MITSUBISHI ELECTRIC

General-Purpose AC Servo

MELSERVO-J2-Super Series

CC-Link Compatible

MODEL

MR-J2S-□CP-S084

SERVO AMPLIFIER
INSTRUCTION MANUAL

F

● 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".

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

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

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

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

1. To prevent electric shock, note the following

⚠ WARNING

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

2. To prevent fire, note the following

⚠ CAUTION

- Install the servo amplifier, servo motor and regenerative resistor on incombustible material. Installing them directly or close to combustibles will lead to a fire.
- Always connect a magnetic contactor (MC) between the main circuit power supply and L_1, L_2, and L_3 of the servo amplifier, and configure the wiring to be able to shut down the power supply on the side of the servo amplifier's power supply. If a magnetic contactor (MC) is not connected, continuous flow of a large current may cause a fire when the servo amplifier malfunctions.
- When a regenerative resistor is used, use an alarm signal to switch main power off. Otherwise, a regenerative transistor fault or the like may overheat the regenerative resistor, causing a fire.

3. To prevent injury, note the follow

⚠ CAUTION

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

4. Additional instructions

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

(1) Transportation and installation

⚠ CAUTION

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

<table>
<tr><th colspan="3" rowspan="2">Environment</th><th colspan="3">Conditions</th></tr>
<tr><th>Servo amplifier</th><th colspan="2">Servo motor</th></tr>
<tr><td rowspan="4">Ambient temperature</td><td rowspan="2">In operation</td><td>[℃]</td><td>0 to +55 (non-freezing)</td><td colspan="2">0 to +40 (non-freezing)</td></tr>
<tr><td>[°F]</td><td>32 to 131 (non-freezing)</td><td colspan="2">32 to 104 (non-freezing)</td></tr>
<tr><td rowspan="2">In storage</td><td>[℃]</td><td>−20 to +65 (non-freezing)</td><td colspan="2">−15 to +70 (non-freezing)</td></tr>
<tr><td>[°F]</td><td>−4 to 149 (non-freezing)</td><td colspan="2">5 to 158 (non-freezing)</td></tr>
<tr><td rowspan="2">Ambient humidity</td><td colspan="2">In operation</td><td>90%RH or less (non-condensing)</td><td colspan="2">80%RH or less (non-condensing)</td></tr>
<tr><td colspan="2">In storage</td><td colspan="3">90%RH or less (non-condensing)</td></tr>
<tr><td colspan="3">Ambience</td><td colspan="3">Indoors (no direct sunlight) Free from corrosive gas, flammable gas, oil mist, dust and dirt</td></tr>
<tr><td colspan="3">Altitude</td><td colspan="3">Max. 1000m (3280 ft) above sea level</td></tr>
<tr><td rowspan="8">(Note) Vibration</td><td colspan="2" rowspan="4">[m/s²]</td><td rowspan="4">5.9 or less</td><td>HC-KFS Series
HC-MFS Series
HC-UFS13 to 73</td><td>X・Y : 49</td></tr>
<tr><td>HC-SFS81
HC-SFS52 to 152
HC-SFS53 to 153
HC-RFS Series
HC-UFS 72・152</td><td>X・Y : 24.5</td></tr>
<tr><td>HC-SFS121・201
HC-SFS202・352
HC-SFS203・353
HC-UFS202</td><td>X : 24.5
Y : 49</td></tr>
<tr><td>HC-SFS301</td><td>X : 24.5
Y : 29.4</td></tr>
<tr><td colspan="2" rowspan="4">[ft/s²]</td><td rowspan="4">19.4 or less</td><td>HC-KFS Series
HC-MFS Series
HC-UFS 13 to 73</td><td>X・Y : 161</td></tr>
<tr><td>HC-SFS81
HC-SFS52 to 152
HC-SFS53 to 153
HC-RFS Series
HC-UFS 72・152</td><td>X・Y : 80</td></tr>
<tr><td>HC-SFS121・201
HC-SFS202・352
HC-SFS203・353
HC-UFS202</td><td>X : 80
Y : 161</td></tr>
<tr><td>HC-SFS301</td><td>X : 80
Y : 96</td></tr>
</table>

Note. Except the servo motor with reduction gear.

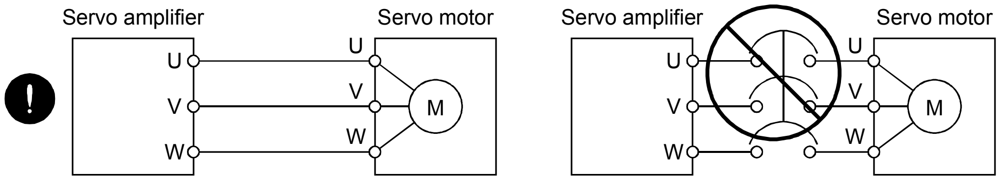
⚠ CAUTION

- Provide adequate protection to prevent screws and other conductive matter, oil and other combustible matter from entering the servo amplifier and servo motor.
- Do not drop or strike servo amplifier or servo motor. Isolate from all impact loads.
- Securely attach the servo motor to the machine. If attach insecurely, the servo motor may come off during operation.
- 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.

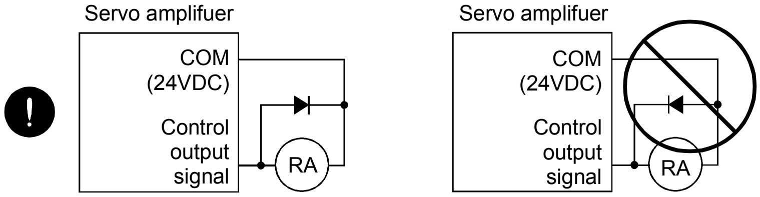
(2) Wiring

⚠ CAUTION

- Wire the equipment correctly and securely. Otherwise, the servo motor may misoperate.
- Do not install a power capacitor, surge absorber or radio noise filter (FR-BIF option) between the servo motor and servo amplifier.
- Connect the output terminals (U, V, W) correctly. Otherwise, the servo motor will operate improperly.
- Connect the servo motor power terminal (U, V, W) to the servo motor power input terminal (U, V, W) directly. Do not let a magnetic contactor, etc. intervene.



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



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

(3) Test run adjustment

⚠ CAUTION

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

(4) Usage

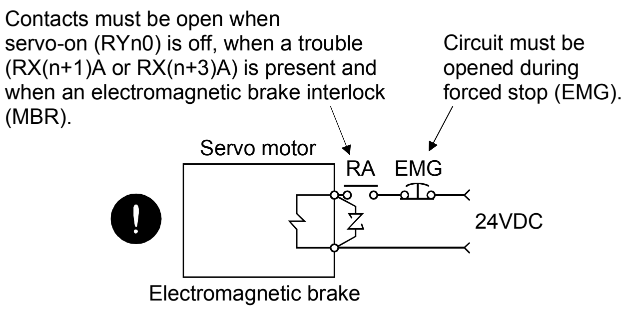
⚠ CAUTION

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

⚠ CAUTION

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



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

(6) Maintenance, inspection and parts replacement

⚠ CAUTION

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

(7) General instruction

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

● About processing of waste ●

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

⚠ FOR MAXIMUM SAFETY

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

⚠ EEP-ROM life

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

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

PRECAUTIONS FOR CHOOSING THE PRODUCTS

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

COMPLIANCE WITH EC DIRECTIVES

1. WHAT ARE EC DIRECTIVES?

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

(1) EMC directive

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

(2) Low voltage directive

The low voltage directive applies also to servo units alone. Hence, they are designed to comply with the low voltage directive.
This servo is certified by TUV, third-party assessment organization, to comply with the low voltage directive.

(3) Machine directive

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

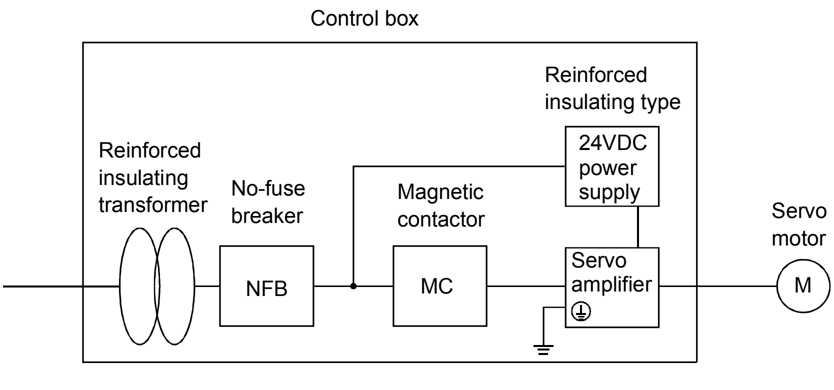
2. PRECAUTIONS FOR COMPLIANCE

(1) Servo amplifiers and servo motors used

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

Servo amplifier series :MR-J2S-10CP-S084 to MR-J2S-700CP-S084
MR-J2S-10CP1-S084 to MR-J2S-40CP1-S084
Servo motor series :HC-KFS□
HC-MFS□
HC-SFS□
HC-RFS□
HC-UFS□
HA-LFS□
HC-LFS□

(2) Configuration



(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) Operate the servo amplifier to meet the requirements of the overvoltage category II set forth in IEC60664-1. For this purpose, a reinforced insulating transformer conforming to the IEC or EN Standard should be used in the power input section.

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

(5) Grounding

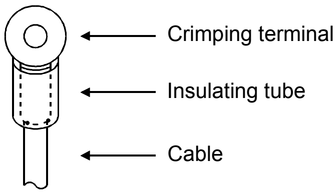
(a) To prevent an electric shock, always connect the protective earth (PE) terminals (marked ⏚) of the servo amplifier to the protective earth (PE) of the control box.

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

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

(6) Wiring

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



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

(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 15.2.2.

(b) The sizes of the cables described in section 15.2.1 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 series :MR-J2S-10CP-S084 to MR-J2S-700CP-S084
MR-J2S-10CP1-S084 to MR-J2S-40CP1-S084

Servo motor series :HC-KFS□
HC-MFS□
HC-SFS□
HC-RFS□
HC-UFS□
HA-LFS□
HC-LFS□

(2) Installation

Install a cooling fan of 100CFM (2.8m^3/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-J2S-10CP(1)-S084 ・ 20CP(1)-S084	1
MR-J2S-40CP(1)-S084 ・ 60CP-S084	2
MR-J2S-70CP-S084 to 350CP-S084	3
MR-J2S-500CP-S084 ・ 700CP-S084	5

(5) Options and auxiliary equipment

Use UL/C-UL standard-compliant products.

(6) Attachment of a servo motor

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

(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 MR-J2S-CP-S084 for the first time. Always purchase them and use the MR-J2S-CP-S084 safely.

Relevant manuals

Manual name	Manual No.
MELSERVO-J2-Super Series To Use the AC Servo Safely	IB(NA)0300010
MELSERVO Servo Motor Instruction Manual	SH(NA)3181
EMC Installation Guidelines	IB(NA)67310

MEMO

CONTENTS

1. FUNCTIONS AND CONFIGURATION

1.1 Introduction

When used with the MR-J2S-T01 CC-Link option unit, the MR-J2S-□CP-S084 CC-Link compatible servo amplifier can support the CC-Link communication functions. Up to 42 axes of servo amplifiers can be controlled/monitored from the programmable controller side.
As the servo, it is based on the MR-J2S-CP AC servo amplifier with built-in positioning functions and 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 3 points of point tables as standard, and they can be increased up to 31 points by using the optional MR Configurator (servo configuration software).
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-J2S-CP-S084 is made easier to use and higher in function by using it with the MR Configurator (servo configuration software).

1.1.1 Features of CC-Link communication functions

(1) Fast communication

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

(a) The highest communication speed is 10Mbps.

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

(2) Variable communication speed/distance system

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

(3) System fault prevention (station separating function)

Because of connection in the bus system, any remote or local station that has become faulty due to power-off or the like does not affect communications with normal remote and local stations.
In addition, use of the two-piece terminal block allows the unit to be changed during data link.

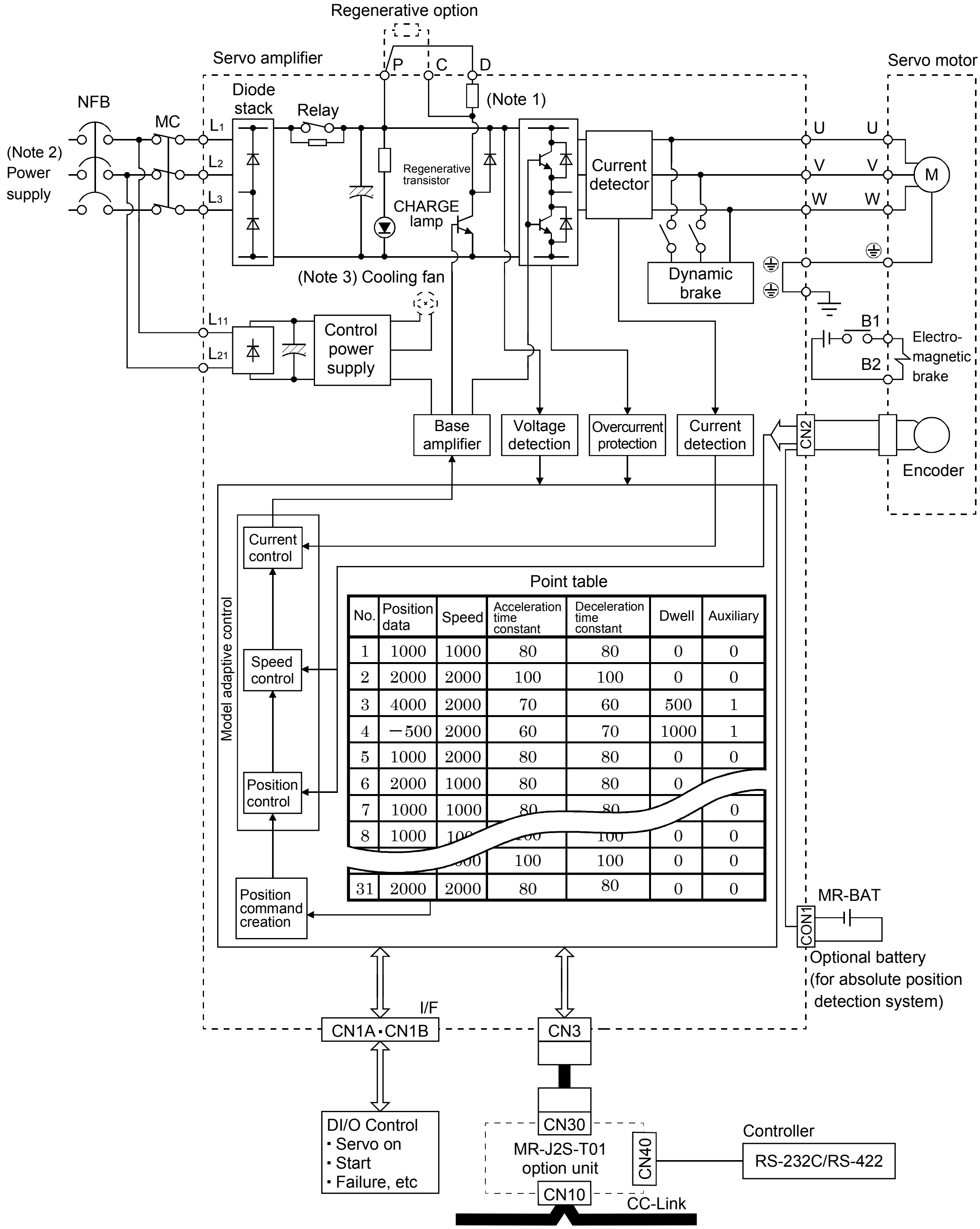
(4) Factory Automation compatible

As the remote device stations of CC-Link, the servo amplifiers share a link system and can be controlled/monitored with programmable controller user programs.
From the programmable controller side, the running speed, acceleration/deceleration time constant and other settings of servo motors can be changed/checked and the servo motors started and stopped.

1.1.2 Function block diagram

The function block diagram of this servo is shown below.

(1) MR-J2S-350CP-S084 or less



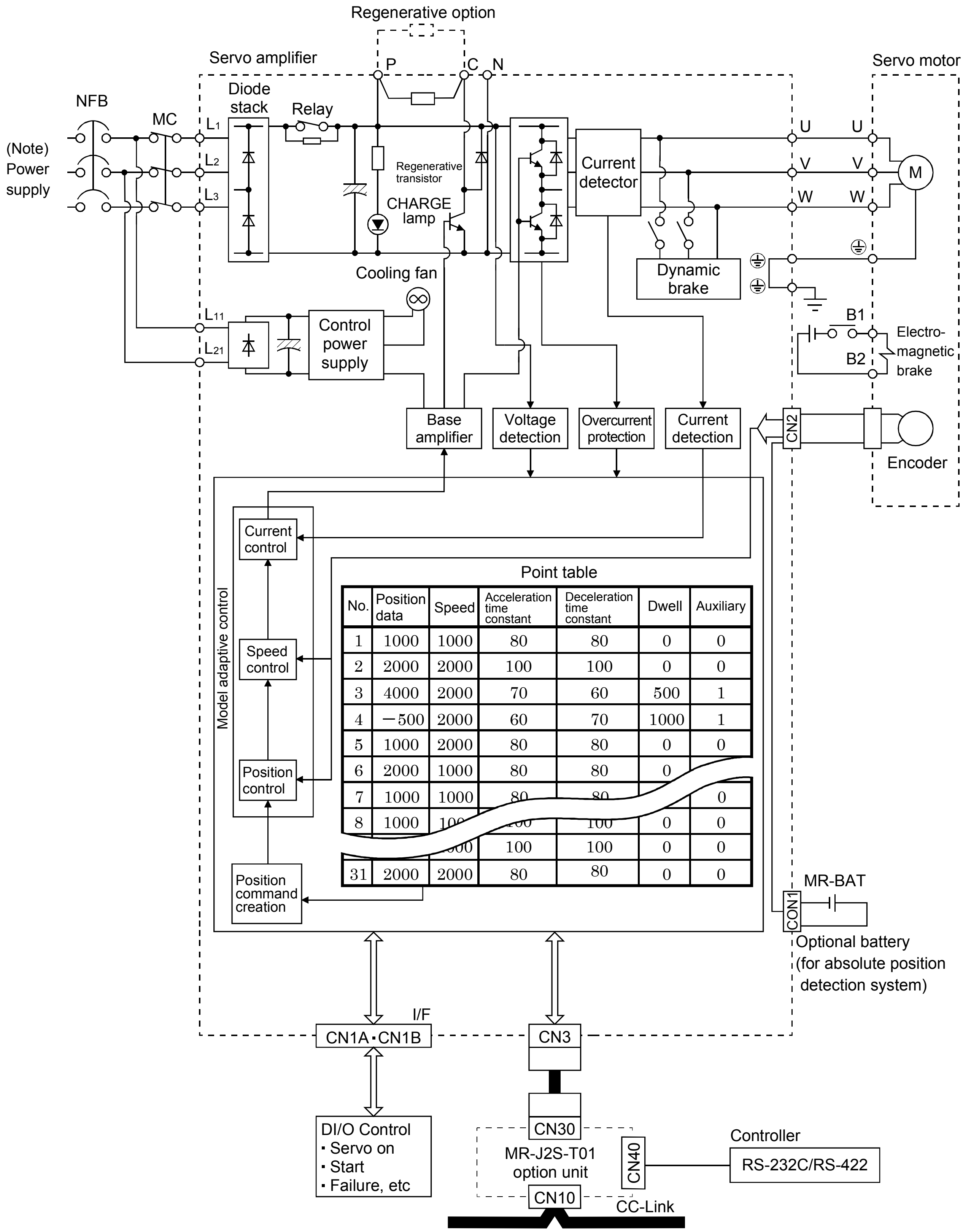
No.	Position data	Speed	Acceleration time constant	Deceleration time constant	Dwell	Auxiliary
1	1000	1000	80	80	0	0
2	2000	2000	100	100	0	0
3	4000	2000	70	60	500	1
4	−500	2000	60	70	1000	1
5	1000	2000	80	80	0	0
6	2000	1000	80	80	0	
7	1000	1000	80	80		0
8	1000	10	100	100	0	0
		00	100	100	0	0
31	2000	2000	80	80	0	0

Note 1. The built-in regenerative resistor is not provided for the MR-J2S-10CP (1)-S084.

2. For 1-phase 230VAC, connect the power supply to L1, L2 and leave L3 open. Refer to section 1.2 for the power supply specification. L3 is not provided for a 1-phase 100 to120VAC power supply.

3. Servo amplifiers MR-J2S-200CP-S084 have a cooling fan.

(2) MR-J2S-500CP-S084 · 700CP-S084



No.	Position data	Speed	Acceleration time constant	Deceleration time constant	Dwell	Auxiliary
1	1000	1000	80	80	0	0
2	2000	2000	100	100	0	0
3	4000	2000	70	60	500	1
4	−500	2000	60	70	1000	1
5	1000	2000	80	80	0	0
6	2000	1000	80	80	0	[illegible]
7	1000	1000	80	80	[illegible]	0
8	1000	[illegible]	[illegible]	100	0	0
[illegible]	[illegible]	[illegible]	100	100	0	0
31	2000	2000	80	80	0	0

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

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. Further, you can assign external input signals to the pins of the connector CN1A and CN1B by setting parameter No. 116 to 118 and parameter No. 79 to 83.
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 5.2)	

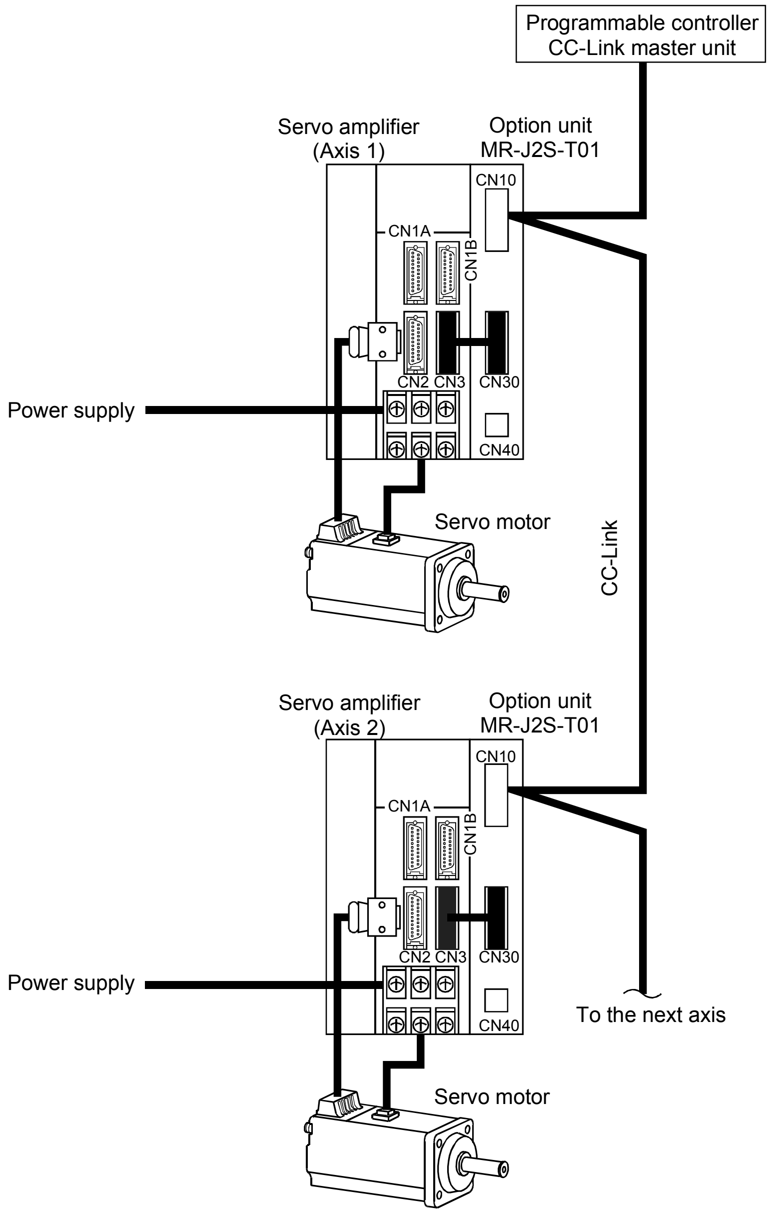
Up to 31 points can be set to the point table.

(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

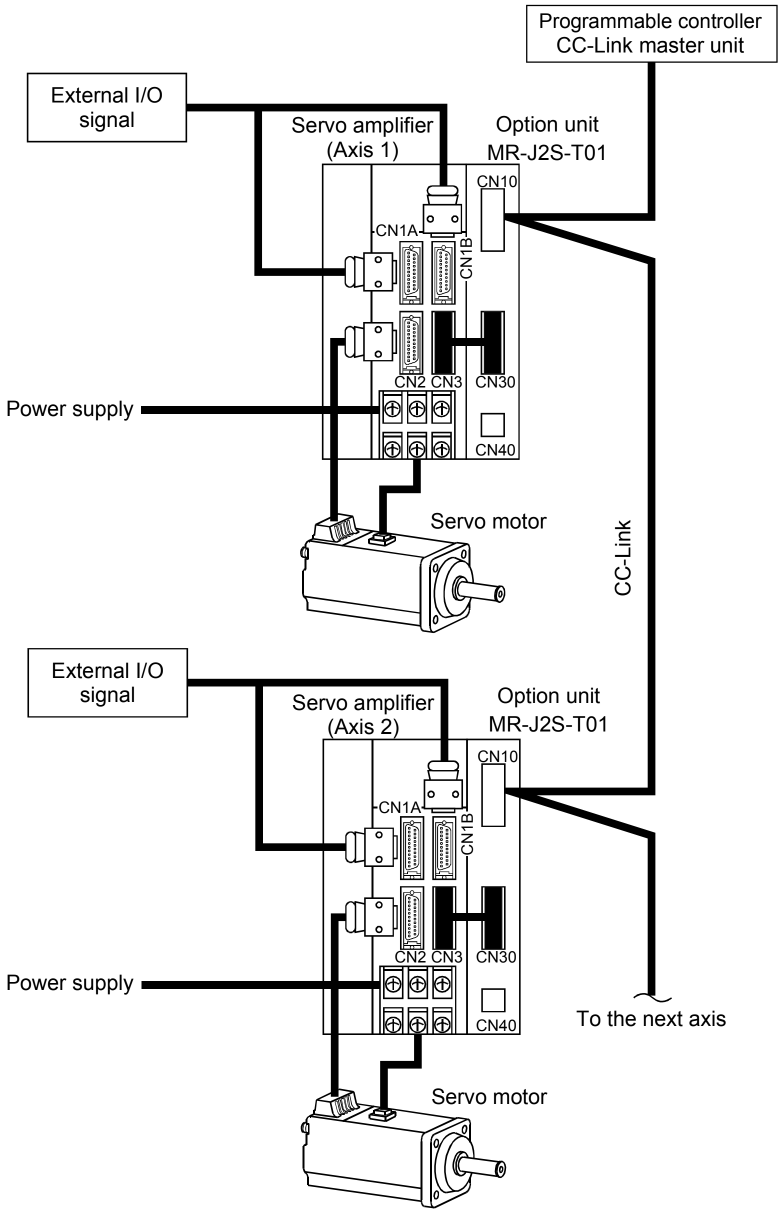


(2) Operation using CC-Link communication functions and external input signals

(a) Operation

Using parameter No. 116 to 118 and parameter No. 79 to 83, 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 CN1A and CN1B connectors and CC-Link communication functions simultaneously.

(b) Configuration



1.2 Servo amplifier standard specifications

> **POINT**
> - Refer to section 3.1 for the specifications of the CC-Link communication functions.

Item \ Servo amplifier MR-J2S-□-S084			10CP	20CP	40CP	60CP	70CP	100CP	200CP	350CP	500CP	700CP	10CP1	20CP1	40CP1
Power supply	Voltage/frequency		3-phase 200 to 230VAC, 50/60Hz or 1-phase 230VAC, 50/60Hz					3-phase 200 to 230VAC, 50/60Hz					1-phase 100 to 120VAC 50/60Hz		
	Permissible voltage fluctuation		3-phase 200 to 230VAC: 170 to 253VAC 1-phase 230VAC: 207 to 253VAC					3-phase 170 to 253VAC					1-phase 85 to 127VAC		
	Permissible frequency fluctuation		Within ±5%												
	Power supply capacity		Refer to section14.2												
	Inrush current		Refer to section 14.5												
Control system			Sine-wave PWM control, current control system												
Dynamic brake			Built-in												
Protective functions			Overcurrent shut-off, regenerative overvoltage shut-off, overload shut-off (electronic thermal relay), servo motor overheat protection, encoder error protection, regenerative brake error protection, undervoltage, instantaneous power failure protection, overspeed protection, excessive error protection												
Command system	Point table number input	Operational specifications	Positioning by specifying the point table No. (31 points)												
		Position command input	Set in point table. 1-point feed length setting range: ±1[μm] to ±999.999[mm]												
		Speed command input	Set in point table. Acceleration/deceleration time is set in point table. S-pattern acceleration/deceleration time constant is set in parameter No.14.												
		System	Signed absolute value command system, incremental value command system, signed absolute value command/incremental value command specifying system												
	Position command data input (when 2 stations are occupied)	Operational specifications	Remote register setting is used for positioning.												
		Position command input	・Remote register is used to set position command data. ・Feed length input setting range: ±1μm to ±999.999m												
		Speed command input	・Remote register is used to make selection from point table. ・Remote register is used to set speed command data (speed). S-pattern acceleration/deceleration time constant is set in parameter No.14.												
		System	Signed absolute value command system, incremental value command system, signed absolute value command/incremental value command specifying system												
Operation mode	Automatic operation mode	Point table	Point table number input, position data input system Positioning operation is performed once in accordance with the position and speed commands.												
		Automatic continuous operation	Varied speed operation (2 to 31 speeds), automatic continuous positioning operation (2 to 31 points)												
	Manual operation mode	Jog	Jog operation is performed in accordance with the parameter-set speed command by contact input or through CC-Link communication function.												

Item			Servo amplifier MR-J2S-□-S084	10CP	20CP	40CP	60CP	70CP	100CP	200CP	350CP	500CP	700CP	10CP1	20CP1	40CP1
Operation mode	Manual home position return mode	Dog type		Home position return is made starting with Z-phase pulse after passage of proximity dog. Home position address may be set. Home position shift distance may be set. Home position return direction may be selected. Automatic at-dog home position return return/automatic stroke return function												
		Count type		Home position return is made by counting encoder pulses after contact with proximity dog. Home position address may be set. Home position shift value may be set. Home position return direction may be set. Automatic at-dog home position return return/automatic stroke return function												
		Data setting type		Home position return is made without dog. Home position may be set at any position by manual operation, etc. Home position address may be set.												
		Stopper type		Home position return is made by pressing machine part against stroke end. Home position address may be set. Home position return direction may be set.												
		Home position ignorance (Servo-on position as home position)		Position where servo-on (RYn0) is switched on is defined as home position. Home position address may be set.												
		Dog type rear end reference		Home position return is made with respect to the rear end of a proximity dog. Home position address may be set. Home position shift value may be set. Home position return direction may be set. Automatic at-dog home position return return/automatic stroke return function												
		Count type front end reference		Home position return is made with respect to the front end of a proximity dog. Home position address may be set. Home position shift value may be set. Home position return direction may be set. Automatic at-dog home position return return/automatic stroke return function												
		Dog cradle type		Home position return is made with respect to the front end of a proximity dog by the first Z-phase pulse. Home position address may be set. Home position shift value may be set. Home position return direction may be set. Automatic at-dog home position return return/automatic stroke return function												
	Automatic positioning to home position			High-speed automatic return to a defined home position.												
Other functions				Absolute position detection, backlash function Overtravel prevention using external limit switch Software stroke limit												
Structure				Self-cooled, open (IP00)					Force-cooling, open (IP00)					Self-cooled, open (IP00)		
Environment	Ambient temperature	In operation	[°C]	0 to +55 (non-freezing)												
			[°F]	32 to +131 (non-freezing)												
		In storage	[°C]	−20 to +65 (non-freezing)												
			[°F]	−4 to +149 (non-freezing)												
	Ambient humidity	In operation		90%RH or less (non-condensing)												
		In storage														
	Ambient			Indoors (no direct sunlight) Free from corrosive gas, flammable gas, oil mist, dust and dirt												
	Altitude			Max. 1000m (3280ft) above sea level												
	Vibration			5.9 [m/s²] or less												
				19.4 [ft/s²] or less												
Mass			[kg]	0.7	0.7	1.1	1.1	1.7	1.7	2.0	2.0	4.9	7.2	0.7	0.7	1.1
			[lb]	1.5	1.5	2.4	2.4	3.75	3.75	4.4	4.4	10.8	15.87	1.5	1.5	2.4

1.3 Function list

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

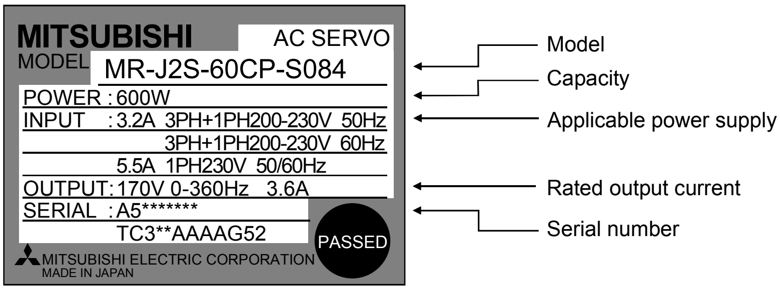
Function	Description	Reference
Positioning by automatic operation	Select the required ones from among 31 preset point tables and perform operation in accordance with the set values. Use the external input signal or communication function to choose the point tables.	Section 5.2
Varied speed operation	Servo motor speed can be varied continuously until the preset moving distance is reached. (Max. set speeds: 31 speeds)	Section 5.2.2 (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 5.2.2 (4)
Manual 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 5.4
High-resolution encoder	High-resolution encoder of 131072 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 5.5
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 10.5
Adaptive vibration suppression control	Servo amplifier detects mechanical resonance and sets filter characteristics automatically to suppress mechanical vibration.	Section 10.3
Low-pass filter	Suppresses high-frequency resonance which occurs as servo system response is increased.	Section 10.4
Machine analyzer function	Analyzes the frequency characteristic of the mechanical system by simply connecting a MR Configurator (servo configuration software)-installed personal computer and servo amplifier.	
Machine simulation	Can simulate machine motions on a personal computer screen on the basis of the machine analyzer results.	
Gain search function	Personal computer changes gains automatically and searches for overshoot-free gains in a short time.	
Slight vibration suppression control	Vibration of ±1 pulse at servo motor stop is suppressed.	Parameter No. 20
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.	Section 6.2.1
Auto tuning	Automatically adjusts the gain to optimum value if load applied to the servo motor shaft varies. Higher in performance than MR-J2 series servo amplifier.	Section 9.2
S-pattern acceleration/deceleration time constant	Acceleration/deceleration can be made smoothly.	Section 6.2.3
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 15.1.1
Brake unit	Used when the regenerative option cannot provide enough regenerative power. Can be used with the servo amplifier of 5kW or more.	Section 15.1.2
Regeneration converter	Used when the regenerative option cannot provide enough regenerative power. Can be used with the servo amplifier of 5kW or more.	Section 15.1.3

Function	Description	Reference
Alarm history	By using the MR Configurator (Servo configuration Software), the current alarm and five past alarm numbers are stored and displayed.	Section 7.8
I/O signal selection (Device setting)	By changing the parameter setting or using the MR Configurator (Servo Configuration Software), any devices can be assigned to 9 input, 5 output and 1 I/O pins.	Parameter No.78 to 83 Parameter No.88 to 90 Parameter No.116 to 118 Section 7.6
Torque limit	Servo motor-torque is limited. Parameter × 2 limit value	Section 4.4.3
Status display	The servo status is displayed.	Section 8.2
Test operation mode	Jog operation, positioning operation, motor-less operation, DO forced output, 1-step feed	Section 7.7
Limit switch	The servo motor travel region can be limited using the forward rotation stroke end (LSP)/reverse rotation stroke end (LSN).	Section 6.2.4
Software limit	The travel region is limited using parameters in terms of address. The function similar to that of a limit switch is limited by parameter.	Section 6.2.7

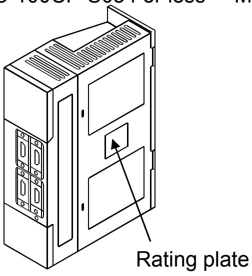
1.4 Model code definition

(1) Rating plate

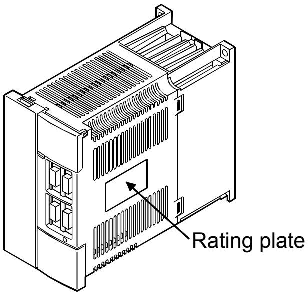
(a) Servo amplifier



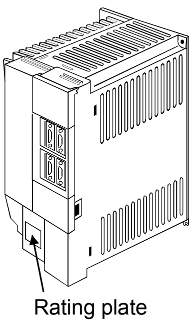
MR-J2S-100CP-S084 or less



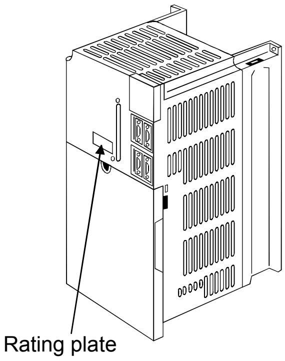
MR-J2S-200CP-S084・350CP-S084



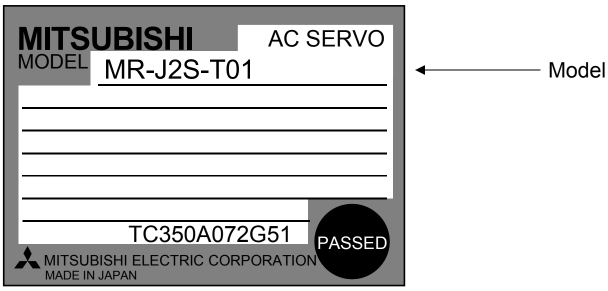
MR-J2S-500CP-S084



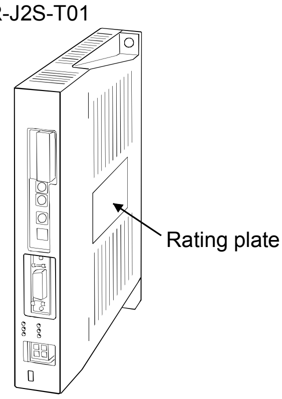
MR-J2S-700CP-S084



(b) CC-Link option unit



MR-J2S-T01



(2) Model of servo amplifier

MR–J2S– □ CP □ –S084

- MR–J2S: Series
- □ (after CP): Power Supply

Symbol	Power supply
None	3-phase 200 to 230VAC (Note1) 1-phase 230VAC
(Note2) 1	1-phase 100V to 120VAC

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

- CP: Built-in positioning functions
- □ (after MR–J2S–): Rated output

Symbol	Rated output [W]	Symbol	Rated output [W]
10	100	100	1000
20	200	200	2000
40	400	350	3500
60	600	500	5000
70	750	700	7000

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 and the models with reduction gears.

Servo amplifier	Servo motors							
	HC-KFS□	HC-MFS□	HC-SFS□			HC-RFS□	HC-UFS□	
			1000r/min	2000r/min	3000r/min		2000r/min	3000r/min
MR-J2S-10CP(1)-S084	053・13	053・13						13
MR-J2S-20CP(1)-S084	23	23						23
MR-J2S-40CP(1)-S084	43	43						43
MR-J2S-60CP-S084				52	53			
MR-J2S-70CP-S084	73	73					72	73
MR-J2S-100CP-S084			81	102	103			
MR-J2S-200CP-S084			121・201	152・202	153・203	103・153	152	
MR-J2S-350CP-S084			301	352	353	203	202	
MR-J2S-500CP-S084				502		353・503	352・502	
MR-J2S-700CP-S084				702				

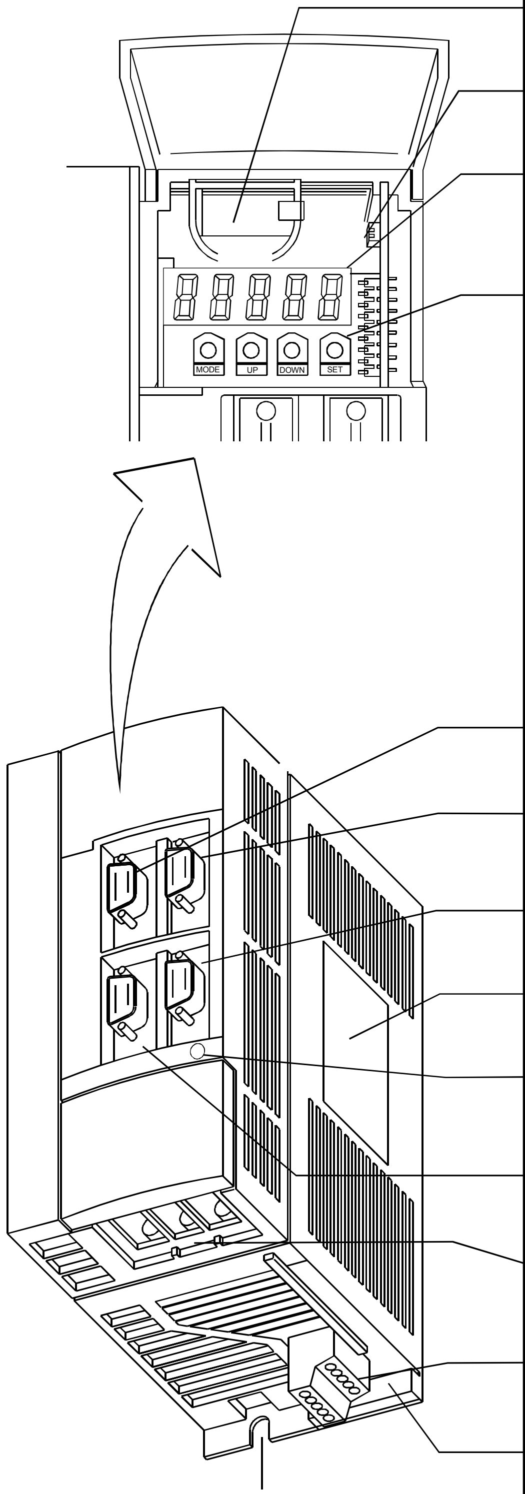
Servo amplifier	Servo motors			
	HA-LFS□			HC-LFS□
	1000r/min	1500r/min	2000r/min	
MR-J2S-60CP-S084				52
MR-J2S-100CP-S084				102
MR-J2S-200CP-S084				152
MR-J2S-350CP-S084				202
MR-J2S-500CP-S084			502	302
MR-J2S-700CP-S084	601 (Note)	701M (Note)	702	

Note. Consult us since the servo amplifier to be used with any of these servo motors is optional.

1.6 Structure

1.6.1 Part names of servo amplifier

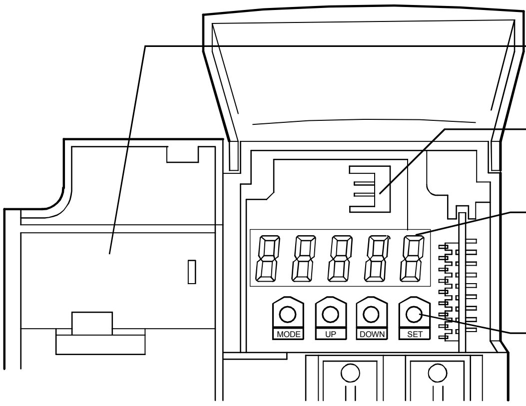
(1) MR-J2S-100CP-S084 or less

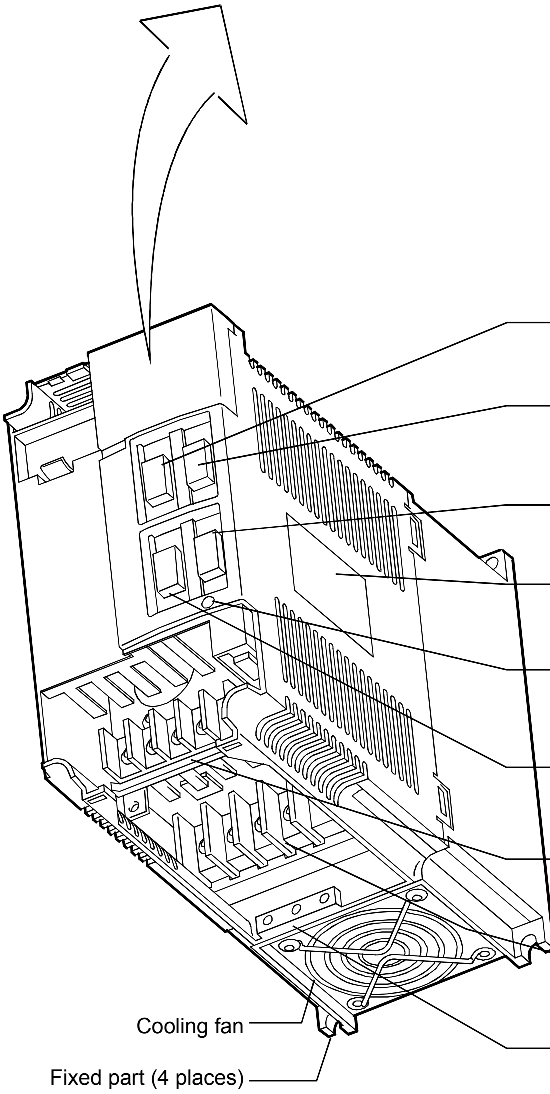


Name/Application	Reference
Battery holder Contains the battery for absolute position data backup.	Section5.5
Battery connector (CON1) Used to connect the battery for absolute position data backup.	Section5.5
Display The 5-digit, seven-segment LED shows the servo status and alarm number.	Chapter8
Operation section Used to perform status display, diagnostic, alarm, parameter and point table setting operations. MODE UP DOWN SET SET: Used to set data. UP, DOWN: Used to change the display or data in each mode. MODE: Used to change the mode.	Chapter8
I/O signal connector (CN1A) Used to connect digital I/O signals.	Section4.3
I/O signal connector (CN1B) Used to connect digital I/O signals.	Section4.3
MR-J2S-T01 connector (CN3) Connector for connection of the MR-J2S-T01 CC-Link option unit.	Chapter7 Section15.1.4
Rating plate	Section1.4
Charge lamp Lit to indicate that the main circuit is charged. While this lamp is lit, do not reconnect the cables.	
Encoder connector (CN2) Used to connect the servo motor encoder.	Section4.3 Section15.1.4
Main circuit terminal block (TE1) Used to connect the input power supply and servo motor.	Section4.7.2 Section13.1
Control circuit terminal block (TE2) Used to connect the control circuit power supply and regenerative option.	Section4.7.2 Section13.1 Section15.1.1
Protective earth (PE) terminal (⏚) Ground terminal.	Section4.10 Section13.1

(2) MR-J2S-200CP-S084 · MR-J2S-350CP-S084

POINT
· This servo amplifier is shown without the front cover. For removal of the front cover, refer to section 1.6.3.

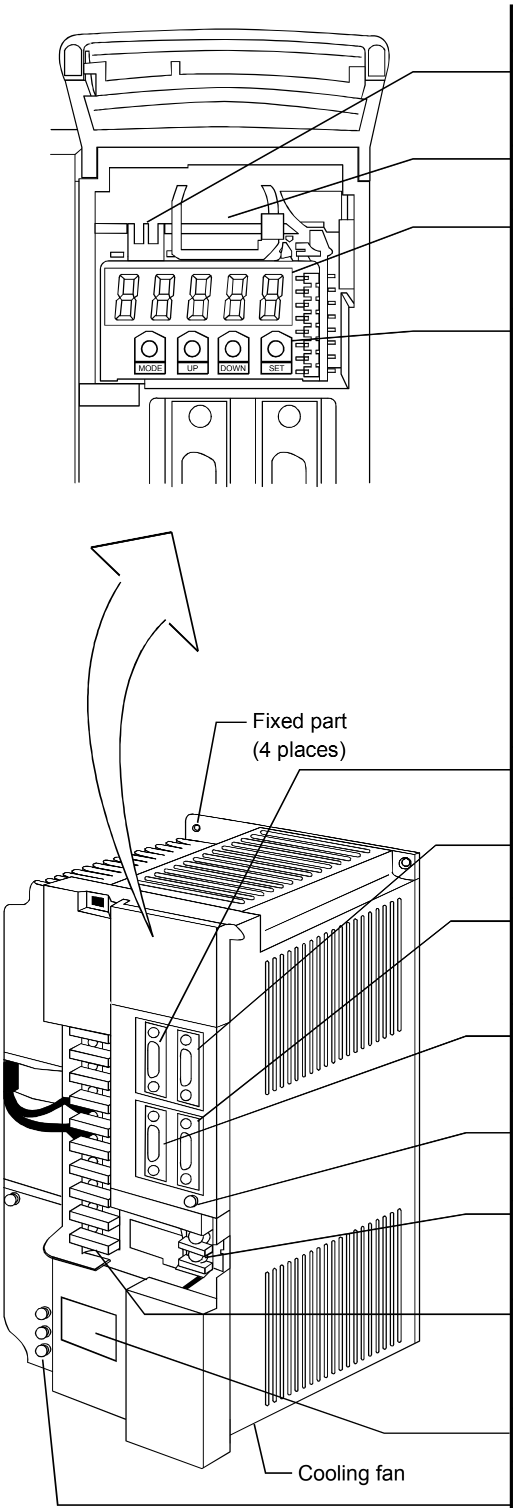




Name/Application	Reference
Battery holder Contains the battery for absolute position data backup.	Section5.5
Battery connector (CON1) Used to connect the battery for absolute position data backup.	Section5.5
Display The 5-digit, seven-segment LED shows the servo status and alarm number.	Chapter8
Operation section Used to perform status display, diagnostic, alarm, parameter and point table setting operations. MODE UP DOWN SET SET: Used to set data. UP, DOWN: Used to change the display or data in each mode. MODE: Used to change the mode.	Chapter8
I/O signal connector (CN1A) Used to connect digital I/O signals.	Section4.3
I/O signal connector (CN1B) Used to connect digital I/O signals.	Section4.3
MR-J2S-T01 connector (CN3) Connector for connection of the MR-J2S-T01 CC-Link option unit.	Chapter7 Section15.1.4
Rating plate	Section1.4
Charge lamp Lit to indicate that the main circuit is charged. While this lamp is lit, do not reconnect the cables.	
Encoder connector (CN2) Used to connect the servo motor encoder.	Section4.3 Section15.1.4
Main circuit terminal block (TE1) Used to connect the input power supply and servo motor.	Section4.7.2 Section13.1
Control circuit terminal block (TE2) Used to connect the control circuit power supply and regenerative option.	Section4.7.2 Section13.1 Section15.1.1
Protective earth (PE) terminal (⏚) Ground terminal.	Section4.10 Section13.1

(3) MR-J2S-500CP-S084

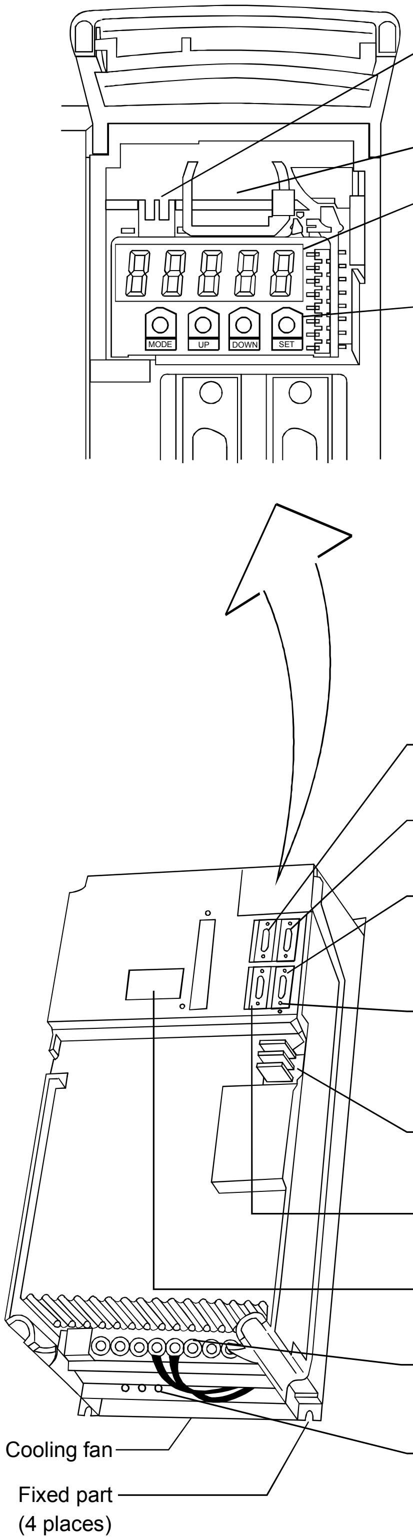
POINT
・The servo amplifier is shown without the front cover. For removal of the front cover, refer to section 1.6.3.



Name/Application	Reference
Battery connector (CON1) Used to connect the battery for absolute position data backup.	Section5.5
Battery holder Contains the battery for absolute position data backup.	Section5.5
Display The 5-digit, seven-segment LED shows the servo status and alarm number.	Chapter8
Operation section Used to perform status display, diagnostic, alarm, parameter and point table setting operations. MODE UP DOWN SET SET: Used to set data. UP, DOWN: Used to change the display or data in each mode. MODE: Used to change the mode.	Chapter8
I/O signal connector (CN1A) Used to connect digital I/O signals.	Section4.3
I/O signal connector (CN1B) Used to connect digital I/O signals.	Section4.3
MR-J2S-T01 connector (CN3) Connector for connection of the MR-J2S-T01 CC-Link option unit.	Chapter7 Section15.1.4
Encoder connector (CN2) Used to connect the servo motor encoder.	Section4.3 Section15.1.4
Charge lamp Lit to indicate that the main circuit is charged. While this lamp is lit, do not reconnect the cables.	
Control circuit terminal block (TE2) Used to connect the control circuit power supply and regenerative option.	Section4.7.2 Section13.1
Main circuit terminal block (TE1) Used to connect the input power supply and servo motor.	Section4.7.2 Section13.1 Section15.1.1
Rating plate	Section1.4
Protective earth (PE) terminal (⏚) Ground terminal.	Section4.10 Section13.1

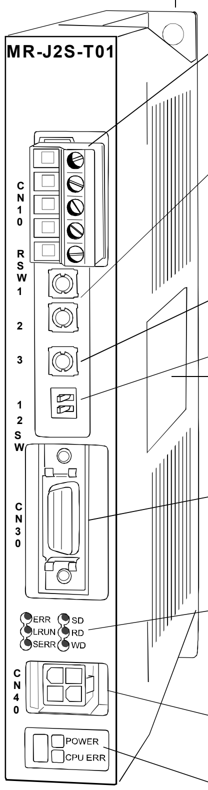
(4) MR-J2S-700CP-S084

> **POINT**
>
> ・The servo amplifier is shown without the front cover. For removal of the front cover, refer to section 1.6.3.



Name/Application	Reference
Battery connector (CON1) Used to connect the battery for absolute position data backup.	Section5.5
Battery holder Contains the battery for absolute position data backup.	Section5.5
Display The 5-digit, seven-segment LED shows the servo status and alarm number.	Chapter8
Operation section Used to perform status display, diagnostic, alarm, parameter and point table setting operations. MODE UP DOWN SET SET: Used to set data. UP, DOWN: Used to change the display or data in each mode. MODE: Used to change the mode.	Chapter8
I/O signal connector (CN1A) Used to connect digital I/O signals.	Section4.3
I/O signal connector (CN1B) Used to connect digital I/O signals.	Section4.3
MR-J2S-T01 connector (CN3) Connector for connection of the MR-J2S-T01 CC-Link option unit.	Chapter7 Section15.1.4
Charge lamp Lit to indicate that the main circuit is charged. While this lamp is lit, do not reconnect the cables.	
Control circuit terminal block (TE2) Used to connect the control circuit power supply.	Section4.7.2 Section13.1
Encoder connector (CN2) Used to connect the servo motor encoder.	Section4.3 Section15.1.4
Rating plate	Section1.4
Main circuit terminal block (TE1) Used to connect the input power supply, regenerative option and servo motor.	Section4.7.2 Section13.1 Section15.1.1
Protective earth (PE) terminal (⏚) Ground terminal.	Section4.10 Section13.1

1.6.2 Part name of CC-Link unit



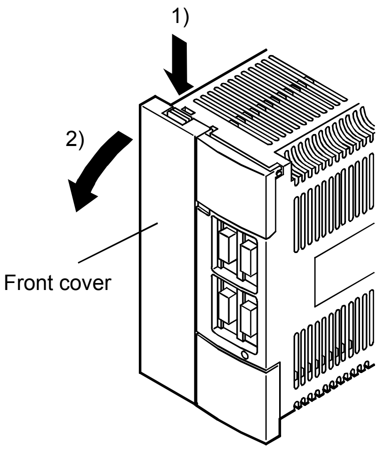
Name/Application	Reference
CC-Link connector (CN10) Wire the CC-Link cable.	Section 3.2.2
Station number switches (RSW1, RSW2) Set the station number of the servo amplifier. RSW1: Set the ten place. RSW2: Set the one place.	Section 3.2.3
Baud rate switch (RSW3) Select the CC-Link communication baud rate.	Section 3.2.4
Occupied station count switch (SW1) Set the number of occupied stations.	Section 3.2.5
Rating plate	Section 1.4
Servo amplifier connector Connect with the CN3 connector of the MR-J2S-CP-S084 servo amplifier.	Section 4.3.1
Communication alarm display section Indicates alarms in CC-Link communication. ●L.ERR ●SD ●L.RUN ●RD ●S.ERR ●WD	Section 12.3
Personal computer connector (CN40) Connect the personal computer.	Chapter 7
Charge lamp Lit when the control circuit is powered on. Green: Normal Orange: Watchdog	

1.6.3 Removal and reinstallation of the front cover

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

(1) For MR-J2S-200CP-S084 or more

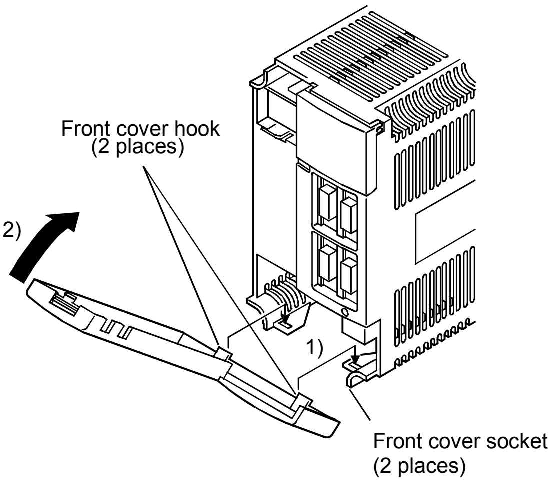
Removal of the front cover



1) Hold down the removing knob.

2) Pull the front cover toward you.

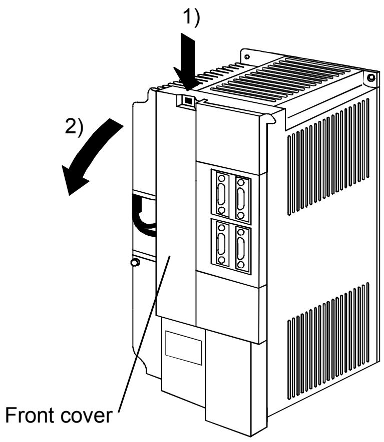
Reinstallation of the front cover



1) Insert the front cover hooks into the front cover sockets of the servo amplifier.
2) Press the front cover against the servo amplifier until the removing knob clicks.

(2) For MR-J2S-500CP-S084

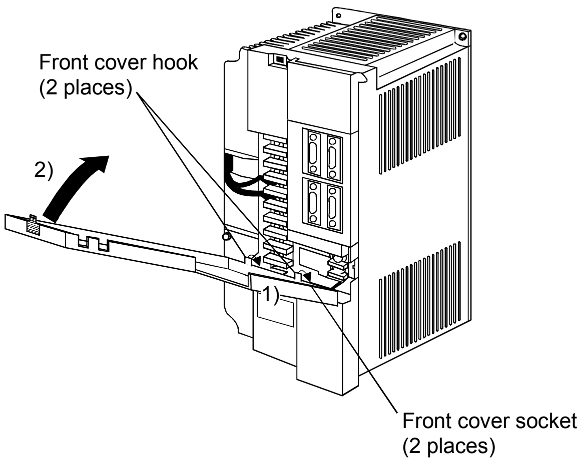
Removal of the front cover



1) Hold down the removing knob.

2) Pull the front cover toward you.

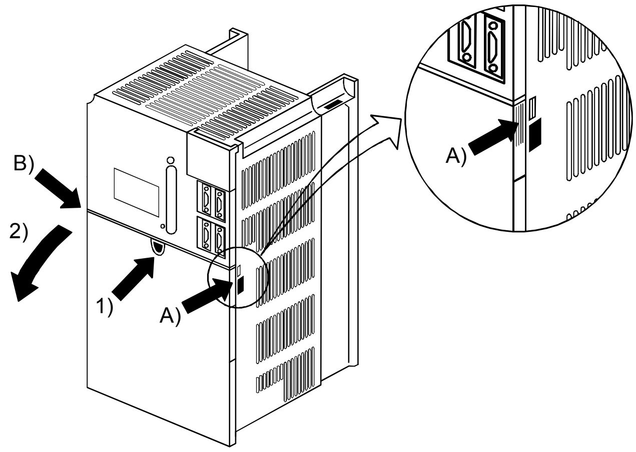
Reinstallation of the front cover



1) Insert the front cover hooks into the front cover sockets of the servo amplifier.
2) Press the front cover against the servo amplifier until the removing knob clicks.

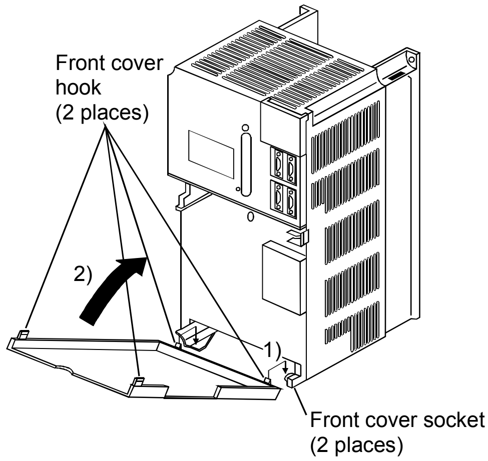
(3) For MR-J2S-700CP-S084

Removal of the front cover



1) Push the removing knob A) or B), and put you finger into the front hole of the front cover.
2) Pull the front cover toward you.

Reinstallation of the front cover



1) Insert the two front cover hooks at the bottom into the sockets of the servo amplifier.
2) Press the front cover against the servo amplifier until the removing knob clicks.

1.7 Servo system with auxiliary equipment

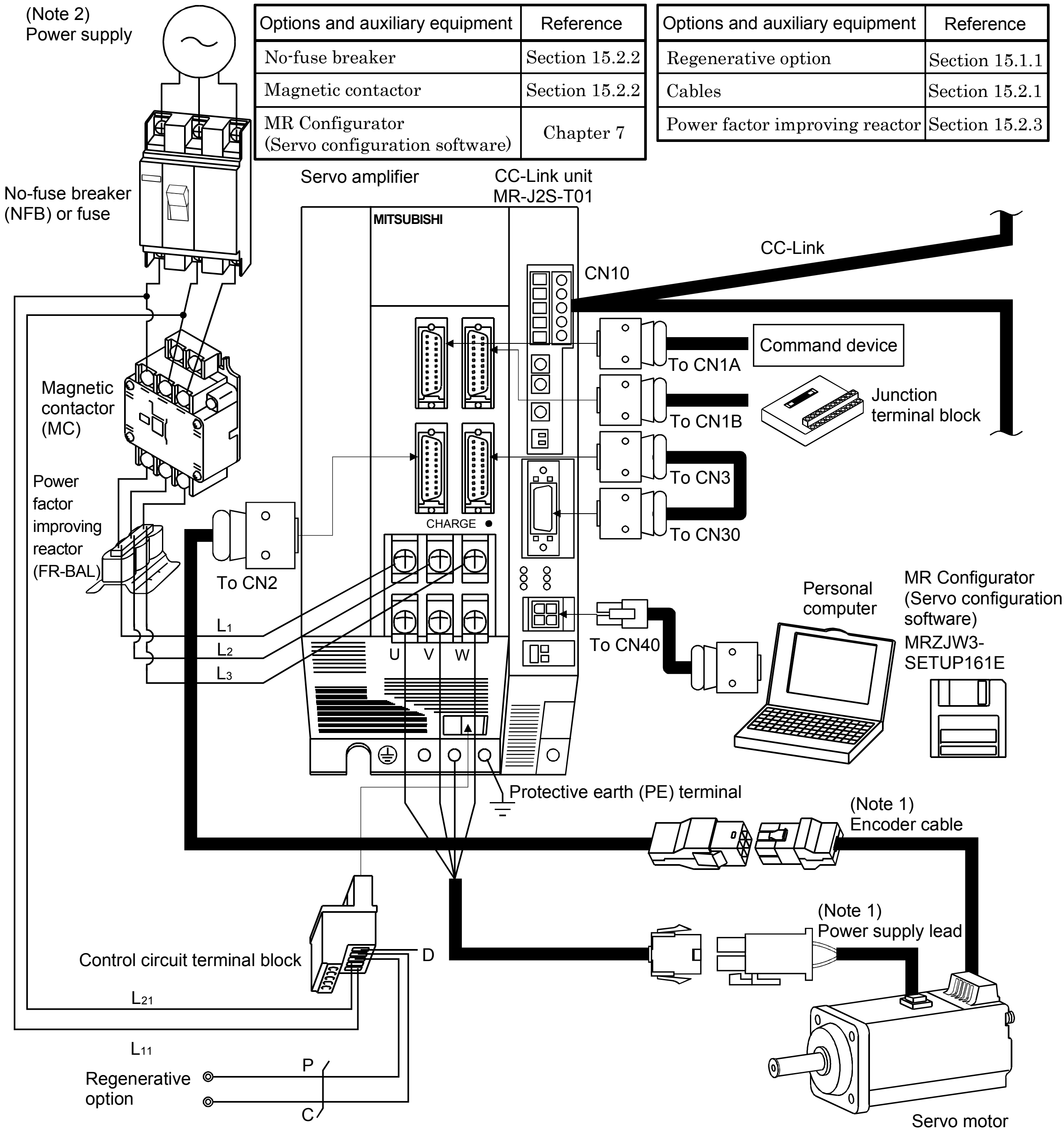
⚠WARNING	・To prevent an electric shock, always connect the protective earth (PE) terminal (terminal marked ⏚) of the servo amplifier to the protective earth (PE) of the control box.

(1) MR-J2S-100CP-S084 or less

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

Options and auxiliary equipment	Reference
No-fuse breaker	Section 15.2.2
Magnetic contactor	Section 15.2.2
MR Configurator (Servo configuration software)	Chapter 7

Options and auxiliary equipment	Reference
Regenerative option	Section 15.1.1
Cables	Section 15.2.1
Power factor improving reactor	Section 15.2.3



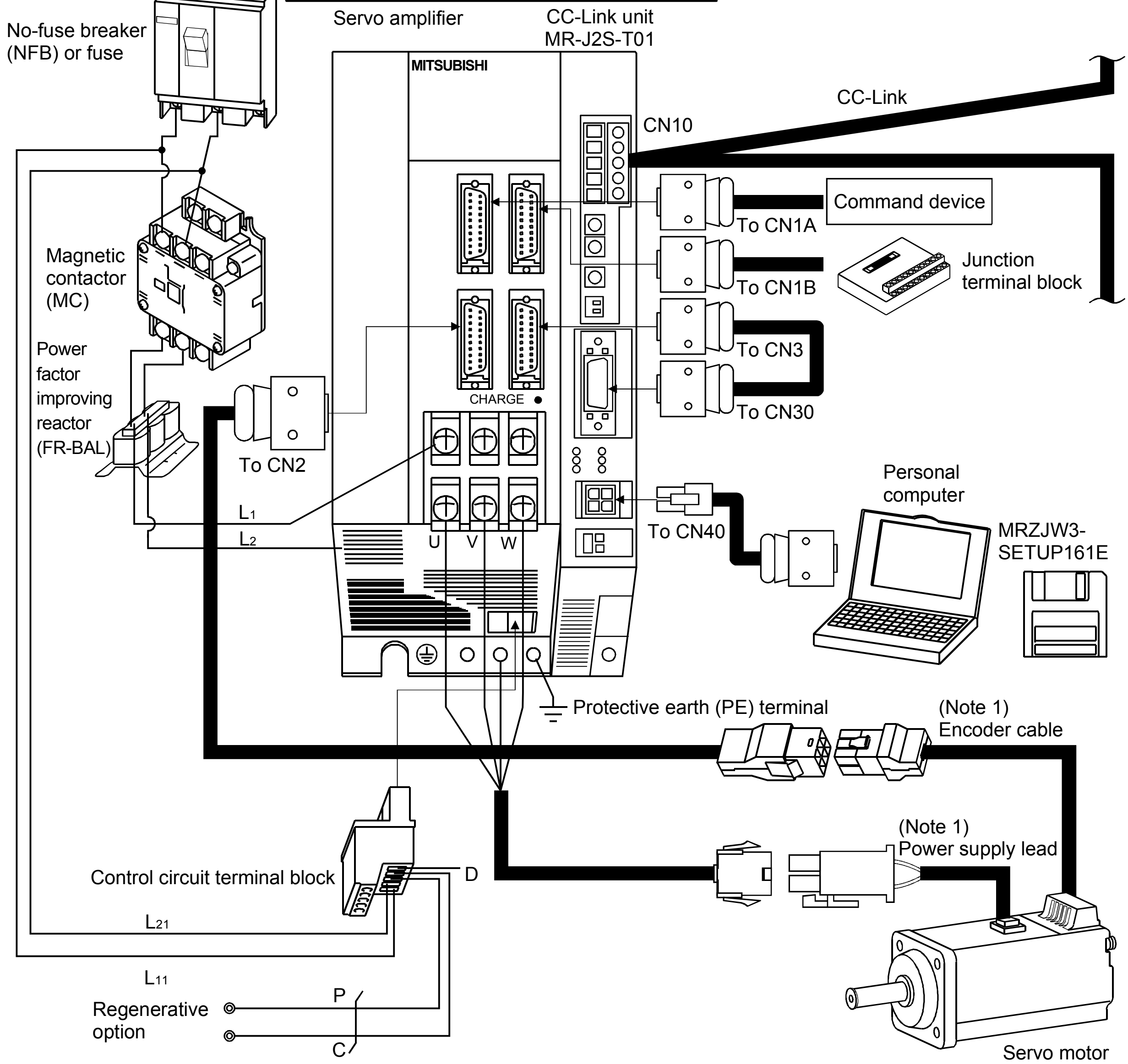
Note 1. The HC-SFS, HC-RFS, HC-UFS 2000r/min series have cannon connectors.

2. A 1-phase 230VAC power supply may be used with the servo amplifier of MR-J2S-70CP-S084 or less. For 1-phase 230 VAC, connect the power supply to L_1 and L_2 terminals and leave L_3 open. Refer to section 1.2 for the power supply specification.

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

Options and auxiliary equipment	Reference
No-fuse breaker	Section 15.2.2
Magnetic contactor	Section 15.2.2
MR Configurator (Servo configuration software)	Chapter 7

Options and auxiliary equipment	Reference
Regenerative option	Section 15.1.1
Cables	Section 15.2.1
Power factor improving reactor	Section 15.2.3



Note 1. The HC-SFS, HC-RFS, HC-UFS 2000r/min series have cannon connectors.

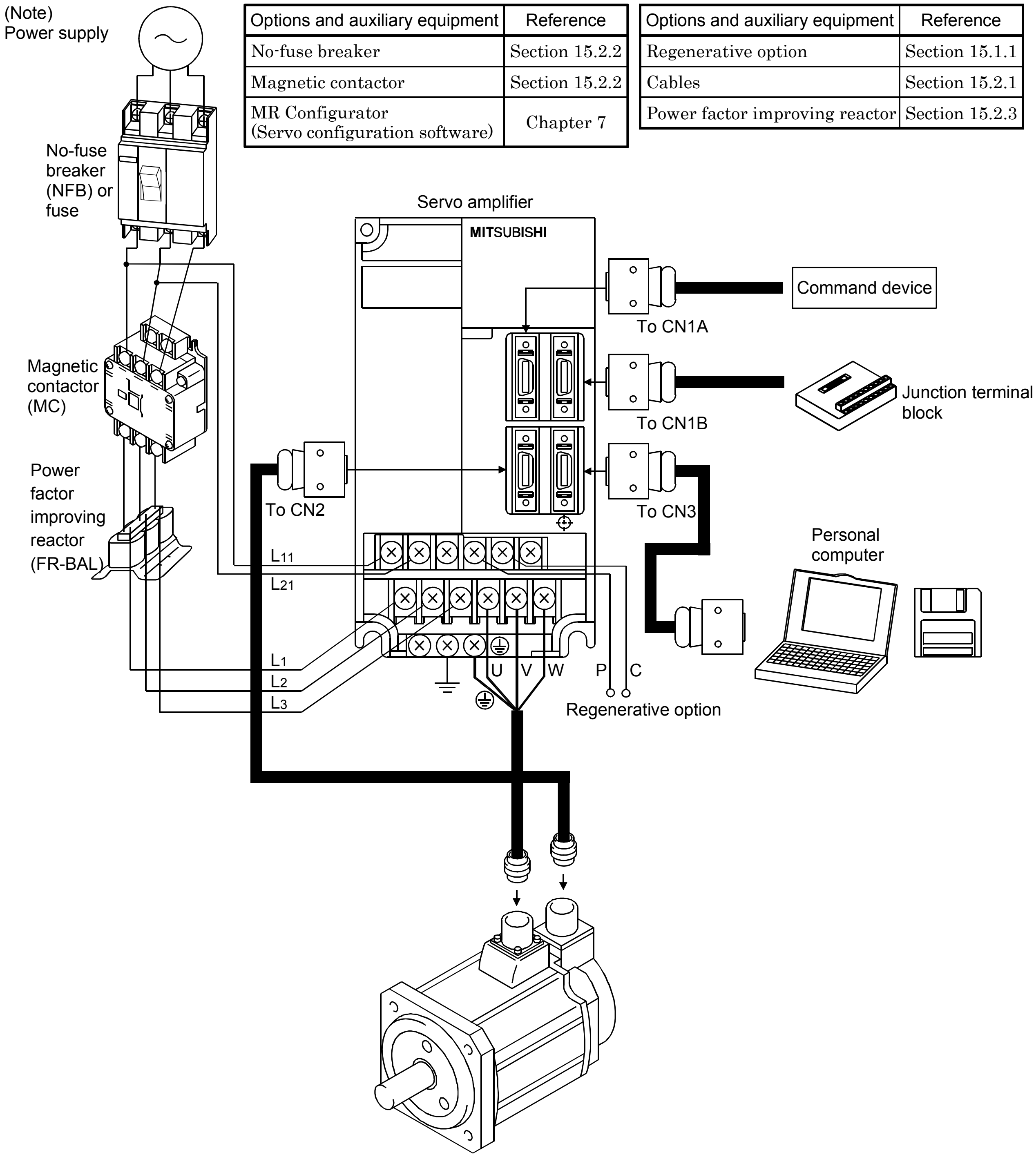
2. Refer to section 1.2 for the power supply specification.

(2) MR-J2S-200CP-S084・MR-J2S-350CP-S084

POINT
・The configuration of the MR-J2S-T01 CC-Link unit is the same as in (1) in this section.

Options and auxiliary equipment	Reference
No-fuse breaker	Section 15.2.2
Magnetic contactor	Section 15.2.2
MR Configurator (Servo configuration software)	Chapter 7

Options and auxiliary equipment	Reference
Regenerative option	Section 15.1.1
Cables	Section 15.2.1
Power factor improving reactor	Section 15.2.3



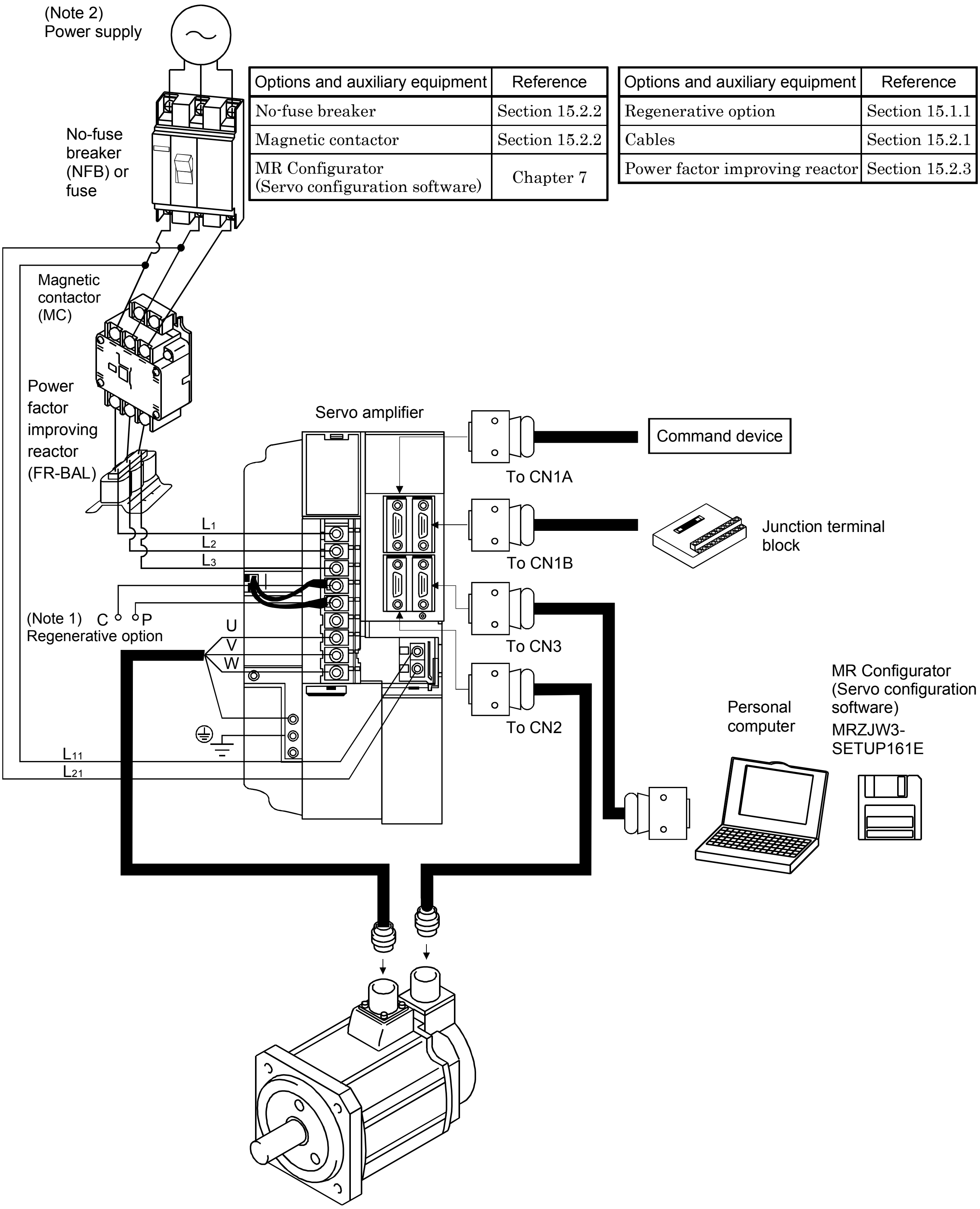
Note. Refer to section 1.2 for the power supply specification.

(3) MR-J2S-500CP-S084

POINT
・The configuration of the MR-J2S-T01 CC-Link unit is the same as in (1) in this section.

Options and auxiliary equipment	Reference
No-fuse breaker	Section 15.2.2
Magnetic contactor	Section 15.2.2
MR Configurator (Servo configuration software)	Chapter 7

Options and auxiliary equipment	Reference
Regenerative option	Section 15.1.1
Cables	Section 15.2.1
Power factor improving reactor	Section 15.2.3



Note 1. When using the regenerative option, remove the lead wires of the built-in regenerative resistor.

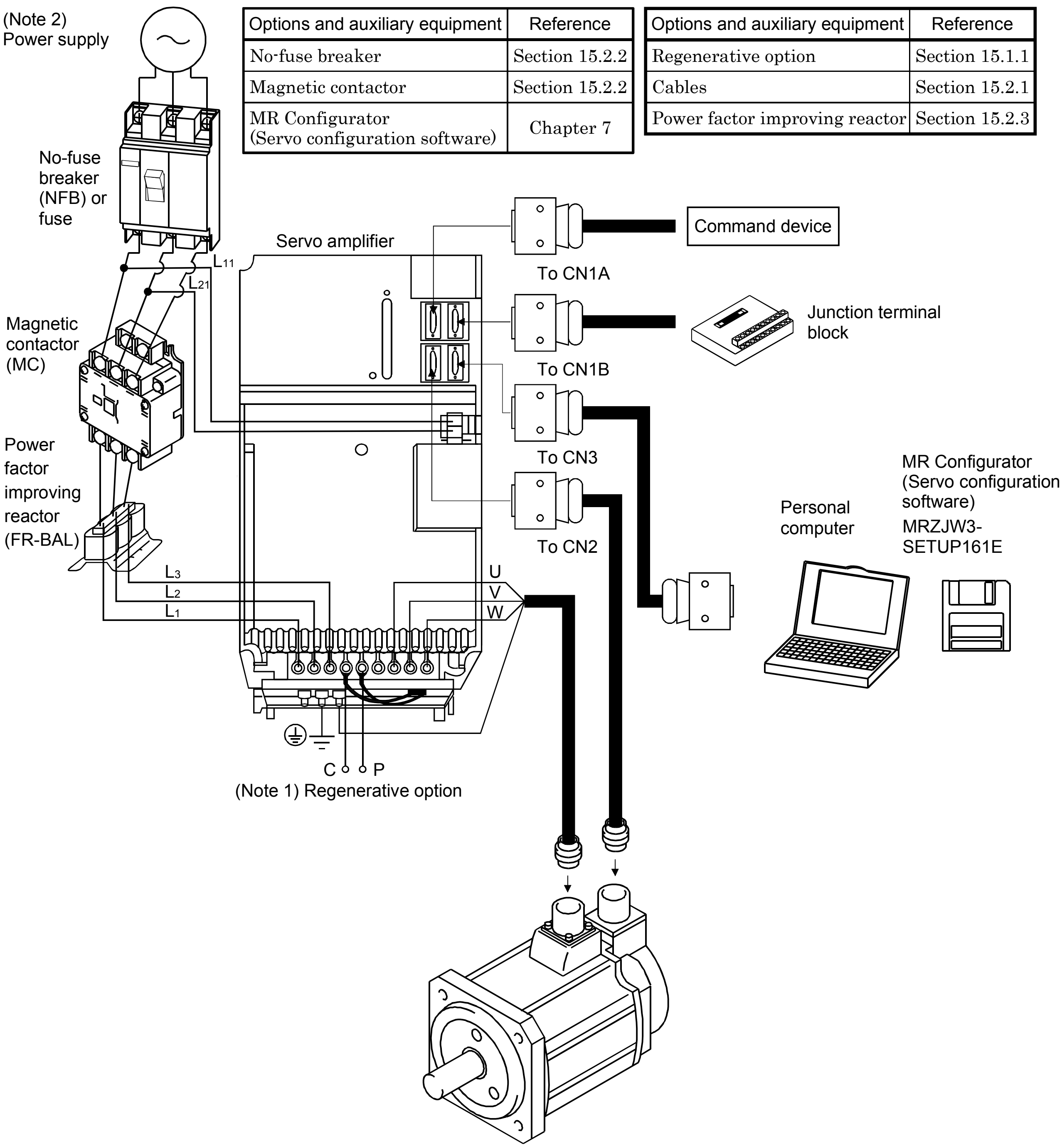
2. Refer to section 1.2 for the power supply specification.

(4) MR-J2S-700CP-S084

POINT
- The configuration of the MR-J2S-T01 CC-Link unit is the same as in (1) in this section.

Options and auxiliary equipment	Reference
No-fuse breaker	Section 15.2.2
Magnetic contactor	Section 15.2.2
MR Configurator (Servo configuration software)	Chapter 7

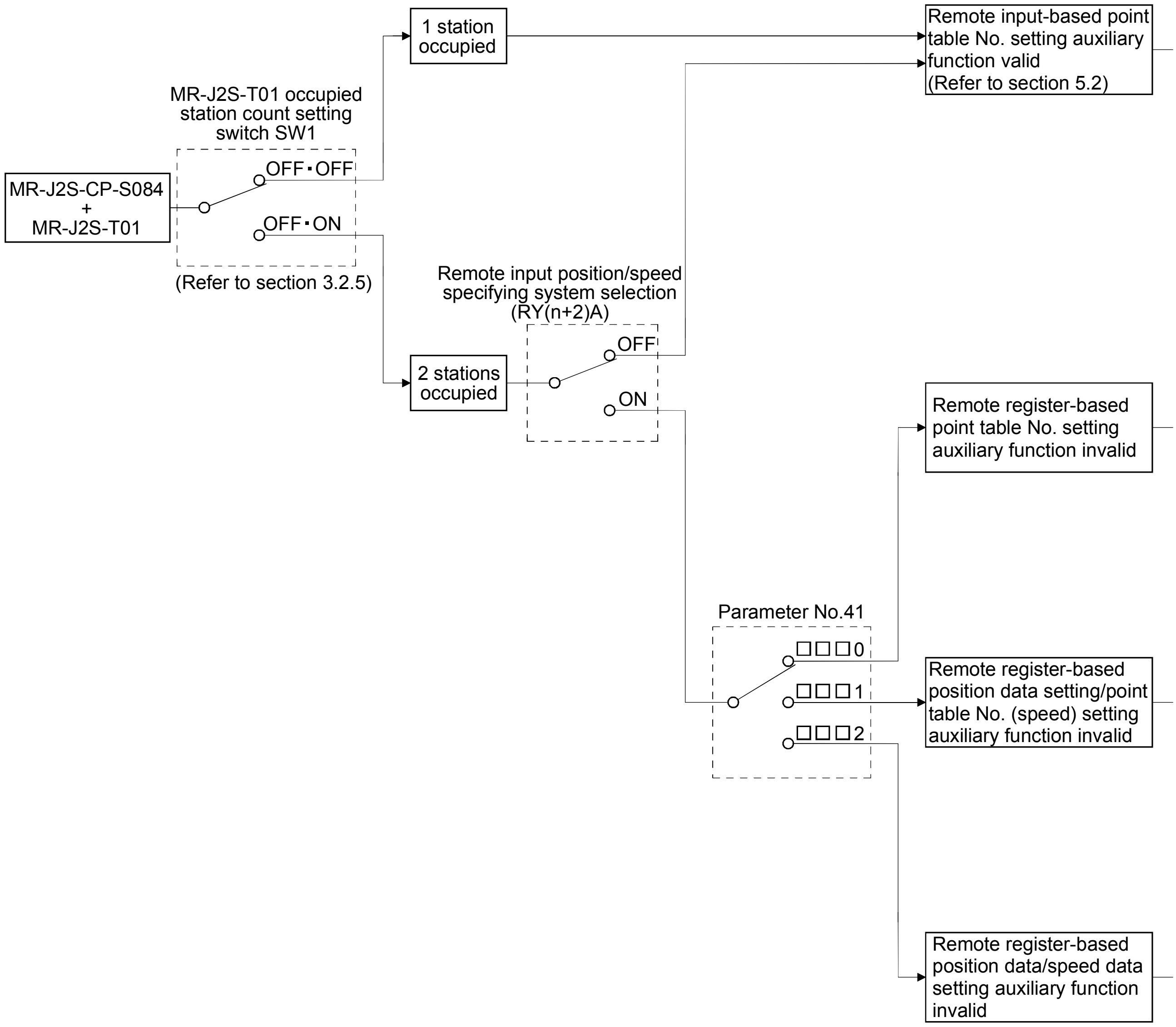
Options and auxiliary equipment	Reference
Regenerative option	Section 15.1.1
Cables	Section 15.2.1
Power factor improving reactor	Section 15.2.3

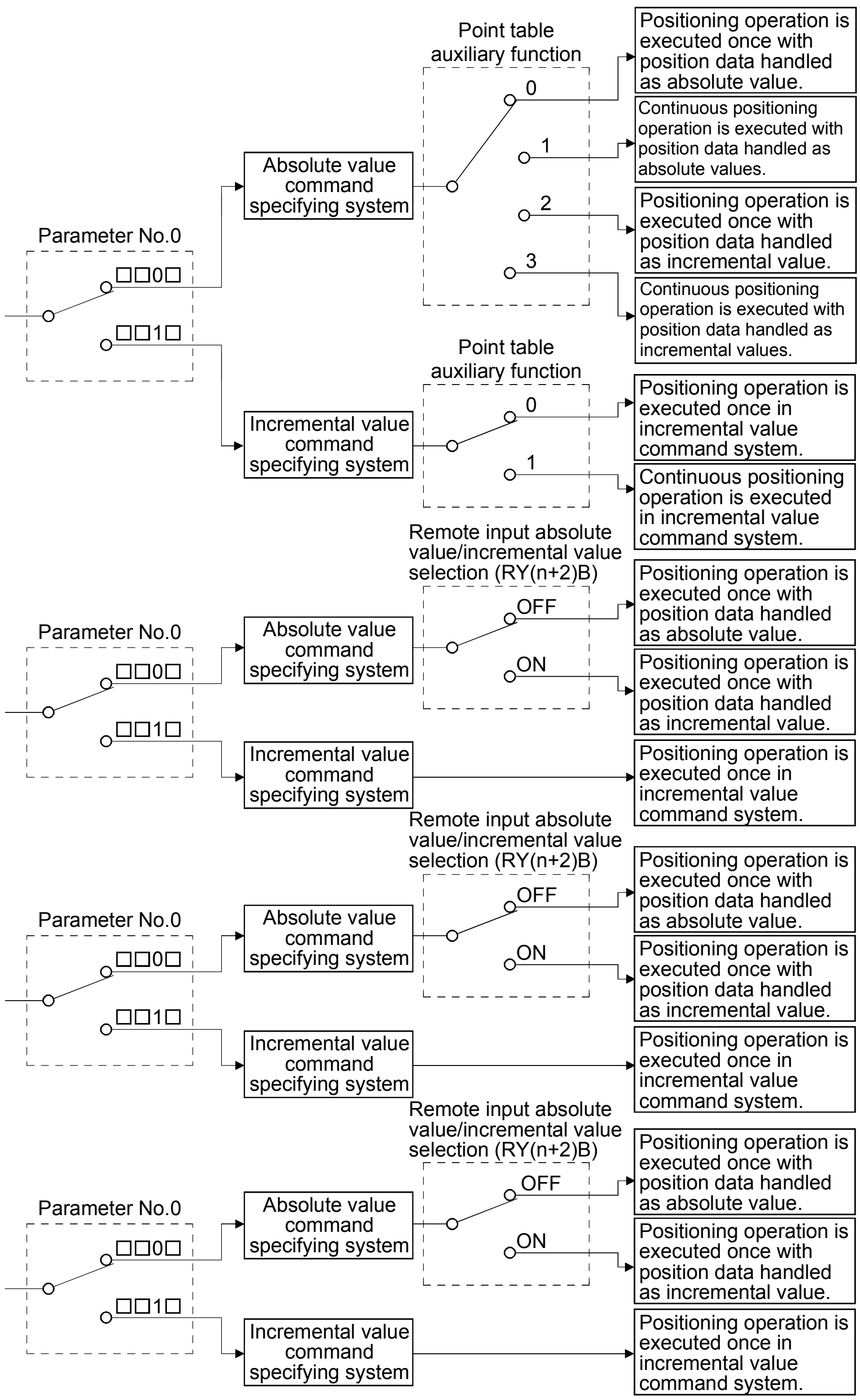


Note 1. When using the regenerative option, remove the lead wires of the built-in regenerative resistor.
2. Refer to section 1.2 for the power supply specification.

1.8 Flowchart 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 following chart for your reference.





Reference	Main description
Section 3.8.2 Section 5.2.2 (1)	Positioning is started by making the start signal valid after selection of the point table with the remote input. Using the auxiliary function, automatic continuous operation can be performed with multiple point tables.
Section 3.8.2 Section 5.2.2 (4)(b)1)	
Section 3.8.2 Section 5.2.2 (2)	
Section 3.8.2 Section 5.2.2 (4)(b)1)	
Section 3.8.2 Section 5.2.2 (1)	
Section 3.8.2 Section 5.2.2 (4)(b)2)	
Section 3.6.3 (1) Section 3.7.6 (3)	Positioning is started by making the start signal valid after selection of the point table with the remote register. The auxiliary function cannot be used.
Section 3.6.3 (2)	Set the position data directly with the remote register, and use the settings of the point table selected with the remote register as the servo motor speed and acceleration/deceleration time constants. Positioning is started by making the start signal valid. The auxiliary
Section 3.6.3(3) Section 3.8.4 Section 5.2.3(1)	Set the position data and servo motor speed directly with the remote register. Use the settings of the point table No. 1 as the acceleration/deceleration time constants. Positioning is started by making the start signal valid. The auxiliary function cannot be used.
Section 3.6.3 (3) Section 5.2.3 (2)	
Section 3.6.3(3) Section 3.7.6(2) Section 5.2.3(3)	

MEMO

2. INSTALLATION

⚠ CAUTION	・Stacking in excess of the limited number of products is not allowed. ・Install the equipment on incombustible material. Installing them directly or close to combustibles will lead to a fire. ・Install the equipment in a load-bearing place in accordance with this Instruction Manual. ・Do not get on or put heavy load on the equipment to prevent injury. ・Use the equipment within the specified environmental condition range. (For the environmental conditions, refer to section 2.1.) ・Provide an adequate protection to prevent screws, metallic detritus and other conductive matter or oil and other combustible matter from entering the servo amplifier. ・Do not block the intake/exhaust ports of the servo amplifier. Otherwise, a fault may occur. ・Do not subject the servo amplifier to drop impact or shock loads as they are precision equipment. ・Do not install or operate a faulty servo amplifier. ・When the product has been stored for an extended period of time, consult Mitsubishi. ・When treating the servo amplifier, be careful about the edged parts such as the corners of the servo amplifier.

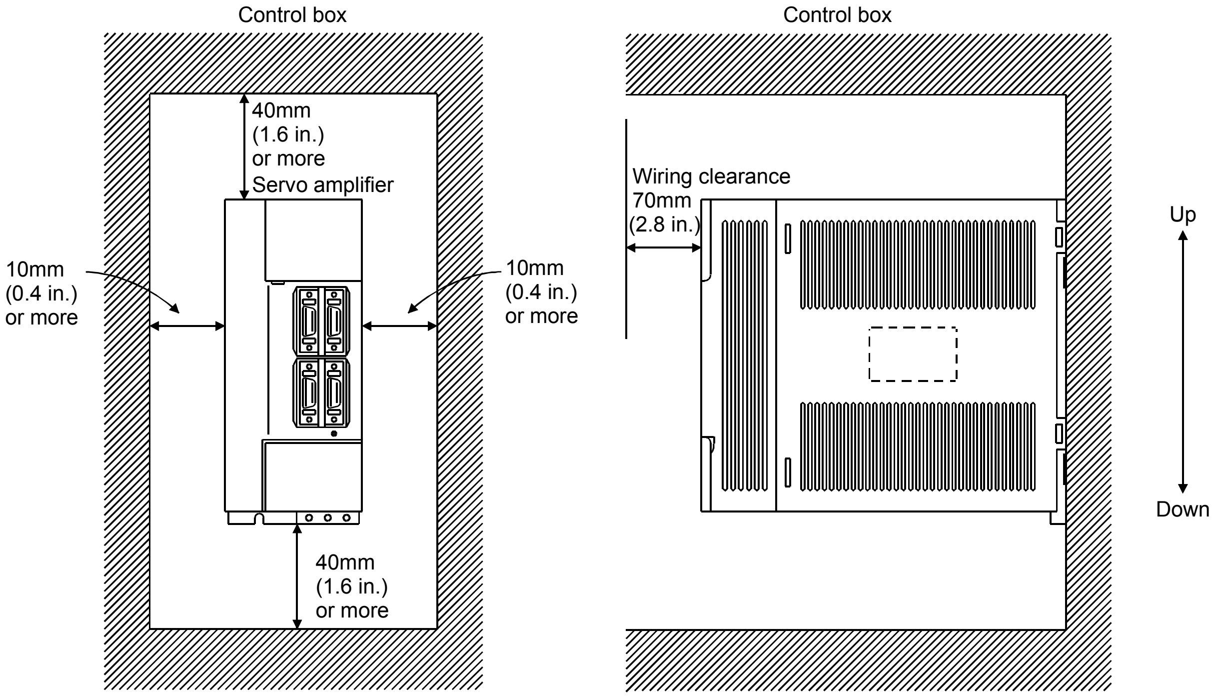
2.1 Environmental conditions

Environment			Conditions
Ambient temperature	In operation	[°C]	0 to +55 (non-freezing)
		[°F]	32 to +131 (non-freezing)
	In storage	[°C]	−20 to +65 (non-freezing)
		[°F]	−4 to +149 (non-freezing)
Ambient humidity	In operation		90%RH or less (non-condensing)
	In storage		
Ambience			Indoors (no direct sunlight) Free from corrosive gas, flammable gas, oil mist, dust and dirt
Altitude			Max. 1000m (3280 ft) above sea level
Vibration		[m/s^2]	5.9 [m/s^2] or less
		[ft/s^2]	19.4 [ft/s^2] or less

2.2 Installation direction and clearances

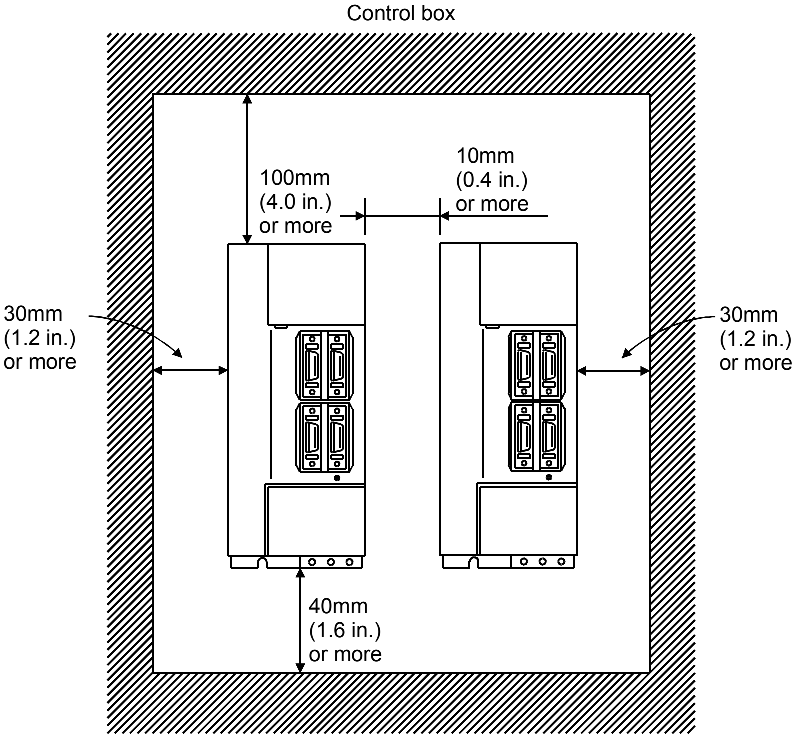
CAUTION	
	・Do not hold the front cover to transport the controller. The controller may drop. ・The equipment must be installed in the specified direction. Otherwise, a fault may occur. ・Leave specified clearances between the servo amplifier and control box inside walls or other equipment.

(1) Installation of one servo amplifier



(2) Installation of two or more servo amplifiers

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



(3) Others

When using heat generating equipment such as the regenerative option, install them with full consideration of heat generation so that the servo amplifier is not affected.
Install the servo amplifier on a perpendicular wall in the correct vertical direction.

2.3 Keep out foreign materials

(1) When installing the unit in a control box, prevent drill chips and wire fragments from entering the servo amplifier.

(2) Prevent oil, water, metallic dust, etc. from entering the servo amplifier through openings in the control box or a cooling fan installed on the ceiling.

(3) When installing the control box in a place where there are much toxic gas, dirt and dust, conduct an air purge (force clean air into the control box from outside to make the internal pressure higher than the external pressure) to prevent such materials from entering the control box.

2.4 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) The flexing lives of the cables are shown below. In actuality, provide a little allowance for these values. For installation on a machine where the servo motor will move, the flexing radius should be made as large as possible. Refer to section 14.4 for the flexing life.

3. CC-Link COMMUNICATION FUNCTIONS

3.1 Communication specifications

POINT
- This servo is equivalent to a remote device station.

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

<table>
<tr><th colspan="3">Item</th><th colspan="5">MR-J2S-T01 specifications</th></tr>
<tr><td colspan="3">Power supply</td><td colspan="5">5VDC supplied from servo amplifier</td></tr>
<tr><td rowspan="14">CC-Link</td><td colspan="2">Applicable CC-Link version</td><td colspan="5">Ver.1.10</td></tr>
<tr><td colspan="2">Applicable servo amplifier</td><td colspan="5">MR-J2S-□CP□-S084</td></tr>
<tr><td colspan="2">Communication speed</td><td colspan="5">10M/5M/2.5M/625k/156kbps</td></tr>
<tr><td colspan="2">Communication system</td><td colspan="5">Broadcast polling system</td></tr>
<tr><td colspan="2">Synchronization system</td><td colspan="5">Frame synchronization system</td></tr>
<tr><td colspan="2">Encoding system</td><td colspan="5">MRZI</td></tr>
<tr><td colspan="2">Transmission path format</td><td colspan="5">Bus format (conforming to EIA RS485)</td></tr>
<tr><td colspan="2">Error control system</td><td colspan="5">CRC ($X^{16}+X^{12}+X^{5}+1$)</td></tr>
<tr><td colspan="2">Connection cable</td><td colspan="5">CC-Link Ver.1.10-compliant cable (Shielded 3-core twisted pair cable)</td></tr>
<tr><td colspan="2">Transmission format</td><td colspan="5">Conforming to HDLC</td></tr>
<tr><td colspan="2">Remote station number</td><td colspan="5">1 to 64</td></tr>
<tr><td rowspan="3">(Note) Cable length</td><td>Communication speed</td><td>156Kbps</td><td>625Kbps</td><td>2.5Mbps</td><td>5Mbps</td><td>10Mbps</td></tr>
<tr><td>Maximum overall cable length</td><td>1200m</td><td>900m</td><td>400m</td><td>160m</td><td>100m</td></tr>
<tr><td>Inter-station cable length</td><td colspan="5">0.2m or more</td></tr>
<tr><td colspan="3">Number of servo amplifiers connected</td><td colspan="5">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.</td></tr>
</table>

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

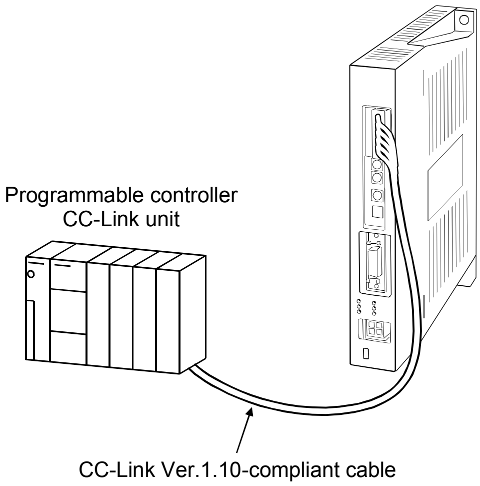
3.2.1 Configuration example

(1) Programmable controller side

Fit "Type AJ61BT11", "Type A1SJ61BT", "Type AJ61QBT11" or "Type A1SJ61QBT" "Control & Communication Link system master/local module" to the main or extension base unit which is loaded with the programmable controller CPU used as the master station.

(2) Wiring

Connect the programmable controller CC-Link unit master station and MR-J2S-T01 CC-Link option unit by a CC-Link Ver.1.10-compliant cable.



(3) For the CPU having the automatic refresh function (Example: QnA series CPU)

Transfer of data to/from the corresponding devices is performed from a sequence ladder and the devices are automatically refreshed by the refresh buffer of the master station at the END instruction to make communications with the remote devices.

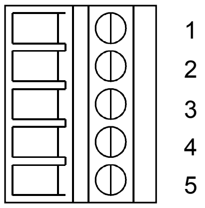
(4) For the CPU having no automatic refresh function (Example: AnA series CPU)

Transfer of data to/from the refresh buffer of the master station is performed directly from a sequence ladder to make communications with the remote devices.

3.2.2 Wiring method

(1) Communication connector

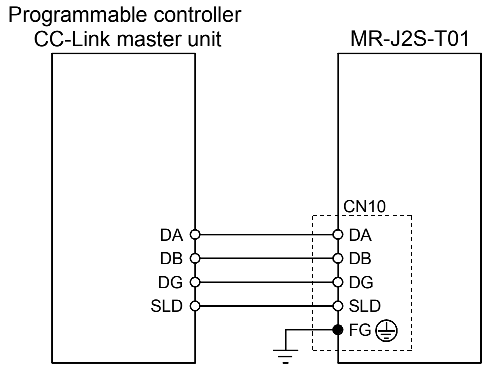
The pin layout of the communication connector CN10 on the MR-J2S-T01 option unit is shown below.



Pin No.	Signal name
1	DA
2	DB
3	DG
4	SLD
5	FG

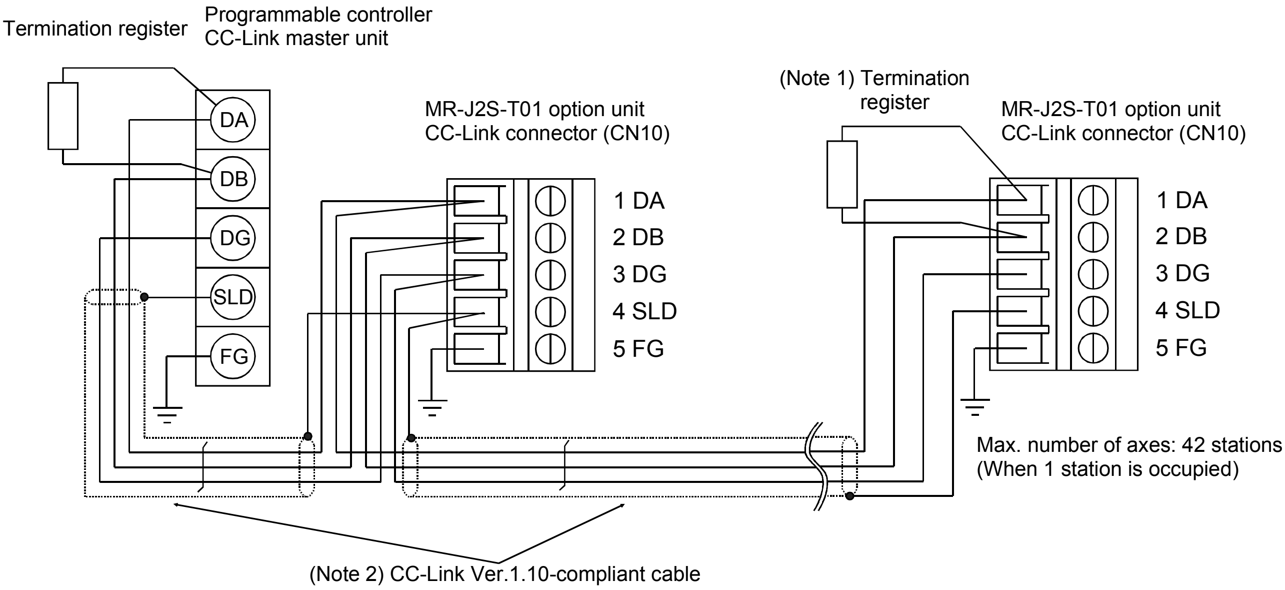
(2) Connection example

The servo amplifier and programmable controller CC-Link master unit are wired as shown below. Refer to section 15.2.1 (3) for the CC-Link Ver.1.10-compliant cable used for connection.



(3) Example of connecting multiple servo units

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



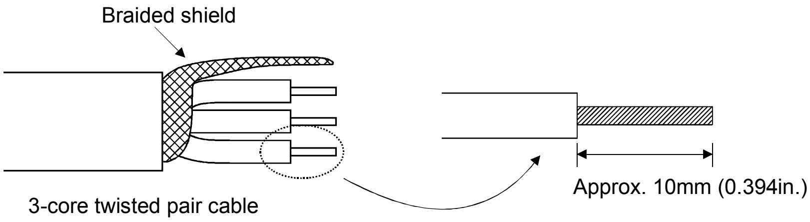
Note 1. Use the termination resistor supplied with the programmable controller. The resistance of the termination resistor depends on the cable used. For details, refer to the open field network CC-Link catalog (L(NA)74108143).

2. Refer to (4) in this section.

(4) How to wire the CC-Link terminal block (TE5)

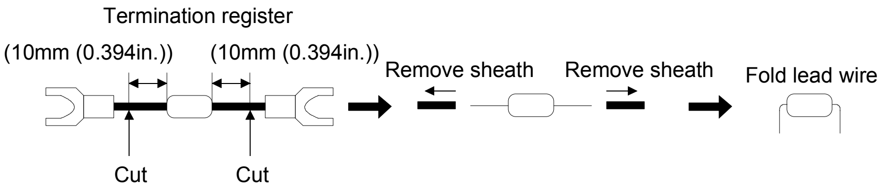
(a) Strip the sheath of the cable and separate the internal wires and braided shield.

(b) Strip the sheaths of the braided shield and internal wires and twist the cores.

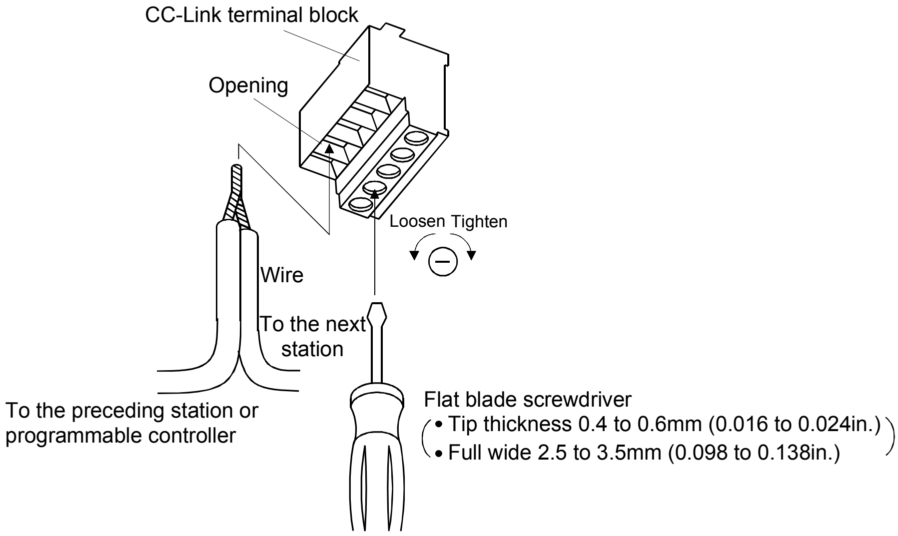


(c) Match and twist the wires and braided shield of the cable connected to the preceding axis or programmable controller and the corresponding wires and braided shield of the cable connected to the subsequent axis.

(d) For the last axis, work the termination resistor supplied to the CC-Link master unit as shown below.



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



POINT

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

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

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

3.2.3 Station number setting

(1) How to number the stations

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

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

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

(c) Max. number of connected units: 42

Note that the following conditions must be satisfied.

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

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-J2S-CP-S084)

d: Number of 4-station occupying units (not available for MR-J2S-CP-S084)

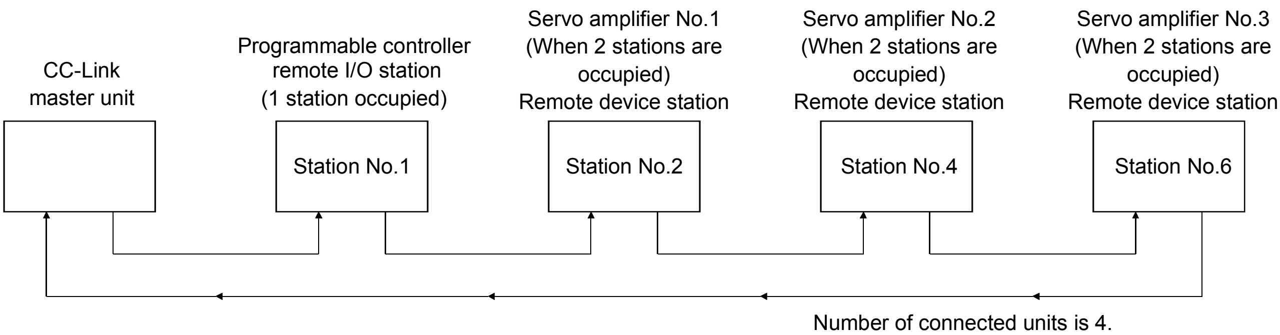
$\{(16\times A) + (54\times B) + (88\times C)\} \leq 2304$

A: Number of remote I/O stations $\leq$ 64

B: Number of remote device stations $\leq$ 42

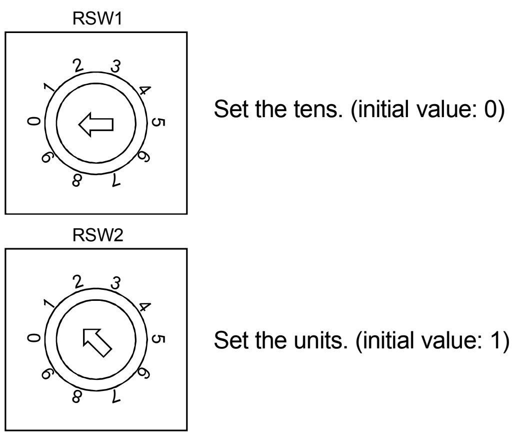
C: Number of local stations $\leq$ 26

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



(2) Station number setting method

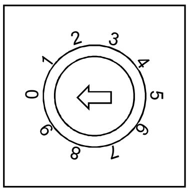
Set the station number with the station number switches (RSW1, RSW2) on the option unit MR-J2S-T01 front. The station number that may be set is any of 1 to 64 in decimal. In the initial status, the station number is set to station 1.



3.2.4 Communication baud rate setting

Set the transfer baud rate of CC-Link with the transfer baud rate switch (RSW1) on the option unit MR-J2S-T01 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.

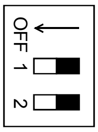
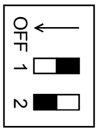
RSW3



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

3.2.5 Occupied station count setting

Set the number of occupied stations with the occupied station count switch (SW1) on the option unit MR-J2S-T01 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.

SW1 setting	Number of occupied stations
 OFF OFF (Initial value)	1 station occupied
 OFF ON	2 stations occupied

3.3 Functions

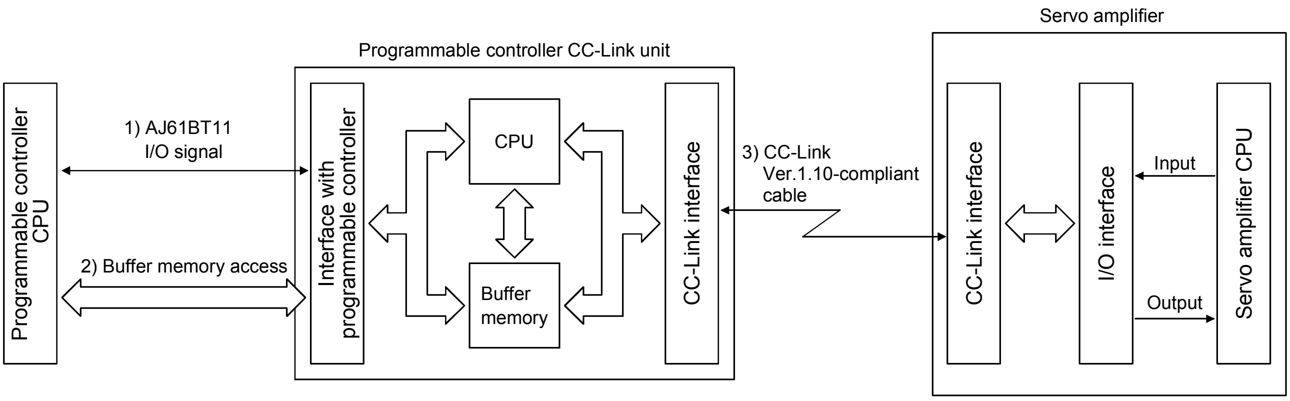
3.3.1 Function block diagram

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

(1) Between the master station and servo amplifier in the CC-Link system, link refresh is normally performed at intervals of 3.5 to 18ms (512 points). The link scan time of link refresh changes with the communication speed. For details, refer to the CC-Link system master/local unit user's manual.

(2) The I/O refresh and master station sequence program are executed asynchronously. Some programmable controllers allow link scans to be synchronized with programmable controller scans.

(3) The FROM instruction from the buffer memory of the CC-Link system master/local unit is used to read data from the servo amplifier, and the TO instruction is used to write data. Some programmable controllers allow automatic refresh to be set to omit the FROM and TO instructions.



3.3.2 Functions

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

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

3.4 Servo amplifier setting

(1) Servo amplifier side operation modes

The MR-J2S-□CP-S084 servo amplifier has the following operation modes.

Operation mode	Description
Test operation mode	The buttons in the operation section of the servo amplifier are operated to run the servo motor.
CC-Link operation mode	CC-Link communication functions are used to operate the servo with the programmable controller programs.

(2) Operation mode changing

(a) Operation mode changing conditions

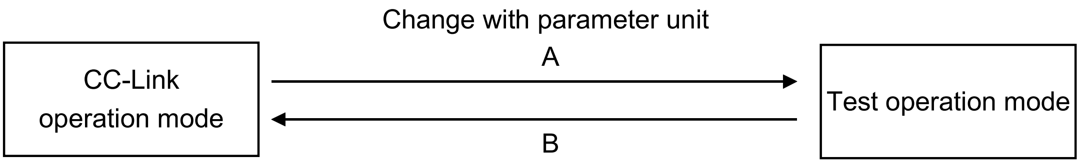
Change the operation mode after making sure that.

1) The servo motor is at a stop.

2) The forward rotation start (RYn1) or reverse rotation start (RYn2) is OFF.

(b) Operation mode changing method

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



Symbol	Changing	Description
A	CC-Link operation mode ↓ Test operation mode	Select the test operation mode with the button in the operation section of the servo amplifier.
B	Test operation mode ↓ CC-Link operation mode	Deselect test operation mode by switching power OFF/ON.

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

3.5.1 I/O signals

The input signals may be used as either the CC-Link or CN1A・CN1B external input signals. Make selection in parameter No. 116・117・118. The output signals can be used as both the CC-Link・ CN1A・CN1B external input signals.

POINT

- In the factory-shipped status, the forward rotation stroke end (RYn4), reverse rotation stroke end (RYn5) and proximity dog (RYn3) are valid as the CN1A・CN1B external input signals.

(1) When 1 station is occupied

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

Programmable controller → Servo amplifier (RYn)

(Note) Device No.	Signal name	Signal abbreviation	External input
RYn0	Servo-on	SON	
RYn1	Forward rotation start	ST1	
RYn2	Reverse rotation start	ST2	
RYn3	Proximity dog	DOG	
RYn4	Forward rotation stroke end	LSP	CN1B-16
RYn5	Reverse rotation stroke end	LSN	CN1B-17
RYn6	Automatic/manual selection	MD0	
RYn7	Temporary stop/Restart	STP	
RYn8	Monitor output execution demand	MOR	
RYn9	Instruction code execution demand	COR	
RYnA	Point table No. selection 1	DI0	
RYnB	Point table No. selection 2	DI1	
RYnC	Point table No. selection 3	DI2	
RYnD	Point table No. selection 4	DI3	
RYnE	Point table No. selection 5	DI4	
RYnF	Reserved		
RY(n+1)0 to RY(n+1)9	Reserved		
RY(n+1)A	Reset	RES	
RY(n+1)B to RY(n+1)F	Reserved		

Servo amplifier → Programmable controller (RXn)

(Note) Device No.	Signal name	Signal abbreviation	External output
RXn0	Ready	RD	CN1B-19
RXn1	In position	INP	
RXn2	Rough match	CPO	CN1B-4
RXn3	Home position return completion	ZP	CN1A-18
RXn4	Limiting torque	TLC	
RXn5	Reserved		
RXn6	Electromagnetic brake interlock	MBR	
RXn7	Temporary stop	PUS	
RXn8	Monitoring	MOF	
RXn9	Instruction code execution completion	COF	
RXnA	Warning	WNG	
RXnB	Battery warning	BWNG	
RXnC	Movement finish	MEND	CN1B-6
RXnD	Reserved		
RXnE	Position range output	POT	
RXnF	Reserved		
RX(n+1)1 to RX(n+1)9	Reserved		
RX(n+1)A	Trouble	ALM	CN1B-18
RX(n+1)B	Remote station communication ready	CRD	
RX(n+1)C to RX(n+1)F	Reserved		

Programmable controller → Servo amplifier (RWwn)

Address No.	Signal name
RWwn	Monitor 1
RWwn+1	Monitor 2
RWwn+2	Instruction code
RWwn+3	Writing data

Servo amplifier → Programmable controller (RWrn)

Address No.	Signal name
RWrn	Monitor 1 data
RWrn+1	Monitor 2 data
RWrn+2	Answer code
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

Programmable controller → Servo amplifier (RYn)

(Note 1) Device No.	Signal name	Signal abbreviation	External input
Yn0	Servo-on	SON	
RYn1	Forward rotation start	ST1	
RYn2	Reverse rotation start	ST2	
RYn3	Proximity dog	DOG	
RYn4	Forward rotation stroke end	LSP	CN1B-16
RYn5	Reverse rotation stroke end	LSN	CN1B-17
RYn6	Automatic/manual selection	MD0	
RYn7	Temporary stop/Restart	STP	
RYn8	Monitor output execution demand	MOR	
RYn9	Instruction code execution demand	COR	
RYnA	Point table No. selection 1	DI0	
RYnB	Point table No. selection 2	DI1	
RYnC	Point table No. selection 3	DI2	
RYnD	Point table No. selection 4	DI3	
RYnE	Point table No. selection 5	DI4	
RYnF to RY(n+1)F	Reserved		
RY(n+2)0	Position instruction execution demand (Note 2)		
RY(n+2)1	Speed instruction execution demand (Note 2)		
RY(n+2)2 to RY(n+2)5	Reserved		
RY(n+2)6	Internal torque limit selection	TL2	
RY(n+2)7	Proportion control	PC	
RY(n+2)8	Gain changing	CDP	
RY(n+2)9	Reserved		
RY(n+2)A	Position/speed specifying system selection		
RY(n+2)B	Absolute value/incremental value selection		
RY(n+2)C to RY(n+2)F	Reserved		
RY(n+3)0 to RY(n+3)9	Reserved		
RY(n+3)A	Reset	RES	
RY(n+3)B to RY(n+3)F	Reserved		

Servo amplifier → Programmable controller (RXn)

(Note 1) Device No.	Signal name	Signal abbreviation	External output
RXn0	Ready	RD	CN1B-19
RXn1	In position	INP	
RXn2	Rough match	CPO	CN1B-4
RXn3	Home position return completion	ZP	CN1A-18
RXn4	Limiting torque	TLC	
RXn5	Reserved		
RXn6	Electromagnetic brake interlock	MBR	
RXn7	Temporary stop	PUS	
RXn8	Monitoring	MOF	
RXn9	Instruction code execution completion	COF	
RXnA	Warning	WNG	
RXnB	Battery warning	BWNG	
RXnC	Movement finish	MEND	CN1B-6
RXnD	Reserved		
RXnE	Position range output	POT	
RXnF to RX(n+1)F	Reserved		
RX(n+2)0	Position instruction execution completion		
RX(n+2)1	Speed instruction execution completion		
RX(n+2)2	Point table No. output 1	PT0	
RX(n+2)3	Point table No. output 2	PT1	
RX(n+2)4	Point table No. output 3	PT2	
RX(n+2)5	Point table No. output 4	PT3	
RX(n+2)6	Point table No. output 5	PT4	
RX(n+2)7 to RX(n+2)9	Reserved		
RX(n+2)A to RX(n+2)F	Reserved		
RX(n+3)0 to RX(n+3)9	Reserved		
RX(n+3)A	Trouble	ALM	CN1B-18
RX(n+3)B	Remote station communication ready	CRD	
RX(n+3)C to RX(n+3)F	Reserved		

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

2. Select the command system using parameter No. 41.

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

Servo amplifier → Programmable controller (RWrn)	
(Note 1) Address No.	Signal name
RWrn	Monitor 1 data lower 16 bit
RWrn+1	Monitor 1 data upper 16 bit
RWrn+2	Answer code
RWrn+3	Read the data
RWrn+4	
RWrn+5	Monitor 2 data lower 16 bit
RWrn+6	Monitor 2 data upper 16 bit
RWrn+7	Reserved

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

2. Specify the code of the lower 16 bit as the monitor code of 32-bit data.

3. When the parameter No. 41 setting is "□□□0", specify the point table No. in RWwn+4. When the parameter No. 41 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. 41 setting is "□□□1", specify the point table No. in RWwn+6. When the parameter No. 41 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. 41 setting is "□□□0", the RWwn+6 value is not used.

3.5.2 Detailed explanation of I/O signals

(1) Input signals

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

<table>
<tr><th rowspan="2">Signal name</th><th rowspan="2">Description</th><th colspan="2">Device No.</th><th rowspan="2">Remarks</th></tr>
<tr><th>1 station occupied</th><th>2 stations occupied</th></tr>
<tr><td>Servo-on</td><td>Turning RYn0 ON powers on the base circuit, making operation ready to start. (Servo on status)
Turning it OFF powers off the base circuit, coasting the servo motor. (Servo off status)</td><td>RYn0</td><td>RYn0</td><td>(Note 1)</td></tr>
<tr><td>Forward rotation start</td><td>1. In absolute value command system
Turning RYn1 ON for automatic operation executes positioning once on the basis of the position data set to the point table.
Turning RYn1 ON for a home position return immediately starts a home position return.
Keeping RYn1 ON for JOG operation performs rotation in the forward rotation direction.
Forward rotation indicates the address increasing direction.
2. In incremental value command system
Turning RYn1 ON for automatic operation executes positioning once in the forward rotation direction on the basis of the position data set to the point table.
Turning RYn1 ON for a home position return immediately starts a home position return.
Keeping RYn1 ON for JOG operation performs rotation in the forward rotation direction.
Forward rotation indicates the address increasing direction.</td><td>RYn1</td><td>RYn1</td><td>(Note 1)</td></tr>
<tr><td>Reverse rotation start</td><td>Use this device in the incremental value command system.
Turning RYn2 ON for automatic operation executes positioning once in the reverse rotation direction on the basis of the position data set to the point table.
Keeping RYn2 ON for JOG operation performs rotation in the reverse rotation direction.
Reverse rotation indicates the address decreasing direction.
Reverse rotation start (RYn2) is also used as the start signal of the high-speed automatic positioning function to the home position.</td><td>RYn2</td><td>RYn2</td><td>(Note 1)</td></tr>
<tr><td>Proximity dog</td><td>In the shipment status, the proximity dog external input signal (CN1B-7) is valid. For use in CC-Link, make it usable in parameter No. 116. When RYn3 is turned OFF, the proximity dog is detected. The polarity of dog detection can be changed using parameter No. 8.
<table><tr><th>Parameter No. 8</th><th>Proximity dog (RYn3) detection polarity</th></tr><tr><td>□0□□ (initial value)</td><td>OFF</td></tr><tr><td>□1□□</td><td>ON</td></tr></table></td><td>RYn3</td><td>RYn3</td><td>(Note 1)</td></tr>
</table>

<table>
<tr><th rowspan="2">Signal name</th><th rowspan="2">Description</th><th colspan="2">Device No.</th><th rowspan="2">Remarks</th></tr>
<tr><th>1 station occupied</th><th>2 stations occupied</th></tr>
<tr><td>Forward rotation stroke end</td><td rowspan="2">In the factory-shipped status, the forward rotation stroke end is valid as the external input signal (CN1B-16) and the reverse rotation stroke end is valid as the external input signal (CN1B-17).
When starting operation, short CN1B-16 - SG and CN1B-17 - SG. Opening them causes a sudden stop, resulting in servo lock.
For use in CC-Link, make it usable in parameter No. 116.
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.22.
When not using the forward/reverse rotation stroke end, set “Automatic ON in parameter No. 84.
<table>
<tr><th colspan="2">(Note) Input signal</th><th colspan="2">Operation</th></tr>
<tr><th>RYn4</th><th>RYn5</th><th>CCW direction</th><th>CW direction</th></tr>
<tr><td>1</td><td>1</td><td>○</td><td>○</td></tr>
<tr><td>0</td><td>1</td><td></td><td>○</td></tr>
<tr><td>1</td><td>0</td><td>○</td><td></td></tr>
<tr><td>0</td><td>0</td><td></td><td></td></tr>
</table>
Note. 0: OFF 1: ON</td><td>RYn4</td><td>RYn4</td><td rowspan="2">(Note 1)
(Note 2)</td></tr>
<tr><td>Reverse rotation stroke end</td><td>RYn5</td><td>RYn5</td></tr>
<tr><td>Automatic/manual selection</td><td>Turning RYn6 ON selects the automatic operation mode, and turning it OFF selects the manual operation mode.</td><td>RYn6</td><td>RYn6</td><td>(Note 1)</td></tr>
<tr><td>Temporary stop/Restart</td><td>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, Temporary stop/Restart input is ignored.</td><td>RYn7</td><td>RYn7</td><td></td></tr>
</table>

Signal name	Description	Device No.		Remarks
		1 station occupied	2 stations occupied	
Monitor output execution demand	When RYn8 is turned ON, the following data and signals are set. At the same time, RXC turns ON. While RXn8 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: Lower 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: Lower 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 error	RYn8	RYn8	
Instruction code execution demand	Turning RYn9 ON executes the processing corresponding to the instruction code set to 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 time, RXn9 turns ON.	RYn9	RYn9	

<table>
<tr><th rowspan="2">Signal name</th><th rowspan="2">Description</th><th colspan="2">Device No.</th><th rowspan="2">Remarks</th></tr>
<tr><th>1 station occupied</th><th>2 stations occupied</th></tr>
<tr><td>Point table No. selection 1</td><td rowspan="5">The point table Nos. combined by RYnA, RYnB, RYnC, RYnD and RYnE are indicated in the following table.
<table>
<tr><th rowspan="2">Point table No.</th><th colspan="5">(Note) Input signals</th></tr>
<tr><th>RYnA</th><th>RYnB</th><th>RYnC</th><th>RYnD</th><th>RYnE</th></tr>
<tr><td>0 (for manual home position return)</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>2</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>3</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>4</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td></tr>
<tr><td>5</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td></tr>
<tr><td>6</td><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td></tr>
<tr><td>7</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td></tr>
<tr><td>8</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td></tr>
<tr><td>9</td><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td></tr>
<tr><td>10</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td></tr>
<tr><td>11</td><td>1</td><td>1</td><td>0</td><td>1</td><td>0</td></tr>
<tr><td>12</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td></tr>
<tr><td>13</td><td>1</td><td>0</td><td>1</td><td>1</td><td>0</td></tr>
<tr><td>14</td><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td></tr>
<tr><td>15</td><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td></tr>
<tr><td>16</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>17</td><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>18</td><td>0</td><td>1</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>19</td><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>20</td><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td></tr>
<tr><td>21</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td></tr>
<tr><td>22</td><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td></tr>
<tr><td>23</td><td>1</td><td>1</td><td>1</td><td>0</td><td>1</td></tr>
<tr><td>24</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td></tr>
<tr><td>25</td><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td></tr>
<tr><td>26</td><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td></tr>
<tr><td>27</td><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td></tr>
<tr><td>28</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td>29</td><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td>30</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td>31</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr>
</table>
Note. 0: OFF 1: ON</td><td>RYnA</td><td>RYnA</td><td rowspan="5">(Note 1)
(Note 2)</td></tr>
<tr><td>Point table No. selection 2</td><td>RYnB</td><td>RYnB</td></tr>
<tr><td>Point table No. selection 3</td><td>RYnC</td><td>RYnC</td></tr>
<tr><td>Point table No. selection 4</td><td>RYnD</td><td>RYnD</td></tr>
<tr><td>Point table No. selection 5</td><td>RYnE</td><td>RYnE</td></tr>
<tr><td>Position instruction demand</td><td>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, RX(n+2)0 turns ON.
Refer to section 3.6.3 for details.</td><td></td><td>RY(n+2)0</td><td></td></tr>
<tr><td>Speed instruction demand</td><td>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.</td><td></td><td>RY(n+2)1</td><td></td></tr>
</table>

Signal name	Description	Device No.		Remarks
		1 station occupied	2 stations occupied	
Internal torque limit selection	Turning RY(n+2)6 OFF makes the torque limit value of parameter No. 28 (internal torque limit 1) valid, and turning it ON makes that of parameter No. 29 (internal torque limit 2) valid. (Refer to section 4.4.3)		RY(n+2)6	(Note 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 2 (parameter No. 29).		RY(n+2)7	(Note 1) (Note 2)
Gain changing	When RY(n+2)8 is turned ON, the load inertia moment ratio changes to parameter No. 64 (ratio of load inertia moment to servo motor inertia moment 2), and the corresponding gain values change to the values obtained by multiplying parameter No. 65 to 67.		RY(n+2)8	(Note 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. Using parameter No. 41, select the instruction code to be set.		RY(n+2)A	
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. 0. Turn RY(n+2)B OFF or ON to select whether the set position data is in the absolute value command system or incremental value command system. OFF: Position data is handled as an absolute value. ON : Position data is handled as an incremental value.		RY(n+2)B	

Signal name	Description	Device No.		Remarks
		1 station occupied	2 stations occupied	
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 12.4.1.) 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. 55 (function selection 6), 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	(Note 1)
Forced stop	This signal is exclusively used as a CN1A/CN1B external input signal. It cannot be used for CC-Link. Opening EMG-SG results in a forced stop status, switches the servo off, and operates the dynamic brake to make a sudden stop. Short EMG-SG in the forced stop status to cancel the forced stop status.			

Note 1. Can be used as a CN1A/CN1B external input signal by setting parameter No. 116 to 118, parameter No. 79 to 83.

2. Can be automatically turned ON (kept ON) internally by setting parameter No. 84 to 86.

(2) Output signals

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

Signal name	Description	Device No.	
		1 station occupied	2 stations occupied
Ready	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. 6. 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	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. 7) Home position return has not been made after occurrence of Absolute position erase (AL.25) or Absolute position counter warning (AL.E3). 8) 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) Forward rotation starting coordinate system ("000_" of parameter No. 1) 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 OFF when the torque set as Internal torque limit 1 (parameter No. 28) or Internal torque limit 2 (parameter No. 29) 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.	RXn8	RXn8

Signal name	Description	Device No.	
		1 station occupied	2 stations occupied
Instruction code execution completion	Refer to Instruction code execution demand.	RXn9	RXn9
Warning	RXnA turns ON when a warning occurs. When no warning has occurred, RXnA turns OFF within about 1s after power-on.	RXnA	RXnA
Battery warning	RXnB turns ON when Open battery cable warning (AL.92) or Battery warning (AL.9F) occurs. When no battery warning has occurred, RXnB turns OFF within about 1s after power-on.	RXnB	RXnB
Movement finish	RXnC turns ON when In position (RXn1) turns ON and the command remaining distance is "0". RXnC turns ON at servo-on.	RXnC	RXnC
Position range	RXnE turns ON when the actual current position falls within the range set in the parameter. It is OFF when a home position return is not yet completed or while the base circuit is off.	RXnE	RXnE
Position instruction execution completion	Refer to Speed instruction execution demand (RY(n+2)0).		RX(n+2)0
Speed instruction execution completion	Refer to Position instruction execution demand (RY(n+2)1).		RX(n+2)1

<table>
<tr><th rowspan="2">Signal name</th><th rowspan="2">Description</th><th colspan="2">Device No.</th></tr>
<tr><th>1 station occupied</th><th>2 stations occupied</th></tr>
<tr><td>Point table No. output 1</td><td rowspan="5">As soon as Movement finish (RXnC) turns ON, the point table No. is output in 5-bit code.
<table>
<tr><th rowspan="2">Point table No.</th><th colspan="5">(Note 1) Output signal</th></tr>
<tr><th>RX(n+2)2</th><th>RX(n+2)3</th><th>RX(n+2)4</th><th>RX(n+2)5</th><th>RX(n+2)6</th></tr>
<tr><td>0 (Note 2)</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>2</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>3</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>4</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td></tr>
<tr><td>5</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td></tr>
<tr><td>6</td><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td></tr>
<tr><td>7</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td></tr>
<tr><td>8</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td></tr>
<tr><td>9</td><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td></tr>
<tr><td>10</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td></tr>
<tr><td>11</td><td>1</td><td>1</td><td>0</td><td>1</td><td>0</td></tr>
<tr><td>12</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td></tr>
<tr><td>13</td><td>1</td><td>0</td><td>1</td><td>1</td><td>0</td></tr>
<tr><td>14</td><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td></tr>
<tr><td>15</td><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td></tr>
<tr><td>16</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>17</td><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>18</td><td>0</td><td>1</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>19</td><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>20</td><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td></tr>
<tr><td>21</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td></tr>
<tr><td>22</td><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td></tr>
<tr><td>23</td><td>1</td><td>1</td><td>1</td><td>0</td><td>1</td></tr>
<tr><td>24</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td></tr>
<tr><td>25</td><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td></tr>
<tr><td>26</td><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td></tr>
<tr><td>27</td><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td></tr>
<tr><td>28</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td>29</td><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td>30</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td>31</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr>
</table>
Note1. 0: OFF 1: ON
2. For manual home position return
RX(n+2)2 to RX(n+2)6 turn OFF in any of the following statuses.
・Power on
・Servo off
・During home position return
・Home position return completion
In any of the following statuses, RX(n+2)2 to RX(n+2)6 maintain their pre-change status (ON/OFF).
・When operation mode is changed
・When Automatic/manual selection (RYn6) is turned from OFF to ON or from ON to OFF to change the operation mode.
・During manual operation
・During execution of automatic positioning to home position</td><td rowspan="5"></td><td>RX(n+2)2</td></tr>
<tr><td>Point table No. output 2</td><td>RX(n+2)3</td></tr>
<tr><td>Point table No. output 3</td><td>RX(n+2)4</td></tr>
<tr><td>Point table No. output 4</td><td>RX(n+2)5</td></tr>
<tr><td>Point table No. output 5</td><td>RX(n+2)6</td></tr>
</table>

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

(3) Remote registers

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

(a) Input (Programmable controller → Servo amplifier)

Remote register		Signal name	Description	Setting range
1 station occupied	2 stations occupied			
RWwn	RWwn	Monitor 1	Demands the status indication data of the servo amplifier. 1) When 1 station is occupied Setting the monitor code of the status indication item to be monitored to RWwn and turning RYn8 to ON sets data to RWrn. RXn8 turns on at the same time. 2) When 2 stations are occupied Setting the monitor code of the status indication item to be monitored to RWwn and turning RYn8 to ON sets data to RWrn. RXn8 turns on at the same time. When demanding 32-bit data, specifying the lower 16-bit code No. and turning RYn8 to ON sets the lower 16-bit data to RWwn and the upper 16-bit data to RWrn. data is stored in the RXn8. RXn8 turns on at the same time. Refer to section 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		Signal name	Description	Setting range
1 station occupied	2 stations occupied			
RWwn+2	RWwn+2	Instruction code	Sets the instruction code used to perform parameter or point table data read, alarm reference or the like. Setting the instruction code 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 definitions.	Refer to section 3.5.4 (1).
RWwn+3	RWwn+3	Writing data	Sets the written data used to perform parameter or point table data write, alarm history clear or the like. Setting the written data to RWwn+3 and turning RYn9 to ON writes the data to the servo amplifier. RXn9 turns to ON on completion of write. Refer to section 3.5.4 (2) for written data definitions.	Refer to section 3.5.4 (2).
	RWwn+4	Point table No./Position command data lower 16 bit	Set the point table No. to be executed in the automatic operation mode when 2 stations are occupied. When the point table No. is set to RWwn+4 and RY(n+2)0 is turned ON, the point table No. is set to the servo amplifier. On completion of setting, RX(n+2)0 turns ON. When the point table is not used, set the position command data. When the lower 16 bits are set to RWwn+4 and the upper 16 bits to RWwn+5, and RY(n+2)0 is turned ON, the position command data in the upper and lower 16 bits are written. On complete of write, RX(n+2)0 turns ON. Use parameter No. 41 to select whether point table No. setting or position command data setting will be made. Refer to section 3.6.3 for details of Point table No./Position command data.	Point table No.: 0 to 31 Absolute value command: Position command data: −999999 to 999999 Incremental value command: Position command data: 0 to 999999
	RWwn+5	Position command data upper 16 bit		
	RWwn+6	Point table No./Speed command data	When the point table is not used, set the point table No. to be executed or the speed command data (servo motor speed [r/min]). When the point table No. is set to RWwn+6 and RY(n+2)1 is turned ON, the point table No. or speed command data is set to the servo amplifier. On completion of setting, RX(n+2)1 turns ON. Use parameter No. 41 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 31 Speed command data: 0 to permissible speed

(b) Output (Servo amplifier → programmable controller)

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

If you set inappropriate code No. or data to the remote register input, the error code is set to 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
RWrn	Monitor 1 data lower 16bit	The lower 16 bits of the data of the monitor code set to RWwn are set.
RWrn+1	Monitor 1 data upper 16bit	The upper 16 bits of the data of the monitor code set to RWwn are set. A sign is set if there are no data in the upper 16 bits.
RWrn+2	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 lower 16bit	The lower 16 bits of the data of the monitor code set to RWwn+1 are set.
RWrn+6	Monitor 2 data upper 16bit	The upper 16 bits of the data of the monitor code set to RWwn+1 are set. A sign is set if there are no data in the upper 16 bits.
RWrn+7		

3.5.3 Monitor codes

To demand 32-bit data when 2 stations are occupied, specify the lower 16-bit code No. Use any of the instruction codes 0101 to 011C to read the decimal point position (multiplying factor) of the status indication.
Setting any code No. that is not given in this section will set the error code (□□1□) to 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 8.2.3.

Code No.		Monitored item	Answer data (Servo amplifier → Programmable controller)	
1 station occupied	2 stations occupied		Data length	Unit
0000h	0000h			
0001h	0001h	Current position lower 16bit	16bit	$\times 10^{STM}$[mm] or $\times 10^{STM}$[inch]
0002h		Current position upper 16bit	16bit	
0003h	0003h	Command position lower 16bit	16bit	
0004h		Command position upper 16bit	16bit	
0005h	0005h	Command remaining distance lower 16bit	16bit	
0006h		Command remaining distance upper 16bit	16bit	
0007h	0007h	Not monitored	16bit	
0008h	0008h	Point table	16bit	[No.]
0009h				
000Ah	000Ah	Feedback pulse value lower 16bit	16bit	[pulse]
000Bh		Feedback pulse value upper 16bit	16bit	[pulse]
000Ch				
000Dh				
000Eh	000Eh	Droop pulse value lower 16bit	16bit	[pulse]
000Fh		Droop pulse value upper 16bit	16bit	[pulse]
0010h	0010h	Torque limit command voltage	16bit	×0.01[V]
0011h	0011h	Regenerative load factor	16bit	[%]
0012h	0012h	Effective load factor	16bit	[%]
0013h	0013h	Peak load factor	16bit	[%]
0014h		Instantaneously occurring torque	16bit	[%]
0015h	0015h	ABS counter	16bit	[rev]
0016h	0016h	Motor speed lower 16bit	16bit	×0.1[rev/min]
0017h		Motor speed upper 16bit	16bit	×0.1[rev/min]
0018h	0018h	Bus voltage	16bit	[V]
0019h	0019h	ABS position lower 16bit	16bit	[pulse]
001Ah		ABS position middle 16bit	16bit	[pulse]
001Bh	001Bh	ABS position upper 16bit	16bit	[pulse]
001Ch	001Ch	Within one-revolution position lower 16bit	16bit	[pulse]
001Dh		Within one-revolution position upper 16bit	16bit	[pulse]

3.5.4 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 (□□1□) 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 → Programmable controller)
0000h	Operation mode Reads the current operation mode.	0000: CC-Link operation mode 0001: Test operation mode
0002h	Travel multiplying factor Reads the multiplying factor of the position data in the point table set in parameter No. 1.	Travel multiplying factor 0300: ×1000 0200: ×100 0100: ×10 0000: ×1
0010h	Current alarm (warning) reading Reads the alarm No. or warning No. occurring currently.	0 0 Occurring alarm No./warning No.
0020h	Alarm number in alarm history (most recent alarm)	0 0 Alarm No. that occurred in past
0021h	Alarm number in alarm history (first recent alarm)	
0022h	Alarm number in alarm history (second recent alarm)	
0023h	Alarm number in alarm history (third recent alarm)	
0024h	Alarm number in alarm history (fourth recent alarm)	
0025h	Alarm number in alarm history (fifth recent alarm)	
0030h	Alarm occurrence time in alarm history (most recent alarm)	Occurrence time of alarm that occurred in past
0031h	Alarm occurrence time in alarm history (first recent alarm)	
0032h	Alarm occurrence time in alarm history (second recent alarm)	
0033h	Alarm occurrence time in alarm history (third recent alarm)	
0034h	Alarm occurrence time in alarm history (fourth recent alarm)	
0035h	Alarm occurrence time in alarm history (fifth recent alarm)	

Code No.	Item/Function	Reading data (RWrn+3) contents (Servo amplifier → Programmable controller)
0040h	Input signal status 0 Reads the statuses (OFF/ON) of the input signals.	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. 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: MD0 bitA: DI0 bitE: DI4 bit3: DOG bit7: STR bitB: DI1 bitF: ―――
0041h	Input signal status 1 Reads the statuses (OFF/ON) of the input signals.	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. bitF bit0 bit0: PSR bit4: ――― bit8: CDP bitC: ――― bit1: SPR bit5: ――― bit9: ――― bitD: ――― bit2: ――― bit6: TL1 bitA: CSL bitE: ――― bit3: ――― bit7: PC bitB: INC bitF: ―――
0042h	Input signal status 2 Reads the statuses (OFF/ON) of the input signals.	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. bitF bit0 bit0: ――― bit4: ――― bit8: ――― bitC: ――― bit1: ――― bit5: ――― bit9: ――― bitD: ――― bit2: ――― bit6: ――― bitA: RES bitE: ――― bit3: ――― bit7: ――― bitB: ――― bitF: ―――
0050h	Output signal status 0 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 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 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: PSF bit4: PT2 bit8: ――― bitC: ――― bit1: SPF bit5: PT3 bit9: ――― bitD: ――― bit2: PT0 bit6: PT4 bitA: ――― bitE: ――― bit3: PT1 bit7: ――― bitB: ――― bitF: ―――

Code No.	Item/Function	Reading data (RWrn+3) contents (Servo amplifier → Programmable controller)
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]. Energization time
0082h	Power ON frequency Reads the number of power-on times from shipment.	Returns the number of power-on times. Power ON frequency
00A0h	Ratio of load inertia moment Reads the estimated ratio of load inertia moment to servo motor shaft inertia moment.	Returns the estimated ratio of load inertia moment to servo motor shaft inertia moment [times]. Ratio of load inertia moment
00B0h	Home position within-1-revolution position lower 16bit (CYC0) Reads the lower 16 bits of the cycle counter value of the absolute home position.	Return unit [pulses] Cycle counter value
00B1h	Home position within-1-revolution position upper 16bit (CYC0) Reads the upper 16 bits of the cycle counter value of the absolute home position.	Return unit [pulses] Cycle counter value
00B2h	Home position Multi-revolution data (ABS0) Multi-revolution counter value of absolute home position reading	Return unit [rev] Multi-revolution counter value
00C0h	Error parameter No./Point data No. reading Reads the parameter No./point table No. in error.	0 Parameter No. or point table 1: Parameter No. 2: Point table No.

Code No.	Item/Function	Reading data (RWrn+3) contents (Servo amplifier → Programmable controller)
0100h to 011Dh	Monitor multiplying factor Reads the multiplying factor of the data to be read with the monitor code. The instruction codes 0100 to 011D correspond to the monitor codes 0000 to 011D. 0000 applies to the instruction code that does not correspond to the monitor code.	Monitor multiplying factor 0003: ×1000 0002: ×100 0001: ×10 0000: ×1
0200h to 027Ch	Parameter No. 0 to 124 data reading Reads the values set in parameter No. 0 to 124. 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. 19, an error code is returned and the data cannot be read. The parameter No. 1 data is headed by "FF" when it is read.	The setting of the requested parameter No. is returned.
0300h to 037Ch	Data form of parameter No. 0 to 124 Reads the data format of the values set in parameter No. 0 to 124. 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. 19, an error code is returned and the data cannot be read.	The setting of the requested parameter No. is returned. 0 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 Data format 0: Used unchanged as hexadecimal 1: Must be converted into decimal Parameter write type 0: Valid after write 1: Valid when power is switched on again after write
0401h to 041Fh 0501h to 051Fh	Position data of point table No. 1 to 31 Reads the point table data of point table No. 1 to 31. 0400 to 041F: Position data in lower 16 bits of point table No. 1 to 31 0500 to 051F: Position data in upper 16 bits of point table No. 1 to 31 Example Instruction code 0413: Lower 16 bits of point table No. 19 Instruction code 0513: Upper 16 bits of point table No. 19	The position data (upper 16 bits or lower 16 bits) set in the requested point table No. is returned.
0601h to 061Fh	Servo motor speed of point table No. 1 to 31 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. Servo motor speed

Code No.	Item/Function	Reading data (RWrn+3) contents (Servo amplifier → Programmable controller)
0701h to 071Fh	Acceleration time constant of point table No. 1 to 31 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 081Fh	Deceleration time constant of point table No. 1 to 31 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 091Fh	Dwell of point table No. 1 to 31 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 0A1Fh	Auxiliary function of point table No. 1 to 31 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 911Fh.

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

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

Code No.	Item	Writing data (RWwn+3) contents (Programmable controller → Servo amplifier)
8010h	Alarm reset command Deactivates the alarm that occurred.	1EA5
8101h	Feedback pulse value display data is clear Resets the display data of the status indication “feedback pulse value” to 0.	1EA5
8200h to 827Ch	Data RAM instruction of parameter No. 0 to 124 Writes the values set in parameter No. 0 to 124 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. 19 or a value outside the setting range of the corresponding parameter is written.	Convert the decimal values into hexadecimal before making setting.

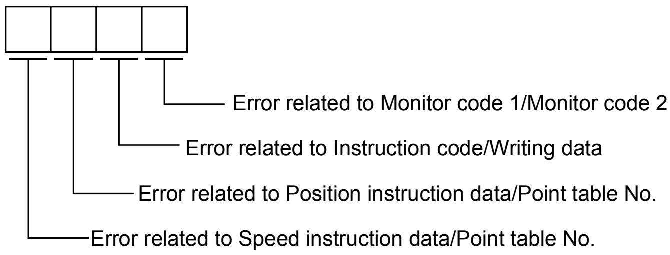
Code No.	Item	Writing data (RWwn+3) contents (Programmable controller → Servo amplifier)
8300h to 837Ch	Data EEP-ROM instruction of parameter 0 to 124 Writes the values set in parameter No. 0 to 124 to EEP-ROM. Written to EEP-ROM, these values are held if power is switched off. The decimal value converted 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. 19 or a value outside the setting range of the corresponding parameter is written.	Convert the decimal values into hexadecimal before making setting.
8401h to 841Fh 8501h to 851Fh	Position data RAM command of point table Writes the position data of point table No. 1 to 31 to RAM. These values are cleared when power is switched off. **Point** ・A set of the upper and lower bits makes position data. When changing the data, always set the data of both lower and upper bits in order of lower 16-bit data and upper 16-bit data. 8400h to 841Fh: Position data in lower 16 bits of point table No. 1 to 31 8500h to 851Fh: Position data in upper 16 bits of point table No. 1 to 31 Example Instruction code 8413h: Lower 16 bits of point table No. 19 Instruction code 8513h: Upper 16 bits of point table No. 19	Convert the values into hexadecimal before making setting.
8601h to 861Fh	Motor speed of point table Writes the motor speeds of point table No. 1 to 31 to RAM. These values are cleared when power is switched off. The decimal value converted from the 2 lower digits of the code No. corresponds to the point table No.	Convert the values into hexadecimal before making setting.
8701h to 871Fh	Acceleration time constant data RAM command of point table Writes the acceleration time constants of point table No. 1 to 31 to RAM. These values are cleared when power is switched off. The decimal value converted from the 2 lower digits of the code No. corresponds to the point table No.	Convert the values into hexadecimal before making setting.
8801h to 881Fh	Deceleration time constant data RAM command of point table Writes the deceleration time constants of point table No. 1 to 31 to RAM. These values are cleared when power is switched off. The decimal value converted from the 2 lower digits of the code No. corresponds to the point table No.	Convert the values into hexadecimal before making setting.

Code No.	Item	Writing data (RWwn+3) contents (Programmable controller → Servo amplifier)
8901h to 891Fh	Dwell data RAM command of point table Writes the dwell data of point table No. 0 to 31 to RAM. These values are cleared when power is switched off. The decimal value converted from the 2 lower digits of the code No. corresponds to the point table No.	Convert the values into hexadecimal before making setting.
8A01h to 8A1Fh	Auxiliary function data RAM command of point table Writes the auxiliary function data of point table No. 0 to 31 to RAM. These values are cleared when power is switched off. The decimal value converted from the 2 lower digits of the code No. corresponds to the point table No.	Convert the values into hexadecimal before making setting.
8B01h to 8B1Fh 8C01h to 8C1Fh	Position data EEP-ROM command of point table Writes the position data of point table No. 1 to 8 to EEP-ROM. Written to EEP-ROM, these values are held if power is switched off. **Point** ・A set of the upper and lower bits makes position data. When changing the data, always set the data of both lower and upper bits in order of lower 16-bit data and upper 16-bit data. 8B01h to 8B1Fh: Position data in lower 16 bits of point table No. 1 to 31 8C01h to 8C1Fh: Position data in upper 16 bits of point table No. 1 to 31 Example Instruction code 8B13h: Lower 16 bits of point table No. 19 Instruction code 8C13h: Upper 16 bits of point table No. 19	Convert the values into hexadecimal before making setting.
8D01h to 8D1Fh	Servo motor speed data EEP-ROM command of point table Writes the servo motor speeds of point table No. 1 to 31 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.	Convert the values into hexadecimal before making setting.
8E01h to 8E1Fh	Acceleration time constant data EEP-ROM command of point table Writes the acceleration time constants of point table No. 1 to 31 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.	Convert the values into hexadecimal before making setting.
8F01h to 8F1Fh	Deceleration time constant data EEP-ROM command of point table Writes the deceleration time constants of point table No. 1 to 31 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.	Convert the values into hexadecimal before making setting.
9001h to 901Fh	Dwell data EEP-ROM command of point table Writes the dwell data of point table No. 1 to 31 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.	Convert the values into hexadecimal before making setting.

Code No.	Item	Writing data (RWwn+3) contents (Programmable controller → Servo amplifier)
9101h to 911Fh	Auxiliary function data EEP-ROM command of point table Writes the auxiliary function data of point table No. 1 to 31 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.	Convert the values into hexadecimal before making setting.

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.



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. 32 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 CN1A・CN1B external input signals

Using parameter No. 116 to 118, you can assign the input signals as the CN1A・CN1B external input signals. The signals assigned as the CN1A・CN1B external input signals cannot be used in CC-Link. Refer to section 4.3.2 (1)(a) 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 CN1B external input signals.

Parameter No.116

0 □ □ □

Signal name	Initial value BIN	Initial value HEX
	0	0
	0	
Servo-on	0	
Reset	0	

Signal name	Initial value BIN	Initial value HEX
Forward rotation stroke end	1	3
Reverse rotation stroke end	1	
Forward rotation start	0	
Reverse rotation start	0	

Signal name	Initial value BIN	Initial value HEX
Automatic/manual selection	0	2
Proximity dog	1	
	0	
	0	

BIN 0: Used in CC-Link
BIN 1: Used as CN1A and CN1B external input signal

Parameter No.117

0 0 □ □

Signal name	Initial value BIN	Initial value HEX
Internal torque limit selection	0	0
Proportion control	0	
Temporary stop/Restart	0	
	0	

Signal name	Initial value BIN	Initial value HEX
	1	0
	1	
	0	
Gain changing selection	0	

BIN 0: Used in CC-Link
BIN 1: Used as CN1A and CN1B external input signal

Parameter No.118

0 0 □ □

Signal name	Initial value BIN	Initial value HEX
Point table No. selection 1	0	0
Point table No. selection 2	0	
Point table No. selection 3	0	
Point table No. selection 4	0	

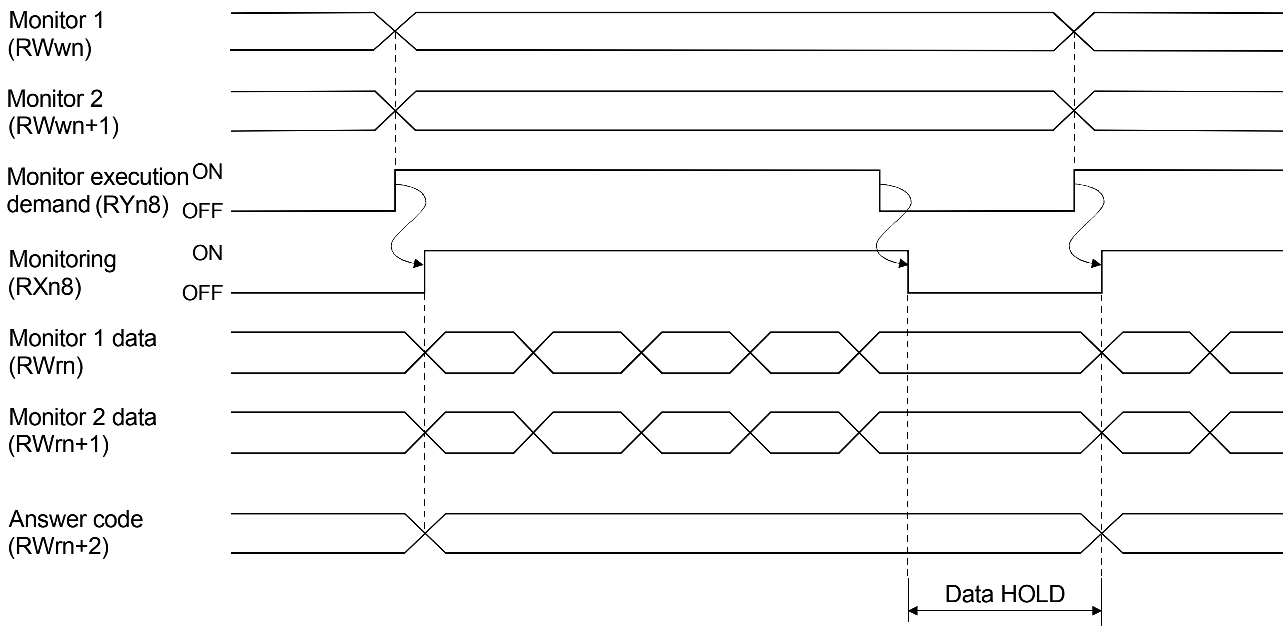
Signal name	Initial value BIN	Initial value HEX
Point table No. selection 5	0	0
	0	
	0	
	0	

BIN 0: Used in CC-Link
BIN 1: Used as CN1A and CN1B external input signal

3.6 Data communication timing charts

3.6.1 Monitor codes

(1) When 1 station is occupied

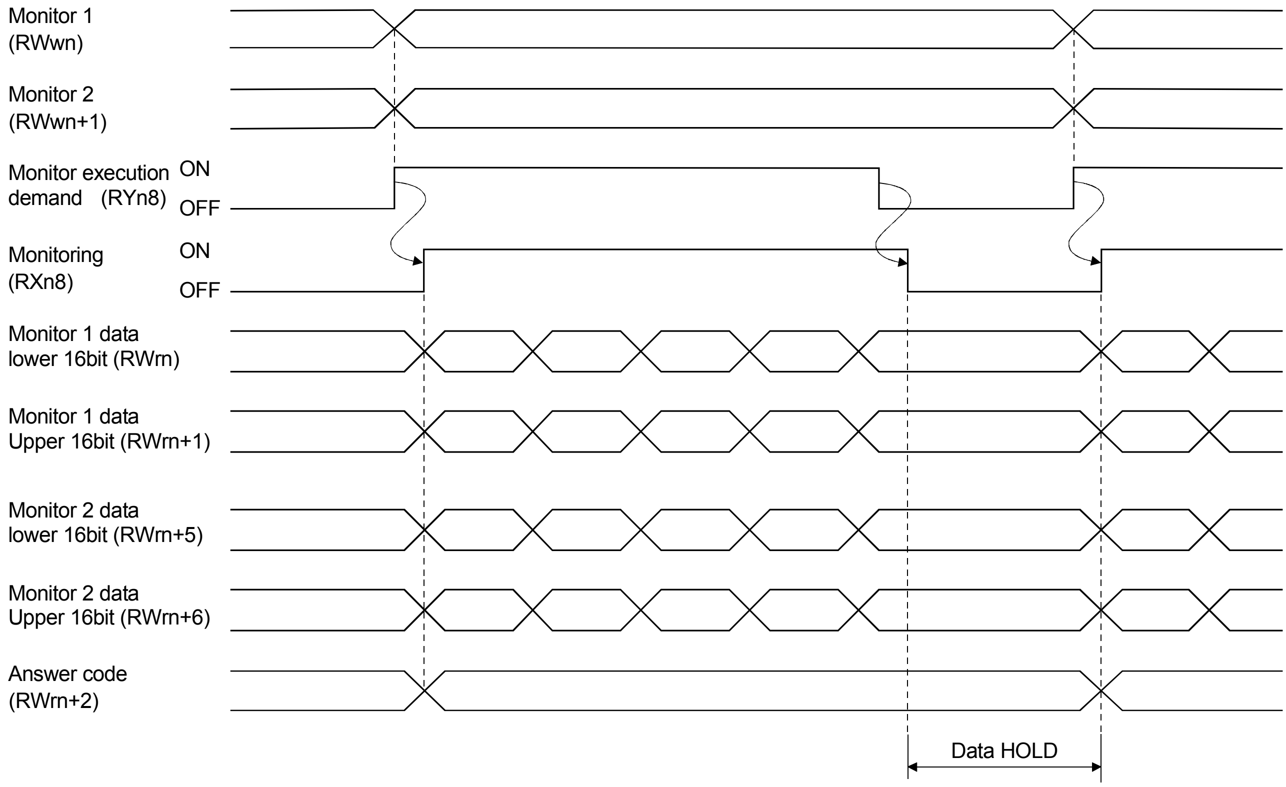


Set the monitor codes (refer to section 3.5.3) to Monitor 1 (RWwn) and Monitor 2 (RWwn+1) and turn Monitor output execution demand (RYn8) to ON. Turning Monitor execution demand (RYn8) to ON sets the next data. Data are all hexadecimal numbers. At this time, Monitoring (RXn8) turns to ON at the same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

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

For 32-bit data, set the lower 16 bits of the monitor code to Monitor 1 (RWwn) and the upper 16 bits to Monitor 2 (RWwn+1) and read them simultaneously.
The monitor data set to the remote register are always updated while Monitor execution demand (RYn8) is ON.
When Monitoring (RXn8) turns to OFF, the data set to Monitor data RWrn, RWrn+1 are held. If the monitor code not in the specifications is set to either Monitor 1 (RWwn) or Monitor 2 (RWwn+1), the corresponding error code (□□□1) is set to Answer code.

(2) When 2 stations are occupied



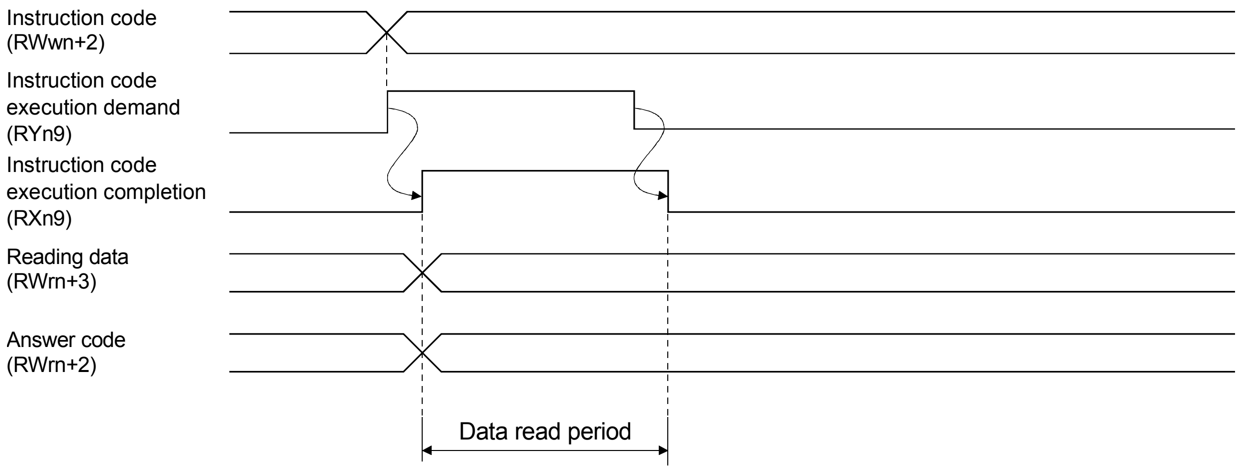
Set the monitor codes (refer to section 3.5.3) to Monitor 1 (RWwn) and Monitor 2 (RWwn+1) and turn Monitor output execution demand (RYn8) to ON. Turning Monitor execution demand (RYn8) to ON sets the next data. 32-bit data are all divided into the upper 16 bits and lower 16 bits, and set to the remote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

Monitor data 1 lower 16 bit (RWrn): Lower 16 bits of data demanded by Monitor 1 (RWwn)
Monitor data 1 upper 16 bit (RWrn+1): Upper 16 bits of data demanded by Monitor 1 (RWwn)
Monitor data 2 lower 16 bit (RWrn+5): Lower 16 bits of data demanded by Monitor 2 (RWwn+1)
Monitor data 2 upper 16 bit (RWrn+6): Upper 16 bits of data demanded by Monitor 2 (RWwn+1)

A sign is set if data does not exist in RWrn+1 • RWrn+6. A "+" sign is indicated by "0000", and "—" by "FFFF".
The monitor data set to the remote register are always updated while Monitoring (RXn8) is ON.
When Monitoring (RXn8) turns to OFF, the data set to Monitor data RWrn, RWrn+1, RWrn+5, RWrn+6 are held.
If the monitor code not in the specifications is set to either Monitor 1 (RWwn) or Monitor 2 (RWwn+1), the corresponding error code (□□□ 1) is set to Answer code.

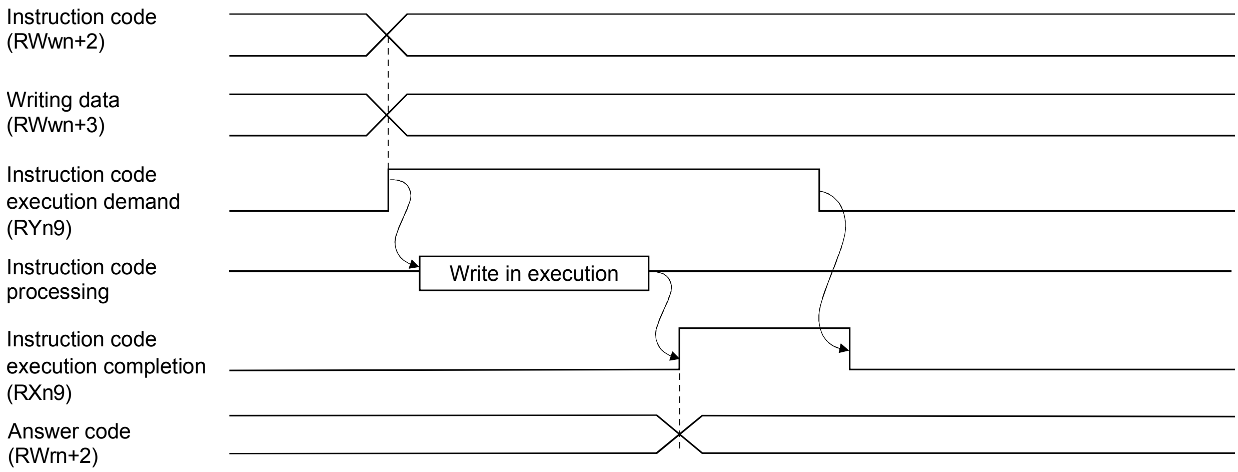
3.6.2 Instruction codes

(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 (□ □ 1 □) is set to Answer code. If any unusable parameter, point table is read, the corresponding error code (□ □ 2 □) is set.
Turn Instruction code execution demand (RYn9) to OFF after completion of data read.

(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 (□□1□) 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

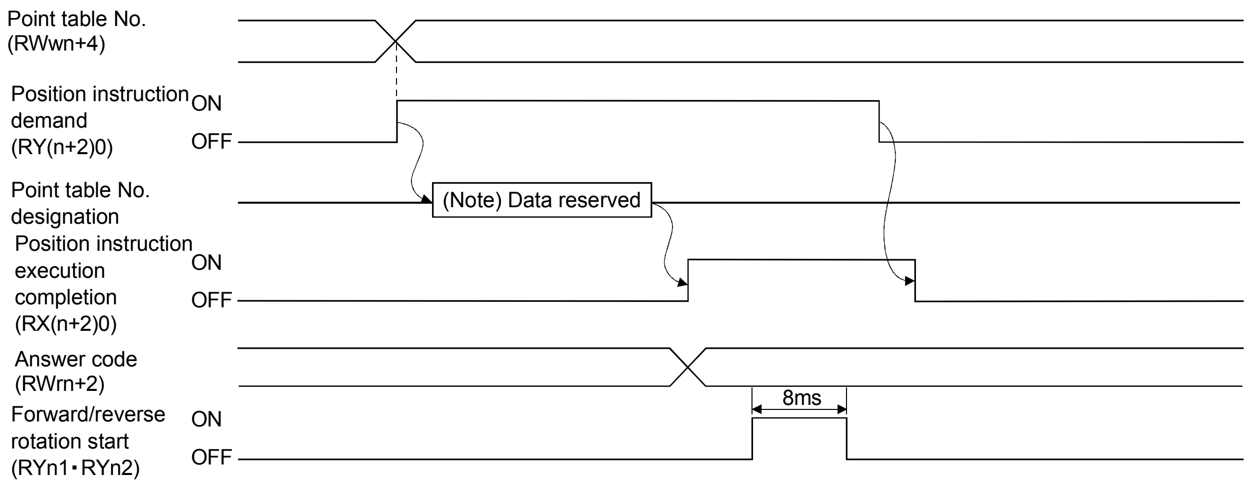
The functions in this section are usable when Position/speed specifying system selection (RY(n+2)A) is ON (remote register-based position/speed specifying system is selected) with 2 stations occupied.
The position command/speed command necessary for positioning can be selected by parameter No. 41 setting as indicated below.

Parameter No.41

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 servo motor speed.

(1) When setting the point table No.

Specify the point table No. stored in the servo amplifier and execute positioning.
Preset "□□□ 0" (initial value) in parameter No. 41 to enable point table No.-setting operation.



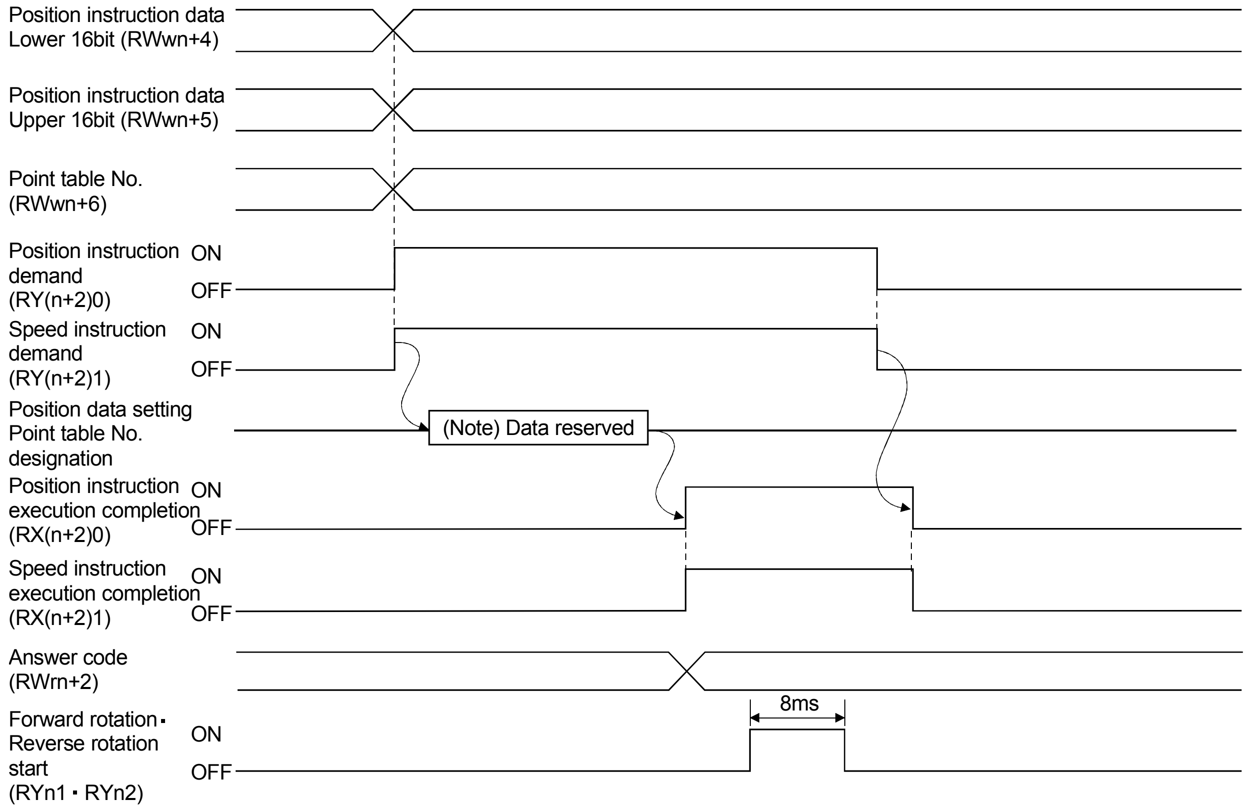
Note. This data is stored into RAM of the servo amplifier. Hence, the data is cleared when power is switched off.

Set the point table No. to point table No. (RWwn+4) and turn Position instruction demand (RY(n+2)0) to ON.
Turning (RY(n+2)0) to ON stores the position block No. into RAM of the servo amplifier.
When the data is stored, Position instruction execution completion (RX(n+2)0) turns to ON.
If data outside the setting range is set to Position block No. (RWwn+4), the error code (refer to section 3.5.5) is set to 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 "□ □ □ 1" in parameter No. 41 to enable position command data-set and point table No. (speed instruction)-setting operation.



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

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

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

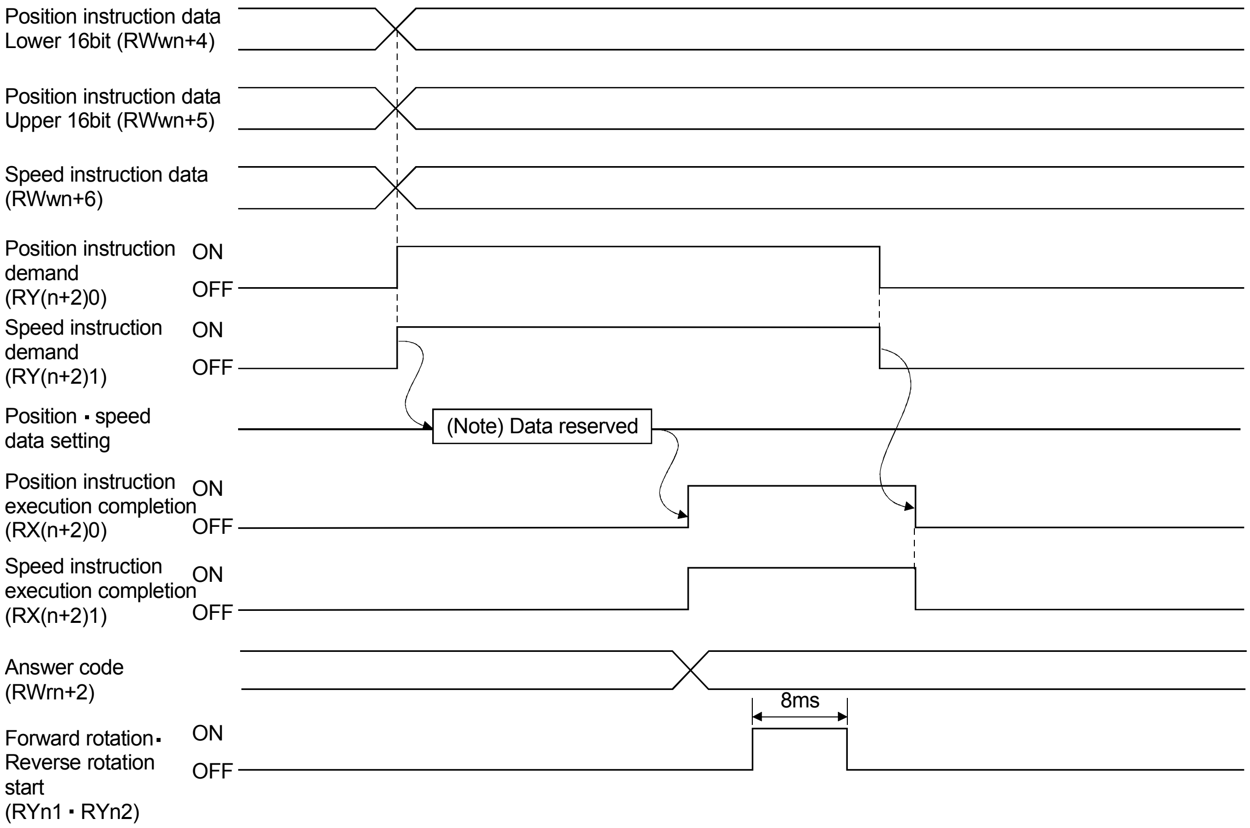
When the data are stored, Position instruction execution completion (RX(n+2)0) and Speed instruction execution completion (RX(n+2)1) turn to ON.

If data outside the setting range is set to any of Position instruction data lower 16 bit (RWwn+4), Position instruction data upper 16 bit (RWwn+5) and point table No. (RWwn+6), the error code (refer to section 3.5.5) is set to 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 "□ □ □ 2" in parameter No. 41 to enable position command data- and speed command data-set operation.



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

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

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

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

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

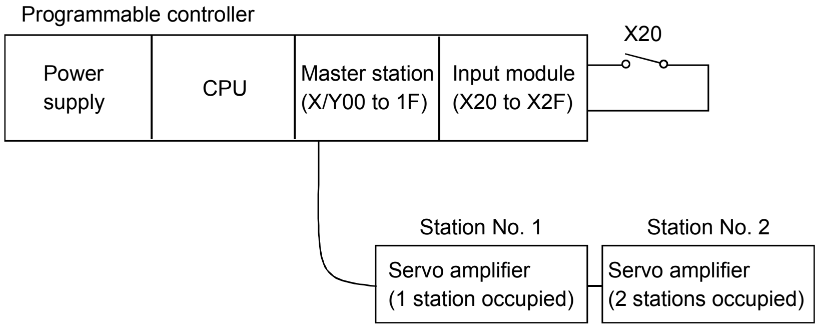
Turn Forward rotation start (RYn1)・Reverse rotation start (RYn2) to ON after Position instruction execution completion (RX(n+2)0) and Speed instruction execution completion (RX(n+2)1) have turned to ON.

3.7 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.

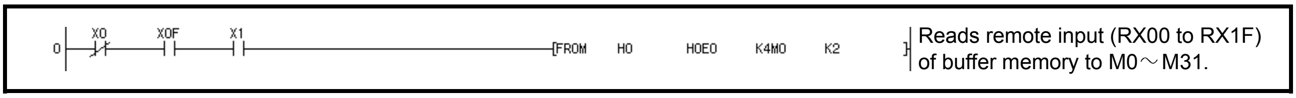
3.7.1 System configuration example

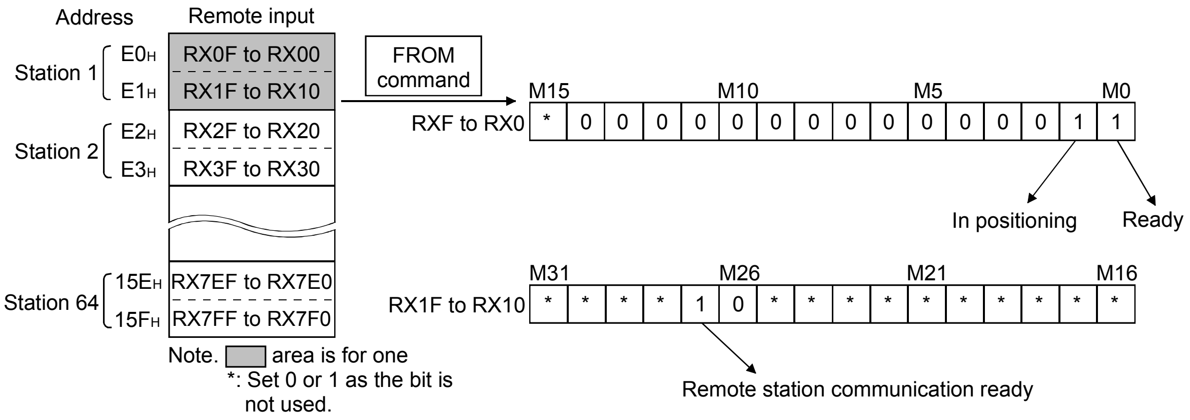
As shown below, the CC-Link system master・local unit is loaded to run two servo amplifiers (1 station occupied / 2 stations occupied).



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～M31.



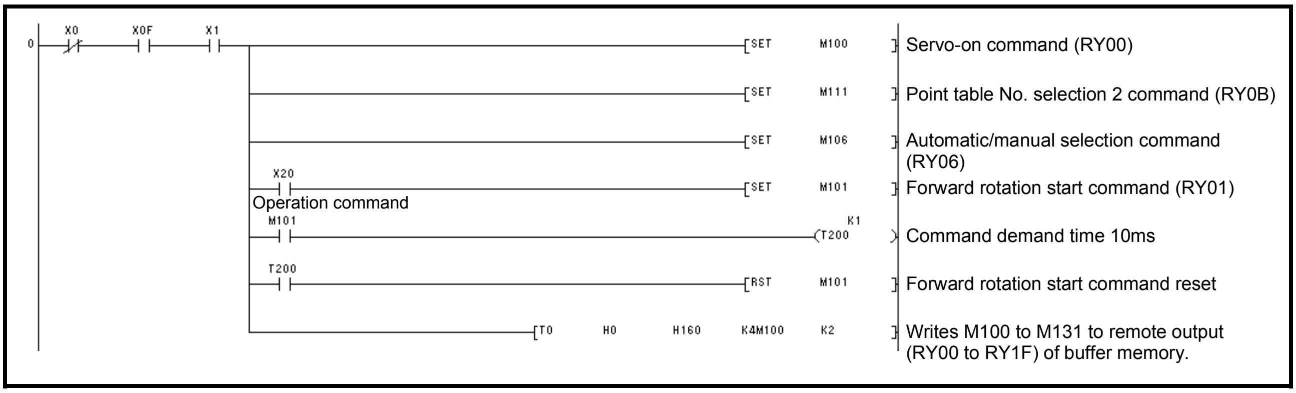


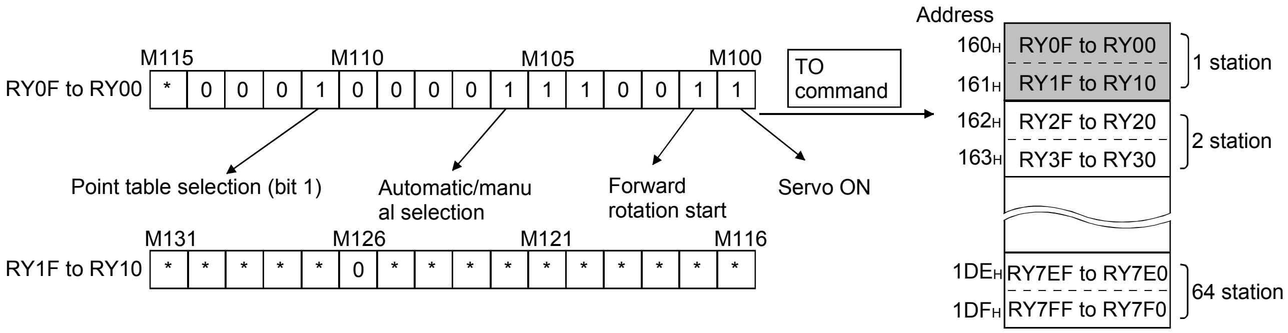
Servo amplifier status (1 station occupied)

M0: Ready (RD)	M8: Monitoring (MOF)	M16: ―――	M24: ―――
M1: In position (INP)	M9: Instruction code execution completion (COF)	M17: ―――	M25: ―――
M2: Rough match (CPO)		M18: ―――	M26: Trouble (ALM)
M3: Home position return completion (ZP)	M10: Warning (WNG)	M19: ―――	M27: Remote station communication ready (CRD)
	M11: Battery warning (BWNG)	M20: ―――	
M4: Limiting torque (TLC)	M12: Movement finish (MEND)	M21: ―――	
M5: ―――	M13: ―――	M22: ―――	M28: ―――
M6: Electromagnetic brake interlock (MBR)	M14: Position range (POT)	M23: ―――	M29: ―――
			M30: ―――
M7: Temporary stop (PUS)	M15: ―――		M31: ―――

3.7.3 Writing the operation commands

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





Note. area is for one servo amplifier.
*: Set 0 as the bit is not used.

Operation commands (1 station occupied)

M100:	Servo-on (SON)	M108:	Monitor output execution demand (MOR)	M116:	———	M124:	———
M101:	Forward rotation start (ST1)			M117:	———	M125:	———
M102:	Reverse rotation start (ST2)	M109:	Instruction code execution demand (COR)	M118:	———	M126:	Reset (RES)
M103:	Proximity dog (DOG)			M119:	———	M127:	———
M104:	Forward rotation stroke end (LSP)	M110:	Point table No. selection 1 (DI0)	M120:	———	M128:	———
		M111:	Point table No. selection 2 (DI1)	M121:	———	M129:	———
M105:	Reverse rotation stroke end (LSN)	M112:	Point table No. selection 3 (DI2)	M122:	———	M130:	———
		M113:	Point table No. selection 4 (DI3)	M123:	———	M131:	———
M106:	Automatic/manual selection (MD0)	M114:	Point table No. selection 5 (DI4)				
		M115:	———				
M107:	Temporary stop (STP)						

3.7.4 Reading the data

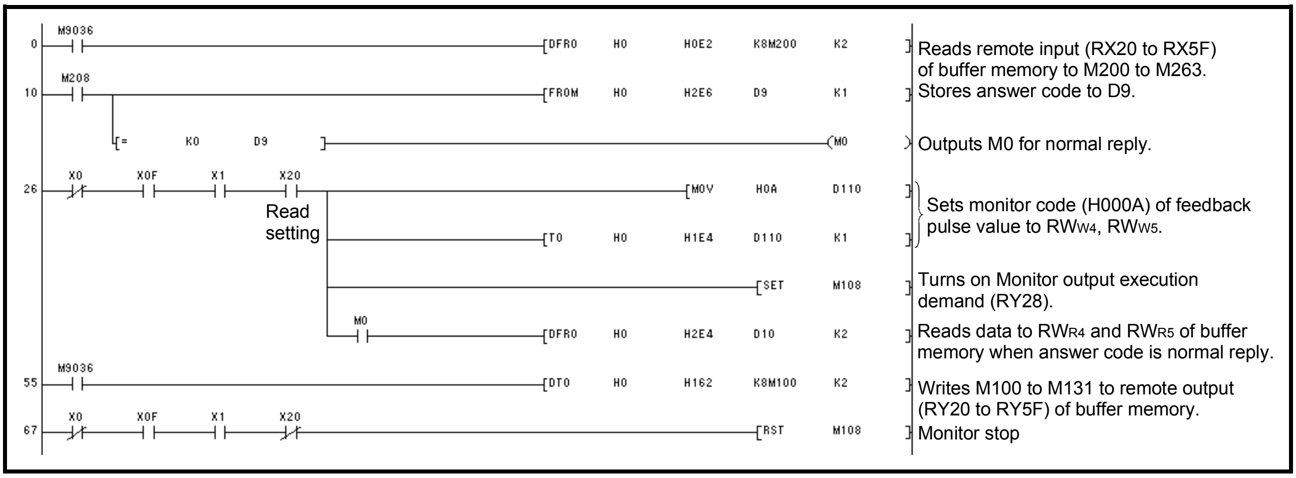
Read various data of the servo amplifier.

(1) Reading the monitor value

Read the (feedback pulse value) of the servo amplifier of station 2 to D10.

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

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

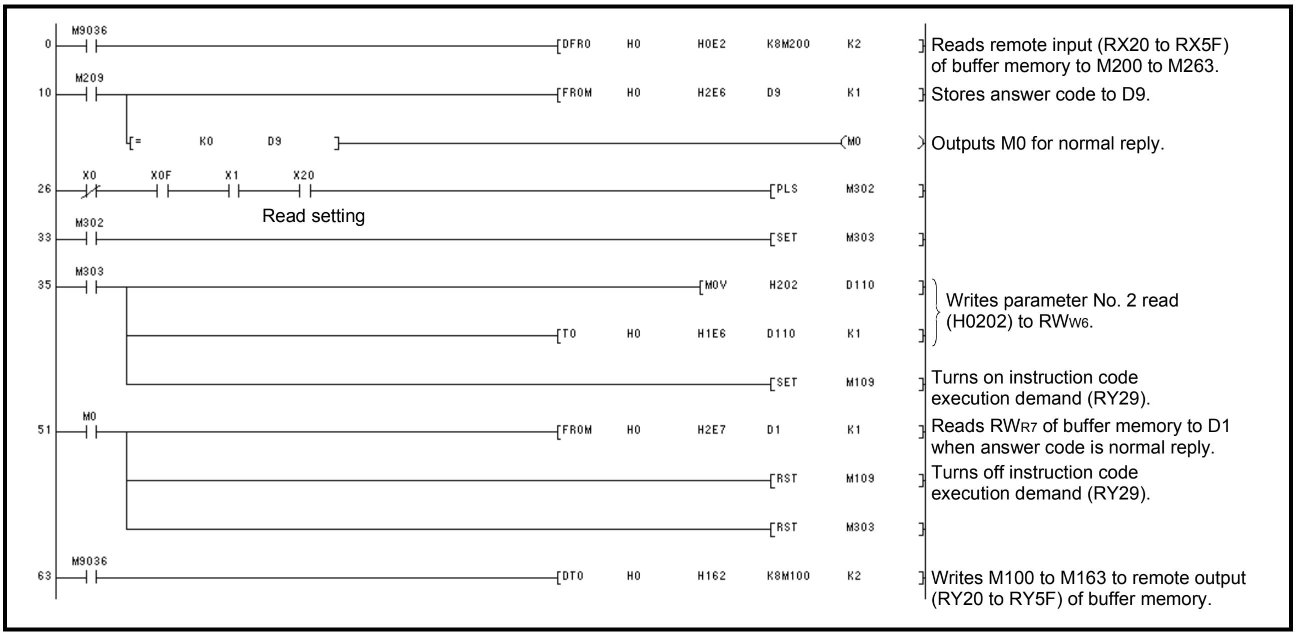


(2) Reading the parameter

Read parameter No. 2 “Function selection 1” of the servo amplifier of station 2 to D1.

Data No.	Description
H0202	Parameter No. 2 setting (hexadecimal)

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

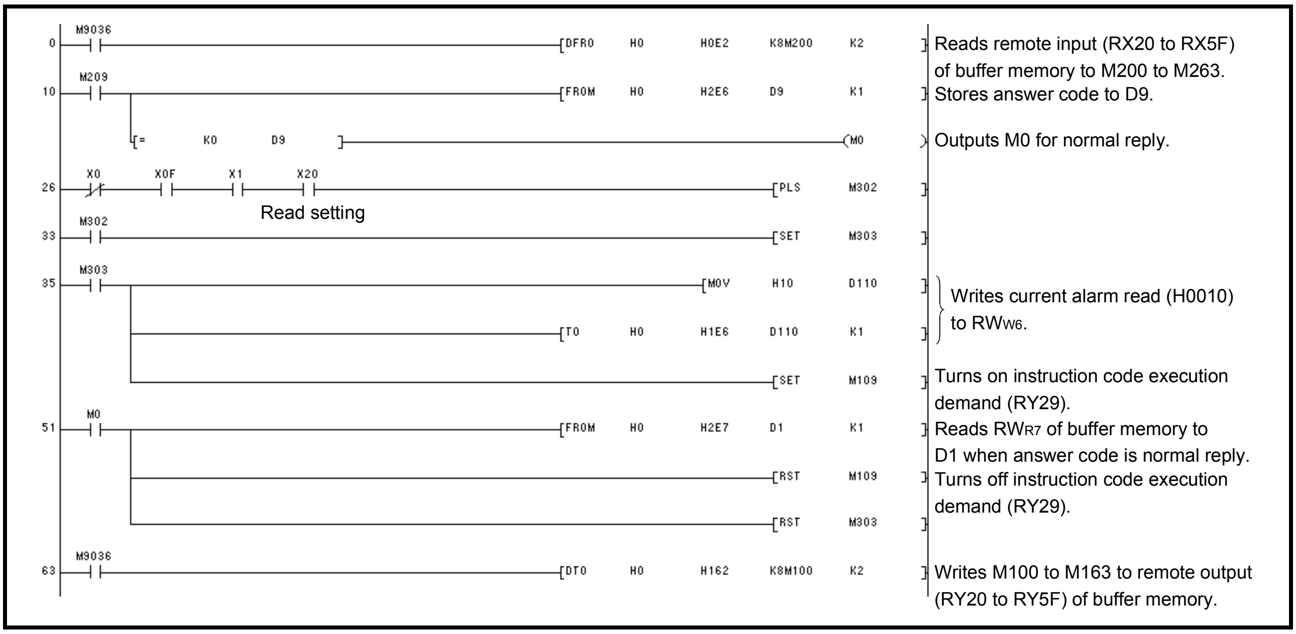


(3) Reading the alarm definition

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.



3.7.5 Writing the data

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

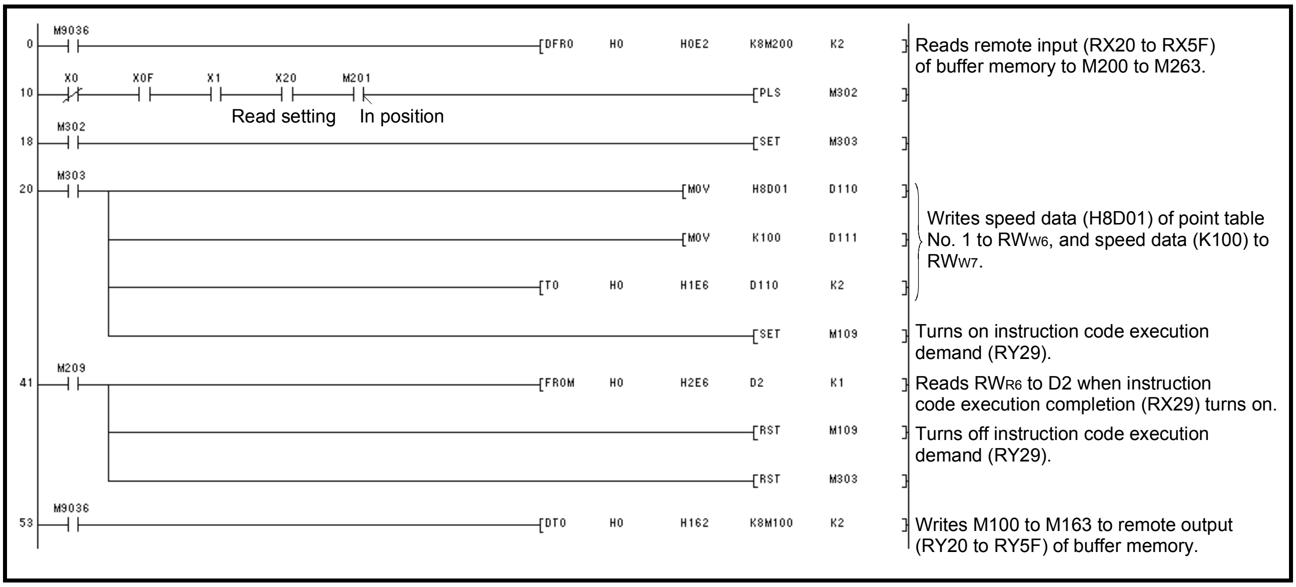
(1) Writing the servo motor speed data of point table

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)

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.



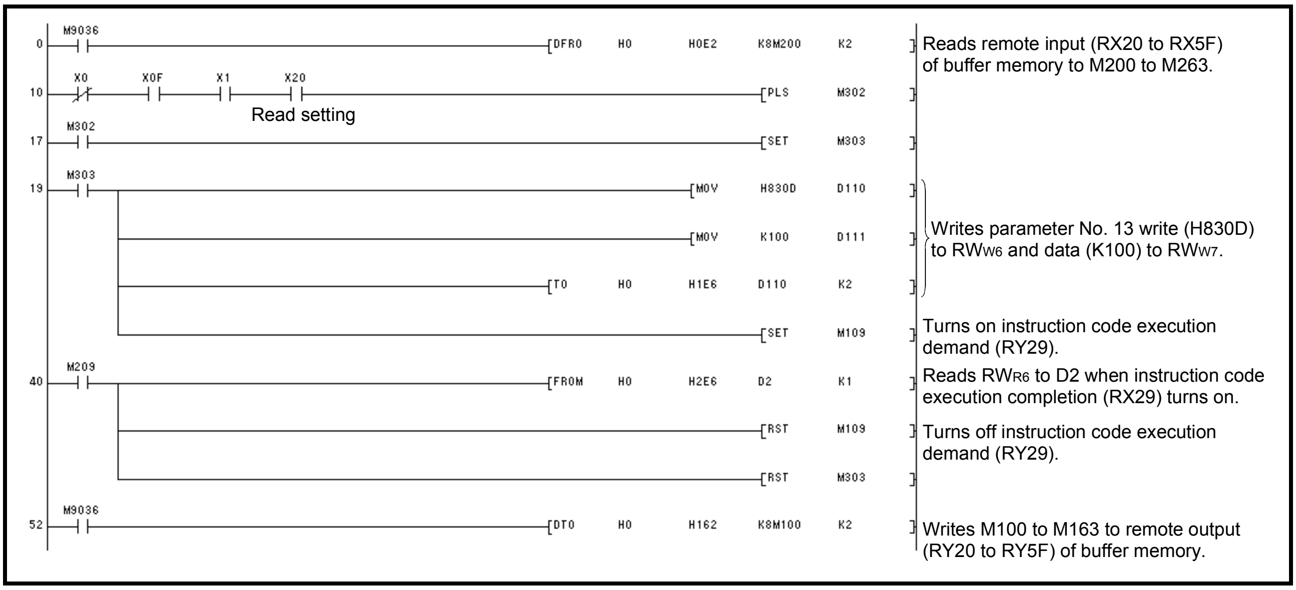
(2) Writing the parameter

Change parameter No. 13 (JOG speed) of the servo amplifier of station 2 to “100”.

Code No.	Description
H830D	Parameter No. 13 write (hexadecimal)

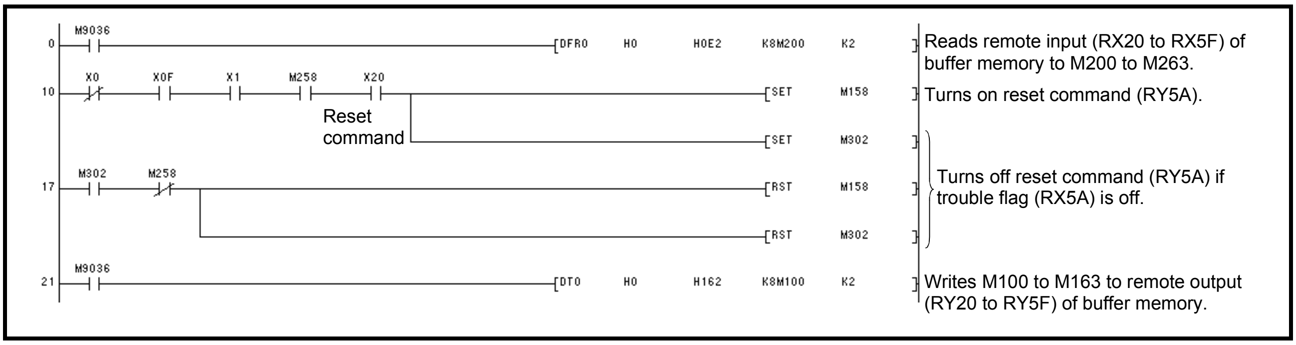
Set data	Description
K100	Set data (decimal)

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



(3) Servo amplifier alarm resetting program examples

(a) Deactivate the alarm of the servo amplifier of station 2 by issuing a command from the programmable controller. This method is limited to servo alarm occurrence.

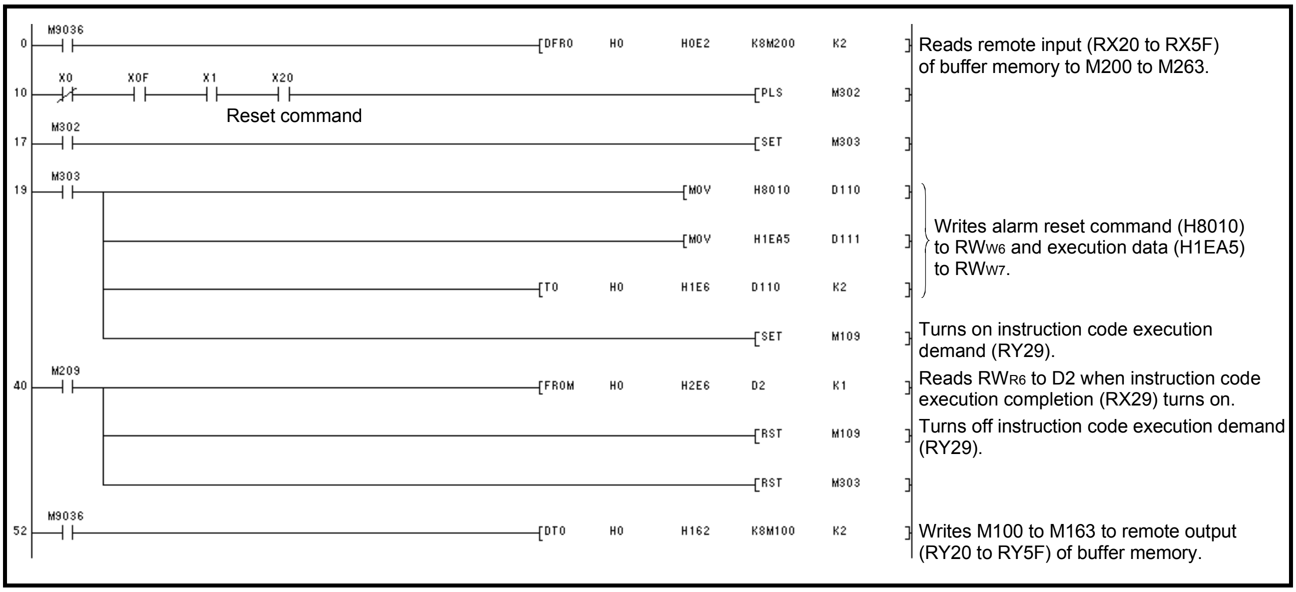


(b) Deactivate the alarm of the servo amplifier of station 2 using the instruction code.

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.



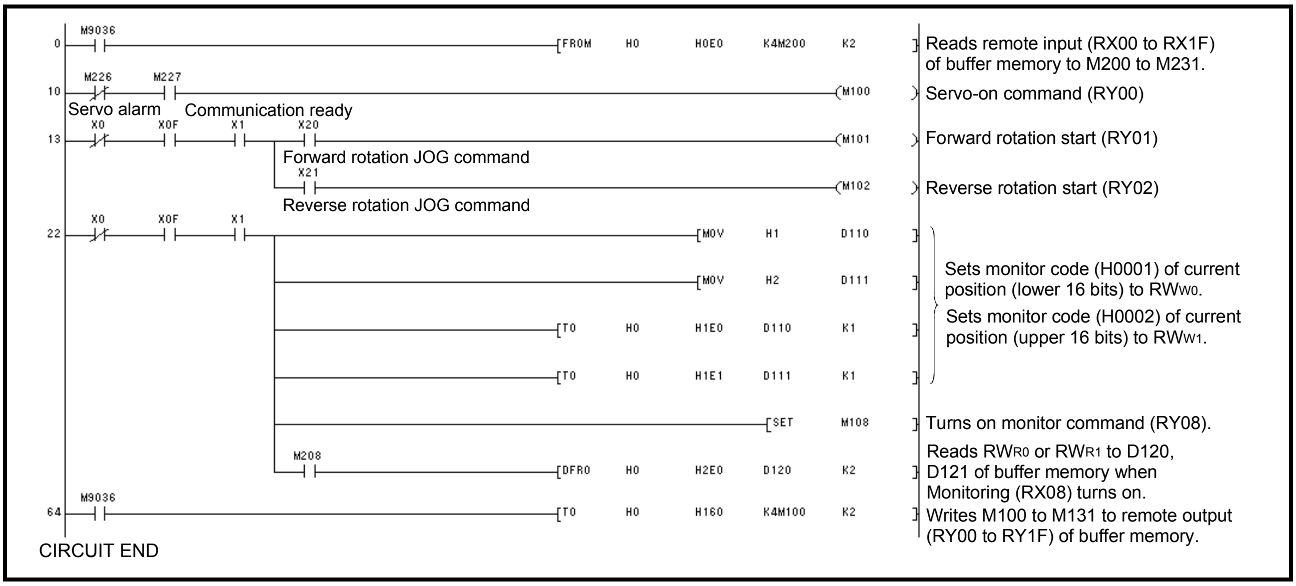
3.7.6 Operation

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)

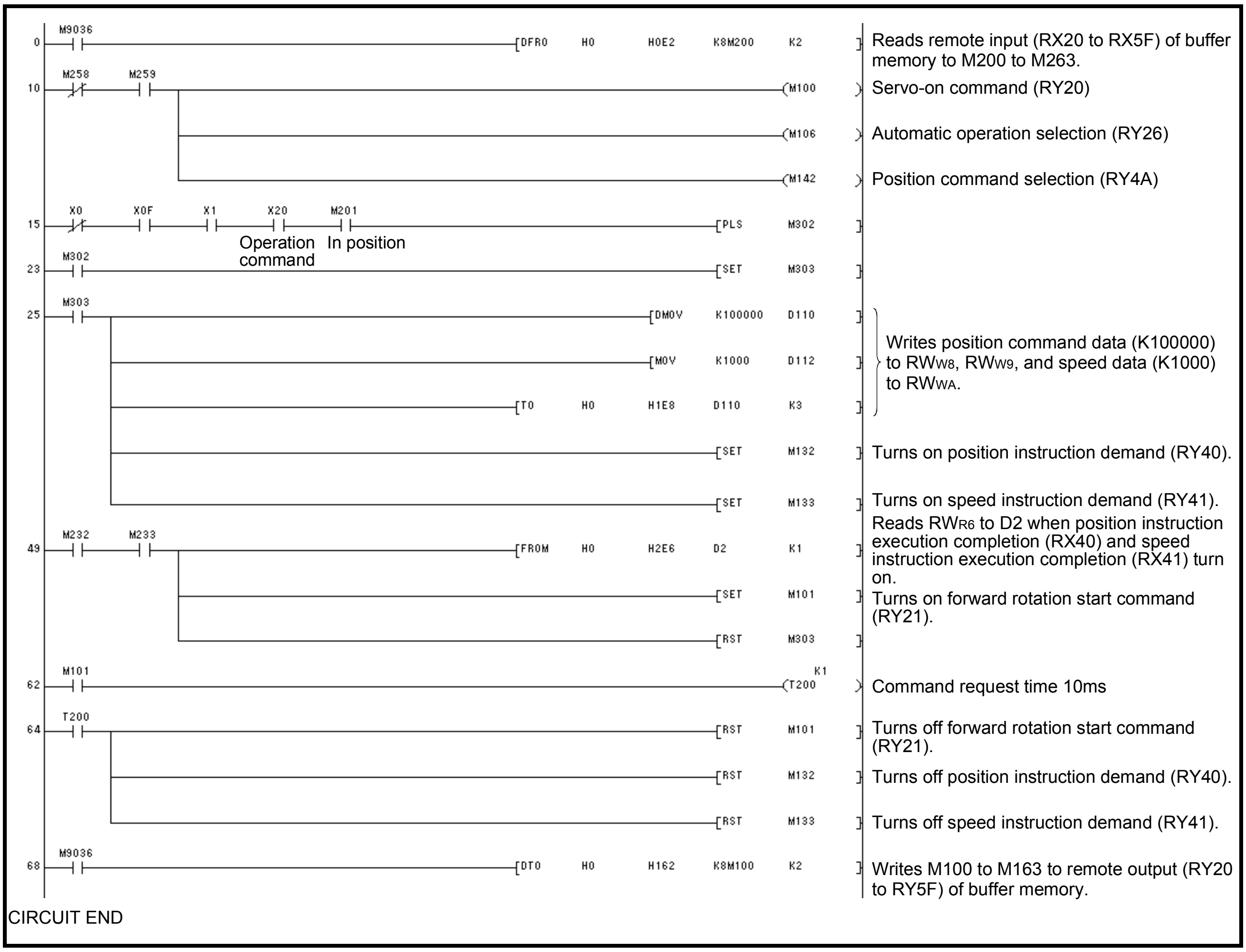


(2) Remote register-based position data/speed data setting

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 "□□□2" in parameter No. 41.

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

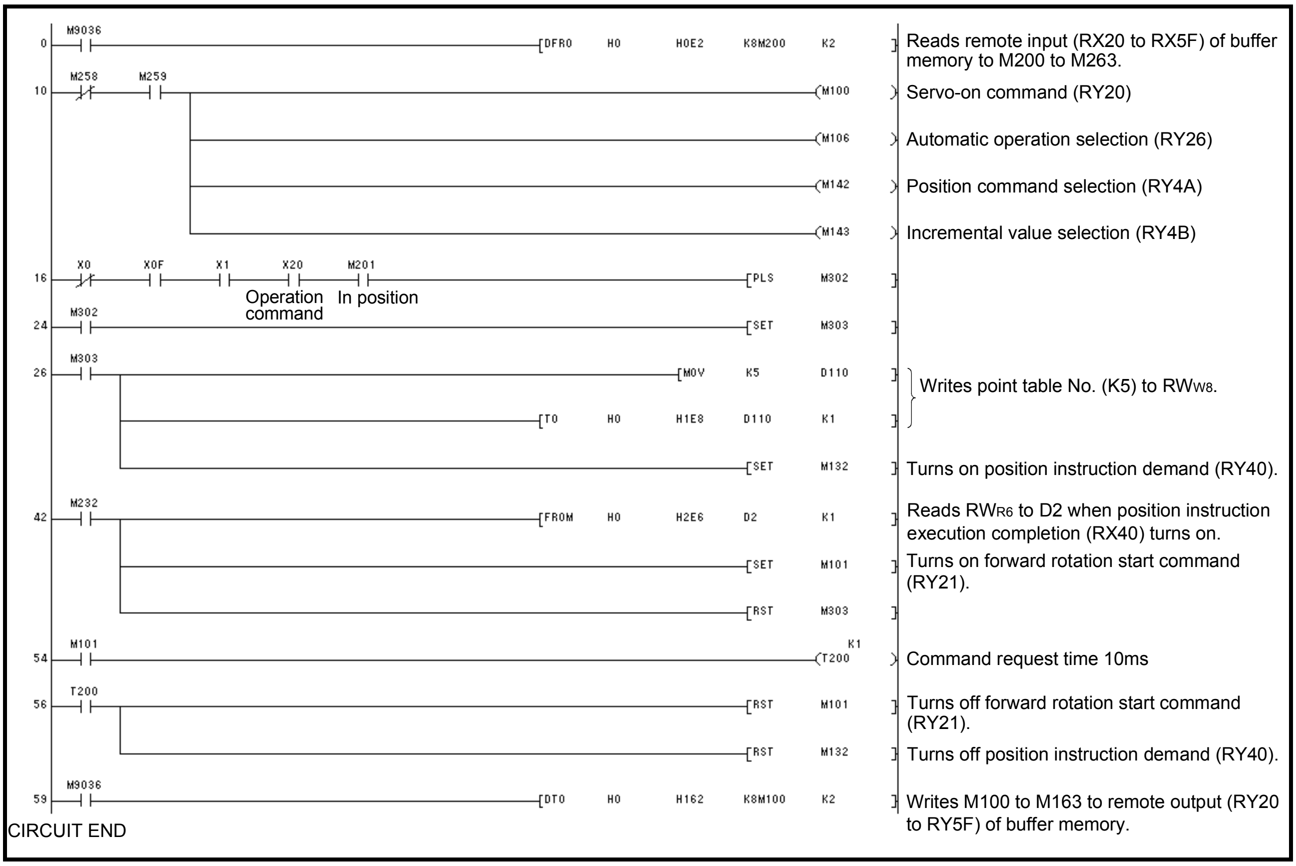


(3) Remote register-based point table No. setting (incremental value command system)

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

Preset "□□0□" in parameter No. 0 and "□□□2" in parameter No. 41.

Set data	Description
K5	Point table No. (decimal)

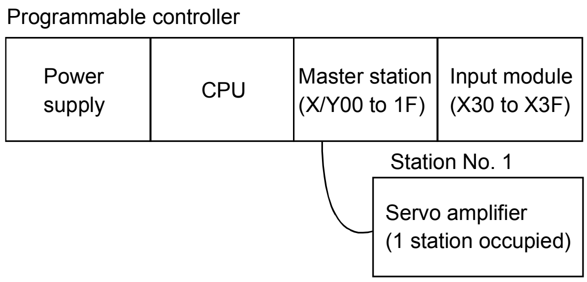


3.8 Continuous operation program example

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).



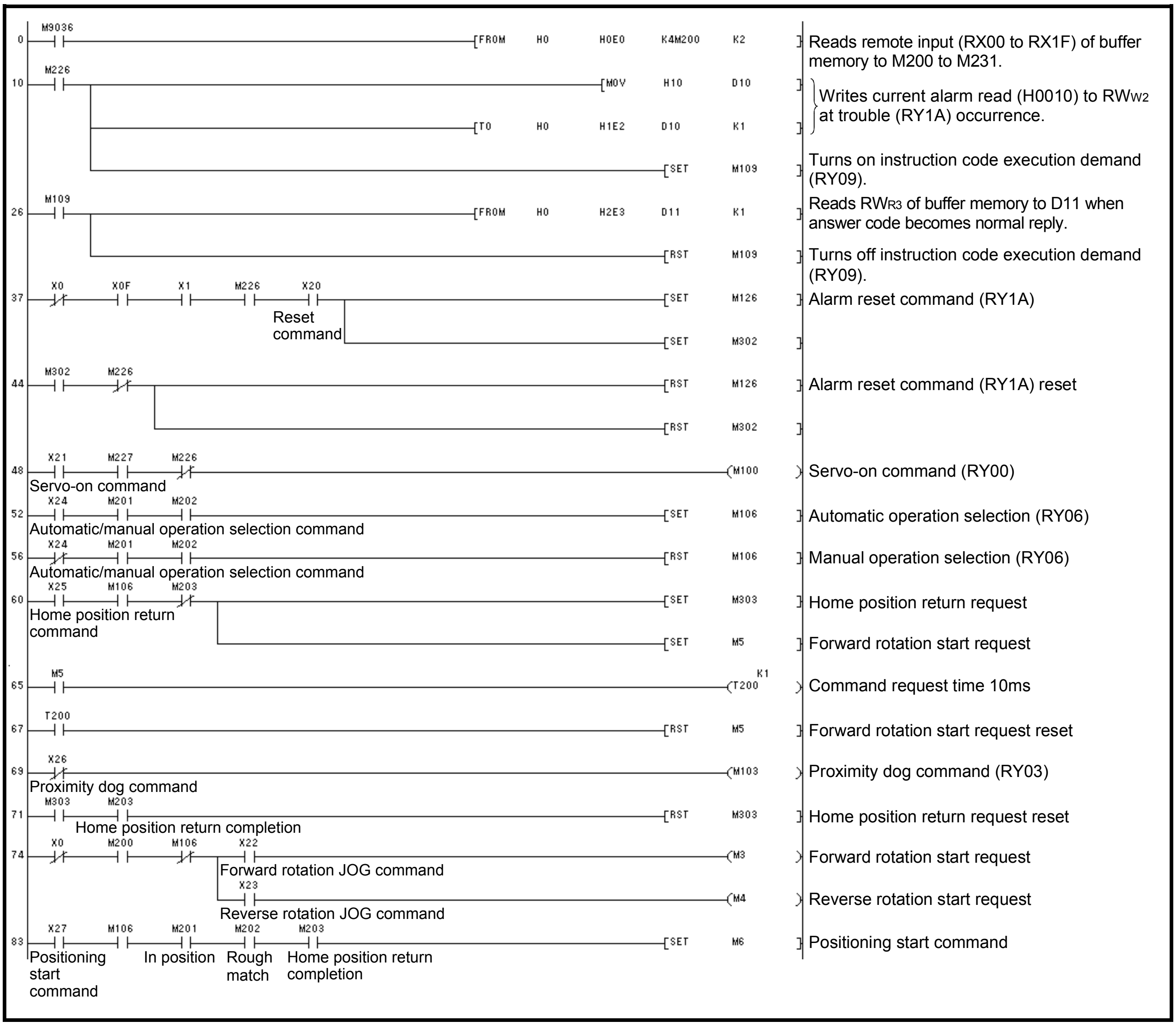
3.8.2 Program example when 1 station is occupied

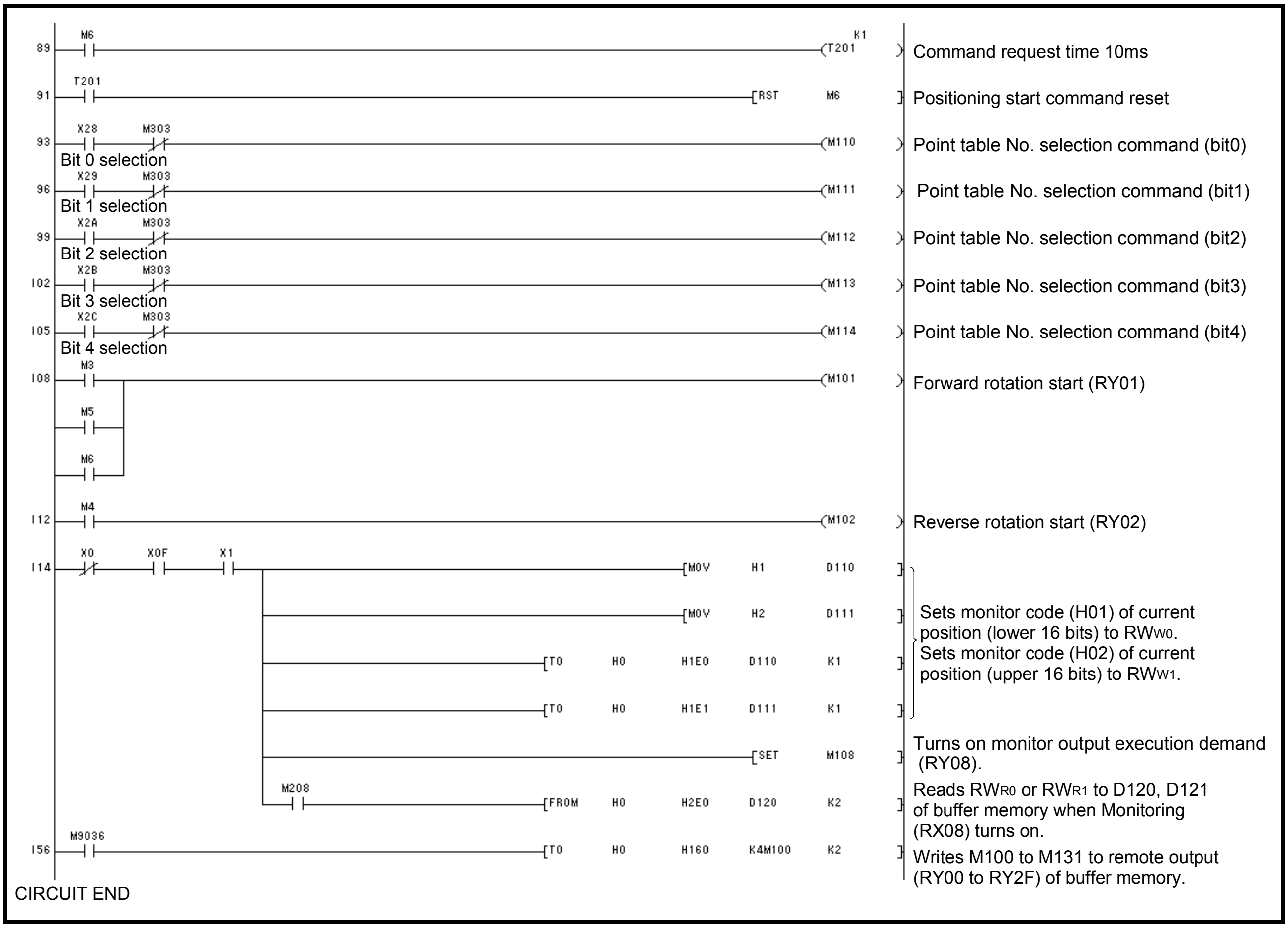
POINT
• To execute a dog type home position return with the CC-Link communication functions, set "□ □ 3 □" in parameter No. 116 and use Proximity dog (DOG) with the remote input (RY03) in this example.

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

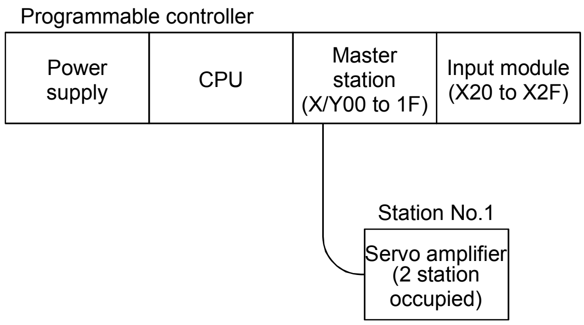
Code No.	Description
H0001	Lower 16-bit data of current position (hexadecimal)
H0002	Upper 16-bit data of current position (hexadecimal)





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

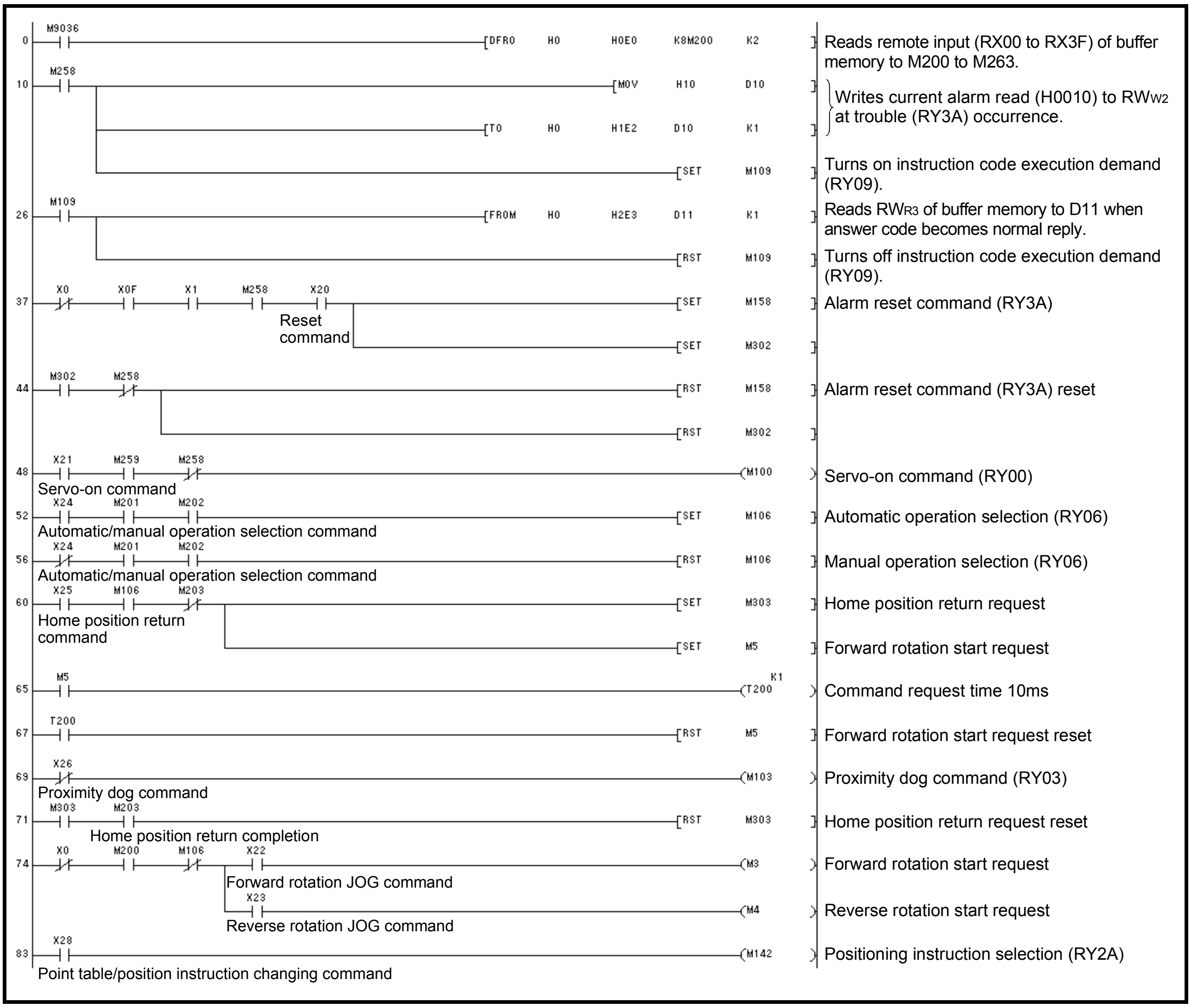
> **POINT**
> - To execute a dog type home position return with the CC-Link communication functions, set "□ □ 3 □" in parameter No. 116 and use Proximity dog (DOG) with the remote input (RY03) in this example.

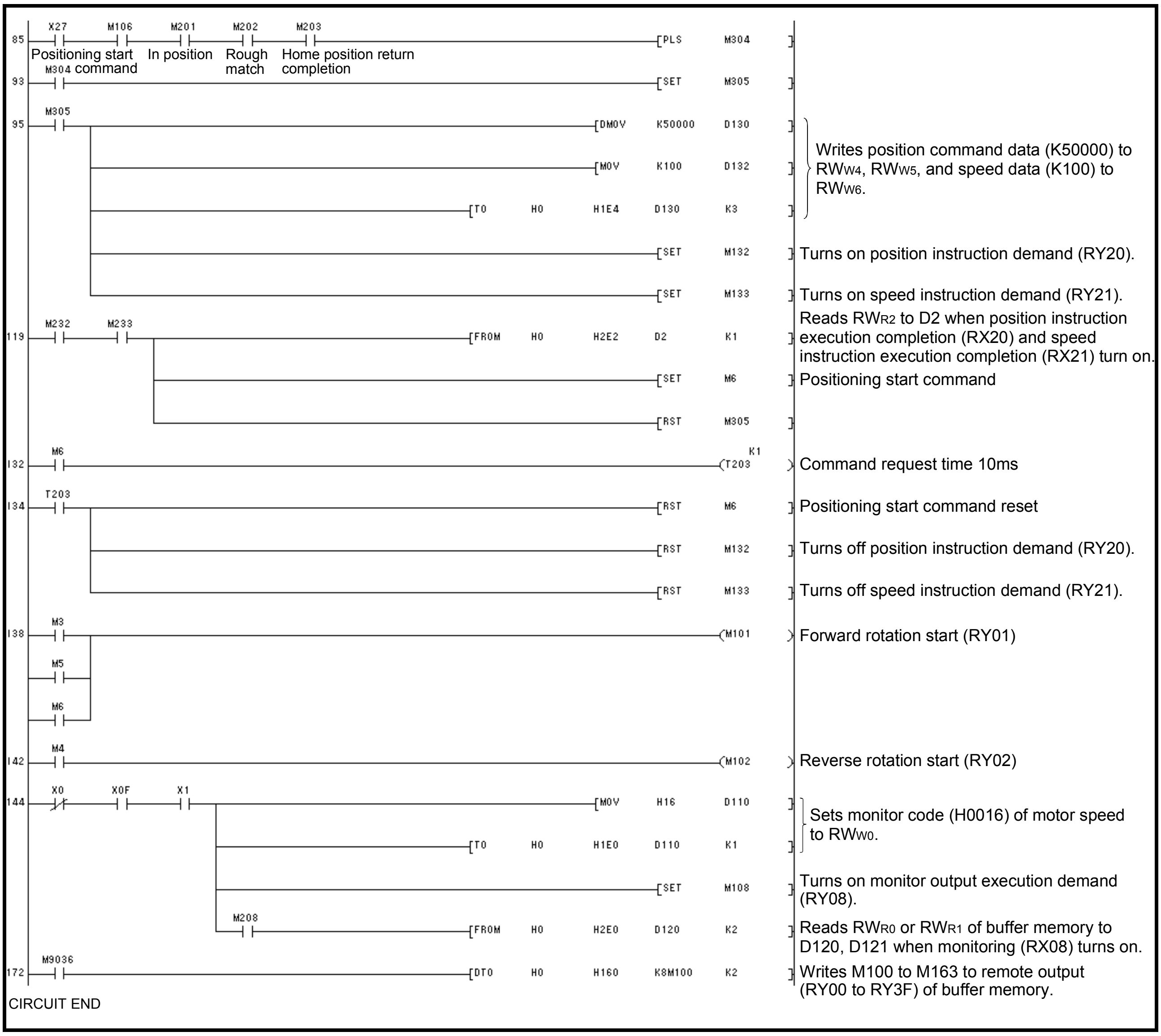
Operate the servo amplifier of station 1 in the positioning mode and read the "motor speed" data.

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)




85
X27
M106
M201
M202
M203
PLS M304
Positioning start command
In position
Rough match
Home position return completion
93
M304
SET M305
95
M305
DMOV K50000 D130
MOV K100 D132
TO H0 H1E4 D130 K3
Writes position command data (K50000) to RWw4, RWw5, and speed data (K100) to RWw6.
SET M132
Turns on position instruction demand (RY20).
SET M133
Turns on speed instruction demand (RY21).
119
M232
M233
FROM H0 H2E2 D2 K1
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
132
M6
K1
T203
Command request time 10ms
134
T203
RST M6
Positioning start command reset
RST M132
Turns off position instruction demand (RY20).
RST M133
Turns off speed instruction demand (RY21).
138
M3
M5
M6
M101
Forward rotation start (RY01)
142
M4
M102
Reverse rotation start (RY02)
144
X0
X0F
X1
MOV H16 D110
TO H0 H1E0 D110 K1
Sets monitor code (H0016) of motor speed to RWw0.
SET M108
Turns on monitor output execution demand (RY08).
M208
FROM H0 H2E0 D120 K2
Reads RWr0 or RWr1 of buffer memory to D120, D121 when monitoring (RX08) turns on.
172
M9036
DTO H0 H160 K8M100 K2
Writes M100 to M163 to remote output (RY00 to RY3F) of buffer memory.
CIRCUIT END

4. SIGNALS AND WIRING

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

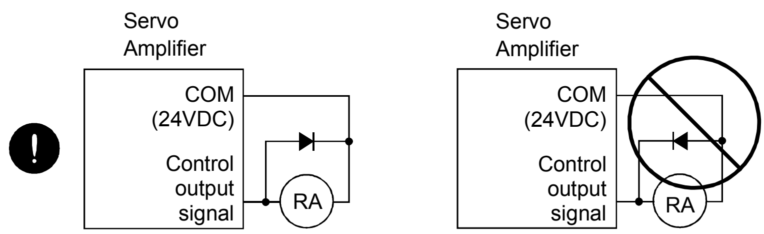
⚠CAUTION

・Wire the equipment correctly and securely. Otherwise, the servo motor may 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.



・Use a noise filter, etc. to minimize the influence of electromagnetic interference, which may be given to electronic equipment used near the servo amplifier.

・Do not install a power capacitor, surge suppressor or radio noise filter (FR-BIF option) with the power line of the servo motor.

・When using the regenerative resistor, switch power off with the alarm signal. Otherwise, a transistor fault or the like may overheat the regenerative resistor, causing a fire.

・Do not modify the equipment.

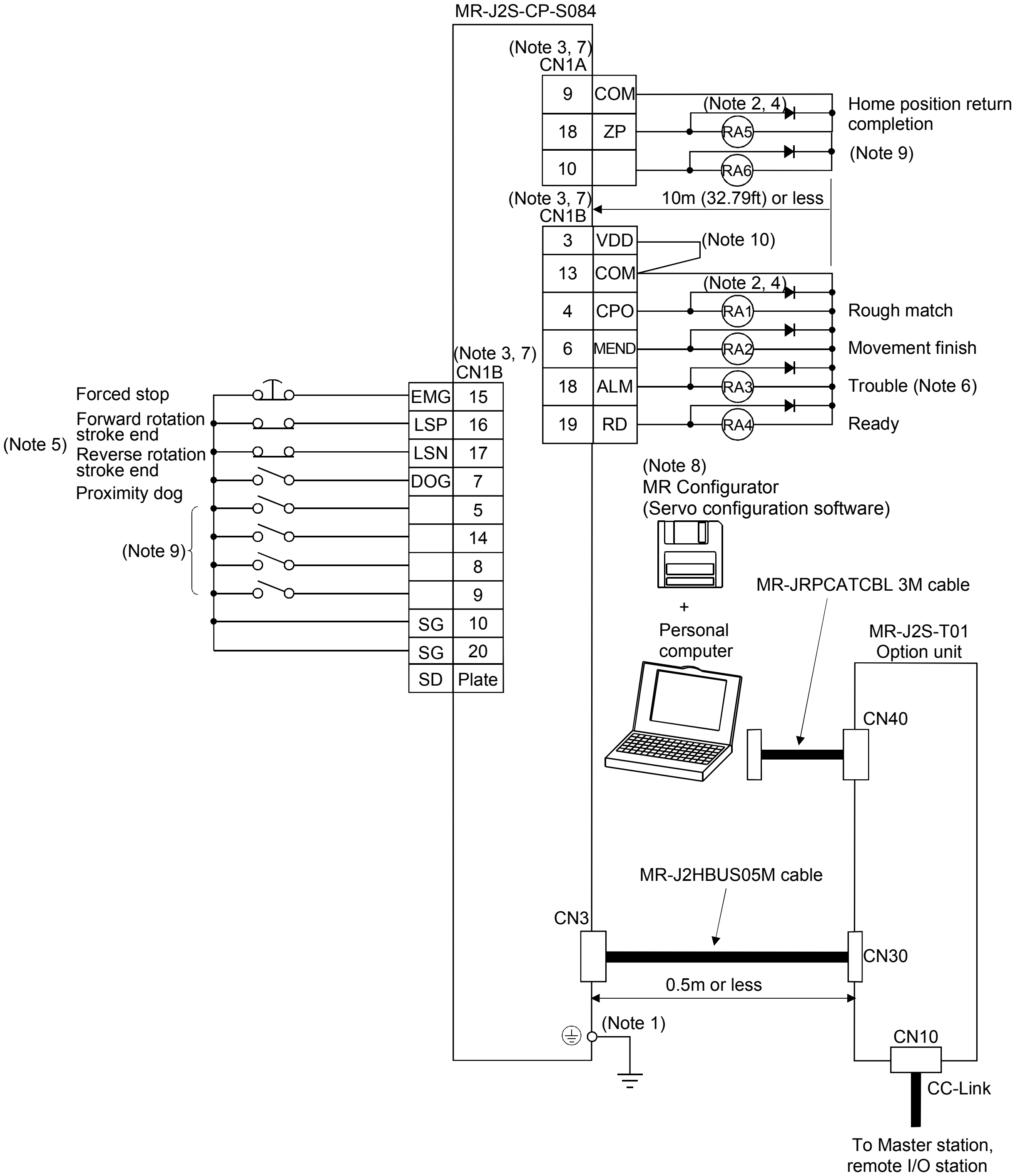
・During power-on, do not open or close the motor power line. Otherwise, a malfunction or faulty may occur.

POINT

・CN1A, CN1B, CN2 and CN3 have the same shape. Wrong connection of the connectors will lead to a failure. Connect them correctly.

4.1 Standard connection example

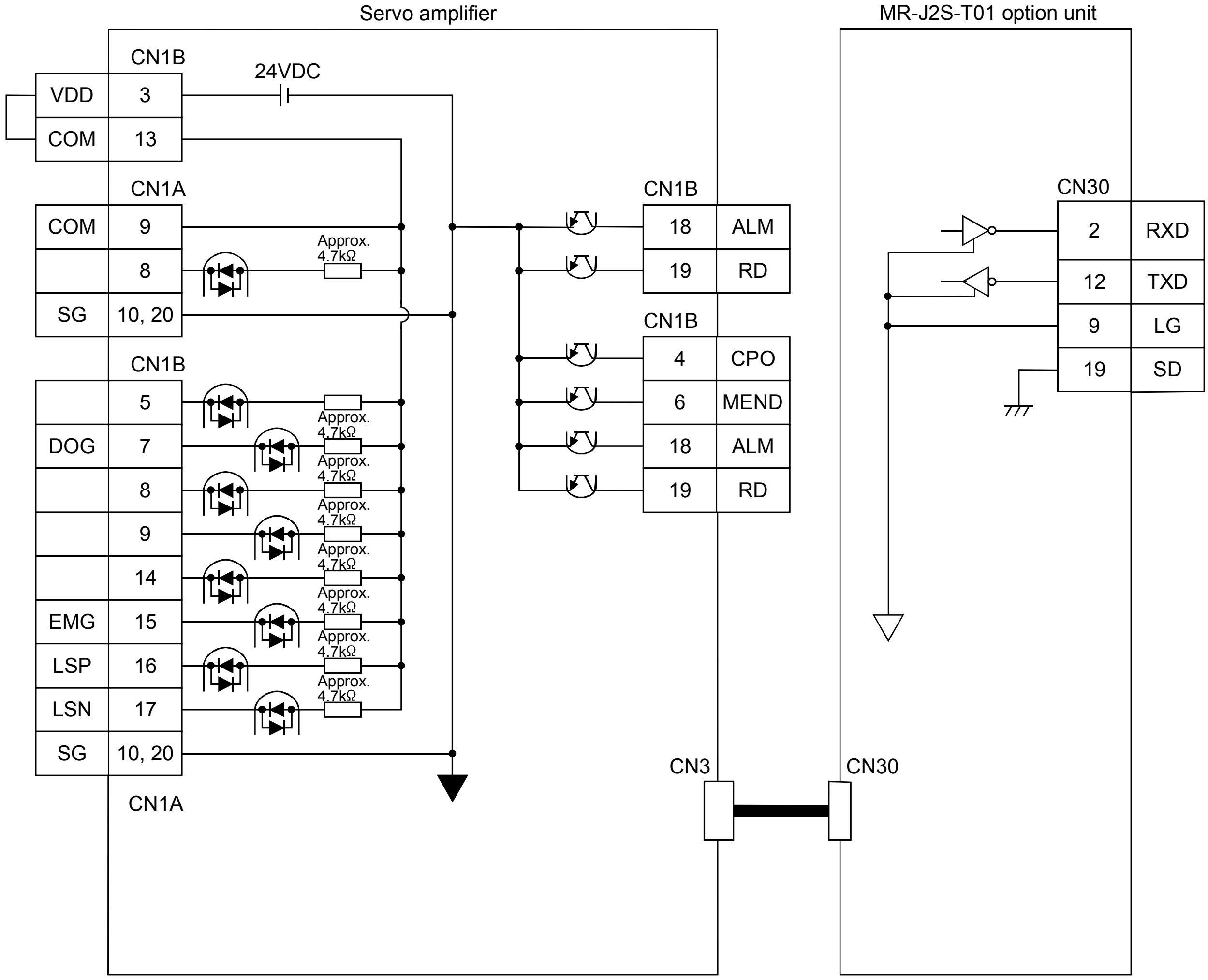
> **POINT**
> - As the cable for connection of the servo amplifier and option unit, always use the MR-J2HBUS05M of 0.5m long. It is not recommended to fabricate this cable on the user side.



Note 1. To prevent an electric shock, always connect the protective earth (PE) terminal (⏚) 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 forced stop and other protective circuits.
3. CN1A, CN1B, CN2 and CN3 have the same shape. Wrong connection of the connectors will lead to a fault.
4. The sum of currents that flow in the external relays should be 80mA max. If it exceeds 80mA, supply interface power from external.
5. When starting operation, always connect the forward/reverse rotation stroke end (LSN/LSP) with SG. (Normally closed contacts)
6. Trouble (ALM) is connected with COM in normal alarm-free condition.
7. The pins with the same signal name are connected in the servo amplifier.
8. Use MRZJW3-SETUP161E.
9. The signals are not yet assigned in the shipment status.
10. When using the internal power supply (VDD), always connect VDD-COM. Do not connect them when supplying external power. Refer to section 4.6.2.

4.2 Internal connection diagram of servo amplifier

This section gives the internal connection diagram where the signal assignment is in the initial status.

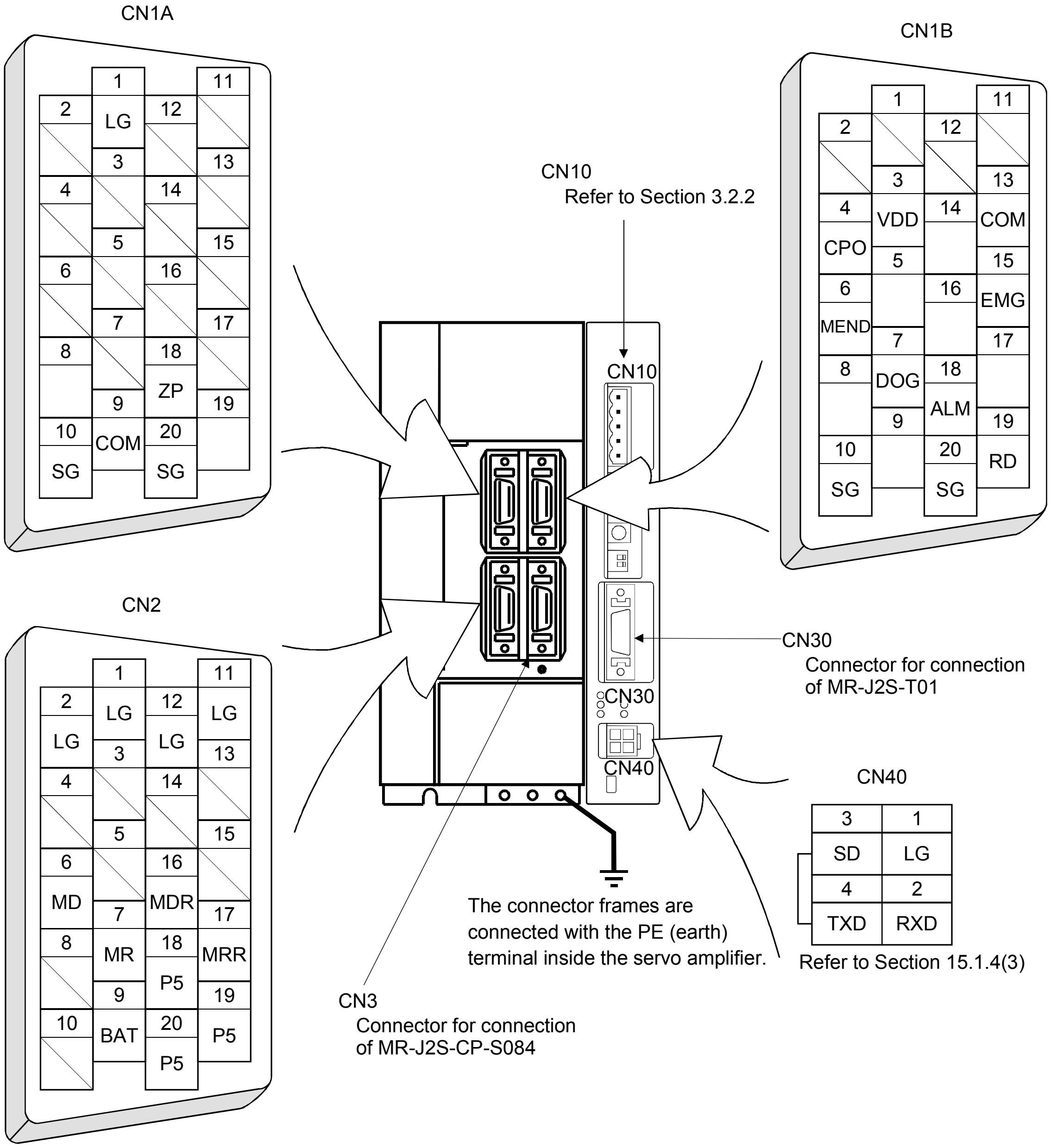


4.3 I/O signals

4.3.1 Connectors and signal arrangements

POINT
・The connector pin-outs shown above are viewed from the cable connector wiring section side. ・To the pins left blank in the CN1A/CN1B connectors, input signals can be assigned by setting parameter No. 116 to 118 and parameter No. 78 to 83.

(1) Signal arrangement



4.3.2 Signal (devices) explanations

(1) I/O devices

POINT
- The devices not indicated in the Connector Pin No. field of the I/O devices can be assigned to the connector CN1A/CN1B using parameter No. 78 to 83, parameter No. 88 to 90 and parameter No. 116 to 118.

(a) Pins whose devices can be changed

Refer to section 4.6.2 for the I/O interfaces (symbols in the I/O Division field in the table) of the corresponding connector pins.

Pin type	Connector pin No.	I/O division	Device in initial status
Input-only pins	CN1A-8	DI-1	Without assigned
	CN1B-5		Without assigned
	CN1B-7		Proximity dog (DOG)
	CN1B-8		Without assigned
	CN1B-9		Without assigned
	CN1B-14		Without assigned
	CN1B-15		Forced stop (EMG)
	CN1B-16		Forward rotation stroke end (LSP)
	CN1B-17		Reverse rotation stroke end (LSN)
I/O pin	CN1A-19	DI-1 or DO-1	The output signal has been assigned in the initial status. Use parameter No. 88 to determine input or output.
Output-only pins	CN1A-18	DO-1	Home position return completion (ZP)
	CN1B-6		Movement finish (MEND)
	CN1B-4		Rough match (CPO)
	CN1B-18		Trouble (ALM)
	CN1B-19		Ready (RD)

(b) Input devices

Device name	Devices symbol	Connector pin No.	Functions/Applications
Forced stop	EMG	CN1B-15	Refer to section 3.5.2 (1).
Servo-on	SON		
Reset	RES		
Forward rotation stroke end	LSP	CN1B-16	
Reverse rotation stroke end	LSN	CN1B-17	
Forward rotation start	ST1		
Reverse rotation start	ST2		
Automatic/manual selection	MD0		
Proximity dog	DOG	CN1A-7	
Point table No. selection 1	DI0		
Point table No. selection 2	DI1		
Point table No. selection 3	DI2		
Point table No. selection 4	DI3		
Point table No. selection 5	DI4		

Device name	Devices symbol	Connector pin No.	Functions/Applications
Internal torque limit selection	TL2		Refer to section 3.5.2 (1).
Proportion control	PC		
Temporary stop/Restart	STP		
Gain changing	CDP		

(c) Output devices

Device name	Devices symbol	Connector pin No.	Functions/Applications
Trouble	ALM	CN1B-18	Refer to section 3.5.2 (2).
Ready	RD	CN1B-19	
Movement finish	MEND	CN1B-6	
Rough match	CPO	CN1B-4	
Home position return completion	ZP	CN1A-18	
Electromagnetic brake interlock	MBR		
Position range	POT		
Warning	WNG		
Battery warning	BWNG		
Limiting torque	TLC		
Temporary stop	PUS		
In position	INP		
Point No. output 1	PTO		
Point No. output 2	PT1		
Point No. output 3	PT2		
Point No. output 4	PT3		
Point No. output 5	PT4		

(2) Power supply

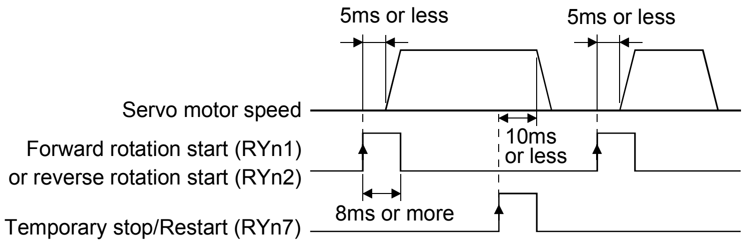
Signal	Signal symbol	Connector pin No.	Functions/Applications
I/F internal power supply	VDD	CN1B-3	Used to output +24V±10% to across VDD-SG. When using this power supply for digital interface, connect it with COM. Permissible current : 80mA
Digital I/F power supply input	COM	CN1A-9 CN1B-13	Used to input 24VDC (200mA or more) for input interface. Connect the positive (+) terminal of the 24VDC external power supply. 24VDC 10%
Digital I/F common	SG	CN1A-10 20 CN1B-10 20	Common terminal for input signals such as SON and EMG. Pins are connected internally. Separated from LG.
Control common	LG	CN1A-1 CN1B-1 CN3- 1 3 11 13	Cannot be used in the MR-J2S-CP-S084.
Shield	SD	Plate	Connect the external conductor of the shield cable.

4.4 Detailed description of signals (devices)

4.4.1 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 (RXn0).

(2) A start in the servo amplifier is made when a forward rotation start (RYn1) or a reverse rotation start (RYn2) changes from OFF to ON. The delay time of the servo amplifier's internal processing is max. 5ms. 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) or a reverse rotation start (RYn2) ・ the start/stop (RYn7) signal should be 8ms 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.

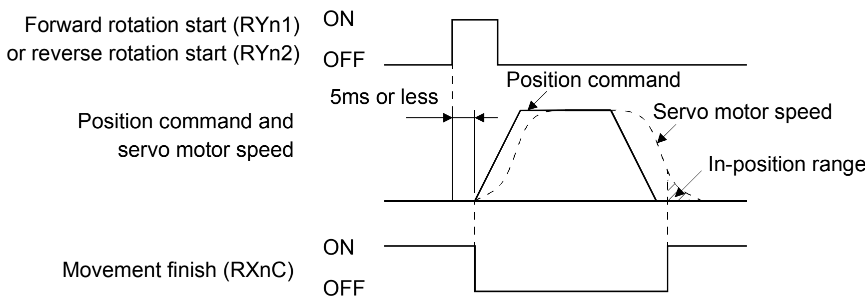
4.4.2 Movement finish · Rough match · In position

POINT

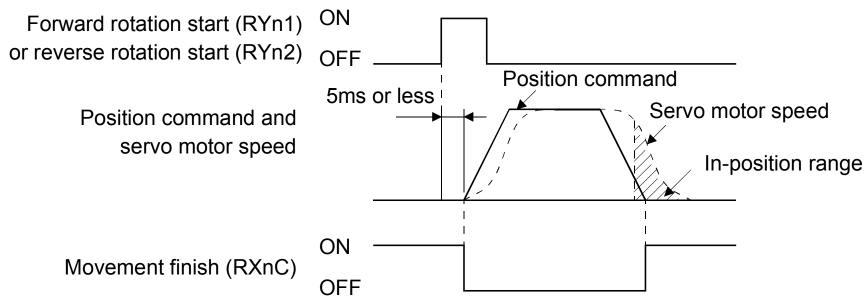
- If an alarm cause, etc. are removed and servo-on occurs after a stop is made by servo-off, alarm occurrence or Forced stop (EMG) ON during automatic operation, Movement finish (RXnC), Rough-match, (RXn2) and In position (RXn1) are turned on. To resume operation, confirm the current position and the 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. 6 (in-position range). RYnC turns ON in the servo-on status.



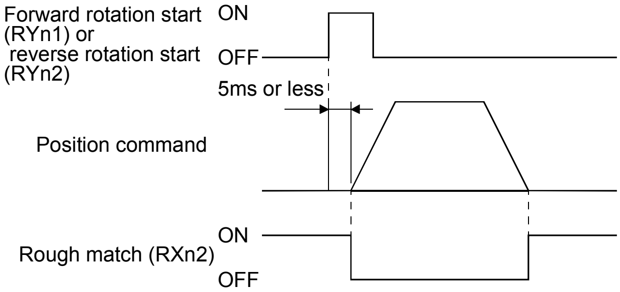
When parameter No. 6 is small



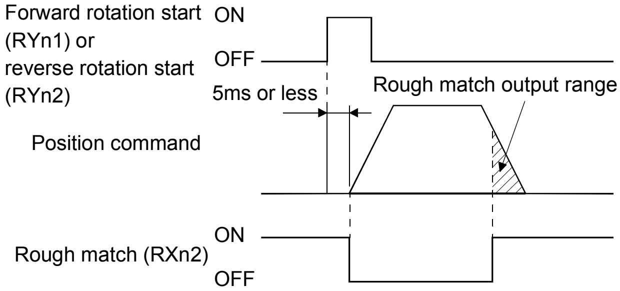
When parameter No. 6 is large

(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. 12 (rough match output range). RXn2 turns ON in the servo-on status.



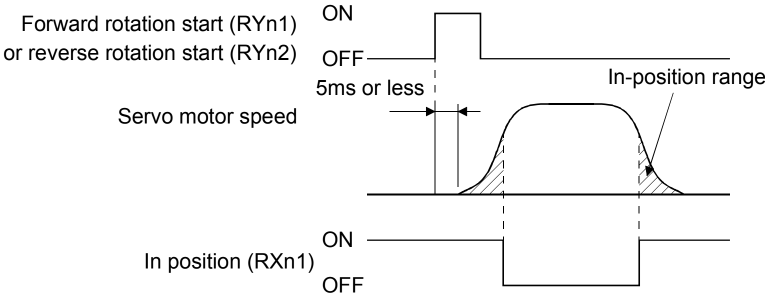
When "0" is set in parameter No. 12



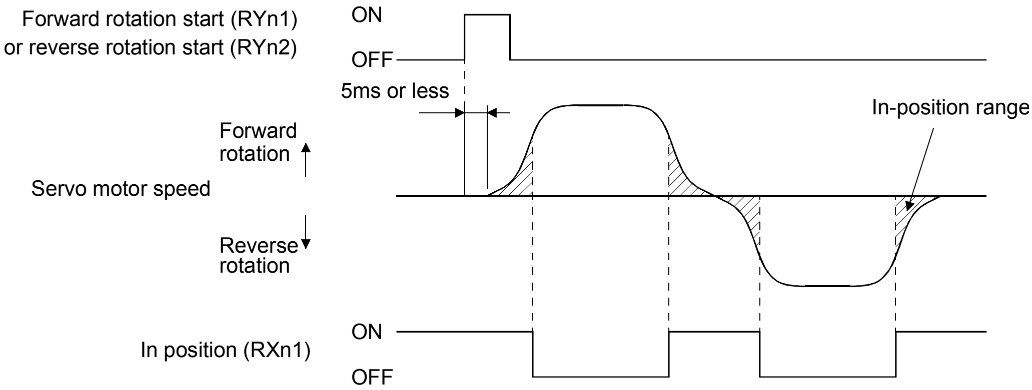
When more than "0" is set in parameter No. 12

(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. 6 (in-position range). INP-SG are connected in the servo-on status.



When positioning operation is performed once



When servo motor reverses rotation direction during automatic continuous operation

4.4.3 Torque limit

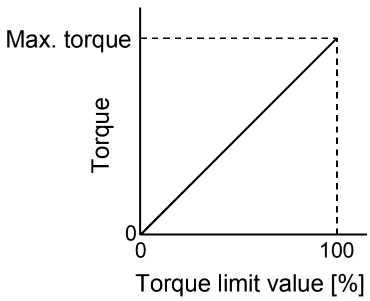
The following table lists the signals and parameters related to the torque limit.

Item	Name	Remarks
Input signals	Internal torque limit selection (RY(n+2)6)	
Output signal	Limiting torque (RXn4)	
Parameters	No.28 (internal torque limit 1)	0 to 100%
	No.29 (internal torque limit 2)	0 to 100%

This function limits torque on the assumption that the maximum torque of the servo motor is 100%.

(1) Internal torque limits 1, 2

Use parameter No.28 and 29 to set the internal torque limit. The following graph shows the torque relative to the setting.



(2) Internal torque limit selection (RY(n+2)6)

Internal torque limit selection (RY(n+2)6) may be used to choose the torque limit values made valid.

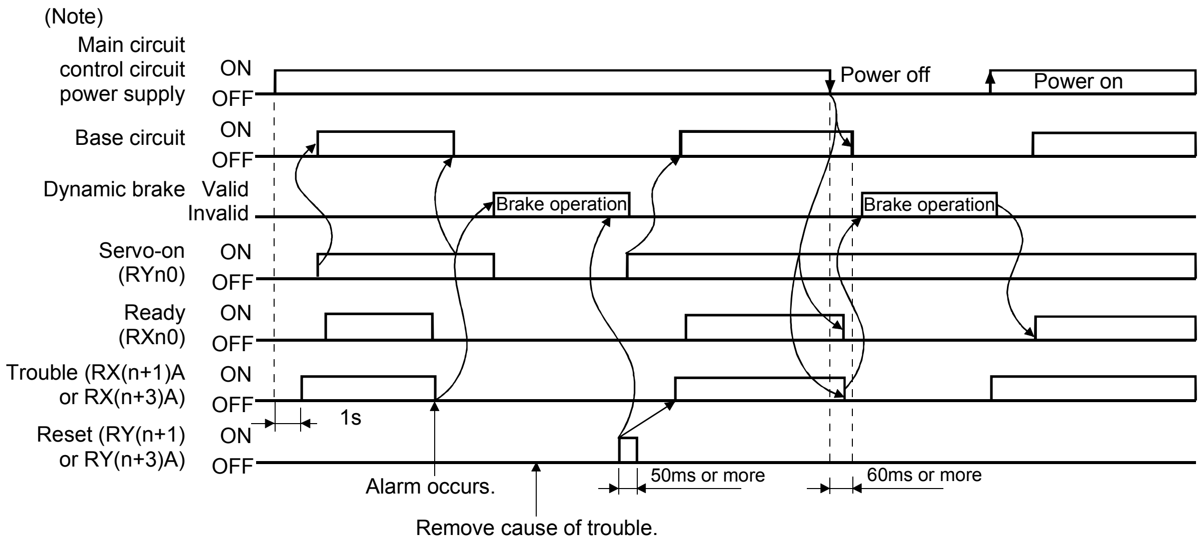
(Note) Input signals RY(n+2)6	Torque limit value made valid
0	Internal torque limit 1 (parameter No. 28)
1	Parameter No. 29 > Parameter No. 28: Parameter No. 28 Parameter No. 29 < Parameter No. 28: Parameter No. 29

Note. 0: off 1: on

4.5 Alarm occurrence timing chart

CAUTION	・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. Switch off the main circuit power as soon as an alarm occurs.

(1) Overcurrent, overload 1 or overload 2

If operation is repeated by switching control circuit power off, then on to reset the overcurrent (AL.32), overload 1 (AL.50) or overload 2 (AL.51) 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 (AL.30) alarm after its occurrence, the external regenerative resistor will generate heat, resulting in an accident.

(3) Instantaneous power failure

Undervoltage (AL.10) 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-J2S-□CP-S084, or to 158VDC or less for the MR-J2S-□CP1-S084.

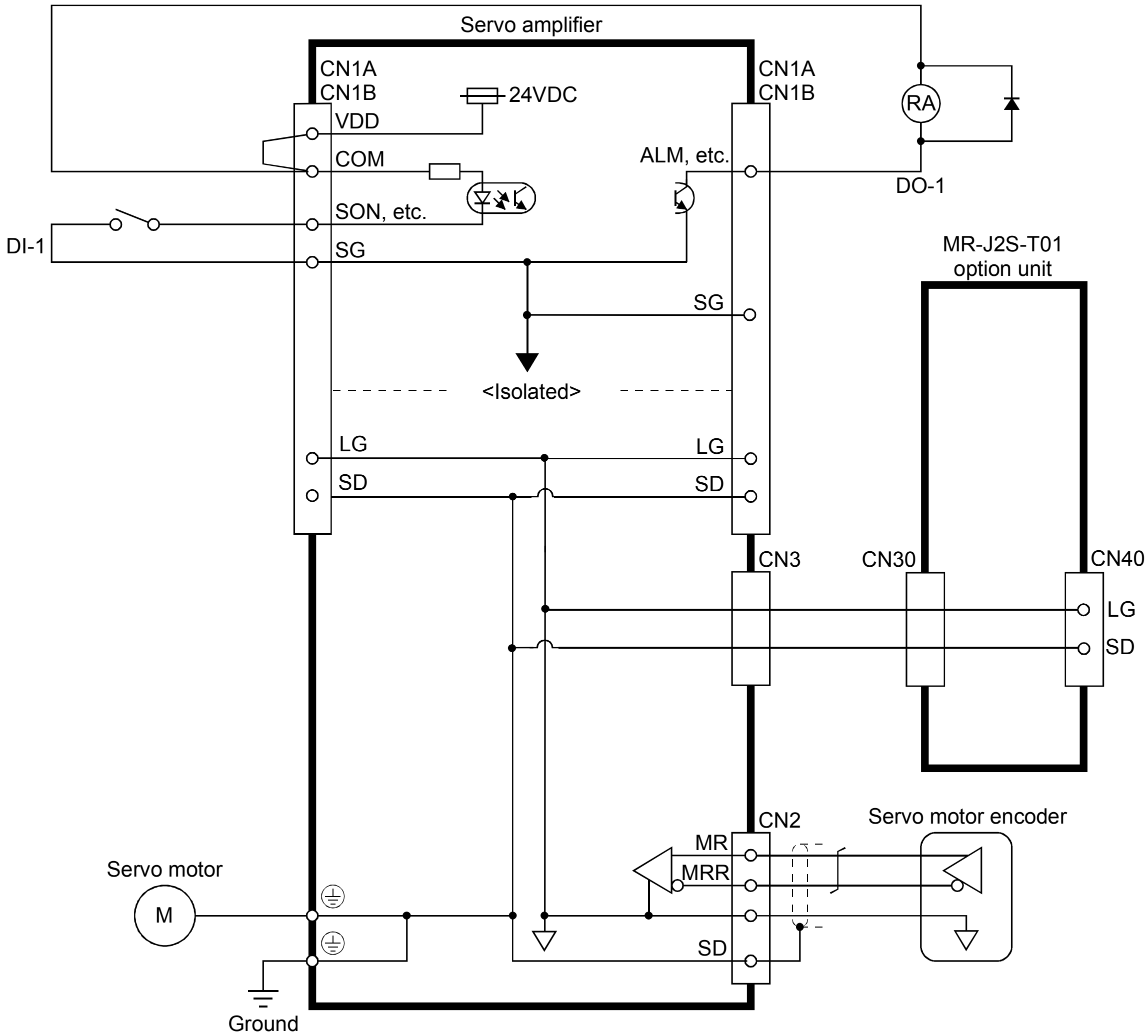
(4) Incremental system

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

4.6 Interfaces

4.6.1 Common line

The following diagram shows the power supply and its common line.

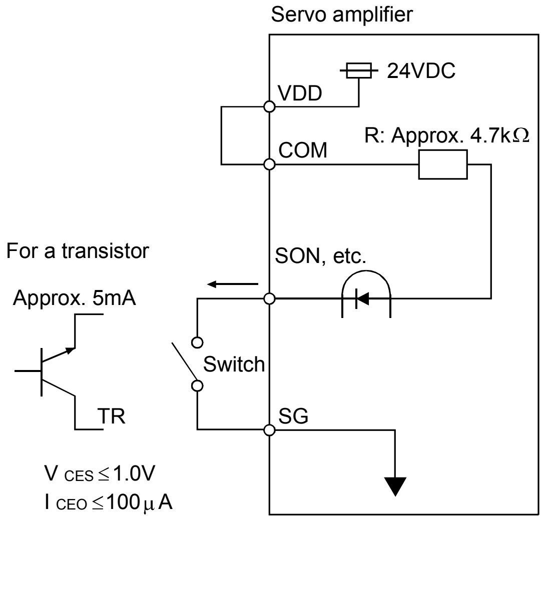
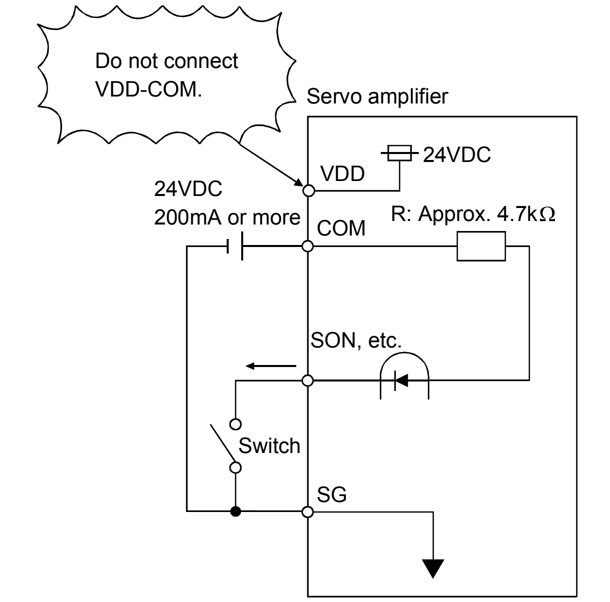


4.6.2 Detailed description of the interfaces

This section gives the details of the I/O signal interfaces (refer to I/O Division in the table) indicated in sections 4.3.2. Refer to this section and connect the interfaces with the external equipment.

(1) Digital input interface DI-1

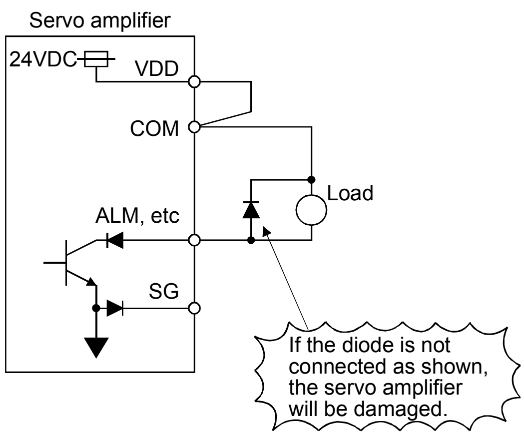
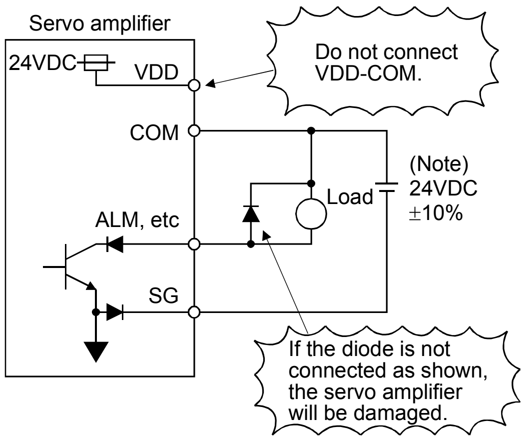
Give a signal with a relay or open collector transistor. Source input is also possible. Refer to (3) in this section.

For use of internal power supply	For use of external power supply
	

(2) Digital output interface DO-1

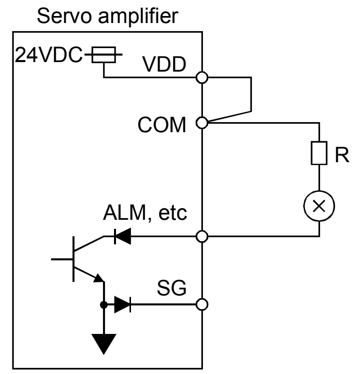
A lamp, relay or photocoupler can be driven. Provide a diode (D) for an inductive load, or an inrush current suppressing resister (R) for a lamp load. (Permissible current: 40mA or less, inrush current: 100mA or less) A maximum of 2.6V voltage drop occurs in the servo amplifier.

(a) Inductive load

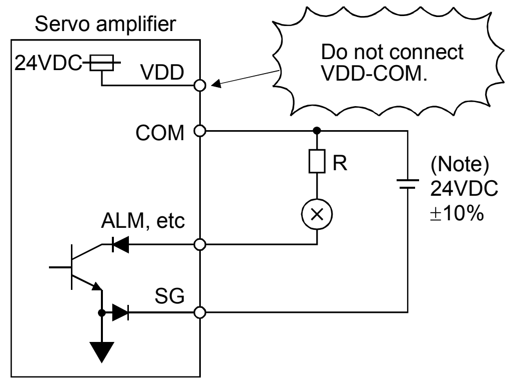
For use of internal power supply	For use of external power supply
	 Note. If the voltage drop (maximum of 2.6V) interferes with the relay operation, apply high voltage (up to 26.4V) from external source.

(b) Lamp load

For use of internal power supply



For use of external power supply

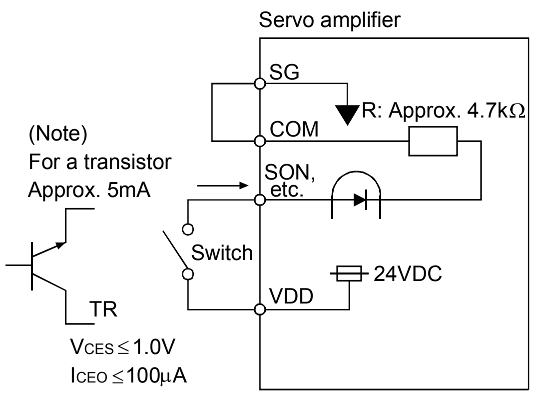


Note. If the voltage drop (maximum of 2.6V) interferes with the relay operation, apply high voltage (up to 26.4V) from external source.

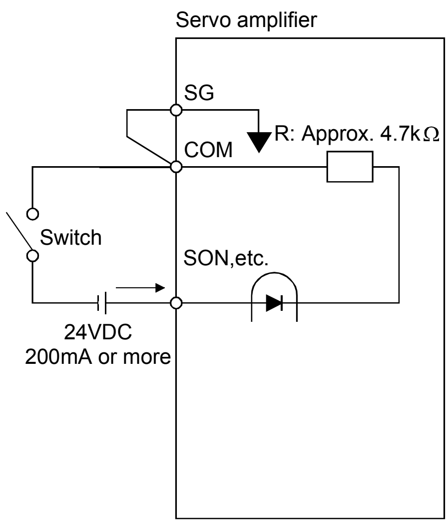
(3) Source input interface

When using the input interface of source type, all DI-1 input signals are of source type. Source output cannot be provided.

For use of internal power supply



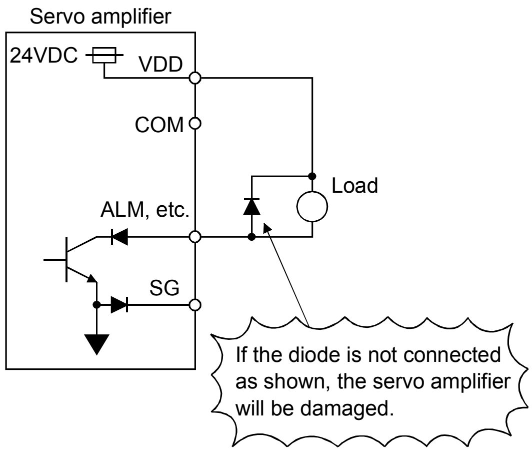
For use of external power supply



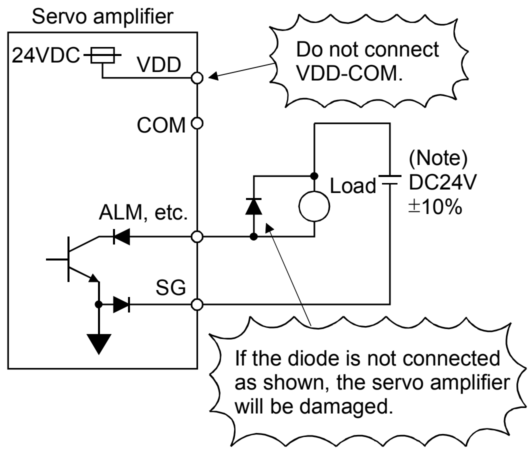
Note. This also applies to the use of the external power supply.

Since no source output is provided, configure the following circuit.

For use of internal power supply



For use of external power supply



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

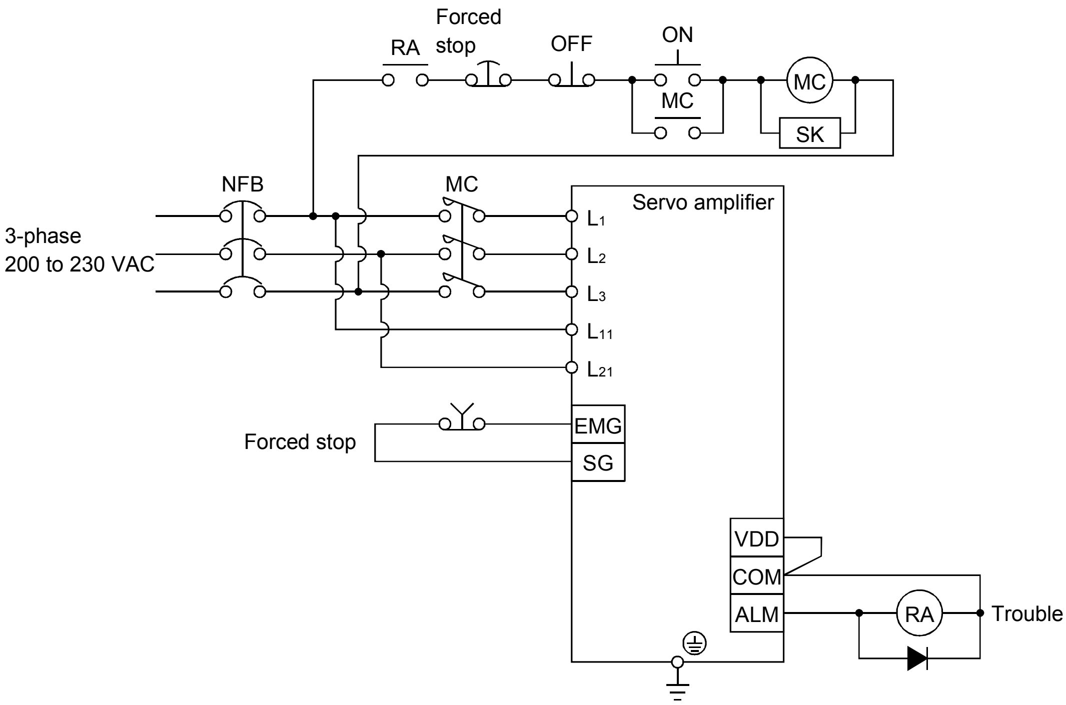
4.7 Input power supply circuit

⚠ CAUTION	・Always connect a magnetic contactor (MC) between the main circuit power supply and L_1, L_2, and L_3 of the servo amplifier, and configure the wiring to be able to shut down the power supply on the side of the servo amplifier's power supply. If a magnetic contactor (MC) is not connected, continuous flow of a large current may cause a fire when the servo amplifier malfunctions. ・Use the trouble (ALM) to switch power off. Otherwise, a regenerative transistor fault or the like may overheat the regenerative resistor, causing a fire.

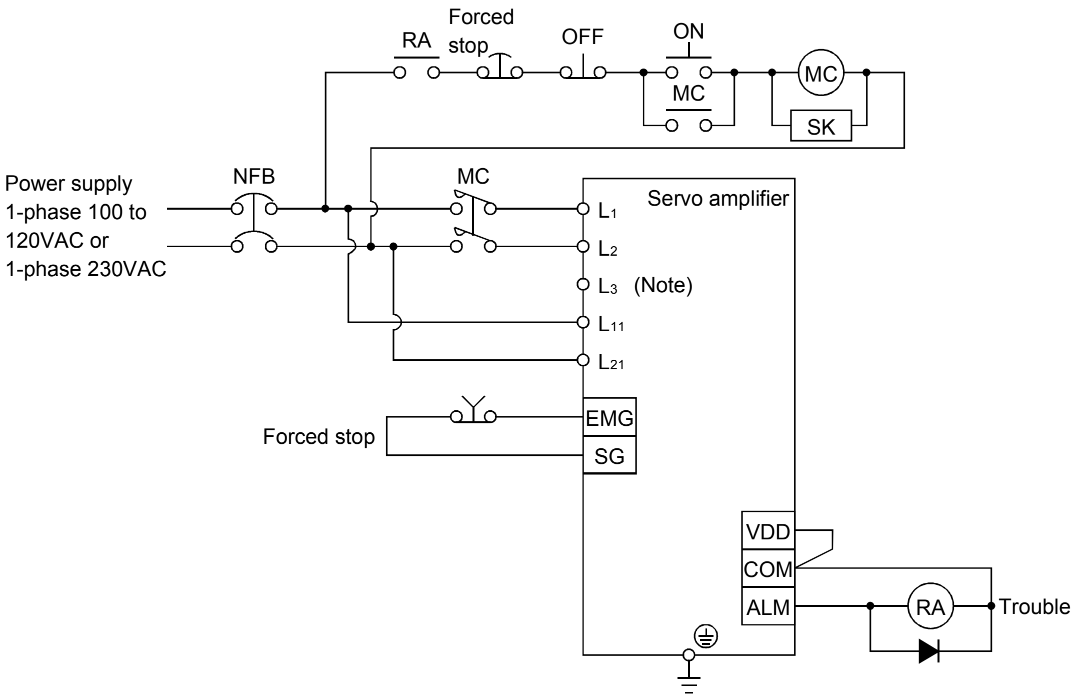
4.7.1 Connection example

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



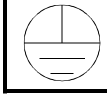
(2) For 1-phase 100 to 120VAC or 1-phase 230VAC power supply



Note. Not provided for 1-phase 100 to 120VAC.

4.7.2 Terminals

The positions and signal arrangements of the terminal blocks change with the capacity of the servo amplifier. Refer to section 13.1.

<table>
<tr><th>Symbol</th><th>Connection target (Application)</th><th>Description</th></tr>
<tr><td>L_1, L_2, L_3</td><td>Main circuit power supply</td><td>Supply L_1, L_2 and L_3 with the following power.
For 1-phase 230VAC, connect the power supply to L_1/L_2 and leave L_3 open.
<table>
<tr><th>Servo amplifier / Power supply</th><th>MR-J2S-10CP-S084 to 70CP-S084</th><th>MR-J2S-100CP-S084 to 700CP-S084</th><th>MR-J2S-10CP1-S084 to 40CP1-S084</th></tr>
<tr><td>3-phase 200 to 230VAC, 50/60Hz</td><td colspan="2">L_1 ・ L_2 ・ L_3</td><td></td></tr>
<tr><td>1-phase 230VAC, 50/60Hz</td><td>L_1 ・ L_2</td><td></td><td></td></tr>
<tr><td>1-phase 100 to 120VAC, 50/60Hz</td><td></td><td></td><td>L_1 ・ L_2</td></tr>
</table></td></tr>
<tr><td>U, V, W</td><td>Servo motor power</td><td>Connect to the servo motor power terminals (U, V, W). During power-on, do not open or close the motor power line. Otherwise, a malfunction or faulty may occur.</td></tr>
<tr><td>L_{11}, L_{21}</td><td>Control circuit power supply</td><td>
<table>
<tr><th>Servo amplifier / Power supply</th><th>MR-J2S-10CP-S084 to 700CP-S084</th><th>MR-J2S-10CP1-S084 to 40CP1-S084</th></tr>
<tr><td>1-phase 200 to 230VAC, 50/60Hz</td><td>L_{11} ・ L_{21}</td><td></td></tr>
<tr><td>1-phase 100 to 120VAC, 50/60Hz</td><td></td><td>L_{11} ・ L_{21}</td></tr>
</table></td></tr>
<tr><td>P, C, D</td><td>Regenerative option</td><td>1) MR-J3-350CP-S084 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 and C terminal.
2) MR-J3-500CP-S084o700CP-S084
MR-J3-500CP-S084 and 700CP-S084 do not have D terminal.
When using servo amplifier built-in regenerative resistor, connect P terminal and C terminal. (Wired by default)
When using regenerative option, disconnect P terminal and C terminal and connect regenerative option to P terminal and C terminal.
Refer to sections 15.1.1 for details.</td></tr>
<tr><td>N</td><td>Regeneration converter
Brake unit</td><td>When using the regeneration converter or brake unit, connect it across P-N.
Do not connect it to the servo amplifier of MR-J2S-200CP-S084 or less.
Refer to sections 15.1.2 and 15.1.3 for details.</td></tr>
<tr><td></td><td>Protective earth (PE)</td><td>Connect this terminal to the protective earth (PE) terminals of the servo motor and control box for grounding.</td></tr>
</table>

4.7.3 Power-on sequence

(1) Power-on procedure

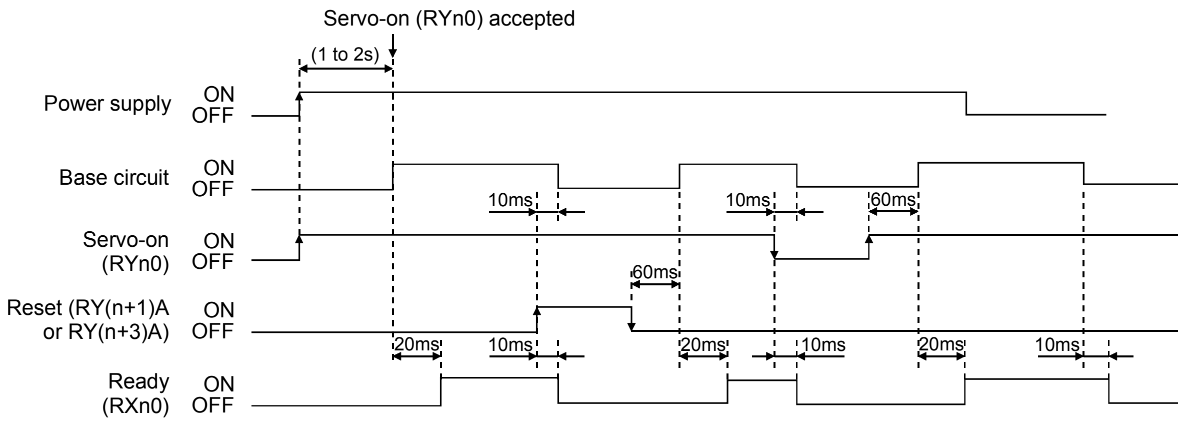
1) Always wire the power supply as shown in above section 4.7.1 using the magnetic contactor with the main circuit power supply (three-phase 200V: L1, L2, L3, single-phase 230V ・ single-phase 100V: L1, L2). Configure up an external sequence to switch off the magnetic contactor as soon as an alarm occurs.

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 (RXn0) will switch on in further about 20ms, making the servo amplifier ready to operate. (Refer to paragraph (2) in this section.)

4) When the reset (RY(n+1)A or RY(n+3)A) is switched on, the base circuit is shut off and the servo motor shaft coasts.

(2) Timing chart

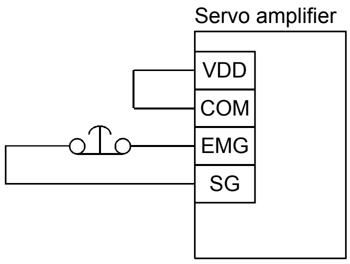


Power-on timing chart

(3) Forced stop

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

Make up a circuit which shuts off main circuit power as soon as EMG-SG are opened at a forced stop. To ensure safety, always install an external forced stop switch across EMG-SG. By disconnecting EMG-SG, 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 (AL.E6).
During ordinary operation, do not use the external forced stop (EMG) to alternate stop and run.
The servo amplifier life may be shortened.



4.8 Connection of servo amplifier and servo motor

4.8.1 Connection instructions

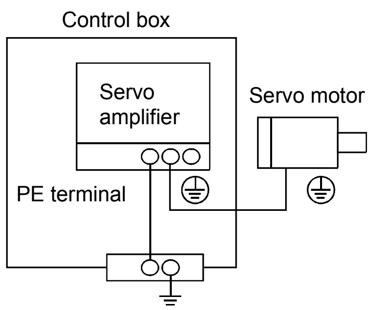
⚠WARNING	・Insulate the connections of the power supply terminals to prevent an electric shock.

⚠CAUTION	・Connect the wires to the correct phase terminals (U, V, W) of the servo amplifier and servo motor. Otherwise, the servo motor will operate improperly. ・Do not connect AC power supply directly to the servo motor. Otherwise, a fault may occur.

POINT
・Do not apply the test lead bars or like of a tester directly to the pins of the connectors supplied with the servo motor. Doing so will deform the pins, causing poor contact.

The connection method differs according to the series and capacity of the servo motor and whether or not the servo motor has the electromagnetic brake. Perform wiring in accordance with this section.

(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.

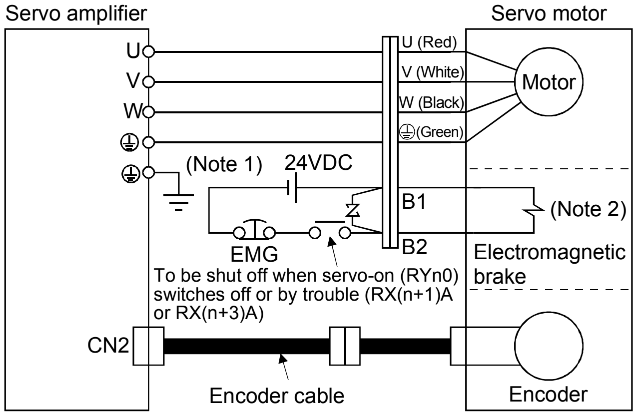
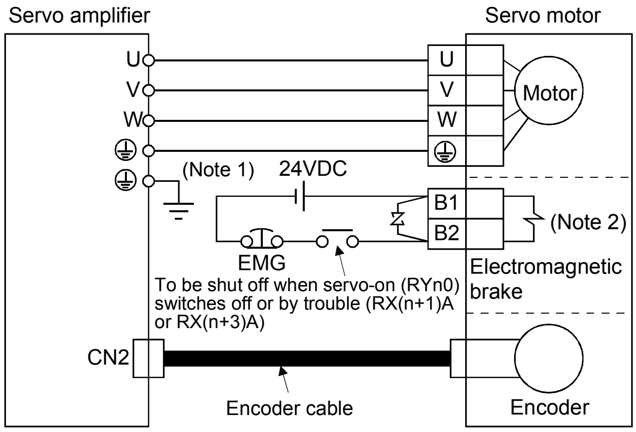
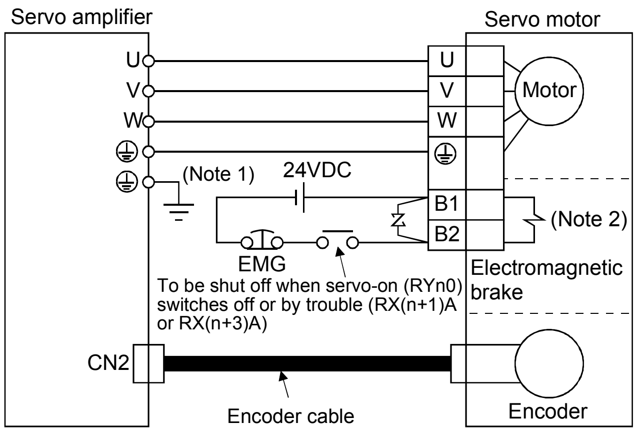


(2) Do not share the 24VDC interface power supply between the interface and electromagnetic brake. Always use the power supply designed exclusively for the electromagnetic brake.

4.8.2 Connection diagram

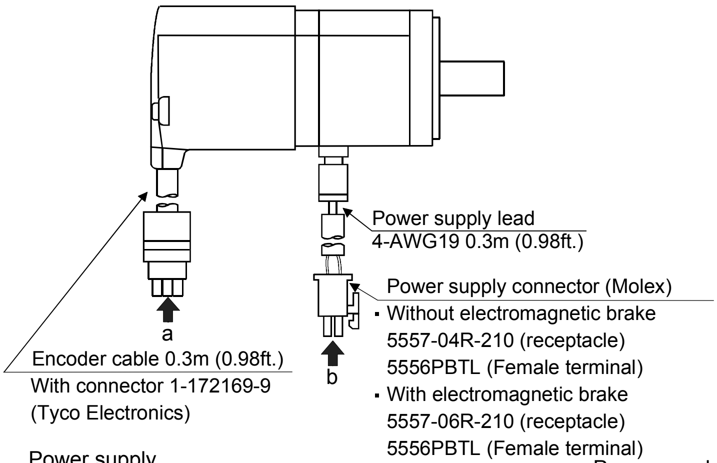
⚠CAUTION	・During power-on, do not open or close the motor power line. Otherwise, a malfunction or faulty may occur.

The following table lists wiring methods according to the servo motor types. Use the connection diagram which conforms to the servo motor used. For cables required for wiring, refer to section 15.2.1. For encoder cable connection, refer to section 15.1.4. For the signal layouts of the connectors, refer to section 4.8.3.
For the servo motor connector, refer to chapter 4 of the Servo Motor Instruction Manual.

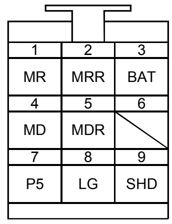
Servo motor	Connection diagram
HC-KFS053 (B) to 73 (B) HC-MFS053 (B) to 73 (B) HC-UFS13 (B) to 73 (B)	 Note 1. To prevent an electric shock, always connect the protective earth (PE) terminal (⏚) of the servo amplifier to the protective earth (PE) of the control box. 2. This circuit applies to the servo motor with electromagnetic brake.
HC-SFS121 (B) to 301 (B) HC-SFS202 (B) to 702 (B) HC-SFS203 (B) · 353 (B) HC-UFS202 (B) to 502 (B) HC-RFS353 (B) to 503 (B)	 Note 1. To prevent an electric shock, always connect the protective earth (PE) terminal (⏚) of the servo amplifier to the protective earth (PE) of the control box. 2. This circuit applies to the servo motor with electromagnetic brake.
HC-SFS81(B) HC-SFS52 (B) to 152 (B) HC-SFS53 (B) to 153 (B) HC-RFS103 (B) to 203 (B) HC-UFS72 (B) · 152 (B)	 Note 1. To prevent an electric shock, always connect the protective earth (PE) terminal (⏚) of the servo amplifier to the protective earth (PE) of the control box. 2. This circuit applies to the servo motor with electromagnetic brake.

4.8.3 I/O terminals

(1) HC-KFS・HC-MFS・HC-UFS3000r/min series

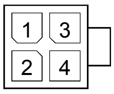


Encoder connector signal arrangement



View a

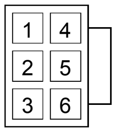
Power supply
connector
5557-04R-210



View b

Pin	Signal
1	U
2	V
3	W
4	⏚(Earth)

Power supply
connector
5557-06R-210

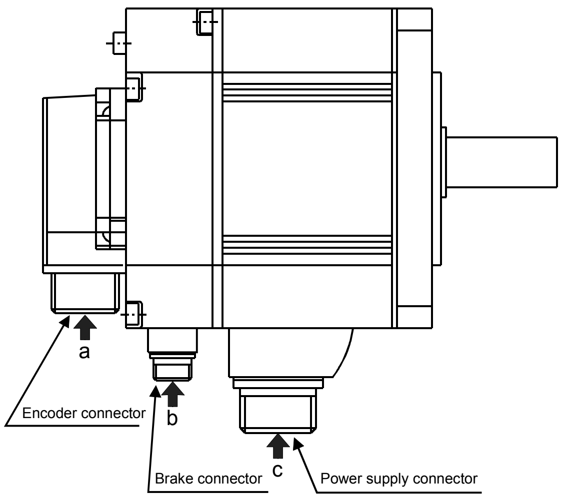


View b

Pin	Signal
1	U
2	V
3	W
4	⏚(Earth)
5	(Note) B1
6	(Note) B2

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

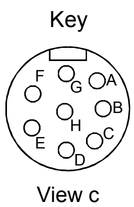
(2) HC-SFS・HC-RFS・HC-UFS2000 r/min series



Servo motor	Servo motor side connectors: For power supply	For encoder	Electromagnetic brake connector
HC-SFS81(B) HC-SFS52(B) to 152(B) HC-SFS53(B) to 153(B)	CE05-2A22-23PD-B	MS3102A20-29P	The connector for power is shared.
HC-SFS121(B) to 301(B) HC-SFS202(B) to 502 (B) HC-SFS203(B)・353(B)	CE05-2A24-17PD-B		MS3102A10SL-4P
HC-SFS702(B)	CE05-2A32-17PD-B		
HC-RFS103(B) to 203 (B)	CE05-2A22-23PD-B		The connector for power is shared.
HC-RFS353(B)・503(B)	CE05-2A24-10PD-B		
HC-UFS72(B)・152(B)	CE05-2A22-23PD-B		
HC-UFS202(B) to 502(B)	CE05-2A24-10PD-B		MS3102A10SL-4P

Power supply connector signal arrangement

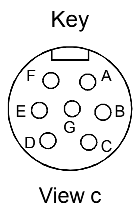
CE05-2A22-23PD-B



Pin	Signal
A	U
B	V
C	W
D	⏚ (Earth)
E	
F	
G	(Note) B1
H	(Note) B2

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

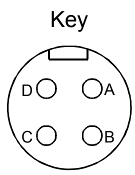
CE05-2A24-10PD-B



Pin	Signal
A	U
B	V
C	W
D	⏚ (Earth)
E	(Note) B1
F	(Note) B2
G	

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

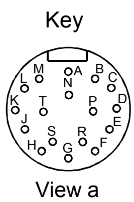
CE05-2A32-17PD-B



Pin	Signal
A	U
B	V
C	W
D	⏚ (Earth)

Encoder connector signal arrangement

MS3102A20-29P

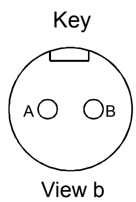


Pin	Signal
A	MD
B	MDR
C	MR
D	MRR
E	
F	BAT
G	LG
H	
J	

Pin	Signal
K	
L	
M	
N	SD
P	
R	LG
S	P5
T	

Electromagnetic brake connector signal arrangement

MS3102A10SL-4P



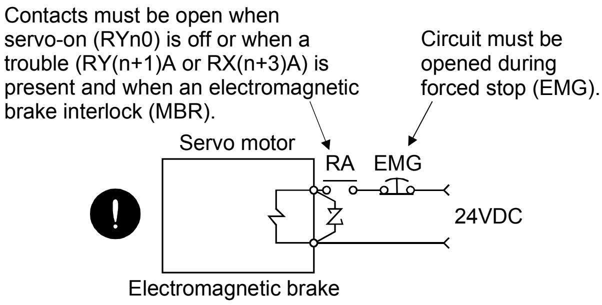
Pin	Signal
A	(Note)B1
B	(Note)B2

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

4.9 Servo motor with electromagnetic brake

⚠ CAUTION

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



- The electromagnetic brake is provided for holding the motor shaft. Do not use it for ordinary braking.
- Before performing the operation, be sure to confirm that the electromagnetic brake operates properly.

POINT

- For the power supply capacity, operation delay time and other specifications of the electromagnetic brake, refer to the Servo Motor Instruction Manual.

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

1) In the device setting of the MR Configurator (Servo Configuration software), make the electromagnetic brake interlock (MBR) available.

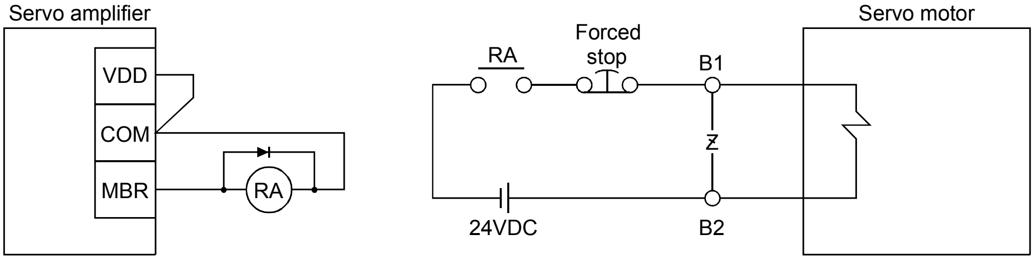
2) Do not share the 24VDC interface power supply between the interface and electromagnetic brake. Always use the power supply designed exclusively for the electromagnetic brake.

3) The brake will operate when the power (24VDC) switches off.

4) While the reset (RY(n+1)A or RY(n+3)A) is on, the base circuit is shut off. When using the servo motor with a vertical shaft, use the electromagnetic brake interlock (MBR).

5) Turn off the servo-on (RYn0) after the servo motor has stopped.

(1) Connection diagram



(2) Setting

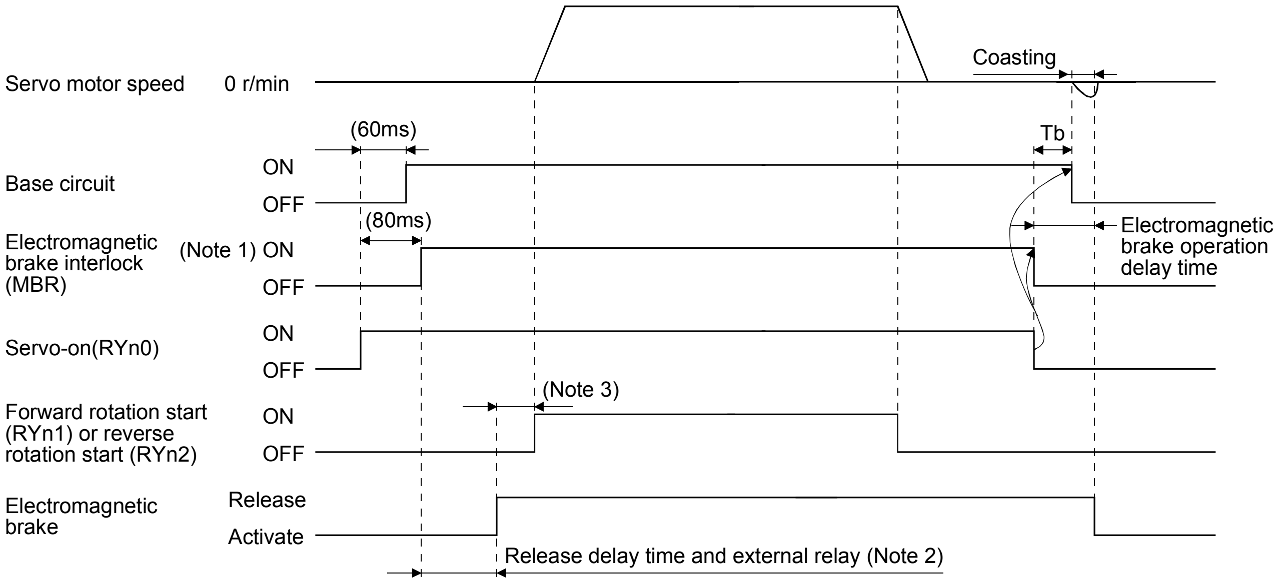
1) In the device setting of the MR Configurator (Servo Configuration Software), make the electromagnetic brake interlock (MBR) available.

2) Using parameter No. 33 (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 (3) in this section.

(3) Timing charts

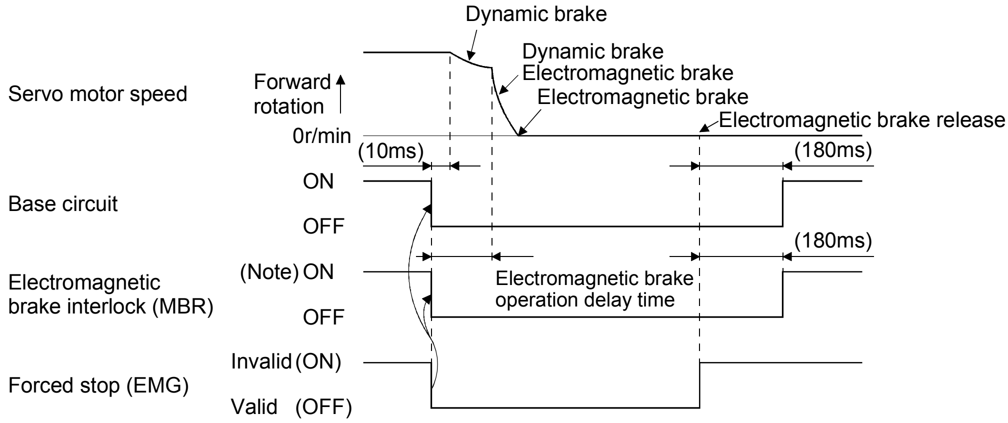
(a) Servo-on (RYn0) command (from controller) ON/OFF

Tb (ms) after servo-on (RYn0) is switched off, 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. For use in vertical lift and similar applications, therefore, set delay time (Tb) to the time which is about equal to the electromagnetic brake operation delay time and during which the load will not drop.



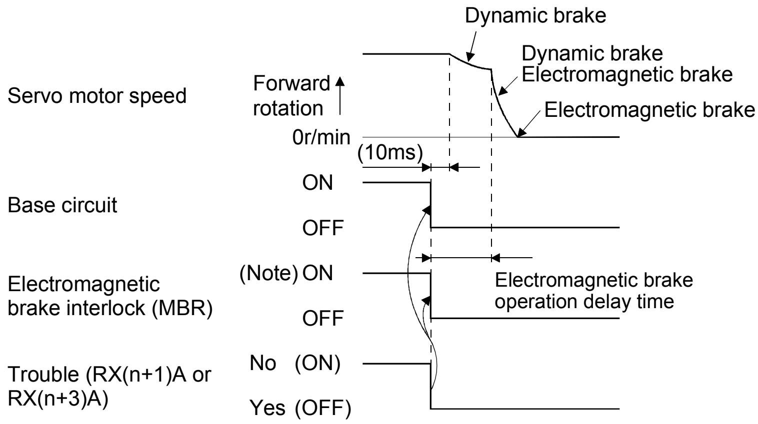
Note 1. ON: Electromagnetic brake is not activated.
OFF: Electromagnetic brake is activated.
2. Electromagnetic brake is released after delaying for the release delay time of electromagnetic brake and operation time of external circuit relay. For the release delay time of electromagnetic brake, refer to the Servo Motor Instruction Manual.
3. After the electromagnetic brake is released, turn ON the RYn1 or RYn2.

(b) Forced stop (EMG) ON/OFF



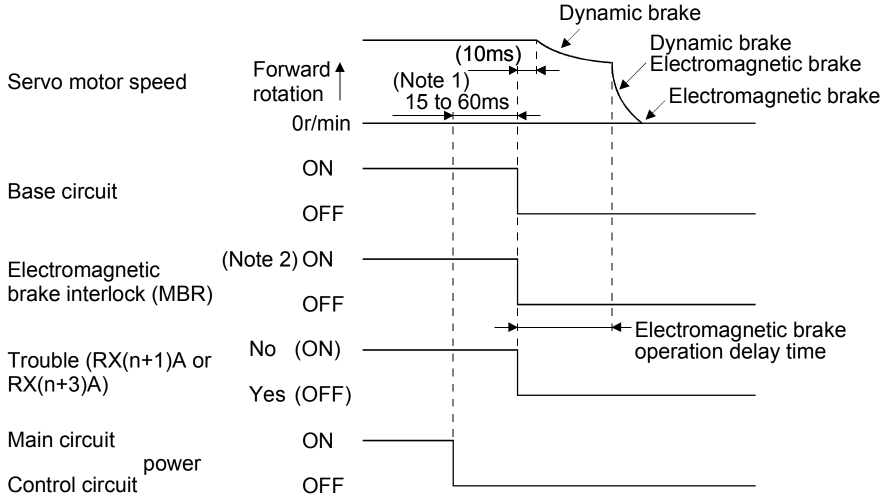
Note. ON: Electromagnetic brake is not activated.
OFF: Electromagnetic brake is activated.

(c) Alarm occurrence



Note. ON: Electromagnetic brake is not activated.
OFF: Electromagnetic brake is activated.

(d) Both main and control circuit power supplies off

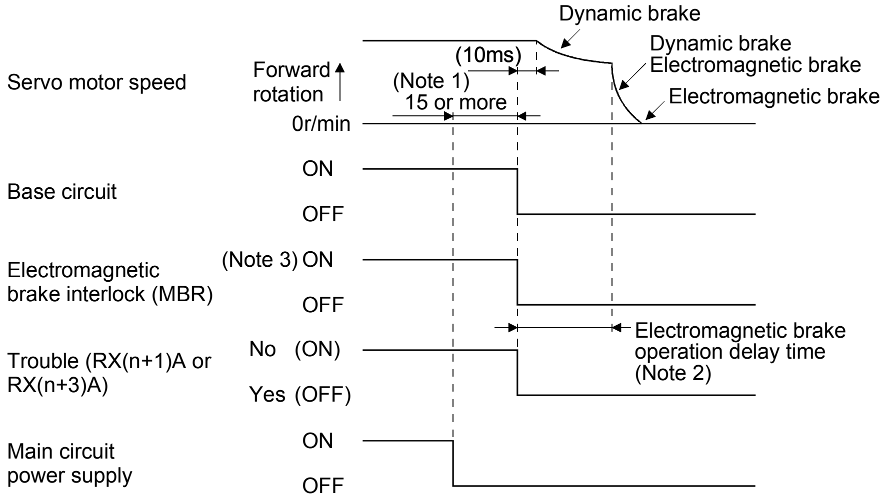


Note 1. Changes with the operating status.

2. ON: Electromagnetic brake is not activated.

OFF: Electromagnetic brake is activated.

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



Note 1. Changes with the operating status.

2. When the main circuit power supply is off in a motor stop status, the main circuit off warning (AL.E9) occurs and the trouble (RX(n+1)A or RX(n+3)A) does not turn off.

3. ON: Electromagnetic brake is not activated.

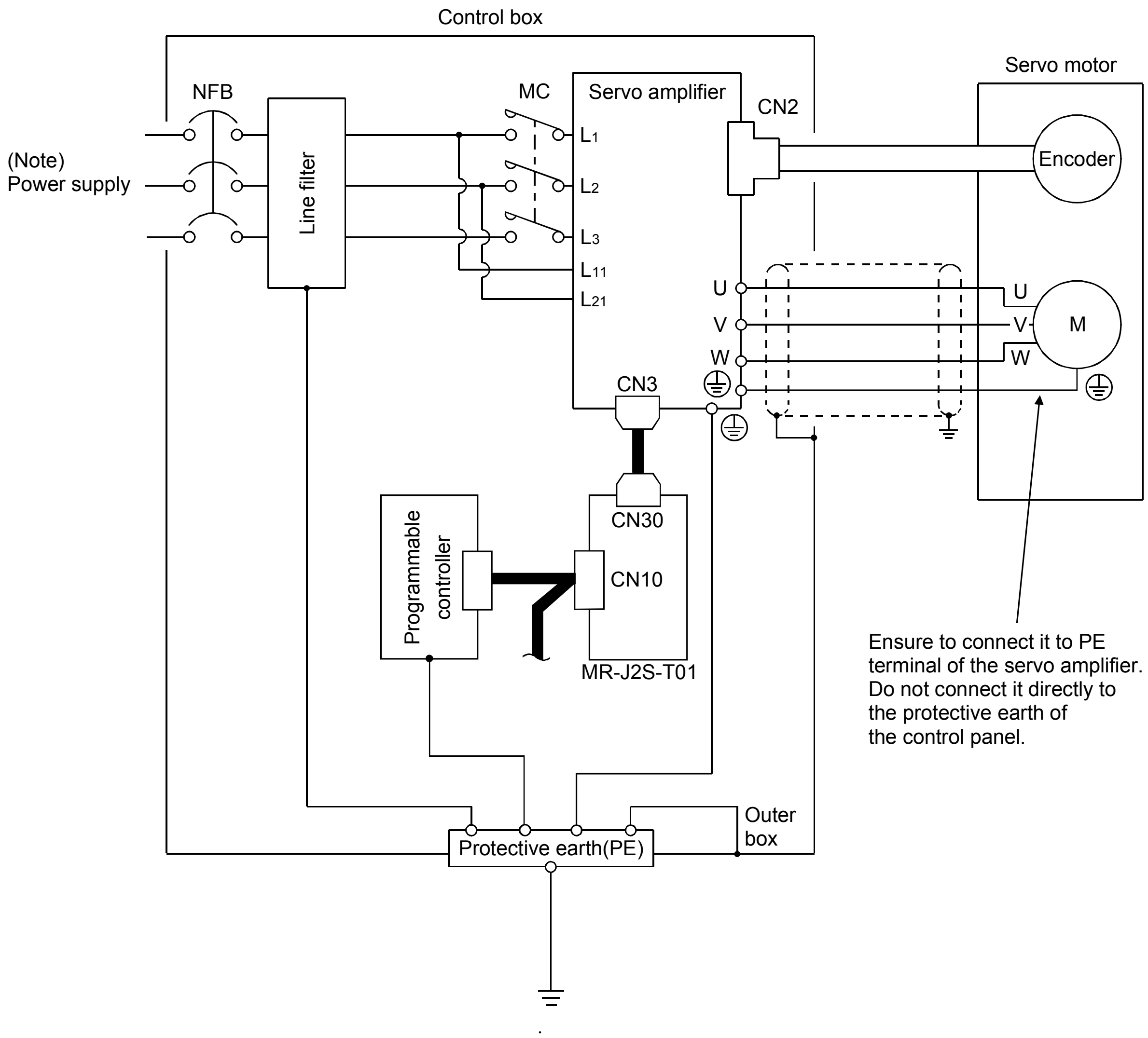
OFF: Electromagnetic brake is activated.

4.10 Grounding

WARNING	
⚠ WARNING	・Ground the servo amplifier and servo motor securely. ・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 230VAC, connect the power supply to L1 ・ L2 and leave L3 open.
There is no L3 for 1-phase 100 to 120VAC power supply. Refer to section 1.2 for the power supply specification.

4.11 Servo amplifier terminal block (TE2) wiring method

POINT

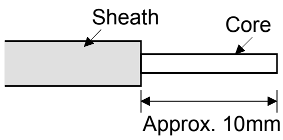
- Refer to Table 15.1 in section 15.2.1 for the cable size used for the cable.

4.11.1 For the servo amplifier produced later than Jan. 2006

(1) Termination of the cables

(a) Solid wire

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



(b) Twisted wire

1) When the wire is inserted directly

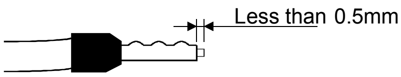
Use the cable after stripping the sheath and twisting the core. At this time, take care to avoid a short caused by the loose wires of the core and the adjacent pole. Do not solder the core as it may cause a contact fault. Alternatively, a bar terminal may be used to put the wires together.

2) When the wires are put together

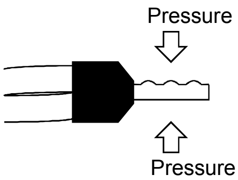
Using a bar terminal.

Cable Size		Bar Terminal Type		Crimping Tool	Manufacturer
[mm^2]	AWG	For 1 cable	For 2 cables		
1.25/1.5	16	AI1.5-10BK	AI-TWIN × 1.5-10BK	CRIMPFOX ZA 3	Phoenix Contact
2/2.5	14	AI2.5-10BU			

Cut the wire running out of bar terminal to less than 0.5mm.



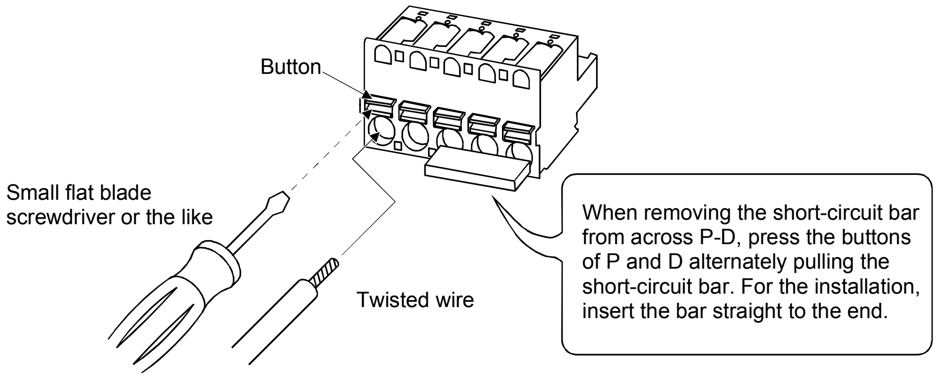
When using a bar terminal for two wires, insert the wires in the direction where the insulation sleeve does not interfere with the next pole and pressure them.



(2) Termination of the cables

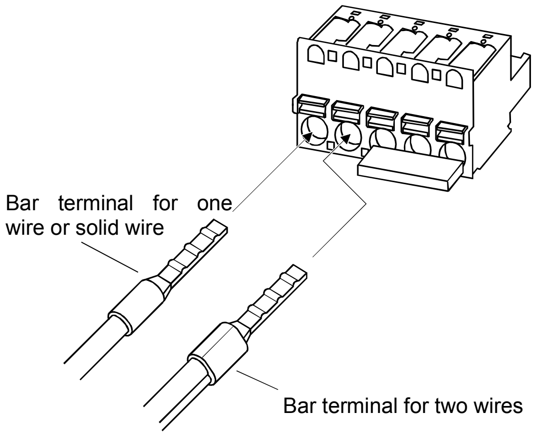
(a) When the wire is inserted directly

Insert the wire to the end pressing the button with a small flat blade screwdriver or the like.



(b) When the wires are put together using a bar terminal

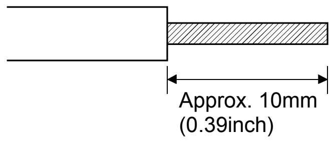
Insert a bar terminal with the odd-shaped side of the pressured terminal on the button side.



4.11.2 For the servo amplifier produced earlier than Dec. 2005

1) Termination of the cables

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



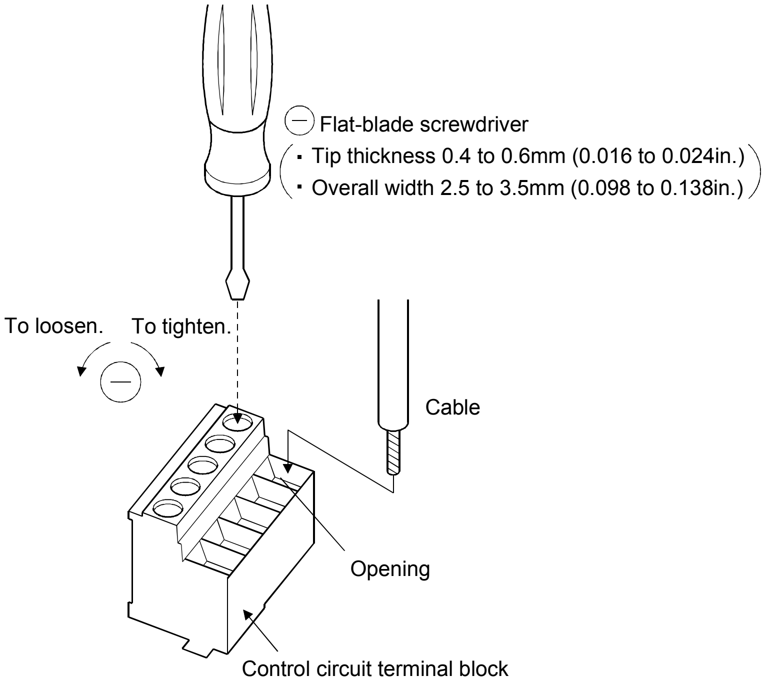
Twisted wire: Use the cable after stripping the sheath and twisting the core. At this time, take care to avoid a short caused by the loose wires of the core and the adjacent pole. Do not solder the core as it may cause a contact fault. Alternatively, a bar terminal may be used to put the wires together.

Cable size		Bar terminal type		Crimping tool	Manufacturer
[mm^2]	AWG	For 1 cable	For 2 cables		
1.25/1.5	16	AI1.5-10BK	AI-TWIN × 1.5-10BK	CRIMPFOX ZA3 or CRIMPFOX UD 6	Phoenix Contact
2/2.5	14	AI2.5-10BU			

2) Connection

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: 0.3 to 0.4N・m (2.7 to 3.5Ib・in)) Before inserting the cable into the opening, make sure that the screw of the terminal is fully loose.

When using a cable of 1.5mm^2 or less, two cables may be inserted into one opening.

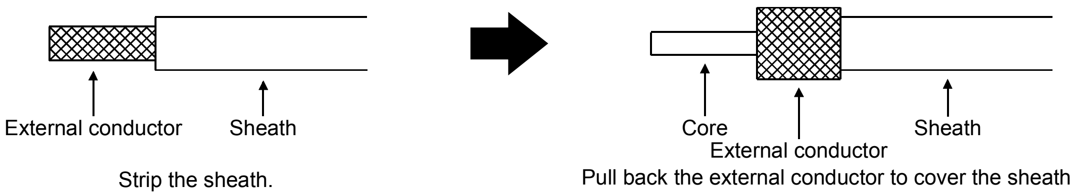


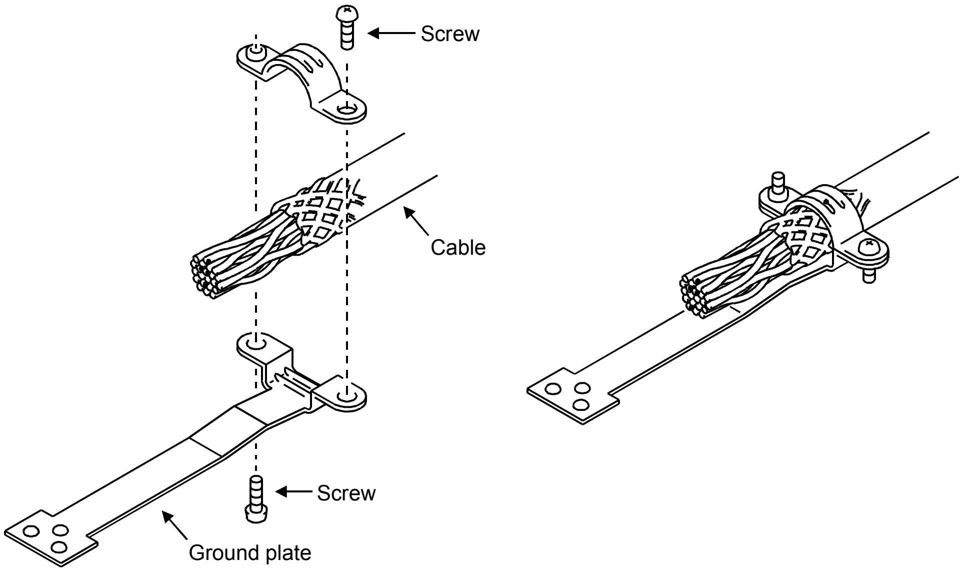
Use of a flat-blade torque screwdriver is recommended to manage the screw tightening torque. The following table indicates the recommended products of the torque screwdriver for tightening torque management and the flat-blade bit for torque screwdriver. When managing torque with a Phillips bit, please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

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

4.12 Instructions for the 3M connector

When fabricating an encoder cable or the like, 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.





MEMO

5. OPERATION

POINT
• In the shipment status, Forward rotation stroke end (LSP), Reverse rotation stroke end (LSN) and Proximity dog (DOG) are valid as the CN1A/CN1B external input signals. However, this chapter explains them with the register No. of the remote input.

5.1 When switching power on for the first time

5.1.1 Pre-operation checks

Before starting operation, check the following.

(1) Wiring

(a) A correct power supply is connected to the power input terminals (L_1, L_2, L_3, L_{11}, L_{21}) of the servo amplifier.

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

(c) The servo motor power terminals (U, V, W) of the servo amplifier are not shorted to the power input terminals (L_1, L_2, L_3) of the servo motor.

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

(e) Note the following when using the regenerative option, brake unit or power regeneration converter.

1) For the MR-J2S-350CP-S084 or less, the lead has been removed from across D-P of the control circuit terminal block, and twisted cables are used for its wiring.

2) For the MR-J2S-500CP-S084 or more, the lead has been removed from across P-C of the servo amplifier built-in regenerative resistor, and twisted cables are used for its wiring.

(f) When stroke end limit switches are used, the signals across LSP-SG and LSN-SG are on during operation.

(g) 24VDC or higher voltages are not applied to the pins of connectors CN1A and CN1B.

(h) SD and SG of connectors CN1A and CN1B are not shorted.

(i) The wiring cables are free from excessive force.

(2) Environment

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

(3) Machine

(a) The screws in the servo motor installation part and shaft-to-machine connection are tight.

(b) The servo motor and the machine connected with the servo motor can be operated.

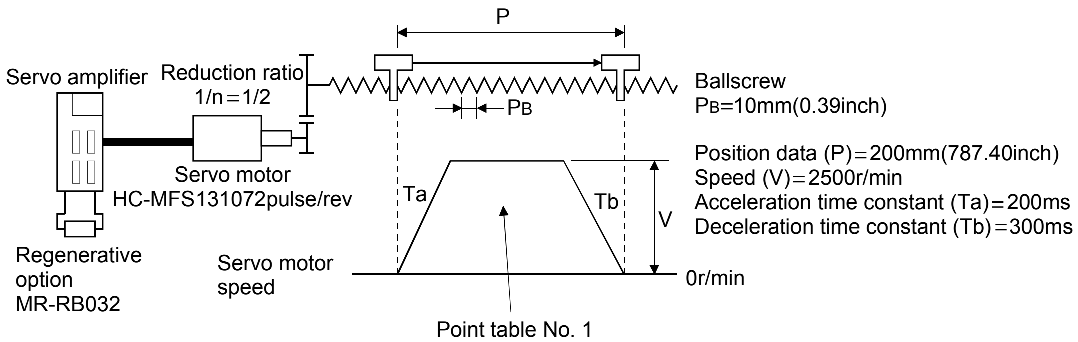
5.1.2 Startup

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

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

Connect the servo motor with a machine after confirming that the servo motor operates properly alone. For startup reference, a single machine structure will be described. Refer to this section and start up the machine safely.

(1) Machine conditions



1) Absolute position detection system used

2) Command resolution: 10µm

3) Command system: Absolute value command system

4) Electronic gear calculation

$$\frac{\mathrm{CMX(pulse)}}{\mathrm{CDV}(\mu\mathrm{m})}=\frac{131072}{\frac{1}{n}\cdot P_B\cdot 1000}=\frac{131072}{\frac{1}{2}\cdot 10\cdot 1000}=\frac{131072}{5000}=\frac{32768}{1250} \qquad (5.1)$$

CMX=32768
CDV=1250

5) For the device command method, external input signals are used by the point table selection, forward rotation start (RYn1), servo-on (RYn0) and other commands.

6) Point table No.1 is used to execute automatic operation once.

(2) Startup procedure

(a) Power on

1) Switch off the servo-on (RYn0).

2) When main circuit power/control circuit power is switched on, "PoS" (Current position) appears on the servo amplifier display.
In the absolute position detection system, first power-on results in the absolute position lost (AL.25) alarm and the servo system cannot be switched on. This is not a failure and takes place due to the uncharged capacitor in the encoder.
The alarm can be deactivated by keeping power on for a few minutes in the alarm status and 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 500r/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.

(b) Test operation

Using jog operation in the "test operation mode" of the MR Configurator (Servo Configuration Software), operated at the speed as low as possible, check whether the servo motor rotates correctly. (Refer to section 7.7.1, 8.9.2)

(c) Parameter setting

Set the parameters according to the structure and specifications of the machine. Refer to chapter 5 for the parameter definitions and to sections 7.4 and 8.6 for the setting method.

Parameter	Name	Setting	Description
No.0	Command system, regenerative option selection	□20□	Absolute value command system. MR-RB032 regenerative option is used.
No.1	Feeding function selection	□□10	When forward rotation start (RYn1) is valid, address is incremented in CCW direction. Since command resolution is 10 times, feed length multiplication factor of 10 times is selected.
No.2	Function selection 1	1□□□	Absolute position detection system.
No.4	Electronic gear numerator (CMX)	32768	From calculation result of formula (5.1)
No.5	Electronic gear denominator (CDV)	1250	From calculation result of formula (5.1)

After setting the above parameters, switch power off once. Then switch power on again to make the set parameter values valid.

(d) Point table setting

Set the point table according to the operation pattern. Refer to section 5.2 for the point table definitions and to sections 7.5 and 8.5 for the setting method.

Position data [$\times 10^{STM}$ μm]	Servo motor speed□[r/min]	Acceleration time constant□[ms]	Deceleration time constant□[ms]	Dwell [ms]	Auxiliary function
20000	2500	200	300	0	0

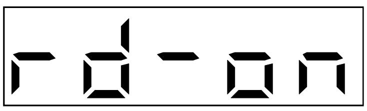
(e) Servo-on

Switch the servo-on in the following procedure.

1) Switch on main circuit/control circuit power.

2) Switch on the servo-on (RYn0).

When placed in the servo-on status, the servo amplifier is ready to operate and the servo motor is locked. By using the sequence in the diagnostic mode in section 8.3, the ready status can be shown on the servo amplifier display. In the operation-ready status, the following screen appears.



(f) Home position return

Perform home position return as required. Refer to section 5.4 for home position return types. A parameter setting example for dog type home position return is given here.

Parameter	Name	Setting	Description
No.8	Home position return type	□000	Dog type home position return is selected. Home position return is started in address incremented direction. Proximity dog (RYn3) is valid when DOG-SG are opened.
No.9	Home position return speed	1000	Motion is made up to proximity dog at 1000r/min.
No.10	Creep speed	10	Motion is made up to home position at 10r/min.
No.11	Home position shift distance	0	No home position shift
No.42	Home position return position data		Set the current position at home position return completion.
No.43	Moving distance after proximity dog		Not used in dog type home position return.

After setting the above parameters, switch power off once. Then switch power on again to make the set parameter values valid.

Set the input signals as listed below and switch on the forward rotation start (RYn1) to execute home position return.

Device name	Symbol	ON/OFF	Description
Automatic/manual selection	RYn6	ON	Home position return mode is selected.
Point table No. selection 1	RYnA	OFF	
Point table No. selection 2	RYnB	OFF	
Forward rotation stroke end	RYn4	ON	CCW rotation side limit switch is turned on.
Reverse rotation stroke end	RYn5	ON	CW rotation side limit switch is turned on.
Servo-on	RYn0	ON	Servo is switched on.

(g) Automatic operation

Set the input signals as listed below and switch on the forward rotation start (RYn1) to execute automatic operation in accordance with point table No.1.

Device name	Symbol	ON/OFF	Description
Automatic/manual selection	RYn6	ON	Automatic operation mode is selected.
Servo-on	RYnA	ON	Servo is switched on.
Forward rotation stroke end	RYnB	ON	CCW rotation side limit switch is turned on.
Reverse rotation stroke end	RYn4	ON	CW rotation side limit switch is turned on.
Point table No. selection 1	RYn5	ON	Point table No.1 is selected.
Point table No. selection 2	RYn0	OFF	

(h) Stop

In any of the following statuses, the servo amplifier interrupts and stops the operation of the servo motor.

When the servo motor used is equipped with an electromagnetic brake, refer to section 4.9 (3). Note that forward rotation stroke end (RYn4), reverse rotation stroke end (RYn5) off has the same stopping pattern as described below.

1) Servo-on (RYn0) OFF

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

2) 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.

3) 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. Servo forced stop warning (AL.E6) occurs.

4) Forward rotation stroke end (RYn4), reverse rotation stroke end (RYn5) 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 Automatic operation mode

5.2.1 What is automatic operation mode?

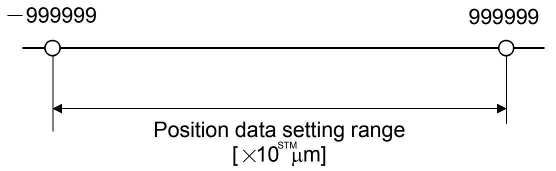
(1) Command system

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

(a) Absolute value command system

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

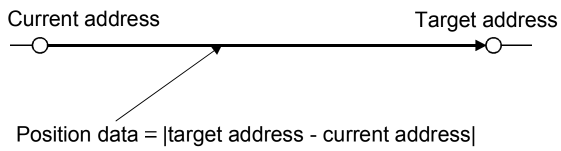
Setting range: −999999 to 999999 [$\times 10^{STM}$ μm] (STM = feed length multiplication parameter No.1)



(b) Incremental value command system

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

Setting range: 0 to 999999 [$\times 10^{STM}$ μm] (STM = feed length multiplication parameter No.1)



(2) Point table

(a) Point table setting

Up to 15 point tables may be set.

Set the point tables using the MR Configurator (Servo Configuration) Software, servo amplifier operation section or CC-Link write instruction code.

The following table lists what to set: Refer to section 5.2.2 for details of the settings.

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

(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.)

(Note) Remote input					Selected point table No.
RYnE	RYnD	RYnC	RYnB	RYnA	
0	0	0	0	0	0 (Manual home position return mode)
0	0	0	0	1	1
0	0	0	1	0	2
0	0	0	1	1	3
0	0	1	0	0	4
0	0	1	0	1	5
0	0	1	1	0	6
0	0	1	1	1	7
0	1	0	0	0	8
0	1	0	0	1	9
0	1	0	1	0	10
0	1	0	1	1	11
0	1	1	0	0	12
0	1	1	0	1	13
0	1	1	1	0	14
0	1	1	1	1	15
1	0	0	0	0	16
1	0	0	0	1	17
1	0	0	1	0	18
1	0	0	1	1	19
1	0	1	0	0	20
1	0	1	0	1	21
1	0	1	1	0	22
1	0	1	1	1	23
1	1	0	0	0	24
1	1	0	0	1	25
1	1	0	1	0	26
1	1	0	1	1	27
1	1	1	0	0	28
1	1	1	0	1	29
1	1	1	1	0	30
1	1	1	1	1	31

Note. 0: OFF
1: ON

5.2.2 Automatic operation using point table

(1) Absolute value command system

(a) Point table

Set the point table values using the MR Configurator (Servo Configuration software), from the servo amplifier operating section or the remote register of CC-Link.

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

Name	Setting range	Unit	Description
Position data	−999999 to 999999	$\times 10^{STM}$μm	(1) When using this point table as absolute value command system Set the target address (absolute value). (2) When using this point table as incremental value command system Set the moving distance. A "-" sign indicates a reverse rotation command.
Motor speed	0 to permissible speed	r/min	Set the command speed of the servo motor for execution of positioning. The setting should be equal to or less than the instantaneous permissible speed of the servo motor.
Acceleration time constant	0 to 20000	ms	Set the time until the rated speed of the servo motor is reached.
Deceleration time constant	0 to 20000	ms	Set the time until the servo motor running at rated speed comes to a stop.
Dwell	0 to 20000	ms	This function is valid when the point table is selected using the input signal or the remote input of CC-Link. It cannot be used when the point table No. is selected using the remote register of CC-Link. Set "0" in the auxiliary function to make the dwell invalid. Set "1" in the auxiliary function and 0 in the dwell to perform continuous operation. When the dwell is set, the position command of the selected point table is completed, and after the set dwell has elapsed, the position command of the next point table is started.
Auxiliary function	0 to 3		This function is valid when the point table is selected using the input signal or the remote input of CC-Link. It cannot be used when the point table No. is selected using the remote register of CC-Link. (1) When using this point table in the absolute value command system 0: Automatic operation is performed in accordance with a single point table chosen. 1: Operation is performed in accordance with consecutive point tables without a stop. (2) When using this point table in the incremental value command system 2: Automatic operation is performed in accordance with a single point table chosen. 3: Operation is performed in accordance with consecutive point tables without a stop. When a different rotation direction is set, smoothing zero (command output) is confirmed and the rotation direction is then reversed. Setting "1" in point table No.31 results in an error. For full information, refer to (4) in this section.

(b) Parameter setting

Set the following parameters to perform automatic operation.

1) Command mode selection (parameter No.0)

Select the absolute value command system.

Parameter No. 0

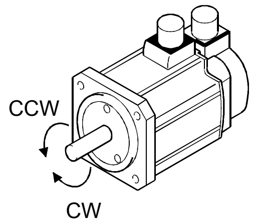
		0	

Absolute value command system

2) Forward rotation start coordinate system selection (parameter No.1)

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

Parameter No. 1 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.1)

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

Parameter No.1 setting	Feed unit [μm]	Position data input range [mm]
□□0□	1	−999.999 to +999.999
□□1□	10	−9999.99 to +9999.99
□□2□	100	−99999.9 to +99999.9
□□3□	1000	−999999 to +999999

(c) Operation

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

Item	Setting method	Description
Automatic operation mode selection	Automatic/manual selection (RYn6)	Turn RYn6 ON.
Point table selection	Point table No. selection 1 (RYnA) Point table No. selection 2 (RYnB) Point table No. selection 3 (RYnC) Point table No. selection 4 (RYnD) Point table No. selection 5 (RYnE)	Refer to section 5.2.1 (2).
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 (Servo Configuration software), from the servo amplifier operating section or the remote register of CC-Link.

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

Name	Setting range	Unit	Description
Position data	0 to 999999	$\times 10^{STM}$μm	Set the moving distance. The unit can be changed using feed length multiplication factor selection of parameter No. 1.
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.31 results in an error. For full information, refer to (4) in this section.

(b) Parameter setting

Set the following parameters to perform automatic operation.

1) Command mode selection (parameter No.0)

Select the incremental value command system.

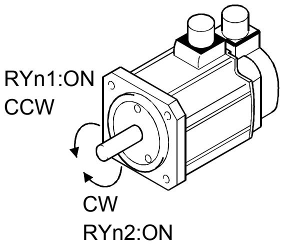
Parameter No. 0

		1	

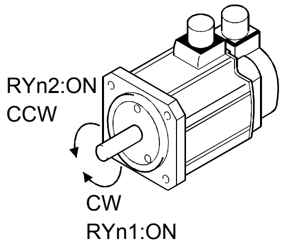
Incremental value command system

2) ST1 coordinate system selection (parameter No.1)
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.1 setting	Servo motor rotation direction	
	Forward rotation start (RYn1) ON	Reverse rotation start (RYn2) ON
□□□0	CCW rotation (address incremented)	CW rotation (address decremented)
□□□1	CW rotation (address incremented)	CCW rotation (address decremented)



Parameter No. 1 □□□0



Parameter No. 1 □□□1

3) Feed length multiplication selection (parameter No.1) Set the unit multiplication factor (STM) of position data.

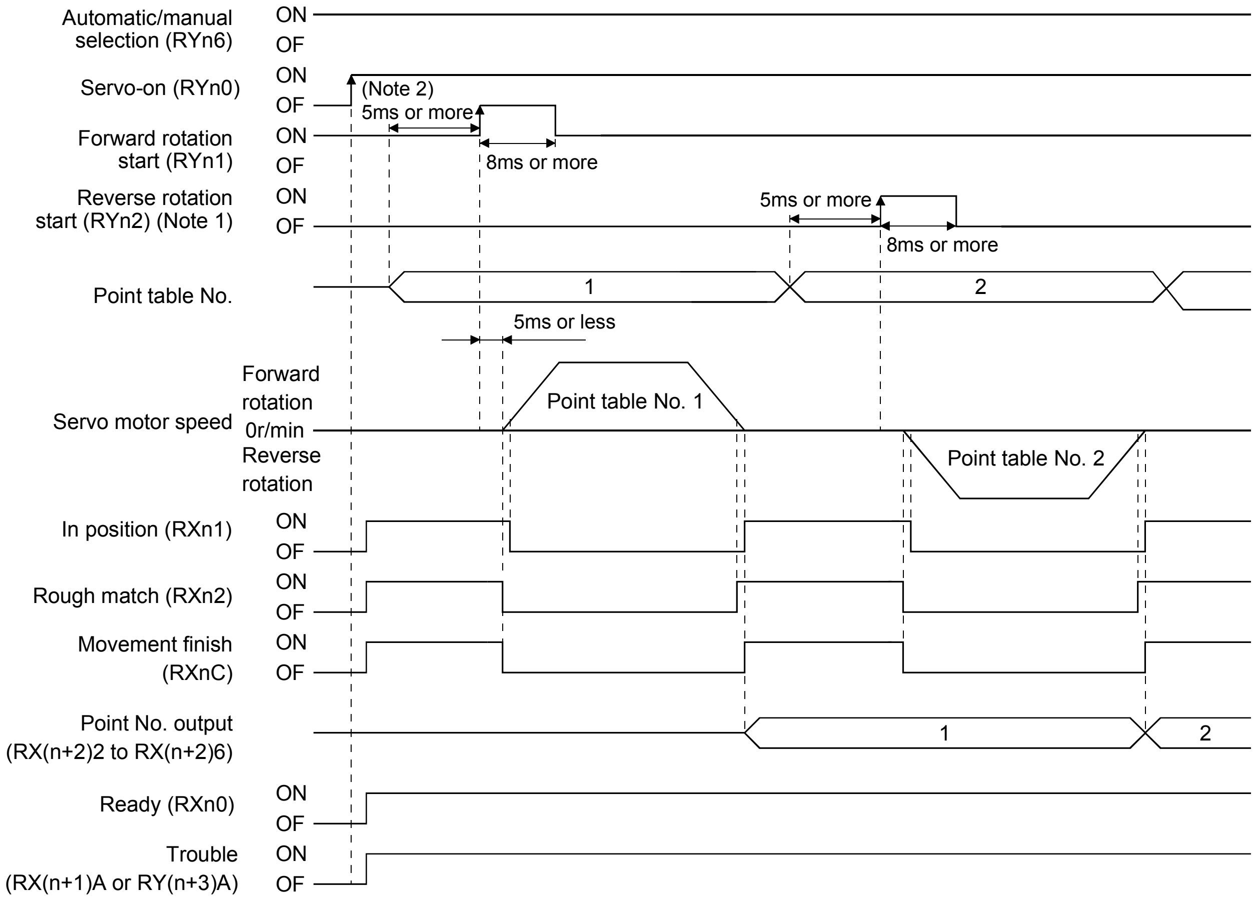
Parameter No.1 setting	Feed unit [μm]	Position data input range [mm]
□□0□	1	0 to 999.999
□□1□	10	0 to 9999.99
□□2□	100	0 to 99999.9
□□3□	1000	0 to 999999

(c) Operation
Choosing the point table using RYnA to RYnE 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)	Refer to section 5.2.1 (2).
Start	Forward rotation start (RYn1) Reverse rotation start (RYn2)	Turn RYn1 ON to start motion in forward rotation direction. 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. 2. 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

Automatic continuous operation
- Speed changing operation
- Automatic continuous positioning operation

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

2) In incremental value command system

Automatic continuous operation
- Speed changing operation
- Automatic continuous positioning operation

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

(b) Varied speed operation

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

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

By setting "1" to the auxiliary function of up to point table No.30, operation can be performed at a maximum of 31 speeds. Set "0" to the auxiliary function of the last point table.

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

The following table gives a setting example.

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

Note 1. Always set "0".

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

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 command system, and the point table No. 4 the incremental value command system.

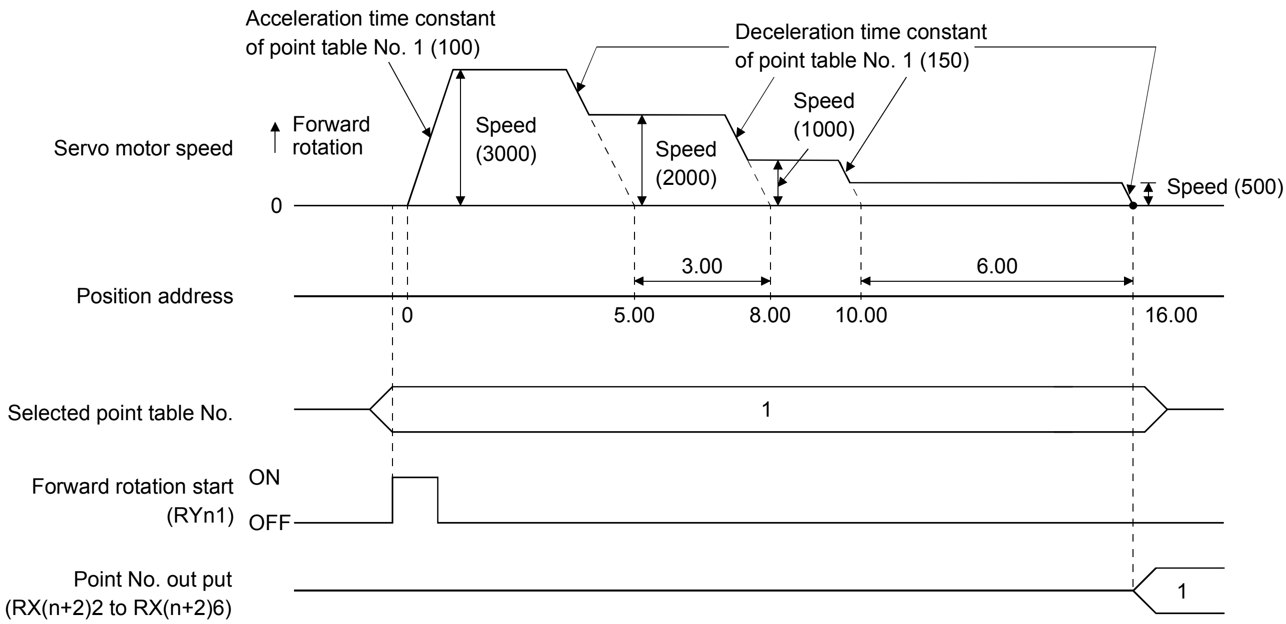
Point table No.	Position data [$\times 10^{STM}\mu m$]	Servo motor speed [r/min]	Acceleration time constant [ms]	Deceleration time constant [ms]	Dwell [ms] (Note 1)	Auxiliary function
1	5.00	3000	100	150	0	1
2	3.00	2000	Invalid	Invalid	0	3
3	10.00	1000	Invalid	Invalid	0	1
4	6.00	500	Invalid	Invalid	0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

2: 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.

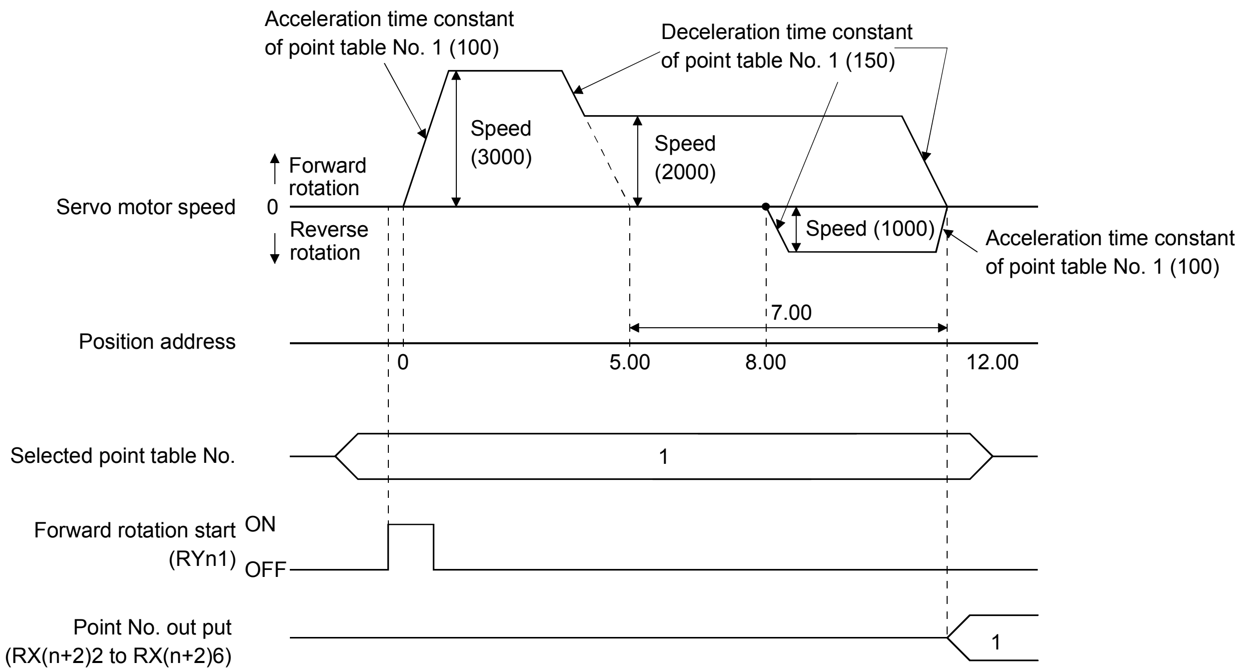
Point table No.	Position data [×10^{STM}μm]	Servo motor speed [r/min]	Acceleration time constant [ms]	Deceleration time constant [ms]	Dwell [ms] (Note 1)	Auxiliary function
1	5.00	3000	100	150	0	1
2	7.00	2000	Invalid	Invalid	0	1
3	8.00	1000	Invalid	Invalid	0	0 (Note 2)

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

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



2) Incremental value command system

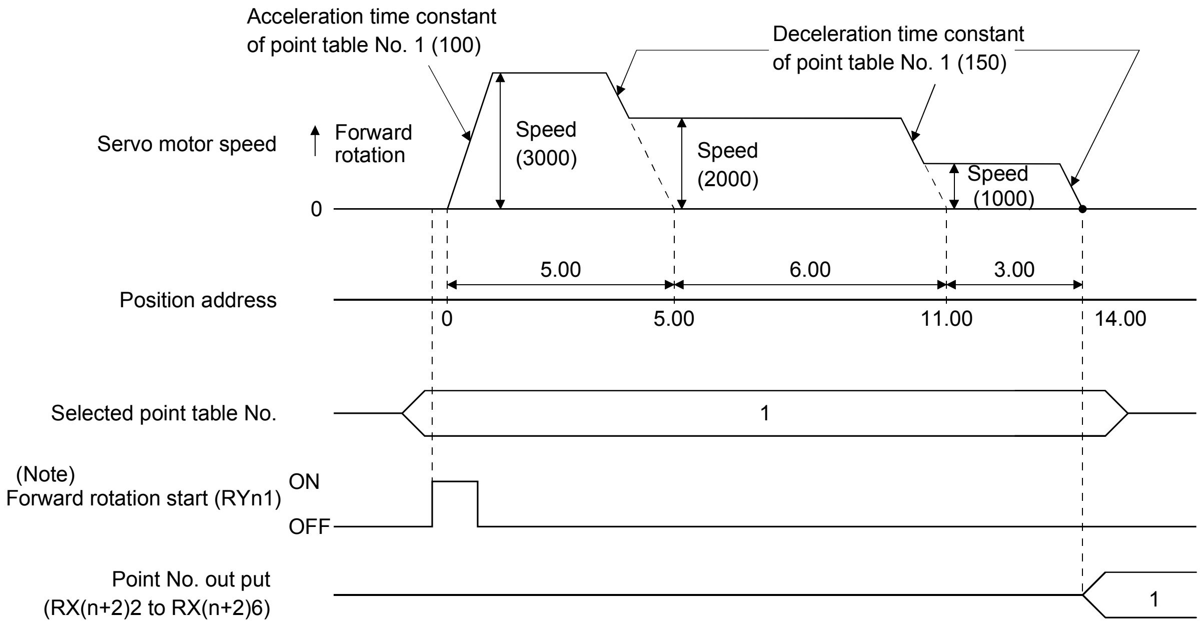
The position data of the incremental value command system is the sum of the position data of the consecutive point tables.

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

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

Note 1. Always set "0".

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



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

(c) Temporary stop/restart

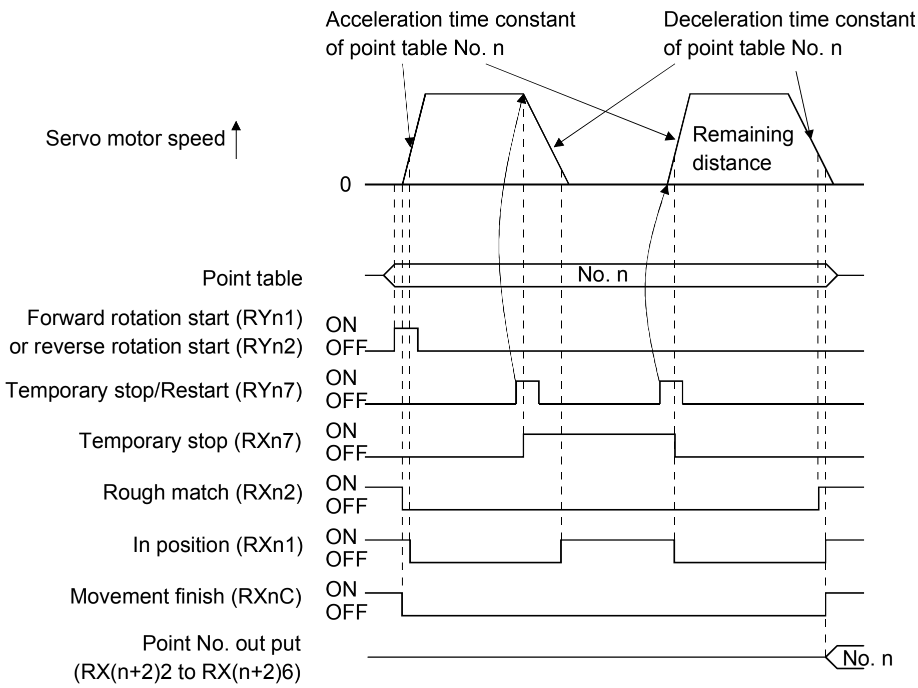
When RYn7 is turned ON during automatic operation, the motor is decelerated to a temporary stop at the deceleration time constant in the point table being executed. When RYn7 is turned ON again, the remaining distance is executed.

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

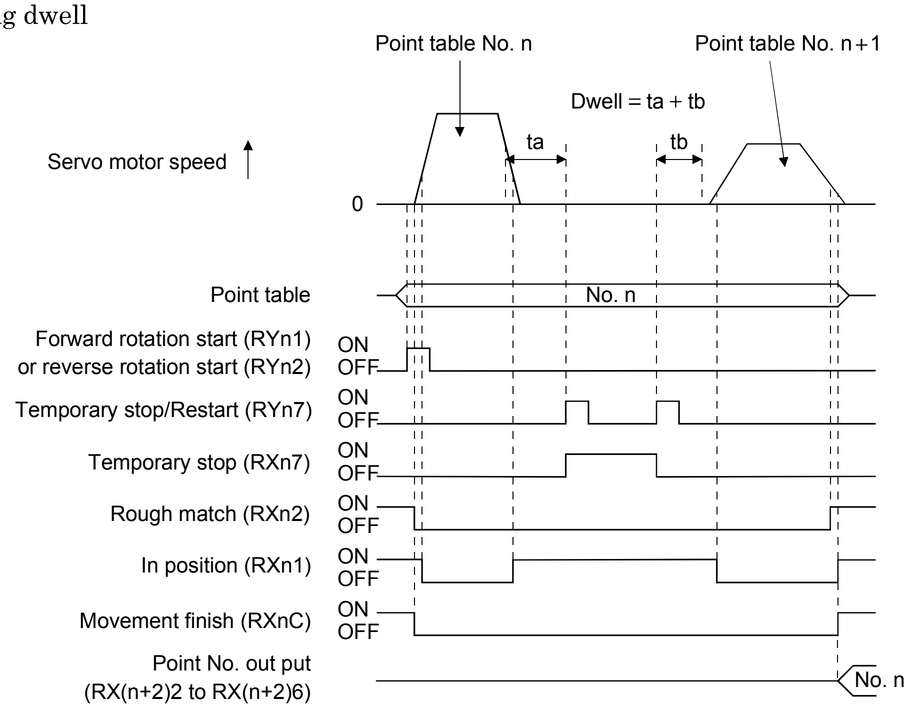
The remaining moving distance is cleared when the operation mode is changed from the automatic mode to the manual mode during a temporary stop.

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

1) When the servo motor is rotating



2) During dwell



5.2.3 Remote register-based position/speed setting

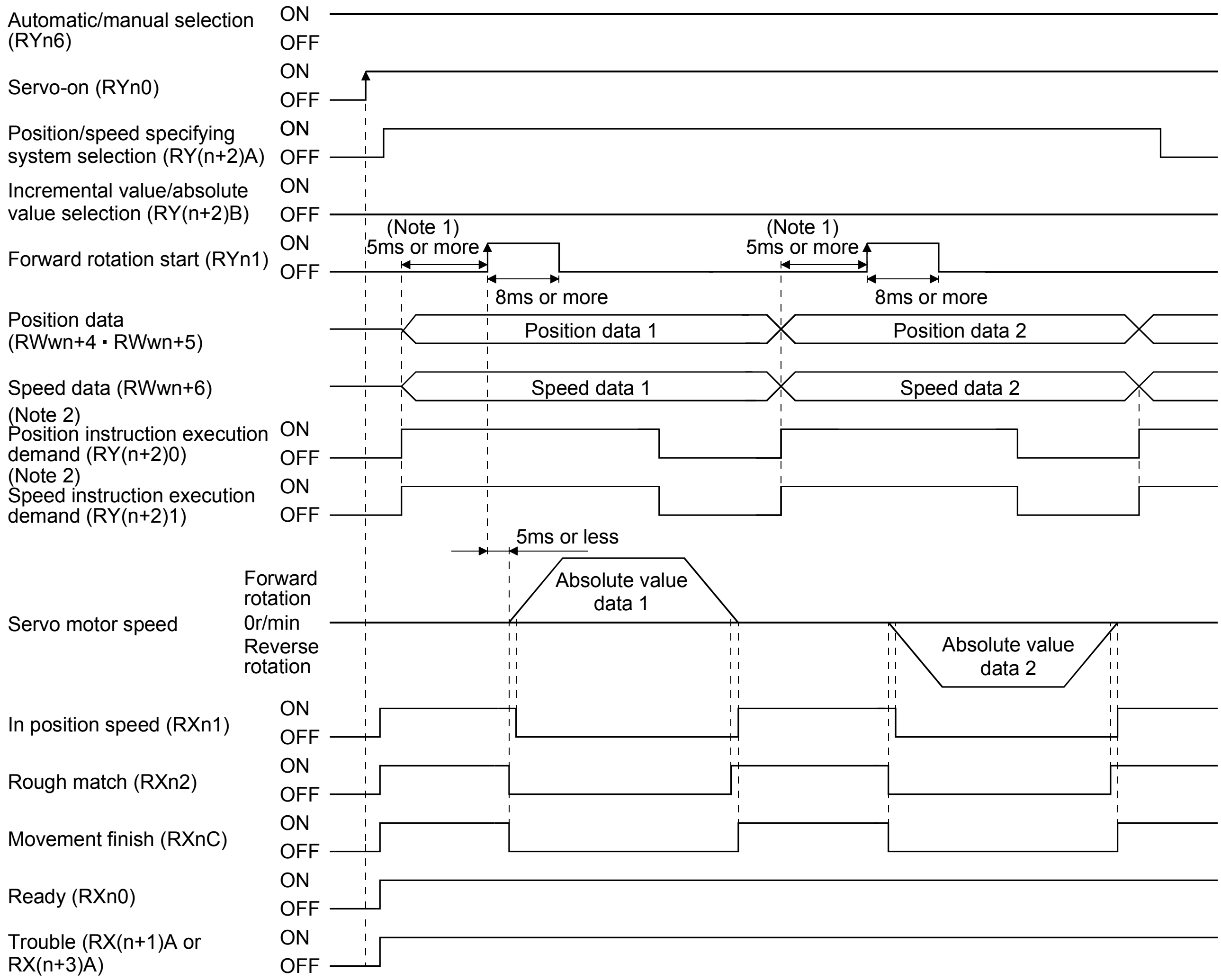
This operation can be used when 2 stations are occupied. This section explains operation to be performed when the remote register is used to specify the position command data/speed command data.

(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.0	□□0□ : Absolute value command system is selected.
Remote register-based position/speed specifying system selection	Parameter No.41	□□□2 : Remote register-based position/speed specifying system is selected.
Position data	Position command data lower 16 bit (RWwn+4)	Set the lower 16 bits of position data to RWwn+4, and the upper 16 bits to RWwn+5. Setting range: −999999 to 999999
	Position command data upper 16 bit (RWwn+5)	
Servo motor speed	Speed command data (RWwn+6)	Set the servo motor speed.

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.



Note 1. An external input signal is detected after a delay of the input filter setting time in parameter No. 2. 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.

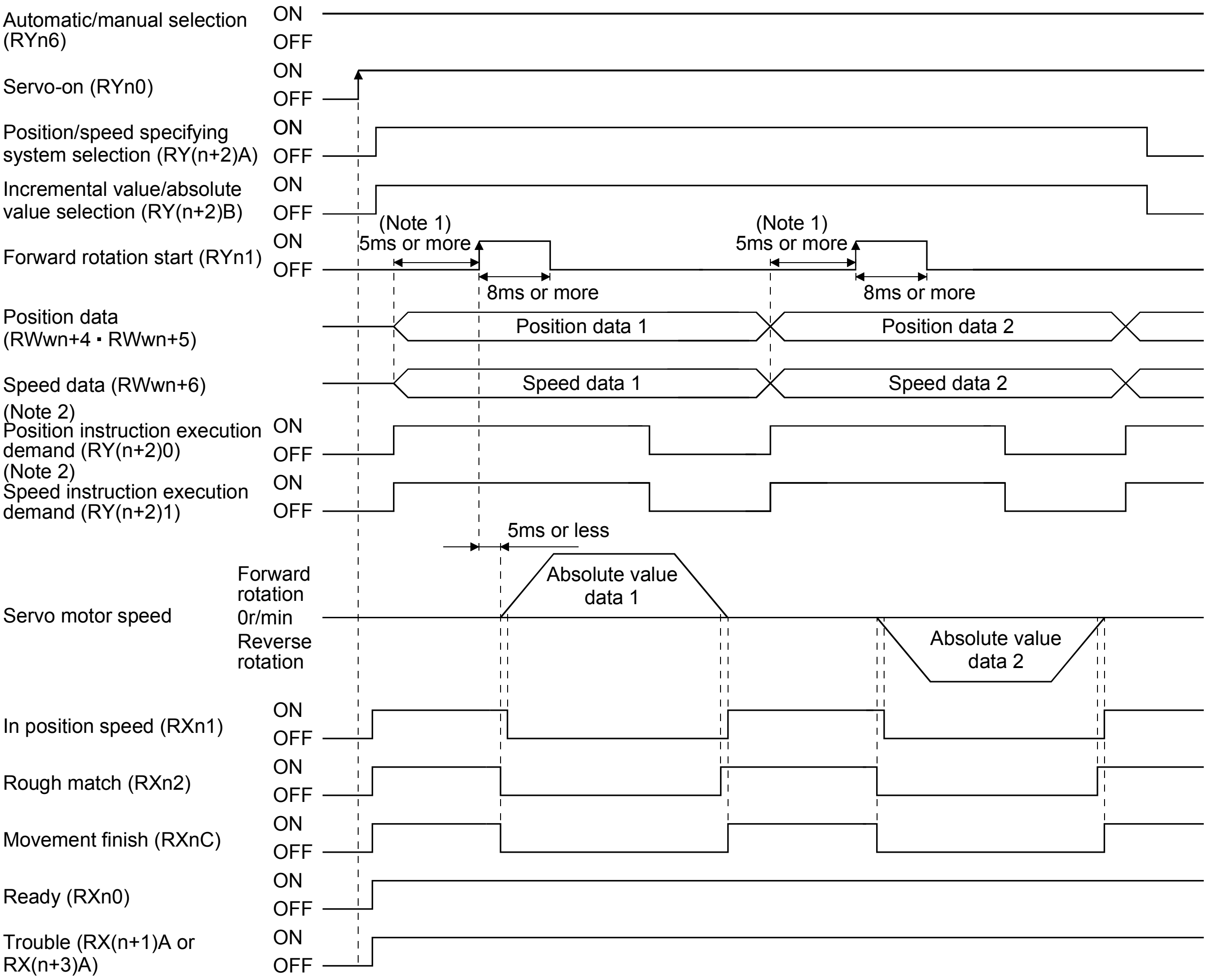
2. For details of the operation timing of RY(n＋2)0 and RY(N＋2)1, refer to the section 3.6.3 (3).

(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.0	□□0□ : Absolute value command system is selected.
Remote register-based position/speed specifying system selection	Parameter No.41	□□□2 : Remote register-based position/speed specifying system is selected.
Position data	Position command data lower 16 bit (RWwn+4)	Set the lower 16 bits of position data to RWwn+4, and the upper 16 bits to RWwn+5. Setting range: −999999 to 999999
	Position command data upper 16 bit (RWwn+5)	
Servo motor speed	Speed command data (RWwn+6)	Set the servo motor speed.

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



Note 1. An external input signal is detected after a delay of the input filter setting time in parameter No. 2. 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.

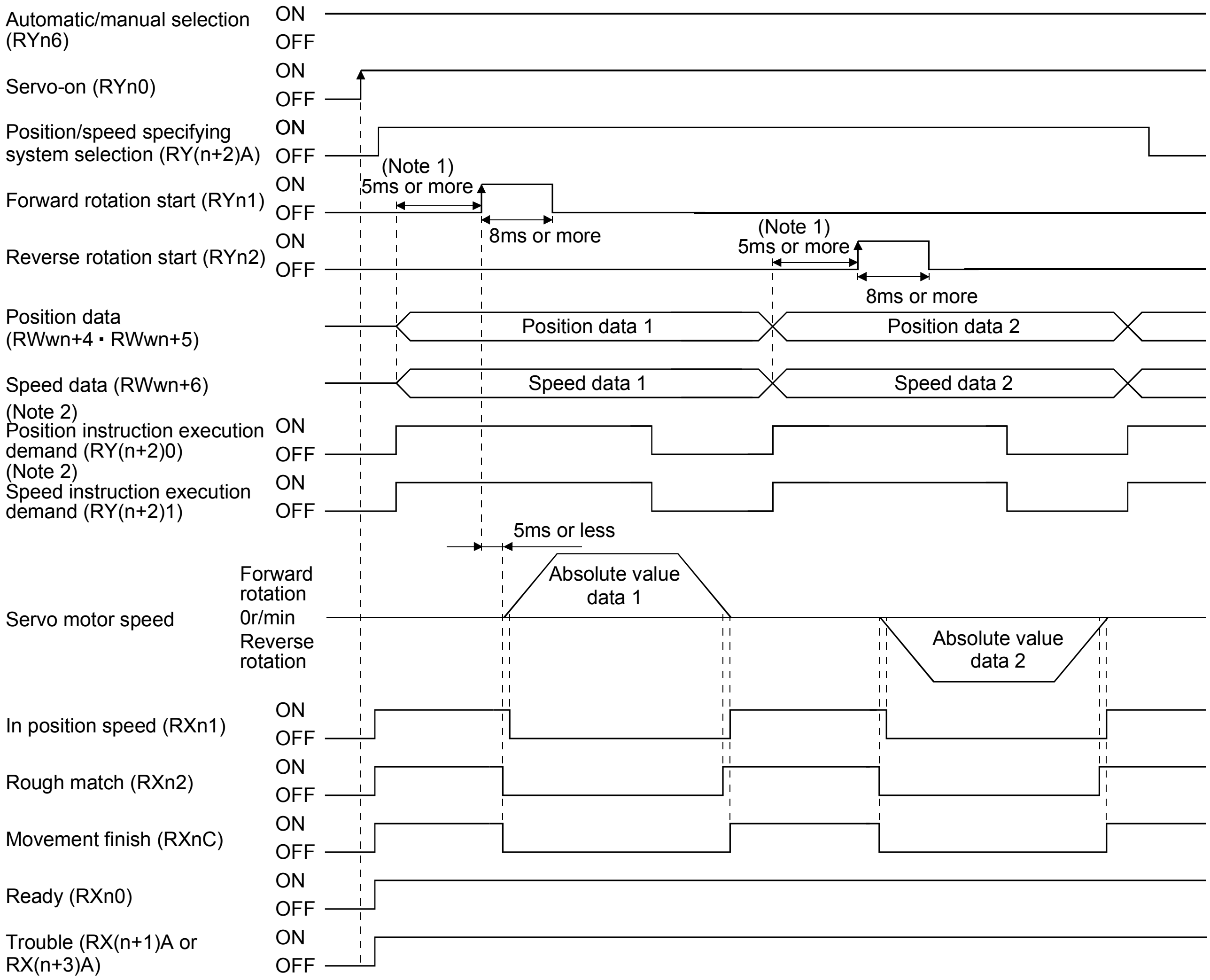
2. For details of the operation timing of RY(n＋2)0 and RY(N＋2)1, refer to the section 3.6.3 (3).

(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.0	□□1□ : Incremental value command system is selected.
Remote register-based position/speed specifying system selection	Parameter No.41	□□□2 : Remote register-based position/speed specifying system is selected.
Position data	Position command data lower 16 bit (RWwn+4)	Set the lower 16 bits of position data to RWwn+4, and the upper 16 bits to RWwn+5. Setting range: 0 to 999999
	Position command data upper 16 bit (RWwn+5)	
Servo motor speed	Speed command data (RWwn+6)	Set the servo motor speed.

Set "□□1□" in parameter No. 0 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 1. 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.

2. For details of the operation timing of RY(n＋2)0 and RY(N＋2)1, refer to the section 3.6.3 (3).

5.3 Manual operation mode

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

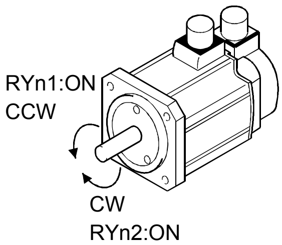
(1) Setting

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

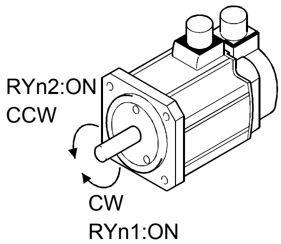
Item	Setting method	Description
Manual operation mode selection	Automatic/manual selection (RYn6)	Turn RYn6 OFF.
Servo motor rotation direction	Parameter No.1	Refer to (2) in this section.
Jog speed	Parameter No.13	Set the speed of the servo motor.
Acceleration/deceleration time constant	Point table No.1	Use the acceleration/deceleration time constants in point table No.1.

(2) Servo motor rotation direction

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



Parameter No. 1 □□□0

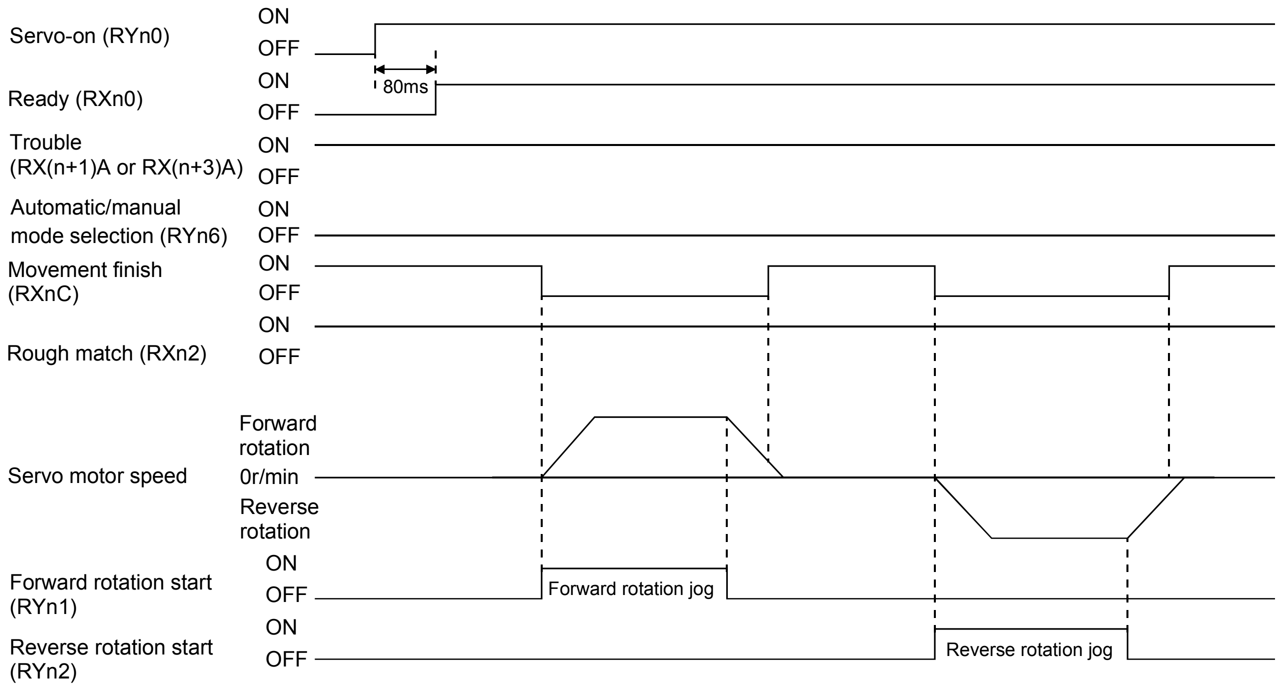


Parameter No. 1 □□□1

(3) Operation

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

(4) Timing chart



5.4 Manual home position return mode

5.4.1 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) Manual home position return types
Choose the optimum home position return according to the machine type, etc.

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

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 parameter No.8 as follows.

Parameter No. 8

0			

Home position return method ······ 1)
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

Home position return direction ······ 2)
0: Address increment direction
1: Address decrement direction

Proximity dog input polarity ······ 3)
0: OFF indicates detection of the dog.
1: ON indicates detection of the dog.

1) Choose the home position return method.

2) Choose the starting direction of home position return. 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.

3) Choose the polarity at which the proximity dog is detected. Set "0" to detect the dog when the proximity dog device (RYn3) is OFF, or "1" to detect the dog when the device is ON.

(3) Instructions

1) Before starting home position return, always make sure that the limit switch operates.

2) Confirm the home position return direction. Incorrect setting will cause the machine to run reversely.

3) Confirm the proximity dog input polarity. Otherwise, misoperation can occur.

5.4.2 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 signals and parameters as follows.

Item	Device/Parameter used	Description
Manual home position return mode selection	Automatic/manual selection (RYn6)	Turn RYn6 ON.
	Point table No. selection 1 (RYnA)	Turn RYnA OFF.
	Point table No. selection 2 (RYnB)	Turn RYnB OFF.
	Point table No. selection 3 (RYnC)	Turn RYnC OFF.
	Point table No. selection 4 (RYnD)	Turn RYnD OFF.
	Point table No. selection 5 (RYnE)	Turn RYnE OFF.
Remote register-based position/speed setting	Position/speed specifying system selection (RY(n+2)A)	Turn RY(n+2)A OFF.
Dog type home position return	Parameter No.8	□□□0 :Dog type home position return is selected.
Home position return direction	Parameter No.8	Refer to section 5.4.1 (2) and choose home position return direction.
Dog input polarity	Parameter No.8	Refer to section 5.4.1 (2) and choose dog input polarity.
Home position return speed	Parameter No.9	Set speed until detection of dog.
Creep speed	Parameter No.10	Set speed after detection of dog.
Home position shift distance	Parameter No.11	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.42	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 (RYn3), the proximity dog should have the length which satisfies formulas (5.2) and (5.3).

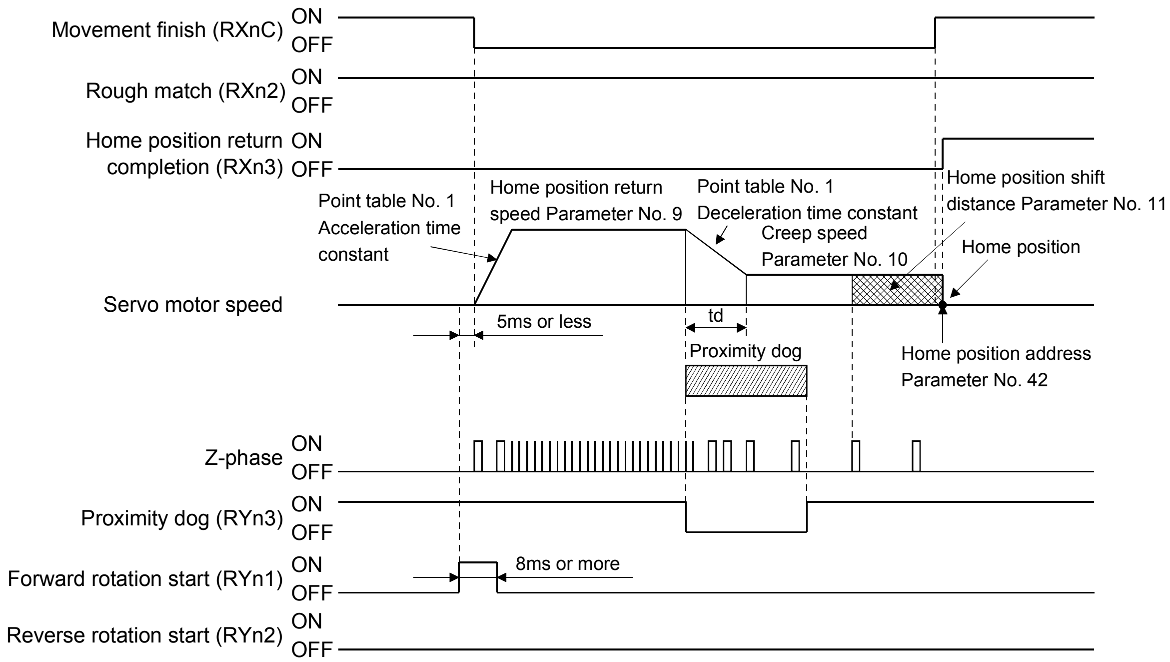
$$L_1 \geq \frac{V}{60} \cdot \frac{td}{2} \quad \cdots\cdots (5.2)$$

L_1 : Proximity dog length [mm]
V : Home position return speed [mm/min]
td : Deceleration time [s]

$$L_2 \geq 2 \cdot \Delta S \quad \cdots\cdots (5.3)$$

L_2 : Proximity dog length [mm]
ΔS : Moving distance per servo motor revolution [mm]

(3) Timing chart

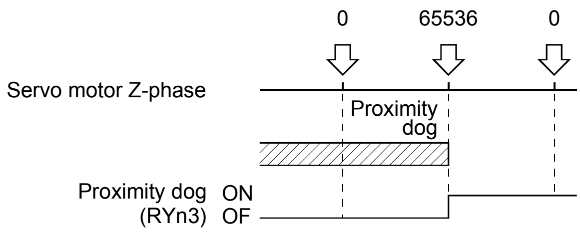


The parameter No.42 (home position return position data) setting value is the positioning address after the home position return is completed.

(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 (RYn3) 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".



5.4.3 Count type home position return

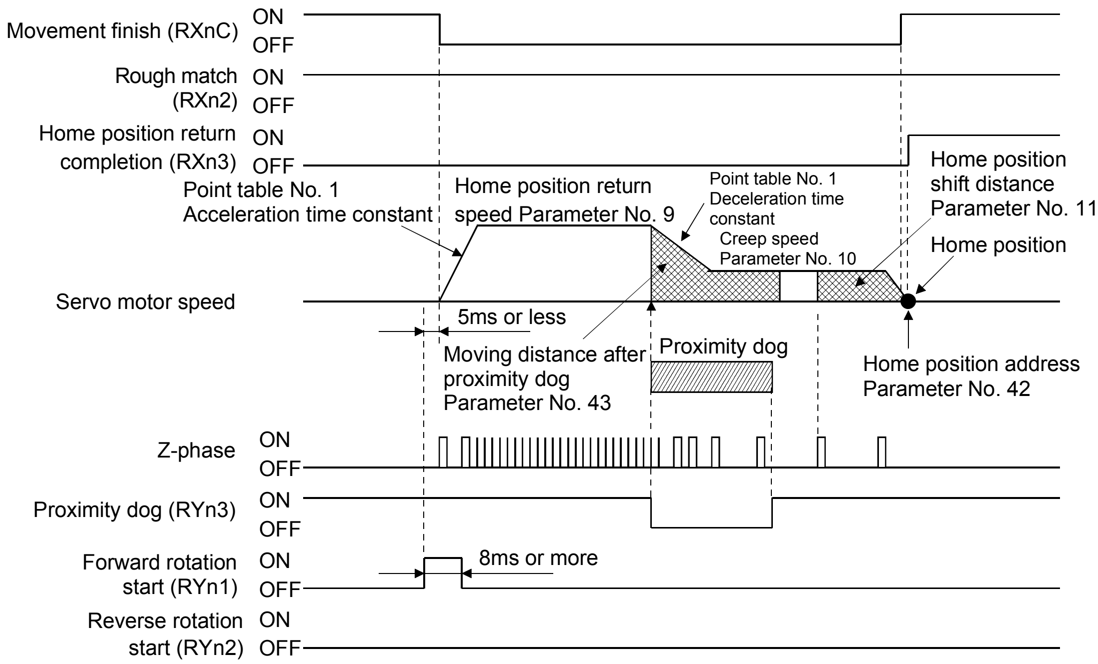
In count type home position return, a motion is made over the distance set in parameter No.43 (moving distance after proximity dog) after detection of the proximity dog front end. The position where the first Z-phase signal is given after that is defined as a home position. Hence, if the proximity dog (RYn3) 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 (RYn3) is entered electrically from a controller or the like.

(1) Signals, parameters

Set the input signals and parameters as follows.

Item	Device/Parameter used	Description
Manual home position return mode selection	Automatic/manual selection (RYn6)	Turn RYn6 ON.
	Point table No. selection 1 (RYnA)	Turn RYnA OFF.
	Point table No. selection 2 (RYnB)	Turn RYnB OFF.
	Point table No. selection 3 (RYnC)	Turn RYnC OFF.
	Point table No. selection 4 (RYnD)	Turn RYnD OFF.
	Point table No. selection 5 (RYnE)	Turn RYnE OFF.
Remote register-based position/speed setting	Position/speed specifying system selection (RY(n+2)A)	Turn RY(n+2)A OFF.
Count type home position return	Parameter No.8	□□□1: Count type home position return is selected.
Home position return direction	Parameter No.8	Refer to section 5.4.1 (2) and choose home position return direction.
Dog input polarity	Parameter No.8	Refer to section 5.4.1 (2) and choose dog input polarity.
Home position return speed	Parameter No.9	Set speed until detection of dog.
Creep speed	Parameter No.10	Set speed after detection of dog.
Home position shift distance	Parameter No.11	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.43	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.42	Set the current position at home position return completion.

(2) Timing chart



The parameter No.42 (home position return position data) setting value is the positioning address after the home position return is completed.

5.4.4 Data setting type home position return

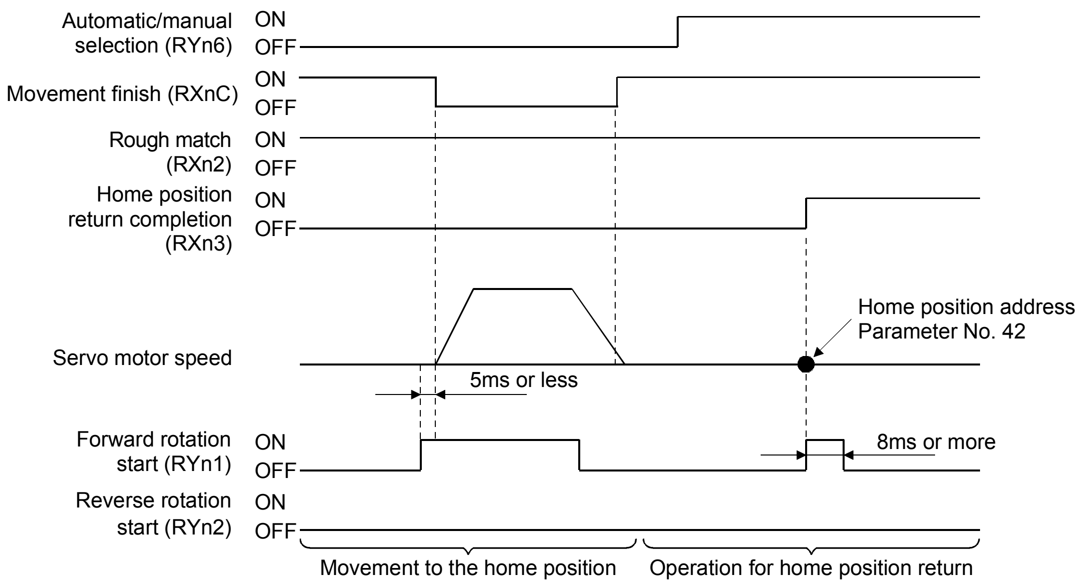
Data setting type home position return is used when it is desired to determine any position as a home position. JOG operation can be used for movement.

(1) Signals, parameters

Set the input signals and parameters as follows.

Item	Device/Parameter used	Description
Manual home position return mode selection	Automatic/manual selection (RYn6)	Turn RYn6 ON.
	Point table No. selection 1 (RYnA)	Turn RYnA OFF.
	Point table No. selection 2 (RYnB)	Turn RYnB OFF.
	Point table No. selection 3 (RYnC)	Turn RYnC OFF.
	Point table No. selection 4 (RYnD)	Turn RYnD OFF.
	Point table No. selection 5 (RYnE)	Turn RYnE OFF.
Remote register-based position/speed setting	Position/speed specifying system selection (RY(n+2)A)	Turn RY(n+2)A OFF.
Data setting type home position return	Parameter No.8	□□□2: Data setting type home position return is selected.
Home position return position data	Parameter No.42	Set the current position at home position return completion.

(2) Timing chart



The parameter No.42 (home position return position data) setting value is the positioning address after the home position return is completed.

5.4.5 Stopper type home position return

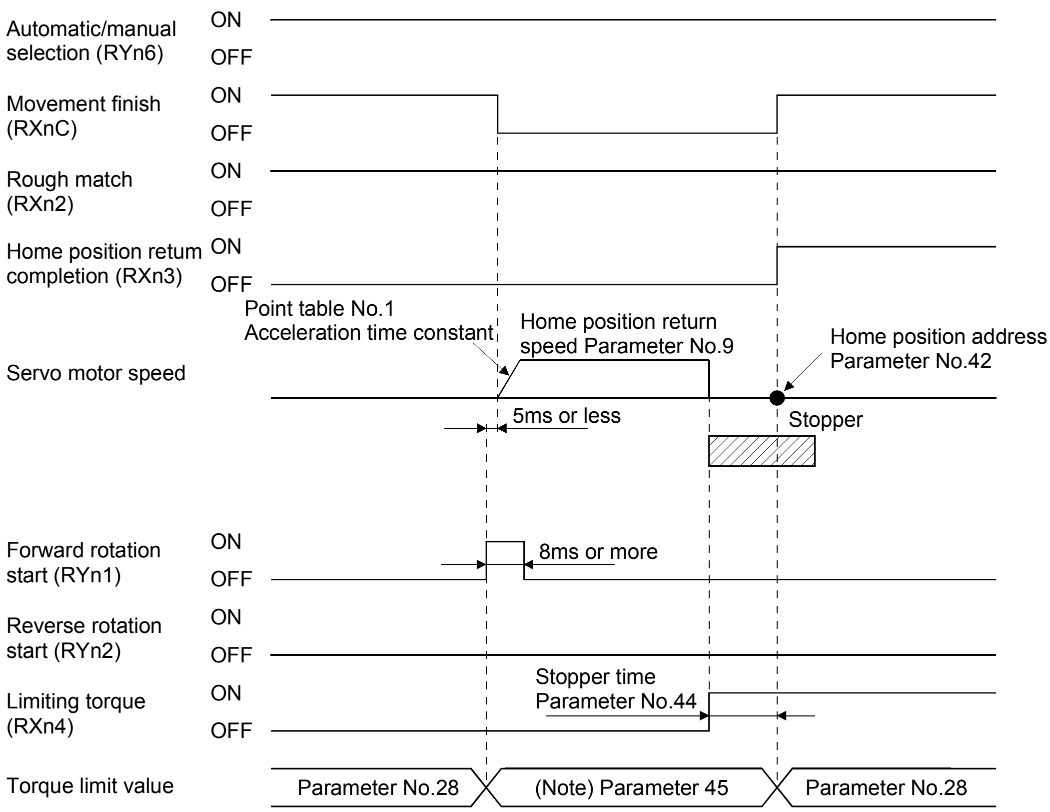
In stopper type home position return, a machine part is pressed against a stopper or the like by jog operation to make a home position return and that position is defined as a home position.

(1) Signals, parameters

Set the input signals and parameters as follows.

Item	Device/Parameter used	Description
Manual home position return mode selection	Automatic/manual selection (RYn6)	Turn RYn6 ON.
	Point table No. selection 1 (RYnA)	Turn RYnA OFF.
	Point table No. selection 2 (RYnB)	Turn RYnB OFF.
	Point table No. selection 3 (RYnC)	Turn RYnC OFF.
	Point table No. selection 4 (RYnD)	Turn RYnD OFF.
	Point table No. selection 5 (RYnE)	Turn RYnE OFF.
Remote register-based position/speed setting	Position/speed specifying system selection (RY(n+2)A)	Turn RY(n+2)A OFF.
Stopper type home position return	Parameter No.8	□□□3: Stopper type home position return is selected.
Home position return direction	Parameter No.8	Refer to section 5.4.1 (2) and choose the home position return direction.
Home position return speed	Parameter No.9	Set the speed till contact with the stopper.
Stopper time	Parameter No.44	Time from when the part makes contact with the stopper to when home position return data is obtained to output home position return completion (RXn3)
Stopper type home position return torque limit	Parameter No.45	Set the servo motor torque limit value for execution of stopper type home position return.
Home position return acceleration time constant	Point table No.1	Use the acceleration time constant of point table No.1.
Home position return position data	Parameter No.42	Set the current position at home position return completion.

(2) Timing chart



Note. The torque limit that is enabled at this point is as follows.

(Note) Internal torque limit selection (RY(N+2)6)	Limit value status			Torque limit to be enabled
0				Parameter No.45
1	Parameter No.29	>	Parameter No.45	Parameter No.45
	Parameter No.29	<	Parameter No.45	Parameter No.29

Note. 0: OFF
1: ON

The parameter No.42 (home position return position data) setting value is the positioning address after the home position return is completed.

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

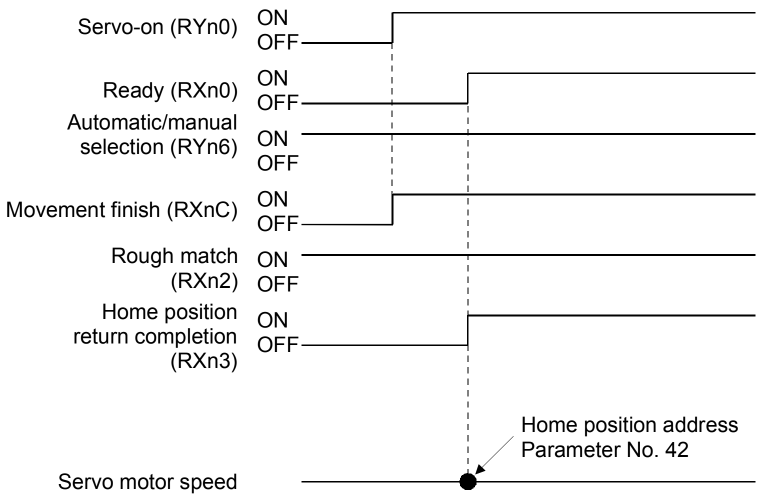
The position where servo is switched on is defined as a home position.

(1) Signals, parameter

Set the input signals and parameter as follows.

Item	Device/Parameter used	Description
Home position ignorance	Parameter No.8	□□□4: Home position ignorance is selected.
Home position return position data	Parameter No.42	Set the current position at home position return completion.

(2) Timing chart



The parameter No.42 (home position return position data) setting value is the positioning address after the home position return is completed.

5.4.7 Dog type rear end reference home position return

POINT
・This home position return method depends on the timing of reading Proximity dog (RYn3) that has detected the rear end of a proximity dog. Hence, if a home position return is made at the creep speed of 100r/min, an error of ±200 pulses will occur in the home position. The error of the home position is larger as the creep speed is higher.

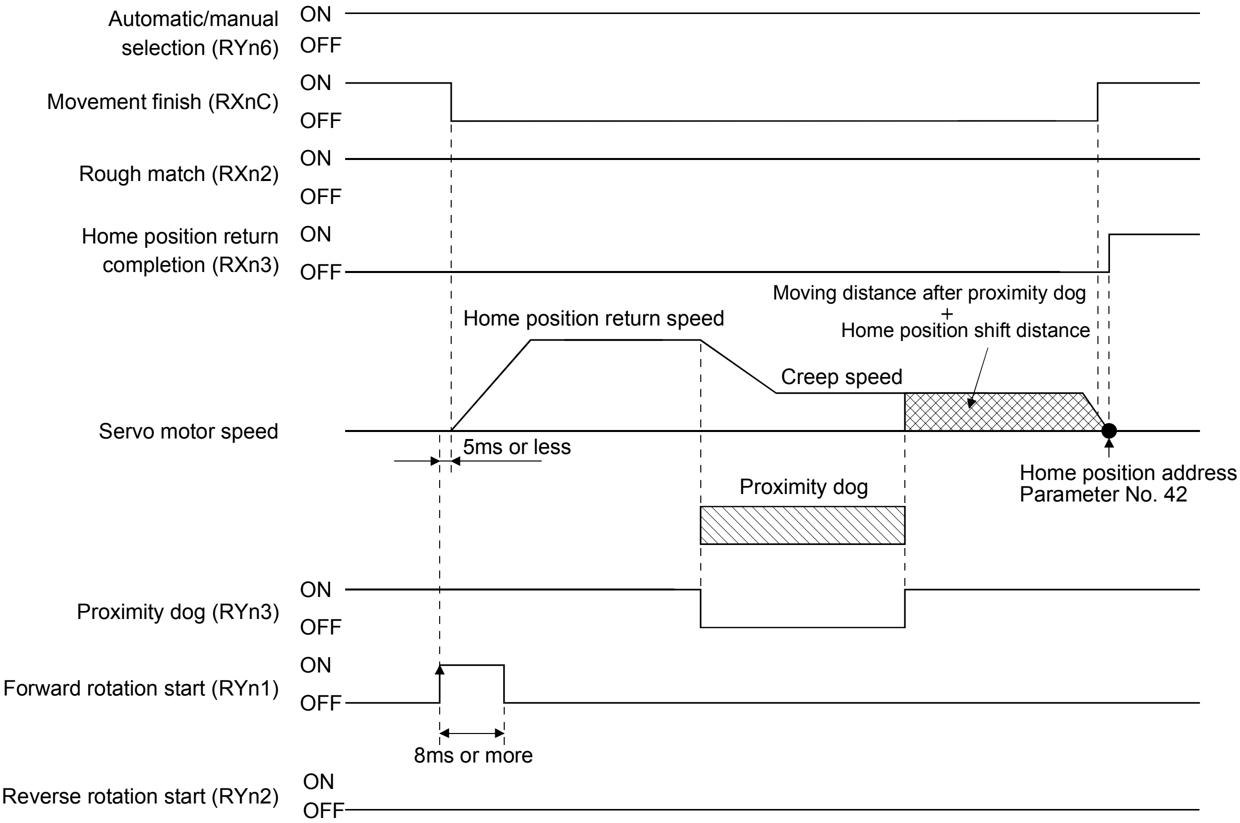
The position where the axis, which had started decelerating at the front end of a proximity dog, has moved the after-proximity dog moving distance and home position shift distance after it passed the rear end is defined as a home position. A home position return that does not depend on the Z-phase signal can be made.

(1) Signals, parameters

Set the input signals and parameters as indicated below.

Item	Device/Parameter used	Description
Manual home position return mode selection	Automatic/manual selection (RYn6)	Turn RYn6 ON.
	Point table No. selection 1 (RYnA)	Turn RYnA OFF.
	Point table No. selection 2 (RYnB)	Turn RYnB OFF.
	Point table No. selection 3 (RYnC)	Turn RYnC OFF.
	Point table No. selection 4 (RYnD)	Turn RYnD OFF.
	Point table No. selection 5 (RYnE)	Turn RYnE OFF.
Remote register-based position/speed setting	Position/speed specifying system selection (RY(n+2)A)	Turn RY(n+2)A OFF.
Dog type rear end reference home position return	Parameter No.8	□□□5: Select the dog type rear end reference.
Home position return direction	Parameter No.8	Refer to section 5.4.1 (2) and select the home position return direction.
Dog input polarity	Parameter No.8	Refer to section 5.4.1 (2) and select the dog input polarity.
Home position return speed	Parameter No.9	Set the speed till the dog is detected.
Creep speed	Parameter No.10	Set the speed after the dog is detected.
Home position shift distance	Parameter No.11	Set when the home position is moved from where the axis has passed the proximity dog rear end.
Moving distance after proximity dog	Parameter No.43	Set the moving distance after the axis has passed the proximity dog rear end.
Home position return acceleration/deceleration time constants	Point table No.1	Use the acceleration/deceleration time constant of point table No. 1.
Home position return position data	Parameter No.42	Set the current position at home position return completion.

(2) Timing chart



The parameter No.42 (home position return position data) setting value is the positioning address after the home position return is completed.

5.4.8 Count type front end reference home position return

POINT
· This home position return method depends on the timing of reading Proximity dog (RYn3) that has detected the front end of a proximity dog. Hence, if a home position return is made at the home position return speed of 100r/min, an error of ±200 pulses will occur in the home position. The error of the home position is larger as the home position return speed is higher.

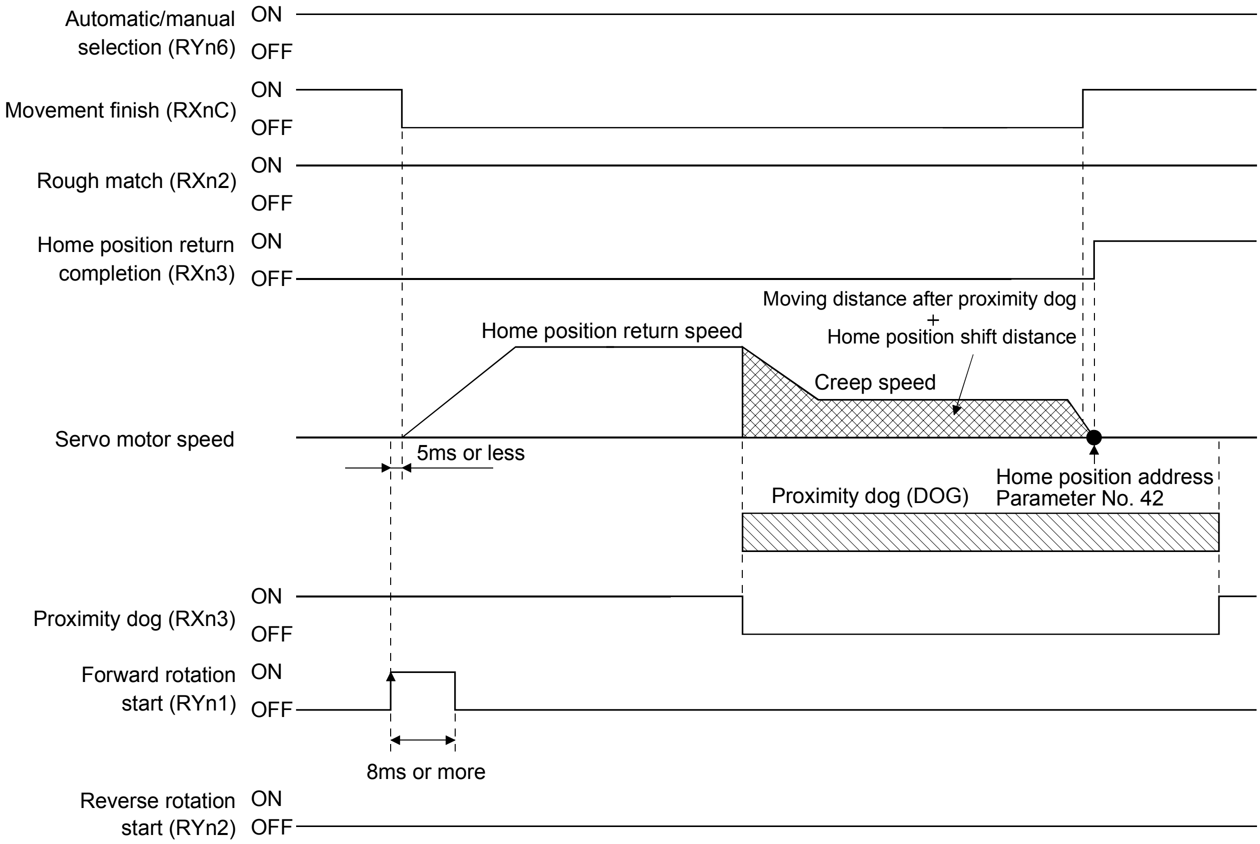
The position where the axis, which had started decelerating at the front end of a proximity dog, has moved the after-proximity dog moving distance and home position shift distance is defined as a home position. A home position return that does not depend on the Z-phase signal can be made. The home position may change if the home position return speed varies.

(1) Signals, parameters

Set the input signals and parameters as indicated below.

Item	Device/Parameter used	Description
Manual home position return mode selection	Automatic/manual selection (RYn6)	Turn RYn6 ON.
	Point table No. selection 1 (RYnA)	Turn RYnA OFF.
	Point table No. selection 2 (RYnB)	Turn RYnB OFF.
	Point table No. selection 3 (RYnC)	Turn RYnC OFF.
	Point table No. selection 4 (RYnD)	Turn RYnD OFF.
	Point table No. selection 5 (RYnE)	Turn RYnE OFF.
Remote register-based position/speed setting	Position/speed specifying system selection (RY(n+2)A)	Turn RY(n+2)A OFF.
Count type dog front end reference home position return	Parameter No.8	□□□6: Select the count type dog front end reference.
Home position return direction	Parameter No.8	Refer to section 5.4.1 (2) and select the home position return direction.
Dog input polarity	Parameter No.8	Refer to section 5.4.1 (2) and select the dog input polarity.
Home position return speed	Parameter No.9	Set the speed till the dog is detected.
Creep speed	Parameter No.10	Set the speed after the dog is detected.
Home position shift distance	Parameter No.11	Set when the home position is moved from where the axis has passed the proximity dog rear end.
Moving distance after proximity dog	Parameter No.43	Set the moving distance after the axis has passed the proximity dog rear end.
Home position return acceleration/ deceleration time constants	Point table No.1	Use the acceleration/deceleration time constant of point table No. 1.
Home position return position data	Parameter No.42	Set the current position at home position return completion.

(2) Timing chart



The parameter No.42 (home position return position data) setting value is the positioning address after the home position return is completed.

5.4.9 Dog cradle type home position return

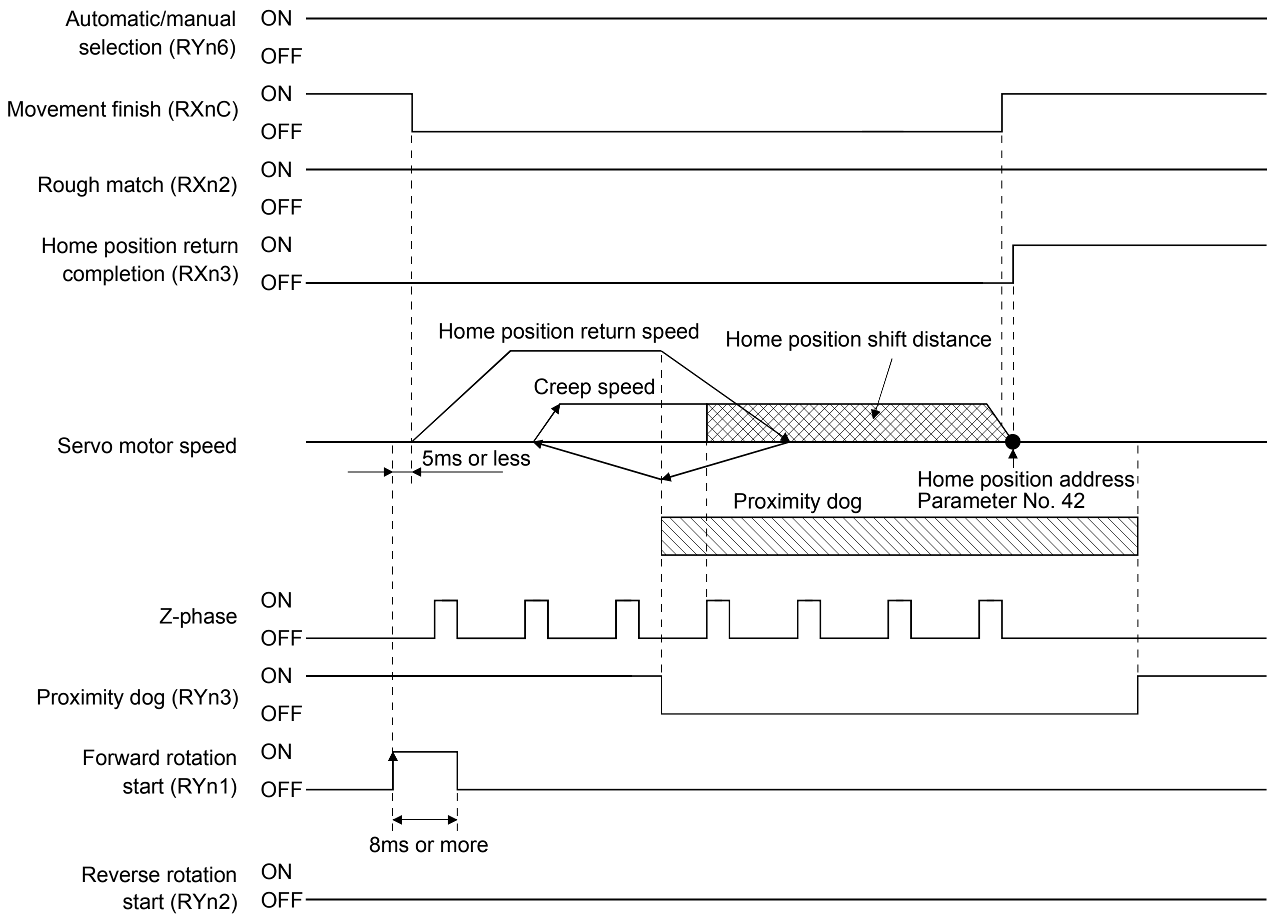
The position where the first Z-phase signal is issued after detection of the proximity dog front end can be defined as a home position.

(1) Signals, parameters

Set the input signals and parameters as indicated below.

Item	Device/Parameter used	Description
Manual home position return mode selection	Automatic/manual selection (RYn6)	Turn RYn6 ON.
	Point table No. selection 1 (RYnA)	Turn RYnA OFF.
	Point table No. selection 2 (RYnB)	Turn RYnB OFF.
	Point table No. selection 3 (RYnC)	Turn RYnC OFF.
	Point table No. selection 4 (RYnD)	Turn RYnD OFF.
	Point table No. selection 5 (RYnE)	Turn RYnE OFF.
Remote register-based position/speed setting	Position/speed specifying system selection (RY(n+2)A)	Turn RY(n+2)A OFF.
Dog cradle type home position return	Parameter No.8	□□□7: Select the dog cradle type.
Home position return direction	Parameter No.8	Refer to section 5.4.1 (2) and select the home position return direction.
Dog input polarity	Parameter No.8	Refer to section 5.4.1 (2) and select the dog input polarity.
Home position return speed	Parameter No.9	Set the speed till the dog is detected.
Creep speed	Parameter No.10	Set the speed after the dog is detected.
Home position shift distance	Parameter No.11	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.42	Set the current position at home position return completion.

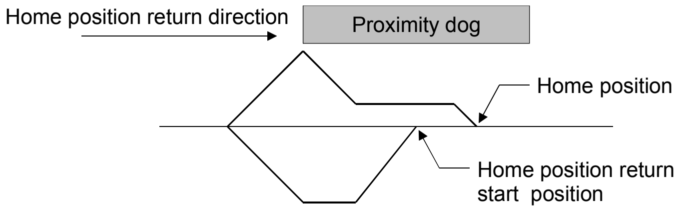
(2) Timing chart



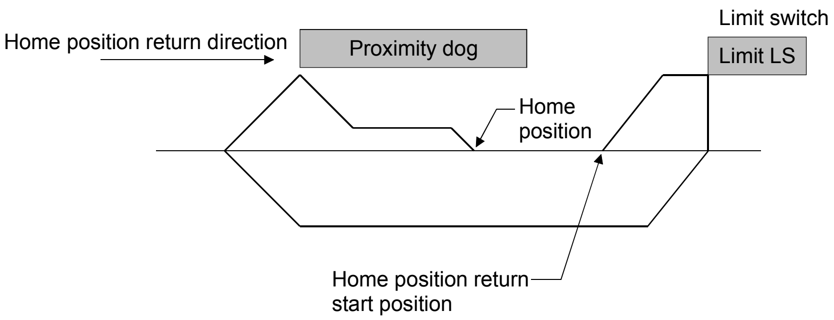
The parameter No.42 (home position return position data) setting value is the positioning address after the home position return is completed.

5.4.10 Home position return automatic return function

If the current position is at or beyond the proximity dog in dog or count type home position return, you need not make a start after making a return by jog operation or the like.
When the current position is at the proximity dog, an automatic return is made before home position return.



At a start, a motion is made in the home position return direction and an automatic return is made on detection of the limit switch. 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 opposite limit switch and AL. 90 occurs.



Software limit cannot be used with these functions.

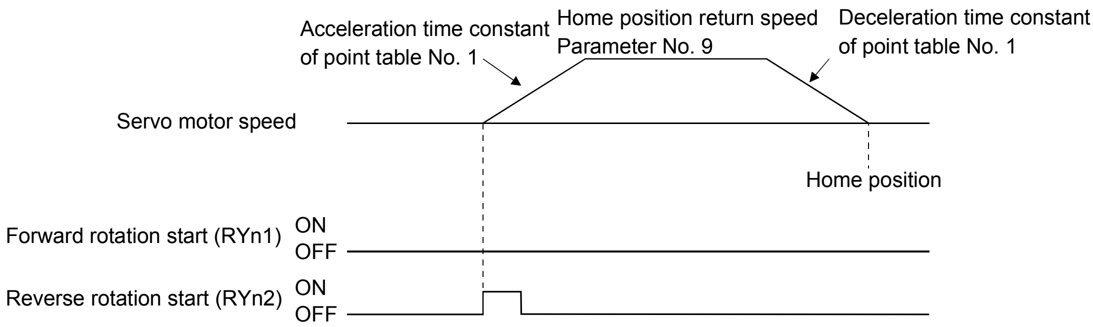
5.4.11 Automatic positioning function to the home position

POINT
· You cannot perform automatic positioning from outside the position data setting range to the home position. In this case, make a home position return again using a manual home position return.

If this function is used when returning to the home position again after performing a manual home position return after a power-on and deciding the home position, automatic positioning can be carried out to the home position at high speed. In an absolute position system, manual home position return is not required after power-on.
Please perform a manual home position return beforehand after a power-on.
Set the input signals and parameter as follows.

Item	Device/Parameter used	Description
Manual home position return mode selection	Automatic/manual selection (RYn6)	Short MD0 ON.
	Point table No. selection 1 (RYnA)	Open DI0 OFF.
	Point table No. selection 2 (RYnB)	Open DI1 OFF.
	Point table No. selection 3 (RYnC)	Turn RYnC OFF.
	Point table No. selection 4 (RYnD)	Turn RYnD OFF.
	Point table No. selection 5 (RYnE)	Turn RYnE OFF.
Home position return speed	Parameter No.9	Speed is set up.
Home position return acceleration time constant	Point table No.1	Use the acceleration 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.9. 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.



5.5 Absolute position detection system

CAUTION	· If an absolute position erase alarm (AL.25) or an absolute position counter warning (AL.E3) has occurred, always perform home position setting again. Not doing so can cause runaway.

POINT

- When the following parameters are changed, the home position is lost when turning on the power after the change. Execute the home position return again when turning on the power.
  - First digit of parameter No.1 (ST1 coordinate system selection)
  - Parameter No. 4 (Electronic gear numerator)
  - Parameter No. 5 (Electronic gear denominator)
  - Parameter No. 42 (Home position return position data)

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
Battery	1 piece of lithium battery (primary battery, nominal + 3.6V) Type: MR-BAT or A6BAT
Maximum revolution range	Home position ± 32767 rev.
(Note 1) Maximum speed at power failure	500r/min
(Note 2) Battery backup time	Approx. 10,000 hours (battery life with power off)
(Note 3) Data holding time during battery replacement	2 hours at delivery, 1 hour in 5 years after delivery
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. Period during which data can be held by the super capacitor in the encoder after power-off, with the battery voltage low or the battery removed, or during which data can be held with the encoder cable disconnected.
Battery replacement should be finished within this period.

(3) Structure

Component	Description
Servo amplifier	Use standard models.
Servo motor	
Battery	MR-BAT or A6BAT
Encoder cable	Use a standard model. When fabricating, refer to section 15.1.4.

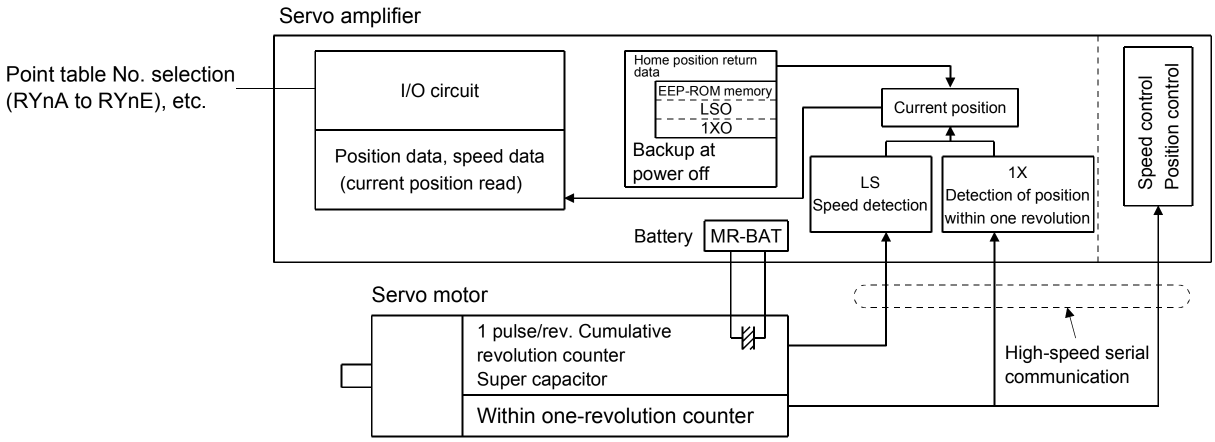
(4) Outline of absolute position detection data communication

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.

Also, the absolute position data, which is battery-backed by the super capacitor in the encoder, can be retained within the specified period (cumulative revolution counter value retaining time) if the cable is unplugged or broken.



(5) Battery installation procedure

WARNING	・Before installing a battery, turn off the main circuit power while keeping the control circuit power on. Wait for 15 minutes or more until the charge lamp turns off. Then, confirm that the voltage between P and N is safe with a voltage tester and others. Otherwise, an electric shock may occur. In addition, always confirm from the front of the servo amplifier whether the charge lamp is off or not.

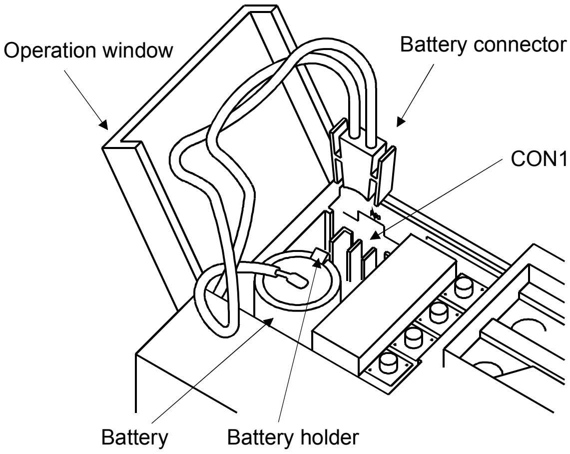
POINT

The internal circuits of the servo amplifier may be damaged by static electricity. Always take the following precautions.
- Ground human body and work bench.
- Do not touch the conductive areas, such as connector pins and electrical parts, directly by hand.

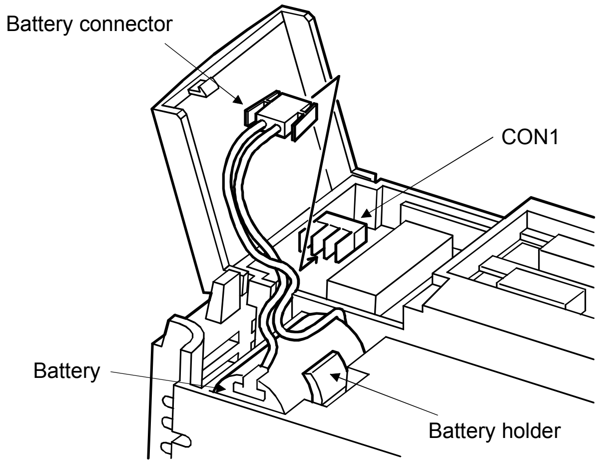
1) Open the operation window. (When the model used is the MR-J2S-200CP-S084・MR-J2S-350CP-S084 or more, also remove the front cover.)

2) Install the battery in the battery holder.

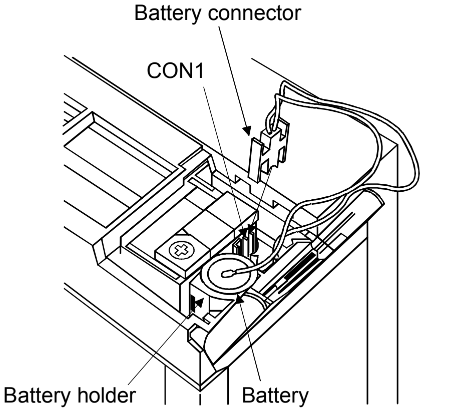
3) Install the battery connector into CON1 until it clicks.



For MR-J2S-100CP-S084 or less



For MR-J2S-200CP-S084・MR-J2S-350CP-S084



For MR-J2S-500CP-S084・MR-J2S-700CP-S084

(6) Parameter setting

Set parameter No.2 (Function selection 1) as indicated below to make the absolute position detection system valid.

Parameter No.2

1			

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

MEMO

6. PARAMETERS

⚠ CAUTION	・Never adjust or change the parameter values extremely as it will make operation instable.

6.1 Parameter list

6.1.1 Parameter write inhibit

POINT

- Set "000E" when using the MR Configurator (Servo Configuration Software) to make device setting.
- After setting the parameter No.19 value, switch power off, then on to make that setting valid.

In the servo amplifier, its parameters are classified into the basic parameters (No.0 to 19), expansion parameters 1 (No.20 to 53), expansion parameters 2 (No.54 to 77), special parameters 1 (No.78 to 90) special parameters 2 (No. 91 to 99) and option unit parameters (No. 100 to 124) according to their safety aspects and frequencies of use. In the factory setting condition, the customer can change the basic parameter values but cannot change the expansion parameter 1・2 values and special parameter 1・2 values. When fine adjustment, e.g. gain adjustment, is required, change the parameter No.19 setting to make the expansion parameters write-enabled.
The following table lists the parameters whose values are made valid for reference/write by setting parameter No. 19. Operation can be performed for the parameters marked ○.

Parameter No.19 setting	Operation	Basic parameters No.0 to No.19	Expansion parameters 1 No.20 to No.53	Expansion parameters 2 No.54 to No.77	Special parameter 1 No.78 to No.90	Special parameter 2 No.91 to No.99	Option unit parameter No.100 to 124
0000 (initial value)	Reference	○					
	Write	○					
000A	Reference	No.19 only					
	Write	No.19 only					
000B	Reference	○	○				
	Write	○					
000C	Reference	○	○				
	Write	○	○				
000E	Reference	○	○	○	○		
	Write	○	○	○	○		
000F	Reference	○	○	○	○	○	
	Write	○	○	○	○	○	
000AB	Reference	○	○	○	○	○	○
	Write	○	○	○	○	○	○

6.1.2 List

POINT
・The parameters marked * before their symbols are made valid by switching power off once and then switching it on again after parameter setting.

Refer to the corresponding reference items for details of the parameters.

(1) Item list

Class	No.	Symbol	Name and Function	Initial value	Unit	Customer setting
Basic parameters	0	*STY	Command system, regenerative option selection	0000		
	1	*FTY	Feeding function selection	0000		
	2	*OP1	Function selection 1	0002		
	3	ATU	Auto tuning	0105		
	4	*CMX	Electronic gear numerator	1		
	5	*CDV	Electronic gear denominator	1		
	6	INP	In-position range	100	μm	
	7	PG1	Position control gain 1	35	rad/s	
	8	ZTY	Home position return type	0010		
	9	ZRF	Home position return speed	500	r/min	
	10	CRF	Creep speed	10	r/min	
	11	ZST	Home position shift distance	0	μm	
	12	CRP	Rough match output range	0	$\times 10^{STM}$ μm	
	13	JOG	Jog speed	100	r/min	
	14	*STC	S-pattern acceleration/deceleration time constant	0	ms	
	15	*SNO	Station number setting	0	station	
	16	*BPS	Communication baud rate selection, alarm history clear	0000		
	17		For manufacturer setting	0100		
	18	*DMD	Status display selection	0000		
	19	*BLK	Parameter write inhibit	0000		

Class	No.	Symbol	Name and Function	Initial value	Unit	Customer setting
Expansion parameters 1	20	*OP2	Function selection 2	0000		
	21		For manufacturer setting	0002		
	22	OP4	Function selection 4	0000		
	23		For manufacturer setting	0		
	24	FFC	Feed forward gain	0	%	
	25		For manufacturer setting	0		
	26			0		
	27			4000		
	28	TL1	Internal torque limit 1	100	%	
	29	TL2	Internal torque limit 2	100	%	
	30	*BKC	Backlash compensation	0	pulse	
	31		For manufacturer setting	0		
	32			0		
	33	MBR	Electromagnetic brake sequence output	100	ms	
	34	GD2	Ratio of load inertia moment to Servo motor inertia moment	70	0.1 times	
	35	PG2	Position control gain 2	35	rad/s	
	36	VG1	Speed control gain 1	177	rad/s	
	37	VG2	Speed control gain 2	817	rad/s	
	38	VIC	Speed integral compensation	48	ms	
	39	VDC	Speed differential compensation	980		
	40		For manufacturer setting	0		
	41	*DSS	Remote register-based position/speed specifying system selection	0000		
	42	*ZSP	Home position return position data	0	$\times 10^{STM}$ μm	
	43	DCT	Moving distance after proximity dog	1000	$\times 10^{STM}$ μm	
	44	ZTM	Stopper type home position return stopper time	100	ms	
	45	ZTT	Stopper type home position return torque limit value	30	%	
	46	LMP	Software limit +	0	$\times 10^{STM}$ μm	
	47					
	48	LMN	Software limit −	0	$\times 10^{STM}$ μm	
	49					
	50	*LPP	Position range output address+	0	$\times 10^{STM}$ μm	
	51					
	52	*LNP	Position range output address −	0	$\times 10^{STM}$ μm	
	53					

Class	No.	Symbol	Name and Function	Initial value	Unit	Customer setting
Expansion parameters 2	54		For manufacturer setting	0000		
	55	*OP6	Function selection 6	0100		
	56		For manufacturer setting	0000		
	57	*OP8	Function selection 8	0000		
	58		For manufacturer setting	0000		
	59			0000		
	60			0000		
	61	NH1	Machine resonance suppression filter 1	0000		
	62	NH2	Machine resonance suppression filter 2	0000		
	63	LPF	Low-pass filter, adaptive vibration suppression control	0000		
	64	GD2B	Ratio of load inertia moment to servo motor inertia moment 2	70	0.1 times	
	65	PG2B	Position control gain 2 changing ratio	100	%	
	66	VG2B	Speed control gain 2 changing ratio	100	%	
	67	VICB	Speed integral compensation changing ratio	100	%	
	68	*CDP	Gain changing selection	0000		
	69	CDS	Gain changing condition	10	(Note)	
	70	CDT	Gain changing time constant	1	ms	
	71		For manufacturer setting	100		
	72			10000		
	73			10		
	74			10		
	75			100		
	76			100		
	77			100		
Special parameters 1	78	*DI0	I/O device selection	0000		
	79	*DI1	Input device selection 1	0000		
	80	*DI2	Input device selection 2	0900		
	81	*DI3	Input device selection 3	0000		
	82	*DI4	Input device selection 4	0100		
	83	*DI5	Input device selection 5	0504		
	84	*DI6	Input device selection 6	0000		
	85	*DI7	Input device selection 7	0000		
	86	*DI8	Input device selection 8	0000		
	87		For manufacturer setting	0000		
	88	*DO1	Output device selection 1	0005		
	89	*DO2	Output device selection 2	0D04		
	90	*DO3	Output device selection 3	0102		
Special parameters 2	91		For manufacturer setting	0000		
	92			0000		
	93			400		
	94			100		
	95			1		
	96			1		
	97			0		
	98			50		
	99			0000		

Note. Depends on the parameter No. 68 setting.

Class	No.	Symbol	Name and Function	Initial value	Unit	Customer setting
Option unit parameter	100		For manufacturer setting	0000		
	101			0000		
	102			0000		
	103			0000		
	104			1		
	105			1		
	106			0		
	107			0		
	108			0		
	109			0		
	110			0		
	111			0		
	112			0		
	113			0		
	114			0		
	115			0001		
	116	*IN1	External I/O function selection 1	0230		
	117	*IN2	External I/O function selection 2	0000		
	118	*IN3	External I/O function selection 3	0000		
	119		For manufacturer setting	0		
	120			0		
	121			0		
	122			0		
	123			0		
	124			0		

(2) Detail list

Class	No.	Symbol	Name and Function	Initial value	Unit	Setting range
Basic parameters	0	*STY	Command system, regenerative option selection Used to select the command system and regenerative option. 0 □ □ 0 Selection of command system (Refer to section 5.2) 0: Absolute value command system 1: Incremental value command system Selection of regenerative option (Refer to section 15.1.1) 0: Not used (The built-in regenerative resistor is used. However, the MR-J2S-10CP-S084 does not have a built-in regenerative resistor and therefore cannot use it.) 1: FR-RC, FR-BU2 2:MR-RB032 3:MR-RB12 4:MR-RB32 5:MR-RB30 6:MR-RB50 (Cooling fan is required) 8:MR-RB31 9:MR-RB51 (Cooling fan is required) Select the regenerative option that is compatible with the servo amplifier. Selection of an incompatible option will result in a parameter error.	0000		Refer to Name and function column.
	1	*FTY	Feeding function selection Used to set the forward rotation start coordinate system and feed length multiplying factor. □ 0 □ □ Forward rotation start coordinate system selection (Refer to section 5.2.2 to 5.2.4) 0: Address is incremented in CCW direction 1: Address is incremented in CW direction Feed length multiplication factor (STM) (Refer to section 5.2.2 to 5.2.4) 0: 1 time 1: 10 times 2: 100 times 3: 1000 times Servo-on (RYn0) -off, forced stop (EMG) -off follow-up for absolute value command in incremental system 0: Invalid 1: Valid Normally, when this servo amplifier is used in the absolute value command method of the incremental system, placing it in a servo off or forced stop status will erase the home position. When "1" is set in this parameter, the home position will not be erased if the servo amplifier is placed in a servo off or forced stop status. Operation can be resumed when servo-on (SON) is turned on again or forced stop (EMG) is canceled.	0000		Refer to Name and function column.

Class	No.	Symbol	Name and Function	Initial value	Unit	Setting range
Basic parameters	2	*OP1	Function selection 1 Used to select the input filter and absolute position detection system. [ ][0][0][ ] Input filter (last digit) 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] Selection of absolute position detection system (first digit) (Refer to section 5.5) 0: Incremental system 1: Absolute position detection system	0002		Refer to Name and function column.
	3	ATU	Auto tuning Used to selection the response level, etc. for execution of auto tuning. (Refer to chapter 9) [0][ ][0][ ] Auto tuning response level setting (last digit) Set value / Response level / Machine resonance frequency guideline: 1 / Low response / 15Hz 2 / / 20Hz 3 / / 25Hz 4 / / 30Hz 5 / / 35Hz 6 / / 45Hz 7 / Middle response / 55Hz 8 / / 70Hz 9 / / 85Hz A / / 105Hz B / / 130Hz C / / 160Hz D / / 200Hz E / High response / 240Hz F / / 300Hz ・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. Gain adjustment mode selection (second digit) (For more information, refer to section 9.1.1.) Set value / Gain adjustment mode / Automatically set parameters: 0 / Interpolation mode / GD2(parameter No.34), PG2(parameter No.35), VG2(parameter No.37), VIC(parameter No.38) 1 / Auto tuning mode 1 / PG1(parameter No.7), GD2(parameter No.34), PG2(parameter No.35), VG1(parameter No.36), VG2(parameter No.37), VIC(parameter No.38) 2 / Auto tuning mode 2 / PG1(parameter No.7), PG2(parameter No.35), VG1(parameter No.36), VG2(parameter No.37), VIC(parameter No.38) 3 / Manual mode 1 / PG2(parameter No.35) 4 / Manual mode 2 /	0105		Refer to Name and function column.

Class	No.	Symbol	Name and Function	Initial value	Unit	Setting range
Basic parameters	4	*CMX	Electronic gear numerator Set the value of electronic gear numerator. Setting "0" sets the number of encoder pulses internally. (Refer to section 6.2.1)	1		0 to 65535
	5	*CDV	Electronic gear denominator Set the value of electronic gear denominator. (Refer to section 6.2.1)	1		1 to 65535
	6	INP	In-position range Used to set the droop pulse range in command unit when Movement finish (RXnC) or In-position (RYn1) is output.	100	μm	0 to 10000
	7	PG1	Position control gain 1 Used to set the gain of position loop 1. (Refer to chapter 9) Increase the gain to improve tracking performance in response to the command.	36	rad/s	4 to 1000
	8	ZTY	Home position return type Used to set the home position return system, home position return direction and proximity dog input polarity. (Refer to section 5.4) 0 □ □ □ 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 Home position return direction 0: Address increment direction 1: Address decrement direction Proximity dog input polarity 0: OFF indicates detection of the dog. 1: ON indicates detection of the dog.	0010		Refer to Name and function column.
	9	ZRF	Home position return speed Used to set the servo motor speed for home position return. (Refer to section 5.4)	500	r/min	0 to permissible speed
	10	CRF	Creep speed Used to set the creep speed after proximity dog detection. (Refer to section 5.4)	10	r/min	0 to permissible speed
	11	ZST	Home position shift distance Used to set the shift distance starting at the Z-phase pulse detection position inside the encoder. (Refer to section 5.4)	0	μm	0 to 65535
	12	CRP	Rough match output range Used to set the command remaining distance range where the rough match (RXn2) is output.	0	$\times 10^{STM}$ μm	0 to 65535
	13	JOG	Jog speed Used to set the jog speed command.	100	r/min	0 to permissible speed
	14	*STC	S-pattern acceleration/deceleration time constant Set when inserting S-pattern time constant into the acceleration/deceleration time constant of the point table. (Refer to section 6.2.3) This time constant is invalid for home position return.	0	ms	0 to 100

Class	No.	Symbol	Name and Function	Initial value	Unit	Setting range
Basic parameters	15	*SNO	Station number setting Used to specify the station number. (Refer to section 3.2.3) 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
	16	*BPS	Communication baud rate selection, alarm history clear Used to select the serial communication baud rate, select various communication conditions, and clear the alarm history. 0 0 □ □ Serial baud rate selection 0: 9600 [bps] 1: 19200[bps] 2: 38400[bps] 3: 57600[bps] Alarm history clear (Refer to section 6.2.5) 0: Invalid 1: Valid When alarm history clear is made valid, the alarm history is cleared at next power-on. After the alarm history is cleared, the setting is automatically made invalid (reset to 0).	0000		Refer to Name and function column.
	17		For manufacturer setting Do not change this value by any means.	0100		
	18	*DMD	Status display selection Used to select the status display shown at power-on. (Refer to section 7.2) 0 0 □ □ Status display on servo amplifier display at power-on 00: Current position (initial value) 01: Command position 02: Command remaining distance 03: Point table No. 04: Cumulative feedback pulses 05: Servo motor speed 06: Droop pulses 07: For manufacturer adjustment 08: Analog torque limit voltage 09: Regenerative load ratio 0A: Effective load ratio 0B: Peak load ratio 0C: Instantaneous torque 0D: Within one-revolution position low 0E: Within one-revolution position high 0F: ABS counter 10: Load inertia moment ratio 11: Bus voltage 12: Option unit communication status	0000		Refer to Name and function column.

<table>
<tr><th>Class</th><th>No.</th><th>Symbol</th><th>Name and Function</th><th>Initial value</th><th>Unit</th><th>Setting range</th></tr>
<tr><td>Basic parameters</td><td>19</td><td>*BLK</td><td>Parameter write inhibit
Used to select the reference and write ranges of the parameters.
Operation can be performed for the parameters marked ○.
<table>
<tr><th>Set value</th><th>Operation</th><th>Basic parameters No.0 to 19</th><th>Expansion parameters 1 No.20 to 53</th><th>Expansion parameters 2 No.54 to 77</th><th>Special parameter 1 No.78 to No.90</th><th>Special parameter 2 No.91 to No.99</th><th>Option unit parameter No.100 to No.124</th></tr>
<tr><td rowspan="2">0000 (initial value)</td><td>Reference</td><td>○</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Write</td><td>○</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">000A</td><td>Reference</td><td>No.19 only</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Write</td><td>No.19 only</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">000B</td><td>Reference</td><td>○</td><td>○</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Write</td><td>○</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">000C</td><td>Reference</td><td>○</td><td>○</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Write</td><td>○</td><td>○</td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">(Note) 000E</td><td>Reference</td><td>○</td><td>○</td><td>○</td><td>○</td><td></td><td></td></tr>
<tr><td>Write</td><td>○</td><td>○</td><td>○</td><td>○</td><td></td><td></td></tr>
<tr><td rowspan="2">(Note) 000F</td><td>Reference</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td></td></tr>
<tr><td>Write</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td></td></tr>
<tr><td rowspan="2">(Note) 00AB</td><td>Reference</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr>
<tr><td>Write</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr>
</table>
Note. Set this parameter when making device setting using the MR Configurator (Servo Configuration Software).</td><td>0000</td><td></td><td>Refer to Name and function column.</td></tr>
<tr><td rowspan="4">Expansion parameters 1</td><td>20</td><td>*OP2</td><td>Function selection 2
Used to select slight vibration suppression control.
Valid when "03□□" or "04□□" is set in parameter No. 3 (Auto tuning).
0 □ 0 0
Slight vibration suppression control selection
0: Invalid
1: Valid</td><td>0000</td><td></td><td>Refer to Name and function column.</td></tr>
<tr><td>21</td><td></td><td>For manufacturer setting
Do not change this value by any means.</td><td>0002</td><td></td><td></td></tr>
<tr><td>22</td><td>OP4</td><td>Function selection 4
Used to select stop processing at forward rotation stroke end (RYn4), reverse rotation stroke end (RYn5) off.
0 0 □ □
Stopping method used when forward rotation stroke end (RYn4), reverse rotation stroke end (RYn5) device or software limit is valid (Refer to section 6.2.5)
0: Sudden stop (home position erased)
1: Slow stop (home position erased)
Stopping method used when software limit is valid
0: Sudden stop (home position erased)
1: Slow stop (home position erased)</td><td>0000</td><td></td><td>Refer to Name and function column.</td></tr>
<tr><td>23</td><td></td><td>For manufacturer setting
Do not change this value by any means.</td><td>0</td><td></td><td></td></tr>
</table>

Class	No.	Symbol	Name and Function	Initial value	Unit	Setting range
Expansion parameters 1	24	FFC	Feed forward gain Set the feed forward gain. When the setting is 100%, the droop pulses during operation at constant speed are nearly zero. However, sudden acceleration/deceleration will increase the overshoot. As a guideline, when the feed forward gain setting is 100%, set 1s or more as the acceleration/deceleration time constant up to the rated speed.	0	%	0 to 100
	25		For manufacturer setting Do not change this value by any means.	0		
	26			0		
	27			4000		
	28	TL1	Internal torque limit 1 Used to limit servo motor-torque on the assumption that the maximum torque is 100%. (Refer to section 4.4.3) When 0 is set, torque is not produced.	100	%	0 to 100
	29	TL2	Internal torque limit 2 Used to limit servo motor-torque on the assumption that the maximum torque is 100%. (Refer to section 4.4.3) When 0 is set, torque is not produced. Made valid by switching on the internal torque limit selection (RY(n+2)6).	100	%	0 to 100
	30	*BKC	Backlash compensation Used to set the backlash compensation made when the command direction is reversed. This function compensates for the number of backlash pulses in the opposite direction to the home position return direction. 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. Note. The setting range differs depending on the software version of servo amplifiers. Version A2 or later: 0 to 1600 Version A1 or before: 0 to 1000	0	pulse	(Note) 0 to 1600
	31		For manufacturer setting Do not change this value by any means.	0		
	32			0		
	33	MBR	Electromagnetic brake sequence output Used to set the delay time (Tb) between when the electromagnetic brake interlock (MBR) switches off and when the base circuit is shut off. (Refer to section 4.9)	100	ms	0 to 1000
	34	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. (Refer to chapter 9) When auto tuning is selected, the result of auto tuning is automatically set.	70	×0.1 times	0 to 1000
	35	PG2	Position control gain 2 Used to set the gain of the position loop. (Refer to chapter 9) Set this parameter to increase the position response level to load disturbance. Higher setting increases the response level but is liable to generate vibration and/or noise. When auto tuning is selected, the result of auto tuning is automatically set.	35	rad/s	1 to 1000
	36	VG1	Speed control gain 1 Normally this parameter value need not be changed. Higher setting increases the response level but is liable to generate vibration and/or noise. (Refer to chapter 9) When auto tuning is selected, the result of auto tuning is automatically set.	177	rad/s	20 to 8000
	37	VG2	Speed control gain 2 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. (Refer to chapter 9) When auto tuning is selected, the result of auto tuning is automatically set.	817	rad/s	20 to 20000

Class	No.	Symbol	Name and Function	Initial value	Unit	Setting range
Expansion parameters 1	38	VIC	Speed integral compensation Used to set the integral time constant of the speed loop. (Refer to chapter 9) When auto tuning is selected, the result of auto tuning is automatically set.	48	ms	1 to 1000
	39	VDC	Speed differential compensation Used to set the differential compensation. (Refer to chapter 9) Made valid when the proportion control (PC) is switched on.	980		0 to 1000
	40		For manufacturer setting Do not change this value by any means.	0		
	41	*DSS	Remote register-based position/speed specifying system selection This parameter is made valid when Position/speed specification selection (RY(n+2)A) is turned ON with 2 stations occupied. Select how to receive the position command and speed command. When 1 station is occupied, selection of "0001" or "0002" will result in a parameter error. 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. / Settheservomotorspeed.	0000		Refer to Name and function column.
	42	*ZSP	Home position return position data Used to set the current position on completion of home position return. (Refer to section 5.4)	0	$\times 10^{STM}$ μm	−32768 to 32767
	43	DCT	Moving distance after proximity dog Used to set the moving distance after proximity dog in count type home position return. (Refer to section 5.4.3)	1000	$\times 10^{STM}$ μm	0 to 65535
	44	ZTM	Stopper type home position return stopper time In stopper type home position return, used to set the time from when the machine part is pressed against the stopper and the torque limit set in parameter No.45 is reached to when the home position is set. (Refer to section 5.4.5)	100	ms	5 to 1000
	45	ZTT	Stopper type home position return torque limit value Used to set the torque limit value relative to the max. torque in [%] in stopper type home position return. (Refer to section 5.4.5)	30	%	1 to 100
	46 47	LMP	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 6.2.7) Set the same sign to parameters No.46 and 47. Setting of different signs will result in a parameter error. Set address:□□□□□□ Upper 3 digits: Parameter No. 46 Lower 3 digits: Parameter No. 47	0	$\times 10^{STM}$ μm	−999999 to 999999

Class	No.	Symbol	Name and Function	Initial value	Unit	Setting range
Expansion parameters 1	48 49	LMN	Software limit − Used to set the address decrement side software stroke limit. The software limit is made invalid if this value is the same as in "software limit +". (Refer to section 6.2.7) Set the same sign to parameters No.48 and 49. Setting of different signs will result in a parameter error. Set address: □□□□□□ Upper 3 digits (Parameter No. 48), Lower 3 digits (Parameter No. 49)	0	$\times 10^{STM}$ μm	−999999 to 999999
	50 51	*LPP	Position range output address + Used to set the address increment side position range output address. Set the same sign to parameters No.50 and 51. Setting of different signs will result in a parameter error. In parameters No. 50 to 53, set the range where position range (RXnE) turns on. (Refer to section 4.3.2 (1)(c)) Set address:□□□□□□ Upper 3 digits (Parameter No. 50), Lower 3 digits (Parameter No. 51)	0	$\times 10^{STM}$ μm	−999999 to 999999
	52 53	*LNP	Position range output address − Used to set the address decrement side position range output address. Set the same sign to parameters No.52 and 53. Setting of different signs will result in a parameter error. Set address:□□□□□□ Upper 3 digits (Parameter No. 52), Lower 3 digits (Parameter No. 53)	0	$\times 10^{STM}$ μm	−999999 to 999999
Expansion parameters 2	54		For manufacturer setting Do not change this value by any means.	0000		
	55	*OP6	Function selection 6 Used to select how to process the base circuit when reset (RES) is valid. 0 □ 0 0 Processing of the base circuit when reset (RES) is valid. 0: Base circuit shut off 1: Base circuit not shut off	0100		Refer to Name and function column.
	56		For manufacturer setting Do not change this value by any means.	0000		
	57	*OP8	Function selection 8 Used to select the protocol of serial communication. 0 □ 0 0 Protocol checksum selection 0: With station numbers 1: No station numbers	0000		Refer to Name and function column.

Class	No.	Symbol	Name and Function	Initial value	Unit	Setting range
Expansion parameters 2	58		For manufacturer setting Do not change this value by any means.	0000		
	59			0000		
	60			0000		
	61	NH1	Machine resonance suppression filter 1 Used to selection the machine resonance suppression filter. (Refer to section 10.2)	0000		Refer to Name and function column.
	62	NH2	Machine resonance suppression filter 2 Used to set the machine resonance suppression filter.	0000		Refer to Name and function column.

Parameter No. 61 (NH1): 0 □ □ □

Notch frequency selection
Set "00" when you have set adaptive vibration suppression control to be "valid" or "held" (parameter No. 63: □1□□or□2 □□).

Setting value	Frequency	Setting value	Frequency	Setting value	Frequency	Setting value	Frequency
00	Invalid	08	562.5	10	281.3	18	187.5
01	4500	09	500	11	264.7	19	180
02	2250	0A	450	12	250	1A	173.1
03	1500	0B	409.1	13	236.8	1B	166.7
04	1125	0C	375	14	225	1C	160.1
05	900	0D	346.2	15	214.3	1D	155.2
06	750	0E	321.4	16	204.5	1E	150
07	642.9	0F	300	17	195.7	1F	145.2

Notch depth selection

Setting value	Depth	Gain
0	Deep	−40dB
1	to	−14dB
2	Shallow	−8dB
3		−4dB

Parameter No. 62 (NH2): 0 □ □ □

Notch frequency
Same setting as in parameter No. 61
However, you need not set "00" if you have set adaptive vibration suppression control to be "valid" or "held".

Notch depth
Same setting as in parameter No. 61

Class	No.	Symbol	Name and Function	Initial value	Unit	Setting range
Expansion parameters 2	63	LPF	Low-pass filter, adaptive vibration suppression control Used to selection the low-pass filter and adaptive vibration suppression control. (Refer to chapter 10) □ □ □ 0 Low-pass filter selection 0: Valid (Automatic adjustment) 1: Invalid When you choose "valid", the filter of the handwidth represented by the following expression is set automatically. For 1kW or less $\frac{\text{VG2 setting}\times 10}{2\pi\times(1+\text{GD2 setting}\times 0.1)}$ [Hz] For 2kW or more $\frac{\text{VG2 setting}\times 5}{2\pi\times(1+\text{GD2 setting}\times 0.1)}$ [Hz] Adaptive vibration suppression control selection Choosing "valid" or "held" in adaptive vibration suppression control selection makes the machine resonance control filter 1 (parameter No. 61) invalid. 0: Invalid 1: Valid Machine resonance frequency is always detected and the filter is generated in response to resonance to suppress machine vibration. 2: Held The characteristics of the filter generated so far are held, and detection of machine resonance is stopped. Adaptive vibration suppression control sensitivity selection Used to set the sensitivity of machine resonance detection. 0: Normal 1: Large sensitivity	0000		Refer to Name and function column.
	64	GD2B	Ratio of load inertia moment to servo motor inertia moment 2 Used to set the ratio of load inertia moment to servo motor inertia moment when gain changing is valid.	70	×0.1 times	0 to 3000
	65	PG2B	Position control gain 2 changing ratio Used to set the ratio of changing the position control gain 2 when gain changing is valid. Made valid when auto tuning is invalid.	100	%	10 to 200
	66	VG2B	Speed control gain 2 changing ratio Used to set the ratio of changing the speed control gain 2 when gain changing is valid. Made valid when auto tuning is invalid.	100	%	10 to 200
	67	VICB	Speed integral compensation changing ratio Used to set the ratio of changing the speed integral compensation when gain changing is valid. Made valid when auto tuning is invalid.	100	%	50 to 1000

Class	No.	Symbol	Name and Function	Initial value	Unit	Setting range
Expansion parameters 2	68	*CDP	Gain changing selection Used to select the gain changing condition. (Refer to section 10.5) 0 0 0 □ Gain changing selection Gains are changed in accordance with the settings of parameters No. 64 to 67 under any of the following conditions: 0: Invalid 1: Gain changing (CDP) signal is ON 2: Command frequency is equal to higher than parameter No. 69 setting 3: Droop pulse value is equal to higher than parameter No. 69 setting 4: Servo motor speed is equal to higher than parameter No. 69 setting	0000		Refer to Name and function column.
	69	CDS	Gain changing condition Used to set the value of gain changing condition (command frequency, droop pulses, servo motor speed) selected in parameter No. 68. The set value unit changes with the changing condition item. (Refer to section 10.5)	10	kpps pulse r/min	10 to 9999
	70	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. 68 and 69. (Refer to section 10.5)	1	ms	0 to 100
	71		For manufacturer setting Do not change this value by any means.	100		
	72			10000		
	73			10		
	74			10		
	75			100		
	76			100		
	77			100		
Special parameters 1	78	*DI0	I/O device selection Used to select whether the CN1A-19 pin will be used as an input device or output device. 0 0 0 □ CN1A-19 pin 0: Output device 1: Input device	0000		Refer to Name and function column.

Class	No.	Symbol	Name and Function	Initial value	Unit	Setting range
Special parameters 1	79	*DI1	Input device selection 1 Used to select the functions of the CN1A-8 and CN1A-19 pins. Set the function of the CN1A-8 pin. The set value and its function are the same as those of the CN1A-19 pin. Set the function of the CN1A-19 pin.	0000		Refer to Name and function column.
	80	*DI2	Input device selection 2 Used to select the functions of the CN1B-5 and CN1B-7 pins. Set the function of the CN1B-5 pin. The set value and its function are the same as those of the CN1A-19 pin. Refer to parameter No. 79 (input device selection 1). Set the function of the CN1B-7 pin. The set value and its function are the same as those of the CN1A-19 pin. Refer to parameter No. 79 (input device selection 1).	0900		Refer to Name and function column.

Parameter No. 79 set values:

Set value	Input selection	Set value	Input selection
00	Without assigned function	13	
01	Forced stop	14	
02	Servo-on	15	
03	Reset	16	
04	Forward rotation stroke end	17	
05	Reverse rotation stroke end	18	
06	Forward rotation start	19	
07	Reverse rotation start	1A	
08	Automatic/manual selection	1B	
09	Proximity dog	1C	
0A		1D	
0B		1E	
0C		1F	
0D		20	Point table No. selection 1
0E		21	Point table No. selection 2
0F		22	Point table No. selection 3
10	Internal torque limit selection	23	Point table No. selection 4
11	Proportion control	24	Point table No. selection 5
12	Temporary stop/Restart	25	

Class	No.	Symbol	Name and Function	Initial value	Unit	Setting range
Special parameters 1	81	*DI3	Input device selection 3 Used to select the functions of the CN1B-8 and CN1B-9 pins. Set the function of the CN1B-8 pin. The set value and its function are the same as those of the CN1A-19 pin. Refer to parameter No. 79 (input device selection 1). Set the function of the CN1B-9 pin. The set value and its function are the same as those of the CN1A-19 pin. Refer to parameter No. 79 (input device selection 1).	0000		Refer to Name and function column.
	82	*DI4	Input device selection 4 Used to select the functions of the CN1B-14 and CN1B-15 pins. Set the function of the CN1B-14 pin. The set value and its function are the same as those of the CN1A-19 pin. Refer to parameter No. 79 (input device selection 1). Set the function of the CN1B-15 pin. The set value and its function are the same as those of the CN1A-19 pin. Refer to parameter No. 79 (input device selection 1).	0100		Refer to Name and function column.
	83	*DI5	Input device selection 5 Used to select the functions of the CN1B-16 and CN1B-17 pins. Set the function of the CN1B-16 pin. The set value and its function are the same as those of the CN1A-19 pin. Refer to parameter No. 79 (input device selection 1). Set the function of the CN1B-17 pin. The set value and its function are the same as those of the CN1A-19 pin. Refer to parameter No. 79 (input device selection 1).	0504		Refer to Name and function column.

<table>
<tr><th>Class</th><th>No.</th><th>Symbol</th><th>Name and Function</th><th>Initial value</th><th>Unit</th><th>Setting range</th></tr>
<tr><td rowspan="2">Special parameters 1</td><td>84</td><td>*DI6</td><td>Input device selection 6
Select the function device signals that will turn ON automatically.
0 □ □ □
<table>
<tr><th rowspan="2">Signal name</th><th colspan="2">Initial value</th></tr>
<tr><th>BIN</th><th>HEX</th></tr>
<tr><td></td><td>0</td><td rowspan="4">0</td></tr>
<tr><td>Forced stop</td><td>0</td></tr>
<tr><td>Servo-on</td><td>0</td></tr>
<tr><td></td><td>0</td></tr>
</table>
<table>
<tr><th rowspan="2">Signal name</th><th colspan="2">Initial value</th></tr>
<tr><th>BIN</th><th>HEX</th></tr>
<tr><td>Forward rotation stroke</td><td>0</td><td rowspan="4">0</td></tr>
<tr><td>Reverse rotation stroke</td><td>0</td></tr>
<tr><td></td><td>0</td></tr>
<tr><td></td><td>0</td></tr>
</table>
<table>
<tr><th rowspan="2">Signal name</th><th colspan="2">Initial value</th></tr>
<tr><th>BIN</th><th>HEX</th></tr>
<tr><td>Automatic/manual</td><td>0</td><td rowspan="4">0</td></tr>
<tr><td></td><td>0</td></tr>
<tr><td></td><td>0</td></tr>
<tr><td></td><td>0</td></tr>
</table>
BIN 0: Used in CC-Link or as external input signal
BIN 1: Automatic ON</td><td>0000</td><td></td><td>Refer to Name and function column.</td></tr>
<tr><td>85</td><td>*DI7</td><td>Input device selection 7
Select the function device signal that will turn ON automatically.
0 0 0 □
<table>
<tr><th rowspan="2">Signal name</th><th colspan="2">Initial value</th></tr>
<tr><th>BIN</th><th>HEX</th></tr>
<tr><td></td><td>0</td><td rowspan="4">0</td></tr>
<tr><td>Proportion control</td><td>0</td></tr>
<tr><td></td><td>0</td></tr>
<tr><td></td><td>0</td></tr>
</table>
BIN 0: Used in CC-Link or as external input signal
BIN 1: Automatic ON</td><td>0000</td><td></td><td>Refer to Name and function column.</td></tr>
</table>

Class	No.	Symbol	Name and Function	Initial value	Unit	Setting range
Special parameters 1	86	*DI8	Input device selection 8 Select the function device signals that will turn ON automatically.	0000		Refer to Name and function column.
	87		For manufacturer setting Do not change this value by any means.	0000		
	88	*DO1	Output device selection 1	0005		Refer to Name and function column.

No. 86 *DI8 — Input device selection 8

Select the function device signals that will turn ON automatically.

0 0 □ □

Signal name	Initial value BIN	Initial value HEX
Point table No. selection 1	0	0
Point table No. selection 2	0	
Point table No. selection 3	0	
Point table No. selection 4	0	

Signal name	Initial value BIN	Initial value HEX
Point table No. selection 5	0	0
	0	
	0	
	0	

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

BIN 1: Automatic ON

No. 88 *DO1 — Output device selection 1

□ □ □ □

Set the function of the CN1A-18 pin. The set value and its function are the same as those of the CN1A-19 pin.

Set the function of the CN1A-19 pin.

Set value	Output selection	Set value	Output selection
00	Without assigned function	13	
01	Ready	14	
02	Trouble	15	
03	In position	16	
04	Rough match	17	
05	Home position return completion	18	
06	Electromagnetic brake interlock	19	
07		1A	
08	Position range	1B	
09	Warning	1C	
0A	Battery warning	1D	
0B	Limiting torque	1E	
0C	Temporary stop	1F	
0D	Movement finish	20	Point No. output 1
0E		21	Point No. output 2
0F		22	Point No. output 3
10		23	Point No. output 4
11		24	Point No. output 5
12		25	

Class	No.	Symbol	Name and Function	Initial value	Unit	Setting range
Special parameters 1	89	*DO2	Output device selection 2 Used to select the functions of the CN1B-4 and CN1B-6 pins. Set the function of the CN1B-4 pin. The set value and its function are the same as those of the CN1A-19 pin. Refer to parameter No. 88 (output device selection 1). Set the function of the CN1B-6 pin. The set value and its function are the same as those of the CN1A-19 pin. Refer to parameter No. 88 (output device selection 1).	0D04		Refer to Name and function column.
	90	*DO3	Output device selection 3 Used to select the functions of the CN1B-18 and CN1B-19 pins. Set the function of the CN1B-18 pin. The set value and its function are the same as those of the CN1A-19 pin. Refer to parameter No. 88 (output device selection 1). Set the function of the CN1B-19 pin. The set value and its function are the same as those of the CN1A-19 pin. Refer to parameter No. 88 (output device selection 1).	0102		Refer to Name and function column.
Special parameters 2	91		For manufacturer setting Do not change this value by any means.	0000		
	92			0000		
	93			400		
	94			100		
	95			1		
	96			1		
	97			0		
	98			50		
	99			0000		
Option unit parameter	100		For manufacturer setting Do not change this value by any means.	0000		
	101			0000		
	102			0000		
	103			0000		
	104			1		
	105			1		
	106			0		
	107			0		
	108			0		
	109			0		
	110			0		
	111			0		
	112			0		
	113			0		
	114			0		
	115			0001		

Class	No.	Symbol	Name and Function	Initial value	Unit	Setting range
Option unit parameter	116	*IN1	External I/O function selection 1 Set any signals to be imported from CN1.	0230		Refer to Name and function column.

0

Signal name	Initial value BIN	Initial value HEX
	0	0
	0	
Servo-on	0	
Reset	0	

Signal name	Initial value BIN	Initial value HEX
Forward rotation stroke end	1	3
Reverse rotation stroke end	1	
Forward rotation start	0	
Reverse rotation start	0	

Signal name	Initial value BIN	Initial value HEX
Automatic/manual	0	2
Proximity dog	1	
	0	
	0	

BIN 0: Used in CC-Link
BIN 1: Used as CN1A/CN1B external input signal

Class	No.	Symbol	Name and Function	Initial value	Unit	Setting range
Option unit parameter	117	*IN2	External I/O function selection 2 Set any signals to be imported from CN1.	0000		Refer to Name and function column.

0 0

Signal name	Initial value BIN	Initial value HEX
Internal torque limit selection	0	0
Proportion control	0	
Temporary stop/Restart	0	
	0	

Signal name	Initial value BIN	Initial value HEX
	1	0
	1	
	0	
Gain changing selection	0	

BIN 0: Used in CC-Link
BIN 1: Used as CN1A/CN1B external input signal

<table>
<tr><th>Class</th><th>No.</th><th>Symbol</th><th>Name and Function</th><th>Initial value</th><th>Unit</th><th>Setting range</th></tr>
<tr><td rowspan="7">Option unit parameter</td><td>118</td><td>*IN3</td><td>External I/O function selection 3
Set any signals to be imported from CN1.

0 0 □ □
<table>
<tr><th rowspan="2">Signal name</th><th colspan="2">Initial value</th></tr>
<tr><th>BIN</th><th>HEX</th></tr>
<tr><td>Point table No. selection 1</td><td>0</td><td rowspan="4">0</td></tr>
<tr><td>Point table No. selection 2</td><td>0</td></tr>
<tr><td>Point table No. selection 3</td><td>0</td></tr>
<tr><td>Point table No. selection 4</td><td>0</td></tr>
</table>
<table>
<tr><th rowspan="2">Signal name</th><th colspan="2">Initial value</th></tr>
<tr><th>BIN</th><th>HEX</th></tr>
<tr><td>Point table No. selection 5</td><td>0</td><td rowspan="4">0</td></tr>
<tr><td></td><td>0</td></tr>
<tr><td></td><td>0</td></tr>
<tr><td></td><td>0</td></tr>
</table>
BIN 0: Used in CC-Link
BIN 1: Used as CN1A/CN1B external input signal</td><td>0000</td><td></td><td>Refer to Name and function column.</td></tr>
<tr><td>119</td><td rowspan="6"></td><td rowspan="6">For manufacturer setting
Do not change this value by any means.</td><td>0</td><td rowspan="6"></td><td rowspan="6"></td></tr>
<tr><td>120</td><td>0</td></tr>
<tr><td>121</td><td>0</td></tr>
<tr><td>122</td><td>0</td></tr>
<tr><td>123</td><td>0</td></tr>
<tr><td>124</td><td>0</td></tr>
</table>

6.2 Detailed explanation

6.2.1 Electronic gear

CAUTION	
⚠ CAUTION	・False setting will result in unexpected fast rotation, causing injury.

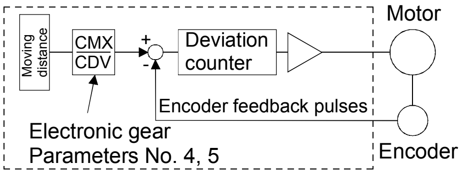
POINT

- The range of the electronic gear setting is. $\frac{1}{10} < \frac{CMX}{CDV} < 1000$. If you set any value outside this range, a parameter error (AL.37) occurs.
- After setting the parameter No.4, 5 value, switch power off, then on to make that setting valid.

(1) Concept of electronic gear

Use the electronic gear (parameters No.4, 5) to make adjustment so that the servo amplifier setting matches the moving distance of the machine. Also, by changing the electronic gear value, the machine can be moved at any multiplication ratio to the moving distance on the servo amplifier.

$$\frac{CMX}{CDV} = \frac{\text{Parameter No. 4}}{\text{Parameter No. 5}}$$



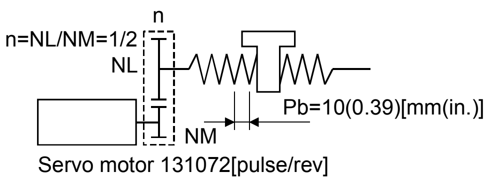
The following examples are used to explain how to calculate the electronic gear value.

POINT

- The following specification symbols are needed for electronic gear calculation.
  - Pb : Ballscrew lead [mm(in.)]
  - n : Reduction ratio
  - Pt : Servo motor resolution [pulse/rev]
  - ΔS : Travel per servo motor revolution [mm/rev]

(a) Ballscrew setting example

Machine specifications



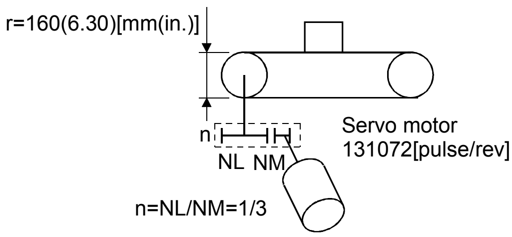
Ballscrew lead: Pb = 10 (0.39) [mm(in.)]
Reduction ratio: n = 1/2
Servo motor resolution: Pt = 131072 [pulse/rev]

$$\frac{CMX}{CDV} = \frac{p_t}{\Delta S} = \frac{p_t}{n \cdot p_b \cdot 1000} = \frac{131072}{1/2 \cdot 10 \cdot 1000} = \frac{131072}{5000} = \frac{32768}{1250}$$

Hence, set 32768 to CMX and 1250 to CDV.

(b) Conveyor setting example

Machine specifications



Pulley diameter: r = 160 (6.30) [mm(in.)]
Reduction ratio: n = 1/3
Servo motor resolution: Pt = 131072 [pulse/rev]

$$\frac{CMX}{CDV} = \frac{p_t}{\Delta S} = \frac{p_t}{n \cdot r \cdot \pi \cdot 1000} = \frac{131072}{1/3 \cdot 160 \cdot \pi \cdot 1000} = \frac{131072}{167551.61} \fallingdotseq \frac{32768}{41888}$$

Reduce CMX and CDV to the setting range or less, and round off the first decimal place.
Hence, set 32768 to CMX and 41888 to CDV.

6.2.2 Changing the status display screen

The status display item of the servo amplifier display shown at power-on can be changed by changing the parameter No.18 (status display selection) settings. In the initial condition, the servo amplifier display shows the servo motor speed.
For display details, refer to section 8.2.

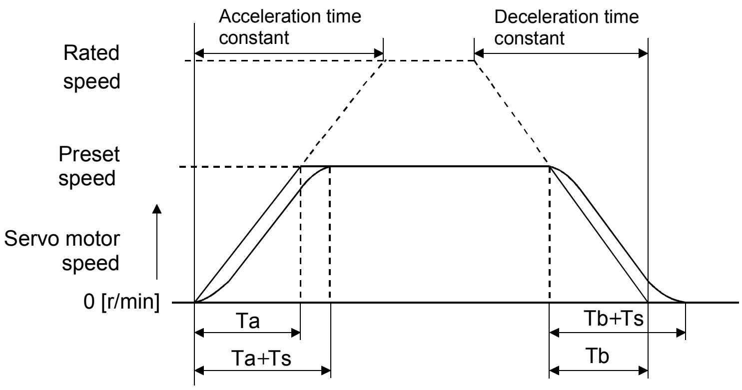
Parameter No. 18

0	0		

Status display on servo amplifier display at power-on
00: Current position (initial value)
01: Command position
02: Command remaining distance
03: Point table No.
04: Cumulative feedback pulses
05: Servo motor speed
06: Droop pulses
07: For manufacturer setting
08: Analog torque limit voltage
09: Regenerative load ratio
0A: Effective load ratio
0B: Peak load ratio
0C: Instantaneous torque
0D: Within one-revolution position low
0E: Within one-revolution position high
0F: ABS counter
10: Load inertia moment ratio
11: Bus voltage
12: Option unit communication status

6.2.3 S-pattern acceleration/deceleration

In servo operation, linear acceleration/deceleration is usually made. By setting the S-pattern acceleration/deceleration time constant (parameter No.14), 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.



Ta: Time until preset speed is reached
Tb: Time until stop
Ts: S-pattern acceleration/deceleration time constant
(parameter No. 14)
Setting range 0 to 100ms

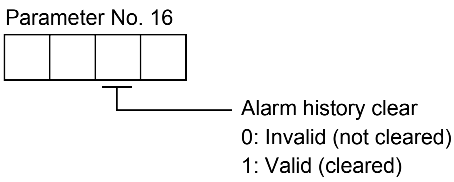
6.2.4 Changing the stop pattern using a limit switch

The servo amplifier is factory-set to make a sudden stop when the limit switch or software limit is made valid. When a sudden stop is not required, e.g. when there is an allowance from the limit switch installation position to the permissible moving range of the machine, a slow stop may be selected by changing the parameter No.22 setting.

Parameter No. 22 setting	Description
□□□0(initial value)	Droop pulses are reset to make a stop. (Sudden stop)
□□□1	Droop pulses are drawn out to make a slow stop. (Slow stop)

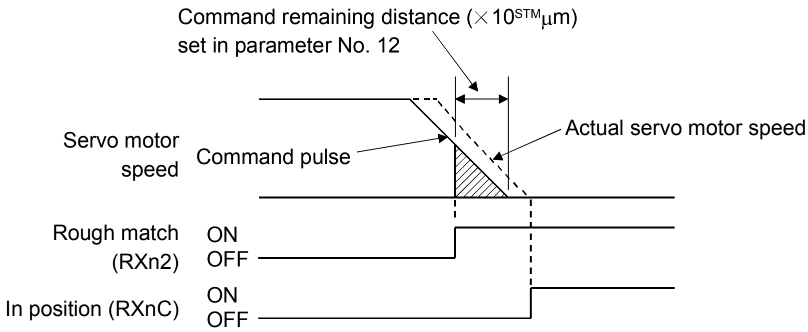
6.2.5 Alarm history clear

The alarm history can be confirmed by using the MR Configurator (Servo Configuration Software). 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.16 (alarm history clear) before starting operation. Clearing the alarm history automatically returns to "□□0□". This parameter is made valid by switching power off, then on after setting.



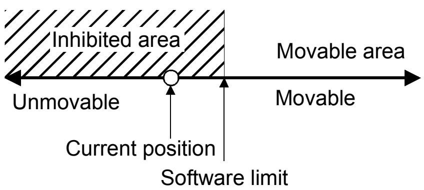
6.2.6 Rough match output

Rough match (RXn2) is output when the command remaining distance reaches the value set in parameter No. 12 (rough match output range). The set remaining distance is 0 to 65535 [$\times 10^{STM}\mu m$].



6.2.7 Software limit

A limit stop using a software limit 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 (AL. 37) will occur if the software limit + setting is less than the software limit − setting.



7. MR Configurator (SERVO CONFIGURATION SOFTWARE)

The MR Configurator (Servo Configuration software) (MR2JW3-SETUP161E) 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
Communication signal	Conforms to RS-232C
Baud rate	57600, 38400, 19200, 9600
System	Station selection
Monitor	Display all・High-speed monitor, trend graph
Alarm	Display, history, amplifier data
Diagnostic	I/O display, function device display, no motor rotation, total power-on time, software number display, motor data display, tuning data, absolute encoder data, axis name setting
Parameters	Parameter list, tuning, change list, detailed information, device setting
Test	Jog, positioning, operation w/o motor, forced output, single-step feed.
Advanced-function	Machine analyzer, gain search, machine simulation
Program-data	Point table
File operation	Data read, save, print
Others	Help display

7.2 System configuration

(1) Components

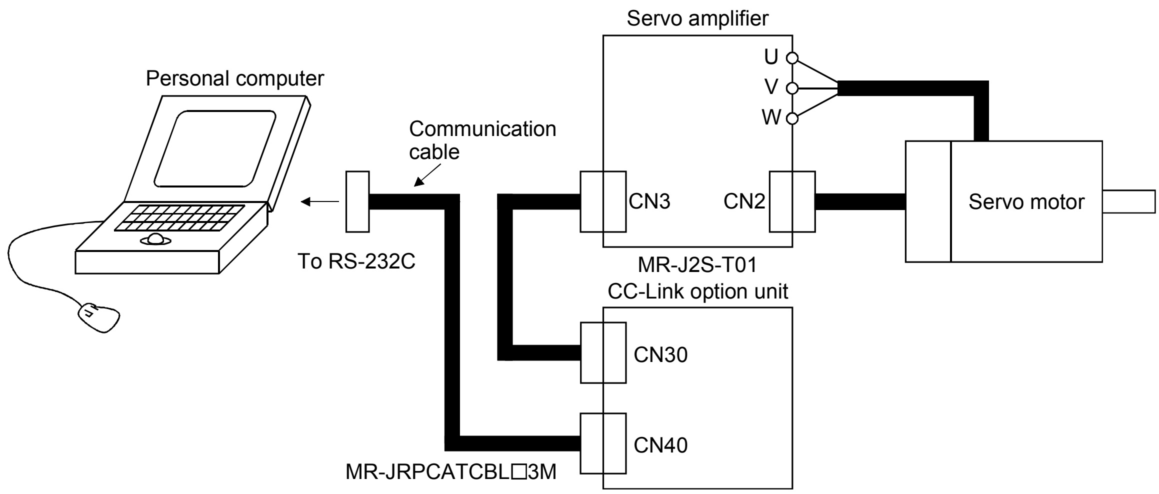
To use this software, the following components are required in addition to the servo amplifier and servo motor.

Model	(Note 1) Description
(Note 2) Personal computer	IBM PC-AT compatible where the English version of Windows® 95, Windows® 98, Windows® Me, Windows NT® Workstation 4.0, Windows® 2000 Professional, Windows® XP Professional or Windows® XP Home Edition operates Processor: Pentium® 133MHz or more (Windows® 95, Windows® 98,Windows NT® Workstation 4.0, Windows® 2000 Professional) Pentium® 150MHz or more (Windows® Me) Pentium® 300MHz or more (Windows® XP Professional, Windows® XP Home Edition) Memory: 16MB or more (Windows® 95), 24MB or more (Windows® 98) 32MB or more (Windows® Me, Windows NT® Workstation 4.0, Windows® 2000 Professional) 128MB or more (Windows® XP Professional, Windows® XP Home Edition) Free hard disk space: 60MB or more Serial port used
OS	Windows® 95, Windows® 98, Windows® Me, Windows NT® Workstation 4.0, 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. Note that a serial mouse is not used.
Printer	Connectable with the above personal computer.
Communication cable	MR-CPCATCBL3M When this cannot be used, refer to (3) section 15.1.4 and fabricate.

Note 1. Windows and Windows NT are 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.

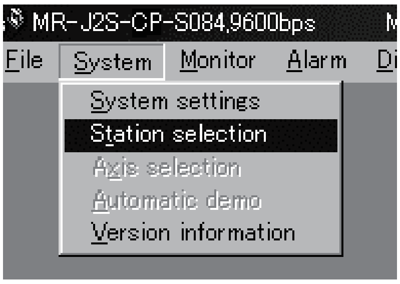
(2) Configuration diagram

For use of RS-232C

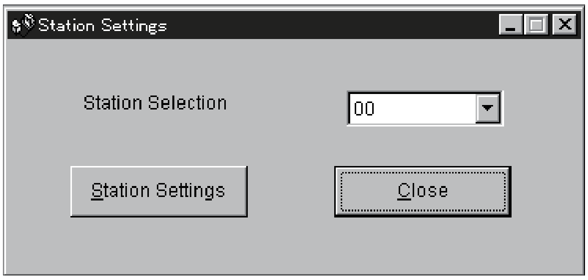


7.3 Station setting

Click “System” on the menu bar and click “Station Selection” on the menu.



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



(1) Station number setting

Choose the station number in the combo box and click the “Station Settings” button to set the station number.

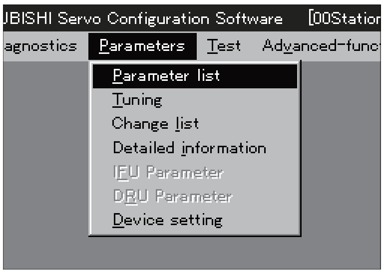
POINT
・This setting should be the same as the station number which has been set in the parameter in the servo amplifier used for communication.

(2) Closing of the station setting window

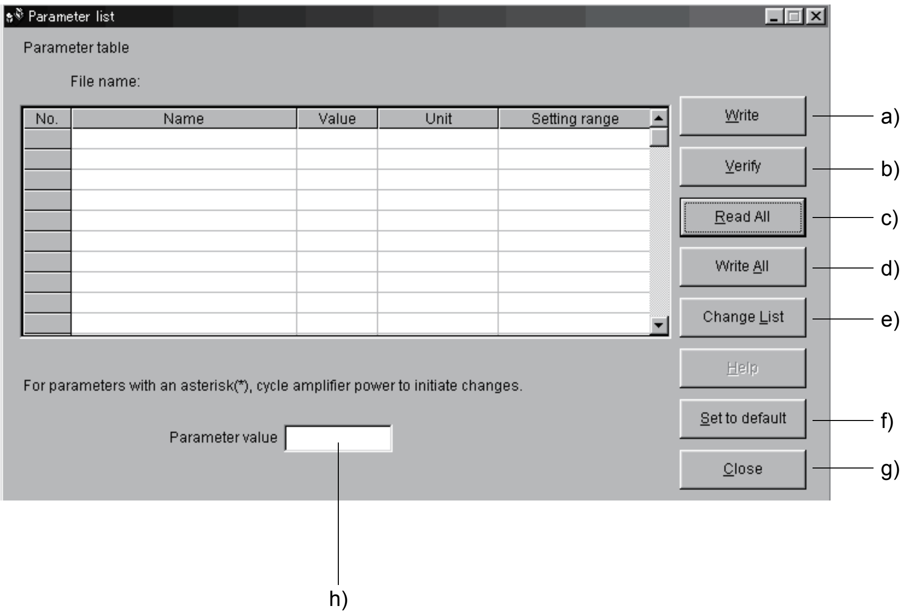
Click the “Close” button to close the window.

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.



(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.

(4) Parameter value batch-write (d))

Click the "Write All" button to write all parameter values to the servo amplifier.

(5) Parameter change list display (e))

Click the "Change List" button to show the numbers, names, initial values and current values of the parameters whose initial value and current value are different. In the offline mode, the parameter change list is not shown.

(6) Parameter default value indication (f))

Click the "Set to default" button to show the initial value of each parameter.

(7) Parameter value change (g))

Choose the parameter to be changed, enter a new value into the "Parameter value" input field, and press the enter key or Enter Data button.

(8) Parameter data file read

Used to read and display the parameter values stored in the file. Use the file selection window to read.

(9) Parameter value storage

Used to store all parameter values being displayed on the window into the specified file. Use the file selection window to store.

(10) Parameter data list print

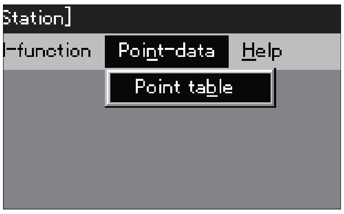
Used to print all parameter values being displayed on the window. Use the "File" menu on the menu bar to print.

(11) Parameter list window closing (h))

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

Click "Position-Data" on the menu bar and click "Point Tables" on the menu.



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

(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.

(5) Point table data insertion (e))

Click the “Insert Row” 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 Row” 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 “Setting” 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 “File” 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 “File” 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 “File” menu on the menu bar to print.

(11) Point table data list window closing (h))

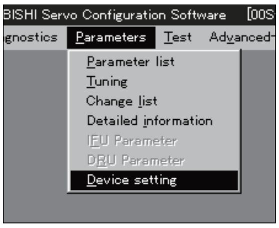
Click the “Close” button to close the window.

7.6 Device assignment method

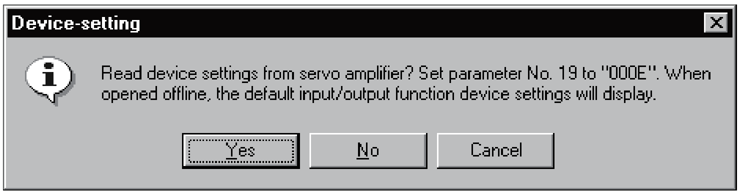
POINT
When using the device setting, preset "000E" in parameter No. 19.

(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.

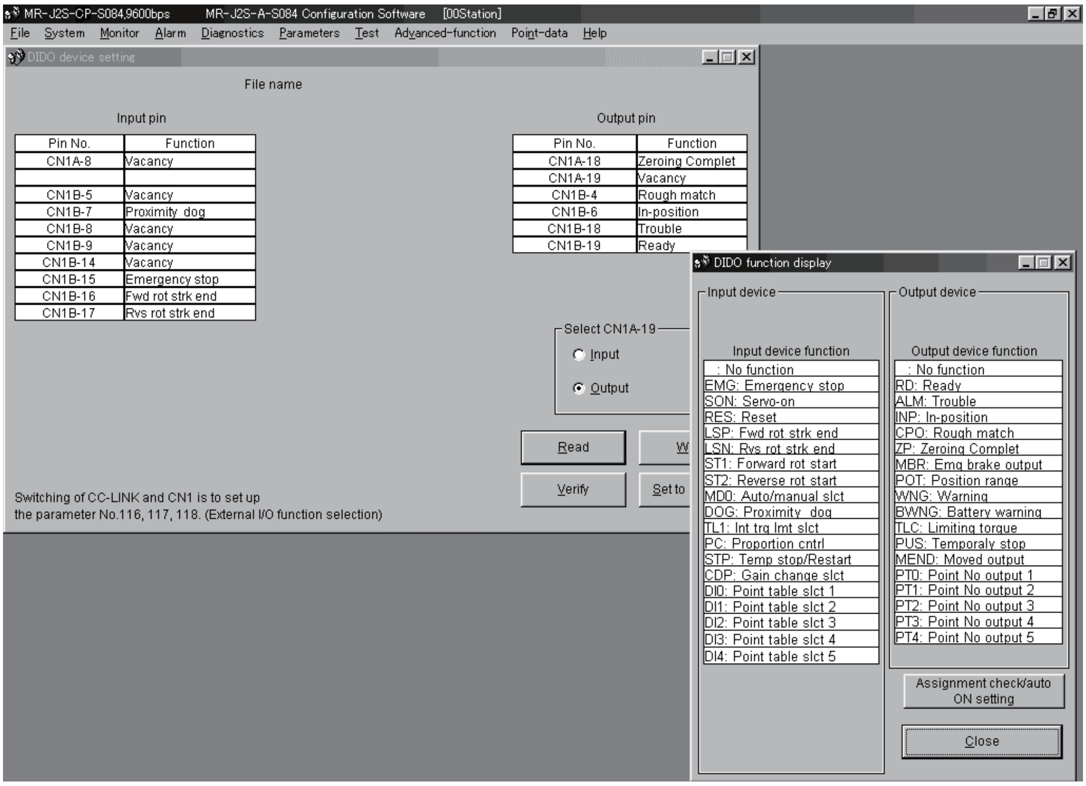


Click "Yes" button reads and displays the function assigned to each pin from the interface unit and extension IO unit.

Click "No" button displays the initial status of the interface unit and extension IO unit.

Click "Cancel" button terminates the processing.

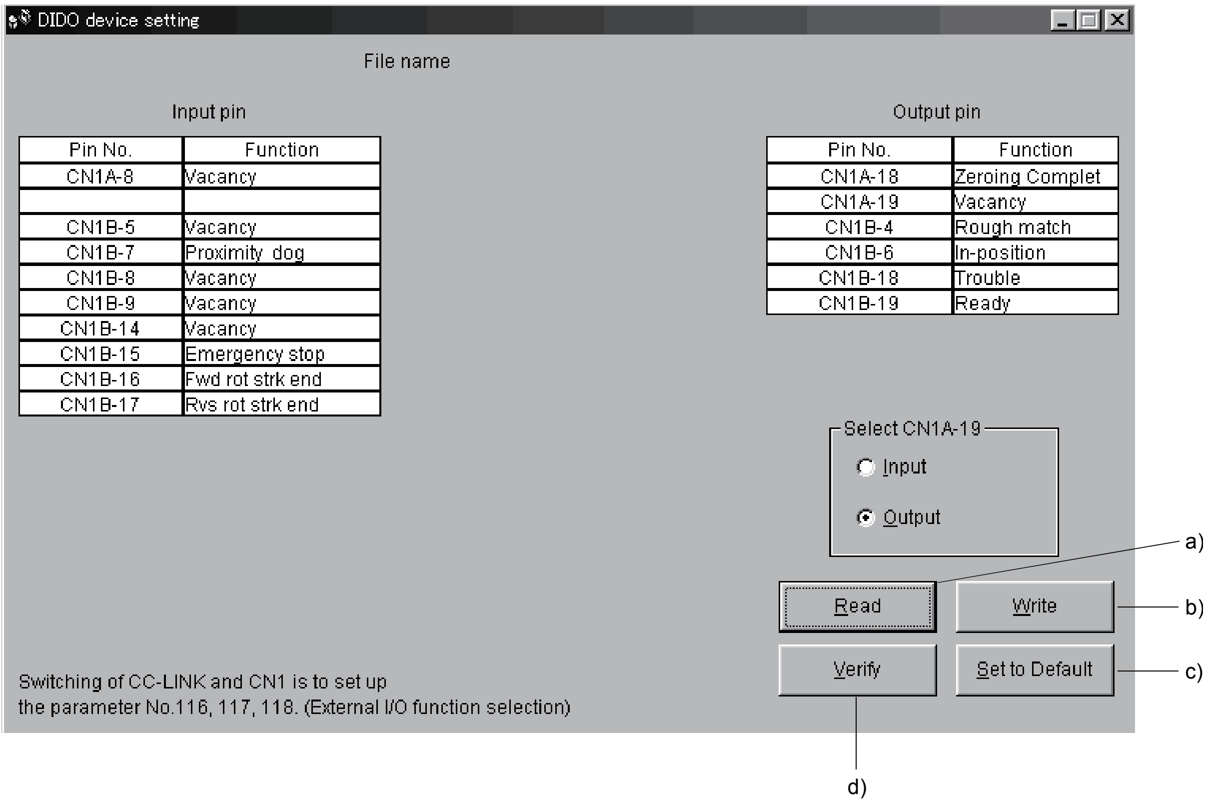
Click "Yes" button or "No" button displays the following two windows.



(2) Screen explanation

(a) DIDO device setting window screen

This is the device assignment screen of the servo amplifier displays the pin assignment status of the servo amplifier.



1) Read of function assignment (a))

Click the “Read” button reads and displays all functions assigned to the pins from the servo amplifier.

2) Write of function assignment (b))

Click the “Write” button writes all pins that are assigned the functions to the servo amplifier.

3) Verify of function assignment (c))

Click the “Verify” button verifies the function assignment in the servo amplifier with the device information on the screen.

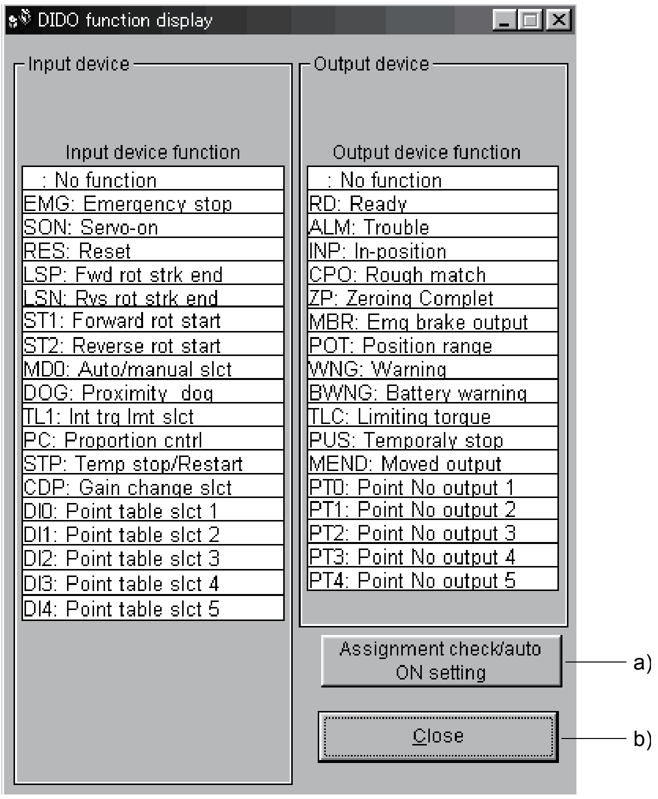
4) Initial setting of function assignment (d))

Click the “Set to Default” button initializes the function assignment.

(b) DIDO function display window screen

This screen is used to select the device assigned to the pins.

The functions displayed below * and * are assignable.



Move the pointer to the place of the function to be assigned. Drag and drop it as-is to the pin you want to assign in the DIDO device setting window.

1) Assignment checking, automatic ON setting (a))

Press this button to display the screen that shows the assignment list and enables auto ON setting.

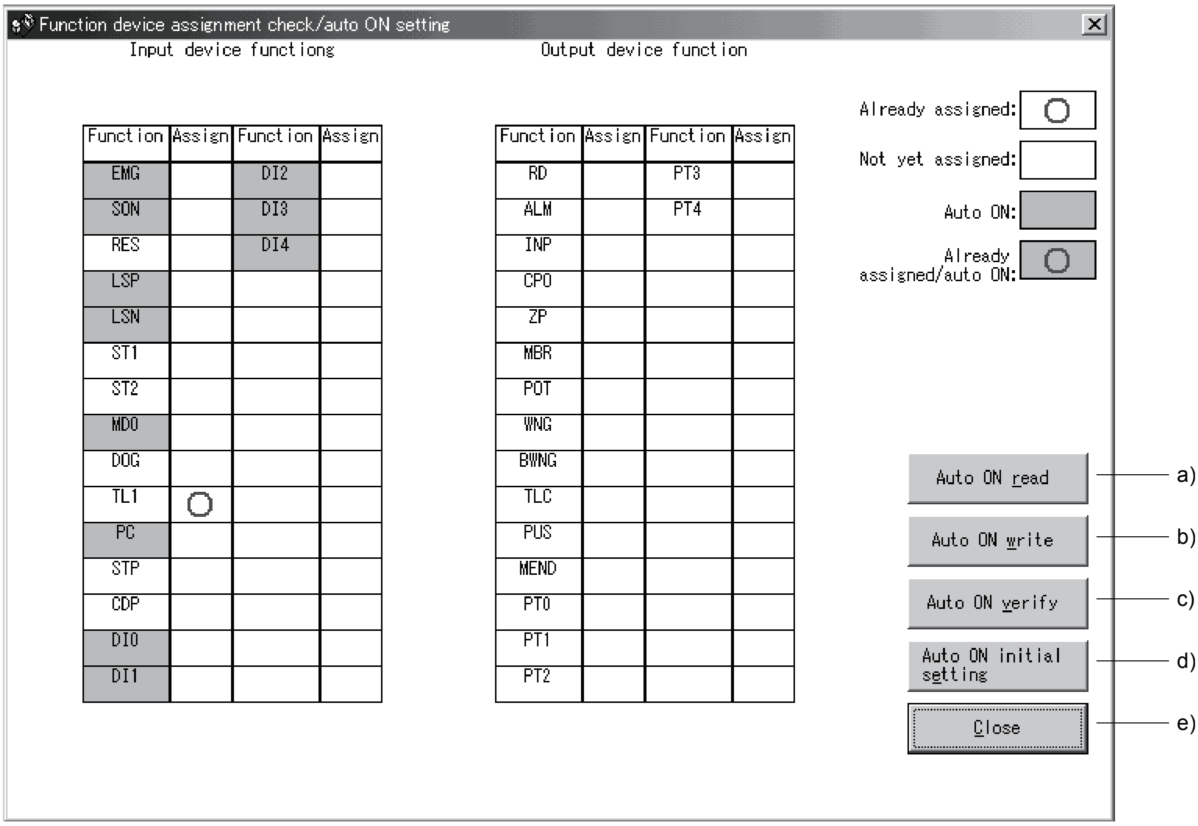
Refer to (c) in this section for more information.

2) Quitting

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

(C) Function device assignment checking・auto ON setting display

Click the “ / ” 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 “Auto ON read” button reads the functions set for auto ON from the interface unit and extension IO unit.

2) Auto ON write of function assignment (b))

Click “Auto ON 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 “Auto ON verify” button verifies the current auto ON setting in the interface unit and extension IO unit with the auto ON setting on the screen.

4) Auto ON initial setting of function assignment (d))

Click “Auto ON initial setting” 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

CAUTION	
⚠ CAUTION	・When confirming the machine operation in the test operation mode, use the machine after checking that the safety mechanism such as the forced stop (EMG) operates. ・If any operational fault has occurred, stop operation using the forced stop (EMG).

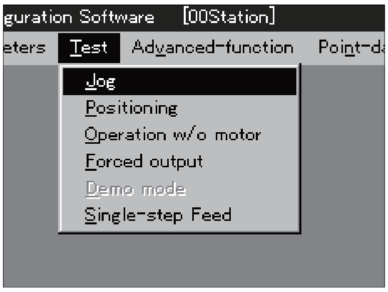
7.7.1 Jog operation

POINT

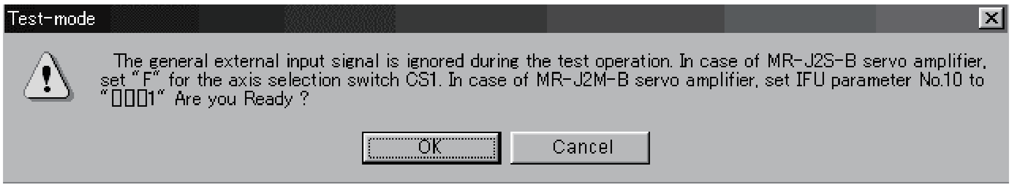
- For the program operation, refer to the manual of MR Configurator.
- The servo motor will not operate if the forced stop (EMG), forward rotation stroke end (LSP) and reverse rotation stroke end (LSN) are off. Make automatic ON setting to turn on these devices or make device setting to assign them as external input signals and turn on across these signals and SG. (Refer to section 7.6.)
- When an alarm occurs, the JOG operation is automatically canceled.

Hold down the “Forward” or “Reverse” button to rotate the servo motor. Release the “Forward” or “Reverse” button to stop.

Click “Test” on the menu bar and choose “Jog” on the menu.

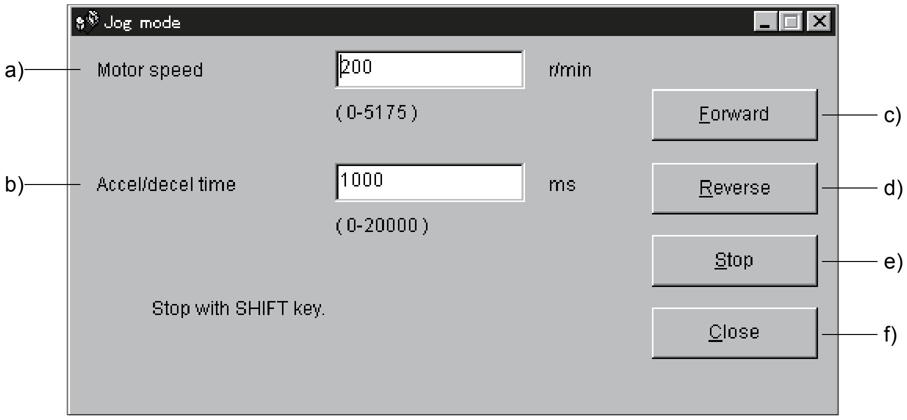


Clicking displays the following window.



Since this window shows the precaution for use of the MR-J2S-B, click the "OK" button.

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



(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))

Release the "Forward" or "Reverse" button to stop the rotation of the servo motor.

(5) Jog operation window closing (f))

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

(6) Cancel of jog operation

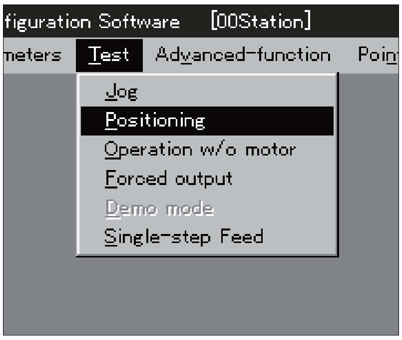
To cancel jog operation, switch off the power of the servo amplifier.

7.7.2 Positioning operation

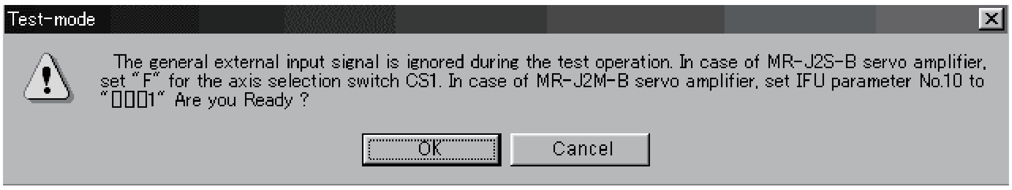
POINT
・The servo motor will not operate if the forced stop (EMG), forward rotation stroke end (LSP) and reverse rotation stroke end (LSN) are off. Make automatic ON setting to turn on these devices or make device setting to assign them as external input signals and turn on across these signals and SG. (Refer to section 7.6.)   ・When an alarm occurs, the positioning operation is automatically canceled.

Click the “Forward” or “Reverse” button to start and rotate the servo motor by the preset moving distance and then stop.

Click “Test” on the menu bar and click “Positioning” on the menu.

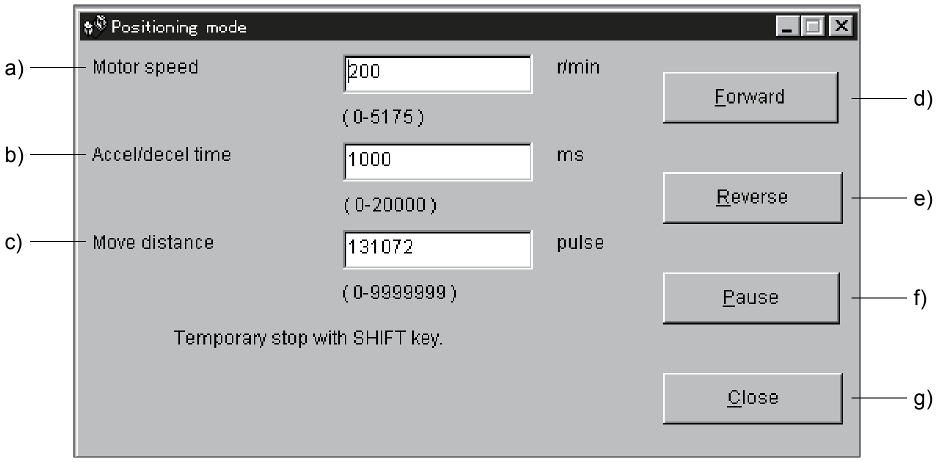


Clicking displays the following window.



Since this window shows the precaution for use of the MR-J2S-B, click the "OK" button.

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



(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) Positioning operation window closing (g))

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

(7) Cancel of positioning operation

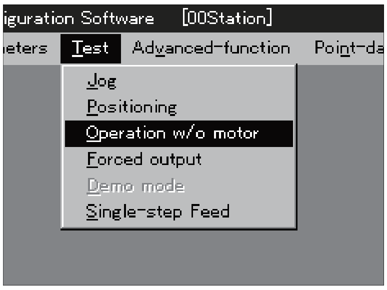
To cancel positioning operation, switch off the power of the servo amplifier.

7.7.3 Motor-less operation

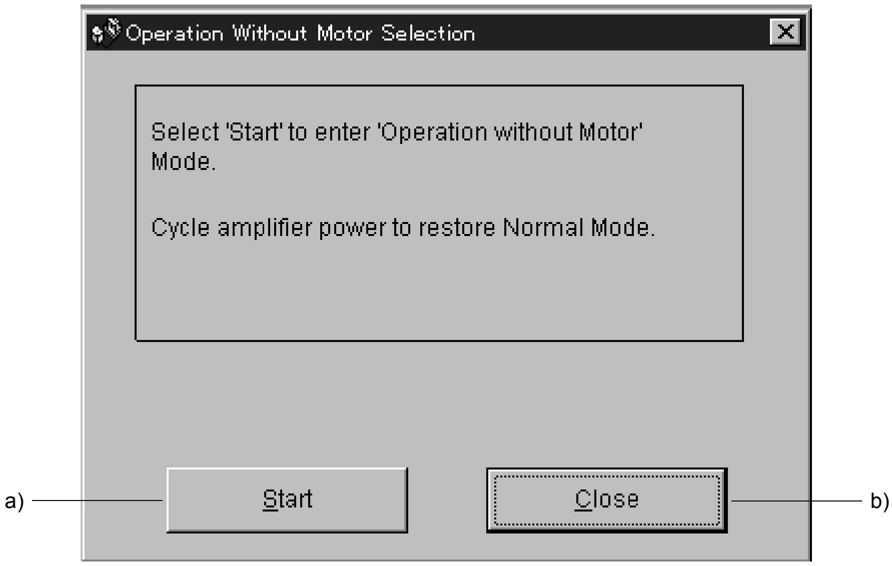
POINT
・When this operation is used in an absolute position detection system, the home position cannot be restored properly.

Without a servo motor being connected, the output signals are provided and the servo amplifier display shows the status as if a servo motor is actually running in response to the external I/O signals.
The sequence of the host programmable controller can be checked without connection of a servo motor.

Click “Test” on the menu bar and click “Operation w/o Motor” on the menu.



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



(1) Execution of motor-less operation (a))
Click “Start” to perform motor-less operation.

(2) Termination of motor-less operation (b))
Click “Close” to close the window.

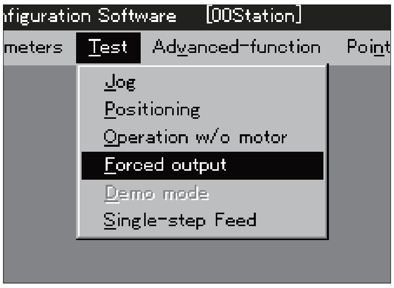
(3) Cancel of motor-less operation
To cancel motor-less operation, switch off the power of the servo amplifier.

7.7.4 Output signal (DO) forced output

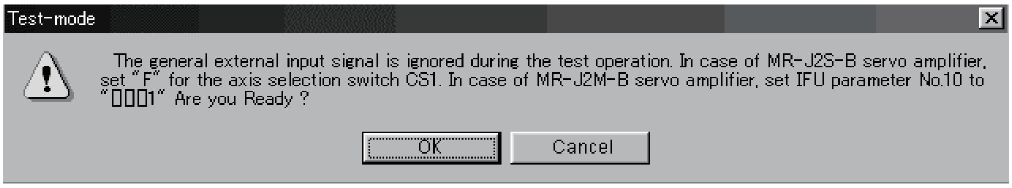
POINT
・When an alarm occurs, the DO forced output is automatically canceled.

Each servo amplifier output signal is forcibly switched on/off independently of the output condition of the output signal.

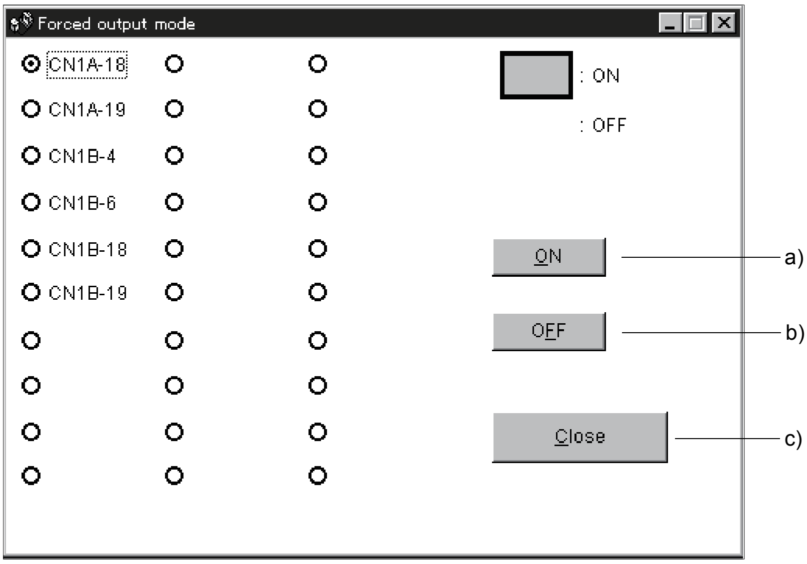
Click “Test” on the menu bar and click “Forced Output” on the menu.



Clicking displays the following window.



Since this window shows the precaution for use of the MR-J2S-B, click the "OK" button.
When the above choices are made, the following window appears.



(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.

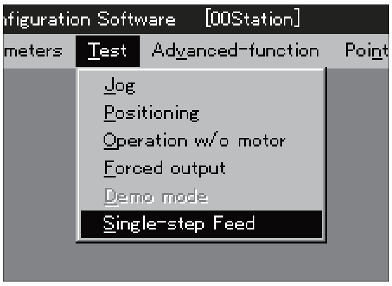
(3) Cancel of DO forced output

To cancel DO forced output, switch off the power of the servo amplifier.

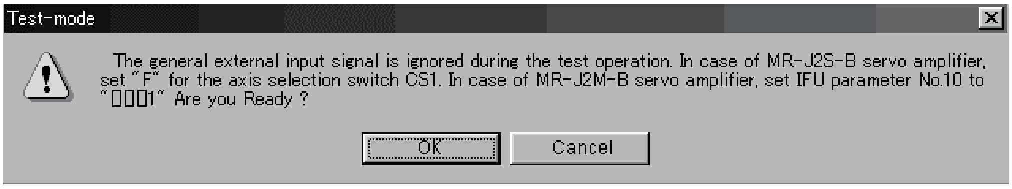
7.7.5 Single-step feed

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.

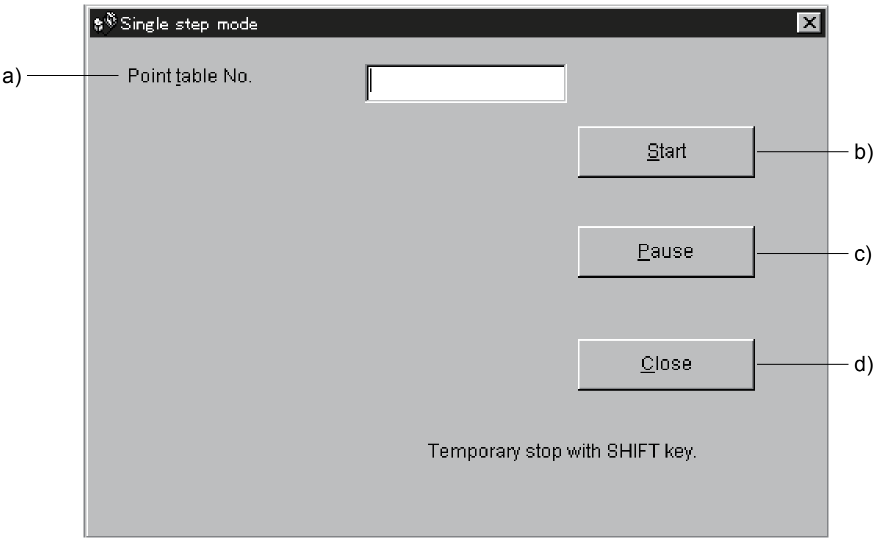
Operation is performed in accordance with the preset point table No.
Click "Test" on the menu bar and click "Single-step Feed" on the menu.



Clicking displays the following window.



Since this window shows the precaution for use of the MR-J2S-B, click the "OK" button.
When the above choices are made, the following window appears.



(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 (d))

Click the "Pause" button again during a temporary stop of the servo motor to clear the remaining moving distance.

(5) Single-step feed window closing (e))

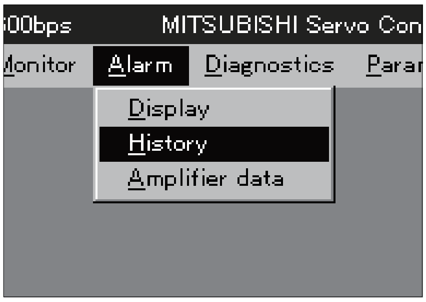
Click the "Close" button to cancel the single-step feed mode and close the window.

(6) Cancel of single-step feed

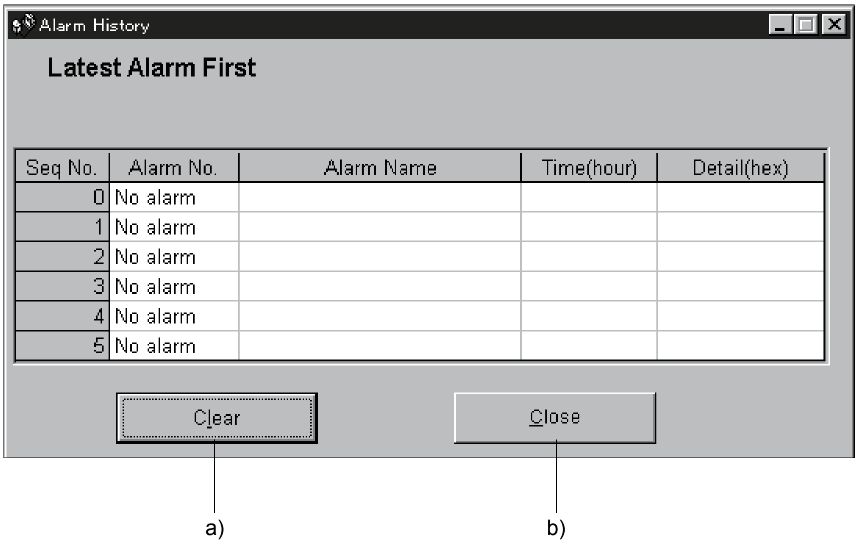
To cancel single-step feed, switch off the power of the servo amplifier.

7.8 Alarm history

Click “Alarms” on the menu bar and click “History” on the menu.



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



(1) Alarm history display

The most recent six alarms are displayed. The smaller numbers indicate newer alarms.

(2) Alarm history clear (a))

Click the “Clear” button to clear the alarm history stored in the servo amplifier.

(3) Closing of alarm history window (b))

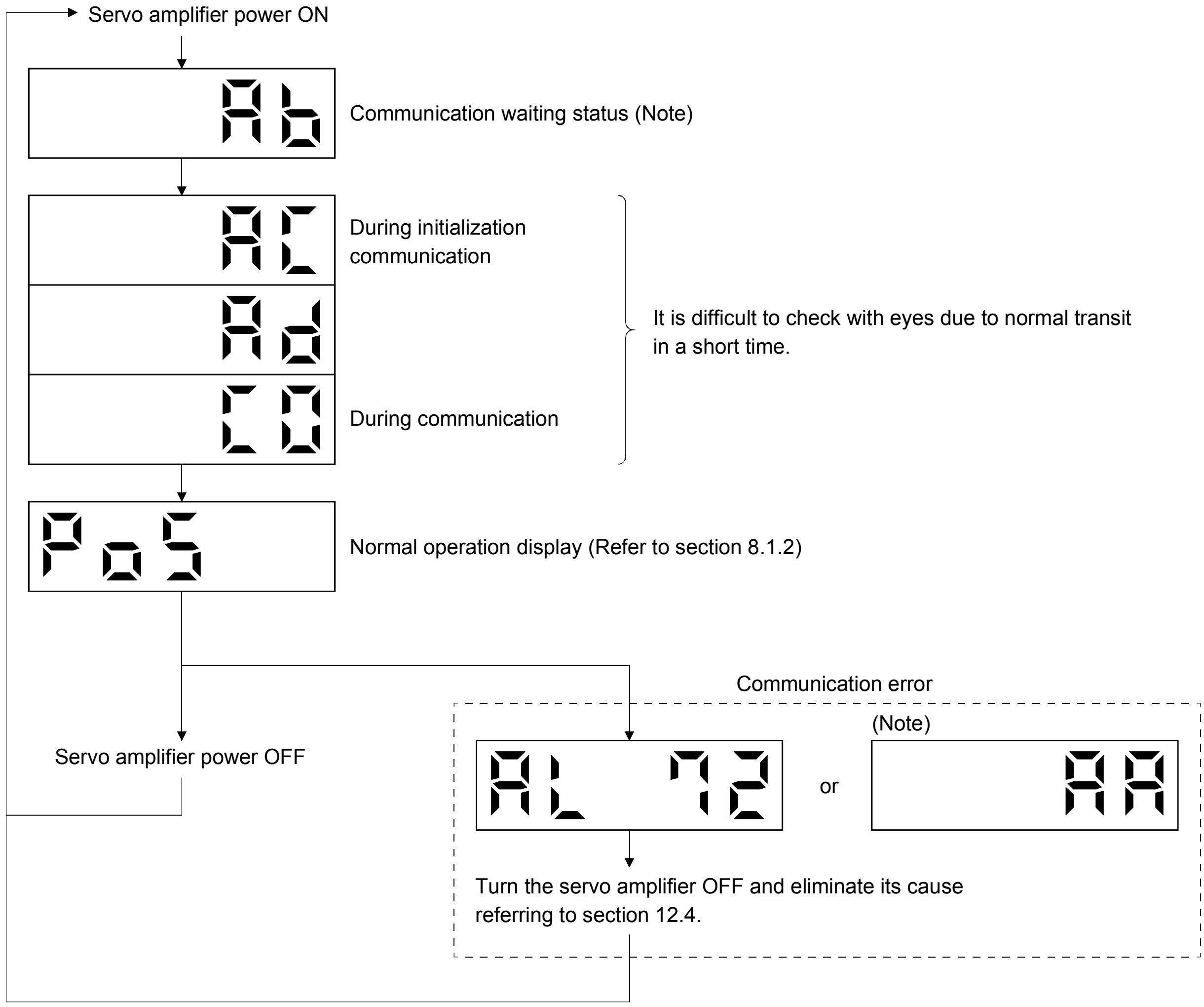
Click the “Close” button to close the window.

8. DISPLAY AND OPERATION

8.1 Display flowchart

Use the display (5-digit, 7-segment LED) on the front panel of the servo amplifier for status display, parameter setting, etc. Set the parameters before operation, diagnose an alarm, confirm external sequences, and/or confirm the operation status.

8.1.1 Display flowchart from powering ON to OFF



Note. Ab MR-J2S-T01 optional module is not connected.

AA MR-J2S-T01 optional module will be unconnected during powering ON.

For these status, turning the servo amplifier OFF and connect MR-J2S-T01 properly.

8.1.2 Display mode transition

Press the "MODE" "UP" or "DOWN" button once to move to the next screen. Refer to section 8.2 and later for the description of the corresponding display mode.
To refer to or set the expansion parameters 1, expansion parameters 2, special parameters 1, special parameters 2 and option unit parameter make them valid with parameter No.19 (parameter write disable).

Display mode transition	Initial screen	Function	Reference
Status display	PoS	Servo status display. At power-on, PoS appears after displaying MR-J2S-T01 option unit communication.	Section 8.2
Diagnosis	rd-oF	Alarm display, external signal display, output signal (DO) forced output, test operation, software version display, VC automatic offset, motor series ID display, motor type ID display, encoder ID display	Section 8.3
Alarm	AL --	Current alarm display, alarm history display, parameter error No. display, point table error No. display.	Section 8.4
Point table	Po001	Display and setting of point table data.	Section 8.5
Basic parameter	P 00	Display and setting of basic parameters.	Section 8.6
Expansion parameter 1	P 20	Display and setting of expansion parameters 1.	
Expansion parameter 2	P 54	Display and setting of expansion parameters 2.	
Special parameter 1	P 78	Display and setting of special parameters 1.	
Special parameter 2	P 91	Display and setting of special parameters 2.	
Option unit parameter	P 100	Display and setting of option unit parameter.	

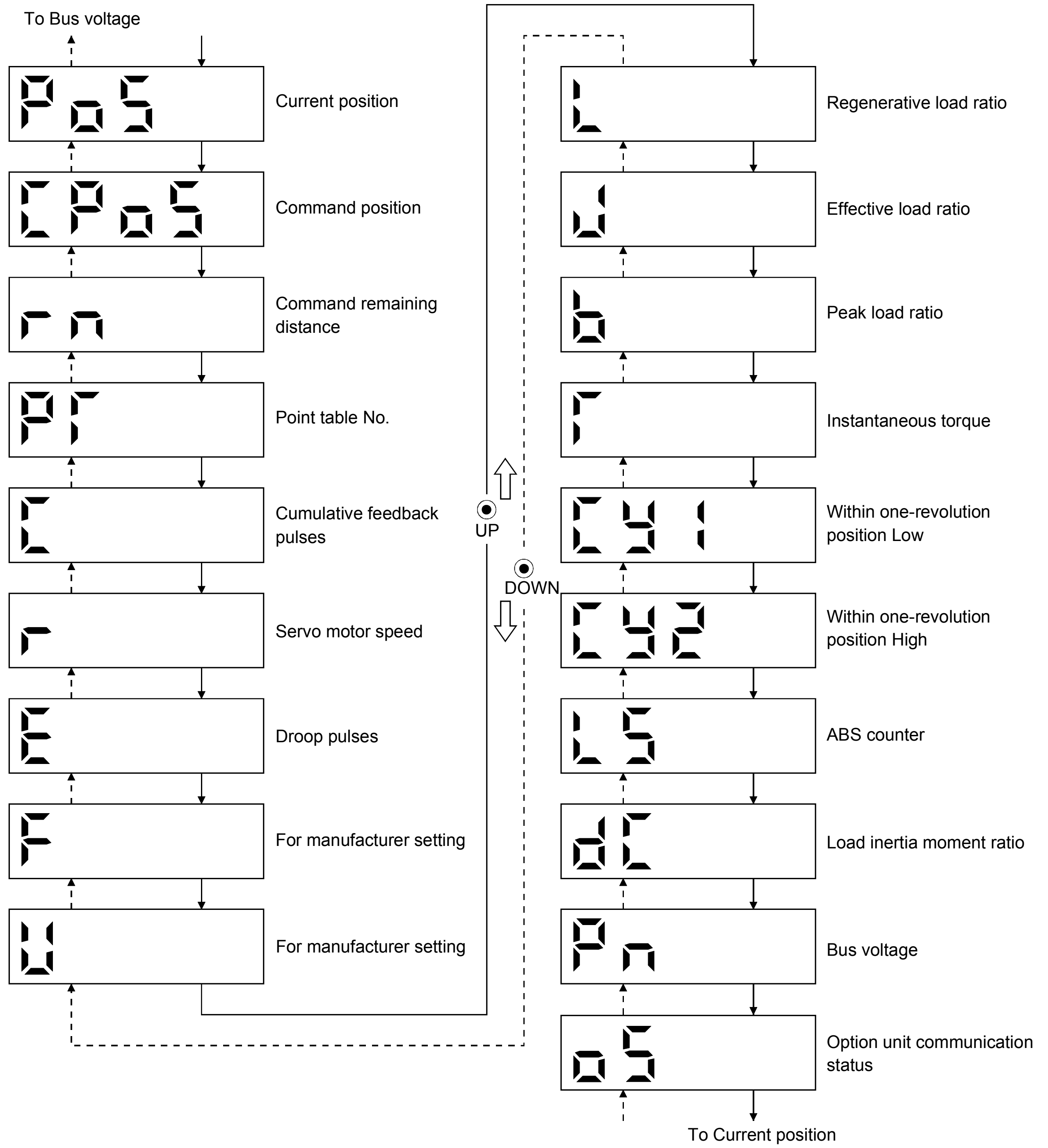
MODE button

8.2 Status display

The servo status during operation is shown on the 5-digit, 7-segment LED display. Press the "UP" or "DOWN" button to change display data as desired. When the required data is selected, the corresponding symbol appears. Press the "SET" button to display its data. At only power-on, however, data appears after the symbol of the status display selected in parameter No. 18 has been shown for 2[s].
The servo amplifier display shows the lower five digits of 16 data items such as the motor speed.

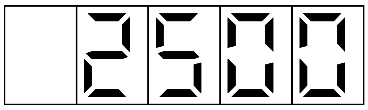
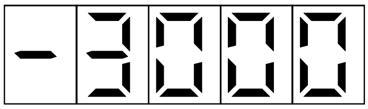
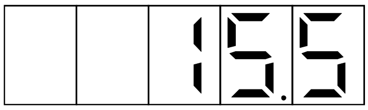
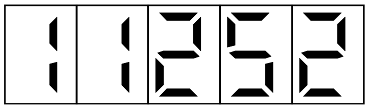
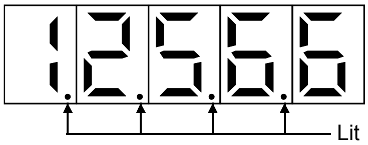
8.2.1 Display transition

After choosing the status display mode with the "MODE" button, pressing the "UP" or "DOWN" button changes the display as shown below.



8.2.2 Display examples

The following table lists display examples.

Item	Status	Displayed data
Servo motor speed	Forward rotation at 2500r/min	
	Reverse rotation at 3000r/min	 Reverse rotation is indicated by "−".
Load inertia moment	15.5 times	
Multi-revolution counter	11252pulse	
	−12566pulse	 Negative value is indicated by the lit decimal points in the upper four digits.

8.2.3 Status display list

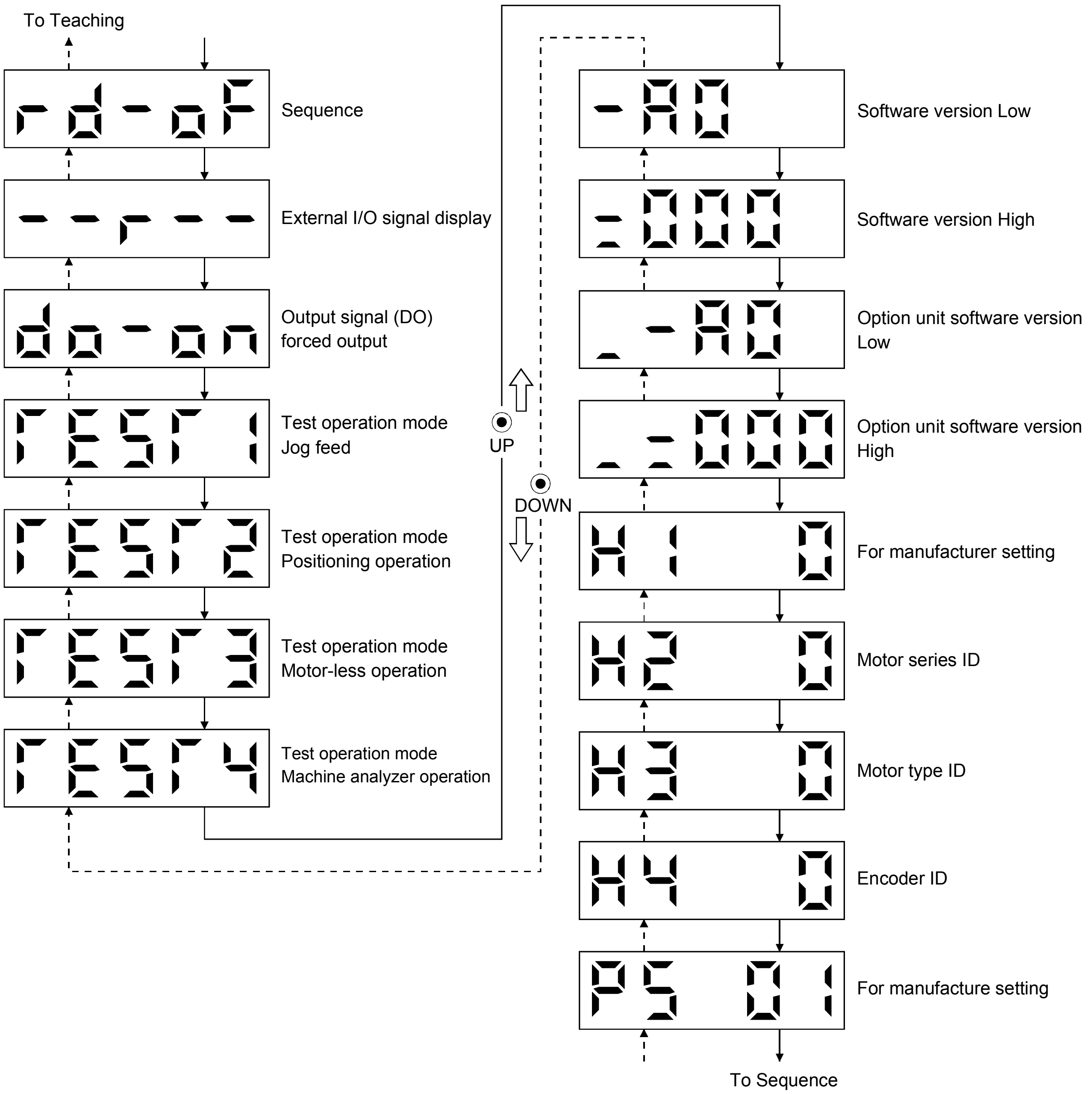
The following table lists the servo statuses that may be shown.

Status display	Symbol	Unit	Description	Display range
Current position	PoS	$\times 10^{STM}$ mm	The current position from the machine home position of 0 is displayed.	−99999 to 99999
Command position	CPoS	$\times 10^{STM}$ mm	The command position is displayed.	−99999 to 99999
Command remaining distance	rn	$\times 10^{STM}$ mm	The command remaining distance of the currently selected point table is displayed.	−99999 to 99999
Point table No.	PT		The point table No. being executed is displayed.	0 to 31
Cumulative feedback pulses	C	pulse	Feedback pulses from the servo motor encoder are counted and displayed. When the value exceeds ±9999999, it returns to zero. Press the "SET" button to reset the display value to zero.	−99999 to 99999
Servo motor speed	r	r/min	The servo motor speed is displayed. "−" is added to the speed of the servo motor rotating in the CW rotation.	−5400 to 5400
Droop pulses	E	pulse	The number of droop pulses in the deviation counter is displayed. "−" is added to the droop pulses in the CW rotation. The displayed number of pulses is not yet multiplied by the electronic gear value.	−99999 to 99999
For manufacturer setting	F	%	For manufacturer setting.	0 to 200
	u	V		0.00 to 10.00
Regenerative load ratio	L	%	The ratio of regenerative power to permissible regenerative power is displayed in %.	0 to 100
Effective load ratio	J	%	The continuous effective load torque is displayed. The effective value in the past 15 seconds is displayed relative to the rated torque of 100%.	0 to 300
Peak load ratio	b	%	The maximum torque generated during acceleration/deceleration, etc. The highest value in the past 15 seconds is displayed relative to the rated torque of 100%.	0 to 300
Instantaneous torque	T	%	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 Low	Cy1	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 99999
Within one-revolution position High	Cy2	100 pulse	The within one-revolution position is displayed in 100 pulse increments of the encoder. 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 1310
ABS counter	LS	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	dC	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	Pn	V	The voltage (across P-N) of the main circuit converter is displayed.	0 to 450
Option unit communication status	oS		Communication waiting status	AA・Ab
			During initialization communication	AC・Ad
			During communication	CO
			Communication stop status due to alarm	—

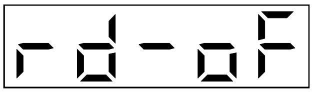
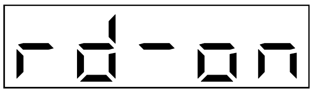
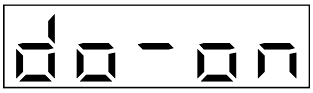
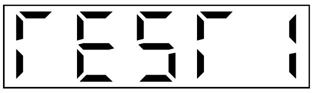
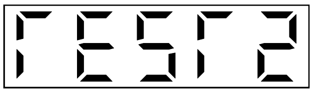
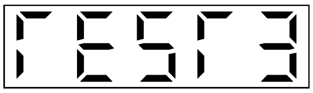
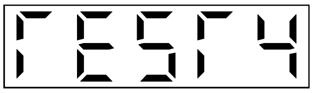
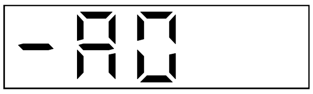
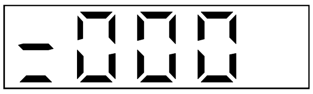
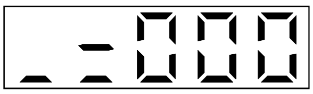
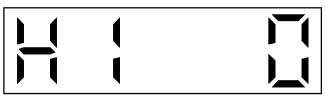
8.3 Diagnosis mode

8.3.1 Display transition

After choosing the diagnosis mode with the "MODE" button, pressing the "UP" or "DOWN" button changes the display as shown below.



8.3.2 Diagnosis mode list

Name		Display	Description
Sequence			Not ready. Indicates that the servo amplifier is being initialized or an alarm has occurred.
			Ready. Indicates that the servo was switched on after completion of initialization and the servo amplifier is ready to operate.
External I/O signal display		Refer to section 8.7.	Indicates the ON-OFF states of the external I/O signals. The upper segments correspond to the input signals and the lower segments to the output signals. Lit: ON Extinguished: OFF The I/O signals can be changed using the MR Configurator (servo configuration software MRZJW3-SETUP161E).
Output signal (DO) forced output			The digital output signal can be forced on/off. (Refer to section 8.8)
Test operation mode	Jog feed		Jog operation can be performed when there is no command from the external command device. (Refer to section 8.9.2)
	Positioning operation		The MR Configurator (servo configuration software MRZJW3-SETUP161E) is required for positioning operation. This operation cannot be performed from the operation section of the servo amplifier. Positioning operation can be performed once when there is no command from the external command device.
	Motor-less operation		Without connection of the servo motor, the servo amplifier provides output signals and displays the status as if the servo motor is running actually in response to the external input signal. (Refer to section 8.9.4)
	Machine analyzer operation		Merely connecting the servo amplifier allows the resonance point of the mechanical system to be measured. The MR Configurator (servo configuration software MRZJW3-SETUP161E) is required for machine analyzer operation.
Software version Low			Indicates the version of the software.
Software version High			Indicates the system number of the software.
Option unit software version Low			Indicates the version of the option unit software.
Option unit software version High			Indicates the version of the option unit software.
For manufacturer setting			Manufacturer setting screen. Do not perform operation on this screen.

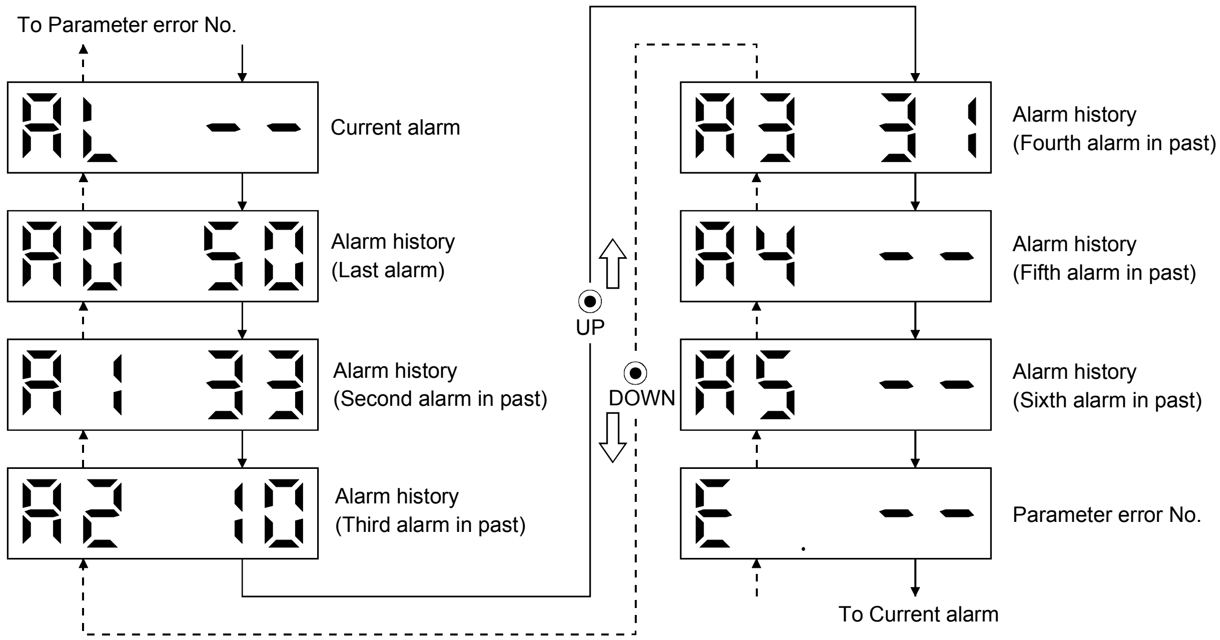
Name	Display	Description
Motor series ID	H2 0	Press the "SET" button to show the motor series ID of the servo motor currently connected. For indication details, refer to the optional MELSERVO Servo Motor Instruction Manual.
Motor type ID	H3 0	Press the "SET" button to show the motor type ID of the servo motor currently connected. For indication details, refer to the optional MELSERVO Servo Motor Instruction Manual.
Encoder ID	H4 0	Press the "SET" button to show the encoder ID of the servo motor currently connected. For indication details, refer to the optional MELSERVO Servo Motor Instruction Manual.
For manufacturer setting	P5 01	This is the screen for manufacturer setting. Do not perform operation on this screen.

8.4 Alarm mode

The current alarm, past alarm history and parameter error are displayed. The lower 2 digits on the display indicate the alarm number that has occurred or the parameter number in error. Display examples are shown below.

8.4.1 Display transition

After choosing the alarm mode with the "MODE" button, pressing the "UP" or "DOWN" button changes the display as shown below.



8.4.2 Alarm mode list

Name	Display	Description
Current alarm	AL --	Indicates no occurrence of an alarm.
	AL.33	Indicates the occurrence of overvoltage (AL.33). Flickers at occurrence of the alarm.
Alarm history	A0 50	Indicates that the last alarm is overload 1 (AL.50).
	A1 33	Indicates that the second alarm in the past is overvoltage (AL.33).
	A2 10	Indicates that the third alarm in the past is undervoltage (AL.10).
	A3 31	Indicates that the fourth alarm in the past is overspeed (AL.31).
	A4 --	Indicates that there is no fifth alarm in the past.
	A5 --	Indicates that there is no sixth alarm in the past.
Parameter error No.	E. --	Indicates no occurrence of parameter error.
	E. 01	Indicates that the data of parameter No. 1 is faulty.
	E.01P	Displayed when any of the set point table values exceeds the setting range. The display given on the left indicates an error in the position data of point table No. 1. P: Position data, d: Servo motor speed, A: Acceleration time constant, b: Deceleration time constant, n: Dwell, H: Auxiliary function

Functions at occurrence of an alarm

(1) The current occurring alarm is displayed. If an alarm occurs while viewing the other mode screen, the screen switches to this screen automatically.

(2) If during alarm occurrence, the other screen can be viewed by pressing the button in the operation section. At this time, the decimal point in the fourth digit remains flickering.

(3) For any alarm, remove its cause and clear it in any of the following methods (for clearable alarms, refer to section 12.4.1).

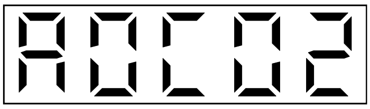
(a) Switch power OFF, then ON.

(b) Press the "SET" button on the current alarm screen.

(c) Turn on the reset (RY(n+1)A or RY(n+3)A) signal.

(4) Use parameter No. 16 to clear the alarm history.

(5) Pressing "SET" on the alarm history display screen for 2s or longer shows the following detailed information display screen. Note that this is provided for maintenance by the manufacturer.



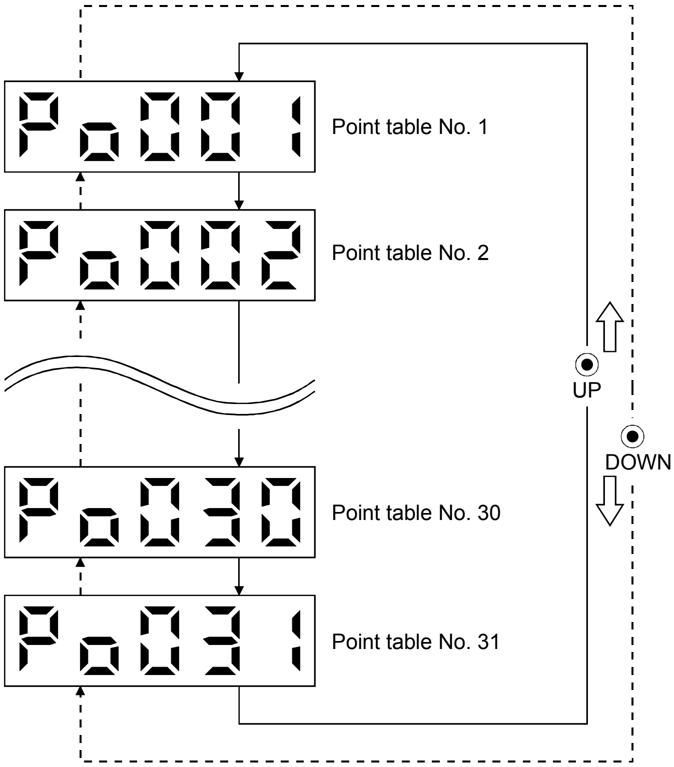
(6) Press "UP" or "DOWN" to move to the next history.

8.5 Point table mode

You can set the target position, servo motor speed, acceleration time, deceleration time, dwell and auxiliary function.

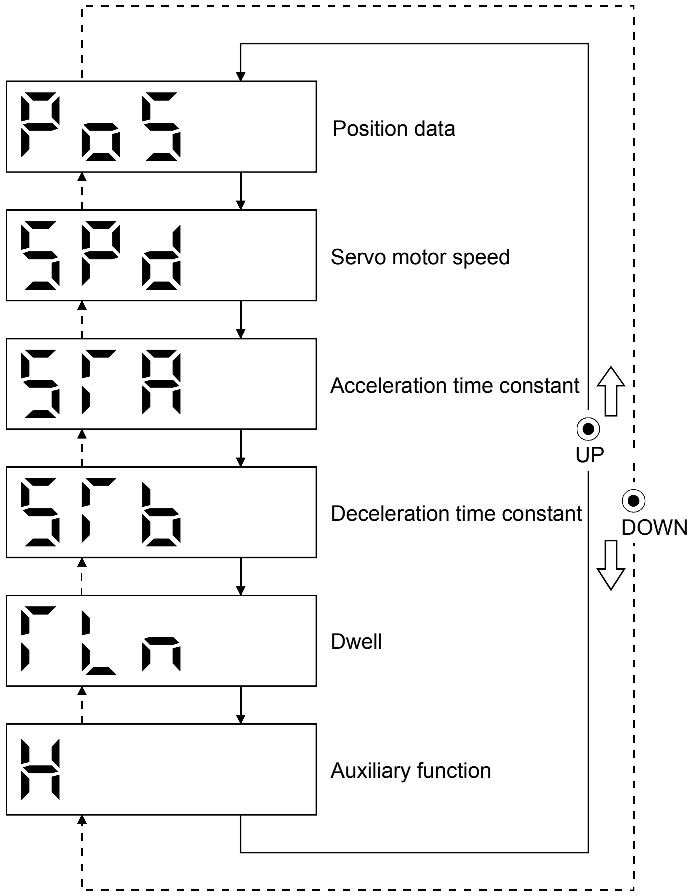
8.5.1 Point table transition

After choosing the point table mode with the "MODE" button, pressing the "UP" or "DOWN" button changes the display as shown below.



8.5.2 Point table mode setting screen sequence

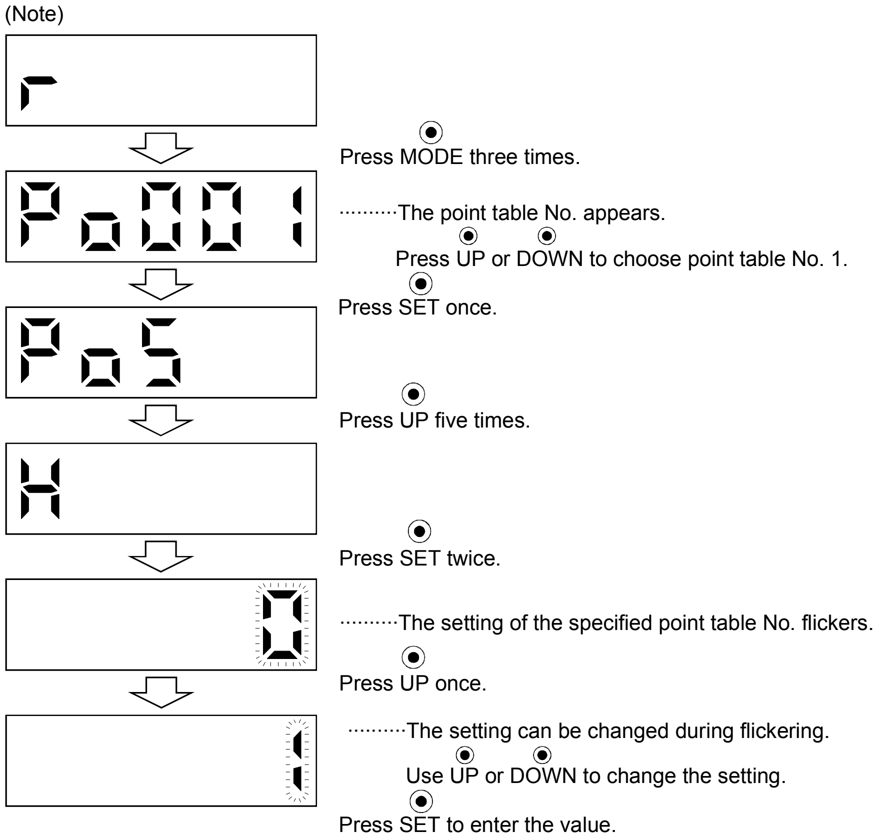
Press "SET" in the point table mode. The following screen appears.
Press "UP" or "DOWN" to move to the next screen.



8.5.3 Operation method

(1) Setting of 5 or less-digit value

The following example provides the after-power-on operation procedure to set "1" in the auxiliary function of point table No.1.

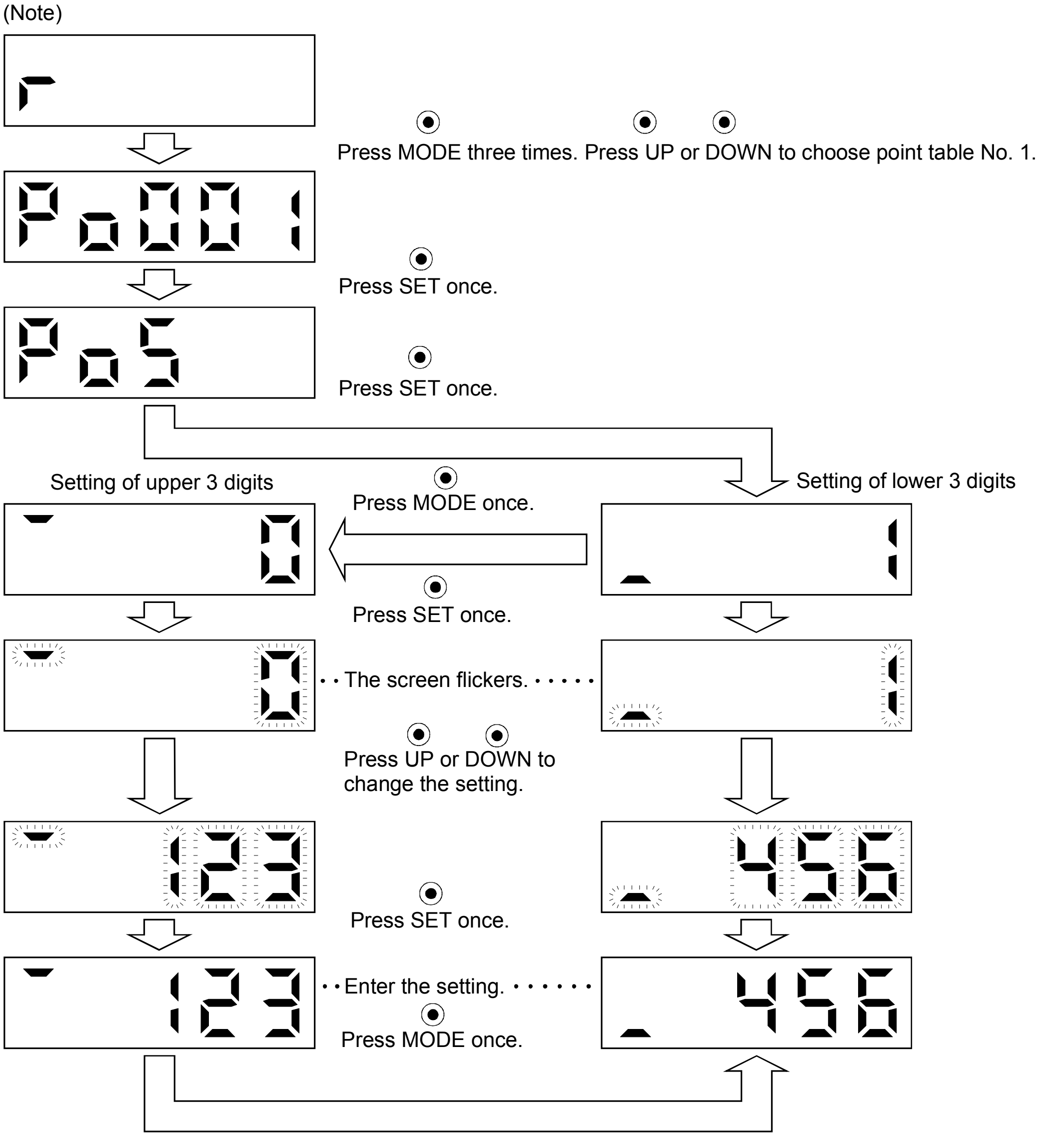


Note. The example assumes that the status display screen that appears at power-on has been set to the servo motor speed in parameter No. 18.

Press "UP" or "DOWN" after completion of the setting to return to the setting item screen. Further, press "UP" and "DOWN" together to return to the point table No. display screen.
During flickering, press "MODE" for 2[s] to discard the new value and display the old value.

(2) Setting of 6 or more-digit value

The following example gives the after-power-on operation procedure to change the target value of point table No.1 to "123456".



Note. The example assumes that the status display screen that appears at power-on has been set to the servo motor speed in parameter No. 18.

Press "UP" or "DOWN" after completion of the setting to return to the setting item screen. Further, press "UP" and "DOWN" together to return to the point table No. display screen.

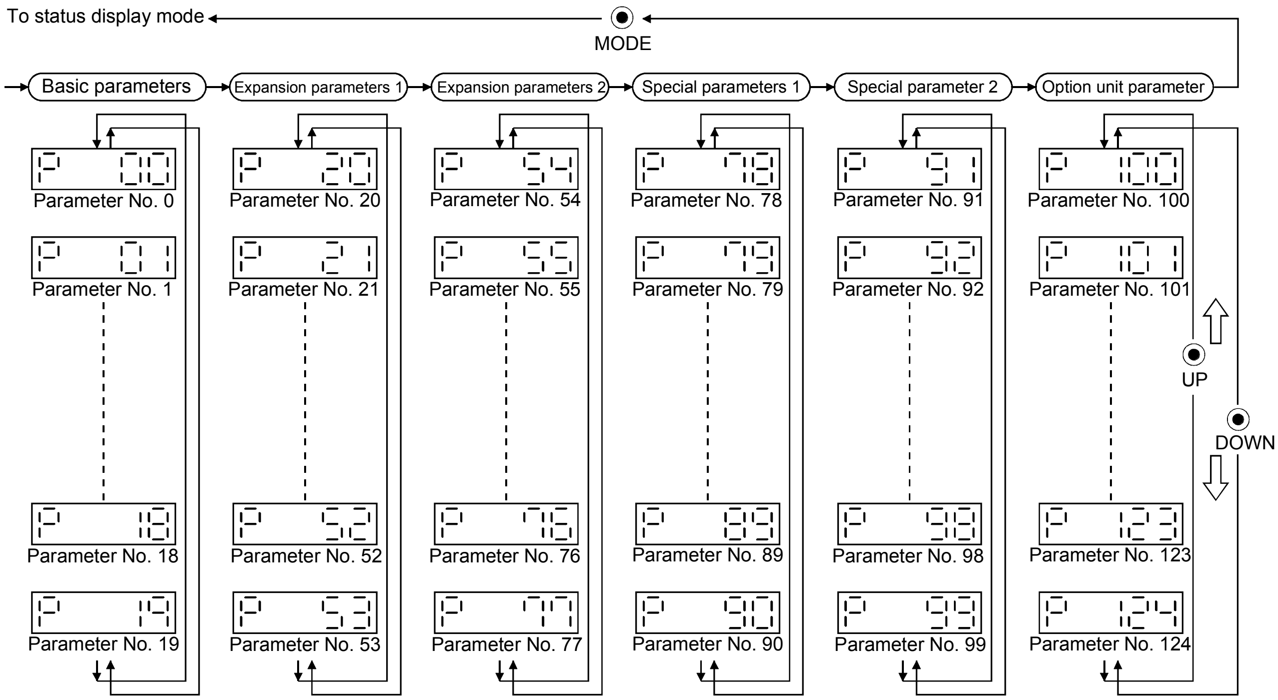
During flickering, press "MODE" for 2[s] to discard the new value and display the old value.

8.6 Parameter mode

POINT
・To use the expansion parameters, change the parameter No. 19 (parameter write inhibit) value. (Refer to section 5.1.1)

8.6.1 Parameter mode transition

After choosing the corresponding parameter mode with the "MODE" button, pressing the "UP" or "DOWN" button changes the display as shown below.

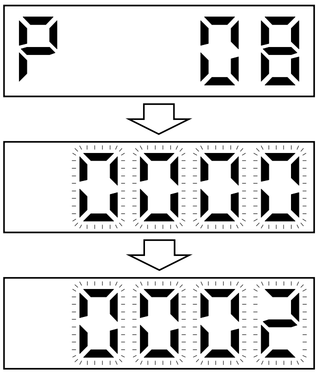


The parameter whose abbreviation is marked * is made valid by switching power off, then on after changing its setting. (Refer to section 6.1.2)

8.6.2 Operation example

(1) Parameter of 5 or less digits

The following example shows the operation procedure performed after power-on to change the home position setting method (Parameter No.8) into the data setting type. Press "MODE" to switch to the basic parameter screen.



Press MODE four times. Select parameter No.8 with UP or DOWN.

······The parameter number is displayed.

Press UP or DOWN to change the number.

Press SET twice.

······The set value of the specified parameter number flickers.

Press UP twice.

······During flickering, the set value can be changed.

Use UP or DOWN .
(□□□2: Data setting type)

Press SET to enter.

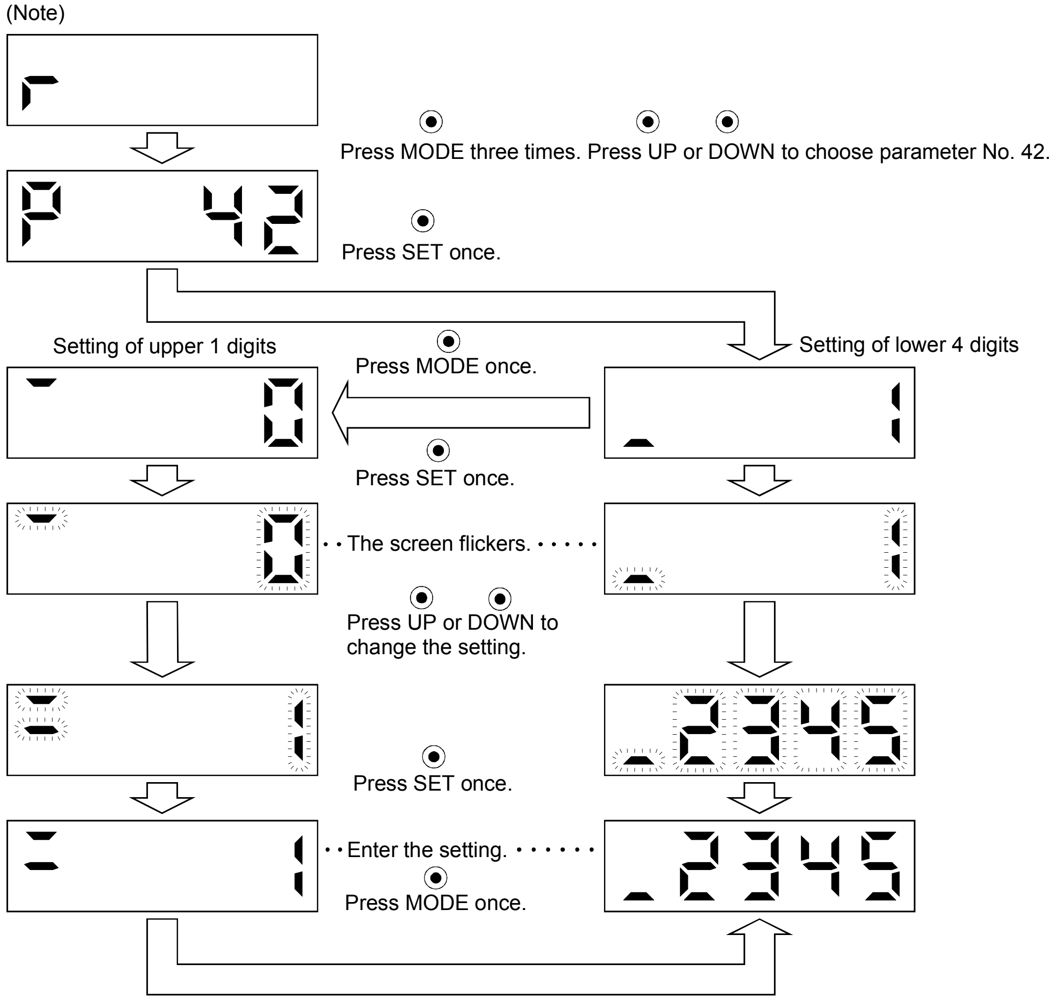
To shift to the next parameter, press the "UP" or "DOWN" button.

When changing the parameter No.8 (home position return type) setting, change its set value, then switch power off once and switch it on again to make the new value valid.

During flickering, press "MODE" for 2[s] to discard the new value and display the old value.

(2) Signed 5-digit parameter

The following example gives the operation procedure to change the home position return position data (parameter No. 42) to "-12345".



Note. The example assumes that the status display screen that appears at power-on has been set to the servo motor speed in parameter No. 18.

When changing the parameter No. 42 setting, change its set value, then switch power off once and switch it on again to make the new value valid.

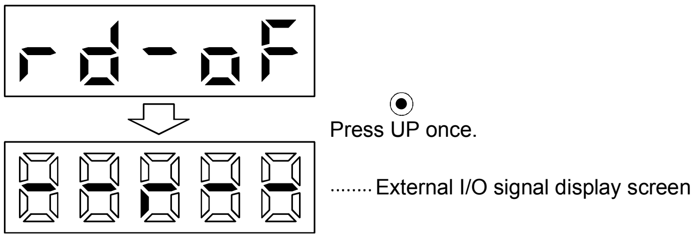
During flickering, press "MODE" for 2[s] to discard the new value and display the old value.

8.7 External I/O signal display

The ON/OFF states of the digital I/O signals connected to the servo amplifier can be confirmed.

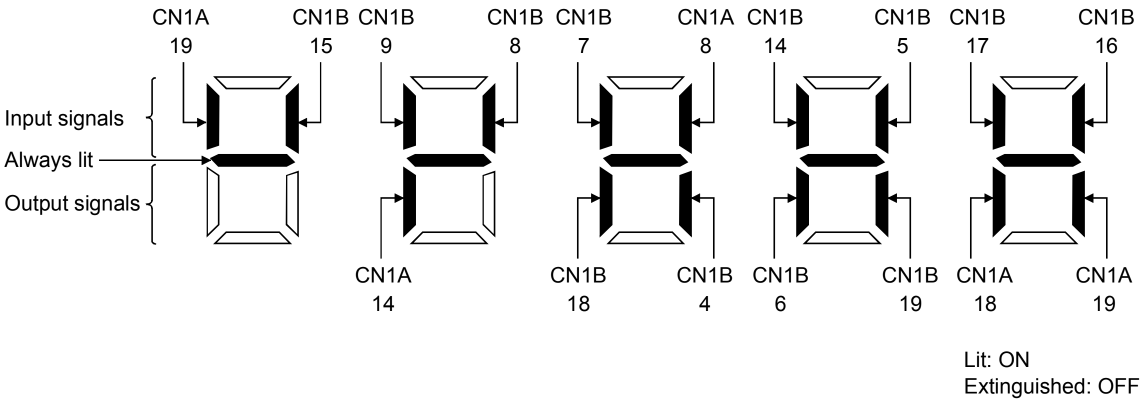
(1) Operation

Call the display screen shown after power-on.
Using the "MODE" button, show the diagnostic screen.



(2) Display definition

The segments of the seven-segment LEDs correspond to the pins.

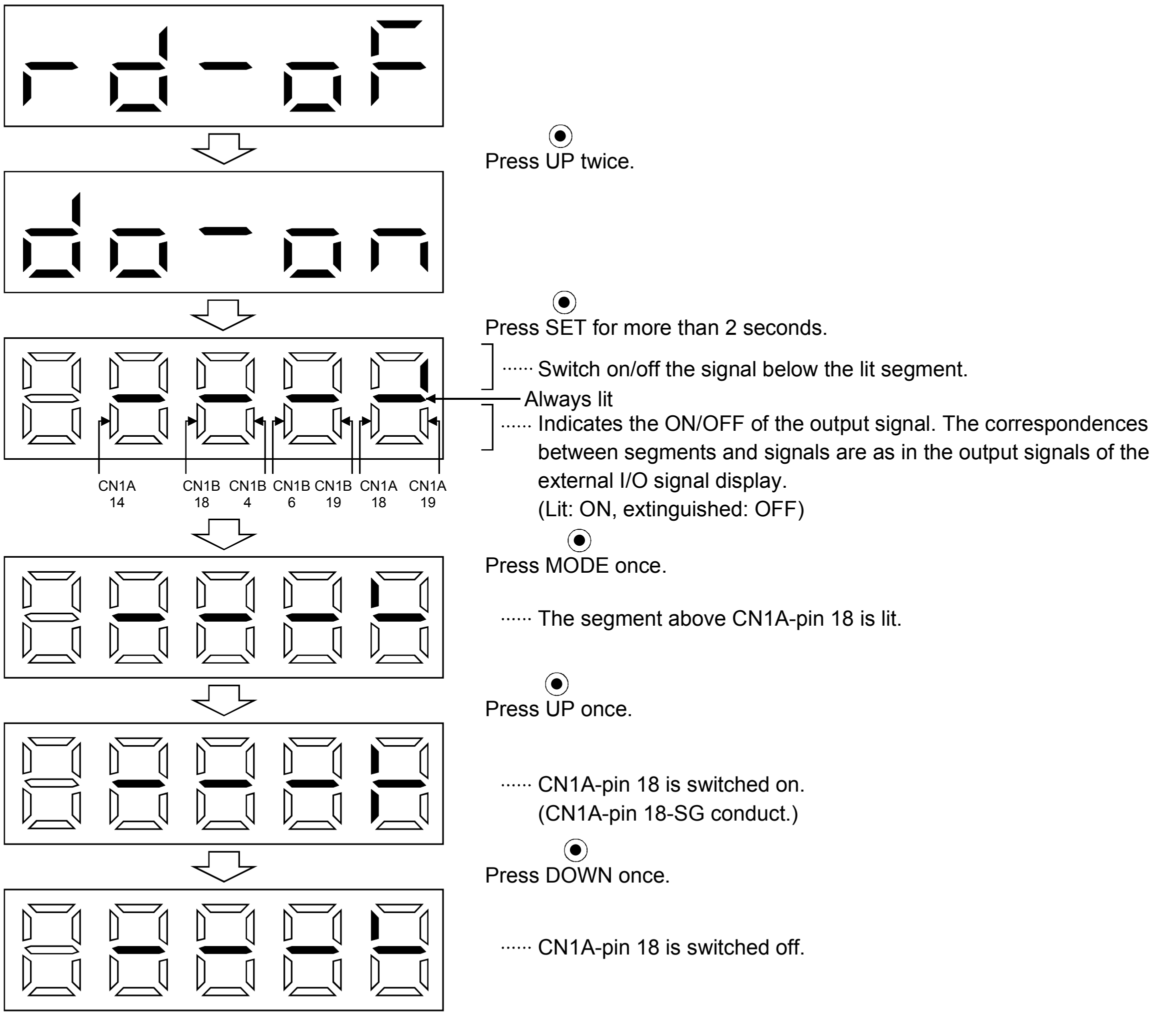


The 7-segment LED shown above indicates ON/OFF.
Each segment at top indicates the input signal and each segment at bottom indicates the output signal. The signals corresponding to the pins in the respective control modes are indicated below.

8.8 Output signal (DO) forced output

POINT
・ When the servo is used in a vertical lift application, turning on Electromagnetic brake interlock (MBR) will release the electromagnetic brake, causing a drop. Take drop preventive measures on the machine side.

The output signal can be forced on/off independently of the servo status. This function is used for output signal wiring check, etc. This operation must be performed in the servo off state (RYn1 off).
Call the display screen shown after power-on.
Using the "MODE" button, show the diagnostic screen.



8.9 Test operation mode

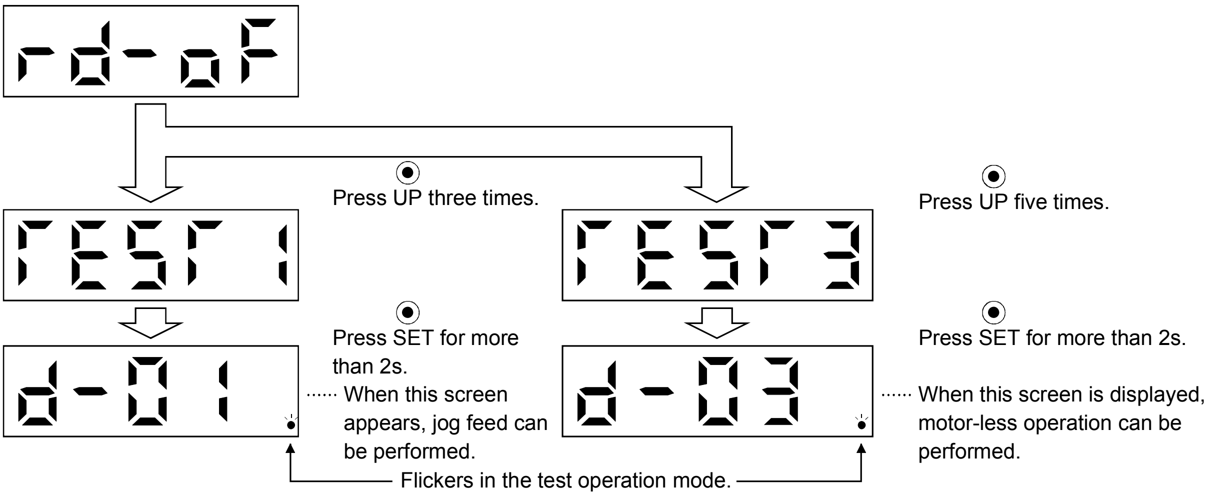
CAUTION	
⚠ CAUTION	・The test operation mode is designed to confirm servo operation and not to confirm machine operation. In this mode, do not use the servo motor with the machine. Always use the servo motor alone. ・If any operational fault has occurred, stop operation using the forced stop (EMG) .

POINT

- The test operation mode cannot be used in the absolute position detection system. Use it after choosing "Incremental system" in parameter No. 1.
- The MR Configurator (servo configuration software) is required to perform positioning operation.
- Test operation cannot be performed if the servo-on (RYn1) signal is not turned OFF.

8.9.1 Mode change

Call the display screen shown after power-on. Choose jog operation/motor-less operation in the following procedure. Using the "MODE" button, show the diagnostic screen.



8.9.2 Jog operation

Jog operation can be performed when there is no command from the external command device.

(1) Operation

Connect EMG-SG to start jog operation and connect VDD-COM to use the internal power supply.
Hold down the "UP" or "DOWN" button to run the servo motor. Release it to stop. When using the MR Configurator (servo configuration software), you can change the operation conditions. 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
Acceleration/deceleration time constant [ms]	1000	0 to 50000

How to use the buttons is explained below.

Button	Description
"UP"	Press to start CCW rotation. Release to stop.
"DOWN"	Press to start CW rotation. Release to stop.

If the communication cable is disconnected during jog operation performed by using the MR Configurator (servo configuration software), the servo motor will be decelerated to a stop.

(2) Status display

You can confirm the servo status during jog operation.
Pressing the "MODE" button in the jog operation-ready status calls the status display screen. With this screen being shown, perform jog operation with the "UP" or "DOWN" button. Every time you press the "MODE" button, the next status display screen appears, and on completion of a screen cycle, pressing that button returns to the jog operation-ready status screen. For full information of the status display, refer to section 8.2. In the test operation mode, you cannot use the "UP" and "DOWN" buttons to change the status display screen from one to another.

(3) Termination of jog operation

To terminate the jog operation, switch power off.

8.9.3 Positioning operation

POINT
・The MR Configurator (servo configuration software) is required to perform positioning operation.

Positioning operation can be performed once when there is no command from the external command device.

(1) Operation

Connect EMG-SG to start positioning operation and connect VDD-COM to use the internal power supply.

Pressing the "Forward" or "Reverse" button on the MR Configurator (servo configuration software) starts the servo motor, which will then stop after moving the preset travel distance. You can change the operation conditions on the MR Configurator (servo configuration software). The initial conditions and setting ranges for operation are listed below.

Item	Initial setting	Setting range
Travel distance [pulse]	10000	0 to 9999999
Speed [r/min]	200	0 to instantaneous permissible speed
Acceleration/deceleration time constant [ms]	1000	0 to 50000

How to use the keys is explained below.

Key	Description
"Forward"	Press to start positioning operation CCW.
"Reverse"	Press to start positioning operation CW.
"Pause"	Press during operation to make a temporary stop. Pressing the "Pause" button again erases the remaining distance. To resume operation, press the button that was pressed to start the operation.

If the communication cable is disconnected during positioning operation, the servo motor will come to a sudden stop.

(2) Status display

You can monitor the status display even during positioning operation.

(3) Termination of positioning operation

To terminate the positioning operation, switch power off.

8.9.4 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 host programmable controller or the like.

(1) Operation

After turning off the signal across SON-SG, choose motor-less operation. After that, perform external operation as in ordinary operation.

(2) Status display

You can confirm the servo status during motor-less operation.

Pressing the "MODE" button in the motor-less operation-ready status calls the status display screen. With this screen being shown, perform motor-less operation. Every time you press the "MODE" button, the next status display screen appears, and on completion of a screen cycle, pressing that button returns to the motor-less operation-ready status screen. For full information of the status display, refer to section 8.2. In the test operation mode, you cannot use the "UP" and "DOWN" buttons to change the status display screen from one to another.

(3) Termination of motor-less operation

To terminate the motor-less operation, switch power off.

9. GENERAL GAIN ADJUSTMENT

9.1 Different adjustment methods

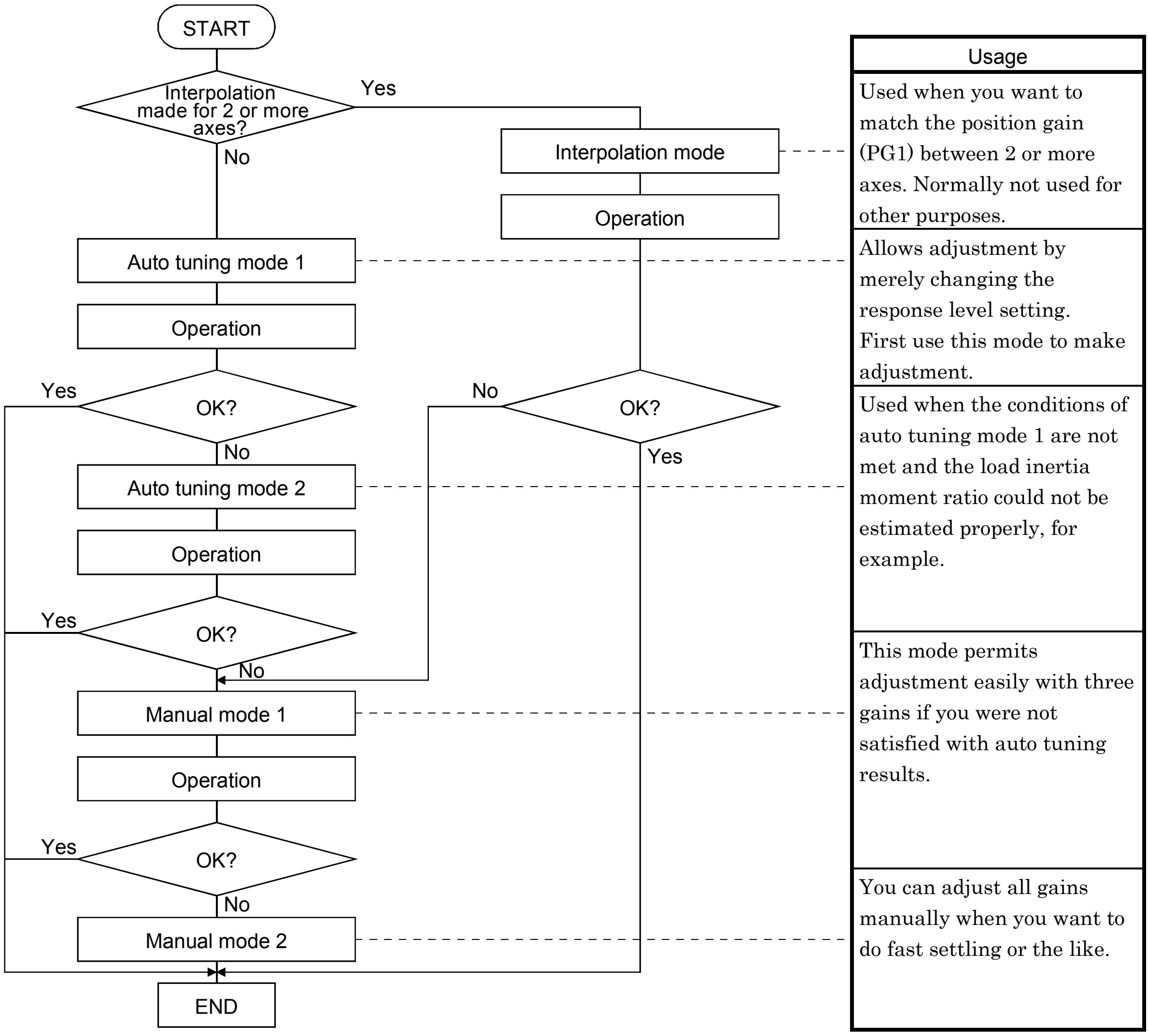
9.1.1 Adjustment on a single servo amplifier

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, manual mode 1 and manual mode 2 in this order.

(1) Gain adjustment mode explanation

Gain adjustment mode	Parameter No. 3 setting	Estimation of load inertia moment ratio	Automatically set parameters	Manually set parameters
Auto tuning mode 1 (initial value)	010□	Always estimated	PG1 (parameter No. 7) GD2 (parameter No. 34) PG2 (parameter No. 35) VG1 (parameter No. 36) VG2 (parameter No. 37) VIC (parameter No. 38)	Response level setting of parameter No. 3
Auto tuning mode 2	020□	Fixed to parameter No. 34 value	PG1 (parameter No. 7) PG2 (parameter No. 35) VG1 (parameter No. 36) VG2 (parameter No. 37) VIC (parameter No. 38)	GD2 (parameter No. 34) Response level setting of parameter No. 3
Manual mode 1	030□		PG2 (parameter No. 35) VG1 (parameter No. 36)	PG1 (parameter No. 7) GD2 (parameter No. 34) VG2 (parameter No. 37) VIC (parameter No. 38)
Manual mode 2	040□			PG1 (parameter No. 7) GD2 (parameter No. 34) PG2 (parameter No. 35) VG1 (parameter No. 36) VG2 (parameter No. 37) VIC (parameter No. 38)
Interpolation mode	000□	Always estimated	GD2 (parameter No. 34) PG2 (parameter No. 35) VG2 (parameter No. 37) VIC (parameter No. 38)	PG1 (parameter No. 7) VG1 (parameter No. 36)

(2) Adjustment sequence and mode usage



9.1.2 Adjustment using MR Configurator (servo configuration software)

This section gives the functions and adjustment that may be performed by using the servo amplifier with the MR Configurator (servo configuration software) 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.	· You can grasp the machine resonance frequency and determine the notch frequency of the machine resonance suppression filter. · You can automatically set the optimum gains in response to the machine characteristic. This simple adjustment is suitable for a machine which has large machine resonance and does not require much settling time.
Gain search	Executing gain search under to-and-fro positioning command measures settling characteristic while simultaneously changing gains, and automatically searches for gains which make settling time shortest.	· 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
7	PG1	Position control gain 1
34	GD2	Ratio of load inertia moment to servo motor inertia moment
35	PG2	Position control gain 2
36	VG1	Speed control gain 1
37	VG2	Speed control gain 2
38	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 motor inertia moment is not more than 100 times.
  - 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 1,2 to make gain adjustment.

(2) Auto tuning mode 2

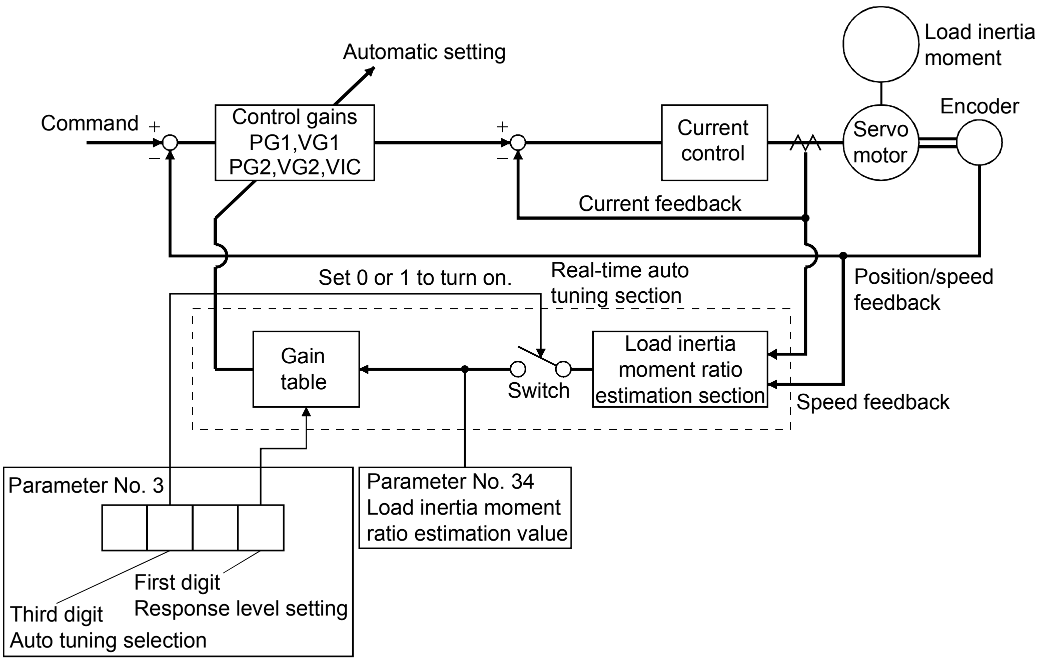
Use the auto tuning mode 2 when proper gain adjustment cannot be made by auto tuning mode 1. Since the load inertia moment ratio is not estimated in this mode, set the value of a correct load inertia moment ratio (parameter No. 34).

The following parameters are automatically adjusted in the auto tuning mode 2.

Parameter No.	Abbreviation	Name
7	PG1	Position control gain 1
35	PG2	Position control gain 2
36	VG1	Speed control gain 1
37	VG2	Speed control gain 2
38	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. 34 (load inertia moment ratio). These results can be confirmed on the status display screen of the servo amplifier display 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.3: □ 2 □ □) 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. 34) value and response level (The first digit of parameter No. 3), the optimum control gains are automatically set on the basis of the internal gain tale.

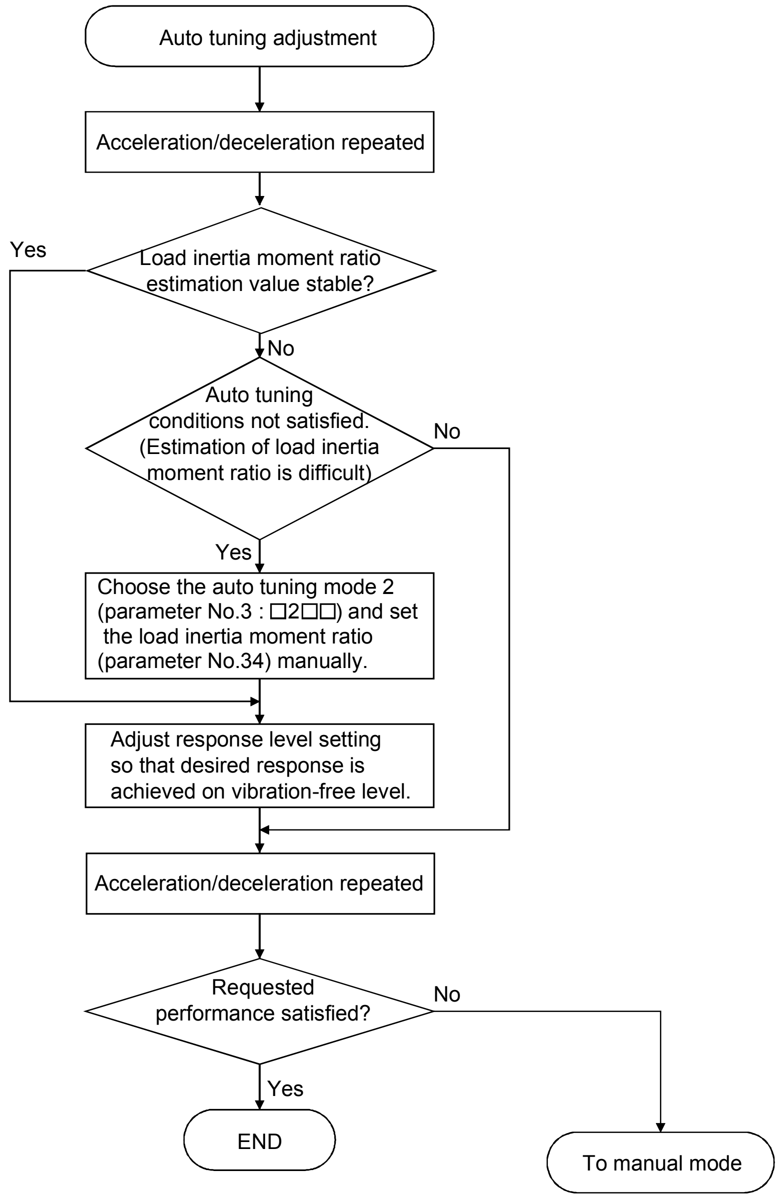
The auto tuning results are saved in the EEP-ROM of the servo amplifier every 60 minutes since power-on. At power-on, auto tuning is performed with the value of each control gain saved in the EEP-ROM being used as an initial value.

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. 3: □ 2 □ □) and set the correct load inertia moment ratio in parameter No. 34.
- When any of the auto tuning mode 1, auto tuning mode 2 and manual mode 1 settings is changed to the manual mode 2 setting, the current control gains and load inertia moment ratio estimation value are saved in the EEP-ROM.

9.2.3 Adjustment procedure by auto tuning

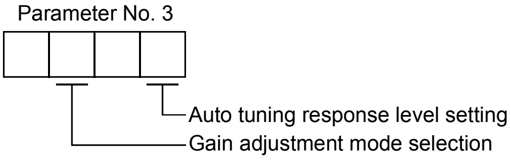
Since auto tuning is made valid before shipment from the factory, simply running the servo motor automatically sets the optimum gains that match the machine. Merely changing the response level setting value as required completes the adjustment. The adjustment procedure is as follows.

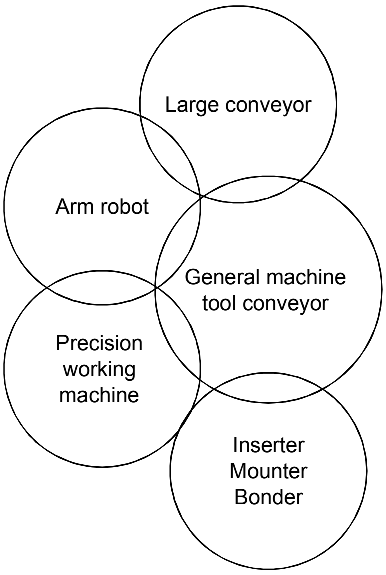


9.2.4 Response level setting in auto tuning mode

Set the response (The first digit of parameter No.3) 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, adaptive vibration suppression control (parameter No. 63) or machine resonance suppression filter (parameter No. 61・62) may be used to suppress machine resonance. Suppressing machine resonance may allow the response level setting to increase. Refer to section 10.2 for the setting of machine resonance suppression filter, and to section 10.3 for the setting of adaptive vibration suppression control.



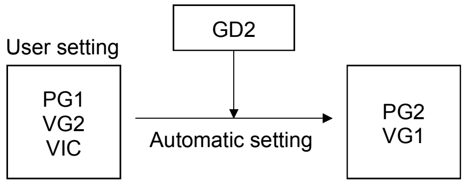
Response level setting	Machine characteristic		
	Machine rigidity	Machine resonance frequency guideline	Guideline of corresponding machine
1	Low	15Hz	
2		20Hz	
3		25Hz	
4	↑	30Hz	
5		35Hz	
6		45Hz	
7		55Hz	
8	Middle	70Hz	
9		85Hz	
A		105Hz	
B		130Hz	
C	↓	160Hz	
D		200Hz	
E		240Hz	
F	High	300Hz	

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.

9.3.1 Operation of manual mode 1

In this mode, setting the three gains of position control gain 1 (PG1), speed control gain 2 (VG2) and speed integral compensation (VIC) automatically sets the other gains to the optimum values according to these gains.



Therefore, you can adjust the model adaptive control system in the same image as the general PI control system (position gain, speed gain, speed integral time constant). Here, the position gain corresponds to PG1, the speed gain to VG2 and the speed integral time constant to VIC. When making gain adjustment in this mode, set the load inertia moment ratio (parameter No. 34) correctly.

9.3.2 Adjustment by manual mode 1

POINT
・If machine resonance occurs, adaptive vibration suppression control (parameter No. 63) or machine resonance suppression filter (parameter No. 61・62) may be used to suppress machine resonance. (Refer to section 10.2, 10.3.)

(1) For speed control

(a) Parameters

The following parameters are used for gain adjustment:

Parameter No.	Abbreviation	Name
7	PG1	Position control gain 1
34	GD2	Ratio of load inertia moment to servo motor inertia moment
37	VG2	Speed control gain 2
38	VIC	Speed integral compensation

(b) Adjustment procedure

Step	Operation	Description
1	Set an estimated value to the ratio of load inertia moment to servo motor inertia moment (parameter No. 34).	
2	Increase the speed control gain 2 (parameter No. 37) within the vibration- and unusual noise-free range, and return slightly if vibration takes place.	Increase the speed control gain.
3	Decrease the speed integral compensation (parameter No. 38) within the vibration-free range, and return slightly if vibration takes place.	Decrease the time constant of the speed integral compensation.
4	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 adaptive vibration suppression control or machine resonance suppression filter and then executing steps 2 and 3.	Suppression of machine resonance. Refer to section 10.2, 10.3.
5	While checking the settling characteristic and rotational status, fine-adjust each gain.	Fine adjustment

(c) Adjustment description

1) Speed control gain 2 (parameter No. 37)

This parameter determines the response level of the speed control loop. Increasing this value enhances response but a too high value will make the mechanical system liable to vibrate. The actual response frequency of the speed loop is as indicated in the following expression:

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

2) Speed integral compensation (VIC: parameter No. 38)

To eliminate stationary deviation against a command, the speed control loop is under proportional integral control. For the speed integral compensation, set the time constant of this integral control. Increasing the setting lowers the response level. However, if the load inertia moment ratio is large or the mechanical system has any vibratory element, the mechanical system is liable to vibrate unless the setting is increased to some degree. The guideline is as indicated in the following expression:

$$\text{Speed integral compensation setting(ms)} \geq \frac{2000 \text{ to } 3000}{\text{Speed control gain 2 setting}/(1+\text{ratio of load inertia moment to servo motor inertia moment setting}\times 0.1)}$$

(2) For position control

(a) Parameters

The following parameters are used for gain adjustment:

Parameter No.	Abbreviation	Name
7	PG1	Position control gain 1
34	GD2	Ratio of load inertia moment to servo motor inertia moment
37	VG2	Speed control gain 2
38	VIC	Speed integral compensation

(b) Adjustment procedure

Step	Operation	Description
1	Set an estimated value to the ratio of load inertia moment to servo motor inertia moment (parameter No. 34).	
2	Set a slightly smaller value to the position control gain 1 (parameter No. 7).	
3	Increase the speed control gain 2 (parameter No. 37) within the vibration- and unusual noise-free range, and return slightly if vibration takes place.	Increase the speed control gain.
4	Decrease the speed integral compensation (parameter No. 38) within the vibration-free range, and return slightly if vibration takes place.	Decrease the time constant of the speed integral compensation.
5	Increase the position control gain 1 (parameter No. 7).	Increase the position control gain.
6	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 adaptive vibration suppression control or machine resonance suppression filter and then executing steps 3 to 5.	Suppression of machine resonance. Refer to section 10.2, 10.3.
7	While checking the settling characteristic and rotational status, fine-adjust each gain.	Fine adjustment

(c) Adjustment description

1) Position control gain 1 (parameter No. 7)

This parameter determines the response level of the position control loop. Increasing position control 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.

$$\text{Position control gain 1 guideline} \leq \frac{\text{Speed control gain 2 setting}}{(1+\text{ratio of load inertia moment to servo motor inertia moment})} \times \left(\frac{1}{3}\text{ to }\frac{1}{5}\right)$$

2) Speed control gain 2 (VG2: parameter No. 37)

This parameter determines the response level of the speed control loop. Increasing this value enhances response but a too high value will make the mechanical system liable to vibrate. The actual response frequency of the speed loop is as indicated in the following expression:

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

3) Speed integral compensation (parameter No. 38)

To eliminate stationary deviation against a command, the speed control loop is under proportional integral control. For the speed integral compensation, set the time constant of this integral control. Increasing the setting lowers the response level. However, if the load inertia moment ratio is large or the mechanical system has any vibratory element, the mechanical system is liable to vibrate unless the setting is increased to some degree. The guideline is as indicated in the following expression:

$$\text{Speed integral compensation setting(ms)} \geq \frac{\text{2000 to 3000}}{\text{Speed control gain 2 setting/ (1+ratio of load inertia moment to servo motor inertia moment 2 setting}\times 0.1)}$$

9.4 Interpolation mode

The interpolation mode is used to match the position control 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 position control gain 2 and speed control gain 2 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
34	GD2	Ratio of load inertia moment to servo motor inertia moment
35	PG2	Position control gain 2
37	VG2	Speed control gain 2
38	VIC	Speed integral compensation

(b) Manually adjusted parameters

The following parameters are adjustable manually.

Parameter No.	Abbreviation	Name
7	PG1	Position control gain 1
36	VG1	Speed control gain 1

(2) Adjustment procedure

Step	Operation	Description
1	Set 15Hz (parameter No. 3: 010□) as the machine resonance frequency of response in the auto tuning mode 1.	Select the auto tuning mode 1.
2	During operation, increase the response level setting (parameter No. 2), and return the setting if vibration occurs.	Adjustment in auto tuning mode 1.
3	Check the values of position control gain 1 (parameter No. 7) and speed control gain 1 (parameter No. 36).	Check the upper setting limits.
4	Set the interpolation mode (parameter No. 3: 000□).	Select the interpolation mode.
5	Set the position control gain 1 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 position control gain 1.	Set position control gain 1.
6	Using the speed control gain 1 value checked in step 3 as the guideline of the upper limit, look at the rotation status and set in speed control gain 1 the value three or more times greater than the position control gain 1 setting.	Set speed control gain 1.
7	Looking at the interpolation characteristic and rotation status, fine-adjust the gains and response level setting.	Fine adjustment.

(3) Adjustment description

(a) Position control gain 1 (parameter No. 7)

This parameter determines the response level of the position control loop. Increasing position control 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. The droop pulse value is determined by the following expression.

$$\text{Droop pulse value (pulse)} = \frac{\text{Rotation speed (r/min)} \times 131{,}072\text{(pulse)}}{\text{Position control gain 1 setting}}$$

(b) Speed control gain 1 (parameter No. 36)

Set the response level of the speed loop of the model. Make setting using the following expression as a guideline.

Speed control gain 1 setting $\geq$ Position control gain 1 setting $\times 3$

9.5 Differences in auto tuning between MELSERVO-J2 and MELSERVO-J2-Super

9.5.1 Response level setting

To meet higher response demands, the MELSERVO-J2-Super series has been changed in response level setting range from the MELSERVO-J2 series. The following table lists comparison of the response level setting.

Parameter No. 3

Auto tuning response level setting

MELSERVO-J2 series		MELSERVO-J2-Super series	
Response level setting	Machine resonance frequency	Response level setting	Machine resonance frequency guideline
		1	15Hz
1	20Hz	2	20Hz
		3	25Hz
		4	30Hz
		5	35Hz
2	40Hz	6	45Hz
		7	55Hz
3	60Hz	8	70Hz
4	80Hz	9	85Hz
5	100Hz	A	105Hz
		B	130Hz
		C	160Hz
		D	200Hz
		E	240Hz
		F	300Hz

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.

9.5.2 Auto tuning selection

The MELSERVO-J2-Super series has an addition of the load inertia moment ratio fixing mode. It also has the addition of the manual mode 1 which permits manual adjustment with three parameters.

Parameter No. 3

Auto tuning selection

Gain adjustment mode		Auto tuning selection		Remarks
		MELSERVO-J2 series	MELSERVO-J2-Super series	
Interpolation mode		0	0	Position control gain 1 is fixed.
Auto tuning	Auto tuning mode 1	1	1	Ordinary auto tuning
	Auto tuning mode 2		2	Estimation of load inertia moment ratio stopped. Response level setting valid.
Auto tuning invalid	Manual mode 1		3	Simple manual adjustment
	Manual mode 2	2	4	Manual adjustment of all gains

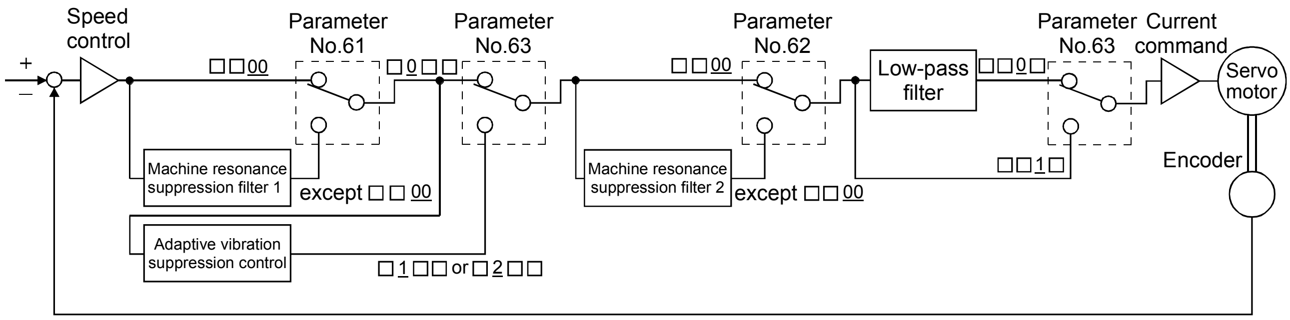
MEMO

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 may cause the mechanical system to produce resonance (vibration or unusual noise) at that resonance frequency. Using the machine resonance suppression filter and adaptive vibration suppression control functions can suppress the resonance of the mechanical system.

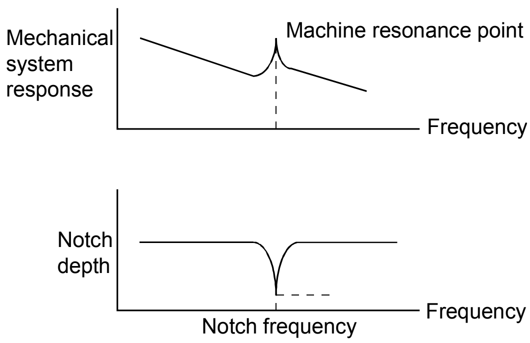
10.1 Function block diagram



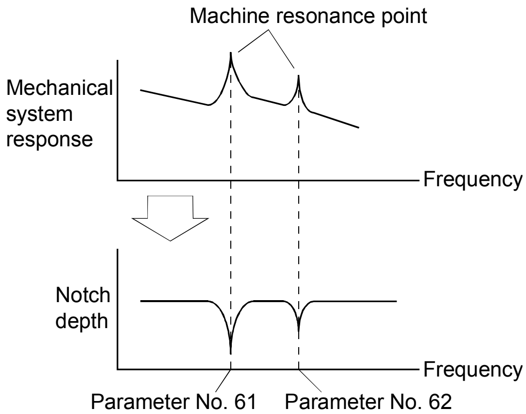
10.2 Machine resonance suppression filter

(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) and gain decreasing depth.



You can use the machine resonance suppression filter 1 (parameter No. 61) and machine resonance suppression filter 2 (parameter No. 62) to suppress the vibration of two resonance frequencies. Note that if adaptive vibration suppression control is made valid, the machine resonance suppression filter 1 (parameter No. 61) is made invalid.



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.

(2) Parameters

(a) Machine resonance suppression filter 1 (parameter No. 61)

Set the notch frequency and notch depth of the machine resonance suppression filter 1 (parameter No. 61)

When you have made adaptive vibration suppression control selection (parameter No. 63) "valid" or "held", make the machine resonance suppression filter 1 invalid (parameter No. 61: 0000).

Parameter No. 61

Notch frequency

Setting value	Frequency	Setting value	Frequency	Setting value	Frequency	Setting value	Frequency
00	Invalid	08	562.5	10	281.3	18	187.5
01	4500	09	500	11	264.7	19	180
02	2250	0A	450	12	250	1A	173.1
03	1500	0B	409.1	13	236.8	1B	166.7
04	1125	0C	375	14	225	1C	160.1
05	900	0D	346.2	15	214.3	1D	155.2
06	750	0E	321.4	16	204.5	1E	150
07	642.9	0F	300	17	195.7	1F	145.2

Notch depth

Setting value	Depth (Gain)
0	Deep (−40dB)
1	↑ (−14dB)
2	↓ (−8dB)
3	Shallow(−4dB)

POINT

- 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.
- 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.
- Resonance may occur if parameter No. 61・62 is used to select a close notch frequency and set a deep notch.

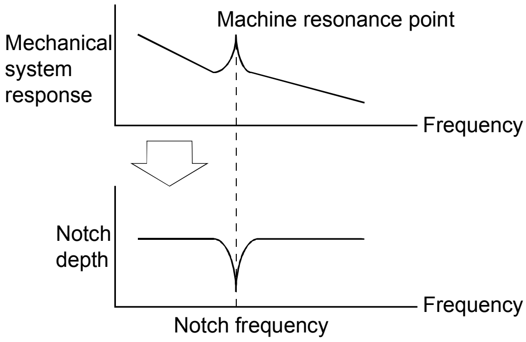
(b) Machine resonance suppression filter 2 (parameter No. 62)

The setting method of machine resonance suppression filter 2 (parameter No. 62) is the same as that of machine resonance suppression filter 1 (parameter No. 61). However, the machine resonance suppression filter 2 can be set independently of whether adaptive vibration suppression control is valid or invalid.

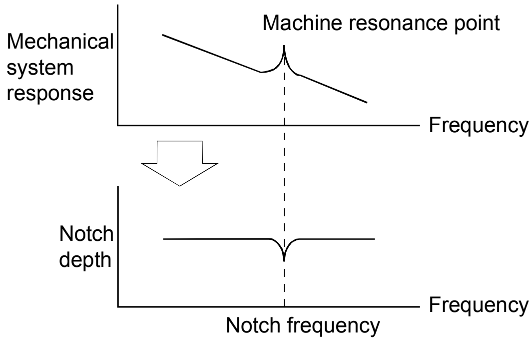
10.3 Adaptive vibration suppression control

(1) Function

Adaptive vibration suppression control is a function in which the servo amplifier detects machine resonance 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. Also, while adaptive vibration suppression control is valid, the servo amplifier always detects machine resonance, and if the resonance frequency changes, it changes the filter characteristics in response to that frequency.



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 vibration suppression control can respond to is about 150 to 500Hz. Adaptive vibration suppression control has no effect on the resonance frequency outside this range. Use the machine resonance suppression filter for the machine resonance of such frequency.
- Adaptive vibration suppression control may provide no effect on a mechanical system which has complex resonance characteristics or which has too large resonance.
- Under operating conditions in which sudden disturbance torque is imposed during operation, the detection of the resonance frequency may malfunction temporarily, causing machine vibration. In such a case, set adaptive vibration suppression control to be "held" (parameter No. 63: □2□□) to fix the characteristics of the adaptive vibration suppression control filter.

(2) Parameters

The operation of adaptive vibration suppression control selection (parameter No.63).

Parameter No. 63

Adaptive vibration suppression control selection
Choosing "valid" or "held" in adaptive vibration suppression control selection makes the machine resonance suppression filter 1 (parameter No. 61) invalid.
0: Invalid
1: Valid
Machine resonance frequency is always detected to generate the filter in response to resonance, suppressing machine vibration.
2: Held
Filter characteristics generated so far is held, and detection of machine resonance is stopped.

Adaptive vibration suppression control sensitivity selection
Set the sensitivity of detecting machine resonance.
0: Normal
1: Large sensitivity

POINT
・Adaptive vibration suppression control is factory-set to be invalid (parameter No. 63: 0000). ・The filter characteristics generated are saved in the EEP-ROM every 60 minutes since power-on. At next power-on, vibration suppression control is performed with this data saved in the EEP-ROM being used as an initial value. ・Setting the adaptive vibration suppression control sensitivity can change the sensitivity of detecting machine resonance. Setting of "large sensitivity" detects smaller machine resonance and generates a filter to suppress machine vibration. However, since a phase delay will also increase, the response of the servo system may not increase.

10.4 Low-pass filter

(1) Function

When a ballscrew or the like is used, resonance of high frequency may occur as the response of the servo system is increased. To prevent this, the low-pass filter is factory-set to be valid for a torque command. The filter frequency of this low-pass filter is automatically adjusted to the value in the following expression:

$$\text{Filter frequency(Hz)} = \frac{\text{Speed control gain 2 setting} \times 10}{2\pi \times (1 + \text{Ratio of load inertia moment to servo motor inertia moment setting} \times 0.1)}$$

(2) Parameter

Set the operation of the low-pass filter (parameter No. 63.)

Parameter No. 63

Low-pass filter selection
0: Valid (automatic adjustment) ← initial value
1: Invalid

POINT
・In a mechanical system where rigidity is extremely high and resonance is difficult to occur, setting the low-pass filter to be "invalid" may increase the servo system response to shorten the settling time.

10.5 Gain changing function

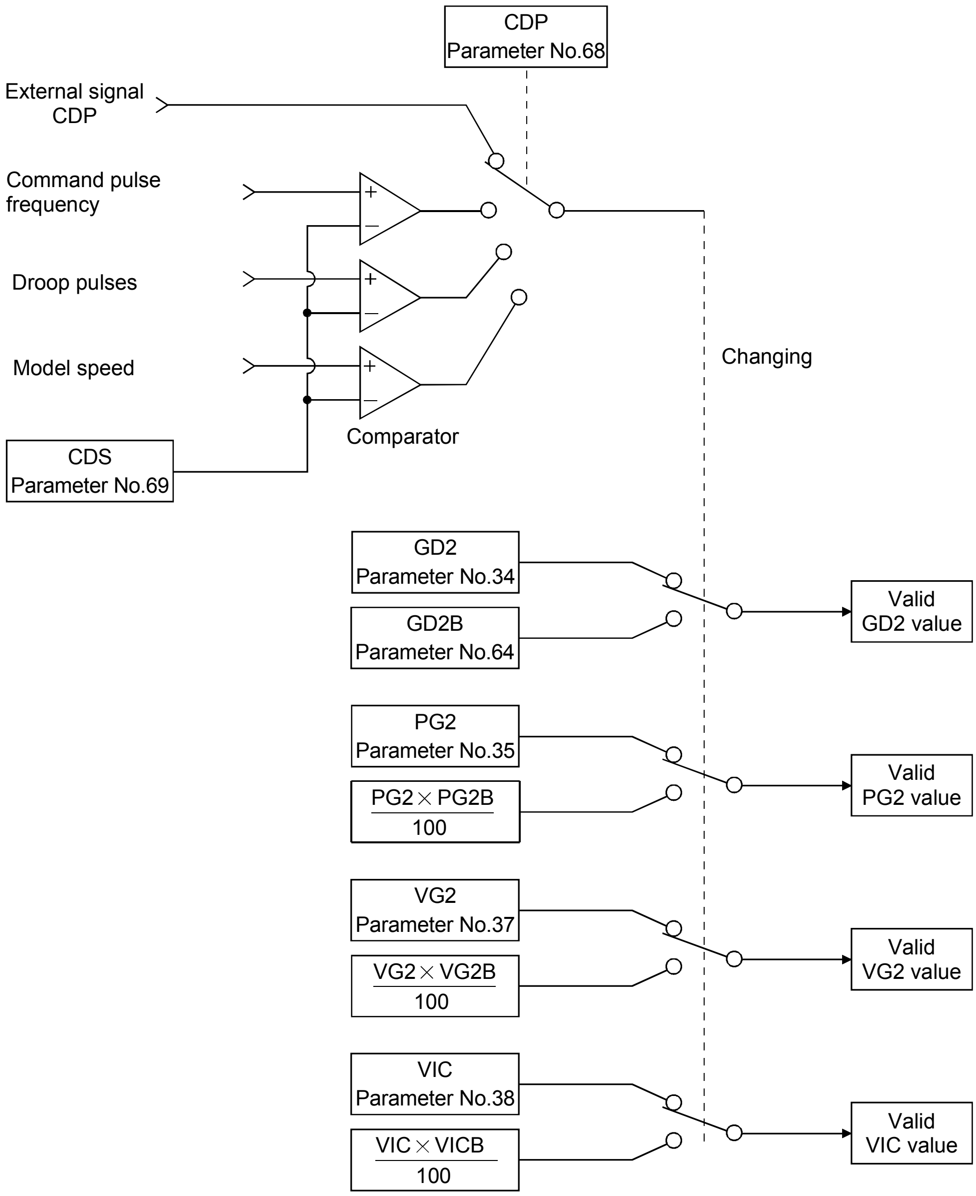
This function can change the gains. You can change between gains during rotation and gains during stop or can use an external signal to change gains during operation.

10.5.1 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).

10.5.2 Function block diagram

The valid control gains PG2, VG2, VIC and GD2 of the actual loop are changed according to the conditions selected by gain changing selection CDP (parameter No. 68) and gain changing condition CDS (parameter No. 69).



10.5.3 Parameters

When using the gain changing function, always set "□4□□" in parameter No.3 (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.	Abbrev-iation	Name	Unit	Description
7	PG1	Position control gain 1	rad/s	Position and speed gains of a model used to set the response level to a command. Always valid.
36	VG1	Speed control gain 1	rad/s	
34	GD2	Ratio of load inertia moment to servo motor inertia moment	0.1 times	Control parameters before changing
35	PG2	Position control gain 2	rad/s	
37	VG2	Speed control gain 2	rad/s	
38	VIC	Speed integral compensation	ms	
64	GD2B	Ratio of load inertia moment to servo motor inertia moment 2	0.1 times	Used to set the ratio of load inertia moment to servo motor inertia moment after changing.
65	PG2B	Position control gain 2 changing ratio	%	Used to set the ratio (%) of the after-changing position control gain 2 to position control gain 2.
66	VG2B	Speed control gain 2 changing ratio	%	Used to set the ratio (%) of the after-changing speed control gain 2 to speed control gain 2.
67	VICB	Speed integral compensation changing ratio	%	Used to set the ratio (%) of the after-changing speed integral compensation to speed integral compensation.
68	CDP	Gain changing selection		Used to select the changing condition.
69	CDS	Gain changing condition	kpps pulse r/min	Used to set the changing condition values.
70	CDT	Gain changing time constant	ms	You can set the filter time constant for a gain change at changing.

(1) Parameters No. 7, 34 to 38

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 control gain 2, speed control gain 2 and speed integral compensation to be changed.

(2) Ratio of load inertia moment to servo motor inertia moment 2 (parameter No. 64)

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. 34).

(3) Position control gain 2 changing ratio (parameter No. 65), speed control gain 2 changing ratio (parameter No. 66), speed integral compensation changing ratio (parameter No. 67)

Set the values of after-changing position control gain 2, speed control gain 2 and speed integral compensation in ratio (%). 100% setting means no gain change.

For example, at the setting of position control gain 2 = 100, speed control gain 2 = 2000, speed integral compensation = 20 and position control gain 2 changing ratio = 180%, speed control gain 2 changing ratio = 150% and speed integral compensation changing ratio = 80%, the after-changing values are as follows:

Position control gain 2 = Position control gain 2 × Position control gain 2 changing ratio /100=180rad/s

Speed control gain 2 = Speed control gain 2 × Speed control gain 2 changing ratio /100 = 3000rad/s

Speed integral compensation = Speed integral compensation × Speed integral compensation changing ratio /100 = 16ms

(4) Gain changing selection (parameter No. 68)

Used to set the gain changing condition. Choose the changing condition in the first digit. If you set "1" here, you can use the gain changing (RY (n+2) 8) external input signal for gain changing. The gain changing signal (RY (n+2) 8) can be assigned to input signals the pins using the MR Configurator (servo configuration software).

Parameter No. 68

Gain changing selection

Gains are changed in accordance with the settings of parameters No. 64 to 67 under any of the following conditions:

0: Invalid
1: Gain changing (RY (n+2) 8) input is ON
2: Command frequency is equal to higher than parameter No. 69 setting
3: Droop pulse value is equal to higher than parameter No. 69 setting
4: Servo motor speed is equal to higher than parameter No. 69 setting

(5) Gain changing condition (parameter No. 69)

When you selected "command frequency", "droop pulses" or "servo motor speed" in gain changing selection (parameter No.68), 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. 70)

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.

10.5.4 Gain changing operation

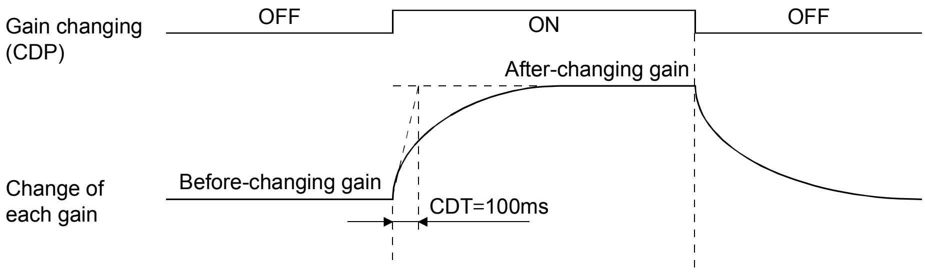
This operation will be described by way of setting examples.

(1) When you choose changing by external input

(a) Setting

Parameter No.	Abbreviation	Name	Setting	Unit
7	PG1	Position control gain 1	100	rad/s
36	VG1	Speed control gain 1	1000	rad/s
34	GD2	Ratio of load inertia moment to servo motor inertia moment	40	0.1 times
35	PG2	Position control gain 2	120	rad/s
37	VG2	Speed control gain 2	3000	rad/s
38	VIC	Speed integral compensation	20	ms
64	GD2B	Ratio of load inertia moment to servo motor inertia moment 2	100	0.1 times
65	PG2B	Position control gain 2 changing ratio	70	%
66	VG2B	Speed control gain 2 changing ratio	133	%
67	VICB	Speed integral compensation changing ratio	250	%
68	CDP	Gain changing selection	0001 (Changed by ON/OFF of pin CN1A-8)	
70	CDT	Gain changing time constant	100	ms

(b) Changing operation



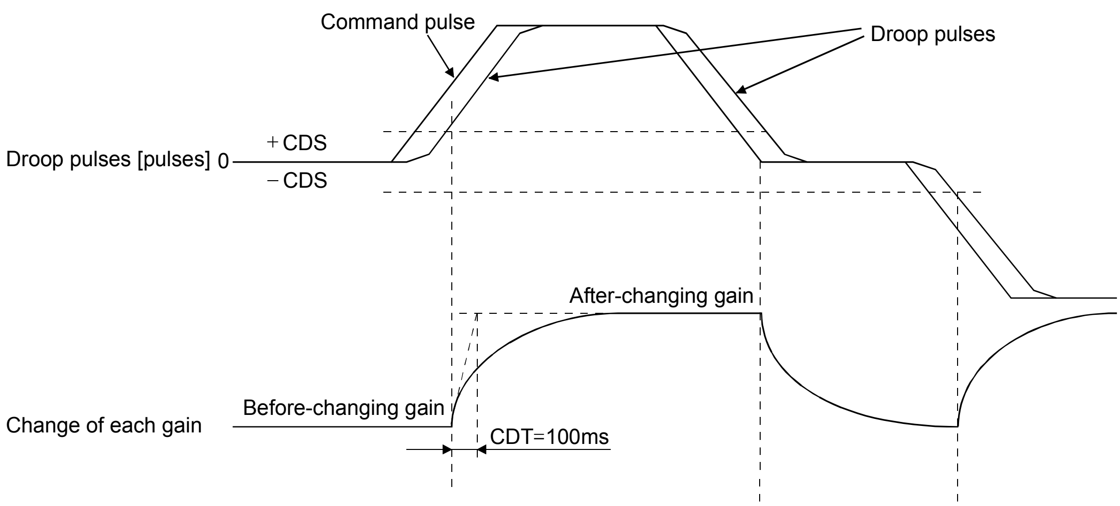
Position control gain 1			100		
Speed control gain 1			1000		
Ratio of load inertia moment to servo motor inertia moment	4.0	→	10.0	→	4.0
Position control gain 2	120	→	84	→	120
Speed control gain 2	3000	→	4000	→	3000
Speed integral compensation	20	→	50	→	20

(2) When you choose changing by droop pulses

(a) Setting

Parameter No.	Abbreviation	Name	Setting	Unit
7	PG1	Position control gain 1	100	rad/s
36	VG1	Speed control gain 1	1000	rad/s
34	GD2	Ratio of load inertia moment to servo motor inertia moment	40	0.1 times
35	PG2	Position control gain 2	120	rad/s
37	VG2	Speed control gain 2	3000	rad/s
38	VIC	Speed integral compensation	20	ms
64	GD2B	Ratio of load inertia moment to servo motor inertia moment 2	100	0.1 times
65	PG2B	Position control gain 2 changing ratio	70	%
66	VG2B	Speed control gain 2 changing ratio	133	%
67	VICB	Speed integral compensation changing ratio	250	%
68	CDP	Gain changing selection	0003 (Changed by droop pulses)	
69	CDS	Gain changing condition	50	pulse
70	CDT	Gain changing time constant	100	ms

(b) Changing operation



Position control gain 1	100						
Speed control gain 1	1000						
Ratio of load inertia moment to servo motor inertia moment	4.0	→	10.0	→	4.0	→	10.0
Position control gain 2	120	→	84	→	120	→	84
Speed control gain 2	3000	→	4000	→	3000	→	4000
Speed integral compensation	20	→	50	→	20	→	50

MEMO

11. INSPECTION

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

(1) Inspection

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) Life

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 forced stop times : 100,000 times
	Cooling fan	10,000 to 30,000hours (2 to 3 years)
	Absolute position battery	Refer to section 5.5

(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 forced 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.

MEMO

12. TROUBLESHOOTING

12.1 Trouble at start-up

CAUTION	・Excessive adjustment or change of parameter setting must not be made as it will make operation instable.

POINT

・Using the MR Configurator (servo configuration software), 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 CN1A, CN1B, CN2 and CN3 are disconnected.	1. Power supply voltage fault 2. Servo amplifier is faulty.	
			Improved when connectors CN1A and CN1B are disconnected.	Power supply of CN1 cabling is shorted.	
			Improved when connector CN2 is disconnected.	1. Power supply of encoder cabling is shorted. 2. Encoder is faulty.	
			Improved when connector CN3 is disconnected.	Power supply of CN3 cabling is shorted.	
		Ab is displayed on LED.	Confirm the connection between connecters CN3 and CN30 of MR-J2S-T01.	1. MR-J2S-T01 is not connected. 2. CN3 cable breakage.	
		Alarm occurs.	Refer to section 12.4 and remove cause.		Section 12.4
2	Switch on servo-on (RYn0) signal.	Alarm occurs.	Refer to section 12.4 and remove cause.		Section 12.4
		Servo motor shaft is not servo-locked (is free).	1. Check the display to see if the servo amplifier is ready to operate. 2. Check the external I/O signal indication to see if the servo-on (RYn0) signal is ON.	1. Servo-on (RYn0) is not input. (Wiring mistake) 2. 24VDC power is not supplied to COM.	Section 8.3.2
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.	

12.2 Operation at error occurrence

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

Error location	Description	Operation mode	
		Test operation	CC-Link operation
Servo side alarm occurrence	Servo operation	Stop	Stop
	Data communication between servo amplifier and CC-Link unit	Continued	Continued
	CC-Link data communication	Continued	Continued
Option unit communication error	Servo operation	Stop	Stop
	Data communication between servo amplifier and CC-Link unit	Stop	Stop
	CC-Link data communication	Stop	Stop
CC-Link communication error	Servo operation	Stop	Stop
	Data communication between servo amplifier and CC-Link unit	Continued	Continued
	CC-Link data communication	Stop	Stop
Programmable controller error/STOP	Servo operation	Continued	Stop
	Data communication between servo amplifier and CC-Link unit	Continued	Continued
	CC-Link data communication	Stop	Stop
Servo side warning occurrence	Servo operation	Stop	Continued
	Data communication between servo amplifier and CC-Link unit	Continued	Continued
	CC-Link data communication	Continued	Continued

12.3 CC-Link communication error

This section gives the definitions of the indications given in the communication alarm display section.
The MR-J2S-T01 option unit has six 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.
S.ERR : Lit when the servo amplifier is in an alarm status.
WD : Lit when the MR-J2S-T01 option unit is in CPU fault.

(Note) Communication alarm display LED				Operation
L.RUN	SD	RD	L.ERR	
○	◎	◎	◎	Normal communication is made, but a CRC error sometimes occurs due to noise.
○	◎	◎	●	Normal communication
○	◎	●	◎	Hardware fault
○	◎	●	●	Hardware fault
○	●	◎	◎	Receive data results in CRC error, disabling a response.
○	●	◎	●	Data does not reach the host.
○	●	●	◎	Hardware fault
○	●	●	●	Hardware fault
●	◎	◎	◎	Polling response is made, but refresh receive is in CRC error.
●	◎	◎	●	Hardware fault
●	◎	●	◎	Hardware fault
●	◎	●	●	Hardware fault
●	●	◎	◎	Data addressed to the host resulted in CRC error.
●	●	◎	●	Data does not reach the host, or the data addressed to the host cannot be received due to noise.
●	●	●	◎	Hardware fault
●	●	●	○	Baud rate setting illegal
●	●	○	○	Station number setting illegal
●	○	○	◎	Baud rate or station number setting changed midway (ERROR flickers for about 4s)
●	●	●	●	Data cannot be received due to power-off, power supply failure, open cable, etc. WDT error occurrence (hardware fault)

Note. ○ : Lit ● : Extinguished ◎ : Flicker

(Note) Communication alarm display LED		Operation (Refer to the above for L.RUN, SD, RD and L.ERR.)
S.ERR	WD	
●	●	Servo amplifier in normal status
○	●	Servo amplifier in alarm occurrence status
*	●	Option unit in normal status
*	○	Option unit in CPU fault status

Note. ○ : Lit ● : Extinguished ◎ : Flicker * : Indefinite

12.4 When alarm or warning has occurred

POINT

- Configure up a circuit which will detect the trouble (RX(n+1)A or RX(n+3)A) signal and turn off the servo-on (RYn0) at occurrence of an alarm.

12.4.1 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 12.4.2 or 12.4.3 and take the appropriate action. When an alarm occurs, Trouble (RX(n+1)A or RX(n+3)A) turns ON.
After its cause has been removed, the alarm can be deactivated in any of the methods marked ○ in the alarm deactivation column.

	Display	Name	Alarm deactivation		
			Power OFF→ON	Press "SET" on current alarm screen.	Alarm reset (RES) signal
Alarms	AL.10	Undervoltage	○	○	○
	AL.12	Memory error 1	○		
	AL.13	Clock error	○		
	AL.15	Memory error 2	○		
	AL.16	Encoder error 1	○		
	AL.17	Board error	○		
	AL.19	Memory error 3	○		
	AL.1A	Motor combination error	○		
	AL.20	Encoder error 2	○		
	AL.24	Main circuit error	○		
	AL.25	Absolute position erase	○		
	AL.30	Regenerative error	○ (Note)	○ (Note)	○ (Note)
	AL.31	Overspeed	○	○	○
	AL.32	Overcurrent	○	○	○
	AL.33	Overvoltage	○		
	AL.37	Parameter error	○		
	AL.45	Main circuit device overheat	○ (Note)	○ (Note)	○ (Note)
	AL.46	Servo motor overheat	○ (Note)	○ (Note)	○ (Note)
	AL.50	Overload 1	○ (Note)	○ (Note)	○ (Note)
	AL.51	Overload 2	○ (Note)	○ (Note)	○ (Note)
	AL.52	Error excessive	○	○	○
	AL.61	Home operation alarm	○	○	○
	AL.72	Option unit communication error	○		
	AL.76	Option unit ID error	○		
	AL.8A	Serial communication time-out error	○	○	○
	AL.8D	CC-Link alarm	○	○	○
	AL.8E	Serial communication error	○	○	○
	88888	Watchdog	○		
Warnings	AL.90	Home position return incomplete	Removing the cause of occurrence deactivates the alarm automatically.		
	AL.92	Open battery cable warning			
	AL.96	Home position setting warning			
	AL.98	Software limit warning			
	AL.9D	CC-Link warning 1			
	AL.9E	CC-Link warning 2			
	AL.9F	Battery warning			
	AL.E0	Excessive regenerative warning			
	AL.E1	Overload warning			
	AL.E3	Absolute position counter warning			
	AL.E6	Servo forced stop warning			
	AL.E9	Main circuit off warning			

Note. Deactivate the alarm about 30 minutes of cooling time after removing the cause of occurrence.

12.4.2 Remedies for alarms

CAUTION	
	・When any alarm has occurred, eliminate its cause, ensure safety, then reset the alarm, and restart operation. Otherwise, injury may occur. ・If an absolute position erase alarm (AL.25) 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, always remove its cause and allow about 30 minutes for cooling before resuming operation. If operation is resumed by switching control circuit power off, then on to reset the alarm, the servo amplifier and servo motor may become faulty.
  - Regenerative error (AL.30)
  - Overload 1 (AL.50)
  - Overload 2 (AL.51)
- The alarm can be deactivated by switching power off, then on press the "SET" button on the current alarm screen or by turning on the reset (RY(n+1)A or RY(n+3)A). For details, refer to section 12.4.1.

When an alarm occurs, the trouble (RX(n+1)A or RX(n+3)A) switches on and the dynamic brake is operated to stop the servo motor. At this time, the display indicates the alarm No.
The servo motor comes to a stop. Remove the cause of the alarm in accordance with this section. The MR Configurator (servo configuration software) may be used to refer to the cause.

Display	Name	Definition	Cause	Action
AL.10	Undervoltage	Power supply voltage dropped. MR-J2S-□CP-S084: 160VAC or less MR-J2S-□CP1-S084: 83VAC or less	1. Power supply voltage is low.	Review the power supply.
			2. There was an instantaneous control power failure of 60ms or longer.	
			3. Shortage of power supply capacity caused the power supply voltage to drop at start, etc.	
			4. The bus voltage dropped to the following value or less. MR-J2S-□CP-S084: 200VDC MR-J2S-□CP1-S084: 158VDC	
			5. Faulty parts in the servo amplifier Checking method Alarm (AL.10) occurs if power is switched on after disconnection of all cables but the control circuit power supply cables.	Change the servo amplifier.
AL.12	Memory error 1	RAM, memory fault	Faulty parts in the servo amplifier Checking method Alarm (any of AL.12 and 13) occurs if power is switched on after disconnection of all cables but the control circuit power supply cables.	Change the servo amplifier.
AL.13	Clock error	Printed board fault		

Display	Name	Definition	Cause	Action
AL.15	Memory error 2	EEP-ROM fault	1. Faulty parts in the servo amplifier Checking method Alarm (AL.15) 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.	
AL.16	Encoder error 1	Communication error occurred between encoder and servo amplifier	1. Encode connector (CN2) disconnected.	Connect correctly.
			2. Encoder fault	Change the servo motor.
			3. Encoder cable faulty (wire breakage or short)	Repair or change the cable.
AL.17	Board error	CPU/parts fault	1. Faulty parts in the servo amplifier. Checking method Alarm (AL.17) occurs if power is switched on after disconnection of all cable but the control circuit power supply cable.	Change the servo amplifier.
		The output terminals U, V, W of the servo amplifier and the input terminals U, V, W of the servo motor are not connected.	2. The wiring of U, V, W is disconnected or not connected.	Correctly connect the output terminals U, V, W of the servo amplifier and the input terminals U, V, W of the servo motor.
AL.19	Memory error 3	ROM memory fault	Faulty parts in the servo amplifier. Checking method Alarm (AL.19) occurs if power is switched on after disconnection of all cable but the control circuit power supply cable.	Change the servo amplifier.
AL.1A	Motor combination error	Wrong combination of servo amplifier and servo motor.	Wrong combination of servo amplifier and servo motor connected.	Use correct combination.
AL.20	Encoder error 2	Communication error occurred between encoder and servo amplifier.	1. Encoder connector (CN2) disconnected.	Connect correctly.
			2. Encoder fault	Change the servo motor.
			3. Encoder cable faulty (wire breakage or shorted)	Repair or change the cable.
		Encoder detected acceleration error.	4. Excessive acceleration is occurred due to oscillation and others.	1. Decrease the speed control gain 2. 2. Decrease the auto tuning response level.
AL.24	Main circuit error	Ground fault occurred at the servo motor power (U,V and W phases) of the servo amplifier.	1. Power input wires and servo motor power cables are in contact at main circuit terminal block (TE1).	Connect correctly.
			2. Sheathes of servo motor power cables deteriorated, resulting in ground fault.	Change the cable.
			3. Main circuit of servo amplifier failed. Checking method AL.24 occurs if the servo is switched on after disconnecting the U, V, W power cables from the servo amplifier.	Change the servo amplifier.

Display	Name	Definition	Cause	Action
AL.25	Absolute position erase	Absolute position data in error	1. Reduced voltage of super capacitor in encoder	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. Always make home position setting again.
			3. Battery cable or battery is faulty.	
		Power was switched on for the first time in the absolute position detection system.	4. Super capacitor of the absolute position encoder is not charged	After leaving the alarm occurring for a few minutes, switch power off, then on again. Always make home position setting again.
AL.30	Regenerative error	Permissible regenerative power of the built-in regenerative resistor or regenerative option is exceeded.	1. Wrong setting of parameter No. 0	Set correctly.
			2. Built-in regenerative resistor or regenerative option is not connected.	Connect correctly
			3. High-duty operation or continuous regenerative operation caused the permissible regenerative power of the regenerative option to be exceeded. Checking method Call the status display and check the regenerative load ratio.	1. Reduce the frequency of positioning. 2. Use the regenerative option of larger capacity. 3. Reduce the load.
			4. Power supply voltage is abnormal. MR-J2S-□CP-S084:260VAC or more MR-J2S-□CP1-S084:135VAC or more	Review power supply
			5. 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. 2) The alarm occurs even after removal of the built-in regenerative resistor or regenerative option.	Change the servo amplifier.
AL.31	Overspeed	Speed has exceeded the instantaneous permissible speed.	1. Input command pulse frequency exceeded the permissible instantaneous speed frequency.	Set command pulses correctly.
			2. Small acceleration/deceleration time constant caused overshoot to be large.	Increase acceleration/deceleration time constant.
			3. Servo system is instable to cause overshoot.	1. Re-set servo gain to proper value. 2. If servo gain cannot be set to proper value. 1) Reduce load inertia moment ratio; or 2) Reexamine acceleration/ deceleration time constant.
			4. Electronic gear ratio is large. (parameters No. 4, 5)	Set correctly.
			5. Encoder faulty.	Change the servo motor.

Display	Name	Definition	Cause	Action
AL.32	Overcurrent	Current that flew is higher than the permissible current of the servo amplifier. (If the alarm (AL.32) occurs again when turning ON the servo after resetting the alarm by turning OFF/ON the power when the alarm (AL.32) first occurred, the transistor (IPM, IGBT) of the servo amplifier may be at fault. In the case, do not repeat to turn OFF/ON the power. Check the transistor with the checking method of “Cause 2”.)	1. Short occurred in servo amplifier output phases U, V and W.	Correct the wiring.
			2. Transistor (IPM) of the servo amplifier faulty. Checking method Alarm (AL.32) occurs if power is switched on after U,V and W are disconnected.	Change the servo amplifier.
			3. Ground fault occurred in servo amplifier output phases U, V and W.	Correct the wiring.
			4. External noise caused the overcurrent detection circuit to misoperate.	Take noise suppression measures.
AL.33	Overvoltage	Converter bus voltage exceeded 400VDC.	1. Regenerative option is not used.	Use the regenerative option.
			2. Though the regenerative option is used, the parameter No. 0 setting is "□ 0 □ □ (not used)".	Make correct setting.
			3. Lead of built-in regenerative resistor or regenerative option is open or disconnected.	1. Change lead. 2. Connect correctly.
			4. Regenerative transistor faulty.	Change servo amplifier
			5. Wire breakage of built-in regenerative resistor or regenerative option.	1. For wire breakage of built-in regenerative resistor, change servo amplifier. 2. For wire breakage of regenerative option, change regenerative option.
			6. Capacity of built-in regenerative resistor or regenerative option is insufficient.	Add regenerative option or increase capacity.
			7. Power supply voltage high.	Review the power supply.
			8. The jumper across BUE-SD of the FR-BU2 brake unit is removed.	Fit the jumper across BUE-SD.

Display	Name	Definition	Cause	Action
AL.37	Parameter error	Parameter setting is wrong.	1. Servo amplifier fault caused the parameter setting to be rewritten.	Change the servo amplifier.
			2. Regenerative option not used with servo amplifier was selected in parameter No.0.	Set parameter No.0 correctly.
			3. Value outside setting range has been set in some parameter.	Set the parameter correctly.
			4. Value outside setting range has been set in electronic gear.	Set parameters No. 4, 5 correctly.
			5. Opposite sign has been set in software limit increasing side (parameters No. 46, 47). Similarly, opposite sign has been set in software limit decreasing side (parameters No. 48, 49).	Set parameters No. 46 to 49 correctly.
			6. Opposite sign has been set in position range output address increasing side (parameters No. 50, 51). Similarly, opposite sign has been set in position range output address decreasing side (parameters No. 52, 53).	Set parameters No. 50 to 53 correctly.
			7. The number of write times to EEP-ROM exceeded 100,000 due to parameter write, etc.	Change the servo amplifier.
AL.45	Main circuit device overheat	Main circuit device overheat	1. Servo amplifier faulty.	Change the servo amplifier.
			2. The power supply was turned on and off continuously by overloaded status.	The drive method is reviewed.
			3. Air cooling fan of servo amplifier stops.	1. Exchange the cooling fan or the servo amplifier. 2. Reduce ambient temperature.
AL.46	Servo motor overheat	Servo motor temperature rise actuated the thermal sensor.	1. Ambient temperature of servo motor is over 40°C (104°F).	Review environment so that ambient temperature is 0 to 40°C (32 to 104°F).
			2. Servo motor is overloaded.	1. Reduce load. 2. Review operation pattern. 3. Use servo motor that provides larger output.
			3. Thermal sensor in encoder is faulty.	Change servo motor.

Display	Name	Definition	Cause	Action
AL.50	Overload 1	Load exceeded overload protection characteristic of servo amplifier.	1. Servo amplifier is used in excess of its continuous output current.	1. Reduce load. 2. Review operation pattern. 3. Use servo motor that provides larger output.
			2. Servo system is instable and hunting.	1. Repeat acceleration/ deceleration to execute auto tuning. 2. Change auto tuning response setting. 3. Set auto tuning to OFF and make gain adjustment manually.
			3. Machine struck something.	1. Review operation pattern. 2. Install limit switches.
			4. Wrong connection of servo motor. Servo amplifier's output terminals U, V, W do not match servo motor's input terminals U, V, W.	Connect correctly.
			5. Encoder faulty. 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.
AL.51	Overload 2	Machine collision or the like caused max. For the time of the alarm occurrence, refer to the section 14.1.	1. Machine struck something.	1. Review operation pattern. 2. Install limit switches.
			2. Wrong connection of servo motor. Servo amplifier's output terminals U, V, W do not match servo motor's input terminals U, V, W.	Connect correctly.
			3. Servo system is instable and hunting.	1. Repeat acceleration/deceleration to execute auto tuning. 2. Change auto tuning response setting. 3. Set auto tuning to OFF and make gain adjustment manually.
			4. Encoder faulty. 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
AL.52	Error excessive	The difference between the model position and the actual servo motor position exceeds 2.5 rotations. (Refer to the function block diagram in section 1.1.2)	1. Acceleration/deceleration time constant is too small.	Increase the acceleration/deceleration time constant.
			2. Internal torque limit 1 (parameter No.28) is too small.	Increase the torque limit value.
			3. Motor cannot be started due to torque shortage caused by power supply voltage drop.	1. Review the power supply capacity. 2. Use servo motor which provides larger output.
			4. Position control gain 1 (parameter No.7) value is small.	Increase set value and adjust to ensure proper operation.
			5. Servo motor shaft was rotated by external force.	1. When torque is limited, increase the limit value. 2. Reduce load. 3. Use servo motor that provides larger output.
			6. Machine struck something.	1. Review operation pattern. 2. Install limit switches.
			7. Encoder faulty	Change the servo motor.
			8. Wrong connection of servo motor. Servo amplifier's output terminals U, V, W do not match servo motor's input terminals U, V, W.	Connect correctly.
AL.61	Home operation alarm	"1" or more has been set to auxiliary function of point table No. 31.	Setting mistake of auxiliary function of point table No. 31.	Set "0" to auxiliary function of point table No. 31.
AL.72	Option unit communication error	The option unit is not connected.	1. The option unit is not connected.	Reconnect the option unit correctly.
			2. Option unit board fault.	Change the option unit.
			3. Cable between option unit and servo amplifier is faulty.	Change the cable.
AL.76	Option unit ID error	The servo amplifier is receiving an unsupported ID.	The option unit not supported by the servo amplifier is connected.	1. Connect the option unit supported by the servo amplifier. 2. Change the option unit.
AL.8A	Serial communication time-out error	RS-232C or RS-422 communication stopped for longer than the time set in parameter No.23.	1. Communication cable breakage.	Repair or change communication cable
			2. Communication cycle longer than parameter No. 23 setting.	Set correct value in parameter.
			3. Wrong protocol.	Correct protocol.
AL.8D	CC-Link alarm	Normal communication with the master station cannot be made.	1. The station number switch setting is 0 or not less than 65.	Set the station number to within the range 1 to 64, and switch power on.
			2. The baud rate switch setting is outside the range 0 to 4.	Set the switch to within the range 0 to 4.
			3. The transmission status is abnormal.	Reexamine the wiring.
			4. CC-Link twisted cable wiring incorrect.	1. Repair or change the CC-Link twisted cable. 2. Connect the cable or connector correctly.
			5. CC-Link twisted cable faulty.	
			6. The CC-Link connector has come off.	
			7. The terminating resistor is not connected.	Connect the terminating resistor correctly.
			8. Noise entered the CC-Link twisted cable.	
AL.8E	Serial communication error	Serial communication error occurred between servo amplifier and communication device (e.g. personal computer).	1. Communication cable fault (Open cable or short circuit)	Repair or change the cable.
			2. Communication device (e.g. personal computer) faulty	Change the communication device (e.g. personal computer).

Display	Name	Definition	Cause	Action
88888	Watchdog	CPU, parts faulty	Fault of parts in servo amplifier Checking method Alarm (88888) occurs if power is switched on after disconnection of all cables but the control circuit power supply cables.	Change servo amplifier.

12.4.3 Remedies for warnings

CAUTION

- If an absolute position counter warning (AL.E3) has occurred, always perform home position setting again. Failure to do so can cause runaway.

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 (AL.E0)
  - Overload warning 1 (AL.E1)

The servo off status is established if a servo forced stop warning (AL.E6) or software limit warning (AL.98) occurs. If any other warning occurs, operation can be continued but an alarm may take place or proper operation may not be performed. Remove the cause of the warning according to this section. Use the optional MR Configurator (servo configuration software) to refer to the cause of warning.

Display	Name	Definition		Cause	Action
AL.90	Home position return incomplete	In incremental system	Positioning operation was performed without home position return.	1. Positioning operation was performed without home position return.	Perform home position return.
			Home position return ended abnormally.	2. Home position return speed could not be decreased to creep speed. 3. Limit switch was actuated during home position return starting at other than position beyond dog.	Review home position return speed/creep speed/moving distance after proximity dog.
		In absolute position detection system	Positioning operation was performed without home position setting.	1. Positioning operation was performed without home position setting.	Perform home position setting.
			Home position setting ended abnormally.	2. Home position setting speed could not be decreased to creep speed. 3. Limit switch was actuated during home position setting starting at other than position beyond dog.	Review home position setting speed/creep speed/moving distance after proximity dog.
			Operation was performed without making home position setting while an absolute position erase (AL.25) is being occurred.	4. Voltage drop in encoder (Battery disconnected.)	After leaving the alarm occurring for a few minutes, switch power off, then on again. Always make home position setting again.
				5. Battery voltage low 6. Battery cable or battery is faulty.	Change battery. Always make home position setting again.
AL.92	Open battery cable warning	Absolute position detection system battery voltage is low.		1. Battery cable is open.	Repair cable or changed.
				2. Battery voltage supplied for the servo amplifier to the encoder fell to about 3.2V or less. (Detected with the encoder)	Change battery.

Display	Name	Definition	Cause	Action
AL.96	Home position setting warning	Home position setting could not be made.	1. Droop pulses remaining are greater than the in-position range setting.	Remove the cause of droop pulse occurrence
			2. Command pulse entered after clearing of droop pulses.	Do not enter command pulse after clearing of droop pulses.
			3. Creep speed high.	Reduce creep speed.
AL.98	Software limit warning	Software limit set in parameter is reached.	1. Software limit was set within actual operation range.	Set parameter No. 48 to 51 correctly.
			2. Point table of position data in excess of software limit was executed.	Set point table correctly.
			3. Software limit was reached during JOG operation or manual pulse generator operation.	Perform operation within software limit range.
AL.9D	CC-Link warning 1	The station number switch or baud rate switch position was changed from the setting at power-on.	1. The station number switch position was changed from the setting at power-on. 2. The baud rate switch position was changed from the setting at power-on. 3. The occupied station count switch position was changed from the setting at power-on.	Return to the setting at power-on.
AL9E	CC-Link warning 2	Communication error of cable	1. The transmission status is abnormal.	Take measures against noise.
			2. CC-Link twisted cable wiring incorrect. 3. CC-Link twisted cable faulty. 4. The CC-Link connector has come off.	1. Change the CC-Link twisted cable. 2. Connect the cable or connector correctly.
			5. The terminating resistor is not connected. 6. Noise entered the CC-Link twisted cable.	Connect the terminating resistor correctly.
AL.9F	Battery warning	Voltage of battery for absolute position detection system reduced.	Battery voltage fell to 3.2VDC or less. (Detected with the servo amplifier)	Change the battery.
AL.E0	Excessive regenerative warning	There is a possibility that regenerative power may exceed permissible regenerative power of built-in regenerative resistor or regenerative option.	Regenerative power increased to 85% or more of permissible regenerative power of built-in regenerative resistor or regenerative option. Checking method Call the status display and check regenerative load ratio.	1. Reduce frequency of positioning. 2. Change regenerative option for the one with larger capacity. 3. Reduce load.
AL.E1	Overload warning	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 AL.50,51.	Refer to AL.50, AL.51.
AL.E3	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.	3. The movement amount from the home position exceeded a 32767 rotation or -37268 rotation in succession.	Make home position setting again.
AL.E6	Servo forced stop warning	EMG-SG are open.	External forced stop was made valid. (EMG-SG opened.)	Ensure safety and deactivate forced stop.
AL.E9	Main circuit off warning	Servo-on (RYn0) was turned ON with the main circuit power OFF.		Switch on main circuit power.

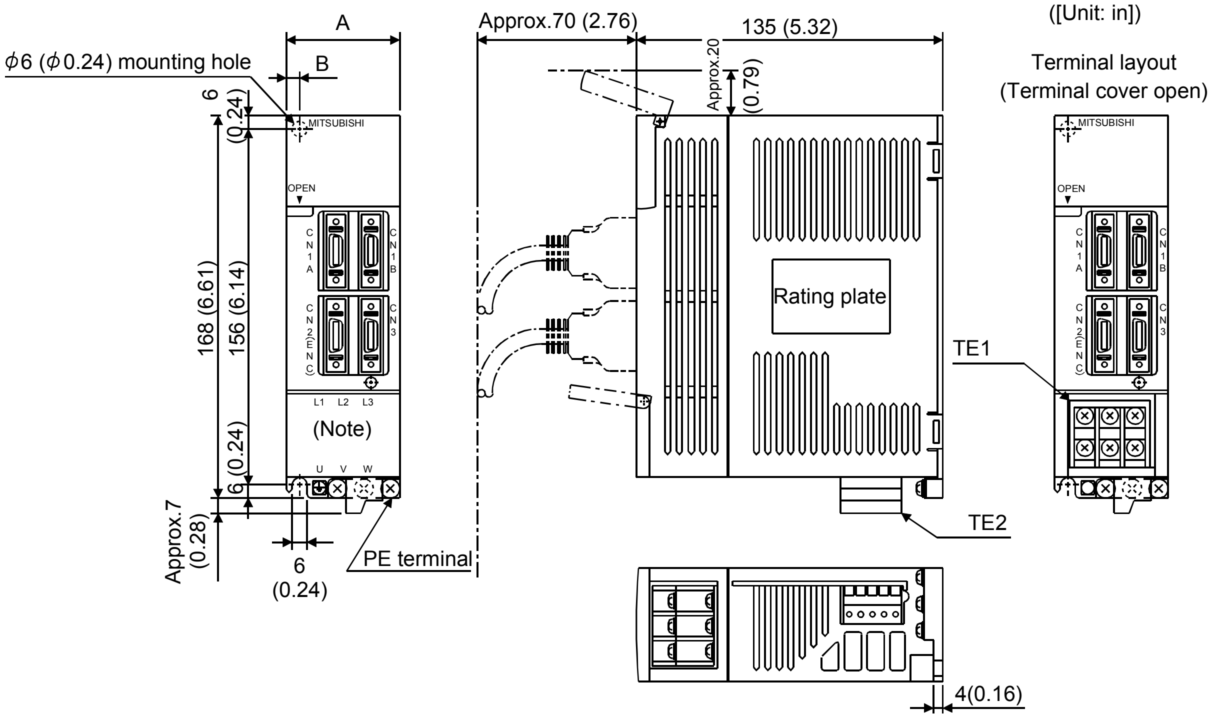
MEMO

13. OUTLINE DIMENSION DRAWINGS

13.1 Servo amplifiers

(1) MR-J2S-10CP-S084 to MR-J2S-60CP-S084 · MR-J2S-10CP1-S084 to MR-J2S-40CP1-S084

[Unit: mm]
([Unit: in])



Servo amplifier	Variable dimensions		Mass
	A	B	[kg] ([lb])
MR-J2S-10CP (1)-S084	50 (1.97)	6 (0.24)	0.7 (1.54)
MR-J2S-20CP (1)-S084			
MR-J2S-40CP (1)-S084	70 (2.76)	22 (0.87)	1.1 (2.43)
MR-J2S-60CP-S084			

Note. This data applies to the 3-phase 200 to 230VAC and 1-phase 230VAC power supply models.

TE1

- For 3-phase 200 to 230VAC and 1-phase 230VAC

L_1	L_2	L_3
U	V	W

Terminal screw: M4
Tightening torque: 1.2 [N·m] (10.6 [lb·in])

- For 1-phase 100 to 120VAC

L_1		L_2
U	V	W

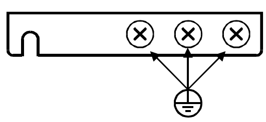
Terminal screw: M4
Tightening torque: 1.2 [N·m] (10.6 [lb·in])

TE2

←Front

D	C	P	L_{21}	L_{11}

PE terminals

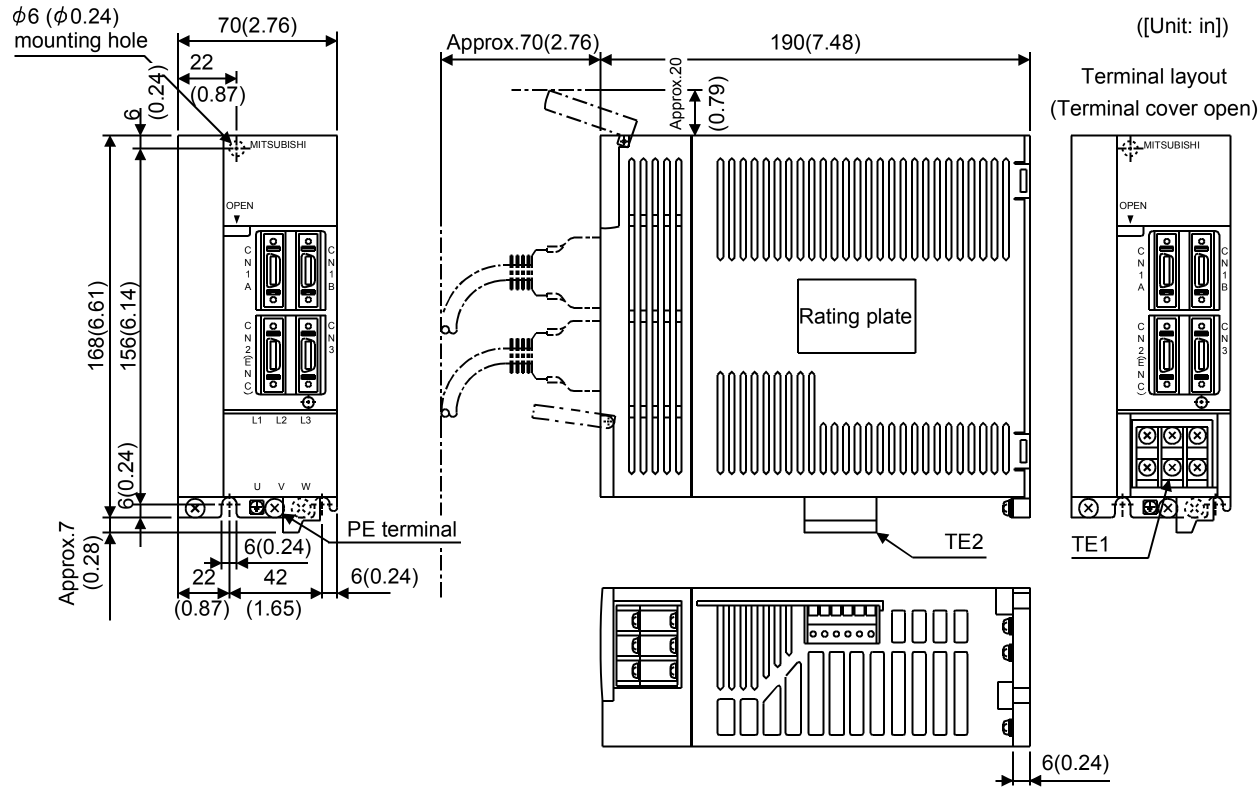


Terminal screw: M4
Tightening torque: 1.2 [N·m] (10.6 [lb·in])

(2) MR-J2S-70CP-S084 · MR-J2S-100CP-S084

[Unit: mm]

([Unit: in])



Servo amplifier	Mass [kg] ([lb])
MR-J2S-70CP-S084	1.7 (3.75)
MR-J2S-100CP-S084	

TE1

L_1	L_2	L_3
U	V	W

Terminal screw: M4

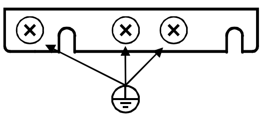
Tightening torque: 1.2 [N·m] (10.6 [lb·in])

TE2

← Front

D	C	P	L_{21}	L_{11}	N

PE terminals



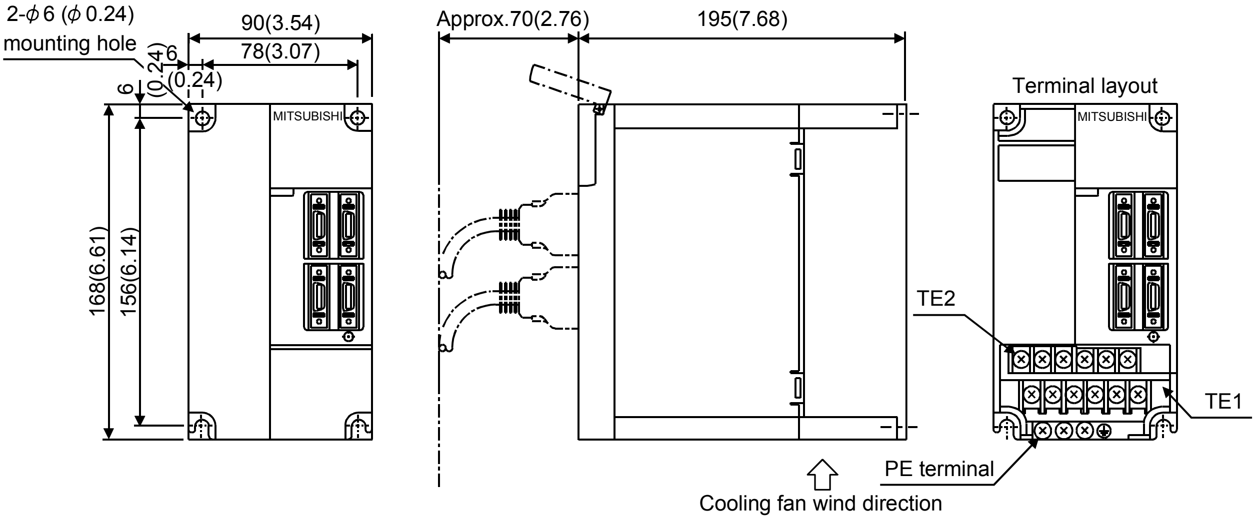
Terminal screw: M4

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

(3) MR-J2S-200CP-S084・MR-J2S-350CP-S084

[Unit: mm]

([Unit: in])



Servo amplifier	Mass [kg] ([lb])
MR-J2S-200CP-S084	2.0 (4.41)
MR-J2S-350CP-S084	

TE1

L1	L2	L3	U	V	W

Terminal screw: M4

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

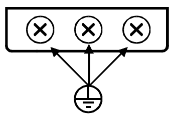
TE2

L11	L21	D	P	C	N

Terminal screw: M4

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

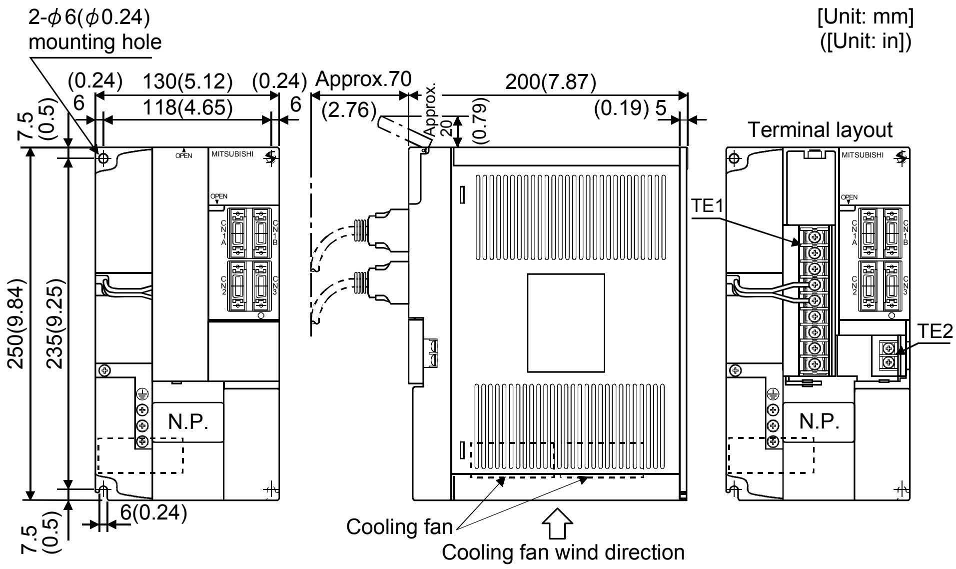
PE terminals



Terminal screw: M4

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

(4) MR-J2S-500CP-S084



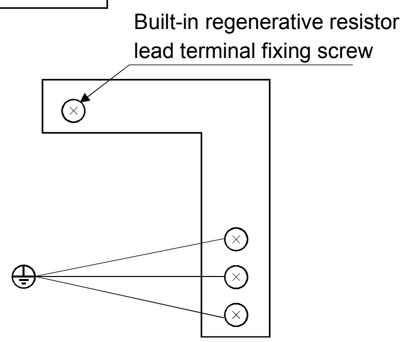
Servo amplifier	Mass [kg] ([lb])
MR-J2S-500CP-S084	4.9 (10.8)

TE1

L_1
L_2
L_3
C
P
N
U
V
W

Terminal screw : M4
Tightening torque : 1.2 [N・m] (10.6 [lb・in])

PE terminals



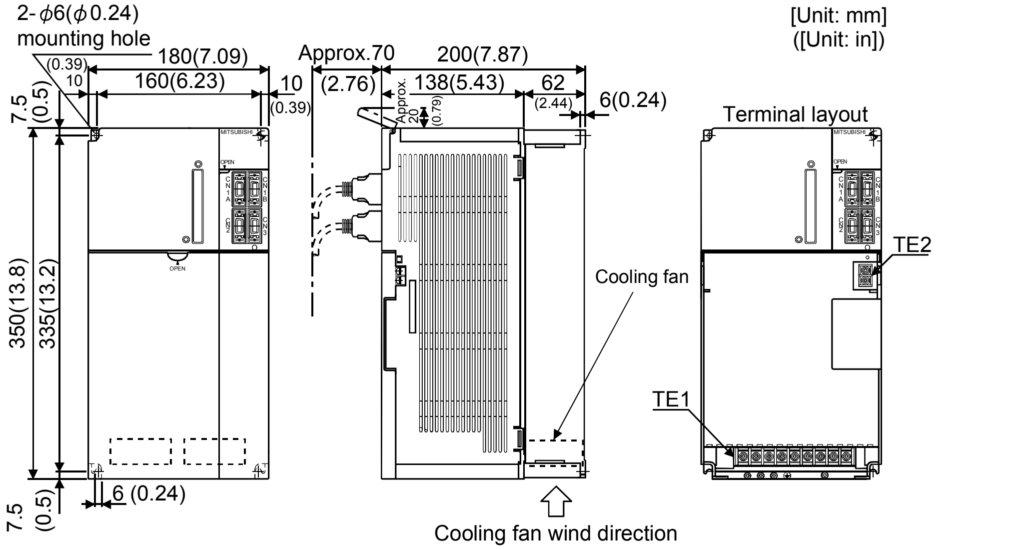
Terminal screw : M4
Tightening torque : 1.2 [N・m] (10.6 [lb・in])

TE2

L_{11}
L_{21}

Terminal screw : M3.5
Tightening torque : 0.8 [N・m] (7.08 [lb・in])

(5) MR-J2S-700CP-S084



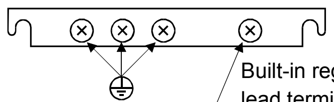
Servo amplifier	Mass [kg] ([lb])
MR-J2S-700CP-S084	7.2 (15.9)

TE1

L_1	L_2	L_3	C	P	N	U	V	W

Terminal screw : M4
Tightening torque : 1.2 [N・m] (10.6 [lb・in])

PE terminals



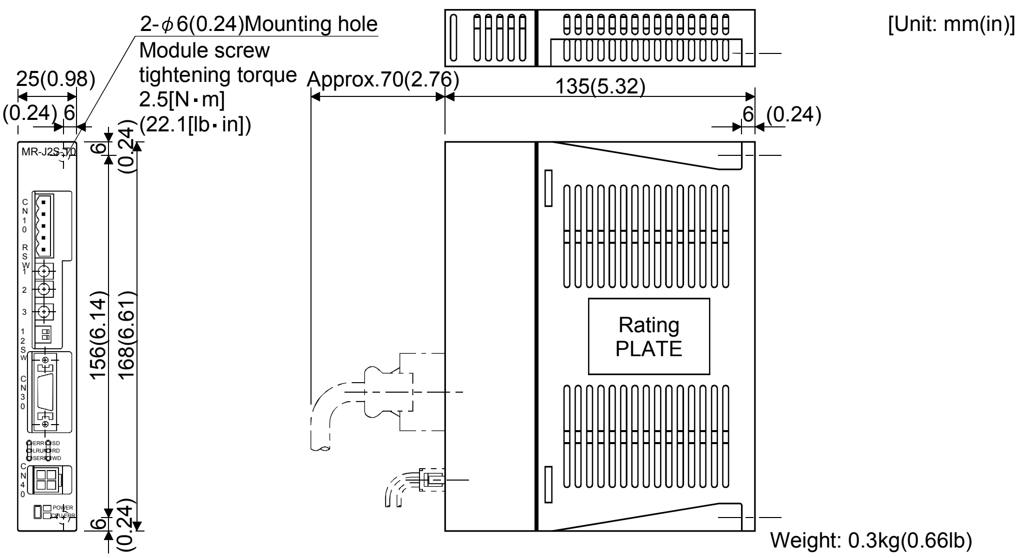
Built-in regenerative resistor lead terminal fixing screw
Terminal screw : M4
Tightening torque : 1.2 [N・m] (10.6 [lb・in])

TE2

L_{11}
L_{21}

Terminal screw : M3.5
Tightening torque : 0.8 [N・m] (7.08 [lb・in])

13.2 CC-Link option unit (MR-J2S-T01)



13.3 Connectors

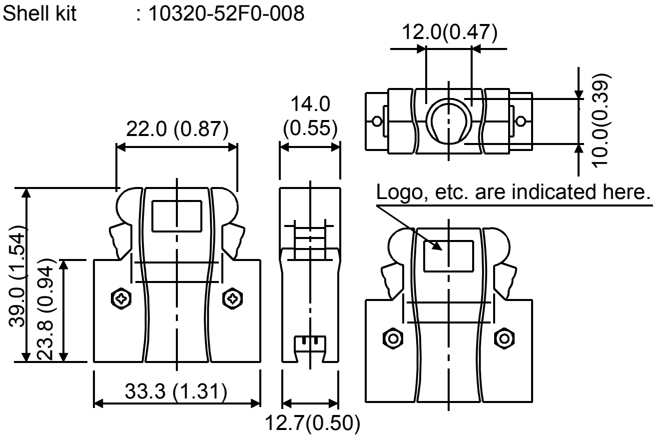
(1) Servo amplifier side

<3M >

(a) Soldered type

Model
Connector : 10120-3000PE
Shell kit : 10320-52F0-008

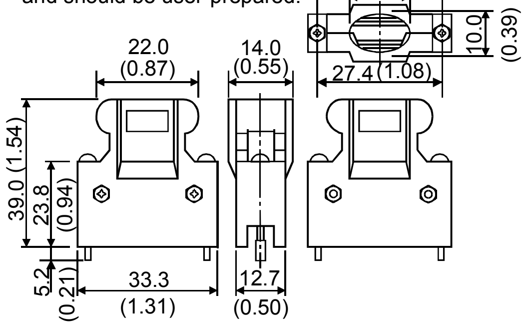
[Unit: mm]
([Unit: in])



(b) Threaded type

Model
Connector : 10120-3000PE
Shell kit : 10320-52A0-008
Note. This is not available as option and should be user-prepared.

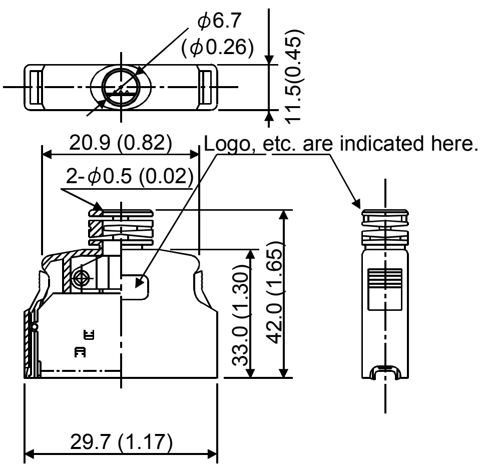
[Unit: mm]
([Unit: in])



(c) Insulation displacement type

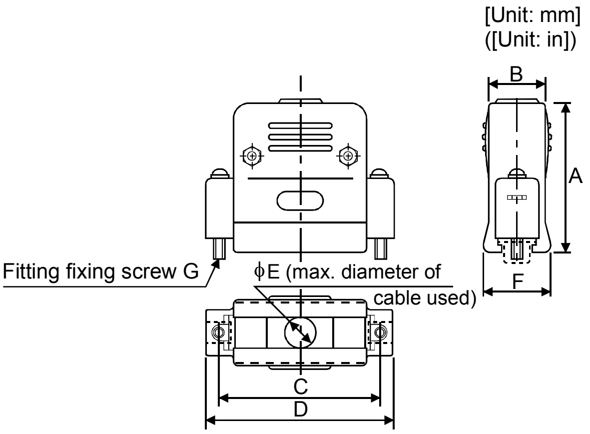
Model
Connector : 10120-6000EL
Shell kit : 10320-3210-000

[Unit: mm]
([Unit: in])



(2) Communication cable connector

<JAE>



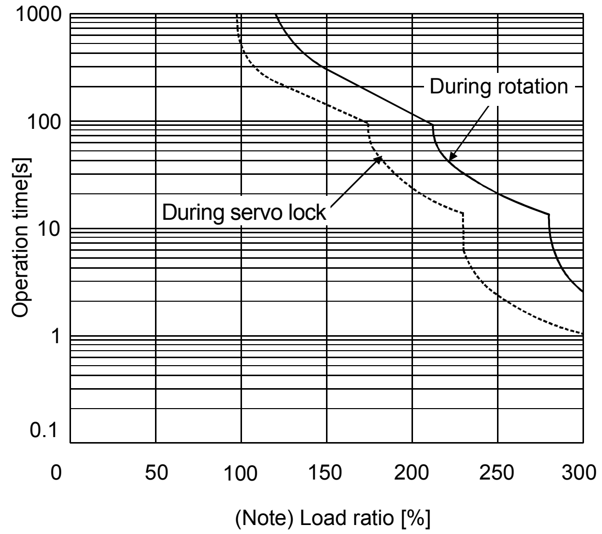
Type	A ±1	B ±1	C ±0.25	D ±1	ϕE	F reference	G
DE-C1-J6-S6	34.5 (1.36)	19 (0.75)	24.99 (0.98)	33 (1.30)	6 (0.24)	18 (0.71)	#4-40

MEMO

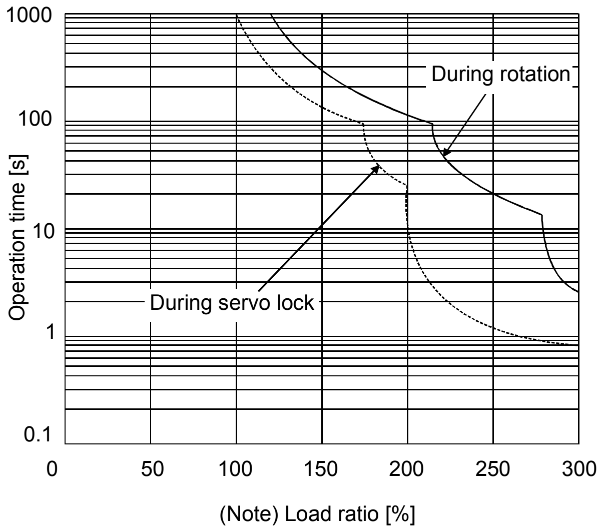
14. CHARACTERISTICS

14.1 Overload protection characteristics

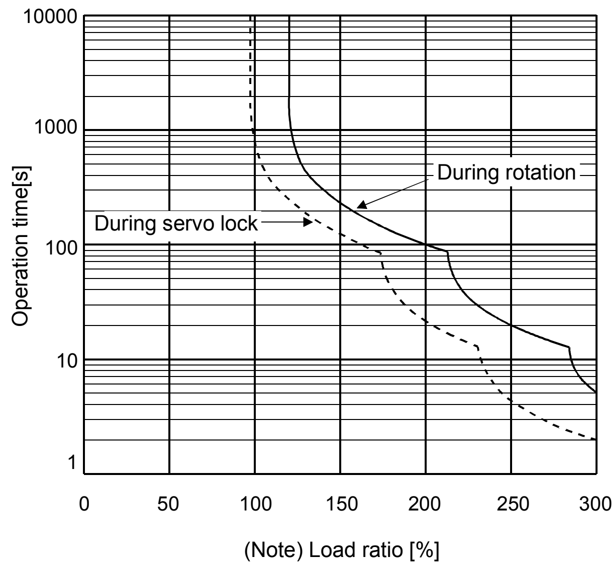
An electronic thermal relay is built in the servo amplifier to protect the servo motor and servo amplifier from overloads. Overload 1 alarm (AL.50) occurs if overload operation performed is above the electronic thermal relay protection curve shown in any of Figs 14.1. Overload 2 alarm (AL.51) occurs 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.



a. MR-J2S-10CP-S084 to MR-J2S-100CP-S084



b. MR-J2S-200CP-S084 to MR-J2S-350CP-S084



c. MR-J2S-500CP-S084 ・ MR-J2S-700CP-S084

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 14.1 Electronic thermal relay protection characteristics

14.2 Power supply equipment capacity and generated loss

(1) Amount of heat generated by the servo amplifier

Table 12.1 indicates servo amplifiers' power supply capacities and losses generated under rated load. For thermal design of an enclosure, use the values in Table 14.1 in consideration for the worst operating conditions. The actual amount of generated heat will be intermediate between values at rated torque and servo-off according to the duty used during operation. When the servo motor is run at less than the maximum speed, the power supply capacity will be smaller than the value in the table, but the servo amplifier's generated heat will not change.

Table 14.1 Power supply capacity and generated heat per servo amplifier at rated output

Servo amplifier	Servo motor	(Note 1) Power supply capacity[kVA]	(Note 2) Servo amplifier-generated heat[W]		Area required for heat dissipation	
			At rated torque	With servo off	[m²]	[ft²]
MR-J2S-10CP(1) -S084	HC-KFS053 · 13	0.3	25	15	0.5	5.4
	HC-MFS053 · 13	0.3	25	15	0.5	5.4
	HC-UFS13	0.3	25	15	0.5	5.4
MR-J2S-20CP(1) -S084	HC-KFS23	0.5	25	15	0.5	5.4
	HC-MFS23	0.5	25	15	0.5	5.4
	HC-UFS23	0.5	25	15	0.5	5.4
MR-J2S-40CP(1) -S084	HC-KFS43	0.9	35	15	0.7	7.5
	HC-MFS43	0.9	35	15	0.7	7.5
	HC-UFS43	0.9	35	15	0.7	7.5
MR-J2S-60CP -S084	HC-SFS52	1.0	40	15	0.8	8.6
	HC-SFS53	1.0	40	15	0.8	8.6
	HC-LFS52	1.0	40	15	0.8	8.6
MR-J2S-70CP -S084	HC-KFS73	1.3	50	15	1.0	10.8
	HC-MFS73	1.3	50	15	1.0	10.8
	HC-UFS72 · 73	1.3	50	15	1.0	10.8
MR-J2S-100CP -S084	HC-SFS81	1.5	50	15	1.0	10.8
	HC-SFS102 · 103	1.7	50	15	1.0	10.8
	HC-LFS102	1.7	50	15	1.0	10.8
MR-J2S-200CP -S084	HC-SFS121	2.1	90	20	1.8	19.4
	HC-SFS201	3.5	90	20	1.8	19.4
	HC-SFS152 · 153	2.5	90	20	1.8	19.4
	HC-SFS202 · 203	3.5	90	20	1.8	19.4
	HC-RFS103	1.8	50	15	1.0	10.8
	HC-RFS153	2.5	90	20	1.8	19.4
	HC-UFS152	2.5	90	20	1.8	19.4
	HC-LFS152	2.5	90	20	1.8	19.4
MR-J2S-350CP -S084	HC-SFS301	4.8	120	20	2.7	29.1
	HC-SFS352 · 353	5.5	130	20	2.7	29.1
	HC-RFS203	3.5	90	20	1.8	19.4
	HC-UFS202	3.5	90	20	1.8	19.4
	HC-LFS202	3.5	90	20	1.8	19.4
MR-J2S-500CP -S084	HC-SFS502	7.5	195	25	3.9	42.0
	HC-RFS353	5.5	135	25	2.7	29.1
	HC-RFS503	7.5	195	25	3.9	42.0
	HC-UFS352	5.5	195	25	3.9	42.0
	HC-UFS502	7.5	195	25	3.9	42.0
	HC-LFS302	4.5	120	25	2.4	25.8
	HA-LFS502	7.5	195	25	3.9	42.0
MR-J2S-700CP -S084	HC-SFS702	10.0	300	25	6.0	64.6
	HA-LFS702	10.6	300	25	6.0	64.6

Note 1. Note that the power supply capacity will vary according to the power supply impedance. This value assumes that the power factor improving reactor is not used.

2. Heat generated during regeneration is not included in the servo amplifier-generated heat. To calculate heat generated by the regenerative option, refer to section 15.1.1.

(2) Heat dissipation area for enclosed servo amplifier

The enclosed control box (hereafter called the control box) which will contain the servo amplifier should be designed to ensure that its temperature rise is within +10°C (+50°F) at the ambient temperature of 40°C (104°F). (With a 5°C (41°F) safety margin, the system should operate within a maximum 55°C (131°F) limit.) The necessary enclosure heat dissipation area can be calculated by Equation 14.1.

$$A=\frac{P}{K\cdot\Delta T} \quad \cdots\cdots (14.1)$$

where, A : Heat dissipation area [m^2]
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 14.1, assume that P is the sum of all losses generated in the enclosure. Refer to Table 14.1 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 cooling fan should be considered.
Table 14.1 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.

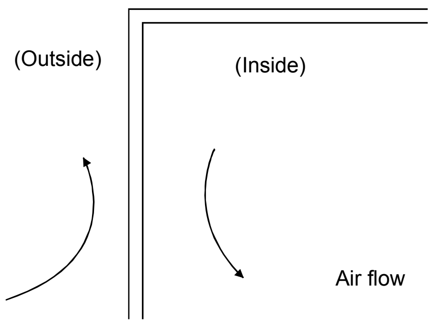


Fig. 14.2 Temperature distribution in enclosure

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.

14.3 Dynamic brake characteristics

14.3.1 Dynamic brake operation

(1) Calculation of coasting distance

Fig. 14.3 shows the pattern in which the servo motor comes to a stop when the dynamic brake is operated. Use Equation 14.2 to calculate an approximate coasting distance to a stop. The dynamic brake time constant τ varies with the servo motor and machine operation speeds. (Refer to (2) in this section.)

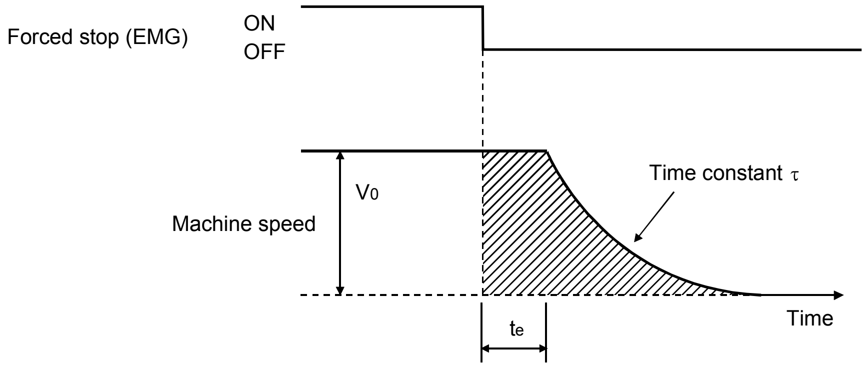


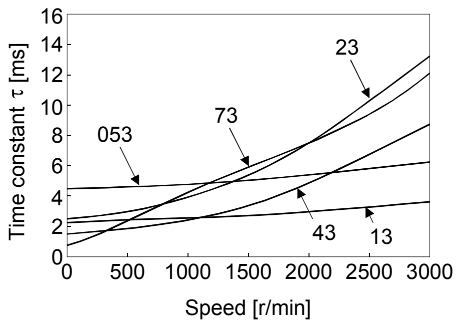
Fig. 14.3 Dynamic brake operation diagram

$$L_{max} = \frac{V_0}{60} \cdot \left\{ t_e + \tau \left(1 + \frac{J_L}{J_M} \right) \right\} \quad \text{(14.2)}$$

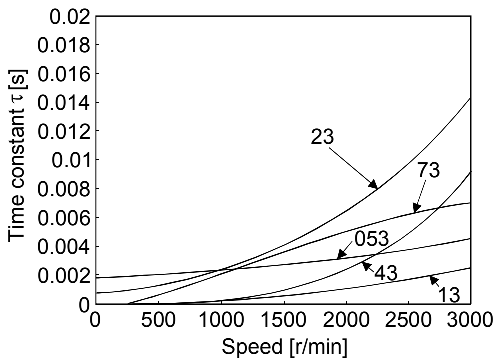
L_{max} : Maximum coasting distance .... [mm][in]
V_0 : Machine rapid feed rate .... [mm/min][in/min]
J_M : Servo motor inertial moment .... [kg・cm²][oz・in²]
J_L : Load inertia moment converted into equivalent value on servo motor shaft..... [kg・cm²][oz・in²]
τ : Brake time constant .... [s]
t_e : Delay time of control section .... [s]
(There is internal relay delay time of about 30ms.)

(2) Dynamic brake time constant

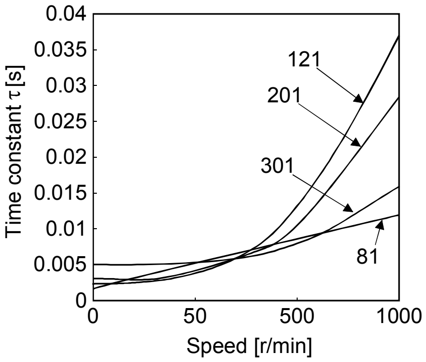
The following shows necessary dynamic brake time constant τ for the equations (14.2).



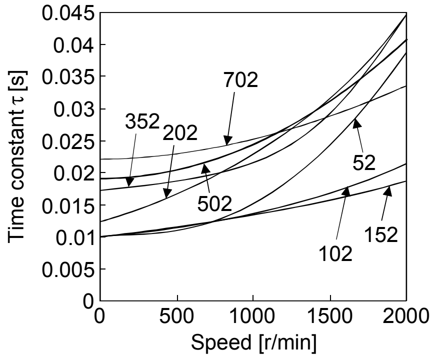
a. HC-KFS series



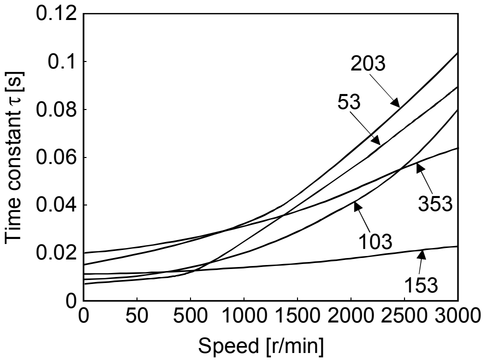
b. HC-MFS series



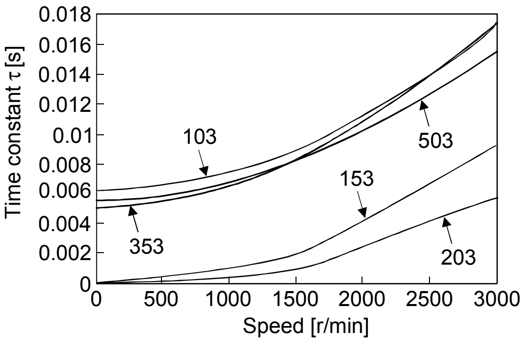
c. HC-SFS1000r/min series



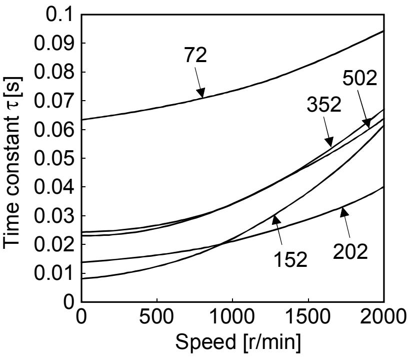
d. HC-SFS2000r/min series



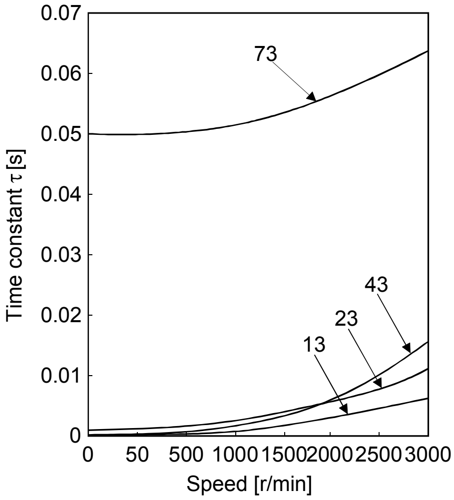
e. HC-SFS3000r/min series



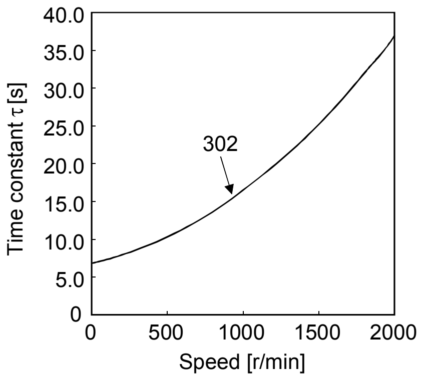
f. HC-RFS series



g. HC-UFS 2000r/min series



h. HC-UFS3000r/min series



i. HC-LFS 2000r/min series

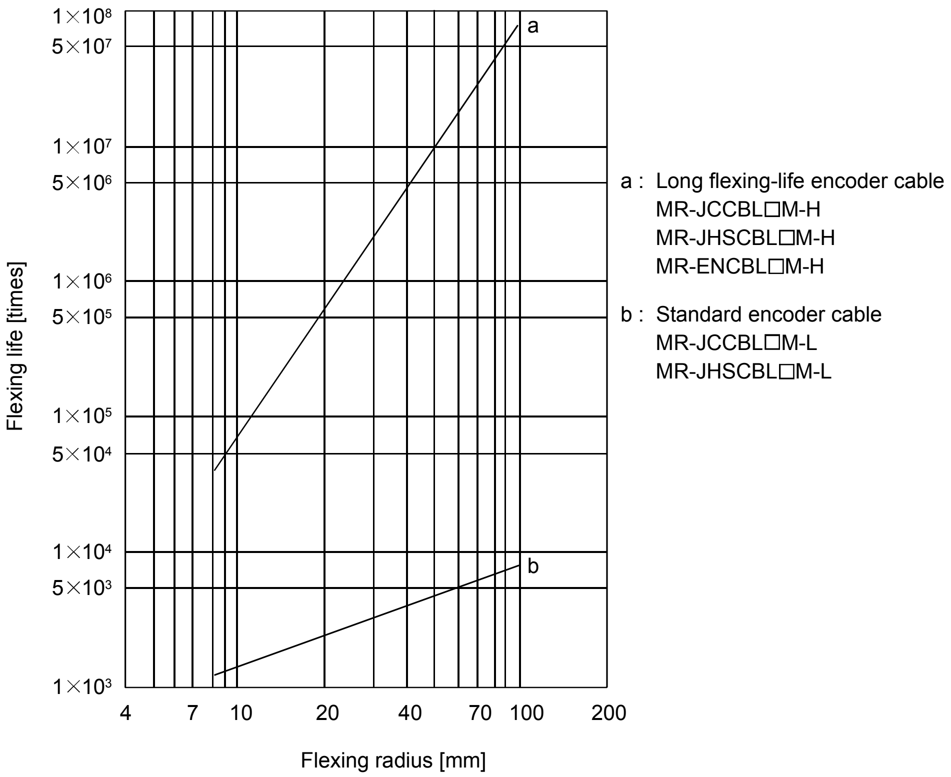
14.3.2 The dynamic brake at the load inertia moment

Use the dynamic brake under the load inertia moment ratio indicated in the following table. If the load inertia moment is higher than this value, the built-in dynamic brake may burn. If there is a possibility that the load inertia moment may exceed the value, contact Mitsubishi.

Servo amplifier	Load inertia moment ratio [times]
MR-J2S-10CP-S084 to MR-J2S-200CP-S084 MR-J2S-10CP1-S084 to MR-J2S-40CP1-S084	30
MR-J2S-350CP-S084	16
MR-J2S-500CP-S084 ・MR-J2S-700CP-S084	15

14.4 Encoder 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.



14.5 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 (253VAC) is applied at the power supply capacity of 2500kVA and the wiring length of 1m (3.28ft).

Servo Amplifier	Inrush Currents (A0-p)	
	Main circuit power supply (L_1, L_2, L_3)	Control circuit power supply (L_{11}, L_{21})
MR-J2S-10CP-S084 ・20CP-S084	30A (Attenuated to approx. 5A in 10ms)	70 to 100A (Attenuated to approx. 0A in 0.5 to 1ms)
MR-J2S-40CP-S084 ・60CP-S084	30A (Attenuated to approx. 5A in 10ms)	
MR-J2S-70CP-S084 ・100CP-S084	54A (Attenuated to approx. 12A in 10ms)	
MR-J2S-200CP-S084 ・350CP-S084	120A (Attenuated to approx. 12A in 20ms)	100 to 130A (Attenuated to approx. 0A in 0.5 to 1ms)
MR-J2S-500CP-S084	44A (Attenuated to approx. 20A in 20ms)	30A (Attenuated to approx. 0A in several ms)
MR-J2S-700CP-S084	88A (Attenuated to approx. 20A in 20ms)	
MR-J2S-10CP1-S084 ・20CP1-S084	59A (Attenuated to approx. 5A in 4ms)	100 to 130A (Attenuated to approx. 0A in 0.5 to 1ms)
MR-J2S-40CP1-S084	72A (Attenuated to approx. 5A in 4ms)	

Since large inrush currents flow in the power supplies, always use no-fuse breakers and magnetic contactors. (Refer to section 15.2.2.)
When circuit protectors are used, it is recommended to use the inertia delay type that will not be tripped by an inrush current.

MEMO

15. OPTIONS AND AUXILIARY EQUIPMENT

⚠WARNING	・Before connecting any option or peripheral equipment, turn off the power and wait for 15 minutes or more until the charge lamp turns off. Then, confirm that the voltage between P and N is safe with a voltage tester and others. Otherwise, an electric shock may occur. In addition, always confirm from the front of the servo amplifier whether the charge lamp is off or not.

⚠CAUTION	・Use the specified auxiliary equipment and options. Unspecified ones may lead to a fault or fire.

15.1 Options

15.1.1 Regenerative options

⚠CAUTION	・The specified combinations of regenerative options and servo amplifiers may only be used. Otherwise, a fire may occur.

(1) Combination and regenerative power
The power values in the table are resistor-generated powers and not rated powers.

Servo amplifier	Regenerative power[W]							
	Built-in regenerative resistor	MR-RB032 [40Ω]	MR-RB12 [40Ω]	MR-RB32 [40Ω]	MR-RB30 [13Ω]	(Note) MR-RB50 [13Ω]	MR-RB31 [6.7Ω]	(Note) MR-RB51 [6.7Ω]
MR-J2S-10CP(1) -S084		30						
MR-J2S-20CP (1) -S084	10	30	100					
MR-J2S-40CP (1) -S084	10	30	100					
MR-J2S-60CP-S084	10	30	100					
MR-J2S-70CP-S084	20	30	100	300				
MR-J2S-100CP-S084	20	30	100	300				
MR-J2S-200CP-S084	100				300	500		
MR-J2S-350CP-S084	100				300	500		
MR-J2S-500CP-S084	130				300	500		
MR-J2S-700CP-S084	170						300	500

Note. Always install a cooling fan.

(2) Selection of the regenerative option

(a) Simple selection method

In horizontal motion applications, select the regenerative option as described below.

When the servo motor is run without load in the regenerative mode from the running speed to a stop, the permissible duty is as indicated in section 5.1 of the separately available Servo Motor Instruction Manual.

For the servo motor with a load, the permissible duty changes according to the inertia moment of the load and can be calculated by the following formula.

$$\text{Permissible duty} = \frac{\text{Permissible duty for servo motor with no load (value indication Section 5.1 in Servo Motor Instruction Manual)}}{(m+1)} \times \left(\frac{\text{ratedspeed}}{\text{running speed}}\right)^2 \text{[times/min]}$$

where m = load inertia moment/servo motor inertia moment

From the permissible duty, find whether the regenerative option is required or not.

Permissible duty < number of positioning times [times/min]

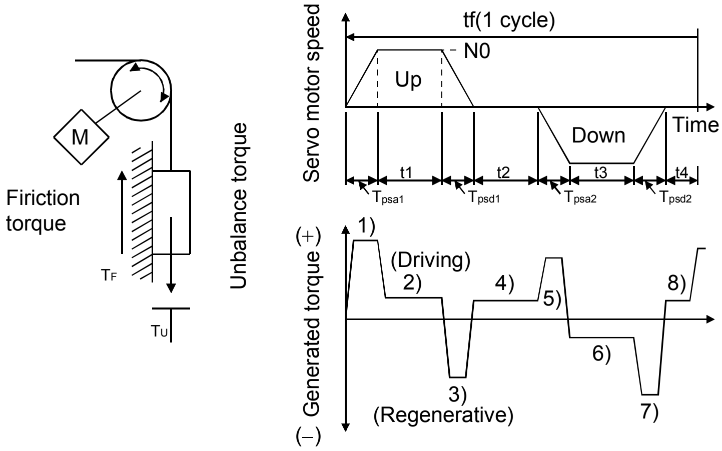
Select the regenerative option out of the combinations in (1) in this section.

(b) To make selection according to regenerative energy

Use the following method when regeneration occurs continuously in vertical motion applications or when it is desired to make an in-depth selection of the regenerative option.

a. Regenerative energy calculation

Use the following table to calculate the regenerative energy.



Formulas for calculating torque and energy in operation

Regenerative power	Torque applied to servo motor [N・m]	Energy [J]
1)	$T_1 = \frac{(J_L + J_M) \cdot N_0}{9.55 \times 10^4} \cdot \frac{1}{T_{psa1}} + T_U + T_F$	$E_1 = \frac{0.1047}{2} \cdot N_0 \cdot T_1 \cdot T_{psa1}$
2)	$T_2 = T_U + T_F$	$E_2 = 0.1047 \cdot N_0 \cdot T_2 \cdot t_1$
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)	$T_4 = T_U$	$E_4 \geq 0$ (N0 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)	$T_6 = -T_U + T_F$	$E_6 = 0.1047 \cdot N_0 \cdot T_6 \cdot t_3$
7)	$T_7 = \frac{-(J_L + J_M) \cdot N_0}{9.55 \times 10^4} \cdot \frac{1}{T_{psd2}} - T_U + T_F$	$E_7 = \frac{0.1047}{2} \cdot N_0 \cdot T_7 \cdot T_{psd2}$

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-J2S-10CP-S084	55	9
MR-J2S-10CP1-S084	55	4
MR-J2S-20CP-S084	70	9
MR-J2S-20CP1-S084	70	4
MR-J2S-40CP-S084	85	11
MR-J2S-40CP1-S084	85	10
MR-J2S-60CP-S084	85	11
MR-J2S-70CP-S084	80	18
MR-J2S-100CP-S084	80	18
MR-J2S-200CP-S084	85	40
MR-J2S-350CP-S084	85	40
MR-J2S-500CP-S084	90	45
MR-J2S-700CP-S084	90	70

Inverse efficiency (η) : Efficiency including some efficiencies of the servo motor and servo amplifier when rated (regenerative) torque is generated at rated speed. Since the efficiency varies with the speed and generated torque, allow for about 10%.

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

Subtract the capacitor charging from the result of multiplying the sum total of regenerative energies by the inverse efficiency to calculate the energy consumed by the regenerative option.

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

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

$$PR\ [W] = ER/tf$$

(3) Connection of the regenerative option

Set parameter No.0 according to the option to be used.

Parameter No.0

Selection of regenerative
0: Not used (The built-in regenerative resistor is used. However, the MR-J2S-10CP-S084 does not have a built-in regenerative resistor and therefore cannot use it.)
1: FR-RC, FR-BU2
2: MR-RB032
3: MR-RB12
4: MR-RB32
5: MR-RB30
6: MR-RB50 (Cooling fan is required)
8: MR-RB31
9: MR-RB51 (Cooling fan is required)

(4) Connection of the regenerative option

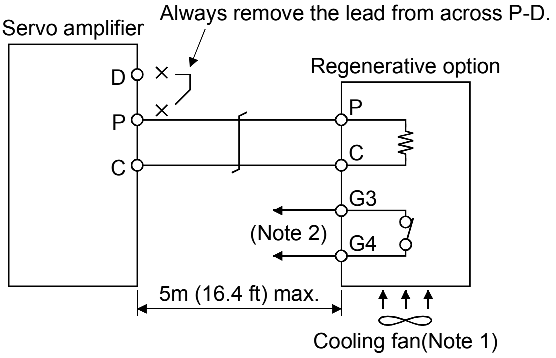
POINT
・When the MR-RB50・MR-RB51 is used, a cooling fan is required to cool it. The cooling fan should be prepared by the customer.

The regenerative option will generate heat of about 100℃. 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-J2S-350CP-S084 or less

Always remove the wiring from across P-D and fit the regenerative option across P-C.

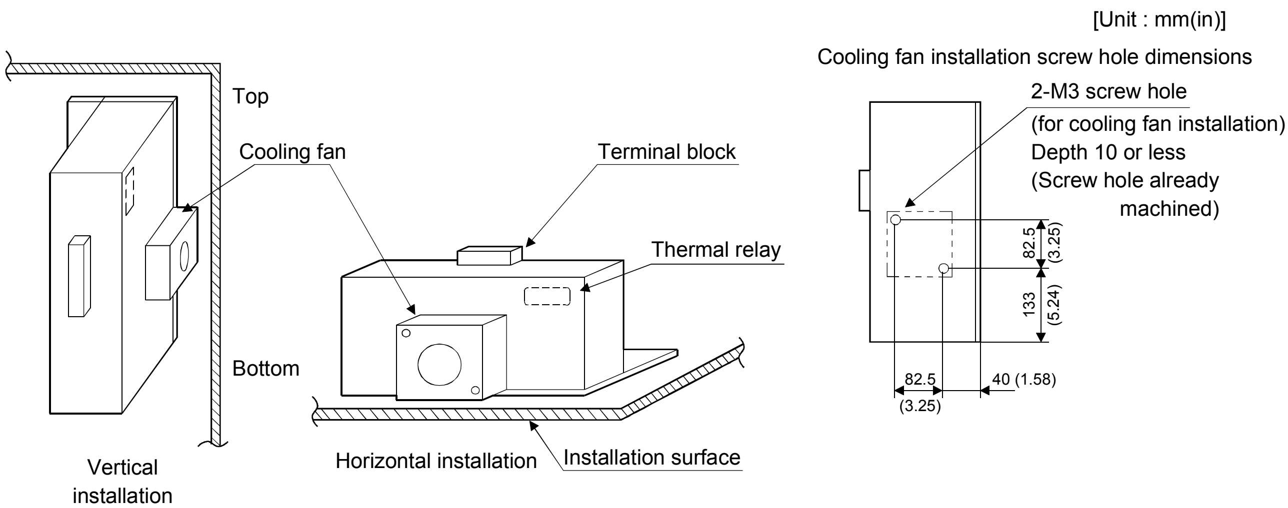
The G3 and G4 terminals act as a thermal sensor. G3-G4 is opened when the regenerative option overheats abnormally.



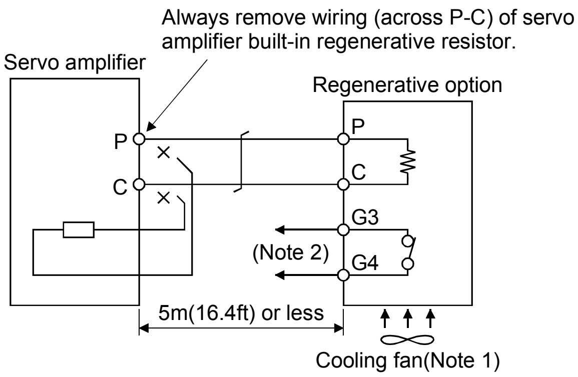
Note 1. When using the MR-RB50, forcibly cool it with a cooling fan (92×92, minimum air flow : 1.0m^3).

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.



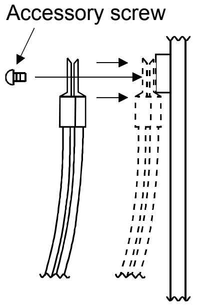
(b) MR-J2S-500CP-S084・MR-J2S-700CP-S084
Always remove the wiring (across P-C) of the servo amplifier built-in regenerative resistor and fit the regenerative option across P-C.
The G3 and G4 terminals act as a thermal sensor. G3-G4 is opened when the regenerative option overheats abnormally.

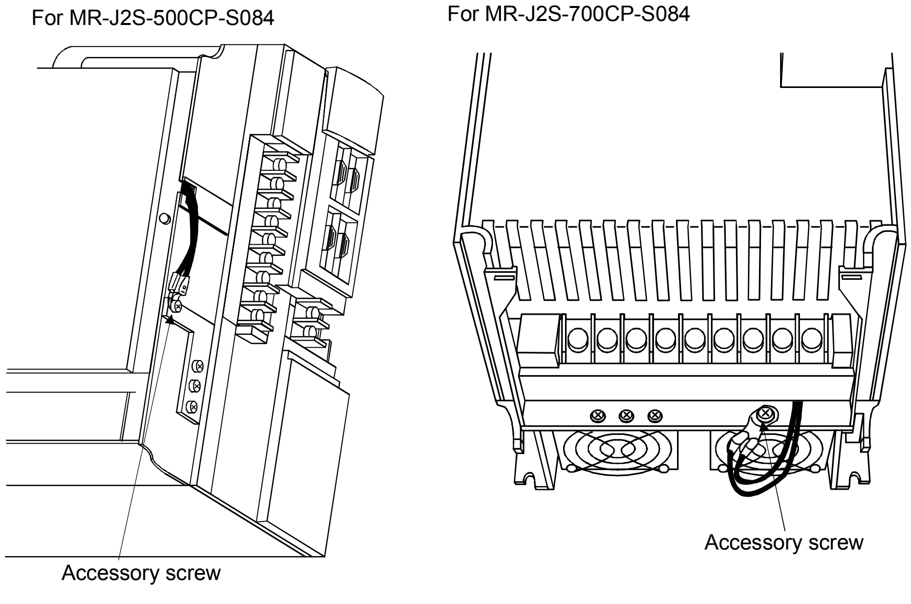


Note 1. When using the MR-RB50 MR-RB51, forcibly cool it with a cooling fan (92×92, minimum air flow : 1.0m^3).
2. Make up a sequence which will switch off the magnetic contactor (MC) when abnormal heating occurs.
G3-G4 contact specifications
Maximum voltage: 120V AC/DC
Maximum current: 0.5A/4.8VDC
Maximum capacity: 2.4VA

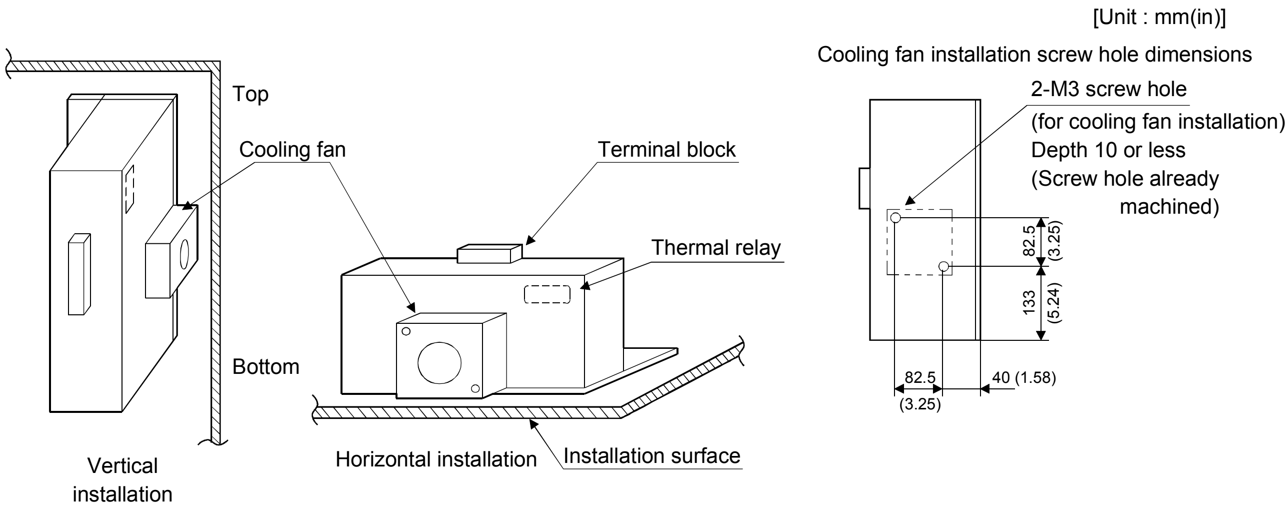
When using the regenerative resistor option, remove the servo amplifier's built-in regenerative resistor terminals (across P-C), fit them back to back, and secure them to the frame with the accessory screw as shown below.

Mounting method



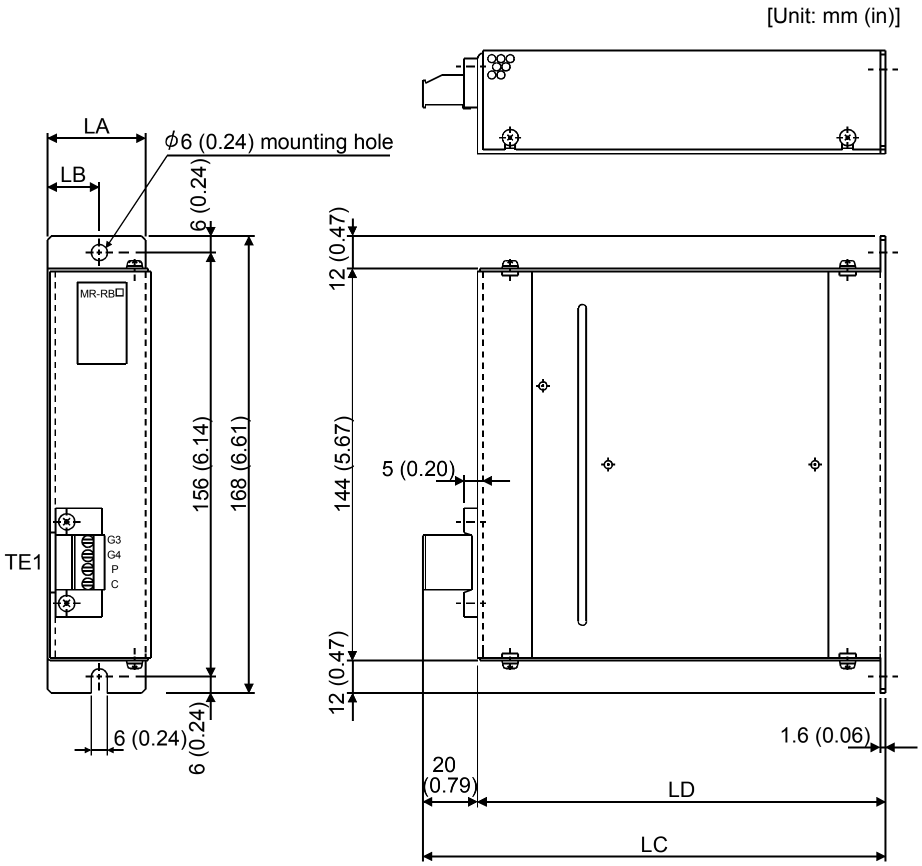


For the MR-RB50・MR-RB51 install the cooling fan as shown.



(5) Outline drawing

(a) MR-RB032・MR-RB12



・TE1

Terminal block

G3
G4
P
C

Terminal screw: M3

Tightening torque:

0.5 to 0.6 [N・m] (4 to 5 [lb・in])

・Mounting screw

Screw size: M5

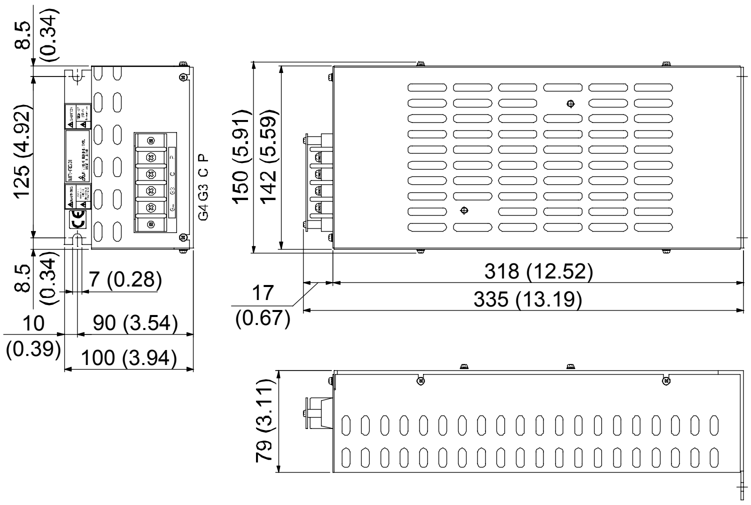
Tightening torque:

3.24 [N・m] (28.7 [lb・in])

Regenerative option	Variable dimensions				Mass	
	LA	LB	LC	LD	[kg]	[lb]
MR-RB032	30 (1.18)	15 (0.59)	119 (4.69)	99 (3.9)	0.5	1.1
MR-RB12	40 (1.58)	15 (0.59)	169 (6.69)	149 (5.87)	1.1	2.4

(b) MR-RB30・MR-RB31・MR-RB32

[Unit: mm (in)]



・Terminal block

P
C
G3
G4

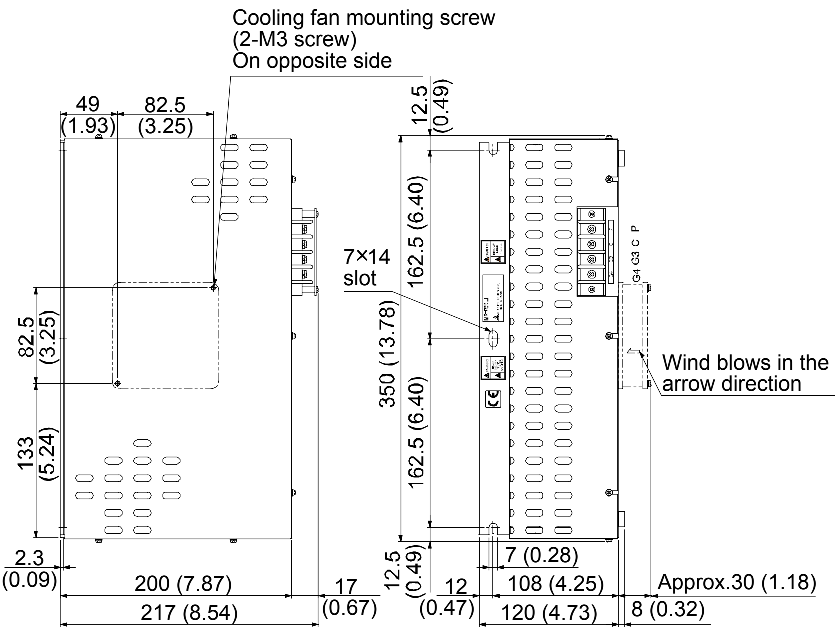
Terminal screw: M4
Tightening torque: 1.2 [N・m] (10.6 [lb・in])

・Mounting screw
Screw: M6
Tightening torque: 5.4 [N・m] (47.79 [lb・in])

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

(c) MR-RB50・MR-RB51

[Unit: mm (in)]



・Terminal block

P
C
G3
G4

Terminal screw: M4
Tightening torque: 1.2 [N・m]
(10.6 [lb・in])

・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	

15.1.2 FR-BU2 brake unit

POINT

- Use a 200V class brake unit and a resistor unit with a 200V class servo amplifier. Combination of different voltage class units and servo amplifier cannot be used.
- Install a brake unit and a resistor unit on a flat surface vertically. When the unit is installed horizontally or diagonally, the heat dissipation effect diminishes.
- Temperature of the resistor unit case rises to higher than 100℃. Keep cables and flammable materials away from the case.
- Ambient temperature condition of the brake unit is between −10℃ (14℉) and +50℃ (122℉). Note that the condition is different from the ambient temperature condition of the servo amplifier (0℃ (32℉) and +55℃ (131℉)).
- Configure the circuit to shut down the power-supply with the alarm output of the brake unit and resistor unit under abnormal condition.
- Use the brake unit with a combination indicated in this section (1).
- For executing a continuous regenerative operation, use FR-RC power regeneration converter.
- Brake unit and regenerative options (Regenerative resistor) cannot be used simultaneously.

Connect the brake unit to the bus of the servo amplifier. As compared to the MR-RB regenerative option, the brake unit can return larger power. Use the brake unit when the regenerative option cannot provide sufficient regenerative capability.
When using the brake unit, set the parameter No.0 of the servo amplifier to " 01□□".
When using the brake unit, always refer to the FR-BU2-(H) Brake Unit Instruction Manual.

(1) Selection

Use a combination of servo amplifier, brake unit and resistor unit listed below.

Brake unit	Resistor unit	Number of connected units	Permissible continuous power [kW]	Total resistance [Ω]	Applicable servo amplifier
FR-BU2-15K	FR-BR-15K	1	0.99	8	MR-J2S-350CP-S084 MR-J2S-500CP-S084
FR-BU2-30K	FR-BR-30K	1	1.99	4	MR-J2S-500CP-S084 MR-J2S-700CP-S084

(2) Brake unit parameter setting

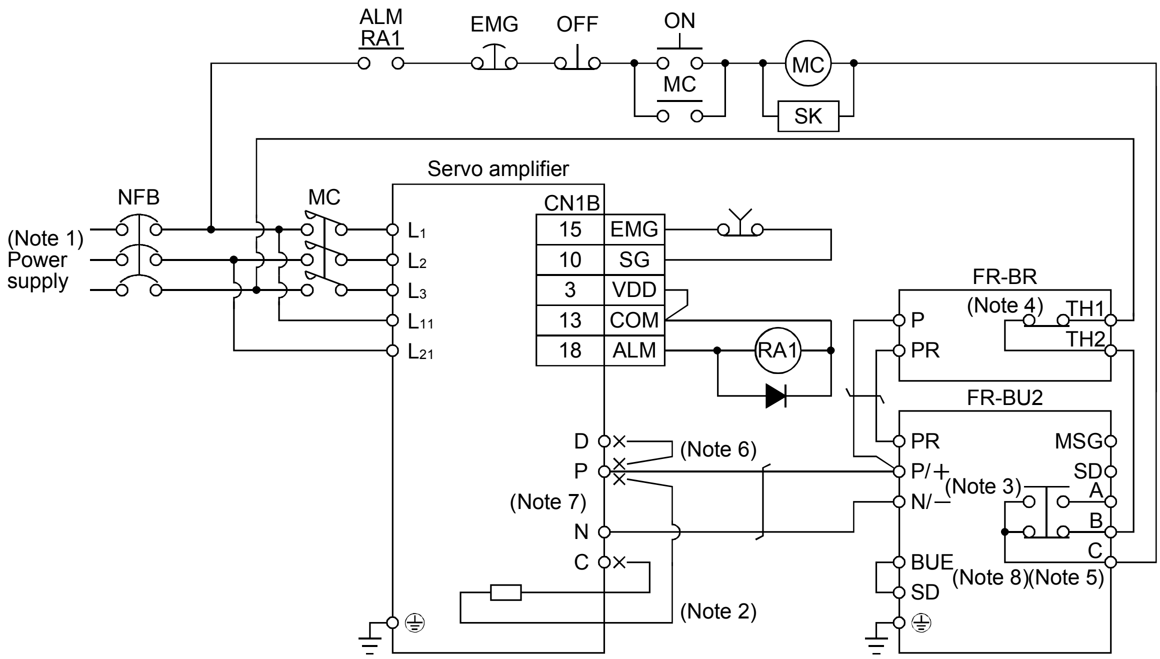
Normally, when using the FR-BU2, changing parameters is not necessary. Whether a parameter can be changed or not is listed below.

Parameter No.	Parameter Name	Change possible/ impossible	Remarks
0	Brake mode switchover	Impossible	Do not change the parameter.
1	Monitor display data selection	Possible	Refer to the FR-BU2-(H) Brake Unit Instruction Manual.
2	Input terminal function selection 1	Impossible	Do not change the parameter.
3	Input terminal function selection 2		
77	Parameter write selection		
78	Cumulative energization time carrying-over times		
CLr	Parameter clear		
ECL	Alarm history clear		
C1	For manufacturer setting		

(3) Connection example

POINT

- Connecting PR terminal of the brake unit to P terminal of the servo amplifier results in brake unit malfunction. Always connect the PR terminal of the brake unit to the PR terminal of the resistor unit.

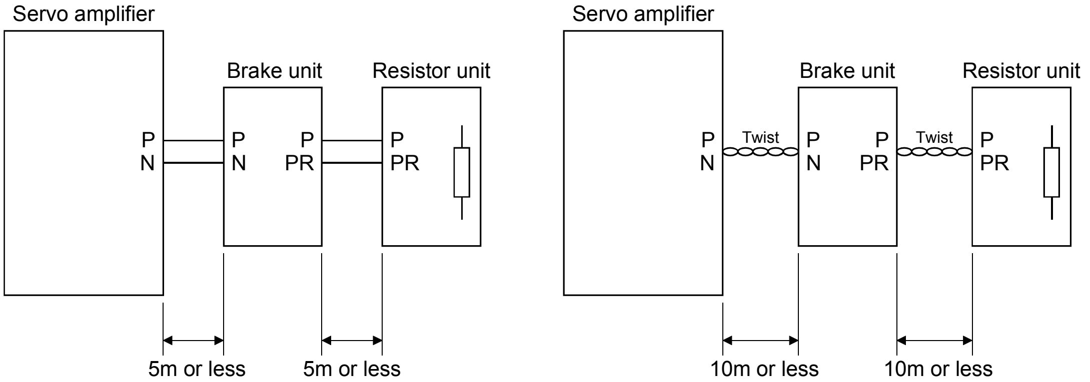


Note 1. For power supply specifications, refer to section 1.2.

2. For the servo amplifier of 5k and 7kW, always disconnect the lead of built-in regenerative resistor, which is connected to the P and C terminals.
3. Connect the P/＋ and N/－ terminals of the brake unit to a correct destination. Wrong connection results in servo amplifier and brake unit malfunction.
4. Contact rating: 1b contact, 110VAC_5A/220VAC_3A
   Normal condition: TH1-TH2 is conducting. Abnormal condition: TH1-TH2 is not conducting.
5. Contact rating: 230VAC_0.3A/30VDC_0.3A
   Normal condition: B-C is conducting/A-C is not conducting. Abnormal condition: B-C is not conducting/A-C is conducting.
6. For the servo amplifier of 3.5kW, always disconnect the wiring between P and D terminals.
7. Do not connect more than one cable to each P to N terminals of the servo amplifier.
8. Always connect between BUE and SD terminals (Factory-wired).

(a) Precautions for wiring

The cables between the servo amplifier and the brake unit, and between the resistor unit and the brake unit should be as short as possible. Always twist the cable longer than 5m (twist five times or more per one meter). Even when the cable is twisted, the cable should be less than 10m. Using cables longer than 5m without twisting or twisted cables longer than 10m, may result in the brake unit malfunction.

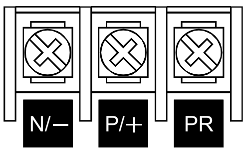


(b) Cables

1) Cables for the brake unit

For the brake unit, HIV cable (600V grade heat-resistant PVC insulated wire) is recommended.

a) Main circuit terminal

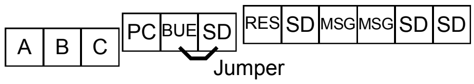


Terminal block

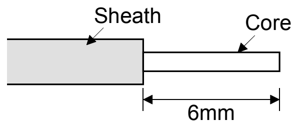
Brake unit	Main circuit terminal screw size	Crimping terminal N/−, P/+, PR, ⏚	Tightening torque [N・m] ([lb・in])	Cable size N/−, P/+, PR, ⏚ HIV cables, etc. [mm²]	Cable size N/−, P/+, PR, ⏚ AWG
FR-BU2-15K	M4	5.5-4	1.5(13.3)	3.5	12
FR-BU2-30K	M5	5.5-5	2.5(22.1)	5.5	10

b) Control circuit terminal

POINT
- Undertightening can cause a cable disconnection or malfunction. Overtightening can cause a short circuit or malfunction due to damage to the screw or the brake unit.



Terminal block



Wire the stripped cable after twisting to prevent the cable from becoming loose. In addition, do not solder it.
Screw size: M3
Tightening torque: 0.5N・m to 0.6N・m
Cable size: 0.3mm^2 to 0.75 mm^2
Screw driver: Small flat-blade screwdriver
(Tip thickness: 0.4mm/Tip width 2.5mm)

(c) Crimping terminals for P and N terminals of servo amplifier

POINT
- Always use recommended crimping terminals or equivalent since some crimping terminals cannot be installed depending on the size.

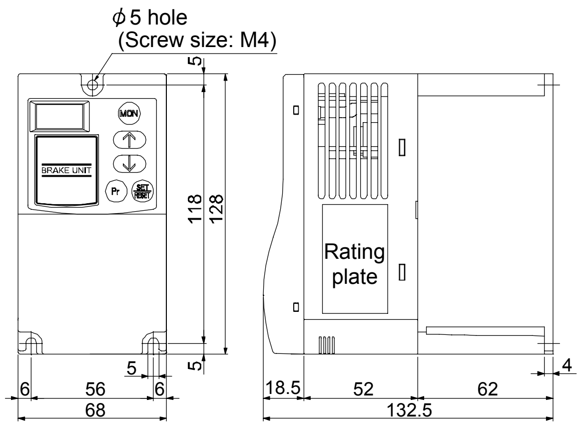
Servo amplifier	Brake unit	Number of connected units	Crimping terminal	Applicable tool	Manufacturer
MR-J2S-350CP-S084	FR-BU2-15K	1	FVD5.5-S4	YNT-1210S	Japan Solderless Terminal
MR-J2S-500CP-S084	FR-BU2-15K	1			
	FR-BU2-30K	1			
MR-J2S-700CP-S084	FR-BU2-30K	1			

(4) Outline dimension drawings

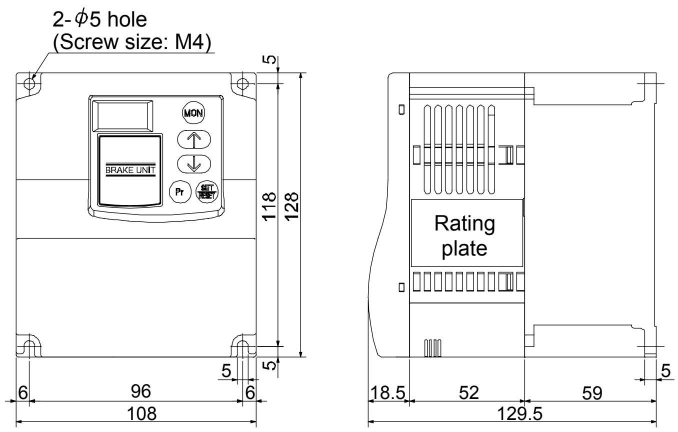
(a) FR-BU2 brake unit

[Unit: mm]

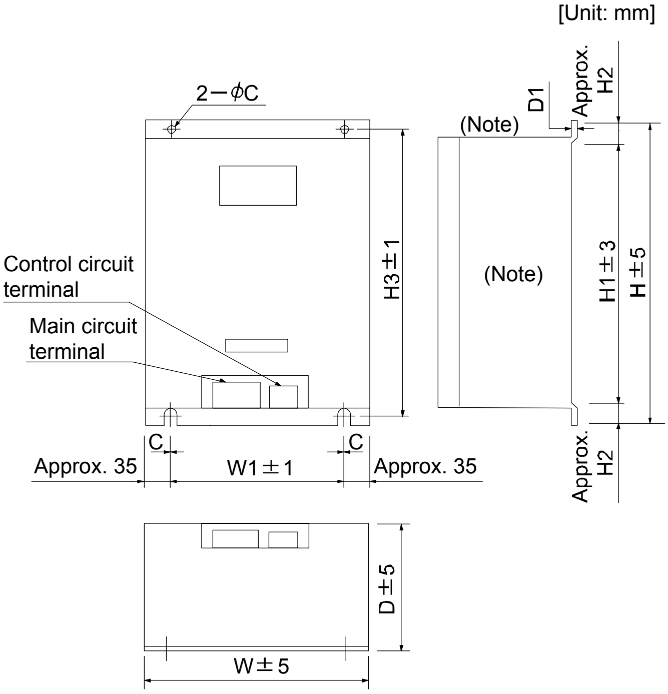
FR-BU2-15K



FR-BU2-30K



(b) FR-BR resistor unit



Note. Ventilation ports are provided on both sides and the top. The bottom is open.

Resistor unit	W	W1	H	H1	H2	H3	D	D1	C	Approximate mass [kg]([lb])
FR-BR-15K	170	100	450	410	20	432	220	3.2	6	15(33.1)
FR-BR-30K	340	270	600	560	20	582	220	4	10	30(66.1)

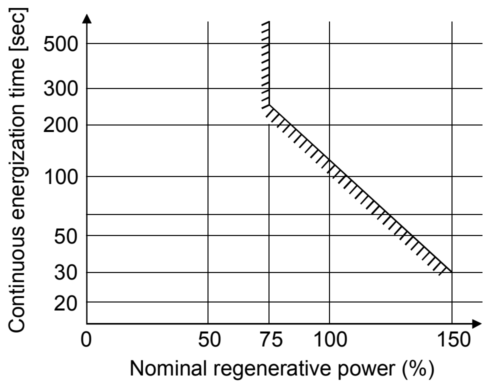
15.1.3 Power regeneration converter

When using the power regeneration converter, set "01□□" in parameter No. 0.

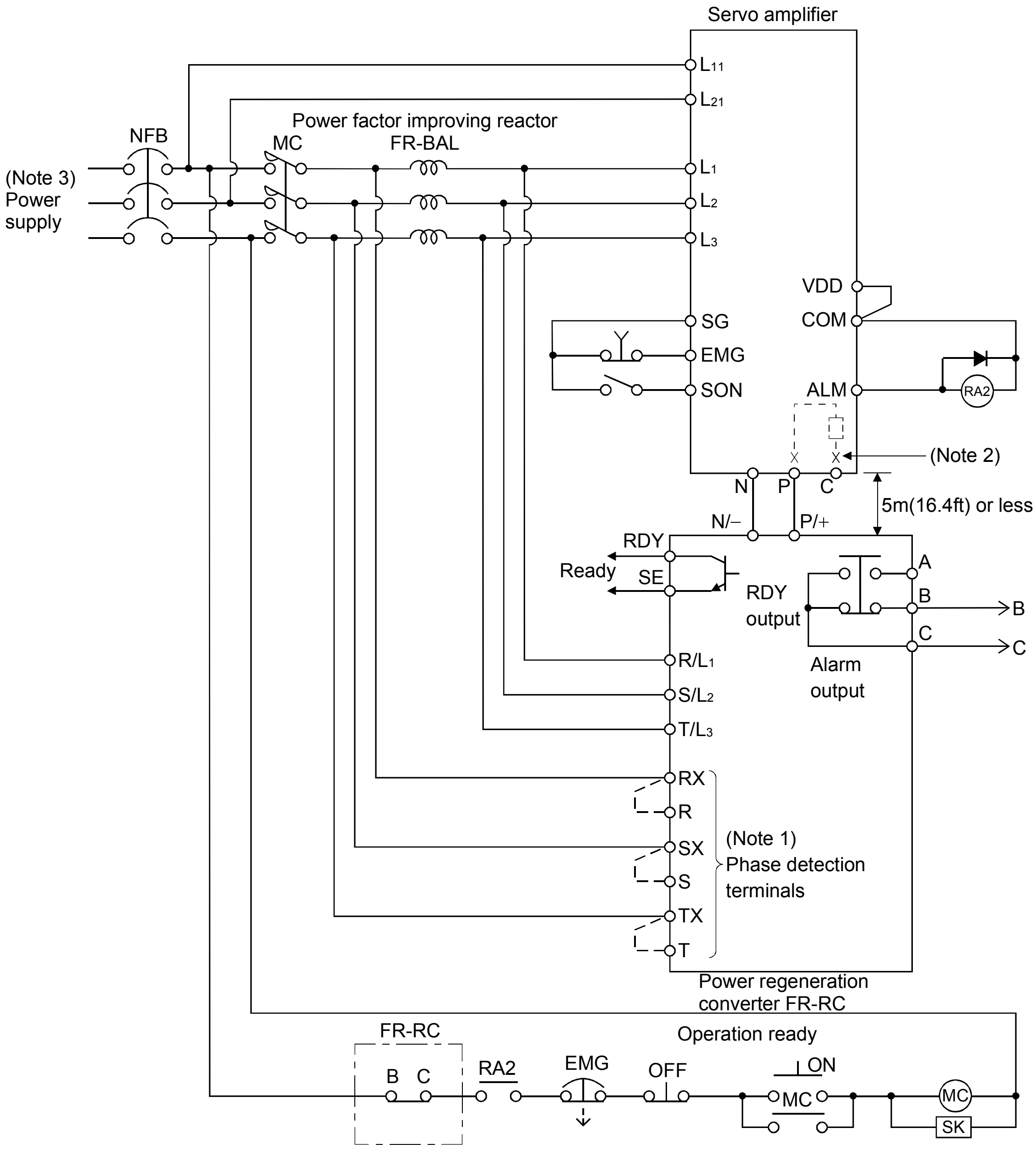
(1) Selection

The converters can continuously return 75% of the nominal regenerative power. They are applied to the servo amplifiers of the MR-J2S-500CP-S084 and MR-J2S-700CP-S084.

Power regeneration converter	Nominal regenerative power (kW)	Servo amplifier
FR-RC15	15	MR-J2S-500CP-S084
FR-RC30	30	MR-J2S-700CP-S084



(2) Connection example



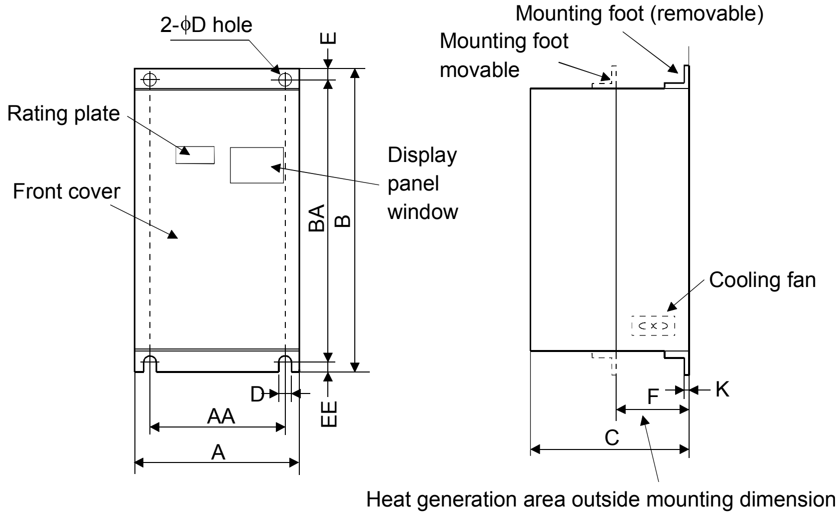
Note 1. When not using the phase detection terminals, fit short bars across RX-R, SX-S and TX-T. With the short bars removed, the FR-RC will not operate.

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. Refer to section 1.2 for the power supply specification.

(3) Outside dimensions of the power regeneration converters

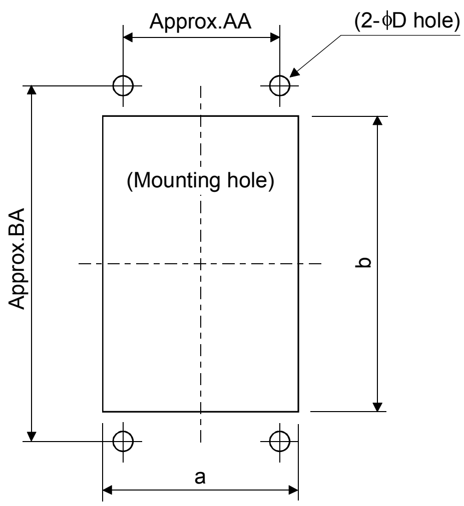
[Unit: mm (in)]



Power regeneration converter	A	AA	B	BA	C	D	E	EE	K	F	Approx. Mass [kg(lb)]
FR-RC-15K	270 (10.630)	200 (7.874)	450 (17.717)	432 (17.008)	195 (7.677)	10 (0.394)	10 (0.394)	8 (0.315)	3.2 (0.126)	87 (3.425)	19 (41.888)
FR-RC-30K	340 (13.386)	270 (10.630)	600 (23.622)	582 (22.913)	195 (7.677)	10 (0.394)	10 (0.394)	8 (0.315)	3.2 (0.126)	90 (3.543)	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.



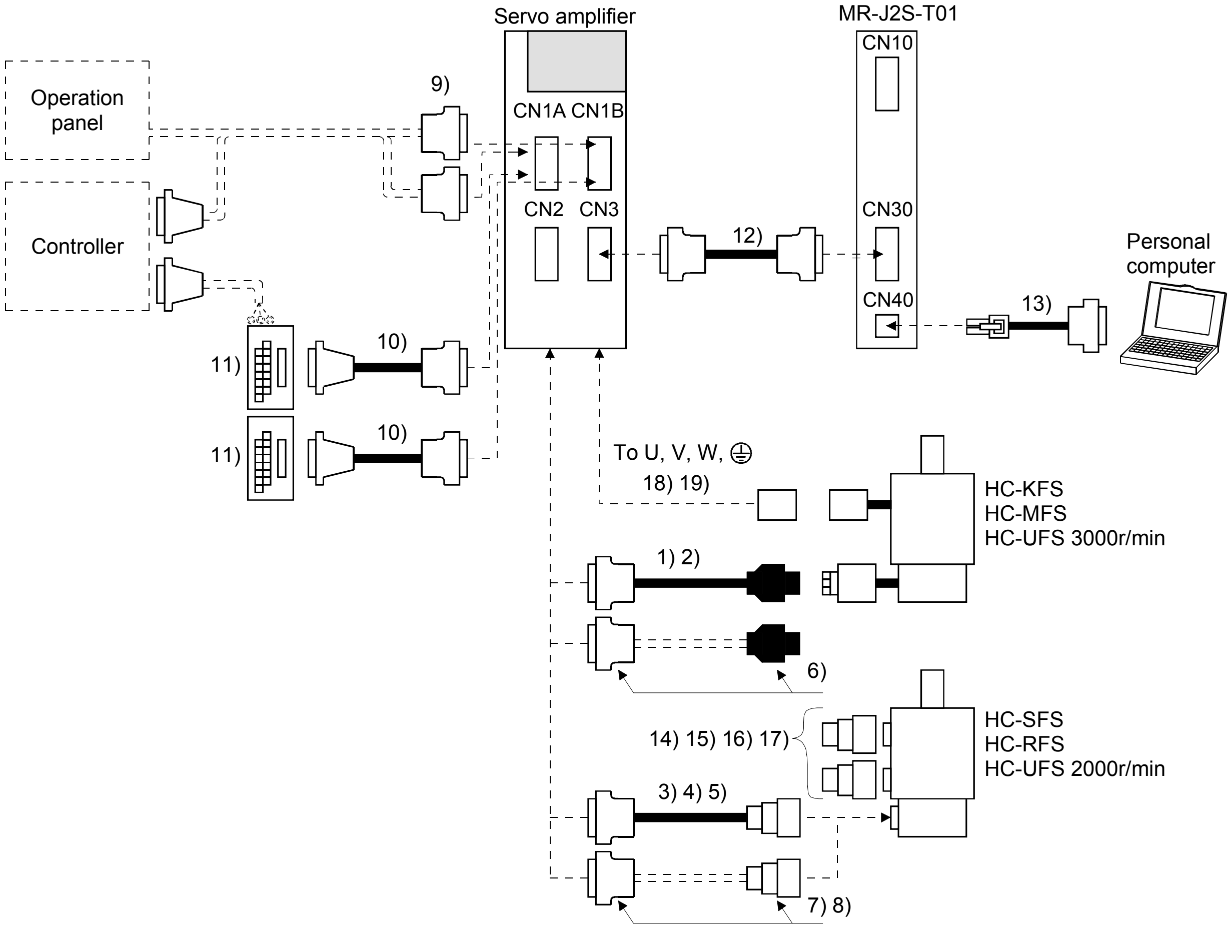
[Unit: mm (in)]

Model	A	B	D	AA	BA
FR-RC-15K	260 (10.236)	412 (16.220)	10 (0.394)	200 (7.874)	432 (17.009)
FR-RC-30K	330 (12.992)	562 (22.126)	10 (0.394)	270 (10.630)	582 (22.913)

15.1.4 Cables and connectors

(1) Cable make-up

The following cables are used for connection with the servo motor and other models. Those indicated by broken lines in the figure are not options.



No.	Product	Model	Description	Application
1)	Standard encoder cable	MR-JCCBL□M-L Refer to (2) in this section.	Connector: 10120-3000PE Shell kit: 10320-52F0-008 (3M or equivalent) Housing: 1-172161-9 Connector pin: 170359-1 (Tyco Electronics or equivalent) Cable clamp: MTI-0002 (Toa Electric Industry)	Standard flexing life IP20
2)	Long flexing life encoder cable	MR-JCCBL□M-H Refer to (2) in this section.		Long flexing life IP20
3)	Standard encoder cable	MR-JHSCBL□M-L Refer to (2) in this section.	Connector: 10120-3000PE Shell kit: 10320-52F0-008 (3M or equivalent) Connector: D/MS3106B20-29S Cable clamp: D/MS3057-12A (DDK)	Standard flexing life IP20
4)	Long flexing life encoder cable	MR-JHSCBL□M-H Refer to (2) in this section.		Long flexing life
5)	IP65-compliant encoder cable	MR-ENCBL□M-H Refer to (2) in this section.	Connector: 10120-3000PE Shell kit: 10320-52F0-008 (3M or equivalent) Connector: D/MS3106A20-29S (D190) Cable clamp: CE3057-12A-3 -D Back shell: CE02-20BS-S-D (DDK) 	Long flexing life IP65 IP67 Not oil-resistant.
6)	Encoder connector set	MR-J2CNM	Connector: 10120-3000PE Shell kit: 10320-52F0-008 (3M or equivalent) Housing: 1-172161-9 Pin: 170359-1 (Tyco Electronics or equivalent) Cable clamp: MTI-0002 (Toa Electric Industry) 	IP20
7)	Encoder connector set	MR-J2CNS	Connector: 10120-3000PE Shell kit: 10320-52F0-008 (3M or equivalent) Connector: D/MS3106B20-29S Cable clamp: D/MS3057-12A (DDK) 	IP20
8)	Encoder connector set	MR-ENCNS	Connector: 10120-3000PE Shell kit: 10320-52F0-008 (3M or equivalent) Connector: D/MS3106A20-29S (D190) Cable clamp: CE3057-12A-3-D Back shell: CE02-20BS-S-D (DDK) 	IP65 IP67

No.	Product	Model	Description	Application
9)	Control signal connector set	MR-J2CN1	Connector: 10120-3000PE Shell kit: 10320-52F0-008 (3M or equivalent) Qty: 2 each	
10)	Junction terminal block cable	MR-J2TBL□M Refer to section15.1.5.	Connector: HIF3BA-20D-2.54R (Hirose Electric) Connector: 10120-6000EL Shell kit: 10320-3210-000 (3M or equivalent)	For MR-J2S-T01 connection
11)	Junction terminal block	MR-TB20	Refer to section 15.1.5.	
12)	Bus cable	MR-J2HBUS05M	Connector: 10120-6000EL Shell kit: 10320-3210-000 (3M or equivalent) Connector: 10120-6000EL Shell kit: 10320-3210-000 (3M or equivalent)	For maintenance junction card connection
13)	Communication cable	Refer to (3) in this section.	Connector: 5557-04R-210 Terminal: 5556 (Molex) Connector: DE-9SF-N Case: DE-C1-J6-S6 (JAE)	For connection with PC-AT-compatible personal computer
14)	Power supply connector set	MR-PWCNS1 Refer to the Servo Motor Instruction Manual.	Connector: CE05-6A22-23SD-D-BSS Cable clamp:CE3057-12A-2-D (DDK)	Must be used to comply with the EN Standard. IP65 IP67
15)	Power supply connector set	MR-PWCNS2 Refer to the Servo Motor Instruction Manual.	Connector: CE05-6A24-10SD-D-BSS Cable clamp: CE3057-16A-2-D (DDK)	
16)	Power supply connector set	MR-PWCNS3 Refer to the Servo Motor Instruction Manual.	Plug: CE05-6A32-17SD-D-BSS Cable clamp: CE3057-20A-1-D (DDK)	
17)	Brake connector set	MR-BKCN Refer to the Servo Motor Instruction Manual.	Plug: D/MS3106A10SL-4S (D190) (DDK) Cable connector: YS010-5-8 (Daiwa Dengyo)	EN Standard-compliant IP65 IP67
18)	Power supply connector set	MR-PWCNK1 Refer to the Servo Motor Instruction Manual.	Plug: 5559-04P-210 Terminal: 5558PBT3L (For AWG16)(6 pcs.) (Molex)	IP20
19)	Power supply connector set	MR-PWCNK2	Plug: 5559-06P-210 Terminal: 5558PBT3L (For AWG16)(8 pcs.) (Molex)	For motor with brake IP20

(2) Encoder cable

CAUTION	・If you have fabricated the encoder cable, connect it correctly. Otherwise, misoperation or explosion may occur.

POINT

- The encoder cable is not oil resistant.
- Refer to section 14.4 for the flexing life of the encoder cable.
- When the encoder cable is used, the sum of the resistance values of the cable used for P5 and the cable used for LG should be within 2.4Ω.
- When soldering the wire to the connector pin, insulate and protect the connection portion using heat-shrinkable tubing.

Generally use the encoder cable available as our options. If the required length is not found in the options, fabricate the cable on the customer side.

(a) MR-JCCBL□M-L・MR-JCCBL□M-H

These encoder cables are used with the HC-KFS・HC-MFS・HC-UFS3000r/min series servo motors.

1) Model explanation

Model: MR-JCCBL□M-□

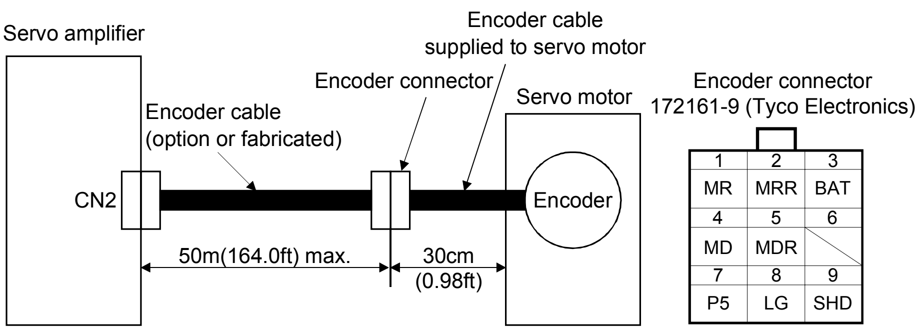
Symbol	Specifications
L	Standard flexing life
H	Long flexing life

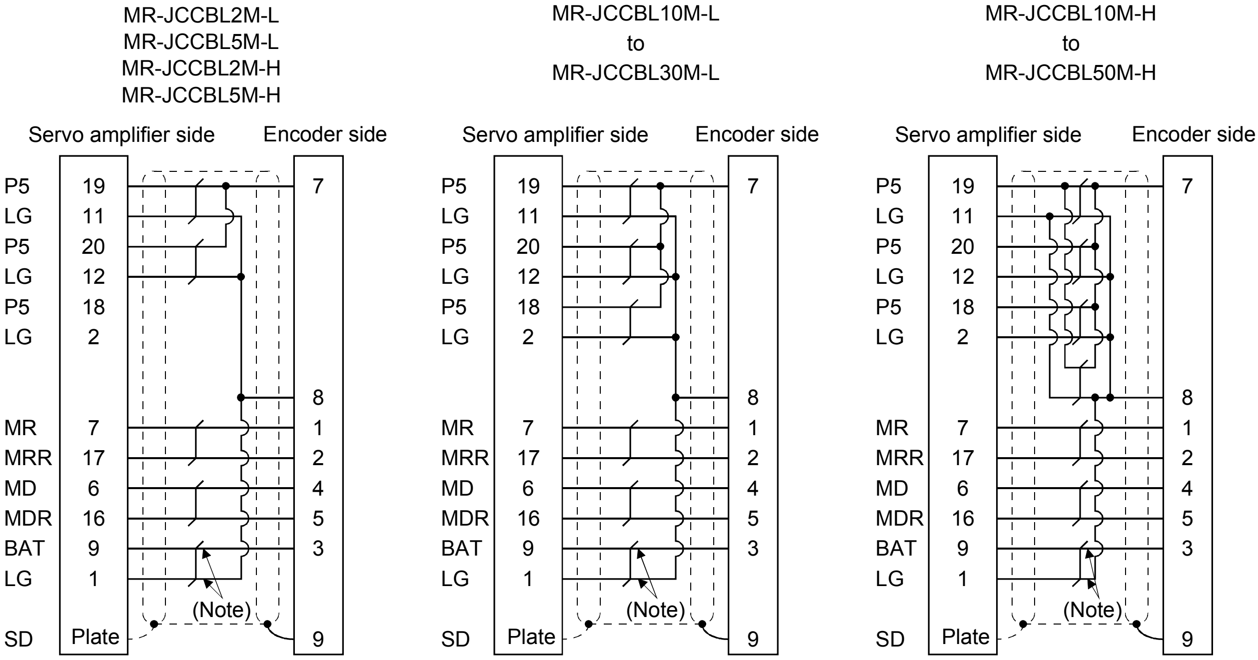
Symbol	(Note) Cable length [m(ft)]
2	2 (6.56)
5	5 (16.4)
10	10 (32.8)
20	20 (65.6)
30	30 (98.4)
40	40 (131.2)
50	50 (164.0)

Note. MR-JCCBL□M-H has no 40(131.2) and 50m(164.0ft) sizes.

2) Connection diagram

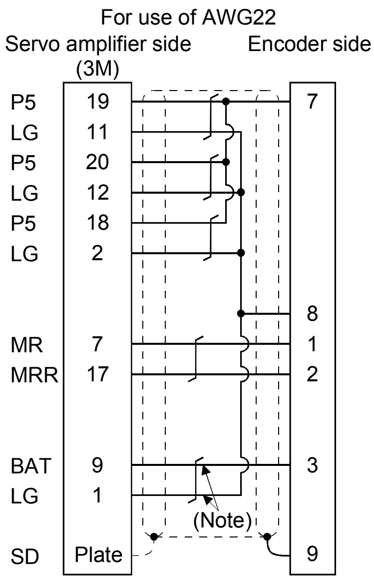
For the pin assignment on the servo amplifier side, refer to section 4.3.1.





Note. Always make connection for use in an absolute position detection system.
This wiring is not needed for use in an incremental system.

When fabricating an encoder cable, use the recommended wires given in section 15.2.1 and the MR-J2CNM connector set for encoder cable fabrication, and fabricate an encoder cable as shown in the following wiring diagram. Referring to this wiring diagram, you can fabricate an encoder cable of up to 50m(164.0ft) length including the length of the encoder cable supplied to the servo motor.
When the encoder cable is to be fabricated by the customer, the wiring of MD and MDR is not required. Refer to chapter 3 of the servo motor instruction guide and choose the encode side connector according to the servo motor installation environment.



Note. Always make connection for use in an absolute position detection system.
This wiring is not needed for use in an incremental system.

(b) MR-JHSCBL□M-L・MR-JHSCBL□M-H・MR-ENCBL□M-H

These encoder cables are used with the HC-SFS・HC-RFS・HC-UFS2000r/min series servo motors.

1) Model explanation

Model: MR-JHSCBL□M- □

Symbol	Specifications
L	Standard flexing life
H	Long flexing life

Symbol	Cable length [m(ft)]
2	2 (6.56)
5	5 (16.4)
10	10 (32.8)
20	20 (65.6)
30	30 (98.4)
40	40 (131.2)
50	50 (164.0)

Note. MR-JHSCBL□M-L has
no 40(131.2) and 50m(164.0ft) sizes.

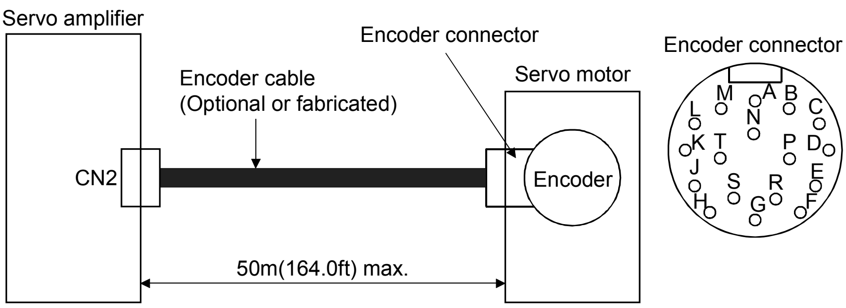
Model: MR-ENCBL□M-H

Long flexing life

Symbol	Cable length [m(ft)]
2	2 (6.56)
5	5 (16.4)
10	10 (32.8)
20	20 (65.6)
30	30 (98.4)
40	40 (131.2)
50	50 (164.0)

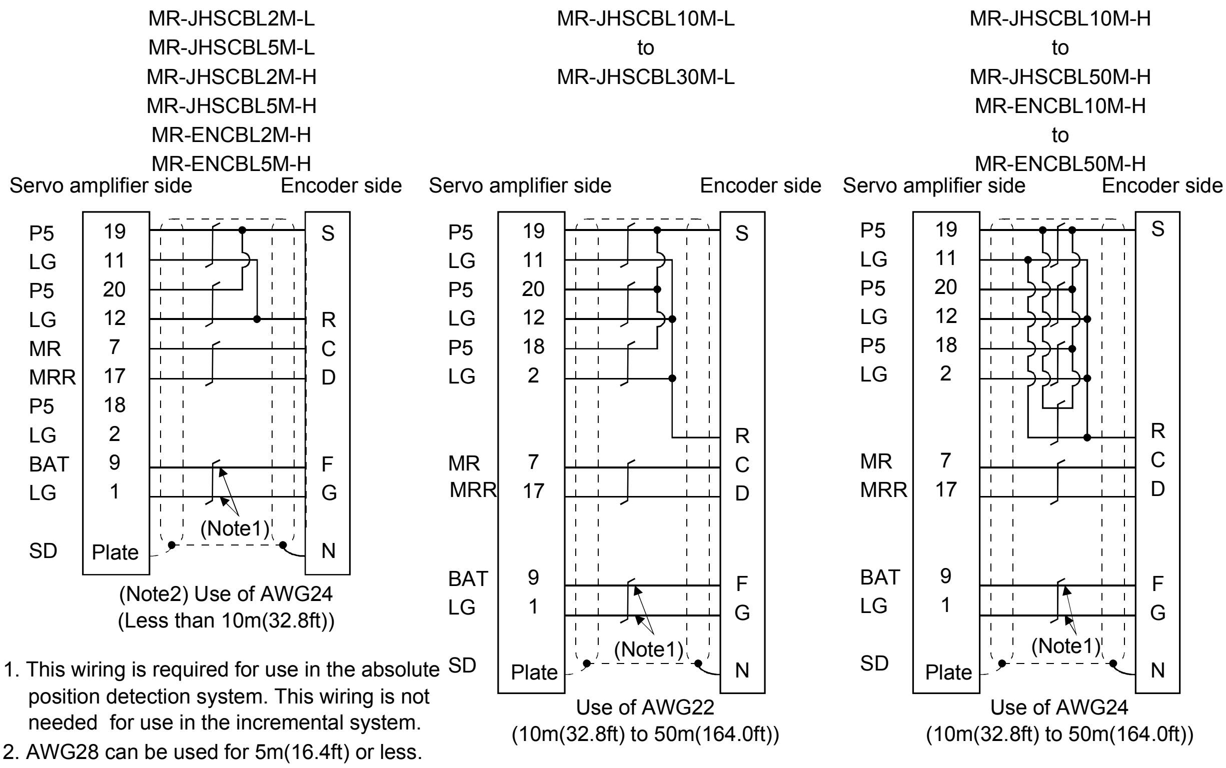
2) Connection diagram

For the pin assignment on the servo amplifier side, refer to section 4.3.1.



Pin	Signal
A	MD
B	MDR
C	MR
D	MRR
E	
F	BAT
G	LG
H	
J	

Pin	Signal
K	
L	
M	
N	SHD
P	
R	LG
S	P5
T	



Note 1. This wiring is required for use in the absolute position detection system. This wiring is not needed for use in the incremental system.

2. AWG28 can be used for 5m(16.4ft) or less.

When fabricating an encoder cable, use the recommended wires given in section 15.2.1 and the MR-J2CNS connector set for encoder cable fabrication, and fabricate an encoder cable in accordance with the optional encoder cable wiring diagram given in this section. You can fabricate an encoder cable of up to 50m(164.0ft) length.

Refer to chapter 3 of the servo motor instruction guide and choose the encode side connector according to the servo motor installation environment.

(3) Communication cable (MR-JRCATCBL3M)

POINT
・This cable may not be used with some personal computers. After fully examining the signals of the RS-232C connector, refer to this section and fabricate the cable.

Select the communication cable according to the shape of the RS-232C connector of the personal computer used. When fabricating the cable, refer to the connection diagram in this section.

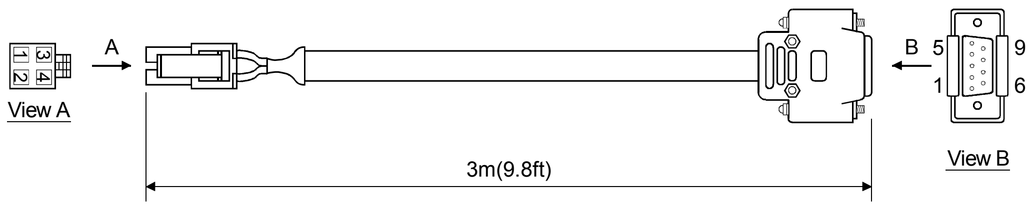
(a) Fabricating instructions

The following must be observed in fabrication.

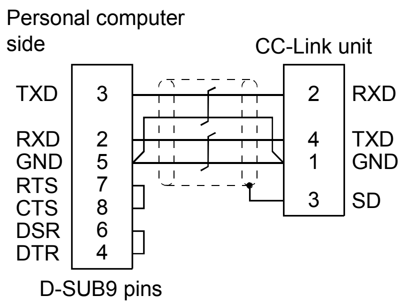
1) Always use a shielded, multi-core cable and connect the shield with FG securely.

2) The optional communication cable is 3m (9.8 ft) long. When the cable is fabricated, its maximum length is 15m (49 ft) in offices of good environment with minimal noise.

(b) Outline drawing



(c) Connection diagram

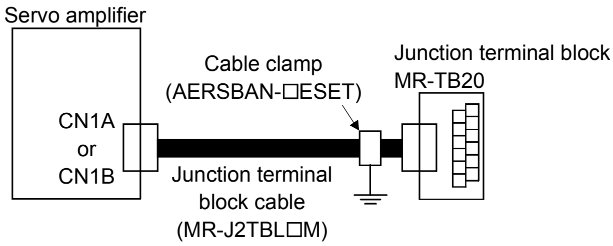


15.1.5 Junction terminal block (MR-TB20)

POINT
・When using the junction terminal block, you cannot use SG of CN1A-20 and CN1B-20. Use SG of CN1A-4 and CN1B-4.

(1) How to use the junction terminal block

Always use the junction terminal block (MR-TB20) with the junction terminal block cable (MR-J2TBL□M) as a set. A connection example is shown below.



Ground the junction terminal block cable on the junction terminal block side with the standard accessory cable clamp fitting (AERSBAN□ESET). For the use of the cable clamp fitting, refer to section 15.2.6, (2)(c).

(2) Terminal labels

The junction terminal block does not include the terminal block labels which indicate the signal layouts for MR-J2S-CP-S084. Cut off the terminal block label in Appendix 2 at the dotted line and fold it up at the centerline for use.

1) For CN1A

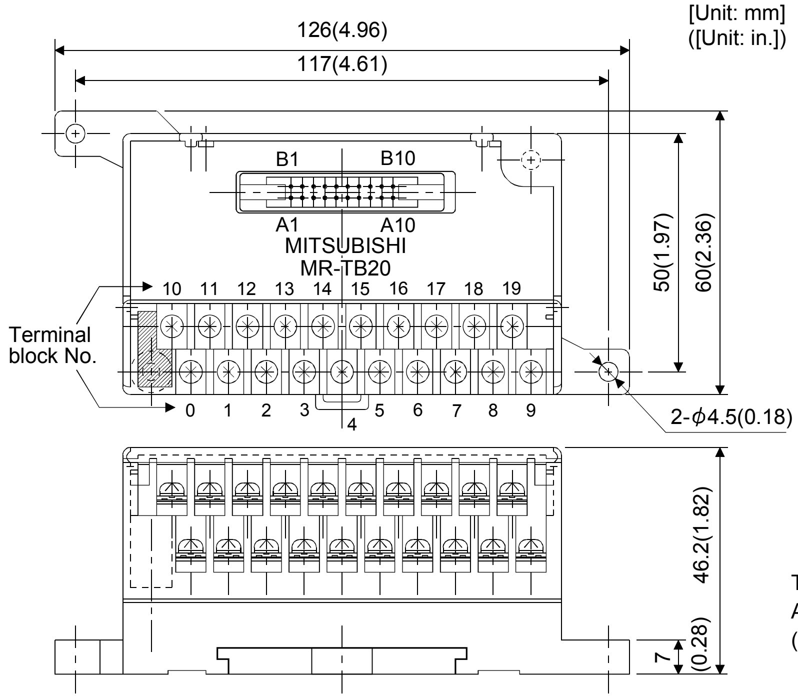
LG 10	11	12	13	COM 14	OPC 15	16	17	18	19	
	0	P15R 1	2	3	SG 4	5	6	7	8	SD 9

2) For CN1B

LG 10	VDD 11	12	13	14	P15R 15	COM 16	17	18	19	
	0	1	2	3	SG 4	5	6	7	8	SD 9

(3) Outline drawing

[Unit: mm]
([Unit: in.])



Terminal screw: M3.5
Applicable cable: Max. $2mm^2$
(Crimping terminal width: 7.2mm (0.283 in) max.)

(4) Junction terminal block cable (MR-J2TBL□M)

Model : MR-J2TBL□M

Symbol	Cable length[m(ft)]
05	0.5 (1.64)
1	1 (3.28)

Junction terminal block side connector (Hirose Electric)
HIF3BA-20D-2.54R (connector)

Servo amplifier side (CN1A・CN1B) connector (3M)
10120-6000EL (connector)
10320-3210-000 (shell kit)

(Note)

Terminal block label For CN1A	Terminal block label For CN1B	Junction terminal block terminal No.	Pin No.	Pin No.
LG	LG	10	B1	1
		0	A1	2
	VDD	11	B2	3
P15R		1	A2	4
		12	B3	5
		2	A3	6
		13	B4	7
		3	A4	8
COM		14	B5	9
SG	SG	4	A5	10
OPC	P15R	15	B6	11
		5	A6	12
	COM	16	B7	13
		6	A7	14
		17	B8	15
		7	A8	16
		18	B9	17
		8	A9	18
		19	B10	19
SD	SD	9	A10	20
				Plate

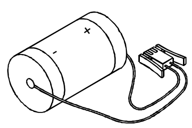
Note. In the blank, any signal can be set using the parameter.

15.1.6 Battery (MR-BAT, A6BAT)

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 September, 2007).

Use the battery to build an absolute position detection system.



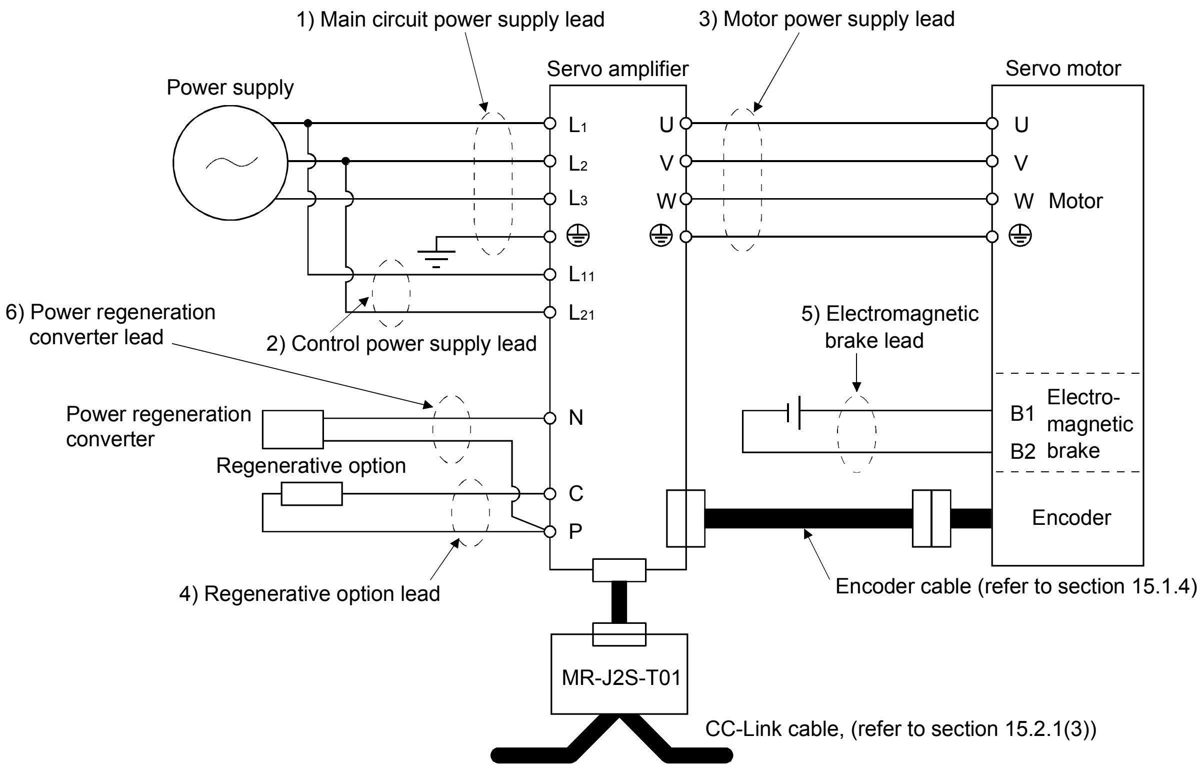
15.2 Auxiliary equipment

Always use the devices indicated in this section or equivalent. To comply with the EN Standard or UL/C-UL (CSA) Standard, use the products which conform to the corresponding standard.

15.2.1 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.



The following table lists wire sizes. The wires used assume that they are 600V vinyl wires and the wiring distance is 30m(98.4ft) max. If the wiring distance is over 30m(98.4ft), choose the wire size in consideration of voltage drop.

The alphabets (a, b, c) in the table correspond to the crimping terminals (Table 15.2) used to wire the servo amplifier. For connection with the terminal block TE2 of the MR-J2S-100CP-S084 or less, refer to section 4.11.

The servo motor side connection method depends on the type and capacity of the servo motor. Refer to section 4.8.

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

Table 15.1 Recommended wires

<table>
<tr><th rowspan="2">Servo amplifier</th><th colspan="5">(Note 1) Wires [mm²]</th></tr>
<tr><th>1) L1 ・ L2 ・ L3</th><th>2) L11 ・ L21</th><th>3) U ・ V ・ W ・ ⏚</th><th>4) P ・ C</th><th>5) B1 ・ B2</th></tr>
<tr><td>MR-J2S-10CP(1)-S084</td><td rowspan="6">2 (AWG14) : a</td><td rowspan="10">1.25 (AWG16)</td><td rowspan="5">1.25 (AWG16) : a</td><td rowspan="9">2 (AWG14) : a</td><td rowspan="10">1.25 (AWG16)</td></tr>
<tr><td>MR-J2S-20CP(1)-S084</td></tr>
<tr><td>MR-J2S-40CP(1)-S084</td></tr>
<tr><td>MR-J2S-60CP-S084</td></tr>
<tr><td>MR-J2S-70CP-S084</td></tr>
<tr><td>MR-J2S-100CP-S084</td><td>2 (AWG14) : a</td></tr>
<tr><td>MR-J2S-200CP-S084</td><td>3.5 (AWG12) : b</td><td>3.5 (AWG12) : b</td></tr>
<tr><td>MR-J2S-350CP-S084</td><td rowspan="2">5.5 (AWG10) : b</td><td>(Note 2)
5.5 (AWG10) : b</td></tr>
<tr><td>MR-J2S-500CP-S084</td><td>5.5 (AWG10) : b</td></tr>
<tr><td>MR-J2S-700CP-S084</td><td>8 (AWG8) : c</td><td>8 (AWG8) : c</td><td>3.5(AW12) : c</td></tr>
</table>

Note 1. For the crimping terminals and applicable tools, refer to table 15.2.

2. 3.5mm² for use of the HC-RFS203 servo motor.

Use wires 6) of the following sizes with the power regeneration converter (FR-RC).

Model	Wires[mm²]
FR-RC-15K	14(AWG6)

Table 15.2 Recommended crimping terminals

<table>
<tr><th rowspan="2">Symbol</th><th colspan="3">Servo amplifier side crimping terminals</th></tr>
<tr><th>Crimping terminal</th><th>Applicable tool</th><th>Manufacturer</th></tr>
<tr><td>a</td><td>32959</td><td>47387</td><td>Tyco Electronics</td></tr>
<tr><td>b</td><td>EVD5.5-4</td><td>YNT-1210S</td><td rowspan="2">Japan Solderless Terminal</td></tr>
<tr><td>c</td><td>FVD8-5</td><td>Body YF-1 ・ E-4
Head YNE-38
Die DH-111 ・ DH-121</td></tr>
</table>

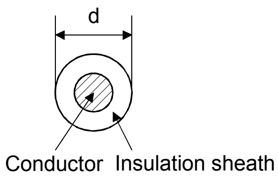
(2) Wires for cables

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

Table 15.3 Wires for option cables

Type	Model	Length [m(ft)]	Core size [mm^2]	Number of Cores	Characteristics of one core			(Note 3) Finishing OD [mm]	Wire model
					Structure [Wires/mm]	Conductor resistance[Ω/mm]	Insulation coating ODd[mm] (Note 1)		
Encoder cable	MR-JCCBL□M-L	2 to 10 (6.56 to 32.8)	0.08	12 (6 pairs)	7/0.127	222	0.38	5.6	UL20276 AWG#28 6pair (BLACK)
		20・30 (65.6・98.4)	0.3	12 (6 pairs)	12/0.18	62	1.2	8.2	UL20276 AWG#22 6pair (BLACK)
	MR-JCCBL□M-H	2・5 (6.56・16.4)	0.2	12 (6 pairs)	40/0.08	105	0.88	7.2	(Note 2) A14B2343 6P
		10 to 50 (32.8 to 164)	0.2	14 (7 pairs)	40/0.08	105	0.88	8.0	(Note 2) A14B0238 7P
	MR-JHSCBL□M-L	2・5 (6.56・16.4)	0.08	8 (4 pairs)	7/0.127	222	0.38	4.7	UL20276 AWG#28 4pair (BLACK)
		10 to 30 (32.8 to 98.4)	0.3	12 (6 pairs)	12/0.18	62	1.2	8.2	UL20276 AWG#22 6pair (BLACK)
	MR-JHSCBL□M-H	2・5 (6.56・16.4)	0.2	8 (4 pairs)	40/0.08	105	0.88	6.5	(Note 2) A14B2339 4P
		10 to 50 (32.8 to 164)	0.2	12 (6 pairs)	40/0.08	105	0.88	7.2	(Note 2) A14B2343 6P
	MR-ENCBL□M-H	2・5 (6.56・16.4)	0.2	8 (4 pairs)	40/0.08	105	0.88	6.5	(Note 2) A14B2339 4P
		10 to 50 (32.8 to 164)	0.2	12 (6 pairs)	40/0.08	105	0.88	7.2	(Note 2) A14B2343 6P
Communication cable	MR-CPCATCBL3M	3 (9.84)	0.08	6 (3 pairs)	7/0.127	222	0.38	4.6	UL20276 AWG#28 3pair (BLACK)

Note 1. d is as shown below.



2. Purchased from Toa Electric Industry
3. Standard OD. Max. OD is about 10% greater.

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

Item	Specifications
Model	FANC-110SBH
Manufacturer	Kuramo Electric
Application	For fixed parts
Size	20AWG×3
Insulator material	Polyethylene foam
Insulator color	Blue, white, and yellow
Sheath material	Oil resistant vinyl
Sheath color	Brown
Operating temperature range (Note)	0 to 75 ℃ (32 to 167°F)
Tensile strength	49N
Minimum bend radius	35mm
Outline dimension	Approx. 7.6mm
Approximate mass	70kg/km
Conductor resistance (20℃)	34.5Ω/km or lower
Characteristic impedance	110±15Ω
Applicable specification	UL AWM Style 2464
	CAN/CSA-C22.2
	No.210.2-M90(cUL)

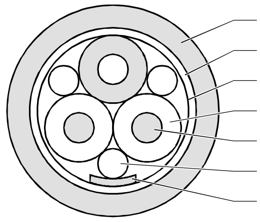


Fig. 15.1 Structure

Note. An upper limit of the operating temperature range shows a heat-resistant temperature of the cable material.
In high-temperature environment, the transmittable distance may be reduced.

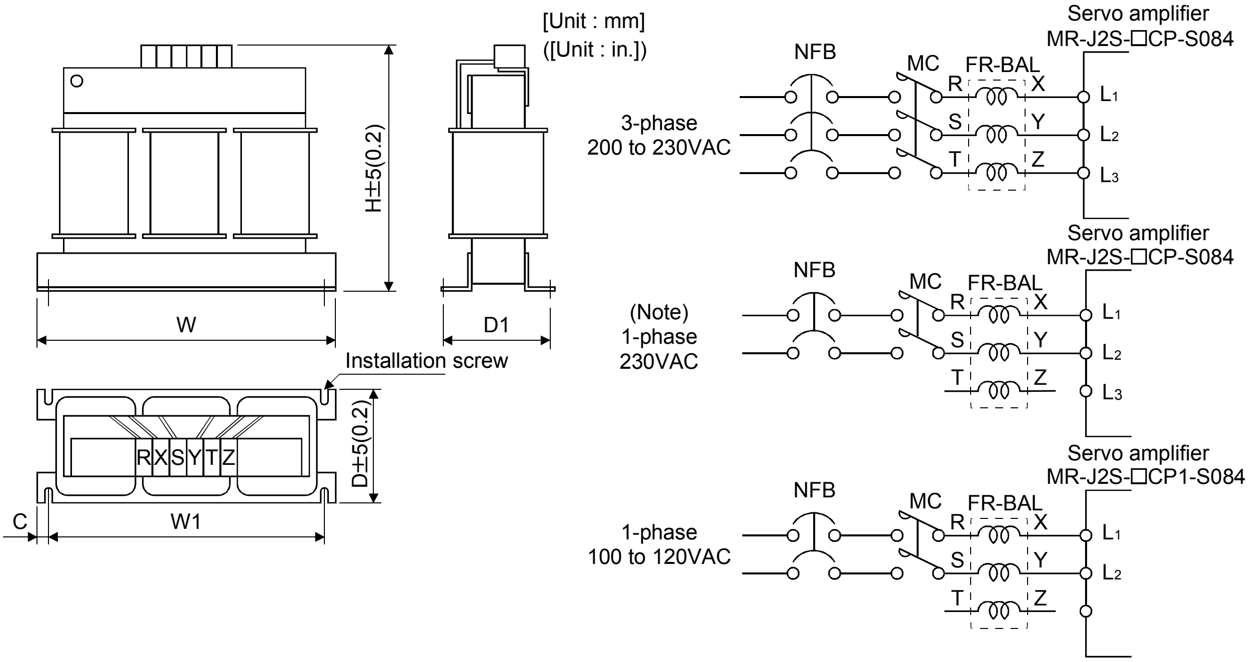
15.2.2 No-fuse breakers, fuses, magnetic contactors

Always use one no-fuse breaker and one magnetic contactor with one servo amplifier. When using a fuse instead of the no-fuse breaker, use the one having the specifications given in this section.

Servo amplifier	No-fuse breaker	Fuse			Magnetic contactor
		Class	Current [A]	Voltage [V]	
MR-J2S-10CP(1)-S084	30 frame 5A	K5	10	250AC	S-N10
MR-J2S-20CP-S084	30 frame 5A	K5	10		
MR-J2S-40CP-S084・20CP1-S084	30 frame 10A	K5	15		
MR-J2S-60CP-S084・40CP1-S084	30 frame 15A	K5	20		
MR-J2S-70CP-S084	30 frame 15A	K5	20		
MR-J2S-100CP-S084	30 frame 15A	K5	25		
MR-J2S-200CP-S084	30 frame 20A	K5	40		S-N18
MR-J2S-350CP-S084	30 frame 30A	K5	70		S-N20
MR-J2S-500CP-S084	50 frame 50A	K5	125		S-N35
MR-J2S-700CP-S084	100 frame 75A	K5	150		S-N50

15.2.3 Power factor improving reactors

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%.



Note. Connect a 1-phase 230VAC power supply to L_1/L_2 and keep L_3 open.

Servo amplifier	Model	Dimensions [mm (in)]						Mounting screw size	Terminal screw size	Mass [kg (lb)]
		W	W1	H	D	D1	C			
MR-J2S-10CP(1)-S084/ 20CP-S084	FR-BAL-0.4K	135 (5.31)	120 (4.72)	115 (4.53)	59 (2.32)	$45^{0}_{-2.5}$ $(1.77^{0}_{-0.098})$	7.5 (0.29)	M4	M3.5	2.0 (4.4)
MR-J2S-40CP-S084/ 20CP1-S084	FR-BAL-0.75K	135 (5.31)	120 (4.72)	115 (4.53)	69 (2.72)	$57^{0}_{-2.5}$ $(2.24^{0}_{-0.098})$	7.5 (0.29)	M4	M3.5	2.8 (6.17)
MR-J2S-60CP-S084/ 70CP-S084/ 40CP1-S084	FR-BAL-1.5K	160 (6.30)	145 (5.71)	140 (5.51)	71 (2.79)	$55^{0}_{-2.5}$ $(2.17^{0}_{-0.098})$	7.5 (0.29)	M4	M3.5	3.7 (8.16)
MR-J2S-100CP-S084	FR-BAL-2.2K	160 (6.30)	145 (5.71)	140 (5.51)	91 (3.58)	$75^{0}_{-2.5}$ $(2.95^{0}_{-0.098})$	7.5 (0.29)	M4	M3.5	5.6 (12.35)
MR-J2S-200CP-S084	FR-BAL-3.7K	220 (8.66)	200 (7.87)	192 (7.56)	90 (3.54)	$70^{0}_{-2.5}$ $(2.76^{0}_{-0.098})$	10 (0.39)	M5	M4	8.5 (18.74)
MR-J2S-350CP-S084	FR-BAL-7.5K	220 (8.66)	200 (7.87)	194 (7.64)	120 (4.72)	$100^{0}_{-2.5}$ $(3.94^{0}_{-0.098})$	10 (0.39)	M5	M5	14.5 (32.0)
MR-J2S-500CP-S084	FR-BAL-11K	280 (11.02)	255 (10.04)	220 (8.66)	135 (5.31)	$100^{0}_{-2.5}$ $(3.94^{0}_{-0.098})$	12.5 (0.49)	M6	M6	19 (41.9)
MR-J2S-700CP-S084	FR-BAL-15K	295 (11.61)	270 (10.62)	275 (10.83)	133 (5.24)	$110^{0}_{-2.5}$ $(4.33^{0}_{-0.098})$	12.5 (0.49)	M6	M6	27 (59.5)

15.2.4 Relays

The following relays should be used with the interfaces.

Interface	Selection example
Relay used for input signals (interface DI-1) signals	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

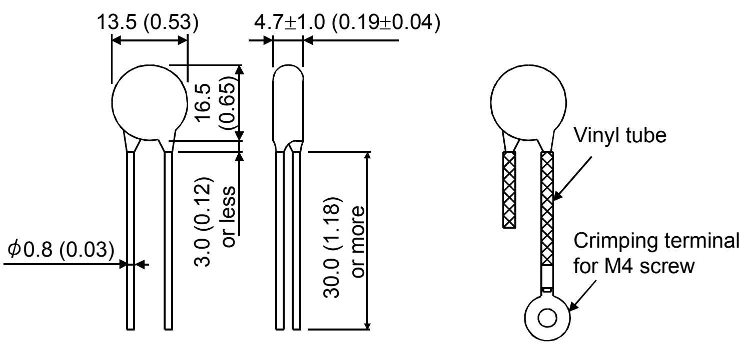
15.2.5 Surge absorbers

A surge absorber is required for the electromagnetic brake. Use the following surge absorber or equivalent. Insulate the wiring as shown in the diagram.

Maximum rating					Maximum limit voltage		Static capacity (reference value)	Varistor voltage rating (range) V1mA
Permissible circuit voltage		Surge immunity	Energy immunity	Rated power				
AC[Vma]	DC[V]	[A]	[J]	[W]	[A]	[V]	[pF]	[V]
140	180	(Note) 500/time	5	0.4	25	360	300	220 (198 to 242)

Note. 1 time = 8 × 20μs

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



15.2.6 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 4.10).

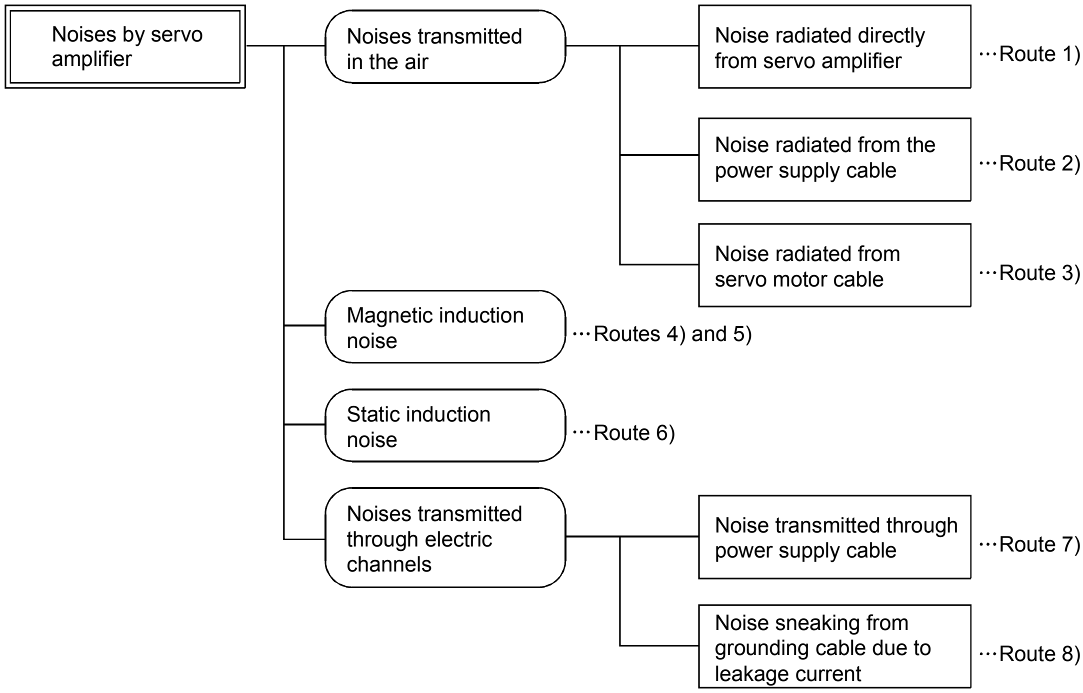
(b) Reduction techniques for external noises that cause the servo amplifier to malfunction

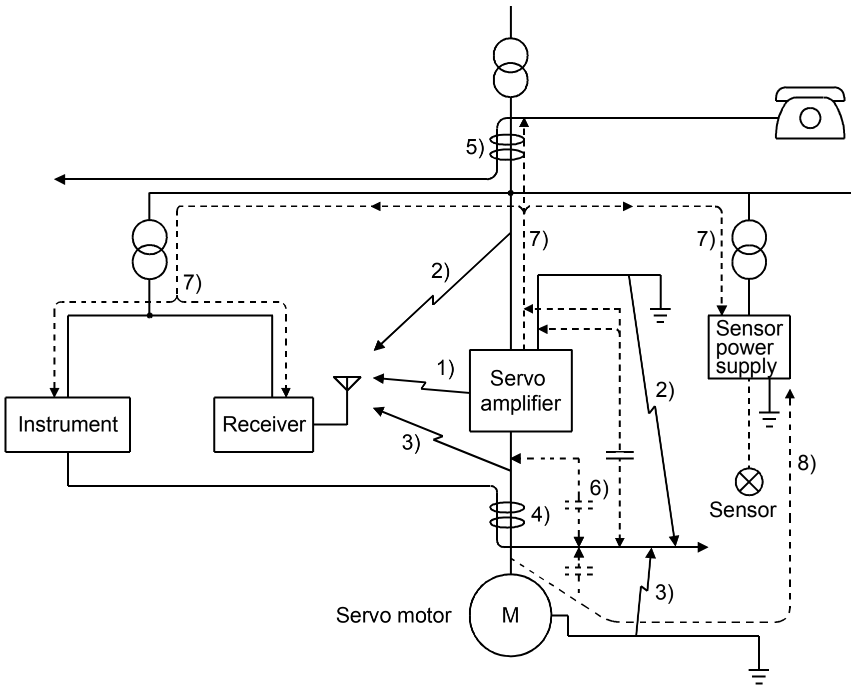
If there are noise sources (such as a magnetic contactor, an electromagnetic brake, and many relays which make a large amount of noise) near the servo amplifier and the servo amplifier may malfunction, the following countermeasures are required.

- Provide surge absorbers on the noise sources to suppress noises.
- Attach data line filters to the signal cables.
- Ground the shields of the encoder connecting cable and the control signal cables with cable clamp fittings.
- Although a surge absorber is built into the servo amplifier, to protect the servo amplifier and other equipment against large exogenous noise and lightning surge, attaching a varistor to the power input section of the equipment is recommended.

(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. 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. 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

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

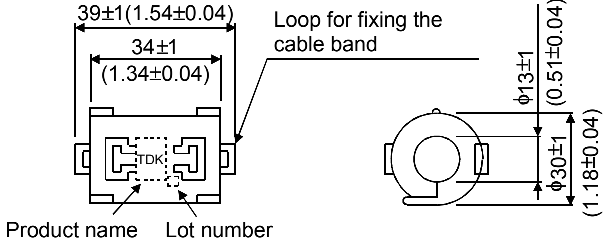
For example, the ZCAT3035-1330 of TDK and the ESD-SR-25 of NEC Tokin make are available as data line filters.

As a reference example, the impedance specifications of the ZCAT3035-1330 (TDK) are indicated below.

This impedances are reference values and not guaranteed values.

Impedance[Ω]	
10 to 100MHz	100 to 500MHz
80	150

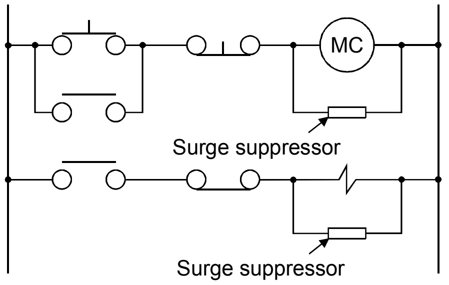
[Unit: mm]([Unit: in.])

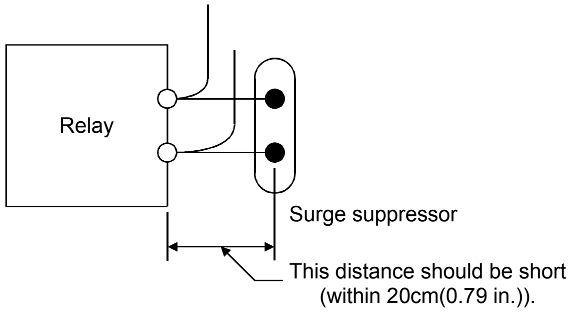


Outline drawing (ZCAT3035-1330)

(b) Surge suppressor

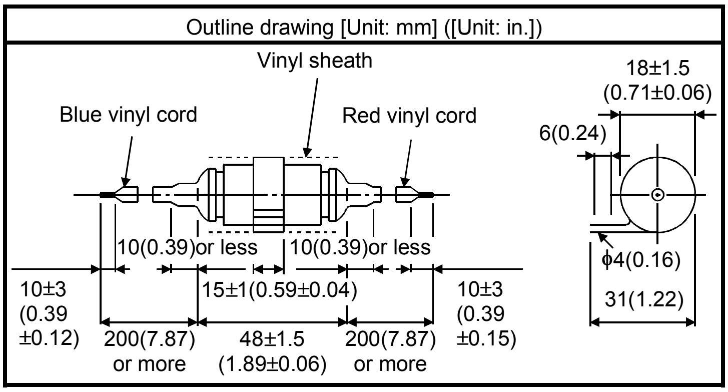
The recommended surge suppressor for installation to an AC relay, AC valve, AC electromagnetic brake or the like near the servo amplifier is shown below. Use this product or equivalent.





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

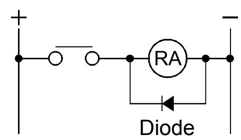
Rated voltage AC[V]	C [μF]	R [Ω]	Test voltage AC[V]
200	0.5	50 (1W)	Across T-C 1000(1 to 5s)



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

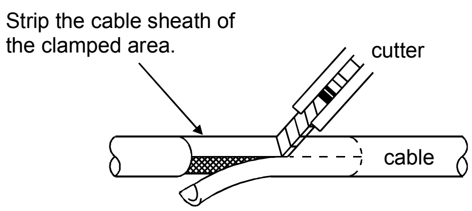


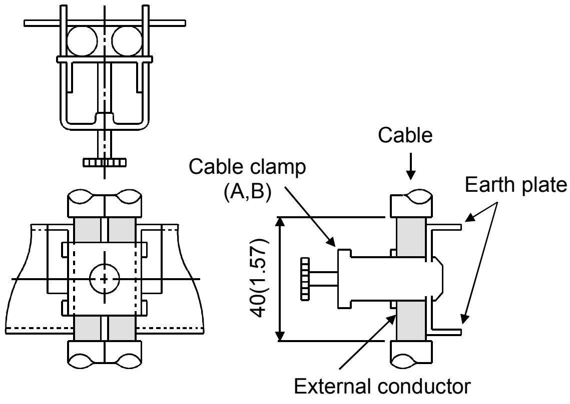
(c) Cable clamp fitting (AERSBAN-□SET)

Generally, the earth of the shielded cable may only be connected to the connector's SD terminal. However, the effect can be increased by directly connecting the cable to an earth plate as shown below.

Install the earth plate near the servo amplifier for the encoder cable. Peel part of the cable sheath to expose the external conductor, and press that part against the earth plate with the cable clamp. If the cable is thin, clamp several cables in a bunch.

The clamp comes as a set with the earth plate.

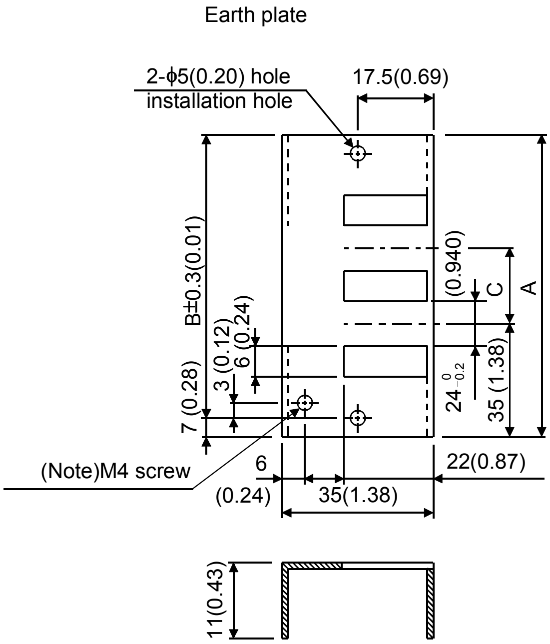


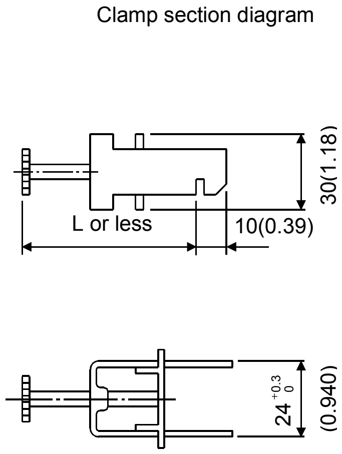


Clamp section diagram

・Outline drawing

[Unit: mm]
([Unit: in.])





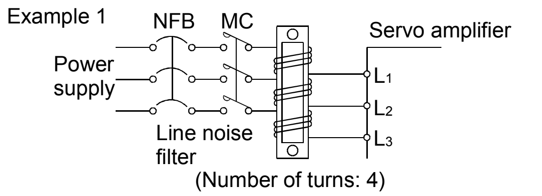
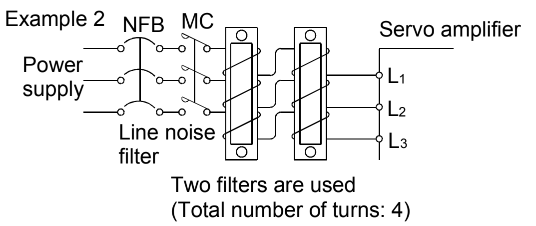
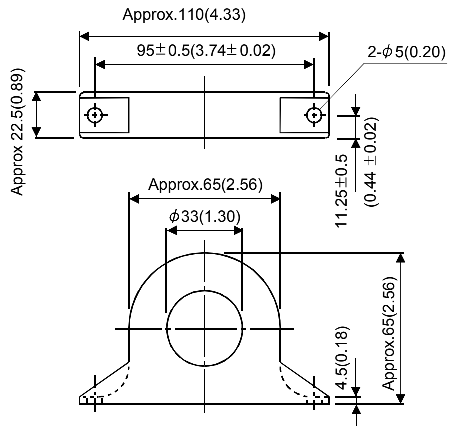
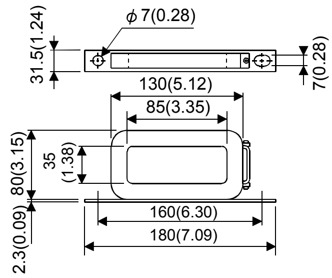
Note. Screw hole for grounding. Connect it to the earth plate of the control box.

Type	A	B	C	Accessory fittings
AERSBAN-DSET	100 (3.94)	86 (3.39)	30 (1.18)	clamp A: 2pcs.
AERSBAN-ESET	70 (2.76)	56 (2.20)		clamp B: 1pc.

Clamp fitting	L
A	70 (2.76)
B	45 (1.77)

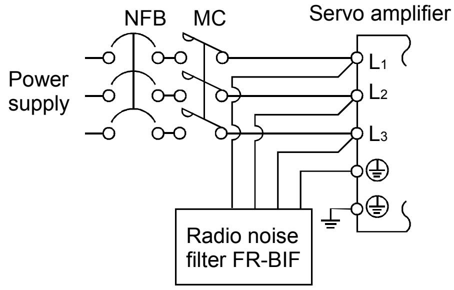
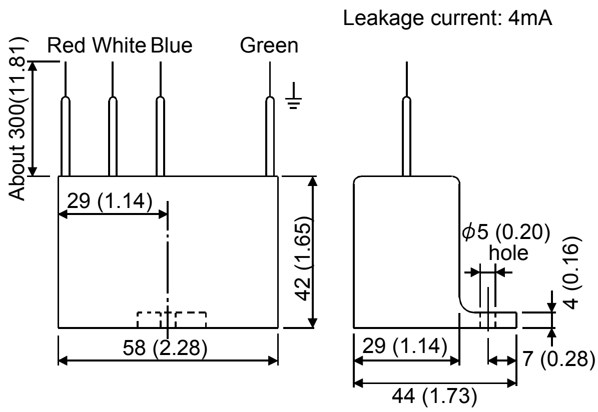
(d) Line noise filter (FR-BLF, FR-BSF01)

This filter is effective in suppressing noises radiated from the power supply side and output side of the servo amplifier and also in suppressing high-frequency leakage current (zero-phase current) especially within 0.5MHz to 5MHz band.

Connection diagram	Outline drawing [Unit: mm] ([Unit: in.])
Use the line noise filters for wires of the main power supply ($L_1 \cdot L_2 \cdot L_3$) and of the motor power supply (U・V・W). Pass each of the 3-phase wires through the line noise filter an equal number of times in the same direction. For the main power supply, the effect of the filter rises as the number of passes increases, but generally four passes would be appropriate. For the motor power supply, passes must be four times or less. Do not pass the grounding (earth) wire through the filter, or the effect of the filter will drop. Wind the wires by passing through the filter to satisfy the required number of passes as shown in Example 1. If the wires are too thick to wind, use two or more filters to have the required number of passes as shown in Example 2. Place the line noise filters as close to the servo amplifier as possible for their best performance.  	FR-BSF01(for MR-J2S-200CP-S084 or less)  FR-BLF(MR-J2S-350CP-S084 or more) 

(e) Radio noise filter (FR-BIF)...for the input side only

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.

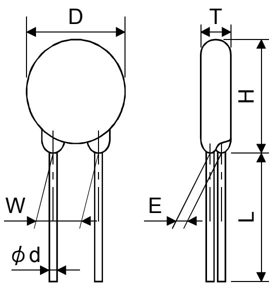
Connection diagram	Outline drawing (Unit: mm) ([Unit: in.])
Make the connection cables as short as possible. Grounding is always required. When using the FR-BIF with a single-phase cable, be sure to insulate the cables not used for wiring. 	

(f) Varistors for input power supply (Recommended)

Varistors are effective to prevent exogenous noise and lightning surge from entering the servo amplifier. When using a varistor, connect it between each phase of the input power supply of the equipment. For varistors, the TND20V-431K and TND20V-471K, manufactured by NIPPON CHEMI-CON, are recommended. For detailed specification and usage of the varistors, refer to the manufacturer catalog.

Varistor	Maximum rating					Maximum limit voltage		Static capacity (reference value)	Varistor voltage rating (range) V1mA
	Permissible circuit voltage		Surge current immunity	Energy immunity	Rated pulse power				
	AC[V_{rms}]	DC[V]	8/20μs[A]	2ms[J]	[W]	[A]	[V]	[pF]	[V]
TND20V-431K	275	350	10000/1 time	195	1.0	100	710	1300	430(387 to 473)
TND20V-471K	300	385	7000/2 time	215			775	1200	470(423 to 517)

[Unit: mm]



Model	D Max.	H Max.	T Max.	E ±1.0	(Note)L min.	ϕd ±0.05	W ±1.0
TND20V-431K	21.5	24.5	6.4	3.3	20	0.8	10.0
TND20V-471K			6.6	3.5			

Note. For special purpose items for lead length (L), contact the manufacturer.

15.2.7 Leakage current breaker

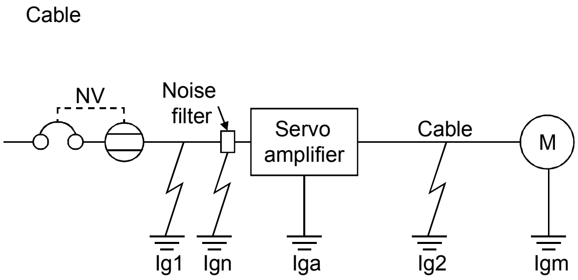
(1) Selection method

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 (11.8 in)) to minimize leakage currents.

Rated sensitivity current ≥ 10 · {Ig1+Ign+Iga+K · (Ig2+Igm)} [mA] ....(15.1)



K: Constant considering the harmonic contents

Leakage current breaker: Type	Leakage current breaker: Mitsubishi products	K
Models provided with harmonic and surge reduction techniques	NV-SP NV-SW NV-CP NV-CW NV-HW	1
General models	BV-C1 NFB NV-L	3

Ig1: Leakage current on the electric channel from the leakage current breaker to the input terminals of the servo amplifier (Found from Fig. 15.2.)

Ig2: Leakage current on the electric channel from the output terminals of the servo amplifier to the servo motor (Found from Fig. 15.2.)

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 15.5.)

Igm: Leakage current of the servo motor (Found from Table 15.4.)

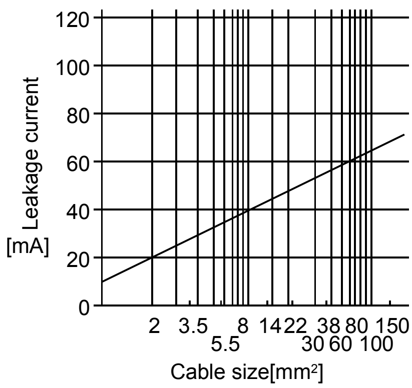


Fig. 15.2 Leakage current example (Ig1, Ig2) for CV cable run in metal conduit

Table 15.4 Servo motor's leakage current example (Igm)

Servo motor power [kW]	Leakage current [mA]
0.05 to 0.5	0.1
0.6 to 1.0	0.1
1.2 to 2.2	0.2
3 to 3.5	0.3
5	0.5
7	0.7

Table 15.5 Servo amplifier's leakage current example (Iga)

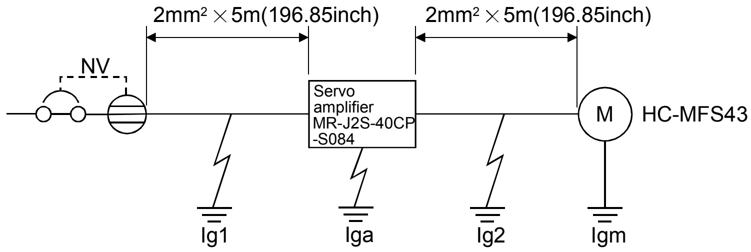
Servo amplifier capacity [kW]	Leakage current [mA]
0.1 to 0.6	0.1
0.7 to 3.5	0.15
5 · 7	2

Table 15.6 Leakage circuit breaker selection example

Servo amplifier	Rated sensitivity current of leakage circuit breaker [mA]
MR-J2S-10CP-S084 to MR-J2S-350CP-S084 MR-J2S-10CP1-S084 to MR-J2S-40CP1-S084	15
MR-J2S-500CP-S084	30
MR-J2S-700CP-S084	50

(2) Selection example

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



Use a leakage current breaker designed for suppressing harmonics/surges.

Find the terms of Equation (15.1) from the diagram.

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

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

Ign = 0 (not used)

Iga = 0.1 [mA]

Igm = 0.1 [mA]

Insert these values in Equation (15.1).

$$Ig \geq 10 \cdot \{0.1+0+0.1+1 \cdot (0.1+0.1)\}$$

$$\geq 4 \text{ [mA]}$$

According to the result of calculation, use a leakage current breaker having the rated sensitivity current (Ig) of 4[mA] or more. A leakage current breaker having Ig of 15[mA] is used with the NV-SP/CP/ SW/CW/HW series.

15.2.8 EMC filter

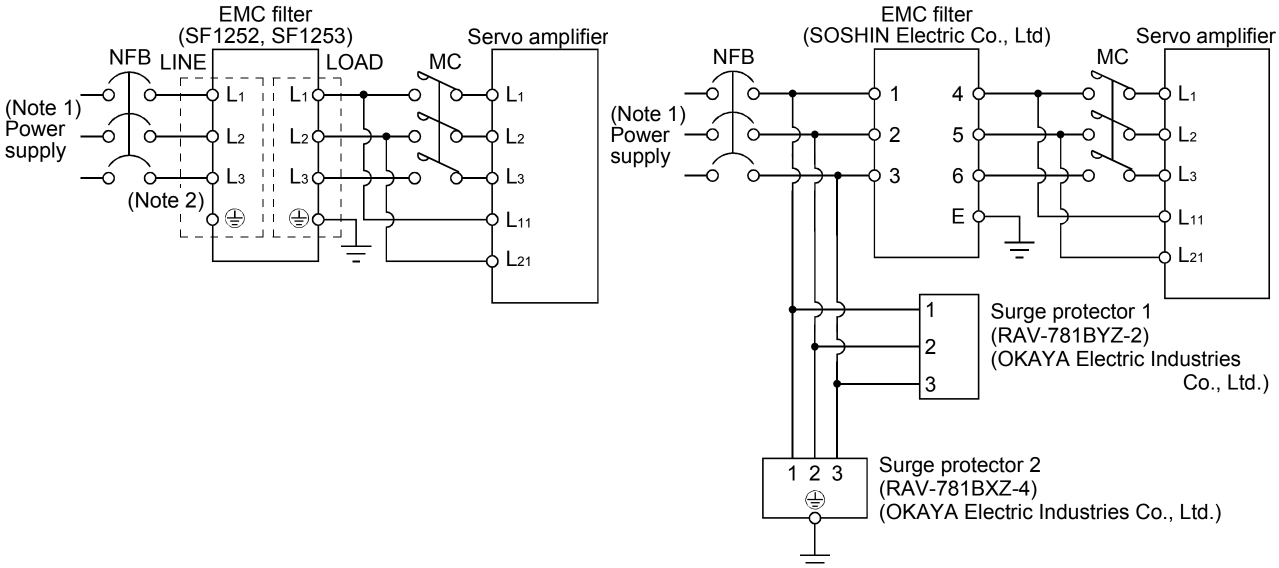
For compliance with the EMC Directive of the EN Standard, it is recommended to use the following filter. Some EMC filters are large in leakage current.

(1) Combination with the servo amplifier

Servo amplifier	Recommended filter		Mass [kg]([lb])
	Model	Leakage current [mA]	
MR-J2S-10CP-S084 to MR-J2S-100CP-S084 MR-J2S-10CP1-S084 to MR-J2S-40CP1-S084	SF1252	38	0.75 (1.65)
MR-J2S-200CP-S084 · MR-J2S-350CP-S084	SF1253	57	1.37 (1.65)
MR-J2S-500CP-S084	(Note) HF-3040A-TM	1.5	5.5 (12.13)
MR-J2S-700CP-S084	(Note) HF-3050A-TM	1.5	6.7 (14.77)

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 1. For 1-phase 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.

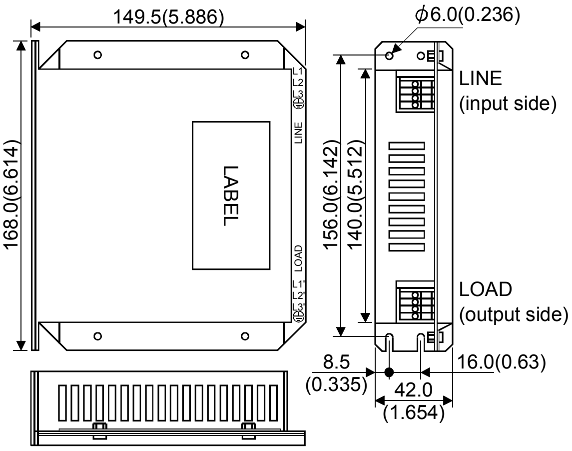
2. Connect when the power supply has earth.

(3) Outline drawing

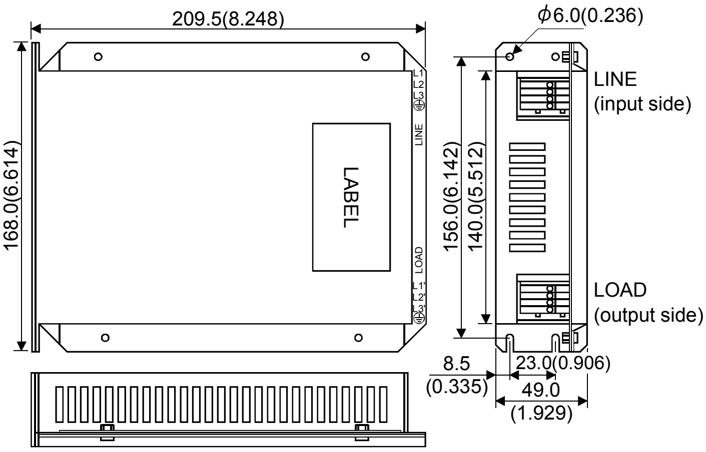
(a) EMC filter

[Unit: mm(in)]

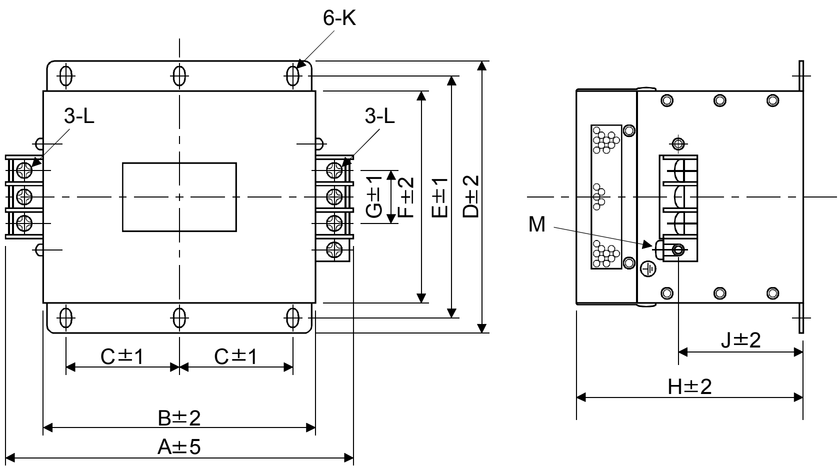
SF1252



SF1253



HF3040-TM・HF-3050A-TM

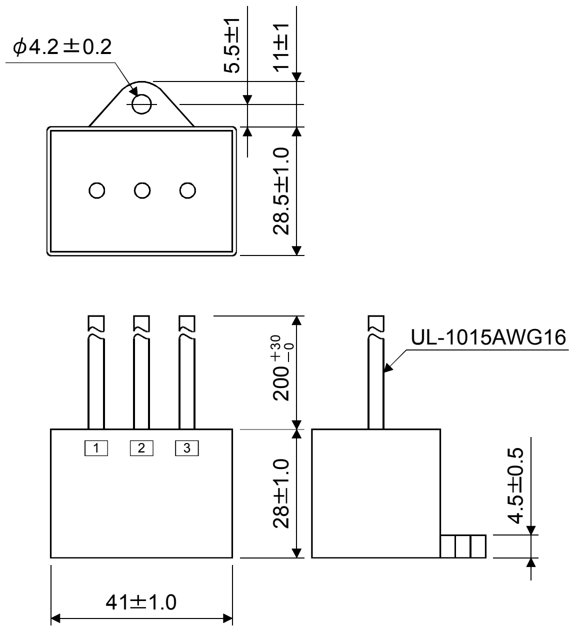


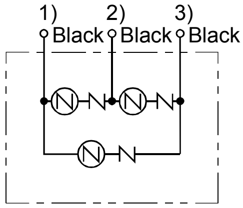
Model	Dimensions [mm(in)]											
	A	B	C	D	E	F	G	H	J	K	L	M
HF3040A-TM	260 (10.23)	210 (8.27)	85 (3.35)	155 (6.10)	140 (5.51)	125 (4.92)	44 (1.73)	140 (5.51)	70 (2.76)	R3.25, length 8	M5	M4
HF3050A-TM	290 (11.42)	240 (9.45)	100 (3.94)	190 (7.48)	175 (6.89)	160 (6.30)	44 (1.73)	170 (5.51)	100 (3.94)		M6	M4

(b) Surge protector

RAV-781BYZ-2

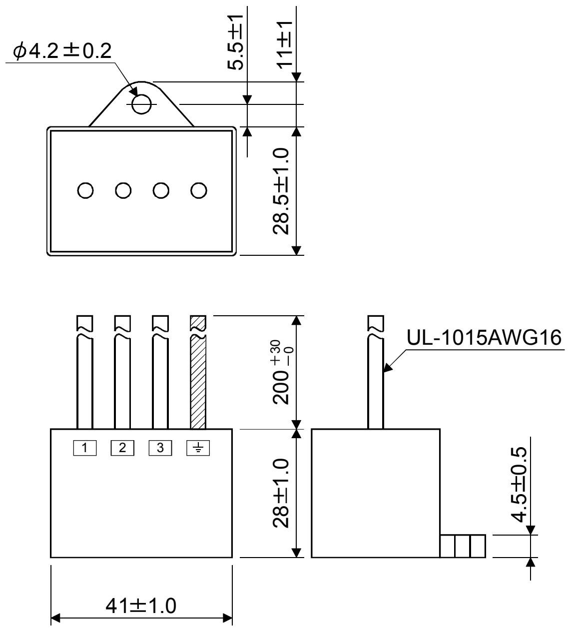
[Unit: mm]

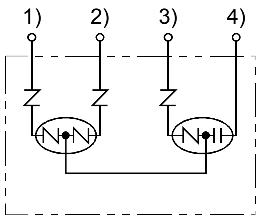




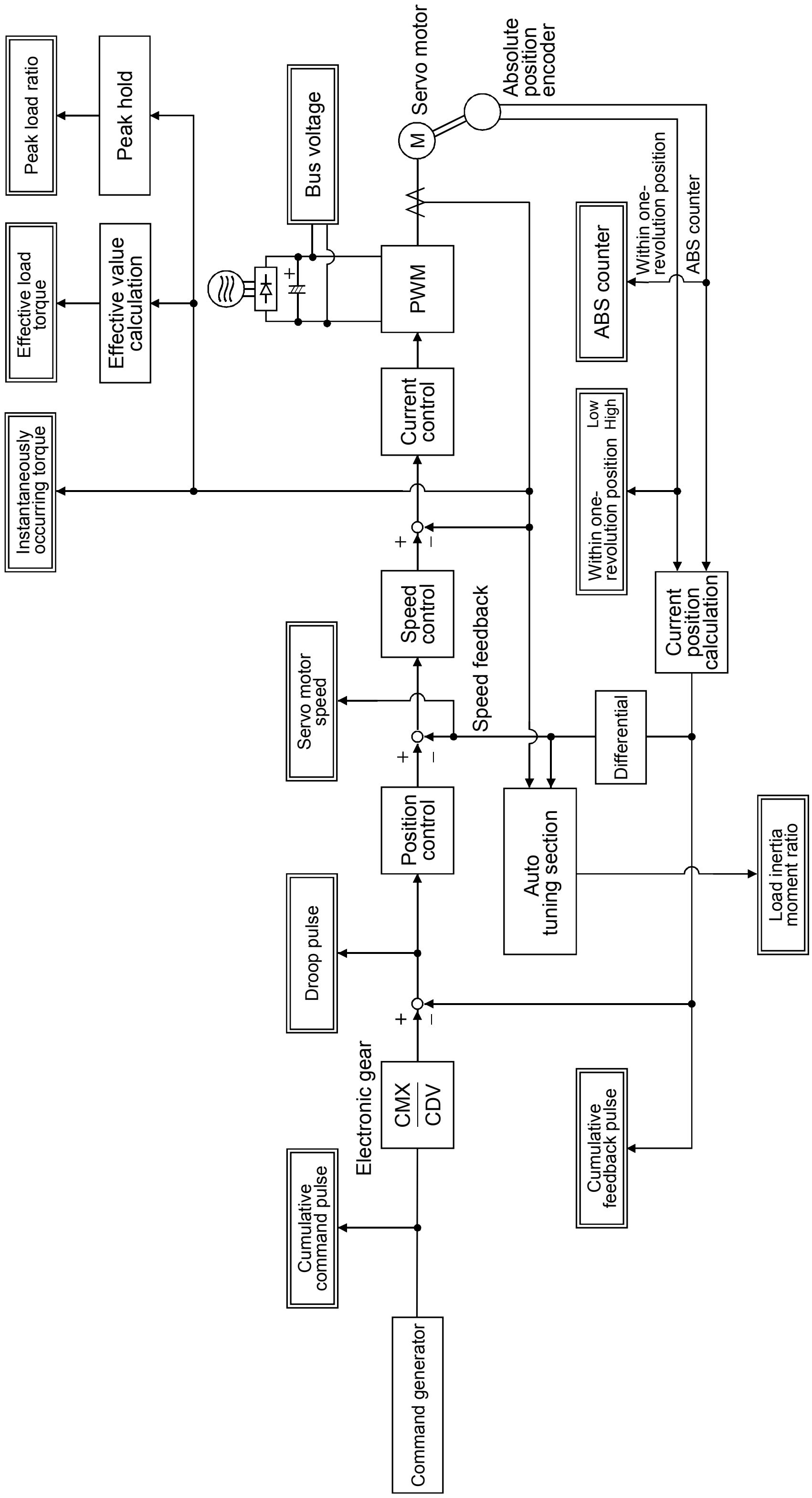
RAV-781BXZ-4

[Unit: mm]



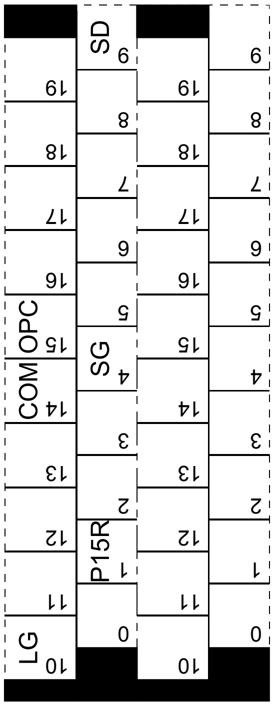


App 1. Status indication block diagram

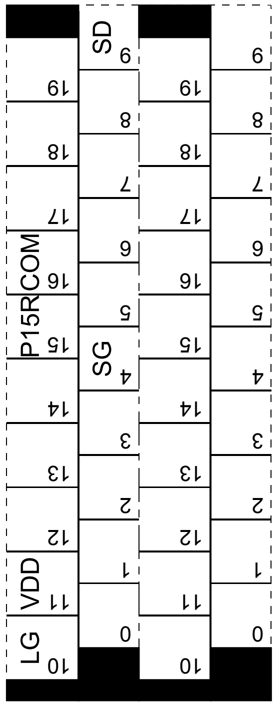


App 2. Junction terminal block (MR-TB20) terminal block labels

For CN1A



For CN1B



App 3. 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)
HC-KFS053	MR-J2S-10CP-S084 MR-J2S-10CP1-S084
HC-KFS13	MR-J2S-10CP-S084 MR-J2S-10CP1-S084
HC-KFS23	MR-J2S-20CP-S084 MR-J2S-20CP1-S084
HC-KFS43	MR-J2S-40CP-S084 MR-J2S-40CP1-S084
HC-KFS73	MR-J2S-70CP-S084
HC-MFS053	MR-J2S-10CP-S084 MR-J2S-10CP1-S084
HC-MFS13	MR-J2S-10CP-S084 MR-J2S-10CP1-S084
HC-MFS23	MR-J2S-20CP-S084 MR-J2S-20CP1-S084
HC-MFS43	MR-J2S-40CP-S084 MR-J2S-40CP1-S084
HC-MFS73	MR-J2S-70CP-S084
HC-SFS81	MR-J2S-100CP-S084
HC-SFS121	MR-J2S-200CP-S084
HC-SFS201	MR-J2S-200CP-S084
HC-SFS301	MR-J2S-350CP-S084
HC-SFS52	MR-J2S-60CP-S084
HC-SFS102	MR-J2S-100CP-S084
HC-SFS152	MR-J2S-200CP-S084
HC-SFS202	MR-J2S-200CP-S084
HC-SFS352	MR-J2S-350CP-S084
HC-SFS502	MR-J2S-500CP-S084
HC-SFS702	MR-J2S-700CP-S084
HC-SFS53	MR-J2S-60CP-S084
HC-SFS103	MR-J2S-100CP-S084
HC-SFS153	MR-J2S-200CP-S084
HC-SFS203	MR-J2S-200CP-S084
HC-SFS353	MR-J2S-350CP-S084

Servo motor	Servo amplifier (Software version)
HC-RFS103	MR-J2S-200CP-S084
HC-RFS153	MR-J2S-200CP-S084
HC-RFS203	MR-J2S-350CP-S084
HC-RFS353	MR-J2S-500CP-S084
HC-RFS503	MR-J2S-500CP-S084
HC-UFS72	MR-J2S-70CP-S084
HC-UFS152	MR-J2S-200CP-S084
HC-UFS202	MR-J2S-350CP-S084
HC-UFS352	MR-J2S-500CP-S084
HC-UFS502	MR-J2S-500CP-S084
HC-UFS13	MR-J2S-10CP-S084 MR-J2S-10CP1-S084
HC-UFS23	MR-J2S-20CP-S084 MR-J2S-20CP1-S084
HC-UFS43	MR-J2S-40CP-S084 MR-J2S-40CP1-S084
HC-UFS73	MR-J2S-70CP-S084
HC-LFS52	MR-J2S-60CP-S084
HC-LFS102	MR-J2S-100CP-S084 (Version A1 or later)
HC-LFS152	MR-J2S-200CP-S084
HC-LFS202	MR-J2S-350CP-S084 (Version A1 or later)
HC-LFS302	MR-J2S-500CP-S084 (Version A1 or later)
HA-LFS502	MR-J2S-500CP-S084
HA-LFS702	MR-J2S-700CP-S084

App 4. Change of connector sets to the RoHS compatible products

Connector sets (options) in the following table are changed to the RoHS compatible products after September, 2006 shipment.
Please accept that the current products might be mixed with RoHS compatible products based on availability.

Model	Current Product	RoHS Compatible Product
MR-J2CNM MR-J2CN1	Amplifier connector (3M or equivalent) 10120-3000VE (connector)	Amplifier connector (3M or equivalent) 10120-3000PE (connector)
MR-J2CNS	Amplifier connector (3M or equivalent) 10120-3000VE (connector) Encoder connector (DDK) MS3057-12A (Cable clump) MS3106B20-29S (Straight plug)	Amplifier connector (3M or equivalent) 10120-3000PE (connector) Encoder connector (DDK) D/MS3057-12A (Cable clump) D/MS3106B20-29S (Straight plug)
MR-ENCNS	Amplifier connector (3M or equivalent) 10120-3000VE (connector) MS3106A20-29S (D190) (Plug, DDK) CE3057-12A-3 (D265) (Cable clump, DDK) CE02-20BS-S (Back shell, DDK)	Amplifier connector (3M or equivalent) 10120-3000PE (connector) D/MS3106A20-29S (D190) (Plug, DDK) CE3057-12A-3-D (Cable clump, DDK) CE02-20BS-S-D (Back shell, DDK)
MR-PWCNS1	Power supply connector (DDK) CE05-6A22-23SD-B-BSS (Connector and back shell) CE3057-12A-2 (D265) (Cable clump)	Power supply connector (DDK) CE05-6A22-23SD-D-BSS (Connector and back shell) CE3057-12A-2-D (Cable clump)
MR-PWCNS2	Power supply connector (DDK) CE05-6A24-24SD-B-BSS (Connector and back shell) CE3057-16A-2 (D265) (Cable clump)	Power supply connector (DDK) CE05-6A24-10SD-B-BSS (Connector and back shell) CE3057-16A-2-D (Cable clump)
MR-PWCNS3	Power supply connector (DDK) CE05-6A32-17SD-B-BSS (Connector and back shell) CE3057-20A-1 (D265) (Cable clump)	Power supply connector (DDK) CE05-6A32-17SD-D-BSS (Connector and back shell) CE3057-20A-1-D (Cable clump)
MR-BKCN	Electromagnetic brake connector MS3106A10SL-4S (D190) (Plug, DDK)	Electromagnetic brake connector D/MS3106A10SL-4S (D190) (Plug, DDK)

REVISIONS

*The manual number is given on the bottom left of the back cover.

Print Data	*Manual Number	Revision
Jun., 2003	SH(NA)030036-A	First edition
Aug., 2004	SH(NA)030036-B	Safety Instructions 3.: Sentence change 4. (1): Writing changed in the table 4. (5): Figure change COMPLIANCE WITH EC DIRECTIVES 2.: Correction to error in writing CONFORMANCE WITH UL/C-UL STANDARD: Correction to error in writing Section 1.1: Text partial review Section 1.1.2: Figure partial correction Section 1.2: Table item addition Section 1.3: Partial review of statement in the table Section 1.4 (1): Figure change Section 1.4 (2): Remark 1 change Section 1.5: Remarks change Section 1.7 (1): (a), (b) Partial review of statement in the table Section 1.7 (2): Partial review of statement in the table Section 1.7 (3): Partial review of statement in the table Section 1.7 (4): Partial review of statement in the table Section 2.1 (4): Writing changed in the table Section 3.5.1 (1): Statement addition Section 3.5.1 (2): Statement change Section 3.5.2 (3): Correction to error in writing Section 3.5.3: Partial correction of statement in the table Figure dimension indication addition, statement review, remarks addition, correction to error in writing, remarks font change Section 4.5: Addition to "Caution" Section 4.5 (3): Writing change Section 4.6.1: Figure change Section 4.6.2 (2): Figure change, remarks deletion Section 4.7.3 (1): Sentence addition Section 4.8.2: Figure change Section 4.8.3: Remarks change Section 4.9: Figure change, statement review Section 4.9 (1): Figure change Section 4.9 (2): Statement review Section 4.9 (3): (d), (e) Figure change, wrong character correction Section 4.10: Figure partial change Section 4.11: POINT addition Section 5.1.2: Caution sentence change Section 5.1.2 (2): Statement review Section 5.2.1 (2): Statement review Section 5.2.2 (1): Statement review Section 5.2.2 (2): Statement review Section 5.2.2 (4): Partial sentence change Section 5.4.2 (3): Timing chart partial addition, sentence change Section 5.4.3 (2): Timing chart partial addition, sentence change Section 5.4.4 (2): Timing chart partial addition, sentence change Section 5.4.5 (2): Timing chart partial addition, sentence change Section 5.4.6 (2): Sentence change

Print Data	*Manual Number	Revision
Aug., 2004	SH(NA)030036-B	Section 5.4.7 (2): Timing chart partial addition, sentence change Section 5.4.8 (2): Timing chart partial addition, sentence change Section 5.4.9 (2): Timing chart partial addition, sentence change Section 5.4.11: Timing chart partial addition Section 5.5 (5): Sentence change Section 6.1.1: Statement review Section 6.1.1 (2): Statement addition/correction, parameter No. change, sentence change in the table Section 6.2.1: Correction to error in writing Section 6.2.4: Statement review Chapter 7: POINT deletion, statement review Section 7.2: Statement review, configuration table contents correction Section 8.2.2: Addition of sentence in the table Section 8.3.2: Statement review Section 8.9: Statement review Section 8.9.2: Statement review Section 8.9.3: Statement review Section 8.5.3: Statement review Section 9.1.2: Statement review Section 10.2 (2): Statement review Section 10.5.3 (4): Statement review Chapter 11: Sentence change Chapter 12: Statement review Section 12.4.2: Statement review, sentence addition, addition/change of indication in the table Section 12.4.3: Statement review, table item addition Section 13.1: Correction to error in writing Section 14.1: Note change Section 14.3: Graph addition Section 14.5: Correction to error in writing, review of statement in the table Chapter 15: Sentence change Section 15.1.1: Correction to error in writing, table contents addition, POINT addition, statement addition, outline drawing change, table contents change Section 15.1.2: Correction to error in writing, remarks change Section 15.1.3 (2): Connection diagram change, remarks addition, correction to error in writing Section 15.1.4: Change of maker name in the table Section 15.1.6: POINT addition Section 15.2.1: Correction to error in writing, remarks font change Section 15.2.3: Dimension representation change, model name addition, change of value in the table Section 15.2.6 (2): Correction to error in writing, connection diagram change, outline drawing change Section 15.2.7 (2): Correction to error in writing Section 15.2.8 (2): Connection diagram change Section 15.2.8 (3): Outline drawing change Appendices: Appendix 3 contents review, Appendix 4 addition Service network: Review
Mar., 2005	SH(NA)030036-C	Section 3.5.2 (2): Sentence review Section 4.5: Caution sentence review

Print Data	*Manual Number	Revision
Mar., 2005	SH(NA)030036-C	Section 4.8.3 (1): Correction of words and sentences Section 4.9: Sentence review Section 5.2.1 (2) (b): Note review Section 5.5: CAUTION sentence addition (1) Sentence review Section 6.1.2 (2): No.55 Review of words in the table Section 7.2 (1): Sentence review Section 10.4 (1): Correction of words and sentences Section 12.4.2: Caution sentence addition, Caution sentence review AL. 17, AL. 19, Sentence addition and review AL. 33 Sentence addition Section 15.1.2 (2): Note review Section 15.1.2 (2) (b): Deletion of words in the figure Section 15.1.3 (2): Note correction Section 15.1.4 (1): 1) 6) Correction of words and sentences Section 15.1.4 (2): 2) Correction of words and sentences Section 15.1.6: Date change in "POINT" Section 15.2.1 (1): Table 15.2 Correction of words and sentences App.5: Correction of telephone No. and date
Jan., 2006	SH(NA)030036-D	Safety Instructions (2): Wiring: Sentence addition Safety Instructions (4): Usage: Sentence addition Chapter 2: CAUTION addition Section 3.2.2 (4) (e): Addition of writing on recommended torque screw driver Section 3.5.3: Correction to error in writing Section 3.5.4: Correction to error in writing Section 3.7.3: Correction to error in writing Section 4.9: CAUTION addition Section 4.11.1: Addition of descriptions Section 5.4.10: Correction of Home position return automatic return function Section 6.1.2 (2): Parameter No.30 Note addition Section 7.7.1: POINT addition Section 7.7.2: POINT addition Section 7.7.4: POINT addition Section 7.7.5: POINT addition Section 8.1.1: Addition Section 12.1: Addition of Fault at Power on Section 12.1: Change of Test operation status for Servo side alarm occurrence to “Stop” Section 12.4.2: AL.72 Addition of Cause Section 12.4.3: POINT addition Section 15.2.6 (2) (d): Change of FR-BSF01 outline drawing
Sep., 2006	SH(NA)030036-E	Safety Instructions (2): Wiring: Connection diagram change Section 1.6.3: Caution deletion, Warning addition Section 3.1: Correction of connection cable in the table Note change Section 3.2.1(2): Correction of CC-Link connection cable Section 3.2.2(2): Correction of CC-Link connection cable Section 3.3.1(3): Correction of CC-Link connection cable Section 3.5.1(1): Correction of the table Section 3.5.1(2): Correction of the table Section 3.5.2(3): Correction of Monitor1 in the table Correction of Monitor2 in the table

Print Data	*Manual Number	Revision
Sep., 2006	SH(NA)030036-E	Section 3.5.2(3): Correction of Point table No./Speed command data in the table Section 3.5.4(1): Sentence review Correction of the table Section 3.5.4(2): Sentence review Chapter 4: CAUTION addition Section 4.4.2: POINT review Section 4.7.2: U, V, and W in the table review Section 4.7.3(3): CAUTION addition Section 4.8.2: CAUTION addition Section 5.5(1): Correction of sentence Section 6.2.1: Correction of POINT Section 8.2.3: Correction of Command position Section 12.4.3: Correction of AL.90 Section 13.3(1)(b): Correction of outline dimension drawing Section 15.1.1(2)(b): Correction of formulas in the table Section 15.1.5(3): Correction of outline dimension drawing
Sep., 2007	SH(NA)030036-F	Safety Instructions 1. To prevent electric shock: Partial change of sentence 2. To prevent fire: Partial change of sentence 4. Additional Instructions (2) Wiring: Addition of sentence Section 1.1.2: Addition of Note Section 1.6.3: POINT: Change of sentence Section 1.7: Addition of Note Section 3.5.1(1): Change of Reset device No. RY1A Section 3.5.1(2): Change of Reserved device No. "RY(n+1)0 to RY(n+1)9" to "RY(n+1)0 to RY(n+1)F" Change of Reserved device No. "RXnF to RX(n+1)9" to "RXnF to RX(n+1)F" Section 3.5.2(1): Change of device No. in Description of Monitor output execution demand Section 3.5.2(2): Change of device No. in Description of Electromagnetic brake interlock Change of device No. in Description of Remote station communication ready Chapter 4: WARNING: Change of sentence Section 4.6.2(2): Note addition in diagram Section 4.6.2(3): Note addition in diagram Section 4.9(3)(a): Change of diagram, Note addition in diagram Section 4.9(3)(b) to (e): Note addition in diagram Section 5.2.3(1) to (3): Addition of RY(n+2)0 and RY(n+2)1 in timing chart and Note addition Section 5.4.2 to 5.4.5: Addition of line in table (Remote register-based position/speed specifying system (only when 2 stations are occupied)) Section 5.4.7 to 5.6.9: Addition of line in table (Remote register-based position/speed specifying system (only when 2 stations are occupied)) Section 5.5: POINT addition Section 5.5(5): WARNING: Change of sentence

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Sep., 2007	SH(NA)030036-F	Chapter 11: WARNING: Change of sentence Section 12.4.2: AL.20 Cause addition Section 12.4.2: Change of sentence in AL.32. Definition Section 12.4.2: Addition of Cause 8, 9 for AL.33 Section 12.4.2: Change of sentence in AL51. Definition Section 13.3: Change of 3M connector to RoHS compatible product Section 14.2: Addition of servo motor Chapter 15: WARNING: Change of sentence Section 15.1.2: Overall change to FR-BU2 Section 15.1.4: Change of 3M connector to RoHS compatible product Change of DDK connector to RoHS compatible product Section 15.2.1(3): Change of twisted cable Section 15.2.6(1)(b): Addition of sentence Section 15.2.6(2)(d): Change of sentence Section 15.2.6(f): Addition Section 15.2.8: Addition of connection diagram and surge protector Appendix 4: Addition

MODEL	
MODEL CODE	

MITSUBISHI ELECTRIC CORPORATION

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