MITSUBISHI ELECTRIC

General-Purpose AC Servo

MELSERVO-J2-Super Series

SSCNET Fully Closed Control Compatible

MODEL

MR-J2S-☐B-PY096
MR-J2S-☐B-S096(5.7kW)

INSTRUCTION MANUAL

B

● 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 Instruction Manual, always keep it accessible to the operator.

1. To prevent electric shock, note the following:

⚠ WARNING
・Before wiring or inspection, switch power off and wait for more than 15 minutes. Then, confirm the voltage is safe with voltage tester. Otherwise, you may get an electric shock. ・Connect the servo amplifier and servo motor to ground. ・Any person who is involved in wiring and inspection should be fully competent to do the work. ・Do not attempt to wire the servo amplifier and servo motor until they have been installed. Otherwise, you may get an electric shock. ・Operate the switches with dry hand to prevent an electric shock. ・The cables should not be damaged, stressed, loaded, or pinched. Otherwise, you may get an electric shock. ・During power-on or operation, do not open the front cover. You may get an electric shock. ・Do not operate the converter unit and 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 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 converter unit and servo amplifier, servo motor and regenerative resistor on incombustible material. Installing them directly or close to combustibles will lead to a fire. ・When the servo amplifier has become faulty, switch off the main servo amplifier power side. Continuous flow of a large current may cause a fire. ・When a regenerative resistor is used, use an alarm signal to switch main power off. Otherwise, a regenerative transistor fault or the like may overheat the regenerative resistor, causing a fire.

3. To prevent injury, note the follow

⚠ 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. ・During power-on or for some time after power-off, do not touch or close a parts (cable etc.) to the servo amplifier heat sink, regenerative resistor, servo motor, etc. 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 controller. The controller 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 controller and servo motor must be installed in the specified direction.
- Leave specified clearances between the servo amplifier and control enclosure walls or other equipment.
- Do not install or operate the servo amplifier and servo motor which has been damaged or has any parts missing.
- Provide adequate protection to prevent screws and other conductive matter, oil and other combustible matter from entering the servo amplifier and servo motor.
- Do not drop or strike servo amplifier or servo motor. Isolate from all impact loads.
- When you keep or use it, please fulfill the following environmental conditions.

| Environment			Conditions		
			Servo amplifier	Servo motor	
Ambient temperature	Operation	[℃]	0 to +55 (non-freezing)	0 to +40 (non-freezing)	
		[℉]	32 to 131 (non-freezing)	32 to 104 (non-freezing)	
	Storage	[℃]	−20 to +65 (non-freezing)	−15 to +70 (non-freezing)	
		[℉]	−4 to 149 (non-freezing)	5 to 158 (non-freezing)	
Ambient humidity	Operation		90%RH or less (non-condensing)	80%RH or less (non-condensing)	
	Storage		90%RH or less (non-condensing)		
Ambience			Indoors (no direct sunlight) Free from corrosive gas, flammable gas, oil mist, dust and dirt		
Altitude			Max. 1000m (3280 ft) above sea level		
(Note) Vibration	[m/s²]	5.9 or less		HC-KFS Series HC-MFS Series HC-UFS13 to 73	X・Y : 49
				HC-SFS81 HC-SFS52 to 152 HC-SFS53 to 153 HC-RFS Series HC-UFS 72・152	X・Y : 24.5
				HC-SFS121・201 HC-SFS202・352 HC-SFS203・353 HC-UFS202 to 502	X : 24.5 Y : 49
				HC-SFS301 HC-SFS502 to 702	X : 24.5 Y : 29.4
				HA-LFS11K2 to 22K2	X : 11.7 Y : 29.4
	[ft/s²]	19.4 or less		HC-KFS Series HC-MFS Series HC-UFS 13 to 73	X・Y : 161
				HC-SFS81 HC-SFS52 to 152 HC-SFS53 to 153 HC-RFS Series HC-UFS 72・152	X・Y : 80
				HC-SFS121・201 HC-SFS202・352 HC-SFS203・353 HC-UFS202 to 502	X : 80 Y : 161
				HC-SFS301 HC-SFS502 to 702	X : 80 Y : 96
				HA-LFS11K2 to 22K2	X : 38 Y : 96

Note. Except the servo motor with reduction gear.

⚠ CAUTION

- 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.
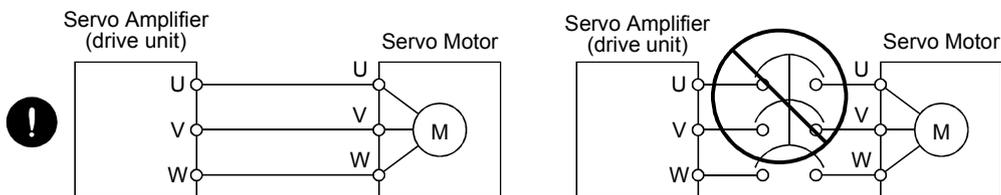
- Do not connect AC power directly to the servo motor. Otherwise, a fault may occur.

- The surge absorbing diode installed on the DC output signal of the servo amplifier relay must be wired in the specified direction. Otherwise, the forced stop (EM1) and other protective circuits may not operate.
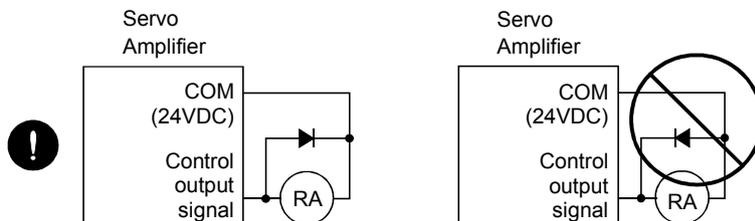
(3) Test run adjustment

⚠ 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.
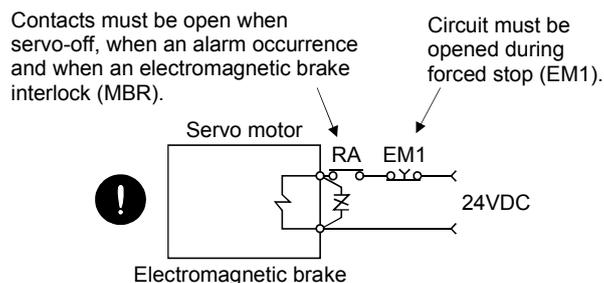
(4) Usage

⚠ CAUTION

· Provide a forced 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 interface unit signals but also by a forced stop (EM1).

Contacts must be open when servo-off, when an alarm occurrence and when an electromagnetic brake interlock (MBR).

Circuit must be opened during forced stop (EM1).

Servo motor

RA EM1

24VDC

Electromagnetic brake

⚠ CAUTION

・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 Instruction Manual may have been drawn without covers and safety guards. When the equipment is operated, the covers and safety guards must be installed as specified. Operation must be performed in accordance with this Instruction Manual.

● About processing of waste ●

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

⚠ FOR MAXIMUM SAFETY

・These products have been manufactured as a general-purpose part for general industries, and have not been designed or manufactured to be incorporated in a device or system used in purposes related to human life.

・Before using the products for special purposes such as nuclear power, electric power, aerospace, medicine, passenger movement vehicles or under water relays, contact Mitsubishi.

・These products have been manufactured under strict quality control. However, when installing the product where major accidents or losses could occur if the product fails, install appropriate backup or failsafe functions in the system.

⚠ EEP-ROM life

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

・Write to the EEP-ROM due to parameter setting changes

Precautions for Choosing the Products

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

COMPLIANCE WITH EC DIRECTIVES

1. WHAT ARE EC DIRECTIVES?

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

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

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

(3) Machine directive
Not being machines, the servo amplifiers need not comply with this directive.
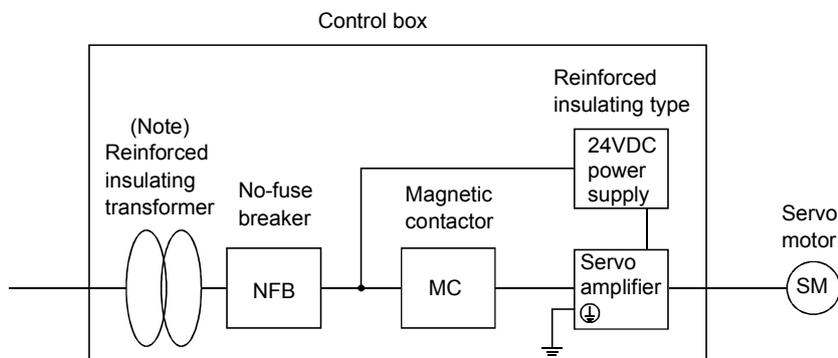
2. PRECAUTIONS FOR COMPLIANCE

(1) Servo amplifiers and servo motors used
Use the servo amplifiers and servo motors which comply with the standard model.

Servo amplifier   :MR-J2S-10B-PY096 to MR-J2S-350B-PY096
    MR-J2S-500B-S096 to MR-J2S-700B-S096
    MR-J2S-10B1-PY096 to MR-J2S-40B1-PY096

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

(2) Configuration

Note. The insulating transformer is not required for the 11kW or more servo amplifier.

(3) Environment
Operate the servo amplifier at or above the contamination level 2 set forth in IEC664. 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 7kW or less to meet the requirements of the overvoltage category II set forth in IEC664. For this purpose, a reinforced insulating transformer conforming to the IEC or EN standard should be used in the power input section.

      Since the 11kW or more servo amplifier can be used under the conditions of the overvoltage category III set forth in IE644, a reinforced insulating transformer is not required in the power input section.

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

(5) Grounding

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

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

PE terminals   PE terminals

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

(6) Wiring

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

Crimping terminal

Insulating tube

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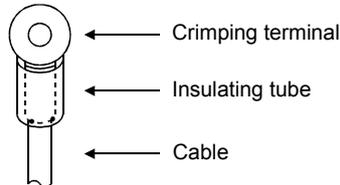
   (b) Use the servo motor side power connector which complies with the EN Standard. The EN Standard compliant power connector sets are available from us as options.

(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 12.2.2.

   (b) The sizes of the cables described in Section 12.2.1 meet the following requirements. To meet the other requirements, follow Table 5 and Appendix C in EN60204-1.
      ・Ambient temperature: 40 (104) [℃ (℉)]
      ・Sheath: PVC (polyvinyl chloride)
      ・Installed on wall surface or open table tray

   (c) Use the EMC filter for noise reduction.

(8) Performing EMC tests

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

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

CONFORMANCE WITH UL/C-UL STANDARD

(1) Servo amplifiers and servo motors used

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

Servo amplifier   :MR-J2S-10B-PY096 to MR-J2S-350B-PY096
                MR-J2S-500B-S096 to MR-J2S-700B-S096
                MR-J2S-10B1-PY096 to MR-J2S-40B1-PY096

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

(2) Installation

Install a cooling fan of 100CFM (2.8m³/min) air flow 4 in (10.16 cm) above the servo amplifier or provide cooling of at least equivalent capability.

(3) Short circuit rating

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

(4) Capacitor discharge time

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

Servo amplifier	Discharge time [min]
MR-J2S-10B(1)・20B(1)	1
MR-J2S-40B(1)・60B	2
MR-J2S-70B to 350B	3
MR-J2S-500B・700B	5
MR-J2S-11KB	4
MR-J2S-15KB	6
MR-J2S-22KB	8

(5) Options and auxiliary equipment

Use UL/C-UL standard-compliant products.

(6) Attachment of a servo motor

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

(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.

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1 FUNCTIONS AND CONFIGURATION

1.1 Overview

This Instruction Manual explains the product that imports a position F/B signal from a full closed encoder, such as a linear scale, to the MR-J2S-B servo amplifier to perform full closed control.

For the items not described in this Instruction Manual, refer to the MELSERVO-J2S-B Specifications and Installation Guide and Instruction Manual since they are the same as those of the standard model.

For the specifications of the A・B・Z differential input I/F unit MR-J2S-CLP01, refer to the MR-J2S-CLP01 Installation Guide.

[Items changed from those of the standard model]
    1) The A・B・Z differential input I/F unit MR-J2S-CLP01 or Mitsubishi serial interface compatible linear scale is used to detect the position F/B signal of a full closed encoder such as a linear scale.
    2) In addition to the full closed control that feeds back the position signal of the full closed encoder, dual F/B control that feeds back a signal composed of the full closed encoder's position F/B signal and the motor position F/B signal has been added as an extended function.
    3) Function to switch pulse output between the full closed encoder and motor end encoder
    4) Addition of restriction on the RS232C communication baud rate (enabled for 9600bps only)

[Functions deleted from the standard model]
    1) Speed・torque control
    2) Motor-less operation (test operation)

1.2 Control block diagram

A full closed control block diagram is shown below.

Full closed control block diagram
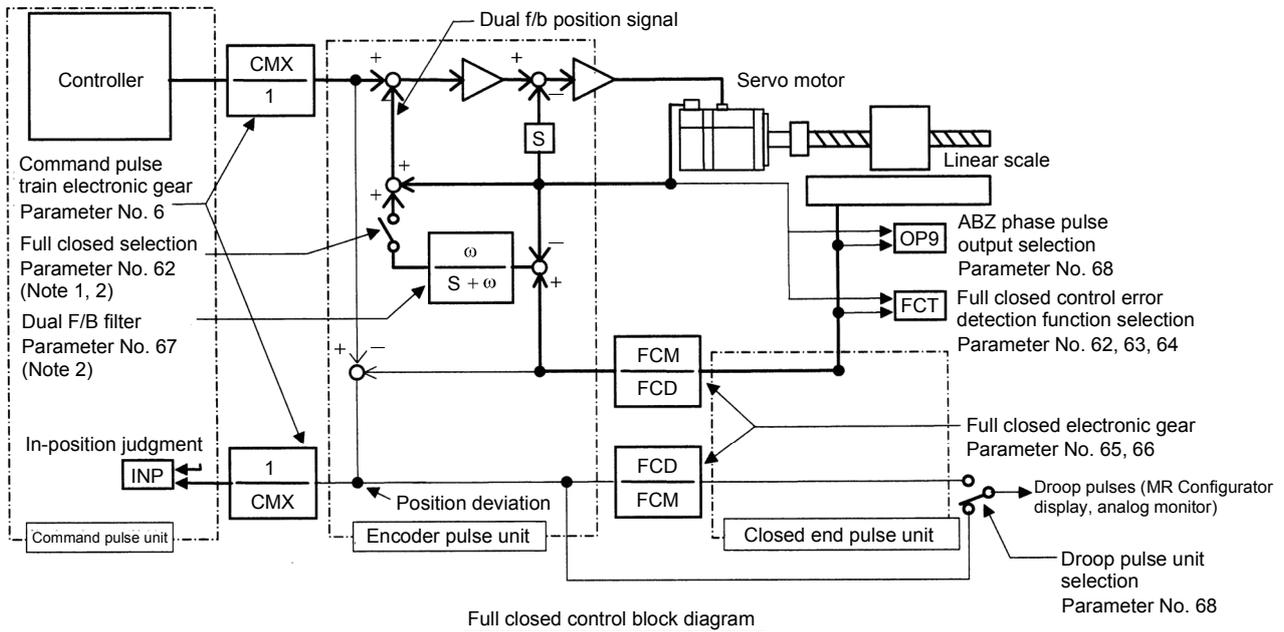
Note 1. Switching between semi closed control and full closed control can be performed by changing the setting of parameter No. 62. When semi closed control is selected, control is always performed on the basis of the position data of the motor end encoder (independently of whether the motor is at a stop or running).

2. When parameter No. 62 "full closed function" is valid, dual F/B control in which the motor F/B signal and full closed encoder F/B signal are combined by the dual F/B filter in parameter No. 67 is performed.

In this case, full closed control is performed when the motor is at a stop, and semi closed control is performed when the motor is operating to improve control performance. When 1000 is set as the filter value of parameter No. 67, full closed control is always performed.

Control Mode	Item	Description
Semi closed control	Feature	Position is controlled according to the motor end data.
	Advantage	Since this control is insusceptible to machine influence (such as machine resonance), the gains of the servo amplifier can be raised and the settling time shortened.
	Disadvantage	If the motor end is at a stop, the machine end may be vibrating or the machine end accuracy not obtained.
Dual F/B control	Feature	Position is controlled according to the motor end data and machine end data.
	Advantage	Control is performed according to the motor end data during operation, and according to the machine end data at a stop in sequence to raise the gains during operation and shorten the settling time. A stop is made with the machine end accuracy.
	Disadvantage	No specific disadvantage.
Full closed control	Feature	Position is controlled according to the machine end data.
	Advantage	The machine end accuracy is obtained not only at a stop but also during operation.
	Disadvantage	Since this control is susceptible to machine influence (such as machine resonance), the gains of the servo amplifier do not rise and the settling time increases.

1.3 Specification list

(1) Servo amplifiers

Servo Amplifier Model MR-J2S-			10B -PY096	20B -PY096	40B -PY096	60B -PY096	70B -PY096	100B -PY096	200B -PY096	350B -PY096	500B -S096	700B -S096	10B1 -PY096	20B1 -PY096	40B1 -PY096
Power supply	Voltage・frequency (Note 1)		Three-phase 200 to 230VAC/50, 60Hz or single-phase 230VAC/50, 60Hz (Note 2)					Three-phase 200 to 230VAC/50, 60Hz (Note 2)					Single-phase 100 to 120VAC/50, 60Hz		
	Permissible voltage fluctuation		Three-phase 170 to 253VAC/50, 60Hz or single-phase 207 to 253VAC/50, 60Hz					Three-phase 170 to 253VAC/50, 60Hz					Single-phase 85 to 127VAC/50, 60Hz		
	Permissible frequency fluctuation		Within ±5%													
	Control system		Sine-wave PWM control・current control system													
	Protective functions		Overcurrent shutoff, regenerative overvoltage shutoff, overload shutoff (electronic thermal relay), servo motor overheat protection, encoder error protection, regeneration error protection, undervoltage・instantaneous power supply protection, overspeed protection, error excessive protection													
	Structure		Self-cooling, open (IP00)						Forced cooling, open (IP00)				Self-cooling, open (IP00)		
Environment	Ambient temperature		0 to 55℃ (non-freezing), storage: −20 to 65℃ (non-freezing)													
	Ambient humidity		90%RH or less (non-condensing), storage: 90%RH or less (non-condensing)													
	Ambience		Indoors (no direct sunlight), without corrosive gas・flammable gas・oil mist・dust and dirt													
	Altitude		1000m or less above sea level													
	Vibration		5.9m/s² or less													
Weight (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

Note 1. The rated output capacity and rated speed of a servo motor used with the servo amplifier assumes that the power supply voltage and frequency are as indicated. They cannot be guaranteed when a power supply voltage drop occurs.
  2. The torque characteristic of the servo amplifier used with a servo motor assumes that the voltage is three-phase 200 to 230VAC or single-phase 230VAC.

1.4 Model name

MR-J2S   —   □   B   1   —   PY096

Mitsubishi general-purpose AC servo amplifier series name

B: SSCNET compatibility

Compatible motor list

Symbol	HC-KFS	HC-MFS	HC-SFS	HC-RFS	HC-UFS
10	053, 13	053, 13	—	—	13
20	23	23	—	—	23
40	43	43	—	—	43
60	—	—	52, 53	—	—
70	73	73	—	—	72, 73
100	—	—	81, 102, 103	—	—
200	—	—	121, 201, 152, 202, 153, 203	103, 153	152
350	—	—	301, 352, 353	203	202
500	—	—	502	353, 503	352, 502
700	—	—	702	—	—

Symbol	Power supply
None	Three-phase 200VAC or single-phase 230VAC (Note 1)
1	Single-phase 100VAC (Note 2)

Note: 1. Single-phase 230VAC is for only the servo amplifier of MR-J2S-70□ or less.
  2. For only the servo amplifier of MR-J2S-40□ or less.

Symbol	Full closed control compatible amplifier
PY096	MR-J2S-B type 0.05 to 3.5kw
S096	MR-J2S-B type 5.0, 7.0kw

Note. The standard specifications comply with the EN, UL and cUL Standards.

1.5 System configuration

(1) When A・B・Z differential input interface unit (MR-J2S-CLP01) is used

The A・B・Z differential input interface unit (MR-J2S-CLP01) converts external ABZ phase pulses into a position feedback signal that can be used for serial communication.

Full closed control is enabled by connecting the output of the MR-J2S-CLP01 to the servo amplifier encoder connector.

⚠ CAUTION	・When the MR-J2S-CLP01 is used, a linear scale without Z phase cannot be connected. Use a linear scale that has the Z phase.

・System configuration example 1 (when ABZ pulse train-specified linear scale is used)
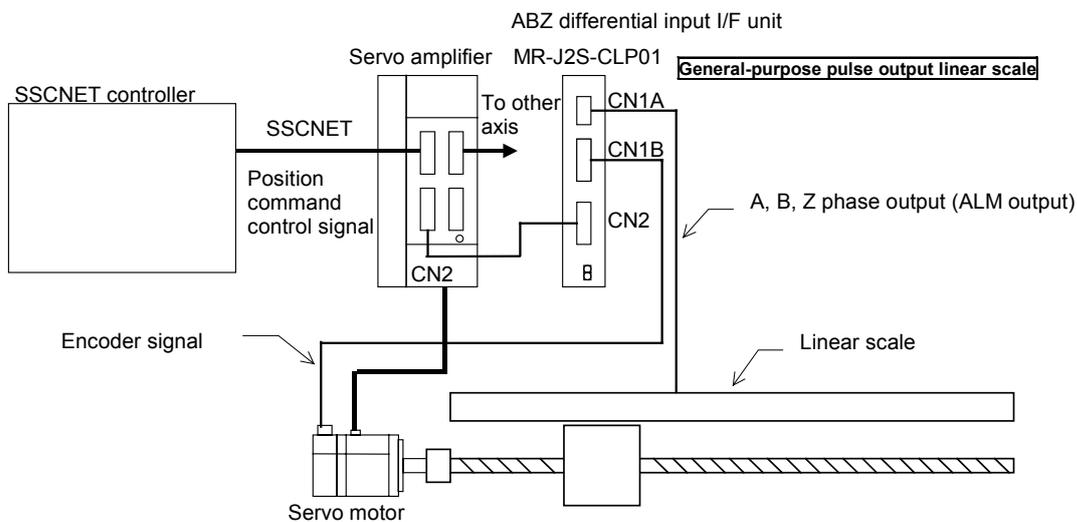
Note 1. A linear scale without Z phase cannot be connected.
    2. No compatibility with an absolute position detection system.

・System configuration example 2 (when ABZ phase pulse train-specified rotary encoder is used)
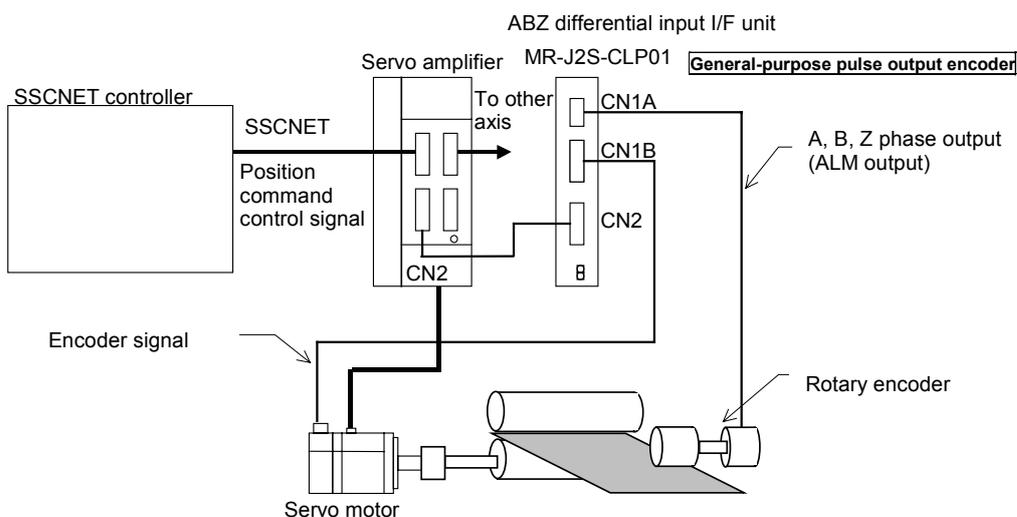
Note 1. A rotary without Z phase cannot be connected.
    2. No compatibility with an absolute position detection system.
    3. In this example, full closed control cannot be performed if there is no stock (work).

(2) When A・B・Z differential input interface unit (MR-J2S-CLP01) is not used

・System configuration example 3 (when serial communication-specified linear scale is used)
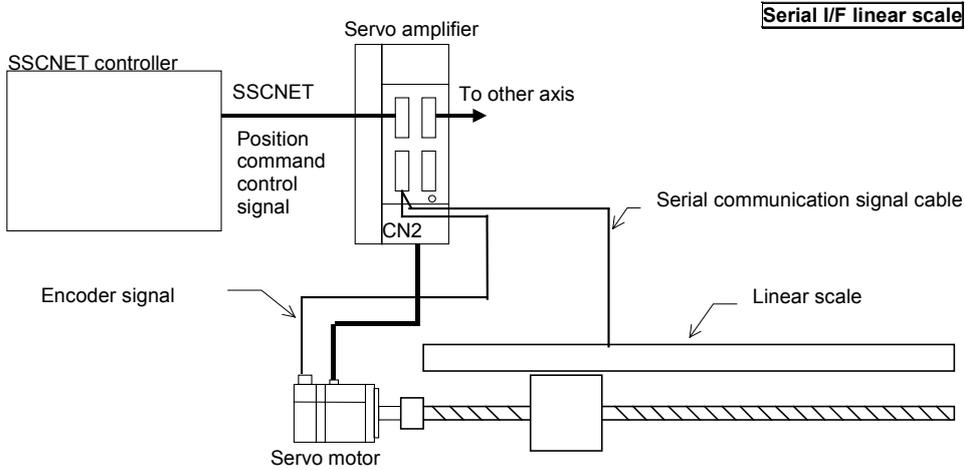
Note 1. When an ABS type linear scale is used, this example is compatible with an absolute position detection system. Note that the battery (MR-BAT) is not needed.

・System configuration example 4 (when serial communication-specified servo motor is used)
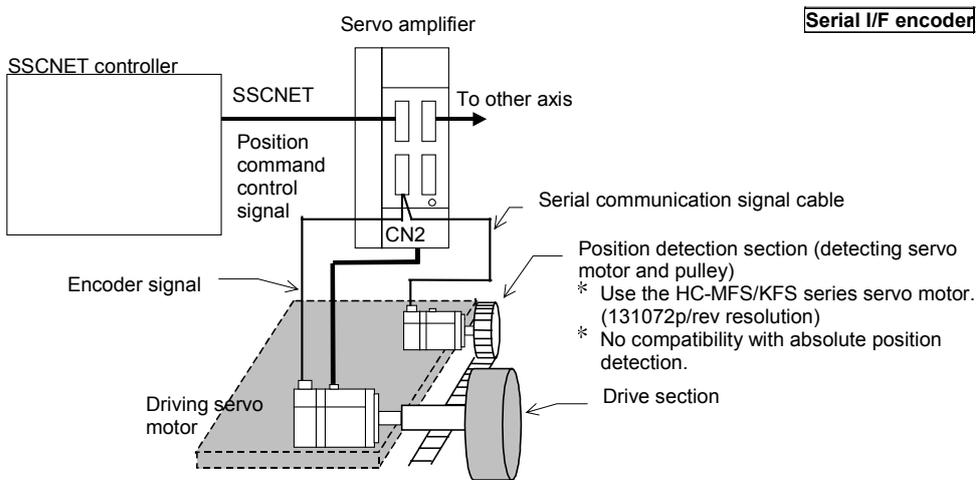
Note 1. Use the HC-KFS series or HC-MFS series servo motor in the position detection section.
     2. No compatibility with an absolute position detection system.

MEMO

2 LINEAR SCALES

Contact the linear scale manufacturer for details of the linear scales such as the specifications, performance and warranties.

2.1 Compatible linear scale list

Scale Type		Manufacturer	Model	Resolution	Rated Speed (Note 1)	Effective Measurement Length (Maximum)	Communication System	Absolute Position System
Mitsubishi serial interface compatibility	ABS type	Mitutoyo	AT343A	0.05μm	2.0m/s	3000mm	2 wire type	○
			AT543A			1500mm		○
		Heidenhain	LC491M	0.05μm	2.0m/s	2040mm	4 wire type	×
	INC type	Sony Precision Technology	SL710 +PL101R +MJ830	0.2μm (Note 2)	6.4m/s	3000mm	2 wire type	×
			SH13 +MJ830	0.005μm (Note 2)	1.4m/s	1240mm		×
		Renishaw	RGH26P	5.0μm	4.0m/s	70000mm	2 wire type	×
			RGH26Q	1.0μm	3.2m/s			×
			RGH26R	0.5μm	1.6m/s			×
A/B/Z phase differential output (MR-CLP01 used) A/B/Z signal required (Note 3)	INC type	Not specified	(Note 3)	Scale dependent (Note 4)	Scale dependent	Scale dependent	2 wire type	×

Note 1. The upper limit value of the linear servo motor speed is the lower value of the maximum speed of the linear servo motor and the rated speed of the linear scale.

2. Changes depending on the setting of the interpolator (MJ830: Sony Precision Technology make). Set the resolution within the range of the minimum resolution to 5μm.

3. The phase difference between the A-phase pulse and B-phase pulse must be 500ns or more, and the Z-phase pulse width be equivalent to one cycle of the A-phase pulse. Also, the Z phase must be synchronized with the A phase/B phase.
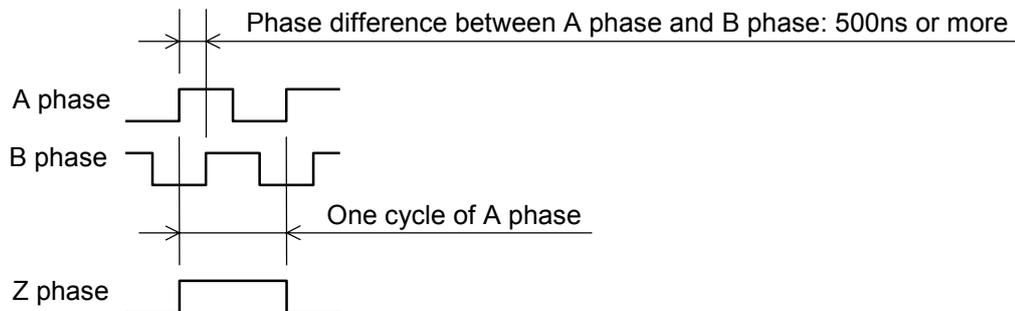
4. The permissible resolution range is 0.005 to 5μm. Select the linear scale within this range.

[About handling of the linear scale]

If the linear scale is mounted improperly, for example, an alarm, position shift, etc. may occur.

In such cases, also check the mounting of the linear scale.

・General check items of the linear scale

(a) Check that the gap between the head and scale is proper.

(b) Check the scale head for rolling and yawing (looseness of scale head section).

(c) Check the scale surface for contamination and scratches.

(d) Check that the vibration and temperature are within the operating range.

(e) Check that the speed is within the permissible range without overshooting.

＊For detailed check items, contact the linear scale manufacturer.

2.1.1 Mitutoyo make linear scales (ABS type)

○Specifications Reference

Contact Mitutoyo for the specifications of these linear scales.

Item	Specifications	
Model	AT343A-□□□	AT543A-□□□
System	Capacitive, photoelectric, combined type	
Effective measurement length	100 to 3000mm	100 to 1500mm
Resolution	0.05μm	
Indication accuracy (20℃)	100 to 1500mm: 3+3L/1000μm 1600mm to 3000mm: 5+5L/1000μm L: Effective measurement length	100 to 1500mm: 3+3L/1000μm L: Effective measurement length
Supply power voltage	5V±5%	
Current consumption	Max.250mA	Max.270mA
Rated response speed	2.0m/s	
Maximum response speed	2.0m/s	
Operating temperature range	0 to 45℃ (non-freezing)	0 to 50℃ (non-freezing)
Operating humidity range	20 to 80%RH (non-condensing)	
Storage temperature range	−20 to 70℃ (non-freezing)	
Storage humidity range	20 to 80%RH (non-condensing)	
Dust tightness・water tightness	IP53 or equivalent (in the indication method given in the instruction manual of the Mitutoyo make linear scale)	
Vibration resistance	100m/s² (55 to 2000Hz)	150m/s² (55 to 2000Hz)
Shock resistance	150m/s² (1/2sin, 11ms)	200m/s² (1/2sin, 11ms)
Sliding force	5N or less	
Output signal	Serial communication compatibility	
Output cable	Mitutoyo make option Part No. 09BAA598A to C:0.2, 2, 3m	Supplied as standard Head cable 5m+output cable 1m
Connection cable (Mitsubishi option)	Refer to the standard connection example in Chapter 3 and fabricate the cable. When the MR-J2SCLCBL02M-P-H is used, any of the following Mitsubishi cables can also be used (Note 1). Output cable length 0.2m: MR-JCCBL2, 5, 10M-H 2m: MR-JCCBL2, 5M-H 3m: MR-JCCBL2M-H	Refer to the standard connection example in Chapter 3 and fabricate the cable. When the MR-J2SCLCBL02M-P-H is used, any of the following Mitsubishi cables can also be used (Note 1). MR-JCCBL2, 5, 10M-H

Note 1. The MR-JCCBL□M-L and MR-JCCBL20M-H and more (20m and more) cannot be used.
　　　2. The battery (MR-BAT) is not required to configure an absolute position detection system.

○Scale unit structure Reference
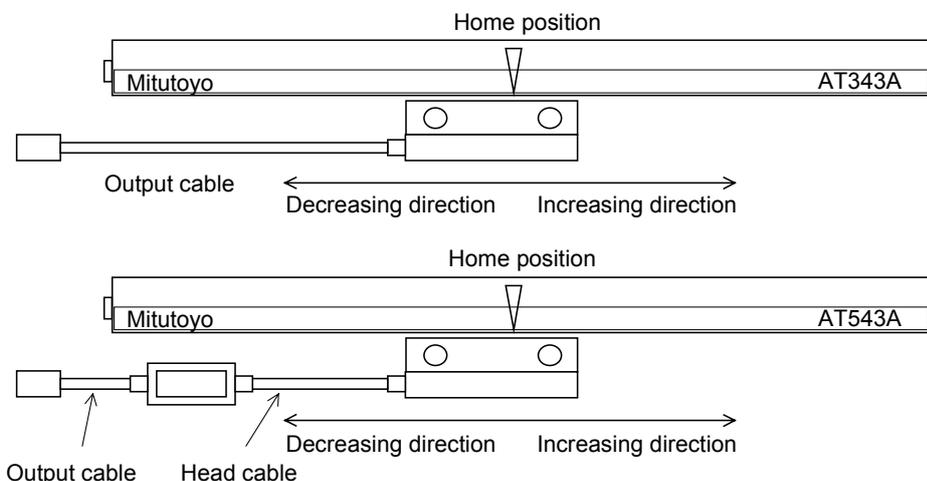
○AT343A and AT543A mounting dimension tables [Reference]   (Dimension unit: mm)

The following tables indicate L0 to L4 and number of mounting blocks or number of fixing holes in the outline drawings shown on the next page.

Model	Effective Measurement Length L0	Maximum Moving Length L1	Full Length L2	Mounting Block Fixing Pitch		Number of Mounting Blocks (pcs.)	Model	Effective Measurement Length L0	Maximum Moving Length L1	Full Length L2	Mounting Block Fixing Pitch		Number of Mounting Blocks (pcs.)
				L3	L4						L3	L4	
AT343A-300	300	330	440	220	150	3	AT343A-1300	1300	1360	1470	735	325	5
AT343A-350	350	380	490	245	175		AT343A-1400	1400	1460	1570	785	350	
AT343A-400	400	430	540	270	200		AT343A-1500	1500	1560	1670	835	375	
AT343A-450	450	480	590	295	225		AT343A-1600	1600	1690	1800	900	400	
AT343A-500	500	540	650	325	250		AT343A-1700	1700	1790	1900	950	425	
AT343A-600	600	650	760	380	300		AT343A-1800	1800	1890	2000	1000	450	
AT343A-700	700	760	870	435	350		AT343A-2000	2000	2100	2210	1105	335	7
AT343A-750	750	810	920	460	375		AT343A-2200	2200	2300	2410	1205	370	
AT343A-800	800	860	970	485	400		AT343A-2400	2400	2500	2610	1305	400	
AT343A-900	900	960	1070	535	450		AT343A-2500	2500	2600	2710	1355	315	9
AT343A-1000	1000	1060	1170	585	500		AT343A-2600	2600	2700	2810	1405	325	
AT343A-1100	1100	1160	1270	635	275	5	AT343A-2800	2800	2900	3010	1505	350	
AT343A-1200	1200	1260	1370	685	300		AT343A-3000	3000	3050	3210	1605	375	

Model	Effective Measurement Length L0	Maximum Moving Length L1	Mounting Hole Position L2	Full Length L3	Number of Fixing Holes (n) (pcs.)	Model	Effective Measurement Length L0	Maximum Moving Length L1	Mounting Hole Position L2	Full Length L3	Number of Fixing Holes (n) (pcs.)
AT543A-100	100	120	12.5	225	3	AT543A-700	700	720	12.5	825	9
AT543A-150	150	170	37.5	275	3	AT543A-750	750	770	37.5	875	9
AT543A-200	200	220	12.5	325	4	AT543A-800	800	820	12.5	925	10
AT543A-250	250	270	37.5	375	4	AT543A-900	900	920	12.5	1025	11
AT543A-300	300	320	12.5	425	5	AT543A-1000	1000	1020	12.5	1125	12
AT543A-350	350	370	37.5	475	5	AT543A-1100	1100	1120	12.5	1225	13
AT543A-400	400	420	12.5	525	6	AT543A-1200	1200	1220	12.5	1325	14
AT543A-450	450	470	37.5	575	6	AT543A-1300	1300	1320	12.5	1425	15
AT543A-500	500	520	12.5	625	7	AT543A-1400	1400	1420	12.5	1525	16
AT543A-600	600	620	12.5	725	8	AT543A-1500	1500	1520	12.5	1625	17

○AT343A outline drawing Reference (Dimension unit: mm)

Effective measurement length 300mm to 3000mm

This outline drawing is based on the data from Mitutoyo. Contact Mitutoyo for this outline drawing.

○AT543A outline drawing Reference (Dimension unit: mm)

This outline drawing is based on the data from Mitutoyo. Contact Mitutoyo for this outline drawing.

○Connection cable connection examples (1)

The following cable wiring examples assume that the linear scale is connected directly to CN2 of the servo amplifier.

(1) Connection example of up to 5m wiring length (This connection example assumes that the following operating combination is satisfied.)

[Operating combination]

Used Wire Size	Scale Model	Scale Side Output Cable Specifications
AWG24	AT343A	Mitutoyo make output cable 2m
AWG24	AT543A	Mitutoyo make output cable 1m

[Connection example]

[Linear scale side connector] (Note 4)

Applicable Housing	172161-9 (Tyco Electronics or equivalent)	RDAD-15S-LNA (Hirose Electric or equivalent)
RQ	1	7
/RQ	2	8
P5 (+5V)	7	3, 4
LG (0V)	8	1, 2
FG	9	15

Note 1. Do not connect the linear scale that is not indicated in this specification.

2. Connect the shield wire to the plate (ground plate) in the connector securely.

3. For the wiring to the servo motor, refer to the standard connection examples in Chapter 3 and the Instruction Manual of the MR-J2S-☐B standard model.

4. Contact the scale manufacturer for detailed specifications such as the combinations, models, types, etc. of the linear scale side output cable and connector.

(2) Connection example of 5m to 30m wiring length (This connection example assumes that the following operating combination is satisfied.)

[Operating combination]

Used Wire Size	Scale Model	Scale Side Output Cable Specifications
AWG24	AT343A	Mitutoyo make output cable 0.2m
AWG22	AT543A	Mitutoyo make output cable 1m

[Connection example]

The wiring length is up to 30m. Depending on the wiring length, however, the number of LG and P5 connections must be changed according to the following table.

Wiring Length	Number of LG and P5 Connections
to 5m	2 parallel
to 10m	4 parallel
to 15m	6 parallel
to 20m	8 parallel
to 25m	10 parallel
to 30m	12 parallel

[Linear scale side connector] (Note 4)

Applicable Housing	172161-9 (Tyco Electronics or equivalent)	RDAD-15S-LNA (Hirose Electric or equivalent)
RQ	1	7
/RQ	2	8
P5 (+5V)	7	3, 4
LG (0V)	8	1, 2
FG	9	15

Note 1. Do not connect the linear scale that is not indicated in this specification.
   2. Connect the shield wire to the plate (ground plate) in the connector securely.
   3. For the wiring to the servo motor, refer to the standard connection examples in Chapter 3 and the Instruction Manual of the MR-J2S-□B standard model.
   4. Contact the scale manufacturer for detailed specifications such as the combinations, models, types, etc. of the linear scale side output cable and connector.
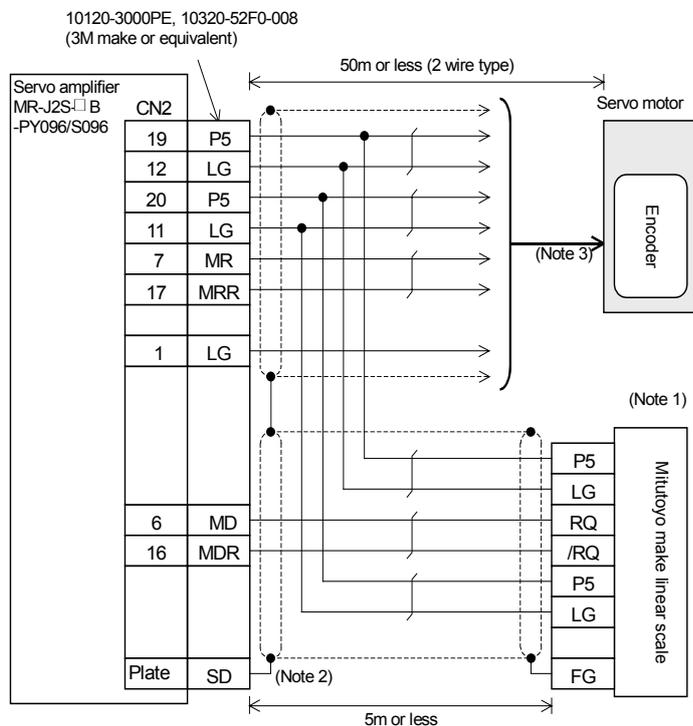
○Connection cable connection examples (2)

The following cable wiring examples assume that the linear scale is connected to CN2 of the servo amplifier using the option cable MR-J2SCLCBL02M-P-H.

(1) Connection example of up to 5m wiring length (This connection example assumes that the following operating combination is satisfied.)

[Operating combination]

Used Wire Size	Scale Model	Scale Side Output Cable Specifications
AWG24	AT343A	Mitutoyo make output cable 2m
AWG24	AT543A	Mitutoyo make output cable 1m

[Connection example]

[Linear scale side connector] (Note 4)

Applicable Housing	172161-9 (Tyco Electronics or equivalent) (Note 5)	RDAD-15S-LNA (Hirose Electric or equivalent)
RQ	1	7
/RQ	2	8
P5 (+5V)	7	3, 4
LG (0V)	8	1, 2
FG	9	15

Note 1. Do not connect the linear scale that is not indicated in this specification.

2. Connect the shield wire to the plate (ground plate) in the connector securely.

3. For the wiring to the servo motor, refer to the standard connection examples in Chapter 3 and the Instruction Manual of the MR-J2S-□B standard model.

4. Contact the scale manufacturer for detailed specifications such as the combinations, models, types, etc. of the linear scale side output cable and connector.

5. When the MR-J2SCLCBL02M-P-H is used, the Mitsubishi option cable can be used as the linear scale connection cable.

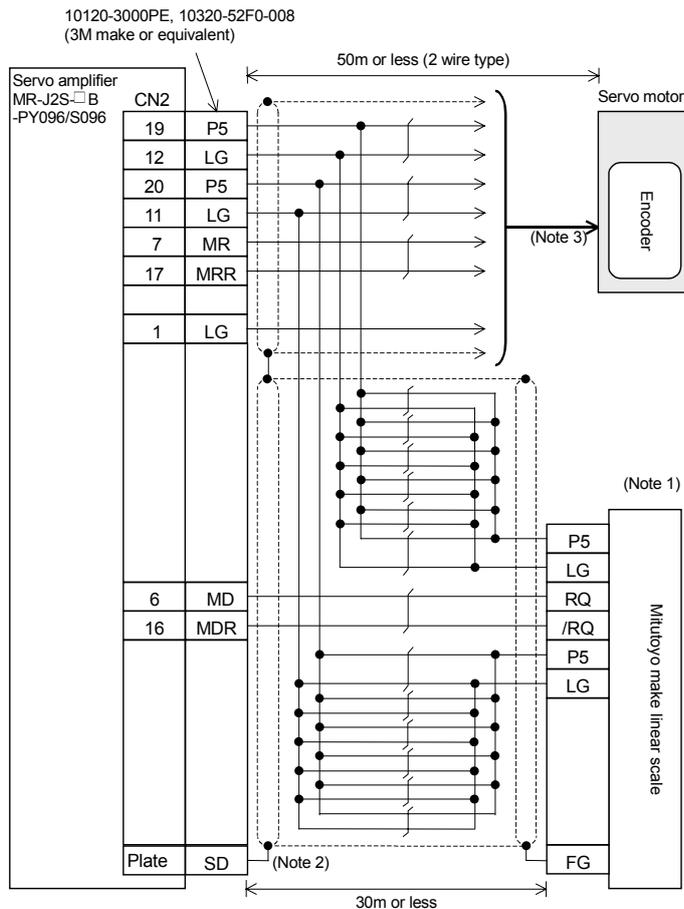| Scale Model	Scale Side Output Cable Length	Mitsubishi Option Cable Model
AT343A	0.2m	MR-JCCBL2, 5, 10M-H
	2m	MR-JCCBL2, 5M-H
	3m	MR-JCCBL2M-H
AT543A	1m	MR-JCCBL2, 5, 10M-H

(2) Connection example of 5m to 30m wiring length (This connection example assumes that the following operating combination is satisfied.)

[Operating combination]

Used Wire Size	Scale Model	Scale Side Output Cable Specifications
AWG24	AT343A	Mitutoyo make output cable 0.2m
AWG22	AT543A	Mitutoyo make output cable 1m

[Connection example]

The wiring length is up to 30m. Depending on the wiring length, however, the number of LG and P5 connections must be changed according to the following table.

Wiring Length	Number of LG and P5 Connections
to 5m	2 parallel
to 10m	4 parallel
to 15m	6 parallel
to 20m	8 parallel
to 25m	10 parallel
to 30m	12 parallel

[Linear scale side connector] (Note 4)

Applicable Housing	172161-9 (Tyco Electronics or equivalent) (Note 5)	RDAD-15S-LNA (Hirose Electric or equivalent)
RQ	1	7
/RQ	2	8
P5 (+5V)	7	3, 4
LG (0V)	8	1, 2
FG	9	15

Note 1. Do not connect the linear scale that is not indicated in this specification.
　2. Connect the shield wire to the plate (ground plate) in the connector securely.
　3. For the wiring to the servo motor, refer to the standard connection examples in Chapter 3 and the Instruction Manual of the MR-J2S-□B standard model.
　4. Contact the scale manufacturer for detailed specifications such as the combinations, models, types, etc. of the linear scale side output cable and connector.
　5. When the MR-J2SCLCBL02M-P-H is used, the Mitsubishi option cable can be used as the linear scale connection cable.

Scale Model	Scale Side Output Cable Length	Mitsubishi Option Cable Model
AT343A	0.2m	MR-JCCBL2, 5, 10M-H
	2m	MR-JCCBL2, 5M-H
	3m	MR-JCCBL2M-H
AT543A	1m	MR-JCCBL2, 5, 10M-H

2.1.2 Heidenhain make linear encoder (linear scale) (ABS type) Scheduled to be compatible

○Specifications Reference Scheduled to be compatible

Contact Heidenhain for the specifications of this linear encoder (linear scale).

Heidenhain Sales Section No. 2: TEL. (03) 3234-7781

Item	Specifications
Model	LC491M
System	Photoelectric scanning system
Effective measurement length	70 to 2040mm
Resolution	0.05μm
Accuracy grade (20℃)	±5μm ±3μm (up to effective measurement length 1240)
Supply power voltage	5V±5% on the linear encoder side
Current consumption	Max.300mA
Rated response speed	2.0m/s
Maximum response speed	2.0m/s
Operating temperature range	0 to 50℃ (non-freezing) (Note 2)
Storage temperature range	−20 to 70℃ (non-freezing)
Dust tightness・water tightness	IP53 (when mounted according to the manual of the Heidenhain make linear encoder) IP64 (when filled with compressed air)
Vibration resistance	100m/s² (DINIEC 68-2-6) without mounting spur 150m/s² (DINIEC 68-2-6) with mounting spur
Shock resistance	150m/s² (DINIEC 68-2-6) (11ms)
Required feeding force	5N or less
Output signal	Serial communication compatibility
Output cable	337 439−×× (17 pin coupling), 367 425−0× (20 pins), etc. (Note 1)
Connection cable	Refer to the standard connection example in Chapter 3 and fabricate the cable.

Note 1. When the MR-J2SCLCBL02M-P-H is used, 367 425−×× (5m or less) can be connected directly.

　　　2. The linear encoder (linear scale) is extremely sensitive to the operating temperature. When it exceeds 50℃, an alarm may occur. It is recommended to pay special attention to the operating temperature and secure the temperature change margins.

　　　3. The battery (MR-BAT) is not required to configure an absolute position detection system.

○Linear encoder (linear scale) unit structure Reference Scheduled to be compatible

Home position

Decreasing direction Increasing direction
(With the housing section fixed)

○LC491M outline drawing [Reference] [Scheduled to be compatible]　　　　　　　(Dimension unit: mm)

This outline drawing is based on the data from Heidenhain. Contact Heidenhain for this outline drawing.

○ = Without mounting spur
ⓤ = With mounting spur
F = Machine guide
P = Measurement point for adjustment
Ⓚ = Dimensional tolerance for machine installation
ⓤ = Compressed air filling port
Ⓢ = Measurement length starting point (pos. 20mm)

Mounting spur

ML		m
70	... 520	0
570	... 920	1
1020	... 1340	2
1440	... 1740	3
1840	... 2040	4

ML		m
2.7	... 20.5"	0
22.4	... 36"	1
40	... 52"	2
56	... 68"	3
72	... 80"	4

○Connection cable connection examples (1)

The following cable wiring examples assume that the linear encoder (linear scale) is connected directly to CN2 of the servo amplifier.

⚠ CAUTION	· When the Heidenhain linear encoder (linear scale) is used, the communication system is of 4 wire type. Change the setting of serial encoder cable selection (parameter No. 23) as indicated below. If a wrong value is set, a servo alarm (alarm 70) occurs. Pr.23 = □ 2 □ □ (4 wire type setting is made valid.)

(1) Connection example of up to 5m wiring length (This connection example assumes that the following operating combination is satisfied.)

[Operating combination]

Used Wire Size	Encoder (Scale) Model	Encoder (Scale) Side Output Cable Specifications
AWG22	LC491M	Heidenhain make output cable 0.5m

[Connection example]

[Linear scale side connector] (Note 4)

Applicable Housing	17 Pin Coupling 291697-26 (Female) (Heidenhain make)	20 Pin Connector (3M or equivalent)
SD	14	6
/SD	17	16
RQ	8	7
/RQ	9	17
5V	7	20
0V	10	1
5V/sensor	1	19
0V/sensor	4	11

Note 1. Do not connect the linear encoder (linear scale) that is not indicated in this specification.
   2. Connect the shield wire to the plate (ground plate) in the connector securely.
   3. For the wiring to the servo motor, refer to the standard connection examples in Chapter 3 and the Instruction Manual of the MR-J2S-□B standard model.
   4. Contact the scale manufacturer for detailed specifications such as the combinations, models, types, etc. of the linear encoder (linear scale) side output cable and connector.

(2) Connection example of 5m to 30m wiring length (This connection example assumes that the following operating combination is satisfied.)

[Operating combination]

Used Wire Size	Encoder (Scale) Model	Encoder (Scale) Side Output Cable Specifications
AWG22	LC491M	Heidenhain make output cable 0.5m

[Connection example]

The wiring length is up to 30m. Depending on the wiring length, however, the number of LG and P5 connections must be changed according to the following table.

Wiring Length	Number of LG and P5 Connections
to 5m	2 parallel
to 10m	4 parallel
to 15m	6 parallel
to 20m	8 parallel
to 25m	10 parallel
to 30m	12 parallel

[Linear scale side connector] (Note 4)

Applicable Housing	17 Pin Coupling 291697-26 (Female) (Heidenhain make)	20 Pin Connector (3M or equivalent)
SD	14	6
/SD	17	16
RQ	8	7
/RQ	9	17
5V	7	20
0V	10	1
5V/sensor	1	19
0V/sensor	4	11

Note 1. Do not connect the linear encoder (linear scale) that is not indicated in this specification.

2. Connect the shield wire to the plate (ground plate) in the connector securely.

3. For the wiring to the servo motor, refer to the standard connection examples in Chapter 3 and the Instruction Manual of the MR-J2S-□B standard model.

4. Contact the scale manufacturer for detailed specifications such as the combinations, models, types, etc. of the linear encoder (linear scale) side output cable and connector.

○Connection cable connection examples (2)

The following cable wiring examples assume that the linear encoder (linear scale) is connected to CN2 of the servo amplifier using the option cable MR-J2SCLCBL02M-P-H.
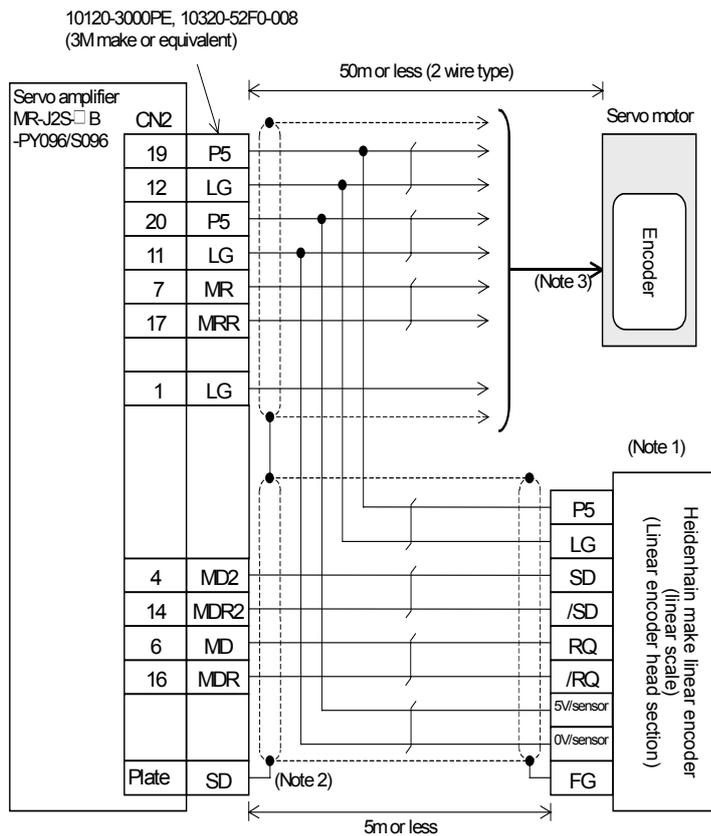
(1) Connection example of up to 5m wiring length (This connection example assumes that the following operating combination is satisfied.)

[Operating combination]

Used Wire Size	Encoder (Scale) Model	Encoder (Scale) Side Output Cable Specifications
AWG22	LC491M	Heidenhain make output cable 0.5m

[Connection example]

[Linear scale side connector] (Note 4)

Applicable Housing	17 Pin Coupling 291697-26 (Female) (Heidenhain make)	20 Pin Connector (Note 5) (3M or equivalent)
SD	14	6
/SD	17	16
RQ	8	7
/RQ	9	17
5V	7	20
0V	10	1
5V/sensor	1	19
0V/sensor	4	11

Note 1. Do not connect the linear encoder (linear scale) that is not indicated in this specification.

2. Connect the shield wire to the plate (ground plate) in the connector securely.

3. For the wiring to the servo motor, refer to the standard connection examples in Chapter 3 and the Instruction Manual of the MR-J2S-☐B standard model.

4. Contact the scale manufacturer for detailed specifications such as the combinations, models, types, etc. of the linear encoder (linear scale) side output cable and connector.

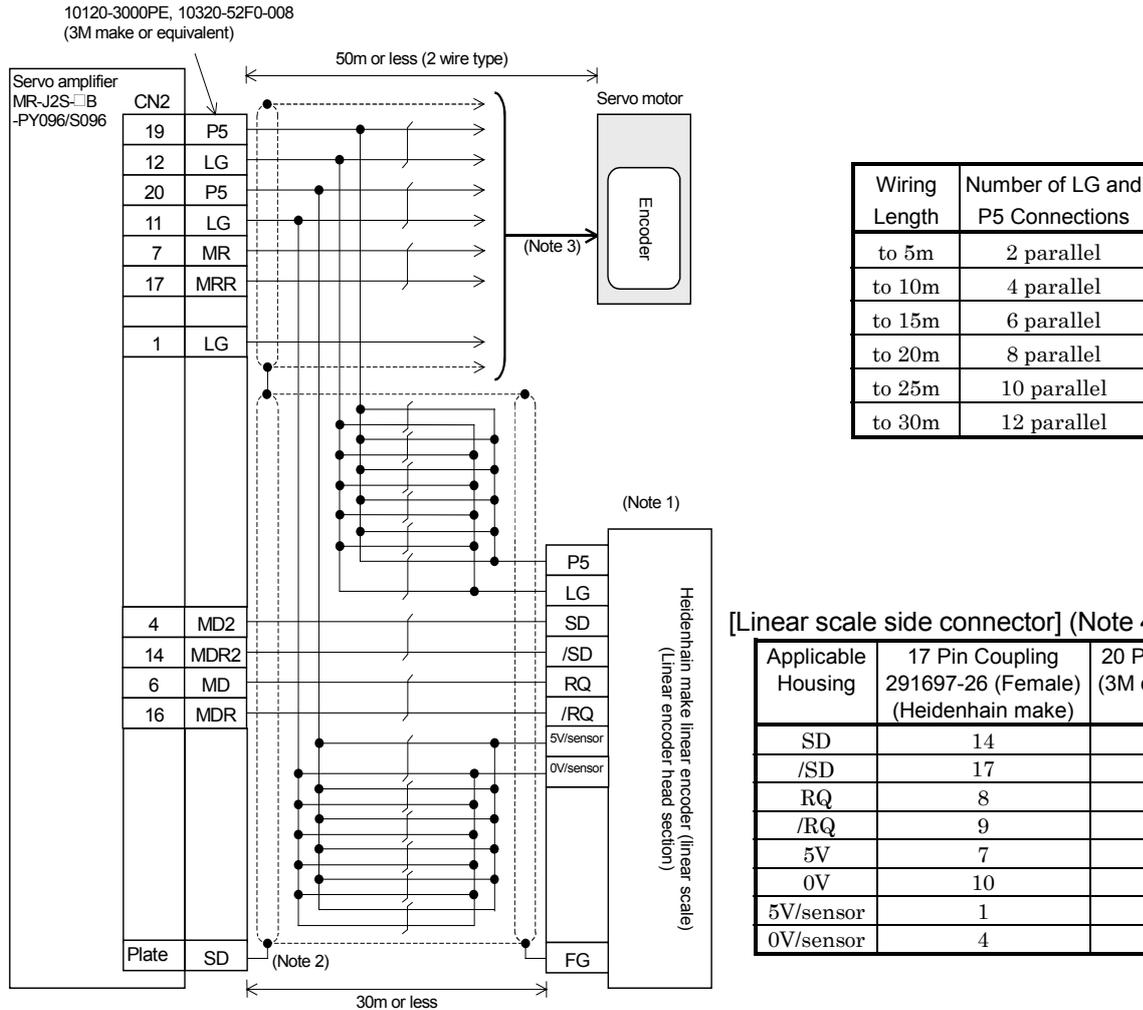5. Can be connected directly when the MR-J2SCLCBL02M-P-H is used.

(2) Connection example of 5m to 30m wiring length (This connection example assumes that the following operating combination is satisfied.)

[Operating combination]

Used Wire Size	Encoder (Scale) Model	Encoder (Scale) Side Output Cable Specifications
AWG22	LC491M	Heidenhain make output cable 0.5m

[Connection example]

The wiring length is up to 30m. Depending on the wiring length, however, the number of LG and P5 connections must be changed according to the following table.

Wiring Length	Number of LG and P5 Connections
to 5m	2 parallel
to 10m	4 parallel
to 15m	6 parallel
to 20m	8 parallel
to 25m	10 parallel
to 30m	12 parallel

[Linear scale side connector] (Note 4)

Applicable Housing	17 Pin Coupling 291697-26 (Female) (Heidenhain make)	20 Pin Connector (Note 5) (3M or equivalent)
SD	14	6
/SD	17	16
RQ	8	7
/RQ	9	17
5V	7	20
0V	10	1
5V/sensor	1	19
0V/sensor	4	11

Note 1. Do not connect the linear encoder (linear scale) that is not indicated in this specification.
  2. Connect the shield wire to the plate (ground plate) in the connector securely.
  3. For the wiring to the servo motor, refer to the standard connection examples in Chapter 3 and the Instruction Manual of the MR-J2S-□B standard model.
  4. Contact the scale manufacturer for detailed specifications such as the combinations, models, types, etc. of the linear encoder (linear scale) side output cable and connector.
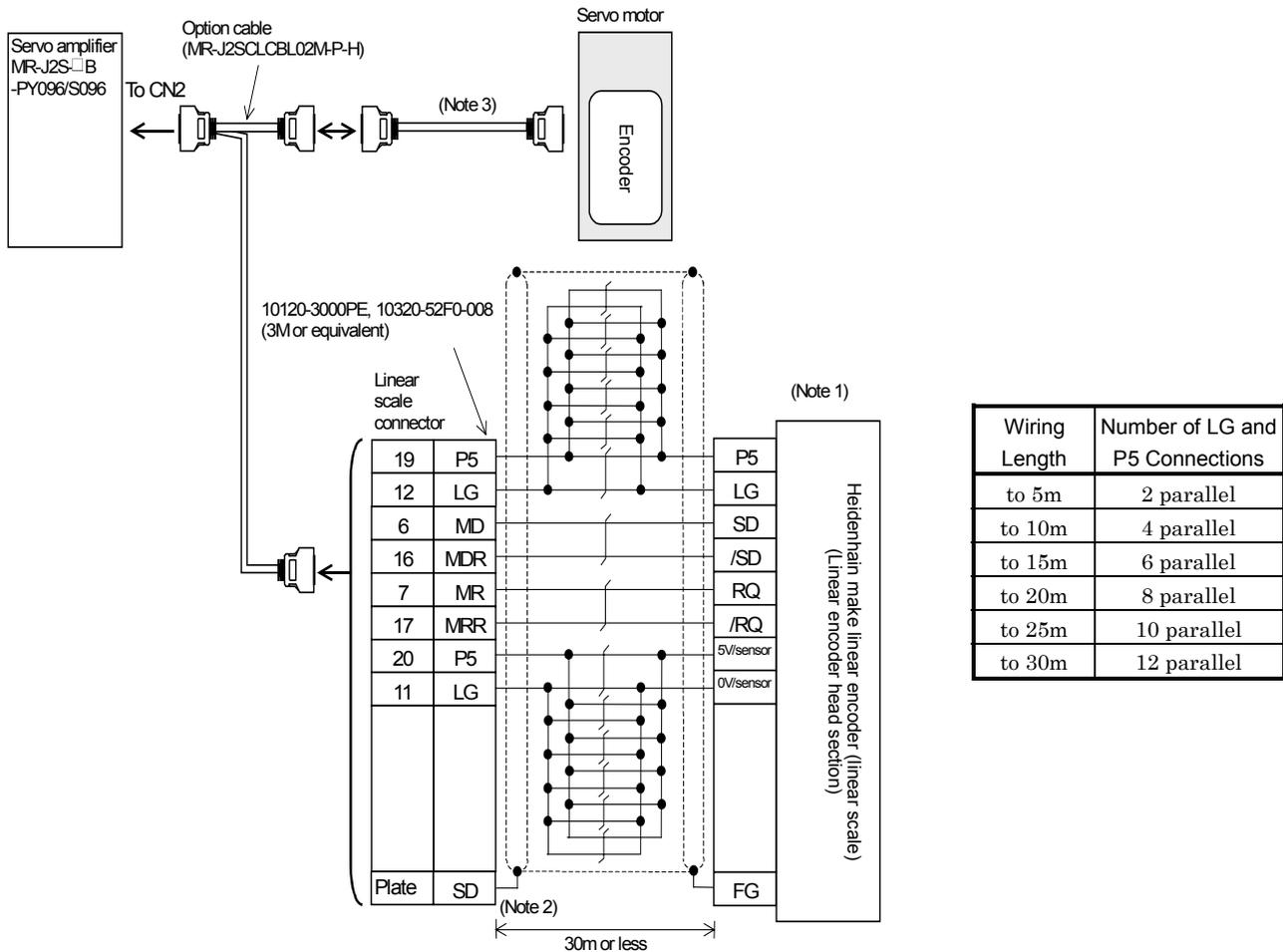 5. Can be connected directly when the MR-J2SCLCBL02M-P-H is used.

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2.1.3 Renishaw make linear encoders (linear scales) (INC type)

○Specifications Reference

Contact Renishaw for the specifications of these linear encoders (linear scales).

Renishaw Encoder Section: TEL. (03) 5332-6023

Item	Specifications		
Model	RGH26P	RGH26Q	RGH26R
System	Optical system		
Effective measurement length	Maximum length 70000mm		
Resolution	5μm	1μm	0.5μm
Accuracy (20℃)	±3μm/m (when compensation is made between two points)		
Supply power voltage	5V±5%		
Current consumption	Max.230mA		
Rated response speed (Note 1)	4.0m/s	3.2m/s	1.6m/s
Maximum response speed	5.0m/s	4.0m/s	2.0m/s
Operating temperature range	0 to 55℃ (non-freezing)		
Operating humidity range	10 to 90%RH (non-condensing)		
Storage temperature range	−20 to 70℃ (non-freezing)		
Dust tightness・water tightness	IP50		
Vibration resistance	100m/s² (55 to 2000Hz)		
Shock resistance	1000m/s² (1/2sin, 11ms)		
Output signal	Serial communication compatibility (Z phase data included, serial communication of reference mark data is also is made) (Note 3)		
Output cable	Renishaw make N-15 PIN Dtype Dtype plug (0.5m)		
Connection cable	Refer to the standard connection example in Chapter 3 and fabricate the cable.		

Note 1. Use at the rated speed or less.

　　　 2. A limit switch signal cannot be imported directly to the servo amplifier. When using a limit switch, use a photocoupler for isolation.

　　　 3. A home position return cannot be made if there is no encoder (scale) home position (reference mark). Always provide an encoder (scale) home position (reference mark).

○Linear encoder (linear scale) unit structure Reference
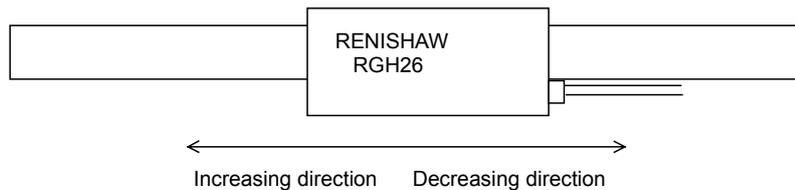
Note 1. Always set an encoder (scale) home position (reference mark).

○RGH26P, RGH26Q, RGH26R outline drawing ⎍Reference⎍ (Dimension unit: mm)

This outline drawing is based on the data from Renishaw. Contact Renishaw for this outline drawing.

- Reference mark actuator
- Dynamic bending radius R50
- Static bending radius R10
- 6 minimum
- 22
- Reference mark sensor position
- Optical center
- M3×0.5, two 9.5 deep holes
- (Yaw tolerance×0.5°)
- //0.38
- 14
- 7
- 14.5
- 4
- 23.5
- 15.5
- 6
- 10.5
- Mounting surface
- Setup LED
- 17
- 16
- 11.6
- (Roll tolerance ±1.0°)
- ⏛0.13
- 3
- 9
- 13
- 27

P limit switch
Mount it with the white point directed toward the machine stock side.
(Size is the same as that of the Q limit switch.)

- P limit sensor position
- 14.6
- 14.6
- 3
- 10
- Mount the Q limit switch with the white point up.
- M3×0.5, two 7.5 deep holes
- Q limit sensor position
- Mounting surface range
- Selectable mounting surface
- 7.6

The arrow indicates the forward moving direction of the read head relative to the scale.

- 44
- 38
- 3
- φ4.7
- (Pitch tolerance ±1.0°)
- //0.8
- 5
- 2
- 10.6
- 2.2
- Scale mounting surface
- Clearance detail
- 0.8±0.1

○Connection cable connection examples (1)

The following cable wiring examples assume that the linear encoder (linear scale) is connected directly to CN2 of the servo amplifier.

(1) Connection example of up to 5m wiring length (This connection example assumes that the following operating combination is satisfied.)

[Operating combination]

Used Wire Size	Encoder (Scale) Model	Encoder (Scale) Side Output Cable Specifications
AWG22	RGH26□	Renishaw make output cable 0.5m

[Connection example]

[Linear encoder side connector] (Note 6)

Applicable Housing	D Sub 15 Pin Female Equivalent
Inner	15
P5	7, 8
LG	2, 9
MR	10
MRR	1
SD	Case

Note 1. Do not connect the linear encoder (linear scale) that is not indicated in this specification.
  2. Connect the shield wire to the plate (ground plate) in the connector securely.
  3. For the wiring to the servo motor, refer to the standard connection examples in Chapter 3 and the Instruction Manual of the MR-J2S-□B standard model.
  4. A limit switch signal cannot be imported directly to the servo amplifier. When using a limit switch, use a photocoupler for isolation as shown above. Contact the scale manufacturer for detailed specifications of the limit switch.
  5. The encoder (scale) home position (reference mark) data is sent to the servo amplifier by serial communication.
  6. Contact the scale manufacturer for detailed specifications such as the combinations, models, types, etc. of the linear encoder (linear scale) side output cable and connector.

(2) Connection example of 5m to 30m wiring length (This connection example assumes that the following operating combination is satisfied.)

[Operating combination]

Used Wire Size	Encoder (Scale) Model	Encoder (Scale) Side Output Cable Specifications
AWG22	RGH26□	Renishaw make output cable 0.5m

[Connection example]

The wiring length is up to 30m. Depending on the wiring length, however, the number of LG and P5 connections must be changed according to the following table.

Wiring Length	Number of LG and P5 Connections
to 5m	2 parallel
to 10m	3 parallel
to 15m	4 parallel
to 20m	5 parallel
to 25m	6 parallel
to 30m	7 parallel

Renishaw make linear encoder (linear scale)

[Linear encoder side connector] (Note 6)

Applicable Housing	D Sub 15 Pin Female Equivalent
Inner	15
P5	7, 8
LG	2, 9
MR	10
MRR	1
SD	Case

Note 1. Do not connect the linear encoder (linear scale) that is not indicated in this specification.
    2. Connect the shield wire to the plate (ground plate) in the connector securely.
    3. For the wiring to the servo motor, refer to the standard connection examples in Chapter 3 and the Instruction Manual of the MR-J2S-□B standard model.
    4. A limit switch signal cannot be imported directly to the servo amplifier. When using a limit switch, use a photocoupler for isolation as shown above. Contact the scale manufacturer for detailed specifications of the limit switch.
    5. The encoder (scale) home position (reference mark) data is sent to the servo amplifier by serial communication.
    6. Contact the scale manufacturer for detailed specifications such as the combinations, models, types, etc. of the linear encoder (linear scale) side output cable and connector.

○Connection cable connection examples (2)
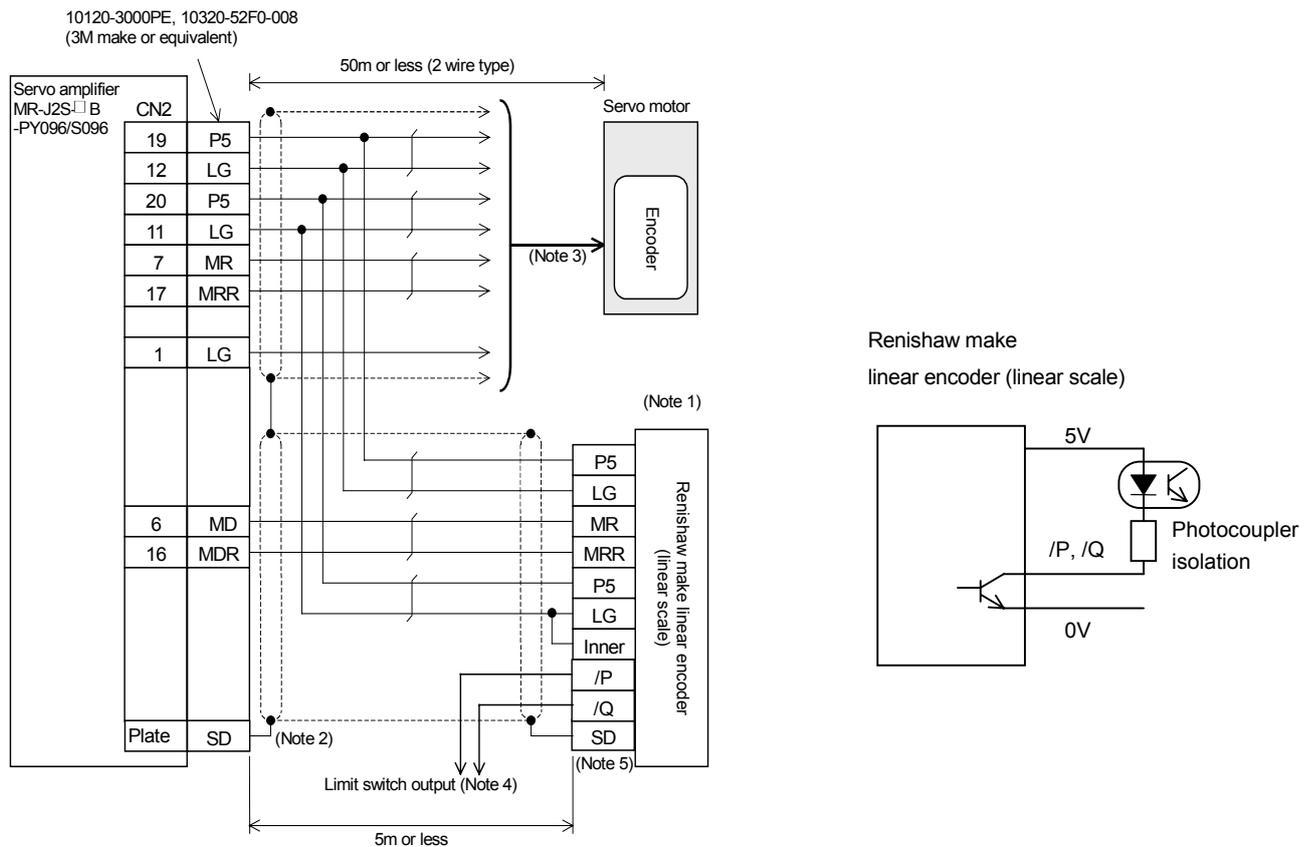
The following cable wiring examples assume that the linear encoder (linear scale) is connected to CN2 of the servo amplifier using the option cable MR-J2SCLCBL02M-P-H.
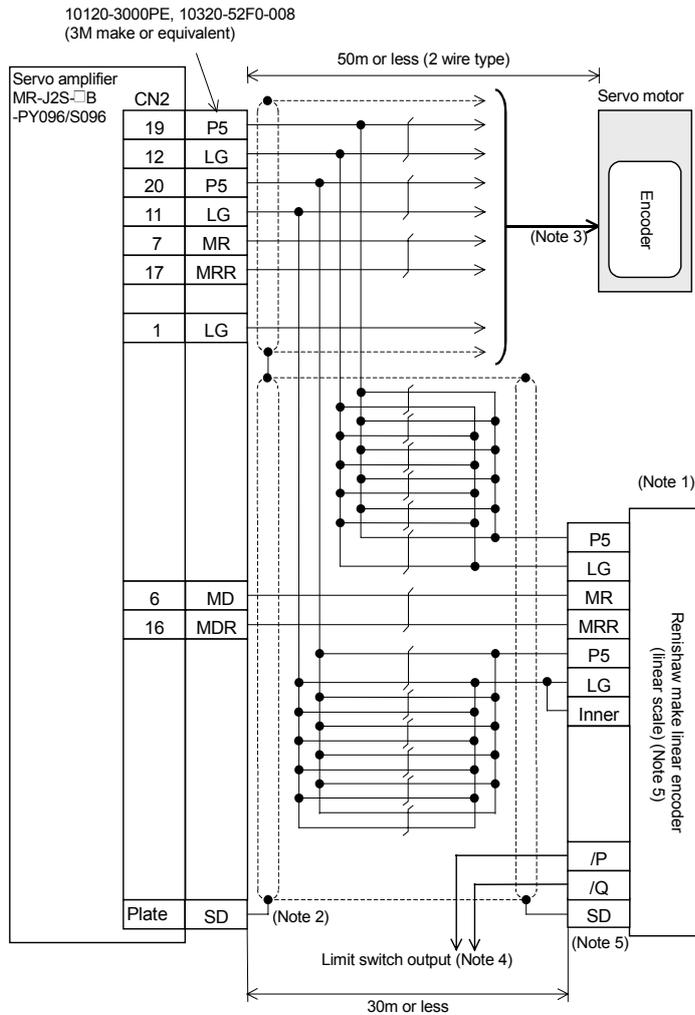
(1) Connection example of up to 5m wiring length (This connection example assumes that the following operating combination is satisfied.)

[Operating combination]

Used Wire Size	Encoder (Scale) Model	Encoder (Scale) Side Output Cable Specifications
AWG22	RGH26□	Renishaw make output cable 0.5m

[Connection example]

[Linear encoder side connector] (Note 6)

Applicable Housing	D Sub 15 Pin Female Equivalent
Inner	15
P5	7, 8
LG	2, 9
MR	10
MRR	1
SD	Case

Note 1. Do not connect the linear encoder (linear scale) that is not indicated in this specification.
2. Connect the shield wire to the plate (ground plate) in the connector securely.
3. For the wiring to the servo motor, refer to the standard connection examples in Chapter 3 and the Instruction Manual of the MR-J2S-□B standard model.
4. A limit switch signal cannot be imported directly to the servo amplifier. When using a limit switch, use a photocoupler for isolation as shown above. Contact the scale manufacturer for detailed specifications of the limit switch.
5. The encoder (scale) home position (reference mark) data is sent to the servo amplifier by serial communication.
6. Contact the scale manufacturer for detailed specifications such as the combinations, models, types, etc. of the linear encoder (linear scale) side output cable and connector.

(2) Connection example of 5m to 30m wiring length (This connection example assumes that the following operating combination is satisfied.)

[Operating combination]

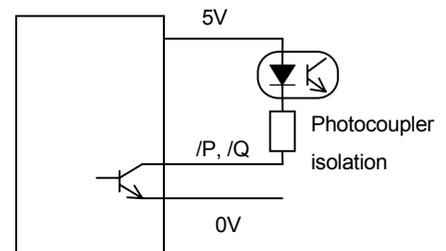| Used Wire Size	Encoder (Scale) Model	Encoder (Scale) Side Output Cable Specifications
AWG22	RGH26□	Renishaw make output cable 0.5m

[Connection example]

The wiring length is up to 30m. Depending on the wiring length, however, the number of LG and P5 connections must be changed according to the following table.

Wiring Length	Number of LG and P5 Connections
to 5m	2 parallel
to 10m	3 parallel
tob15m	4 parallel
to 20m	5 parallel
to 25m	6 parallel
to 30m	7 parallel

[Linear encoder side connector] (Note 6)

Applicable Housing	D Sub 15 Pin Female Equivalent
Inner	15
P5	7, 8
LG	2, 9
MR	10
MRR	1
SD	Case

Note 1. Do not connect the linear encoder (linear scale) that is not indicated in this specification.
  2. Connect the shield wire to the plate (ground plate) in the connector securely.
  3. For the wiring to the servo motor, refer to the standard connection examples in Chapter 3 and the Instruction Manual of the MR-J2S-□B standard model.
  4. A limit switch signal cannot be imported directly to the servo amplifier. When using a limit switch, use a photocoupler for isolation as shown above. Contact the scale manufacturer for detailed specifications of the limit switch.
  5. The encoder (scale) home position (reference mark) data is sent to the servo amplifier by serial communication.
  6. Contact the scale manufacturer for detailed specifications such as the combinations, models, types, etc. of the linear encoder (linear scale) side output cable and connector.

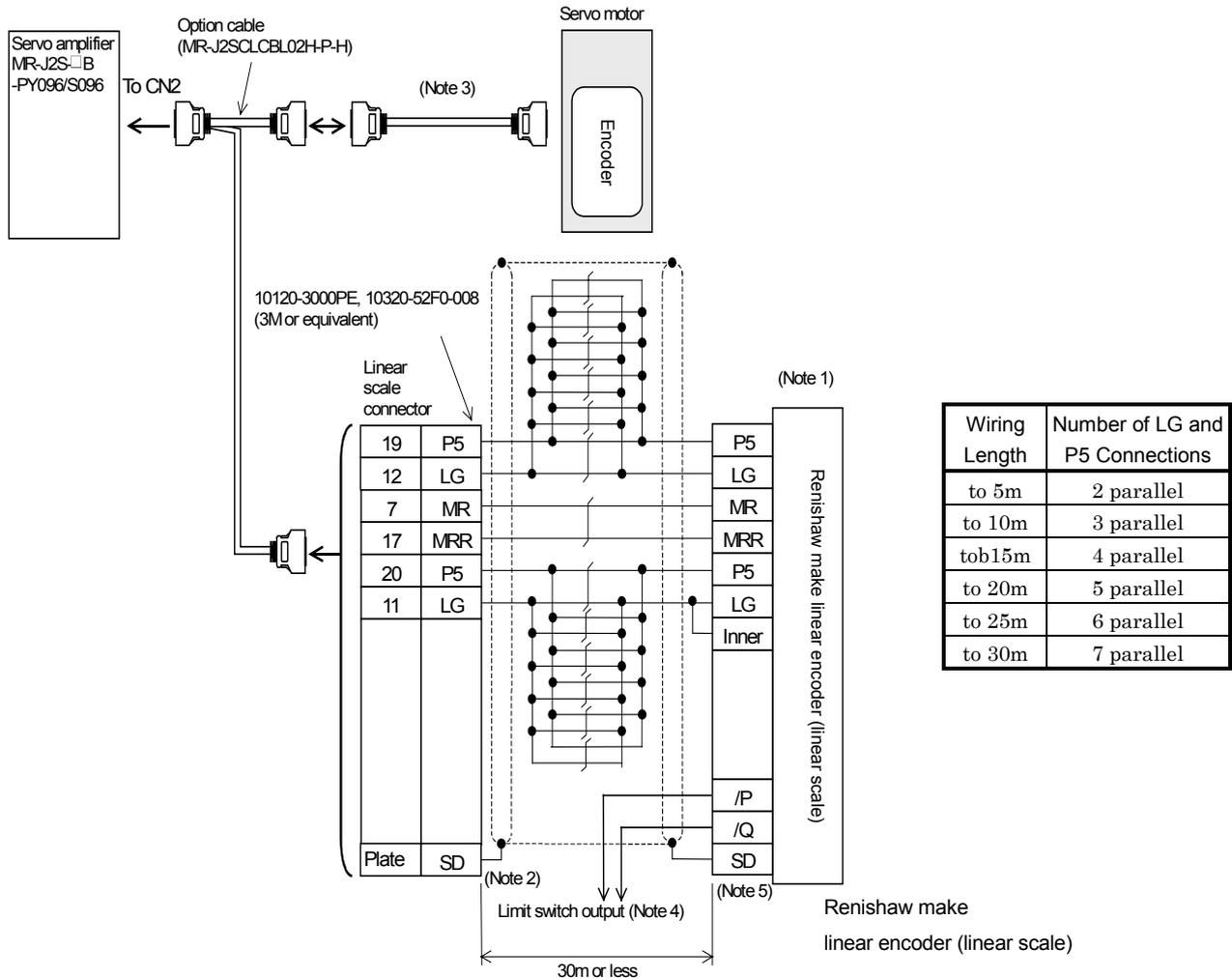2.1.4 Sony precision technology make linear encoders (linear scales) (INC type)

○Specifications Reference

Contact Sony Precision Technology for the specifications of these linear encoders (linear scales).

Sony Precision Technology Sales Section: TEL. (03) 3490-3915

Item	Specifications	
Interpolator model	MJ830	─
Linear encoder model	─	SL710+PL101R (H)
System	Magnetic detection system	
Effective measurement length	50 to 3000mm	
Resolution	Min. 0.2μm (Note 2)	
Accuracy	±10μm	
Supply power voltage	5V (4.5 to 5.5V) (Note 1)	
Power consumption	Max. 3W	
Rated response speed	6.4 m/s	
Maximum response speed	6.4 m/s	
Operating temperature range	0 to 55℃ (non-freezing)	0 to 45℃ (non-freezing)
Storage temperature range	−20 to 65℃ (non-freezing)	− 20 to 50℃ (non-freezing)
Dust tightness・water tightness	No protective structure	IP50 (PL101R), IP64 (PL101RH)
Vibration resistance	9.6m/s^2 5 to 800Hz	20m/s^2 50 to 2000Hz
Shock resistance	980m/s^2 11ms	980m/s^2 11ms
Output signal	Serial communication compatibility (Z phase data included)	
Output extension cable	─	CK-T1□
Connection cable	Refer to the standard connection example in Chapter 3 and fabricate the cable.	─

Item	Specifications	
Interpolator model	MJ830	─
Linear encoder model	─	SH13
System	Optical detection system	
Effective measurement length	70 to 1240mm	
Resolution	Min. 0.005μm (Note 2)	
Accuracy	±3μm A3 type ±5μm A5 type	
Supply power voltage	5V (4.5 to 5.5V) (Note 1)	
Power consumption	Max. 3W	
Rated response speed	1.4m/s	
Maximum response speed	2.0m/s	
Operating temperature range	0 to 55℃ (non-freezing)	0 to 45℃ (non-freezing)
Storage temperature range	− 20 to 65℃ (non-freezing)	− 10 to 60℃ (non-freezing)
Dust tightness・water tightness	No protective structure	IP53 (in accordance with the mounting in the manual of the Sony Precision Technology make linear encoder)
Vibration resistance	9.6m/s^2 5 to 800Hz	98m/s^2 (30 to 1000Hz, 30 minutes)
Shock resistance	980m/s^2 11ms	294m/s^2 (11ms, three directions XYZ, three times each)
Output signal	Serial communication compatibility (Z phase data included) (Note 3)	
Output extension cable	─	CR4-05NNT0□, CR4-10NNT01 (10m)
Connection cable	Refer to the standard connection example in Chapter 3 and fabricate the cable.	─

Note 1. For the 24V-specified interpolator, contact Sony Precision Technology.
2. Changes depending on the setting of the interpolator.
3. A home position return cannot be made if there is no encoder (scale) home position (reference mark). Always provide an encoder (scale) home position (reference mark).

○Linear encoder (linear scale) unit structure Reference

[When interpolator (MJ830) MODE switch = 5]

When PL101 or SL700 is used

SONY SL700 | ○ SONY | ○
 | PL101R |
 | ○ | ○

← Increasing direction   Decreasing direction →

When SH13 is used

SH13

○ △ ○

← Decreasing direction   Increasing direction →
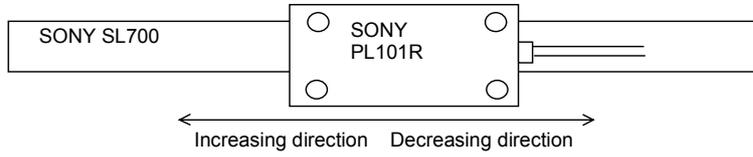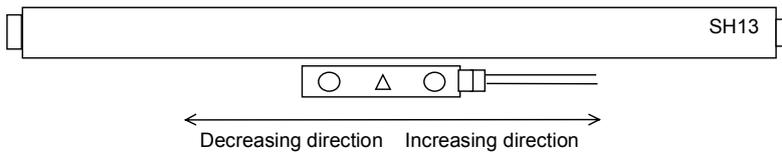
Note 1. Note that the increasing direction/decreasing direction of the linear encoder (linear scale) changes depending on the setting of the interpolator (MJ830).
　　 2. Always set an encoder (scale) home position (reference mark).

○SL710 outline drawing [Reference]   (Dimension unit: mm)

This outline drawing is based on the data from Sony Precision Technology. Contact Sony Precision Technology for this outline drawing.
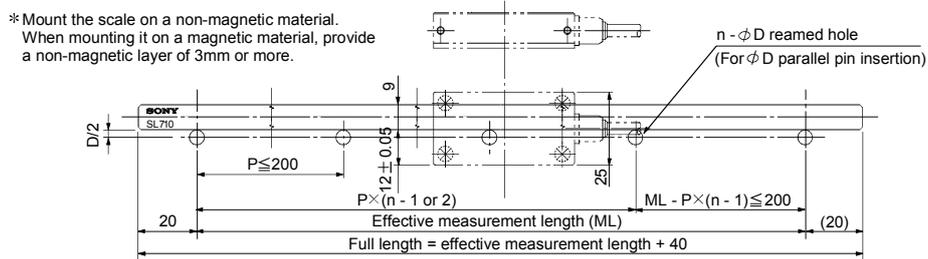
○PL101 outline drawing [Reference]   (Dimension unit: mm)

This outline drawing is based on the data from Sony Precision Technology. Contact Sony Precision Technology for this outline drawing.

○SH13 outline drawing [Reference]   (Dimension unit: mm)

This outline drawing is based on the data from Sony Precision Technology. Contact Sony Precision Technology for this outline drawing.

SH13-		007	012	017	022	027	032	037	042	047	052	057	062	067	072	077	082	092	102	114	124
Effective measurement length	L	mm	70	120	170	220	270	320	370	420	470	520	570	620	670	720	770	820	920	1020	1140	1240
Middle support	n											1	1	1	1	1	1	1	1	2	2	2
Middle support mounting hole pitch	A	mm										307	332	357	382	407	432	457	507	380	420	450
	P1	mm																		354	394	434
Home position	Z	mm	35	60	85	110	135	160	185	210	235	260	285	310	335	360	385	410	460	510	570	620
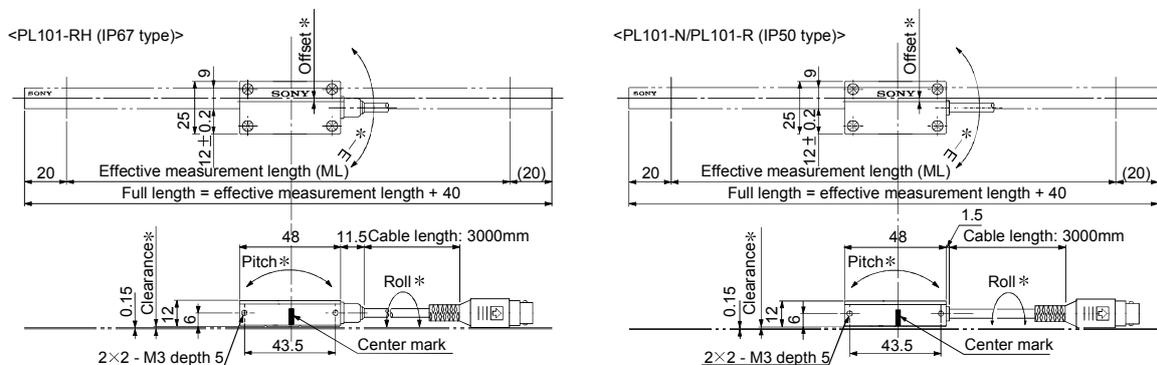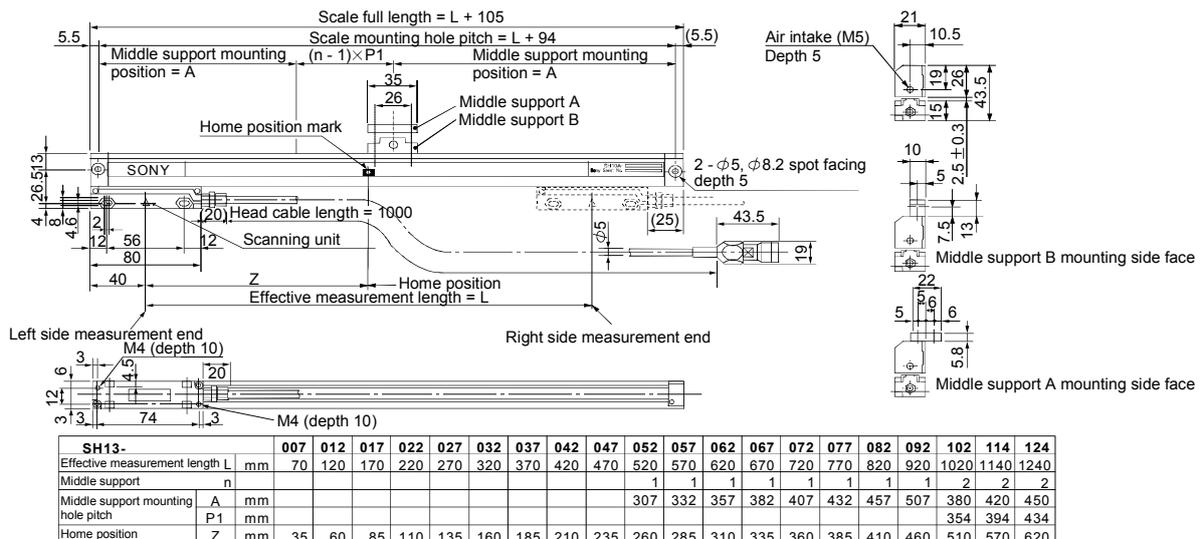
○MJ830 outline drawing Reference (Dimension unit: mm)

This outline drawing is based on the data from Sony Precision Technology. Contact Sony Precision Technology for this outline drawing.
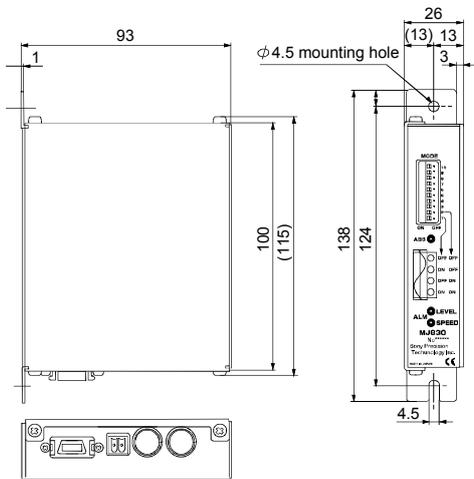
○Connection cable connection example (1)

The following cable wiring example assumes that the linear encoder (linear scale) is connected directly to CN2 of the servo amplifier.

(1) Connection example of up to 30m wiring length (This connection example assumes that the following operating combination is satisfied.)

[Operating combination]

Used Wire Size	Interpolator Model
AWG28	MJ830

[Connection example]

[Linear encoder side connector] (Note 4)

Applicable Housing	10114-3000PE, 10314-52F0-008 3M or Equivalent
OV	11, 12
MR	4
MRR	5
SHD	7

Note 1. Do not connect the linear encoder (linear scale) that is not indicated in this specification.
   2. Connect the shield wire to the plate (ground plate) in the connector securely.
   3. For the wiring to the servo motor, refer to the standard connection examples in Chapter 3 and the Instruction Manual of the MR-J2S-☐B standard model.
   4. Contact the scale manufacturer for detailed specifications such as the combinations, models, types, etc. of the linear encoder (linear scale) side output cable and connector.

○Connection cable connection example (2)

The following cable wiring example assumes that the linear encoder (linear scale) is connected to CN2 of the servo amplifier using the option cable MR-J2SCLCBL02M-P-H.

(1) Connection example of up to 30m wiring length (This connection example assumes that the following operating combination is satisfied.)

[Operating combination]

Used Wire Size	Interpolator Model
AWG28	MJ830

[Connection example]

[Linear encoder side connector] (Note 4)

Applicable Housing	10114-3000PE, 10314-52F0-008 3M or Equivalent
OV	11, 12
MR	4
MRR	5
SHD	7

Note 1. Do not connect the linear encoder (linear scale) that is not indicated in this specification.

2. Connect the shield wire to the plate (ground plate) in the connector securely.

3. For the wiring to the servo motor, refer to the standard connection examples in Chapter 3 and the Instruction Manual of the MR-J2S-□B standard model.

4. Contact the scale manufacturer for detailed specifications such as the combinations, models, types, etc. of the linear encoder (linear scale) side output cable and connector.

2.2 A・B・Z-phase differential input interface unit specifications

Contact the linear scale manufacturer for the specifications of the A/B/Z-phase differential output linear scale. (Since the permissible resolution range is 0.005 to 5μm, select the linear scale within this range.)

○Specifications

Item		Description
Model		MR-J2S-CLP01
Power supply	Permissible voltage fluctuation	DC4.85 to 5.25V
	Current consumption	200mA (when power is supplied from servo amplifier) 250mA (when power is supplied from external power supply) (Note 1)
Input signal		A・B・Z-phase differential input signal
Minimum phase difference		500ns
Output signal		High-speed serial communication (Z phase data included)
Structure		Open (IP00)
Environment	Ambient temperature	0 to 55℃ (non-freezing)
	Storage temperature	−20 to 65℃ (non-freezing)
	Ambient humidity	90%RH or less (non-condensing)
	Storage humidity	90%RH or less (non-condensing)
	Ambience	Indoors (no direct sunlight) Without corrosive gas, flammable gas, oil mist, dust and dirt
	Altitude	1000m or less above sea level
	Vibration	5.9m/s^2 or less
Weight		0.4kg

Note 1. The power supply of the linear scale is not included. When an external power supply is used, an up to 350mA linear scale can be used.

○MR-J2S-CLP01 outline drawing

[Unit: mm]

Terminal layout

TE1

P5L
P50
⏚

Model	Weight [kg]
MR-J2S-CLP01	0.4
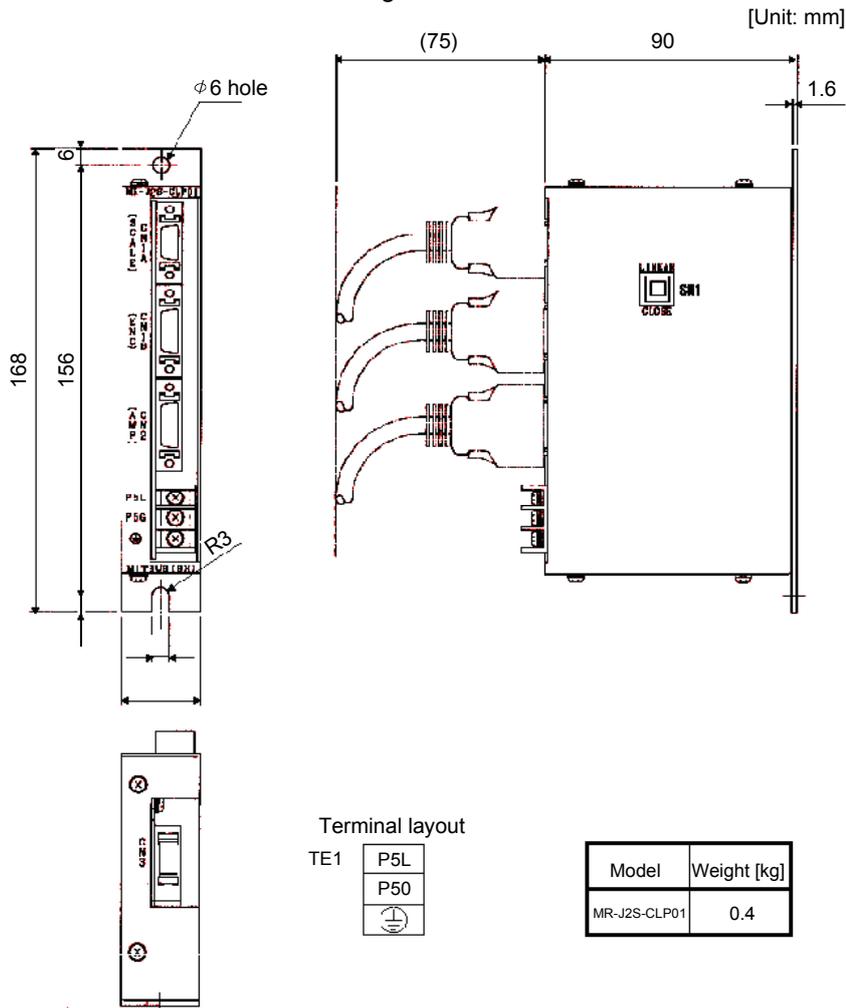
○Connection cable connection example
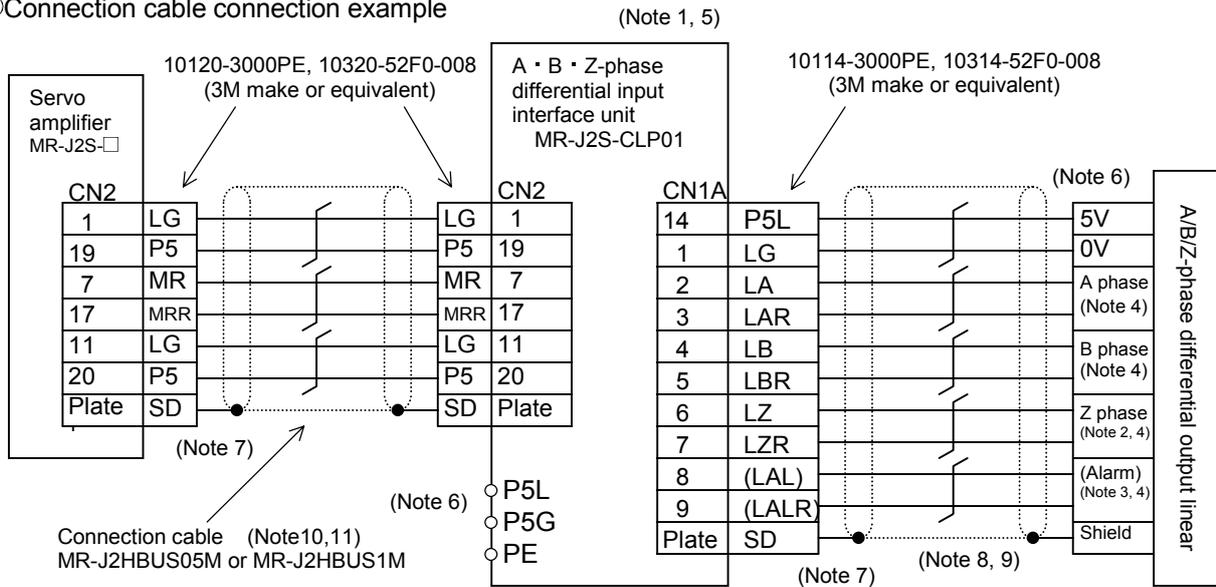
Note 1. The A/B/Z-phase differential input interface unit is required to use the A・B・Z-phase differential output linear scale.

2. If there is no Z phase, an alarm occurs and operation cannot be performed.

3. If there is no alarm output, change the setting of the following servo amplifier parameter.
Pr.62 = 0 □ □ □

4. The A-phase, B-phase, Z-phase and alarm signals must be provided as differential line driver outputs.
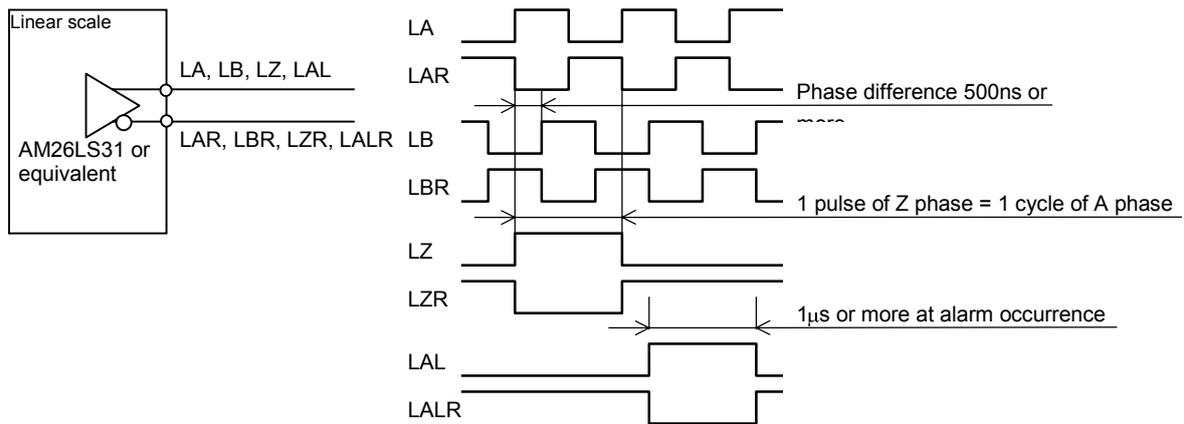
5. Set the internal setting switch (SW1) to CLOSE.
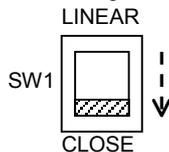
6. If the current consumption of the linear scale exceeds 150mA, supply external power.

7. Connect the shield wire to the plate (ground plate) in the connector securely.

8. Use a cable that can endure bending motion for a long time.

9. Because of RS-422 communication, the cable length is maximum 30m. However, it may be necessary to shorten the length depending on the power supply voltage drop and linear scale specifications.

10. As the connection cable, use the MR-J2HBUS05M or MR-J2HBUS1M.

11. When a connection cable is to be fabricated, the cable length should be within 1m.

MEMO

2 - 30

3 SIGNALS AND WIRING

3.1 Standard connection examples of full closed control servo amplifier control signals

(1) When MR-J2S-CLP01 is used

Configure a sequence that will turn off MC at an alarm or emergency stop.

Power supply
Three-phase 200 to 230VAC or single-phase 100VAC/single-phase 230VAC (Note 13)

If the regenerative option is connected incorrectly, the servo amplifier is damaged.

In the case of MR-J2S-500B/700B
Configure a sequence that will turn off MC at an alarm or emergency stop.

Servo amplifier
MR-J2S-□B-S096

When connecting an external regenerative option, always disconnect the link from across P-D.

When connecting an external regenerative option, always disconnect the link from across C-P.

Regenerative option

Servo amplifier
MR-J2S-□B
-PY096/-S096
(Axis 1)

Regenerative option
When connecting an external regenerative option, always disconnect the link from across P-D.

Motor
HC-KFS, MFS, UFS3000r/min series

24VDC — EM1 — RA1 — Z
Shut off when servo-on signal turns off or alarm signal turns on.

(Note 4) Electromagnetic brake

A·B·Z-phase differential input interface unit
MR-J2S-CLP01

Set SW1 to CLOSE.
CLOSE

CN1A
1	LG
2	LA
3	LAR
4	LB
5	LBR
6	LZ
7	LZR
8	LAL
9	LALR
14	P5L
Plate	SD

General-purpose linear scale or rotary encoder (A·B·Z-phase differential output type)

Connect the MR-HP4CN1 connector to the CN1A connector.

MR-J2HBUS□M cable
Use 1m or less.

Controller
· A171SH
· A172SH
· A173UH
· A273UH
□ QD75M
□ Q172
□ Q173
· Position Board

Cable clamp

Use the MR-J2HBUS□M-A cable with the A171SH,A172SH, A173UH or A273UH, and the MR-J2HBUS□M cable with the QD75M.
(Note 1) Refer to the "Motion Controller Q Series Catalog" for the cable between Q172/Q173 and amplifier, and to the "Position Board, Interface Board New Product News (SV0206-1)" for the cable between Position Board and amplifier.

CN1B
7	P5		7	P5
8	LG		8	LG
1	MR		1	MR
2	MRR		2	MRR
4	MD		4	MD
5	MDR		5	MDR
3	BAT		3	BAT
9	SD		9	SD
6	CNT		6	CNT

Encoder

MR-JCCBL□M-H cable or MR-JCCBL□M-L cable Use 30m or less.

CN3 RS-232C
12	TxD		RD
11	LG		GND
2	RxD		SD
1	LG		GND

Commercially available personal computer + Windows
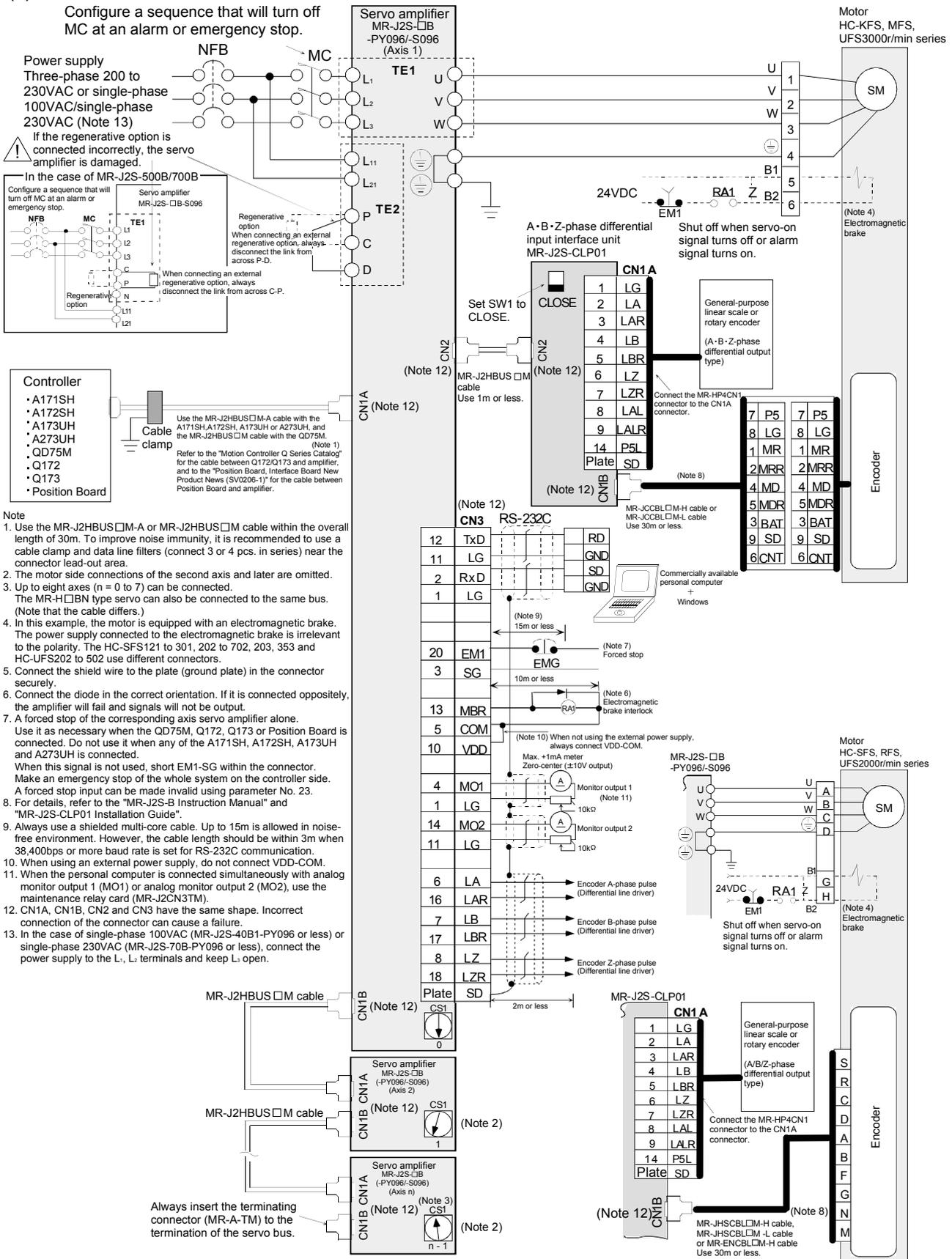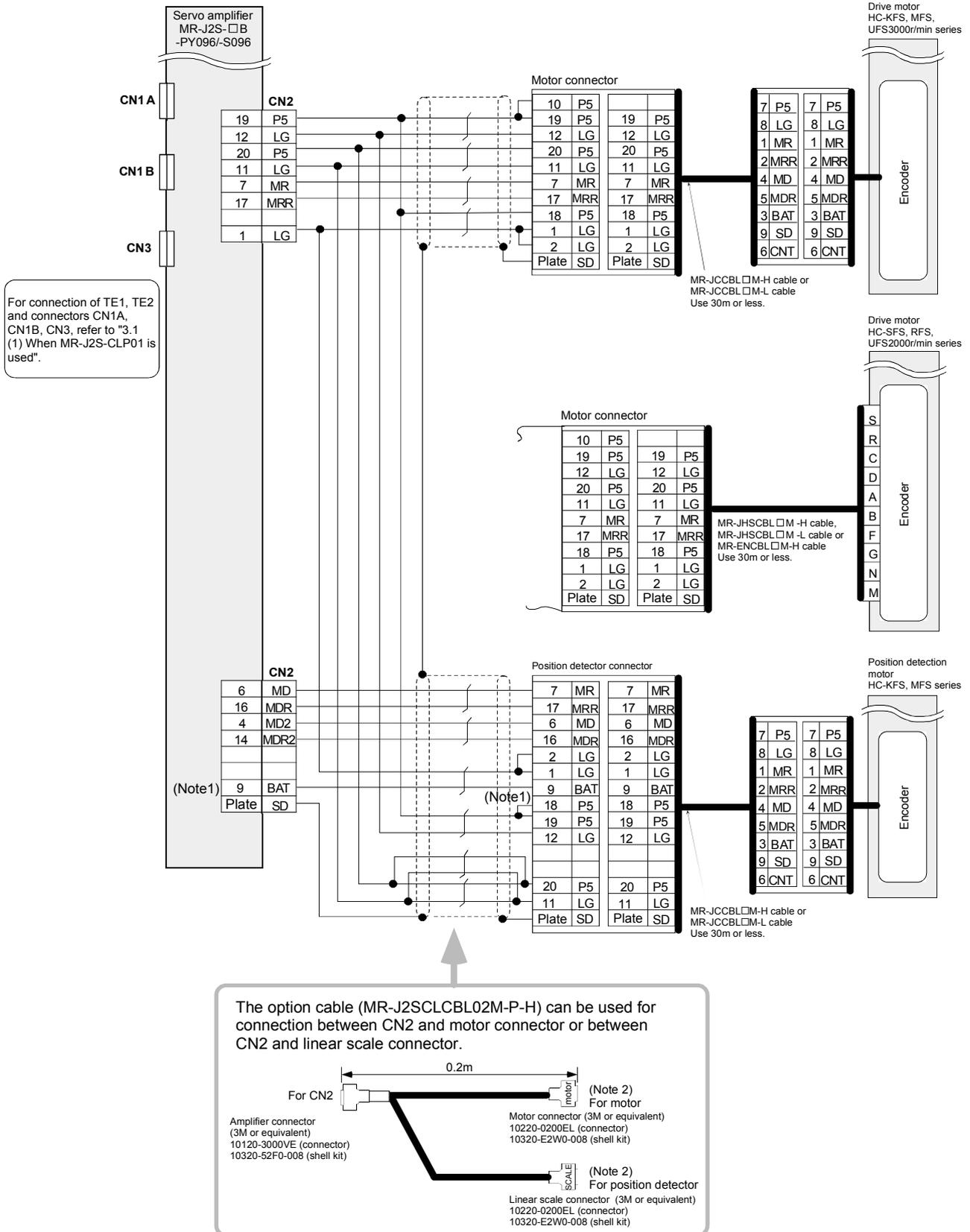
(Note 9) 15m or less

| 20 | EM1 | EMG | (Note 7) Forced stop |
| 3 | SG | | |

10m or less

13	MBR		(Note 6) Electromagnetic brake interlock
5	COM		
10	VDD		(Note 10) When not using the external power supply, always connect VDD-COM.

Max. +1mA meter
Zero-center (±10V output)

4	MO1	Monitor output 1 (Note 11) 10kΩ
1	LG	
14	MO2	Monitor output 2 10kΩ
11	LG	

Motor
HC-SFS, RFS, UFS2000r/min series

MR-J2S-□B
-PY096/-S096

24VDC — EM1 — RA1 — Z
Shut off when servo-on signal turns off or alarm signal turns on.

(Note 4) Electromagnetic brake

6	LA	Encoder A-phase pulse (Differential line driver)
16	LAR	
7	LB	Encoder B-phase pulse (Differential line driver)
17	LBR	
8	LZ	Encoder Z-phase pulse (Differential line driver)
18	LZR	
Plate	SD	2m or less

MR-J2HBUS□M cable
CS1 0

Servo amplifier
MR-J2S-□B (-PY096/-S096) (Axis 2)
CS1 1 (Note 2)

MR-J2HBUS□M cable

Servo amplifier
MR-J2S-□B (-PY096/-S096) (Axis n)
(Note 3)
CS1 n - 1 (Note 2)

Always insert the terminating connector (MR-A-TM) to the termination of the servo bus.

MR-J2S-CLP01
CN1A
1	LG
2	LA
3	LAR
4	LB
5	LBR
6	LZ
7	LZR
8	LAL
9	LALR
14	P5L
Plate	SD

General-purpose linear scale or rotary encoder (A/B/Z-phase differential output type)

Connect the MR-HP4CN1 connector to the CN1A connector.

Encoder
S R C D A B F G N M

MR-JHSCBL□M-H cable, MR-JHSCBL□M-L cable or MR-ENCBL□M-H cable Use 30m or less.

Note
1. Use the MR-J2HBUS□M-A or MR-J2HBUS□M cable within the overall length of 30m. To improve noise immunity, it is recommended to use a cable clamp and data line filters (connect 3 or 4 pcs. in series) near the connector lead-out area.
2. The motor side connections of the second axis and later are omitted.
3. Up to eight axes (n = 0 to 7) can be connected.
   The MR-H□BN type servo can also be connected to the same bus. (Note that the cable differs.)
4. In this example, the motor is equipped with an electromagnetic brake. The power supply connected to the electromagnetic brake is irrelevant to the polarity. The HC-SFS121 to 301, 202 to 702, 203, 353 and HC-UFS202 to 502 use different connectors.
5. Connect the shield wire to the plate (ground plate) in the connector securely.
6. Connect the diode in the correct orientation. If it is connected oppositely, the amplifier will fail and signals will not be output.
7. A forced stop of the corresponding axis servo amplifier alone. Use it as necessary when the QD75M, Q172, Q173 or Position Board is connected. Do not use it when any of the A171SH, A172SH, A173UH and A273UH is connected.
   When this signal is not used, short EM1-SG within the connector. Make an emergency stop of the whole system on the controller side. A forced stop input can be made invalid using parameter No. 23.
8. For details, refer to the "MR-J2S-B Instruction Manual" and "MR-J2S-CLP01 Installation Guide".
9. Always use a shielded multi-core cable. Up to 15m is allowed in noise-free environment. However, the cable length should be within 3m when 38,400bps or more baud rate is set for RS-232C communication.
10. When using an external power supply, do not connect VDD-COM.
11. When the personal computer is connected simultaneously with analog monitor output 1 (MO1) or analog monitor output 2 (MO2), use the maintenance relay card (MR-J2CN3TM).
12. CN1A, CN1B, CN2 and CN3 have the same shape. Incorrect connection of the connector can cause a failure.
13. In the case of single-phase 100VAC (MR-J2S-40B1-PY096 or less) or single-phase 230VAC (MR-J2S-70B-PY096 or less), connect the power supply to the L₁, L₂ terminals and keep L₃ open.

MR-J2HBUS□M cable

(2) When serial communication compatible linear scale is connected to closed end F/B

Servo amplifier
MR-J2S-☐B
-PY096/-S096

For connection of TE1, TE2 and connectors CN1A, CN1B, CN3, refer to "3.1 (1) When MR-J2S-CLP01 is used".

Using the ABS type scale enables an absolute position detection system to be configured. At that time, the battery (MR-BAT) is not needed.

Motor
HC-KFS, MFS,
UFS3000r/min series

MR-JCCBL☐M-H cable or
MR-JCCBL☐M-L cable
Use 30m or less.

Motor
HC-SFS, RFS,
UFS2000r/min series

MR-JHSCBL☐M -H cable,
MR-JHSCBL☐M -L cable or
MR-ENCBL☐M-H cable
Use 30m or less.

The option cable (MR-J2SCLCBL02M-P-H) can be used for connection between CN2 and motor connector or between CN2 and linear scale connector.

0.2m

For CN2

Amplifier connector
(3M or equivalent)
10120-3000PE (connector)
10320-52F0-008 (shell kit)

(Note 5)
For motor
Motor connector (3M or equivalent)
10220-0200EL (connector)
10320-E2W0-008 (shell kit)

(Note 5)
For linear scale
Linear scale connector (3M or equivalent)
10220-0200EL (connector)
10320-E2W0-008 (shell kit)

Mitutoyo make linear scale (Note7)

Sony Precision Technology make interpolator / Sony Precision Technology make linear encoder (linear scale) (Note7)

Stabilized power supply (5V) (Note3)

Renishaw make linear encoder (linear scale) (Note7)

Limit switch output

Heidenhain make linear encoder (linear scale) (Note4, 7)

The Heidenhain make linear scale is compatible with the MR-J2S-B-PY096/-S096 type only.

Note 1. Fabricate the linear scale connection cable on the customer side using the optional CN1 connector (MR-J2CN1).
2. Contact the corresponding scale manufacturer for the linear scale and interpolator side pin numbers.
3. For the specifications of the stabilized power supply, contact Sony Precision Technology.
4. To use the Heidenhain make linear scale, the parameter No. 23 (in the case of the MR-J2S-B-PY096/-S096 type) setting must be changed. Refer to "CHAPTER 2 LINEAR SCALES" for more information.
5. The motor connector and linear scale connector have the same shape. Incorrect connection of the connector can cause a failure.
6. This wiring is for AWG22. Up to 30m is allowed by changing the wiring.
Refer to " CHAPTER 2 LINEAR SCALES " for details of wiring.
7. Use after confirming the specifications of the linear scale such as the temperatures, vibration resistance and protective structure. For use in the environment having much static noise, contact the scale manufacturer separately.

(3) When serial communication compatible servo motor is connected to closed end F/B

For connection of TE1, TE2 and connectors CN1A, CN1B, CN3, refer to "3.1 (1) When MR-J2S-CLP01 is used".

Servo amplifier MR-J2S-□B -PY096/-S096

Drive motor HC-KFS, MFS, UFS3000r/min series

MR-JCCBL□M-H cable or MR-JCCBL□M-L cable Use 30m or less.

Drive motor HC-SFS, RFS, UFS2000r/min series

MR-JHSCBL□M -H cable, MR-JHSCBL□M -L cable or MR-ENCBL□M-H cable Use 30m or less.

Position detection motor HC-KFS, MFS series

MR-JCCBL□M-H cable or MR-JCCBL□M-L cable Use 30m or less.

The option cable (MR-J2SCLCBL02M-P-H) can be used for connection between CN2 and motor connector or between CN2 and linear scale connector.

0.2m

For CN2

(Note 2) For motor

Amplifier connector (3M or equivalent) 10120-3000VE (connector) 10320-52F0-008 (shell kit)

Motor connector (3M or equivalent) 10220-0200EL (connector) 10320-E2W0-008 (shell kit)

(Note 2) For position detector

Linear scale connector (3M or equivalent) 10220-0200EL (connector) 10320-E2W0-008 (shell kit)

Note 1. Fabricate the linear scale connection cable on the customer side using the optional CN1 connector (MR-J2CWired in the option cable (MR-J2SCLCBL02M-P-H). Note that it is not compatible with an absolute position detection system.
　　　2. The motor connector and position detector connector have the same shape. Incorrect connection of the connector can cause a failure.

(4) About CN2 wiring for closed end serial communication compatibility (when MR-J2CLCBL02M-P-H is used)
  For use of the serial I/F compatible encoder, the wiring diagram shows that a bifurcated cable is to be connected. When using the option cable MR-J2CLCBL02M-P-H in the bifurcated wiring area, perform wiring as shown below.

  (a) For serial communication compatible linear scale
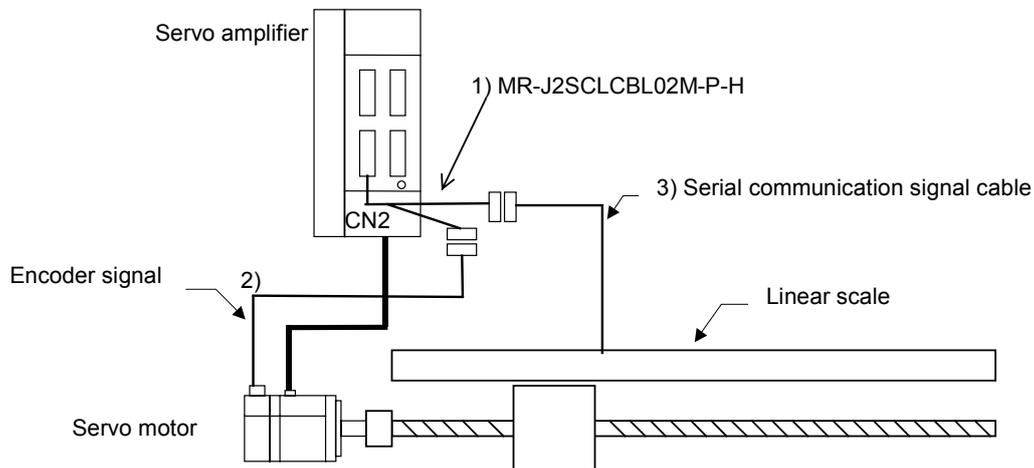
  1) Use the MR-J2SCLCBL02M-P-H.
     (Refer to "CHAPTER 7 OPTIONS AND AUXILIARY EQUIPMENT" for details such as internal connection.)
  2) Use the encoder cable (e.g. MR-JCCBL □ M-H, MR-JHSCBL □ M-H, MR-ENCBL □ M-H) of the servo motor.
  3) The wiring method changes depending on the linear scale.
     Confirm "CHAPTER 2 LINEAR SCALES" and fabricate a connection cable on the customer side.

  (b) For serial communication compatible rotary encoder
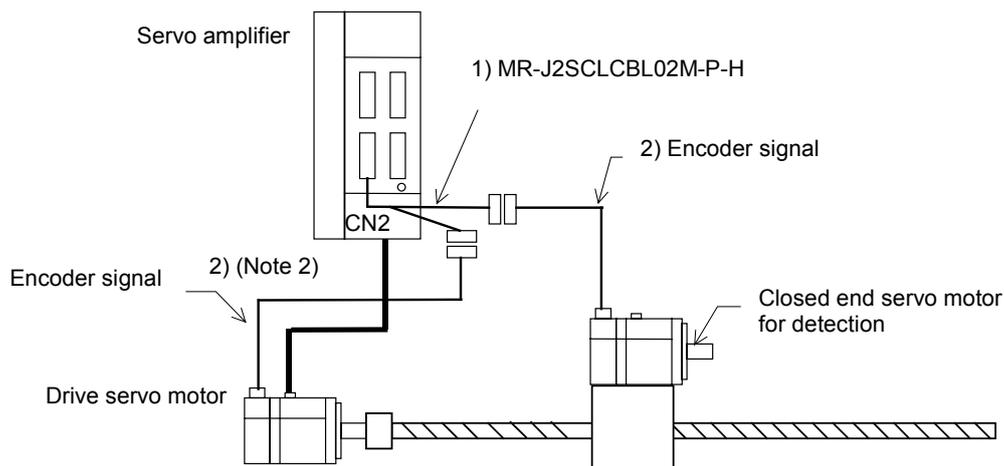
  1) Use the MR-J2SCLCBL02M-P-H.
     (Refer to " CHAPTER 7 OPTIONS AND AUXILIARY EQUIPMENT " for details such as internal connection.)
  2) Use the encoder cable (e.g. MR-JCCBL □ M-H, MR-JHSCBL □ M-H, MR-ENCBL □ M-H) of the servo motor.

3.2 Signal · terminal explanation

(1) Main circuit terminal block, control circuit terminal block

Signal Name	Abbreviation	Terminal Block	Description
Main circuit power supply	L1, L2, L3	TE1	Main circuit power input terminals. MR-J2S-□□B : Connect three-phase 200 to 230VAC/50, 60Hz. MR-J2S-□□B1 : Connect single-phase 100 to 120VAC/50, 60Hz.
Servo motor output	U, V, W	TE1	Servo motor power output terminals. Connect to the servo motor power supply terminals (U, V, W). During power-on, do not open or close the motor power line. Otherwise, a malfunction or faulty may occur.
Control circuit power supply	L11, L21	TE2	Control circuit power input terminals. L11 should be in the same power supply phase with L1, and L21 with L2. MR-J2S-□□B : Connect to single-phase 200 to 230VAC/50, 60Hz. MR-J2S-□□B1 : Connect to single-phase 100 to 120VAC/50, 60Hz.
Regenerative option	P, C, D	TE2	Regenerative option connection terminals. Factory-wired across P-D. When using the regenerative option, always remove the wire across P-D and connect the regenerative option across P-C.
	N	—	—	Keep open.
Protective earth	PE	Chassis	Ground terminal. Connect to the earth terminal of the servo motor and the protective earth of the control box for grounding.

(2) CN3

Signal Name	Abbreviation	Pin No.	Function/Application
Digital I/F power supply input	COM	5	24VDC for input interface is input. Digital interface driver power input terminal. COM is all connected internally. When using an external power supply, connect a power supply of 24VDC and 200mA or more instead of VDD.
I/F internal power supply output	VDD	10	Digital interface driver power output terminal. 24VDC is output across VDD-SG. Connect with COM. (Do not make connection when using an external power supply.) The permissible current is 80mA.
Digital I/F common	SG	3	24V common for VDD/COM and isolated from LG.
Control common	LG	1, 11	Control common used as a monitor common.
Encoder A-phase pulse	LA	6	Encoder A-phase pulse output terminals. The pulses set in parameter No. 38 (ENR) in the output type selected in parameter No. 68 (FC2) are output in the differential line driver system.
	LAR	16	
Encoder B-phase pulse	LB	7	Encoder B-phase pulse output terminals. The pulses set in parameter No. 38 (ENR) in the output type selected in parameter No. 68 (FC2) are output in the differential line driver system.
	LBR	17	
Encoder Z-phase pulse	LZ	8	Encoder Z-phase pulse output terminals. 1 pulse is output per servo motor revolution. By setting parameter No. 68 (FC2), the Z phase (reference mark) of the full closed encoder can be output.
	LZR	18	
Monitor output	MO1	4	Monitor output signal output terminals. The data set in parameter No. 22 (MOD) is output in analog form. The multiplying factor can be set in parameter No. 22 (MOD).
	MO2	14	
Electromagnetic brake interlock	MBR	13	MBR-SG are disconnected at servo-off or alarm. At alarm occurrence, they are disconnected independently of the base circuit state.
Forced stop	EM1	20	When EM1-SG are opened, a forced stop state occurs, the servo switches off, and the dynamic brake is operated to make a stop. The forced stop signal can be made invalid using parameter No. 23.
Shield	SD	Plate	Connect one end of the shield wire.

3.3 About power-on

The servo amplifier can accept a servo-on command within about 5s after the main circuit is powered on. Therefore, when SON is turned on as soon as the main circuit is powered on, the base circuit switches on within about 5s to make operation ready.

[Timing chart]
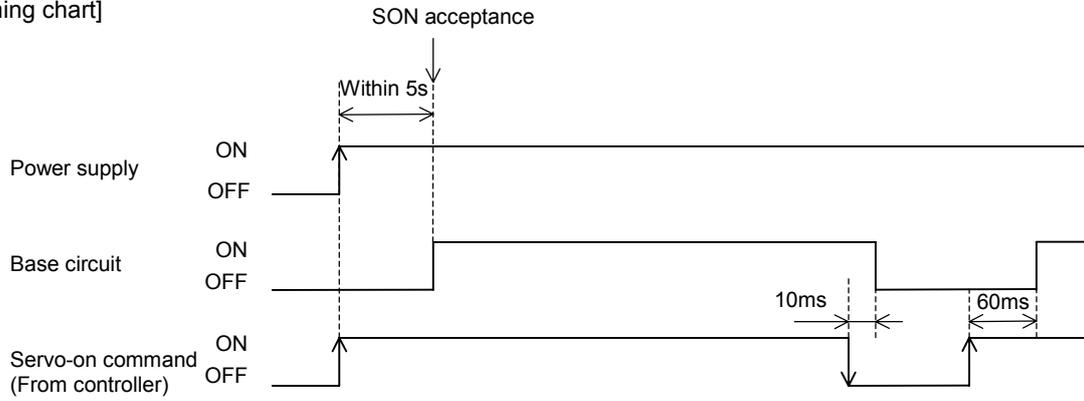
4 OPERATION AND FUNCTIONS

4.1 Startup

4.1.1 Startup procedure

Start up the full closed control system in the following procedure.

Completion of installation and wiring

Adjustment and operation check in semi closed control

Positioning operation check using MR Configurator

Gain adjustment

Check that the servo equipment is normal. Do as necessary.

Adjustment and operation check in full closed control

Selection of full closed function

Refer to Section 4.1.2.

Selection of full closed encoder communication system

Refer to Section 4.1.3.

Setting of full closed encoder polarity

Refer to Section 4.1.4.

Setting of full closed encoder electronic gear

Refer to Section 4.1.5.

Confirmation of full closed encoder position data

Refer to Section 4.1.6.

Positioning operation check using MR Configurator

Gain adjustment

Adjustment of dual F/B switching filter (for dual F/B control)

Refer to Section 4.1.7.

Positioning operation check by controller

Refer to Section 4.3.

Home position return operation

Positioning operation

Refer to Section 4.2.

Completion of full closed control system startup

4.1.2 Selection of full closed function

(1) Parameters

No.	Abbreviation	Name and Function	Initial Value	Unit	Setting Range
62	＊FCT	Full closed selection: Select the full closed encoder direction, full closed control error detection function 1 and full closed control error detection function 2. □□□■ Full closed function 0: Invalid 1: Always valid 2: Switching valid (semi/full switching by host controller)	1300		0000h to 1312h
67	DUF	Dual F/B filter Set the bandwidth of the dual F/B filter. At 1000rad/s setting, the full closed control is made always valid. At 0rad/s setting, the full closed control is made invalid. About half of the position loop gain 2 in parameter No. 15 is the guideline of the upper setting limit.	10	rad/s	0 to 1000

Note 1. When changing the setting of the above parameter, set "000F" in parameter No. 40 "parameter block (＊BLK)".
 2. After setting the parameter marked ＊, switch power off once. The setting is made valid by switching power on again.

(2) Parameter setting method

Selection between semi closed control and full closed control can be made by combining the settings of parameter No. 62 and No. 67.

Pr62 (FCT)	Full Closed Function	Pr67 (DUF)	Control Mode
□□□0	Invalid	—	Semi closed control
□□□1	Valid	0 to 999	Dual F/B full closed control
		1000	Completely full closed control

When the full closed function switching is valid (semi/full switching by host controller), the combinations are as follows.
At this time, the semi/full switching signal is invalid and semi closed control is performed in the test operation from the MR Configurator.

Pr62 (FCT)	Semi/Full Switching Signal	Pr 67 (DUF)	Control Mode	MR Configurator Test Operation Mode
□□□2	Semi selection	—	Semi closed control	
□□□2	Full selection	1 to 999	Dual F/B full closed control	Semi closed control
		1000	Completely full closed control	

⚠ CAUTION	・ Contact your sales representative for the models and specifications of the host controller that allows semi/full switching.

4.1.3 Selection of full closed encoder communication system

(1) Parameters

No.	Abbreviation	Name and Function	Initial Value	Unit	Setting Range
23	*OP1	Optional function 1: Select the optional function 1.	0000		0000h to 0201h

Serial encoder cable selection
Select the communication systems of CH1 (for motor) and CH2 (for full closed encoder).

Hundreds digit setting	When full closed function is invalid (Pr:62: □□□0)		When full closed function is valid (Pr:62: □□□1 or 2)	
	ENC CH1	ENC CH2	ENC CH1	ENC CH2
0	2 wire type	Unusable	2 wire type	2 wire type
1	4 wire type	Unusable	4 wire type	Unusable
2	2 wire type	Unusable	2 wire type	4 wire type

Note 1. After setting the parameter marked ∗, switch power off once. The setting is made valid by switching power on again.

(2) Parameter setting method

The communication system changes depending on the full closed encoder type.

Refer to section 2.1 Compatible Linear Scale List for the communication systems of the full closed encoders.

⚠ CAUTION	· If a wrong value is set in Serial encoder cable selection (parameter No. 23), a servo alarm (alarm 70) occurs at power-on of the servo amplifier.

4.1.4 Setting of full closed encoder polarity

(1) Parameter

No.	Abbreviation	Name and Function	Initial Value	Unit	Setting Range
62	∗FCT	Full closed selection Select the full closed encoder direction, full closed control error detection function 1 and full closed control error detection function 2. Full closed encoder polarity 0: Scale increasing direction in motor CCW direction 1: Scale increasing direction in motor CW direction	1300		0000h to 1312h

Note 1. When changing the setting of the above parameter, set "000F" in parameter No. 40 "parameter block (∗BLK)".

    2. After setting the parameter marked ∗, switch power off once. The setting is made valid by switching power on again.

(2) Parameter setting method

Make setting so that the CCW direction (forward rotation direction) of the servomotor matches the increasing direction of the full closed encoder feedback.

∗This setting must be made for all linear scales or rotary encoders.

[Pr. 62 = □ □ 0 □: When the encoder address increasing direction is set for motor CCW]
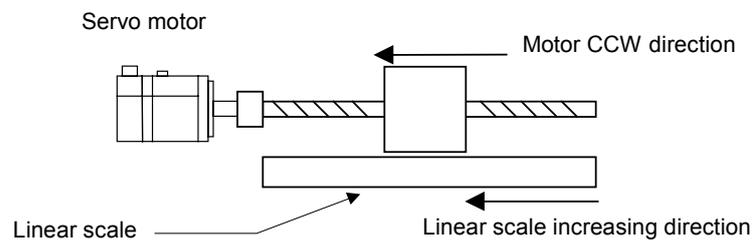
[Pr. 62 = □ □ 1 □: When the encoder address increasing direction is set for motor CW]
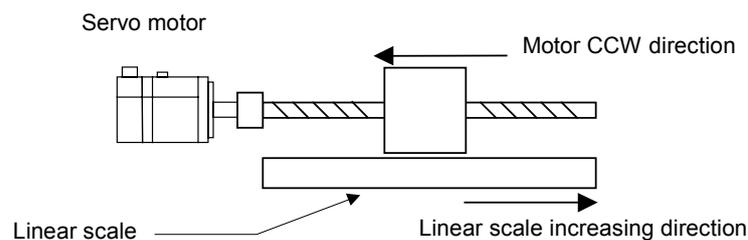
(3) How to confirm the full closed encoder feedback direction

For the way to confirm the full closed encoder feedback direction, refer to "4.1.6 Confirmation of full closed encoder position data".

⚠ CAUTION	• If a wrong value is set in the encoder direction of the full closed encoder selection (parameter No. 62), normal operation may not performed, causing machine collision. It may also cause a servo alarm (AL. 42) during positioning operation. • The above full closed encoder polarity setting is irrelevant to Pr. 7 (POL) "rotation direction selection". As described above, always make setting according to the relationship between the servo motor and linear scale or rotary encoder.

4.1.5 Setting of full closed encoder electronic gear

(1) Parameters

No.	Abbreviation	Name and Function	Initial Value	Unit	Setting Range
65	＊FCM	Full closed electronic gear numerator Set the numerator of the electronic gear relative to the full closed encoder pulse.	1		1 to 65535
66	＊FCD	Full closed electronic gear denominator Set the denominator of the electronic gear relative to the full closed encoder pulse.	1		1 to 65535

Note 1. When changing the setting of the above parameter, set "000F" in parameter No. 40 "parameter block (＊BLK)".
2. After setting the parameter marked ＊, switch power off once. The setting is made valid by switching power on again.

(2) Parameter setting method

For the full closed electronic gear setting, set the ratio of the full closed encoder feedback to the servo motor encoder feedback.

$$\frac{\text{FCM}}{\text{FCD}} \qquad \frac{\text{Number of servo motor encoder pulses per servo}}{\text{Number of full closed encoder pulses per servo}}$$

Make setting so that the full closed electronic gear $\dfrac{\text{FCM}}{\text{FCD}}$ does not fall outside the

$\dfrac{1}{100} < \dfrac{\text{FCM}}{\text{FCD}} < \dfrac{100}{1}$ range.

＊This setting must be made for all linear scales or rotary encoders.

[Setting example 1] When the servo motor is directly coupled with a ballscrew and the linear scale resolution is 0.05μm

Servo motor
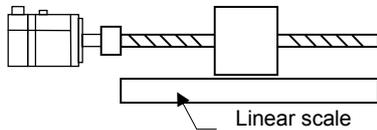
Linear scale

<Conditions>
Servo motor resolution : 131072pulse/rev
Ballscrew lead : 4mm
Linear scale resolution : 0.05μm

Calculate the number of linear scale pulses per servo motor revolution.

Ballscrew lead / linear scale resolution = 4mm/0.05μm = 80000pluse

$$\frac{\text{FCM}}{\text{FCD}} = \frac{131072}{80000} = \frac{\textbf{1024}}{\textbf{625}}$$

[Setting example 2] When a rotary encoder at roll feed detection end is used for detection

Pulley diameter d2 = 20mm

Servo motor

Rotary encoder
5000pulse/rev

Pulley diameter   d1 = 30mm
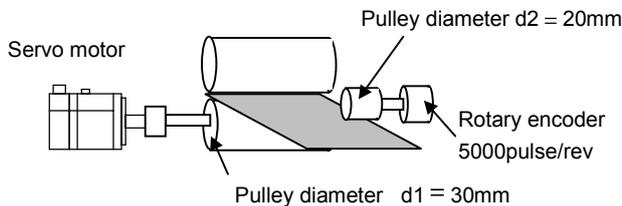
<Conditions>
Servo motor resolution : 131072pulse/rev
Servo motor side pulley diameter : 30mm
Rotary encoder side pulley diameter : 20mm
Rotary encoder resolution : 5000pulse/rev
(20000 pulses/rev after multiplication by 4)

When the pulley diameters or reduction ratios differ, consider that in calculation.
For the rotary encoder, make calculation using the number of pulses multiplied by 4.

$$\frac{\text{FCM}}{\text{FCD}} = \frac{131072 \times 20}{20000 \times 30} = \frac{\textbf{8192}}{\textbf{1875}}$$

⚠ CAUTION	・ If a wrong value is set in the linear scale electronic gear (parameter No. 65, 66), normal operation may not performed. It may also cause a servo alarm (AL. 42) during positioning operation.

4.1.6 Confirmation of full closed encoder position data

Check the full closed encoder mounting and parameter settings for any problems.

> POINT
> ・Depending on the check items, the MR Configurator may be used.
>   Refer to "4.6 About Setup" for the data displayed on the MR Configurator.

[Check items]

When checking the following items, the full closed control mode must be selected by setting parameter No. 62 and No. 67.

＊For the control mode setting, refer to "4.1.2 Selection of full closed function".

No.	Check Item	Checking Method/Description
1	Read of full closed encoder position data	With the full closed encoder in a normal state (mounting, connection, etc.), the cumulative feedback pulse 2 (full closed encoder side) value is counted normally when the full closed encoder is moved.
2	Read of full closed encoder scale home position (reference mark, Z phase)	With the scale home position (reference mark, Z phase) of the full closed encoder in a normal state (mounting, connection, etc.), the within-full-one-revolution position (full closed encoder side) value is cleared to 0 when the scale home position (reference mark, Z phase) is passed through by moving the full closed encoder.
3	Confirmation of full closed encoder feedback direction (Setting of full closed encoder polarity)	Confirm the full closed encoder feedback direction at the within-full-one-revolution position (full closed encoder side) by moving the device (full closed encoder) manually in a servo off state. When the servo motor and full closed encoder feedback directions match, running the servo motor in the CCW direction (counterclockwise as viewed from the shaft end) increases the within-full-one-revolution position (full closed encoder side), and running the servo motor in the CW direction (clockwise as viewed from the shaft end) decreases the within-full-one-revolution position (full closed encoder side). When the servo motor and full closed encoder directions do not match, operation is performed oppositely.
4	Setting of full closed electronic gear	When the servo motor and full closed encoders operate synchronously, the cumulative feedback pulse (motor encoder side) and cumulative feedback pulse 2 (full closed encoder side) values increase in accordance with the setting ratio of the full closed electronic gear (FCM/FCD). [Confirmation example] When the servo motor is directly coupled with a ballscrew and the linear scale resolution is $1.0\mu m$ ・Motor encoder resolution = 131072pullse/rev ・Ballscrew lead = 4.0mm ・Linear scale resolution = $1.0\mu m$ When the movement is equivalent to one servo motor revolution (machine end 4.0mm) Cumulative feedback pulse 2 (full closed encoder side) = 4000 pulses

4.1.7 Setting of dual feedback switching filter

(1) Parameter

No.	Abbreviation	Name and Function	Initial Value	Unit	Setting Range
67	DUF	Dual F/B filter Set the bandwidth of the dual F/B filter. At 1000rad/s setting, the full closed control is made always valid. At 0rad/s setting, the full closed control is made invalid. About half of the position loop gain 2 in parameter No. 15 is the guideline of the upper setting limit.	10	rad/s	0 to 1000

Note 1. When changing the setting of the above parameter, set "000F" in parameter No. 40 "parameter block (＊BLK)".

(2) Parameter setting method

1) With the initial value (setting = 10) set in parameter No. 67, make gain adjustment by auto tuning, etc. as in semi closed control.

2) While observing the servo operation waveform with the graph function, etc. of the MR Configurator, adjust the dual F/B filter.

The dual F/B filter operates as described below depending on the setting.

No. 67 Setting	Smaller ←→ Larger 1 (initial value = 10) to PG2 setting/2		1000
Control mode	Dual F/B		Full closed
Vibration	Less likely to occur.	More likely to occur.	─
Settling time	Increases.	Decreases.	─

Increasing the dual F/B filter setting shortens the settling time, but increases motor vibration since the motor is more likely to be influenced by the full closed encoder vibration. The maximum setting of the dual F/B filter should be less than half of the PG2 setting.

[Reduction of settling time]: Increase the dual F/B filter setting.
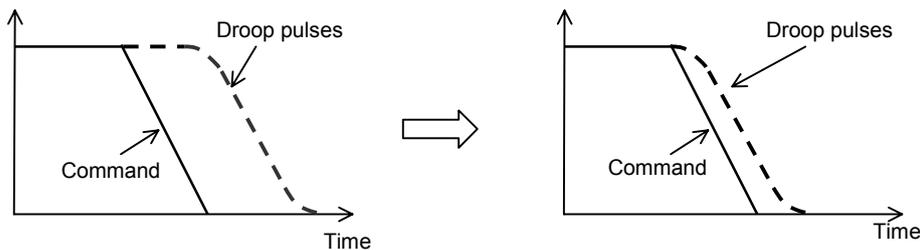
[Suppression of vibration]: Decrease the dual F/B filter setting.
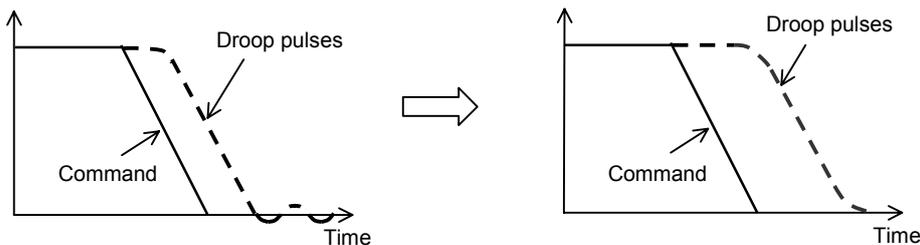
4.2 Home position return operation

4.2.1 General precautions

Home position return operation is all performed according to the full closed encoder feedback data, independently of the full closed encoder type. It is irrelevant to the Z-phase position of the motor encoder. In the case of a home position return using a dog signal, the scale home position (reference mark) must be passed through when an incremental type linear scale is used, or the Z phase be passed through when a rotary encoder is used, during a period from a home position return start until the dog signal turns off.

4.2.2 Full closed encoder types and home position return methods

(1) About proximity dog type home position return using absolute linear scale Serial I/F

When an absolute linear scale is used, the home position reference position is the position per motor encoder resolution relative to the scale home position (absolute position data = 0).

In the case of a proximity dog type home position return, the nearest position after proximity dog OFF is the home position.

The scale home position may be set in any position.
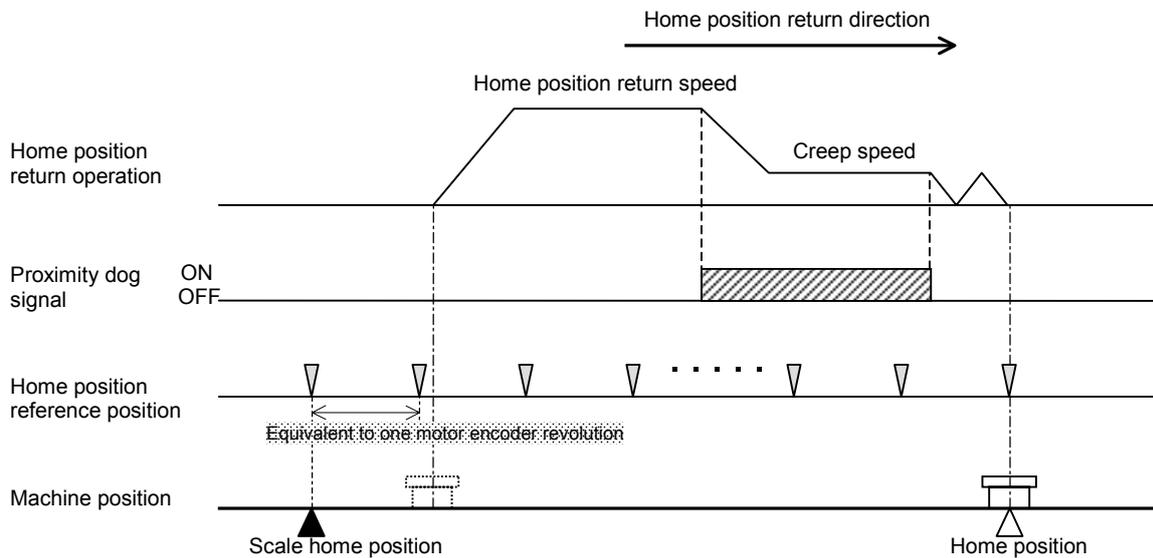
(2) About proximity dog type home position return using incremental linear scale

Serial I/F · General-purpose pulse output

When an incremental linear scale is used, the home position is the position per motor encoder resolution relative to the scale home position (reference mark) passed through first after a home position return start.

In the case of a proximity dog type home position return, the nearest position after proximity dog OFF is the home position.

Set one scale home position in the full stroke, and set it in the position that can always be passed through after a home position return start.
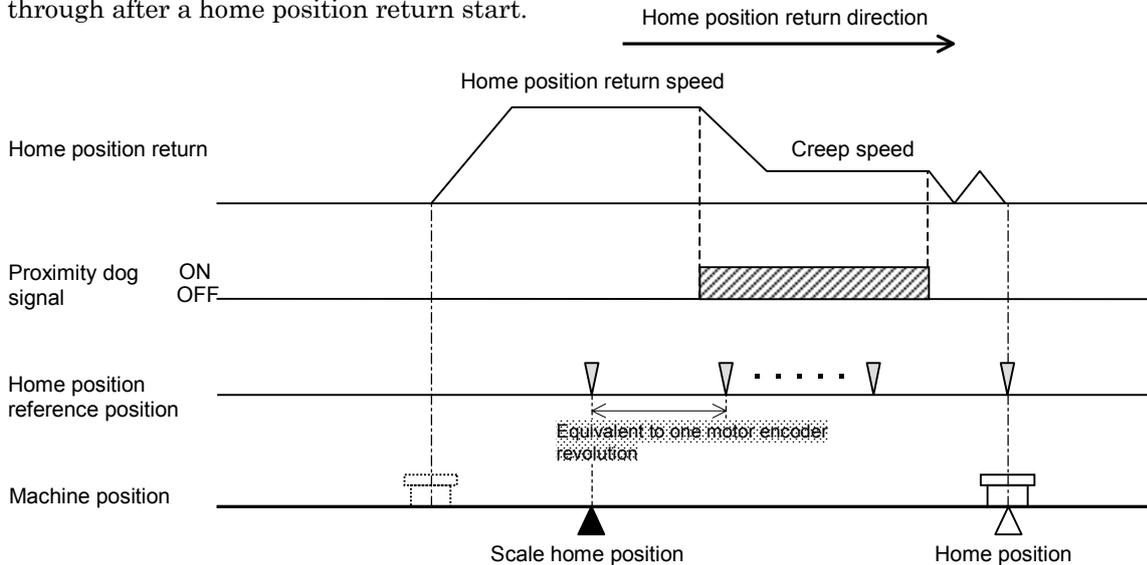
If a home position return is started at the position where the scale home position (reference mark) does not exist in the home position return direction, a home position return error occurs in the controller (the error definition changes depending on the controller type). When starting a home position return at the position where the scale home position (reference mark) does not exist in the home position return direction, move the axis up to the stroke end on the side opposite to the home position return direction by jog operation, etc. of the controller once, then make a home position return.
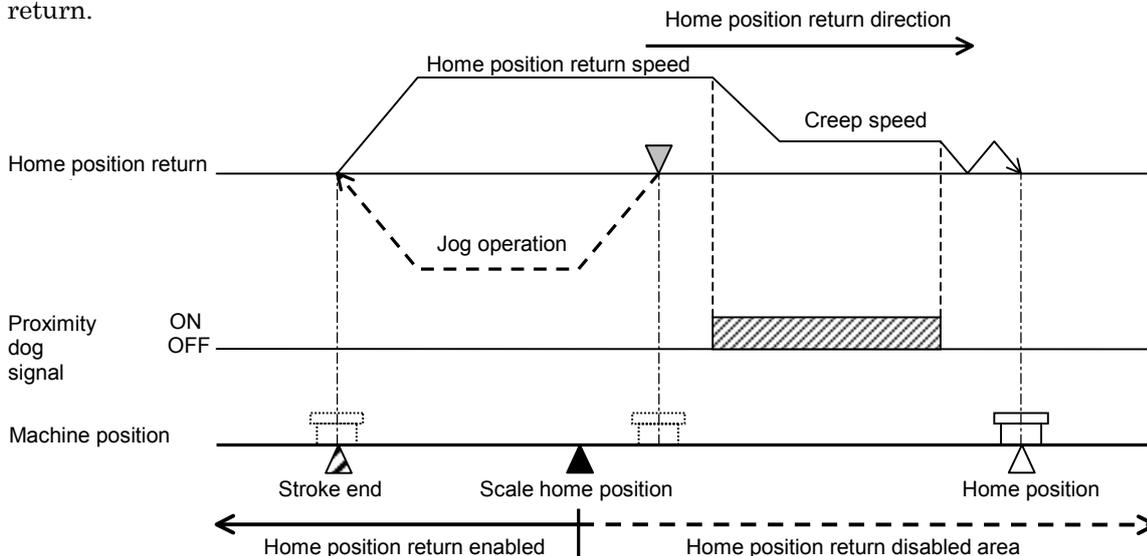
⚠ CAUTION	· To execute a home position return securely, start a home position return after moving the axis to the opposite stroke end by jog operation, etc. of the controller. · To execute a home position return securely, start a home position ret A home position return cannot be made if the incremental linear scale does not have a scale home position (reference mark). Always provide a scale home position (reference mark). (One place in the full stroke)

[Precautions]

Note the following if the system uses the positioning module (QD75M) or VME bus Position Board (MR-MC01) as a position controller.

The scale home position (reference mark) has some∗ width in the region where the signal turns on.

∗The signal ON width changes depending on the used linear scale.
Contact the scale manufacturer for details.

The positioning module (QD75M) or VME bus Position Board (MR-MC01) determines the home position reference position when the scale home position (reference mark) is passed through first after power-on of the servo amplifier. Therefore, a lag equivalent to the scale home position signal width is produced in the home position reference position depending on the direction in which the scale home position (reference mark) is passed through.
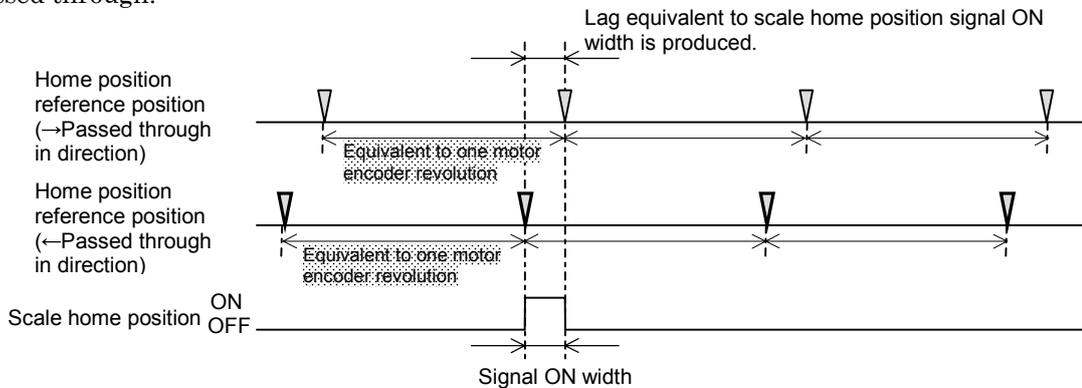
Therefore, when it is desired to always make a home position return to the same position without a lag equivalent to the scale home position signal width, a home position return must be performed so that the scale home position is always passed through in the same direction.

The following indicates a home position return method in which a lag equivalent to the scale home position signal width is not produced in the positioning module (QD75M) or VME bus Position Board (MR-MC01).

[Home position return method in which lag equivalent to scale home position signal width is not produced]

(a) Move the linear servo motor to the position where the stroke end signal on the side opposite to the home position return direction turns on.
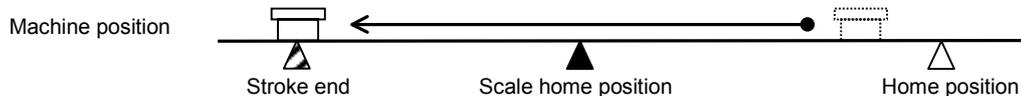
(b) Perform the power-on reset of the servo amplifier or reset the controller.

(c) Switch on the servo and make a home position return.

4 - 10
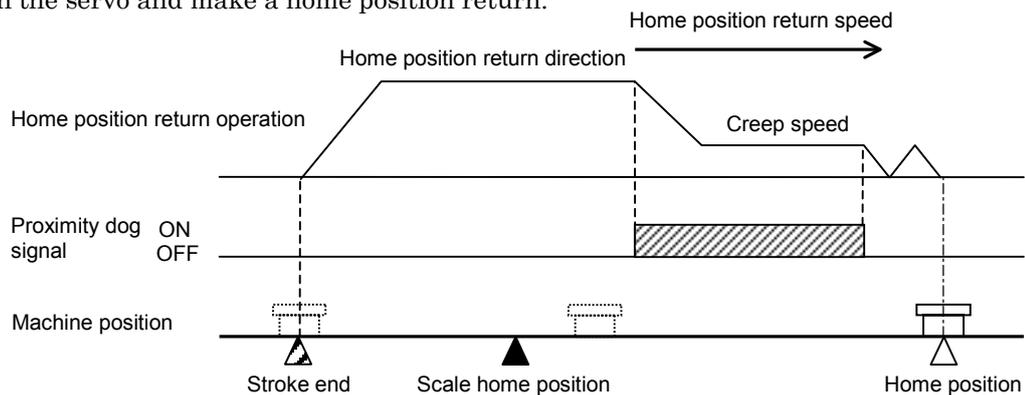
SUPPLEMENT
・ The positioning module (QD75M) and VME bus Position Board (MR-MC01) are scheduled for modification to operate like the other controllers.

Contact your sales representative for the modification time and compatible versions.

⚠ CAUTION
・ The home position return retry function of the positioning module (QD75M) cannot be used.

(3) About proximity dog type home position return using rotary encoder

Serial I/F ・ General-purpose pulse output

The home position using a rotary encoder as a full closed encoder is as described below. It is the position per motor encoder resolution, starting at the position where the Z phase of the full closed encoder is passed through first after power-on of the servo amplifier.

Home position reference is position per motor encoder resolution relative to Z-phase signal of full closed encoder that was passed through first after power-on of servo amplifier.
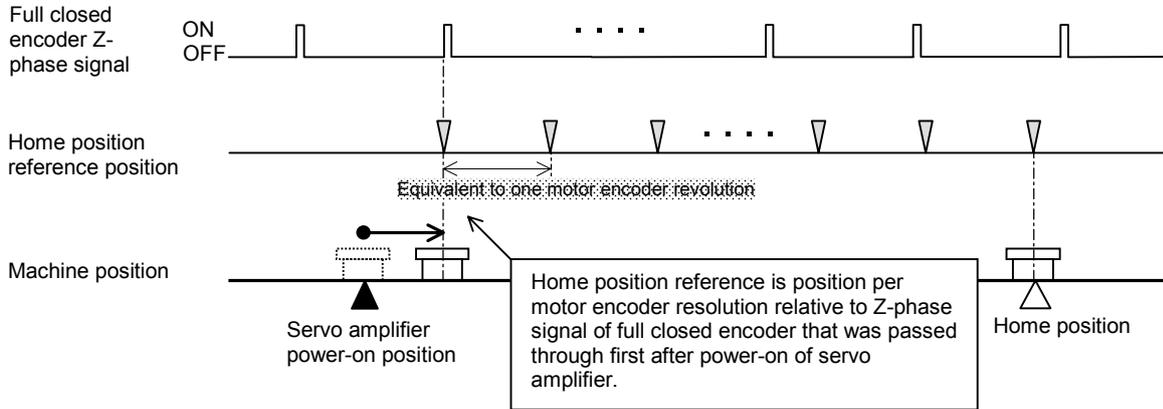
[Precautions]

Precautions for passage of Z phase

The home position reference position is set relative to the Z phase position of the full closed encoder that is passed through first after power-on of the servo amplifier.

In Case A and Case B where the power-on position differs as shown below, the power-on position must be noted since the axis cannot stop at the same home position return position.
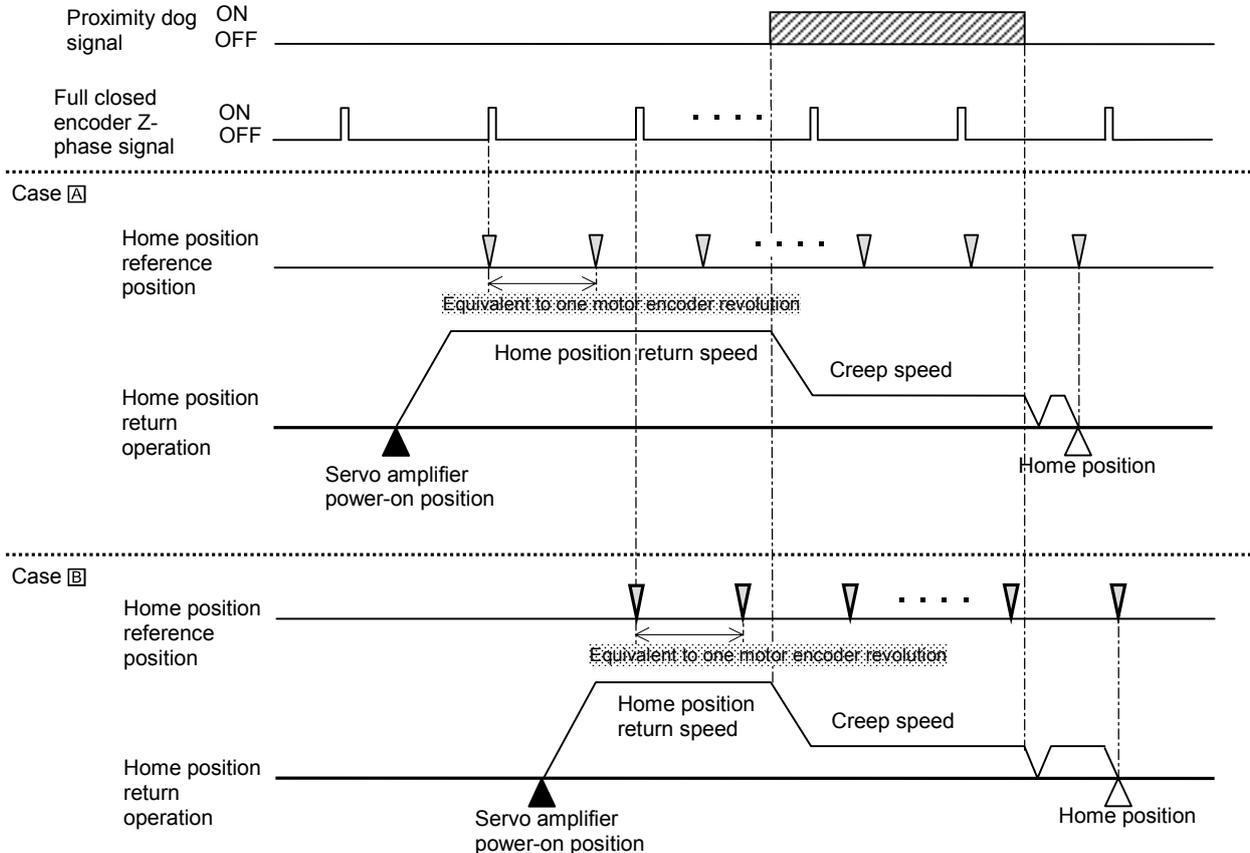
[Method for always making home position return to the same position]

(a) Move the linear servo motor to the position where the stroke end signal on the side opposite to the home position return direction turns on.

Machine position

Stroke end   Scale home position   Home position

(b) <u>Perform the power-on reset of the servo amplifier or reset the controller</u>.

(c) Switch on the servo and make a home position return.

Home position return direction

Home position return speed

Home position return operation

Creep speed

Proximity dog signal   ON   OFF

Machine position

Stroke end   Scale home position   Home position
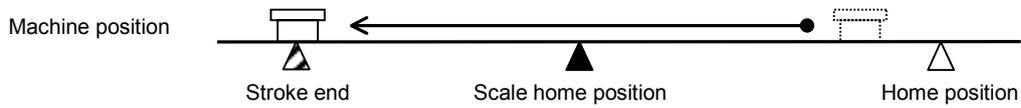
(4) About data setting type · count type 2) (QD75M) | Common to all full closed encoders |

In the data setting type/count type 2) (QD75M) home position return method, a home position return can be normally made if the home position has been passed through (in either direction) before start of a home position return, since a scale home position (reference mark) or the Z-phase signal of a rotary encoder is not required.

When the linear scale used does not have a scale home position (reference mark) or the machine has no distance of one motor encoder revolution until the Z phase of the rotary encoder is passed through, a home position return can be made by changing the parameter (Pr. 33 "home position setting condition selection") setting if the home position is not yet passed through.

4.3 Operation from controller

The full closed control compatible amplifier can be used with any of the following controllers.

Classification	Model	Remarks
Motion controller	A17□SHCPU, A173UHCPU A273UHCPU (-S3) Q17□CPU	Speed control (II) instructions (VVF, VVR) cannot be used.
Positioning module	QD75M□	AD(A1SD)75M□ cannot be used. Home position return must be made with care.
Position Board	MR-MC10 (PCI bus compatible)	
	MR-MC2□ (CPCI bus compatible)	
	MR-MC30 (ISA bus compatible)	
	MR-MC01 (VME bus compatible)	Home position return must be made with care.

Note. An ABS type linear scale is required to configure an absolute position system.
The battery (MR-BAT) need not be fitted to the servo amplifier.

4.3.1 Operation from controller

Positioning operation from the controller is basically performed like the standard model servo.
However, some parameter settings and home position return operation change depending on the controller type.

4.3.2 Controller setting

When using full closed control, make the following setting.
Set the other servo parameters and control parameters as in the standard servo.

(1) Motion controller, positioning module

After writing parameter No. 23, 33, 62, 65, 66, and 68 to the servo amplifier, turn off the power supply and then on again to make the setting valid. (For motion controller, resetting makes the servo amplifier setting valid.)

Setting Item		Settings	
		Motion controller	Positioning module
		A17□SH, A173UH, A273UH Q17□	QD75M
Command resolution		Motor encoder resolution unit	
Servo parameters	Amplifier setting	MR-J2S-□B	
	Motor setting	Automatic setting	
	Serial encoder cable selection (parameter No. 23)	Setting is necessary only when a 4 wire type linear scale is used. Contact your sales representative for the setting method.	Set using sequence ladder.
	Home position setting condition selection (parameter No. 33)	Contact your sales representative for the setting method.	
	Full closed selection (parameter No. 62)	Set using MR Configurator.	
	Full closed control error detection 1 (parameter No. 63)		
	Full closed control error detection 2 (parameter No. 64)		
	Full closed electronic gear numerator (parameter No. 65)		
	Full closed electronic gear denominator (parameter No. 66)		
	Dual F/B filter (parameter No. 67)		
	Full closed selection 2 (parameter No. 68)		
Positioning control parameters	Unit setting	mm/inch/degree/pulse	
	Moving distance per pulse (AP, AL, AM) Number of pulses per revolution (AP) Moving distance per revolution (AL) Unit multiplying factor (AM)	Set AP, AL and AM as usual with motor encoder resolution.	

SUPPLEMENT

· In the future, the Q motion controller (Q17□) is scheduled to allow the servo parameter Pr. 40 to Pr. 75 settings to be changed from the peripheral software.

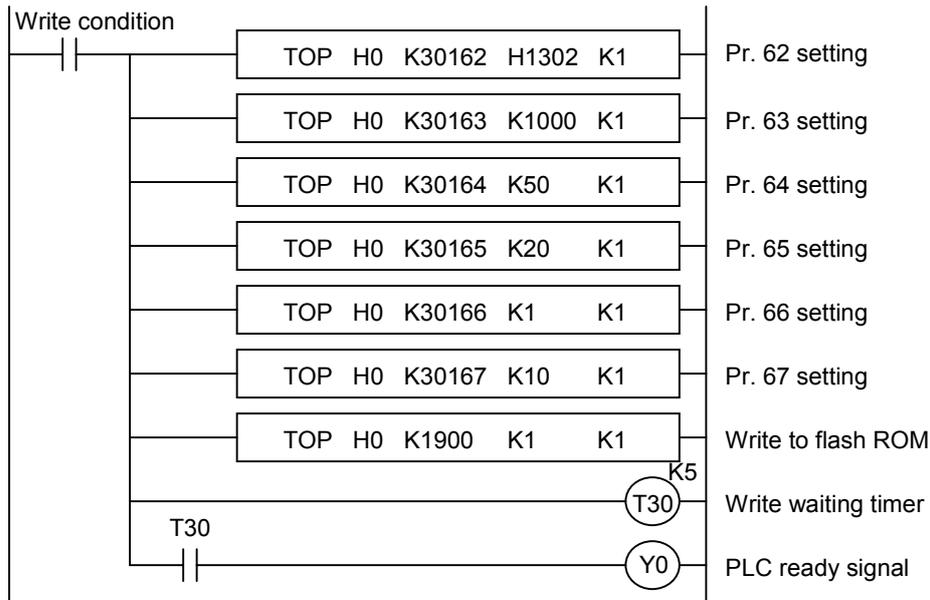Contact your sales representative for the modification time and compatible versions.

[Precautions]

The positioning module (QD75M) controls the servo parameters No. 0 to 75. Therefore, when setting any of the servo parameters up to No. 75, change the buffer memory setting of the positioning module in a sequence program.

If the settings of the parameters No. 0 to 75 are changed using the MR Configurator, they are not reflected on the positioning module.

[Reference sequence program]

Example of writing the servo parameters (No. 62 to 67) of Axis No. 1

```
Write condition
   ┤├──┬──┤ TOP  H0  K30162  H1302  K1 ├──  Pr. 62 setting
       │
       ├──┤ TOP  H0  K30163  K1000  K1 ├──  Pr. 63 setting
       │
       ├──┤ TOP  H0  K30164  K50    K1 ├──  Pr. 64 setting
       │
       ├──┤ TOP  H0  K30165  K20    K1 ├──  Pr. 65 setting
       │
       ├──┤ TOP  H0  K30166  K1     K1 ├──  Pr. 66 setting
       │
       ├──┤ TOP  H0  K30167  K10    K1 ├──  Pr. 67 setting
       │
       ├──┤ TOP  H0  K1900   K1     K1 ├──  Write to flash ROM
       │                              K5
       │                           ( T30 )  Write waiting timer
   T30 │
   ─┤├─┴──────────────────────────( Y0 )    PLC ready signal
```

∗The flash ROM has a restriction on the write count. Therefore, when setting data using a sequence program every time, for example, do not write data to the flash ROM.

∗When controlling multiple axes, write the parameters to all axes.

(2) Position Board

Setting Item		Settings	
		Position Board	
		MR-MC01	MR-MC10, MR-MC2□, MR-MC30
Command resolution		Motor encoder resolution unit	
Servo parameters	Motor type (parameter No. 3)	0080h (131072) (Add = 0603h)	0080h (Automatic setting) (Add = 0414h)
	Serial encoder cable selection (parameter No. 23)	Setting is necessary only when a 4 wire type linear scale is used.	
	Home position setting condition selection (parameter No. 33)	Set as required.	
	Full closed selection (parameter No. 62)	Set using MR Configurator.	
	Full closed control error detection 1 (parameter No. 63)		
	Full closed control error detection 2 (parameter No. 64)		
	Full closed electronic gear numerator (parameter No. 65)		
	Full closed electronic gear denominator (parameter No. 66)		
	Dual F/B filter (parameter No. 67)		
	Full closed selection 2 (parameter No. 68)		
Control parameters	Home position return option (OPZ1)	No setting	1□□□h
	Electronic gear setting (CMX, CDV)	Set as usual with motor encoder resolution.	

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4.4 Functions

4.4.1 Full closed control error detection

If full closed control becomes instable for some reason, the speed at servo motor end may increase abnormally.

The full closed control error detection function is a protective function designed to pre-detect it and stop operation.

The full closed control error detection function has two different detection methods, speed difference and position difference, and errors are detected only when the corresponding functions are made valid by setting Full closed selection (parameter No. 62).

The detection level setting can be changed using the parameters (No. 63, 64).

(1) Parameters

No.	Abbreviation	Name and Function	Initial Value	Unit	Setting Range
62	*FCT	Full closed selection: Select the full closed encoder direction, full closed control error detection function 1 and full closed control error detection function 2. Full closed control error detection function 0: Invalid 1: Full closed control error detection function 1 valid 2: Full closed control error detection function 2 valid 3: Full closed control error detection functions 1 and 2 both valid	1300		0000h to 1312h
63	BC1	Full closed control error detection 1 Set the speed difference error detection level of Full closed control error detection 1. Whether this function is valid or invalid can be selected using parameter No. 62 (FCT). 1 to permissible speed	400	r/min	1 to permissible speed
64	BC2	Full closed control error detection 2 Set the position difference error detection level of Full closed control error detection 2. Whether this function is valid or invalid can be selected using parameter No. 62 (FCT).	10	0.1rev	1 to 2000

Note 1. When changing the setting of the above parameter, set "000F" in parameter No. 40 "parameter block (*BLK)".

2. After setting the parameter marked *, switch power off once. The setting is made valid by switching power on again.

(2) Linear servo control error detection function

Servo motor

1) Motor end F/B speed (r/min)
2) Motor end F/B position (pulse)

3) Full closed end F/B speed (r/min)
4) Full closed end F/B position (pulse)
(Motor end equivalent value)

Example of linear scale
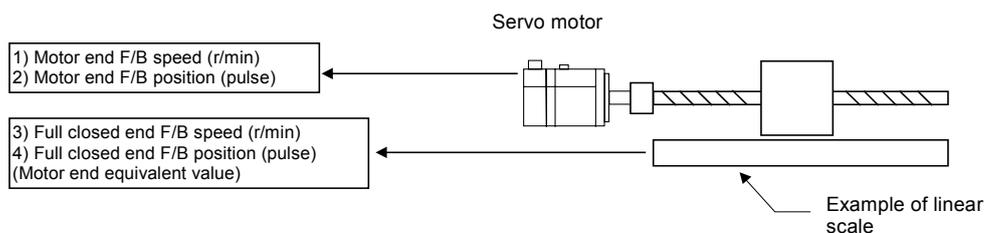
(a) Speed difference error detection

If there is a difference of not less than the setting (1 to permissible speed, r/min) between 1) motor end F/B speed and 3) full closed end F/B speed as a result of comparison, a stop is made due to an alarm (AL42). In the default setting of the parameter, the error level is 400r/min.

(b) Position difference error detection

If there is a difference of not less than the setting (0.1 to 200.0rev) between 2) motor end F/B position and 4) full closed end F/B position as a result of comparison, a stop is made due to an alarm (AL42). In the default setting of the parameter, the error level is 1.0rev.

＊In the default settings of the parameters, speed difference error detection and position difference error detection are both valid.

4.4.2 Auto tuning function

The auto tuning function is the same as that of the standard servo.
For full information, refer to the Instruction Manual of the MR-J2S-□B standard model.

4.4.3 Machine analyzer function

The machine analyzer function of the MR Configurator is the same as that of the standard servo.
For full information, refer to the Instruction Manual of the MR-J2S-□B standard model.
This function is activated by the feedback of the motor encoder. It is irrelevant to the full closed encoder.

4.4.4 Test operation

```
POINT
・When performing test operation using the MR Configurator, it is
 necessary to reset the power supply after setting the axis number of the
 servo amplifier to "F".
```

Test operation can be performed by combining the MR Configurator that runs on the personal computer and the servo amplifier.
The full closed control compatible amplifier cannot use motor-less operation.

Function	Item	Usability	Remarks
Test operation	Jog operation	Usable	Performed by the feedback of the motor encoder. It is irrelevant to the full closed encoder.
	Positioning operation	Usable	In a semi closed control/full closed control state, operation is performed in the control mode states as set in parameter No. 62, No. 67.
	Program operation	Usable	When full closed function switching is valid (semi/full switching by host controller), semi closed control is always valid.
	DO forced output	Usable	Same as the standard servo function.
	Motor-less operation	Unusable	Not supported.

4.5 Absolute position detection system

An ABS type linear scale is necessary to configure an absolute position detection system under full closed control using a linear scale.

In this case, absolute value data are backed up on the linear scale side, and therefore, the encoder battery (MR-BAT) need not be installed to the servo amplifier.

POINT
· When configuring an absolute position detection system with this servo amplifier under semi closed control, the encoder battery (MR-BAT) must be installed to the servo amplifier like the standard amplifier. At this time, the option cable (MR-J2SCLCBL02M-P-H) cannot be used. Connect the encoder cable of the motor encoder directly to the servo amplifier.

[Precautions]

Make setting to make Absolute position detection valid in the servo parameter (Pr. 1 = 0001). The system can be used in the following limited conditions.

(1) Using conditions
    1) Use an absolute type linear scale with the full closed encoder.
    2) Select Always full closed (Pr. 62 = □□□1).

(2) Absolute position detection range using encoder

Encoder Type	Absolute Position Detection Enabled Range
Linear scale (Serial I/F)	Movable distance range of scale (within 32-bit absolute position data)

(3) Alarm detection
    The absolute position-related alarm (25) and warnings (92, 9F, E3) are not detected.

4.6 About the MR Configurator
4.6.1 When current version of MR Configurator (MRZJW3-SETUP121 to -SETUP151 S/W: E0 version) is used

The following indicates how to check whether the full closed-related parameter settings are normal or not and whether the servo motor and full closed encoders operate normally or not.

Select "MR-J2S-B" in the system setting of the MR Configurator. Opening the batch monitor screen displays the following screen.
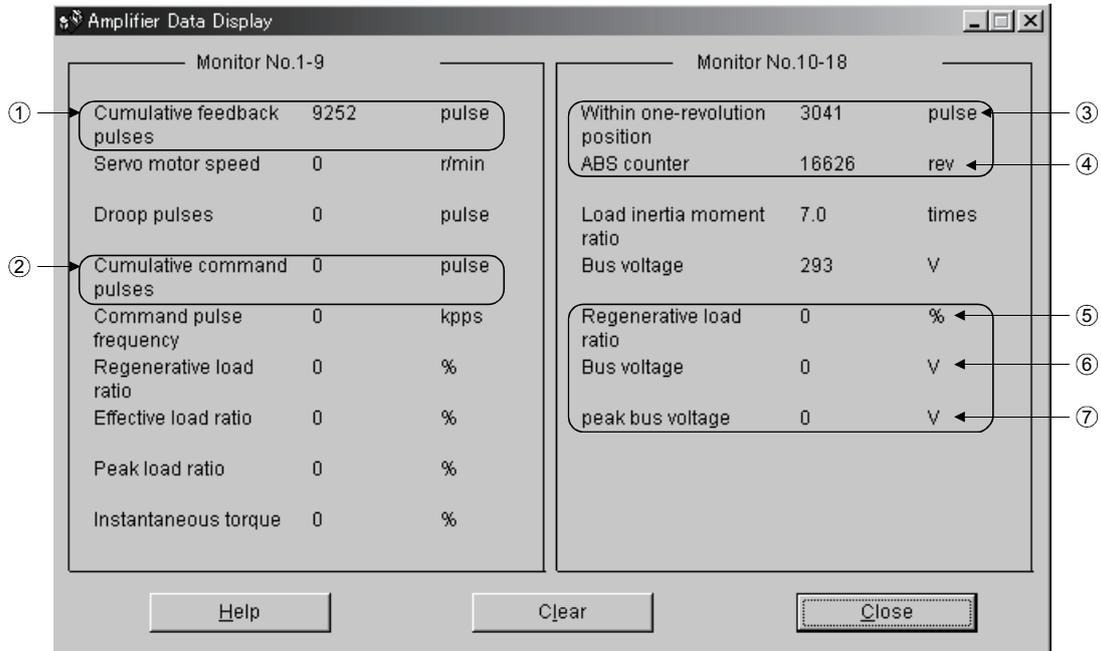
(1) Explanation of display items

The following table indicates the display items that are related to the servo motor and full closed encoders.

Symbol	Name	Explanation
1)	Cumulative feedback pulse	Feedback pulses from the servo motor encoder are counted and displayed. Click "Clear" to reset the value to 0.
2)	Command pulse frequency	Position command inputs from the command controller are counted and displayed. Click "Clear" to reset the value to 0.
3)	Within-one-revolution position	The within-one-revolution position of the servo motor encoder is displayed.
4)	ABS counter	The multi-revolution counter (number of revolutions from home position) of the servo motor encoder is displayed. The value is incremented or decremented by 1 per servo motor revolution.
5)	Regenerative load ratio (→read as Cumulative feedback pulse 2) ＊Caution: The name does not match what is monitored. The real regenerative load ratio is displayed on the left side.	Feedback pulses from the full closed encoder are counted and displayed. The value is displayed in the pulse unit of the closed encoder. Click "Clear" to reset the value to 0.
6)	Bus voltage (→read as Within-full-one-revolution position) ＊Caution: The name does not match what is monitored. The real bus voltage is displayed two lines above.	The within-one-revolution position of the full closed encoder is displayed. In the case of an INC linear scale, the Z-phase counter is displayed. The value is counted up from 0 relative to the home position (reference mark). The value is displayed in the pulse unit of the closed encoder. In the case of an ABS linear scale, the virtual within-one-revolution position (equivalent to lower 17 bits of the conversion result of 32-bit absolute position data into the motor end unit, 0 to 131071) is displayed.
7)	Peak bus voltage (→read as Full ABS counter) ＊Caution: The name does not match what is monitored.	The multi-revolution counter (number of revolutions from home position) of the full closed encoder is displayed. In the case of an ABS linear scale, the virtual multi-revolution counter (equivalent to lower 15 bits of the conversion result of 32-bit absolute position data into the motor end unit, 0 to 32767) is displayed.

4.6.2 When full closed compatible MR Configurator (MRZJW3-SETUP151 S/W: E1 version or later) is used
Select "MR-J2S-B full closed" in the system setting of the MR Configurator.

(1) Batch monitor screen

∗This screen is designed to display Cumulative feedback pulse 2, Within-full-one-revolution position and Full ABS counter as formal names.
∗Refer to above Section 4.7.1 for the explanation of what are displayed.

(2) Diagnosis - full closed diagnosis screen
The position-related monitor indications and parameters on the full closed function are all displayed on a single screen.
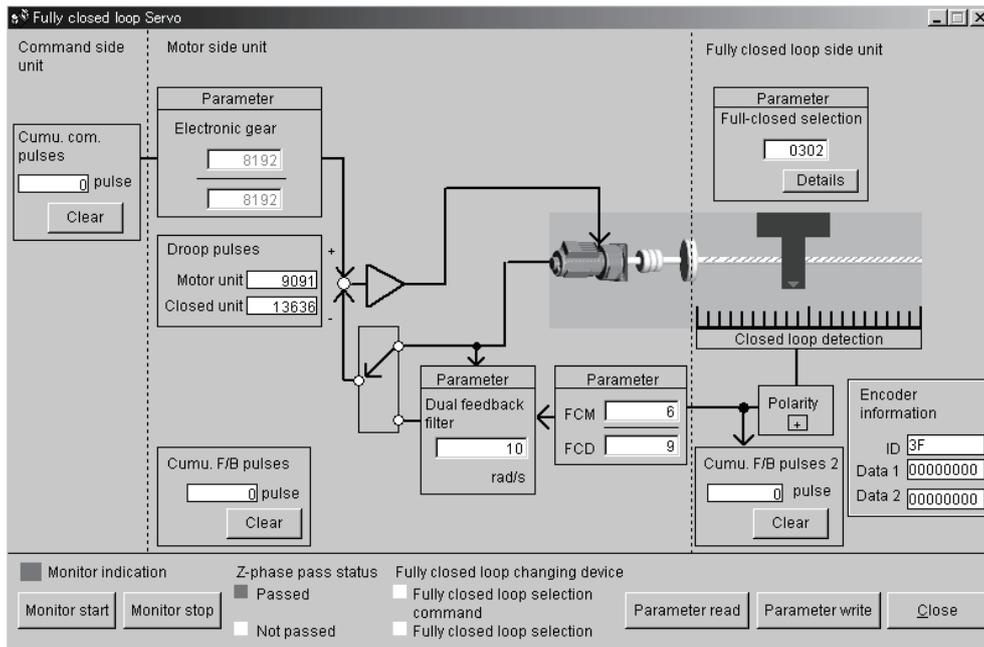
(The explanation is given on the next page.)

[Explanation of display items and functions]

・For the monitor display item, click "Start monitor" to read it continuously from the amplifier. Click "Stop monitor" to stop read.

・For the parameter item, click "Read parameter" to read it from the amplifier, and click "Write parameter" to write.

Name	Explanation
Command pulse frequency	Commands from the host controller are counted and displayed. Click "Clear" to reset the value to 0.
Cumulative feedback pulse	Feedback pulses from the servo motor encoder are counted and displayed. Click "Clear" to reset the value to 0.
Droop pulses	When the full closed function is "invalid", a deviation from the command that uses the servo motor encoder as F/B is displayed. When the full closed function is "valid" or "semi/full switching", a deviation from the command that uses the closed encoder as F/B is displayed.
Cumulative feedback pulse 2	Feedback pulses from the full closed encoder are counted and displayed. The value is displayed in the pulse unit of the closed encoder. Click "Clear" to reset the value to 0.

Encoder data	The data of the closed end encoder are displayed.
	 The displayed data change depending on the closed encoder type.
	 ・ID : The ID number of the encoder is displayed.
	 ・Data 1 : In the case of the INC type, a counter starting at power-on is displayed.
	      In the ABS type linear encoder, absolute position data is displayed.
	      In the case of the ABS type rotary encoder, a multi-revolution counter is displayed.
	 ・Data 2 : In the case of the INC type, the distance (number of pulses) from the reference mark (Z phase) is displayed.
	      In the ABS type linear encoder, 00000000 is displayed.
	      In the case of the ABS type rotary encoder, a cycle counter is displayed.

Polarity	A ⊞ or ⊟ sign is displayed according to the full closed encoder polarity specified in the full closed selection parameter. Note: Full closed encoder polarity ⊞ is displayed when the setting is "0: Address increasing direction for motor CCW".
Z-phase pass state	When the full closed function is "invalid", the Z-phase pass state of the servo motor encoder is displayed. When the full closed function is "valid" or "semi/full switching", the Z-phase pass state of the closed encoder is displayed.
Full closed switching device	Displayed only when "semi/full switching" is selected for the full closed function. The switching device selection command state and the internal state during selection are displayed.
Parameter	The parameter related to the full closed control is displayed. Its setting can be changed and the new value can be written to the servo amplifier. The related parameters are as follows. ・Electronic gear : Pr. 6 ・Dual F/B filter : Pr. 67 ・FCM : Pr. 65 ・FCD : Pr. 66 ・Full closed selection : Pr. 62, 63, 64

5. PARAMETERS

5 PARAMETERS

5.1 Parameter list

```
┌─────────────────────────────────────────────────────────────────────────┐
│ SUPPLEMENT                                                                │
│ ・For any parameter flagged with an asterisk (*), set the parameter value │
│   and switch power off, then switch it on again to make the setting valid.│
│   Parameter is set at the timing when communication is established        │
│   between the servo system controller and the servo amplifier             │
│   (displayed in b*).                                                      │
│   Subsequently, turn off the power supply of servo amplifier and then on  │
│   again.                                                                  │
└─────────────────────────────────────────────────────────────────────────┘
```

Class	No.	Abbreviation	Name	Initial Value	Unit	Remarks
Basic parameters	01	*AMS	Amplifier setting	0000		
	02	*REG	Regenerative resistor	0000		
	03		For manufacture setting	0080		
	04		For manufacture setting	0000		
	05		For manufacture setting	1		
	06	*FBP	Feedback pulse	0		
	07	*POL	Rotation direction selection	0		
	08	ATU	Auto tuning	0001		
	09	RSP	Servo response level setting	0005		
	10	TLP	Forward rotation torque limit value	300	%	
	11	TLN	Reverse rotation torque limit value	300	%	
Adjustment parameters	12	GD2	Ratio of load inertia moment to servo motor inertia moment	70	×0.1 times	
	13	PG1	Position loop gain 1	35	rad/s	
	14	VG1	Speed loop gain 1	177	rad/s	
	15	PG2	Position loop gain 2	35	rad/s	
	16	VG2	Speed loop gain 2	817	rad/s	
	17	VIC	Speed integral compensation	48	msec	
	18	NCH	Machine resonance suppression filter	0		
	19	FFC	Feed forward gain	0	%	
	20	INP	In-position range	100	pulse	
	21	MBR	Electromagnetic brake sequence output	0	msec	
	22	MOD	Analog monitor output	0001		
	23	*OP1	Optional function 1	0000		
	24	*OP2	Optional function 2	0000		
	25	LPF	Low-pass filter/adaptive vibration suppression control	0000		
	26		For manufacture setting	0000		
Expansion parameters	27	MO1	Monitor output 1 offset	0	mv	
	28	MO2	Monitor output 2 offset	0	mv	
	29		For manufacture setting	0001		
	30	ZSP	Zero speed	50	r/min	
	31	ERZ	Error excessive alarm level	80	0.1rev	
	32	OP5	Optional function 5	0000		
	33	*OP6	Optional function 6	0000		
	34	VPI	PI-PID switching position droop	0	pulse	
	35		For manufacture setting	0		
	36	VDC	Speed differential compensation	980		
	37		For manufacture setting	0010		
	38	*ENR	Encoder output pulse	4000	pulse/rev	
	39		For manufacture setting	0		
	40	*BLK	Parameter write inhibit	0000		

The parameters marked * are valid only at power-on.

Class	No.	Abbreviation	Name	Initial Value	Unit	Remarks
Expansion parameters 2	41		For manufacture setting	500		
	42		For manufacture setting	0000		
	43		For manufacture setting	0111		
	44		For manufacture setting	20		
	45		For manufacture setting	50		
	46		For manufacture setting	0		
	47		For manufacture setting	0		
	48		For manufacture setting	0		
	49		For manufacture setting	0000		
	50		For manufacture setting	10		
	51		For manufacture setting	1		
	52		For manufacture setting	70		
	53		For manufacture setting	100		
	54		For manufacture setting	100		
	55		For manufacture setting	100		
	56		For manufacture setting	0000		
	57		For manufacture setting	0000		
	58		For manufacture setting	0000		
	59		For manufacture setting	0000		
	60	*OPC	Optional function C	0000		
	61		For manufacture setting	0000		
	62	*FCT	Full closed selection (additional function unavailable for the standard model)	1300		
	63	BC1	Full closed control error detection 1 (additional function unavailable for the standard model)	400	r/min	
	64	BC2	Full closed control error detection 2 (additional function unavailable for the standard model)	10	0.1rev	
	65	*FCM	Full closed electronic gear numerator (additional function unavailable for the standard model)	1		
	66	*FCD	Full closed electronic gear denominator (additional function unavailable for the standard model)	1		
	67	DUF	Dual F/B filter (additional function unavailable for the standard model)	10		
	68	*FC2	Full closed selection 2 (additional function unavailable for the standard model)	0000		
	69			0		
	70			0		
	71			0		
	72			0		
	73			0		
	74			0		
	75			0		

The parameters marked * are valid only at power-on.

The following parameters are those added to or modified in the MR-J2S-□□B-S096.
For other parameters, refer to the MELSERVO-J2S-B Instruction Manual as they are the same as those of the standard model.

Class	No.	Abbreviation	Name	Initial Value	Unit	Setting Range
Basic parameters	01	*AMS	Amplifier setting Select the amplifier setting. Absolute position detection selection 0: Invalid (used in incremental system) 1: Valid (used in absolute position detection system) Note: The INC type linear scale is compatible with the incremental system only. It is also compatible with the incremental system only when "2: Switching valid" is selected for the full closed function. If absolute position detection valid is selected in such cases, the parameter error AL-37 occurs.	0000		0000h to 0001h
Adjustment parameter	22	MOD	Analog monitor output Set the signals output to the analog monitor outputs. Analog monitor ch2 output selection The settings and their definitions are as in analog monitor ch1. Analog monitor ch1 output selection 0: Motor speed (±8V/maximum speed) 1: Torque (±8V/maximum torque) 2: Motor speed (+8V/maximum speed) 3: Torque (+8V/maximum torque) 4: Current command (±8V/maximum current command) 5: Speed command (±8V/maximum speed) 6: Droop pulses (±10V/128 pulses) 7: Droop pulses (±10V/2048 pulses) 8: Droop pulses (±10V/8192 pulses) 9: Droop pulses (±10V/32768 pulses) A: Droop pulses (±10V/131072 pulses) B: Bus voltage (+8V/400V) C: Motor end full closed end position difference (±10V/131072 pulses) Droop pulses are in the pulse unit of the motor end. The difference between the position command and linear scale is output. By setting parameter No. 68 "droop pulse unit selection", droop pulses can be output in the full closed end pulse unit.	0001		0000h to 4C4Ch
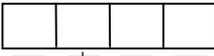
The parameter marked * is valid only at power-on.

Class	No.	Abbreviation	Name	Initial Value	Unit	Setting Range
	23	＊OP1	Optional function 1: Select the optional function 1. Servo forced stop selection Select the servo forced stop function of the CN3-20 input. 0: Valid (forced stop signal is used) 1: Invalid (forced stop signal is not used)monitor ch1. Serial encoder cable selection Select the communication systems of CH1 (for motor) and CH2 (for full closed encoder).	0000		0000h to 0201h

Serial encoder cable selection table:

Hundreds digit setting	When full closed function is invalid (Pr. 62: □□□0)		When full closed function is valid (Pr. 62: □□□1 or 2)	
	ENC CH1	ENC CH2	ENC CH1	ENC CH2
0	2 wire type	Unusable	2 wire type	2 wire type
1	4 wire type	Unusable	4 wire type	Unusable
2	2 wire type	Unusable	2 wire type	4 wire type

Class column (vertical): Adjustment parameter

The parameter marked ＊ is valid only at power-on.

Class	No.	Abbreviation	Name	Initial Value	Unit	Setting Range

Expansion parameters	33	*OP6	Optional function 6:
			Select the optional function 6.
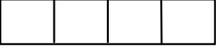			
			Serial communication baud rate selection
			  0: 9600[bps]
			Serial communication response delay time selection
			  0: Invalid
			  1: Valid, a replay is sent after a delay time of 888μsec or more
			Encoder pulse output setting selection
			  0: Output pulse setting
			  1: Division ratio setting
			Home position setting condition selection
			Select the condition under which a home position setting is made from the servo system controller.
			  0: Motor Z-phase pass required after power on
			  1: Motor Z-phase pass not required after power on
			    (Used in a data setting type home position return where the Z phase is not passed through.)
				0000		0000h to 1110h

	38	*ENR	Encoder output pulse: Set the encoder output provided by the servo amplifier in terms of the number of output pulses per revolution or a division ratio. This selection depends on parameter No. 33. Use the maximum output frequency within 1.3Mpulse/sec. 1) In the case of division ratio setting $$\text{Number of output pulses equivalent to one motor revolution} = \frac{\text{Number of encoder pulses equivalent to one motor revolution}}{\text{ENR setting}}$$ 2) In the case of output pulse setting Number of output pulses equivalent to one motor revolution = ENR setting *Set the above number of output pulses in terms of the number of pulses multiplied by 4 in AB phases. Note: When the full closed function is made valid in parameter No. 62 (FCT) and the ABZ-phase pulse output of the full closed encoder is selected in parameter No. 68 (FC2), consider it as "equivalent to one motor revolution" = "moving distance of the full closed encoder equivalent to one revolution of the semi closed end motor". For example, when the linear scale of 0.1μm resolution is installed as the full closed encoder to move 10mm per servo motor revolution, 1) On the assumption that the ENR setting is 20 for division ratio setting $$\text{Number of output pulses for 10mm movement} = \frac{100000 \text{ (equivalent to one motor revolution)}}{20} = 500$$ 2) On the assumption that the ENR setting is 20 for output pulse setting Number of output pulses for 10mm movement = 20	4000		0 to 65535

The parameters marked * are valid only at power-on.

Class	No.	Abbreviation	Name	Initial Value	Unit	Setting Range
Expansion parameters	40	*BLK	Parameter write inhibit: Select the reference and write ranges of the parameters. MR Configurator 	Setting	Reference Range	Write Range
---	---	---
Other than the following	00 to 11, 40	00 to 11, 40
000A	40	40
000C	00 to 40	00 to 11, 40
000E	00 to 40	00 to 40
000F	00 to 75	00 to 75
100E	00 to 40	40 only		0000		0000h to 100Eh
Expansion parameters 2	60	*OPC	Optional function C: Select the encoder pulse output direction. Encoder pulse output direction selection 0: A-phase 90℃ lead for CCW 1: A-phase 90℃ lead for CW	0000		0000h to 0100h
	62	*FCT	Full closed selection: Select the full closed encoder rotation direction, full closed control error detection function 1 and full closed control error detection function 2. Full closed function 0: Invalid 1: Always valid 2: Switching valid (semi/full switching by host controller) Full closed encoder polarity 0: Address increasing direction for motor CCW 1: Address increasing direction for motor CW Full closed control error detection function 	Setting	Full closed control error detection function
---	---
0	Invalid
1	Full closed control error detection function 1 valid
2	Full closed control error detection function 2 valid
3	Full closed control error detection functions 1 and 2 both valid	 Full closed encoder error (AL-2A) selection 0: Invalid (when ALM signal is not connected in MR-J2S-CLP01) 1: Valid	1300		0000h to 1312h
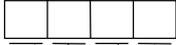
The parameters marked * are valid only at power-on.

Class	No.	Abbreviation	Name	Initial Value	Unit	Setting Range
Expansion parameters 2	63	BC1	Full closed control error detection 1: Set the speed difference error detection level of the full closed control error detection function 1. (Set in terms of the servo motor end-equivalent speed.) Whether this function is valid or invalid can be selected using parameter No. 62 (FCT).	400	r/min	1 to permissible speed
	64	BC2	Full closed control error detection 2: Set the position difference error detection level of the full closed control error detection 2 function. (Set in terms of the number of servo motor end-equivalent revolutions.) Whether this function is valid or invalid can be selected using parameter No. 62 (FCT).	10	0.1rev	1 to 2000
	65	*FCM	Full closed electronic gear numerator: Set the numerator of the electronic gear relative to the full closed encoder pulse.	1		1 to 65535
	66	*FCD	Full closed electronic gear denominator: Set the denominator of the electronic gear relative to the full closed encoder pulse.	1		1 to 65535
	67	DUF	Dual F/B filter: Set the bandwidth of the dual F/B filter. At 1000rad/s setting, the full closed control is made always valid. At 0rad/s setting, the full closed control is made invalid. About half of the position loop gain 2 in parameter No. 15 is the guideline of the upper setting limit.	10	rad/s	0 to 1000
	68	*FC2	Full closed selection 2: Select the functions related to full closed control. ⬚⬚⬚⬚ Pulse output setting 0: ABZ phase pulses of the full closed encoder are output. 1: ABZ phase pulses of the motor end encoder are output. (Note: When the full closed function is invalid (including when the semi closed function is selected at the time of the switching valid setting), the ABZ phase pulses of the motor end encoder are forcibly output.) Droop pulse unit selection 0: Motor end pulse unit 1: Closed end pulse unit With this setting, the droop pulse unit of the MR Configurator batch monitor display, monitor graph data and analog monitor output can be selected. (Note: When the full closed function is invalid (including when the semi closed function is selected at the time of the switching valid setting), the motor end pulse unit is forcibly set.)	0000		0000h to 0011h

The parameters marked * are valid only at power-on.

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6 TROUBLESHOOTING

6.1 Alarm list

The following protective functions are the alarms that differ from those of the standard model.
For the other alarms, refer to the MELSERVO-J2S-B Specifications and Installation Guide and Instruction Manual since they are the same as those of the standard model.

Indication	Name	Definition	Occurrence Factor	Corrective Action
AL28	Full closed encoder error 2	Linear scale operating environment was abnormal.	The linear scale temperature is high. (Mitutoyo make linear scale)	Check the linear scale temperature and contact the scale manufacturer.
			Reduction of linear scale signal level (Sony Precision Technology make linear encoder)	Check the mounting state of the linear scale.
AL2A	Full closed encoder error 1	Full closed encoder (linear scale or ABZ phase pulse-specified encoder) is faulty.	Full closed encoder fault	Contact the full closed encoder manufacturer.
			Linear scale alarm	Confirm the detailed information given in Section 6.2 and contact the scale manufacturer.
			The linear scale speed exceeded the specification range.	Use the linear scale at the speed within the specification range.
			Linear scale and detection head mounting position error	Adjust the linear scale and detection head mounting positions.
			Noise entry	Take noise reduction measures. Contact the full closed encoder manufacturer.
			The MR-J2S-CLP01 connector CN1A is disconnected.	Connect it correctly.
			ALM output of the full closed encoder (when ALM output detection is valid in parameter No. 62)	Change the full closed encoder.
AL42	Full closed control error detection	Full closed control error detection function was activated. 1) The difference between the F/B speed of the full closed encoder and the F/B speed of the motor end encoder reached or exceeded the setting of Pr. 63. 2) The motor shaft-equivalent difference between the F/B position of the full closed encoder and the F/B position of the motor end encoder reached or exceeded the setting of Pr. 64.	Full closed encoder failure	Change the full closed encoder.
			The polarity of the full closed encoder is set oppositely.	Check the mounting orientation of the full closed encoder. Reexamine the setting of parameter No. 62.
			The setting of the full closed encoder electronic gear is wrong.	Reexamine the settings of parameter No. 65, 66. Check the mounting state of the full closed encoder.
			The resolution setting for the full closed encoder is incorrect.	Set the resolution setting for the full closed encoder correctly.
AL70	Full closed encoder communication error 1	Error occurred in communication between the full closed encoder and servo amplifier.	The connector CN2 is disconnected.	Connect it correctly.
			MR-J2S-CLP01 unit failure	Change the unit.
			The internal setting switch (SW1) for MR-J2S -CLP01 unit is not closed.	Set correctly.
			Full closed encoder cable failure	Correct or change the cable.
AL71	Full closed encoder communication error 2	Error occurred in communication between the full closed encoder and servo amplifier.	MR-J2S-CLP01 unit failure	Change the unit.
			Full closed encoder cable failure	Correct or change the cable.
			Full closed encoder cable wiring mistake (All of the A-, B- and Z-phase signal and power supply wires are not yet connected. Especially note that the wiring of the MR-J2S-CLP01 unit Z-phase cannot be omitted.)	Reexamine the wiring.
			The startup timing of 5V power supply for the MR-J2S-CLP01 unit is slow.	Speed up the startup timing of 5V power supply for the MR-J2S-CLP01 unit.

Note: The above alarms are cleared by powering off the servo amplifier. They are not cleared by performing an alarm reset.

6.2 Scale error (AL. 2A) details classified by linear scale manufacturer

When the occurrence cause of alarm 2A is unknown, contact the linear scale manufacturer after confirming the scale error details in the following table on the basis of the alarm detail information of the alarm history display on the MR Configurator.

Detail Information Bit	Scale Error (Alarm 2A) Details			
	Mitutoyo	Sony Precision Technology	Heidenhain	Renishaw
Bit7	Optical overspeed	—	Overspeed error	—
Bit6	ROM・RAM error	—	—	Overspeed
Bit5	EEPROM error	Encoder alarm	EEPROM error	—
Bit4	CPU error	—	CPU error	—
Bit3	Capacitive error	—	ABS data error	—
Bit2	Photoelectric error	—	INC data error	—
Bit1	Photoelectric・capacitive data mismatch	Encoder warning	Scale level error INC/ABS data mismatch error —	Level error
Bit0	Initialization error	—	Initialization error	—

○Example in which alarm 2A occurred on Mitutoyo make linear scale AT343A

Alarm details : 44h

When the alarm detail information of alarm 2A is 44h, bit 6 and bit 2 are on as indicated below, indicating that the ROM・RAM error and photoelectric error occurred.
Use this information when contacting the scale manufacturer.

```
        bit7  bit6  bit5  bit4  bit3  bit2  bit1  bit0
44h =    0     1     0     0     0     1     0     0
         └──────────4──────────┘  └──────────4──────────┘
```
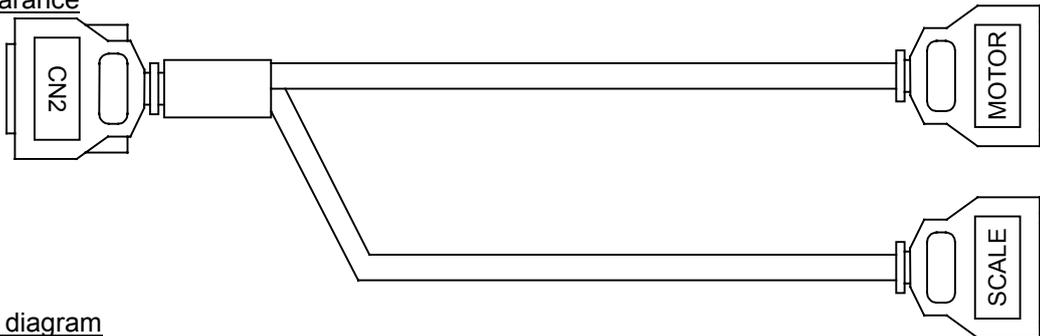
7 OPTIONS AND AUXILIARY EQUIPMENT

7.1 CN2 wiring option cable (MR-J2SCLCBL02M-P-H)

The internal wiring of the option cable (MR-J2SCLCBL02M-P-H) is as shown below.
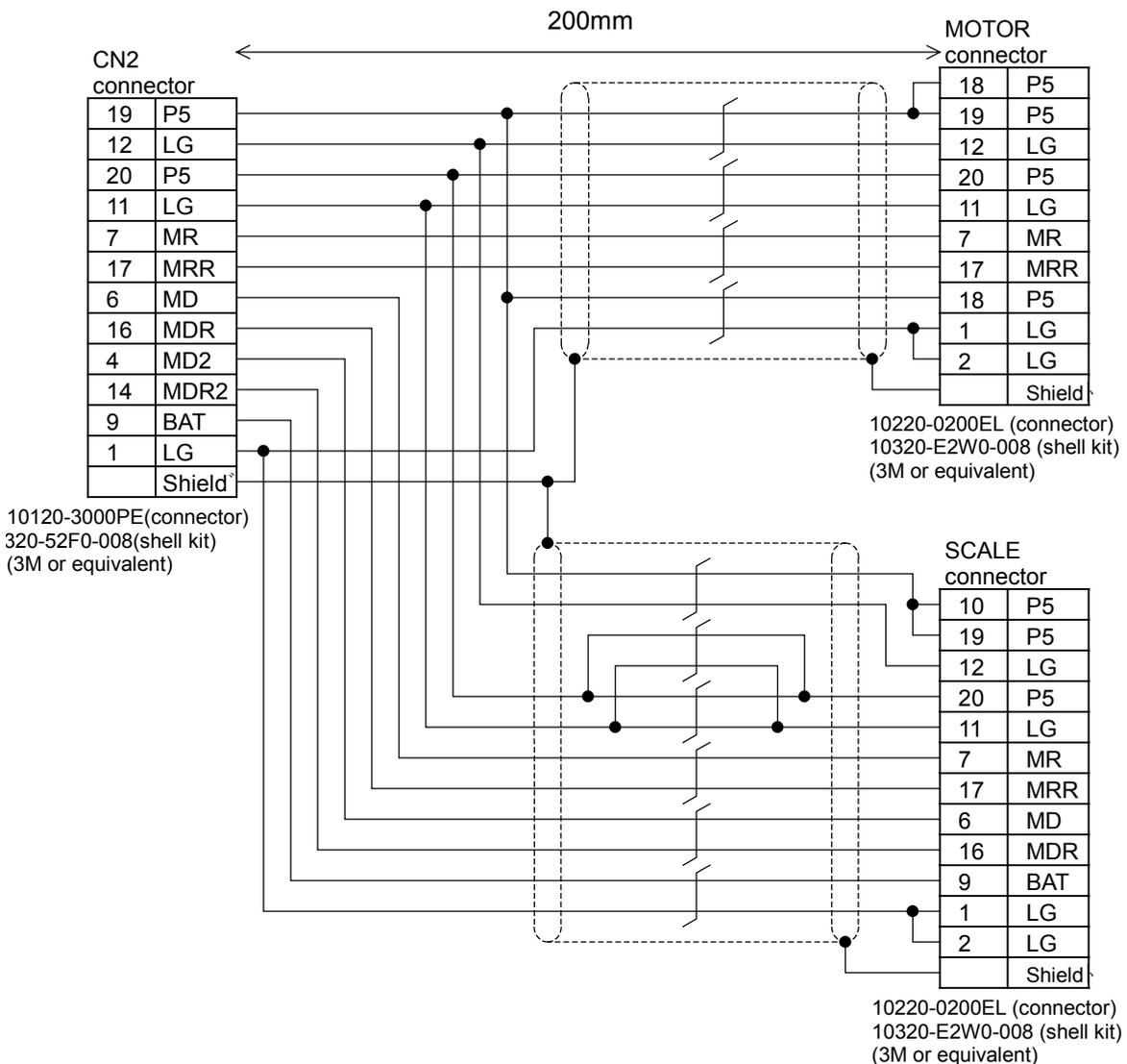
Explanation of connectors

CN2 connector　　　　 ： Connect to CN2 of the servo amplifier.

MOTOR connector　　　 ： Connect the encoder cable (e.g. MR-JCCBL □ M-H, MR-JHSCBL □ M-H, MR-ENCBL □ M-H) of the servo motor.

SCALE connector　　　　： Connect the serial communication encoder connector at the full closed end.

Appearance

Wiring diagram

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REVISIONS

Print Data	*Manual Number	Revision	
Feb., 2003	SH(NA)030035-A	First edition	
Jan., 2007	SH(NA)030035-B	Chapter 2	Change of connector type name manufactured by 3M
			Originally 10120-3000VE
		Section 4.3. 2 (1)	Addition of sentence
		Section 5.1	Addition of sentence
			Change of initial value for parameter No. 17 Originally 20
		Section 6.1	Addition of cause for AL. 42
			Addition of cause for AL. 70
			Addition of cause for AL. 71

MODEL	
MODEL CODE	

MITSUBISHI ELECTRIC CORPORATION

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