

MELSERVO MR-J3-xT

Servo Amplifier

Instruction manual

General Purpose AC Servo MELSERVO-J3 series

Bulit-in positioning function model

CC-Link



Distributor for:





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	Telefon / Phone: +49(0)6181 9704-0 Telefax / Fax: +49(0)6181 9704-99			
	E-Mail: info@epa.de Internet: www.epa.de			
Author:	MITSUBISHI ELECTRIC CORPORATION			
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Article: MR-J3-xT

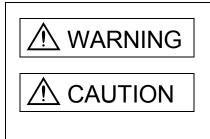


Safety Instructions

(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 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:

<u> </u>	
 Before wiring or inspection, switch power off and wait for more than 15 minutes. Then, confirm the voltage is safe with voltage tester. Otherwise, you may get an electric shock. 	
 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	
 Do not install the servo amplifier, servo motor and regenerative resistor on or near combustibles. Otherwise a fire may cause. 	

- When the servo amplifier has become faulty, switch off the main servo amplifier power side. Continuous flow of a large current may cause a fire.
- 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



- 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.						
•			•	er. The servo amplifier may dro	OD.	
			•	ordance with the Instruction Ma	•	
	•		ervo equipment. Do not put he			
			rvo motor must be installed in	, , , , , , , , , , , , , , , , , , , ,		
	•			and control enclosure walls or	other equipment	
•				otor which has been damaged		
missing.				otor which has been damaged	i or has any parts	
•	nuato prot	actio	n to prevent screws and othe	r conductive matter, oil and otl	her combustible	
	• •		rvo amplifier and servo motor			
	•		•			
			amplifier or servo motor. Isola			
	eep or use	ε π, p	lease fulfill the following envir		1	
Envi	ronment		Servo amplifier	Conditions Servo moto		
	During	[°C]	0 to +55 (non-freezing)	0 to +40 (non-freezing)	1	
Ambient	operation	[°F]	32 to 131 (non-freezing)	32 to 104 (non-freezing)		
temperature			-20 to +65 (non-freezing)	-15 to +70 (non-freezing)		
	In storage	[°F]	-4 to 149 (non-freezing)	5 to 158 (non-freezing)		
	In operation	1.1	90%RH or less (non-condensing)	80%RH or less (non-condensing)		
Ambient humidity	In storage		90%RH or less (non-condensing)	5		
Ambience	· · ·		Indoors (no direct sunlight) Free from corrosive gas, flammable gas, oil mist, dust and dirt			
Altitude			Max. 1000m (3280 ft) above sea level			
				HF-MP Series	X ■ Y : 49	
				HF-KP Series		
				HF-SP 52 to 152		
				HF-SP 51 • 81	X ■ Y : 24.5	
				HC-RP Series HC-UP 72 • 152		

Note. Except the servo motor with reduction gear.

[m/s²]

5.9 or less

(Note)

Vibration

Securely attach the servo motor to the machine. If attach insecurely, the servo motor may come off during
operation.

HF-SP 202 • 352

HF-SP 121 • 201

HC-UP 202 to 502

HF-SP 301 • 421 HF- SP 502 • 702

HA-LP601 to12K1

HA-LP701M to 15K1M

HA-LP502 to 22K2 HA-LP15K1 to 25K1 HA-LP22K1M X : 24.5

X : 24.5

Y : 29.5

X : 11.7

Y:29.4

X • Y:9.8

Y:49

• The servo motor with reduction gear must be installed in the specified direction to prevent oil leakage.

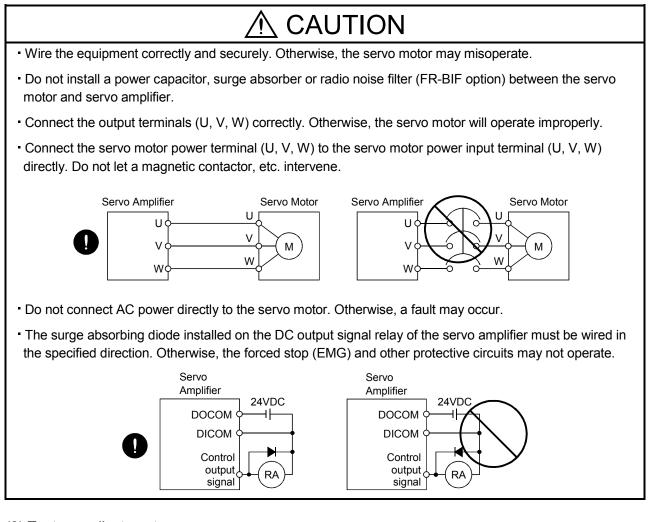
• Take safety measures, e.g. provide covers, to prevent accidental access to the rotating parts of the servo motor during operation.

• 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



(3) Test run adjustment



- 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

- 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 ballscrew 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

• 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 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). Contacts must be open when Circuit must be servo-off, when an trouble (ALM) opened during and when an electromagnetic brake forced stop (EMG). interlock (RXn6). Servo motor RA EMG ഫ് 24VDC Electromagnetic brake • 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

• 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.

\land 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.

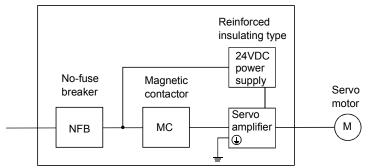
Servo amplifier	:MR-J3-10T to MR-J3-22KT
	MR-J3-10T1 to MR-J3-40T1

	MR-J3-10T1 to N
Servo motor	:HF-MP□
	HF-KP 🗆
	HF-SP□
	HC-RP 🗆
	HC-UP
	HC-LP 🗆
	HA-LP 🗆

(2) Configuration

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

Control box



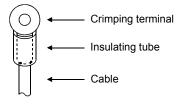
(3) Environment

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 system for single phasesupply, a reinforced 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 insulationreinforced 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. 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 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
Servo motor	:HF-MP□
	HF-KP 🗆
	HF-SP□
	HC-RP
	HC-UP
	HC-LP 🗆
	HA-LP 🗆

(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.

(3) Short circuit rating

This servo amplifier conforms to the circuit whose peak current is limited to 5000A or less. Having been subjected to the short-circuit tests of the UL in the alternating-current circuit, the servo amplifier conforms to the above circuit.

(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 • 10T1 • 20T1	2
MR-J3-70T	3
MR-J3-40T1	4
MR-J3-100T	5
MR-J3-200T • 350T	9
MR-J3-500T • 700T	10
MR-J3-11KT	4
MR-J3-15KT	6
MR-J3-22KT	8

(5) Options and auxiliary equipment

Use UL/C-UL standard-compliant products.

This servo amplifier is UL/C-UL-listed when using the fuses indicated in the following table. When the servo amplifier must comply with the UL/C-UL Standard, be sure to use these fuses.

Servo amplifier		Fuse	
	Class	Current [A]	Voltage [V]
MR-J3-10T (1) • 20T		10	
MR-J3-40T • 20T1		15	
MR-J3-60T to 100T • 40T1		20	
MR-J3-200T		40	
MR-J3-350T	т	70	AC250
MR-J3-500T	I	125	A0230
MR-J3-700T		150	
MR-J3-11KT		200	
MR-J3-15KT		250	
MR-J3-22KT		350	

(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 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 To Use the AC Servo Safely	IB(NA)0300077
MELSERVO Servo Motor Instruction Manual Vol.2	SH(NA)030041
EMC Installation Guidelines	IB(NA)67310

CONTENTS

1.1 Introduction	
1.1.1 Features of CC-Link communication functions	
1.1.2 Function block diagram	
1.1.3 System configuration	
1.2 Servo amplifier standard specifications	
1.3 Function list	
1.4 Model code definition	
1.5 Combination with servo motor	
1.6 Structure	
1.6.1 Parts identification	
1.6.2 Removal and reinstallation of the front cover	
1.7 Configuration including auxiliary equipment	1 -21
1.8 Selection of operation method	
2. INSTALLATION	2 - 1 to 2 - 4
2.1 Installation direction and clearances	
2.2 Keep out foreign materials	
2.3 Cable stress	2 - 3

2.3 Cable stress	2 -	3
2.4 Inspection items	2 -	4
2.5 Parts having service lives	2 -	4
5		

3. CC-LINK COMMUNICATION FUNCTIONS

1. FUNCTIONS AND CONFIGURATION

3.1 Communication specifications	3 - 1
3.2 System configuration	
3.2.1 Configuration example	
3.2.2 Wiring method	
3.2.3 Station number setting	3 - 5
3.2.4 Communication baud rate setting	
3.2.5 Occupied station count setting	
3.3 Functions	
3.3.1 Function block diagram	
3.3.2 Functions	
3.4 Servo amplifier setting	
3.5 I/O Signals (I/O devices) transferred to/from the PLC CPU	
3.5.1 I/O signals (I/O devices)	
3.5.2 Detailed explanation of I/O signals	3 -12
3.5.3 Monitor codes	
3.5.4 Instruction codes (RWwn+2 • RWwn+3)	3 -23
3.5.5 Answer codes (RWrn+2)	
3.5.6 Setting the CN6 external input signals	3 -31
3.6 Data communication timing charts	
3.6.1 Monitor codes	
3.6.2 Instruction codes	

3 - 1 to 3 -56

1 - 1 to 1 -28

3.6.3 Remote register-based position/speed setting	3 -37
3.7 Function-by-function programming examples	
3.7.1 System configuration example	
3.7.2 Reading the servo amplifier status	3 -41
3.7.3 Writing the operation commands	3 -42
3.7.4 Reading the data	3 -43
3.7.5 Writing the data	
3.7.6 Operation	
3.8 Continuous operation program example	
3.8.1 System configuration example when 1 station is occupied	
3.8.2 Program example when 1 station is occupied	
3.8.3 System configuration example when 2 stations are occupied	
3.8.4 Program example when 2 stations are occupied	3 -55

4. SIGNALS AND WIRING

4 - 1 to 4 -46

4.1 Input power supply circuit	4 - 2
4.2 I/O signal connection diagram	4 - 7
4.3 Explanation of power supply system	4 - 8
4.3.1 Signal explanations	
4.3.2 Power-on sequence	4 - 9
4.3.3 CNP1, CNP2, CNP3 wiring method	
4.4 Connectors and signal arrangements	
4.5 Signal (device) explanation	4 -19
4.5.1 I/O devices	4 -19
4.5.2 Input signals	
4.5.3 Output signals	4 -22
4.5.4 Power supply	4 -23
4.6 Detailed description of signals (devices)	
4.6.1 Forward rotation start • reverse rotation start • temporary stop/restart	
4.6.2 Movement finish • rough match • in position	4 -24
4.6.3 Torque limit	
4.7 Alarm occurrence timing chart	4 -27
4.8 Interface	4 -28
4.8.1 Internal connection diagram	4 -28
4.8.2 Detailed description of interfaces	4 -29
4.8.3 Source I/O interfaces	4 -31
4.9 Treatment of cable shield external conductor	
4.10 Connection of servo amplifier and servo motor	4 -33
4.10.1 Connection instructions	
4.10.2 Power supply cable wiring diagrams	4 -34
4.11 Servo motor with electromagnetic brake	4 -41
4.11.1 Safety precautions	4 -41
4.11.2 Timing charts	4 -42
4.11.3 Wiring diagrams (HF-MP series • HF-KP series servo motor)	4 -44
4.12 Grounding	4 -45

5. STARTUP	5 - 1 to 5 -58
5.1 Switching power on for the first time	5 - 1
5.1.1 Startup procedure	
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	
5.5 Manual operation mode	5 -26
5.5.1 JOG operation	5 -26
5.5.2 Manual pulse generator	5 -27
5.6 Manual home position return mode	5 -29
5.6.1 Outline of home position return	5 -29
5.6.2 Dog type home position return	5 -32
5.6.3 Count type home position return	
5.6.4 Data setting type home position return	
5.6.5 Stopper type home position return	
5.6.6 Home position ignorance (servo-on position defined as home position)	
5.6.7 Dog type rear end reference home position return	
5.6.8 Count type front end reference home position return	
5.6.9 Dog cradle type home position return	
5.6.10 Dog type first Z-phase reference home position return	
5.6.11 Dog type front end reference home position return method	
5.6.12 Dogless Z-phase reference home position return method	
5.6.13 Home position return automatic return function	
5.6.14 Automatic positioning function to the home position	
5.7 Roll feed display function in roll feed mode	
5.8 Absolute position detection system	5 -55

6. PARAMETERS

6 -	1	to	6	-36	

6.1 Basic setting parameters (No.PA	6 - 1
6.1.1 Parameter list	
6.1.2 Parameter write inhibit	
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	
6.1.8 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 D)	
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 -26
6.3.4 Alarm history clear	
6.3.5 Rough match output	
6.3.6 Software limit	
6.4 I/O setting parameters (No. PD D D)	
6.4.1 Parameter list	
6.4.2 Detail list	6 -29

7. MR Configurator

7 - 1 to 7 -26

8 - 1 to 8 -20

7.1 Specifications	
7.2 System configuration	7 - 1
7.3 Station selection	7 - 3
7.4 Parameters	7 - 4
7.5 Point table	7 - 6
7.6 Device assignment method	7 - 8
7.7 Test operation	
7.7.1 Jog operation	7 -12
7.7.2 Positioning operation	
7.7.3 Motor-less operation	7 -17
7.7.4 Output signal (DO) forced output	7 -18
7.7.5 Single-step feed	7 -19
7.8 Alarm	7 -22
7.8.1 Alarm display	7 -22
7.8.2 Batch display of data at alarm occurrence	7 -23
7.8.3 Alarm history	

8. PARAMETER UNIT (MR-PRU03)

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

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)	
8.5.4 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	

9. GENERAL GAIN ADJUSTMENT

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 Function block diagram	
10.2 Adaptive filter I	
10.3 Machine resonance suppression filter	
10.4 Advanced vibration suppression control	
10.5 Low-pass filter	
10.6 Gain changing function	
10.6.1 Applications	
10.6.2 Function block diagram	
10.6.3 Parameters	
10.6.4 Gain changing operation	

11. TROUBLESHOOTING

1	1-	1	to	11	-1	2

11.1 Trouble at start-up11.2 Operation at error occurrence11.3 CC-Link communication error	
11.4 When alarm or warning has occurred 11.4.1 Alarms and warning list	
11.4.2 Remedies for alarms	
11.5 Point table error	
12. OUTLINE DRAWINGS	12- 1 to 12- 8
12.1 Servo amplifier	

9 - 1 to 9 -12

10- 1 to 10-16

12.2 Connector for CN3	
13. CHARACTERISTICS	13- 1 to 13- 8
 13.1 Overload protection characteristics	
14. OPTIONS AND AUXILIARY EQUIPMENT	14- 1 to 14-66

14.1 Cable/connector sets	14- 1
14.1.1 Combinations of cable/connector sets	14- 1
14.1.2 Encoder cable/connector sets	14- 7
14.1.3 Motor power supply cables	14-16
14.1.4 Motor brake cables	14-17
14.2 Regenerative options	14-18
14.3 Brake unit	14-27
14.4 Power regeneration converter	14-30
14.5 Power regeneration common converter	14-33
14.6 External dynamic brake	14-38
14.7 Battery MR-J3BAT	14-42
14.8 Heat sink outside mounting attachment (MR-J3ACN)	14-43
14.9 Recommended wires	14-45
14.10 No-fuse breakers, fuses, magnetic contactors	
14.11 Power factor improving DC reactor	14-51
14.12 Power factor improving reactors	14-52
14.13 Relays (recommended)	14-53
14.14 Surge absorbers (recommended)	14-53
14.15 Noise reduction techniques	14-54
14.16 Leakage current breaker	14-60
14.17 EMC filter (recommended)	14-62
14.18 MR-HDP01 manual pulse generator	14-64

15. COMMUNICATION FUNCTION

15- 1 to 15-46

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) 15-30 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	15.4 Command and data No. list	-10
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	15.4.1 Read commands	-10
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		
15.5.1 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 Detailed explanations of commands	-17
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		
15.5.4 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	15.5.2 Status display	-19
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	15.5.3 Parameters	-20
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		
15.5.6 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	15.5.5 Device ON/OFF	-28
15.5.8 Test operation mode 15-31 15.5.9 Alarm history 15-37 15.5.10 Current alarm 15-38		
15.5.9 Alarm history	15.5.7 Input devices ON/OFF (test operation) 15-3	-30
15.5.10 Current alarm	15.5.8 Test operation mode	-31
15.5.10 Current alarm	15.5.9 Alarm history	-37
15.5.11 Point table	15.5.10 Current alarm	-38
	15.5.11 Point table	-39
15.5.12 Servo amplifier group designation	15.5.12 Servo amplifier group designation	45
15.5.13 Other commands 15-46	15.5.13 Other commands	-46

APPENDIX

App- 1 to App- 5

App 1. Parameter list	App- 1
App 2. Signal layout recording paper	Арр- 3
App 3. Twin type connector: outline drawing for 721-2105/026-000(WAGO)	Арр- 4
App 4. Combination of servo amplifier and servo motor	App- 5

MEMO

1.1 Introduction

The MR-J3- \Box 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 PLC 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 poweroff 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.

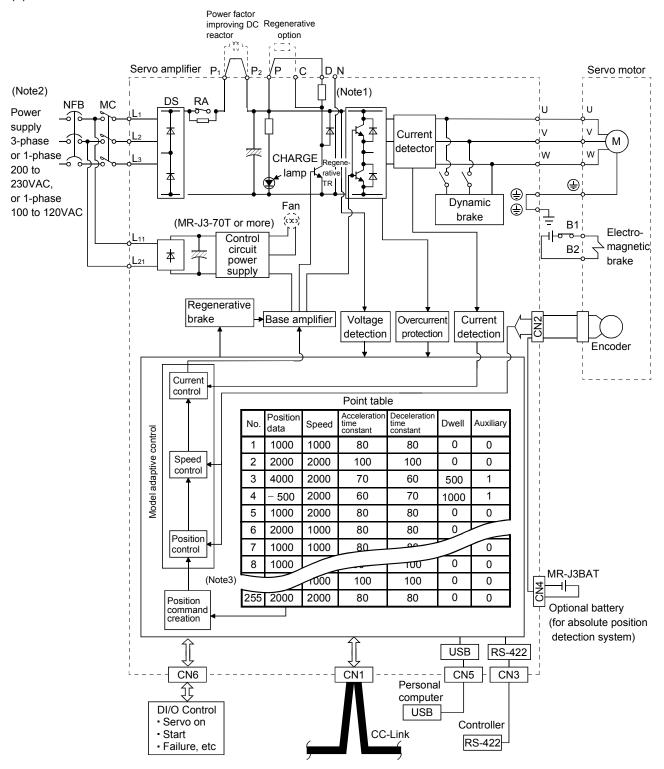
(4) Factory Automation compatible

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

From the PLC 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.

1.1.2 Function block diagram

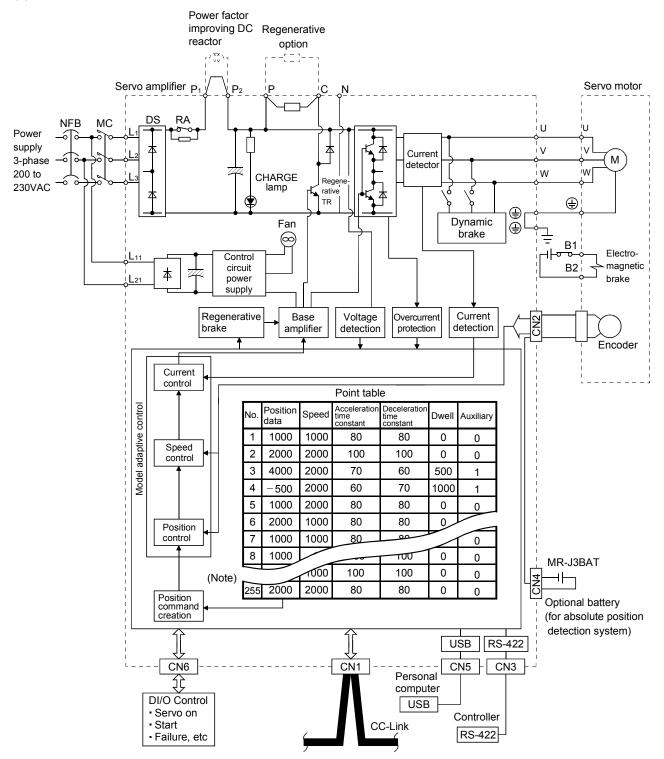
The function block diagram of this servo is shown below. (1) MR-J3-350T or less



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

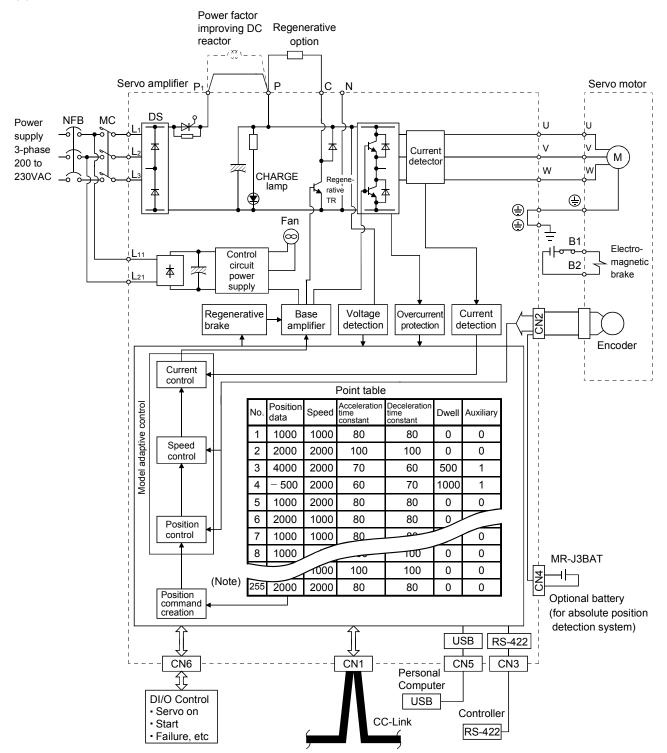
- 2. For 1-phase 200 to 230VAC, connect the power supply to L_1, L_2 and leave L_3 open.
- There is no L_3 for 1-phase 100 to 120VAC power supply.
- 3. For the case when 2 stations are occupied. When 1 station is occupied, the point table ends at No. 31.

(2) MR-J3-500T • MR-J3-700T



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

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



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

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)	

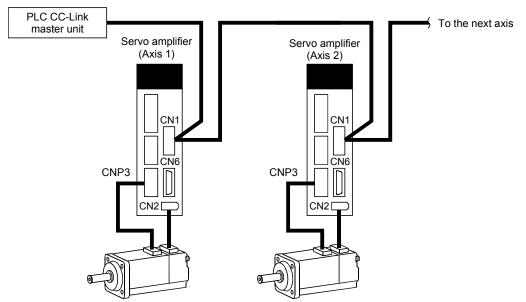
There are 31 points of point tables to be used when 1 station is occupied and 255 points when 2 stations are occupied.

(1) Operation using CC-Link communication functions

(a) Operation

All signals 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.

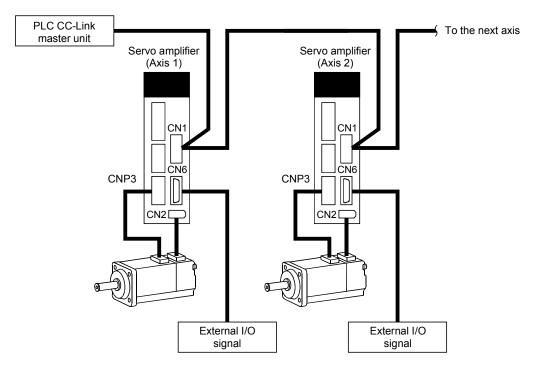
(b) Configuration



- (2) Operation using CC-Link communication functions and external input signals
 - (a) Operation

Using parameter No. PD06 to PD08 and parameter No. PD12, PD14, input signals can be assigned to the external input signals of CN1A and CN1B. The signals assigned to the external input signals cannot be used with the CC-Link communication functions. Output signals can be used with the CN6 connectors and CC-Link communication functions simultaneously.

(b) Configuration



1.2 Servo amplifier standard specifications

<u> </u>		Servo Amplifier																	
Item		MR-J3-D	10T	20T	40T	60T	70T	100T	200T	350T	500T	7001	11K	τ [·]	15KT	22KT	10T1	20T1	40T1
ILEIT	Voltage/frequ	lency		3-phase or 1-phase 200 to 230VAC, 50/60Hz 3-phase 200 to 230VAC, 50/60Hz										1-phase 100V to 120VAC, 50/60Hz					
Power supply	Permissible v	oltage fluctuation	3-ph	3-phase or 1-phase 200 to 230VAC: 170 to 3-phase 170 to 253VAC 1-phase 85 t 132VAC									85 to						
ower	Permissible fi fluctuation	requency		253VAC Within ±5%															
ш	Power supply	/ capacity		Refer to section 13.2 Refer to section 13.5															
-	Inrush curren															001			
		irequency									C, 50/6	0Hz						hase 1 /AC, 50	
	trol circuit	Permissible voltage fluctuation						1-pha	ase 17	0 to 25	3VAC						1-	phase 8 132VA	
pow	er supply	Permissible frequency fluctuation								۷	Vithin	±5%							
		Input					30W						45	W				30W	
		Inrush current								Refer	to sec	tion 13	3.5						
	rface power	Voltage, frequency								D	C24V±	10%							
sup		Power supply capacity								Note 1	,								
	trol System amic brake							Sine-\ Built-ir		PWM co	ontrol,	curren			,	m ption	1	Built-ir	
Prot	ective functior	IS	servo	o mo rvolta	ent shut-off, regenerative overvoltage shut-off, overload shut-off (electronic thermal relay), otor overheat protection, encoder error protection, regenerative brake error protection, tage, instantaneous power failure protection, overspeed protection, excessive error														
		Operational specifications	Posit	tionin	ıg by	speci	fying f	the poi	nt table	e No. (2	255 po	ints)							
	Point table number	Position command input	Set ir	n poi	nt tab	ole. 1-	point	feed le	ngth s	etting r	ange: :	±1[μm]	to ±9	999.	999[r	nm]			
_	input	Speed command input		•				ation/d celerati				•				. PC13			
system		System	Signe	ed at	osolut	te valı	le coi		d syste	m, incr	ement	al valu	e con	nma				absolu	te
ommand system		Operational specifications						s used				, <u>, .</u>	otom						
mo	Position	Position	. Re	mot	o rogi	istor i	e 1160	d to se	t nosit	ion cor	nman	eteb k							
0	command	command input			•			ng rang	•										
	data input	command input			-				-				ahla						
	(when 2 stations are	Speed command input	 Remote register is used to make selection from point table. Remote register is used to set speed command data (speed). 																
	occupied)	System	S-pattern acceleration/deceleration time constant is set in parameter No. PC13. Signed absolute value command system, incremental value command system, signed absolute value command/incremental value command specifying system										te						
	Automatic	Point table	Point	t tabl	e nun	nber i	nput,	positio	n data	input s	ystem				ition	and sr	eed co	mmand	s
Operation mode	operation mode	Automatic continuous operation		ed sp	• •													(2 to 2	
Opera	Manual operation	Jog	Jog operation is performed in accordance with the parameter-set speed command by contact inp or through CC-Link communication function.									input							

/		Servo Amplifier																	
		MR-J3-	10T	20T	40T	60T	70T	100T	200T	350T	500T	700T	11KT	15KT	22KT	10T1	20T1	40T1	
Item	ו																		
		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	Hom direc	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 posiset.									-	tion add	lress ma	ay be							
		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	Posi	tion v	vhere	servo	o-on (RYn0)	is swit	ched o	n is de	fined a	s home	e positi	on.				
		ignorance	Hom	ie po	sition	addre	ess m	ay be s	set.										
		(Servo-on																	
		position as																	
		home position)																	
		, ,	Hom	e po	sition	returr	n is m	ade wi	th resp	ect to t	he rea	r end o	f a pro	ximity	dog.				
		Dog type rear	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																
ode	Home	end reference	direction may be set.																
Ĕ	position		Automatic at-dog home position return return/automatic stroke return function																
Itior	return mode		Home position return is made with respect to the front end of a proximity dog.																
Operation mode		Count type front	Home position address may be set. Home position shift value may be set. Home position return																
õ		end reference	direction may be set.																
														urn fun					
					sition	retur	n is n	nade v	vith res	spect to	the fi	ront en	d of a	proxim	nity dog	g by the	e first Z	-phase	
			Home position return is made with respect to the front end of a proximity dog by the first Z-phase pulse.																
		Dog cradle type	Home position address may be set. Home position shift value may be set. Home position return direction may be set.																
								acition	roturn	roturn/	autom	atic stre	ko roti	urn fun	ction				
																g by the	a lact 7	nhasa	
			pulse		511011	retur	11 13 1	naue v	viui iea	speci ii			uora	pioxin	iity uoų	y by the		-рпазе	
		Dog type last Z-	•		sition	addr	ess n	nav be	e set. I	Home I	oositior	n shift	value	may b	e set.	Home	oosition	return	
		phase reference		•	may b			,						,					
			Auto	matio	c at-de	og ho	me po	osition	return	return/a	automa	atic stro	ke reti	urn fun	ction				
			Hom	ie po	sition	returr	n is m	ade to	the do	g front	end wi	th resp	ect to	the fror	nt end o	of a pro	ximity d	log.	
		Dog type front	Hom	ie po	sition	addr	ess n	nay be	e set. I	Home	oositior	n shift	value	may b	e set.	Home p	position	return	
		end reference			may b														
						<u> </u>								urn fun					
		Dogless Z-		•								•		he Z ph					
		phase reference						nay be	e set. I	nome	JUSITIO	i snift	value	may b	e set.	nome	position	return	
	Automatia	itioning to home			may b ed aut			im to c	a defin	ed hom	e noci	tion							
	position	sitioning to home	' ''gi'	oper		una					5 2031								
			Abso	olute	positi	on de	etectio	on, bac	klash	functio	n								
Oth	er functions		Over	rtrave	el pre	ventio	on usi	ng ext	ernal li	mit sw	itch								
			Soft	ware	strok	e limi	t			<u>.</u>		<u>.</u>							
Stru	cture		Sel		led, o 200)	pen			Fo	orce-co	oling, c	open (II	P00)			Self-	cooled, (IP00)	open	

\sim		Servo A	mplifier																
		M	R-J3-□	10T	20T	40T	60T	70T	100T	200T	350T	500T	700T	11KT	15KT	22KT	10T1	20T1	40T1
Iten	n		/																
		During		(Note	e 2) 0	to +5	5 (no	n-free	ezing)										
	Ambient	operation	[°F]	32 to	+131	(non	-freez	zing)											
	temperature	In storage	[°C]	-20	to +6	5 (no	n-free	ezing))										
ant		in storage	[°F]	-4 t	o +14	9 (no	n-free	ezing))										
Ĕ	Ambient	In operation		00%	0%RH or less (non-condensing)														
p	humidity	In storage		30 /0		1033	(1011-	conu	ensing)									
Environment	Ambient				ors (n from					ble gas	, oil mi	st, dus	t and d	lirt					
	Altitude			Max.	1000	m (32	280ft)	abov	e sea l	evel									
	Vibration			5.9 [I	5.9 [m/s ²] or less														
Mas			[kg]	0.8	0.8	1.0	1.0	1.4	1.4	2.3	2.3	4.6	6.2	18	18	19	0.8	0.8	1.0
ivid	55		[lb]	1.8	1.8	2.2	2.2	3.1	3.1	5.071	5.071	10.1	13.7	39.68	39.68	41.88	1.8	1.8	2.2

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 or at 75% or smaller effective load ratio.

1.3 Function list

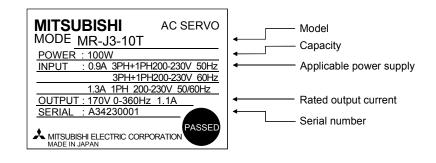
The following table lists the functions of this servo. For details of the functions, refer to the reference field.

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 external signal 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 I	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 servo configuration software-installed personal computer and servo amplifier. MR Configurator MRZJW3-SETUP221E 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 MRZJW3-SETUP221E 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 MRZJW3-SETUP221E is necessary for this function.	
Slight vibration suppression control	Suppresses vibration of ± 1 pulse produced at a servo motor stop.	Parameters No. PB24

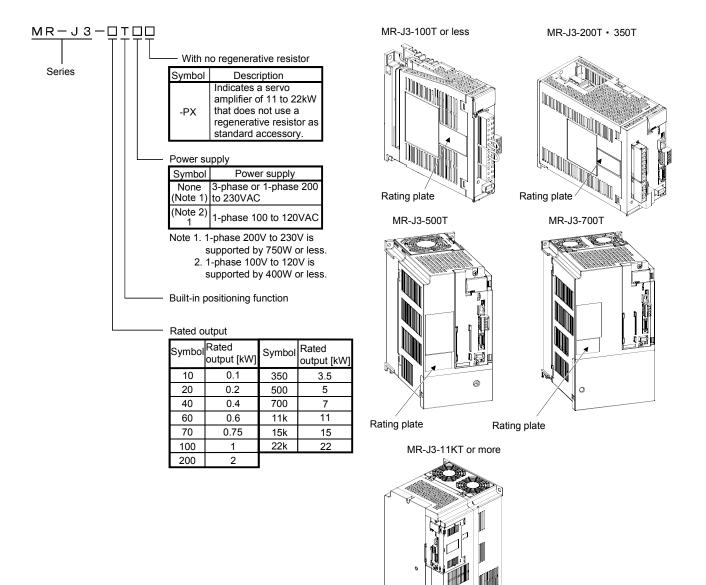
Function	Description	Reference		
Electronic gear	The electronic gear is used to make adjustment so that the servo amplifier setting matches the machine moving distance. Also, changing the electronic gear value allows the machine to be moved at any multiplication ratio to the moving distance using the servo amplifier.			
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		
I/O signal selection (Device setting)	Any input signal 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 • singl - step feed.	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).	Section 4.5.2		
Software limit	re 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.			

1.4 Model code definition

(1) Rating plate



(2) Model



Rating plate

1.5 Combination with servo motor

The following table lists combinations of servo amplifiers and servo motors. The same combinations apply to the models with electromagnetic brakes.

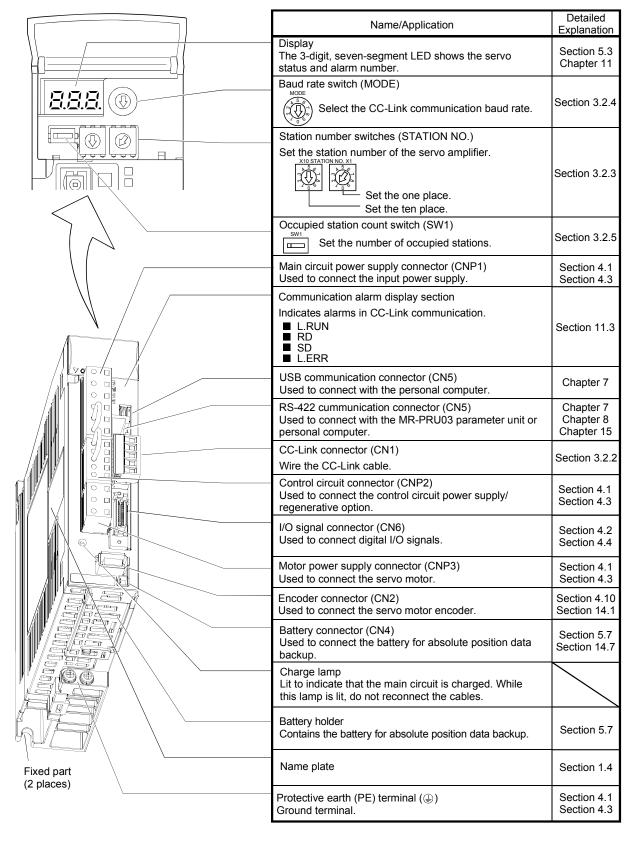
	Servo motors						
Servo amplifier	HF-MP□	HF-KP□	HF-SP□				
			1000r/min	2000r/min	HC-RP□	HC-UP□	HC-LP□
MR-J3-10T (1)	053 • 13	053 • 13				/	
MR-J3-20T (1)	23	23					
MR-J3-40T (1)	43	43					
MR-J3-60T			51	52			52
MR-J3-70T	73	73				72	
MR-J3-100T			81	102			102
MR-J3-200T			121 • 201	152 • 202	103 • 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 motors			
Servo amplifier	HA-LPD				
	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		

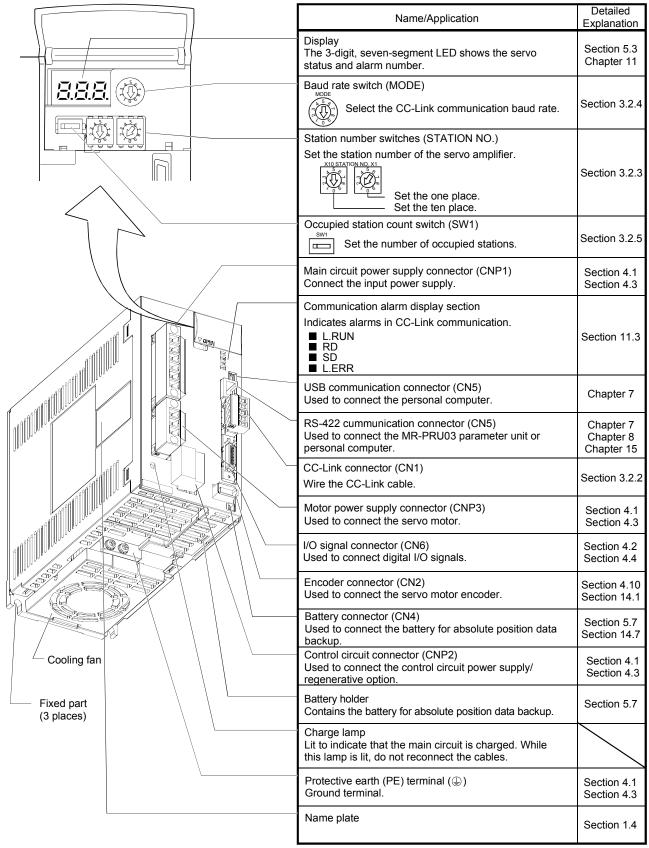
1.6 Structure

1.6.1 Parts identification

(1) MR-J3-100T or less



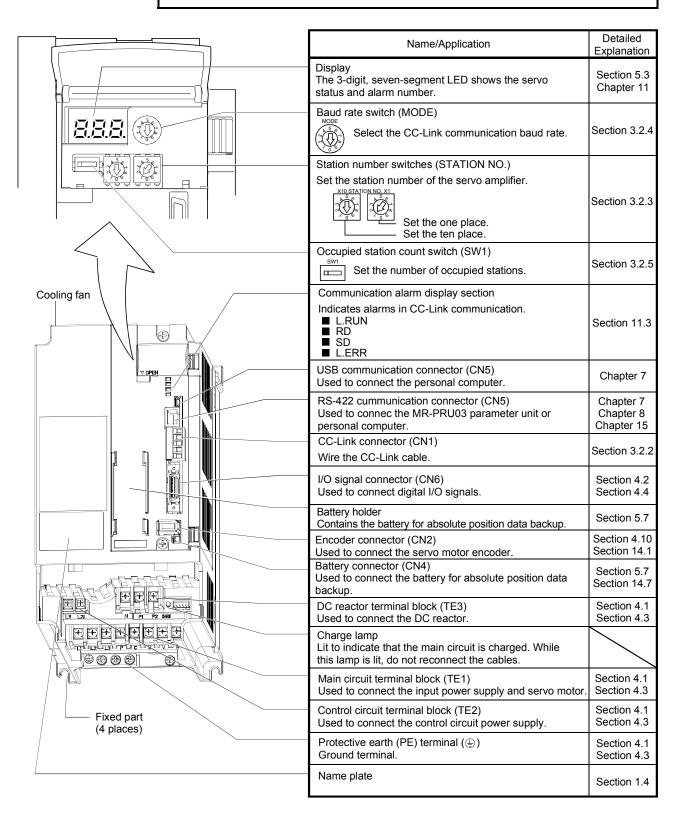
(2) MR-J3-200T • MR-J3-350T



(3) MR-J3-500T

POINT

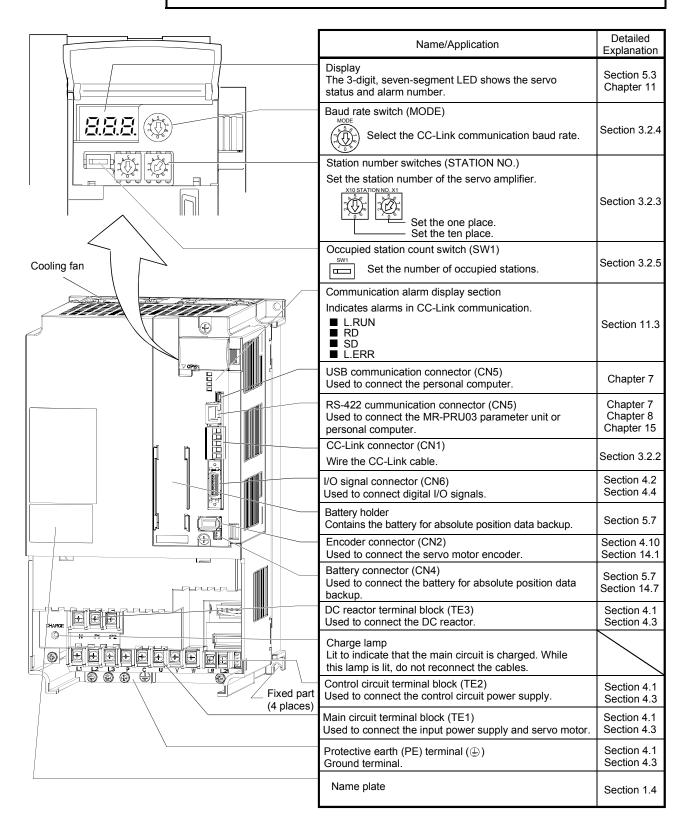
• The servo amplifier is shown without the front cover. For removal of the front cover, refer to section 1.7.2.



(4) MR-J3-700T

POINT

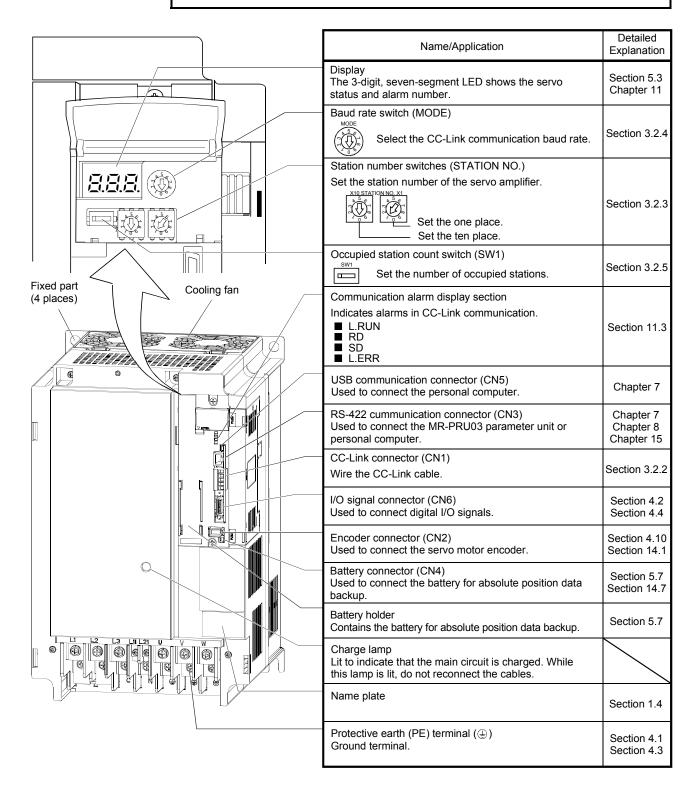
• The servo amplifier is shown without the front cover. For removal of the front cover, refer to section 1.7.2.



(5) MR-J3-11KT or more

POINT

• The servo amplifier is shown without the front cover. For removal of the front cover, refer to section 1.7.2.

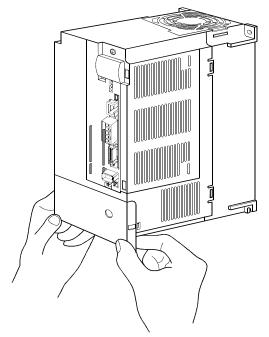


1.6.2 Removal and reinstallation of the front cover

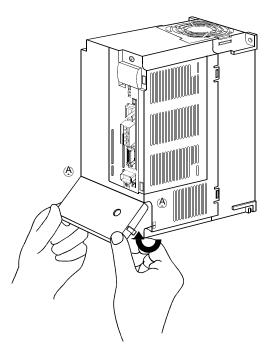
WARNING • Before removing or reinstalling the front cover, make sure that the charge lamp is off more than 15 minutes after power off. Otherwise, you may get an electric shock.

(1) For MR-J3-700T or less

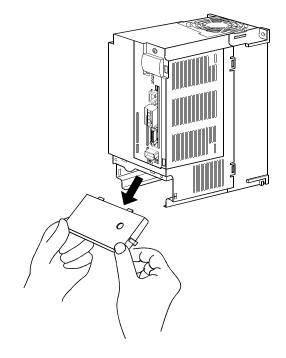
Removal of the front cover



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



Pull up the cover, supporting at point (A).

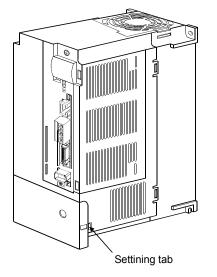


Pull out the front cover to remove.

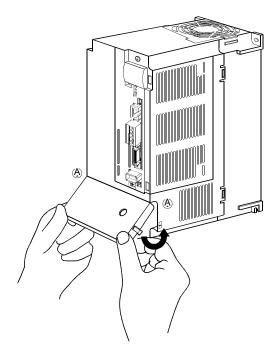
Front cover setting tab

Reinstallation of the front cover

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



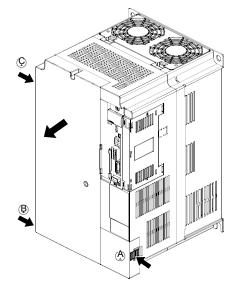
Push the setting tabs until they click.



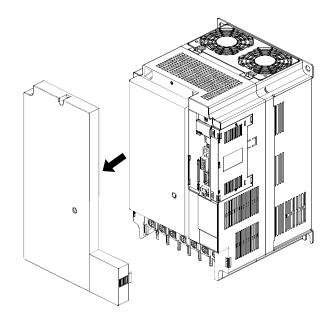
Pull up the cover, supporting at point (A).

(2) For MR-J3-11KT or more

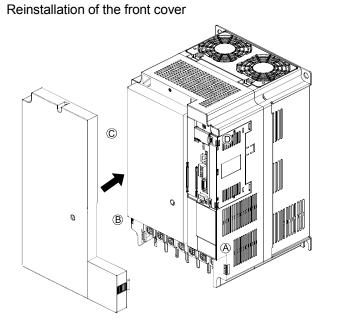
Removal of the front cover

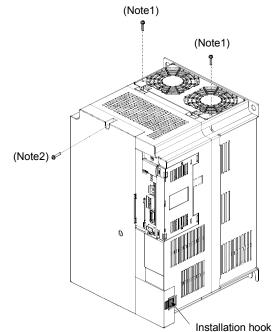


- 1) Press the removing knob on the lower side of the front cover (A and B) and release the installation hook.
- 2) Press the removing knob of C and release the external hook.



3) Pull it to remove the front cover.





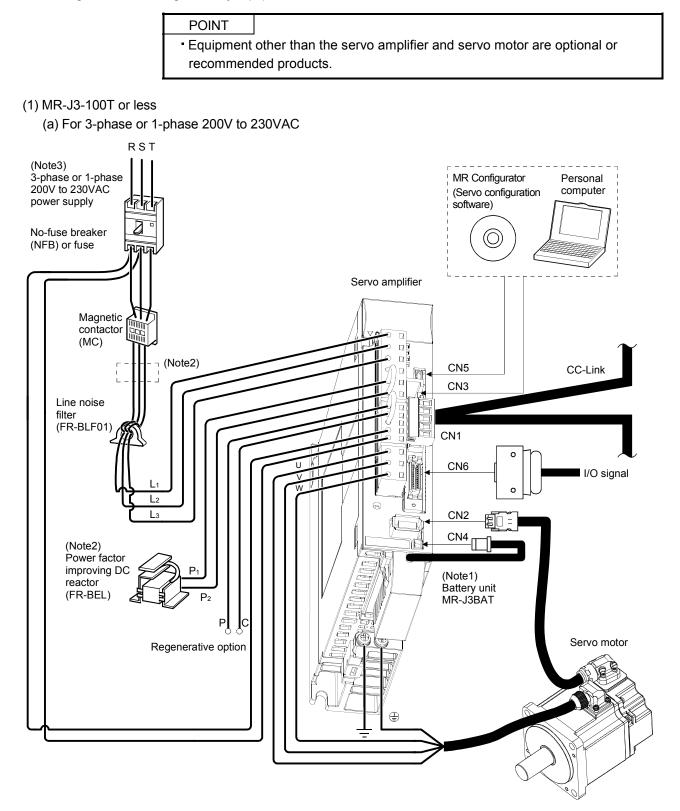
sockets of body cover (A to D) to reinstall it.

1) Fit the front cover installation hooks on the 2) Push the front cover until hearing the clicking noise of the installation hook.

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

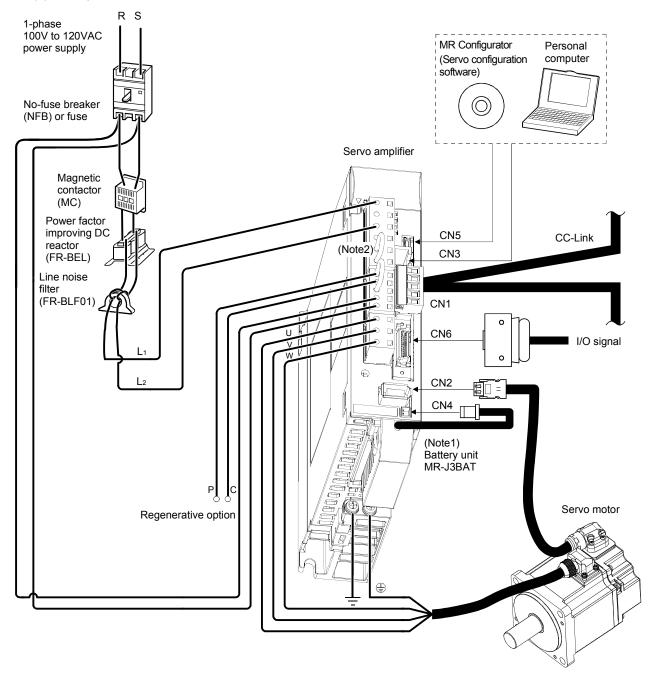
2. If drilling approximately \$\overline{4}\$ of a hole on the front cover, the front cover can be locked on the body with an enclosed screw (M4 imes 40).

1.7 Configuration including auxiliary equipment



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

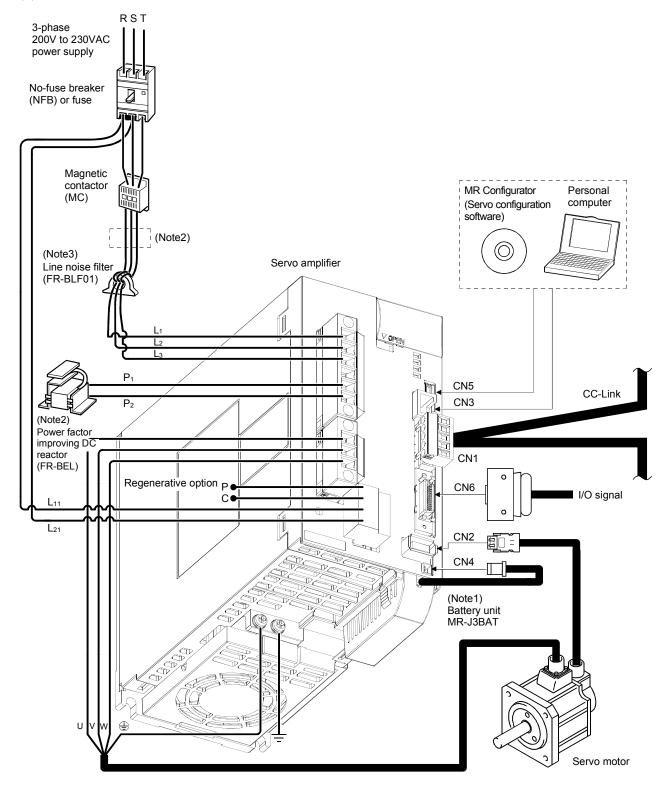
- 2. The AC reactor can also be used. In this case, the DC reactor cannot be used.
- 3. A 1-phase 200V to 230VAC power supply may be used with the servo amplifier of MR-J3-70T or less. For 1-phase 200V to 230VAC, connect the power supply to $L_1 - L_2$ and leave L_3 open.



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

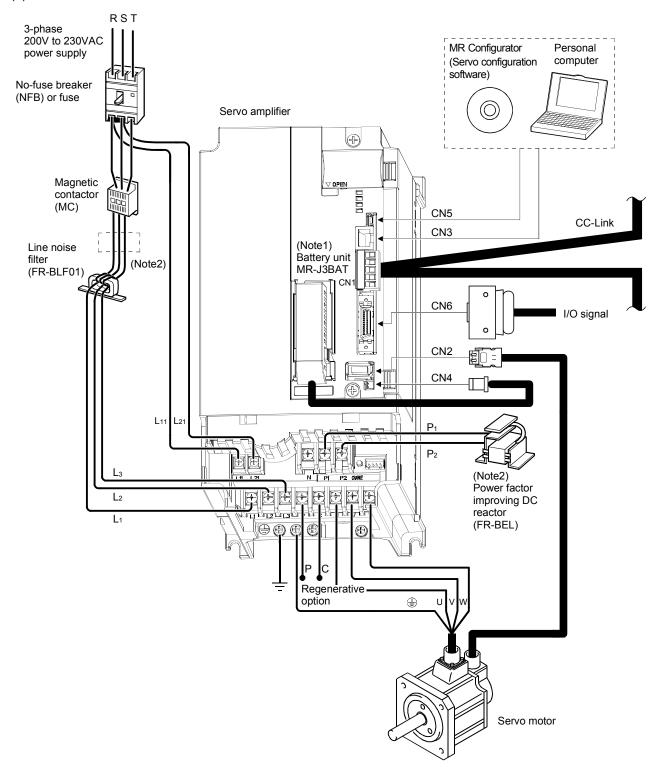
Note 1. The battery unit (option) is used for the absolute position detection system in the position control mode. 2. The power factor improving DC reactor cannot be used.

(2) MR-J3-200T • MR-J3-350T



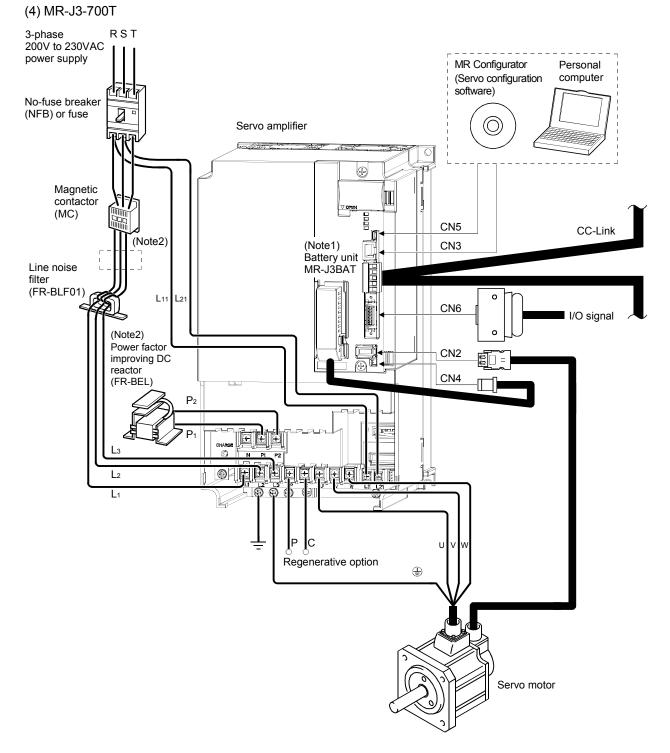
Note 1. The battery unit (option) is used for the absolute position detection system in the position control mode.

- 2. The AC reactor can also be used. In this case, the DC reactor cannot be used.
- 3. For MR-J3-350T, use FR-BLF.



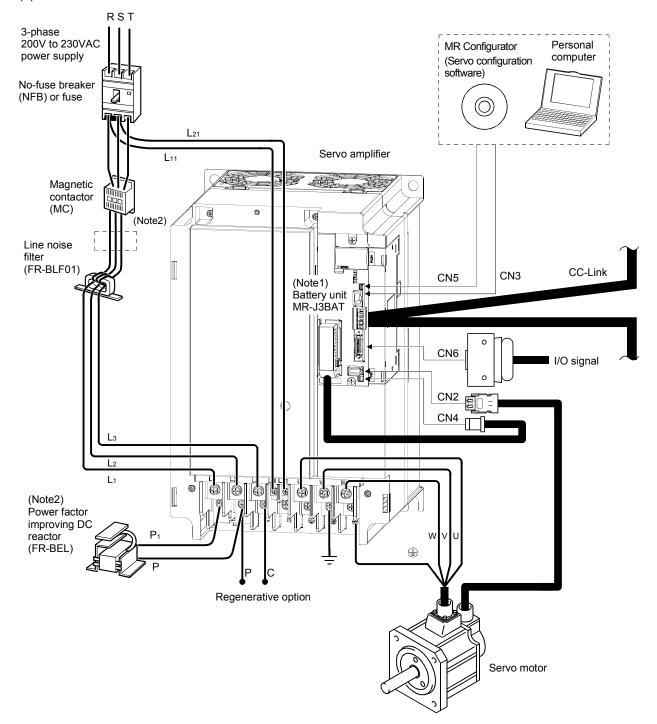
(3) MR-J3-500T

Note 1. The battery unit (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.



Note 1. The battery unit (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.



(5) MR-J3-11KT or more

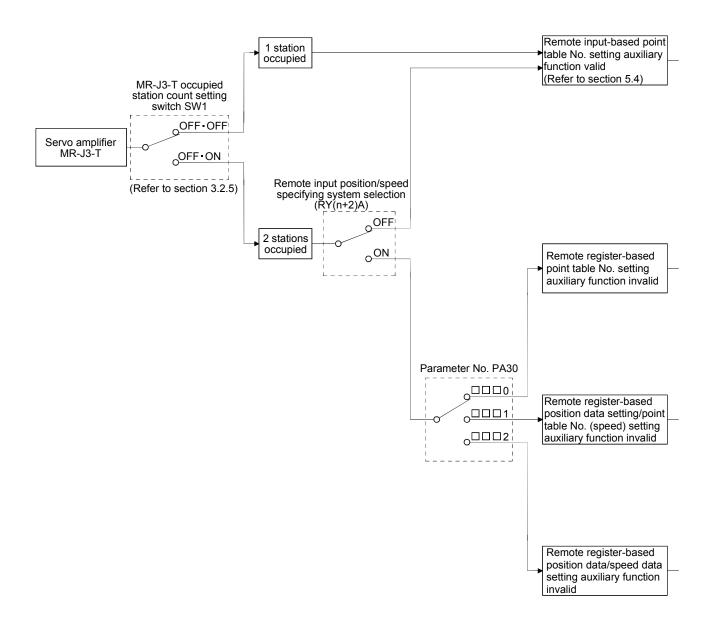
Note 1. The battery unit (option) is used for the absolute position detection system in the position control mode.

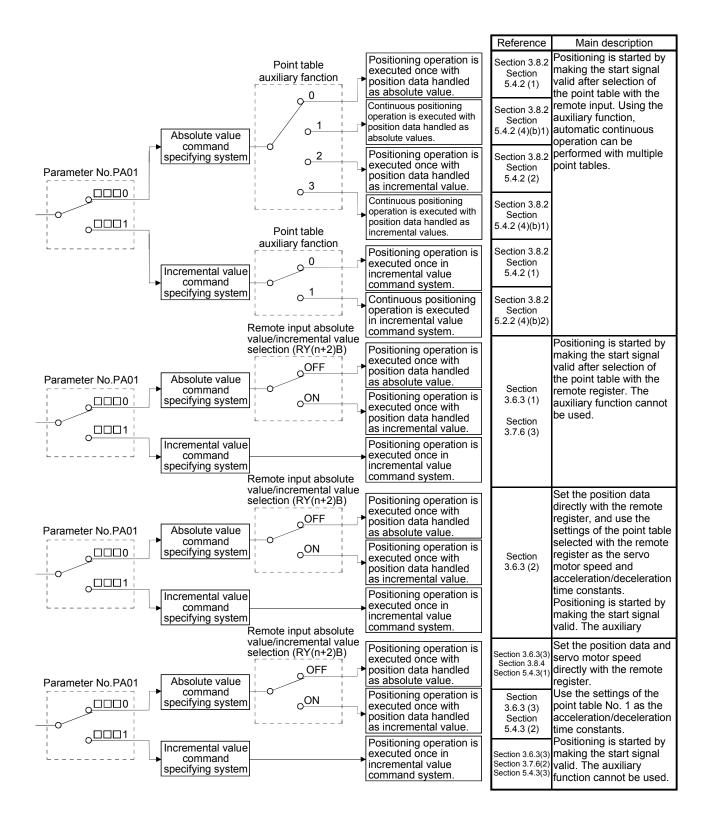
2. The AC reactor can also be used. In this case, the DC reactor cannot be used.

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 signal, parameter and point table setting.

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

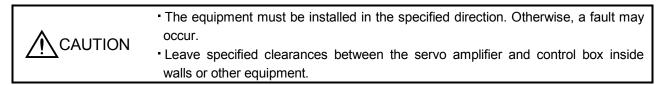




2. INSTALLATION

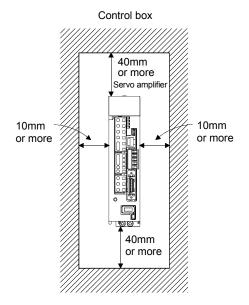
CAUTION	 Stacking in excess of the limited number of products is not allowed. Install the equipment to incombustibles. Installing them directly or close to combustibles will led to a fire. Install the equipment in a load-bearing place in accordance with this Instruction Manual. Do not get on or put heavy 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.

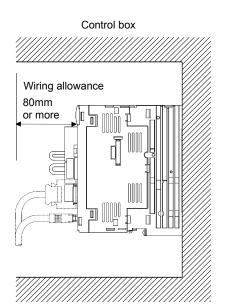
2.1 Installation direction and clearances



(1) 7kW or less

(a) Installation of one servo amplifier

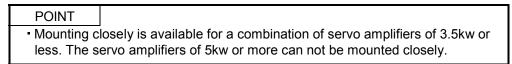






(b) Installation of two or more servo amplifiers

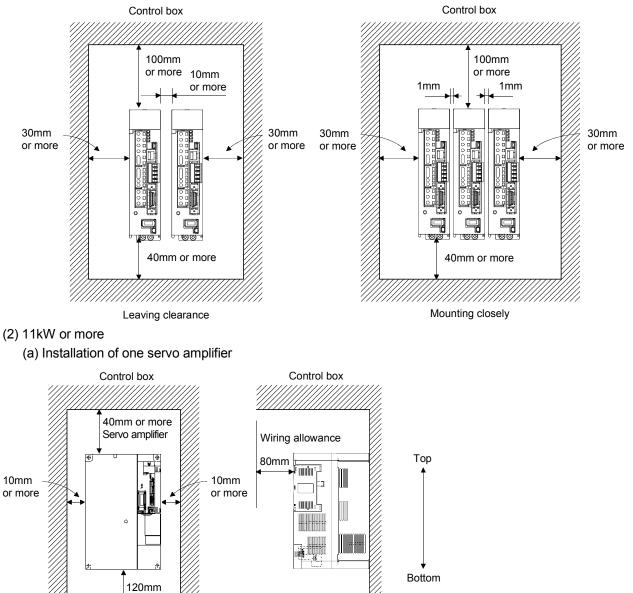
or more



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

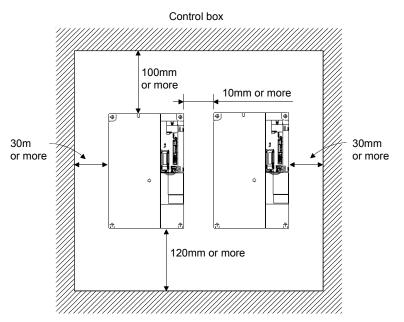
When installing the servo amplifiers closely, leave a clearance of 1mm between the adjacent servo amplifiers in consideration of mounting tolerances.

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



(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 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 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) supplied with the servo motor, and flex the optional encoder cable or the power supply and brake wiring cables. 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.

2.4 Inspection items

 Before starting maintenance and/or inspection, make sure that the charge lamp is off more than 15 minutes after power-off. Then, confirm that the voltage is safe in the tester or the like. Otherwise, you may get an electric shock. 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 safes 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:

- (a) Check for loose terminal block screws. Retighten any loose screws.
- (b) 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		

(a) 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.

(b) 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.

(c) Servo amplifier cooling fan

The cooling fan bearings reach the end of their life in 10,000 to 30,000 hours. Normally, therefore, the 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

3.1 Communication specifications

POINT	
 This servo 	is equivalent to a remote device station.

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

Item			Specifications						
Power supply			5VDC supplied from servo amplifier						
	Applicable CC-Link version				Ver.1.10				
	Communi	cation speed		10M/5	M/2.5M/625k/15	6kbps			
	Communi	cation system		Broa	adcast polling sys	stem			
Synchronization system			Frame	synchronization	system				
	Encoding system				MRZI				
논	는 Transmission path format			Bus format (conforming to EIA RS485)					
CC-Link	Error cont	Error control system		CRC (X ¹⁶ +X ¹² +X ⁵ +1)					
ö	Connection cable		CC-Link Ver.1.10-compliant cable (Shielded 3-core twisted pair cable)						
	Transmiss	sion format	Conforming to HDLC						
	Remote st	tation number	1 to 64						
	(Note)	Communication speed	156Kbps	625Kbps	2.5Mbps	5Mbps	10Mbps		
	Cable Maximum overall cable length		1200m	900m	400m	160m	100m		
	length Interstation 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.

3.2 System configuration

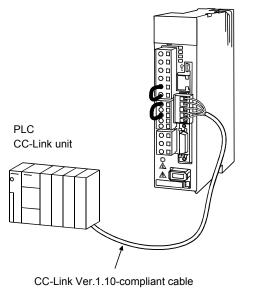
3.2.1 Configuration example

(1) PLC 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 PLC CPU used as the master station.

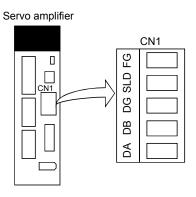
(2) Wiring

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



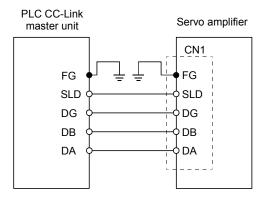
- 3.2.2 Wiring method
- (1) Communication connector

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



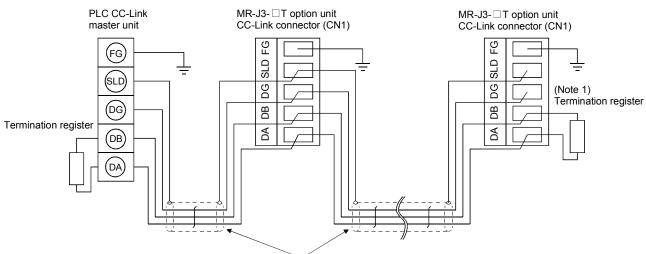
(2) Connection example

The servo amplifier and PLC 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 PLC user programs.

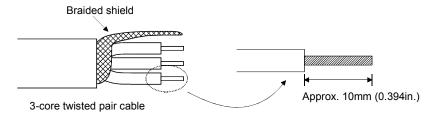


(Note 2) CC-Link Ver.1.10-compliant cable

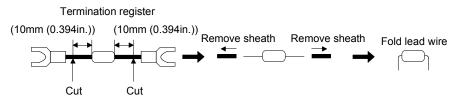
- Note 1. Use the termination resistor supplied with the PLC. The resistance of the termination resistor depends on the cable used. For details, refer to the open field network CC-Link catalog (L(NA)74108143).
 - 2. Refer to (4) of this section.

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

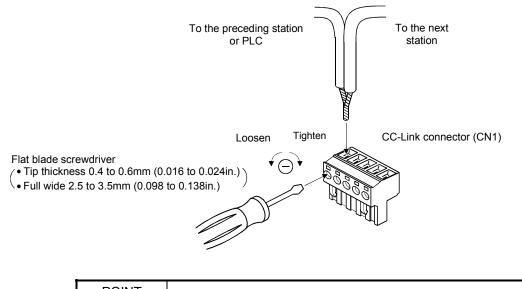
- (a) Strip the sheath of the cable and separate the internal wires and braided shield.
- (b) Strip the sheaths of the braided shield and internal wires and twist the cores.



- (c) Match and twist the wires and braided shield of the cable connected to the preceding axis or PLC 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 solo 	ler 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	Maker/Representative	
Torque screwdriver	N6L TDK	Nakamura Seisakusho	
Bit for torque screwdriver	B-30, flat-blade, H3.5 X 73L	Shiro Sangyo	

3.2.3 Station number setting

POINT	
- Be sure to	set the station numbers within the range of 1 to 64. Do not set the
other value	PS.

(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:

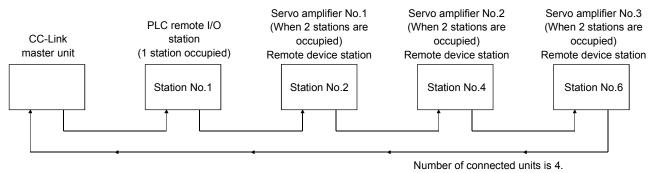
(a) Station numbers may be set within the range 1 to 64.

- (b) One servo amplifier occupies 1 or 2 stations. (One station of PLC remote device station)
- (c) Max. number of connected units: 42

Note that the following conditions must be satisfied:

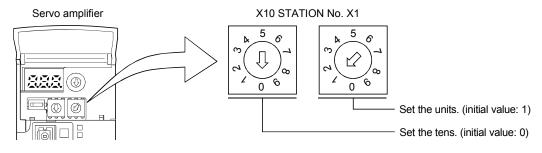
- $\{(1\times a) + (2\times B) + (3\times d) + (4\times d)\} \leq 64$
- a: Number of 1-station occupying units
- b: Number of 2-station occupying units
- c: Number of 3-station occupying units (not available for MR-J3-T)
- d: Number of 4-station occupying units (not available for MR-J3-T)
- ${(16 \times A) + (54 \times B) + (88 \times C)} \le 2304$
- A: Number of remote I/O stations ≤ 64
- B: Number of remote device stations \leq 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

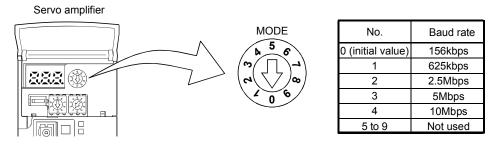
Set the station number with the station number switches (STATION NO.) on the servo amplifier front. The station number that may be set is any of 1 to 64 in decimal. In the initial status, the station number is set to station 1.



3.2.4 Communication baud rate setting

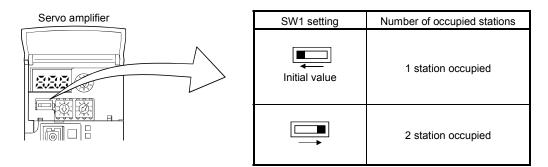
Set the transfer baud rate of CC-Link with the transfer baud rate switch (MODE) on the servo amplifier front. The initial value is set to 156kbps.

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.



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 signals 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.

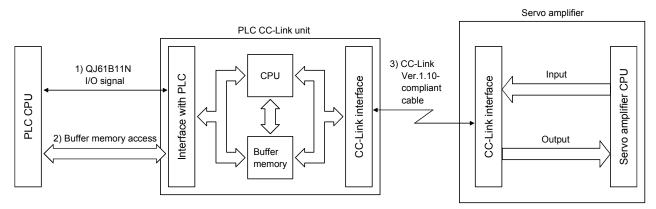


3.3 Functions

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 PLCs allow link scans to be synchronized with PLC 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 PLCs 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 PLC in the CC-Link system in the CC-Link operation mode or test operation mode.

Item	Operation mode				
item	CC-Link operation mode	Test operation mode			
Monitor	0	0			
Operation	0				
Parameter write	0	0			
Parameter read	0	0			
Point table data write	0	0			
Point table data read	0	0			

3.4 Servo amplifier setting

(1) Servo amplifier side operation modes

This servo amplifier has the following operation modes:

Operation mode	eration 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 PLC 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.

Test operation mode is selected using a parameter unit or a personal computer in which MR Configurator is

CC-Link	or a personal computer in which MR Configurator is installed.	
operation mode		Test operation mode
	Deselect test operation mode by switching power OFF/ON.	

3.5 I/O signals (I/O devices) transferred to/from the PLC 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
 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

$PLC \rightarrow Servo amplifier (RYn)$			Servo amplifier $ ightarrow$ PLC (RXn)				
(Note) Device No.	Signal name	Signal abbreviation	CN6 connector pin No.	(Note) Device No.	Signal name	Signal abbreviation	CN6 connector pin No.
RYn0	Servo-on	SON	/	RXn0	Ready	RD	14
RYn1	Forward rotation start	ST1		RXn1	In position	INP	
RYn2	Reverse rotation start	ST2		RXn2	Rough match	CPO	
RYn3	Proximity dog	DOG	2	RXn3	Home position return completion	ZP	16
RYn4	Forward rotation stroke end	LSP	3	RXn4	Limiting torque	TLC	
RYn5	Reverse rotation stroke end	LSN	4	RXn5	Reserved		/
RYn6	Automatic/manual selection	MDO		RXn6	Electromagnetic brake interlock	MBR	
RYn7	Temporary stop/Restart	TSTP		RXn7	Temporary stop	PUS	
RYn8	Monitor output execution demand	MOR		RXn8	Monitoring	MOF	
RYn9	Instruction code execution demand	COR		RXn9	Instruction code execution completion	COF	
RYnA	Point table No. selection 1	DI0		RXnA	Warning	WNG	
RYnB	Point table No. selection 2	DI1		RXnB	Battery warning	BWNG	
RYnC	Point table No. selection 3	DI2		RXnC	Movement finish	MEND	
RYnD	Point table No. selection 4	DI3		RXnD	Dynamic brake interlock	DB	
RYnE	Point table No. selection 5	DI4		RXnE	Position range output	POT	
RYnF	Clear	CR		RXnF	Reserved		
RY(n+1)0 to RY(n+1)9	Reserved			RX(n+1)1 to RX(n+1)9	Reserved		
RY1A	Reset	RES		RX(n+1)A	Trouble	ALM	15
RY(n+1)B				RX(n+1)B	Remote station communication ready	CRD	
to RY(n+1)F	Reserved			RX(n+1)C to RX(n+1)F	Reserved		

	PLC $ ightarrow$ Servo amplifier (RWwn)	Servo amplifier $ ightarrow$ PLC (RWrn)				
Address No. Signal name		Address No.	Signal name			
RWwn	Monitor 1	RWm	Monitor 1 data			
RWwn+1	Monitor 2	RWrn+1	Monitor 2 data			
RWwn+2	Instruction code	RWrn+2	Answer code			
RWwn+3	Writing data	RWrn+3	Reading data			

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

(2) When 2 stations are occupied

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

	PLC \rightarrow Servo amplifier (RY	n)			Servo amplifier $ ightarrow$ PLC (R)	Xn)	
(Note 1)		Signal	CN6	(Note 1)		Signal	CN6
Device No.	Signal name	abbreviation	connector pin No.	Device No.	Signal name	abbreviation	connector pin No.
RYn0	Servo-on	SON		RXn0	Ready	RD	14
RYn1	Forward rotation start	ST1		RXn1	In position	INP	
RYn2	Reverse rotation start	ST2		RXn2	Rough match	CPO	
RYn3	Proximity dog	DOG	2	RXn3	Home position return completion	ZP	16
RYn4	Forward rotation stroke end	LSP	3	RXn4	Limiting torque	TLC	
RYn5	Reverse rotation stroke end	LSN	4	RXn5	Reserved		
RYn6	Automatic/manual selection	MDO	/	RXn6	Electromagnetic brake interlock	MBR	
RYn7	Temporary stop/Restart	TSTP		RXn7	Temporary stop	PUS	
RYn8	Monitor output execution demand	MOR	/	RXn8	Monitoring	MOF	
RYn9	Instruction code execution demand	COR		RXn9	Instruction code execution completion	COF	
RYnA	Point table No. selection 1	DI0		RXnA	Warning	WNG	
RYnB	Point table No. selection 2	DI1	/	RXnB	Battery warning	BWNG	\sim
RYnC	Point table No. selection 3	DI2		RXnC	Movement finish	MEND	\sim
RYnD	Point table No. selection 4	DI3	\sim	RXnD	Dynamic brake interlock	DB	\sim
RYnE	Point table No. selection 5	DI4		RXnE	Position range output	POT	\sim
RYnF	Clear	CR			5	N	
RY(n+1)0				RXnF			\mathbf{i}
to	Reserved			to	Reserved		
RY(n+1)9				RX(n+1)9			
RY(n+2)0	Position instruction execution demand (Note)			RX(n+2)0	Position instruction execution completion		$\overline{}$
RY(n+2)1	Speed instruction execution demand (Note)	\square		RX(n+2)1	Speed instruction execution completion	\square	$\overline{}$
RY(n+2)2	Reserved	\sim		RX(n+2)2	Point table No. output 1	PT0	$\overline{}$
RY(n+2)3	Point table No. selection 6	DI5		RX(n+2)3	Point table No. output 2	PT1	
RY(n+2)4	Point table No. selection 7	DI6	\sim	RX(n+2)4	Point table No. output 2	PT2	
RY(n+2)5	Point table No. selection 8	DI7	\sim	RX(n+2)5	Point table No. output 4	PT3	
RY(n+2)6	Internal torque limit selection	TL1		RX(n+2)6	Point table No. output 5	PT4	
RY(n+2)7	Proportion control	PC		RX(n+2)7	Point table No. output 6	PT5	
RY(n+2)8	Gain switch	CDP	\sim	RX(n+2)8	Point table No. output 7	PT6	
RY(n+2)9	Reserved			RX(n+2)9	Point table No. output 8	PT7	
1(11/2)3							
RY(n+2)A	Position/speed specifying system selection			RX(n+2)A to RX(n+2)F	Reserved		
RY(n+2)B	Absolute value/incremental value selection			RX(n+3)0 to RX(n+3)9	Reserved		
RY(n+2)C to RY(n+2)F	Reserved			RX(n+3)A	Trouble	ALM	15
RY(n+3)0 to RY(n+3)9	Reserved			RX(n+3)B	Remote station communication ready	CRD	
RY(n+3)A	Reset	RES		RX(n+3)C to RX(n+3)F	Reserved		
RY(n+3)B to RY(n+3)F	Reserved						

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

	$PLC \rightarrow Servo amplifier (RWwn)$	Servo amplifier \rightarrow PLC (RWrn)				
(Note 1) Address No.	Signal name	(Note 1) Address No.	Signal name			
RWwn	(Note 2) Monitor 1	RWm	Monitor 1 data under 16 bit			
RWwn+1	(Note 2) Monitor 2	RWrn+1	Monitor 1 data upper 16 bit			
RWwn+2	Instruction code	RWrn+2	Answer code			
RWwn+3	Writing data	RWrn+3	Read the data			
RWwn+4	(Note 3) Position command data under 16 bit/Point table No.	RWrn+4				
RWwn+5	Position command data upper 16 bit	RWrn+5	Monitor 2 data under 16 bit			
RWwn+6	(Note 4) Speed command data/Point table No.	RWrn+6	Monitor 2 data upper 16 bit			
RWwn+7	Reserved	RWrn+7	Reserved			

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

2. Specify the code of the under 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 the parameter No. PC30 setting is "□□□0", the RWwn+6 value is not used.

3.5.2 Detailed explanation of I/O signals

(1) Input signals

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

Signal name		Devic	e No.	
(Device name)	Description	1 station	2 stations	Remarks
(Device fiame)		occupied	occupied	
Servo-on	Turning RYn0 ON powers on the base circuit, making	RYn0	RYn0	*1
	operation ready to start. (Servo on status)			
	Turning it OFF powers off the base circuit, coasting the servo			
	motor. (Servo off status)			
Forward rotation start	1. In absolute value command system	RYn1	RYn1	*1
	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.			
Reverse rotation start	Use this device in the incremental value command system.	RYn2	RYn2	*1
	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.			

		Devid	ce No.	
Signal name	Description	1 station occupied	2 stations occupied	Remarks
Proximity dog	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.	RYn3	RYn3	*1
	Parameter No. PD16 Proximity dog (RYn3) detection polarity 0 (initial value) 0FF 1 ON			
Forward rotation stroke end	In the factory-shipped status, the forward rotation stroke end	RYn4	RYn4	*1
Reverse 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). When starting operation, short CN6-3 - DOCOM and CN6-4 - DOCOM. Opening them causes a sudden stop, resulting in servo lock. 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. $(Note) Input signal Operation \\ \hline 1 1 0 \bigcirc \\ \hline 1 0 \hline 1 0 $	RYn5	RYn5	*2
	0 0 Note. 0: OFF 1: ON			
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	Turning RYn7 ON during automatic operation makes a temporary stop. Turning RYn7 ON again makes a restart. Forward rotation start (RYn1) or Reverse rotation start (RYn2) is ignored if it is turned ON during a temporary stop. When the automatic operation mode is changed to the manual operation mode during a temporary stop, the movement remaining distance is erased. During a home position return or during JOG operation,	RYn7	RYn7	

										Devid	ce No.	
Signal name				De	scriptic	n				1 station occupied	2 stations occupied	Remarks
Monitor output execution demand	set. At the monitor v 1) When Remote (RWw) Remote or error 2) When Remote Monitor Remote by Mote Remote by Mote Remote by Mote Remote By Mote Remote	 When RYn8 is turned ON, the following data and signals are set. At the same time, RXC turns ON. While RYn8 is ON, the monitor values are kept updated. 1) When 1 station is occupied Remote register RWrn: Data demanded by Monitor 1 (RWwn) Remote register RWrn+1: Data demanded by Monitor 2 (RWwn+1) Remote register RWrn+2: Answer code indicating normal or error 2) When 2 stations are occupied Remote register RWrn: Under 16 bits of data demanded by Monitor 1 (RWwn) Remote register RWrn+1: Upper 16 bits of data demanded by Monitor 1 (RWwn) Remote register RWrn+5: Under 16 bits of data demanded by Monitor 2 (RWwn+2) Remote register RWrn+6: Upper 16 bits of data demanded by Monitor 2 (RWwn+2) Remote register RWrn+2: Answer code indicating normal or arror 							RYn8	RYn8		
Instruction code execution demand	Turning F the instru After con	or error Turning RYn9 ON executes the processing corresponding to the instruction code stored in remote register RWwn+2. After completion of instruction code execution, the answer code indicating normal or error is set to RWrn+2. At the same							RYn9	RYn9		
Point table No. selection 1	The poin by RYnA				nome p	osition	return	are se	elected	RYnA	RYnA	*1 *2
Point table No. selection 2	Point		(/-		lote 1) F	Remote i	nput			RYnB	RYnB	
Point table No. selection 3	table No.			RY (n+2)3	RYnE					RYnC	RYnC	-
Point table No. selection 4	(Note 2) 1 2	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 1	0 1 0	RYnD	RYnD	
Point table No. selection 5	3 4	0	0	0	0	0	0	1 0	1 0	RYnE	RYnE	
Point table No. selection 6					•	•	· ·				RY(n+2)3	
Point table No. selection 7	254 255	1 1	1 1	1 1	1 1	1 1	1 1	1 1	0 1		RY(n+2)4	
Point table No. selection 8	Note 1. 0: 2. Ho			urn is a s	setting						RY(n+2)5	
Clear	When the position of edge of F When the pulses an	control RYnF. e parai	count The pu meter I	er droc ulse wic No. PD	op pulso dth sho 22 sett	es is c uld be ing is '	eared	at the or more	leading e.		RYnF	*1 *2

		Devid	e No.	
Signal name	Description	1 station occupied	2 stations occupied	Remarks
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 answer code indicating normal or error is set to RWrn+2. At the same time,		RY(n+2)0	
	RX(n+2)0 turns ON. Refer to section 3.6.3 for details.			
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 answer 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 finish (RXnC) is turned OFF, for example, turning Proportion control (RY(n+2)7) ON as soon as Movement finish (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	

		Devic	e No	
Signal name	Description	1 station	2 stations	Remarks
		occupied	occupied	
Absolute value/incremental value selection	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. OFF: Position data is handled as an absolute value. ON : Position data is handled as an incremental value.		RY(n+2)B	
Reset	Keeping RY(n+1)A or RY(n+3)A ON for 50ms or longer allows an alarm to be deactivated. Some alarms cannot be deactivated by Reset RY(n+1)A or RY(n+3)A. (Refer to section 11.4.1.) 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. This signal is not designed to make a stop. Do not turn it ON during operation.	RY(n+1)A	RY(n+3)A	*1
Forced stop	This signal is exclusively used as a CN6 external input signal. It cannot be used for CC-Link. Opening EMG-DOCOM results in a forced stop status, switches the servo off, and operates the dynamic brake to make a sudden stop. Short EMG-DOCOM in the forced stop status to cancel the forced stop status.			

(2) Output signals

POINT	
 The output 	devices can be used for both the remote output and the external
output sign	als of CN6 connector.

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

		Devie	ce No.
Signal name	Description	1 station	2 stations
		occupied	occupied
Ready	In the factory-shipped status, a proximity dog 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 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 electronic gear change. 9) Home position return has not been made after the absolute position system was changed from invalid to valid. 10) Parameter No. PA13 (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

										Devid	ce No.
Signal name				De	scriptio	n				1 station	2 stations
										occupied	occupied
Instruction code execution completion	Refer to Ir	Refer to Instruction code execution demand (RYn9).									RXn9
Warning	RXnA turr			-						RXnA	RXnA
	When no	warning	has oc	curred,	RXnA t	urns OF	F within	n about	1s after		
	power-on.										
Battery warning	RXnB turr				-				-	RXnB	RXnB
	warning (/ turns OFF				-	-	j nas oc	currea,	RANB		
Movement finish	RXnC turi						ON an	d the co	mmand	RXnC	RXnC
	remaining			•					, minana	10410	10410
	RXnC turr										
Dynamic brake interlock	RXnD tur	ns off s	imultan	eously	when th	ne dyna	mic bra	ke is o	perated.	RXnD	RXnD
	When usi	ng the	externa	l dynam	nic brak	e on the	e servo	amplifi	er of 11		
	kW or mo	ore, this	device	e is requ	uired. (F	Refer to	sectior	n 14.6.)	For the		
	servo amp						•				
Position range	RXnE turr			e actua	curren	t positio	n falls v	within th	e range	RXnE	RXnE
	set in the	•									
	It is OFF where the base of th			osition	return is	s not yet	comple	eted or v	while		
Position instruction	Refer to S			n execi	ition de	mand (F	7Y(n+2	0)			RX(n+2)0
execution completion		peeu n	1011 00110				χη (Π· Ζ.	,0).			10((11)2)0
Speed instruction execution	Refer to	Positio	n instr	uction (executio	on dem	and (R	Y(n+2)	1). This	\setminus	RX(n+2)1
completion	device is i						•	` '	,		, ,
	amplifier of	of 11kW	or mor	e. (Refe	er to sec	tion 14.	6.)				
	This is no	t require	ed with	servo a	mplifiers	s of 7kW	/ or less	S.			
Point table No. output 1	As soon a output in 8			nish (R)	(nC) tur	ns ON,	the poir	nt table	No. is		RX(n+2)2
Point table No. output 2				٩)	lote) Re	mote ou	tput				RX(n+2)3
	Point table No.	RX	RX	RX	RX	RX	RX	RX	RX		
Point table No. output 3		(n+2)9	(n+2)8	(n+2)7	(n+2)6	(n+2)5	(n+2)4	(n+2)3	(n+2)2		RX(n+2)4
	1	0	0	0	0	0	0	0	1		107(11, 2)+
	2	0	0	0	0	0	0	1	0		D)(() 0)5
Point table No. output 4	3	0	0	0	0	0	0	1	1		RX(n+2)5
	4	0	0	0	0	0	1	0	0		
Point table No. output 5	-	•	•	-	•	-	•	•	.		RX(n+2)6
	-	•	-	•	•		•	•	-		
Point table No. output 6	1	•		•	•	•	•	•	-		RX(n+2)7
	254	1	1	1	1	1	1	1	0		
Point table No. output 7	255	1	1	1	1	1	1	1	1		RX(n+2)8
	Note. 0: O	FF 1: C	N								10((11)2)0
	RX(n+2)2		า+2)6 tเ	ırn OFF	in any	of the fo	ollowing	statuse	s.		
Point table No. output 8	• Power on									RX(n+2)9	
	Servo off During home position return										
	Home position return completion										
	In any of		-		RX(n+	2)2 to R	RX(n+2)	6 maint	ain their		
	pre-chang										
	 When o When A 					(n6) ie +	urnad f	rom ∩⊏	F to ON		
	or from							01		\	
	 During r 			-	•					\	
	• During e	executio	on of au	tomatic	positior	ning to h	iome po	sition			V

		Device No.	
Signal name	Description	1 station	2 stations
		occupied	occupied
Trouble	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 1s after power is switched ON.	RX(n+1)A	RX(n+3)A
Remote station	This signal turns ON at power-on and turns off at a trouble occurrence	RX(n+1)B	RX(n+3)B
communication ready	or in the reset (RX (n+1) B or RX (n+3) B) ON status.		

(3) Remote registers

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

(a) Input (PLC \rightarrow servo amplifier)

Remote	register			
1 station	2 stations	Signal name	Description	Setting range
occupied	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 RWm. 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 3.5.3 for the item of the monitor code of the status indication. 	Refer to section 3.5.3.
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 3.5.3 for the item of the monitor code of the status indication. 	Refer to section 3.5.3.

Remote	register			
1 station	2 stations	Signal name	Description	Setting range
occupied	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 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 under 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 under 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 under 16 bits are	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	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.	
	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.	Point table No.: 0 to 255 Speed command data: 0 to permissible speed

(b) Output (Servo amplifier \rightarrow PLC)

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 Answer 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	Answer 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
RWm	Monitor 1 data under 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	Answer 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 under 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		

3.5.3 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 ($\Box\Box\Box\Box$) to Answer 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.			Answer data (Servo amplifier \rightarrow PLC)	
1 station	2 stations	Monitored item	Data longth	Unit
occupied	occupied		Data length	Unit
0000h	0000h			
0001h	0001h	Current position under 16bit	16bit	
0002h		Current position upper 16bit	16bit	
0003h	0003h	Command position under 16bit	16bit	imes10 ^{STM} [mm] or imes10 ^{STM} [inch]
0004h		Command position upper 16bit	16bit	×10 ^{STM} [inch]
0005h	0005h	Command remaining distance under 16bit	16bit	1
0006h		Command remaining distance upper 16bit	16bit	
0007h	0007h	Not monitored	16bit	
0008h	0008h	Point table	16bit	[No.]
0009h				
000Ah	000Ah	Feedback pulse value under 16bit	16bit	[pulse]
000Bh		Feedback pulse value upper 16bit	16bit	[pulse]
000Ch				
000Dh				
000Eh	000Eh	Droop pulse value under 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		Instantaneusly occurring torque	16bit	[%]
0015h	0015h	ABS counter	16bit	[rev]
0016h	0016h	Motor speed under 16bit	16bit	imes0.1[rev/min]
0017h		Motor speed upper 16bit	16bit	imes0.1[rev/min]
0018h	0018h	Bus voltage	16bit	[V]
0019h	0019h	ABS position under 16bit	16bit	[pulse]
001Ah		ABS position middle 16bit	16bit	[pulse]
001Bh	001Bh	ABS position upper 16bit	16bit	[pulse]
001Ch	001Ch	Within one-revolution position under 16bit	16bit	[pulse]
001Dh		Within one-revolution position upper 16bit	16bit	[pulse]

3.5.4 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 ($\Box\Box\Box\Box$) to Answer 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 \rightarrow PLC)
0000h	Operation mode	0000: CC-Link operation mode
	Reads the current 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.	Travel multiplying factor
		0300: ×1000
		0200: ×100 0100: ×10
		0000: ×1
0040		
0010h	Current alarm (warning) reading Reads the alarm No. or warning No.	0 0
	occurring currently.	
	occurring currentiy.	Occurring alarm No./warning No.
0020h	Alarm number in alarm history (most recent	
002011	alarm)	0 0
0021h	Alarm number in alarm history (first recent	
	alarm)	Alarm No. that occurred in past
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	
00245	recent alarm)	
0031h	Alarm occurrence time in alarm history (first recent alarm)	Occurrence time of alarm that occurred in past
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)	

Code No.	Item/Function	Reading data (RWrn+3) contents (Servo amplifier → PLC)
0040h	Input signal status 0 Reads the statuses (OFF/ON) of the input	bit 0 to bit F indicate the OFF/ON statuses of the corresponding input signals. Refer to section 3.5.1 for the meanings of the abbreviations.
	signals.	bitF bit0
		When 2 stations are occupied, DI0, DI1 and DI2 do not function and therefore they are always "0".
		bit0: SON bit4: LSP bit8: MOR bitC: DI2
		bit1: ST1 bit5: LSN bit9: COR bitD: DI3
		bit2: ST2 bit6: MDO bitA: DI0 bitE: DI4 bit3: DOG bit7: TSTP bitB: DI1 bitF:
0041h	Input signal status 1	bit 0 to bit F indicate the OFF/ON statuses of the corresponding input
	Reads the statuses (OFF/ON) of the input	signals. Refer to section 3.5.1 for the meanings of the abbreviations.
	signals.	bitF bit0
		bit0: PSR bit4: DI6 bit8: CDP bitC:
		bit1: SPR bit5: DI7 bit9: bitD: bit2: bit6: TL1 bitA: CSL bitE:
		bit3: DI5 bit7: PC bitB: INC bitF:
0042h	Input signal status 2	bit 0 to bit F indicate the OFF/ON statuses of the corresponding input
	Reads the statuses (OFF/ON) of the input signals.	signals. Refer to section 3.5.1 for the meanings of the abbreviations. bitF bit0
	Signals.	bitF bit0
		bit0: bit4: bit8: bitC:
		bit1: bit5: bit9: bitD: bit2: bit6: bitA: RES bitE:
		bit3: bit7: bitB: bitF:
0050h	Output signal status 0	bit 0 to bit F indicate the OFF/ON statuses of the corresponding
	Reads the statuses (OFF/ON) of the Output	output signals. Refer to section 3.5.1 for the meanings of the
	signals.	abbreviations. bitF bit0
		bit0: RD bit4: TLC bit8: MOF bitC: MEND
		bit1: INP bit5: bit9: COF bitD:
		bit2: CPO bit6: MBR bitA: WNG bitE: POT bit3: ZP bit7: PUS bitB: BWNG bitF:
0051h	Output signal status 1	bit 0 to bit F indicate the OFF/ON statuses of the corresponding
	Reads the statuses (OFF/ON) of the Output	output signals. Refer to section 3.5.1 for the meanings of the
	signals.	abbreviations. bitF bit0
		bitF bit0
		When 2 stations are occupied, MC0 and MC1 do not function and
		therefore they are always "0".
		bit0: PSF bit4: PT2 bit8: PT6 bitC: bit1: SPF bit5: PT3 bit9: PT7 bitD:
		bit2: PT0 bit6: PT4 bitA: bitE:
		bit3: PT1 bit7: PT5 bitB: bitF:

Code No.	Item/Function	Reading data (RWrn+3) contents (Servo amplifier → PLC)
0052h	Output signal status 2 Reads the statuses (OFF/ON) of the Output signals.	bit 0 to bit F indicate the OFF/ON statuses of the corresponding output signals. Refer to section 3.5.1 for the meanings of the abbreviations. bitF bit0 When 2 stations are occupied, MC0 and MC1 do not function and therefore they are always "0". bit0: bit4: bit8: bitC: bit1: bit5: bit9: bitD: bit2: bit6: bitA: ALM bitE: bit3: bit7: bitB: CRD bitF:
0081h	Energization time Reads the energization time from shipment.	Returns the energization time [h].
0082h	Power ON frequency Reads the number of power-on times from shipment.	Returns the number of power-on times.
00A0h	Ratio of load inertia moment Reads the estimated ratio of load inertia moment to servo motor shaft inertia moment.	Return unit [times].
00B0h	Home position within-1-revolution position under 16bit (CYC0) Reads the under 16 bits of the cycle counter value of the absolute home position.	Return unit [pulses].
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].
00B2h	Home position Multi-revolution data (ABS0) Multi-revolution counter value of absolute home position reading	Return unit [rev].
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) 1: Parameter No. 2: Point table No.

Code No.	Item/Function	Reading data (RWrn+3) contents (Servo amplifier → PLC)
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 0001: ×100 0000: ×10
0200h	Parameter group reading Reads the parameter group to be read with code No.8200h to be written.	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)
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.	The value set in the parameter No. corresponding to the requested group name is stored. 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 4: Fourth least significant digit 2: Valid after write 1: Valid when power is switched on again after write
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 under 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: Under 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.

Code No.	Item/Function	Reading data (RWrn+3) contents (Servo amplifier → PLC)
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 ($\Box\Box\Box\Box$) is stored in answer code (RWrn+2).

Code No.	Item	Writing data (RWwn+3) contents (PLC \rightarrow 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)

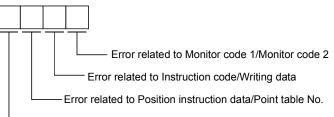
Code No.	Item	Writing data (RWwn+3) contents (PLC → Servo amplifier)
8201h	Data RAM instruction of parameter	Convert the decimal values into hexadecimal before
to	Writes the set value of each No. of the parameter group	making setting.
82FFh	written by code No.8200h to RAM. These values are	
	cleared 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.	
8301h	Data EEP-ROM instruction of parameter	Convert the decimal values into hexadecimal before
to	Writes the set value of each No. of the parameter group	making setting.
83FFh	written with code No.8200h to EEP-ROM. Written to	
	EEP-ROM, 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.	
8401h	Position data RAM command of point table	Convert the values into hexadecimal before making
to	Writes the position data of point table No. 1 to 255 to	setting.
84FFh	RAM. These values are cleared when power is switched	
	off.	
8501h	A set of the upper and under bits makes position data.	
to	When changing the data, always set the data of both	
85FFh	under and upper bits in order of under 16-bit data and	
	upper 16-bit data.	
	8400 to 841F: Position data in under 16 bits of point	
	table No. 1 to 255	
	8500 to 851F: Position data in upper 16 bits of point	
	table No. 1 to 255	
	Example	
	Instruction code 8413: Under 16 bits of point table No.	
	19	
	Instruction code 8513: Upper 16 bits of point table No.	
	19	
8601h	Motor speed of point table	Convert the values into hexadecimal before making
to	Writes the motor speeds of point table No. 1 to 255 to	setting.
86FFh	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.	
8701h	Acceleration time constant data RAM command of point	Convert the values into hexadecimal before making
to	table	setting.
87FFh	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.	

Code No.	Item		V	-		RWwn+3) conto ervo amplifier)	ents	
8801h	Deceleration time constant data RAM command of point	Convert	the			hexadecimal	before	makina
to	table	setting.						0
88FFh	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.							
8901h	Dwell data RAM command of point table	Convert	the	values	into	hexadecimal	before	making
to	Writes the dwell data of point table No. 0 to 255 to RAM.	setting.						0
89FFh	These values are cleared when power is switched off.	Ĵ						
	The decimal value converted from the 2 lower digits of							
	the code No. corresponds to the point table No.							
8A01h	Auxiliary function data RAM command of point table	Convert	the	values	into	hexadecimal	before	making
to	Writes the auxiliary function data of point table No. 0 to	setting.						
8AFFh	31 to RAM. These values are cleared when power is	gi						
	switched off.							
	The decimal value converted from the 2 lower digits of							
	the code No. corresponds to the point table No.							
8B01h	Position data EEP-ROM command of point table	Convert	the	values	into	hexadecimal	before	making
to	Writes the position data of point table No. 1 to 255 to	setting.						
8BFFh	EEP-ROM. Written to EEP-ROM, these values are held	gi						
	if power is switched off.							
8C01h	The lower 16 bits are written in even code and the upper							
to	16 bits in odd code.							
8CFFh	8B01h to 8BFF: Position data in under 16 bits of point							
	table No. 1 to 255							
	8C01h to 8CFF: Position data in upper 16 bits of point							
	table No. 1 to 255							
	Example							
	Instruction code 8B13: Under 16 bits of point table No.							
	19							
	Instruction code 8C13: Upper 16 bits of point table No.							
	19							
8D01h	Servo motor speed data EEP-ROM command of point	Convert	the	values	into	hexadecimal	before	making
to	table	setting.						_
8DFFh	Writes the servo motor speeds of point table No. 1 to	-						
	255 to EEP-ROM. Written to EEP-ROM, 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.							
8E01h	Acceleration time constant data EEP-ROM command of	Convert	the	values	into	hexadecimal	before	making
to	point table	setting.						
8EFFh	Writes the acceleration time constants of point table No.							
	1 to 255 to EEP-ROM. Written to EEP-ROM, 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.							
8F01h	Deceleration time constant data EEP-ROM command of	Convert	the	values	into	hexadecimal	before	making
to	point table	setting.						-
8FFFh	Writes the deceleration time constants of point table No.							
	1 to 255 to EEP-ROM. Written to EEP-ROM, 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.							

Code No.	Item	Writing data (RWwn+3) contents (PLC \rightarrow Servo amplifier)			
9001h	Dwell data EEP-ROM command of point table	Convert the values into hexadecimal before making			
to	Writes the dwell data of point table No. 1 to 255 to EEP-	setting.			
90FFh	ROM. Written to EEP-ROM, 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.				
9101h	Auxiliary function data EEP-ROM command of point	Convert the values into hexadecimal before making			
to	table	setting.			
91FFh	Writes the auxiliary function data of point table No. 1 to				
	255 to EEP-ROM. Written to EEP-ROM, 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.				

3.5.5 Answer 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 Answer code (RWwn+2). "0000" is set if they are normal.



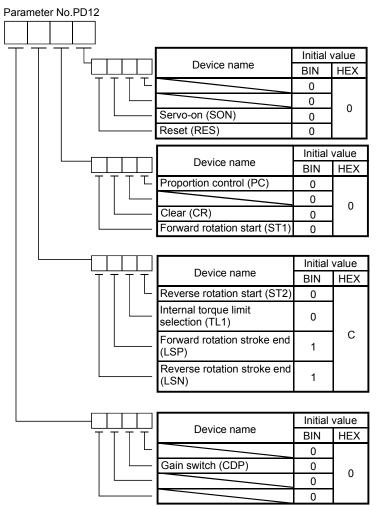
----Error related to Speed instruction data/Point table No.

Code No.	Error	Details
0	Normal answer	Instruction was completed normally.
1	Code error	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	The parameter No. disabled for reference was set.
3	Write range error	 An attempt was made to write the parameter or point table data outside the setting range.

3.5.6 Setting the CN6 external input signals

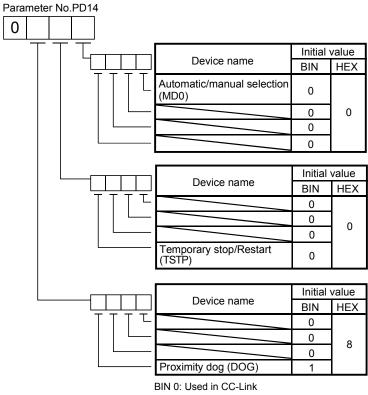
Using parameter No. PD06 to PD08, PD12 and PD14, you can assign the input signals as the CN6 external input signals. The signals assigned as the CN6 external input signals cannot be used in CC-Link. Refer to section 4.5.1 for the pins to which signals can be assigned.

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.



BIN 0: Used in CC-Link

BIN 1: Used as CN6 external input signal



BIN 1: Used as CN6 external input signal

3.6 Data communication timing charts

3.6.1 Monitor codes

(1) When 1 station	n is occupied	
Monitor 1 (RWwn)		
Monitor 2 (RWwn+1)		X
Monitor execution ^{ON} demand (RYn8) OF		,
Monitoring ON (RXn8) OF	1	
Monitor 1 data (RWrn)		
Monitor 2 data (RWrn+1)		
Answer code		
(RWm+2)		

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 ($\Box\Box\Box\Box1$) is set to Answer code.

Monitor 1 (RWwn)		
Monitor 2 (RWwn+1)		
Monitor execution ON demand (RYn8) OFF	ţ	<u>}</u>
Monitoring ON (RXn8) OFF		
Monitor 1 data Under 16bit (RWrn)		X
Monitor 1 data Upper 16bit (RWrn+1)		X
Monitor 2 data Under 16bit (RWrn+5)		
Monitor 2 data Upper 16bit (RWrn+6)		X
Answer code (RWrn+2)		×
		Data HOLD →

(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 under 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 under 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)

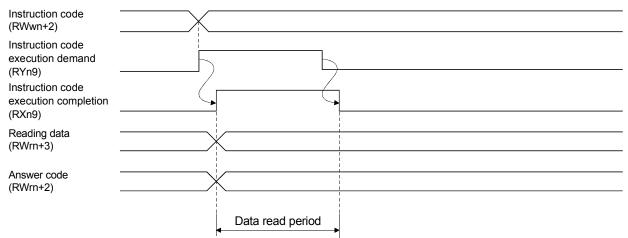
A sign is set if data does not exist in RWrn+1 • RWrn+6. A "+" sign is indicated by "0000", and "-" by "FFFF". The monitor data set to the remote register are always updated while Monitoring (RXn8) is ON.

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 ($\Box\Box\Box$ 1) is set to Answer code.

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 ($\Box\Box\Box$ 1 \Box) is set to Answer code. If any unusable parameter, point table is read, the corresponding error code ($\Box\Box$ 2 \Box) is set.

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

	,	,			
Instruction code (RWwn+2)					
Writing data (RWwn+3)					
Instruction code execution demand (RYn9)				<u>ک</u>	
Instruction code processing		Write in execution]		
Instruction code execution completion (RXn9)					
Answer code (RWrn+2)					

(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 Wiring 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 ($\Box\Box\Box$) is set to Answer code.

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

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.

arar	nete	r No	PC3	0		
]		
			L	Set value	Position command	Speed command
				0	Specify the point tabl	e No.
				1	Set the position	Specify the point table No.
				2	data.	Set the servo motor speed.

(1) When setting the point table No.

Ρ

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

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

Point table No. (RWwn+4)	·	
Position instructio demand (RY(n+2)0)	ⁿ ON OFF	
Point table No. designation Position instruction execution completion (RX(n+2)0)	ON ON OFF	(Note) Data reserved
Answer code (RWrn+2) Forward/reverse rotation start (RYn1•RYn2)	ON OFF	6ms ,

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 Answer 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.

(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 "DDD1" in parameter No. PC30 to enable position command data-set and point table No. (speed instruction)-setting operation.

Position instruction da Lower 16bit (RWwn+4	
Position instruction da	
Upper 16bit (RWwn+5	
Delist table Nie	
Point table No. (RWwn+6)	X
· · ·	
Position instruction O demand	N
(RY(n+2)0) O	FF
Speed instruction O	Ν
demand	
(Rf(1+2)1)	
Position data setting Point table No.	(Note) Data reserved
designation	
Position instruction O	N (
execution completion (RX(n+2)0)	FF
Speed instruction O	
execution completion	
(RX(n+2)1) O	FF
Answer code	
(RWm+2)	6ms
Forward rotation	← →
Reverse rotation	
(RYn1 · RYn2)	

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 under 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 under 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 Answer 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) 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 "DDD2" in parameter No. PC30 to enable position command data- and speed command data-set

operation.

Position instruction Lower 16bit (RWwn		
Position instruction Upper 16bit (RWwn		
Speed instruction da (RWwn+6)	ata	
Position instruction demand (RY(n+2)0) Speed instruction demand (RY(n+2)1)	ON OFF ON OFF	
Position - speed data setting		(Note) Data reserved
Position instruction execution completio (RX(n+2)0)	ON n OFF	
Speed instruction execution completio (RX(n+2)1)	ON on OFF	
Answer code (RWm+2)		
Forward rotation Reverse rotation start (RYn1 · RYn2)	ON OFF	

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 under 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 under 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 Answer code.

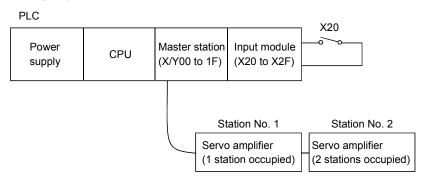
Turn Forward rotation start (RYn1) \cdot Reverse rotation start (RYn2) to ON after Position instruction execution completion (RX(n+2)0) and Speed instruction execution completion (RX(n+2)1) have turned to ON.

3.7 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.

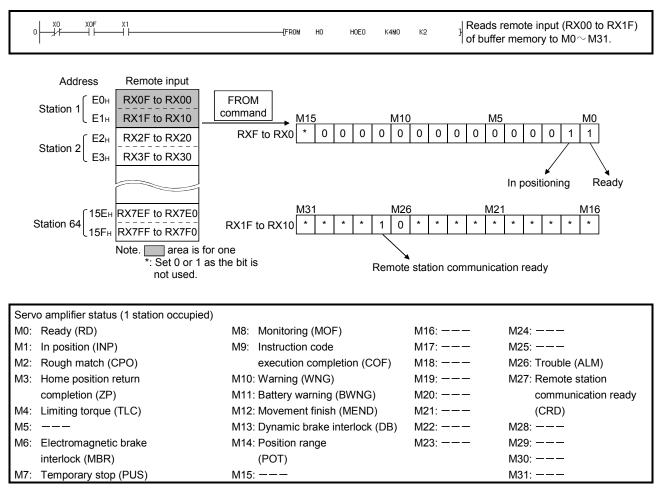
3.7.1 System configuration example

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



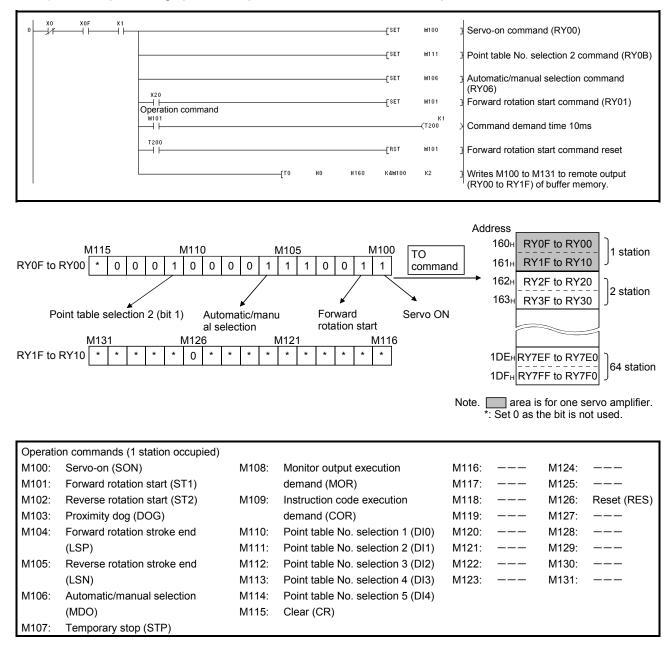
3.7.2 Reading the servo amplifier status

Read the status of the servo amplifier 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 $M0 \sim M31$.



3.7.3 Writing the operation commands

To operate the servo amplifier, write the operation commands to the remote output RY (addresses 160_H to 1DF_H). Perform positioning operation of point table No. 2 for the servo amplifier of station 2.



3.7.4 Reading the data

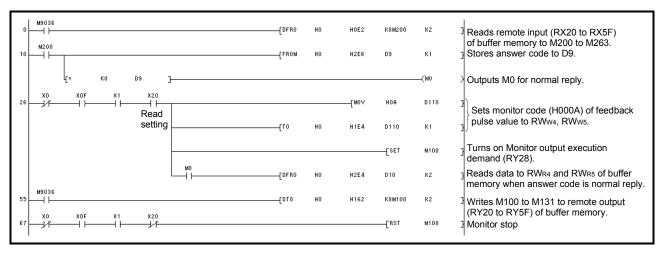
Read various data of the servo amplifier.

(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)

The answer code at instruction code execution is set to D9.



(2) Reading the parameter

Read parameter No. PA01 "Control mode" of the servo amplifier of station 2 to D1.

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

The answer code at instruction code execution is set to D9.

0	N9036	X0F	X1	X20			 [DFRO	HO	HOE2	K8₩200 [Pls	K2 M302	Reads remote input of buffer memory (RX20 to RX5F) to M200 to M263.
17-	M302						 			[SET	N 303]
19	M303 		,						[`NOV	H8200	D110	
							 		[MOV	HO	D111	Writes parameter group No. write (H8200) to RWwe and parameter group
							 -[то	HO	H1E6	D110	K2	PA (K0) to RWw7.
	M303	M209								{SET	M109] Turns on instruction code execution demand (RY29).
40-	M3U3							_ .		-[RST	M109	Turns off instruction code execution
							 			[RST	M303	demand (RY29) and proceeds to the next when instruction code execution
										[SET	N304	completion (RX29) turns on.
45	#304 					<u>.</u>			[#OV	H204	D110	Writes parameter No.PA04 read (H0204)
	-						 [T0	HO	H1E6	D110	K1	to RWw6.
										[SET	N109	3
61	₩304	N209 					 [FROM	HO	H2E6	D9	K1	Outputs M0 for normal reply.
			l _{[=}	KO	D9]	 				-(NO	>
78-	₩304 	MO 		<u></u>			 [FROM	HO	H2E7	D1	KI	Reads RW _{R7} of buffer memory to D1 when answer code is normal reply.
							 			[RST	N109	Turn off instruction code execution demand (RY29).
										[RST	M304	Writes M100 to M163 to remote output (RY20 to RY5F) of buffer memory.
91-	₩9036 —						 [ото	HO	H162	K8M100	K2]

(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)

The answer code at instruction code execution is set to D9.

0	М9036 — ↓ М209		[DFR0	но	H0E2 H2E6	K8M200 D9	K2	Reads remote input (RX20 to RX5F) of buffer memory to M200 to M263.
10-		(= ко D9 <u>]</u>	[FROM	HU	HZEB	D9	кт —(мо	 Stores answer code to D9. Outputs M0 for normal reply.
26	×0 ↓/;	xoF x1 x20 Read setting				[PLS	M302	3
33	мзо2 — ↓ мзоз					[SET	M303	3
35	 				[M0V	H10	D110	Writes current alarm read (H0010)
			[T0	HO	H1E6	D110	K1) ∫ to RWw6.
51	мо		FROM	но	H2E7	[SET D1	M109 K1	Turns on instruction code execution demand (RY29).
51-			[FROM	HU	H2E7		KT M109	Reads RWR7 of buffer memory to D1 when answer code is normal reply. Turns off instruction code execution
						[RST	M303	demand (RY29).
63 -	мэозе —		[DTO	HO	H162	K8M100	К2	Writes M100 to M163 to remote output (RY20 to RY5F) of buffer memory.

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 speed block No. 1 of the servo amplifier of station 2 to "100".

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

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

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

0	мэозе		[DFR0	но	HOE2	K8M200	К2	Reads remote input (RX20 to RX5F)
10	×0 // ¯	X0F X1 X20 M201				[PLS	M302	of buffer memory to M200 to M263.
18	M302	Read setting In position				[SET	M303	3
20	M303				FM0V	H8D01	D110	-
					г. ГМОУ	K100	D111	Writes speed data (H8D01) of point table No. 1 to RWw6, and speed data (K100) to
				но	H1E6	D110		
			[10	HU	H1E6	U110	К2	۶) (
	M209					[SET	M109	Turns on instruction code execution demand (RY29).
41			[FROM	HO	H2E6	D2	K1	Reads RWR6 to D2 when instruction code execution completion (RX29) turns on.
						[RST	M109	Turns off instruction code execution demand (RY29).
						[RST	M303	3
53	M9036		[DTO	HO	H162	K8M100	К2	Writes M100 to M163 to remote output (RY20 to RY5F) of buffer memory.

(2) Writing the parameter

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					
K2	Set data (decimal)					

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

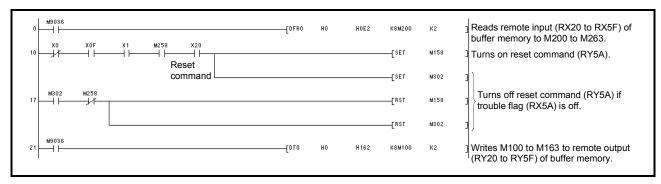
Code No.	Description
H820C	Parameter No. PC12 write (hexadecimal)

Set data	Description
K100	Set data (decimal)

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

0	N9036					{DFR0	HO	HOE2	K8M200	K2		Reads remote input of buffer memory
10	xo X	X0F	X1	X20				·	[PLS	M302		(RX20 to RX5F) to M200 to M263.
17									[SET	M303	3	
19	M303							[MOV	H8200	D110]	
								[NOV	H2	D111	3	Writes parameter group No. write (H8200) to RWw6 and parameter group PC (K2) to RWw7.
						[то	HO	H1E6	D110	K2	ł	
	M303	N209							[SET	M109		Turns on instruction code execution demand (RY29).
40					· · · · · · · · · · · · · · · · · · ·				[RST	M 109	J	Turns off instruction code execution
									[RST	M303	ł	demand (RY29) and proceeds to the next when instruction code execution
									[SET	N304	ŀ	completion (RX29) turns on.
45	M304 							[Nov	H8202	D110	3	
								[Nov	K100	D111]	Writes parameter No.PC12 write (H820C) to RWw6 and data (K100) to RWw7.
						{TO	HO	H1E6	D110	K1	3	J
	l					••• • • • •		·	[SET	N109	3	Turns on instruction code execution demand (RY29).
66	M304	N209 			<u>. </u>	[FROM	HO	H2E6	D2	K1	3	Reads RWw6 to D2 when instruction code execution completion (RX29) turns on.
			-						[RST	N109	3	Turn off instruction code execution demand (RY29).
1			L						[RST	N304]	(1120).
79	M9036					[DTO	HO	H162	K8M100	K2	Ţ	Writes M100 to M163 to remote output (RY20 to RY5F) of buffer memory.

- (3) Servo amplifier alarm resetting program examples
 - (a) Deactivate the alarm of the servo amplifier of station 2 by issuing a command from the PLC. This method is limited to servo alarm occurrence.



(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)

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

0	м9036 — ХО	X0F X1 X20	[DFR0	HO	HOE2	K8M200	К2	Reads remote input (RX20 to RX5F) of buffer memory to M200 to M263.
10	Ĵř–	Reset command				-[PLS	M302	3
17	M302	Reset command				[SET	M303	3
19	мзоз —	1			[M0V	H8010	D110)
					—[МОУ	H1EA5	D111	Writes alarm reset command (H8010) to RWwe and execution data (H1EA5) to RWw7.
			[T0	но	H1E6	D110	К2) 10 RVVW7.
						[SET	M109	Turns on instruction code execution demand (RY29).
40	M209 ──┤		FROM	HO	H2E6	D2	К1	Reads RWR6 to D2 when instruction code execution completion (RX29) turns on.
						[RST	M109	Turns off instruction code execution demand (RY29).
						[RST	M303	3
52	мэозе —		{DTO	HO	H162	K8M100	К2	Writes M100 to M163 to remote output (RY20 to RY5F) of buffer memory.

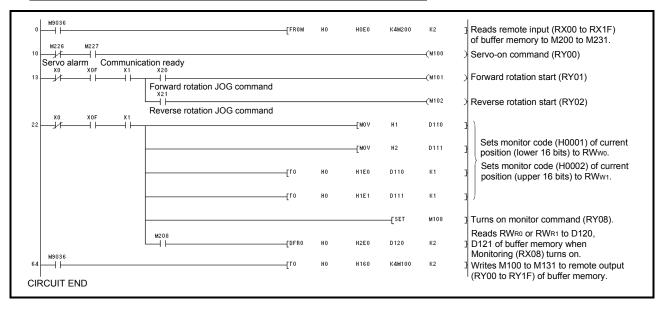
3.7.6 Operation

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)					



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

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.

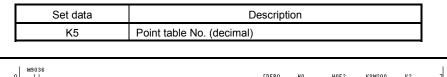
Preset "DDD2" in parameter No. PC30.

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

0	M9036	M259		[DFRO		HOE2	K8M200	К2	Reads remote input (RX20 to RX5F) of buffer memory to M200 to M263.
10	_//							—(м100) Servo-on command (RY20)
		-						—(M106	Automatic operation selection (RY26)
		L						—(M142	> Position command selection (RY4A)
15	×0 //	X0F	x1 x20 M201 → → → → → → Operation In p				-[PLS	M302	3
23	M302		command				-[SET	M303	3
25	мзоз —					[DMOV	K100000	D110	٤
						[MOV	K1000	D112	Writes position command data (K100000) to RWws, RWws, and speed data (K1000) to RWwA.
				[10	HO	H1E8	D110	КЗ	
							[SET	M132	Turns on position instruction demand (RY40).
							-[SET	M133	J Turns on speed instruction demand (RY41).
49	M232	M233		[FR0M	і но	H2E6	D2	К1	Reads RWR6 to D2 when position instruction execution completion (RX40) and speed instruction execution completion (RX41) turn
		-					[SET	M101	on. I Turns on forward rotation start command (RY21).
							-[RST	M303	3
62	M101							к1 —(Т200	Command request time 10ms
64	T200						[RST	M101] Turns off forward rotation start command (RY21).
							[rst	M132	Turns off position instruction demand (RY40).
							[RST	M133] Turns off speed instruction demand (RY41).
68	M9036			[DT0	HO	H162	K8M100	K2	Writes M100 to M163 to remote output (RY20 to RY5F) of buffer memory.
CIRC	CUIT EN	ID							

(3) Remote register-based point table No. setting (incremental value command system) Operate the servo amplifier of station 2 with incremental values after specifying the point table No. 5 in the direct specification mode.

Preset "DDD1" in parameter No. PA01 and "DDD2" in parameter No. PA30.



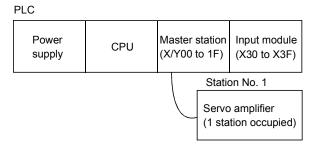
0 M9036		-[DFRO	но	HOE2	K8M200	К2	Reads remote input (RX20 to RX5F) of buffer memory to M200 to M263.
10 M258 M25						-(M100	Servo-on command (RY20)
						—(м106	Automatic operation selection (RY26)
						(M142	Position command selection (RY4A)
						—(M143	Incremental value selection (RY4B)
	F X1 X20 M201 Operation In position				-[PLS	M302	3
24 M302	command				[SET	M303	3
26 M303				[MOV	К5	D110	Writes point table No. (K5) to RWws.
		-[10	но	H1E8	D110	К1	
					[SET	M132	Turns on position instruction demand (RY40).
42 M232		[FROM	HO	H2E6	D2	К1	Reads RWR6 to D2 when position instruction execution completion (RX40) turns on.
					[SET	M101] Turns on forward rotation start command (RY21).
					-[rst	M303	3
M101						K1 (T200	Command request time 10ms
56 T200					[RST	M101	Turns off forward rotation start command (RY21).
					[^{RST}	M132	Turns off position instruction demand (RY40).
		[DTO	HO	H162	K8M100	К2	Writes M100 to M163 to remote output (RY20 to RY5F) of buffer memory.

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).



3.8.2 Program example when 1 station is occupied

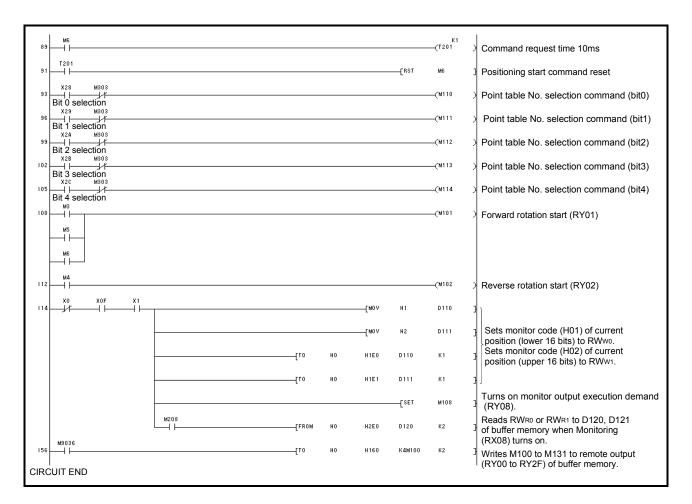
POINT ■ To execute a dog type home position return with the CC-Link communication functions, set "□0□□" in parameter No. PD14 and use Proximity dog (DOG) with the remote input (RY03) in this example.

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

Operation: Alarm reset, dog type zeroing, JOG operation, automatic operation under point table command

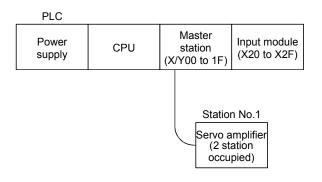
Code No.	Description				
H0001	Lower 16-bit data of current position (hexadecimal)				
H0002	Upper 16-bit data of current position (hexadecimal)				

0 M9036		-[FROM	но	HOEO	K4M200	K2	Reads remote input (RX00 to RX1F) of buffer memory to M200 to M231.
10 M226				[MOV	H10	D10	Urites current alarm read (H0010) to RWw2
		-[10	HO	H1E2	D10	К1] ∫at trouble (RY1A) occurrence.
					[SET	M109	Turns on instruction code execution demand (RY09).
26 M109		-[FROM	HO	H2E3	D11	К1	Reads RWR3 of buffer memory to D11 when answer code becomes normal reply.
					[RST	M109] Turns off instruction code execution demand (RY09).
37 X0	x0F X1 M226 X20 Reset				[SET	M126	Alarm reset command (RY1A)
	command				[SET	M302	3
44	M226				[RST	M126] Alarm reset command (RY1A) reset
					[RST	M302	3
						-(M100	Servo-on command (RY00)
52 X24	M201 M202 matic/manual operation selection command				[SET	M106	Automatic operation selection (RY06)
56 X24	M201 M202				[RST	M106	Manual operation selection (RY06)
60 X25	M106 M203				[SET	M303	Home position return request
comm	position return and				[SET	M5] Forward rotation start request
65 — М5						K1 (T200	Command request time 10ms
67 T200					[RST	M5	Forward rotation start request reset
69 X26						-(M103	Proximity dog command (RY03)
Proxir M303 71						M303	Home position return request reset
74 X0	Home position return completion				-	(M3	Forward rotation start request
	Forward rotation JOG command						
X27	Reverse rotation JOG command					-(M4	Reverse rotation start request
** Positio	oning In position Rough Home position return				[SET	MG	Positioning start command
start comm	match completion and						



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).



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 "□0□□" in parameter No. PD14 and use Proximity dog (DOG) with the remote input (RY03) in this example.

٦

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

Operation: Alarm reset, dog type zeroing, JOG operation, automatic operation under point table command

Code No.	Description
H0016	32-bit data of motor speed (hexadecimal)
Code No.	Description
K5000	Position command data (decimal)
K100	Speed command data (decimal)

0 M9036 M258		[DFRO	HO	HOEO	K8M200	К2	Reads remote input (RX00 to RX3F) of buffer memory to M200 to M263.
10				[MOV	H10	D10	Writes current alarm read (H0010) to RWw2 at trouble (RY3A) occurrence.
		[T0	HO	H1E2	D10 	К1 M109	Turns on instruction code execution demand
							(RY09).
26 M109		[FROM	HO	H2E3	D11	К1	Reads RWR3 of buffer memory to D11 when answer code becomes normal reply.
xo	X0F X1 M258 X20				[RST	M109	Turns off instruction code execution demand (RY09).
37					[SET	M158	Alarm reset command (RY3A)
	command				[SET	M302	3
44	M258				[RST	M158	Alarm reset command (RY3A) reset
					[RST	M302	3
48 X21 Servo-o	₩259 ₩258 					—(М100	Servo-on command (RY00)
52 X24	M201 M202 				[SET	M106	Automatic operation selection (RY06)
56 X24	M201 M202 — I I IIII M202 tic/manual operation selection command				[RST	M106	Manual operation selection (RY06)
60 X25					[SET	M303	Home position return request
commar					[SET	М5	Forward rotation start request
65 M5						K1 (T200	Command request time 10ms
67 T200					[^{RST}	M5	Forward rotation start request reset
69 X26 Provimit	ty dog command					(M103	Proximity dog command (RY03)
M303	M203 H203 Home position return completion				[RST	M303	Home position return request reset
						—(M3	Forward rotation start request
	Forward rotation JOG comma	and					
	Reverse rotation JOG comma	and				(M4	Reverse rotation start request
⁸³ Point tal	ble/position instruction changing command					—(M142	Positioning instruction selection (RY2A)

3. CC-LINK COMMUNICATION FUNCTIONS

85	x27 	M106 ──┤	M201	M202	M203 Home position return				[PLS	M304	3
h	M304 COI ⊣	mand		match	completion				[SET	M305	I I I I I I I I I I I I I I I I I I I
	мзо5 -							Симоч	K50000	D130	ر د
								[M0V	K100	D132	Writes position command data (K50000) to RWw4, RWw5, and speed data (K100) to RWw6.
	-					[10	но	H1E4	D130	КЗ	ر د
									[SET	M132] Turns on position instruction demand (RY20).
	l								[set	M133	Turns on speed instruction demand (RY21).
	M232 ┥┝──	₩233 —				[FROM	но	H2E2	D2	К1	Reads RWR2 to D2 when position instruction execution completion (RX20) and speed instruction execution completion (RX21) turn on.
									[SET	M6	Positioning start command
									-[RST	M305	2
132	м6 -									K1 (T203	Command request time 10ms
	г203 Н Н — Т								[RST	MG	Positioning start command reset
									[RST	M132	Turns off position instruction demand (RY20).
									-[RST	M133	Turns off speed instruction demand (RY21).
138	мз -									—(M101	> Forward rotation start (RY01)
	м5 -										
	ме 										
	м4 -									(M102	> Reverse rotation start (RY02)
	x0 ↓/	×0F ──	×1					[M0V	H16	D110	3 Sets monitor code (H0016) of motor speed
						[T0	HO	H1E0	D110	К1	to RWwo.
									[SET	M108	Turns on monitor output execution demand (RY08).
				M208		[FROM	HO	H2E0	D120	К2	Reads RWR0 or RWR1 of buffer memory to D120, D121 when monitoring (RX08) turns on.
172	19036 H					[DT0	HO	H160	K8M100	К2	Writes M100 to M163 to remote output (RY00 to RY3F) of buffer memory.
CIRCL	JIT ENI	D									

	 Any person who is involved in wiring should be fully competent to do the work. Before starting wiring, switch power off, then wait for more than 15 minutes, and after the charge lamp has gone off, make sure that the voltage is safe in the tester or like. Otherwise, you may get an electric shock. 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 misoperate, 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. Servo Amplifier Quipting Quipting Quipting

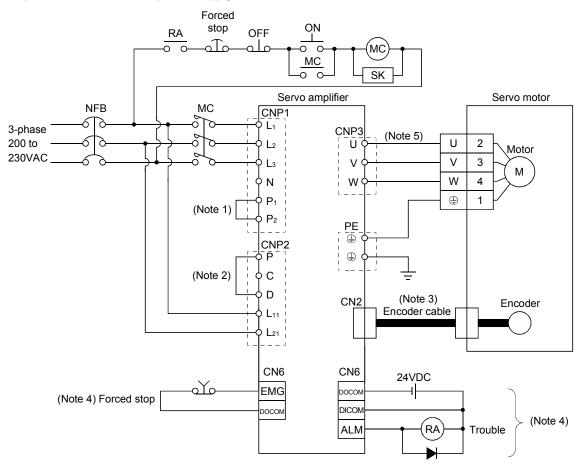
4.1 Input power supply circuit

 When the servo amplifier has become faulty, switch power off on a amplifier power side. Continuous flow of a large current may cause a fire. Use the trouble signal to switch power off. Otherwise, a regenerative fault or the like may overheat the regenerative resistor, causing a fire. During power-on, do not open or close the motor power line. Otherwise malfunction or faulty may occur. 	transistor
---	------------

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-P2. (Factory-wired.) When using the power factor improving DC reactor, refer to section 14.11.

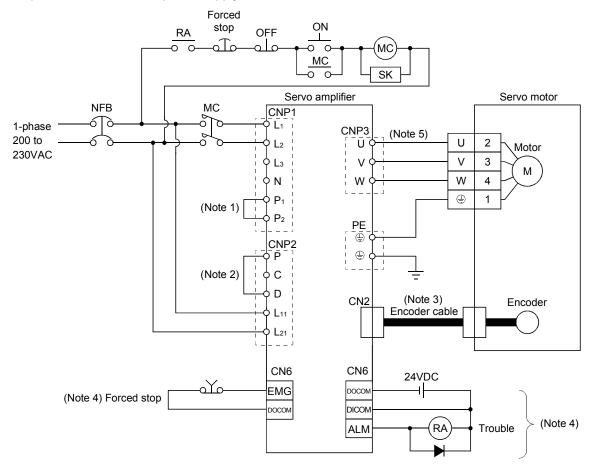
2. Always connect P-D. (Factory-wired.) When using the regenerative option, refer to section 14.2.

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.



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

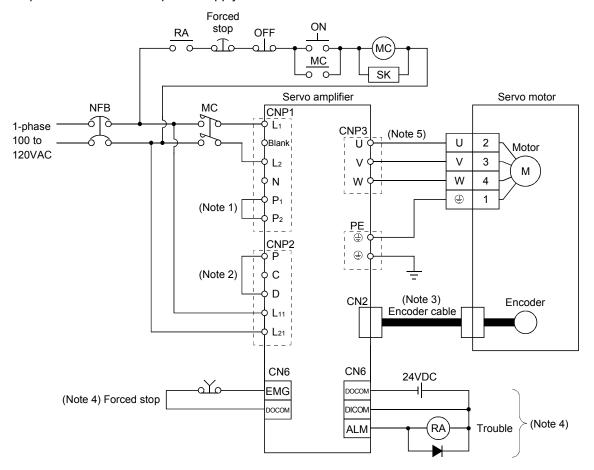
Note 1. Always connect P1-P2. (Factory-wired.) When using the power factor improving DC reactor, refer to section 14.11.

2. Always connect P-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.

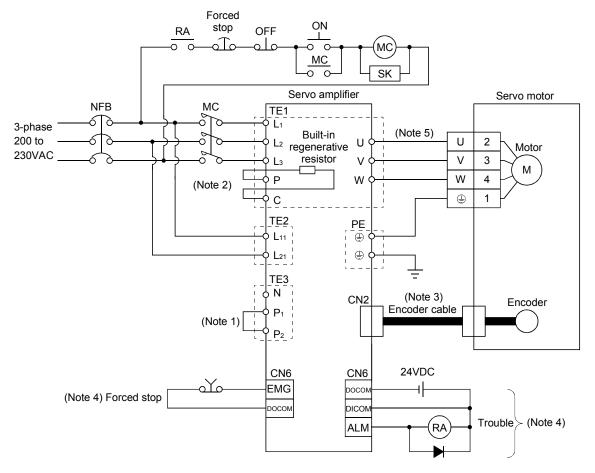


(3) For 1-phase 100 to 120VAC power supply to MR-J3-10T1 to MR-J3-40T1

Note 1. Always connect P1-P2. (Factory-wired.) The power factor improving DC reactor cannot be used.

- 2. Always connect P-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.

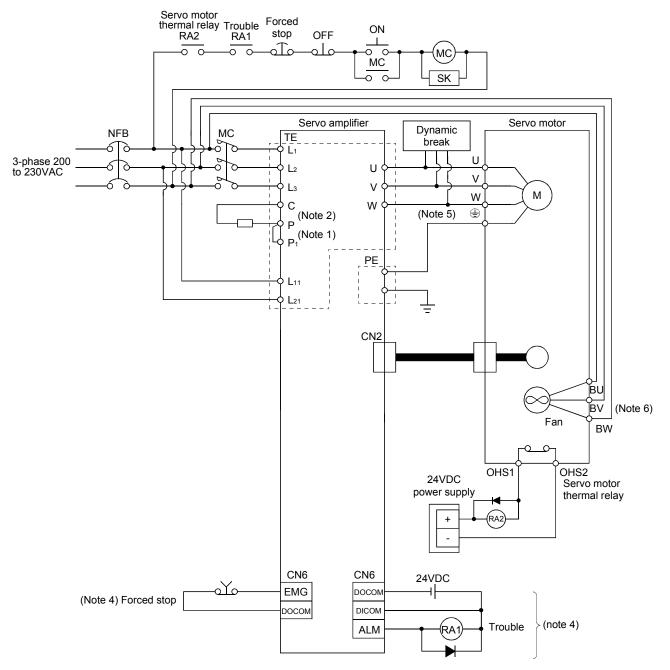
(4) MR-J3-500T • MR-J3-700T



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

- 2. Always connect P-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.

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



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

2. When using the regenerative option, refer to section 14.2.

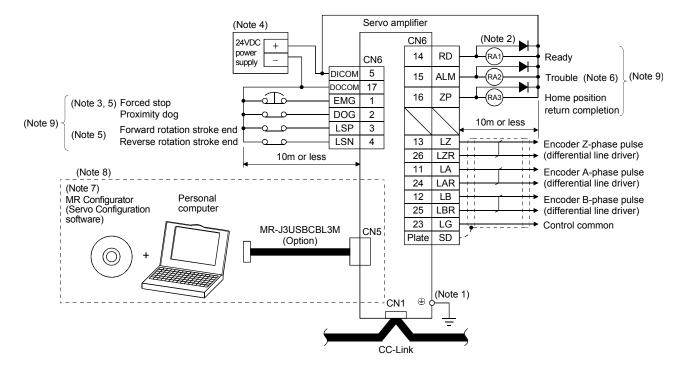
3. For the encoder cable, use of the option cable is recommended. Refer to section 14.1 for selection of the cable.

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

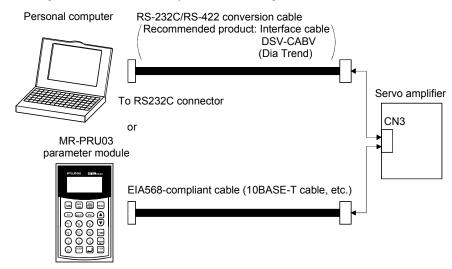
5. Refer to section 4.10.

6. There is no BW if HA-LP11K2 is used.

4.2 I/O signal connection diagram



- Note 1. To prevent an electric shock, always connect the protective earth (PE) terminal (terminal marked) 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±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.
 - 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.

4.3 Explanation of power supply system

4.3.1 Signal explanations

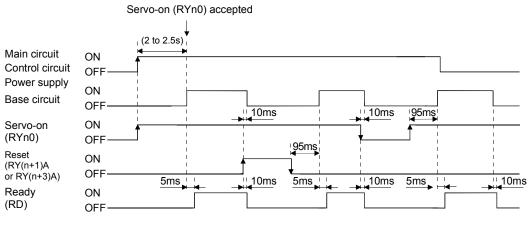
POINT
 For the layout of connector and terminal block, refer to outline drawings in chapter 10.

Abbreviation	Connection Target (Application)	Description						
		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.						
L1 L2	Main circuit power	Servo amplifier MR-J3- 10T to 70T	MR-J3- 100T to 22KT	MR-J3- 10T1 to 40T1				
L3	supply		L2 • L3					
		1-phase 200V to 230VAC, 50/60Hz L1 · L2						
		1-phase 100V to 120VAC, 50/60Hz		L1 • L2				
P1 P2 P C D	Power factor improving DC reactor Regenerative option	 MR-J3-700T or less When not using the power factor improving DC reactor, connect P1-P2. (Factory-wired.) When using the power factor improving DC reactor, disconnect the wiring across P1-P2 an connect the power factor improving DC reactor across P1-P2. MR-J3-11KT to 22KT MR-J3-11KT to 22KT do not have P2 terminal. When not using the power factor improving reactor, connect P1-P. (Factory-wired) When using the power factor improving reactor, connect P1-P. (Factory-wired) When using the power factor improving reactor, connect it across P-P1. Refer to section 14.11. MR-J3-350T or less When using servo amplifier built-in regenerative resistor, connect between P-D terminals (Wired by default) When using regenerative option, disconnect between P-D terminals and connect regenerative option to P terminal. When using servo amplifier built-in regenerative resistor, connect P terminal and C terminal. When using servo amplifier built-in regenerative resistor, connect P terminal and C terminal. When using servo amplifier built-in regenerative resistor, connect P terminal and C terminal. When using servo amplifier built-in regenerative resistor, connect P terminal and C terminal. When using servo amplifier built-in regenerative resistor, connect P terminal and C terminal. When using servo amplifier built-in regenerative resistor, connect P terminal and C terminal. When using servo amplifier built-in regenerative resistor, connect P terminal and C terminal. When using servo amplifier built-in regenerative resistor, connect P terminal and C terminal. When using regenerative option, disconnect P terminal and C terminal. When using regenerative option, disconnect P terminal and C terminal. When using regenerative option, disconnect P terminal and C terminal. When using regenerative option, disconne						
		regenerative option to P terminal and C terminal. 3) MR-J3-11KT to 22KT MR-J3-11KT to 22KT do not have D terminal. When not using the power supply return converter and the brak the regenerative option to P terminal and C terminal. Refer to section 14.2 to 14.5. Supply the following power to L ₁₁ • L ₂₁ . Servo amplifier MR-J3-10T MF	ke unit, make	sure to conne				
L11	Control circuit	Power supply to 22KT	to 40T1					
L21	power supply	1-phase 200V to 230VAC, 50/60Hz L11 · L21						
			_11 • L21					
U	Servo motor	Connect to the servo motor nower supply terminals (IT V/ W). Due	rina nower-on	u do not open				
V W	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.						
Ν	Return converter Brake unit	When using return converter/brake unit, connect to P terminal and N terminal. Do not connect to servo amplifier MR-J3-350T or less. For details, refer to section 14.3 to 14.5.						
٢	Protective earth (PE)	Connect to the earth terminal of the servo motor and to the protection box to perform arounding.	ctive earth (P	E) of the contr				

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) of 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



Power-on timing chart

(3) Forced stop

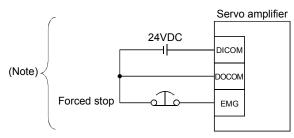
Provide an external forced stop circuit to ensure that operation can be stopped and
power switched off immediately.

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 RTn2 must be off.



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

4.3.3 CNP1, CNP2, CNP3 wiring method

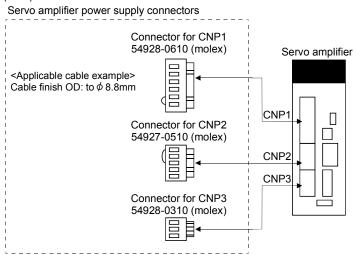
POINT	
 Refer to 	Table 14.1 in section 14.9 for the wire sizes used for wiring.
• MR-J3-	500T or more does not have these connectors.

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

(1) MR-J3-100T or less

(a) Servo amplifier power supply connectors

(Note)

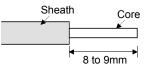


Note. These connectors are of insert type. As the crimping type, the following connectors (Molex) are recommended. For CNP1: 51241-0600 (connector), 56125-0118 (terminal)

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 ϕ 3.8mm

(b) Termination of the cables

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



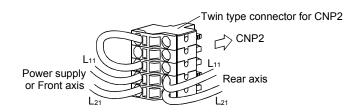
Twisted wire: Use the cable after stripping the sheath and twisting the core. At this time, take care to avoid a short caused by the loose wires of the core and the adjacent pole. Do not solder the core as it may cause a contact fault. Alternatively, a bar terminal may be used to put the wires together.

Cable	e size	Bar term	Crimping tool (Note2)	
[mm ²]	AWG	For 1 cable (Note1)		
1.25/1.5	16	AI1.5-10BK	AI-TWIN2 $ imes$ 1.5-10BK	
2/2.5	14	AI2.5-10BU		Variocrimp 4 206-204

Note1. Maker: Phoenix Contact

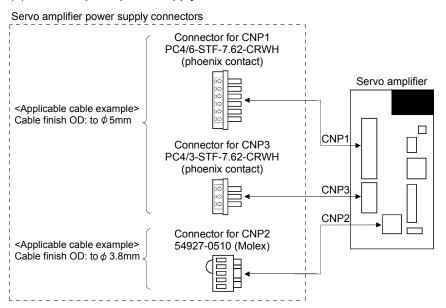
2. Maker: WAGO Japan

(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-J3-350T

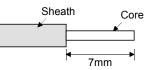
(a) Servo amplifier power supply connectors



(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	Cable size Bar terminal type			Crimping tool	Maker
[mm ²]	AWG	For 1 cable For 2 cables		Crimping tool	IVIAKEI
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		

2) CNP2

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

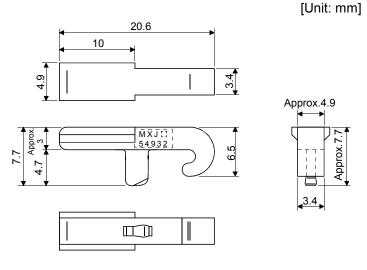
(c) As twin type connector for CNP2 (L₁₁, L₂₁) is the same as MR-J3-100T or smaller. Refer to (1) (C) of this section. (3) Insertion of cable into 54928-0610 • 54927-0510 and 54928-0310 (Molex)

POINT

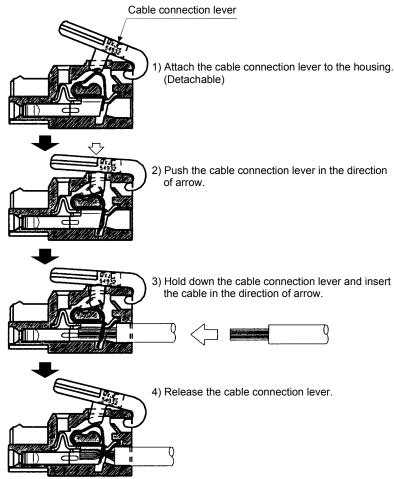
 It may be difficult for a cable to be inserted to the connector depending on wire size or bar terminal configuration. In this case, change the wire type or correct it in order to prevent the end of bar terminal from widening, and then insert it.

How to connect a cable to the servo amplifier power supply connector is shown below. (a) When using the supplied cable connection lever

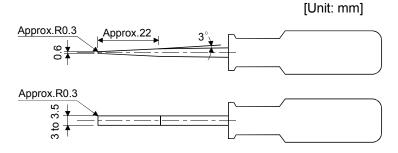
1) The servo amplifier is packed with the cable connection lever 54932-0000 (Molex).



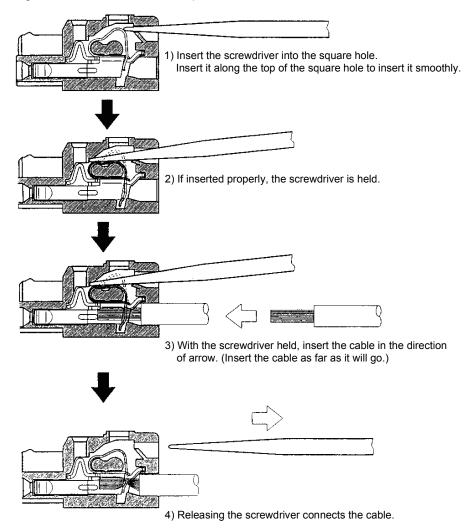
2) Cable connection procedure



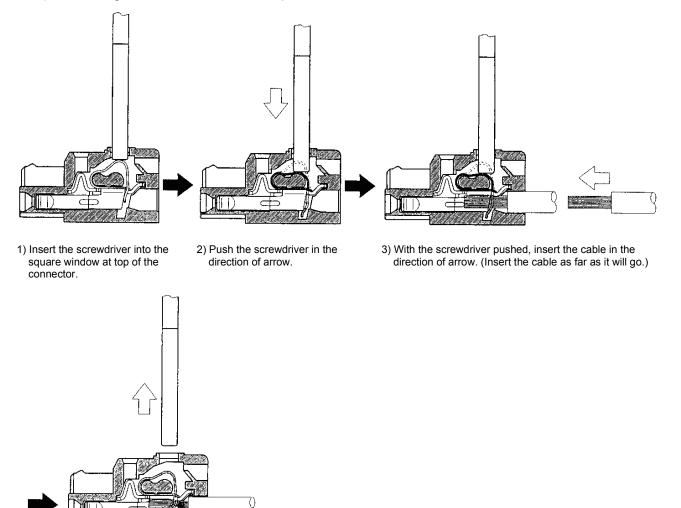
- (b) Inserting the cable into the connector
 - 1) Applicable flat-blade screwdriver dimensions Always use the screwdriver shown here to do the work.



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



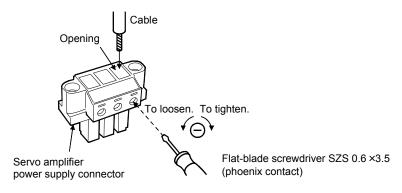
3) When using the flat-blade screwdriver - part 2



4) Releasing the screwdriver connects the cable.

(4) How to insert the cable into PC4/6-STF-7.62-CRWH or PC4/3-STF-7.62-CRWH connector Insert the core of the cable into the opening and tighten the screw with a flat-blade screwdriver so that the cable does not come off. (Tightening torque: 0.5 to 0.6N m(4.425 to 5.31 lb in)) Before inserting the cable into the opening, make sure that the screw of the terminal is fully loose.

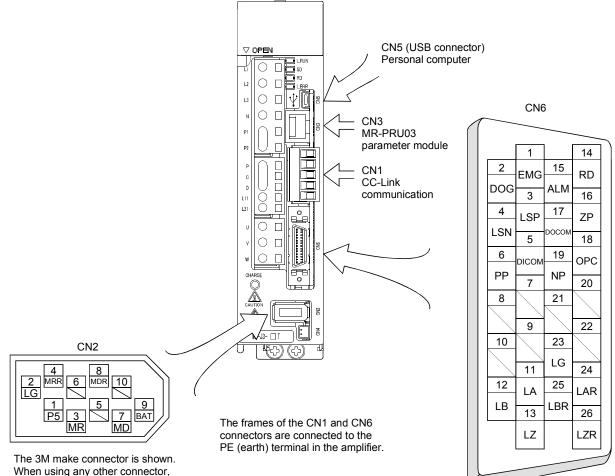
When using a cable of 1.5mm² or less, two cables may be inserted into one opening.



4.4 Connectors and signal arrangements

	POINT	
•	The pin cor	figurations of the connectors are as viewed from the cable
	connector v	viring 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.



When using any other connector, refer to section 14.1.2.

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	D0-1	Ready (RD)	No.PD09
	15		Trouble (ALM)	No.PD10
	16		Home position return completion (ZP)	No.PD11

(1) Input device

POINT
 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.			Functio	ons/Applications
Forced stop	EMG	CN6-1				-1. Assigning this device to any other pin is r to section 3.5.1 (1).
Servo-on	SON		For de	vice details, ref	er 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 switch	CDP					
Reset	RES	/				
Clear	CR		edge. ⁻ When	The pulse width	should be 10 No. PD22 se	control counter droop pulses on its leading ms or more. etting is "□ □ □ 1", the pulses are always
Manual pulse generator multiplication 1	TP0				•	or of the manual pulse generator. er No. PA05 setting is made valid.
Manual pulse generator multiplication 2	TP1	\land		(Note) Inp	out signal	Manual pulse generator multiplication factor
				TP1	TP0	multiplication ractor
				0	0	Parameter No. PA05 setting
				0	1	1 time
				1	0	10 times
				1	1	100 times
				Note. 0: OFF 1: ON		

Note. These are pin Nos. assigned at default.

(2) Output device

POINT	
 Output dev 	vices assigned to the CN6 connector pins can be used with the
remote ou	tput 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 finish	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	\sim	
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.

Device	Symbol	Connector pin No.	Functions/Applications
Zero speed	ZSP		ZSP turns on when the servo motor speed is zero speed (50r/min) or less. Zero speed can be changed using parameter No. PC17. Example Zero speed is 50r/min Forward rotation OFF level 70r/min oN level 50r/min Servo motor 0r/min direction OFF level
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
	NP	CN6-19	14.18.)

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	DO-2
Encoder B-phase pulse (differential line driver)	LB LBR	CN6-12 CN6-25	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.	
Encoder Z-dhase 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 400µs. For home position return using this pulse, set the creep speed to 100r/min. or less.	DO-2

4.5.4 Power supply

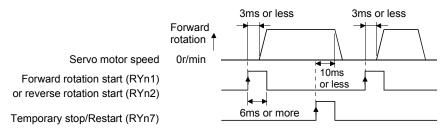
Signal	Symbol	Connector pin No.	Functions/Applications	I/O division
Digital I/F power supply input	DICOM	CN6-5	Used to input 24VDC (24VDC±10% 150mA) for I/O interface. The power supply capacity changes depending on the number of I/O interface points to be used. Connect the plus of 24VDC terminal external 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 (RYn)1 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 signals 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 finish (RXnC) is output.

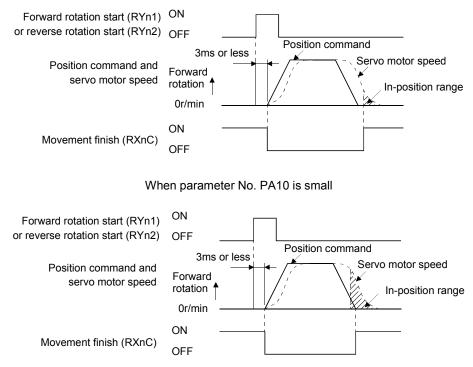
4.6.2 Movement finish • rough match • in position

POINT

 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 finish (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 finish

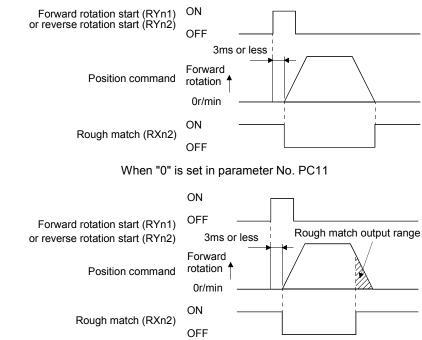
The following timing charts show the output timing relationships between the position command generated in the servo amplifier and the movement finished (RYnC). This timing can be changed using parameter No. PA10 (in-position range). RYnC turns ON in the servo-on status.



When parameter No. PA10 is large

(2) Rough match

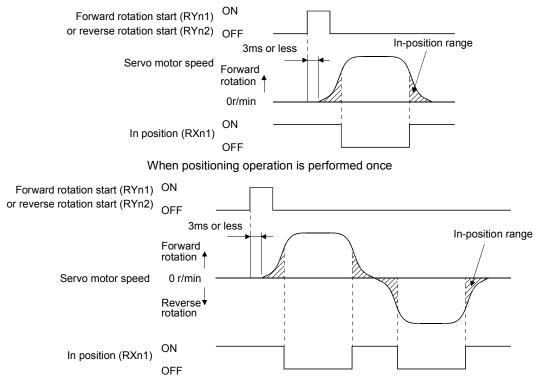
The following timing charts show the relationships between the signal and the position command generated in the servo amplifier. This timing can be changed using parameter No. PC11 (rough match output range). RXn2 turns ON in the servo-on status.



When 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.



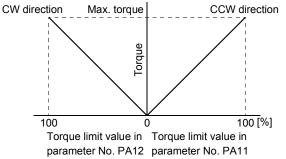
When servo motor reverses rotation direction during automatic continuous operation

4.6.3 Torque limit

	- If the torque limit is canceled during servo lock, the servomotor may suddenly
<u>VI</u> CAUTION	rotate according to position deviation in respect to the command position.

(1) Torque limit and torque

By setting parameter No. PA11 (forward torque limit) or parameter No. PA12 (reverse 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 torque limit (parameter No. PA11), or reverse torque limit (parameter No. PA12) can be chosen using the external torque limit selection (RY(n+2)6).

(Note) RY(n+2)6	Validated torque limit value			
(NOLE) K (11+2)0	CCW driving/CW regeneration	CW driving/CCW regeneration		
0	Parameter No. PA11	Parameter No. PA12		
1	Parameter	No. PC35		

Note. 0: OFF 1: ON

1. 011

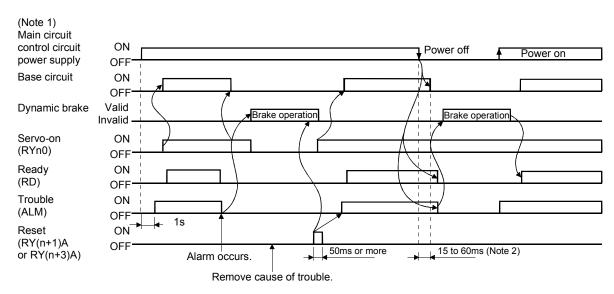
(3) Limiting torque (RXn4)

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

4.7 Alarm occurrence timing chart

• 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

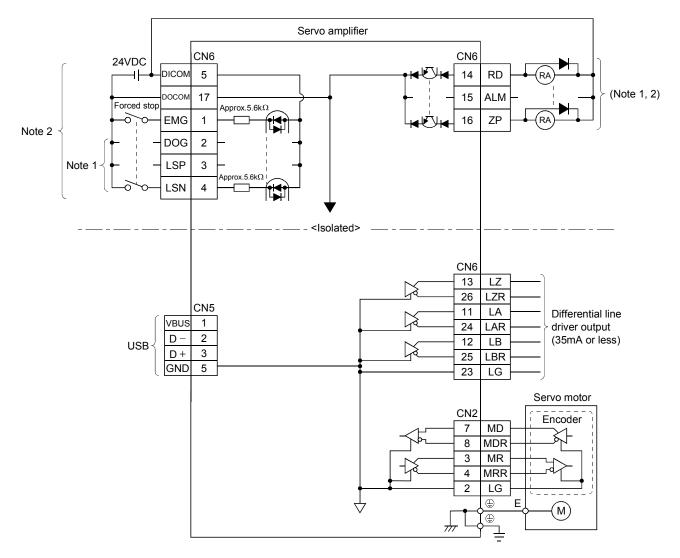
If operation is repeated by switching control circuit power off, then on to reset the regenerative (A30) alarm after its occurrence, the external regenerative resistor will generate heat, resulting in an accident.

- (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, or to 158VDC or less for the MR-J3-□T1.
- (4) Incremental system

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

4.8 Interface

4.8.1 Internal connection diagram



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

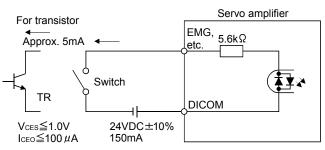
2. For this sink I/O interface. For the source I/O interface, refer to section 4.8.3.

4.8.2 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

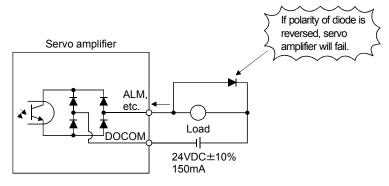
Give a signal with a relay or open collector transistor. Refer to section 4.8.3 for the source input.



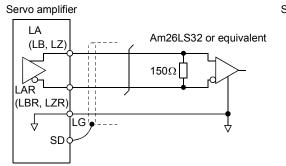
(2) Digital output interface DO-1

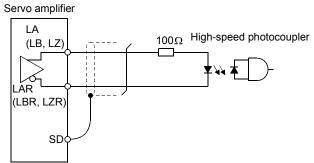
A lamp, relay or photocoupler can be driven. Install a diode (D) for an inductive load, or install an inrush current suppressing resistor (R) for a lamp load. (Permissible current: 40mA or less, inrush current: 100mA or less) A maximum of 2.6V voltage drop occurs in the servo amplifier.

Refer to section 4.8.3 for the source output.

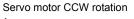


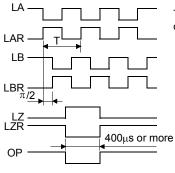
- (3) Encoder pulse output DO-2 (Differential line driver system)
 - (a) Interface
 - Max. output current: 35mA





(b) Output pulse



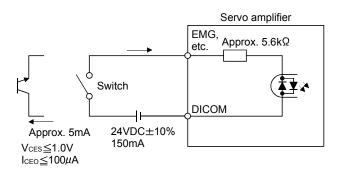


Time cycle (T) is determined by the settings of parameter No.PA15 and PC19.

4.8.3 Source I/O interfaces

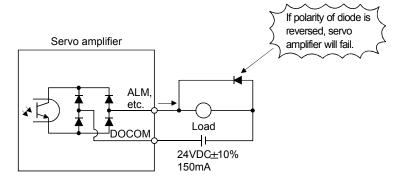
In this servo amplifier, source type I/O interfaces can be used. In this case, all DI-1 input signals and DO-1 output signals are of source type. Perform wiring according to the following interfaces.

(1) Digital input interface DI-1



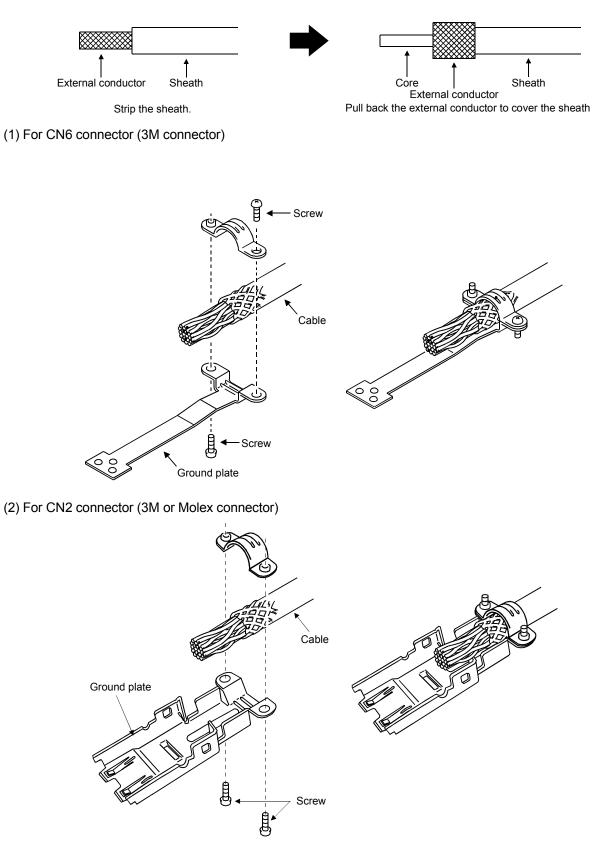
(2) Digital output interface DO-1

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



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.



4.10 Connection of servo amplifier and servo motor

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

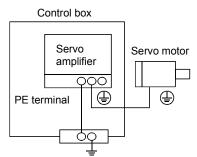
4.10.1 Connection instructions

 Insulate the connections of the power supply terminals to prevent an electric shock.
Connect the wires to the correct phase terminals (U, V, W) of the servo amplifier
and servo motor. Otherwise, the servo motor will operate improperly.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 cal		ction 14.1 for the selection of the encoder cable.	

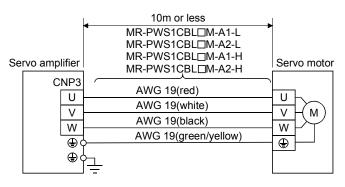
This section indicates the connection of the motor power supply (U, V, W). Use of the optional cable and connector set is recommended for connection between the servo amplifier and servo motor. When the options are not available, use the recommended products. Refer to section 14.1 for details of the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



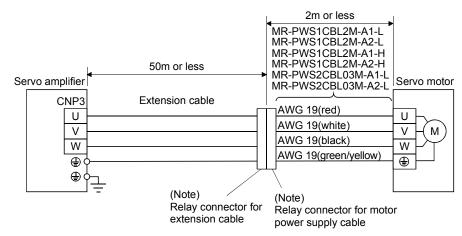
(2) Do not share the 24VDC interface power supply between the interface and electromagnetic brake. Always use the power supply designed exclusively for the electromagnetic brake.

- 4.10.2 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.

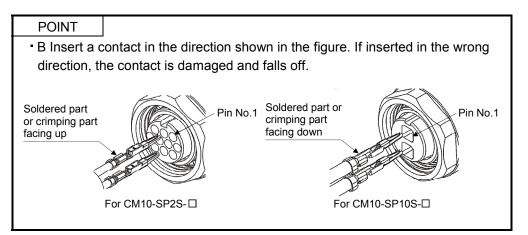


Note. Use of the following connectors is recommended when ingress protection (IP65) is necessary.

Relay Connector	Description	Protective Structure
Relay connector for extension cable	Connector: RM15WTP-4P Cord clamp: RM-15WTP-CP(5) (Hirose Electric)	IP65
ricitly connector for	Connector: RM15WTJA-4S Cord clamp: RM-15WTP-CP(8) (Hirose Electric)	IP65

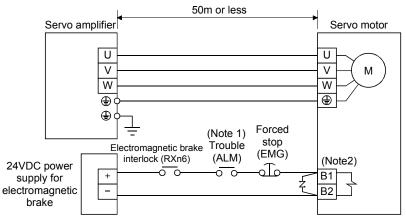
4. SIGNALS AND WIRING

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

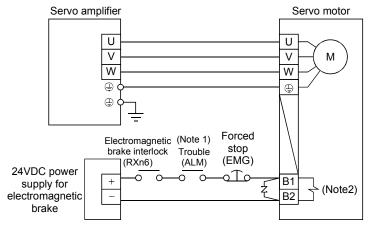


(a) Wiring diagrams

Refer to section 14.9 for the cables used for wiring.



When the power supply connector and the electromagnetic brake connector are separately supplied

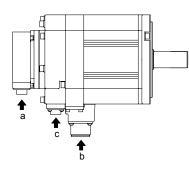


When the power supply connector and the electromagnetic brake connector are shared Note 1. Shut off the circuit on detection of the servo amplifier alarm.

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

(b) Connector and signal allotment

The connector fitting the servomotor is prepared as optional equipment. Refer to section 14.1. For types other than those prepared as optional equipment, refer to chapter 3 in Servomotor Instruction Manual, Vol. 2 to select.



	Servo motor side connectors			
Servo motor	Encoder	Power supply	Electromagnetic brake	
HF-SP52 to 152		MS3102A18-10P		
HF-SP51 • 81		W00102A10-101		
HF-SP202 to 502		MS3102A22-22P	CM10-R2P (DDK)	
HF-SP121 to 301		WIGG TUZAZZ-ZZF		
HF-SP421 • 702	CM10-R10P	CE05-2A32-17RD-B		
HC-RP103 to 203		CE05-2A22-23PD-B		
HC-RP353 • 503	(DDK)	CE05-2A24-10PD-B	The connector for power is shared	
HC-UP72 • 152		CE05-2A22-23PD-B		
HC-UP202 to 502		CE05-2A24-10PD-B	MS3102A10SL-4P	
HC-LP52 to 152		CE05-2A22-23PD-B	The connector for power is shared	
HC-LP202 • 302		CE05-2A24-10PD-B	MS3102A10SL-4P	

Pov Encoder connector signal allotment CM10-R10P

1

2

3

4

5

6

7

8

9

10

Signal

MR

MRR

BAT

LG

Ρ5

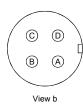
SHD

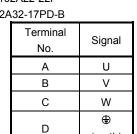
Terminal No.



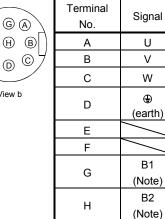
View a

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





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



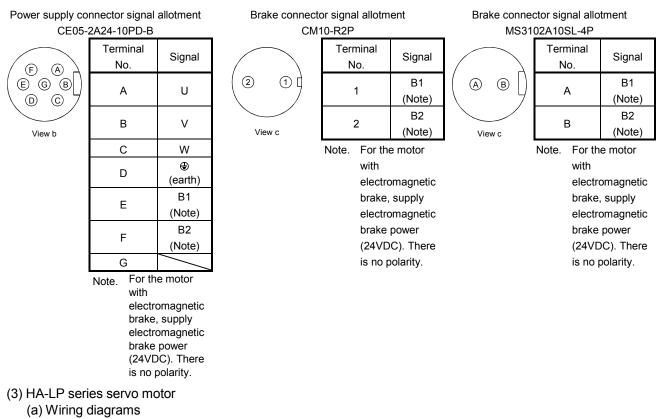
For the motor Note. with electromagnetic brake, supply electromagnetic brake power (24VDC). There is no polarity.

F E

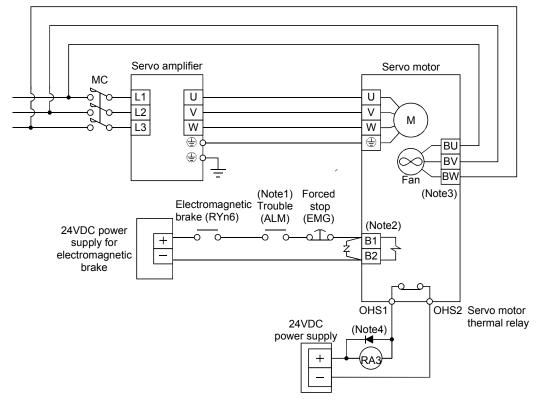
(earth)

 \odot D View b

4. SIGNALS AND WIRING



Refer to section 14.9 for the cables used for wiring.

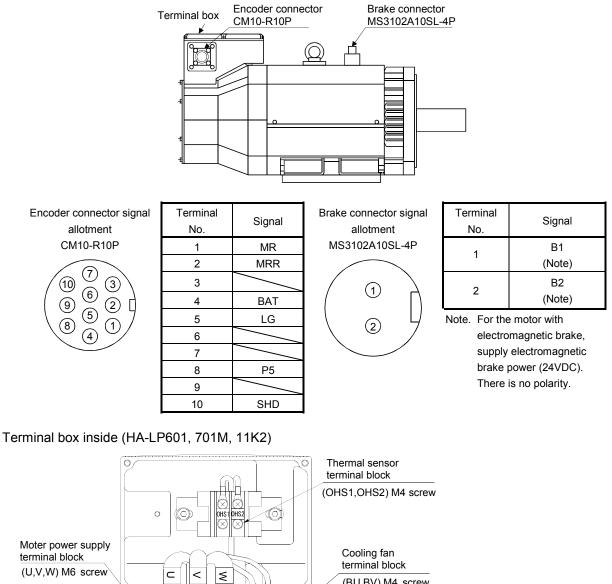


Note 1. Shut off the circuit on detection of the servo amplifier alarm.

- 2. When using the external dynamic brake, refer to section 14.6.
- 3. There is no BW for HA-LP801, HA-LP12K1, HA-LP11K1M or HA-LP11K2.
- 4. Configure the power supply circuit which turns off the magnetic contactor after detection of servo motor thermal.

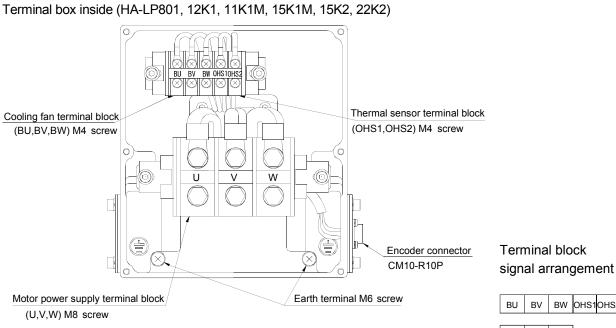
4. SIGNALS AND WIRING

(b) Servo motor terminals

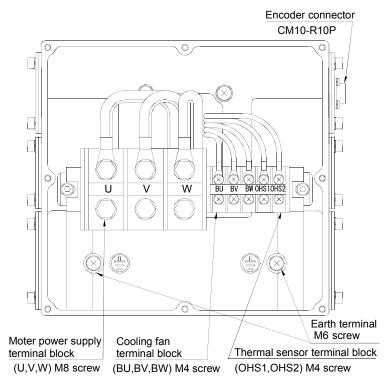


Moter power supply terminal block (U,V,W) M6 screw (BU,BV) M4 screw Earth terminal W BU (×) BV M6 screw i k Terminal block signal 0 arrangement Encoder connector 0 CM10-R10P OHS1OHS2





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





U V W

Terminal block signal arrangement

U	v	W	BU	BV	BW	OHS1	OHS2

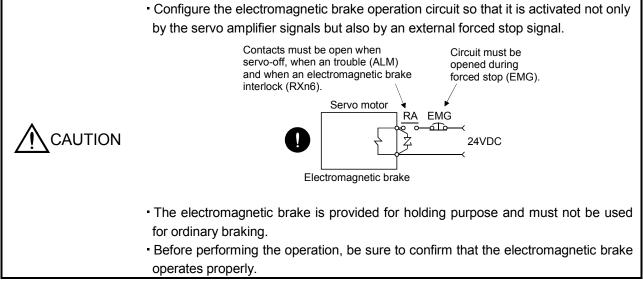
4. SIGNALS AND WIRING

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.			
		Supp	bly power which satisfies the following speci	fications.	
			HA-LP801 • HA-LP12K1 • HA-LP11K1M •	HA-LP11K2	
			Item	Description	
			Voltage/frequency	Single-phase 200 to 220VAC, 50Hz Single-phase 200 to 230VAC, 60Hz	
			Power consumption [W]	42(50Hz)/54(60Hz)	
	(Note)		Rated voltage [V]	0.12(50Hz)/0.25(60Hz)	
Cooling fan	BU • BV • BW		HA-LP15K1 • HA-LP15K1M • HA-LP15K2 • HA-LP20K1 • HA-LP25K1 • HA-LP22K1M • HA-LP22K2		
			Item	Description	
			Voltage/frequency	Single-phase 200 to 220VAC, 50Hz Single-phase 200 to 230VAC, 60Hz	
			Power consumption [W]	42(50Hz)/54(60Hz)	
			Rated voltage [V]	0.30(50Hz)/0.25(60Hz)	
Motor thermal relay	OHS1 • OHS2	OHS1—OHS2 are opened when heat is generated to an abnormal temperature. Maximum rating: AC/DC 125V, or 250V, 2A Minimum rating: AC/DC 6V, 0.15A			
Earth terminal	Ð	For grounding, connect to the earth of the control box via the earth terminal of the servo amplifier.			

Note. There is no BW if HA-LP801,HA-LP12K1, HA-LP11K1M or HA-LP11K2 is used.

4.11 Servo motor with electromagnetic brake

4.11.1 Safety precautions



Ĩ	POINT	
	 Refer to th 	e 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 electromagnetic brake is used:

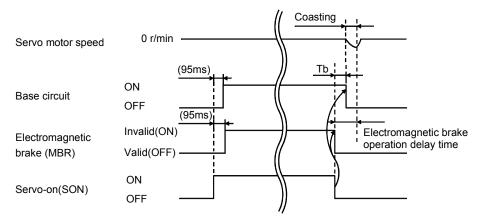
- 1) Do not share the 24VDC interface power supply between the interface and electromagnetic brake. Always use the power supply designed exclusively for the electromagnetic brake.
- 2) The brake will operate when the power (24VDC) switches off.
- 3) Switch off the servo-on (RYn0) after the servo motor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

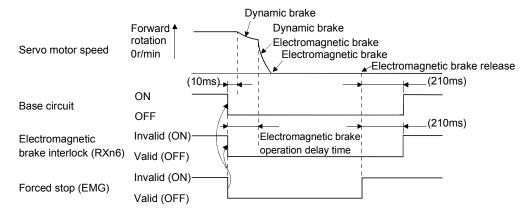
4.11.2 Timing charts

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

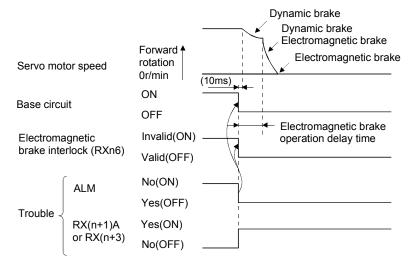
Tb [ms] after the servo-on (RYn0) signal is switched off, the servo lock is released and the servo motor coasts. If the electromagnetic brake is made valid in the servo lock status, the brake life may be shorter. Therefore, when using the electromagnetic brake in a vertical lift application or the like,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



(2) Forced stop (EMG) ON/OFF

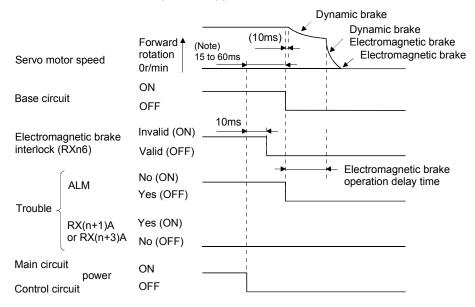


(3) Alarm occurrence



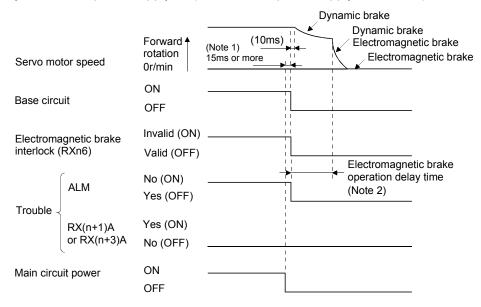
4. SIGNALS AND WIRING

(4) Both main and control circuit power supplies off



Note. Changes with the operating status.

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



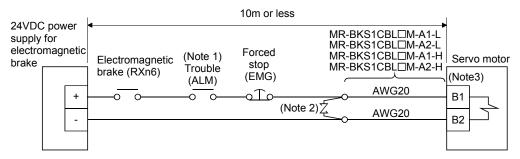
Note 1. Changes with the operating status.

- When the main circuit power supply is off in a motor stop status, the main circuit off warning (A.E9) occurs and the trouble (ALM) does not turn off.

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

POINT • 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. Shut off the circuit on detection of the servo amplifier alarm.

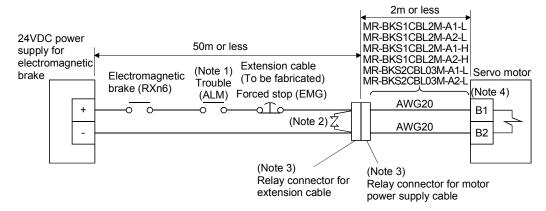
2. Connect a surge absorber as close to the servo motor as possible.

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

When fabricating the motor brake cable MR-BKS1CBL-DM-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 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 1. Shut off the circuit on detection of the servo amplifier alarm.

- 2. Connect a surge absorber as close to the servo motor as possible.
- 3. Use of the following connectors is recommended when ingress protection (IP65) is necessary.
- 4. There is no polarity in electromagnetic brake terminals (B1 and B2).

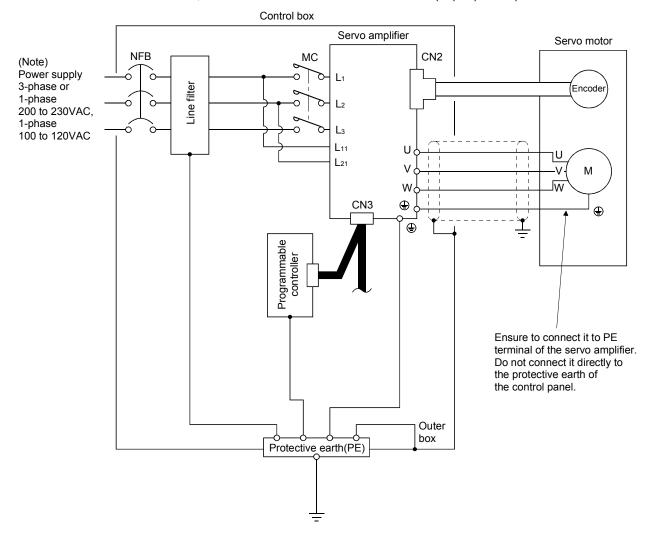
Relay Connector	Description	Protective Structure
Relay connector for extension cable	CM10-CR2P-* (DDK) [⊥] Wire size: S, M, L	IP65
Relay connector for motor power supply cable	CM10-SP2S- * (DDK) ^T Wire size: S, M, L	IP65

4. SIGNALS AND WIRING

4.12 Grounding

•	 Ground the servo amplifier and servo motor securely.
WARNING	 To prevent an electric shock, always connect the protective earth (PE) terminal 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 $L_1 \cdot L_2$ and leave L_3 open. There is no L_3 for 1-phase 100 to 120VAC power supply.

MEMO

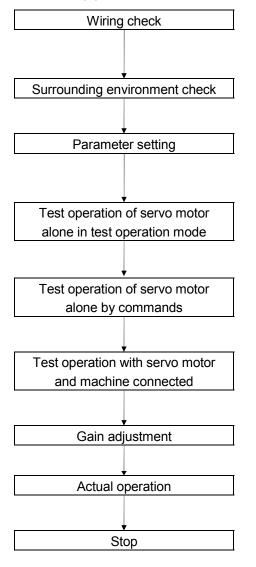
5. STARTUP

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

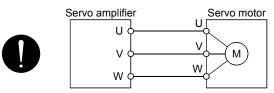
Stop giving commands and stop operation.

5.1.2 Wiring check

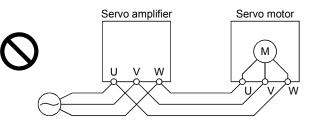
(1) Power supply system wiring

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.

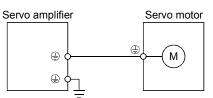


2) The power supplied to the servo amplifier should not be connected to the servo motor power supply terminals (U, V, W). To do so will fail the connected servo amplifier and servo motor.

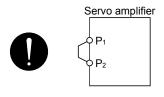


3) The earth terminal of the servo motor is connected to the PE terminal of the servo amplifier.





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

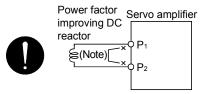


- (c) When option and auxiliary equipment are used
 - 1) When regenerative option is used under 3.5kW
 - The lead between P terminal and D terminal of CNP2 connector should not be connected.
 - The generative brake option should be connected to P terminal and C terminal.
 - A twisted cable should be used. (Refer to section 14.2)

- 2) When regenerative option is used over 5kW
- The lead of built-in regenerative resistor connected to P terminal and D 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 supply return converter are used over 5kW

- The lead of built-in regenerative resistor connected to P terminal and D terminal of TE1 terminal block should not be connected.
- Brake unit, power supply return 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 across P1-P2 (For 11kW or more, P-P1). (Refer to section 14.11.)



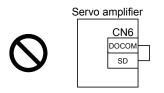
Note. Always disconnect the wiring across P1-P2 (For 11kW or more, P-P1).

(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.

5.2 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 4.11.2 for the servo motor equipped with 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

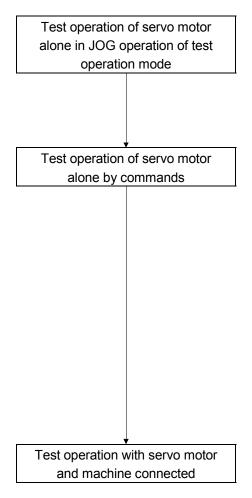
The base circuit is shut off and the dynamic brake is operated to bring the servo motor to a sudden stop. The servo forced stop warning (AE6) occurs.

(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.

5.2.3 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.

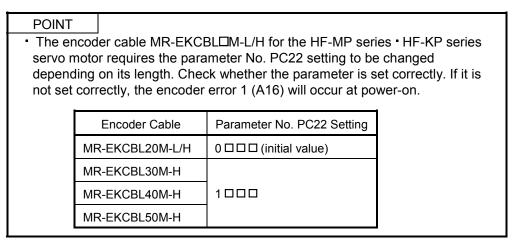
- Switch on the Forced stop (EMG) and Servo-on (RYn0). When the servo amplifier is put in a servo-on status, the Ready (RD) switches on.
- 2) Switch on the Forward rotation stroke end (LSP) or Reverse rotation stroke end (LSN).
- 3) When the point table is designated to switch on the forward rotation (RYn1) or reverse rotation (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.

- 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 (ST1) or reverse rotation start (ST2) 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, command pulse frequency, load ratio, etc.
- 4) Then, check automatic operation with the program of the command device.

5.2.4 Parameter setting



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

Parameter Group	Main Description
Basic setting parameter	Set the basic setting parameters first. Generally, operation can be performed by merely setting this
(No. PA □ □)	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	If satisfactory operation cannot be achieved by the gain adjustment made by auto tuning, execute in-
(No. PB □ □)	depth gain adjustment using this parameter group.
	This parameter group must also be set when the gain switching function is used.
Extension setting parameter	This parameter group is unique to MR-J3-□T servo amplifier.
(No. PC □ □)	
I/O setting parameter	Used when changing the I/O devices of the servo amplifier.
(No. PD 🗆 🗆)	

5. STARTUP

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.

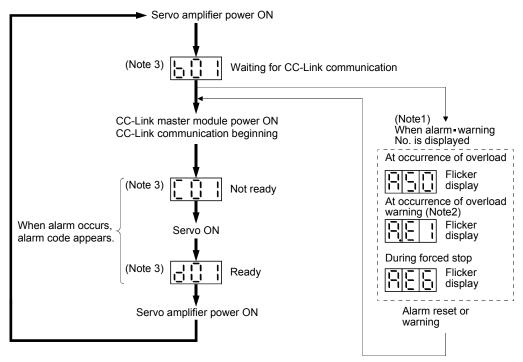
5.2.6 Actual operation

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.

5.3 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.The right-hand segments of b01, c02 and d16 indicate the axis number. (Below example indicates Station No.1)

581	503	<u>8</u> 84
Station	Station	Station
No.1	No.2	No.64

(2) Indication list

Indication	Status	Description		
b##	Waiting for CC-Link communication	CC-Link master module is OFF.		
(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) A * *	Alarm - Warning	• Warning The alarm No./warning No. that occurred is displayed. (Refer to section 11.4.)		
888	CPU error	CPU watchdog error has occurred.		
(Note 3) b 0 0.		JOG operation • positioning operation • programmed operation • DO forced output • single- step feed		
(Note 1)	(Note 4) Test operation mode	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 the warning/alarm No.

Note 3. Requires MR Configurator or MR-PRU03 parameter module.

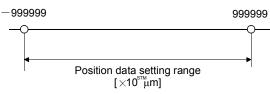
- 5.4 Automatic operation mode
- 5.4.1 What is automatic operation mode?
- (1) Command system

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 9999999 [$\times 10^{STM} \mu m$] (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 [×10^{STM} µm] (STM = feed length multiplication parameter No.PA05) Current address Target address →O Position data = |target address - current address|

- (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	t Set the deceleration time constant.		
Dwell	Set the waiting time when performing automatic continuous operation.		
Auxiliary function	Set when performing automatic continuous 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)								
2 stations occupied 1 station occupied					Selected point table No.			
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

5.4.2 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.

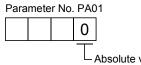
Set the position data, motor speed, acceleration time constant, deceleration time constant, dwell and auxiliary function to the point table. The following table gives a setting example. However, this function cannot be used when the point table No. is selected using the remote register of CC-Link:

Name	Setting range	Unit	Description
Position data	-999999 to 999999	×10 ^{s™} μm	 When using this point table as absolute value command system Set the target address (absolute value). 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 this section (4).

(b) Parameter setting

Set the following parameters to perform automatic operation:

- 1) Command mode selection (parameter No.PA01)
 - Select the absolute value command system.

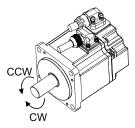


Absolute value command system

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]
	1	-999.999 to +999.999
	10	-9999.99 to +9999.99
	100	-99999.9 to +99999.9
	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 No. selection 1 (RYnA)	
	Point table No. selection 2 (RYnB)	
	Point table No. selection 3 (RYnC)	
Point table selection	Point table No. selection 4 (RYnD)	Defer to eachier $E(4,1,(2))$
	Point table No. selection 5 (RYnE)	Refer to section 5.4.1, (2).
	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)	
Start	Forward rotation start (RYn1)	Turn RYn1 ON to start.

(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:

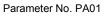
Name	Setting range	Unit	Description	
Position data	0 to 999999	×10 ^{s™} μm	Set the moving distance. The unit can be changed using feed length multiplication factor selection of parameter No. PA05.	
Servo motor speed	0 to permissible speed	r/min	Set the command speed of the servo motor for execution 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) of 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.

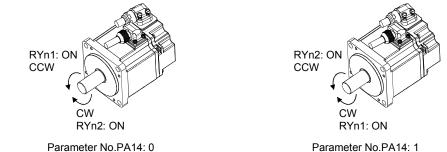




2) Forward rotation direction selection (parameter No.PA14)

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		
Falameter NO.FA 14 Setting	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)	



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]
	1	0 to 999.999
	10	0 to 9999.99
	100	0 to 99999.9
	1000	0 to 999999

(c) Operation

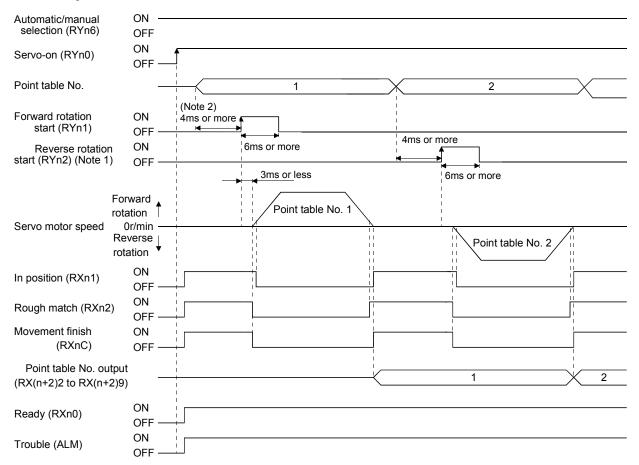
Choosing the point table using RYnA to RynE, RY(n+2)3 to RY(n+2)5 and turning RYn1 ON starts a motion in the forward rotation direction over the moving distance of the position data at the preset speed and acceleration time constant.

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.
Start	Reverse rotation start (RYn2)	Turn RYn2 ON to start motion in reverse rotation direction.

(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. External input signal detection delays by the input filter setting time of parameter No. PD19. Also, make up a sequence that will change the point table selection earlier by the time that takes into account the output signal sequence from the controller and the variation of a signal change due to the hardware.

(4) Automatic continuous operation

POINT

• 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

	Point table setting		
		Auxiliary function	
	Dwell	When position data is absolute value	When position data is incremental value
Automatic continuous Speed changing operation	0	1	3
positioning operation	1 or more	1	3

2) In incremental value command system

		Point table setting
Automatic continuous	Dwell	Auxiliary function
Automatic continuous Speed changing operation	0	1
positioning operation	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.

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

The following table gives a setting example:

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.

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.

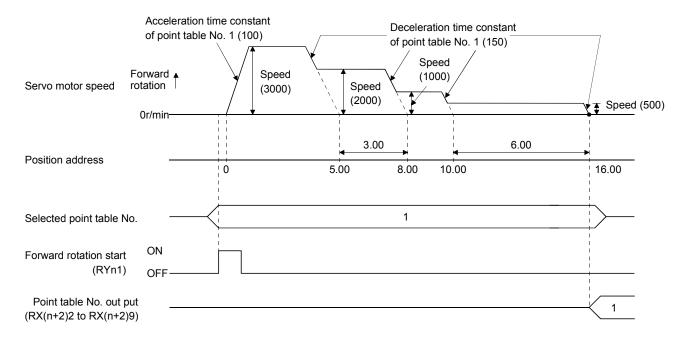
Point table	Position data	Servo motor	Acceleration time constant	Deceleration time constant	Dwell [ms]	Auxiliary
No.	[×10 ^{s™} µm]	speed [r/min]	[ms]	[ms]	(Note 1)	function
1	5.00	3000	100	150	0	1
2	3.00	2000	Invalid	Invalid	0	3
3	10.00	1000	Invalid	Invalid	0	1
4	6.00	500	Invalid	Invalid	0	0 (Note 2)

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



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.

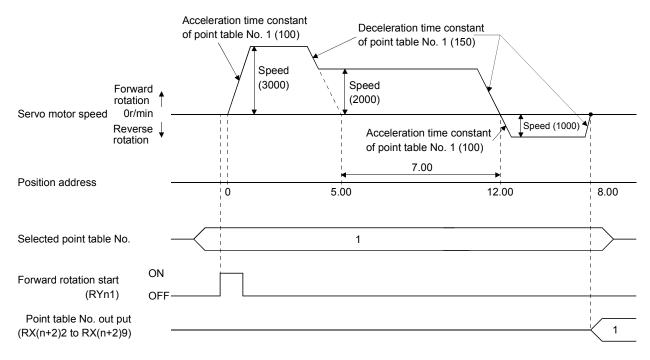
Point table	Position data	Servo motor	Acceleration time constant	Deceleration time constant	Dwell [ms]	Auxiliary
No.	[×10 ^{s™} µm]	speed [r/min]	[ms]	[ms]	(Note 1)	function
1	5.00	3000	100	150	0	1
2	7.00	2000	Invalid	Invalid	0	1
3	8.00	1000	Invalid	Invalid	0	0 (Note 2)

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



2) Incremental value command system

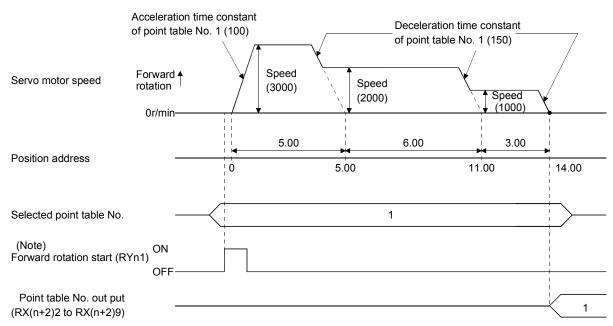
The position data of the incremental value command system is the sum of the position data of the consecutive point tables.

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

Point table	Position data	Servo motor	Acceleration time constant	Deceleration time constant	Dwell [ms]	Auxiliary
No.	[×10 ^{s™} µm]	speed [r/min]	[ms]	[ms]	(Note 1)	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.

(c) Temporary stop/restart

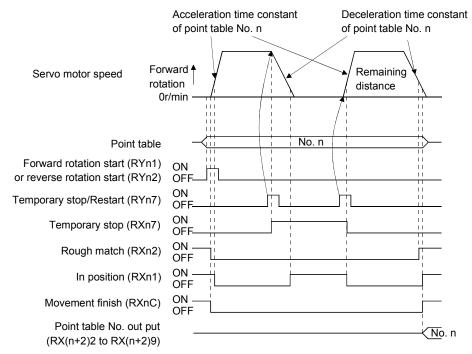
When RYn7 is turned ON during automatic operation, the motor is decelerated to a temporary stop at the deceleration time constant in the point table being executed. When RYn7 is turned ON again, the remaining distance is executed.

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

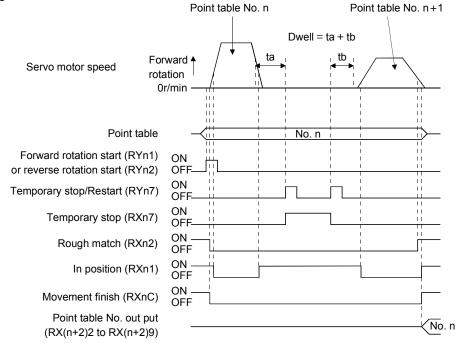
The remaining moving distance is cleared when the operation mode is changed from the automatic mode to the manual mode during a temporary stop.

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

1) When the servo motor is rotating



2) During dwell



5 - 21

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 signals and parameters as indicated below.

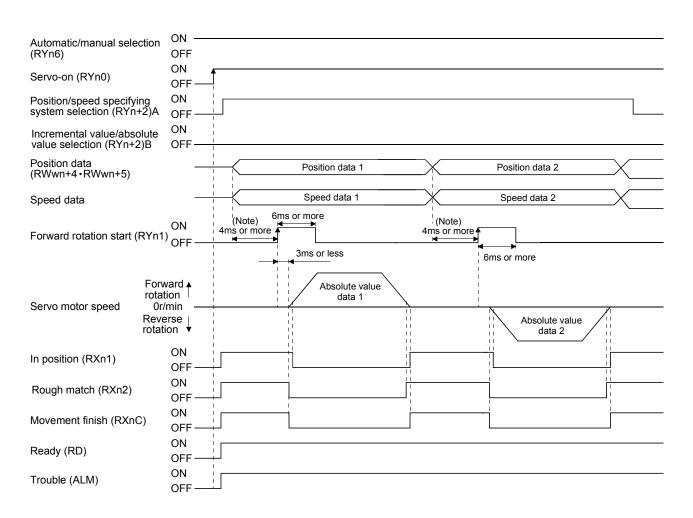
Item	Used device/parameter	Description
Automatic operation mode	Automatic/manual selection (RYn6)	Turn RYn6 ON.
Remote register-based position/speed setting	Position/speed specifying system selection (RY(n+2)A)	Turn RY(n+2)A ON.
Command system	Parameter No.PA03	□□□0 : Absolute value command system is selected.
Remote register-based position/speed specifying system selection	Parameter No.PC30	DD2: Remote register-based position/speed specifying system is selected.
Position data	Position command data under 16 bit (RWwn+4) Position command data upper 16 bit (RWwn+5)	Set the under 16 bits of position data to RWwn+4, and the upper 16 bits to RWwn+5. Setting range: -9999999 to 999999
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. STARTUP



Note. An external input signal is detected after a delay of the input filter setting time in parameter No. PD19. Also, configure a sequence that will change Point table selection earlier with consideration given to the output signal sequence from the controller and the variations of signal changes due to the hardware.

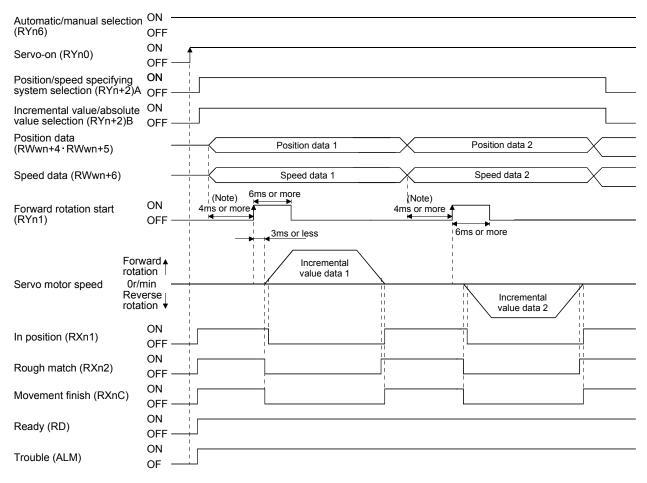
5. STARTUP

(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 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.PA03	□□□0 : Absolute value command system is selected.
Remote register-based position/speed specifying system selection	Parameter No.PC30	□□□2 : Remote register-based position/speed specifying system is selected.
Position data	Position command data under 16 bit (RWwn+4) Position command data upper 16 bit	Set the under 16 bits of position data to RWwn+4, and the upper 16 bits to RWwn+5.
	(RWwn+5)	Setting range: -9999999 to 999999
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.



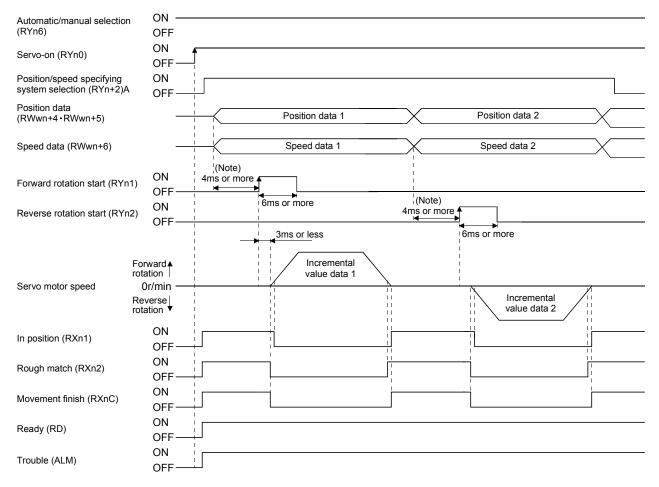
Note. An external input signal is detected after a delay of the input filter setting time in parameter No. PD19. Also, configure a sequence that will change Point table selection earlier with consideration given to the output signal sequence from the controller and the variations of signal changes due to the hardware.

(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.PA30	□□□1 : Incremental value command system is selected.
Remote register-based position/speed specifying system selection	Parameter No.PC30	□□□2 : Remote register-based position/speed specifying system is selected.
Position data	Position command data under 16 bit (RWwn+4) Position command data upper 16 bit	Set the under 16 bits of position data to RWwn+4, and the upper 16 bits to RWwn+5
Servo motor speed	(RWwn+5) Speed command data (RWwn+6)	Setting range: 0 to 999999 Set the servo motor speed.

Set " $\Box\Box\Box$ 1" in parameter No. PA03 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.



Note. An external input signal is detected after a delay of the input filter setting time in parameter No. PD19. Also, configure a sequence that will change Point table selection earlier with consideration given to the output signal sequence from the controller and the variations of signal changes due to the hardware.

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

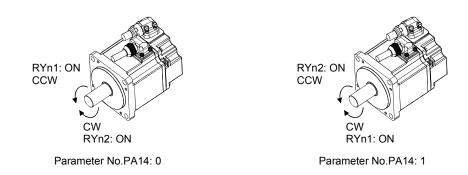
(1) Setting

Set the input 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.
Servo motor rotation direction	Parameter No.PA14	Refer to (2) of this section.
Jog speed	Parameter No.PC12	Set the speed of the servo motor.
	Point table No.1	Use the acceleration/deceleration
Acceleration/deceleration time constant		time constants in point table No.1.

(2) Servo motor rotation direction

Parameter No. PA14 setting	Servo motor rotation direction	
Farameter No. FA14 Setting	Forward rotation start (RYn1) ON	Reverse rotation start (RYn2) ON
0	CCW rotation	CW rotation
1	CW rotation	CCW rotation



(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) of this section. By turning RYn2 ON, the servo motor rotates in the reverse direction to forward rotation start (RYn1).

(4) Timing chart

Automatic/manual selection (RYn6)	ON OFF		
Servo-on (RYn0)	ON OFF		
Forward rotation start (RYn1		Forward rotation jog	
Reverse rotation start (RYn2	2) ON OFF		Reverse rotation jog
Forw rotati Servo motor speed 0r/mi Reve rotati	ion in erse		
Rough match (RXn2)	ON OFF		
Movement finish (RXnC)	ON OFF		
Ready (RD)	ON OFF		
Trouble (ALM)	ON OFF		

5.5.2 Manual pulse generator

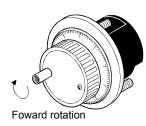
(1) Setting

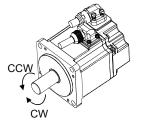
Set the input signal and parameters as follows according to the purpose of use. In this case, the point table No. selection 1 to 8 (RYnA to RYnE, RY(n+2)3 to RY(n+2)5) are invalid:

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) of this section.
Servo motor rotation direction	Parameter No.PA14	Refer to (2) of this section.

(2) Servo motor rotation direction

Decemptor No. DA14 patting	Servo motor rotation direction	
Parameter No. PA14 setting	Manual pulse generator: forward rotation	Manual pulse generator: reverse rotation
0	CCW rotation	CW rotation
1	CW rotation	CCW rotation





5 - 27

(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
	1 time	1[^µ m]
	10 times	10[µm]
	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[µm]
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) of this section.

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.

(1) Home position return types

Choose the optimum home position return according to the machine type, etc.

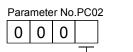
Туре	Home position return method	Features
Dog type home position return	With deceleration started at the front end of a proximity dog, the position where the first Z-phase signal is given past the rear end of the dog or a motion has been made over the home position shift distance starting from the Z-phase signal is defined as a home position.(Note)	 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.	 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.	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.	 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.	 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.	 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.	 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.	

Note. The Z-phase signal is a signal recognized in the servo amplifier once per servo motor revolution and cannot be used as an output signal.

(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).



- 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

> Proximity dog input polarity 0: OFF indicates detection of the dog. 1: ON indicates detection of the dog.

(3) Instructions

0

- 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. Otherwise, misoperation can occur.

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) Signals, parameters

Set the input devices and parameters as follows:

Item	Device/Parameter used	Description
Manual home position return mode	Automatic/manual selection (RYn6)	Turn RYn6 ON.
selection	Point table No. selection 1 to 8	RYnA to RYnE, RY(n+2)3 to RY(n+2)5 are
	(RYnA to RYnE, RY(n+2)3 to RY(n+2)5)	turned off.
Dog type home position return	Parameter No.PC02	□□□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):

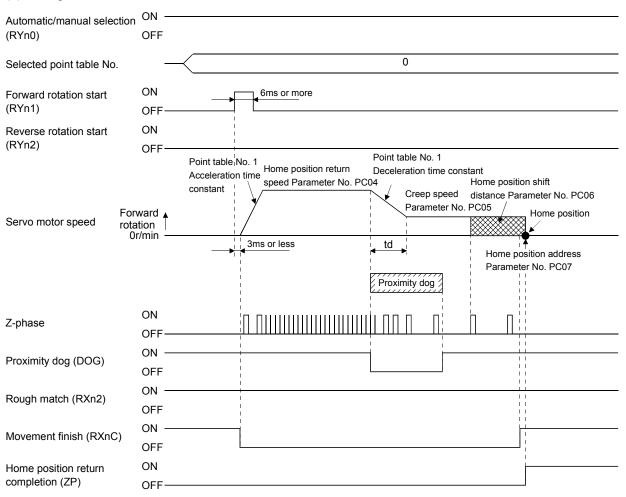
$$L_1 \geq \frac{V}{60} \cdot \frac{td}{2} \dots (5.1)$$

- L₁ : Proximity dog length [mm]
- V : Home position return speed [mm/min]
- td : Deceleration time [s]

 $L_2 \ge 2 \cdot \Delta S.$

- L_2 : Proximity dog length [mm]
- $\vartriangle S$ $\ :$ Moving distance per servo motor revolution [mm]

(3) Timing chart

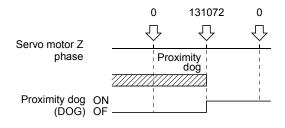


The parameter No.PC07 (home position return position data) setting value is the positioning address after the home position return is completed.

(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.



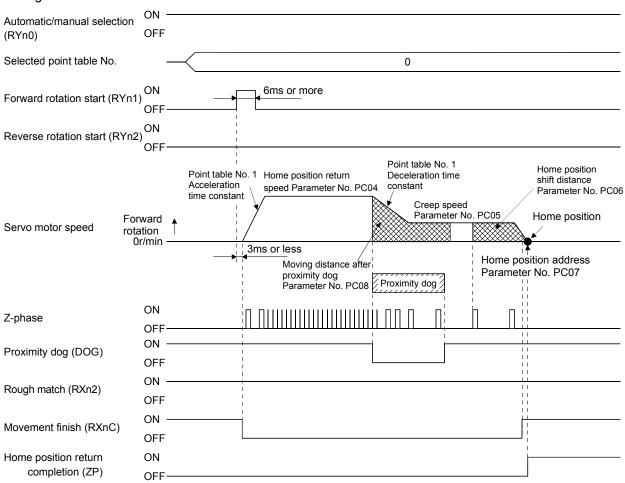
5.6.3 Count type home position return

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) Signals, parameters

Item	Device/Parameter used	Description
Manual home position return mode	Automatic/manual selection (RYn6)	Turn RYn6 ON.
selection	Point table No. selection 1 to 8	RYnA to RYnE, RY(n+2)3 to RY(n+2)5 are
	(RYnA to RYnE, RY(n+2)3 to RY(n+2)5)	turned off.
Count type home position return	Parameter No.PC02	□□□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.

(2) Timing chart



5.6.4 Data setting type home position return

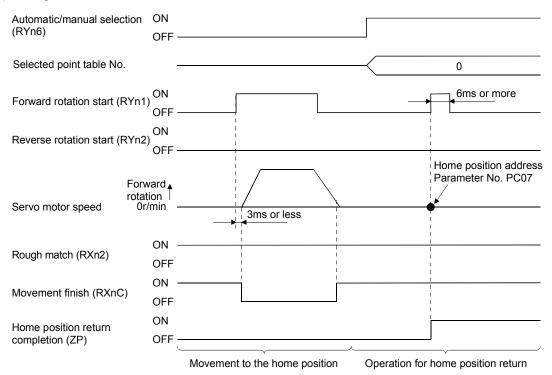
Data setting type home position return is used when it is desired to determine any position as a home position. JOG operation can be used for movement.

(1) Signals, parameters

Set the input devices and parameters as follows:

Item	Device/Parameter used	Description
Manual home position return mode	Automatic/manual selection (RYn6)	Turn RYn6 ON.
Manual home position return mode selection	Point table No. selection 1 to 8	RYnA to RYnE, RY(n+2)3 to RY(n+2)5 are
Selection	(RYnA to RYnE, RY(n+2)3 to RY(n+2)5)	turned off.
Data setting type home position	Parameter No.PC02	□□□2: Data setting type home position
return	Parameter No.PC02	return is selected.
Lieme position return position data	Parameter No.PC07	Set the current position at home position
Home position return position data		return completion.

(2) Timing chart



5.6.5 Stopper type home position return

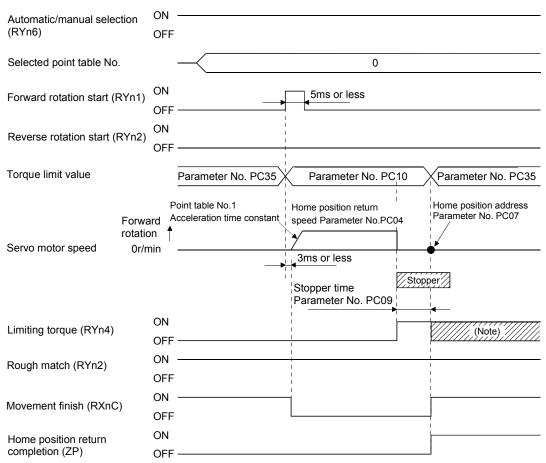
In stopper type home position return, a machine part is pressed against a stopper or the like by jog operation to make a home position return and that position is defined as a home position.

(1) Signals, parameters

Set the input devices and parameters as follows:

Item	Device/Parameter used	Description
Manual home position return	Automatic/manual selection (RYn6)	Turn RYn6 ON.
mode selection	Point table No. selection 1 to 8	RYnA to RYnE, RY(n+2)3 to RY(n+2)5 are turned
	(RYnA to RYnE, RY(n+2)3 to RY(n+2)5)	off.
Stopper type home position	Parameter No.PC02	□□□3:Stopper type home position return is
return		selected.
Home position return direction	Parameter No.PC03	Refer to section 5.6.1 (2) and choose the home
nome position retain direction		position return direction.
Home position return speed	Parameter No.PC04	Set the speed till contact with the stopper.
	Parameter No.PC09	Time from when the part makes contact with the
Stopper time		stopper to when home position return data is
		obtained to output home position return
		completion (ZP).
Stopper type home position	Parameter No.PC10	Set the servo motor torque limit value for
return torque limit	Parameter No.PCTU	execution of stopper type home position return.
Home position return	Point table No.1	Use the acceleration time constant of point table
acceleration time constant		No.1.
Home position return position	Decemeter No DC07	Set the current position at home position return
data	Parameter No.PC07	completion.

(2) Timing chart



Note. Turns ON when the torque reaches the value set to Forward torque limit (parameter No. PA11), Reverse torque limit (parameter No. PA12), Internal torque limit (parameter No. PC35) or Analog torque limit (TLA).

5.6.6 Home position ignorance (servo-on position defined as home position)

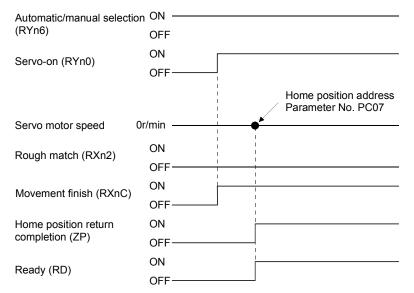
The position where servo is switched on is defined as a home position.

(1) Signals, parameter

Set the input devices and parameter as follows:

Item	Device/Parameter used	Description
Manual home position return	Automatic/manual selection (RYn6)	Turn RYn6 ON.
mode selection	Point table No. selection 1 to 8	RYnA to RYnE, RY(n+2)3 to RY(n+2)5 are
mode selection	(RYnA to RYnE, RY(n+2)3 to RY(n+2)5)	turned off.
Home position ignorance	Parameter No.PC02	□□□4: Home position ignorance is selected.
Home position return position data	Peremeter No BC07	Set the current position at home position return
Home position return position data		completion.

(2) Timing chart



5.6.7 Dog type rear end reference home position return

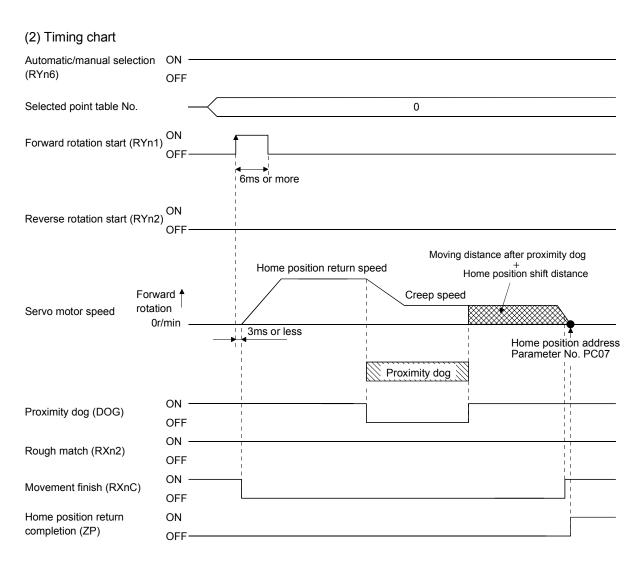
POINT	
 This home 	position return method depends on the timing of reading Proximity dog
(DOG) that	has detected the rear end of a proximity dog. Hence, if a home
position ret	urn is made at the creep speed of 100r/min, an error of \pm 400 pulses
will occur ir	the home position. The error of the home position is larger as the
creep speed	d 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) Signals, parameters

Set the input devices and parameters as indicated below.

Item	Device/Parameter used	Description
Manual home position return mode	Automatic/manual selection (RYn6)	Turn RYn6 ON.
selection	Point table No. selection 1 to 8	RYnA to RYnE, RY(n+2)3 to RY(n+2)5 are
	(RYnA to RYnE, RY(n+2)3 to RY(n+2)5)	turned off.
Dog type rear end reference home	Parameter No.PC02	□□□5: Select the dog type rear end
position return		reference.
Home position return direction	Parameter No.PC03	Refer to section 5.6.1 (2) and select the home
Home position return direction	Falameter NO.FC03	position return direction.
Dog input polarity	Parameter No.PD16	Refer to section 5.6.1 (2) and select the dog
Dog input polarity		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.
		Set when the home position is moved from
Home position shift distance	Parameter No.PC06	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
Moving distance after proximity dog		passed the proximity dog rear end.
Home position return acceleration/	Point table No.1	Use the acceleration/deceleration time
deceleration time constants		constant of point table No. 1.
Home position return position data	Parameter No.PC07	Set the current position at home position return
Tome position return position data		completion.



5.6.8 Count type front end reference home position return

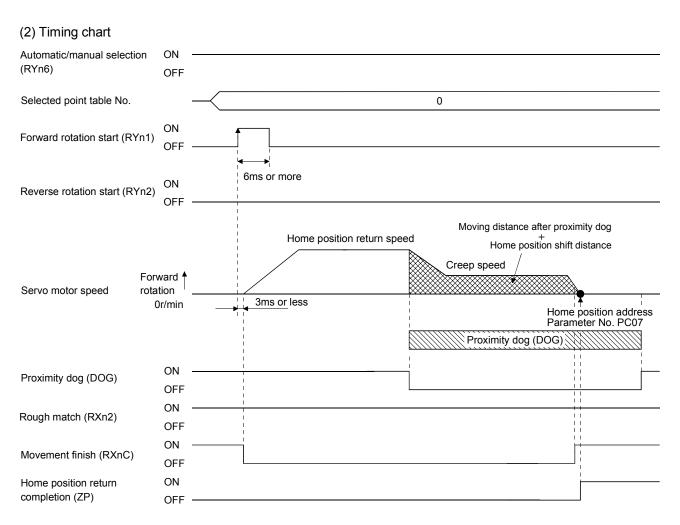
POINT	
 This home provide the second se	position return method depends on the timing of reading Proximity dog
(DOG) that	has detected the front end of a proximity dog. Hence, if a home
position retu	Irn is made at the home position return speed of 100r/min, an error of
\pm 400 pulse	s will occur in the home position. The error of the home position is
larger as the	e 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) Signals, parameters

Set the input devices and parameters as indicated below.

Item	Device/Parameter used	Description
Manual home position return mode	Automatic/manual selection (RYn6)	Turn RYn6 ON.
selection	Point table No. selection 1 to 8	RYnA to RYnE, RY(n+2)3 to RY(n+2)5 are
	(RYnA to RYnE, RY(n+2)3 to RY(n+2)5)	turned off.
Count type dog front end reference	Parameter No.PC02	$\Box \Box \Box$ 6: Select the count type dog front end
home position return		reference.
Home position return direction	Parameter No.PC03	Refer to section 5.6.1 (2) and select the home
nome position return direction		position return direction.
Dog input polarity	Parameter No.PD16	Refer to section 5.6.1 (2) and select the dog
Dog input polarity		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.
		Set when the home position is moved from
Home position shift distance	Parameter No.PC06	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/	Point table No.1	Use the acceleration/deceleration time constant
deceleration time constants		of point table No. 1.
Llome position return position data	Parameter No.PC07	Set the current position at home position return
Home position return position data		completion.



5.6.9 Dog cradle type home position return

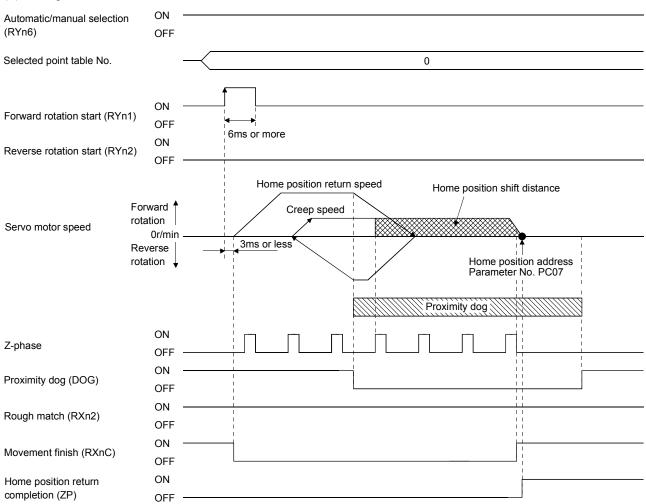
The position where the first Z-phase signal is issued after detection of the proximity dog front end can be defined as a home position.

(1) Signals, parameters

Set the input devices and parameters as indicated below.

Item	Device/Parameter used	Description
	Automatic/manual selection (RYn6)	Turn RYn6 ON.
Manual home position return mode selection	Point table No. selection 1 to 8	RYnA to RYnE, RY(n+2)3 to RY(n+2)5 are
	(RYnA to RYnE, RY(n+2)3 to RY(n+2)5)	turned off.
Dog cradle type home position return	Parameter No.PC02	\Box \Box \Box 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.

(2) Timing chart



5.6.10 Dog type first Z-phase reference home position return

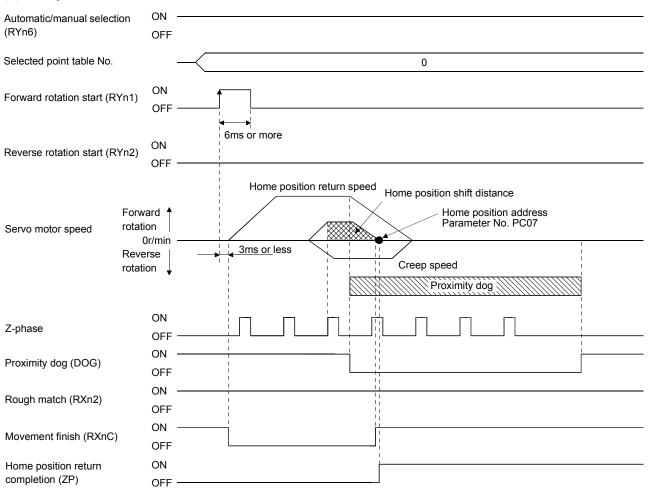
After the proximity dog front end is detected, the current position moves in the reverse direction at creep speed. After this moving away from the proximity dog, the home position is determined to be where the first Z-phase pulse is issued.

(1) Signals, parameters

Set the input devices and parameters as indicated below.

Item	Device/Parameter used	Description
	Automatic/manual selection (RYn6)	Turn RYn6 ON.
Manual home position return mode selection	Point table No. selection 1 to 8	RYnA to RYnE, RY(n+2)3 to RY(n+2)5 are
	(RYnA to RYnE, RY(n+2)3 to RY(n+2)5)	turned off.
Dog cradle type home position return	Parameter No.PC02	□ □ □ 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.

(2) Timing chart



5.6.11 Dog type front end reference home position return method

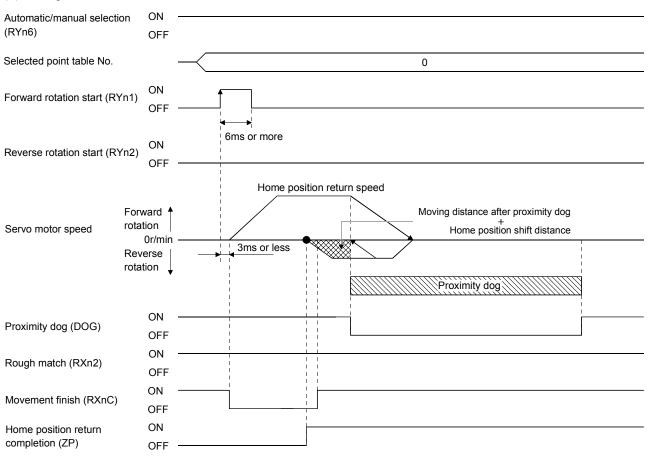
The home position is determined to be the position of the front end of the proximity dog.

(1) Signals, parameters

Set the input devices and parameters as indicated below.

Item	Device/Parameter used	Description
Manual home position raturn made	Automatic/manual selection (RYn6)	Turn RYn6 ON.
Manual home position return mode selection	Point table No. selection 1 to 8	RYnA to RYnE, RY(n+2)3 to RY(n+2)5 are
	(RYnA to RYnE, RY(n+2)3 to RY(n+2)5)	turned off.
Dog cradle type home position return	Parameter No.PC02	□ □ □ 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.

(2) Timing chart



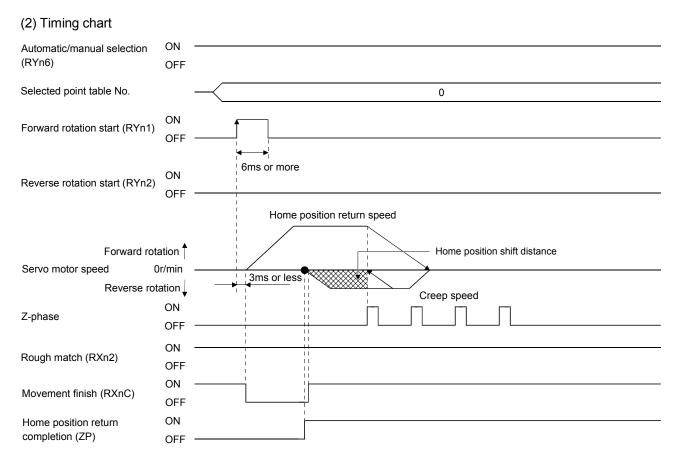
5.6.12 Dogless Z-phase reference home position return method

The home position is determined to be where the first Z-phase pulse is issued after the home position return is started.

(1) Signals, parameters

Set the input devices and parameters as indicated below.

Item	Device/Parameter used	Description
	Automatic/manual selection (RYn6)	Turn RYn6 ON.
Manual home position return mode selection	Point table No. selection 1 to 8	RYnA to RYnE, RY(n+2)3 to RY(n+2)5 are
001001.011	(RYnA to RYnE, RY(n+2)3 to RY(n+2)5)	turned off.
Dog cradle type home position return	Parameter No.PC02	\Box \Box \Box 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.

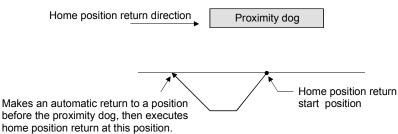


5.6.13 Home position return automatic return function

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.

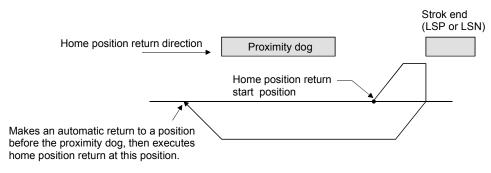
(1) When the current position is at the proximity dog

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 strok 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.

5.6.14 Automatic positioning function to the home position

POINT	
range to the	perform automatic positioning from outside the position data setting home position. In this case, make a home position return again using ome position return.

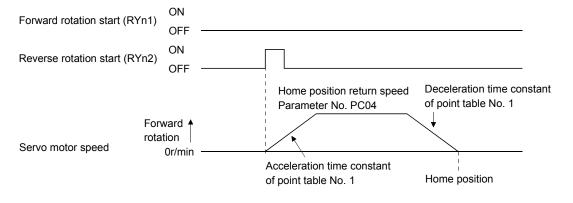
If this function is used when returning to the home position again after performing a manual home position return after a power-on and deciding the home position, automatic positioning can be carried out to the home position at high speed. In an absolute position system, manual home position return is 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	Automatic/manual selection (RYn6)	Turn RYn6 ON.		
selection	Point table No. selection 1 to 8	RYnA to RYnE, RY(n+2)3 to RY(n+2)5 are		
Selection	(RYnA to RYnE, RY(n+2)3 to RY(n+2)5)	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.



5.7 Roll feed display function in roll feed mode

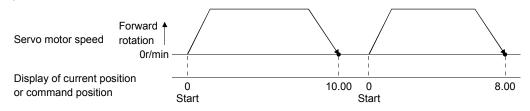
With the roll feed display function, the servo amplifier can operate in the roll feed mode. The roll feed mode uses the incremental system.

(1) Parameter settings

No.	Name	Digit to be set	Setting item	Setting value	Description
PA03	Absolute position detection system		Operation system	□□□0 (initial value)	Make sure to set the incremental system. The absolute position detection system cannot be used.
PC28	Function selection C-7		Selection between current position display and command position display	0010	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.

	Details	
Automatic operation	Automatic operation according to the point table	Section 5.4.2
Manual anaration	JOG operation	Section 5.5.1
Manual operation	Manual pulse generator operation	Section 5.5.2
Home position return mode	Section 5.6	

5.8 Absolute position detection system

•	 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 can
	cause runaway.

This servo amplifier contains a single-axis controller. Also, all servo motor encoders are compatible with an absolute position 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		
Detter	1 piece of lithium battery (primary battery, nominal + 3.6V)		
Battery	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.

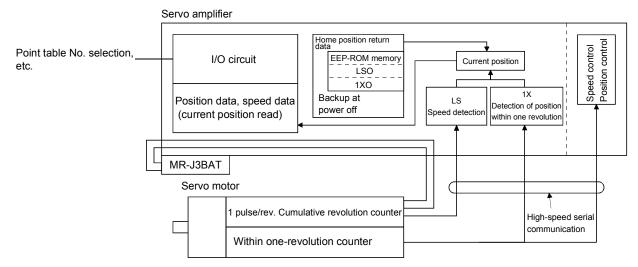
(3) Structure

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



 Before starting battery installation procedure, make sure that the charge lamp is off more than 15 minutes after power is switched OFF. Then, confirm that the voltage between P-N terminals is safe in the tester or the like with control circuit power ON. Otherwise, you may get an electric shock.

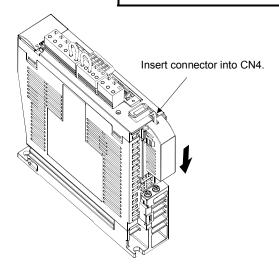
POINT

• The internal circuits of the servo amplifier may be damaged by static electricity. Always take the following precautions:

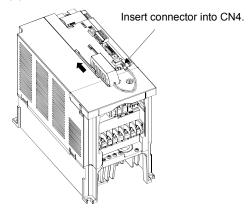
- Ground human body and work bench.
- Do not touch the conductive areas, such as connector pins and electrical parts, directly by hand.

 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.

- (a) For MR-J3-350T or less
 - POINT
 - For the servo amplifier of 3.5kW or less, in the state to insert the battery, it is not possible to wire for the earth. Insert the battery after executing the earth wiring of the servo amplifier.

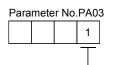


(b) For MR-J3 500T or more



(c) Parameter setting

Set parameter No.PA03 (Absolute position detection system) as indicated below to make the absolute position detection system valid:



Selection of absolute position detection system
0: Incremental system
1: Absolute position detection system

6. PARAMETERS

6. PARAMETERS

· Never adjust or change the parameter values extremely as it will make operation CAUTION 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. PADD) 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	0001h	
PA09	RSP	Auto tuning response	12	
PA10	INP	In-position range	100	μm
PA11	TLP	Forward torque limit	100.0	%
PA12	TLN	Reverse torque limit	100.0	%
PA13		For manufacturer setting	0000h	
PA14	*POL	Rotation direction selection	0	
PA15	*ENR	Encoder output pulses	4000	pulse/rev
PA16		For manufacturer setting	0	\backslash
PA17			0000h	
PA18			0000h	
PA19	*BLK	Parameter write inhibit	000Ch	

6.1.2 Parameter write inhibit

	Parameter			Unit	Sotting Dange
No.	Symbol	Name	Value Unit Setting Rang		Setting Range
PA19	*BLK	Parameter write inhibit	000Ch	/	Refer to the text.

POINT

 This parameter is made valid when power is switched off, then on after setting, or when the controller reset has been performed.

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 \bigcirc .

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	0			
000011	Write	0			
0000	Reference	0	0	0	
000Bh	Write	0	0	0	
000Ch	Reference	0	0	0	0
(initial value)	Write	0	0	0	0
	Reference	0			
100Bh	Write	Parameter No. PA19 only			
	Reference	0	0	0	0
100Ch	Write	Parameter No. PA19 only			

6.1.3 Selection of command system

		Parameter	Initial	Unit	Cotting Dongo
No.	Symbol	Name	Value	Unit	Setting Range
PA01	*STY	Control mode	0000h		Refer to the text.
		POINT			

 This parameter is made valid when power is switched off, then on after setting, or when the controller reset has been performed.

Select the command system.

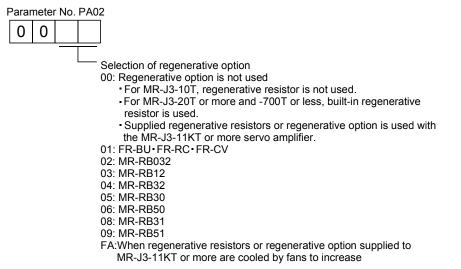
ł	Parar	nete	r No.	PA01
	0	0	0	
				—
				Selection of command system
				(Refer to section 5.4)
				0: Absolute value command system
				1: Incremental value command system

6.1.4 Selection of regenerative option

	Parameter				Sotting Pango
No.	o. Symbol Name		Value	llue Unit	Setting Range
PA02	*REG	Regenerative option	0000h	/	Refer to the text.

POINT	
 This parame setting. 	eter is made valid when power is switched off, then on after
 Wrong settir 	ng may cause the regenerative option to burn.
•	erative option selected is not for use with the servo amplifier, error (A37) occurs.

Set this parameter when using the regenerative option, brake unit, power regeneration converter, or power regeneration common converter.



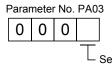
6.1.5 Using absolute position detection system

	Parameter				Sotting Dange
No.	Symbol	Name	Value	Unit	Setting Range
PA03	*ABS	Absolute position detection system	0000h		Refer to the text.

POINT

• This parameter is made valid when power is switched off, then on after setting, or when the controller reset has been performed.

Set this parameter when using the absolute position detection system.



0

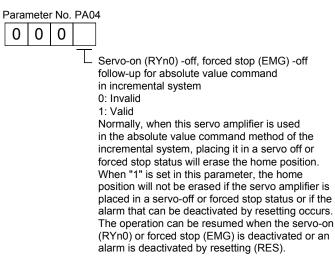
Selection of absolute position detection system (refer to section 5.7) 0: Used in incremental system 1: Used in absolute position detection system

6.1.6 Follow-up for absolute value command system in incremental system

	Parameter			Unit	Sotting Pango
No.	No. Symbol Name			Onit	Setting Range
PA04	*AOP1	Function selection A-1	0000h		Refer to the text.

POINT						
 This param 	 This parameter is made valid when power is switched off, then on after 					
setting, or when the controller reset has been performed.						

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.



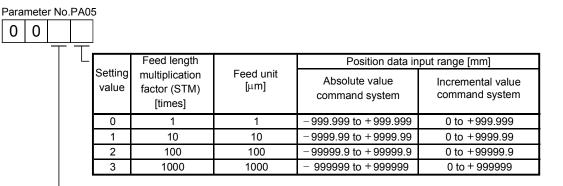
6.1.7 Feeding function selection

No. Symbol Name Value			Parameter	Initial	Unit	Sotting Bango
PA05 *FTY Feeding function selection 0000h Refer to the text	No.	Symbol	Name	Value	Unit	Setting Range
	PA05	*FTY	Feeding function selection	0000h		Refer to the text.

 This parameter is made valid when power is switched off, then on after setting, or when the controller reset has been performed.

Select the feed length multiplication and the manual pulse generator input multiplication.

POINT



- Manual pulse generator multiplication factor

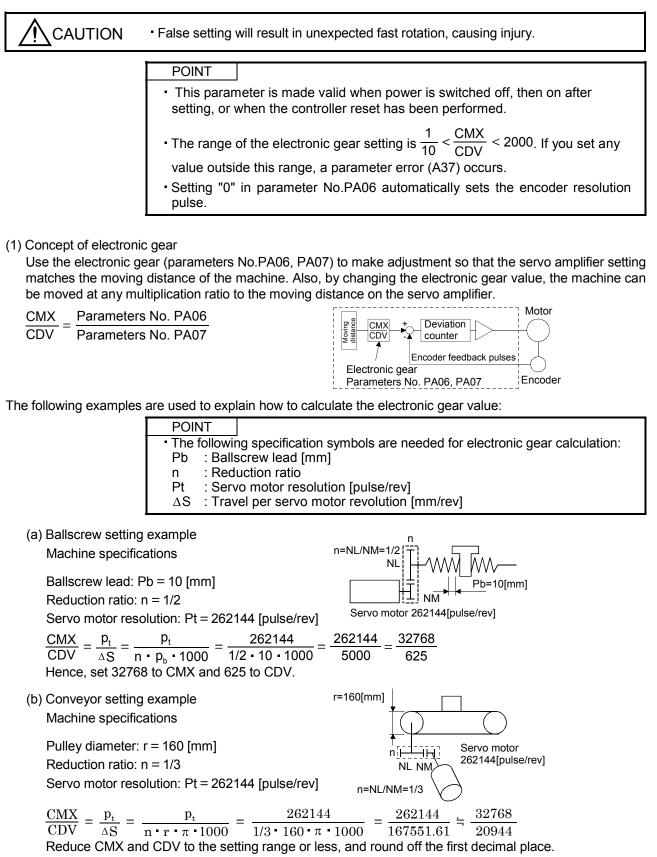
0: 1 time

1: 10 times

2: 100 times

6 - 5

6.1.8 Electronic gear



Hence, set 32768 to CMX and 20944 to CDV.

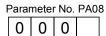
6.1.9 Auto tuning

	Parameter				Sotting Dange
No.	Symbol	Name	Value	Unit	Setting Range
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.



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

(2) Auto tuning response (parameter No. PA09)

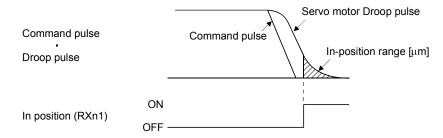
If the machine hunts or generates large gear sound, decrease the set value. To improve performance, e.g. shorten the settling time, increase the set value.

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	Ì	11.3	18] 1	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	Unit	Sotting Dange
No.	Symbol	Name	Value	Unit	Setting Range
PA10	INP	In-position range	100	μm	0 to 10000

Set the range, where In position (RXn1) and Movement finish (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.



6.1.11 Torque limit

		Parameter	Initial	Unit	Sotting Dongo	
No.	Symbol	Name	Value	Unit	Setting Range	
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.

When torque is output with the analog monitor output, the smaller torque of the values in this parameter and parameter No. PA12 (reverse rotation torque limit) is the maximum output voltage (+8V).

(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.

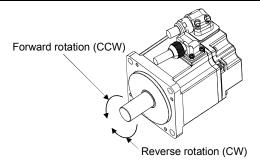
6.1.12 Selection of servo motor rotation direction

		Parameter	Initial	Unit	Sotting Dange
No.	Symbol	Name	Value	Unit	Setting Range
PA14	*POL	Rotation direction selection	0		0•1

POINT
This parameter is made valid when power is switched off, then on after setting, or when the controller reset has been performed.

Select servo motor rotation direction relative to the input pulse train.

Parameter No. PA14	Servo Motor Ro	otation Direction
Setting	Forward rotation start (Ryn1)	Reverse rotation start (Ryn2)
Octaing	ON	ON
0	CCW	CW
1	CW	CCW



6.1.13 Encoder output pulse

		Parameter	Initial	Unit	Sotting Dange
No.	Symbol	Name	Value	Unit	Setting Range
PA15	*ENR	Encoder output pulse	4000	pulse/ rev	1 to 65535

POINT

• This parameter is made valid when power is switched off, then on after setting, or when the controller reset has been performed.

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.

(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:

A·B-phase output pulses = $\frac{5600}{4}$ = 1400[pulse]

(2) For output division ratio setting

Set "
 1
 1
 " in parameter No. PC19.

The number of pulses per servo motor revolution is divided by the set value.

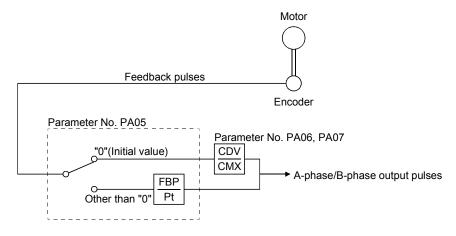
Output pulse = Resolution per servo motor revolution [pulses/rev] Set value

For instance, set "8" to Parameter No. PA15, the actually output A/B-phase pulses are as indicated below:

A·B-phase output pulses = $\frac{262144}{8} \cdot \frac{1}{4} = 8192$ [pulse]

(3) When outputting pulse train similar to command pulses

and output as shown below. The feedback pulses can be output in the same pulse unit as the command pulses.



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 filter tuning mode (Advanced vibration suppression control)	0000h	
PB03		For manufacturer setting	0000h	\sim
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	times
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 form selection 1	0000h	/
PB15	NH2	Machine resonance suppression filter 2	4500	Hz
PB16	NHQ2	Notch form selection 2	0000h	/
PB17		Automatic setting parameter		\square
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			0.00	
PB22	\sim	For manufacturer setting	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	times
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	\setminus \Box		0.00	Λ
PB36	\backslash		0.00]\
PB37			100] \
PB38			0] \
PB39			0	1 \
PB40		For manufacturer setting	0	1 \
PB41		v	1125	1 \
PB42			1125	
	\setminus			+
PB43	\setminus		0004h	- \
PB44	\		0.0	- \
PB45	\backslash		0000h	

6.2.2 Detail list

No.	Symbol	Name and Function	Initial Value	Unit	Setting Range
PB01	FILT	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).	0000h		
		Hand Hand Hand Hand Hand Hand Hand Hand			
		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. PB13 and PB14 are fixed to the initial values. 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.			

No.	Symbol		Name	and Function	Initial Value	Unit	Setting Range
PB02	VRFT	control) The vibrat setting is suppressi Select the paramete automatic (paramete times. Dr () Ma	tion suppression is valid wh " □ □ □ 2" or " □ □ □ 3". W ion is always invalid. e setting method for vibration r to " □ □ □ 1" (vibration su cally changes the vibration set er No. PB19) and vibration set er No. PB20) after positionin roop pulse Command ichine end sition 0 0 0 0	mode (advanced vibration suppression ten the parameter No. PA08 (auto tuning) hen PA08 is " 🗆 🗆 1", vibration In suppression control tuning. Setting this ppression control tuning mode) suppression control - vibration frequency suppression control - resonance frequency is done the predetermined number of Uroop pulse dutomatic Droop pulse Command Machine end position	0000h		
		Setting	Vibration suppression	Automatically set			
		0	control tuning mode Vibration suppression control OFF	parameter (Note)			
		1	Vibration suppression control tuning mode (Advanced vibration suppression control)	Parameter No. PB19 Parameter No. PB20			
		2	Manual mode				
		Note. Par	ameter No. PB19 and PB20	are fixed to the initial values.			
		positioning period of suppressi When this	g is done the predetermine time, and the setting chang ion control tuning is not nec s parameter is set to "	 1", the tuning is completed after d number or times for the predetermined es to " □ □ □ 2". When the vibration essary, the setting changes to " □ □ □ 0". 0", the initial values are set to the ion frequency and vibration suppression 			
			· · ·	ever, this does not occur when the servo off.	00005		
PB03			ifacturer setting lange this value by any mea	ans	0000h		
PB04	FFC	Feed forw Set the fe operation accelerati	vard gain red forward gain. When the at constant speed are near ion/deceleration will increas	setting is 100%, the droop pulses during ly zero. However, sudden e the overshoot. As a guideline, when the	0	%	0 to 100
			ard gain setting is 100%, se ion/deceleration time consta				

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	times	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

No.	Symbol	Name and Function	Initial Value	Unit	Setting Range
PB14	NHQ1	Notch shape selection 1 Used to selection the machine resonance suppression filter 1. 0 0 Votch depth selection Setting value Depth 0 0 1 to -14dB 2 to -8dB 3 Shallow -4dB 1 to -14dB 2 to -8dB 3 Shallow -4dB 2 to 1 to 3 Standard 2 4 3 Wide 5 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	0000h		Refer to Name and function column.
PB15	NH2	parameter is ignored. 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.	4500	Hz	100 to 4500
PB16	NHQ2	Notch shape selection 2 Select the shape of the machine resonance suppression filter 2. Machine resonance suppression filter 2 selection O: Invalid 1: Valid Notch depth selection Setting value Depth Gain O Deep -40dB 1 to -14dB 2 to -8dB 3 Shallow -4dB Notch width Notch width Setting value Width α O Standard 2 1 to 4 3 Wide 5	0000h		Refer to Name and function column.
PB17		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).			

No.	Symbol	Name and Function	Initial Value	Unit	Setting Range
PB18	LPF	Low pass filter setting 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.	3141	rad/s	100 to 18000
PB19	VRF1	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.	100.0	Hz	0.1 to 100.0
PB20	VRF2	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.	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	Low pass filter selection Select the low pass filter.	0000h		Refer to Name and function column.
PB24	*MVS	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. 0 0 0	0000h		Refer to Name and function column.

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.) 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) Gain changing condition 0: Valid at more than condition (Valid when gain changing (RX(n+2)8) is OFF) 1: Valid at less than condition (Valid when gain changing (RX(n+2)8) is OFF)	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:	7.0	times	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:	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:	33.7	ms	0.1 to 5000.0

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	100.0	Hz	0.1 to
		changing is valid. This parameter is made valid when the parameter No. PB02			100.0
		setting is "			
		the changing after the servo motor has stopped.			
PB34	VRF2B	Gain changing - vibration suppression control - resonance frequency setting	100.0	Hz	0.1
		Set the resonance frequency for vibration suppression control when the gain			to
		changing is valid. This parameter is made valid when the parameter No. PB02			100.0
		setting is " \Box \Box \Box \Box 2" and the parameter No. PB26 setting is " \Box \Box \Box 1".			
		When using the vibration suppression control gain changing, always execute			
		the changing after the servo motor has stopped.			
PB35		For manufacturer setting	0.00		
PB36		Do not change this value by any means.	0.00		
PB37			100		
PB38			0	/	
PB39	/		0		
PB40	/		0		
PB41	/		1125	/	
PB42	\backslash		1125		
PB43			0004h		
PB44	/		0.0		
PB45			0000h		

6.3 Extension setting parameters (No. PC 🗆 🗆)

6.3.1 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	*ZPS	Home position return position data	0	$ imes$ 10 ^{STM} μ m
PC08	DCT	Moving distance after proximity dog	1000	×10 ^{s™} μm
PC09	ZTM	Stopper type home position return stopper time	100	ms
PC10	ZTT	Stopper type home position return torque limit value	15	%
PC11	CRP	Rough match output range	0	×10 ^{s™} 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	\backslash	For manufacturer setting	0000h	
PC24	*COP3	Function selection C-3	0000h	
PC25	\backslash	For manufacturer setting	0000h	
PC26	*COP5	Function selection C-5	0000h	
PC27		For manufacturer setting	0000h	
PC28	\mathbf{i}	J. J	0000h	
PC29	\backslash		0000h	
PC30	*DSS	Remote register-based position/speed specifying system selection	0000h	
PC31	LMPL	Software limit +	0	×10 ^{s™} μm
PC32	LMPH			
PC33	LMNL	Software limit —	0	×10 ^{s™} μm
PC34	LMNH			•
PC35	TL2	Internal torque limit 2	100.0	%
PC36		For manufacturer setting	0000h	
PC37	*LPPL	Position range output address +	0	×10 ^{s™} μm
PC38	*LPPH		C C	
PC39	*LNPL	Position range output address —	0	×10 ^{s™} μm
PC40	*LNPH	. content ango output addrood	Ŭ	7.10 p
PC41	\	For manufacturer setting	8192	
PC42	\setminus		1024	$\langle \rangle$
	\setminus			
PC43			500	
PC44	\setminus		0	
PC45	\		10	
PC46	\setminus		100	
PC47	\		0000h	
PC48	/		0000h	<u> </u>

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	0000h	/	
		Do not change this value by any means.			
PC02	*ZTY	Home position return type	0000h		Refer to
		Used to set the home position return system. (Refer to section 5.6)		\backslash	Name and
				\backslash	function
					column.
		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			
		A. Dogless Z-phase relevence			
PC03	*ZDIR	Home position return direction	0001h		Refer to
		Used to set the home position return direction.		\backslash	Name and
					function
					column.
		Home position return direction			
		0: Address increment direction		$\langle \rangle$	
		1: Address decrement direction			
PC04	ZRF	Home position return speed	500	r/min	0 to
		Used to set the servo motor speed for home position return.			permissible
		(Refer to section 5.6)			speed
PC05	CRF	Creep speed	10	r/min	0 to
		Used to set the creep speed after proximity dog detection.			permissible
D 000	707	(Refer to section 5.6)			speed
PC06	ZST	Home position shift distance	0	μm	0 to
		Used to set the shift distance starting at the Z-phase pulse detection position inside the encoder (Refer to eaction 5.6)			to 65535
PC07	*ZPS	inside the encoder. (Refer to section 5.6) Home position return position data	0	×10 ^{s™} μm	-32768
FCUI	253	Used to set the current position on completion of home position return.	U	×10 μm	-32700 to
		(Refer to section 5.6)			32767
PC08	DCT	Moving distance after proximity dog	1000	×10 ^{s™} μm	0
1 000	201	Used to set the moving distance after proximity dog in count type home	1000	7 .10 p	to
		position return. (Refer to section 5.6)			65535
PC09	ZTM	Stopper type home position return stopper time	100	ms	5
		In stopper type home position return, used to set the time from when the			to
		machine part is pressed against the stopper and the torque limit set in			1000
		parameter No.PC10 is reached to when the home position is set.			
		(Refer to section 5.6.5)			

No.	Symbol	Name and Function	Initial value	Unit	Setting range
PC10	ZTT	Stopper type home position return torque limit	15.0	%	1
		Used to set the torque limit value relative to the max. torque in [%] in stopper			to
		type home position return. (Refer to section 5.6.5)			100.0
PC11	CRP	Rough match output range	0	$ imes$ 10 ^{STM} μ m	0
		Used to set the command remaining distance range where the rough match			to
		(RXn2) is output.			65535
PC12	JOG	Jog speed	100	r/min	0
		Used to set the jog speed command.			to permissible
					speed
PC13	*STC	S-pattern acceleration/deceleration time constant	0	ms	0
		Set when inserting S-pattern time constant into the acceleration/deceleration			to
		time constant of the point table. (Refer to section 6.3.3)			1000
		This time constant is invalid for home position return.			
PC14	*BKC	Backlash compensation	0	pulse	0
		Used to set the backlash compensation made when the command			to
		direction is reversed.			32000
		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.			
PC15		For manufacturer setting	0000h		
		Do not change this value by any means.			
PC16	MBR	Electromagnetic brake sequence output	100	ms	0
		Used to set the delay time (Tb) between when the electromagnetic brake			to
		interlock (RXn6) switches off and when the base circuit is shut off.			1000
PC17	ZSP	Zero speed	50	r/min	0
		Used to set the output range of the zero speed (ZSP).			to
		Zero speed signal detection has hysteresis width of 20r/min.			10000
PC18	*BPS	Alarm history clear	0000h	\setminus	Refer to
		Used to clear the alarm history.		\setminus	Name and
				\setminus	function
		0 0 0			column.
		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	1	1	
		is automatically made invalid (reset to 0).		\	

PC19 *ENRS		0000h		
	Use to select the, encoder output pulse direction and encoder pulse output setting. OOO Encoder pulse output phase changing Changes the phases of A, B-phase encoder pulses output . Set value OCW O A phase CCW O A phase B phase B phase CCW CW A phase Encoder output pulse setting selection (refer to parameter No. PA15) O: 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.			Refer to Name and function column.
PC20 *SNO	Station number setting Used to specify the station number for RS-422 serial 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.	0000h		Refer to Name and function column.
PC22 *COP	I Function selection C-1 Select the encoder cable communication system selection. Image: Communication system selection Image: Communication system selection <td>0000h</td> <td></td> <td>Refer to the Name and Function field.</td>	0000h		Refer to the Name and Function field.
PC23	For manufacturer setting Do not change this value by any means.	0000h	\square	

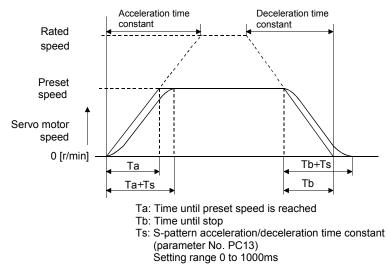
No.	Symbol	Name and Function	Initial value	Unit	Setting range
PC24	*COP3	Function selection C-3 Select the unit of the in-position range. 0 0 0 In-position range unit selection 0: Command input unit 1: Servo motor encoder unit	0000h		Refer to Name and function column
PC25	\searrow	For manufacturer setting Do not change this value by any means.	0000h		
PC26	*COP5	Function selection C-5 Select the stroke limit warning (A99). OOOO 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 PC28 PC29		For manufacturer setting Do not change this value by any means.	0000h 0000h 0000h		
PC30	*DSS	Remote register-based position/speed specifying system 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 "0100" or "0002" will result in a parameter error. 0 0 0 Set value Position command Speed command 0 Specify the point table No. 1 Set the position data. Specify the point table No. 2 Set the position data.	0000		Refer to Name and function column.
PC31 PC32	LMPL	Software limit + Used to set the address increment side software stroke limit. The software limit is made invalid if this value is the same as in "software limit —". (Refer to section 6.3.6) Set the same sign to parameters No. PC31 and No. PC32. Setting of different signs will result in a parameter error. Set address: Upper 3 Lower 3 digits Upper 3 Lower 3 digits Parameter No. PC31 Parameter No. PC32 The software limit+ is a set of upper digits and lower digits. To change the	0	×10 ^{sтм} µm	999999 to 999999
		a ne software limit+ is a set of upper digits and lower digits. To change the value, set in the order of lower digits to upper digits.			

No.	Symbol	Name and Function	Initial value	Unit	Setting range
PC33	LMNL	Software limit -	0	$ imes$ 10 ^{STM} μ m	-999999
PC34	LMNH	Used to set the address decrement side software stroke limit. The software			to
		limit is made invalid if this value is the same as in "software limit +".			999999
		(Refer to section 6.3.6)			
		Set the same sign to parameters No. PC33 and PC34. Setting of different			
		signs will result in a parameter error.			
		Set address:			
		Upper 3 Lower 3			
		digits digits			
		Parameter No. PC33			
		Parameter No. PC34			
		The software limit – is a set of upper digits and lower digits. To change the			
		value, set in the order of lower digits to upper digits.			
PC35	TL2	Internal torque limit 2	100.0	%	0
		Set this parameter to limit servo motor torque on the assumption that the			to
		maximum torque is 100[%].			100.0
		When 0 is set, torque is not produced.			
PC36		For manufacturer setting	0000h		
D007		Do not change this value by any means.		×10 ^{s™µ} m	
PC37	*LPPL	Position range output address + Used to set the address increment side position range output address. Set	0	× 10° ~~µm	-999999
PC38	*LPPH	the same sign to parameters No. PC37 and PC38. Setting of different signs			to
		will result in a parameter error.			999999
		In parameters No. PC37 to PC40, set the range where position range (RXnE)			
		turns on.			
		Set address:			
		Upper 3 Lower 3			
		digits digits			
		Parameter No. PC37			
		Parameter No. PC38			
		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.		STM	
PC39	*LNPL	Position range output address —	0	×10 ^{sтм} µm	-999999
PC40	*LNPH				to
		the same sign to parameters No. PC39 and PC40. Setting of different signs will result in a parameter error.			999999
		Set address:			
		Upper 3 Lower 3			
		digits digits			
		Parameter No. PC39 Parameter No. PC40 Parameter No. PC40			
		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.			
		To change the value, set in the order of lower digits to upper digits.			

No.	Symbol	Name and Function	Initial value	Unit	Setting range
PC41	\setminus	For manufacturer setting	8192	\setminus	\land
PC42	\setminus	Do not change this value by any means.	1024	\setminus	\backslash
PC43	\backslash		500	\backslash	\backslash
PC44			0		\backslash
PC45			10	\setminus	\setminus
PC46			100		\setminus
PC47			0000h		\setminus
PC48			0000h	\setminus	\backslash
PC49			0000h		
PC50			0000h		

6.3.3 S-pattern acceleration/deceleration

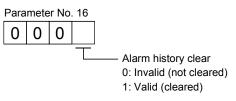
In servo operation, linear acceleration/deceleration is usually made. By setting the S-pattern acceleration/deceleration time constant (parameter No. PC13), a smooth start/stop can be made. When the S-pattern time constant is set, smooth positioning is executed as shown below. Note that the time equivalent to the S-pattern time constant setting increases until positioning (RXnC) is complete.



6.3.4 Alarm history clear

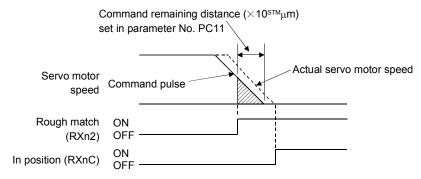
The alarm history can be confirmed by using the MR Configurator. The servo amplifier stores one current alarm and five past alarms from when its power is switched on first. To control alarms which will occur during operation, clear the alarm history using parameter No. PC18 (alarm history clear) before starting operation. Clearing the alarm history automatically returns to " \Box \Box \Box \Box ".

This parameter is made valid by switching power off, then on after setting.



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 set remaining distance is 0 to 65535 [$\times 10^{STM} \mu m$].



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.

///Inhibited area	Movable area
Unmovable	 Movable
Current pos	re limit

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	Input signal device selection 1 (CN6-pin 14)	0002h	
PD10	*DO2	Input signal device selection 2 (CN6-pin 15)	0003h	
PD11	*DO3	Input signal device selection 3 (CN6-pin 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	\searrow	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-2	0000h	
PD23		For manufacturer setting	0000h	
PD24	*DOP5	Function selection D-5	0000h	
PD25	\setminus	For manufacturer setting	0000h	\backslash
PD26	\setminus		0000h	
PD27	\setminus		0000h	
PD28	\setminus		0000h	
PD29	\setminus		0000h	
PD30	\setminus		0000h	1 \

6.4.2 Detail list

No.	Symbol	Name and Function	Initial value	Unit	Setting range
PD01	*DIA1	Input signal automatic ON selection 1 Select the input devices to be automatically turned ON. part is for manufacturer setting. Do not set the value by any means.	0000h		Refer to Name and function column.
		Signal name Initial value BIN HEX 0 0 0 0 0 0 0 0			
		Signal name Initial value BIN HEX Proportion control (PC) 0 0 0 0 0			
		Signal name Initial value BIN HEX 0 0 Forward rotation 0 stroke end (LSP) 0 Reverse rotation 0 stroke end (LSN) 0			
		Signal name Initial value BIN HEX Forced stop (EMG) 0 0 0 0 0 0 0 BIN 0: Used in CC-Link or as external input signal. BIN 1: Automatic ON			
PD02		For example, to turn ON SON, the setting is "□□□4". For manufacturer setting Do not change this value by any means.	0000h		

No.	Symbol	Name and Function	Initial value	Unit	Setting range
PD03	*DIA3	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. Signal name Initial value BIN HEX Automatic/manual 0 selection (MD0) 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0000h		Refer to Name and function column.
PD04	*DIA4	Input signal automatic ON selection 4 Select the input devices to be automatically turned ON. part is for manufacturer setting. Do not set the value by any means.	0000h		Refer to Name and function column.
		Signal name Initial value			
		Image: Section 1 (Section 1) BIN HEX Point table No. 0 BIN 0: Used in CC-Link or as external input signal. BIN 1: Automatic ON			
PD05		For manufacturer setting Do not change this value by any means.	0000h		

No.	Symbol		Name and Function			Initial value	Unit	Setting range
PD06	*DI2	Any input o	al device selection 2 (CN6-2) device can be assigned to the CN6-2 pin.			002Bh		Refer to Name and function column.
		Setting	Input device					
		(Note)	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	TL2	•			
		0A	Forward rotation stroke end	LSP				
		0B	Reverse rotation stroke end	LSN	•			
		0D	Gain switch	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				
0007	*510	setti	other setting values than shown in this table	e are for manufact	urer			
PD07	*DI3	Any input of The device	al device selection 3 (CN6-3) device can be assigned to the CN6-3 pin. es that can be assigned and the setting No. PD06.		same as in	000Ah		Refer to Name and function column.
PD08	*DI4	Any input of The device	al device selection 4 (CN6-4) device can be assigned to the CN6-4 pin. es that can be assigned and the setting No. PD06.		same as in	000Bh		Refer to Name and function column.

No.	Symbol		Name and Funct	ion		Initial value	Unit	Setting range
PD09	*DO1		nal device selection 1 (CN6-14) t signal can be assigned to the CN6-14			0002h		Refer to Name and function column.
		The device	es that can be assigned are indicated i	n the following table.				
		Setting	Output device					
		(Note)	Name	Symbol				
		00	Always OFF					
		02	Ready	RD				
		03	Trouble	ALM				
		04	In position					
		05 06	Electromagnetic brake interlock Dynamic brake interlock	MBR DB				
		00	Limiting torque	TLC				
		07	Warning	WNG				
		00	Battery warning	BWNG				
		00 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 finish	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				
			Point table No. output 8 other setting values than shown in this	PT7 s table are for manufact	urer			
PD10	*DO2	Any output The devic	ng. nal device selection 2 (CN6-15) t signal can be assigned to the CN6-13 ses that can be assigned and the se No. PD09. Select the output device of the	tting method are the s	same as in	0003h		Refer to Name and function column.

No.	Symbol	Name and Function	Initial value	Unit	Setting range
PD11	*DO3	Output signal device selection 3 (CN6-16) Any output signal can be assigned to the CN6-16 pin. The devices that can be assigned and the setting method are the same as in parameter No. PD09. 0 0 Select the output device of the CN6-16 pin	0024h		Refer to Name and function column.
PD12	DIN1	External DI function selection 1 This function sets any signal imported from the CN6 connector. part is for manufacturer setting. Do not set the value by any means.	0C00h		Refer to Name and function column.
		Signal name Initial value BIN HEX Proportion control (PC) 0 Clear (CR) 0 Forward rotation start 0			
		Signal name Initial value BIN HEX Reverse rotation start (ST2) 0 Internal torque limit (TL1) 0 Forward rotation stroke end (LSP) 1 Reverse rotation 1			
		Signal name BIN HEX Gain switch (CDP) 0 0 0 0 0 0 0 0 0 0 0 0 0			
PD13		BIN 1: Used in CN6 external input signal For manufacturer setting Do not change this value by any means.	0000h		

No.	Symbol	Name and Function	Initial value	Unit	Setting range
PD14	DIN3	External DI function selection 3 This function sets any signal imported from the CN6 connector. part is for manufacturer setting. Do not set the value by any means.	0800h		Refer to Name and function column.
		Signal name Initial value BIN HEX Automatic/manual 0 selection (MD0) 0 0 8 0 0 0 0 0 0 0 0 0 0 0 0 0 0			
PD15		BIN 0: Used in CC-Link BIN 1: Used in CN6 external input signal For manufacturer setting	0000h		
PD16	*DIAB	Do not change this value by any means. Input polarity selection Used to set the proximity dog input polarity. (Refer to section 5.6) Proximity dog input polarity 0: OFF indicates detection of the dog. 1: ON indicates detection of the dog.	0000h		Refer to Name and function column.
PD17 PD18 PD19	*DIF	For manufacturer setting Do not change this value by any means. Response level setting Used to select the input. 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]	0000h 0000h 0002h		Refer to Name and function column.

No.	Symbol	Name and Function	Initial value	Unit	Setting range
PD20	*DOP1	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. Image: the stop processing method used when forward rotation stroke end (LSP), reverse rotation stroke end (LSP), reverse rotation stroke end (LSN) device or software limit is valid Image: the stop processing method used when forward rotation stroke end (LSN) device or software limit is valid Image: the stop stop processing method used when forward rotation stroke end (LSN) device or software limit is valid Image: the stop stop stop stop (home position erased) Image: the stop stop (home position erased) Image: the stop stop stop (beceleration to a stop by deceleration time constant) Image: the stop stop stop stop stop stop stop stop	0010h		Refer to Name and function column.
PD21		For manufacturer setting Do not change this value by any means.	0000h		
PD22	*DOP3	Function selection D-3 Set the clear (RYnF). O O O Clear (RYnF) selection 0: Droop pulses are cleared on the leading edge. 1: While on, droop pulses are always cleared.	0000h		Refer to Name and function column.
PD23		For manufacturer setting	0000h		

No.	Symbol	Name and Function	Initial value	Unit	Setting range
PD24	*DOP5	Function selection D-5 Select the output status of the warning (WNG). 0 0 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. Setting (Note) Device status Remote RX(n+1)A or RX(n+3)A 1 0 Output Remote RX(n+3)A 0 0 Output WNG OFF 4LM OFF Warning occurred. 1 Output RX(n+1)A or RX(n+3)A 1 0 Output RXnA 0 0 Output ON ALM 0 1 Output WNG OFF 1 Output WNG OFF ALM OFF Warning occurred. 1 Output WNG OFF ALM OFF Warning occurred. Note. 0: OFF Warning Warning	0000h		
		1: ON			
PD25 PD26 PD27 PD28 PD29 PD30		For manufacturer setting Do not change this value by any means.	0000h 0000h 0000h 0000h 0000h 0000h		

7. MR Configurator

The MR Configurator (MRZJW3-SETUP221 version B4 or later) 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
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, turning, 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

7.2 System configuration

(a) Components

To use this software, the following components are required in addition to the servo amplifier and servo motor:

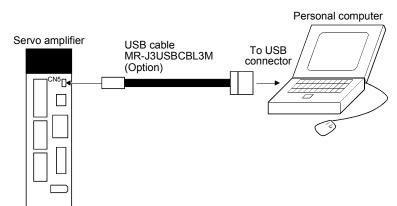
Model	Description			
(Note 2) Personal computer	IBM PC-AT compatible where the English version of Windows [®] 98, Windows [®] Me, Windows [®] 2000 Professional, Windows [®] XP Professional and Windows [®] XP Home Edition operates Processor: Pentium [®] 133MHz or more (Windows [®] 98, Windows [®] 2000 Professional) Pentium [®] 150MHz or more (Windows [®] Me) Pentium [®] 300MHz or more (Windows [®] XP Professional, Windows [®] XP Home Edition) Memory: 24MB or more (Windows [®] 98) 32MB or more (Windows [®] Me, Windows [®] 2000 Professional) 128MB or more (Windows [®] XP Professional, Windows [®] XP Home Edition) Free hard disk space: 130MB or more			
OS	Windows [®] 98, Windows [®] Me, Windows [®] 2000 Professional, Windows [®] XP Professional, Windows [®] XP Home Edition (English version)			
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	LUSV-CABV (Ulatrend) is recommended			
RS-422/232C converter	FA-T-RS40VS (Mitsubishi Electric Engineering) is recommended. Required for use of the multidrop communication function.			

Note 1. Windows is the registered trademarks of Microsoft Corporation in the United State and other countries.

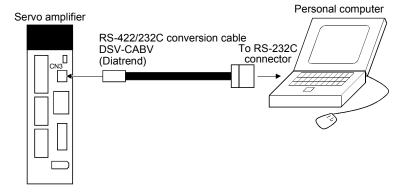
Pentium is the registered trademarks of Intel Corporation.

2. On some personal computers, this software may not run properly.

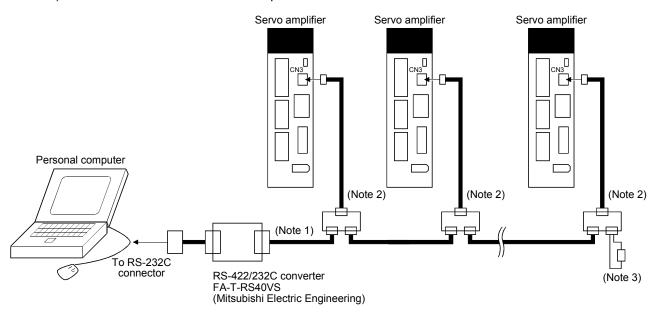
- (b) Connection with servo amplifier
 - 1) For use of USB



2) For use of RS-422



3) For use of RS-422 to make multidrop connection



Note 1. Refer to section 15.1 for cable wiring.

- 2. The BMJ-8 (Hakko Electric Machine Works) is recommended as the branch connector.
- 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.

7.3 Station selection

 View
 Setup
 Monitor
 Alarm
 Diagnostics
 F

 System settings...
 Image: System setings...
 Image: System settings...</td

Click "Setup" on the menu bar and click "System settings" on the menu.

When the above choices are made, the following window appears:

	System Settings	\mathbf{X}
	Model Selection : MR-J3-T	
a)	Station Selection : 00	
	Communication Device : Servo amplifier connection RS-232C	
	Baud Rate Selection : 9600	
	Comm Port Selection : AUTO	
	Connection selection	
	© Online	
	C Offline	
	<u>O</u> K <u>C</u> ancel	

(1) Station number selection

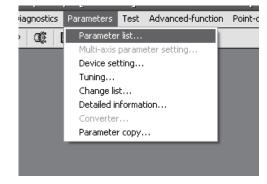
Choose the station number in the combo box (a)).

POINT	
•	g should be the same as the station number which has been set in eter in the servo amplifier used for communication.

(2) Closing of the station selection window

Click the "OK" button to close the window.

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:

g)	h)	i)	j)	k)	l)
* Parameter Setting Basic setting	Basic setting (list)		Extension setting		Parameter block
Command mode Absolute position detect ABS system sel. Follow up coloction of co		ABS)	Regenerative brake option Feed function selection Manual pulse input Feed length magnification	('FTY)	× •
Follow-up selection at sr Follow-up at servo-off or In-position range (INP) pulse (1 to Forward Reverse rotation Reverse rotation torque II Reverse rotation torque II	emergency stop 100000) (Common con torque limit (TLP, TL) mit % imit %	and pulse)	Electronic gear setting(Electronic gear numerate Electronic gear denomin Auto tuning mode (ATU, Auto tuning mode Auto tuning response Encoder Output pulse (*)	ator [RSP) ENR)	Eldt gear X
Rotation direction select ST1 coordinate system s	election	_	Select the dividing ratio v	,	PC19 (*ENRS).
C)	ay detailed description.	Verify b)	Write All	Set to default	<u>Close</u>

(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 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- \Box 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 (I))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.

7.5 Point table

POINT

 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:

	name:			g)			
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	0	0	0	0	0
3	0.000	0	0	0	0	0	0
4		0	0	0	0	0	0
5		0	0	0	0	0	0
6		0	0	0	0	0	0
7		0	0	0	0	0	0
8		0	0	0	0	0	0
9		0	0	0	0	0	0
10		0	0	0	0	0	0
11	0.000	0	0	0	0	0	0
12		0	0	0	0	0	0
STN		Times	1	n the same value	n as that of para	n meter PA05.	
-	Insert	<u>D</u> elete	1				
	<u>R</u> ead All	<u>W</u> rite	⊻erit	fy V	/rite <u>A</u> ll		<u>C</u> lose

- (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.

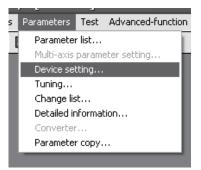
7. MR Configurator

7.6 Device assignment method

POINT
 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.

19 MR Configurator - Project name - (Axis1) [00Station] MR-J3-T Servo amplifier con	nection USB		- 6 X
Project Wew Setup Monitor Alarm Diagnostics Para				
口見聞句 御服 必必 偏 圖 (ଠୟ			
DIDO Device Setting	- ×			
File name				
Input pin	Output pin			
Pin No. Function	Pin No. Function			
CN6-1 EMG	CN5-14			
CN6-2 CN6-3	CN6-15 CN6-16			
CN6-4		S DIDO Function Display		
		- Input device	Coutput device	
		:Vacancy	:Always OFF	
		SON :Servo-on	RD Ready	
		RES :Reset	ALM :Trouble	
"Vacancy" can be selected by clicking on the		PC :Proportion ontri	INP : In-position MBR : Electromagnetic brake interlock	
function setting field.	Read Write	CR :Clear	DB :External dynamic brake	
The gray display fields cannot be set because the function is fixed.	Verify Set to Default	ST1 : Forward rot start ST2 : Reverse rot start	TLC :Umiting torque MNG :Warning	
"OFF" always OFF	Zeuw	IL1 : Int trg Int sict	BWNG :Battery warning	
		LSP :Fwd rot strk LSN :Rvs rot strk	SA :Speed reached ZSP :Zero speed	
		CDP :Gain change selection	CDPS :Variable gain selection	
		MD0 :Automatic/manual selection		
		TPO :Manual pulse magnification slct 1 TP1 :Manual pulse magnification slct 2	CPO :Rough match ZP :Home position return completed	
			POT :Position range	
		TSTP :Temporary stop/Restart DOG :Proximity dog	PUS :Temporary stop MEND :Movement finish	
		DOS PROMINY dog	HERD INSTITUT	
			PT0 :Point table No. output 1	
			PT1 :Point table No. output 2	
			PT2 :Point table No. output 3 PT3 :Point table No. output 4	
			PT4 :Point table No. output 5	
			PT5 :Point table No. output 6 PT6 :Point table No. output 7	
			PT7 : Point table No. output 8	
		14100	ment check / auto CN	
		Sund.	setina Close	
	SCRL			
🕼 start 🥵 MR Configurator - Pr 👘 I			EN 🤔	🙀 6:01 PM

(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.

💖 DIDO Device Setting			
File name			
Input pin	Output pin		
Pin No. Function	Pin No. Function		
CN6-1 EMG CN6-2 CN6-3 CN6-4	CN6-14 CN6-15 CN6-16		
"Vacancy" can be selected by clicking on the function setting field.	Read	Write	— a)
The gray display fields cannot be set because the function is fixed.	Verify	Set to Default	— b)
"OFF" always OFF			— d)
	c)		

- 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.
- 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.

(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.

🔊 DIDO Function Display	
-Input device	Output device
:Vacancy	:Always OFF
SON :Servo-on	RD :Ready
RES :Reset	ALM :Trouble
PC : Proportion cntrl	INP :In-position
	MBR :Electromagnetic brake interlock
CR :Clear	DB :External dynamic brake
ST1 :Forward rot start	TLC :Limiting torque
ST2 :Reverse rot start	WNG :Warning
TL1 :Int trg Imt sict	BWNG :Battery warning
LSP :Fwd rot strk	SA :Speed reached
LSN :Rvs rot strk	ZSP :Zero speed
CDP :Gain change selection	CDPS :Variable gain selection
MD0 :Automatic/manual selection	
TPO :Manual pulse magnification slct 1	CP0 :Rough match
TP1 :Manual pulse magnification slct 2	ZP :Home position return completed
	POT :Position range
TSTP :Temporary stop/Restart	PUS :Temporary stop
DOG :Proximity dog	MEND :Movement finish
	PTD : Point table No. output 1
	PT0 :Point table No. output 1 PT1 :Point table No. output 2
	PT2 :Point table No. output 2
	PT3 :Point table No. output 3
	PT4 :Point table No. output 5
	PT5 :Point table No. output 6
	PT6 :Point table No. output 7
	PT7 :Point table No. output 8
	ment check / auto ON Close
	setting
	a) b)

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))

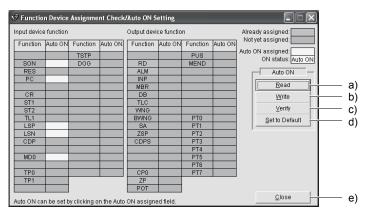
Press this button to display the screen that shows the assignment list and enables auto ON setting. Refer to (2)(c) of this section for more information.

2) Quitting

Click "Close" button to exit from the window. (b))

(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.
- 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.
- 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.

7.7 Test operation

 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).

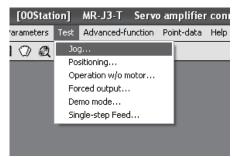
7.7.1 Jog operation

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.

POINT



Clicking displays the confirmation window for switching to the test operation mode.

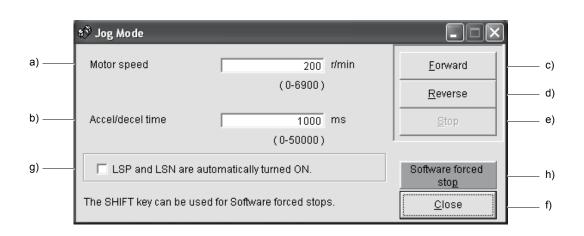
Test-mo	de 🛛 🗙
	The general external input signal is ignored during the test operation.
	Cancel

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.

SON	\mathbf{X}
⚠	Make sure that operation is at a stop.
	ОК

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.



(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) Servo motor start (c), d))

Hold down the "Forward" button to rotate the servo motor in the CCW rotation direction. Hold down the "Reverse" button to rotate the servo motor in the CW rotation direction.

(4) Servo motor stop (e))

Click the "Stop" button to stop the rotation of the servo motor.

- (5) 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 external signal LSP and the LSN signal are ignored.
- (6) 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
- (7) Jog operation window closing (f))

forced stop" button again to make the "Forward" and "Reverse" buttons enabled.

Click the "Close" button to cancel the jog operation mode and close the window.

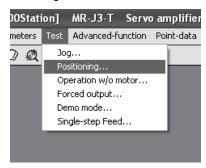
(8) Switching to CC-Link operation mode To switch from the test operation mode to the CC-Link operation mode, turn OFF the power of the servo amplifier.

7.7.2 Positioning operation

POINT	
	motor will not operate if the forced stop (EMG), forward rotation
	(LSP) and reverse rotation stroke end (LSN) are off. Make
	ON setting to turn on these devices or make device setting to n as external input signals and turn on across these signals and
-	Refer to section 7.6.)
· ·	larm occurs, the positioning operation is automatically canceled

• 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.

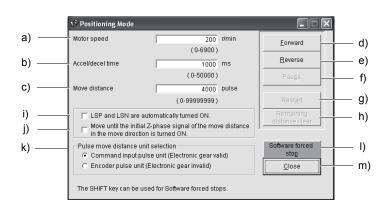
Test-mode 🛛 🗙		
♪	The general external input signal is ignored during the test operation.	
	Cancel	

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.

SON	×
	Make sure that operation is at a stop.
	ОК

After confirming that the operation is in the stop status, click the "OK" button to display the setting screen for the positioning operation.



- (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 external signal LSP and the LSN 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.

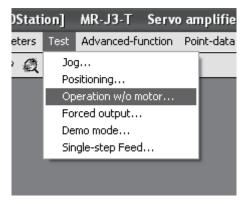
7.7.3 Motor-less operation

POINT	
When this of	operation is used in an absolute position detection system, the
home posit	ion 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:

Select 'Start' to enter 'Operation without Motor' Mode. Cycle amplifier power to restore Normal Mode.	Operation Without Motor Selection
Cycle amplifier power to restore Normal Mode.	· · · · · · · · · · · · · · · · · · ·
	Cycle amplifier power to restore Normal Mode.

- 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.

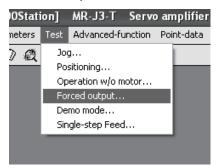
Note that just clicking the "Close" button does not cancel motor-less operation. To cancel motor-less operation, turn ON the power of the servo amplifier and switch to the CC-Link operation mode once.

7.7.4 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.

Test-mode 🛛 🗙		
	The general external input signal is ignored during the test operation.	
	Cancel	

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.

SON	X
	Make sure that operation is at a stop.
	ОК

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:

🕸 Forced Output Mode		
C CN6-14 C CN6-15 C CN6-16	:ON :OFF	
	0EF	———— a) ———— b)
	Close	c)

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
 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.

00Stati	ion]	MR-J3-T	Servo	o amp	lifier	Ċ
meters	Test	Advanced-fu	Inction	Point-	data	ŀ
<u>) Q</u>	Po Op Fo De	g sitioning ieration w/o m rced output mo mode igle-step Feed				

Clicking displays the confirmation window for switching to the test operation mode.

Test-mo	Test-mode		
	The general external input signal is ignored during the test operation.		
	Cancel		

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.

SON	×
⚠	Make sure that operation is at a stop.
	ОК

After confirming that the operation is in the stop status, click the "OK" button.

	s [®] Single-step Feed		
a) —	Point table No.	<u>S</u> tart	— b)
	(1-255)	Pa <u>u</u> se	— c)
		Rest <u>a</u> rt	— d)
		Remaining distance clear	— e)
		Software forced stop	— f)
	The SHIFT key can be used for Software forced stops.	Close	—— g)

(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.

7.8 Alarm

7.8.1 Alarm display

POINT	
occurrence, the	clicked or any other operation is performed during alarm following message window appears. The example given here nat indicates an occurrence of Encoder error 1 (16).
	Servo-alarm
	A servo alarm has occurred. Correct problem before proceeding. Alarm: 16:Encoder error 1 Encoder connector (CN2) disconnected. Encoder fault. Encoder cable faulty (Write breakage or shorted) Encoder cable faulty (2-wire) selection was wrong in parameter setting.
	OK

The current alarm can be displayed.

To display the current alarm, click "Alarm" on the menu bar and click "Display" on the menu.

- Project name - (Axis1) [00Stati						
Monitor	Alarm	Diagnostics	Pa	rame	ters	
	Disp Hist Amp		Q			

When the above choices are made, the following window appears:

🕸 Alarm Display	
Current Alarm	
Alarm Number	AL16
Alarm Name	Encoder error 1
Cause of Alarm	
	N2) disconnected. Write breakage or shorted) wire, 4-wire) selection was wr
Time of A	larm (hour:min:sec)
10:39:5	56
Reset	Close
- >	L)
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 (16).

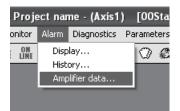
(2) Alarm reset (a))

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:

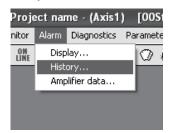
🕸 Amplifier Data	
File name:	[Read from Amp]
Alarm Monitor No.1-10	Alarm Monitor No.11-20
	<u>C</u> lose

Click the "Read" button to read the monitor data at error occurrence from the servo amplifier. Read results are displayed as follows.

🕸 Amplifier Data					×
File name:			<u>R</u> e	ad fro	m Amp
Alarm Monitor No.1-10			Alarm Monitor No.11-20		
Current position	0.000	mm	Peak load ratio	0	%
Command position	0.000	mm	Instantaneous torque	0	%
Command remaining	0.000	mm	Within one-revolution	0	pulse
distance Point table No.	0		position ABS counter	0	rev
Cumulative feedback	0	pulse	Load inertia moment ratio	0.0	times
pulses Servo motor speed	0	r/min	Bus voltage	0	v
Droop pulses	0	pulse			
Override	0	%			
Regenerative load ratio	0	%			
Effective load ratio	0	%			
			<u>C</u> lose		1

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 H	listory				_ D ×
l	Lates	t Alarm First				
l						
L	Seq No.	Alarm No.	Alarm Name		Time(hour)	Detail(hex)
L	0	No alarm				
L	1	No alarm				
L	2	No alarm				
L	3	No alarm				
L	4	No alarm				
L	5	No alarm				
L						
L		C	lear	(Close	
L				<u></u>		
			1		I	
		ä	a)		b)	

(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.

MEMO

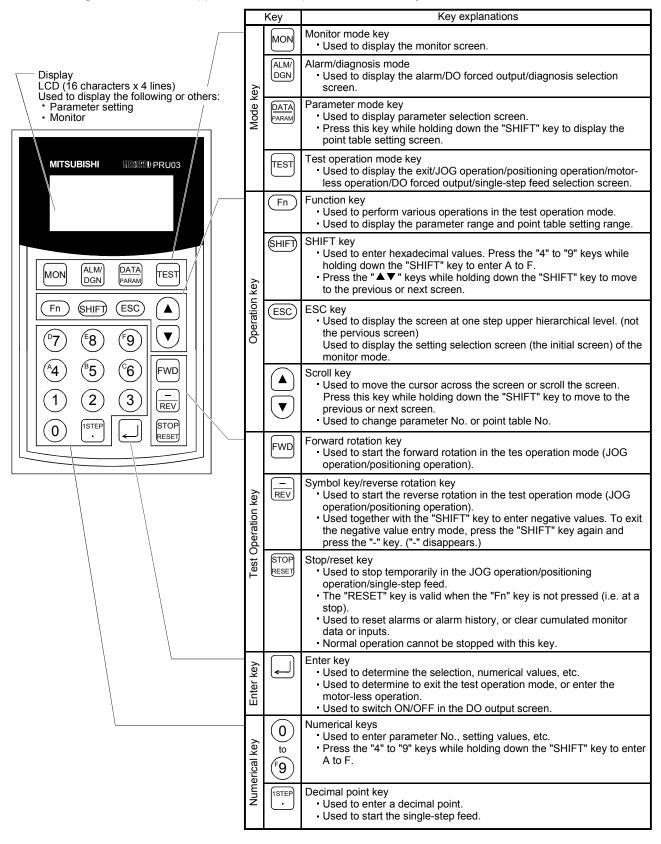
8. PARAMETER UNIT (MR-PRU03)

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.

8.1 External appearance and key explanations

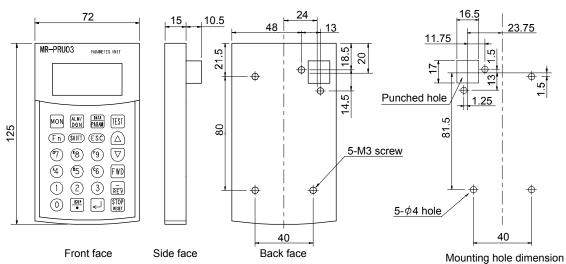
This section gives the external appearance and explanations of the keys.



8.2 Specifications

Item		Description		
Model		MR-PRU03		
Power supply		Supplied from the servo amplifier		
	Parameter mode	Basic setting parameters, Gain/filter parameters, Extension setting		
		parameters, I/O setting parameters		
		Current position, Command position, Command remaining distance, Point		
		table No., Feedback pulse value, Servo motor speed, Droop pulse value,		
	Monitor mode (Status display)	Regenerative load factor, Effective load factor, Peak load factor,		
suc		Instantaneous torque, Within one-revolution position, ABS counter, Load		
⁻ unctions		inertia moment ratio, Bus voltage		
Fui	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,		
	Test operation mode	Single-step feed		
	Point table mode	Point data, Servo motor speed, Acceleration/deceleration time constant,		
	Form table mode	Dwell, Auxiliary function		
Displa	y section	LCD system (16 characters $ imes$ 4 lines)		
	Ambient temperature	− 10 to +55°C (non-freezing)		
ent	Ambient humidity	90%RH or less (non-condensing)		
ũu	Storage temperature range	−20 to +65°C (non-freezing)		
Environment	Storage humidity range	90%RH or less (non-condensing)		
En	Ambianaa	Indoors (no direct sunlight) Free from corrosive gas, flammable gas, oil mist,		
	Ambience	dust and dirt		
Mass [g]		130		

8.3 Outline dimension drawings



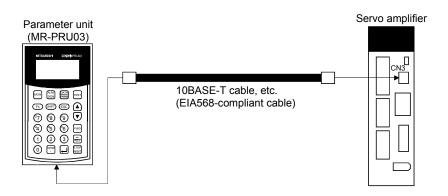
[Unit: mm]

8.4 Connection with servo amplifier

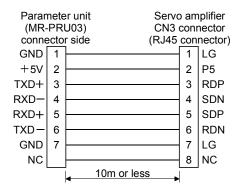
8.4.1 Single axis

(1) Configuration diagram

Operate the single-axis servo amplifier. It is recommended to use the following cable.



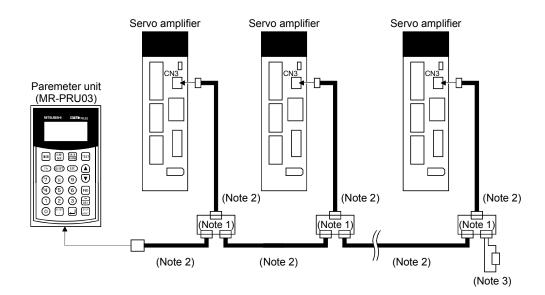
(2) Cable internal wiring diagram



8.4.2 Multidrop connection

(1) Configuration diagram

Up to 32 axes of servo amplifiers from stations 0 to 31 can be operated on the same bus.



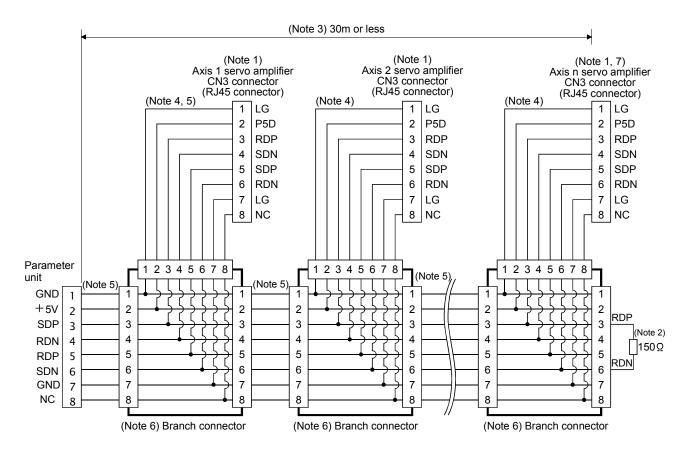
Note 1. The BMJ-8 (Hakko Electric Machine Works) is recommended as the branch connector.

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.

(2) Cable internal wiring diagram

Wire the cables as shown below.



Note 1. Recommended connector (Hirose Electric)

Plug: TM10P-88P

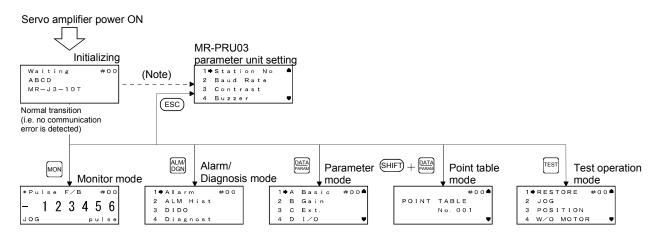
Connection tool: CL250-0228-1

- 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.)

8.5 Display

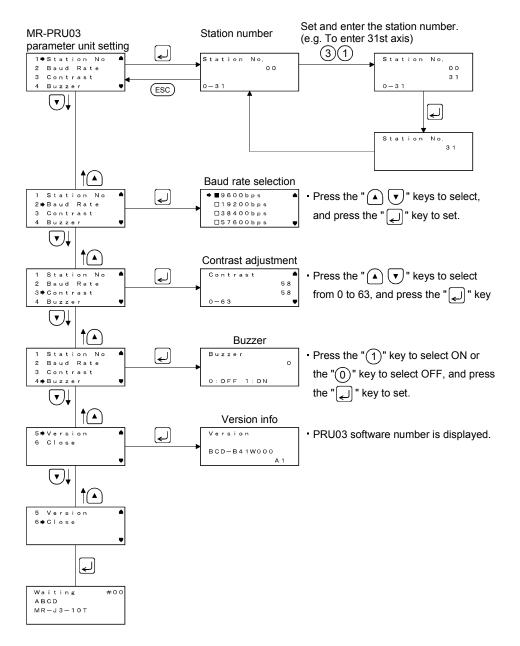
Connect the MR-PRU03 parameter unit to the servo amplifier, and turn ON the power of the servo amplifier. In this section, the screen transition of the MR-PRU03 parameter unit is explained, together with the operation procedure in each mode.

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.

8.5.2 MR-PRU03 parameter unit setting

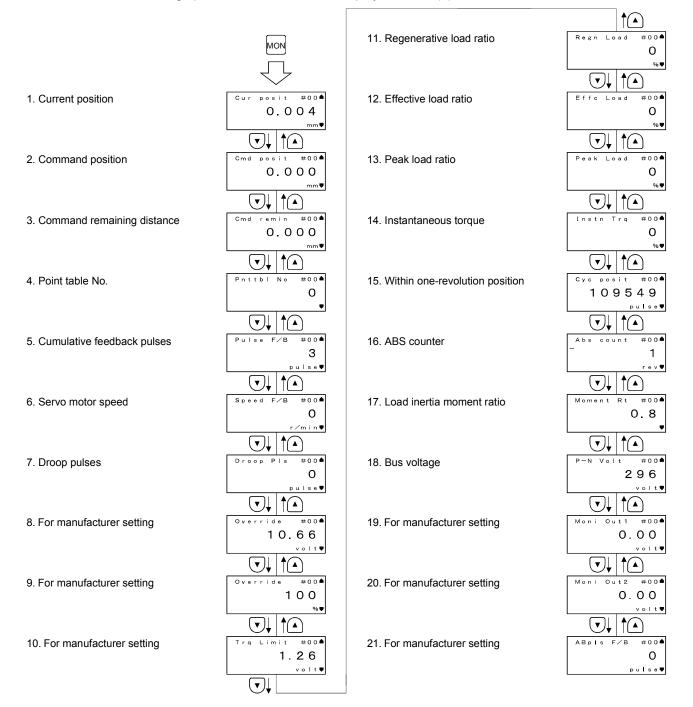


Note. Press the "SHIFT" key and "ESC" key together on any screen to return to the station number setting screen.

8.5.3 Monitor mode (status display)

(1) Monitor display

The servo status during operation is shown on the display. Refer to (2) of this section for details.



(2) Monitor display list

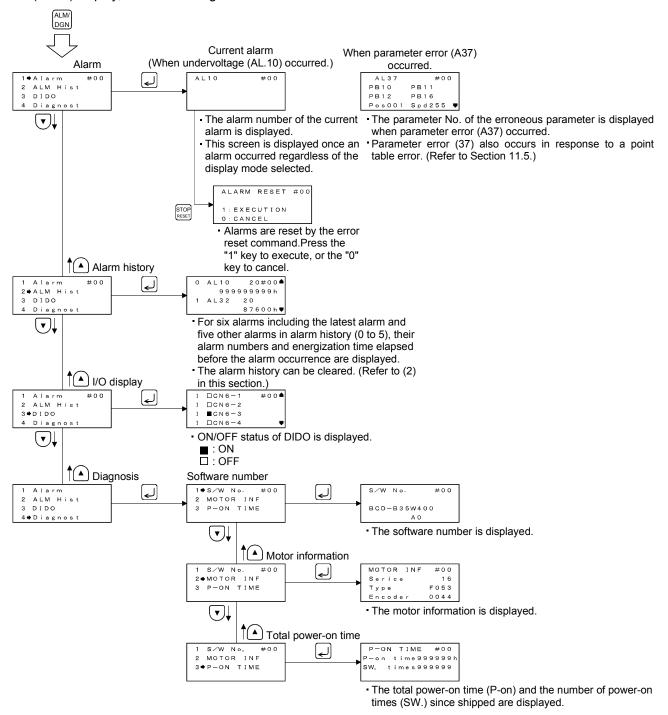
The following table lists the items and descriptions of monitor display.

Status display	Display on parameter	Unit	Description	Display range
unit		•••••		
Current position	Cur posit	×10 ^{s™} mm	The current position from the machine home position of 0 is displayed.	-99999999 to 9999999
Command position	Cmd Posit	×10 ^{S™} mm	The command position is displayed.	-99999999 to 9999999
Command remaining distance	Cmd remin	×10 ^{s™} mm	The command remaining distance of the currently selected point table is displayed.	-9999999999 to 9999999999
Point table No.	Pnttbl No		The point table No. being executed is displayed.	0 to 255
Cumulative feedback	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.	– 9999999999 to 9999999999
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 ×0.1r/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	times	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) of the main circuit converter is displayed.	0 to 450

8.5.4 Alarm/diagnostic mode

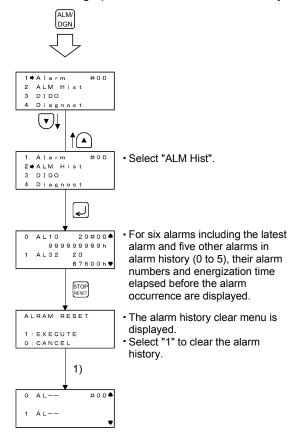
(1) Alarm display

The flowchart below shows the procedure of settings involving alarms, alarm history, external I/O signal (DIDO) display, device and diagnosis.



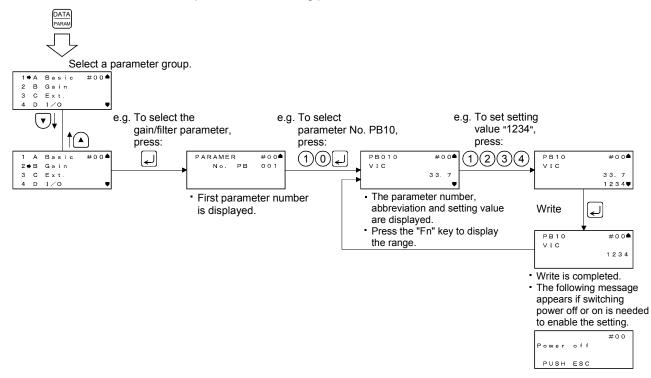
(2) Alarm history clear

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.

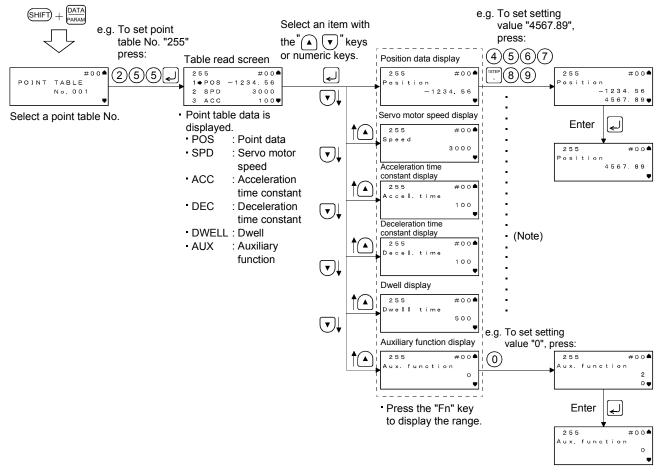


8.5.5 Parameter mode

The flowchart below shows the procedure for setting parameters.



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.

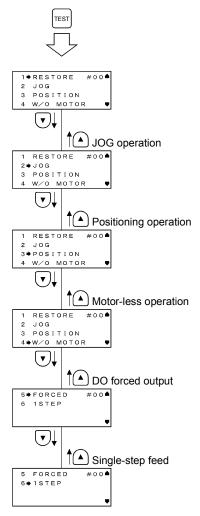
8.5.7 Test operation mode

 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		
 The test op 	peration mode cannot be used in the absolute position detection	
system. Use it after choosing "□□□0" in parameter No. PA03.		
 Test operation cannot be performed if the servo-on signal is not turned 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 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).



(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.

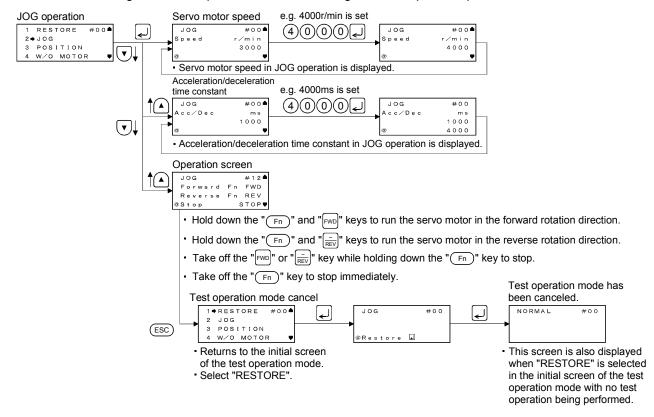
(a) Operation/cancel

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.

(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.

(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

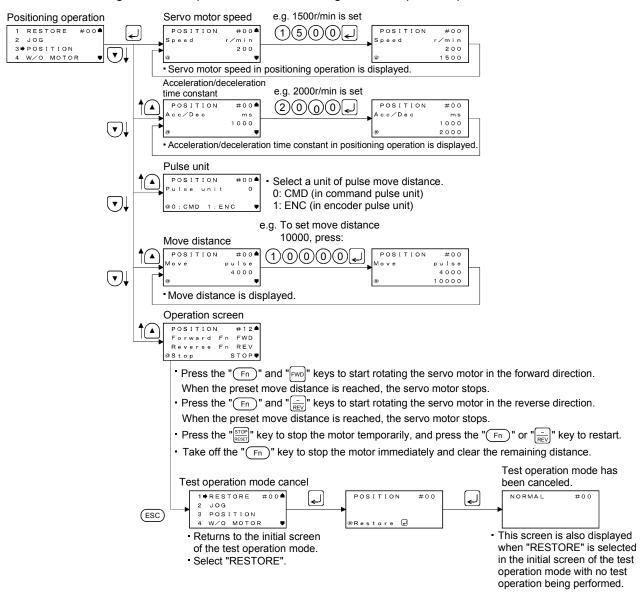
You can change the operation conditions with the parameter unit. The initial conditions and setting ranges for operation are listed below:

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.



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.

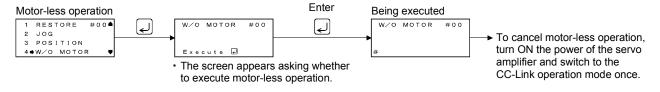
(3) Motor-less operation

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 signals. This operation can be used to check the sequence of a servo system controller 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

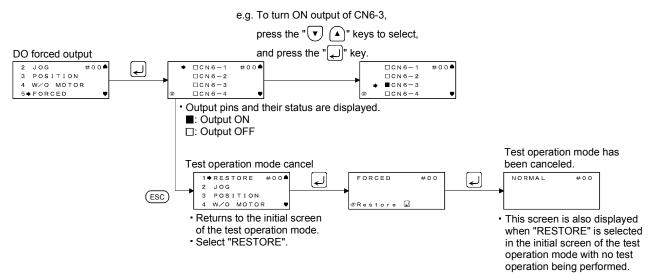
You can monitor the status display even during motor-less operation.

(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.

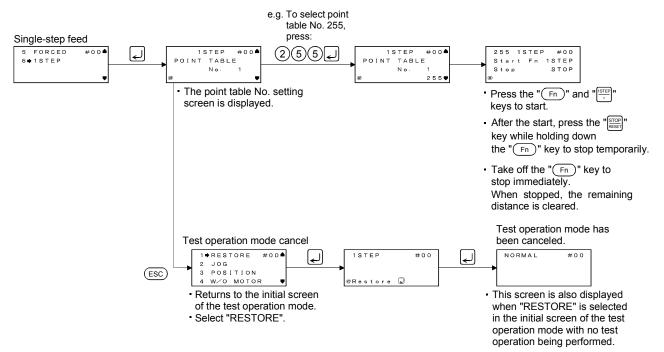


(5) Single-step feed

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	#00 COMMUNICATION ERROR PUSH ESC	 Hardware reason Mismatch in station number Mismatch in baud rate
Setting error	PB10 #00 VIC 1234 INPUT ERR.	Incorrect input, etc.
Write error	PB10 #00 VIC 1234 WRITE ERR.	Value is written while write is disabled.
EEP-ROM write error	#00 EEPROM ERR. PUSH ESC	 Parts in the MR-PRU03 parameter unit are faulty. EEP-ROM built in the MR-PRU03 parameter unit has been overwritten more than 100000 times.

8. PARAMETER UNIT (MR-PRU03)

(2) Messages

Message	Description
#00 Power off PUSH ESC	Valid parameters were written when power is off.
#00 Do not change station no push esc	The MR-PRU03 parameter unit was used to set a station number and perform transition during the test operation mode.
#00 SET TEST DRIVE DIFFER PUSH ESC	Operation mode is the test operation mode.
#00 TEST MODE CHANGED PUSH ESC	The test mode was changed due to external factor.
#00 DO NOT READ PARAMETER PUSH ESC	Reading settings specified for the parameter write disable (parameter No. PA19) was attempted.
TEST DRIVE ON PUSH ESC	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.
SERVO NOT READY PUSH ESC	The ready cannot be turned ON due to alarm, etc.
#12 Son on Push esc	Operation mode can be switched to the test operation mode at servo-on.
#12 DO NOT CHANGE STATION NO PUSH ESC	Station number change was attempted in the test operation mode.
#12 DO NOT WRITE BLOCK NUMBER PUSH ESC	Point table No. change was attempted in the single-step feed operation.

9. GENERAL GAIN ADJUSTMENT

9.1 Different adjustment methods

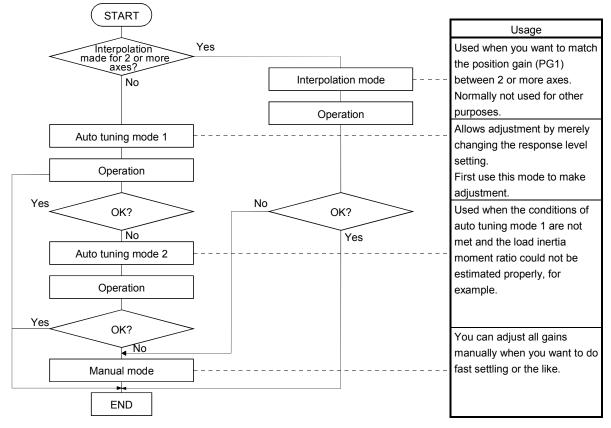
9.1.1 Adjustment on a single servo amplifier

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)

(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.	suppression filter. You can automatically set the optimum gains in response	
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.	 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.	 You can optimize gain adjustment and command pattern on personal computer. 	

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

- 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

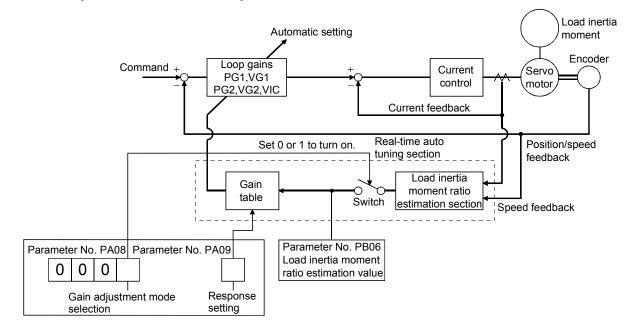
Use the auto tuning mode 2 when proper gain adjustment cannot be made by auto tuning mode 1. Since the load inertia moment ratio is not estimated in this mode, set the value of a correct load inertia moment ratio (parameter No. PB06).

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

9.2.2 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 servo configuration software section.

If the value of the load inertia moment ratio is already known or if estimation cannot be made properly, chose 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 tale.

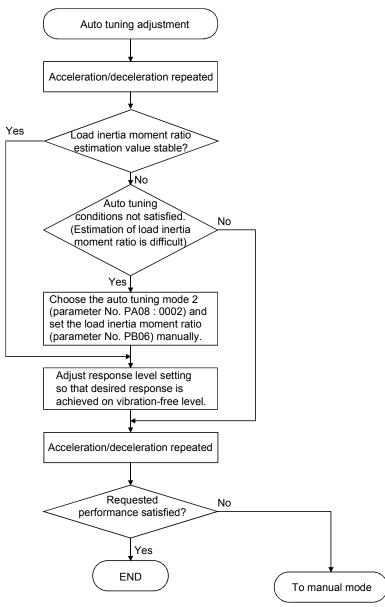
The auto tuning results are saved in the EEP-ROM of the servo amplifier every 60 minutes since power-on. At power-on, auto tuning is performed with the value of each loop gain saved in the EEP-ROM being used as an initial value.

POINT

- 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.

9.2.3 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.



9.2.4 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.

	Machine characteristic		
Response level setting	Machine rigidity	Machine resonance frequency guideline	Guideline of corresponding machine
1	Low	10.0	
2		11.3	
3	1	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	Large conveyor
12		37.0	Large conveyor
13		41.7	
14	- ↓	47.0	Arm robot
15		52.9	
16	Middle	59.6	General machine
17		67.1	tool conveyor
18	•	75.6	Precision
19		85.2	working machine
20		95.9	
21		108.0	Inserter Mounter
22		121.7	Bonder
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	

Setting of parameter No. PA09

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

 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

(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:

Speed loop response	Speed loop gain setting
frequency(Hz)	(1+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:

Speed integral compensation	2000 to 3000
setting(ms)	Speed loop gain setting/ (1+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.

Model loop gain \leq -	Speed loop gain setting	$-\sqrt{(1_{to} 1)}$
guideline guideline	(1+ ratio of load inertia moment to servo mortar inertia moment)	$-\times \left(\frac{1}{4} \operatorname{to} \frac{1}{8}\right)$

(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.

(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:

Speed loop response = $\frac{\text{Speed loop gain 2 setting}}{(1 + \text{ratio of load inertia moment to servo motor inertia moment}) \times 2\pi}$

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:

Speed integral	2000 to 3000
compensation setting(ms)	Speed loop gain 2 setting/ (1+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.

Model loop gain $\leq \frac{\text{Speed loop gain setting}}{(1 + \text{ratio of load inertia moment to servo mortar inertia moment})} \times \left(\frac{1}{4} \text{to} \frac{1}{8}\right)$

4) Model loop gain (PG1: parameter No. PB07)

This parameter determines the response level to a position command. Increasing position loop gain 1 improves track ability to a position command but a too high value will make overshooting liable to occur at the time of settling.

 $\begin{array}{l} \text{Model loop gain} \leq \frac{\text{Speed loop gain 2 setting}}{(1 + \text{ratio of load inertia moment to servo motor inertia moment)}} \times \left(\frac{1}{4} \text{ to } \frac{1}{8}\right)$

9.4 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, the model loop gain and speed loop gain which determine command track ability are set manually and the other parameter 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.

Rotation speed (r/min) ×262144(pulse)

Droop pulse value (pulse) =

```
60
Model loop gain setting
```

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
	15	4	14.3
		5	16.1
		6	18.1
	20	7	20.4
		8	23.0
	25	9	25.9
	30	10	29.2
		11	32.9
	35	12	37.0
		13	41.7
	45	14	47.0
	55	15	52.9
		16	59.6
	70	17	67.1
		18	75.6
	85	19	85.2
		20	95.9
	105	21	108.0
		22	121.7
	130	23	137.1
	160	24	154.4
		25	173.9
	200	26	195.9
		27	220.6
DDDE	240	28	248.5
		29	279.9
	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.

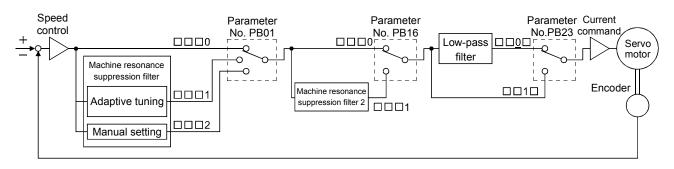
10. SPECIAL ADJUSTMENT FUNCTIONS

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.

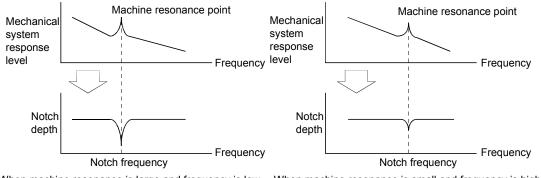
10.1 Function block diagram



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.

(2) Parameters

The operation of adaptive tuning mode (parameter No. PB01).

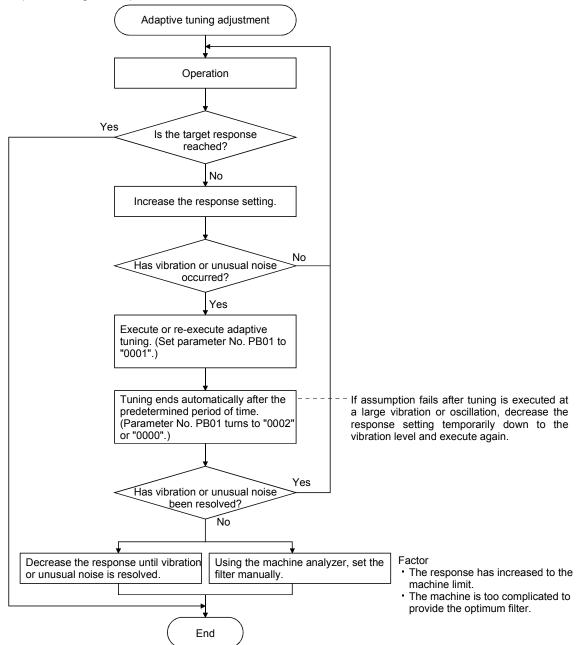


Filter tuning mode selection

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.

(3) Adaptive tuning mode procedure



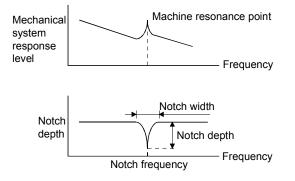
POINT

- "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.

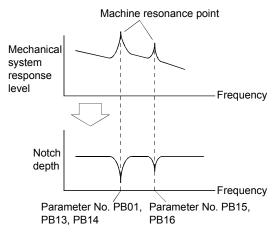
10.3 Machine resonance suppression filter

(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.



(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)

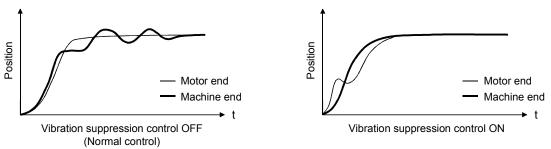
When you have made adaptive filter tuning mode (parameter No. PB01) "manual mode", set up the machine resonance suppression filter 1 becomes effective.

POINT

- 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.
- 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.
- A deeper notch has a higher effect on machine resonance suppression but increases a phase delay and may increase vibration.
- A deeper notch has a higher effect on machine resonance suppression but increases a phase delay and may increase vibration.
- The machine characteristic can be grasped beforehand by the machine analyzer on the MR Configurator (Servo configuration software). This allows the required notch frequency and depth to be determined.

- 10.4 Advanced vibration suppression control
- (1) Operation

Vibration suppression control is used to further suppress machine end vibration, such as workpiece end vibration and base shake. The motor side operation is adjusted for positioning so that the machine does not shake.

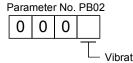


When the advanced vibration suppression control (vibration suppression control tuning mode parameter No. PB02) is executed, the vibration frequency at machine end can automatically be estimated to suppress machine end vibration.

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).



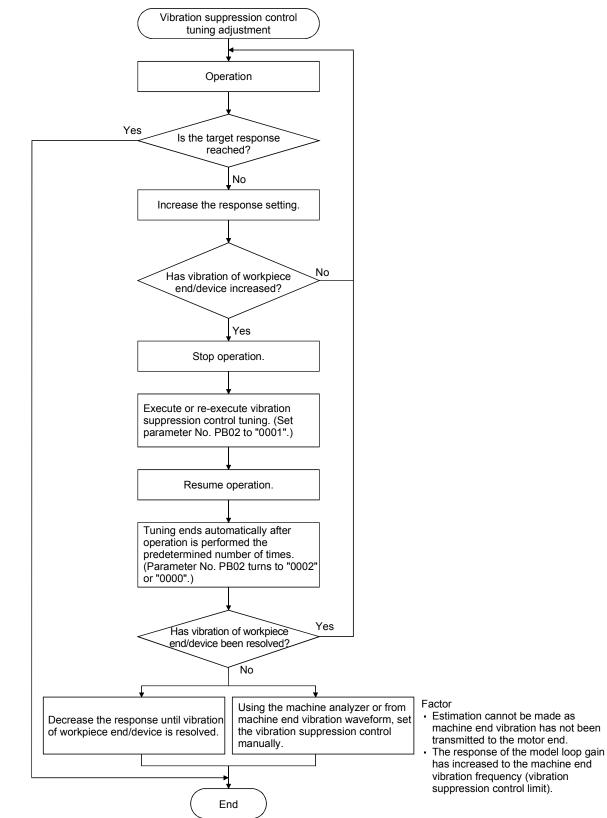
 Vibration suppression control tuning mode

Setting	Vibration Suppression Control Tuning Mode	Automatically Set Parameter
0	Vibration suppression control OFF	(Note)
4	Vibration suppression control tuning mode	Parameter No. PB19
1	(Advanced vibration suppression control)	Parameter No. PB20
2	Manual mode	

Note. Parameter No. PB19 and PB20 are fixed to the initial values.

POINT

- 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 end 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.

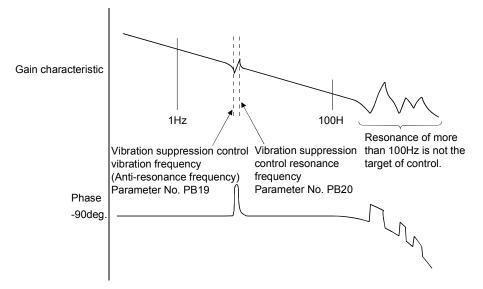


(3) Vibration suppression control tuning mode procedure

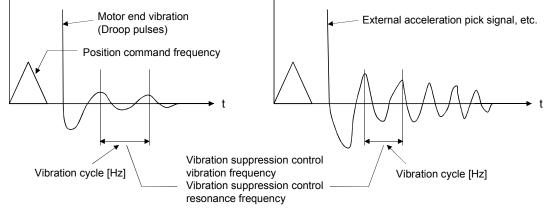
(4) Vibration suppression control manual mode

Measure work end 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



Set the same value.

POINT

- When machine end vibration does not show up in motor end vibration, the setting of the motor end 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×PG1) > vibration frequency

- 10.5 Low-pass filter
- (1) Function

When a ballscrew 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:

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.)



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 external signal to change gains during operation.

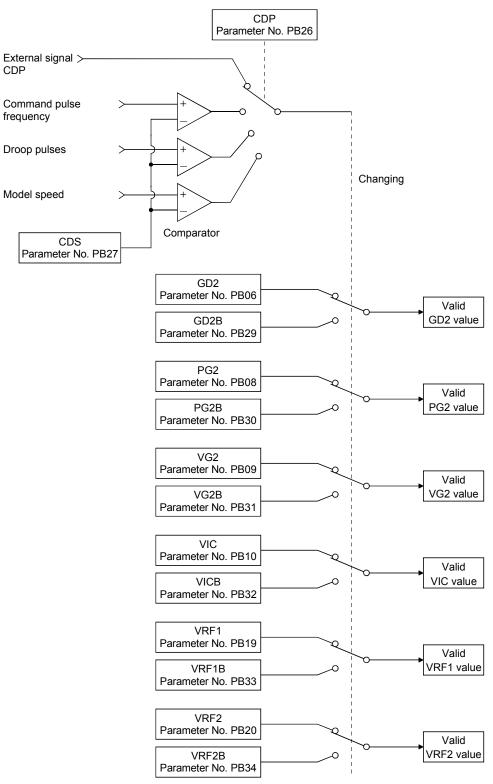
10.6.1 Applications

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 external signal 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).

10.6.2 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).



10.6.3 Parameters

When using the gain changing function, always set "DDD3" 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.

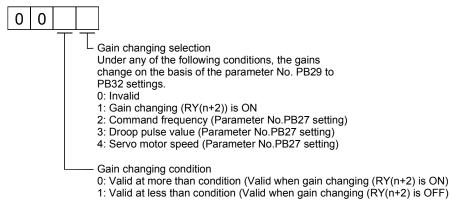
Parameter No.	Abbrevi ation	Name	Unit	Description
PB06	GD2	Ratio of load inertia moment to servo motor inertia moment	times	Control parameters before changing
PB07	PG1	Model loop gain	rad/s	Position and speed gains of a model used to set the response level to a command. Always valid.
PB08	PG2	Position 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	times	Used to set the ratio of load inertia moment to servo motor inertia moment after changing.
PB30	PG2B	Gain changing position loop gain 2	rad/s	Used to set the value of the after-changing position loop gain 2.
PB31	VG2B	Gain changing speed loop gain 2	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.

(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)) external input signal for gain changing.



(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.

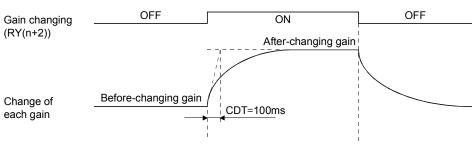
10.6.4 Gain changing operation

This operation will be described by way of setting examples.

(1) When you choose changing by external input(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	times
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	times
PB30	PG2B	Gain changing position loop gain	84	
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 signal)	
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



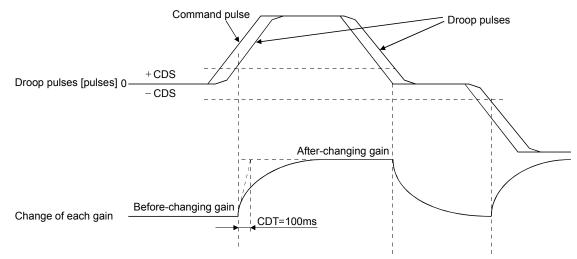
Model loop gain 1			100		
Ratio of load inertia moment to servo motor inertia moment	4.0	\rightarrow	10.0	\rightarrow	4.0
Position loop gain	120	\rightarrow	84	\rightarrow	120
Speed loop gain	3000	\rightarrow	4000	\rightarrow	3000
Speed integral compensation	20	\rightarrow	50	\rightarrow	20

(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	times
PB08	PG2	Position loop gain	120	rad/s
PB09	VG2	Speed loop gain 2	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	times
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	\rightarrow	10.0	\rightarrow	4.0	\rightarrow	10.0
Position loop gain	120	\rightarrow	84	\rightarrow	120	\rightarrow	84
Speed loop gain	3000	\rightarrow	4000	\rightarrow	3000	\rightarrow	4000
Speed integral compensation	20	\rightarrow	50	\rightarrow	20	\rightarrow	50

MEMO

11.1 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	LED is not lit. LED flickers.	Not improved if connectors CN2, CN3 and CN6 are disconnected.	 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.	 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 14.4 and remo	ve cause.	Section 14.4
2	Switch on servo-on	Alarm occurs.	Refer to section 14.4 and remo	ve cause.	Section 14.4
	(RYn0) signal.	Servo motor shaft is not servo-locked (is free).	 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. 	 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: 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.	

11.2 Operation at error occurrence

An error occurring during operation will result in any of the statuses indicated in the following table.

Error location	Description	Operati	Operation mode		
	Description	Test operation	CC-Link operation		
Servo side alarm	Servo operation	Stop	Stop		
occurrence	CC-Link data communication	Continued	Continued		
Option unit	Servo operation	Stop	Stop		
communication error	CC-Link data communication	Stop	Stop		
CC-Link	Servo operation	Stop	Stop		
communication error	CC-Link data communication	Stop	Stop		
PLC error/STOP	Servo operation	Continued	Stop		
FLC EII0//STOF	CC-Link data communication	Stop	Stop		
Servo side warning	Servo operation	Stop	Continued		
occurrence	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) Cor	nmunicatio	n alarm di	splay LED	Operation	
L.RUN	SD	RD	L.ERR	ορειαιοί	
0	0	0	0	Normal communication is made, but a CRC error sometimes occurs due to noise.	
0	0	0		Normal communication	
0	0	•	0	Hardware fault	
0	0	•	•	Hardware fault	
\bigcirc	•	0	0	Receive data results in CRC error, disabling a response.	
\bigcirc	•	0		Data does not reach the host.	
\bigcirc		•	Ô	Hardware fault	
\bigcirc	•	•		Hardware fault	
•	0	0	0	Polling response is made, but refresh receive is in CRC error.	
•	0	0		Hardware fault	
•	\odot	•	0	Hardware fault	
•	0	•		Hardware fault	
•	•	0	0	Data addressed to the host resulted in CRC error.	
		0		Data does not reach the host, or the data addressed to the host cannot be received due to	
•	•	0	•	noise.	
•	•	•	0	Hardware fault	
	•	•	0	Baud rate setting illegal	
	•	0	0	Station number setting illegal	
	0	0	Ô	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. \bigcirc : Lit \bullet : Extinguished \bigcirc : Flicker

11.4 When alarm or warning has occurred

POINT

 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 \bigcirc in the alarm deactivation column.

\mathbf{I}							Display	Name
			Ala	Irm deactivatio	n		A90	Home positoning incomplete warning
$ \rangle$							A92	Open battery cable warning
$ \rangle$				(Note3)			A96	Home position setting error
	Display	Name	_	MR	(Note2)		A98	Software limit warning
			Power OFF→ON	Configurator	Alarm reset		A99	Stoke limit warning
			OFF /ON	parameter	(RES)		A9D	CC-Link warning 1
				unit	(A9E	CC-Link warning 2
						gs	A9F	Battery warning
	A10	Undervoltage	0	0	0	Warnings	AE0	Excessive regeneration warning
	A12	Memory error 1 (RAM)	0		/	Var	AE1	Overload warning 1
	A13	Clock error	0		/	_	AE3	Absolute position counter warning
	A15	Memory error 2 (EEP-ROM)	0				AE6	Servo emergency stop warning
	A16	Encoder error 1 (At power on)	0		\backslash		AE8	Cooling fan speed reduction warning
	A17	Board error	0		/		AE9	Main circuit off warning
	A19	Memory error 3 (Flash-ROM)	0				AEC	Overload warning 2
	A1A	Motor combination error	0		/		AED	Output watt excess warning
	A20	Encoder error 2	0					
	A24	Main circuit error	0	0	0			
	A25	Absolute position erase	0		/			
	A30	Regenerative error	(Note 1)	(Note 1)	(Note 1)			
6	A31	Overspeed	0	0	0			
Ĕ	A32	Overcurrent	0					
Alarms	A33	Overvoltage	0	0	0			
	A35	Command pulse frequency alarm	0	0	0			
1	A37	Parameter error	0					
	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	0		/			
	A50	Overload 1	(Note 1)	(Note 1)	(Note 1)			
	A51	Overload 2	(Note 1)	(Note 1)	(Note 1)			
1	A52	Error excessive	0	0	0			
	A61	Operation alarm	0	0	0			
	A8A	Serial communication time-out	0	0	0			
	A8D	CC-Link alarm	0	0	0			
	A8E	Serial communication error	0	0	0			
	888	Watchdog	0					
Note	1 Deact	ivate the alarm about 30 minutes o	f cooling tim	a after removi	ng the car	ise of	occurren	<u>60</u>

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.

11.4.2 Remedies for alarms

	 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. Otherwise, misoperation may occur. 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 servomotor. 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. The optional MR Configuration may be used to refer to the cause.

Display	Name	Definition	Cause	Action
A10	Undervoltage	Power supply voltage	 Power supply voltage is low. There was an instantaneous control power failure of 60ms or longer. Shortage of power supply capacity caused the power supply voltage to drop at start, etc. The bus voltage dropped to the following value or less. MR-J3-□T: 200VDC MR-J3-□T1: 158VDC Faulty parts in 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. 	Review the power supply.
A12	Memory error 1 (RAM)	RAM, memory fault	Faulty parts in the servo amplifier. Checking method	Change the servo amplifier.
A13	Clock error	Printed board fault	Alarm (any of A11 and A13) occurs if power is switched on after disconnection of all cables but the control circuit power supply cables.	

Display	Name	Definition	Cause	Action
A15	Memory error 2 (EEP-ROM)	EEP-ROM fault	1. Faulty parts in the servo amplifier Checking method Alarm (A15) occurs if power is switched on after disconnection of all cables but the control circuit power supply cables.	Change the servo amplifier.
			2. The number of write times to EEP- ROM exceeded 100,000.	
A16	Encoder error 1 (At power on)	occurred between encoder and servo	Encoder connector (CN2) disconnected. Encoder fault	Connect correctly. Change the servo motor.
			 Encoder cable faulty (Wire breakage or shorted) Encoder cable type (2-wire, 4-wire) selection was wrong in parameter setting. 	Repair or change cable. 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	Checking method Alarm (A17 or A19) occurs if power is switched on after disconnection of all cables but the control circuit power supply cable.	
A1A	Motor combination error	Wrong combination of servo anplifier and servo motor.	Wrong combination of servo amplifier and servo motor connected.	Use correct combination.
A20	Encoder error 2	occurred between	1. Encoder connector (CN2) disconnected.	Connect correctly.
		amplifier.	2. Encoder cable faulty (Wire breakage or shorted)	Repair or change the cable.
			3. Encoder fault	Change the servo motor.
A24	Main circuit error	occurred at the servo	 Power input wires and servo motor power wires are in contact. Sheathes of servo motor power cables deteriorated, resulting in ground fault. 	Connect correctly. Change the cable.
			3. Main circuit of servo amplifier failed. Checking method A24 occurs if the servo is switched on after disconnecting the U, V, W power cables from the servo amplifier.	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 battery.
			 Battery cable or battery is faulty. Home position not set. 	Always make home position setting again. After leaving the alarm occurring for a few minutes, switch power off, then on again. Always make home position setting again.

Display	Name	Definition	Cause	Action
A30	Regenerative	Permissible	1. Wrong setting of parameter No.	Set correctly.
	alarm	regenerative resistor or regenerative	PA02 2. Built-in regenerative resistor or regenerative option is not connected.	Connect correctly
		option is exceeded.	 High-duty operation or continuous regenerative operation caused the permissible regenerative power of the regenerative option to be exceeded. Checking method 	 Reduce the frequency of positioning. Use the regenerative option of larger capacity. Reduce the load.
			Call the status display and check the regenerative load ratio. 4. Power supply voltage is abnormal.	Review power supply
			MR-J3-□T:260VAC or more MR-J3-□T1:More than 135VAC	
			 Built-in regenerative resistor or regenerative option faulty. 	Change servo amplifier or regenerative option.
		Regenerative transistor fault	 6. Regenerative transistor faulty. Checking method 1) The regenerative option has overheated abnormally. 	Change the servo amplifier.
			2) The alarm occurs even after removal of the built-in regenerative resistor or regenerative option.	
A31	Overspeed	Speed has exceeded the instantaneous	 Input command pulse frequency exceeded the permissible instantaneous speed frequency. 	Set command pulses correctly.
		permissible speed.	 Small acceleration/deceleration time constant caused overshoot to be large. 	Increase acceleration/deceleration time constant.
			 Servo system is instable to cause overshoot. 	 Re-set servo gain to proper value. If servo gain cannot be set to proper value: Reduce load inertia moment ratio; or Reexamine acceleration/ deceleration time constant.
			 Electronic gear ratio is large (parameters No. PA06, PA07) 	Set correctly.
			5. Encoder faulty.	Change the servo motor.
A32	Overcurrent	Current that flew is higher than the	1. Short occurred in servo motor power (U, V, W).	Correct the wiring.
		permissible current of the servo amplifier.	2. Transistor (IPM) of the servo amplifier faulty. Checking method Alarm (A32) occurs if power is switched on after U,V and W are disconnected.	Change the servo amplifier.
			 Ground fault occurred in servo motor power (U, V, W). 	Correct the wiring.
			 External noise caused the overcurrent detection circuit to misoperate. 	Take noise suppression measures.

Display	Name	Definition	Cause	Action
A33	Overvoltage	The following shows	1. Regenerative option is not used.	Use the regenerative option.
	Ū.	the input value of	2. Though the regenerative option is	Set correctly.
		converter bus	used, the parameter No.PA02	
		voltage.	setting is " \Box \Box 00 (not used)".	
		MR-J3-⊟T(1)	3. Lead of built-in regenerative resistor	1. Change lead.
			or regenerative option is open or	2. Connect correctly.
			disconnected.	
			4. Regenerative transistor faulty.	Change servo amplifier
			5. Wire breakage of built-in	1. For wire breakage of built-in regenerative
			regenerative resistor or regenerative	resistor, change servo amplifier.
			option.	2. For wire breakage of regenerative option,
				change regenerative option.
			6. Capacity of built-in regenerative	Add regenerative option or increase
			resistor or regenerative option is insufficient.	capacity.
				Poviow the newer supply
			 Power supply voltage high. Ground fault occurred in servo 	Review the power supply. Correct the wiring.
			motor power (U, V, W).	Correct the winnig.
A35	Command pulse	Input pulse frequency		Change the pulse frequency to a proper
A00	frequency error	of the command	generator is too high.	value.
	inequency enter	pulse is too high.	2. Noise entered the pulses of the	Take action against noise.
		,	manual pulse generator.	
			3. Manual pulse generator failure.	Change the manual pulse generator.
A37	Parameter error	Parameter setting is	1. Servo amplifier fault caused the	Change the servo amplifier.
-		wrong.	parameter setting to be rewritten.	
		Ũ	2. Regenerative option not used with	Set parameter No.PA02 correctly.
			servo amplifier was selected in	
			parameter No.PA02.	
			3. The number of write times to EEP-	Change the servo amplifier.
			ROM exceeded 100,000 due to	
			parameter write, etc.	
A45	Main circuit	Main circuit device	1. Servo amplifier faulty.	Change the servo amplifier.
	device overheat	overheat.	2. The power supply was turned on	The drive method is reviewed.
			and off continuously by overloaded	
			status.	
			3. Ambient temperature of servo motor	
			is over 55°C.	temperature is 0 to 55°C.
			4. Used beyond the specifications of	Use within the range of specifications.
A 4 G	Convo motor	Sonio motor	close mounting.	Deview environment as that embient
A46	Servo motor overheat	Servo motor temperature rise	 Ambient temperature of servo motor is over 40°C. 	Review environment so that ambient temperature is 0 to 40°C.
	overneat			
		sensor.	2. Servo motor is overloaded.	 Reduce load. Review operation pattern.
				3. Use servo motor that provides larger
				output.
			3. Thermal sensor in encoder is faulty.	Change servo motor.
A47	Cooling fan	The cooling fan of	Cooling fan life expiration (Refer to	Change the cooling fan of the servo
	alarm	the servo amplifier	section 2.5.)	amplifier.
	alarm		Foreign matter caught in the fan	Remove the foreign matter.
		decreased to or	stopped rotation.	
		below the alarm	The power supply of the cooling fan	Change servo amplifier.

Display	Name	Definition	Cause	Action
A50	Overload 1	Load exceeded overload protection characteristic of servo amplifier.	 Servo amplifier is used in excess of its continuous output current. 	 Reduce load. Review operation pattern. Use servo motor that provides larger output.
			 Servo system is instable and hunting. 	 Repeat acceleration/ deceleration to execute auto tuning. Change auto tuning response setting. Set auto tuning to OFF and make gain adjustment manually.
			3. Machine struck something.	 Review operation pattern. Install limit switches.
			 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. Checking method 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.	Change the servo motor.
A51	Overload 2	Machine collision or the like caused max.	1. Machine struck something.	 Review operation pattern. Install limit switches.
		output current to flow successively for several seconds. Servo motor locked:	 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.
		1s or more During rotation: 2.5s or more	3. Servo system is instable and hunting.	 Repeat acceleration/deceleration to execute auto tuning. Change auto tuning response setting. Set auto tuning to OFF and make gain adjustment manually.
			4. Encoder faulty. Checking method 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.	Change the servo motor.

Display	Name	Definition	Cause	Action
A52	Error excessive	The difference between the model	1. Acceleration/deceleration time constant is too small.	Increase the acceleration/deceleration time constant.
		actual servomotor position exceeds	2. Foward torque limit (parameter No.PA11) or reverse torque limit (parameter No.PA12) are too small.	Increase the torque limit value.
		three rotations. (Refer to the function block diagram in section 1.1.2.)	 Motor cannot be started due to torque shortage caused by power supply voltage drop. 	 Review the power supply capacity. Use servo motor which provides larger output.
		Section 1.1.2.)	 Position loop gain (parameter No.PB08) value is small. 	Increase set value and adjust to ensure proper operation.
			 Servo motor shaft was rotated by external force. 	 When torque is limited, increase the limit value. Reduce load. Use servo motor that provides larger output.
			6. Machine struck something.	 Review operation pattern. Install limit switches.
			7. Encoder faulty.	Change the servo motor.
			 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	1. Communication cable breakage.	Repair or change communication cable
	communication time-out error	than the specified	 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	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.
		cannot be made.	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.
			 The transmission status is abnormal. 	Reexamine the wiring.
			 CC-Link twisted cable wiring incorrect. 	1. Repair or change the CC-Link twisted cable.
			 CC-Link twisted cable faulty. The CC-Link connector has come off. 	2. Connect the cable or connector correctly.
			 The terminating resistor is not connected. Noise entered the CC-Link twisted 	Connect the terminating resistor correctly
			cable.	
A8E	Serial communication	Serial communication error occurred between servo	1. Communication cable fault (Open cable or short circuit).	Repair or change the cable.
	error	amplifier and communication device (e.g. personal computer).	 Communication device (e.g. personal computer) faulty. 	Change the communication device (e.g. personal computer).
(Note) 888	Watchdog	CPU, parts faulty.	Fault of parts in servo amplifier. Checking method Alarm (888) occurs if power is switched on after disconnection of all cables but the control circuit power supply cable.	Change 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. Otherwise, misoperation may occur.

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 AL.E6 or AL.EA occurs, 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. Use the optional servo configuration software to refer to the cause of warning.

Remove the cause of warning according to this section. Use the optional MR Configurator to refer to a factor of warning occurrence.

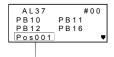
Display	Name		Definition	Cause	Action
A90	Home position return incomplete	system	Positioning operation was performed without home position return.	 Positioning operation was performed without home position return. 	Perform home position return.
		In incremental	ended abnormally.	 Home position return speed could not be decreased to creep speed. Limit switch was actuated during home position return starting at other than position beyond dog. 	Review home position return speed/creep speed/moving distance after proximity dog.
		system	Positioning operation was performed without home position setting.	1. Positioning operation was performed without home position setting.	Perform home position setting.
		position detection s	Home position setting ended abnormally.	 Home position setting speed could not be decreased to creep speed. Limit switch was actuated during home position setting starting at other than position beyond dog. 	Review home position setting speed/creep speed/moving distance after proximity dog.
		In absolute pos	performed without making home position setting while	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 6. Battery cable or battery is faulty. 	Change battery. Always make home position setting again.
A92	Open battery cable			1. Battery cable is open.	Repair cable or changed.
	warning detection s voltage is l		ction system battery ge is low.	 Battery voltage supplied from the servo amplifier to the encoder fell to about 3V or less. (Detected with the encoder) 	Change battery.
A96	Home position setting warning		e position setting d not be made.	1. Droop pulses remaining are greater than the in-position range setting.	Remove the cause of droop pulse occurrence
				droop pulses.	Do not enter command pulse after clearing of droop pulses.
				3. Creep speed high.	Reduce creep speed.

Display	Name	Definition	Cause	Action
A98	Software limit	Software limit set in	1. Software limit was set within actual	Set parameter No. PC31 to PC34
	warning	parameter is reached.	operation range.	correctly.
			Point table of position data in excess of software limit was executed.	Set point table correctly.
			 Software limit was reached during JOG operation or manual pulse generator operation. 	Perform operation within software limit range.
A99	Stroke limit warning	The stroke end (LSP or LSN) of the direction which gave instructions was turned off.	The limit switch became valid.	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.	 The station number switch position was changed from the setting at power-on. The baud rate switch position was changed from the setting at power-on. The occupied station count switch position was changed from the setting at power-on. 	Return to the setting at power-on.
A9E	CC-Link warning 2	Communication error of	1. The transmission status is abnormal.	Take measures against noise.
		cable.	 CC-Link twisted cable wiring incorrect. CC-Link twisted cable faulty. 	1. Change the CC-Link twisted cable.
			4. The CC-Link connector has come off.	2. Connect the cable or connector correctly.
				Connect the terminating resistor
105	Detter service and in a		6. Noise entered the CC-Link twisted cable.	correctly.
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	regenerative power may	Regenerative power increased to 85% or more of permissible regenerative power of built-in regenerative resistor or regenerative option. Checking method Call the status display and check regenerative load ratio.	 Reduce frequency of positioning. Change regenerative option for the one with larger capacity. 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. Cause, checking method Refer to A50, A51.	Refer to AL.50, AL.51.
AE3	Absolute position counter warning	Absolute position encoder pulses faulty.	1. Noise entered the encoder.	Take noise suppression measures.
			2. Encoder faulty.	Change servo motor.
	The multi-revolution counter value of the absolute position encoder exceeded the maximum revolution range.		 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		was turned off.)	Ensure safety and deactivate forced stop.
AE8 Cooling fan spee 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	Cooling fan life expiration (Refer to section 2.5.) The power supply of the cooling fan is	Change the cooling fan of the servo amplifier. Change servo amplifier.
450	Main aircuit off	amplifiers equipped with a cooling fan.	broken.	
AE9	Main circuit off warning	Servo-on (SON) was switched on with main circuit power off.		Switch on main circuit power.

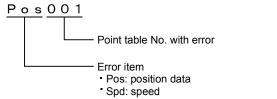
Display	Name	Definition	Cause	Action
AEC	Overload warning 2	current exceeding the rating flew intensively in	During a stop, the status in which a current flew intensively in any of the U, V and W phases of the servo motor occurred repeatedly, exceeding the warning level.	 Reduce the positioning frequency at the specific positioning address. Reduce the load. Replace the servo amplifier/ servo motor with the one of larger capacity.
AED	Output watt excess warning	output wattage (speed \times torque) of the servo motor	Continuous operation was performed with the output wattage (speed \times torque) of the servo motor exceeding 150% of the rated output.	 Reduce the servo motor speed. 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 (37), the point table error details are displayed.



Point table error details For the point table No.1 position data error



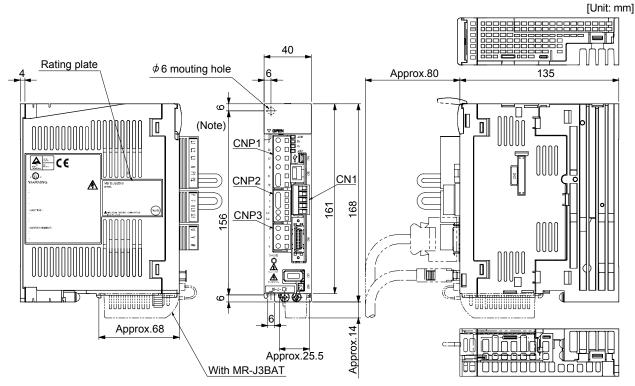
- Acc: acceleration time constant Dec: deceleration time constant
- Dwl: dwell
- Aux: auxiliary function

12. OUTLINE DRAWINGS

12. OUTLINE DRAWINGS

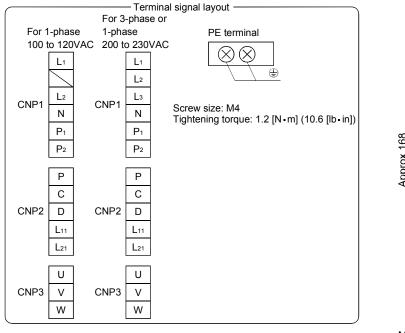
- 12.1 Servo amplifier
- (1) MR-J3-10T MR-J3-20T

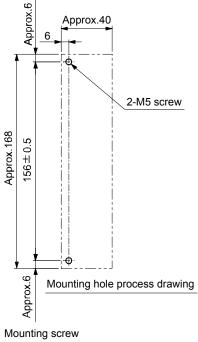
MR-J3-10T1 • MR-J3-20T1



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])



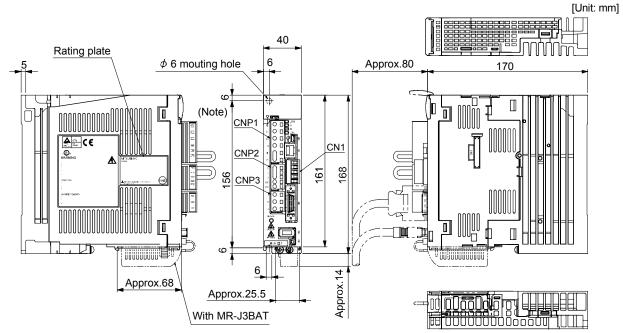


Screw size: M5 Tightening torque: 3.24[N · m] (28.7[lb · in])

12. OUTLINE DRAWINGS

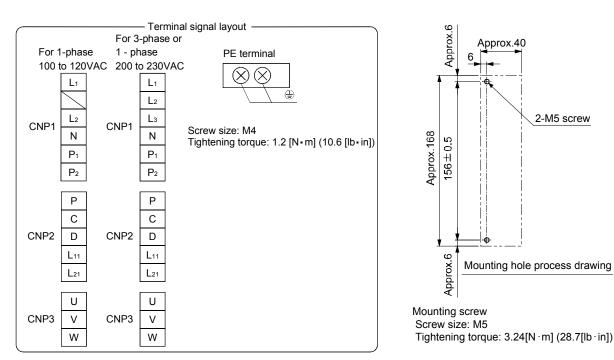
(2) MR-J3-40T • MR-J3-60T

MR-J3-40T1

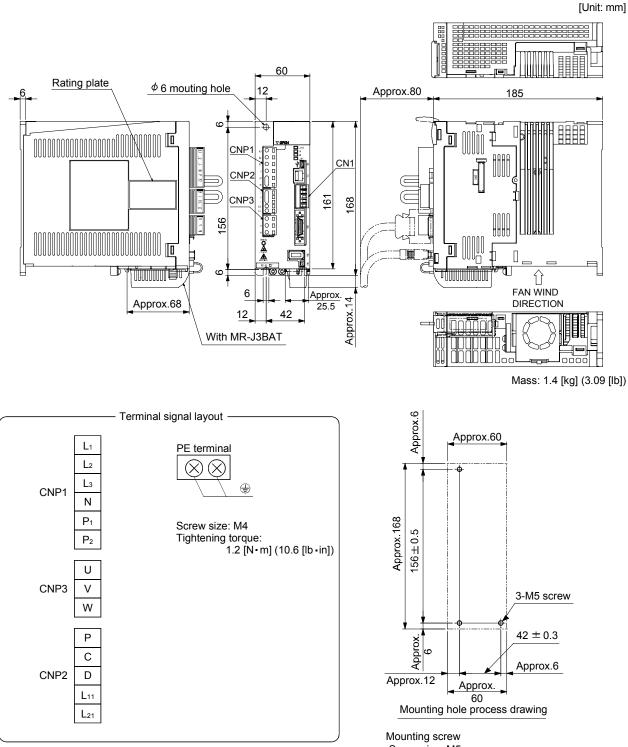


Note. This data applies to the 3-phase or 1-phase 200 to 230VAC power supply models. For a single-phase, 100 to 120VAC power supply, refer to the terminal signal layout.

Mass: 1.0 [kg] (2.21 [lb])

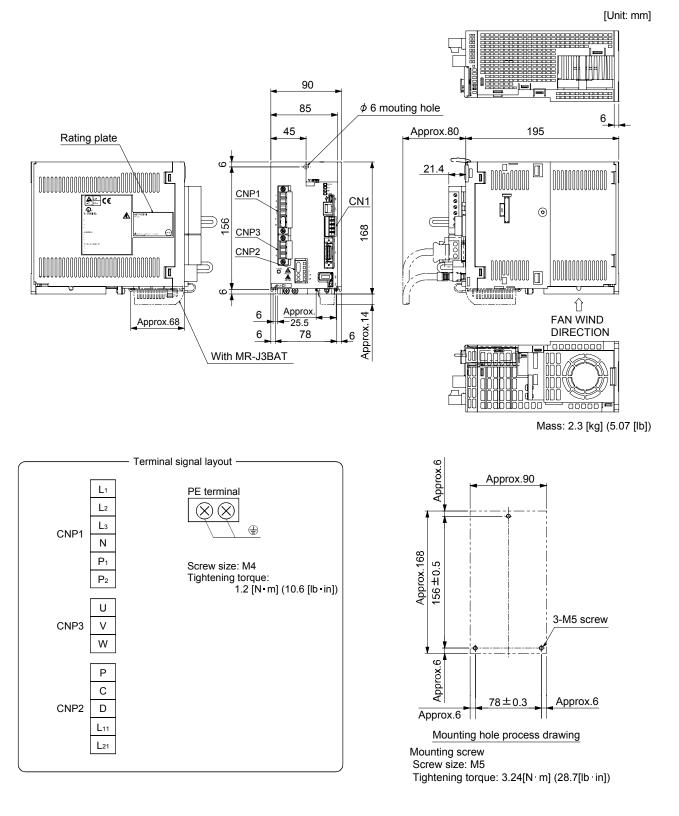


(3) MR-J3-70T • MR-J3-100T



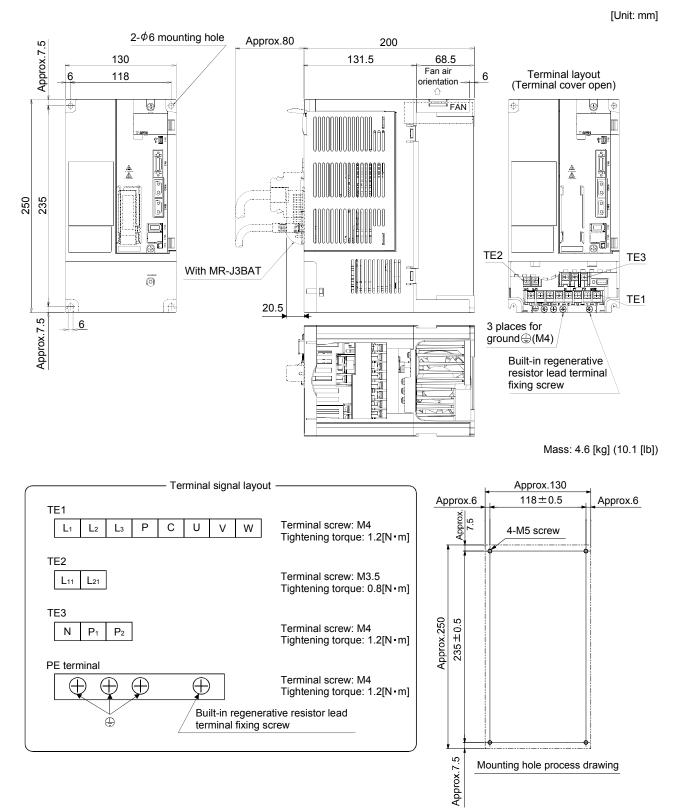
Screw size: M5 Tightening torque: 3.24[N·m] (28.7[Ib·in])

(4) MR-J3-200T • MR-J3-350T



12. OUTLINE DRAWINGS

(5) MR-J3-500T

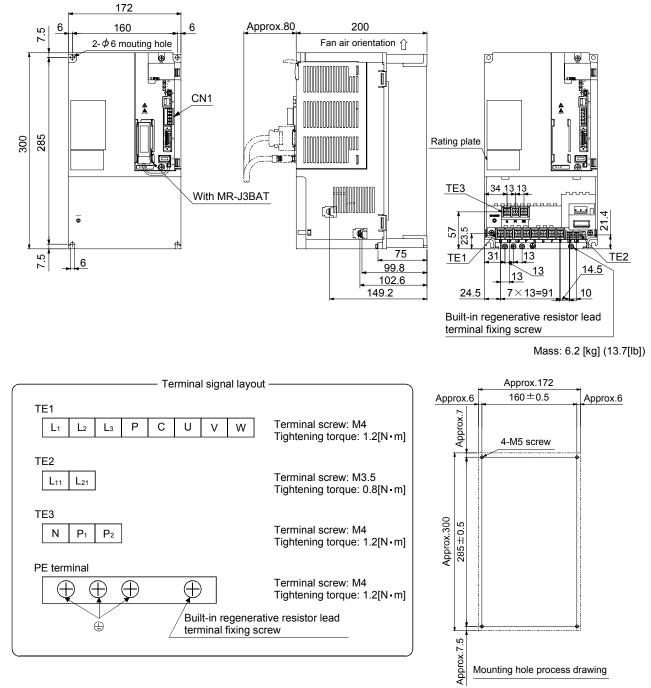


Mounting screw Screw size: M5 Tightening torque: 3.24[N·m] (28.7[lb·in])

12. OUTLINE DRAWINGS

(6) MR-J3-700T

[Unit: mm]



Mounting screw Screw size: M5 Tightening torque: 3.24[N ·m] (28.7[lb ·in])

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

12

Ð

_12

12

400 376

2

[Unit: mm] 260 Approx.80 12 260 236 Fan air Orientation ϕ 2-12 mouting hole \oplus CN1] Ű. ö 0 With MR-J3BAT 123 13 23 Rating plate ŧ 36.5 舟 183 ΤE 227 26 $52 6 \times 26 = 156$ Approx.260 236 ± 0.5 Approx.12 Approx.12 Approx.12 4-M10 screw 1 Servo amplifier Mass[kg]([lb]) Approx.400 376 ±0.5 18.0(40) MR-J3-11KT MR-J3-15KT 18.0(40) MR-J3-22KT 19.0(42) Approx.12 Mounting hole process drawing

TE									
L1	L2	Lз	L11 L21	U	V	W	7		
P 1	Ρ	С	Ν	Ð	(٢			
							_		
	_	_		_			L1 L2 L3 U V W P1 P C N	L11• L21	Ð
МВ	J3-11	VТ	Screw size				M6	M4	M6
	J3-11		Tightening torque [(lb:in)][N • m]		е	3.0	1.2	6.0	
	Screw size				M8	M4	M8		
MR-	MR-J3-22KT Tightening torque [(Ib:in)][N • m]			le	6.0	1.2	6.0		
								•	

Terminal	signal la	ayout

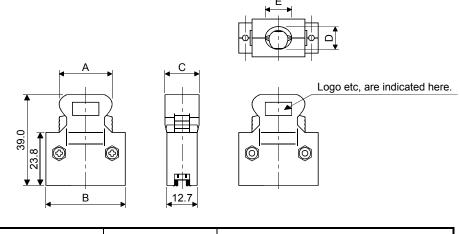
Mounting	screw
----------	-------

Servo amplifier	Screw size	Tightening torque [N m]([Ib in])
MR-J3-11KT MR-J3-15KT MR-J3-22KT	M10	26.5 (234.5)

12.2 Connector for CN3

(1) One-touch lock type

[Unit: mm]

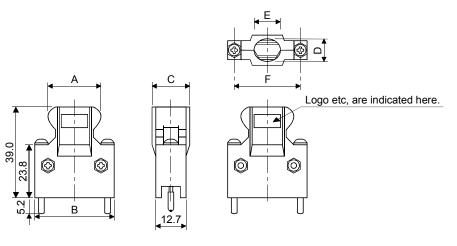


	Connector	Shell kit	Each type of dimension					
		Shell Kit	А	В	С	D	E	
	10120-3000VE	10320-52F0-008	22.0	33.3	14.0	10.0	12.0	

(2) Jack screw M2.6 type

This is not available as option.

[Unit: mm]



Connector	Shell kit	Each type of dimension						
	Shell Kit	А	В	С	D	Е	F	
10120-3000VE	10320-52F0-008	22.0	33.3	14.0	10.0	12.0	27.4	

13. CHARACTERISTICS

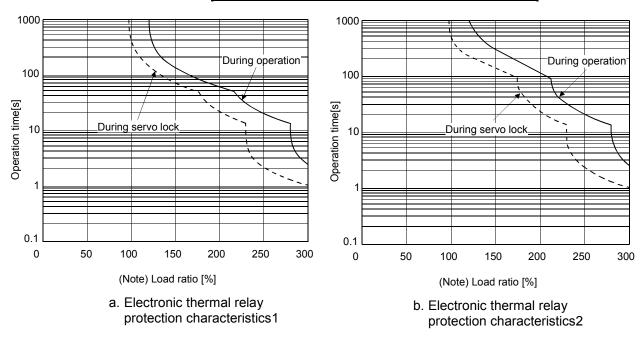
13.1 Overload protection characteristics

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 flew 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, or use it at 75% or a smaller effective load ratio.

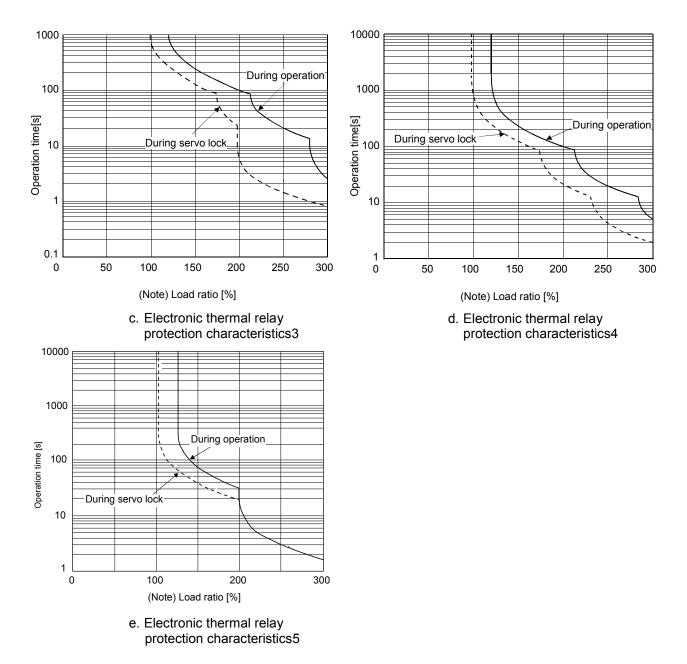
Servo amplifier	Graph	
MR-J3-10T (1)	Fig 12. 1 a	
MR-J3-20T (1) • MR-J3-40T (1)		
MR-J3-60T to MR-J3-100T	Fig 12. 1 b	
MR-J3-200T • Mr-J3-350T	Fig 12. 1 c	
MR-J3-500T • MR-J3-700T	Fig 12. 1 d	
MR-J3-11KT to MR-J3-22KT	Fig 12. 1 e	



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 (1/2)

13 CHARACTERISTICS



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 (2/2)

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.

Servo amplifier	Servo motor	(Note 1) Power supply	(No Servo amplifier-g	Area required for heat dissipation	
		capacity[kVA]	At rated torque	With servo off	[m²]
	HF-MP053	0.3	25	15	0.5
MR-J3-10T (1)	HF-MP13	0.3	25	15	0.5
	HF-KP053 • 13	0.3	25	15	0.5
	HF-MP23	0.5	25	15	0.5
MR-J3-20T (1)	HF-KP23	0.5	25	15	0.5
	HF-MP43	0.9	35	15	0.7
MR-J3-40T (1)	HF-KP43	0.9	35	15	0.7
	HF-SP52	1.0	40	15	0.8
MR-J3-60T	HF-SP51	1.0	40	15	0.8
	HC-LP52	1.0	40	15	0.8
	HF-MP73	1.3	50	15	1.0
MR-J3-70T	HF-KP73	1.3	50	15	1.0
	HC-UP72	1.3	50	15	1.0
	HF-SP102	1.7	50	15	1.0
MR-J3-100T	HF-SP81	1.5	50	15	1.0
	HC-LP102	1.7	50	15	1.0
	HF-SP152	2.5	90	20	1.8
	HF-SP202	3.5	90	20	1.8
	HF-SP121	2.1	90	20	1.8
	HF-SP201	3.5	90	20	1.8
MR-J3-200T	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
	HF-SP352	5.5	130	20	2.7
	HC-RP203	3.5	90	20	1.8
MR-J3-350T	HC-UP202	3.5	90	20	1.8
	HC-LP202	3.5	90	20	1.8
	HF-SP301	4.8	120	20	2.4
	HF-SP502	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
MR-J3-500T	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

Table 13.1 Power supply capacity and generated heat per servo amplifier at rated output

13 CHARACTERISTICS

Servo amplifier	Servo motor	(Note 1) Power supply	(No Servo amplifier-o	Area required for heat dissipation	
		capacity[kVA]	At rated torque	With servo off	[m²]
	HF-SP702	10.0	300	25	6.0
MR-J3-700T	HA-LP702	10.6	300	25	6.0
IVIR-J3-7001	HA-LP601	10.0	260	25	5.2
	HA-LP701M	11.0	300	25	6.0
	HA-LP11K2	16.0	530	45	11.0
MR-J3-11KT	HA-LP801	12.0	390	45	7.8
IVIR-J3-11K1	HA-LP12K1	18.0	580	45	11.6
	HA-LP11K1M	16.0	530	45	11.0
	HA-LP15K2	22.0	640	45	13.0
MR-J3-15KT	HA-LP15K1	22.0	640	45	13.0
	HA-LP15K1M	22.0	640	45	13.0
	HA-LP22K2	33.0	850	55	17.0
	HA-LP20K1	30.1	775	55	15.5
MR-J3-22KT	HA-LP25K1	37.6	970	55	19.4
	HA-LP22K1M	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, in section 14.2.

(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 $+10^{\circ}C$ ($+50^{\circ}F$) at the ambient temperature of $40^{\circ}C$ ($104^{\circ}F$). (With a 5°C ($41^{\circ}F$) safety margin, the system should operate within a maximum 55°C ($131^{\circ}F$) limit.) The necessary enclosure heat dissipation area can be calculated by Equation 13.1:

$$A = \frac{P}{K \cdot \Delta T}$$
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 wit 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 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.

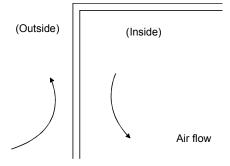
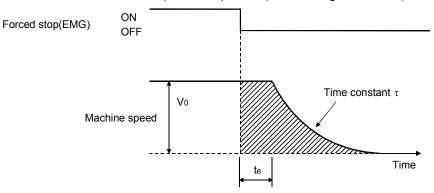


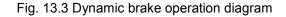
Fig. 13.2 Temperature distribution in enclosure

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.

13.3 Dynamic brake characteristics

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 Fig. 13.4, 13.5)





$L_{max} = \frac{V_0}{60} \cdot \left\{ t_e + \tau \left[1 + \frac{J_L}{J_M} \right] \right\}$	
$\begin{array}{llllllllllllllllllllllllllllllllllll$	[mm/min][in/min] walue on servo motor shaft[kg • cm²][oz • in²] [cz • in²] [s] [s] walue of about 30ms. For 11kW to 22kW servo, a delay of the external relay and a delay of the
25 20 15 10 5 0 1000 2000 3000 4000 5000 6000	Speed [r/min]
Speed [r/min] HF-MP series	HF-KP series
$f_{\text{sup}}^{\text{form}}$	120 100 100 102 102 102 102 102

Fig. 13.4 Dynamic brake time constant

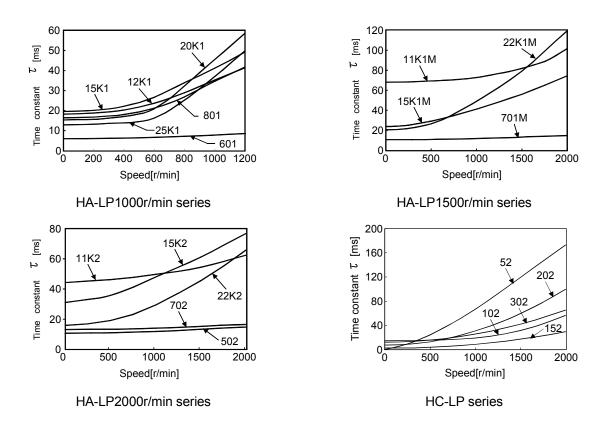


Fig. 13.5 Dynamic brake time constant2

Use the dynamic brake at the load inertia moment 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.

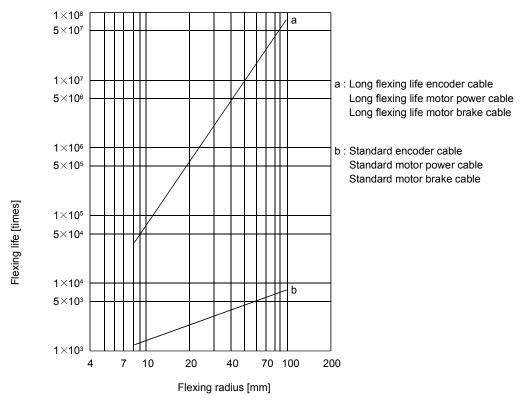
Servo amplifier	Load inertia moment ratio [times]
MR-J3-10T (1)	
MR-J3-20T (1)	
MR-J3-40T (1)	
MR-J3-60T	30
MR-J3-70T	
MR-J3-100T	
MR-J3-200T	
MR-J3-350T	16
MR-J3-500T	15
MR-J3-700T	(Note 1) 15
(Note 2) MR-J3-11KT	
(Note 2) MR-J3-15KT	30
(Note 2) MR-J3-22KT	

Note 1. The value is 5 when used at motor speed over 2000r/min.

2. When the external dynamic brake is used.

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 (200VAC class: 253VAC) is applied at the power supply capacity of 2500kVA and the wiring length of 1m.

Servo Amplifier	Inrush Cur	rents (A ₀ -p)
Servo Ampimer	Main circuit power supply (L ₁ , L ₂ , L ₃)	Control circuit power supply (L ₁₁ , L ₂₁)
MR-J3-10T to 60T	30A (Attenuated to approx. 5A in 10ms)	
MR-J3-70T • 100T	54A (Attenuated to approx. 12A in 10ms)	20 to 30A
MR-J3-200T • 350T	120A (Attenuated to approx. 12A in 20ms)	(Attenuated to approx. 0A in 1 to 2ms)
MR-J3-10T1 to 40T1	38A (Attenuated to approx. 14A in 10ms)	
MR-J3-500T	44A (Attenuated to approx. 20A in 20ms)	
MR-J3-700T	88A (Attenuated to approx. 20A in 20ms)	
MR-J3-11KT		30A (Attenuated to approx. 0A in 3ms)
MR-J3-15KT	235A (Attenuated to approx. 20A in 20ms)	
MR-J3-22KT		

Since large inrush currents flow in the power supplies, always use no-fuse breakers and magnetic contactors. (Refer to section 14.10.)

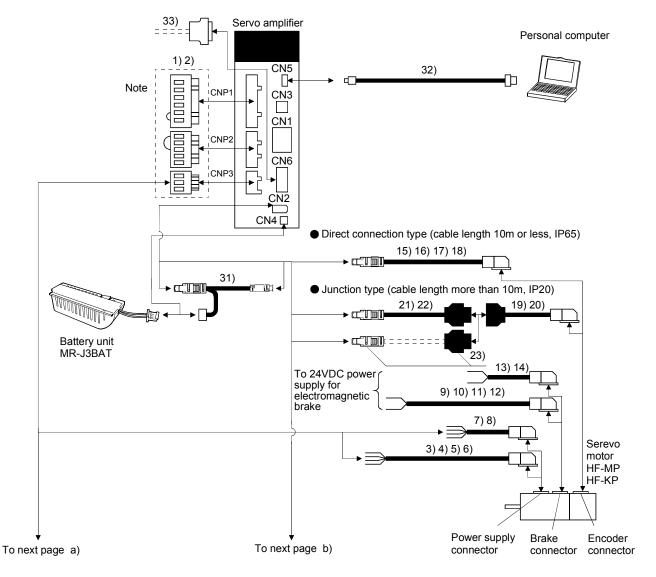
When circuit protectors are used, it is recommended to use the inertia delay type that will not be tripped by an inrush current.

 Before connecting any option or auxiliary equipment, make sure that the charge lamp is off more than 15 minutes after power-off, then confirm the voltage with a tester or the like. Otherwise, you may get an electric shock.
 Use the specified auxiliary equipment and options. Unspecified ones may lead to a fault or fire.

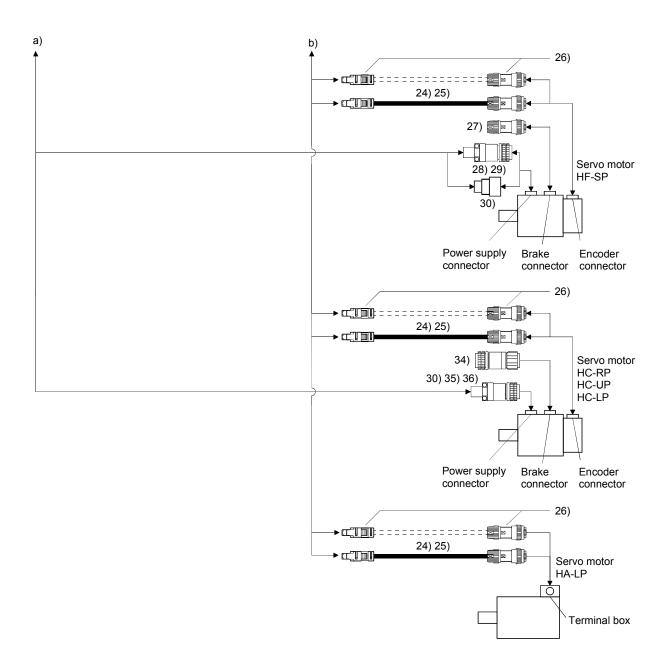
14.1 Cable/connector sets

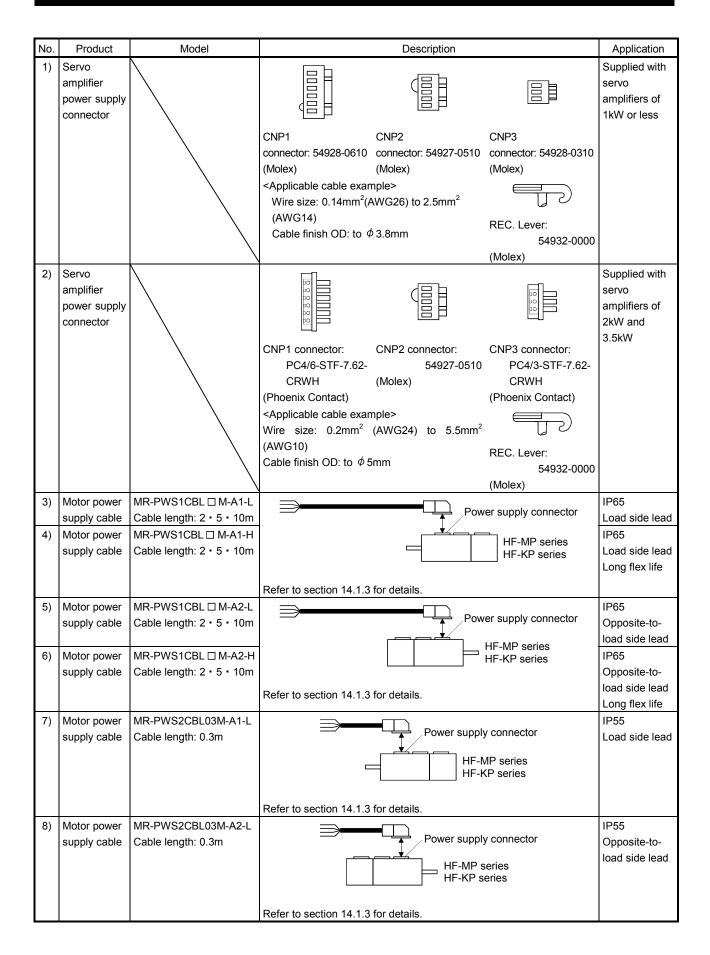
As the cables and connectors used with this servo, purchase the options indicated in this section.

14.1.1 Combinations of cable/connector sets



Note. Connectors for 3.5kw or less. For 5kw or more, terminal blocks.





No.	Product	Model	Description	Application
9)	Motor brake	MR-BKS1CBL M-A1-L		IP65
,	cable	Cable length: 2 · 5 · 10m	Brake connector	Load side lead
10)	Motor brake	MR-BKS1CBL I M-A1-H		IP65
10)	cable	Cable length: 2 • 5 • 10m		Load side lead
	Cable		HF-KP series	Long flex life
				Long liex life
			Refer to section 14.1.4 for details.	
11)	Motor brake	MR-BKS1CBL M-A2-L	Brake connector	IP65
	cable	Cable length: 2 · 5 · 10m	Brake connector	Opposite-to-
			HF-MP series	load side lead
12)	Motor brake	MR-BKS1CBL M-A2-H	HF-KP series	IP65
	cable	Cable length: 2 · 5 · 10m		Opposite-to-
			Refer to section 14.1.4 for details.	load side lead
				Long flex life
13)	Motor brake	MR-BKS2CBL03M-A1-L		IP55
	cable	Cable length: 0.3m	Brake connector	Load side lead
			HF-MP series	
			Defende cection 11.1.1 for details	
14)	Motor brake	MR-BKS2CBL03M-A2-L	Refer to section 14.1.4 for details.	IP55
14)			Brake connector	
	cable	Cable length: 0.3m		Opposite-to-
			HF-MP series	load side lead
			HF-KP series	
			Refer to section 14.1.4 for details.	
15)	Encoder	MR-J3ENCBL M-A1-L		IP65
	cable	Cable length: 2 · 5 · 10m		Load side lead
16)	Encoder	MR-J3ENCBL M-A1-H	HF-MP series	IP65
	cable	Cable length: 2 · 5 · 10m		Opposite-to-
				load side lead
			Defer to contian 14.1.2 (1) for datails	Long flex life
17)	Freedor		Refer to section 14.1.2 (1) for details.	IDEE
17)	Encoder	MR-J3ENCBL I M-A2-L		IP65 Opposito to
	cable	Cable length: 2 • 5 • 10m		Opposite-to- load side lead
10)	- .		HF-MP series	-
18)	Encoder	MR-J3ENCBL I M-A2-H	HF-KP series	IP65
	cable	Cable length: 2 · 5 · 10m		Opposite-to-
			Refer to section 14.1.2 (1) for details.	load side lead
40	En es d			Long flex life
19)	Encoder	MR-J3JCBL03M-A1-L		IP20
	cable	Cable length: 0.3m		Load side lead
			HF-MP series	
			Refer to section 14.1.2 (3) for details.	
20)	Encoder	MR-J3JCBL03M-A2-L		IP20
20)	cable	Cable length: 0.3m	Encoder connector	Opposite-to-
	Cable			load side lead
			HF-MP series	
			HF-KP series	
			Refer to section 14.1.2 (3) for details.	
	1			1

No.	Product	Model	Description		Application
21)	Encoder	MR-EKCBL M-L			IP20
-	cable	Cable length: 20 · 30m			
22)	Encoder	MR-EKCBL 🗆 M-H			IP20
	cable	Cable length:	For HF-MP • HF-KP series		Long flex life
		20 · 30 · 40 · 50m	Refer to section 14.1.2 (2) for details.		
23)	Encoder connector set	MR-ECNM	er_T mn	•	IP20
			For HF-MP • HF-KP series		
			Refer to section 14.1.2 (2) for details.		
24)	Encoder cable	MR-J3ENSCBL □ M-L Cable length: 2 • 5 • 10 • 20 • 30m			IP67 Standard flex life
25)	Encoder	MR-J3ENSCBL II M-H	For HF-SP HA-LP HC-UP HC-LP HC-RP s	eries	IP67
23)	cable	Cable length:	Refer to section 14.1.2 (4) for details.		Long flex life
		2 • 5 • 10 • 20 • 30 • 40 • 50m			
26)	Encoder connector set	MR-J3SCNS			IP67
			For HF-SP · HA-LP · HC-UP · HC-LP · HC-RP s	eries	
			Refer to section 14.1.2 (4) for details.		
27)	Brake	MR-BKCNS1	Straight plug: CM10-SP2S-L		IP67
	connector		SUCKEL CUILACL. CIVITO-#2230(32)-100		
	set		(DDK)	HF-SP series	
28)	Power	MR-PWCNS4	Plug: CE05-6A18-10SD-B-BSS		IP67
,	supply		Cable clamp: CE3057-10A-1 (D265)		
	connector		(DDK)		
	set		Example of applicable cable	For HF-SP51 • 81	
			Applicable wire size: 2mm ² (AWG14) to 3.5mm ²	For HF-SP52 • 152	
			(AWG12)		
201	Devuer		Cable finish		1007
29)	Power supply	MR-PWCNS5	Cable clamp: CE3057-12A-1 (D265)		IP67
	connector		(DDK)		
	set		Example of applicable cable	For HF-SP121 • 201	
			Applicable wire size: 5.5mm ² (AWG10) to 8mm ² (AWG8)	For HF-SP202 to 502	
			Cable finish ϕ D: ϕ 12.5 to 16mm		
30)	Power	MR-PWCNS3	Plug: CE05-6A32-17SD-B-BSS		IP65
	supply connector		Cable clamp: CE3057-20A-1(D265) (DDK)		IP67
	set		Example of applicable cable	For HF-SP702	Be sure to use this when
			Applicable wire size: 14mm ² (AWG6) to 22mm ²	For HC-UP	corresponding
			(AWG4)	For HC-LP	to EN
			Cable finish ϕ D: ϕ 22 to 23.8mm	For HC-RP	Standard.
31)	Cable for	MR-J3BTCBL03M			For connection
	connecting				of battery
	battery				
			Refer to section 14.1.2 (5) for details.		

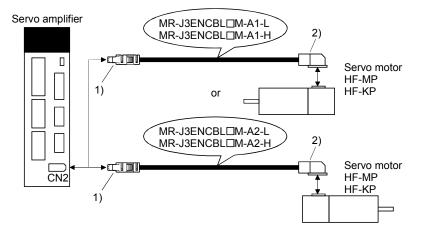
No.	Product	Model	Description		Application
32)	USB cable	MR-J3USBCBL3M Cable length: 3m	For CN5 connector For personal con minB connector (5-pin) A connector	For connection with PC-AT compatible personal computer	
33)	Connector set	3M or equivalent)			
34)	Break connector set	MR-BKCN	Plug: MS3106A10SL-4S(D190) (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 HC-UP For HC-LP For HC-RP	EN standard compliant IP65 IP67
35)	Power supply connector set	MR-PWCNS1	Plug: CE05-6A22-23SD-B-BSS Cable clamp: CE3057-12A-2(D265) (DDK) Example of applicable cable Applicable wire size: 2mm ² (AWG14) to 3.5mm ² (AWG12) Cable finish: \$\overline{9}9.5\$ to 13mm	For HC-UP For HC-LP For HC-RP	Be sure to use this when corresponding to EN standard IP65 IP67
36)	Power supply connector set	MR-PWCNS2	Plug: CE05-6A24-10SD-B-BSS Cable clamp: CE3057-16A-2(D265) (DDK) Example of applicable cable Applicable wire size: 5.5mm ² (AWG10) to 8mm ² (AWG8) Cable finish: \$\overline{13}\$ to 15.5mm		

- 14.1.2 Encoder cable/connector sets
- (1) MR-J3ENCBL I M-A1-L/H MR-J3ENCBL I 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 \Box part of the cable model. The cables of the lengths with the symbols are available.

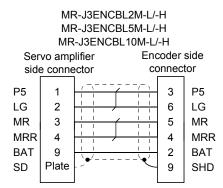
Cable Medel		Cable Length								Flex Life	Application
Cable Model	0.3m	2m	5m	10m	20m	30m	40m	50m	Structure	Flex Lile	Application
MR-J3ENCBL		2	5	10		\square	\square	\square	IP65	Standard	For HF-MP HF-KP servo
MR-J3ENCBL 🗆 M-A1-H		2	5	10	\searrow	\searrow	\searrow	\square	IP65	Long flex	motor Load side lead
MR-J3ENCBL		2	5	10	\square	\square	\square	\square	IP65	Standard	For HF-MP • HF-KP servo
MR-J3ENCBL		2	5	10		\sum	\sum	\square	IP65	Long flex	motor Opposite-to-load side lead

(a) Connection of servo amplifier and servo motor



Cable Model	1) Servo Amplifier	side Connector	2) Encoder side Connector
MR-J3ENCBL M-A1-L	Receptacle: 36210-0100FD	Connector set: 54599-1019	Connector: 1674320-1
	Shell kit: 536310-3200-008	(Molex)	Crimping tool for ground clip:
	(3M)		1596970-1
MR-J3ENCBL 🗆 M-A1-H	(Note) Signal layout	(Note) Signal layout	Crimping tool for receptacle contact: 1596847
	2 MRR 6 10	2 4 6 8 10 LG MRR 6 8 10	(Tyco Electronics)
			(Note) Signal layout
	P5 3 7 BAT	1 3 5 7 9 P5 MR 5 BAT	
	View seen from wiring side.	View seen from wiring side.	5 MR 6 P5G 3 P5 4 MRR
	Note. Keep open the pins shown with	. Especially, pin 10 is provided	
	for manufacturer adjustment. If	it is connected with any other pin,	View seen from wiring side.
MR-J3ENCBL 🗆 M-A2-L	the servo amplifier cannot opera	te normally.	Note. Keep open the pin shown
MR-J3ENCBL M-A2-H			with an 🖂.

(b) Cable internal wiring diagram



(2) MR-EKCBL I M-L/H

POINT	
 The following 	ng encoder cables are of four-wire type. When using any of these
encoder ca	bles, set parameter No. PC22 to "1 \Box \Box " to select the four-wire
type.	
MR-EKCBL	_30M-L
MR-EKCBI	_30M-H
MR-EKCBI	_40M-H
MR-EKCBI	_50M-H

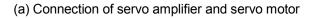
The servo amplifier and servo motor cannot be connected with these cables only. The servo motor side encoder cable (MR-J3JCBL03M-A1-L or MR-J3JCBL03M-A2-L) is required.

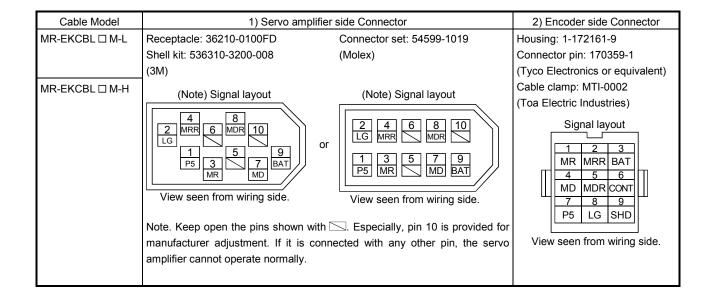
The numerals in the Cable Length field of the table are the symbols entered in the \Box part of the cable model. The cables of the lengths with the symbols are available.

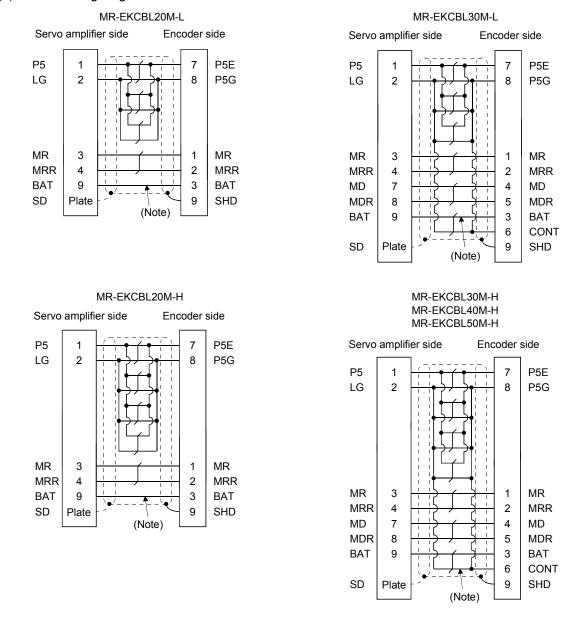
Cable Model		Cable Length							Protective	Flex Life	Application
	0.3m	2m	5m	10m	20m	30m	40m	50m	Structure		Application
MR-EKCBL 🗆 M-L					20	(Note) 30			IP20	Standard	For HF-MP • HF-KP servo motor
MR-EKCBL 🗆 M-H					20	(Note) 30	(Note) 40	(Note) 50	IP20	Long flex	Use in combination with MR-J3JCBL03M-A1-L or MR-J3JCBL03M-A2-L.

Note. Four-wire type cable.

Servo amplifier







(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	MR-EKCBL20M-H	MR-EKCBL30M-H					
		MR-EKCBL40M-H					
		MR-EKCBL50M-H					

(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								
		•							
	Servo amplifier side connector	Encoder side connector							
	Receptacle: 36210-0100FD	Housing: 1-172161-9							
	Shell kit: 536310-3200-008	Connector pin: 170359-1							
	(3M)	(Tyco Electronics or equivalent)							
	Or	Cable clamp: MTI-0002							
	Connector set: 54599-1019(Molex)	(Toa Electric Industries)							

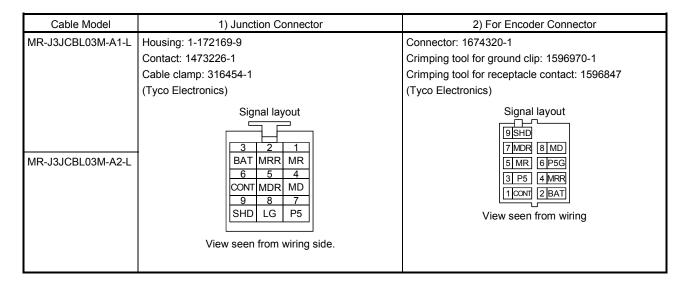
(3) MR-J3JCBL03M-A1-L • MR-J3JCLB03M-A2-L

The servo amplifier and servo motor cannot be connected with these cables only. The servo motor side encoder cable (MR-EKCBL \square M-L/H) is required.

Cable Model	Cable Length	Protective Structure	Flex Life	Application
MR-J3JCBL03M-A1-L MR-J3JCBL03M-A2-L	0.3m	IP20	Standard	For HF-MP • HF-KP servo motor Load side lead Use in combination with MR-EKCBL \Box M-L/H. For HF-MP • HF-KP servo motor Opposite-to-load side lead Use in combination with MR-EKCBL \Box M-L/H.

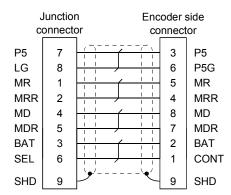
(a) Connection of servo amplifier and servo motor





(b) Internal wiring diagram

MR-J3JCBL03M-A1-L

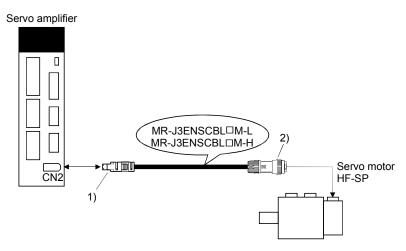


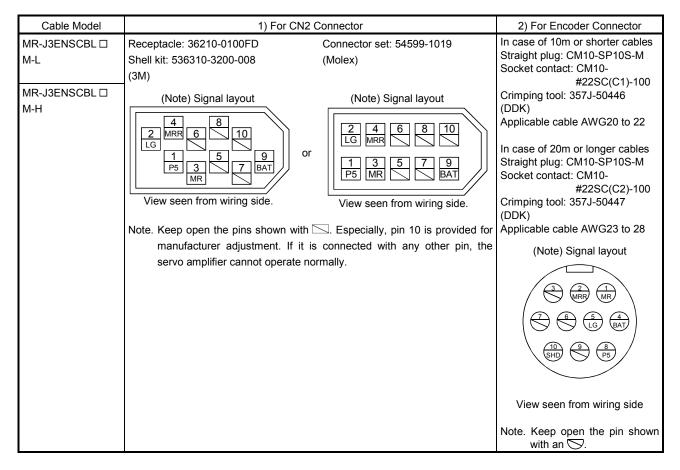
(4) MR-J3ENSCBL I M-L • MR-J3ENSCBL I M-H

These cables are detector cables for HF-SP Series servomotors. 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.

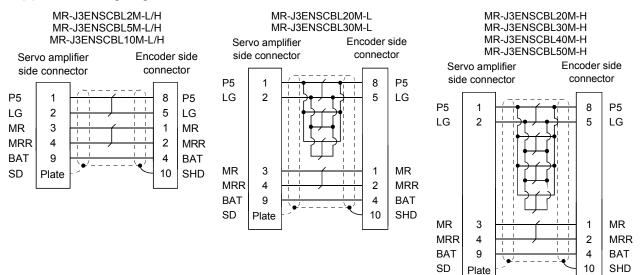
Cable Model	Cable Length								Flex Life	Application
	2m	5m	10m	20m	30m	40m	50m	Structure	Flex Life	Application
MR-J3ENSCBL	2	5	10	20	30	\searrow		IP67	Standard	Ear HE SD convolmetor
MR- J3ENSCBL	2	5	10	20	30	40	50	IP67	Long flex	For HF-SP servo motor

(a) Connection of servo amplifier and servo motor





(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.

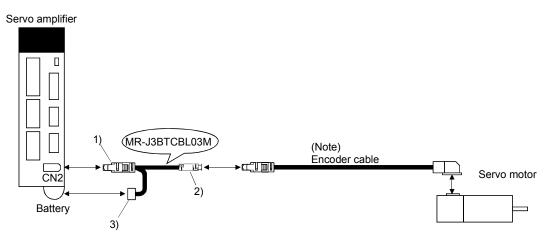
Parts/Tool	Description								
Connector set	MR- J3SCNS (Option)								
	[1][1][1][1][1][1][1][1][1][1][1][1][1][
	Servo amplifier side connector	Encoder side connector							
	Receptacle: 36210-0100FD	Straight plug: CM10-SP10S-M							
	Shell kit: 536310-3200-008	Socket contact: CM10-#22SC(S1)-100							
	(3M)	Applicable wire size: AWG20 or less							
	Or	Recommended tightening jig: 357J-51456T							
	Connector set: 54599-1019	(DDK)							
	(Molex)								

(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) of this section.

Cable Model	1) For CN2 Connector	1) Junction Connector	2) For Battery Connector
MR-J3BTCBL03M	Receptacle: 36210-0100FD 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-EP2428PCFA (Hirose Denki)

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.

Load side lead

motor

IP55

Standard

For HF-MP • HF-KP servo

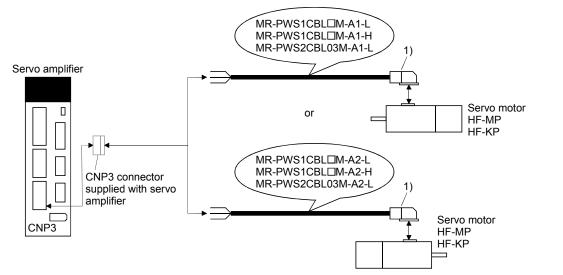
Opposite-to-load side lead

Refer to section 4.10 when wiring.											
Cable Model	Cable Medel Cable Length							Protective	Flex Life	Application	
Cable Model	0.3m	2m	5m	10m	20m	30m	40m	50m	Structure	I IEX LIIE	Application
MR-PWS1CBL IM-A1-L		2	5	10				\square	IP65	Standard	For HF-MP [■] HF-KP servo motor Load side lead
MR-PWS1CBL I M-A2-L		2	5	10				\square	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	For HF-MP • HF-KP servo motor Load side lead
MR-PWS1CBL 🗆 M-A2-H		2	5	10		\square		\square	IP65	Long flex	For HF-MP • HF-KP servo motor Opposite-to-load side lead
MR-PWS2CBL I M-A1-L	03			\backslash			$\overline{\ }$		IP55	Standard	For HF-MP HF-KP servo motor

MR-PWS2CBL 🗆 M-A2-L

(1) Connection of servo amplifier and servo motor

03



Cable Model	1) For Motor Power Supply Connector					
MR-PWS1CBL M-A1-L	Connector: JN4FT04SJ1	Signal layout				
MR-PWS1CBL M-A2-L	Hod, socket insulator Bushing, ground nut					
MR-PWS1CBL M-A1-H	Contact: ST-TMH-S-C1B-100(A534G)					
MR-PWS1CBL 🗆 M-A2-H	Crimping tool: CT160-3TM5B					
MR-PWS2CBL03M-A1-L	(Japan Aviation Electronics Industry)					
MR-PWS2CBL03M-A2-L		View seen from wiring side.				

(2) Internal wiring diagram

MR-PWS1CBLDM-A1-H MR-PWS1CBLDM-A2-H MR-PWS2CBL03M-A1-L MR-PWS1CBL03M-A2-L



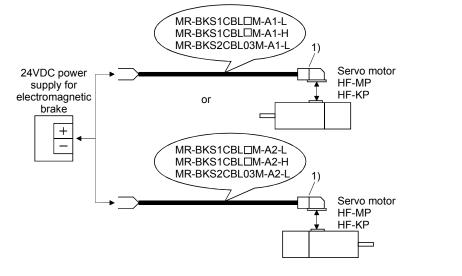
14.1.4 Motor brake cables

These cables are motor brake cables for the HF-MP \cdot HF-KP series servo motors. The numerals in the Cable Length field of the table are the symbols entered in the \Box part of the cable model. The cables of the lengths with the symbols are available.

Refer to section 4.11 when wiring.

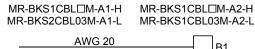
Cable Model		-		Cable L	ength	-	-		Protective	Flex Life	Application
	0.3m	2m	5m	10m	20m	30m	40m	50m	Structure	I IEX LIIE	Application
MR-PWS1CBL 🗆 M-A1-L		2	5	10					IP65	Standard	For HF-MP [■] HF-KP servo motor Load side lead
MR-PWS1CBL 🗆 M-A2-L		2	5	10					IP65	Standard	For HF-MP • HF-KP servo motor Opposite-to-load side lead
MR-PWS1CBL 🗆 M-A1-H		2	5	10				\sum	IP65	Long flex	For HF-MP • HF-KP servo motor Load side lead
MR-PWS1CBL 🗆 M-A2-H		2	5	10					IP65	Long flex	For HF-MP • HF-KP servo motor Opposite-to-load side lead
MR-PWS2CBL 🗆 M-A1-L	03		\searrow	\searrow				\sum	IP55	Standard	For HF-MP • HF-KP servo motor Load side lead
MR-PWS2CBL 🗆 M-A2-L	03	\sum		\sum		\sum	\sum	\sum	IP55	Standard	For HF-MP • HF-KP servo motor Opposite-to-load side lead

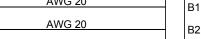
(1) Connection of servo amplifier and servo motor



Cable Model	1) For Motor Brake C	connector		
MR-BKS1CBL M-A1-L	Connector: JN4FT02SJ1	Signal layout		
MR-BKS1CBL M-A2-L	Hod, socket insulator			
MR-BKS1CBL M-A1-H	Bushing, ground nut			
MR-BKS1CBL M-A2-H	Contact: ST-TMH-S-C1B-100(A534G)			
MR-BKS2CBL03M-A1-L	Crimping tool: CT160-3TMH5B			
MR-BKS2CBL03M-A2-L	(Japan Aviation Electronics Industry)	View seen from wiring side.		

(2) Internal wiring diagram





14. OPTIONS AND AUXILIARY EQUIPMENT

14.2 Regenerative options

 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.

		Regenerative power[W]						
Servo amplifier	Built-in regenerative resistor	MR-RB032 [40Ω]	MR-RB12 [40Ω]	MR-RB30 [13Ω]	MR-RB31 [6.7Ω]	MR-RB32 [40Ω]	MR-RB50 [13Ω]	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

	(Note) Regenerative power[W]					
Servo amplifier	External regenerative resistor (Accessory)	MR-RB5E [6Ω]	MR-RB9P [4.5Ω]	MR-RBB9F [3Ω]		
MR-J3-11KT	500 (800)	500 (800)				
MR-J3-15KT	850 (1300)		850 (1300)			
MR-J3-22KT	850 (1300)			850 (1300)		

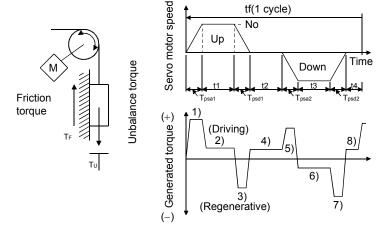
Note: Values in parentheses assume the installation of a cooling fan.

(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.



Regenerative power	Torque applied to servo motor [N · m]	Energy [J]		
1)	$T_{1} = \frac{(J_{L} + J_{M}) \cdot N_{0}}{9.55 \times 10^{4}} \cdot \frac{1}{T_{psa1}} + T_{U} + T_{F}$	$E_1 = \frac{0.1047}{2} \cdot N_0 \cdot T_1 \cdot T_{psa1}$		
2)	$T_2 = T_U + T_F$	$E_2 = 0.1047$ N_0 T_2 t_1		
3)	$T_3 = \frac{-(J_L + J_M) \cdot N_0}{9.55 \times 10^4} \cdot \frac{1}{T_{psd1}} + T_U + T_F$	$E_3 = \frac{0.1047}{2} \cdot N_0 \cdot T_3 \cdot T_{psd1}$		
4), 8)	$T_4 = T_U$	E₄≥0 (No regeneration)		
5)	$T_5 = \frac{(J_L + J_M) \cdot N_0}{9.55 \times 10^4} \cdot \frac{1}{T_{psa2}} - T_U + T_F$	$E_5 = \frac{0.1047}{2} \cdot N_0 \cdot T_5 \cdot T_{psa2}$		
6)	$T_6 = -T_U + T_F$	$E_6 = 0.1047$ N_0 T_6 t_3		
7)	$T_7 = \frac{-(J_L + J_M) \cdot N_0}{9.55 \times 10^4} \cdot \frac{1}{T_{psd2}} - T_U + T_F$	$E_7 = \frac{0.1047}{2} \cdot N_0 \cdot T_7 \cdot T_{psd_2}$		

Formulas for calculating torque and energy in operation

From the calculation results in 1) to 8), find the absolute value (Es) of the sum total of negative energies.

(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]
MR-J3-10T	55	9
MR-J3-10T1	55	4
MR-J3-20T	70	9
MR-J3-20T1	70	4
MR-J3-40T	85	11
MR-J3-40T1	85	10
MR-J3-60T	85	11
MR-J3-70T	80	18
MR-J3-100T	80	18
MR-J3-200T	85	40
MR-J3-350T	85	40
MR-J3-500T	90	45
MR-J3-700T	90	70
MR-J3-11KT	90	120
MR-J3-15KT	90	170
MR-J3-22KT	90	250

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%.
 (Ec) :Energy charged into the electrolytic capacitor in the servo amplifier.

Capacitor charging (Ec)

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.

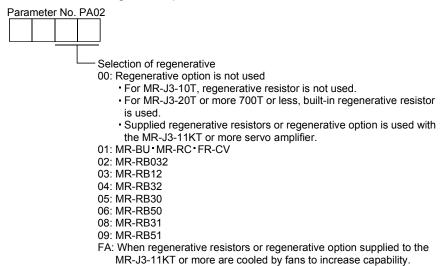
$$ER[J] = \eta \cdot Es - Ec$$

Calculate the power consumption of the regenerative option on the basis of single-cycle operation period tf [s] to select the necessary regenerative option.

PR [W] = ER/tf(14.1)

(3) Connection of the regenerative option

Set parameter No. PA02 according to the open to be used.



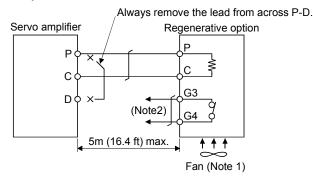
(4) Connection of the regenerative option

POINT	
 When the M 	/R-RB50 • MR-RB51 is used, a fan is required to cool it. The
cooling fan	should be prepared by the customer.
 For the size 	es of wires used for wiring, refer to section 14.9.

The regenerative option will generate heat of about 100°C. 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.

(a) MR-J3-350T or less

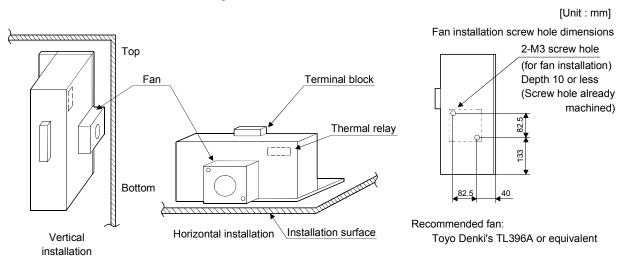
Always remove the wiring from across P-D and fit the regenerative option across P-C. The G3 and G4 terminals act as a thermal sensor. G3-G4 is disconnected when the regenerative option overheats abnormally.



Note 1. When using the MR-RB50, forcibly cool it with a cooling fan (1.0m³/min,□92 or so).

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

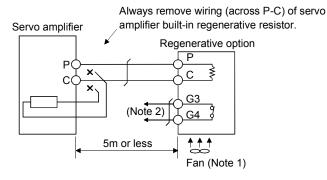


For the MR-RB50 install the cooling fan as shown.

(b) MR-J3-500T • MR-J3-700T

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.

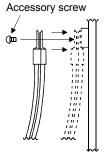


Note 1. When using the MR-RB50 • MR-RB51, forcibly cool it with a cooling fan (1.0m³/min,□92 or so). 2. Make up a sequence which will switch off the magnetic contactor (MC)

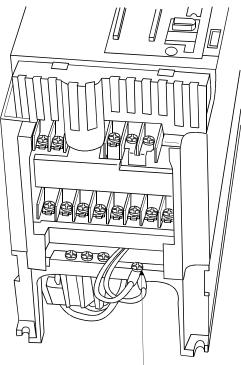
when abnormal heating occurs. G3-G4 contact specifications Maximum voltage: 120V AC/DC Maximum current: 0.5A/4.8VDC Maximum capacity: 2.4VA

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

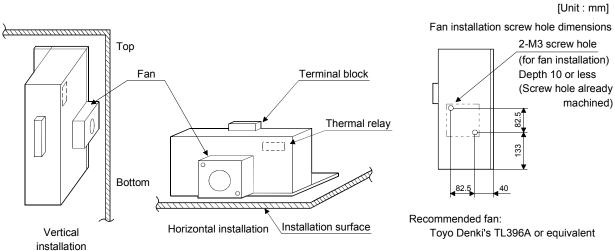


The drawing below shows the MR-J3-500B. Refer to (6) of section 12.1 Outline drawings for the position of the fixing screw for MR-J3-700T.



Built-in regenerative resistor lead terminal fixing screw

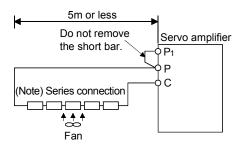
For the MR-RB51 install the cooling fan as shown.





(c) MR-J3-11KT to MR-J3-22KT (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 fans (1.0m 3 /min, 92 (about two fans) improves the regeneration capability. In this case, set "



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) provided by Mitsubishi Electric Corporation.

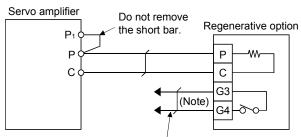
Servo Amplifier	Regenerative	Regenerativ	e Power [W]	Resistance	Number of
Servo Ampliner	Resistor	Normal	Cooling	[Ω]	Resistors
MR-J3-11KT	GRZG400-1.5Ω	500	800	6	4
MR-J3-15KT	GRZG400-0.9Ω	850	1300	4.5	5
MR-J3-22KT	GRZG400-0.6Ω	850	1300	3	5

(d) MR-J3-11KT-PX to MR-J3-22KT-PX (when using the regenerative option)

The MR-J3-11KT-PX to MR-J3-22KT-PX servo amplifiers are not supplied with regenerative resistors. When using any of these servo amplifiers, always use the MR-RB5E, 9P and 9F regenerative option. The MR-RB5E, 9P and 9F are regenerative options that have encased the GRZG400-1.5 Ω , GRZG400-0.9 Ω , GRZG400-0.6 Ω respectively. When using any of these regenerative options, make the same parameter setting as when using the GRZG400-1.5 Ω , GRZG400-0.9 Ω , GRZG400-0.6 Ω (supplied regenerative resistors or regenerative option is used with 11kW or more servo amplifier).

Cooling the regenerative option with fans improves regenerative capability.

The G3 and G4 terminals are for the thermal protector. G3-G4 is opened when the regenerative option overheats abnormally.

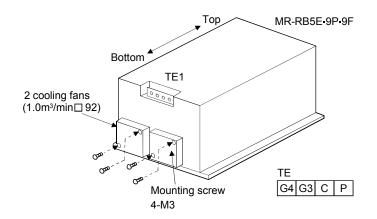


Configure up a circuit which shuts off main circuit power when thermal protector operates.

Note. Specifications of contact across G3-G4 Maximum voltage : 120V AC/DC Maximum current : 0.5A/4.8VDC Maximum capacity : 2.4VA

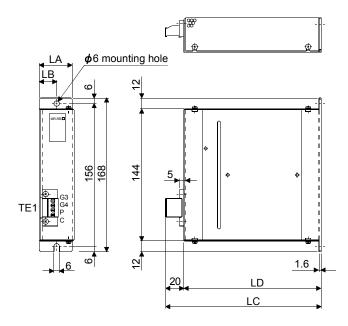
Servo Amplifier	Regenerative Option	Resistance	Regenerative Power [W]		
Servo Ampliner	Regenerative Option	[Ω]	Without Fans	With Fans	
MR-J3-11KT-PX	MR-RB5E	6	500	800	
MR-J3-15KT-PX	MR-RB9P	4.5	850	1300	
MR-J3-22KT-PX	MR-RB9F	3	850	1300	

When using fans, install them using the mounting holes provided in the bottom of the regenerative option. In this case, set "



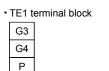
(5) Outline dimension drawings

(a) MR-RB032 • MR-RB12



(b) MR-RB30 • MR-RB31 • MR-RB32

[Unit: mm]



С

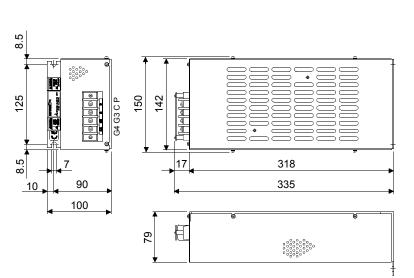
Terminal screw: M3 Tightening torque: 0.5 to 0.6 [N·m] (4 to 5 [lb·in])

Mounting screw
 Screw: M5
 Tightening torque: 3.2 [N • m] (

Tightening torque	: 3.2 [N •	m] (28.3 [lb	• in])
-------------------	------------	--------------	--------

Regenerative	Variable dimensions				Mass	
option	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

[Unit: mm]





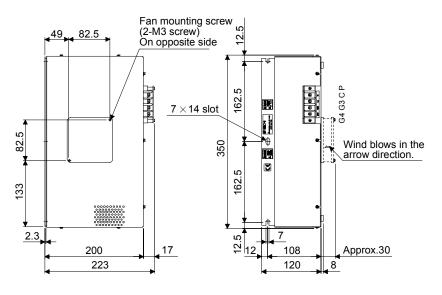
Terminal block

Terminal screw: M4 Tightening torque: 1.2 [N·m] (10 [lb·in])

 Mounting screw
 Screw: M6
 Tightening torque: 5.4 [N • m] (47.8 [lb • in])

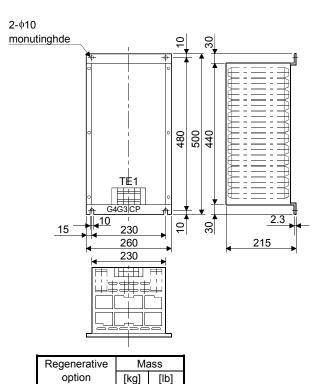
Regenerative option	Mass		
	[kg]	[lb]	
MR-RB30			
MR-RB31	2.9	6.4	
MR-RB32			

(c) MR-RB50 • MR-RB51



(d) MR-RB5E • MR-RB9P • MR-RB9F

[Unit: mm]



MR-RB5E

MR-RB9P

MR-RB9F

10

11

11

22.0

24.3

24.3

Ferminal	block	

G4	G3	С	Ρ

Terminal screw: M5

Tightening torque: 2.0 [N m](17 [lb in])

Mounting screw
 Screw size: M8

Tightening torque: 13.2 [N-m](116.83 [lb-in])

Terminal block

P C Terminal screw: M4 G3 Tightening torque: 1.2 [N-m](10 [lb-in]) G4

Mounting screw

Screw : M6

Tightening torque: 5.4 [N-m](47.79 [lb-in])

Regenerative option	Mass			
	[kg]	[lb]		
MR-RB50	5.6	12.3		
MR-RB51	5.0			

Approx. Approx. Appr	orox.											
	ž ž	Regenerative		Variable mensior		Mounting	Tightening torque	Mass [kg]				
- € Approx.330 9.5		brake	А	С	к	screw size	[N m] ([lb in])	([lb])				
						- 10	0 5.5	39		10.0	0.0	
411	¢47	GRZG400-0.9Ω	10	0.0	00	M8	13.2	0.8				
		GRZG400-0.6Ω	16	16 8.2 46			(116.83)	(1.76)				

(e) $GRZG400-1.5\Omega \cdot GRZG400-0.9\Omega \cdot GRZG400-0.6\Omega$ (standard accessories)

14.3 Brake Unit

POINT

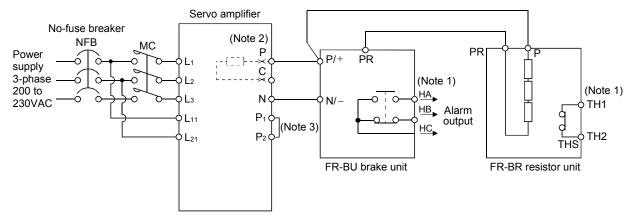
- The brake unit and resistor unit of other than 200V class are not applicable to the servo amplifier.
 - The brake unit and resistor unit of the same capacity must be combined. The units of different capacities may result in damage.
- The brake unit and resistor unit must be installed on a vertical surface in the vertical direction. If they are installed in the horizontal direction or on a horizontal surface, a heat dissipation effect reduces.
- The temperature of the resistor unit casing rises to higher than 100°C. Do not cause cables and combustibles to make contact with the casing.

The brake unit is the integration of the regenerative control and resistor and is connected to the bus (across P-N) of the servo amplifier. As compared to the MR-RB regenerative option, the brake unit can return larger power. Hence, use this brake unit when the MR-RB cannot provide sufficient regenerative capability. When using the brake unit, set " $\Box \Box \Box \Box$ " in parameter No.PA02.

(1) Selection

Brake unit	Resistor unit	Permissible Continuous Power [kw]	Max. Instantaneous Power [kw]	Applicable Servo Amplifier
FR-BU-15K	FR-BR-15K	0.99	16.5	MR-J3-500T MR-J3-700T
FR-BU-30K	FR-BR-30K	1.99	33.4	MR-J3-11KT
FR-BU-55K	FR-BR-55K	3.91	66.8	MR-J3-15KT MR-J3-22KT

(2) Connection example

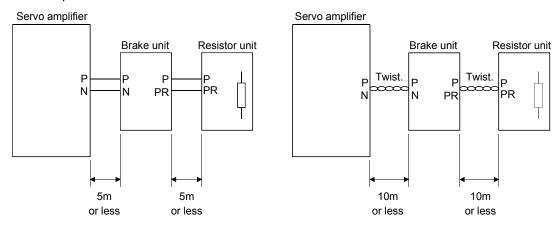


Note 1. Make up the external sequence to switch the power off when an alarm occurs or when the thermal relay is actuated.

- 2. When using servo amplifiers of 5kW and 7kW, always remove the lead of built-in regenerative resistor connected to P terminal and C terminal.
- 3. Always connect P₁-P₂ (For 11k to 22kW, connect P-P₁). (Factory-wired.) When using the power factor improving DC reactor, refer to section 14.11.

The cables between the servo amplifier and brake unit and between the resistor unit and brake unit should be as short as possible. The cables longer than 5m should be twisted. If twisted, the cables must not be longer than 10m.

The cable size should be equal to or larger than the recommended size. See the brake unit instruction manual. You cannot connect one set of brake unit to two servo amplifiers or two sets of brake units to one servo amplifier.



(3) Outside dimensions

(a) Brake unit (FR-BU)

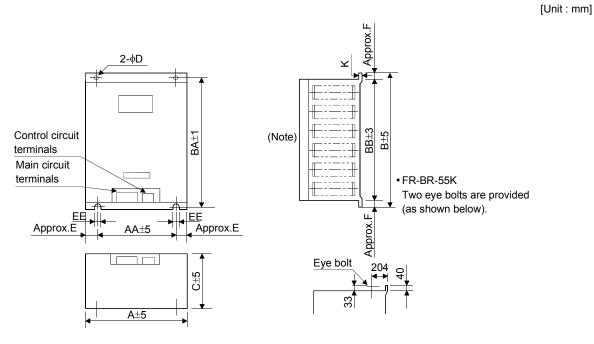
φD Π (Note) Operation Control circuit display terminals Main circuit Π terminals ĮĮh С EE≯ Е AA Δ

Note: Ventilation ports are provided in both side faces and top face. The bottom face is open.

Brake Unit	A	AA	В	BA	С	D	Е	EE	к	F	Approx. Mass [kg(lb)]
FR-BU-15K	100	60	240	225	128	6	18.5	6	48.5	7.5	2.4 (5.291)
FR-BU-30K	160	90	240	225	128	6	33.5	6	78.5	7.5	3.2 (7.055)
FR-BU-55K	265	145	240	225	128		58.6	6		7.5	5.8 (12.79)

[Unit : mm]

(b) Resistor unit (FR-BR)



Note: Ventilation ports are provided in both side faces and top face. The bottom face is open.

Resistor Unit Model	А	AA	В	BA	BB	С	D	E	EE	к	F	Approx. Mass [kg(lb)]
FR-BR-15K	170	100	450	432	410	220	6	35	6	1.6	20	15 (66.139)
FR-BR-30K	340	270	600	582	560	220	10	35	10	2	20	30 (33.069)
FR-BR-55K	480	410	700	670	620	450	12	35	12	3.2	40	70 (154.3)

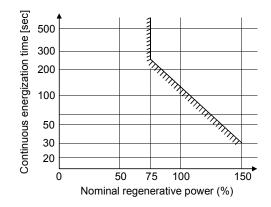
14.4 Power regeneration converter

When using the power regeneration converter, set "DD01" in parameter No.PA02.

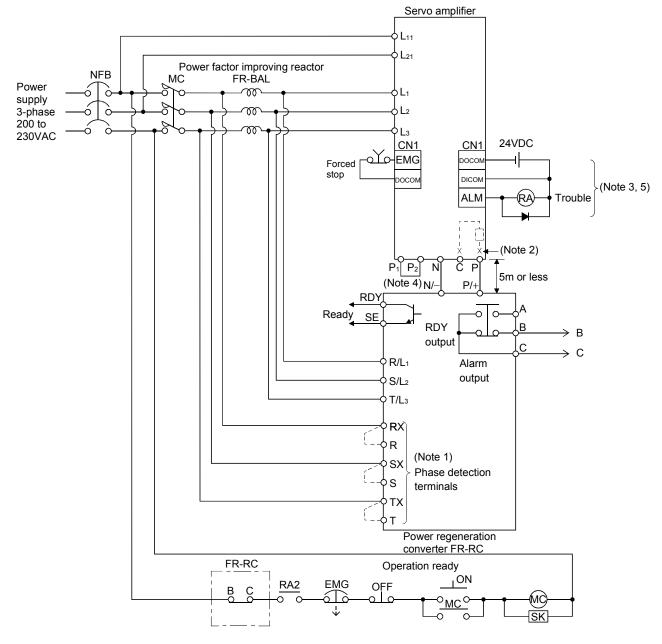
(1) Selection

The converters can continuously return 75% of the nominal regenerative power. They are applied to the servo amplifiers of the 5kW 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



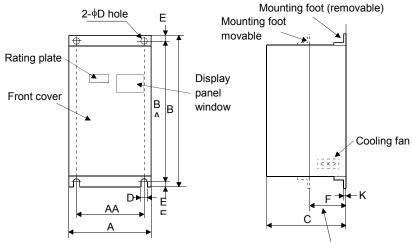
(2) Connection example



- Note 1. When not using the phase detection terminals, fit the jumpers across RX-R, SX-S and TX-T. If the jumpers remain removed, the FR-RC will not operate.
 - 2. When using servo amplifiers of 5kW and 7kW, always remove the lead of built-in regenerative resistor connected to P terminal and C terminal.
 - 3. For sink input-output interface. Refer to section 4.8.3 for source input-output interface.
 - 4. Always connect P₁-P₂ (For 11k to 22kW, connect P-P₁). (Factory-wired.) When using the power factor improving DC reactor, refer to section 14.11.
 - 5. When setting not to output Trouble (ALM) with parameter change, configure power supply circuit for turning magnet contactor off after detecting an occurrence of alarm on the controller side.

(3) Outside dimensions of the power regeneration converters

[Unit : mm]



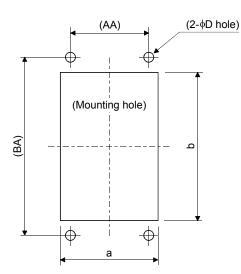
Heat generation area outside mounting dimension

Power regeneration converter	A	AA	В	BA	С	D	E	EE	К	F	Approx. Mass [kg(lb)]
FR-RC-15K	270	200	450	432	195	10	10	8	3.2	87	19 (41.888)
FR-RC-30K	340	270	600	582	195	10	10	8	3.2	90	31 (68.343)

(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	а	b	D	AA	BA
FR-RC-15K	260	412	10	200	432
FR-RC-30K	330	562	10	270	582
FR-RC-55K	470	642	12	410	670

14.5 Power regeneration common converter

POINT	
 For details 	of the power regeneration common converter FR-CV, refer to the
FR-CV Inst	allation 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.
- Connect the DC power supply between the FR-CV and servo amplifier with correct polarity. Connection with incorrect polarity will fail the FR-CV and servo amplifier.
- Two or more FR-CV's cannot be installed to improve regeneration capability. Two or more FR-CV's cannot be connected to the same DC power supply line.

When using the power regeneration common converter, set parameter No. PA02 to " $\Box \Box 01$ ".

(1) Model

$$F R - C V - \Box K$$

Applicable servo amplifier capacity [kW]

(2) Selection

The power regenerative common converter FR-CV can be used for the servo amplifier of 200VAC class with 750W to 22kW. The following shows the restrictions on using the FR-CV.

- (a) Up to six servo amplifiers can be connected to one FR-CV.
- (b) FR-CV capacity [W] Total of rated capacities [W] of servo amplifiers connected to FR-CV2.
- (c) The total of used servo motor rated currents should be equal to or less than the applicable current [A] of the FR-CV.
- (d) Among the servo amplifiers connected to the FR-CV, the servo amplifier of the maximum capacity should be equal to or less than the maximum connectable capacity [W].

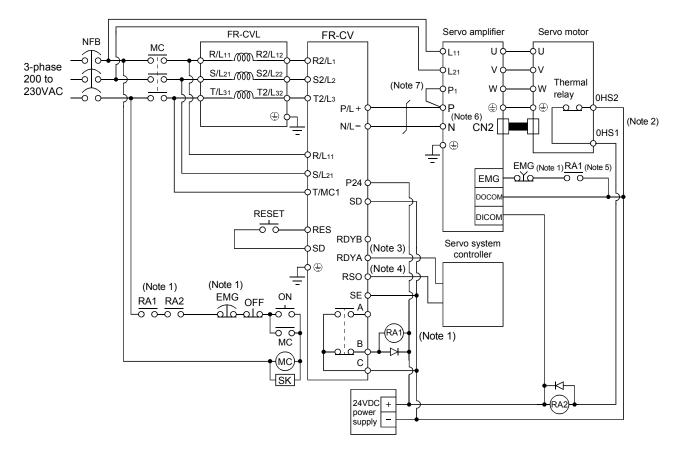
The following table lists the restrictions.

Item		FR-CV-								
item	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			

When using the FR-CV, 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-11 K
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

(3) Connection diagram



- 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 RS0 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 RS0 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 P-P1. (Factory-wired.)

(4) Wires used for wiring

(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. The used wires are based on the 600V vinyl wires.

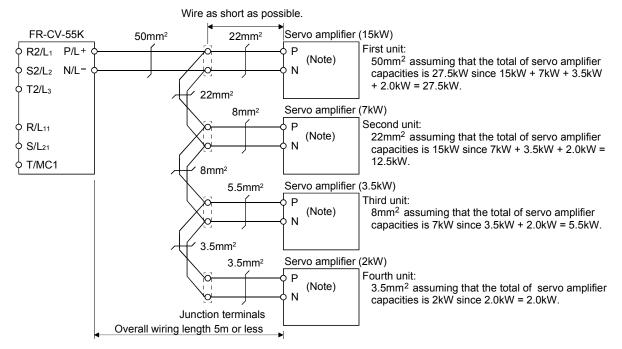
Total of servo amplifier capacities [kW]	Wires [mm ²]
1 or less	2
2	3.5
5	5.5
7	8
11	14
15	22
22	50

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

(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.



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).

- (5) Other precautions
 - (a) Always use the FR-CVL as the power factor improving reactor. Do not use the FR-BAL or FR-BEL.
 - (b) The inputs/outputs (main circuits) of the FR-CV 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) or line noise filter (FR-BSF01, FR-BLF).
 - (c) The overall wiring length for connection of the DC power supply between the FR-CV and servo amplifiers should be 5m or less, and the wiring must be twisted.

(6) Specifications

	Power regeneration cor	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	
	Total of connectable rated currents	33	46	61	90	115	145	215		
Output	Regenerative	Short-time rating	Total capacity of applicable servo motors, 300% torque, 60s (Note1)							
braking torque		Continuous rating	100% torque							
Rated input AC voltage/frequency			Three-phase 200 to 220V 50Hz, 200 to 230V 60Hz							
Power supply	Permissible AC volta	Three-phase 170 to 242V 50Hz, 170 to 253V 60Hz								
Fower suppry	Permissible frequenc	±5%								
	Power supply capacity (Note2) [kVA]		17	20	28	41	52	66	100	
Protective struc	ture (JEM 1030), coolir	ng system	Open type (IP00), forced cooling							
Ambient temperature			-10°C to +50°C (non-freezing)							
Environment Ambient humidity			90%RH or less (non-condensing)							
	Indoors (without corrosive gas, flammable gas, oil mist, dust and dirt)									
Altitude, vibration			1000m or less above sea level, 5.9m/s ² 2 or less (compliant with JIS C 0040)							
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	

Note1. 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.

14.6 External dynamic brake

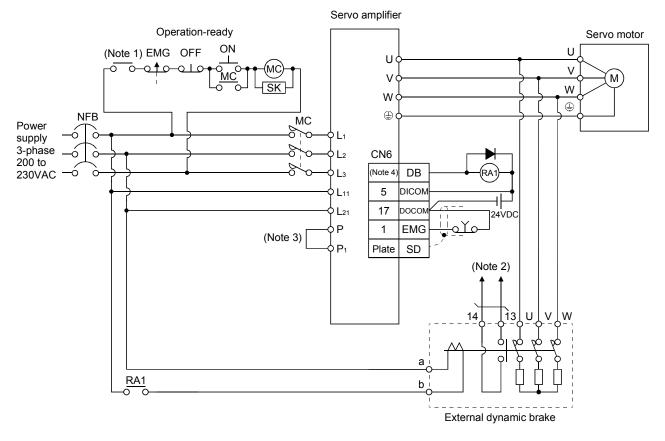
POINT						
0	up a sequence which switches off the contact of the brake unit after as) it has turned off the servo on signal at a power failure or					
 For the bra section 13. 	king time taken when the dynamic brake is operated, refer to 3.					
 The brake 	The brake unit is rated for a short duration. Do not use it for high duty.					
 When the optimized bindicated b	lynamic brake is used, the power supply voltage is restricted as elow.					
3-Phase 1	70 to 220VAC/50Hz					
3-Phase 1	70 to 242VAC/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.PD12 to PD14.

Servo amplifier	Dynamic brake
MR-J3-11KT	DBU-11K
MR-J3-15KT	DBU-15K
MR-J3-22KT	DBU-22K

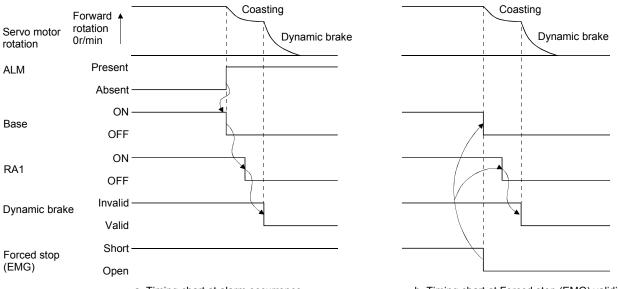
(2) Connection example



Note 1. Configure up the circuit to switch power off in the external sequence at servo alarm occurrence.

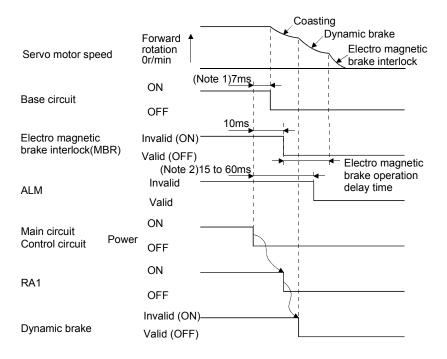
- 2. Terminals 13, 14 are normally open contact outputs. If the dynamic brake is seized, terminals 13, 14 will open. Therefore, configure up an external sequence to prevent servo-on.
- 3. For the servo amplifiers from 11k to 22kW, be sure to connect P P1. (Factory-wired)
- When using the power factor DC reactor, refer to Section 14.11.
- 4. Assign the dynamic brake sequence (DB) in the parameters No.PD12 to PD14.

14. OPTIONS AND AUXILIARY EQUIPMENT



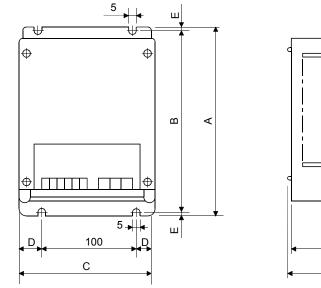
a. Timing chart at alarm occurrence

b. Timing chart at Forced stop (EMG) validity



- 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

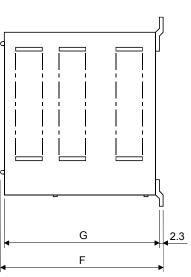
(3) Outline dimension drawing



Terminal block E a b 13 14 (GND)

Screw : M3.5

Tightening torque: 0.8 [N·m](7 [lb·in])



[Unit: mm]

UVW Screw: M4

Tightening torque: 1.2 [N·m](10.6 [lb·in])

Dynamic brake	А	В	С	D	E	F	G	Mass [kg]([lb])	Connection wire [mm ²]
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

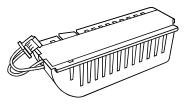
14.7 Battery MR-J3BAT

POINT

• 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 July, 2006).

(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 name 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).



The year and month of manufacture

14.8 Heat sink outside mounting attachment (MR-J3ACN)

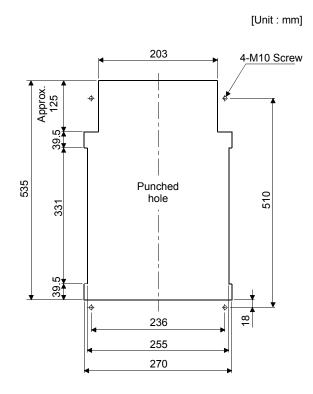
Use the heat sink outside mounting attachment to mount the heat generation area of the servo amplifier in the outside of the control box to dissipate servo amplifier-generated heat to the outside of the box and reduce the amount of heat generated in the box, thereby allowing a compact control box to 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.

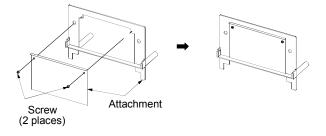
The environment outside the control box when using the heat sink outside mounting attachment should be within the range of the servo amplifier operating environment conditions.

The heat sink outside mounting attachment of MR-J3ACN can be used for MR-J3-11KT to MR-J3-22KT.

(1) Panel cut dimensions

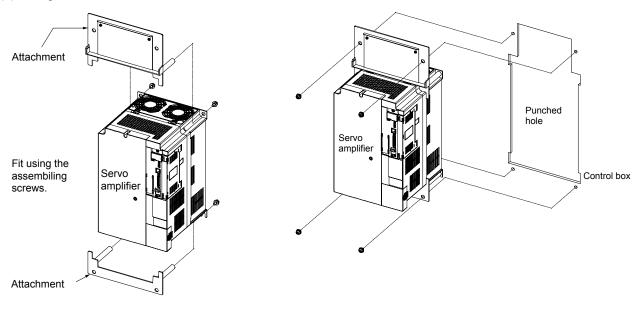


(2) How to assemble the attachment for a heat sink outside mounting attachment



14. OPTIONS AND AUXILIARY EQUIPMENT

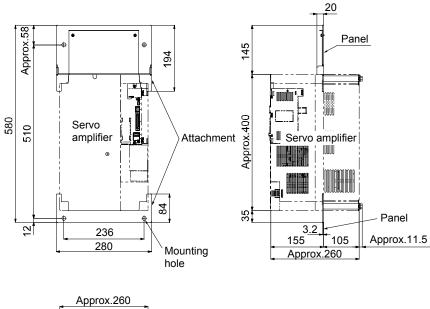
(3) Fitting method



a. Assembling the heat sink outside mounting attachment

b. Installation to the control box

(4) Outline dimension drawing

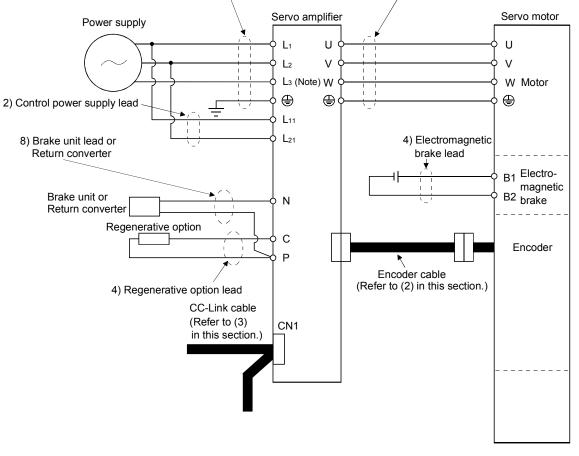


Approx.260

14.9 Recommended wires

(1) Wires for power supply wiring

The following diagram shows the wires used for wiring. Use the wires given in this section or equivalent.1) Main circuit power supply lead3) Motor power supply lead



Note. There is no L_3 for 1-phase 100 to 120VAC power supply.

The following table lists wire sizes. The wires used assume that they are 600V vinyl wires and the wiring distance is 30m max. If the wiring distance is over 30m, choose the wire size in consideration of voltage drop.

To comply with the UL/C-UL (CSA) Standard, use UL-recognized copper wires rated at 60°C (140°F) or more for wiring.

				Wires [mm ²]			
Servo amplifier	1) L1 • L2 • L3 • ⊕	2) L11 • L21	3) U • V • W • ⊕	4) P • C	5) B1 • B2	6) BU • BV • BW	7) OHS1 • OHS2
MR-J3-10T (1)						Ν	\backslash
MR-J3-20T (1)						$ \rangle$	$ \rangle$
MR-J3-40T (1)	2 (AWG14)		1.25 (AWG16)				
MR-J3-60T	2 (AWG14)						
MR-J3-70T				- 2(AWG14)			
MR-J3-100T			2 (AWG14)				
MR-J3-200T	3.5 (AWG12)		3.5 (AWG12)				
MR-J3-350T	5.5 (AWG10)		5.5 (AWG10)		1.25 (AWG16)		
MR-J3-500T	5.5(AWG10):	1.25	5.5(AWG10):				
	b(note)	(AWG16)	b(note)		1.20 (7.00010)		
MR-J3-700T	8(AWG8):		8(AWG8):	2 5(4)4(012): b			
	c(note)	-	c(note)	3.5(AWG12): b			\\
MR-J3-11KT	14(4)4/06): 0		22/AMCA): d				
(Note2)	14(AWG6): c	-	22(AWG4): d			2(0)0(014)	
MR-J3-15KT	22(0)0(C4): d		30(A)A(C2): c	5.5(AWG10): a			1.25(AWG16)
(Note2)	22(AWG4): d		30(AWG2): e	5.5(AVIG10). a		2(AWG14)	1.23(AVIG10)
MR-J3-22KT	50(AWG1/0): f		60(AWG2/0): f				
(Note2)	00(70001/0).1		00(70002/0).1				

Table 14.1 Recommended wires

Note 1. For crimping terminals and applicable tools, refer to Table 14.2.

2. When connecting to the terminal block, be sure to use the screws which are provided with the terminal block.

Use wires 8) of the following sizes with the brake unit (FR-BU) and power regeneration converter (FR-RC).

Model	Wires[mm ²]
FR-BU-15K	3.5(AWG12)
FR-BU-30K	5.5(AWG10)
FR-BU-55K	14(AWG6)
FR-RC-15K	14(AWG6)
FR-RC-30K	14(AWG6)
FR-RC-55K	22(AWG4)

Table 14.2 Recommended crimping terminals

	Ser	vo amplifier side crimping t	erminals		Ser	vo amplifier side crimping t	erminals	
Symbol	Crimping terminal	Applicable tool	Maker name	Symbol	Crimping terminal	Applicable tool	Maker name	
	00000	50000	Тусо			Body YPT-60-21 Dice TD-124 TD-112	Japan	
а	32968	59239	Electronics	(Note 1⁺2) e	38-S6	Body YF-1 E-4 Head YET-60-1 Dice TD-124 TD-112	Solderless Terminal	
b	FVD8-5	Body YF-1•E-4 Head YNE-38 Dice DH-111•DH-121			R38-6S	NOP60 NOM60	NICHIFU	
с	FVD14-6	Body YF-1•E-4 Head YNE-38 Dice DH-112•DH-122	Japan Solderless Terminal	Solderless		(Note 1)	Body YDT-60-21 Dice TD-125 TD-113	Japan
d	FVD22-6	Body YF-1•E-4 Head YNE-38 Dice DH-113•DH-123		Т	R60-8	Body YF-1•E-4 Head YET-60-1 Dice TD-125•TD-113	Solderless Terminal	

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.

(2) Wires for cables

When fabricating a cable, use the wire models given in the following table or equivalent:

					Charac	eristics of c	ne core				
Туре	Model	Length [m(ft)]	Core size [mm²]	Number of Cores	Structure [Wires/mm]	Conductor resistance [Ω/mm]	Insulation coating ODd [mm] (Note 1)	(Note 3) Finishing OD [mm]	Wire model		
	MR-J3ENCBL 🗆 M-A1-L	2 to 10	AWG22	6	7/0.26	53	1.2	7.1±0.3	(Note 3) VSVP 7/0.26 (AWG#22 or		
	MR-J3ENCBL 🗆 M-A2-L	2.0.10	/ 011	(3 pairs)		or less			equivalent)-3P Ban-gi-shi-16823		
	MR-J3ENCBL 🗆 M-A1-H	2 to 10	AWG22	6	70/0.08	56	1.2	7.1±0.3	(Note 3) ETEF SVP 70/0.08 (AWG#22 or		
	MR-J3ENCBL 🗆 M-A2-H	2 to 10	/WV OZZ	(3 pairs)		or less		7.1±0.3	equivalent)-3P Ban-gi-shi-16824		
	MR-J3JCBL03M-A1-L	0.3	AWG26	8	30/0.08	233	1.2	7.1±0.3	(Note 5) T/2464-1061/Ⅱ A-SB 4P ×		
	MR-J3JCBL03M-A2-L	0.0	/	(4 pairs)		or less	1.2	7.1±0.0	26AWG		
		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		
Encoder	MR-EKCBL 🗆 M-L	MR-EKCBL 🗆 M-L		0.08mm ²	4 (2 pairs) 12	7/0.127	234 or less 63.6	0.67		cable (A-TYPE)	
cable		20 • 30	0.3mm ²	(6 pairs)	12/0.18	or less	1.2	8.2	UL20276 AWG#23 6pair(BLACK)		
	MR-EKCBL 🗆 M-H	20	0.2mm ²	12 (6 pairs)	40/0.08	105 or less	0.88	7.2	(Note 3) A14B2343 6P		
		30 to 50	0.2mm ²	14 (7 pairs)	40/0.08	105 or less	0.88	8.0	(Note 3) J14B0238(0.2*7P)		
	MR-J3ENSCBL 🗆 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 VSVCAWG#23 [×] 6P Ban-gi-shi-15038		
	MR-J3ENSCBL 🗆 M-H	2 to 10	AWG22	6 (3 pairs)	70/0.08	56 or less	1.2	7.1±0.3	(Note 3) ETEF 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) ETFE ▪ SVP 40/0.08mm [×] 6P Ban-gi-shi-15266		
	MR-PWS1CBL M-A1-L	2 to 10									
	MR-PWS1CBL M-A2-L	2 to 10				05.40					
Motor power supply cable		2 to 10 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		
Supply Cable	MR-PWS1CBL DIM-A2-H	0.3	10019			01 1635			CE CUIC 2100 AWO 10 4 COIES		
	MR-PWS2CBL03M-A2-L	0.3									
	MR-BKS1CBL I M-A1-L	2 to 10									
	MR-BKS1CBL I M-A2-L	2 to 10									
Motor brake	MR-BKS1CBL IM-A1-H	2 to 10	(Note 6)	2	100/0.08	38.14	1.3	4.0±0.3	(Note 4)		
cable	MR-BKS1CBL M-A2-H	2 to 10	AWG20	_		or less		4.0±0.3	UL Style 2103 AWG20 2 cores		
	MR-BKS2CBL03M-A1-L MR-BKS2CBL03M-A2-L	0.3									
MR-BKS2CBL03M-A2-		0.0	1		1						

Table 14.3 Wires for option cables

Note 1. d is as shown below:



Conductor Insulation sheath

- 2. Purchased from Toa Electric Industry
- 3. Standard OD. Max. OD is about 10% greater.
- 4. Kurabe
- 5. Taiyo Electric Wire and Cable

(3) CC-Link twisted cable

POINT
 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.

Item	Specifications
Model	Kurashige Kogyo make FANC-SB 0.5mm $^2 imes$ 3 (Note)
Cable type	Shielded twisted cable
Conductor sectional area	0.5mm ²
Conductor resistance (20°C)	37.8Ω/km or less
Insulation resistance	10000Ω/km or more
Withstand voltage	500VDC 1 minute
Capacitance (1kHz)	60nF/km or less
Characteristic impedance (1MHz)	100±15Ω
Section	DA Sheath Shield White Yellow Aluminum tape DB DG Ground wire
Outline dimension	7mm
Approx. Mass	65kg/km

Note. For any inquiry, please contact your nearest Mitsubishi Electric System Service Co., Ltd.

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.

	No-fuse	breaker				
Servo amplifier	Not using power		(Note) Class	Fuse Current [A]	Voltage [V]	Magnetic contactor
MR-J3-10T(1)	30A frame 5A	30A frame 5A	K5	10		
MR-J3-20T	30A frame 5A	30A frame 5A	K5	10		
MR-J3-20T1	30A frame 10A	30A frame 10A	K5	15		S-N10
MR-J3-40T	30A frame 10A	30A frame 5A	K5	15		
MR-J3-60T • 70T • 100T • 40T1	30A frame 15A	30A frame 10A	K5	20		
MR-J3-200T	30A frame 20A	30A frame 15A	K5	40	AC250	S-N18
MR-J3-350T	30A frame 30A	30A frame 30A	K5	70	AC250	S-N20
MR-J3-500T	50A frame 50A	50A frame 40A	K5	125		S-N35
MR-J3-700T	100A frame 75A	50A frame 50A	K5	150		S-N50
MR-J3-11KT	100A frame 100A	100A frame 75A	K5	200		S-N65
MR-J3-15KT	225A frame 125A	100A frame 100A	K5	250		S-N95
MR-J3-22KT	225A frame 175A	225A frame 150A	K5	350	Ī	S-N125

Note. This servo amplifier is UL/C-UL-listed when using a Class T fuse. Therefore, when using the servo amplifier as a UL/C-UL Standard compliant product, be sure to use the Class T fuse.

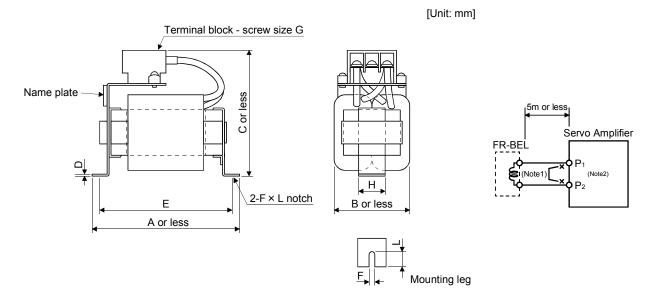
14.11 Power factor improving DC reactor

POINT	
 For 100VA 	C class servo amplifiers, the power factor improving DC reactor
cannot be u	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 the wiring across P_1 - P_2 (For 11kW or more, disconnect the wiring across P- P_1). 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.



Note 1. When using the power factor improving DC reactor, disconnect the wiring across P-P₁. 2. For 11kW or more, the wiring across P-P₁ is connected.

Servo Amplifier	Power Factor Improving DC				Dim	ensions [mm]				Mounting Screw	Mass	Used Power Supply
Servo Ampinier	Reactor	А	В	С	D	Е	F	L	G	Н	Size	[kg(lb)]	[mm ²]
MR-J3-10T • 20T	FR-BEL-0.4K	110	50	94	1.6	95	6	12	M3.5	25	M5	0.5 (1.10)	
MR-J3-40T	FR-BEL-0.75K	120	53	102	1.6	105	6	12	M4	25	M5	0.7 (1.54)	2
MR-J3-60T • 70T	FR-BEL-1.5K	130	65	110	1.6	115	6	12	M4	30	M5	1.1 (2.43)	(AWG14)
MR-J3-100T	FR-BEL-2.2K	130	65	110	1.6	115	6	12	M4	30	M5	1.2 (2.43)	
MR-J3-200T	FR-BEL-3.7K	150	75	102	2.0	135	6	12	M4	40	M5	1.7 (3.75)	3.5 (AWG12)
MR-J3-350T	FR-BEL-7.5K	150	75	126	2.0	135	6	12	M5	40	M5	2.3 (5.07)	5.5 (AWG10)
MR-J3-500T	FR-BEL-11K	170	93	132	2.3	155	6	14	M5	50	M5	3.1 (6.84)	5.5(AWG10)
MR-J3-700T	FR-BEL-15K	170	93	170	2.3	155	6	14	M8	56	M5	3.8 (8.38)	8(AWG8)
MR-J3-11KT	FR-BEL-15K	170	93	170	2.3	155	6	14	M8	56	M5	3.8 (8.38)	22(AWG4)
MR-J3-15KT	FR-BEL-22K	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(AWG1/0)

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.

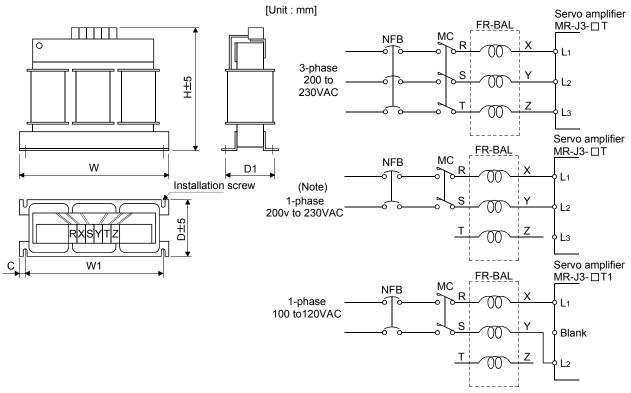
It can reduce the power capacity.

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.



		Dimensions [mm]						Mounting	Terminal	Mass
Servo amplifier	Model	W	W1	Н	D	D1	С	screw size	screw size	[kg (lb)]
MR-J3-10T/20T/10T1	FR-BAL-0.4K	135	120	115	59	45- ⁰ .5	7.5	M4	M3.5	2.0 (4.4)
MR-J3-40T/20T1	FR-BAL-0.75K	135	120	115	69	57- ⁰ .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	75-2.5	7.5	M4	M3.5	5.6 (12.35)
MR-J3-200T	FR-BAL-3.7K	220	200	192	90	70±5	10	M5	M4	8.5 (18.74)
MR-J3-350T	FR-BAL-7.5K	220	200	194	120	100±5	10	M5	M5	14.5 (32.0)
MR-J3-500T	FR-BAL-11K	280	255	220	135	100	12.5	M6	M6	19 (41.9)
MR-J3-700T	FR-BAL-15K	295	270	275	133	110-2.5	12.5	M6	M6	27(59.53)
MR-J3-11KT	FR-DAL-ION	295	270	275	133	110-2.5	12.5	IVIO	IVIO	27(59.55)
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(94.79)

Note. For the 1-phase 200V to 230V power supply, Connect the power supply to L1, L2 and leave L3 open.

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 40mA or less
	(Ex.) Omron : type MY

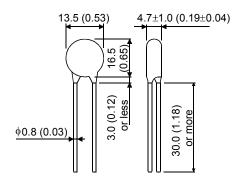
14.14 Surge absorbers (recommended)

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.

	Μ	laximum ratir	ng			Static		
Permissibl volta		Surge immunity	Energy immunity	Rated power	Maximum limit voltage		capacity (reference value)	Varistor voltage rating (range) V1mA
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 μ s

(Example) ERZV10D221 (Matsushita Electric Industry) TNR-10V221K (Nippon chemi-con) Outline drawing [mm] ([in]) (ERZ-C10DK221)



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.

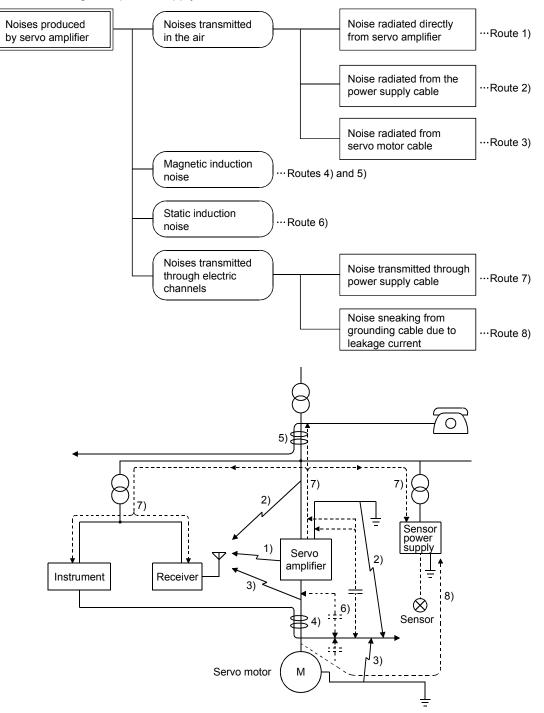
(1) Noise reduction techniques

- (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.

(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.



Noise transmission route	Suppression techniques
1) 2) 3)	 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. 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)	 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. Provide maximum clearance between easily affected devices and the servo amplifier. Provide maximum clearance between easily affected signal cables and the I/O cables of the servo amplifier. Avoid laying the power lines (I/O cables of the servo amplifier) and signal cables side by side or bundling them together. Use shielded wires for signal and power cables or put the cables in separate metal conduits.
7)	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. 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)	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.

(2) Noise reduction products

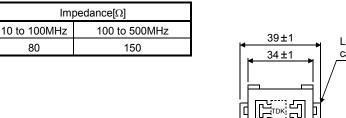
(a) Data line filter (Recommended)

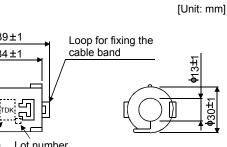
Noise can be prevented by installing a data line filter onto the encoder cable, etc.

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.



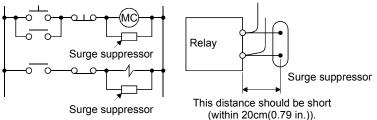


Product name Lot number

Outline drawing (ZCAT3035-1330)

(b) Surge suppressor

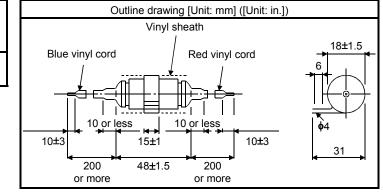
The recommended surge suppressor for installation to an AC relay, AC valve, AC electromagnetic brake or the like near the servo amplifier is shown below. Use this product or equivalent.



(Ex.) 972A.2003 50411 (Matsuo Electric Co.,Ltd.-200VAC rating)

Diode

Rated voltage AC[V]	C [µF]	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.

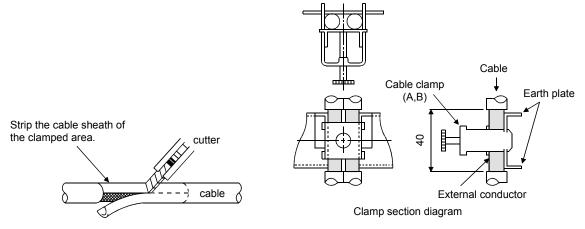
Maximum voltage: Not less than 4 times the drive voltage of the relay or the like

Maximum current: Not less than twice the drive current of the relay or the like

(c) Cable clamp fitting AERSBAN - DSET

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.

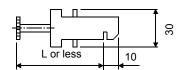


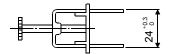
Outline drawing

Earth plate

[Unit: mm]

Clamp section diagram



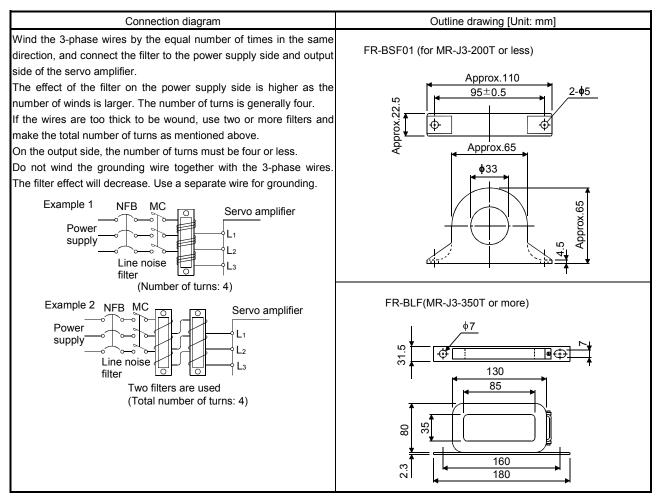


Note. Screw hole for grounding. Connect it to the earth plate of the control box.

Туре	А	В	С	Accessory fittings
AERSBAN-DSET	100	86	30	clamp A: 2pcs.
AERSBAN-ESET	70	56		clamp B: 1pc.

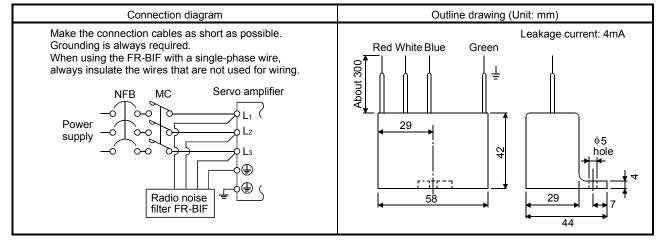
Clamp fitting	L
А	70
В	45

- (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.



(e) Radio noise filter (FR-BIF)

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 is designed for the input only.



14.16 Leakage current breaker

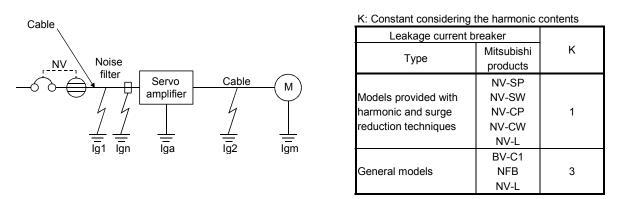
(1) Selection method

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.

Rated sensitivity current \geq 10 • {lg1+lgn+lga+K • (lg2+lgm)} [mA].....(14.2)



- Ig1: Leakage current on the electric channel from the leakage current breaker to the input terminals of the servo amplifier (Found from Fig. 14.1.)
- Ig2: Leakage current on the electric channel from the output terminals of the servo amplifier to the servo motor (Found from Fig. 14.1.)
- Ign: Leakage current when a filter is connected to the input side (4.4mA per one FR-BIF)
- Iga: Leakage current of the servo amplifier (Found from Table 14.5.)
- Igm: Leakage current of the servo motor (Found from Table 14.4.)

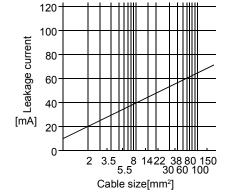


Fig14.1 Leakage current example (Ig1, Ig2) for CV cable run in metal conduit

14. OPTIONS AND AUXILIARY EQUIPMENT

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 14.4 Servo motor's leakage current example (Igm)

	icanage carrent example (iga)
Servo amplifier capacity [kW]	Leakage current [mA]
0.1 to 0.6	0.1
0.75 to 3.5	0.15
5•7	2
11 • 15	5.5
22	7
Table 14.6 Leakage c	circuit breaker selection example
Servo amplifier	Rated sensitivity current of leakage circuit breaker [mA
MR-J3-10T to MR-J3-350T	15
MR-J3-10T1 to MR-J3-40T1	
MR-J3-500T	30

50

100

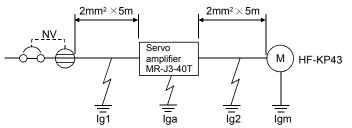
Table 14.5 Servo amplifier's leakage current example (Iga)

(2) Selection example

Indicated below is an example of selecting a leakage current breaker under the following conditions:

MR-J3-700T

MR-J3-11KT to MR-J3-22KT



Use a leakage current breaker generally available. Find the terms of Equation (14.2) from the diagram:

$$Ig1 = 20 \cdot \frac{5}{1000} = 0.1 \ [mA]$$

$$Ig2 = 20 \cdot \frac{5}{1000} = 0.1 \text{ [mA]}$$

Ign = 0 (not used)

Iga = 0.1 [mA]

Igm = 0.1 [mA]

Insert these values in Equation (14.2):

$$\lg \ge 10 \cdot \{0.1 + 0 + 0.1 + 1 \cdot (0.1 + 0.1)\}$$

≥ 4.0 [mA]

According to the result of calculation, use a leakage current breaker having the rated sensitivity current (Ig) of 4.0[mA] or more. A leakage current breaker having Ig of 15[mA] is used with the NV-SP/SW/CP/CW/HW series.

14 - 61

14.17 EMC filter (recommended)

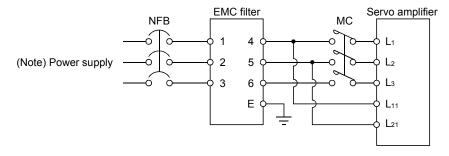
For compliance with the EMC directive of the EN Standard, it is recommended to use the following filter: Some EMC filters are large in leakage current.

(1) Combination with the servo amplifier

Servo amplifier	Recomme	Mass [kg]([lb])		
Servo ampliner	Model	Leakage current [mA]		
MR-J3-10B to MR-J3-100B		F	3 (6.61)	
MR-J3-10B1 to MR-J3-40B1	(Note) HF3010A-UN	5		
MR-J3-250B • MR-J3-350B	(Note) HF3030A-UN	5	5.5 (12.13)	
MR-J3-500B • MR-J3-700B	(Note) HF3040A-UN	1.5	6.0 (13.23)	
MR-J3-11KB to MR-J3-22KB	(Note) HF3100A-UN	6.5	15 (33.07)	

Note. Soshin Electric A surge protector is separately required to use any of these EMC filters. (Refer to the EMC Installation Guidelines.)

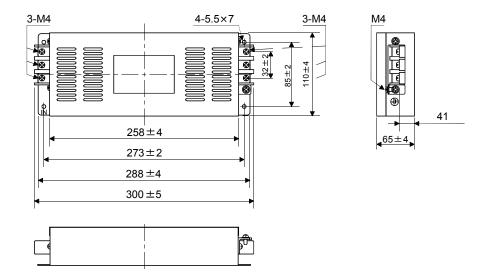
(2) Connection example



Note. For 1-phase 200V to 230VAC power supply, connect the power supply to L_1, L_2 and leave L_3 open. There is no L_3 for 1-phase 100 to 120VAC power supply.

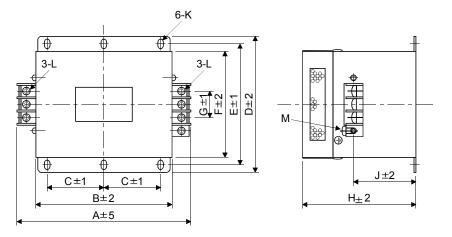
(3) Outline drawing

HF3010A-UN



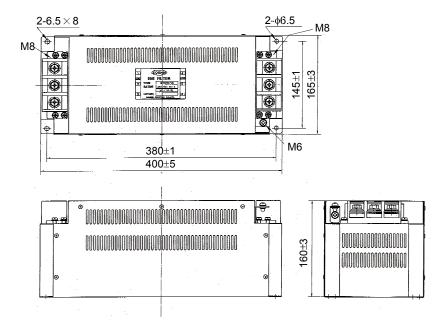
[Unit: mm]

HF3030A-UN • HF-3040A-UN



Model						Dimensio	ons [mm]					
Woder	А	В	С	D	E	F	G	Н	J	К	L	М
HF3030A-UN	260	210	85	155	140	125	44	140	70	R3.25,	M5	M4
HF3040A-UN	260	210	85	155	140	125	44	140	70	length 8	M5	M4

HF3100A-UN



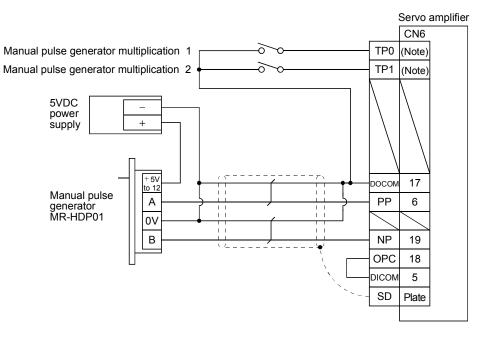
14.18 MR-HDP01 manual pulse generator

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	
,	Voltage	4.5 to 13.2VDC	
Power supply	Current	60mA or less	
	consumption	Soft A of 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	
Storage temperature range		-30°C to + 80°C	

(2) Connection example



Note. Assign TP0 and PT1 using parameter No. PD06 to PD08 • PD12 • PD14.

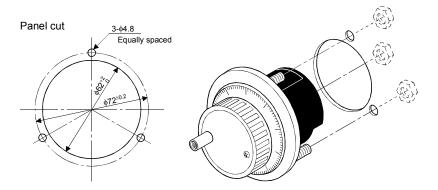
14. OPTIONS AND AUXILIARY EQUIPMENT

(3) Terminal layout

+5 to	
12V 0V A B	
$\otimes \otimes \otimes \otimes$	

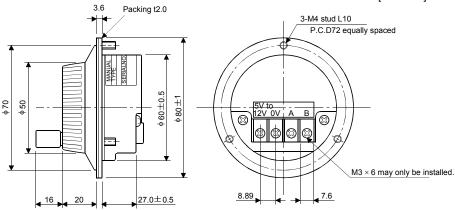
Signal	Description
+5 to 12V	Power input
0V	Common for power and signal
А	A-phase pulse output
В	B-phase pulse output

(4) Installation



(5) Outline drawing

[Unit: mm]



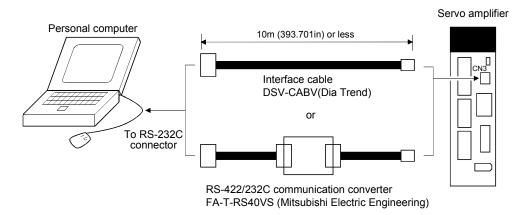
MEMO

15. COMMUNICATION FUNCTION

Using the serial communication function of RS-422, this servo amplifier enables servo operation, parameter change, monitor function, etc.

- 15.1 Configuration
- (1) Single axis

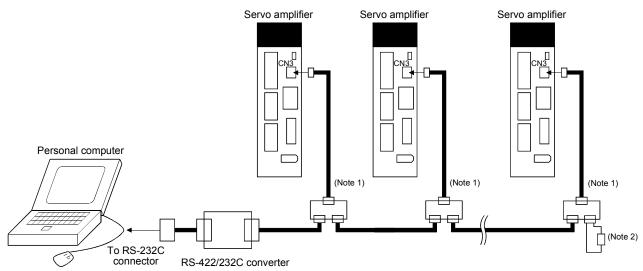
Operate the single-axis servo amplifier. It is recommended to use the following cable or RS-422/232C communication converter.



(2) Multidrop connection

(a) Diagrammatic sketch

Up to 32 axes of servo amplifiers from stations 0 to 31 can be operated on the same bus.

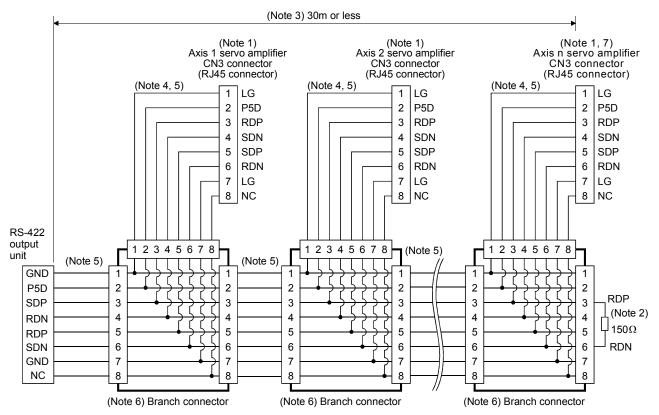


Note 1. The BMJ-8 (Hakko Electric Machine Works) is recommended as the branch connector.

2. 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.

(b) Cable connection diagram

Wire the cables as shown below.



Note 1. Recommended connector (Hirose Electric)

Plug: TM10P-88P

Connection tool: CL250-0228-1

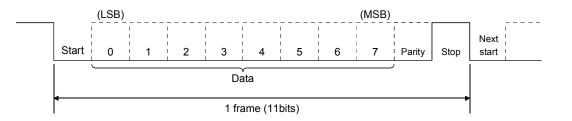
- 2. The final axis must be terminated between RDP (pin No. 3) and RDN (pin No.6) on the receiving side (servo amplifier) with a 150Ω resistor.
- 3. The overall length is 30m or less in low-noise environment.
- 4. The wiring between the branch connector and servo amplifier should be as short as possible.
- 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.)

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	9600/19200/3	600/19200/38400/57600/115200 asynchronous system		
	Start bit	: 1 bit		
	Data bit	: 8 bits		
Transfer code	Parity bit	: 1 bit (even)		
	Stop bit	: 1 bit		
Transfer protocol	Character sy	Character system, half-duplex communication system		



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 800µs or "1" to send back data in 800µs or more.



1: Valid, reply sent in 800 µs 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.

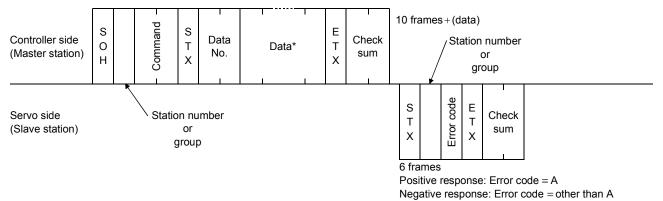
15.3 Protocol

15.3.1 Transmission data configuration

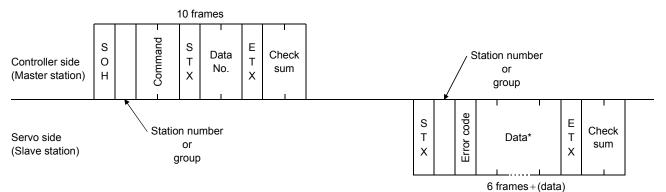
Since up to 32 axes may be connected to the bus, add a station number or group to the command, data No., etc. to determine the destination servo amplifier of data communication. Set the station number to each servo amplifier using the parameter and set the group to each station using the communication 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.

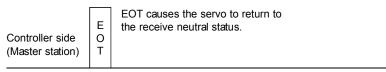
(1) Transmission of data from the controller to the servo



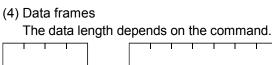
(2) Transmission of data request from the controller to the servo

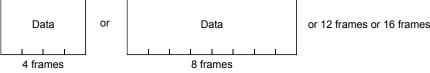


(3) Recovery of communication status by time-out



Servo side (Slave station)





15 - 5

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.

	
>	
\rightarrow	
>	

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

C R	0	1	2	3	4	5	6	7
0	NUL	DLE	Space	0	0	Ρ	•	р
1	SOH	DC ₁	!	1	А	Q	а	q
2	STX	DC_2	"	2	В	R	b	r
3	ETX	DC_3	#	3	С	s	С	S
4			\$	4	D	Г	d	t
5			%	5	Е	J	e	u
6			&	6	F	V	f	v
7			£	7	G	W	g	w
8			(8	Ξ	Х	h	х
9)	9	—	Υ	ï	у
10			*	•••	J	Ζ	j	z
11			+	• •	к	[k	{
12			,	<	L	¥	Ι	
13			_	Ш	М]	m	}
14			-	^	Ν	^	n	-
15			/	?	0	_	0	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	А	В	С	D	Е	F

Station number	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
ASCII code	G	Н	Ι	J	К	L	М	Ν	0	Ρ	Q	R	S	Т	U	V

For example, "30H" is transmitted in hexadecimal for the station number of "0" (axis 1).

(4) Group

Group	а	b	с	d	е	f	All group
ASCII code	а	b	С	d	е	f	*

For example, "61H" is transmitted in hexadecimal for group a.

15.3.3 Error codes

Error codes are used in the following cases and an error code of single-code length is transmitted.

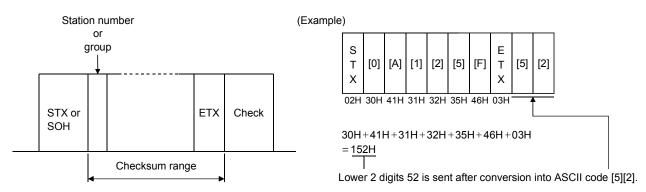
On receipt of data from the master station, the slave station sends the error code corresponding to that data to the master station.

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	Lifor hame	Description	Remarks	
[A]	[a]	Normal operation	Data transmitted was processed properly.	Positive response	
[B]	[b]	Parity error	Parity error occurred in the transmitted data.		
[C]	[C]	Checksum error	Checksum error occurred in the transmitted data.		
וחו	[d]	Character error	Character not existing in the specifications was		
[D]	[U]	Character entor	transmitted.	Negative response	
r=1	[0]	Command error	Command not existing in the specifications was	Negative response	
[E]	[e]		transmitted.		
[F]	[f]	Data No. error	Data No. not existing in the specifications was		
[,]	נין	Data No. enoi	transmitted.		

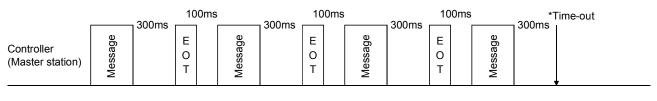
15.3.4 Checksum

The check sum 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).



15.3.5 Time-out operation

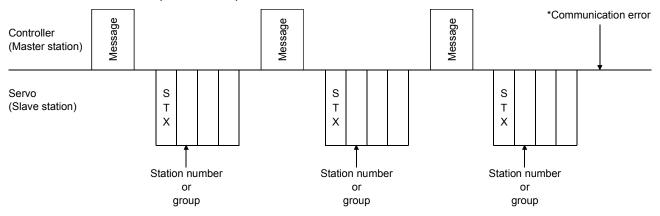
The master station transmits EOT when the slave station does not start reply operation (STX is not received) 300ms after the master station has ended communication operation. 100ms after that, the master station retransmits the message. Time-out occurs if the slave station does not answer after the master station has performed the above operation three times. (Communication error)



Servo (Slave station)

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.

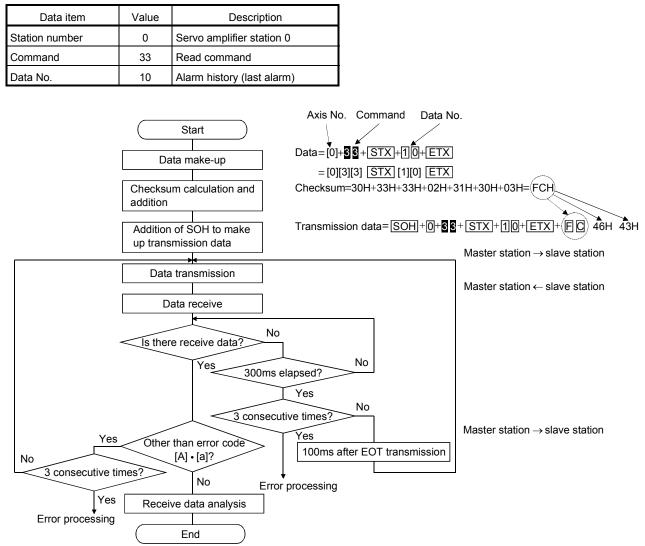
15.3.7 Initialization

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:



15.4 Command and data No. list

POINT	
If the comr	nand 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]	Status display data value and	Current position	12
	[8] [1]	processing information	Command position	
	[8] [2]		Command remaining distance	
	[8] [3]		Point table No.	
	[8] [4]		Cumulative feedback pulses	
	[8] [5]	1	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	

(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]	•	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	

(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])

Command	Data No.		Description	Frame Length
[0] [2]	[0][0]	Current alarm number		4
[3] [5]	[0][0]	0][0] Status display name and unit at C	Current position	16
	[0][1]	alarm occurrence	Command position	
	[0][2]		Command remaining distance	
	[0][3]	F	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	Current position	12
	[0][1]	processing information at alarm	Command position	
	[0][2]	occurrence	Command remaining distance	
	[0][3]	C	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]	1	ABS counter	
	[1][0]	1	Load inertia moment ratio	
	[1][1]		Bus voltage	

15. COMMUNICATION FUNCTION

Command	Data No.	Description	Frame length
[4][0]	[0][1] to [F][F]	Position data read	8
		The decimal equivalent of the data No. value (hexadecimal) corresponds to the Point	
		table No.	

(6) Point table/position data (Command [4][0])

(7) Point table/speed data (Command [5][0])

Command	Data No.	Description	Frame length
[5][0]	[0][1] to [F][F]	Speed data read	8
		The decimal equivalent of the data No. value (hexadecimal) corresponds to the Point	
		table No.	

(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	8
		The decimal equivalent of the data No. value (hexadecimal) corresponds to the Point	
		table No.	

(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	8
		The decimal equivalent of the data No. value (hexadecimal) corresponds to the Point	
		table No.	

(10) Point table/dwell (Command [6][0])

Command	Data No.	Description	Frame length
[6][0]	[0][1] to [F][F]	Dwell read	8
		The decimal equivalent of the data No. value (hexadecimal) corresponds to the Point	
		table No.	

(11) Point table/auxiliary function (Command [6][4])

Command	Data No.	Description	Frame length
[6][4]	[0][1] to [F][F]	Auxiliary function read	8
		The decimal equivalent of the data No. value (hexadecimal) corresponds to the Point	
		table No.	

(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	4
		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	

(14) Others

Command	Data No.	Description	Frame length
[0] [2]	[9] [0]	Servo motor end 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
Γ	[9] [2]	[6] [0]	Communication input device signal	Refer to section 15.5.5	8
		[6] [1]			

(4) Alarm history (Command [8][2])

ĺ	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	-9999999 to 999999	8
		The decimal equivalent of the data No. value		
		(hexadecimal) corresponds to the Point table No.		

(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	0 to Permissible	8
		The decimal equivalent of the data No. value	instantaneous speed	
		(hexadecimal) corresponds to the Point table No.		

15. COMMUNICATION FUNCTION

(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	0 to 20000	8
		The decimal equivalent of the data No. value		
		(hexadecimal) corresponds to the Point table No.		

(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	0 to 20000	8
		The decimal equivalent of the data No. value		
		(hexadecimal) corresponds to the Point table No.		

(10) Point table/dwell (Command [C][A])

Command	Data No.	Description	Setting range	Frame length
[C][A]	[0][1] to [F][F]	Dwell write	0 to 20000	8
		The decimal equivalent of the data No. value		
		(hexadecimal) corresponds to the Point table No.		

(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	0 to 3	8
		The decimal equivalent of the data No. value		
		(hexadecimal) corresponds to the Point table No.		

(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 1EA5			
		and pulse train inputs with the exception of EMG, LSP and			
		LSN, independently of the external ON/OFF statuses.			
[9][0]	[0][3]	Changes the output devices (DO) into the value of	1EA5	4	
		command [8][B] or command [A][0] + data No. [0][1].			
[9][0]	[1][0]	Enables the disabled input devices (DI), external analog	1EA5	4	
		input signals and pulse train inputs with the exception of			
		EMG, LSP and LSN.			
[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 to 0005	4	
		0000: Test operation mode cancel			
		0001: JOG operation			
		0002: Positioning operation			
		0003: Motorless operation			
		0004: Output signal (DO) forced output			
		0005: Single-step feed			

15. COMMUNICATION FUNCTION

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 7FFFFFF	8
	[2] [0]	Sets the moving distance in the test operation mode (JOG operation, positioning operation).	00000000 to 7FFFFFF	8
	[2] [1]	Selects the positioning direction of test operation (positioning operation). OOOO OOO OOO OOO OOOOOOOOOOOOOOOOOOO	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	4

(14) Test operation mode data (Command [9][2] - [A][0])

(15) Group setting (Command [9][F])

, ,	U (
Command	Data No.	Description	Setting range	Frame length
[9] [F]	[0] [0]	Setting of group	a to f	4

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.

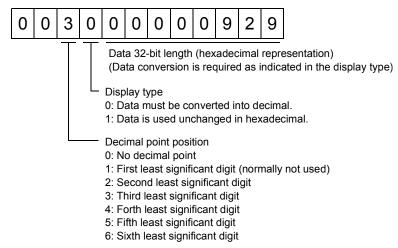
Since whether data must be processed or not and how to process data depend on the monitoring, parameters, etc., follow the detailed explanation of the corresponding command.

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.



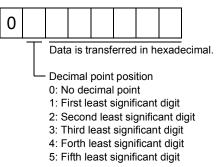
Since the display type is "0" in this case, the hexadecimal data is converted into decimal. 00000929H \rightarrow 2345

As the decimal point position is "3", a decimal point is placed in the third least significant digit. Hence, "23.45" is displayed.

(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. $155\rightarrow$ 9B

Hence, "0200009B" is transmitted.

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.

	(0	0														
--	---	---	---	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Unit characters (5 digits)

Name characters (9 digits)

(2) Status display data read

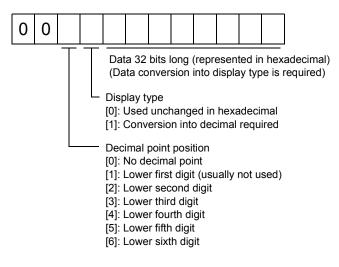
Read the status display data and processing information.

(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.

15.5.3 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.PADD)

- 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)

(4) Reading the setting

Read the parameter setting. Specify the parameter group in advance (refer to (1) in this section).

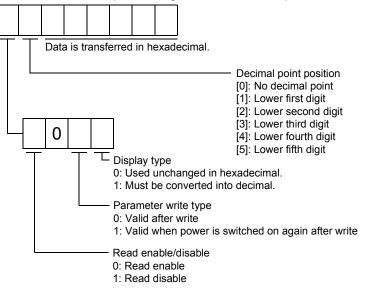
(a) Transmission

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) of 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.

(6) Parameter write

POINT
 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 EEP-ROM. The EEP-ROM 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 EEP-ROM is limited to approximately 100, 000.

Write the parameter setting into EEP-ROM of the servo amplifier. Specify the parameter group in advance (refer to (1) of 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) of this section.

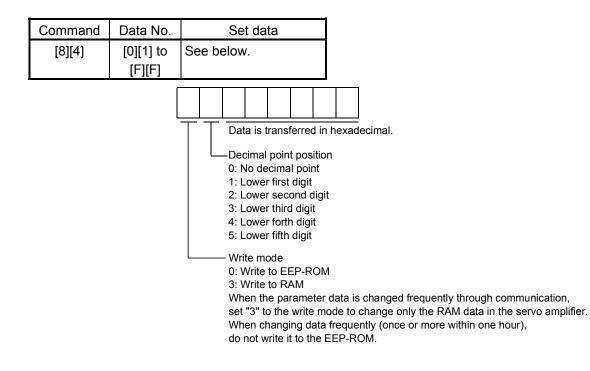
Transmit command [8][4], the data No. , and the set data.

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.



- 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.

b	31	 	 b1	b)													
Γ																		1:ON
																		0:OFF

Command of each bit is transmitted to the master	
station as hexadecimal data.	

bit	Data No. [0][0]		Data No. [0][1]	
DIL	Device name	Symbol	Device name	Symbol
0	Servo-on	SON	Ν	
1	Forward rotation stroke end	LSP] \	
2	Reverse rotation stroke end	LSN		1
3		/		1
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		\backslash		
14		\backslash		
15				
16				
17	Automatic/manual selection	MD0		
18	Proximity dog	DOG		
19		\backslash		
20		\backslash		
21				
22				
23	Override selection	OVR	\	
24	Temporary stop/Restart	TSTP	Point table No. selection 1	DI0
25		$\left \right\rangle$	Point table No. selection 2	DI1
26			Point table No. selection 3	DI2
27	Gain switch	CDP	Point table No. selection 4	DI3
28		\backslash	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

(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].

15

Command	Data No.
[1][2]	[4][0]

(b) Reply

bit

0

1

2

3

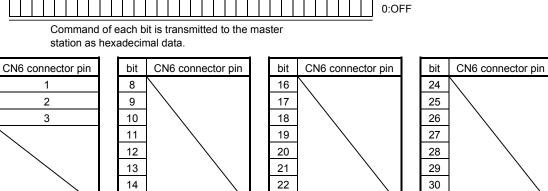
4 5

6

7

The ON/OFF statuses of the input pins are sent back.





23

31

(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.

b31	 	b1 b0
		1:ON
		0:OFF

Command of each bit is transmitted to the master station as hexadecimal data.

	Data No. [6][0]		Data No. [6][1]	
bit	Device name	Symbol	Device name	Symbol
0	Servo-on	SON	Ν	
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		\setminus		
9				
10				
11	Forward rotation start	ST1		
12	Reverse rotation start	ST2		
13		\land		
14				
15				
16			$\langle \rangle$	
17	Automatic/manual selection	MD0		
18	Proximity dog	DOG		
19		\backslash		
20				
21				
22				
23	Override selection	OVR	\	
24	Temporary stop/Restart	TSTP	Point table No. selection 1	DI0
25		$\left \right\rangle$	Point table No. selection 2	DI1
26			Point table No. selection 3	DI2
27	Gain switch	CDP	Point table No. selection 4	DI3
28		$\left \right\rangle$	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

(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].

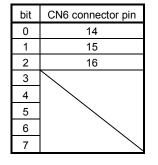
Command	Data No.
[1][2]	[C][0]

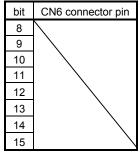
(b) Reply

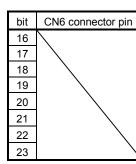
The slave station sends back the ON/OFF statuses of the output pins.

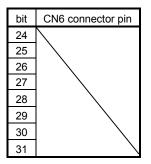
b3	1-	 	b1	bC)													
																		1:ON
																		0:OFF

Command of each bit is transmitted to the master station as hexadecimal data.









(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.

b	31	 	 b1	b)													
ſ																		1:ON
																		0:OFF

Command of each bit is transmitted to the master station as hexadecimal data.

bit	Data No. [8][0]		Data No. [8][1]	
DIL	Device name	Symbol	Device name	Symbol
0	Ready	RD	Ν	
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		\searrow		
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		\backslash		
21		\backslash		
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 finish	MEND	Point table No. output 5	PT4
29		\searrow	Point table No. output 6	PT5
30			Point table No. output 7	PT6
31			Point table No. output 8	PT7

15.5.5 Device ON/OFF

POINT
• 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]		
b31			00 10
			1:ON
			0:OFF

Command of each bit is transmitted to the slave station as hexadecimal data.

bit	Data No. [6][0]		Data No. [6][1]	
Dit	Device name	Symbol	Device name	Symbol
0	Servo-on	SON	Ν	
1	Forward rotation stroke end	LSP		
2	Reverse rotation stroke end	LSN		1
3		/		1
4	Internal torque limit selection	TL1		
5	Proportion control	PC		
6	Reset	RES		
7	Clear	CR		
8		\setminus		
9				
10				
11	Forward rotation start	ST1		
12	Reverse rotation start	ST2		
13		\land		
14				
15				
16				
17	Automatic/manual selection	MD0		
18	Proximity dog	DOG		
19		\backslash		
20				
21				
22				
23	Override selection	OVR	\\	
24	Temporary stop/Restart	TSTP	Point table No. selection 1	DI0
25		$\left \right\rangle$	Point table No. selection 2	DI1
26			Point table No. selection 3	DI2
27	Gain switch	CDP	Point table No. selection 4	DI3
28		\backslash	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

15.5.6 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

۰.			
	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

۰.			
	Command	Data No.	Data
	[9][0]	[1][3]	1EA5

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]		
b31			b1 b0
			1: ON
			0: OFF

Command of each bit is transmitted to the slave station as hexadecimal data.

bit	Data No. [0][0]		Data No. [0][1]	
DIL	Device name	Symbol	Device name	Symbol
0	Servo-on	SON	Ν	
1	Forward rotation stroke end	LSP	$ \rangle$	
2	Reverse rotation stroke end	LSN		\
3		/		
4	Internal torque limit selection	TL1		
5	Proportion control	PC		
6	Reset	RES		
7	Clear	CR		
8			\backslash	
9				
10				
11	Forward rotation start	ST1		
12	Reverse rotation start	ST2		
13		\backslash		
14		\backslash		
15				
16				
17	Automatic/manual selection	MD0		
18	Proximity dog	DOG		
19		\backslash		
20		\backslash		
21				
22				
23	Override selection	OVR	\\	
24	Temporary stop/Restart	TSTP	Point table No. selection 1	DI0
25		\searrow	Point table No. selection 2	DI1
26			Point table No. selection 3	DI2
27	Gain switch	CDP	Point table No. selection 4	DI3
28		\backslash	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

15.5.8 Test operation mode

Р	O	N	Ι

- 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.

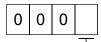
a. Transmission

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.

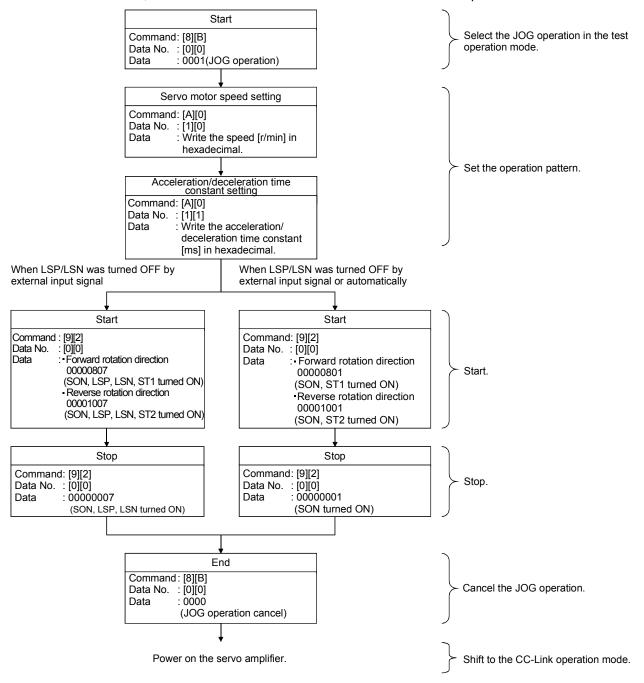


- Test operation mode read

- 0: Normal mode (not test operation mode)
- 1: JOG operation
- 2: Positioning operation
- 3: Motorless operation
- 4: DO forced output
- 5: Single-step feed

(2) JOG operation

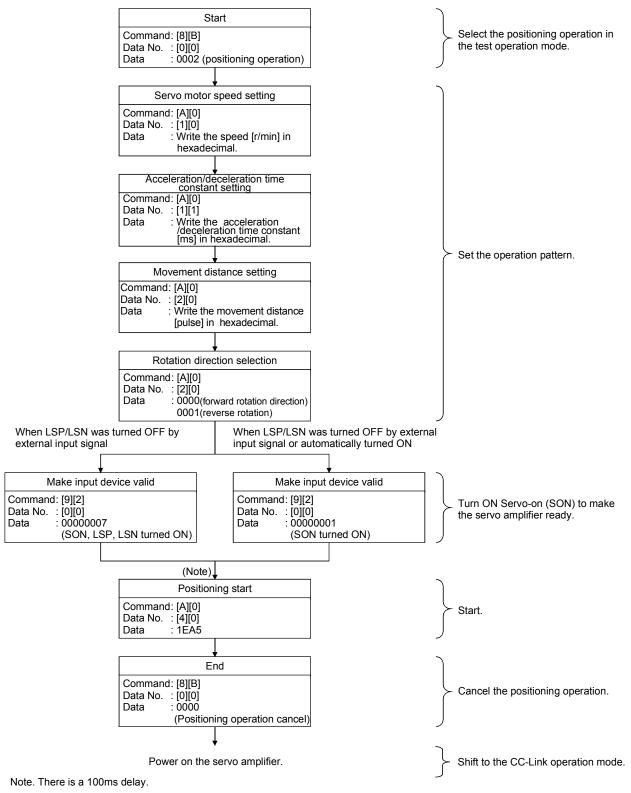
Send the command, data No. and data as indicated below to execute JOG operation.



(3) Positioning operation

(a) Operation procedure

Send the command, data No. and data as indicated below to execute positioning operation.



(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

Note.
indicates a blank.

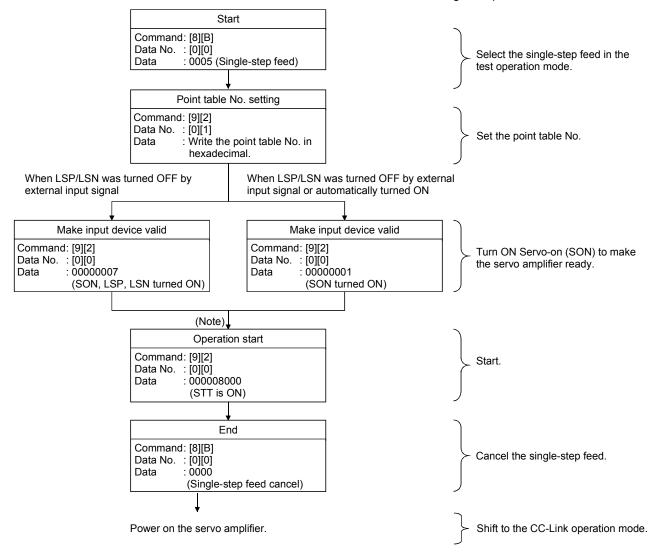
Send the following command, data No. and data during a temporary stop to stop positioning operation and erase the remaining movement distance.

Command	Data No.	(Note) Data
[A][0]	[4][1]	

Note.
indicates a blank.

(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].

(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.

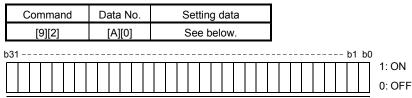
0	0	0	4

Selection of test operation mode

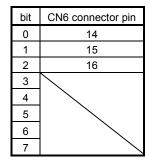
4: DO forced output (output signal forced output)

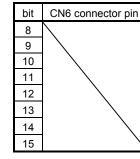
(b) External output signal ON/OFF

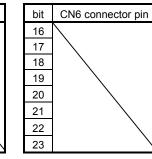
Transmit the following communication commands:

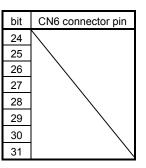


Command of each bit is sent to the slave station in hexadecimal.









(c) Canceling DO forced output

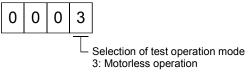
Transmit command [8][B] + data No. [0][0] + data to cancel DO forced output.

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.



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.

15.5.9 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.

0	0	

Alarm No. is transferred in decimal.

For example, "0032" means A32 and "00FF" means A_ (no alarm).

(2) Alarm occurrence time read

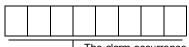
Read the occurrence time of alarm which occurred in the past.

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 decimal. 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

15.5.10 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		
		-	

L Alarm No. is transferred in decimal.

For example, "0032" means A32 and "00FF" means A_ _ (no alarm).

(2) Read of the status display at alarm occurrence

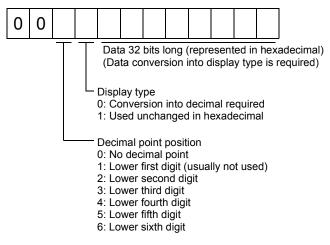
Read the status display data at alarm occurrence. When the data No. corresponding to the status display item is transmitted, the data value and data processing information are sent back.

(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.



(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

15.5.11 Point table

(1) Data read

(a) Position data

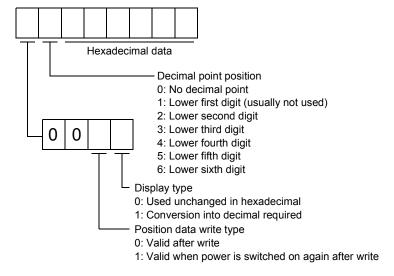
Read the position data of the point table.

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

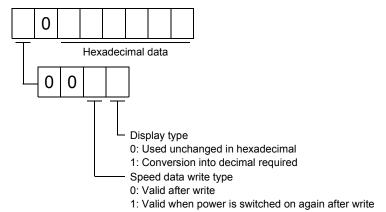
Read the speed data of the point table.

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.



(c) Acceleration time constant

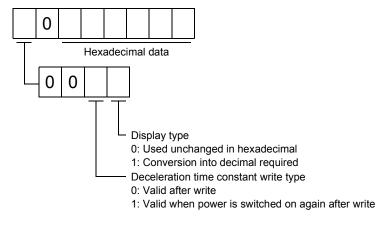
Read the acceleration time constant of the point table.

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

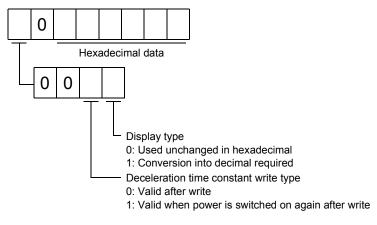
Read the deceleration time constant of the point table.

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.



(e) Dwell

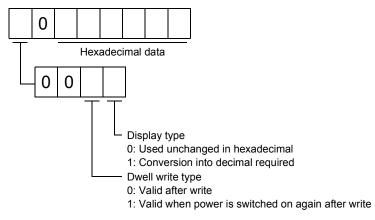
Read the dwell of the point table.

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

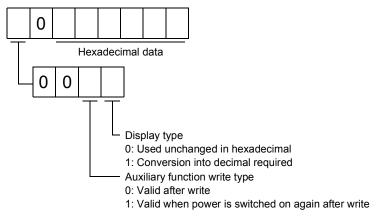
Read the auxiliary function of the point table.

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.



(2) Data write

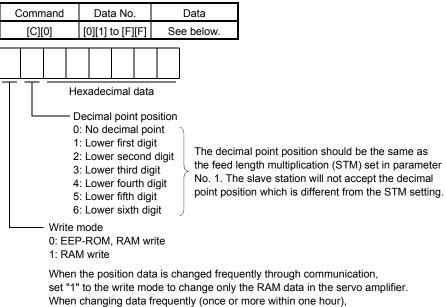
POINT

 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 EEP-ROM. The EEP-ROM 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 EEP-ROM 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.

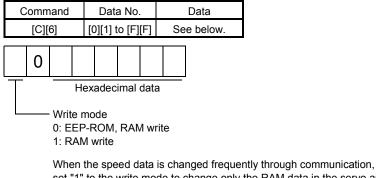


do not write it to the EEP-ROM.

(b) Speed data

Write the speed data of the point table.

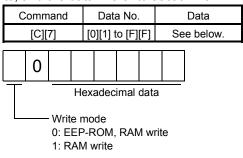
Transmit command [C][6], any of data No. [0][1] to [F][F] corresponding to the point table to be written to, and the data. Refer to section 15.4.2.



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 EEP-ROM. (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.



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 EEP-ROM.

(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.

Co	Command			Data No.				Data		
	[C][8]			[0][1] to [F][F]				See below.		
	0]	
Τ		Hexadecimal data						a		
	Write n 0: EEP					RAN	/l wi	rite		

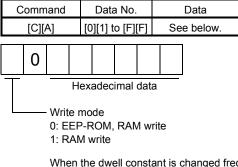
1: RAM write

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 EEP-ROM.

(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.



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 EEP-ROM.

(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.		
0						
U Hexadecimal data Write mode 0: EEP-ROM, 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 EEP-ROM.

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.

С	omm	and		Data No.	Data	
	[9][F]		[0][0]	See below.	
•		•		1		•
0		0				
				 Group design No group a Group a Group b Group c Group d Group e Group f 		
			S re 0	esponse to the Response dis	a can be sent bac read command c able be set back.	ck or not in f the master station.

Data can be set back.

(2) Group setting read

Read the set group designation value from the slave station.

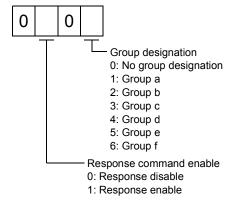
(a) Transmission

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.



15.5.13 Other commands

(1) Servo motor end pulse unit absolute position

Read the absolute position in the servo motor end pulse unit.

Note that overflow will occur in the position of 8192 or more revolutions from the home position.

(a) Transmission

Send command [0][2] and data No. [9][0].

Command	Data No.
[0][2]	[9][0]

(b) Reply

The slave station sends back the requested servo motor end pulses.

Absolute value is sent back in hexadecimal in the servo motor end pulse unit. (Must be converted into decimal)

For example, data "000186A0" is 100000 [pulse] in the motor end pulse unit.

(2) Command unit absolute position

Read the absolute position in the command unit.

(a) Transmission

Send command [0][2] and data No. [9][1].

Command	Data No.
[0][2]	[9][1]

(b) Reply

The slave station sends back the requested command pulses.

Absolute value is sent back in hexadecimal in the command unit. (Must be converted into decimal)

For example, data "000186A0" is 100000 [pulse] in the command unit.

(3) Software version

Reads the software version of the servo amplifier.

(a) Transmission

Send command [0][2] and data No.[7][0].

Command	Data No.
[0][2]	[7][0]

(b) Reply

The slave station returns the software version requested.

|
 |
|------|------|------|------|------|------|------|------|
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-Space

Software version (15 digits)

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.

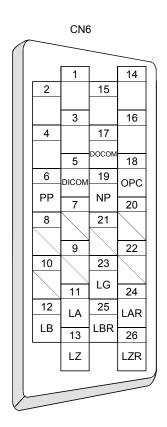
-		
	Bas	ic setting parameters (PA □ □)
No.	Symbol	Name
PA01	*STY	Control mode
PA02	*REG	Regenerative option
PA03	*ABS	Absolute position detection system
PA04	*AOP1	Function selection A-1
PA05	*FTY	Feeding function selection
PA06	*CMX	Electronic gear numerator
PA07	*CDV	Electronic gear denominator
PA08	ATU	Auto tuning
PA09	RSP	Auto tuning response
PA10	INP	In-position range
PA11	TLP	Forward torque limit
PA12	TLN	Reverse torque limit
PA13	/	For manufacturer setting
PA14	*POL	Rotation direction selection
PA15	*ENR	Encoder output pulses
PA16		
to		For manufacturer setting
PA18		
PA19	*BLK	Parameter write inhibit

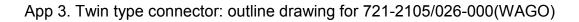
		Gain/filter parameters (PB 🗆 🗆)
No.	Symbol	Name
PB01	FILT	Adaptive tuning mode (Adaptive filter II)
PB02	VRFT	Vibration suppression control filter tuning mode (Advanced vibration suppression control)
PB03	/	For manufacturer setting
PB04	FFC	Feed forward gain
PB05	\backslash	For manufacturer setting
	~~~~	Ratio of load inertia moment to servo motor
PB06	GD2	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		
PB22		For manufacturer setting
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	$\mathbf{i}$	For manufacturer setting
PB45		•

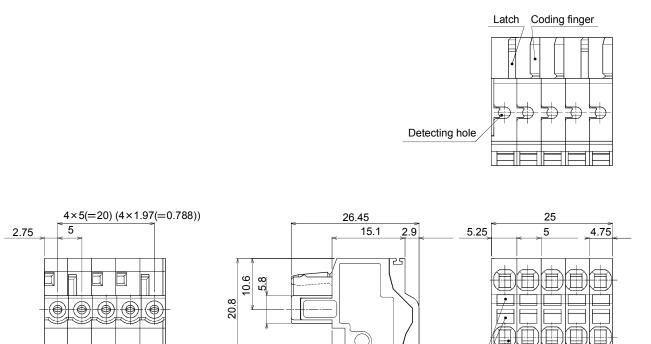
	Evtonsio	n setting parameters (PC [] [])	
No.	Symbol	n setting parameters (PC  ) Name	
-	Symbol		
PC01	+771	For manufacturer setting	
PC02 PC03	*ZTY *ZDIR	Home position return type	
		Home position return direction	
PC04	ZRF	Home position return speed	
PC05	CRF	Creep speed	
PC06	ZST	Home position shift 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	$\sim$	For manufacturer setting	
PC16	MBR	Electromagnetic brake sequence	
PC17	ZSP	Zero speed	
PC18	*BPS	· · · · · · · · · · · · · · · · · · ·	
PC19	*ENRS	Encoder output pulse selection	
PC20	*SNO	Station number setting	
	0110	RS-422 communication function	
PC21	*SOP	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			
to PC29		For manufacturer setting	
PC30	*DSS	Remote register-based position/speed specifying system selection	
PC31	LMPL		
PC32	LMPH	Software limit +	
PC33	LMNL	Cofficient limit	
PC34	LMNH	Software limit —	
PC35	TL2	Internal torque limit 2	
PC36	$\sim$	For manufacturer setting	
PC37	*LPPL		
PC38	*LPPH	Position range output address +	
PC39	*LNPL		
PC40	*LNPH	Position range output address —	
PC41			
to	$\mathbf{i}$	For manufacturer setting	
PC50	$\sim$		
1 000			

	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-pin 14)			
PD10	*DO2	Input signal device selection 2 (CN6-pin 15)			
PD11	*DO3	Input signal device selection 3 (CN6-pin 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 manufacturar actting			
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	$\overline{\}$				
to		For manufacturer setting			
PD30					
	```				

App 2. Signal layout recording paper







2.7

Driver slot

Wire inserting hole

# App 4. Combination of servo amplifier and servo motor

The servo amplifier software versions compatible with the servo motors are indicated in the parentheses. The servo amplifiers whose software versions are not indicated can be used regardless of the versions.

Servo motor	Servo amplifier (Software version)
HF-KP053	MR-J3-10T
TH -RF 033	MR-J3-101
HF-KP13	MR-J3-10T
	MR-J3-10T1
HF-KP23	MR-J3-20T
111 14 20	MR-J3-20T1
HF-KP43	MR-J3-40T
	MR-J3-40T1
HF-KP73	MR-J3-70T
HF-SP52	MR-J3-60T
HF-SP102	MR-J3-100T
HF-SP152	MR-J3-200T
HF-SP202	MR-J3-200T
HF-SP352	MR-J3-350T
HF-SP502	MR-J3-500T
HF-SP702	MR-J3-700T
HF-SP51	MR-J3-60T
HF-SP81	MR-J3-100T
HF-SP121	MR-J3-200T
HF-SP201	MR-J3-200T
HF-MP053	MR-J3-10T
	MR-J3-10T1
HF-MP13	MR-J3-10T
	MR-J3-10T1
HF-MP23	MR-J3-20T
	MR-J3-20T1
HF-MP43	MR-J3-40T
	MR-J3-40T1
HF-MP73	MR-J3-70T
HA-LP801	MR-J3-11KT
HA-LP12K1	MR-J3-11KT
HA-LP11K1M	MR-J3-11KT
HA-LP11K2	MR-J3-11KT
HA-LP15K1	MR-J3-15KT
HA-LP15K1M	MR-J3-15KT
HA-LP15K2	MR-J3-15KT
HA-LP20K1	MR-J3-22KT
HA-LP25K1	MR-J3-22KT
HA-LP22K1M	MR-J3-22KT
HA-LP22K2	MR-J3-22KT

Servo motor	Servo amplifier (Software version)	
HC-RP103	MR-J3-200T	
HC-RP153	MR-J3-200T	
HC-RP203	MR-J3-350T	
HC-RP353	MR-J3-500T	
HC-RP503	MR-J3-500T	
HC-UP72	MR-J3-70T	
HC-UP152	MR-J3-200T	
HC-UP203	MR-J3-350T	
HC-UP352	MR-J3-500T	
HC-UP502	MR-J3-500T	
HC-LP52	MR-J3-60T	
HC-LP102	MR-J3-100T	
HC-LP152	MR-J3-200T	
HC-LP202	MR-J3-350T	
HC-LP302	MR-J3-500T	
HF-SP301	MR-J3-350T	
HF-SP421	MR-J3-500T	
HA-LP502	MR-J3-500T	
HA-LP601	MR-J3-700T	
HA-LP701M	MR-J3-700T	
HA-LP702	MR-J3-700T	

# 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
Jul., 2006	SП(INA)030050-В	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 Section 4.8.2(3)(b)	Diagram partly modified
		Section 4.8.2(3)(b) Section 4.10.2(2)	Parameter No.19 in diagram changed 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

MODEL	
MODEL CODE	

# MITSUBISHI ELECTRIC CORPORATION

HEAD OFFICE : TOKYO BLDG MARUNOUCHI TOKYO 100-8310