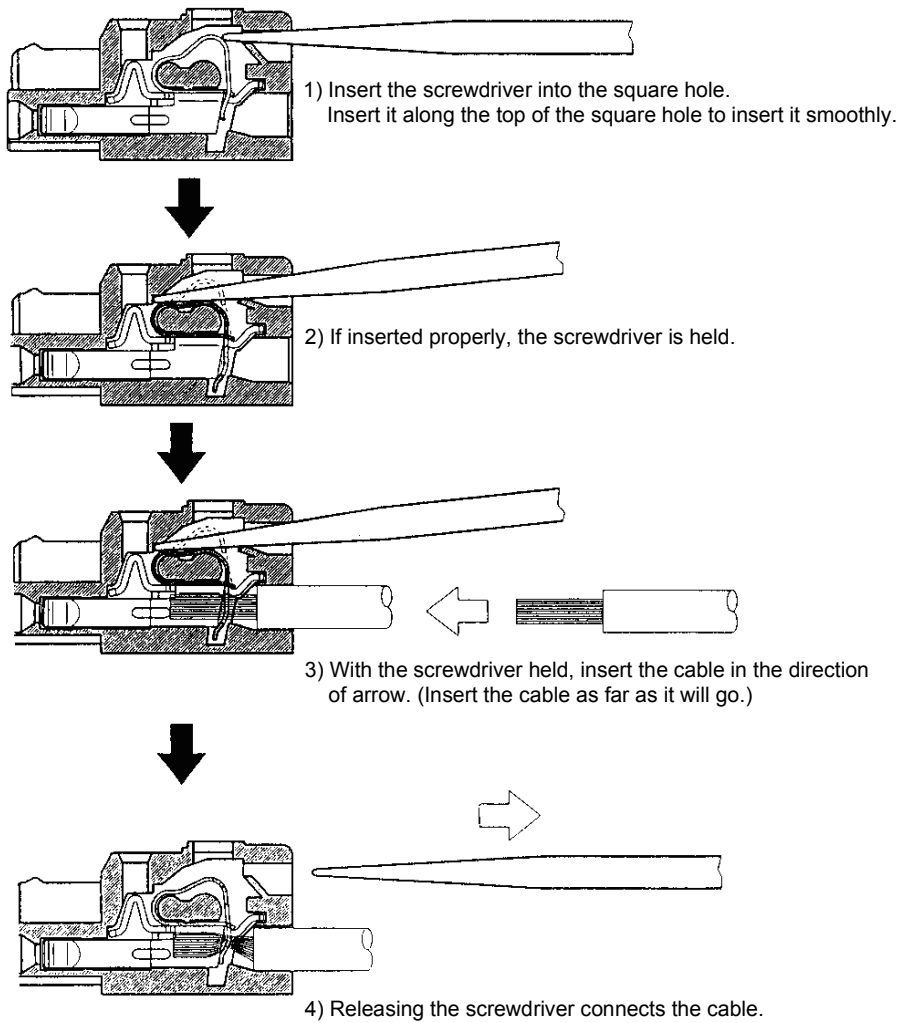
(b) Inserting the cable into the connector

1) Applicable flat-blade screwdriver dimensions

Always use the screwdriver shown here to do the work.

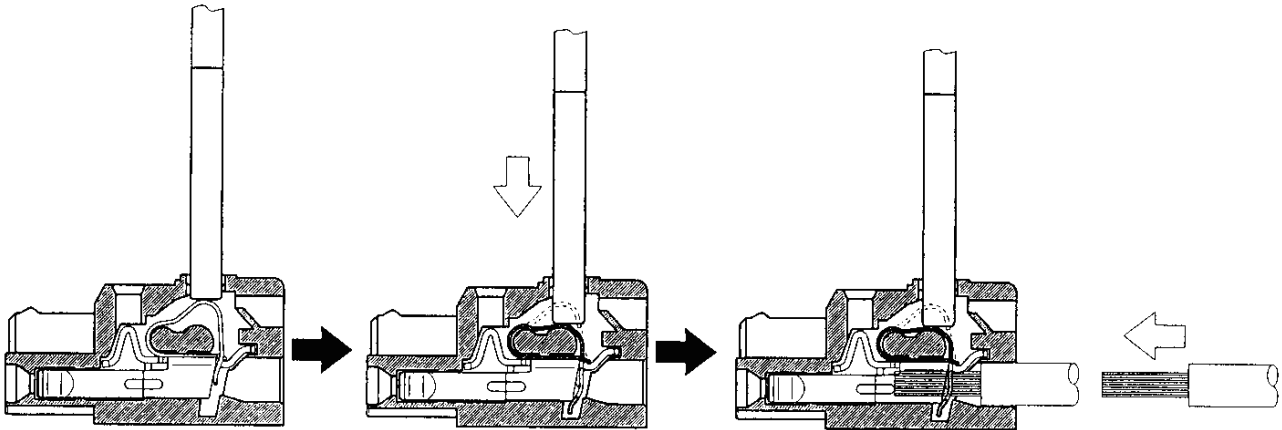


2) When using the flat-blade screwdriver - part 1



4. SIGNALS AND WIRING

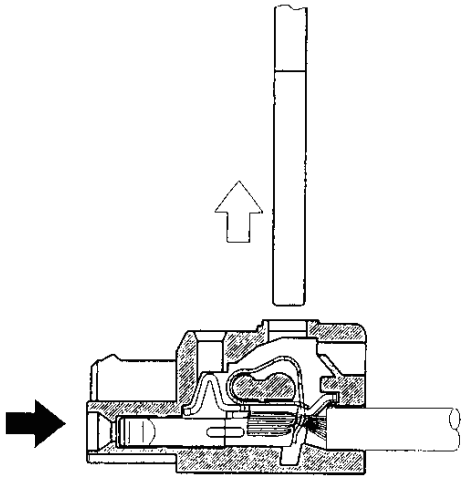
3) When using the flat-blade screwdriver - part 2



1) Insert the screwdriver into the square window at top of the connector.

2) Push the screwdriver in the direction of arrow.

3) With the screwdriver pushed, insert the cable in the direction of arrow. (Insert the cable as far as it will go.)



4) Releasing the screwdriver connects the cable.

4. SIGNALS AND WIRING

(5) How to insert the cable into Phoenix Contact connector

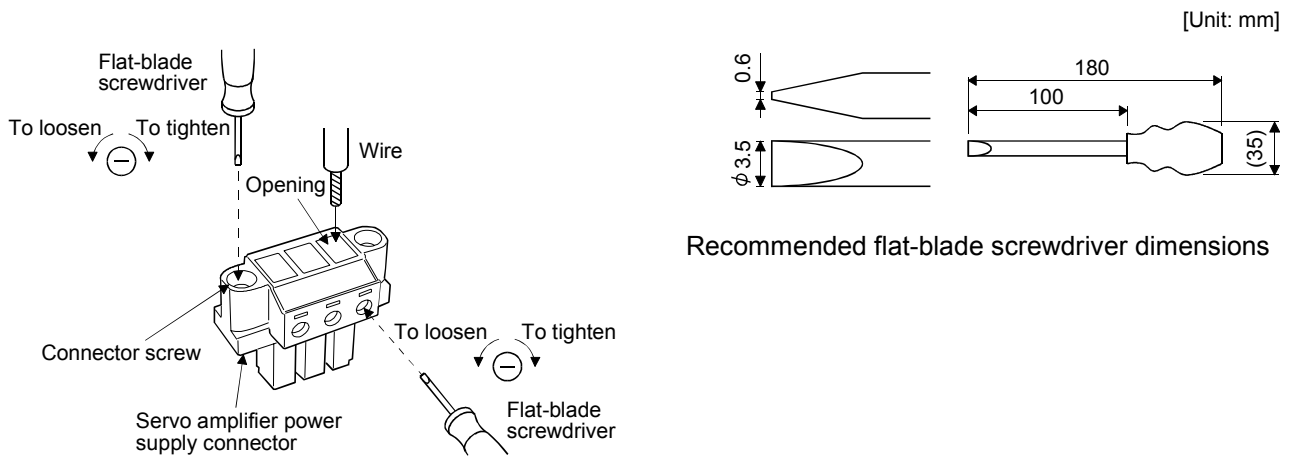
POINT
▪ Do not use a precision driver because the cable cannot be tightened with enough torque.

Insertion of cables into Phoenix Contact connector PC4/6-STF-7.62-CRWH or PC4/3-STF-7.62-CRWH is shown as follows.

Before inserting the cable into the opening, make sure that the screw of the terminal is fully loose. Insert the core of the cable into the opening and tighten the screw with a flat-blade screwdriver. When the cable is not tightened enough to the connector, the cable or connector may generate heat because of the poor contact. (When using a cable of 1.5mm^2 or less, two cables may be inserted into one opening.)

Secure the connector to the servo amplifier by tightening the connector screw.

For securing the cable and the connector, use a flat-blade driver with 0.6mm blade edge thickness and 3.5mm diameter (Recommended flat-blade screwdriver: Phoenix Contact SZS 0.6×3.5). Apply 0.5 to 0.6 N·m torque to screw.



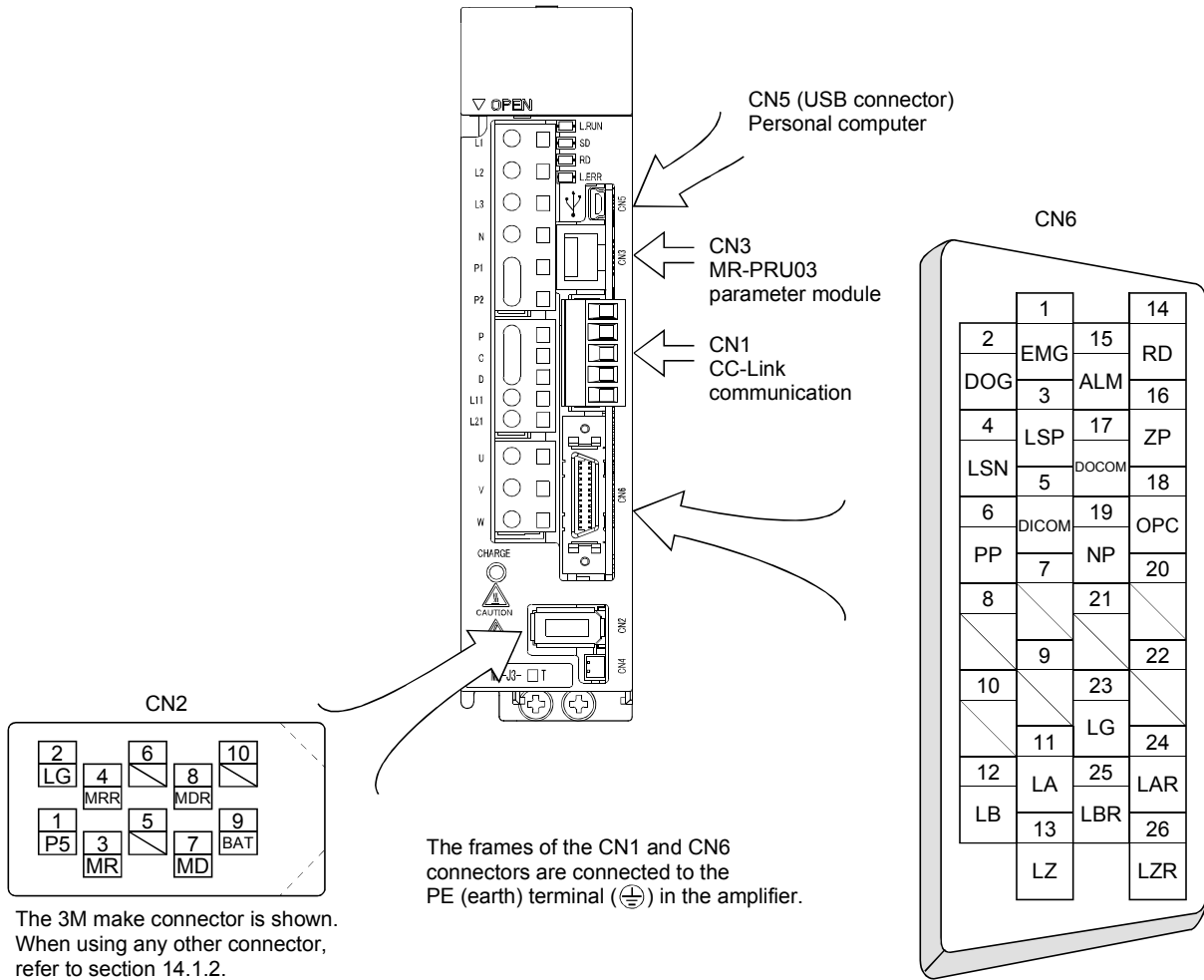
4. SIGNALS AND WIRING

4.4 Connectors and signal arrangements

POINT

- The pin configurations of the connectors are as viewed from the cable connector wiring section.

The servo amplifier front view shown is that of the MR-J3-20T or less. Refer to chapter 12 Outline Drawings for the appearances and connector layouts of the other servo amplifiers.



4. SIGNALS AND WIRING

4.5 Signal (device) explanation

4.5.1 I/O devices

The CN6 connector provides three pins for inputs and three other pins for outputs. Devices assigned to these pins are changeable. To make this change, configure parameter settings of Nos. PD06 to PD11, PD12, and PD14. Refer to section 4.8.2 for the I/O interfaces (symbols in the I/O Division field in the table) of the corresponding connector pins.

Pin type	CN6 connector pin No.	I/O division	Device in initial status	Parameter of change target device
Input-only pins	1	DI-1	Forced stop (EMG)	
	2		Proximity dog (DOG)	No.PD06
	3		Forward rotation stroke end (LSP)	No.PD07
	4		Reverse rotation stroke end (LSN)	No.PD08
Output-only pins	14	DO-1	Ready (RD)	No.PD09
	15		Trouble (ALM)	No.PD10
	16		Home position return completion (ZP)	No.PD11

4. SIGNALS AND WIRING

(1) Input device

POINT
<ul style="list-style-type: none"> Input devices assigned to the CN6 connector pins cannot be used with the remote input of the CC-Link communication function.

Device	Symbol	Connector pin No.	Functions/Applications																	
Forced stop	EMG	CN6-1	Forced stop (EMG) is fixed at CN6-1. Assigning this device to any other pin is not allowed. For device details, refer to section 3.5.1 (1).																	
Servo-on	SON		For device details, refer to section 3.5.1 (1).																	
Forward rotation start	ST1																			
Reverse rotation start	ST2																			
Proximity dog	DOG	CN6-2 (Note)																		
Forward rotation stroke end	LSP	CN6-3 (Note)																		
Reverse rotation stroke end	LSN	CN6-4 (Note)																		
Automatic/manual selection	MD0																			
Temporary stop/Restart	TSTP																			
Internal torque limit selection	TL1																			
Proportion control	PC																			
Gain changing	CDP																			
Reset	RES																			
Clear	CR			Turn CR on to clear the position control counter droop pulses on its leading edge. The pulse width should be 10ms or more. When the parameter No.PD22 setting is " <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 1", the pulses are always cleared while CR is on.																
Manual pulse generator multiplication 1	TP0		Used to select the multiplication factor of the manual pulse generator. When it is not selected, the parameter No.PA05 setting is made valid.																	
Manual pulse generator multiplication 2	TP1		<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2">(Note) Input device</th> <th rowspan="2">Manual pulse generator multiplication factor</th> </tr> <tr> <th>TP1</th> <th>TP0</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>Parameter No.PA05 setting</td> </tr> <tr> <td>0</td> <td>1</td> <td>1 time</td> </tr> <tr> <td>1</td> <td>0</td> <td>10 times</td> </tr> <tr> <td>1</td> <td>1</td> <td>100 times</td> </tr> </tbody> </table> <p>Note. 0: OFF 1: ON</p>	(Note) Input device		Manual pulse generator multiplication factor	TP1	TP0	0	0	Parameter No.PA05 setting	0	1	1 time	1	0	10 times	1	1	100 times
(Note) Input device		Manual pulse generator multiplication factor																		
TP1	TP0																			
0	0	Parameter No.PA05 setting																		
0	1	1 time																		
1	0	10 times																		
1	1	100 times																		

Note. These are pin Nos. assigned at default.

4. SIGNALS AND WIRING

(2) Output device

POINT
<ul style="list-style-type: none"> Output devices assigned to the CN6 connector pins can be used with the remote output of the CC-Link communication function.

Device	Symbol	Connector pin No.	Functions/Applications
Ready	RD	CN6-14 (Note)	For device details, refer to section 3.5.1 (2).
Trouble	ALM	CN6-15 (Note)	ALM turns off when power is switched off or the protective circuit is activated to shut off the base circuit. Without alarm occurring, ALM turns on within 1.5s after power-on. The significance of this device is opposite of that of remote output (RX (n+1)A or RX (n+3)A).
Home position return completion	ZP	CN6-16 (Note)	For device details, refer to section 3.5.1 (2).
In position	INP		
Rough match	CPO		
Limiting torque	TLC		
Electromagnetic brake interlock	MBR		
Temporary stop	PUS		
Warning	WNG		
Battery warning	BWNG		
Movement completion	MEND		
dynamic brake interlock	DB		
Position range	POT		
Point table No. output 1	PT0		
Point table No. output 2	PT1		
Point table No. output 3	PT2		
Point table No. output 4	PT3		
Point table No. output 5	PT4		
Point table No. output 6	PT5		
Point table No. output 7	PT6		
Point table No. output 8	PT7		
Speed command reached	SA		SA turns on when servo-on (SON) is on and the commanded speed is at the target speed. SA always turns on when servo-on (SON) is on and the commanded speed is 0r/min. SA turns off when servo-on (SON) is off or the commanded speed is in acceleration/deceleration.

4. SIGNALS AND WIRING

Device	Symbol	Connector pin No.	Functions/Applications
Zero speed	ZSP		<p>ZSP turns on when the servo motor speed is zero speed (50r/min) or less. Zero speed can be changed using parameter No.PC17.</p> <p>Example Zero speed is 50r/min</p> <p>The graph shows servo motor speed (0r/min) and ZSP signal. Forward rotation direction has OFF level at 70r/min and ON level at 50r/min. Reverse rotation direction has ON level at 50r/min and OFF level at 70r/min. ZSP is ON when speed is between 50r/min and 70r/min. Hysteresis width is 20r/min. ZSP turns on 1) when the servo motor is decelerated to 50r/min, and ZSP turns off 2) when the servo motor is accelerated to 70r/min again. ZSP turns on 3) when the servo motor is decelerated again to 50r/min, and turns off 4) when the servo motor speed has reached -70r/min.</p> <p>The range from the point when the servo motor speed has reached ON level, and ZSP turns on, to the point when it is accelerated again and has reached OFF level is called hysteresis width.</p> <p>Hysteresis width is 20r/min for this servo amplifier.</p>
Variable gain selection	CDPS		CDPS is on during gain changing.

Note. These are pin Nos. assigned at default.

4.5.2 Input signals

Device	Symbol	Connector pin No.	Functions/Applications
Manual pulse generator	PP	CN6-6	Used to connect the manual pulse generator (MR-HDP01). (Refer to section 14.18.)
	NP	CN6-19	

4.5.3 Output signals

Refer to section 4.8.2 for the output interfaces (symbols in the I/O Division field in the table) of the corresponding connector pins.

Signal	Symbol	Connector pin No.	Functions/Applications	I/O division
Encoder A-phase pulse (differential line driver)	LA LAR	CN6-11 CN6-24	Outputs pulses per servo motor revolution set in parameter No.PA15 in the differential line driver system. In CCW rotation of the servo motor, the encoder B-phase pulse lags the encoder A-phase pulse by a phase angle of $\pi/2$.	DO-2
Encoder B-phase pulse (differential line driver)	LB LBR	CN6-12 CN6-25	The relationships between rotation direction and phase difference of the A- and B-phase pulses can be changed using parameter No. PC19.	
Encoder Z-phase pulse (differential line driver)	LZ LZR	CN6-13 CN6-26	Outputs the zero-point signal of the encoder in the differential line driver system. One pulse is output per servo motor revolution. This signal turns on when the zero-point position is reached. (Negative logic) The minimum pulse width is about 400 μ s. For home position return using this pulse, set the creep speed to 100r/min. or less.	DO-2

4. SIGNALS AND WIRING

4.5.4 Power supply

Signal	Symbol	Connector pin No.	Functions/Applications	I/O division
Digital I/F power supply input	DICOM	CN6-5	Used to input 24VDC (24VDC±10% 150mA) for I/O interface. The power supply capacity changes depending on the number of I/O interface points to be used. Connect the plus of 24VDC terminal external power supply for the sink interface.	
Digital I/F common	DOCOM	CN6-17	Common terminal for input signals such as DOG and EMG. Pins are connected internally. Separated from LG. Connect the plus of 24VDC terminal external power supply for the source interface.	
Open collector power input	OPC	CN6-18	When using the MR-HDP01 manual pulse generator, connect OPC and DICOMD, and supply OPC with the positive (+) voltage of 24VDC.	
Control common	LG	CN6-23	Common terminal for the differential line driver of the encoder pulses (LA · LAR · LB · LBR · LZ · LZR).	
Shield	SD	Plate	Connect the external conductor of the shield cable.	

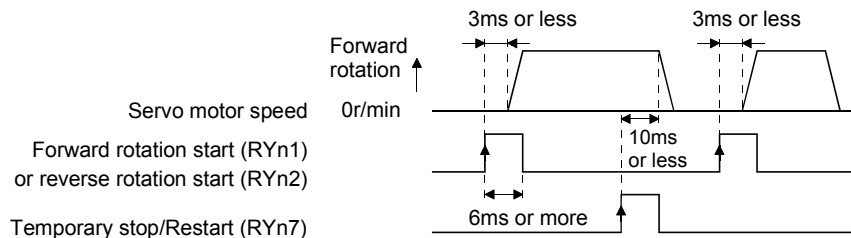
4.6 Detailed description of signals (devices)

4.6.1 Forward rotation start · reverse rotation start · temporary stop/restart

(1) A forward rotation start (RYn1) or a reverse rotation start (RYn2) should make the sequence which can be used after the main circuit has been established. These signals are invalid if it is switched on before the main circuit is established.

Normally, it is interlocked with the ready signal (RD).

(2) A start in the servo amplifier is made when a forward rotation start (RYn1) or a reverse rotation start (RYn2) changes from OFF to ON. The delay time of the servo amplifier's internal processing is max. 3ms. The delay time of other devices is max. 10ms.



(3) When a programmable controller is used, the ON time of a forward rotation start (RYn1), a reverse rotation start (RYn2) or temporary start/stop (RYn7) signal should be 6ms or longer to prevent a malfunction.

(4) During operation, the forward rotation start (RYn1) or reverse rotation start (RYn2) is not accepted. The next operation should always be started after the rough match (RXn2) is output with the rough match output range set to "0" or after the movement completion (RXnC) is output.

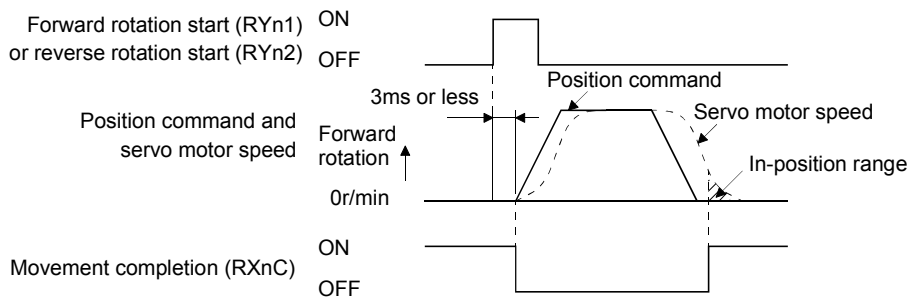
4. SIGNALS AND WIRING

4.6.2 Movement completion ▪ rough match ▪ in position

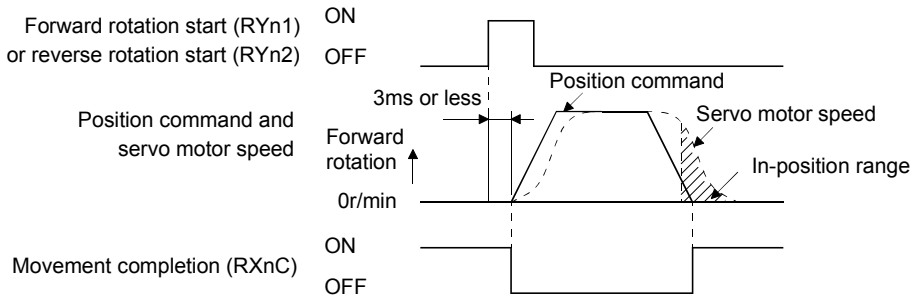
POINT
<ul style="list-style-type: none"> ▪ If an alarm cause, etc. are removed and servo-on occurs after a stop is made by servo-off, alarm occurrence or Forced stop (EMG) ON during automatic operation, Movement completion (MEND), Rough-match, (CPO) and In position (INP) are turned on. To resume operation, confirm the current position and the selected point table No. for preventing unexpected operation.

(1) Movement completion

The following timing charts show the output timing relationships between the position command generated in the servo amplifier and the movement completion (RYnC). This timing can be changed using parameter No.PA10 (in-position range). RYnC turns ON in the servo-on status.



When parameter No.PA10 is small

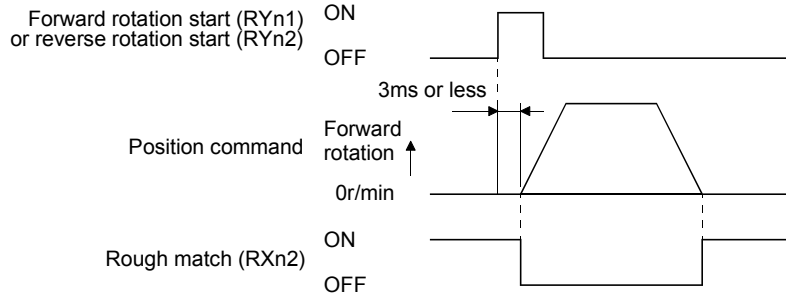


When parameter No.PA10 is large

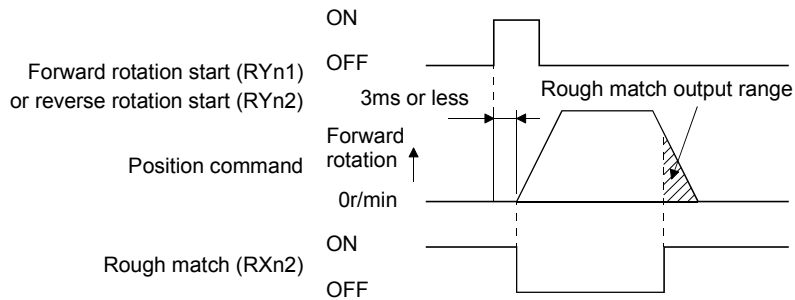
4. SIGNALS AND WIRING

(2) Rough match

The following timing charts show the relationships between the signal and the position command generated in the servo amplifier. This timing can be changed using parameter No.PC11 (rough match output range). RXn2 turns ON in the servo-on status.



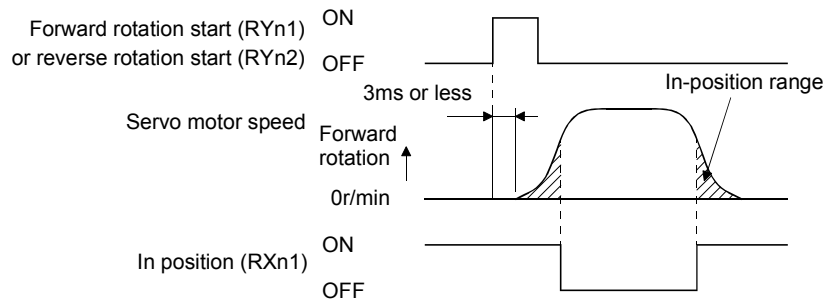
When "0" is set in parameter No.PC11



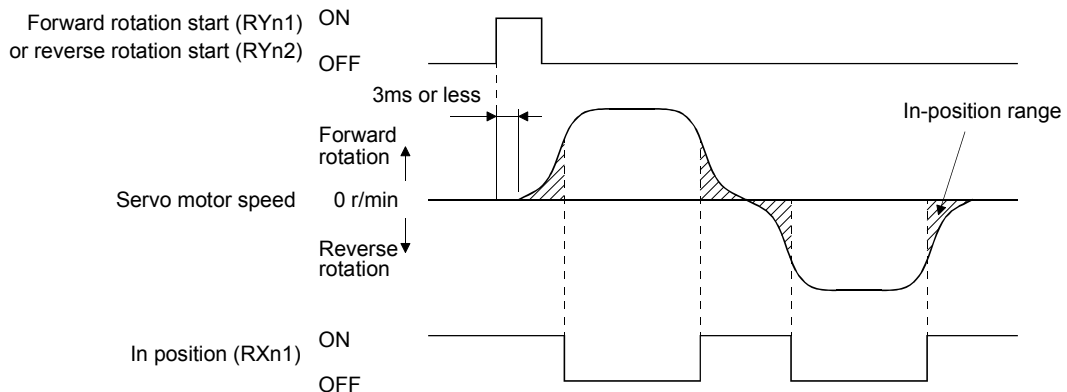
When more than "0" is set in parameter No.PC11

(3) In position

The following timing chart shows the relationship between the signal and the feedback pulse of the servo motor. This timing can be changed using parameter No.PA10 (in-position range). turns on RYn1 in the servo-on status.



When positioning operation is performed once



When servo motor reverses rotation direction during automatic continuous operation

4. SIGNALS AND WIRING

4.6.3 Torque limit

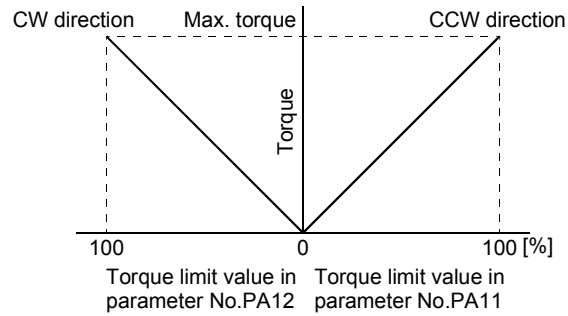


CAUTION

▪ If the torque limit is canceled during servo lock, the servo motor may suddenly rotate according to position deviation in respect to the command position.

(1) Torque limit and torque

By setting parameter No.PA11 (forward rotation torque limit) or parameter No.PA12 (reverse rotation torque limit), torque is always limited to the maximum value during operation. A relationship between the limit value and servo motor torque is shown below.



(2) Torque limit value selection

As shown below, the forward rotation torque limit (parameter No.PA11), reverse rotation torque limit (parameter No.PA12) or internal torque limit 2 (parameter No.PC35) can be chosen using the external torque limit selection (RY(n+2)6).

(Note) RY(n+2) 6	Limit value status	Torque limit to be enabled	
		CCW driving/CW regeneration	CW driving/CCW regeneration
0		Parameter No.PA11	Parameter No.PA12
1	Parameter No.PC35 > Parameter No.PA11 Parameter No.PA12	Parameter No.PA11	Parameter No.PA12
	Parameter No.PC35 < Parameter No.PA11 Parameter No.PA12	Parameter No.PC35	Parameter No.PC35


Note. 0: OFF
1: ON

(3) Limiting torque (RXn4)

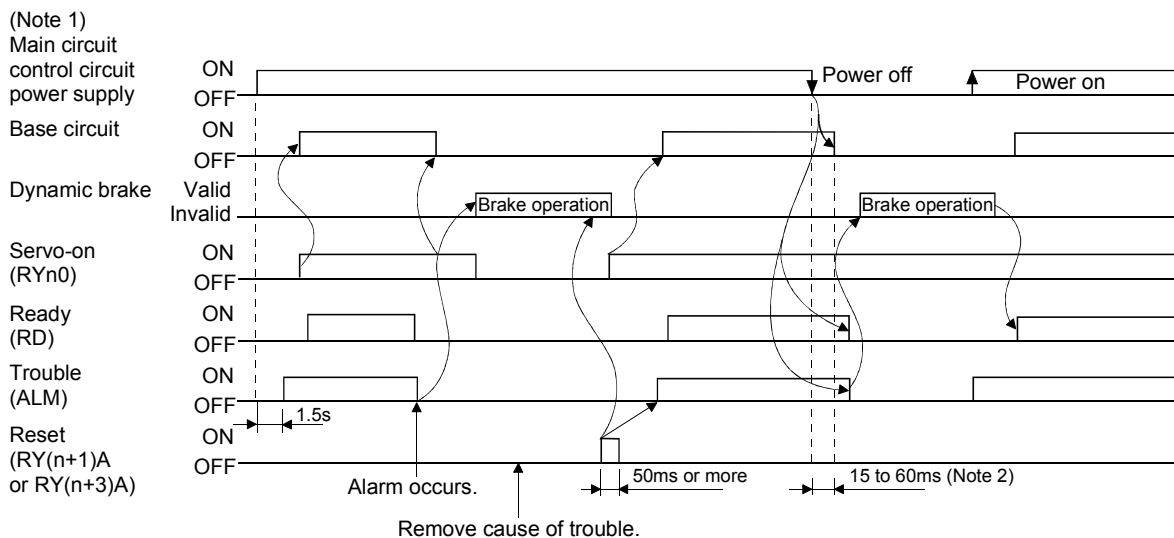
RXn4 turns on when the servo motor torque reaches the torque limited.

4. SIGNALS AND WIRING

4.7 Alarm occurrence timing chart

 CAUTION	<ul style="list-style-type: none"> When an alarm has occurred, remove its cause, make sure that the operation signal is not being input, ensure safety, and reset the alarm before restarting operation. As soon as an alarm occurs, turn off Servo-on (RYn0) and power off.
--	--

When an alarm occurs in the servo amplifier, the base circuit is shut off and the servo motor is coated to a stop. Switch off the main circuit power supply in the external sequence. To reset the alarm, switch the control circuit power supply from off to on, press the "SET" button on the current alarm screen, or turn the reset (RY(n+1)A or RY(n+3)A) from off to on. However, the alarm cannot be reset unless its cause is removed.



Note 1. Shut off the main circuit power as soon as an alarm occurs.

2. Changes depending on the operating status.

(1) Overcurrent, overload 1 or overload 2

If operation is repeated by switching control circuit power off, then on to reset the overcurrent (A32), overload 1 (A50) or overload 2 (A51) alarm after its occurrence, without removing its cause, the servo amplifier and servo motor may become faulty due to temperature rise. Securely remove the cause of the alarm and also allow about 30 minutes for cooling before resuming operation.

(2) Regenerative alarm

If operation is repeated by switching control circuit power off, then on to reset the regenerative (A30) alarm after its occurrence, the external regenerative resistor will generate heat, resulting in an accident.

(3) Instantaneous power failure

Undervoltage (A10) occurs when the input power is in either of the following statuses.

- A power failure of the control circuit power supply continues for 60ms or longer and the control circuit is not completely off.
- The bus voltage dropped to 200VDC or less for the MR-J3-□T, to 158VDC or less for the MR-J3-□T1, or to 380VDC or less for the MR-J3-□T4.

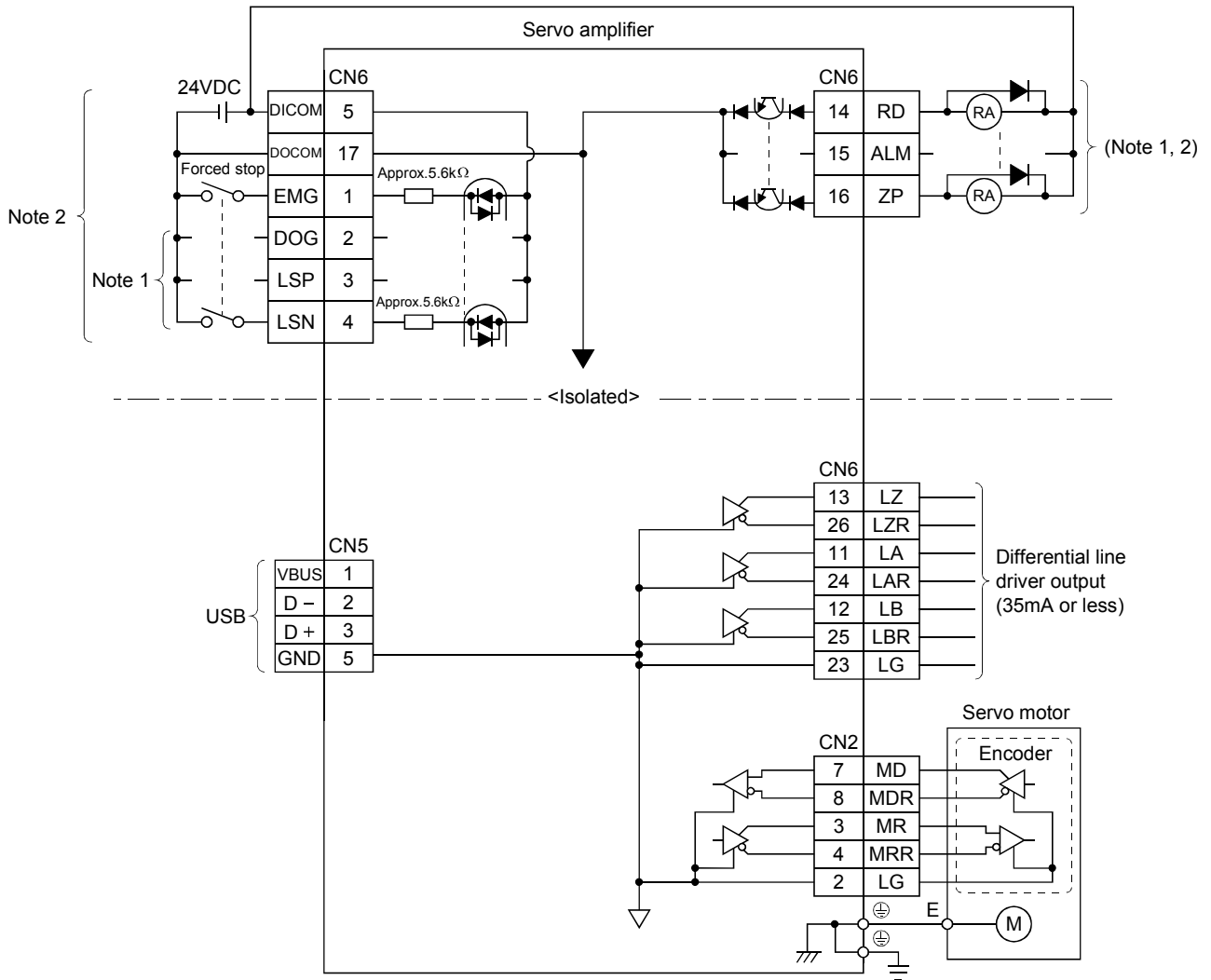
(4) Incremental system

When an alarm occurs, the home position is lost. When resuming operation after deactivating the alarm, make a home position return.

4. SIGNALS AND WIRING

4.8 Interface

4.8.1 Internal connection diagram



Note 1. Devices assigned to these pins can be changed in the parameter settings.

2. For this sink I/O interface. For the source I/O interface, refer to section 4.8.3.

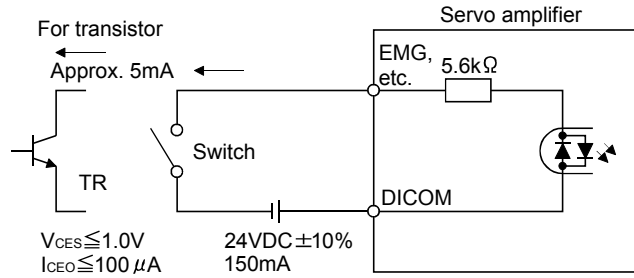
4. SIGNALS AND WIRING

4.8.2 Detailed description of interfaces

This section provides the details of the I/O signal interfaces (refer to the I/O division in the table) given in section 4.5.1. Refer to this section and make connection with the external equipment.

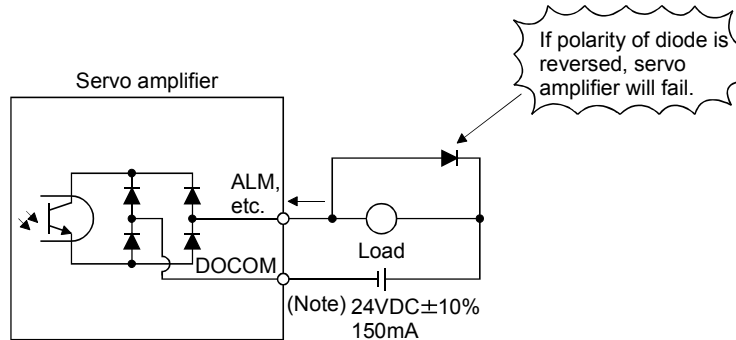
(1) Digital input interface DI-1

Give a signal with a relay or open collector transistor. Refer to section 4.8.3 for the source input.



(2) Digital output interface DO-1

A lamp, relay or photocoupler can be driven. Install a diode (D) for an inductive load, or install an inrush current suppressing resistor (R) for a lamp load. (Rated current: 40mA or less, maximum current: 50mA or less, inrush current: 100mA or less) A maximum of 2.6V voltage drop occurs in the servo amplifier. Refer to section 4.8.3 for the source output.



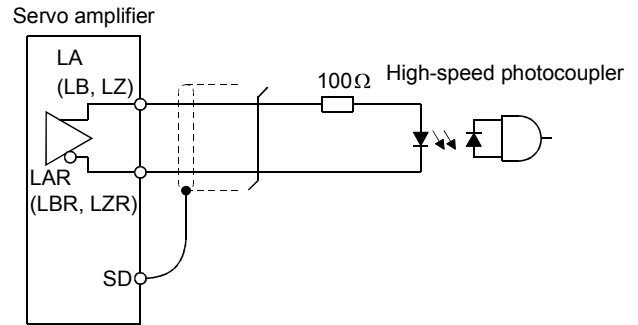
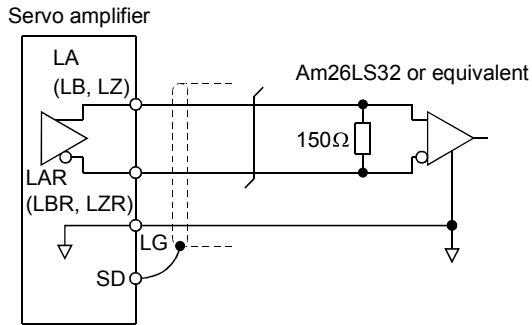
Note. If the voltage drop (maximum of 2.6V) interferes with the relay operation, apply high voltage (up to 26.4V) from external source.

4. SIGNALS AND WIRING

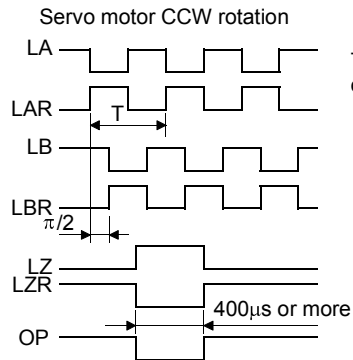
(3) Encoder output pulse DO-2 (Differential line driver system)

(a) Interface

Max. output current: 35mA



(b) Output pulse



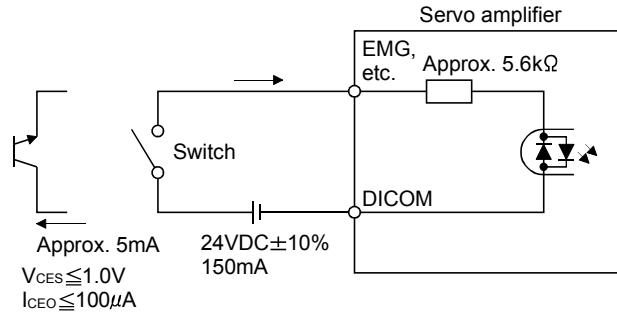
Time cycle (T) is determined by the settings of parameter No.PA15 and PC19.

4. SIGNALS AND WIRING

4.8.3 Source I/O interfaces

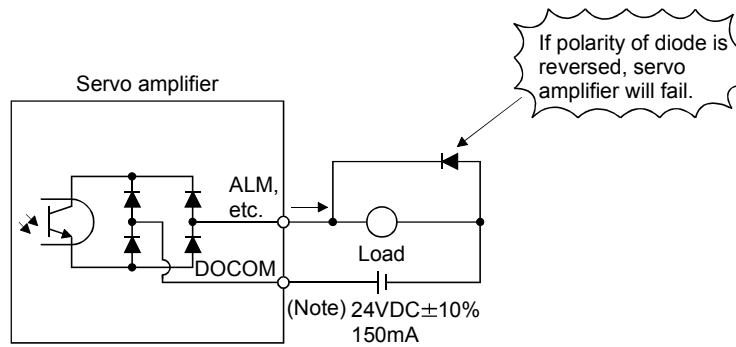
In this servo amplifier, source type I/O interfaces can be used. In this case, all DI-1 input signals and DO-1 output signals are of source type. Perform wiring according to the following interfaces.

(1) Digital input interface DI-1



(2) Digital output interface DO-1

A maximum of 2.6V voltage drop occurs in the servo amplifier.

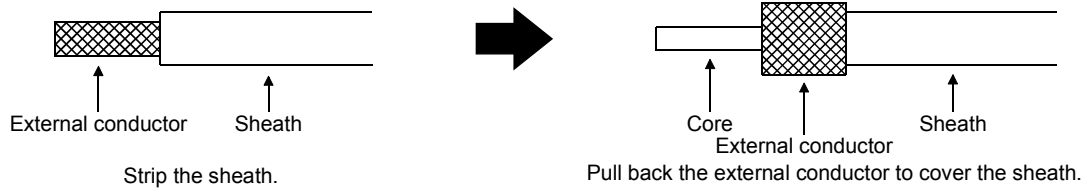


Note. If the voltage drop (maximum of 2.6V) interferes with the relay operation, apply high voltage (up to 26.4V) from external source.

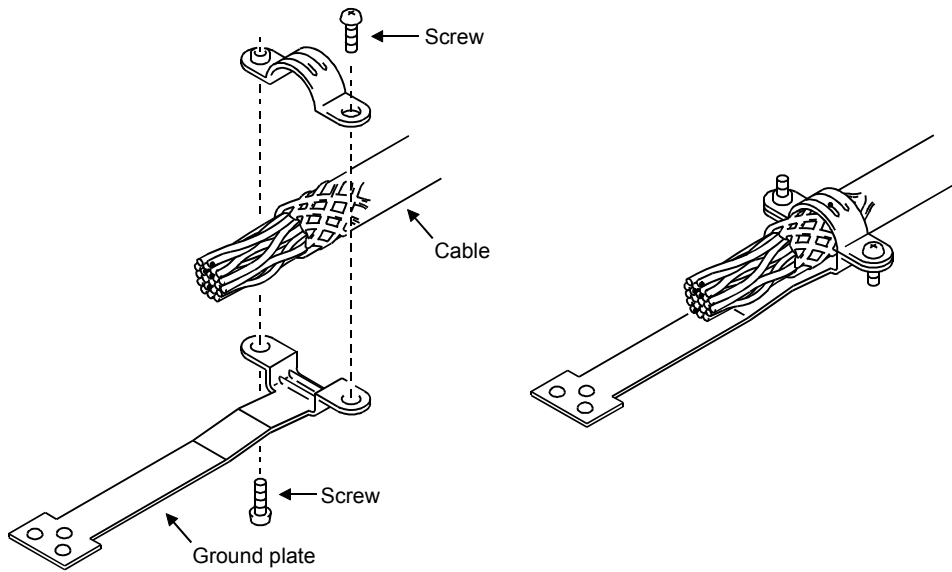
4. SIGNALS AND WIRING

4.9 Treatment of cable shield external conductor

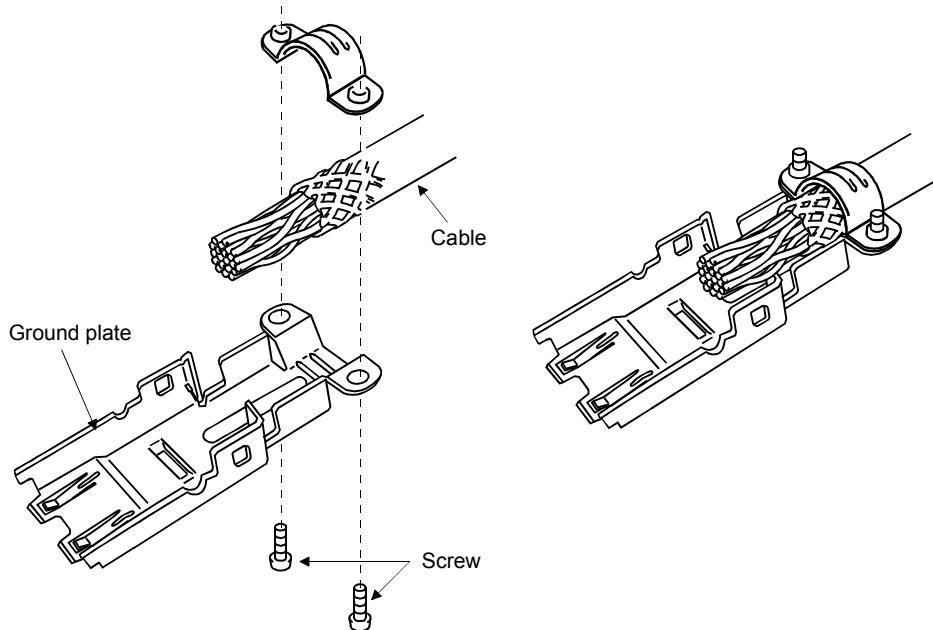
In the case of the CN2 and CN6 connectors, securely connect the shielded external conductor of the cable to the ground plate as shown in this section and fix it to the connector shell.



(1) For CN6 connector (3M connector)



(2) For CN2 connector (3M or Molex connector)



4. SIGNALS AND WIRING

4.10 Connection of servo amplifier and servo motor



WARNING

- During power-on, do not open or close the motor power line. Otherwise, a malfunction or faulty may occur.

4.10.1 Connection instructions



WARNING

- Insulate the connections of the power supply terminals to prevent an electric shock.



CAUTION

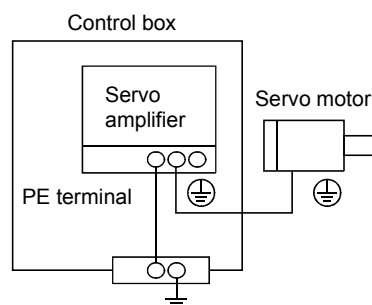
- Connect the wires to the correct phase terminals (U, V, W) of the servo amplifier and servo motor. Not doing so may cause unexpected operation.
- Do not connect AC power supply directly to the servo motor. Otherwise, a fault may occur.

POINT

- Refer to section 14.1 for the selection of the encoder cable.

This section indicates the connection of the servo motor power (U, V, W). Use of the optional cable and connector set is recommended for connection between the servo amplifier and servo motor. When the options are not available, use the recommended products. Refer to section 14.1 for details of the options.

- (1) For grounding, connect the earth cable of the servo motor to the protective earth (PE) terminal (⊕) of the servo amplifier and connect the ground cable of the servo amplifier to the earth via the protective earth of the control box. Do not connect them directly to the protective earth of the control panel.



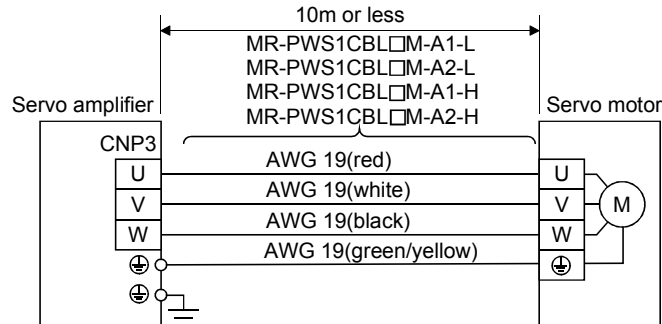
- (2) Do not share the 24VDC interface power supply between the interface and electromagnetic brake. Always use the power supply designed exclusively for the electromagnetic brake.

4. SIGNALS AND WIRING

4.10.2 Power supply cable wiring diagrams

(1) HF-MP service • HF-KP series servo motor

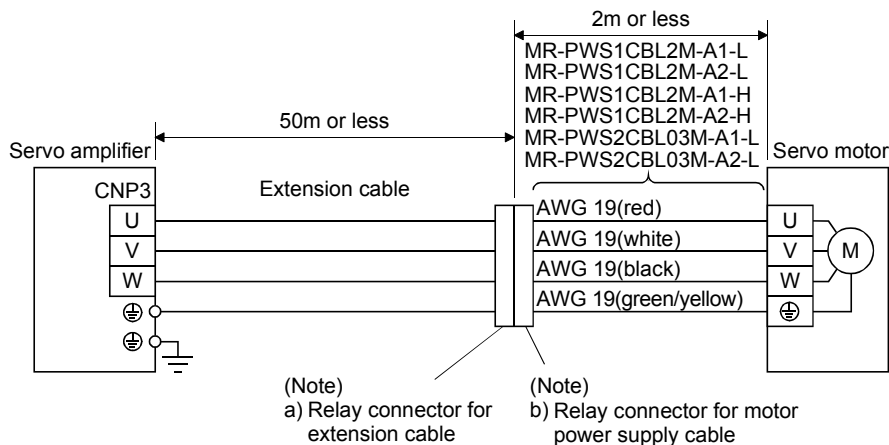
(a) When cable length is 10m or less



(b) When cable length exceeds 10m

When the cable length exceeds 10m, fabricate an extension cable as shown below. In this case, the motor power supply cable pulled from the servo motor should be within 2m long.

Refer to section 14.9 for the wire used for the extension cable.

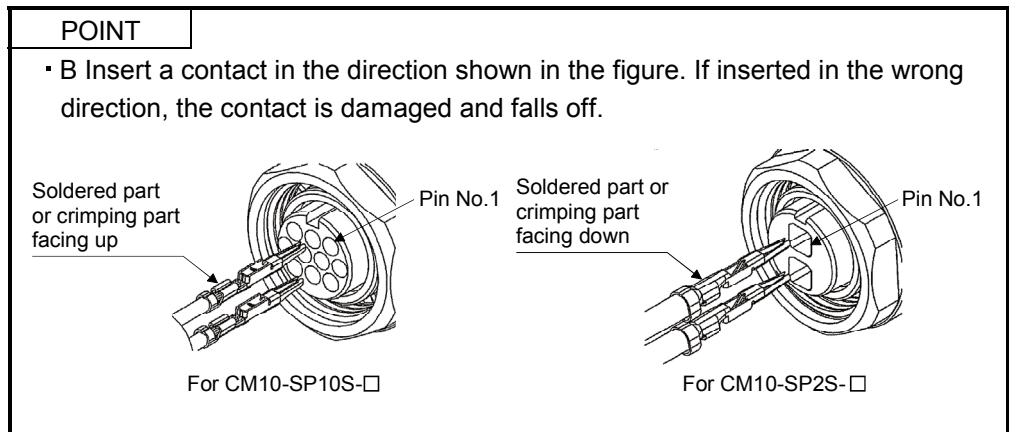


Note. Use of the following connectors is recommended when ingress protection (IP65) is necessary.

Relay connector	Description	Protective structure
a) Relay connector for extension cable	Connector: RM15WTPZ-4P(71) Cord clamp: RM15WTP-CP(5)(71) (Hirose Electric) └ Numeral changes depending on the cable OD	IP65
b) Relay connector for motor power supply cable	Connector: RM15WTJA-4S(71) Cord clamp: RM15WTP-CP(8)(71) (Hirose Electric) └ Numeral changes depending on the cable OD	IP65

4. SIGNALS AND WIRING

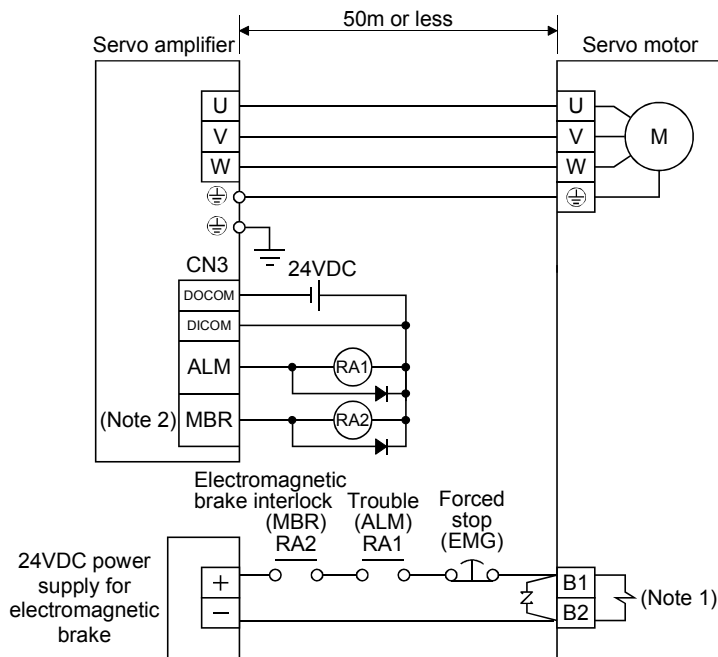
(2) HF-SP series • HC-RP series • HC-UP series • HC-LP series servo motor



(a) Wiring diagrams

Refer to section 14.9 for the cables used for wiring.

1) When the power supply connector and the electromagnetic brake connector are separately supplied.

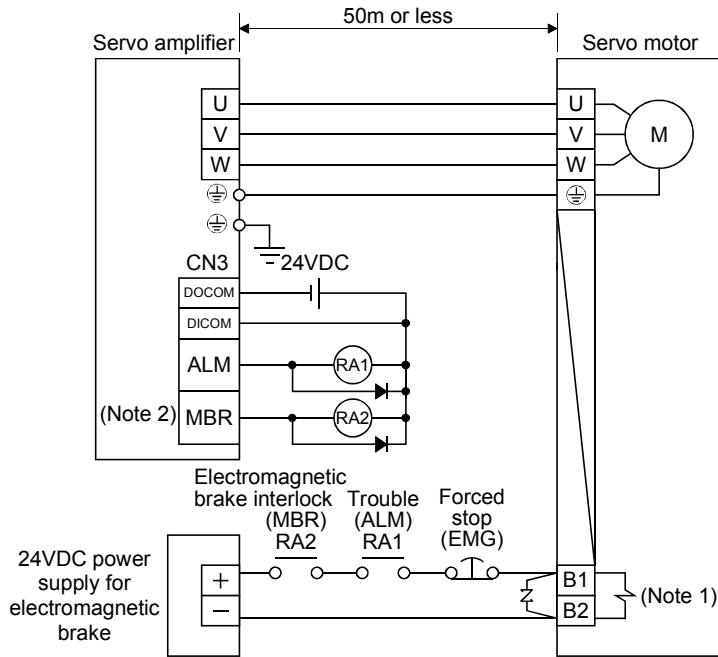


Note 1. There is no polarity in electromagnetic brake terminals B1 and B2.

2. When using a servo motor with an electromagnetic brake, assign the electromagnetic brake interlock (MBR) to external output signal in the parameters No.PD09 to PD11.

4. SIGNALS AND WIRING

2) When the power supply connector and the electromagnetic brake connector are shared.

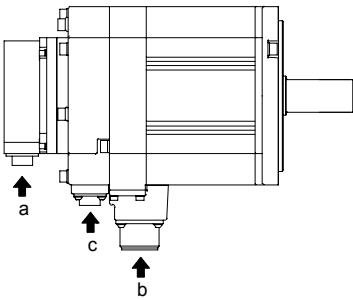


Note 1. There is no polarity in electromagnetic brake terminals B1 and B2.

2. When using a servo motor with an electromagnetic brake, assign the electromagnetic brake interlock (MBR) to external output signal in the parameters No.PD09 to PD11.

(b) Connector and signal allotment

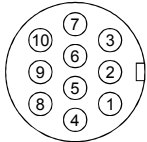
The connector fitting the servo motor is prepared as optional equipment. Refer to section 14.1. For types other than those prepared as optional equipment, refer to chapter 3 in Servo Motor Instruction Manual (Vol.2), to select.



Servo motor	Servo motor side connectors		
	Encoder	Power supply	Electromagnetic brake
HF-SP52(4) to 152(4)	CM10-R10P (DDK)	MS3102A18-10P	CM10-R2P (DDK)
HF-SP51 * 81		MS3102A22-22P	
HF-SP202(4) to 502(4)			
HF-SP121 to 301		CE05-2A32-17PD-B	The connector for power is shared
HF-SP421 * 702(4)		CE05-2A22-23PD-B	
HC-RP103 to 203		CE05-2A24-10PD-B	
HC-RP353 * 503		CE05-2A22-23PD-B	
HC-UP72 * 152		CE05-2A24-10PD-B	MS3102A10SL-4P
HC-UP202 to 502		CE05-2A24-10PD-B	The connector for power is shared
HC-LP52 to 152		CE05-2A22-23PD-B	
HC-LP202 * 302		CE05-2A24-10PD-B	MS3102A10SL-4P

4. SIGNALS AND WIRING

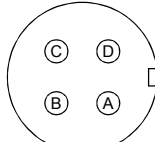
Encoder connector signal allotment
CM10-R10P



View a

Terminal No.	Signal
1	MR
2	MRR
3	
4	BAT
5	LG
6	
7	
8	P5
9	
10	SHD

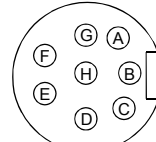
Power supply connector signal allotment
MS3102A18-10P
MS3102A22-22P
CE05-2A32-17PD-B



View b

Terminal No.	Signal
A	U
B	V
C	W
D	⊕ (earth)

Power supply connector signal allotment
CE05-2A22-23PD-B

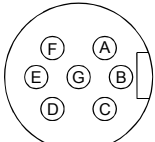


View b

Terminal No.	Signal
A	U
B	V
C	W
D	⊕ (earth)
E	
F	
G	B2 (Note)
H	B1 (Note)

Note. For the motor with an electromagnetic brake, supply electromagnetic brake power (24VDC). There is no polarity.

Power supply connector signal allotment
CE05-2A24-10PD-B

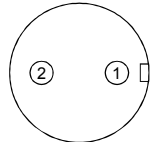


View b

Terminal No.	Signal
A	U
B	V
C	W
D	⊕ (earth)
E	B1 (Note)
F	B2 (Note)
G	

Note. For the motor with an electromagnetic brake, supply electromagnetic brake power (24VDC). There is no polarity.

Brake connector signal allotment
CM10-R2P

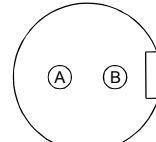


View c

Terminal No.	Signal
1	B1 (Note)
2	B2 (Note)

Note. For the motor with an electromagnetic brake, supply electromagnetic brake power (24VDC). There is no polarity.

Brake connector signal allotment
MS3102A10SL-4P



View c

Terminal No.	Signal
A	B1 (Note)
B	B2 (Note)

Note. For the motor with an electromagnetic brake, supply electromagnetic brake power (24VDC). There is no polarity.

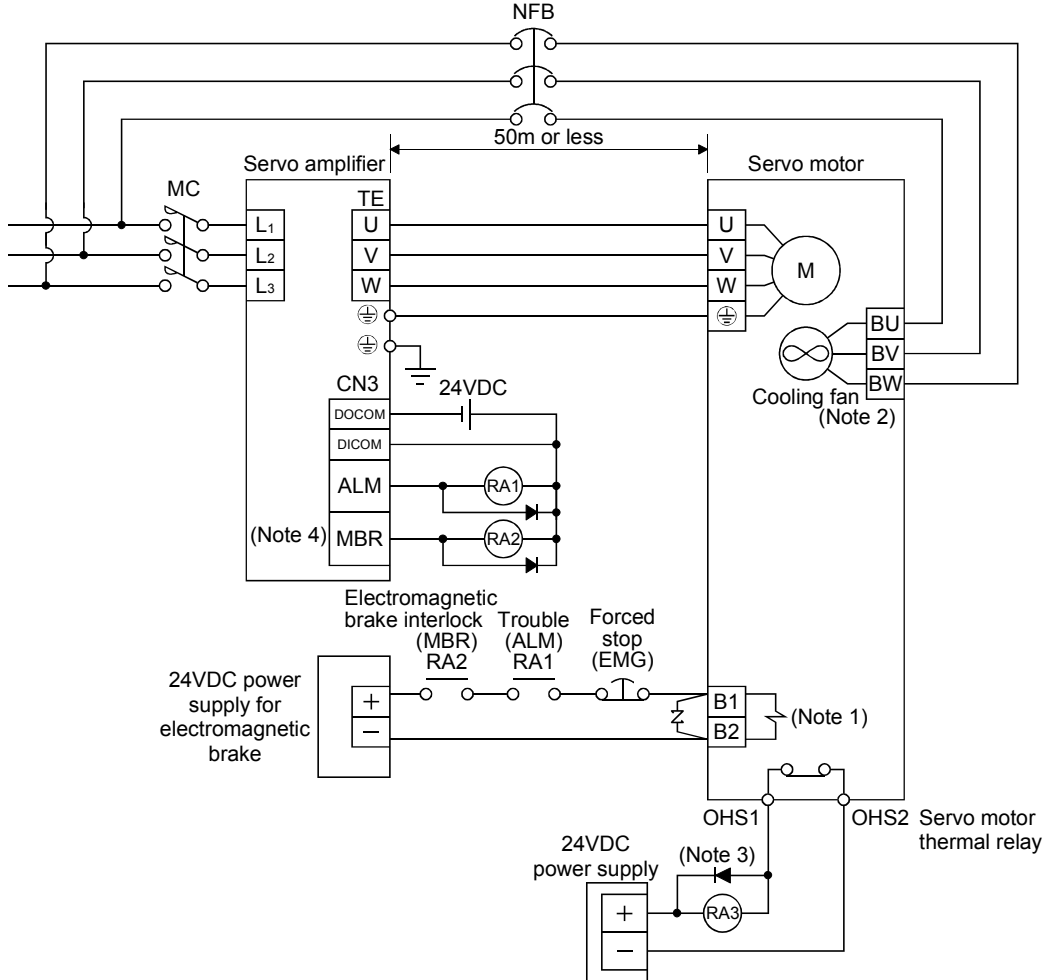
4. SIGNALS AND WIRING

(3) HA-LP series servo motor

(a) Wiring diagrams

Refer to section 14.9 for the cables used for wiring.

1) 200V class



Note 1. There is no polarity in electromagnetic brake terminals B1 and B2.

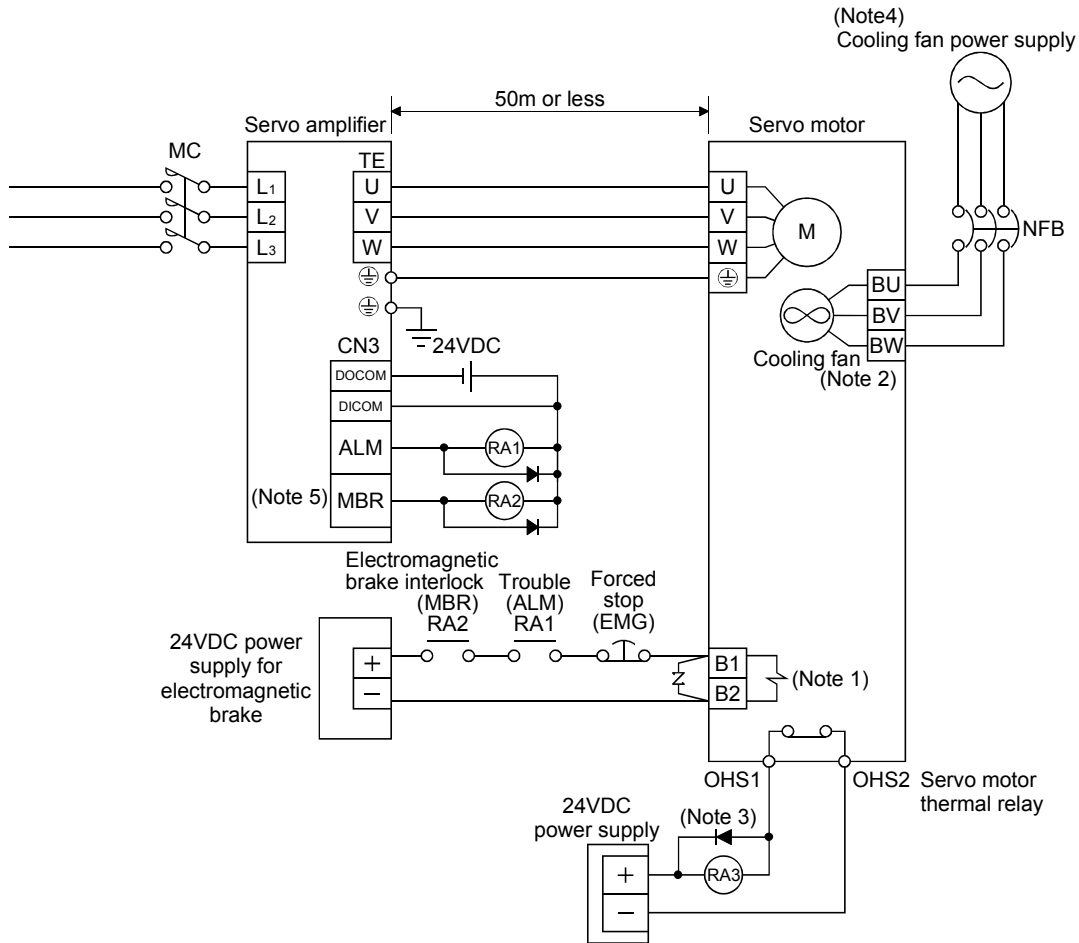
2. There is no BW when the power supply of the cooling fan is a 1-phase.

3. Configure the power supply circuit which turns off the magnetic contactor after detection of servo motor thermal.

4. When using a servo motor with an electromagnetic brake, assign the electromagnetic brake interlock (MBR) to external output signal in the parameters No.PD09 to PD11.

4. SIGNALS AND WIRING

2) 400V class



Note 1. There is no polarity in electromagnetic brake terminals B1 and B2.

2. There is no BW when the power supply of the cooling fan is a 1-phase.

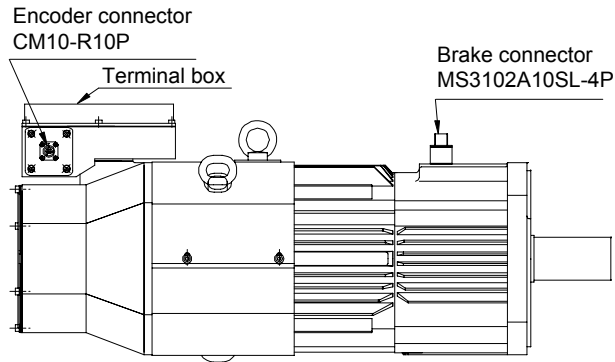
3. Configure the power supply circuit which turns off the magnetic contactor after detection of servo motor thermal.

4. For the cooling fan power supply, refer to (3) (b) in this section.

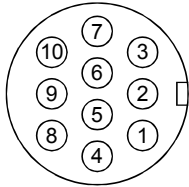
5. When using a servo motor with an electromagnetic brake, assign the electromagnetic brake interlock (MBR) to external output signal in the parameters No.PD09 to PD11.

4. SIGNALS AND WIRING

(b) Servo motor terminals

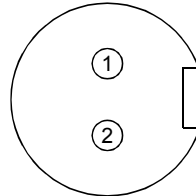


Encoder connector signal allotment
CM10-R10P



Terminal No.	Signal
1	MR
2	MRR
3	
4	BAT
5	LG
6	
7	
8	P5
9	
10	SHD

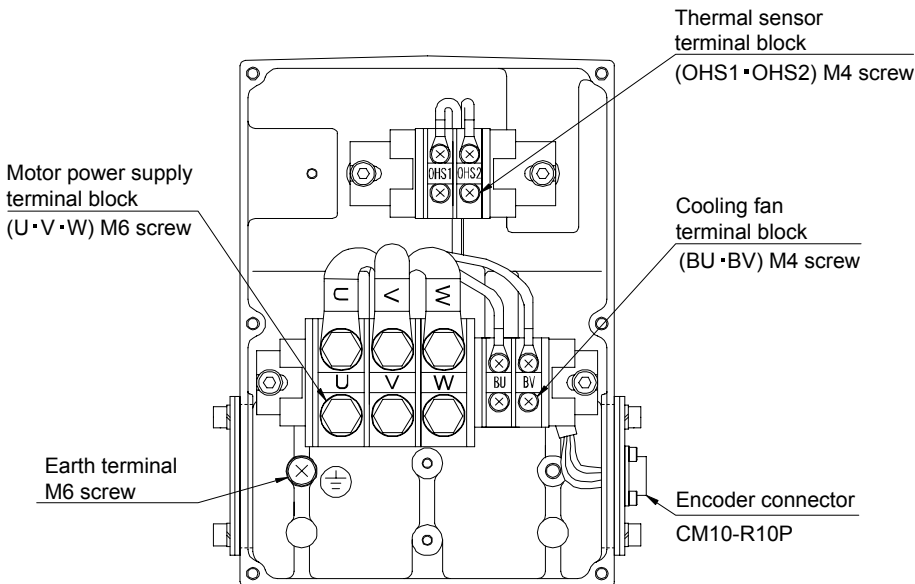
Brake connector signal allotment
MS3102A10SL-4P



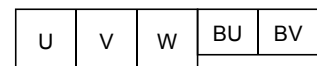
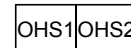
Terminal No.	Signal
1	B1 (Note)
2	B2 (Note)

Note. For the motor with an electromagnetic brake, supply electromagnetic brake power (24VDC). There is no polarity.

Terminal box inside (HA-LP601(4) · 701M(4) · 11K2(4))

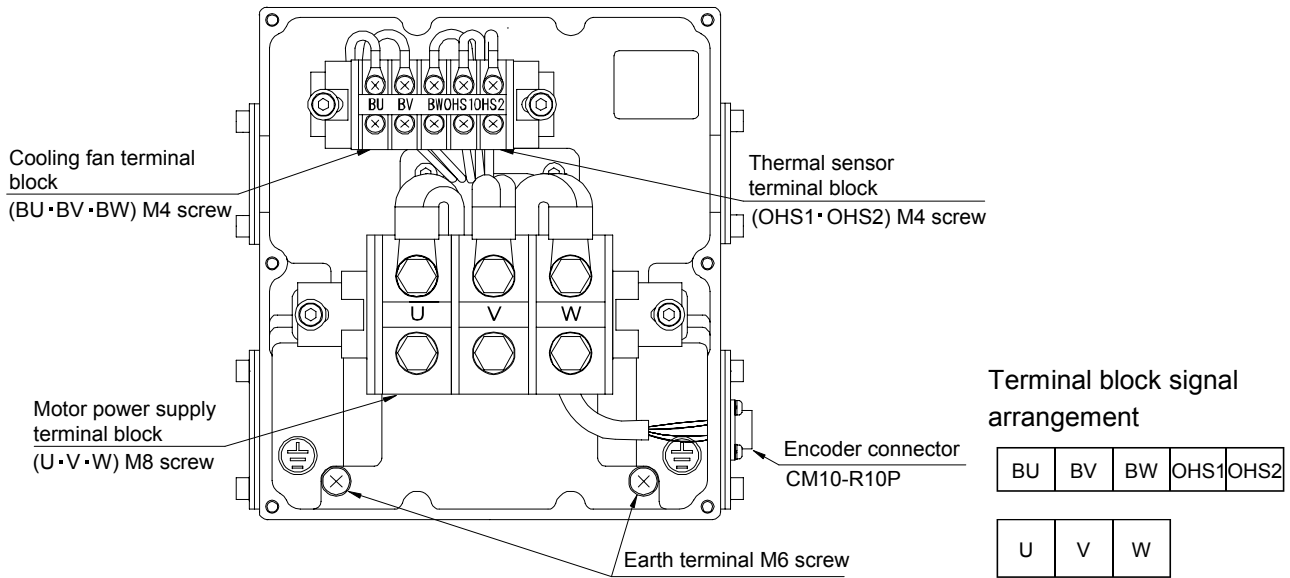


Terminal block signal arrangement

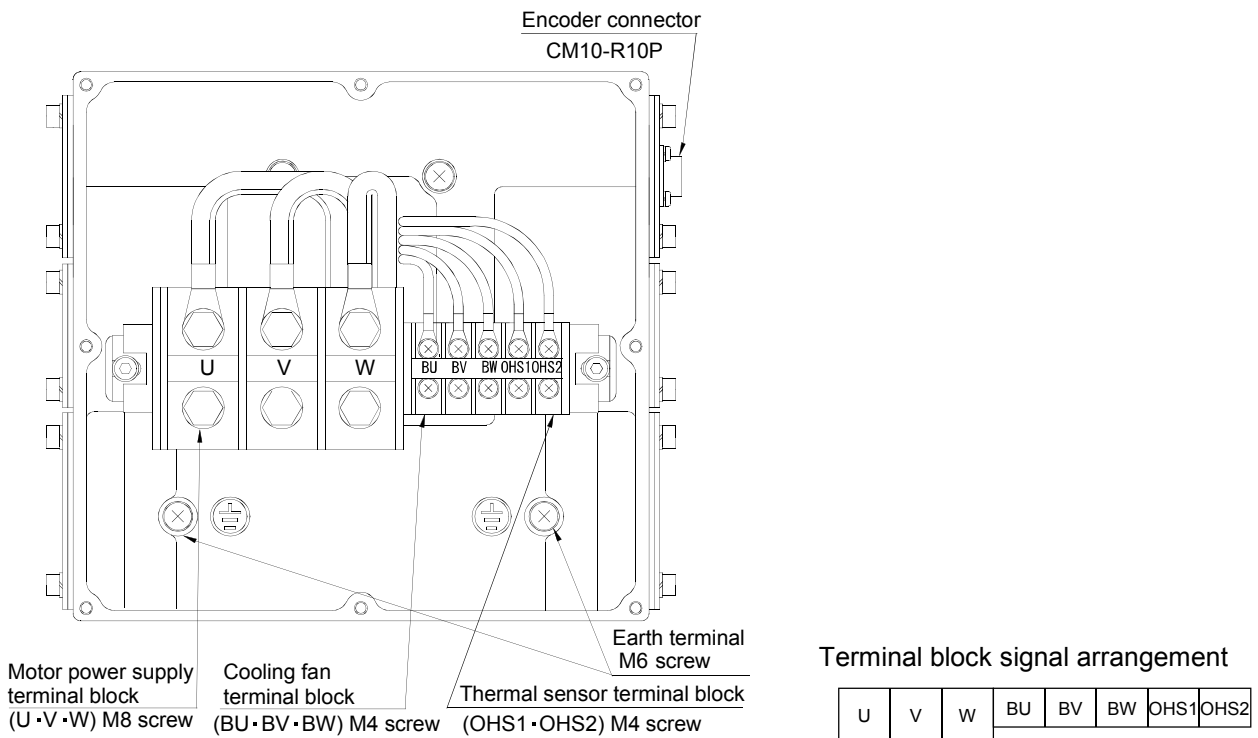


4. SIGNALS AND WIRING

Terminal box inside (HA-LP801(4) • 12K1(4) • 11K1M(4) • 15K1M(4) • 15K2(4) • 22K2(4))

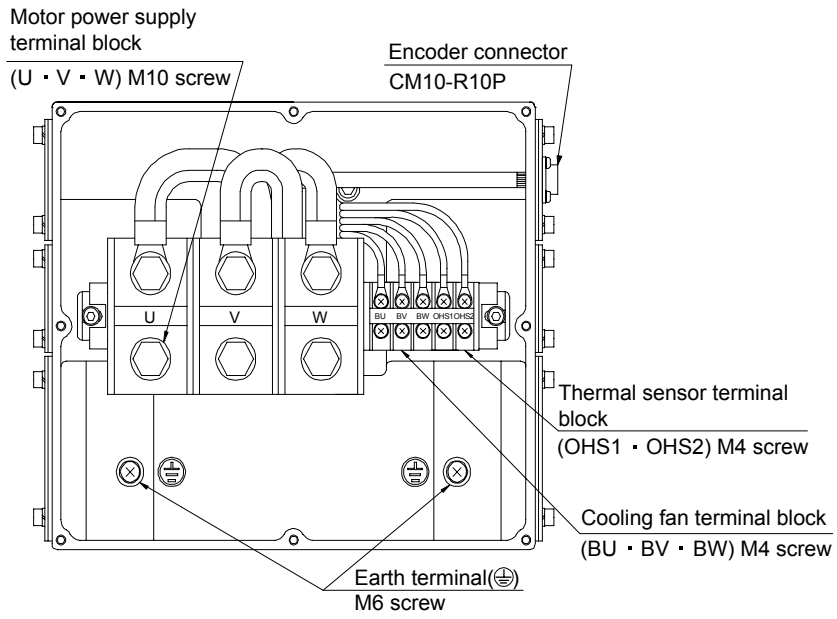


Terminal box inside (HA-LP15K1(4) • 20K1(4) • 22K1M(4))



4. SIGNALS AND WIRING

Terminal box inside (HA-LP25K1)



Terminal block signal arrangement

U	V	W	BU	BV	BW	OHS1	OHS2
---	---	---	----	----	----	------	------

4. SIGNALS AND WIRING

Signal name	Abbreviation	Description																																																									
Power supply	U · V · W	Connect to the motor output terminals (U, V, W) of the servo amplifier. During power-on, do not open or close the motor power line. Otherwise, a malfunction or faulty may occur.																																																									
Cooling fan	(Note) BU · BV · BW	<p>Supply power which satisfies the following specifications.</p> <table border="1"> <thead> <tr> <th>Servo motor</th> <th>Voltage division</th> <th>Voltage/ frequency</th> <th>Power consumption [W]</th> <th>Rated current [A]</th> </tr> </thead> <tbody> <tr> <td rowspan="2">HA-LP601, 701M, 11K2</td> <td rowspan="2">200V class</td> <td>1-phase 200 to 220VAC 50Hz</td> <td>42(50Hz) 54(60Hz)</td> <td>0.21(50Hz) 0.25(60Hz)</td> </tr> <tr> <td>1-phase 200 to 230VAC 60Hz</td> <td></td> <td></td> </tr> <tr> <td rowspan="2">HA-LP801, 12K1, 11K1M, 15K1M, 15K2, 22K2</td> <td rowspan="2"></td> <td>3-phase 200 to 230VAC 50Hz/60Hz</td> <td>62(50Hz) 76(60Hz)</td> <td>0.18(50Hz) 0.17(60Hz)</td> </tr> <tr> <td></td> <td>65(50Hz) 85(60Hz)</td> <td>0.20(50Hz) 0.22(60Hz)</td> </tr> <tr> <td>HA-LP15K1, 20K1, 22K1M</td> <td></td> <td></td> <td>120(50Hz) 175(60Hz)</td> <td>0.65(50Hz) 0.80(60Hz)</td> </tr> <tr> <td>HA-LP25K1</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td rowspan="2">HA-LP6014, 701M4, 11K24</td> <td rowspan="2">400V class</td> <td>1-phase 200 to 220VAC 50Hz</td> <td>42(50Hz) 54(60Hz)</td> <td>0.21(50Hz) 0.25(60Hz)</td> </tr> <tr> <td>1-phase 200 to 230VAC 60Hz</td> <td></td> <td></td> </tr> <tr> <td rowspan="2">HA-LP8014, 12K14, 11K1M4, 15K1M4, 15K24, 22K24</td> <td rowspan="2"></td> <td>3-phase 380 to 440VAC 50Hz</td> <td>62(50Hz) 76(60Hz)</td> <td>0.14(50Hz) 0.11(60Hz)</td> </tr> <tr> <td>3-phase 380 to 480VAC 60Hz</td> <td></td> <td></td> </tr> <tr> <td>HA-LP15K14, 20K14, 22K1M4</td> <td></td> <td>3-phase 380 to 460VAC 50Hz</td> <td>65(50Hz) 85(60Hz)</td> <td>0.12(50Hz) 0.14(60Hz)</td> </tr> <tr> <td>HA-LP25K14</td> <td></td> <td>3-phase 380 to 480VAC 60Hz</td> <td>110(50Hz) 150(60Hz)</td> <td>0.20(50Hz) 0.22(60Hz)</td> </tr> </tbody> </table>	Servo motor	Voltage division	Voltage/ frequency	Power consumption [W]	Rated current [A]	HA-LP601, 701M, 11K2	200V class	1-phase 200 to 220VAC 50Hz	42(50Hz) 54(60Hz)	0.21(50Hz) 0.25(60Hz)	1-phase 200 to 230VAC 60Hz			HA-LP801, 12K1, 11K1M, 15K1M, 15K2, 22K2		3-phase 200 to 230VAC 50Hz/60Hz	62(50Hz) 76(60Hz)	0.18(50Hz) 0.17(60Hz)		65(50Hz) 85(60Hz)	0.20(50Hz) 0.22(60Hz)	HA-LP15K1, 20K1, 22K1M			120(50Hz) 175(60Hz)	0.65(50Hz) 0.80(60Hz)	HA-LP25K1					HA-LP6014, 701M4, 11K24	400V class	1-phase 200 to 220VAC 50Hz	42(50Hz) 54(60Hz)	0.21(50Hz) 0.25(60Hz)	1-phase 200 to 230VAC 60Hz			HA-LP8014, 12K14, 11K1M4, 15K1M4, 15K24, 22K24		3-phase 380 to 440VAC 50Hz	62(50Hz) 76(60Hz)	0.14(50Hz) 0.11(60Hz)	3-phase 380 to 480VAC 60Hz			HA-LP15K14, 20K14, 22K1M4		3-phase 380 to 460VAC 50Hz	65(50Hz) 85(60Hz)	0.12(50Hz) 0.14(60Hz)	HA-LP25K14		3-phase 380 to 480VAC 60Hz	110(50Hz) 150(60Hz)	0.20(50Hz) 0.22(60Hz)
Servo motor	Voltage division	Voltage/ frequency	Power consumption [W]	Rated current [A]																																																							
HA-LP601, 701M, 11K2	200V class	1-phase 200 to 220VAC 50Hz	42(50Hz) 54(60Hz)	0.21(50Hz) 0.25(60Hz)																																																							
		1-phase 200 to 230VAC 60Hz																																																									
HA-LP801, 12K1, 11K1M, 15K1M, 15K2, 22K2		3-phase 200 to 230VAC 50Hz/60Hz	62(50Hz) 76(60Hz)	0.18(50Hz) 0.17(60Hz)																																																							
			65(50Hz) 85(60Hz)	0.20(50Hz) 0.22(60Hz)																																																							
HA-LP15K1, 20K1, 22K1M			120(50Hz) 175(60Hz)	0.65(50Hz) 0.80(60Hz)																																																							
HA-LP25K1																																																											
HA-LP6014, 701M4, 11K24	400V class	1-phase 200 to 220VAC 50Hz	42(50Hz) 54(60Hz)	0.21(50Hz) 0.25(60Hz)																																																							
		1-phase 200 to 230VAC 60Hz																																																									
HA-LP8014, 12K14, 11K1M4, 15K1M4, 15K24, 22K24		3-phase 380 to 440VAC 50Hz	62(50Hz) 76(60Hz)	0.14(50Hz) 0.11(60Hz)																																																							
		3-phase 380 to 480VAC 60Hz																																																									
HA-LP15K14, 20K14, 22K1M4		3-phase 380 to 460VAC 50Hz	65(50Hz) 85(60Hz)	0.12(50Hz) 0.14(60Hz)																																																							
HA-LP25K14		3-phase 380 to 480VAC 60Hz	110(50Hz) 150(60Hz)	0.20(50Hz) 0.22(60Hz)																																																							
Motor thermal relay	OHS1 · OHS2	OHS1—OHS2 are opened when heat is generated to an abnormal temperature. Maximum rating: 125VAC/DC, 3A or 250VAC/DC, 2A Minimum rating: 6VAC/DC, 0.15A																																																									
Earth terminal	⊕	For grounding, connect to the earth of the control box via the earth terminal of the servo amplifier.																																																									

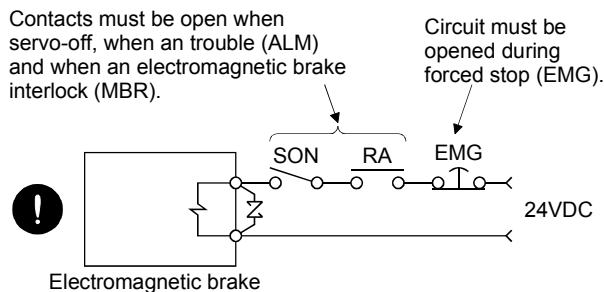
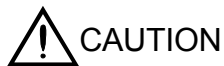
Note. There is no BW when the power supply of the cooling fan is a 1-phase.

4. SIGNALS AND WIRING

4.11 Servo motor with an electromagnetic brake

4.11.1 Safety precautions

- Configure the electromagnetic brake operation circuit so that it is activated not only by the servo amplifier signals but also by an external forced stop signal.



- The electromagnetic brake is provided for holding purpose and must not be used for ordinary braking.
- Before performing the operation, be sure to confirm that the electromagnetic brake operates properly.

POINT

- Refer to the Servo Motor Instruction Manual (Vol.2) for specifications such as the power supply capacity and operation delay time of the electromagnetic brake.

Note the following when the servo motor equipped with an electromagnetic brake is used.

- 1) Do not share the 24VDC interface power supply between the interface and electromagnetic brake. Always use the power supply designed exclusively for the electromagnetic brake.
- 2) The brake will operate when the power (24VDC) switches off.
- 3) Switch off the servo-on (RYn0) after the servo motor has stopped.

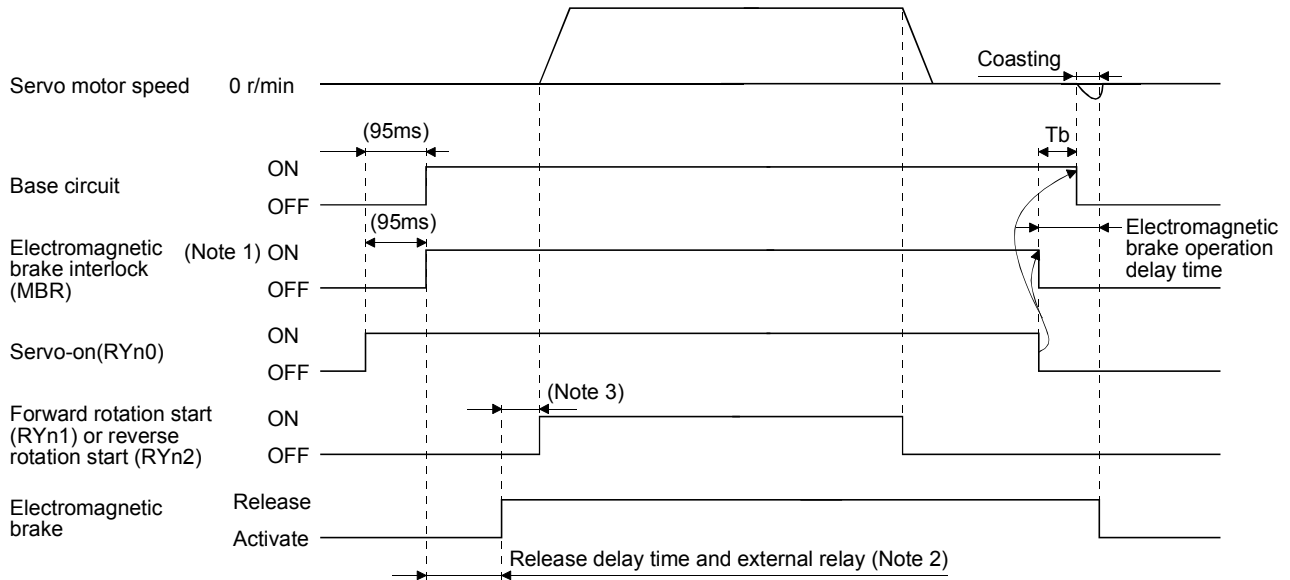
Using parameter No.PC16 (electromagnetic brake sequence output), set a time delay (Tb) at servo-off from electromagnetic brake operation to base circuit shut-off as in the timing chart shown in section 4.11.2 in this section.

4. SIGNALS AND WIRING

4.11.2 Timing charts

(1) Servo-on (RYn0) command (from controller) ON/OFF

T_b [ms] after the servo-on (RYn0) is switched off, the servo lock is released and the servo motor coasts. If the electromagnetic brake is made valid in the servo lock status, the brake life may be shorter. Therefore, when using the electromagnetic brake in a vertical lift application or the like, set T_b to about the same as the electromagnetic brake operation delay time to prevent a drop.



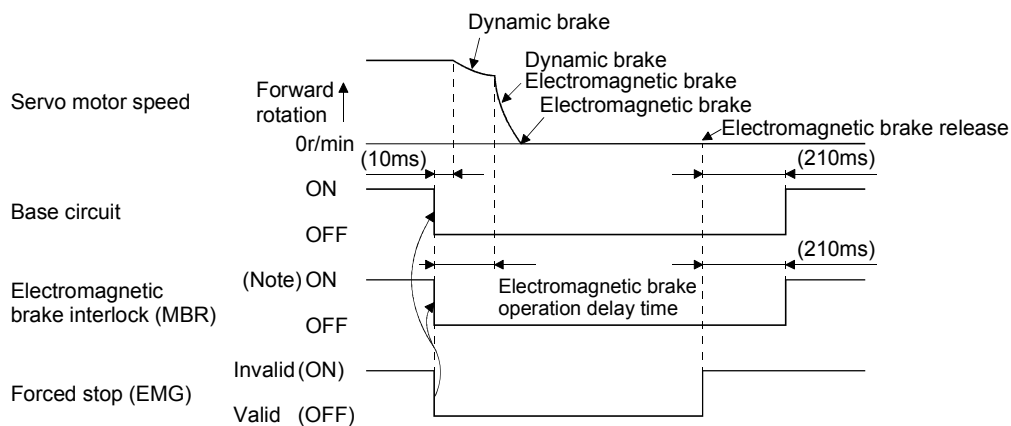
Note 1. ON: Electromagnetic brake is not activated.

OFF: Electromagnetic brake is activated.

2. Electromagnetic brake is released after delaying for the release delay time of electromagnetic brake and operation time of external circuit relay. For the release delay time of electromagnetic brake, refer to the Servo Motor Instruction Manual (Vol.2).

3. After the electromagnetic brake is released, turn ON the RYn1 or RYn2.

(2) Forced stop (EMG) ON/OFF

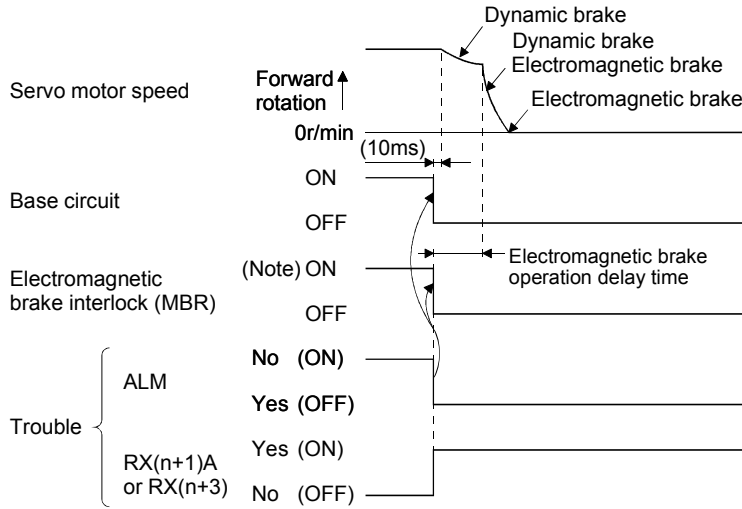


Note. ON: Electromagnetic brake is not activated.

OFF: Electromagnetic brake is activated.

4. SIGNALS AND WIRING

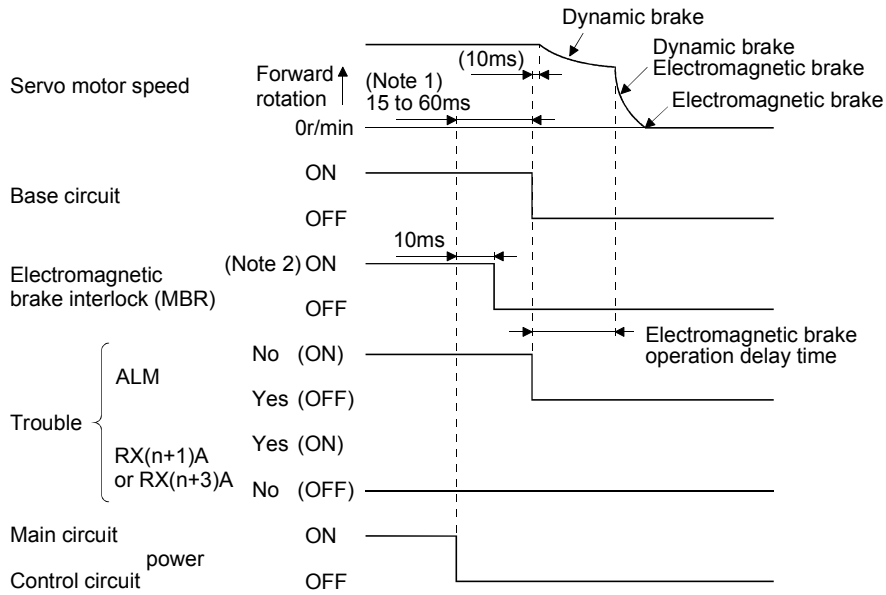
(3) Alarm occurrence



Note. ON: Electromagnetic brake is not activated.

OFF: Electromagnetic brake is activated.

(4) Both main and control circuit power supplies off



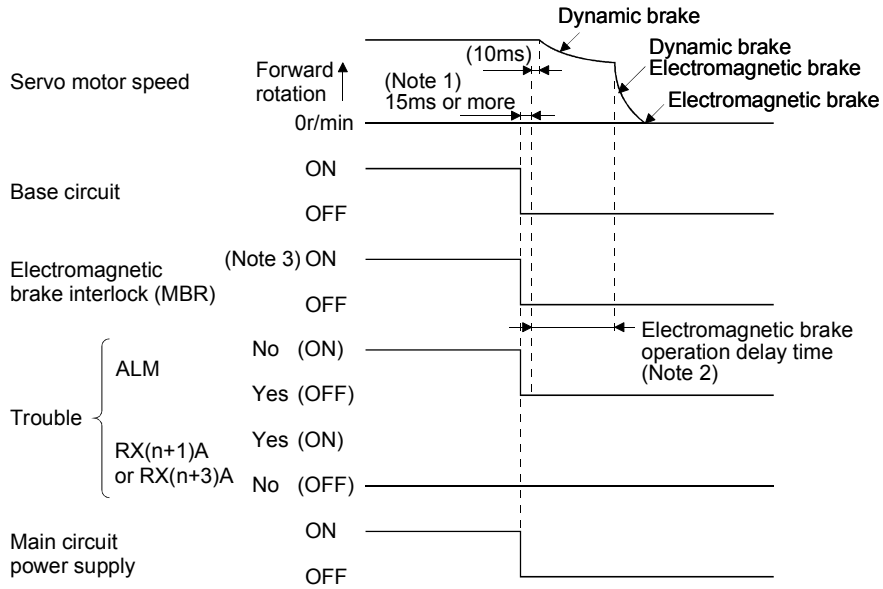
Note 1. Changes with the operating status.

2. ON: Electromagnetic brake is not activated.

OFF: Electromagnetic brake is activated.

4. SIGNALS AND WIRING

(5) Only main circuit power supply off (control circuit power supply remains on)



Note 1. Changes with the operating status.

2. When the main circuit power supply is off in a motor stop status, the main circuit off warning (AE9) occurs and the trouble (ALM) does not turn off.

3. ON: Electromagnetic brake is not activated.

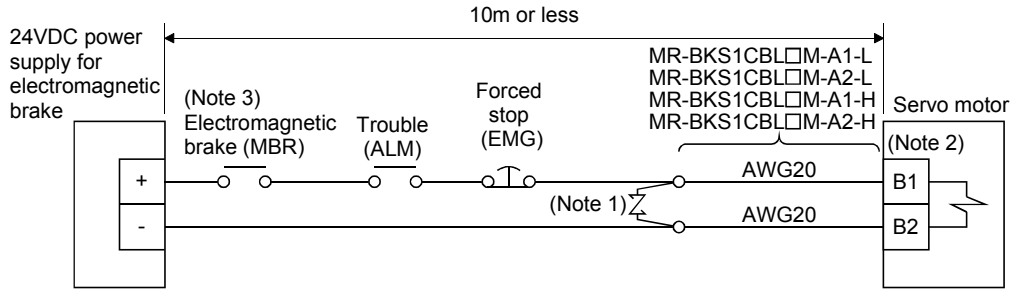
OFF: Electromagnetic brake is activated.

4. SIGNALS AND WIRING

4.11.3 Wiring diagrams (HF-MP series • HF-KP series servo motor)

POINT
<ul style="list-style-type: none"> • For HF-SP series • HC-RP series • HC-UP series • HC-LP series servo motors, refer to section 4.10.2 (2).

(1) When cable length is 10m or less



Note 1. Connect a surge absorber as close to the servo motor as possible.

2. There is no polarity in electromagnetic brake terminals (B1 and B2).

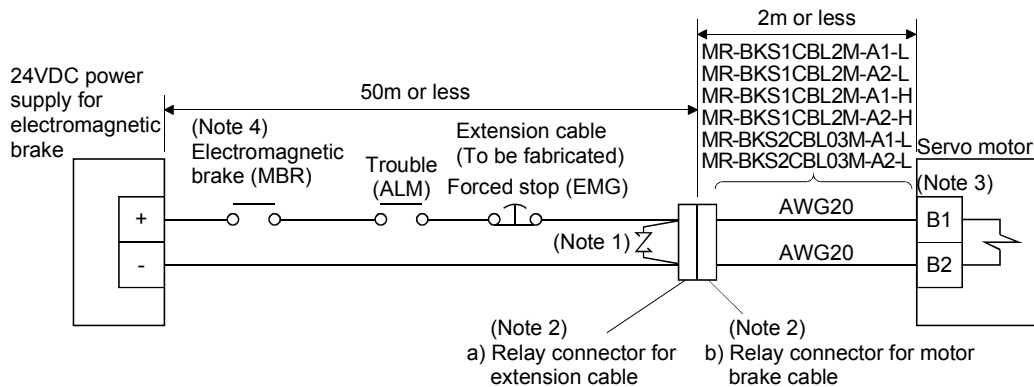
3. When using a servo motor with an electromagnetic brake, assign the electromagnetic brake interlock (MBR) to external output signal in the parameters No.PD09 to PD11.

When fabricating the motor brake cable MR-BKS1CBL-□M-H, refer to section 14.1.4.

(2) When cable length exceeds 10m

When the cable length exceeds 10m, fabricate an extension cable as shown below on the customer side. In this case, the motor brake cable should be within 2m long.

Refer to section 14.9 for the wire used for the extension cable.



Note 1. Connect a surge absorber as close to the servo motor as possible.

2. Use of the following connectors is recommended when ingress protection (IP65) is necessary.

Relay connector	Description	Protective structure
a) Relay connector for extension cable	CM10-CR2P-* (DDK) Wire size: S, M, L	IP65
b) Relay connector for motor brake cable	CM10-SP2S-* (DDK) Wire size: S, M, L	IP65

3. There is no polarity in electromagnetic brake terminals (B1 and B2).

4. When using a servo motor with an electromagnetic brake, assign the electromagnetic brake interlock (MBR) to external output signal in the parameters No.PD09 to PD11.

4. SIGNALS AND WIRING

4.12 Grounding

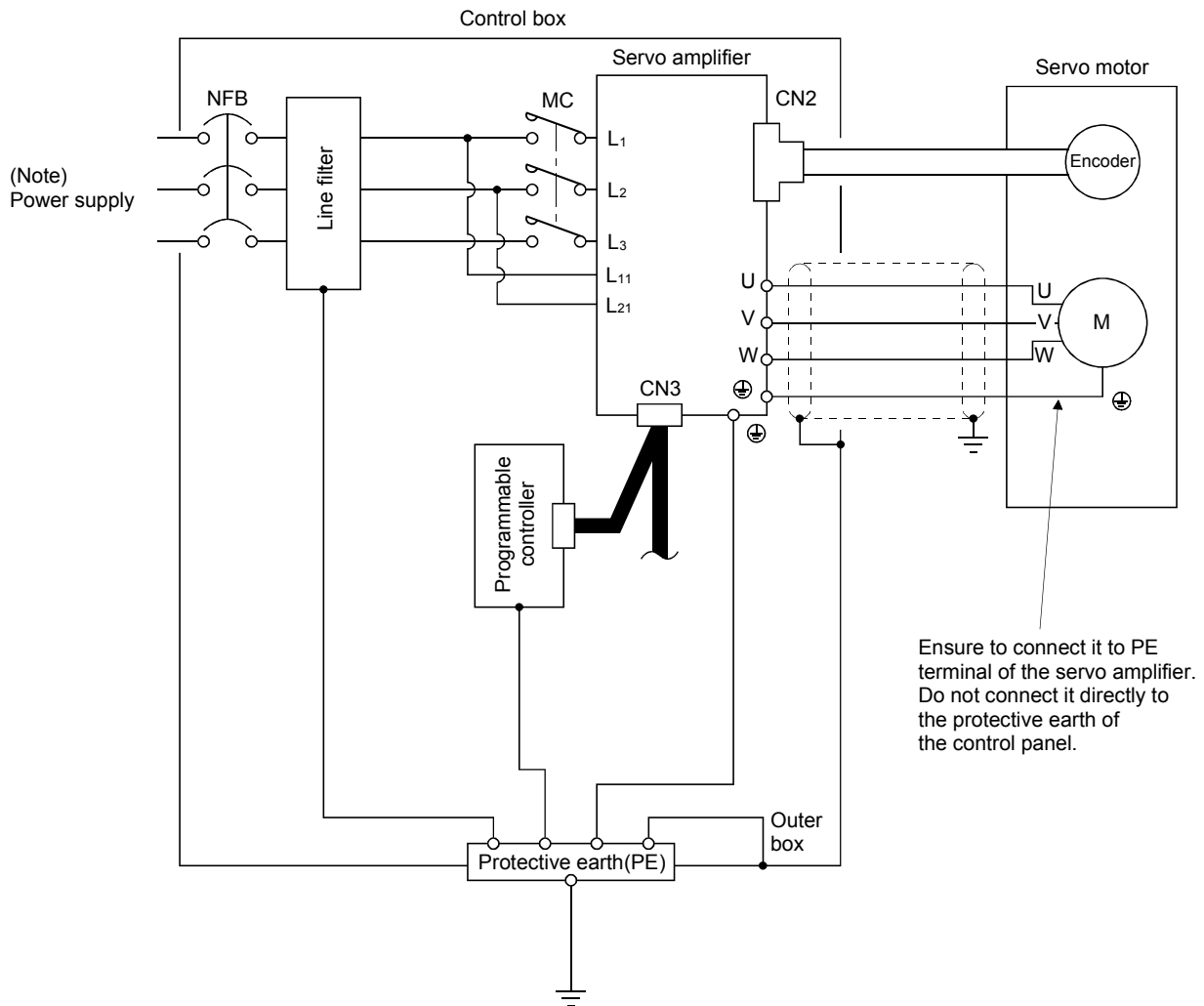


WARNING

- Ground the servo amplifier and servo motor securely.
- To prevent an electric shock, always connect the protective earth (PE) terminal (terminal marked ⊕) of the servo amplifier with the protective earth (PE) of the control box.

The servo amplifier switches the power transistor on-off to supply power to the servo motor. Depending on the wiring and ground cable routing, the servo amplifier may be affected by the switching noise (due to di/dt and dv/dt) of the transistor. To prevent such a fault, refer to the following diagram and always ground.

To conform to the EMC Directive, refer to the EMC Installation Guidelines (IB(NA)67310).



Note. For 1-phase 200 to 230VAC or 1-phase 100 to 120VAC, connect the power supply to L1 • L2 and leave L3 open. There is no L3 for 1-phase 100 to 120VAC power supply. Refer to section 1.2 for the power supply specification.

5. OPERATION

5. OPERATION



WARNING

Do not operate the switches with wet hands. You may get an electric shock.



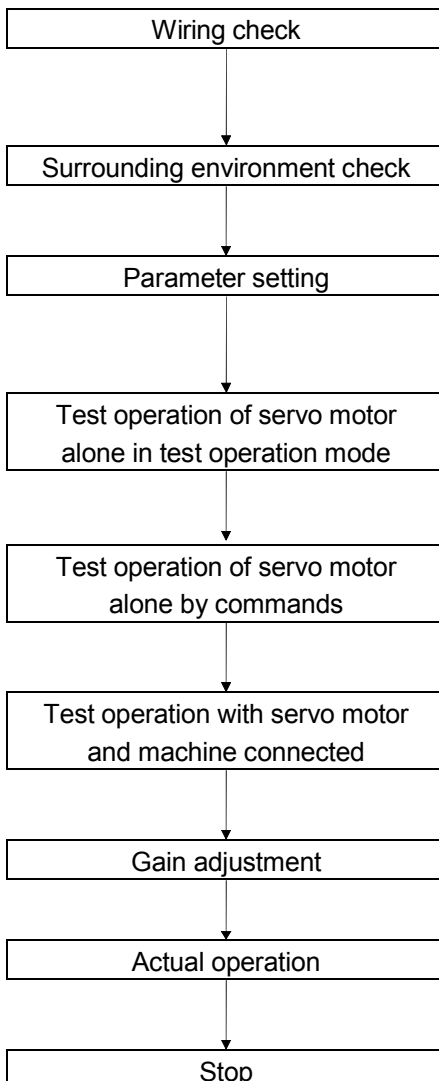
CAUTION

- Before starting operation, check the parameters. Some machines may perform unexpected operation.
- Take safety measures, e.g. provide covers, to prevent accidental contact of hands and parts (cables, etc.) with the servo amplifier heat sink, regenerative resistor, servo motor, etc. since they may be hot while power is on or for some time after power-off. Their temperatures may be high and you may get burnt or a parts may damaged.
- During operation, never touch the rotating parts of the servo motor. Doing so can cause injury.

5.1 Switching power on for the first time

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

5.1.1 Startup procedure



Check whether the servo amplifier and servo motor are wired correctly using visual inspection, DO forced output function (Section 7.7.4, 8.5.7 (4)), etc. (Refer to section 5.1.2.)

Check the surrounding environment of the servo amplifier and servo motor. (Refer to section 5.1.3.)

Set the parameters as necessary, such as the used control mode and regenerative option selection with the parameter unit or MR Configurator. (Refer to chapter 6.)

For the test operation, with the servo motor disconnected from the machine and operated at the speed as low as possible, and check whether the servo motor rotates correctly. (Refer to sections 7.7 and 8.5.7.)

For the test operation with the servo motor disconnected from the machine and operated at the speed as low as possible, and check whether the servo motor rotates correctly.

Connect the servo motor with the machine, give operation commands from the host command device, and check machine motions.

Make gain adjustment to optimize the machine motions. (Refer to chapter 9.)

Stop giving commands and stop operation.

5. OPERATION

5.1.2 Wiring check

(1) Power supply system wiring

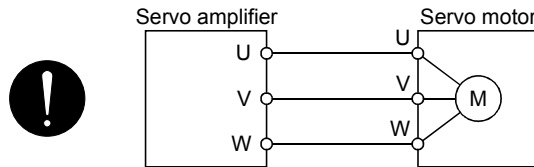
Before switching on the main circuit and control circuit power supplies, check the following items.

(a) Power supply system wiring

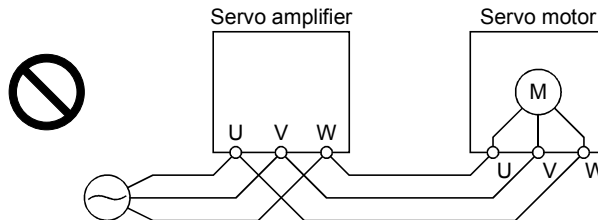
The power supplied to the power input terminals (L1, L2, L3, L11, L21) of the servo amplifier should satisfy the defined specifications. (Refer to section 1.2.)

(b) Connection of servo amplifier and servo motor

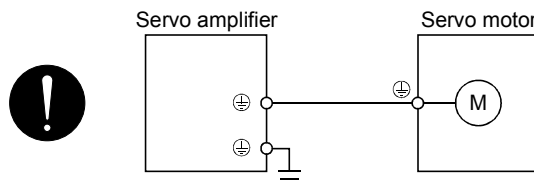
1) The servo motor power supply terminals (U, V, W) of the servo amplifier match in phase with the power input terminals (U, V, W) of the servo motor.



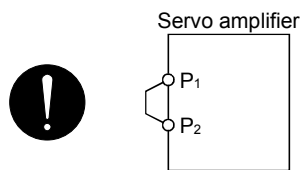
2) The power supplied to the servo amplifier should not be connected to the servo motor power supply terminals (U, V, W). To do so will fail the connected servo amplifier and servo motor.



3) The earth terminal of the servo motor is connected to the PE terminal of the servo amplifier.



4) P₁-P₂ (For 11kW or more, P₁-P) should be connected.



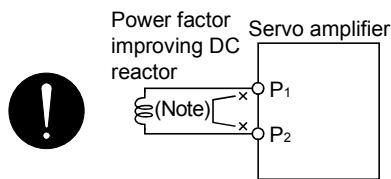
(c) When option and auxiliary equipment are used

1) When regenerative option is used under 3.5kW for 200V class and 2kW for 400V class

- The lead between P terminal and D terminal of CNP2 connector should not be connected.
- The generative brake option should be connected to P terminal and C terminal.
- A twisted cable should be used. (Refer to section 14.2.)

5. OPERATION

- 2) When regenerative option is used over 5kW for 200V class and 3.5kW for 400V class
 - The lead of built-in regenerative resistor connected to P terminal and C terminal of TE1 terminal block should not be connected.
 - The generative brake option should be connected to P terminal and C terminal.
 - A twisted cable should be used when wiring is over 5m and under 10m. (Refer to section 14.2.)
- 3) When brake unit and power regenerative converter are used over 5kW
 - The lead of built-in regenerative resistor connected to P terminal and C terminal of TE1 terminal block should not be connected.
 - Brake unit, power regenerative converter or power regeneration common converter should be connected to P terminal and N terminal. (Refer to section 14.3 to 14.5.)
- 4) The power factor improving DC reactor should be connected P₁ and P₂ (For 11kW or more, P₁ and P). (Refer to section 14.11.)



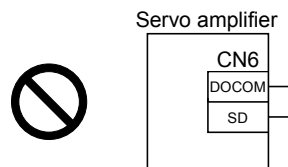
Note. Always disconnect P₁ and P₂ (For 11kW or more, P₁ and P).

(2) I/O signal wiring

- (a) The I/O signals should be connected correctly.

Use DO forced output to forcibly turn on/off the pins of the CN6 connector. This function can be used to perform a wiring check. (Refer to section 7.7.4.) In this case, switch on the control circuit power supply only.

- (b) 24VDC or higher voltage is not applied to the pins of connectors CN6.
- (c) SD and DOCOM of connector CN6 is not shorted.



5.1.3 Surrounding environment

(1) Cable routing

- (a) The wiring cables are free from excessive force.
- (b) The encoder cable should not be used in excess of its flex life. (Refer to section 13.4.)
- (c) The connector part of the servo motor should not be strained.

(2) Environment

Signal cables and power cables are not shorted by wire offcuts, metallic dust or the like.

5. OPERATION

5.2 Startup

5.2.1 Power on and off procedures

(1) Power-on

Switch power on in the following procedure. Always follow this procedure at power-on.

- 1) Switch off the servo-on (RYn0).
- 2) Make sure that the Forward rotation start (RYn1) and Reverse rotation start (RYn2) are off.
- 3) Switch on the main circuit power supply and control circuit power supply.

When main circuit power/control circuit power is switched on, the servo amplifier display shows "b01" (if the servo amplifier has the station number of 1).



In the absolute position detection system, first power-on results in the absolute position lost (A25) alarm and the servo system cannot be switched on.

The alarm can be deactivated then switching power off once and on again.

Also in the absolute position detection system, if power is switched on at the servo motor speed of 3000r/min or higher, position mismatch may occur due to external force or the like. Power must therefore be switched on when the servo motor is at a stop.

(2) Power-off

- 1) Make sure that the Forward rotation start (RYn1) and Reverse rotation start (RYn2) are off.
- 2) Switch off the Servo-on (RYn0).
- 3) Switch off the main circuit power supply and control circuit power supply.

5.2.2 Stop

In any of the following statuses, the servo amplifier interrupts and stops the operation of the servo motor. Refer to section 4.11 for the servo motor equipped with an electromagnetic brake.

(a) Servo-on (RYn0) OFF

The base circuit is shut off and the servo motor coasts.

(b) Alarm occurrence

When an alarm occurs, the base circuit is shut off and the dynamic brake is operated to bring the servo motor to a sudden stop.

(c) Forced stop (EMG) OFF

The base circuit is shut off and the dynamic brake is operated to bring the servo motor to a sudden stop. The servo forced stop warning (AE6) occurs.

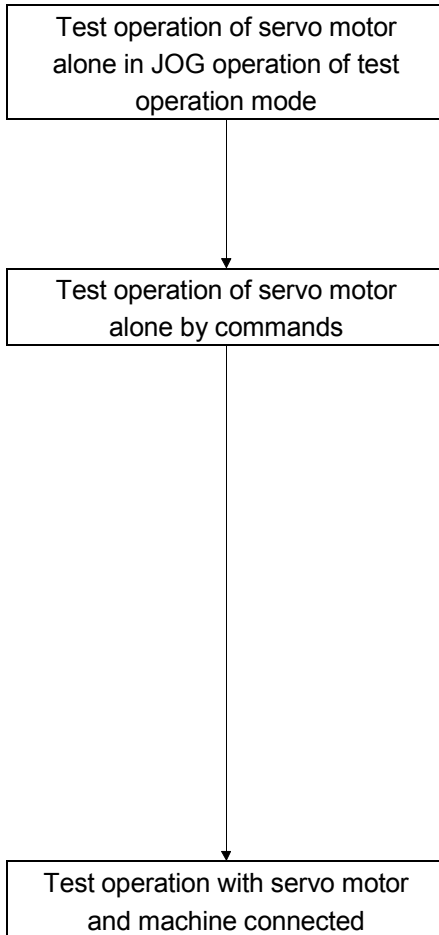
(d) Forward rotation stroke end (LSP), reverse rotation stroke end (LSN) OFF

The droop pulse value is erased and the servo motor is stopped and servo-locked. It can be run in the opposite direction.

5. OPERATION

5.2.3 Test operation

Before starting actual operation, perform test operation to make sure that the machine operates normally. Refer to section 5.2.1 for the power on and off methods of the servo amplifier.



In this step, confirm that the servo amplifier and servo motor operate normally.

With the servo motor disconnected from the machine, use the test operation mode and check whether the servo motor correctly rotates at the slowest speed. Refer to section 7.7 and 8.5.7 for the test operation mode.

In this step, confirm that the servo motor correctly rotates at the slowest speed under the commands from the command device. Make sure that the servo motor rotates in the following procedure.

- 1) Switch on the Forced stop (EMG) and Servo-on (RYn0). When the servo amplifier is put in a servo-on status, the Ready (RD) switches on.
- 2) Switch on the Forward rotation stroke end (LSP) or Reverse rotation stroke end (LSN).
- 3) When the point table is designated to switch on the forward rotation start (RYn1) or reverse rotation start (RYn2), the servo motor starts rotating. Give a low speed command at first and check the rotation direction, etc. of the servo motor. If the servo motor does not operate in the intended direction, check the input signal.

In this step, connect the servo motor with the machine and confirm that the machine operates normally under the commands from the command device.

Make sure that the servo motor rotates in the following procedure.

- 1) Switch on the Forced stop (EMG) and Servo-on (RYn0). When the servo amplifier is put in a servo-on status, the Ready (RD) switches on.
- 2) Switch on the Forward rotation stroke end (LSP) or Reverse rotation stroke end (LSN).
- 3) When the point table is specified from the command device and the forward rotation start (RYn1) or reverse rotation start (RYn2) is turned ON, the servo motor starts rotating. Give a low speed command at first and check the operation direction, etc. of the machine. If the machine does not operate in the intended direction, check the input signal. In the status display, check for any problems of the servo motor speed, load ratio, etc.
- 4) Then, check automatic operation with the program of the command device.

5. OPERATION

5.2.4 Parameter setting

POINT								
<ul style="list-style-type: none"> The encoder cable MR-EKCBL□M-L/H for the HF-MP series • HF-KP series servo motor requires the parameter No.PC22 setting to be changed depending on its length. Check whether the parameter is set correctly. If it is not set correctly, the encoder error 1 (A16) will occur at power-on. <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Encoder cable</th> <th>Parameter No.PC22 setting</th> </tr> </thead> <tbody> <tr> <td>MR-EKCBL20M-L/H</td> <td>0 □ □ □ (initial value)</td> </tr> <tr> <td>MR-EKCBL30M-H</td> <td rowspan="3">1 □ □ □</td> </tr> <tr> <td>MR-EKCBL40M-H</td> </tr> <tr> <td>MR-EKCBL50M-H</td> </tr> </tbody> </table>	Encoder cable	Parameter No.PC22 setting	MR-EKCBL20M-L/H	0 □ □ □ (initial value)	MR-EKCBL30M-H	1 □ □ □	MR-EKCBL40M-H	MR-EKCBL50M-H
Encoder cable	Parameter No.PC22 setting							
MR-EKCBL20M-L/H	0 □ □ □ (initial value)							
MR-EKCBL30M-H	1 □ □ □							
MR-EKCBL40M-H								
MR-EKCBL50M-H								

The servo amplifier can be used by merely changing the basic setting parameters (No.PA □ □) mainly. As necessary, set the gain filter parameters (No.PB □ □), extension setting parameters (No.PC □ □) and I/O setting parameters (No.PD □ □).

Parameter group	Main description
Basic setting parameter (No.PA □ □)	Set the basic setting parameters first. Generally, operation can be performed by merely setting this parameter group. In this parameter group, set the following items. Control mode selection (select the position control mode) Regenerative option selection Absolute position detection system selection Setting of command input pulses per revolution Electronic gear setting Auto tuning selection and adjustment In-position range setting Torque limit setting Command pulse input form selection Servo motor rotation direction selection Encoder output pulse setting
Gain filter parameter (No.PB □ □)	If satisfactory operation cannot be achieved by the gain adjustment made by auto tuning, execute in-depth gain adjustment using this parameter group. This parameter group must also be set when the gain changing function is used.
Extension setting parameter (No.PC □ □)	This parameter group is unique to MR-J3-□T servo amplifier.
I/O setting parameter (No.PD □ □)	Used when changing the I/O devices of the servo amplifier.

5. OPERATION

5.2.5 Point table setting

Set necessary items to the point table before starting operation. The following table indicates the items that must be set.

Name	Description
Position data	Set the position data for movement.
Servo motor speed	Set the command speed of the servo motor for execution of positioning.
Acceleration time constant	Set the acceleration time constant.
Deceleration time constant	Set the deceleration time constant.
Dwell	Set the waiting time when performing automatic continuous operation.
Auxiliary function	Set when performing automatic continuous operation.

Refer to section 5.4.2 for details of the point table.

5.2.6 Actual operation

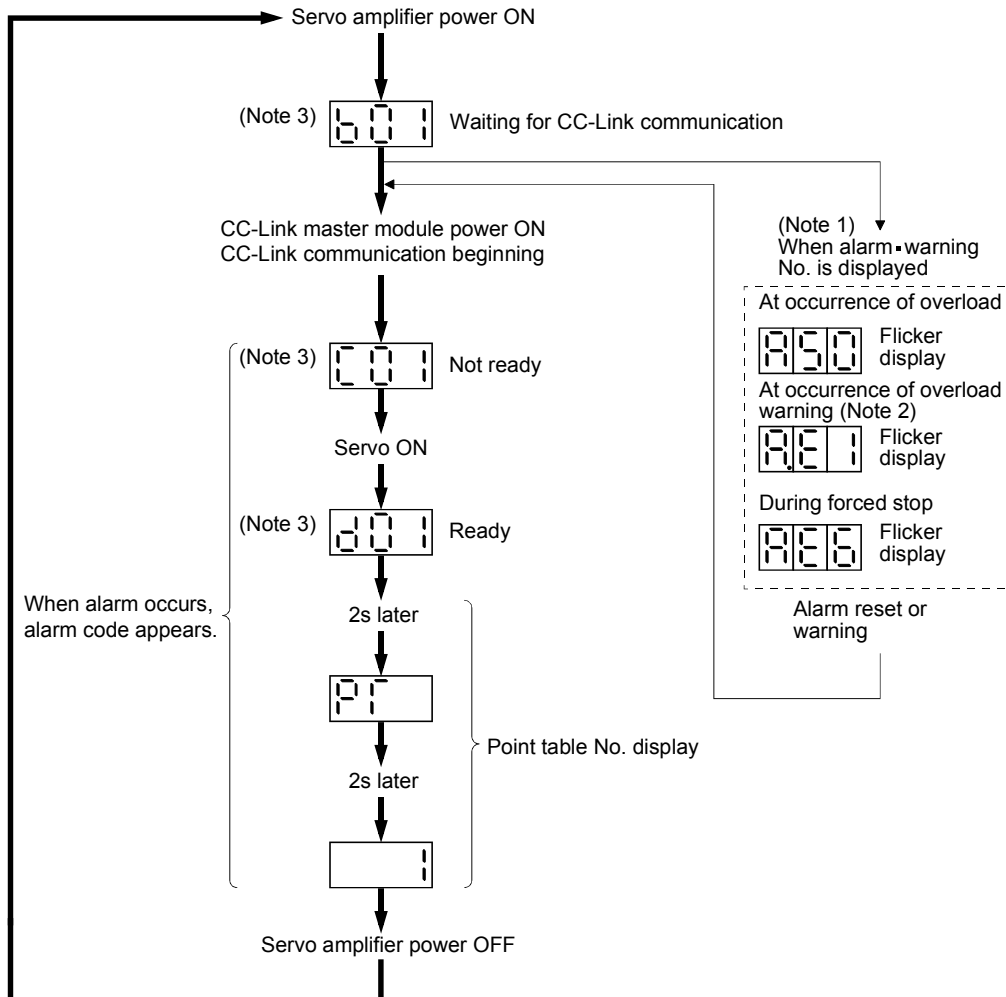
Start actual operation after confirmation of normal operation by test operation and completion of the corresponding parameter settings. Perform a home position return as necessary.

5. OPERATION

5.3 Servo amplifier display

On the servo amplifier display (three-digit, seven-segment display), check the status of communication with the CC-Link controller at power-on, check the station number, and diagnose a fault at occurrence of an alarm.

(1) Display sequence



Note 1. Only alarm and warning No. are displayed, but no station No. is displayed.

2. If warning other than AE6 occurs during the servo on, flickering the second place of decimal point indicates that it is during the servo on.

3. The right-hand segments of b01, c02 and d64 indicate the axis number.

(Below example indicates Station No.1)

b01	c02	...	d64
Station	Station		Station
No.1	No.2		No.64

5. OPERATION

(2) Indication list

Indication	Status	Description
b##	Waiting for CC-Link communication	<ul style="list-style-type: none"> Power of the CC-Link master module was switched on at the condition that the power of CC-Link master module is OFF. The CC-Link master module is faulty.
(Note 1) d##	Ready	The servo was switched on after completion of initialization and the servo amplifier is ready to operate. (This is indicated for 2 seconds.)
(Note 1) C##	Not ready	The servo amplifier is being initialized or an alarm has occurred.
(Note 2) \$\$\$	Ready for operation	Two seconds have passed after the servo amplifier is ready to operate by turning ON the servo-on (RYn1).
(Note 3) A**	Alarm · Warning	The alarm No./warning No. that occurred is displayed. (Refer to section 11.4.)
888	CPU error	CPU watchdog error has occurred.
(Note 4) b00	(Note 4) Test operation mode	JOG operation · positioning operation · programmed operation · DO forced output · single-step feed
(Note 1) d## C##		Motor-less operation

Note 1. ## denotes any of numerals 00 to 16 and what it means is listed below.

##	Description
00	Set to the test operation mode.
01	Station number 1
02	Station number 2
03	Station number 3
:	:
:	:
62	Station number 62
63	Station number 63
64	Station number 64

Note 2. \$\$\$ indicates numbers from 0 to 255, and the number indicates the executing point table number.

3. ** indicates the warning/alarm No.

4. Requires MR Configurator or MR-PRU03 parameter module.

5. OPERATION

5.4 Automatic operation mode

5.4.1 What is automatic operation mode?

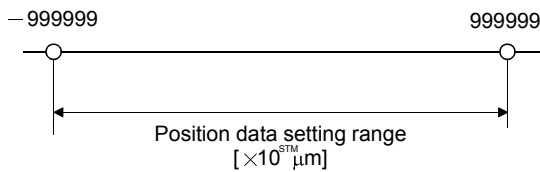
(1) Command system

After selection of preset point tables using the input signals or communication, operation is started by the forward rotation start (RYn1) or reverse rotation start (RYn2). Automatic operation has the absolute value command system, incremental value command system.

(a) Absolute value command system

As position data, set the target address to be reached.

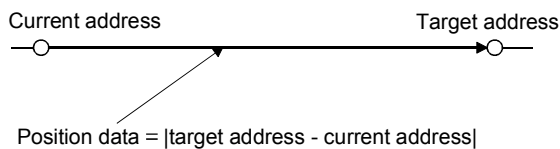
Setting range: -999999 to 999999 [$\times 10^{\text{STM}}$ μm] (STM = feed length multiplication parameter No.PA05)



(b) Incremental value command system

As position data, set the moving distance from the current address to the target address.

Setting range: 0 to 999999 [$\times 10^{\text{STM}}$ μm] (STM = feed length multiplication parameter No.PA05)



(2) Point table

(a) Point table setting

Up to 255 point tables may be set.

Set the point tables using the MR Configurator Software, the MR-PRU03 parameter unit or CC-Link write instruction code.

The following table lists what to set: Refer to section 5.4.2 for details of the settings.

Name	Description
Position data	Set the position data for movement.
Servo motor speed	Set the command speed of the servo motor for execution of positioning.
Acceleration time constant	Set the acceleration time constant.
Deceleration time constant	Set the deceleration time constant.
Dwell	Set the waiting time when performing automatic continuous operation.
Auxiliary function	Set when performing automatic continuous operation.

5. OPERATION

(b) Selection of point table

Using the input signal or CC-Link, select the point table No. with the remote input and remote register from the command device (controller) such as a personal computer.

The following table lists the point table No. selected in response to the remote input. When 2 stations are occupied, the point table No. can be selected by remote register setting. (Refer to section 3.6.3.)

Remote input (0: OFF 1: ON)								Selected point table No.
2 stations occupied			1 station occupied					
RY(n+2)5	RY(n+2)4	RY(n+2)3	RYnE	RYnD	RYnC	RYnB	RYnA	
0	0	0	0	0	0	0	1	1
0	0	0	0	0	0	1	0	2
0	0	0	0	0	0	1	1	3
0	0	0	0	0	1	0	0	4
.
.
.
1	1	1	1	1	1	1	0	254
1	1	1	1	1	1	1	1	255

5. OPERATION

5.4.2 Automatic operation using point table

(1) Absolute value command system

(a) Point table

Set the point table values using the MR Configurator, the MR-PRU03 parameter unit or the remote register of CC-Link.

Set the position data, motor speed, acceleration time constant, deceleration time constant, dwell and auxiliary function to the point table. The following table gives a setting example. However, this function cannot be used when the point table No. is selected using the remote register of CC-Link.

Name	Setting range	Unit	Description
Position data	-999999 to 999999	$\times 10^{\text{STM}}\mu\text{m}$	(1) When using this point table as absolute value command system Set the target address (absolute value). (2) When using this point table as incremental value command system Set the moving distance. A "-" sign indicates a reverse rotation command.
Motor speed	0 to permissible speed	r/min	Set the command speed of the servo motor for execution of positioning. The setting should be equal to or less than the instantaneous permissible speed of the servo motor.
Acceleration time constant	0 to 20000	ms	Set the time until the rated speed of the servo motor is reached.
Deceleration time constant	0 to 20000	ms	Set the time until the servo motor running at rated speed comes to a stop.
Dwell	0 to 20000	ms	This function is valid when the point table is selected using the input signal or the remote input of CC-Link. It cannot be used when the point table No. is selected using the remote register of CC-Link. Set "0" in the auxiliary function to make the dwell invalid. Set "1" in the auxiliary function and 0 in the dwell to perform continuous operation. When the dwell is set, the position command of the selected point table is completed, and after the set dwell has elapsed, the position command of the next point table is started.
Auxiliary function	0 to 3		This function is valid when the point table is selected using the input signal or the remote input of CC-Link. It cannot be used when the point table No. is selected using the remote register of CC-Link. (1) When using this point table in the absolute value command system 0: Automatic operation is performed in accordance with a single point table chosen. 1: Operation is performed in accordance with consecutive point tables without a stop. (2) When using this point table in the incremental value command system 2: Automatic operation is performed in accordance with a single point table chosen. 3: Operation is performed in accordance with consecutive point tables without a stop. When a different rotation direction is set, smoothing zero (command output) is confirmed and the rotation direction is then reversed. Setting "1" in point table No.255 results in an error. For full information, refer to (4) in this section.

(b) Parameter setting

Set the following parameters to perform automatic operation.

1) Command mode selection (parameter No.PA01)

Select the absolute value command system.

Parameter No.PA01

			0
--	--	--	---

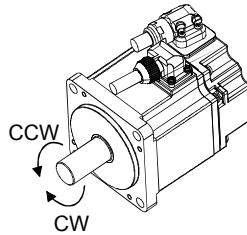
└ Absolute value command system

5. OPERATION

2) Rotation direction selection (parameter No.PA14)

Choose the servo motor rotation direction at the time when the forward rotation start (RYn1) is switched on.

Parameter No.PA14 setting	Servo motor rotation direction when forward rotation start (RYn1) is switched on
0	CCW rotation with + position data CW rotation with - position data
1	CW rotation with + position data CCW rotation with - position data



3) Feed length multiplication selection (parameter No.PA05)

Set the unit multiplication factor (STM) of position data.

Parameter No.PA05 setting	Feed unit [μm]	Position data input range [mm]
<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 0	1	-999.999 to +999.999
<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 1	10	-9999.99 to +9999.99
<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 2	100	-99999.9 to +99999.9
<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 3	1000	-999999 to +999999

(c) Operation

Choosing the point table using RYnA to RYnE, RY(n+2)3 to RY(n+2)5 and turning RYn1 ON starts positioning to the position data at the preset speed, acceleration time constant and deceleration time constant. At this time, reverse rotation start (RYn2) is invalid.

Item	Setting method	Description
Automatic operation mode selection	Automatic/manual selection (RYn6)	Turn RYn6 ON.
Point table selection	Point table No. selection 1 (RYnA) Point table No. selection 2 (RYnB) Point table No. selection 3 (RYnC) Point table No. selection 4 (RYnD) Point table No. selection 5 (RYnE) Point table No. selection 6 (RY(n+2)3) Point table No. selection 7 (RY(n+2)4) Point table No. selection 8 (RY(n+2)5)	Refer to section 5.4.1(2).
Start	Forward rotation start (RYn1)	Turn RYn1 ON to start.

5. OPERATION

(2) Incremental value command system

(a) Point table

Set the point table values using the MR Configurator, the MR-PRU03 parameter unit or the remote register of CC-Link.

Set the position data, motor speed, acceleration time constant, deceleration time constant, dwell and auxiliary function to the point table. The following table gives a setting example.

Name	Setting range	Unit	Description
Position data	0 to 999999	$\times 10^{\text{STM}} \mu\text{m}$	Set the moving distance. The unit can be changed using feed length multiplication factor selection of parameter No.PA05.
Servo motor speed	0 to permissible speed	r/min	Set the command speed of the servo motor for execution of positioning. The setting should be equal to or less than the instantaneous permissible speed of the servo motor.
Acceleration time constant	0 to 20000	ms	Set the time until the rated speed of the servo motor is reached.
Deceleration time constant	0 to 20000	ms	Set the time until the servo motor running at rated speed comes to a stop.
Dwell	0 to 20000	ms	This function is valid when the point table is selected using the input signal or the remote input of CC-Link. It cannot be used when the point table No. is selected using the remote register of CC-Link. Set "0" in the auxiliary function to make the dwell invalid. Set "1" in the auxiliary function and 0 in the dwell to perform continuous operation. When the dwell is set, the position command of the selected point table is completed, and after the set dwell has elapsed, the position command of the next point table is started.
Auxiliary function	0 · 1		This function is valid when the point table is selected using the input signal or the remote input of CC-Link. It cannot be used when the point table No. is selected using the remote register of CC-Link. 0: Automatic operation is performed in accordance with a single point table chosen. 1: Operation is performed in accordance with consecutive point tables without a stop. When a different rotation direction is set, smoothing zero (command output) is confirmed and the rotation direction is then reversed. Setting "1" in point table No.255 results in an error. For full information, refer to (4) in this section.

(b) Parameter setting

Set the following parameters to perform automatic operation.

1) Command mode selection (parameter No.PA01)

Select the incremental value command system.

Parameter No.PA01

			1
--	--	--	---

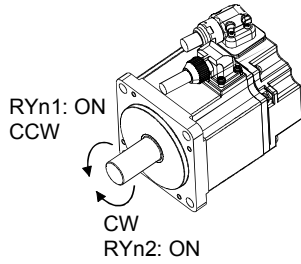
Incremental value command system

5. OPERATION

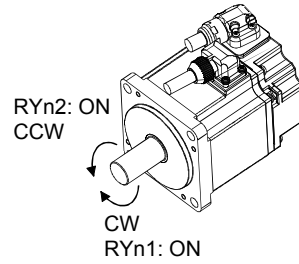
2) Forward rotation direction selection (parameter No.PA14)

Choose the servo motor rotation direction at the time when the forward rotation start (RYn1) signal or reverse rotation start (RYn2) signal is switched on.

Parameter No.PA14 setting	Servo motor rotation direction	
	Forward rotation start (RYn1) ON	Reverse rotation start (RYn2) ON
0	CCW rotation (address incremented)	CW rotation (address decremented)
1	CW rotation (address incremented)	CCW rotation (address decremented)



Parameter No.PA14: 0



Parameter No.PA14: 1

3) Feed length multiplication selection (parameter No.PA05)

Set the unit multiplication factor (STM) of position data.

Parameter No.PA05 setting	Feed unit [μm]	Position data input range [mm]
<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 0	1	0 to 999.999
<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 1	10	0 to 9999.99
<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 2	100	0 to 99999.9
<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 3	1000	0 to 999999

(c) Operation

Choosing the point table using RYnA to RYnE, RY(n+2)3 to RY(n+2)5 and turning RYn1 ON starts a motion in the forward rotation direction over the moving distance of the position data at the preset speed and acceleration time constant.

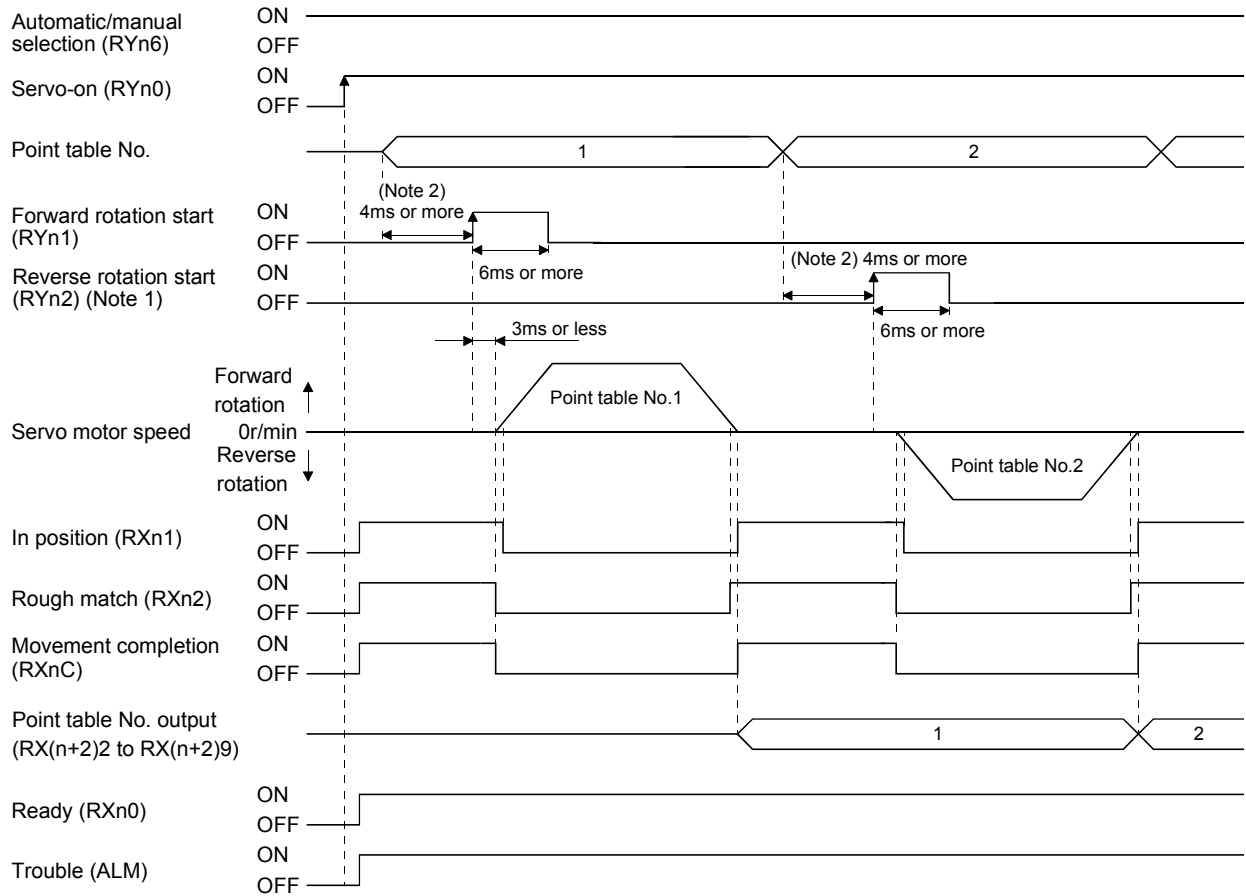
Turning RYn2 ON starts a motion in the reverse rotation direction according to the values set to the selected point table.

Item	Setting method	Description
Automatic operation mode selection	Automatic/manual selection (RYn6)	Turn RYn6 ON.
Point table selection	Point table No. selection 1 (RYnA) Point table No. selection 2 (RYnB) Point table No. selection 3 (RYnC) Point table No. selection 4 (RYnD) Point table No. selection 5 (RYnE) Point table No. selection 6 (RY(n+2)3) Point table No. selection 7 (RY(n+2)4) Point table No. selection 8 (RY(n+2)5)	Refer to section 5.4.1(2).
Start	Forward rotation start (RYn1)	Turn RYn1 ON to start motion in forward rotation direction.
	Reverse rotation start (RYn2)	Turn RYn2 ON to start motion in reverse rotation direction.

5. OPERATION

(3) Automatic operation timing chart

The timing chart is shown below.



Note 1. Reverse rotation start (RYn2) is invalid in the absolute value command system.

2. Configure a sequence that changes the point table selection earlier, considering the delay time of CC-Link communication.

5. OPERATION

(4) Automatic continuous operation

POINT
<ul style="list-style-type: none"> This function is valid when the point table is selected using the input signal or the remote input of CC-Link. It cannot be used when the point table No. is selected using the remote register of CC-Link.

(a) What is automatic continuous operation?

By merely choosing one point table and making a start (RYn1 or RYn2), operation can be performed in accordance with the point tables having consecutive numbers.

Automatic operation is available in two types: varied speed operation and automatic continuous positioning operation.

Either type may be selected as follows.

1) In absolute value command specifying system

Automatic continuous operation { Speed changing operation
Automatic continuous positioning operation

Point table setting		
Dwell	Auxiliary function	
	When position data is absolute value	When position data is incremental value
0	1	3
1 or more	1	3

2) In incremental value command system

Automatic continuous operation { Speed changing operation
Automatic continuous positioning operation

Point table setting	
Dwell	Auxiliary function
0	1
1 or more	1

(b) Varied speed operation

Speed during positioning operation can be changed by setting the auxiliary function of the point table. Use the number of point tables equal to the number of speeds to be set.

By setting "1" to the auxiliary function, operation is performed at the speed set in the next point table during positioning. The position data valid at this time is the data selected at start and the acceleration and deceleration time constants of the subsequent point tables are made invalid.

By setting "1" to the auxiliary function of up to point table No.254, operation can be performed at a maximum of 255 speeds. Set "0" to the auxiliary function of the last point table.

When performing varied speed operation, always set "0" to the dwell. If "1" or more is set, automatic continuous positioning operation is made valid.

The following table gives a setting example.

Point table No.	Dwell [ms] (Note 1)	Auxiliary function	Variable speed operation
1	0	1	Consecutive point table data
2	0	1	
3	0	0 (Note 2)	
4	0	1	Consecutive point table data
5	0	1	
6	0	1	
7	0	0 (Note 2)	

Note 1. Always set "0".

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

5. OPERATION

1) Absolute value command specifying system

This system is an auxiliary function for point tables to perform automatic operation by specifying the absolute value command or incremental value command.

▪ Positioning in single direction

The operation example given below assumes that the set values are as indicated in the following table. Here, the point table No.1 uses the absolute value command system, the point table No.2 the incremental value command system, the point table No.3 the absolute value system, and the point table No.4 the incremental value command system.

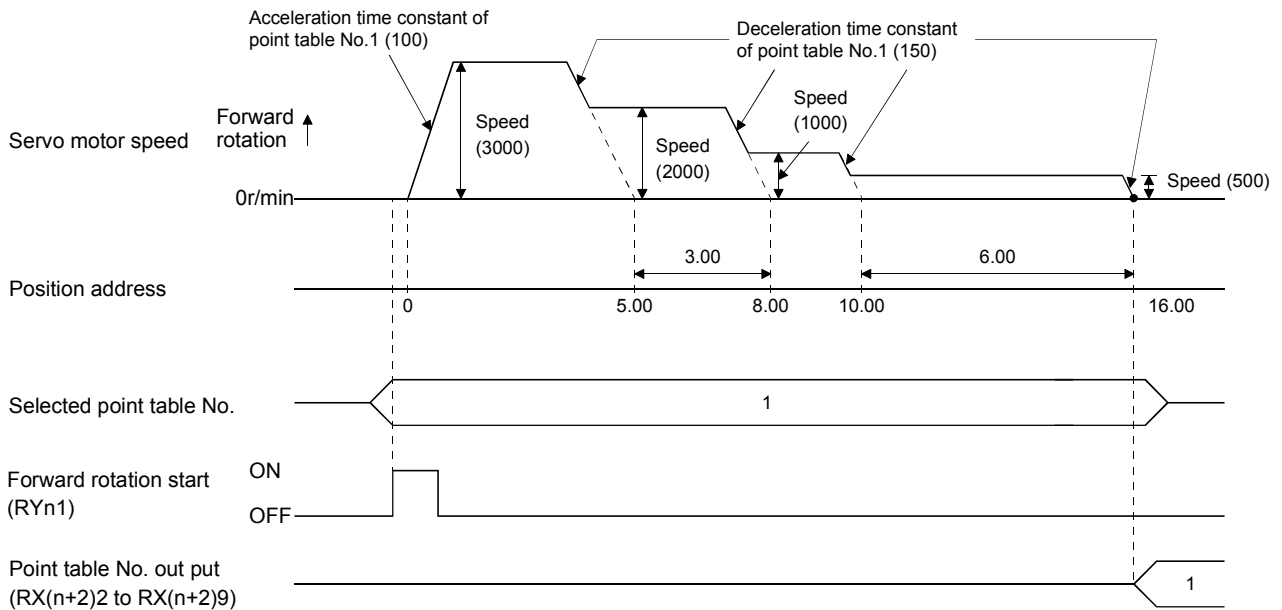
Point table No.	Position data [$\times 10^{\text{STM}} \mu\text{m}$]	Servo motor speed [r/min]	Acceleration time constant [ms]	Deceleration time constant [ms]	Dwell [ms] (Note 1)	Auxiliary function
1	5.00	3000	100	150	0	1
2	3.00	2000	Invalid	Invalid	0	3
3	10.00	1000	Invalid	Invalid	0	1
4	6.00	500	Invalid	Invalid	0	0 (Note 2)

Note 1. Always set "0".

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

0: When point table is used in absolute value command system

1: When point table is used in incremental value command system



5. OPERATION

- Positioning that reverses the direction midway

The operation example given below assumes that the set values are as indicated in the following table. Here, the point table No.1 uses the absolute value command system, the point table No.2 the incremental value command system, and the point table No.3 the absolute value system.

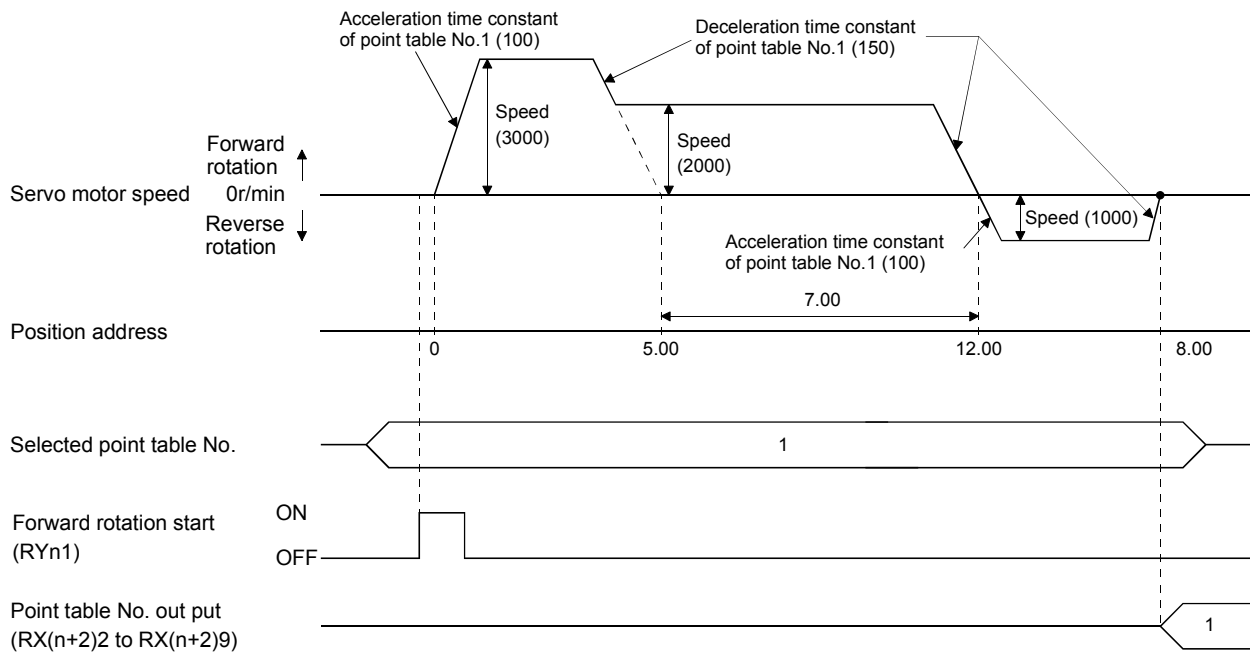
Point table No.	Position data [$\times 10^{\text{STM}} \mu\text{m}$]	Servo motor speed [r/min]	Acceleration time constant [ms]	Deceleration time constant [ms]	Dwell [ms] (Note 1)	Auxiliary function
1	5.00	3000	100	150	0	1
2	7.00	2000	Invalid	Invalid	0	1
3	8.00	1000	Invalid	Invalid	0	0 (Note 2)

Note 1. Always set "0".

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

0: When point table is used in absolute value command system

1: When point table is used in incremental value command system



5. OPERATION

2) Incremental value command system

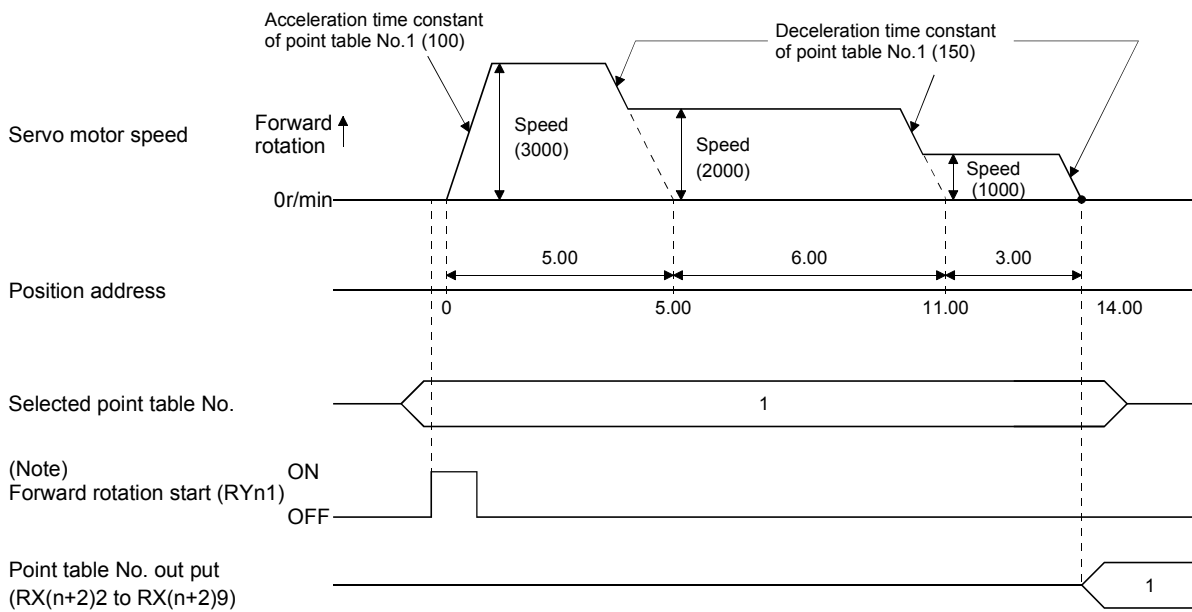
The position data of the incremental value command system is the sum of the position data of the consecutive point tables.

The operation example given below assumes that the set values are as indicated in the following table.

Point table No.	Position data [$\times 10^{\text{STM}} \mu\text{m}$]	Servo motor speed [r/min]	Acceleration time constant [ms]	Deceleration time constant [ms]	Dwell [ms] (Note 1)	Auxiliary function
1	5.00	3000	100	150	0	1
2	6.00	2000	Invalid	Invalid	0	1
3	3.00	1000	Invalid	Invalid	0	0 (Note 2)

Note 1. Always set "0".

2. Always set "0" to the auxiliary function of the last point table among the consecutive point tables.



Note. Turning on Reverse rotation start (RYn2) starts positioning in the reverse rotation direction.

5. OPERATION

(c) Temporary stop/restart

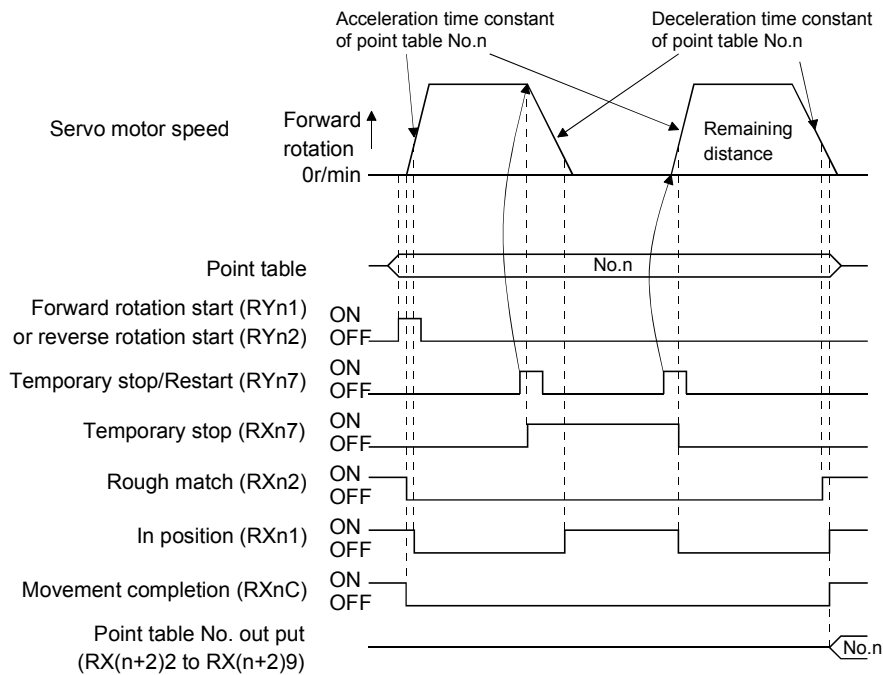
When RYn7 is turned ON during automatic operation, the motor is decelerated to a temporary stop at the deceleration time constant in the point table being executed. When RYn7 is turned ON again, the remaining distance is executed.

If the forward/reverse rotation start signal (RYn1 or RYn2) is ignored if it is switched on during a temporary stop.

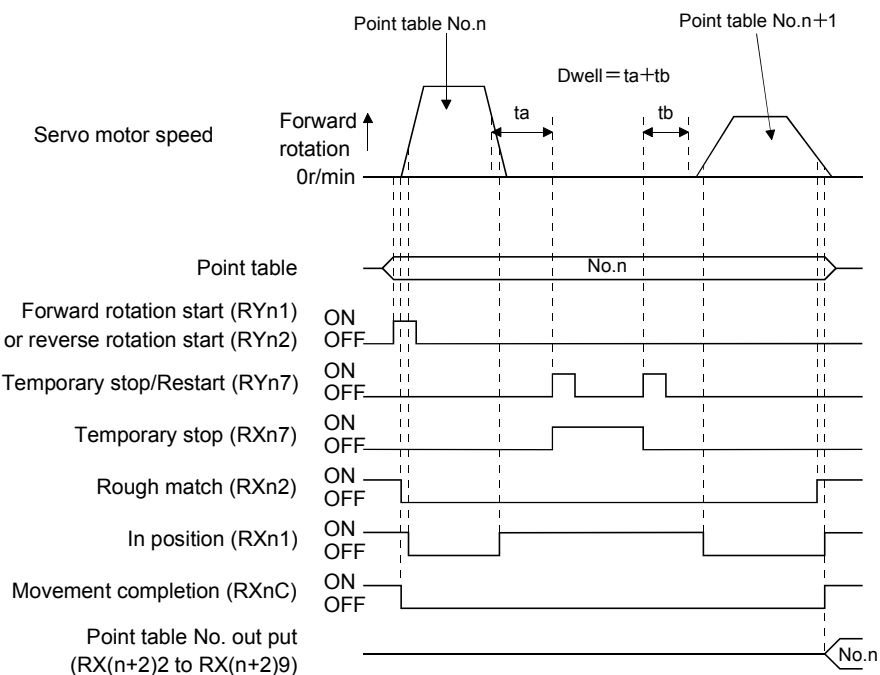
The remaining moving distance is cleared when the operation mode is changed from the automatic mode to the manual mode during a temporary stop.

The temporary stop/restart input is ignored during zeroing and jog operation.

1) When the servo motor is rotating



2) During dwell



5. OPERATION

5.4.3 Remote register-based position/speed setting

This operation can be used when 2 stations are occupied. This section explains operation to be performed when the remote register is used to specify the position command data/speed command data.

(1) Absolute value command positioning in absolute value command system

The position data set in the absolute value command system are used as absolute values in positioning. Set the input devices and parameters as indicated below.

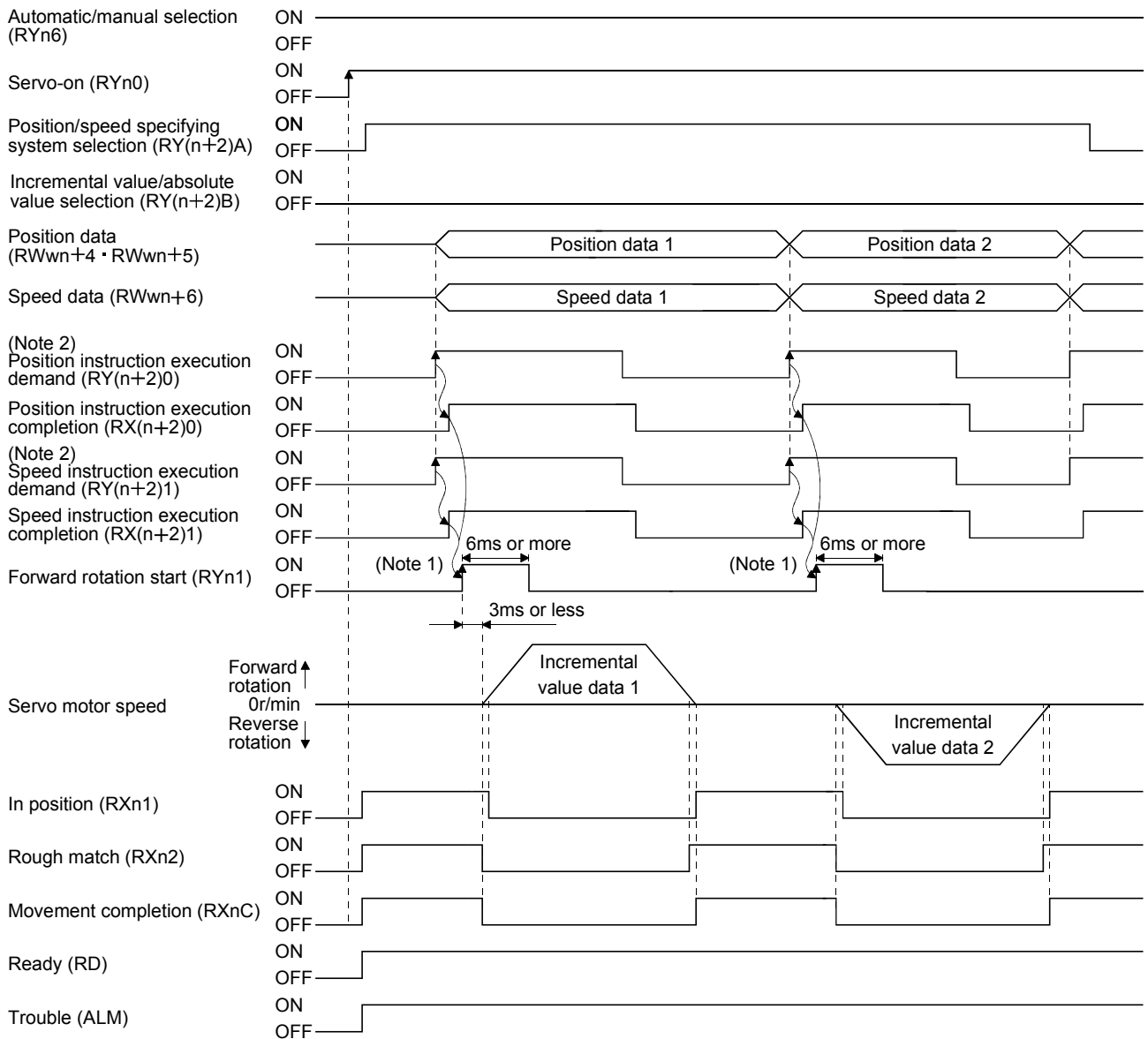
Item	Used device/parameter	Description
Automatic operation mode	Automatic/manual selection (RYn6)	Turn RYn6 ON.
Remote register-based position/speed setting	Position/speed specifying system selection (RY(n+2)A)	Turn RY(n+2)A ON.
Command system	Parameter No.PA01	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 0 : Absolute value command system is selected.
Remote register-based position/speed specifying system selection	Parameter No.PC30	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 2 : Remote register-based position/speed specifying system is selected. In the case, always set an acceleration/deceleration time constant in the point table No.1.
Position data	Position command data lower 16 bit (RWwn+4)	Set the lower 16 bits of position data to RWwn+4, and the upper 16 bits to RWwn+5. Setting range: -999999 to 999999
	Position command data upper 16 bit (RWwn+5)	
Servo motor speed	Speed command data (RWwn+6)	Set the servo motor speed.

Set the position data to RWwn+4/RWwn+5, and the speed command data to RWwn+6, and store them into the servo amplifier.

In the absolute value command system, Absolute value/incremental value selection (RY(n+2)B) can be used to select whether the values set to the position data are absolute values or incremental values. The position data set to RWwn+4/RWwn+5 are handled as absolute values when RY(n+2)B is turned OFF or as incremental values when it is turned ON. During operation, how the position data will be handled (absolute values or incremental values) depends on the status of RY(n+2)B when Forward rotation start (RYn1) is turned ON.

Here, RY(n+2)B is turned OFF since the position data are handled as absolute values.

5. OPERATION



Note 1. Configure a sequence that changes the point table selection earlier, considering the delay time of CC-Link communication.

2. For details of the operation timing of RY(n+2)0 and RY(n+2)1, refer to the section 3.6.2 (3).

5. OPERATION

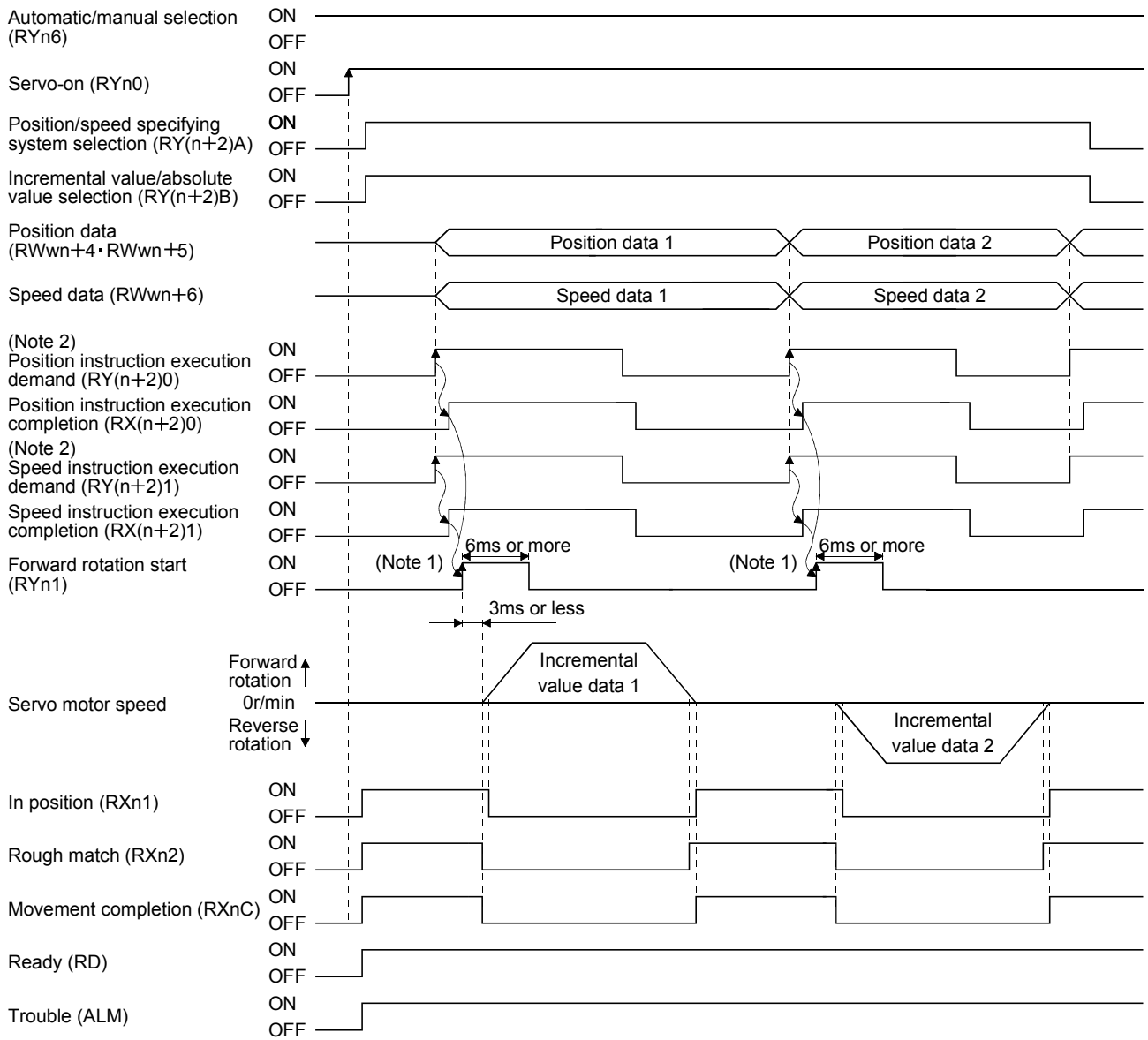
(2) Incremental value command positioning in absolute value command system

The position data set in the absolute value command system are used as incremental values in positioning. Set the input devices and parameters as indicated below.

Item	Used device/parameter	Description
Automatic operation mode	Automatic/manual selection (RYn6)	Turn RYn6 ON.
Remote register-based position/speed setting	Position/speed specifying system selection (RY(n+2)A)	Turn RY(n+2)A ON.
Command system	Parameter No.PA01	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 0 : Absolute value command system is selected.
Remote register-based position/speed specifying system selection	Parameter No.PC30	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 2 : Remote register-based position/speed specifying system is selected.
Position data	Position command data lower 16 bit (RWwn+4)	Set the lower 16 bits of position data to RWwn+4, and the upper 16 bits to RWwn+5. Setting range: -999999 to 999999
	Position command data upper 16 bit (RWwn+5)	
Servo motor speed	Speed command data (RWwn+6)	Set the servo motor speed.

Here, Absolute value/incremental value selection RY(n+2)B is turned ON since the position data are handled as incremental values.

5. OPERATION



Note 1. Configure a sequence that changes the point table selection earlier, considering the delay time of CC-Link communication.

2. For details of the operation timing of RY(n+2)0 and RY(n+2)1, refer to the section 3.6.2 (3).

5. OPERATION

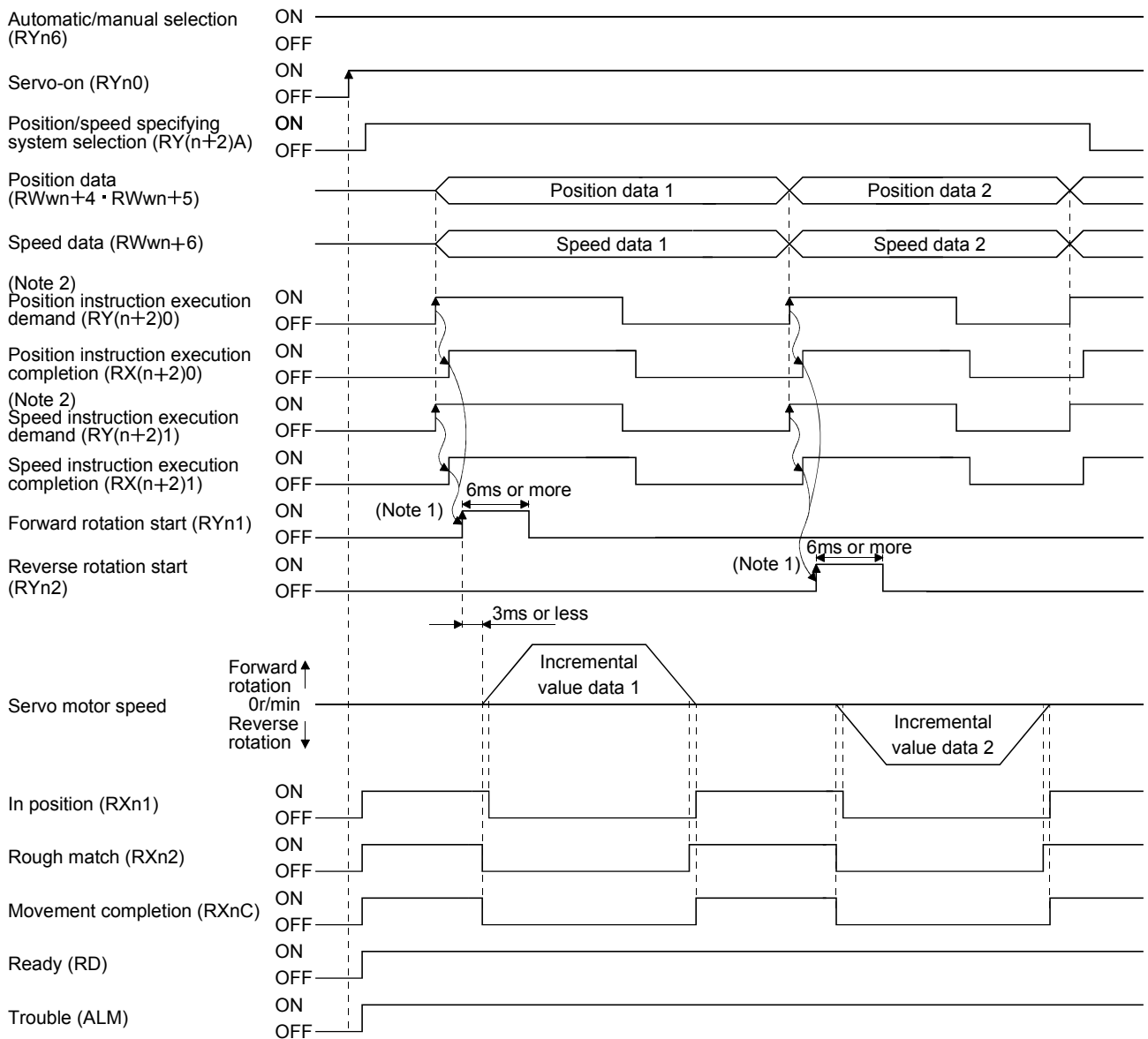
(3) Positioning in incremental value command system

Execute positioning in the incremental value command system. Set the input signals and parameters as indicated below.

Item	Used device/parameter	Description
Automatic operation mode	Automatic/manual selection (RYn6)	Turn RYn6 ON.
Remote register-based position/speed setting	Position/speed specifying system selection (RY(n+2)A)	Turn RY(n+2)A ON.
Command system	Parameter No.PA01	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 1 : Incremental value command system is selected.
Remote register-based position/speed specifying system selection	Parameter No.PC30	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 2 : Remote register-based position/speed specifying system is selected. In the case, always set an acceleration/deceleration time constant in the point table No.1.
Position data	Position command data lower 16 bit (RWwn+4)	Set the lower 16 bits of position data to RWwn+4, and the upper 16 bits to RWwn+5. Setting range: 0 to 999999
	Position command data upper 16 bit (RWwn+5)	
Servo motor speed	Speed command data (RWwn+6)	Set the servo motor speed.

Set "1" in parameter No.PA01 to select the incremental value command system. In the incremental value command system, the position data are handled as incremental values. Hence, Absolute value/incremental value selection (RY(n+2)B) is invalid.

5. OPERATION



Note 1. Configure a sequence that changes the point table selection earlier, considering the delay time of CC-Link communication.

2. For details of the operation timing of RY(n+2)0 and RY(n+2)1, refer to the section 3.6.2 (3).

5. OPERATION

5.5 Manual operation mode

For machine adjustment, home position matching, etc., jog operation or a manual pulse generator may be used to make a motion to any position.

5.5.1 JOG operation

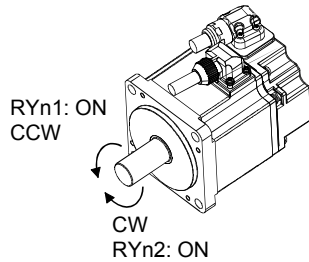
(1) Setting

Set the input device and parameters as follows according to the purpose of use. In this case, the point table No. selection 1 to 8 (RYnA to RYnE, RY(n+2)3 to RY(n+2)5) are invalid.

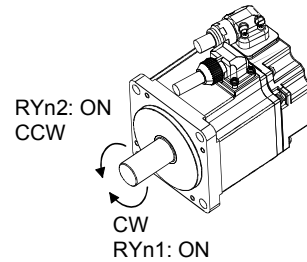
Item	Used device/parameter	Description
Manual operation mode selection	Automatic/manual selection (RYn6)	Turn RYn6 OFF.
Servo motor rotation direction	Parameter No.PA14	Refer to (2) in this section.
Jog speed	Parameter No.PC12	Set the speed of the servo motor.
Acceleration/deceleration time constant	Point table No.1	Use the acceleration/deceleration time constants in point table No.1.

(2) Servo motor rotation direction

Parameter No.PA14 setting	Servo motor rotation direction	
	Forward rotation start (RYn1) ON	Reverse rotation start (RYn2) ON
0	CCW rotation	CW rotation
1	CW rotation	CCW rotation



Parameter No.PA14: 0



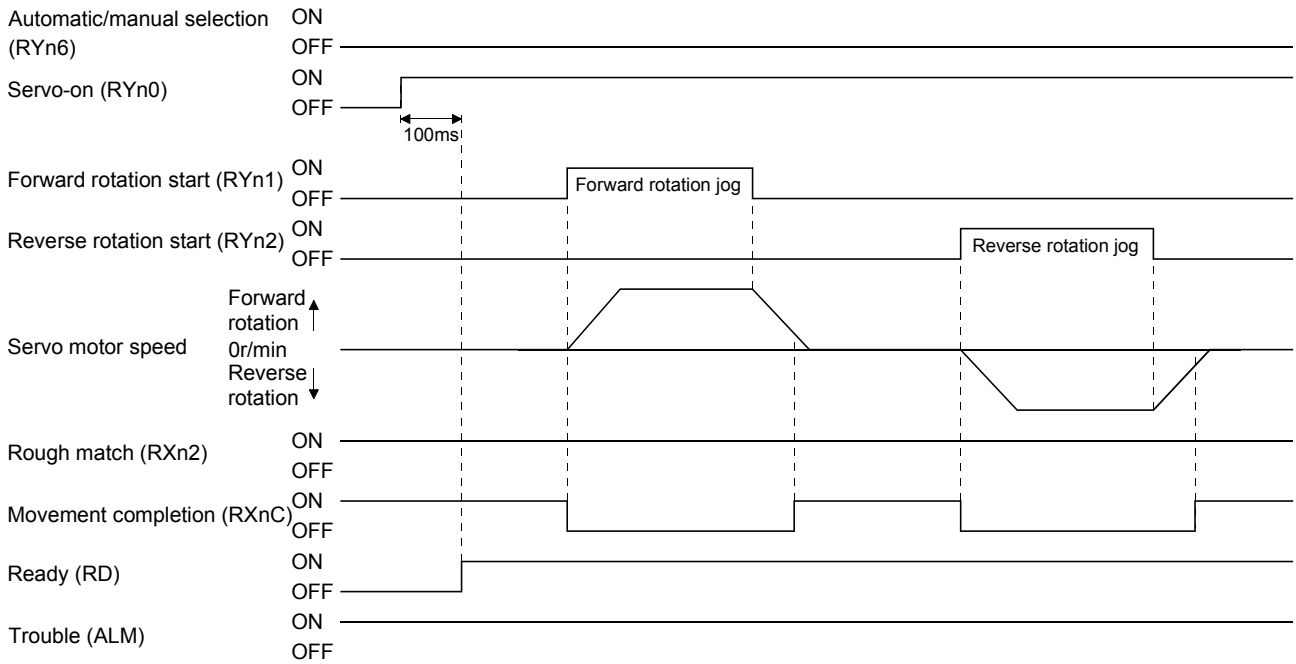
Parameter No.PA14: 1

(3) Operation

By turning RYn1 ON, operation is performed under the conditions of the jog speed set in the parameter and the acceleration and deceleration time constants in set point table No.1. For the rotation direction, refer to (2) in this section. By turning RYn2 ON, the servo motor rotates in the reverse direction to forward rotation start (RYn1).

5. OPERATION

(4) Timing chart



5.5.2 Manual pulse generator

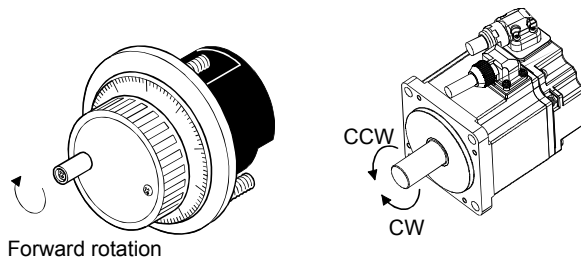
(1) Setting

Set the input signal and parameters as follows according to the purpose of use. In this case, the point table No. selection 1 to 8 (RYnA to RYnE, RY(n+2)3 to RY(n+2)5) are invalid.

Item	Setting method	Description
Manual operation mode selection	Automatic/manual selection (RYn6)	Turn RYn6 OFF.
Manual pulse generator multiplication	Parameter No.PA05	For more information, refer to (3) in this section.
Servo motor rotation direction	Parameter No.PA14	Refer to (2) in this section.

(2) Servo motor rotation direction

Parameter No.PA14 setting	Servo motor rotation direction	
	Manual pulse generator: forward rotation	Manual pulse generator: reverse rotation
0	CCW rotation	CW rotation
1	CW rotation	CCW rotation



5. OPERATION

(3) Manual pulse generator multiplication

(a) Using the parameter for setting

Use parameter No.PA05 to set the multiplication ratio of the servo motor rotation to the manual pulse generator rotation.

Parameter No.PA05 setting	Multiplication ratio of servo motor rotation to manual pulse generator rotation	Moving distance
□□0□	1 time	1[μ m]
□□1□	10 times	10[μ m]
□□2□	100 times	100[μ m]

(b) Using the input signals for setting (devices)

Set the pulse generator multiplication 1 (TP0) and the pulse generator multiplication 2 (TP1) to the CN6 connector pins in the parameters of Nos. PD06 to PD08.

(Note) Pulse generator multiplication 2 (TP1)	(Note) Pulse generator multiplication 1 (TP0)	Multiplication ratio of servo motor rotation to manual pulse generator rotation	Moving distance
0	0	Parameter No.PA05 setting valid	
0	1	1 time	1[μ m]
1	0	10 times	10[μ m]
1	1	100 times	100[μ m]

Note. 0: OFF

1: ON

(4) Operation

Turn the manual pulse generator to rotate the servo motor. For the rotation direction of servo motor, refer to (2) in this section.

5. OPERATION

5.6 Manual home position return mode

5.6.1 Outline of home position return

Home position return is performed to match the command coordinates with the machine coordinates. In the incremental system, home position return is required every time input power is switched on. In the absolute position detection system, once home position return is done at the time of installation, the current position is retained if power is switched off. Hence, home position return is not required when power is switched on again. This servo amplifier has the home position return methods given in this section. Choose the most appropriate method for your machine structure and application.

This servo amplifier has the home position return automatic return function which executes home position return by making an automatic return to a proper position if the machine has stopped beyond or at the proximity dog. Manual motion by jog operation or the like is not required.

5. OPERATION

(1) Home position return types

Choose the optimum home position return according to the machine type, etc.

Type	Home position return method	Features
Dog type home position return	With deceleration started at the front end of a proximity dog, the position where the first Z-phase signal is given past the rear end of the dog or a motion has been made over the home position shift distance starting from the Z-phase signal is defined as a home position.	<ul style="list-style-type: none"> • General home position return method using a proximity dog. • Repeatability of home position return is excellent. • The machine is less burdened. • Used when the width of the proximity dog can be set greater than the deceleration distance of the servo motor.
Count type home position return	With deceleration started at the front end of a proximity dog, the position where the first Z-phase signal is given after advancement over the preset moving distance after the proximity dog or a motion has been made over the home position shift distance starting from the Z-phase signal is defined as a home position.	<ul style="list-style-type: none"> • Home position return method using a proximity dog. • Used when it is desired to minimize the length of the proximity dog.
Data setting type home position return	An arbitrary position is defined as a home position.	<ul style="list-style-type: none"> • No proximity dog required.
Stopper type home position return	The position where the machine stops when its part is pressed against a machine stopper is defined as a home position.	<ul style="list-style-type: none"> • Since the machine part collides with the machine be fully lowered. • The machine and stopper strength must be increased.
Home position ignorance (Servo-on position as home position)	The position where servo is switched on is defined as a home position.	
Dog type rear end reference	The position where the axis, which had started decelerating at the front end of a proximity dog, has moved the after-proximity dog moving distance and home position shift distance after it passed the rear end is defined as a home position.	<ul style="list-style-type: none"> • The Z-phase signal is not needed.
Count type front end reference	The position where the axis, which had started decelerating at the front end of a proximity dog, has moved the after-proximity dog moving distance and home position shift distance is defined as a home position.	<ul style="list-style-type: none"> • The Z-phase signal is not needed.
Dog cradle type	The position where the first Z-phase signal is issued after detection of the proximity dog front end is defined as a home position.	
Dog type first Z-phase reference	After the proximity dog front end is detected, the current position moves away from the proximity dog in the reverse direction. In this movement, the home position is defined to be where the first Z-phase signal is issued or the position that is the home position shift distance away from where the first Z-phase signal is issued.	
Dog type front end reference	The home position is the front end of the proximity dog.	<ul style="list-style-type: none"> • The Z-phase signal is not needed.
Dogless Z-phase reference	The home position is defined to be where the first Z-phase signal is issued or the position that is the home position shift distance away from where the first Z-phase signal is issued.	

5. OPERATION

(2) Home position return parameter

When performing home position return, set each parameter as follows.

(a) Choose the home position return method with parameter No.PC02 (Home position return type).

Parameter No.PC02

0	0	0	
---	---	---	--

- └ Home position return method
0: Dog type
1: Count type
2: Data setting type
3: Stopper type
4: Home position ignorance (Servo-on position as home position)
5: Dog type rear end reference
6: Count type front end reference
7: Dog cradle type
8: Dog type first Z-phase reference
9: Dog type front end reference
A: Dogless Z-phase reference

(b) Choose the starting direction of home position return with parameter No.PC03 (Home position return direction). Set "0" to start home position return in the direction in which the address is incremented from the current position, or "1" to start home position return in the direction in which the address is decremented.

Parameter No.PC03

0	0	0	
---	---	---	--

- └ Home position return direction
0: Address increment direction
1: Address decrement direction

(c) Choose the polarity at which the proximity dog is detected with parameter No.PD16 (Input polarity setting). Set "0" to detect the dog when the proximity dog device (DOG) is OFF, or "1" to detect the dog when the device is ON.

Parameter No.PD16

0	0	0	
---	---	---	--

- └ Proximity dog input polarity
0: OFF indicates detection of the dog
1: ON indicates detection of the dog

(3) Instructions

- 1) Before starting home position return, always make sure that the limit switch operates.
- 2) Confirm the home position return direction. Incorrect setting will cause the machine to run reversely.
- 3) Confirm the proximity dog input polarity. Not doing so may cause unexpected operation.

5. OPERATION

5.6.2 Dog type home position return

A home position return method using a proximity dog. With deceleration started at the front end of the proximity dog, the position where the first Z-phase signal is given past the rear end of the dog or a motion has been made over the home position shift distance starting from the Z-phase signal is defined as a home position.

(1) Devices, parameters

Set the input devices and parameters as follows.

Item	Device/Parameter used	Description
Manual home position return mode selection	Automatic/manual selection (RYn6)	Turn RYn6 ON.
	Point table No. selection 1 to 8 (RYnA to RYnE, RY(n+2)3 to RY(n+2)5)	RYnA to RYnE, RY(n+2)3 to RY(n+2)5 are turned off.
Remote register-based position/speed setting (Only when two stations are occupied)	Position/speed specifying system selection (RY(n+2)A)	Turn RY(n+2)A ON.
Dog type home position return	Parameter No.PC02	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 0 :Dog type home position return is selected.
Home position return direction	Parameter No.PC03	Refer to section 5.6.1 (2) and choose home position return direction.
Dog input polarity	Parameter No.PD16	Refer to section 5.6.1 (2) and choose dog input polarity.
Home position return speed	Parameter No.PC04	Set speed until detection of dog.
Creep speed	Parameter No.PC05	Set speed after detection of dog.
Home position shift distance	Parameter No.PC06	Set when shifting the home position starting at the first Z-phase signal after passage of proximity dog rear end.
Home position return acceleration/deceleration time constants	Point table No.1	Use the acceleration/deceleration time constants of point table No.1.
Home position return position data	Parameter No.PC07	Set the current position at home position return completion.

(2) Length of proximity dog

To ensure that the Z-phase signal of the servo motor is generated during detection of the proximity dog (DOG), the proximity dog should have the length which satisfies formulas (5.1) and (5.2).

$$L_1 \geq \frac{V}{60} \cdot \frac{td}{2} \dots\dots\dots (5.1)$$

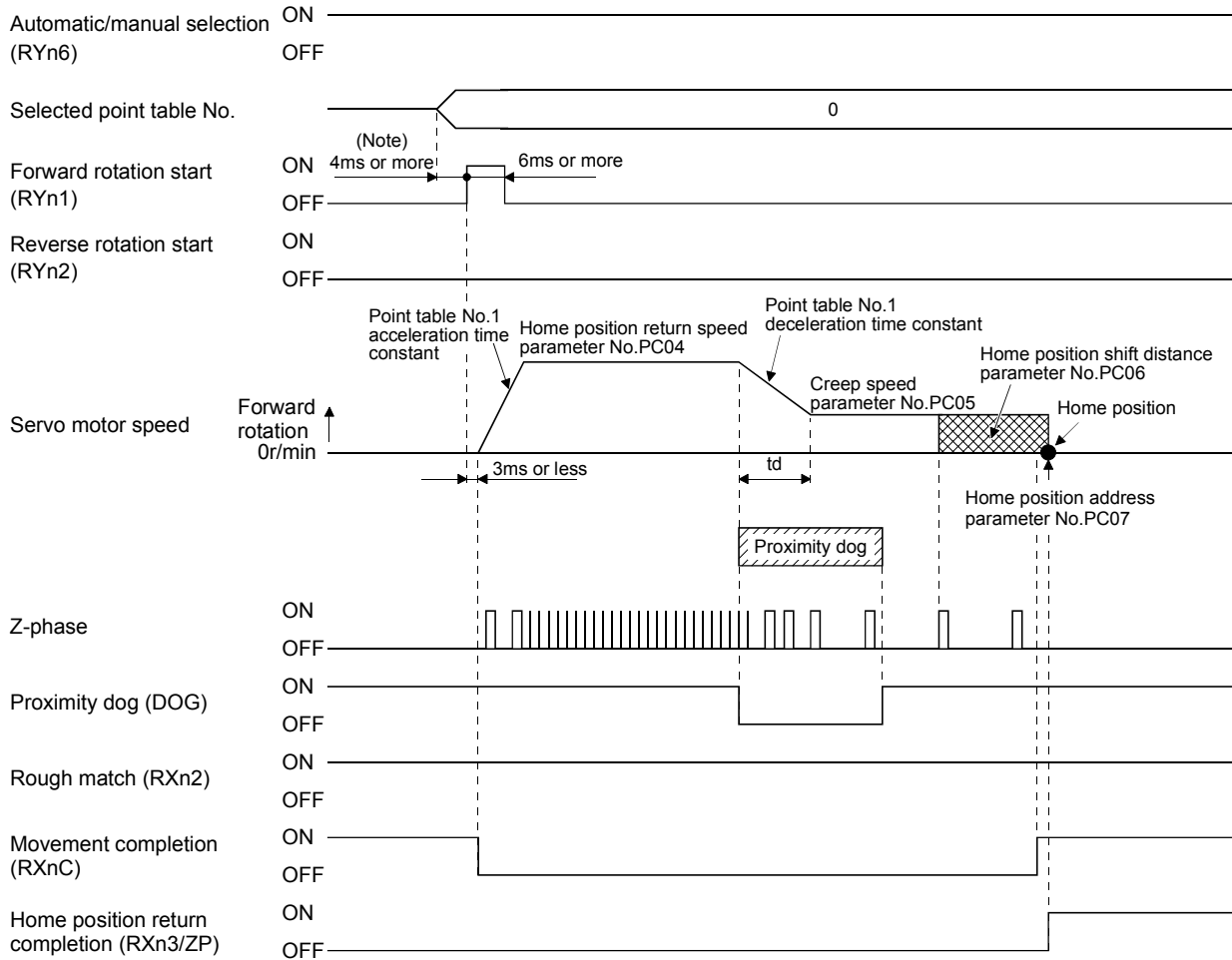
L_1 : Proximity dog length [mm]
 V : Home position return speed [mm/min]
 td : Deceleration time [s]

$$L_2 \geq 2 \cdot \Delta S \dots\dots\dots (5.2)$$

L_2 : Proximity dog length [mm]
 ΔS : Moving distance per servo motor revolution [mm]

5. OPERATION

(3) Timing chart



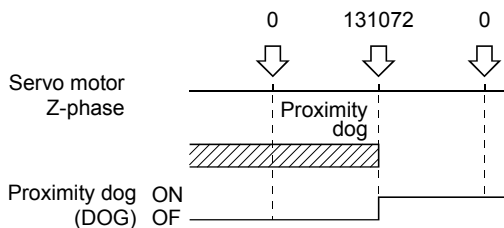
Note. Configure a sequence that changes the point table selection earlier, considering the delay time of CC-Link communication.

The parameter No.PC07 (home position return position data) setting value is the positioning address after the home position return is completed.

(4) Adjustment

In dog type home position return, adjust to ensure that the Z-phase signal is generated during dog detection. Locate the rear end of the proximity dog (DOG) at approximately the center of two consecutive Z-phase signals.

The position where the Z-phase signal is generated can be monitored in "Within one-revolution position" of "Status display" of the MR Configurator or the parameter unit.



5. OPERATION

5.6.3 Count type home position return

In count type home position return, a motion is made over the distance set in parameter No.PC08 (moving distance after proximity dog) after detection of the proximity dog front end. The position where the first Z-phase signal is given after that is defined as a home position. Hence, if the proximity dog (DOG) is 10ms or longer, there is no restriction on the dog length. This home position return method is used when the required proximity dog length cannot be reserved to use dog type home position return or when the proximity dog (DOG) is entered electrically from a controller or the like.

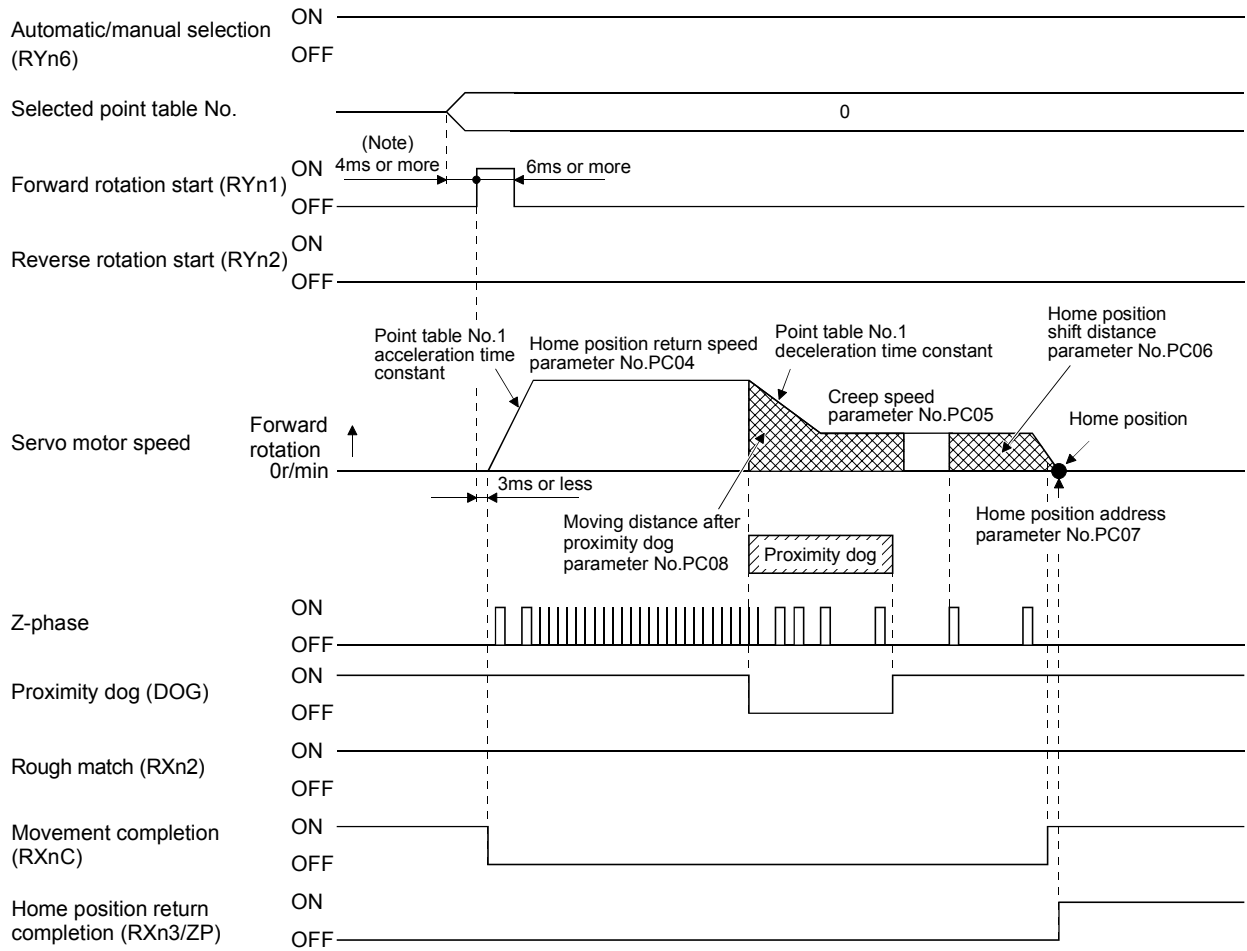
(1) Devices, parameters

Set the input devices and parameters as follows.

Item	Device/Parameter used	Description
Manual home position return mode selection	Automatic/manual selection (RYn6)	Turn RYn6 ON.
	Point table No. selection 1 to 8 (RYnA to RYnE, RY(n+2)3 to RY(n+2)5)	RYnA to RYnE, RY(n+2)3 to RY(n+2)5 are turned off.
Remote register-based position/speed setting (Only when two stations are occupied)	Position/speed specifying system selection (RY(n+2)A)	Turn RY(n+2)A ON.
Count type home position return	Parameter No.PC02	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 1: Count type home position return is selected.
Home position return direction	Parameter No.PC03	Refer to section 5.6.1 (2) and choose home position return direction.
Dog input polarity	Parameter No.PD16	Refer to section 5.6.1 (2) and choose dog input polarity.
Home position return speed	Parameter No.PC04	Set speed until detection of dog.
Creep speed	Parameter No.PC05	Set speed after detection of dog.
Home position shift distance	Parameter No.PC06	Set when shifting the home position, starting at the first Z-phase signal given after passage of the proximity dog front end and movement over the moving distance.
Moving distance after proximity dog	Parameter No.PC08	Set the moving distance after passage of proximity dog front end.
Home position return acceleration/deceleration time constants	Point table No.1	Use the acceleration/deceleration time constants of point table No.1.
Home position return position data	Parameter No.PC07	Set the current position at home position return completion.

5. OPERATION

(2) Timing chart



Note. Configure a sequence that changes the point table selection earlier, considering the delay time of CC-Link communication.

The parameter No.PC07 (home position return position data) setting value is the positioning address after the home position return is completed.

5. OPERATION

5.6.4 Data setting type home position return

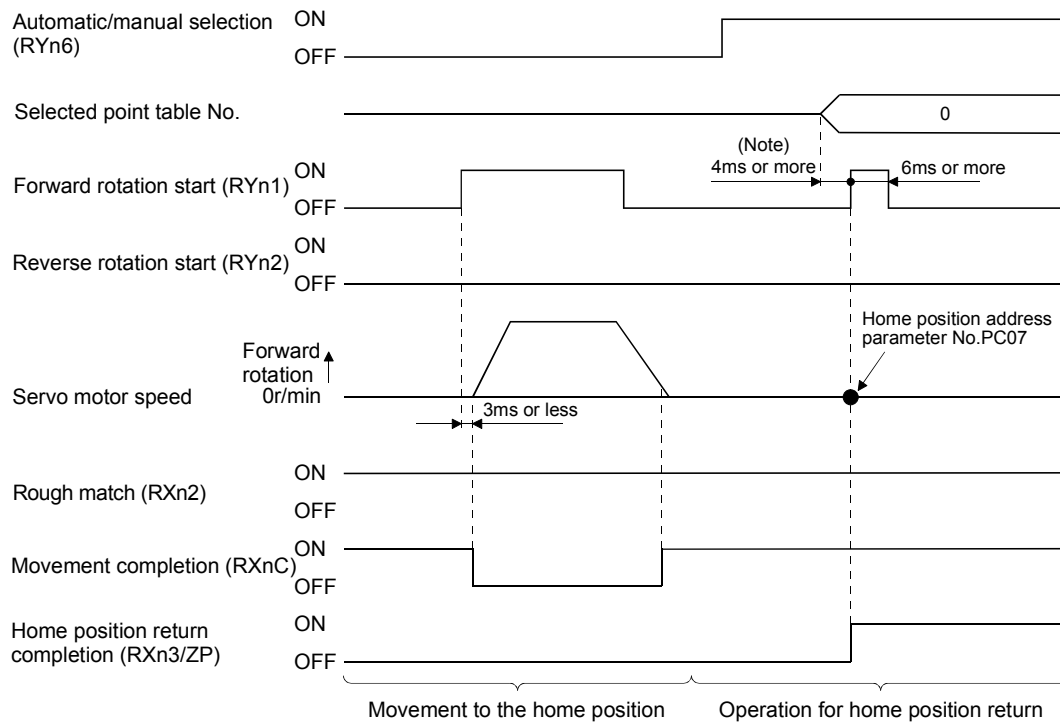
Data setting type home position return is used when it is desired to determine any position as a home position. JOG operation can be used for movement.

(1) Devices, parameters

Set the input devices and parameters as follows.

Item	Device/Parameter used	Description
Manual home position return mode selection	Automatic/manual selection (RYn6)	Turn RYn6 ON.
	Point table No. selection 1 to 8 (RYnA to RYnE, RY(n+2)3 to RY(n+2)5)	RYnA to RYnE, RY(n+2)3 to RY(n+2)5 are turned off.
Remote register-based position/speed setting (Only when two stations are occupied)	Position/speed specifying system selection (RY(n+2)A)	Turn RY(n+2)A ON.
Data setting type home position return	Parameter No.PC02	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 2: Data setting type home position return is selected.
Home position return position data	Parameter No.PC07	Set the current position at home position return completion.

(2) Timing chart



Note. Configure a sequence that changes the point table selection earlier, considering the delay time of CC-Link communication.

The parameter No.PC07 (home position return position data) setting value is the positioning address after the home position return is completed.

5. OPERATION

5.6.5 Stopper type home position return

In stopper type home position return, a machine part is pressed against a stopper or the like by jog operation to make a home position return and that position is defined as a home position.

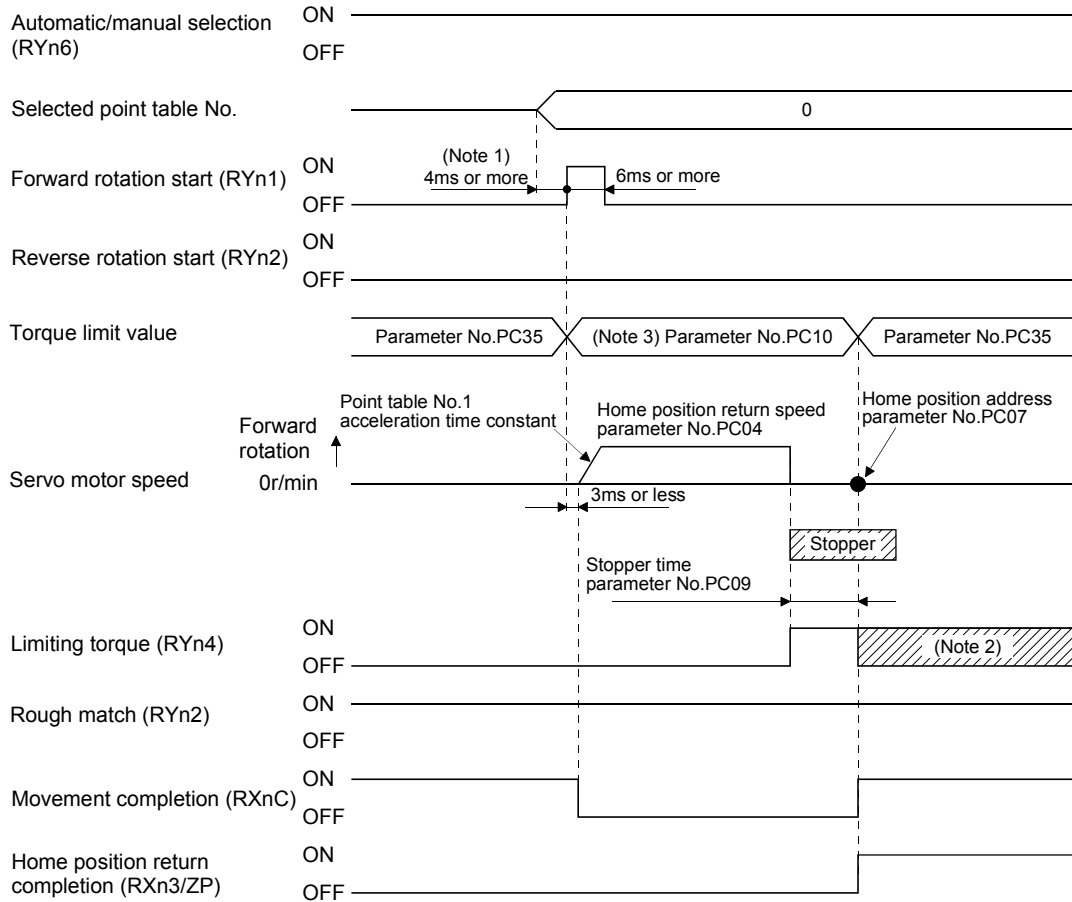
(1) Devices, parameters

Set the input devices and parameters as follows.

Item	Device/Parameter used	Description
Manual home position return mode selection	Automatic/manual selection (RYn6)	Turn RYn6 ON.
	Point table No. selection 1 to 8 (RYnA to RYnE, RY(n+2)3 to RY(n+2)5)	RYnA to RYnE, RY(n+2)3 to RY(n+2)5 are turned off.
Remote register-based position/speed setting (Only when two stations are occupied)	Position/speed specifying system selection (RY(n+2)A)	Turn RY(n+2)A ON.
Stopper type home position return	Parameter No.PC02	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 3: Stopper type home position return is selected.
Home position return direction	Parameter No.PC03	Refer to section 5.6.1 (2) and choose the home position return direction.
Home position return speed	Parameter No.PC04	Set the speed till contact with the stopper.
Stopper time	Parameter No.PC09	Time from when the part makes contact with the stopper to when home position return data is obtained to output home position return completion (ZP).
Stopper type home position return torque limit value	Parameter No.PC10	Set the servo motor torque limit value for execution of stopper type home position return.
Home position return acceleration time constant	Point table No.1	Use the acceleration time constant of point table No.1.
Home position return position data	Parameter No.PC07	Set the current position at home position return completion.

5. OPERATION

(2) Timing chart



Note 1. Configure a sequence that changes the point table selection earlier, considering the delay time of CC-Link communication.

2. Turns ON when the torque reaches the value set to Forward rotation torque limit (parameter No.PA11), Reverse rotation torque limit (parameter No.PA12) or Internal torque limit (parameter No.PC35).

3. The torque limit that is enabled at this point is as follows.

(Note) Internal torque limit selection (RY(n+2)6)	Limit value status	Torque limit to be enabled
0		Parameter No.PC10
1	Parameter No.PC35 > Parameter No.PC10	Parameter No.PC10
	Parameter No.PC35 < Parameter No.PC10	Parameter No.PC35

Note. 0: OFF

1: ON

The parameter No.PC07 (home position return position data) setting value is the positioning address after the home position return is completed.

5. OPERATION

5.6.6 Home position ignorance (servo-on position defined as home position)

The position where servo is switched on is defined as a home position.

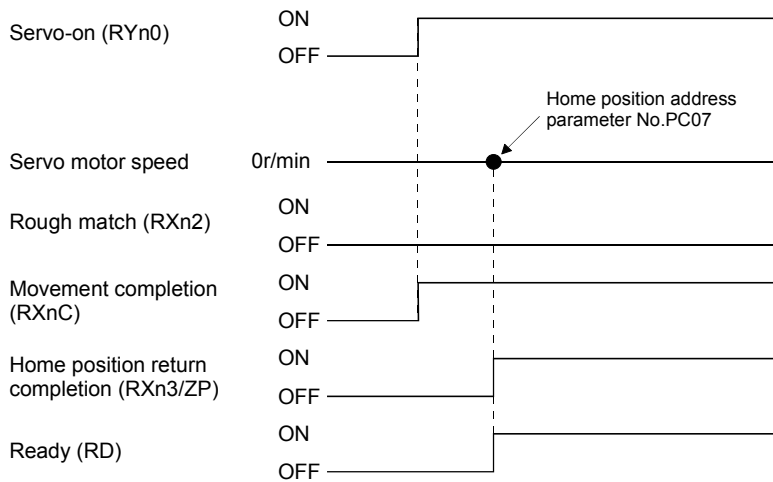
POINT
<ul style="list-style-type: none"> When executing this home position return, changing to the home position return mode is not necessary.

(1) Devices, parameter

Set the input devices and parameter as follows.

Item	Device/Parameter used	Description
Home position ignorance	Parameter No.PC02	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 4: Home position ignorance is selected.
Home position return position data	Parameter No.PC07	Set the current position at home position return completion.

(2) Timing chart



The parameter No.PC07 (home position return position data) setting value is the positioning address after the home position return is completed.

5. OPERATION

5.6.7 Dog type rear end reference home position return

POINT
<ul style="list-style-type: none"> This home position return method depends on the timing of reading Proximity dog (DOG) that has detected the rear end of a proximity dog. Hence, if a home position return is made at the creep speed of 100r/min, an error of ± 400 pulses will occur in the home position. The error of the home position is larger as the creep speed is higher.

The position where the axis, which had started decelerating at the front end of a proximity dog, has moved the after-proximity dog moving distance and home position shift distance after it passed the rear end is defined as a home position. A home position return that does not depend on the Z-phase signal can be made.

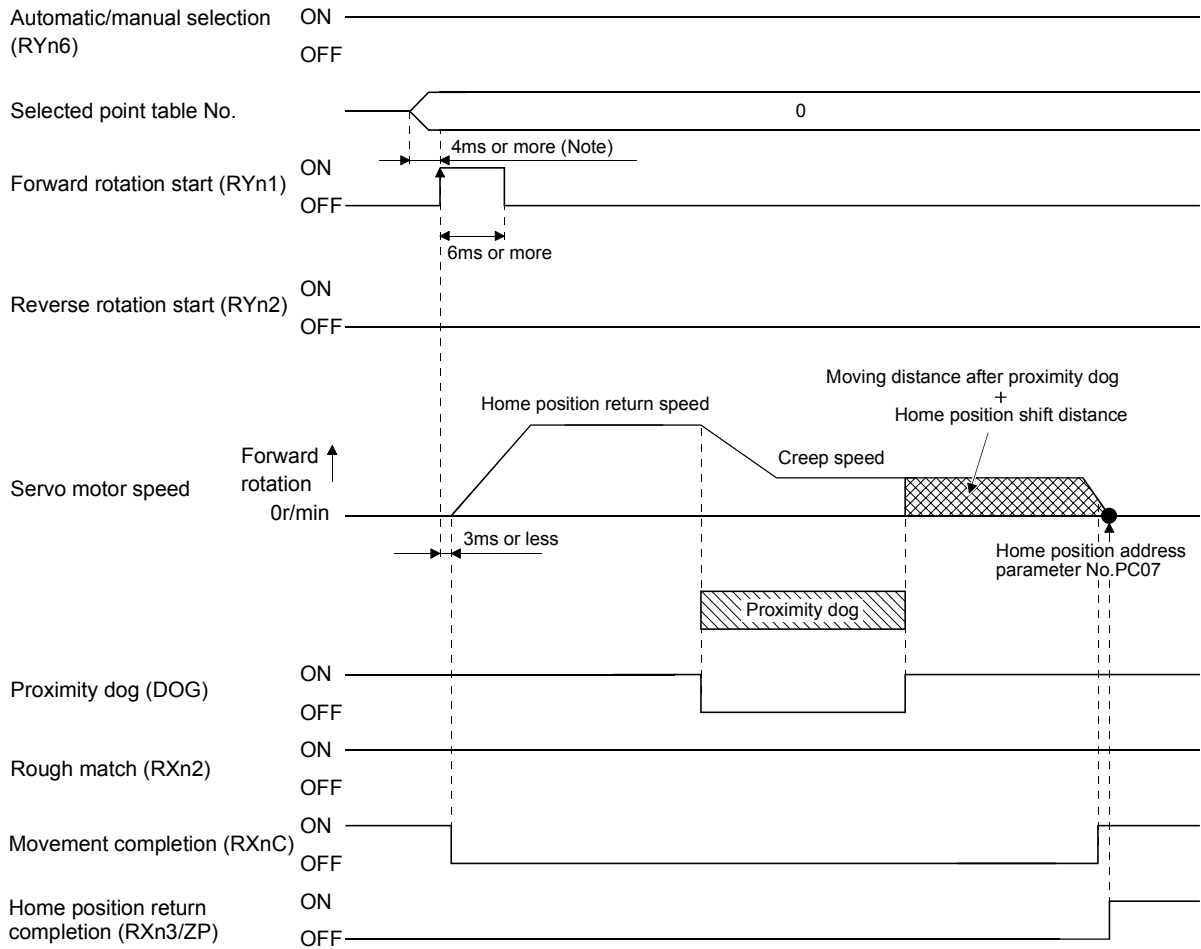
(1) Devices, parameters

Set the input devices and parameters as indicated below.

Item	Device/Parameter used	Description
Manual home position return mode selection	Automatic/manual selection (RYn6)	Turn RYn6 ON.
	Point table No. selection 1 to 8 (RYnA to RYnE, RY(n+2)3 to RY(n+2)5)	RYnA to RYnE, RY(n+2)3 to RY(n+2)5 are turned off.
Remote register-based position/speed setting (Only when two stations are occupied)	Position/speed specifying system selection (RY(n+2)A)	Turn RY(n+2)A ON.
Dog type rear end reference home position return	Parameter No.PC02	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 5: Select the dog type rear end reference.
Home position return direction	Parameter No.PC03	Refer to section 5.6.1 (2) and select the home position return direction.
Dog input polarity	Parameter No.PD16	Refer to section 5.6.1 (2) and select the dog input polarity.
Home position return speed	Parameter No.PC04	Set the speed till the dog is detected.
Creep speed	Parameter No.PC05	Set the speed after the dog is detected.
Home position shift distance	Parameter No.PC06	Set when the home position is moved from where the axis has passed the proximity dog rear end.
Moving distance after proximity dog	Parameter No.PC08	Set the moving distance after the axis has passed the proximity dog rear end.
Home position return acceleration/ deceleration time constants	Point table No.1	Use the acceleration/deceleration time constant of point table No.1.
Home position return position data	Parameter No.PC07	Set the current position at home position return completion.

5. OPERATION

(2) Timing chart



Note. Configure a sequence that changes the point table selection earlier, considering the delay time of CC-Link communication.

The parameter No.PC17 (home position return position data) setting value is the positioning address after the home position return is completed.

5. OPERATION

5.6.8 Count type front end reference home position return

POINT	<ul style="list-style-type: none"> This home position return method depends on the timing of reading Proximity dog (DOG) that has detected the front end of a proximity dog. Hence, if a home position return is made at the home position return speed of 100r/min, an error of ± 400 pulses will occur in the home position. The error of the home position is larger as the home position return speed is higher.
-------	--

The position where the axis, which had started decelerating at the front end of a proximity dog, has moved the after-proximity dog moving distance and home position shift distance is defined as a home position. A home position return that does not depend on the Z-phase signal can be made. The home position may change if the home position return speed varies.

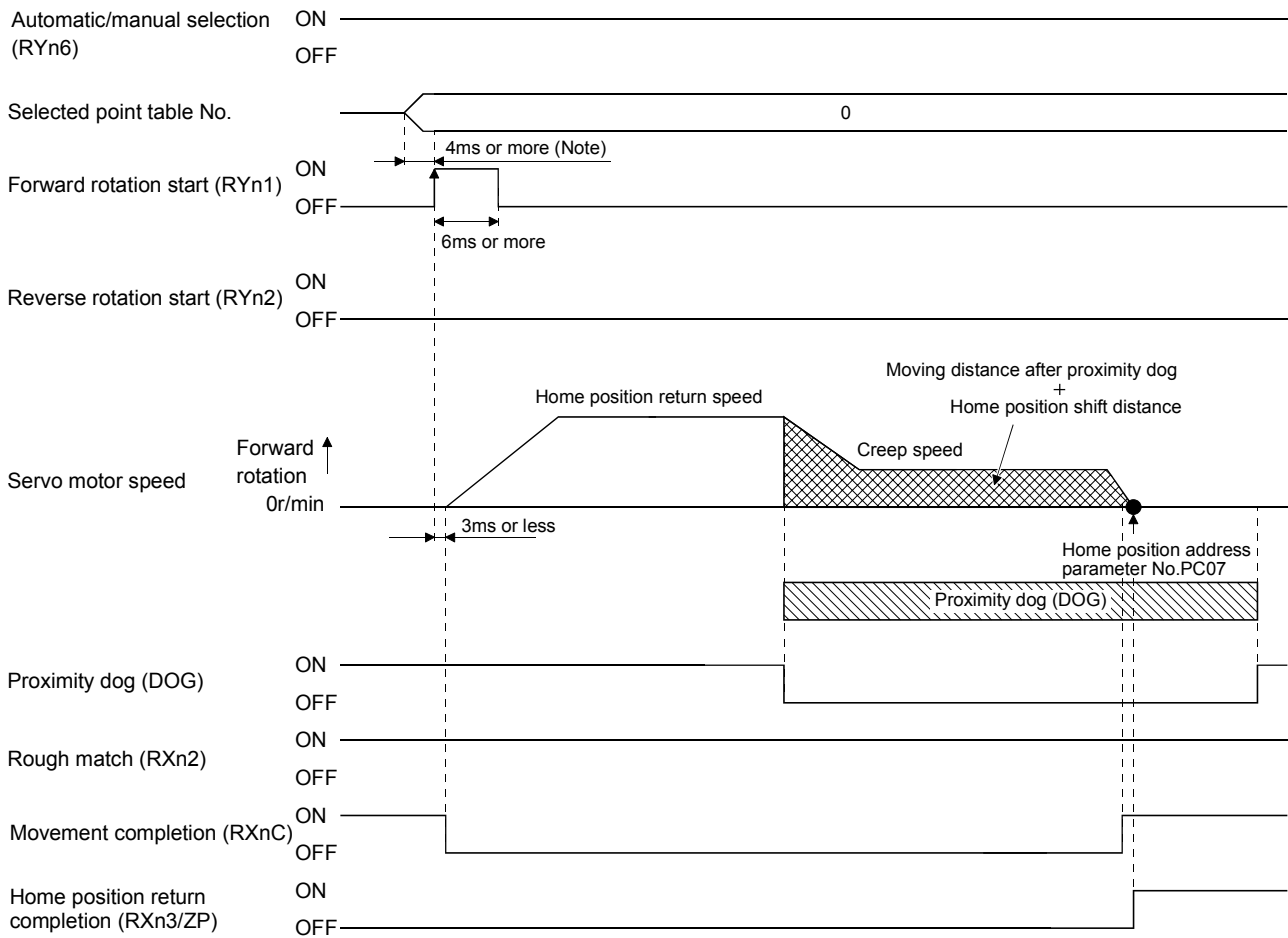
(1) Devices, parameters

Set the input devices and parameters as indicated below.

Item	Device/Parameter used	Description
Manual home position return mode selection	Automatic/manual selection (RYn6)	Turn RYn6 ON.
	Point table No. selection 1 to 8 (RYnA to RYnE, RY(n+2)3 to RY(n+2)5)	RYnA to RYnE, RY(n+2)3 to RY(n+2)5 are turned off.
Remote register-based position/speed setting (Only when two stations are occupied)	Position/speed specifying system selection (RY(n+2)A)	Turn RY(n+2)A ON.
Count type dog front end reference home position return	Parameter No.PC02	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 6: Select the count type dog front end reference.
Home position return direction	Parameter No.PC03	Refer to section 5.6.1 (2) and select the home position return direction.
Dog input polarity	Parameter No.PD16	Refer to section 5.6.1 (2) and select the dog input polarity.
Home position return speed	Parameter No.PC04	Set the speed till the dog is detected.
Creep speed	Parameter No.PC05	Set the speed after the dog is detected.
Home position shift distance	Parameter No.PC06	Set when the home position is moved from where the axis has passed the proximity dog rear end.
Moving distance after proximity dog	Parameter No.PC08	Set the moving distance after the axis has passed the proximity dog rear end.
Home position return acceleration/ deceleration time constants	Point table No.1	Use the acceleration/deceleration time constant of point table No.1.
Home position return position data	Parameter No.PC07	Set the current position at home position return completion.

5. OPERATION

(2) Timing chart



Note. Configure a sequence that changes the point table selection earlier, considering the delay time of CC-Link communication.

The parameter No.PC07 (home position return position data) setting value is the positioning address after the home position return is completed.

5. OPERATION

5.6.9 Dog cradle type home position return

The position where the first Z-phase signal is issued after detection of the proximity dog front end can be defined as a home position.

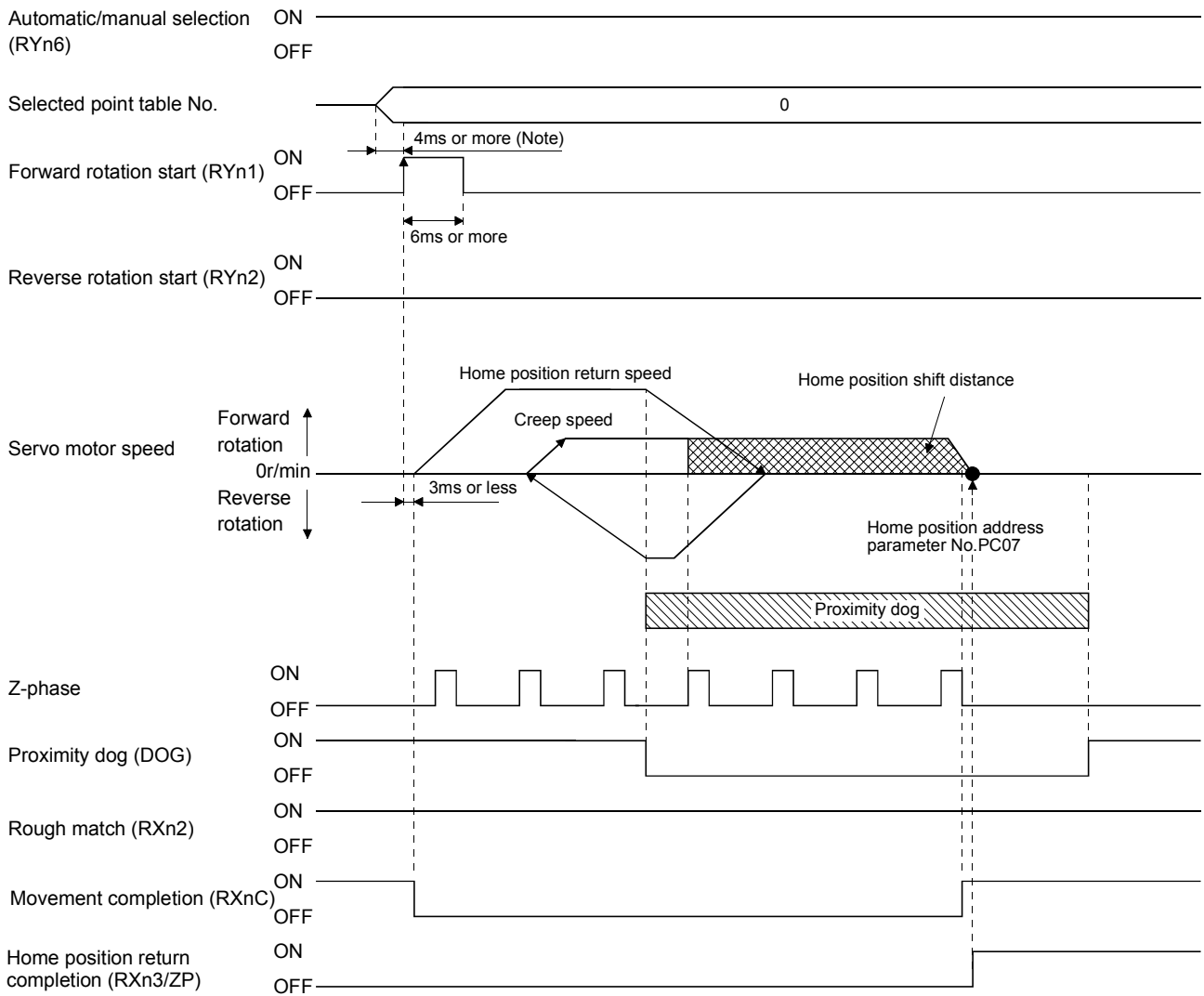
(1) Devices, parameters

Set the input devices and parameters as indicated below.

Item	Device/Parameter used	Description
Manual home position return mode selection	Automatic/manual selection (RYn6)	Turn RYn6 ON.
	Point table No. selection 1 to 8 (RYnA to RYnE, RY(n+2)3 to RY(n+2)5)	RYnA to RYnE, RY(n+2)3 to RY(n+2)5 are turned off.
Remote register-based position/speed setting (Only when two stations are occupied)	Position/speed specifying system selection (RY(n++2)A)	Turn RY(n+2)A ON.
Dog cradle type home position return	Parameter No.PC02	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 7: Select the dog cradle type.
Home position return direction	Parameter No.PC03	Refer to section 5.6.1 (2) and select the home position return direction.
Dog input polarity	Parameter No.PD16	Refer to section 5.6.1 (2) and select the dog input polarity.
Home position return speed	Parameter No.PC04	Set the speed till the dog is detected.
Creep speed	Parameter No.PC05	Set the speed after the dog is detected.
Home position shift distance	Parameter No.PC06	Set when the home position is moved from the Z-phase signal position.
Home position return acceleration/deceleration time constants	Point table No.1	Use the acceleration/deceleration time constant of point table No.1.
Home position return position data	Parameter No.PC07	Set the current position at home position return completion.

5. OPERATION

(2) Timing chart



Note. Configure a sequence that changes the point table selection earlier, considering the delay time of CC-Link communication.

The parameter No.PC07 (home position return position data) setting value is the positioning address after the home position return is completed.

5. OPERATION

5.6.10 Dog type first Z-phase reference home position return

After the proximity dog front end is detected, the current position moves in the reverse direction at creep speed. After this moving away from the proximity dog, the home position is determined to be where the first Z-phase pulse is issued.

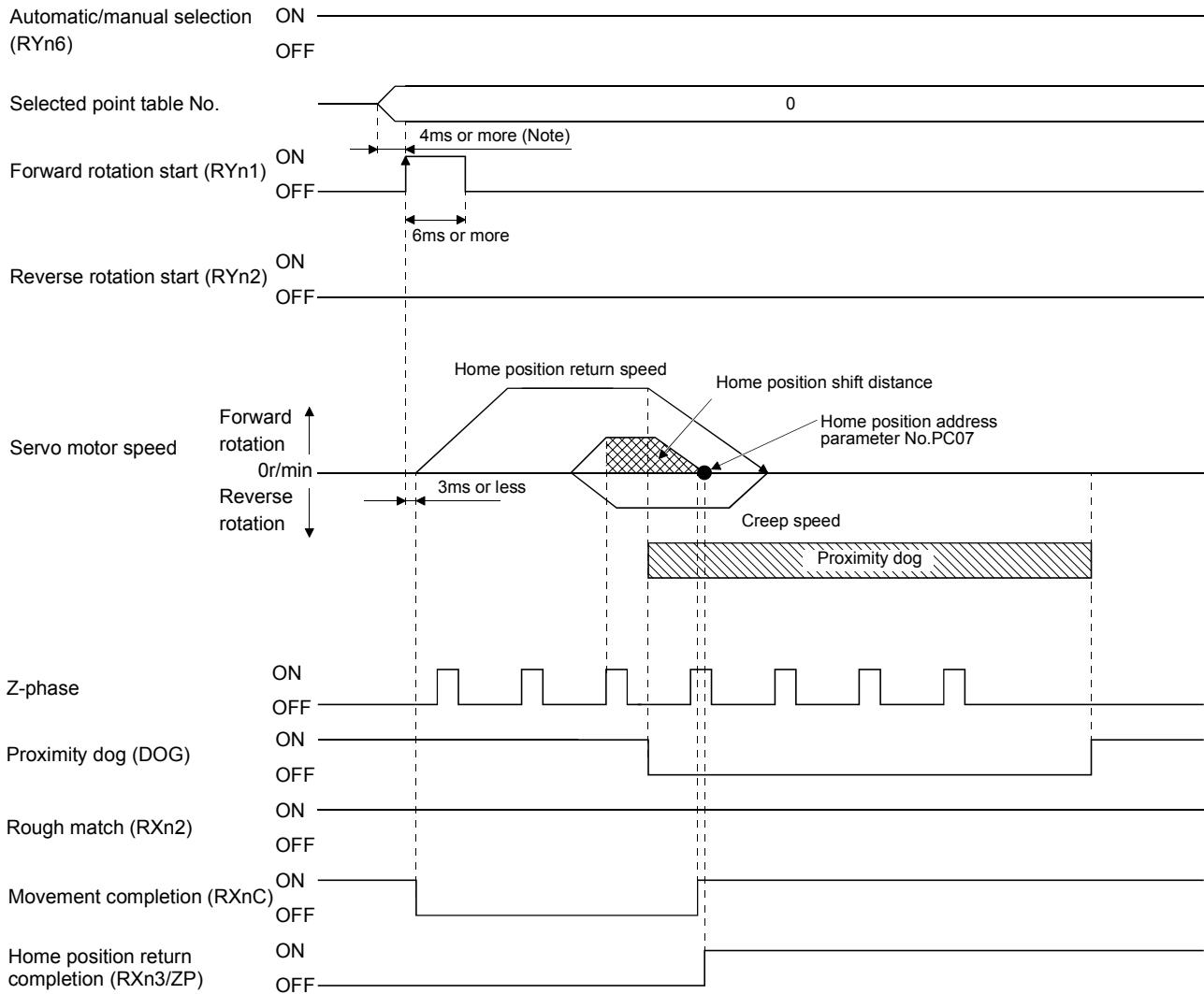
(1) Devices, parameters

Set the input devices and parameters as indicated below.

Item	Device/Parameter used	Description
Manual home position return mode selection	Automatic/manual selection (RYn6)	Turn RYn6 ON.
	Point table No. selection 1 to 8 (RYnA to RYnE, RY(n+2)3 to RY(n+2)5)	RYnA to RYnE, RY(n+2)3 to RY(n+2)5 are turned off.
Remote register-based position/speed setting (Only when two stations are occupied)	Position/speed specifying system selection (RY(n+2)A)	Turn RY(n+2)A ON.
Dog cradle type home position return	Parameter No.PC02	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 8: Select the dog cradle type.
Home position return direction	Parameter No.PC03	Refer to section 5.6.1 (2) and select the home position return direction.
Dog input polarity	Parameter No.PD16	Refer to section 5.6.1 (2) and select the dog input polarity.
Home position return speed	Parameter No.PC04	Set the speed till the dog is detected.
Creep speed	Parameter No.PC05	Set the speed after the dog is detected.
Home position shift distance	Parameter No.PC06	Set when the home position is moved from the Z-phase signal position.
Home position return acceleration/deceleration time constants	Point table No.1	Use the acceleration/deceleration time constant of point table No.1.
Home position return position data	Parameter No.PC07	Set the current position at home position return completion.

5. OPERATION

(2) Timing chart



Note. Configure a sequence that changes the point table selection earlier, considering the delay time of CC-Link communication.

The parameter No.PC07 (home position return position data) setting value is the positioning address after the home position return is completed.

5. OPERATION

5.6.11 Dog type front end reference home position return method

The home position is determined to be the position of the front end of the proximity dog.

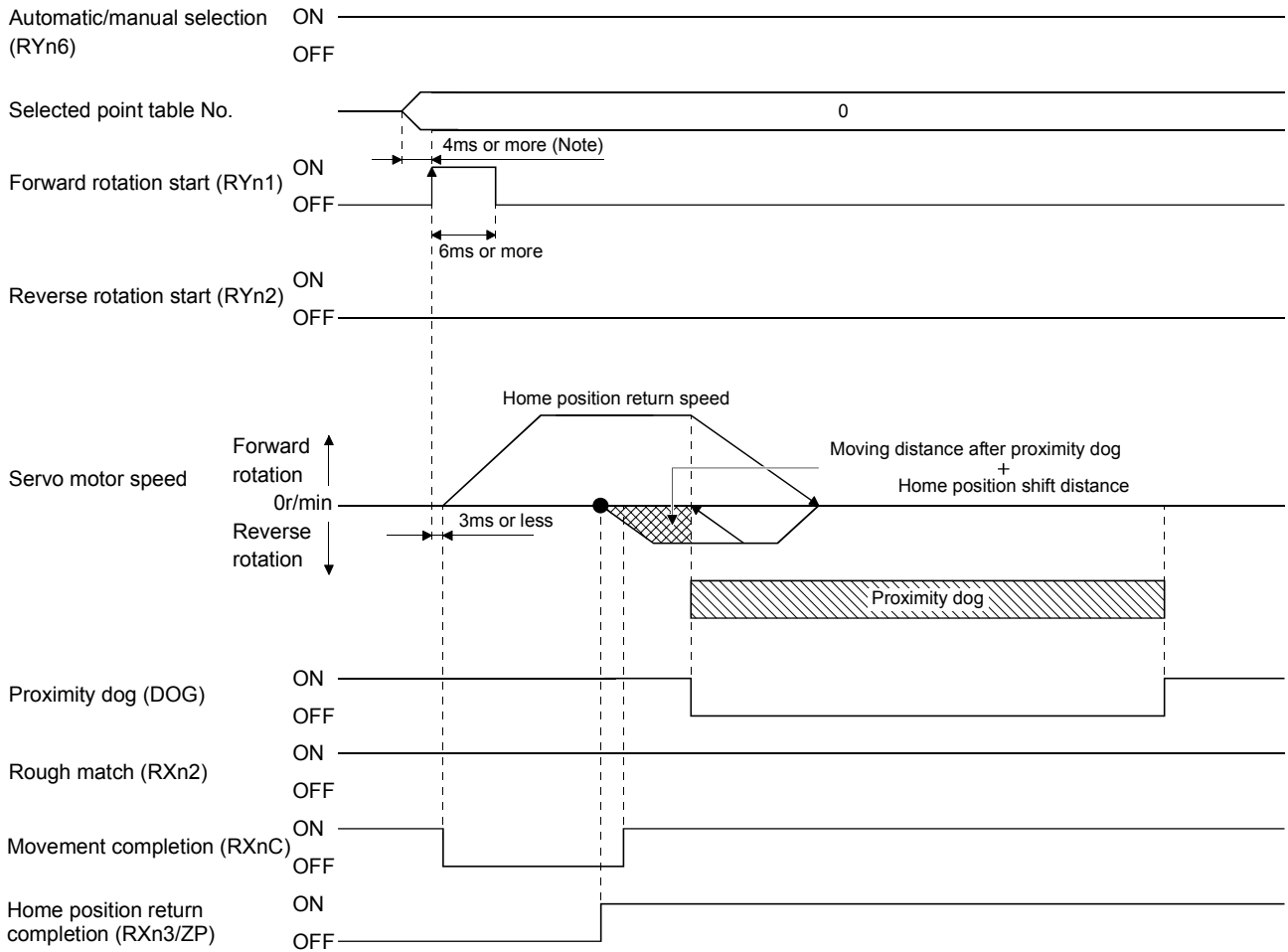
(1) Devices, parameters

Set the input devices and parameters as indicated below.

Item	Device/Parameter used	Description
Manual home position return mode selection	Automatic/manual selection (RYn6)	Turn RYn6 ON.
	Point table No. selection 1 to 8 (RYnA to RYnE, RY(n+2)3 to RY(n+2)5)	RYnA to RYnE, RY(n+2)3 to RY(n+2)5 are turned off.
Remote register-based position/speed setting (Only when two stations are occupied)	Position/speed specifying system selection (RY(n+2)A)	Turn RY(n+2)A ON.
Dog cradle type home position return	Parameter No.PC02	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 9: Select the dog cradle type.
Home position return direction	Parameter No.PC03	Refer to section 5.6.1 (2) and select the home position return direction.
Dog input polarity	Parameter No.PD16	Refer to section 5.6.1 (2) and select the dog input polarity.
Home position return speed	Parameter No.PC04	Set the speed till the dog is detected.
Creep speed	Parameter No.PC05	Set the speed after the dog is detected.
Home position shift distance	Parameter No.PC06	Set when the home position is moved from the Z-phase signal position.
Home position return acceleration/deceleration time constants	Point table No.1	Use the acceleration/deceleration time constant of point table No.1.
Home position return position data	Parameter No.PC07	Set the current position at home position return completion.

5. OPERATION

(2) Timing chart



Note. Configure a sequence that changes the point table selection earlier, considering the delay time of CC-Link communication.

The parameter No.PC07 (home position return position data) setting value is the positioning address after the home position return is completed.

5. OPERATION

5.6.12 Dogless Z-phase reference home position return method

The home position is determined to be where the first Z-phase pulse is issued after the home position return is started.

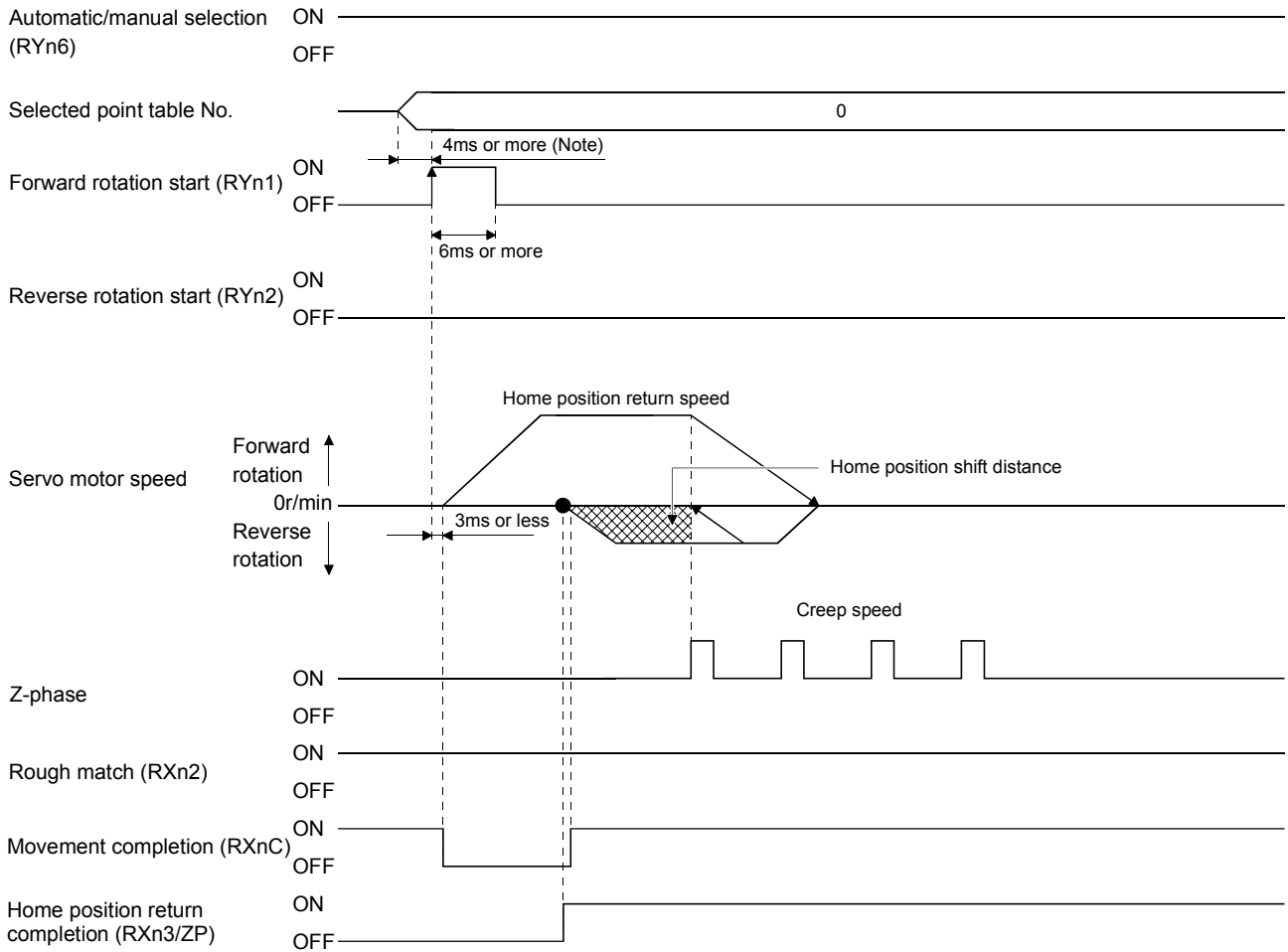
(1) Devices, parameters

Set the input devices and parameters as indicated below.

Item	Device/Parameter used	Description
Manual home position return mode selection	Automatic/manual selection (RYn6)	Turn RYn6 ON.
	Point table No. selection 1 to 8 (RYnA to RYnE, RY(n+2)3 to RY(n+2)5)	RYnA to RYnE, RY(n+2)3 to RY(n+2)5 are turned off.
Remote register-based position/speed setting (Only when two stations are occupied)	Position/speed specifying system selection (RY(n+2)A)	Turn RY(n+2)A ON.
Dog cradle type home position return	Parameter No.PC02	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> A: Select the dog cradle type.
Home position return direction	Parameter No.PC03	Refer to section 5.6.1 (2) and select the home position return direction.
Home position return speed	Parameter No.PC04	Set the speed till the dog is detected.
Creep speed	Parameter No.PC05	Set the speed after the dog is detected.
Home position shift distance	Parameter No.PC06	Set when the home position is moved from the Z-phase signal position.
Home position return acceleration/deceleration time constants	Point table No.1	Use the acceleration/deceleration time constant of point table No.1.
Home position return position data	Parameter No.PC07	Set the current position at home position return completion.

5. OPERATION

(2) Timing chart



Note. Configure a sequence that changes the point table selection earlier, considering the delay time of CC-Link communication.

The parameter No.PC07 (home position return position data) setting value is the positioning address after the home position return is completed.

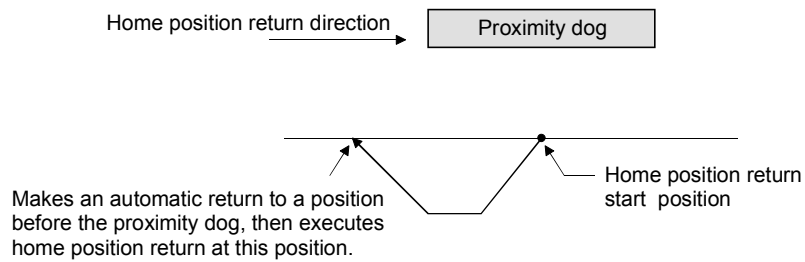
5. OPERATION

5.6.13 Home position return automatic return function

If the current position is at or beyond the proximity dog in the home position return using the proximity dog, this function starts home position return after making a return to the position where the home position return can be made.

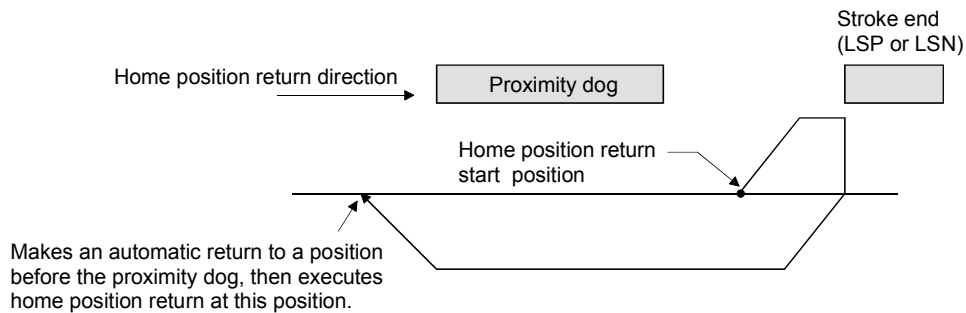
(1) When the current position is at the proximity dog

When the current position is at the proximity dog, an automatic return is made before home position return.



(2) When the current position is beyond the proximity dog

At a start, a motion is made in the home position return direction and an automatic return is made on detection of the stroke end (LSP or LSN). The motion stops past the front end of the proximity dog, and home position return is resumed at that position. If the proximity dog cannot be detected, the motion stops on detection of the LSP or LSN switch and A90 occurs.



Software limit cannot be used with these functions.

5. OPERATION

5.6.14 Automatic positioning function to the home position

POINT
<ul style="list-style-type: none"> You cannot perform automatic positioning from outside the position data setting range to the home position. In this case, make a home position return again using a manual home position return.

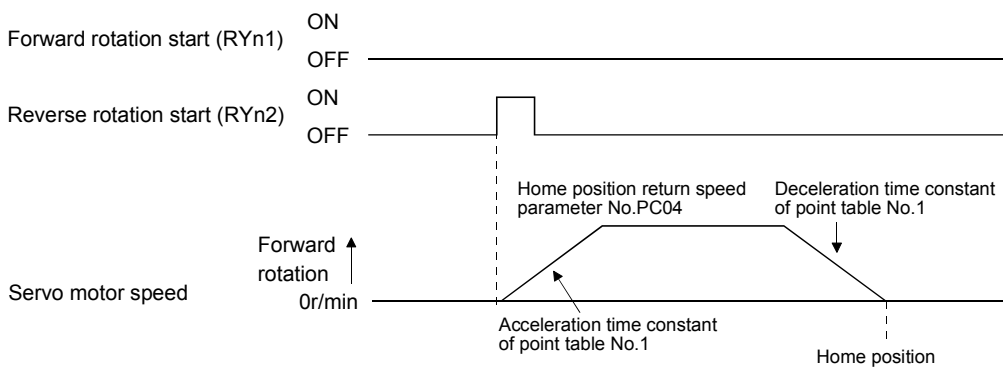
If this function is used when returning to the home position again after performing a manual home position return after a power-on and deciding the home position, automatic positioning can be carried out to the home position at high speed. In an absolute position detection system, manual home position return is not required after power-on.

Please perform a manual home position return beforehand after a power-on.

Set the input signals and parameter as follows.

Item	Device/Parameter used	Description
Manual home position return mode selection	Automatic/manual selection (RYn6)	Turn RYn6 ON.
	Point table No. selection 1 to 8 (RYnA to RYnE, RY(n+2)3 to RY(n+2)5)	RYnA to RYnE, RY(n+2)3 to RY(n+2)5 are turned off.
Home position return speed	Parameter No.PC04	Set the speed till the dog is detected.
Home position return acceleration/deceleration time constants	Point table No.1	Use the acceleration/deceleration time constant of point table No.1.

Set up the home position return speed of the automatic positioning function to the home position by parameter No.PC04. Use the data of point table No.1 to set the acceleration time constant and deceleration time constant. When reverse rotation start (RYn2) is ON, it will position automatically at the home position.



5. OPERATION

5.7 Roll feed display function in roll feed mode

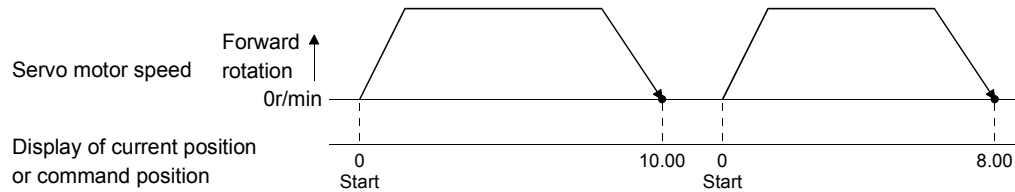
With the roll feed display function, the servo amplifier can operate in the roll feed mode. The roll feed mode uses the incremental system.

(1) Parameter settings

No.	Name	Digit to be set	Setting item	Setting value	Description
PA03	Absolute position detection system	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>	Operation system	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 0 (initial value)	Make sure to set the incremental system. The absolute position detection system cannot be used.
PC28	Function selection C-7	<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	Selection between current position display and command position display	<input type="checkbox"/> <input type="checkbox"/> 1 <input type="checkbox"/>	Select roll feed display.

(2) Roll feed display function

At start up, the roll feed display function clears the status display of the current position and command position to zero.



(3) Operation procedure

Changes are made only on the status display of the current position and commanded position. The same operation procedure as that in each operation mode can be used.

Operation procedure		Details
Automatic operation	Automatic operation according to the point table	Section 5.4.2
Manual operation	JOG operation	Section 5.5.1
	Manual pulse generator operation	Section 5.5.2
Home position return mode		Section 5.6

5. OPERATION

5.8 Absolute position detection system



CAUTION

- If an absolute position erase alarm (A25) or an absolute position counter warning (AE3) has occurred, always perform home position setting again. Not doing so may cause unexpected operation.

POINT

- If the encoder cable is disconnected, absolute position data will be lost in the following servo motor series. HF-MP, HF-KP, HC-SP, HC-RP, HC-UP, HC-LP, and HA-LP. After disconnecting the encoder cable, always execute home position setting and then positioning operation.
- When the following parameters are changed, the home position is lost when turning on the power after the change. Execute the home position return again when turning on the power.
 - Parameter No.PA06 (Electronic gear numerator)
 - Parameter No.PA07 (Electronic gear denominator)
 - Parameter No.PA14 (Rotation direction selection)
 - Parameter No.PC07 (Home position return position data)

This servo amplifier contains a single-axis controller. Also, all servo motor encoders are compatible with an absolute position detection system. Hence, an absolute position detection system can be configured up by merely loading an absolute position data back-up battery and setting parameter values.

(1) Restrictions

An absolute position detection system cannot be built under the following conditions.

- 1) Stroke-less coordinate system, e.g. rotary shaft, infinite positioning.
- 2) Operation performed in incremental value command type positioning system.

(2) Specifications

Item	Description
System	Electronic battery backup system.
Battery	1 piece of lithium battery (primary battery, nominal + 3.6V) Type: MR-J3BAT.
Maximum revolution range	Home position \pm 32767 rev.
(Note 1) Maximum speed at power failure	3000r/min
(Note 2) Battery backup time	Approx. 10,000 hours (battery life with power off)
Battery storage period	5 years from date of manufacture.

Note 1. Maximum speed available when the shaft is rotated by external force at the time of power failure or the like.

2. Time to hold data by a battery with power off. It is recommended to replace the battery in three years independently of whether power is kept on or off.

5. OPERATION

(3) Structure

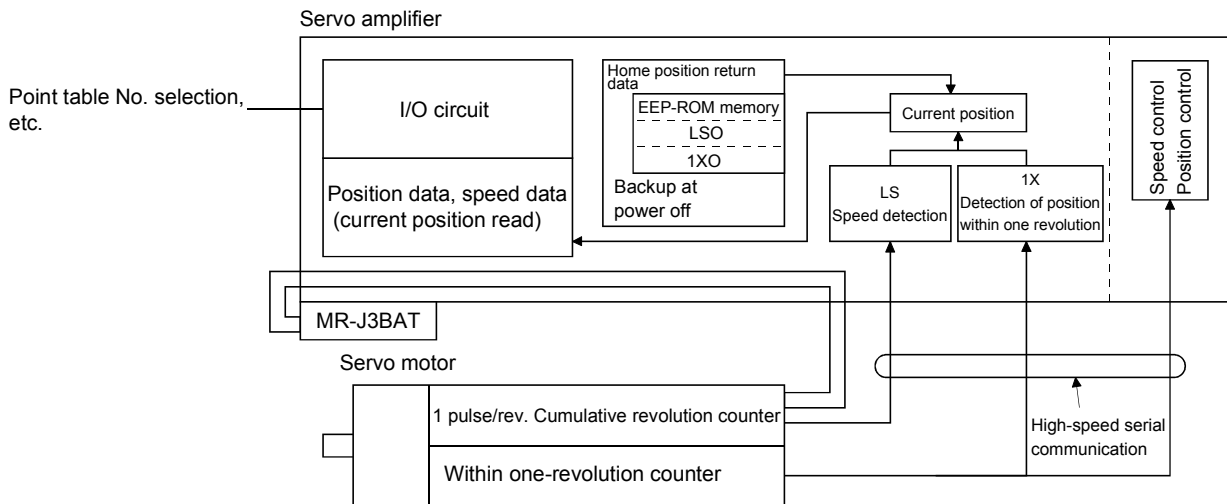
Component	Description
Servo amplifier	Use standard models.
Servo motor	
Battery	MR-J3BAT
Encoder cable	Use a standard model. (Refer to section 14.1.)

(4) Outline of absolute position detection data communication

For normal operation, as shown below, the encoder consists of a detector designed to detect a position within one revolution and a cumulative revolution counter designed to detect the number of revolutions.

The absolute position detection system always detects the absolute position of the machine and keeps it battery-backed, independently of whether the general-purpose programming controller power is on or off. Therefore, once the home position is defined at the time of machine installation, home position return is not needed when power is switched on thereafter.

If a power failure or a fault occurs, restoration is easy.



(5) Battery installation procedure



WARNING

- Before installing a battery, turn off the main circuit power while keeping the control circuit power on. Wait for 15 minutes or more until the charge lamp turns off. Then, confirm that the voltage between P(+) and N(−) is safe with a voltage tester and others. Otherwise, an electric shock may occur. In addition, always confirm from the front of the servo amplifier whether the charge lamp is off or not.

POINT

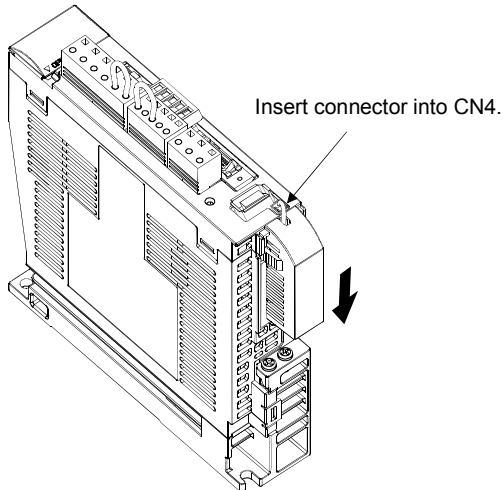
- The internal circuits of the servo amplifier may be damaged by static electricity. Always take the following precautions.
 - Ground human body and work bench.
 - Do not touch the conductive areas, such as connector pins and electrical parts, directly by hand.
- Before starting battery changing procedure, make sure that the main circuit power is switched OFF with the control circuit power ON. When battery is changed with the control power OFF, the absolute position data is lost.

5. OPERATION

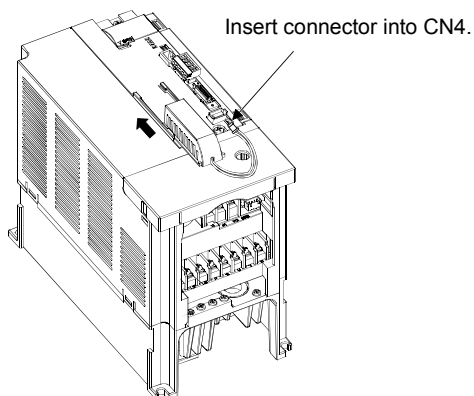
(a) For MR-J3-350T or less • MR-J3-200T4 or less

POINT

- For the servo amplifier with a battery holder on the bottom, it is not possible to wire for the earth with the battery installed. Insert the battery after executing the earth wiring of the servo amplifier.



(b) For MR-J3-500T or more • MR-J3-350T4 or more



(c) Parameter setting

Set parameter No.PA03 (Absolute position detection system) as indicated below to make the absolute position detection system valid.

Parameter No.PA03

			1
--	--	--	---

Selection of absolute position detection system
0: Incremental system
1: Absolute position detection system

6. PARAMETERS

6. PARAMETERS



CAUTION

- Never adjust or change the parameter values extremely as it will make operation instable.

POINT

- For any parameter whose symbol is preceded by *, set the parameter value and switch power off once, then switch it on again to make that parameter setting valid.

In this servo amplifier, the parameters are classified into the following groups on a function basis.

Parameter group	Main description
Basic setting parameters (No.PA□□)	Make basic setting with these parameters. Generally, the operation is possible only with these parameter settings.
Gain/filter parameters (No.PB□□)	Use these parameters when making gain adjustment manually.
Extension setting parameters (No.PC□□)	These parameters are inherent to the MR-J3-□T servo amplifier.
I/O setting parameters (No.PD□□)	Use these parameters when changing the I/O devices of the servo amplifier.

Mainly setting the basic setting parameters (No.PA□□) allows the setting of the basic parameters at the time of introduction.

6.1 Basic setting parameters (No.PA□□)

6.1.1 Parameter list

No.	Symbol	Name	Initial value	Unit
PA01	*STY	Control mode	0000h	
PA02	*REG	Regenerative option	0000h	
PA03	*ABS	Absolute position detection system	0000h	
PA04	*AOP1	Function selection A-1	0000h	
PA05	*FTY	Feeding function selection	0000h	
PA06	*CMX	Electronic gear numerator	1	
PA07	*CDV	Electronic gear denominator	1	
PA08	ATU	Auto tuning mode	0001h	
PA09	RSP	Auto tuning response	12	
PA10	INP	In-position range	100	μm
PA11	TLP	Forward rotation torque limit	100.0	%
PA12	TLN	Reverse rotation torque limit	100.0	%
PA13		For manufacturer setting	0002h	
PA14	*POL	Rotation direction selection	0	
PA15	*ENR	Encoder output pulses	4000	pulse/rev
PA16		For manufacturer setting	0000h	
PA17			0000h	
PA18			0000h	
PA19	*BLK	Parameter write inhibit	000Ch	

6. PARAMETERS

6.1.2 Parameter write inhibit

Parameter			Initial value	Unit	Setting range
No.	Symbol	Name			
PA19	*BLK	Parameter write inhibit	000Ch		Refer to the text.

POINT
<ul style="list-style-type: none"> ▪ This parameter is made valid when power is switched off, then on after setting.

In the factory setting, this servo amplifier allows changes to the basic setting parameter, gain/filter parameter and extension setting parameter settings. With the setting of parameter No.PA19, write can be disabled to prevent accidental changes.

The following table indicates the parameters which are enabled for reference and write by the setting of parameter No.PA19. Operation can be performed for the parameters marked ○.

Parameter No.PA19 setting	Setting operation	Basic setting parameters No.PA □□	Gain/Filter parameters No.PB □□	Extension setting parameters No.PC □□	I/O setting parameters No.PD □□
0000h	Reference	○	/	/	/
	Write	○	/	/	/
000Bh	Reference	○	○	○	/
	Write	○	○	○	/
000Ch (initial value)	Reference	○	○	○	○
	Write	○	○	○	○
100Bh	Reference	○	/	/	/
	Write	Parameter No. PA19 only	/	/	/
100Ch	Reference	○	○	○	○
	Write	Parameter No. PA19 only	/	/	/

6. PARAMETERS

6.1.3 Selection of command system

Parameter			Initial value	Unit	Setting range
No.	Symbol	Name			
PA01	*STY	Control mode	0000h		Refer to the text.

POINT
<ul style="list-style-type: none"> This parameter is made valid when power is switched off, then on after setting.

Select the command system.

Parameter No.PA01

0	0	0	
---	---	---	--

Selection of command system
(Refer to section 5.4)
0: Absolute value command system
1: Incremental value command system

6.1.4 Selection of regenerative option

Parameter			Initial value	Unit	Setting range
No.	Symbol	Name			
PA02	*REG	Regenerative option	0000h		Refer to the text.

POINT
<ul style="list-style-type: none"> This parameter is made valid when power is switched off, then on after setting. Wrong setting may cause the regenerative option to burn. If the regenerative option selected is not for use with the servo amplifier, parameter error (A37) occurs.

Set this parameter when using the regenerative option, brake unit, power regeneration converter, or power regeneration common converter.

Parameter No.PA02

0	0		
---	---	--	--

Selection of regenerative option
00: Regenerative option is not used

- For servo amplifier of 100W, regenerative resistor is not used.
- For servo amplifier of 200 to 7kW, built-in regenerative resistor is used.
- Supplied regenerative resistors or regenerative option is used with the servo amplifier of 11k to 22kW.

01: FR-BU2-(H)•FR-RC-(H)•FR-CV-(H)
02: MR-RB032
03: MR-RB12
04: MR-RB32
05: MR-RB30
06: MR-RB50(Cooling fan is required)
08: MR-RB31
09: MR-RB51(Cooling fan is required)
80: MR-RB1H-4
81: MR-RB3M-4(Cooling fan is required)
82: MR-RB3G-4(Cooling fan is required)
83: MR-RB5G-4(Cooling fan is required)
84: MR-RB34-4(Cooling fan is required)
85: MR-RB54-4(Cooling fan is required)
FA: When the supplied regenerative resistor is cooled by the cooling fan to increase the ability with the servo amplifier of 11k to 22kW.

6. PARAMETERS

6.1.5 Using absolute position detection system

Parameter			Initial value	Unit	Setting range
No.	Symbol	Name			
PA03	*ABS	Absolute position detection system	0000h		Refer to the text.

POINT
<ul style="list-style-type: none"> This parameter is made valid when power is switched off, then on after setting.

Set this parameter when using the absolute position detection system.

Parameter No. PA03

0	0	0	
---	---	---	--

Selection of absolute position detection system (refer to section 5.7)
 0: Used in incremental system
 1: Used in absolute position detection system

6.1.6 Follow-up for absolute value command system in incremental system

Parameter			Initial value	Unit	Setting range
No.	Symbol	Name			
PA04	*AOP1	Function selection A-1	0000h		Refer to the text.

POINT
<ul style="list-style-type: none"> This parameter is made valid when power is switched off, then on after setting.

If this parameter is made valid, the home position is not lost in the servo-off or forced stop state, and the operation can be resumed when the servo-on (RYn0) or forced stop (EMG) is deactivated.

Parameter No. PA04

0	0	0	
---	---	---	--

Servo-on (RYn0) -off, forced stop (EMG) -off follow-up for absolute value command in incremental system
 0: Invalid
 1: Valid

Normally, when this servo amplifier is used in the absolute value command method of the incremental system, placing it in a servo off or forced stop status will erase the home position. When "1" is set in this parameter, the home position will not be erased if the servo amplifier is placed in a servo-off or forced stop status or if the alarm that can be deactivated by resetting occurs. The operation can be resumed when the servo-on (RYn0) or forced stop (EMG) is deactivated or an alarm is deactivated by resetting (RES).

6. PARAMETERS

6.1.7 Feeding function selection

Parameter			Initial value	Unit	Setting range
No.	Symbol	Name			
PA05	*FTY	Feeding function selection	0000h		Refer to the text.

POINT
<ul style="list-style-type: none"> This parameter is made valid when power is switched off, then on after setting.

Select the feed length multiplication and the manual pulse generator input multiplication.

Parameter No. PA05

0	0		
---	---	--	--

Setting value	Feed length multiplication factor (STM) [times]	Feed unit [μm]	Position data input range [mm]	
			Absolute value command system	Incremental value command system
0	1	1	-999.999 to +999.999	0 to +999.999
1	10	10	-9999.99 to +9999.99	0 to +9999.99
2	100	100	-99999.9 to +99999.9	0 to +99999.9
3	1000	1000	-999999 to +999999	0 to +999999

Manual pulse generator multiplication factor
 0: 1 time
 1: 10 times
 2: 100 times

6. PARAMETERS

6.1.8 Electronic gear

Parameter			Initial value	Unit	Setting range
No.	Symbol	Name			
PA06	*CMX	Electronic gear numerator	1		0 to 65535
PA07	*CDV	Electronic gear denominator	1		1 to 65535



CAUTION

• False setting will result in unexpected fast rotation, causing injury.

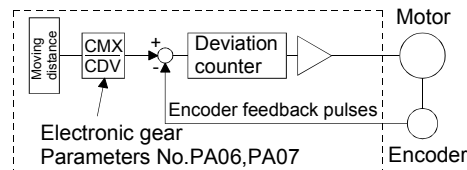
POINT

- This parameter is made valid when power is switched off, then on after setting.
- The range of the electronic gear setting is $\frac{1}{10} < \frac{CMX}{CDV} < 2000$. If you set any value outside this range, a parameter error (A37) occurs.
- Setting "0" in parameter No.PA06 automatically sets the encoder resolution pulse.

(1) Concept of electronic gear

Use the electronic gear (parameters No.PA06, PA07) to make adjustment so that the servo amplifier setting matches the moving distance of the machine. Also, by changing the electronic gear value, the machine can be moved at any multiplication ratio to the moving distance on the servo amplifier.

$$\frac{CMX}{CDV} = \frac{\text{Parameters No.PA06}}{\text{Parameters No.PA07}}$$



The following examples are used to explain how to calculate the electronic gear value.

POINT

- The following specification symbols are needed for electronic gear calculation.
 - Pb : Ball screw lead [mm]
 - n : Reduction ratio
 - Pt : Servo motor resolution [pulse/rev]
 - ΔS : Travel per servo motor revolution [mm/rev]

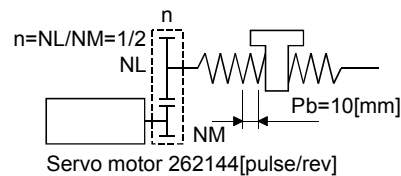
(a) Ball screw setting example

Machine specifications

Ball screw lead: Pb = 10 [mm]

Reduction ratio: n = 1/2

Servo motor resolution: Pt = 262144 [pulse/rev]



$$\frac{CMX}{CDV} = \frac{P_t}{\Delta S} = \frac{P_t}{n \cdot p_b \cdot 1000} = \frac{262144}{1/2 \cdot 10 \cdot 1000} = \frac{262144}{5000} = \frac{32768}{625}$$

Hence, set 32768 to CMX and 625 to CDV.

6. PARAMETERS

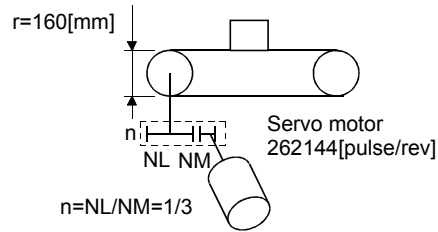
(b) Conveyor setting example

Machine specifications

Pulley diameter: $r = 160$ [mm]

Reduction ratio: $n = 1/3$

Servo motor resolution: $P_t = 262144$ [pulse/rev]



$$\frac{CMX}{CDV} = \frac{p_t}{\Delta S} = \frac{p_t}{n \cdot r \cdot \pi \cdot 1000} = \frac{262144}{1/3 \cdot 160 \cdot \pi \cdot 1000} = \frac{262144}{167551.61} = \frac{32768}{20944}$$

Reduce CMX and CDV to the setting range or less, and round off the first decimal place. Hence, set 32768 to CMX and 20944 to CDV.

6.1.9 Auto tuning

Parameter			Initial value	Unit	Setting range
No.	Symbol	Name			
PA08	ATU	Auto tuning mode	0001h		Refer to the text.
PA09	RSP	Auto tuning response	12		1 to 32

Make gain adjustment using auto tuning. Refer to section 9.2 for details.

(1) Auto tuning mode (parameter No.PA08)

Select the gain adjustment mode.

Parameter No.PA08

0	0	0	
---	---	---	--

Gain adjustment mode setting

Setting	Gain adjustment mode	Automatically set parameter No. (Note)
0	Interpolation mode	PB06 · PB08 · PB09 · PB10
1	Auto tuning mode 1	PB06 · PB07 · PB08 · PB09 · PB10
2	Auto tuning mode 2	PB07 · PB08 · PB09 · PB10
3	Manual mode	

Note. The parameters have the following names.

Parameter No.	Name
PB06	Ratio of load inertia moment to servo motor inertia moment
PB07	Model loop gain
PB08	Position loop gain
PB09	Speed loop gain
PB10	Speed integral compensation

6. PARAMETERS

(2) Auto tuning response (parameter No.PA09)

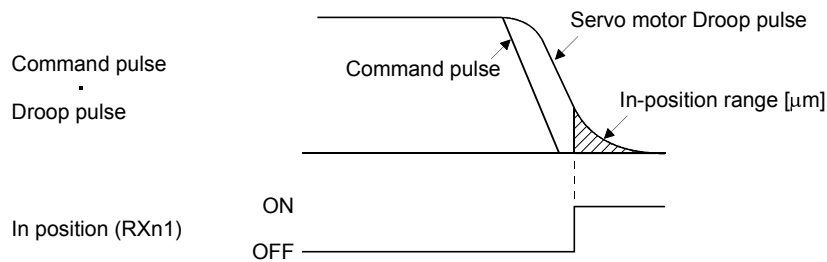
If the machine hunts or generates large gear sound, decrease the set value. To improve performance, e.g. shorten the settling time, increase the set value.

Setting	Response	Guideline for machine resonance frequency [Hz]	Setting	Response	Guideline for machine resonance frequency [Hz]
1	Low response ↑	10.0	17	Low response ↑	67.1
2		11.3	18		75.6
3		12.7	19		85.2
4		14.3	20		95.9
5		16.1	21		108.0
6		18.1	22		121.7
7		20.4	23		137.1
8		23.0	24		154.4
9		25.9	25		173.9
10		29.2	26		195.9
11		32.9	27		220.6
12		37.0	28		248.5
13		41.7	29		279.9
14		47.0	30		315.3
15	52.9	31	355.1		
16	Middle response	59.6	32	Middle response	400.0

6.1.10 In-position range

Parameter			Initial value	Unit	Setting range
No.	Symbol	Name			
PA10	INP	In-position range	100	μm	0 to 10000

Set the range, where In position (RXn1) and Movement completion (RXnC) are output, in the command pulse unit before calculation of the electronic gear. With the setting of parameter No.PC24, the range can be changed to the encoder output pulse unit.



6. PARAMETERS

6.1.11 Torque limit

Parameter			Initial value	Unit	Setting range
No.	Symbol	Name			
PA11	TLP	Forward rotation torque limit	100.0	%	0 to 100.0
PA12	TLN	Reverse rotation torque limit	100.0	%	0 to 100.0

The torque generated by the servo motor can be limited.

(1) Forward rotation torque limit (parameter No.PA11)

Set this parameter on the assumption that the maximum torque is 100[%]. Set this parameter when limiting the torque of the servo motor in the CCW driving mode or CW regeneration mode. Set this parameter to "0.0" to generate no torque.

(2) Reverse rotation torque limit (parameter No.PA12)

Set this parameter on the assumption that the maximum torque is 100[%]. Set this parameter when limiting the torque of the servo motor in the CW driving mode or CCW regeneration mode. Set this parameter to "0.0" to generate no torque.

6. PARAMETERS

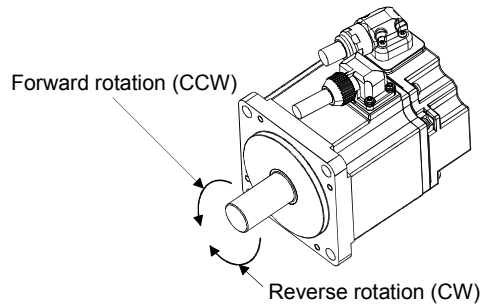
6.1.12 Selection of servo motor rotation direction

Parameter			Initial value	Unit	Setting range
No.	Symbol	Name			
PA14	*POL	Rotation direction selection	0		0 · 1

POINT
<ul style="list-style-type: none"> This parameter is made valid when power is switched off, then on after setting.

Select servo motor rotation direction relative to the input pulse train.

Parameter No.PA14 Setting	Servo Motor Rotation Direction	
	Forward rotation start (Ryn1)	Reverse rotation start (Ryn2)
	ON	ON
0	CCW	CW
1	CW	CCW



6.1.13 Encoder output pulse

Parameter			Initial value	Unit	Setting range
No.	Symbol	Name			
PA15	*ENR	Encoder output pulse	4000	pulse/rev	1 to 65535

POINT
<ul style="list-style-type: none"> This parameter is made valid when power is switched off, then on after setting.

Used to set the encoder pulses (A-phase, B-phase) output by the servo amplifier.

Set the value 4 times greater than the A-phase or B-phase pulses.

You can use parameter No.PC19 to choose the output pulse setting or output division ratio setting.

The number of A/B-phase pulses actually output is 1/4 times greater than the preset number of pulses.

The maximum output frequency is 4.6Mpps (after multiplication by 4). Use this parameter within this range.

6. PARAMETERS

(1) For output pulse designation

Set "□□ 0 □" (initial value) in parameter No.PC19.

Set the number of pulses per servo motor revolution.

Output pulse = set value [pulses/rev]

For instance, set "5600" to Parameter No.PA15, the actually output A/B-phase pulses are as indicated below.

$$\text{A} \cdot \text{B-phase output pulses} = \frac{5600}{4} = 1400[\text{pulse}]$$

(2) For output division ratio setting

Set "□□ 1 □" in parameter No.PC19.

The number of pulses per servo motor revolution is divided by the set value.

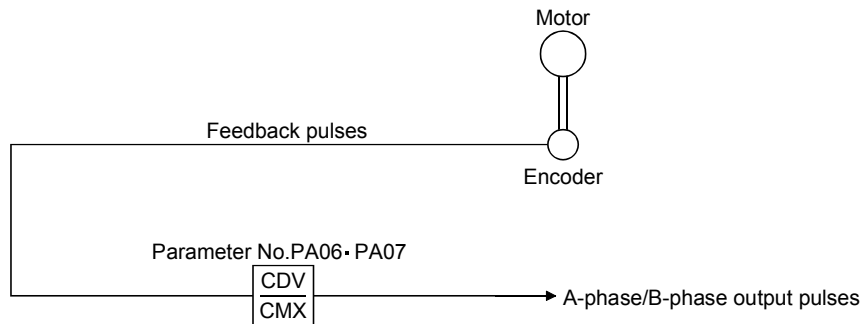
$$\text{Output pulse} = \frac{\text{Resolution per servo motor revolution}}{\text{Set value}} [\text{pulses/rev}]$$

For instance, set "8" to Parameter No.PA15, the actually output A/B-phase pulses are as indicated below.

$$\text{A} \cdot \text{B-phase output pulses} = \frac{262144}{8} \cdot \frac{1}{4} = 8192[\text{pulse}]$$

(3) When outputting pulse train similar to command pulses

Set parameter No.PC19 to "□□ 2 □". The feedback pulses from the servo motor encoder are processed and output as shown below. The feedback pulses can be output in the same pulse unit as the command pulses.



6. PARAMETERS

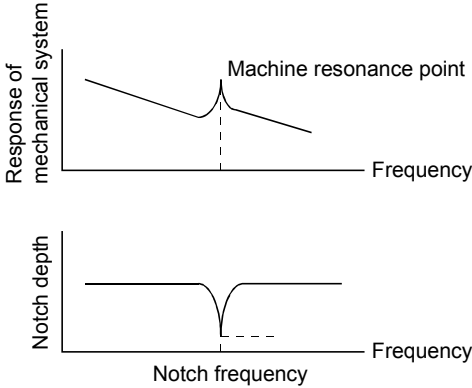
6.2 Gain/filter parameters (No.PB □□)

6.2.1 Parameter list

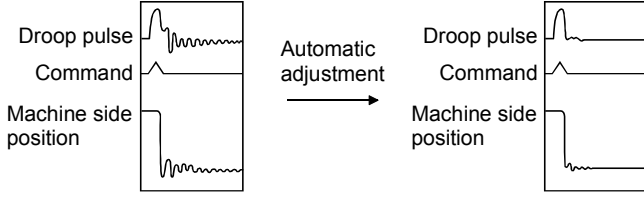
No.	Symbol	Name	Initial value	Unit
PB01	FILT	Adaptive tuning mode (Adaptive filter II)	0000h	
PB02	VRFT	Vibration suppression control tuning mode (Advanced vibration suppression control)	0000h	
PB03		For manufacturer setting	0000h	
PB04	FFC	Feed forward gain	0	%
PB05		For manufacturer setting	500	
PB06	GD2	Ratio of load inertia moment to servo motor inertia moment	7.0	Multiplier (× 1)
PB07	PG1	Model loop gain	24	rad/s
PB08	PG2	Position loop gain	37	rad/s
PB09	VG2	Speed loop gain	823	rad/s
PB10	VIC	Speed integral compensation	33.7	ms
PB11	VDC	Speed differential compensation	980	
PB12		For manufacturer setting	0	
PB13	NH1	Machine resonance suppression filter 1	4500	Hz
PB14	NHQ1	Notch shape selection 1	0000h	
PB15	NH2	Machine resonance suppression filter 2	4500	Hz
PB16	NHQ2	Notch shape selection 2	0000h	
PB17		Automatic setting parameter		
PB18	LPF	Low-pass filter	3141	rad/s
PB19	VRF1	Vibration suppression control vibration frequency setting	100.0	Hz
PB20	VRF2	Vibration suppression control resonance frequency setting	100.0	Hz
PB21		For manufacturer setting	0.00	
PB22			0.00	
PB23	VFBF	Low-pass filter selection	0000h	
PB24	*MVS	Slight vibration suppression control selection	0000h	
PB25		For manufacturer setting	0000h	
PB26	*CDP	Gain changing selection	0000h	
PB27	CDL	Gain changing condition	10	
PB28	CDT	Gain changing time constant	1	ms
PB29	GD2B	Gain changing ratio of load inertia moment to servo motor inertia moment	7.0	Multiplier (× 1)
PB30	PG2B	Gain changing position loop gain	37	rad/s
PB31	VG2B	Gain changing speed loop gain	823	rad/s
PB32	VICB	Gain changing speed integral compensation	33.7	ms
PB33	VRF1B	Gain changing vibration suppression control vibration frequency setting	100.0	Hz
PB34	VRF2B	Gain changing vibration suppression control resonance frequency setting	100.0	Hz
PB35		For manufacturer setting	0.00	
PB36			0.00	
PB37			100	
PB38			0	
PB39			0	
PB40			0	
PB41			1125	
PB42			1125	
PB43			0004h	
PB44			0000h	
PB45			0000h	

6. PARAMETERS

6.2.2 Detail list

No.	Symbol	Name and function	Initial value	Unit	Setting range												
PB01	FILT	<p>Adaptive tuning mode (Adaptive filter II) Select the setting method for filter tuning. Setting this parameter to "□□□1" (filter tuning mode 1) automatically changes the machine resonance suppression filter 1 (parameter No.PB13) and notch shape selection (parameter No.PB14).</p>  <p style="text-align: center;"> 0 0 0 □ </p> <p style="text-align: center;">└ Filter tuning mode selection</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Setting</th> <th>Filter adjustment mode</th> <th>Automatically set parameter</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0</td> <td>Filter OFF</td> <td>(Note)</td> </tr> <tr> <td style="text-align: center;">1</td> <td>Filter tuning mode</td> <td>Parameter No.PB13 Parameter No.PB14</td> </tr> <tr> <td style="text-align: center;">2</td> <td>Manual mode</td> <td></td> </tr> </tbody> </table> <p>Note. Parameter No.PB13 and PB14 are fixed to the initial values.</p> <p>When this parameter is set to "□□□1", the tuning is completed after positioning is done the predetermined number or times for the predetermined period of time, and the setting changes to "□□□2". When the filter tuning is not necessary, the setting changes to "□□□0". When this parameter is set to "□□□0", the initial values are set to the machine resonance suppression filter 1 and notch shape selection. However, this does not occur when the servo off.</p>	Setting	Filter adjustment mode	Automatically set parameter	0	Filter OFF	(Note)	1	Filter tuning mode	Parameter No.PB13 Parameter No.PB14	2	Manual mode		0000h		
Setting	Filter adjustment mode	Automatically set parameter															
0	Filter OFF	(Note)															
1	Filter tuning mode	Parameter No.PB13 Parameter No.PB14															
2	Manual mode																

6. PARAMETERS

No.	Symbol	Name and function	Initial value	Unit	Setting range																
PB02	VRFT	<p>Vibration suppression control tuning mode (Advanced vibration suppression control)</p> <p>The vibration suppression is valid when the parameter No.PA08 (auto tuning) setting is "□□□2" or "□□□3". When PA08 is "□□□1", vibration suppression is always invalid.</p> <p>Select the setting method for vibration suppression control tuning. Setting this parameter to "□□□1" (vibration suppression control tuning mode) automatically changes the vibration suppression control - vibration frequency (parameter No.PB19) and vibration suppression control - resonance frequency (parameter No.PB20) after positioning is done the predetermined number of times.</p> <div style="text-align: center;">  </div> <div style="text-align: center; margin-top: 10px;"> <table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="width: 20px; text-align: center;">0</td> <td style="width: 20px; text-align: center;">0</td> <td style="width: 20px; text-align: center;">0</td> <td style="width: 20px; text-align: center;">□</td> </tr> </table> <p style="margin-left: 40px;">└ Vibration suppression control tuning mode</p> </div> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th style="width: 10%;">Setting</th> <th style="width: 40%;">Vibration suppression control tuning mode</th> <th style="width: 50%;">Automatically set parameter</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0</td> <td>Vibration suppression control OFF</td> <td>(Note)</td> </tr> <tr> <td style="text-align: center;">1</td> <td>Vibration suppression control tuning mode (Advanced vibration suppression control)</td> <td>Parameter No.PB19 Parameter No.PB20</td> </tr> <tr> <td style="text-align: center;">2</td> <td>Manual mode</td> <td style="border: none;"></td> </tr> </tbody> </table> <p>Note. Parameter No.PB19 and PB20 are fixed to the initial values.</p> <p>When this parameter is set to "□□□1", the tuning is completed after positioning is done the predetermined number or times for the predetermined period of time, and the setting changes to "□□□2". When the vibration suppression control tuning is not necessary, the setting changes to "□□□0". When this parameter is set to "□□□0", the initial values are set to the vibration suppression control - vibration frequency and vibration suppression control - resonance frequency. However, this does not occur when the servo off.</p>	0	0	0	□	Setting	Vibration suppression control tuning mode	Automatically set parameter	0	Vibration suppression control OFF	(Note)	1	Vibration suppression control tuning mode (Advanced vibration suppression control)	Parameter No.PB19 Parameter No.PB20	2	Manual mode		0000h		
0	0	0	□																		
Setting	Vibration suppression control tuning mode	Automatically set parameter																			
0	Vibration suppression control OFF	(Note)																			
1	Vibration suppression control tuning mode (Advanced vibration suppression control)	Parameter No.PB19 Parameter No.PB20																			
2	Manual mode																				
PB03		<p>For manufacturer setting</p> <p>Do not change this value by any means.</p>	0000h																		
PB04	FFC	<p>Feed forward gain</p> <p>Set the feed forward gain. When the setting is 100%, the droop pulses during operation at constant speed are nearly zero. However, sudden acceleration/deceleration will increase the overshoot. As a guideline, when the feed forward gain setting is 100%, set 1s or more as the acceleration/deceleration time constant up to the rated speed.</p>	0	%	0 to 100																

6. PARAMETERS

No.	Symbol	Name and function	Initial value	Unit	Setting range
PB05		For manufacturer setting Do not change this value by any means.	500		
PB06	GD2	Ratio of load inertia moment to servo motor inertia moment Used to set the ratio of the load inertia moment to the servo motor shaft inertia moment. When auto tuning mode 1 and interpolation mode is selected, the result of auto tuning is automatically used. (Refer to section 9.1.1) In this case, it varies between 0 and 100.0.	7.0	Multiplier (× 1)	0 to 300.0
PB07	PG1	Model loop gain Set the response gain up to the target position. Increase the gain to improve track ability in response to the command. When auto turning mode 1,2 is selected, the result of auto turning is automatically used.	24	rad/s	1 to 2000
PB08	PG2	Position loop gain Used to set the gain of the position loop. Set this parameter to increase the position response to level load disturbance. Higher setting increases the response level but is liable to generate vibration and/or noise. When auto tuning mode 1,2 and interpolation mode is selected, the result of auto tuning is automatically used.	37	rad/s	1 to 1000
PB09	VG2	Speed loop gain Set this parameter when vibration occurs on machines of low rigidity or large backlash. Higher setting increases the response level but is liable to generate vibration and/or noise. When auto tuning mode 1,2 manual mode and interpolation mode is selected, the result of auto tuning is automatically used.	823	rad/s	20 to 50000
PB10	VIC	Speed integral compensation Used to set the integral time constant of the speed loop. Lower setting increases the response level but is liable to generate vibration and/or noise. When auto tuning mode 1,2 and interpolation mode is selected, the result of auto tuning is automatically used.	33.7	ms	0.1 to 1000.0
PB11	VDC	Speed differential compensation Used to set the differential compensation. Made valid when the proportion control (RY(n+2)7) is switched on.	980		0 to 1000
PB12		For manufacturer setting Do not change this value by any means.	0		
PB13	NH1	Machine resonance suppression filter 1 Set the notch frequency of the machine resonance suppression filter 1. Setting parameter No.PB01 (filter tuning mode 1) to "□□□1" automatically changes this parameter. When the parameter No.PB01 setting is "□□□0", the setting of this parameter is ignored.	4500	Hz	100 to 4500

6. PARAMETERS

No.	Symbol	Name and function	Initial value	Unit	Setting range																										
PB14	NHQ1	<p>Notch shape selection 1 Used to selection the machine resonance suppression filter 1.</p> <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px; margin-right: 10px;">0</div> <div style="border: 1px solid black; width: 20px; height: 20px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; margin-right: 5px;"></div> <div style="border: 1px solid black; padding: 2px; margin-left: 10px;">0</div> </div> <p style="margin-left: 40px;">Notch depth selection</p> <table border="1" style="margin-left: 40px;"> <thead> <tr> <th>Setting value</th> <th>Depth</th> <th>Gain</th> </tr> </thead> <tbody> <tr> <td>0</td> <td rowspan="2">Deep</td> <td>-40dB</td> </tr> <tr> <td>1</td> <td>-14dB</td> </tr> <tr> <td>2</td> <td rowspan="2">Shallow</td> <td>-8dB</td> </tr> <tr> <td>3</td> <td>-4dB</td> </tr> </tbody> </table> <p style="margin-left: 40px;">Notch width</p> <table border="1" style="margin-left: 40px;"> <thead> <tr> <th>Setting value</th> <th>Width</th> <th>α</th> </tr> </thead> <tbody> <tr> <td>0</td> <td rowspan="2">Standard</td> <td>2</td> </tr> <tr> <td>1</td> <td>3</td> </tr> <tr> <td>2</td> <td rowspan="2">Wide</td> <td>4</td> </tr> <tr> <td>3</td> <td>5</td> </tr> </tbody> </table> <p style="margin-left: 40px;">Setting parameter No.PB01 (filter tuning mode 1) to "□□□1" automatically changes this parameter. When the parameter No.PB01 setting is "□□□0", the setting of this parameter is ignored.</p>	Setting value	Depth	Gain	0	Deep	-40dB	1	-14dB	2	Shallow	-8dB	3	-4dB	Setting value	Width	α	0	Standard	2	1	3	2	Wide	4	3	5	0000h		Refer to name and function column.
Setting value	Depth	Gain																													
0	Deep	-40dB																													
1		-14dB																													
2	Shallow	-8dB																													
3		-4dB																													
Setting value	Width	α																													
0	Standard	2																													
1		3																													
2	Wide	4																													
3		5																													
PB15	NH2	<p>Machine resonance suppression filter 2 Set the notch frequency of the machine resonance suppression filter 2. Set parameter No.PB16 (notch shape selection 2) to "□□□1" to make this parameter valid.</p>	4500	Hz	100 to 4500																										
PB16	NHQ2	<p>Notch shape selection 2 Select the shape of the machine resonance suppression filter 2.</p> <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px; margin-right: 10px;">0</div> <div style="border: 1px solid black; width: 20px; height: 20px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; margin-right: 5px;"></div> </div> <p style="margin-left: 40px;">Machine resonance suppression filter 2 selection 0: Invalid 1: Valid</p> <p style="margin-left: 40px;">Notch depth selection</p> <table border="1" style="margin-left: 40px;"> <thead> <tr> <th>Setting value</th> <th>Depth</th> <th>Gain</th> </tr> </thead> <tbody> <tr> <td>0</td> <td rowspan="2">Deep</td> <td>-40dB</td> </tr> <tr> <td>1</td> <td>-14dB</td> </tr> <tr> <td>2</td> <td rowspan="2">Shallow</td> <td>-8dB</td> </tr> <tr> <td>3</td> <td>-4dB</td> </tr> </tbody> </table> <p style="margin-left: 40px;">Notch width</p> <table border="1" style="margin-left: 40px;"> <thead> <tr> <th>Setting value</th> <th>Width</th> <th>α</th> </tr> </thead> <tbody> <tr> <td>0</td> <td rowspan="2">Standard</td> <td>2</td> </tr> <tr> <td>1</td> <td>3</td> </tr> <tr> <td>2</td> <td rowspan="2">Wide</td> <td>4</td> </tr> <tr> <td>3</td> <td>5</td> </tr> </tbody> </table>	Setting value	Depth	Gain	0	Deep	-40dB	1	-14dB	2	Shallow	-8dB	3	-4dB	Setting value	Width	α	0	Standard	2	1	3	2	Wide	4	3	5	0000h		Refer to name and function column.
Setting value	Depth	Gain																													
0	Deep	-40dB																													
1		-14dB																													
2	Shallow	-8dB																													
3		-4dB																													
Setting value	Width	α																													
0	Standard	2																													
1		3																													
2	Wide	4																													
3		5																													
PB17		<p>Automatic setting parameter The value of this parameter is set according to a set value of parameter No.PB06 (Ratio of load inertia moment to servo motor inertia moment).</p>																													

6. PARAMETERS

No.	Symbol	Name and function	Initial value	Unit	Setting range				
PB18	LPF	<p>Low-pass filter Set the low-pass filter. Setting parameter No.PB23 (low-pass filter selection) to "□□0□" automatically changes this parameter. When parameter No.PB23 is set to "□□1□", this parameter can be set manually.</p>	3141	rad/s	100 to 18000				
PB19	VRF1	<p>Vibration suppression control vibration frequency setting Set the vibration frequency for vibration suppression control to suppress low-frequency machine vibration, such as enclosure vibration. Setting parameter No.PB02 (vibration suppression control tuning mode) to "□□□1" automatically changes this parameter. When parameter No.PB02 is set to "□□□2", this parameter can be set manually.</p>	100.0	Hz	0.1 to 100.0				
PB20	VRF2	<p>Vibration suppression control resonance frequency setting Set the resonance frequency for vibration suppression control to suppress low-frequency machine vibration, such as enclosure vibration. Setting parameter No.PB02 (vibration suppression control tuning mode) to "□□□1" automatically changes this parameter. When parameter No.PB02 is set to "□□□2", this parameter can be set manually.</p>	100.0	Hz	0.1 to 100.0				
PB21	/	For manufacturer setting	0.00	/	/				
PB22		Do not change this value by any means.	0.00						
PB23	VFBF	<p>Low-pass filter selection Select the low-pass filter.</p> <div style="border: 1px solid black; display: inline-block; padding: 2px;"> <table style="border-collapse: collapse; text-align: center;"> <tr> <td style="border: 1px solid black; width: 20px; height: 20px;">0</td> <td style="border: 1px solid black; width: 20px; height: 20px;">0</td> <td style="border: 1px solid black; width: 20px; height: 20px;">□</td> <td style="border: 1px solid black; width: 20px; height: 20px;">0</td> </tr> </table> </div> <p style="margin-left: 40px;">└─ Low-pass filter selection 0: Automatic setting 1: Manual setting (parameter No.PB18 setting)</p> <p>When automatic setting has been selected, select the filter that has the band width close to the one calculated with $\frac{VG2 \cdot 10}{1 + GD2}$ [rad/s]</p>	0	0	□	0	0000h	/	Refer to name and function column.
0	0	□	0						
PB24	*MVS	<p>Slight vibration suppression control selection Select the slight vibration suppression control. When parameter No.PA08 (auto tuning mode) is set to "□□□3", this parameter is made valid.</p> <div style="border: 1px solid black; display: inline-block; padding: 2px;"> <table style="border-collapse: collapse; text-align: center;"> <tr> <td style="border: 1px solid black; width: 20px; height: 20px;">0</td> <td style="border: 1px solid black; width: 20px; height: 20px;">0</td> <td style="border: 1px solid black; width: 20px; height: 20px;">0</td> <td style="border: 1px solid black; width: 20px; height: 20px;">□</td> </tr> </table> </div> <p style="margin-left: 40px;">└─ Slight vibration suppression control selection 0: Invalid 1: Valid</p>	0	0	0	□	0000h	Refer to name and function column.	
0	0	0	□						

6. PARAMETERS

No.	Symbol	Name and function	Initial value	Unit	Setting range
PB25		For manufacturer setting Do not change this value by any means.	0000h		
PB26	*CDP	Gain changing selection Select the gain changing condition. (Refer to section 10.6.) <div style="display: flex; align-items: center; margin-bottom: 5px;"> <div style="border: 1px solid black; padding: 2px 5px; margin-right: 5px;">0</div> <div style="border: 1px solid black; padding: 2px 5px; margin-right: 5px;">0</div> <div style="border: 1px solid black; padding: 2px 5px; margin-right: 5px;"> </div> <div style="border: 1px solid black; padding: 2px 5px; margin-right: 5px;"> </div> </div> <p style="margin-left: 20px;">└ Gain changing selection Under any of the following conditions, the gains change on the basis of the parameter No.PB29 to PB32 settings. 0: Invalid 1: Gain changing (RX(n+2)8) is ON 2: Command frequency (Parameter No.PB27 setting) 3: Droop pulse value (Parameter No.PB27 setting) 4: Servo motor speed (Parameter No.PB27 setting)</p> <p style="margin-left: 20px;">└ Gain changing condition 0: Valid at more than condition (Valid when gain changing (RX(n+2)8) is ON) 1: Valid at less than condition (Valid when gain changing (RX(n+2)8) is OFF)</p>	0000h		Refer to name and function column.
PB27	CDL	Gain changing condition Used to set the value of gain changing condition (command frequency, droop pulses, servo motor speed) selected in parameter No.PB26. The set value unit changes with the changing condition item. (Refer to section 10.6.)	10	kpps pulse r/min	0 to 9999
PB28	CDT	Gain changing time constant Used to set the time constant at which the gains will change in response to the conditions set in parameters No.PB26 and PB27. (Refer to section 10.6.)	1	ms	0 to 100
PB29	GD2B	Gain changing ratio of load inertia moment to servo motor inertia moment Used to set the ratio of load inertia moment to servo motor inertia moment when gain changing is valid. This parameter is made valid when the auto tuning is invalid (parameter No. PA08: □□□3).	7.0	Multiplier (× 1)	0 to 300.0
PB30	PG2B	Gain changing position loop gain Set the position loop gain when the gain changing is valid. This parameter is made valid when the auto tuning is invalid (parameter No. PA08: □□□3).	37	rad/s	1 to 2000
PB31	VG2B	Gain changing speed loop gain Set the speed loop gain when the gain changing is valid. This parameter is made valid when the auto tuning is invalid (parameter No. PA08: □□□3). Note. The setting range of 50000 applies to the servo amplifier whose software version is A3 or later. The setting range of the servo amplifier whose software version is older than A3 is 20 to 20000. When the software version of MR Configurator is A3 or earlier, 20001 or more cannot be set. Use the display/operation section of the servo amplifier to set 20001 or more.	823	rad/s	20 to 20000
PB32	VICB	Gain changing speed integral compensation Set the speed integral compensation when the gain changing is valid. This parameter is made valid when the auto tuning is invalid (parameter No. PA08: □□□3).	33.7	ms	0.1 to 5000.0

6. PARAMETERS

No.	Symbol	Name and function	Initial value	Unit	Setting range
PB33	VRF1B	Gain changing vibration suppression control vibration frequency setting Set the vibration frequency for vibration suppression control when the gain changing is valid. This parameter is made valid when the parameter No.PB02 setting is "□□□2" and the parameter No.PB26 setting is "□□□1". When using the vibration suppression control gain changing, always execute the changing after the servo motor has stopped.	100.0	Hz	0.1 to 100.0
PB34	VRF2B	Gain changing vibration suppression control resonance frequency setting Set the resonance frequency for vibration suppression control when the gain changing is valid. This parameter is made valid when the parameter No.PB02 setting is "□□□2" and the parameter No.PB26 setting is "□□□1". When using the vibration suppression control gain changing, always execute the changing after the servo motor has stopped.	100.0	Hz	0.1 to 100.0
PB35		For manufacturer setting Do not change this value by any means.	0.00		
PB36			0.00		
PB37			100		
PB38			0		
PB39			0		
PB40			0		
PB41			1125		
PB42			1125		
PB43			0004h		
PB44			0000h		
PB45	0000h				

6. PARAMETERS

6.3 Extension setting parameters (No.PC □□)

6.3.1 Parameter list

No.	Symbol	Name and function	Initial value	Unit		
PC01		For manufacturer setting	0000h			
PC02	*ZTY	Home position return type	0000h			
PC03	*ZDIR	Home position return direction	0001h			
PC04	ZRF	Home position return speed	500	r/min		
PC05	CRF	Creep speed	10	r/min		
PC06	ZST	Home position shift distance	0	μm		
PC07	*ZPS	Home position return position data	0	×10 ^{STM} μm		
PC08	DCT	Moving distance after proximity dog	1000	×10 ^{STM} μm		
PC09	ZTM	Stopper type home position return stopper time	100	ms		
PC10	ZTT	Stopper type home position return torque limit value	15.0	%		
PC11	CRP	Rough match output range	0	×10 ^{STM} μm		
PC12	JOG	Jog speed	100	r/min		
PC13	*STC	S-pattern acceleration/deceleration time constant	0	ms		
PC14	*BKC	Backlash compensation	0	pulse		
PC15		For manufacturer setting	0000h			
PC16	MBR	Electromagnetic brake sequence output	100	ms		
PC17	ZSP	Zero speed	50	r/min		
PC18	*BPS	Alarm history clear	0000h			
PC19	*ENRS	Encoder output pulse selection	0000h			
PC20	*SNO	Station number setting	0	station		
PC21	*SOP	RS-422 communication function selection	0000h			
PC22	*COP1	Function selection C-1	0000h			
PC23		For manufacturer setting	0000h			
PC24	*COP3	Function selection C-3	0000h			
PC25		For manufacturer setting	0000h			
PC26	*COP5	Function selection C-5	0000h			
PC27		For manufacturer setting	0000h			
PC28	*COP7	Function selection C-7	0000h			
PC29		For manufacturer setting	0000h			
PC30	*DSS	Remote register-based position/speed specifying system selection	0000h			
PC31	LMPL	Software limit +	0	×10 ^{STM} μm		
PC32	LMPH					
PC33	LMNL				Software limit -	×10 ^{STM} μm
PC34	LMNH					
PC35	TL2	Internal torque limit 2	100.0	%		
PC36		For manufacturer setting	0000h			
PC37	*LPPL	Position range output address +	0	×10 ^{STM} μm		
PC38	*LPPH					
PC39	*LNPL	Position range output address -	0	×10 ^{STM} μm		
PC40	*LNPH					
PC41		For manufacturer setting	0000h			
PC42			0000h			
PC43			0000h			
PC44			0000h			
PC45			0000h			
PC46			0000h			
PC47			0000h			
PC48			0000h			

6. PARAMETERS

No.	Symbol	Name and function	Initial value	Unit
PC49	/	For manufacturer setting	0000h	/
PC50			0000h	

6.3.2 Detail list

No.	Symbol	Name and function	Initial value	Unit	Setting range				
PC01	/	For manufacturer setting Do not change this value by any means.	0000h	/	/				
PC02	*ZTY	Home position return type Used to set the home position return system. (Refer to section 5.6.) <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td style="width: 20px; text-align: center;">0</td> <td style="width: 20px; text-align: center;">0</td> <td style="width: 20px; text-align: center;">0</td> <td style="width: 20px; text-align: center;"> </td> </tr> </table> <div style="margin-left: 40px;"> └ Home position return system 0: Dog type 1: Count type 2: Data setting type 3: Stopper type 4: Home position ignorance (Servo-on position as home position) 5: Dog type rear end reference 6: Count type front end reference 7: Dog cradle type 8: Dog type right-before Z-phase reference 9: Dog type front end reference A: Dogless Z-phase reference </div>	0	0	0		0000h	/	Refer to name and function column.
0	0	0							
PC03	*ZDIR	Home position return direction Used to set the home position return direction. <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td style="width: 20px; text-align: center;">0</td> <td style="width: 20px; text-align: center;">0</td> <td style="width: 20px; text-align: center;">0</td> <td style="width: 20px; text-align: center;"> </td> </tr> </table> <div style="margin-left: 40px;"> └ Home position return direction 0: Address increment direction 1: Address decrement direction </div>	0	0	0		0001h	/	Refer to name and function column.
0	0	0							
PC04	ZRF	Home position return speed Used to set the servo motor speed for home position return. (Refer to section 5.6.)	500	r/min	0 to permissible speed				
PC05	CRF	Creep speed Used to set the creep speed after proximity dog detection. (Refer to section 5.6.)	10	r/min	0 to permissible speed				
PC06	ZST	Home position shift distance Used to set the shift distance starting at the Z-phase pulse detection position inside the encoder. (Refer to section 5.6.)	0	μm	0 to 65535				
PC07	*ZPS	Home position return position data Used to set the current position on completion of home position return. (Refer to section 5.6.)	0	× 10 ^{STM} μm	−32768 to 32767				
PC08	DCT	Moving distance after proximity dog Used to set the moving distance after proximity dog in count type home position return. (Refer to section 5.6.)	1000	× 10 ^{STM} μm	0 to 65535				
PC09	ZTM	Stopper type home position return stopper time In stopper type home position return, used to set the time from when the machine part is pressed against the stopper and the torque limit set in parameter No.PC10 is reached to when the home position is set. (Refer to section 5.6.5.)	100	ms	5 to 1000				

6. PARAMETERS

No.	Symbol	Name and function	Initial value	Unit	Setting range				
PC10	ZTT	Stopper type home position return torque limit value Used to set the torque limit value relative to the max. torque in [%] in stopper type home position return. (Refer to section 5.6.5.)	15.0	%	1 to 100.0				
PC11	CRP	Rough match output range Used to set the command remaining distance range where the rough match (RXn2) is output.	0	$\times 10^{\text{STM}} \mu\text{m}$	0 to 65535				
PC12	JOG	Jog speed Used to set the jog speed command.	100	r/min	0 to permissible speed				
PC13	*STC	S-pattern acceleration/deceleration time constant Set when inserting S-pattern time constant into the acceleration/deceleration time constant of the point table. (Refer to section 6.3.3.) This time constant is invalid for home position return.	0	ms	0 to 1000				
PC14	*BKC	Backlash compensation Used to set the backlash compensation made when the command direction is reversed. This function compensates for the number of backlash pulses in the opposite direction to the home position return direction. For the home position ignorance (servo-on position as home position), this function compensates for the number of backlash pulses in the opposite direction to the first rotating direction after establishing the home position by switching ON the servo-on (RYn0). In the absolute position detection system, this function compensates for the backlash pulse count in the direction opposite to the operating direction at power-on.	0	pulse	0 to 32000				
PC15		For manufacturer setting Do not change this value by any means.	0000h						
PC16	MBR	Electromagnetic brake sequence output Used to set the delay time (Tb) between when the electromagnetic brake interlock (MBR) switches off and when the base circuit is shut off.	100	ms	0 to 1000				
PC17	ZSP	Zero speed Used to set the output range of the zero speed (ZSP). Zero speed signal detection has hysteresis width of 20r/min.	50	r/min	0 to 10000				
PC18	*BPS	Alarm history clear Used to clear the alarm history. <table border="1" style="margin-left: 20px;"> <tr> <td style="width: 20px; height: 20px; text-align: center;">0</td> <td style="width: 20px; height: 20px; text-align: center;">0</td> <td style="width: 20px; height: 20px; text-align: center;">0</td> <td style="width: 20px; height: 20px;"></td> </tr> </table> Alarm history clear 0: Invalid 1: Valid When alarm history clear is made valid, the alarm history is cleared at next power-on. After the alarm history is cleared, the setting is automatically made invalid (reset to 0).	0	0	0		0000h		Refer to name and function column.
0	0	0							

6. PARAMETERS

No.	Symbol	Name and function	Initial value	Unit	Setting range											
PC19	*ENRS	<p>Encoder output pulse selection</p> <p>Use to select the, encoder output pulse direction and encoder output pulse setting.</p> <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px; margin-right: 10px;">0</div> <div style="border: 1px solid black; padding: 2px; margin-right: 10px;">0</div> <div style="border: 1px solid black; padding: 2px; margin-right: 10px;"></div> <div style="border: 1px solid black; padding: 2px;"></div> </div> <p style="margin-left: 40px;">Encoder output pulse phase changing Changes the phases of A, B-phase encoder pulses output .</p> <table border="1" style="margin-left: 40px; border-collapse: collapse; text-align: center;"> <thead> <tr> <th rowspan="2">Set value</th> <th colspan="2">Servo motor rotation direction</th> </tr> <tr> <th>CCW</th> <th>CW</th> </tr> </thead> <tbody> <tr> <td>0</td> <td> A-phase B-phase </td> <td> A-phase B-phase </td> </tr> <tr> <td>1</td> <td> A-phase B-phase </td> <td> A-phase B-phase </td> </tr> </tbody> </table> <p style="margin-left: 40px;">Encoder output pulse setting selection (refer to parameter No.PA15). 0: Output pulse designation 1: Division ratio setting 2: Ratio is automatically set to command pulse unit Setting "2" makes the parameter No.PA15 (encoder output pulse) setting invalid.</p>	Set value	Servo motor rotation direction		CCW	CW	0	A-phase B-phase	A-phase B-phase	1	A-phase B-phase	A-phase B-phase	0000h		Refer to name and function column.
Set value	Servo motor rotation direction															
	CCW	CW														
0	A-phase B-phase	A-phase B-phase														
1	A-phase B-phase	A-phase B-phase														
PC20	*SNO	<p>Station number setting</p> <p>Used to specify the station number for RS-422 serial communication and USB communication.</p> <p>Always set one station to one axis of servo amplifier. If one station number is set to two or more stations, normal communication cannot be made.</p>	0	station	0 to 31											
PC21	*SOP	<p>RS-422 communication function selection</p> <p>Select the communication I/F and select the RS-422 communication conditions.</p> <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px; margin-right: 10px;">0</div> <div style="border: 1px solid black; padding: 2px; margin-right: 10px;"></div> <div style="border: 1px solid black; padding: 2px; margin-right: 10px;"></div> <div style="border: 1px solid black; padding: 2px;">0</div> </div> <p style="margin-left: 40px;">RS-422 communication baud rate selection 0: 9600 [bps] 1: 19200 [bps] 2: 38400 [bps] 3: 57600 [bps] 4: 115200[bps]</p> <p style="margin-left: 40px;">RS-422 communication response delay time 0: Invalid 1: Valid, reply sent after delay time of 800 μs or more</p>	0000h		Refer to name and function column.											
PC22	*COP1	<p>Function selection C-1</p> <p>Select the encoder cable communication system selection.</p> <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px; margin-right: 10px;"></div> <div style="border: 1px solid black; padding: 2px; margin-right: 10px;">0</div> <div style="border: 1px solid black; padding: 2px; margin-right: 10px;">0</div> <div style="border: 1px solid black; padding: 2px;">0</div> </div> <p style="margin-left: 40px;">Encoder cable communication system selection 0: Two-wire type 1: Four-wire type The following encoder cables are of 4-wire type. MR-EKCBL30M-L MR-EKCBL30M-H MR-EKCBL40M-H MR-EKCBL50M-H The other encoder cables are all of 2-wire type. Incorrect setting will result in an encoder alarm 1 (A16) or encoder alarm 2 (A20).</p>	0000h		Refer to the name and function field.											

6. PARAMETERS

No.	Symbol	Name and function	Initial value	Unit	Setting range																						
PC23		For manufacturer setting Do not change this value by any means.	0000h																								
PC24	*COP3	Function selection C-3 Select the unit of the in-position range. <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td style="width: 20px; height: 20px; text-align: center;">0</td> <td style="width: 20px; height: 20px; text-align: center;">0</td> <td style="width: 20px; height: 20px; text-align: center;">0</td> <td style="width: 20px; height: 20px;"></td> </tr> </table> In-position range unit selection 0: Command input unit 1: Servo motor encoder unit	0	0	0		0000h	Refer to name and function column.																			
0	0	0																									
PC25		For manufacturer setting Do not change this value by any means.	0000h																								
PC26	*COP5	Function selection C-5 Select the stroke limit warning (A99). <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td style="width: 20px; height: 20px; text-align: center;">0</td> <td style="width: 20px; height: 20px; text-align: center;">0</td> <td style="width: 20px; height: 20px; text-align: center;">0</td> <td style="width: 20px; height: 20px;"></td> </tr> </table> Stroke limit warning (A99) selection 0: Valid 1: Invalid When this parameter is set to "1", A99 will not occur if the forward rotation stroke end (LSP) or reverse rotation stroke end (LSN) turns OFF.	0	0	0		0000h	Refer to name and function column.																			
0	0	0																									
PC27		For manufacturer setting Do not change this value by any means.	0000h																								
PC28	*COP7	Function selection C-7 Select the display method of the current position and command position. <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td style="width: 20px; height: 20px; text-align: center;">0</td> <td style="width: 20px; height: 20px; text-align: center;">0</td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> </tr> </table> Electronic gear fraction clear selection 0: Invalid 1: Valid By setting it to "1", the fraction of the last command by the electronic gear is cleared when starting automatic operation. Current position and command position display selection	0	0			0000h	Refer to name and function column.																			
0	0																										
		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">Setting value</th> <th rowspan="2">Display method</th> <th rowspan="2">Operation mode</th> <th colspan="2">Status display</th> </tr> <tr> <th>Current position</th> <th>Command position</th> </tr> </thead> <tbody> <tr> <td rowspan="2">0</td> <td rowspan="2">Positioning display</td> <td>Automatic</td> <td>The actual current position where the machine home position is assumed as 0 is displayed.</td> <td>The command current position where the machine home position is assumed as 0 is displayed.</td> </tr> <tr> <td>Manual</td> <td>The actual current position where the machine home position is assumed as 0 is displayed.</td> <td>The command current position where the machine home position is assumed as 0 is displayed.</td> </tr> <tr> <td rowspan="2">1</td> <td rowspan="2">Roll feed display</td> <td>Automatic</td> <td>The actual current position where the automatic operation start position is assumed as 0 is displayed.</td> <td>The count starts from 0 when the start signal is turned on, and the command current position to the target position is displayed. During a stop, the command position of the selected point table is displayed.</td> </tr> <tr> <td>Manual</td> <td>The actual current position where the automatic operation start position is assumed as 0 is displayed.</td> <td>The command position of the selected point table is displayed.</td> </tr> </tbody> </table>	Setting value	Display method	Operation mode	Status display		Current position	Command position	0	Positioning display	Automatic	The actual current position where the machine home position is assumed as 0 is displayed.	The command current position where the machine home position is assumed as 0 is displayed.	Manual	The actual current position where the machine home position is assumed as 0 is displayed.	The command current position where the machine home position is assumed as 0 is displayed.	1	Roll feed display	Automatic	The actual current position where the automatic operation start position is assumed as 0 is displayed.	The count starts from 0 when the start signal is turned on, and the command current position to the target position is displayed. During a stop, the command position of the selected point table is displayed.	Manual	The actual current position where the automatic operation start position is assumed as 0 is displayed.	The command position of the selected point table is displayed.		
Setting value	Display method	Operation mode				Status display																					
			Current position	Command position																							
0	Positioning display	Automatic	The actual current position where the machine home position is assumed as 0 is displayed.	The command current position where the machine home position is assumed as 0 is displayed.																							
		Manual	The actual current position where the machine home position is assumed as 0 is displayed.	The command current position where the machine home position is assumed as 0 is displayed.																							
1	Roll feed display	Automatic	The actual current position where the automatic operation start position is assumed as 0 is displayed.	The count starts from 0 when the start signal is turned on, and the command current position to the target position is displayed. During a stop, the command position of the selected point table is displayed.																							
		Manual	The actual current position where the automatic operation start position is assumed as 0 is displayed.	The command position of the selected point table is displayed.																							

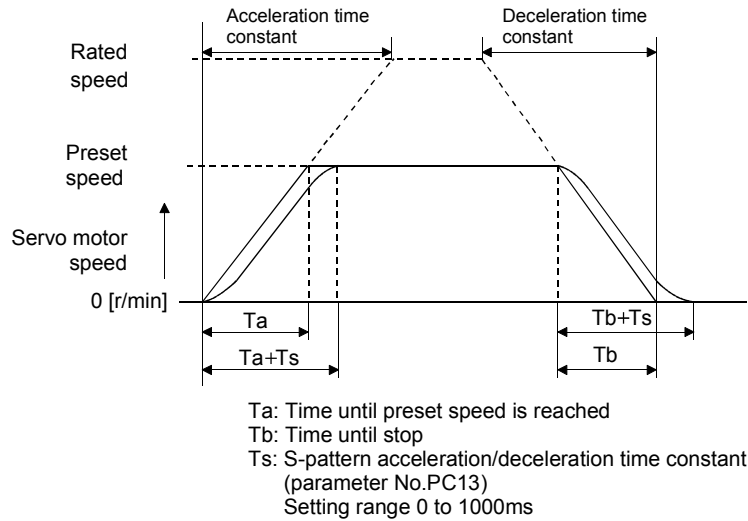
6. PARAMETERS

No.	Symbol	Name and function	Initial value	Unit	Setting range
PC37	*LPPL	Position range output address +	0	$\times 10^{\text{STM}} \mu\text{m}$	—999999
PC38	*LPPH	Used to set the address increment side position range output address. Set the same sign to parameters No.PC37 and PC38. Setting of different signs will result in a parameter error. In parameters No.PC37 to PC40, set the range where position range (RXnE) turns on. <div style="text-align: center;"> Set address: □□□□□□ ┌───┬───┐ Upper 3 Lower 3 digits digits └───┬───┘ └───┬───┘ Parameter No.PC37 Parameter No.PC38 </div> Position range output address + is a set of upper digits and lower digits. To change the value, set in the order of lower digits to upper digits.			—999999 to 999999
PC39	*LNPL	Position range output address —	0	$\times 10^{\text{STM}} \mu\text{m}$	—999999
PC40	*LNPH	Used to set the address decrement side position range output address. Set the same sign to parameters No.PC39 and PC40. Setting of different signs will result in a parameter error. <div style="text-align: center;"> Set address: □□□□□□ ┌───┬───┐ Upper 3 Lower 3 digits digits └───┬───┘ └───┬───┘ Parameter No.PC39 Parameter No.PC40 </div> Position range output address — is a set of upper digits and lower digits. To change the value, set in the order of lower digits to upper digits.			—999999 to 999999
PC41		For manufacturer setting	0000h		
PC42		Do not change this value by any means.	0000h		
PC43			0000h		
PC44			0000h		
PC45			0000h		
PC46			0000h		
PC47			0000h		
PC48			0000h		
PC49			0000h		
PC50			0000h		

6. PARAMETERS

6.3.3 S-pattern acceleration/deceleration

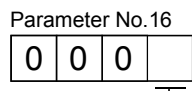
In servo operation, linear acceleration/deceleration is usually made. By setting the S-pattern acceleration/deceleration time constant (parameter No.PC13), a smooth start/stop can be made. When the S-pattern time constant is set, smooth positioning is executed as shown below. Note that the time equivalent to the S-pattern time constant setting increases until positioning (RXnC) is complete.



6.3.4 Alarm history clear

The alarm history can be confirmed by using the MR Configurator. The servo amplifier stores one current alarm and five past alarms from when its power is switched on first. To control alarms which will occur during operation, clear the alarm history using parameter No.PC18 (alarm history clear) before starting operation. Clearing the alarm history automatically returns to "□□□□".

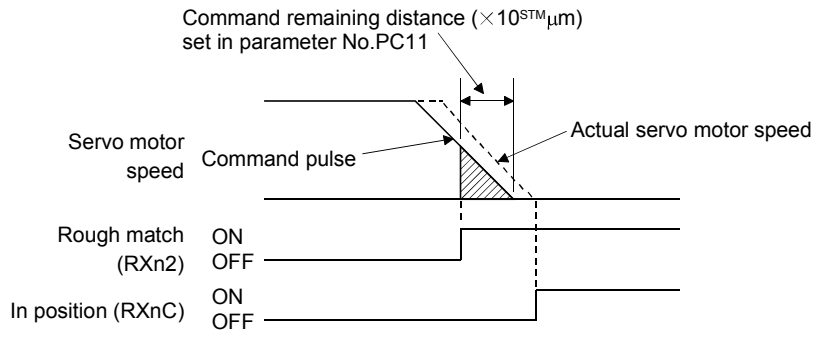
This parameter is made valid by switching power off, then on after setting.



Alarm history clear
 0: Invalid (not cleared)
 1: Valid (cleared)

6.3.5 Rough match output

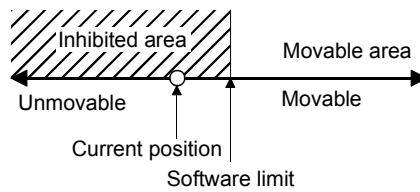
Rough match (RXn2) is output when the command remaining distance reaches the value set in parameter No.PC11 (rough match output range). The setting range is 0 to 65535 [$\times 10^{STM} \mu\text{m}$].



6. PARAMETERS

6.3.6 Software limit

A limit stop using a software limit (parameter No.PC31 to PC34) is made as in stroke end operation. When a motion goes beyond the setting range, the motor is stopped and servo-locked. This function is made valid at power-on but made invalid during home position return. This function is made invalid when the software limit + setting is the same as the software limit – setting. A parameter error (A37) will occur if the software limit + setting is less than the software limit – setting.



6. PARAMETERS

6.4 I/O setting parameters (No.PD □□)

6.4.1 Parameter list


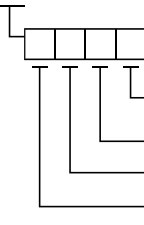
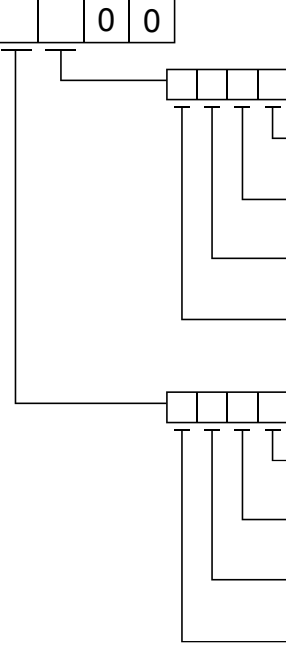
No.	Symbol	Name	Initial value	Unit
PD01	*DIA1	Input signal automatic ON selection 1	0000h	
PD02		For manufacturer setting	0000h	
PD03	*DIA3	Input signal automatic ON selection 3	0000h	
PD04	*DIA4	Input signal automatic ON selection 4	0000h	
PD05		For manufacturer setting	0000h	
PD06	*DI2	Input signal device selection 2 (CN6-2)	002Bh	
PD07	*DI3	Input signal device selection 3 (CN6-3)	000Ah	
PD08	*DI4	Input signal device selection 4 (CN6-4)	000Bh	
PD09	*DO1	Output signal device selection 1 (CN6-14)	0002h	
PD10	*DO2	Output signal device selection 2 (CN6-15)	0003h	
PD11	*DO3	Output signal device selection 3 (CN6-16)	0024h	
PD12	DIN1	External DI function selection 1	0C00h	
PD13		For manufacturer setting	0000h	
PD14	DIN3	External DI function selection 3	0800h	
PD15		For manufacturer setting	0000h	
PD16	*DIAB	Input polarity selection	0000h	
PD17		For manufacturer setting	0000h	
PD18			0000h	
PD19	*DIF	Response level setting	0002h	
PD20	*DOP1	Function selection D-1	0010h	
PD21		For manufacturer setting	0000h	
PD22	*DOP3	Function selection D-3	0000h	
PD23		For manufacturer setting	0000h	
PD24	*DOP5	Function selection D-5	0000h	
PD25		For manufacturer setting	0000h	
PD26			0000h	
PD27			0000h	
PD28			0000h	
PD29			0000h	
PD30			0000h	

6. PARAMETERS

6.4.2 Detail list

No.	Symbol	Name and function	Initial value	Unit	Setting range																													
PD01	*DIA1	<p>Input signal automatic ON selection 1 Select the input devices to be automatically turned ON. </p> <table border="1"> <thead> <tr> <th rowspan="2">Device name</th> <th colspan="2">Initial value</th> </tr> <tr> <th>BIN</th> <th>HEX</th> </tr> </thead> <tbody> <tr> <td rowspan="4">Servo-on (SON)</td> <td>0</td> <td rowspan="4">0</td> </tr> <tr> <td>0</td> </tr> <tr> <td>0</td> </tr> <tr> <td>0</td> </tr> <tr> <td rowspan="4">Proportion control (PC)</td> <td>0</td> <td rowspan="4">0</td> </tr> <tr> <td>0</td> </tr> <tr> <td>0</td> </tr> <tr> <td>0</td> </tr> <tr> <td rowspan="4">Forward rotation stroke end (LSP)</td> <td>0</td> <td rowspan="4">0</td> </tr> <tr> <td>0</td> </tr> <tr> <td>0</td> </tr> <tr> <td>0</td> </tr> <tr> <td rowspan="4">Reverse rotation stroke end (LSN)</td> <td>0</td> <td rowspan="4">0</td> </tr> <tr> <td>0</td> </tr> <tr> <td>0</td> </tr> <tr> <td>0</td> </tr> </tbody> </table> <p> BIN 0: Used in CC-Link or as external input signal. BIN 1: Automatic ON </p> <p>For example, to turn ON SON, the setting is "□□□4".</p>	Device name	Initial value		BIN	HEX	Servo-on (SON)	0	0	0	0	0	Proportion control (PC)	0	0	0	0	0	Forward rotation stroke end (LSP)	0	0	0	0	0	Reverse rotation stroke end (LSN)	0	0	0	0	0	0000h		Refer to name and function column.
Device name	Initial value																																	
	BIN	HEX																																
Servo-on (SON)	0	0																																
	0																																	
	0																																	
	0																																	
Proportion control (PC)	0	0																																
	0																																	
	0																																	
	0																																	
Forward rotation stroke end (LSP)	0	0																																
	0																																	
	0																																	
	0																																	
Reverse rotation stroke end (LSN)	0	0																																
	0																																	
	0																																	
	0																																	
PD02		<p>For manufacturer setting Do not change this value by any means.</p>	0000h																															

6. PARAMETERS

No.	Symbol	Name and function	Initial value	Unit	Setting range																												
PD03	*DIA3	<p>Input signal automatic ON selection 3 Select the input devices to be automatically turned ON.  part is for manufacturer setting. Do not set the value by any means.</p> <p>0 0 0 0</p>  <table border="1"> <thead> <tr> <th rowspan="2">Device name</th> <th colspan="2">Initial value</th> </tr> <tr> <th>BIN</th> <th>HEX</th> </tr> </thead> <tbody> <tr> <td>Automatic/manual selection (MD0)</td> <td>0</td> <td rowspan="4">0</td> </tr> <tr> <td></td> <td>0</td> </tr> <tr> <td></td> <td>0</td> </tr> <tr> <td></td> <td>0</td> </tr> </tbody> </table> <p>BIN 0: Used in CC-Link or as external input signal. BIN 1: Automatic ON</p>	Device name	Initial value		BIN	HEX	Automatic/manual selection (MD0)	0	0		0		0		0	0000h		Refer to name and function column.														
Device name	Initial value																																
	BIN	HEX																															
Automatic/manual selection (MD0)	0	0																															
	0																																
	0																																
	0																																
PD04	*DIA4	<p>Input signal automatic ON selection 4 Select the input devices to be automatically turned ON.</p> <p>0 0</p>  <table border="1"> <thead> <tr> <th rowspan="2">Device name</th> <th colspan="2">Initial value</th> </tr> <tr> <th>BIN</th> <th>HEX</th> </tr> </thead> <tbody> <tr> <td>Point table No. selection 1 (D10)</td> <td>0</td> <td rowspan="4">0</td> </tr> <tr> <td>Point table No. selection 2 (D11)</td> <td>0</td> </tr> <tr> <td>Point table No. selection 3 (D12)</td> <td>0</td> </tr> <tr> <td>Point table No. selection 4 (D13)</td> <td>0</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th rowspan="2">Device name</th> <th colspan="2">Initial value</th> </tr> <tr> <th>BIN</th> <th>HEX</th> </tr> </thead> <tbody> <tr> <td>Point table No. selection 5 (D14)</td> <td>0</td> <td rowspan="4">0</td> </tr> <tr> <td>Point table No. selection 6 (D15)</td> <td>0</td> </tr> <tr> <td>Point table No. selection 7 (D16)</td> <td>0</td> </tr> <tr> <td>Point table No. selection 8 (D17)</td> <td>0</td> </tr> </tbody> </table> <p>BIN 0: Used in CC-Link or as external input signal. BIN 1: Automatic ON</p>	Device name	Initial value		BIN	HEX	Point table No. selection 1 (D10)	0	0	Point table No. selection 2 (D11)	0	Point table No. selection 3 (D12)	0	Point table No. selection 4 (D13)	0	Device name	Initial value		BIN	HEX	Point table No. selection 5 (D14)	0	0	Point table No. selection 6 (D15)	0	Point table No. selection 7 (D16)	0	Point table No. selection 8 (D17)	0	0000h		Refer to name and function column.
Device name	Initial value																																
	BIN	HEX																															
Point table No. selection 1 (D10)	0	0																															
Point table No. selection 2 (D11)	0																																
Point table No. selection 3 (D12)	0																																
Point table No. selection 4 (D13)	0																																
Device name	Initial value																																
	BIN	HEX																															
Point table No. selection 5 (D14)	0	0																															
Point table No. selection 6 (D15)	0																																
Point table No. selection 7 (D16)	0																																
Point table No. selection 8 (D17)	0																																
PD05		<p>For manufacturer setting Do not change this value by any means.</p>	0000h																														

6. PARAMETERS

No.	Symbol	Name and function	Initial value	Unit	Setting range																																																									
PD06	*DI2	<p>Output signal device selection 2 (CN6-2) Any input device can be assigned to the CN6-2 pin.</p> <table border="1" style="margin-left: 20px;"> <tr> <td style="width: 20px; text-align: center;">0</td> <td style="width: 20px; text-align: center;">0</td> <td style="width: 20px;"></td> <td style="width: 20px;"></td> </tr> </table> <p style="margin-left: 40px;">Select the input device of the CN6-2 pin</p> <p>The devices that can be assigned are indicated in the following table.</p> <table border="1" style="margin-left: 20px;"> <thead> <tr> <th rowspan="2">Setting (Note)</th> <th colspan="2">Input device</th> </tr> <tr> <th>Name</th> <th>Abbreviation</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>No assignment function</td> <td></td> </tr> <tr> <td>02</td> <td>Servo-on</td> <td>SON</td> </tr> <tr> <td>03</td> <td>Reset</td> <td>RES</td> </tr> <tr> <td>04</td> <td>Proportion control</td> <td>PC</td> </tr> <tr> <td>06</td> <td>Clear</td> <td>CR</td> </tr> <tr> <td>07</td> <td>Forward rotation start</td> <td>ST1</td> </tr> <tr> <td>08</td> <td>Reverse rotation start</td> <td>ST2</td> </tr> <tr> <td>09</td> <td>Internal torque limit selection</td> <td>TL1</td> </tr> <tr> <td>0A</td> <td>Forward rotation stroke end</td> <td>LSP</td> </tr> <tr> <td>0B</td> <td>Reverse rotation stroke end</td> <td>LSN</td> </tr> <tr> <td>0D</td> <td>Gain changing</td> <td>CDP</td> </tr> <tr> <td>20</td> <td>Automatic/manual selection</td> <td>MD0</td> </tr> <tr> <td>24</td> <td>Manual pulse generator multiplication 1</td> <td>TP0</td> </tr> <tr> <td>25</td> <td>Manual pulse generator multiplication 2</td> <td>TP1</td> </tr> <tr> <td>27</td> <td>Temporary stop/restart</td> <td>TSTP</td> </tr> <tr> <td>2B</td> <td>Proximity dog</td> <td>DOG</td> </tr> </tbody> </table> <p>Note. The other setting values than shown in this table are for manufacturer setting.</p>	0	0			Setting (Note)	Input device		Name	Abbreviation	00	No assignment function		02	Servo-on	SON	03	Reset	RES	04	Proportion control	PC	06	Clear	CR	07	Forward rotation start	ST1	08	Reverse rotation start	ST2	09	Internal torque limit selection	TL1	0A	Forward rotation stroke end	LSP	0B	Reverse rotation stroke end	LSN	0D	Gain changing	CDP	20	Automatic/manual selection	MD0	24	Manual pulse generator multiplication 1	TP0	25	Manual pulse generator multiplication 2	TP1	27	Temporary stop/restart	TSTP	2B	Proximity dog	DOG	002Bh		Refer to name and function column.
0	0																																																													
Setting (Note)	Input device																																																													
	Name	Abbreviation																																																												
00	No assignment function																																																													
02	Servo-on	SON																																																												
03	Reset	RES																																																												
04	Proportion control	PC																																																												
06	Clear	CR																																																												
07	Forward rotation start	ST1																																																												
08	Reverse rotation start	ST2																																																												
09	Internal torque limit selection	TL1																																																												
0A	Forward rotation stroke end	LSP																																																												
0B	Reverse rotation stroke end	LSN																																																												
0D	Gain changing	CDP																																																												
20	Automatic/manual selection	MD0																																																												
24	Manual pulse generator multiplication 1	TP0																																																												
25	Manual pulse generator multiplication 2	TP1																																																												
27	Temporary stop/restart	TSTP																																																												
2B	Proximity dog	DOG																																																												
PD07	*DI3	<p>Output signal device selection 3 (CN6-3) Any input device can be assigned to the CN6-3 pin. The devices that can be assigned and the setting method are the same as in parameter No.PD06.</p> <table border="1" style="margin-left: 20px;"> <tr> <td style="width: 20px; text-align: center;">0</td> <td style="width: 20px; text-align: center;">0</td> <td style="width: 20px;"></td> <td style="width: 20px;"></td> </tr> </table> <p style="margin-left: 40px;">Select the input device of the CN6-3 pin</p>	0	0			000Ah		Refer to name and function column.																																																					
0	0																																																													
PD08	*DI4	<p>Output signal device selection 4 (CN6-4) Any input device can be assigned to the CN6-4 pin. The devices that can be assigned and the setting method are the same as in parameter No.PD06.</p> <table border="1" style="margin-left: 20px;"> <tr> <td style="width: 20px; text-align: center;">0</td> <td style="width: 20px; text-align: center;">0</td> <td style="width: 20px;"></td> <td style="width: 20px;"></td> </tr> </table> <p style="margin-left: 40px;">Select the input device of the CN6-4 pin</p>	0	0			000Bh		Refer to name and function column.																																																					
0	0																																																													


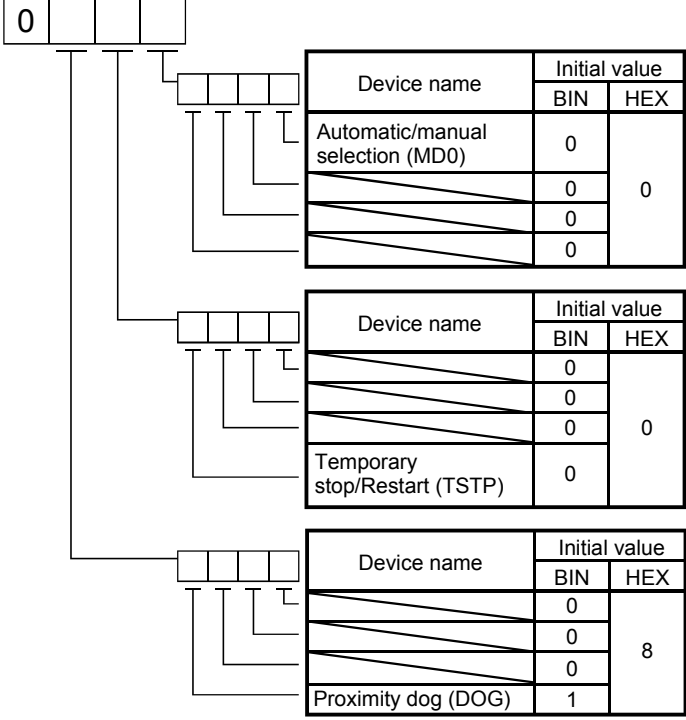





























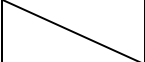
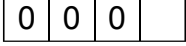


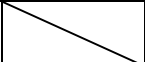


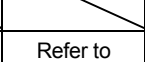
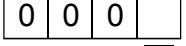
6. PARAMETERS

No.	Symbol	Name and function	Initial value	Unit	Setting range																																																																																				
PD09	*DO1	<p>Output signal device selection 1 (CN6-14) Any output signal can be assigned to the CN6-14 pin.</p> <table border="1" style="margin-left: 20px;"> <tr> <td style="width: 20px; text-align: center;">0</td> <td style="width: 20px; text-align: center;">0</td> <td style="width: 20px;"></td> <td style="width: 20px;"></td> </tr> </table> <p style="margin-left: 40px;">Select the output device of the CN6-14 pin</p> <p>The devices that can be assigned are indicated in the following table.</p> <table border="1" style="margin-left: 20px;"> <thead> <tr> <th rowspan="2">Setting (Note)</th> <th colspan="2">Output device</th> </tr> <tr> <th>Name</th> <th>Symbol</th> </tr> </thead> <tbody> <tr><td>00</td><td>Always OFF</td><td></td></tr> <tr><td>02</td><td>Ready</td><td>RD</td></tr> <tr><td>03</td><td>Trouble</td><td>ALM</td></tr> <tr><td>04</td><td>In position</td><td>INP</td></tr> <tr><td>05</td><td>Electromagnetic brake interlock</td><td>MBR</td></tr> <tr><td>06</td><td>Dynamic brake interlock</td><td>DB</td></tr> <tr><td>07</td><td>Limiting torque</td><td>TLC</td></tr> <tr><td>08</td><td>Warning</td><td>WNG</td></tr> <tr><td>09</td><td>Battery warning</td><td>BWNG</td></tr> <tr><td>0A</td><td>Speed command reached</td><td>SA</td></tr> <tr><td>0C</td><td>Zero speed</td><td>ZSP</td></tr> <tr><td>0F</td><td>Variable gain selection</td><td>CDPS</td></tr> <tr><td>23</td><td>Rough match</td><td>CPO</td></tr> <tr><td>24</td><td>Home position return completion</td><td>ZP</td></tr> <tr><td>25</td><td>Position range</td><td>POT</td></tr> <tr><td>26</td><td>Temporary stop</td><td>PUS</td></tr> <tr><td>27</td><td>Movement completion</td><td>MEND</td></tr> <tr><td>38</td><td>Point table No. output 1</td><td>PT0</td></tr> <tr><td>39</td><td>Point table No. output 2</td><td>PT1</td></tr> <tr><td>3A</td><td>Point table No. output 3</td><td>PT2</td></tr> <tr><td>3B</td><td>Point table No. output 4</td><td>PT3</td></tr> <tr><td>3C</td><td>Point table No. output 5</td><td>PT4</td></tr> <tr><td>3D</td><td>Point table No. output 6</td><td>PT5</td></tr> <tr><td>3E</td><td>Point table No. output 7</td><td>PT6</td></tr> <tr><td>3F</td><td>Point table No. output 8</td><td>PT7</td></tr> </tbody> </table> <p>Note. The other setting values than shown in this table are for manufacturer setting.</p>	0	0			Setting (Note)	Output device		Name	Symbol	00	Always OFF		02	Ready	RD	03	Trouble	ALM	04	In position	INP	05	Electromagnetic brake interlock	MBR	06	Dynamic brake interlock	DB	07	Limiting torque	TLC	08	Warning	WNG	09	Battery warning	BWNG	0A	Speed command reached	SA	0C	Zero speed	ZSP	0F	Variable gain selection	CDPS	23	Rough match	CPO	24	Home position return completion	ZP	25	Position range	POT	26	Temporary stop	PUS	27	Movement completion	MEND	38	Point table No. output 1	PT0	39	Point table No. output 2	PT1	3A	Point table No. output 3	PT2	3B	Point table No. output 4	PT3	3C	Point table No. output 5	PT4	3D	Point table No. output 6	PT5	3E	Point table No. output 7	PT6	3F	Point table No. output 8	PT7	0002h		Refer to name and function column.
0	0																																																																																								
Setting (Note)	Output device																																																																																								
	Name	Symbol																																																																																							
00	Always OFF																																																																																								
02	Ready	RD																																																																																							
03	Trouble	ALM																																																																																							
04	In position	INP																																																																																							
05	Electromagnetic brake interlock	MBR																																																																																							
06	Dynamic brake interlock	DB																																																																																							
07	Limiting torque	TLC																																																																																							
08	Warning	WNG																																																																																							
09	Battery warning	BWNG																																																																																							
0A	Speed command reached	SA																																																																																							
0C	Zero speed	ZSP																																																																																							
0F	Variable gain selection	CDPS																																																																																							
23	Rough match	CPO																																																																																							
24	Home position return completion	ZP																																																																																							
25	Position range	POT																																																																																							
26	Temporary stop	PUS																																																																																							
27	Movement completion	MEND																																																																																							
38	Point table No. output 1	PT0																																																																																							
39	Point table No. output 2	PT1																																																																																							
3A	Point table No. output 3	PT2																																																																																							
3B	Point table No. output 4	PT3																																																																																							
3C	Point table No. output 5	PT4																																																																																							
3D	Point table No. output 6	PT5																																																																																							
3E	Point table No. output 7	PT6																																																																																							
3F	Point table No. output 8	PT7																																																																																							
PD10	*DO2	<p>Output signal device selection 2 (CN6-15) Any output signal can be assigned to the CN6-15 pin. The devices that can be assigned and the setting method are the same as in parameter No.PD09.</p> <table border="1" style="margin-left: 20px;"> <tr> <td style="width: 20px; text-align: center;">0</td> <td style="width: 20px; text-align: center;">0</td> <td style="width: 20px;"></td> <td style="width: 20px;"></td> </tr> </table> <p style="margin-left: 40px;">Select the output device of the CN6-15 pin</p>	0	0			0003h		Refer to name and function column.																																																																																
0	0																																																																																								


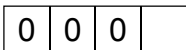
6. PARAMETERS

No.	Symbol	Name and function	Initial value	Unit	Setting range																																																																
PD11	*DO3	<p>Output signal device selection 3 (CN6-16)</p> <p>Any output signal can be assigned to the CN6-16 pin.</p> <p>The devices that can be assigned and the setting method are the same as in parameter No.PD09.</p> <div style="display: flex; align-items: center; margin-top: 10px;"> <div style="border: 1px solid black; padding: 2px; margin-right: 5px;">0</div> <div style="border: 1px solid black; padding: 2px; margin-right: 5px;">0</div> <div style="border: 1px solid black; padding: 2px; margin-right: 5px;"> </div> <div style="border: 1px solid black; padding: 2px;"> </div> </div> <p style="margin-left: 40px;">Select the output device of the CN6-16 pin</p>	0024h		Refer to name and function column.																																																																
PD12	DIN1	<p>External DI function selection 1</p> <p>This function sets any signal imported from the CN6 connector.</p> <p> part is for manufacturer setting. Do not set the value by any means.</p> <div style="margin-top: 10px;"> <table border="1" style="margin-top: 10px; width: 100%;"> <thead> <tr> <th rowspan="2">Device name</th> <th colspan="2">Initial value</th> </tr> <tr> <th>BIN</th> <th>HEX</th> </tr> </thead> <tbody> <tr> <td></td> <td>0</td> <td rowspan="4">0</td> </tr> <tr> <td></td> <td>0</td> </tr> <tr> <td>Servo-on (SON)</td> <td>0</td> </tr> <tr> <td>Reset (RES)</td> <td>0</td> </tr> <tr> <td colspan="3"> </td> </tr> <tr> <th rowspan="2">Device name</th> <th colspan="2">Initial value</th> </tr> <tr> <th>BIN</th> <th>HEX</th> </tr> <tr> <td>Proportion control (PC)</td> <td>0</td> <td rowspan="4">0</td> </tr> <tr> <td></td> <td>0</td> </tr> <tr> <td>Clear (CR)</td> <td>0</td> </tr> <tr> <td>Forward rotation start (ST1)</td> <td>0</td> </tr> <tr> <td colspan="3"> </td> </tr> <tr> <th rowspan="2">Device name</th> <th colspan="2">Initial value</th> </tr> <tr> <th>BIN</th> <th>HEX</th> </tr> <tr> <td>Reverse rotation start (ST2)</td> <td>0</td> <td rowspan="5">C</td> </tr> <tr> <td>Internal torque limit (TL1)</td> <td>0</td> </tr> <tr> <td>Forward rotation stroke end (LSP)</td> <td>1</td> </tr> <tr> <td>Reverse rotation stroke end (LSN)</td> <td>1</td> </tr> <tr> <td></td> <td> </td> </tr> <tr> <th rowspan="2">Device name</th> <th colspan="2">Initial value</th> </tr> <tr> <th>BIN</th> <th>HEX</th> </tr> <tr> <td></td> <td>0</td> <td rowspan="4">0</td> </tr> <tr> <td>Gain changing (CDP)</td> <td>0</td> </tr> <tr> <td></td> <td>0</td> </tr> <tr> <td></td> <td>0</td> </tr> </tbody> </table> <p style="margin-left: 40px; margin-top: 5px;">BIN 0: Used in CC-Link BIN 1: Used in CN6 external input signal</p> </div>	Device name	Initial value		BIN	HEX		0	0		0	Servo-on (SON)	0	Reset (RES)	0				Device name	Initial value		BIN	HEX	Proportion control (PC)	0	0		0	Clear (CR)	0	Forward rotation start (ST1)	0				Device name	Initial value		BIN	HEX	Reverse rotation start (ST2)	0	C	Internal torque limit (TL1)	0	Forward rotation stroke end (LSP)	1	Reverse rotation stroke end (LSN)	1			Device name	Initial value		BIN	HEX		0	0	Gain changing (CDP)	0		0		0	0C00h		Refer to name and function column.
Device name	Initial value																																																																				
	BIN	HEX																																																																			
	0	0																																																																			
	0																																																																				
Servo-on (SON)	0																																																																				
Reset (RES)	0																																																																				
Device name	Initial value																																																																				
	BIN	HEX																																																																			
Proportion control (PC)	0	0																																																																			
	0																																																																				
Clear (CR)	0																																																																				
Forward rotation start (ST1)	0																																																																				
Device name	Initial value																																																																				
	BIN	HEX																																																																			
Reverse rotation start (ST2)	0	C																																																																			
Internal torque limit (TL1)	0																																																																				
Forward rotation stroke end (LSP)	1																																																																				
Reverse rotation stroke end (LSN)	1																																																																				
Device name	Initial value																																																																				
	BIN	HEX																																																																			
	0	0																																																																			
Gain changing (CDP)	0																																																																				
	0																																																																				
	0																																																																				
PD13		<p>For manufacturer setting</p> <p>Do not change this value by any means.</p>	0000h																																																																		

6. PARAMETERS

No.	Symbol	Name and function	Initial value	Unit	Setting range																																										
PD14	DIN3	<p>External DI function selection 3</p> <p>This function sets any signal imported from the CN6 connector.</p> <p> part is for manufacturer setting. Do not set the value by any means.</p>  <table border="1"> <thead> <tr> <th rowspan="2">Device name</th> <th colspan="2">Initial value</th> </tr> <tr> <th>BIN</th> <th>HEX</th> </tr> </thead> <tbody> <tr> <td>Automatic/manual selection (MD0)</td> <td>0</td> <td rowspan="4">0</td> </tr> <tr> <td></td> <td>0</td> </tr> <tr> <td></td> <td>0</td> </tr> <tr> <td></td> <td>0</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th rowspan="2">Device name</th> <th colspan="2">Initial value</th> </tr> <tr> <th>BIN</th> <th>HEX</th> </tr> </thead> <tbody> <tr> <td></td> <td>0</td> <td rowspan="4">0</td> </tr> <tr> <td></td> <td>0</td> </tr> <tr> <td></td> <td>0</td> </tr> <tr> <td>Temporary stop/Restart (TSTP)</td> <td>0</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th rowspan="2">Device name</th> <th colspan="2">Initial value</th> </tr> <tr> <th>BIN</th> <th>HEX</th> </tr> </thead> <tbody> <tr> <td></td> <td>0</td> <td rowspan="4">8</td> </tr> <tr> <td></td> <td>0</td> </tr> <tr> <td></td> <td>0</td> </tr> <tr> <td>Proximity dog (DOG)</td> <td>1</td> </tr> </tbody> </table> <p>BIN 0: Used in CC-Link BIN 1: Used in CN6 external input signal</p>	Device name	Initial value		BIN	HEX	Automatic/manual selection (MD0)	0	0		0		0		0	Device name	Initial value		BIN	HEX		0	0		0		0	Temporary stop/Restart (TSTP)	0	Device name	Initial value		BIN	HEX		0	8		0		0	Proximity dog (DOG)	1	0800h		Refer to name and function column.
Device name	Initial value																																														
	BIN	HEX																																													
Automatic/manual selection (MD0)	0	0																																													
	0																																														
	0																																														
	0																																														
Device name	Initial value																																														
	BIN	HEX																																													
	0	0																																													
	0																																														
	0																																														
Temporary stop/Restart (TSTP)	0																																														
Device name	Initial value																																														
	BIN	HEX																																													
	0	8																																													
	0																																														
	0																																														
Proximity dog (DOG)	1																																														
PD15		<p>For manufacturer setting</p> <p>Do not change this value by any means.</p>	0000h																																												
PD16	*DIAB	<p>Input polarity selection</p> <p>Used to set the proximity dog input polarity. (Refer to section 5.6.)</p>  <p>Proximity dog input polarity 0: OFF indicates detection of the dog 1: ON indicates detection of the dog</p>	0000h		Refer to name and function column.																																										
PD17		For manufacturer setting	0000h																																												
PD18		Do not change this value by any means.	0000h																																												
PD19	*DIF	<p>Response level setting</p> <p>Used to select the input.</p>  <p>Input filter If external input signal causes chattering due to noise, etc., input filter is used to suppress it. 0: None 1: 0.88[ms] 2: 1.77[ms] 3: 2.66[ms] 4: 3.55[ms] 5: 4.44[ms]</p>	0002h		Refer to name and function column.																																										

6. PARAMETERS

No.	Symbol	Name and function	Initial value	Unit	Setting range
PD20	*DOP1	<p>Function selection D-1 Select the stop processing at forward rotation stroke end (LSN)/reverse rotation stroke end (LSN) OFF and the base circuit status at reset (RY(N+1)A or RY(n+3)A) ON.</p>  <p>Stopping method used when forward rotation stroke end (LSP), reverse rotation stroke end (LSN) device or software limit is valid 0: Sudden stop (home position erased) 1: Slow stop (home position erased) 2: Slow stop (Deceleration to a stop by deceleration time constant) 3: Sudden stop (Stop by remaining move distance clear)</p> <p>Selection of base circuit status at reset (RY(n+1)A or RY(n+3)A)ON 0: Base circuit not switched off 1: Base circuit switched off</p> <p>Stopping method used when software limit is valid 0: Sudden stop (home position erased) 1: Slow stop (home position erased) 2: Slow stop (Deceleration to a stop by deceleration time constant) 3: Sudden stop (Stop by remaining move distance clear)</p> <p>As in the following parameter settings, when the home position is lost by the forward rotation stroke end, reverse rotation stroke end, or the software limit detection, the home position return completion (ZP) turns on by turning OFF/ON the servo-on (RYn0). In this case, there is no need to perform the home position return again.</p> <p>1. In absolute position detection system Parameter No.PA03: <input type="checkbox"/><input type="checkbox"/><input type="checkbox"/> 1 (Select the absolute position detection system) Parameter No.PA01: <input type="checkbox"/><input type="checkbox"/><input type="checkbox"/> 0 (Select the absolute value command system)</p> <p>2. In incremental system Parameter No.PA03: <input type="checkbox"/><input type="checkbox"/><input type="checkbox"/> 0 (Select the incremental system) Parameter No.PA01: <input type="checkbox"/><input type="checkbox"/><input type="checkbox"/> 0 (Select the absolute value command system) Parameter No.PA04: <input type="checkbox"/><input type="checkbox"/><input type="checkbox"/> 1 (Follow-up valid)</p>	0010h		Refer to name and function column.
PD21		<p>For manufacturer setting Do not change this value by any means.</p>	0000h		
PD22	*DOP3	<p>Function selection D-3 Set the clear (RYnF).</p>  <p>Clear (RYnF) selection 0: Droop pulses are cleared on the leading edge. 1: While on, droop pulses are always cleared.</p>	0000h		Refer to name and function column.
PD23		<p>For manufacturer setting Do not change this value by any means.</p>	0000h		

6. PARAMETERS

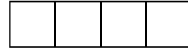
No.	Symbol	Name and function	Initial value	Unit	Setting range																																											
PD24	*DOP5	<p>Function selection D-5 Select the output status of the warning (WNG).</p> <div style="border: 1px solid black; padding: 5px; display: inline-block;"> <table style="border-collapse: collapse;"> <tr> <td style="border: 1px solid black; width: 20px; text-align: center;">0</td> <td style="border: 1px solid black; width: 20px; text-align: center;">0</td> <td style="border: 1px solid black; width: 20px; text-align: center;"> </td> <td style="border: 1px solid black; width: 20px; text-align: center;">0</td> </tr> </table> </div> <p style="margin-left: 40px;">Selection of output device at warning occurrence Select the warning (RXnA) and trouble (RX(n+1)A or RX(n+3)A) output status at warning occurrence.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Setting</th> <th colspan="2">(Note) Device status</th> </tr> </thead> <tbody> <tr> <td rowspan="6" style="text-align: center; vertical-align: middle;">0</td> <td rowspan="3">Remote output</td> <td>RXnA 1</td> <td></td> </tr> <tr> <td>RX(n+1)A or RX(n+3)A 1</td> <td></td> </tr> <tr> <td>RX(n+3)A 0</td> <td></td> </tr> <tr> <td rowspan="3">Output device</td> <td>WNG ON</td> <td></td> </tr> <tr> <td>OFF</td> <td></td> </tr> <tr> <td>ALM ON</td> <td></td> </tr> <tr> <td>OFF</td> <td></td> <td style="text-align: right;">Warning occurred.</td> </tr> <tr> <td rowspan="6" style="text-align: center; vertical-align: middle;">1</td> <td rowspan="3">Remote output</td> <td>RXnA 1</td> <td></td> </tr> <tr> <td>RX(n+1)A or RX(n+3)A 1</td> <td></td> </tr> <tr> <td>RX(n+3)A 0</td> <td></td> </tr> <tr> <td rowspan="3">Output device</td> <td>WNG ON</td> <td></td> </tr> <tr> <td>OFF</td> <td></td> </tr> <tr> <td>ALM ON</td> <td></td> </tr> <tr> <td>OFF</td> <td></td> <td style="text-align: right;">Warning occurred.</td> </tr> </tbody> </table> <p>Note. 0: OFF 1: ON</p>	0	0		0	Setting	(Note) Device status		0	Remote output	RXnA 1		RX(n+1)A or RX(n+3)A 1		RX(n+3)A 0		Output device	WNG ON		OFF		ALM ON		OFF		Warning occurred.	1	Remote output	RXnA 1		RX(n+1)A or RX(n+3)A 1		RX(n+3)A 0		Output device	WNG ON		OFF		ALM ON		OFF		Warning occurred.	0000h		
0	0		0																																													
Setting	(Note) Device status																																															
0	Remote output	RXnA 1																																														
		RX(n+1)A or RX(n+3)A 1																																														
		RX(n+3)A 0																																														
	Output device	WNG ON																																														
		OFF																																														
		ALM ON																																														
OFF		Warning occurred.																																														
1	Remote output	RXnA 1																																														
		RX(n+1)A or RX(n+3)A 1																																														
		RX(n+3)A 0																																														
	Output device	WNG ON																																														
		OFF																																														
		ALM ON																																														
OFF		Warning occurred.																																														
PD25		For manufacturer setting	0000h																																													
PD26		Do not change this value by any means.	0000h																																													
PD27			0000h																																													
PD28			0000h																																													
PD29			0000h																																													
PD30			0000h																																													

6. PARAMETERS

6.4.3 Stopping method when the forward stroke end (LSP) or reverse stroke end (LSN) is valid

The setting of the first digit of parameter No.PD20 enables to select a stopping method of the servo motor when the forward rotation stroke end (LSP) or reverse rotation stroke end (LSN) turns off.

Parameter No.PD20



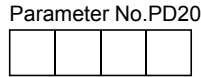
- Stopping method used when forward rotation stroke end (LSP) or reverse rotation stroke end (LSN) is valid
- 0: Sudden stop (home position erased)
 - 1: Slow stop (home position erased)
 - 2: Slow stop (Deceleration to a stop by deceleration time constant)
 - 3: Sudden stop (Stop by remaining move distance clear)

Setting value of parameter No.PD20	Operation status		Remarks
	When rotating at constant speed	When decelerating to stop	
□□□0 (Initial value)			<p>Clears droop pulses and stops. Erases the home position. A difference occurs between the command position and the current position. Execute a home position return again.</p>
□□□1			<p>Moves for the amount of droop pulse and stops. Erases the home position. A difference occurs between the command position and the current position. Execute a home position return again.</p>
□□□2			<p>Decelerates to stop at the deceleration time constant. Continues to rotate for the amount of S-pattern acceleration/deceleration time constant delay. Keeps the home position.</p>
□□□3			<p>Moves for the amount of droop pulse and stops. Continues to rotate for the amount of S-pattern acceleration/deceleration time constant delay. Keeps the home position.</p>

6. PARAMETERS

6.4.4 Stopping method when a software limit is detected

A stopping method of the servo motor when a software limit (parameter No.PC31 to PC34) is detected can be selected. The software limit imposes a limit on the command position, which is controlled in the servo amplifier. Therefore, actual position does not reach to the software limit set position.



- Stopping method used when software limit is detected
- 0: Sudden stop (home position erased)
 - 1: Slow stop (home position erased)
 - 2: Slow stop (Deceleration to a stop by deceleration time constant)
 - 3: Sudden stop (Stop by remaining move distance clear)

Setting value of parameter No.PD20	Operation status		Remarks
	When rotating at constant speed	When decelerating to stop	
<input type="checkbox"/> 0 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> (Initial value)			Clears droop pulses and stops. Erases the home position. A difference occurs between the command position and the current position. Execute a home position return again.
<input type="checkbox"/> 1 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			Moves for the amount of droop pulse and stops. Erases the home position. A difference occurs between the command position and the current position. Execute a home position return again.
<input type="checkbox"/> 2 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			Decelerates to stop at the deceleration time constant. Continues to rotate for the amount of S-pattern acceleration/deceleration time constant delay. Keeps the home position.
<input type="checkbox"/> 3 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			Moves for the amount of droop pulse and stops. Continues to rotate for the amount of S-pattern acceleration/deceleration time constant delay. Keeps the home position.

7. MR Configurator

7. MR Configurator

The MR Configurator uses the communication function of the servo amplifier to perform parameter setting changes, graph display, test operation, etc. on a personal computer.

7.1 Specifications

Item	Description															
Compatibility with a servo amplifier	The following table shows MR Configurator software version for each servo amplifier.															
	<table border="1"> <thead> <tr> <th colspan="2">MR Configurator</th> <th colspan="2">Compatible servo amplifier</th> </tr> <tr> <th>Model</th> <th>Software version</th> <th>100V class 200V class</th> <th>400V class</th> </tr> </thead> <tbody> <tr> <td rowspan="2">MRZJW3-SETUP221E</td> <td>B0</td> <td style="text-align: center;">/</td> <td style="text-align: center;">/</td> </tr> <tr> <td>C0 or later</td> <td style="text-align: center;">○</td> <td style="text-align: center;">○</td> </tr> </tbody> </table>	MR Configurator		Compatible servo amplifier		Model	Software version	100V class 200V class	400V class	MRZJW3-SETUP221E	B0	/	/	C0 or later	○	○
	MR Configurator		Compatible servo amplifier													
	Model	Software version	100V class 200V class	400V class												
MRZJW3-SETUP221E	B0	/	/													
	C0 or later	○	○													
Baud rate [bps]	115200, 57600, 38400, 19200, 9600															
Monitor	Display, I/O interface display, high speed monitor, trend graph															
Alarm	Display, history, amplifier data															
Diagnostic	No motor rotation, system information, tuning data, absolute encoder data, Axis name setting.															
Parameters	Parameter list, device setting, tuning, change list, detailed information															
Test operation	Jog operation, positioning operation, motor-less operation, Do forced output, program operation, single-step feed, parameter copy.															
Advanced function	Machine analyzer, gain search, machine simulation, Robust disturbance compensation.															
Point data	Point table															
File operation	Data read, save, delete, print															
Others	Automatic demo, help display															

7. MR Configurator

7.2 System configuration

(1) Components

To use this software, the following components are required in addition to the servo amplifier and servo motor.

Equipment		(Note 1) Description
(Note 2, 3) Personal computer	OS	IBM PC/AT compatible where the English version of Windows [®] 98, Windows [®] Me, Windows [®] 2000 Professional, Windows [®] XP Professional, Windows [®] XP Home Edition, Windows Vista [®] Home Basic, Windows Vista [®] Home Premium, Windows Vista [®] Business, Windows Vista [®] Ultimate, Windows Vista [®] Enterprise operates
	Processor	Pentium [®] 133MHz or more (Windows [®] 98, Windows [®] 2000 Professional) Pentium [®] 150MHz or more (Windows [®] Me) Pentium [®] 300MHz or more (Windows [®] XP Professional, Windows [®] XP Home Edition) 32-bit (x86) processor of 1GHz or higher (Windows Vista [®] Home Basic, Windows Vista [®] Home Premium, Windows Vista [®] Business, Windows Vista [®] Ultimate, Windows Vista [®] Enterprise)
	Memory	24MB or more (Windows [®] 98) 32MB or more (Windows [®] Me, Windows [®] 2000 Professional) 128MB or more (Windows [®] XP Professional, Windows [®] XP Home Edition) 512MB or more (Windows Vista [®] Home Basic) 1GB or more (Windows Vista [®] Home Premium, Windows Vista [®] Business, Windows Vista [®] Ultimate, Windows Vista [®] Enterprise)
	Hard Disk	130MB or more of free space
Browser		Internet Explorer 4.0 or more
Display		One whose resolution is 800 × 600 or more and that can provide a high color (16 bit) display. Connectable with the above personal computer.
Keyboard		Connectable with the above personal computer.
Mouse		Connectable with the above personal computer.
Printer		Connectable with the above personal computer.
USB cable		MR-J3USBCBL3M
RS-422/232C conversion cable		DSV-CABV (Diatrend) is recommended.

Note 1. Windows and Windows Vista are the registered trademarks of Microsoft Corporation in the United States and other countries.

Pentium is the registered trademarks of Intel Corporation.

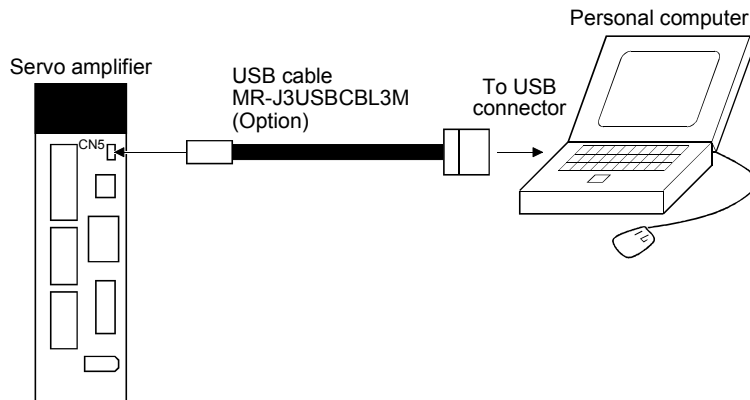
2. On some personal computers, MR Configurator may not run properly.

3. 64-bit Windows XP and 64-bit Windows Vista are not supported.

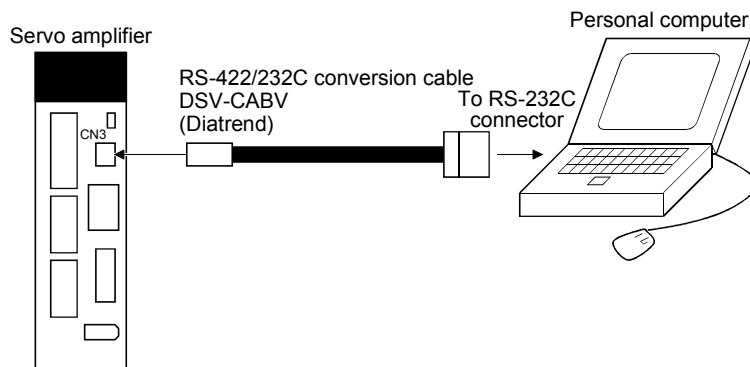
7. MR Configurator

(2) Connection with servo amplifier

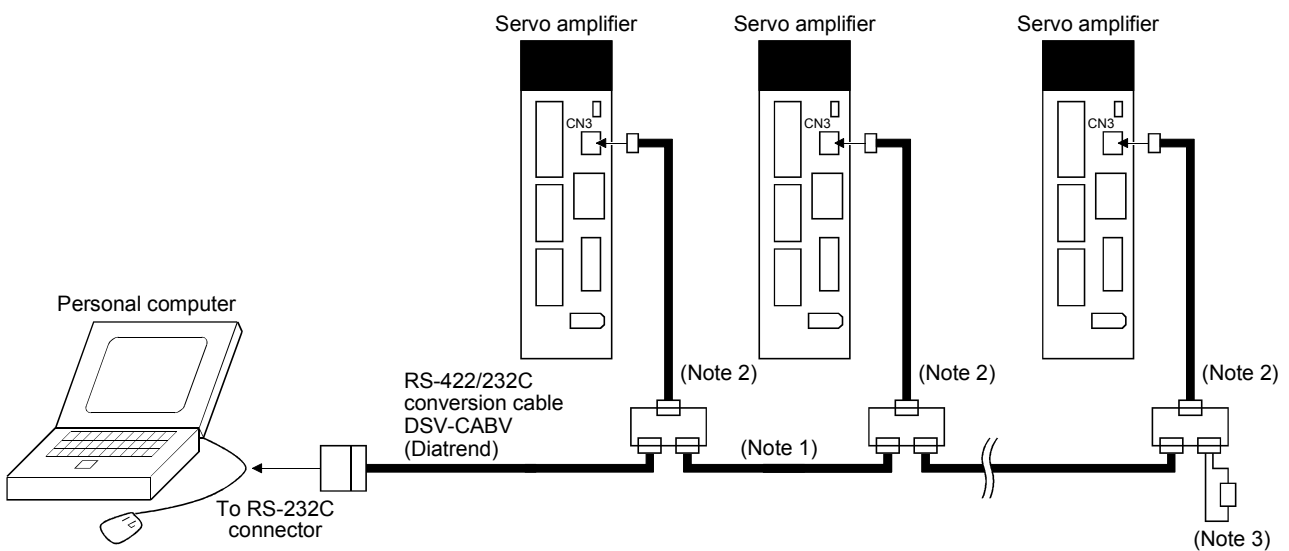
(a) For use of USB



(b) For use of RS-422



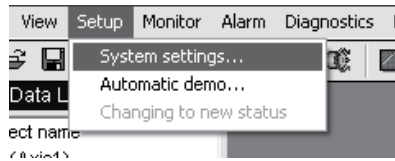
(c) For use of RS-422 to make multidrop connection



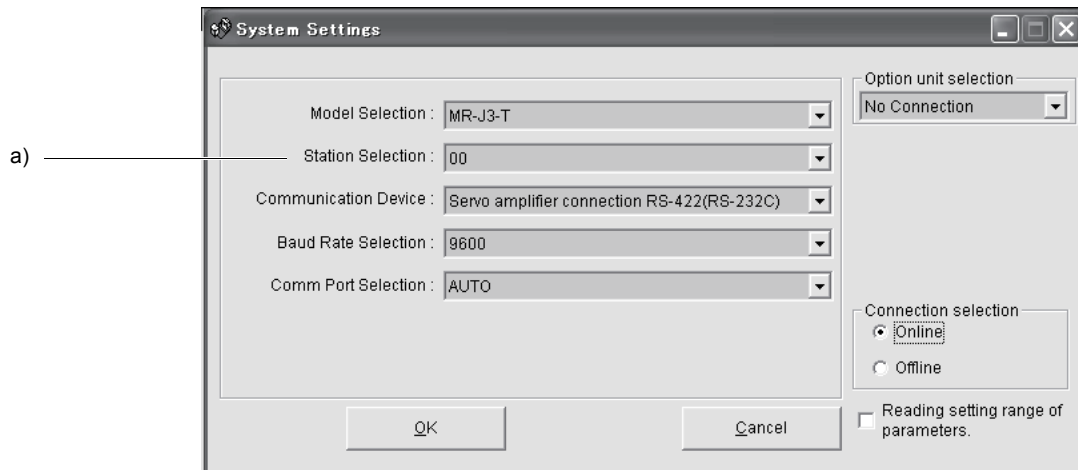
7. MR Configurator

7.3 Station selection

Click "Setup" on the menu bar and click "System settings" on the menu.



When the above choices are made, the following window appears.



(1) Station number selection

Choose the station number in the combo box (a).

POINT
▪ This setting should be the same as the station number which has been set in the parameter in the servo amplifier used for communication.

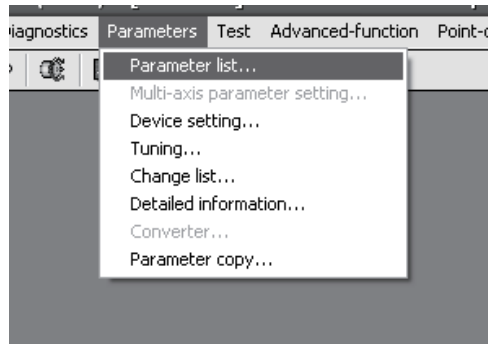
(2) Closing of the station selection window

Click the "OK" button to close the window.

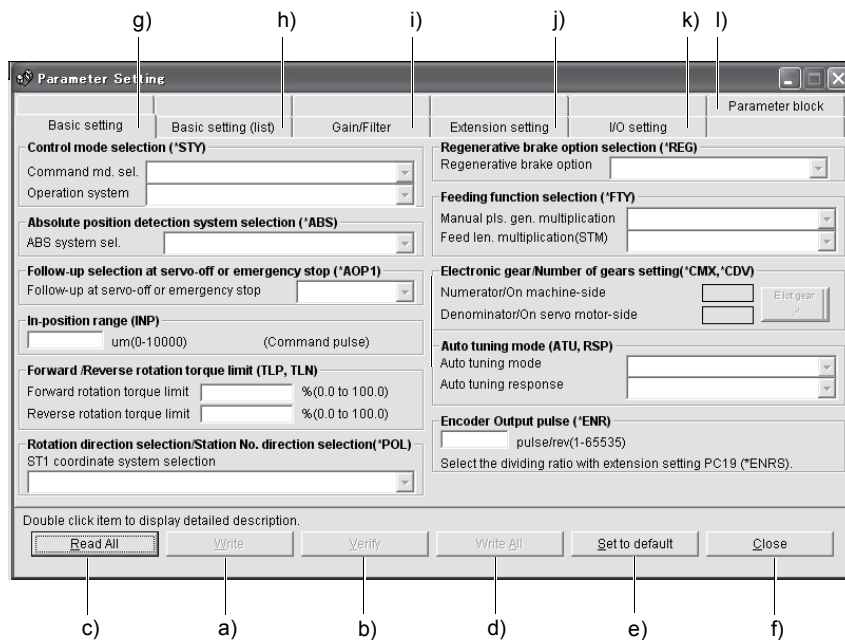
7. MR Configurator

7.4 Parameters

Click "Parameters" on the menu bar and click "Parameter list" on the menu.



When the above choices are made, the following window appears.



(1) Parameter value write (a)

Click the parameter whose setting was changed and press the "Write" button to write the new parameter setting to the servo amplifier.

(2) Parameter value verify (b)

Click the "Verify" button to verify all parameter values being displayed and the parameter values of the servo amplifier.

(3) Parameter value batch-read (c)

Click the "Read All" button to read and display all parameter values from the servo amplifier.

7. MR Configurator

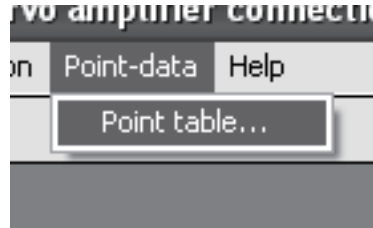
- (4) Parameter value batch-write (d)
Click the "Write All" button to write all parameter values to the servo amplifier.
- (5) Parameter default value indication (e)
Click the "Set to default" button to show the initial value of each parameter.
- (6) Basic settings for parameters (g)
Used to make the basic settings such as control mode selection and absolute position detection system selection.
- (7) Basic setting parameters (h)
Used to make the basic settings for the servo amplifier. Select a parameter to be changed the setting, enter a new value to "Set value" and click "Enter".
- (8) Gain/Filter parameters (i)
Used to adjust the gain manually. Select a parameter to be changed, enter a new value to "Set value" and click "Enter".
- (9) Extension setting parameters (j)
Used to make the setting unique to MR-J3-□T servo amplifier. Select a parameter to be changed, enter a new value to "Set value" and click "Enter".
- (10) I/O setting parameters (k)
Used to change the I/O device of the servo amplifier. Select a parameter to be changed, enter a new value to "Set value" and click "Enter".
- (11) Parameter block (l)
Used to set the availability of parameter write.
- (12) Parameter data file read
Used to read and display the parameter values stored in the file. Use the "Project" menu on the menu bar to read.
- (13) Parameter value storage
Used to store all parameter values being displayed on the window into the specified file. Use the "Project" menu on the menu bar to store.
- (14) Parameter data list print
Used to print all parameter values being displayed on the window. Use the "Project" menu on the menu bar to print.
- (15) Parameter list window closing (f)
Click the "Close" button to close the window. If the "Close" button is clicked without (1) parameter value write or (4) parameter value batch-write being performed, the parameter value changed is made invalid.

7. MR Configurator

7.5 Point table

POINT
<ul style="list-style-type: none">The value of the parameter No. PA05 set on the parameter setting screen is not engaged with the STM (feed length multiplication) value on the point table list screen. Set the STM (feed length multiplication) value to the same as set in the parameter No. PA05 on the point table list screen.

Click "Point-data" on the menu bar and click "Point table" on the menu.



When the above choices are made, the following window appears.

No.	Position Data	Speed Data	Accel Time	Decel Time	Dwell Time	Aux. Func.	M Code
1	0.000	0	0	0	0	0	0
2	0.000	0	0	0	0	0	0
3	0.000	0	0	0	0	0	0
4	0.000	0	0	0	0	0	0
5	0.000	0	0	0	0	0	0
6	0.000	0	0	0	0	0	0
7	0.000	0	0	0	0	0	0
8	0.000	0	0	0	0	0	0
9	0.000	0	0	0	0	0	0
10	0.000	0	0	0	0	0	0
11	0.000	0	0	0	0	0	0
12	0.000	0	0	0	0	0	0
13	0.000	0	0	0	0	0	0

STM 1 Times Set STM to the same value as that of parameter PA05.

Buttons: Read All, Write, Verify, Write All, Close

Labels: a) under Write, b) under Verify, c) under Read All, d) under Write All, h) under Close, f) under STM, e) under Write

(1) Point table data write (a)

Click the point table data changed and press the "Write" button to write the new point table data to the servo amplifier.

(2) Point table data verify (b)

Click the "Verify" button to verify all data being displayed and the data of the servo amplifier.

(3) Point table data batch-read (c)

Click the "Read All" button to read and display all point table data from the servo amplifier.

(4) Point table data batch-write (d)

Click the "Write All" button to write all point table data to the servo amplifier.

7. MR Configurator

(5) Point table data insertion (e)

Click the "Insert" button to insert one block of data into the position before the point table No. chosen. The blocks after the chosen point table No. are shifted down one by one.

(6) Point table data deletion (f)

Click the "Delete" button to delete all data in the point table No. chosen. The blocks after the chosen point table No. are shifted up one by one.

(7) Point table data change (g)

Click the data to be changed, enter a new value into the "Enter" input field, and press the enter key or Enter Data button.

(8) Point table data file read

Used to read and display the point table data stored in the file. Use the "Project" menu on the menu bar to read.

(9) Point table data storage

Used to store all point table data being displayed on the window into the specified file. Use the "Project" menu on the menu bar to store.

(10) Point table data list print

Used to print all point table data being displayed on the window. Use the "Project" menu on the menu bar to print.

(11) Point table data list window closing (h)

Click the "Close" button to close the window.

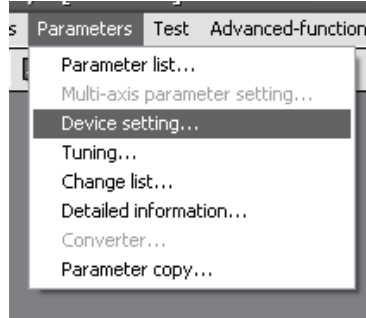
7. MR Configurator

7.6 Device assignment method

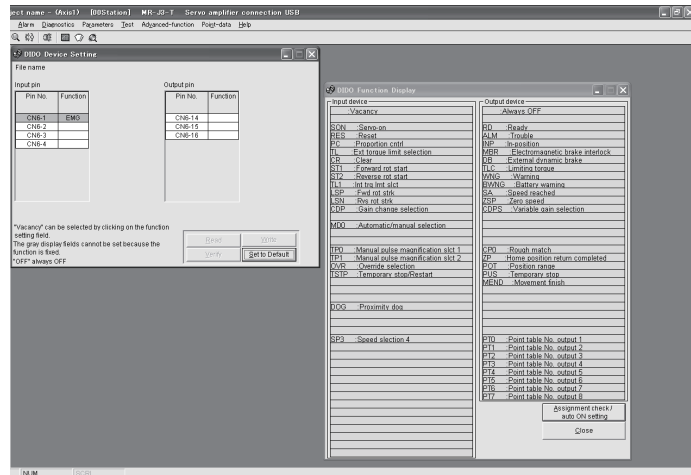
POINT
<ul style="list-style-type: none"> To use a device as an external I/O signal, the settings for the parameter No. PD12 and PD14 are required after the device is assigned according to the device setting described below.

(1) How to open the setting screen

Click "Parameters" on the menu bar and click "Device setting" in the menu.



Making selection displays the following window.

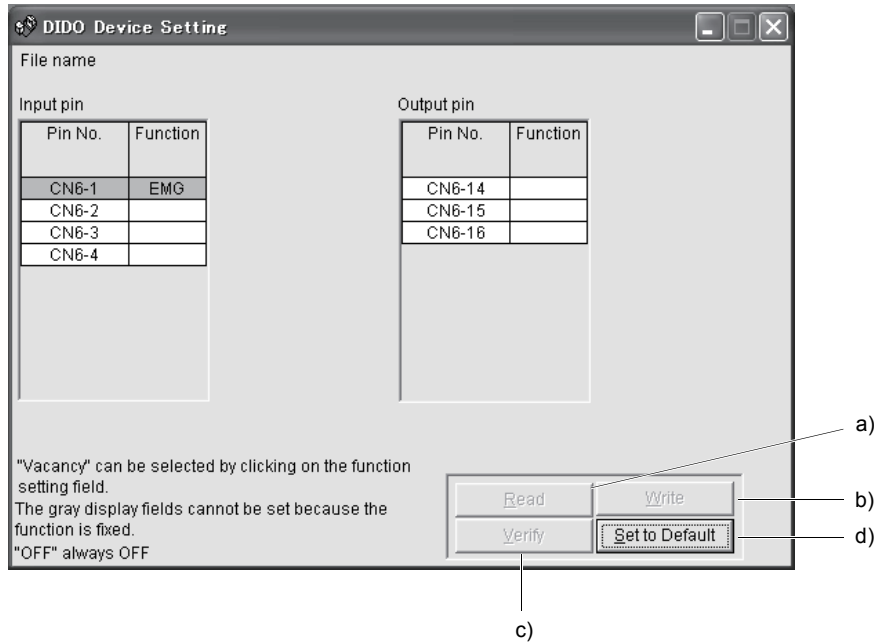


7. MR Configurator

(2) Screen explanation

(a) DIDO device setting window screen

This is the device assignment screen of the servo amplifier displays the pin assignment status of the servo amplifier.



1) Read of function assignment (a)

Click the "Read" button reads and displays all functions assigned to the pins from the servo amplifier.

2) Write of function assignment (b)

Click the "Write" button writes all pins that are assigned the functions to the servo amplifier.

3) Verify of function assignment (c)

Click the "Verify" button verifies the function assignment in the servo amplifier with the device information on the screen.

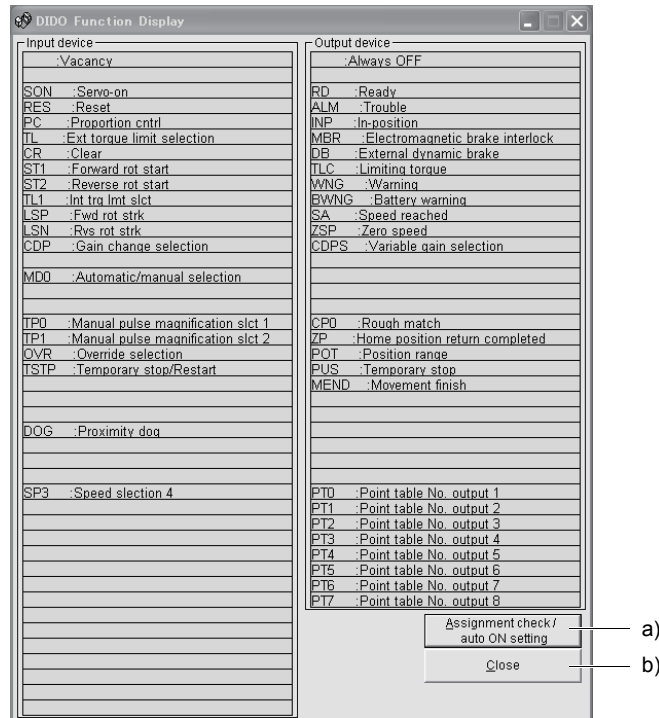
4) Initial setting of function assignment (d)

Click the "Set to Default" button initializes the function assignment.

7. MR Configurator

(b) DIDO function display window screen

This screen is used to select the device assigned to the pins.
The functions displayed below * and * are assignable.



Move the pointer to the place of the function to be assigned. Drag and drop it as-is to the pin you want to assign in the DIDO device setting window.

1) Assignment checking, automatic ON setting (a)

Press this button to display the screen that shows the assignment list and enables auto ON setting.
Refer to (2)(c) in this section for more information.

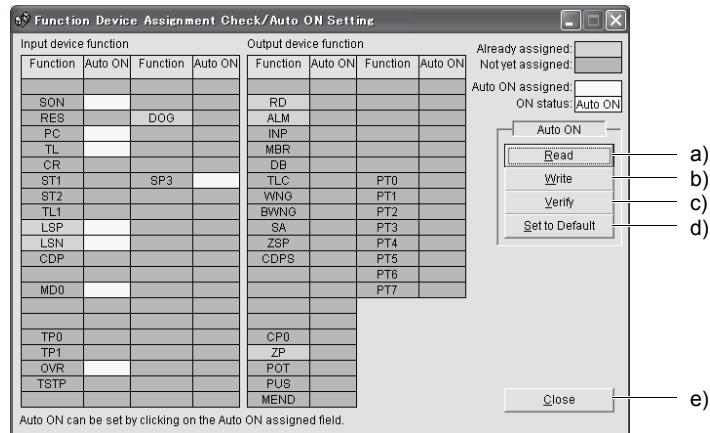
2) Quitting

Click "Close" button to exit from the window. (b)

7. MR Configurator

(c) Function device assignment checking auto ON setting display

Click the "Assignment check / auto ON setting" button in the DIDO function display window displays the following window.



The assigned functions are indicated by.

The functions assigned by auto ON are grayed. When you want to set auto ON to the function that is enabled for auto ON, click the corresponding cell. Clicking it again disables auto ON.

1) Auto ON read of function assignment (a)

Click "Read" button reads the functions set for auto ON from the interface unit and extension IO unit.

2) Auto ON write of function assignment (b)

Click "Write" button writes the functions currently set for auto ON to the interface unit and extension IO unit.

3) Auto ON verify of function assignment (c)

Click "Verify" button verifies the current auto ON setting in the interface unit and extension IO unit with the auto ON setting on the screen.

4) Auto ON initial setting of function assignment (d)

Click "Set to Default" button initializes the auto ON setting.

5) Quitting the function device assignment checking/auto ON setting window (e)

Click "Close" button exits from the window.

7. MR Configurator

7.7 Test operation



CAUTION

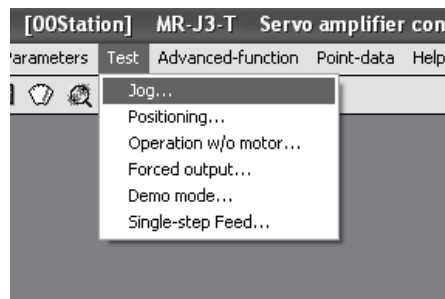
- When confirming the machine operation in the test operation mode, use the machine after checking that the safety mechanism such as the forced stop (EMG) operates.
- If any operational fault has occurred, stop operation using the forced stop (EMG).

7.7.1 Jog operation

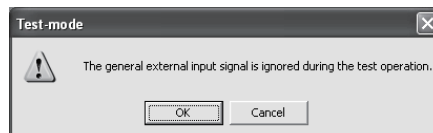
POINT

- For the program operation, refer to the manual of MR Configurator.
- The servo motor will not operate if the forced stop (EMG), forward rotation stroke end (LSP) and reverse rotation stroke end (LSN) are off. Make automatic ON setting to turn on these devices or make device setting to assign them as external input signals and turn on across these signals and SG. (Refer to section 7.6.)
- When an alarm occurs, the JOG operation is automatically canceled.

Click "Test" on the menu bar and choose "Jog" on the menu.

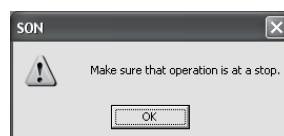


Clicking displays the confirmation window for switching to the test operation mode.



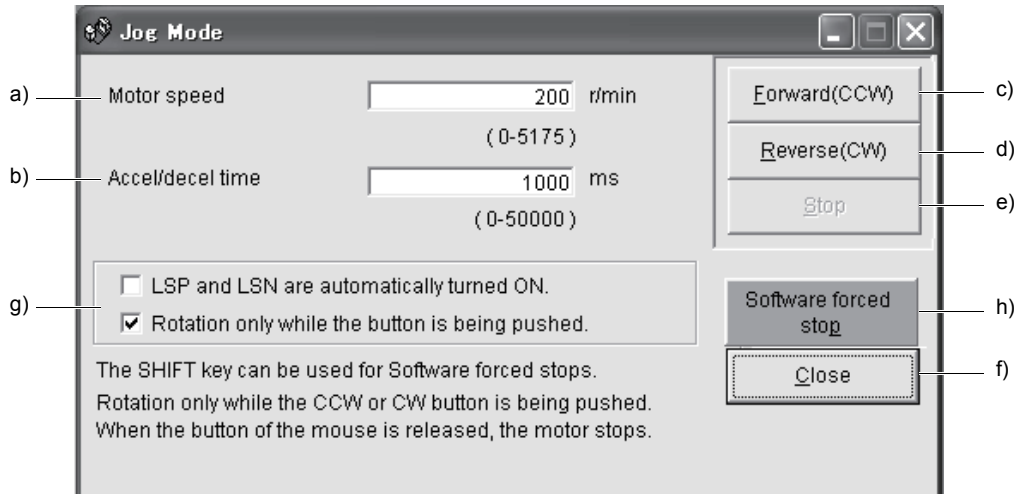
Click the "OK" button to display the setting screen of the Jog operation.

During the servo on, the confirmation window indicating that the next operation is in the stop status is displayed.



Turn the servo off, confirm that the operation is in the stop status, and click the "OK" button to display the setting screen for the Jog operation.

7. MR Configurator



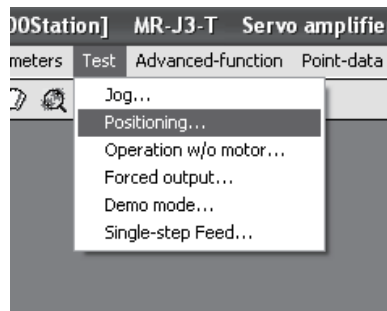
- (1) Servo motor speed setting (a)
Enter a new value into the "Motor speed" input field and press the enter key.
- (2) Acceleration/deceleration time constant setting (b)
Enter a new value into the "Accel/decel time" input field and press the enter key.
- (3) Start button operation selection
Check the check box for operating the servo motor only while pressing the button. Uncheck the check box for stopping the operation by pressing the "Stop" or "Software forced stop" button.
- (4) Servo motor start (c, d)
 - (a) When stopping the operation by pressing the "Stop" or "Software forced stop" button
Click the "Forward" button to rotate the servo motor in the CCW rotation direction.
Click the "Reverse" button to rotate the servo motor in the CW rotation direction.
 - (b) When operating the servo motor only while pressing the button
While pressing the "Forward" button, the servo motor rotates in the CCW rotation direction.
While pressing the "Reverse" button, the servo motor rotates in the CW rotation direction.
- (5) Servo motor stop (e)
 - (a) When stopping the operation by pressing the "Stop" or "Software forced stop" button
Click the "Stop" button to stop the rotation of the servo motor.
 - (b) When operating the servo motor only while pressing the button
Release the "Forward" or "Reverse" button to stop the rotation of the servo motor.
- (6) LSP/LSN (stroke end) automatic ON setting (g)
Put a check mark in the check box to automatically turn ON LSP/LSN. After selecting the check box, the LSP and the LSN of external signal are ignored.
- (7) Servo motor software forced stop (h)
Click the "Software forced stop" button to stop the servo motor rotation immediately. When the "Software forced stop" button is enabled, the "Forward" and "Reverse" buttons cannot be used. Click the "Software forced stop" button again to make the "Forward" and "Reverse" buttons enabled.
- (8) Jog operation window closing (f)
Click the "Close" button to cancel the jog operation mode and close the window.
- (9) Switching to CC-Link operation mode
To switch from the test operation mode to the CC-Link operation mode, turn OFF the power of the servo amplifier.

7. MR Configurator

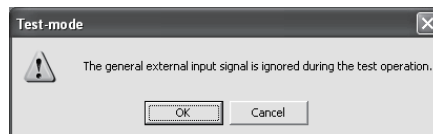
7.7.2 Positioning operation

POINT
<ul style="list-style-type: none">▪ The servo motor will not operate if the forced stop (EMG), forward rotation stroke end (LSP) and reverse rotation stroke end (LSN) are off. Make automatic ON setting to turn on these devices or make device setting to assign them as external input signals and turn on across these signals and DOCOM. (Refer to section 7.6.)▪ When an alarm occurs, the positioning operation is automatically canceled.

Click "Test" on the menu bar and click "Positioning" on the menu.

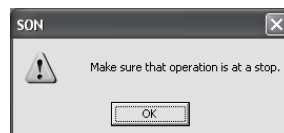


Clicking displays the confirmation window for switching to the test operation mode.



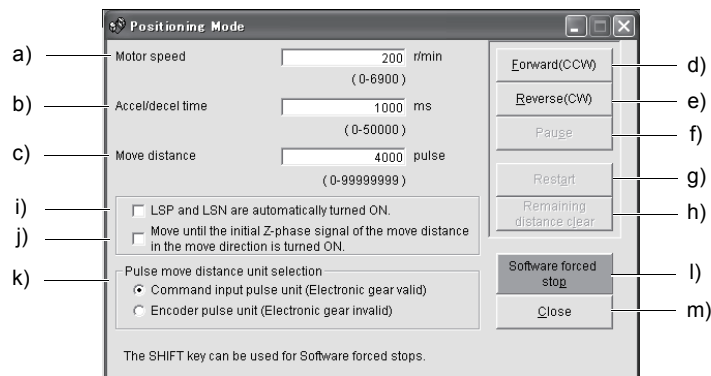
Click the "OK" button to display the setting screen of the Positioning operation.

During the servo on, the confirmation window indicating that the next operation is in the stop status is displayed.



After confirming that the operation is in the stop status, click the "OK" button to display the setting screen for the positioning operation.

7. MR Configurator



(1) Servo motor speed setting (a)

Enter a new value into the "Motor speed" input field and press the enter key.

(2) Acceleration/deceleration time constant setting (b)

Enter a new value into the "Accel/decel time" input field and press the enter key.

(3) Moving distance setting (c)

Enter a new value into the "Move distance" input field and press the enter key.

(4) Servo motor start (d), e)

Click the "Forward" button to rotate the servo motor in the forward rotation direction.

Click the "Reverse" button to rotate the servo motor in the reverse rotation direction.

(5) Temporary stop of servo motor (f)

Click the "Pause" button to stop the servo motor temporarily.

(6) Servo motor restart (g)

Click the "Restart" button during the temporary stop to restart the rotations for the remaining move distance.

Enter a new value into the "Motor speed" input field and press the enter key.

(7) Move distance clear (h)

Click the "Remaining distance clear" during the temporary stop to clear the remaining move distance.

(8) LSP/LSN (stroke end) automatic ON setting (i)

Put a check mark in the check box to automatically turn ON LSP/LSN. After selecting the check box, the LSP and the LSN of external signal are ignored.

(9) Automatic ON setting for the movement to the Z-phase signal (j)

To move to the first Z-phase signal of the move distance + move direction, put a check mark in the check box.

7. MR Configurator

(10) Pulse move distance unit selection (k)

Select with the option buttons whether the moving distance set is in the command input pulse unit or in the encoder pulse unit.

(11) Servo motor software forced stop (1))

Click the "Software forced stop" button to stop the servo motor rotation immediately. When the "Software forced stop" button is enabled, the "Forward" and "Reverse" buttons cannot be used. Click the "Software forced stop" button again to make the "Forward" and "Reverse" buttons enabled.

(12) Positioning operation window closing (m)

Click the "Close" button to cancel the positioning operation mode and close the window.

(13) Switching to CC-Link operation mode

To switch from the test operation mode to the CC-Link operation mode, turn OFF the power of the servo amplifier.

7. MR Configurator

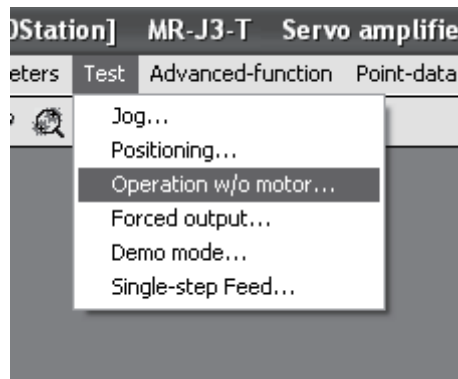
7.7.3 Motor-less operation

POINT
▪ When this operation is used in an absolute position detection system, the home position cannot be restored properly.

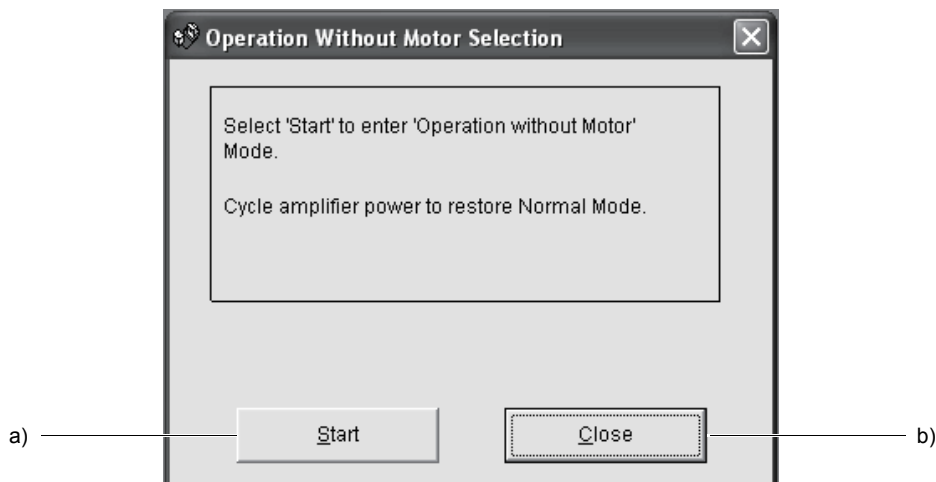
Without a servo motor being connected, the output signals are provided and the servo amplifier display shows the status as if a servo motor is actually running in response to the external I/O signals.

The sequence of the host programmable controller (PC) can be checked without connection of a servo motor.

Click "Test" on the menu bar and click "Operation w/o Motor" on the menu.



When the above choices are made, the following window appears.



(1) Execution of motor-less operation (a)

Click "Start" to perform motor-less operation.

(2) Termination of motor-less operation (b)

Click "Close" to close the window.

Note that just clicking the "Close" button does not cancel motor-less operation. To cancel motor-less operation, turn ON the power of the servo amplifier and switch to the CC-Link operation mode once.

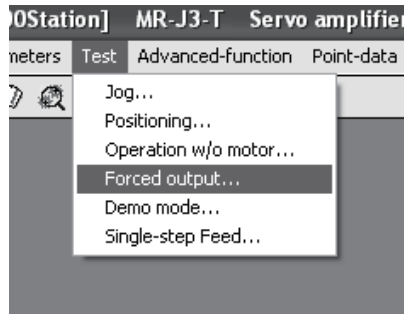
7. MR Configurator

7.7.4 Output signal (DO) forced output

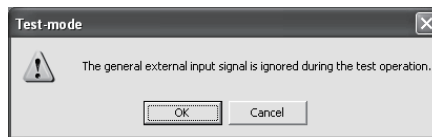
POINT
• When an alarm occurs, the DO forced output is automatically canceled.

Each servo amplifier output signal is forcibly switched on/off independently of the output condition of the output signal.

Click "Test" on the menu bar and click "Forced output" on the menu.

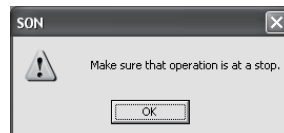


Clicking displays the confirmation window for switching to the test operation mode.



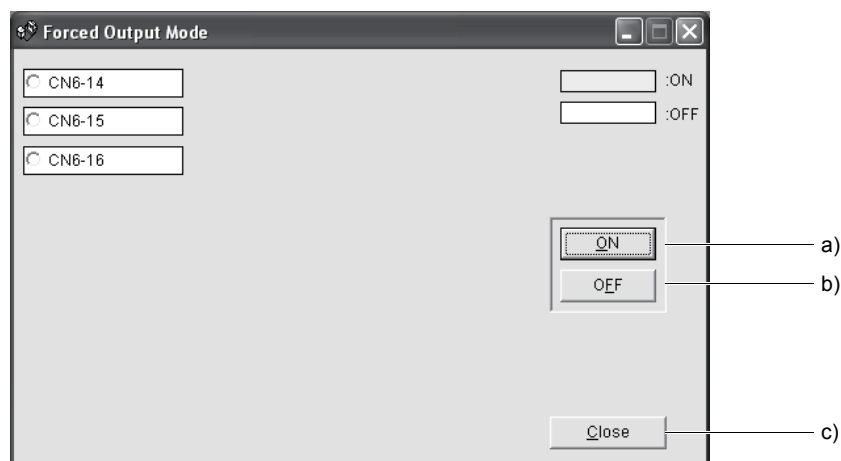
Click the "OK" button to display the setting screen of the DO forced output.

During the servo on, the confirmation window indicating that the next operation is in the stop status is displayed.



After confirming that the operation is in the stop status, click the "OK" button to display the setting screen for the DO forced output.

When the above choices are made, the following window appears.



7. MR Configurator

(1) Signal ON/OFF setting (a), b)

Choose the signal name or pin number and click the "ON" or "OFF" button to write the corresponding signal status to the servo amplifier.

(2) DO forced output window closing (c)

Click the "Close" button to cancel the DO forced output mode and close the window.

(3) Switching to CC-Link operation mode

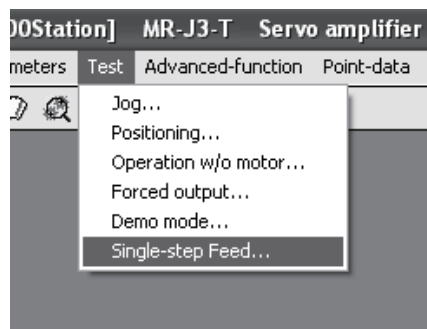
To switch from the test operation mode to the CC-Link operation mode, turn OFF the power of the servo amplifier.

7.7.5 Single-step feed

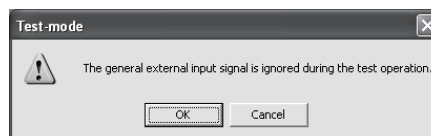
POINT
<ul style="list-style-type: none">▪ The servo motor will not operate if the forced stop (EMG), forward rotation stroke end (LSP) and reverse rotation stroke end (LSN) are off. Make automatic ON setting to turn on these devices or make device setting to assign them as external input signals and turn on across these signals and SG. (Refer to section 7.6.)▪ When an alarm occurs, the 1-step feed is automatically canceled.

Operation is performed in accordance with the preset point table No.

Click "Test" on the menu bar and click "Single-step Feed" on the menu.



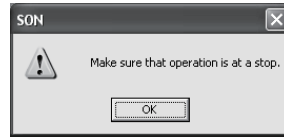
Clicking displays the confirmation window for switching to the test operation mode.



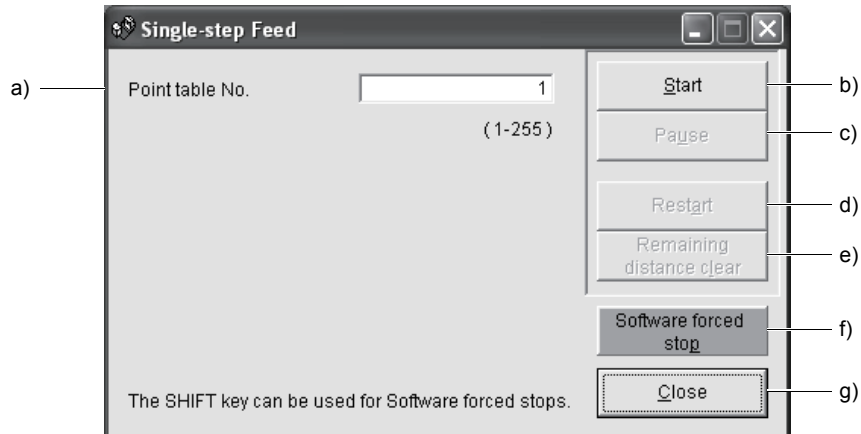
7. MR Configurator

Click the "OK" button to display the setting screen of the Single-step feed.

During the servo on, the confirmation window indicating that the next operation is in the stop status is displayed.



After confirming that the operation is in the stop status, click the "OK" button.



(1) Point table No. setting (a)

Enter the point table No. into the "Point table No." input field and press the enter key.

(2) Servo motor start (b)

Click the "Start" button to rotate the servo motor.

(3) Temporary stop of servo motor (c)

Press the "Pause" button to stop the servo motor temporarily.

(4) Servo motor stop (c)

Click the "Pause" button again during a temporary stop of the servo motor to clear the remaining moving distance.

(5) Servo motor restart (d)

Click the "Restart" button during the temporary stop to restart the rotations for the remaining move distance.

(6) Move distance clear (e)

Click the "Remaining distance clear" during the temporary stop to clear the remaining move distance.

7. MR Configurator

(7) Servo motor software forced stop (f)

Click the "Software forced stop" button to stop the servo motor rotation immediately. When the "Software forced stop" button is enabled, the "Start" button cannot be used. Click the "Software forced stop" button again to make the "Start" button enabled.

(8) Single-step feed window closing (g)

Click the "Close" button to cancel the single-step feed mode and close the window.

(9) Switching to CC-Link operation mode

To switch from the test operation mode to the CC-Link operation mode, turn OFF the power of the servo amplifier.

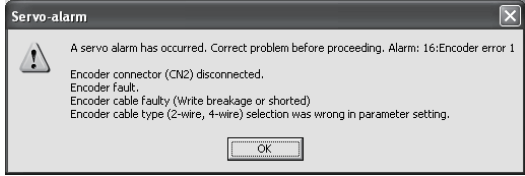
7. MR Configurator

7.8 Alarm

7.8.1 Alarm display

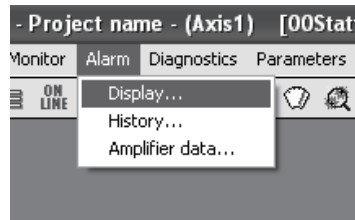
POINT

- If a menu is clicked or any other operation is performed during alarm occurrence, the following message window appears. The example given here is the window that indicates an occurrence of Encoder error 1 (A16).

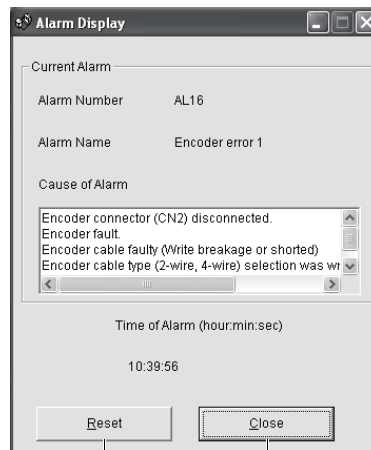


The current alarm can be displayed.

To display the current alarm, click "Alarm" on the menu bar and click "Display" on the menu.



When the above choices are made, the following window appears.



a)

b)

7. MR Configurator

(1) Current alarm display

The window shows the alarm number, name, cause and occurrence time.

The following example is the window that indicates an occurrence of Encoder error 1 (A16).

(2) Alarm reset (a)

Click the "Reset alarm" button to reset the current alarm and clear alarms on the window. The alarm at this time is stored as the latest alarm.

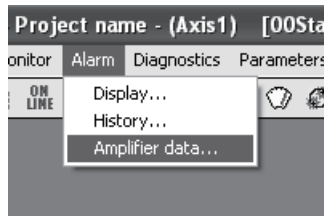
(3) Closing the current alarm window (b)

Click the "Close" button to close the window.

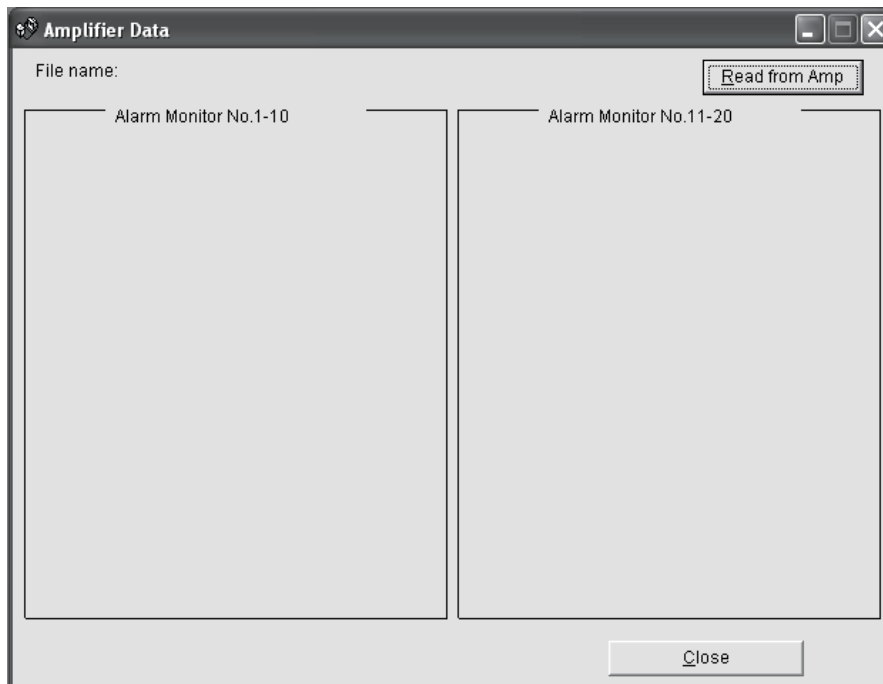
7.8.2 Batch display of data at alarm occurrence

Monitor data during alarm occurrence is displayed.

To display monitor data, click "Alarm" on the menu bar and click "Amplifier data" on the menu.

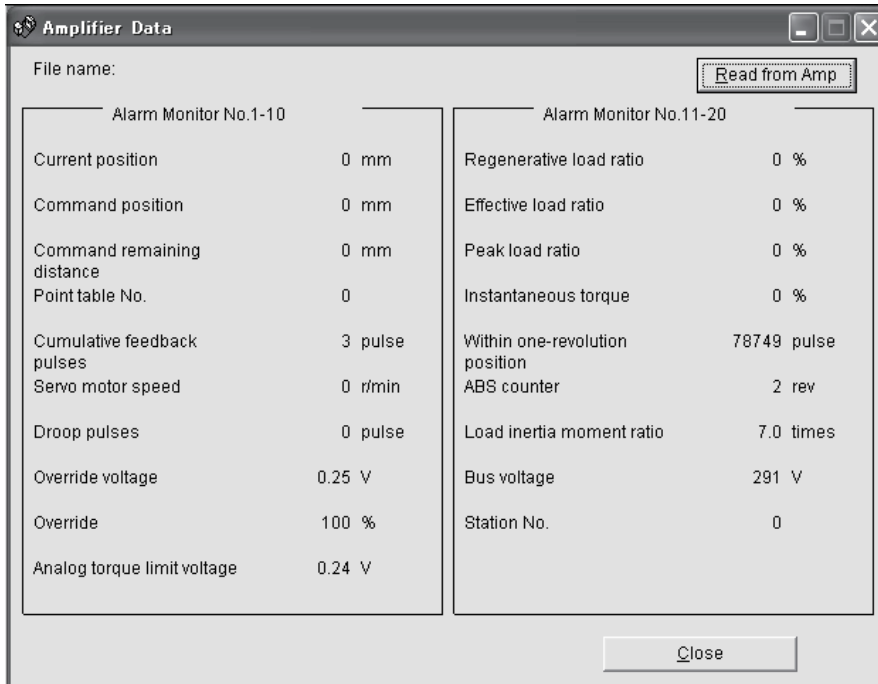


When the above choices are made, the following window appears.



7. MR Configurator

Click the "Read" button to read the monitor data at error occurrence from the servo amplifier. Read results are displayed as follows.



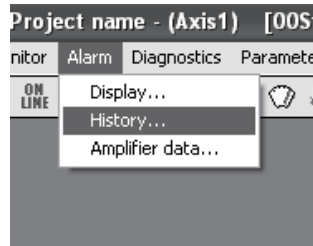
The screenshot shows a window titled "Amplifier Data" with a "Read from Amp" button and a "Close" button. The data is organized into two columns:

Alarm Monitor No.1-10		Alarm Monitor No.11-20	
Current position	0 mm	Regenerative load ratio	0 %
Command position	0 mm	Effective load ratio	0 %
Command remaining distance	0 mm	Peak load ratio	0 %
Point table No.	0	Instantaneous torque	0 %
Cumulative feedback pulses	3 pulse	Within one-revolution position	78749 pulse
Servo motor speed	0 r/min	ABS counter	2 rev
Droop pulses	0 pulse	Load inertia moment ratio	7.0 times
Override voltage	0.25 V	Bus voltage	291 V
Override	100 %	Station No.	0
Analog torque limit voltage	0.24 V		

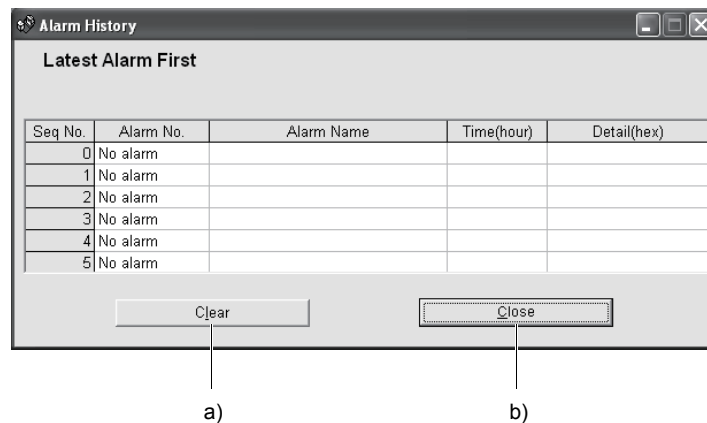
7. MR Configurator

7.8.3 Alarm history

Click "Alarm" on the menu bar and click "History" on the menu.



When the above choices are made, the following window appears.



(1) Alarm history display

The most recent six alarms are displayed. The smaller numbers indicate newer alarms.

(2) Alarm history clear (a)

Click the "Clear" button to clear the alarm history stored in the servo amplifier.

(3) Closing of alarm history window (b)

Click the "Close" button to close the window.

8. PARAMETER UNIT (MR-PRU03)

8. PARAMETER UNIT (MR-PRU03)

POINT
▪ Do not use MR-PRU03 parameter unit and MR Configurator together.

Perform simple data setting, test operation, parameter setting, etc. without MR Configurator by connecting the MR-PRU03 parameter unit to the servo amplifier.

8. PARAMETER UNIT (MR-PRU03)

8.1 External appearance and key explanations

This section gives the external appearance and explanations of the keys.

Display LCD (16 characters x 4 lines)
Used to display the following or others:
• Parameter setting
• Monitor

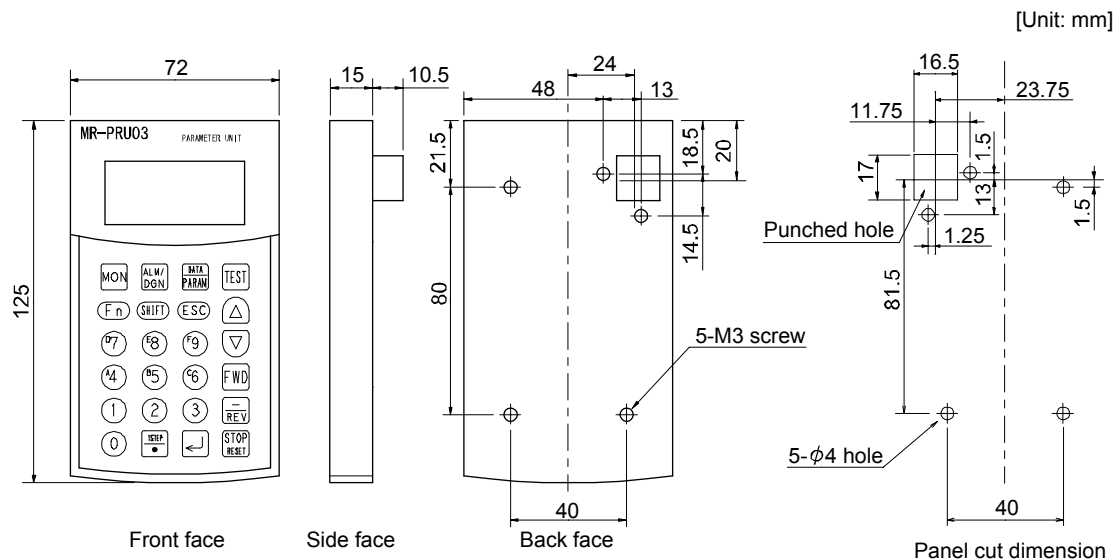
	Key	Key explanations
Mode key	MON	Monitor mode key • Used to display the monitor screen.
	ALM/DGN	Alarm/diagnosis mode • Used to display the alarm/DO forced output/diagnosis selection screen.
	DATA PARAM	Parameter mode key • Used to display parameter selection screen. • Press this key while holding down the "SHIFT" key to display the point table setting screen.
	TEST	Test operation mode key • Used to display the exit/JOG operation/positioning operation/motor-less operation/DO forced output/single-step feed selection screen.
Operation key	Fn	Function key • Used to perform various operations in the test operation mode. • Used to display the parameter range and point table setting range.
	SHIFT	SHIFT key • Used to enter hexadecimal values. Press the "4" to "9" keys while holding down the "SHIFT" key to enter A to F. • Press the "▲▼" keys while holding down the "SHIFT" key to move to the previous or next screen.
	ESC	ESC key • Used to display the screen at one step upper hierarchical level. (not the pervious screen) Used to display the setting selection screen (the initial screen) of the monitor mode.
	▲ ▼	Scroll key • Used to move the cursor across the screen or scroll the screen. Press this key while holding down the "SHIFT" key to move to the previous or next screen. • Used to change parameter No. or point table No.
	FWD	Forward rotation key • Used to start the forward rotation in the test operation mode (JOG operation/positioning operation).
Test Operation key	- REV	Symbol key/reverse rotation key • Used to start the reverse rotation in the test operation mode (JOG operation/positioning operation). • Used together with the "SHIFT" key to enter negative values. To exit the negative value entry mode, press the "SHIFT" key again and press the "-" key. ("- disappears.)
	STOP RESET	Stop/reset key • Used to stop temporarily in the JOG operation/positioning operation/single-step feed. • The "RESET" key is valid when the "Fn" key is not pressed (i.e. at a stop). • Used to reset alarms or alarm history, or clear cumulated monitor data or inputs. • Normal operation cannot be stopped with this key.
Enter key	↵	Enter key • Used to determine the selection, numerical values, etc. • Used to determine to exit the test operation mode, or enter the motor-less operation. • Used to switch ON/OFF in the DO output screen.
Numerical key	0 to F9	Numerical keys • Used to enter parameter No., setting values, etc. • Press the "4" to "9" keys while holding down the "SHIFT" key to enter A to F.
	1STEP .	Decimal point key • Used to enter a decimal point. • Used to start the single-step feed.

8. PARAMETER UNIT (MR-PRU03)

8.2 Specifications

Item		Description
Model		MR-PRU03
Power supply		Supplied from the servo amplifier
Functions	Parameter mode	Basic setting parameters, Gain/filter parameters, Extension setting parameters, I/O setting parameters
	Monitor mode (Status display)	Current position, Command position, Command remaining distance, Point table No., Feedback pulse value, Servo motor speed, Droop pulse value, Regenerative load factor, Effective load factor, Peak load factor, Instantaneous torque, Within one-revolution position, ABS counter, Load inertia moment ratio, Bus voltage
	Diagnosis mode	External I/O display, motor information
	Alarm mode	Current alarm, Alarm history
	Test operation mode	Jog operation, Positioning operation, DO forced output, Motor-less operation, Single-step feed
	Point table mode	Point data, Servo motor speed, Acceleration/deceleration time constant, Dwell, Auxiliary function
Display section		LCD system (16 characters × 4 lines)
Environment	Ambient temperature	- 10 to +55°C (14 to 131°F) (non-freezing)
	Ambient humidity	90%RH or less (non-condensing)
	Storage temperature range	- 20 to +65°C (- 4 to 149°F) (non-freezing)
	Storage humidity range	90%RH or less (non-condensing)
	Ambience	Indoors (no direct sunlight) Free from corrosive gas, flammable gas, oil mist, dust and dirt
Mass [g] ([lb])		130 (0.287)

8.3 Outline dimension drawings



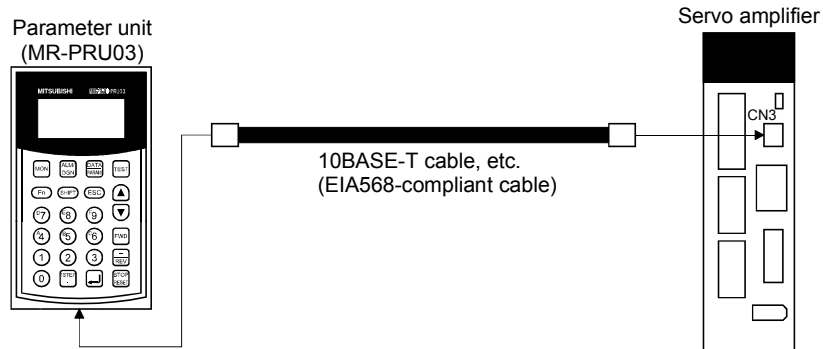
8. PARAMETER UNIT (MR-PRU03)

8.4 Connection with servo amplifier

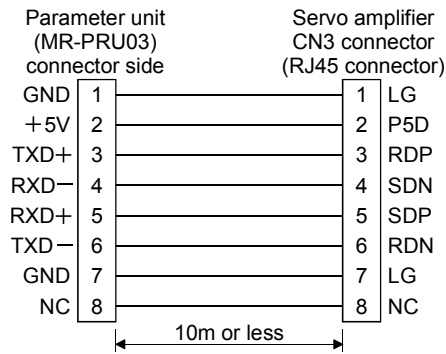
8.4.1 Single axis

(1) Configuration diagram

Operate the single-axis servo amplifier. It is recommended to use the following cable.



(2) Cable internal wiring diagram

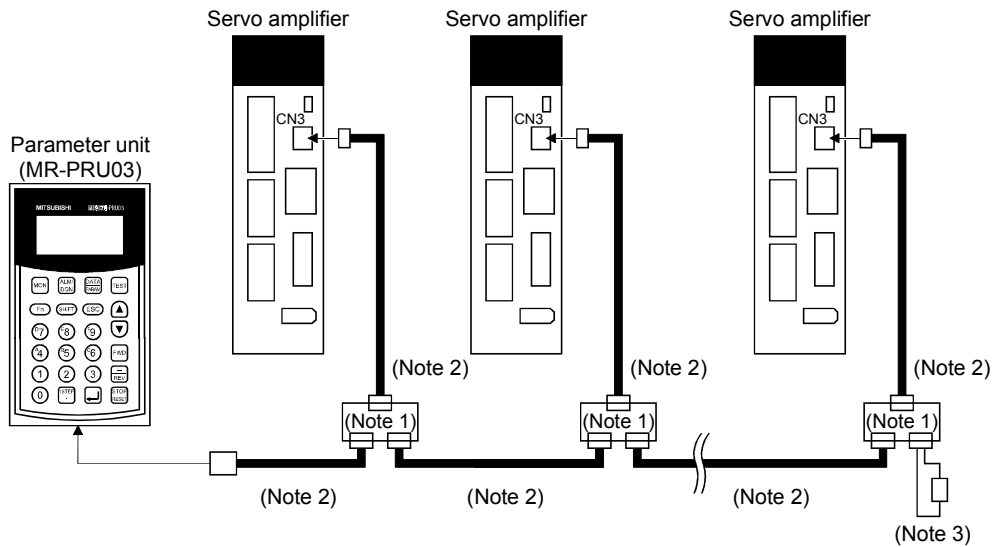


8. PARAMETER UNIT (MR-PRU03)

8.4.2 Multidrop connection

(1) Configuration diagram

Up to 32 axes of servo amplifiers from stations 0 to 31 can be operated on the same bus.



Note 1. The BMJ-8 (Hakko Electric Machine Works) is recommended as the branch connector.

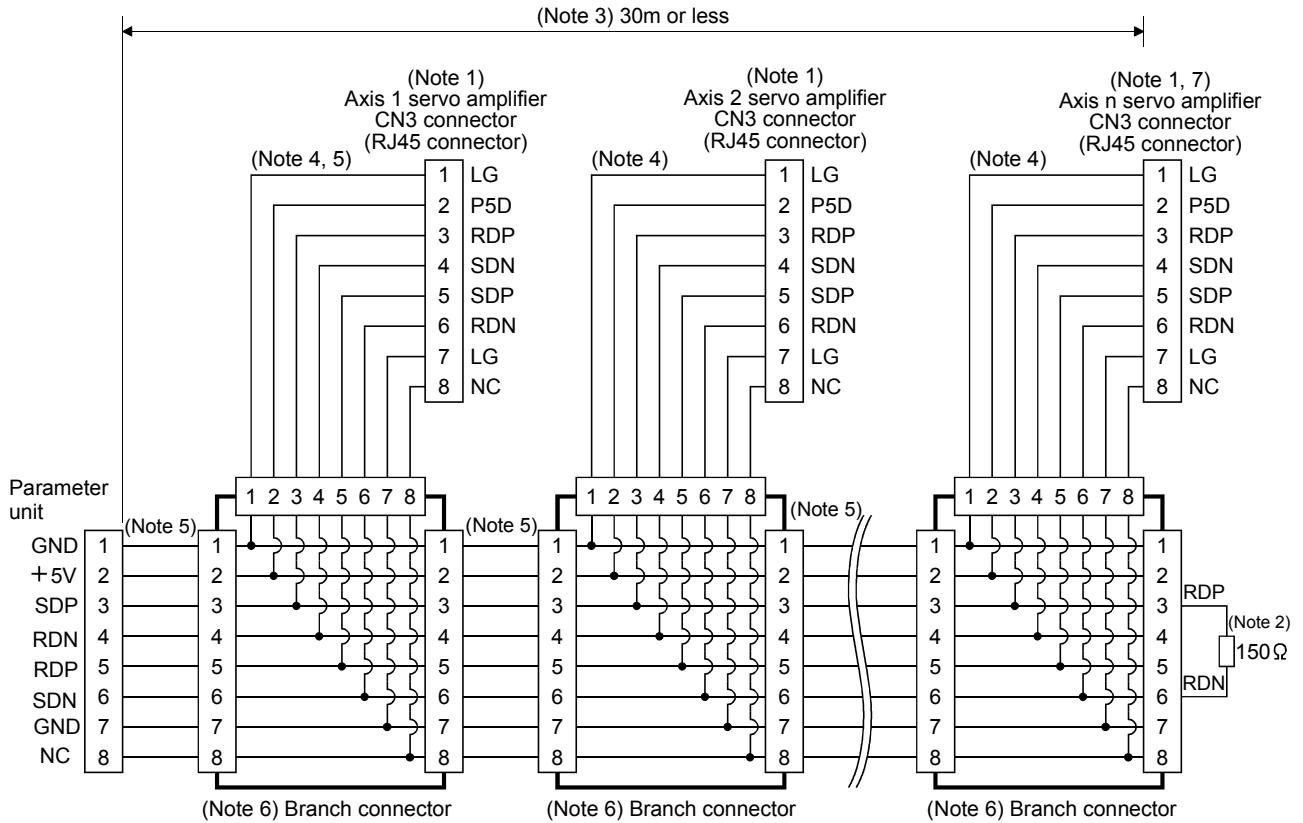
2. Use the 10BASE-T cable (EIA568-compliant), etc.

3. The final axis must be terminated between RDP (pin No.3) and RDN (pin No.6) on the receiving side (servo amplifier) with a 150Ω resistor.

8. PARAMETER UNIT (MR-PRU03)

(2) Cable internal wiring diagram

Wire the cables as shown below.



Note 1. Recommended connector (Hirose Electric)

Plug: TM10P-88P

Connection tool: CL250-0228-1

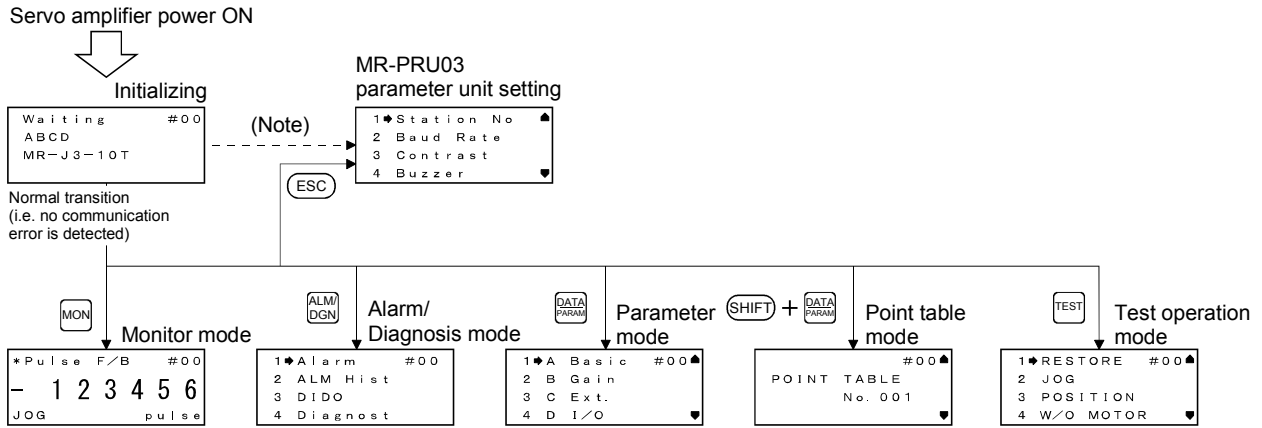
2. The final axis must be terminated between RDP (pin No.3) and RDN (pin No.6) on the receiving side (servo amplifier) with a 150Ω resistor.
3. The overall length is 30m or less in low-noise environment.
4. The wiring between the branch connector and servo amplifier should be as short as possible.
5. Use the EIA568-compliant cable (10BASE-T cable, etc.).
6. Recommended branch connector: BMJ-8 (Hakko Electric Machine Works)
7. $n \leq 32$ (Up to 32 axes can be connected.)

8. PARAMETER UNIT (MR-PRU03)

8.5 Display

Connect the MR-PRU03 parameter unit to the servo amplifier, and turn ON the power of the servo amplifier. In this section, the screen transition of the MR-PRU03 parameter unit is explained, together with the operation procedure in each mode.

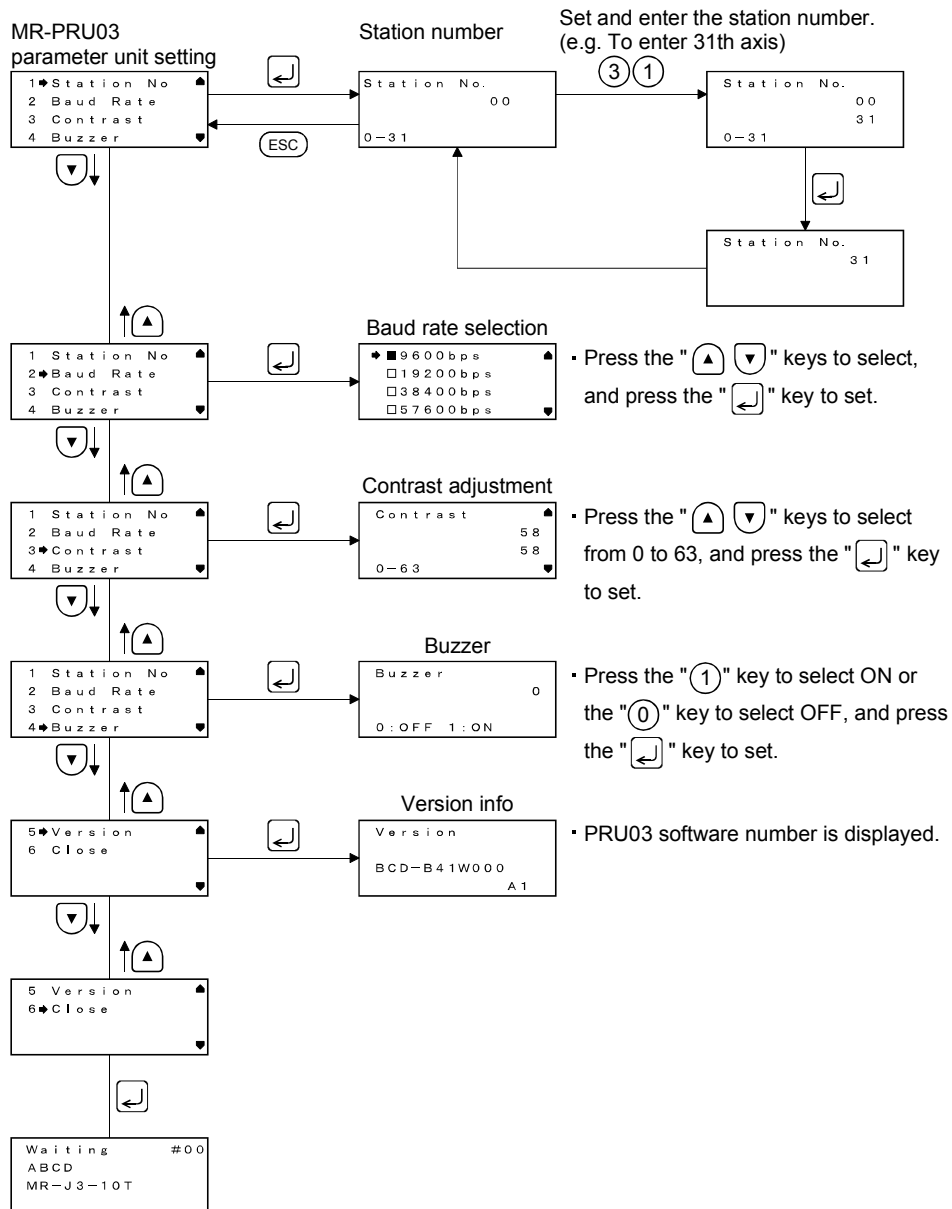
8.5.1 Outline of screen transition



Note. If initialization communication fails, a communication error is displayed. Press the "ESC" key to return to the PRU setting screen.

8. PARAMETER UNIT (MR-PRU03)

8.5.2 MR-PRU03 parameter unit setting



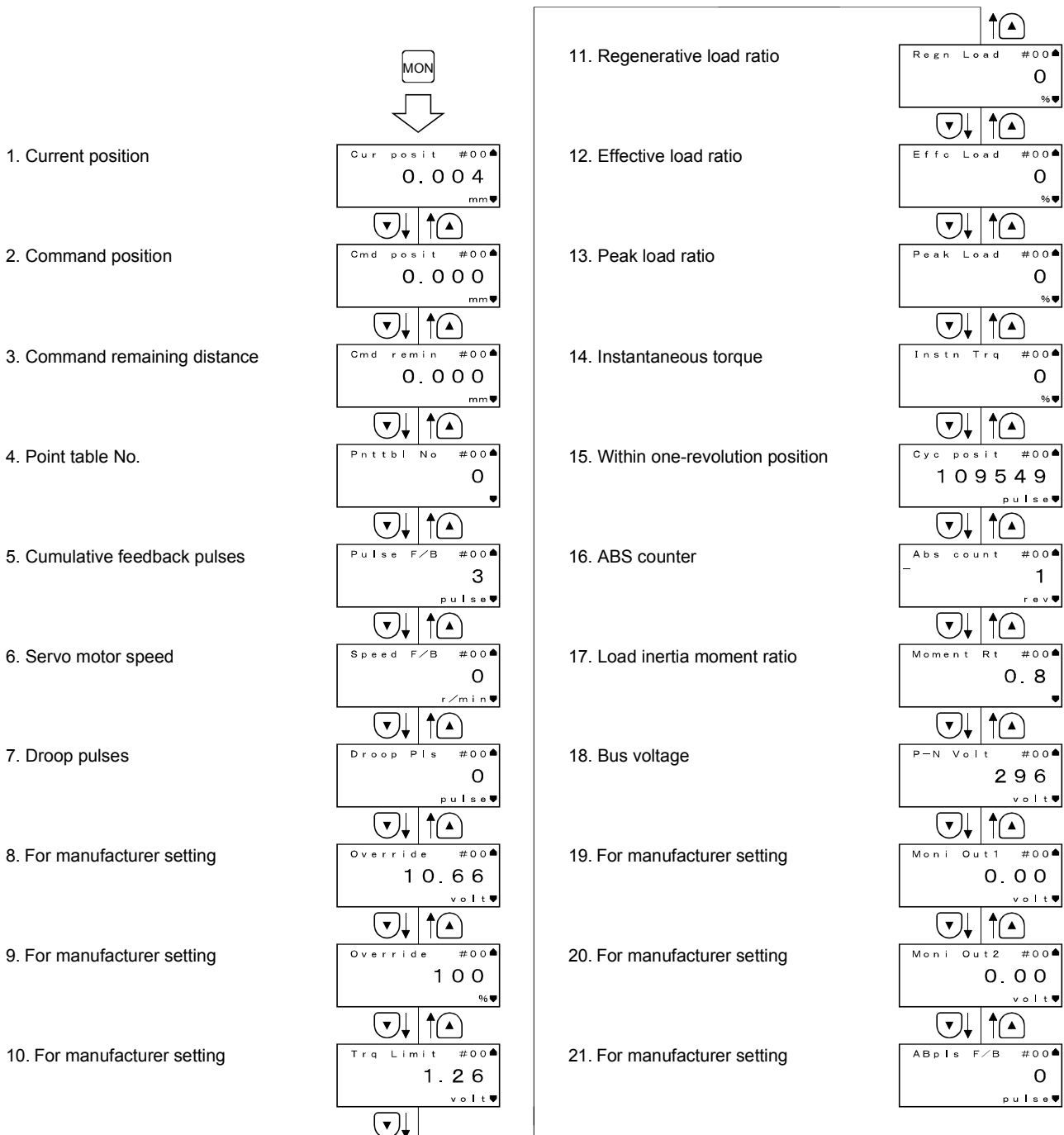
Note. Press the "SHIFT" key and "ESC" key together on any screen to return to the station number setting screen.

8. PARAMETER UNIT (MR-PRU03)

8.5.3 Monitor mode (status display)

(1) Monitor display

The servo status during operation is shown on the display. Refer to (2) in this section for details.



8. PARAMETER UNIT (MR-PRU03)

(2) Monitor display list

The following table lists the items and descriptions of monitor display.

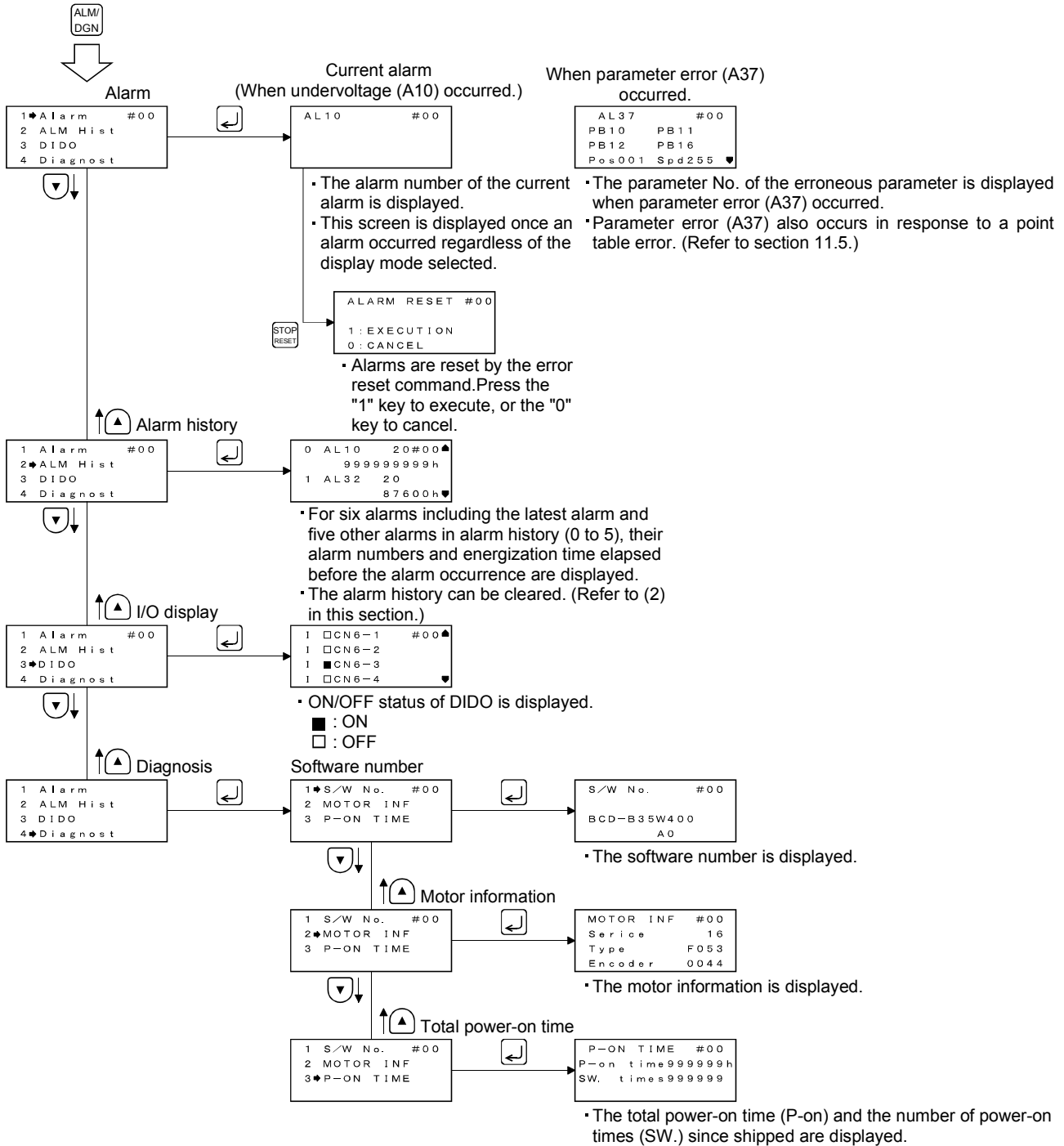
Status display	Display on parameter unit	Unit	Description	Display range
Current position	Cur posit	$\times 10^{\text{STM}}$ mm	The current position from the machine home position of 0 is displayed.	-9999999 to 9999999
Command position	Cmd Posit	$\times 10^{\text{STM}}$ mm	The command position is displayed.	-9999999 to 9999999
Command remaining distance	Cmd remin	$\times 10^{\text{STM}}$ mm	The command remaining distance of the currently selected point table is displayed.	-999999999 to 999999999
Point table No.	Pnttbl No		The point table No. being executed is displayed.	0 to 255
Cumulative feedback pulses	Pulse F/B	pulse	Feedback pulses from the servo motor encoder are counted and displayed. When the value exceeds ± 999999 , characters are displayed smaller. Press the "RESET" key of the parameter unit to reset the display value to zero.	-999999999 to 999999999
Servo motor speed	Speed F/B	r/min	The servo motor speed is displayed. "-" is added to the speed of the servo motor rotating in the reverse rotation. The value rounded off is displayed in $\times 0.1$ r/min.	-7200 to 7200
Droop pulse	Droop Pls	pulse	The number of droop pulses in the deviation counter is displayed. "- " is added to the reverse pulses. When the value exceeds ± 999999 , characters are displayed smaller. The number of pulses displayed is in the encoder pulse unit.	-999999999 to 999999999
Regenerative load ratio	Regn Load	%	The ratio of regenerative power to permissible regenerative power is displayed in %. When regenerative option is used, the ratio to the permissible regenerative power is displayed.	0 to 100
Effective load ratio	Effc Load	%	The continuous effective load current is displayed. The effective value is displayed relative to the rated current of 100%.	0 to 300
Peak load ratio	Peak Load	%	The maximum torque is displayed. The highest value in the past 15 seconds is displayed relative to the rated torque of 100%.	0 to 400
Instantaneous torque	Instn Trq	%	Torque that occurred instantaneously is displayed. The value of the torque that occurred is displayed in real time relative to the rate torque of 100%.	0 to 400
Within one-revolution position	Cyc posit	pulse	Position within one revolution is displayed in encoder pulses. The value returns to 0 when it exceeds the maximum number of pulses. The value is incremented in the CCW direction of rotation.	0 to 262143
ABS counter	Abs count	rev	Travel value from the home position in the absolute position detection systems is displayed in terms of the absolute position detectors counter value.	-32768 to 32767
Load inertia moment ratio	Moment Rt	Multiplier ($\times 1$)	The estimated ratio of the load inertia moment to the servo motor shaft inertia moment is displayed.	0.0 to 300.0
Bus voltage	P-N Volt	V	The voltage (across P-N or P+ - N-) of the main circuit converter is displayed.	0 to 900

8. PARAMETER UNIT (MR-PRU03)

8.5.4 Alarm/diagnostic mode

(1) Alarm display

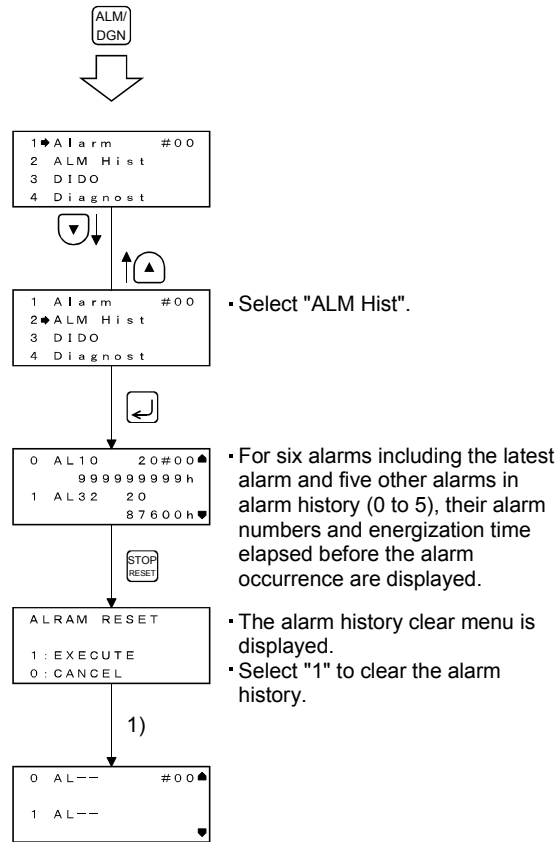
The flowchart below shows the procedure of settings involving alarms, alarm history, external I/O signal (DIDO) display, device and diagnosis.



8. PARAMETER UNIT (MR-PRU03)

(2) Alarm history clear

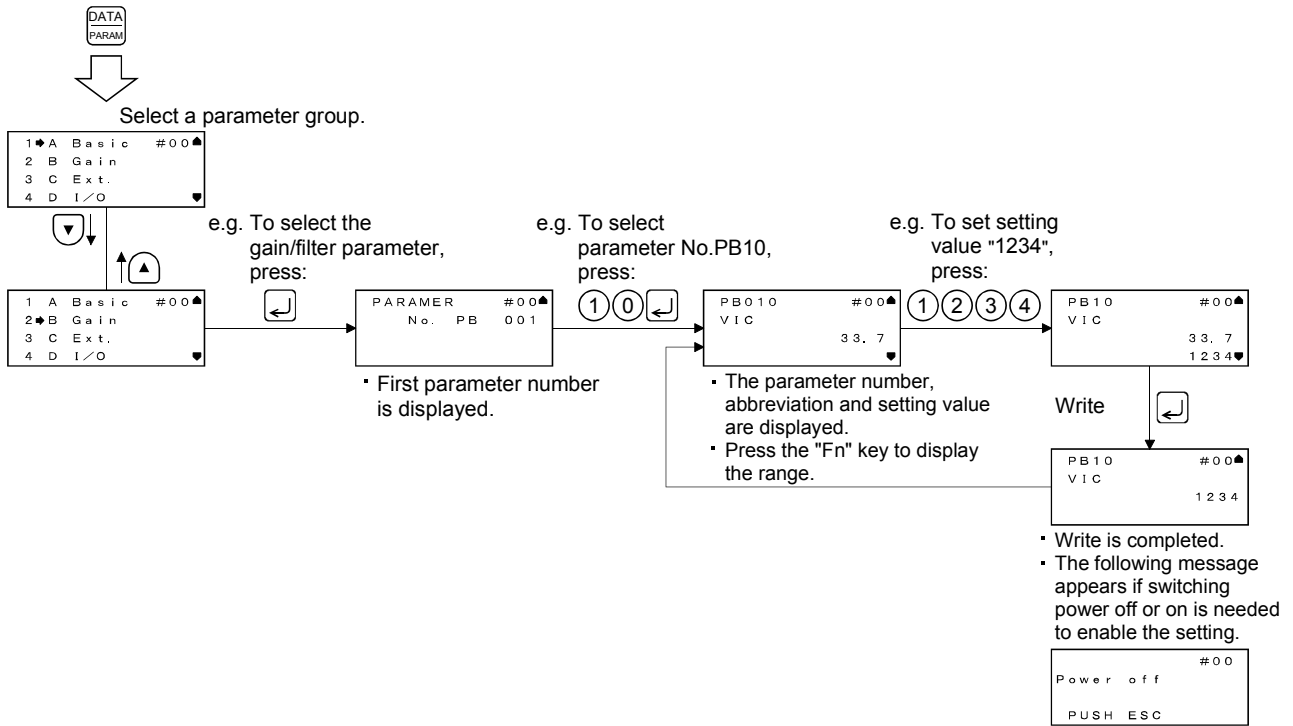
The servo amplifier stores one current alarm and five past alarms from when its power is switched on first. To control alarms which will occur during operation, clear the alarm history before starting operation.



8. PARAMETER UNIT (MR-PRU03)

8.5.5 Parameter mode

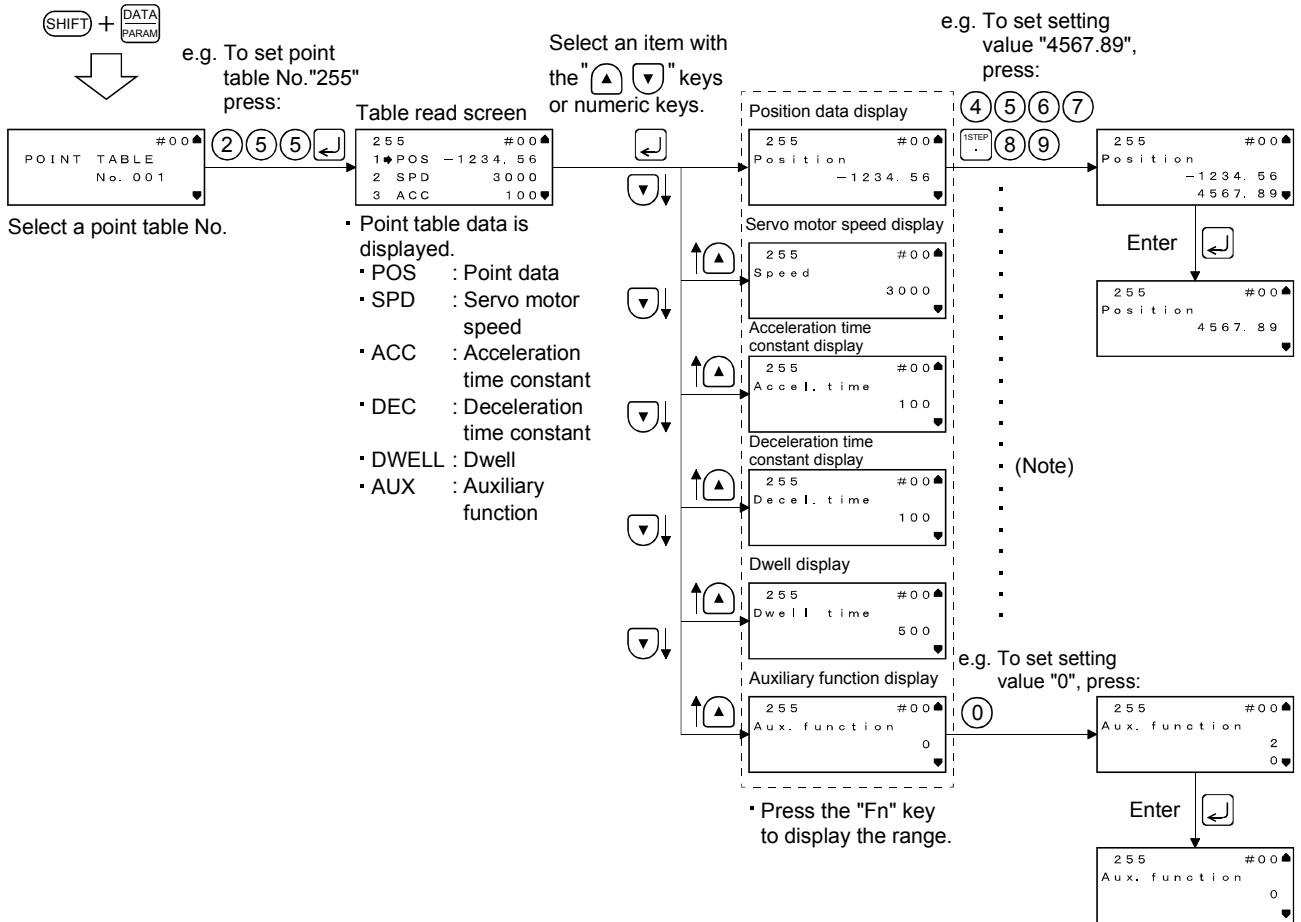
The flowchart below shows the procedure for setting parameters.



8. PARAMETER UNIT (MR-PRU03)

8.5.6 Point table mode

The flowchart below shows the procedure for setting point table data.



Note. This applies to all types of data.

8. PARAMETER UNIT (MR-PRU03)

8.5.7 Test operation mode



CAUTION

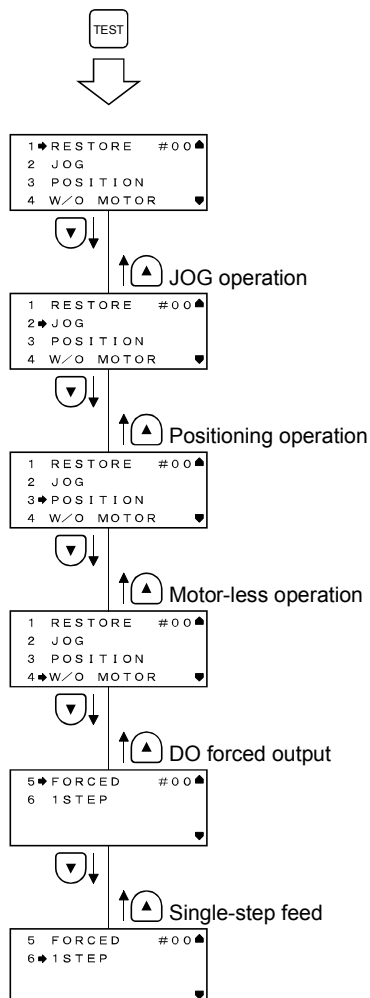
- When confirming the machine operation in the test operation mode, use the machine after checking that the safety mechanism such as the forced stop (EMG) operates.
- If any operational fault has occurred, stop operation using the forced stop (EMG).

POINT

- Test operation cannot be executed without turning the servo OFF.

Exiting test/JOG operation/positioning operation/motor-less operation/DO forced stop/single-step feed can be performed in this mode. The following shows how to set each operation.

When the servo motor equipped with an electromagnetic brake is used, make sure to program a sequence circuit which will operate the electromagnetic brake by the servo amplifier electromagnetic brake interlock (MBR).



8. PARAMETER UNIT (MR-PRU03)

(1) Jog operation

Jog operation can be performed when there is no command from the external command device. Connect EMG-DOCOM to start jog operation.

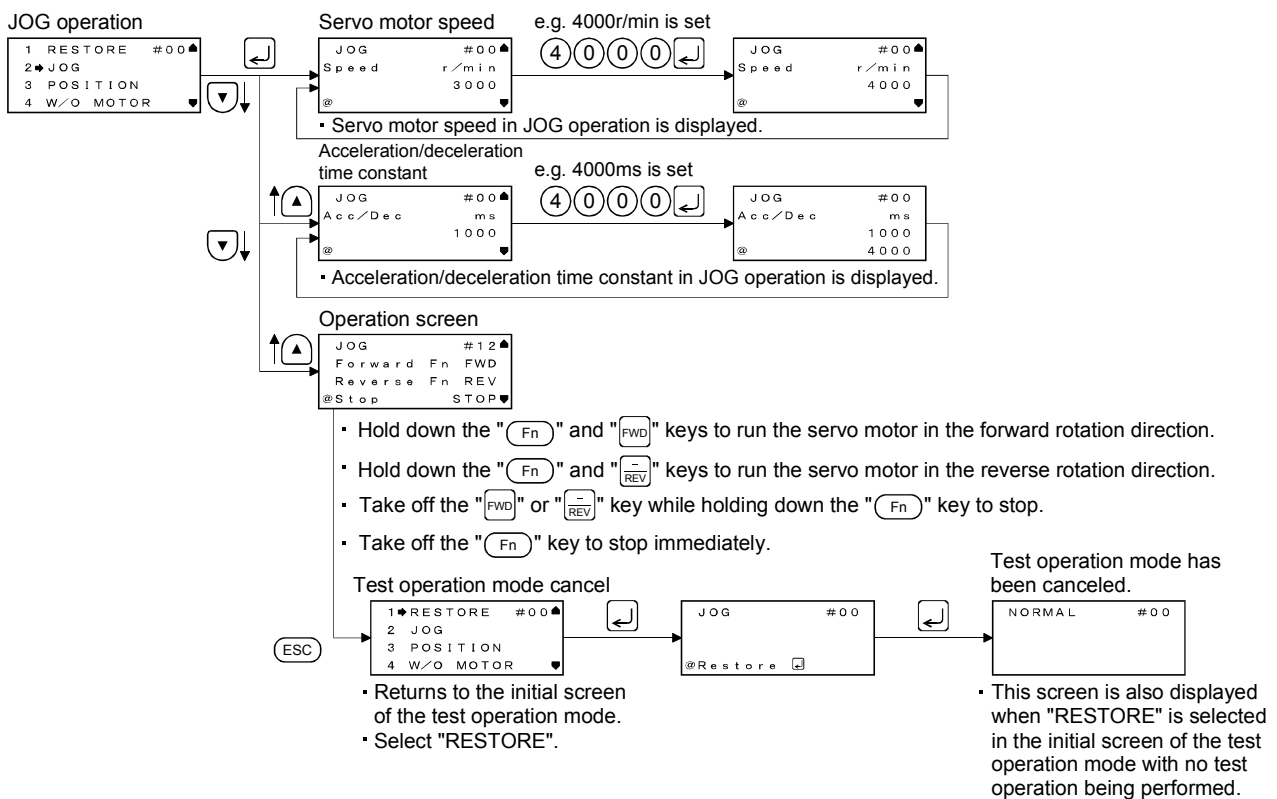
(a) Operation/cancel

You can change the operation conditions with the parameter unit. The initial conditions and setting ranges for operation are listed below.

Item	Initial setting	Setting range
Speed [r/min]	200	0 to instantaneous permissible speed
(Note) Acceleration/deceleration time constant [ms]	1000	0 to 20000

Note. Acceleration time constant refers to time required to reach the rated speed from stop status (0r/min), and deceleration time constant refers to time required to reach 0r/min from the rated speed.

The following shows the operation condition settings and the operation procedures.



If the parameter unit cable is disconnected during jog operation, the servo motor will be decelerated to a stop.

To switch from the test operation mode to the CC-Link operation mode, turn OFF the power of the servo amplifier.

(b) Status display

You can monitor the status display even during JOG operation. At this time, the "FWD", "REV" and "STOP" keys can be used.

8. PARAMETER UNIT (MR-PRU03)

(2) Positioning operation

Positioning operation can be performed once when there is no command from the external command device.

Connect EMG-DOCOM to start positioning operation.

(a) Operation/cancel

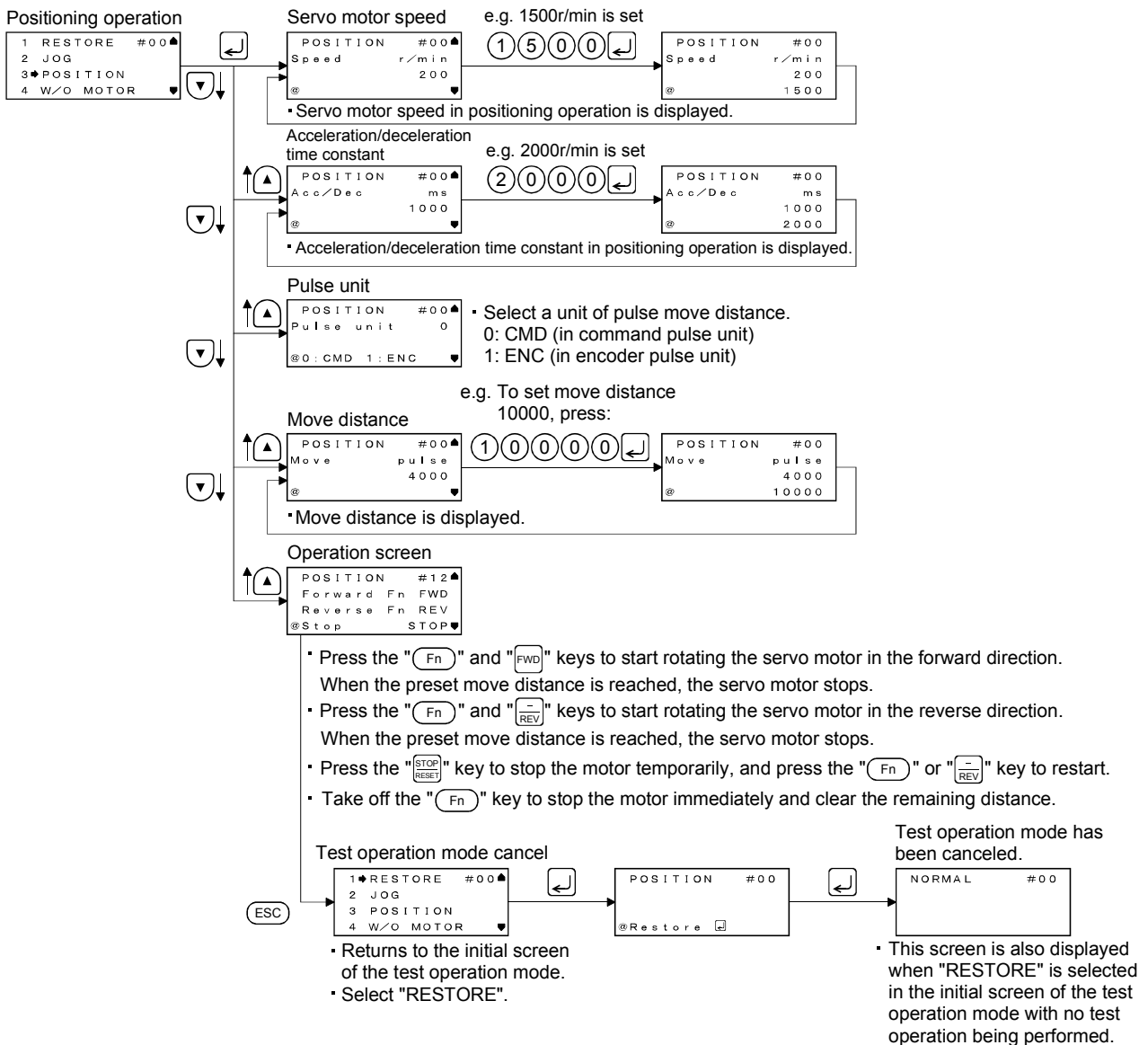
You can change the operation conditions with the parameter unit. The initial conditions and setting ranges for operation are listed below.

Item	Initial setting	Setting range
Speed [r/min]	200	0 to instantaneous permissible speed
(Note 2) Acceleration/deceleration time constant [ms]	1000	0 to 20000
(Note 1) Travel distance [pulse]	4000	0 to 99999999

Note 1. The unit of move distance can be changed using feed length multiplication factor selection of parameter No.PA05.

2. Acceleration time constant refers to time required to reach the rated speed from stop status (0r/min), and deceleration time constant refers to time required to reach 0r/min from the rated speed.

The following shows the operation condition settings and the operation procedures.



8. PARAMETER UNIT (MR-PRU03)

If the communication cable is disconnected during positioning operation, the servo motor will come to a sudden stop.

(b) Status display

You can monitor the status display even during positioning operation. At this time, the "FWD", "REV" and "STOP" keys can be used.

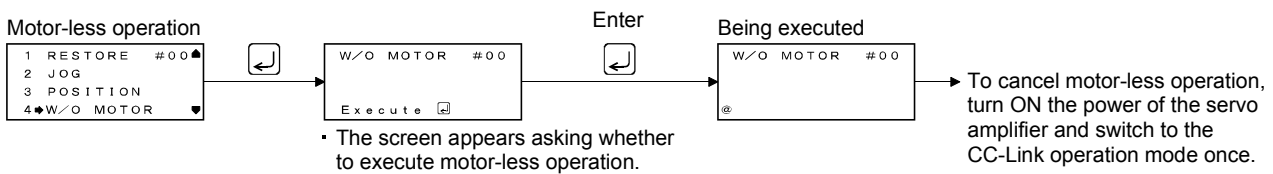
(3) Motor-less operation

Without connecting the servo motor, you can provide output signals or monitor the status display as if the servo motor is running in response to external input devices. This operation can be used to check the sequence of a sequencer or the like.

(a) Operation/cancel

After turning off the SON signal, choose motor-less operation. After that, perform external operation as in ordinary operation.

The following shows the operation procedures.



(b) Status display

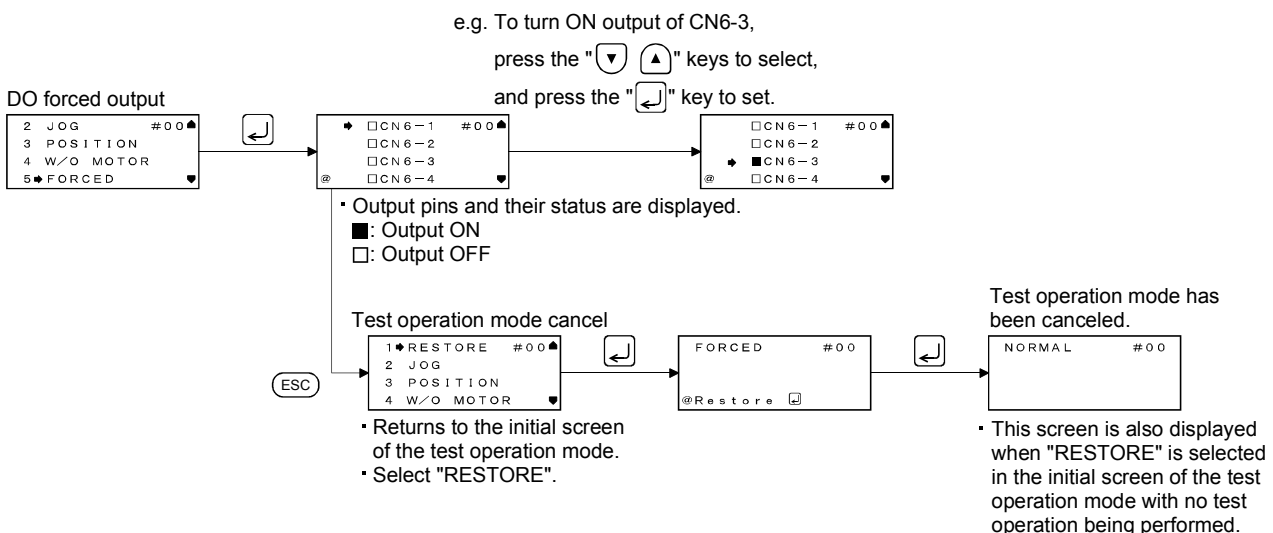
You can monitor the status display even during motor-less operation.

(4) DO forced output

Each output signal can be forced on/off independently of the servo status. This function is used for the servo wiring check, etc.

Connect EMG-DOCOM to start DO forced output.

The following shows the operation procedures.



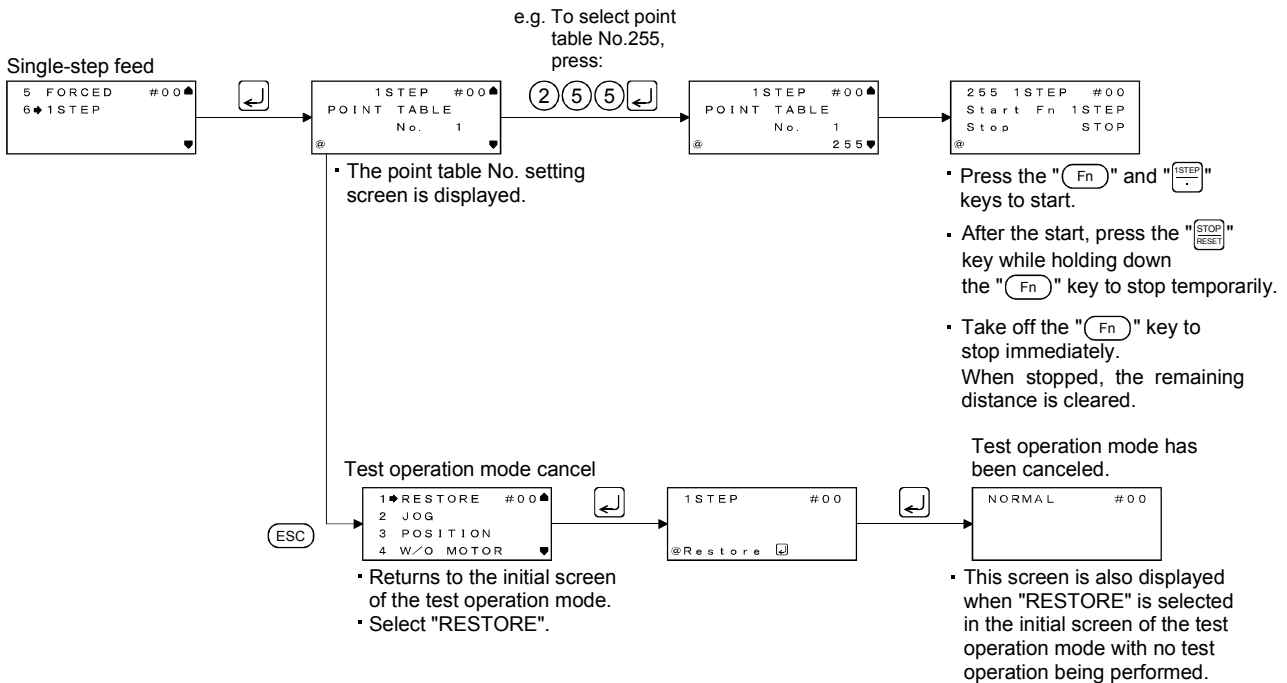
8. PARAMETER UNIT (MR-PRU03)

(5) Single-step feed

Operation is performed in accordance with the preset point table No.

Connect EMG-DOCOM to start single-step feed.

The following shows the operation condition settings and the operation procedures.



8.6 Error message list

When using the MR-PRU03 parameter unit, the following error messages may be displayed. When displayed, refer to this section to remove cause.

(1) Error messages

Operation	Message	Cause
Communication error		1. Hardware reason 2. Mismatch in station number 3. Mismatch in baud rate
Setting error		Incorrect input, etc.
Write error		Value is written while write is disabled.
EEP-ROM write error		1. Parts in the MR-PRU03 parameter unit are faulty. 2. EEPROM built in the MR-PRU03 parameter unit has been overwritten more than 100000 times.

8. PARAMETER UNIT (MR-PRU03)

(2) Messages

Message	Description
<pre> Power off #00 PUSH ESC </pre>	Valid parameters were written when power is off.
<pre> DO NOT CHANGE #00 STATION NO PUSH ESC </pre>	The MR-PRU03 parameter unit was used to set a station number and perform transition during the test operation mode.
<pre> SET TEST DRIVE #00 DIFFER PUSH ESC </pre>	Operation mode is the test operation mode.
<pre> TEST MODE #00 CHANGED PUSH ESC </pre>	The test mode was changed due to external factor.
<pre> DO NOT READ #00 PARAMETER PUSH ESC </pre>	Reading settings specified for the parameter write disable (parameter No.PA19) was attempted.
<pre> TEST DRIVE ON PUSH ESC </pre>	In the test operation, the "ESC" key was pressed while the "Fn" key was held down to switch the screen to the MR-PRU03 parameter unit setting screen.
<pre> SERVO NOT READY PUSH ESC </pre>	The ready cannot be turned ON due to alarm, etc.
<pre> SON ON #12 PUSH ESC </pre>	Operation mode can be switched to the test operation mode at servo-on.
<pre> DO NOT CHANGE #12 STATION NO PUSH ESC </pre>	Station number change was attempted in the test operation mode.
<pre> DO NOT WRITE #12 BLOCK NUMBER PUSH ESC </pre>	Point table No. change was attempted in the single-step feed operation.

9 GENERAL GAIN ADJUSTMENT

9. GENERAL GAIN ADJUSTMENT

9.1 Different adjustment methods

9.1.1 Adjustment on a single servo amplifier

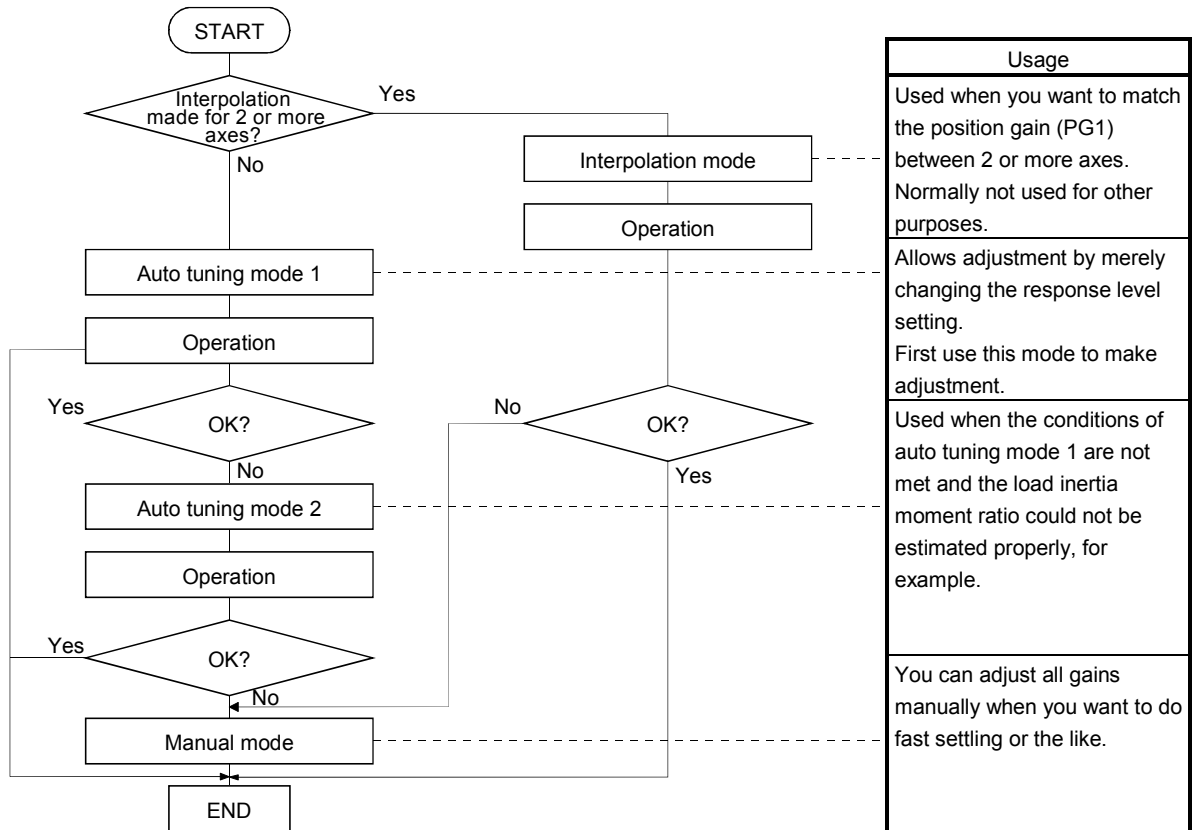
The gain adjustment in this section can be made on a single servo amplifier. For gain adjustment, first execute auto tuning mode 1. If you are not satisfied with the results, execute auto tuning mode 2 and manual mode in this order.

(1) Gain adjustment mode explanation

Gain adjustment mode	Parameter No. PA08 setting	Estimation of load inertia moment ratio	Automatically set parameters	Manually set parameters
Auto tuning mode 1 (initial value)	0001	Always estimated	GD2 (parameter No.PB06) PG2 (parameter No.PB08) PG1 (parameter No.PB07) VG2 (parameter No.PB09) VIC (parameter No.PB10)	Response level setting of parameter No.2
Auto tuning mode 2	0002	Fixed to parameter No. PB06 value	PG2 (parameter No.PB08) PG1 (parameter No.PB07) VG2 (parameter No.PB09) VIC (parameter No.PB10)	GD2 (parameter No.PB06) Response level setting of parameter No.PA09
Manual mode	0003			PG1 (parameter No.PB07) GD2 (parameter No.PB06) VG2 (parameter No.PB09) VIC (parameter No.PB10)
Interpolation mode	0000	Always estimated	GD2 (parameter No.PB06) PG2 (parameter No.PB08) VG2 (parameter No.PB09) VIC (parameter No.PB10)	PG1 (parameter No.PB07)

9. GENERAL GAIN ADJUSTMENT

(2) Adjustment sequence and mode usage



9.1.2 Adjustment using MR Configurator

This section gives the functions and adjustment that may be performed by using the servo amplifier with the MR Configurator which operates on a personal computer.

Function	Description	Adjustment
Machine analyzer	With the machine and servo motor coupled, the characteristic of the mechanical system can be measured by giving a random vibration command from the personal computer to the servo and measuring the machine response.	<ul style="list-style-type: none"> You can grasp the machine resonance frequency and determine the notch frequency of the machine resonance suppression filter. You can automatically set the optimum gains in response to the machine characteristic. This simple adjustment is suitable for a machine which has large machine resonance and does not require much settling time.
Gain search	Executing gain search under to-and-fro positioning command measures settling characteristic while simultaneously changing gains, and automatically searches for gains which make settling time shortest.	<ul style="list-style-type: none"> You can automatically set gains which make positioning settling time shortest.
Machine simulation	Response at positioning settling of a machine can be simulated from machine analyzer results on personal computer.	<ul style="list-style-type: none"> You can optimize gain adjustment and command pattern on personal computer.

9. GENERAL GAIN ADJUSTMENT

9.2 Auto tuning

9.2.1 Auto tuning mode

The servo amplifier has a real-time auto tuning function which estimates the machine characteristic (load inertia moment ratio) in real time and automatically sets the optimum gains according to that value. This function permits ease of gain adjustment of the servo amplifier.

(1) Auto tuning mode 1

The servo amplifier is factory-set to the auto tuning mode 1.

In this mode, the load inertia moment ratio of a machine is always estimated to set the optimum gains automatically.

The following parameters are automatically adjusted in the auto tuning mode 1.

Parameter No.	Abbreviation	Name
PB06	GD2	Ratio of load inertia moment to servo motor inertia moment
PB07	PG1	Model loop gain
PB08	PG2	Position loop gain
PB09	VG2	Speed loop gain
PB10	VIC	Speed integral compensation

POINT
<ul style="list-style-type: none"> ▪ The auto tuning mode 1 may not be performed properly if the following conditions are not satisfied. ▪ Time to reach 2000r/min is the acceleration/deceleration time constant of 5s or less. ▪ Speed is 150r/min or higher. ▪ The ratio of load inertia moment to servo motor inertia moment is 100 times or less. ▪ The acceleration/deceleration torque is 10% or more of the rated torque. ▪ Under operating conditions which will impose sudden disturbance torque during acceleration/deceleration or on a machine which is extremely loose, auto tuning may not function properly, either. In such cases, use the auto tuning mode 2 or manual mode to make gain adjustment.

(2) Auto tuning mode 2

Use the auto tuning mode 2 when proper gain adjustment cannot be made by auto tuning mode 1. Since the load inertia moment ratio is not estimated in this mode, set the value of a correct load inertia moment ratio (parameter No.PB06).

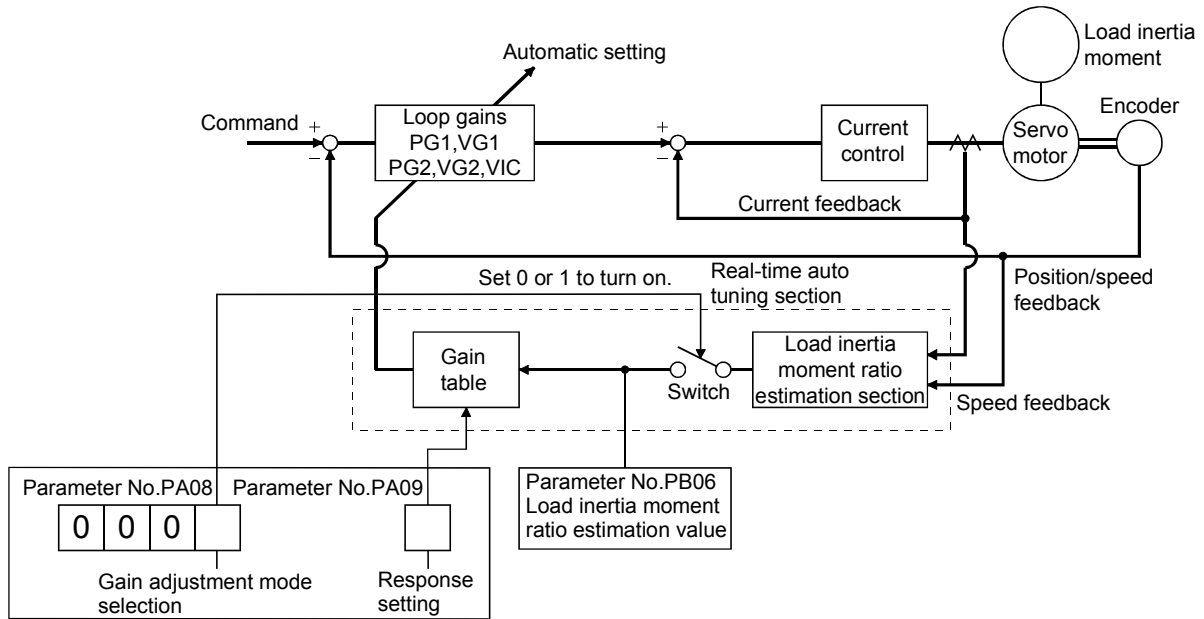
The following parameters are automatically adjusted in the auto tuning mode 2.

Parameter No.	Abbreviation	Name
PB07	PG1	Model loop gain
PB08	PG2	Position loop gain
PB09	VG2	Speed loop gain
PB10	VIC	Speed integral compensation

9. GENERAL GAIN ADJUSTMENT

9.2.2 Auto tuning mode operation

The block diagram of real-time auto tuning is shown below.



When a servo motor is accelerated/decelerated, the load inertia moment ratio estimation section always estimates the load inertia moment ratio from the current and speed of the servo motor. The results of estimation are written to parameter No.PB06 (the ratio of load inertia moment to servo motor). These results can be confirmed on the status display screen of the MR Configurator section.

If the value of the load inertia moment ratio is already known or if estimation cannot be made properly, choose the "auto tuning mode 2" (parameter No.PA08: 0002) to stop the estimation of the load inertia moment ratio (Switch in above diagram turned off), and set the load inertia moment ratio (parameter No.34) manually.

From the preset load inertia moment ratio (parameter No.PB06) value and response level (parameter No.PA09), the optimum loop gains are automatically set on the basis of the internal gain table.

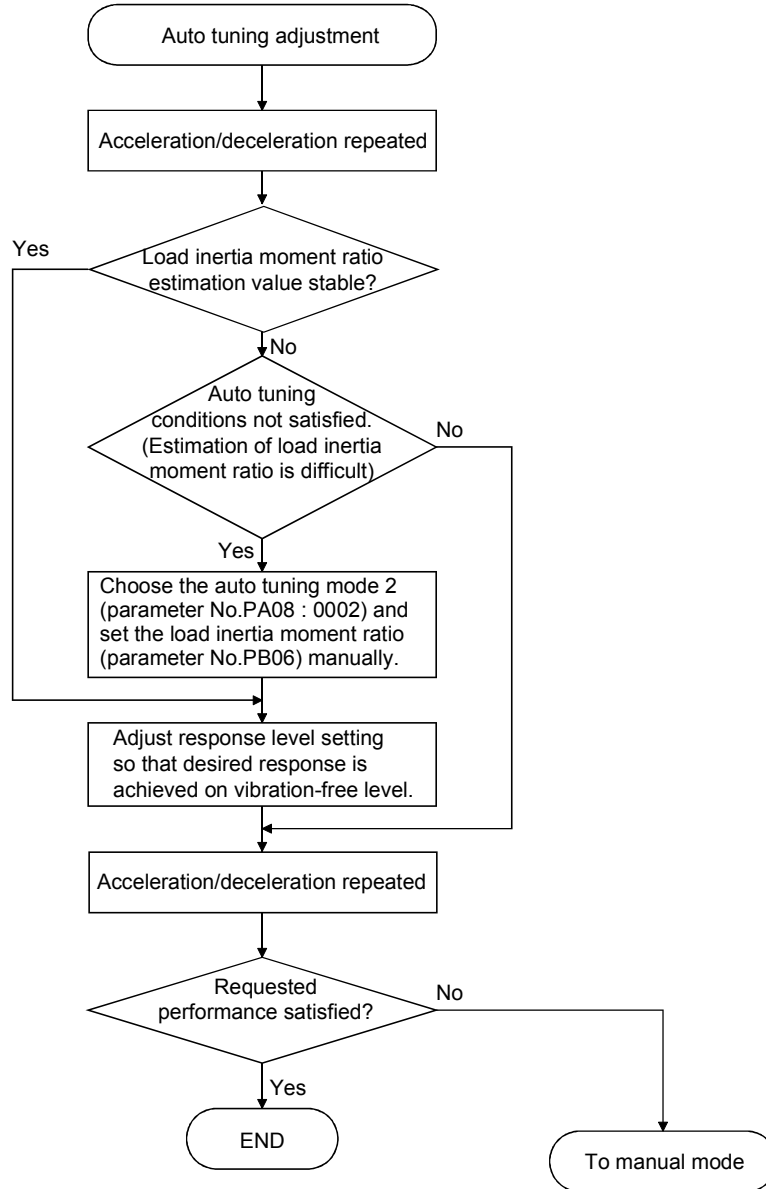
The auto tuning results are saved in the EEP-ROM of the servo amplifier every 60 minutes since power-on. At power-on, auto tuning is performed with the value of each loop gain saved in the EEP-ROM being used as an initial value.

POINT
<ul style="list-style-type: none"> ▪ If sudden disturbance torque is imposed during operation, the estimation of the inertia moment ratio may malfunction temporarily. In such a case, choose the "auto tuning mode 2" (parameter No.PA08: 0002) and set the correct load inertia moment ratio in parameter No.PB06. ▪ When any of the auto tuning mode 1 and auto tuning mode settings is changed to the manual mode 2 setting, the current loop gains and load inertia moment ratio estimation value are saved in the EEP-ROM.

9. GENERAL GAIN ADJUSTMENT

9.2.3 Adjustment procedure by auto tuning

Since auto tuning is made valid before shipment from the factory, simply running the servo motor automatically sets the optimum gains that match the machine. Merely changing the response level setting value as required completes the adjustment. The adjustment procedure is as follows.

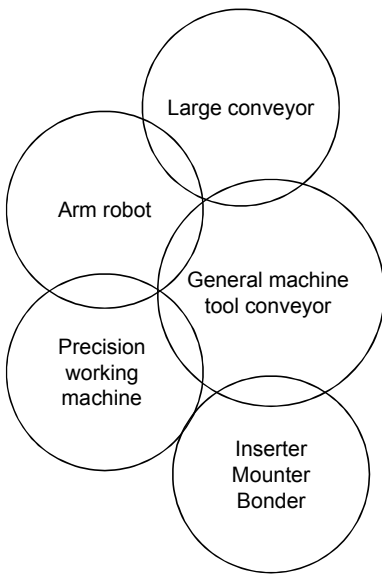


9. GENERAL GAIN ADJUSTMENT

9.2.4 Response level setting in auto tuning mode

Set the response (The first digit of parameter No.PA09) of the whole servo system. As the response level setting is increased, the track ability and settling time for a command decreases, but a too high response level will generate vibration. Hence, make setting until desired response is obtained within the vibration-free range. If the response level setting cannot be increased up to the desired response because of machine resonance beyond 100Hz, filter tuning mode (parameter No.PB01) or machine resonance suppression filter (parameter No.PB13 to PB16) may be used to suppress machine resonance. Suppressing machine resonance may allow the response level setting to increase. Refer to section 10.3 for filter tuning mode and machine resonance suppression filter.

Setting of parameter No.PA09

Response level setting	Machine characteristic		
	Machine rigidity	Machine resonance frequency guideline	Guideline of corresponding machine
1	Low ↑	10.0	
2		11.3	
3		12.7	
4		14.3	
5		16.1	
6		18.1	
7		20.4	
8		23.0	
9		25.9	
10		29.2	
11		32.9	
12	37.0		
13	41.7		
14	47.0		
15	52.9		
16	Middle	59.6	
17	↓ ↑	67.1	
18		75.6	
19		85.2	
20		95.9	
21		108.0	
22		121.7	
23		137.1	
24		154.4	
25		173.9	
26		195.9	
27		220.6	
28		248.5	
29		279.9	
30		315.3	
31		355.1	
32		High		400.0

9. GENERAL GAIN ADJUSTMENT

9.3 Manual mode 1 (simple manual adjustment)

If you are not satisfied with the adjustment of auto tuning, you can make simple manual adjustment with three parameters.

POINT	<ul style="list-style-type: none"> If machine resonance occurs, filter tuning mode (parameter No.PB01) or machine resonance suppression filter (parameter No.PB13 to PB16) may be used to suppress machine resonance. (Refer to section 10.1.)
-------	---

(1) For speed control

(a) Parameters

The following parameters are used for gain adjustment.

Parameter No.	Abbreviation	Name
PB06	GD2	Ratio of load inertia moment to servo motor inertia moment
PB07	PG1	Model loop gain
PB09	VG2	Speed loop gain
PB10	VIC	Speed integral compensation

(b) Adjustment procedure

Step	Operation	Description
1	Brief-adjust with auto tuning. Refer to section 9.2.3.	
2	Change the setting of auto tuning to the manual mode (Parameter No.PA08: 0003).	
3	Set an estimated value to the ratio of load inertia moment to servo motor inertia moment. (If the estimate value with auto tuning is correct, setting change is not required.)	
4	Set a slightly smaller value to the model loop gain Set a slightly larger value to the speed integral compensation.	
5	Increase the speed loop gain within the vibration- and unusual noise-free range, and return slightly if vibration takes place.	Increase the speed loop gain.
6	Decrease the speed integral compensation within the vibration-free range, and return slightly if vibration takes place.	Decrease the time constant of the speed integral compensation.
7	Increase the model loop gain, and return slightly if overshooting takes place.	Increase the model loop gain.
8	If the gains cannot be increased due to mechanical system resonance or the like and the desired response cannot be achieved, response may be increased by suppressing resonance with filter tuning mode or machine resonance suppression filter and then executing steps 2 and 3.	Suppression of machine resonance. Refer to section 10.2, 10.3.
9	While checking the settling characteristic and rotational status, fine-adjust each gain.	Fine adjustment

9. GENERAL GAIN ADJUSTMENT

(c) Adjustment description

1) Speed loop gain (parameter No.PB09)

This parameter determines the response level of the speed control loop. Increasing this value enhances response but a too high value will make the mechanical system liable to vibrate. The actual response frequency of the speed loop is as indicated in the following expression.

$$\text{Speed loop response frequency(Hz)} = \frac{\text{Speed loop gain setting}}{(1 + \text{ratio of load inertia moment to servo motor inertia moment}) \times 2\pi}$$

2) Speed integral compensation (VIC: parameter No.PB10)

To eliminate stationary deviation against a command, the speed control loop is under proportional integral control. For the speed integral compensation, set the time constant of this integral control. Increasing the setting lowers the response level. However, if the load inertia moment ratio is large or the mechanical system has any vibratory element, the mechanical system is liable to vibrate unless the setting is increased to some degree. The guideline is as indicated in the following expression.

$$\text{Speed integral compensation setting(ms)} \geq \frac{2000 \text{ to } 3000}{\text{Speed loop gain setting} / (1 + \text{ratio of load inertia moment to servo motor inertia moment setting} \times 0.1)}$$

3) Model loop gain (PG1: Parameter No.PB07)

This parameter determines the response level to a position command. Increasing the model loop gain improves track ability to a position command, but a too high value will make overshooting liable to occur at the time of setting.

$$\text{Model loop gain guideline} \leq \frac{\text{Speed loop gain setting}}{(1 + \text{ratio of load inertia moment to servo motor inertia moment})} \times \left(\frac{1}{4} \text{ to } \frac{1}{8} \right)$$

9. GENERAL GAIN ADJUSTMENT

(2) For position control

(a) Parameters

The following parameters are used for gain adjustment.

Parameter No.	Abbreviation	Name
PB06	GD2	Ratio of load inertia moment to servo motor inertia moment
PB07	PG1	Model loop gain
PB08	PG2	Position loop gain
PB09	VG2	Speed loop gain
PB10	VIC	Speed integral compensation

(b) Adjustment procedure

Step	Operation	Description
1	Brief-adjust with auto tuning. Refer to section 9.2.3.	
2	Change the setting of auto tuning to the manual mode (Parameter No.PA08: 0003).	
3	Set an estimated value to the ratio of load inertia moment to servo motor inertia moment. (If the estimate value with auto tuning is correct, setting change is not required.)	
4	Set a slightly smaller value to the model loop gain and the position loop gain. Set a slightly larger value to the speed integral compensation.	
5	Increase the speed loop gain within the vibration- and unusual noise-free range, and return slightly if vibration takes place.	Increase the speed loop gain.
6	Decrease the speed integral compensation within the vibration-free range, and return slightly if vibration takes place.	Decrease the time constant of the speed integral compensation.
7	Increase the position loop gain, and return slightly if vibration takes place.	Increase the position loop gain.
8	Increase the model loop gain, and return slightly if overshooting takes place.	Increase the position loop gain.
9	If the gains cannot be increased due to mechanical system resonance or the like and the desired response cannot be achieved, response may be increased by suppressing resonance with filter tuning mode or machine resonance suppression filter and then executing steps 3 to 5.	Suppression of machine resonance. Refer to section 10.2 · 10.3.
10	While checking the settling characteristic and rotational status, fine-adjust each gain.	Fine adjustment.

9. GENERAL GAIN ADJUSTMENT

(c) Adjustment description

1) Speed loop gain (VG2: parameter No.PB09)

This parameter determines the response level of the speed control loop. Increasing this value enhances response but a too high value will make the mechanical system liable to vibrate. The actual response frequency of the speed loop is as indicated in the following expression.

$$\text{Speed loop response frequency(Hz)} = \frac{\text{Speed loop gain 2 setting}}{(1 + \text{ratio of load inertia moment to servo motor inertia moment}) \times 2\pi}$$

2) Speed integral compensation (VIC: parameter No.PB10)

To eliminate stationary deviation against a command, the speed control loop is under proportional integral control. For the speed integral compensation, set the time constant of this integral control. Increasing the setting lowers the response level. However, if the load inertia moment ratio is large or the mechanical system has any vibratory element, the mechanical system is liable to vibrate unless the setting is increased to some degree. The guideline is as indicated in the following expression.

$$\text{Speed integral compensation setting(ms)} \geq \frac{2000 \text{ to } 3000}{\text{Speed loop gain 2 setting} / (1 + \text{ratio of load inertia moment to servo motor inertia moment 2 setting})}$$

3) Model loop gain (PG1: Parameter No.PB07)

This parameter determines the response level to a position command. Increasing the model loop gain improves track ability to a position command, but a too high value will make overshooting liable to occur at the time of setting.

$$\text{Model control gain guideline} \leq \frac{\text{Speed loop gain setting}}{(1 + \text{ratio of load inertia moment to servo mortar inertia moment})} \times \left(\frac{1}{4} \text{ to } \frac{1}{8} \right)$$

4) Model loop gain (PG1: parameter No.PB07)

This parameter determines the response level to a position command. Increasing model loop gain improves track ability to a position command but a too high value will make overshooting liable to occur at the time of settling.

$$\text{Model loop gain guideline} \leq \frac{\text{Speed loop gain 2 setting}}{(1 + \text{ratio of load inertia moment to servo motor inertia moment})} \times \left(\frac{1}{4} \text{ to } \frac{1}{8} \right)$$

9. GENERAL GAIN ADJUSTMENT

9.4 Interpolation mode

The interpolation mode is used to match the position loop gains of the axes when performing the interpolation operation of servo motors of two or more axes for an X-Y table or the like. In this mode, manually set the model loop gain that determines command track ability. Other parameters for gain adjustment are set automatically.

(1) Parameter

(a) Automatically adjusted parameters

The following parameters are automatically adjusted by auto tuning.

Parameter No.	Abbreviation	Name
PB06	GD2	Ratio of load inertia moment to servo motor inertia moment
PB08	PG2	Position loop gain
PB09	VG2	Speed loop gain
PB10	VIC	Speed integral compensation

(b) Manually adjusted parameters

The following parameters are adjustable manually.

Parameter No.	Abbreviation	Name
PB07	PG1	Model loop gain

(2) Adjustment procedure

Step	Operation	Description
1	Set to the auto tuning mode.	Select the auto tuning mode 1.
2	During operation, increase the response level setting (parameter No.PA09), and return the setting if vibration occurs.	Adjustment in auto tuning mode 1.
3	Check the values of model loop gain.	Check the upper setting limits.
4	Set the interpolation mode (parameter No.PA08: 0000).	Select the interpolation mode.
5	Set the model loop gain of all the axes to be interpolated to the same value. At that time, adjust to the setting value of the axis, which has the smallest model loop gain.	Set position loop gain.
6	Looking at the interpolation characteristic and rotation status, fine-adjust the gains and response level setting.	Fine adjustment.

(3) Adjustment description

(a) Model loop gain (parameter No.PB07)

This parameter determines the response level of the position control loop. Increasing model loop gain improves track ability to a position command but a too high value will make overshooting liable to occur at the time of settling. The droop pulse value is determined by the following expression.

$$\text{Droop pulse value (pulse)} = \frac{\frac{\text{Rotation speed (r/min)}}{60} \times 262144(\text{pulse})}{\text{Model loop gain setting}}$$

9. GENERAL GAIN ADJUSTMENT

9.5 Differences between MELSERVO-J2-Super and MELSERVO-J3 in auto tuning

To meet higher response demands, the MELSERVO-J3 series has been changed in response level setting range from the MR-J2-Super. The following table lists comparison of the response level setting.

MELSERVO-J2-Super		MELSERVO-J3	
Parameter No.3 setting	Guideline for machine resonance frequency [Hz]	Parameter No.PA09 setting	Guideline for machine resonance frequency [Hz]
		1	10.0
		2	11.3
		3	12.7
□□□1	15	4	14.3
		5	16.1
		6	18.1
□□□2	20	7	20.4
		8	23.0
□□□3	25	9	25.9
□□□4	30	10	29.2
		11	32.9
□□□5	35	12	37.0
		13	41.7
□□□6	45	14	47.0
□□□7	55	15	52.9
		16	59.6
□□□8	70	17	67.1
		18	75.6
□□□9	85	19	85.2
		20	95.9
□□□A	105	21	108.0
		22	121.7
□□□B	130	23	137.1
□□□C	160	24	154.4
		25	173.9
□□□D	200	26	195.9
		27	220.6
□□□E	240	28	248.5
		29	279.9
□□□F	300	30	315.3
		31	355.1
		32	400.0

Note that because of a slight difference in gain adjustment pattern, response may not be the same if the resonance frequency is set to the same value.

10. SPECIAL ADJUSTMENT FUNCTIONS

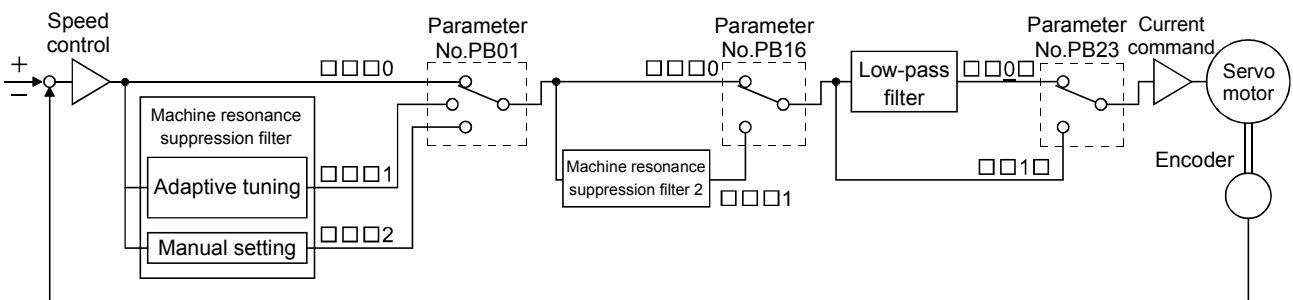
10. SPECIAL ADJUSTMENT FUNCTIONS

POINT

- The functions given in this chapter need not be used generally. Use them if you are not satisfied with the machine status after making adjustment in the methods in chapter 9.

If a mechanical system has a natural resonance point, increasing the servo system response level may cause the mechanical system to produce resonance (vibration or unusual noise) at that resonance frequency. Using the machine resonance suppression filter and adaptive tuning can suppress the resonance of the mechanical system.

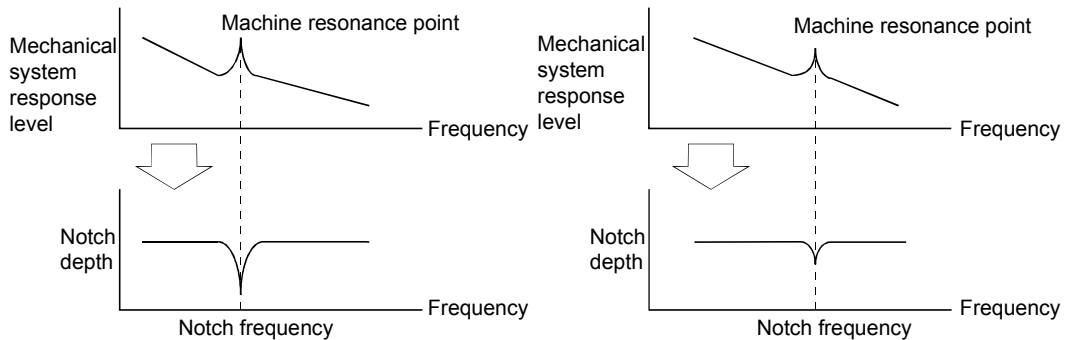
10.1 Function block diagram



10.2 Adaptive filter II

(1) Function

Adaptive filter II (adaptive tuning) is a function in which the servo amplifier detects machine vibration for a predetermined period of time and sets the filter characteristics automatically to suppress mechanical system vibration. Since the filter characteristics (frequency, depth) are set automatically, you need not be conscious of the resonance frequency of a mechanical system.



When machine resonance is large and frequency is low When machine resonance is small and frequency is high

POINT

- The machine resonance frequency which adaptive tuning mode can respond to is about 100 to 2.25kHz. Adaptive vibration suppression control has no effect on the resonance frequency outside this range.
- Adaptive vibration suppression control may provide no effect on a mechanical system which has complex resonance characteristics.

10. SPECIAL ADJUSTMENT FUNCTIONS

(2) Parameters

The operation of adaptive tuning mode (parameter No.PB01).

Parameter No.PB01

0	0	0	
---	---	---	--

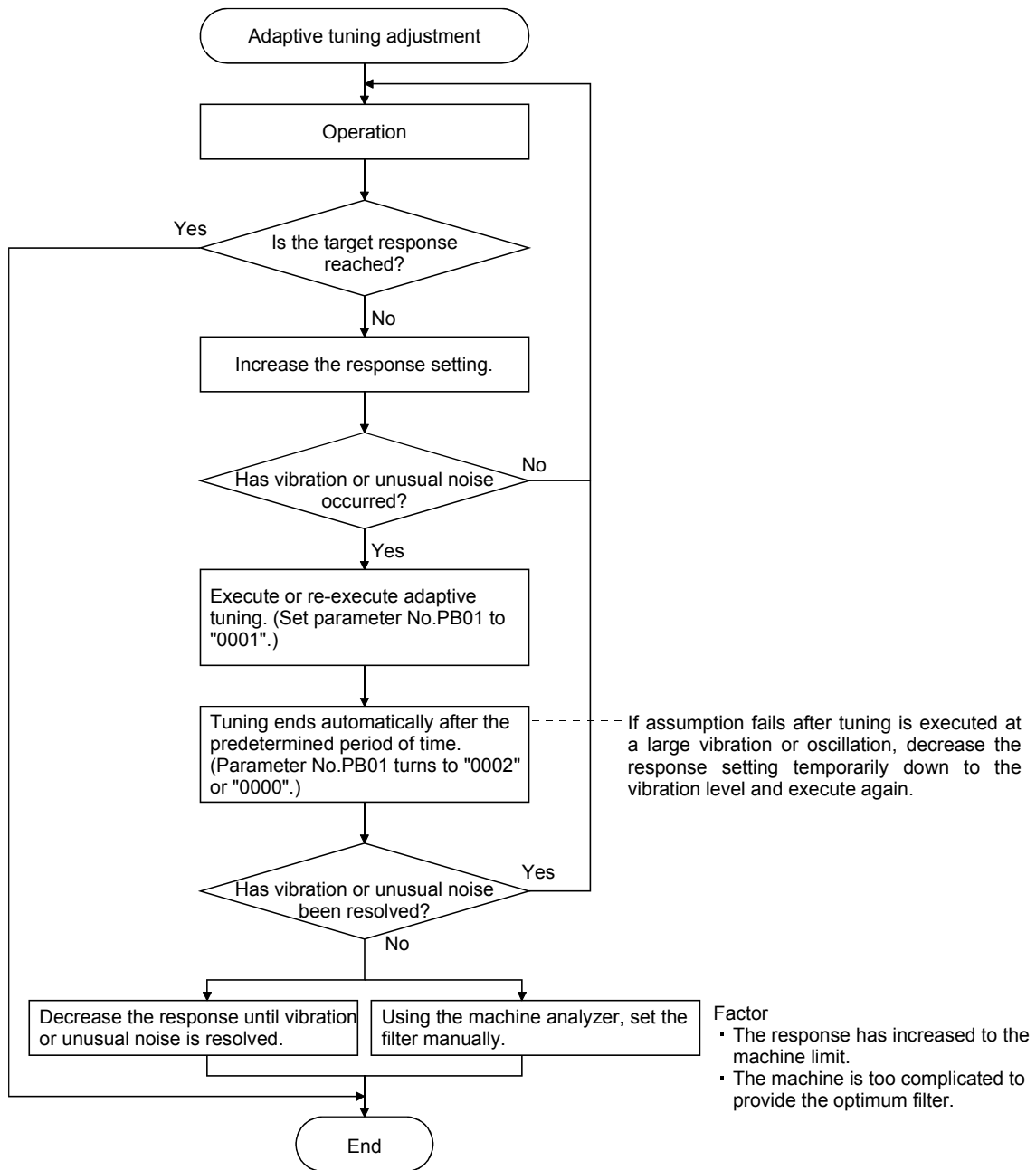
└ Filter tuning mode selection

Setting	Filter adjustment mode	Automatically set parameter
0	Filter OFF	(Note)
1	Filter tuning mode	Parameter No.PB13 Parameter No.PB14
2	Manual mode	

Note. Parameter No.PB19 and PB20 are fixed to the initial values.

10. SPECIAL ADJUSTMENT FUNCTIONS

(3) Adaptive tuning mode procedure



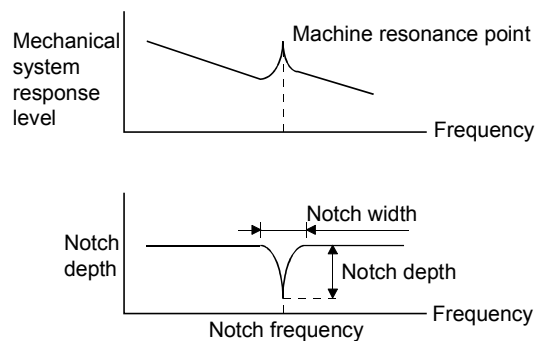
10. SPECIAL ADJUSTMENT FUNCTIONS

POINT
<ul style="list-style-type: none"> ▪ "Filter OFF" enables a return to the factory-set initial value. ▪ When adaptive tuning is executed, vibration sound increases as an excitation signal is forcibly applied for several seconds. ▪ When adaptive tuning is executed, machine resonance is detected for a maximum of 10 seconds and a filter is generated. After filter generation, the adaptive tuning mode automatically shifts to the manual mode. ▪ Adaptive tuning generates the optimum filter with the currently set control gains. If vibration occurs when the response setting is increased, execute adaptive tuning again. ▪ During adaptive tuning, a filter having the best notch depth at the set control gain is generated. To allow a filter margin against machine resonance, increase the notch depth in the manual mode.

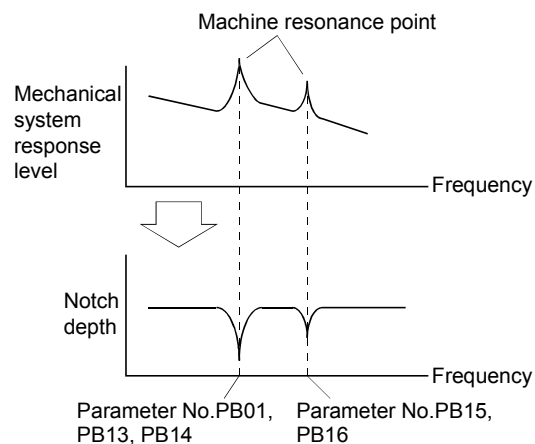
10.3 Machine resonance suppression filter

(1) Function

The machine resonance suppression filter is a filter function (notch filter) which decreases the gain of the specific frequency to suppress the resonance of the mechanical system. You can set the gain decreasing frequency (notch frequency), gain decreasing depth and width.



You can use the machine resonance suppression filter 1 (parameter No.PB13, PB14) and machine resonance suppression filter 2 (parameter No.PB15, PB16) to suppress the vibration of two resonance frequencies. Execution of adaptive tuning in the filter tuning mode automatically adjusts the machine resonance suppression filter. When adaptive tuning is ON, the adaptive tuning mode shifts to the manual mode after the predetermined period of time. The manual mode enables manual setting using the machine resonance suppression filter 1.



10. SPECIAL ADJUSTMENT FUNCTIONS

(2) Parameters

(a) Machine resonance suppression filter 1 (parameter No.PB13, PB14)

Set the notch frequency, notch depth and notch width of the machine resonance suppression filter 1 (parameter No.PB13, PB14)

When you have made adaptive filter tuning mode (parameter No.PB01) "manual mode", set up the machine resonance suppression filter 1 becomes effective.

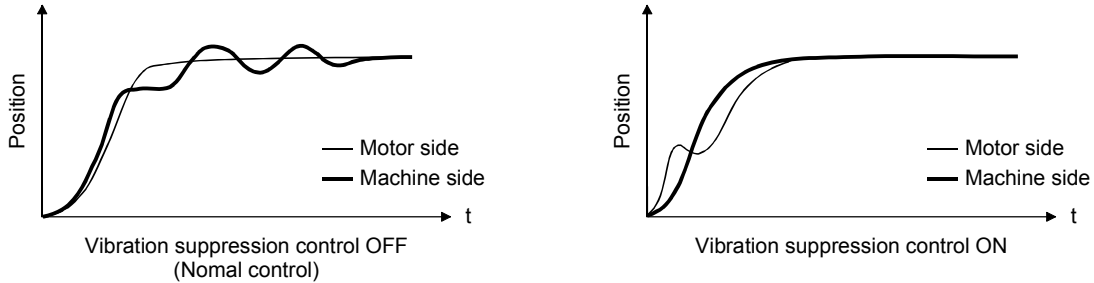
POINT	
	<ul style="list-style-type: none"><li>▪ The machine resonance suppression filter is a delay factor for the servo system. Hence, vibration may increase if you set a wrong resonance frequency or a too deep notch.<li>▪ If the frequency of machine resonance is unknown, decrease the notch frequency from higher to lower ones in order. The optimum notch frequency is set at the point where vibration is minimal.<li>▪ A deeper notch has a higher effect on machine resonance suppression but increases a phase delay and may increase vibration.<li>▪ A deeper notch has a higher effect on machine resonance suppression but increases a phase delay and may increase vibration.<li>▪ The machine characteristic can be grasped beforehand by the machine analyzer on the MR Configurator. This allows the required notch frequency and depth to be determined.

10. SPECIAL ADJUSTMENT FUNCTIONS

10.4 Advanced vibration suppression control

(1) Operation

Vibration suppression control is used to further suppress machine side vibration, such as workpiece end vibration and base shake. The motor side operation is adjusted for positioning so that the machine does not shake.



When the advanced vibration suppression control (vibration suppression control tuning mode parameter No.PB02) is executed, the vibration frequency at machine side can automatically be estimated to suppress machine side vibration.

In the vibration suppression control tuning mode, this mode shifts to the manual mode after operation is performed the predetermined number of times. The manual mode enables manual setting using the vibration suppression control vibration frequency setting (parameter No.PB19) and vibration suppression control resonance frequency setting (parameter No.PB20).

(2) Parameter

Select the operation of the vibration suppression control tuning mode (parameter No.PB02).

Parameter No.PB02

0	0	0	
---	---	---	--

Vibration suppression control tuning mode

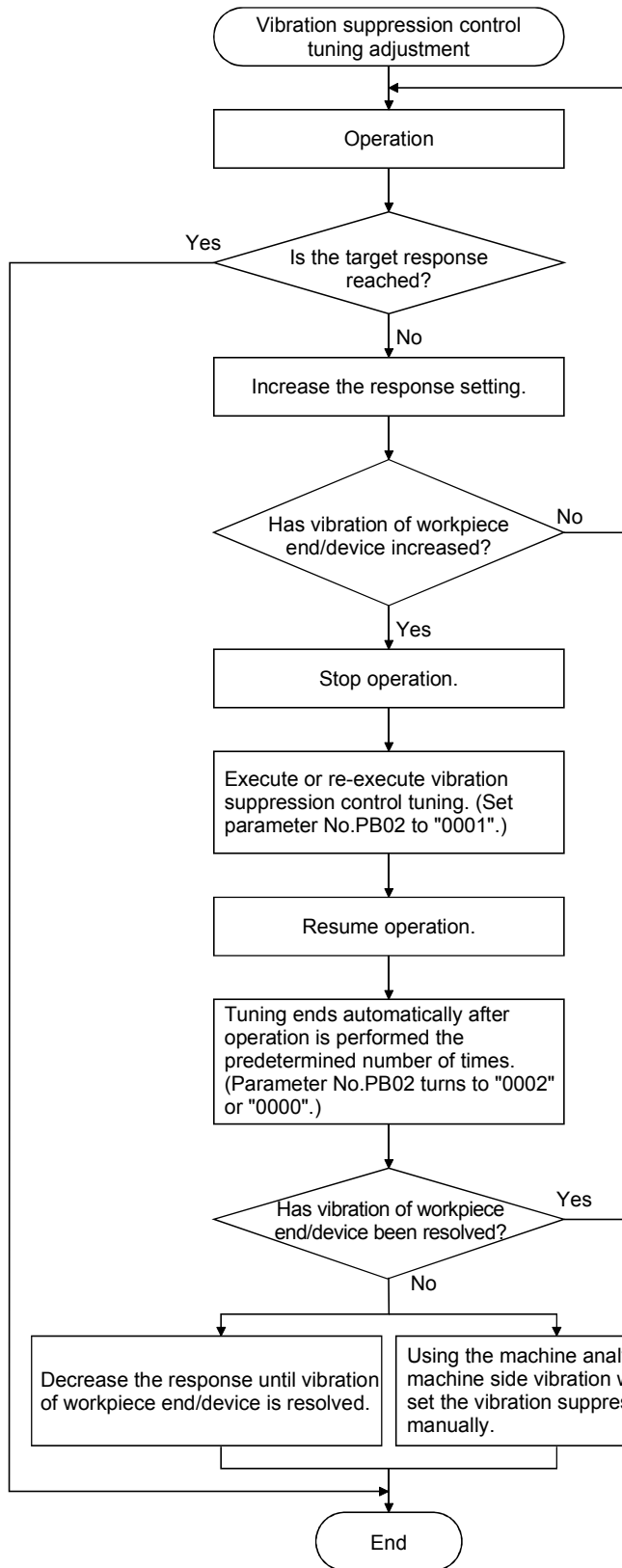
Setting	Vibration suppression control tuning mode	Automatically set parameter
0	Vibration suppression control OFF	(Note)
1	Vibration suppression control tuning mode (Advanced vibration suppression control)	Parameter No.PB19 Parameter No.PB20
2	Manual mode	

Note. Parameter No.PB19 and PB20 are fixed to the initial values.

POINT
<ul style="list-style-type: none"> The function is made valid when the auto tuning mode (parameter No.PA08) is the auto tuning mode 2 ("0002") or manual mode ("0003"). The machine resonance frequency supported in the vibration suppression control tuning mode is 1.0Hz to 100.0Hz. The function is not effective for vibration outside this range. Stop the motor before changing the vibration suppression control-related parameters (parameter No.PB02, PB19, PB20, PB33, PB34). A failure to do so will cause a shock. For positioning operation during execution of vibration suppression control tuning, provide a stop time to ensure a stop after full vibration damping. Vibration suppression control tuning may not make normal estimation if the residual vibration at the motor side is small. Vibration suppression control tuning sets the optimum parameter with the currently set control gains. When the response setting is increased, set vibration suppression control tuning again.

10. SPECIAL ADJUSTMENT FUNCTIONS

(3) Vibration suppression control tuning mode procedure



Factor

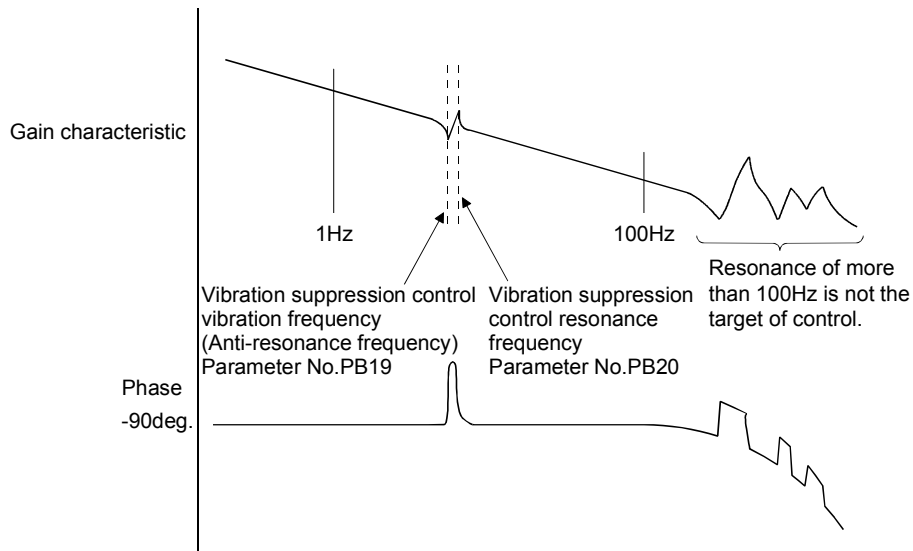
- Estimation cannot be made as machine side vibration has not been transmitted to the motor side.
- The response of the model loop gain has increased to the machine side vibration frequency (vibration suppression control limit).

10. SPECIAL ADJUSTMENT FUNCTIONS

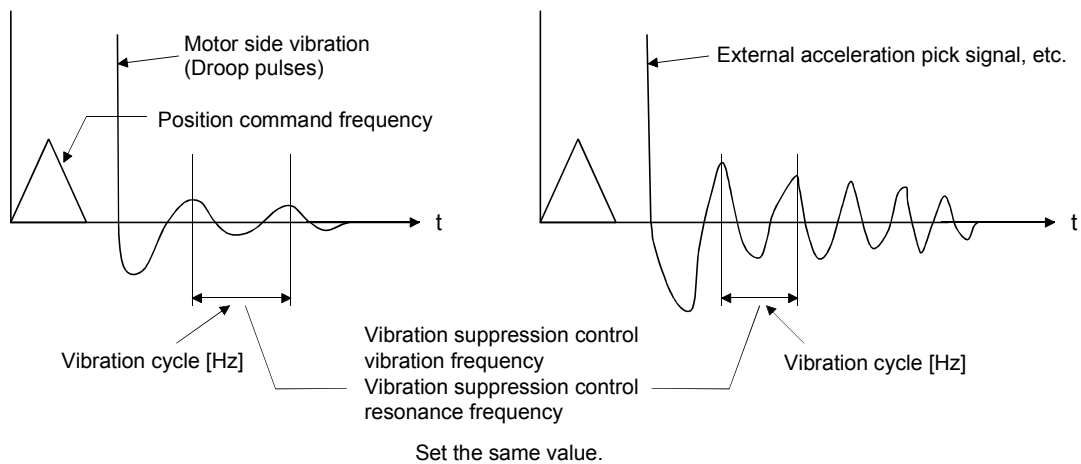
(4) Vibration suppression control manual mode

Measure work side vibration and device shake with the machine analyzer or external measuring instrument, and set the vibration suppression control vibration frequency (parameter No.PB19) and vibration suppression control resonance frequency (parameter No.PB20) to set vibration suppression control manually.

(a) When a vibration peak can be confirmed using MR Configurator, machine analyzer or external FFT equipment



(b) When vibration can be confirmed using monitor signal or external sensor



10. SPECIAL ADJUSTMENT FUNCTIONS

POINT
<ul style="list-style-type: none">▪ When machine side vibration does not show up in motor side vibration, the setting of the motor side vibration frequency does not produce an effect.▪ When the anti-resonance frequency and resonance frequency can be confirmed using the machine analyzer or external FFT device, do not set the same value but set different values to improve the vibration suppression performance.▪ A vibration suppression control effect is not produced if the relationship between the model loop gain (parameter No.PB07) value and vibration frequency is as indicated below. Make setting after decreasing PG1, e.g. reduce the response setting. $\frac{1}{2\pi} (1.5 \times PG1) > \text{vibration frequency}$

10. SPECIAL ADJUSTMENT FUNCTIONS

10.5 Low-pass filter

(1) Function

When a ball screw or the like is used, resonance of high frequency may occur as the response level of the servo system is increased. To prevent this, the low-pass filter is factory-set to be valid for a torque command. The filter frequency of this low-pass filter is automatically adjusted to the value in the following expression.

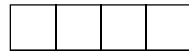
$$\text{Filter frequency(rad/s)} = \frac{VG2}{1 + GD2} \times 10$$

When parameter No.PB23 is set to "□□1□", manual setting can be made with parameter No.PB18.

(2) Parameter

Set the operation of the low-pass filter selection (parameter No.PB23.)

Parameter No.PB23



Low-pass filter selection

0: Automatic setting (initial value)

1: Manual setting (parameter No.PB18 setting)

10.6 Gain changing function

This function can change the gains. You can change between gains during rotation and gains during stop or can use an input device to change gains during operation.

10.6.1 Applications

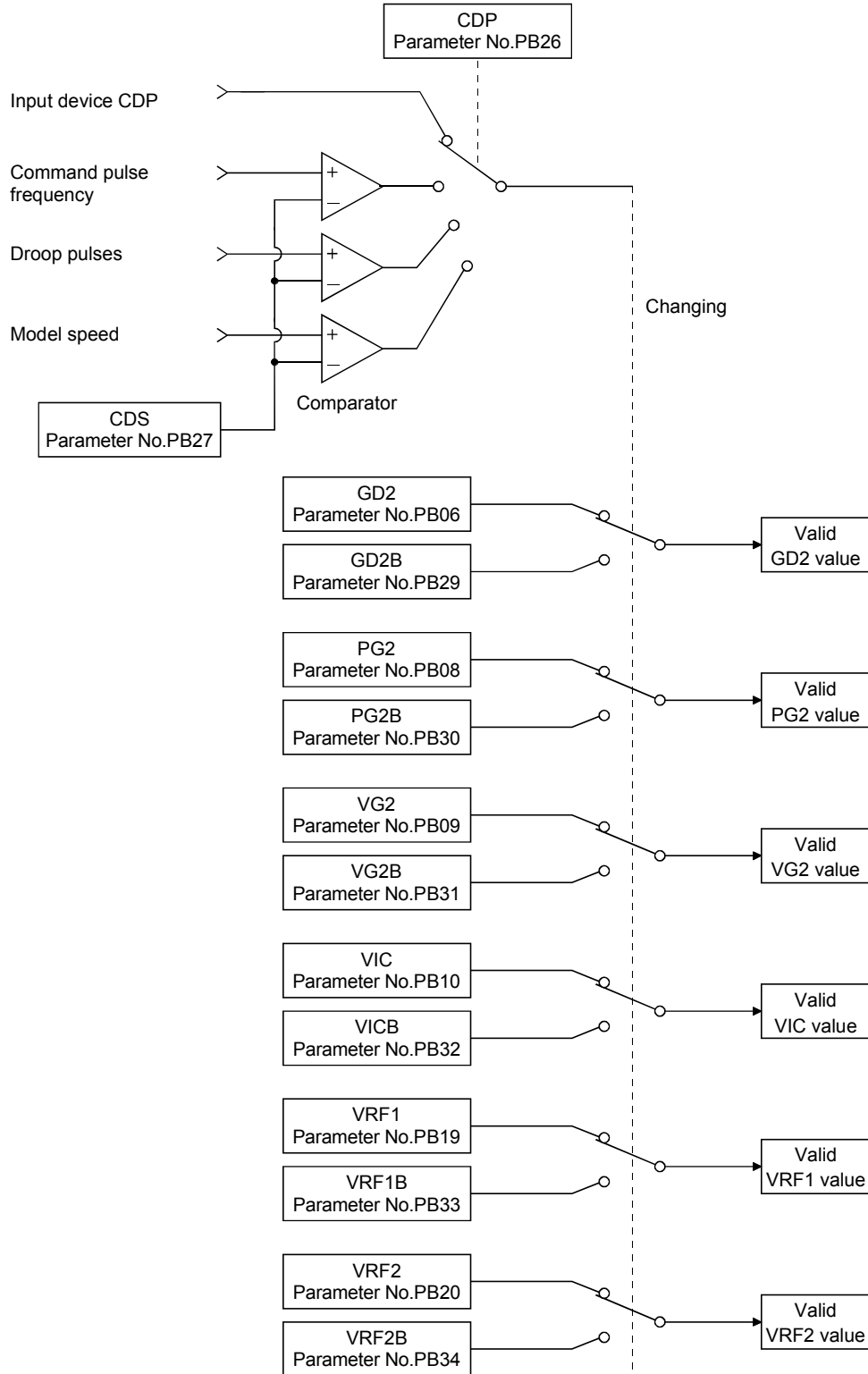
This function is used when.

- (1) You want to increase the gains during servo lock but decrease the gains to reduce noise during rotation.
- (2) You want to increase the gains during settling to shorten the stop settling time.
- (3) You want to change the gains using an input device to ensure stability of the servo system since the load inertia moment ratio varies greatly during a stop (e.g. a large load is mounted on a carrier).

10. SPECIAL ADJUSTMENT FUNCTIONS

10.6.2 Function block diagram

The valid loop gains PG2, VG2, VIC and GD2 of the actual loop are changed according to the conditions selected by gain changing selection CDP (parameter No.PB26) and gain changing condition CDS (parameter No.PB27).



10. SPECIAL ADJUSTMENT FUNCTIONS

10.6.3 Parameters

When using the gain changing function, always set "□□□3" in parameter No.PA08 (auto tuning) to choose the manual mode of the gain adjustment modes. The gain changing function cannot be used in the auto tuning mode.

Parameter No.	Abbreviation	Name	Unit	Description
PB06	GD2	Ratio of load inertia moment to servo motor inertia moment	Multiplier (× 1)	Control parameters before changing.
PB07	PG1	Model loop gain	rad/s	Position and speed gains of a model used to set the response level to a command. Always valid.
PB08	PG2	Position loop gain	rad/s	
PB09	VG2	Speed loop gain	rad/s	
PB10	VIC	Speed integral compensation	ms	
PB29	GD2B	Gain changing ratio of load inertia moment to servo motor inertia moment	Multiplier (× 1)	Used to set the ratio of load inertia moment to servo motor inertia moment after changing.
PB30	PG2B	Gain changing position loop gain	rad/s	Used to set the value of the after-changing position loop gain.
PB31	VG2B	Gain changing speed loop gain	rad/s	Used to set the value of the after-changing speed loop gain.
PB32	VICB	Gain changing speed integral compensation	ms	Used to set the value of the after-changing speed integral compensation.
PB26	CDP	Gain changing selection		Used to select the changing condition.
PB27	CDS	Gain changing condition	kpps pulse r/min	Used to set the changing condition values.
PB28	CDT	Gain changing time constant	ms	You can set the filter time constant for a gain change at changing.
PB33	VRF1B	Gain changing vibration suppression control vibration frequency setting	Hz	Used to set the value of the after-changing vibration suppression control vibration frequency setting.
PB34	VRF2B	Gain changing vibration suppression control resonance frequency setting	Hz	Used to set the value of the after-changing vibration suppression control resonance frequency setting.

10. SPECIAL ADJUSTMENT FUNCTIONS

(1) Parameters No.PB06 to PB10

These parameters are the same as in ordinary manual adjustment. Gain changing allows the values of ratio of load inertia moment to servo motor inertia moment, position loop gain, speed loop gain and speed integral compensation to be changed.

(2) Gain changing ratio of load inertia moment to servo motor inertia moment (GD2B: parameter No.PB29)

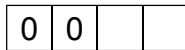
Set the ratio of load inertia moment to servo motor inertia moment after changing. If the load inertia moment ratio does not change, set it to the same value as ratio of load inertia moment to servo motor inertia moment (parameter No.PB06).

(3) Gain changing position loop gain (parameter No.PB30), Gain changing speed loop gain (parameter No.PB31), Gain changing speed integral compensation (parameter No.PB32)

Set the values of after-changing position loop gain, speed loop gain and speed integral compensation.

(4) Gain changing selection (parameter No.PB26)

Used to set the gain changing condition. Choose the changing condition in the first digit and second digit. If you set "1" in the first digit here, you can use the gain changing (RY(n+2)) input device for gain changing.



Gain changing selection

Under any of the following conditions, the gains change on the basis of the parameter No.PB29 to PB32 settings.

0: Invalid

1: Gain changing (RY(n+2)) is ON

2: Command frequency (Parameter No.PB27 setting)

3: Droop pulse value (Parameter No.PB27 setting)

4: Servo motor speed (Parameter No.PB27 setting)

Gain changing condition

0: Valid at more than condition (Valid when gain changing (RY(n+2)) is ON)

1: Valid at less than condition (Valid when gain changing (RY(n+2)) is OFF)

(5) Gain changing condition (parameter No.PB27)

When you selected "command frequency", "droop pulses" or "servo motor speed" in gain changing selection (parameter No.PB26), set the gain changing level.

The setting unit is as follows.

Gain changing condition	Unit
Command frequency	kpps
Droop pulses	pulse
Servo motor speed	r/min

(6) Gain changing time constant (parameter No.PB28)

You can set the primary delay filter to each gain at gain changing. This parameter is used to suppress shock given to the machine if the gain difference is large at gain changing, for example.

10. SPECIAL ADJUSTMENT FUNCTIONS

10.6.4 Gain changing operation

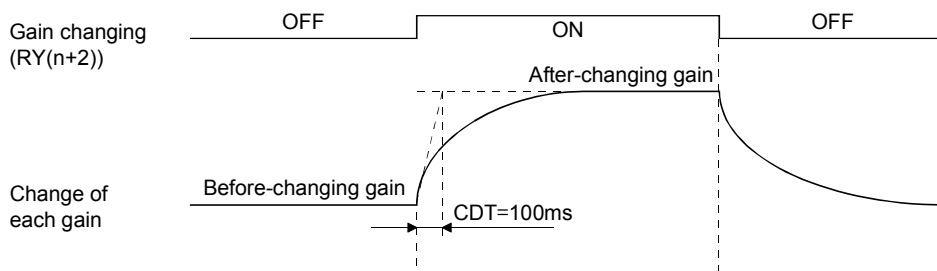
This operation will be described by way of setting examples.

(1) When you choose changing by input device

(a) Setting

Parameter No.	Abbreviation	Name	Setting	Unit
PB07	PG1	Model loop gain	100	rad/s
PB06	GD2	Ratio of load inertia moment to servo motor inertia moment	4.0	Multiplier (× 1)
PB08	PG2	Position loop gain	120	rad/s
PB09	VG2	Speed loop gain	3000	rad/s
PB10	VIC	Speed integral compensation	20	ms
PB29	GD2B	Gain changing ratio of load inertia moment to servo motor inertia moment	10.0	Multiplier (× 1)
PB30	PG2B	Gain changing position loop gain	84	rad/s
PB31	VG2B	Gain changing speed loop gain	4000	rad/s
PB32	VICB	Gain changing speed integral compensation	50	ms
PB26	CDP	Gain changing selection	0001 (Changed by ON/OFF of Input device)	
PB28	CDT	Gain changing time constant	100	ms
PB33	VRF1B	Gain changing vibration suppression control vibration frequency setting	Used to set the value of the after-changing vibration suppression control vibration frequency setting.	Hz
PB34	VRF2B	Gain changing vibration suppression control resonance frequency setting	Used to set the value of the after-changing vibration suppression control resonance frequency setting.	Hz

(b) Changing operation



Model loop gain 1	100		
Ratio of load inertia moment to servo motor inertia moment	4.0	→	10.0 → 4.0
Position loop gain	120	→	84 → 120
Speed loop gain	3000	→	4000 → 3000
Speed integral compensation	20	→	50 → 20

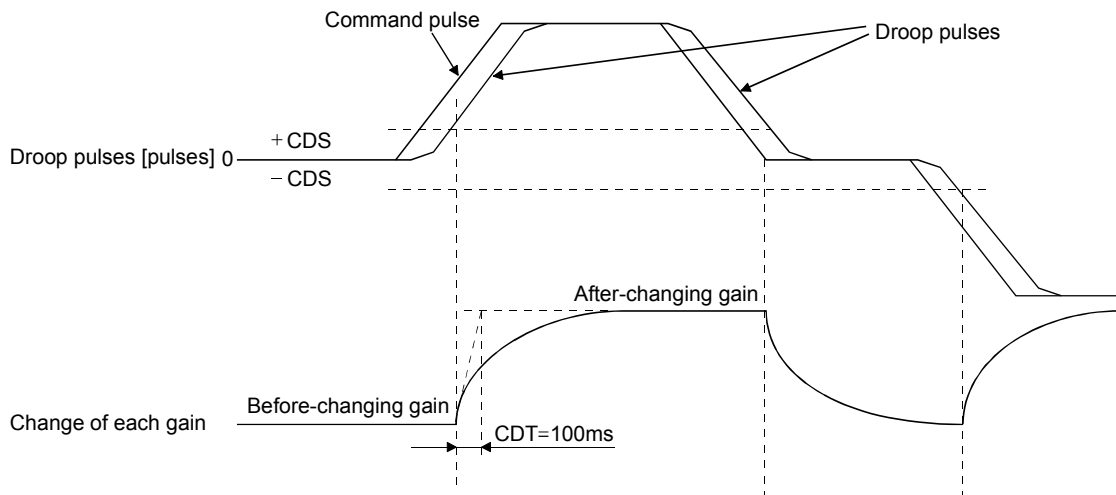
10. SPECIAL ADJUSTMENT FUNCTIONS

(2) When you choose changing by droop pulses

(a) Setting

Parameter No.	Abbreviation	Name	Setting	Unit
PB07	PG1	Model loop gain	100	rad/s
PB06	GD2	Ratio of load inertia moment to servo motor inertia moment	4.0	Multiplier (×1)
PB08	PG2	Position loop gain	120	rad/s
PB09	VG2	Speed loop gain	3000	rad/s
PB10	VIC	Speed integral compensation	20	ms
PB29	GD2B	Gain changing ratio of load inertia moment to servo motor inertia moment	10.0	Multiplier (×1)
PB30	PG2B	Gain changing position loop gain	84	rad/s
PB31	VG2B	Gain changing speed loop gain	4000	rad/s
PB32	VICB	Gain changing speed integral compensation	50	ms
PB26	CDP	Gain changing selection	0003 (Changed by droop pulses)	
PB27	CDS	Gain changing condition	50	pulse
PB28	CDT	Gain changing time constant	100	ms

(b) Changing operation




Model loop gain	100						
Ratio of load inertia moment to servo motor inertia moment	4.0	→	10.0	→	4.0	→	10.0
Position loop gain	120	→	84	→	120	→	84
Speed loop gain	3000	→	4000	→	3000	→	4000
Speed integral compensation	20	→	50	→	20	→	50

11. TROUBLESHOOTING

11. TROUBLESHOOTING

11.1 Trouble at start-up

 CAUTION	<ul style="list-style-type: none"> Excessive adjustment or change of parameter setting must not be made as it will make operation instable.
--	--

POINT	<ul style="list-style-type: none"> Using the MR Configurator, you can refer to unrotated servo motor reasons, etc.
--------------	---

The following faults may occur at start-up. If any of such faults occurs, take the corresponding action.

No.	Start-up sequence	Fault	Investigation	Possible cause	Reference
1	Power on	<ul style="list-style-type: none"> LED is not lit. LED flickers. 	Not improved if connectors CN2, CN3 and CN6 are disconnected.	1. Power supply voltage fault 2. Servo amplifier is faulty.	/
			Improved when connectors CN6 is disconnected.	Power supply of CN6 cabling is shorted.	
			Improved when connector CN2 is disconnected.	1. Power supply of encoder cabling is shorted. 2. Encoder is faulty.	
			Improved when connector CN3 is disconnected.	Power supply of CN3 cabling is shorted.	
		Alarm occurs.	Refer to section 14.4 and remove cause.		Section 14.4
2	Switch on servo-on (RYn0) signal.	Alarm occurs.	Refer to section 14.4 and remove cause.		Section 14.4
		Servo motor shaft is not servo-locked (is free).	1. Check the display to see if the servo amplifier is ready to operate. 2. Check the external I/O signal indication to see if the servo-on (RYn0) signal is ON.	1. Servo-on (RYn0) is not input. (Wiring mistake) 2. 24VDC power is not supplied to DICOM.	Section 8.5.4
3	Gain adjustment	Rotation ripples (speed fluctuations) are large at low speed.	Make gain adjustment in the following procedure. 1. Increase the auto tuning response level. 2. Repeat acceleration and deceleration several times to complete auto tuning.	Gain adjustment fault	Chapter 9
		Large load inertia moment causes the servo motor shaft to oscillate side to side.	If the servo motor may be run with safety, repeat acceleration and deceleration several times to complete auto tuning.	Gain adjustment fault	Chapter 9
4	Cyclic operation	Position shift occurs	Confirm the cumulative command pulses, cumulative feedback pulses and actual servo motor position.	Pulse counting error, etc. due to noise.	/

11. TROUBLESHOOTING

11.2 Operation at error occurrence

An error occurring during operation will result in any of the statuses indicated in the following table.

Error location	Description	Operation mode	
		Test operation	CC-Link operation
Servo side alarm occurrence	Servo operation	Stop	Stop
	CC-Link data communication	Continued	Continued
Option unit communication error	Servo operation	Stop	Stop
	CC-Link data communication	Stop	Stop
CC-Link communication error	Servo operation	Stop	Stop
	CC-Link data communication	Stop	Stop
Programmable controller error/STOP	Servo operation	Continued	Stop
	CC-Link data communication	Stop	Stop
Servo side warning occurrence	Servo operation	Stop	Continued
	CC-Link data communication	Continued	Continued

11.3 CC-Link communication error

This section gives the definitions of the indications given in the communication alarm display section. The servo amplifier has four LED indications.

L.RUN : Lit at normal receive of refresh data. Extinguished when data is not received for a given period of time.

SD : Lit when send data is "0".

RD : Lit when the carrier of receive data is detected.

L.ERR : Lit when the data addressed to the host is in CRC or abort error.

(Note) Communication alarm display LED				Operation
L.RUN	SD	RD	L.ERR	
○	◎	◎	◎	Normal communication is made, but a CRC error sometimes occurs due to noise.
○	◎	◎	●	Normal communication
○	◎	●	◎	Hardware fault
○	◎	●	●	Hardware fault
○	●	◎	◎	Receive data results in CRC error, disabling a response.
○	●	◎	●	Data does not reach the host.
○	●	●	◎	Hardware fault
○	●	●	●	Hardware fault
●	◎	◎	◎	Polling response is made, but refresh receive is in CRC error.
●	◎	◎	●	Hardware fault
●	◎	●	●	Hardware fault
●	●	◎	◎	Data addressed to the host resulted in CRC error.
●	●	◎	●	Data does not reach the host, or the data addressed to the host cannot be received due to noise.
●	●	●	◎	Hardware fault
●	●	●	○	Baud rate setting illegal
●	●	○	○	Station number setting illegal
●	○	○	◎	Baud rate or station number setting changed midway (ERROR flickers for about 4s)
●	●	●	●	Data cannot be received due to power-off, power supply failure, open cable, etc. WDT error occurrence (hardware fault)

Note. ○ : Lit ● : Extinguished ◎ : Flicker

11. TROUBLESHOOTING

11.4 When alarm or warning has occurred

POINT
<ul style="list-style-type: none"> Configure up a circuit which will detect the trouble (ALM) signal and turn off the servo-on (RYn0) at occurrence of an alarm.

11.4.1 Alarms and warning list

When a fault occurs during operation, the corresponding alarm or warning is displayed. If any alarm or warning has occurred, refer to section 11.4.2 or 11.4.3 and take the appropriate action. When an alarm occurs, ALM turns off.

After its cause has been removed, the alarm can be deactivated in any of the methods marked ○ in the alarm deactivation column.

	Display	Name	Alarm deactivation		
			Power OFF→ON	(Note3) MR Configurator parameter unit	(Note2) Alarm reset (RES)
Alarms	A10	Undervoltage	○	○	○
	A12	Memory error 1 (RAM)	○	○	○
	A13	Clock error	○	○	○
	A15	Memory error 2 (EEP-ROM)	○	○	○
	A16	Encoder error 1 (At power on)	○	○	○
	A17	Board error	○	○	○
	A19	Memory error 3 (Flash-ROM)	○	○	○
	A1A	Motor combination error	○	○	○
	A20	Encoder error 2	○	○	○
	A24	Main circuit error	○	○	○
	A25	Absolute position erase	○	○	○
	A30	Regenerative error	(Note 1) ○	(Note 1) ○	(Note 1) ○
	A31	Overspeed	○	○	○
	A32	Overcurrent	○	○	○
	A33	Overvoltage	○	○	○
	A35	Command pulse frequency alarm	○	○	○
	A37	Parameter error	○	○	○
	A45	Main circuit device overheat	(Note 1) ○	(Note 1) ○	(Note 1) ○
	A46	Servo motor overheat	(Note 1) ○	(Note 1) ○	(Note 1) ○
	A47	Cooling fan alarm	○	○	○
	A50	Overload 1	(Note 1) ○	(Note 1) ○	(Note 1) ○
	A51	Overload 2	(Note 1) ○	(Note 1) ○	(Note 1) ○
	A52	Error excessive	○	○	○
	A61	Operation alarm	○	○	○
	A8A	Serial communication time-out	○	○	○
	A8D	CC-Link alarm	○	○	○
	A8E	Serial communication error	○	○	○
	888	Watchdog	○	○	○

	Display	Name
Warnings	A90	Home positioning incomplete warning
	A92	Open battery cable warning
	A96	Home position setting error
	A98	Software limit warning
	A99	Stroke limit warning
	A9D	CC-Link warning 1
	A9E	CC-Link warning 2
	A9F	Battery warning
	AE0	Excessive regeneration warning
	AE1	Overload warning 1
	AE3	Absolute position counter warning
	AE6	Servo emergency stop warning
	AE8	Cooling fan speed reduction warning
	AE9	Main circuit off warning
	AEC	Overload warning 2
AED	Output watt excess warning	

Note 1. Deactivate the alarm about 30 minutes of cooling time after removing the cause of occurrence.

2. Turns on RY(n+1)A or RY(n+3)A.

3. Clicking the "Alarm reset" button on the "Alarm display" screen of MR Configurator allows an alarm to be deactivated. Pressing the "STOP RESET" key of the parameter unit allows an alarm to be deactivated.

11. TROUBLESHOOTING

11.4.2 Remedies for alarms



CAUTION

- When any alarm has occurred, eliminate its cause, ensure safety, then reset the alarm, and restart operation. Otherwise, injury may occur.
- If an absolute position erase (A25) occurred, always make home position setting again. Not doing so may cause unexpected operation.
- As soon as an alarm occurs, turn off Servo-on (RYn0) and power off.

POINT

- When any of the following alarms has occurred, do not deactivate the alarm and resume operation repeatedly. To do so will cause the servo amplifier/servo motor to fail. Remove the cause of occurrence, and leave a cooling time of more than 30 minutes before resuming operation.
 - Regenerative error (A30)
 - Overload 1 (A50)
 - Overload 2 (A51)
- For the alarm deactivation method, refer to section 11.4.1.

When an alarm occurs, the trouble (ALM) switches off and the dynamic brake is operated to stop the servo motor. At this time, the display indicates the alarm No.

The servo motor comes to a stop. Remove the cause of the alarm in accordance with this section. Use the MR Configurator to refer to a factor of alarm occurrence.

Display	Name	Definition	Cause	Action
A10	Undervoltage	Power supply voltage dropped. MR-J3-□T: 160VAC or less MR-J3-□T1: 83VAC or less MR-J3-□T4: 280VAC or less	1. Power supply voltage is low.	Check the power supply.
			2. There was an instantaneous control power failure of 60ms or longer.	
			3. Shortage of power supply capacity caused the power supply voltage to drop at start, etc.	
			4. The bus voltage dropped to the following value or less. MR-J3-□T: 200VDC MR-J3-□T1: 158VDC MR-J3-□T4: 380VDC	
			5. Faulty parts in the servo amplifier.	Change the servo amplifier.
			Checking method Alarm (A10) occurs if power is switched on after disconnection of all cables but the control circuit power supply cables.	
A12	Memory error 1 (RAM)	RAM, memory fault	Faulty parts in the servo amplifier.	Change the servo amplifier.
A13	Clock error	Printed board fault	Checking method Alarm (any of A12 and A13) occurs if power is switched on after disconnection of all cables but the control circuit power supply cables.	

11. TROUBLESHOOTING

Display	Name	Definition	Cause	Action
A15	Memory error 2 (EEP-ROM)	EEP-ROM fault	1. Faulty parts in the servo amplifier <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 5px auto;"> Checking method Alarm (A15) occurs if power is switched on after disconnection of all cables but the control circuit power supply cables. </div>	Change the servo amplifier.
			2. The number of write times to EEPROM exceeded 100,000.	
A16	Encoder error 1 (At power on)	Communication error occurred between encoder and servo amplifier.	1. Encoder connector (CN2) disconnected.	Connect correctly.
			2. Encoder fault	Change the servo motor.
			3. Encoder cable faulty (Wire breakage or shorted)	Repair or change the cable.
			4. Encoder cable type (2-wire, 4-wire) selection was wrong in parameter setting.	Correct the setting in the fourth digit of parameter No.PC22.
A17	Board error	CPU/parts fault	Faulty parts in the servo amplifier	Change the servo amplifier.
A19	Memory error 3 (Flash ROM)	ROM memory fault	<div style="border: 1px solid black; padding: 5px; width: fit-content;"> Checking method Alarm (A17 or A19) occurs if power is switched on after disconnection of all cables but the control circuit power supply cable. </div>	
A1A	Motor combination error	Wrong combination of servo amplifier and servo motor.	Wrong combination of servo amplifier and servo motor connected.	Use correct combination.
A20	Encoder error 2	Communication error occurred between encoder and servo amplifier.	1. Encoder connector (CN2) disconnected.	Connect correctly.
			2. Encoder cable faulty (Wire breakage or shorted)	Repair or change the cable.
			3. Encoder fault	Change the servo motor.
A24	Main circuit error	Ground fault occurred at the servo motor power (U,V and W phases) of the servo amplifier.	1. Power input wires and servo motor power wires are in contact.	Connect correctly.
			2. Sheathes of servo motor power cables deteriorated, resulting in ground fault.	Change the cable.
			3. Main circuit of servo amplifier failed. <div style="border: 1px solid black; padding: 5px; width: fit-content;"> Checking method Alarm (A24) occurs if the servo is switched on after disconnecting the U, V, W power cables from the servo amplifier. </div>	Change the servo amplifier.
A25	Absolute position erase	Absolute position data in error	1. Voltage drop in encoder (Battery disconnected.)	After leaving the alarm occurring for a few minutes, switch power off, then on again. Always make home position setting again.
			2. Battery voltage low	Change the battery.
			3. Battery cable or battery is faulty.	Always make home position setting again.
		Power was switched on for the first time in the absolute position detection system.	4. Home position not set.	After leaving the alarm occurring for a few minutes, switch power off, then on again. Always make home position setting again.

11. TROUBLESHOOTING

Display	Name	Definition	Cause	Action
A30	Regenerative error	Permissible regenerative power of the built-in regenerative resistor or regenerative option is exceeded.	1. Wrong setting of parameter No. PA02	Set correctly.
			2. Built-in regenerative resistor or regenerative option is not connected.	Connect correctly
			3. High-duty operation or continuous regenerative operation caused the permissible regenerative power of the regenerative option to be exceeded. <div style="border: 1px solid black; padding: 5px; width: fit-content;"> Checking method Call the status display and check the regenerative load ratio. </div>	1. Reduce the frequency of positioning. 2. Use the regenerative option of larger capacity. 3. Reduce the load.
			4. Power supply voltage is abnormal. MR-J3-□T:260VAC or more MR-J3-□T1:More than 135VAC	Check the power supply
			5. Built-in regenerative resistor or regenerative option faulty.	Change the servo amplifier or regenerative option.
	Regenerative transistor fault	6. Regenerative transistor faulty. <div style="border: 1px solid black; padding: 5px; width: fit-content;"> Checking method 1) The regenerative option has overheated abnormally. 2) The alarm occurs even after removal of the built-in regenerative resistor or regenerative option. </div>	Change the servo amplifier.	
A31	Overspeed	Speed has exceeded the instantaneous permissible speed.	1. Input command pulse frequency exceeded the permissible instantaneous speed frequency.	Set command pulses correctly.
			2. Small acceleration/deceleration time constant caused overshoot to be large.	Increase acceleration/deceleration time constant.
			3. Servo system is instable to cause overshoot.	1. Re-set servo gain to proper value. 2. If servo gain cannot be set to proper value. 1) Reduce load inertia moment ratio; or 2) Reexamine acceleration/ deceleration time constant.
			4. Electronic gear ratio is large (parameters No.PA06, PA07)	Set correctly.
			5. Encoder faulty.	Change the servo motor.

11. TROUBLESHOOTING

Display	Name	Definition	Cause	Action
A32	Overcurrent	Current that flew is higher than the permissible current of the servo amplifier. (If the alarm (A32) occurs again when turning ON the servo after resetting the alarm by turning OFF/ON the power when the alarm (A32) first occurred, the transistor (IPM, IGBT) of the servo amplifier may be at fault. In the case, do not repeat to turn OFF/ON the power. Check the transistor with the checking method of "Cause 2".)	1. Short occurred in servo motor power (U, V, W).	Correct the wiring.
			2. Transistor (IPM, IGBT) of the servo amplifier faulty. <div style="border: 1px solid black; padding: 5px; margin: 5px 0;">Checking method Alarm (A32) occurs if power is switched on after U,V and W are disconnected.</div>	Change the servo amplifier.
			3. Ground fault occurred in servo motor power (U, V, W).	Correct the wiring.
			4. External noise caused the overcurrent detection circuit to misoperate.	Take noise suppression measures.
A33	Overvoltage	The following shows the input value of converter bus voltage. MR-J3-□T(1): 400VDC or more MR-J3-□T4: 800VDC or more	1. Regenerative option is not used.	Use the regenerative option.
			2. Though the regenerative option is used, the parameter No.PA02 setting is "□□00 (not used)".	Set correctly.
			3. Lead of built-in regenerative resistor or regenerative option is open or disconnected.	1. Change the lead. 2. Connect correctly.
			4. Regenerative transistor faulty.	Change the servo amplifier
			5. Wire breakage of built-in regenerative resistor or regenerative option.	1. For wire breakage of built-in regenerative resistor, change the servo amplifier. 2. For wire breakage of regenerative option, change the regenerative option.
			6. Capacity of built-in regenerative resistor or regenerative option is insufficient.	Add regenerative option or increase capacity.
			7. Power supply voltage high.	Check the power supply.
			8. Ground fault occurred in servo motor power (U, V, W).	Correct the wiring.
			9. The jumper across BUE-SD of the FR-BU2 brake unit is removed.	Fit the jumper across BUE-SD.
A35	Command pulse frequency error	Input pulse frequency of the command pulse is too high.	1. Pulse frequency of the manual pulse generator is too high.	Change the pulse frequency to a proper value.
			2. Noise entered the pulses of the manual pulse generator.	Take action against noise.
			3. Manual pulse generator failure.	Change the manual pulse generator.

11. TROUBLESHOOTING

Display	Name	Definition	Cause	Action
A37	Parameter error	Parameter setting is wrong.	1. Servo amplifier fault caused the parameter setting to be rewritten.	Change the servo amplifier.
			2. Regenerative option not used with servo amplifier was selected in parameter No.PA02.	Set parameter No.PA02 correctly.
			3. Value outside setting range has been set in electronic gear.	Set parameters No.PA06, PA07 correctly.
			4. Opposite sign has been set in software limit increasing side (parameters No.PC31, PC32). Similarly, opposite sign has been set in software limit decreasing side (parameters No.PC33, PC34).	Set parameters No.PC31 to PC34 correctly.
			5. Opposite sign has been set in position range output address increasing side (parameters No. PC37, PC38). Similarly, opposite sign has been set in position range output address decreasing side (parameters No.PC39, PC40).	Set parameters No.PC37 to PC40 correctly.
			6. The number of write times to EEPROM exceeded 100,000 due to parameter write, etc.	Change the servo amplifier.
			7. The torque limit switching dog system or torque limit switching data set system is selected for home position return in the point table positioning operation. (Parameter No.PC02)	These home position return types cannot be used. Set the parameter No.PC02 correctly.
			Point table setting is wrong.	8. Setting value is out of the setting range.	Set it correctly.
A45	Main circuit device overheat	Main circuit device overheat.	1. Servo amplifier faulty.	Change the servo amplifier.
			2. The power supply was turned on and off continuously by overloaded status.	The drive method is reviewed.
			3. Ambient temperature of servo motor is over 55°C (131°F).	Check environment so that ambient temperature is 0 to 55°C (32 to 131°F).
			4. Used beyond the specifications of close mounting.	Use within the range of specifications.
A46	Servo motor overheat	Servo motor temperature rise actuated the thermal sensor.	1. Ambient temperature of servo motor is over 40°C (104°F).	Check environment so that ambient temperature is 0 to 40°C (32 to 104°F).
			2. Servo motor is overloaded.	1. Reduce load. 2. Check operation pattern. 3. Use servo motor that provides larger output.
			3. Thermal sensor in encoder is faulty.	Change the servo motor.
A47	Cooling fan alarm	The cooling fan of the servo amplifier stopped, or its speed decreased to or below the alarm level.	1. Cooling fan life expiration (Refer to section 2.5.)	Change the cooling fan of the servo amplifier.
			2. Foreign matter caught in the cooling fan stopped rotation.	Remove the foreign matter.
			3. The power supply of the cooling fan failed.	Change the servo amplifier.

11. TROUBLESHOOTING

Display	Name	Definition	Cause	Action
A50	Overload 1	Load exceeded overload protection characteristic of servo amplifier.	1. Servo amplifier is used in excess of its continuous output current.	1. Reduce load. 2. Check operation pattern. 3. Use servo motor that provides larger output.
			2. Servo system is instable and hunting.	1. Repeat acceleration/deceleration to execute auto tuning. 2. Change auto tuning response setting. 3. Set auto tuning to OFF and make gain adjustment manually.
			3. Machine struck something.	1. Check operation pattern. 2. Install limit switches.
			4. Wrong connection of servo motor. Servo amplifier's output terminals U, V, W do not match servo motor's input terminals U, V, W.	Connect correctly.
			5. Encoder faulty. <div style="border: 1px solid black; padding: 5px; width: fit-content;"> <p style="text-align: center;">Checking method</p> <p>When the servo motor shaft is rotated with the servo off, the cumulative feedback pulses do not vary in proportion to the rotary angle of the shaft but the indication skips or returns midway.</p> </div>	Change the servo motor.
			6. After Overload 2 (A51) occurred, turn OFF/ON the power supply to clear the alarm. Then the overload operation is repeated.	1. Reduce load. 2. Check operation pattern. 3. Use servo motor that provides larger output.
A51	Overload 2	Machine collision or the like caused max. For the time of the alarm occurrence, refer to the section 13.1.	1. Machine struck something.	1. Check operation pattern. 2. Install limit switches.
			2. Wrong connection of servo motor. Servo amplifier's output terminals U, V, W do not match servo motor's input terminals U, V, W.	Connect correctly.
			3. Servo system is instable and hunting.	1. Repeat acceleration/deceleration to execute auto tuning. 2. Change auto tuning response setting. 3. Set auto tuning to OFF and make gain adjustment manually.
			4. Encoder faulty. <div style="border: 1px solid black; padding: 5px; width: fit-content;"> <p style="text-align: center;">Checking method</p> <p>When the servo motor shaft is rotated with the servo off, the cumulative feedback pulses do not vary in proportion to the rotary angle of the shaft but the indication skips or returns midway.</p> </div>	Change the servo motor.

11. TROUBLESHOOTING

Display	Name	Definition	Cause	Action
A52	Error excessive	The difference between the model position and the actual servo motor position exceeds three rotations. (Refer to the function block diagram in section 1.1.2.)	1. Acceleration/deceleration time constant is too small.	Increase the acceleration/deceleration time constant.
			2. Forward rotation torque limit (parameter No.PA11) or reverse rotation torque limit (parameter No.PA12) are too small.	Increase the torque limit value.
			3. Motor cannot be started due to torque shortage caused by power supply voltage drop.	1. Check the power supply capacity. 2. Use servo motor which provides larger output.
			4. Position loop gain (parameter No.PB08) value is small.	Increase set value and adjust to ensure proper operation.
			5. Servo motor shaft was rotated by external force.	1. When torque is limited, increase the limit value. 2. Reduce load. 3. Use servo motor that provides larger output.
			6. Machine struck something.	1. Check operation pattern. 2. Install limit switches.
			7. Encoder faulty.	Change the servo motor.
			8. Wrong connection of servo motor. Servo amplifier's output terminals U, V, W do not match servo motor's input terminals U, V, W.	Connect correctly.
A61	Operation alarm	Setting mistake of auxiliary function.	"1" or "3" is set for the auxiliary function of point table No.255.	Set "0" or "2" for the value of auxiliary function.
A8A	Serial communication time-out error	Communication stopped for longer than the specified time.	1. Communication cable breakage.	Repair or change the communication cable.
			2. Communication cycle longer than regulated time.	Shorten the communication cycle.
			3. Wrong protocol.	Correct protocol.
A8D	CC-Link alarm	Normal communication with the master station cannot be made.	1. The station number switch (STATION NO.) setting is 0 or not less than 65.	Set the station number to within the range 1 to 64, and switch power on.
			2. The baud rate switch (MODE) setting is outside the range 0 to 4.	Set the baud rate switch (MODE) to within the range 0 to 4.
			3. The transmission status is abnormal.	Reexamine the wiring.
			4. CC-Link twisted cable wiring incorrect.	1. Repair or change the CC-Link twisted cable. 2. Connect the cable or connector correctly.
			5. CC-Link twisted cable faulty.	
			6. The CC-Link connector has come off.	Connect the terminating resistor correctly.
			7. The terminating resistor is not connected.	
			8. Noise entered the CC-Link twisted cable.	
			9. The programmable controller CC-Link unit was reset.	
A8E	Serial communication error	Serial communication error occurred between servo amplifier and communication device (e.g. personal computer).	1. Communication cable fault (Open cable or short circuit).	Repair or change the cable.
			2. Communication device (e.g. personal computer) faulty.	Change the communication device (e.g. personal computer).

11. TROUBLESHOOTING

Display	Name	Definition	Cause	Action
(Note) 888	Watchdog	CPU, parts faulty.	Fault of parts in servo amplifier. <div style="border: 1px solid black; padding: 5px; width: fit-content;"> Checking method Alarm (888) occurs if power is switched on after disconnection of all cables but the control circuit power supply cable. </div>	Change the servo amplifier.

Note. At power-on, "888" appears instantaneously, but it is not an error.

11.4.3 Remedies for warnings



- If an absolute position counter warning (AE3) occurred, always make home position setting again. Not doing so may cause unexpected operation.

POINT

- When any of the following alarms has occurred, do not resume operation by switching power of the servo amplifier OFF/ON repeatedly. The servo amplifier and servo motor may become faulty. If the power of the servo amplifier is switched OFF/ON during the alarms, allow more than 30 minutes for cooling before resuming operation.
 - Excessive regenerative warning (AE0)
 - Overload warning 1 (AE1)

If AE6 occur, the servo off status is established. If any other warning occurs, operation can be continued but an alarm may take place or proper operation may not be performed.

Remove the cause of warning according to this section. Use the MR Configurator to refer to a factor of warning occurrence.

Display	Name	Definition	Cause	Action	
A90	Home position return incomplete	In incremental system	Positioning operation was performed without home position return.	1. Positioning operation was performed without home position return.	Perform home position return.
			Home position return ended abnormally.	2. Home position return speed could not be decreased to creep speed. 3. Limit switch was actuated during home position return starting at other than position beyond dog.	Check home position return speed/creep speed/moving distance after proximity dog.
		In absolute position detection system	Positioning operation was performed without home position setting.	1. Positioning operation was performed without home position setting.	Perform home position setting.
			Home position setting ended abnormally.	2. Home position setting speed could not be decreased to creep speed. 3. Limit switch was actuated during home position setting starting at other than position beyond dog.	Check home position setting speed/creep speed/moving distance after proximity dog.
			Operation was performed without making home position setting while an absolute position erase (A25) is being occurred.	4. Voltage drop in encoder (Battery disconnected.)	After leaving the alarm occurring for a few minutes, switch power off, then on again. Always make home position setting again.
				5. Battery voltage low	Change the battery.
6. Battery cable or battery is faulty.	Always make home position setting again.				

11. TROUBLESHOOTING

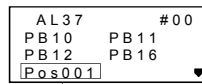
Display	Name	Definition	Cause	Action
A92	Open battery cable warning	Absolute position detection system battery voltage is low.	1. Battery cable is open.	Repair cable or changed.
			2. Battery voltage supplied from the servo amplifier to the encoder fell to about 3V or less. (Detected with the encoder)	Change the battery.
A96	Home position setting warning	Home position setting could not be made.	1. Droop pulses remaining are greater than the in-position range setting.	Remove the cause of droop pulse occurrence
			2. Command pulse entered after clearing of droop pulses.	Do not enter command pulse after clearing of droop pulses.
			3. Creep speed high.	Reduce creep speed.
A98	Software limit warning	Software limit set in parameter is reached.	1. Software limit was set within actual operation range.	Set parameter No.PC31 to PC34 correctly.
			2. Point table of position data in excess of software limit was executed.	Set point table correctly.
			3. Software limit was reached during JOG operation or manual pulse generator operation.	Perform operation within software limit range.
A99	Stroke limit warning	The limit switch become valid.	The stroke end (LSP or LSN) of the direction which gave instructions was turned off.	Reexamine the operation pattern to turn LSP/LSN ON.
A9D	CC-Link warning 1	The station number switch or baud rate switch position was changed from the setting at power-on.	1. The station number switch position was changed from the setting at power-on.	Return to the setting at power-on.
			2. The baud rate switch position was changed from the setting at power-on.	
			3. The occupied station count switch position was changed from the setting at power-on.	
A9E	CC-Link warning 2	Communication error of cable.	1. The transmission status is abnormal.	Take measures against noise.
			2. CC-Link twisted cable wiring incorrect.	1. Change the CC-Link twisted cable. 2. Connect the cable or connector correctly.
			3. CC-Link twisted cable faulty.	
			4. The CC-Link connector has come off.	Connect the terminating resistor correctly.
			5. The terminating resistor is not connected.	
			6. Noise entered the CC-Link twisted cable.	
A9F	Battery warning	Voltage of battery for absolute position detection system reduced.	Battery voltage fell to 3.2V or less. (Detected with the servo amplifier)	Change the battery.
AE0	Excessive regenerative warning	There is a possibility that regenerative power may exceed permissible regenerative power of built-in regenerative resistor or regenerative option.	Regenerative power increased to 85% or more of permissible regenerative power of built-in regenerative resistor or regenerative option. <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 5px auto;"> Checking method Call the status display and check regenerative load ratio. </div>	1. Reduce frequency of positioning. 2. Change the regenerative option for the one with larger capacity. 3. Reduce load.
AE1	Overload warning 1	There is a possibility that overload alarm 1 or 2 may occur.	Load increased to 85% or more of overload alarm 1 or 2 occurrence level. <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 5px auto;"> Cause, checking method Refer to A50, A51. </div>	Refer to A50, A51.
AE3	Absolute position counter warning	Absolute position encoder pulses faulty.	1. Noise entered the encoder.	Take noise suppression measures.
			2. Encoder faulty.	Change the servo motor.
		The multi-revolution counter value of the absolute position encoder exceeded the maximum revolution range.	3. The movement amount from the home position exceeded a 32767 rotation or 37268 rotation in succession.	Make home position setting again.
AE6	Servo forced stop warning	EMG is off.	External forced stop was made valid. (EMG was turned off.)	Ensure safety and deactivate forced stop.

11. TROUBLESHOOTING

Display	Name	Definition	Cause	Action
AE8	Cooling fan speed reduction warning	The speed of the servo amplifier decreased to or below the warning level. This warning is not displayed with MR-J3-70T/100T among servo amplifiers equipped with a cooling fan.	Cooling fan life expiration (Refer to section 2.5.)	Change the cooling fan of the servo amplifier.
			The power supply of the cooling fan is broken.	Change the servo amplifier.
AE9	Main circuit off warning	Servo-on (SON) was switched on with main circuit power off.		Switch on main circuit power.
AEC	Overload warning 2	Operation, in which a current exceeding the rating flow intensively in any of the U, V and W phases of the servo motor, was repeated.	During a stop, the status in which a current flew intensively in any of the U, V and W phases of the servo motor occurred repeatedly, exceeding the warning level.	<ol style="list-style-type: none"> 1. Reduce the positioning frequency at the specific positioning address. 2. Reduce the load. 3. Replace the servo amplifier/ servo motor with the one of larger capacity.
AED	Output watt excess warning	The status, in which the output wattage (speed × torque) of the servo motor exceeded the rated output, continued steadily.	Continuous operation was performed with the output wattage (speed × torque) of the servo motor exceeding 150% of the rated output.	<ol style="list-style-type: none"> 1. Reduce the servo motor speed. 2. Reduce the load.

11.5 Point table error

When a point table error occurs, the parameter error (A37) occurs. After the parameter No. of parameter error (A37), the point table error details are displayed.



Point table error details
For the point table No.1 position data error

P o s 0 0 1

Point table No. with error

Error item

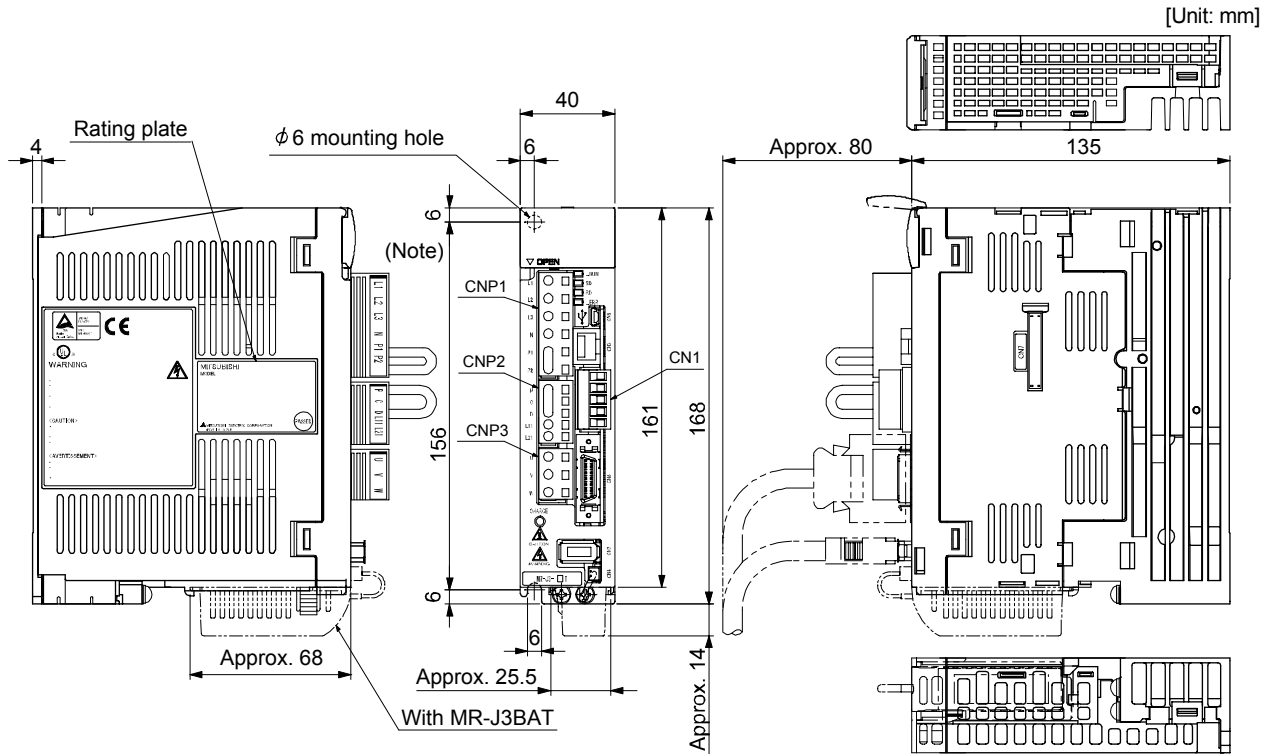
- Pos: position data
- Spd: speed
- Acc: acceleration time constant
- Dec: deceleration time constant
- Dwl: dwell
- Aux: auxiliary function

12. OUTLINE DRAWINGS

12. OUTLINE DRAWINGS

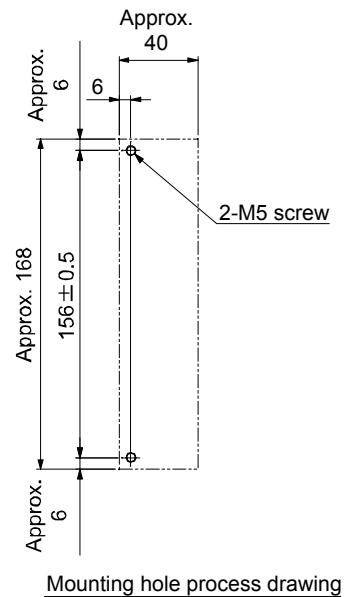
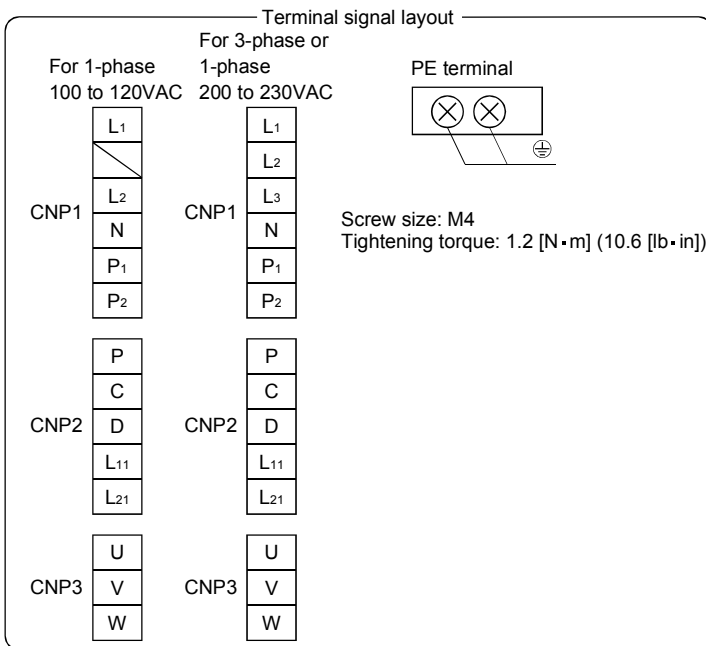
12.1 Servo amplifier

- (1) MR-J3-10T • MR-J3-20T
MR-J3-10T1 • MR-J3-20T1



Note. This data applies to the 3-phase or 1-phase 200 to 230VAC power supply models.
For a single-phase, 100 to 120VAC power supply, refer to the terminal signal layout.

Mass: 0.8 [kg] (1.76 [lb])

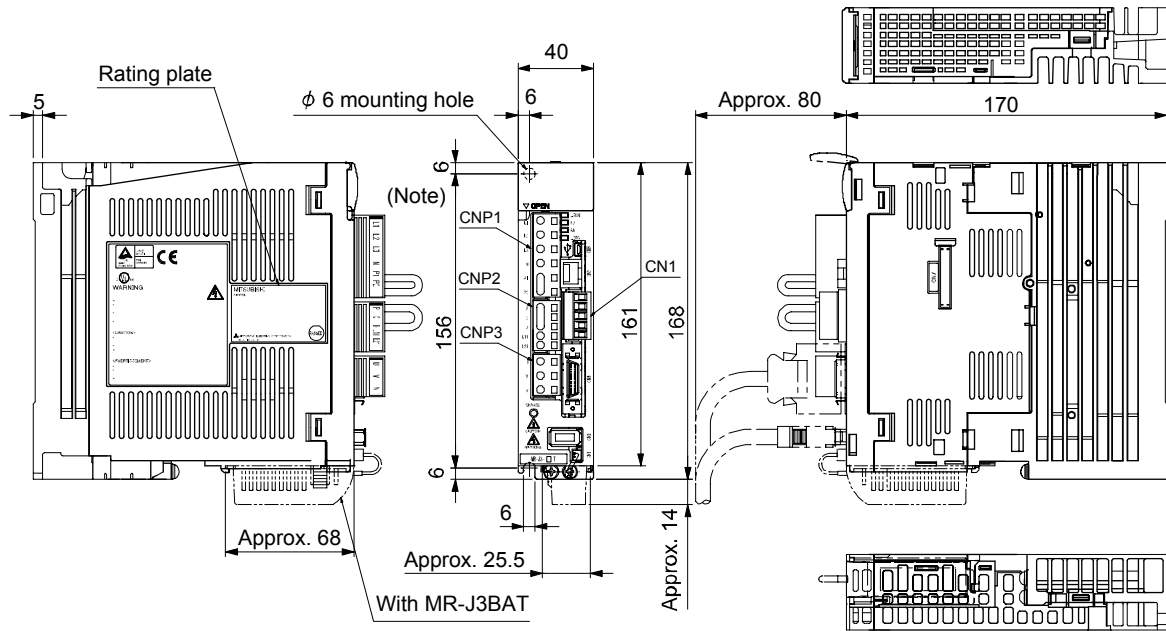


Mounting screw
Screw size: M5
Tightening torque: 3.24[N·m] (28.7[lb·in])

12. OUTLINE DRAWINGS

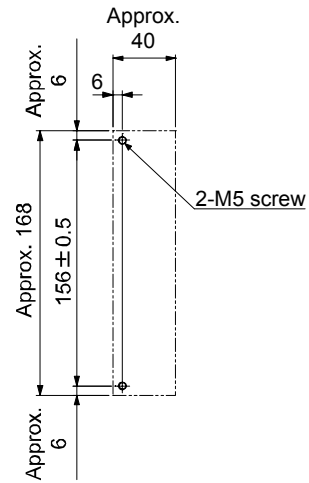
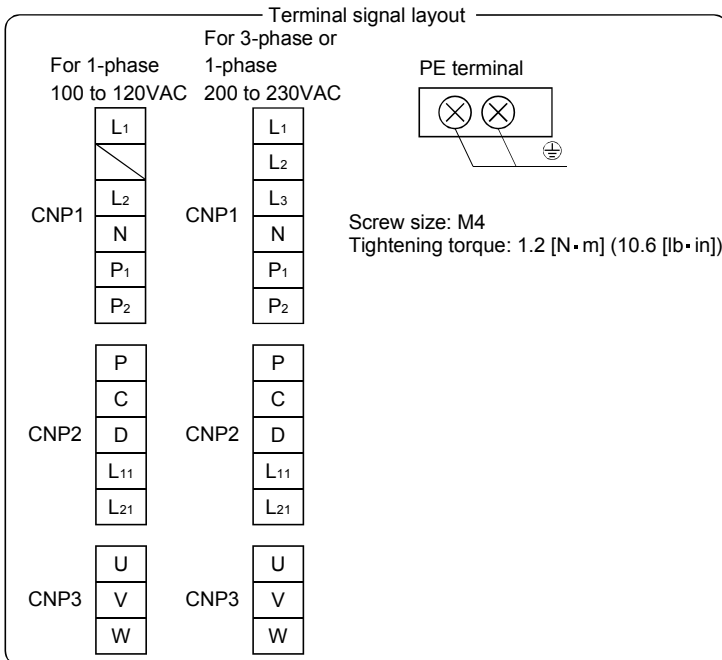
(2) MR-J3-40T · MR-J3-60T MR-J3-40T1

[Unit: mm]



Note. This data applies to the 3-phase or 1-phase 200 to 230VAC power supply models.
For a single-phase, 100 to 120VAC power supply, refer to the terminal signal layout.

Mass: 1.0 [kg] (2.21 [lb])



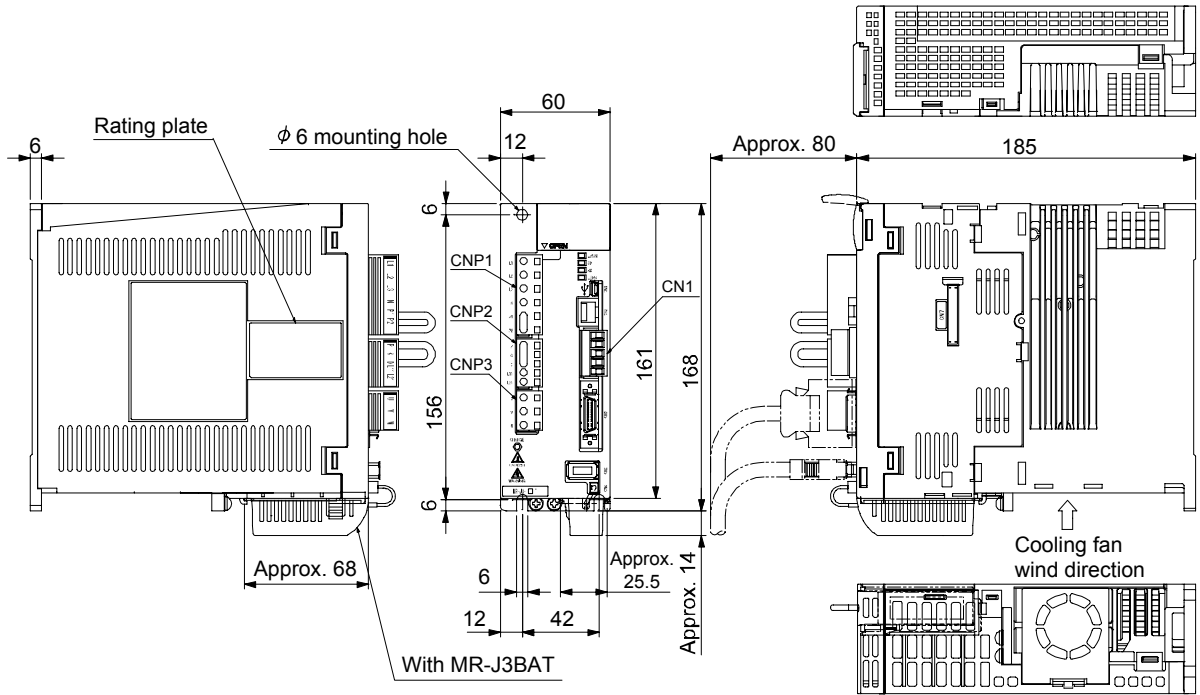
Mounting hole process drawing

Mounting screw
Screw size: M5
Tightening torque: 3.24[N·m] (28.7[lb·in])

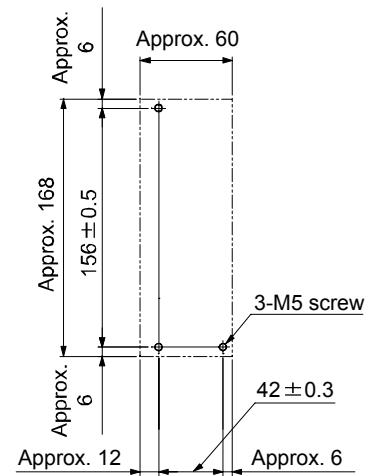
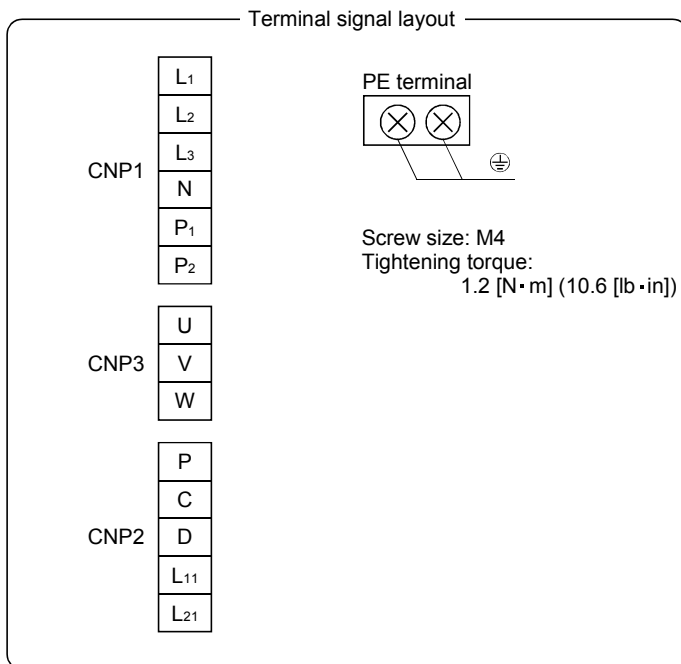
12. OUTLINE DRAWINGS

(3) MR-J3-70T · MR-J3-100T

[Unit: mm]



Mass: 1.4 [kg] (3.09 [lb])



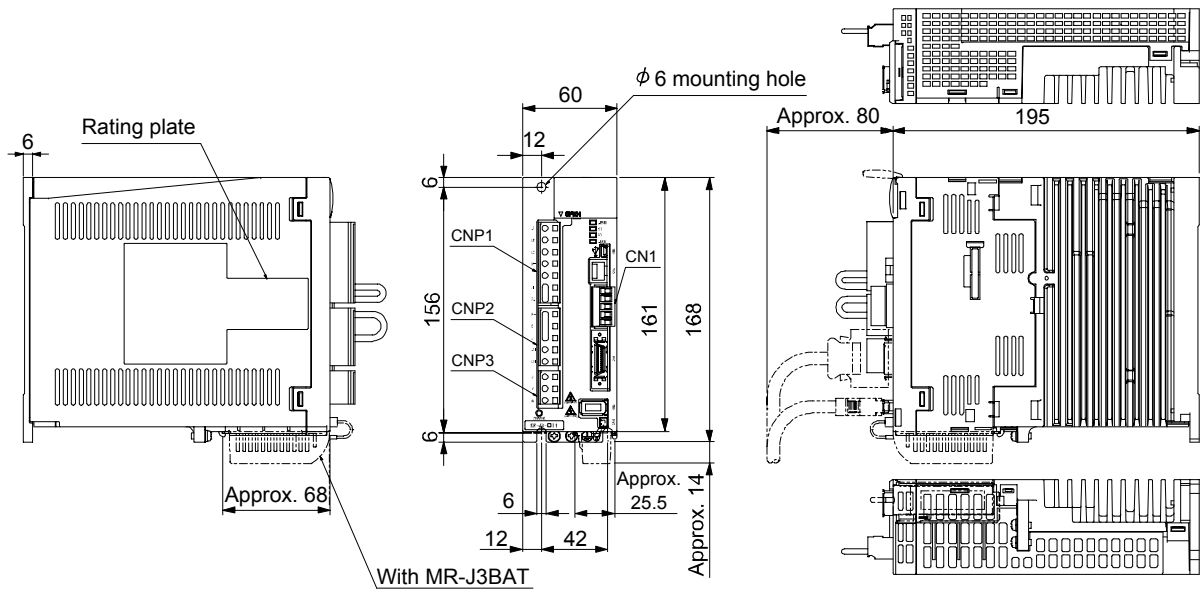
Mounting hole process drawing

Mounting screw
Screw size: M5
Tightening torque: 3.24[N·m] (28.7[lb·in])

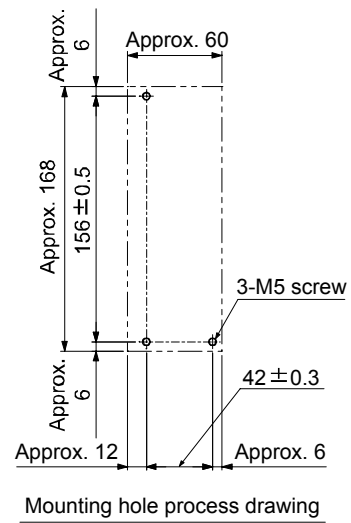
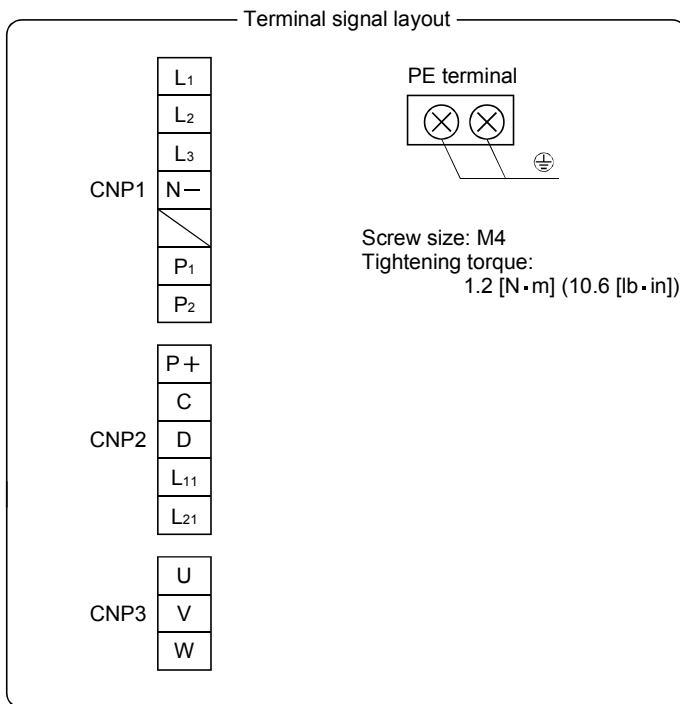
12. OUTLINE DRAWINGS

(4) MR-J3-60T4 • MR-J3-100T4

[Unit: mm]



Mass: 1.4 [kg] (3.09 [lb])

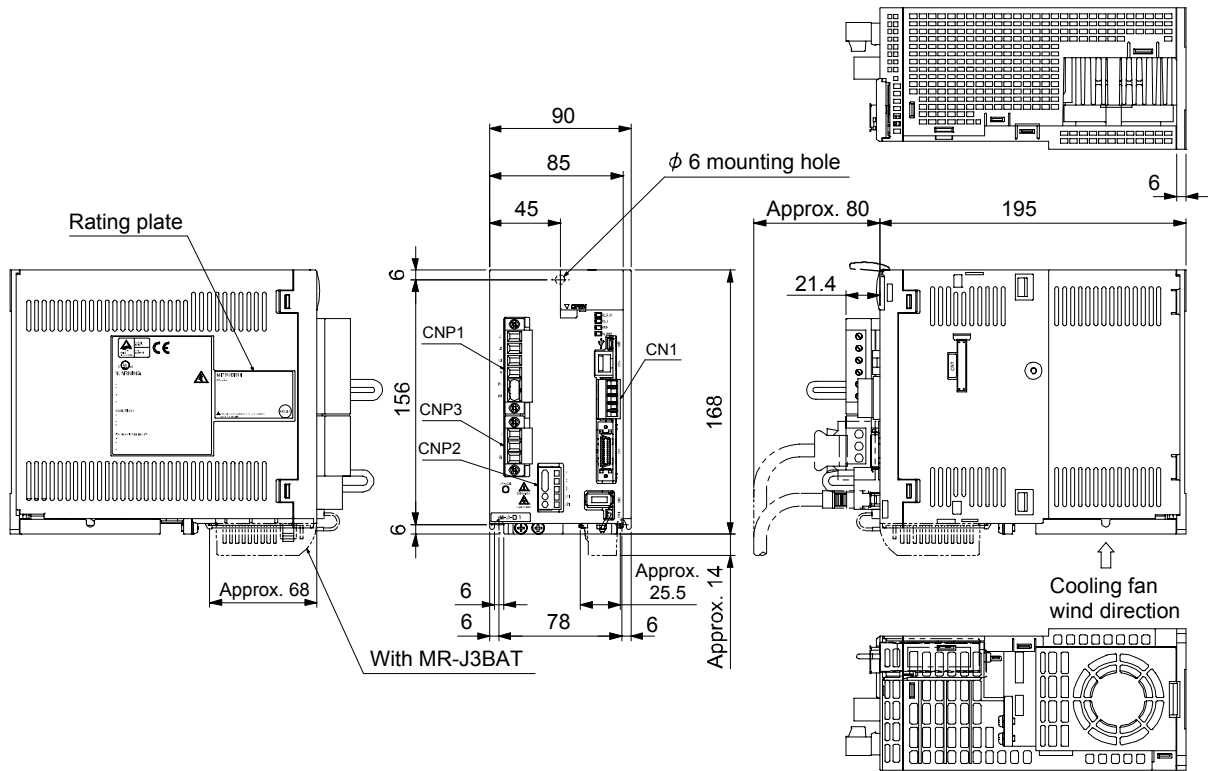


Mounting screw
Screw size: M5
Tightening torque: 3.24 [N·m] (28.7 [lb·in])

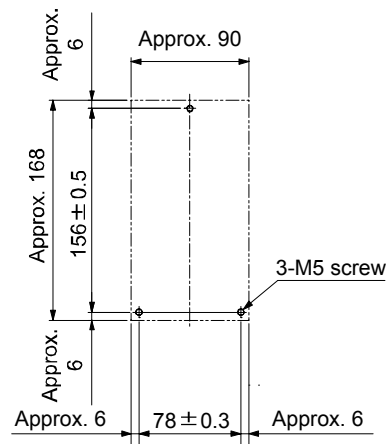
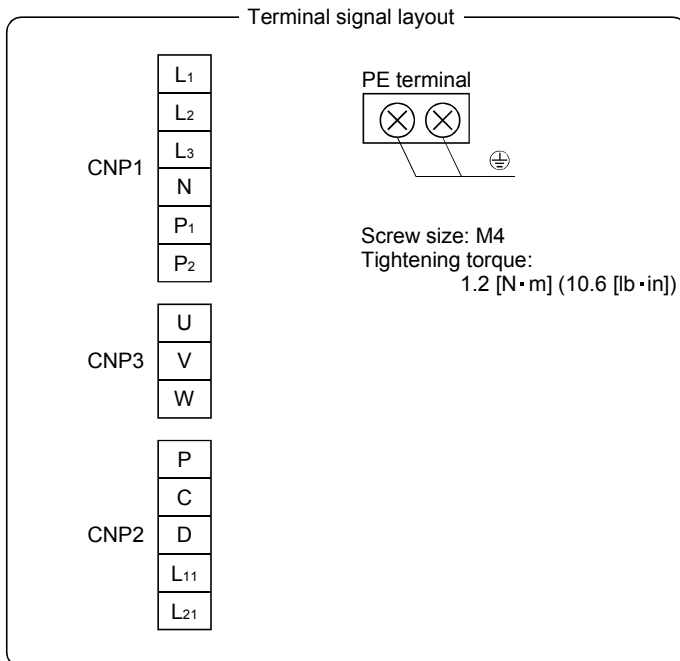
12. OUTLINE DRAWINGS

(6) MR-J3-350T

[Unit: mm]



Mass: 2.3 [kg] (5.07 [lb])



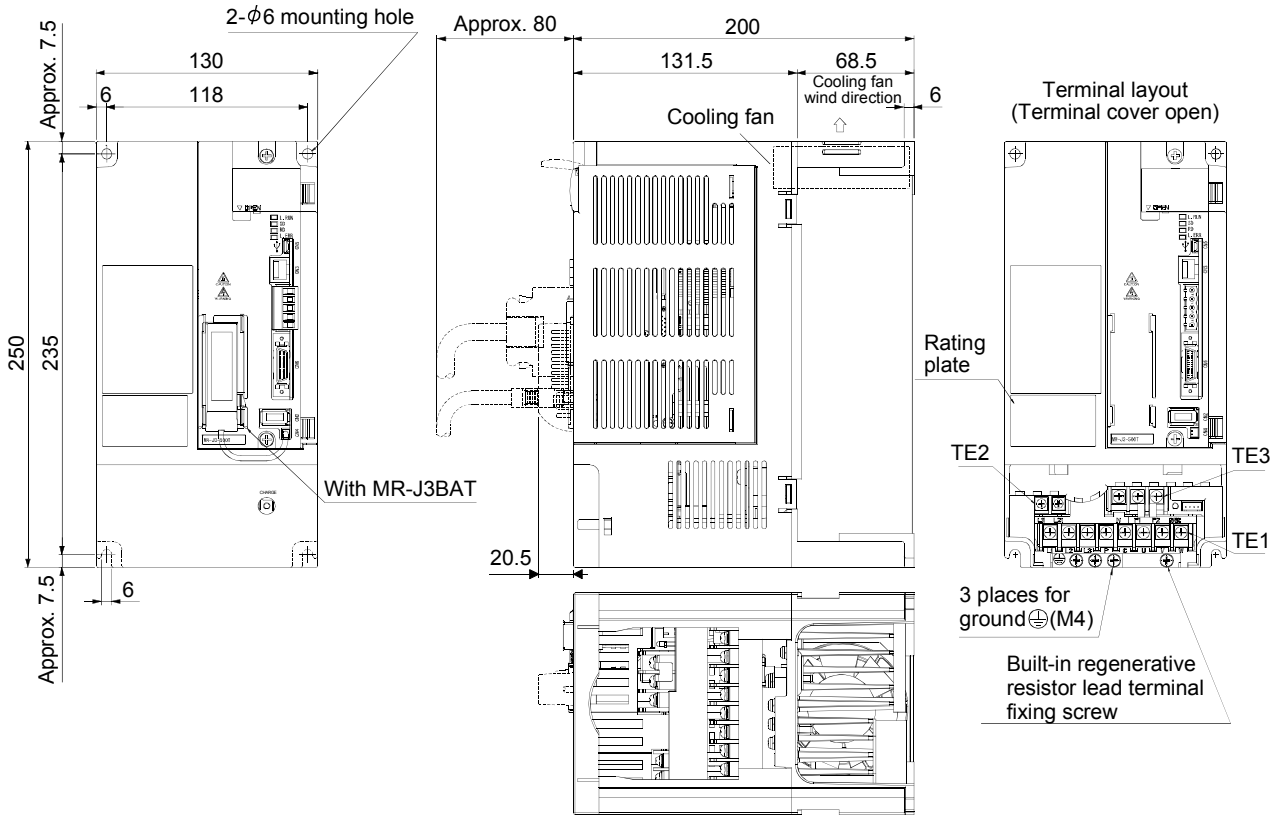
Mounting hole process drawing

Mounting screw
Screw size: M5
Tightening torque: 3.24[N·m] (28.7[lb·in])

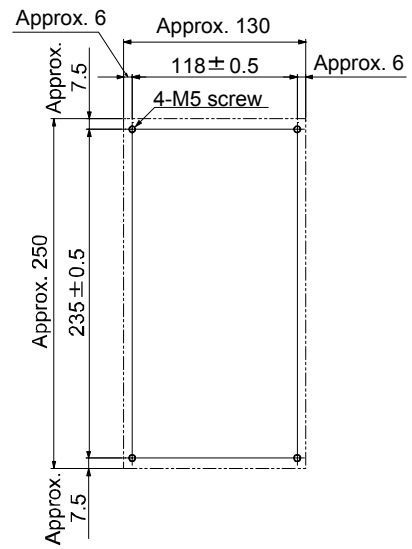
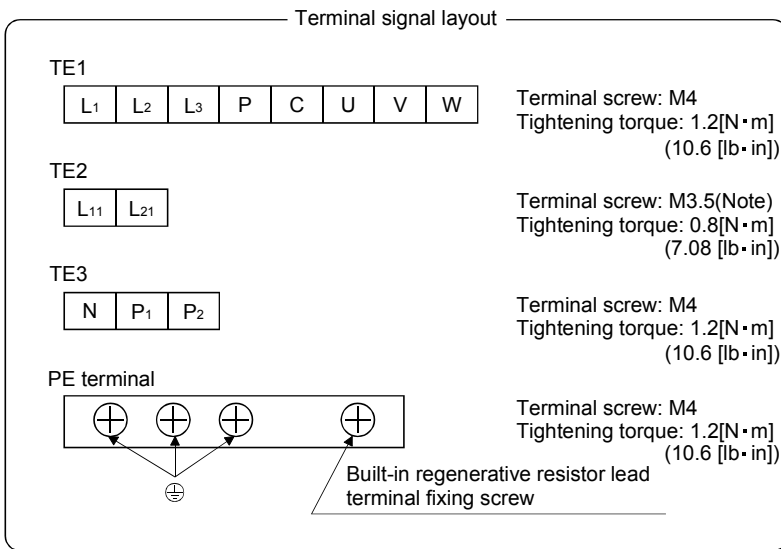
12. OUTLINE DRAWINGS

(7) MR-J3-350T4 · MR-J3-500T(4)

[Unit: mm]



Mass: 4.6 [kg] (10.1 [lb])



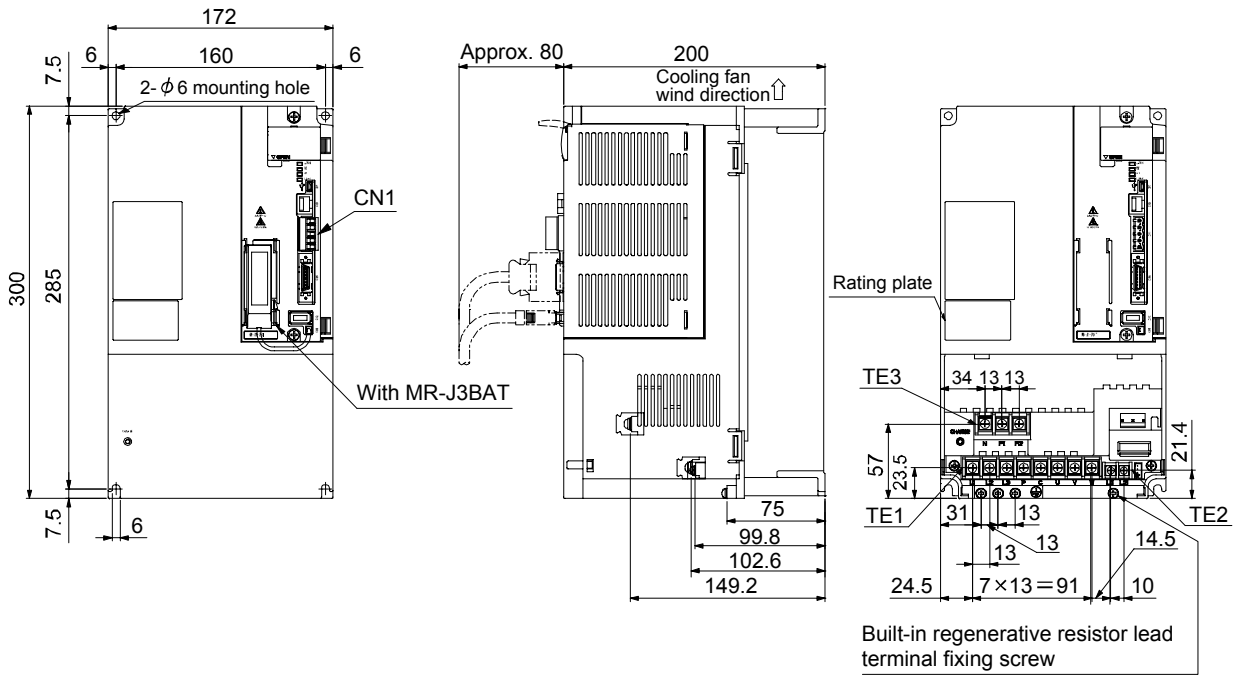
Note. Screw size is M3.5 for the control circuit terminal block (TE2) of the servo amplifier manufactured in April 2007 or later. Screw size is M3 for the control terminal block (TE2) of the servo amplifier manufactured in March 2007 or earlier.

Mounting screw
Screw size: M5
Tightening torque: 3.24[N·m] (28.7[lb·in])

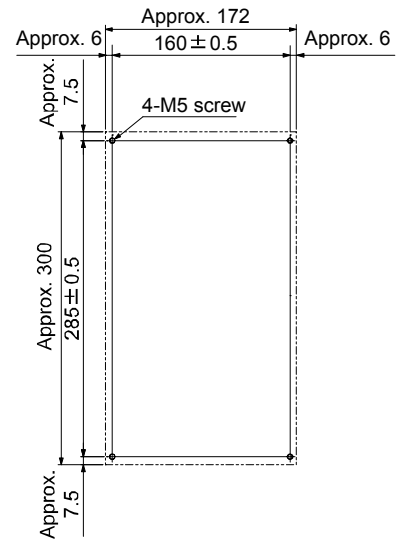
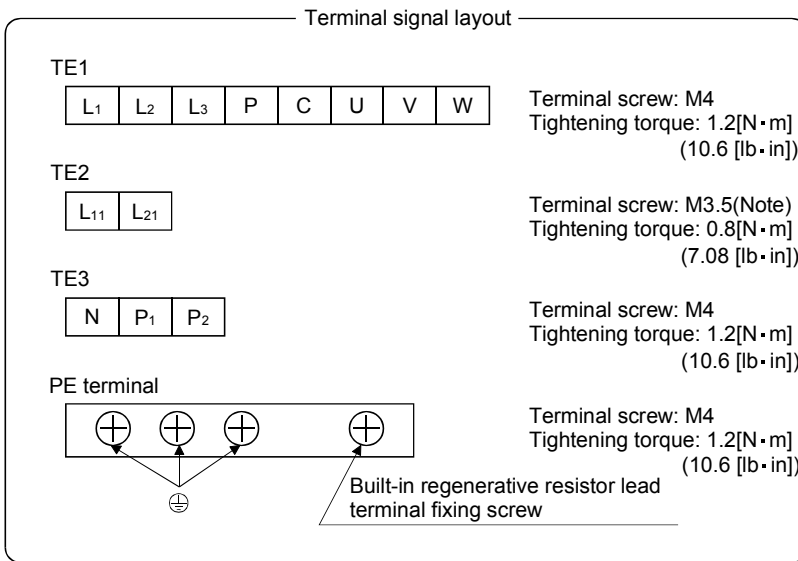
12. OUTLINE DRAWINGS

(8) MR-J3-700T(4)

[Unit: mm]



Mass: 6.2 [kg] (13.7[lb])



Mounting hole process drawing

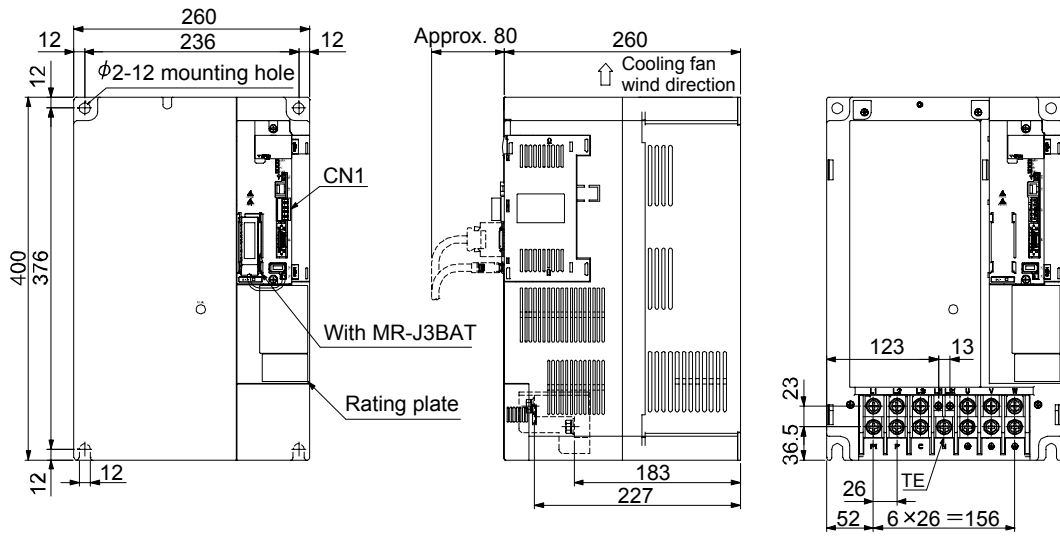
Note. Screw size is M3.5 for the control circuit terminal block (TE2) of the servo amplifier manufactured in April 2007 or later. Screw size is M3 for the control terminal block (TE2) of the servo amplifier manufactured in March 2007 or earlier.

Mounting screw
Screw size: M5
Tightening torque: 3.24[N·m] (28.7[lb·in])

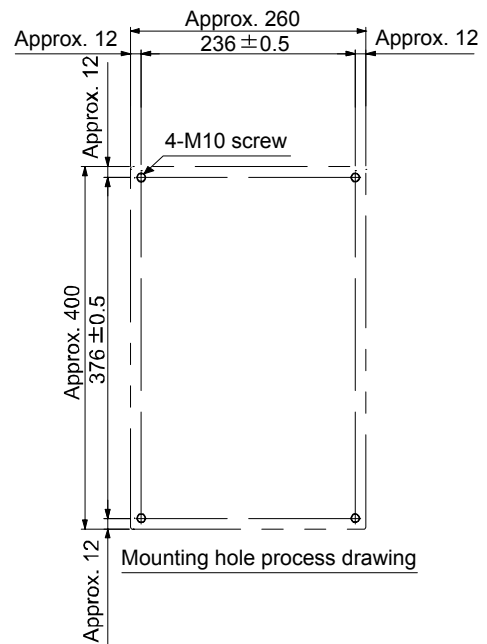
12. OUTLINE DRAWINGS

(9) MR-J3-11KT(4) to 22KT(4)

[Unit: mm]



Servo amplifier	Mass[kg]([lb])
MR-J3-11KT(4)	18.0(39.7)
MR-J3-15KT(4)	18.0(39.7)
MR-J3-22KT(4)	19.0(41.9)



Terminal signal layout

TE

L ₁	L ₂	L ₃	L ₁₁	L ₂₁	U	V	W
P ₁	P	C	N		\oplus	\oplus	\oplus

		L ₁ · L ₂ · L ₃ · U · V · W · P ₁ · P · C · N · \oplus	L ₁₁ · L ₂₁
MR-J3-11KT(4)	Screw size	M6	M4
	Tightening torque [(lb·in)][N·m]	3.0	1.2
MR-J3-15KT(4)	Screw size	M8	M4
	Tightening torque [(lb·in)][N·m]	6.0	1.2

Mounting screw

Servo amplifier	Screw size	Tightening torque [N·m]([lb·in])
MR-J3-11KT(4)	M10	26.5 (234.5)
MR-J3-15KT(4)		
MR-J3-22KT(4)		

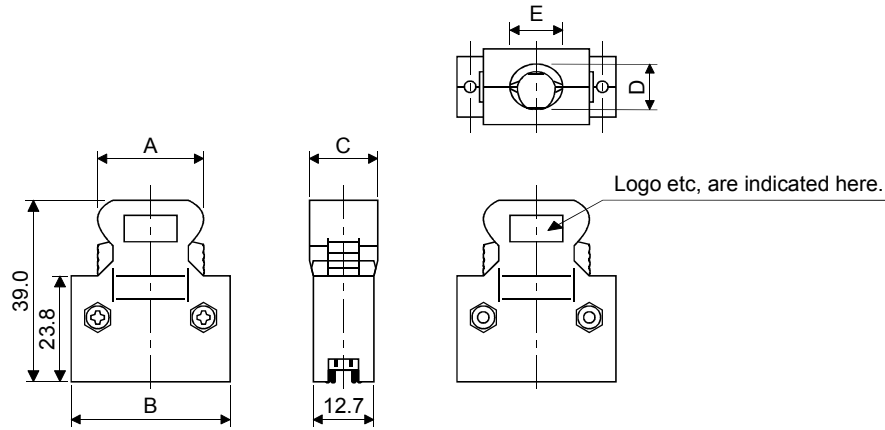
12. OUTLINE DRAWINGS

12.2 Connector

(1) Miniature delta ribbon (MDR) system (3M)

(a) One-touch lock type

[Unit: mm]

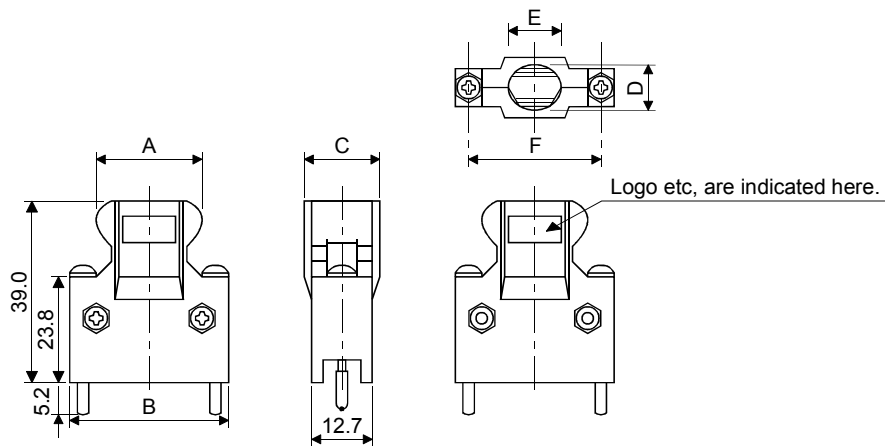


Connector	Shell kit	Each type of dimension				
		A	B	C	D	E
10150-3000PE	10350-52F0-008	41.1	52.4	18.0	14.0	17.0

(b) Jack screw M2.6 type

This is not available as option.

[Unit: mm]



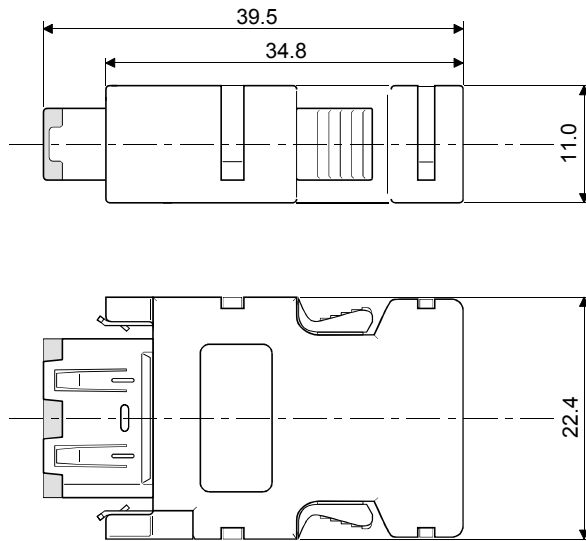
Connector	Shell kit	Each type of dimension					
		A	B	C	D	E	F
10150-3000PE	10350-52A0-008	41.1	52.4	18.0	14.0	17.0	46.5

12. OUTLINE DRAWINGS

(2) SCR connector system (3M)

Receptacle: 36210-0100PL

Shell kit : 36310-3200-008



13. CHARACTERISTICS

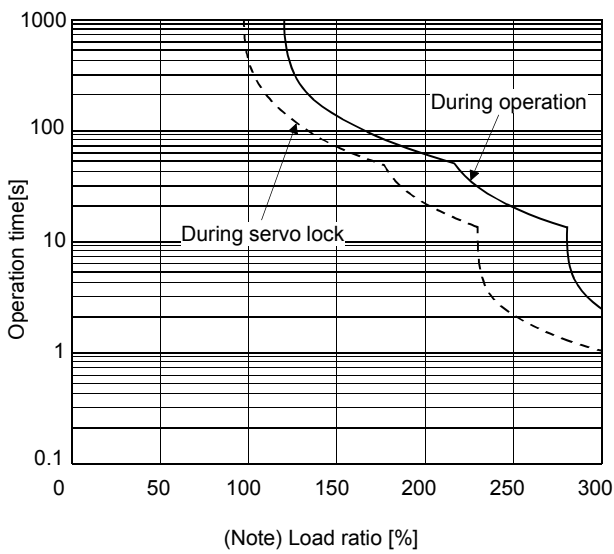
13. CHARACTERISTICS

13.1 Overload protection characteristics

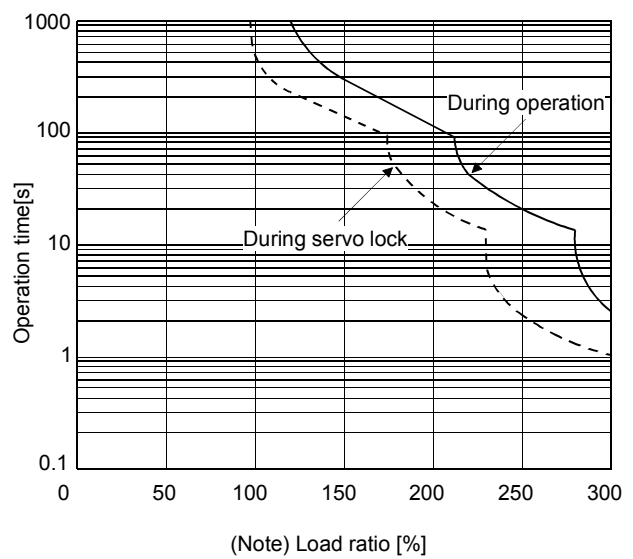
An electronic thermal relay is built in the servo amplifier to protect the servo motor and servo amplifier from overloads. Overload 1 alarm (A50) occurs if overload operation performed is above the electronic thermal relay protection curve shown in any of Figs 13.1. Overload 2 alarm (A51) occurs if the maximum current flow continuously for several seconds due to machine collision, etc. Use the equipment on the left-hand side area of the continuous or broken line in the graph.

In a machine like the one for vertical lift application where unbalanced torque will be produced, it is recommended to use the machine so that the unbalanced torque is 70% or less of the rated torque.

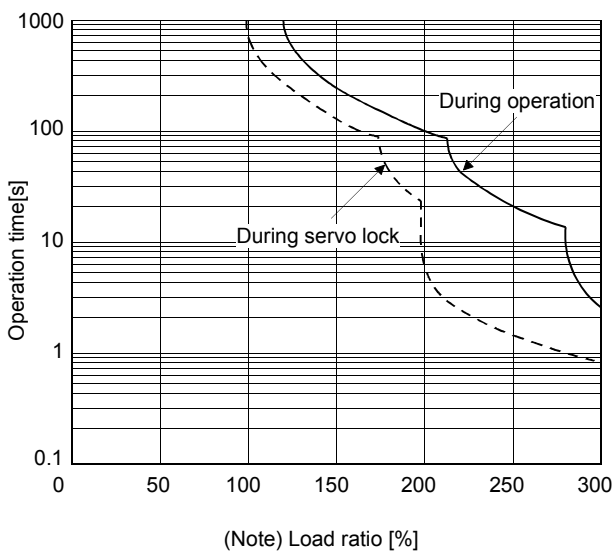
When you carry out adhesion mounting of the servo amplifier, make circumference temperature into 0 to 45°C (32 to 113°F), or use it at 75% or smaller effective load ratio.



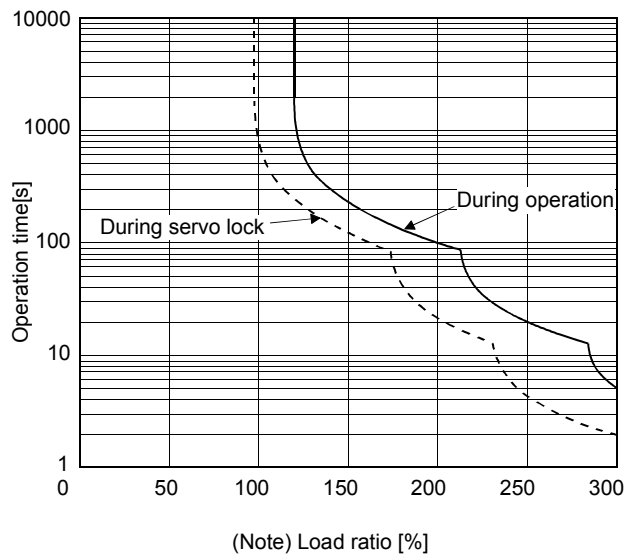
MR-J3-10T(1)



MR-J3-20T(1) • MR-J3-40T(1)
MR-J3-60T(4) to MR-J3-100T(4)

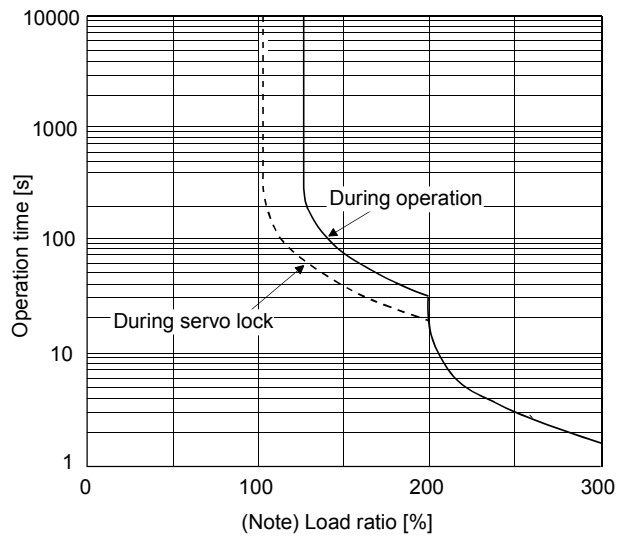


MR-J3-200T(4) • MR-J3-350T(4)



MR-J3-500T(4) • MR-J3-700T(4)

13 CHARACTERISTICS



MR-J3-11KT(4) to MR-J3-22KT(4)

Note. If operation that generates torque more than 100% of the rating is performed with an abnormally high frequency in a servo motor stop status (servo lock status) or in a 30r/min or less low-speed operation status, the servo amplifier may fail even when the electronic thermal relay protection is not activated.

Fig 13.1 Electronic thermal relay protection characteristics

13 CHARACTERISTICS

13.2 Power supply equipment capacity and generated loss

(1) Amount of heat generated by the servo amplifier

Table 13.1 indicates servo amplifiers' power supply capacities and losses generated under rated load. For thermal design of an enclosure, use the values in Table 13.1 in consideration for the worst operating conditions. The actual amount of generated heat will be intermediate between values at rated torque and servo off according to the duty used during operation. When the servo motor is run at less than the maximum speed, the power supply capacity will be smaller than the value in the table, but the servo amplifier's generated heat will not change.

Table 13.1 Power supply capacity and generated heat per servo amplifier at rated output

Servo amplifier	Servo motor	(Note 1) Power supply capacity [kVA]	(Note 2) Servo amplifier-generated heat[W]		Area required for heat dissipation [m ²]
			At rated torque	With servo off	
MR-J3-10T (1)	HF-MP053	0.3	25	15	0.5
	HF-MP13	0.3	25	15	0.5
	HF-KP053 · 13	0.3	25	15	0.5
MR-J3-20T (1)	HF-MP23	0.5	25	15	0.5
	HF-KP23	0.5	25	15	0.5
MR-J3-40T (1)	HF-MP43	0.9	35	15	0.7
	HF-KP43	0.9	35	15	0.7
MR-J3-60T (4)	HF-SP52 (4)	1.0	40	15	0.8
	HF-SP51	1.0	40	15	0.8
	HC-LP52	1.0	40	15	0.8
MR-J3-70T	HF-MP73	1.3	50	15	1.0
	HF-KP73	1.3	50	15	1.0
	HC-UP72	1.3	50	15	1.0
MR-J3-100T (4)	HF-SP102 (4)	1.7	50	15	1.0
	HF-SP81	1.5	50	15	1.0
	HC-LP102	1.7	50	15	1.0
MR-J3-200T (4)	HF-SP152 (4)	2.5	90	20	1.8
	HF-SP202 (4)	3.5	90	20	1.8
	HF-SP121	2.1	90	20	1.8
	HF-SP201	3.5	90	20	1.8
	HC-RP103	1.8	50	15	1.0
	HC-RP153	2.5	90	20	1.8
	HC-UP152	2.5	90	20	1.8
HC-LP152	2.5	90	20	1.8	
MR-J3-350T (4)	HF-SP352 (4)	5.5	130	20 (25) (Note 3)	2.7
	HC-RP203	3.5	90	20	1.8
	HC-UP202	3.5	90	20	1.8
	HC-LP202	3.5	90	20	1.8
	HF-SP301	4.8	120	20	2.4
MR-J3-500T (4)	HF-SP502 (4)	7.5	195	25	3.9
	HC-RP353	5.5	135	25	2.7
	HC-RP503	7.5	195	25	3.9
	HC-UP352	5.5	195	25	3.9
	HC-UP502	7.5	195	25	3.9
	HC-LP302	4.5	120	25	2.4
	HA-LP502	7.5	195	25	3.9
HF-SP421	6.7	160	25	3.2	

13 CHARACTERISTICS

Servo amplifier	Servo motor	(Note 1) Power supply capacity [kVA]	(Note 2) Servo amplifier-generated heat[W]		Area required for heat dissipation [m ²]
			At rated torque	With servo off	
MR-J3-700T (4)	HF-SP702 (4)	10.0	300	25	6.0
	HA-LP702	10.6	300	25	6.0
	HA-LP601 (4)	10.0	260	25	5.2
	HA-LP701M (4)	11.0	300	25	6.0
MR-J3-11KT (4)	HC-LP11K2 (4)	16.0	530	45	11.0
	HC-LP801 (4)	12.0	390	45	7.8
	HC-LP12K1 (4)	18.0	580	45	11.6
	HC-LP11K1M (4)	16.0	530	45	11.0
MR-J3-15KT (4)	HC-LP15K2 (4)	22.0	640	45	13.0
	HC-LP15K1 (4)	22.0	640	45	13.0
	HC-LP15K1M (4)	22.0	640	45	13.0
MR-J3-22KT (4)	HC-LP22K2 (4)	33.0	850	55	17.0
	HC-LP20K1 (4)	30.1	775	55	15.5
	HC-LP25K1	37.6	970	55	19.4
	HC-LP22K1M (4)	33.0	850	55	17.0

Note 1. Note that the power supply capacity will vary according to the power supply impedance. This value assumes that the power factor improving reactor is not used.

2. Heat generated during regeneration is not included in the servo amplifier-generated heat. To calculate heat generated by the regenerative option, refer to section 14.2.

3. For 400V class, the value is within the ().

13 CHARACTERISTICS

(2) Heat dissipation area for enclosed servo amplifier

The enclosed control box (hereafter called the control box) which will contain the servo amplifier should be designed to ensure that its temperature rise is within +10°C (+50°F) at the ambient temperature of 40°C (104°F). (With a 5°C (41°F) safety margin, the system should operate within a maximum 55°C (131°F) limit.) The necessary enclosure heat dissipation area can be calculated by Equation 13.1.

$$A = \frac{P}{K \cdot \Delta T} \dots\dots\dots (13.1)$$

- where, A : Heat dissipation area [m²]
- P : Loss generated in the control box [W]
- ΔT : Difference between internal and ambient temperatures [°C]
- K : Heat dissipation coefficient [5 to 6]

When calculating the heat dissipation area with Equation 13.1, assume that P is the sum of all losses generated in the enclosure. Refer to Table 13.1 for heat generated by the servo amplifier. "A" indicates the effective area for heat dissipation, but if the enclosure is directly installed on an insulated wall, that extra amount must be added to the enclosure's surface area.

The required heat dissipation area will vary with the conditions in the enclosure. If convection in the enclosure is poor and heat builds up, effective heat dissipation will not be possible. Therefore, arrangement of the equipment in the enclosure and the use of a cooling fan should be considered.

Table 13.1 lists the enclosure dissipation area for each servo amplifier when the servo amplifier is operated at the ambient temperature of 40°C (104°F) under rated load.

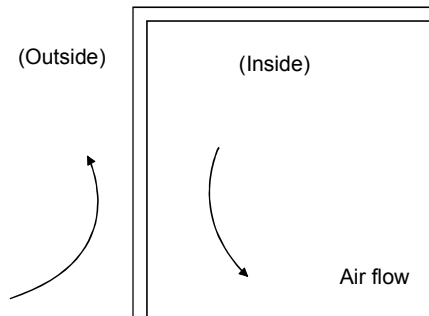


Fig. 13.2 Temperature distribution in enclosure

When air flows along the outer wall of the enclosure, effective heat exchange will be possible, because the temperature slope inside and outside the enclosure will be steeper.

13 CHARACTERISTICS

13.3 Dynamic brake characteristics

13.3.1 Dynamic brake operation

(1) Calculation of coasting distance

Fig. 13.3 shows the pattern in which the servo motor comes to a stop when the dynamic brake is operated. Use Equation 13.2 to calculate an approximate coasting distance to a stop. The dynamic brake time constant τ varies with the servo motor and machine operation speeds. (Refer to (2)(a), (b) in this section.)

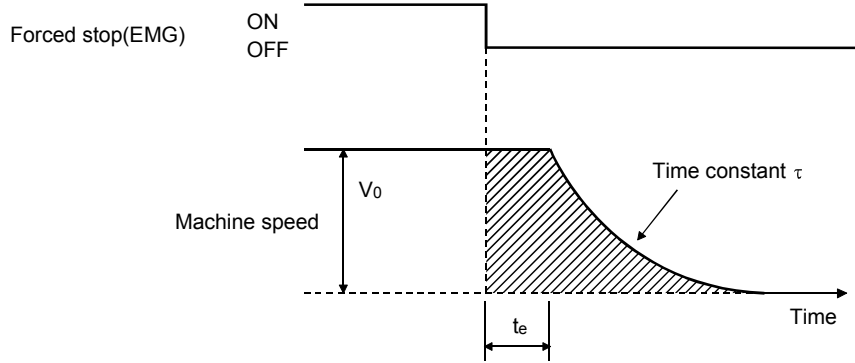


Fig. 13.3 Dynamic brake operation diagram

$$L_{max} = \frac{V_0}{60} \cdot \left\{ t_e + \tau \left[1 + \frac{J_L}{J_M} \right] \right\} \dots \dots \dots (13.2)$$

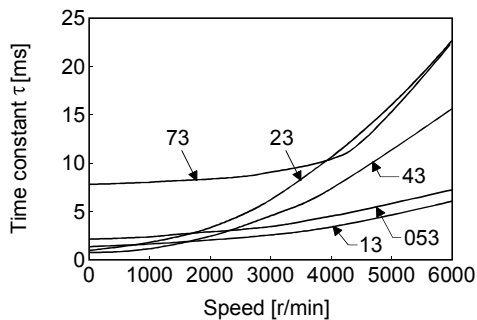
- L_{max} : Maximum coasting distance [mm][in]
- V_0 : Machine rapid feed rate [mm/min][in/min]
- J_M : Servo motor inertial moment..... [kg · cm²][oz · in²]
- J_L : Load inertia moment converted into equivalent value on servo motor shaft..... [kg · cm²][oz · in²]
- τ : Brake time constant [s]
- t_e : Delay time of control section..... [s]

For 7kW or less servo, there is internal relay delay time of about 30ms. For 11k to 22kW servo, there is delay time of about 100ms caused by a delay of the external relay and a delay of the magnetic contactor built in the external dynamic brake.

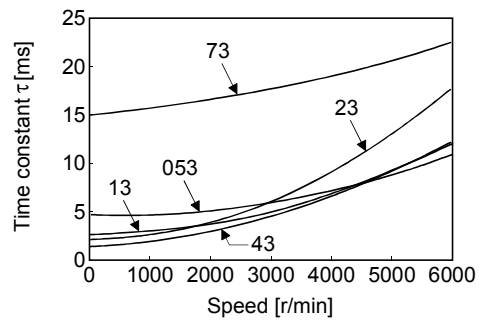
(2) Dynamic brake time constant

The following shows necessary dynamic brake time constant τ for the equations (13.2).

(a) 200V class servo motor

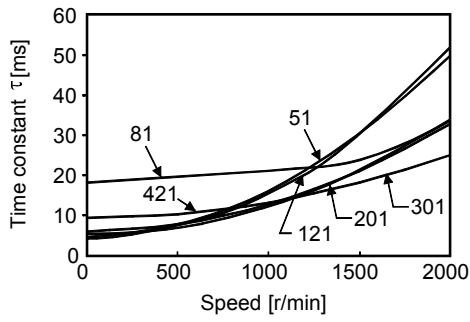


HF-MP series

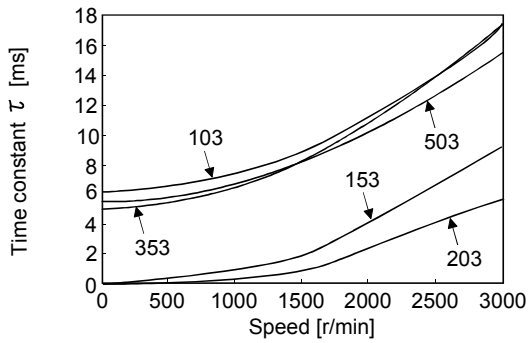


HF-KP series

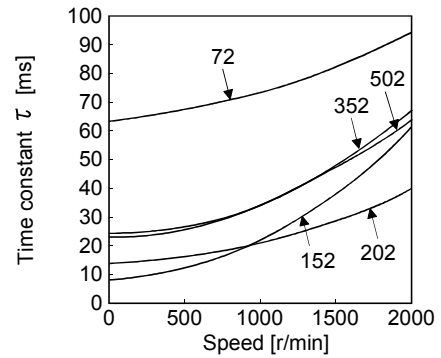
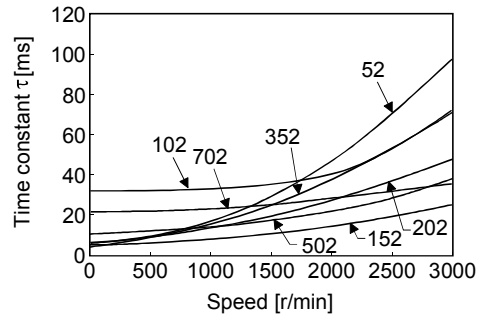
13 CHARACTERISTICS



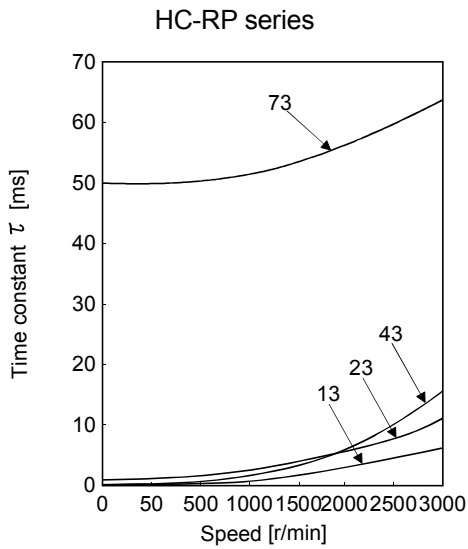
HF-SP1000r/min series



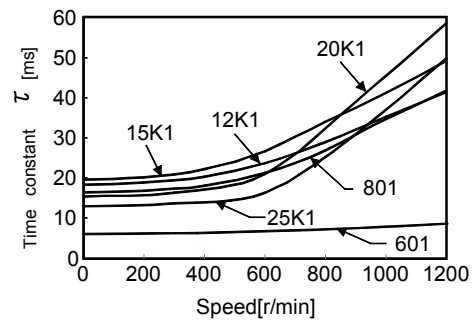
HF-SP2000r/min series



HC-UP2000r/min series

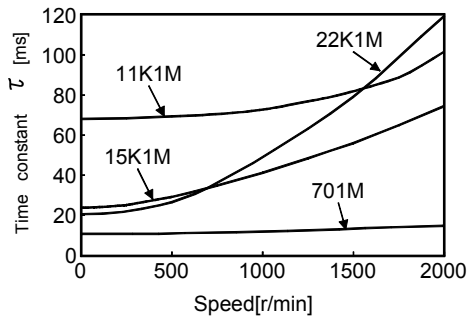


HC-UP3000r/min series

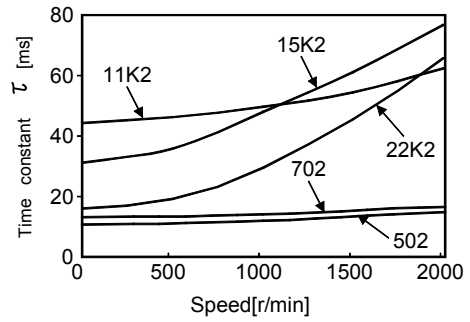


HA-LP1000r/min series

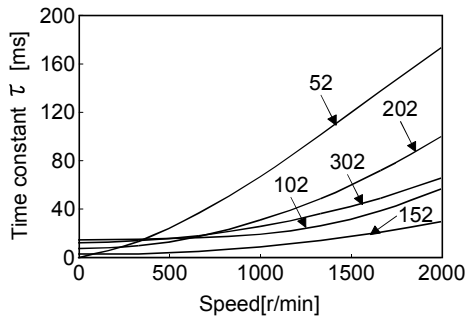
13 CHARACTERISTICS



HA-LP1500r/min series

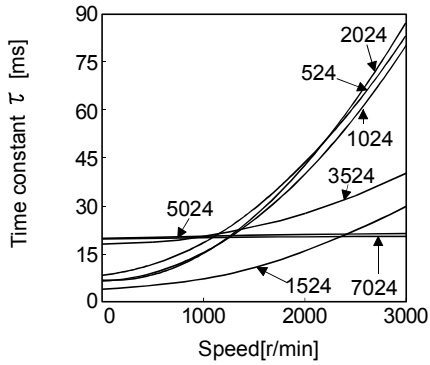


HA-LP2000r/min series

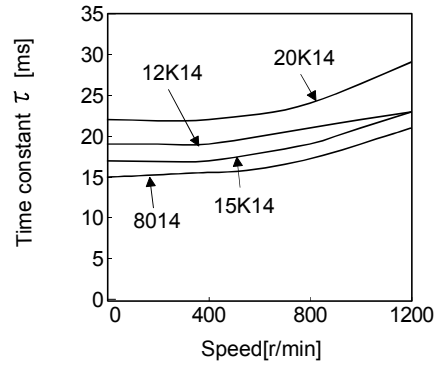


HC-LP series

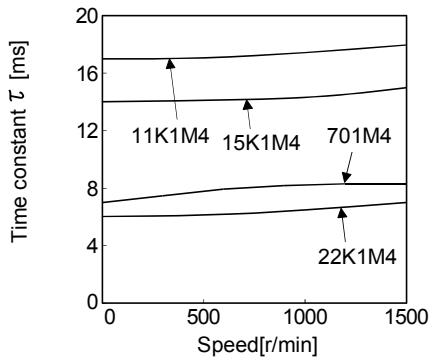
(b) 400V class servo motor



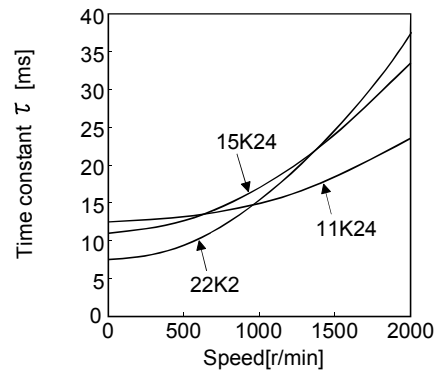
HF-SP2000r/min series



HA-LP1000r/min series



HA-LP1500r/min series



HA-LP2000r/min series

13 CHARACTERISTICS

13.3.2 The dynamic brake at the load inertia moment

Use the dynamic brake under the load inertia moment ratio indicated in the following table. If the load inertia moment is higher than this value, the built-in dynamic brake may burn. If there is a possibility that the load inertia moment may exceed the value, contact Mitsubishi.

The values of the load inertia moment ratio in the table are the values at the maximum rotation speed of the servo motor.

Servo amplifier	Servo motor									
	HF-KP□	HF-MP□	HF-SP□1	HF-SP□2	HC-RP□	HC-UP□	HC-LP□	HA-LP□1	HA-LP□1M	HA-LP□2
MR-J3-10T(1)	30	30	/	/	/	/	/	/	/	/
MR-J3-20T(1)	30	30								
MR-J3-40T(1)	30	30								
MR-J3-60T	/	/	30	30	/	/	30	/	/	/
MR-J3-70T			30	30			30			
MR-J3-100T			30	30			30			
MR-J3-200T			30	30			30			
MR-J3-350T			16	16			16			
MR-J3-500T			15	15			15			
MR-J3-700T			5 (Note 1)	5 (Note 1)			5 (Note 1)			
MR-J3-11KT (Note 2)			30	30			30			
MR-J3-15KT (Note 2)			30	30			30			
MR-J3-22KT (Note 2)			30	30			30			

Servo amplifier	Servo motor			
	HF-SP□4	HA-LP□14	HA-LP□1M4	HA-LP□24
MR-J3-60T4	5 (Note 1)	/	/	/
MR-J3-100T4	5 (Note 1)			
MR-J3-200T4	5 (Note 1)			
MR-J3-350T4	5 (Note 1)			
MR-J3-500T4	5 (Note 1)			
MR-J3-700T4	5 (Note 1)				10	10
MR-J3-11KT4 (Note 2)	30	30	30	
MR-J3-15KT4 (Note 2)	30	30	30	
MR-J3-22KT4 (Note 2)	30	30	30	

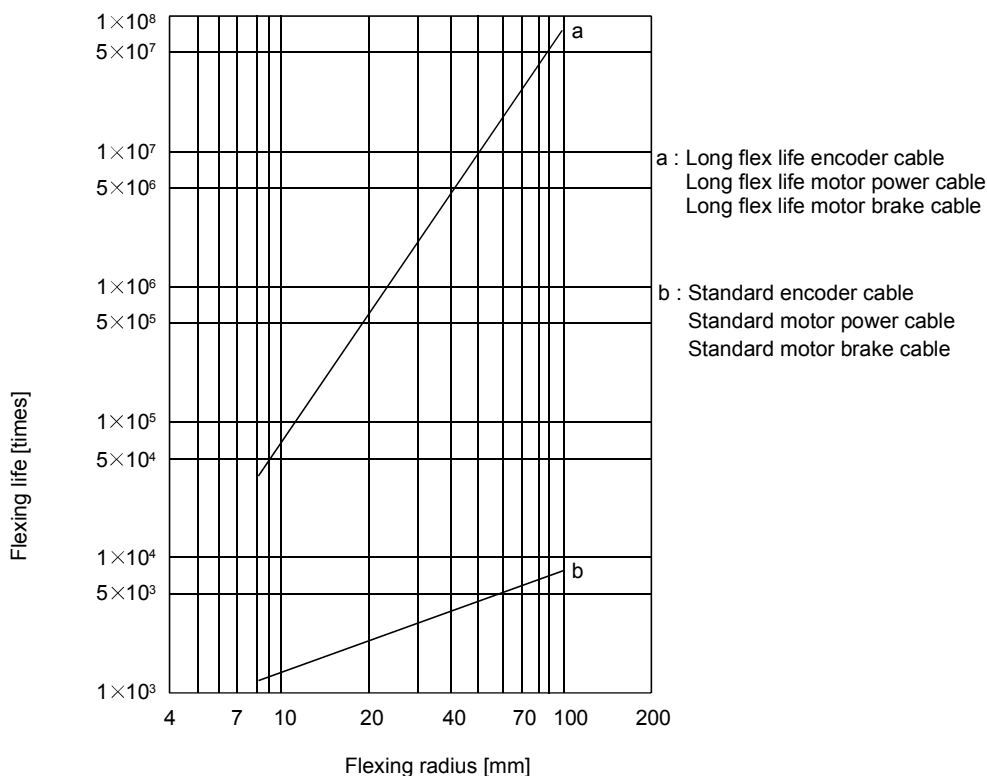
Note 1. The load inertia moment ratio is 15 at the rated rotation speed.

2. When the external dynamic brake is used.

13 CHARACTERISTICS

13.4 Cable flexing life

The flexing life of the cables is shown below. This graph calculated values. Since they are not guaranteed values, provide a little allowance for these values.



13.5 Inrush currents at power-on of main circuit and control circuit

The following table indicates the inrush currents (reference data) that will flow when the maximum permissible voltage (200V class: 253VAC, 400V class: 528VAC) is applied at the power supply capacity of 2500kVA and the wiring length of 1m.

Servo amplifier	Inrush currents (A_{0-p})	
	Main circuit power supply (L_1, L_2, L_3)	Control circuit power supply (L_{11}, L_{21})
MR-J3-10T1 to 40T1	38A (Attenuated to approx. 14A in 10ms)	20 to 30A (Attenuated to approx. 0A in 1 to 2ms)
MR-J3-10T to 60T	30A (Attenuated to approx. 5A in 10ms)	
MR-J3-70T · 100T	54A (Attenuated to approx. 12A in 10ms)	
MR-J3-200T · 350T	120A (Attenuated to approx. 12A in 20ms)	
MR-J3-500T	44A (Attenuated to approx. 20A in 20ms)	30A (Attenuated to approx. 0A in 3ms)
MR-J3-700T	88A (Attenuated to approx. 20A in 20ms)	
MR-J3-11KT	235A (Attenuated to approx. 20A in 20ms)	
MR-J3-15KT		
MR-J3-22KT		
MR-J3-60T4 · 100T4	100A (Attenuated to approx. 5A in 10ms)	40 to 50A (Attenuated to approx. 0A in 2ms)
MR-J3-200T4	120A (Attenuated to approx. 12A in 20ms)	
MR-J3-350T4 · 500T4	66A (Attenuated to approx. 10A in 20ms)	41A (Attenuated to approx. 0A in 3ms)
MR-J3-700T4	67A (Attenuated to approx. 34A in 20ms)	
MR-J3-11KT4	325A (Attenuated to approx. 20A in 20ms)	45A (Attenuated to approx. 0A in 3ms)
MR-J3-15KT4		
MR-J3-22KT4		

Since large inrush currents flow in the power supplies, always use no-fuse breakers and magnetic contactors. (Refer to section 14.10.)

When circuit protectors are used, it is recommended to use the inertia delay type that will not be tripped by an inrush current.

14. OPTIONS AND AUXILIARY EQUIPMENT

14. OPTIONS AND AUXILIARY EQUIPMENT

 **WARNING**

- Before connecting any option or peripheral equipment, turn off the power and wait for 15 minutes or more until the charge lamp turns off. Then, confirm that the voltage between P(+) and N(-) is safe with a voltage tester and others. Otherwise, an electric shock may occur. In addition, always confirm from the front of the servo amplifier whether the charge lamp is off or not.

 **CAUTION**

- Use the specified auxiliary equipment and options. Unspecified ones may lead to a fault or fire.

14.1 Cable/connector sets

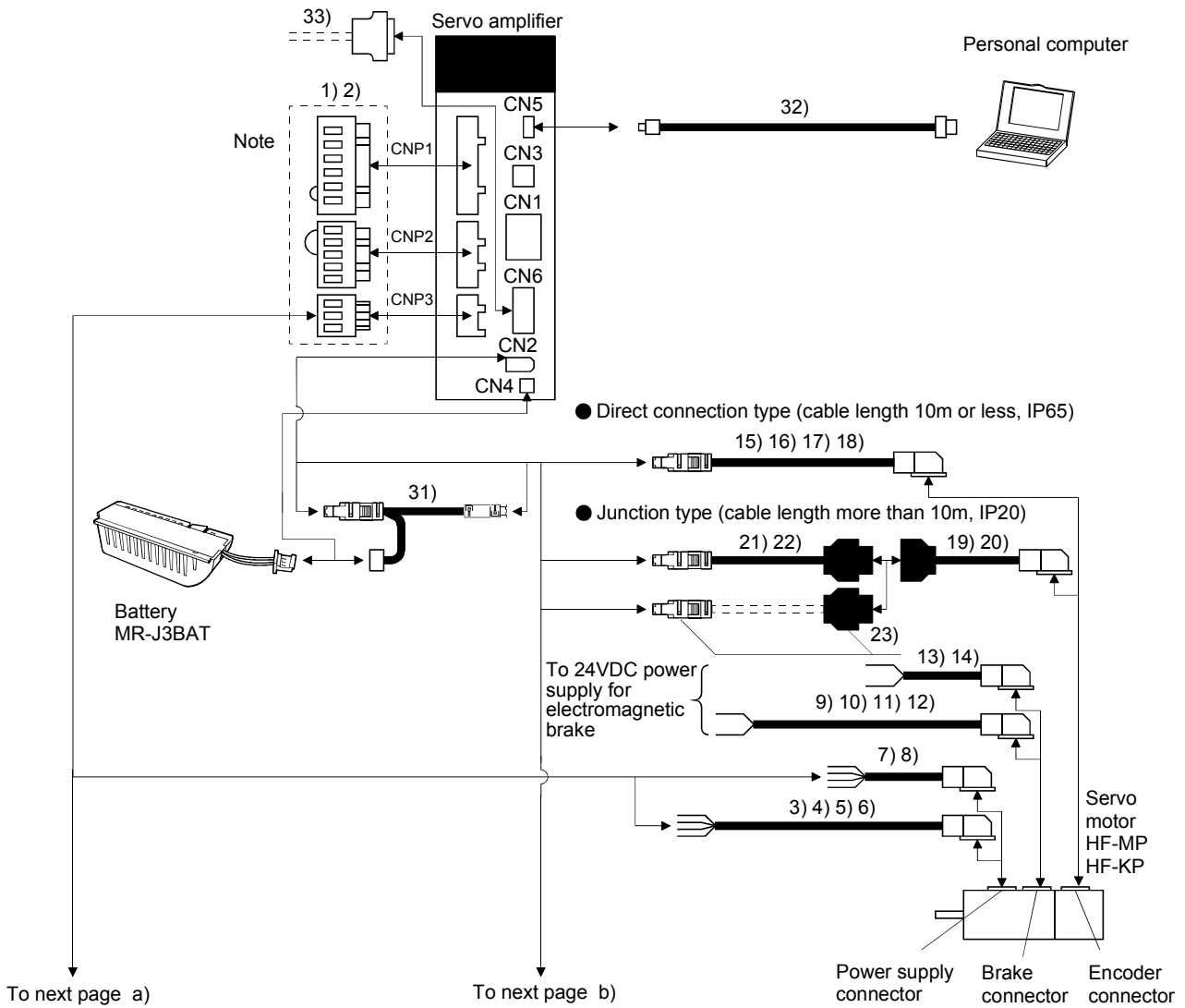
POINT

- Protective structure indicated for cables and connectors is for a cable or connector alone. When the cables and connectors are used to connect the servo amplifier and servo motor, and if protective structures of the servo amplifier and servo motor are lower than that of the cable and connector, specifications of the servo amplifier and servo motor apply.

As the cables and connectors used with this servo, purchase the options indicated in this section.

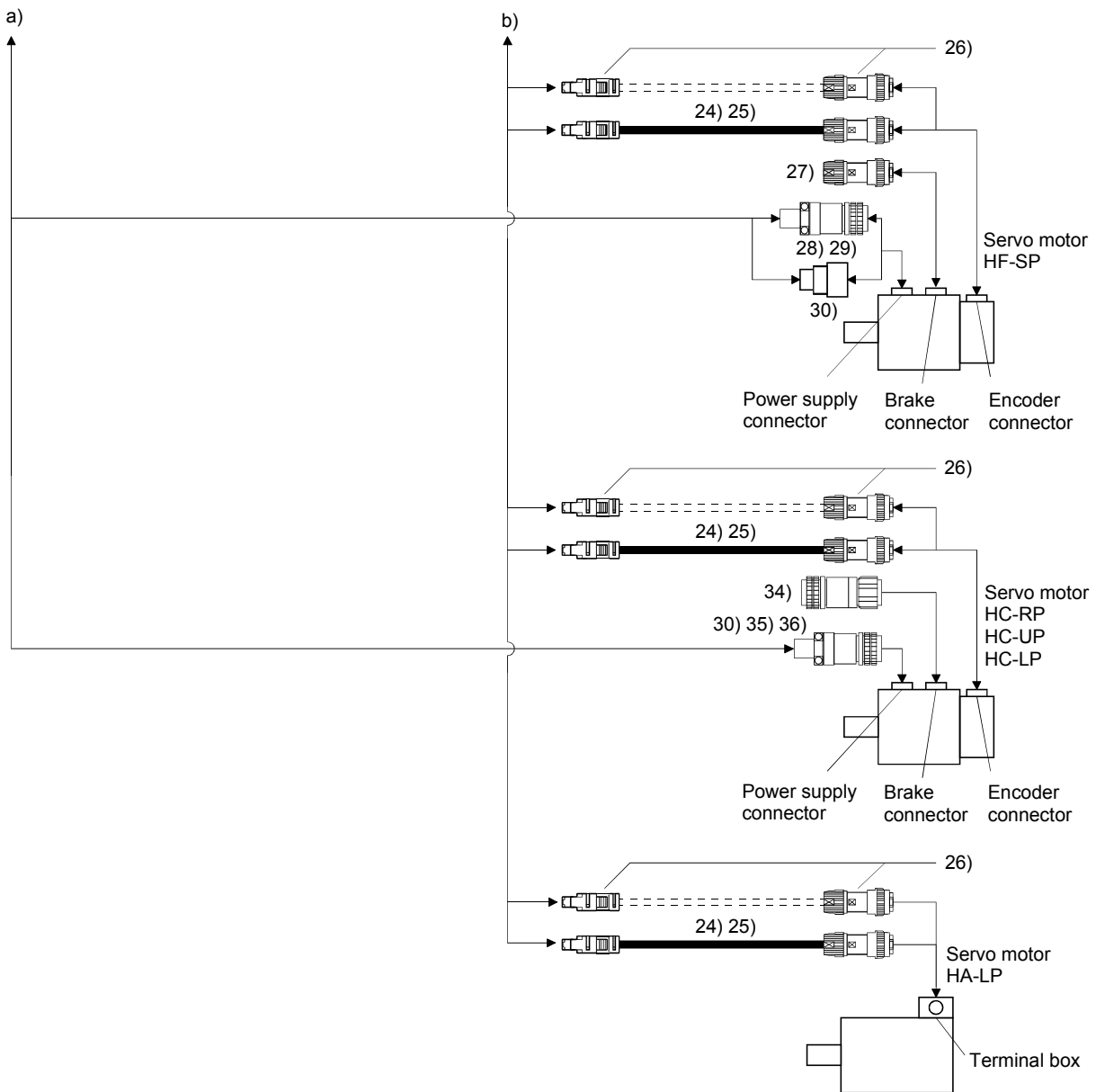
14. OPTIONS AND AUXILIARY EQUIPMENT

14.1.1 Combinations of cable/connector sets

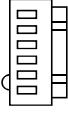


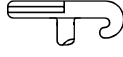
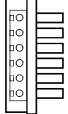


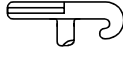



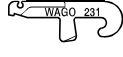
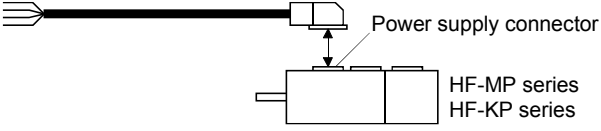
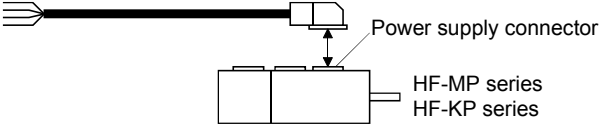


Note. Connectors for 3.5kW or less For 5kW or more, terminal blocks

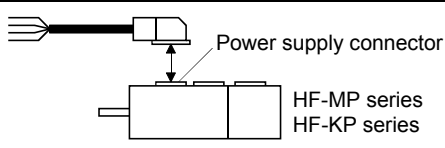
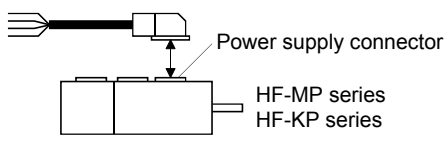
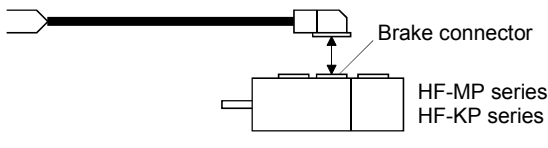
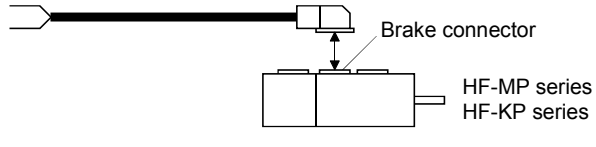
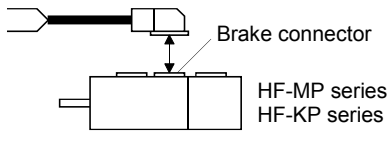
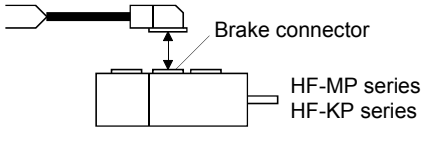
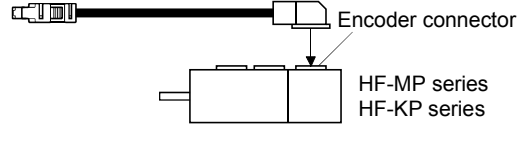
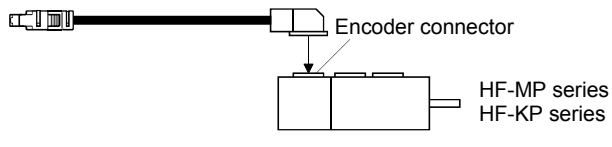
14. OPTIONS AND AUXILIARY EQUIPMENT



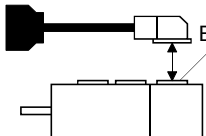
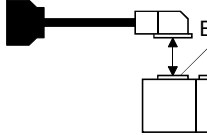





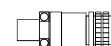
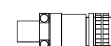
14. OPTIONS AND AUXILIARY EQUIPMENT

No.	Product	Model	Description	Application
1)	Servo amplifier power supply connector		 <p>CNP1 connector: 54928-0670 (Molex)</p>  <p>CNP2 connector: 54928-0520 (Molex)</p>  <p>CNP3 connector: 54928-0370 (Molex)</p> <p><Applicable cable example> Wire size: 0.14mm²(AWG26) to 2.5mm²(AWG14) Cable finish OD: to ϕ 3.8mm</p>  <p>REC. Lever: 54932-0000 (Molex)</p>	Supplied with servo amplifiers of 1kW or less in 100V class and 200V class
2)	Servo amplifier power supply connector		 <p>CNP1 connector: PC4/6-STF-7.62-CRWH (Phoenix Contact)</p>  <p>CNP2 connector: 54928-0520 (Molex)</p>  <p>CNP3 connector: PC4/3-STF-7.62-CRWH (Phoenix Contact)</p> <p><Applicable cable example> Wire size: 0.2mm²(AWG24) to 5.5mm²(AWG10) Cable finish OD: to ϕ 5mm</p>  <p>REC. Lever: 54932-0000 (Molex)</p>	Supplied with servo amplifiers of 3.5kW in 200V class
		 <p>CNP1 connector: 721-207/026-000 (Plug) (WAGO)</p>  <p>CNP2 connector: 721-205/026-000 (Plug) (WAGO)</p>  <p>CNP3 connector: 721-203/026-000 (Plug) (WAGO)</p> <p><Applicable cable example> Wire size: 0.08mm²(AWG28) to 2.5mm²(AWG12) Cable finish OD: to ϕ 4.1mm</p>  <p>REC. Lever: 231-131 (WAGO)</p>	Supplied with servo amplifiers of 2kW in 200V class and 2kW or less in 400V class	
3)	Motor power supply cable	MR-PWS1CBL □ M-A1-L Cable length: 2 · 5 · 10m	 <p>Power supply connector</p> <p>HF-MP series HF-KP series</p>	IP65 Load side lead
4)	Motor power supply cable	MR-PWS1CBL □ M-A1-H Cable length: 2 · 5 · 10m		Refer to section 14.1.3 for details.	IP65 Load side lead Long flex life
5)	Motor power supply cable	MR-PWS1CBL □ M-A2-L Cable length: 2 · 5 · 10m	 <p>Power supply connector</p> <p>HF-MP series HF-KP series</p>	IP65 Opposite-to-load side lead
6)	Motor power supply cable	MR-PWS1CBL □ M-A2-H Cable length: 2 · 5 · 10m		Refer to section 14.1.3 for details.	IP65 Opposite-to-load side lead Long flex life

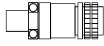






14. OPTIONS AND AUXILIARY EQUIPMENT

No.	Product	Model	Description	Application
7)	Motor power supply cable	MR-PWS2CBL03M-A1-L Cable length: 0.3m	 <p>Power supply connector</p> <p>HF-MP series HF-KP series</p> <p>Refer to section 14.1.3 for details.</p>	IP55 Load side lead
8)	Motor power supply cable	MR-PWS2CBL03M-A2-L Cable length: 0.3m	 <p>Power supply connector</p> <p>HF-MP series HF-KP series</p> <p>Refer to section 14.1.3 for details.</p>	IP55 Opposite-to-load side lead
9)	Motor brake cable	MR-BKS1CBL □ M-A1-L Cable length: 2 · 5 · 10m	 <p>Brake connector</p> <p>HF-MP series HF-KP series</p> <p>Refer to section 14.1.4 for details.</p>	IP65 Load side lead
10)	Motor brake cable	MR-BKS1CBL □ M-A1-H Cable length: 2 · 5 · 10m		IP65 Load side lead Long flex life
11)	Motor brake cable	MR-BKS1CBL □ M-A2-L Cable length: 2 · 5 · 10m	 <p>Brake connector</p> <p>HF-MP series HF-KP series</p> <p>Refer to section 14.1.4 for details.</p>	IP65 Opposite-to-load side lead
12)	Motor brake cable	MR-BKS1CBL □ M-A2-H Cable length: 2 · 5 · 10m		IP65 Opposite-to-load side lead Long flex life
13)	Motor brake cable	MR-BKS2CBL03M-A1-L Cable length: 0.3m	 <p>Brake connector</p> <p>HF-MP series HF-KP series</p> <p>Refer to section 14.1.4 for details.</p>	IP55 Load side lead
14)	Motor brake cable	MR-BKS2CBL03M-A2-L Cable length: 0.3m	 <p>Brake connector</p> <p>HF-MP series HF-KP series</p> <p>Refer to section 14.1.4 for details.</p>	IP55 Opposite-to-load side lead
15)	Encoder cable	MR-J3ENCBL □ M-A1-L Cable length: 2 · 5 · 10m	 <p>Encoder connector</p> <p>HF-MP series HF-KP series</p> <p>Refer to section 14.1.2 (1) for details.</p>	IP65 Load side lead
16)	Encoder cable	MR-J3ENCBL □ M-A1-H Cable length: 2 · 5 · 10m		IP65 Opposite-to-load side lead Long flex life
17)	Encoder cable	MR-J3ENCBL □ M-A2-L Cable length: 2 · 5 · 10m	 <p>Encoder connector</p> <p>HF-MP series HF-KP series</p> <p>Refer to section 14.1.2 (1) for details.</p>	IP65 Opposite-to-load side lead
18)	Encoder cable	MR-J3ENCBL □ M-A2-H Cable length: 2 · 5 · 10m		IP65 Opposite-to-load side lead Long flex life

14. OPTIONS AND AUXILIARY EQUIPMENT

No.	Product	Model	Description	Application
19)	Encoder cable	MR-J3JCBL03M-A1-L Cable length: 0.3m	 <p>Encoder connector HF-MP series HF-KP series</p> <p>Refer to section 14.1.2 (3) for details.</p>	IP20 Load side lead
20)	Encoder cable	MR-J3JCBL03M-A2-L Cable length: 0.3m	 <p>Encoder connector HF-MP series HF-KP series</p> <p>Refer to section 14.1.2 (3) for details.</p>	IP20 Opposite-to-load side lead
21)	Encoder cable	MR-EKCBL □ M-L Cable length: 20 · 30m	 <p>For HF-MP · HF-KP series Refer to section 14.1.2 (2) for details.</p>	IP20
22)	Encoder cable	MR-EKCBL □ M-H Cable length: 20 · 30 · 40 · 50m		IP20 Long flex life
23)	Encoder connector set	MR-ECNM	 <p>For HF-MP · HF-KP series Refer to section 14.1.2 (2) for details.</p>	IP20
24)	Encoder cable	MR-J3ENSCBL □ M-L Cable length: 2 · 5 · 10 · 20 · 30m	 <p>For HF-SP · HA-LP · HC-UP · HC-LP · HC-RP series Refer to section 14.1.2 (4) for details.</p>	IP67 Standard flex life
25)	Encoder cable	MR-J3ENSCBL □ M-H Cable length: 2 · 5 · 10 · 20 · 30 · 40 · 50m		IP67 Long flex life
26)	Encoder connector set	MR-J3SCNS	 <p>For HF-SP · HA-LP · HC-UP · HC-LP · HC-RP series Refer to section 14.1.2 (4) for details.</p>	IP67
27)	Brake connector set	MR-BKCNS1	<p>Straight plug: CM10-SP2S-L Socket contact: CM10-#22SC(S2)-100 (DDK)</p>  <p>For HF-SP series</p>	IP67
28)	Power supply connector set	MR-PWCNS4	<p>Plug: CE05-6A18-10SD-B-BSS Cable clamp: CE3057-10A-1 (D265) (DDK)</p>  <p>Example of applicable cable Applicable wire size: 2mm² (AWG14) to 3.5mm² (AWG12) Cable finish φD: φ 10.5 to 14.1mm</p> <p>For HF-SP51 · 81 For HF-SP52 · 152</p>	IP67
29)	Power supply connector set	MR-PWCNS5	<p>Plug: CE05-6A22-22SD-D-BSS Cable clamp: CE3057-12A-1-D (D265) (DDK)</p>  <p>Example of applicable cable Applicable wire size: 5.5mm² (AWG10) to 8mm² (AWG8) Cable finish φD: φ 12.5 to 16mm</p> <p>For HF-SP121 to 301 For HF-SP202 to 502</p>	IP67

14. OPTIONS AND AUXILIARY EQUIPMENT

No.	Product	Model	Description	Application	
30)	Power supply connector set	MR-PWCNS3	Plug: CE05-6A32-17SD-D-BSS Cable clamp: CE3057-20A-1-D (D265) (DDK) Example of applicable cable Applicable wire size: 14mm ² (AWG6) to 22mm ² (AWG4) Cable finish ϕ D: ϕ 22 to 23.8mm	 For HF-SP421 For HF-SP702 For HA-LP702	IP67 Be sure to use this when corresponding to EN Standard.
31)	Cable for connecting battery	MR-J3BTCBL03M	 Refer to section 14.1.2 (5) for details.	For connection of battery	
32)	USB cable	MR-J3USBCBL3M Cable length: 3m	For CN5 connector minB connector (5-pin)	For personal computer connector A connector 	For connection with PC-AT compatible personal computer
33)	Connector set	MR-J2CMP2	 Connector: 10126-3000PE Shell kit: 10326-52F0-008(3M or equivalent)		
34)	Break connector set	MR-BKCN	Plug: D/MS3106A10SL-4S(D190) (DDK) For cable connector : YS010-5-8(Daiwa Dengyo) Example of applicable cable Applicable wire size: 0.3mm ² (AWG22) to 1.25mm ² (AWG16) Cable finish: ϕ 5 to 8.3mm	 For HA-LP For HC-UP For HC-LP	EN standard compliant IP65
35)	Power supply connector set	MR-PWCNS1	Plug: CE05-6A22-23SD-D-BSS Cable clamp: CE3057-12A-2-D (DDK) Example of applicable cable Applicable wire size: 2mm ² (AWG14) to 3.5mm ² (AWG12) Cable finish: ϕ 9.5 to 13mm	 For HC-UP For HC-LP For HC-RP	Be sure to use this when corresponding to EN standard IP65
36)	Power supply connector set	MR-PWCNS2	Plug: CE05-6A24-10SD-D-BSS Cable clamp: CE3057-16A-2-D (DDK) Example of applicable cable Applicable wire size: 5.5mm ² (AWG10) to 8mm ² (AWG8) Cable finish: ϕ 13 to 15.5mm	 For HA-LP For HC-UP For HC-LP For HC-RP	

14. OPTIONS AND AUXILIARY EQUIPMENT

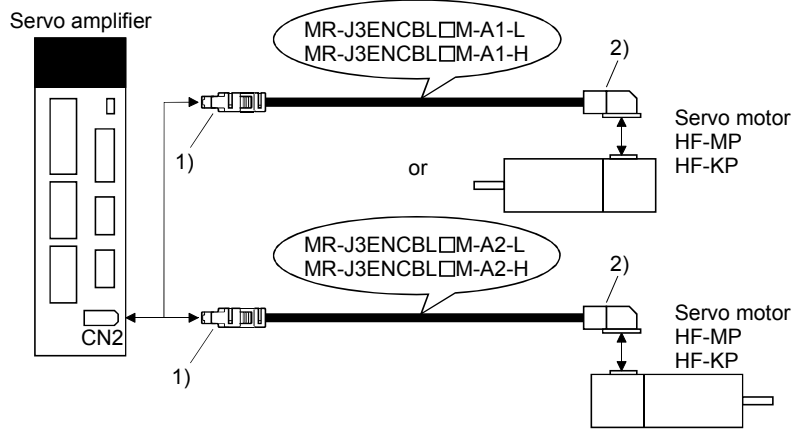
14.1.2 Encoder cable/connector sets

(1) MR-J3ENCBL □ M-A1-L/H · MR-J3ENCBL □ M-A2-L/H

These cables are encoder cables for the HF-MP · HF-KP series servo motors. The numerals in the Cable Length field of the table are the symbols entered in the □ part of the cable model. The cables of the lengths with the symbols are available.

Cable model	Cable length							Protective structure	Flex life	Application
	2m	5m	10m	20m	30m	40m	50m			
MR-J3ENCBL □ M-A1-L	2	5	10	/	/	/	/	IP65	Standard	For HF-MP · HF-KP servo motor Load side lead
MR-J3ENCBL □ M-A1-H	2	5	10	/	/	/	/	IP65	Long flex life	
MR-J3ENCBL □ M-A2-L	2	5	10	/	/	/	/	IP65	Standard	For HF-MP · HF-KP servo motor Opposite-to-load side lead
MR-J3ENCBL □ M-A2-H	2	5	10	/	/	/	/	IP65	Long flex life	

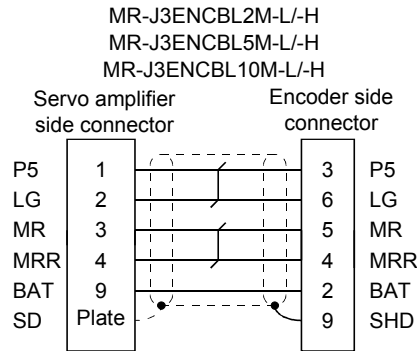
(a) Connection of servo amplifier and servo motor



Cable model	1) For CN2 connector	2) For encoder connector
MR-J3ENCBL □ M-A1-L	Receptacle: 36210-0100PL Shell kit: 36310-3200-008 (3M)	Connector: 1674320-1 Crimping tool for ground clip: 1596970-1 Crimping tool for receptacle contact: 1596847-1 (Tyco Electronics)
MR-J3ENCBL □ M-A1-H	(Note) Signal layout 	(Note) Signal layout
MR-J3ENCBL □ M-A2-L	(Note) Signal layout 	(Note) Signal layout
MR-J3ENCBL □ M-A2-H	Note. Keep open the pins shown with . Especially, pin 10 is provided for manufacturer adjustment. If it is connected with any other pin, the servo amplifier cannot operate normally.	Note. Keep open the pin shown with an .

14. OPTIONS AND AUXILIARY EQUIPMENT

(b) Cable internal wiring diagram



(2) MR-EKCBL □ M-L/H

POINT
<ul style="list-style-type: none"> ▪ The following encoder cables are of four-wire type. When using any of these encoder cables, set parameter No.PC22 to "1 □ □ □" to select the four-wire type. MR-EKCBL30M-L MR-EKCBL30M-H MR-EKCBL40M-H MR-EKCBL50M-H

The servo amplifier and servo motor cannot be connected with these cables only. The servo motor side encoder cable (MR-J3JCBL03M-A1-L or MR-J3JCBL03M-A2-L) is required.

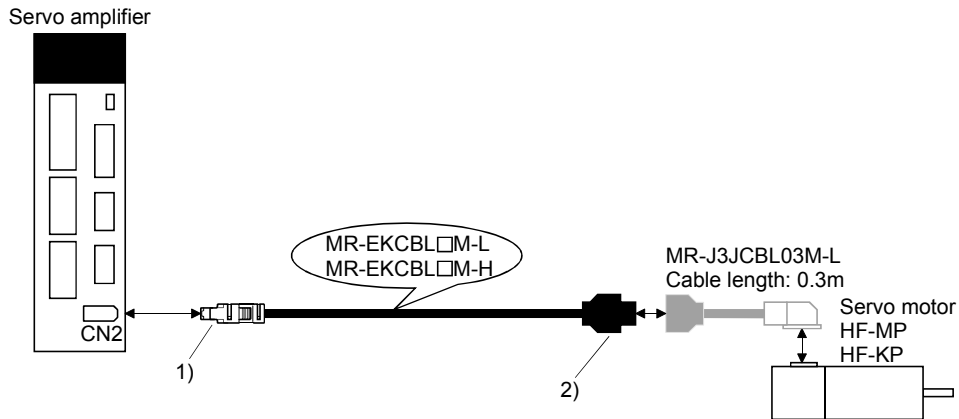
The numerals in the Cable Length field of the table are the symbols entered in the □ part of the cable model. The cables of the lengths with the symbols are available.

Cable model	Cable length							Protective structure	Flex life	Application
	2m	5m	10m	20m	30m	40m	50m			
MR-EKCBL □ M-L	/	/	/	20	(Note) 30	/	/	IP20	Standard	For HF-MP ▪ HF-KP servo motor
MR-EKCBL □ M-H	/	/	/	20	(Note) 30	(Note) 40	(Note) 50	IP20	Long flex life	Use in combination with MR-J3JCBL03M-A1-L or MR-J3JCBL03M-A2-L.

Note. Four-wire type cable.

14. OPTIONS AND AUXILIARY EQUIPMENT

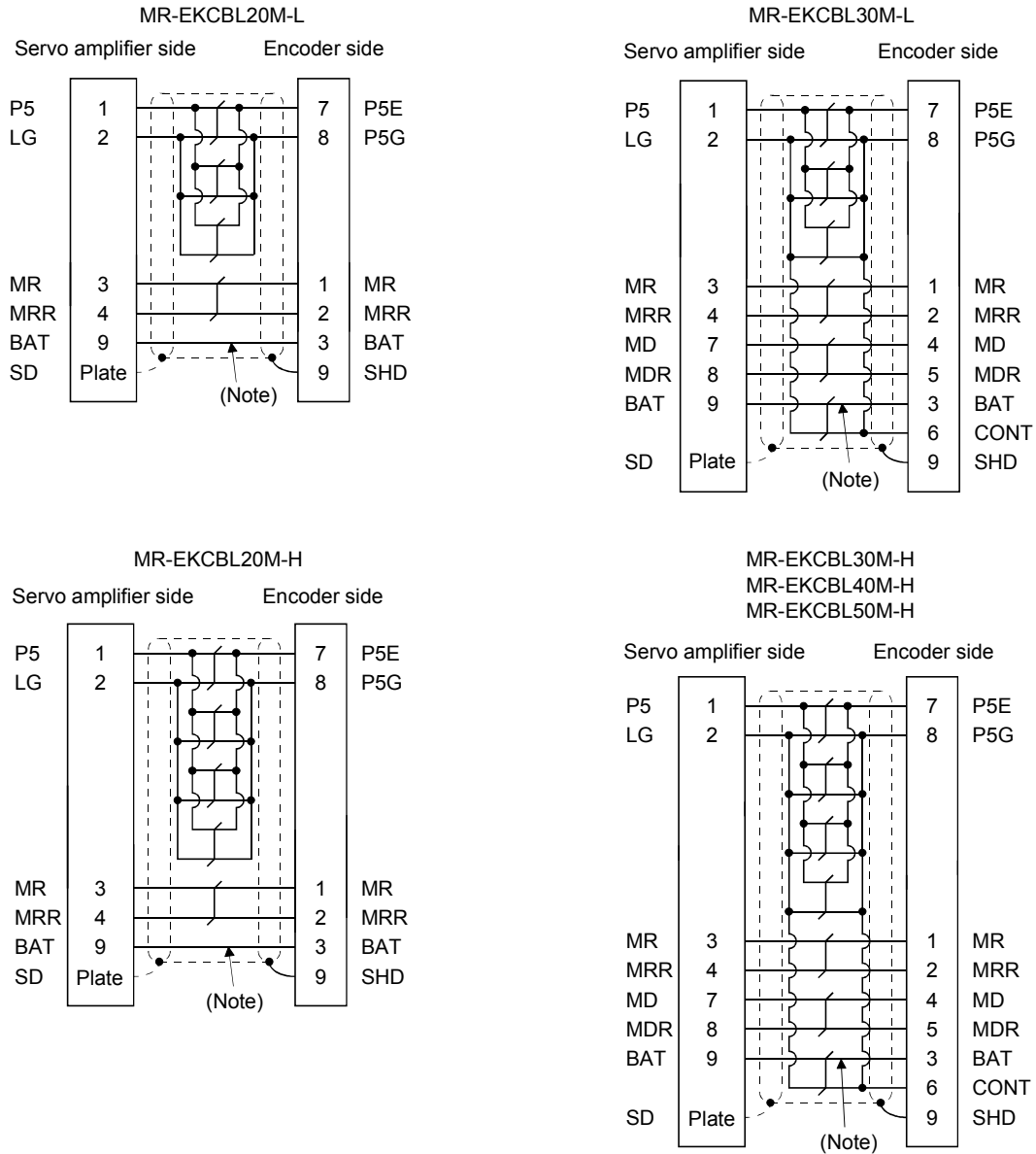
(a) Connection of servo amplifier and servo motor



Cable model	1) Servo amplifier side connector	2) Encoder side connector
MR-EKCBL □ M-L	<p>Receptacle: 36210-0100PL Shell kit: 536310-3200-008 (3M)</p> <p>Connector set: 54599-1019 (Molex)</p> <p>(Note) Signal layout</p> <p>View seen from wiring side.</p>	<p>Housing: 1-172161-9 Connector pin: 170359-1 (Tyco Electronics or equivalent) Cable clamp: MTI-0002 (Toa Electric Industries)</p> <p>(Note) Signal layout</p> <p>View seen from wiring side.</p>
MR-EKCBL □ M-H	<p>(Note) Signal layout</p> <p>View seen from wiring side.</p> <p>Note. Keep open the pins shown with . Especially, pin 10 is provided for manufacturer adjustment. If it is connected with any other pin, the servo amplifier cannot operate normally.</p>	<p>Signal layout</p> <p>View seen from wiring side.</p>

14. OPTIONS AND AUXILIARY EQUIPMENT

(b) Internal wiring diagram



Note. Always make connection for use in an absolute position detection system. Wiring is not necessary for use in an incremental system.



When fabricating the cable, use the wiring diagram corresponding to the length indicated below.

Cable flex life	Applicable wiring diagram	
	Less than 10m	30m to 50m
Standard	MR-EKCBL20M-L	
Long flex life	MR-EKCBL20M-H	MR-EKCBL30M-H MR-EKCBL40M-H MR-EKCBL50M-H

14. OPTIONS AND AUXILIARY EQUIPMENT

(c) When fabricating the encoder cable

When fabricating the cable, prepare the following parts and tool, and fabricate it according to the wiring diagram in (b). Refer to section 14.9 for the specifications of the used cable.

Parts/Tool	Description										
Connector set	MR-ECNM										
	 										
	<table border="0"> <tr> <td>Servo amplifier side connector</td> <td>Encoder side connector</td> </tr> <tr> <td>Receptacle: 36210-0100PL</td> <td>Housing: 1-172161-9</td> </tr> <tr> <td>Shell kit: 536310-3200-008 (3M)</td> <td>Connector pin: 170359-1 (Tyco Electronics or equivalent)</td> </tr> <tr> <td>Or</td> <td>Cable clamp: MTI-0002 (Toa Electric Industries)</td> </tr> <tr> <td>Connector set: 54599-1019(Molex)</td> <td></td> </tr> </table>	Servo amplifier side connector	Encoder side connector	Receptacle: 36210-0100PL	Housing: 1-172161-9	Shell kit: 536310-3200-008 (3M)	Connector pin: 170359-1 (Tyco Electronics or equivalent)	Or	Cable clamp: MTI-0002 (Toa Electric Industries)	Connector set: 54599-1019(Molex)	
Servo amplifier side connector	Encoder side connector										
Receptacle: 36210-0100PL	Housing: 1-172161-9										
Shell kit: 536310-3200-008 (3M)	Connector pin: 170359-1 (Tyco Electronics or equivalent)										
Or	Cable clamp: MTI-0002 (Toa Electric Industries)										
Connector set: 54599-1019(Molex)											

(3) MR-J3JCBL03M-A1-L • MR-J3JCBL03M-A2-L

The servo amplifier and servo motor cannot be connected with these cables only. The servo motor side encoder cable (MR-EKCBL □ M-L/H) is required.

Cable model	Cable length	Protective structure	Flex life	Application
MR-J3JCBL03M-A1-L	0.3m	IP20	Standard	For HF-MP • HF-KP servo motor Load side lead Use in combination with MR-EKCBL □ M-L/H.
MR-J3JCBL03M-A2-L				For HF-MP • HF-KP servo motor Opposite-to-load side lead Use in combination with MR-EKCBL □ M-L/H.

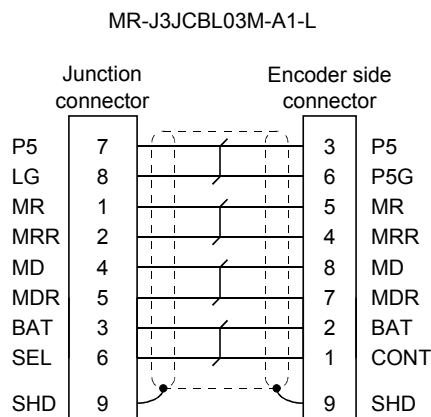
14. OPTIONS AND AUXILIARY EQUIPMENT

(a) Connection of servo amplifier and servo motor



Cable model	1) Junction connector	2) For encoder connector																																	
MR-J3JCBL03M-A1-L	Housing: 1-172169-9 Contact: 1473226-1 Cable clamp: 316454-1 (Tyco Electronics)	Connector: 1674320-1 Crimping tool for ground clip: 1596970-1 Crimping tool for receptacle contact: 1596847-1 (Tyco Electronics)																																	
MR-J3JCBL03M-A2-L	<p>Signal layout</p> <table border="1"> <tr><td>3</td><td>2</td><td>1</td></tr> <tr><td>BAT</td><td>MRR</td><td>MR</td></tr> <tr><td>6</td><td>5</td><td>4</td></tr> <tr><td>CONT</td><td>MDR</td><td>MD</td></tr> <tr><td>9</td><td>8</td><td>7</td></tr> <tr><td>SHD</td><td>LG</td><td>P5</td></tr> </table> <p>View seen from wiring side.</p>	3	2	1	BAT	MRR	MR	6	5	4	CONT	MDR	MD	9	8	7	SHD	LG	P5	<p>Signal layout</p> <table border="1"> <tr><td>9</td><td>SHD</td><td></td></tr> <tr><td>7</td><td>MDR</td><td>8 MD</td></tr> <tr><td>5</td><td>MR</td><td>6 P5G</td></tr> <tr><td>3</td><td>P5</td><td>4 MRR</td></tr> <tr><td>1</td><td>CONT</td><td>2 BAT</td></tr> </table> <p>View seen from wiring side.</p>	9	SHD		7	MDR	8 MD	5	MR	6 P5G	3	P5	4 MRR	1	CONT	2 BAT
3	2	1																																	
BAT	MRR	MR																																	
6	5	4																																	
CONT	MDR	MD																																	
9	8	7																																	
SHD	LG	P5																																	
9	SHD																																		
7	MDR	8 MD																																	
5	MR	6 P5G																																	
3	P5	4 MRR																																	
1	CONT	2 BAT																																	

(b) Internal wiring diagram



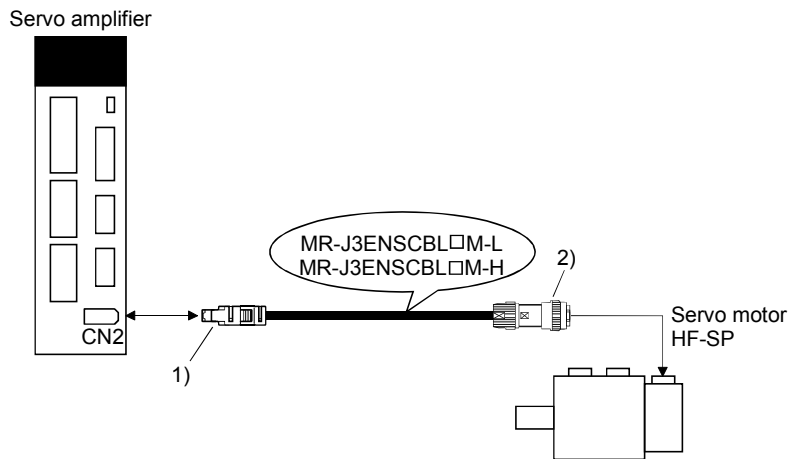
14. OPTIONS AND AUXILIARY EQUIPMENT

(4) MR-J3ENSCBL □ M-L · MR-J3ENSCBL □ M-H

These cables are detector cables for HF-SP · HA-LP · HC-RP · HC-UP · HC-LP series servo motors. The number in the cable length column of the table indicates the symbol filling the square □ in the cable model. Cable lengths corresponding to the specified symbols are prepared.

Cable model	Cable length							Protective structure	Flex life	Application
	2m	5m	10m	20m	30m	40m	50m			
MR-J3ENSCBL □ M-L	2	5	10	20	30	40	50	IP67	Standard	For HF-SP · HA-LP · HC-RP · HC-UP · HC-LP servo motor
MR-J3ENSCBL □ M-H	2	5	10	20	30	40	50	IP67	Long flex life	

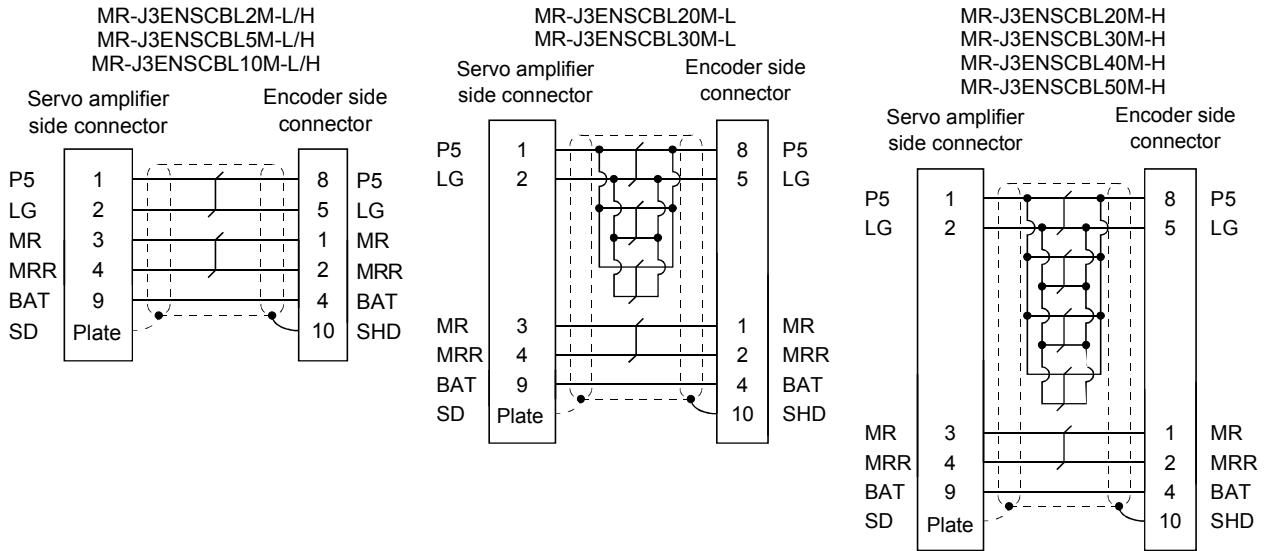
(a) Connection of servo amplifier and servo motor



Cable model	1) For CN2 connector		2) For encoder connector
MR-J3ENSCBL □ M-L	Receptacle: 36210-0100PL Shell kit: 536310-3200-008 (3M) (Note) Signal layout View seen from wiring side.	Connector set: 54599-1019 (Molex) (Note) Signal layout View seen from wiring side.	In case of 10m or shorter cables Straight plug: CM10-SP10S-M Socket contact: CM10-#22SC(C1)-100 Crimping tool: 357J-50446 (DDK) Applicable cable AWG20 to 22 In case of 20m or longer cables Straight plug: CM10-SP10S-M Socket contact: CM10-#22SC(C2)-100 Crimping tool: 357J-50447 (DDK) Applicable cable AWG23 to 28
MR-J3ENSCBL □ M-H	Note. Keep open the pins shown with . Especially, pin 10 is provided for manufacturer adjustment. If it is connected with any other pin, the servo amplifier cannot operate normally.		(Note) Signal layout View seen from wiring side Note. Keep open the pin shown with an .



14. OPTIONS AND AUXILIARY EQUIPMENT

(b) Internal wiring diagram



(c) When fabricating the encoder cable

When fabricating the cable, prepare the following parts and tool, and fabricate it according to the wiring diagram in (b). Refer to section 14.9 for the specifications of the used cable.

Parts/Tool	Description										
Connector set	MR- J3SCNS (Option)										
	 										
	<table border="0"> <tr> <td>Servo amplifier side connector</td> <td>Encoder side connector</td> </tr> <tr> <td>Receptacle: 36210-0100PL</td> <td>Straight plug: CM10-SP10S-M</td> </tr> <tr> <td>Shell kit: 536310-3200-008 (3M)</td> <td>Socket contact: CM10-#22SC(S1)-100</td> </tr> <tr> <td>Or</td> <td>Applicable wire size: AWG20 or less</td> </tr> <tr> <td>Connector set: 54599-1019 (Molex)</td> <td>Recommended tightening jig: 357J-51456T (DDK)</td> </tr> </table>	Servo amplifier side connector	Encoder side connector	Receptacle: 36210-0100PL	Straight plug: CM10-SP10S-M	Shell kit: 536310-3200-008 (3M)	Socket contact: CM10-#22SC(S1)-100	Or	Applicable wire size: AWG20 or less	Connector set: 54599-1019 (Molex)	Recommended tightening jig: 357J-51456T (DDK)
Servo amplifier side connector	Encoder side connector										
Receptacle: 36210-0100PL	Straight plug: CM10-SP10S-M										
Shell kit: 536310-3200-008 (3M)	Socket contact: CM10-#22SC(S1)-100										
Or	Applicable wire size: AWG20 or less										
Connector set: 54599-1019 (Molex)	Recommended tightening jig: 357J-51456T (DDK)										

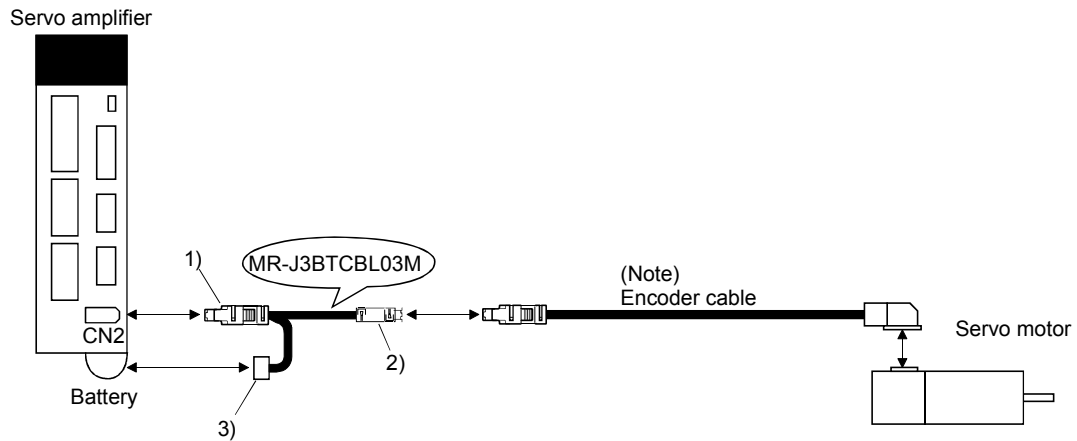
14. OPTIONS AND AUXILIARY EQUIPMENT

(5) MR-J3BTCBL03M

This cable is a battery connection cable. Use this cable to retain the current position even if the detector cable is disconnected from the servo amplifier.

Cable model	Cable length	Application
MR-J3BTCBL03M	0.3m	For HF-MP ▪ HF-KP ▪ HF-SP servo motor

(a) Connection of servo amplifier and servo motor



Note. For the detector cable, refer to (1), (2), (3) and (4) in this section.

Cable model	1) For CN2 connector	2) Junction connector	3) For battery connector
MR-J3BTCBL03M	Receptacle: 36210-0100PL Shell kit: 536310-3200-008 (3M) Or Connector set: 54599-1019 (Molex)	Plug: 36110-3000FD Shell kit: 36310-F200-008 (3M)	Connector: DF3-2EP-2C Contact: DF3-EP2428PCA (Hirose Denki)

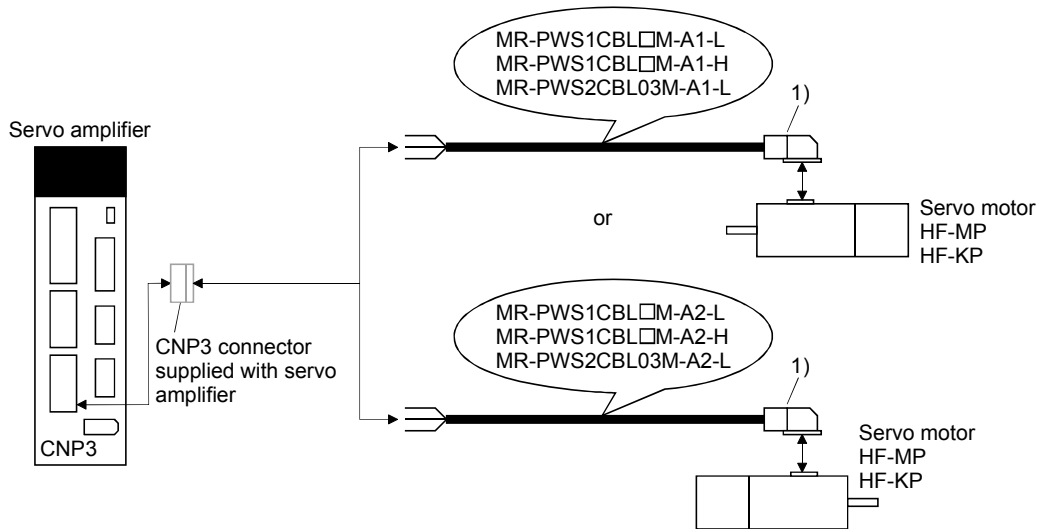
14. OPTIONS AND AUXILIARY EQUIPMENT

14.1.3 Motor power supply cables

These cables are motor power supply cables for the HF-MP • HF-KP series servo motors. The numerals in the Cable Length field of the table are the symbols entered in the □ part of the cable model. The cables of the lengths with the symbols are available. Refer to section 4.10 when wiring.

Cable model	Cable length				Protective structure	Flex life	Application
	0.3m	2m	5m	10m			
MR-PWS1CBL □ M-A1-L		2	5	10	IP65	Standard	For HF-MP • HF-KP servo motor Load side lead
MR-PWS1CBL □ M-A2-L		2	5	10	IP65	Standard	For HF-MP • HF-KP servo motor Opposite-to-load side lead
MR-PWS1CBL □ M-A1-H		2	5	10	IP65	Long flex life	For HF-MP • HF-KP servo motor Load side lead
MR-PWS1CBL □ M-A2-H		2	5	10	IP65	Long flex life	For HF-MP • HF-KP servo motor Opposite-to-load side lead
MR-PWS2CBL □ M-A1-L	03				IP55	Standard	For HF-MP • HF-KP servo motor Load side lead
MR-PWS2CBL □ M-A2-L	03				IP55	Standard	For HF-MP • HF-KP servo motor Opposite-to-load side lead

(1) Connection of servo amplifier and servo motor



Cable model	1) For motor power supply connector	
MR-PWS1CBL □ M-A1-L	Connector: JN4FT04SJ1-R Hod, socket insulator Bushing, ground nut Contact: ST-TMH-S-C1B-100-(A534G) Crimping tool: CT160-3-TMH5B (Japan Aviation Electronics Industry)	Signal layout View seen from wiring side.
MR-PWS1CBL □ M-A2-L		
MR-PWS1CBL □ M-A1-H		
MR-PWS1CBL □ M-A2-H		
MR-PWS2CBL03M-A1-L	Connector: JN4FT04SJ2-R Hod, socket insulator Bushing, ground nut Contact: ST-TMH-S-C1B-100-(A534G) Crimping tool: CT160-3-TMH5B (Japan Aviation Electronics Industry)	
MR-PWS2CBL03M-A2-L		

(2) Internal wiring diagram

MR-PWS1CBL□M-A1-H MR-PWS1CBL□M-A2-H
 MR-PWS2CBL03M-A1-L MR-PWS2CBL03M-A2-L



Note. These are not shielded cables.

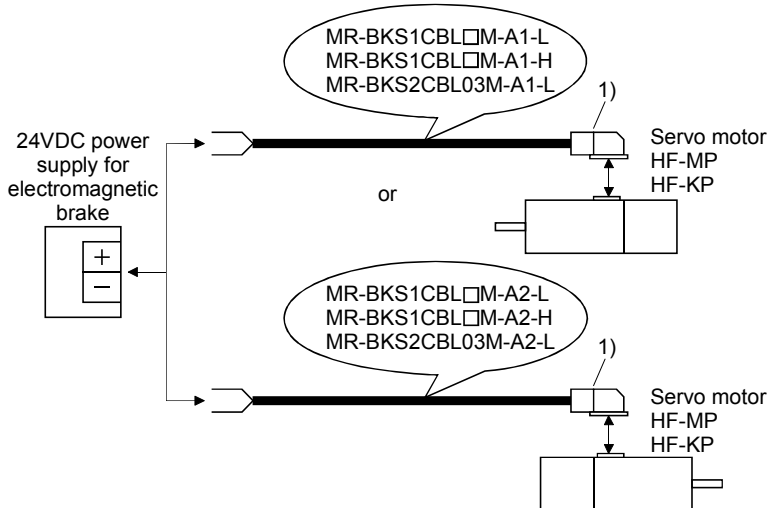
14. OPTIONS AND AUXILIARY EQUIPMENT

14.1.4 Motor brake cables

These cables are motor brake cables for the HF-MP · HF-KP series servo motors. The numerals in the Cable Length field of the table are the symbols entered in the □ part of the cable model. The cables of the lengths with the symbols are available. Refer to section 4.11 when wiring.

Cable model	Cable length				Protective structure	Flex life	Application
	0.3m	2m	5m	10m			
MR-PWS1CBL □ M-A1-L	□	2	5	10	IP65	Standard	For HF-MP · HF-KP servo motor Load side lead
MR-PWS1CBL □ M-A2-L	□	2	5	10	IP65	Standard	For HF-MP · HF-KP servo motor Opposite-to-load side lead
MR-PWS1CBL □ M-A1-H	□	2	5	10	IP65	Long flex life	For HF-MP · HF-KP servo motor Load side lead
MR-PWS1CBL □ M-A2-H	□	2	5	10	IP65	Long flex life	For HF-MP · HF-KP servo motor Opposite-to-load side lead
MR-PWS2CBL □ M-A1-L	03	□	□	□	IP55	Standard	For HF-MP · HF-KP servo motor Load side lead
MR-PWS2CBL □ M-A2-L	03	□	□	□	IP55	Standard	For HF-MP · HF-KP servo motor Opposite-to-load side lead

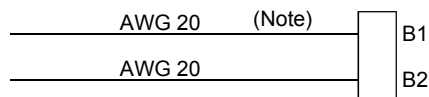
(1) Connection of servo amplifier and servo motor



Cable model	1) For motor brake connector	
MR-BKS1CBL □ M-A1-L	Connector: JN4FT02SJ1-R Hod, socket insulator Bushing, ground nut Contact: ST-TMH-S-C1B-100-(A534G) Crimping tool: CT160-3-TMH5B (Japan Aviation Electronics Industry)	Signal layout View seen from wiring side.
MR-BKS1CBL □ M-A2-L		
MR-BKS1CBL □ M-A1-H		
MR-BKS1CBL □ M-A2-H		
MR-BKS2CBL03M-A1-L	Connector: JN4FT02SJ2-R Hod, socket insulator Bushing, ground nut Contact: ST-TMH-S-C1B-100-(A534G) Crimping tool: CT160-3-TMH5B (Japan Aviation Electronics Industry)	
MR-BKS2CBL03M-A2-L		

(2) Internal wiring diagram

MR-BKS1CBL□M-A1-H MR-BKS1CBL□M-A2-H
 MR-BKS2CBL03M-A1-L MR-BKS2CBL03M-A2-L



Note. These are not shielded cables.

14. OPTIONS AND AUXILIARY EQUIPMENT

14.2 Regenerative options



CAUTION

* The specified combinations of regenerative options and servo amplifiers may only be used. Otherwise, a fire may occur.

(1) Combination and regenerative power

The power values in the table are resistor-generated powers and not rated powers.

Servo amplifier	Regenerative power[W]							
	Built-in regenerative resistor	MR-RB032 [40Ω]	MR-RB12 [40Ω]	MR-RB30 [13Ω]	MR-RB31 [6.7Ω]	MR-RB32 [40Ω]	(Note 1) MR-RB50 [13Ω]	(Note 1) MR-MB51 [6.7Ω]
MR-J3-10T (1)		30						
MR-J3-20T (1)	10	30	100					
MR-J3-40T (1)	10	30	100					
MR-J3-60T	10	30	100					
MR-J3-70T	20	30	100			300		
MR-J3-100T	20	30	100			300		
MR-J3-200T	100			300			500	
MR-J3-350T	100			300			500	
MR-J3-500T	130				300			500
MR-J3-700T	170				300			500

Servo amplifier	Regenerative power[W]						
	Built-in regenerative resistor	MR-RB1H-4 [82Ω]	(Note 1) MR-RB3M-4 [120Ω]	(Note 1) MR-RB3G-4 [47Ω]	(Note 1) MR-RB5G-4 [47Ω]	(Note 1) MR-RB34-4 [26Ω]	(Note 1) MR-RB54-4 [26Ω]
MR-J3-60T4	15	100	300				
MR-J3-100T4	15	100	300				
MR-J3-200T4	100			300	500		
MR-J3-350T4	100			300	500		
MR-J3-500T4	130					300	500
MR-J3-700T4	170					300	500

Servo amplifier	(Note 2) Regenerative power[W]						
	External regenerative resistor (Accessory)	MR-RB5E [6Ω]	MR-RB9P [4.5Ω]	MR-RB9F [3Ω]	MR-RB6B-4 [20Ω]	MR-RB60-4 [12.5Ω]	MR-RB6K-4 [10Ω]
MR-J3-11KT	500 (800)	500 (800)					
MR-J3-15KT	850 (1300)		850 (1300)				
MR-J3-22KT	850 (1300)			850 (1300)			
MR-J3-11KT4	500 (800)				500 (800)		
MR-J3-15KT4	850 (1300)					850 (1300)	
MR-J3-22KT4	850 (1300)						850 (1300)

Note 1. Always install a cooling fan.

2. Values in parentheses assume the installation of a cooling fan.

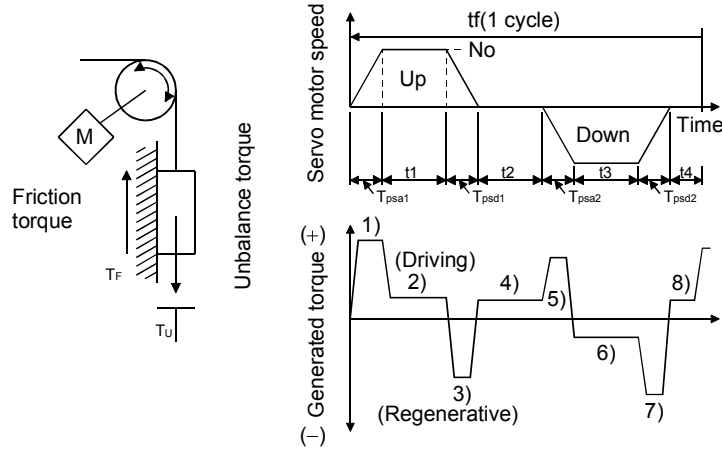
14. OPTIONS AND AUXILIARY EQUIPMENT

(2) Selection of the regenerative option

Use the following method when regeneration occurs continuously in vertical motion applications or when it is desired to make an in-depth selection of the regenerative option.

(a) Regenerative energy calculation

Use the following table to calculate the regenerative energy.



Formulas for calculating torque and energy in operation

Regenerative power	Torque applied to servo motor [N · m]	Energy [J]
1)	$T_1 = \frac{(JL + JM) \cdot N_0}{9.55 \times 10^4} \cdot \frac{1}{T_{psa1}} + T_U + T_F$	$E_1 = \frac{0.1047}{2} \cdot N_0 \cdot T_1 \cdot T_{psa1}$
2)	$T_2 = T_U + T_F$	$E_2 = 0.1047 \cdot N_0 \cdot T_2 \cdot t_1$
3)	$T_3 = \frac{-(JL + JM) \cdot N_0}{9.55 \times 10^4} \cdot \frac{1}{T_{psd1}} + T_U + T_F$	$E_3 = \frac{0.1047}{2} \cdot N_0 \cdot T_3 \cdot T_{psd1}$
4), 8)	$T_4 = T_U$	$E_4 \geq 0$ (No regeneration)
5)	$T_5 = \frac{(JL + JM) \cdot N_0}{9.55 \times 10^4} \cdot \frac{1}{T_{psa2}} - T_U + T_F$	$E_5 = \frac{0.1047}{2} \cdot N_0 \cdot T_5 \cdot T_{psa2}$
6)	$T_6 = -T_U + T_F$	$E_6 = 0.1047 \cdot N_0 \cdot T_6 \cdot t_3$
7)	$T_7 = \frac{-(JL + JM) \cdot N_0}{9.55 \times 10^4} \cdot \frac{1}{T_{psd2}} - T_U + T_F$	$E_7 = \frac{0.1047}{2} \cdot N_0 \cdot T_7 \cdot T_{psd2}$

From the calculation results in 1) to 8), find the absolute value (Es) of the sum total of negative energies.

14. OPTIONS AND AUXILIARY EQUIPMENT

(b) Losses of servo motor and servo amplifier in regenerative mode

The following table lists the efficiencies and other data of the servo motor and servo amplifier in the regenerative mode.

Servo amplifier	Inverse efficiency[%]	Capacitor charging[J]	Servo amplifier	Inverse efficiency[%]	Capacitor charging[J]
MR-J3-10T	55	9	MR-J3-200T	85	40
MR-J3-10T1	55	4	MR-J3-200T4	85	25
MR-J3-20T	70	9	MR-J3-350T	85	40
MR-J3-20T1	70	4	MR-J3-350T4	85	36
MR-J3-40T	85	11	MR-J3-500T(4)	90	45
MR-J3-40T1	85	10	MR-J3-700T(4)	90	70
MR-J3-60T(4)	85	11	MR-J3-11KT(4)	90	120
MR-J3-70T	80	18	MR-J3-15KT(4)	90	170
MR-J3-100T	80	18	MR-J3-22KT(4)	90	250
MR-J3-100T4	80	12			

Inverse efficiency (η) :Efficiency including some efficiencies of the servo motor and servo amplifier when rated (regenerative) torque is generated at rated speed. Since the efficiency varies with the speed and generated torque, allow for about 10%.

Capacitor charging (E_c) :Energy charged into the electrolytic capacitor in the servo amplifier.

Subtract the capacitor charging from the result of multiplying the sum total of regenerative energies by the inverse efficiency to calculate the energy consumed by the regenerative option.

$$ER [J] = \eta \cdot E_s - E_c$$

Calculate the power consumption of the regenerative option on the basis of single-cycle operation period t_f [s] to select the necessary regenerative option.

$$PR [W] = ER/t_f$$

14. OPTIONS AND AUXILIARY EQUIPMENT

(3) Parameter setting

Set parameter No.PA02 according to the option to be used.

Parameter No.PA02

0	0		
---	---	--	--

Selection of regenerative option

00: Regenerative option is not used

- For servo amplifier of 100W, regenerative resistor is not used.
- For servo amplifier of 200 to 7kW, built-in regenerative resistor is used.
- Supplied regenerative resistors or regenerative option is used with the servo amplifier of 11k to 22kW.

01: FR-BU2-(H)• FR-RC-(H)• FR-CV-(H)

02: MR-RB032

03: MR-RB12

04: MR-RB32

05: MR-RB30

06: MR-RB50(Cooling fan is required)

08: MR-RB31

09: MR-RB51(Cooling fan is required)

80: MR-RB1H-4

81: MR-RB3M-4(Cooling fan is required)

82: MR-RB3G-4(Cooling fan is required)

83: MR-RB5G-4(Cooling fan is required)

84: MR-RB34-4(Cooling fan is required)

85: MR-RB54-4(Cooling fan is required)

FA: When the supplied regenerative resistor is cooled by the cooling fan to increase the ability with the servo amplifier of 11k to 22kW.

Regenerative resistor, regenerative option	Setting value
Standard supplied regenerative resistor	00
Standard supplied regenerative resistor (with a cooling fan to cool it)	FA
MR-RB5E	00
MR-RB5E (with a cooling fan to cool it)	FA
MR-RB9P	00
MR-RB9P (with a cooling fan to cool it)	FA
MR-RB9F	00
MR-RB9F (with a cooling fan to cool it)	FA
MR-RB6B-4	00
MR-RB6B-4 (with a cooling fan to cool it)	FA
MR-RB60-4	00
MR-RB60-4 (with a cooling fan to cool it)	FA
MR-RB6K-4	00
MR-RB6K-4 (with a cooling fan to cool it)	FA

(4) Connection of the regenerative option

POINT
<ul style="list-style-type: none"> • When the MR-RB50 • MR-RB51 • MR-RB3M-4 • MR-RB3G-4 • MR-RB5G-4 • MR-RB34-4 • MR-RB54-4 is used, a cooling fan is required to cool it. The cooling fan should be prepared by the customer. • For the sizes of wires used for wiring, refer to section 14.9.

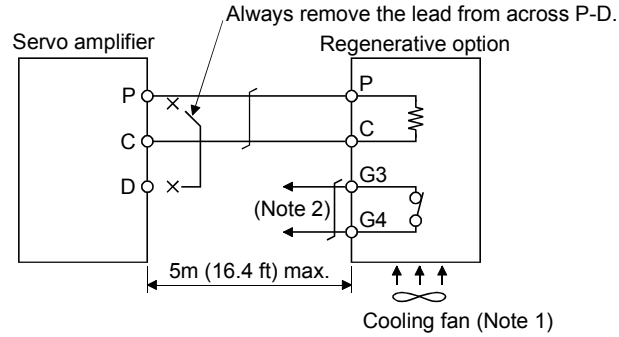
The regenerative option will cause a temperature rise of +100°C relative to the ambient temperature. Fully examine heat dissipation, installation position, used cables, etc. before installing the option. For wiring, use flame-resistant cables and keep them clear of the regenerative option body. Always use twisted cables of max. 5m length for connection with the servo amplifier.

14. OPTIONS AND AUXILIARY EQUIPMENT

(a) MR-J3-350T or less • MR-J3-200T4 or less

Always remove the wiring from across P-D and fit the regenerative option across P-C.

The G3 and G4 terminals act as a thermal sensor. G3-G4 is disconnected when the regenerative option overheats abnormally.



Note 1. When using the MR-RB50, MR-RB3M-4, MR-RB3G-4 or MR-RB5G-4, forcibly cool it with a cooling fan (92×92, minimum air flow : 1.0m³).

2. Make up a sequence which will switch off the magnetic contactor (MC) when abnormal heating occurs.

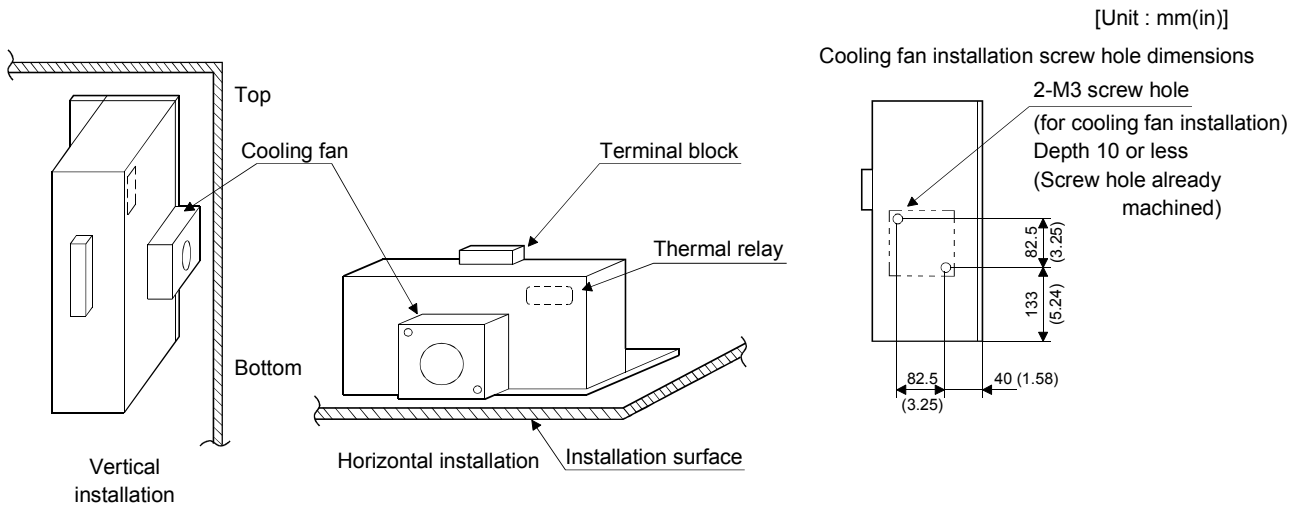
G3-G4 contact specifications

Maximum voltage: 120V AC/DC

Maximum current: 0.5A/4.8VDC

Maximum capacity: 2.4VA

For the MR-RB50, MR-RB3M-4, MR-RB3G-4 or MR-RB5G-4 install the cooling fan as shown.

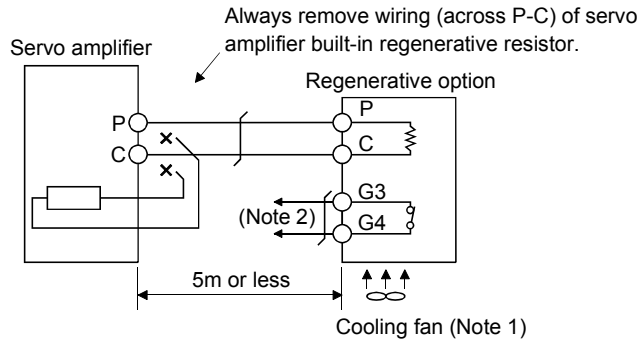


14. OPTIONS AND AUXILIARY EQUIPMENT

(b) MR-J3-350T4 • MR-J3-500T(4) • MR-J3-700T(4)

Always remove the wiring (across P-C) of the servo amplifier built-in regenerative resistor and fit the regenerative option across P-C.

The G3 and G4 terminals act as a thermal sensor. G3-G4 is opened when the regenerative option overheats abnormally.



Note 1. When using the MR-RB51, MR-RB3G-4, MR-RB5G-4, MR-RB34-4 or MR-RB54-4, forcibly cool it with a cooling fan (92×92, minimum air flow : 1.0m³).

2. Make up a sequence which will switch off the magnetic contactor (MC) when abnormal heating occurs.

G3-G4 contact specifications

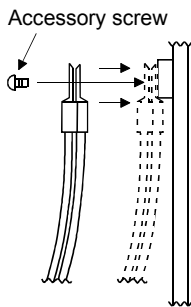
Maximum voltage: 120V AC/DC

Maximum current: 0.5A/4.8VDC

Maximum capacity: 2.4VA

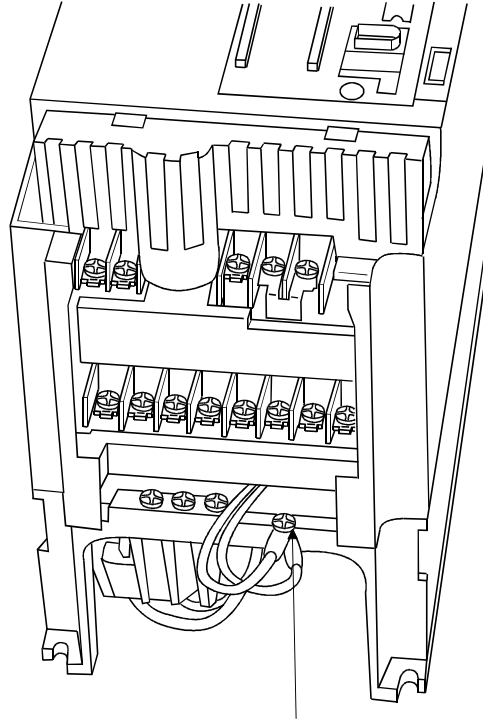
When using the regenerative resistor option, remove the servo amplifier's built-in regenerative resistor terminals (across P-C), fit them back to back, and secure them to the frame with the accessory screw as shown below.

Mounting method



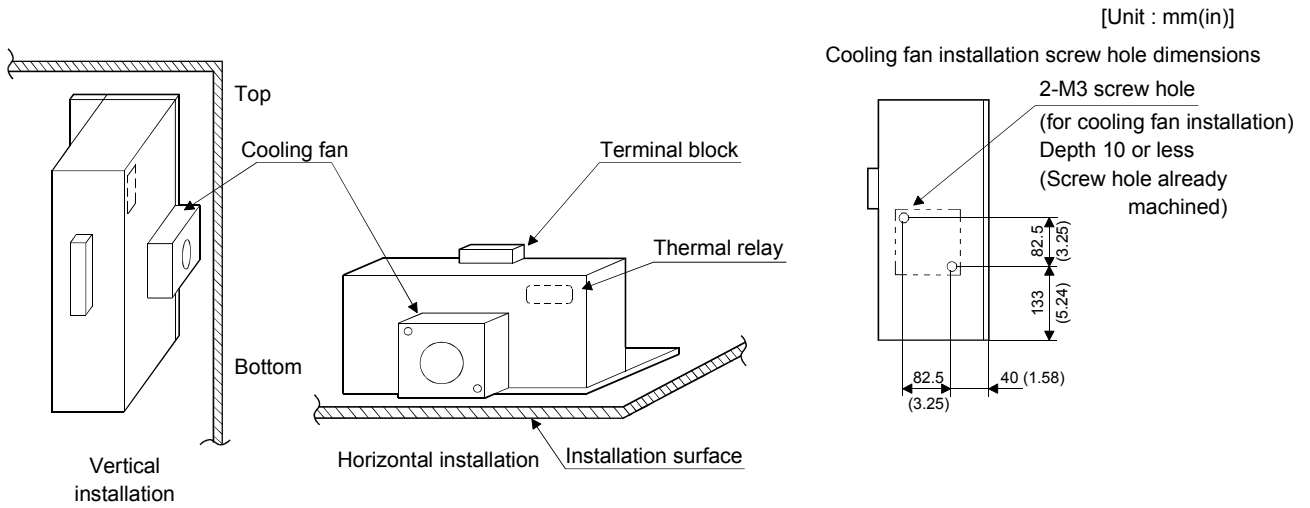
14. OPTIONS AND AUXILIARY EQUIPMENT

The drawing below shows the MR-J3-350T4 and MR-J3-500T(4). Refer to section 12.1 (6) Outline drawings for the position of the fixing screw for MR-J3-700T(4).



Built-in regenerative resistor
lead terminal fixing screw

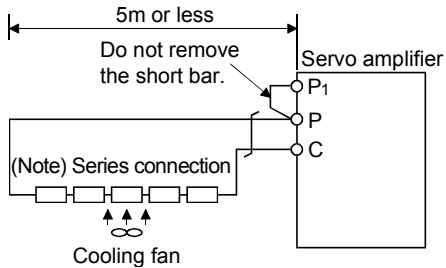
For the MR-RB51, MR-RB3G-4, MR-RB5G-4, MR-RB34-4 or MR-RB54-4 install the cooling fan as shown.



14. OPTIONS AND AUXILIARY EQUIPMENT

(c) MR-J3-11KT(4) to MR-J3-22KT(4) (when using the supplied regenerative resistor)

When using the regenerative resistors supplied to the servo amplifier, the specified number of resistors (4 or 5 resistors) must be connected in series. If they are connected in parallel or in less than the specified number, the servo amplifier may become faulty and/or the regenerative resistors burn. Install the resistors at intervals of about 70mm. Cooling the resistors with two cooling fans (92×92 , minimum air flow : 1.0m^3) improves the regeneration capability. In this case, set "□□FA" in parameter No.PA02.



Note. The number of resistors connected in series depends on the resistor type. The thermal sensor is not mounted on the attached regenerative resistor. An abnormal heating of resistor may be generated at a regenerative circuit failure. Install a thermal sensor near the resistor and establish a protective circuit to shut off the main circuit power supply when abnormal heating occurs. The detection level of the thermal sensor varies according to the settings of the resistor. Set the thermal sensor in the most appropriate position on your design basis or use the thermal sensor built-in regenerative option (MR-RB5E, 9P, 9F, 6B-4, 60-4 and 6K-4) provided by Mitsubishi Electric Corporation.

Servo amplifier	Regenerative resistor	Regenerative power [W]		Resistance [Ω]	Number of resistors
		Normal	Cooling		
MR-J3-11KT	GRZG400-1.5Ω	500	800	6	4
MR-J3-15KT	GRZG400-0.9Ω	850	1300	4.5	5
MR-J3-22KT	GRZG400-0.6Ω	850	1300	3	5
MR-J3-11KT4	GRZG400-5.0Ω	500	800	20	4
MR-J3-15KT4	GRZG400-2.5Ω	850	1300	12.5	5
MR-J3-22KT4	GRZG400-2.0Ω	850	1300	10	5

14. OPTIONS AND AUXILIARY EQUIPMENT

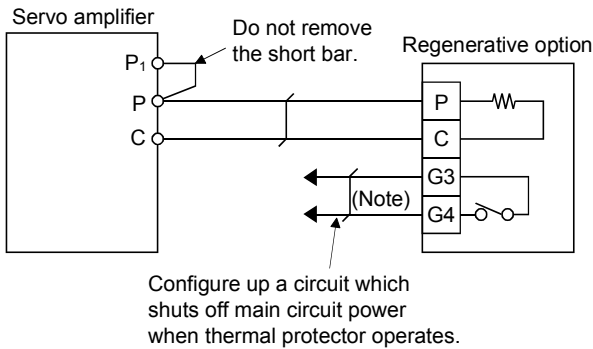
(d) MR-J3-11KT(4)-PX to MR-J3-22KT(4)-PX (when using the regenerative option)

The MR-J3-11KT(4)-PX to MR-J3-22KT(4)-PX servo amplifiers are not supplied with regenerative resistors. When using any of these servo amplifiers, always use the MR-RB5E, 9P, 9F, 6B-4, 60-4 and 6K-4 regenerative option.

The MR-RB5E, 9P, 9F, 6B-4, 60-4 and 6K-4 are regenerative options that have encased the GRZG400-1.5Ω, GRZG400-0.9Ω, GRZG400-0.6Ω, GRZG400-5.0Ω, GRZG400-2.5Ω, GRZG400-2.0Ω respectively. When using any of these regenerative options, make the same parameter setting as when using the GRZG400-1.5Ω, GRZG400-0.9Ω, GRZG400-0.6Ω, GRZG400-5.0Ω, GRZG400-2.5Ω, GRZG400-2.0Ω (supplied regenerative resistors or regenerative option is used with 11kW or more servo amplifier).

Cooling the regenerative option with cooling fans improves regenerative capability.

The G3 and G4 terminals are for the thermal protector. G3-G4 is opened when the regenerative option overheats abnormally.



Note. Specifications of contact across G3-G4

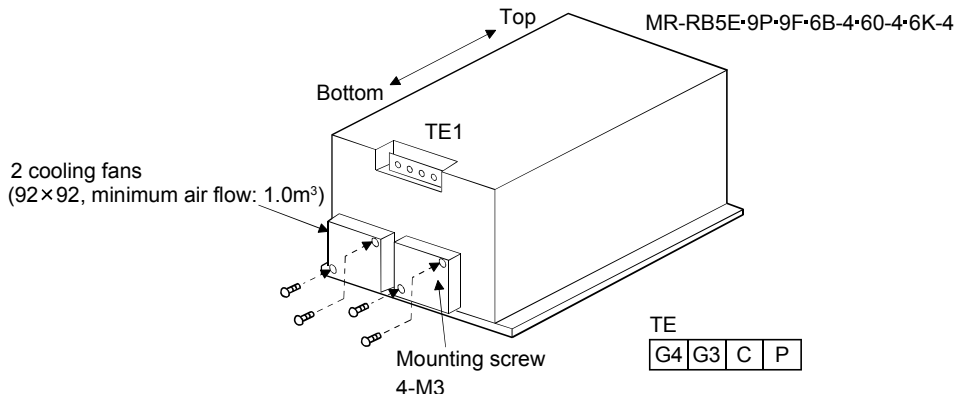
Maximum voltage : 120V AC/DC

Maximum current : 0.5A/4.8VDC

Maximum capacity : 2.4VA

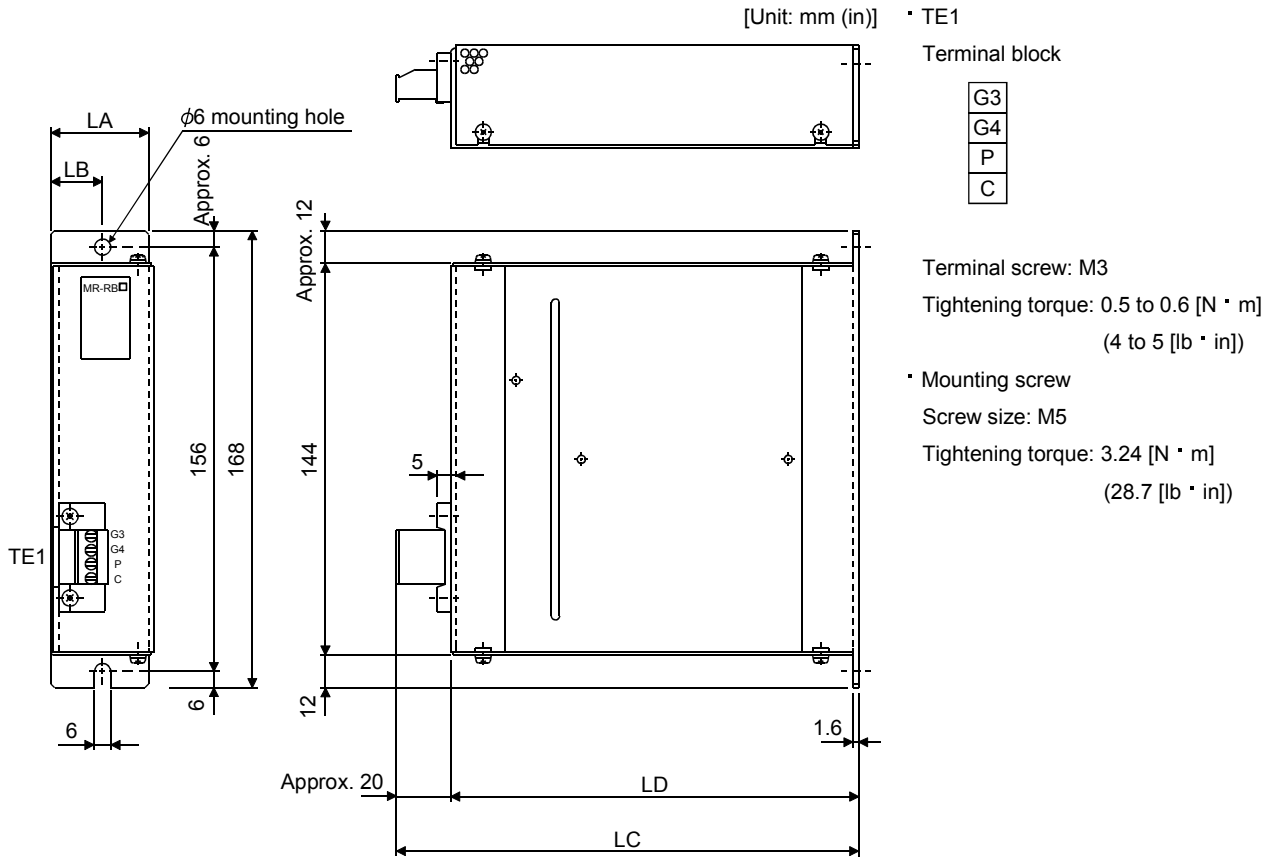
Servo amplifier	Regenerative option model	Resistance [Ω]	Regenerative power [W]	
			Without cooling fans	With cooling fans
MR-J3-11KT-PX	MR-RB5E	6	500	800
MR-J3-15KT-PX	MR-RB9P	4.5	850	1300
MR-J3-22KT-PX	MR-RB9F	3	850	1300
MR-J3-11KT4-PX	MR-RB6B-4	20	500	800
MR-J3-15KT4-PX	MR-RB60-4	12.5	850	1300
MR-J3-22KT4-PX	MR-RB6K-4	10	850	1300

When using cooling fans, install them using the mounting holes provided in the bottom of the regenerative option. In this case, set "□ □FA" in parameter No.PA02.



14. OPTIONS AND AUXILIARY EQUIPMENT

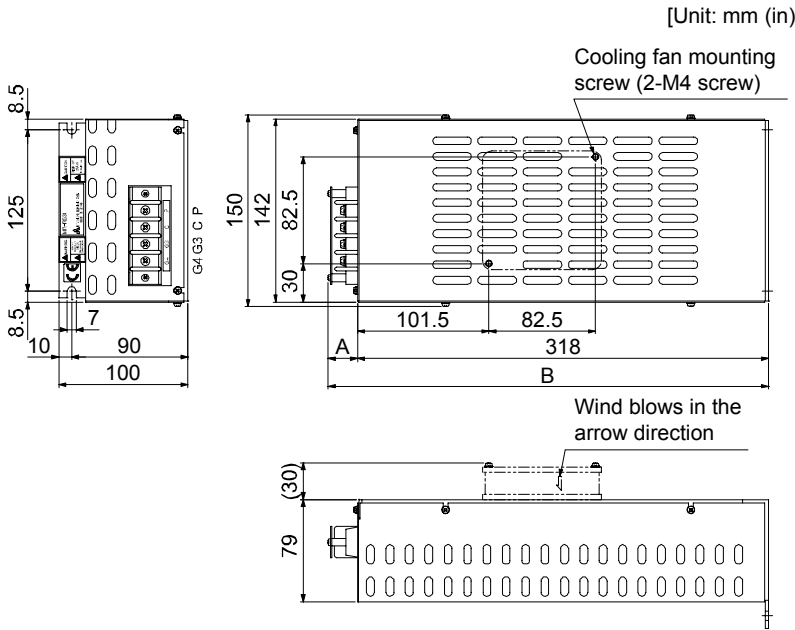
(5) Outline dimension drawings (a) MR-RB032 • MR-RB12



Regenerative option	Variable dimensions				Mass	
	LA	LB	LC	LD	[kg]	[lb]
MR-RB032	30	15	119	99	0.5	1.1
MR-RB12	40	15	169	149	1.1	2.4

14. OPTIONS AND AUXILIARY EQUIPMENT

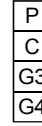
(b) MR-RB30 · MR-RB31 · MR-RB32 · MR-RB34-4 · MR-RB3M-4 · MR-RB3G-4



[Unit: mm (in)]

• TE1

Terminal block



Terminal screw: M4

Tightening torque: 1.2 [N · m] (10.62 [lb · in])

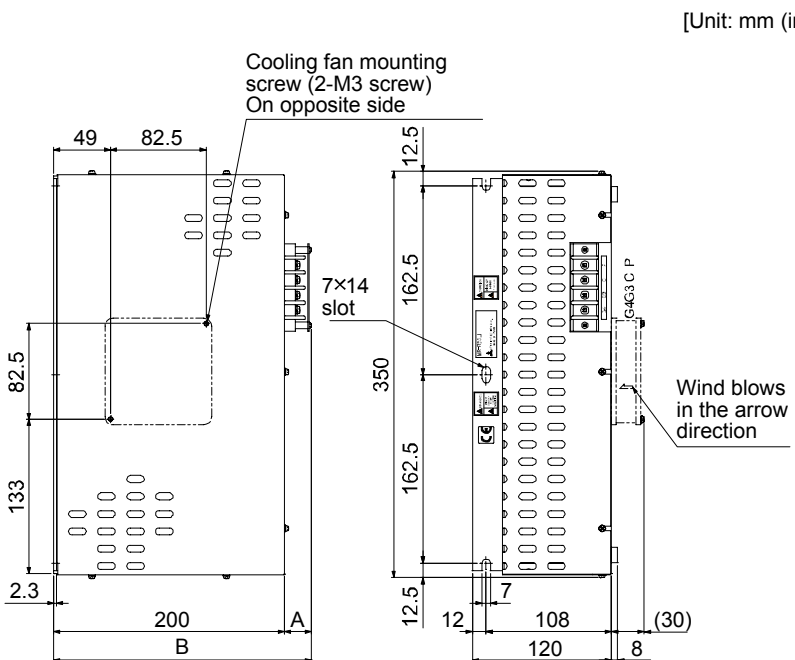
• Mounting screw

Screw size: M6

Tightening torque: 5.4 [N · m] (47.79 [lb · in])

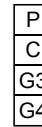
Regenerative option	Variable dimensions		Mass [kg] (lb)
	A	B	
MR-RB30	17	335	2.9 (6.4)
MR-RB31			
MR-RB32			
MR-RB34-4	23	341	
MR-RB3M-4			
MR-RB3G-4			

(c) MR-RB50 · MR-RB51 · MR-RB54-4 · MR-RB5G-4



[Unit: mm (in)]

• Terminal block



Terminal screw: M4

Tightening torque: 1.2 [N · m] (10.62 [lb · in])

• Mounting screw

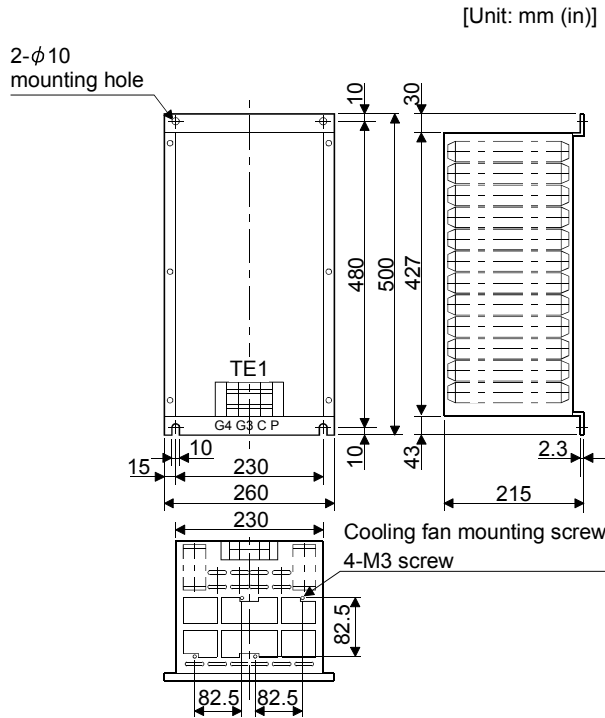
Screw size: M6

Tightening torque: 5.4 [N · m] (47.79 [lb · in])

Regenerative option	Variable dimensions		Mass [kg] (lb)
	A	B	
MR-RB50	17	217	5.6 (12.3)
MR-RB51			
MR-RB54-4	23	233	
MR-RB5G-4			

14. OPTIONS AND AUXILIARY EQUIPMENT

(d) MR-RB5E • MR-RB9P • MR-RB9F • MR-RB6B-4 • MR-RB60-4 • MR-RB6K-4



• Terminal block

G4	G3	C	P
----	----	---	---

Terminal screw: M5

Tightening torque: 2.0 [N · m] (17.70 [lb · in])

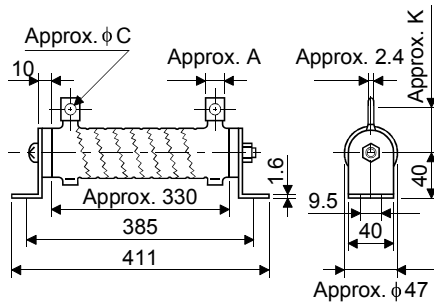
• Mounting screw

Screw size: M8

Tightening torque: 13.2 [N · m] (116.83 [lb · in])

Regenerative option	Mass	
	[kg]	[lb]
MR-RB5E	10	22.0
MR-RB9P	11	24.3
MR-RB9F	11	24.3
MR-RB6B-4	10	22.0
MR-RB60-4	11	24.3
MR-RB6K-4	11	24.3

(e) GRZG400-1.5Ω • GRZG400-0.9Ω • GRZG400-0.6Ω • GRZG400-5.0Ω • GRZG400-2.5Ω • GRZG400-2.0Ω (standard accessories)



Regenerative brake	Variable dimensions			Mounting screw size	Tightening torque [N · m] (lb · in)	Mass [kg] (lb)
	A	C	K			
GRZG400-1.5Ω	10	5.5	39	M8	13.2 (116.83)	0.8 (1.76)
GRZG400-0.9Ω						
GRZG400-0.6Ω	16	8.2	46			
GRZG400-5.0Ω	10	5.5	39			
GRZG400-2.5Ω						
GRZG400-2.0Ω						

14. OPTIONS AND AUXILIARY EQUIPMENT

14.3 FR-BU2-(H) brake unit

POINT	
	<ul style="list-style-type: none">▪ Use a 200V class brake unit and a resistor unit with a 200V class servo amplifier, and a 400V class brake unit and a resistor unit with a 400V class servo amplifier. Combination of different voltage class units and servo amplifier cannot be used.▪ Install a brake unit and a resistor unit on a flat surface vertically. When the unit is installed horizontally or diagonally, the heat dissipation effect diminishes.▪ Temperature of the resistor unit case rises to higher than 100°C. Keep cables and flammable materials away from the case.▪ Ambient temperature condition of the brake unit is between -10°C (14°F) and $+50^{\circ}\text{C}$ (122°F). Note that the condition is different from the ambient temperature condition of the servo amplifier (between 0°C (32°F) and $+55^{\circ}\text{C}$ (131°F)).▪ Configure the circuit to shut down the power-supply with the alarm output of the brake unit and resistor unit under abnormal condition.▪ Use the brake unit with a combination indicated in section 14.3.1.▪ For executing a continuous regenerative operation, use FR-RC-(H) power regeneration converter or FR-CV-(H) power regeneration common converter.▪ Brake unit and regenerative options (Regenerative resistor) cannot be used simultaneously.

Connect the brake unit to the bus of the servo amplifier. As compared to the MR-RB regenerative option, the brake unit can return larger power. Use the brake unit when the regenerative option cannot provide sufficient regenerative capability.

When using the brake unit, set the parameter No.PA02 of the servo amplifier to "□□01".

When using the brake unit, always refer to the FR-BU2-(H) Brake Unit Instruction Manual.

14. OPTIONS AND AUXILIARY EQUIPMENT

14.3.1 Selection

Use a combination of servo amplifier, brake unit and resistor unit listed below.

Brake unit		Resistor unit	Number of connected units	Permissible continuous power [kW]	Total resistance [Ω]	Applicable servo amplifier
200V class	FR-BU2-15K	FR-BR-15K	1	0.99	8	MR-J3-500T (Note)
			2 (parallel)	1.98	4	MR-J3-500T MR-J3-700T MR-J3-11KT MR-J3-15KT
	FR-BU2-30K	FR-BR-30K	1	1.99	4	MR-J3-500T MR-J3-700T MR-J3-11KT MR-J3-15KT
	FR-BU2-55K	FR-BR-55K	1	3.91	2	MR-J3-11KT MR-J3-15KT MR-J3-22KT
		MT-BR5-55K	1	5.5	2	MR-J3-22KT
	400V class	FR-BU2-H30K	FR-BR-H30K	1	1.99	16	MR-J3-500T4 MR-J3-700T4 MR-J3-11KT4
FR-BU2-H55K		FR-BR-H55K	1	3.91	8	MR-J3-11KT4 MR-J3-15KT4 MR-J3-22KT4
FR-BU2-H75K		MT-BR5-H75K	1	7.5	6.5	MR-J3-22KT4

Note. The combination is limited only when using with the servo motors HC-LP302, HC-RP353, HA-LP502 or HC-UP352.

14.3.2 Brake unit parameter setting

Normally, when using the FR-BU2-(H), changing parameters is not necessary. Whether a parameter can be changed or not is listed below.

Parameter		Change possible/ impossible	Remarks
No.	Name		
0	Brake mode switchover	Impossible	Do not change the parameter.
1	Monitor display data selection	Possible	Refer to the FR-BU2-(H) Brake Unit Instruction Manual.
2	Input terminal function selection 1	Impossible	Do not change the parameter.
3	Input terminal function selection 2		
77	Parameter write selection		
78	Cumulative energization time carrying-over times		
CLr	Parameter clear		
ECL	Alarm history clear		
C1	For manufacturer setting		

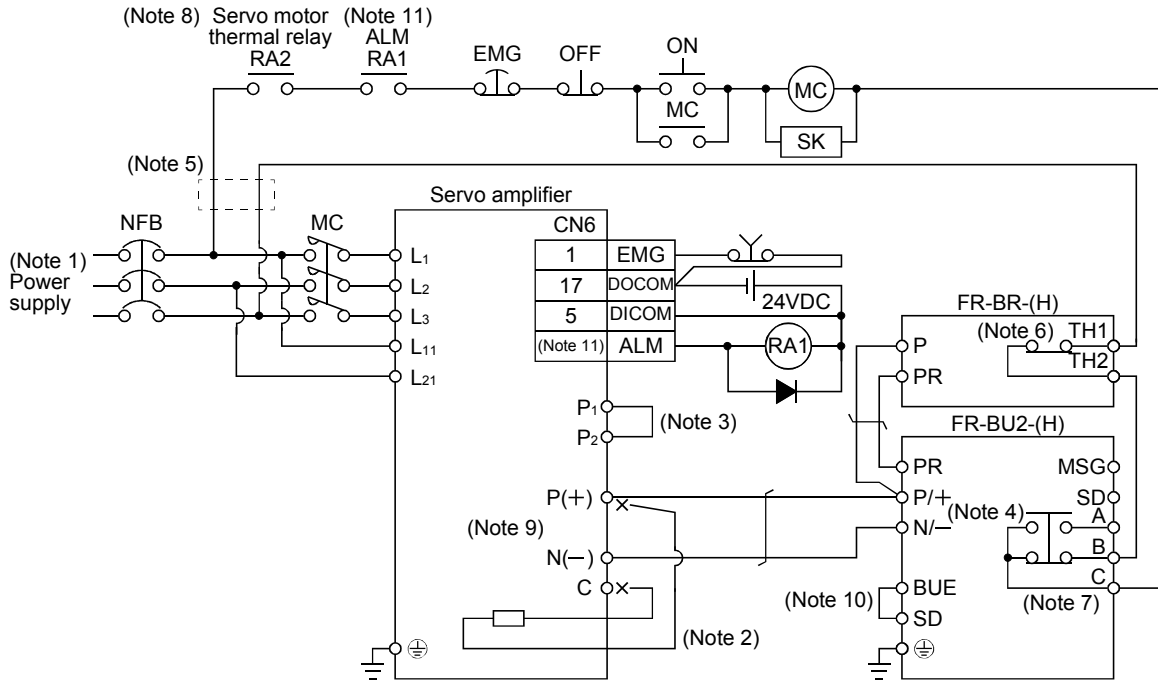
14. OPTIONS AND AUXILIARY EQUIPMENT

14.3.3 Connection example

POINT
<ul style="list-style-type: none"> Connecting PR terminal of the brake unit to P terminal of the servo amplifier results in brake unit malfunction. Always connect the PR terminal of the brake unit to the PR terminal of the resistor unit.

(1) Combination with FR-BR-(H) resistor unit

(a) When connecting a brake unit to a servo amplifier



Note 1. For power supply specifications, refer to section 1.2.

2. For the servo amplifier of 5k and 7kW, always disconnect the lead of built-in regenerative resistor, which is connected to the P and C terminals. For the servo amplifier of 11k to 22kW, do not connect a supplied regenerative resistor to the P and C terminals.

3. Always connect P₁ and P₂ terminals (P₁ and P for the servo amplifier of 11k to 22kW) (Factory-wired). When using the power factor improving DC reactor, refer to section 14.11.

4. Connect the P/+ and N/- terminals of the brake unit to a correct destination. Wrong connection results in servo amplifier and brake unit malfunction.

5. For 400VAC class, a step-down transformer is required.

6. Contact rating: 1b contact, 110VAC_5A/220VAC_3A

Normal condition: TH1-TH2 is conducting. Abnormal condition: TH1-TH2 is not conducting.

7. Contact rating: 230VAC_0.3A/30VDC_0.3A

Normal condition: B-C is conducting/A-C is not conducting. Abnormal condition: B-C is not conducting/A-C is conducting.

8. For the servo amplifier of 3.5kW, always disconnect P and D terminals.

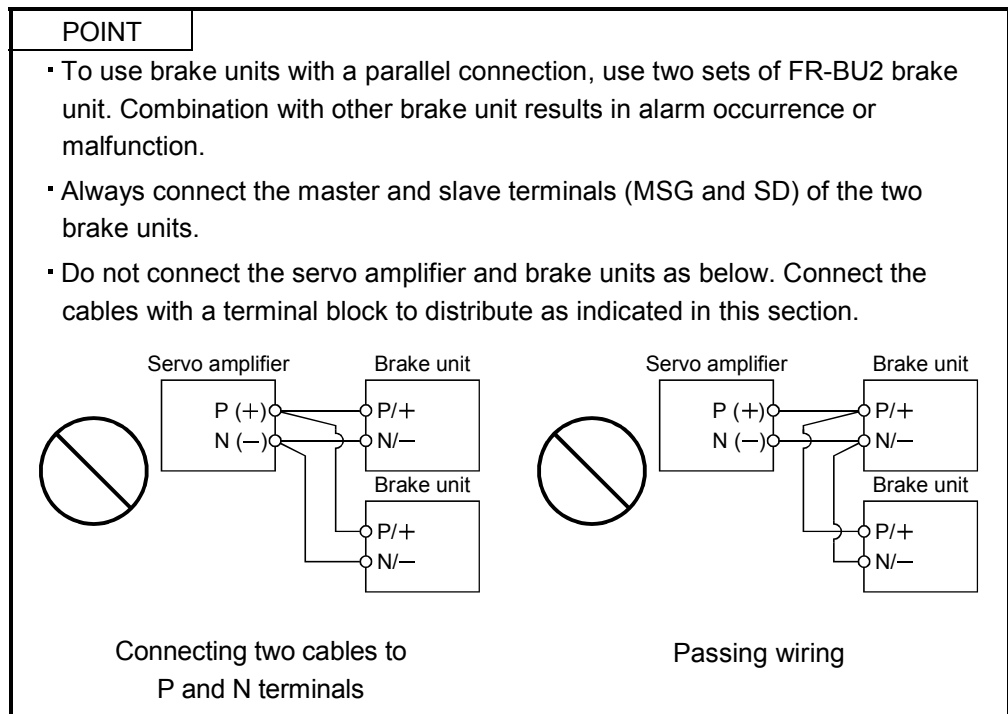
9. Do not connect more than one cable to each P(+) to N(-) terminals of the servo amplifier.

10. Always connect BUE and SD terminals (Factory-wired).

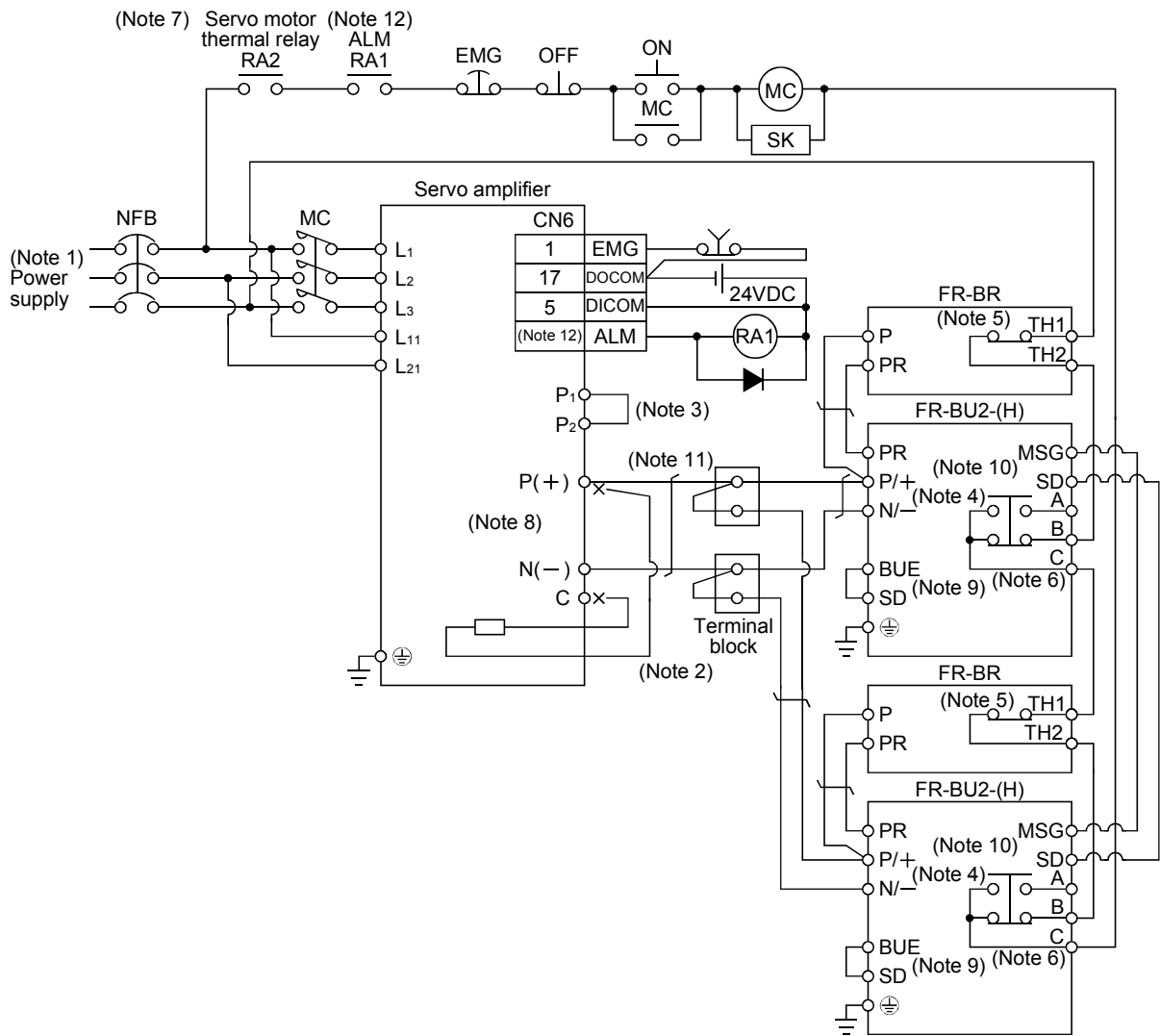
11. The diagram is for when outputting the trouble (ALM) is enabled by changing the parameter. When disabling to output the trouble (ALM), configure the power supply circuit to turn off the magnetic contactor after detecting an alarm occurrence on the controller side.

14. OPTIONS AND AUXILIARY EQUIPMENT

(b) When connecting two brake units to a servo amplifier



14. OPTIONS AND AUXILIARY EQUIPMENT

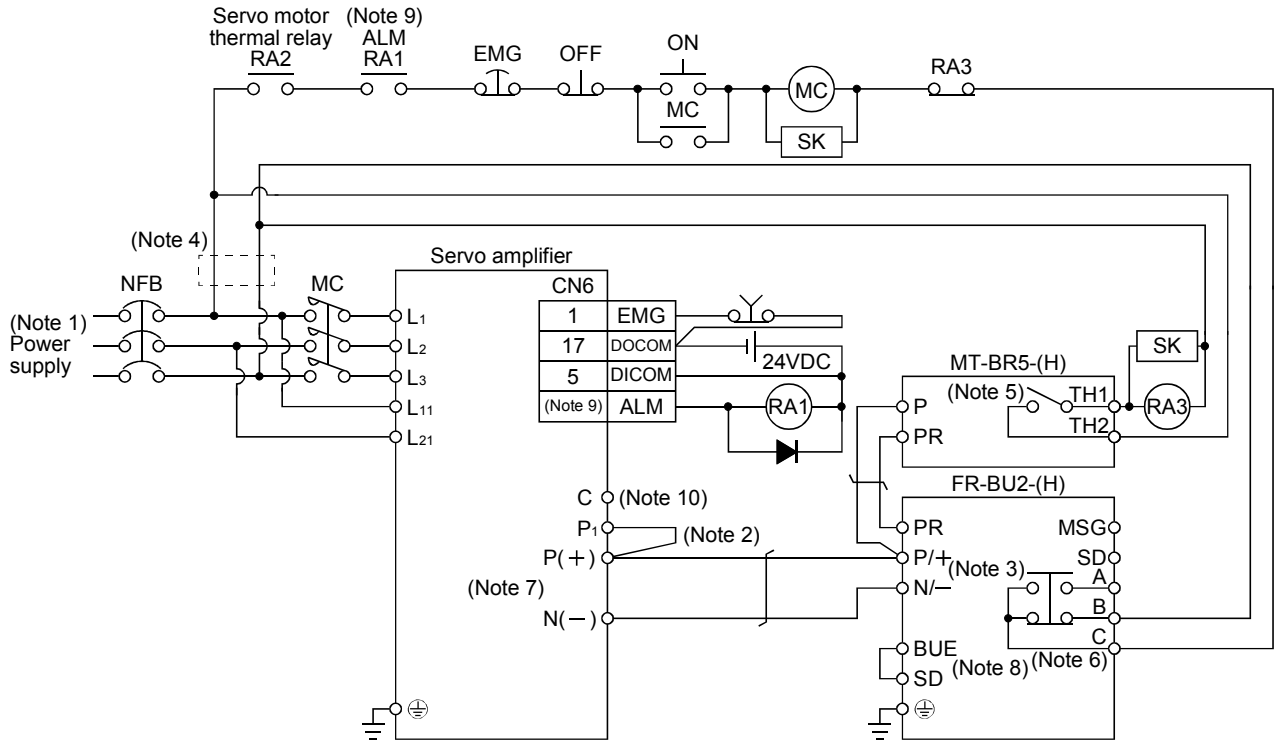


Note 1. For power supply specifications, refer to section 1.2.

2. For the servo amplifier of 5k and 7kW, always disconnect the lead of built-in regenerative resistor, which is connected to the P and C terminals. For the servo amplifier of 11k and 15kW, do not connect a supplied regenerative resistor to the P and C terminals.
3. Always connect P₁ and P₂ terminals (P₁ and P for the servo amplifier of 11k and 15kW) (Factory-wired). When using the power factor improving DC reactor, refer to section 14.11.
4. Connect the P/+ and N/- terminals of the brake unit to a correct destination. Wrong connection results in servo amplifier and brake unit malfunction.
5. Contact rating: 1b contact, 110VAC_5A/220VAC_3A
Normal condition: TH1-TH2 is conducting. Abnormal condition: TH1-TH2 is not conducting.
6. Contact rating: 230VAC_0.3A/30VDC_0.3A
Normal condition: B-C is conducting/A-C is not conducting. Abnormal condition: B-C is not conducting/A-C is conducting.
7. For the servo amplifier of 11kW or more, connect the thermal relay sensor of the servo amplifier.
8. Do not connect more than one cable to each P and N terminals of the servo amplifier.
9. Always connect BUE and SD terminals (Factory-wired).
10. Connect the MSG and SD terminals of the brake unit to a correct destination. Wrong connection results in servo amplifier and brake unit malfunction.
11. For the cable to connect the terminal block and the P and N terminals of the servo amplifier, use the cable indicated in (4) (b) in this section.
12. The diagram is for when outputting the trouble (ALM) is enabled by changing the parameter. When disabling to output the trouble (ALM), configure the power supply circuit to turn off the magnetic contactor after detecting an alarm occurrence on the controller side.

14. OPTIONS AND AUXILIARY EQUIPMENT

(2) Combination with MT-BR5-(H) resistor unit



Note 1. For power supply specifications, refer to section 1.2.

2. Always connect P₁ and P(+) terminals (Factory-wired). When using the power factor improving DC reactor, refer to section 14.11.

3. Connect the P/+ and N/- terminals of the brake unit to a correct destination. Wrong connection results in servo amplifier and brake unit malfunction.

4. For the servo amplifier of 400V class, a step-down transformer is required.

5. Contact rating: 1a contact, 110VAC_5A/220VAC_3A

Normal condition: TH1-TH2 is not conducting. Abnormal condition: TH1-TH2 is conducting.

6. Contact rating: 230VAC_0.3A/30VDC_0.3A

Normal condition: B-C is conducting/A-C is not conducting. Abnormal condition: B-C is not conducting/A-C is conducting.

7. Do not connect more than one cable to each P(+) and N(-) terminals of the servo amplifier.

8. Always connect BUE and SD terminals (Factory-wired).

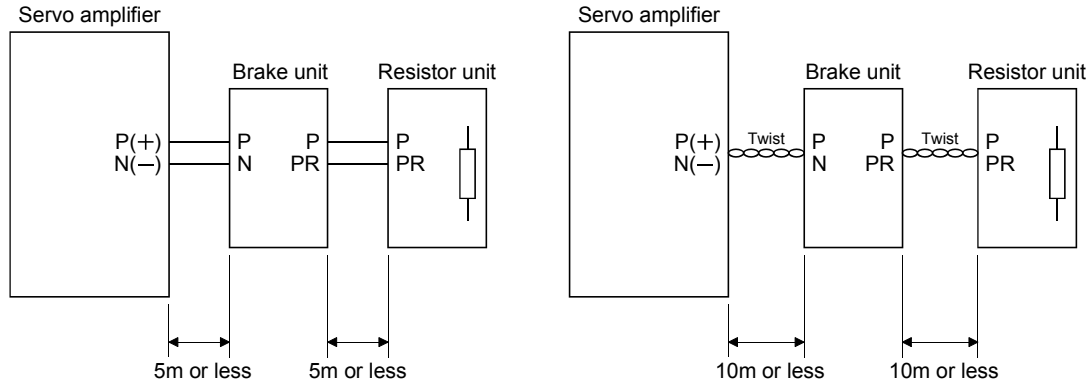
9. The diagram is for when outputting the trouble (ALM) is enabled by changing the parameter. When disabling to output the trouble (ALM), configure the power supply circuit to turn off the magnetic contactor after detecting an alarm occurrence on the controller side.

10. For the servo amplifier of 22kW, do not connect a supplied regenerative resistor to the P and C terminals.

14. OPTIONS AND AUXILIARY EQUIPMENT

(3) Precautions for wiring

The cables between the servo amplifier and the brake unit, and between the resistor unit and the brake unit should be as short as possible. Always twist the cable longer than 5m (twist five times or more per one meter). Even when the cable is twisted, the cable should be less than 10m. Using cables longer than 5m without twisting or twisted cables longer than 10m, may result in the brake unit malfunction.

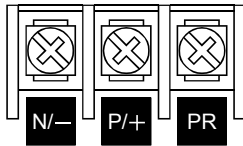


(4) Cables

(a) Cables for the brake unit

For the brake unit, HIV wire (600V Grade heat-resistant polyvinyl chloride insulated wire) is recommended.

1) Main circuit terminal



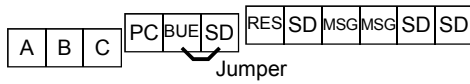
Terminal block

Brake unit		Main circuit terminal screw size	Crimping terminal N/-, P/+, PR, ⊕	Tightening torque [N · m] ([lb · in])	Wire size	
					N/-, P/+, PR, ⊕	
					HIV wire [mm ²]	AWG
200V class	FR-BU2-15K	M4	5.5-4	1.5(13.3)	3.5	12
	FR-BU2-30K	M5	5.5-5	2.5(22.1)	5.5	10
	FR-BU2-55K	M6	14-6	4.4(38.9)	14	6
400V class	FR-BU2-H30K	M4	5.5-4	1.5(13.3)	3.5	12
	FR-BU2-H55K	M5	5.5-5	2.5(22.1)	5.5	10
	FR-BU2-H75K	M6	14-6	4.4(38.9)	14	6

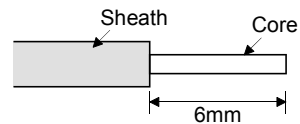
14. OPTIONS AND AUXILIARY EQUIPMENT

2) Control circuit terminal

POINT
<ul style="list-style-type: none"> Undertightening can cause a cable disconnection or malfunction. Overtightening can cause a short circuit or malfunction due to damage to the screw or the brake unit.



Terminal block



Wire the stripped cable after twisting to prevent the cable from becoming loose. In addition, do not solder it.

Screw size: M3

Tightening torque: 0.5N · m to 0.6N · m

Wire size: 0.3mm² to 0.75 mm²

Screw driver: Small flat-blade screwdriver

(Tip thickness: 0.4mm/Tip width 2.5mm)

(b) Cables for connecting the servo amplifier and a distribution terminal block when connecting two sets of the brake unit

Brake unit	Wire size	
	HIV wire [mm ²]	AWG
FR-BU2-15K	8	8

14. OPTIONS AND AUXILIARY EQUIPMENT

(5) Crimping terminals for P and N terminals of servo amplifier

(a) Recommended crimping terminals

POINT
<ul style="list-style-type: none"> Always use recommended crimping terminals or equivalent since some crimping terminals cannot be installed depending on the size.

	Servo amplifier	Brake unit	Number of connected units	Crimping terminal (Manufacturer)	(Note 1) Applicable tool
200V class	MR-J3-500T	FR-BU2-15K	1	FVD5.5-S4(Japan Solderless Terminal)	c
			2	8-4NS(Japan Solderless Terminal) (Note 2)	d
	MR-J3-700T	FR-BU2-15K	1	FVD5.5-S4(Japan Solderless Terminal)	c
			2	8-4NS(Japan Solderless Terminal) (Note 2)	d
	MR-J3-11KT	FR-BU2-30K	1	FVD5.5-S4(Japan Solderless Terminal)	c
			2	FVD8-6(Japan Solderless Terminal)	a
			1	FVD5.5-6(Japan Solderless Terminal)	c
	MR-J3-15KT	FR-BU2-55K	1	FVD14-6(Japan Solderless Terminal)	b
			2	FVD8-6(Japan Solderless Terminal)	a
			1	FVD5.5-6(Japan Solderless Terminal)	c
400V class	MR-J3-22KT	FR-BU2-55K	1	FVD14-8(Japan Solderless Terminal)	b
	MR-J3-500T4	FR-BU2-H30K	1	FVD5.5-S4(Japan Solderless Terminal)	c
			1	FVD5.5-S4(Japan Solderless Terminal)	c
	MR-J3-700T4	FR-BU2-H30K	1	FVD5.5-6(Japan Solderless Terminal)	c
			1	FVD5.5-6(Japan Solderless Terminal)	c
	MR-J3-11KT4	FR-BU2-H55K	1	FVD5.5-6(Japan Solderless Terminal)	c
MR-J3-15KT4	FR-BU2-H55K	1	FVD5.5-6(Japan Solderless Terminal)	c	
MR-J3-22KT4	FR-BU2-H55K	1	FVD5.5-8(Japan Solderless Terminal)	c	
		1	FVD14-8(Japan Solderless Terminal)	b	

Note 1. Symbols in the applicable tool field indicate applicable tools in (5)(b) in this section.

2. Coat the crimping part with an insulation tube.

(b) Applicable tool

Symbol	Servo amplifier side crimping terminals				Manufacturer
	Crimping terminal	Applicable tool			
		Body	Head	Dice	
a	FVD8-6	YF-1 · E-4	YNE-38	DH-111 · DH121	Japan Solderless Terminal
b	FVD14-6 FVD14-8	YF-1 · E-4	YNE-38	DH-112 · DH122	
c	FVD5.5-S4 FVD5.5-6	YNT-1210S			
d	8-4NS	YHT-8S			

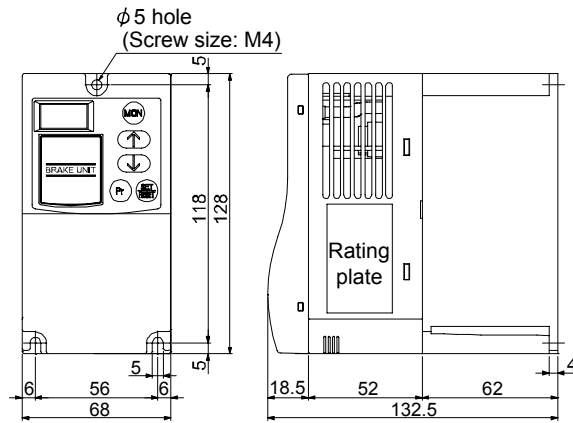
14. OPTIONS AND AUXILIARY EQUIPMENT

14.3.4 Outline dimension drawings

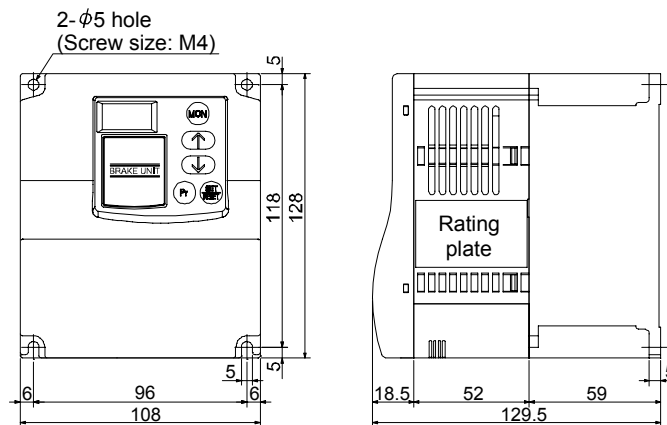
(1) FR-BU2- (H) brake unit

[Unit: mm]

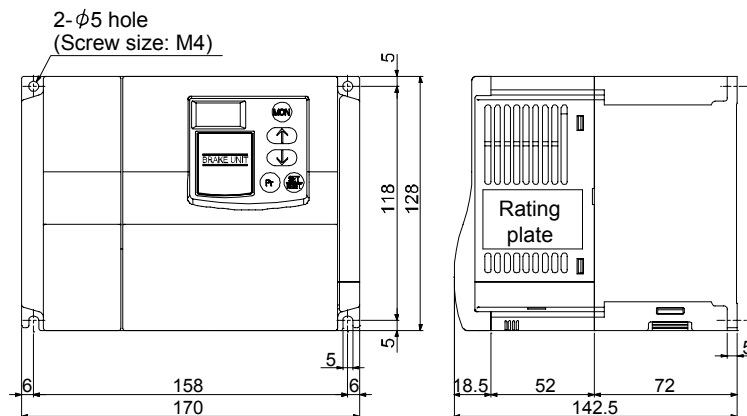
FR-BU2-15K



FR-BU2-30K
FR-BU2-H30K



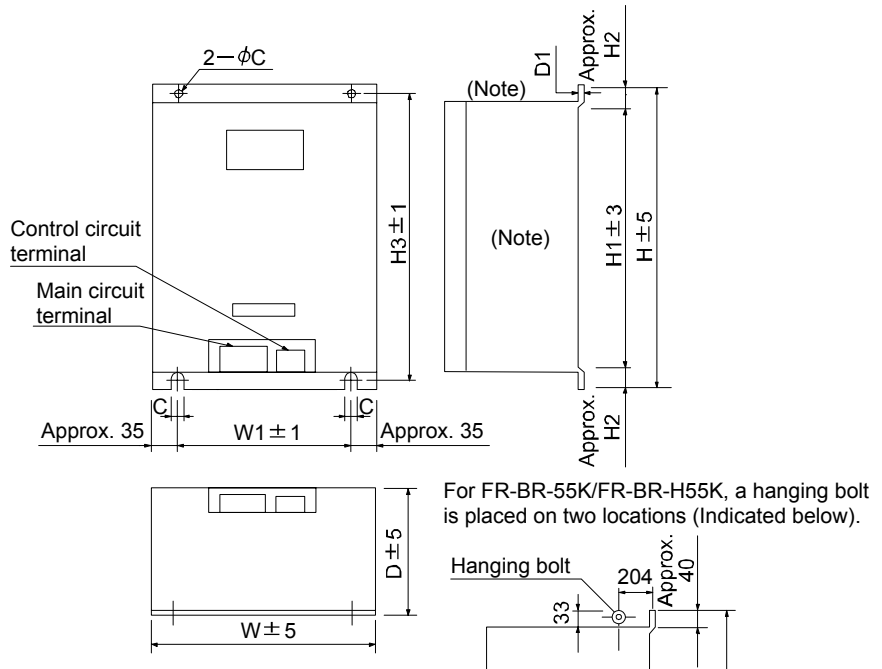
FR-BU2-55K
FR-BU2-H55K, H75K



14. OPTIONS AND AUXILIARY EQUIPMENT

(2) FR-BR- (H) resistor unit

[Unit: mm]

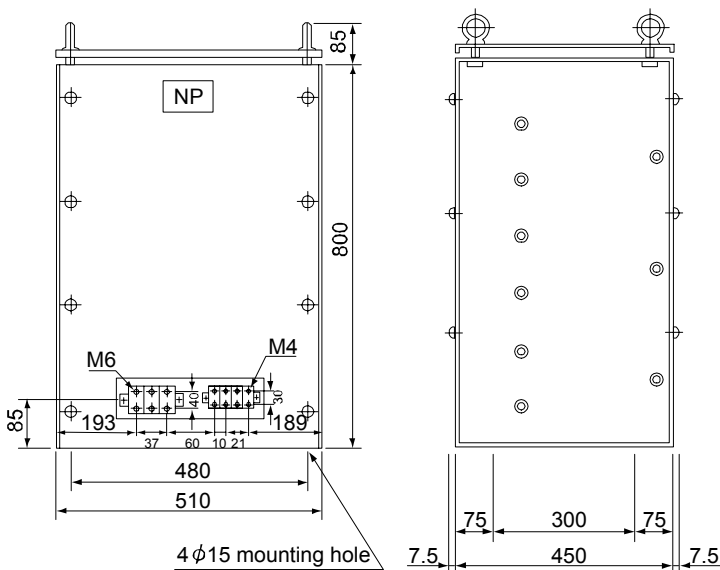


Note. Ventilation ports are provided on both sides and the top. The bottom is open.

Resistor unit		W	W1	H	H1	H2	H3	D	D1	C	Approximate mass [kg]([lb])
200V class	FR-BR-15K	170	100	450	410	20	432	220	3.2	6	15(33.1)
	FR-BR-30K	340	270	600	560	20	582	220	4	10	30(66.1)
	FR-BR-55K	480	410	700	620	40	670	450	3.2	12	70(154)
400V class	FR-BR-H30K	340	270	600	560	20	582	220	4	10	30(66.1)
	FR-BR-H55K	480	410	700	620	40	670	450	3.2	12	70(154)

(3) MT-BR5- (H) resistor unit

[Unit: mm]



Resistor unit		Resistance value	Approximate mass [kg]([lb])
200V class	MT-BR5-55K	2.0 Ω	50(110)
400V class	MT-BR5-H75K	6.5 Ω	70(154)

14. OPTIONS AND AUXILIARY EQUIPMENT

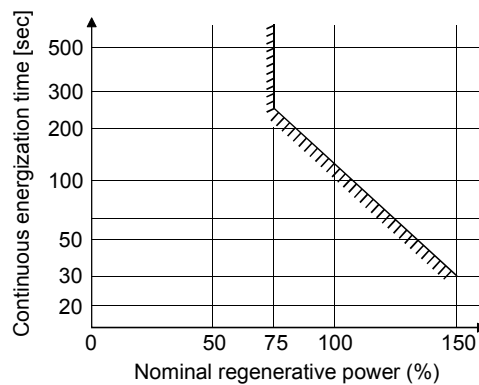
14.4 Power regeneration converter

When using the power regeneration converter, set "□□ 01" in parameter No.PA02.

(1) Selection

The converters can continuously return 75% of the nominal regenerative power. They are applied to the servo amplifiers of the 5k to 22kW.

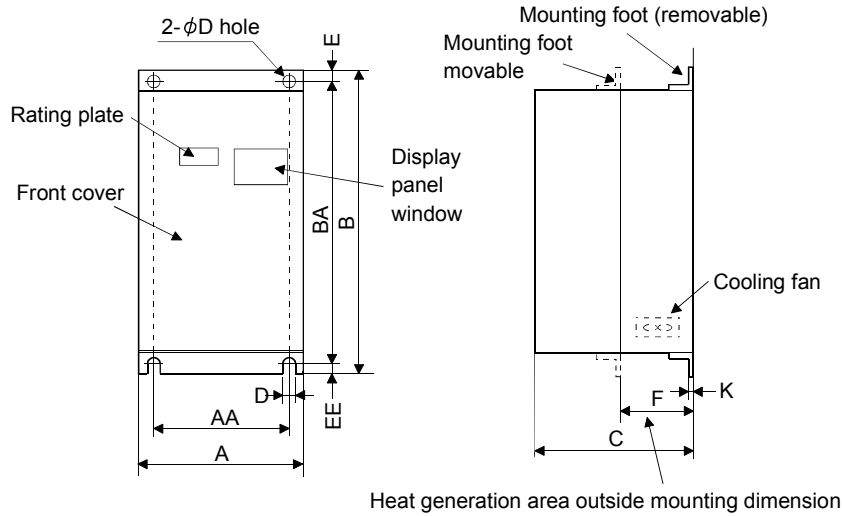
Power regeneration converter	Nominal regenerative power (kW)	Servo amplifier
FR-RC-15K	15	MR-J3-500T MR-J3-700T
FR-RC-30K	30	MR-J3-11KT MR-J3-15KT
FR-RC-55K	55	MR-J3-22KT
FR-RC-H15K	15	MR-J3-500T4 MR-J3-700T4
FR-RC-H30K	30	MR-J3-11KT4 MR-J3-15KT4
FR-RC-H55K	55	MR-J3-22KT4



14. OPTIONS AND AUXILIARY EQUIPMENT

(3) Outside dimensions of the power regeneration converters

[Unit : mm]

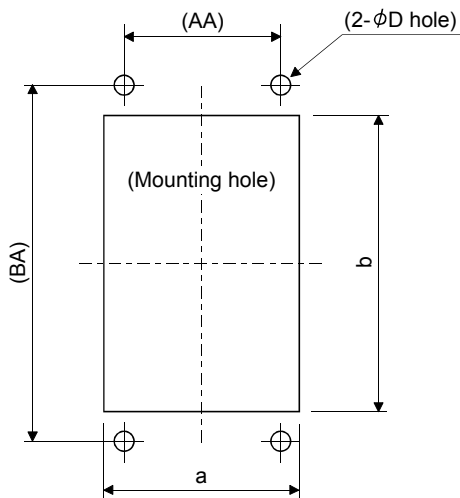


Power regeneration converter	A	AA	B	BA	C	D	E	EE	K	F	Approx. mass [kg(lb)]
FR-RC-15K	270	200	450	432	195	10	10	8	3.2	87	19 (41.888)
FR-RC-H15K	340	270	600	582	195	10	10	8	3.2	90	31 (68.343)
FR-RC-30K											
FR-RC-H30K	480	410	700	670	250	12	15	15	3.2	135	55 (121.3)
FR-RC-55K											
FR-RC-H55K											

(4) Mounting hole machining dimensions

When the power regeneration converter is fitted to a totally enclosed type box, mount the heat generating area of the converter outside the box to provide heat generation measures. At this time, the mounting hole having the following dimensions is machined in the box.

[Unit : mm]



Model	a	b	D	AA	BA
FR-RC-15K	260	412	10	200	432
FR-RC-H15K	330	562	10	270	582
FR-RC-30K					
FR-RC-H30K	470	642	12	410	670
FR-RC-55K					
FR-RC-H55K					

14. OPTIONS AND AUXILIARY EQUIPMENT

14.5 Power regeneration common converter

POINT
<ul style="list-style-type: none"> Use the FR-CV for the servo amplifier of 200V class and the FR-CV-H for that of 400V class. For details of the power regeneration common converter FR-CV-(H), refer to the FR-CV-(H) Installation Guide (IB(NA)0600075). Do not supply power to the main circuit power supply terminals (L1, L2, L3) of the servo amplifier. Doing so will fail the servo amplifier and FR-CV-(H). Connect the DC power supply between the FR-CV-(H) and servo amplifier with correct polarity. Connection with incorrect polarity will fail the FR-CV-(H) and servo amplifier. Two or more FR-CV-(H)'s cannot be installed to improve regeneration capability. Two or more FR-CV-(H)'s cannot be connected to the same DC power supply line.

When using the power regeneration common converter, set parameter No.PA02 to "□□01".

(1) Model

FR-CV-□□

Capacity

Symbol	Capacity [kW]
7.5K	7.5
11K	11
15K	15
22K	22
30K	30
37K	37
55K	55

Symbol	Voltage class
None	200V class
H	400V class

(2) Selection

The power regenerative common converter FR-CV can be used for the servo amplifier of 200V class with 3.5k to 22kW and that of 400V class with 11k to 22kW. The following shows the restrictions on using the FR-CV-(H).

- Up to six servo amplifiers can be connected to one FR-CV-(H).
- FR-CV-(H) capacity [W] Total of rated capacities [W] of servo amplifiers connected to FR-CV-(H).
- The total of used servo motor rated currents should be equal to or less than the applicable current [A] of the FR-CV-(H).
- Among the servo amplifiers connected to the FR-CV-(H), the servo amplifier of the maximum capacity should be equal to or less than the maximum connectable capacity [W].

14. OPTIONS AND AUXILIARY EQUIPMENT

The following table lists the restrictions.

Item	FR-CV-□						
	7.5K	11K	15K	22K	30K	37K	55K
Maximum number of connected servo amplifiers	6						
Total of connectable servo amplifier capacities [kW]	3.75	5.5	7.5	11	15	18.5	27.5
Total of connectable servo motor rated currents [A]	33	46	61	90	115	145	215
Maximum servo amplifier capacity [kW]	3.5	5	7	11	15	15	22

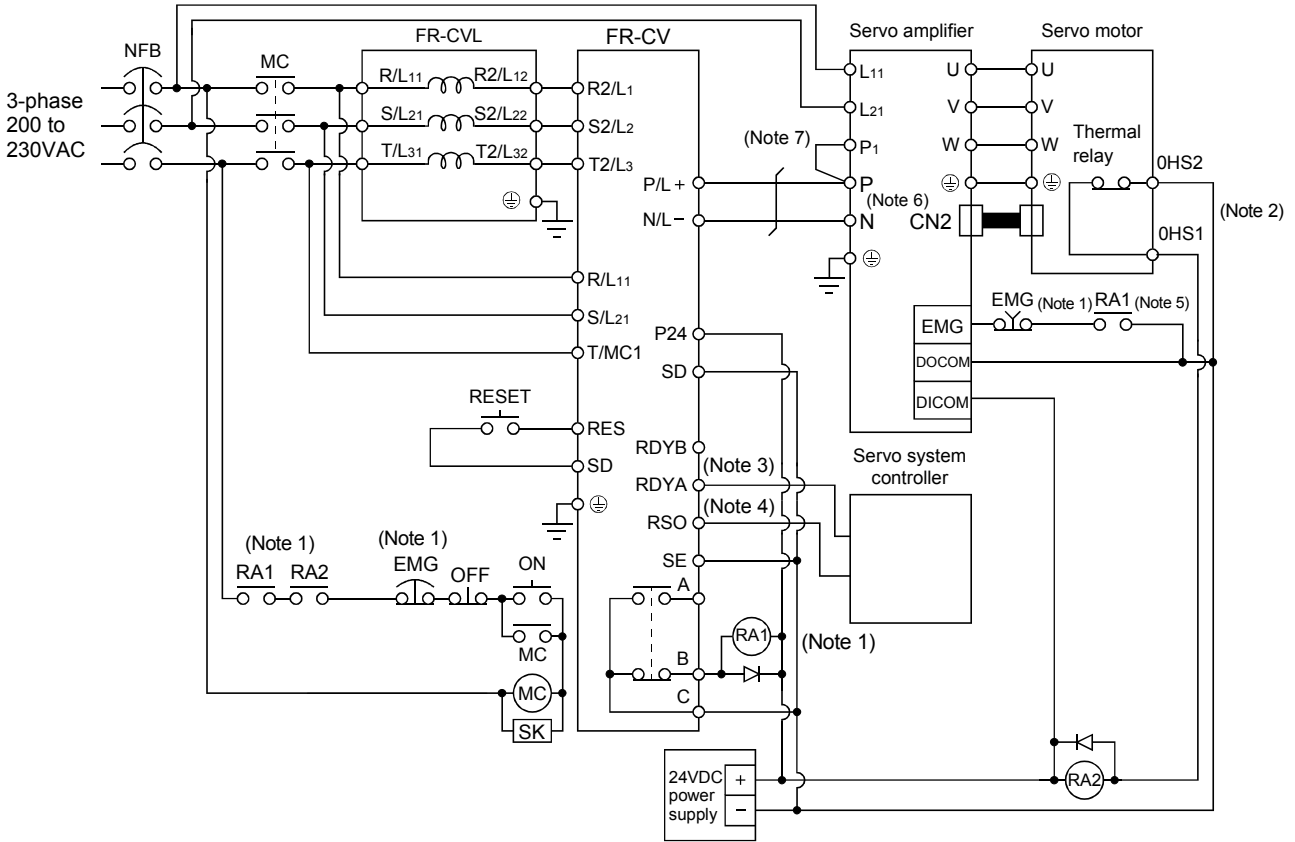
Item	FR-CV-H□			
	22K	30K	37K	55K
Maximum number of connected servo amplifiers	6			
Total of connectable servo amplifier capacities [kW]	11	15	18.5	27.5
Total of connectable servo motor rated currents [A]	90	115	145	215
Maximum servo amplifier capacity [kW]	11	15	15	22

When using the FR-CV-(H), always install the dedicated stand-alone reactor (FR-CVL-(H)).

Power regeneration common converter	Dedicated stand-alone reactor
FR-CV-7.5K(-AT)	FR-CVL-7.5K
FR-CV-11 K(-AT)	FR-CVL-11K
FR-CV-15K(-AT)	FR-CVL-15K
FR-CV-22K(-AT)	FR-CVL-22K
FR-CV-30K(-AT)	FR-CVL-30K
FR-CV-37K	FR-CVL-37K
FR-CV-55K	FR-CVL-55K
FR-CV-H22K(-AT)	FR-CVL-H22K
FR-CV-H30K(-AT)	FR-CVL-H30K
FR-CV-H37K	FR-CVL-H37K
FR-CV-H55K	FR-CVL-H55K

14. OPTIONS AND AUXILIARY EQUIPMENT

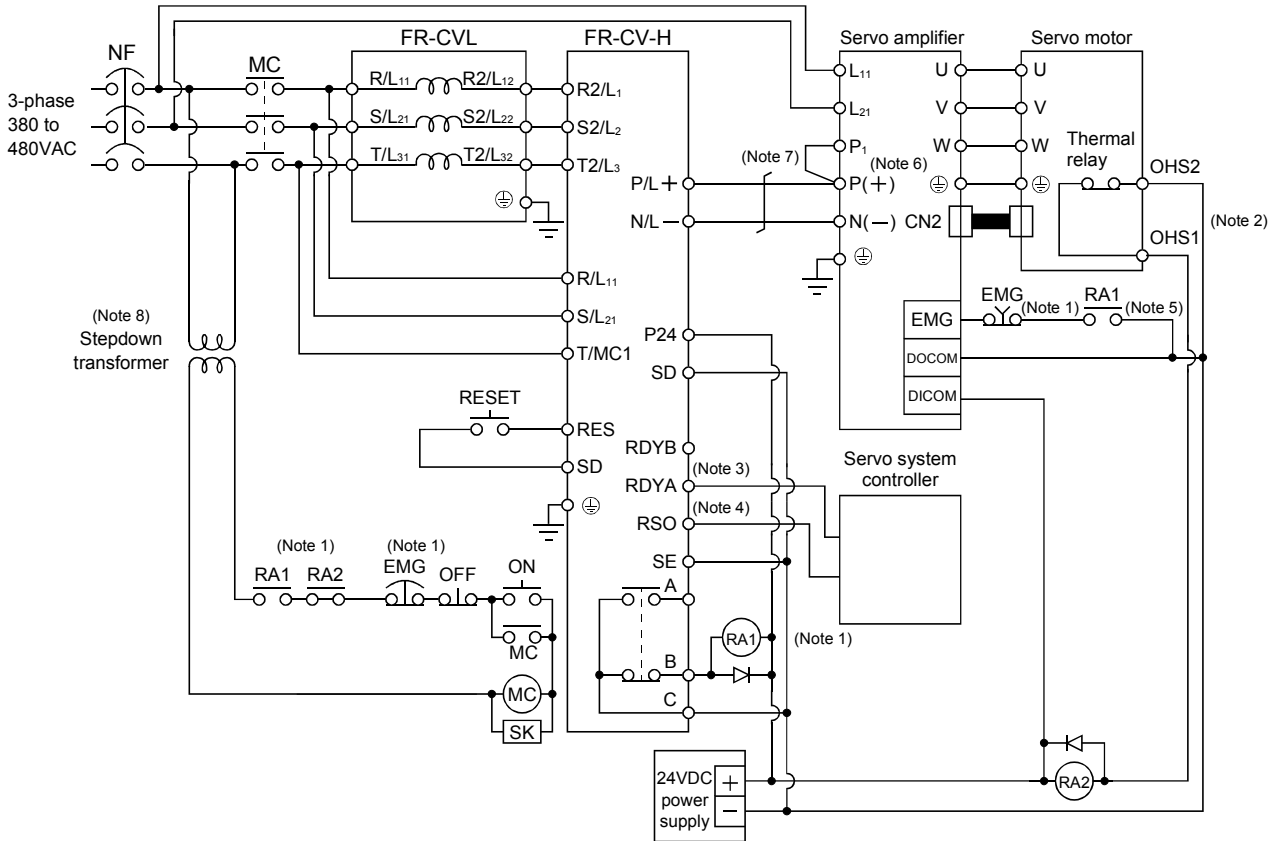
(3) Connection diagram (a) 200V class



- Note 1. Configure a sequence that will shut off main circuit power at an emergency stop or at FR-CV or servo amplifier alarm occurrence.
2. For the servo motor with thermal relay, configure a sequence that will shut off main circuit power when the thermal relay operates.
3. For the servo amplifier, configure a sequence that will switch the servo on after the FR-CV is ready.
4. For the FR-CV, the RSO signal turns off when it is put in a ready-to-operate status where the reset signal is input. Configure a sequence that will make the servo inoperative when the RSO signal is on.
5. Configure a sequence that will make a stop with the emergency stop input of the programmable controller if an alarm occurs in the FR-CV. When the programmable controller does not have an emergency stop input, use the forced stop input of the servo amplifier to make a stop as shown in the diagram.
6. When using the servo amplifier of 7kW or less, make sure to disconnect the wiring of built-in regeneration resistor (3.5kW or less: P-D, 5k/7kW: P-C).
7. When using the servo amplifier of 11k to 22kW, make sure to connect P₁ and P. (Factory-wired.)

14. OPTIONS AND AUXILIARY EQUIPMENT

(b) 400V class



- Note 1. Configure a sequence that will shut off main circuit power at an emergency stop or at FR-CV-H or servo amplifier alarm occurrence.
2. For the servo motor with thermal relay, configure a sequence that will shut off main circuit power when the thermal relay operates.
3. For the servo amplifier, configure a sequence that will switch the servo on after the FR-CV-H is ready.
4. For the FR-CV-H, the RSO signal turns off when it is put in a ready-to-operate status where the reset signal is input. Configure a sequence that will make the servo inoperative when the RSO signal is on.
5. Configure a sequence that will make a stop with the emergency stop input of the servo system controller if an alarm occurs in the FR-CV-H. When the servo system controller does not have an emergency stop input, use the forced stop input of the servo amplifier to make a stop as shown in the diagram.
6. When using the servo amplifier of 7kW or less, make sure to disconnect the wiring of built-in regenerative resistor (2kW or less: P-D, 3.5kW to 7kW: P-C).
7. When using the servo amplifier of 11kW to 22kW, make sure to connect P₁ and P. (Factory-wired.)
8. Stepdown transformer is required for coil voltage of magnetic contactor more than 200V class servo amplifiers.

14. OPTIONS AND AUXILIARY EQUIPMENT

(4) Selection example of wires used for wiring

POINT	<ul style="list-style-type: none"> ▪ Selection condition of wire size is as follows. <li style="padding-left: 20px;">Wire type: 600V Polyvinyl chloride insulated wire (IV wire) <li style="padding-left: 20px;">Construction condition: One wire is constructed in the air
-------	--

(a) Wire sizes

1) Across P-P(+), N-N(—)

The following table indicates the connection wire sizes of the DC power supply (P, N terminals) between the FR-CV and servo amplifier.

Total of servo amplifier capacities [kW]	Wires [mm ²]
1 or less	2
2	3.5
5	5.5
7	8
11	14
15	22
22	50

The following table indicates the connection wire sizes of the DC power supply (P(+), N(—) terminals) between the FR-CV-H and servo amplifier.

Total of servo amplifier capacities [kW]	Wires [mm ²]
1 or less	2
2	3.5
5	5.5
7	8
11	8
15	22
22	22

2) Grounding

For grounding, use the wire of the size equal to or greater than that indicated in the following table, and make it as short as possible.

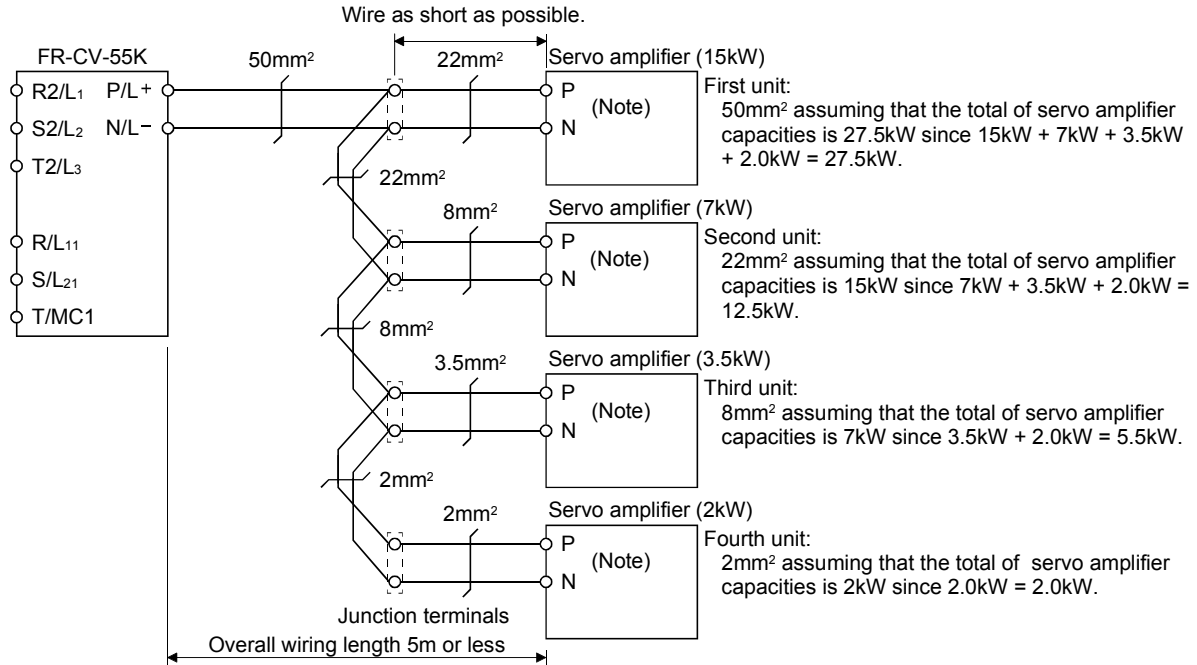
Power regeneration common converter	Grounding wire size [mm ²]
FR-CV-7.5K to FR-CV-15K	14
FR-CV-22K * FR-CV-30K	22
FR-CV-37K * FR-CV-55K	38
FR-CV-H22K * FR-CV-H30K	8
FR-CV-H37K * FR-CV-H55K	22

14. OPTIONS AND AUXILIARY EQUIPMENT

(b) Example of selecting the wire sizes

When connecting multiple servo amplifiers, always use junction terminals for wiring the servo amplifier terminals P, N. Also, connect the servo amplifiers in the order of larger to smaller capacities.

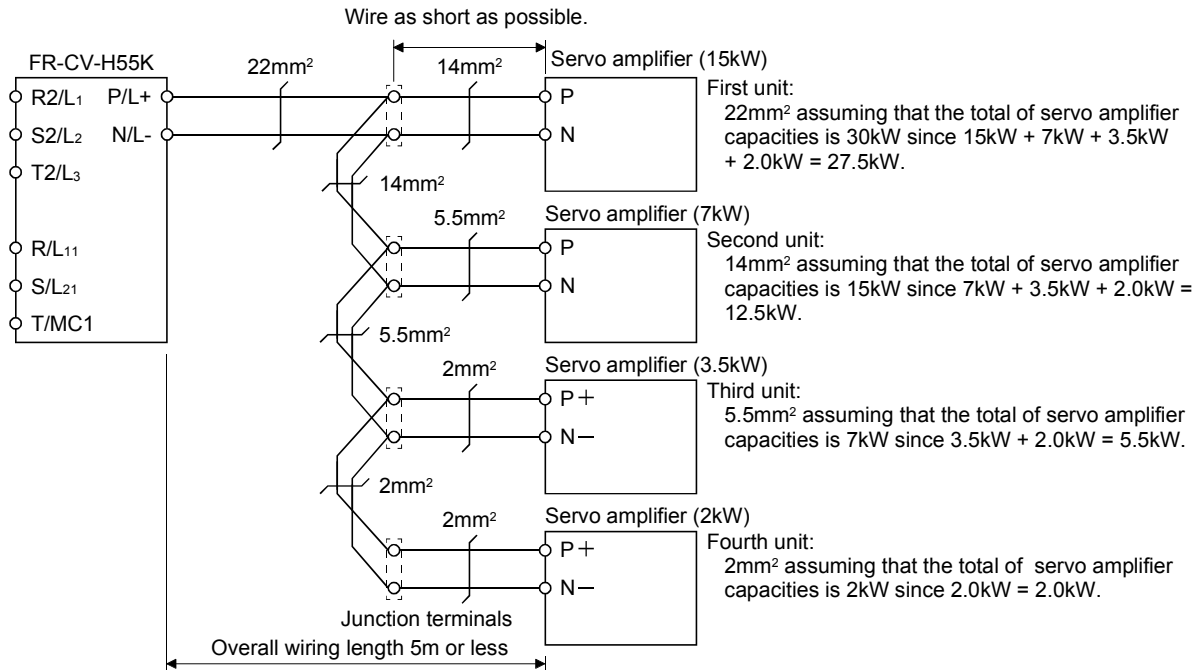
1) 200V class



Note. When using the servo amplifier of 7kW or less, make sure to disconnect the wiring of built-in regeneration resistor (3.5kW or less: P-D, 5k/7kW: P-C).

14. OPTIONS AND AUXILIARY EQUIPMENT

2) 400V class



(5) Other precautions

- Always use the FR-CVL-(H) as the power factor improving reactor. Do not use the FR-BAL or FR-BEL.
- The inputs/outputs (main circuits) of the FR-CV-(H) and servo amplifiers include high-frequency components and may provide electromagnetic wave interference to communication equipment (such as AM radios) used near them. In this case, interference can be reduced by installing the radio noise filter (FR-BIF-(H)) or line noise filter (FR-BSF01, FR-BLF).
- The overall wiring length for connection of the DC power supply between the FR-CV-(H) and servo amplifiers should be 5m or less, and the wiring must be twisted.

14. OPTIONS AND AUXILIARY EQUIPMENT

(6) Specifications

Power regeneration common converter FR-CV-□		7.5K	11K	15K	22K	30K	37K	55K
Item								
Total of connectable servo amplifier capacities [kW]		3.75	5.5	7.5	11	15	18.5	27.5
Maximum servo amplifier capacity [kW]		3.5	5	7	11	15	15	22
Output	Total of connectable servo motor rated currents [A]	33	46	61	90	115	145	215
	Regenerative braking torque	Short-time rating	Total capacity of applicable servo motors, 300% torque, 60s (Note 1)					
		Continuous rating	100% torque					
Power supply	Rated input AC voltage/frequency	Three-phase 200 to 220V 50Hz, 200 to 230V 60Hz						
	Permissible AC voltage fluctuation	Three-phase 170 to 242V 50Hz, 170 to 253V 60Hz						
	Permissible frequency fluctuation	±5%						
	Power supply capacity (Note 2) [kVA]	17	20	28	41	52	66	100
Protective structure (JEM 1030), cooling system		Open type (IP00), forced cooling						
Environment	Ambient temperature	-10°C to +50°C (14 to 122°F) (non-freezing)						
	Ambient humidity	90%RH or less (non-condensing)						
	Ambience	Indoors (without corrosive gas, flammable gas, oil mist, dust and dirt)						
Altitude, vibration		1000m or less above sea level, 5.9m/s ² or less						
No-fuse breaker or leakage current breaker		30AF 30A	50AF 50A	100AF 75A	100AF 100A	225AF 125A	225AF 125A	225AF 175A
Magnetic contactor		S-N20	S-N35	S-N50	S-N65	S-N95	S-N95	S-N125

Power regeneration common converter FR-CV-H□		22K	30K	37K	55K
Item					
Total of connectable servo amplifier capacities [kW]		11	15	18.5	27.5
Maximum servo amplifier capacity [kW]		11	15	15	22
Output	Total of connectable servo motor rated currents [A]	43	57	71	110
	Regenerative braking torque	Short-time rating	Total capacity of applicable servo motors, 300% torque, 60s (Note1)		
		Continuous rating	100% torque		
Power supply	Rated input AC voltage/frequency	Three-phase 380 to 480V, 50Hz/60Hz			
	Permissible AC voltage fluctuation	Three-phase 323 to 528V, 50Hz/60Hz			
	Permissible frequency fluctuation	±5%			
	Power supply capacity [kVA]	41	52	66	100
Protective structure (JEM 1030), cooling system		Open type (IP00), forced cooling			
Environment	Ambient temperature	-10°C to +50°C (14 to 122°F) (non-freezing)			
	Ambient humidity	90%RH or less (non-condensing)			
	Ambience	Indoors (without corrosive gas, flammable gas, oil mist, dust and dirt)			
Altitude, vibration		1000m or less above sea level, 5.9m/s ² or less			
No-fuse breaker or leakage current breaker		60AF 60A	100AF 175A	100AF 175A	225AF 125A
Magnetic contactor		S-N25	S-N35	S-N35	S-N65

Note 1. This is the time when the protective function of the FR-CV is activated. The protective function of the servo amplifier is activated in the time indicated in section 13.1.

2. When connecting the capacity of connectable servo amplifier, specify the value of servo amplifier.

14. OPTIONS AND AUXILIARY EQUIPMENT

14.6 External dynamic brake

POINT
<ul style="list-style-type: none">▪ Configure up a sequence which switches off the contact of the brake unit after (or as soon as) it has turned off the servo on signal at a power failure or failure.▪ For the braking time taken when the dynamic brake is operated, refer to section 13.3.▪ The brake unit is rated for a short duration. Do not use it for high duty.▪ When using the 400V class dynamic brake, the power supply voltage is restricted to 1-phase 380VAC to 463VAC (50Hz/60Hz).

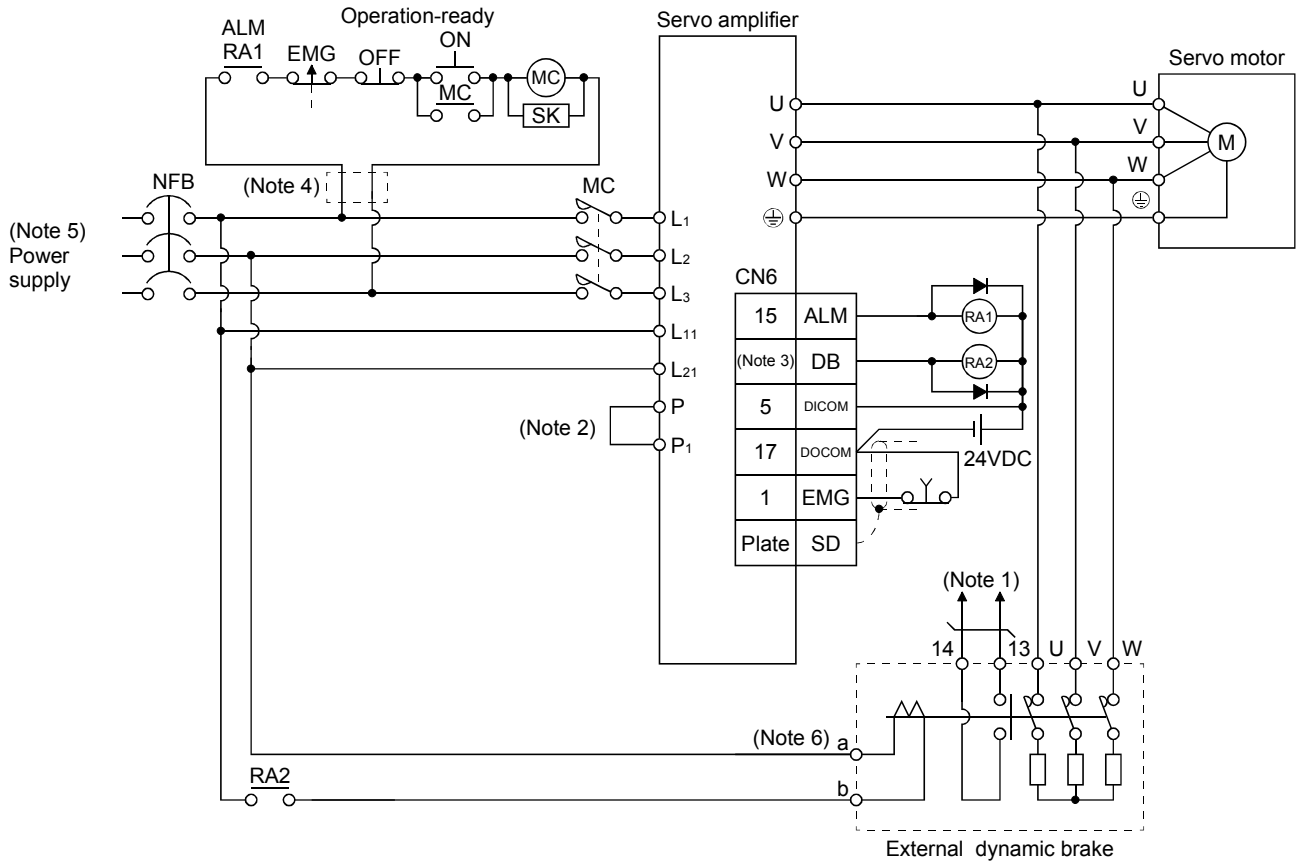
(1) Selection of dynamic brake

The dynamic brake is designed to bring the servo motor to a sudden stop when a power failure occurs or the protective circuit is activated, and is built in the 7kW or less servo amplifier. Since it is not built in the 11kW or more servo amplifier, purchase it separately if required. Assign the dynamic brake interlock (DB) to any of CN6-14, CN6-15, and CN6-16 pins in parameter No.PD09, PD10 or PD11.

Servo amplifier	Dynamic brake
MR-J3-11KT	DBU-11K
MR-J3-15KT	DBU-15K
MR-J3-22KT	DBU-22K
MR-J3-11KT4	DBU-11K-4
MR-J3-15KT4	DBU-22K-4
MR-J3-22KT4	

14. OPTIONS AND AUXILIARY EQUIPMENT

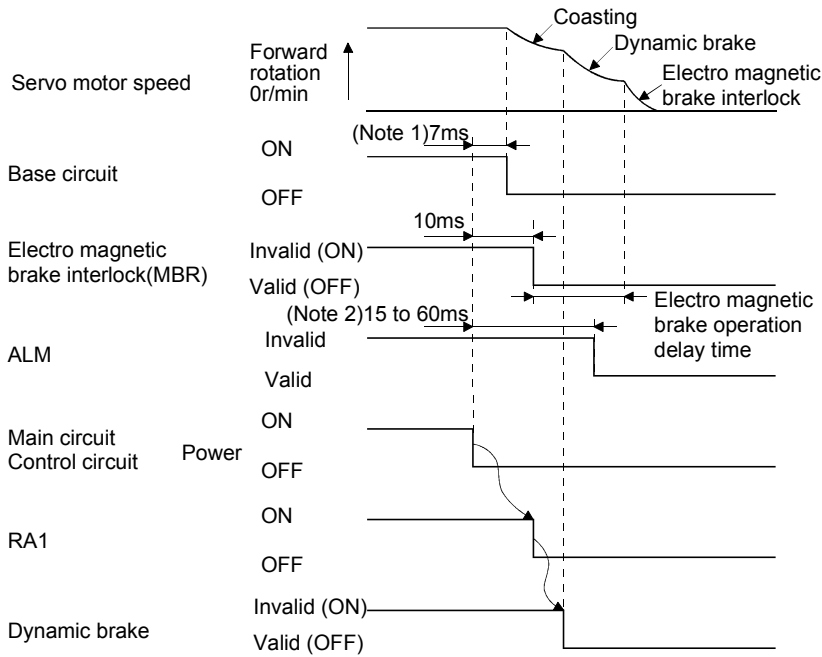
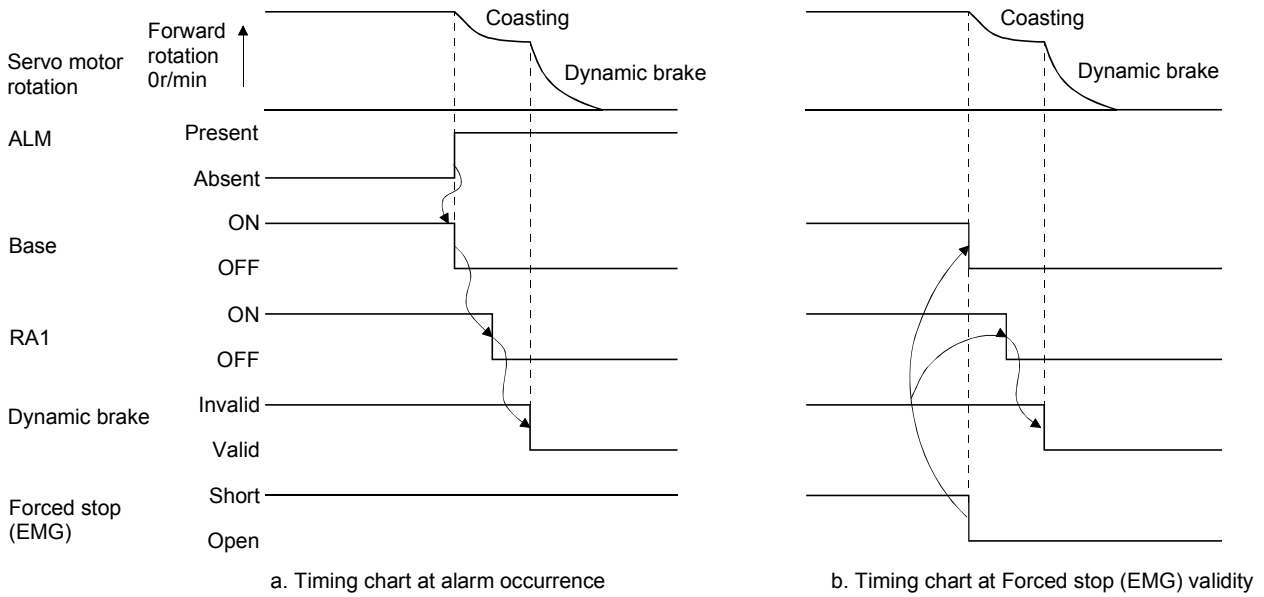
(2) Connection example



- Note 1. Terminals 13, 14 are normally open contact outputs. If the dynamic brake is seized, terminals 13, 14 will open. Therefore, configure up an external sequence to prevent servo-on.
2. When using the servo amplifier of 11k to 22kW, make sure to connect P₁ and P. (Factory-wired.)
When using the power factor DC reactor, refer to section 14.11.
3. Assign the dynamic brake interlock (DB) in the parameters No.PD12 to PD14.
4. Stepdown transformer is required for coil voltage of magnetic contactor more than 200V class in 400V class servo amplifiers.
5. Refer to section 1.2 for the power supply specification.
6. The power supply voltage of the inside magnet contactor for 400V class dynamic brake DBU-11K-4 and DBU-22K-4 is restricted as follows. When using these dynamic brakes, use them within the range of the power supply.

Dynamic brake	Power supply voltage
DBU-11K-4	1-phase 380 to 463VAC 50Hz/60Hz
DBU-22K-4	

14. OPTIONS AND AUXILIARY EQUIPMENT



Note 1. When powering OFF, the RA1 of external dynamic brake circuit will be turned OFF, and the base circuit is turned OFF earlier than usual before an output shortage occurs. (Only when assigning the DB as the output signal in the parameter No.PD12 and PD14)

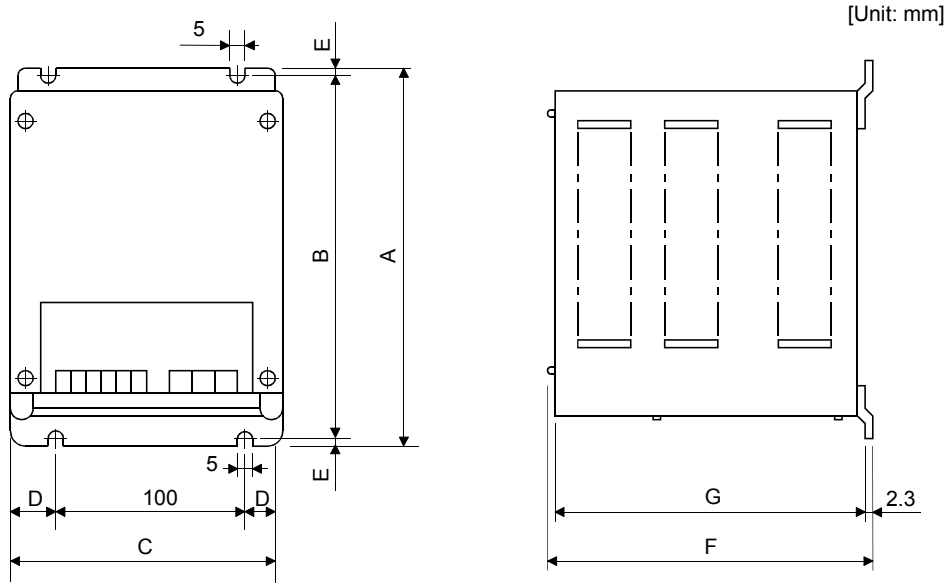
2. Variable according to the operation status.

c. Timing chart when both of the main and control circuit power are OFF

14. OPTIONS AND AUXILIARY EQUIPMENT

(3) Outline dimension drawing

(a) DBU-11K • DBU-15K • DBU-22K



Screw : M3.5

Tightening torque: 0.8 [N·m](7 [lb·in])

U	V	W
---	---	---

Screw : M4

Tightening torque: 1.2 [N·m](10.6 [lb·in])

Dynamic brake	A	B	C	D	E	F	G	Mass [kg]([lb])	Connection wire [mm ²] (Note)
DBU-11K	200	190	140	20	5	170	163.5	2 (4.41)	5.5
DBU-15K, 22K	250	238	150	25	6	235	228	6 (13.23)	5.5

Note. Selection condition of wire size is as follows.

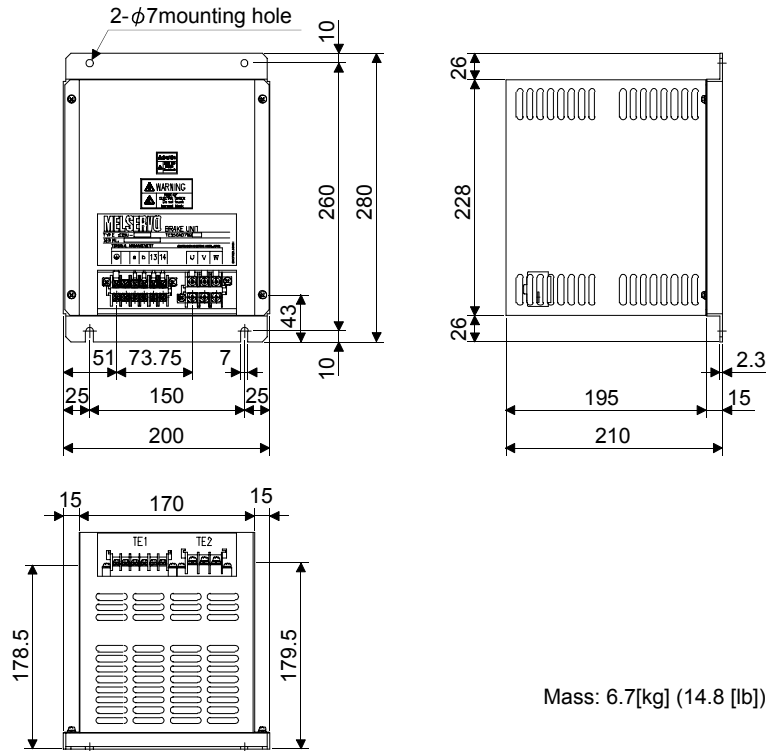
Wire type: 600V Polyvinyl chloride insulated wire (IV wire)

Construction condition: One wire is constructed in the air

14. OPTIONS AND AUXILIARY EQUIPMENT

(b) DBU-11K-4 • DBU-22K-4

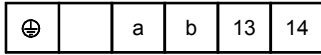
[Unit: mm]



Mass: 6.7[kg] (14.8 [lb])

Terminal block

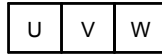
TE1



Screw: M3.5

Tightening torque: 0.8[N·m](7[lb·in])

TE2



Screw: M4

Tightening torque: 1.2[N·m](10.6[lb·in])

Dynamic brake	Wire [mm ²] (Note)	
	a · b	U · V · W
DBU-11K-4	2	5.5
DBU-22K-4	2	5.5

Note. Selection condition of wire size is as follows.

Wire type: 600V Polyvinyl chloride insulated wire (IV wire)

Construction condition: One wire is constructed in the air

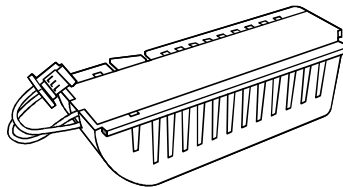
14. OPTIONS AND AUXILIARY EQUIPMENT

14.7 Battery MR-J3BAT

POINT	
	<ul style="list-style-type: none">▪ The revision (Edition 44) of the Dangerous Goods Rule of the International Air Transport Association (IATA) went into effect on January 1, 2003 and was enforced immediately. In this rule, "provisions of the lithium and lithium ion batteries" were revised to tighten the restrictions on the air transportation of batteries. However, since this battery is non-dangerous goods (non-Class 9), air transportation of 24 or less batteries is outside the range of the restrictions. Air transportation of more than 24 batteries requires packing compliant with the Packing Standard 903. When a self-certificate is necessary for battery safety tests, contact our branch or representative. For more information, consult our branch or representative. (As of Jun, 2008).

(1) Purpose of use for MR-J3BAT

This battery is used to construct an absolute position detection system. Refer to section 14.3 for the fitting method, etc.

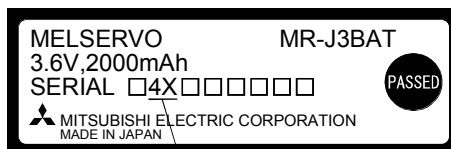


(2) Year and month when MR-J3BAT is manufactured

The year and month when MR-J3BAT is manufactured are written down in Serial No. on the rating plate of the battery back face.

The year and month of manufacture are indicated by the last one digit of the year and 1 to 9, X(10), Y(11), Z(12).

For October 2004, the Serial No. is like, "SERIAL □4X□□□□□□".



The year and month of manufacture

14. OPTIONS AND AUXILIARY EQUIPMENT

14.8 Heat sink outside mounting attachment (MR-J3ACN)

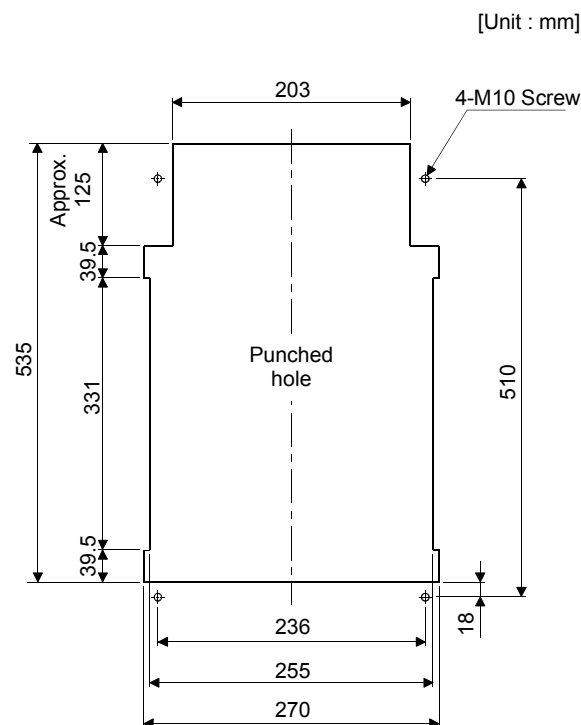
Use the heat sink outside mounting attachment to mount the heat generation area of the servo amplifier in the outside of the control box to dissipate servo amplifier-generated heat to the outside of the box and reduce the amount of heat generated in the box, thereby allowing a compact control box to be designed.

In the control box, machine a hole having the panel cut dimensions, fit the heat sink outside mounting attachment to the servo amplifier with the fitting screws (4 screws supplied), and install the servo amplifier to the control box.

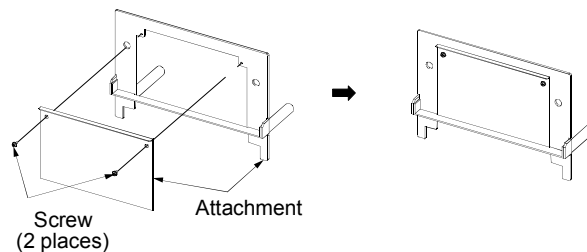
The environment outside the control box when using the heat sink outside mounting attachment should be within the range of the servo amplifier operating environment conditions.

The heat sink outside mounting attachment of MR-J3ACN can be used for MR-J3-11KT(4) to MR-J3-22KT(4).

(1) Panel cut dimensions

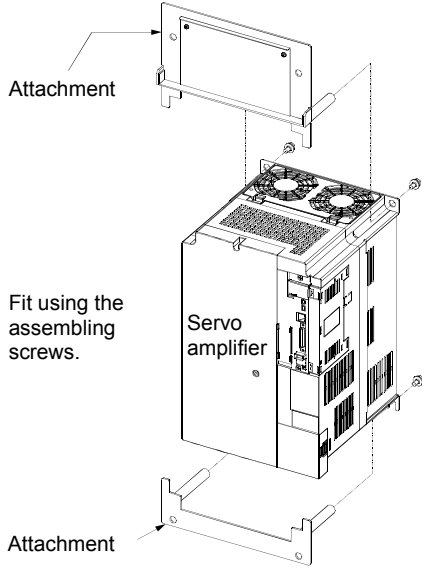


(2) How to assemble the attachment for a heat sink outside mounting attachment

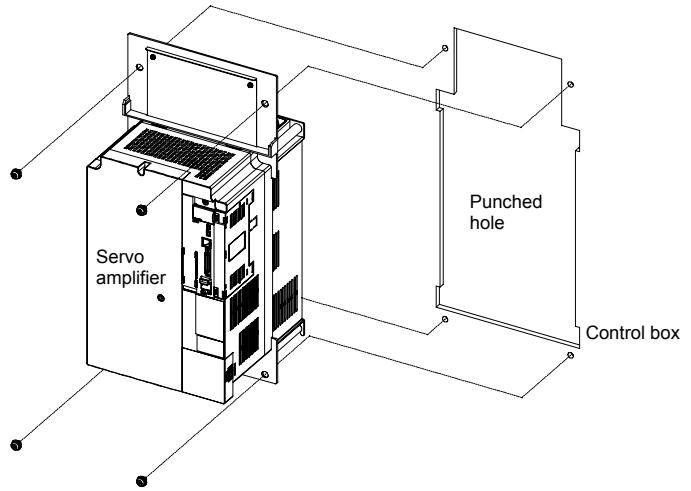


14. OPTIONS AND AUXILIARY EQUIPMENT

(3) Fitting method



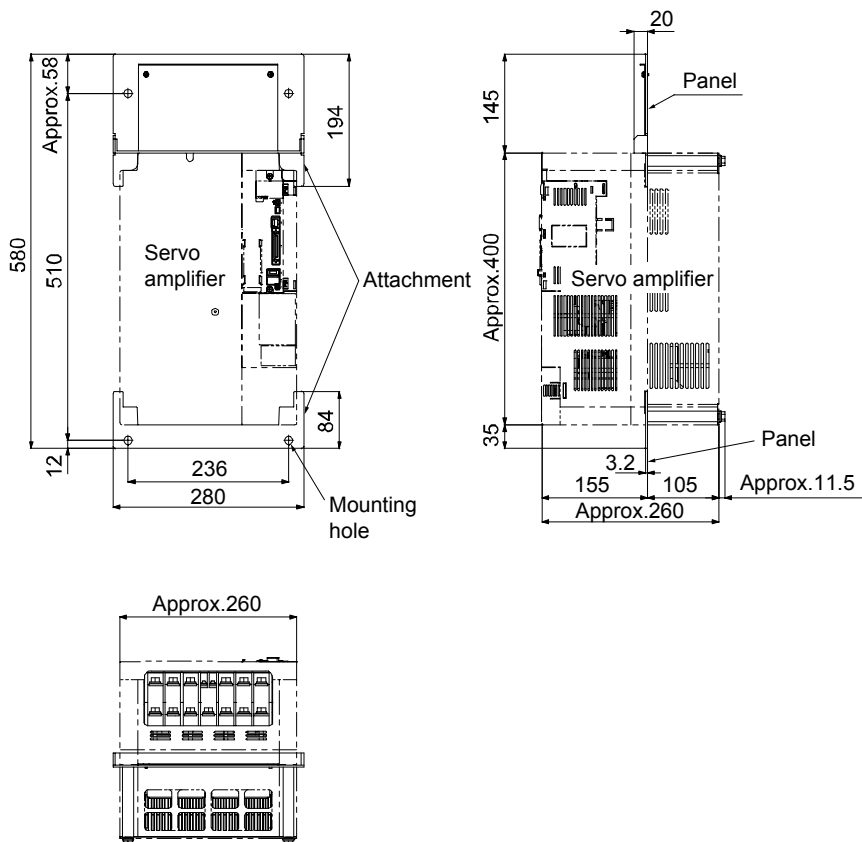
a. Assembling the heat sink outside mounting attachment



b. Installation to the control box

(4) Outline dimension drawing

[Unit: mm]



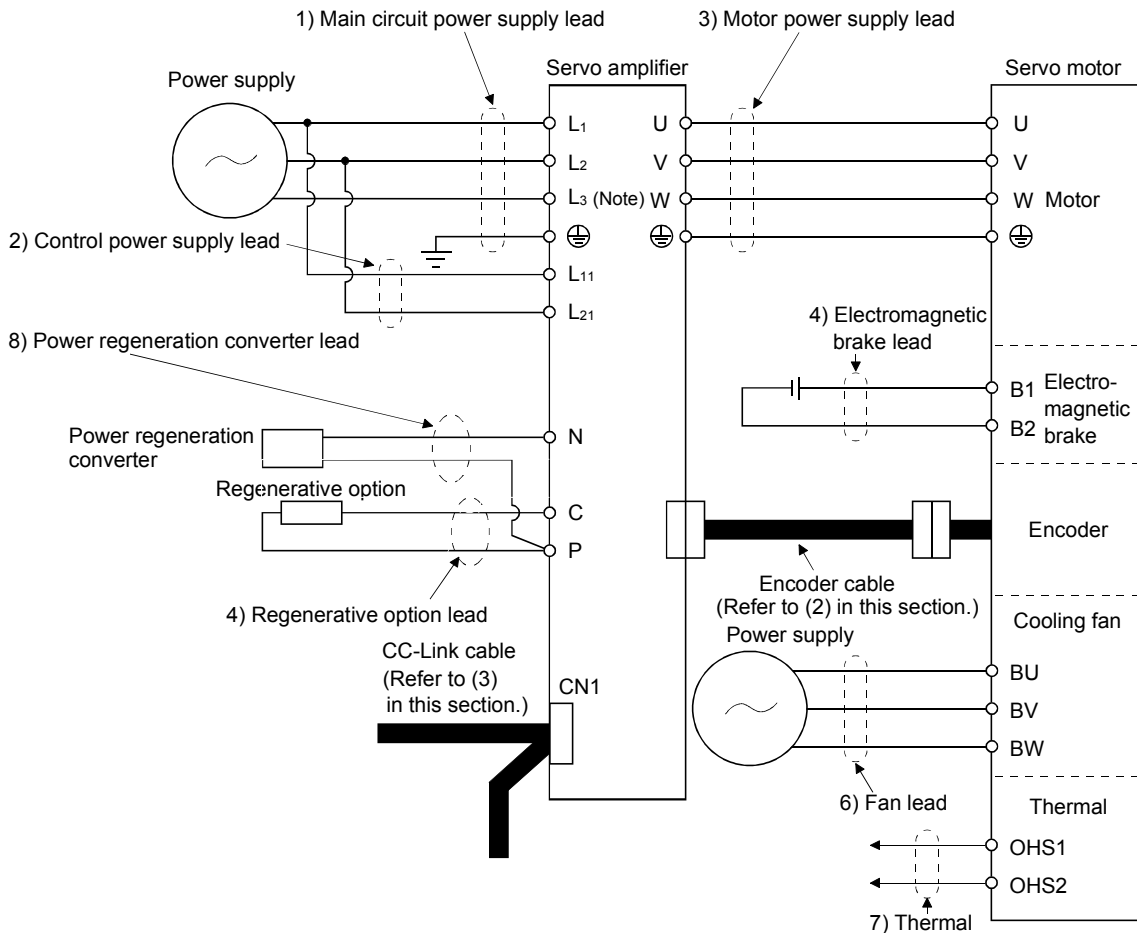
14. OPTIONS AND AUXILIARY EQUIPMENT

14.9 Selection example of wires

POINT
<ul style="list-style-type: none"> Wires indicated in this section are separated wires. When using a cable for power line (U, V, and W) between the servo amplifier and servo motor, use a 600V grade EP rubber insulated chloroprene sheath cab-tire cable (2PNCT). For selection of cables, refer to appendix 6. To comply with the UL/C-UL (CSA) Standard, use UL-recognized copper wires rated at 60°C (140°F) or more for wiring. To comply with other standards, use a wire that is complied with each standard Selection condition of wire size is as follows. Construction condition: One wire is constructed in the air Wire length: 30m or less

(1) Wires for power supply wiring

The following diagram shows the wires used for wiring. Use the wires given in this section or equivalent.



Note. There is no L3 for 1-phase 100 to 120VAC power supply.

14. OPTIONS AND AUXILIARY EQUIPMENT

(a) When using the 600V Polyvinyl chloride insulated wire (IV wire)
 Selection example of wire size when using IV wires is indicated below.

Table 14.1 Wire size selection example 1 (IV wire)

Servo amplifier	Wires [mm ²] (Note 1, 4)								
	1) L ₁ · L ₂ · L ₃ · ⊕	2) L ₁₁ · L ₂₁	3) U · V · W · ⊕	4) P · C	5) B1 · B2	6) BU · BV · BW	7) OHS1 · OHS2		
MR-J3-10T(1)	2(AWG14)	1.25(AWG16)	1.25(AWG16)	2(AWG14)	1.25(AWG16)	/	/		
MR-J3-20T(1)									
MR-J3-40T(1)									
MR-J3-60T			2(AWG14)						
MR-J3-70T									
MR-J3-100T									
MR-J3-200T			3.5(AWG12)					3.5(AWG12)	
MR-J3-500T (Note 2)	5.5(AWG10): a	1.25(AWG16): h	5.5(AWG10): a	2(AWG14): g		2(AWG14) (Note 3)	1.25(AWG16) (Note 3)		
MR-J3-700T (Note 2)	8(AWG8): b	8(AWG8): b	3.5(AWG12): a						
MR-J3-11KT (Note 2)	14(AWG6): c	1.25(AWG16): g	22(AWG4): d	5.5(AWG10): j		2(AWG14)	1.25(AWG16)		
MR-J3-15KT (Note 2)	22(AWG4): d		30(AWG2): e	5.5(AWG10): k					
MR-J3-22KT (Note 2)	50(AWG1/0): f		60(AWG2/0): f						
MR-J3-60T4	2(AWG14)	1.25(AWG16)	1.25(AWG16)	2(AWG14)		/	/		
MR-J3-100T4			2(AWG14)						
MR-J3-200T4	2(AWG14): g	1.25(AWG16): h	2(AWG14): g	2(AWG14): g					
MR-J3-350T4			2(AWG14): g						
MR-J3-500T4 (Note 2)			5.5(AWG10): a					5.5(AWG10): a	
MR-J3-700T4 (Note 2)	8(AWG8): l	1.25(AWG16): g	8(AWG8): l	3.5(AWG12): j				2(AWG14)	1.25(AWG16)
MR-J3-11KT4 (Note 2)			22(AWG4): d	5.5(AWG10): j					
MR-J3-15KT4 (Note 2)			14(AWG6): c	22(AWG4): n						5.5(AWG10): k
MR-J3-22KT4 (Note 2)	14(AWG6): m								

Note 1. Alphabets in the table indicate crimping tools. For crimping terminals and applicable tools, refer to (1) (c) in this section.

- When connecting to the terminal block, be sure to use the screws which are provided with the terminal block.
- For the servo motor with a cooling fan.
- Wires are selected based on the highest rated current among combining servo motors.

Use wires 8) of the following sizes with the power regeneration converter (FR-RC-(H)).

Model	Wires[mm ²]
FR-RC-15K	14(AWG6)
FR-RC-30K	14(AWG6)
FR-RC-55K	22(AWG4)
FR-RC-H15K	14(AWG6)
FR-RC-H30K	14(AWG6)
FR-RC-H55K	14(AWG6)

14. OPTIONS AND AUXILIARY EQUIPMENT

(b) When using the 600V Grade heat-resistant polyvinyl chloride insulated wire (HIV wire)

Selection example of wire size when using HIV wires is indicated below. For the wire (8)) for power regeneration converter (FR-RC-(H)), use the IV wire indicated in (1) (a) in this section.

Table 14.2 Wire size selection example 2 (HIV wire)

Servo amplifier	Wires [mm ²] (Note 1, 4)							
	1) L ₁ · L ₂ · L ₃ · ⊕	2) L ₁₁ · L ₂₁	3) U · V · W · ⊕	4) P · C	5) B1 · B2	6) BU · BV · BW	7) OHS1 · OHS2	
MR-J3-10T(1)	2(AWG14)	1.25(AWG16)	1.25(AWG16)	2(AWG14)	1.25(AWG16)	1.25(AWG16)	1.25(AWG16)	
MR-J3-20T(1)								
MR-J3-40T(1)								
MR-J3-60T								
MR-J3-70T								
MR-J3-100T								
MR-J3-200T								
MR-J3-350T	3.5(AWG12)		3.5(AWG12)					
MR-J3-500T (Note 2)	5.5(AWG10): a	1.25(AWG16): h	5.5(AWG10): a	2(AWG14): g	1.25(AWG16)			
MR-J3-700T (Note 2)	8(AWG8): b		8(AWG8): b	2(AWG14): g		1.25(AWG16) (Note 3)	1.25(AWG16) (Note 3)	
MR-J3-11KT (Note 2)	14(AWG6): c	1.25(AWG16): g	14(AWG6): c	3.5(AWG12): j		1.25(AWG16)	1.25(AWG16)	1.25(AWG16)
MR-J3-15KT (Note 2)	22(AWG4): d		22(AWG4): d					
MR-J3-22KT (Note 2)	38(AWG1): p		38(AWG1): p	5.5(AWG10): k				
MR-J3-60T4	2(AWG14)	1.25(AWG16)	1.25(AWG16)	2(AWG14)		1.25(AWG16)	1.25(AWG16)	1.25(AWG16)
MR-J3-100T4								
MR-J3-200T4								
MR-J3-350T4	2(AWG14): g	1.25(AWG16): h	2(AWG14): g	2(AWG14): g				
MR-J3-500T4 (Note 2)	3.5(AWG12): a		3.5(AWG12): a					
MR-J3-700T4 (Note 2)			5.5(AWG10): a		1.25(AWG16) (Note 3)				1.25(AWG16) (Note 3)
MR-J3-11KT4 (Note 2)	5.5(AWG10): j	1.25(AWG16): g	8(AWG8): l	2(AWG14): q	1.25(AWG16)				1.25(AWG16)
MR-J3-15KT4 (Note 2)	8(AWG8): l		14(AWG6): c	3.5(AWG12): j				
MR-J3-22KT4 (Note 2)	14(AWG6): m		14(AWG6): m	3.5(AWG12): k				

Note 1. Alphabets in the table indicate crimping tools. For crimping terminals and applicable tools, refer to (1) (c) in this section.

2. When connecting to the terminal block, be sure to use the screws which are provided with the terminal block.
3. For the servo motor with a cooling fan.
4. Wires are selected based on the highest rated current among combining servo motors.

14. OPTIONS AND AUXILIARY EQUIPMENT

(c) Selection example of crimping terminals

Selection example of crimping terminals for the servo amplifier terminal box when using the wires mentioned in (1) (a) and (b) in this section is indicated below.

Symbol	Servo amplifier side crimping terminals				Manufacturer
	(Note 2) Crimping terminal	Applicable tool			
		Body	Head	Dice	
a	FVD5.5-4	YNT-1210S			Japan Solderless Terminal
(Note 1)b	8-4NS	YHT-8S			
c	FVD14-6	YF-1 · E-4	YNE-38	DH-112 · DH122	
d	FVD22-6			DH-113 · DH123	
(Note 1)e	38-6	YPT-60-21		TD-112 · TD-124	
		YF-1 · E-4				YET-60-1
(Note 1)f	R60-8	YPT-60-21		TD-113 · TD-125	
		YF-1 · E-4				YET-60-1
g	FVD2-4	YNT-1614			
h	FVD2-M3				
j	FVD5.5-6				
k	FVD5.5-8				
l	FVD8-6	YF-1 · E-4	YNE-38	DH-111 · DH121	
m	FVD14-8			DH-112 · DH122	
n	FVD22-8			DH-113 · DH123	
(Note 1)p	R38-8	YPT-60-21		TD-112 · TD-124	
		YF-1 · E-4				YET-60-1
q	FVD2-6	YNT-1614			

Note 1. Coat the part of crimping with the insulation tube.

2. Some crimping terminals may not be mounted depending on the size. Make sure to use the recommended ones or equivalent ones.

14. OPTIONS AND AUXILIARY EQUIPMENT

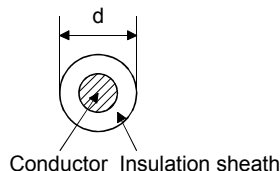
(2) Wires for cables

When fabricating a cable, use the wire models given in the following table or equivalent.

Table 14.3 Wires for option cables

Type	Model	Length [m(ft)]	Core size [mm ²]	Number of cores	Characteristics of one core			(Note 3) Finishing OD [mm]	Wire model
					Structure [wires/mm]	Conductor resistance [Ω/mm]	Insulation coating OD d [mm] (Note 1)		
Encoder cable	MR-J3ENCBL □ M-A1-L	2 to 10	AWG22	6 (3 pairs)	7/0.26	53 or less	1.2	7.1±0.3	(Note 3) VSVP 7/0.26 (AWG#22 or equivalent)-3P Ban-gi-shi-16823
	MR-J3ENCBL □ M-A2-L								
	MR-J3ENCBL □ M-A1-H	2 to 10	AWG22	6 (3 pairs)	70/0.08	56 or less	1.2	7.1±0.3	(Note 3) ETFE SVP 70/0.08 (AWG#22 or equivalent)-3P Ban-gi-shi-16824
	MR-J3ENCBL □ M-A2-H								
	MR-J3JCBL03M-A1-L	0.3	AWG26	8 (4 pairs)	30/0.08	233 or less	1.2	7.1±0.3	(Note 5) T/2464-1061/II A-SB 4P × 26AWG
	MR-J3JCBL03M-A2-L								
	MR-EKCBL □ M-L	2 to 10	0.3mm ²	4 (2 pairs)	12/0.18	65.7 or less	1.3	7.3	(Note 3) 20276 composite 4-pair shielded cable (A-TYPE)
			0.08mm ²	4 (2 pairs)	7/0.127	234 or less	0.67		
	MR-EKCBL □ M-H	20 · 30	0.3mm ²	12 (6 pairs)	12/0.18	63.6 or less	1.2	8.2	UL20276 AWG#23 6pair(BLACK)
		20	0.2mm ²	12 (6 pairs)	40/0.08	105 or less	0.88	7.2	(Note 3) A14B2343 6P
	MR-J3ENCBL □ M-L	2 to 10	AWG22	6 (3 pairs)	7/0.26	53 or less	1.2	7.1±0.3	(Note 3) VSVP 7/0.26 (Equivalent to AWG#22)-3P Ban-gi-shi-16823
		20 · 30	AWG23	12 (6 pairs)	12/0.18	63.3 or less	1.2	8.2±0.3	(Note 3) 20276 VSVC AWG#23 × 6P Ban-gi-shi-15038
	MR-J3ENCBL □ M-H	2 to 10	AWG22	6 (3 pairs)	70/0.08	56 or less	1.2	7.1±0.3	(Note 3) ETFE SVP 70/0.08 (Equivalent to AWG#22)-3P Ban-gi-shi-16824
		20 to 50	AWG24	12 (6 pairs)	40/0.08	105 or less	0.88	7.2	(Note 3) ETRE · SVP 40/0.08mm × 6P Ban-gi-shi-15266
Motor power supply cable	MR-PWS1CBL □ M-A1-L	2 to 10	(Note 6) AWG19	4	50/0.08	25.40 or less	1.8	5.7±0.3	(Note 4) UL Style 2103 AWG19 4 cores
	MR-PWS1CBL □ M-A2-L	2 to 10							
	MR-PWS1CBL □ M-A1-H	2 to 10							
	MR-PWS1CBL □ M-A2-H	2 to 10							
	MR-PWS2CBL03M-A1-L	0.3							
MR-PWS2CBL03M-A2-L	0.3								
Motor brake cable	MR-BKS1CBL □ M-A1-L	2 to 10	(Note 6) AWG20	2	100/0.08	38.14 or less	1.3	4.0±0.3	(Note 4) UL Style 2103 AWG20 2 cores
	MR-BKS1CBL □ M-A2-L	2 to 10							
	MR-BKS1CBL □ M-A1-H	2 to 10							
	MR-BKS1CBL □ M-A2-H	2 to 10							
	MR-BKS2CBL03M-A1-L	0.3							
MR-BKS2CBL03M-A2-L	0.3								

Note 1. d is as shown below.



2. Purchased from Toa Electric Industry
3. Standard OD. Max. OD is about 10% greater.
4. Kurabe
5. Taiyo Electric Wire and Cable
6. These wire sizes assume that the UL-compliant wires are used at the wiring length of 10m.

14. OPTIONS AND AUXILIARY EQUIPMENT

(3) CC-Link twisted cable

POINT
<ul style="list-style-type: none"> For the cables other than the one indicated here, refer to the open field network CC-Link catalog (L(NA)74108143).

The specifications of the twisted cable usable in CC-Link and the recommended cable are indicated below. If the cable used is other than the recommended cable indicated in the following table, we cannot guarantee the performance of CC-Link. For inquiries on CC-Link compatible cables, contact the nearest Mitsubishi Electric System Service.

Item	Specifications
Model	FANC-110SBH
Manufacturer	Kuramo Electric
Application	For fixed parts
Size	20AWG × 3
Insulator material	Polyethylene foam
Insulator color	Blue, white, and yellow
Sheath material	Oil resistant vinyl
Sheath color	Brown
Operating temperature range (Note)	0 to 75 °C (32 to 167°F)
Tensile strength	49N
Minimum bend radius	35mm
Outline dimension	Approx. 7.6mm
Approximate mass	70kg/km
Conductor resistance (20°C)	34.5Ω/km or lower
Characteristic impedance	110±15Ω
Applicable specification	UL AWM Style 2464
	CAN/CSA-C22.2
	No.210.2-M90(cUL)

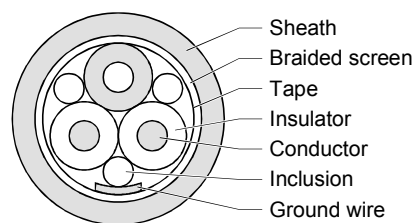


Fig. 14.1 Structure

Note. An upper limit of the operating temperature range shows a heat-resistant temperature of the cable material. In high-temperature environment, the transmittable distance may be reduced.

14. OPTIONS AND AUXILIARY EQUIPMENT

14.10 No-fuse breakers, fuses, magnetic contactors

Always use one no-fuse breaker and one magnetic contactor with one servo amplifier. When using a fuse instead of the no-fuse breaker, use the one having the specifications given in this section.

Servo amplifier	No-fuse breaker		Fuse			Magnetic contactor
	Not using power factor improving reactor	Using power factor improving reactor	(Note) Class	Current [A]	Voltage AC [V]	
MR-J3-10T (1)	30A frame 5A	30A frame 5A	T	10	250	S-N10
MR-J3-20T	30A frame 5A	30A frame 5A		10		
MR-J3-20T1	30A frame 10A	30A frame 10A		15		
MR-J3-40T	30A frame 10A	30A frame 5A		15		
MR-J3-60T • 70T • 100T • 40T1	30A frame 15A	30A frame 10A		20		
MR-J3-200T	30A frame 20A	30A frame 15A		40		
MR-J3-350T	30A frame 30A	30A frame 30A		70		
MR-J3-500T	50A frame 50A	50A frame 40A		125		
MR-J3-700T	100A frame 75A	50A frame 50A		150		
MR-J3-11KT	100A frame 100A	100A frame 75A		200		
MR-J3-15KT	225A frame 125A	100A frame 100A		250		
MR-J3-22KT	225A frame 175A	225A frame 150A		350		
MR-J3-60T4	30A frame 5A	30A frame 5A		10	600	S-N10
MR-J3-100T4	30A frame 10A	30A frame 10A		15		
MR-J3-200T4	30A frame 15A	30A frame 15A		25		
MR-J3-350T4	30A frame 20A	30A frame 20A		35		
MR-J3-500T4	30A frame 30A	30A frame 30A		50		
MR-J3-700T4	50A frame 40A	50A frame 30A		65		
MR-J3-11KT4	60A frame 60A	50A frame 50A		100		
MR-J3-15KT4	100A frame 75A	60A frame 60A		150		
MR-J3-22KT4	225A frame 125A	100A frame 100A	175			

Note. When not using the servo amplifier as a UL/C-UL Standard compliant product, K5 class fuse can be used.

14. OPTIONS AND AUXILIARY EQUIPMENT

14.11 Power factor improving DC reactor

POINT
<ul style="list-style-type: none"> For the 100V power supply type (MR-J3-□T1), the power factor improving DC reactor cannot be used.

The power factor improving DC reactor increases the form factor of the servo amplifier's input current to improve the power factor. It can decrease the power supply capacity. As compared to the power factor improving AC reactor (FR-BAL), it can decrease the loss. The input power factor is improved to about 95%. It is also effective to reduce the input side harmonics.

When connecting the power factor improving DC reactor to the servo amplifier, always disconnect P₁ and P₂ (For 11kW or more, disconnect P₁ and P). If it remains connected, the effect of the power factor improving DC reactor is not produced.

When used, the power factor improving DC reactor generates heat. To release heat, therefore, leave a 10cm or more clearance at each of the top and bottom, and a 5cm or more clearance on each side.

[Unit: mm]

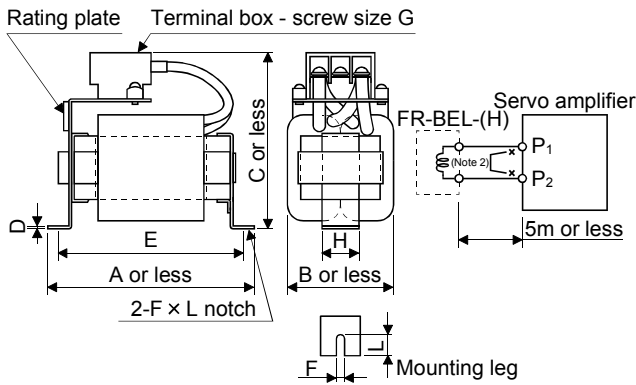


Fig. 14.2

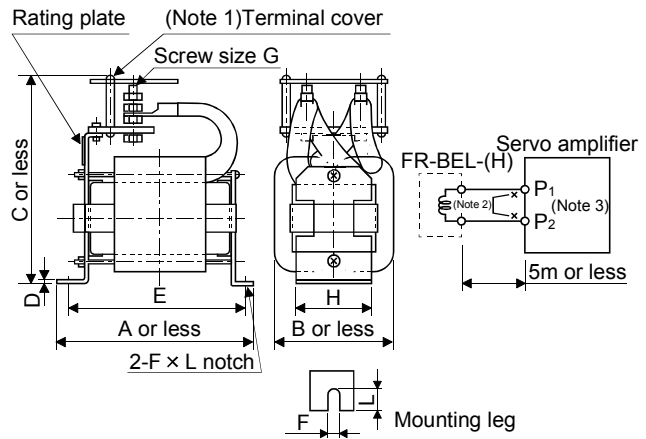


Fig. 14.3

Note 1. Since the terminal cover is supplied, attach it after connecting a wire.

2. When using DC reactor, disconnect P₁ and P₂.

3. When over 11kW, "P₂" becomes "P" respectively.

14. OPTIONS AND AUXILIARY EQUIPMENT

Servo amplifier	Power factor improving DC reactor	Outline drawing	Dimensions [mm]										Mounting screw size	Mass [kg(lb)]	Wire [mm ²] (Note)
			A	B	C	D	E	F	L	G	H				
MR-J3-10T • 20T	FR-BEL-0.4K	Fig. 14.2	110	50	94	1.6	95	6	12	M3.5	25	M5	0.5(1.10)	2(AWG14)	
MR-J3-40T	FR-BEL-0.75K		120	53	102	1.6	105	6	12	M4	25	M5	0.7(1.54)		
MR-J3-60T • 70T	FR-BEL-1.5K		130	65	110	1.6	115	6	12	M4	30	M5	1.1(2.43)		
MR-J3-100T	FR-BEL-2.2K		130	65	110	1.6	115	6	12	M4	30	M5	1.2(2.65)		
MR-J3-200T	FR-BEL-3.7K		150	75	102	2.0	135	6	12	M4	40	M5	1.7(3.75)		
MR-J3-350T	FR-BEL-7.5K		150	75	126	2.0	135	6	12	M5	40	M5	2.3(5.07)		3.5(AWG12)
MR-J3-500T	FR-BEL-11K		170	93	132	2.3	155	6	14	M5	50	M5	3.1(6.83)	5.5(AWG10)	
MR-J3-700T	FR-BEL-15K	Fig. 14.3	170	93	170	2.3	155	6	14	M8	56	M5	3.8(8.38)	8(AWG8)	
MR-J3-11KT														22(AWG4)	
MR-J3-15KT	FR-BEL-22K	Fig. 14.3	185	119	182	2.6	165	7	15	M8	70	M6	5.4(11.91)	30(AWG2)	
MR-J3-22KT	FR-BEL-30K		185	119	201	2.6	165	7	15	M8	70	M6	6.7(14.77)	60(AWG2/0)	
MR-J3-60T4	FR-BEL-H1.5K	Fig. 14.2	130	63	89	1.6	115	6	12	M3.5	32	M5	0.9(1.98)	2(AWG14)	
MR-J3-100T4	FR-BEL-H2.2K		130	63	101	1.6	115	6	12	M3.5	32	M5	1.1(2.43)		
MR-J3-200T4	FR-BEL-H3.7K		150	75	102	2	135	6	12	M4	40	M5	1.7(3.75)		
MR-J3-350T4	FR-BEL-H7.5K		150	75	124	2	135	6	12	M4	40	M5	2.3(5.07)		
MR-J3-500T4	FR-BEL-H11K		170	93	132	2.3	155	6	14	M5	50	M5	3.1(6.83)	5.5(AWG10)	
MR-J3-700T4	FR-BEL-H15K	Fig. 14.3	170	93	160	2.3	155	6	14	M6	56	M5	3.7(8.16)	8(AWG8)	
MR-J3-11KT4														22(AWG4)	
MR-J3-15KT4	FR-BEL-H22K	Fig. 14.3	185	119	171	2.6	165	7	15	M6	70	M6	5.0(11.02)	22(AWG4)	
MR-J3-22KT4	FR-BEL-H30K		185	119	189	2.6	165	7	15	M6	70	M6	6.7(14.77)		

Note. Selection condition of wire size is as follows.

Wire type: 600V Polyvinyl chloride insulated wire (IV wire)

Construction condition: One wire is constructed in the air

14. OPTIONS AND AUXILIARY EQUIPMENT

14.12 Power factor improving reactors

The power factor improving reactors improve the phase factor by increasing the form factor of servo amplifier's input current.

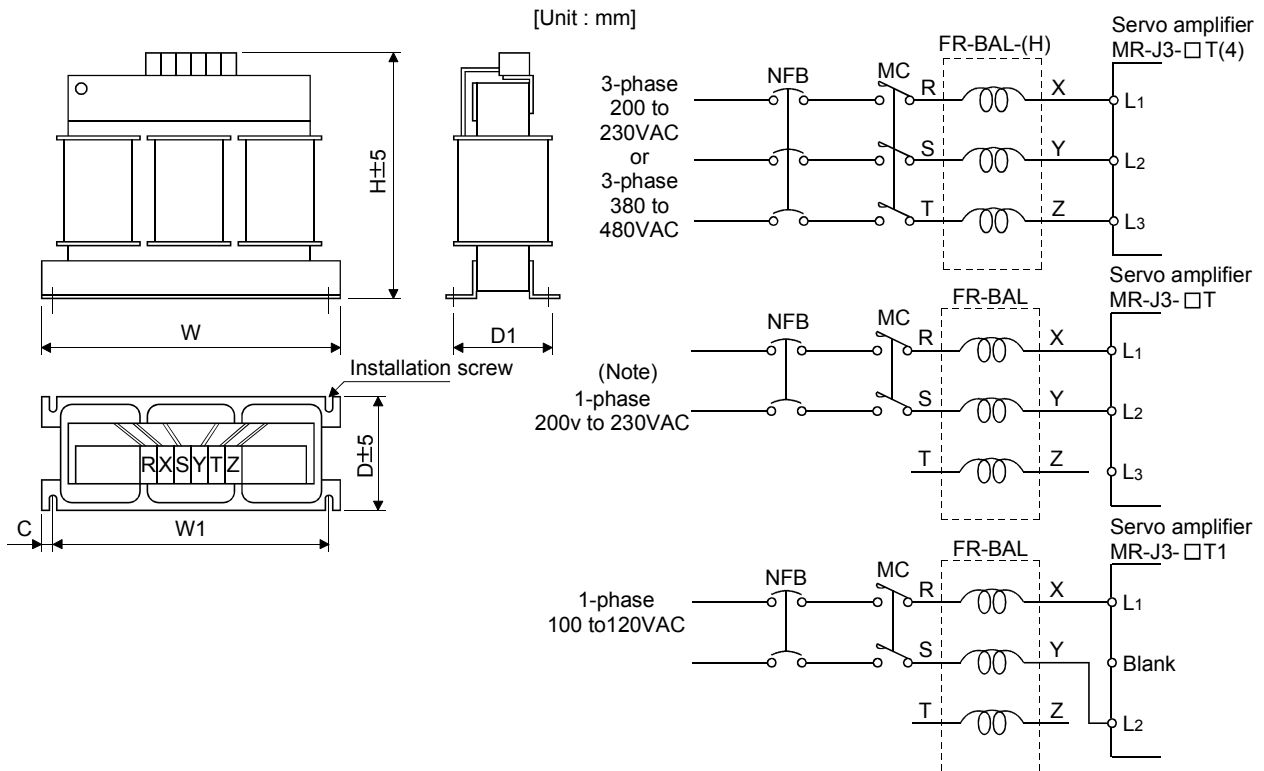
It can reduce the power capacity.

The input power factor is improved to be about 90%. For use with a 1-phase power supply, it may be slightly lower than 90%.

In addition, it reduces the higher harmonic of input side.

When using power factor improving reactors for two servo amplifiers or more, be sure to connect a power factor improving reactor to each servo amplifier.

If using only one power factor improving reactor, enough improvement effect of phase factor cannot be obtained unless all servo amplifiers are operated.



Note. For the 1-phase 200V to 230V power supply, Connect the power supply to L₁, L₂ and leave L₃ open.

14. OPTIONS AND AUXILIARY EQUIPMENT

Servo amplifier	Model	Dimensions [mm]						Mounting screw size	Terminal screw size	Mass [kg (lb)]
		W	W1	H	D	D1	C			
MR-J3-10T • 20T • 10T1	FR-BAL-0.4K	135	120	115	59	45 ⁰ _{-2.5}	7.5	M4	M3.5	2.0 (4.41)
MR-J3-40T • 20T1	FR-BAL-0.75K	135	120	115	69	57 ⁰ _{-2.5}	7.5	M4	M3.5	2.8 (6.17)
MR-J3-60T • 70T • 40T1	FR-BAL-1.5K	160	145	140	71	55 ⁰ _{-2.5}	7.5	M4	M3.5	3.7 (8.16)
MR-J3-100T	FR-BAL-2.2K	160	145	140	91	75 ⁰ _{-2.5}	7.5	M4	M3.5	5.6 (12.35)
MR-J3-200T	FR-BAL-3.7K	220	200	192	90	70 ⁰ _{-2.5}	10	M5	M4	8.5 (18.74)
MR-J3-350T	FR-BAL-7.5K	220	200	194	120	100 ⁰ _{-2.5}	10	M5	M5	14.5 (31.97)
MR-J3-500T	FR-BAL-11K	280	255	220	135	100 ⁰ _{-2.5}	12.5	M6	M6	19 (41.89)
MR-J3-700T	FR-BAL-15K	295	270	275	133	110 ⁰ _{-2.5}	12.5	M6	M6	27 (59.53)
MR-J3-11KT										
MR-J3-15KT	FR-BAL-22K	290	240	301	199	170±5	25	M8	M8	35 (77.16)
MR-J3-22KT	FR-BAL-30K	290	240	301	219	190±5	25	M8	M8	43 (94.80)
MR-J3-60T4	FR-BAL-H1.5K	160	145	140	87	70 ⁰ _{-2.5}	7.5	M4	M3.5	5.3 (11.68)
MR-J3-100T4	FR-BAL-H2.2K	160	145	140	91	75 ⁰ _{-2.5}	7.5	M4	M3.5	5.9 (13.01)
MR-J3-200T4	FR-BAL-H3.7K	220	200	190	90	70 ⁰ _{-2.5}	10	M5	M3.5	8.5 (18.74)
MR-J3-350T4	FR-BAL-H7.5K	220	200	192	120	100±5	10	M5	M4	14 (30.87)
MR-J3-500T4	FR-BAL-H11K	280	255	226	130	100±5	12.5	M6	M5	18.5 (40.79)
MR-J3-700T4	FR-BAL-H15K	295	270	244	130	110±5	12.5	M6	M5	27 (59.53)
MR-J3-11KT4										
MR-J3-15KT4	FR-BAL-H22K	290	240	269	199	170±5	25	M8	M8	Approx.35 (Approx.77.16)
MR-J3-22KT4	FR-BAL-H30K	290	240	290	219	190±5	25	M8	M8	Approx.43 (Approx.94.80)

14. OPTIONS AND AUXILIARY EQUIPMENT

14.13 Relays (recommended)

The following relays should be used with the interfaces.

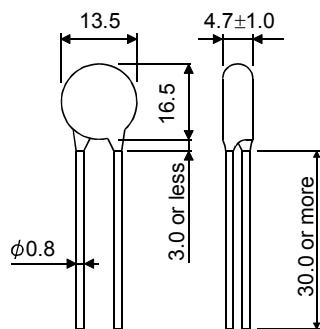
Interface	Selection example
Relay used for digital input command signals (interface DI-1)	To prevent defective contacts , use a relay for small signal (twin contacts). (Ex.) Omron : type G2A , MY
Relay used for digital output signals (interface DO-1)	Small relay with 12VDC or 24VDC of rated current 40mA or less (Ex.) Omron : type MY

14.14 Surge absorbers (recommended)

A surge absorber is required for the electromagnetic brake. Use the following surge absorber or equivalent. When using the surge absorber, perform insulation beforehand to prevent short-circuit.

Maximum rating					Maximum limit voltage		Static capacity (reference value)	Varistor voltage rating (range) V1mA
Permissible circuit voltage		Surge immunity	Energy immunity	Rated power				
AC [Vma]	DC [V]	[A]	[J]	[W]	[A]	[V]	[pF]	[V]
140	180	(Note) 500/time	5	0.4	25	360	300	220 (198 to 242)

Note. 1 time = $8 \times 20\mu\text{s}$



[Unit: mm]

(Example) ERZV10D221 (Matsushita Electric Industry)
TNR-10V221K (Nippon chemi-con)
Outline drawing [mm] (ERZ-C10DK221)

14. OPTIONS AND AUXILIARY EQUIPMENT

14.15 Noise reduction techniques

Noises are classified into external noises which enter the servo amplifier to cause it to malfunction and those radiated by the servo amplifier to cause peripheral devices to malfunction. Since the servo amplifier is an electronic device which handles small signals, the following general noise reduction techniques are required. Also, the servo amplifier can be a source of noise as its outputs are chopped by high carrier frequencies. If peripheral devices malfunction due to noises produced by the servo amplifier, noise suppression measures must be taken. The measures will vary slightly with the routes of noise transmission.

(1) Noise reduction techniques

(a) General reduction techniques

- Avoid laying power lines (input and output cables) and signal cables side by side or do not bundle them together. Separate power lines from signal cables.
- Use shielded, twisted pair cables for connection with the encoder and for control signal transmission, and connect the shield to the SD terminal.
- Ground the servo amplifier, servo motor, etc. together at one point (refer to section 4.12).

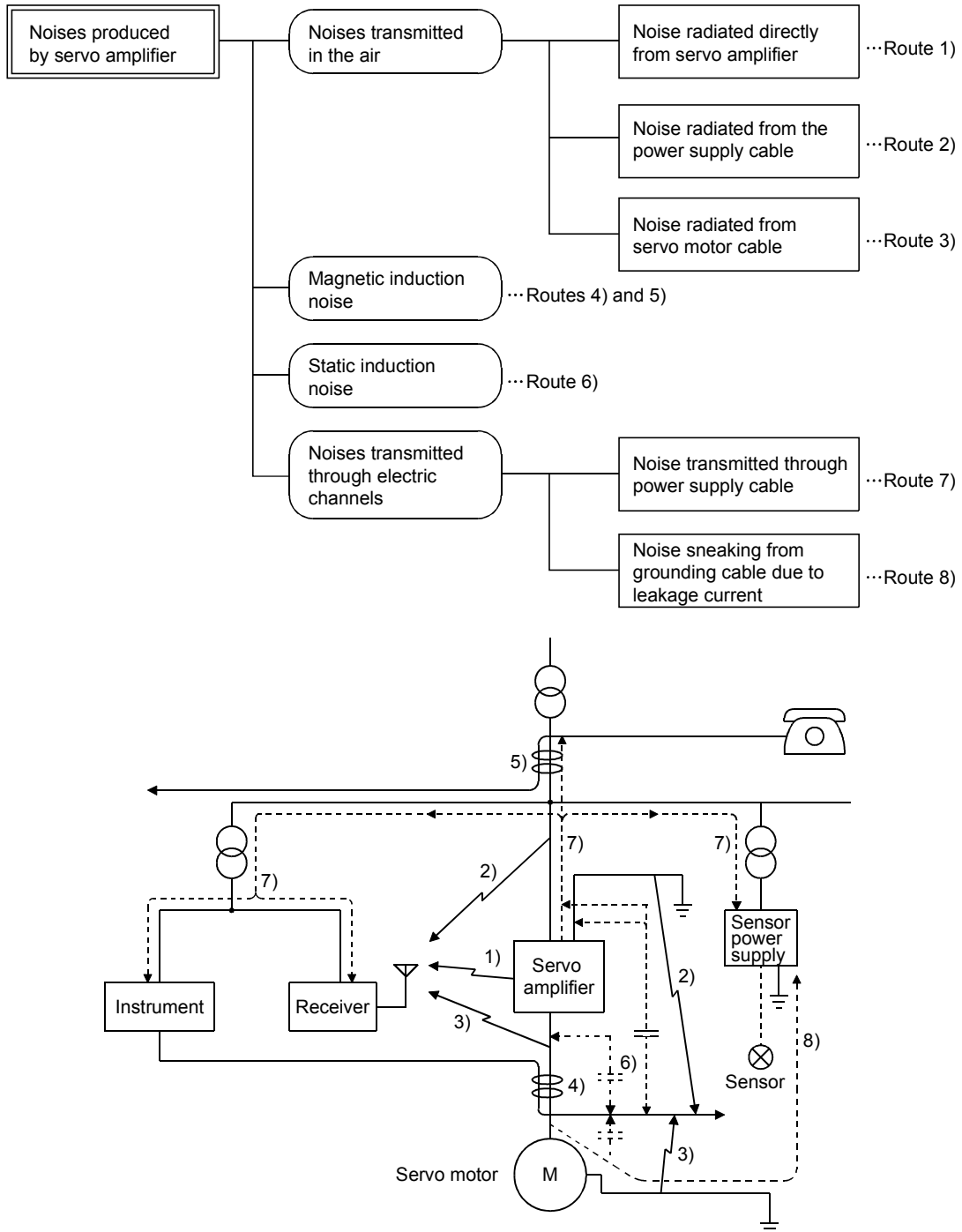
(b) Reduction techniques for external noises that cause the servo amplifier to malfunction

If there are noise sources (such as a magnetic contactor, an electromagnetic brake, and many relays which make a large amount of noise) near the servo amplifier and the servo amplifier may malfunction, the following countermeasures are required.

- Provide surge absorbers on the noise sources to suppress noises.
- Attach data line filters to the signal cables.
- Ground the shields of the encoder connecting cable and the control signal cables with cable clamp fittings.
- Although a surge absorber is built into the servo amplifier, to protect the servo amplifier and other equipment against large exogenous noise and lightning surge, attaching a varistor to the power input section of the equipment is recommended.

14. OPTIONS AND AUXILIARY EQUIPMENT

(c) Techniques for noises radiated by the servo amplifier that cause peripheral devices to malfunction
 Noises produced by the servo amplifier are classified into those radiated from the cables connected to the servo amplifier and its main circuits (input and output circuits), those induced electromagnetically or statically by the signal cables of the peripheral devices located near the main circuit cables, and those transmitted through the power supply cables.



14. OPTIONS AND AUXILIARY EQUIPMENT

Noise transmission route	Suppression techniques
1) 2) 3)	<p>When measuring instruments, receivers, sensors, etc. which handle weak signals and may malfunction due to noise and/or their signal cables are contained in a control box together with the servo amplifier or run near the servo amplifier, such devices may malfunction due to noises transmitted through the air. The following techniques are required.</p> <ol style="list-style-type: none"> 1. Provide maximum clearance between easily affected devices and the servo amplifier. 2. Provide maximum clearance between easily affected signal cables and the I/O cables of the servo amplifier. 3. Avoid laying the power lines (Input cables of the servo amplifier) and signal cables side by side or bundling them together. 4. Insert a line noise filter to the I/O cables or a radio noise filter on the input line. 5. Use shielded wires for signal and power cables or put cables in separate metal conduits.
4) 5) 6)	<p>When the power lines and the signal cables are laid side by side or bundled together, magnetic induction noise and static induction noise will be transmitted through the signal cables and malfunction may occur. The following techniques are required.</p> <ol style="list-style-type: none"> 1. Provide maximum clearance between easily affected devices and the servo amplifier. 2. Provide maximum clearance between easily affected signal cables and the I/O cables of the servo amplifier. 3. Avoid laying the power lines (I/O cables of the servo amplifier) and signal cables side by side or bundling them together. 4. Use shielded wires for signal and power cables or put the cables in separate metal conduits.
7)	<p>When the power supply of peripheral devices is connected to the power supply of the servo amplifier system, noises produced by the servo amplifier may be transmitted back through the power supply cable and the devices may malfunction. The following techniques are required.</p> <ol style="list-style-type: none"> 1. Insert the radio noise filter (FR-BIF) on the power cables (Input cables) of the servo amplifier. 2. Insert the line noise filter (FR-BSF01 · FR-BLF) on the power cables of the servo amplifier.
8)	<p>When the cables of peripheral devices are connected to the servo amplifier to make a closed loop circuit, leakage current may flow to malfunction the peripheral devices. If so, malfunction may be prevented by disconnecting the grounding cable of the peripheral device.</p>

(2) Noise reduction products

(a) Data line filter (Recommended)

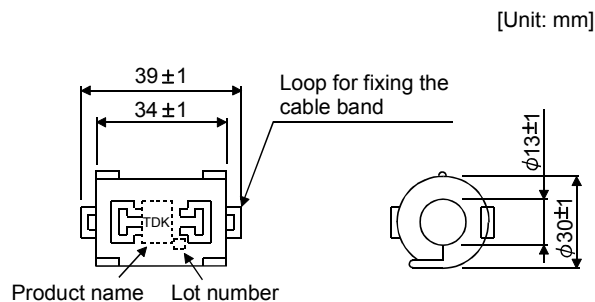
Noise can be prevented by installing a data line filter onto the encoder cable, etc.

For example, the ZCAT3035-1330 of TDK and the ESD-SR-25 of NEC TOKIN make are available as data line filters.

As a reference example, the impedance specifications of the ZCAT3035-1330 (TDK) are indicated below.

This impedance is reference values and not guaranteed values.

Impedance[Ω]	
10 to 100MHz	100 to 500MHz
80	150

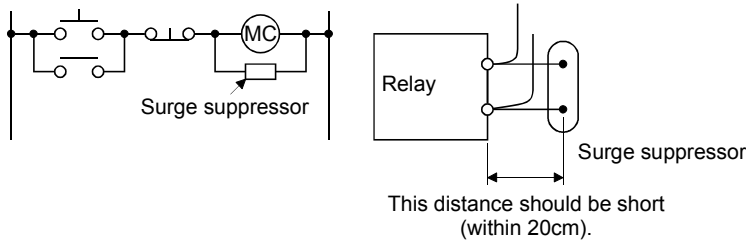


Outline drawing (ZCAT3035-1330)

14. OPTIONS AND AUXILIARY EQUIPMENT

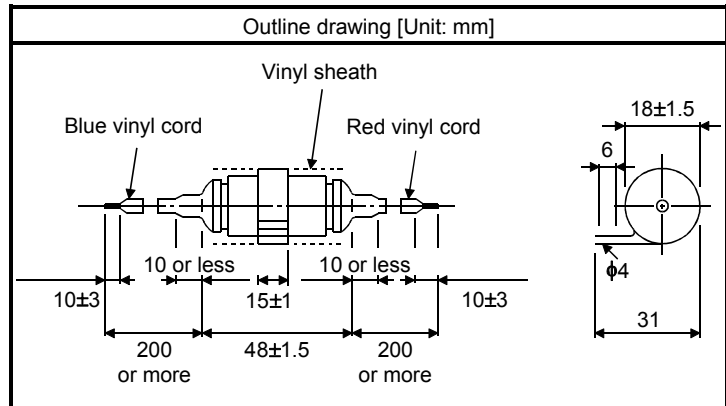
(b) Surge suppressor

The recommended surge suppressor for installation to an AC relay, AC valve, or the like near the servo amplifier is shown below. Use this product or equivalent.



(Ex.) 972A.2003 50411
(Matsuo Electric Co.,Ltd.—200VAC rating)

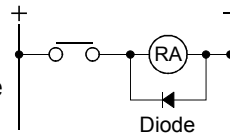
Rated voltage AC[V]	C [μ F]	R [Ω]	Test voltage AC[V]
200	0.5	50 (1W)	Across T-C 1000(1 to 5s)



Note that a diode should be installed to a DC relay, DC valve or the like.

Maximum voltage: Not less than 4 times the drive voltage of the relay or the like

Maximum current: Not less than twice the drive current of the relay or the like

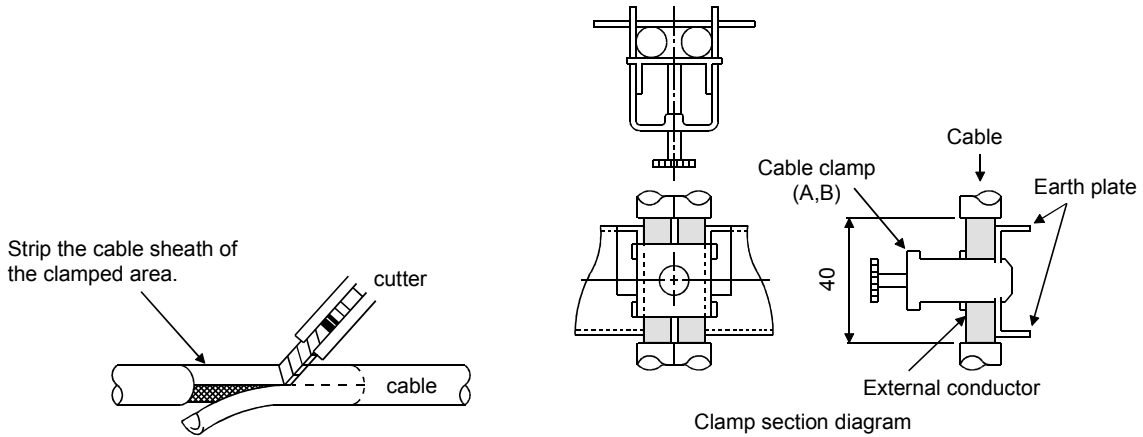


14. OPTIONS AND AUXILIARY EQUIPMENT

(c) Cable clamp fitting AERSBAN - □SET

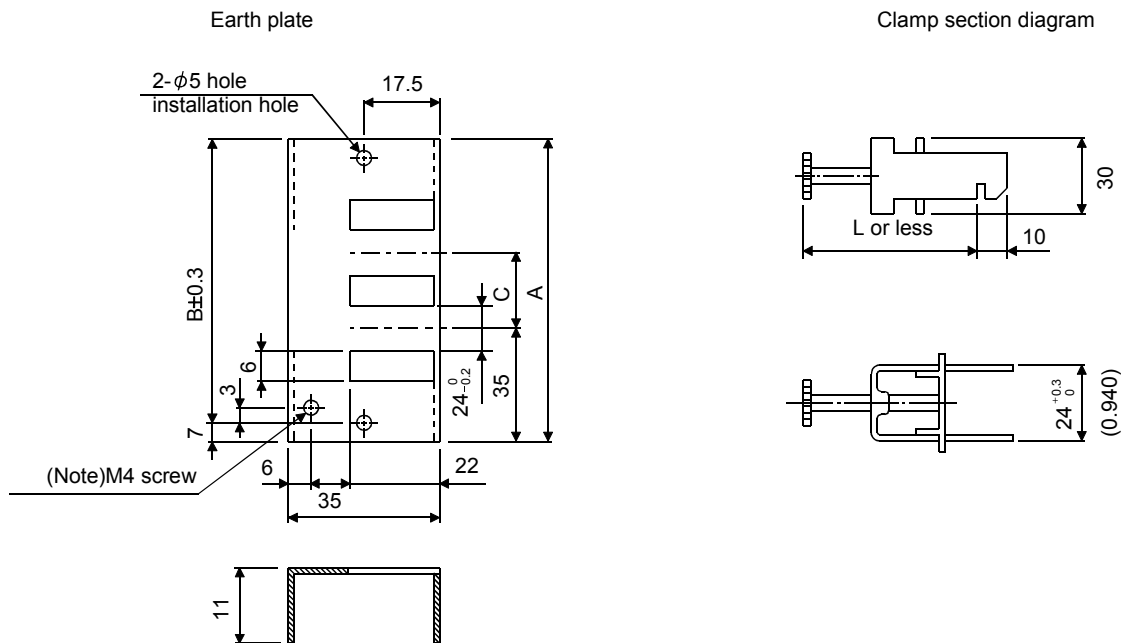
Generally, the earth of the shielded cable may only be connected to the connector's SD terminal. However, the effect can be increased by directly connecting the cable to an earth plate as shown below. Install the earth plate near the servo amplifier for the encoder cable. Peel part of the cable sheath to expose the external conductor, and press that part against the earth plate with the cable clamp. If the cable is thin, clamp several cables in a bunch. The clamp comes as a set with the earth plate.

[Unit: mm]



Outline drawing

[Unit: mm]



Note. Screw hole for grounding. Connect it to the earth plate of the control box.

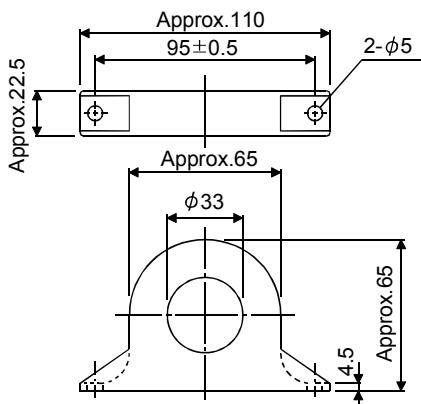
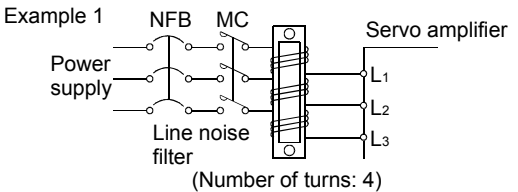
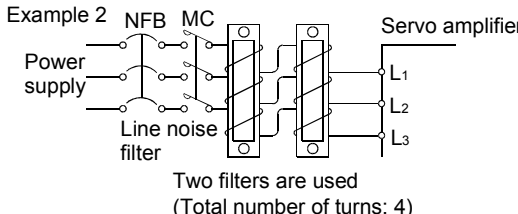
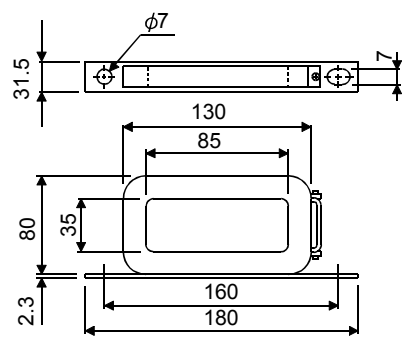
Type	A	B	C	Accessory fittings
AERSBAN-DSET	100	86	30	clamp A: 2pcs.
AERSBAN-ESET	70	56		clamp B: 1pc.

Clamp fitting	L
A	70
B	45

14. OPTIONS AND AUXILIARY EQUIPMENT

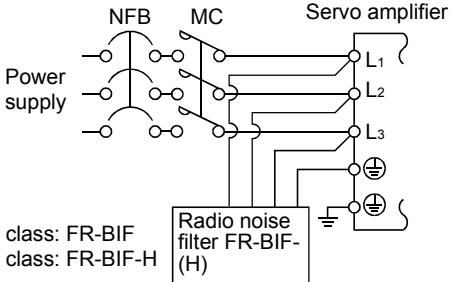
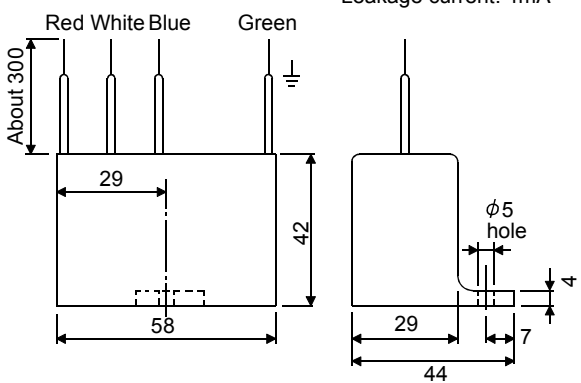
(d) Line noise filter (FR-BSF01, FR-BLF)

This filter is effective in suppressing noises radiated from the power supply side and output side of the servo amplifier and also in suppressing high-frequency leakage current (zero-phase current) especially within 0.5MHz to 5MHz band.

Connection diagram	Outline drawing [Unit: mm]
<p>Use the line noise filters for wires of the main power supply (L₁ · L₂ · L₃) and of the motor power supply (U · V · W). Pass each of the 3-phase wires through the line noise filter an equal number of times in the same direction. For the main power supply, the effect of the filter rises as the number of passes increases, but generally four passes would be appropriate. For the motor power supply, passes must be four times or less. Do not pass the grounding (earth) wire through the filter, or the effect of the filter will drop. Wind the wires by passing through the filter to satisfy the required number of passes as shown in Example 1. If the wires are too thick to wind, use two or more filters to have the required number of passes as shown in Example 2. Place the line noise filters as close to the servo amplifier as possible for their best performance.</p>	<p>FR-BSF01 (for wire size 3.5mm² (AWG12) or less)</p> 
<p>Example 1</p>  <p>(Number of turns: 4)</p> <p>Example 2</p>  <p>Two filters are used (Total number of turns: 4)</p>	<p>FR-BLF (for wire size 5.5mm² (AWG10) or more)</p> 

(e) Radio noise filter (FR-BIF-(H))

This filter is effective in suppressing noises radiated from the power supply side of the servo amplifier especially in 10MHz and lower radio frequency bands. The FR-BIF-(H) is designed for the input only.

Connection diagram	Outline drawing (Unit: mm)
<p>Make the connection cables as short as possible. Grounding is always required. When using the FR-BIF with a single-phase power supply, always insulate the wires that are not used for wiring.</p>  <p>200V class: FR-BIF 400V class: FR-BIF-(H)</p>	<p>Leakage current: 4mA</p> 

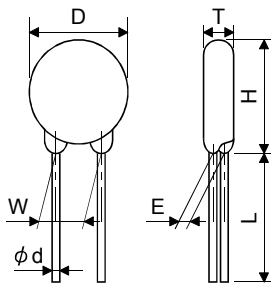
14. OPTIONS AND AUXILIARY EQUIPMENT

(f) Varistors for input power supply (Recommended)

Varistors are effective to prevent exogenous noise and lightning surge from entering the servo amplifier. When using a varistor, connect it between each phase of the input power supply of the equipment. For varistors, the TND20V-431K, TND20V-471K and TND20V-102K, manufactured by NIPPON CHEMI-CON, are recommended. For detailed specification and usage of the varistors, refer to the manufacturer catalog.

Power supply voltage	Varistor	Maximum rating					Maximum limit voltage		Static capacity (reference value)	Varistor voltage rating (range) V1mA
		Permissible circuit voltage		Surge current immunity	Energy immunity	Rated pulse power	[A]	[V]		
		AC[V _{rms}]	DC[V]	8/20μs[A]	2ms[J]	[W]				
100V class	TND20V-431K	275	350	10000/1 time	195	1.0	100	710	1300	430(387 to 473)
200V class	TND20V-471K	300	385	7000/2 time	215			775	1200	470(423 to 517)
400V class	TND20V-102K	625	825	7500/1 time 6500/2 time	400			1650	500	1000(900 to 1100)

[Unit: mm]



Model	D Max.	H Max.	T Max.	E ±1.0	(Note)L min.	φd ±0.05	W ±1.0
TND20V-431K	21.5	24.5	6.4	3.3	20	0.8	10.0
TND20V-471K			6.6	3.5			
TND20V-102K	22.5	25.5	9.5	6.4			

Note. For special purpose items for lead length (L), contact the manufacturer.

14. OPTIONS AND AUXILIARY EQUIPMENT

14.16 Leakage current breaker

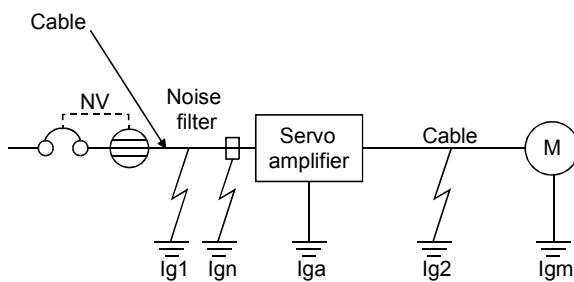
(1) Selection method

High-frequency chopper currents controlled by pulse width modulation flow in the AC servo circuits. Leakage currents containing harmonic contents are larger than those of the motor which is run with a commercial power supply.

Select a leakage current breaker according to the following formula, and ground the servo amplifier, servo motor, etc. securely.

Make the input and output cables as short as possible, and also make the grounding cable as long as possible (about 30cm) to minimize leakage currents.

$$\text{Rated sensitivity current} \geq 10 \cdot \{I_{g1} + I_{gn} + I_{ga} + K \cdot (I_{g2} + I_{gm})\} \text{ [mA]} \quad (14.1)$$



K: Constant considering the harmonic contents

Leakage current breaker		K
Type	Mitsubishi products	
Models provided with harmonic and surge reduction techniques	NV-SP NV-SW NV-CP NV-CW NV-L	1
General models	BV-C1 NFB NV-L	3

Ig1: Leakage current on the electric channel from the leakage current breaker to the input terminals of the servo amplifier (Found from Fig. 14.4.)

Ig2: Leakage current on the electric channel from the output terminals of the servo amplifier to the servo motor (Found from Fig. 14.4.)

Ign: Leakage current when a filter is connected to the input side (4.4mA per one FR-BIF-(H))

Iga: Leakage current of the servo amplifier (Found from Table 14.5.)

Igm: Leakage current of the servo motor (Found from Table 14.4.)

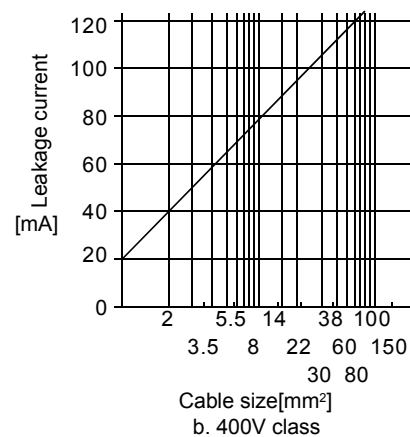
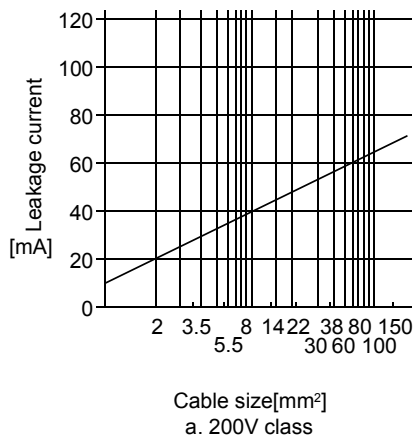


Fig. 14.4 Leakage current example (Ig1, Ig2) for CV cable run in metal conduit

14. OPTIONS AND AUXILIARY EQUIPMENT

Table 14.4 Servo motor's leakage current example (Igm)

Servo motor output [kW]	Leakage current [mA]
0.05 to 1	0.1
2	0.2
3.5	0.3
5	0.5
7	0.7
11	1.0
15	1.3
22	2.3

Table 14.5 Servo amplifier's leakage current example (Iga)

Servo amplifier capacity [kW]	Leakage current [mA]
0.1 to 0.6	0.1
0.75 to 3.5 (Note)	0.15
5 · 7	2
11 · 15	5.5
22	7

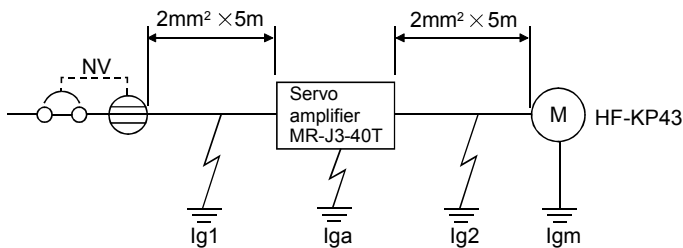
Note. For the 3.5kW of 400V class, leakage current is 2mA, which is the same as for 5kW and 7kW.

Table 14.6 Leakage circuit breaker selection example

Servo amplifier	Rated sensitivity current of leakage circuit breaker [mA]
MR-J3-10T to MR-J3-350T MR-J3-10T1 to MR-J3-40T1 MR-J3-60T4 to MR-J3-350T4	15
MR-J3-500T(4)	30
MR-J3-700T(4)	50
MR-J3-11KT(4) to MR-J3-22KT(4)	100

(2) Selection example

Indicated below is an example of selecting a leakage current breaker under the following conditions.



Use a leakage current breaker generally available.

Find the terms of Equation (14.1) from the diagram.

$$I_{g1} = 20 \cdot \frac{5}{1000} = 0.1 \text{ [mA]}$$

$$I_{g2} = 20 \cdot \frac{5}{1000} = 0.1 \text{ [mA]}$$

$$I_{gn} = 0 \text{ (not used)}$$

$$I_{ga} = 0.1 \text{ [mA]}$$

$$I_{gm} = 0.1 \text{ [mA]}$$

Insert these values in Equation (14.1).

$$I_g \geq 10 \cdot \{0.1+0+0.1+1 \cdot (0.1+0.1)\}$$

$$\geq 4.0 \text{ [mA]}$$

According to the result of calculation, use a leakage current breaker having the rated sensitivity current (I_g) of 4.0[mA] or more. A leakage current breaker having I_g of 15[mA] is used with the NV-SP/SW/CP/CW/HW series.

14. OPTIONS AND AUXILIARY EQUIPMENT

14.17 EMC filter (recommended)

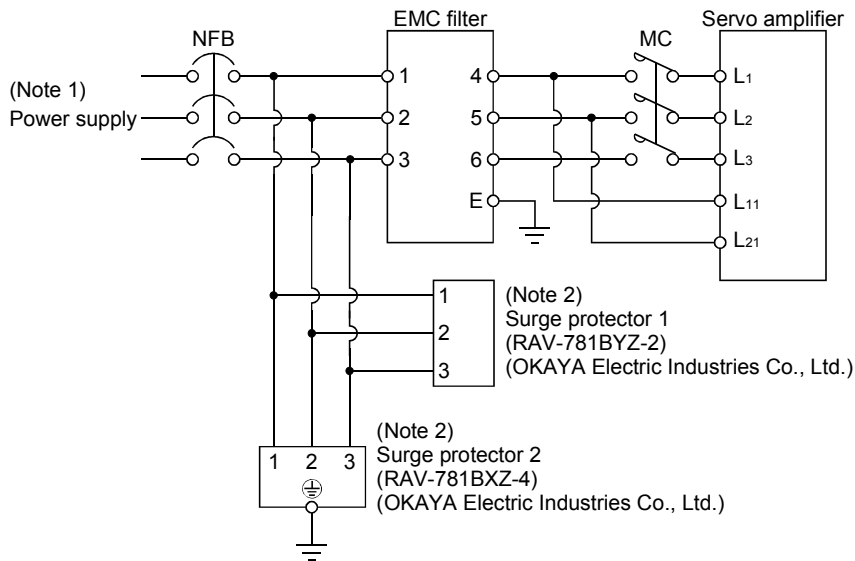
For compliance with the EMC directive of the EN Standard, it is recommended to use the following filter. Some EMC filters are large in leakage current.

(1) Combination with the servo amplifier

Servo amplifier	Recommended filter (Soshin Electric)		Mass [kg]([lb])
	Model	Leakage current [mA]	
MR-J3-10T to MR-J3-100T MR-J3-10T1 to MR-J3-40T1	(Note) HF3010A-UN	5	3 (6.61)
MR-J3-250T * MR-J3-350T	(Note) HF3030A-UN		5.5 (12.13)
MR-J3-500T * MR-J3-700T	(Note) HF3040A-UN	1.5	6.0 (13.23)
MR-J3-11KT to MR-J3-22KT	(Note) HF3100A-UN	6.5	15 (33.07)
MR-J3-60T4 to MR-J3-100T4	TF3005C-TX	5.5	6(13.23)
MR-J3-200T4 to MR-J3-700T4	TF3020C-TX		7.5(16.54)
MR-J3-11KT4	TF3030C-TX		12.5(27.56)
MR-J3-15KT4	TF3040C-TX		
MR-J3-22KT4	TF3060C-TX		

Note. A surge protector is separately required to use any of these EMC filters.

(2) Connection example



Note 1. For 1-phase 200V to 230VAC power supply, connect the power supply to L1, L2 and leave L3 open.

There is no L3 for 1-phase 100 to 120VAC power supply. Refer to section 1.3 for the power supply specification.

2. The example is when a surge protector is connected.

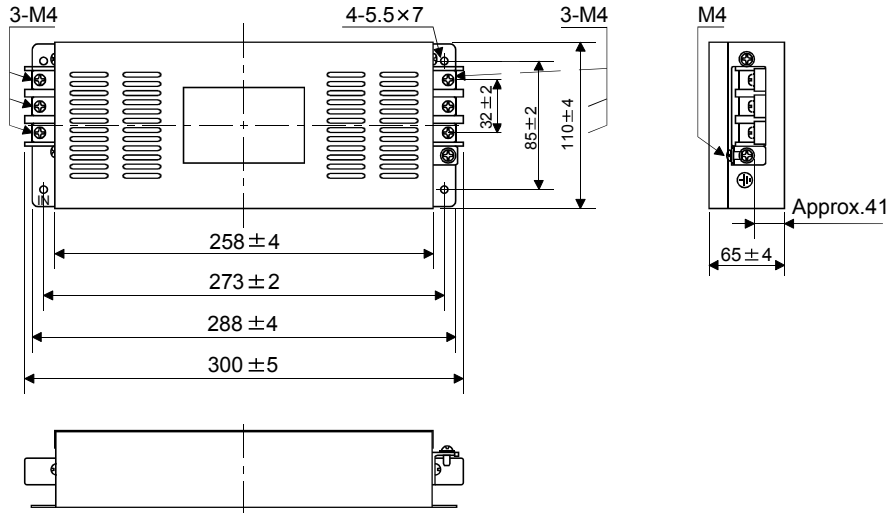
14. OPTIONS AND AUXILIARY EQUIPMENT

(3) Outline drawing

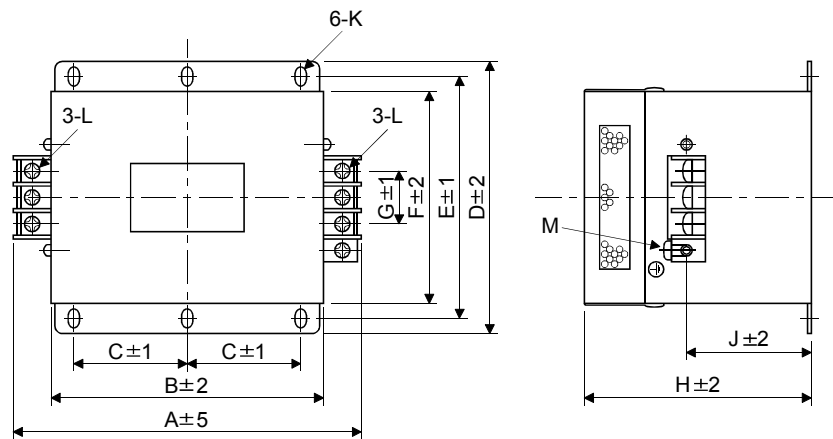
(a) EMC filter

HF3010A-UN

[Unit: mm]



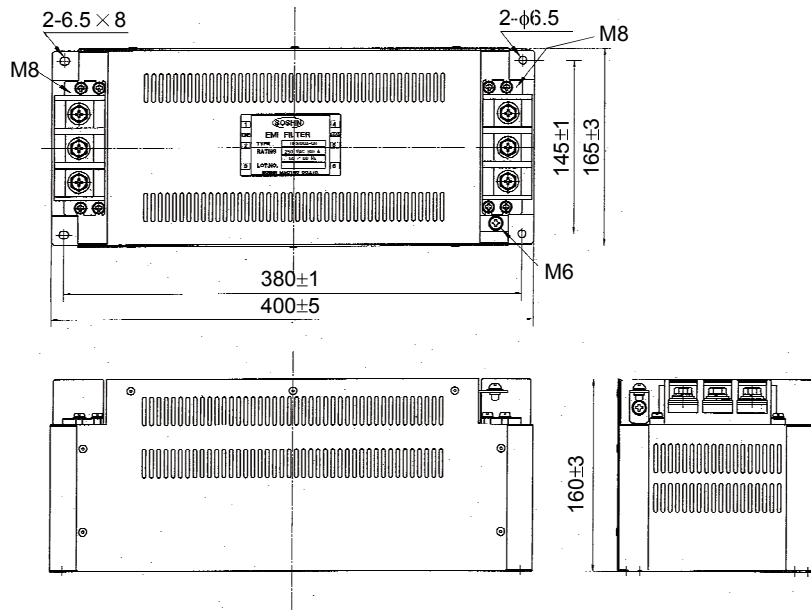
HF3030A-UN • HF-3040A-UN



Model	Dimensions [mm]											
	A	B	C	D	E	F	G	H	J	K	L	M
HF3030A-UN	260	210	85	155	140	125	44	140	70	R3.25, length 8	M5	M4
HF3040A-UN												

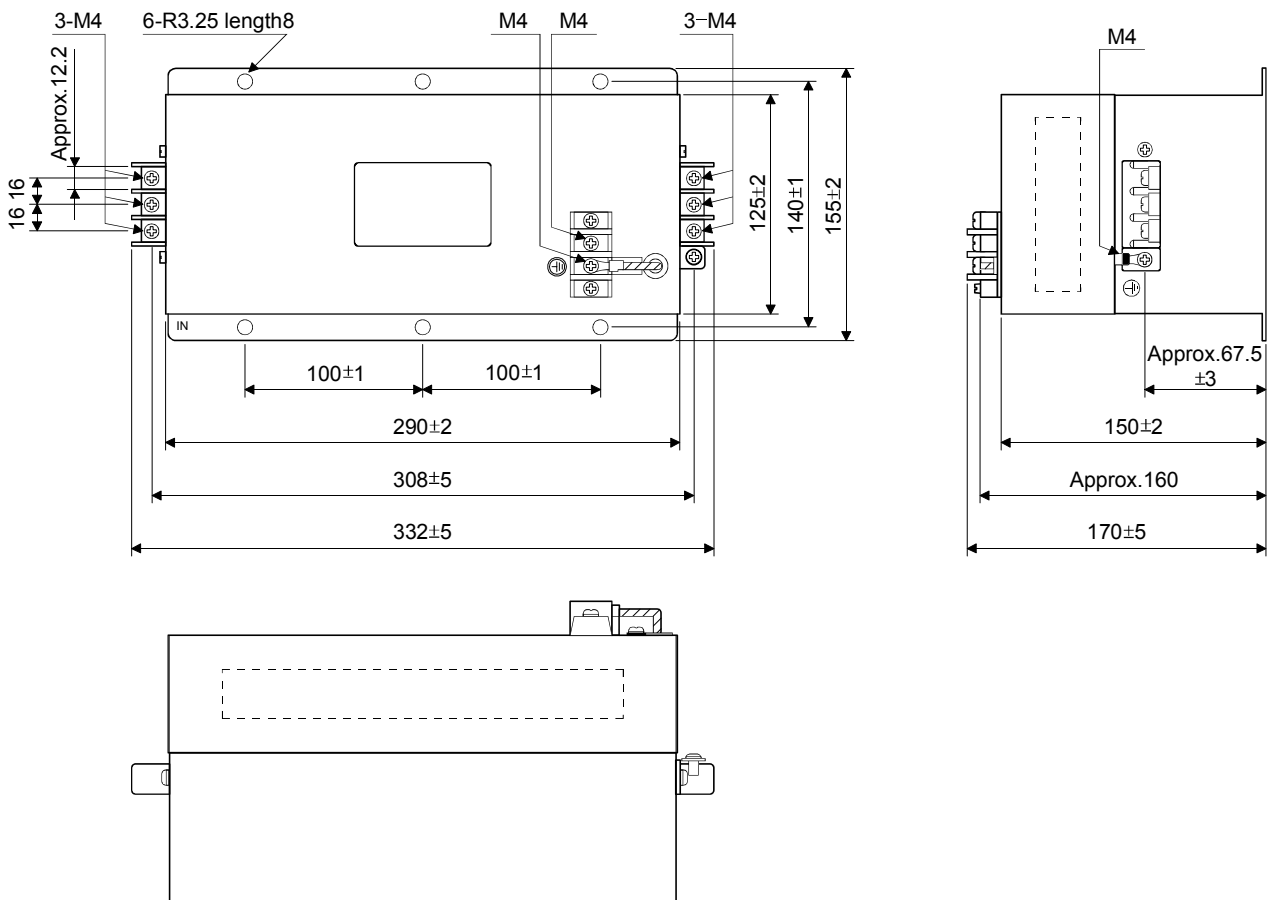
14. OPTIONS AND AUXILIARY EQUIPMENT

HF3100A-UN



TF3005C-TX • TX3020C-TX • TF3030C-TX

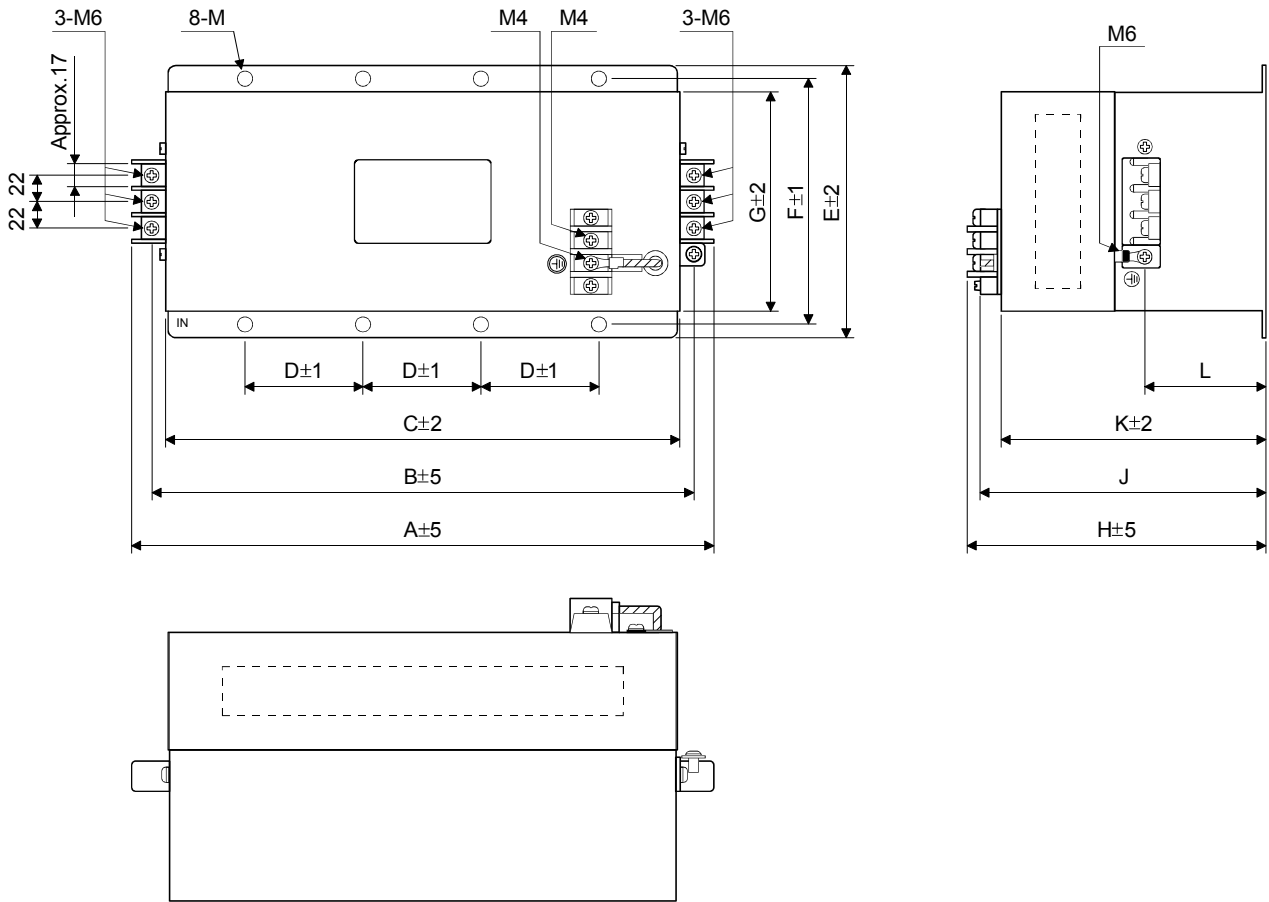
[Unit: mm]



14. OPTIONS AND AUXILIARY EQUIPMENT

TF3040C-TX • TF3060C-TX

[Unit: mm]



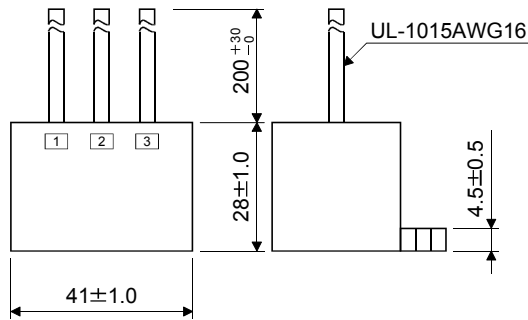
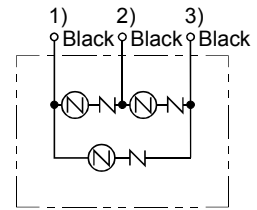
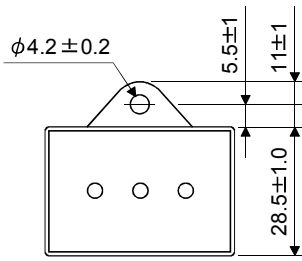
Model	Dimensions [mm]											
	A	B	C	D	E	F	G	H	J	K	L	M
TF3040C-TX	438	412	390	100	175	160	145	200	Approx.190	180	Approx.91.5	R3.25 length 8 (M6)
TF3060C-TX												

14. OPTIONS AND AUXILIARY EQUIPMENT

(b) Surge protector

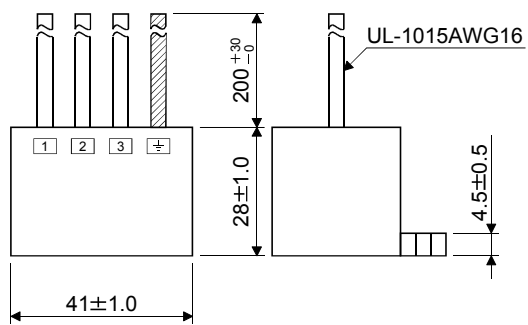
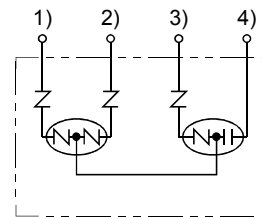
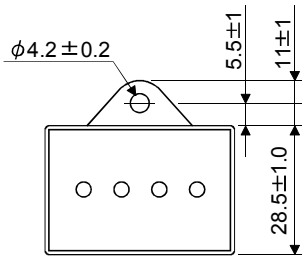
RAV-781BYZ-2

[Unit: mm]



RAV-781BXZ-4

[Unit: mm]



14. OPTIONS AND AUXILIARY EQUIPMENT

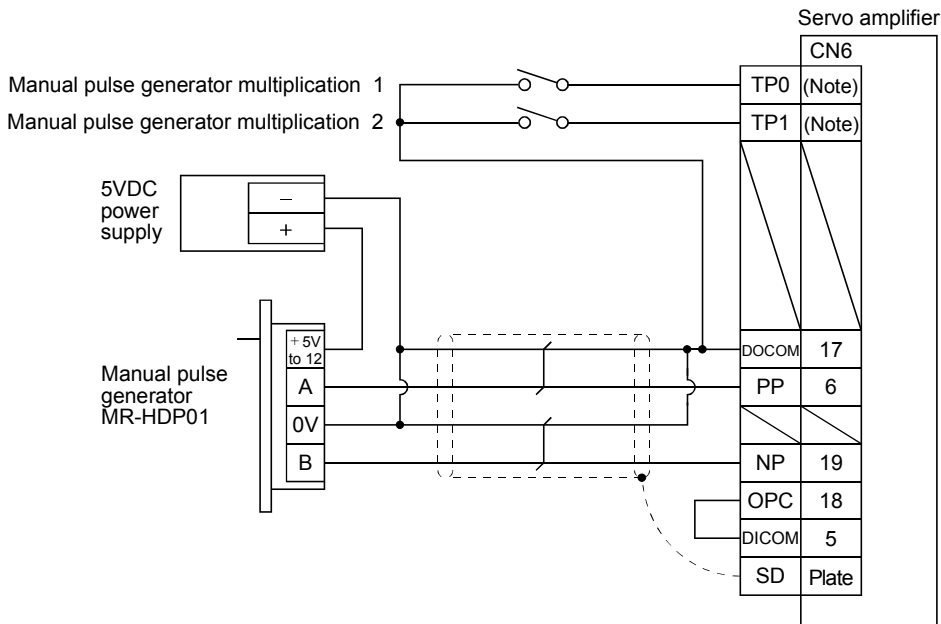
14.18 MR-HDP01 manual pulse generator

Use the MR-HDP01 manual pulse generator to rotate the servo motor. Using external input signals, the moving distance of the servo motor can be specified in accordance with pulses generated from MR-HDP01. To do this specification, in the parameter No.PD06 to PD08, assign the manual pulse generator multiplication 1 (TP0) and 2 (TP1) to the CN6 connector pins.

(1) Specifications

Item		Specifications
Power supply	Voltage	4.5 to 13.2VDC
	Current consumption	60mA or less
interface		Output current max. 20mA for open collector output
Pulse signal form		A-phase, B-phase, 2 signals of 90° phase difference
Pulse resolution		100pulse/rev
Max. speed		600r/min moment, 200r/min normally
Operating temperature range		-10°C to +60°C (14 to 140°F)
Storage temperature range		-30°C to +80°C (-22 to 176°F)

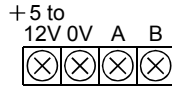
(2) Connection example



Note. Assign TP0 and TP1 using parameter No.PD06 to PD08 • PD12 • PD14.

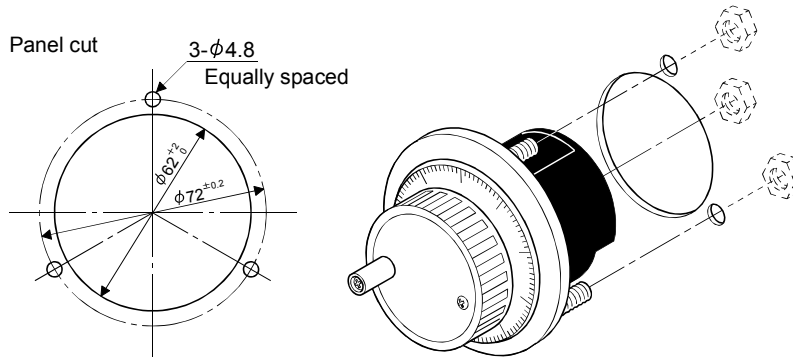
14. OPTIONS AND AUXILIARY EQUIPMENT

(3) Terminal layout

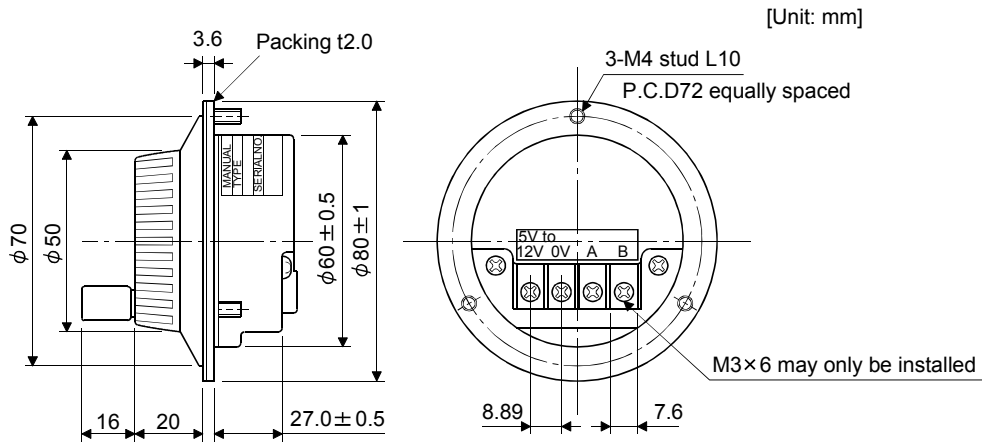


Signal	Description
+5 to 12V	Power input
0V	Common for power and signal
A	A-phase pulse output
B	B-phase pulse output

(4) Installation



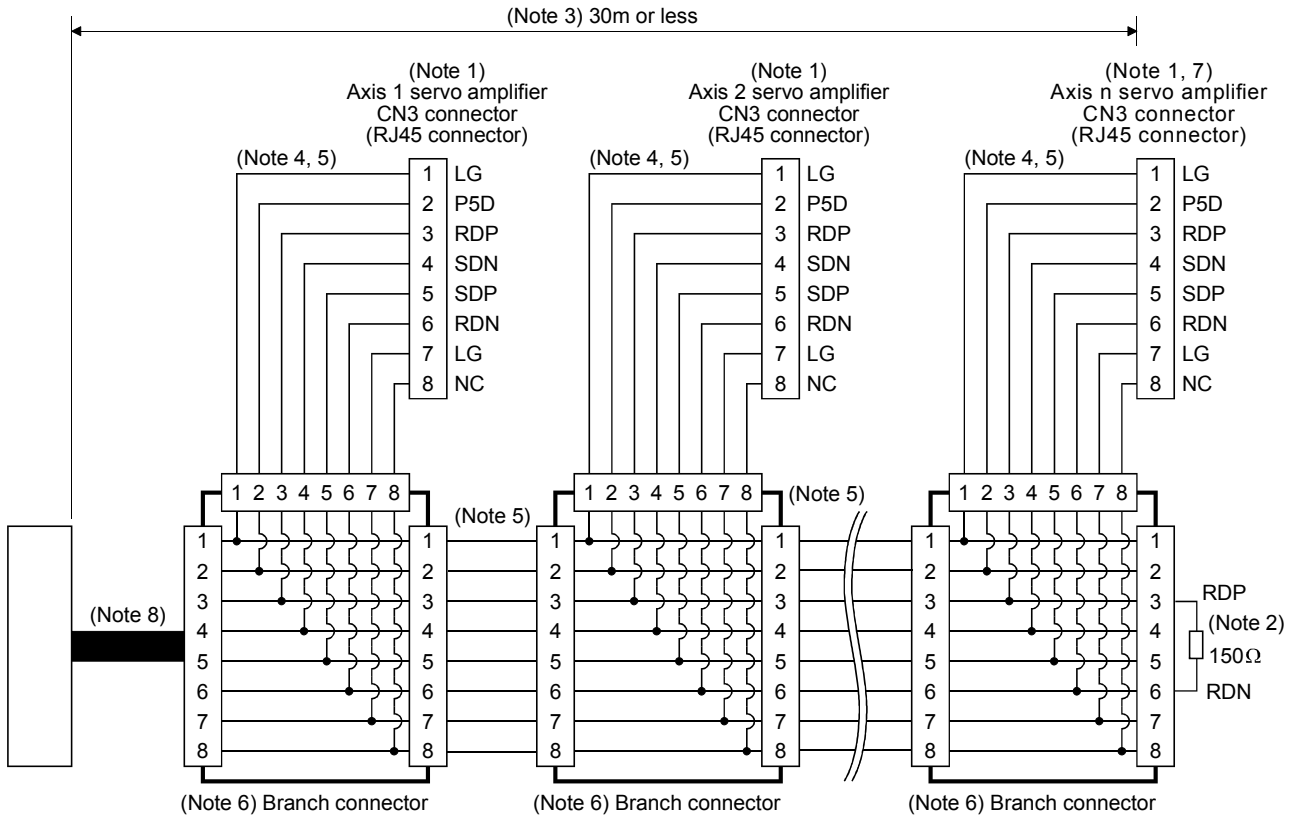
(5) Outline drawing



15. COMMUNICATION FUNCTION

(b) Cable connection diagram

Wire the cables as shown below.



Note 1. Recommended connector (Hirose Electric)

Plug: TM10P-88P

Connection tool: CL250-0228-1

2. The final axis must be terminated between RDP (pin No.3) and RDN (pin No.6) on the receiving side (servo amplifier) with a 150Ω resistor.
3. The overall length is 30m or less in low-noise environment.
4. The wiring between the branch connector and servo amplifier should be as short as possible.
5. Use the EIA568-compliant cable (10BASE-T cable, etc.).
6. Recommended branch connector: BMJ-8 (Hakko Electric Machine Works)
7. $n \leq 32$ (Up to 32 axes can be connected.)
8. RS-422/232C conversion cable DSV-CABV (Diatrend).

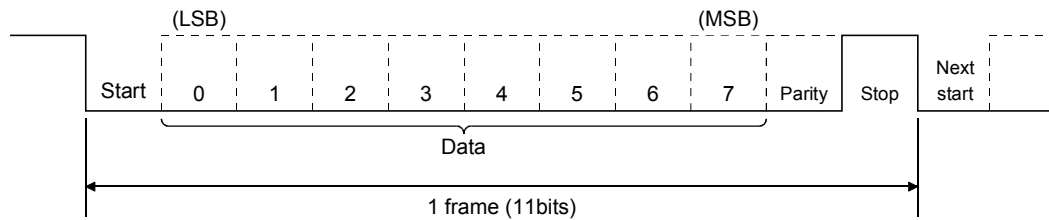
15. COMMUNICATION FUNCTION

15.2 Communication specifications

15.2.1 Communication overview

This servo amplifier is designed to send a reply on receipt of an instruction. The device which gives this instruction (e.g. personal computer) is called a master station and the device which sends a reply in response to the instruction (servo amplifier) is called a slave station. When fetching data successively, the master station repeatedly commands the slave station to send data.

Item	Description
Baud rate	9600/19200/38400/57600/115200 asynchronous system
Transfer code	Start bit : 1 bit Data bit : 8 bits Parity bit : 1 bit (even) Stop bit : 1 bit
Transfer protocol	Character system, half-duplex communication system



15. COMMUNICATION FUNCTION

15.2.2 Parameter setting

When the USB/RS-422 communication function is used to operate the servo, set the communication specifications of the servo amplifier in the corresponding parameters.

After setting the values of these parameters, they are made valid by switching power off once, then on again.

(1) Serial communication baud rate

Choose the communication speed. Match this value to the communication speed of the sending end (master station).

Parameter No.PC21

--	--	--	--

Communication baud rate

- 0: 9600[bps]
- 1: 19200[bps]
- 2: 38400[bps]
- 3: 57600[bps]
- 4: 115200[bps]

(2) RS-422 communication response delay time

Set the time from when the servo amplifier (slave station) receives communication data to when it sends back data. Set "0" to send back data in less than 800 μ s or "1" to send back data in 800 μ s or more.

Parameter No.PC21

--	--	--	--

RS-422 communication response delay time

- 0: Invalid
- 1: Valid, reply sent in 800 μ s or more

(3) Station number setting

Set the station number of the servo amplifier in parameter No.PC20. The setting range is station 0 to 31.

15. COMMUNICATION FUNCTION

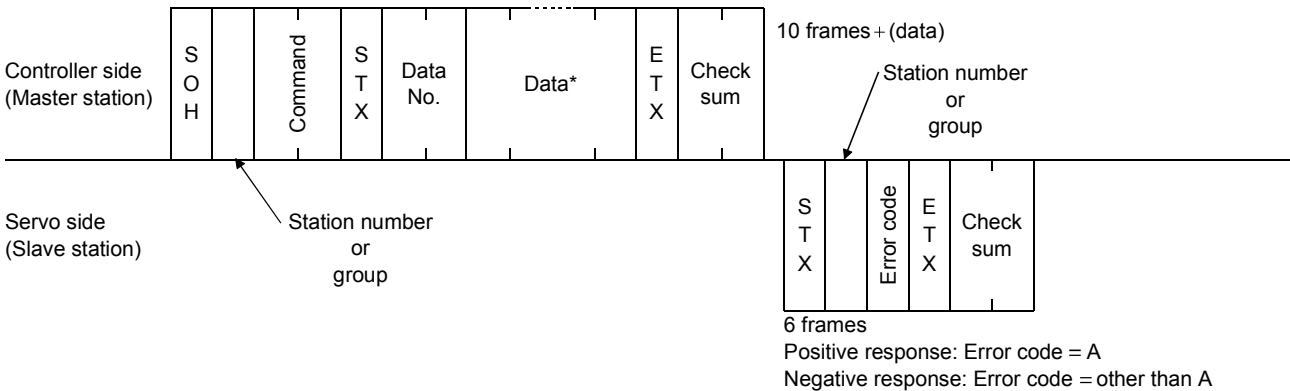
15.3 Protocol

15.3.1 Transmission data configuration

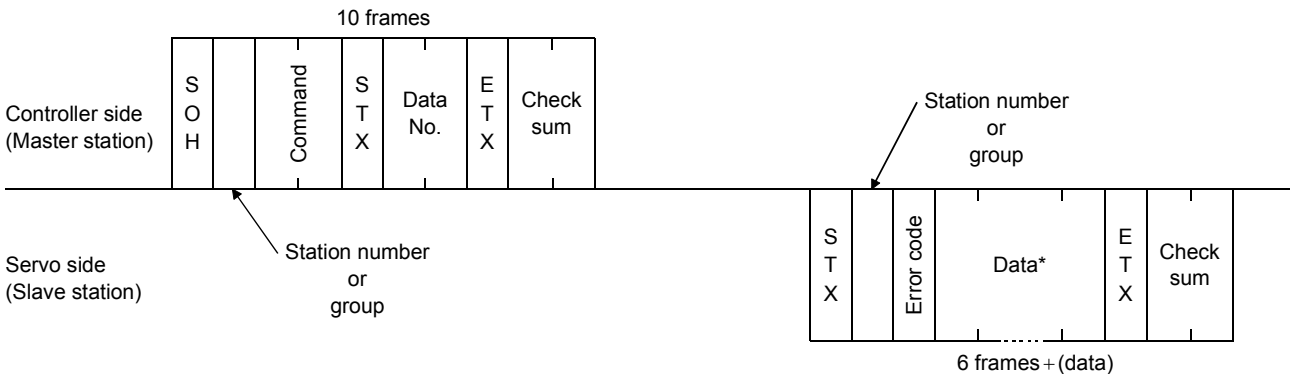
Since up to 32 axes may be connected to the bus, add a station number or group to the command, data No., etc. to determine the destination servo amplifier of data communication. Set the station number to each servo amplifier using the parameter and set the group to each station using the communication command. Transmission data is valid for the servo amplifier of the specified station number or group.

When "*" is set as the station number added to the transmission data, the transmission data is made valid for all servo amplifiers connected. However, when return data is required from the servo amplifier in response to the transmission data, set "0" to the station number of the servo amplifier which must provide the return data.

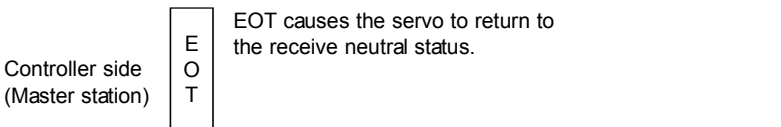
(1) Transmission of data from the controller to the servo



(2) Transmission of data request from the controller to the servo



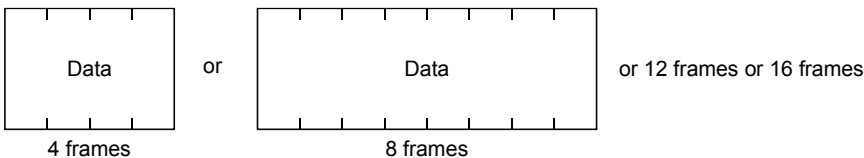
(3) Recovery of communication status by time-out



Servo side (Slave station)

(4) Data frames

The data length depends on the command.



15. COMMUNICATION FUNCTION

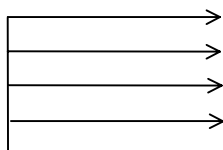
15.3.2 Character codes

(1) Control codes

Code name	Hexadecimal (ASCII code)	Description	Personal computer terminal key operation (General)
SOH	01H	start of head	ctrl + A
STX	02H	start of text	ctrl + B
ETX	03H	end of text	ctrl + C
EOT	04H	end of transmission	ctrl + D

(2) Codes for data

ASCII codes are used.



b ₈	0	0	0	0	0	0	0	0
b ₇	0	0	0	0	1	1	1	1
b ₆	0	0	1	1	0	0	1	1
b ₅	0	1	0	1	0	1	0	1

b ₈ to b ₅	b ₄	b ₃	b ₂	b ₁
	0	0	0	0
	0	0	0	1
	0	0	1	0
	0	0	1	1
	0	1	0	0
	0	1	0	1
	0	1	1	0
	0	1	1	1
	1	0	0	0
	1	0	0	1
	1	0	1	0
	1	0	1	1
	1	1	0	0
	1	1	0	1
	1	1	1	0
	1	1	1	1

R \ C	C							
	0	1	2	3	4	5	6	7
0	NUL	DLE	Space	0	@	P	`	p
1	SOH	DC ₁	!	1	A	Q	a	q
2	STX	DC ₂	"	2	B	R	b	r
3	ETX	DC ₃	#	3	C	S	c	s
4			\$	4	D	T	d	t
5			%	5	E	U	e	u
6			&	6	F	V	f	v
7			'	7	G	W	g	w
8			(	8	H	X	h	x
9			)	9	I	Y	i	y
10			*	:	J	Z	j	z
11			+	;	K	[	k	{
12			,	<	L	¥	l	|
13			-	=	M	]	m	}
14			.	>	N	^	n	~
15			/	?	O	_	o	DEL

(3) Station numbers

You may set 32 station numbers from station 0 to station 31 and the ASCII unit codes are used to specify the stations.

Station number	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
ASCII code	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F

Station number	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
ASCII code	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V

For example, "30H" is transmitted in hexadecimal for the station number of "0" (axis 1).

(4) Group

Group	a	b	c	d	e	f	All group
ASCII code	a	b	c	d	e	f	*

For example, "61H" is transmitted in hexadecimal for group a.

15. COMMUNICATION FUNCTION

15.3.3 Error codes

Error codes are used in the following cases and an error code of single-code length is transmitted.

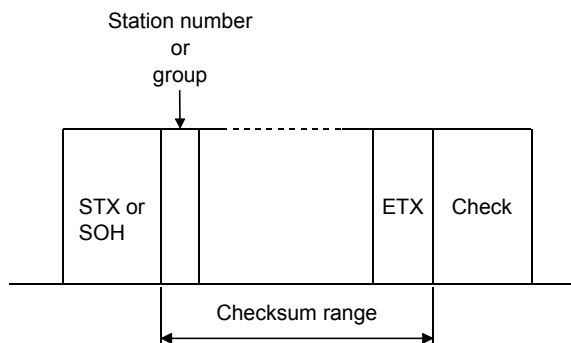
On receipt of data from the master station, the slave station sends the error code corresponding to that data to the master station.

The error code sent in upper case indicates that the servo is normal and the one in lower case indicates that an alarm occurred.

Error code		Error name	Description	Remarks
Servo normal	Servo alarm			
[A]	[a]	Normal operation	Data transmitted was processed properly.	Positive response
[B]	[b]	Parity error	Parity error occurred in the transmitted data.	Negative response
[C]	[c]	Checksum error	Checksum error occurred in the transmitted data.	
[D]	[d]	Character error	Character not existing in the specifications was transmitted.	
[E]	[e]	Command error	Command not existing in the specifications was transmitted.	
[F]	[f]	Data No. error	Data No. not existing in the specifications was transmitted.	

15.3.4 Checksum

The checksum is a ASCII-coded hexadecimal representing the lower two digits of the sum of ASCII-coded hexadecimal numbers up to ETX, with the exception of the first control code (STX or SOH).



(Example)

S							E		
T	[0]	[A]	[1]	[2]	[5]	[F]	T	[5]	[2]
X							X		
	02H	30H	41H	31H	32H	35H	46H	03H	

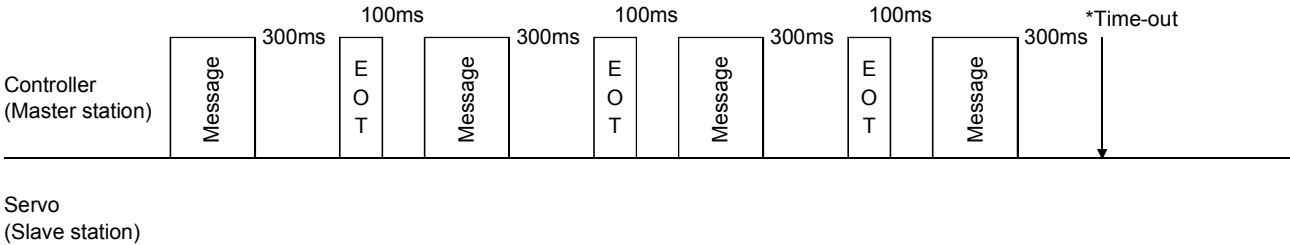
$$30H + 41H + 31H + 32H + 35H + 46H + 03H = 152H$$

Lower 2 digits 52 is sent after conversion into ASCII code [5][2].

15. COMMUNICATION FUNCTION

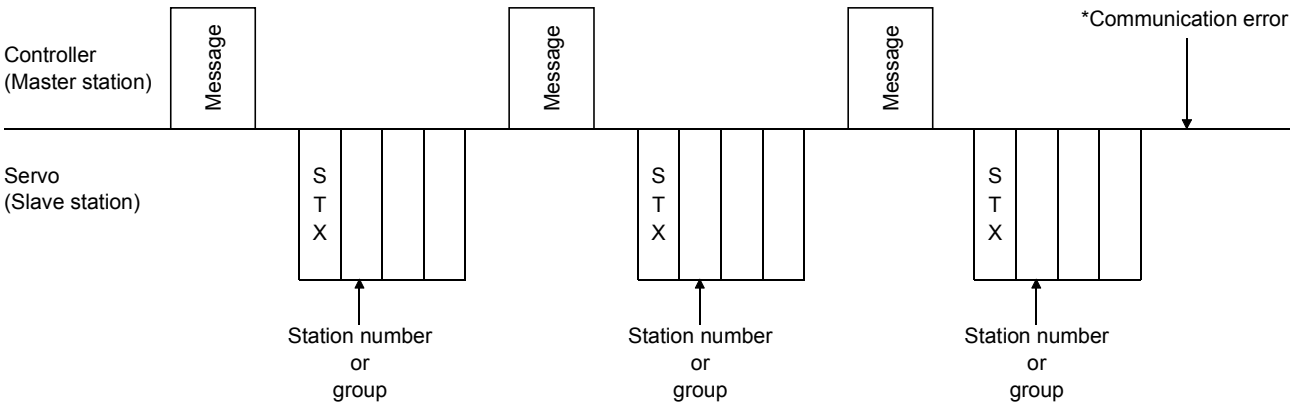
15.3.5 Time-out operation

The master station transmits EOT when the slave station does not start reply operation (STX is not received) 300ms after the master station has ended communication operation. 100ms after that, the master station retransmits the message. Time-out occurs if the slave station does not answer after the master station has performed the above operation three times. (Communication error)



15.3.6 Retry operation

When a fault occurs in communication between the master and slave stations, the error code in the response data from the slave station is a negative response code ([B] to [F], [b] to [f]). In this case, the master station retransmits the message which was sent at the occurrence of the fault (Retry operation). A communication error occurs if the above operation is repeated and results in the error three or more consecutive times.



Similarly, when the master station detects a fault (e.g. checksum, parity) in the response data from the slave station, the master station retransmits the message which was sent at the occurrence of the fault. A communication error occurs if the retry operation is performed three times.

15. COMMUNICATION FUNCTION

15.3.7 Initialization

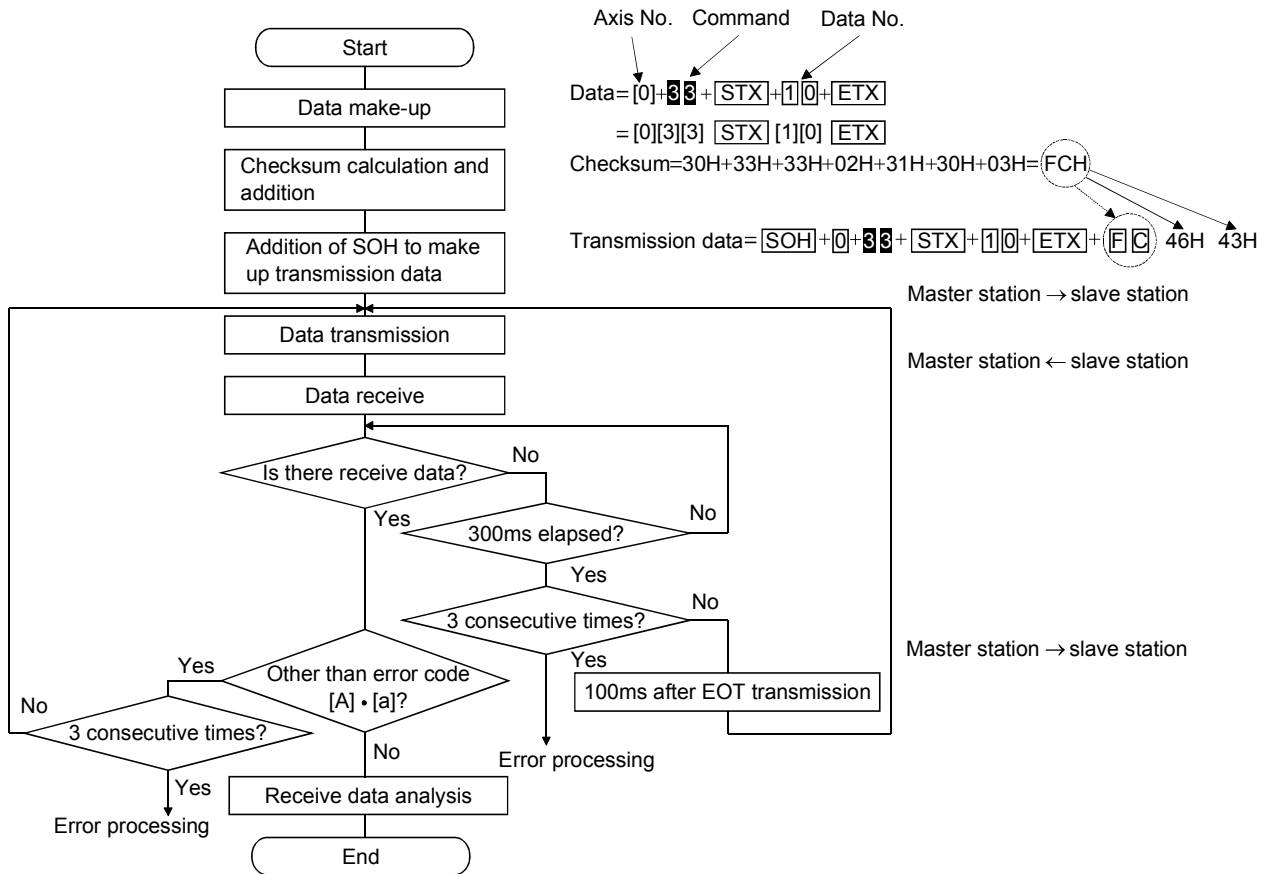
After the slave station is switched on, it cannot reply to communication until the internal initialization processing terminates. Hence, at power-on, ordinary communication should be started after.

- (1) 1s or more time has elapsed after the slave station is switched on; and
- (2) Making sure that normal communication can be made by reading the parameter or other data which does not pose any safety problems.

15.3.8 Communication procedure example

The following example reads the set value of alarm history (last alarm) from the servo amplifier of station 0.

Data item	Value	Description
Station number	0	Servo amplifier station 0
Command	33	Read command
Data No.	10	Alarm history (last alarm)



15. COMMUNICATION FUNCTION

15.4 Command and data No. list

POINT	<ul style="list-style-type: none"> If the command and data No. are the same, the description may be different depending on models of servo amplifiers.
-------	---

15.4.1 Read commands

(1) Status display (Command [0][1])

Command	Data No.	Description	Display item	Frame length			
[0] [1]	[0] [0]	Status display name and unit	Current position	16			
	[0] [1]		Command position				
	[0] [2]		Command remaining distance				
	[0] [3]		Point table No.				
	[0] [4]		Cumulative feedback pulses				
	[0] [5]		Servo motor speed				
	[0] [6]		Droop pulses				
	[0] [7]						
	[0] [8]						
	[0] [9]						
	[0] [A]		Regenerative load ratio				
	[0] [B]		Effective load ratio				
	[0] [C]		Peak load ratio				
	[0] [D]		Instantaneous torque				
	[0] [E]		Within one-revolution position				
	[0] [F]		ABS counter				
	[1] [0]		Load inertia moment ratio				
	[1] [1]		Bus voltage				
	[8] [0]		[8] [0]		Status display data value and processing information	Current position	12
			[8] [1]			Command position	
[8] [2]		Command remaining distance					
[8] [3]		Point table No.					
[8] [4]		Cumulative feedback pulses					
[8] [5]		Servo motor speed					
[8] [6]		Droop pulses					
[8] [7]							
[8] [8]							
[8] [9]							
[8] [A]		Regenerative load ratio					
[8] [B]		Effective load ratio					
[8] [C]		Peak load ratio					
[8] [D]		Instantaneous torque					
[8] [E]		Within one-revolution position					
[8] [F]		ABS counter					
[9] [0]		Load inertia moment ratio					
[9] [1]		Bus voltage					

15. COMMUNICATION FUNCTION

(2) Parameters (Command [0][4] · [0][5] · [0][6] · [0][7] · [0][8] · [0][9])

Command	Data No.	Description	Frame length
[0][4]	[0][1]	Parameter group read 0000: Basic setting parameter (No.PA□□) 0001: Gain filter parameter (No.PB□□) 0002: Extension setting parameter (No.PC□□) 0003: I/O setting parameter (No.PD□□)	4
[0][5]	[0][1] to [F][F]	Current values of parameters Reads the current values of the parameters in the parameter group specified with the command [8][5] + data No. [0][0]. Before reading the current values, therefore, always specify the parameter group with the command [8][5] + data No. [0][0]. The decimal equivalent of the data No. value (hexadecimal) corresponds to the parameter number.	8
[0][6]	[0][1] to [F][F]	Upper limit values of parameter setting ranges Reads the permissible upper limit values of the parameters in the parameter group specified with the command [8][5] + data No. [0][0]. Before reading the upper limit values, therefore, always specify the parameter group with the command [8][5] + data No. [0][0]. The decimal equivalent of the data No. value (hexadecimal) corresponds to the parameter number.	8
[0][7]	[0][1] to [F][F]	Lower limit values of parameter setting ranges Reads the permissible lower limit values of the parameters in the parameter group specified with the command [8][5] + data No. [0][0]. Before reading the lower limit values, therefore, always specify the parameter group with the command [8][5] + data No. [0][0]. The decimal equivalent of the data No. value (hexadecimal) corresponds to the parameter number.	8
[0][8]	[0][1] to [F][F]	Abbreviations of parameters Reads the abbreviations of the parameters in the parameter group specified with the command [8][5] + data No. [0][0]. Before reading the abbreviations, therefore, always specify the parameter group with the command [8][5] + data No. [0][0]. The decimal equivalent of the data No. value (hexadecimal) corresponds to the parameter number.	12
[0][9]	[0][1] to [F][F]	Write enable/disable of parameters Reads write enable/disable of the parameters in the parameter group specified with the command [8][5] + data No. [0][0]. Before reading write enable/disable, therefore, always specify the parameter group with the command [8][5] + data No. [0][0]. 0000: Write enabled 0001: Write disabled	4

(3) External I/O signals (Command [1][2])

Command	Data No.	Description	Frame length
[1][2]	[0][0]	Input device status	8
	[0][1]		
	[4][0]	External input pin status	
	[6][0]	Status of input device turned ON by communication	
	[6][1]		
	[8][0]	Output device status	
	[8][1]		
	[C][0]	External output pin status	

15. COMMUNICATION FUNCTION

(4) Alarm history (Command [3][3])

Command	Data No.	Description	Alarm occurrence sequence	Frame length
[3] [3]	[1] [0]	Alarm number in alarm history	most recent alarm	4
	[1] [1]		first alarm in past	
	[1] [2]		second alarm in past	
	[1] [3]		third alarm in past	
	[1] [4]		fourth alarm in past	
	[1] [5]		fifth alarm in past	
	[2] [0]	Alarm occurrence time in alarm history	most recent alarm	8
	[2] [1]		first alarm in past	
	[2] [2]		second alarm in past	
	[2] [3]		third alarm in past	
	[2] [4]		fourth alarm in past	
	[2] [5]		fifth alarm in past	

(5) Current alarm (Command [0][2], [3][5])

Command	Data No.	Description	Frame length	
[0] [2]	[0][0]	Current alarm number	4	
[3] [5]	[0][0]	Status display name and unit at alarm occurrence	Current position	
	[0][1]		Command position	
	[0][2]		Command remaining distance	
	[0][3]		Point table No.	
	[0][4]		Cumulative feedback pulses	
	[0][5]		Servo motor speed	
	[0][6]		Droop pulses	
	[0][7]			
	[0][8]			
	[0][9]			
	[0][A]		Regenerative load ratio	
	[0][B]		Effective load ratio	
	[0][C]		Peak load ratio	
	[0][D]		Instantaneous torque	
	[0][E]		Within one-revolution position	
	[0][F]		ABS counter	
	[1][0]		Load inertia moment ratio	
	[1][1]		Bus voltage	
	[0][0]		Status display data value and processing information at alarm occurrence	Current position
	[0][1]			Command position
	[0][2]			Command remaining distance
	[0][3]			Point table No.
	[0][4]			Cumulative feedback pulses
	[0][5]			Servo motor speed
	[0][6]			Droop pulses
[0][7]				
[0][8]				
[0][9]				
[0][A]	Regenerative load ratio			
[0][B]	Effective load ratio			
[0][C]	Peak load ratio			
[0][D]	Instantaneous torque			
[0][E]	Within one-revolution position			
[0][F]	ABS counter			
[1][0]	Load inertia moment ratio			
[1][1]	Bus voltage			

15. COMMUNICATION FUNCTION

(6) Point table/position data (Command [4][0])

Command	Data No.	Description	Frame length
[4][0]	[0][1] to [F][F]	Position data read The decimal equivalent of the data No. value (hexadecimal) corresponds to the Point table No.	8

(7) Point table/speed data (Command [5][0])

Command	Data No.	Description	Frame length
[5][0]	[0][1] to [F][F]	Speed data read The decimal equivalent of the data No. value (hexadecimal) corresponds to the Point table No.	8

(8) Point table/acceleration time constant (Command [5][4])

Command	Data No.	Description	Frame length
[5][4]	[0][1] to [F][F]	Acceleration time constant read The decimal equivalent of the data No. value (hexadecimal) corresponds to the Point table No.	8

(9) Point table/deceleration time constant (Command [5][8])

Command	Data No.	Description	Frame length
[5][8]	[0][1] to [F][F]	Deceleration time constant read The decimal equivalent of the data No. value (hexadecimal) corresponds to the Point table No.	8

(10) Point table/dwell (Command [6][0])

Command	Data No.	Description	Frame length
[6][0]	[0][1] to [F][F]	Dwell read The decimal equivalent of the data No. value (hexadecimal) corresponds to the Point table No.	8

(11) Point table/auxiliary function (Command [6][4])

Command	Data No.	Description	Frame length
[6][4]	[0][1] to [F][F]	Auxiliary function read The decimal equivalent of the data No. value (hexadecimal) corresponds to the Point table No.	8

(12) Group setting (Command [1][F])

Command	Data No.	Description	Frame length
[1][F]	[0][0]	Reading of group setting value	4

(13) Test operation mode (Command [0][0])

Command	Data No.	Description	Frame length
[0][0]	[1][2]	Test operation mode read 0000: Normal mode (not test operation mode) 0001: JOG operation 0002: Positioning operation 0003: Motorless operation 0004: Output signal (DO) forced output 0005: Single-step feed	4

15. COMMUNICATION FUNCTION

(14) Others

Command	Data No.	Description	Frame length
[0] [2]	[9] [0]	Servo motor side pulse unit absolute position	8
	[9] [1]	Command unit absolute position	8
	[7] [0]	Software version	16

15.4.2 Write commands

(1) Status display (Command [8][1])

Command	Data No.	Description	Setting range	Frame length
[8] [1]	[0] [0]	Status display data erasure	1EA5	4

(2) Parameters (Command [8][4] - [8][5])

Command	Data No.	Description	Setting range	Frame length
[8] [4]	[0][1] to [F][F]	Write of parameters Writes the values of the parameters in the parameter group specified with the command [8][5] + data No. [0][0]. Before writing the values, therefore, always specify the parameter group with the command [8][5] + data No. [0][0]. The decimal equivalent of the data No. value (hexadecimal) corresponds to the parameter number.	Depending on the parameter	8
[8] [5]	[0] [0]	Parameter group write 0000: Basic setting parameter (No.PA□□) 0001: Gain filter parameter (No.PB□□) 0002: Extension setting parameter (No.PC□□) 0003: I/O setting parameter (No.PD□□)	0000 to 0003	4

(3) External I/O signal (Command [9][2])

Command	Data No.	Description	Setting range	Frame length
[9] [2]	[6] [0]	Communication input device signal	Refer to section 15.5.5	8
	[6] [1]			

(4) Alarm history (Command [8][2])

Command	Data No.	Description	Setting range	Frame length
[8] [2]	[2] [0]	Alarm history erasure	1EA5	4

(5) Current alarm (Command [8][2])

Command	Data No.	Description	Setting range	Frame length
[8] [2]	[0] [0]	Alarm erasure	1EA5	4

(6) Point table/position data (Command [C][0])

Command	Data No.	Description	Setting range	Frame length
[C][0]	[0][1] to [F][F]	Position data write The decimal equivalent of the data No. value (hexadecimal) corresponds to the Point table No.	-999999 to 999999	8

15. COMMUNICATION FUNCTION

(7) Point table/speed data (Command [C][6])

Command	Data No.	Description	Setting range	Frame length
[C][6]	[0][1] to [F][F]	Speed data write The decimal equivalent of the data No. value (hexadecimal) corresponds to the Point table No.	0 to Permissible instantaneous speed	8

(8) Point table/acceleration time constant (Command [C][7])

Command	Data No.	Description	Setting range	Frame length
[C][7]	[0][1] to [F][F]	Acceleration time constant write The decimal equivalent of the data No. value (hexadecimal) corresponds to the Point table No.	0 to 20000	8

(9) Point table/deceleration time constant (Command [C][8])

Command	Data No.	Description	Setting range	Frame length
[C][8]	[0][1] to [F][F]	Deceleration time constant write The decimal equivalent of the data No. value (hexadecimal) corresponds to the Point table No.	0 to 20000	8

(10) Point table/dwell (Command [C][A])

Command	Data No.	Description	Setting range	Frame length
[C][A]	[0][1] to [F][F]	Dwell write The decimal equivalent of the data No. value (hexadecimal) corresponds to the Point table No.	0 to 20000	8

(11) Point table/auxiliary function (Command [C][B])

Command	Data No.	Description	Setting range	Frame length
[C][B]	[0][1] to [F][F]	Auxiliary function write The decimal equivalent of the data No. value (hexadecimal) corresponds to the Point table No.	0 to 3	8

(12) External input signal disable (Command [9][0])

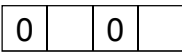
Command	Data No.	Description	Setting range	Frame length
[9][0]	[0][0]	Turns off the input devices, external analog input signals and pulse train inputs with the exception of EMG, LSP and LSN, independently of the external ON/OFF statuses.	1EA5	4
[9][0]	[0][3]	Disables all output devices (DO).	1EA5	4
[9][0]	[1][0]	Enables the disabled input devices (DI), external analog input signals and pulse train inputs with the exception of EMG, LSP and LSN.	1EA5	4
[9][0]	[1][3]	Enables the disabled output devices (DO).	1EA5	4

(13) Operation mode selection (Command [8][B])

Command	Data No.	Description	Setting range	Frame length
[8][B]	[0][0]	Operation mode switching 0000: Test operation mode cancel 0001: JOG operation 0002: Positioning operation 0003: Motorless operation 0004: Output signal (DO) forced output 0005: Single-step feed	0000 to 0005	4

15. COMMUNICATION FUNCTION

(14) Test operation mode data (Command [9][2] · [A][0])

Command	Data No.	Description	Setting range	Frame length
[9] [2]	[0] [0]	Input signal for test operation	Refer to section 15.5.7.	8
	[0] [1]			
	[A] [0]	Forced output of signal pin	Refer to section 15.5.9.	8
[A] [0]	[1] [0]	Writes the speed in the test operation mode (JOG operation, positioning operation).	0000 to 7FFF	4
	[1] [1]	Writes the acceleration/deceleration time constant in the test operation mode (JOG operation, positioning operation).	00000000 to 7FFFFFFF	8
	[2] [0]	Sets the moving distance in the test operation mode (JOG operation, positioning operation).	00000000 to 7FFFFFFF	8
	[2] [1]	Selects the positioning direction of test operation (positioning operation).  0: Forward rotation direction 1: Reverse rotation direction 0: Command pulse unit 1: Encoder pulse unit	0000 to 0001	4
	[4] [0]	Test operation (positioning operation) start command.	1EA5	4
	[4] [1]	Used to make a temporary stop during test operation (positioning operation). □ in the data indicates a blank. STOP: Temporary stop G0□□: Restart for remaining distance CLR□: Remaining distance clear.	STOP G0□□ CLR□	4

(15) Group setting (Command [9][F])

Command	Data No.	Description	Setting range	Frame length
[9] [F]	[0] [0]	Setting of group	a to f	4

15. COMMUNICATION FUNCTION

15.5 Detailed explanations of commands

15.5.1 Data processing

When the master station transmits a command + data No. or a command + data No. + data to a slave station, the servo amplifier returns a reply or data according to the purpose.

When numerical values are represented in these send data and receive data, they are represented in decimal, hexadecimal, etc.

Therefore, data must be processed according to the application.

Since whether data must be processed or not and how to process data depend on the monitoring, parameters, etc., follow the detailed explanation of the corresponding command.

The following methods are how to process send and receive data when reading and writing data.

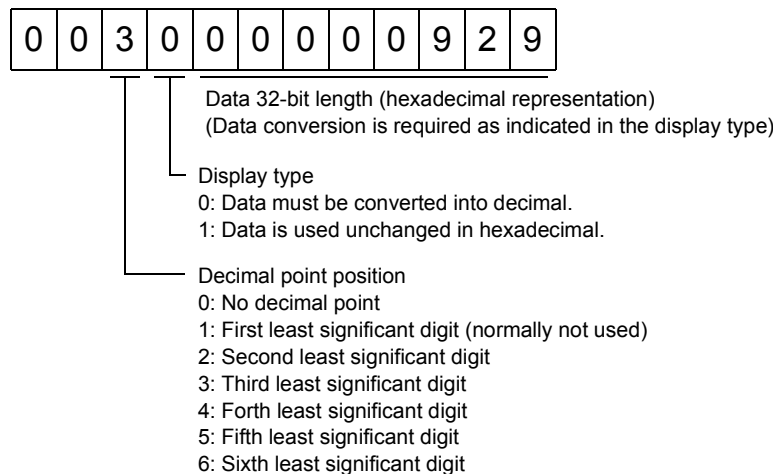
(1) Processing the read data

When the display type is 0, the eight-character data is converted from hexadecimal to decimal and a decimal point is placed according to the decimal point position information.

When the display type is 1, the eight-character data is used unchanged.

The following example indicates how to process the receive data "00300000929" given to show.

The receive data is as follows.



Since the display type is "0" in this case, the hexadecimal data is converted into decimal.

00000929H→2345

As the decimal point position is "3", a decimal point is placed in the third least significant digit.

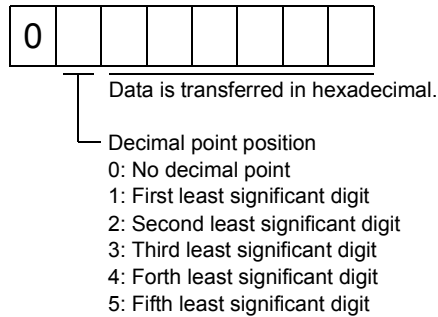
Hence, "23.45" is displayed.

15. COMMUNICATION FUNCTION

(2) Writing the processed data

When the data to be written is handled as decimal, the decimal point position must be specified. If it is not specified, the data cannot be written. When the data is handled as hexadecimal, specify "0" as the decimal point position.

The data to be sent is the following value.



By way of example, here is described how to process the set data when a value of "15.5" is sent.

Since the decimal point position is the second digit, the decimal point position data is "2".

As the data to be sent is hexadecimal, the decimal data is converted into hexadecimal.

155→9B

Hence, "0200009B" is transmitted.

15. COMMUNICATION FUNCTION

15.5.2 Status display

(1) Reading the status display name and unit

Read the status display name and unit.

(a) Transmission

Transmit command [0][1] and the data No. corresponding to the status display item to be read, [0][0] to [0][E]. (Refer to section 15.4.1.)

(b) Reply

The slave station sends back the status display name and unit requested.



(2) Status display data read

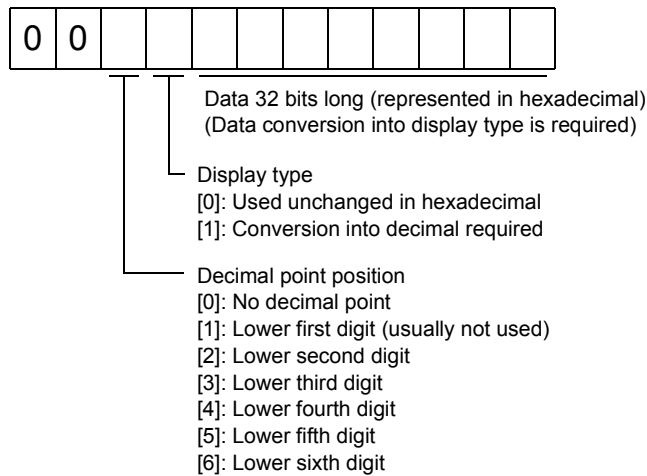
Read the status display data and processing information.

(a) Transmission

Transmit command [0][1] and the data No. corresponding to the status display item to be read. Refer to section 15.4.1.

(b) Reply

The slave station sends back the status display data requested.



(3) Status display data clear

The cumulative feedback pulse data of the status display is cleared. Send this command immediately after reading the status display item. The data of the status display item transmitted is cleared to zero.

Command	Data No.	Data
[8][1]	[0][0]	[1][E][A][5]

For example, after sending command [0][1] and data No. [8][0] and receiving the status display data, send command [8][1], data No. [0][0] and data [1EA5] to clear the cumulative feedback pulse value to zero.

15. COMMUNICATION FUNCTION

15.5.3 Parameters

(1) Specify the parameter group

The group of the parameters to be operated must be specified in advance to read or write the parameter settings, etc. Write data to the servo amplifier as described below to specify the parameter group to be operated.

Command	Data No.	Transmission data	Parameter group
[8] [5]	[0] [0]	0000	Basic setting parameter (No.PA□□)
		0001	Gain filter parameter (No.PB□□)
		0002	Extension setting parameter (No.PC□□)
		0003	I/O setting parameter (No.PD□□)

(2) Reading the parameter group

Read the parameter group.

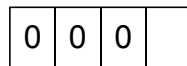
(a) Transmission

Send command [0][4] and data No.[0][1].

Command	Data No.
[0] [4]	[0] [1]

(b) Reply

The slave station sends back the preset parameter group.



Parameter group
 0: Basic setting parameter (No.PA□□)
 1: Gain filter parameter (No.PB□□)
 2: Extension setting parameter (No.PC□□)
 3: I/O setting parameter (No.PD□□)

(3) Reading the symbol

Read the parameter name. Specify the parameter group in advance (refer to (1) in this section).

(a) Transmission

Transmit command [0][8] and the data No. corresponding to the parameter No., [0][0] to [F][F]. (Refer to section 15.4.1.)

The data No. is expressed in hexadecimal. The decimal equivalent of the data No. value corresponds to the parameter number.

(b) Reply

The slave station sends back the name of the parameter No. requested.



Name characters (9 digits)

15. COMMUNICATION FUNCTION

(4) Reading the setting

Read the parameter setting. Specify the parameter group in advance (refer to (1) in this section).

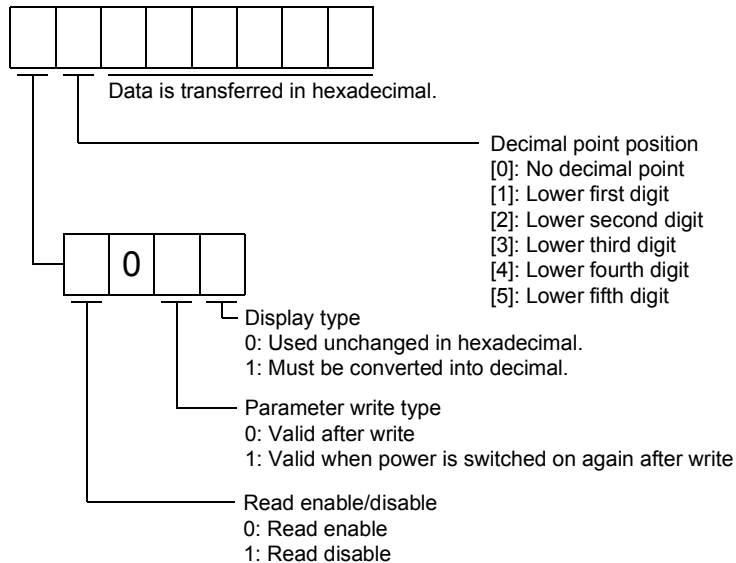
(a) Transmission

Transmit command [0][5] and the data No. corresponding to the parameter No., [0][0] to [F][F]. (Refer to section 15.4.1.)

The data No. is expressed in hexadecimal. The decimal equivalent of the data No. value corresponds to the parameter number.

(b) Reply

The slave station sends back the data and processing information of the parameter No. requested.



For example, data "1200270F" means 999.9 (decimal display format) and data "0003ABC" means 3ABC (hexadecimal display format).

When the display type is "0" (hexadecimal) and the decimal point position is other than 0, the display type is a special hexadecimal display format and "F" of the data value is handled as a blank. Data "01FFF053" means 053 (special hexadecimal display format).

"1 (Read disable)" is transferred to the "Read enable/disable" section and "000000" is transferred to the data section when the parameter that was read is the one inaccessible for write/reference in the parameter write disable setting of parameter No.PA19.

(5) Reading the setting range

Read the parameter setting range. Specify the parameter group in advance (refer to (1) in this section).

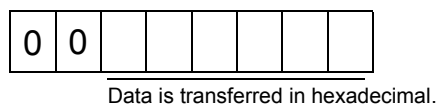
(a) Transmission

When reading the upper limit value, transmit command [0][6] and the data No. corresponding to the parameter No., [0][0] to [F][F]. When reading the lower limit value, transmit command [0][7] and the data No. corresponding to the parameter No., [0][0] to [F][F]. (Refer to section 15.4.1.)

The data No. is expressed in hexadecimal. The decimal equivalent of the data No. value corresponds to the parameter number.

(b) Reply

The slave station sends back the data and processing information of the parameter No. requested.



For example, data "10FFFFEC" means -20.

15. COMMUNICATION FUNCTION

(6) Parameter write

POINT
<ul style="list-style-type: none"> If setting values need to be changed with a high frequency (i.e. one time or more per one hour), write the setting values to the RAM, not the EEPROM. The EEPROM has a limitation in the number of write times and exceeding this limitation causes the servo amplifier to malfunction. Note that the number of write times to the EEPROM is limited to approximately 100,000.

Write the parameter setting into EEPROM of the servo amplifier. Specify the parameter group in advance (refer to (1) in this section).

Write the value within the setting enabled range. For the setting enabled range, refer to chapter 6 or read the setting range by performing operation in (3) in this section.

Transmit command [8][4], the data No. , and the set data.

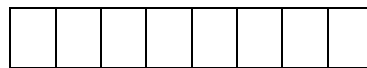
The data No. is expressed in hexadecimal. The decimal equivalent of the data No. value corresponds to the parameter number.

When the data to be written is handled as decimal, the decimal point position must be specified. If it is not specified, data cannot be written. When the data is handled as hexadecimal, specify 0 as the decimal point position.

Write the data after making sure that it is within the upper/lower limit value range.

Read the parameter data to be written, confirm the decimal point position, and create transmission data to prevent error occurrence. On completion of write, read the same parameter data to verify that data has been written correctly.

Command	Data No.	Set data
[8][4]	[0][1] to [F][F]	See below.



Data is transferred in hexadecimal.

Decimal point position

0: No decimal point

1: Lower first digit

2: Lower second digit

3: Lower third digit

4: Lower fourth digit

5: Lower fifth digit

Write mode

0: Write to EEPROM

3: Write to RAM

When the parameter data is changed frequently through communication, set "3" to the write mode to change only the RAM data in the servo amplifier.

When changing data frequently (once or more within one hour), do not write it to the EEPROM.

15. COMMUNICATION FUNCTION

15.5.4 External I/O signal statuses (DIO diagnosis)

(1) Reading of input device statuses

Read the statuses of the input devices.

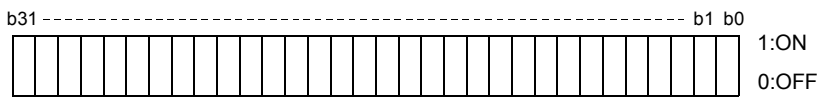
(a) Transmission

Transmit command [1][2] and the data No. corresponding to the input device.

Command	Data No.
[1][2]	[0][0]
	[0][1]

(b) Reply

The slave station sends back the statuses of the input pins.



Command of each bit is transmitted to the master station as hexadecimal data.

bit	Data No. [0][0]		Data No. [0][1]			
	Device name	Symbol	Device name	Symbol		
0	Servo-on	SON				
1	Forward rotation stroke end	LSP				
2	Reverse rotation stroke end	LSN				
3						
4	Internal torque limit selection	TL1				
5	Proportion control	PC				
6	Reset	RES				
7	Clear	CR				
8						
9						
10						
11	Forward rotation start	ST1				
12	Reverse rotation start	ST2				
13						
14						
15						
16						
17	Automatic/manual selection	MD0				
18	Proximity dog	DOG				
19						
20						
21						
22						
23	Override selection	OVR				
24	Temporary stop/Restart	TSTP			Point table No. selection 1	DI0
25					Point table No. selection 2	DI1
26					Point table No. selection 3	DI2
27	Gain changing	CDP			Point table No. selection 4	DI3
28					Point table No. selection 5	DI4
29					Point table No. selection 6	DI5
30					Point table No. selection 7	DI6
31			Point table No. selection 8	DI7		

15. COMMUNICATION FUNCTION

(2) External input pin status read

Read the ON/OFF statuses of the external output pins.

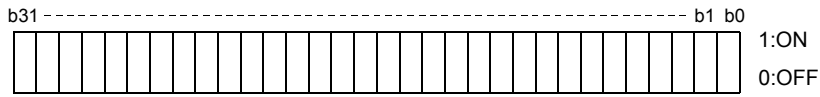
(a) Transmission

Transmit command [1][2] and data No. [4][0].

Command	Data No.
[1][2]	[4][0]

(b) Reply

The ON/OFF statuses of the input pins are sent back.



Command of each bit is transmitted to the master station as hexadecimal data.

bit	CN6 connector pin
0	1
1	2
2	3
3	4
4	
5	
6	
7	

bit	CN6 connector pin
8	
9	
10	
11	
12	
13	
14	
15	

bit	CN6 connector pin
16	
17	
18	
19	
20	
21	
22	
23	

bit	CN6 connector pin
24	
25	
26	
27	
28	
29	
30	
31	

15. COMMUNICATION FUNCTION

(3) Read of the statuses of input devices switched on through communication

Read the ON/OFF statuses of the input devices switched on through communication.

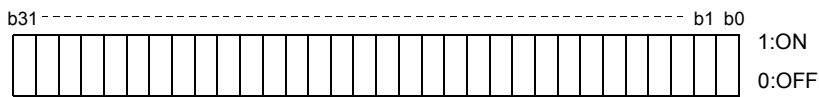
(a) Transmission

Transmit command [1][2] and the data No. corresponding to the input device.

Command	Data No.
[1][2]	[6][0]
	[6][1]

(b) Reply

The slave station sends back the statuses of the input pins.



Command of each bit is transmitted to the master station as hexadecimal data.

bit	Data No. [6][0]		Data No. [6][1]	
	Device name	Symbol	Device name	Symbol
0	Servo-on	SON		
1	Forward rotation stroke end	LSP		
2	Reverse rotation stroke end	LSN		
3				
4	Internal torque limit selection	TL1		
5	Proportion control	PC		
6	Reset	RES		
7	Clear	CR		
8				
9				
10				
11	Forward rotation start	ST1		
12	Reverse rotation start	ST2		
13				
14				
15				
16				
17	Automatic/manual selection	MD0		
18	Proximity dog	DOG		
19				
20				
21				
22				
23	Override selection	OVR		
24	Temporary stop/Restart	TSTP	Point table No. selection 1	DI0
25			Point table No. selection 2	DI1
26			Point table No. selection 3	DI2
27	Gain changing	CDP	Point table No. selection 4	DI3
28			Point table No. selection 5	DI4
29			Point table No. selection 6	DI5
30			Point table No. selection 7	DI6
31			Point table No. selection 8	DI7

15. COMMUNICATION FUNCTION

(4) External output pin status read

Read the ON/OFF statuses of the external output pins.

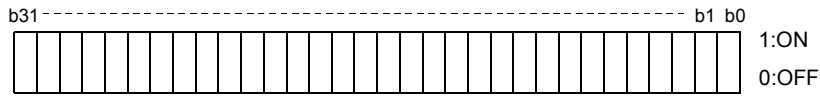
(a) Transmission

Transmit command [1][2] and data No. [C][0].

Command	Data No.
[1][2]	[C][0]

(b) Reply

The slave station sends back the ON/OFF statuses of the output pins.



Command of each bit is transmitted to the master station as hexadecimal data.

bit	CN6 connector pin
0	14
1	15
2	16
3	
4	
5	
6	
7	

bit	CN6 connector pin
8	
9	
10	
11	
12	
13	
14	
15	

bit	CN6 connector pin
16	
17	
18	
19	
20	
21	
22	
23	

bit	CN6 connector pin
24	
25	
26	
27	
28	
29	
30	
31	

15. COMMUNICATION FUNCTION

(5) Read of the statuses of output devices
 Read the ON/OFF statuses of the output devices.

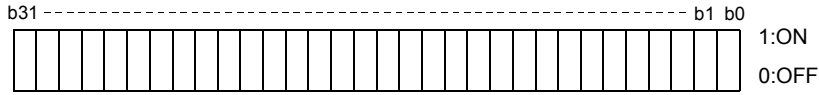
(a) Transmission

Transmit command [1][2] and the data No. corresponding to the output device.

Command	Data No.
[1][2]	[8][0]
	[8][1]

(b) Reply

The slave station sends back the statuses of the output devices.



Command of each bit is transmitted to the master station as hexadecimal data.

bit	Data No. [8][0]		Data No. [8][1]	
	Device name	Symbol	Device name	Symbol
0	Ready	RD		
1				
2	Zero speed	ZSP		
3	Limiting torque	TLC		
4				
5	In position	INP		
6				
7	Warning	WNG		
8	Trouble	ALM		
9				
10	Electromagnetic brake interlock	MBR		
11	dynamic brake interlock	DB		
12				
13				
14				
15	Battery warning	BWNG		
16	Rough match	CPO		
17	Home position return completion	ZP		
18	Position range output	POT		
19	Temporary stop	PUS		
20				
21				
22				
23				
24			Point table No. output 1	PT0
25	Variable gain selection	CDPS	Point table No. output 2	PT1
26			Point table No. output 3	PT2
27			Point table No. output 4	PT3
28	Movement completion	MEND	Point table No. output 5	PT4
29			Point table No. output 6	PT5
30			Point table No. output 7	PT6
31			Point table No. output 8	PT7

15. COMMUNICATION FUNCTION

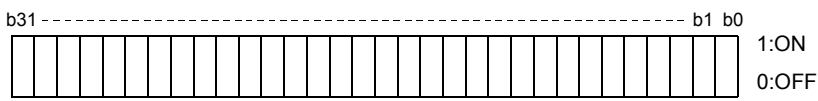
15.5.5 Device ON/OFF

POINT
<ul style="list-style-type: none"> The ON/OFF states of all devices in the servo amplifier are the states of the data received last. Hence, when there is a device which must be kept ON, send data which turns that device ON every time.

Each input device can be switched on/off. However, when the device to be switched off exists in the external input signal, also switch off that input signal.

Send command [9][2], data No. corresponding to the input device and data.

Command	Data No.	Set data
[9][2]	[6][0]	See below.
	[6][1]	



Command of each bit is transmitted to the slave station as hexadecimal data.

bit	Data No. [6][0]		Data No. [6][1]	
	Device name	Symbol	Device name	Symbol
0	Servo-on	SON		
1	Forward rotation stroke end	LSP		
2	Reverse rotation stroke end	LSN		
3				
4	Internal torque limit selection	TL1		
5	Proportion control	PC		
6	Reset	RES		
7	Clear	CR		
8				
9				
10				
11	Forward rotation start	ST1		
12	Reverse rotation start	ST2		
13				
14				
15				
16				
17	Automatic/manual selection	MD0		
18	Proximity dog	DOG		
19				
20				
21				
22				
23	Override selection	OVR		
24	Temporary stop/Restart	TSTP	Point table No. selection 1	DI0
25			Point table No. selection 2	DI1
26			Point table No. selection 3	DI2
27	Gain changing	CDP	Point table No. selection 4	DI3
28			Point table No. selection 5	DI4
29			Point table No. selection 6	DI5
30			Point table No. selection 7	DI6
31			Point table No. selection 8	DI7

15. COMMUNICATION FUNCTION

15.5.6 Disable/enable of I/O devices (DIO)

Inputs can be disabled independently of the I/O devices ON/OFF. When inputs are disabled, the input signals (devices) are recognized as follows. Among the input devices, EMG, LSP and LSN cannot be disabled.

Signal	Status
Input devices (DI)	OFF

(1) Disabling/enabling the input devices (DI), external analog input signals and pulse train inputs with the exception of EMG, LSP and LSN.

Transmit the following communication commands.

(a) Disable

Command	Data No.	Data
[9][0]	[0][0]	1EA5

(b) Enable

Command	Data No.	Data
[9][0]	[1][0]	1EA5

(2) Disabling/enabling the output devices (DO)

Transmit the following communication commands.

(a) Disable

Command	Data No.	Data
[9][0]	[0][3]	1EA5

(b) Enable

Command	Data No.	Data
[9][0]	[1][3]	1EA5

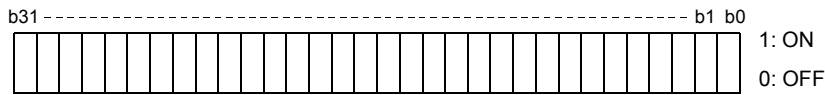
15. COMMUNICATION FUNCTION

15.5.7 Input devices ON/OFF (test operation)

Each input devices can be turned on/off for test operation. when the device to be switched off exists in the external input signal, also switch off that input signal.

Send command [9] [2], data No. corresponding to the input device and data.

Command	Data No.	Set data
[9][2]	[0][0]	See below
	[0][1]	



Command of each bit is transmitted to the slave station as hexadecimal data.

bit	Data No. [0][0]		Data No. [0][1]	
	Device name	Symbol	Device name	Symbol
0	Servo-on	SON		
1	Forward rotation stroke end	LSP		
2	Reverse rotation stroke end	LSN		
3				
4	Internal torque limit selection	TL1		
5	Proportion control	PC		
6	Reset	RES		
7	Clear	CR		
8				
9				
10				
11	Forward rotation start	ST1		
12	Reverse rotation start	ST2		
13				
14				
15				
16				
17	Automatic/manual selection	MD0		
18	Proximity dog	DOG		
19				
20				
21				
22				
23	Override selection	OVR		
24	Temporary stop/Restart	TSTP	Point table No. selection 1	DI0
25			Point table No. selection 2	DI1
26			Point table No. selection 3	DI2
27	Gain changing	CDP	Point table No. selection 4	DI3
28			Point table No. selection 5	DI4
29			Point table No. selection 6	DI5
30			Point table No. selection 7	DI6
31			Point table No. selection 8	DI7

15. COMMUNICATION FUNCTION

15.5.8 Test operation mode

POINT
<ul style="list-style-type: none"> ▪ The test operation mode is used to confirm operation. Do not use it for actual operation. ▪ If communication stops for longer than 0.5s during test operation, the servo amplifier decelerates to a stop, resulting in servo lock. To prevent this, continue communication all the time, e.g. monitor the status display. ▪ Even during operation, the servo amplifier can be put in the test operation mode. ▪ In this case, as soon as the test operation mode is selected, the base circuit is shut off, coasting the servo amplifier.

(1) Preparation and cancel of test operation mode

(a) Preparation of test operation mode

Set the test operation mode type in the following procedure.

Send the command [8][B] + data No. [0][0] to select the test operation mode.

Command	Data No.	Transmission Data	Test Operation Mode Selection
[8][B]	[0][0]	0001	JOG operation
		0002	Positioning operation
		0003	Motorless operation
		0004	DO forced output
		0005	Single-step feed

2) Confirmation of test operation mode

Read the test operation mode set for the slave station, and confirm that it is set correctly.

a. Transmission

Send the command [0][0] + data No. [1][2].

Command	Data No.
[0][0]	[1][2]

b. Return

The slave station returns the set test operation mode.

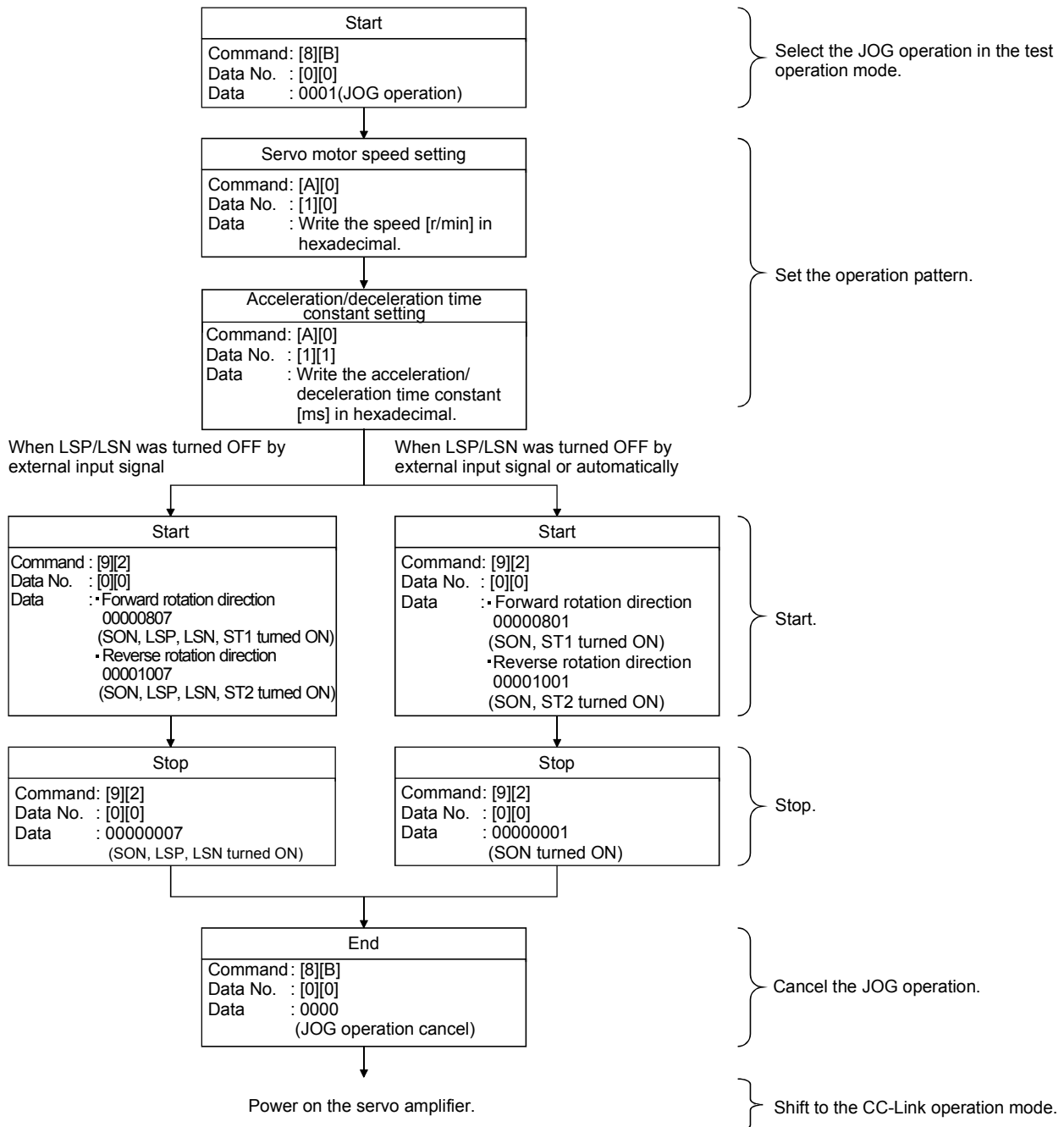
0	0	0	
---	---	---	--

- └ Test operation mode read
- 0: Normal mode (not test operation mode)
 - 1: JOG operation
 - 2: Positioning operation
 - 3: Motorless operation
 - 4: DO forced output
 - 5: Single-step feed

15. COMMUNICATION FUNCTION

(2) JOG operation

Send the command, data No. and data as indicated below to execute JOG operation.

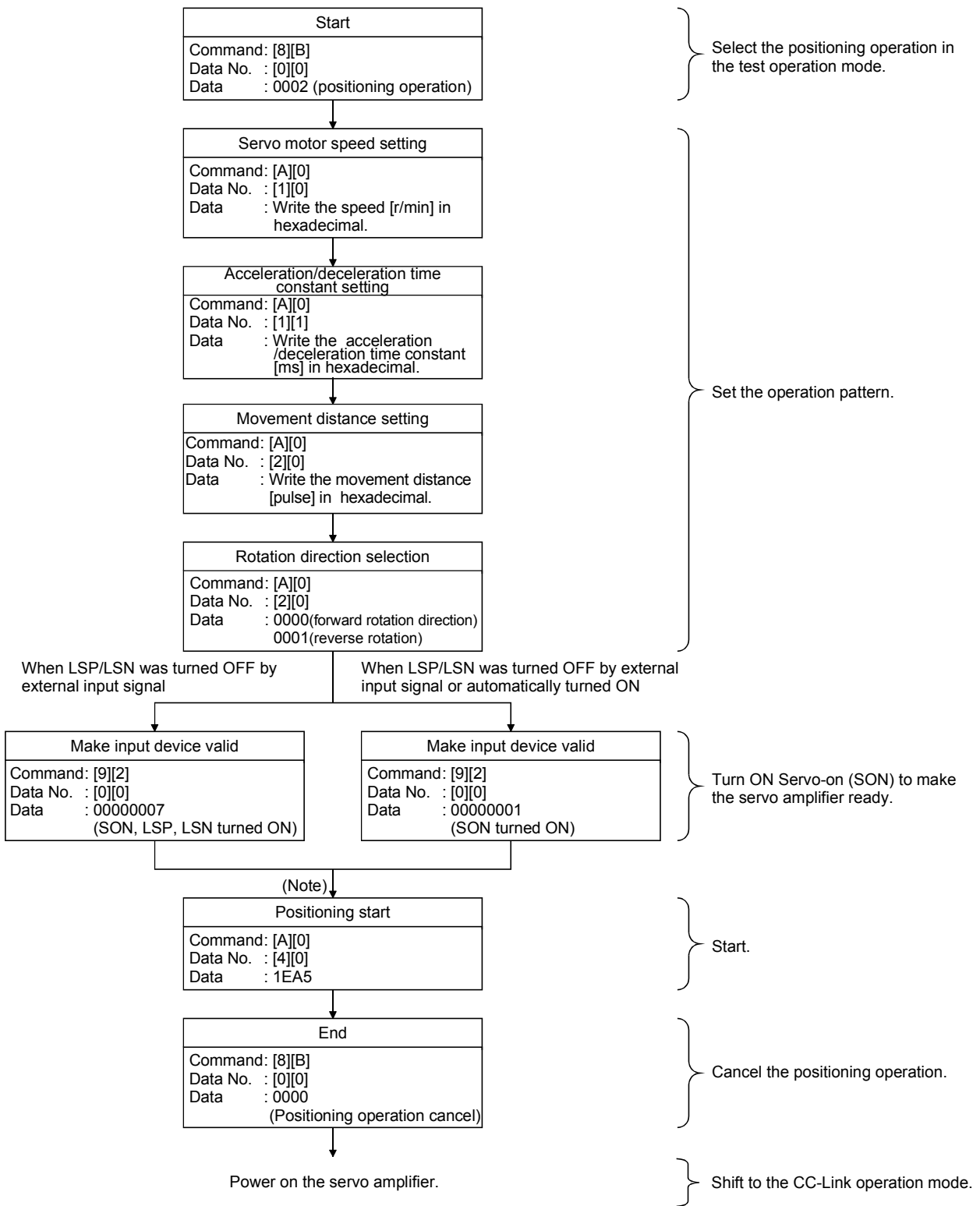


15. COMMUNICATION FUNCTION

(3) Positioning operation

(a) Operation procedure

Send the command, data No. and data as indicated below to execute positioning operation.



Note. There is a 100ms delay.

15. COMMUNICATION FUNCTION

(b) Temporary stop/restart/remaining distance clear

Send the following command, data No. and data during positioning operation to make deceleration to a stop.

Command	Data No.	Data
[A][0]	[4][1]	STOP

Send the following command, data No. and data during a temporary stop to make a restart.

Command	Data No.	(Note) Data
[A][0]	[4][1]	GO <input type="checkbox"/> <input type="checkbox"/>

Note. indicates a blank.

Send the following command, data No. and data during a temporary stop to stop positioning operation and erase the remaining movement distance.

Command	Data No.	(Note) Data
[A][0]	[4][1]	CLR <input type="checkbox"/>

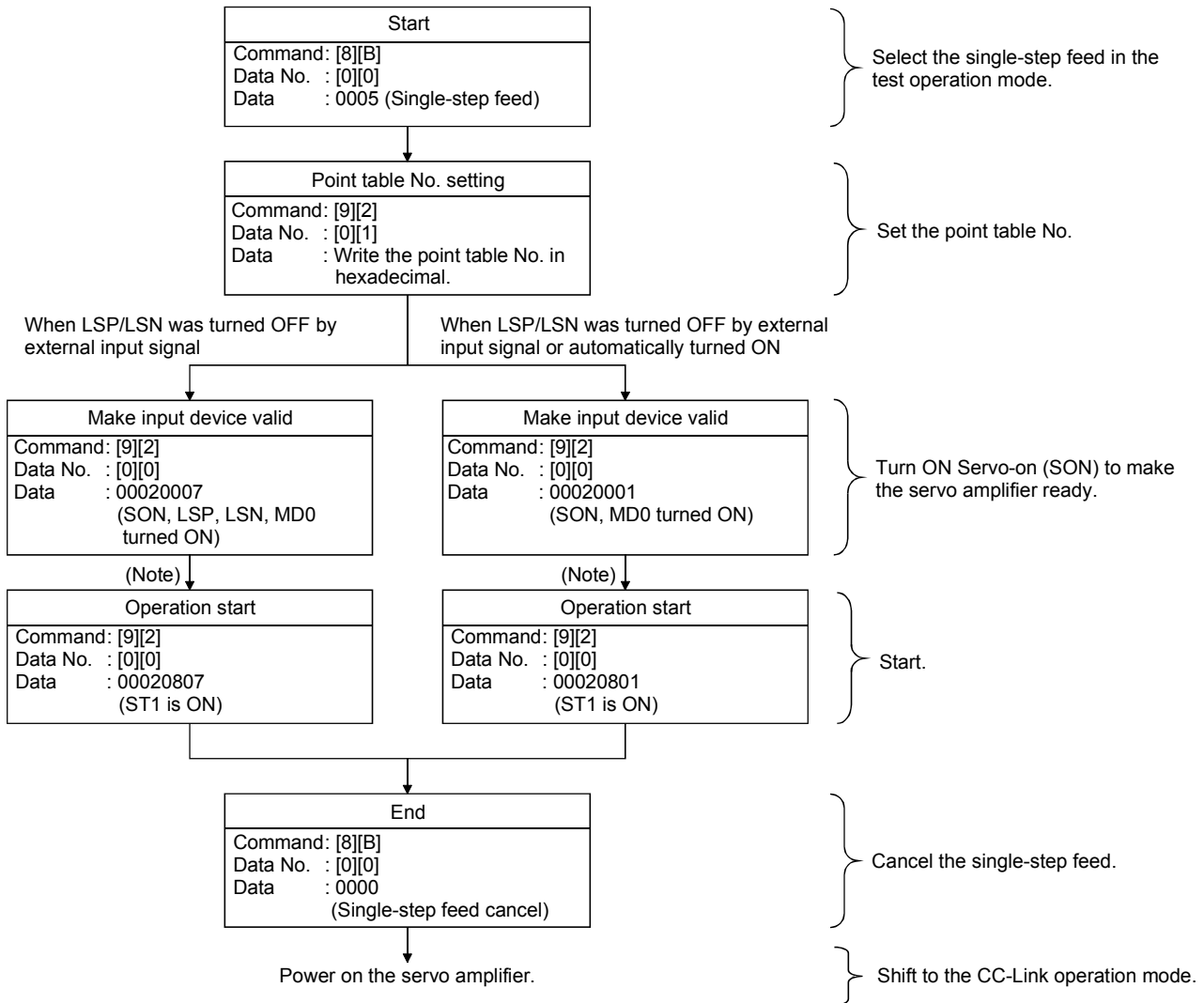
Note. indicates a blank.

15. COMMUNICATION FUNCTION

(4) Single-step feed

Set necessary items to the point table before starting the single-step feed.

Send the command, data No. and data as indicated below to execute single-step feed.



Note. Start operation after home position return completion (ZP) is confirmed. Refer to 17th bit of the data read with command [1][2] and data No.[8][0].

15. COMMUNICATION FUNCTION

(5) Output signal pin ON/OFF output signal (DO) forced output

In the test operation mode, the output signal pins can be turned on/off independently of the servo status. Using command [9][0], disable the output signals in advance.

(a) Choosing DO forced output in test operation mode

Transmit command [8][B] + data No. [0][0] + data "0004" to choose DO forced output.

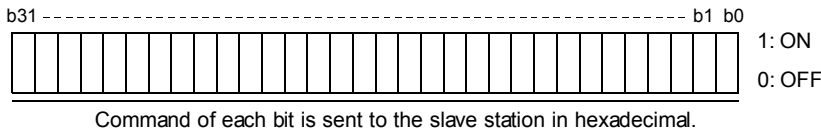
0	0	0	4
---	---	---	---

Selection of test operation mode
4: DO forced output (output signal forced output)

(b) External output signal ON/OFF

Transmit the following communication commands.

Command	Data No.	Setting data
[9][2]	[A][0]	See below.



bit	CN6 connector pin
0	14
1	15
2	16
3	
4	
5	
6	
7	

bit	CN6 connector pin
8	
9	
10	
11	
12	
13	
14	
15	

bit	CN6 connector pin
16	
17	
18	
19	
20	
21	
22	
23	

bit	CN6 connector pin
24	
25	
26	
27	
28	
29	
30	
31	

(c) Canceling DO forced output

Transmit command [8][B] + data No. [0][0] + data to cancel DO forced output.

Command	Data No.	Transmission data	Description
[8][B]	[0][0]	0000	Cancel DO forced output

(6) Motorless operation

(a) Performing motorless operation

Transmit command [8][B] + data No. [0][0] + data "0003" to perform motorless operation.

0	0	0	3
---	---	---	---

Selection of test operation mode
3: Motorless operation

To perform operation after performing the motorless operation, issue a command from the host controller.

(b) Canceling motorless operation

The motorless operation cannot be canceled in the same way as the test operation mode (transmit command [8][B] + data No. [0][0] + data "0000"). To cancel the motorless operation, power on the servo amplifier and shift to the CC-Link operation mode beforehand.

15. COMMUNICATION FUNCTION

15.5.9 Alarm history

(1) Alarm No. read

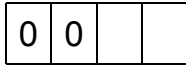
Read the alarm No. which occurred in the past. The alarm numbers and occurrence times of No. 0 (last alarm) to No. 5 (sixth alarm in the past) are read.

(a) Transmission

Send command [3][3] and data No. [1][0] to [1][5]. Refer to section 15.4.1.

(b) Reply

The alarm No. corresponding to the data No. is provided.



└ Alarm No. is transferred in hexadecimal.

For example, "0032" means A32 and "00FF" means A__ (no alarm).

(2) Alarm occurrence time read

Read the occurrence time of alarm which occurred in the past.

The alarm occurrence time corresponding to the data No. is provided in terms of the total time beginning with operation start, with the minute unit omitted.

(a) Transmission

Send command [3][3] and data No. [2][0] to [2][5].

Refer to section 15.4.1.

(b) Reply



└ The alarm occurrence time is transferred in hexadecimal.
Hexadecimal must be converted into decimal.

For example, data "01F5" means that the alarm occurred in 501 hours after start of operation.

(3) Alarm history clear

Erase the alarm history.

Send command [8][2] and data No. [2][0].

Command	Data No.	Data
[8][2]	[2][0]	1EA5

15. COMMUNICATION FUNCTION

15.5.10 Current alarm

(1) Current alarm read

Read the alarm No. which is occurring currently.

(a) Transmission

Send command [0][2] and data No. [0][0].

Command	Data No.
[0][2]	[0][0]

(b) Reply

The slave station sends back the alarm currently occurring.

0	0		
---	---	--	--

Alarm No. is transferred in hexadecimal.

For example, "0032" means A32 and "00FF" means A__ (no alarm).

(2) Read of the status display at alarm occurrence

Read the status display data at alarm occurrence. When the data No. corresponding to the status display item is transmitted, the data value and data processing information are sent back.

(a) Transmission

Send command [3][5] and any of data No. [8][0] to [8][E] corresponding to the status display item to be read. Refer to section 15.4.1.

(b) Reply

The slave station sends back the requested status display data at alarm occurrence.

0	0																		
---	---	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Data 32 bits long (represented in hexadecimal)
(Data conversion into display type is required)

Display type
0: Conversion into decimal required
1: Used unchanged in hexadecimal

Decimal point position
0: No decimal point
1: Lower first digit (usually not used)
2: Lower second digit
3: Lower third digit
4: Lower fourth digit
5: Lower fifth digit
6: Lower sixth digit

(3) Current alarm clear

As by the reset (RES) on, reset the servo amplifier alarm to make the servo amplifier ready to operate. After removing the cause of the alarm, reset the alarm with no command entered.

Command	Data No.	Data
[8][2]	[0][0]	1EA5

15. COMMUNICATION FUNCTION

15.5.11 Point table

(1) Data read

(a) Position data

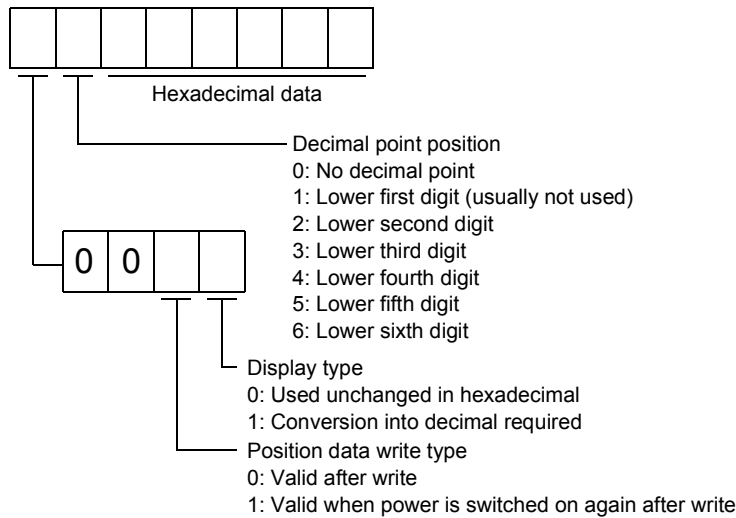
Read the position data of the point table.

1) Transmission

Transmit command [4][0] and any of data No. [0][1] to [F][F] corresponding to the point table to be read. Refer to section 15.4.1.

2) Reply

The slave station sends back the position data of the requested point table.



(b) Speed data

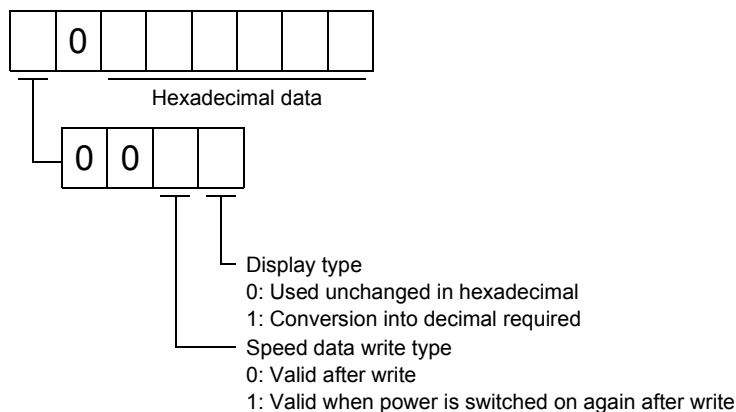
Read the speed data of the point table.

1) Transmission

Transmit command [5][0] and any of data No. [0][1] to [F][F] corresponding to the point table to be read. Refer to section 15.4.1.

2) Reply

The slave station sends back the speed data of the requested point table.



15. COMMUNICATION FUNCTION

(c) Acceleration time constant

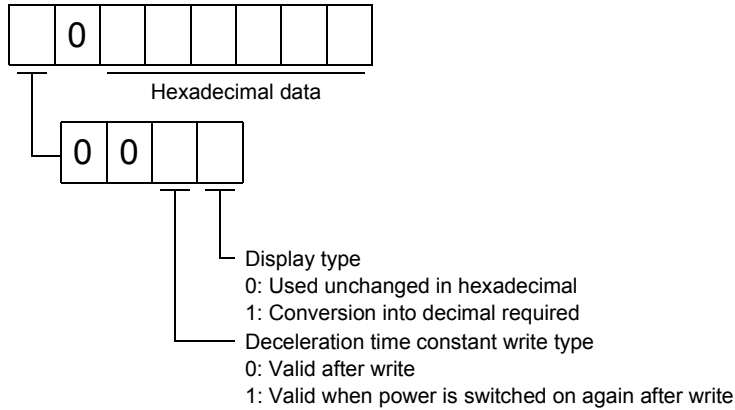
Read the acceleration time constant of the point table.

1) Transmission

Transmit command [5][4] and any of data No. [0][1] to [F][F] corresponding to the point table to be read. Refer to section 15.4.1.

2) Reply

The slave station sends back the acceleration time constant of the requested point table.



(d) Deceleration time constant

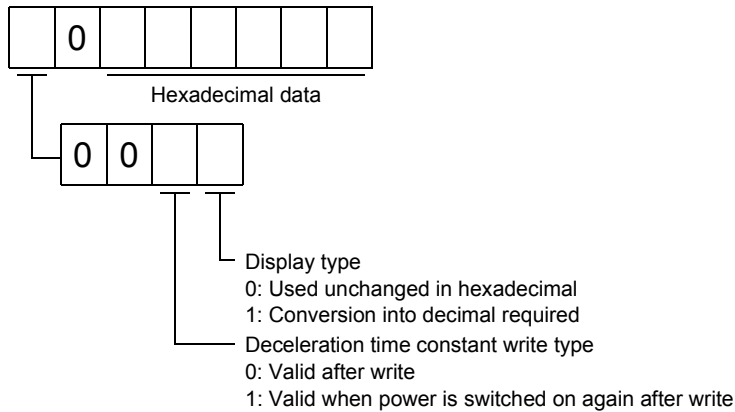
Read the deceleration time constant of the point table.

1) Transmission

Transmit command [5][8] and any of data No. [0][1] to [F][F] corresponding to the point table to be read. Refer to section 15.4.1.

2) Reply

The slave station sends back the deceleration time constant of the requested point table.



15. COMMUNICATION FUNCTION

(e) Dwell

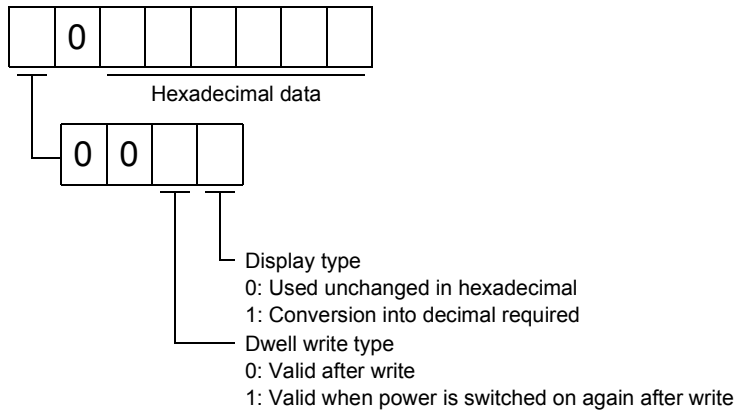
Read the dwell of the point table.

1) Transmission

Transmit command [6][0] and any of data No. [0][1] to [F][F] corresponding to the point table to be read. Refer to section 15.4.1.

2) Reply

The slave station sends back the dwell of the requested point table.



(f) Auxiliary function

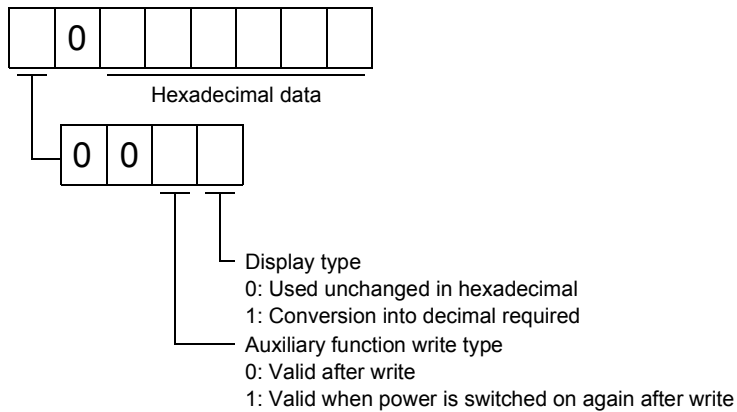
Read the auxiliary function of the point table.

1) Transmission

Transmit command [6][4] and any of data No. [0][1] to [F][F] corresponding to the point table to be read. Refer to section 15.4.1.

2) Reply

The slave station sends back the auxiliary function of the requested point table.



15. COMMUNICATION FUNCTION

(2) Data write

POINT
<ul style="list-style-type: none"> If setting values need to be changed with a high frequency (i.e. one time or more per one hour), write the setting values to the RAM, not the EEPROM. The EEPROM has a limitation in the number of write times and exceeding this limitation causes the servo amplifier to malfunction. Note that the number of write times to the EEPROM is limited to approximately 100,000.

(a) Position data

Write the position data of the point table.

Transmit command [C][0], any of data No. [0][1] to [F][F] corresponding to the point table to be written to, and the data. Refer to section 15.4.2.

Command	Data No.	Data
[C][0]	[0][1] to [F][F]	See below.



Hexadecimal data

Decimal point position

- 0: No decimal point
- 1: Lower first digit
- 2: Lower second digit
- 3: Lower third digit
- 4: Lower fourth digit
- 5: Lower fifth digit
- 6: Lower sixth digit

The decimal point position should be the same as the feed length multiplication (STM) set in parameter No. 1. The slave station will not accept the decimal point position which is different from the STM setting.

Write mode

- 0: EEPROM, RAM write
- 1: RAM write

When the position data is changed frequently through communication, set "1" to the write mode to change only the RAM data in the servo amplifier. When changing data frequently (once or more within one hour), do not write it to the EEPROM.

(b) Speed data

Write the speed data of the point table.

Transmit command [C][6], any of data No. [0][1] to [F][F] corresponding to the point table to be written to, and the data. Refer to section 15.4.2.

Command	Data No.	Data
[C][6]	[0][1] to [F][F]	See below.



Hexadecimal data

Write mode

- 0: EEPROM, RAM write
- 1: RAM write

When the speed data is changed frequently through communication, set "1" to the write mode to change only the RAM data in the servo amplifier. When changing data frequently (once or more within one hour), do not write it to the EEPROM.

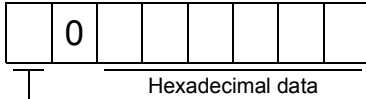
15. COMMUNICATION FUNCTION

(c) Acceleration time constant

Write the acceleration time constant of the point table.

Transmit command [C][7], any of data No. [0][1] to [F][F] corresponding to the point table to be written to, and the data. Refer to section 15.4.2.

Command	Data No.	Data
[C][7]	[0][1] to [F][F]	See below.



Write mode
 0: EEPROM, RAM write
 1: RAM write

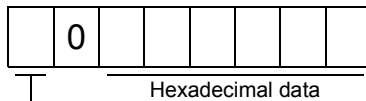
When the acceleration time constant is changed frequently through communication, set "1" to the write mode to change only the RAM data in the servo amplifier. When changing data frequently (once or more within one hour), do not write it to the EEPROM.

(d) Deceleration time constant

Write the deceleration time constant of the point table.

Transmit command [C][8], any of data No. [0][1] to [F][F] corresponding to the point table to be written to, and the data. Refer to section 15.4.2.

Command	Data No.	Data
[C][8]	[0][1] to [F][F]	See below.



Write mode
 0: EEPROM, RAM write
 1: RAM write

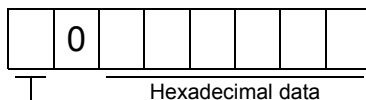
When the deceleration time is changed frequently through communication, set "1" to the write mode to change only the RAM data in the servo amplifier. When changing data frequently (once or more within one hour), do not write it to the EEPROM.

(e) Dwell

Write the dwell of the point table.

Transmit command [C][A], any of data No. [0][1] to [F][F] corresponding to the point table to be written to, and the data. Refer to section 15.4.2.

Command	Data No.	Data
[C][A]	[0][1] to [F][F]	See below.



Write mode
 0: EEPROM, RAM write
 1: RAM write

When the dwell constant is changed frequently through communication, set "1" to the write mode to change only the RAM data in the servo amplifier. When changing data frequently (once or more within one hour), do not write it to the EEPROM.

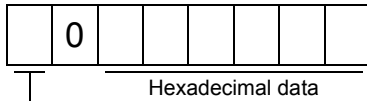
15. COMMUNICATION FUNCTION

(f) Auxiliary function

Write the auxiliary function of the point table.

Transmit command [C][B], any of data No. [0][1] to [F][F] corresponding to the point table to be written to, and the data. Refer to section 15.4.2.

Command	Data No.	Data
[C][B]	[0][1] to [F][F]	See below.



Write mode

0: EEPROM, RAM write

1: RAM write

When the auxiliary function constant is changed frequently through communication,

set "1" to the write mode to change only the RAM data in the servo amplifier.

When changing data frequently (once or more within one hour),

do not write it to the EEPROM.

15. COMMUNICATION FUNCTION

15.5.12 Servo amplifier group designation

With group setting made to the slave stations, data can be transmitted simultaneously to two or more slave stations set as a group.

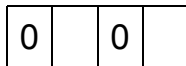
(1) Group setting write

Write the group designation value to the slave station.

(a) Transmission

Transmit command [9][F], data No. [0][0] and data.

Command	Data No.	Data
[9][F]	[0][0]	See below.



- Group designation
 - 0: No group designation
 - 1: Group a
 - 2: Group b
 - 3: Group c
 - 4: Group d
 - 5: Group e
 - 6: Group f
- Response command enable
 - Set whether data can be sent back or not in response to the read command of the master station.
 - 0: Response disable
 - Data cannot be set back.
 - 1: Response enable
 - Data can be set back.

(2) Group setting read

Read the set group designation value from the slave station.

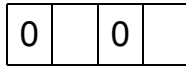
(a) Transmission

Transmit command [1][F] and data No. [0][0].

Command	Data No.
[1][F]	[0][0]

(b) Reply

The slave station sends back the group setting of the point table requested.



- Group designation
 - 0: No group designation
 - 1: Group a
 - 2: Group b
 - 3: Group c
 - 4: Group d
 - 5: Group e
 - 6: Group f
- Response command enable
 - 0: Response disable
 - 1: Response enable

16. INDEXER POSITIONING OPERATION

16. INDEXER POSITIONING OPERATION

POINT
<ul style="list-style-type: none"> To execute the indexer positioning operation, parameter needs to be changed. Set the parameter No.PA01 to "1□□□".

This chapter provides the indexer positioning operation method using MR-J3-□T servo amplifier. Any matters not described in this chapter are the same as those of the point table positioning operation. For more information, refer to chapters up to 15.

16.1 Function

16.1.1 Overview

Using the next station selection 1 (RYnA) to the next station selection 8 (RY(n+2)5) devices, stations from No.0 to No.254 can be specified.

Settings of servo motor speed and acceleration/deceleration time constant are carried out by specifying the point table number from 1 to 8 using the speed selection 1 (RY(n+2)C) to the speed selection 3 (RY(n+2)E) devices. Speed command data can be directly specified by using the remote register when two stations are occupied.

16.1.2 Servo amplifier standard specifications (functions only)

Item		Description	
Command system	Station command input	Available with CC-Link communication CC-Link communication (1 station occupied): 31 stations CC-Link communication (2 stations occupied): 255 stations	
	Speed command input	Available with CC-Link communication (2 stations occupied) Set the speed command data (speed) by the remote register.	
	Remote register Speed No. input	Select a speed and acceleration/deceleration time constant by the point table	
Operation mode	Automatic operation mode	Rotation direction specifying indexer	Positioning operation is executed to the set station. Rotation direction can be specified.
		Shortest rotating indexer	Positioning operation is executed to the set station. The servo motor rotates in the closest direction from current position.
	Manual operation mode	Indexer JOG operation	Turning on the start signal (RYn1) makes the servo motor rotate in the direction specified by the rotation direction specifying. Turning off the start signal (RYn1) makes the servo motor perform positioning operation to the closest station where the motor can decelerate to stop.
		JOG operation	In accordance with the speed data set in parameters, JOG operation is performed by using CC-Link communication
	Home position return mode	Torque limit changing dog type	Home position return is performed by the Z-phase pulse count after passing proximity dog. Home position address may be set. Home position shift distance may be set. Home position return direction may be selected. Automatic at-dog home position return return/automatic stroke return function. Automatic torque limit changing function
		Torque limit changing data setting type	Home position return is made without dog. Home position may be set at any position by manual operation, etc. Home position address may be set. Automatic torque limit changing function
Automatic positioning to home position		High-speed automatic return to a defined home position.	

16. INDEXER POSITIONING OPERATION

16.1.3 Function list

The following table lists the functions of this servo. For details of the functions, refer to the reference field.

Function	Description	Reference
Automatic operation mode 1 (Rotation direction specifying indexer)	In this operation mode, the servo motor rotates in the specified direction and performs a positioning operation to the next station divided in 2 to 255.	Section 16.7.2
Automatic operation mode 2 (Shortest rotating indexer)	In this operation mode, the servo motor rotates in the shortest direction and performs a positioning operation to the next station divided in 2 to 255.	Section 16.7.3
Manual operation mode	1. Indexer JOG operation When stopping, this JOG operation enables the servo motor to perform positioning to the station where the servo motor can decelerate to stop. 2. JOG operation When stopping, this JOG operation enables the servo motor to decelerate to stop regardless of stations.	Section 16.8
Home position return	Torque limit changing dog type, torque limit changing data setting type	Section 16.9
High-resolution encoder	High-resolution encoder of 262144 pulses/rev is used as a servo motor encoder.	
Absolute position detection system	By merely setting the home position once, home position return need not be done at each power on.	Section 16.10
Gain changing function	You can switch between gains during rotation and gains during stop or use an input device to change gains during operation.	Section 10.6
Advanced vibration suppression control	This function suppresses vibration at the arm end or residual vibration.	Section 10.4
Adaptive filter II	Servo amplifier detects mechanical resonance and sets filter characteristics automatically to suppress mechanical vibration.	Section 10.2
Low-pass filter	Suppresses high-frequency resonance which occurs as servo system response is increased.	Section 10.5
Machine analyzer function	Analyzes the frequency characteristic of the mechanical system by simply connecting a MR Configurator installed personal computer and servo amplifier. MR Configurator is necessary for this function.	
Machine simulation	Can simulate machine motions on a personal computer screen on the basis of the machine analyzer results. MR Configurator is necessary for this function.	
Gain search function	Personal computer changes gains automatically and searches for overshoot-free gains in a short time. MR Configurator is necessary for this function.	
Slight vibration suppression control	Suppresses vibration of ± 1 pulse produced at a servo motor stop.	Parameters No. PB24
Electronic gear	The electronic gear is used to make adjustment so that the servo amplifier setting matches the machine moving distance. Also, changing the electronic gear value allows the machine to be moved at any multiplication ratio to the moving distance using the servo amplifier.	Parameter No. PA06, PA07
Auto tuning	Automatically adjusts the gain to optimum value if load applied to the servo motor shaft varies.	Section 9.2
Regenerative option	Used when the built-in regenerative resistor of the servo amplifier does not have sufficient regenerative capability for the regenerative power generated.	Section 14.2
Brake unit	Used when the regenerative option cannot provide enough regenerative power. Can be used with the servo amplifier of 5kW or more.	Section 14.3
Regeneration converter	Used when the regenerative option cannot provide enough regenerative power. Can be used with the servo amplifier of 5kW or more.	Section 14.4
Alarm history clear	Alarm history is cleared.	Parameter No. PC18

16. INDEXER POSITIONING OPERATION

Function	Description	Reference
Torque limit	Servo motor-torque is limited.	Section 16.3.2 (3) Section 16.11.1 (9)
Output signal (DO) forced output	Output signal can be forced on/off independently of the servo status. Use this function for output signal wiring check, etc.	Section 7.7.4 Section 8.5.7(4)
Test operation mode	JOG operation * positioning operation * DO forced output. MR Configurator is necessary for this function.	Section 7.7 Section 8.5.7
Limit switch	The servo motor travel region can be limited using the forward rotation stroke end (LSP)/reverse rotation stroke end (LSN).	

16.2 I/O signals (I/O devices) transferred to/from the programmable controller CPU

16.2.1 I/O signals (I/O devices)

(1) When 1 station is occupied

RYn/RXn: 32 points each, RWrn/RWwn: 4 points each

Programmable controller → Servo amplifier (RYn)	
(Note) Device No.	Device name
RYn0	Servo-on
RYn1	Start
RYn2	Rotation direction specifying
RYn3 to RYn5	Not available
RYn6	Operation mode selection 1
RYn7	Operation mode selection 2
RYn8	Monitor output execution demand
RYn9	Instruction code execution demand
RYnA	Next station selection 1
RYnB	Next station selection 2
RYnC	Next station selection 3
RYnD	Next station selection 4
RYnE	Next station selection 5
RYnF to RY(n+1)9	Not available
RY(n+1)A	Reset
RY(n+1)B to RY(n+1)F	Not available

Servo amplifier → Programmable controller (RXn)	
(Note) Device No.	Device name
RXn0	Ready
RXn1	In position
RXn2	Rough match
RXn3	Home position return completion
RXn4	Limiting torque
RXn5	Not available
RXn6	Electromagnetic brake interlock
RXn7	Temporary stop
RXn8	Monitoring
RXn9	Instruction code execution completion
RXnA	Warning
RXnB	Battery warning
RXnC	Movement completion
RXnD	Dynamic brake interlock
RXnE to RX(n+1)9	Not available
RX(n+1)A	Trouble
RX(n+1)B	Remote station communication ready
RX(n+1)C to RX(n+1)F	Not available

Programmable controller → Servo amplifier (RWwn)	
Address No.	Signal
RWwn	Monitor 1
RWwn+1	Monitor 2
RWwn+2	Instruction code
RWwn+3	Writing data

Servo amplifier → Programmable controller (RWrn)	
Address No.	Signal
RWrn	Monitor 1 data
RWrn+1	Monitor 2 data
RWrn+2	Respond code
RWrn+3	Reading data

Note. "n" depends on the station number setting.

16. INDEXER POSITIONING OPERATION

(2) When 2 stations are occupied

RXn/RYn: 64 points each, RWrn/RWwn: 8 points each

Programmable controller → Servo amplifier (RYn)		Servo amplifier → Programmable controller (RXn)	
(Note) Device No.	Device name	(Note) Device No.	Device name
RYn0	Servo-on	RXn0	Ready
RYn1	Start	RXn1	In position
RYn2	Rotation direction specifying	RXn2	Rough match
RYn3 to RYn5	Not available	RXn3	Home position return completion
RYn6	Operation mode selection 1	RXn4	Limiting torque
RYn7	Operation mode selection 2	RXn5	Not available
RYn8	Monitor output execution demand	RXn6	Electromagnetic brake interlock
RYn9	Instruction code execution demand	RXn7	Temporary stop
RYnA	Next station selection 1	RXn8	Monitoring
RYnB	Next station selection 2	RXn9	Instruction code execution completion
RYnC	Next station selection 3	RXnA	Warning
RYnD	Next station selection 4	RXnB	Battery warning
RYnE	Next station selection 5	RXnC	Movement completion
RYnF to RY(n+1)F	Not available	RXnD	Dynamic brake interlock
RY(n+2)0	Position instruction execution demand	RXnE to RX(n+1)F	Not available
RY(n+2)1	Speed instruction execution demand	RX(n+2)0	Position instruction execution completion
RY(n+2)2	Not available	RX(n+2)1	Speed instruction execution completion
RY(n+2)3	Next station selection 6	RX(n+2)2	Station output 1
RY(n+2)4	Next station selection 7	RX(n+2)3	Station output 2
RY(n+2)5	Next station selection 8	RX(n+2)4	Station output 3
RY(n+2)6	Internal torque limit selection	RX(n+2)5	Station output 4
RY(n+2)7	Proportion control	RX(n+2)6	Station output 5
RY(n+2)8	Gain changing	RX(n+2)7	Station output 6
RY(n+2)9	Not available	RX(n+2)8	Station output 7
RY(n+2)A	Position/speed specifying system selection	RX(n+2)9	Station output 8
RY(n+2)B	Not available	RX(n+2)A to RX(n+3)9	Not available
RY(n+2)C	Speed selection 1	RX(n+3)A	Trouble
RY(n+2)D	Speed selection 2	RX(n+3)B	Remote station communication ready
RY(n+2)E	Speed selection 3	RX(n+3)C to RX(n+3)F	Not available
RY(n+2)F to RY(n+3)9	Not available		
RY(n+3)A	Reset		
RY(n+3)B to RY(n+3)F	Not available		

Note. "n" depends on the station number setting.

16. INDEXER POSITIONING OPERATION

Programmable controller → Servo amplifier (RWwn)		Servo amplifier → Programmable controller (RWrn)	
(Note 1) Address No.	Signal	(Note 1) Address No.	Signal
RWwn	Monitor 1 (Note 2)	RWrn	Monitor 1 data lower 16 bit
RWwn+1	Monitor 2 (Note 2)	RWwn+1	Monitor 1 data upper 16 bit
RWwn+2	Instruction code	RWwn+2	Respond code
RWwn+3	Writing data	RWwn+3	Reading data
RWwn+4	Next station	RWwn+4	
RWwn+5		RWwn+5	Monitor 2 data lower 16 bit
RWwn+6	Point table No./Speed command data (Note 3)	RWwn+6	Monitor 2 data upper 16 bit
RWwn+7	Not available	RWwn+7	Not available

Note 1. "n" depends on the station number setting.

2. Specify the code of the lower 16 bit as the monitor code of 32-bit data.
3. When the parameter No.PC30 setting is "□□□□", specify the point table No. in RWwn+6. When the parameter No.PC30 setting is "□□1□", specify the speed data in RWwn+6, and turn ON Speed instruction execution demand (RY(n+2)1). When setting the parameter No.PC30 to "□□1□", always set the acceleration/deceleration time constant in the point table No.1.

16.2.2 Detailed explanation of I/O signals

(1) Input signals (Input devices)

The note signs in the remarks column indicates the following descriptions.

*: Can be automatic turned ON internally by setting parameters No.PD01.

Signal name (Device name)	Description	Device No.		Remarks
		1 station occupied	2 stations occupied	
Servo-on	Turning RYn0 ON powers on the base circuit, making operation ready to start. (Servo on status) Turning it OFF powers off the base circuit, coasting the servo motor. (Servo off status)	RYn0	RYn0	*
Start	<ol style="list-style-type: none"> 1. Automatic operation mode 1 and 2 Turning on RYn1 performs positioning operation once to the specified station number. 2. Manual operation mode Turning on RYn1 in the indexer JOG operation makes the servo motor rotate in the RYn2 specified direction only while RYn1 is on. Turning it off makes the servo motor perform positioning to the station where the servo motor can decelerate to stop. Turning on RYn1 in JOG operation makes the servo motor rotate in the RYn2 specified direction only while RYn1 is on. Turning it off makes the servo motor decelerate to stop regardless of stations. 3. Home position return mode Turning on RYn1 immediately starts a home position return. 	RYn1	RYn1	

16. INDEXER POSITIONING OPERATION

Signal name (Device name)	Description	Device No.		Remarks																								
		1 station occupied	2 stations occupied																									
Rotation direction specifying	<p>Turning on/off RYn2 specifies the rotation direction at start.</p> <p>1. Automatic operation mode 1 Rotation direction changes according to the parameter No.PA14 setting. RYn2 is used only for the automatic operation mode 1 (Rotation direction specifying indexer). It is not used for the automatic operation mode 2 (Shortest rotating indexer).</p> <table border="1"> <thead> <tr> <th>(Note) RYn2</th> <th>Parameter No.PA14</th> <th>Servo motor rotation direction</th> </tr> </thead> <tbody> <tr> <td rowspan="2">0</td> <td>0</td> <td>CCW</td> </tr> <tr> <td>1</td> <td>CW</td> </tr> <tr> <td rowspan="2">1</td> <td>0</td> <td>CW</td> </tr> <tr> <td>1</td> <td>CCW</td> </tr> </tbody> </table> <p>Note. 0: OFF 1: ON</p> <p>2. Manual operation mode It is not affected by the parameter No.PA14.</p> <table border="1"> <thead> <tr> <th>(Note) RYn2</th> <th>Parameter No.PA14</th> <th>Servo motor rotation direction</th> </tr> </thead> <tbody> <tr> <td rowspan="2">0</td> <td>0</td> <td rowspan="2">CCW</td> </tr> <tr> <td>1</td> </tr> <tr> <td rowspan="2">1</td> <td>0</td> <td rowspan="2">CW</td> </tr> <tr> <td>1</td> </tr> </tbody> </table> <p>Note. 0: OFF 1: ON</p> <p>3. Home position return mode RYn2 is invalid. Specify the rotation direction in the home position return mode by using the parameter No.PC03.</p>	(Note) RYn2	Parameter No.PA14	Servo motor rotation direction	0	0	CCW	1	CW	1	0	CW	1	CCW	(Note) RYn2	Parameter No.PA14	Servo motor rotation direction	0	0	CCW	1	1	0	CW	1	RYn2	RYn2	
(Note) RYn2	Parameter No.PA14	Servo motor rotation direction																										
0	0	CCW																										
	1	CW																										
1	0	CW																										
	1	CCW																										
(Note) RYn2	Parameter No.PA14	Servo motor rotation direction																										
0	0	CCW																										
	1																											
1	0	CW																										
	1																											
Operation mode selection 1	Select the operation mode.	RYn6	RYn6																									
Operation mode selection 2	<table border="1"> <thead> <tr> <th colspan="2">(Note) Remote input</th> <th rowspan="2">Operation mode</th> </tr> <tr> <th>Ryn7</th> <th>Ryn6</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>Home position return mode</td> </tr> <tr> <td>0</td> <td>1</td> <td>Manual operation mode</td> </tr> <tr> <td>1</td> <td>0</td> <td>Automatic operation mode 1 (Rotation direction specifying indexer)</td> </tr> <tr> <td>1</td> <td>1</td> <td>Automatic operation mode 2 (Shortest rotating indexer)</td> </tr> </tbody> </table> <p>Note. 0: OFF 1: ON</p>	(Note) Remote input		Operation mode	Ryn7	Ryn6	0	0	Home position return mode	0	1	Manual operation mode	1	0	Automatic operation mode 1 (Rotation direction specifying indexer)	1	1	Automatic operation mode 2 (Shortest rotating indexer)	RYn7	RYn7								
(Note) Remote input		Operation mode																										
Ryn7	Ryn6																											
0	0	Home position return mode																										
0	1	Manual operation mode																										
1	0	Automatic operation mode 1 (Rotation direction specifying indexer)																										
1	1	Automatic operation mode 2 (Shortest rotating indexer)																										

16. INDEXER POSITIONING OPERATION

Signal name (Device name)	Description	Device No.		Remarks																																																																																																												
		1 station occupied	2 stations occupied																																																																																																													
Monitor output execution demand	<p>When RYn8 is turned ON, the following data and signals are set. At the same time, RXn8 turns ON. While RYn8 is ON, the monitor values are kept updated.</p> <p>1) When 1 station is occupied</p> <p>Remote register RWrn: Data demanded by Monitor 1 (RWwn)</p> <p>Remote register RWrn+1: Data demanded by Monitor 2 (RWwn+1)</p> <p>Remote register RWrn+2: Respond code indicating normal or error</p> <p>2) When 2 stations are occupied</p> <p>Remote register RWrn: Lower 16 bits of data demanded by Monitor 1 (RWwn)</p> <p>Remote register RWrn+1: Upper 16 bits of data demanded by Monitor 1 (RWwn)</p> <p>Remote register RWrn+5: Lower 16 bits of data demanded by Monitor 2 (RWwn+2)</p> <p>Remote register RWrn+6: Upper 16 bits of data demanded by Monitor 2 (RWwn+2)</p> <p>Remote register RWrn+2: Respond code indicating normal or error</p>	RYn8	RYn8																																																																																																													
Instruction code execution demand	<p>Turning RYn9 ON executes the processing corresponding to the instruction code stored in remote register RWwn+2. After completion of instruction code execution, the respond code indicating normal or error is set to RWrn+2. At the same time, RXn9 turns ON.</p> <p>Refer to section 16.2.4 for details.</p>	RYn9	RYn9																																																																																																													
Next station selection 1	Select the station number by using RYnA to RY(n+2)5.	RYnA	RYnA																																																																																																													
Next station selection 2	<table border="1"> <thead> <tr> <th rowspan="2">Station No.</th> <th colspan="9">(Note 1) Remote input</th> </tr> <tr> <th>RY (n+2)5</th> <th>RY (n+2)4</th> <th>RY (n+2)3</th> <th>RYnE</th> <th>RYnD</th> <th>RYnC</th> <th>RYnB</th> <th>RYnA</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>1</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>1</td> </tr> <tr> <td>2</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>1</td> <td>0</td> </tr> <tr> <td>3</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>1</td> <td>1</td> </tr> <tr> <td>4</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>1</td> <td>0</td> <td>0</td> </tr> <tr> <td>.</td> <td>.</td> <td>.</td> <td>.</td> <td>.</td> <td>.</td> <td>.</td> <td>.</td> <td>.</td> </tr> <tr> <td>.</td> <td>.</td> <td>.</td> <td>.</td> <td>.</td> <td>.</td> <td>.</td> <td>.</td> <td>.</td> </tr> <tr> <td>.</td> <td>.</td> <td>.</td> <td>.</td> <td>.</td> <td>.</td> <td>.</td> <td>.</td> <td>.</td> </tr> <tr> <td>254</td> <td>1</td> <td>1</td> <td>1</td> <td>1</td> <td>1</td> <td>1</td> <td>1</td> <td>0</td> </tr> <tr> <td>(Note 2)</td> <td>1</td> <td>1</td> <td>1</td> <td>1</td> <td>1</td> <td>1</td> <td>1</td> <td>1</td> </tr> </tbody> </table> <p>Note 1. 0: OFF 1: ON</p> <p>2. When setting "1" for all RYnA to RYnE and RY(n+2)3 to RY(n+2)5, the station warning (A97) occurs.</p>	Station No.	(Note 1) Remote input									RY (n+2)5	RY (n+2)4	RY (n+2)3	RYnE	RYnD	RYnC	RYnB	RYnA	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	1	0	3	0	0	0	0	0	0	1	1	4	0	0	0	0	0	1	0	0	254	1	1	1	1	1	1	1	0	(Note 2)	1	1	1	1	1	1	1	1	RYnB	RYnB	
Station No.			(Note 1) Remote input																																																																																																													
		RY (n+2)5	RY (n+2)4	RY (n+2)3	RYnE	RYnD	RYnC	RYnB	RYnA																																																																																																							
0		0	0	0	0	0	0	0	0																																																																																																							
1		0	0	0	0	0	0	0	1																																																																																																							
2		0	0	0	0	0	0	1	0																																																																																																							
3		0	0	0	0	0	0	1	1																																																																																																							
4		0	0	0	0	0	1	0	0																																																																																																							
.																																																																																																								
.																																																																																																								
.																																																																																																								
254	1	1	1	1	1	1	1	0																																																																																																								
(Note 2)	1	1	1	1	1	1	1	1																																																																																																								
Next station selection 3	RYnC	RYnC																																																																																																														
Next station selection 4	RYnD	RYnD																																																																																																														
Next station selection 5	RYnE	RYnE																																																																																																														
Next station selection 6		RY(n+2)3																																																																																																														
Next station selection 7		RY(n+2)4																																																																																																														
Next station selection 8		RY(n+2)5																																																																																																														

16. INDEXER POSITIONING OPERATION

Signal name (Device name)	Description	Device No.		Remarks
		1 station occupied	2 stations occupied	
Position instruction execution demand	When RY(n+2) is turned on, the next station number set in the remote register RWwn+4 is set. When it is set to the servo amplifier, the respond code indicating normal or error is set to RWrn+2. At the same time, RX(n+2)0 turns ON. Refer to section 3.6.3 for details.		RY(n+2)0	
Speed instruction demand	When RY(n+2)1 is turned ON, the point table No. or speed command data set to remote register RWwn+6 is set. When it is set to the servo amplifier, the respond code indicating normal or error is set to RWrn+2. At the same time, RX(n+2)1 turns ON. Refer to section 3.6.3 for details.		RY(n+2)1	
Internal torque limit selection	Turning RY(n+2)6 OFF makes the torque limit value of parameter No.PA11 (forward rotation torque limit) * parameter No.PA12 (reverse rotation torque limit) valid, and turning it ON makes that of parameter No.PC35 (internal torque limit). (Refer to section 16.3.2 (3))		RY(n+2)6	
Proportion control	When RY(n+2)7 is turned ON, the speed amplifier is switched from the proportional integral type to the proportional type. If the servo motor at a stop is rotated even one pulse by an external factor, it develops torque in an attempt to compensate for a position shift. When the shaft is locked mechanically after Movement completion (RXnC) is turned OFF, for example, turning Proportion control (RY(n+2)7) ON as soon as Movement completion (RXnC) turns OFF allows control of unnecessary torque developed in an attempt to compensate for a position shift. When the shaft is to be locked for an extended period of time, turn Internal torque limit selection (RY(n+2)6) ON simultaneously with Proportion control (RY(n+2)7) to make the torque not more than the rated torque using Internal torque limit (parameter No.PC35).		RY(n+2)7	*
Gain changing	When RY(n+2)8 is turned ON, the load inertia moment ratio and the corresponding gain values change to the values of parameter No.PB29 to PB32. To change the gain using RY(n+2)8, make the auto tuning invalid.		RY(n+2)8	
Position/speed specifying system selection	Select how to give a speed command. (Refer to section 3.6.3.) OFF: Remote input-based speed specifying system Specifying the point table No. with Point table No. selection (RYnA to RYnE) gives a speed command. ON : Remote register-based speed specifying system Setting the instruction code to the remote register (RWwn+4 to RWwn+6) gives a speed command. Set the parameter No.PC30 (direct specification selection) to "□□□2".		RY(n+2)A	

16. INDEXER POSITIONING OPERATION

Signal name (Device name)	Description	Device No.		Remarks																																							
		1 station occupied	2 stations occupied																																								
Speed selection 1	Set the servo motor speed, acceleration time constant, and deceleration time constant for positioning operation by selecting the point table number from 1 to 8 using RY(n+2)C, RY(n+2)D, and RY(n+2)E.		RY(n+2)C																																								
Speed selection 2			RY(n+2)D																																								
Speed selection 3				RY(n+2)E																																							
	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="3">(Note) Remoto input</th> <th rowspan="2">Point table No.</th> </tr> <tr> <th>RY(n+2)E</th> <th>RY(n+2)D</th> <th>RY(n+2)C</th> </tr> </thead> <tbody> <tr><td>0</td><td>0</td><td>0</td><td>1</td></tr> <tr><td>0</td><td>0</td><td>1</td><td>2</td></tr> <tr><td>0</td><td>1</td><td>0</td><td>3</td></tr> <tr><td>0</td><td>1</td><td>1</td><td>4</td></tr> <tr><td>1</td><td>0</td><td>0</td><td>5</td></tr> <tr><td>1</td><td>0</td><td>1</td><td>6</td></tr> <tr><td>1</td><td>1</td><td>0</td><td>7</td></tr> <tr><td>1</td><td>1</td><td>1</td><td>8</td></tr> </tbody> </table> <p>Note. 0: OFF 1: ON</p>	(Note) Remoto input			Point table No.	RY(n+2)E	RY(n+2)D	RY(n+2)C	0	0	0	1	0	0	1	2	0	1	0	3	0	1	1	4	1	0	0	5	1	0	1	6	1	1	0	7	1	1	1	8			
(Note) Remoto input			Point table No.																																								
RY(n+2)E	RY(n+2)D	RY(n+2)C																																									
0	0	0	1																																								
0	0	1	2																																								
0	1	0	3																																								
0	1	1	4																																								
1	0	0	5																																								
1	0	1	6																																								
1	1	0	7																																								
1	1	1	8																																								
Reset	<p>Keeping RY(n+1)A or RY(n+3)A ON for 50ms or longer allows an alarm to be deactivated.</p> <p>Some alarms cannot be deactivated by Reset RY(n+1)A or RY(n+3)A. (Refer to section 16.12.4 (1))</p> <p>If RY(n+1)A or RY(n+3)A is turned ON with no alarm occurring, the base circuit will not be shut off. When "□□1□" is set in parameter No.PD20 (function selection D-1), the base circuit is shut off.</p> <p>This device is not designed to make a stop. Do not turn it ON during operation.</p>	RY(n+1)A	RY(n+3)A																																								

16. INDEXER POSITIONING OPERATION

(2) Output signals (Output device)

POINT
<ul style="list-style-type: none"> The output devices can be used for both the remote output and the external output signals of CN6 connector.

The signal whose Device No. field has an oblique line cannot be used in CC-Link.

Signal name (Device name)	Description	Device No.	
		1 station occupied	2 stations occupied
Ready	A ready is assigned to the CN6-14 pin as an external output signal. RXn0 turns ON when the servo amplifier is ready to operate after servo-on.	RXn0	RXn0
In position	RXn1 turns ON when the droop pulse value is within the preset in-position range. The in-position range can be changed using parameter No.PA10. Increasing the in-position range may result in a continuous conduction status during low-speed rotation. RXn1 turns ON at servo-on.	RXn1	RXn1
Rough match	RXn2 turns ON when the command remaining distance becomes less than the rough match output range set in the parameter. RXn2 turns ON at servo-on.	RXn2	RXn2
Home position return completion	The home position return completion is assigned to the CN6-16 pin as an external output signal. RXn3 turns ON when a home position return is completed. RXn3 turns ON at completion of a home position return. In an absolute position detection system, RXn3 turns ON when operation is ready to start, but turns OFF in any of the following cases. 1) Servo-on (RYn0) is turned OFF. 2) Forced stop (EMG) is turned OFF. 3) Reset (RY(n+1)A or RY(n+3)A) is turned ON. 4) Alarm occurs. 5) Forward rotation stroke end (RYn4) or Reverse rotation stroke end (RYn5) is turned OFF. 6) Home position return has not been made after product purchase. 7) Home position return has not been made after occurrence of Absolute position erase (A25) or Absolute position counter warning (AE3). 8) Home position return has not been made after electronic gear change. 9) Home position return has not been made after the absolute position detection system was changed from invalid to valid. 10) Parameter No.PA14 (Station No. direction selection) has been changed. 11) While a home position return is being made. When any of 1) to 11) has not occurred and a home position return is already completed at least once, Home position return completion (RXn3) turns to the same output status as Ready (RXn0).	RXn3	RXn3
Limiting torque	RXn4 turns ON when the torque is reached at the time of torque generation.	RXn4	RXn4
Electromagnetic brake interlock	RXn6 turns OFF at servo-off or alarm occurrence. At alarm occurrence, it turns OFF independently of the base circuit status.	RXn6	RXn6
Monitoring	Refer to Monitor output execution demand (RYn8).	RXn8	RXn8
Instruction code execution completion	Refer to Instruction code execution demand (RYn9).	RXn9	RXn9

16. INDEXER POSITIONING OPERATION

Signal name (Device name)	Description	Device No.																																																																																																			
		1 station occupied	2 stations occupied																																																																																																		
Warning	RXnA turns ON when a warning occurs. When no warning has occurred, RXnA turns OFF within about 1s after power-on.	RXnA	RXnA																																																																																																		
Battery warning	RXnB turns ON when Open battery cable warning (A92) or Battery warning (A9F) occurs. When no battery warning has occurred, RXnB turns OFF within about 1s after power-on.	RXnB	RXnB																																																																																																		
Movement completion	RXnC turns ON when In position (RXn1) turns ON and the command remaining distance is "0". RXnC turns ON at servo-on.	RXnC	RXnC																																																																																																		
Dynamic brake interlock	RXnD turns off simultaneously when the dynamic brake is operated. When using the external dynamic brake on the servo amplifier of 11kW or more, this device is required. (Refer to section 14.6.) For the servo amplifier of 7kw or less, it is not necessary to use this device.	RXnD	RXnD																																																																																																		
Position instruction execution completion	Refer to Speed instruction execution demand (RY(n+2)0).		RX(n+2)0																																																																																																		
Speed instruction execution completion	Refer to Position instruction execution demand (RY(n+2)1).		RX(n+2)1																																																																																																		
Station output 1	As soon as the movement completion (RXnC) turns on, the station number is output in 8-bit code.		RX(n+2)2																																																																																																		
Station output 2	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">Station No.</th> <th colspan="8">(Note 1) Remote output</th> </tr> <tr> <th>RX (n+2)9</th> <th>RX (n+2)8</th> <th>RX (n+2)7</th> <th>RX (n+2)6</th> <th>RX (n+2)5</th> <th>RX (n+2)4</th> <th>RX (n+2)3</th> <th>RX (n+2)2</th> </tr> </thead> <tbody> <tr> <td>(Note 2)</td> <td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td> </tr> <tr> <td>0</td> <td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td> </tr> <tr> <td>1</td> <td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td> </tr> <tr> <td>2</td> <td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td><td>1</td> </tr> <tr> <td>.</td> <td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td> </tr> <tr> <td>.</td> <td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td> </tr> <tr> <td>.</td> <td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td> </tr> <tr> <td>253</td> <td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td> </tr> <tr> <td>254</td> <td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td> </tr> </tbody> </table> <p>Note 1. 0: OFF 1: ON</p> <p>2. All station outputs turn to "0" (OFF) when the current position is out of the in-position range.</p> <p>At power-on, emergency stop or alarm occurrence, if the current position is within the in-position range of each station, corresponding station number is output.</p> <p>While operating in the automatic operation mode, if the current position is within the in-position range of the target next station, corresponding station number is output.</p> <p>While operating in the indexer JOG operation of manual operation mode, if the current position is within the in-position range of the station where the servo motor stops by turning off the start (RYn1), corresponding station number is output.</p> <p>When home position return is incomplete, station number is not output.</p>	Station No.	(Note 1) Remote output								RX (n+2)9	RX (n+2)8	RX (n+2)7	RX (n+2)6	RX (n+2)5	RX (n+2)4	RX (n+2)3	RX (n+2)2	(Note 2)	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	2	1	1	1	1	1	1	0	1	253	0	0	0	0	0	0	1	0	254	0	0	0	0	0	0	0	1		RX(n+2)3
Station No.			(Note 1) Remote output																																																																																																		
		RX (n+2)9	RX (n+2)8	RX (n+2)7	RX (n+2)6	RX (n+2)5	RX (n+2)4	RX (n+2)3	RX (n+2)2																																																																																												
(Note 2)		0	0	0	0	0	0	0	0																																																																																												
0		1	1	1	1	1	1	1	1																																																																																												
1		1	1	1	1	1	1	1	0																																																																																												
2		1	1	1	1	1	1	0	1																																																																																												
.																																																																																													
.																																																																																													
.																																																																																													
253	0	0	0	0	0	0	1	0																																																																																													
254	0	0	0	0	0	0	0	1																																																																																													
Station output 3			RX(n+2)4																																																																																																		
Station output 4			RX(n+2)5																																																																																																		
Station output 5			RX(n+2)6																																																																																																		
Station output 6			RX(n+2)7																																																																																																		
Station output 7			RX(n+2)8																																																																																																		
Station output 8			RX(n+2)9																																																																																																		

16. INDEXER POSITIONING OPERATION

Signal name (Device name)	Description	Device No.	
		1 station occupied	2 stations occupied
Trouble	A trouble is assigned to the CN6-15 pin as an external output signal. RX(n+1)A or RX(n+3)A turns ON when the protective circuit is activated to shut off the base circuit. When no alarm has occurred, RX(n+1)A or RX(n+3)A turns OFF within about 1.5s after power is switched ON.	RX(n+1)A	RX(n+3)A
Remote station communication ready	This signal turns ON at power-on and turns off at a trouble occurrence or in the reset (RY(n+1)A or RY(n+3)A) ON status.	RX(n+1)B	RX(n+3)B

(3) Remote registers

The signal whose Remote Register field has an oblique line cannot be used.

(a) Input (Programmable controller → servo amplifier)

Remote register		Signal name	Description	Setting range
1 station occupied	2 stations occupied			
RWwn	RWwn	Monitor 1	Demands the status indication data of the servo amplifier. 1) When 1 station is occupied Setting the monitor code of the status indication item to be monitored to RWwn and turning RYn8 to ON sets data to RWrn. RXn8 turns on at the same time. 2) When 2 stations are occupied Setting the monitor code of the status indication item to be monitored to RWwn and turning RYn8 to ON sets data to RWrn. RXn8 turns on at the same time. When demanding 32-bit data, specifying the lower 16-bit code No. and turning RYn8 to ON sets the lower 16-bit data to RWwn and the upper 16-bit data to RWrn. data is stored in the RXn8. RXn8 turns on at the same time. Refer to section 16.2.3 for the item of the monitor code of the status indication.	Refer to section 16.2.3.
RWwn+1	RWwn+1	Monitor 2	Demands the status indication data of the servo amplifier. 1) When 1 station is occupied Setting the monitor code of the status indication item to be monitored to RWwn+1 and turning RYn8 to ON sets data to RWrn+1. RXn8 turns on at the same time. 2) When 2 stations are occupied Setting the monitor code of the status indication item to be monitored to RWwn+1 and turning RYn8 to ON sets data to RWrn+5. RXn8 turns on at the same time. When demanding 32-bit data, specifying the lower 16-bit code No. and turning RYn8 to ON sets the lower 16-bit data to RWwn+5 and the upper 16-bit data to RWrn+6. Data is stored in the RXn8. RXn8 turns on at the same time. Refer to section 16.2.3 for the item of the monitor code of the status indication.	Refer to section 16.2.3.
RWwn+2	RWwn+2	Instruction code	Sets the instruction code used to perform parameter or point table data read and write, alarm reference or the like. Setting the instruction code No. to RWwn+2 and turning RYn9 to ON executes the instruction. RXn9 turns to ON on completion of instruction execution. Refer to section 16.2.4 (1) for instruction code No. definitions.	Refer to section 16.2.4 (1).

16. INDEXER POSITIONING OPERATION

Remote register		Signal name	Description	Setting range
1 station occupied	2 stations occupied			
RWwn+3	RWwn+3	Writing data	Sets the written data used to perform parameter or point table data write, alarm history clear or the like. Setting the written data to RWwn+3 and turning RYn9 to ON writes the data to the servo amplifier. RXn9 turns to ON on completion of write. Refer to section 16.2.4 (2) for written data definitions.	Refer to section 16.2.4 (2).

(b) Output (Servo amplifier → Programmable controller)

Note that the data set to RWrn and RWrn+1 depends on whether 1 station or 2 stations are occupied.

If you set inappropriate code No. or data to the remote register input, the error code is set to respond code (RWrn+2). Refer to section 3.5.5 for the error code.

When 1 station is occupied

Remote register	Signal name	Description
RWrn	Monitor 1 data	The data of the monitor code set to RWwn is set.
RWrn+1	Monitor 2 data	The data of the monitor code set to RWwn+1 is set.
RWrn+2	Respond code	"0000" is set when the codes set to RWwn to RWwn+3 are executed normally.
RWrn+3	Reading data	Data corresponding to the read code set to RWwn+2 is set.

When 2 stations are occupied

Remote register	Signal name	Description
RWrn	Monitor 1 data lower 16bit	The lower 16 bits of the data of the monitor code set to RWwn are set.
RWrn+1	Monitor 1 data upper 16bit	The upper 16 bits of the data of the monitor code set to RWwn are set. A sign is set if there are no data in the upper 16 bits.
RWrn+2	Respond code	"0000" is set when the codes set to RWwn to RWwn+6 are executed normally.
RWrn+3	Reading data	Data corresponding to the read code set to RWwn+2 is set.
RWrn+4		
RWrn+5	Monitor 2 data lower 16bit	The lower 16 bits of the data of the monitor code set to RWwn+1 are set.
RWrn+6	Monitor 2 data upper 16bit	The upper 16 bits of the data of the monitor code set to RWwn+1 are set. A sign is set if there are no data in the upper 16 bits.
RWrn+7		

16. INDEXER POSITIONING OPERATION

16.2.3 Monitor codes

To demand 32-bit data when 2 stations are occupied, specify the lower 16-bit code No. Use any of the instruction codes 0101 to 011C to read the decimal point position (multiplying factor) of the status indication. Setting any code No. that is not given in this section will set the error code (□□1□) to respond code (RWrn+2). At this time, "0000" is set to RWrn, RWrn+1, RWrn+5 and RWrn+6.

Code No.		Monitored item	Answer data (Servo amplifier → Programmable controller)	
1 station occupied	2 stations occupied		Data length	Unit
0000h	0000h			
0001h	0001h	Not used in indexer positioning operation.		
0002h				
0003h	0003h			
0004h				
0005h	0005h			
0006h				
0007h	0007h			
0008h	0008h	Point table No.	16bit	[No.]
0009h				
000Ah	000Ah	Feedback pulse value lower 16bit	16bit	[pulse]
000Bh		Feedback pulse value upper 16bit	16bit	[pulse]
000Ch				
000Dh				
000Eh	000Eh	Droop pulse value lower 16bit	16bit	[pulse]
000Fh		Droop pulse value upper 16bit	16bit	[pulse]
0010h	0010h			
0011h	0011h	Regenerative load factor	16bit	[%]
0012h	0012h	Effective load factor	16bit	[%]
0013h	0013h	Peak load factor	16bit	[%]
0014h	0014h	Instantaneously occurring torque	16bit	[%]
0015h	0015h	ABS counter	16bit	[rev]
0016h	0016h	Motor speed lower 16bit	16bit	× 0.1[rev/min]
0017h		Motor speed upper 16bit	16bit	× 0.1[rev/min]
0018h	0018h	Bus voltage	16bit	[V]
0019h	0019h	Not used in indexer positioning operation.		
001Ah				
001Bh	001Bh			
001Ch	001Ch	Within one-revolution position lower 16bit	16bit	[pulse]
001Dh		Within one-revolution position upper 16bit	16bit	[pulse]
001Eh	001Eh	Station No.	16bit	[No.]

16. INDEXER POSITIONING OPERATION

16.2.4 Instruction codes (RWwn+2 · RWwn+3)


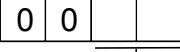
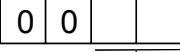

Refer to section 3.6.2 for the instruction code timing charts.

(1) Read instruction codes

The word data requested to be read with the instruction code 0000h to 0AFFh is read by Read code (RWrn+3).

Set the command code No. corresponding to the item to RWrn+2. The codes and answer data are all 4-digit hexadecimal numbers.

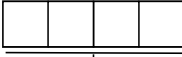






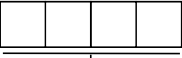
Setting any command code No. that is not given in this section will set the error code (□□1□) to respond code (RWrn+2). At this time, "0000" is set to Reading data (RWrn+3).

Code No.	Item/Function	Reading data (RWrn+3) contents (Servo amplifier → Programmable controller)
0000h	Operation mode Reads the current operation mode.	0000: CC-Link operation mode 0001: Test operation mode
0002h	Travel multiplying factor Reads the multiplying factor of the position data in the point table set in parameter No.PA05.	 <p>Travel multiplying factor</p> <p>0300: ×1000 0200: ×100 0100: ×10 0000: ×1</p>
0010h	Current alarm (warning) reading Reads the alarm No. or warning No. occurring currently.	 <p>Occurring alarm No./warning No.</p>
0020h	Alarm number in alarm history (most recent alarm)	 <p>Alarm No. that occurred in past</p>
0021h	Alarm number in alarm history (first recent alarm)	
0022h	Alarm number in alarm history (second recent alarm)	
0023h	Alarm number in alarm history (third recent alarm)	
0024h	Alarm number in alarm history (fourth recent alarm)	
0025h	Alarm number in alarm history (fifth recent alarm)	
0030h	Alarm occurrence time in alarm history (most recent alarm)	 <p>Occurrence time of alarm that occurred in past</p>
0031h	Alarm occurrence time in alarm history (first recent alarm)	
0032h	Alarm occurrence time in alarm history (second recent alarm)	
0033h	Alarm occurrence time in alarm history (third recent alarm)	
0034h	Alarm occurrence time in alarm history (fourth recent alarm)	
0035h	Alarm occurrence time in alarm history (fifth recent alarm)	

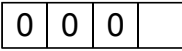
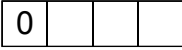
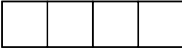
16. INDEXER POSITIONING OPERATION

Code No.	Item/Function	Reading data (RWrn+3) contents (Servo amplifier → Programmable controller)																																																													
0050h	Output device status 0 Reads the statuses (OFF/ON) of the Output devices.	<p>bit 0 to bit F indicate the OFF/ON statuses of the corresponding output devices.</p> <p>bitF bit0</p> <table border="1" style="width:100%; text-align:center;"> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </table> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width:5%;">bit</th> <th style="width:65%;">Device</th> <th style="width:5%;">bit</th> <th style="width:65%;">Device</th> </tr> </thead> <tbody> <tr><td>0</td><td>Ready</td><td>8</td><td>Monitoring</td></tr> <tr><td>1</td><td>In position</td><td>9</td><td>Instruction code execution completion</td></tr> <tr><td>2</td><td>Rough match</td><td>A</td><td>Warning</td></tr> <tr><td>3</td><td>Home position return completion</td><td>B</td><td>Battery warning</td></tr> <tr><td>4</td><td>Limiting torque</td><td>C</td><td>Movement completion</td></tr> <tr><td>5</td><td></td><td>D</td><td>Dynamic brake</td></tr> <tr><td>6</td><td>Electromagnetic brake interlock</td><td>E</td><td></td></tr> <tr><td>7</td><td></td><td>F</td><td></td></tr> </tbody> </table>																						bit	Device	bit	Device	0	Ready	8	Monitoring	1	In position	9	Instruction code execution completion	2	Rough match	A	Warning	3	Home position return completion	B	Battery warning	4	Limiting torque	C	Movement completion	5		D	Dynamic brake	6	Electromagnetic brake interlock	E		7		F					
bit	Device	bit	Device																																																												
0	Ready	8	Monitoring																																																												
1	In position	9	Instruction code execution completion																																																												
2	Rough match	A	Warning																																																												
3	Home position return completion	B	Battery warning																																																												
4	Limiting torque	C	Movement completion																																																												
5		D	Dynamic brake																																																												
6	Electromagnetic brake interlock	E																																																													
7		F																																																													
0051h	Output device status 1 Reads the statuses (OFF/ON) of the Output devices.	<p>bit 0 to bit F indicate the OFF/ON statuses of the corresponding output devices.</p> <p>bitF bit0</p> <table border="1" style="width:100%; text-align:center;"> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </table> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width:5%;">bit</th> <th style="width:65%;">Device</th> <th style="width:5%;">bit</th> <th style="width:65%;">Device</th> </tr> </thead> <tbody> <tr><td>0</td><td>Position instruction execution completion</td><td>7</td><td>Station output 6</td></tr> <tr><td>1</td><td>Speed instruction execution completion</td><td>8</td><td>Station output 7</td></tr> <tr><td>2</td><td>Station output 1</td><td>9</td><td>Station output 8</td></tr> <tr><td>3</td><td>Station output 2</td><td>A</td><td>Station output 9</td></tr> <tr><td>4</td><td>Station output 3</td><td>B</td><td></td></tr> <tr><td>5</td><td>Station output 4</td><td>C</td><td></td></tr> <tr><td>6</td><td>Station output 5</td><td>D</td><td></td></tr> <tr><td></td><td></td><td>E</td><td></td></tr> <tr><td></td><td></td><td>F</td><td>For manufacturer setting</td></tr> </tbody> </table>																						bit	Device	bit	Device	0	Position instruction execution completion	7	Station output 6	1	Speed instruction execution completion	8	Station output 7	2	Station output 1	9	Station output 8	3	Station output 2	A	Station output 9	4	Station output 3	B		5	Station output 4	C		6	Station output 5	D				E				F	For manufacturer setting
bit	Device	bit	Device																																																												
0	Position instruction execution completion	7	Station output 6																																																												
1	Speed instruction execution completion	8	Station output 7																																																												
2	Station output 1	9	Station output 8																																																												
3	Station output 2	A	Station output 9																																																												
4	Station output 3	B																																																													
5	Station output 4	C																																																													
6	Station output 5	D																																																													
		E																																																													
		F	For manufacturer setting																																																												
0052h	Output device status 2 Reads the statuses (OFF/ON) of the Output devices.	<p>bit 0 to bit F indicate the OFF/ON statuses of the corresponding output devices.</p> <p>bitF bit0</p> <table border="1" style="width:100%; text-align:center;"> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </table> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width:5%;">bit</th> <th style="width:65%;">Device</th> <th style="width:5%;">bit</th> <th style="width:65%;">Device</th> </tr> </thead> <tbody> <tr><td>0</td><td></td><td>9</td><td></td></tr> <tr><td>1</td><td></td><td>A</td><td>Trouble</td></tr> <tr><td>2</td><td></td><td>B</td><td>Remote station communication ready</td></tr> <tr><td>3</td><td></td><td>C</td><td></td></tr> <tr><td>4</td><td></td><td>D</td><td></td></tr> <tr><td>5</td><td></td><td>E</td><td></td></tr> <tr><td>6</td><td></td><td>F</td><td></td></tr> <tr><td>7</td><td></td><td></td><td></td></tr> <tr><td>8</td><td></td><td></td><td></td></tr> </tbody> </table>																						bit	Device	bit	Device	0		9		1		A	Trouble	2		B	Remote station communication ready	3		C		4		D		5		E		6		F		7				8			
bit	Device	bit	Device																																																												
0		9																																																													
1		A	Trouble																																																												
2		B	Remote station communication ready																																																												
3		C																																																													
4		D																																																													
5		E																																																													
6		F																																																													
7																																																															
8																																																															

16. INDEXER POSITIONING OPERATION

Code No.	Item/Function	Reading data (RWrn+3) contents (Servo amplifier → Programmable controller)
0081h	Energization time Reads the energization time from shipment.	Returns the energization time [h].  Energization time
0082h	Power ON frequency Reads the number of power-on times from shipment.	Returns the number of power-on times.  Power ON frequency
00A0h	Ratio of load inertia moment Reads the estimated ratio of load inertia moment to servo motor shaft inertia moment.	Return unit [times].  Ratio of load inertia moment
00B0h	Home position within-1-revolution position lower 16bit (CYC0) Reads the lower 16 bits of the cycle counter value of the absolute home position.	Return unit [pulses].  Cycle counter value
00B1h	Home position within-1-revolution position upper 16bit Reads the upper 16 bits of the cycle counter value of the absolute home position.	Return unit [pulses].  Cycle counter value
00B2h	Home position Multi-revolution data (ABS0) Multi-revolution counter value of absolute home position reading.	Return unit [rev].  Multi-revolution counter value
00C0h	Error parameter No./Point data No. reading Reads the parameter No./point table No. in error.	 Parameter No. or point table No. Parameter group 0: Basic setting parameters (No.PA□□) 1: Gain/filter parameters (No.PB□□) 2: Extension setting parameters (No.PC□□) 3: I/O setting parameters (No.PD□□) Type 1: Parameter No. 2: Point table No.
0100h to 011Dh	Monitor multiplying factor Reads the multiplying factor of the data to be read with the monitor code. The instruction codes 0100 to 011D correspond to the monitor codes 0000 to 001D. 0000 applies to the instruction code that does not correspond to the monitor code.	 Monitor multiplying factor 0003: ×1000 0002: ×100 0001: ×10 0000: ×1

16. INDEXER POSITIONING OPERATION

Code No.	Item/Function	Reading data (RWrn+3) contents (Servo amplifier → Programmable controller)
0200h	Parameter group reading Reads the parameter group to be read with code No.8200h to be written.	 <p>Parameter group 0: Basic setting parameters (No.PA□□) 1: Gain/filter parameters (No.PB□□) 2: Extension setting parameters (No.PC□□) 3: I/O setting parameters (No.PD□□)</p>
0201h to 02FFh	Parameter data reading Reads the set value of each No. of the parameter group read with code No.0200h. The decimal value converted from the 2 lower digits of the code No. corresponds to the parameter No. If the instruction code is set outside the range set in parameter No.PA19, an error code is returned and the data cannot be read.	The value set in the parameter No. corresponding to the requested group name is stored.
0301h to 03FFh	Data form of parameter Reads the data format of each No. of the parameter group read with code No.0200h. The decimal value converted from the 2 lower digits of the code No. corresponds to the parameter No. If the instruction code is set outside the range set in parameter No.PA19, an error code is returned and the data cannot be read.	<p>The value set in the parameter No. corresponding to the requested group name is stored.</p>  <p>Decimal point position 0: Without decimal point 1: First least significant digit (without decimal point) 2: Second least significant digit 3: Third least significant digit 4: Fourth least significant digit</p> <p>Data format 0: Used unchanged as hexadecimal 1: Must be converted into decimal</p> <p>Parameter write type 0: Valid after write 1: Valid when power is switched on again after write</p>
0601h to 06FFh	Servo motor speed of point table No.1 to 255 The decimal value converted from the 2 lower digits of the code No. corresponds to the point table No.	<p>The servo motor speed set to the requested point table No. is returned.</p>  <p>Servo motor speed</p>
0701h to 07FFh	Acceleration time constant of point table No.1 to 255 The decimal value converted from the 2 lower digits of the code No. corresponds to the point table No.	The acceleration time constant set to the requested point table No. is returned.
0801h to 08FFh	Deceleration time constant of point table No.1 to 255 The decimal value converted from the 2 lower digits of the code No. corresponds to the point table No.	The deceleration time constant set to the requested point table No. is returned.

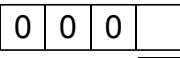
16. INDEXER POSITIONING OPERATION

(2) Write instruction codes

Set the data, which was requested to be written with the instruction code 8010h to 91FFh.

Set the instruction code No. corresponding to the item to Instruction code (RWwn+2) and the written data to Writing data (RWwn+3). The codes and answer data are all 4-digit hexadecimal numbers.

When the instruction code which has not been described in this section is set, the error code (□□1□) is stored in respond code (RWrn+2).

Code No.	Item	Writing data (RWwn+3) contents (Programmable controller → Servo amplifier)
8010h	Alarm reset command Deactivates the alarm that occurred.	1EA5
8101h	Feedback pulse value display data is clear Resets the display data of the status indication "feedback pulse value" to 0.	1EA5
8200h	Parameter group write command Writes the group of parameters that are written to with codes No.8201h to 82FFh and 8301h to 83FFh. Writes the group of parameters that are read with codes No.0201h to 02FFh and 0301h to 03FFh.	 <p>Parameter group 0: Basic setting parameters (No.PA□□) 1: Gain/filter parameters (No.PB□□) 2: Extension setting parameters (No.PC□□) 3: I/O setting parameters (No.PD□□)</p>
8201h to 82FFh	Data RAM instruction of parameter Writes the set value of each No. of the parameter group written by code No.8200h to RAM. These values are cleared when power is switched off. The decimal value converted from the 2 lower digits of the code No. corresponds to the parameter No. An error code is returned if an instruction code outside the range set in parameter No. PA19 or a value outside the setting range of the corresponding parameter is written.	Convert the decimal values into hexadecimal before setting.
8301h to 83FFh	Data EEPROM instruction of parameter Writes the set value of each No. of the parameter group written with code No.8200h to EEPROM. Written to EEPROM, these values are held if power is switched off. The decimal value converted from the 2 lower digits of the code No. corresponds to the parameter No. An error code is returned if an instruction code outside the range set in parameter No.PA19 or a value outside the setting range of the corresponding parameter is written.	Convert the decimal values into hexadecimal before setting.
8601h to 86FFh	Motor speed of point table Writes the motor speeds of point table No.1 to 255 to RAM. These values are cleared when power is switched off. The decimal value converted from the 2 lower digits of the code No. corresponds to the point table No.	Convert the values into hexadecimal before setting.

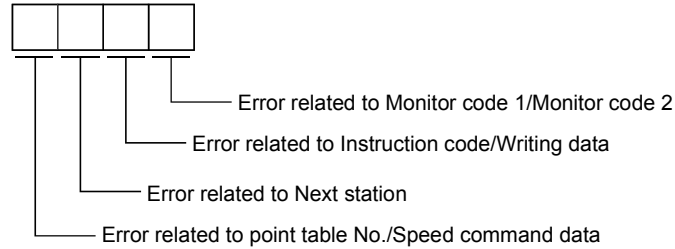
16. INDEXER POSITIONING OPERATION

Code No.	Item	Writing data (RWwn+3) contents (Programmable controller → Servo amplifier)
8701h to 87FFh	Acceleration time constant data RAM command of point table Writes the acceleration time constants of point table No.1 to 255 to RAM. These values are cleared when power is switched off. The decimal value converted from the 2 lower digits of the code No. corresponds to the point table No.	Convert the values into hexadecimal before setting.
8801h to 88FFh	Deceleration time constant data RAM command of point table Writes the deceleration time constants of point table No.1 to 255 to RAM. These values are cleared when power is switched off. The decimal value converted from the 2 lower digits of the code No. corresponds to the point table No.	Convert the values into hexadecimal before setting.
8D01h to 8DFFh	Servo motor speed data EEPROM command of point table Writes the servo motor speeds of point table No.1 to 255 to EEPROM. Written to EEPROM, these values are held if power is switched off. The decimal value converted from the 2 lower digits of the code No. corresponds to the point table No.	Convert the values into hexadecimal before setting.
8E01h to 8EFFh	Acceleration time constant data EEPROM command of point table Writes the acceleration time constants of point table No.1 to 255 to EEPROM. Written to EEPROM, these values are held if power is switched off. The decimal value converted from the 2 lower digits of the code No. corresponds to the point table No.	Convert the values into hexadecimal before setting.
8F01h to 8FFFh	Deceleration time constant data EEPROM command of point table Writes the deceleration time constants of point table No.1 to 255 to EEPROM. Written to EEPROM, these values are held if power is switched off. The decimal value converted from the 2 lower digits of the code No. corresponds to the point table No.	Convert the values into hexadecimal before setting.

16. INDEXER POSITIONING OPERATION

16.2.5 Respond codes (RW_{rn}+2)

If any of the monitor codes, instruction codes, Next station, Point table Nos./Speed command data set to the remote register is outside the setting range, the corresponding error code is set to respond code (RW_{wn}+2). "0000" is set if they are normal.



Code No.	Error	Details
0	Normal answer	Instruction was completed normally.
1	Code error	<ul style="list-style-type: none"> ▪ The monitor code not in the specifications was set. ▪ Read/write of the point table of No.255 or later was set.
2	Parameter ▪ point table selection error	<ul style="list-style-type: none"> ▪ The parameter No. disabled for reference was set.
3	Write range error	<ul style="list-style-type: none"> ▪ An attempt was made to write the parameter or point table data outside the setting range.

16. INDEXER POSITIONING OPERATION

16.3 Signal

16.3.1 Signal (device) explanation

POINT
<ul style="list-style-type: none"> In the indexer positioning operation, devices assigned to the CN6 connector cannot be changed.

(1) I/O device

(a) Input device

Device	Symbol	Connector pin No.	Functions/Applications																								
Forced stop	EMG	CN6-1	Turn EMG off (open between commons) to bring the motor to an emergency stop state, in which the base circuit is shut off and the dynamic brake is operated. Turn EMG on (short between commons) in the emergency stop state to reset that state.																								
Proximity dog	DOG	CN6-2	When DOG is turned OFF, the proximity dog is detected. The polarity of dog detection can be changed using parameter No.PD16. <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Parameter No.PD16</th> <th>Proximity dog (DOG) detection polarity</th> </tr> </thead> <tbody> <tr> <td><input type="checkbox"/>0<input type="checkbox"/><input type="checkbox"/> (initial value)</td> <td>OFF</td> </tr> <tr> <td><input type="checkbox"/>1<input type="checkbox"/><input type="checkbox"/></td> <td>ON</td> </tr> </tbody> </table>	Parameter No.PD16	Proximity dog (DOG) detection polarity	<input type="checkbox"/> 0 <input type="checkbox"/> <input type="checkbox"/> (initial value)	OFF	<input type="checkbox"/> 1 <input type="checkbox"/> <input type="checkbox"/>	ON																		
Parameter No.PD16	Proximity dog (DOG) detection polarity																										
<input type="checkbox"/> 0 <input type="checkbox"/> <input type="checkbox"/> (initial value)	OFF																										
<input type="checkbox"/> 1 <input type="checkbox"/> <input type="checkbox"/>	ON																										
Forward rotation stroke end	LSP	CN6-3	When starting operation, turn LSP/LSN to ON. Turning it to OFF causes a sudden stop, resulting in servo lock. A stopping method can be changed in parameter No.PD20. When not using the forward/reverse rotation stroke end, set "Automatic ON" in parameter No.PD01.																								
Reverse rotation stroke end	LSN	CN6-4																									
			<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2">(Note) Input signal</th> <th colspan="2">Operation</th> </tr> <tr> <th>LSP</th> <th>LSN</th> <th>CCW direction</th> <th>CW direction</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1</td> <td style="text-align: center;">○</td> <td style="text-align: center;">○</td> </tr> <tr> <td>0</td> <td>1</td> <td style="text-align: center;">/</td> <td style="text-align: center;">○</td> </tr> <tr> <td>1</td> <td>0</td> <td style="text-align: center;">○</td> <td style="text-align: center;">/</td> </tr> <tr> <td>0</td> <td>0</td> <td style="text-align: center;">/</td> <td style="text-align: center;">/</td> </tr> </tbody> </table> <p>Note. 0: OFF 1: ON</p>	(Note) Input signal		Operation		LSP	LSN	CCW direction	CW direction	1	1	○	○	0	1	/	○	1	0	○	/	0	0	/	/
(Note) Input signal		Operation																									
LSP	LSN	CCW direction	CW direction																								
1	1	○	○																								
0	1	/	○																								
1	0	○	/																								
0	0	/	/																								

16. INDEXER POSITIONING OPERATION

(b) Output device

POINT
<ul style="list-style-type: none"> Output devices assigned to the CN6 connector pins can be used with the remote output of the CC-Link communication function.

Device	Symbol	Connector pin No.	Functions/Applications
Ready	RD	CN6-14	RD turns ON when the servo amplifier is ready to operate after servo-on.
Trouble	ALM	CN6-15	ALM turns off when power is switched off or the protective circuit is activated to shut off the base circuit. Without alarm occurring, ALM turns on within 1.5s after power-on. The significance of this device is opposite of that of remote output (RX (n+1)A or RX (n+3)A).
Home position return completion	ZP	CN6-16	ZP turns ON when a home position return is completed. ZP turns ON at completion of a home position return. In an absolute position detection system, RXn3 turns ON when operation is ready to start, but turns OFF in any of the following cases. 1) Servo-on (RYn0) is turned OFF. 2) Forced stop (EMG) is turned OFF. 3) Reset (RY(n+1)A or RY(n+3)A) is turned ON. 4) Alarm occurs. 5) Forward rotation stroke end (LSP) or Reverse rotation stroke end (LSN) is turned OFF. 6) Home position return has not been made after product purchase. 7) Home position return has not been made after occurrence of Absolute position erase (A25) or Absolute position counter warning (AE3). 8) Home position return has not been made after electronic gear change. 9) Home position return has not been made after the absolute position detection system was changed from invalid to valid. 10) Parameter No.PA14 (Station No. direction selection) has been changed. 11) While a home position return is being made. When any of 1) to 11) has not occurred and a home position return is already completed at least once, Home position return completion (ZP) turns to the same output status as Ready (RD).

(2) Input signals

Device	Symbol	Connector pin No.	Functions/Applications
Manual pulse generator	PP	CN6-6	Not used in indexer positioning operation.
	NP	CN6-19	

16. INDEXER POSITIONING OPERATION

(3) Output signals

Refer to section 4.8.2 for the output interfaces (symbols in the I/O Division field in the table) of the corresponding connector pins.

Device	Symbol	Connector pin No.	Functions/Applications	I/O division
Encoder A-phase pulse (differential line driver)	LA LAR	CN6-11 CN6-24	Outputs pulses per servo motor revolution set in parameter No.PA15 in the differential line driver system. In CCW rotation of the servo motor, the encoder B-phase pulse lags the encoder A-phase pulse by a phase angle of $\pi/2$. The relationships between rotation direction and phase difference of the A- and B-phase pulses can be changed using parameter No.PC19	DO-2
Encoder B-phase pulse (differential line driver)	LB LBR	CN6-12 CN6-25		
Encoder Z-phase pulse (differential line driver)	LZ LZR	CN6-13 CN6-26	Outputs the zero-point signal of the encoder in the differential line driver system. One pulse is output per servo motor revolution. This signal turns on when the zero-point position is reached. (Negative logic) The minimum pulse width is about 400 μ s. For home position return using this pulse, set the creep speed to 100r/min. or less.	DO-2

(4) Power supply

Signal	Symbol	Connector pin No.	Functions/Applications	I/O division
Digital I/F power supply input	DICOM	CN6-5	Used to input 24VDC (24VDC \pm 10% 150mA) for I/O interface. The power supply capacity changes depending on the number of I/O interface points to be used. Connect the plus of 24VDC terminal external power supply for the sink interface.	
Digital I/F common	DOCOM	CN6-17	Common terminal for input signals such as DOG and EMG. Pins are connected internally. Separated from LG. Connect the plus of 24VDC terminal external power supply for the source interface.	
MR-HDP01 open collector power input	OPC	CN6-18	Not used in indexer positioning operation.	
Control common	LG	CN6-23	Common terminal for the differential line driver of the encoder pulses (LA * LAR * LB * LBR * LZ * LZR).	
Shield	SD	Plate	Connect the external conductor of the shield cable.	

16. INDEXER POSITIONING OPERATION

16.3.2 Detailed description of signals (devices)

(1) Forward rotation start • reverse rotation start • temporary stop/restart

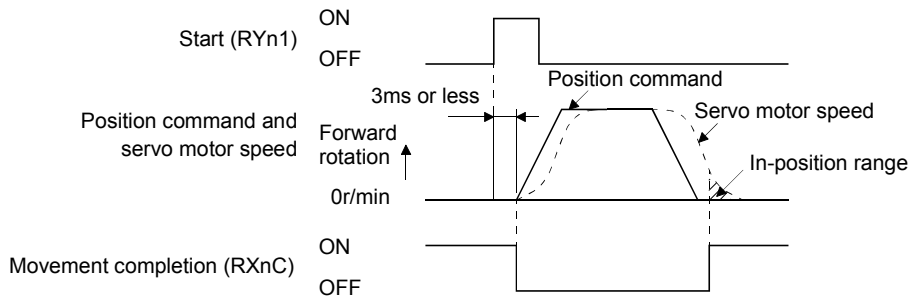
- (a) A start (RYn1) should make the sequence which can be used after the main circuit has been established. These signals are invalid if it is switched on before the main circuit is established. Normally, it is interlocked with the ready signal (RD).
- (b) A start in the servo amplifier is made when a start (RYn1) changes from OFF to ON. The delay time of the servo amplifier's internal processing is max. 3ms. The delay time of other devices is max. 10ms.
- (c) When a programmable controller is used, the ON time of a start (RYn1), should be 6ms or longer to prevent a malfunction.
- (d) During operation, the start (RYn1) is not accepted. The next operation should always be started after the rough match (RXn2) is output with the rough match output range set to "0" or after the movement completion (RXnC) is output.

(2) Movement completion • rough match • in position

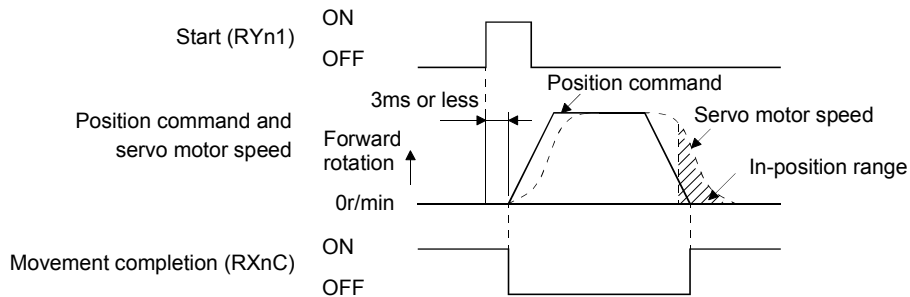
POINT
<ul style="list-style-type: none"> • If an alarm cause, etc. are removed and servo-on occurs after a stop is made by servo-off, alarm occurrence or Forced stop (EMG) ON during automatic operation, Movement completion (MEND), Rough-match, (CPO) and In position (INP) are turned on. To resume operation, confirm the current position and the selected point table No. for preventing unexpected operation.

(a) Movement completion

The following timing charts show the output timing relationships between the position command generated in the servo amplifier and the movement completion (RYnC). This timing can be changed using parameter No.PA10 (in-position range). RYnC turns ON in the servo-on status.



When parameter No.PA10 is small

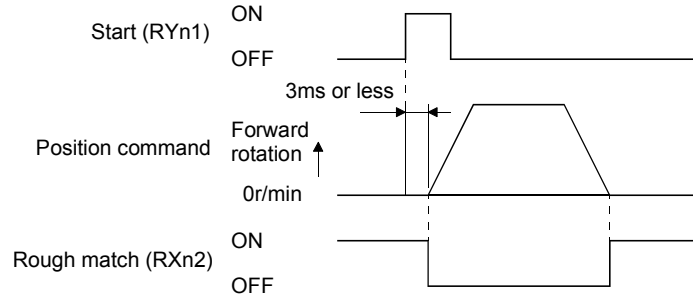


When parameter No.PA10 is large

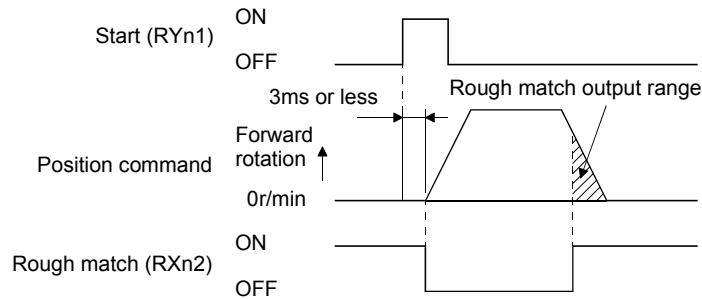
16. INDEXER POSITIONING OPERATION

(b) Rough match

The following timing charts show the relationships between the signal and the position command generated in the servo amplifier. This timing can be changed using parameter No.PC11 (rough match output range). RXn2 turns ON in the servo-on status.



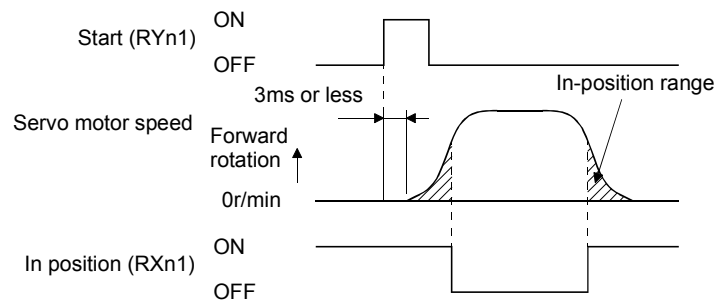
When "0" is set in parameter No.PC11



When more than "0" is set in parameter No.PC11

(c) In position

The following timing chart shows the relationship between the signal and the feedback pulse of the servo motor. This timing can be changed using parameter No.PA10 (in-position range). turns on RYn1 in the servo-on status.



When positioning operation is performed once

16. INDEXER POSITIONING OPERATION

(3) Torque limit



CAUTION

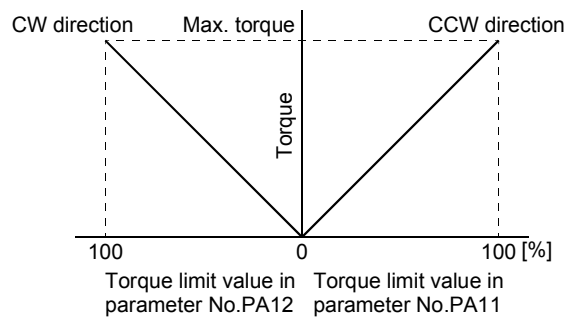
▪ If the torque limit is canceled during servo lock, the servo motor may suddenly rotate according to position deviation in respect to the command position.

POINT

▪ In the indexer positioning operation, the torque limit 2 becomes automatically effective depending on the operation status.

(a) Torque limit and torque

By setting parameter No.PA11 (forward rotation torque limit) or parameter No.PA12 (reverse rotation torque limit), torque is always limited to the maximum value during operation. A relationship between the limit value and servo motor torque is shown below.



(b) Torque limit value selection

As shown below, the forward rotation torque limit (parameter No.PA11), reverse rotation torque limit (parameter No.PA12) or internal torque limit 2 (parameter No.PC35) can be chosen using the external torque limit selection (RY(n+2)6).

(Note) RY(n+2) 6	Limit value status	Torque limit to be enabled	
		CCW driving/CW regeneration	CW driving/CCW regeneration
0		Parameter No.PA11	Parameter No.PA12
1	Parameter No.PC35 > Parameter No.PA11 Parameter No.PA12	Parameter No.PA11	Parameter No.PA12
	Parameter No.PC35 < Parameter No.PA11 Parameter No.PA12	Parameter No.PC35	Parameter No.PC35

Note. 0: OFF

1: ON

(c) Limiting torque (RXn4)

RXn4 turns on when the servo motor torque reaches the torque limited.

16. INDEXER POSITIONING OPERATION

16.4 Switching power on for the first time



WARNING

▪ Do not operate the switches with wet hands. You may get an electric shock.

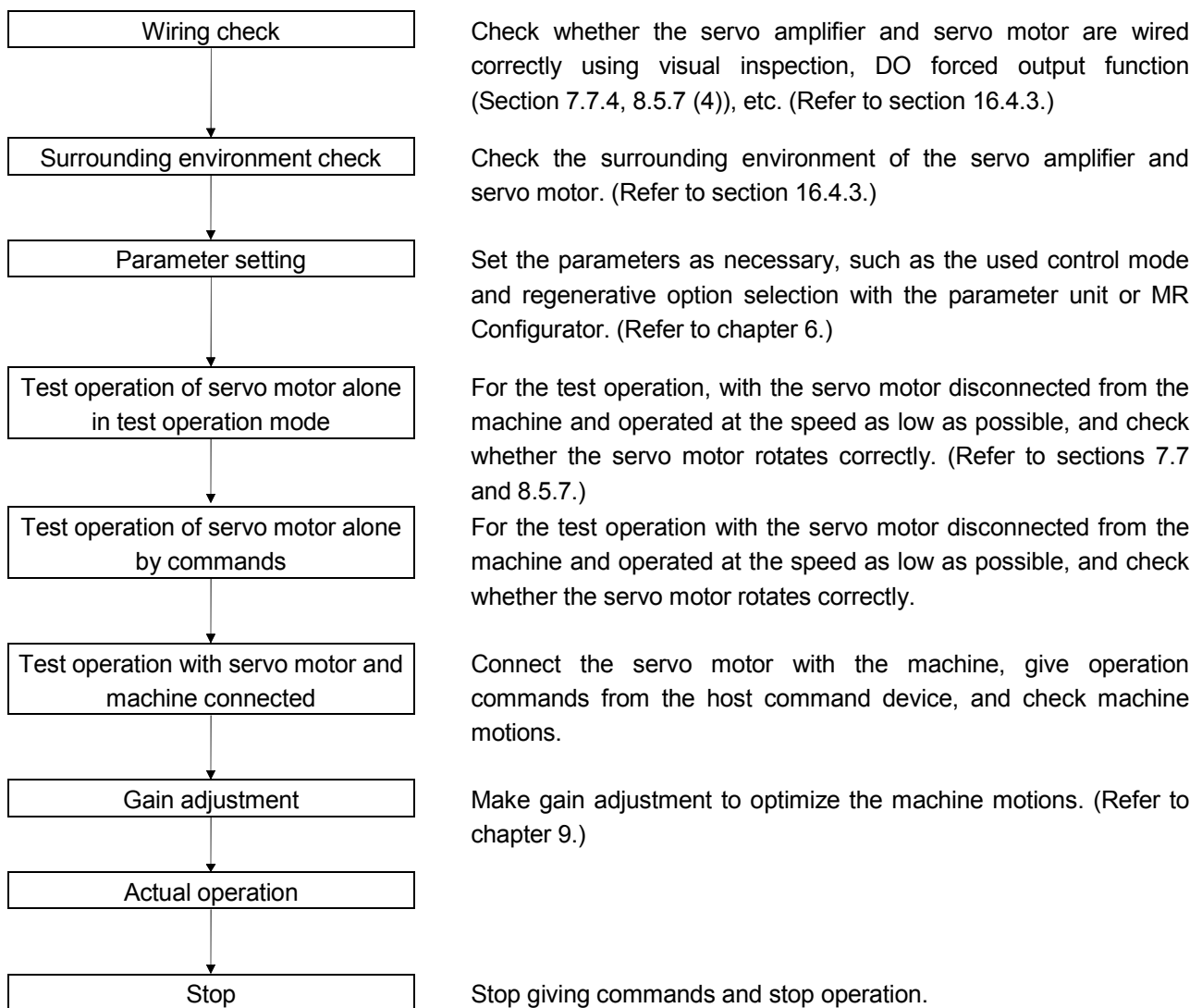


CAUTION

- Before starting operation, check the parameters. Some machines may perform unexpected operation.
- Take safety measures, e.g. provide covers, to prevent accidental contact of hands and parts (cables, etc.) with the servo amplifier heat sink, regenerative resistor, servo motor, etc. since they may be hot while power is on or for some time after power-off. Their temperatures may be high and you may get burnt or a parts may damaged.
- During operation, never touch the rotating parts of the servo motor. Doing so can cause injury.

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

16.4.1 Startup procedure



16. INDEXER POSITIONING OPERATION

16.4.2 Wiring check

(1) Power supply system wiring

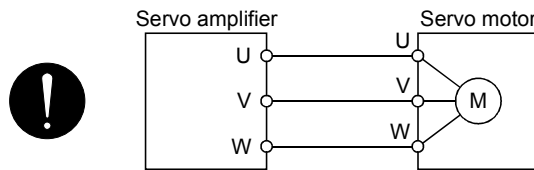
Before switching on the main circuit and control circuit power supplies, check the following items.

(a) Power supply system wiring

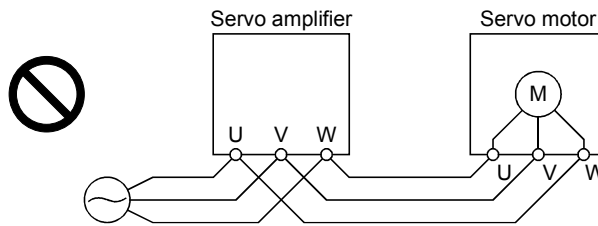
The power supplied to the power input terminals (L1, L2, L3, L11, L21) of the servo amplifier should satisfy the defined specifications. (Refer to section 1.2.)

(b) Connection of servo amplifier and servo motor

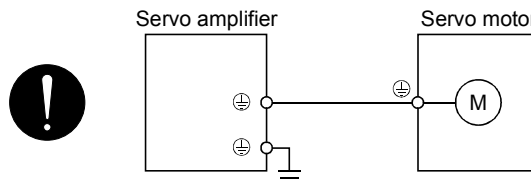
1) The servo motor power supply terminals (U, V, W) of the servo amplifier match in phase with the power input terminals (U, V, W) of the servo motor.



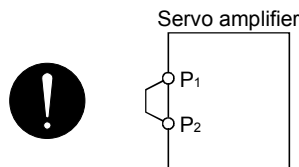
2) The power supplied to the servo amplifier should not be connected to the servo motor power supply terminals (U, V, W). To do so will fail the connected servo amplifier and servo motor.



3) The earth terminal of the servo motor is connected to the PE terminal of the servo amplifier.



4) P₁-P₂ (For 11kW or more, P₁-P) should be connected.

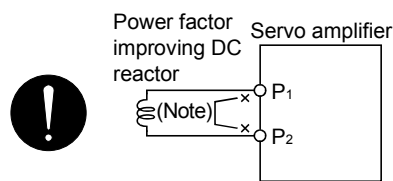


(c) When option and auxiliary equipment are used

- 1) When regenerative option is used under 3.5kW for 200V class and 2kW for 400V class
 - The lead between P terminal and D terminal of CNP2 connector should not be connected.
 - The generative brake option should be connected to P terminal and C terminal.
 - A twisted cable should be used. (Refer to section 14.2.)

16. INDEXER POSITIONING OPERATION

- 2) When regenerative option is used over 5kW for 200V class and 3.5kW for 400V class
 - The lead of built-in regenerative resistor connected to P terminal and C terminal of TE1 terminal block should not be connected.
 - The generative brake option should be connected to P terminal and C terminal.
 - A twisted cable should be used when wiring is over 5m and under 10m. (Refer to section 14.2.)
- 3) When brake unit and power regenerative converter are used over 5kW
 - The lead of built-in regenerative resistor connected to P terminal and C terminal of TE1 terminal block should not be connected.
 - Brake unit, power regenerative converter or power regeneration common converter should be connected to P terminal and N terminal. (Refer to section 14.3 to 14.5.)
- 4) The power factor improving DC reactor should be connected P₁ and P₂ (For 11kW or more, P₁ and P). (Refer to section 14.11.)



Note. Always disconnect P₁ and P₂ (For 11kW or more, P₁ and P).

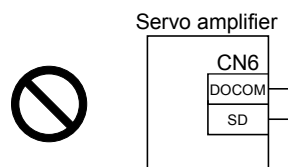
(2) I/O signal wiring

- (a) The I/O signals should be connected correctly.

Use DO forced output to forcibly turn on/off the pins of the CN6 connector. This function can be used to perform a wiring check. (Refer to section 7.7.4.) In this case, switch on the control circuit power supply only.

- (b) 24VDC or higher voltage is not applied to the pins of connectors CN6.

- (c) SD and DOCOM of connector CN6 is not shorted.



16.4.3 Surrounding environment

(1) Cable routing

- (a) The wiring cables are free from excessive force.
- (b) The encoder cable should not be used in excess of its flex life. (Refer to section 13.4.)
- (c) The connector part of the servo motor should not be strained.

(2) Environment

Signal cables and power cables are not shorted by wire offcuts, metallic dust or the like.

16. INDEXER POSITIONING OPERATION

16.5 Startup

16.5.1 Power on and off procedures

(1) Power-on

Switch power on in the following procedure. Always follow this procedure at power-on.

- 1) Switch off the servo-on (RYn0).
- 2) Make sure that the start (RYn1) is off.
- 3) Switch on the main circuit power supply and control circuit power supply.
When main circuit power/control circuit power is switched on, the servo amplifier display shows "b01" (if the servo amplifier has the station number of 1).



In the absolute position detection system, first power-on results in the absolute position lost (A25) alarm and the servo system cannot be switched on.

The alarm can be deactivated then switching power off once and on again.

Also in the absolute position detection system, if power is switched on at the servo motor speed of 3000r/min or higher, position mismatch may occur due to external force or the like. Power must therefore be switched on when the servo motor is at a stop.

(2) Power-off

- 1) Make sure that the start (RYn1) is off.
- 2) Switch off the Servo-on (RYn0).
- 3) Switch off the main circuit power supply and control circuit power supply.

16.5.2 Stop

In any of the following statuses, the servo amplifier interrupts and stops the operation of the servo motor. Refer to section 4.11 for the servo motor equipped with an electromagnetic brake.

(a) Servo-on (RYn0) OFF

The base circuit is shut off and the servo motor coasts.

(b) Alarm occurrence

When an alarm occurs, the base circuit is shut off and the dynamic brake is operated to bring the servo motor to a sudden stop.

(c) Forced stop (EMG) OFF

The base circuit is shut off and the dynamic brake is operated to bring the servo motor to a sudden stop. The servo forced stop warning (AE6) occurs.

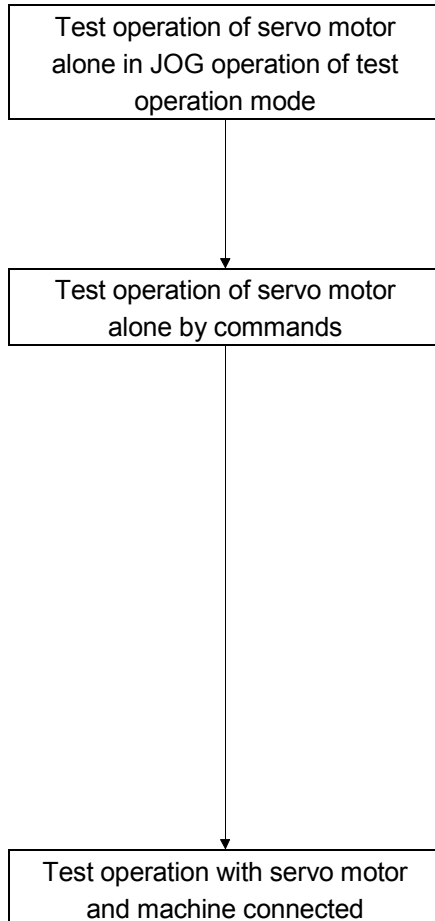
(d) Forward rotation stroke end (LSP), reverse rotation stroke end (LSN) OFF

The droop pulse value is erased and the servo motor is stopped and servo-locked. It can be run in the opposite direction.

16. INDEXER POSITIONING OPERATION

16.5.3 Test operation

Before starting actual operation, perform test operation to make sure that the machine operates normally. Refer to section 16.5.1 for the power on and off methods of the servo amplifier.



In this step, confirm that the servo amplifier and servo motor operate normally.

With the servo motor disconnected from the machine, use the test operation mode and check whether the servo motor correctly rotates at the slowest speed. Refer to section 7.7 and 8.5.7 for the test operation mode.

In this step, confirm that the servo motor correctly rotates at the slowest speed under the commands from the command device. Make sure that the servo motor rotates in the following procedure.

- 1) Switch on the Forced stop (EMG) and Servo-on (RYn0). When the servo amplifier is put in a servo-on status, the Ready (RD) switches on.
- 2) Switch on the Forward rotation stroke end (LSP) or Reverse rotation stroke end (LSN).
- 3) When the point table is designated to switch on the start (RYn1) the servo motor starts rotating. Give a low speed command at first and check the rotation direction, etc. of the servo motor. If the servo motor does not operate in the intended direction, check the input signal.

In this step, connect the servo motor with the machine and confirm that the machine operates normally under the commands from the command device.

Make sure that the servo motor rotates in the following procedure.

- 1) Switch on the Forced stop (EMG) and Servo-on (RYn0). When the servo amplifier is put in a servo-on status, the Ready (RD) switches on.
- 2) Switch on the Forward rotation stroke end (LSP) or Reverse rotation stroke end (LSN).
- 3) When the point table is specified from the command device and the start (RYn1) is turned ON, the servo motor starts rotating. Give a low speed command at first and check the operation direction, etc. of the machine. If the machine does not operate in the intended direction, check the input signal. In the status display, check for any problems of the servo motor speed, load ratio, etc.
- 4) Then, check automatic operation with the program of the command device.

16. INDEXER POSITIONING OPERATION

16.5.4 Parameter setting

POINT									
	<ul style="list-style-type: none"> The encoder cable MR-EKCBL□M-L/H for the HF-MP series • HF-KP series servo motor requires the parameter No.PC22 setting to be changed depending on its length. Check whether the parameter is set correctly. If it is not set correctly, the encoder error 1 (A16) will occur at power-on. 								
	<table border="1"> <thead> <tr> <th>Encoder cable</th> <th>Parameter No.PC22 setting</th> </tr> </thead> <tbody> <tr> <td>MR-EKCBL20M-L/H</td> <td>0□□□ (initial value)</td> </tr> <tr> <td>MR-EKCBL30M-H</td> <td rowspan="3">1□□□</td> </tr> <tr> <td>MR-EKCBL40M-H</td> </tr> <tr> <td>MR-EKCBL50M-H</td> </tr> </tbody> </table>	Encoder cable	Parameter No.PC22 setting	MR-EKCBL20M-L/H	0□□□ (initial value)	MR-EKCBL30M-H	1□□□	MR-EKCBL40M-H	MR-EKCBL50M-H
Encoder cable	Parameter No.PC22 setting								
MR-EKCBL20M-L/H	0□□□ (initial value)								
MR-EKCBL30M-H	1□□□								
MR-EKCBL40M-H									
MR-EKCBL50M-H									

The servo amplifier can be used by merely changing the basic setting parameters (No.PA□□) mainly. As necessary, set the gain filter parameters (No.PB□□), extension setting parameters (No.PC□□) and I/O setting parameters (No.PD□□).

Parameter group	Main description
Basic setting parameter (No.PA□□)	<p>Set the basic setting parameters first. Generally, operation can be performed by merely setting this parameter group.</p> <p>In this parameter group, set the following items.</p> <ul style="list-style-type: none"> Control mode selection (select the position control mode) Regenerative option selection Absolute position detection system selection Setting of command input pulses per revolution Electronic gear setting Auto tuning selection and adjustment In-position range setting Torque limit setting Command pulse input form selection Servo motor rotation direction selection Encoder output pulse setting
Gain filter parameter (No.PB□□)	<p>If satisfactory operation cannot be achieved by the gain adjustment made by auto tuning, execute in-depth gain adjustment using this parameter group.</p> <p>This parameter group must also be set when the gain changing function is used.</p>
Extension setting parameter (No.PC□□)	This parameter group is unique to MR-J3-□T servo amplifier.
I/O setting parameter (No.PD□□)	Set the stopping method of the stroke end (LSP and LSN), torque limit delay time and others.

16. INDEXER POSITIONING OPERATION

16.5.5 Point table setting

Set necessary items to the point table before starting operation. The following table indicates the items that must be set.

Name	Description
Position data	Not used in indexer positioning operation. Do not change this value by any means.
Servo motor speed	Set the command speed of the servo motor for execution of positioning.
Acceleration time constant	Set the acceleration time constant.
Deceleration time constant	Set the deceleration time constant.
Dwell	Not used in indexer positioning operation. Do not change this value by any means.
Auxiliary function	Not used in indexer positioning operation. Do not change this value by any means.

16.5.6 Actual operation

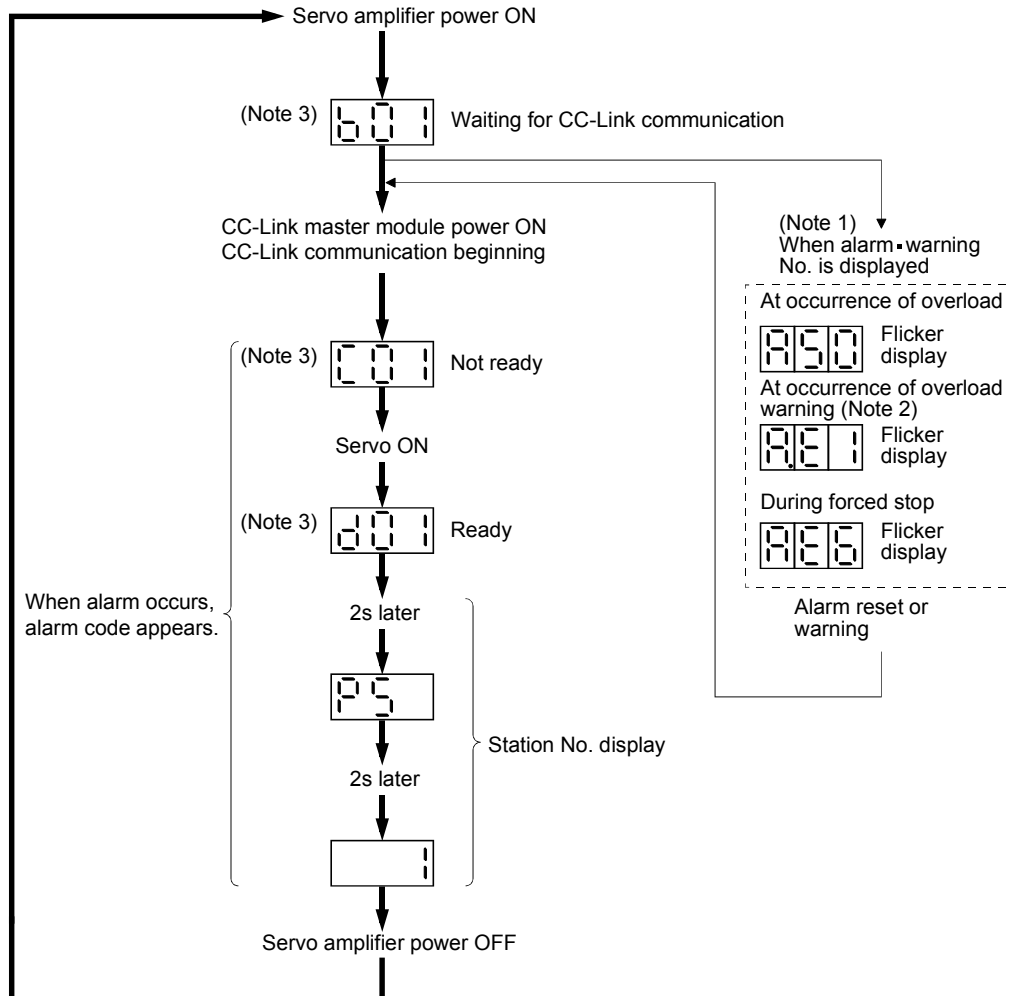
Start actual operation after confirmation of normal operation by test operation and completion of the corresponding parameter settings. Perform a home position return as necessary.

16. INDEXER POSITIONING OPERATION

16.6 Servo amplifier display

On the servo amplifier display (three-digit, seven-segment display), check the status of communication with the CC-Link controller at power-on, check the station number, and diagnose a fault at occurrence of an alarm.

(1) Display sequence



Note 1. Only alarm and warning No. are displayed, but no station No. is displayed.

2. If warning other than AE6 occurs during the servo on, flickering the second place of decimal point indicates that it is during the servo on.
3. The right-hand segments of b01, c02 and d64 indicate the axis number.
(Below example indicates Station No.1)

b01	c02	...	d64
Station No.1	Station No.2		Station No.64

16. INDEXER POSITIONING OPERATION

(2) Indication list

Indication	Status	Description
b###	Waiting for CC-Link communication	<ul style="list-style-type: none"> Power of the CC-Link master module was switched on at the condition that the power of CC-Link master module is OFF. The CC-Link master module is faulty.
(Note 1) d###	Ready	The servo was switched on after completion of initialization and the servo amplifier is ready to operate. (This is indicated for 2 seconds.)
(Note 1) C###	Not ready	The servo amplifier is being initialized or an alarm has occurred.
(Note 2) \$\$\$	Ready for operation	Two seconds have passed after the servo amplifier is ready to operate by turning ON the servo-on (RYn1).
(Note 3) A**	Alarm · Warning	The alarm No./warning No. that occurred is displayed. (Refer to section 16.12.4.)
888	CPU error	CPU watchdog error has occurred.
(Note 4) b00	(Note 4) Test operation mode	JOG operation · positioning operation · programmed operation · DO forced output
(Note 1) d### C###		Motor-less operation

Note 1. ## denotes any of numerals 00 to 16 and what it means is listed below.

##	Description
00	Set to the test operation mode.
01	Station number 1
02	Station number 2
03	Station number 3
:	:
:	:
62	Station number 62
63	Station number 63
64	Station number 64

Note 2. \$\$\$ indicates numbers from 0 to 254, and the number indicates the executing station number.

3. ** indicates the warning/alarm No.

4. Requires MR Configurator or MR-PRU03 parameter module.

16. INDEXER POSITIONING OPERATION

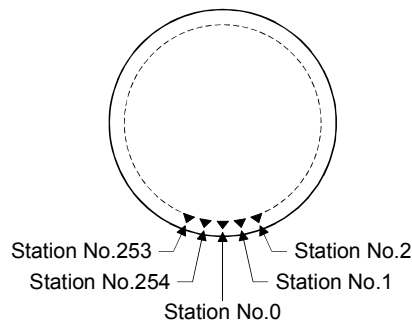
16.7 Automatic operation mode

POINT
<ul style="list-style-type: none"> ▪ In the absolute position detection system, the following restriction condition applies for the number of gears on machine-side (parameter No.PA06 CMX) and servo motor speed (N). <ul style="list-style-type: none"> ▪ When $CMX \leq 2000$, $N < 3076.7$ r/min ▪ When $CMX > 2000$, $N < 3276.7 - CMX$ r/min ▪ When the servo motor is operated at servo motor speed higher than the limit value, the absolute position counter warning (AE3) occurs.

16.7.1 What is automatic operation mode?

(1) Concept of indexer

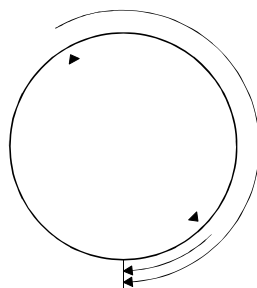
Select the station, which is dividing the circumference (360 degrees) of the machine side into up to 255, using 8-bit device of the next station selection 1 to 8 (RYnA to RYnE, and RY(n+2)3 to RY(n+2)5), and execute positioning.



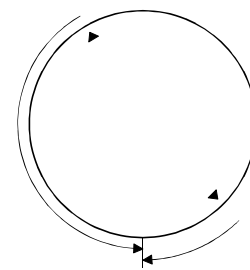
Set the number of stations in the parameter No.PC46.

(2) Rotation direction

There are two types of operation methods: Rotation direction specifying indexer, which is to always rotate in the fixed direction and execute positioning to a station, and Shortest rotating indexer, which is to automatically change the rotation direction for the shortest distance and execute positioning to a station.



Rotation direction specifying indexer



Shortest rotating indexer

16. INDEXER POSITIONING OPERATION

16.7.2 Automatic operation mode 1 (Rotation direction specifying indexer)

In this operation mode, the servo motor rotates in the fixed direction and executes positioning to a station.

(1) When not using the remote register

Select the station number using 8-bit device of the next station selection 1 to 8 (RYnA to RYnE, and RY(n+2)3 to RY(n+2)5), and execute positioning. For the servo motor speed and acceleration/ deceleration time constant during operation, the value set in the point table is used.

(a) Device/Parameter

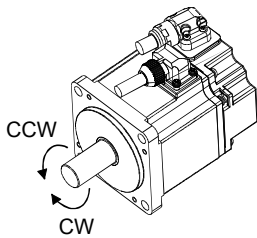
Set the input devices and parameters as indicated below.

Item	Device/Parameter	Setting description
Indexer positioning operation selection	Parameter No.PA01	1□□□: Select the indexer positioning operation.
Automatic operation mode 1 (Rotation direction specifying indexer) selection	Operation mode selection 1 (RYn6)	Turn off RYn6.
	Operation mode selection 2 (RYn7)	Turn on RYn7.

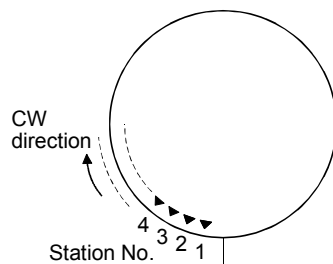
(b) Other parameter settings

1) Setting the allocation direction of station numbers

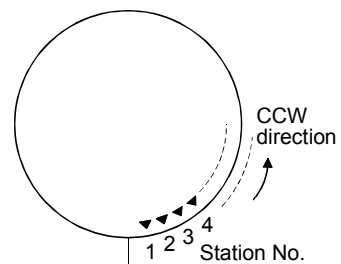
Select the allocation direction of station numbers using the parameter No.PA14 (Station No. direction selection).



Parameter No.PA14 setting	Station No. allocation direction Start (RYn1) ON
0 (Initial value)	Station No. is allocated in CW direction in order of 1, 2, 3...
1	Station No. is allocated in CCW direction in order of 1, 2, 3...



Parameter No.PA14: 0 (Initial value)

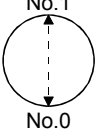
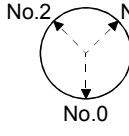
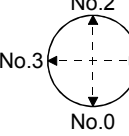
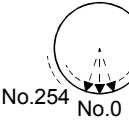


Parameter No.PA14: 1

16. INDEXER POSITIONING OPERATION

2) Setting the number of stations

Set the number of stations in the parameter No.PC46.

	Parameter No.PC46 setting value				
	0000 to 0002	0003	0004	...	00FF
Number of stations	2	3	4	...	255
Station No.				...	

(c) Setting the speed data

Set the servo motor speed, acceleration time constant, and deceleration time constant in the point table number 1 to 8.

Name	Setting range	Unit	Description
Servo motor speed	0 to permissible speed	r/min	Set the command speed of the servo motor for execution of positioning. The setting should be equal to or less than the instantaneous permissible speed of the servo motor.
Acceleration time constant	0 to 20000	ms	Set the time until the rated speed of the servo motor is reached.
Deceleration time constant	0 to 20000	ms	Set the time until the servo motor running at rated speed comes to a stop.

(d) Operation

Select the station number for positioning, using 8-bit device of the next station selection 1 to 8 (RYnA to RYnE, and RY(n+2)3 to RY(n+2)5).

(Note) Device								Station No.
2 stations occupied			1 stations occupied					
RY(n+2)5	RY(n+2)4	RY(n+2)3	RYnE	RYnD	RYnC	RYnB	RYnA	
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	1	1
0	0	0	0	0	0	1	0	2
0	0	0	0	0	1	0	1	3
.
.
.
1	1	1	1	1	1	0	1	253
1	1	1	1	1	1	1	0	254

Note. 0: OFF

1: ON

16. INDEXER POSITIONING OPERATION

Select the point table using the speed selection 1 (RY(n+2)C) to speed selection 3 (RY(n+2)E). Turn on the start (RYn1) to execute positioning with the speed data set in the point table. Rotation direction of the servo motor is the direction set in the rotation direction specifying (RYn2). When one station is occupied, RY(n+2)C, RY(n+2)D, and RY(n+2)E are not available so that the point table number cannot be selected. Use point table No.1 when one station is occupied.

(Note) Device			Point table No.
RY(n+2)E	RY(n+2)D	RY(n+2)C	
0	0	0	1
0	0	1	2
0	1	0	3
0	1	1	4
1	0	0	5
1	0	1	6
1	1	0	7
1	1	1	8

Note. 0: OFF

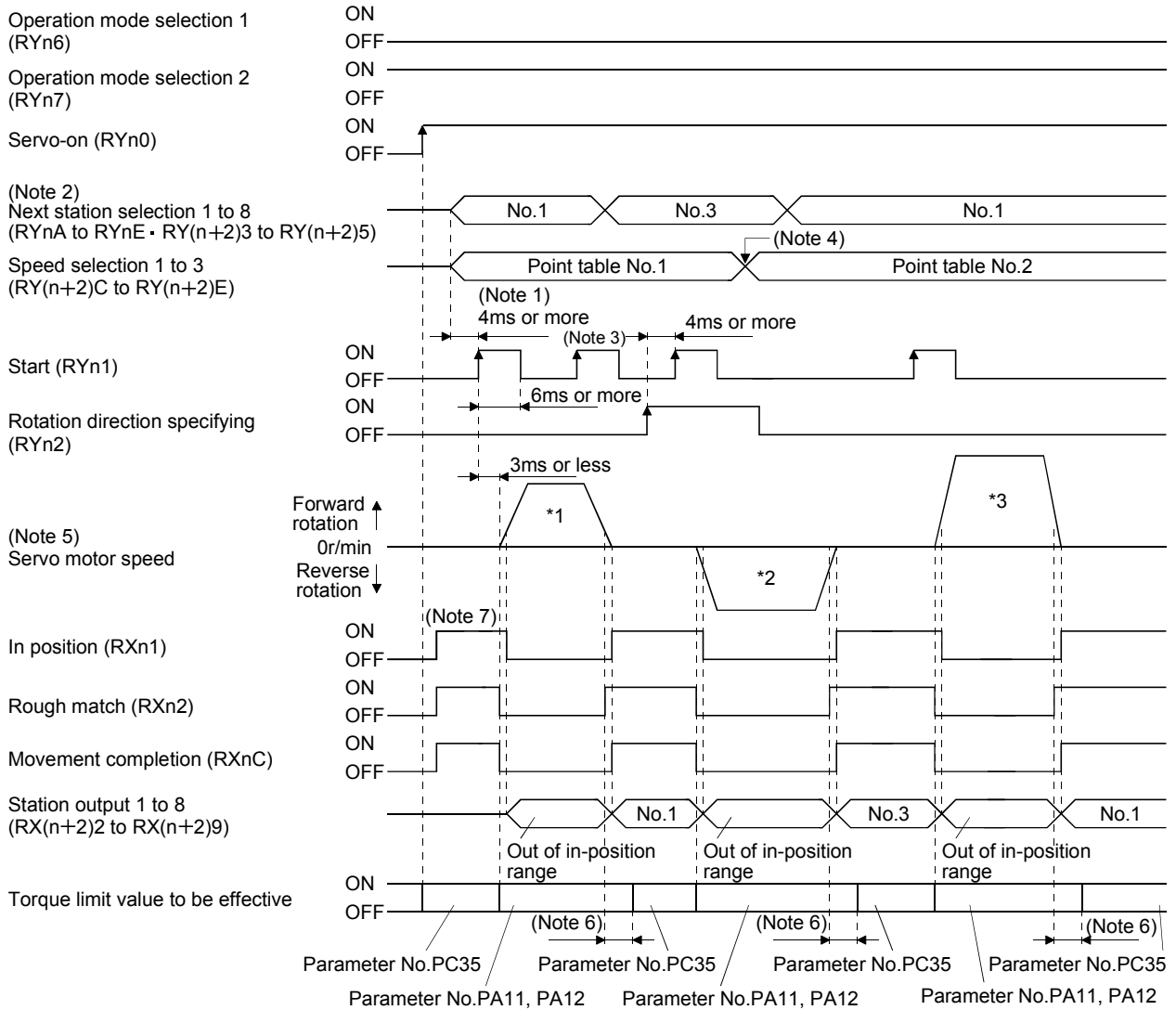
1: ON

16. INDEXER POSITIONING OPERATION

(e) Timing chart

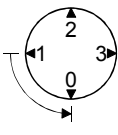
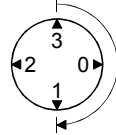
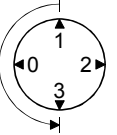
POINT	<ul style="list-style-type: none"> Always execute a home position return. The home positioning incomplete (A90) occurs when turning on the start (RYn1) without executing a home position return.
-------	--

The timing chart is shown below.



16. INDEXER POSITIONING OPERATION

- Note 1. Configure a sequence that changes the next station selection (RYnA to RYnE and RY(n+2)3 to RY(n+2)5) and speed selection (RY(n+2)C to RY(n+2)E) earlier, considering the delay time of CC-Link communication.
- When the selected station number exceeds the value that is dividing number set in the parameter No.PC46 minus one, the next station warning (A97) occurs.
 - The start (RYn1) is invalid even if it is turned on during operation. When executing another operation, turn on RYn1 after the movement completion (RXnC) turns on.
 - Change of the servo motor speed and acceleration/deceleration time constant by the speed selection 1 (RY(n+2)C) to speed selection 3 (RY(n+2)E) becomes effective when the start (RYn1) turns on. Even if the speed selection 1 to 3 are changed during servo motor rotation, they do not become effective.
 - The following shows the operation to be executed.

Operation	*1	*2	*3
Station	No.1	No.3	No.1
Servo motor speed Acceleration/deceleration time constant	Point table No.1	Point table No.1	Point table No.2
Positioning			

- Delay time from when RXn1 turns on until the torque limit value changes to the parameter No.PC35 value can be set in the parameter No.PD26.
- After power-on, if the current position is within the in-position range of each station, the in position (RXn1) turns on.

(2) When using the remote register

Select the station number using the next station (RWwn+4) remote register and execute positioning. For the speed data during operation, select the point table number using the point table No./Speed command data (RWwn+6) remote register, or directly set the servo motor speed.

(a) Device/Parameter

Set the input devices and parameters as indicated below.

Item	Device/Parameter	Setting description
Indexer positioning operation selection	Parameter No.PA01	1□□□: Select the indexer positioning operation.
Speed data setting method selection	Parameter No.PC30	Select the setting method for speed data. □□0□: Uses the point table setting value. □□1□: Uses the servo motor speed setting value for the point table No./Speed command data (RWwn+6) remote register. In the case, always set the acceleration/deceleration time constant in the point table No.1. (Refer to (2) (c) in this section.)
Automatic operation mode 1 (Rotation direction specifying indexer) selection	Operation mode selection 1 (RYn6)	Turn off RYn6.
	Operation mode selection 2 (RYn7)	Turn on RYn7.
Position/speed specifying system selection	Position/speed specifying system selection (RY(n+2)A)	Turn on RY(n+2)A.

16. INDEXER POSITIONING OPERATION

(b) Other parameter settings

1) Setting the servo motor rotation direction and allocation direction of station numbers

Select the allocation direction of station numbers using the parameter No.PA14 (Station No. direction selection). Setting is the same as that for when not using the remote register. Refer to (1) (b) 1) in this section.

2) Setting the number of stations

Set the number of stations in the parameter No.PC46. Setting is the same as that for when not using the remote register. Refer to (1) (b) 2) in this section.

(c) Setting the speed data

1) When using the speed data of point table

Set the servo motor speed, acceleration time constant, and deceleration time constant in the point table number 1 to 8.

Name	Setting range	Unit	Description
Servo motor speed	0 to permissible speed	r/min	Set the command speed of the servo motor for execution of positioning. The setting should be equal to or less than the instantaneous permissible speed of the servo motor.
Acceleration time constant	0 to 20000	ms	Set the time until the rated speed of the servo motor is reached.
Deceleration time constant	0 to 20000	ms	Set the time until the servo motor running at rated speed comes to a stop.

(2) When directly setting the servo motor speed (only when two stations are occupied)

Set the followings because the acceleration time constant and deceleration time constant of the point table No.1 are used.

Name	Setting range	Unit	Description
Servo motor speed	0 to permissible speed	r/min	Setting is not required.
Acceleration time constant	0 to 20000	ms	Set the time until the rated speed of the servo motor is reached.
Deceleration time constant	0 to 20000	ms	Set the time until the servo motor running at rated speed comes to a stop.

(d) Operation

1) When using the speed data of point table

Set the station number for positioning by using the next station (RWwn+4) remote register. Set the point table number in the point table No./Speed command data (RWwn+6) remote register. Turn on the start (RYn1) to execute positioning with the speed data set in the point table.

2) When directly setting the servo motor speed (only when two stations are occupied)

Set the station number for positioning by using the next station (RWwn+4) remote register. Set the servo motor speed in the point table No./Speed command data (RWwn+6) remote register. Turn on the start (RYn1) to execute positioning with the servo motor speed set in RWwn+6 and the acceleration time constant and deceleration time constant set in the point table No.1.

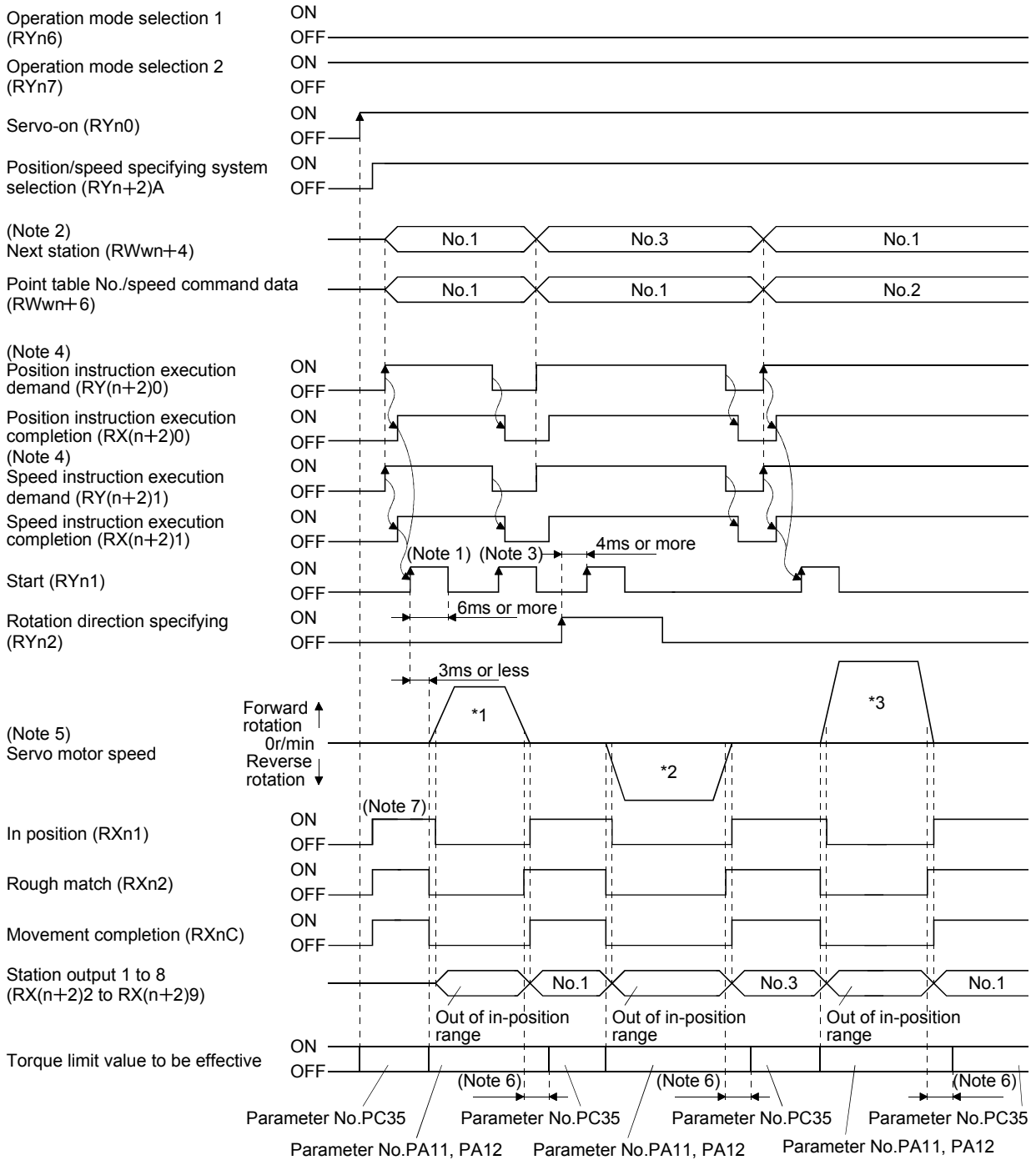
16. INDEXER POSITIONING OPERATION

(e) Timing chart

POINT
<ul style="list-style-type: none"> Always execute a home position return. The home positioning incomplete (A90) occurs when turning on the start (RYn1) without executing a home position return.

The timing chart is shown below.

1) When using the speed data of point table



16. INDEXER POSITIONING OPERATION

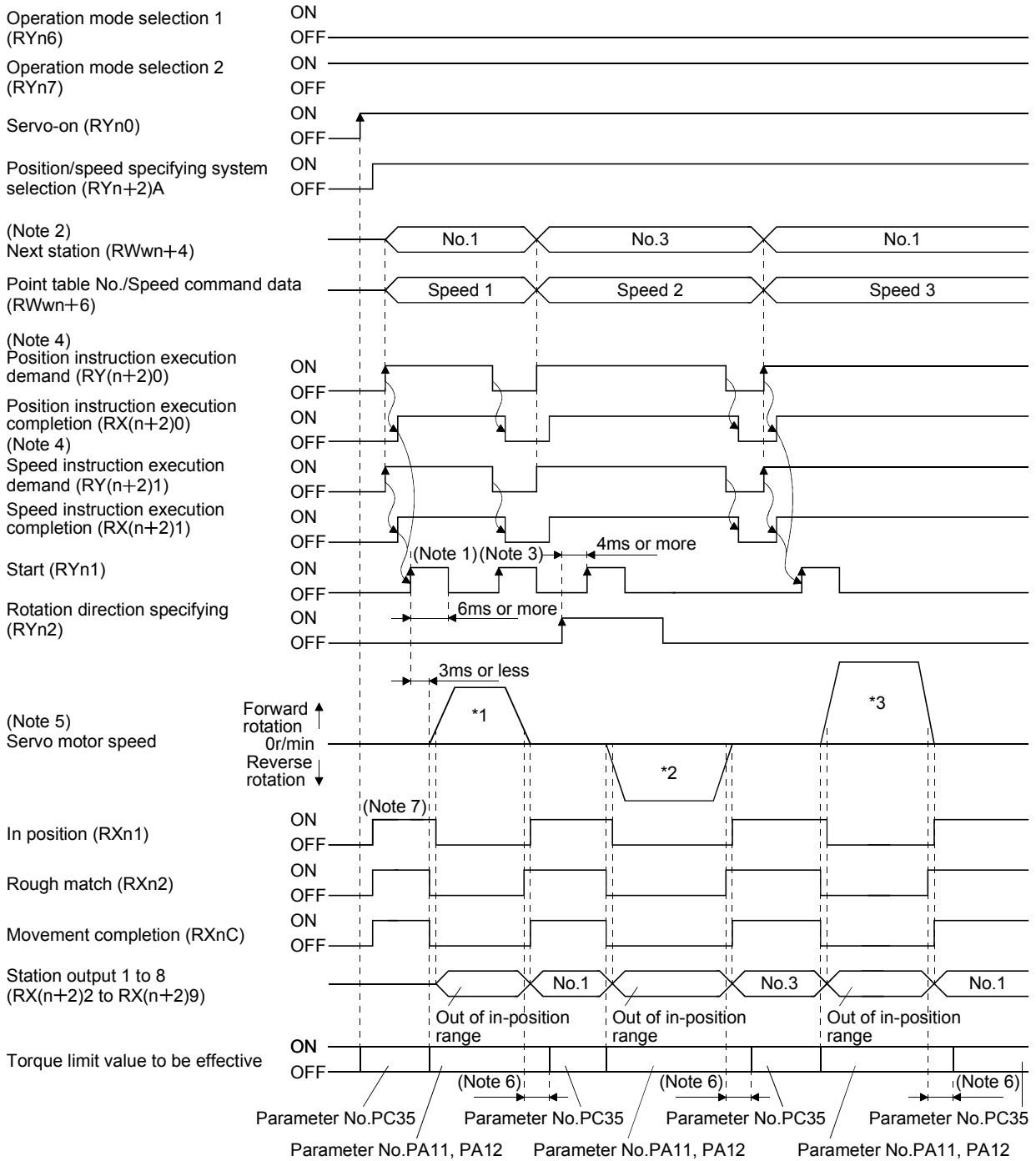
- Note 1. Configure a sequence that changes RWwn+4 and RWwn+6 earlier, considering the delay time of CC-Link communication.
2. When the selected station number exceeds the value that is dividing number set in the parameter No.PC46 minus one, the next station warning (A97) occurs
 3. The start (RYn1) is invalid even if it is turned on during operation. When executing another operation, turn on RYn1 after the movement completion (RXnC) turns on.
 4. For details of the operation timing of RY(n+2)0 and RY(N+2)1, refer to the section 3.6.2 (3).
 5. The following shows the operation to be executed.

Operation	*1	*2	*3
Station	No.1	No.2	No.3
Servo motor speed Acceleration/deceleration time constant	Point table No.1	Point table No.1	Point table No.2
Positioning			

6. Delay time from when RXn1 turns on until the torque limit value changes to the parameter No.PC35 value can be set in the parameter No.PD26.
7. After power-on, if the current position is with the in-position range of each station, the in position (RXn1) turns on.

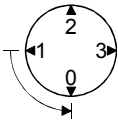
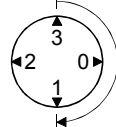
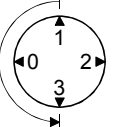
16. INDEXER POSITIONING OPERATION

2) When directly setting the servo motor speed



16. INDEXER POSITIONING OPERATION

- Note 1. Configure a sequence that changes RWwn+4 and RWwn+6 earlier, considering the delay time of CC-Link communication.
2. When the selected station number exceeds the value that is dividing number set in the parameter No.PC46 minus one, the next station warning (A97) occurs.
 3. The start (RYn1) is invalid even if it is turned on during operation. When executing another operation, turn on RYn1 after the movement completion (RXnC) turns on.
 4. For details of the operation timing of RY(n+2)0 and RY(N+2)1, refer to the section 3.6.2 (3).
 5. The following shows the operation to be executed.

Operation	*1	*2	*3
Station	No.1	No.3	No.1
Servo motor speed	Speed 1	Speed 2	Speed 3
Acceleration/deceleration time constant	Point table No.1	Point table No.1	Point table No.1
Positioning			

6. Delay time from when RXn1 turns on until the torque limit value changes to the parameter No.PC35 value can be set in the parameter No.PD26.
7. After power-on, if the current position is with the in-position range of each station, the in position (RXn1) turns on.

16. INDEXER POSITIONING OPERATION

16.7.3 Automatic operation mode 2 (Shortest rotating indexer)

In this operation mode, the servo motor automatically changes the direction for the shortest distance and executes positioning.

(1) When not using the remote register

Select the station number using 8-bit device of the next station selection 1 to 8 (RYnA to RYnE, and RY(n+2)3 to RY(n+2)5), and execute positioning. For the servo motor speed and acceleration/ deceleration time constant during operation, the value set in the point table is used.

(a) Device/Parameter

Set the input devices and parameters as indicated below.

Item	Device/Parameter	Setting description
Indexer positioning operation selection	Parameter No.PA01	1□□□: Select the indexer positioning operation.
Automatic operation mode 2 (Rotation direction specifying indexer) selection	Operation mode selection 1 (RYn6)	Turn on MD0.
	Operation mode selection 2 (RYn7)	Turn on MD1.

(b) Other parameter settings (Setting the number of stations)

Set the number of stations in the parameter No.PC46. Setting is the same as that for the automatic operation mode 1. Refer to (1) (b) 2) in section 16.7.2.

In the automatic operation mode 2, the station No. direction selection (parameter No.PA14) is not used.

(c) Setting the speed data

Set the servo motor speed, acceleration time constant, and deceleration time constant in the point table number 1 to 8. Setting is the same as that for the automatic operation mode 1. Refer to (1) (c) in section 16.7.2.

(d) Operation

Select the station number for positioning, using 8-bit device of the next station selection 1 to 8 (RYnA to RYnE, and RY(n+2)3 to RY(n+2)5).

(Note) Device								Station No.
2 stations occupied			1 stations occupied					
RY(n+2)5	RY(n+2)4	RY(n+2)3	RYnE	RYnD	RYnC	RYnB	RYnA	
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	1	1
0	0	0	0	0	0	1	0	2
0	0	0	0	0	1	0	1	3
.
.
.
1	1	1	1	1	1	1	0	253
1	1	1	1	1	1	1	1	254

Note. 0: OFF
1: ON

16. INDEXER POSITIONING OPERATION

Select the point table using the speed selection 1 (RY(n+2)C) to speed selection 3 (RY(n+2)E). Turn on the start (RYn1) to execute positioning with the speed data set in the point table. When one station is occupied, RY(n+2)C, RY(n+2)D, and RY(n+2)E are not available so that the point table number cannot be selected. Use the point table No.1 when one station is occupied.

(Note) Device			Pint table No.
RY(n+2)E	RY(n+2)D	RY(n+2)C	
0	0	0	1
0	0	1	2
0	1	0	3
0	1	1	4
1	0	0	5
1	0	1	6
1	1	0	7
1	1	1	8

Note. 0: OFF

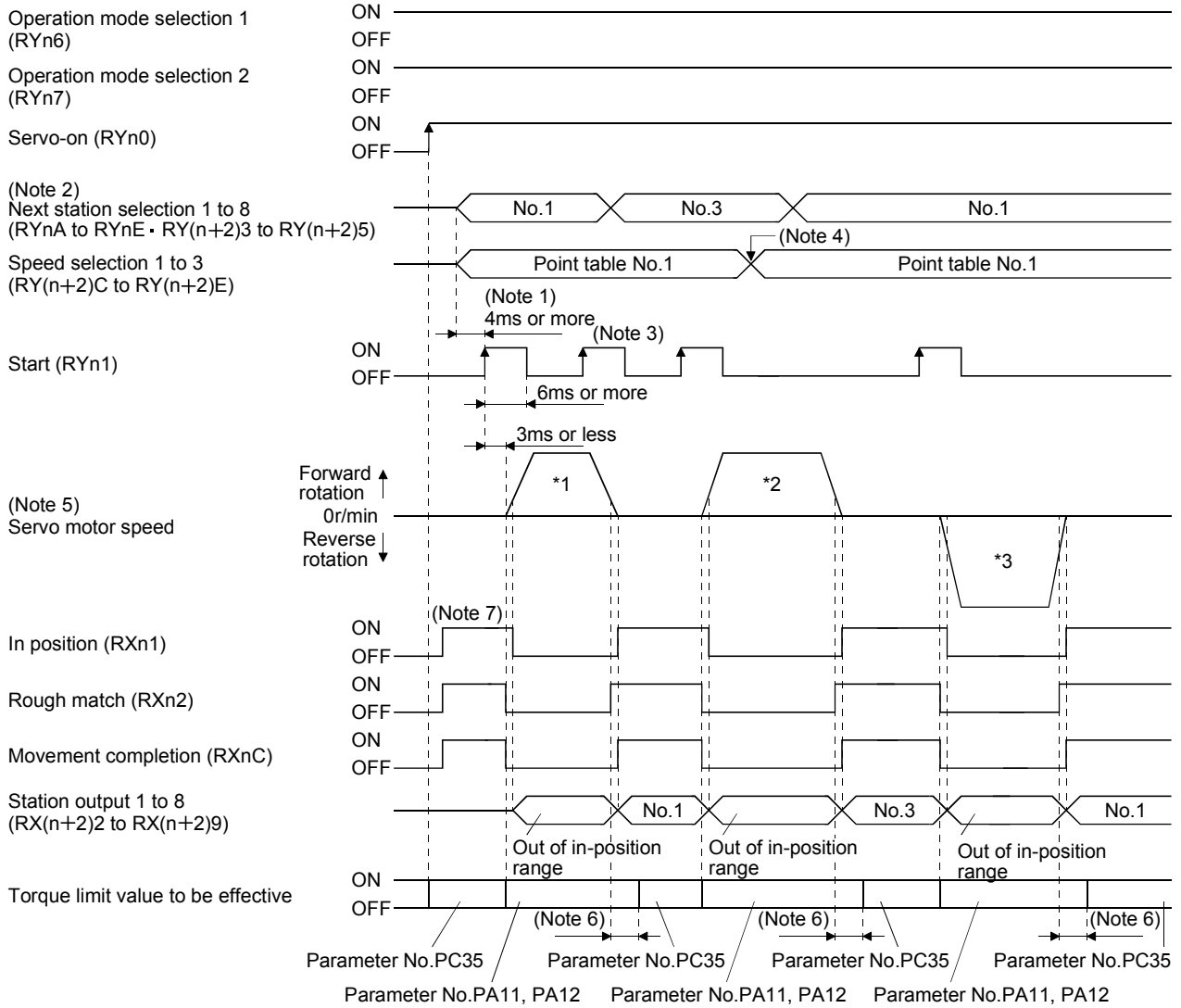
1: ON

16. INDEXER POSITIONING OPERATION

(e) Timing chart

POINT
<ul style="list-style-type: none"> Always execute a home position return. The home positioning incomplete (A90) occurs when turning on the start (RYn1) without executing a home position return.

The timing chart is shown below.



16. INDEXER POSITIONING OPERATION

- Note 1. Configure a sequence that changes the next station selection (RYnA to RYnE and RY(n+2)3 to RY(n+2)5) and speed selection (RY(n+2)C to RY(n+2)E) earlier, considering the delay time of CC-Link communication.
- When the selected station number exceeds the value that is dividing number set in the parameter No.PC46 minus one, the next station warning (A97) occurs.
 - The start (RYn1) is invalid even if it is turned on during operation. When executing another operation, turn on RYn1 after the movement completion (RXnC) turns on.
 - Change of the servo motor speed and acceleration/deceleration time constant by the speed selection 1 (RY(n+2)C) to speed selection 3 (RY(n+2)E) becomes effective when the start (RYn1) turns on. Even if the speed selection 1 to 3 are changed during servo motor rotation, they do not become effective.
 - The following shows the operation to be executed.

Operation	*1	*2	*3
Station	No.1	No.3	No.1
Servo motor speed Acceleration/deceleration time constant	Point table No.1	Point table No.1	Point table No.2
Positioning			

- Delay time from when RXn1 turns on until the torque limit value changes to the parameter No.PC35 value can be set in the parameter No.PD26.
- After power-on, if the current position is with the in-position range of each station, the in position (RXn1) turns on.

(2) When using the remote register

Select the station number using the next station (RWwn+4) remote register and execute positioning. For the speed data during operation, select the point table number using the point table No./Speed command data (RWwn+6) remote register, or directly set the servo motor speed.

(a) Device/Parameter

Set the input devices and parameters as indicated below.

Item	Device/Parameter	Setting description
Indexer positioning operation selection	Parameter No.PA01	1□□□: Select the indexer positioning operation.
Speed data setting method selection	Parameter No.PC30	Select the setting method for speed data. □□0□: Uses the point table setting value. □□1□: Uses the servo motor speed setting value for the point table No./Speed command data (RWwn+6) remote register. In the case, always set the acceleration/deceleration time constant in the point table No.1. (Refer to (2) (c) in this section.)
Automatic operation mode 2 (Rotation direction specifying indexer) selection	Operation mode selection 1 (RYn6)	Turn on RYn6.
	Operation mode selection 2 (RYn7)	Turn on RYn7.
Position/speed specifying system selection	Position/speed specifying system selection (RY(n+2)A)	Turn on RY(n+2)A.

16. INDEXER POSITIONING OPERATION

(b) Other parameter settings (Setting the number of stations)

Set the number of stations in the parameter No.PC46. Setting is the same as that for the automatic operation mode 1. Refer to (1) (b) 2) in section 16.7.2.

In the automatic operation mode 2, the station No. direction selection (parameter No.PA14) is not used.

(c) Setting the speed data

1) When using the speed data of point table

Set the servo motor speed, acceleration time constant, and deceleration time constant in the point table number 1 to 7. Setting is the same as that for the automatic operation mode 1. Refer to (2) (c) 1) in section 16.7.2.

2) When directly setting the servo motor speed (only when two stations are occupied)

Set the followings because the acceleration time constant and deceleration time constant of the point table No.1 are used. Setting is the same as that for the automatic operation mode 1. Refer to (2) (c) 2) in section 16.7.2.

(d) Operation

1) When using the speed data of point table

Set the station number for positioning by using the next station (RWwn+4) remote register. Set the point table number in the point table No./Speed command data (RWwn+6) remote register. Turn on the start (RYn1) to execute positioning with the speed data set in the point table.

2) When directly setting the servo motor speed (only when two stations are occupied)

Set the station number for positioning by using the next station (RWwn+4) remote register. Set the servo motor speed in the point table No./Speed command data (RWwn+6) remote register. Turn on the start (RYn1) to execute positioning with the servo motor speed set in RWwn+6 and the acceleration time constant and deceleration time constant set in the point table No.1.

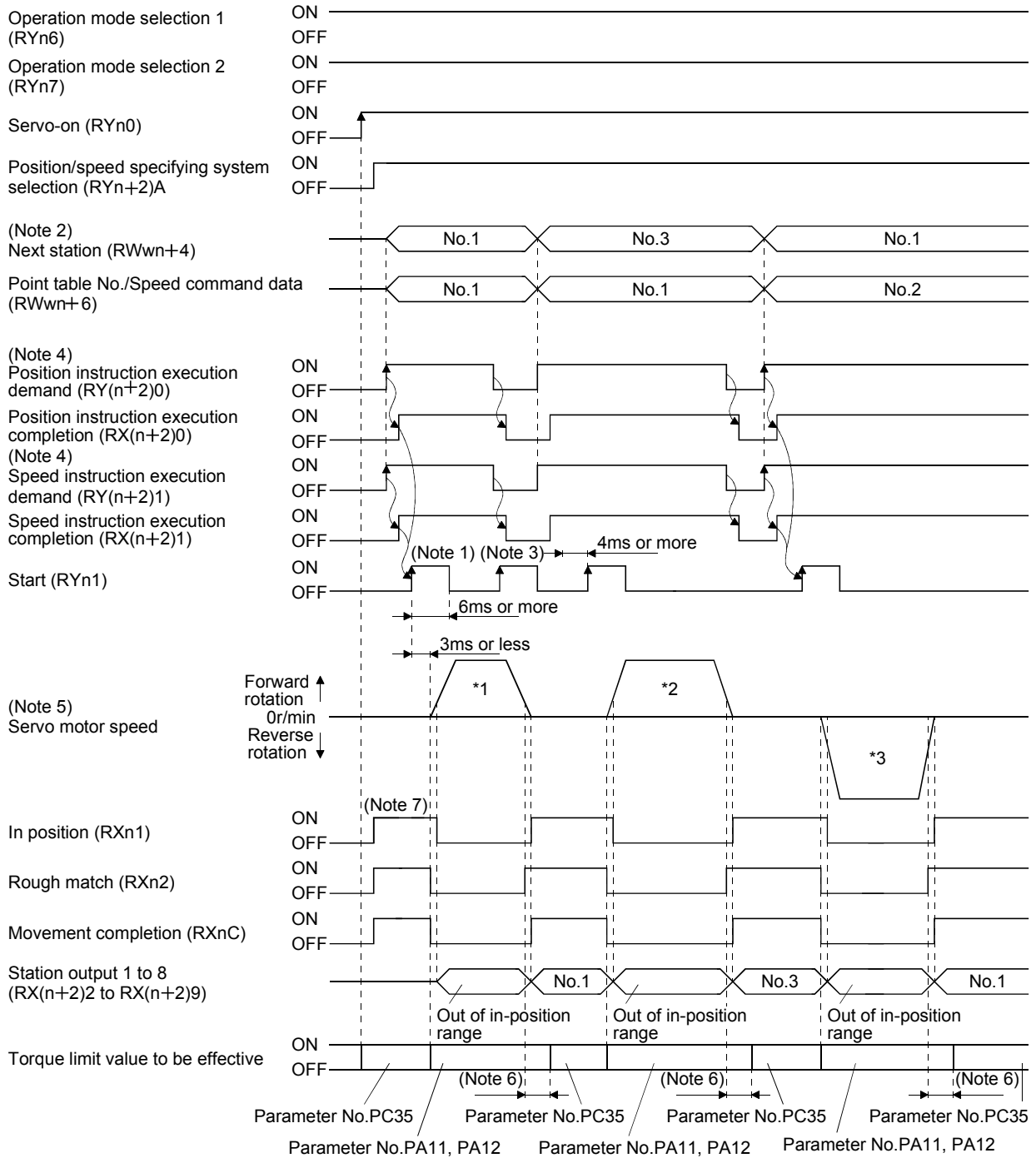
16. INDEXER POSITIONING OPERATION

(e) Timing chart

POINT
<ul style="list-style-type: none"> Always execute a home position return. The home positioning incomplete (A90) occurs when turning on the start (RYn1) without executing a home position return.

The timing chart is shown below.

1) When using the speed data of point table



16. INDEXER POSITIONING OPERATION

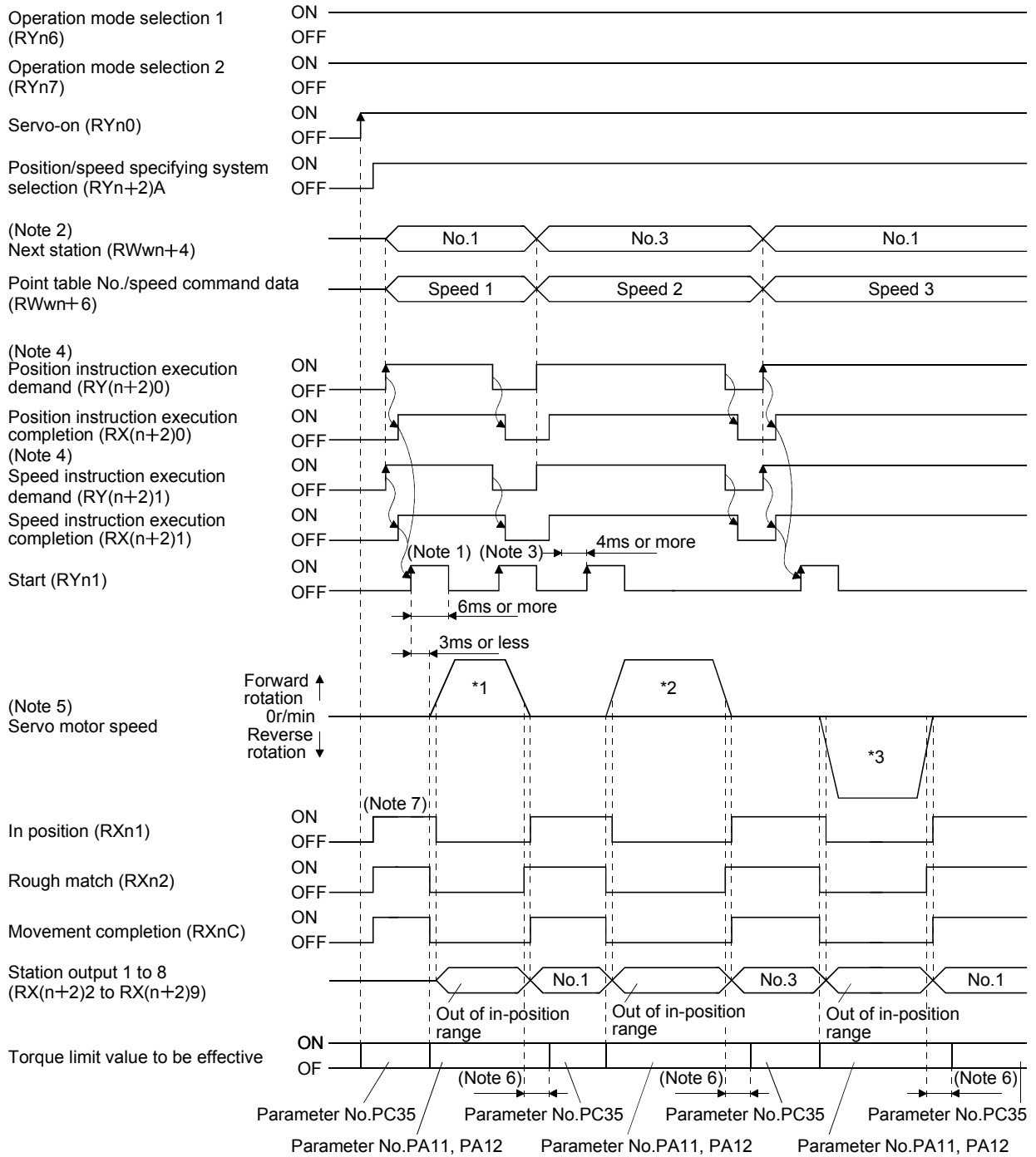
- Note 1. Configure a sequence that changes RWwn+4 and RWwn+6 earlier, considering the delay time of CC-Link communication.
2. When the selected station number exceeds the value that is dividing number set in the parameter No.PC46 minus one, the next station warning (A97) occurs.
 3. The start (RYn1) is invalid even if it is turned on during operation. When executing another operation, turn on RYn1 after the movement completion (RXnC) turns on.
 4. For details of the operation timing of RY(n+2)0 and RY(N+2)1, refer to the section 3.6.2 (3).
 5. The following shows the operation to be executed.

Operation	*1	*2	*3
Station	No.1	No.3	No.1
Servo motor speed Acceleration/deceleration time constant	Point table No.1	Point table No.1	Point table No.2
Positioning			

6. Delay time from when RXn1 turns on until the torque limit value changes to the parameter No.PC35 value can be set in the parameter No.PD26.
7. After power-on, if the current position is with the in-position range of each station, the in position (RXn1) turns on.

16. INDEXER POSITIONING OPERATION

2) When directly setting the servo motor speed (only when 2 stations are occupied)



16. INDEXER POSITIONING OPERATION

- Note 1. Configure a sequence that changes RWwn+4 and RWwn+6 earlier, considering the delay time of CC-Link communication.
2. When the selected station number exceeds the value that is dividing number set in the parameter No.PC46 minus one, the next station warning (A97) occurs.
 3. The start (RYn1) is invalid even if it is turned on during operation. When executing another operation, turn on RYn1 after the movement completion (RXnC) turns on.
 4. For details of the operation timing of RY(n+2)0 and RY(N+2)1, refer to the section 3.6.2 (3).
 5. The following shows the operation to be executed.

Operation	*1	*2	*3
Station	No.1	No.3	No.1
Servo motor speed	Speed 1	Speed 2	Speed 3
Acceleration/deceleration time constant	Point table No.1	Point table No.1	Point table No.1
Positioning			

6. Delay time from when RXn1 turns on until the torque limit value changes to the parameter No.PC35 value can be set in the parameter No.PD26.
7. After power-on, if the current position is with the in-position range of each station, the in position (RXn1) turns on.

16. INDEXER POSITIONING OPERATION

16.8 Manual operation mode

For adjusting the machine or home position, JOG operation or indexer JOG operation can be used to move the position to any position.

16.8.1 Indexer JOG operation

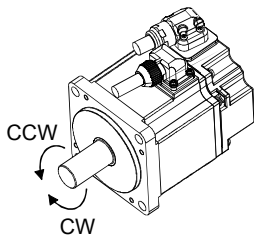
(1) Setting

Set the devices and parameters as indicated below according to the purpose of use. In this case, the next station selection 1 to 8 (RYnA to RYnE and RY(n+2)3 to RY(n+2)5) and the speed selection 1 to 3 (RY(n+2)C to RY(n+2)E) are invalid.

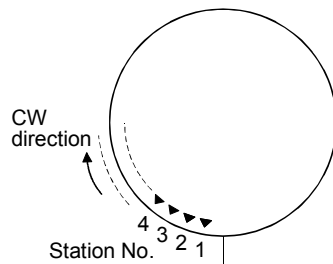
Item	Device/Parameter	Setting description
Indexer positioning operation selection	Parameter No.PA01	1□□□: Select the indexer positioning operation.
Manual operation mode selection	Operation mode selection 1 (RYn6)	Turn on RYn6.
	Operation mode selection 2 (RYn7)	Turn off RYn7.
Indexer JOG operation selection	Parameter No.PC45	Set it to "□□□0 (Initial value)"
Station No. direction	Parameter No.PA14	Refer to (2) in this section.
JOG speed	Point table No.1	Use the servo motor speed in the point table No.1.
Acceleration/deceleration time constant	Point table No.1	Use the acceleration/deceleration time constant in the point table No.1.

(2) Setting the allocation direction of station numbers

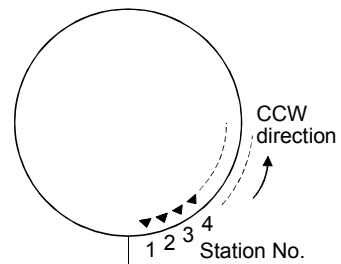
Select the allocation direction of station numbers using the parameter No.PA14 (Station No. direction selection).



Parameter No.PA14 setting	Station No. allocation direction Start (RYn1) ON
0 (Initial value)	Station No. is allocated in CW direction in order of 1, 2, 3...
1	Station No. is allocated in CCW direction in order of 1, 2, 3...



Parameter No.PA14: 0 (Initial value)



Parameter No.PA14: 1

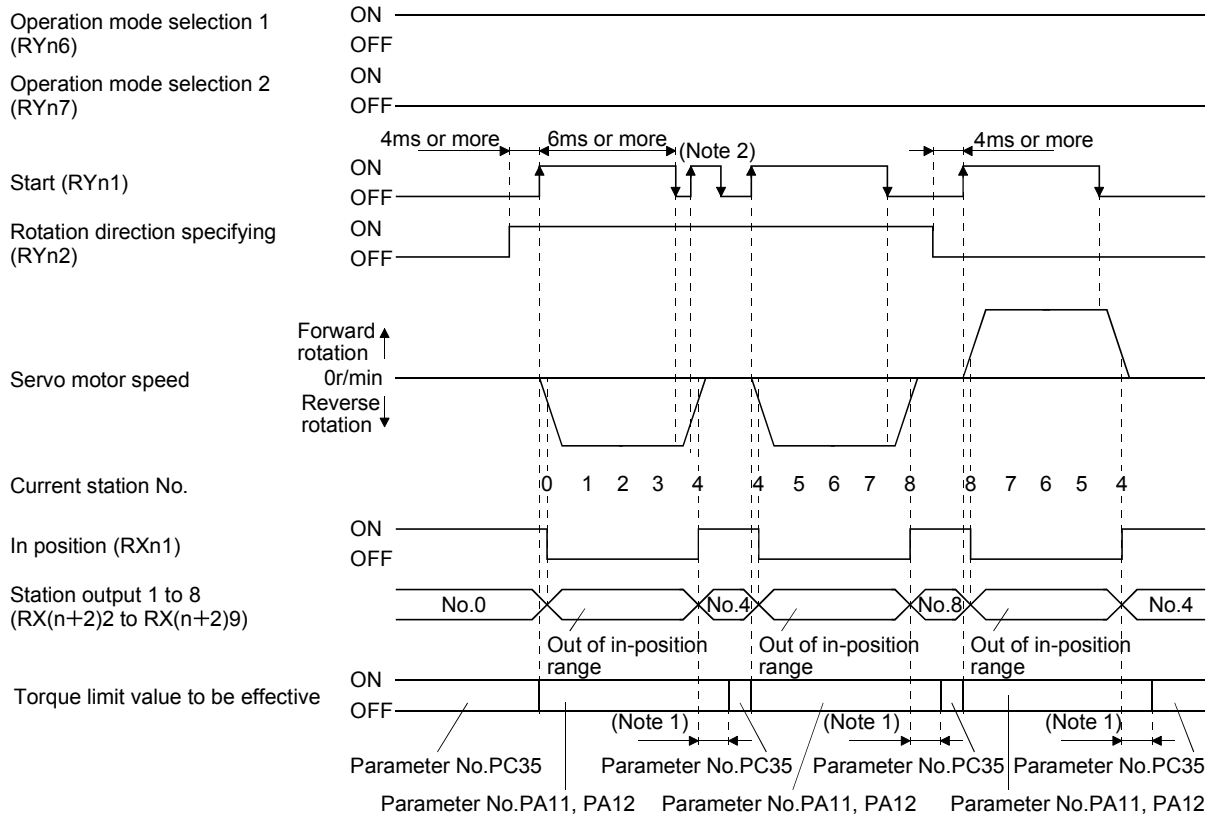
16. INDEXER POSITIONING OPERATION

(3) Operation

Turn on the start (RYn1) to operate the servo motor with the servo motor speed, acceleration time constant, and deceleration time constant set in the point table No.1. Turning off RYn1 makes the servo motor execute positioning to the station where the servo motor can decelerate to stop. For the rotation direction, refer to (2) in this section.

(4) Timing chart

The following timing chart shows an example when executing the indexer JOG operation from the status where the servo motor is at a stop on the station No.0 when the servo-on is turned on.



Note 1. Torque limit delay time can be set in the parameter No.PD26.

2. The start (RYn1) is invalid even if it is turned on during operation. When executing another operation, turn on RYn1 after the movement completion (RXnC) turns on.

16. INDEXER POSITIONING OPERATION

16.8.2 JOG operation

(1) Setting

Set the devices and parameters as indicated below for the purpose of use. In this case, the next station selection 1 to 8 (RYnA to RYnE and RY(n+2)3 to RY(n+2)5) and the speed selection 1 to 3 (RY(n+2)C to RY(n+2)E) are invalid.

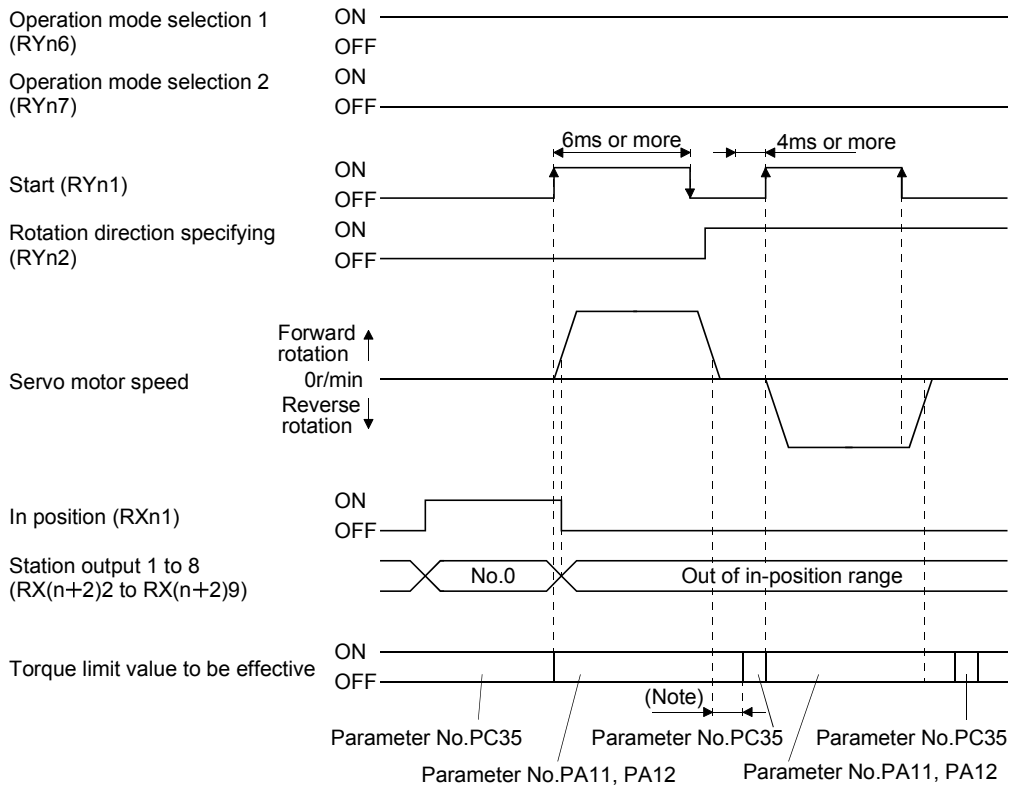
Item	Device/Parameter	Setting description
Indexer positioning operation selection	Parameter No.PA01	1□□□: Select the indexer positioning operation.
Manual operation mode selection	Operation mode selection 1 (RYn6)	Turn on RYn6
	Operation mode selection 2 (RYn7)	Turn off RYn7
JOG operation selection	Parameter No.PC45	Set it to "□□□1".
Station No. direction	Parameter No.PA14	Refer to (2) in this section.
JOG speed	Point table No.1	The setting is the same as for the indexer JOG operation. Refer to (2) in section 16.8.1.
Acceleration/deceleration time constant	Point table No.1	Use the acceleration/deceleration time constant in the point table No.1.

(2) Operation

Turn on the start (RYn1) to operate the servo motor with the servo motor speed, acceleration time constant, and deceleration time constant set in the point table No.1. Turning off RYn1 makes the servo motor decelerate to stop regardless of stations. For the rotation direction, refer to (2) in section 16.8.1.

(3) Timing chart

The following timing chart shows an example when executing the indexer JOG operation from the status where the servo motor is at a stop on the station No.0 when the servo-on is turned on.



Note. Torque limit delay time can be set in the parameter No.PD26.

16. INDEXER POSITIONING OPERATION

16.9 Home position return mode

16.9.1 Outline of home position return

Home position return is performed to match the command coordinates with the machine coordinates. In the incremental system, home position return is required every time input power is switched on. In the absolute position detection system, once home position return is done at the time of installation, the current position is retained if power is switched off. Hence, home position return is not required when power is switched on again. This servo amplifier has the home position return methods given in this section. Choose the most appropriate method for your machine structure and application.

This servo amplifier has the home position return automatic return function which executes home position return by making an automatic return to a proper position if the machine has stopped beyond or at the proximity dog. Manual motion by jog operation or the like is not required.

(1) Home position return types

Choose the optimum home position return according to the machine type, etc.

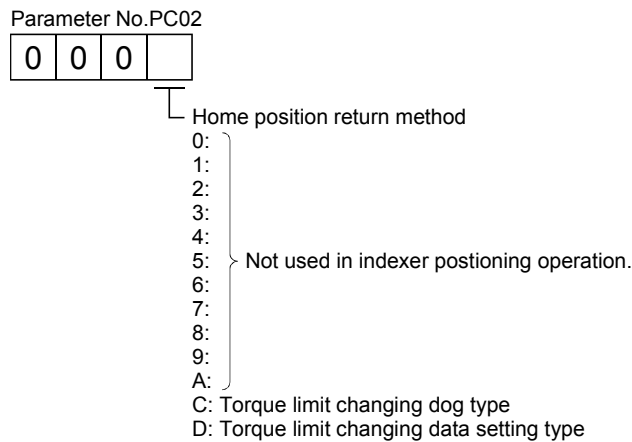
Type	Home position return method	Features
Torque limit changing dog type home position return	With deceleration started at the front end of a proximity dog, the position where the first Z-phase signal is given past the rear end of the dog or a motion has been made over the home position shift distance starting from the Z-phase signal is defined as a home position.	<ul style="list-style-type: none"> ▪ General home position return method using a proximity dog. ▪ Repeatability of home position return is excellent. ▪ The machine is less burdened. ▪ Used when the width of the proximity dog can be set greater than the deceleration distance of the servo motor. ▪ Torque limit value by the parameter No.PC35 (Internal torque limit 2) becomes effective while the servo motor at stop.
Torque limit changing data setting type home position return	An arbitrary position is defined as a home position.	<ul style="list-style-type: none"> ▪ No proximity dog required. ▪ Torque limit value turns to "0" in the home position return mode.

16. INDEXER POSITIONING OPERATION

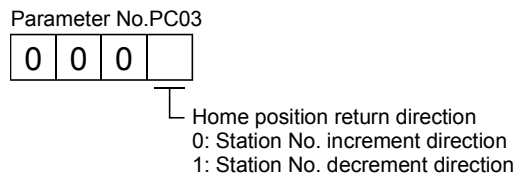
(2) Home position return parameter

When performing home position return, set each parameter as follows.

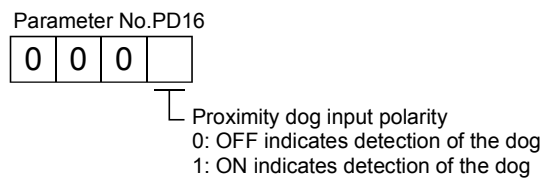
(a) Choose the home position return method with parameter No.PC02 (Home position return type).



(b) Choose the starting direction of home position return with parameter No.PC03 (Home position return direction). Set "0" to start home position return in the direction in which the station No. is incremented from the current position, or "1" to start home position return in the direction in which the address is decremented.



(c) Choose the polarity at which the proximity dog is detected with parameter No.PD16 (Input polarity setting). Set "0" to detect the dog when the proximity dog device (DOG) is OFF, or "1" to detect the dog when the device is ON.



(3) Instructions

- 1) Before starting home position return, always make sure that the limit switch operates.
- 2) Confirm the home position return direction. Incorrect setting will cause the machine to run reversely.
- 3) Confirm the proximity dog input polarity. Not doing so may cause unexpected operation.

16. INDEXER POSITIONING OPERATION

16.9.2 Torque limit changing dog type home position return

A home position return method using a proximity dog. With deceleration started at the front end of the proximity dog, the position where the first Z-phase signal is given past the rear end of the dog or a motion has been made over the home position shift distance starting from the Z-phase signal is defined as a home position. A limit can be put on the servo motor torque at home position return execution and at stop separately.

(1) Devices, parameters

Set the input devices and parameters as follows.

Item	Device/Parameter used	Description
Home position return mode selection	Operation mode selection 1 (RYn6)	Turn off RYn6.
	Operation mode selection 2 (RYn7)	Turn off RYn7.
Torque limit changing dog type home position return	Parameter No.PC02	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> C: Torque limit changing dog type home position return is selected.
Home position return direction	Parameter No.PC03	Refer to section 16.9.1 (2) and choose home position return direction.
Dog input polarity	Parameter No.PD16	Refer to section 16.9.1 (2) and choose dog input polarity.
Home position return speed	Parameter No.PC04	Set speed until detection of dog.
Creep speed	Parameter No.PC05	Set speed after detection of dog.
Home position shift distance	Parameter No.PC06	Set when shifting the home position starting at the first Z-phase signal after passage of proximity dog rear end.
Home position return acceleration/deceleration time constants	Point table No.1	Use the acceleration/deceleration time constants of point table No.1.
Torque limit value at home position return execution	Point table No.PA11	Set the torque limit value for the forward rotation direction at home position return execution.
	Point table No.PA12	Set the torque limit value for the reverse rotation direction at home position return execution.
Torque limit value at stop	Point table No.PC35	Set the torque limit value at stop.

(2) Length of proximity dog

Adjust the length of proximity dog or home position return speed so that the servo motor speed reaches to the creep speed while detecting the proximity dog (DOG).

$$L_1 \geq \frac{V}{60} \cdot \frac{td}{2} \times \frac{CDV}{CMX} \times 360$$

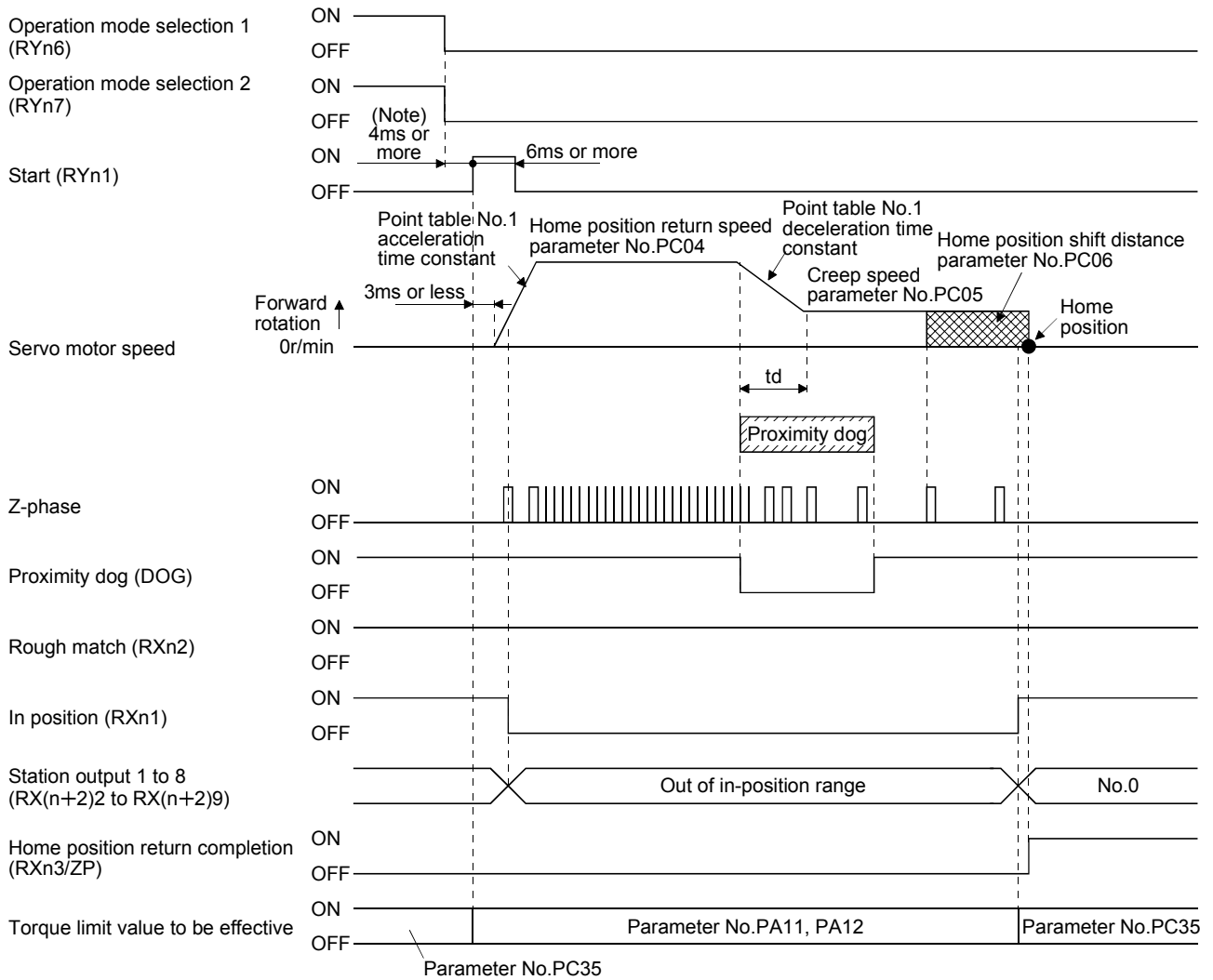
L_1 : Angle that proximity dog holds on the circumference of machine side [degree]

V : Home position return speed of motor side [r/min]

td : Deceleration time of motor side [s]

16. INDEXER POSITIONING OPERATION

(3) Timing chart



Note. Configure a sequence that changes the operation mode earlier, considering the delay time of CC-Link communication.

16. INDEXER POSITIONING OPERATION

16.9.3 Torque limit changing data setting type home position return

POINT
<ul style="list-style-type: none"> Torque limit becomes effective after completing the torque limit changing data setting type home position return, so that when the servo motor is rotated by the external force, a difference occurs in between the command position and the current position. In the home position return mode, even if a difference occurs in between the command position and the current position, the error excessive alarm (A52) does not occur. Therefore, when the mode is changed from home position return to automatic operation, depending on the size of difference between the command position and the current position, the error excessive alarm (A52) occurs. Note that if the error excessive alarm (A52) does not occur, the servo motor rotates to eliminate the difference.

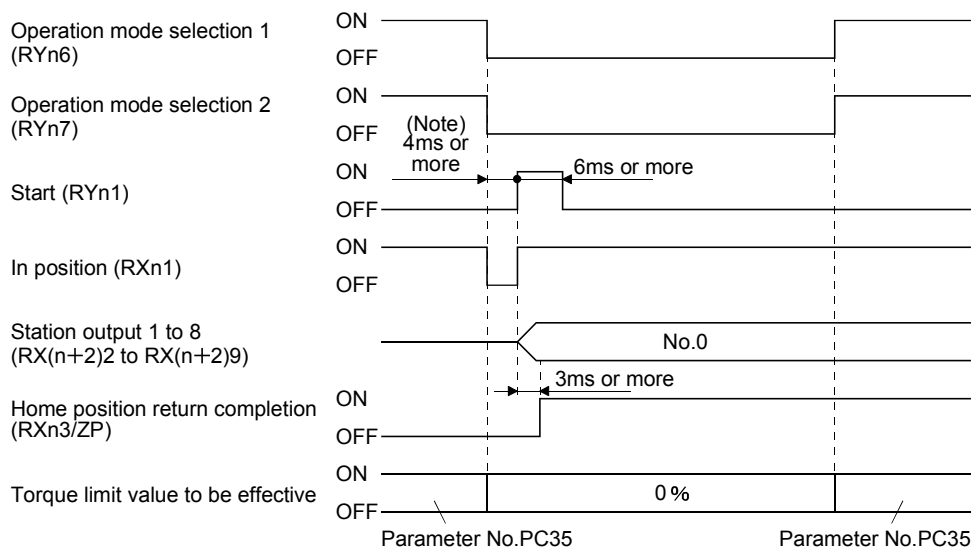
Use the torque limit changing data setting type home position return to set the home position in any place. JOG operation can be used for moving a position. For this home position return, torque generation is stopped at the same time when the mode is changed to the home position return mode. Home position can be set for any position by rotating the axis with external force.

The proximity dog (DOG) cannot be used. The proximity dog (DOG) is disabled even if it is turned off.

(1) Device/Parameter

Set the input devices and parameters as indicated below.

Item	Device/Parameter	Setting description
Home position return mode selection	Operation mode selection 1 (RYn6)	Turn off RYn6.
	Operation mode selection 2 (RYn7)	Turn off RYn7.
Position/speed specifying system by remote register (only when 2 stations are occupied)	Position/speed specifying system selection (RY(n+2)A)	Turn off RY(n+2)A.
Torque limit changing data setting type home position return	Parameter No.PC02	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> D: Select the torque limit changing data setting type.



Note. Configure a sequence that changes the operation mode earlier, considering the delay time of CC-Link communication.

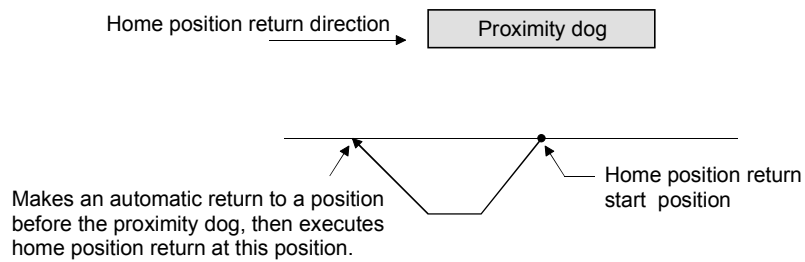
16. INDEXER POSITIONING OPERATION

16.9.4 Home position return automatic return function

If the current position is at or beyond the proximity dog in the home position return using the proximity dog, this function starts home position return after making a return to the position where the home position return can be made.

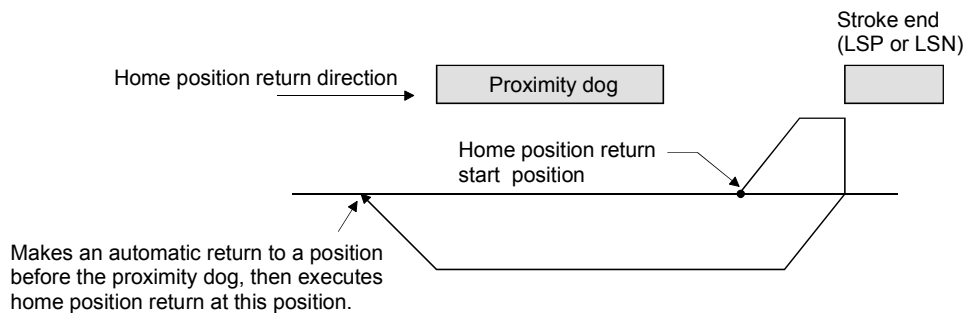
(1) When the current position is at the proximity dog

When the current position is at the proximity dog, an automatic return is made before home position return.



(2) When the current position is beyond the proximity dog

At a start, a motion is made in the home position return direction and an automatic return is made on detection of the stroke end (LSP or LSN). The motion stops past the front end of the proximity dog, and home position return is resumed at that position. If the proximity dog cannot be detected, the motion stops on detection of the LSP or LSN switch and A90 occurs.



Software limit cannot be used with these functions.

16. INDEXER POSITIONING OPERATION

16.10 Absolute position detection system



CAUTION

- If an absolute position erase alarm (A25) or an absolute position counter warning (AE3) has occurred, always perform home position setting again. Not doing so may cause unexpected operation.

POINT

- If the encoder cable is disconnected, absolute position data will be lost in the following servo motor series. HF-MP, HF-KP, HC-SP, HC-RP, HC-UP, HC-LP, and HA-LP. After disconnecting the encoder cable, always execute home position setting and then positioning operation.
- When the following parameters are changed, the home position is lost when turning on the power after the change. Execute the home position return again when turning on the power.
 - Parameter No.PA06 (Number of gears on machine-side)
 - Parameter No.PA07 (Number of gears on servo motor-side)
 - Parameter No.PA14 (Station No. direction selection)
 - Parameter No.PC07 (Home position return position data)

This servo amplifier contains a single-axis controller. Also, all servo motor encoders are compatible with an absolute position detection system. Hence, an absolute position detection system can be configured up by merely loading an absolute position data back-up battery and setting parameter values.

(1) Restrictions

In the absolute position detection system, the following restriction condition applies for the number of gears on machine-side (parameter No.PA06 CMX) and servo motor speed (N).

- When $CMX \leq 2000$, $N < 3076.7 \text{ r/min}$
- When $CMX > 2000$, $N < 3276.7 - CMX \text{ r/min}$

When the servo motor is operated at servo motor speed higher than the limited value, the absolute position counter warning (AE3) occurs.

(2) Specifications

Item	Description
System	Electronic battery backup system.
Battery	1 piece of lithium battery (primary battery, nominal +3.6V) Type: MR-J3BAT.
Maximum revolution range	Home position+32767 rev.
(Note 1) Maximum speed at power failure	3000r/min
(Note 2) Battery backup time	Approx. 10,000 hours (battery life with power off)
Battery storage period	5 years from date of manufacture.

Note 1. Maximum speed available when the shaft is rotated by external force at the time of power failure or the like.

2. Time to hold data by a battery with power off. It is recommended to replace the battery in three years independently of whether power is kept on or off.

16. INDEXER POSITIONING OPERATION

(3) Structure

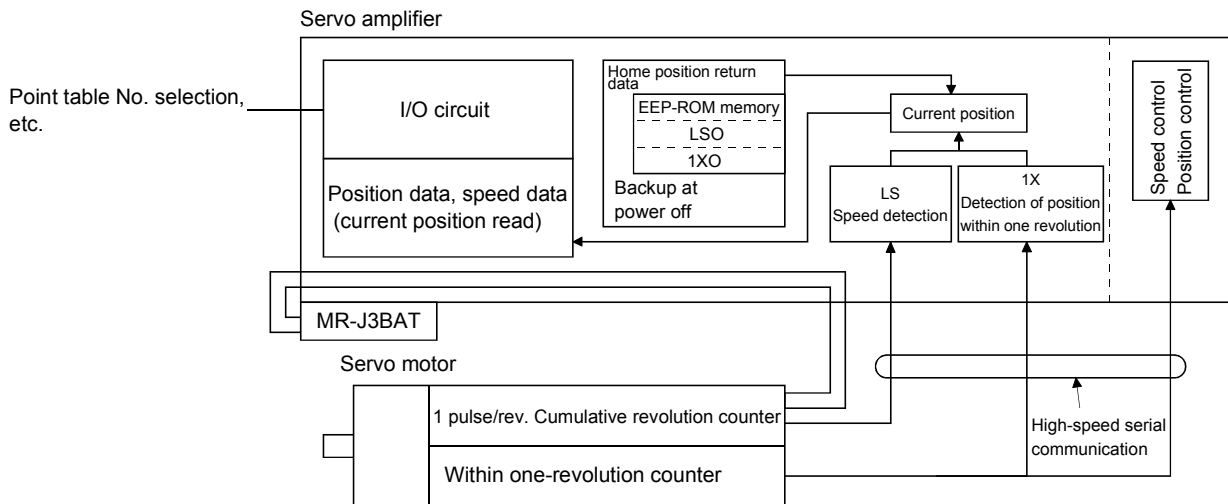
Component	Description
Servo amplifier	Use standard models.
Servo motor	
Battery	MR-J3BAT
Encoder cable	Use a standard model. (Refer to section 14.1.)

(4) Outline of absolute position detection data communication

For normal operation, as shown below, the encoder consists of a detector designed to detect a position within one revolution and a cumulative revolution counter designed to detect the number of revolutions.

The absolute position detection system always detects the absolute position of the machine and keeps it battery-backed, independently of whether the general-purpose programming controller power is on or off. Therefore, once the home position is defined at the time of machine installation, home position return is not needed when power is switched on thereafter.

If a power failure or a fault occurs, restoration is easy.



(5) Battery installation procedure



WARNING

- Before installing a battery, turn off the main circuit power while keeping the control circuit power on. Wait for 15 minutes or more until the charge lamp turns off. Then, confirm that the voltage between P(+) and N(-) is safe with a voltage tester and others. Otherwise, an electric shock may occur. In addition, always confirm from the front of the servo amplifier whether the charge lamp is off or not.

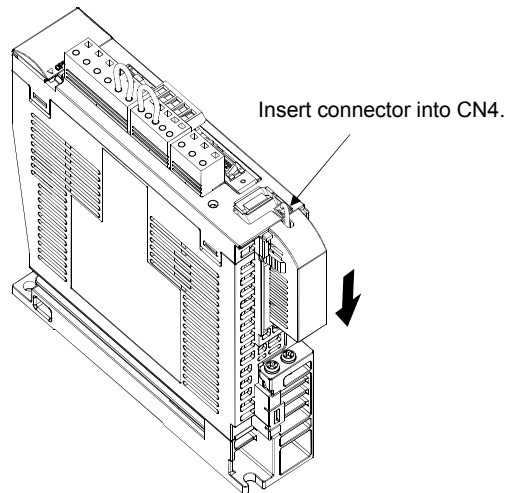
POINT

- The internal circuits of the servo amplifier may be damaged by static electricity. Always take the following precautions.
 - Ground human body and work bench.
 - Do not touch the conductive areas, such as connector pins and electrical parts, directly by hand.
- Before starting battery changing procedure, make sure that the main circuit power is switched OFF with the control circuit power ON. When battery is changed with the control power OFF, the absolute position data is lost.

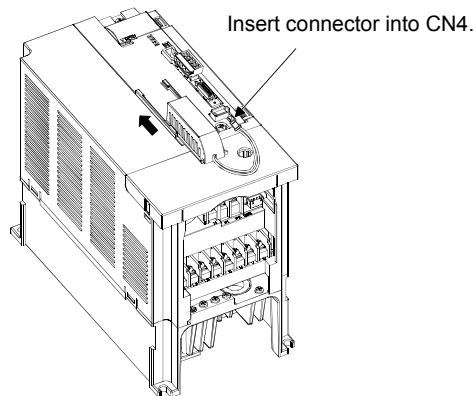
16. INDEXER POSITIONING OPERATION

(a) For MR-J3-350T or less • MR-J3-200T4 or less

POINT
▪ For the servo amplifier with a battery holder on the bottom, it is not possible to wire for the earth with the battery installed. Insert the battery after executing the earth wiring of the servo amplifier.



(b) For MR-J3-500T or more • MR-J3-350T4 or more



(c) Parameter setting

Set parameter No.PA03 (Absolute position detection system) as indicated below to make the absolute position detection system valid.

Parameter No.PA03

			1
--	--	--	---

Selection of absolute position detection system
0: Incremental system
1: Absolute position detection system

16. INDEXER POSITIONING OPERATION

16.11 Parameters



CAUTION

▪ Never adjust or change the parameter values extremely as it will make operation instable.

POINT

▪ For any parameter whose symbol is preceded by *, set the parameter value and switch power off once, then switch it on again to make that parameter setting valid.

In this servo amplifier, the parameters are classified into the following groups on a function basis.

Parameter group	Main description
Basic setting parameters (No.PA□□)	Make basic setting with these parameters. Generally, the operation is possible only with these parameter settings.
Gain/filter parameters (No.PB□□)	Use these parameters when making gain adjustment manually.
Extension setting parameters (No.PC□□)	These parameters are inherent to the MR-J3-□T servo amplifier.
I/O setting parameters (No.PD□□)	Use these parameters when changing the I/O devices of the servo amplifier.

Mainly setting the basic setting parameters (No.PA□□) allows the setting of the basic parameters at the time of introduction.

16.11.1 Basic setting parameters (No.PA□□)

(1) Parameter list

No.	Symbol	Name	Initial value	Unit
PA01	*STY	Control mode	0000h	
PA02	*REG	Regenerative option	0000h	
PA03	*ABS	Absolute position detection system	0000h	
PA04		Not used in indexer positioning operation.	0000h	
PA05		Do not change the parameter.	0000h	
PA06	*CMX	Number of gears on machine-side	1	
PA07	*CDV	Number of gears on servo motor-side	1	
PA08	ATU	Auto tuning mode	0001h	
PA09	RSP	Auto tuning response	12	
PA10	INP	In-position range	100	pulse
PA11	TLP	Forward rotation torque limit	100.0	%
PA12	TLN	Reverse rotation torque limit	100.0	%
PA13		For manufacturer setting	0002h	
PA14	*POL	Rotation direction selection	0	
PA15	*ENR	Encoder output pulses	4000	pulse/rev
PA16		For manufacturer setting	0000h	
PA17		Do not change this valve by any means.	0000h	
PA18			0000h	
PA19	*BLK	Parameter write inhibit	000Ch	

16. INDEXER POSITIONING OPERATION

(2) Parameter write inhibit

Parameter			Initial value	Unit	Setting range
No.	Symbol	Name			
PA19	*BLK	Parameter write inhibit	000Ch		Refer to the text.

POINT
<ul style="list-style-type: none"> This parameter is made valid when power is switched off, then on after setting.

In the factory setting, this servo amplifier allows changes to the basic setting parameter, gain/filter parameter and extension setting parameter settings. With the setting of parameter No.PA19, write can be disabled to prevent accidental changes.

The following table indicates the parameters which are enabled for reference and write by the setting of parameter No.PA19. Operation can be performed for the parameters marked ○.

Parameter No.PA19 setting	Setting operation	Basic setting parameters No.PA□□	Gain/Filter parameters No.PB□□	Extension setting parameters No.PC□□	I/O setting parameters No.PD□□
0000h	Reference	○			
	Write	○			
000Bh	Reference	○	○	○	
	Write	○	○	○	
000Ch (initial value)	Reference	○	○	○	○
	Write	○	○	○	○
100Bh	Reference	○			
	Write	Parameter No. PA19 only			
100Ch	Reference	○	○	○	○
	Write	Parameter No. PA19 only			

(3) Selection of command system

Parameter			Initial value	Unit	Setting range
No.	Symbol	Name			
PA01	*STY	Control mode	0000h		Refer to the text.

POINT
<ul style="list-style-type: none"> This parameter is made valid when power is switched off, then on after setting.

Select the command system.

Parameter No.PA01

	0	0	0
--	---	---	---

Operation method
 0: Point table positioning operation
 1: Indexer positioning operation

16. INDEXER POSITIONING OPERATION

(4) Selection of regenerative option

Parameter			Initial value	Unit	Setting range
No.	Symbol	Name			
PA02	*REG	Regenerative option	0000h		Refer to the text.

POINT
<ul style="list-style-type: none"> ▪ This parameter is made valid when power is switched off, then on after setting. ▪ Wrong setting may cause the regenerative option to burn. ▪ If the regenerative option selected is not for use with the servo amplifier, parameter error (A37) occurs.

Set this parameter when using the regenerative option, brake unit, power regeneration converter, or power regeneration common converter.

Parameter No. PA02

0	0		
---	---	--	--

Selection of regenerative option

00: Regenerative option is not used

- For servo amplifier of 100W, regenerative resistor is not used.
- For servo amplifier of 200 to 7kW, built-in regenerative resistor is used.
- Supplied regenerative resistors or regenerative option is used with the servo amplifier of 11k to 22kW.

01: FR-BU2-(H)•FR-RC-(H)•FR-CV-(H)

02: MR-RB032

03: MR-RB12

04: MR-RB32

05: MR-RB30

06: MR-RB50(Cooling fan is required)

08: MR-RB31

09: MR-RB51(Cooling fan is required)

80: MR-RB1H-4

81: MR-RB3M-4(Cooling fan is required)

82: MR-RB3G-4(Cooling fan is required)

83: MR-RB5G-4(Cooling fan is required)

84: MR-RB34-4(Cooling fan is required)

85: MR-RB54-4(Cooling fan is required)

FA: When the supplied regenerative resistor is cooled by the cooling fan to increase the ability with the servo amplifier of 11k to 22kW.

(5) Using absolute position detection system

Parameter			Initial value	Unit	Setting range
No.	Symbol	Name			
PA03	*ABS	Absolute position detection system	0000h		Refer to the text.

POINT
<ul style="list-style-type: none"> ▪ This parameter is made valid when power is switched off, then on after setting.

Set this parameter when using the absolute position detection system.

Parameter No. PA03

0	0	0	
---	---	---	--

Selection of absolute position detection system (refer to section 16.10)

0: Used in incremental system

1: Used in absolute position detection system

16. INDEXER POSITIONING OPERATION

(6) Electronic gear

Parameter			Initial value	Unit	Setting range
No.	Symbol	Name			
PA06	*CMX	Number of gears on machine-side	1		1 to 16384
PA07	*CDV	Number of gears on servo motor-side	1		1 to 16384



CAUTION

▪ False setting will result in unexpected fast rotation, causing injury.

POINT

- This parameter is made valid when power is switched off, then on after setting.
- Set the electronic gear within the following condition range.
 - (1) $1/9999 \leq \text{CMX}/\text{CDV} \leq 9999$
 - (2) $\text{CDV} \times \text{STN} \leq 32767$
 - (3) $\text{CMX} \times \text{CDV} \leq 100000$

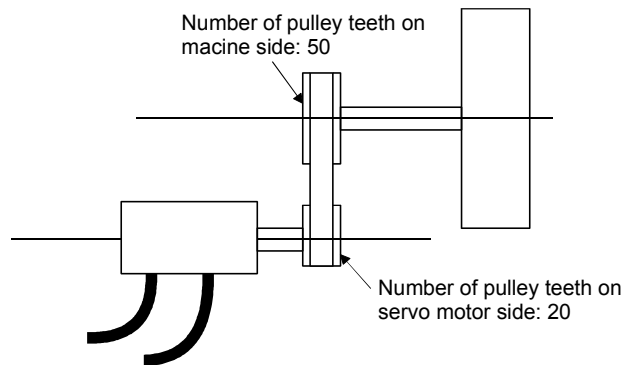
When a value out of the condition range is set, the parameter error (A37) occurs. If the setting of electronic gear ratio is small, the servo motor may not operate with the set servo motor speed.
- Setting range of the parameters No.PA06 and PA07 for the indexer positioning operation is 1 to 16384. It is different from the setting range for the point table positioning operation.

Use the parameters No. PA06 and PA07 to adjust the rotation amount “m” on the servo motor shaft that is necessary to rotate the machine side “n” times. A setting example for electronic gear is shown next.

16. INDEXER POSITIONING OPERATION

(a) Example 1

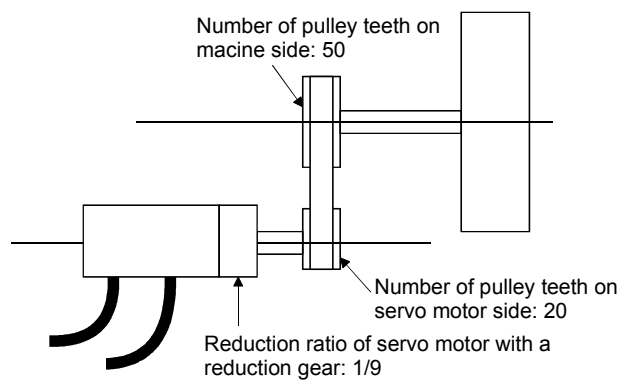
When the number of pulley teeth on the machine-side is 50, and the number of pulley teeth on the servo motor side is 20.



Parameter No.PA06: 50
Parameter No.PA07: 20

(b) Example 2

When the number of pulley teeth on the machine-side is 50, the number of pulley teeth on the servo motor side is 20, and using the servo motor with 1/9 reduction gear.



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

Parameter No.PA06: 450
Parameter No.PA07: 20

16. INDEXER POSITIONING OPERATION

(7) Auto tuning

Parameter			Initial value	Unit	Setting range
No.	Symbol	Name			
PA08	ATU	Auto tuning mode	0001h		Refer to the text.
PA09	RSP	Auto tuning response	12		1 to 32

Make gain adjustment using auto tuning. Refer to section 9.2 for details.

(a) Auto tuning mode (parameter No.PA08)

Select the gain adjustment mode.

Parameter No.PA08

0	0	0	
---	---	---	--

Gain adjustment mode setting

Setting	Gain adjustment mode	Automatically set parameter No. (Note)
0	Interpolation mode	PB06· PB08· PB09· PB10
1	Auto tuning mode 1	PB06· PB07· PB08· PB09· PB10
2	Auto tuning mode 2	PB07· PB08· PB09· PB10
3	Manual mode	

Note. The parameters have the following names.

Parameter No.	Name
PB06	Ratio of load inertia moment to servo motor inertia moment
PB07	Model loop gain
PB08	Position loop gain
PB09	Speed loop gain
PB10	Speed integral compensation

(b) Auto tuning response (parameter No.PA09)

If the machine hunts or generates large gear sound, decrease the set value. To improve performance, e.g. shorten the settling time, increase the set value.

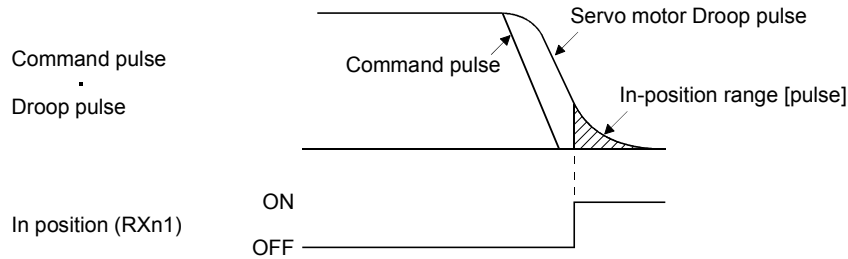
Setting	Response	Guideline for machine resonance frequency [Hz]	Setting	Response	Guideline for machine resonance frequency [Hz]
1	Low response ↑ ↓	10.0	17	Low response ↑ ↓	67.1
2		11.3	18		75.6
3		12.7	19		85.2
4		14.3	20		95.9
5		16.1	21		108.0
6		18.1	22		121.7
7		20.4	23		137.1
8		23.0	24		154.4
9		25.9	25		173.9
10		29.2	26		195.9
11		32.9	27		220.6
12		37.0	28		248.5
13		41.7	29		279.9
14		47.0	30		315.3
15		52.9	31		355.1
16	Middle response	59.6	32	Middle response	400.0

16. INDEXER POSITIONING OPERATION

(8) In-position range

Parameter			Initial value	Unit	Setting range
No.	Symbol	Name			
PA10	INP	In-position range	100	pulse	0 to 10000

Set the range for outputting the movement completion (RXnC) and the in position (RXn1) in command pulse unit.



(9) Torque limit

Parameter			Initial value	Unit	Setting range
No.	Symbol	Name			
PA11	TLP	Forward rotation torque limit	100.0	%	0 to 100.0
PA12	TLN	Reverse rotation torque limit	100.0	%	0 to 100.0

The torque generated by the servo motor can be limited.

(a) Forward rotation torque limit (parameter No.PA11)

Set this parameter on the assumption that the maximum torque is 100[%]. Set this parameter when limiting the torque of the servo motor in the CCW driving mode or CW regeneration mode. Set this parameter to "0.0" to generate no torque.

(b) Reverse rotation torque limit (parameter No.PA12)

Set this parameter on the assumption that the maximum torque is 100[%]. Set this parameter when limiting the torque of the servo motor in the CW driving mode or CCW regeneration mode. Set this parameter to "0.0" to generate no torque.

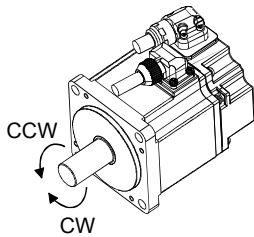
16. INDEXER POSITIONING OPERATION

(10) Station No. direction selection

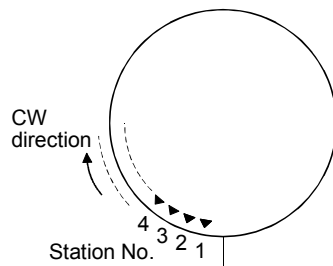
Parameter			Initial value	Unit	Setting range
No.	Symbol	Name			
PA14	*POL	Station No. direction selection	0		0 - 1

POINT
<ul style="list-style-type: none"> This parameter is made valid when power is switched off, then on after setting.

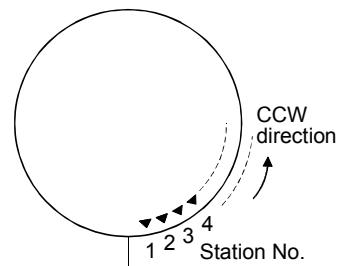
Select the allocation direction of station numbers using the parameter No.PA14 (Station No. direction selection).



Parameter No.PA14 setting	Station No. allocation direction Start (RYn1) ON
0 (Initial value)	Station No. is allocated in CW direction in order of 1, 2, 3...
1	Station No. is allocated in CCW direction in order of 1, 2, 3...



Parameter No.PA14: 0 (Initial value)



Parameter No.PA14: 1

16. INDEXER POSITIONING OPERATION

(11)Encoder output pulse

Parameter			Initial value	Unit	Setting range
No.	Symbol	Name			
PA15	*ENR	Encoder output pulse	4000	pulse/rev	1 to 65535

POINT	<ul style="list-style-type: none"> This parameter is made valid when power is switched off, then on after setting.
-------	---

Used to set the encoder pulses (A-phase, B-phase) output by the servo amplifier.

Set the value 4 times greater than the A-phase or B-phase pulses.

You can use parameter No.PC19 to choose the output pulse setting or output division ratio setting.

The number of A/B-phase pulses actually output is 1/4 times greater than the preset number of pulses.

The maximum output frequency is 4.6Mpps (after multiplication by 4). Use this parameter within this range.

(a) For output pulse designation

Set "□□□" (initial value) in parameter No.PC19.

Set the number of pulses per servo motor revolution.

Output pulse = set value [pulses/rev]

For instance, set "5600" to Parameter No.PA15, the actually output A/B-phase pulses are as indicated below.

$$A \cdot B\text{-phase output pulses} = \frac{5600}{4} = 1400[\text{pulse}]$$

(b) For output division ratio setting

Set "□□1□" in parameter No.PC19.

The number of pulses per servo motor revolution is divided by the set value.

$$\text{Output pulse} = \frac{\text{Resolution per servo motor revolution}}{\text{Set value}} [\text{pulses/rev}]$$

For instance, set "8" to Parameter No.PA15, the actually output A/B-phase pulses are as indicated below.

$$A \cdot B\text{-phase output pulses} = \frac{262144}{8} \cdot \frac{1}{4} = 8192[\text{pulse}]$$

16. INDEXER POSITIONING OPERATION

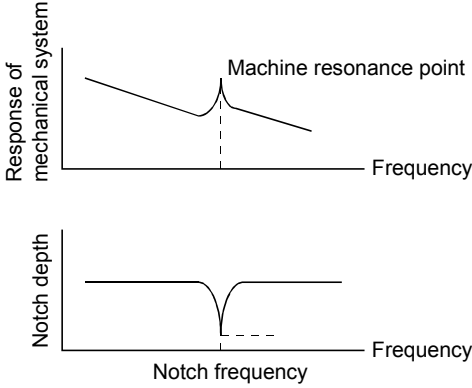
16.11.2 Gain/filter parameters (No.PB□□)

(1) Parameter list

No.	Symbol	Name	Initial value	Unit
PB01	FILT	Adaptive tuning mode (Adaptive filter II)	0000h	
PB02	VRFT	Vibration suppression control tuning mode (Advanced vibration suppression control)	0000h	
PB03		For manufacturer setting	0000h	
PB04	FFC	Feed forward gain	0	%
PB05		For manufacturer setting	500	
PB06	GD2	Ratio of load inertia moment to servo motor inertia moment	7.0	Multiplier (× 1)
PB07	PG1	Model loop gain	24	rad/s
PB08	PG2	Position loop gain	37	rad/s
PB09	VG2	Speed loop gain	823	rad/s
PB10	VIC	Speed integral compensation	33.7	ms
PB11	VDC	Speed differential compensation	980	
PB12		For manufacturer setting	0	
PB13	NH1	Machine resonance suppression filter 1	4500	Hz
PB14	NHQ1	Notch shape selection 1	0000h	
PB15	NH2	Machine resonance suppression filter 2	4500	Hz
PB16	NHQ2	Notch shape selection 2	0000h	
PB17		Automatic setting parameter		
PB18	LPF	Low-pass filter	3141	rad/s
PB19	VRF1	Vibration suppression control vibration frequency setting	100.0	Hz
PB20	VRF2	Vibration suppression control resonance frequency setting	100.0	Hz
PB21		For manufacturer setting	0.00	
PB22			0.00	
PB23	VFBF	Low-pass filter selection	0000h	
PB24	*MVS	Slight vibration suppression control selection	0000h	
PB25		For manufacturer setting	0000h	
PB26	*CDP	Gain changing selection	0000h	
PB27	CDL	Gain changing condition	10	
PB28	CDT	Gain changing time constant	1	ms
PB29	GD2B	Gain changing ratio of load inertia moment to servo motor inertia moment	7.0	Multiplier (× 1)
PB30	PG2B	Gain changing position loop gain	37	rad/s
PB31	VG2B	Gain changing speed loop gain	823	rad/s
PB32	VICB	Gain changing speed integral compensation	33.7	ms
PB33	VRF1B	Gain changing vibration suppression control vibration frequency setting	100.0	Hz
PB34	VRF2B	Gain changing vibration suppression control resonance frequency setting	100.0	Hz
PB35		For manufacturer setting	0.00	
PB36			0.00	
PB37			100	
PB38			0	
PB39			0	
PB40			0	
PB41			1125	
PB42			1125	
PB43			0004h	
PB44			0000h	
PB45			0000h	

16. INDEXER POSITIONING OPERATION

(2) Detail list

No.	Symbol	Name and function	Initial value	Unit	Setting range												
PB01	FILT	<p>Adaptive tuning mode (Adaptive filter II) Select the setting method for filter tuning. Setting this parameter to "□□□1" (filter tuning mode 1) automatically changes the machine resonance suppression filter 1 (parameter No.PB13) and notch shape selection (parameter No.PB14).</p>  <p style="text-align: center;"> 0 0 0 </p> <p style="text-align: center;">└ Filter tuning mode selection</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Setting</th> <th>Filter adjustment mode</th> <th>Automatically set parameter</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Filter OFF</td> <td>(Note)</td> </tr> <tr> <td>1</td> <td>Filter tuning mode</td> <td>Parameter No.PB13 Parameter No.PB14</td> </tr> <tr> <td>2</td> <td>Manual mode</td> <td></td> </tr> </tbody> </table> <p>Note. Parameter No.PB13 and PB14 are fixed to the initial values.</p> <p>When this parameter is set to "□□□1", the tuning is completed after positioning is done the predetermined number or times for the predetermined period of time, and the setting changes to "□□□2". When the filter tuning is not necessary, the setting changes to "□□□0". When this parameter is set to "□□□0", the initial values are set to the machine resonance suppression filter 1 and notch shape selection. However, this does not occur when the servo off.</p>	Setting	Filter adjustment mode	Automatically set parameter	0	Filter OFF	(Note)	1	Filter tuning mode	Parameter No.PB13 Parameter No.PB14	2	Manual mode		0000h		
Setting	Filter adjustment mode	Automatically set parameter															
0	Filter OFF	(Note)															
1	Filter tuning mode	Parameter No.PB13 Parameter No.PB14															
2	Manual mode																

16. INDEXER POSITIONING OPERATION

No.	Symbol	Name and function	Initial value	Unit	Setting range																
PB02	VRFT	<p>Vibration suppression control tuning mode (Advanced vibration suppression control)</p> <p>The vibration suppression is valid when the parameter No.PA08 (auto tuning) setting is "□□□2" or "□□□3". When PA08 is "□□□1", vibration suppression is always invalid.</p> <p>Select the setting method for vibration suppression control tuning. Setting this parameter to "□□□1" (vibration suppression control tuning mode) automatically changes the vibration suppression control vibration frequency (parameter No.PB19) and vibration suppression control resonance frequency (parameter No.PB20) after positioning is done the predetermined number of times.</p> <div style="text-align: center;"> </div> <div style="text-align: center;"> <table border="1" style="margin: 0 auto;"> <tr> <td style="width: 20px; height: 20px;">0</td> <td style="width: 20px; height: 20px;">0</td> <td style="width: 20px; height: 20px;">0</td> <td style="width: 20px; height: 20px;">□</td> </tr> </table> <p>└ Vibration suppression control tuning mode</p> </div> <table border="1" style="margin: 10px auto; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Setting</th> <th style="width: 40%;">Vibration suppression control tuning mode</th> <th style="width: 50%;">Automatically set parameter</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0</td> <td>Vibration suppression control OFF</td> <td>(Note)</td> </tr> <tr> <td style="text-align: center;">1</td> <td>Vibration suppression control tuning mode (Advanced vibration suppression control)</td> <td>Parameter No.PB19 Parameter No.PB20</td> </tr> <tr> <td style="text-align: center;">2</td> <td>Manual mode</td> <td></td> </tr> </tbody> </table> <p>Note. Parameter No.PB19 and PB20 are fixed to the initial values.</p> <p>When this parameter is set to "□□□1", the tuning is completed after positioning is done the predetermined number or times for the predetermined period of time, and the setting changes to "□□□2". When the vibration suppression control tuning is not necessary, the setting changes to "□□□0". When this parameter is set to "□□□0", the initial values are set to the vibration suppression control - vibration frequency and vibration suppression control - resonance frequency. However, this does not occur when the servo off.</p>	0	0	0	□	Setting	Vibration suppression control tuning mode	Automatically set parameter	0	Vibration suppression control OFF	(Note)	1	Vibration suppression control tuning mode (Advanced vibration suppression control)	Parameter No.PB19 Parameter No.PB20	2	Manual mode		0000h		
0	0	0	□																		
Setting	Vibration suppression control tuning mode	Automatically set parameter																			
0	Vibration suppression control OFF	(Note)																			
1	Vibration suppression control tuning mode (Advanced vibration suppression control)	Parameter No.PB19 Parameter No.PB20																			
2	Manual mode																				
PB03		For manufacturer setting Do not change this value by any means.	0000h																		
PB04	FFC	<p>Feed forward gain</p> <p>Set the feed forward gain. When the setting is 100%, the droop pulses during operation at constant speed are nearly zero. However, sudden acceleration/deceleration will increase the overshoot. As a guideline, when the feed forward gain setting is 100%, set 1s or more as the acceleration/deceleration time constant up to the rated speed.</p>	0	%	0 to 100																

16. INDEXER POSITIONING OPERATION

No.	Symbol	Name and function	Initial value	Unit	Setting range
PB05		For manufacturer setting Do not change this value by any means.	500		
PB06	GD2	Ratio of load inertia moment to servo motor inertia moment Used to set the ratio of the load inertia moment to the servo motor shaft inertia moment. When auto tuning mode 1 and interpolation mode is selected, the result of auto tuning is automatically used. (Refer to section 9.1.1) In this case, it varies between 0 and 100.0.	7.0	Multiplier (× 1)	0 to 300.0
PB07	PG1	Model loop gain Set the response gain up to the target position. Increase the gain to improve track ability in response to the command. When auto turning mode 1,2 is selected, the result of auto turning is automatically used.	24	rad/s	1 to 2000
PB08	PG2	Position loop gain Used to set the gain of the position loop. Set this parameter to increase the position response to level load disturbance. Higher setting increases the response level but is liable to generate vibration and/or noise. When auto tuning mode 1,2 and interpolation mode is selected, the result of auto tuning is automatically used.	37	rad/s	1 to 1000
PB09	VG2	Speed loop gain Set this parameter when vibration occurs on machines of low rigidity or large backlash. Higher setting increases the response level but is liable to generate vibration and/or noise. When auto tuning mode 1,2 manual mode and interpolation mode is selected, the result of auto tuning is automatically used.	823	rad/s	20 to 50000
PB10	VIC	Speed integral compensation Used to set the integral time constant of the speed loop. Lower setting increases the response level but is liable to generate vibration and/or noise. When auto tuning mode 1,2 and interpolation mode is selected, the result of auto tuning is automatically used.	33.7	ms	0.1 to 1000.0
PB11	VDC	Speed differential compensation Used to set the differential compensation. Made valid when the proportion control (RY(n+2)7) is switched on.	980		0 to 1000
PB12		For manufacturer setting Do not change this value by any means.	0		
PB13	NH1	Machine resonance suppression filter 1 Set the notch frequency of the machine resonance suppression filter 1. Setting parameter No.PB01 (filter tuning mode 1) to "□□□1" automatically changes this parameter. When the parameter No.PB01 setting is "□□□0", the setting of this parameter is ignored.	4500	Hz	100 to 4500

16. INDEXER POSITIONING OPERATION

No.	Symbol	Name and function	Initial value	Unit	Setting range																										
PB14	NHQ1	<p>Notch shape selection 1 Used to selection the machine resonance suppression filter 1.</p> <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px; margin-right: 10px;">0</div> <div style="border: 1px solid black; width: 20px; height: 20px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; margin-right: 5px;"></div> <div style="border: 1px solid black; padding: 2px; margin-left: 10px;">0</div> </div> <p style="margin-left: 40px;">Notch depth selection</p> <table border="1" style="margin-left: 40px;"> <thead> <tr> <th>Setting value</th> <th>Depth</th> <th>Gain</th> </tr> </thead> <tbody> <tr> <td>0</td> <td rowspan="2">Deep</td> <td>-40dB</td> </tr> <tr> <td>1</td> <td>-14dB</td> </tr> <tr> <td>2</td> <td rowspan="2">Shallow</td> <td>-8dB</td> </tr> <tr> <td>3</td> <td>-4dB</td> </tr> </tbody> </table> <p style="margin-left: 40px;">Notch width</p> <table border="1" style="margin-left: 40px;"> <thead> <tr> <th>Setting value</th> <th>Width</th> <th>α</th> </tr> </thead> <tbody> <tr> <td>0</td> <td rowspan="2">Standard</td> <td>2</td> </tr> <tr> <td>1</td> <td>3</td> </tr> <tr> <td>2</td> <td rowspan="2">Wide</td> <td>4</td> </tr> <tr> <td>3</td> <td>5</td> </tr> </tbody> </table> <p style="margin-left: 40px;">Setting parameter No.PB01 (filter tuning mode 1) to "□□□1" automatically changes this parameter. When the parameter No.PB01 setting is "□□□0", the setting of this parameter is ignored.</p>	Setting value	Depth	Gain	0	Deep	-40dB	1	-14dB	2	Shallow	-8dB	3	-4dB	Setting value	Width	α	0	Standard	2	1	3	2	Wide	4	3	5	0000h		Refer to name and function column.
Setting value	Depth	Gain																													
0	Deep	-40dB																													
1		-14dB																													
2	Shallow	-8dB																													
3		-4dB																													
Setting value	Width	α																													
0	Standard	2																													
1		3																													
2	Wide	4																													
3		5																													
PB15	NH2	<p>Machine resonance suppression filter 2 Set the notch frequency of the machine resonance suppression filter 2. Set parameter No.PB16 (notch shape selection 2) to "□□□1" to make this parameter valid.</p>	4500	Hz	100 to 4500																										
PB16	NHQ2	<p>Notch shape selection 2 Select the shape of the machine resonance suppression filter 2.</p> <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px; margin-right: 10px;">0</div> <div style="border: 1px solid black; width: 20px; height: 20px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; margin-right: 5px;"></div> </div> <p style="margin-left: 40px;">Machine resonance suppression filter 2 selection 0: Invalid 1: Valid</p> <p style="margin-left: 40px;">Notch depth selection</p> <table border="1" style="margin-left: 40px;"> <thead> <tr> <th>Setting value</th> <th>Depth</th> <th>Gain</th> </tr> </thead> <tbody> <tr> <td>0</td> <td rowspan="2">Deep</td> <td>-40dB</td> </tr> <tr> <td>1</td> <td>-14dB</td> </tr> <tr> <td>2</td> <td rowspan="2">Shallow</td> <td>-8dB</td> </tr> <tr> <td>3</td> <td>-4dB</td> </tr> </tbody> </table> <p style="margin-left: 40px;">Notch width</p> <table border="1" style="margin-left: 40px;"> <thead> <tr> <th>Setting value</th> <th>Width</th> <th>α</th> </tr> </thead> <tbody> <tr> <td>0</td> <td rowspan="2">Standard</td> <td>2</td> </tr> <tr> <td>1</td> <td>3</td> </tr> <tr> <td>2</td> <td rowspan="2">Wide</td> <td>4</td> </tr> <tr> <td>3</td> <td>5</td> </tr> </tbody> </table>	Setting value	Depth	Gain	0	Deep	-40dB	1	-14dB	2	Shallow	-8dB	3	-4dB	Setting value	Width	α	0	Standard	2	1	3	2	Wide	4	3	5	0000h		Refer to name and function column.
Setting value	Depth	Gain																													
0	Deep	-40dB																													
1		-14dB																													
2	Shallow	-8dB																													
3		-4dB																													
Setting value	Width	α																													
0	Standard	2																													
1		3																													
2	Wide	4																													
3		5																													
PB17		<p>Automatic setting parameter The value of this parameter is set according to a set value of parameter No.PB06 (Ratio of load inertia moment to servo motor inertia moment).</p>																													

16. INDEXER POSITIONING OPERATION

No.	Symbol	Name and function	Initial value	Unit	Setting range					
PB18	LPF	<p>Low-pass filter</p> <p>Set the low-pass filter.</p> <p>Setting parameter No.PB23 (low-pass filter selection) to "□□0□" automatically changes this parameter.</p> <p>When parameter No.PB23 is set to "□□1□", this parameter can be set manually.</p>	3141	rad/s	100 to 18000					
PB19	VRF1	<p>Vibration suppression control vibration frequency setting</p> <p>Set the vibration frequency for vibration suppression control to suppress low-frequency machine vibration, such as enclosure vibration.</p> <p>Setting parameter No.PB02 (vibration suppression control tuning mode) to "□□□1" automatically changes this parameter. When parameter No.PB02 is set to "□□□2", this parameter can be set manually.</p>	100.0	Hz	0.1 to 100.0					
PB20	VRF2	<p>Vibration suppression control resonance frequency setting</p> <p>Set the resonance frequency for vibration suppression control to suppress low-frequency machine vibration, such as enclosure vibration.</p> <p>Setting parameter No.PB02 (vibration suppression control tuning mode) to "□□□1" automatically changes this parameter. When parameter No.PB02 is set to "□□□2", this parameter can be set manually.</p>	100.0	Hz	0.1 to 100.0					
PB21		For manufacturer setting	0.00							
PB22		Do not change this value by any means.	0.00							
PB23	VFBF	<p>Low-pass filter selection</p> <p>Select the low-pass filter.</p> <div style="border: 1px solid black; display: inline-block; padding: 2px;"> <table style="border-collapse: collapse; text-align: center;"> <tr> <td style="border: 1px solid black; width: 20px; height: 20px;">0</td> <td style="border: 1px solid black; width: 20px; height: 20px;">0</td> <td style="border: 1px solid black; width: 20px; height: 20px;">□</td> <td style="border: 1px solid black; width: 20px; height: 20px;">□</td> <td style="border: 1px solid black; width: 20px; height: 20px;">0</td> </tr> </table> </div> <p style="margin-left: 40px;">└─ Low-pass filter selection 0: Automatic setting 1: Manual setting (parameter No.PB18 setting)</p> <p>When automatic setting has been selected, select the filter that has the band width close to the one calculated with $\frac{VG2 \cdot 10}{1 + GD2}$ [rad/s]</p>	0	0	□	□	0	0000h		Refer to name and function column.
0	0	□	□	0						
PB24	*MVS	<p>Slight vibration suppression control selection</p> <p>Select the slight vibration suppression control.</p> <p>When parameter No.PA08 (auto tuning mode) is set to "□□□3", this parameter is made valid.</p> <div style="border: 1px solid black; display: inline-block; padding: 2px;"> <table style="border-collapse: collapse; text-align: center;"> <tr> <td style="border: 1px solid black; width: 20px; height: 20px;">0</td> <td style="border: 1px solid black; width: 20px; height: 20px;">0</td> <td style="border: 1px solid black; width: 20px; height: 20px;">0</td> <td style="border: 1px solid black; width: 20px; height: 20px;">□</td> </tr> </table> </div> <p style="margin-left: 40px;">└─ Slight vibration suppression control selection 0: Invalid 1: Valid</p>	0	0	0	□	0000h		Refer to name and function column.	
0	0	0	□							

16. INDEXER POSITIONING OPERATION

No.	Symbol	Name and function	Initial value	Unit	Setting range
PB25		For manufacturer setting Do not change this value by any means.	0000h		
PB26	*CDP	Gain changing selection Select the gain changing condition. (Refer to section 10.6.) <div style="border: 1px solid black; display: inline-block; padding: 2px;">0 0 <input type="checkbox"/> <input type="checkbox"/></div> <div style="margin-left: 20px;"> Gain changing selection Under any of the following conditions, the gains change on the basis of the parameter No.PB29 to PB32 settings. 0: Invalid 1: Gain changing (RX(n+2)8) is ON 2: Command frequency (Parameter No.PB27 setting) 3: Droop pulse value (Parameter No.PB27 setting) 4: Servo motor speed (Parameter No.PB27 setting) </div> <div style="margin-left: 20px;"> Gain changing condition 0: Valid at more than condition (Valid when gain changing (RX(n+2)8) is ON) 1: Valid at less than condition (Valid when gain changing (RX(n+2)8) is OFF) </div>	0000h		Refer to name and function column.
PB27	CDL	Gain changing condition Used to set the value of gain changing condition (command frequency, droop pulses, servo motor speed) selected in parameter No.PB26. The set value unit changes with the changing condition item. (Refer to section 10.6.)	10	kpps pulse r/min	0 to 9999
PB28	CDT	Gain changing time constant Used to set the time constant at which the gains will change in response to the conditions set in parameters No.PB26 and PB27. (Refer to section 10.6.)	1	ms	0 to 100
PB29	GD2B	Gain changing ratio of load inertia moment to servo motor inertia moment Used to set the ratio of load inertia moment to servo motor inertia moment when gain changing is valid. This parameter is made valid when the auto tuning is invalid (parameter No. PA08: <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 3).	7.0	Multiplier (×1)	0 to 300.0
PB30	PG2B	Gain changing position loop gain Set the position loop gain when the gain changing is valid. This parameter is made valid when the auto tuning is invalid (parameter No. PA08: <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 3).	37	rad/s	1 to 2000
PB31	VG2B	Gain changing speed loop gain Set the speed loop gain when the gain changing is valid. This parameter is made valid when the auto tuning is invalid (parameter No. PA08: <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 3). Note. The setting range of 50000 applies to the servo amplifier whose software version is A3 or later. The setting range of the servo amplifier whose software version is older than A3 is 20 to 20000. When the software version of MR Configurator is A3 or earlier, 20001 or more cannot be set. Use the display/operation section of the servo amplifier to set 20001 or more.	823	rad/s	20 to 20000
PB32	VICB	Gain changing speed integral compensation Set the speed integral compensation when the gain changing is valid. This parameter is made valid when the auto tuning is invalid (parameter No. PA08: <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 3).	33.7	ms	0.1 to 5000.0

16. INDEXER POSITIONING OPERATION

No.	Symbol	Name and function	Initial value	Unit	Setting range
PB33	VRF1B	Gain changing vibration suppression control vibration frequency setting Set the vibration frequency for vibration suppression control when the gain changing is valid. This parameter is made valid when the parameter No.PB02 setting is "□□□2" and the parameter No.PB26 setting is "□□□1". When using the vibration suppression control gain changing, always execute the changing after the servo motor has stopped.	100.0	Hz	0.1 to 100.0
PB34	VRF2B	Gain changing vibration suppression control resonance frequency setting Set the resonance frequency for vibration suppression control when the gain changing is valid. This parameter is made valid when the parameter No.PB02 setting is "□□□2" and the parameter No.PB26 setting is "□□□1". When using the vibration suppression control gain changing, always execute the changing after the servo motor has stopped.	100.0	Hz	0.1 to 100.0
PB35		For manufacturer setting Do not change this value by any means.	0.00		
PB36			0.00		
PB37			100		
PB38			0		
PB39			0		
PB40			0		
PB41			1125		
PB42			1125		
PB43			0004h		
PB44			0000h		
PB45			0000h		

16. INDEXER POSITIONING OPERATION

16.11.3 Extension setting parameters (No.PC□□)

(1) Parameter list

No.	Symbol	Name	Initial value	Unit
PC01		For manufacturer setting	0000h	
PC02	*ZTY	Home position return type	0000h	
PC03	*ZDIR	Home position return direction	0001h	
PC04	ZRF	Home position return speed	500	r/min
PC05	CRF	Creep speed	10	r/min
PC06	ZST	Home position shift distance	0	μm
PC07		Not used in indexer positioning operation.	0	
PC08			1000	
PC09			100	
PC10			15.0	
PC11	CRP	Rough match output range	0	pulse
PC12	JOG	Jog speed	100	r/min
PC13		Not used in indexer positioning operation.	0	
PC14	*BKC	Backlash compensation	0	pulse
PC15		For manufacturer setting	0000h	
PC16	MBR	Electromagnetic brake sequence output	100	ms
PC17		Not used in indexer positioning operation.	50	
PC18	*BPS	Alarm history clear	0000h	
PC19	*ENRS	Encoder output pulse selection	0000h	
PC20	*SNO	Station number setting	0	station
PC21	*SOP	RS-422 communication function selection	0000h	
PC22	*COP1	Function selection C-1	0000h	
PC23		For manufacturer setting	0000h	
PC24		Not used in indexer positioning operation.	0000h	
PC25		For manufacturer setting	0000h	
PC26	*COP5	Function selection C-5	0000h	
PC27		For manufacturer setting	0000h	
PC28		Not used in indexer positioning operation.	0000h	
PC29		For manufacturer setting	0000h	
PC30	*DSS	Remote register-based position/speed specifying system selection	0000h	
PC31		Not used in indexer positioning operation.	0	
PC32			0	
PC33				
PC34				
PC35	TL2	Internal torque limit 2	100.0	%
PC36		For manufacturer setting	0000h	
PC37		Not used in indexer positioning operation.	0	
PC38			0	
PC39				
PC40				
PC41		For manufacturer setting	0000h	
PC42			0000h	
PC43			0000h	
PC44			0000h	
PC45	*COP9	Function selection C-9	0000h	
PC46	*STN	Indexer positioning operation number of stations/rotation	0000h	
PC47	PSST	Indexer positioning operation station home position shift distance	0000h	pulse
PC48		For manufacturer setting	0000h	

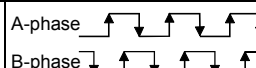
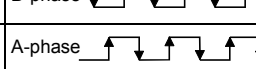
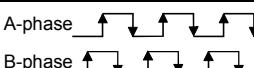
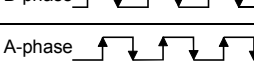
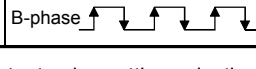
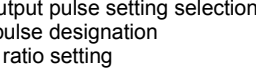
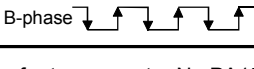
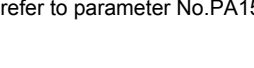
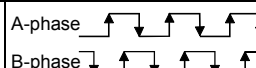
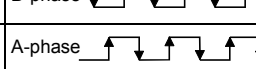
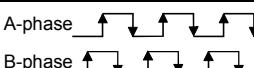
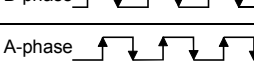
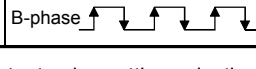
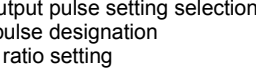
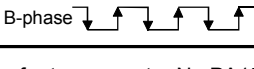
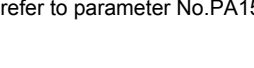
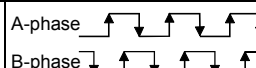
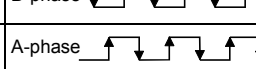
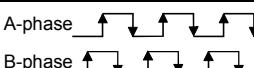
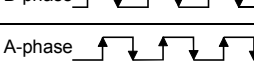
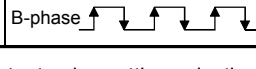
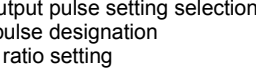
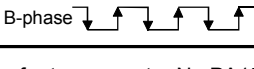
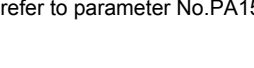
16. INDEXER POSITIONING OPERATION

No.	Symbol	Name and function	Initial value	Unit
PC49	/	For manufacturer setting	0000h	/
PC50			0000h	

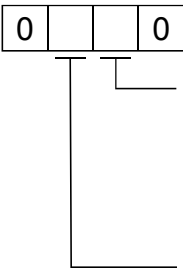
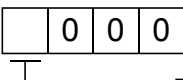
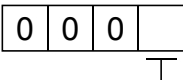
(2) Detail list

No.	Symbol	Name and function	Initial value	Unit	Setting range				
PC01	/	For manufacturer setting Do not change this value by any means.	0000h	/	/				
PC02	*ZTY	Home position return type Used to set the home position return system. (Refer to section 5.6.) Parameter No.PC02 <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td style="width: 20px; text-align: center;">0</td> <td style="width: 20px; text-align: center;">0</td> <td style="width: 20px; text-align: center;">0</td> <td style="width: 20px; text-align: center;">□</td> </tr> </table> <div style="display: inline-block; vertical-align: middle; margin-left: 20px;"> Home position return method 0: } 1: } 2: } 3: } 4: } 5: } } Not used in indexer positioning operation. 6: } 7: } 8: } 9: } A: } C: Torque limit changing dog type D: Torque limit changing data setting type </div>	0	0	0	□	0000h	/	Refer to name and function column.
0	0	0	□						
PC03	*ZDIR	Home position return direction Used to set the home position return direction. Parameter No.PC03 <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td style="width: 20px; text-align: center;">0</td> <td style="width: 20px; text-align: center;">0</td> <td style="width: 20px; text-align: center;">0</td> <td style="width: 20px; text-align: center;">□</td> </tr> </table> <div style="display: inline-block; vertical-align: middle; margin-left: 20px;"> Home position return direction 0: Station No. increment direction 1: Station No. decrement direction </div>	0	0	0	□	0001h	/	Refer to name and function column.
0	0	0	□						
PC04	ZRF	Home position return speed Used to set the servo motor speed for home position return. (Refer to section 16.9.)	500	r/min	0 to permissible speed				
PC05	CRF	Creep speed Used to set the creep speed after proximity dog detection. (Refer to section 16.9.)	10	r/min	0 to permissible speed				
PC06	ZST	Home position shift distance Used to set the shift distance starting at the Z-phase pulse detection position inside the encoder. (Refer to section 16.9.)	0	μm	0 to 65535				
PC07	/	Not used in indexer positioning operation. Do not change the parameter.	0	/	/				
PC08			1000						
PC09			100						
PC10			15.0						
PC11	CRP	Rough match output range Used to set the command remaining distance range where the rough match (RXn2) is output.	0	$\times 10^{\text{STM}} \mu\text{m}$	0 to 65535				
PC12	JOG	Jog speed Used to set the jog speed command.	100	r/min	0 to permissible speed				

16. INDEXER POSITIONING OPERATION

No.	Symbol	Name and function	Initial value	Unit	Setting range															
PC13		Not used in indexer positioning operation. Do not change the parameter.	0																	
PC14	*BKC	Backlash compensation Used to set the backlash compensation made when the command direction is reversed. This function compensates for the number of backlash pulses in the opposite direction to the home position return direction. For the home position ignorance (servo-on position as home position), this function compensates for the number of backlash pulses in the opposite direction to the first rotating direction after establishing the home position by switching ON the servo-on (RYn0). In the absolute position detection system, this function compensates for the backlash pulse count in the direction opposite to the operating direction at power-on.	0	pulse	0 to 32000															
PC15		For manufacturer setting Do not change this value by any means.	0000h																	
PC16	MBR	Electromagnetic brake sequence output Used to set the delay time (Tb) between when the electromagnetic brake interlock (MBR) switches off and when the base circuit is shut off.	100	ms	0 to 1000															
PC17		Not used in indexer positioning operation. Do not change the parameter.	50																	
PC18	*BPS	Alarm history clear Used to clear the alarm history. <table border="1" style="margin-left: 20px;"> <tr> <td style="width: 20px; height: 20px; text-align: center;">0</td> <td style="width: 20px; height: 20px; text-align: center;">0</td> <td style="width: 20px; height: 20px; text-align: center;">0</td> <td style="width: 20px; height: 20px;"></td> </tr> </table> Alarm history clear 0: Invalid 1: Valid When alarm history clear is made valid, the alarm history is cleared at next power-on. After the alarm history is cleared, the setting is automatically made invalid (reset to 0).	0	0	0		0000h		Refer to name and function column.											
0	0	0																		
PC19	*ENRS	Encoder output pulse selection Use to select the, encoder output pulse direction and encoder output pulse setting. <table border="1" style="margin-left: 20px;"> <tr> <td style="width: 20px; height: 20px; text-align: center;">0</td> <td style="width: 20px; height: 20px; text-align: center;">0</td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> </tr> </table> Encoder output pulse phase changing Changes the phases of A, B-phase encoder pulses output . <table border="1" style="margin-left: 20px; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">Set value</th> <th colspan="2">Servo motor rotation direction</th> </tr> <tr> <th>CCW</th> <th>CW</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0</td> <td>A-phase  B-phase </td> <td>A-phase  B-phase </td> </tr> <tr> <td style="text-align: center;">1</td> <td>A-phase  B-phase </td> <td>A-phase  B-phase </td> </tr> </tbody> </table> Encoder output pulse setting selection (refer to parameter No.PA15). 0: Output pulse designation 1: Division ratio setting 2: Outputs the encoder pulse without processing it.	0	0			Set value	Servo motor rotation direction		CCW	CW	0	A-phase  B-phase 	A-phase  B-phase 	1	A-phase  B-phase 	A-phase  B-phase 	0000h		Refer to name and function column.
0	0																			
Set value	Servo motor rotation direction																			
	CCW	CW																		
0	A-phase  B-phase 	A-phase  B-phase 																		
1	A-phase  B-phase 	A-phase  B-phase 																		

16. INDEXER POSITIONING OPERATION

No.	Symbol	Name and function	Initial value	Unit	Setting range
PC20	*SNO	Station number setting Used to specify the station number for RS-422 serial communication and USB communication. Always set one station to one axis of servo amplifier. If one station number is set to two or more stations, normal communication cannot be made.	0	station	0 to 31
PC21	*SOP	RS-422 communication function selection Select the communication I/F and select the RS-422 communication conditions. <div style="border: 1px solid black; display: inline-block; padding: 2px;">0 0 0 0</div>  <ul style="list-style-type: none"> RS-422 communication baud rate selection 0: 9600 [bps] 1: 19200 [bps] 2: 38400 [bps] 3: 57600 [bps] 4: 115200 [bps] RS-422 communication response delay time 0: Invalid 1: Valid, reply sent after delay time of 800 μs or more 	0000h		Refer to name and function column.
PC22	*COP1	Function selection C-1 Select the encoder cable communication system selection. <div style="border: 1px solid black; display: inline-block; padding: 2px;">0 0 0 0</div>  <ul style="list-style-type: none"> Encoder cable communication system selection 0: Two-wire type 1: Four-wire type The following encoder cables are of 4-wire type. MR-EKCBL30M-L MR-EKCBL30M-H MR-EKCBL40M-H MR-EKCBL50M-H The other encoder cables are all of 2-wire type. Incorrect setting will result in an encoder alarm 1 (A16) or encoder alarm 2 (A20). 	0000h		Refer to the name and function field.
PC23		For manufacturer setting Do not change this value by any means.	0000h		
PC24		Not used in indexer positioning operation. Do not change the parameter.	0000h		
PC25		For manufacturer setting Do not change this value by any means.	0000h		
PC26	*COP5	Function selection C-5 Select the stroke limit warning (A99). <div style="border: 1px solid black; display: inline-block; padding: 2px;">0 0 0 0</div>  <ul style="list-style-type: none"> Stroke limit warning (A99) selection 0: Valid 1: Invalid When this parameter is set to "1", A99 will not occur if the forward rotation stroke end (LSP) or reverse rotation stroke end (LSN) turns OFF. 	0000h		Refer to name and function column.
PC27		For manufacturer setting Do not change this value by any means.	0000h		
PC28		Not used in indexer positioning operation. Do not change the parameter.	0000h		

16. INDEXER POSITIONING OPERATION

No.	Symbol	Name and function	Initial value	Unit	Setting range																				
PC29		For manufacturer setting Do not change this value by any means.	0000h																						
PC30	*DSS	Remote register-based position/speed specifying system selection This parameter is made valid when Position/speed specification selection (RY(n+2)A) is turned ON with 2 stations occupied. Select how to receive the position command and speed command. When 1 station is occupied, selection of "0001" or "0002" will result in a parameter error. <table border="1" style="margin-left: 20px;"> <tr> <td style="width: 20px; text-align: center;">0</td> <td style="width: 20px; text-align: center;">0</td> <td style="width: 20px; text-align: center;">0</td> <td style="width: 20px; text-align: center;">□</td> </tr> <tr> <td colspan="4" style="text-align: center;">└─┬─┘</td> </tr> <tr> <td style="text-align: center;">Set value</td> <td style="text-align: center;">Position command</td> <td colspan="2" style="text-align: center;">Speed command</td> </tr> <tr> <td style="text-align: center;">0</td> <td rowspan="2" style="text-align: center;">Set the station No.</td> <td colspan="2" style="text-align: center;">Specify the servo point table No.</td> </tr> <tr> <td style="text-align: center;">1</td> <td colspan="2" style="text-align: center;">Specify the servo motor speed. (Note)</td> </tr> </table> Note. In the case, always set the acceleration/deceleration time constant in the point table No.1.	0	0	0	□	└─┬─┘				Set value	Position command	Speed command		0	Set the station No.	Specify the servo point table No.		1	Specify the servo motor speed. (Note)		0000h		Refer to name and function column.	
0	0	0	□																						
└─┬─┘																									
Set value	Position command	Speed command																							
0	Set the station No.	Specify the servo point table No.																							
1		Specify the servo motor speed. (Note)																							
PC31		Not used in indexer positioning operation. Do not change the parameter.	0																						
PC32			0																						
PC33																									
PC34																									
PC35	TL2	Internal torque limit 2 Set this parameter to limit servo motor torque on the assumption that the maximum torque is 100[%]. When 0 is set, torque is not produced.	100.0	%	0 to 100.0																				
PC36		For manufacturer setting Do not change this value by any means.	0000h																						
PC37		Not used in indexer positioning operation. Do not change the parameter.	0																						
PC38			0																						
PC39																									
PC40																									
PC41		For manufacturer setting Do not change this value by any means.	0000h																						
PC42			0000h																						
PC43			0000h																						
PC44			0000h																						
PC45	*COP9	Function selection C-9 Select the manual operation mode. <table border="1" style="margin-left: 20px;"> <tr> <td style="width: 20px; text-align: center;">0</td> <td style="width: 20px; text-align: center;">0</td> <td style="width: 20px; text-align: center;">0</td> <td style="width: 20px; text-align: center;">□</td> </tr> <tr> <td colspan="4" style="text-align: center;">└─┬─┘</td> </tr> <tr> <td colspan="4" style="text-align: center;">Manual operation for indexer positioning operation selection (Refer to section 16.7.3)</td> </tr> <tr> <td colspan="4" style="text-align: center;">0: Indexer JOG operation</td> </tr> <tr> <td colspan="4" style="text-align: center;">1: JOG operation</td> </tr> </table>	0	0	0	□	└─┬─┘				Manual operation for indexer positioning operation selection (Refer to section 16.7.3)				0: Indexer JOG operation				1: JOG operation				0000h		0000h to 0001h
0	0	0	□																						
└─┬─┘																									
Manual operation for indexer positioning operation selection (Refer to section 16.7.3)																									
0: Indexer JOG operation																									
1: JOG operation																									

16. INDEXER POSITIONING OPERATION

No.	Symbol	Name and function	Initial value	Unit	Setting range																				
PC46	*STN	Indexer positioning operation number of stations/rotation Set the number of stations (dividing number) per machine rotation. When the setting value is 2 or lower, the number of stations is set to 2. <table border="1" style="margin: 10px auto;"> <thead> <tr> <th>Setting value</th> <th>Number of stations</th> </tr> </thead> <tbody> <tr><td>0000</td><td>2</td></tr> <tr><td>0001</td><td>2</td></tr> <tr><td>0002</td><td>2</td></tr> <tr><td>0003</td><td>3</td></tr> <tr><td>0004</td><td>4</td></tr> <tr><td>.</td><td>.</td></tr> <tr><td>.</td><td>.</td></tr> <tr><td>.</td><td>.</td></tr> <tr><td>00FF</td><td>255</td></tr> </tbody> </table>	Setting value	Number of stations	0000	2	0001	2	0002	2	0003	3	0004	4	00FF	255	0000h	Number of stations	0000h to 00FFh
Setting value	Number of stations																								
0000	2																								
0001	2																								
0002	2																								
0003	3																								
0004	4																								
.	.																								
.	.																								
.	.																								
00FF	255																								
PC47	PSST	Indexer positioning operation station home position shift distance This parameter is available only in the absolute position detection system. Set the distance for shifting the home position toward the set home position in number of pulses. This shift distance does not become valid immediately after the home position setting. It becomes valid after turning off and then on the power. When the shift distance is larger than the in-position range, the in position (RXn1) does not turn on at power-on. Set the number of pulses to be shifted after converting it into hexadecimal. The setting range is from -2000 to 2000 pulse.	0000h	pulse	Refer to name and function column																				
PC48	/	For manufacturer setting	0000h	/	/																				
PC49		Do not change this value by any means.	0000h																						
PC50			0000h																						

(3) Alarm history clear

The alarm history can be confirmed by using the MR Configurator. The servo amplifier stores one current alarm and five past alarms from when its power is switched on first. To control alarms which will occur during operation, clear the alarm history using parameter No.PC18 (alarm history clear) before starting operation. Clearing the alarm history automatically returns to "□□□0".

This parameter is made valid by switching power off, then on after setting.

Parameter No.16

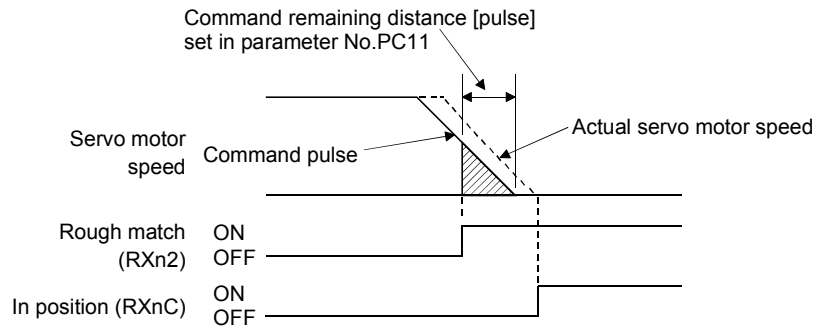
0	0	0	□
---	---	---	---

Alarm history clear
 0: Invalid (not cleared)
 1: Valid (cleared)

16. INDEXER POSITIONING OPERATION

(4) Rough match output

Rough match (RXn2) is output when the command remaining distance reaches the value set in parameter No.PC11 (rough match output range). The setting range is 0 to 65535 [pulse].



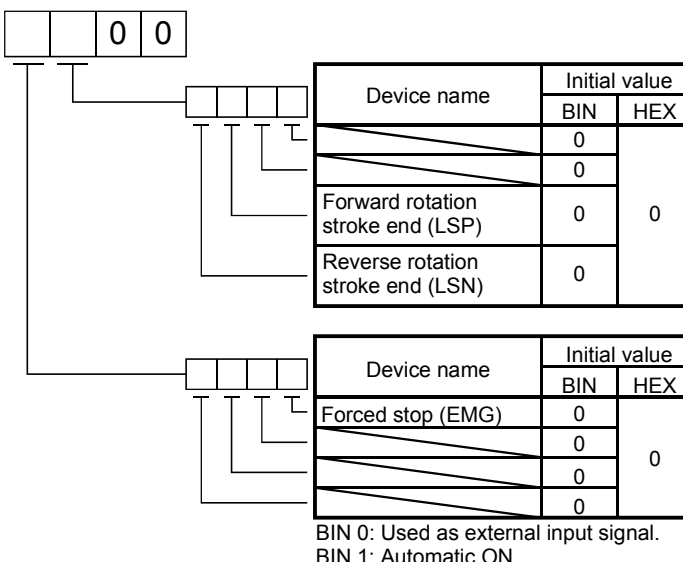
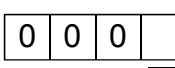
16.11.4 I/O setting parameters (No.PD□□□)

(1) Parameter list

No.	Symbol	Name	Initial value	Unit
PD01	*DIA1	Input signal automatic ON selection 1	0000h	
PD02		For manufacturer setting	0000h	
PD03		Not used in indexer positioning operation.	0000h	
PD04			0000h	
PD05		For manufacturer setting	0000h	
PD06		Not used in indexer positioning operation.	002Bh	
PD07			000Ah	
PD08			000Bh	
PD09			0002h	
PD10			0003h	
PD11			0024h	
PD12			0C00h	
PD13		For manufacturer setting	0000h	
PD14		Not used in indexer positioning operation.	0800h	
PD15		For manufacturer setting	0000h	
PD16	*DIAB	Input polarity selection	0000h	
PD17		For manufacturer setting	0000h	
PD18			0000h	
PD19	*DIF	Response level setting	0002h	
PD20	*DOP1	Function selection D-1	0010h	
PD21		For manufacturer setting	0000h	
PD22		Not used in indexer positioning operation.	0000h	
PD23		For manufacturer setting	0000h	
PD24	*DOP5	Function selection D-5	0000h	
PD25		For manufacturer setting	0000h	
PD26	TLT	Indexer positioning operation torque limit delay time	0064h	
PD27		For manufacturer setting	0000h	
PD28			0000h	
PD29			0000h	
PD30			0000h	

16. INDEXER POSITIONING OPERATION

(2) Detail list

No.	Symbol	Name and function	Initial value	Unit	Setting range
PD01	*DIA1	<p>Input signal automatic ON selection 1 Select the input devices to be automatically turned ON. <input type="checkbox"/> part is for manufacturer setting. Do not set the value by any means.</p>  <p>For example, to turn ON SON, the setting is "□□□4".</p>	0000h		Refer to name and function column.
PD02		For manufacturer setting Do not change this value by any means.	0000h		
PD03		Not used in indexer positioning operation.	0000h		
PD04		Do not change the parameter.	0000h		
PD05		For manufacturer setting Do not change this value by any means.	0000h		
PD06		Not used in indexer positioning operation. Do not change the parameter.	002Bh		
PD07			000Ah		
PD08			000Bh		
PD09			0002h		
PD10			0003h		
PD11			0024h		
PD12			0C00h		
PD13		For manufacturer setting Do not change this value by any means.	0000h		
PD14		Not used in indexer positioning operation. Do not change the parameter.	0800h		
PD15		For manufacturer setting Do not change this value by any means.	0000h		
PD16	*DIAB	<p>Input polarity selection Used to set the proximity dog input polarity. (Refer to section 5.6.)</p>  <p>Proximity dog input polarity 0: OFF indicates detection of the dog 1: ON indicates detection of the dog</p>	0000h		Refer to name and function column.

16. INDEXER POSITIONING OPERATION

No.	Symbol	Name and function	Initial value	Unit	Setting range				
PD17		For manufacturer setting	0000h						
PD18		Do not change this value by any means.	0000h						
PD19	*DIF	<p>Response level setting Used to select the input.</p> <table border="1" style="margin-left: 20px;"> <tr> <td style="width: 20px; text-align: center;">0</td> <td style="width: 20px; text-align: center;">0</td> <td style="width: 20px; text-align: center;">0</td> <td style="width: 20px; text-align: center;"> </td> </tr> </table> <p style="margin-left: 40px;">└─ Input filter If external input signal causes chattering due to noise, etc., input filter is used to suppress it.</p> <p style="margin-left: 40px;">0: None 1: 0.88[ms] 2: 1.77[ms] 3: 2.66[ms] 4: 3.55[ms] 5: 4.44[ms]</p>	0	0	0		0002h		Refer to name and function column.
0	0	0							
PD20	*DOP1	<p>Function selection D-1 Select the stop processing at forward rotation stroke end (LSN)/reverse rotation stroke end (LSN) OFF and the base circuit status at reset (RY(N+1)A or RY(n+3)A) ON.</p> <table border="1" style="margin-left: 20px;"> <tr> <td style="width: 20px; text-align: center;">0</td> <td style="width: 20px; text-align: center;">0</td> <td style="width: 20px; text-align: center;"> </td> <td style="width: 20px; text-align: center;"> </td> </tr> </table> <p style="margin-left: 40px;">└─ Stopping method used when forward rotation stroke end (LSP), reverse rotation stroke end (LSN) device or software limit is valid 0: Sudden stop (home position erased) 1: Slow stop (home position erased) 2: Slow stop (Setting contents is the same as for "1".) 3: Sudden stop (Setting contents is the same as for "0".) Even in this case, when LSP or LSN is detected, home position return is required again before executing automatic operation. However, in the absolute position detection system (parameter No.PA03:□□□1), the home position return completion (ZP) can be turned on by turning on the servo-on. In the case, executing another home position.</p> <p style="margin-left: 40px;">└─ Selection of base circuit status at reset (RY(n+1)A or RY(n+3)A)ON 0: Base circuit not switched off 1: Base circuit switched off</p>	0	0			0010h		Refer to name and function column.
0	0								
PD21		For manufacturer setting	0000h						
		Do not change this value by any means.							
PD22		Not used in indexer positioning operation.	0000h						
		Do not change the parameter.							
PD23		For manufacturer setting	0000h						
		Do not change this value by any means.							

16. INDEXER POSITIONING OPERATION

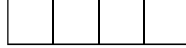
No.	Symbol	Name and function	Initial value	Unit	Setting range																									
PD24	*DOP5	<p>Function selection D-5 Select the output status of the warning (RXnA).</p> <p>0 0 0</p> <p>Selection of output device at warning occurrence Select the warning (RXnA) and trouble (RX(n+1)A or RX(n+3)A) output status at warning occurrence.</p> <table border="1"> <thead> <tr> <th>Setting</th> <th colspan="2">(Note) Device status</th> </tr> </thead> <tbody> <tr> <td rowspan="2">0</td> <td>Remote output</td> <td> <table border="0"> <tr> <td>RXnA</td> <td>1</td> <td rowspan="2"></td> </tr> <tr> <td>RX(n+1)A or RX(n+3)A</td> <td>1</td> </tr> </table> </td> </tr> <tr> <td>Output device</td> <td>ALM</td> <td>ON</td> </tr> <tr> <td rowspan="2">1</td> <td>Remote output</td> <td> <table border="0"> <tr> <td>RXnA</td> <td>1</td> <td rowspan="2"></td> </tr> <tr> <td>RX(n+1)A or RX(n+3)A</td> <td>1</td> </tr> </table> </td> </tr> <tr> <td>Output device</td> <td>ALM</td> <td>OFF</td> </tr> </tbody> </table> <p>Note. 0: OFF 1: ON</p>	Setting	(Note) Device status		0	Remote output	<table border="0"> <tr> <td>RXnA</td> <td>1</td> <td rowspan="2"></td> </tr> <tr> <td>RX(n+1)A or RX(n+3)A</td> <td>1</td> </tr> </table>	RXnA	1		RX(n+1)A or RX(n+3)A	1	Output device	ALM	ON	1	Remote output	<table border="0"> <tr> <td>RXnA</td> <td>1</td> <td rowspan="2"></td> </tr> <tr> <td>RX(n+1)A or RX(n+3)A</td> <td>1</td> </tr> </table>	RXnA	1		RX(n+1)A or RX(n+3)A	1	Output device	ALM	OFF	0000h		
Setting	(Note) Device status																													
0	Remote output	<table border="0"> <tr> <td>RXnA</td> <td>1</td> <td rowspan="2"></td> </tr> <tr> <td>RX(n+1)A or RX(n+3)A</td> <td>1</td> </tr> </table>	RXnA	1		RX(n+1)A or RX(n+3)A	1																							
	RXnA	1																												
RX(n+1)A or RX(n+3)A	1																													
Output device	ALM	ON																												
1	Remote output	<table border="0"> <tr> <td>RXnA</td> <td>1</td> <td rowspan="2"></td> </tr> <tr> <td>RX(n+1)A or RX(n+3)A</td> <td>1</td> </tr> </table>	RXnA	1		RX(n+1)A or RX(n+3)A	1																							
	RXnA	1																												
RX(n+1)A or RX(n+3)A	1																													
Output device	ALM	OFF																												
PD25		For manufacturer setting Do not change this value by any means.	0000h																											
PD26	TLT	Indexer positioning operation torque limit delay time Set the delay time from when the in position (RXn1) turns on until the internal torque limit 2 (parameter No.PC35) becomes effective. Set the delay time after converting it into hexadecimal. The setting range is from 0 to 1000 ms.	0064h	ms	Refer to name and function column.																									
PD27		For manufacturer setting	0000h																											
PD28		Do not change this value by any means.	0000h																											
PD29			0000h																											
PD30			0000h																											

16. INDEXER POSITIONING OPERATION

(3) Stopping method when the forward stroke end (LSP) or reverse stroke end (LSN) is valid

The setting of the first digit of parameter No.PD20 enables to select a stopping method of the servo motor when the forward rotation stroke end (LSP) or reverse rotation stroke end (LSN) turns off.

Parameter No.PD20



- Stopping method when the forward rotation stroke end (LSP) or reverse rotation stroke end (LSN) is valid
- 0: Sudden stop (home position erased)
 - 1: Slow stop (home position erased)
 - 2: Slow stop (Setting contents is the same as for "1".)
 - 3: Sudden stop (Setting contents is the same as for "0".)

Setting value of parameter No.PD20	Operation status		Remarks
	When rotating at constant speed	When decelerating to stop	
□□□0 (Initial value) . □□□3			Clears droop pulses and stops. Erases the home position. A difference occurs between the command position and the current position. Execute a home position return again.
□□□1 . □□□2			Moves for the amount of droop pulse and stops. Erases the home position. A difference occurs between the command position and the current position. Execute a home position return again.

16. INDEXER POSITIONING OPERATION

16.12 TROUBLESHOOTING

16.12.1 Trouble at start-up



CAUTION

- Excessive adjustment or change of parameter setting must not be made as it will make operation instable.

POINT

- Using the MR Configurator, you can refer to unrotated servo motor reasons, etc.

The following faults may occur at start-up. If any of such faults occurs, take the corresponding action.

No.	Start-up sequence	Fault	Investigation	Possible cause	Reference
1	Power on	<ul style="list-style-type: none"> LED is not lit. LED flickers. 	Not improved if connectors CN2, CN3 and CN6 are disconnected.	<ol style="list-style-type: none"> Power supply voltage fault Servo amplifier is faulty. 	/
			Improved when connectors CN6 is disconnected.	Power supply of CN6 cabling is shorted.	
			Improved when connector CN2 is disconnected.	<ol style="list-style-type: none"> Power supply of encoder cabling is shorted. Encoder is faulty. 	
			Improved when connector CN3 is disconnected.	Power supply of CN3 cabling is shorted.	
		Alarm occurs.	Refer to section 16.12.4 and remove cause.		Section 16.12.4
2	Switch on servo-on (RYn0) signal.	Alarm occurs.	Refer to section 16.12.4 and remove cause.		Section 16.12.4
		Servo motor shaft is not servo-locked (is free).	<ol style="list-style-type: none"> Check the display to see if the servo amplifier is ready to operate. Check the external I/O signal indication to see if the servo-on (RYn0) signal is ON. 	<ol style="list-style-type: none"> Servo-on (RYn0) is not input. (Wiring mistake) 24VDC power is not supplied to DICOM. 	Section 8.5.4
3	Gain adjustment	Rotation ripples (speed fluctuations) are large at low speed.	Make gain adjustment in the following procedure. <ol style="list-style-type: none"> Increase the auto tuning response level. Repeat acceleration and deceleration several times to complete auto tuning. 	Gain adjustment fault	Chapter 9
		Large load inertia moment causes the servo motor shaft to oscillate side to side.	If the servo motor may be run with safety, repeat acceleration and deceleration several times to complete auto tuning.	Gain adjustment fault	Chapter 9
4	Cyclic operation	Position shift occurs	Confirm the cumulative command pulses, cumulative feedback pulses and actual servo motor position.	Pulse counting error, etc. due to noise.	/

16. INDEXER POSITIONING OPERATION

16.12.2 Operation at error occurrence

An error occurring during operation will result in any of the statuses indicated in the following table.

Error location	Description	Operation mode	
		Test operation	CC-Link operation
Servo side alarm occurrence	Servo operation	Stop	Stop
	CC-Link data communication	Continued	Continued
Option unit communication error	Servo operation	Stop	Stop
	CC-Link data communication	Stop	Stop
CC-Link communication error	Servo operation	Stop	Stop
	CC-Link data communication	Stop	Stop
Programmable controller error/STOP	Servo operation	Continued	Stop
	CC-Link data communication	Stop	Stop
Servo side warning occurrence	Servo operation	Stop	Continued
	CC-Link data communication	Continued	Continued

16.12.3 CC-Link communication error

This section gives the definitions of the indications given in the communication alarm display section. The servo amplifier has four LED indications.

L.RUN : Lit at normal receive of refresh data. Extinguished when data is not received for a given period of time.

SD : Lit when send data is "0".

RD : Lit when the carrier of receive data is detected.

L.ERR : Lit when the data addressed to the host is in CRC or abort error.

(Note) Communication alarm display LED				Operation
L.RUN	SD	RD	L.ERR	
○	◎	◎	◎	Normal communication is made, but a CRC error sometimes occurs due to noise.
○	◎	◎	●	Normal communication
○	◎	●	◎	Hardware fault
○	◎	●	●	Hardware fault
○	●	◎	◎	Receive data results in CRC error, disabling a response.
○	●	◎	●	Data does not reach the host.
○	●	●	◎	Hardware fault
○	●	●	●	Hardware fault
●	◎	◎	◎	Polling response is made, but refresh receive is in CRC error.
●	◎	◎	●	Hardware fault
●	◎	●	◎	Hardware fault
●	◎	●	●	Hardware fault
●	●	◎	◎	Data addressed to the host resulted in CRC error.
●	●	◎	●	Data does not reach the host, or the data addressed to the host cannot be received due to noise.
●	●	●	◎	Hardware fault
●	●	●	○	Baud rate setting illegal
●	●	○	○	Station number setting illegal
●	○	○	◎	Baud rate or station number setting changed midway (ERROR flickers for about 4s)
●	●	●	●	Data cannot be received due to power-off, power supply failure, open cable, etc. WDT error occurrence (hardware fault)

Note. ○ : Lit ● : Extinguished ◎ : Flicker

16. INDEXER POSITIONING OPERATION

16.12.4 When alarm or warning has occurred

POINT
<ul style="list-style-type: none"> Configure up a circuit which will detect the trouble (ALM) signal and turn off the servo-on (RYn0) at occurrence of an alarm.

(1) Alarms and warning list

When a fault occurs during operation, the corresponding alarm or warning is displayed. If any alarm or warning has occurred, refer to (2), (3) in this section and take the appropriate action. When an alarm occurs, ALM turns off.

After its cause has been removed, the alarm can be deactivated in any of the methods marked ○ in the alarm deactivation column.

	Display	Name	Alarm deactivation			Display	Name	
			Power OFF→ON	(Note 3) MR Configurator parameter unit	(Note 2) Alarm reset (RES)			
Alarms	A10	Undervoltage	○	○	○	Warnings	A90	Home positioning incomplete warning
	A12	Memory error 1 (RAM)	○	△	△		A92	Open battery cable warning
	A13	Clock error	○	△	△		A96	Home position setting error
	A15	Memory error 2 (EEP-ROM)	○	△	△		A97	Next station warning
	A16	Encoder error 1 (At power on)	○	△	△		A99	Stroke limit warning
	A17	Board error	○	△	△		A9D	CC-Link warning 1
	A19	Memory error 3 (Flash-ROM)	○	△	△		A9E	CC-Link warning 2
	A1A	Motor combination error	○	△	△		A9F	Battery warning
	A20	Encoder error 2	○	△	△		AE0	Excessive regeneration warning
	A24	Main circuit error	○	○	○		AE1	Overload warning 1
	A25	Absolute position erase	○	△	△		AE3	Absolute position counter warning
	A30	Regenerative error	(Note 1) ○	(Note 1) ○	(Note 1) ○		AE6	Servo forced stop warning
	A31	Overspeed	○	○	○		AE8	Cooling fan speed reduction warning
	A32	Overcurrent	○	△	△		AE9	Main circuit off warning
	A33	Overvoltage	○	○	○		AEC	Overload warning 2
	A37	Parameter error	○	△	△		AED	Output watt excess warning
	A45	Main circuit device overheat	(Note 1) ○	(Note 1) ○	(Note 1) ○			
	A46	Servo motor overheat	(Note 1) ○	(Note 1) ○	(Note 1) ○			
	A47	Cooling fan alarm	○	△	△			
	A50	Overload 1	(Note 1) ○	(Note 1) ○	(Note 1) ○			
	A51	Overload 2	(Note 1) ○	(Note 1) ○	(Note 1) ○			
	A52	Error excessive	○	○	○			
	A61	Operation alarm	○	○	○			
	A8A	Serial communication time-out error	○	○	○			
	A8D	CC-Link alarm	○	○	○			
	A8E	Serial communication error	○	○	○			
	888	Watchdog	○	△	△			

Note 1. Deactivate the alarm about 30 minutes of cooling time after removing the cause of occurrence.

2. Turns on RY(n+1)A or RY(n+3)A.

3. Clicking the "Alarm reset" button on the "Alarm display" screen of MR Configurator allows an alarm to be deactivated.

Pressing the "STOP RESET" key of the parameter unit allows an alarm to be deactivated.

16. INDEXER POSITIONING OPERATION

(2) Remedies for alarms



CAUTION

- When any alarm has occurred, eliminate its cause, ensure safety, then reset the alarm, and restart operation. Otherwise, injury may occur.
- If an absolute position erase (A25) occurred, always make home position setting again. Not doing so may cause unexpected operation.
- As soon as an alarm occurs, turn off Servo-on (RYn0) and power off.

POINT

- When any of the following alarms has occurred, do not deactivate the alarm and resume operation repeatedly. To do so will cause the servo amplifier/servo motor to fail. Remove the cause of occurrence, and leave a cooling time of more than 30 minutes before resuming operation.
 - Regenerative error (A30)
 - Overload 1 (A50)
 - Overload 2 (A51)
- For the alarm deactivation method, refer to (1) in this section.

When an alarm occurs, the trouble (ALM) switches off and the dynamic brake is operated to stop the servo motor. At this time, the display indicates the alarm No.

The servo motor comes to a stop. Remove the cause of the alarm in accordance with this section. Use the MR Configurator to refer to a factor of alarm occurrence.

Display	Name	Definition	Cause	Action
A10	Undervoltage	Power supply voltage dropped. MR-J3-□T: 160VAC or less MR-J3-□T1: 83VAC or less MR-J3-□T4: 280VAC or less	1. Power supply voltage is low.	Check the power supply.
			2. There was an instantaneous control power failure of 60ms or longer.	
			3. Shortage of power supply capacity caused the power supply voltage to drop at start, etc.	
			4. The bus voltage dropped to the following value or less. MR-J3-□T: 200VDC MR-J3-□T1: 158VDC MR-J3-□T4: 380VDC	
			5. Faulty parts in the servo amplifier. <div style="border: 1px solid black; padding: 5px; width: fit-content;"> Checking method Alarm (A10) occurs if power is switched on after disconnection of all cables but the control circuit power supply cables. </div>	Change the servo amplifier.
A12	Memory error 1 (RAM)	RAM, memory fault	Faulty parts in the servo amplifier. <div style="border: 1px solid black; padding: 5px; width: fit-content;"> Checking method Alarm (any of A12 and A13) occurs if power is switched on after disconnection of all cables but the control circuit power supply cables. </div>	Change the servo amplifier.
A13	Clock error	Printed board fault		

16. INDEXER POSITIONING OPERATION

Display	Name	Definition	Cause	Action
A15	Memory error 2 (EEP-ROM)	EEP-ROM fault	1. Faulty parts in the servo amplifier <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 5px auto;"> Checking method Alarm (A15) occurs if power is switched on after disconnection of all cables but the control circuit power supply cables. </div>	Change the servo amplifier.
			2. The number of write times to EEPROM exceeded 100,000.	
			3. The multi-revolution data, which is saved as a home position, read from EEPROM is abnormal.	Execute a home position setting.
A16	Encoder error 1 (At power on)	Communication error occurred between encoder and servo amplifier.	1. Encoder connector (CN2) disconnected.	Connect correctly.
			2. Encoder fault	Change the servo motor.
			3. Encoder cable faulty (Wire breakage or shorted)	Repair or change the cable.
			4. Encoder cable type (2-wire, 4-wire) selection was wrong in parameter setting.	Correct the setting in the fourth digit of parameter No.PC22.
A17	Board error	CPU/parts fault	Faulty parts in the servo amplifier	Change the servo amplifier.
A19	Memory error 3 (Flash ROM)	ROM memory fault	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 5px auto;"> Checking method Alarm (A17 or A19) occurs if power is switched on after disconnection of all cables but the control circuit power supply cable. </div>	Change the servo amplifier.
A1A	Motor combination error	Wrong combination of servo amplifier and servo motor.	Wrong combination of servo amplifier and servo motor connected.	Use correct combination.
A20	Encoder error 2	Communication error occurred between encoder and servo amplifier.	1. Encoder connector (CN2) disconnected.	Connect correctly.
			2. Encoder cable faulty (Wire breakage or shorted)	Repair or change the cable.
			3. Encoder fault	Change the servo motor.
A24	Main circuit error	Ground fault occurred at the servo motor power (U,V and W phases) of the servo amplifier.	1. Power input wires and servo motor power wires are in contact.	Connect correctly.
			2. Sheaths of servo motor power cables deteriorated, resulting in ground fault.	Change the cable.
			3. Main circuit of servo amplifier failed. <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 5px auto;"> Checking method Alarm (A24) occurs if the servo is switched on after disconnecting the U, V, W power cables from the servo amplifier. </div>	Change the servo amplifier.
A25	Absolute position erase	Absolute position data in error	1. Voltage drop in encoder (Battery disconnected.)	After leaving the alarm occurring for a few minutes, switch power off, then on again. Always make home position setting again.
			2. Battery voltage low		Change the battery.
			3. Battery cable or battery is faulty.	Always make home position setting again.
		4. Home position not set.	After leaving the alarm occurring for a few minutes, switch power off, then on again. Always make home position setting again.	
		Power was switched on for the first time in the absolute position detection system.		

16. INDEXER POSITIONING OPERATION

Display	Name	Definition	Cause	Action
A30	Regenerative error	Permissible regenerative power of the built-in regenerative resistor or regenerative option is exceeded.	1. Wrong setting of parameter No. PA02	Set correctly.
			2. Built-in regenerative resistor or regenerative option is not connected.	Connect correctly
			3. High-duty operation or continuous regenerative operation caused the permissible regenerative power of the regenerative option to be exceeded. <div style="border: 1px solid black; padding: 5px; width: fit-content;"> Checking method Call the status display and check the regenerative load ratio. </div>	1. Reduce the frequency of positioning. 2. Use the regenerative option of larger capacity. 3. Reduce the load.
			4. Power supply voltage is abnormal. MR-J3-□T:260VAC or more MR-J3-□T1:More than 135VAC	Check the power supply
			5. Built-in regenerative resistor or regenerative option faulty.	Change the servo amplifier or regenerative option.
		Regenerative transistor fault	6. Regenerative transistor faulty. <div style="border: 1px solid black; padding: 5px; width: fit-content;"> Checking method 1) The regenerative option has overheated abnormally. 2) The alarm occurs even after removal of the built-in regenerative resistor or regenerative option. </div>	Change the servo amplifier.
A31	Overspeed	Speed has exceeded the instantaneous permissible speed.	1. Input command pulse frequency exceeded the permissible instantaneous speed frequency.	Set command pulses correctly.
			2. Small acceleration/deceleration time constant caused overshoot to be large.	Increase acceleration/deceleration time constant.
			3. Servo system is instable to cause overshoot.	1. Re-set servo gain to proper value. 2. If servo gain cannot be set to proper value. 1) Reduce load inertia moment ratio; or 2) Reexamine acceleration/ deceleration time constant.
			4. Electronic gear ratio is large (parameters No.PA06, PA07)	Set correctly.
			5. Encoder faulty.	Change the servo motor.

16. INDEXER POSITIONING OPERATION

Display	Name	Definition	Cause	Action
A32	Overcurrent	Current that flew is higher than the permissible current of the servo amplifier. (If the alarm (A32) occurs again when turning ON the servo after resetting the alarm by turning OFF/ON the power when the alarm (A32) first occurred, the transistor (IPM, IGBT) of the servo amplifier may be at fault. In the case, do not repeat to turn OFF/ON the power. Check the transistor with the checking method of "Cause 2".)	1. Short occurred in servo motor power (U, V, W).	Correct the wiring.
			2. Transistor (IPM, IGBT) of the servo amplifier faulty. <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 5px auto;">Checking method Alarm (A32) occurs if power is switched on after U,V and W are disconnected.</div>	Change the servo amplifier.
			3. Ground fault occurred in servo motor power (U, V, W).	Correct the wiring.
			4. External noise caused the overcurrent detection circuit to misoperate.	Take noise suppression measures.
A33	Overvoltage	The following shows the input value of converter bus voltage. MR-J3-□T(1): 400VDC or more MR-J3-□T4: 800VDC or more	1. Regenerative option is not used.	Use the regenerative option.
			2. Though the regenerative option is used, the parameter No.PA02 setting is "□□00 (not used)".	Set correctly.
			3. Lead of built-in regenerative resistor or regenerative option is open or disconnected.	1. Change the lead. 2. Connect correctly.
			4. Regenerative transistor faulty.	Change the servo amplifier
			5. Wire breakage of built-in regenerative resistor or regenerative option.	1. For wire breakage of built-in regenerative resistor, change the servo amplifier. 2. For wire breakage of regenerative option, change the regenerative option.
			6. Capacity of built-in regenerative resistor or regenerative option is insufficient.	Add regenerative option or increase capacity.
			7. Power supply voltage high.	Check the power supply.
			8. Ground fault occurred in servo motor power (U, V, W).	Correct the wiring.
			9. The jumper across BUE-SD of the FR-BU2 brake unit is removed.	Fit the jumper across BUE-SD.

16. INDEXER POSITIONING OPERATION

Display	Name	Definition	Cause	Action
A37	Parameter error	Parameter setting is wrong.	1. Servo amplifier fault caused the parameter setting to be rewritten.	Change the servo amplifier.
			2. Regenerative option not used with servo amplifier was selected in parameter No.PA02.	Set parameter No.PA02 correctly.
			3. Value outside setting range has been set in electronic gear.	Set parameters No.PA06, PA07 correctly.
			4. The number of write times to EEPROM exceeded 100,000 due to parameter write, etc.	Change the servo amplifier.
			5. The MR-J3-D01 is connected to the servo amplifier for the indexer positioning operation.	The MR-J3-D01 cannot be used for the indexer positioning operation.
		Point table setting is wrong.	6. Setting value is out of the setting range.	Set it correctly.
A45	Main circuit device overheat	Main circuit device overheat.	1. Servo amplifier faulty.	Change the servo amplifier.
			2. The power supply was turned on and off continuously by overloaded status.	The drive method is reviewed.
			3. Ambient temperature of servo motor is over 55°C (131°F).	Check environment so that ambient temperature is 0 to 55°C (32 to 131°F).
			4. Used beyond the specifications of close mounting.	Use within the range of specifications.
A46	Servo motor overheat	Servo motor temperature rise actuated the thermal sensor.	1. Ambient temperature of servo motor is over 40°C (104°F).	Check environment so that ambient temperature is 0 to 40°C (32 to 104°F).
			2. Servo motor is overloaded.	1. Reduce load. 2. Check operation pattern. 3. Use servo motor that provides larger output.
			3. Thermal sensor in encoder is faulty.	Change the servo motor.
A47	Cooling fan alarm	The cooling fan of the servo amplifier stopped, or its speed decreased to or below the alarm level.	Cooling fan life expiration (Refer to section 2.5.)	Change the cooling fan of the servo amplifier.
			Foreign matter caught in the cooling fan stopped rotation.	Remove the foreign matter.
			The power supply of the cooling fan failed.	Change the servo amplifier.

16. INDEXER POSITIONING OPERATION

Display	Name	Definition	Cause	Action
A50	Overload 1	Load exceeded overload protection characteristic of servo amplifier.	1. Servo amplifier is used in excess of its continuous output current.	1. Reduce load. 2. Check operation pattern. 3. Use servo motor that provides larger output.
			2. Servo system is instable and hunting.	1. Repeat acceleration/deceleration to execute auto tuning. 2. Change auto tuning response setting. 3. Set auto tuning to OFF and make gain adjustment manually.
			3. Machine struck something.	1. Check operation pattern. 2. Install limit switches.
			4. Wrong connection of servo motor. Servo amplifier's output terminals U, V, W do not match servo motor's input terminals U, V, W.	Connect correctly.
			5. Encoder faulty. <div style="border: 1px solid black; padding: 5px; width: fit-content;"> <p style="text-align: center;">Checking method</p> <p>When the servo motor shaft is rotated with the servo off, the cumulative feedback pulses do not vary in proportion to the rotary angle of the shaft but the indication skips or returns midway.</p> </div>	Change the servo motor.
			6. After Overload 2 (A51) occurred, turn OFF/ON the power supply to clear the alarm. Then the overload operation is repeated.	1. Reduce load. 2. Check operation pattern. 3. Use servo motor that provides larger output.
A51	Overload 2	Machine collision or the like caused max. For the time of the alarm occurrence, refer to the section 13.1.	1. Machine struck something.	1. Check operation pattern. 2. Install limit switches.
			2. Wrong connection of servo motor. Servo amplifier's output terminals U, V, W do not match servo motor's input terminals U, V, W.	Connect correctly.
			3. Servo system is instable and hunting.	1. Repeat acceleration/deceleration to execute auto tuning. 2. Change auto tuning response setting. 3. Set auto tuning to OFF and make gain adjustment manually.
			4. Encoder faulty. <div style="border: 1px solid black; padding: 5px; width: fit-content;"> <p style="text-align: center;">Checking method</p> <p>When the servo motor shaft is rotated with the servo off, the cumulative feedback pulses do not vary in proportion to the rotary angle of the shaft but the indication skips or returns midway.</p> </div>	Change the servo motor.

16. INDEXER POSITIONING OPERATION

Display	Name	Definition	Cause	Action
A52	Error excessive	The difference between the model position and the actual servo motor position exceeds three rotations. (Refer to the function block diagram in section 1.1.2.)	1. Acceleration/deceleration time constant is too small.	Increase the acceleration/deceleration time constant.
			2. Forward rotation torque limit (parameter No.PA11) or reverse rotation torque limit (parameter No.PA12) are too small.	Increase the torque limit value.
			3. Motor cannot be started due to torque shortage caused by power supply voltage drop.	1. Check the power supply capacity. 2. Use servo motor which provides larger output.
			4. Position loop gain (parameter No.PB08) value is small.	Increase set value and adjust to ensure proper operation.
			5. Servo motor shaft was rotated by external force.	1. When torque is limited, increase the limit value. 2. Reduce load. 3. Use servo motor that provides larger output.
			6. Machine struck something.	1. Check operation pattern. 2. Install limit switches.
			7. Encoder faulty.	Change the servo motor.
			8. Wrong connection of servo motor. Servo amplifier's output terminals U, V, W do not match servo motor's input terminals U, V, W.	Connect correctly.
A61	Operation alarm	Setting mistake of auxiliary function.	"1" or "3" is set for the auxiliary function of point table No.255.	Set "0" or "2" for the value of auxiliary function.
A8A	Serial communication time-out error	Communication stopped for longer than the specified time.	1. Communication cable breakage.	Repair or change the communication cable.
			2. Communication cycle longer than regulated time.	Shorten the communication cycle.
			3. Wrong protocol.	Correct protocol.
A8D	CC-Link alarm	Normal communication with the master station cannot be made.	1. The station number switch (STATION NO.) setting is 0 or not less than 65.	Set the station number to within the range 1 to 64, and switch power on.
			2. The baud rate switch (MODE) setting is outside the range 0 to 4.	Set the baud rate switch (MODE) to within the range 0 to 4.
			3. The transmission status is abnormal.	Reexamine the wiring.
			4. CC-Link twisted cable wiring incorrect.	1. Repair or change the CC-Link twisted cable.
			5. CC-Link twisted cable faulty.	2. Connect the cable or connector correctly.
			6. The CC-Link connector has come off.	
			7. The terminating resistor is not connected.	Connect the terminating resistor correctly.
			8. Noise entered the CC-Link twisted cable.	
			9. The programmable controller CC-Link unit was reset.	
A8E	Serial communication error	Serial communication error occurred between servo amplifier and communication device (e.g. personal computer).	1. Communication cable fault (Open cable or short circuit).	Repair or change the cable.
			2. Communication device (e.g. personal computer) faulty.	Change the communication device (e.g. personal computer).

16. INDEXER POSITIONING OPERATION

Display	Name	Definition	Cause	Action
(Note) 888	Watchdog	CPU, parts faulty.	Fault of parts in servo amplifier. <div style="border: 1px solid black; padding: 5px; width: fit-content;"> Checking method Alarm (888) occurs if power is switched on after disconnection of all cables but the control circuit power supply cable. </div>	Change the servo amplifier.

Note. At power-on, "888" appears instantaneously, but it is not an error.

(3) Remedies for warnings



CAUTION

- If an absolute position counter warning (AE3) occurred, always make home position setting again. Not doing so may cause unexpected operation.

POINT

- When any of the following alarms has occurred, do not resume operation by switching power of the servo amplifier OFF/ON repeatedly. The servo amplifier and servo motor may become faulty. If the power of the servo amplifier is switched OFF/ON during the alarms, allow more than 30 minutes for cooling before resuming operation.
 - Excessive regenerative warning (AE0)
 - Overload warning 1 (AE1)
- Always execute a home position return when the forward rotation stroke end (LSP) or the reverse rotation stroke end (LSN) turns off.

16. INDEXER POSITIONING OPERATION

If AE6 occur, the servo off status is established. If any other warning occurs, operation can be continued but an alarm may take place or proper operation may not be performed.

Remove the cause of warning according to this section. Use the MR Configurator to refer to a factor of warning occurrence.

Display	Name	Definition	Cause	Action		
A90	Home position return incomplete	In incremental system	Positioning operation was performed without home position return.	1. Positioning operation was performed without home position return.	Perform home position return.	
			Home position return ended abnormally.	2. Home position return speed could not be decreased to creep speed.	3. Limit switch was actuated during home position return starting at other than position beyond dog.	Check home position return speed/creep speed/moving distance after proximity dog.
				Home position return is incomplete.		4. Indexer JOG operation (in automatic/manual operation) was executed without home position return.
			Home position return is incomplete.	5. The operation method (parameter No.PA01), electronic gear (parameter No.PA06 and PA07), station No. direction selection (parameter No.PA14), or number of stations/rotation (parameter No.PC46) is changed.		
				In absolute position detection system	Positioning operation was performed without home position setting.	1. Positioning operation was performed without home position setting.
			Home position setting ended abnormally.		2. Home position setting speed could not be decreased to creep speed.	3. Limit switch was actuated during home position setting starting at other than position beyond dog.
		Operation was performed without making home position setting while an absolute position erase (A25) is being occurred.			4. Voltage drop in encoder (Battery disconnected.)	
			5. Battery voltage low		Change the battery.	
			6. Battery cable or battery is faulty.		Always make home position setting again.	
		Home position setting is incomplete.	7. Indexer JOG operation (in automatic/manual operation) was executed without home position setting.		8. The operation method (parameter No.PA01), electronic gear (parameter No.PA06 and PA07), station No. direction selection (parameter No.PA14), or number of stations/rotation (parameter No.PC46) is changed.	Perform home position setting. This warning is automatically cleared after executing a home position setting.

16. INDEXER POSITIONING OPERATION

Display	Name	Definition	Cause	Action
A92	Open battery cable warning	Absolute position detection system battery voltage is low.	1. Battery cable is open.	Repair cable or changed.
			2. Battery voltage supplied from the servo amplifier to the encoder fell to about 3V or less. (Detected with the encoder)	Change the battery.
A96	Home position setting error	Home position setting could not be made.	1. Droop pulses remaining are greater than the in-position range setting.	Remove the cause of droop pulse occurrence
			2. Command pulse entered after clearing of droop pulses.	Do not enter command pulse after clearing of droop pulses.
			3. Creep speed high.	Reduce creep speed.
A97	Next station warning	Automatic operation is executed with invalid next station setting.	1. Automatic operation has been started when station number that exceeded the setting value of parameter No.PC46 (number of stations/rotation) is specified.	Specify the station number up to the maximum number of stations set in the parameter No.PC46 (indexer positioning operation number of stations/rotation).
			2. Automatic operation has been started when the next station selection 1 to 8 (RYnA to RYnE, and RY(n+2)3 to RY(n+2)5) are all set to on.	
A99	Stroke limit warning	The limit switch become valid.	The stroke end (LSP or LSN) of the direction which gave instructions was turned off.	Reexamine the operation pattern to turn LSP/LSN ON.
A9D	CC-Link warning 1	The station number switch or baud rate switch position was changed from the setting at power-on.	1. The station number switch position was changed from the setting at power-on.	Return to the setting at power-on.
			2. The baud rate switch position was changed from the setting at power-on.	
			3. The occupied station count switch position was changed from the setting at power-on.	
A9E	CC-Link warning 2	Communication error of cable.	1. The transmission status is abnormal.	Take measures against noise.
			2. CC-Link twisted cable wiring incorrect.	
			3. CC-Link twisted cable faulty.	1. Change the CC-Link twisted cable. 2. Connect the cable or connector correctly.
			4. The CC-Link connector has come off.	
			5. The terminating resistor is not connected.	Connect the terminating resistor correctly.
			6. Noise entered the CC-Link twisted cable.	
A9F	Battery warning	Voltage of battery for absolute position detection system reduced.	Battery voltage fell to 3.2V or less. (Detected with the servo amplifier)	Change the battery.
AE0	Excessive regenerative warning	There is a possibility that regenerative power may exceed permissible regenerative power of built-in regenerative resistor or regenerative option.	Regenerative power increased to 85% or more of permissible regenerative power of built-in regenerative resistor or regenerative option. <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 5px auto;"> — Checking method — Call the status display and check regenerative load ratio. </div>	1. Reduce frequency of positioning. 2. Change the regenerative option for the one with larger capacity. 3. Reduce load.
AE1	Overload warning 1	There is a possibility that overload alarm 1 or 2 may occur.	Load increased to 85% or more of overload alarm 1 or 2 occurrence level. <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 5px auto;"> — Cause, checking method — Refer to A50, A51. </div>	Refer to A50, A51.

16. INDEXER POSITIONING OPERATION

Display	Name	Definition	Cause	Action
AE3	Absolute position counter warning	Absolute position encoder pulses faulty.	1. Noise entered the encoder.	Take noise suppression measures.
			2. Encoder faulty.	Change the servo motor.
		The multi-revolution counter value of the absolute position encoder exceeded the maximum revolution range.	3. The movement amount from the home position exceeded a 32767 rotation or 37268 rotation in succession.	Make home position setting again.
		The update cycle for writing the multi-revolution counter value of the absolute position encoder to EEPROM is short.	Refer to POINT in section 16.7.	Refer to POINT in section 16.7.
AE6	Servo forced stop warning	EMG is off.	External forced stop was made valid. (EMG was turned off.)	Ensure safety and deactivate forced stop.
AE8	Cooling fan speed reduction warning	The speed of the servo amplifier decreased to or below the warning level. This warning is not displayed with MR-J3-70T/100T among servo amplifiers equipped with a cooling fan.	Cooling fan life expiration (Refer to section 2.5.)	Change the cooling fan of the servo amplifier.
			The power supply of the cooling fan is broken.	Change the servo amplifier.
AE9	Main circuit off warning	Servo-on (SON) was switched on with main circuit power off.		Switch on main circuit power.
AEC	Overload warning 2	Operation, in which a current exceeding the rating flew intensively in any of the U, V and W phases of the servo motor, was repeated.	During a stop, the status in which a current flew intensively in any of the U, V and W phases of the servo motor occurred repeatedly, exceeding the warning level.	<ol style="list-style-type: none"> 1. Reduce the positioning frequency at the specific positioning address. 2. Reduce the load. 3. Replace the servo amplifier/ servo motor with the one of larger capacity.
AED	Output watt excess warning	The status, in which the output wattage (speed × torque) of the servo motor exceeded the rated output, continued steadily.	Continuous operation was performed with the output wattage (speed × torque) of the servo motor exceeding 150% of the rated output.	<ol style="list-style-type: none"> 1. Reduce the servo motor speed. 2. Reduce the load.

16. INDEXER POSITIONING OPERATION

16.12.5 Point table error

When a point table error occurs, the parameter error (A37) occurs. After the parameter No. of parameter error (A37), the point table error details are displayed.

AL37	#00
PB10	PB11
PB12	PB16
[Spd001]	

Point table error details
For the point table No.1 speed data error

P o s 0 0 1

Point table No. with error

Error item

- Spd: speed
- Acc: acceleration time constant
- Dec: deceleration time constant

APPENDIX

App. 1 Parameter list

POINT

- For any parameter whose symbol is preceded by *, set the parameter value and switch power off once, then switch it on again to make that parameter setting valid.

Basic setting parameters (PA□□)		
No.	Symbol	Name
PA01	*STY	Control mode
PA02	*REG	Regenerative option
PA03	*ABS	Absolute position detection system
PA04	*AOP1	Function selection A-1
PA05	*FTY	Feeding function selection
PA06	*CMX	Electronic gear numerator
PA07	*CDV	Electronic gear denominator
PA08	ATU	Auto tuning
PA09	RSP	Auto tuning response
PA10	INP	In-position range
PA11	TLP	Forward rotation torque limit
PA12	TLN	Reverse rotation torque limit
PA13		For manufacturer setting
PA14	*POL	Rotation direction selection
PA15	*ENR	Encoder output pulses
PA16 to PA18		For manufacturer setting
PA19	*BLK	Parameter write inhibit

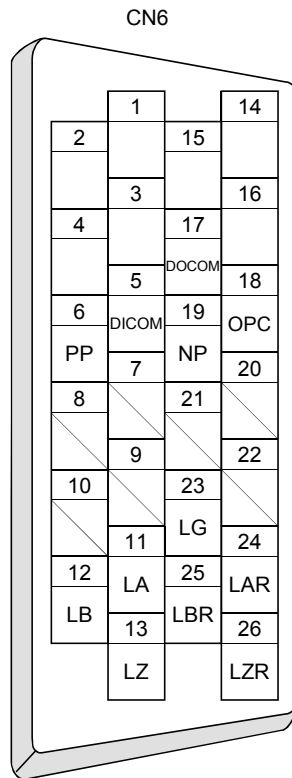
Gain/filter parameters (PB□□)		
No.	Symbol	Name
PB01	FILT	Adaptive tuning mode (Adaptive filter II)
PB02	VRFT	Vibration suppression control tuning mode (Advanced vibration suppression control)
PB03		For manufacturer setting
PB04	FFC	Feed forward gain
PB05		For manufacturer setting
PB06	GD2	Ratio of load inertia moment to servo motor inertia moment
PB07	PG1	Model loop gain
PB08	PG2	Position loop gain
PB09	VG2	Speed loop gain
PB10	VIC	Speed integral compensation
PB11	VDC	Speed differential compensation
PB12		For manufacturer setting
PB13	NH1	Machine resonance suppression filter 1
PB14	NHQ1	Notch form selection 1
PB15	NH2	Machine resonance suppression filter 2
PB16	NHQ2	Notch form selection 2
PB17		Automatic setting parameter
PB18	LPF	Low-pass filter
PB19	VRF1	Vibration suppression control vibration frequency setting
PB20	VRF2	Vibration suppression control resonance frequency setting
PB21		For manufacturer setting
PB22		
PB23	VFBF	Low-pass filter selection
PB24	*MVS	Slight vibration suppression control selection
PB25		For manufacturer setting
PB26	*CDP	Gain changing selection
PB27	CDL	Gain changing condition
PB28	CDT	Gain changing time constant
PB29	GD2B	Gain changing ratio of load inertia moment to servo motor inertia moment
PB30	PG2B	Gain changing position loop gain
PB31	VG2B	Gain changing speed loop gain
PB32	VICB	Gain changing speed integral compensation
PB33	VRF1B	Gain changing vibration suppression control vibration frequency setting
PB34	VRF2B	Gain changing vibration suppression control resonance frequency setting
PB35 to PB45		For manufacturer setting

APPENDIX

Extension setting parameters (PC □□)		
No.	Symbol	Name
PC01		For manufacturer setting
PC02	*ZTY	Home position return type
PC03	*ZDIR	Home position return direction
PC04	ZRF	Home position return speed
PC05	CRF	Creep speed
PC06	ZST	Home position shift distance
PC07	*ZPS	Home position return position data
PC08	DCT	Moving distance after proximity dog
PC09	ZTM	Stopper type home position return stopper time
PC10	ZTT	Stopper type home position return torque limit value
PC11	CRP	Rough match output range
PC12	JOG	Jog speed
PC13	*STC	S-pattern acceleration/deceleration time constant
PC14	*BKC	Backlash compensation
PC15		For manufacturer setting
PC16	MBR	Electromagnetic brake sequence output
PC17	ZSP	Zero speed
PC18	*BPS	Alarm history clear
PC19	*ENRS	Encoder output pulse selection
PC20	*SNO	Station number setting
PC21	*SOP	RS-422 communication function selection
PC22	*COP1	Function selection C-1
PC23		For manufacturer setting
PC24	*COP3	Function selection C-3
PC25		For manufacturer setting
PC26	*COP5	Function selection C-5
PC27		For manufacturer setting
PC28	*COP7	Function selection C-7
PC29		For manufacturer setting
PC30	*DSS	Remote register-based position/speed specifying system selection
PC31	LMPL	Software limit +
PC32	LMPH	
PC33	LMNL	Software limit -
PC34	LMNH	
PC35	TL2	Internal torque limit 2
PC36		For manufacturer setting
PC37	*LPPL	Position range output address +
PC38	*LPPH	
PC39	*LNPL	Position range output address -
PC40	*LNPH	
PC41 to PC50		For manufacturer setting

I/O setting parameters (PD □□)		
No.	Symbol	Name
PD01	*DIA1	Input signal automatic ON selection 1
PD02		For manufacturer setting
PD03	*DIA3	Input signal automatic ON selection 3
PD04	*DIA4	Input signal automatic ON selection 4
PD05		For manufacturer setting
PD06	*DI2	Input signal device selection 2 (CN6-2)
PD07	*DI3	Input signal device selection 3 (CN6-3)
PD08	*DI4	Input signal device selection 4 (CN6-4)
PD09	*DO1	Input signal device selection 1 (CN6-14)
PD10	*DO2	Input signal device selection 2 (CN6-15)
PD11	*DO3	Input signal device selection 3 (CN6-16)
PD12	DIN1	External DI function selection 1
PD13		For manufacturer setting
PD14	DIN3	External DI function selection 3
PD15		For manufacturer setting
PD16	*DIAB	Input polarity selection
PD17		For manufacturer setting
PD18		For manufacturer setting
PD19	*DIF	Response level setting
PD20	*DOP1	Function selection D-1
PD21		For manufacturer setting
PD22	*DOP3	Function selection D-2
PD23		For manufacturer setting
PD24	*DOP5	Function selection D-5
PD25 to PD30		For manufacturer setting

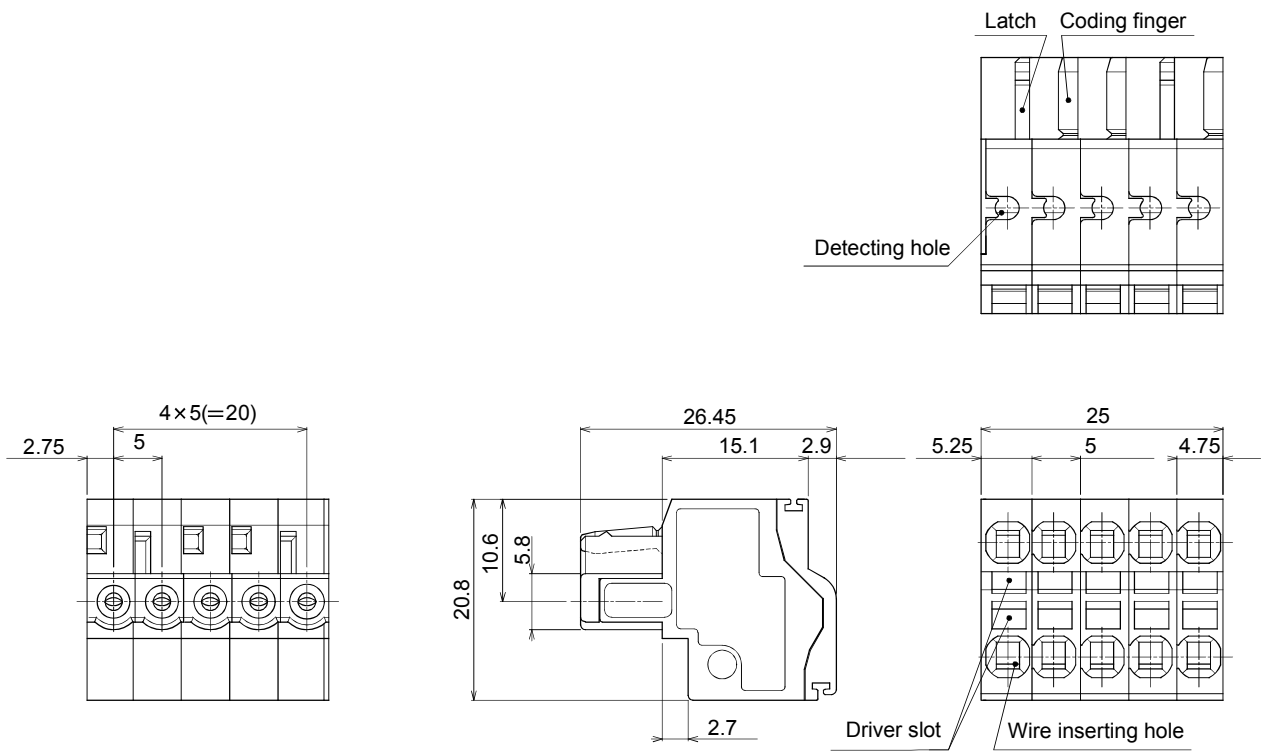
App. 2 Signal layout recording paper



APPENDIX

App. 3 Twin type connector: outline drawing for 721-2105/026-000(WAGO)

[Unit: mm]



APPENDIX

App. 4 Change of connector sets to the RoHS compatible products

Connector sets (options) in the following table are changed to the RoHS compatible products after September, 2006 shipment.

Please accept that the current products might be mixed with RoHS compatible products based on availability.

Model	Current product	RoHS compatible product
MR-J3SCNS MR-ECNM	Amplifier connector (3M or equivalent of 3M) 36210-0100JL (Receptacle) (Note)	Amplifier connector (3M or equivalent of 3M) 36210-0100PL (Receptacle)
MR-PWCNS4	Power supply connector (DDK) CE05-6A18-10SD-B-BSS (Connector and Back shell) CE3057-10A-1 (D265) (Cable clump)	Power supply connector (DDK) CE05-6A18-10SD-D-BSS (Connector and Back shell) CE3057-10A-1-D (Cable clump)
MR-PWCNS5	Power supply connector (DDK) CE05-6A22-22SD-B-BSS (Connector and Back shell) CE3057-12A-1 (D265) (Cable clump)	Power supply connector (DDK) CE05-6A22-22SD-D-BSS (Connector and Back shell) CE3057-12A-1-D (Cable clump)
MR-PWCNS3	Power supply connector (DDK) CE05-6A32-17SD-B-BSS (Connector and Back shell) CE3057-20A-1 (D265) (Cable clump)	Power supply connector (DDK) CE05-6A32-17SD-D-BSS (Connector and Back shell) CE3057-20A-1-D (Cable clump)
MR-PWCNS1	Power supply connector (DDK) CE05-6A22-23SD-B-BSS (Connector and Back shell) CE3057-12A-2 (D265) (Cable clump)	Power supply connector (DDK) CE05-6A22-23SD-D-BSS (Connector and Back shell) CE3057-12A-2-D (Cable clump)
MR-PWCNS2	Power supply connector (DDK) CE05-6A24-10SD-B-BSS (Connector and Back shell) CE3057-16A-2 (D265) (Cable clump)	Power supply connector (DDK) CE05-6A24-10SD-D-BSS (Connector and Back shell) CE3057-16A-2-D (Cable clump)
MR-BKCN	Electromagnetic brake connector MS3106A10SL-4S(D190) (Plug, DDK)	Electromagnetic brake connector D/MS3106A10SL-4S(D190) (Plug, DDK)
MR-J2CMP2	Amplifier connector (3M or equivalent of 3M) 10126-3000VE (connector)	Amplifier connector (3M or equivalent of 3M) 10126-3000PE (connector)

Note. RoHS compatible 36210-0100FD may be packed with current connector sets.

App. 5 MR-J3-200T-RT servo amplifier

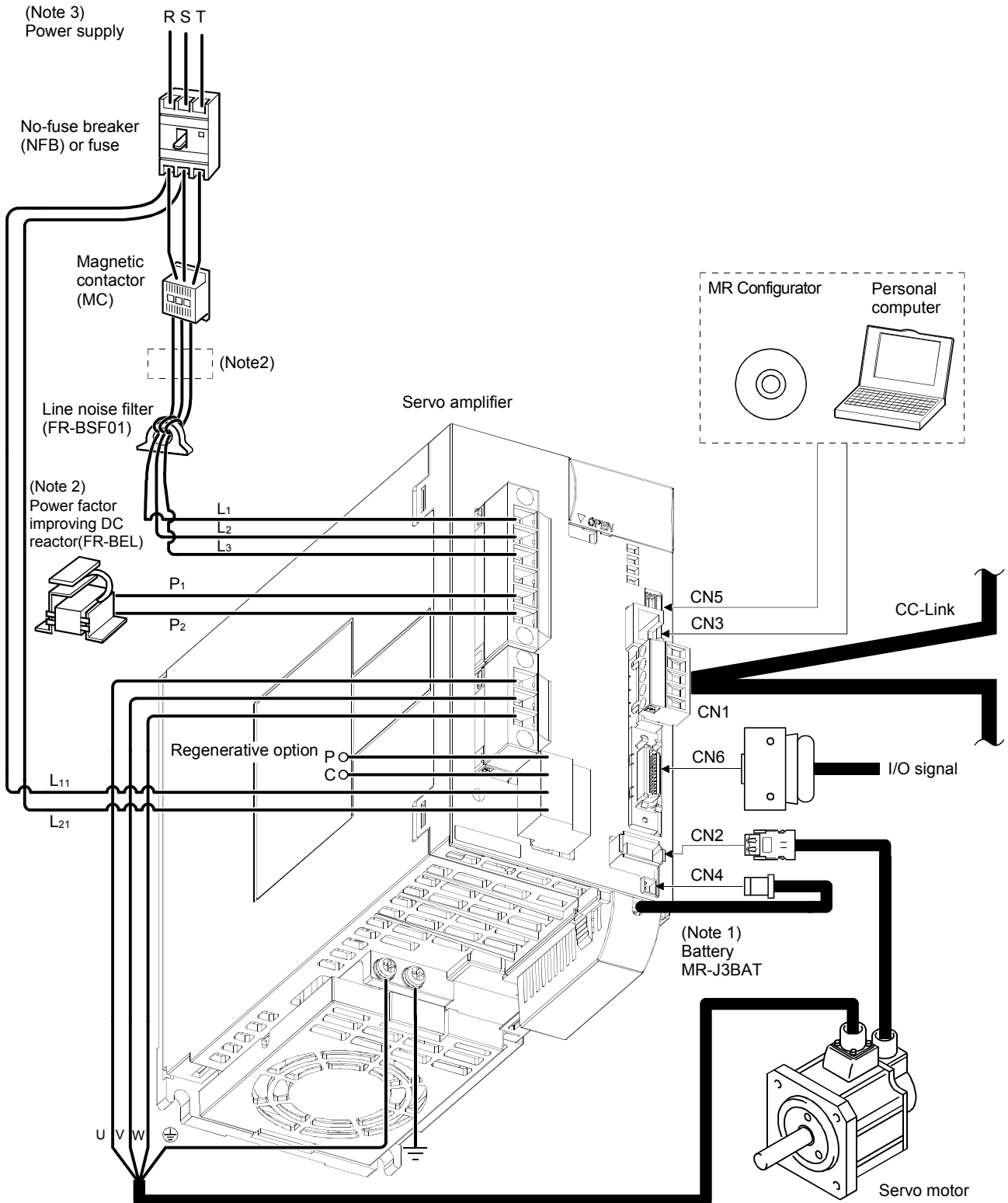
Connectors (CNP1, CNP2, and CNP3) and appearance of MR-J3-200T servo amplifier have been changed from January 2008 production. Model name of the existing servo amplifier is changed to MR-J3-200T-RT. The difference between new MR-J3-200T servo amplifier and existing MR-J3-200T-RT servo amplifier is described in this appendix. Sections within parentheses in the following sections indicate corresponding sections of the instruction manual.

App. 5.1 Parts identification (1.6.1 Parts identification)

Name/Application	Detailed explanation
Display The 3-digit, seven-segment LED shows the servo status and alarm number.	Section 5.3 Chapter 11
Baud rate switch (MODE) Select the CC-Link communication baud rate.	Section 3.2.4
Station number switches (STATION NO.) Set the station number of the servo amplifier. Set the one place. Set the ten place.	Section 3.2.3
Occupied station count switch (SW1) Set the number of occupied stations.	Section 3.2.5
Main circuit power supply connector (CNP1) Used to connect the input power supply.	Section 4.1 Section 4.3 Section 12.1
Communication alarm display section Indicates alarms in CC-Link communication. ■ L.RUN ■ SD ■ RD ■ L.ERR	Section 11.3
USB communication connector (CN5) Used to connect the personal computer.	Chapter 7
RS-422 communication connector (CN3) Used to connect the MR-PRU03 parameter unit or personal computer.	Chapter 7 Chapter 8 Chapter 15
CC-Link connector (CN1) Wire the CC-Link cable.	Section 3.2.2
Servo motor power connector (CNP3) Used to connect the servo motor.	Section 4.1 Section 4.3 Section 12.1
I/O signal connector (CN6) Used to connect digital I/O signals.	Section 4.2 Section 4.4
Encoder connector (CN2) Used to connect the servo motor encoder.	Section 4.10 Section 14.1
Battery connector (CN4) Used to connect the battery for absolute position data backup.	Section 5.8 Section 14.7
Control circuit connector (CNP2) Used to connect the control circuit power supply/ regenerative option.	Section 4.1 Section 4.3 Section 12.1 Section 14.2
Battery holder Contains the battery for absolute position data backup.	Section 5.8
Charge lamp Lit to indicate that the main circuit is charged. While this lamp is lit, do not reconnect the cables.	
Protective earth (PE) terminal (⊕) Ground terminal.	Section 4.1 Section 4.3 Section 12.1
Rating plate	Section 1.4

Labels in the diagram:
Cooling fan
Fixed part (3 places)

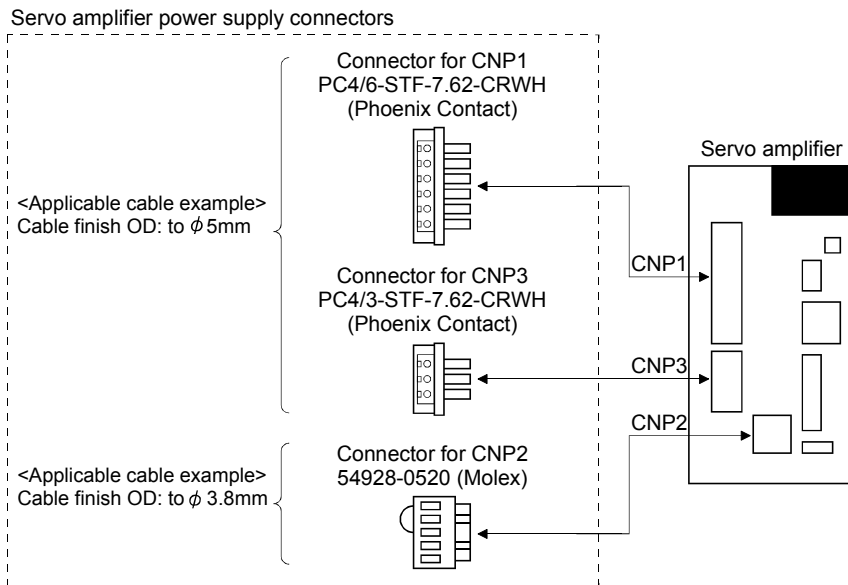
App. 5.2 Configuration including auxiliary equipment (1.7 Configuration including auxiliary equipment)



- Note 1. The battery (option) is used for the absolute position detection system in the position control mode.
2. The AC reactor can also be used. In this case, the DC reactor cannot be used. When not using DC reactor, short P₁ and P₂.
3. Refer to section 1.2 for the power supply specification.

App. 5.3 CNP1, CNP2, CNP3 wiring method (4.3.3 CNP1, CNP2, CNP3 wiring method)

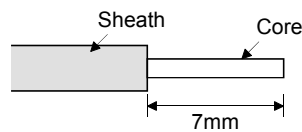
(a) Servo amplifier power supply connectors



(b) Termination of the cables

1) CNP1 • CNP3

Solid wire: After the sheath has been stripped, the cable can be used as it is.



Twisted wire: Use the cable after stripping the sheath and twisting the core. At this time, take care to avoid a short caused by the loose wires of the core and the adjacent pole. Do not solder the core as it may cause a contact fault. Alternatively, a bar terminal may be used to put the wires together.

Cable size		Bar terminal type		Crimping tool	Manufacturer
[mm ²]	AWG	For 1 cable	For 2 cables		
1.25/1.5	16	AI1.5-8BK	AI-TWIN2 × 1.5-8BK	CRIMPFOX-ZA3	Phoenix Contact
2.0/2.5	14	AI2.5-8BU	AI-TWIN2 × 2.5-10BU		
3.5	12	AI4-10Y			

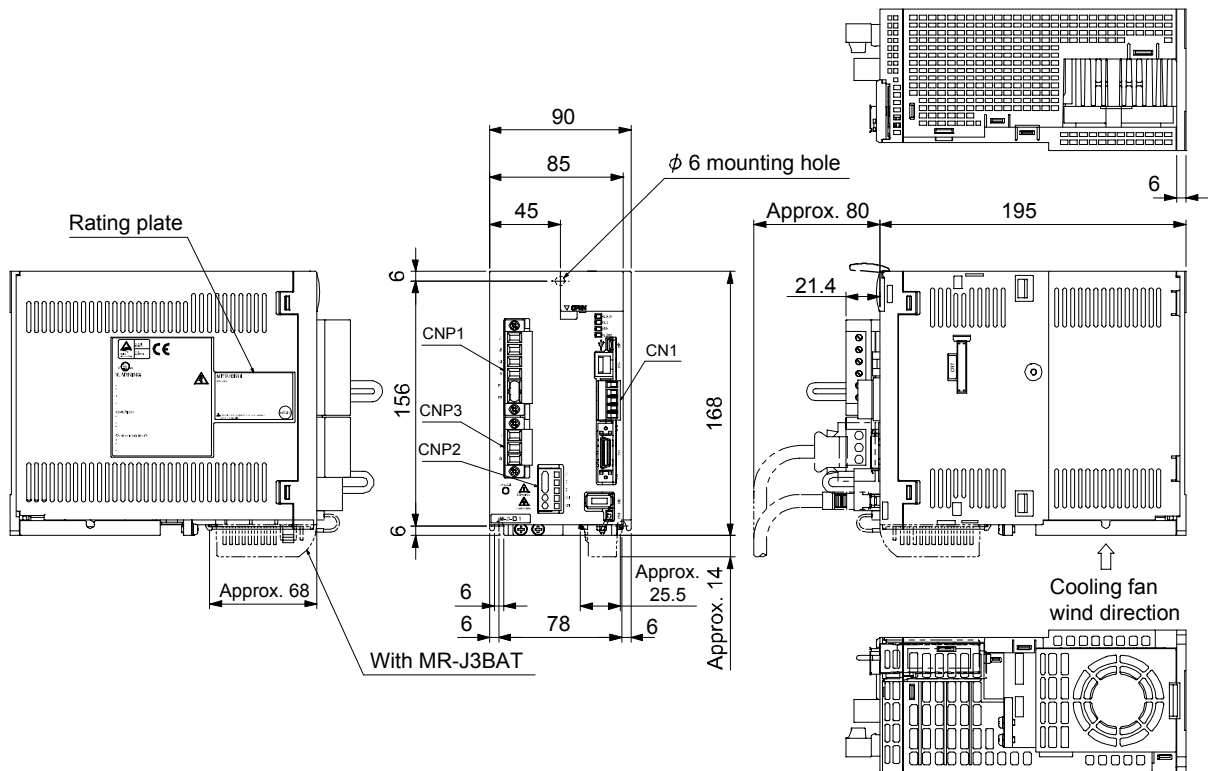
2) CNP2

CNP2 is the same as MR-J3-100T or smaller capacities. Refer to section 4.3.3 (1) (b).

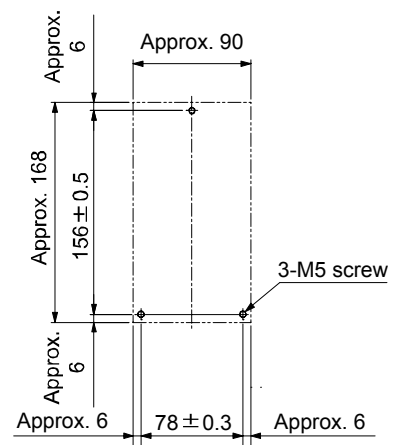
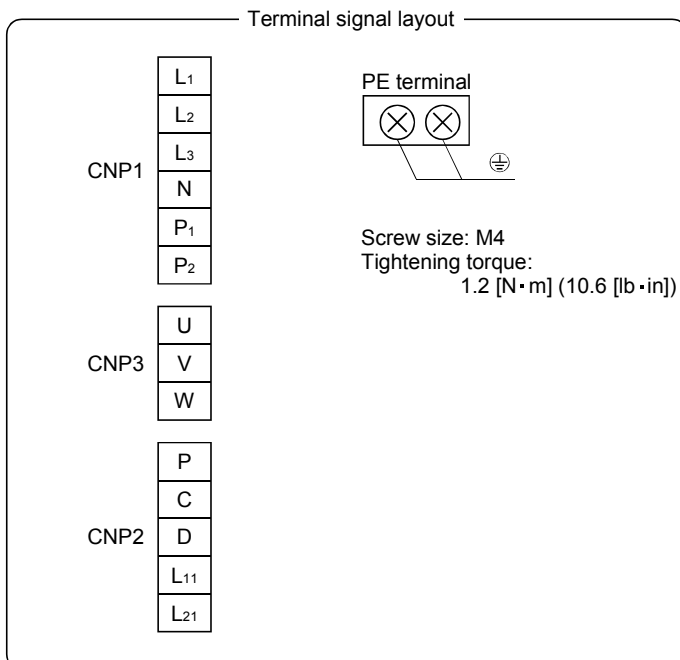
APPENDIX

App. 5.4 OUTLINE DRAWINGS (Chapter 12 OUTLINE DRAWINGS)

[Unit: mm]



Mass: 2.3 [kg] (5.07 [lb])



Mounting hole process drawing

Mounting screw
Screw size: M5
Tightening torque: 3.24[N·m] (28.7[lb·in])

App. 6 Selection example of servo motor power cable

POINT
<ul style="list-style-type: none"> ▪ Selection condition of wire size is as follows. Wire length: 30m or less ▪ Depending on the cable selected, there may be cases that the cable does not fit into the Mitsubishi optional or recommended cable clamp. Select a cable clamp according to the cable diameter.

Selection example when using the 600V grade EP rubber insulated chloroprene sheath cab-tire cable (2PNCT) for servo motor power (U, V, and W) is indicated below.

Servo motor	Wire size [mm ²]
HF-SP52	1.25
HF-SP102	1.25
HF-SP152	2
HF-SP202	2
HF-SP352	3.5
HF-SP502	5.5
HF-SP702	8
HF-SP51	1.25
HF-SP81	1.25
HF-SP121	2
HF-SP201	2
HF-SP301	3.5
HF-SP421	5.5
HF-SP524	1.25
HF-SP1024	1.25
HF-SP1524	2
HF-SP2024	2
HF-SP3524	2
HF-SP5024	3.5
HF-SP7024	5.5
HC-RP103	2

Servo motor	Wire size [mm ²]
HC-RP153	2
HC-RP203 (Note)	3.5
HC-RP353 (Note)	5.5
HC-RP503 (Note)	5.5
HC-LP52	1.25
HC-LP102	1.25
HC-LP152	2
HC-LP202	3.5
HC-LP302	5.5
HC-UP72	1.25
HC-UP152	2
HC-UP202	3.5
HC-UP352	5.5
HC-UP502	5.5
HA-LP601	8
HA-LP801	14
HA-LP12K1	14
HA-LP15K1	22
HA-LP20K1	38
HA-LP25K1	38
HA-LP701M	8

Servo motor	Wire size [mm ²]
HA-LP11K1M	14
HA-LP15K1M	22
HA-LP22K1M	38
HA-LP502	5.5
HA-LP702	8
HA-LP11K2	14
HA-LP15K2	22
HA-LP22K2	22
HA-LP6014	5.5
HA-LP8014	5.5
HA-LP12K14	8
HA-LP15K14	14
HA-LP20K14	14
HA-LP701M4	5.5
HA-LP11K1M4	8
HA-LP15K1M4	14
HA-LP22K1M4	14
HA-LP11K24	8
HA-LP15K24	14
HA-LP22K24	14

Note. Use a composite cable and others when combining with wiring of the electromagnetic brake power in the same cable.

APPENDIX

App. 7 Parameter list

POINT
<ul style="list-style-type: none"> For any parameter whose symbol is preceded by *, set the parameter value and switch power off once, then switch it on again to make that parameter setting valid.

Basic setting parameters (PA□□)		
No.	Symbol	Name
PA01	*STY	Control mode
PA02	*REG	Regenerative option
PA03	*ABS	Absolute position detection system
PA04		Not used in indexer positioning operation.
PA05		
PA06	*CMX	Number of gears on machine-side
PA07	*CDV	Number of gears on servo motor-side
PA08	ATU	Auto tuning
PA09	RSP	Auto tuning response
PA10	INP	In-position range
PA11	TLP	Forward rotation torque limit
PA12	TLN	Reverse rotation torque limit
PA13		For manufacturer setting
PA14	*POL	Rotation direction selection
PA15	*ENR	Encoder output pulses
PA16 to PA18		For manufacturer setting
PA19	*BLK	Parameter write inhibit

Gain/filter parameters (PB□□)		
No.	Symbol	Name
PB01	FILT	Adaptive tuning mode (Adaptive filter II)
PB02	VRFT	Vibration suppression control tuning mode (Advanced vibration suppression control)
PB03		For manufacturer setting
PB04	FFC	Feed forward gain
PB05		For manufacturer setting
PB06	GD2	Ratio of load inertia moment to servo motor inertia moment
PB07	PG1	Model loop gain
PB08	PG2	Position loop gain
PB09	VG2	Speed loop gain
PB10	VIC	Speed integral compensation
PB11	VDC	Speed differential compensation
PB12		For manufacturer setting
PB13	NH1	Machine resonance suppression filter 1
PB14	NHQ1	Notch form selection 1
PB15	NH2	Machine resonance suppression filter 2
PB16	NHQ2	Notch form selection 2
PB17		Automatic setting parameter
PB18	LPF	Low-pass filter
PB19	VRF1	Vibration suppression control vibration frequency setting
PB20	VRF2	Vibration suppression control resonance frequency setting
PB21		For manufacturer setting
PB22		
PB23	VFBF	Low-pass filter selection
PB24	*MVS	Slight vibration suppression control selection
PB25		For manufacturer setting
PB26	*CDP	Gain changing selection
PB27	CDL	Gain changing condition
PB28	CDT	Gain changing time constant
PB29	GD2B	Gain changing ratio of load inertia moment to servo motor inertia moment
PB30	PG2B	Gain changing position loop gain
PB31	VG2B	Gain changing speed loop gain
PB32	VICB	Gain changing speed integral compensation
PB33	VRF1B	Gain changing vibration suppression control vibration frequency setting
PB34	VRF2B	Gain changing vibration suppression control resonance frequency setting
PB35 to PB45		For manufacturer setting

APPENDIX

Extension setting parameters (PC □□)		
No.	Symbol	Name
PC01		For manufacturer setting
PC02	*ZTY	Home position return type
PC03	*ZDIR	Home position return direction
PC04	ZRF	Home position return speed
PC05	CRF	Creep speed
PC06	ZST	Home position shift distance
PC07		Not used in indexer positioning operation.
PC08		
PC09		
PC10		
PC11	CRP	Rough match output range
PC12	JOG	Jog speed
PC13		Not used in indexer positioning operation.
PC14	*BKC	Backlash compensation
PC15		For manufacturer setting
PC16	MBR	Electromagnetic brake sequence output
PC17		Not used in indexer positioning operation.
PC18	*BPS	Alarm history clear
PC19	*ENRS	Encoder output pulse selection
PC20	*SNO	Station number setting
PC21	*SOP	RS-422 communication function selection
PC22	*COP1	Function selection C-1
PC23		For manufacturer setting
PC24		Not used in indexer positioning operation.
PC25		For manufacturer setting
PC26	*COP5	Function selection C-5
PC27		For manufacturer setting
PC28	*COP7	Function selection C-7
PC29		For manufacturer setting
PC30	*DSS	Remote register-based position/speed specifying system selection
PC31		Not used in indexer positioning operation.
PC32		
PC33		
PC34		
PC35	TL2	Internal torque limit 2
PC36		For manufacturer setting
PC37		Not used in indexer positioning operation.
PC38		
PC39		
PC40		
PC41 to PC44		For manufacturer setting
PC45	*COP9	Function selection C-9
PC46	*STN	Indexer positioning operation number of stations/rotation
PC47	PSST	Indexer positioning operation station home position shift distance
PC48 to PC50		For manufacturer setting

I/O setting parameters (PD □□)		
No.	Symbol	Name
PD01	*DIA1	Input signal automatic ON selection 1
PD02		For manufacturer setting
PD03		Not used in indexer positioning operation.
PD04		
PD05		
PD06		
PD07		Not used in indexer positioning operation.
PD08		
PD09		
PD10		
PD11		
PD12		For manufacturer setting
PD13		
PD14		Not used in indexer positioning operation.
PD15		For manufacturer setting
PD16	*DIAB	Input polarity selection
PD17		For manufacturer setting
PD18		
PD19	*DIF	Response level setting
PD20	*DOP1	Function selection D-1
PD21		For manufacturer setting
PD22		Not used in indexer positioning operation.
PD23		For manufacturer setting
PD24	*DOP5	Function selection D-5
PD25		For manufacturer setting
PD26	TLT	Indexer positioning operation torque limit delay time
PD27 to PD30		For manufacturer setting

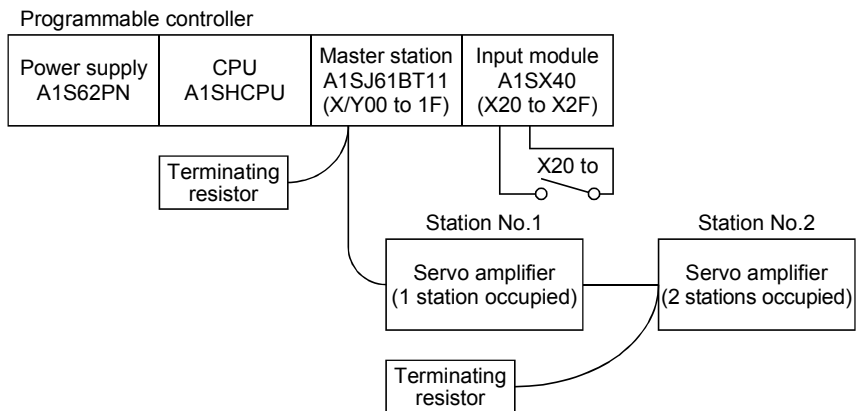
App. 8 Program example with MELSEC-A series programmable controllers (point table positioning operation)

App. 8.1 Function-by-function programming examples

This section explains specific programming examples for servo operation, monitor, parameter read and write, and others on the basis of the equipment makeup shown in appendix 8.1.1.

App.8.1.1 System configuration example

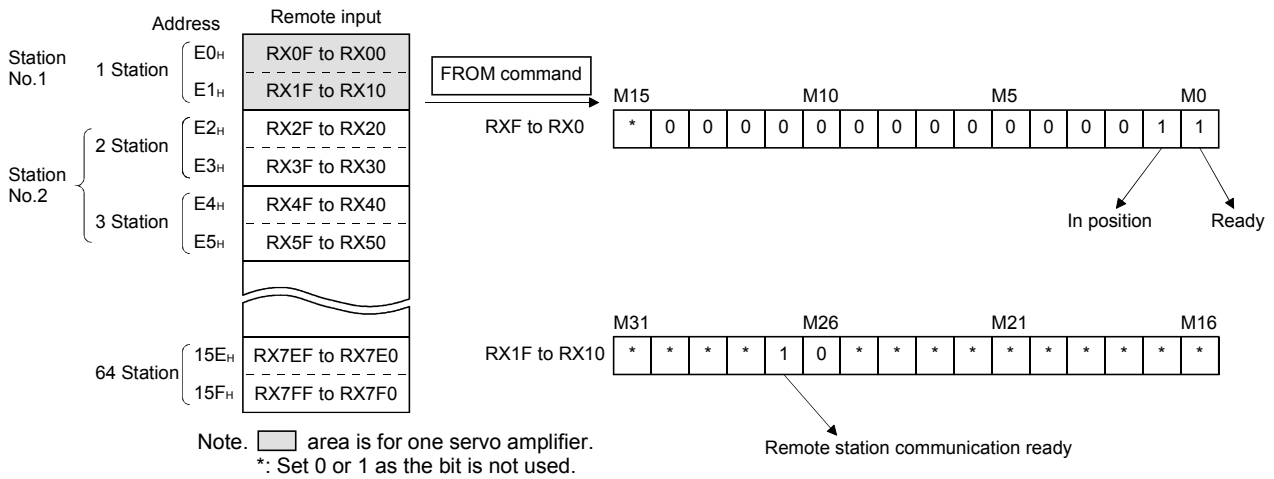
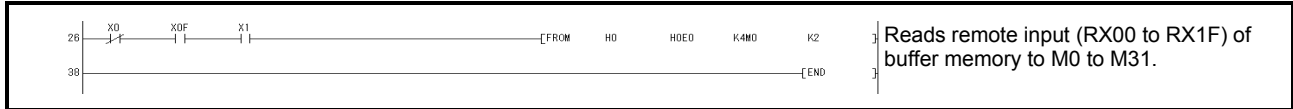
As shown below, the CC-Link system master - local unit is loaded to run two servo amplifiers (1 station occupied / 2 stations occupied).



APPENDIX

App. 8.1.2 Reading the servo amplifier status

Read the servo amplifier status from the master station buffer memory. The servo amplifier status is always stored in the remote input RX (addresses E0H to 15FH) Read the servo amplifier status of station 1 to M0 to M31.

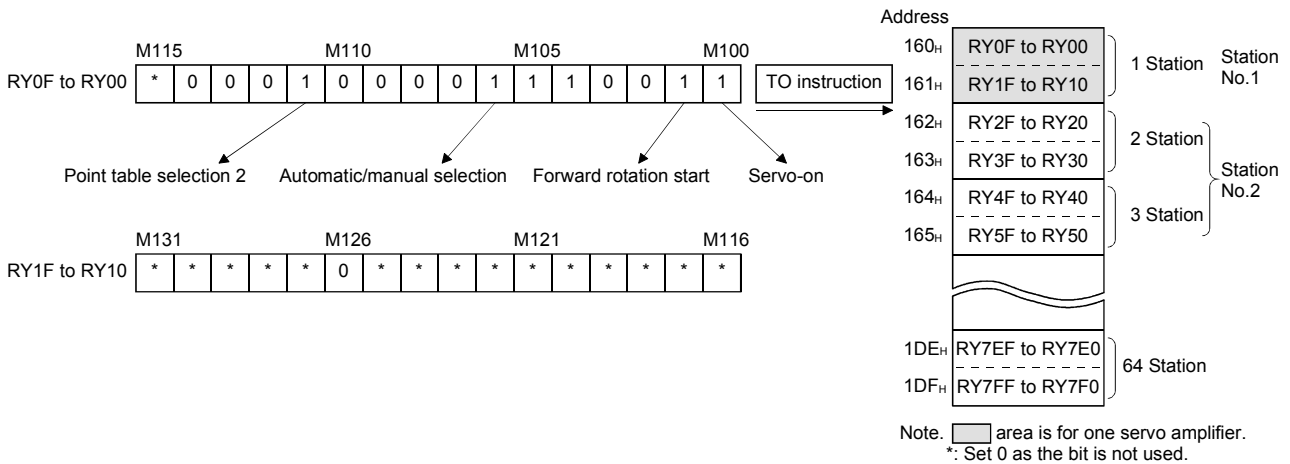
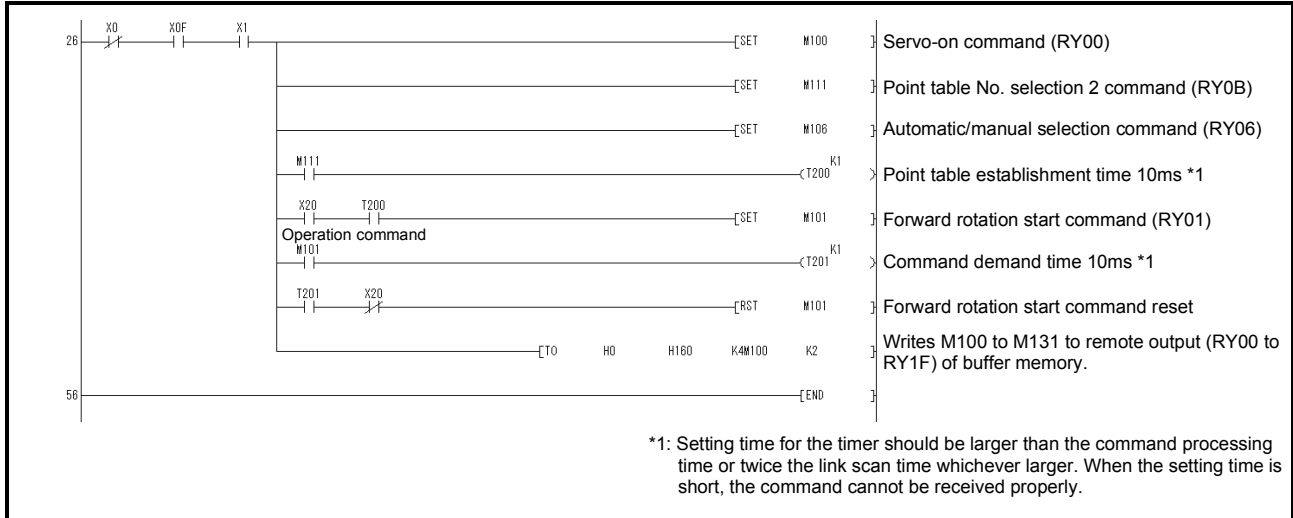


Servo amplifier status (1 station occupied)			
M0: Ready (RD)	M8: Monitoring (MOF)	M16: ---	M24: ---
M1: In position (INP)	M9: Instruction code execution completion (COF)	M17: ---	M25: ---
M2: Rough match (CPO)	M10: Warning (WNG)	M18: ---	M26: Trouble (ALM)
M3: Home position return completion (ZP)	M11: Battery warning (BWNG)	M19: ---	M27: Remote station communication ready (CRD)
M4: Limiting torque (TLC)	M12: Movement completion (MEND)	M20: ---	M28: ---
M5: ---	M13: Dynamic brake interlock (DB)	M21: ---	M29: ---
M6: Electromagnetic brake interlock (MBR)	M14: Position range (POT)	M22: ---	M30: ---
M7: Temporary stop (PUS)	M15: ---	M23: ---	M31: ---

APPENDIX

App. 8.1.3 Writing the operation commands

To operate the servo amplifier, write the operation commands to the remote output RY (addresses 160H to 1DFH). Perform positioning operation of point table No.2 for the servo amplifier of station 2. Start the operation by turning on X20.



Operation commands (1 station occupied)			
M100: Servo-on (SON)	M108: Monitor output execution demand (MOR)	M116: ---	M124: ---
M101: Forward rotation start (ST1)	M109: Instruction code execution demand (COR)	M117: ---	M125: ---
M102: Reverse rotation start (ST2)	M110: Point table No. selection 1 (DI0)	M118: ---	M126: Reset (RES)
M103: Proximity dog (DOG)	M111: Point table No. selection 2 (DI1)	M119: ---	M127: ---
M104: Forward rotation stroke end (LSP)	M112: Point table No. selection 3 (DI2)	M120: ---	M128: ---
M105: Reverse rotation stroke end (LSN)	M113: Point table No. selection 4 (DI3)	M121: ---	M129: ---
M106: Automatic/manual selection (MDO)	M114: Point table No. selection 5 (DI4)	M122: ---	M130: ---
M107: Temporary stop/Restart (TSTP)	M115: Clear (CR)	M123: ---	M131: ---

APPENDIX

App. 8.1.4 Reading the data

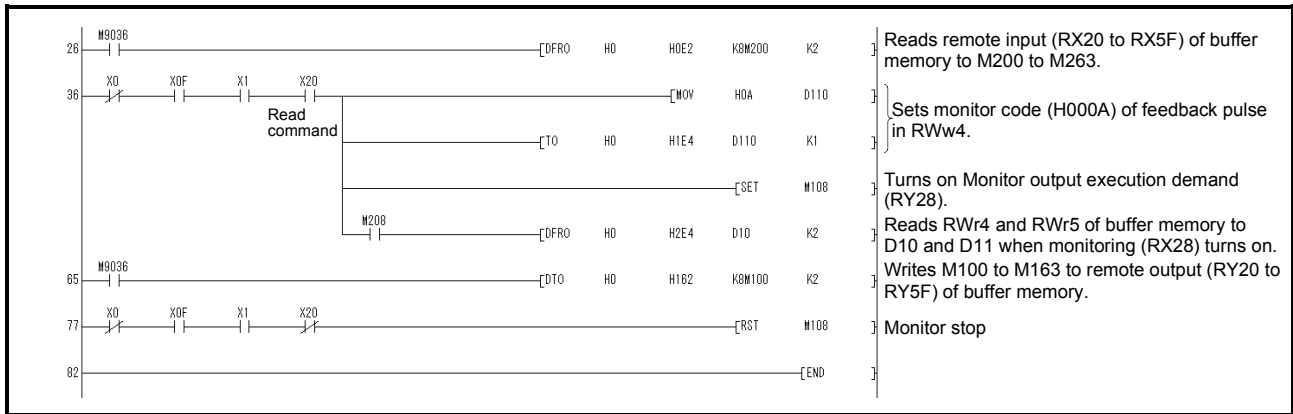
Read various data of the servo amplifier.

(1) Reading the monitor value

Read the (feedback pulse value) of the servo amplifier of station 2 to D1.

Data No.	Description
H000A	Cumulative feedback pulse data (hexadecimal)

Read the cumulative feedback pulse monitor by turning on X20.



APPENDIX

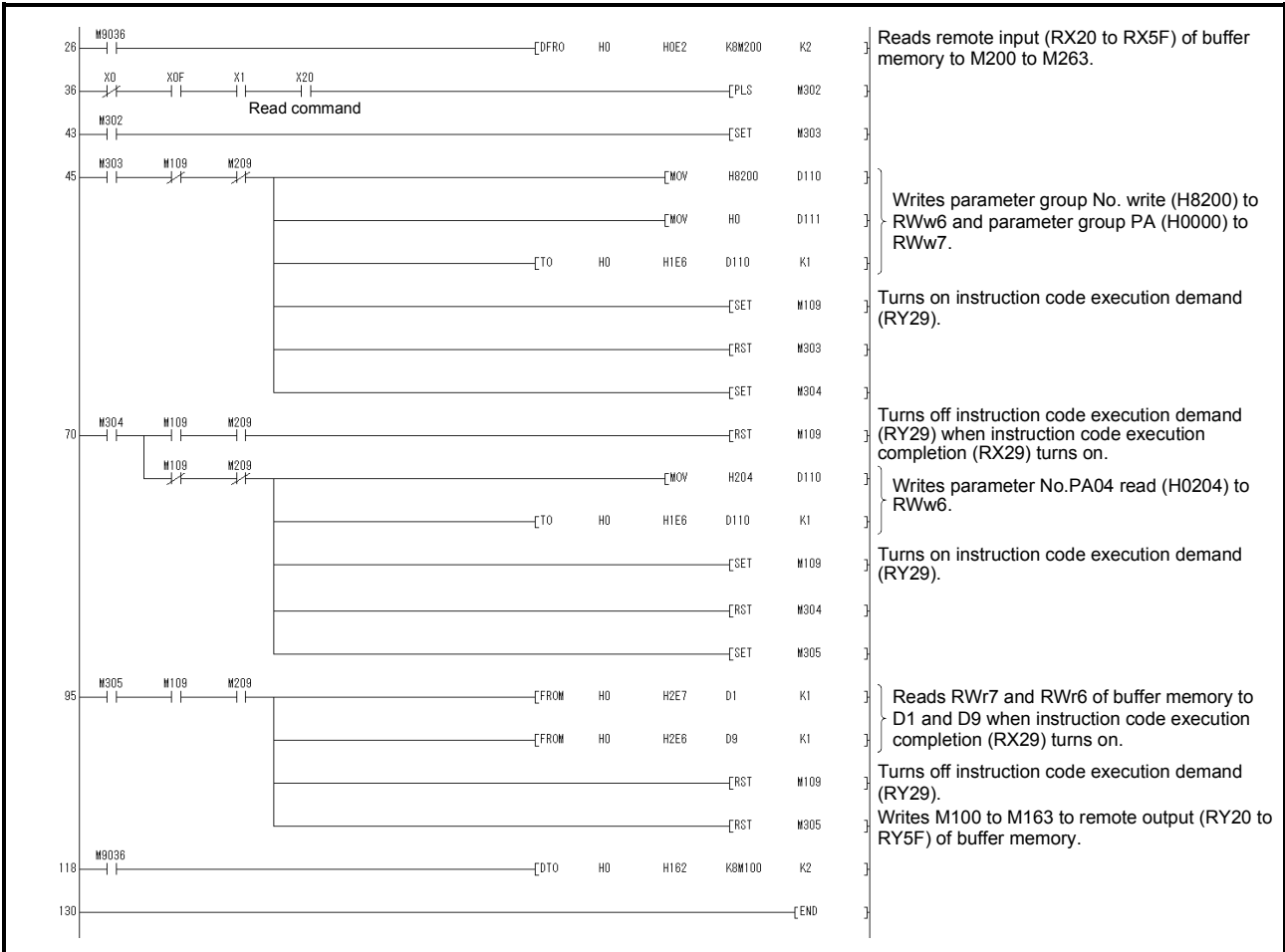
(2) Reading the parameter

Read parameter No.PA04 "Function selection A-1" of the servo amplifier of station 2 to D1.

Data No.	Description
H8200	Parameter group selection
H2024	Parameter No.PA04 setting (hexadecimal)

Read the parameter No.PA04 by turning on X20.

The respond code at instruction code execution is set to D9.



APPENDIX

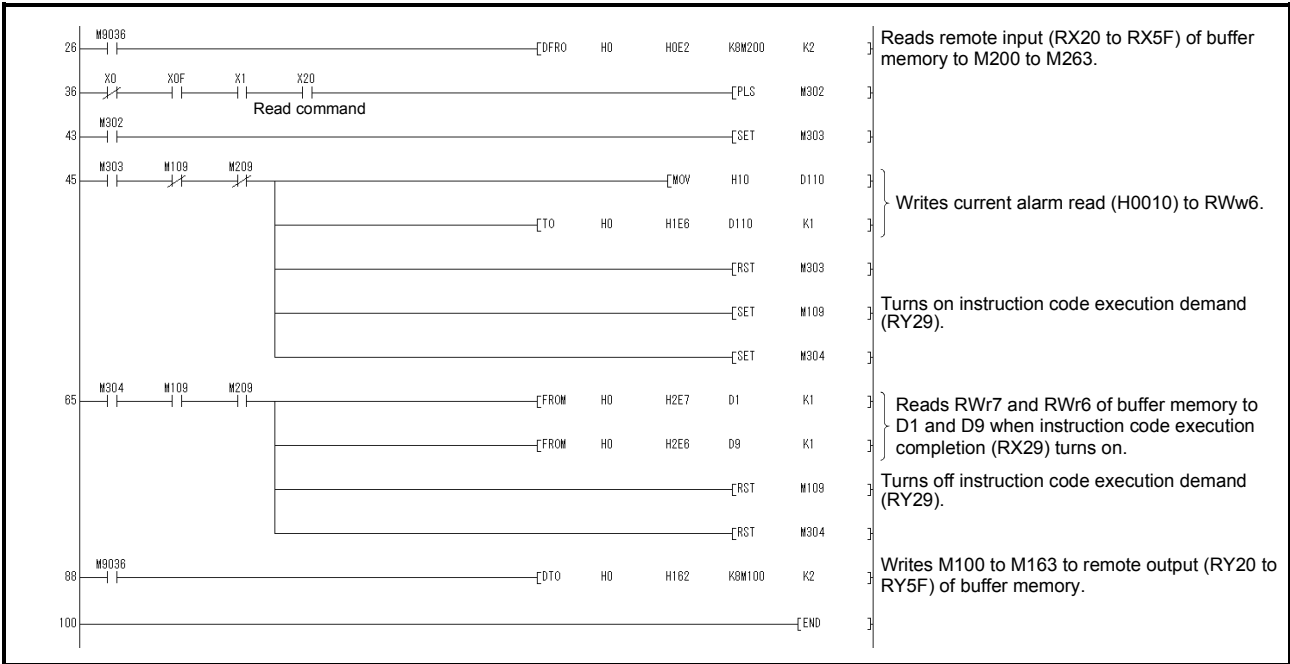
(3) Reading the alarm definition

Read the alarm definition of the servo amplifier of station 2 to D1.

Data No.	Description
H0010	Occurring alarm/warning No. (hexadecimal)

Read current alarms by turning on X20.

The respond code at instruction code execution is set to D9.



APPENDIX

App. 8.1.5 Writing the data

This section explains the programs for writing various data to the servo amplifier.

(1) Writing the servo motor speed data of point table

Change the servo motor speed data in the point table No.1 of the servo amplifier of station 2 to "100".

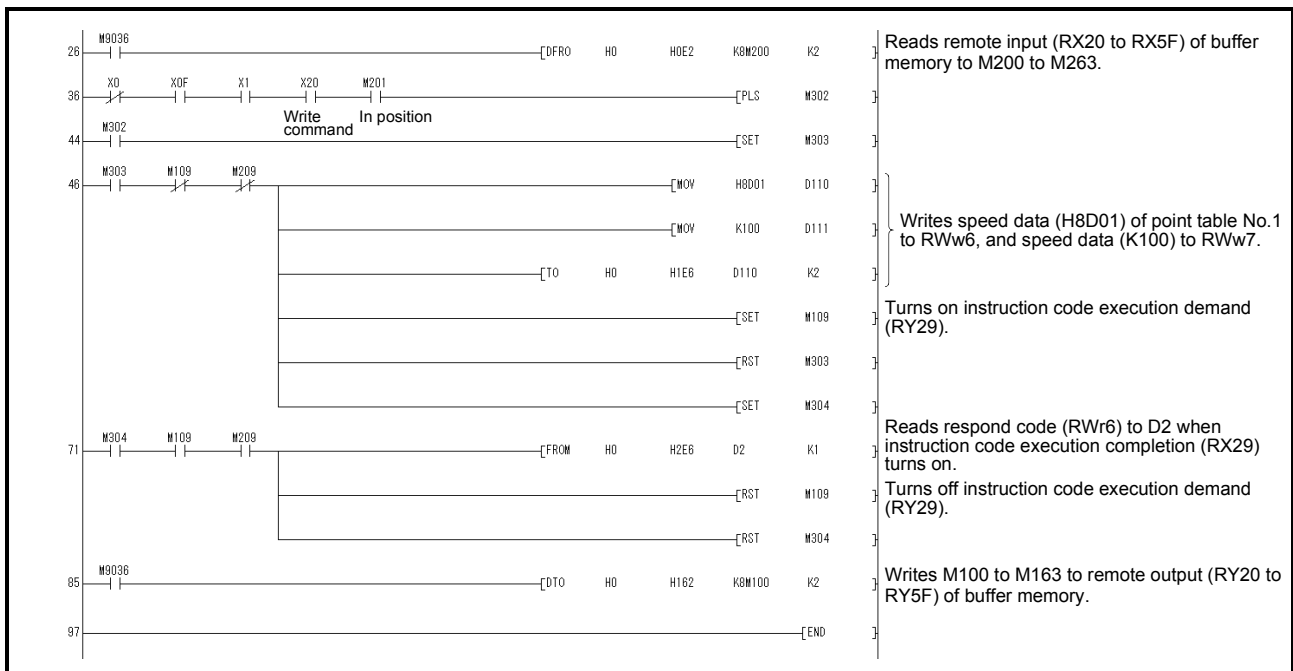
The following shows a program example for writing data to the servo amplifier when two stations are occupied. Writing is disabled for the servo amplifier when one station is occupied.

Code No.	Description
H8D01	Write of servo motor speed data of point table No.1 (hexadecimal)

Set data	Description
K100	Servo motor speed data of point table No.1 (decimal)

Write the data to the servo motor speed data of point table No.1 by turning on X20.

The respond code at instruction code execution is set to D2.



APPENDIX

(2) Writing the parameter

The following shows a program example when two stations are occupied.

Change parameter No.PC12 (JOG speed) of the servo amplifier of station 2 to "100".

The parameter group PC is specified as follows.

Code No.	Description
8200h	Parameter group selection

Set data	Description
H0002	Set data (hexadecimal)

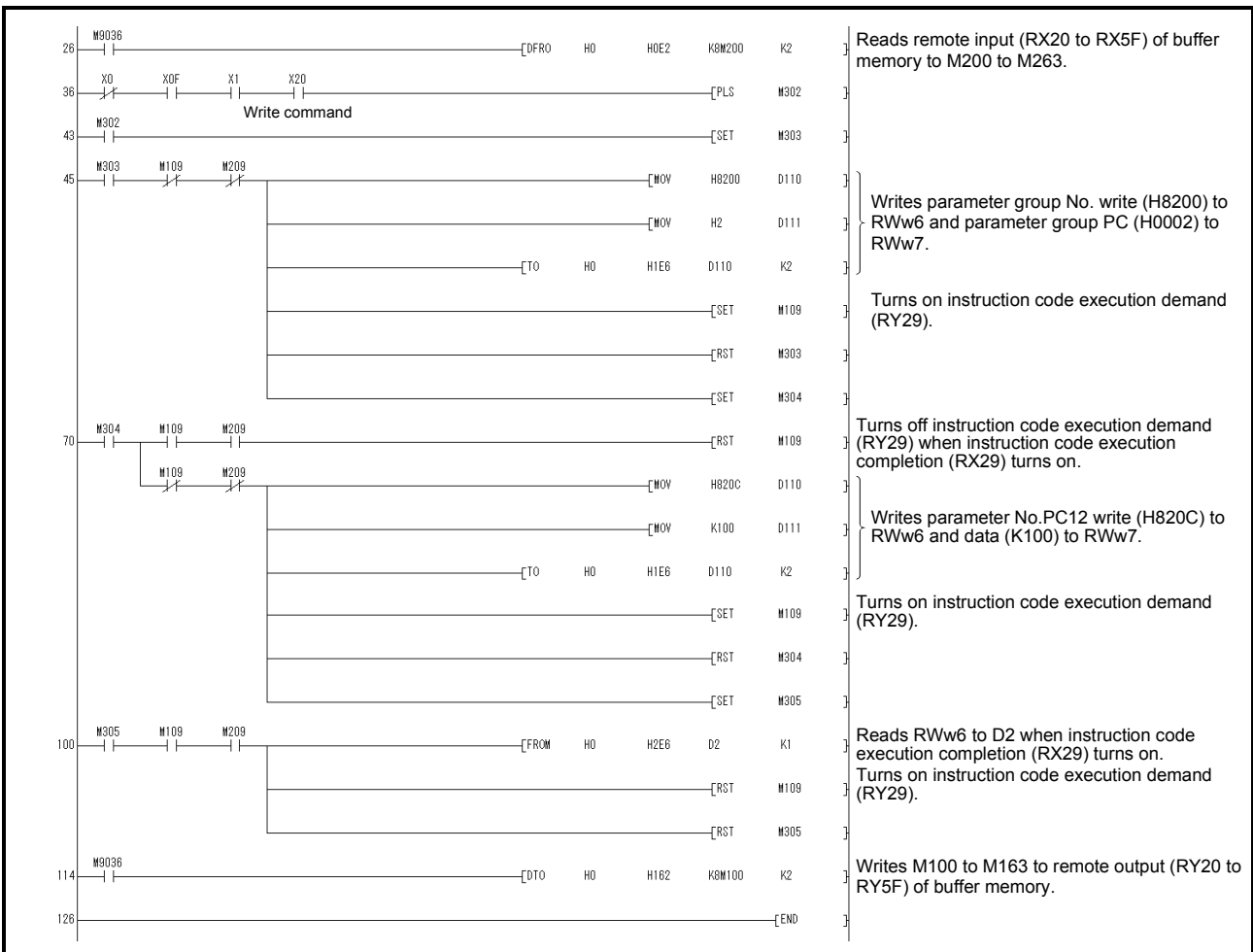
The parameter No.12 is changed to "100" as follows.

Code No.	Description
H820C	Parameter No.PC12 write (hexadecimal)

Set data	Description
K100	Set data (decimal)

Write the data to the parameter No.PC12 by turning on X20.

The respond code at instruction code execution is set to D2.

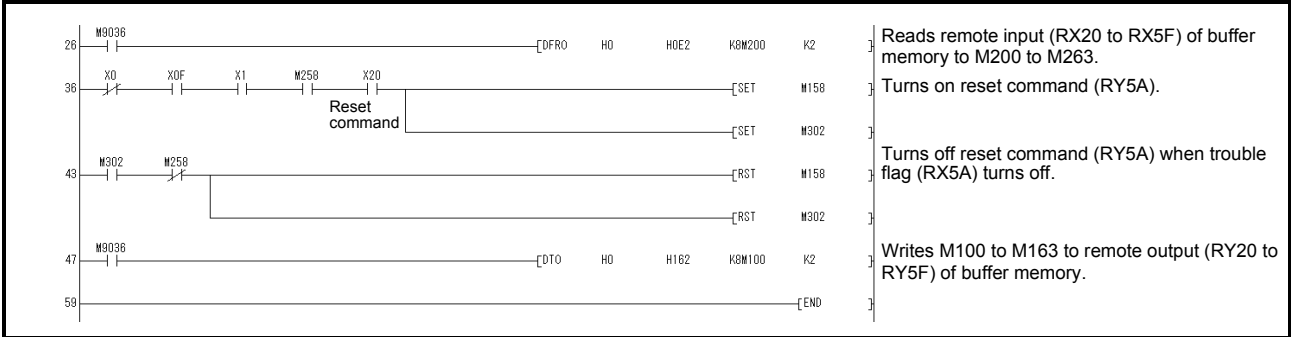


APPENDIX

(3) Servo amplifier alarm resetting program examples

(a) Deactivate the alarm of the servo amplifier of station 2 by issuing a command from the programmable controller.

Reset the servo amplifier on the occurrence of a servo alarm by turning on X20.



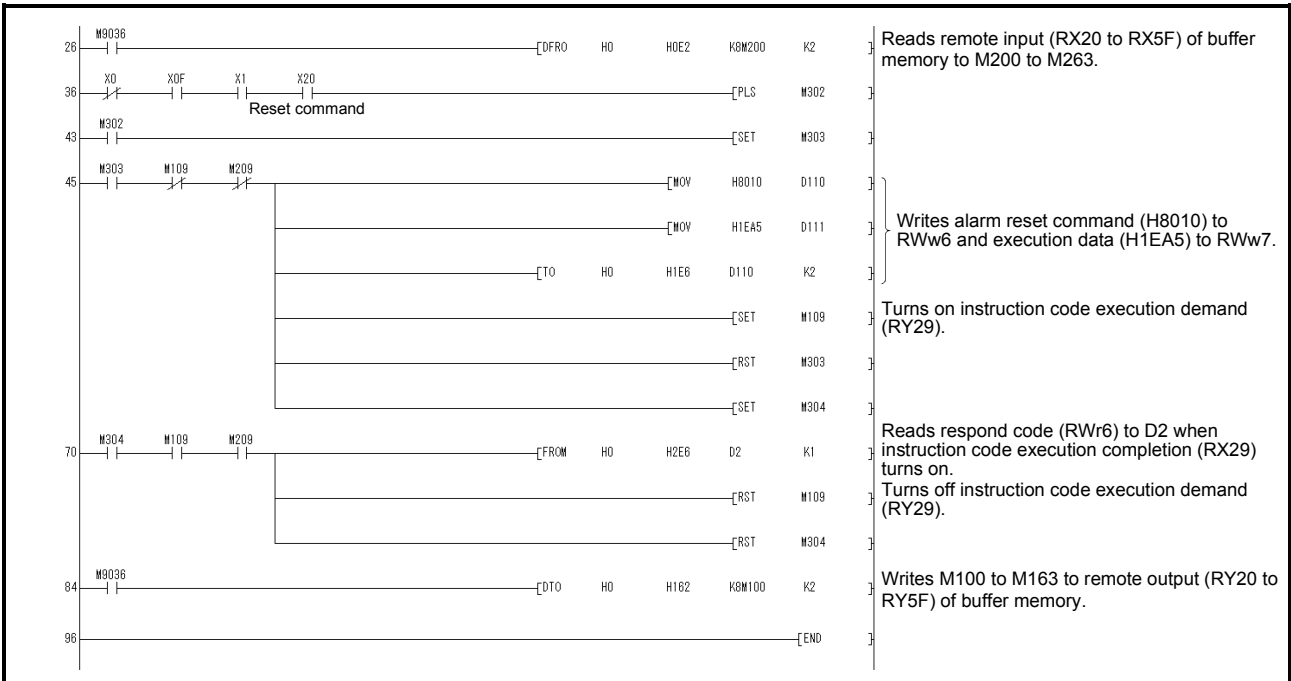
(b) Deactivate the alarm of the servo amplifier of station 2 using the instruction code.

Code No.	Description
H8010	Alarm reset command (hexadecimal)

Set data	Description
H1EA5	Execution data (hexadecimal)

Reset the servo amplifier by turning on X20.

The respond code at instruction code execution is set to D2.



APPENDIX

App. 8.1.6 Operation

This section explains the operation programs of the servo amplifier.

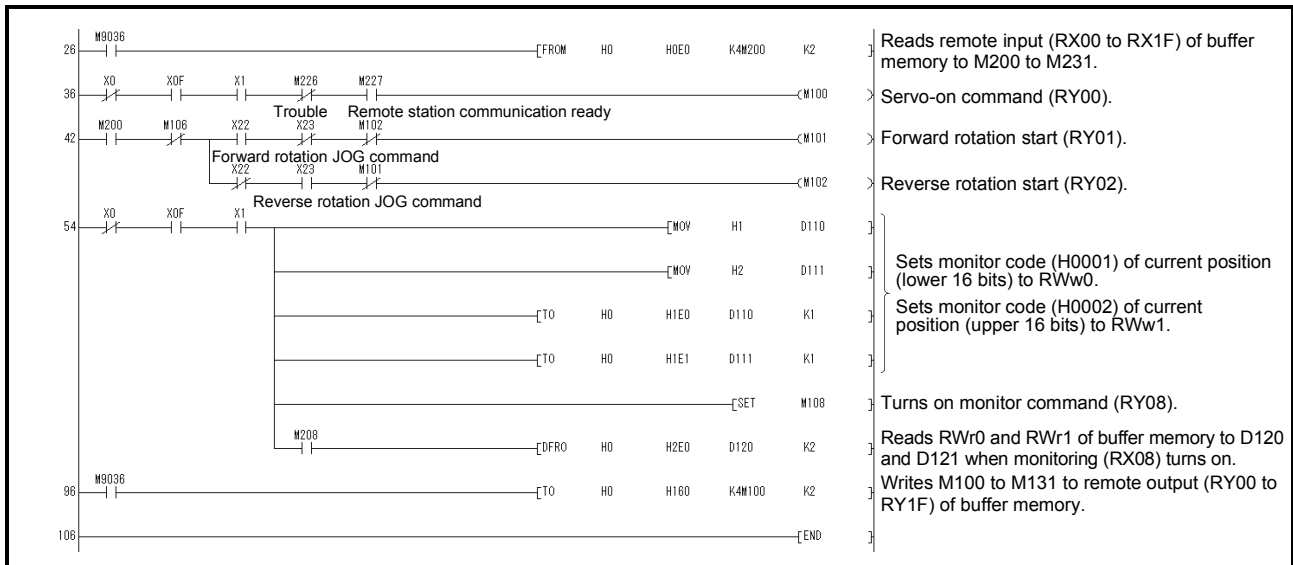
(1) JOG operation

Perform JOG operation of the servo amplifier of station 1 and read the "current position" data.

Code No.	Description
H0001	Lower 16-bit data of current position (hexadecimal)
H0002	Upper 16-bit data of current position (hexadecimal)

Start the forward rotation JOG operation by turning on X22.

Start the reverse rotation JOG operation by turning on X23.



APPENDIX

(2) Remote register-based position data/speed data setting

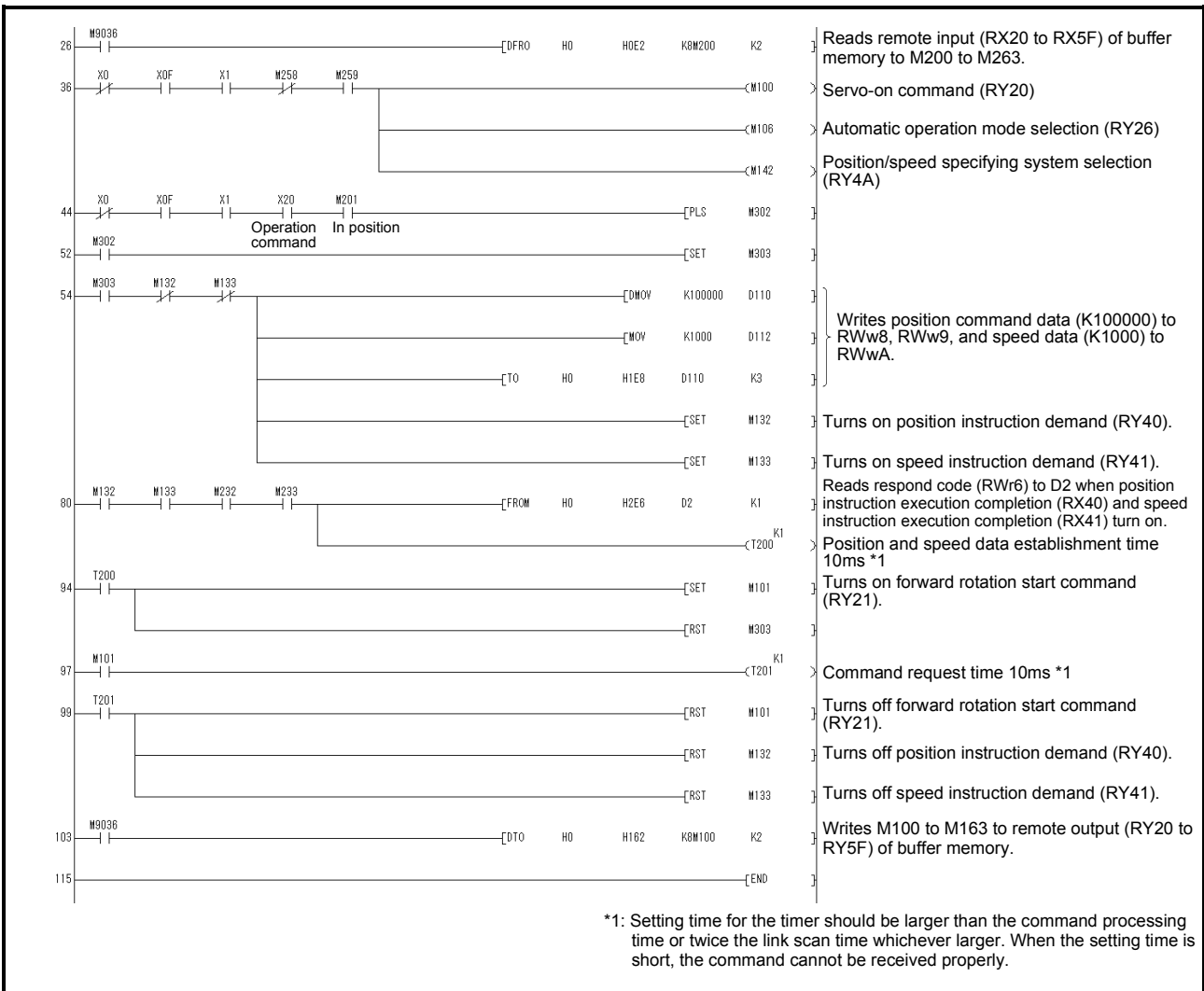
The following program example is only applicable when two stations are occupied.

Operate the servo amplifier of station 2 after specifying the position data as "100000" and the speed data as "1000" in the direct specification mode.

Preset "□□□2" in parameter No.PC30.

Set data	Description
K100000	Position command data (decimal)
K1000	Speed command data (decimal)

Execute positioning operation with position and speed settings specified in the remote register by turning on X20.



APPENDIX

(3) Remote register-based point table No. setting (incremental value command system)

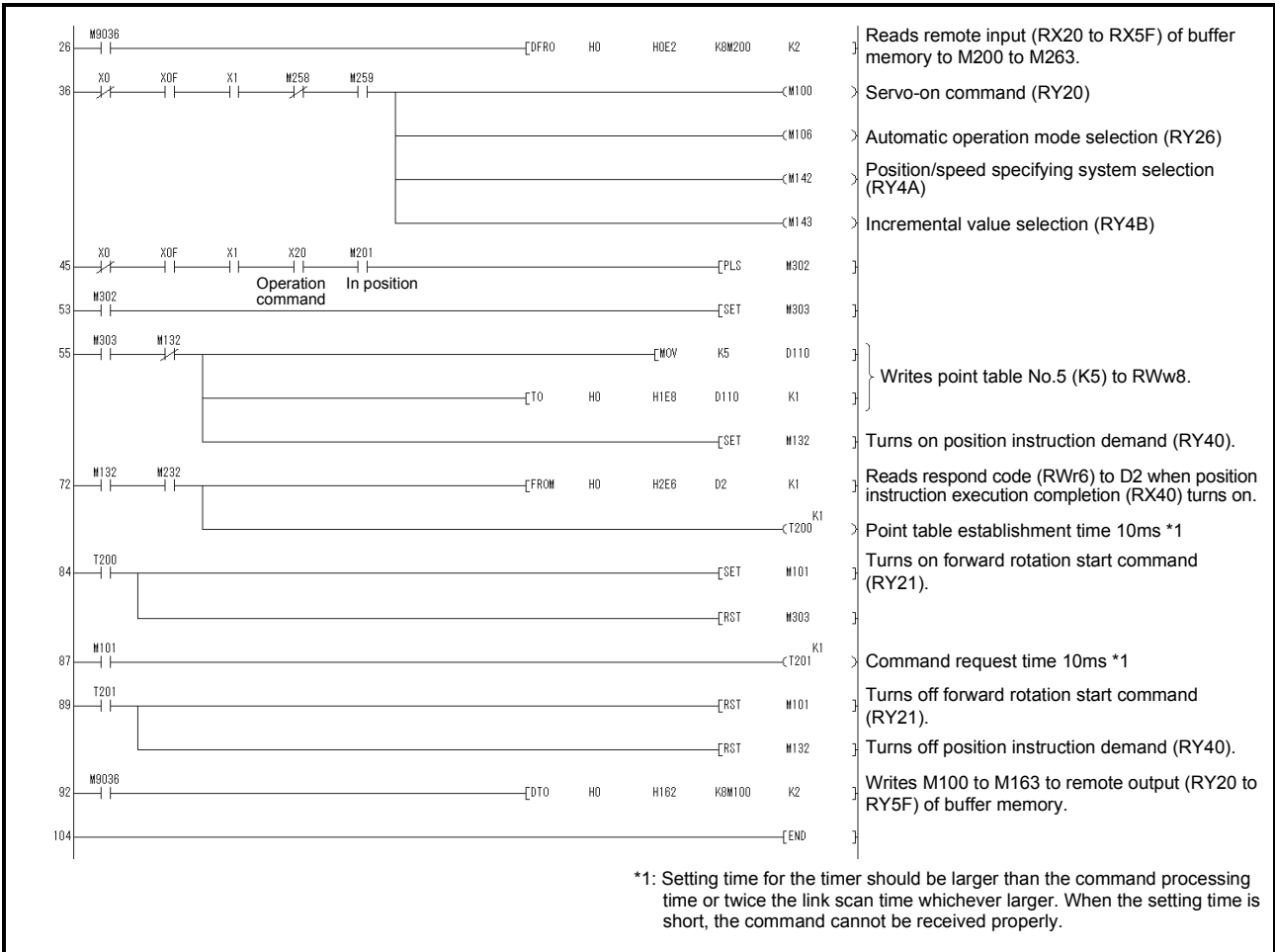
The following program example is only applicable when two stations are occupied.

Operate the servo amplifier of station 2 with incremental values after specifying the point table No.5 in the direct specification mode.

Preset "□□□0" in parameter No.PA01 and "□□□0" in parameter No.PC30.

Set data	Description
K5	Point table No. (decimal)

Execute positioning operation to the point table No.5 by turning on X20.



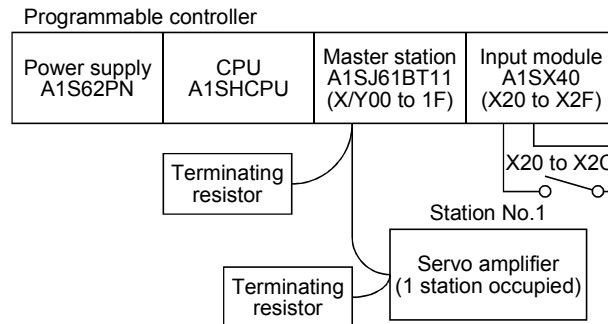
APPENDIX

App. 8.2 Continuous operation program example

This section shows a program example which includes a series of communication operations from a servo start. The program will be described on the basis of the equipment makeup shown in appendix 8.2.1, appendix 8.2.3.

App. 8.2.1 System configuration example when 1 station is occupied

As shown below, the CC-Link system master • local unit is loaded to run one servo amplifier (1 station occupied).



Input signal assignment

Input signal	Signal name	General operation when the input is on
X20	Reset command	Resets the servo amplifier on an occurrence of a servo alarm.
X21	Servo-on command	Turns on the servo motor. (Servo-on status)
X22	Forward rotation JOG command	Executes a forward JOG operation in the manual operation mode.
X23	Reverse rotation JOG command	Executes a reverse JOG operation in the manual operation mode.
X24	Automatic/manual selection	OFF: Manual operation mode ON: Automatic operation mode
X25	Home position return command	Executes a dog type home position return when home position return is incomplete in the automatic operation mode.
X26	Proximity dog command	OFF: Proximity dog is on. (Note) ON: Proximity dog is off.
X27	Positioning start command	Executes a positioning operation to the point table number specified by X28 to X2C when home position return is incomplete in the automatic operation mode.
X28	No. selection 1	Specifies the position for the point table No. selection 1
X29	No. selection 2	Specifies the position for the point table No. selection 2
X2A	No. selection 3	Specifies the position for the point table No. selection 3
X2B	No. selection 4	Specifies the position for the point table No. selection 4
X2C	No. selection 5	Specifies the position for the point table No. selection 5

Note. This is when the parameter No.PD16 is set to "□□□0 (initial value)" (detects the dog at off).

APPENDIX

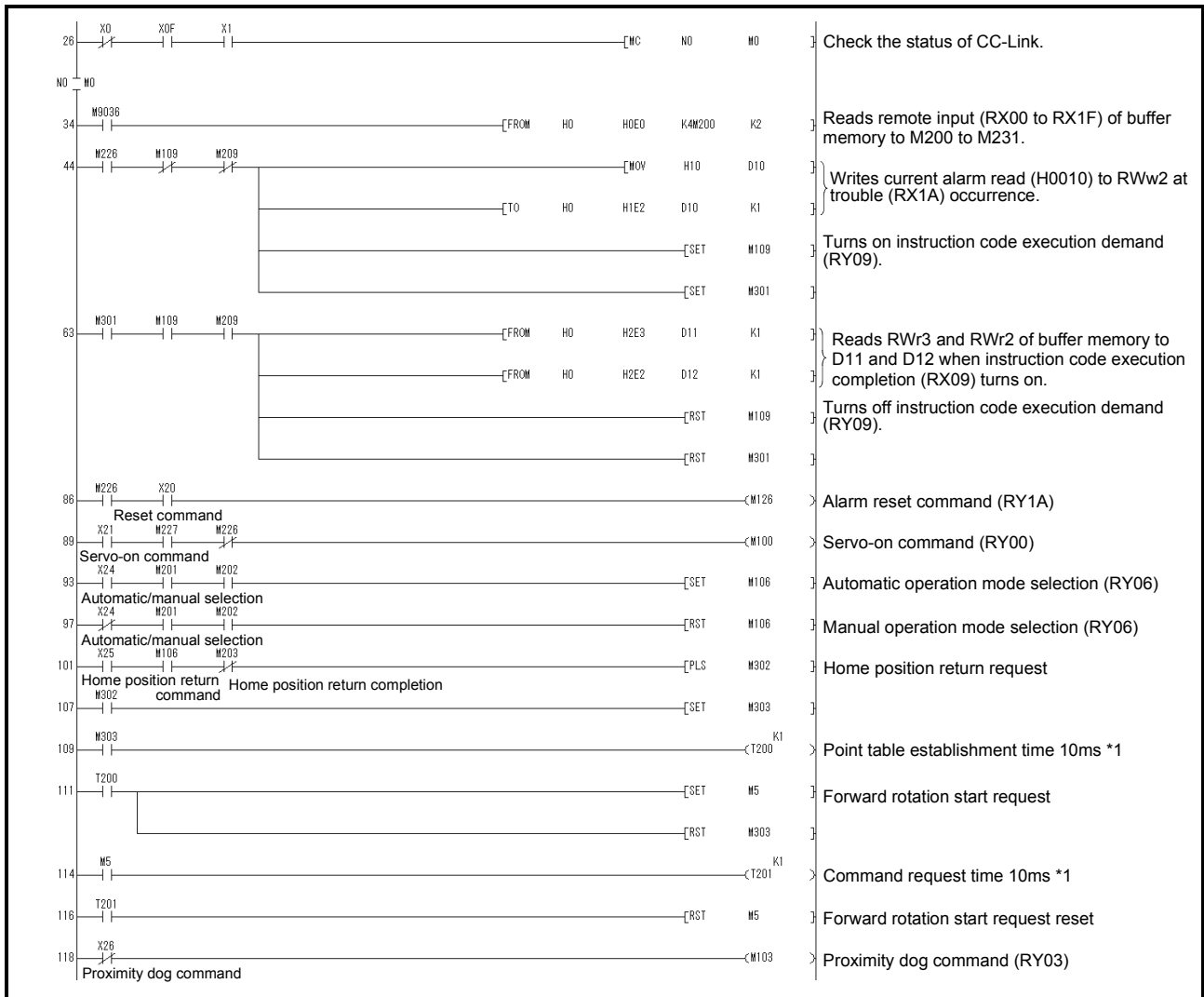
App. 8.2.2 Program example when 1 station is occupied

POINT
<ul style="list-style-type: none"> To execute a dog type home position return with the CC-Link communication functions, set "□0□□" in parameter No.PD14 and use Proximity dog (DOG) with the remote input (RY03) in this example.

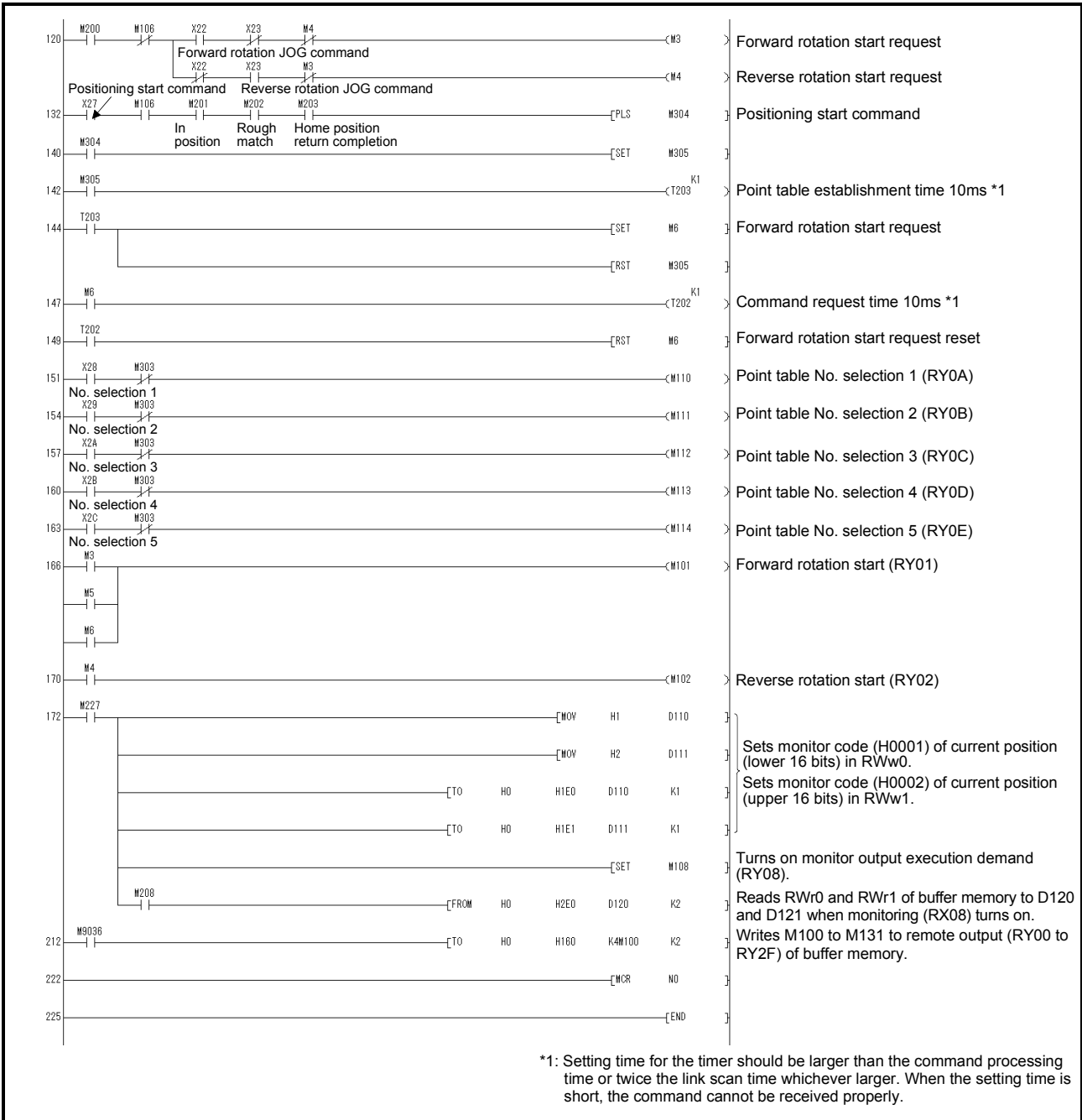
Operate the servo amplifier of station 1 in the positioning mode and read the "current position" data.

Operation: Alarm reset, dog type home position return, JOG operation, automatic operation under point table command

Code No.	Description
H0001	Lower 16-bit data of current position (hexadecimal)
H0002	Upper 16-bit data of current position (hexadecimal)



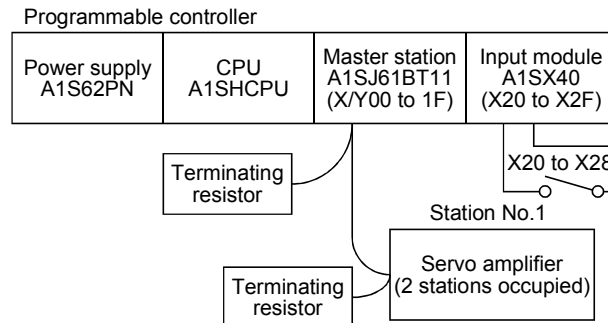
APPENDIX



*1: Setting time for the timer should be larger than the command processing time or twice the link scan time whichever larger. When the setting time is short, the command cannot be received properly.

App. 8.2.3 System configuration example when 2 stations are occupied

As shown below, the CC-Link system master • local unit is loaded to run one servo amplifiers (2 station occupied).



Input signal assignment

Input signal	Signal name	General operation when the input is on
X20	Reset command	Resets the servo amplifier on an occurrence of a servo alarm.
X21	Servo-on command	Turns on the servo motor. (Servo-on status)
X22	Forward rotation JOG command	Executes a forward JOG operation in the manual operation mode.
X23	Reverse rotation JOG command	Executes a reverse JOG operation in the manual operation mode.
X24	Automatic/manual selection	OFF: Manual operation mode ON: Automatic operation mode
X25	Home position return command	Executes a dog type home position return when home position return is incomplete in the automatic operation mode.
X26	Proximity dog command	OFF: Proximity dog is on. (Note) ON: Proximity dog is off.
X27	Positioning start command	Executes a positioning operation with position and speed settings specified in the remote register when home position return is completed in the automatic operation mode.
X28	Position/speed setting system changing command	Changes to position/speed specification by the remote register.

Note. This is when the parameter No.PD16 is set to "□□□0 (initial value)" (detects the dog at off).

APPENDIX

App. 8.2.4 Program example when 2 stations are occupied

POINT

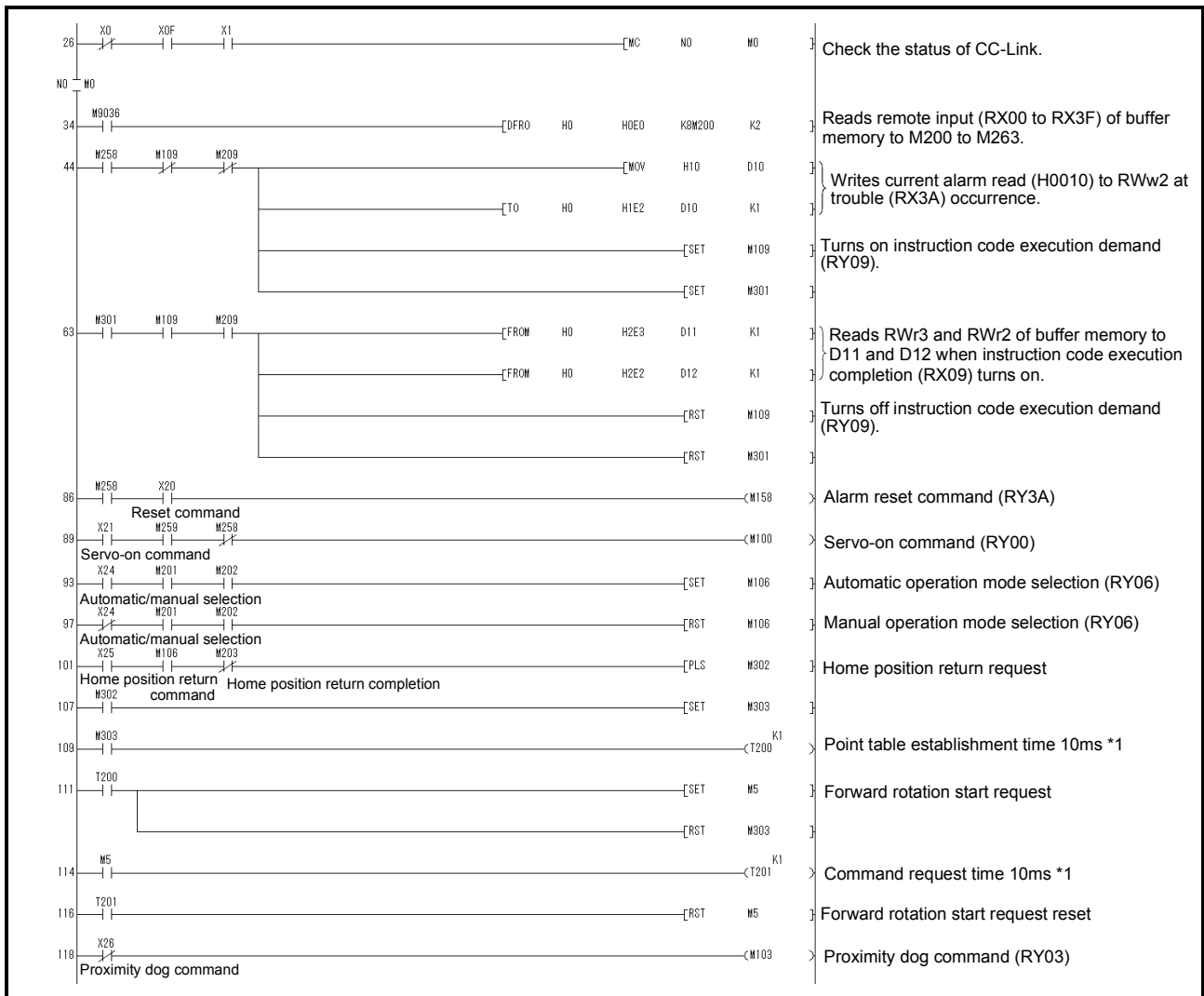
- To execute a dog type home position return with the CC-Link communication functions, set "□□□□" in parameter No.PD14 and use Proximity dog (DOG) with the remote input (RY03) in this example.

Operate the servo amplifier of station 1 in the positioning mode and read the "motor speed" data.
 Preset the parameter No.PC30 to "□□□□".

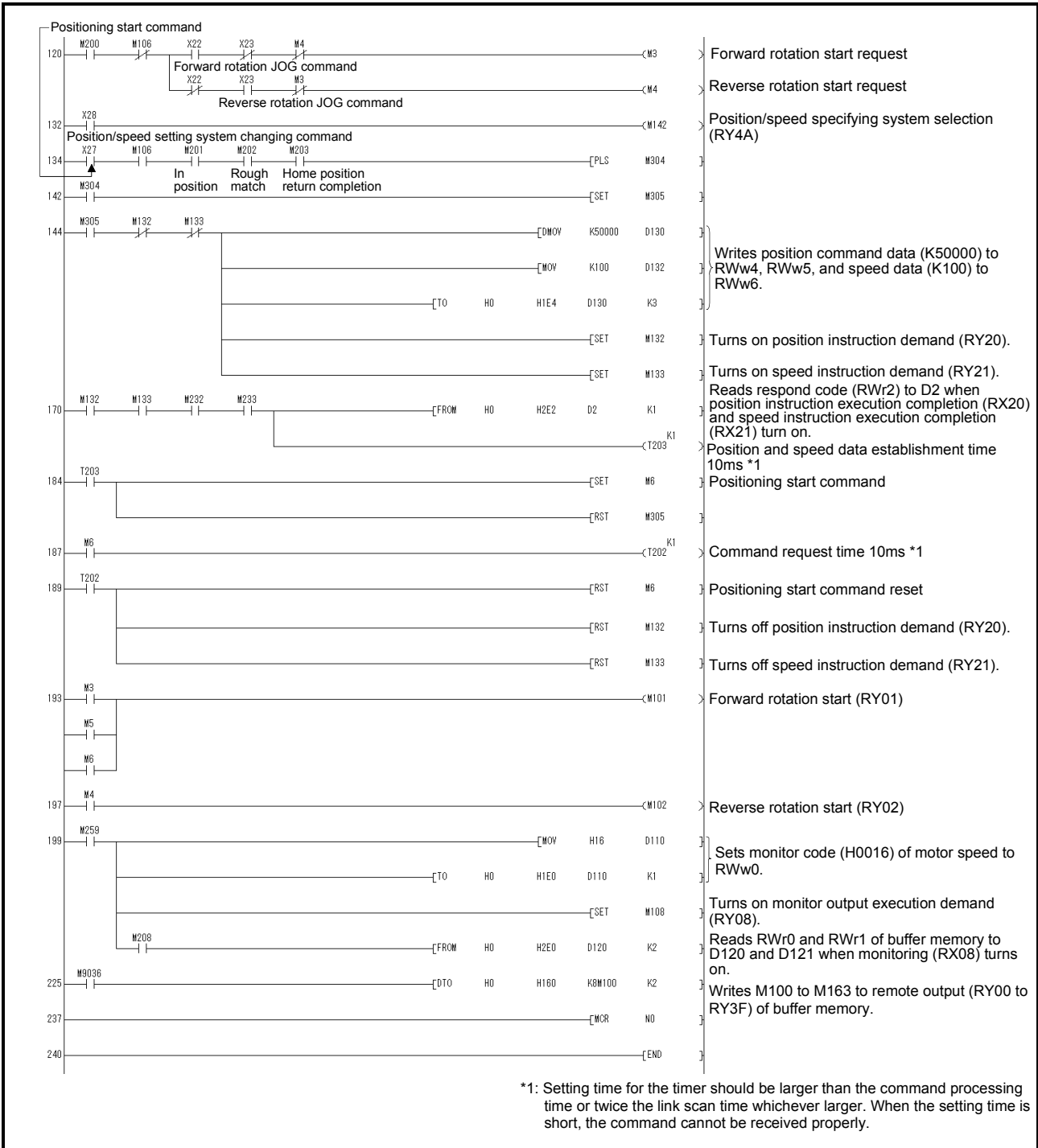
Operation: Alarm reset, dog type home position return, JOG operation, automatic operation under point table command

Code No.	Description
H0016	32-bit data of motor speed (hexadecimal)

Code No.	Description
K50000	Position command data (decimal)
K100	Speed command data (decimal)



APPENDIX



REVISIONS

*The manual number is given on the bottom left of the back cover.

Print Data	*Manual Number	Revision	
Apr., 2006	SH(NA)030058-A	First edition	
Jul., 2006	SH(NA)030058-B	Chapter 2	CAUTION added
		Section 3.5.2(2)	Description of DB changed
		Section 3.5.3	Note deleted
		Section 3.6.3(1)	On duration: 5ms of RYn1 and RYn2 in diagram modified
		Section 3.6.3(2)	On duration: 5ms of RYn1 and RYn2 in diagram modified
		Section 3.6.3(3)	On duration: 5ms of RYn1 and RYn2 in diagram modified
		Section 3.7.1	Diagram partly modified
		Section 4.8.2(3)(b)	Parameter No.19 in diagram changed
		Section 4.10.2(2)	POINT added
		Section 5.6.5(2)	NOTE added
		Section 5.6.8	POINT changed
		Section 5.8(1)	Restrictions changed
		Section 5.8(5)(a)	POINT added
		Section 6.2.1	Name of parameter No.PB17: For manufacturer setting changed
		Section 6.2.2	Name of parameter No.PB17: For manufacturer setting changed
		Section 6.3.5	Parameter No.12 in diagram changed
		Section 6.4.2	Initial value: 0000h of parameter No. PD20 modified
			Sentence of parameter No. PD24 changed
		Section 9.3(1)(a)	Parameter No. PB07 added
		Section 9.5	Section title modified
		Section 13.1	Diagrams added
		Section 14.1.1	Model: MR-CCN1 of No.33 modified
		Section 15.4.1(5)	Commands: [3] and [5] added
		Section 15.4.2	(15) Group setting (Command [9][F]) added
		App 1	Name of parameter No.PB17: For manufacturer setting changed
Oct., 2007	SH(NA)030058-C	Servo amplifier	MR-J3-60T4 to MR-J3-22KT4 added
		Servo motor	HF-SP524/1024/1524/2024/3524/5024/7024 HA-LP6014/701M4 added
		Section 1.1.2	Note regarding cooling fan added
		Section 1.6.1	Description for "motor power supply connector" changed to "servo motor power connector"
		Section 1.7	Note added with change of notation for power supply
		Section 2.1 (1)(b)	POINT description changed
		Section 4.1	Note regarding stepdown transformer added
		Section 4.3.3 (3)	Wiring method for MR-J3-200T4 added as (3)
		Section 4.3.3 (4)	Cable insertion method added for Wago Japan
		Section 4.3.3 (5)	Cable insertion method for Phoenix Contact Connector changed
		Section 4.11.3	Note regarding circuit breaking method deleted
		Section 6.1.4	For parameter No.PA02, setting values 80 to 87 added
		Section 7.1	Compatible versions added on table
		Section 11.4.2	For descriptions of A10, A30 and A33, MR-J3-□T4 added
		Section 12.2	Connector type changed for RoHS compatibility
		Section 13.1	Diagram layout changed

Print Data	*Manual Number	Revision	
Oct., 2007	SH(NA)030058-C	Section 13.2	400V compatible added
		Section 13.3	Dynamic brake time constant and load inertia moment ratio compatible with 400V added. The calculation methods and graph in section 13.3.1, the permissible load inertia moment in 13.3.2, each divided by paragraph.
		Section 13.5	Inrush current at 400V added
		Section 14.1.1	Connector model changed for RoHS compatibility
		Section 14.1.1 2)	Connector for MR-J3-200T4/350T4 added
		Section 14.1.2	Connector type and configuration changed for RoHS compatibility
		Section 14.2 (1)	400V compatible regenerative option added
		Section 14.2 (2)(b)	Descriptions of table modified
		Section 14.2 (3)	For parameter No.PA02, setting values 80 to 87 added
		Section 14.2 (4)	400V compatible regenerative option added
		Section 14.2 (5)(b),(c)	Due to the addition of MR-RB34-4 and MR-RB54-4, changed dimension added
		Section 14.2 (5)	Description added
		Section 14.3 (3)(b)	Outline drawing and dimension table changed
		Section 14.4 (2)	Note regarding stepdown transformer added
		Section 14.4 (3)	FR-RC-H15K, FR-RC-H30K, FR-RC-H55K added
		Section 14.4 (4)	FR-RC-H15K, FR-RC-H30K, FR-RC-H55K added
		Section 14.5 (3)(b)	Note regarding stepdown transformer added
		Section 14.5 (4)(b) 2)	Wire diameter instructions changed
		Section 14.5 (6)	Description "compliant with JIS" deleted
		Section 14.6 (2)	Circuit in connection example changed, note regarding stepdown transformer added
		Section 14.7 (3)	Outline drawing added
		Section 14.9 (1)	Recommended wires compliant with MR-J3-60T4 to MR-J3-22KT4 added
		Section 14.9 (3)	Recommended twist cables for CC-Link changed
		Appendix 4	Table for changing connector set to RoHS compliant products added
Feb., 2008	SH(NA)030058-D	Safety Instructions	
		1. Additional instructions	Partial change of sentence
		CONFORMANCE WITH UL/C-UL STANDARD	
		(3)	Original item title: Short circuit rating, Original current value: 5000A
		(5)	Fuse deleted
		<<About the wires used for wiring>>	Addition
		Section 1.2 (1)	Original mass of MR-J3-200T: 2.3kg
		Section 1.4	Overview of MR-J3-200T changed
		Section 1.6.1 (2)	Overview of MR-J3-200T changed Addition in diagram
		Section 1.7 (3)	Overview of MR-J3-200T changed Addition in diagram
		Section 2.1 (1)(b)	POINT Change of sentence
		Section 3.7.5 (2)	Ladder partial change
		Section 4.3.1	Description in table partially changed
		Section 4.3.3	Components of terminal block for MR-J3-200T changed

Print Data	*Manual Number	Revision	
Feb., 2008	SH(NA)030058-D	Section 4.10.2 (3)(b) Section 4.11.2 (1) Section 4.11.2 (5) to (8) Section 5.3 (1) Section 5.3 (2) Section 7.2 (1) Section 7.2 (2) 1) Section 8.5.7 (1)(a) Section 11.4.2 Section 12.1 (5) Section 14.1.1 2) Section 14.1.3 (2) Section 14.1.4 (2) Section 14.5 (3)(a), (b) Section 14.5 (4) Section 14.9 Section 14.10 Section 14.11 Appendix 5 Appendix 6	Figure partially changed Change of diagram No-fuse breaker for cooling fan added Change of diagram Indication description and Note 2 added Component description changed RS-422/232C converter FA-T-RS40VS deleted Addition of sentence Definition of Parameter error (A37) changed Outline drawing of MR-J3-200T changed, POINT added Components of MR-J3-200T terminal block changed, Applicable wire size for WAGO terminal block changed Addition of Note Addition of Note Addition of Note POINT addition 600V Grade heat-resistant polyvinyl chloride insulated wire (HIV wire) added Fuse class changed (original: K5 class) Note added to the table Addition Addition
Jun., 2008	SH(NA)030058-E	All pages CONFORMANCE WITH UL/C-UL STANDARD (2) Installation (3) Short circuit rating Section 1.1.6 Section 3.5.1 (2) Section 3.5.2 (3) (a) RW/wn+6 Section 3.7 Section 3.8 Section 4.10.1 Section 5.4.2 (3) Section 5.4.3 Section 5.6.1 (1) Section 5.6.2 (3) Section 5.6.3 (2) Section 5.6.4 (2) Section 5.6.5 (2) Section 5.6.6 Section 5.6.6 (1) Section 5.6.7 (2) Section 5.6.8 (2) Section 5.6.9 (2) Section 5.6.10 (2)	"PLC" changed to "programmable controller" Change of sentence Change of sentence Error of communication alarm display position corrected Note 4. Addition of sentence Addition of sentence Changed Changed CAUTION changed Timing chart partially changed, Note 1 changed Description added to the remote register-based position/ speed specifying system selection Timing chart partially changed, Note 1 changed Note. Deleted Note. Change of sentence Note. Change of sentence Note. Change of sentence Note. Change of sentence POINT addition Change of table Note. Change of sentence Note. Change of sentence Note. Change of sentence Note. Change of sentence

Print Data	*Manual Number	Revision
Jun., 2008	SH(NA)030058-E	Section 5.6.11 (2) Note. Change of sentence Section 5.6.12 (2) Note. Change of sentence Section 6.3 Parameter No.PC28 added Section 6.4.3 Addition Section 6.4.4 Addition Section 7.7.1 Starting method added Section 11.4.2 "Cause" added to CC-Link alarm (A8D) Section 14.1 POINT addition Chapter 16 Addition Appendix 7 Addition Appendix 8 Addition

MODEL	
MODEL CODE	



HEAD OFFICE : TOKYO BLDG MARUNOUCHI TOKYO 100-8310