

General-Purpose AC Servo

MELSERVO-J2M Series

SSCNET Compatible

MODEL

MR-J2M-P8B

MR-J2M-□DU

MR-J2M-BU□

SERVO AMPLIFIER

INSTRUCTION MANUAL

● Safety Instructions ●

(Always read these instructions before using the equipment.)

Do not attempt to install, operate, maintain or inspect the units until you have read through this Instruction Manual, Installation Guide, Servo Motor Instruction Manual and appended documents carefully and can use the equipment properly. Do not use the units until you have a full knowledge of the equipment, safety information and instructions.

In this Instruction Manual, the safety instruction levels are classified into "WARNING" and "CAUTION".




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





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

Note that the CAUTION level may lead to a serious consequence according to conditions. Please follow the instructions of both levels because they are important to personnel safety.

What must not be done and what must be done are indicated by the following diagrammatic symbols:

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

: Indicates what must be done. For example, grounding is indicated by .

In this Instruction Manual, instructions at a lower level than the above, instructions for other functions, and so on are classified into "POINT".

After reading this 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 base unit 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 for each unit and the servo motor until they are installed. Otherwise, you can obtain the electric shock.
- Operate the switches with dry hand to prevent an electric shock.
- The cables should not be damaged, stressed, loaded, or pinched. Otherwise, you may get an electric shock.
- During power-on or operation, do not open the front cover of the servo amplifier. You may get an electric shock.
- Do not operate the servo amplifier with the front cover removed. High-voltage terminals and charging area are exposed and you may get an electric shock.
- Except for wiring or periodic inspection, do not remove the front cover even of the servo amplifier if the power is off. The servo amplifier is charged and you may get an electric shock.

2. To prevent fire, note the following:

CAUTION

- Do not install the base unit, servo motor and regenerative brake resistor on or near combustibles. Otherwise a fire may cause.
- When each unit has become faulty, switch off the main base unit power side. Continuous flow of a large current may cause a fire.
- When a regenerative brake resistor is used, use an alarm signal to switch main power off. Otherwise, a regenerative brake transistor fault or the like may overheat the regenerative brake resistor, causing a fire.

3. To prevent injury, note the follow

CAUTION

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

4. Additional instructions

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

(1) Transportation and installation

CAUTION

- Transport the products correctly according to their masses.
- 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 each unit. Each unit may drop.
- Install the each unit 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 base unit and control enclosure walls or other equipment.
- Do not install or operate the unit 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 each unit and servo motor.
- Do not drop or strike each unit or servo motor. Isolate from all impact loads.
- When you keep or use it, please fulfill the following environmental conditions.

Environment		Conditions		
		Each unit	Servo motor	
Ambient temperature	During operation	[°C]	0 to +55 (non-freezing)	0 to +40 (non-freezing)
		[°F]	32 to 131 (non-freezing)	32 to 104 (non-freezing)
	In storage	[°C]	-20 to +65 (non-freezing)	-15 to +70 (non-freezing)
		[°F]	-4 to 149 (non-freezing)	5 to 158 (non-freezing)
Ambient humidity	During operation	90%RH or less (non-condensing)		80%RH or less (non-condensing)
	In storage	90%RH or less (non-condensing)		
Ambience		Indoors (no direct sunlight) Free from corrosive gas, flammable gas, oil mist, dust and dirt		
Altitude		Max. 1000m (3280 ft) above sea level		
(Note) Vibration	[m/s ²]	5.9 or less	HC-KFS Series HC-MFS Series HC-UFS13 to 43	X · Y : 49
	[ft/s ²]	19.4 or less	HC-KFS Series HC-MFS Series HC-UFS13 to 43	X · Y : 161

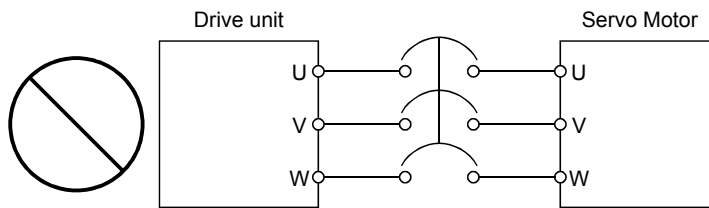
Note. Except the servo motor with reduction gear.

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

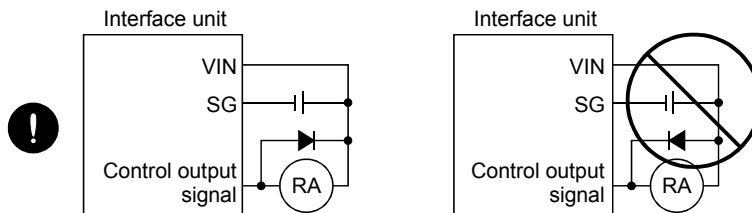
(2) Wiring

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 drive unit.
- Connect the output terminals (U, V, W) correctly. Otherwise, the servo motor will operate improperly.
- Connect the servo motor power terminal (U, V, W) to the servo motor power input terminal (U, V, W) directly. Do not let a magnetic contactor, etc. intervene.



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

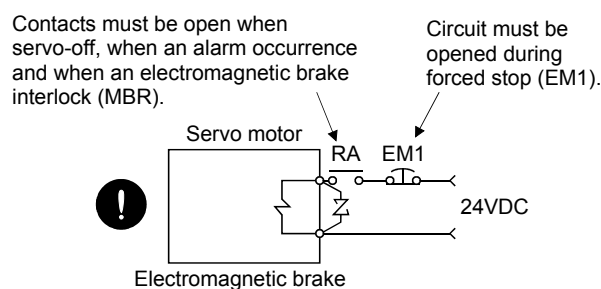
⚠ CAUTION

- Provide an emergency stop circuit to ensure that operation can be stopped and power switched off immediately.
- Any person who is involved in disassembly and repair should be fully competent to do the work.
- Before resetting an alarm, make sure that the run signal of the servo amplifier is off to prevent an accident. A sudden restart is made if an alarm is reset with the run signal on.
- Do not modify the equipment.
- Use a noise filter, etc. to minimize the influence of electromagnetic interference, which may be caused by electronic equipment used near MELSERVO-J2M.
- Burning or breaking each unit may cause a toxic gas. Do not burn or break each unit.
- Use the drive unit 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).



- 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 drive unit 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 (MELSERVO-J2M is contained) 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 MELSERVO-J2M. Hence, they are designed to comply with the low voltage directive.

MELSERVO-J2M is certified by TUV, third-party assessment organization, to comply with the low voltage directive.

(3) Machine directive

Not being machines, MELSERVO-J2M need not comply with this directive.

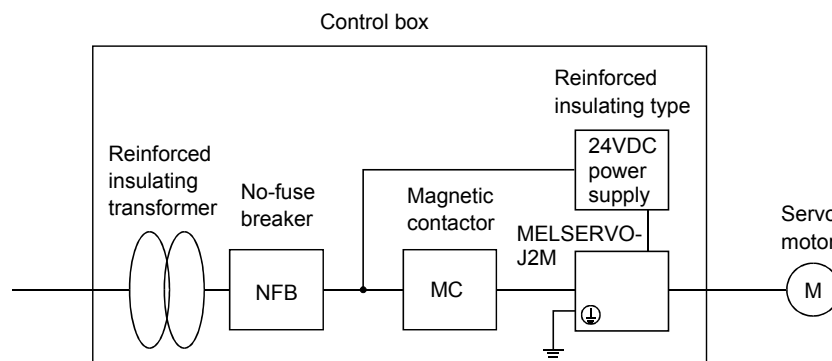
2. PRECAUTIONS FOR COMPLIANCE

(1) Unit and servo motors used

Use each units and servo motors which comply with the standard model.

Drive unit	:MR-J2M-□DU
Interface unit	:MR-J2M-P8B
Base unit	:MR-J2M-BU□
Servo motor	:HC-KFS□ HC-MFS□ HC-UFS□

(2) Configuration



(3) Environment

Operate MELSERVO-J2M at or above the contamination level 2 set forth in IEC60664-1. For this purpose, install MELSERVO-J2M in a control box which is protected against water, oil, carbon, dust, dirt, etc. (IP54).

(4) Power supply

(a) Operate MELSERVO-J2M to meet the requirements of the overvoltage category II set forth in IEC60664-1. For this purpose, a reinforced insulating transformer conforming to the IEC or EN standard should be used in the power input section.

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

(5) Grounding

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

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

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

(d) The protective earth (PE) of the servo motor is connected to the protective earth of the base unit via the screw which fastens the drive unit to the base unit. When fixing the drive unit to the base unit, therefore, tighten the accessory screw securely.

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

(c) Use the EMC filter for noise reduction.

(7) Performing EMC tests

When EMC tests are run on a machine/device into which MELSERVO-J2M 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 MELSERVO-J2M, refer to the EMC Installation Guidelines(IB(NA)67310).

CONFORMANCE WITH UL/C-UL STANDARD

The MELSERVO-J2M complies with UL508C.

(1) Unit and servo motors used

Use the each units and servo motors which comply with the standard model.

Drive unit :MR-J2M-□DU
 Interface unit :MR-J2M-P8B
 Base unit :MR-J2M-BU□
 Servo motor :HC-KFS□
 HC-MFS□
 HC-UFS□

(2) Installation

Install a fan of 100CFM (2.8m³/min)air flow 4 in (10.16 cm) above MELSERVO-J2M or provide cooling of at least equivalent capability.

(3) Short circuit rating

MELSERVO-J2M 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, MELSERVO-J2M 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.

Base unit	Discharge time [min]
MR-J2M-BU4	3
MR-J2M-BU6	4
MR-J2M-BU8	5

(5) Options and auxiliary equipment

Use UL/C-UL standard-compliant products.

(6) Attachment of a servo motor

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

(7) About wiring protection

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

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

<<About the manuals>>

This Instruction Manual and the MELSERVO Servo Motor Instruction Manual are required if you use MELSERVO-J2M for the first time. Always purchase them and use the MELSERVO-J2M safely. Also read the manual of the servo system controller.

Relevant manuals

Manual name	Manual No.
MELSERVO-J2M Series To Use the AC Servo Safely (Packed with the MR-J2M-P8B, MR-J2M-□BU and MR-J2M-BU□)	IB(NA)0300027
MELSERVO Servo Motor Instruction Manual	SH(NA)3181
EMC Installation Guidelines	IB(NA)67310

In this Instruction Manual, the drive unit, interface unit and base unit may be referred to as follows:

Drive unit : DRU
 Interface unit : IFU
 Base unit : BU

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Optional Servo Motor Instruction Manual CONTENTS

The rough table of contents of the optional MELSERVO Servo Motor Instruction Manual is introduced here for your reference. Note that the contents of the Servo Motor Instruction Manual are not included in this Instruction Manual.

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1. FUNCTIONS AND CONFIGURATION

1. FUNCTIONS AND CONFIGURATION

1.1 Overview

The Mitsubishi general-purpose AC servo MELSERVO-J2M series is an AC servo which has realized wiring-saving, energy-saving and space-saving in addition to the high performance and high functions of the MELSERVO-J2-Super series. Connected with a servo system controller or like by a serial bus (SSCNET), the equipment reads position data directly to perform operation. Data from a command unit are used to control the speeds and directions of servo motors and execute precision positioning.

The MELSERVO-J2M series consists of an interface unit (abbreviated to the IFU) to be connected with a servo system controller, drive units (abbreviated to the DRU) for driving and controlling servo motors, and a base unit (abbreviated to the BU) where these units are installed.

A torque limit is applied to the drive unit by the clamp circuit to protect the main circuit power transistors from overcurrent caused by abrupt acceleration/deceleration or overload. In addition, the torque limit value can be changed as desired using the parameter.

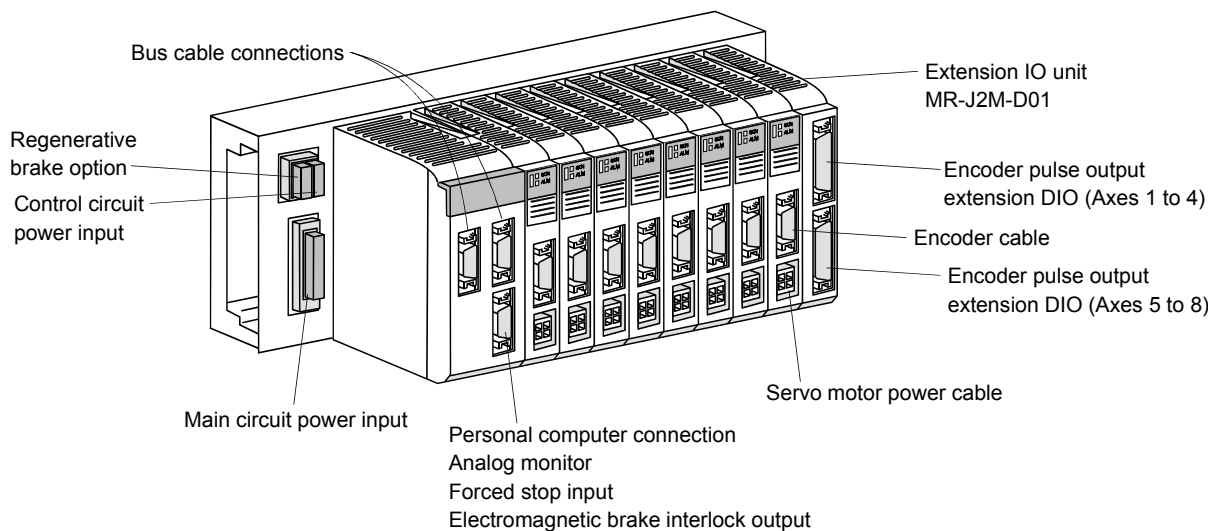
The interface unit has an RS-232C serial communication function to allow the parameter setting, test operation, status indication monitoring, gain adjustment and others of all units to be performed using a personal computer or like where the MR Configurator (servo configuration software) is installed. By choosing the axis number of the drive unit using the MR Configurator (servo configuration software), you can select the unit to communicate with, without changing the cabling.

The real-time auto tuning function automatically adjusts the servo gains according to a machine.

The MELSERVO-J2M series supports as standard the absolute position encoders which have 131072 pulses/rev resolution, ensuring control as accurate as that of the MELSERVO-J2-Super series. Simply adding the optional battery unit configures an absolute position detection system. Hence, merely setting a home position once makes it unnecessary to perform a home position return at power-on, alarm occurrence or like.

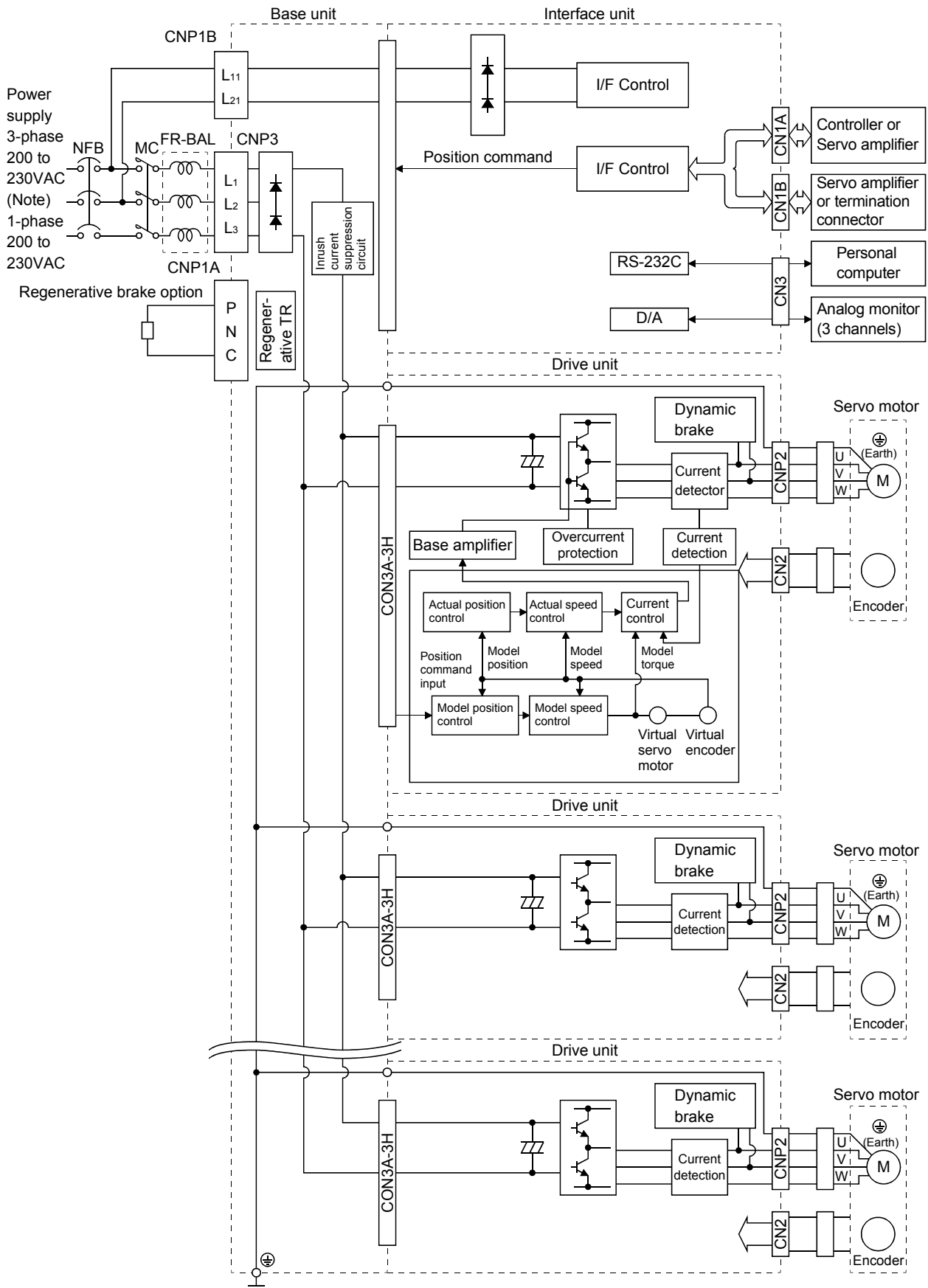
The MELSERVO-J2M series has a control circuit power supply in the interface unit and main circuit converter and regenerative functions in the base unit to batch-wire the main circuit power input, regenerative brake connection and control circuit power input, achieving wiring-saving.

In the MELSERVO-J2M series, main circuit converter sharing has improved the capacitor regeneration capability dramatically. Except for the operation pattern where all axes slow down simultaneously, the capacitor can be used for regeneration. You can save the energy which used to be consumed by the regenerative brake resistor.



1. FUNCTIONS AND CONFIGURATION

1.2 Function block diagram



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

1. FUNCTIONS AND CONFIGURATION

1.3 Unit standard specifications

(1) Base unit

Model		MR-J2M-BU4	MR-J2M-BU6	MR-J2M-BU8
Number of slots		4	6	8
(Note) Control circuit power supply	Voltage/frequency	3-phase 200 to 230VAC or 1-phase 200 to 230VAC, 50/60Hz		
	Permissible voltage fluctuation	1-phase 170 to 253VAC		
	Permissible frequency fluctuation	Within 5%		
Main circuit power supply	Inrush current	20A (5ms)		
	Voltage/frequency	3-phase 200 to 230VAC or 1-phase 200 to 230VAC, 50/60Hz		
	Permissible voltage fluctuation	3-phase 170 to 253VAC or 1-phase 170 to 253VAC, 50/60Hz		
	Permissible frequency fluctuation	Within 5%		
	Maximum servo motor connection capacity [W]	1600	2400	3200
	Continuous capacity [W]	1280	1920	2560
Inrush current		62.5A (15ms)		
Function		Converter function, regenerative control, rushing into current control function		
Protective functions		Regenerative overvoltage shut-off, regenerative fault protection, undervoltage /instantaneous power failure protection		
Mass	[kg]	1.1	1.3	1.5
	[lb]	2.4	2.9	3.3

Note. The control circuit power supply is recorded to the interface unit.

(2) Drive unit

Model		MR-J2M-10DU	MR-J2M-20DU	MR-J2M-40DU	MR-J2M-70DU
Power supply	Voltage/frequency	270 to 311VDC			
	Permissible voltage fluctuation	230 to 342VDC			
Control system		Sine-wave PWM control, current control system			
Dynamic brake		Built-in			
Protective functions		Overcurrent shut-off, functions overload shut-off (electronic thermal relay), servo motor overheat protection, encoder fault protection, overspeed protection, excessive error protection			
Structure		Open (IP00)			
Cooling method		Self-cooled	Force-cooling (With built-in fan unit)		
Mass	[kg]	0.4	0.4	0.4	0.7
	[lb]	0.89	0.89	0.89	1.54

(3) Interface unit

Model		MR-J2M-P8B
Control circuit power supply		Power supply circuit for each unit(8 slots or less)
Interface		SSCNET interface 1channel RS-232C interface 1channel
DIO		Forced stop input(1 point), Electromagnetic brake sequence output (1 point)
AIO		Analog monitor 3channel
Structure		Open (IP00)
Mass	[kg]	0.5
	[lb]	1.10

1. FUNCTIONS AND CONFIGURATION

1.4 Function list

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

(1) Drive unit (Abbreviation DRU)

Function	Description	Reference
High-resolution encoder	High-resolution encoder of 131072 pulses/rev is used as a servo motor encoder.	
Auto tuning	Automatically adjusts the gain to optimum value if load applied to the servo motor shaft varies.	Chapter 6
Adaptive vibration suppression control	MELSERVO-J2M detects mechanical resonance and sets filter characteristics automatically to suppress mechanical vibration.	Section 7.3
Low-pass filter	Suppresses high-frequency resonance which occurs as servo system response is increased.	Section 7.4
Slight vibration suppression control	Suppresses vibration of 1 pulse produced at a servo motor stop.	DRU Parameter No.24
Forced stop signal automatic ON	Forced stop (EM1) can be automatically switched on internally to invalidate it.	DRU Parameter No.23
Torque limit	Servo motor torque can be limited to any value.	DRU Parameters No.10, No.11

(2) Interface unit (Abbreviation IFU)

Function	Description	Reference
Forced stop signal input	Disconnect forced stop (EM1) to bring the servo motor to a forced stop state, in which the servo is switched off and the dynamic brake is operated.	Section 3.2.2
Electromagnetic brake output	In the servo-off or alarm status, this signal is disconnected. When an alarm occurs, they are disconnected, independently of the base circuit status. It is possible to use it to excite an electromagnetic brake.	Section 3.2.2
Analog monitor	Servo status is output in terms of voltage in real time.	Section 5.2.3

(3) Base unit (Abbreviation BU)

Function	Description	Reference
Regenerative brake option	Used when the built-in regenerative brake resistor of the unit does not have sufficient regenerative capability for the regenerative power generated.	Section 12.1.1

(4) MR Configurator (servo configuration software)

Function	Description	Reference
Machine analyzer function	Analyzes the frequency characteristic of the mechanical system.	
Machine simulation	Can simulate machine motions on a personal computer screen on the basis of the machine analyzer results.	
Gain search function	Can simulate machine motions on the basis of the machine analyzer results.	
Test operation mode	JOG operation and positioning operation are possible.	

(5) Option unit

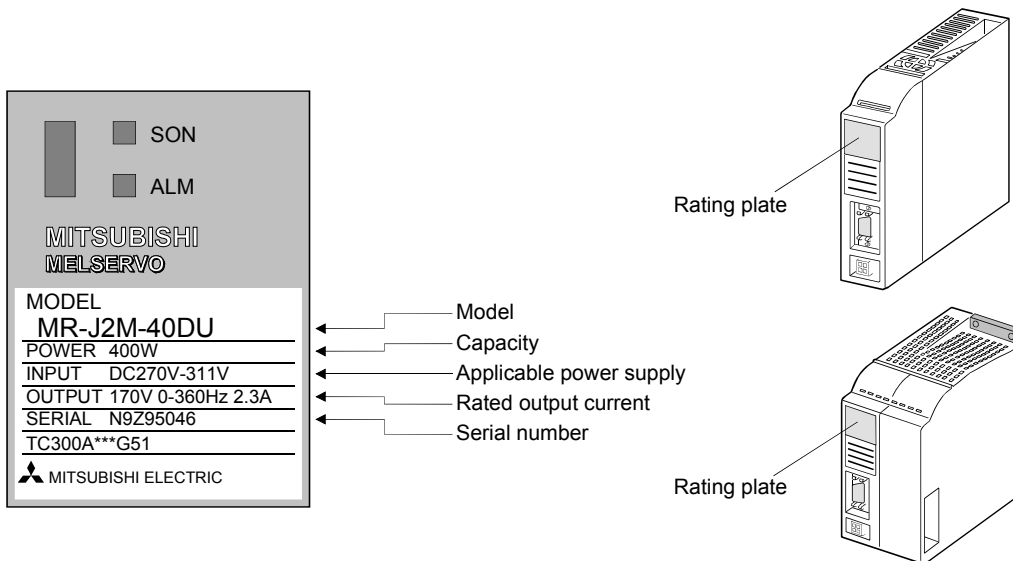
Function	Description	Reference
Absolute position detection system	Merely setting a home position once makes home position return unnecessary at every power-on. Battery unit MR-J2M-BT is necessary.	
Encoder pulse output	The encoder feedback is output from enhancing IO unit MR-J2M-D01 by the A · B · Z phase pulse. The number of pulses output by the parameter can be changed.	

1. FUNCTIONS AND CONFIGURATION

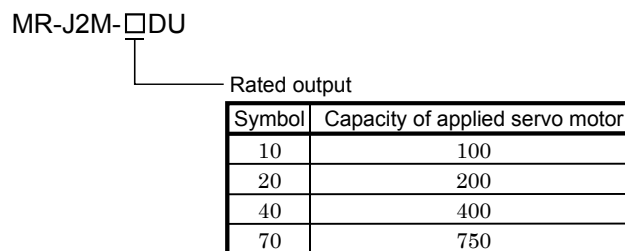
1.5 Model code definition

(1) Drive unit

(a) Rating plate

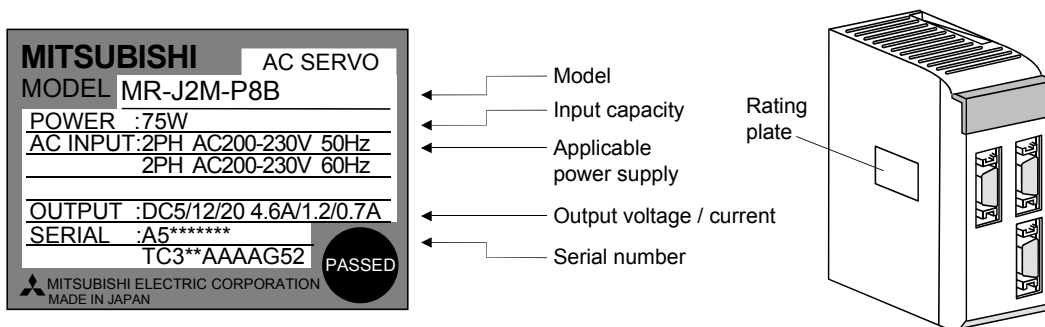


(b) Model code

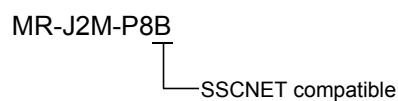


(2) Interface unit

(a) Rating plate



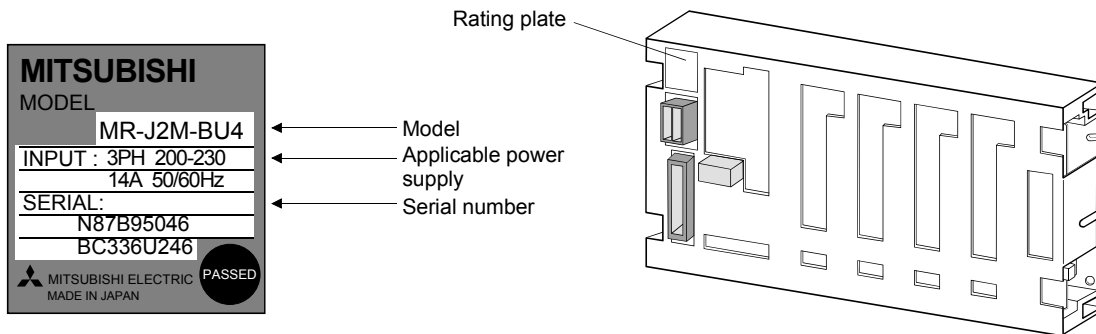
(b) Model code



1. FUNCTIONS AND CONFIGURATION

(3) Base unit

(a) Rating plate



(b) Model code

MR-J2M-BU□

Symbol	Number of slots	Maximum servo motor connection capacity [W]	Continuous capacity [W]
4	4	1600	1280
6	6	2400	1920
8	8	3200	2560

1.6 Combination with servo motor

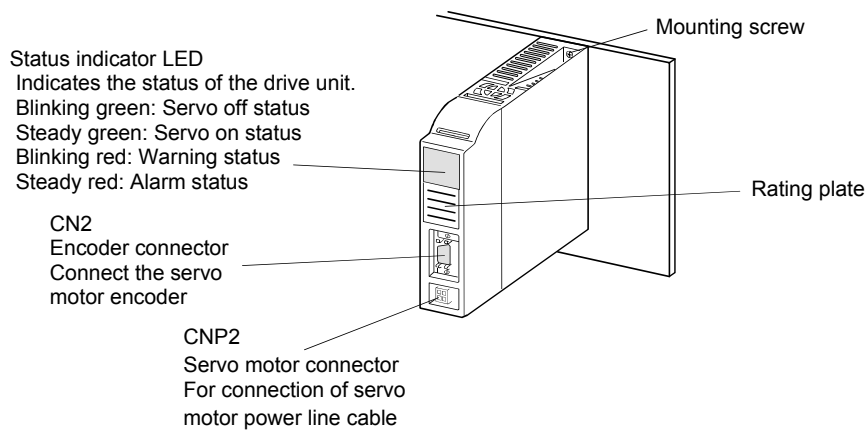
The following table lists combinations of drive units and servo motors. The same combinations apply to the models with electromagnetic brakes and the models with reduction gears.

Drive unit	Servo motor		
	HC-KFS□	HC-MFS□	HC-UFS□
MR-J2M-10DU	053 ▪ 13	053 ▪ 13	13
MR-J2M-20DU	23	23	23
MR-J2M-40DU	43	43	43
MR-J2M-70DU	73	73	73

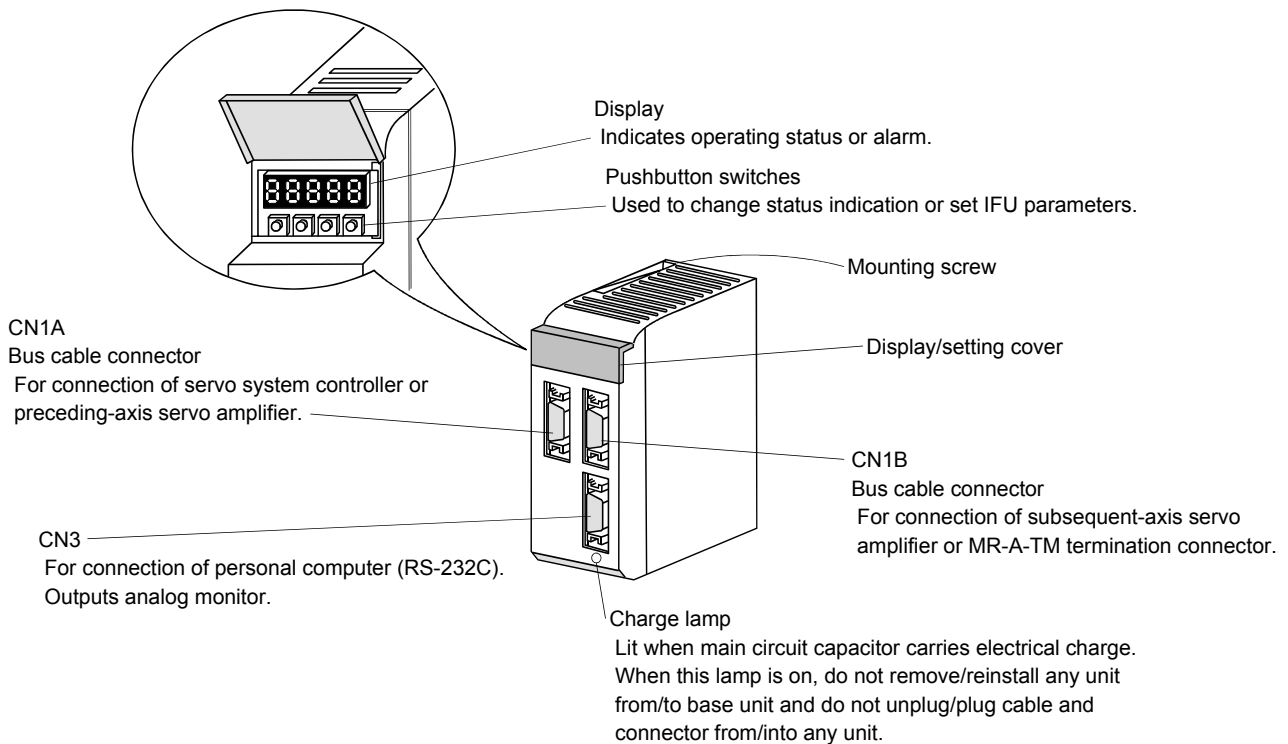
1. FUNCTIONS AND CONFIGURATION

1.7 Parts identification

(1) Drive unit



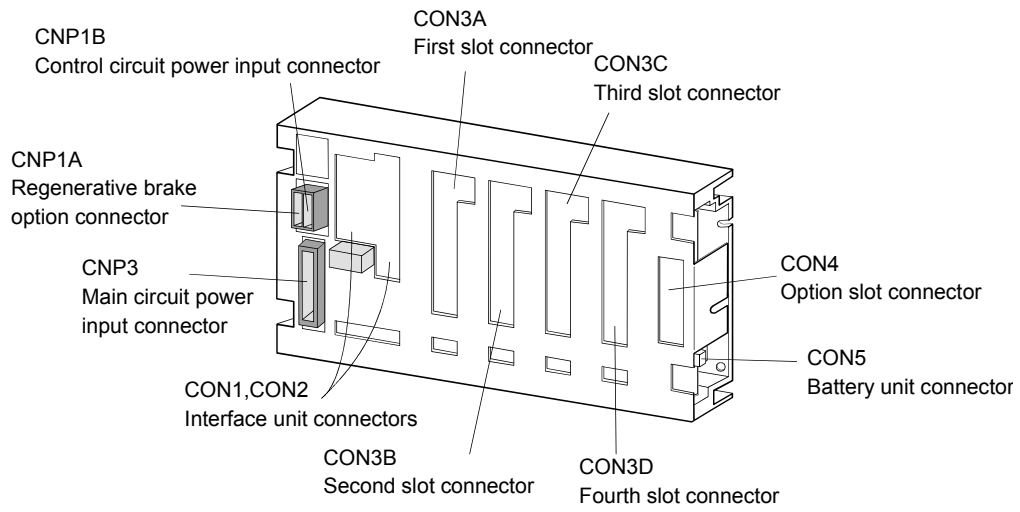
(2) Interface unit



1. FUNCTIONS AND CONFIGURATION

(3) Base unit

The following shows the MR-J2M-BU4.



1. FUNCTIONS AND CONFIGURATION

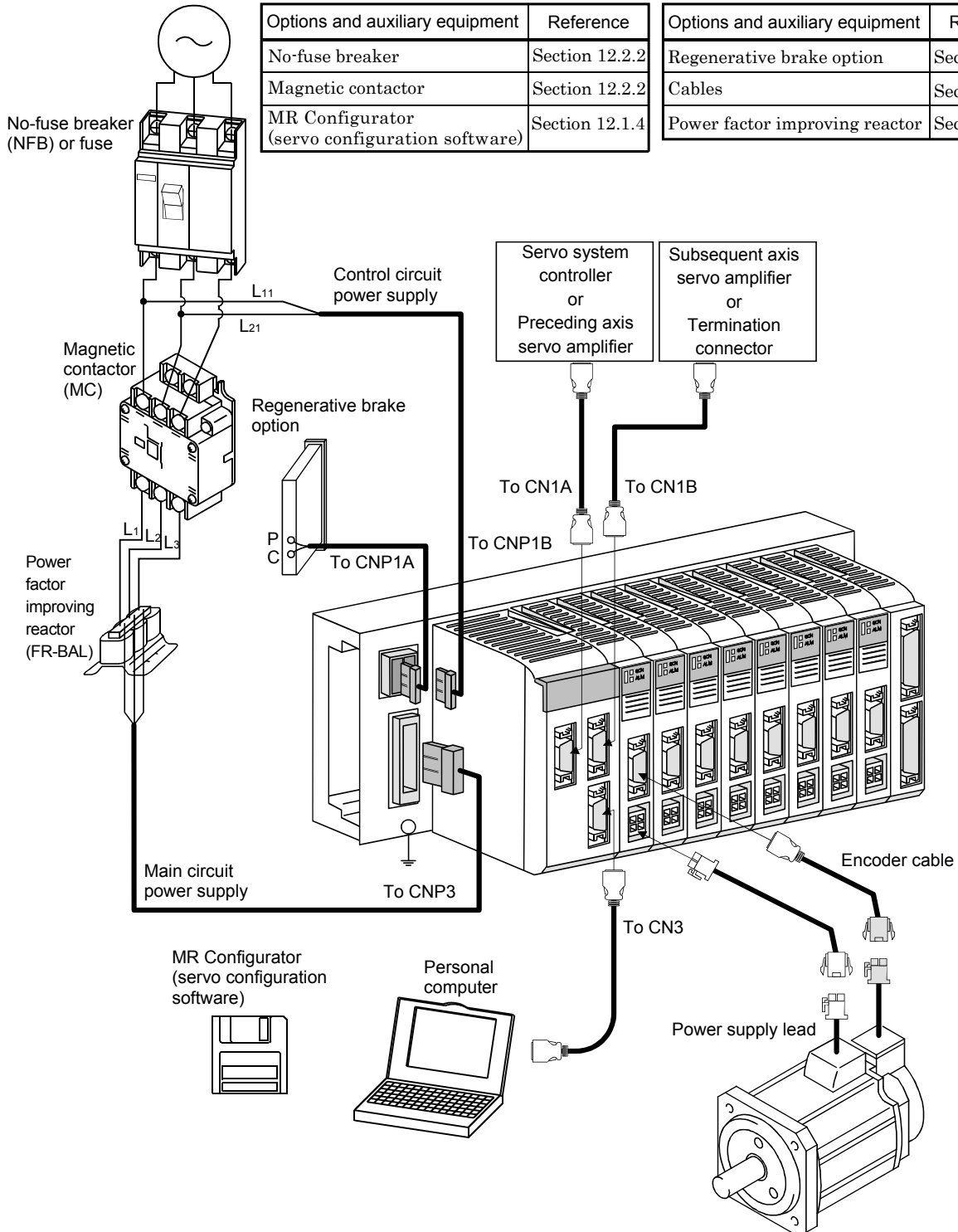
1.8 Servo system with auxiliary equipment

WARNING To prevent an electric shock, always connect the protective earth (PE) terminal (terminal marked \oplus) of the base unit to the protective earth (PE) of the control box.

3-phase 200V to 230VAC
 (Note) 1-phase 200V to 230VAC
 power supply

Options and auxiliary equipment	Reference
No-fuse breaker	Section 12.2.2
Magnetic contactor	Section 12.2.2
MR Configurator (servo configuration software)	Section 12.1.4

Options and auxiliary equipment	Reference
Regenerative brake option	Section 12.1.1
Cables	Section 12.2.1
Power factor improving reactor	Section 12.2.3



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

2. INSTALLATION AND START UP

2. INSTALLATION AND START UP



CAUTION

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

2.1 Environmental conditions

The following environmental conditions are common to the drive unit, interface unit and base unit.

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

2. INSTALLATION AND START UP

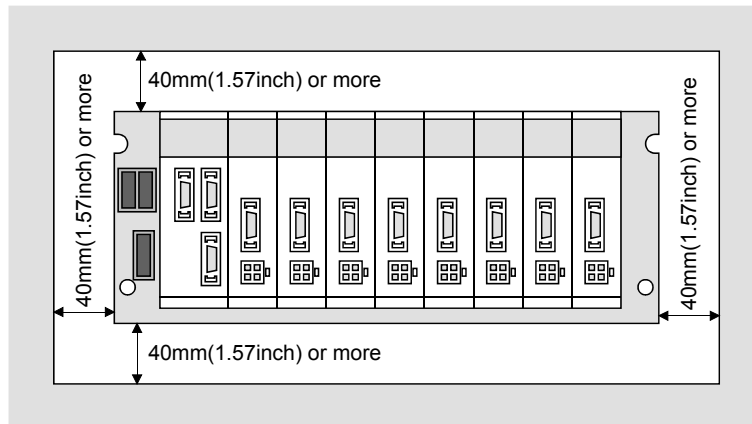
2.2 Installation direction and clearances



CAUTION

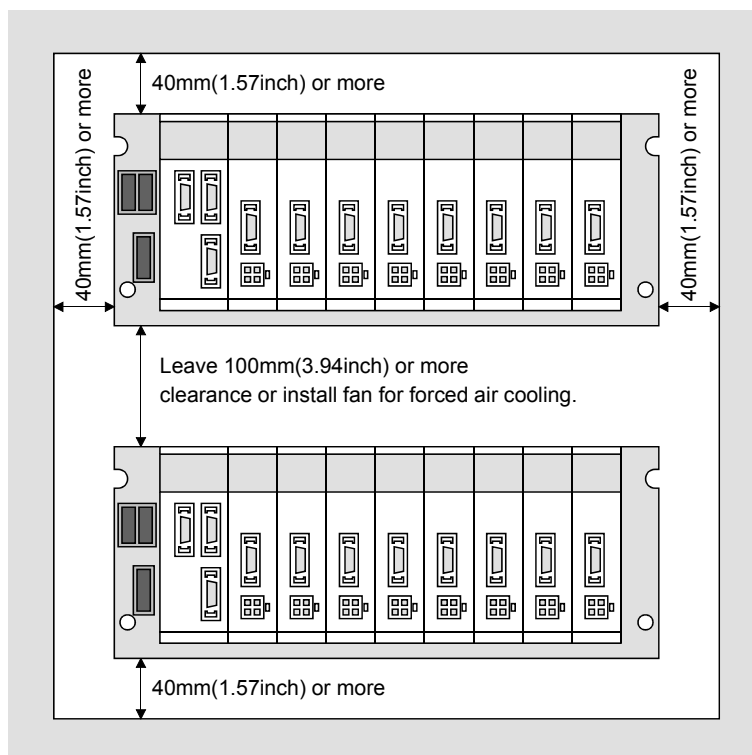
- The equipment must be installed in the specified direction. Otherwise, a fault may occur.
- Leave specified clearances between each unit and control box inside walls or other equipment.

(1) Installation of one MELSERVO-J2M



(2) Installation of two or more MELSERVO-J2M

When installing two units vertically, heat generated by the lower unit influences the ambient temperature of the upper unit. Suppress temperature rises in the control box so that the temperature between the upper and lower units satisfies the environmental conditions. Also provide adequate clearances between the units or install a fan.



2. INSTALLATION AND START UP

(3) Others

When using heat generating equipment such as the regenerative brake option, install them with full consideration of heat generation so that MELSERVO-J2M is not affected.

Install MELSERVO-J2M on a perpendicular wall in the correct vertical direction.

2.3 Keep out foreign materials

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

2.4 Cable stress

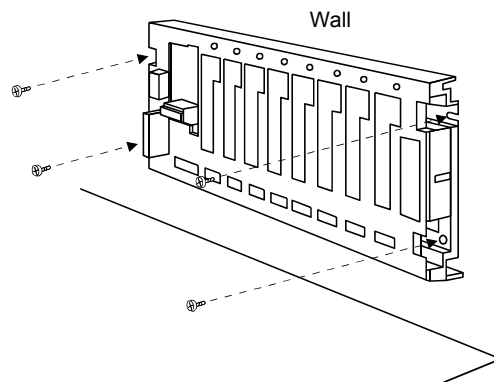
- (1) The way of clamping the cable must be fully examined so that flexing stress and cable's own mass stress are not applied to the cable connection.
- (2) For use in any application where the servo motor moves, fix the cables (encoder, power supply, brake) supplied with the servo motor, and flex the optional encoder cable or the power supply and brake wiring cables. Use the optional encoder cable within the flexing life range. Use the power supply and brake wiring cables within the flexing life of the cables.
- (3) Avoid any probability that the cable sheath might be cut by sharp chips, rubbed by a machine corner or stamped by workers or vehicles.
- (4) For installation on a machine where the servo motor will move, the flexing radius should be made as large as possible. Refer to section 11.4 for the flexing life.

2. INSTALLATION AND START UP

2.5 Mounting method

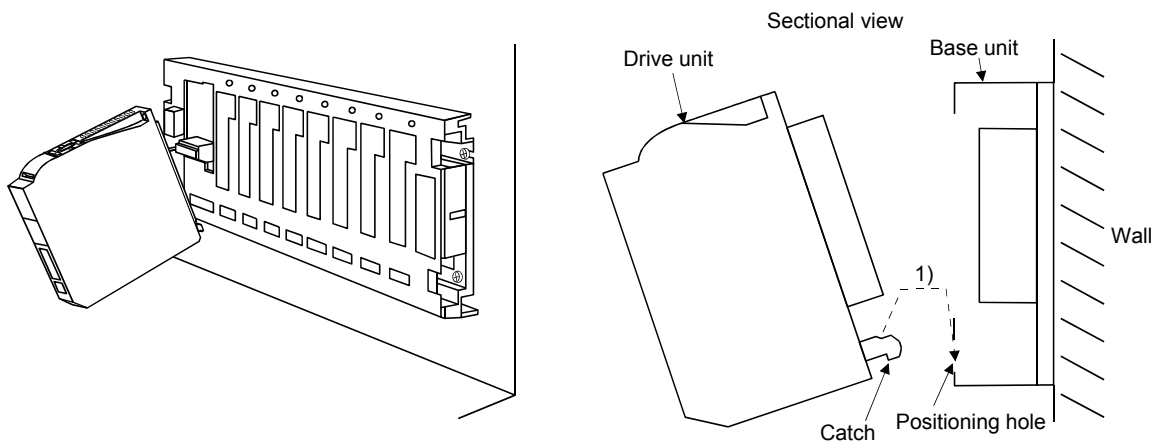
(1) Base unit

As shown below, mount the base unit on the wall of a control box or like with M5 screws.

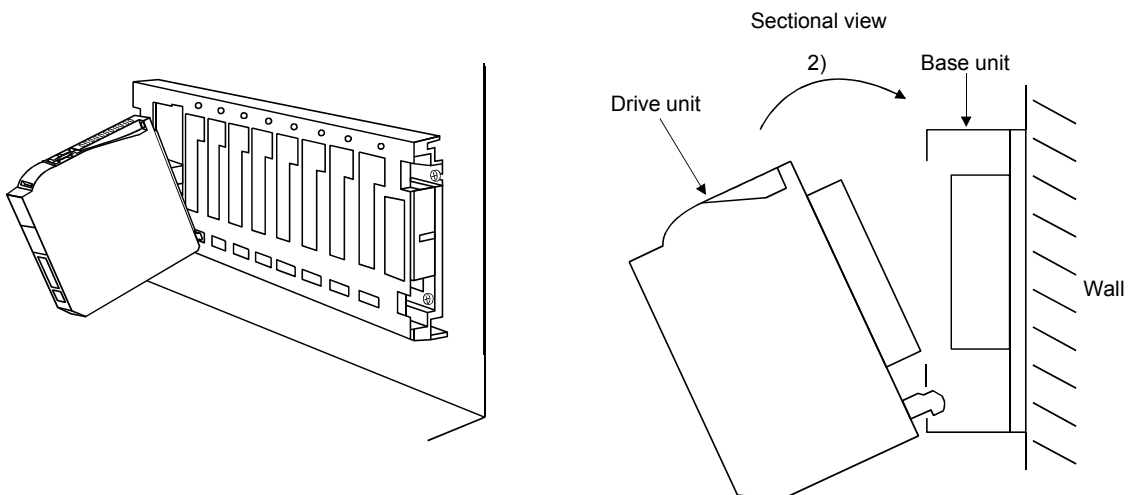


(2) Interface unit/drive unit (MR-J2M-40DU or less)

The following example gives installation of the drive unit to the base unit. The same also applies to the interface unit.

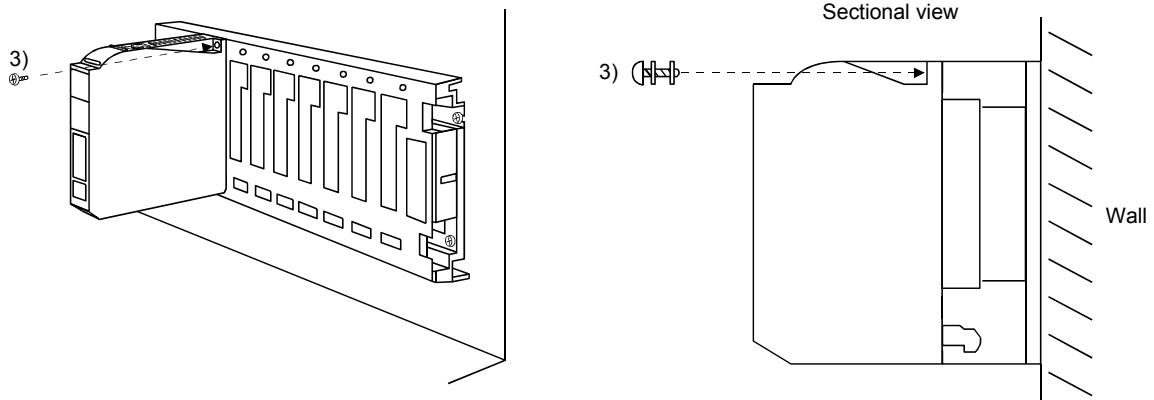


1) Hook the catch of the drive unit in the positioning hole of the base unit.



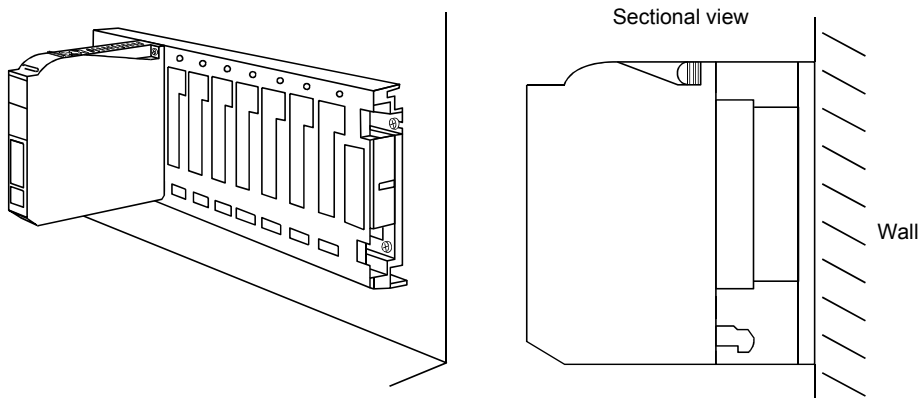
2) Using the catch hooked in the positioning hole as a support, push the drive unit in.

2. INSTALLATION AND START UP



3) Tighten the M4 screw supplied for the base unit to fasten the drive unit to the base unit.

POINT
▪ Securely tighten the drive unit fixing screw.



(3) Drive unit (MR-J2M-70DU)

When using the MR-J2M-70DU, install it on two slots of the base unit. The slot number of this drive unit is that of the left hand side slot of the two occupied slots, when they are viewed from the front of the base unit.

2. INSTALLATION AND START UP

2.6 When switching power on for the first time

Before starting operation, check the following:

(1) Wiring

- (a) Check that the control circuit power cable, main circuit power cable and servo motor power cable are fabricated properly.
- (b) Check that the control circuit power cable is connected to the CNP1B connector and the main circuit power cable is connected to the CNP3 connector.
- (c) Check that the servo motor power cable is connected to the drive unit CNP2 connector.
- (d) The earth terminal of the servo motor is connected to the PE terminal of the drive unit. Also check that the drive unit is screwed to the base unit securely.
- (e) When using the regenerative brake option, check that the cable using twisted wires is fabricated properly and it is connected to the CNP1A connector properly.
- (f) 24VDC or higher voltages are not applied to the pins of connector CN3.
- (g) SD and SG of connector CN3 are not shorted.
- (h) The wiring cables are free from excessive force.
- (i) CN1A should be connected with the bus cable connected to the servo system controller or preceding axis servo amplifier, and CN1B should be connected with the bus cable connected to the subsequent axis servo amplifier or with the termination connector MR-A-TM.
- (j) Check that the encoder cable and servo motor power cable connected to the drive unit are connected to the same servo motor properly.

(2) Axis number

- (a) Check that the axis numbers of the servo system controller match the axis number settings of the corresponding drive units.
- (b) When changing the factory setting of any axis number (axis number = slot number), check that the IFU parameter No. 11 to 18 values are set without fail.
- (c) Check that the encoder cable and motor power cable of the servo motor are wired to the drive unit mounted to the slot as in the axis setting.

(3) Parameters

- (a) Check that the drive unit parameters are set to correct values using the servo system controller screen or MR Configurator (servo configuration software).
- (b) Check that the interface unit parameters are set to correct values using the interface unit display or MR Configurator (servo configuration software).

(4) Environment

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

(5) Machine

- (a) The screws in the servo motor installation part and shaft-to-machine connection are tight.
- (b) The servo motor and the machine connected with the servo motor can be operated.

2. INSTALLATION AND START UP

2.7 Start up



- Do not operate the switches with wet hands. You may get an electric shock.
- Do not operate the controller with the front cover removed. High-voltage terminals and charging area exposed and you may get an electric shock.
- During power-on or operation, do not open the front cover. You may get an electric shock.

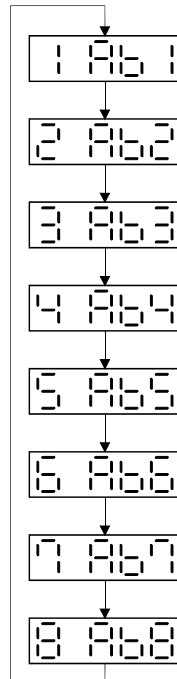


- Before starting operation, check the parameters. Some machines may perform unexpected operation.
- Take safety measures, e.g. provide covers, to prevent accidental contact of hands and parts (cables, etc.) with the servo amplifier heat sink, regenerative brake resistor, servo motor, etc. since they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

Connect the servo motor with a machine after confirming that the servo motor operates properly alone.

(1) Power on

Switching on the main circuit power/control circuit power places the interface unit display in the scroll status as shown below.



In the absolute position detection system, first power-on results in the absolute position lost (A.25) alarm and the servo system cannot be switched on. This is not a failure and takes place due to the uncharged capacitor in the encoder.

The alarm can be deactivated by keeping power on for a few minutes in the alarm status and then switching power off once and on again.

Also in the absolute position detection system, if power is switched on at the servo motor speed of 500r/min or higher, position mismatch may occur due to external force or the like. Power must therefore be switched on when the servo motor is at a stop.

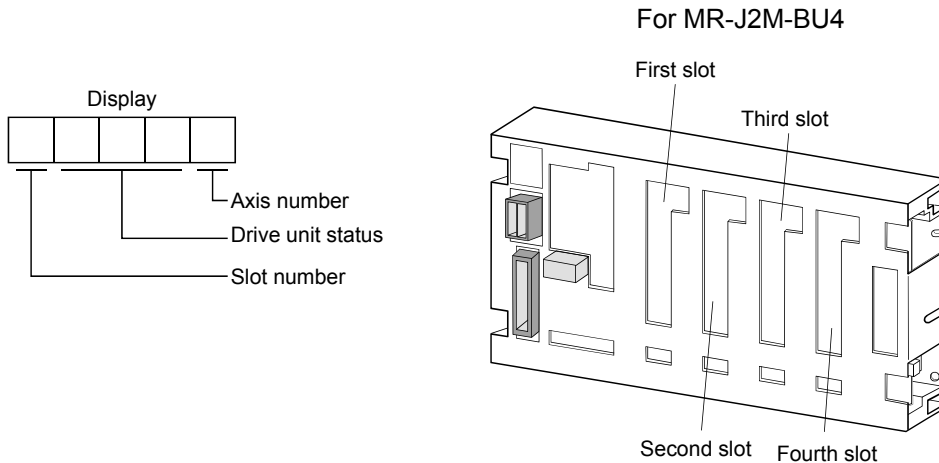
2. INSTALLATION AND START UP

(2) Parameter setting

Set the parameters according to the structure and specifications of the machine. Refer to Chapter 5 for the parameter definitions.

(3) Checking the axis number

On the interface unit display, check that the slot numbers and axis numbers are as set. Set the drive unit axis numbers in the IFU parameters No. 11 to 18.



(4) Servo-on

Switch the servo-on in the following procedure:

- 1) Switch on main circuit/control circuit power supply.
- 2) The controller transmits the servo-on command.

When placed in the servo-on status, MELSERVO-J2M is ready to operate and the servo motor is locked.

(5) Home position return

Always perform home position return before starting positioning operation.

(6) Stop

If any of the following situations occurs, MELSERVO-J2M suspends the running of the servo motor and brings it to a stop.

When the servo motor is equipped with an electromagnetic brake, refer to Section 3.7.

	Operation/command	Stopping condition
Servo system controller	Servo off command	The base circuit is shut off and the servo motor coasts.
	Forced stop command	The base circuit is shut off and the dynamic brake operates to bring the servo motor to stop. The controller forced stop (A.E7) occurs.
MELSERVO-J2M	Alarm occurrence	The base circuit is shut off and the dynamic brake operates to bring the servo motor to stop.
	Forced stop (EM1) OFF	The base circuit is shut off and the dynamic brake operates to bring the servo motor to stop. The servo forced stop (A.E6) occurs.

2. INSTALLATION AND START UP

2.8 Control axis selection

POINT

- The control axis number set to the IFU parameter software should be the same as the one set to the servo system controller.

Set the control axis numbers of the drive units in the IFU parameters No. 11 to 18.

Setting the same control axis numbers in a single communication system will disable normal operation.

Each control axis can be set independently of the slot number where the drive unit has been installed.

The axis numbers of the drive units installed to the slots are factory-set as listed below.

IFU Parameter No.	Name	Initial Value	(Note) Definition
11	1 slot axis number selection	0000	Axis 1
12	2 slot axis number selection	0001	Axis 2
13	3 slot axis number selection	0002	Axis 3
14	4 slot axis number selection	0003	Axis 4
15	5 slot axis number selection	0004	Axis 5
16	6 slot axis number selection	0005	Axis 6
17	7 slot axis number selection	0006	Axis 7
18	8 slot axis number selection	0007	Axis 8

Note. The axis number is represented as a set value +1.

3. SIGNALS AND WIRING

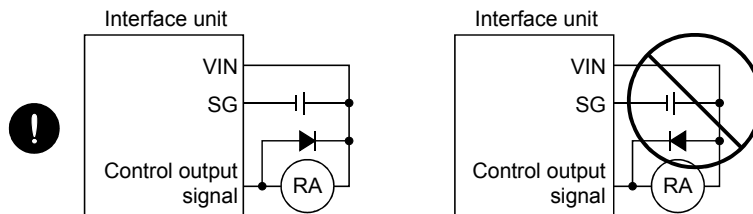
3. SIGNALS AND WIRING

WARNING

- Any person who is involved in wiring should be fully competent to do the work.
- Before starting wiring, make sure that the voltage is safe in the tester more than 15 minutes after power-off. Otherwise, you may get an electric shock.
- Ground the base unit and the servo motor securely.
- Do not attempt to wire each unit and servo motor until they have been installed. Otherwise, you may get an electric shock.
- The cables should not be damaged, stressed excessively, loaded heavily, or pinched. Otherwise, you may get an electric shock.

CAUTION

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



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

POINT

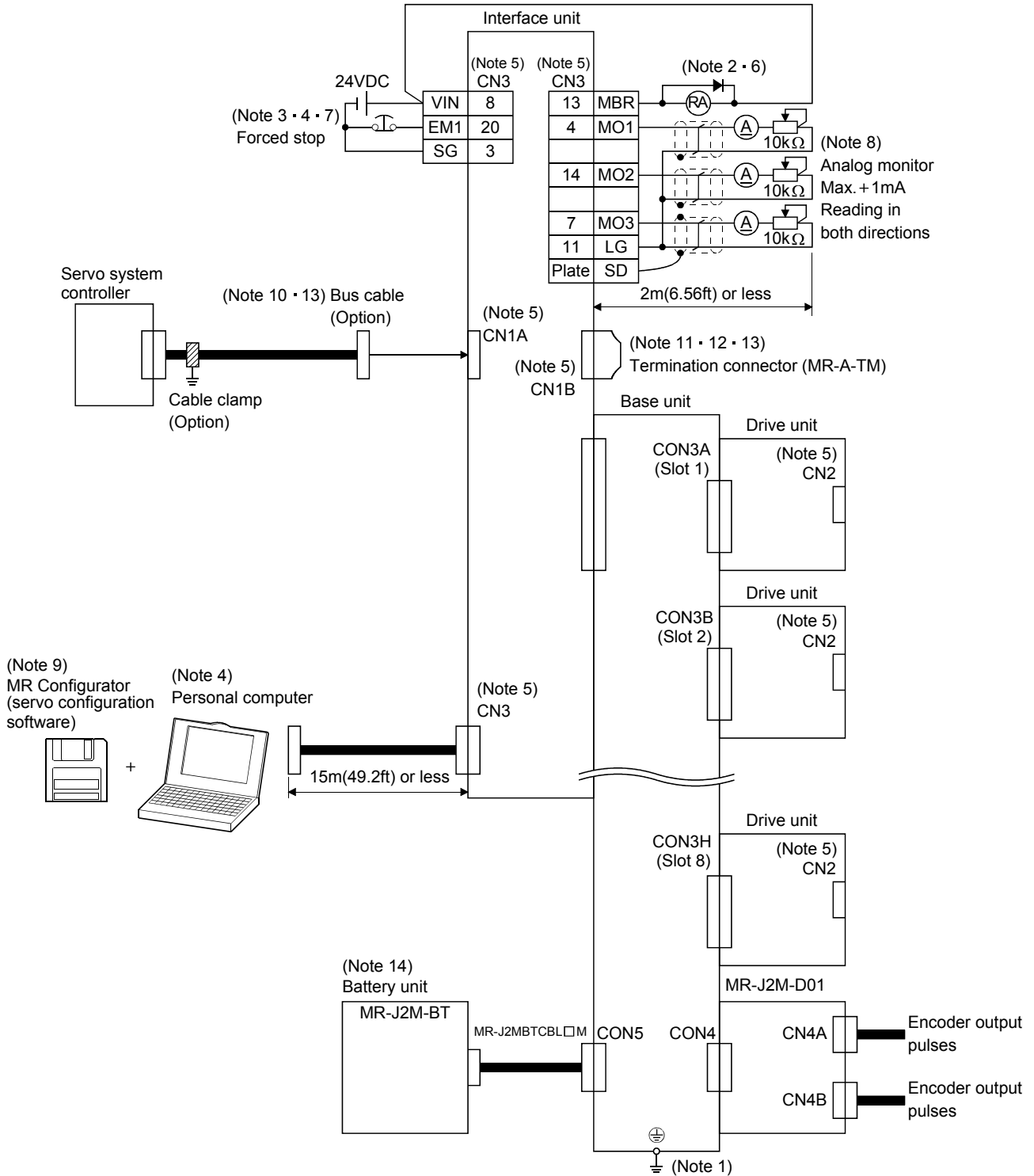
- CN1A, CN1B, CN2 and CN3 have the same shape. Wrong connection of the connectors will lead to a failure. Connect them correctly.

3. SIGNALS AND WIRING

3.1 Connection example of control signal system

POINT

- Refer to Section 3.4 for the connection of the power supply system and to Section 3.5 for connection with the servo motor.



3. SIGNALS AND WIRING

- Note 1. To prevent an electric shock, always connect the protective earth (PE) terminal (terminal marked \oplus) of the base unit to the protective earth (PE) of the control box.
2. Connect the diode in the correct direction. If it is connected reversely, the interface unit will be faulty and will not output signals, disabling the forced stop and other protective circuits.
 3. If the controller does not have a forced stop function, always install a forced stop switch (Normally closed).
 4. When a personal computer is connected for use of the test operation mode, always use the maintenance junction card (MR-J2CN3TM) to enable the use of the forced stop (EM1). (Refer to section 12.1.5)
 5. CN1A, CN1B, CN2 and CN3 have the same shape. Wrong connection of the connectors will lead to a fault.
 6. When using the electromagnetic brake interlock (MBR) or forced stop (EM1), always supply 24VDC between VIN and SG.
 7. When starting operation, always connect the forced stop (EM1) and SG. (Normally closed contacts) By setting "0001" in DRU parameter No.23 of the drive unit, the forced stop (EM1) can be made invalid.
 8. When connecting the personal computer together with analog monitor 1 ▪ 2 ▪ 3 use the maintenance junction card (MR-J2CN3TM). (Refer to Section 12.1.3.)
 9. Use MRZJW3-SETUP151E.
 10. Use the bus cable at the overall distance of 30m(98.4ft) or less. In addition, to improve noise immunity, it is recommended to use a cable clamp and data line filters (three or four filters connected in series) near the connector outlet.
 11. Up to eight axes (n = 1 to 8) may be connected. The MR-J2S-□B/MR-J2-03B5 servo amplifier may be connected on the same bus.
 12. Always insert the termination connector (MR-A-TM) into CN1B of the interface unit located at the termination.
 13. The bus cable used with the SSCNET depends on the preceding or subsequent controller or servo amplifier connected. Refer to the following table and choose the bus cable.

		MR-J2M-P8B	MR-J2S-□B	MR-J2-03B5
QD75M		MR-J2HBUS□M		
Motion controller	Q172CPU(N)	Q172J2BCBL□M(-B)		
	Q173CPU(N)	Q173J2B△CBL□M		
	A motion	MR-J2HBUS□M-A		
MR-J2M-P8B ▪ MR-J2S-□B ▪ MR-J2-03B5 Maintenance junction card		MR-J2HBUS□M		

14. When using an absolute position detection system, connect the battery unit (MR-J2M-BT).

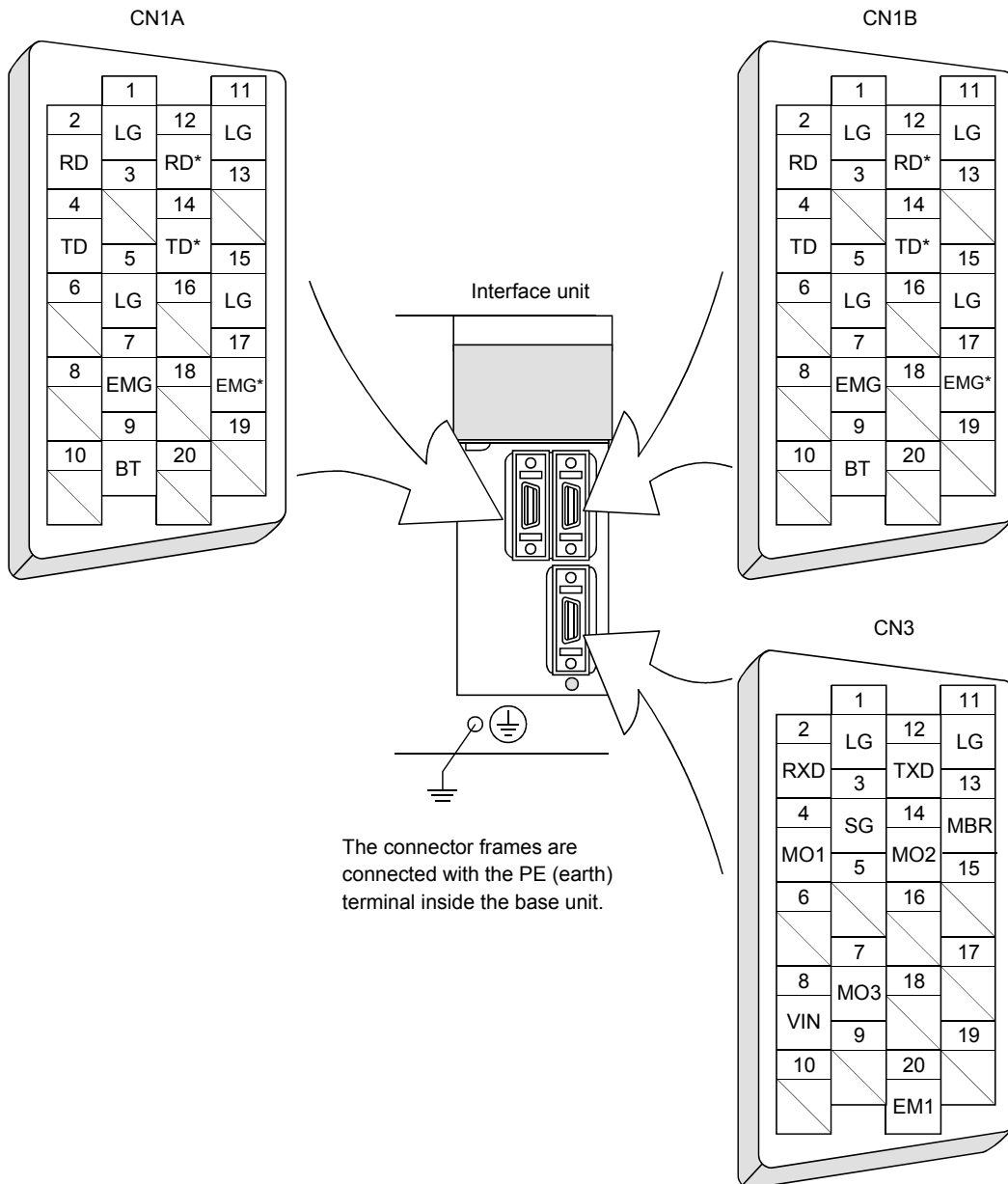
3. SIGNALS AND WIRING

3.2 I/O signals of interface unit

3.2.1 Connectors and signal arrangements

POINT

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



Connector	Cable side connector	
	Model	Maker
CN1A CN1B CN3	1. Soldering type Connector: 10120-3000VE Shell kit: 10320-52F0-008 2. Insulation displacement type Connector: 10120-6000EL Shell kit: 10320-3210-000	3M

3. SIGNALS AND WIRING

3.2.2 Signal explanations

For the I/O interfaces (symbols in I/O column in the table), refer to Section 3.2.3.

(1) Connector applications

Connector	Name	Function/Application
CN1A	Connector for bus cable from preceding axis.	Used for connection with the controller or preceding-axis servo amplifier.
CN1B	Connector for bus cable to next axis	Used for connection with the next-axis servo amplifier or for connection of the termination connector.
CN3	Communication connector (I/O signal connector)	Used for connection with the personal computer. Serves as an I/O signal connector when the personal computer is not used.

(2) I/O signals

(a) Input signal

Signal	Symbol	Connector Pin No.	Function/Application	I/O Division
Forced stop	EM1	CN3 20	Disconnect EM1-SG to bring the servo motor to a forced stop state, in which the servo is switched off and the dynamic brake is operated. In the forced stop state, connect EM1-SG to reset that state.	DI-1

(b) Output signals

Signal	Symbol	Connector Pin No.	Function/Application	I/O Division
Electromagnetic brake interlock	MBR	CN3 13	MBR-SG are disconnected when a forced stop is made valid, an alarm occurs in the interface unit or drive unit, or the servo switches off. With IFU parameter No. 10, choose the axis number of the drive unit that will use this signal.	DO-1
Analog monitor 1	MO1	CN3 4	Used to output the data set in IFU parameter No.3 to across MO1-LG in terms of voltage. Resolution 10 bits	Analog output
Analog monitor 2	MO2	CN3 14	Used to output the data set in IFU parameter No.4 to across MO2-LG in terms of voltage. Resolution 10 bits	Analog output
Analog monitor 3	MO3	CN3 7	Used to output the data set in IFU parameter No.5 to across MO3-LG in terms of voltage. Resolution 10 bits	Analog output

(c) Power supply

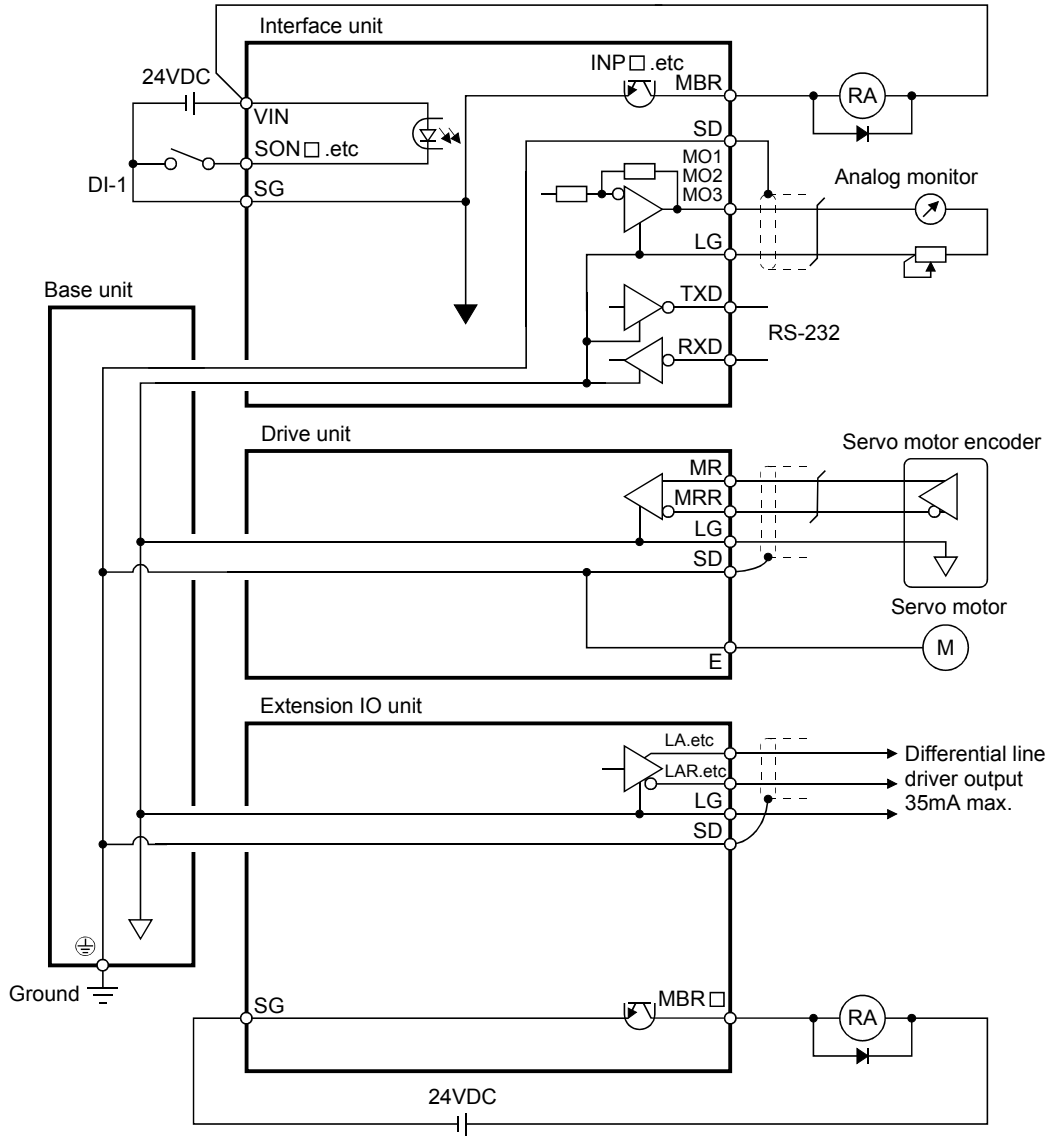
Signal	Symbol	Connector Pin No.	Function/Application
Power input for digital interface	VIN	CN3 8	Driver power input terminal for digital interface. Used to input 24VDC (200mA or more) for input interface.
Common for digital interface	SG	CN3 3	Common terminal to VIN. Pins are connected internally. Separated from LG.
Control common	LG	CN3 1 11	Common terminal to MO1, MO2 and MO3.
Shield	SD	Plate	Connect the external conductor of the shield cable.

3. SIGNALS AND WIRING

3.2.3 Interfaces

(1) Common line

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



3. SIGNALS AND WIRING

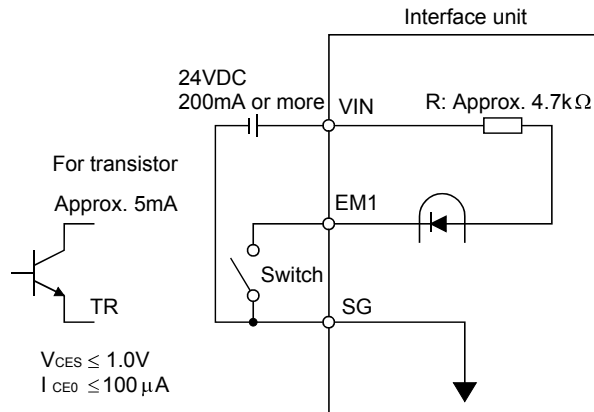
(2) Detailed description of the interfaces

This section gives the details of the I/O signal interfaces (refer to I/O Division in the table) indicated in Sections 3.2.2.

Refer to this section and connect the interfaces with the external equipment.

(a) Digital input interface DI-1

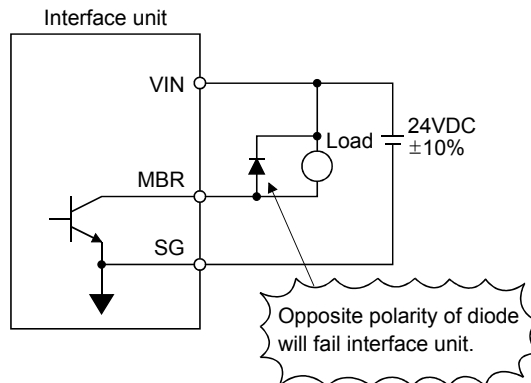
Give a signal with a relay or open collector transistor.



(b) Digital output interface DO-1

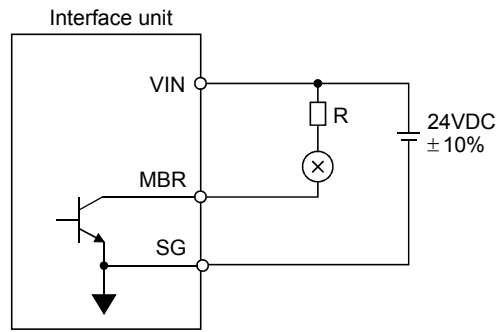
A lamp, relay or photocoupler can be driven. Provide a diode (D) for an inductive load, or an inrush current suppressing resistor (R) for a lamp load. (Permissible current: 40mA or less, inrush current: 100mA or less)

1) Inductive load



3. SIGNALS AND WIRING

2) Lamp load

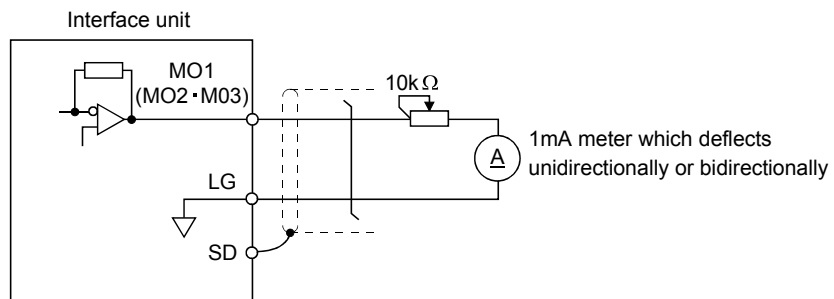


(c) Analog output

Output voltage : $\pm 4V$

Max. output current : $0.5mA$

Resolution : 10bit



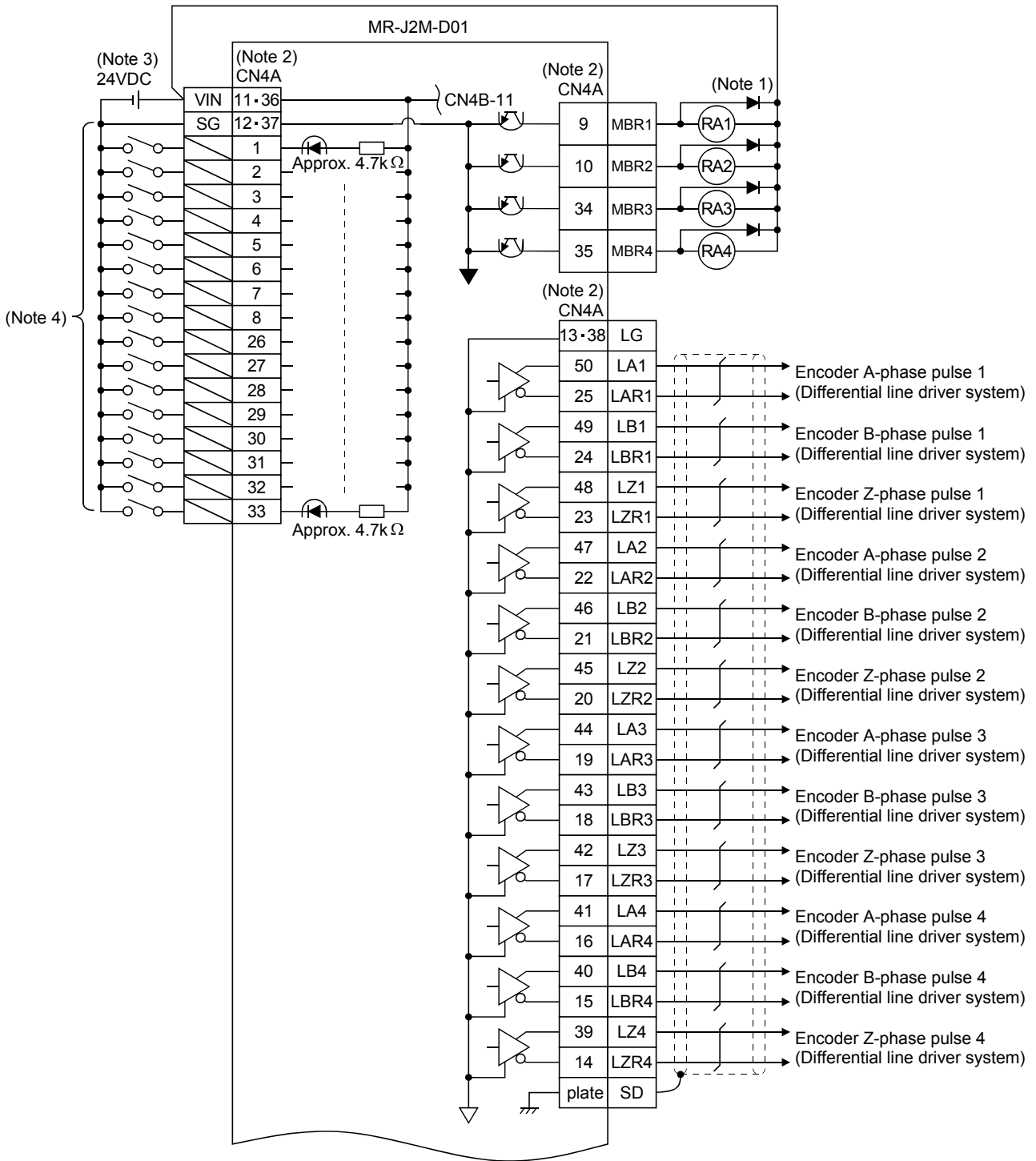
3. SIGNALS AND WIRING

3.3 Signals and wiring for extension IO unit

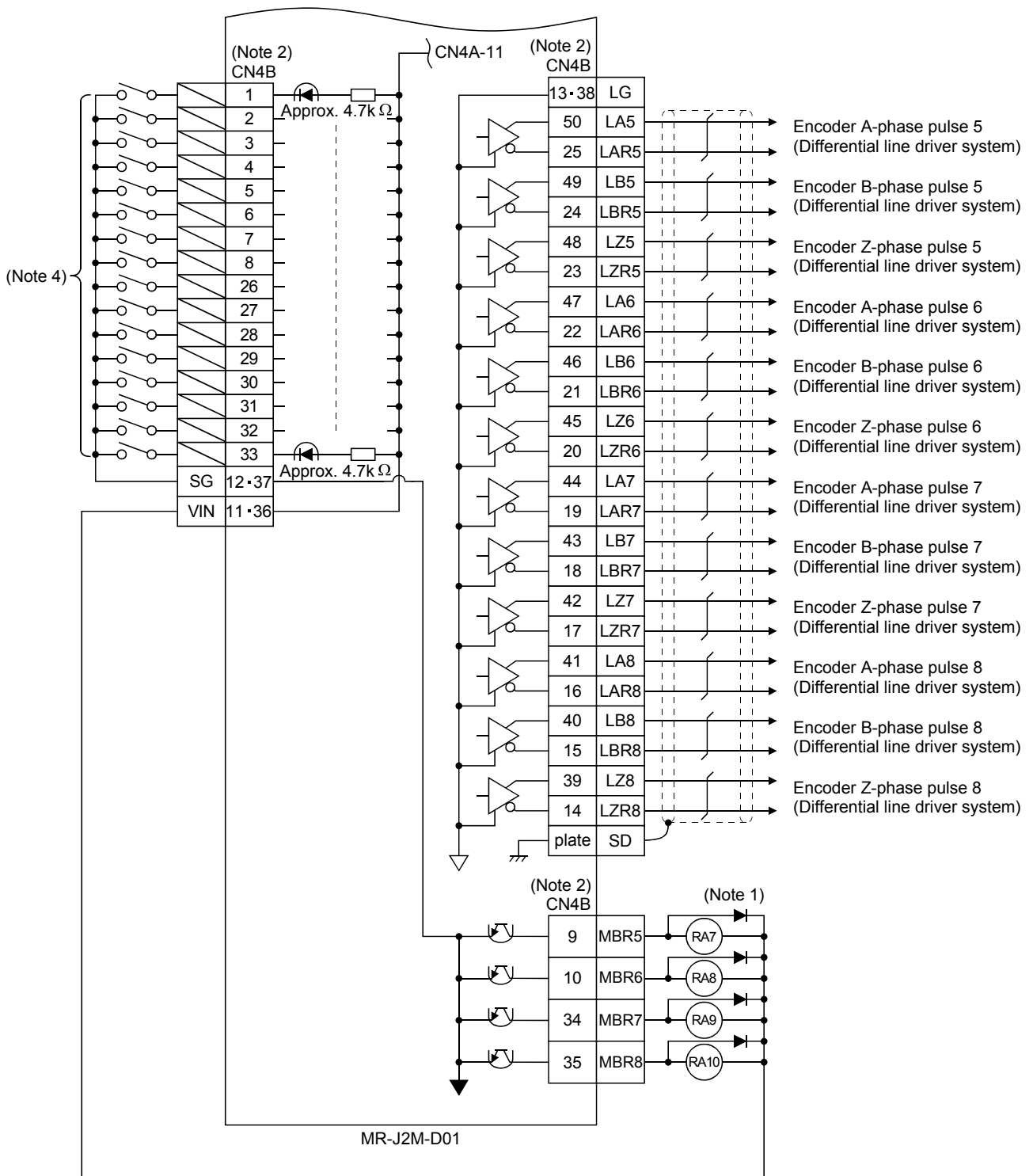
3.3.1 Connection example

POINT

- The pins without symbols can be assigned any devices using the MR Configurator (servo configuration software).



3. SIGNALS AND WIRING



- Note 1. Connect the diodes in the correct orientation. Opposite connection may cause the servo amplifier to be faulty and disable the signals from being output, making the forced stop and other protective circuits inoperative.
- 2. The signals having the same name are connected to the inside of the servo amplifier.
- 3. Always connect 24VDC (200mA).
- 4. These pins are unavailable when the MR-J2M-P8B is used as the interface unit.

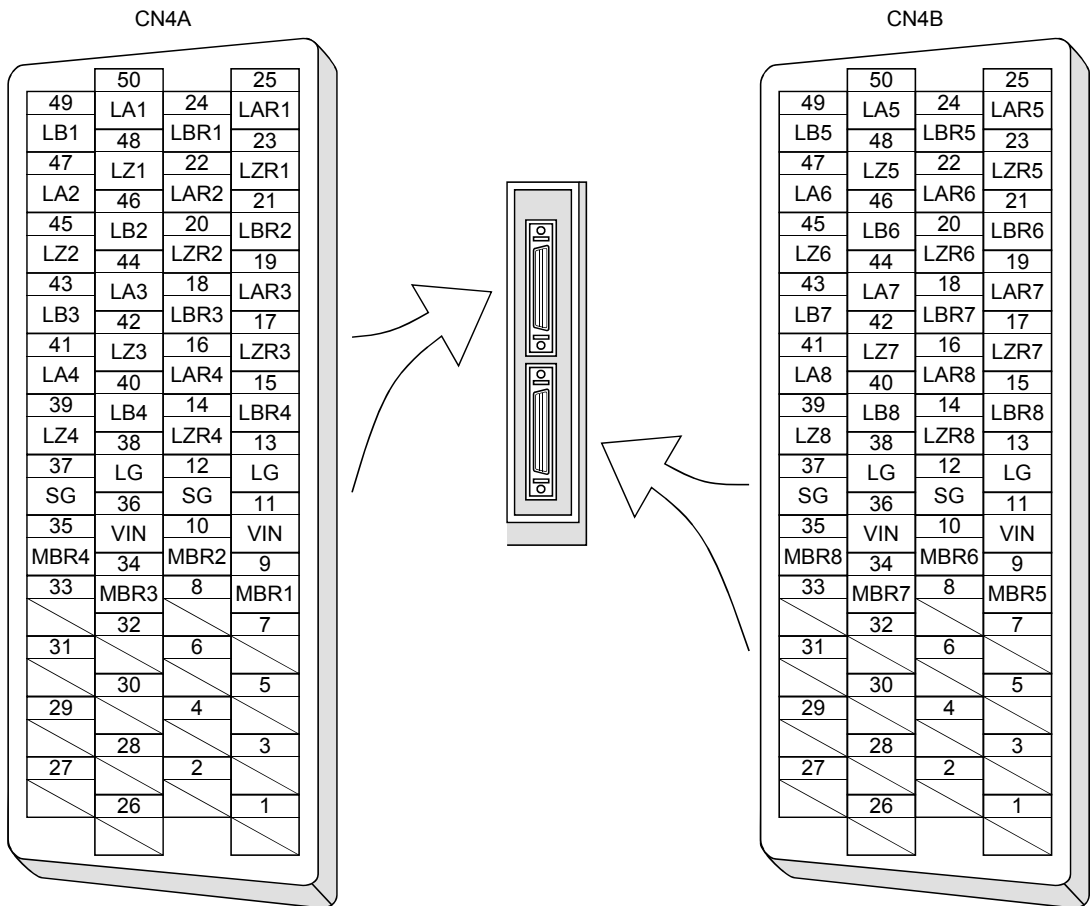
3. SIGNALS AND WIRING

3.3.2 Connectors and signal configurations

(1) Signal configurations

POINT

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



3. SIGNALS AND WIRING

3.3.3 Output signal explanations

For the IO interfaces (system in I/O column in the table), refer to section 3.2.3.

Signal	Symbol	Connector pin No.	Function/Applications	I/O division								
Encoder A-phase pulse 1	LA1	CN4A-50	As LA□, LAR□, LB□ and LBR□, the pulses per servo motor revolution set in the DRU parameter No. 38 of the corresponding slots are output in the differential line driver system.	DO-2								
Encoder B-phase pulse 1	LAR1	CN4A-25										
Encoder B-phase pulse 1	LB1	CN4A-49	In CCW rotation of the servo motor, the encoder B-phase pulse lags the encoder A-phase pulse by a phase angle of $\pi/2$.									
Encoder Z-phase pulse 1	LBR1	CN4A-24										
Encoder Z-phase pulse 1	LZ1	CN4A-48	The relationships between rotation direction and phase difference of the A- and B-phase pulses can be changed using DRU parameter No. 33.									
Encoder Z-phase pulse 1	LZR1	CN4A-23										
Encoder A-phase pulse 2	LA2	CN4A-47	As LZ□ and LZR□ the zero-point signals of the encoders of the corresponding slots are output. One pulse is output per servo motor revolution. The same signals as OP□ are output in the differential line driver system.									
Encoder B-phase pulse 2	LAR2	CN4A-22										
Encoder B-phase pulse 2	LB2	CN4A-46	• Encoder pulse outputs for slot 1									
Encoder Z-phase pulse 2	LBR2	CN4A-21										
Encoder Z-phase pulse 2	LZ2	CN4A-45	<table border="1"> <thead> <tr> <th>Signal</th> <th>Symbol</th> </tr> </thead> <tbody> <tr> <td>Encoder A-phase pulse 1</td> <td>LA1 • LAR1</td> </tr> <tr> <td>Encoder B-phase pulse 1</td> <td>LB1 • LBR1</td> </tr> <tr> <td>Encoder Z-phase pulse 1</td> <td>LZ1 • LZR1</td> </tr> </tbody> </table>		Signal	Symbol	Encoder A-phase pulse 1	LA1 • LAR1	Encoder B-phase pulse 1	LB1 • LBR1	Encoder Z-phase pulse 1	LZ1 • LZR1
Signal	Symbol											
Encoder A-phase pulse 1	LA1 • LAR1											
Encoder B-phase pulse 1	LB1 • LBR1											
Encoder Z-phase pulse 1	LZ1 • LZR1											
Encoder Z-phase pulse 2	LZR2	CN4A-20	<table border="1"> <thead> <tr> <th>Signal</th> <th>Symbol</th> </tr> </thead> <tbody> <tr> <td>Encoder A-phase pulse 2</td> <td>LA2 • LAR2</td> </tr> <tr> <td>Encoder B-phase pulse 2</td> <td>LB2 • LBR2</td> </tr> <tr> <td>Encoder Z-phase pulse 2</td> <td>LZ2 • LZR2</td> </tr> </tbody> </table>		Signal	Symbol	Encoder A-phase pulse 2	LA2 • LAR2	Encoder B-phase pulse 2	LB2 • LBR2	Encoder Z-phase pulse 2	LZ2 • LZR2
Signal	Symbol											
Encoder A-phase pulse 2	LA2 • LAR2											
Encoder B-phase pulse 2	LB2 • LBR2											
Encoder Z-phase pulse 2	LZ2 • LZR2											
Encoder A-phase pulse 3	LA3	CN4A-44	• Encoder pulse outputs for slot 2									
Encoder B-phase pulse 3	LAR3	CN4A-19										
Encoder B-phase pulse 3	LB3	CN4A-43	<table border="1"> <thead> <tr> <th>Signal</th> <th>Symbol</th> </tr> </thead> <tbody> <tr> <td>Encoder A-phase pulse 3</td> <td>LA3 • LAR3</td> </tr> <tr> <td>Encoder B-phase pulse 3</td> <td>LB3 • LBR3</td> </tr> <tr> <td>Encoder Z-phase pulse 3</td> <td>LZ3 • LZR3</td> </tr> </tbody> </table>	Signal	Symbol	Encoder A-phase pulse 3	LA3 • LAR3	Encoder B-phase pulse 3	LB3 • LBR3	Encoder Z-phase pulse 3	LZ3 • LZR3	
Signal	Symbol											
Encoder A-phase pulse 3	LA3 • LAR3											
Encoder B-phase pulse 3	LB3 • LBR3											
Encoder Z-phase pulse 3	LZ3 • LZR3											
Encoder Z-phase pulse 3	LBR3	CN4A-18	<table border="1"> <thead> <tr> <th>Signal</th> <th>Symbol</th> </tr> </thead> <tbody> <tr> <td>Encoder A-phase pulse 4</td> <td>LA4 • LAR4</td> </tr> <tr> <td>Encoder B-phase pulse 4</td> <td>LB4 • LBR4</td> </tr> <tr> <td>Encoder Z-phase pulse 4</td> <td>LZ4 • LZR4</td> </tr> </tbody> </table>	Signal	Symbol	Encoder A-phase pulse 4	LA4 • LAR4	Encoder B-phase pulse 4	LB4 • LBR4	Encoder Z-phase pulse 4	LZ4 • LZR4	
Signal	Symbol											
Encoder A-phase pulse 4	LA4 • LAR4											
Encoder B-phase pulse 4	LB4 • LBR4											
Encoder Z-phase pulse 4	LZ4 • LZR4											
Encoder Z-phase pulse 3	LZ3	CN4A-42	• Encoder pulse outputs for slot 3									
Encoder Z-phase pulse 3	LZR3	CN4A-17										
Encoder A-phase pulse 4	LA4	CN4A-41	<table border="1"> <thead> <tr> <th>Signal</th> <th>Symbol</th> </tr> </thead> <tbody> <tr> <td>Encoder A-phase pulse 4</td> <td>LA4 • LAR4</td> </tr> <tr> <td>Encoder B-phase pulse 4</td> <td>LB4 • LBR4</td> </tr> <tr> <td>Encoder Z-phase pulse 4</td> <td>LZ4 • LZR4</td> </tr> </tbody> </table>	Signal	Symbol	Encoder A-phase pulse 4	LA4 • LAR4	Encoder B-phase pulse 4	LB4 • LBR4	Encoder Z-phase pulse 4	LZ4 • LZR4	
Signal	Symbol											
Encoder A-phase pulse 4	LA4 • LAR4											
Encoder B-phase pulse 4	LB4 • LBR4											
Encoder Z-phase pulse 4	LZ4 • LZR4											
Encoder B-phase pulse 4	LAR4	CN4A-16	• Encoder pulse outputs for slot 4									
Encoder B-phase pulse 4	LB4	CN4A-40										
Encoder Z-phase pulse 4	LBR4	CN4A-15	<table border="1"> <thead> <tr> <th>Signal</th> <th>Symbol</th> </tr> </thead> <tbody> <tr> <td>Encoder A-phase pulse 5</td> <td>LA5 • LAR5</td> </tr> <tr> <td>Encoder B-phase pulse 5</td> <td>LB5 • LBR5</td> </tr> <tr> <td>Encoder Z-phase pulse 5</td> <td>LZ5 • LZR5</td> </tr> </tbody> </table>	Signal	Symbol	Encoder A-phase pulse 5	LA5 • LAR5	Encoder B-phase pulse 5	LB5 • LBR5	Encoder Z-phase pulse 5	LZ5 • LZR5	
Signal	Symbol											
Encoder A-phase pulse 5	LA5 • LAR5											
Encoder B-phase pulse 5	LB5 • LBR5											
Encoder Z-phase pulse 5	LZ5 • LZR5											
Encoder Z-phase pulse 4	LZ4	CN4A-39	• Encoder pulse outputs for slot 5									
Encoder Z-phase pulse 4	LZR4	CN4A-14										
Encoder A-phase pulse 5	LA5	CN4B-50	<table border="1"> <thead> <tr> <th>Signal</th> <th>Symbol</th> </tr> </thead> <tbody> <tr> <td>Encoder A-phase pulse 5</td> <td>LA5 • LAR5</td> </tr> <tr> <td>Encoder B-phase pulse 5</td> <td>LB5 • LBR5</td> </tr> <tr> <td>Encoder Z-phase pulse 5</td> <td>LZ5 • LZR5</td> </tr> </tbody> </table>	Signal	Symbol	Encoder A-phase pulse 5	LA5 • LAR5	Encoder B-phase pulse 5	LB5 • LBR5	Encoder Z-phase pulse 5	LZ5 • LZR5	
Signal	Symbol											
Encoder A-phase pulse 5	LA5 • LAR5											
Encoder B-phase pulse 5	LB5 • LBR5											
Encoder Z-phase pulse 5	LZ5 • LZR5											
Encoder B-phase pulse 5	LAR5	CN4B-25	• Encoder pulse outputs for slot 6									
Encoder B-phase pulse 5	LB5	CN4B-49										
Encoder Z-phase pulse 5	LBR5	CN4B-24	<table border="1"> <thead> <tr> <th>Signal</th> <th>Symbol</th> </tr> </thead> <tbody> <tr> <td>Encoder A-phase pulse 6</td> <td>LA6 • LAR6</td> </tr> <tr> <td>Encoder B-phase pulse 6</td> <td>LB6 • LBR6</td> </tr> <tr> <td>Encoder Z-phase pulse 6</td> <td>LZ6 • LZR6</td> </tr> </tbody> </table>	Signal	Symbol	Encoder A-phase pulse 6	LA6 • LAR6	Encoder B-phase pulse 6	LB6 • LBR6	Encoder Z-phase pulse 6	LZ6 • LZR6	
Signal	Symbol											
Encoder A-phase pulse 6	LA6 • LAR6											
Encoder B-phase pulse 6	LB6 • LBR6											
Encoder Z-phase pulse 6	LZ6 • LZR6											
Encoder Z-phase pulse 5	LZ5	CN4B-48	• Encoder pulse outputs for slot 7									
Encoder Z-phase pulse 5	LZR5	CN4B-23										
Encoder A-phase pulse 6	LA6	CN4B-47	<table border="1"> <thead> <tr> <th>Signal</th> <th>Symbol</th> </tr> </thead> <tbody> <tr> <td>Encoder A-phase pulse 6</td> <td>LA6 • LAR6</td> </tr> <tr> <td>Encoder B-phase pulse 6</td> <td>LB6 • LBR6</td> </tr> <tr> <td>Encoder Z-phase pulse 6</td> <td>LZ6 • LZR6</td> </tr> </tbody> </table>	Signal	Symbol	Encoder A-phase pulse 6	LA6 • LAR6	Encoder B-phase pulse 6	LB6 • LBR6	Encoder Z-phase pulse 6	LZ6 • LZR6	
Signal	Symbol											
Encoder A-phase pulse 6	LA6 • LAR6											
Encoder B-phase pulse 6	LB6 • LBR6											
Encoder Z-phase pulse 6	LZ6 • LZR6											
Encoder B-phase pulse 6	LAR6	CN4B-22	• Encoder pulse outputs for slot 8									
Encoder B-phase pulse 6	LB6	CN4B-46										
Encoder Z-phase pulse 6	LBR6	CN4B-21	<table border="1"> <thead> <tr> <th>Signal</th> <th>Symbol</th> </tr> </thead> <tbody> <tr> <td>Encoder A-phase pulse 7</td> <td>LA7 • LAR7</td> </tr> <tr> <td>Encoder B-phase pulse 7</td> <td>LB7 • LBR7</td> </tr> <tr> <td>Encoder Z-phase pulse 7</td> <td>LZ7 • LZR7</td> </tr> </tbody> </table>	Signal	Symbol	Encoder A-phase pulse 7	LA7 • LAR7	Encoder B-phase pulse 7	LB7 • LBR7	Encoder Z-phase pulse 7	LZ7 • LZR7	
Signal	Symbol											
Encoder A-phase pulse 7	LA7 • LAR7											
Encoder B-phase pulse 7	LB7 • LBR7											
Encoder Z-phase pulse 7	LZ7 • LZR7											
Encoder Z-phase pulse 6	LZ6	CN4B-45	• Encoder pulse outputs for slot 8									
Encoder Z-phase pulse 6	LZR6	CN4B-20										
Encoder A-phase pulse 7	LA7	CN4B-44	<table border="1"> <thead> <tr> <th>Signal</th> <th>Symbol</th> </tr> </thead> <tbody> <tr> <td>Encoder A-phase pulse 7</td> <td>LA7 • LAR7</td> </tr> <tr> <td>Encoder B-phase pulse 7</td> <td>LB7 • LBR7</td> </tr> <tr> <td>Encoder Z-phase pulse 7</td> <td>LZ7 • LZR7</td> </tr> </tbody> </table>	Signal	Symbol	Encoder A-phase pulse 7	LA7 • LAR7	Encoder B-phase pulse 7	LB7 • LBR7	Encoder Z-phase pulse 7	LZ7 • LZR7	
Signal	Symbol											
Encoder A-phase pulse 7	LA7 • LAR7											
Encoder B-phase pulse 7	LB7 • LBR7											
Encoder Z-phase pulse 7	LZ7 • LZR7											
Encoder B-phase pulse 7	LAR7	CN4B-19	• Encoder pulse outputs for slot 8									
Encoder B-phase pulse 7	LB7	CN4B-43										
Encoder Z-phase pulse 7	LBR7	CN4B-18	<table border="1"> <thead> <tr> <th>Signal</th> <th>Symbol</th> </tr> </thead> <tbody> <tr> <td>Encoder A-phase pulse 8</td> <td>LA8 • LAR8</td> </tr> <tr> <td>Encoder B-phase pulse 8</td> <td>LB8 • LBR8</td> </tr> <tr> <td>Encoder Z-phase pulse 8</td> <td>LZ8 • LZR8</td> </tr> </tbody> </table>	Signal	Symbol	Encoder A-phase pulse 8	LA8 • LAR8	Encoder B-phase pulse 8	LB8 • LBR8	Encoder Z-phase pulse 8	LZ8 • LZR8	
Signal	Symbol											
Encoder A-phase pulse 8	LA8 • LAR8											
Encoder B-phase pulse 8	LB8 • LBR8											
Encoder Z-phase pulse 8	LZ8 • LZR8											
Encoder Z-phase pulse 7	LZ7	CN4B-42	• Encoder pulse outputs for slot 8									
Encoder Z-phase pulse 7	LZR7	CN4B-17										
Encoder A-phase pulse 8	LA8	CN4B-41	<table border="1"> <thead> <tr> <th>Signal</th> <th>Symbol</th> </tr> </thead> <tbody> <tr> <td>Encoder A-phase pulse 8</td> <td>LA8 • LAR8</td> </tr> <tr> <td>Encoder B-phase pulse 8</td> <td>LB8 • LBR8</td> </tr> <tr> <td>Encoder Z-phase pulse 8</td> <td>LZ8 • LZR8</td> </tr> </tbody> </table>	Signal	Symbol	Encoder A-phase pulse 8	LA8 • LAR8	Encoder B-phase pulse 8	LB8 • LBR8	Encoder Z-phase pulse 8	LZ8 • LZR8	
Signal	Symbol											
Encoder A-phase pulse 8	LA8 • LAR8											
Encoder B-phase pulse 8	LB8 • LBR8											
Encoder Z-phase pulse 8	LZ8 • LZR8											
Encoder B-phase pulse 8	LAR8	CN4B-16	• Encoder pulse outputs for slot 8									
Encoder B-phase pulse 8	LB8	CN4B-40										
Encoder Z-phase pulse 8	LBR8	CN4B-15	<table border="1"> <thead> <tr> <th>Signal</th> <th>Symbol</th> </tr> </thead> <tbody> <tr> <td>Encoder A-phase pulse 8</td> <td>LA8 • LAR8</td> </tr> <tr> <td>Encoder B-phase pulse 8</td> <td>LB8 • LBR8</td> </tr> <tr> <td>Encoder Z-phase pulse 8</td> <td>LZ8 • LZR8</td> </tr> </tbody> </table>	Signal	Symbol	Encoder A-phase pulse 8	LA8 • LAR8	Encoder B-phase pulse 8	LB8 • LBR8	Encoder Z-phase pulse 8	LZ8 • LZR8	
Signal	Symbol											
Encoder A-phase pulse 8	LA8 • LAR8											
Encoder B-phase pulse 8	LB8 • LBR8											
Encoder Z-phase pulse 8	LZ8 • LZR8											
Encoder Z-phase pulse 8	LZ8	CN4B-39	• Encoder pulse outputs for slot 8									
Encoder Z-phase pulse 8	LZR8	CN4B-14										

3. SIGNALS AND WIRING

Signal	Symbol	Connector pin No.	Function/Applications	I/O division
Electromagnetic brake interlock 1	MBR1	CN4A-9	MBR1: Electromagnetic brake interlock signal for axis 1 MBR2: Electromagnetic brake interlock signal for axis 2 MBR3: Electromagnetic brake interlock signal for axis 3 MBR4: Electromagnetic brake interlock signal for axis 4 MBR5: Electromagnetic brake interlock signal for axis 5 MBR6: Electromagnetic brake interlock signal for axis 6 MBR7: Electromagnetic brake interlock signal for axis 7 MBR8: Electromagnetic brake interlock signal for axis 8 MBR□-SG are disconnected when a forced stop is made valid, an alarm occurs in the interface unit or drive unit, or the servo switches off. At alarm occurrence, they are disconnected independently of the base circuit status.	DO-1
Electromagnetic brake interlock 2	MBR2	CN4A-10		
Electromagnetic brake interlock 3	MBR3	CN4A-34		
Electromagnetic brake interlock 4	MBR4	CN4A-35		
Electromagnetic brake interlock 5	MBR5	CN4A-9		
Electromagnetic brake interlock 6	MBR6	CN4A-10		
Electromagnetic brake interlock 7	MBR7	CN4A-34		
Electromagnetic brake interlock 8	MBR8	CN4A-35		

3. SIGNALS AND WIRING

3.4 Signals and wiring for base unit



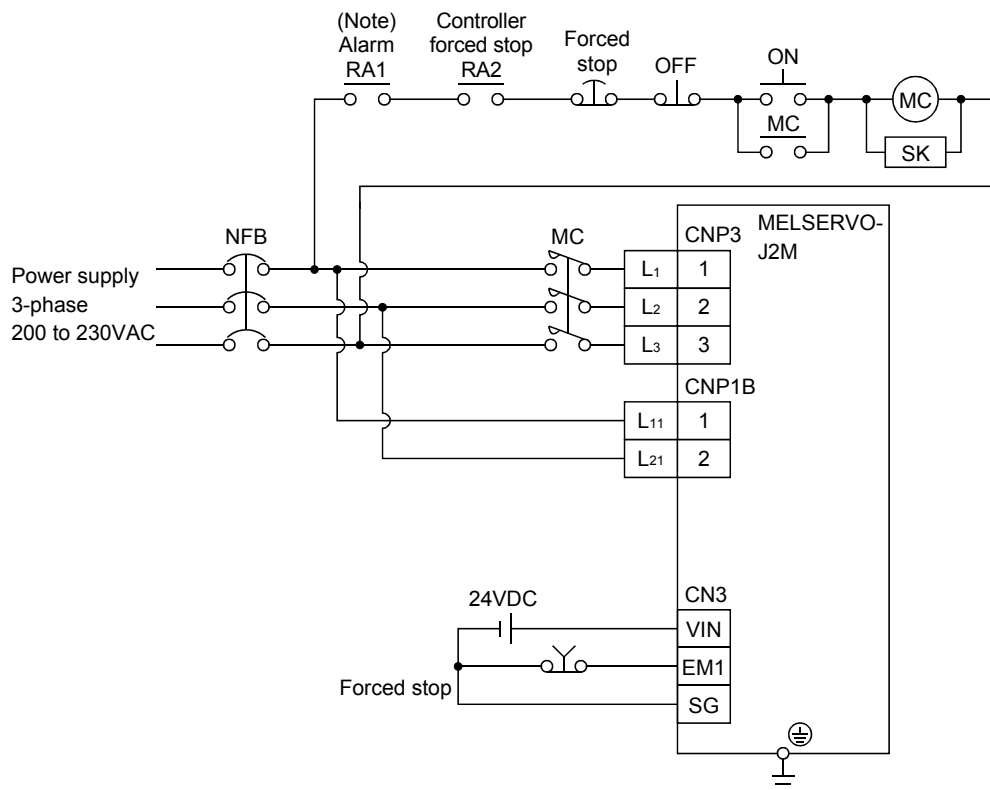
CAUTION

- When each unit has become faulty, switch power off on the base unit power side. Continuous flow of a large current may cause a fire.
- Switch power off at detection of an alarm. Otherwise, a regenerative brake transistor fault or the like may overheat the regenerative brake resistor, causing a fire.
- Fabricate the cables noting the shapes of the CNP1A housing (X type) and CNP1B housing (Y type).

3.4.1 Connection example of power line circuit

Wire the power supply/main circuit as shown below so that power is shut off and the servo-on command turned off as soon as an alarm occurs, a servo forced stop is made valid, or a controller forced stop is made valid. A no-fuse breaker (NFB) must be used with the input cables of the power supply.

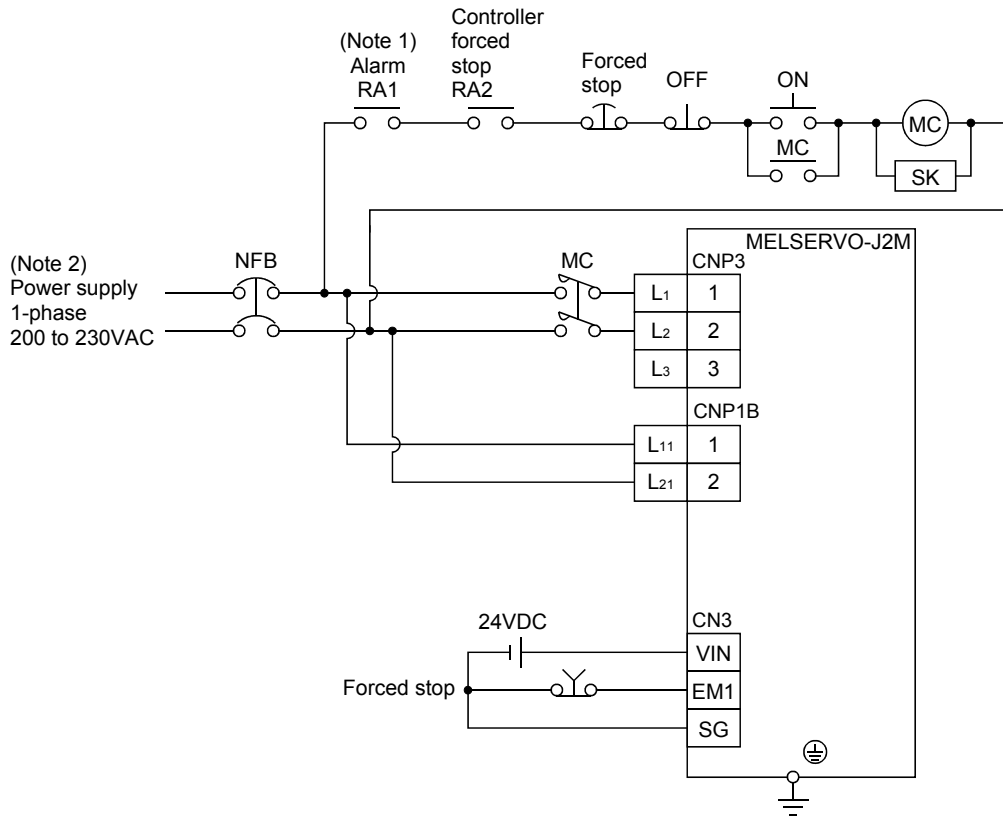
(1) For 3-phase 200 to 230VAC power supply



Note. Configure up the power supply circuit which switches off the magnetic contactor after detection of alarm occurrence on the controller side.

3. SIGNALS AND WIRING

(2) For 1-phase 200 to 230VAC power supply



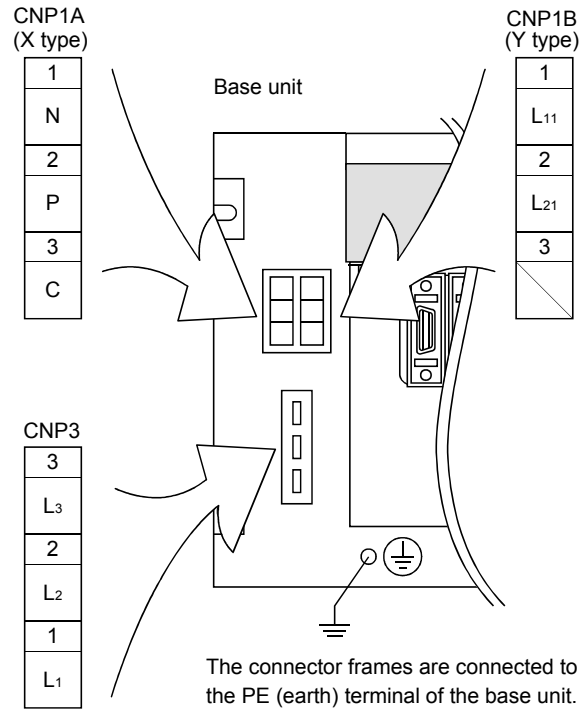
Note 1. Configure up the power supply circuit which switches off the magnetic contactor after detection of alarm occurrence on the controller side.

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

3. SIGNALS AND WIRING

3.4.2 Connectors and signal configurations

POINT
<ul style="list-style-type: none"> The pin configurations of the connectors are as viewed from the cable connector wiring section.




Connector	Cable side connector	
	Model	Maker
CNP1A	Housing: 1-178128-3 (X type) Contact: 917511-2 (max. sheath OD: ϕ 2.8[mm]) 353717-2 (max. sheath OD: ϕ 3.4[mm]) (Note)	Tyco Electronics
CNP1B	Housing: 2-178128-3 (Y type) Contact: 917511-2 (max. sheath OD: ϕ 2.8[mm]) 353717-2 (max. sheath OD: ϕ 3.4[mm]) (Note)	
CNP3	Housing: 1-179958-3 Contact: 316041-2	

Note. This contact is not included in the option (MR-J2MCNM).

3. SIGNALS AND WIRING

3.4.3 Terminals

Refer to Section 10.2.1 for the layouts and signal configurations of the terminal blocks.

Connector	Pin No.	Code	Connection target (Application)	Description
CNP3	1	L1	Main circuit power	(1) When using a three-phase power supply Supply L1, L2 and L3 with three-phase, 200 to 230VAC, 50/60Hz power. (2) When using a signal-phase power supply Supply L1 and L2 with signal-phase, 200 to 230VAC, 50/60Hz power.
	2	L2		
	3	L3		
CNP1B	1	L11	Control circuit power	Supply L11 and L21 with single-phase, 200 to 230VAC, 50/60Hz power.
	2	L21		
	3			
CNP1A	1	N	Regenerative brake option	Connect the regenerative brake option across P-C. Keep N open. (Refer to Section 12.1.1)
	2	P		
	3	C		
			Protective earth (PE)	Connect this terminal to the protective earth (PE) terminals of the servo motor and control box for grounding.

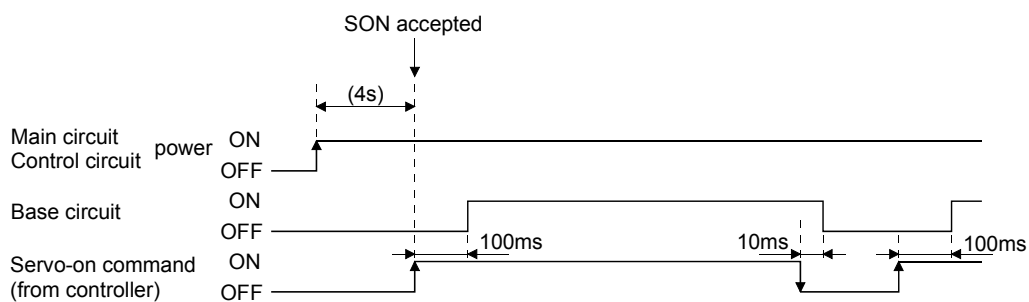
3. SIGNALS AND WIRING

3.4.4 Power-on sequence

(1) Power-on procedure

- 1) Always wire the power supply as shown in above Section 3.4.1 using the magnetic contactor with the main circuit power supply (3-phase 200V: L1, L2, L3, 1-phase 200 to 230VAC: L1, L2). Configure up an external sequence to switch off the magnetic contactor as soon as an alarm occurs.
- 2) Switch on the control circuit power supply L11, L21 simultaneously with the main circuit power supply or before switching on the main circuit power supply. If the main circuit power supply is not on, the display shows the corresponding warning. However, by switching on the main circuit power supply, the warning disappears and MELSERVO-J2M will operate properly.
- 3) Each drive unit can accept the servo-on command within 4s the main circuit power supply is switched on. (Refer to paragraph (2) in this section.)

(2) Timing chart



(3) Forced stop

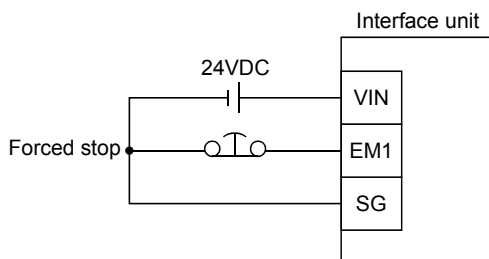


CAUTION

• Install an emergency stop circuit externally to ensure that operation can be stopped and power shut off immediately.

If the controller does not have a forced stop function, make up a circuit which shuts off main circuit power as soon as EM1-SG are opened at a forced stop. To ensure safety, always install a forced stop switch across EM1-SG. By disconnecting EM1-SG, the dynamic brake is operated to bring the servo motor to a stop. At this time, the display shows the servo forced stop warning (A.E6).

During ordinary operation, do not use forced stop (EM1) to alternate stop and run. The service life of each drive unit may be shortened.



3. SIGNALS AND WIRING

3.5 Connection of drive unit and servo motor

3.5.1 Connection instructions



CAUTION

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

POINT

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

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

- (1) The protective earth of the servo motor joins to the base unit via the drive unit mounting screw. Connect the protective earth terminal of the base unit to the protective earth of the control box to discharge electricity to the earth.
- (2) The power supply for the electromagnetic brake should not be used as the 24VDC power supply for interface. Always use the power supply for electromagnetic brake only.

3.5.2 Connection diagram

The following table lists wiring methods according to the servo motor types. Use the connection diagram which conforms to the servo motor used. For cables required for wiring, refer to Section 12.2.1. For encoder cable connection, refer to Section 12.1.2. For the signal layouts of the connectors, refer to Section 3.5.3.

For the servo motor connector, refer to Chapter 3 of the Servo Motor Instruction Manual.

Servo motor	Connection diagram
<p>HC-KFS053 (B) to 73 (B) HC-MFS053 (B) to 73 (B) HC-UFS13 (B) to 73 (B)</p>	<p>Note 1. To prevent an electric shock, always connect the protective earth (PE) terminal of the base unit to the protective earth (PE) of the control box.</p> <p>2. This circuit applies to the servo motor with electromagnetic brake.</p> <p>3. The protective earth of the servo motor is connected to the base unit via the drive unit mounting screw.</p>

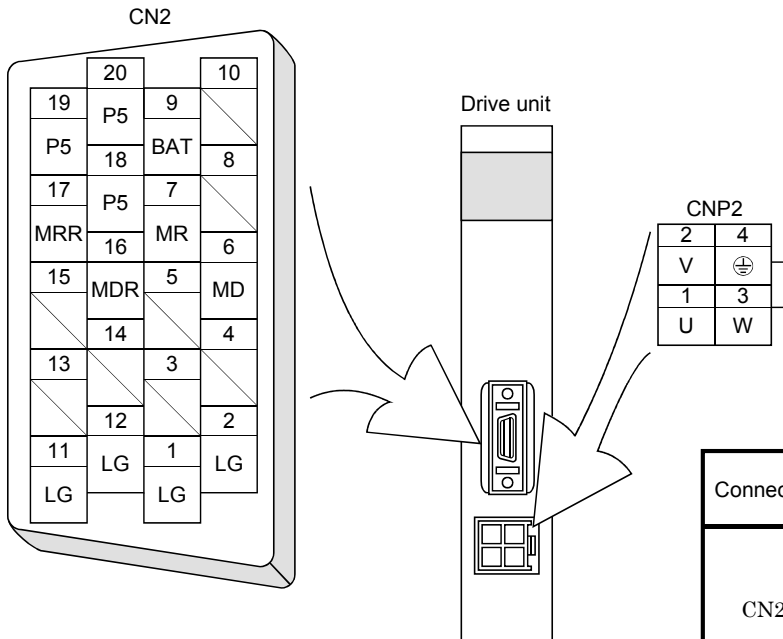
3. SIGNALS AND WIRING

3.5.3 I/O terminals

(1) Drive unit

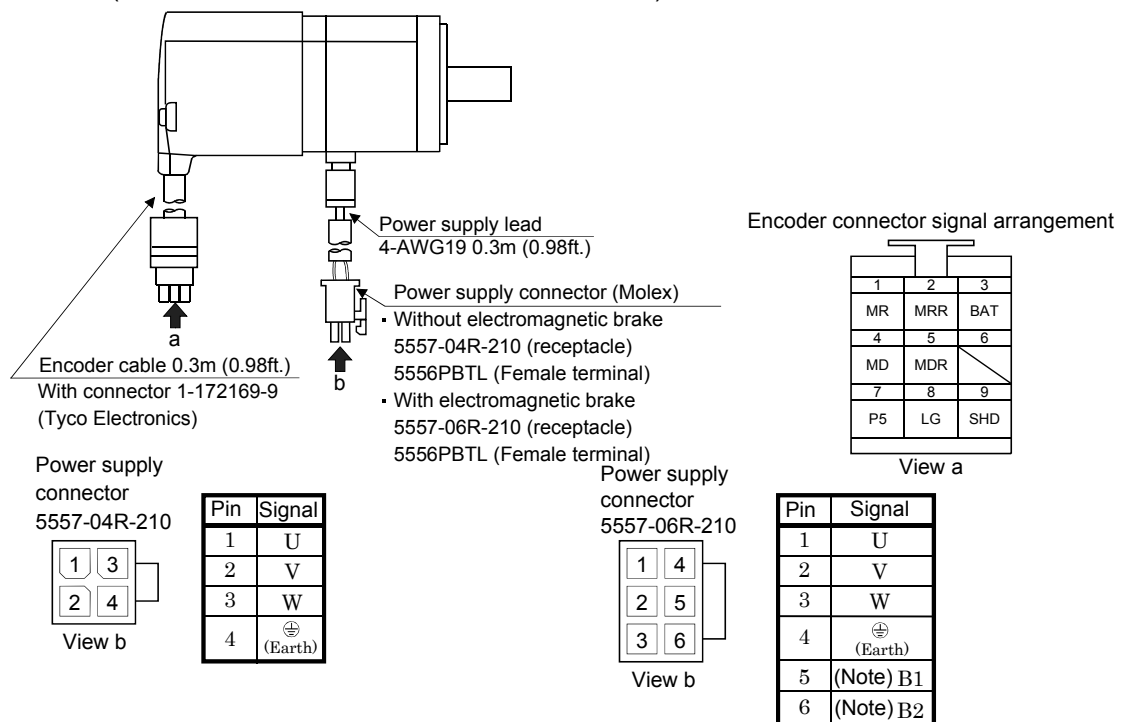
POINT

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



Connector	Cable side connector	
	Model	Maker
CN2	1. Soldering type Connector: 10120-3000VE Shell kit: 10320-52F0-008 2. Insulation displacement type Connector: 10120-6000EL Shell kit: 10320-3210-000	3M
CNP2	Housing: 5557-04R-210 Terminal: 5556PBT3L	Molex


(2) Servo motor (HC-KFS • HC-MFS • HC-UFS3000r/min series)



Note. Supply electromagnetic brake power (24VDC). There is no polarity.

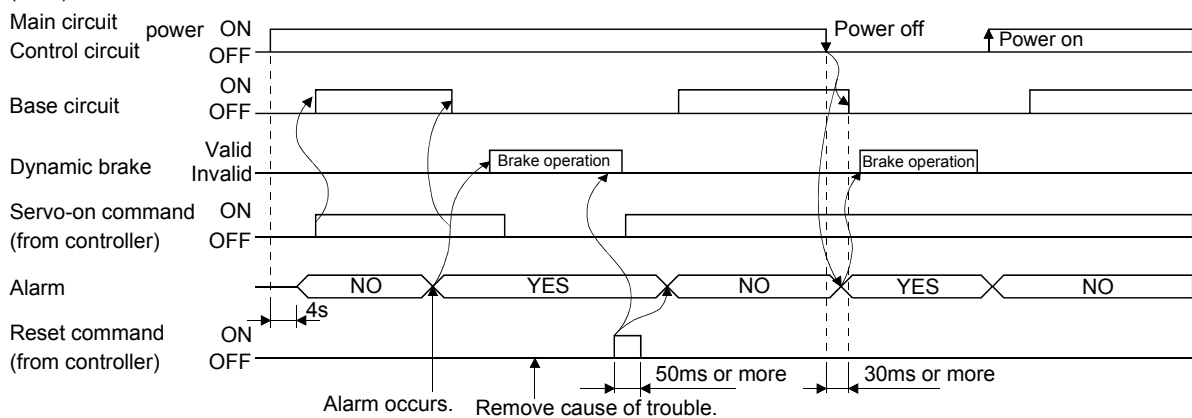
3. SIGNALS AND WIRING

3.6 Alarm occurrence timing chart

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

When an alarm occurs in each unit, the base circuit is shut off and the servo motor is coasted to a stop. Switch off the main circuit power supply in the external sequence. To deactivate the alarm, power the control circuit off, then on or give the error reset or CPU reset command from the servo system controller. However, the alarm cannot be deactivated unless its cause is removed.

(Note)



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

(1) Overcurrent, overload 1 or overload 2

If operation is repeated by switching control circuit power off, then on to reset the overcurrent (A.32), overload 1 (A.50), overload 2 (A.51) or multi axis overload (A.53) alarm after its occurrence, without removing its cause, each unit and servo motor may become faulty due to temperature rise. Securely remove the cause of the alarm and also allow about 30 minutes for cooling before resuming operation.

(2) Regenerative alarm

If operation is repeated by switching control circuit power off, then on to reset the regenerative (A.30) alarm after its occurrence, the external regenerative brake resistor will generate heat, resulting in an accident.

(3) Instantaneous power failure


Undervoltage (A. 10) occurs when the input power is in either of the following statuses.

- A power failure of the control circuit power supply continues for 30ms or longer and the control circuit is not completely off.
- The bus voltage dropped to 200VDC or less.

3. SIGNALS AND WIRING

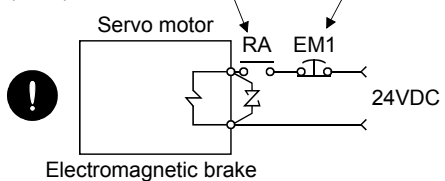
3.7 Servo motor with electromagnetic brake

CAUTION



- Configure the electromagnetic brake operation circuit so that it is activated not only by the interface unit signals but also by an external 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).



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

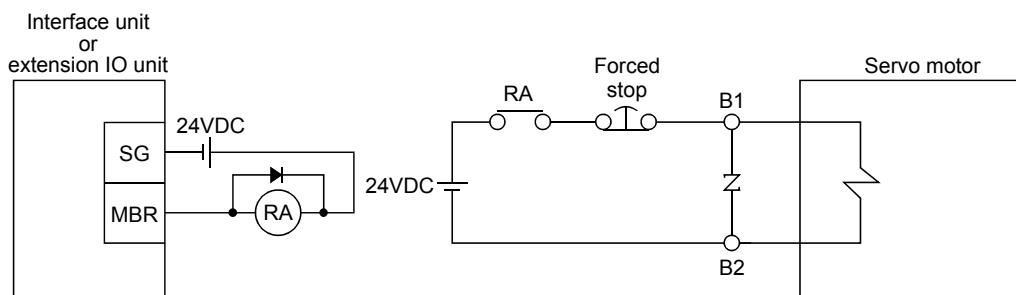
POINT

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

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

- 1) Do not share the 24VDC interface power supply between the interface and electromagnetic brake. Always use the power supply designed exclusively for the electromagnetic brake.
- 2) The brake will operate when the power (24VDC) switches off.
- 3) Switch off the servo-on command after the servo motor has stopped.
- 4) Using the IFU parameter No.10, select the axis number of the drive unit which uses the electromagnetic brake interlock (MBR).

(1) Connection diagram



(2) Setting

In DRU parameter No.21 (electromagnetic brake sequence output), set the delay time (Tb) from electromagnetic brake operation to base circuit shut-off at a servo off time as in the timing chart in (4) in this section.

3. SIGNALS AND WIRING

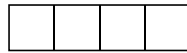
(3) Electromagnetic brake interlock signal

There are the following electromagnetic brake interlock signals. The MR-J2M-D01 is required to use MBR1 to MBR8. Load the MR-J2M-D01 to the option slot of the base unit.

Signal	Symbol	Connector Pin No.	Description
Electromagnetic brake interlock	MBR	CN3-13	Electromagnetic brake interlock signal for all axes or the axis selected in parameter No. 10
Electromagnetic brake interlock 1	MBR1	CN4A-9	Electromagnetic brake interlock signal for axis 1
Electromagnetic brake interlock 2	MBR2	CN4A-10	Electromagnetic brake interlock signal for axis 2
Electromagnetic brake interlock 3	MBR3	CN4A-34	Electromagnetic brake interlock signal for axis 3
Electromagnetic brake interlock 4	MBR4	CN4A-35	Electromagnetic brake interlock signal for axis 4
Electromagnetic brake interlock 5	MBR5	CN4B-9	Electromagnetic brake interlock signal for axis 5
Electromagnetic brake interlock 6	MBR6	CN4B-10	Electromagnetic brake interlock signal for axis 6
Electromagnetic brake interlock 7	MBR7	CN4B-34	Electromagnetic brake interlock signal for axis 7
Electromagnetic brake interlock 8	MBR8	CN4B-35	Electromagnetic brake interlock signal for axis 8

(a) Electromagnetic brake interlock (MBR)

This signal is output from the CN3 connector of the interface unit. This signal allows you to select the axis number of the drive unit to be used with IFU parameter No. 10.



Electromagnetic brake interlock output axis number selection
Choose the axis number of the drive unit that will use electromagnetic brake interlock output (MBR).

Setting	Selected Axis
0	All connected axes
1	Axis 1
2	Axis 2
3	Axis 3
4	Axis 4
5	Axis 5
6	Axis 6
7	Axis 7
8	Axis 8

1) When selecting the corresponding axis number

The timing chart of the corresponding axis is the same as in (4) of this section.

2) When using all axes

The timing chart in (4)(a) of this section changes as described below.

When the base circuits of all connected axes turn on, electromagnetic brake interlock (MBR) turns on. If the servo on command timings differ between the axes, the axis whose servo on occurred first will result in overload alarm. Hence, the servo on command should be given to all axes at the same timing.

The others are as shown in (4) of this section.

3. SIGNALS AND WIRING

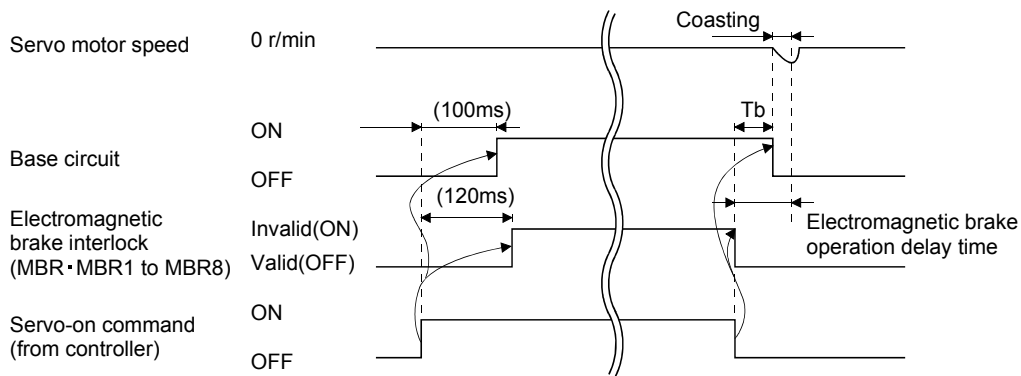
(b) Electromagnetic brake interlock 1 to 8 (MBR1 to MBR8)

By adding an extension IO unit, you can use the electromagnetic brake interlock (MBR) for each axis. The timing chart is as shown in (4) of this section.

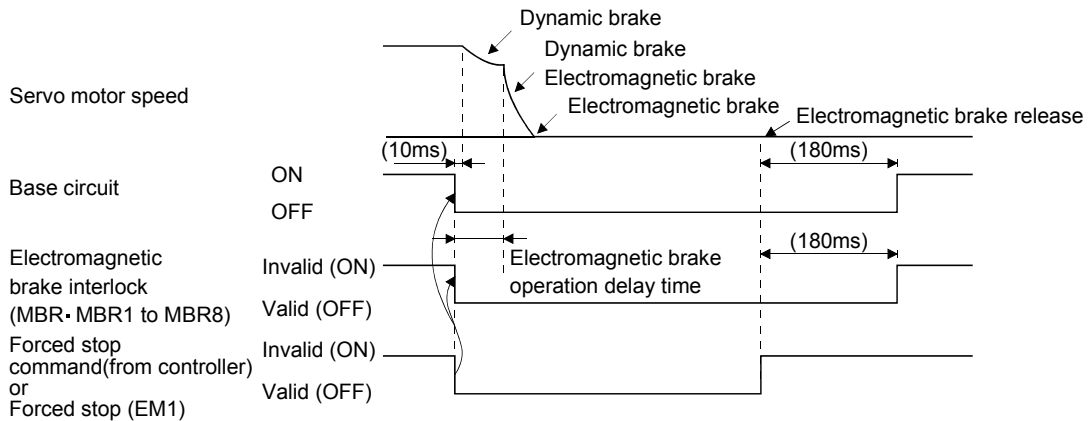
(4) Timing charts

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

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

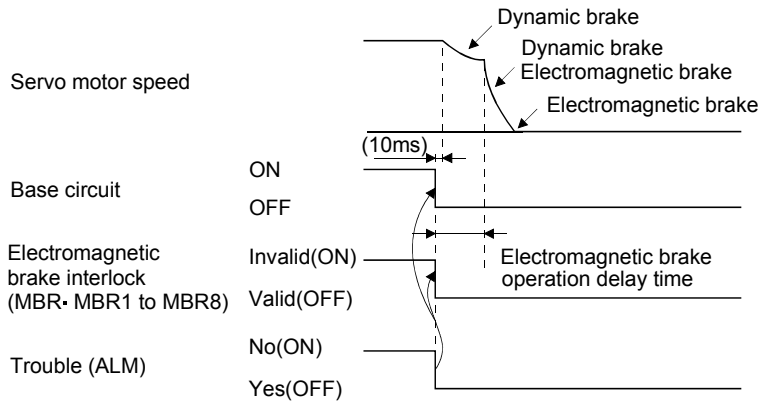


(b) Forced stop command (from controller) or forced stop (EM1) ON/OFF

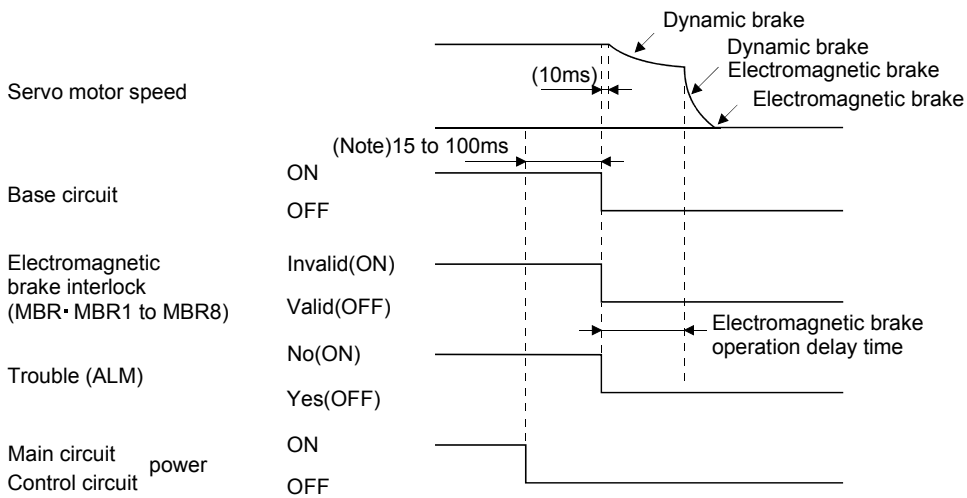


3. SIGNALS AND WIRING

(c) Alarm occurrence

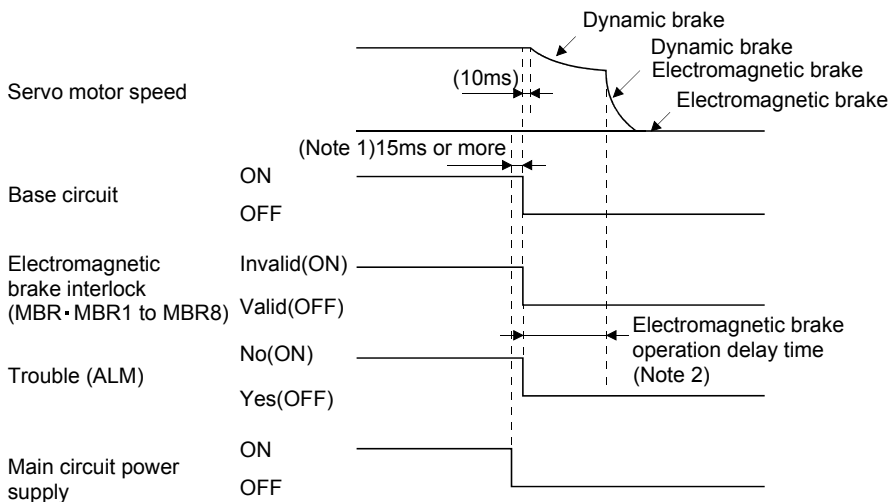


(d) Both main and control circuit power supplies off



Note. Changes with the operating status.

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



Note 1. Changes with the operating status.

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

3. SIGNALS AND WIRING

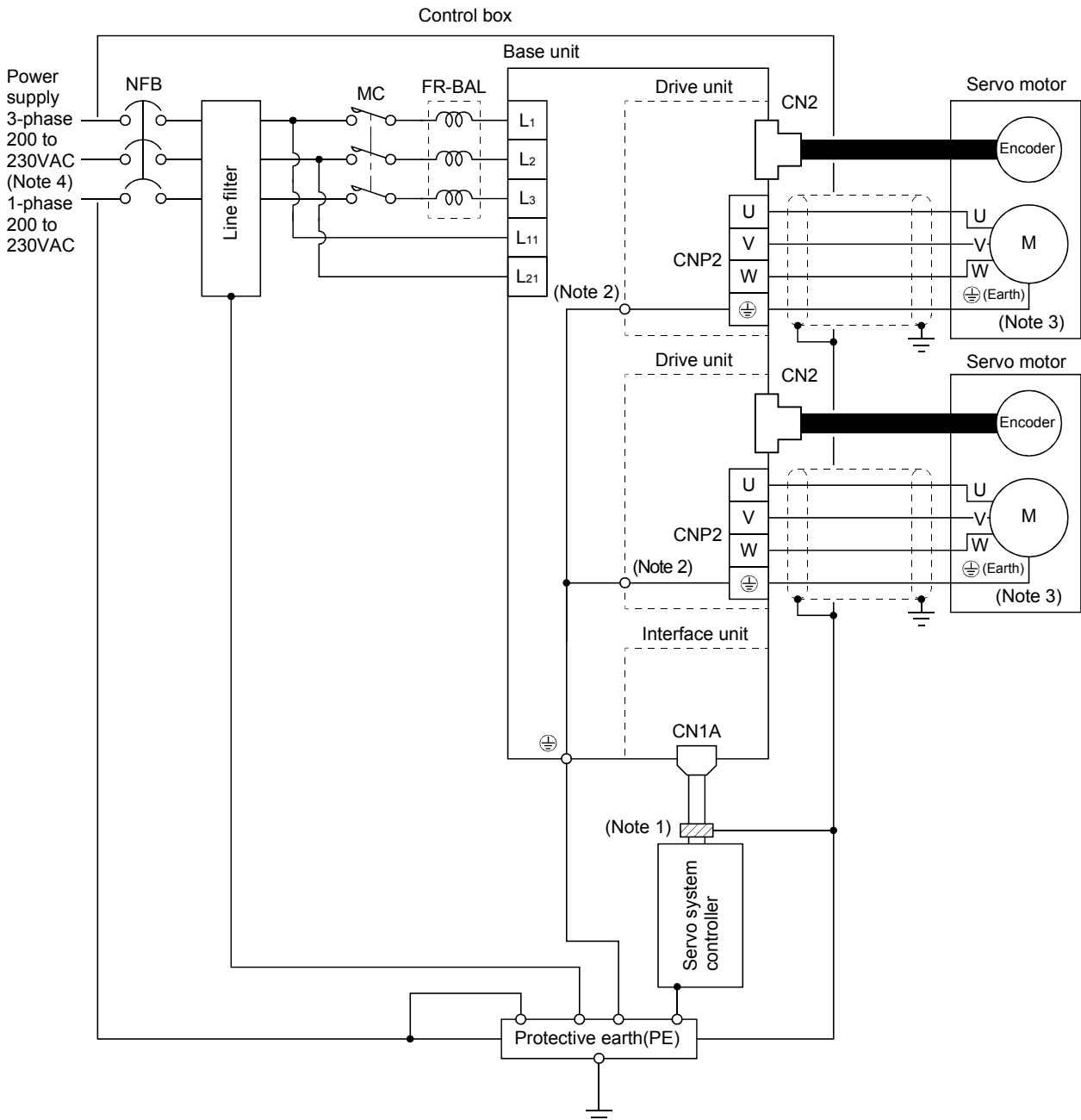
3.8 Grounding



WARNING

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

The base unit switches the power transistor on-off to supply power to the servo motor. Depending on the wiring and ground cablerouting, MELSERVO-J2M may be affected by the switching noise (due to di/dt and dv/dt) of the transistor. To prevent such a fault, refer to the following diagram and always ground. To conform to the EMC Directive, refer to the EMC Installation Guidelines (IB(NA)67310).

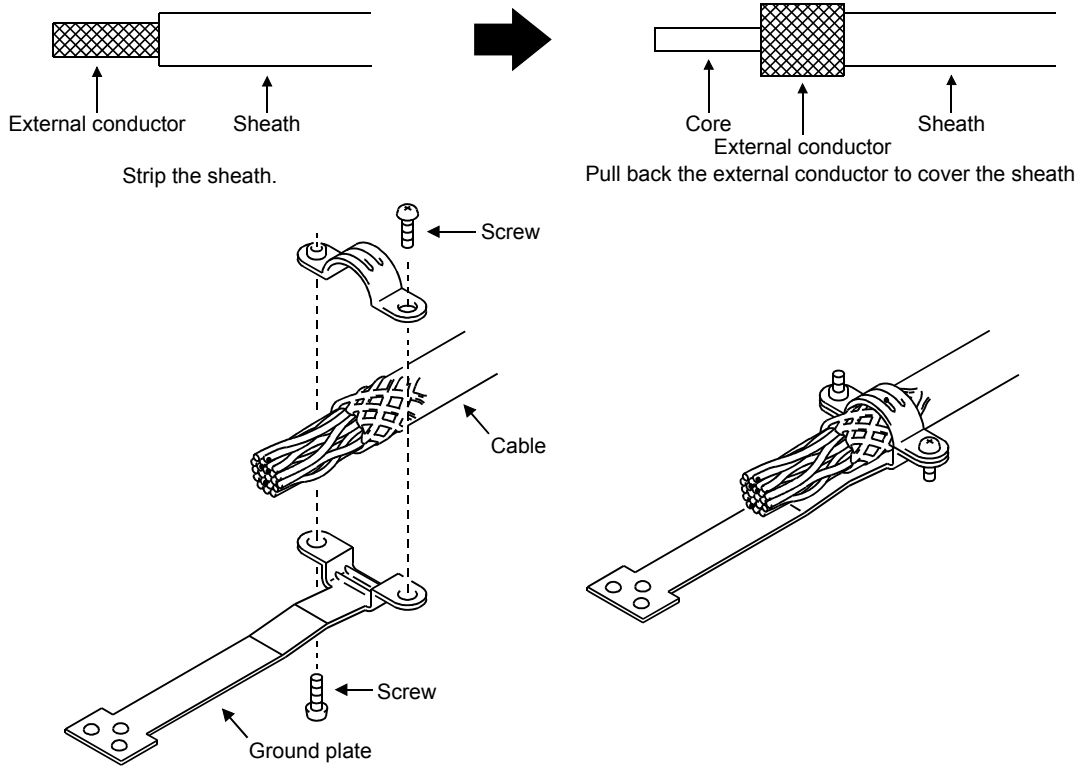


- Note 1. To reduce the influence of external noise, we recommend you to ground the bus cable near the controller using a cable clamping fixture or to connect three or four data line filters in series.
2. The mounting screw of the drive unit is also used for PE connection of the servo motor.
3. Ensure to connect it to PE terminal of the drive unit. Do not connect it directly to the protective earth of the control panel.
4. For 1-phase 230VAC, connect the power supply to L1 -L2 and leave L3 open.

3. SIGNALS AND WIRING

3.9 Instructions for the 3M connector

When fabricating an encoder cable or the like, securely connect the shielded external conductor of the cable to the ground plate as shown in this section and fix it to the connector shell.



4. OPERATION AND DISPLAY

4. OPERATION AND DISPLAY

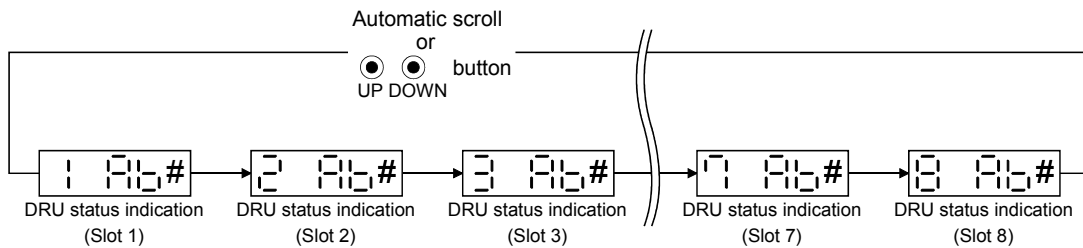
On the interface unit display (5-digit, seven-segment display), check the status of communication with the servo system controller at power-on, check the axis number, and diagnose a fault at occurrence of an alarm.

4.1 Normal indication

When powered on, the MELSERVO-J2M is placed in the automatic scroll mode in which the statuses of the drive units installed on the base unit appear at intervals of 2 seconds in due order. At this time, open slot numbers do not appear.

In the initial status, the indication is in the automatic scroll mode. Pressing the "SET" button switches the automatic scroll mode to the fixed mode. In the fixed mode, pressing the "UP" or "DOWN" button displays the status of the subsequent-axis drive unit.

If an alarm/warning occurs in the interface unit, the alarm/warning number of the interface unit appears. (Refer to Section 4.1.2)

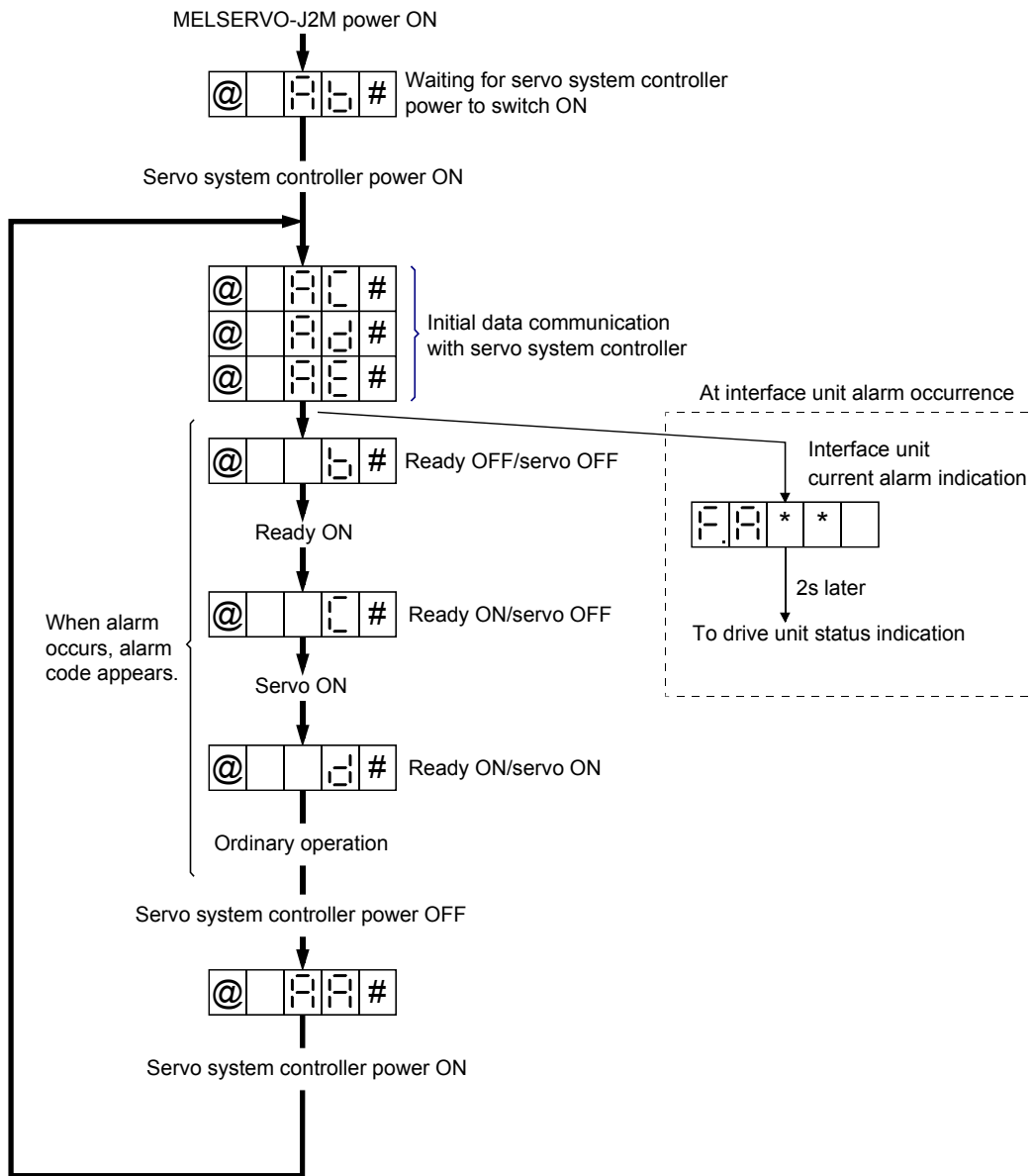


Pressing the "MODE" button in the automatic scroll mode for more than 2s switches to the interface-related display mode in which the data of the interface unit appears. (Refer to Section 4.2)

4. OPERATION AND DISPLAY

4.1.1 Display sequence

@ in the diagram denotes the slot number of the base unit and # the axis number of the drive unit.



4. OPERATION AND DISPLAY

(1) Indication list

(Note 1) Indication	Status	Description
@ Ab#	Initializing	MELSERVO-J2M was switched on when power to the servo system controller is off.
@ AA#	Initializing	<ul style="list-style-type: none"> ▪ Power to the servo system controller was switched off during power-on of MELSERVO-J2M. ▪ The axis No. set to the servo system controller does not match the axis No. set with IFU parameter No.11 to No.18. ▪ MELSERVO-J2M fault occurred or an error took place in communication with the servo system controller. In this case, the indication changes: "Ab" → "AC" → "Ad" → "Ab" ▪ The servo system controller is faulty.
@ AC#	Initializing	Communication started between the servo system controller and MELSERVO-J2M.
@ Ad#	Initializing	The initial parameters from the servo system controller were received.
@ AE#	Initialize completion	Initial data communication with the servo system controller was completed.
@ b#	Ready OFF	The ready off signal from the servo system controller was received.
@ C#	Servo OFF	The ready off signal from the servo system controller was received.
@ d#	Servo ON	The ready off signal from the servo system controller was received.
(Note 2) @A**#	Alarm · Warning	The alarm No./warning No. that occurred is displayed. (Refer to Section 9.1.)
@T b#. @T c#. @T d#.	(Note 3) Test operation mode	It is a state of the test operation mode with the MR Configurator (servo configuration software). JOG operation, positioning operation, programmed operation, DO forced output, motor-less operation.

Note 1. @ denotes the slot number of the base unit and # the axis number of the drive unit.

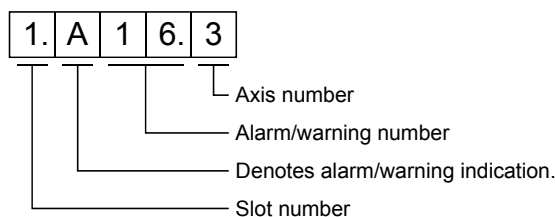
2. ** indicates the warning/alarm No.

4.1.2 If alarm/warning occurs

(1) If alarm/warning occurs in drive unit

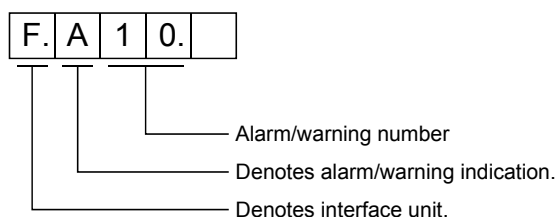
An alarm/warning which occurred in the drive unit is represented by the following indication.

The following indication example assumes that an encoder error (A.16) occurred in the drive unit of axis 3 installed on slot 1. During alarm occurrence, the decimal points in the fifth and second digits flicker.



(2) If alarm/warning occurs in interface unit

An alarm/warning which occurred in the interface unit is represented by the following indication. The following indication example assumes that interface unit undervoltage (A.10) occurred. During alarm occurrence, the decimal points in the fifth and second digits flicker.

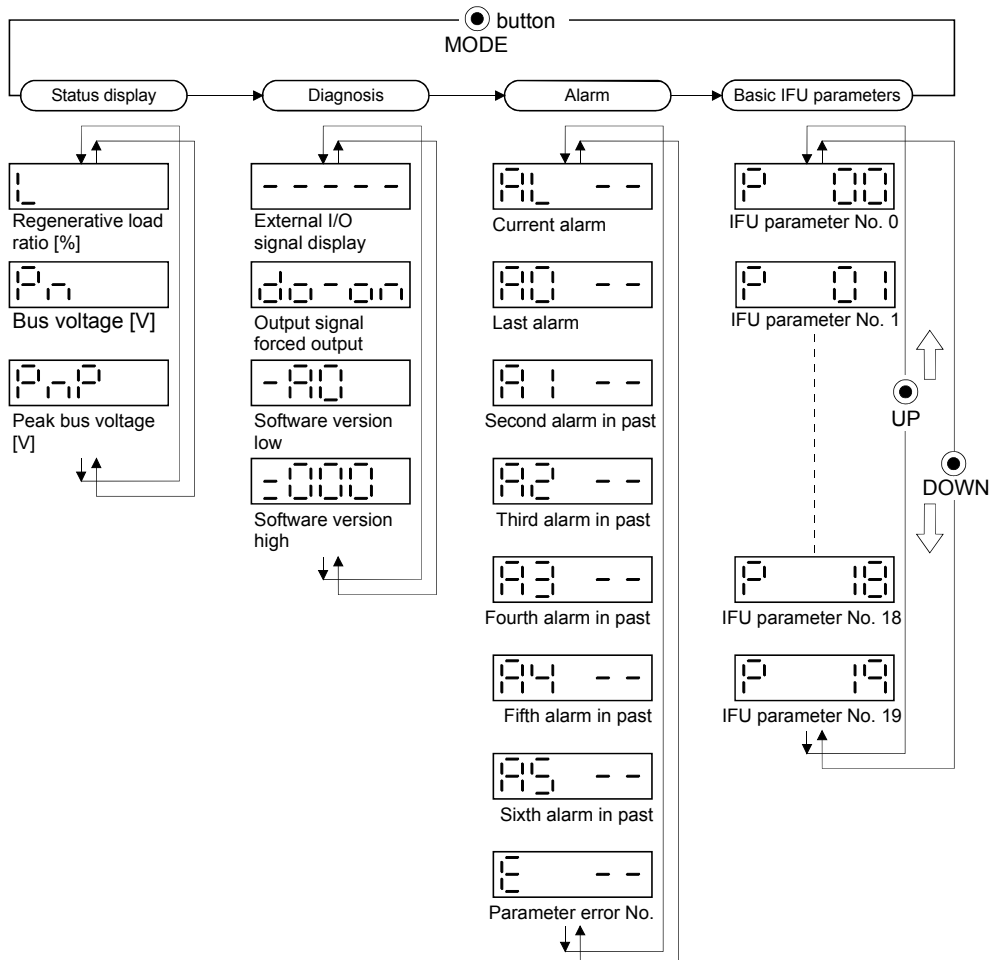


4. OPERATION AND DISPLAY

4.2 Status display mode of interface unit

4.2.1 Display flowchart

Use the display (5-digit, 7-segment LED) on the front panel of the interface unit for status display, parameter setting, etc. Set the parameters before operation, diagnose an alarm, confirm external sequences, and/or confirm the operation status. The unit is in the automatic scroll mode at power-on. Press the "MODE" button for more than 2s to change the display before starting operation. Press the "MODE" "UP" or "DOWN" button once to move to the next screen.



4. OPERATION AND DISPLAY

4.2.2 Status display of interface unit

MELSERVO-J2M status during operation is shown on the 5-digit, 7-segment LED display. Press the "UP" or "DOWN" button to change display data as desired. When the required data is selected, the corresponding symbol appears. Press the "SET" button to display its data.

(1) Display examples

The following table lists display examples:

Item	Status	Displayed data				
		Interface unit display				
Regenerative load ratio	60%				60	
Bus voltage	270V			270		
Peak bus voltage	350V			350		

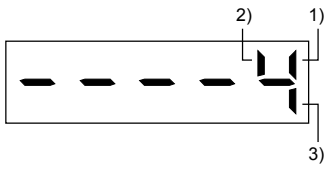
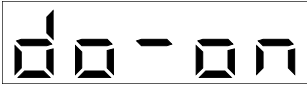


(2) Status display list

The following table lists the servo statuses that may be shown: Refer to Appendix 1 for the measurement point.

Name	Symbol	Unit	Description	Display range
Regenerative load ratio	L	%	The ratio of regenerative power to permissible regenerative power is displayed in %.	0 to 100
Bus voltage	Pn	V	The voltage (across P-N) of the main circuit converter is displayed.	0 to 450
Peak bus voltage	PnP	V	Shows the maximum voltage of the main circuit converter (across P-N). The maximum value during past 15s is displayed. If there is a difference of 40V or more between the bus voltage and peak bus voltage during normal operation, use the regenerative brake option.	0 to 450

4. OPERATION AND DISPLAY

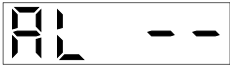
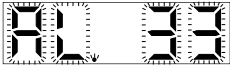








4.2.3 Diagnostic mode of interface unit

Name	Display	Description
External I/O signal display		<p>Shows the ON/OFF states of the external I/O signals and whether a forced stop command from the servo system controller is present or not.</p> <p>1) Forced stop command from servo system controller Absent: On Present: Off</p> <p>2) Forced stop (EM1) ON: On OFF: Off</p> <p>3) Electromagnetic brake interlock (MBR) ON: On OFF: Off</p>
Output signal forced output		<p>The digital output signal can be forced on/off. For more information, refer to section 4.2.6.</p>
Software version low		<p>Indicates the version of the software.</p>
Software version high		<p>Indicates the system number of the software.</p>

4. OPERATION AND DISPLAY

4.2.4 Alarm mode of interface unit

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

Name	Display	Description
Current alarm		Indicates no occurrence of an alarm.
		Indicates the occurrence of overvoltage (A.33). Flickers at occurrence of the alarm.
Alarm history		Indicates that the last alarm is Multiple axis overload (A.53).
		Indicates that the second alarm in the past is overvoltage (A.33).
		Indicates that the third alarm in the past is undervoltage (A.10).
		Indicates that the fourth alarm in the past is overspeed (A.31).
		Indicates that there is no fifth alarm in the past.
		Indicates that there is no sixth alarm in the past.
Parameter error No.		Indicates no occurrence of parameter error.
		Indicates that the data of parameter No. 1 is faulty.

Functions at occurrence of an alarm

- (1) Any mode screen displays the current alarm.
- (2) Even during alarm occurrence, the other screen can be viewed by pressing the button in the operation area. At this time, the decimal point in the fourth digit remains flickering.
- (3) For any alarm, remove its cause and clear it in any of the following:
 - (a) Switch power OFF, then ON.
 - (b) Press the "SET" button on the current alarm screen.
 - (c) Turn on the alarm reset (RES) methods (for clearable alarms, refer to Section 9.1).
- (4) Use IFU parameter No. 16 to clear the alarm history.
- (5) Pressing "SET" button on the alarm history display screen for 2s or longer shows the following detailed information display screen. Note that this is provided for maintenance by the manufacturer.



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

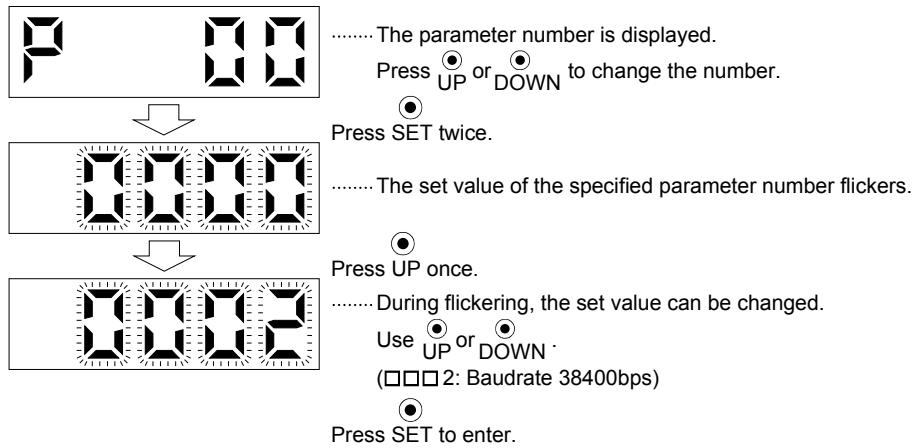
4. OPERATION AND DISPLAY

4.2.5 Interface unit parameter mode

The parameters whose abbreviations are marked* are made valid by changing the setting and then switching power off once and switching it on again. Refer to Section 5.2.2.

The following example shows the operation procedure performed after power-on to change the serial communication baudrate (IFU parameter No. 0) to 38400bps.

Using the "MODE" button, show the basic parameter screen.



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

When changing the parameter No. 0 setting, change its set value, then switch power off once and switch it on again to make the new value valid.

4. OPERATION AND DISPLAY

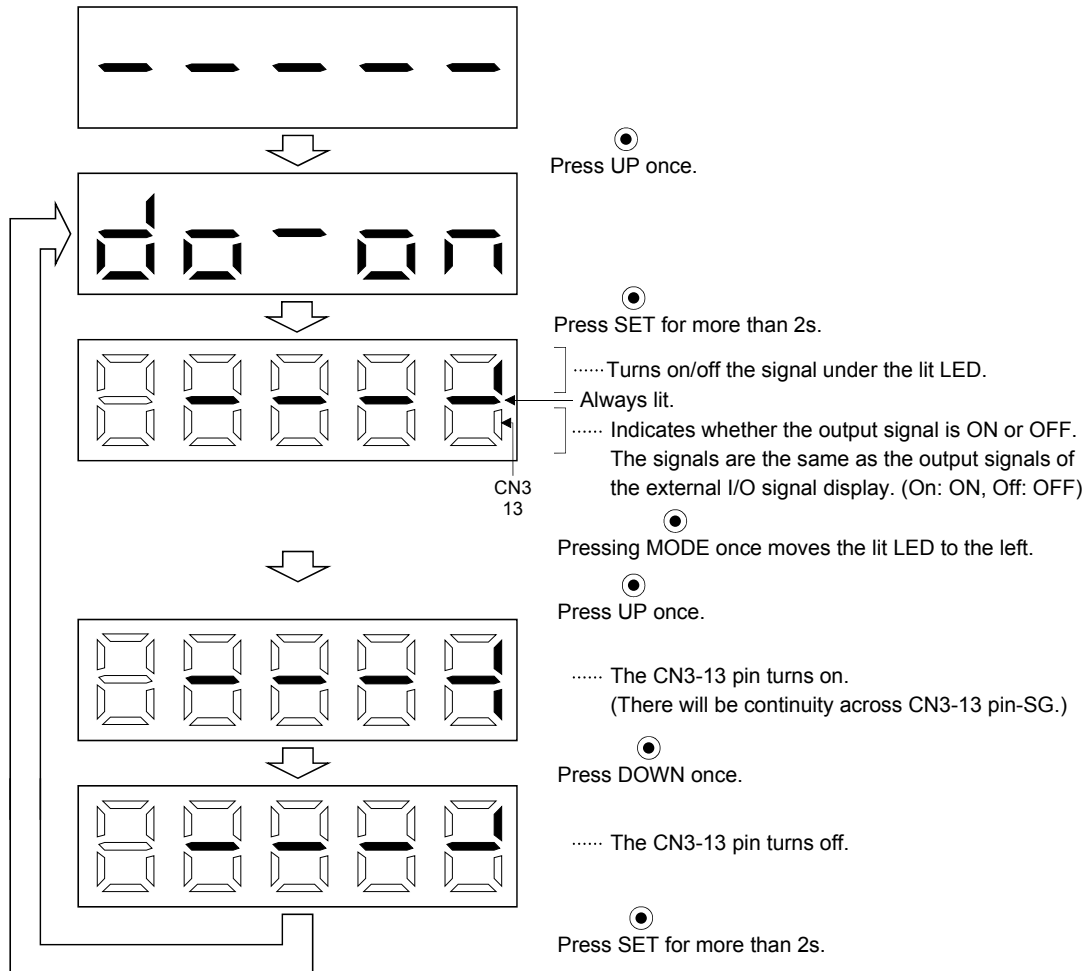
4.2.6 Output signal (DO) forced output

POINT	
	▪ This function is available during test operation.

The output signal can be forced on/off independently of the servo status. This function is used for output signal wiring check, etc. This operation must be performed in the servo off state.

Call the display screen shown after power-on.

Using the "MODE" button, show the diagnostic screen.



5. PARAMETERS

5. PARAMETERS



CAUTION

- Never adjust or change the parameter values extremely as it will make operation instable.

POINT

- When MELSERVO-J2M is connected with the servo system controller, the parameters are set to the values of the servo system controller. Switching power off, then on makes the values set on the MR Configurator (servo configuration software) invalid and the servo system controller values valid.
- In the maker setting parameters, do not set any values other than the initial values.
- Setting may not be made to some parameters and ranges depending on the model or version of the servo system controller. For details, refer to the servo system controller user's manual.

The IFU and DRU parameters can be set in the following methods.

Parameters	Setting Method
IFU parameters	Pushbuttons in interface unit operation section MR Configurator (servo configuration software)
DRU parameters	MR Configurator (servo configuration software) Servo system controller

5.1 Drive unit

5.1.1 Parameter write inhibit

POINT

- When setting the parameter values from the servo system controller, the DRU parameter No. 40 setting need not be changed.

In this drive unit, the parameters are classified into the basic DRU parameters (No. 1 to 11), adjustment DRU parameters (No. 12 to 26) and expansion DRU parameters (No. 27 to 40) according to their safety aspects and frequencies of use. The values of the basic DRU parameters may be set/changed by the customer, but those of the adjustment and expansion DRU parameters cannot. When in-depth adjustment such as gain adjustment is required, change the DRU parameter No. 40 value to make all parameters accessible. DRU parameter No. 40 is made valid by switching power off, then on after setting its value.

The following table indicates the parameters which are enabled for reference and write by DRU parameter No. 40 setting.

Setting	Operation	Operation from controller	Operation from MR Configurator (servo configuration software)
0000(initial value)	Reference	DRU parameter No.1 to 39	DRU parameter No.1 to 11 ▪ 40
	Write		
000A	Reference	DRU parameter No.1 to 39	DRU parameter No.40
	Write		
000C	Reference	DRU parameter No.1 to 39	DRU parameter No.1 to 40
	Write		DRU parameter No.1 to 11 ▪ 40
000E	Reference	DRU parameter No.1 to 39	DRU parameter No.1 to 40
	Write		
100E	Reference	DRU parameter No.1 to 39	DRU parameter No.1 to 40
	Write		DRU parameter No.40

5. PARAMETERS

5.1.2 Lists

POINT
<ul style="list-style-type: none"> For any DRU parameter whose symbol is preceded by*, set the DRU parameter value and switch power off once, then switch it on again to make that parameter setting valid. The parameter is set when communication between the servo system controller and servo amplifier is established (b* is displayed). After that, power the servo amplifier off once and then on again.

(1) Item list

Classification	No.	Symbol	Name	(Note) Initial Value	Unit	Customer setting
Basic parameters	1	*AMS	Amplifier setting	0000		
	2	*REG	Regenerative brake resistor	0000		
	3		For automatic setting by servo system controller	0080		
	4			000		
	5			1		
	6	*FBP		Feedback pulse number	0	
	7	*POL	Rotation direction selection	0		
	8	ATU	Auto tuning	0001		
	9	RSP	Servo response	0005		
	10	TLP	Forward rotation torque limit	300	%	
	11	TLN	Reverse rotation torque limit	300	%	
Adjustment parameters	12	GD2	Ratio of load inertia to servo motor inertia (load inertia ratio)	7.0	times	
	13	PG1	Position control gain 1	35	rad/s	
	14	VG1	Speed control gain 1	177	rad/s	
	15	PG2	Position control gain 2	35	rad/s	
	16	VG2	Speed control gain 2	817	rad/s	
	17	VIC	Speed integral compensation	48	ms	
	18	NCH	Machine resonance suppression filter 1 (Notch filter)	0000		
	19	FFC	Feed forward gain	0	%	
	20	INP	In-position range	100	pulse	
	21	MBR	Electromagnetic brake sequence output	0	ms	
	22		For manufacturer setting	0001		
	23	*OP1	Optional function 1	0000		
	24	*OP2	Optional function 2	0000		
	25	LPF	Low-pass filter/adaptive vibration suppression control	0000		
Expansion parameters	26		For manufacturer setting	0		
	27			0		
	28			0		
	29			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 control switch-over position droop	0	pulse	
	35		For manufacturer setting	0		
	36	VDC	Speed differential compensation	980		
	37		For manufacturer setting	0010		
	38	*ENR	Encoder output pulses	4000	pulse/rev	
	39		For manufacturer setting	0		
	40	*BLK	DRU parameter write inhibit	0000		

Note. Factory settings of the servo amplifier. Connecting it with the servo system controller and switching power on changes them to the settings of the servo system controller.

5. PARAMETERS

Classification	No.	Symbol	Name	(Note) Initial Value	Unit	Customer setting
Expansion DRU parameters 2	41		For manufacturer setting	500		
	42			0000		
	43			0111		
	44			20		
	45			50		
	46			0		
	47			0		
	48			0		
	49	*CDP	Gain changing selection	0000		
	50	CDS	Gain changing condition	10	(Note)	
	51	CDT	Gain changing time constant	1	ms	
	52	GD2B	Ratio of load inertia moment to Servo motor inertia moment 2	7.0	times	
	53	PG2B	Position control gain 2 changing ratio	100	%	
	54	VG2B	Speed control gain 2 changing ratio	100	%	
	55	VICB	Speed integral compensation changing ratio	100	%	
	56		For manufacturer setting	0000		
	57			0000		
	58			0000		
	59			0000		
	60	*OPC	Optional function C	0000		
	61	NH2	Machine resonance suppression filter 2	0000		
	62		For manufacturer setting	0000		
	63			400		
	64			100		
	65			1		
	66			1		
	67			0		
68	0					
69	0					
70	0					
71	0					
72	0					
73	0					
74	0					
75	0					

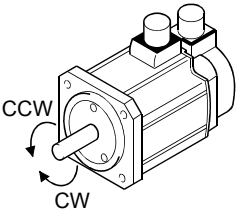
Note. Depends on the DRU parameter No. 49 setting.

5. PARAMETERS

(2) Details list

Classification	No.	Symbol	Name and Function	Initial Value	Unit	Setting Range											
Basic DRU parameters	1	*AMS	Amplifier setting Used to select the absolute position detection. <div style="border: 1px solid black; display: inline-block; padding: 2px;">0 0 0</div> Absolute position detection selection 0: Invalid (Used in incremental system.) 1: Valid (Used in absolute position detection system.)	0000		Refer to name and function column.											
	2	*REG	Regenerative brake resistor Used to select the regenerative brake option used. The values set to the drive units installed on the base unit should all be the same. <div style="border: 1px solid black; display: inline-block; padding: 2px;">0 0</div> Regenerative selection brake option (The built-in regenerative brake resistor is used.) 00: Not used 06: MR-RB34 07: MR-RB54 10: MR-RB032 11: MR-RB14 <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p style="text-align: center;">POINT</p> <ul style="list-style-type: none"> • Wrong setting may cause the regenerative brake option to burn. • If the regenerative brake option selected is not for use with the drive unit, parameter error (A.37) occurs. </div>	0000		Refer to name and function column.											
	3		For automatic setting by servo system controller	0080													
	4		Automatically set from the servo system controller	0000													
	5			1													
	6	*FBP	Feedback pulse number Set the number of pulses per revolution in the controller side command unit. Information on the motor such as the feedback pulse value, present position, droop pulses and within-one-revolution position are derived from the values converted into the number of pulses set here. <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th style="width: 15%;">Setting</th> <th>Number of feedback pulses</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>16384</td> </tr> <tr> <td>1</td> <td>8192</td> </tr> <tr> <td>6</td> <td>32768</td> </tr> <tr> <td>7</td> <td>131072</td> </tr> <tr> <td>255</td> <td>Depending on the number of motor resolution pulses.</td> </tr> </tbody> </table> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p style="text-align: center;">POINT</p> <ul style="list-style-type: none"> • If the number of pulses set exceeds the actual motor resolution, the motor resolution is set automatically. </div>	Setting	Number of feedback pulses	0	16384	1	8192	6	32768	7	131072	255	Depending on the number of motor resolution pulses.	0	
Setting	Number of feedback pulses																
0	16384																
1	8192																
6	32768																
7	131072																
255	Depending on the number of motor resolution pulses.																

5. PARAMETERS

Classification	No.	Symbol	Name and Function	Initial Value	Unit	Setting Range																					
Basic DRU parameters	7	*POL	Rotation direction selection Used to select the rotation direction of the servo motor. 0: Forward rotation (CCW) with the increase of the positioning address. 1: Reverse rotation (CW) with the increase of the positioning address. <div style="text-align: center;">  </div>	0		Refer to name and function column.																					
	8	ATU	Auto tuning Used to select the gain adjustment mode of auto tuning. <div style="text-align: center;"> <table border="1" style="margin: 10px auto;"> <tr> <td style="width: 20px; text-align: center;">0</td> <td style="width: 20px; text-align: center;">0</td> <td style="width: 20px; text-align: center;">0</td> <td style="width: 20px;"></td> </tr> </table> <p>Gain adjustment mode selection (For details, refer to Section 6.1.1.)</p> <table border="1" style="margin: 10px auto;"> <thead> <tr> <th style="width: 10%;">Set value</th> <th style="width: 30%;">Gain adjustment mode</th> <th style="width: 60%;">Description</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0</td> <td>Interpolation mode</td> <td>Fixes position control gain 1 (parameter No. 13).</td> </tr> <tr> <td style="text-align: center;">1</td> <td>Auto tuning mode 1</td> <td>Ordinary auto tuning.</td> </tr> <tr> <td style="text-align: center;">3</td> <td>Auto tuning mode 2</td> <td>Fixes the load inertia moment ratio set in parameter No. 12. Response level setting can be changed.</td> </tr> <tr> <td style="text-align: center;">4</td> <td>Manual mode 1</td> <td>Simple manual adjustment.</td> </tr> <tr> <td style="text-align: center;">2</td> <td>Manual mode 2</td> <td>Manual adjustment of all gains.</td> </tr> </tbody> </table> </div>	0	0	0		Set value	Gain adjustment mode	Description	0	Interpolation mode	Fixes position control gain 1 (parameter No. 13).	1	Auto tuning mode 1	Ordinary auto tuning.	3	Auto tuning mode 2	Fixes the load inertia moment ratio set in parameter No. 12. Response level setting can be changed.	4	Manual mode 1	Simple manual adjustment.	2	Manual mode 2	Manual adjustment of all gains.	0001	
0	0	0																									
Set value	Gain adjustment mode	Description																									
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5. PARAMETERS

Classification	No.	Symbol	Name and Function	Initial Value	Unit	Setting Range																																				
Basic DRU parameters	9	RSP	<p>Servo response Used to select the response level of auto tuning.</p> <p><input type="text" value="0"/> <input type="text" value="0"/> <input type="text" value="0"/> <input type="text" value=""/></p> <p>Auto tuning response level selection</p> <table border="1"> <thead> <tr> <th>Set value</th> <th>Response level</th> <th>Machine resonance frequency guideline</th> </tr> </thead> <tbody> <tr><td>1</td><td rowspan="4">Low response</td><td>15Hz</td></tr> <tr><td>2</td><td>20Hz</td></tr> <tr><td>3</td><td>25Hz</td></tr> <tr><td>4</td><td>30Hz</td></tr> <tr><td>5</td><td rowspan="4">Middle response</td><td>35Hz</td></tr> <tr><td>6</td><td>45Hz</td></tr> <tr><td>7</td><td>55Hz</td></tr> <tr><td>8</td><td>70Hz</td></tr> <tr><td>9</td><td rowspan="4">High response</td><td>85Hz</td></tr> <tr><td>A</td><td>105Hz</td></tr> <tr><td>B</td><td>130Hz</td></tr> <tr><td>C</td><td>160Hz</td></tr> <tr><td>D</td><td>200Hz</td></tr> <tr><td>E</td><td>240Hz</td></tr> <tr><td>F</td><td>300Hz</td></tr> </tbody> </table> <ul style="list-style-type: none"> • If the machine hunts or generates large gear sound, decrease the set value. • To improve performance, e.g. shorten the settling time, increase the set value. 	Set value	Response level	Machine resonance frequency guideline	1	Low response	15Hz	2	20Hz	3	25Hz	4	30Hz	5	Middle response	35Hz	6	45Hz	7	55Hz	8	70Hz	9	High response	85Hz	A	105Hz	B	130Hz	C	160Hz	D	200Hz	E	240Hz	F	300Hz	0005		Refer to name and function column.
	Set value	Response level	Machine resonance frequency guideline																																							
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8		70Hz																																								
9	High response	85Hz																																								
A		105Hz																																								
B		130Hz																																								
C		160Hz																																								
D	200Hz																																									
E	240Hz																																									
F	300Hz																																									
	10	TLP	<p>Forward rotation torque limit Assume that the rated torque is 100[%]. Used to limit the torque in the forward rotation driving mode and reverse rotation regenerative mode. In other than the test operation mode on the MR Configurator (servo configuration software), the torque limit value on the servo system controller side is made valid.</p>	300	%	0 to 500																																				
	11	TLN	<p>Reverse rotation torque limit Assume that the rated torque is 100[%]. Used to limit the torque in the forward rotation driving mode and forward rotation regenerative mode. In other than the test operation mode on the MR Configurator (servo configuration software), the torque limit value on the servo system controller side is made valid.</p>	300	%	0 to 500																																				
Adjustment DRU parameters	12	GD2	<p>Ratio of load inertia moment to servo motor inertia moment Used to set the ratio of the load inertia moment to the servo motor shaft inertia moment. When auto tuning mode 1 and interpolation mode is selected, the result of auto tuning is automatically used. (Refer to section 6.1.1) In this case, it varies between 0 and 1000.</p>	7.0	times	0.0 to 300.0																																				
	13	PG1	<p>Position loop gain 1 Used to set the gain of position loop 1. Increase the gain to improve trackability performance in response to the position command. When auto turning mode 1,2 is selected, the result of auto turning is automatically used.</p>	35	rad/s	4 to 2000																																				

5. PARAMETERS

Classification	No.	Symbol	Name and Function	Initial Value	Unit	Setting Range																																																																																				
Adjustment DRU parameters	14	VG1	Speed loop gain 1 Normally this parameter setting need not be changed. Higher setting increases the response level but is liable to generate vibration and/or noise. When auto tuning mode 1,2 and interpolation mode is selected, the result of auto tuning is automatically used.	177	rad/s	20 to 5000																																																																																				
	15	PG2	Position loop gain 2 Used to set the gain of the position loop. Set this parameter to increase position response to load disturbance. Higher setting increases the response level but is liable to generate vibration and/or noise. When auto tuning mode 1 • 2, manual mode and interpolation mode is selected, the result of auto tuning is automatically used.	35	rad/s	1 to 1000																																																																																				
	16	VG2	Speed loop gain 2 Set this parameter when vibration occurs on machines of low rigidity or large backlash. Higher setting increases the response level but is liable to generate vibration and/or noise. When auto tuning mode 1 • 2 and interpolation mode is selected, the result of auto tuning is automatically used.	817	rad/s	20 to 20000																																																																																				
	17	VIC	Speed integral compensation Used to set the constant of integral compensation. When auto tuning mode 1 • 2 and interpolation mode is selected, the result of auto tuning is automatically used.	48	ms	1 to 1000																																																																																				
	18	NCH	Machine resonance suppression filter 1 (Notch filter) Used to select the machine resonance suppression filter. (Refer to Section 7.2.) <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px; margin-right: 5px;">0</div> <div style="margin-left: 10px;"> <table border="1" style="border-collapse: collapse; text-align: center;"> <thead> <tr> <th>Setting</th> <th>Frequency</th> <th>Setting</th> <th>Frequency</th> <th>Setting</th> <th>Frequency</th> <th>Setting</th> <th>Frequency</th> </tr> </thead> <tbody> <tr><td>00</td><td>Invalid</td><td>08</td><td>562.5</td><td>10</td><td>281.3</td><td>18</td><td>187.5</td></tr> <tr><td>01</td><td>4500</td><td>09</td><td>500</td><td>11</td><td>264.7</td><td>19</td><td>180</td></tr> <tr><td>02</td><td>2250</td><td>0A</td><td>450</td><td>12</td><td>250</td><td>1A</td><td>173.1</td></tr> <tr><td>03</td><td>1500</td><td>0B</td><td>409.1</td><td>13</td><td>236.8</td><td>1B</td><td>166.7</td></tr> <tr><td>04</td><td>1125</td><td>0C</td><td>375</td><td>14</td><td>225</td><td>1C</td><td>160.1</td></tr> <tr><td>05</td><td>900</td><td>0D</td><td>346.2</td><td>15</td><td>214.3</td><td>1D</td><td>155.2</td></tr> <tr><td>06</td><td>750</td><td>0E</td><td>321.4</td><td>16</td><td>204.5</td><td>1E</td><td>150</td></tr> <tr><td>07</td><td>642.9</td><td>0F</td><td>300</td><td>17</td><td>195.7</td><td>1F</td><td>145.2</td></tr> </tbody> </table> </div> </div> <div style="margin-left: 40px;"> <p>Notch frequency selection</p> <table border="1" style="border-collapse: collapse; text-align: center;"> <thead> <tr> <th>Setting</th> <th>Depth</th> <th>Gain</th> </tr> </thead> <tbody> <tr><td>0</td><td rowspan="2">Deep</td><td>-40dB</td></tr> <tr><td>1</td><td>-14dB</td></tr> <tr><td>2</td><td rowspan="2">Shallow</td><td>-8dB</td></tr> <tr><td>3</td><td>-4dB</td></tr> </tbody> </table> </div>	Setting	Frequency	Setting	Frequency	Setting	Frequency	Setting	Frequency	00	Invalid	08	562.5	10	281.3	18	187.5	01	4500	09	500	11	264.7	19	180	02	2250	0A	450	12	250	1A	173.1	03	1500	0B	409.1	13	236.8	1B	166.7	04	1125	0C	375	14	225	1C	160.1	05	900	0D	346.2	15	214.3	1D	155.2	06	750	0E	321.4	16	204.5	1E	150	07	642.9	0F	300	17	195.7	1F	145.2	Setting	Depth	Gain	0	Deep	-40dB	1	-14dB	2	Shallow	-8dB	3	-4dB	0	
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3		-4dB																																																																																								
19	FFC	Feed forward gain Set the feed forward gain. When the setting is 100%, the droop pulses during operation at constant speed are nearly zero. However, sudden acceleration/deceleration will increase the overshoot. As a guideline, when the feed forward gain setting is 100%, set 1s or more as the acceleration/deceleration time constant up to the rated speed.	0	%	0 to 100																																																																																					

5. PARAMETERS

Classification	No.	Symbol	Name and Function	Initial Value	Unit	Setting Range
Adjustment DRU parameters	20	INP	<p>In-position range</p> <p>Used to set the droop pulse range in which the in-position (INP) will be output to the controller. Make setting in the feedback pulse unit (parameter No. 6).</p> <p>For example, when you want to set $\pm 10\mu\text{m}$ in the conditions that the ballscrew is direct coupled, the lead is 10mm (0.39inch), and the feedback pulses are 8192 pulses/rev (parameter No. 6 : 1), set "8" as indicated by the following expression:</p> $\frac{10 \times 10^{-6}}{10 \times 10^{-3}} \cdot 8192 = 8.192 \approx 8$	100	pulse	0 to 50000
	21	MBR	<p>Electromagnetic brake sequence output</p> <p>Used to set a time delay (Tb) from when the electromagnetic brake interlock (MBR) turns off until the base circuit is shut off.</p>	100	ms	0 to 1000
	22		<p>For manufacturer setting</p> <p>Do not change this value by any means.</p>	0001		
	23	*OP1	<p>Optional function 1</p> <p>Used to make the servo forced stop function invalid.</p> <div style="border: 1px solid black; padding: 5px; display: inline-block; margin-bottom: 10px;"> 0 0 </div> <p style="margin-left: 40px;">— Servo forced stop selection 0: Valid (Use the forced stop (EM1).) 1: Invalid (Do not use the forced stop (EM1).) Automatically switched on internally</p> <p style="margin-left: 40px;">— Encoder cable selection 0: 2-wire type (when MR-JCCBL □ M-L/H is used) 1: 4-wire type (when MR-JC4CBL □ M-H is used)</p>	0000		Refer to name and function column.
	24	*OP2	<p>Optional function 2</p> <p>Used to select slight vibration suppression control and motor-less operation</p> <div style="border: 1px solid black; padding: 5px; display: inline-block; margin-bottom: 10px;"> 0 0 </div> <p style="margin-left: 40px;">— Slight vibration suppression control selection Made valid when auto tuning selection is set to "0002" in parameter No.8. Used to suppress vibration at a stop. 0: Invalid 1: Valid</p> <p style="margin-left: 40px;">— Motor-less operation selection 0: Invalid 1: Makes motor-less operation valid.</p> <p style="margin-left: 40px;">When motor-less operation is made valid, signal output or status display can be provided as if the servo motor is running actually in response to the servo system controller command, without the servo motor being connected. Motor-less operation is performed as in the motor-less operation using the MR Configurator (servo configuration software). (Refer to Section 5.2.4.)</p>	0000		Refer to name and function column.

5. PARAMETERS

Classification	No.	Symbol	Name and Function	Initial Value	Unit	Setting Range
Adjustment DRU parameters	25	LPF	<p>Low-pass filter/adaptive vibration suppression control Used to select the low-pass filter and adaptive vibration suppression control. (Refer to Chapter 7.)</p> <div style="border: 1px solid black; display: inline-block; padding: 2px;"> 0 </div> <p> — Low-pass filter selection 0: Valid (Automatic adjustment) 1: Invalid When you choose "valid", $\frac{VG2 \text{ setting} \times 10}{2\pi(1+GD2 \text{ setting} \times 0.1)}$ [Hz] bandwidth filter is set automatically. </p> <p> — Adaptive vibration suppression control selection 0: Invalid 1: Valid Machine resonance frequency is always detected and the filter is generated in response to resonance to suppress machine vibration. 2: Held The characteristics of the filter generated so far are held, and detection of machine resonance is stopped. </p> <p> — Adaptive vibration suppression control sensitivity selection Used to select the sensitivity of machine resonance detection. 0: Normal 1: Large sensitivity </p>	0000		Refer to name and function column.
	26		<p>For manufacturer setting Do not change this value by any means.</p>	0		
	27		<p>For manufacturer setting Do not change this value by any means.</p>	0		
Expansion DRU parameters	28		<p>Do not change this value by any means.</p>	0		
	29			0001		
	30	ZSP	<p>Zero speed Used to set the output range of the zero speed (ZSP).</p>	50	r/min	0 to 10000
	31	ERZ	<p>Error excessive alarm level Used to set the output range of the error excessive alarm.</p>	80	0.1rev	0 to 1000
	32	OP5	<p>Optional function 5 Used to select PI-PID control switch-over.</p> <div style="border: 1px solid black; display: inline-block; padding: 2px;"> 0 0 0 </div> <p> — PI-PID control switch over selection 0: PI control is always valid. 1: Droop-based switching is valid in position control mode (refer to DRU parameter No. 34). 2: PID control is always valid. </p>	0000		Refer to name and function column.

5. PARAMETERS

Classification	No.	Symbol	Name and Function	Initial Value	Unit	Setting Range			
Expansion DRU parameters	33	*OP6	Option function 6 Used to select the serial communication baudrate, serial communication response delay time setting and encoder output pulse setting. <div style="border: 1px solid black; display: inline-block; padding: 2px;"> <table style="border-collapse: collapse;"> <tr> <td style="border: 1px solid black; width: 20px; text-align: center;">0</td> <td style="border: 1px solid black; width: 20px; text-align: center;">0</td> <td style="border: 1px solid black; width: 20px; text-align: center;">0</td> </tr> </table> </div> Encoder output pulse setting selection (refer to parameter No.38) 0: Output pulse setting 1: Division ratio setting	0	0	0	0000		Refer to name and function column.
	0	0	0						
	34	VPI	PI-PID control switch-over position droop Used to set the position droop value (number of pulses) at which PI control is switched over to PID control. Set "0001" in DRU parameter No. 32 to make this function valid.	0	pulse	0 to 50000			
	35		For manufacturer setting Do not change this value by any means.	0					
	36	VDC	Speed differential compensation Used to set the differential compensation.	980		0 to 1000			
	37		For manufacturer setting	0010					
38	*ENR	Encoder output pulses <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;"> POINT • The MR-J2M-D01 extension IO unit is required to output the encoder pulses (A phase, B phase, Z phase). </div> Used to set the encoder pulses (A-phase, B-phase) output by the enhancing IO unit. Set the value 4 times greater than the A-phase and B-phase pulses. You can use DRU parameter No.33 to choose the output pulse setting or output division ratio setting. The number of A-phase and B-phase pulses actually output is 1/4 times greater than the preset number of pulses. The maximum output frequency is 1.3Mpps (after multiplication by 4). Use this parameter within this range. • For output pulse designation Set "0□□□" (initial value) in DRU parameter No.33. Set the number of pulses per servo motor revolution. Output pulse = set value [pulses/rev] At the setting of 5600, for example, the actually output A-phase and B-phase pulses are as indicated below: $\text{A-phase and B-phase output pulses} = \frac{5600}{4} = 1400[\text{pulse}]$ • For output division ratio setting Set "1□□□" in DRU parameter No.33. The number of pulses per servo motor revolution is divided by the set value. $\text{Output pulse} = \frac{\text{Resolution per servo motor revolution}}{\text{Set value}} [\text{pulses/rev}]$ At the setting of 8, for example, the actually output A-phase and B-phase pulses are as indicated below: $\text{A-phase and B-phase output pulses} = \frac{131072}{8} \cdot \frac{1}{4} = 4096[\text{pulse}]$	4000	pulse/rev	1 to 65535				

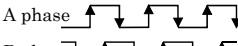
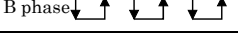
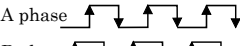
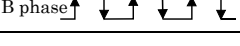

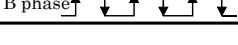
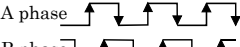
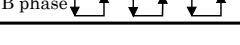
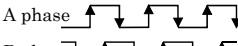
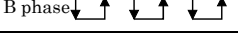
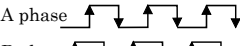
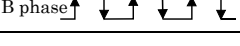

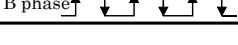
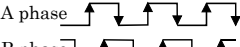
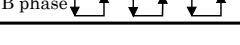
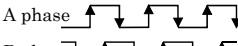
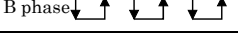
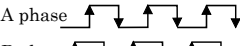
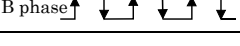

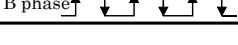
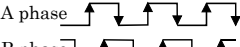
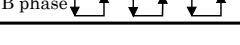
5. PARAMETERS

Classification	No.	Symbol	Name and Function	Initial Value	Unit	Setting Range																															
Expansion DRU parameters	39		For manufacturer setting Do not change this value by any means.	0																																	
	40	*BLK	DRU Parameter blocks write inhibit	0000		Refer to name and function column.																															
			<table border="1"> <thead> <tr> <th>Setting</th> <th>Operation</th> <th>Operation from controller</th> <th>Operation from MR Configurator (servo configuration software)</th> </tr> </thead> <tbody> <tr> <td rowspan="2">0000 (initial value)</td> <td>Reference</td> <td rowspan="2">DRU parameter No.1 to 39</td> <td rowspan="2">DRU parameter No.1 to 11 ▪ 40</td> </tr> <tr> <td>Write</td> </tr> <tr> <td rowspan="2">000A</td> <td>Reference</td> <td rowspan="2">DRU parameter No.1 to 39</td> <td rowspan="2">DRU parameter No.40</td> </tr> <tr> <td>Write</td> </tr> <tr> <td rowspan="2">000C</td> <td>Reference</td> <td rowspan="2">DRU parameter No.1 to 39</td> <td>DRU parameter No.1 to 40</td> </tr> <tr> <td>Write</td> <td>DRU parameter No.1 to 11 ▪ 40</td> </tr> <tr> <td rowspan="2">000E</td> <td>Reference</td> <td rowspan="2">DRU parameter No.1 to 39</td> <td rowspan="2">DRU parameter No.1 to 40</td> </tr> <tr> <td>Write</td> </tr> <tr> <td rowspan="2">100E</td> <td>Reference</td> <td rowspan="2">DRU parameter No.1 to 39</td> <td rowspan="2">DRU parameter No.1 to 40</td> </tr> <tr> <td>Write</td> <td>DRU parameter No.40</td> </tr> </tbody> </table>	Setting	Operation	Operation from controller	Operation from MR Configurator (servo configuration software)	0000 (initial value)	Reference	DRU parameter No.1 to 39	DRU parameter No.1 to 11 ▪ 40	Write	000A	Reference	DRU parameter No.1 to 39	DRU parameter No.40	Write	000C	Reference	DRU parameter No.1 to 39	DRU parameter No.1 to 40	Write	DRU parameter No.1 to 11 ▪ 40	000E	Reference	DRU parameter No.1 to 39	DRU parameter No.1 to 40	Write	100E	Reference	DRU parameter No.1 to 39	DRU parameter No.1 to 40	Write	DRU parameter No.40			
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	Write			DRU parameter No.40																																	

5. PARAMETERS

Class	No.	Symbol	Name and function	Initial value	Unit	Setting range
Expansion DRU parameters 2	41		For manufacturer setting Do not change this value by any means.	500		
	42			0000		
	43			0111		
	44			20		
	45			50		
	46			0		
	47			0		
	48			0		
	49	*CDP	Gain changing selection Used to select the gain changing condition. (Refer to Section 7.5.) <div style="border: 1px solid black; display: inline-block; padding: 2px;">0 0 0 </div> Gain changing selection Gains are changed in accordance with the settings of parameters No. 52 to 55 under any of the following conditions: 0: Invalid 1: Control command from controller 2: Command frequency is equal to higher than parameter No. 50 setting 3: Droop pulse value is equal to higher than parameter No. 50 setting 4: Servo motor speed is equal to higher than parameter No. 50 setting	0000		Refer to Name and function column
	50	CDS	Gain changing condition Used to set the value of gain changing condition (command frequency, droop pulses, servo motor speed) selected in parameter No. 49. The set value unit changes with the changing condition item. (Refer to Section 7.5.)	10	kpps pulse r/min	0 to 9999
	51	CDT	Gain changing time constant Used to set the time constant at which the gains will change in response to the conditions set in parameters No. 49 and 50. (Refer to Section 7.5.)	1	ms	0 to 100
	52	GD2B	Ratio of load inertia moment to servo motor inertia moment 2 Used to set the ratio of load inertia moment to servo motor inertia moment when gain changing is valid.	7.0	times	0 to 300.0
	53	PG2B	Position control gain 2 changing ratio Used to set the ratio of changing the position control gain 2 when gain changing is valid. Made valid when auto tuning is invalid.	100	%	10 to 200
	54	VG2B	Speed control gain 2 changing ratio Used to set the ratio of changing the speed control gain 2 when gain changing is valid. Made valid when auto tuning is invalid.	100	%	10 to 200
	55	VICB	Speed integral compensation changing ratio Used to set the ratio of changing the speed integral compensation when gain changing is valid. Made valid when auto tuning is invalid.	100	%	50 to 1000
56		For manufacturer setting Do not change this value by any means.	0000			
57			0000			
58			0000			
59			0000			

5. PARAMETERS

Class	No.	Symbol	Name and function	Initial value	Unit	Setting range																																																																																							
Expansion DRU parameters 2	60	*OPC	<p>Optional function C Use to select the encoder output pulse direction.</p> <div style="border: 1px solid black; display: inline-block; padding: 2px;">0 0 0</div> <p>Encoder pulse output phase changing Changes the phases of A, B-phase encoder pulses output .</p> <table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th rowspan="2">Set value</th> <th colspan="2">Servo motor rotation direction</th> </tr> <tr> <th>CCW</th> <th>CW</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>A phase  B phase </td> <td>A phase  B phase </td> </tr> <tr> <td>1</td> <td>A phase  B phase </td> <td>A phase  B phase </td> </tr> </tbody> </table>	Set value	Servo motor rotation direction		CCW	CW	0	A phase  B phase 	A phase  B phase 	1	A phase  B phase 	A phase  B phase 	0000		Refer to Name and function column																																																																												
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1	A phase  B phase 	A phase  B phase 																																																																																											
	61	NH2	<p>Machine resonance suppression filter 2 Used to selection the machine resonance suppression filter. (Refer to Section 7.2.)</p> <div style="border: 1px solid black; display: inline-block; padding: 2px;">0</div> <p>Notch frequency selection Set "00" when you have set adaptive vibration suppression control to be "valid" or "held" (parameter No. 25: $\square 1 \square \square$ or $\square 2 \square \square$).</p> <table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th>Setting value</th> <th>Frequency</th> <th>Setting value</th> <th>Frequency</th> <th>Setting value</th> <th>Frequency</th> <th>Setting value</th> <th>Frequency</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>Invalid</td> <td>08</td> <td>562.5</td> <td>10</td> <td>281.3</td> <td>18</td> <td>187.5</td> </tr> <tr> <td>01</td> <td>4500</td> <td>09</td> <td>500</td> <td>11</td> <td>264.7</td> <td>19</td> <td>180</td> </tr> <tr> <td>02</td> <td>2250</td> <td>0A</td> <td>450</td> <td>12</td> <td>250</td> <td>1A</td> <td>173.1</td> </tr> <tr> <td>03</td> <td>1500</td> <td>0B</td> <td>409.1</td> <td>13</td> <td>236.8</td> <td>1B</td> <td>166.7</td> </tr> <tr> <td>04</td> <td>1125</td> <td>0C</td> <td>375</td> <td>14</td> <td>225</td> <td>1C</td> <td>160.1</td> </tr> <tr> <td>05</td> <td>900</td> <td>0D</td> <td>346.2</td> <td>15</td> <td>214.3</td> <td>1D</td> <td>155.2</td> </tr> <tr> <td>06</td> <td>750</td> <td>0E</td> <td>321.4</td> <td>16</td> <td>204.5</td> <td>1E</td> <td>150</td> </tr> <tr> <td>07</td> <td>642.9</td> <td>0F</td> <td>300</td> <td>17</td> <td>195.7</td> <td>1F</td> <td>145.2</td> </tr> </tbody> </table> <p>Notch depth selection</p> <table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th>Setting value</th> <th>Depth</th> <th>Gain</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Deep</td> <td>-40dB</td> </tr> <tr> <td>1</td> <td>to</td> <td>-14dB</td> </tr> <tr> <td>2</td> <td>Shallow</td> <td>-8dB</td> </tr> <tr> <td>3</td> <td></td> <td>-4dB</td> </tr> </tbody> </table>	Setting value	Frequency	Setting value	Frequency	Setting value	Frequency	Setting value	Frequency	00	Invalid	08	562.5	10	281.3	18	187.5	01	4500	09	500	11	264.7	19	180	02	2250	0A	450	12	250	1A	173.1	03	1500	0B	409.1	13	236.8	1B	166.7	04	1125	0C	375	14	225	1C	160.1	05	900	0D	346.2	15	214.3	1D	155.2	06	750	0E	321.4	16	204.5	1E	150	07	642.9	0F	300	17	195.7	1F	145.2	Setting value	Depth	Gain	0	Deep	-40dB	1	to	-14dB	2	Shallow	-8dB	3		-4dB	0000		Refer to Name and function column
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2	Shallow	-8dB																																																																																											
3		-4dB																																																																																											

5. PARAMETERS

Class	No.	Symbol	Name and function	Initial value	Unit	Setting range
Expansion DRU parameters 2	62		For manufacturer setting Do not change this value by any means.	0000		
	63			400		
	64			100		
	65			1		
	66			1		
	67			0		
	68			0		
	69			0		
	70			0		
	71			0		
	72			0		
	73			0		
	74			0		
	75			0		

5. PARAMETERS

5.2 Interface unit

5.2.1 IFU parameter write inhibit

POINT
<ul style="list-style-type: none"> Use the unit operation section pushbutton switches or MR Configurator (servo configuration software) to set the IFU parameters of the interface unit. They cannot be set from the servo system controller.

Use the unit pushbutton switches or MR Configurator (servo configuration software) to set the interface unit parameters.

The following table indicates the IFU parameters which are made valid for reference and write by setting the IFU parameter No. 19.

Setting	Setting operation	Operation from unit operation section or MR Configurator (servo configuration software)
0000 (initial value)	Reference	IFU parameter No. 1 to 19
	Write	
000A	Reference	IFU parameter No. 19
	Write	

5.2.2 Lists

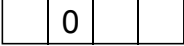
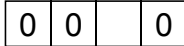
POINT
<ul style="list-style-type: none"> For any IFU parameter whose symbol is preceded by*, set the IFU parameter value and switch power off once, then switch it on again to make that parameter setting valid. The parameter is set when communication between the servo system controller and servo amplifier is established (b* is displayed). After that, power the servo amplifier off once and then on again.

(1) Item list

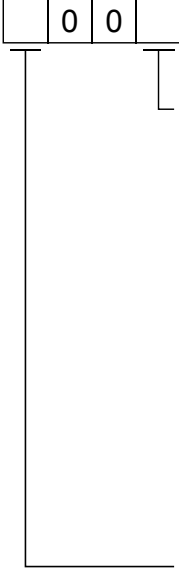
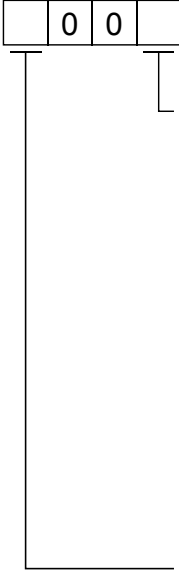
Classification	No.	Symbol	Name	Initial Value	Unit	Customer setting
Basic IFU parameters	0	*BPS	Serial communication baudrate selection, alarm history clear	0000		
	1	SIC	Serial communication time-out selection	0		
	2	*OP1	Function selection 1	0000		
	3	MD1	Analog monitor 1 output	0000		
	4	MD2	Analog monitor 2 output	0000		
	5	MD3	Analog monitor 3 output	0000		
	6	MO1	Analog monitor 1 offset	0	mV	
	7	MO2	Analog monitor 2 offset	0	mV	
	8	MO3	Analog monitor 3 offset	0	mV	
	9	*SSC	SSCNET type selection	0200		
	10	*OP2	Optional function 2	0020		
	11	*SL1	Slot 1 axis number selection	0000		
	12	*SL2	Slot 2 axis number selection	0001		
	13	*SL3	Slot 3 axis number selection	0002		
	14	*SL4	Slot 4 axis number selection	0003		
	15	*SL5	Slot 5 axis number selection	0004		
	16	*SL6	Slot 6 axis number selection	0005		
	17	*SL7	Slot 7 axis number selection	0006		
	18	*SL8	Slot 8 axis number selection	0007		
19	*BLK	IFU parameter write inhibit	0000			

5. PARAMETERS


(2) Details list

Classification	No.	Symbol	Name and Function	Initial Value	Unit	Setting Range
Basic IFU parameters	0	*BPS	<p>Serial communication function selection, alarm history clear Used to select the serial communication baudrate, select various communication conditions, and clear the alarm history.</p>  <p>Serial baudrate selection 0: 9600 [bps] 1: 19200[bps] 2: 38400[bps] 3: 57600[bps]</p> <p>Alarm history clear 0: Invalid 1: Valid When alarm history clear is made valid, the alarm history is cleared at next power-on. After the alarm history is cleared, the setting is automatically made invalid reset to "0".</p> <p>Serial communication response delay time 0: Invalid 1: Valid, reply sent after delay time of 800μs or more</p>	0000		Refer to name and function column.
	1	SIC	<p>Serial communication time-out selection Set the time-out period of the communication protocol in [s] unit. Setting "0" disables time-out check.</p>	0	s	0 to 60
	2	*OP1	<p>Function selection 1 Used to select the protocol of serial communication.</p>  <p>Protocol checksum selection 0: Yes (checksum added) 1: No (checksum not added)</p>	0000		Refer to name and function column.

5. PARAMETERS

Classification	No.	Symbol	Name and Function	Initial Value	Unit	Setting Range
Basic IFU parameters	3	*MD1	<p>Analog monitor 1 output Choose the signal to be output to analog monitor 1.</p>  <p>Analog monitor 1 selection 0: Servo motor speed ($\pm 4V/\text{max. Servo motor speed}$) 1: Torque ($\pm 4V/\text{max. Torque}$) 2: Servo motor speed ($\pm 4V/\text{max. Servo motor speed}$) 3: Torque ($\pm 4V/\text{max. Torque}$) 4: Current command ($\pm 4V/\text{max. Current command}$) 5: Speed command ($\pm 4V/\text{max. Servo motor speed}$) 6: Droop pulses ($\pm 4V/128\text{pulse}$) 7: Droop pulses ($\pm 4V/2048\text{pulse}$) 8: Droop pulses ($\pm 4V/8192\text{pulse}$) 9: Droop pulses ($\pm 4V/32768\text{pulse}$) A: Droop pulses ($\pm 4V/131072\text{pulse}$) B: Bus voltage ($\pm 4V/400V$) C: In position ($\pm 4V/\text{ON}$) D: Ready ($\pm 4V/\text{ON}$) E: Trouble ($\pm 4V/\text{ON}$)</p> <p>Axis number of channel 1 Choose the axis number output to analog monitor 1. Axis number = set value. Selecting 0 disables output.</p>	0000		Refer to name and function column.
	4	*MD2	<p>Analog monitor 2 output Choose the signal to be output to analog monitor 2.</p>  <p>Analog monitor 2 selection 0: Servo motor speed ($\pm 4V/\text{max. Servo motor speed}$) 1: Torque ($\pm 4V/\text{max. Torque}$) 2: Servo motor speed ($\pm 4V/\text{max. Servo motor speed}$) 3: Torque ($\pm 4V/\text{max. Torque}$) 4: Current command ($\pm 4V/\text{max. Current command}$) 5: Speed command ($\pm 4V/\text{max. Servo motor speed}$) 6: Droop pulses ($\pm 4V/128\text{pulse}$) 7: Droop pulses ($\pm 4V/2048\text{pulse}$) 8: Droop pulses ($\pm 4V/8192\text{pulse}$) 9: Droop pulses ($\pm 4V/32768\text{pulse}$) A: Droop pulses ($\pm 4V/131072\text{pulse}$) B: Bus voltage ($\pm 4V/400V$) C: In position ($\pm 4V/\text{ON}$) D: Ready ($\pm 4V/\text{ON}$) E: Trouble ($\pm 4V/\text{ON}$)</p> <p>Axis number of channel 2 Choose the axis number output to analog monitor 2. Axis number = set value. Selecting 0 disables output.</p>	0000		Refer to name and function column.

5. PARAMETERS

Classification	No.	Symbol	Name and Function	Initial Value	Unit	Setting Range
Basic IFU parameters	5	*MD3	Analog monitor 3 output Choose the signal to be output to analog monitor 3.  <p>Analog monitor 3 selection</p> <ul style="list-style-type: none"> 0: Servo motor speed ($\pm 4V/\text{max.}$ Servo motor speed) 1: Torque ($+ 4V/\text{max.}$ Torque) 2: Servo motor speed ($\pm 4V/\text{max.}$ Servo motor speed) 3: Torque ($+ 4V/\text{max.}$ Torque) 4: Current command ($\pm 4V/\text{max.}$ Current command) 5: Speed command ($\pm 4V/\text{max.}$ Servo motor speed) 6: Droop pulses ($\pm 4V/128\text{pulse}$) 7: Droop pulses ($\pm 4V/2048\text{pulse}$) 8: Droop pulses ($\pm 4V/8192\text{pulse}$) 9: Droop pulses ($\pm 4V/32768\text{pulse}$) A: Droop pulses ($\pm 4V/131072\text{pulse}$) B: Bus voltage ($+ 4V/400V$) C: In position ($+ 4V/\text{ON}$) D: Ready ($+ 4V/\text{ON}$) E: Trouble ($+ 4V/\text{ON}$) <p>Axis number of channel 3 Choose the axis number output to analog monitor 3. Axis number = set value. Selecting 0 disables output.</p>	0000		Refer to name and function column.
	6	MO1	Analog monitor 1 offset Used to set the offset voltage of the analog monitor 1 (MO1).	0	mV	-999 to 999
	7	MO2	Analog monitor 2 offset Used to set the offset voltage of the analog monitor 2 (MO2).	0	mV	-999 to 999
	8	MO3	Analog monitor 3 offset Used to set the offset voltage of the analog monitor 3 (MO2).	0	mV	-999 to 999

5. PARAMETERS

Classification	No.	Symbol	Name and Function	Initial Value	Unit	Setting Range																							
Basic IFU parameters	9	*SSC	<p>SSCNET type selection Select the network type of the interface unit.</p> <div style="text-align: center;"> <table border="1" style="display: inline-table;"> <tr> <td style="width: 20px; height: 20px;">0</td> <td style="width: 20px; height: 20px;">2</td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> </tr> </table> </div> <p style="margin-left: 100px;">SSCNET type selection 00: SSCNET3.5ms 01: SSCNET1.7ms 02: SSCNET0.8ms 12: SSCNETII</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p style="text-align: center; margin: 0;">POINT</p> <ul style="list-style-type: none"> ▪ When using motion controller Q series, set the communication cycle according to the motion controller. The initial settings of communication cycle/number of control axes of motion controller Q series are as follows: <ol style="list-style-type: none"> 1. Q173CPU SV13: SSCNET0.8ms/1 to 8 axes, SSCNET1.7ms/9 to 16 axes, SSCNET3.5ms/17 to 32 axes SV22: SSCNET0.8ms/1 to 4 axes, SSCNET1.7ms/5 to 12 axes, SSCNET3.5ms/13 to 32 axes 2. Q172CPU SV13: SSCNET0.8ms/1 to 8 axes SV22: SSCNET0.8ms/1 to 4 axes, SSCNET1.7ms/5 to 8 axes <p>The communication cycle of motion controller can be changed using the parameter.</p> <p>In the case of MR-J2M, initialization of servo amplifier MR-J2M (LED indication "@ Ab#" or "@ AC#") will not be completed, if the communication cycle settings are different between the motion controller and servo amplifier MR-J2M.</p> </div>	0	2			0200		Refer to name and function column.																			
	0	2																											
10	*OP2	<p>Optional function 2 Choose the input signal filter and test operation.</p> <div style="text-align: center;"> <table border="1" style="display: inline-table;"> <tr> <td style="width: 20px; height: 20px;">0</td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> </tr> </table> </div> <p style="margin-left: 100px;">Test operation selection 0: Invalid 1: Valid</p> <p style="margin-left: 100px;">Input signal filter 0: No 1: 1.777ms 2: 3.555ms</p> <p style="margin-left: 100px;">Electromagnetic brake interlock output axis number selection Choose the axis number of the drive unit which uses electromagnetic brake interlock output (MBR).</p> <table border="1" style="margin-left: 100px; margin-top: 10px;"> <thead> <tr> <th>Setting</th> <th>Selected Axis</th> </tr> </thead> <tbody> <tr><td>0</td><td>All connected axes</td></tr> <tr><td>1</td><td>First axis</td></tr> <tr><td>2</td><td>Second axis</td></tr> <tr><td>3</td><td>Third axis</td></tr> <tr><td>4</td><td>Fourth axis</td></tr> <tr><td>5</td><td>Fifth axis</td></tr> <tr><td>6</td><td>Sixth axis</td></tr> <tr><td>7</td><td>Seventh axis</td></tr> <tr><td>8</td><td>Eighth axis</td></tr> </tbody> </table>	0				Setting	Selected Axis	0	All connected axes	1	First axis	2	Second axis	3	Third axis	4	Fourth axis	5	Fifth axis	6	Sixth axis	7	Seventh axis	8	Eighth axis	0020		Refer to name and function column.
0																													
Setting	Selected Axis																												
0	All connected axes																												
1	First axis																												
2	Second axis																												
3	Third axis																												
4	Fourth axis																												
5	Fifth axis																												
6	Sixth axis																												
7	Seventh axis																												
8	Eighth axis																												

5. PARAMETERS

Classification	No.	Symbol	Name and Function	Initial Value	Unit	Setting Range										
Basic IFU parameters	11	*SL1	Slot 1 axis number selection Choose the axis number of the drive unit connected to the first slot of the base unit. (Refer to Section 2.8) Axis number = set value + 1 In the initial setting, the first axis is set to the first slot.	0000		0000 to 0007h										
	12	*SL2	Slot 2 axis number selection Choose the axis number of the drive unit connected to the second slot of the base unit. (Refer to Section 2.8) Axis number = set value + 1 In the initial setting, the second axis is set to the second slot.	0001		0000 to 0007h										
	13	*SL3	Slot 3 axis number selection Choose the axis number of the drive unit connected to the third slot of the base unit. (Refer to Section 2.8) Axis number = set value + 1 In the initial setting, the third axis is set to the third slot.	0002		0000 to 0007h										
	14	*SL4	Slot 4 axis number selection Choose the axis number of the drive unit connected to the fourth slot of the base unit. (Refer to Section 2.8) Axis number = set value + 1 In the initial setting, the fourth axis is set to the fourth slot.	0003		0000 to 0007h										
	15	*SL5	Slot 5 axis number selection Choose the axis number of the drive unit connected to the fifth slot of the base unit. (Refer to Section 2.8) Axis number = set value + 1 In the initial setting, the fifth axis is set to the fifth slot.	0004		0000 to 0007h										
	16	*SL6	Slot 6 axis number selection Choose the axis number of the drive unit connected to the sixth slot of the base unit. (Refer to Section 2.8) Axis number = set value + 1 In the initial setting, the sixth axis is set to the sixth slot.	0005		0000 to 0007h										
	17	*SL7	Slot 7 axis number selection Choose the axis number of the drive unit connected to the seventh slot of the base unit. (Refer to Section 2.8) Axis number = set value + 1 In the initial setting, the seventh axis is set to the seventh slot.	0006		0000 to 0007h										
	18	*SL8	Slot 8 axis number selection Choose the axis number of the drive unit connected to the eighth slot of the base unit. (Refer to Section 2.8) Axis number = set value + 1 In the initial setting, the eighth axis is set to the eighth slot.	0007		0000 to 0007h										
	19	*BLK	IFU parameter write inhibit <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Setting</th> <th>Setting operation</th> <th>Operation from unit operation section or MR Configurator (servo configuration software)</th> </tr> </thead> <tbody> <tr> <td rowspan="2">0000 (initial value)</td> <td>Reference</td> <td rowspan="2">IFU parameter No. 1 to 19</td> </tr> <tr> <td>Write</td> </tr> <tr> <td rowspan="2">000A</td> <td>Reference</td> <td rowspan="2">IFU parameter No. 19</td> </tr> <tr> <td>Write</td> </tr> </tbody> </table>	Setting	Setting operation	Operation from unit operation section or MR Configurator (servo configuration software)	0000 (initial value)	Reference	IFU parameter No. 1 to 19	Write	000A	Reference	IFU parameter No. 19	Write	0000	
Setting	Setting operation	Operation from unit operation section or MR Configurator (servo configuration software)														
0000 (initial value)	Reference	IFU parameter No. 1 to 19														
	Write															
000A	Reference	IFU parameter No. 19														
	Write															

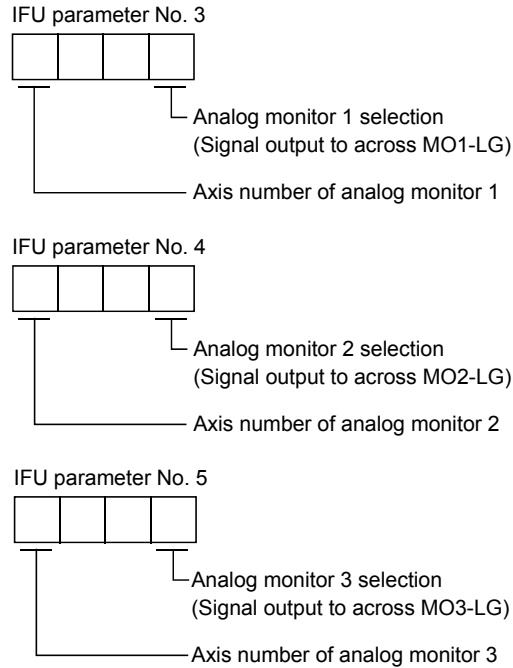
5. PARAMETERS

5.2.3 Analog monitor

The servo status can be output to 3 channels in terms of voltage. Using an ammeter enables monitoring the servo status.

(1) Setting

Change the following digits of IFU parameter No.3 to 5:



IFU parameters No.6 to 8 can be used to set the offset voltages to the analog output voltages. The setting range is between -999 and 999 mV.

IFU parameter No.	Description	Setting range [mV]
6	Used to set the offset voltage for the analog monitor 1.	-999 to 999
7	Used to set the offset voltage for the analog monitor 2.	
8	Used to set the offset voltage for the analog monitor 3.	

(2) Settings

The three channels are all factory-set to output servo motor speeds. By changing the IFU parameter No. 3 to 5 values, you can change the data as shown in the following table.

Refer to (3) for measurement points.

Setting	Output item	Data
0	Servo motor speed	
1	Torque (Note)	

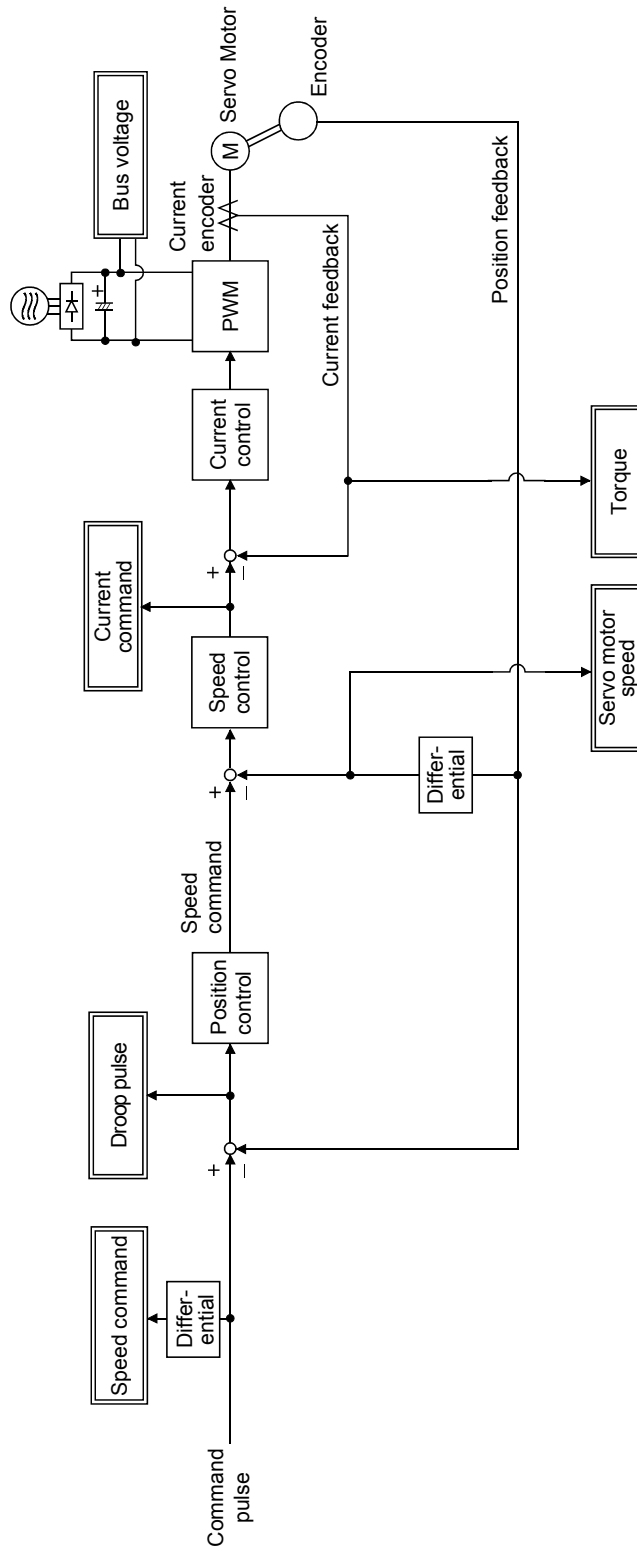
5. PARAMETERS

Setting	Output item	Data	Setting	Output item	Data
2	Servo motor speed		9	Droop pulses ($\pm 4V/32768$ pulse)	
3	Torque (Note)		A	Droop pulses ($\pm 4V/131072$ pulse)	
4	Current command		B	Bus voltage	
5	Speed command		C	In-position	
6	Droop pulses ($\pm 4V/128$ pulse)		D	Ready	
7	Droop pulses ($\pm 4V/2048$ pulse)		E	Failure	
8	Droop pulses ($\pm 4V/8192$ pulse)				

Note. 4V is outputted at the maximum torque.

5. PARAMETERS

(3) Analog monitor block diagram



5. PARAMETERS

5.2.4 Test operation mode



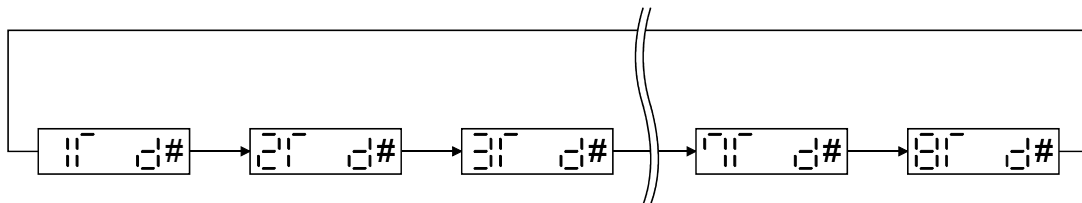
CAUTION

- The test operation mode is designed for servo operation confirmation and not for machine operation confirmation. Do not use this mode with the machine. Always use the servo motor alone.
- If an operation fault occurred, use the forced stop (EM1) to make a stop.

By using a personal computer and the MR Configurator (servo configuration software), you can execute jog operation, positioning operation, motor-less operation and DO forced output without connecting the servo system controller.

(1) Setting and indication

- 1) Set "□□□1" in the IFU parameter No. 10 to enable test operation. After setting, switch power off once, then on again to make the IFU parameter No. 10 valid.
- 2) Switching power on changes the interface unit display as shown below. # in the figure below indicates the axis number of the drive unit.



- 3) Perform test operation using the personal computer.

(2) Test operation mode

(a) Jog operation

Jog operation can be performed without using the servo system controller. Use this operation with the forced stop reset. This operation may be used independently of whether the servo is on or off and whether the servo system controller is connected or not.

Exercise control on the jog operation screen of the MR Configurator (servo configuration software).

1) Operation pattern

Item	Initial value	Setting range
Speed [r/min]	200	0 to max. speed
Acceleration/deceleration time constant [ms]	1000	1 to 20000

2) Operation method

Operation	Screen control
Forward rotation start	"Click Forward" button.
Reverse rotation start	"Click Reverse" button.
Stop	"Click Stop" button.

(b) Positioning operation

Positioning operation can be performed without using the servo system controller. Use this operation with the forced stop reset. This operation may be used independently of whether the servo is on or off and whether the servo system controller is connected or not.

Exercise control on the positioning operation screen of the MR Configurator (servo configuration software).

5. PARAMETERS

1) Operation pattern

Item	Initial value	Setting range
Travel [pulse]	100000	0 to 9999999
Speed [r/min]	200	0 to max. speed
Acceleration/deceleration time constant [ms]	1000	1 to 50000

2) Operation method

Operation	Screen control
Forward rotation start	"Click Forward" button.
Reverse rotation start	"Click Reverse" button.
Pause	"Click Pause" button.

(c) Program operation

Positioning operation can be performed in two or more operation patterns combined, without using the servo system controller. Use this operation with the forced stop reset. This operation may be used independently of whether the servo is on or off and whether the servo system controller is connected or not.

Exercise control on the programmed operation screen of the MR Configurator (servo configuration software). For full information, refer to the MR Configurator (servo configuration software) Installation Guide.

Operation	Screen Control
Start	"Click Start" button.
Stop	"Click Reset" button.

(d) Motorless operation

POINT
<ul style="list-style-type: none"> Motor-less operation may be used with the MR Configurator (servo configuration software). Usually, however, use motor-less operation which is available by making the servo system controller parameter setting.

Without connecting the servo motor, output signals or status displays can be provided in response to the servo system controller commands as if the servo motor is actually running. This operation may be used to check the servo system controller sequence. Use this operation with the forced stop reset. Use this operation with MELSERVO-J2M connected to the servo system controller.

Exercise control on the motor-less operation screen of the MR Configurator (servo configuration software).

1) Load conditions

Load Item	Condition
Load torque	0
Load inertia moment ratio	Same as servo motor inertia moment

2) Alarms

The following alarms and warning do not occur. However, the other alarms and warnings occur as when the servo motor is connected:

- Encoder error 1 (A.16)
- Encoder error 2 (A.20)
- Absolute position erasure (A.25)
- Battery cable breakage warning (A.92)

5. PARAMETERS

(e) Output signal (DO) forced output

Output signals can be switched on/off forcibly independently of the servo status. Use this function for output signal wiring check, etc.

Exercise control on the DO forced output screen of the MR Configurator (servo configuration software).

(3) Configuration

Configuration should be as in Section 3.1. Always install a forced stop switch to enable a stop at occurrence of an alarm.

6. GENERAL GAIN ADJUSTMENT

6. GENERAL GAIN ADJUSTMENT

6.1 Different adjustment methods

6.1.1 Adjustment on a MELSERVO-J2M

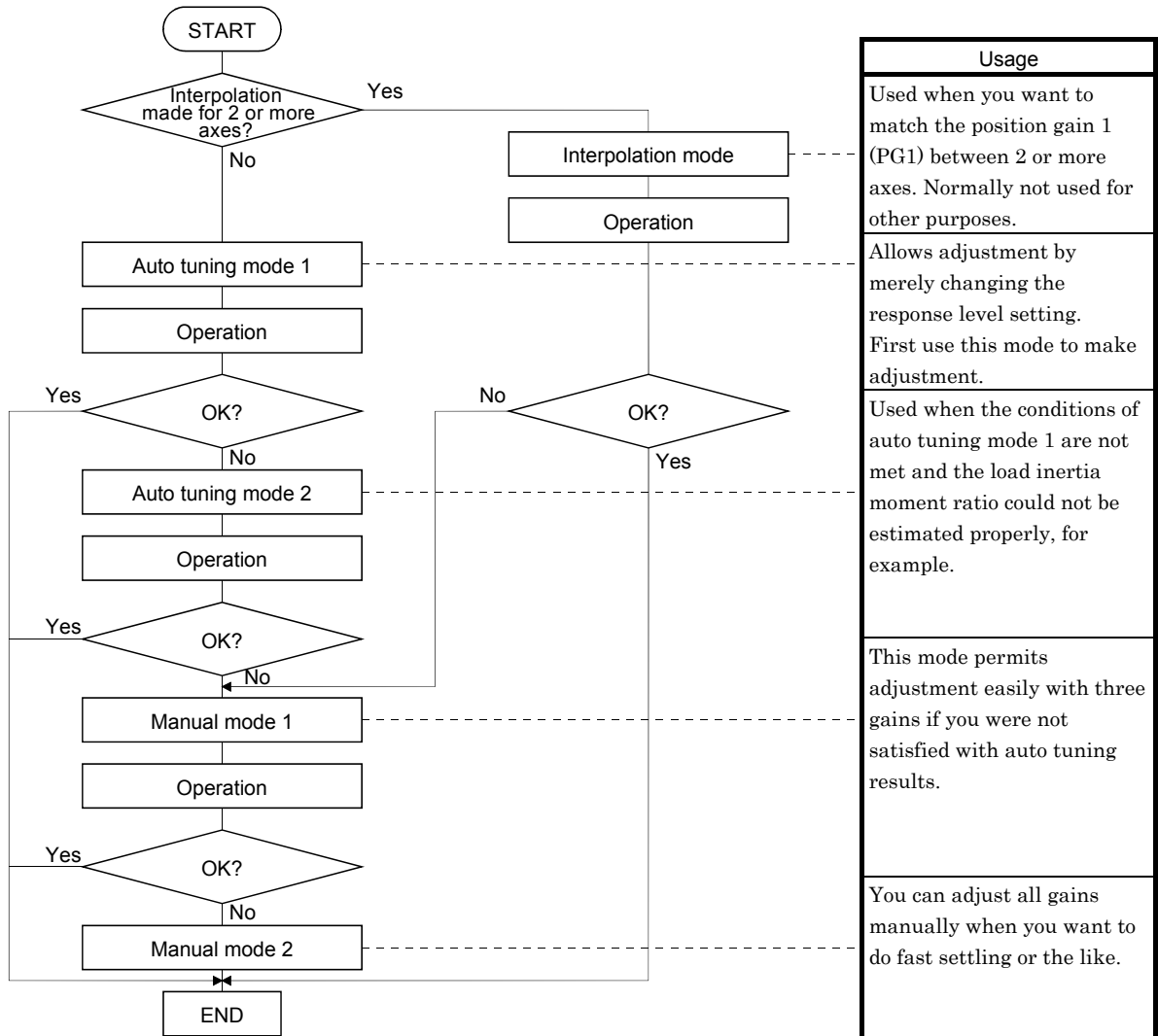
The gain adjustment in this section can be made on MELSERVO-J2M. For gain adjustment, first execute auto tuning mode 1. If you are not satisfied with the results, execute auto tuning mode 2, manual mode 1 and manual mode 2 in this order.

(1) Gain adjustment mode explanation

Gain adjustment mode	DRU parameter No. 8 setting	Estimation of load inertia moment ratio	Automatically set parameters	Manually set parameters
Auto tuning mode 1 (initial value)	0001	Always estimated	GD2 (DRU parameter No. 12) PG1 (DRU parameter No. 13) VG1 (DRU parameter No. 14) PG2 (DRU parameter No. 15) VG2 (DRU parameter No. 16) VIC (DRU parameter No. 17)	RSP (DRU parameter No. 9)
Auto tuning mode 2	0003	Fixed to parameter No. 12 value	PG1 (DRU parameter No. 13) VG1 (DRU parameter No. 14) PG2 (DRU parameter No. 15) VG2 (DRU parameter No. 16) VIC (DRU parameter No. 17)	GD2 (DRU parameter No. 12) RSP (DRU parameter No. 9)
Manual mode 1	0004		VG1 (DRU parameter No. 14) PG2 (DRU parameter No. 15)	GD2 (DRU parameter No. 12) PG1 (DRU parameter No. 13) VG2 (DRU parameter No. 16) VIC (DRU parameter No. 17)
Manual mode 2	0002			GD2 (DRU parameter No. 12) PG1 (DRU parameter No. 13) VG1 (DRU parameter No. 14) PG2 (DRU parameter No. 15) VG2 (DRU parameter No. 16) VIC (DRU parameter No. 17)
Interpolation mode	0000	Always estimated	GD2 (DRU parameter No. 12) PG2 (DRU parameter No. 15) VG2 (DRU parameter No. 16) VIC (DRU parameter No. 17)	PG1 (DRU parameter No. 13) VG1 (DRU parameter No. 14)

6. GENERAL GAIN ADJUSTMENT

(2) Adjustment sequence and mode usage



6. GENERAL GAIN ADJUSTMENT

6.1.2 Adjustment using MR Configurator (servo configuration software)

This section gives the functions and adjustment that may be performed by using MELSERVO-J2M with the MR Configurator (servo configuration software) which operates on a personal computer.

Function	Description	Adjustment
Machine analyzer	With the machine and servo motor coupled, the characteristic of the mechanical system can be measured by giving a random vibration command from the personal computer to the servo and measuring the machine response.	<ul style="list-style-type: none">• You can grasp the machine resonance frequency and determine the notch frequency of the machine resonance suppression filter.• You can automatically set the optimum gains in response to the machine characteristic. This simple adjustment is suitable for a machine which has large machine resonance and does not require much settling time.
Gain search	Executing gain search under to-and-fro positioning command measures settling characteristic while simultaneously changing gains, and automatically searches for gains which make settling time shortest.	<ul style="list-style-type: none">• You can automatically set gains which make positioning settling time shortest.
Machine simulation	Response at positioning settling of a machine can be simulated from machine analyzer results on personal computer.	<ul style="list-style-type: none">• You can optimize gain adjustment and command pattern on personal computer.

6. GENERAL GAIN ADJUSTMENT

6.2 Auto tuning

6.2.1 Auto tuning mode

MELSERVO-J2M has a real-time auto tuning function which estimates the machine characteristic (load inertia moment ratio) in real time and automatically sets the optimum gains according to that value. This function permits ease of gain adjustment of MELSERVO-J2M.

(1) Auto tuning mode 1

MELSERVO-J2M is factory-set to the auto tuning mode 1.

In this mode, the load inertia moment ratio of a machine is always estimated to set the optimum gains automatically.

The following DRU parameters are automatically adjusted in the auto tuning mode 1.

DRU parameter No.	Abbreviation	Name
12	GD2	Ratio of load inertia moment to servo motor inertia moment
13	PG1	Position control gain 1
14	VG1	Speed control gain 1
15	PG2	Position control gain 2
16	VG2	Speed control gain 2
17	VIC	Speed integral compensation

POINT
<ul style="list-style-type: none"> ▪ The auto tuning mode 1 may not be performed properly if the following conditions are not satisfied. <ul style="list-style-type: none"> ▪ Time to reach 2000r/min is the acceleration/deceleration time constant of 5s or less. ▪ Speed is 150r/min or higher. ▪ The ratio of load inertia moment to servo motor inertia moment is not more than 100 times. ▪ The acceleration/deceleration torque is 10% or more of the rated torque. ▪ Under operating conditions which will impose sudden disturbance torque during acceleration/deceleration or on a machine which is extremely loose, auto tuning may not function properly, either. In such cases, use the auto tuning mode 2 or manual mode 1 ▪ 2 to make gain adjustment.

(2) Auto tuning mode 2

Use the auto tuning mode 2 when proper gain adjustment cannot be made by auto tuning mode 1. Since the load inertia moment ratio is not estimated in this mode, set the value of a correct load inertia moment ratio (DRU parameter No. 12).

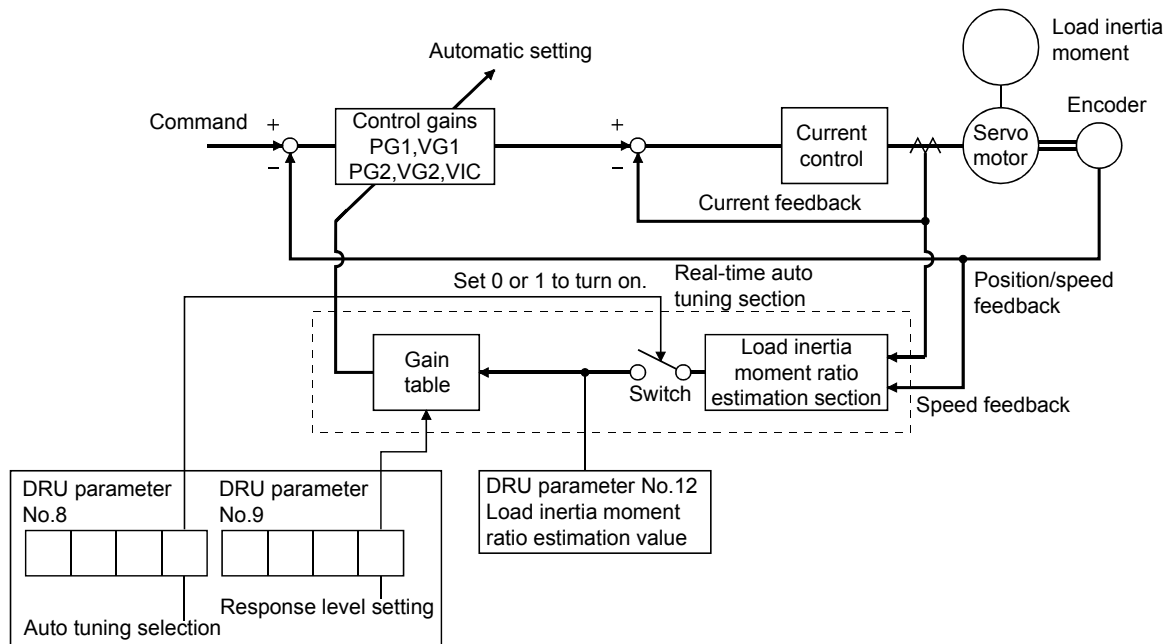
The following DRU parameters are automatically adjusted in the auto tuning mode 2.

DRU parameter No.	Abbreviation	Name
13	PG1	Position control gain 1
14	VG1	Speed control gain 1
15	PG2	Position control gain 2
16	VG2	Speed control gain 2
17	VIC	Speed integral compensation

6. GENERAL GAIN ADJUSTMENT

6.2.2 Auto tuning mode operation

The block diagram of real-time auto tuning is shown below.



When a servo motor is accelerated/decelerated, the load inertia moment ratio estimation section always estimates the load inertia moment ratio from the current and speed of the servo motor. The results of estimation are written to DRU parameter No. 12 (the ratio of load inertia moment to servo motor). These results can be confirmed on the status display screen of the MR Configurator (servo configuration software section).

If the value of the load inertia moment ratio is already known or if estimation cannot be made properly, chose the "auto tuning mode 2" (DRU parameter No.8:0003) to stop the estimation of the load inertia moment ratio (Switch in above diagram turned off), and set the load inertia moment ratio (DRU parameter No. 12) manually.

From the preset load inertia moment ratio (DRU parameter No. 12) value and response level (DRU parameter No. 9), the optimum control gains are automatically set on the basis of the internal gain tale.

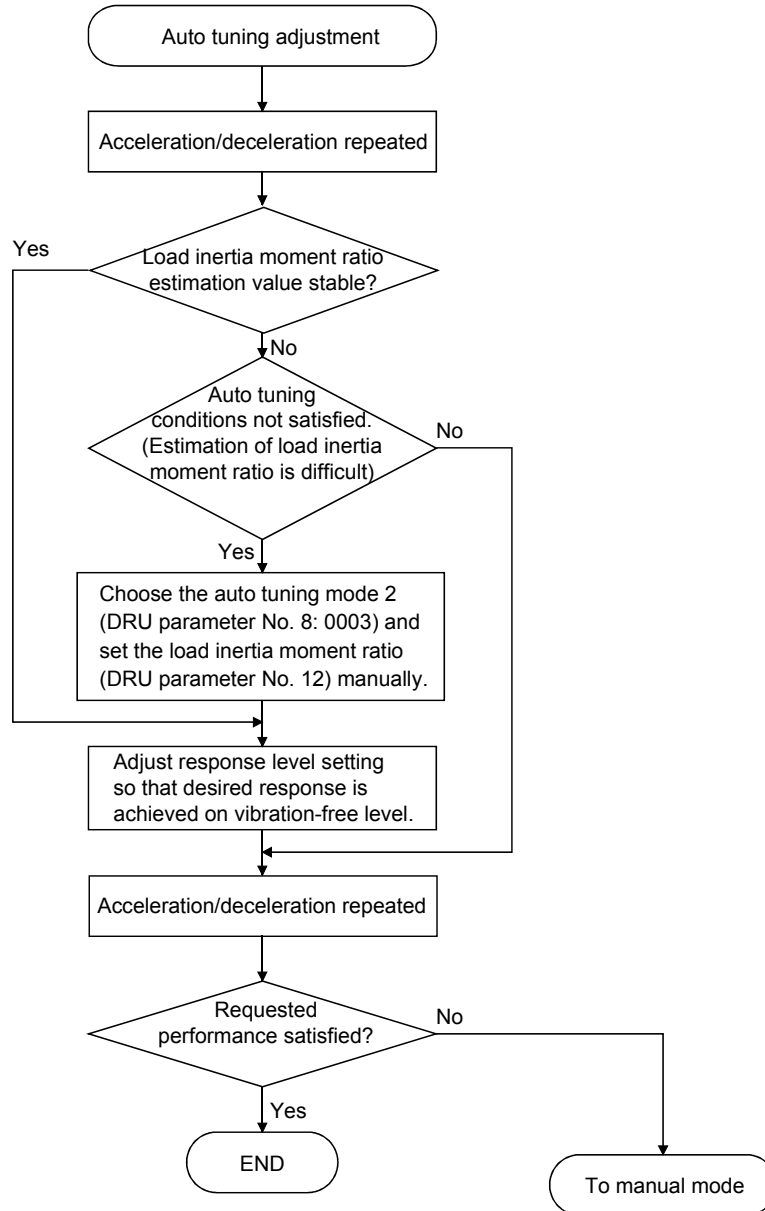
The auto tuning results are saved in the servo system controller every 10 minutes since power-on. At power-on, auto tuning is performed with the value of each control gain saved in the servo system controller being used as an initial value.

POINT
<ul style="list-style-type: none"> ▪ If sudden disturbance torque is imposed during operation, the estimation of the inertia moment ratio may malfunction temporarily. In such a case, choose the "auto tuning mode 2" (DRU parameter No. 8: 0003) and set the correct load inertia moment ratio in DRU parameter No. 12. ▪ When any of the auto tuning mode 1, auto tuning mode 2 and manual mode 1 settings is changed to the manual mode 2 setting, the current control gains and load inertia moment ratio estimation value are saved in the EEP-ROM.

6. GENERAL GAIN ADJUSTMENT

6.2.3 Adjustment procedure by auto tuning

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

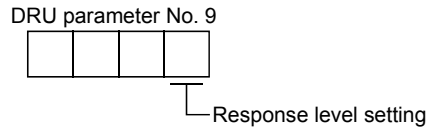


6. GENERAL GAIN ADJUSTMENT

6.2.4 Response level setting in auto tuning mode

Set the response (DRU parameter No.9) of the whole servo system. As the response level setting is increased, the trackability and settling time for a command decreases, but a too high response level will generate vibration. Hence, make setting until desired response is obtained within the vibration-free range.

If the response level setting cannot be increased up to the desired response because of machine resonance beyond 100Hz, adaptive vibration suppression control (DRU parameter No. 25) or machine resonance suppression filter (DRU parameter No. 18) may be used to suppress machine resonance. Suppressing machine resonance may allow the response level setting to increase. Refer to Section 7.2, 7.3 for adaptive vibration suppression control and machine resonance suppression filter.



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

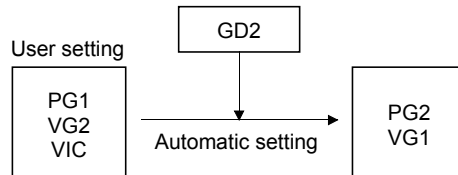
6. GENERAL GAIN ADJUSTMENT

6.3 Manual mode 1 (simple manual adjustment)

If you are not satisfied with the adjustment of auto tuning, you can make simple manual adjustment with three DRU parameters.

6.3.1 Operation of manual mode 1

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



Therefore, you can adjust the model adaptive control system in the same image as the general PI control system (position gain, speed gain, speed integral time constant). Here, the position gain corresponds to PG1, the speed gain to VG2 and the speed integral time constant to VIC. When making gain adjustment in this mode, set the load inertia moment ratio (DRU parameter No. 12) correctly.

6.3.2 Adjustment by manual mode 1

POINT
<ul style="list-style-type: none"> If machine resonance occurs, adaptive vibration suppression control (DRU parameter No. 25) or machine resonance suppression filter (DRU parameter No. 18) may be used to suppress machine resonance. (Refer to Section 7.2, 7.3.)

(1) For speed control

(a) Parameters

The following parameters are used for gain adjustment:

DRU parameter No.	Abbreviation	Name
12	GD2	Ratio of load inertia moment to servo motor inertia moment
16	VG2	Speed control gain 2
17	VIC	Speed integral compensation

(b) Adjustment procedure

Step	Operation	Description
1	Set an estimated value to the ratio of load inertia moment to servo motor inertia moment (DRU parameter No. 12).	
2	Increase the speed control gain 2 (DRU parameter No. 16) within the vibration- and unusual noise-free range, and return slightly if vibration takes place.	Increase the speed control gain.
3	Decrease the speed integral compensation (DRU parameter No. 17) within the vibration-free range, and return slightly if vibration takes place.	Decrease the time constant of the speed integral compensation.
4	If the gains cannot be increased due to mechanical system resonance or the like and the desired response cannot be achieved, response may be increased by suppressing resonance with adaptive vibration suppression control or machine resonance suppression filter and then executing steps 2 and 3.	Suppression of machine resonance Refer to Section 7.2, 7.3.
5	While checking the settling characteristic and rotational status, fine-adjust each gain.	Fine adjustment

6. GENERAL GAIN ADJUSTMENT

(c) Adjustment description

1) Speed control gain 2 (DRU parameter No. 16)

This parameter determines the response level of the speed control loop. Increasing this value enhances response but a too high value will make the mechanical system liable to vibrate. The actual response frequency of the speed loop is as indicated in the following expression:

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

2) Speed integral compensation (DRU parameter No. 17)

To eliminate stationary deviation against a command, the speed control loop is under proportional integral control. For the speed integral compensation, set the time constant of this integral control. Increasing the setting lowers the response level. However, if the load inertia moment ratio is large or the mechanical system has any vibratory element, the mechanical system is liable to vibrate unless the setting is increased to some degree. The guideline is as indicated in the following expression:

$$\text{Speed integral composition setting (ms)} \geq \frac{2000 \text{ to } 3000}{\text{Speed control gain 2 setting} / (1 + \text{ratio of load inertia moment to servo motor inertia moment})}$$

(2) For position control

(a) Parameters

The following parameters are used for gain adjustment:

DRU parameter No.	Abbreviation	Name
12	GD2	Ratio of load inertia moment to servo motor inertia moment
13	PG1	Position control gain 1
16	VG2	Speed control gain 2
17	VIC	Speed integral compensation

(b) Adjustment procedure

Step	Operation	Description
1	Set an estimated value to the ratio of load inertia moment to servo motor inertia moment (DRU parameter No. 12).	
2	Set a slightly smaller value to the position control gain 1 (DRU parameter No. 13).	
3	Increase the speed control gain 2 (DRU parameter No. 16) within the vibration- and unusual noise-free range, and return slightly if vibration takes place.	Increase the speed control gain.
4	Decrease the speed integral compensation (DRU parameter No. 17) within the vibration-free range, and return slightly if vibration takes place.	Decrease the time constant of the speed integral compensation.
5	Increase the position control gain 1 (DRU parameter No. 13).	Increase the position control gain.
6	If the gains cannot be increased due to mechanical system resonance or the like and the desired response cannot be achieved, response may be increased by suppressing resonance with adaptive vibration suppression control or machine resonance suppression filter and then executing steps 3 to 5.	Suppression of machine resonance Refer to Section 7.2 and 7.3.
7	While checking the settling characteristic and rotational status, fine-adjust each gain.	Fine adjustment

6. GENERAL GAIN ADJUSTMENT

(c) Adjustment description

1) Position control gain 1 (DRU parameter No. 13)

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

$$\text{Position control gain 1 guideline} \leq \frac{\text{Speed control gain 2 setting}}{(1 + \text{ratio of load inertia moment to servo motor inertia moment})} \times \left(\frac{1}{3} \text{ to } \frac{1}{5} \right)$$

2) Speed control gain 2 (DRU parameter No. 16)

This parameter determines the response level of the speed control loop. Increasing this value enhances response but a too high value will make the mechanical system liable to vibrate. The actual response frequency of the speed loop is as indicated in the following expression:

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

3) Speed integral compensation (DRU parameter No. 17)

To eliminate stationary deviation against a command, the speed control loop is under proportional integral control. For the speed integral compensation, set the time constant of this integral control. Increasing the setting lowers the response level. However, if the load inertia moment ratio is large or the mechanical system has any vibratory element, the mechanical system is liable to vibrate unless the setting is increased to some degree. The guideline is as indicated in the following expression:

$$\text{Speed integral compensation setting(ms)} \geq \frac{2000 \text{ to } 3000}{\text{Speed control gain 2 setting} / (1 + \text{ratio of load inertia moment to servo motor inertia moment set value})}$$

6. GENERAL GAIN ADJUSTMENT

6.4 Interpolation mode

The interpolation mode is used to match the position control gains of the axes when performing the interpolation operation of servo motors of two or more axes for an X-Y table or the like. In this mode, the position control gain 1 and speed control gain 1 which determine command trackability are set manually and the other gain adjusting parameters are set automatically.

(1) Parameter

(a) Automatically adjusted parameters

The following parameters are automatically adjusted by auto tuning.

DRU parameter No.	Abbreviation	Name
12	GD2	Ratio of load inertia moment to servo motor inertia moment
15	PG2	Position control gain 2
16	VG2	Speed control gain 2
17	VIC	Speed integral compensation

(b) Manually adjusted parameters

The following parameters are adjustable manually.

DRU parameter No.	Abbreviation	Name
13	PG1	Position control gain 1
14	VG1	Speed control gain 1

(2) Adjustment procedure

Step	Operation	Description
1	Choose the auto tuning mode 1 (DRU parameter No. 8: 0001) and set the machine resonance frequency of the response level to 15Hz 1 (DRU parameter No. 9: 0001).	Select the auto tuning mode 1.
2	During operation, increase the response level setting (DRU parameter No. 9), and return the setting if vibration occurs.	Adjustment in auto tuning mode 1.
3	Check the values of position control gain 1 (DRU parameter No. 13) and speed control gain 1 (DRU parameter No. 14).	Check the upper setting limits.
4	Choose the interpolation mode (DRU parameter No. 8: 0000).	Select the interpolation mode.
5	Using the position control gain 1 value checked in step 3 as the guideline of the upper limit, set in position control gain 1 the value identical to the position loop gain of the axis to be interpolated.	Set position control gain 1.
6	Using the speed control gain 1 value checked in step 3 as the guideline of the upper limit, look at the rotation status and set in speed control gain 1 the value three or more times greater than the position control gain 1 setting.	Set speed control gain 1.
7	Looking at the interpolation characteristic and rotation status, fine-adjust the gains and response level setting.	Fine adjustment.

(3) Adjustment description

(a) Position control gain 1 (DRU parameter No.13)

This parameter determines the response level of the position control loop. Increasing PG1 improves trackability to a position command but a too high value will make overshooting liable to occur at the time of settling. The droop pulse value is determined by the following expression.

$$\text{Droop pulse value (pulse)} = \frac{\frac{\text{Rotation speed (r/min)}}{60} \times 131,072(\text{pulse})}{\text{Position control gain set value}}$$

(b) Speed control gain 1 (DRU parameter No. 14)

Set the response level of the speed loop of the model. Make setting using the following expression as a guideline.

$$\text{Speed control gain 1 setting} \geq \text{Position control gain 1 setting} \times 3$$

7. SPECIAL ADJUSTMENT FUNCTIONS

7. SPECIAL ADJUSTMENT FUNCTIONS

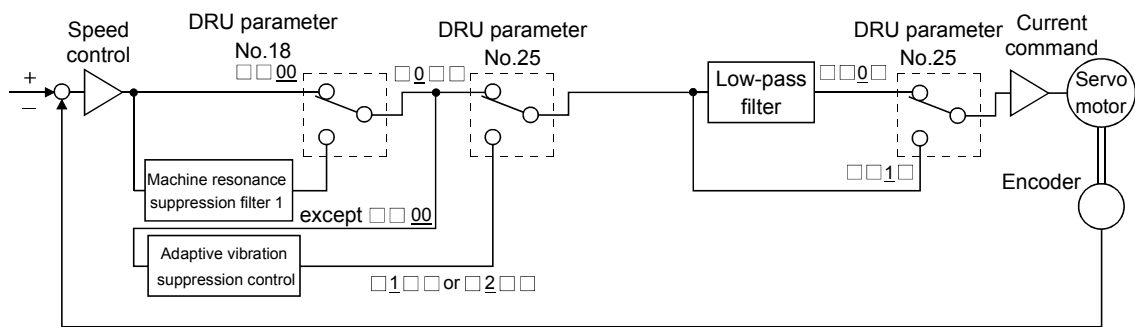
POINT

- The functions given in this chapter need not be used generally. Use them if you are not satisfied with the machine status after making adjustment in the methods in Chapter 6.

If a mechanical system has a natural resonance level point, increasing the servo system response may cause the mechanical system to produce resonance (vibration or unusual noise) at that resonance frequency.

Using the machine resonance suppression filter and adaptive vibration suppression control functions can suppress the resonance of the mechanical system.

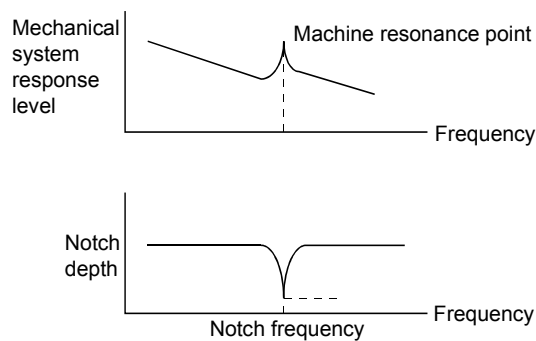
7.1 Function block diagram



7.2 Machine resonance suppression filter

(1) Function

The machine resonance suppression filter is a filter function (notch filter) which decreases the gain of the specific frequency to suppress the resonance of the mechanical system. You can set the gain decreasing frequency (notch frequency) and gain decreasing depth.



POINT

- The machine resonance suppression filter is a delay factor for the servo system. Hence, vibration may increase if you set a wrong resonance frequency or a too deep notch.

7. SPECIAL ADJUSTMENT FUNCTIONS

(2) Parameters

Set the notch frequency and notch depth of the machine resonance suppression filter 1 (DRU parameter No. 18).

DRU parameter No. 18

--	--	--	--

Notch frequency selection

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

Notch depth selection

Setting	Depth (Gain)
0	Deep (-40dB)
1	↑ (-14dB)
2	↓ (-8dB)
3	Shallow (-4dB)

POINT

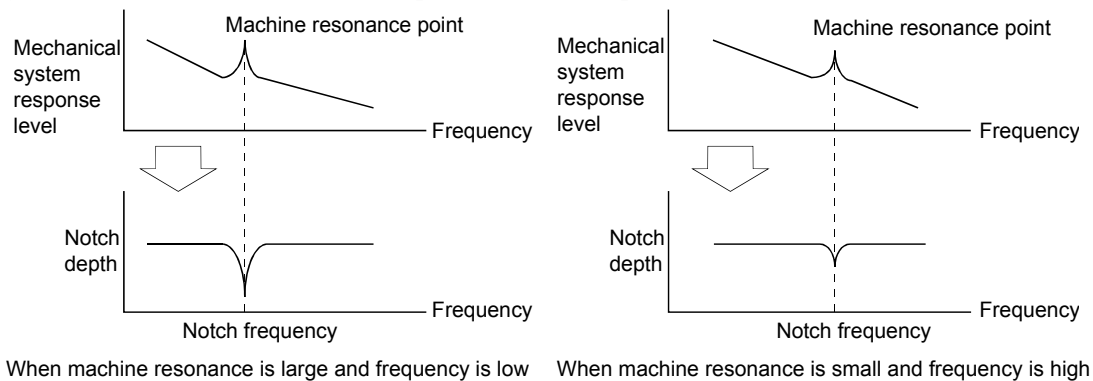
- If the frequency of machine resonance is unknown, decrease the notch frequency from higher to lower ones in order. The optimum notch frequency is set at the point where vibration is minimal.
- A deeper notch has a higher effect on machine resonance suppression but increases a phase delay and may increase vibration.
- The machine characteristic can be grasped beforehand by the machine analyzer on the MR Configurator (servo configuration software). This allows the required notch frequency and depth to be determined.

7. SPECIAL ADJUSTMENT FUNCTIONS

7.3 Adaptive vibration suppression control

(1) Function

Adaptive vibration suppression control is a function in which the drive unit detects machine resonance and sets the filter characteristics automatically to suppress mechanical system vibration. Since the filter characteristics (frequency, depth) are set automatically, you need not be conscious of the resonance frequency of a mechanical system. Also, while adaptive vibration suppression control is valid, MELSERVO-J2M always detects machine resonance, and if the resonance frequency changes, it changes the filter characteristics in response to that frequency.

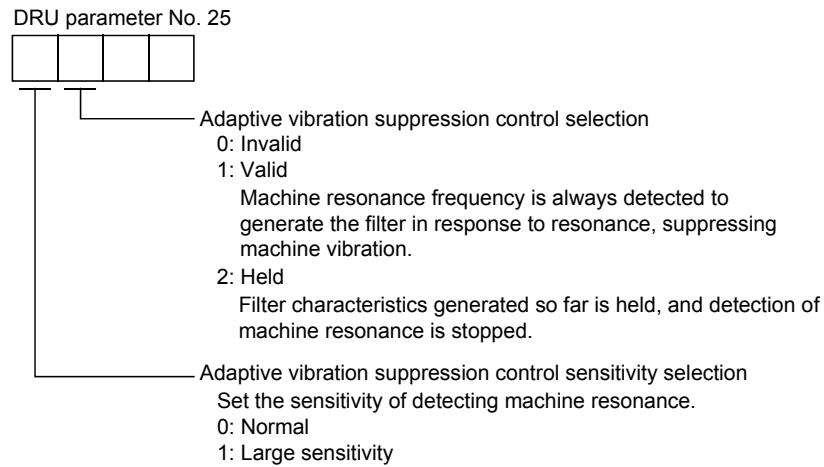


POINT
<ul style="list-style-type: none">▪ The machine resonance frequency which adaptive vibration suppression control can respond to is about 150 to 500Hz. Adaptive vibration suppression control has no effect on the resonance frequency outside this range. Use the machine resonance suppression filter for the machine resonance of such frequency.▪ Adaptive vibration suppression control may provide no effect on a mechanical system which has complex resonance characteristics or which has too large resonance.▪ Under operating conditions in which sudden disturbance torque is imposed during operation, the detection of the resonance frequency may malfunction temporarily, causing machine vibration. In such a case, set adaptive vibration suppression control to be "held" (DRU parameter No. 25: □ 2 □ □) to fix the characteristics of the adaptive vibration suppression control filter.

7. SPECIAL ADJUSTMENT FUNCTIONS

(2) Parameters

The operation of adaptive vibration suppression control selection (DRU parameter No.25).



POINT
<ul style="list-style-type: none"> ▪ Adaptive vibration suppression control is factory-set to be "invalid" (DRU parameter No. 25: 0000). ▪ Selection the adaptive vibration suppression control sensitivity can change the sensitivity of detecting machine resonance. Selection of "large sensitivity" detects smaller machine resonance and generates a filter to suppress machine vibration. However, since a phase delay will also increase, the response of the servo system may not increase.

7.4 Low-pass filter

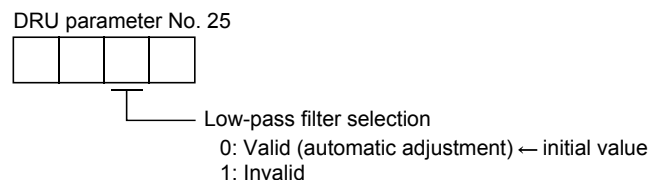
(1) Function

When a ballscrew or the like is used, resonance level of high frequency may occur as the response of the servo system is increased. To prevent this, the low-pass filter is factory-set to be valid for a torque command. The filter frequency of this low-pass filter is automatically adjusted to the value in the following expression:

$$\text{Filter frequency (Hz)} = \frac{\text{Speed control gain 2 set value} \times 10}{2\pi \times (1 + \text{ratio of load inertia moment to servo motor inertia moment set value} \times 0.1)}$$

(2) Parameter

Set the operation of the low-pass filter (DRU parameter No.25).



POINT
<ul style="list-style-type: none"> ▪ In a mechanical system where rigidity is extremely high and resonance is difficult to occur, setting the low-pass filter to be "invalid" may increase the servo system response to shorten the settling time.

7. SPECIAL ADJUSTMENT FUNCTIONS

7.5 Gain changing function

This function can change the gains. You can change between gains during rotation and gains during stop or can use an external signal to change gains during operation.

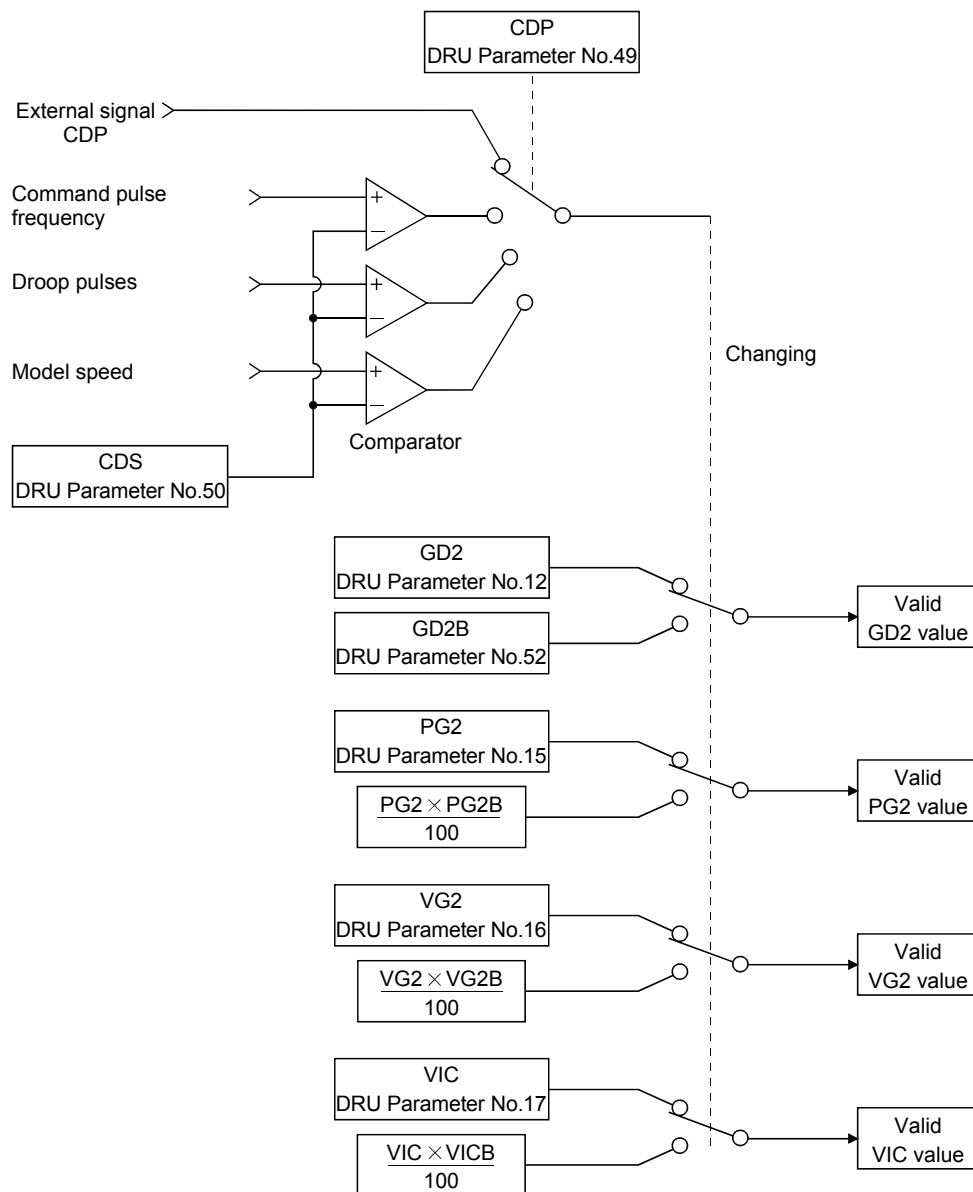
7.5.1 Applications

This function is used when:

- (1) You want to increase the gains during servo lock but decrease the gains to reduce noise during rotation.
- (2) You want to increase the gains during settling to shorten the stop settling time.
- (3) You want to change the gains using an external signal to ensure stability of the servo system since the load inertia moment ratio varies greatly during a stop (e.g. a large load is mounted on a carrier).

7.5.2 Function block diagram

The valid control gains PG2, VG2, VIC and GD2 of the actual loop are changed according to the conditions selected by gain changing selection CDP (DRU parameter No. 49) and gain changing condition CDS (DRU parameter No. 50).



7. SPECIAL ADJUSTMENT FUNCTIONS

7.5.3 Parameters

When using the gain changing function, always set "□□4□" in DRU parameter No.2 (auto tuning) to choose the manual mode 1 of the gain adjustment modes. The gain changing function cannot be used in the auto tuning mode.

DRU Parameter No.	Abbreviation	Name	Unit	Description
13	PG1	Position control gain 1	rad/s	Position and speed gains of a model used to set the response level to a command. Always valid.
14	VG1	Speed control gain 1	rad/s	
12	GD2	Ratio of load inertia moment to servo motor inertia moment	0.1 times	Control parameters before changing
15	PG2	Position control gain 2	rad/s	
16	VG2	Speed control gain 2	rad/s	
17	VIC	Speed integral compensation	ms	
52	GD2B	Ratio of load inertia moment to servo motor inertia moment 2	0.1 times	Used to set the ratio of load inertia moment to servo motor inertia moment after changing.
53	PG2B	Position control gain 2 changing ratio	%	Used to set the ratio (%) of the after-changing position control gain 2 to position control gain 2.
54	VG2B	Speed control gain 2 changing ratio	%	Used to set the ratio (%) of the after-changing speed control gain 2 to speed control gain 2.
55	VICB	Speed integral compensation changing ratio	%	Used to set the ratio (%) of the after-changing speed integral compensation to speed integral compensation.
49	CDP	Gain changing selection		Used to select the changing condition.
50	CDS	Gain changing condition	kpps pulse r/min	Used to set the changing condition values.
51	CDT	Gain changing time constant	ms	You can set the filter time constant for a gain change at changing.

7. SPECIAL ADJUSTMENT FUNCTIONS

(1) DRU Parameters No. 12 to 17

These parameters are the same as in ordinary manual adjustment. Gain changing allows the values of ratio of load inertia moment to servo motor inertia moment, position control gain 2, speed control gain 2 and speed integral compensation to be changed.

(2) Ratio of load inertia moment to servo motor inertia moment 2 (GD2B: DRU parameter No. 52)

Set the ratio of load inertia moment to servo motor inertia moment after changing. If the load inertia moment ratio does not change, set it to the same value as ratio of load inertia moment to servo motor inertia moment (parameter No. 34).

(3) Position control gain 2 changing ratio (DRU parameter No. 53), speed control gain 2 changing ratio (DRU parameter No. 54), speed integral compensation changing ratio (DRU parameter No. 55)

Set the values of after-changing position control gain 2, speed control gain 2 and speed integral compensation in ratio (%). 100% setting means no gain change.

For example, at the setting of position control gain 2 = 100, speed control gain 2 = 2000, speed integral compensation = 20 and position control gain 2 changing ratio = 180%, speed control gain 2 changing ratio = 150% and speed integral compensation changing ratio = 80%, the after-changing values are as follows:

Position control gain 2 = Position control gain 2 × Position control gain 2 changing ratio /100=180rad/s
 Speed control gain 2 = Speed control gain 2 × Speed control gain 2 changing ratio /100 = 3000rad/s
 Speed integral compensation = Speed integral compensation × Speed integral compensation changing ratio /100 = 16ms

(4) Gain changing selection (DRU parameter No. 49)

Used to set the gain changing condition. Choose the changing condition in the first digit. If you set "1" here, gains can be changed by the control command of controller.

DRU Parameter No. 49

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Gain changing selection

Gains are changed in accordance with the settings of DRU parameters No. 52 to 55 under any of the following conditions:

- 0: Invalid
- 1: Control command from controller
- 2: Command frequency is equal to higher than parameter No. 66 setting
- 3: Droop pulse value is equal to higher than parameter No. 66 setting
- 4: Servo motor speed is equal to higher than parameter No. 66 setting

(5) Gain changing condition (DRU parameter No. 50)

When you selected "command frequency", "droop pulses" or "servo motor speed" in gain changing selection (parameter No.65), set the gain changing level.

The setting unit is as follows:

Gain changing condition	Unit
Command frequency	kpps
Droop pulses	pulse
Servo motor speed	r/min

(6) Gain changing time constant (DRU parameter No. 51)

You can set the primary delay filter to each gain at gain changing. This parameter is used to suppress shock given to the machine if the gain difference is large at gain changing, for example.

7. SPECIAL ADJUSTMENT FUNCTIONS

7.5.4 Gain changing operation

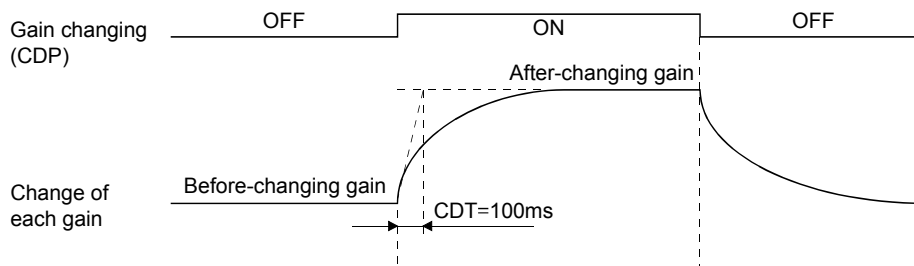
This operation will be described by way of setting examples.

(1) When you choose changing by external input

(a) Setting

DRU Parameter No.	Abbreviation	Name	Setting	Unit
13	PG1	Position control gain 1	100	rad/s
14	VG1	Speed control gain 1	1000	rad/s
12	GD2	Ratio of load inertia moment to servo motor inertia moment	4	0.1 times
15	PG2	Position control gain 2	120	rad/s
16	VG2	Speed control gain 2	3000	rad/s
17	VIC	Speed integral compensation	20	ms
52	GD2B	Ratio of load inertia moment to servo motor inertia moment 2	100	0.1 times
53	PG2B	Position control gain 2 changing ratio	70	%
54	VG2B	Speed control gain 2 changing ratio	133	%
55	VICB	Speed integral compensation changing ratio	250	%
49	CDP	Gain changing selection	0001 (Control command from controller)	
51	CDT	Gain changing time constant	100	ms

(b) Changing operation



Position control gain 1		100	
Speed control gain 1		1000	
Ratio of load inertia moment to servo motor inertia moment	4.0	→	10.0 → 4.0
Position control gain 2	120	→	84 → 120
Speed control gain 2	3000	→	4000 → 3000
Speed integral compensation	20	→	50 → 20

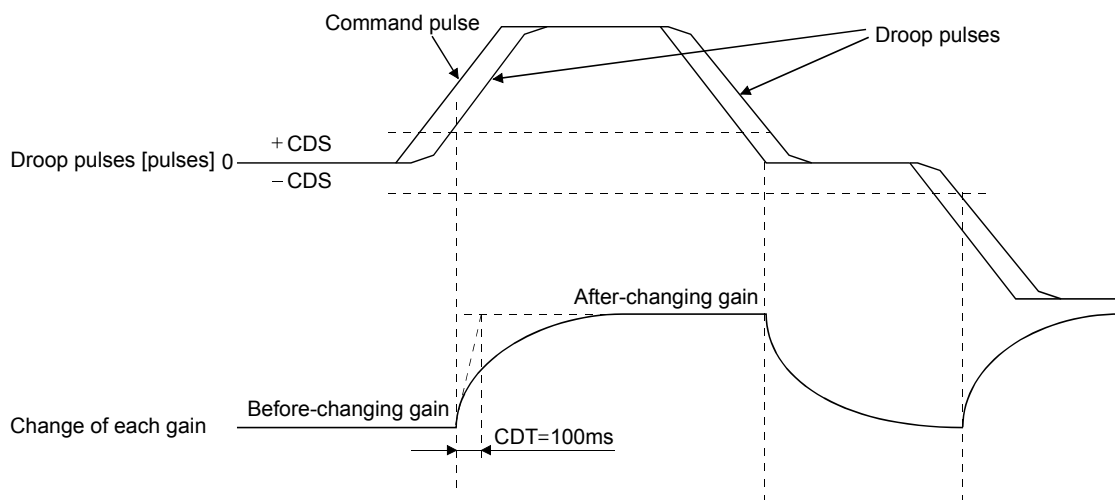
7. SPECIAL ADJUSTMENT FUNCTIONS

(2) When you choose changing by droop pulses

(a) Setting

DRU Parameter No.	Abbreviation	Name	Setting	Unit
13	PG1	Position control gain 1	100	rad/s
14	VG1	Speed control gain 1	1000	rad/s
12	GD2	Ratio of load inertia moment to servo motor inertia moment	40	0.1 times
15	PG2	Position control gain 2	120	rad/s
16	VG2	Speed control gain 2	3000	rad/s
17	VIC	Speed integral compensation	20	ms
52	GD2B	Ratio of load inertia moment to servo motor inertia moment 2	100	0.1 times
53	PG2B	Position control gain 2 changing ratio	70	%
54	VG2B	Speed control gain 2 changing ratio	133	%
55	VICB	Speed integral compensation changing ratio	250	%
49	CDP	Gain changing selection	0003 (Changed by droop pulses)	
50	CDS	Gain changing condition	50	pulse
51	CDT	Gain changing time constant	100	ms

(b) Changing operation



Position control gain 1	100						
Speed control gain 1	1000						
Ratio of load inertia moment to servo motor inertia moment	4.0	→	10.0	→	4.0	→	10.0
Position control gain 2	120	→	84	→	120	→	84
Speed control gain 2	3000	→	4000	→	3000	→	4000
Speed integral compensation	20	→	50	→	20	→	50

8. INSPECTION

8. INSPECTION



- Before starting maintenance and/or inspection, make sure that the charge lamp is off more than 15 minutes after power-off. Then, confirm that the voltage is safe in the tester or the like. Otherwise, you may get an electric shock.
- Any person who is involved in inspection should be fully competent to do the work. Otherwise, you may get an electric shock. For repair and parts replacement, contact your safes representative.

POINT

- Do not test MELSERVO-J2M with a megger (measure insulation resistance), or it may become faulty.
- Do not disassemble and/or repair the equipment on customer side.

(1) Inspection

It is recommended to make the following checks periodically:

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

(2) Life

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

Part name	Life guideline
Smoothing capacitor	10 years
Relay	Number of power-on and number of forced Stop times:100,000times.
Cooling fan	10,000 to 30,000hours (2 to 3 years)
Absolute position battery unit	Refer to Section 13.2

(a) Smoothing capacitor

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

(b) Relays

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

(c) Drive unit cooling fan

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

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

9. TROUBLESHOOTING

9. TROUBLESHOOTING

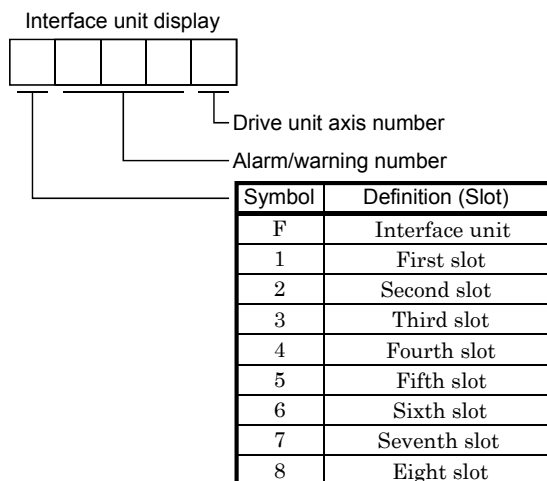
9.1 Alarms and warning list

POINT
▪ The alarm/warning whose indication is not given does not exist in that unit.

When a fault occurs during operation, the corresponding alarm or warning is displayed. If any alarm or warning has occurred, refer to Section 9.2 or 9.3 and take the appropriate action.

After its cause has been removed, the alarm can be deactivated in any of the methods marked ○ in the alarm deactivation column.

When an alarm/warning occurs, the interface unit display shows the corresponding unit and alarm number.



9. TROUBLESHOOTING

	Display	Name	Alarm deactivation	
			Error reset	CPU reset
Alarms	A.10	Undervoltage	<input type="radio"/>	<input type="radio"/>
	A.12	Memory error 1		
	A.13	Clock error		
	A.14	Watchdog		
	A.15	Memory error 2		
	A.16	Encoder error 1		
	A.17	Board error		
	A.19	Memory error 3		
	A.1A	Motor combination error		
	A.1B	Axis set error		
	A.1C	Base unit bus error 1		
	A.1D	Base unit bus error 2		
	A.1E	Drive unit mounting error		
	A.20	Encoder error 2		
	A.24	Main circuit error	<input type="radio"/>	<input type="radio"/>
	A.25	Absolute position erase		
	A.30	Regenerative error	<input type="radio"/> (Note 1)	<input type="radio"/> (Note 1)
	A.31	Overspeed	<input type="radio"/>	<input type="radio"/>
	A.32	Overcurrent	<input type="radio"/>	<input type="radio"/>
	A.33	Overvoltage	<input type="radio"/>	<input type="radio"/>
	A.34	CRC error	<input type="radio"/>	<input type="radio"/>
	A.35	Command frequency error	<input type="radio"/>	<input type="radio"/>
	A.36	Transfer error	<input type="radio"/>	<input type="radio"/>
	A.37	IFU parameter error		
		DRU parameter error		<input type="radio"/>
	A.38	DRU parameter adjustment error		<input type="radio"/>
	A.45	Main circuit device overheat	<input type="radio"/> (Note 1)	<input type="radio"/> (Note 1)
	A.46	Servo motor overheat	<input type="radio"/> (Note 1)	<input type="radio"/> (Note 1)
	A.50	Overload 1	<input type="radio"/> (Note 1)	<input type="radio"/> (Note 1)
	A.51	Overload 2	<input type="radio"/> (Note 1)	<input type="radio"/> (Note 1)
	A.52	Error excessive	<input type="radio"/>	<input type="radio"/>
	A.53	Multiple axis overload	<input type="radio"/>	<input type="radio"/>
A.54	Drive unit alarm	<input type="radio"/> (Note 2)	<input type="radio"/> (Note 2)	
A.78	Option slot fault			
A.79	Option slot loading error			
A.8A	Serial communication time-out	<input type="radio"/>	<input type="radio"/>	
A.8E	Serial communication error	<input type="radio"/>	<input type="radio"/>	
A.88	Watchdog			
Warnings	A.92	Open battery cable warning	Removing the cause of occurrence deactivates the alarm automatically.	
	A.96	Home position setting warning		
	A.9F	Battery warning		
	A.E0	Excessive regenerative warning		
	A.E1	Overload warning		
	A.E3	Absolute position counter warning		
	A.E4	Parameter warning		
	A.E6	Servo forced stop warning		
	A.E7	Controller forced stop warning		
A.E9	Main circuit off warning			

Note 1. Deactivate the alarm about 30 minutes of cooling time after removing the cause of occurrence.

2. Resetting the drive unit alarm automatically deactivates the alarm display.

9. TROUBLESHOOTING

9.2 Remedies for alarms



CAUTION

- When any alarm has occurred, eliminate its cause, ensure safety, then reset the alarm, and restart operation. Otherwise, injury may occur.
- If an absolute position erase (A.25) occurred, always make home position setting again. Otherwise, misoperation may occur.
- As soon as an alarm occurs, make the Servo off status and interrupt the main circuit power.

POINT

- When any of the following alarms has occurred, always remove its cause and allow about 30 minutes for cooling before resuming operation. If operation is resumed by switching control circuit power off, then on to reset the alarm, each unit and servo motor may become faulty. To protect the main circuit elements, any of these servo alarms cannot be deactivated from the servo system controller until the specified time elapses after its occurrence. Judging the load changing condition until the alarm occurs, the servo amplifier calculates this specified time automatically.
- Regenerative error (A.30) ▪ Overload 2 (A.51)
- Overload 1 (A.50) ▪ Multi axis overload (A.53)
- The alarm can be deactivated by switching power off, then on or by the error reset command ▪ CPU reset from the servo system controller. For details, refer to Section 9.1.

When an alarm occurs, the dynamic brake is operated to stop the servomotor. At this time, the display indicates the alarm No. The servo motor comes to a stop. Remove the cause of the alarm in accordance with this section. The optional MR Configurator (servo configuration software) may be used to refer to the cause.

@ in the Indication field denotes the slot number of the base unit and # the axis number of the drive unit.

Display		Name	Definition	Cause	Action
IFU	DRU				
FA.10		Undervoltage	Power supply voltage fell to or below 160VAC.	<ol style="list-style-type: none"> 1. Power supply voltage is low. 2. There was an instantaneous control circuit power failure of 30ms or longer. 3. Shortage of power supply capacity caused the power supply voltage to drop at start, etc. 4. Power was restored after the bus voltage had dropped to 200VDC. (Main circuit power switched on within 5s after it had switched off.) 	Review the power supply.
				<ol style="list-style-type: none"> 5. Faulty parts in the base unit. <div style="border: 1px solid black; padding: 2px; margin: 5px 0;"> — Checking method — Alarm (A.10) occurs if interface unit is changed. </div> 	Change the base unit.
				<ol style="list-style-type: none"> 6. Faulty parts in interface unit. <div style="border: 1px solid black; padding: 2px; margin: 5px 0;"> — Checking method — Alarm (A.10) occurs if base unit is changed. </div> 	Change the interface unit.
				<ol style="list-style-type: none"> 7. CNP3 or CNP1B connector unplugged. 	Connect properly.
FA.12		Memory error 1	RAM, memory fault	Faulty parts in the interface unit. <div style="border: 1px solid black; padding: 2px; margin: 5px 0;"> — Checking method — Alarm (any of A.11 and 13) occurs if power is switched on after disconnection of all cables but the control circuit power supply cables. </div>	Change the interface unit.
FA.13		Clock error	Printed board fault.		
FA.14		Watchdog	CPU/parts fault		
FA.15		Memory error 2	EPP-ROM fault	<div style="border: 1px solid black; padding: 2px; margin: 5px 0;"> — Checking method — Alarm (A.15) occurs if power is switched on after disconnection of all cables but the control circuit power supply cables. </div>	Change the interface unit.

9. TROUBLESHOOTING

Display		Name	Definition	Cause	Action
IFU	DRU				
	@A.12#	Memory error 1	RAM, memory fault	Faulty parts in the drive unit. ——— Checking method ——— Alarm (any of A.12 to 15) occurs if power is switched on after disconnection of all cables but the control circuit power supply cables.	Change the drive unit.
	@A.13#	Clock error	Printed board fault.		
	@A.14#	Watchdog	CPU/parts fault		
	@A.15#	Memory error 2	EEP-ROM fault		
	@A.16#	Encoder error 1	Communication error occurred between encoder and servo amplifier.	1. Encoder connector (CN2) disconnected.	Connect correctly.
				2. Encoder fault.	Change the servo motor.
				3. Encoder cable faulty. (Wire breakage or shorted)	Repair or change cable.
	@A.17#	Board error 2	CPU/parts fault	1. Faulty parts in the drive unit. ——— Checking method ——— Alarm (A.17) occurs if power is switched on after disconnection of all cables but the control circuit power supply cables.	Change the drive unit.
			The output terminals U, V, W of drive unit and the input terminals U, V, W of the servo motor are not connected.	2. The wiring of U, V, W is disconnected or not connected.	Correctly connect the output terminals U, V, W of the drive unit and the input terminals U, V, W of the servo motor.
FA.19	@A.19#	Memory error 3	ROM memory fault	Faulty parts in the interface unit or drive unit. ——— Checking method ——— Alarm (A.19) occurs if power is switched on after disconnection of all cables but the control circuit power supply cables.	Change the interface unit or drive unit.
	@A.1A#	Servo motor combination error	Wrong combination of drive unit and servo motor.	Wrong combination of drive unit and servo motor connected.	Use correct combination.
FA.1B		Axis set error	Drive units installed on the same drive unit have the same axis number.	IFU parameter No. 11 to 18 setting mistake.	Make correct setting.
FA.1C		Base unit bus error 1	There is error in communication between interface unit and drive unit.	1. Interface unit connection fault.	Connect the interface unit to the base unit properly.
				2. Interface unit failure.	Change the interface unit.
				3. Base unit failure.	Change the base unit.
FA.1D		Base unit bus error 2	There is error in communication between interface unit and drive unit.	1. Drive unit connection fault.	Connect the drive unit to the base unit properly.
				2. Drive unit failure.	Change the drive unit.
				3. Base unit failure.	Change the base unit.
FA.1E		Drive unit mounting error	Drive unit came off the base unit after initialization.	1. Drive unit connection fault.	Connect the drive unit to the base unit properly.
				2. Base unit failure.	Change the base unit.
				3. Faulty parts in drive unit. ——— Checking method ——— Alarm (A.1E) occurs if power is switched on after disconnection of the U, V, W power cables.	Change the drive unit.

9. TROUBLESHOOTING

Display		Name	Definition	Cause	Action
IFU	DRU				
	@A.20#	Encoder error 2	Communication error occurred between encoder and drive unit.	1. Encoder connector (CN2) disconnected.	Connect correctly.
				2. Encoder fault.	Change the servo motor.
				3. Encoder cable faulty. (Wire breakage or shorted)	Repair or change cable.
	@A.24#	Main circuit error	Ground fault occurred at the servo motor outputs (U,V and W) of the drive unit.	1. Power input wires and servo motor output wires are in contact at CNP2.	Connect correctly.
				2. Sheathes of servo motor power cables deteriorated, resulting in ground fault.	Change the cable.
				3. Main circuit of drive unit failed. <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 5px auto;"> <p style="text-align: center;">Checking method</p> <p>Alarm (A.24) occurs if power is switched on after disconnection of the U, V, W power cables.</p> </div>	Change the drive unit.
	@A.25#	Absolute position erase	Absolute position data in error.	1. Battery voltage low. 2. Battery cable or battery is faulty.	Change battery. Always make home position setting again.
			Power was switched on for the first time in the absolute position detection system.	3. Super capacitor of the absolute position encoder is not charged.	After leaving the alarm occurring for a few minutes, switch power off, then on again. Always make home position setting again.
FA.30		Regenerative alarm	Permissible regenerative power of the regenerative brake option is exceeded.	1. Mismatch between used regenerative brake option and DRU parameter No. 2 setting.	Set correctly.
				2. Regenerative brake option is not connected.	Connect correctly.
				3. High-duty operation or continuous regenerative operation caused the permissible regenerative power of the regenerative brake option to be exceeded. <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 5px auto;"> <p style="text-align: center;">Checking method</p> <p>Call the status display and check the regenerative load ratio.</p> </div>	1. Reduce the frequency of positioning. 2. Use the regenerative brake option of larger capacity. 3. Reduce the load.
				4. Power supply voltage rose to or above 200VAC.	Review power supply.
				5. Regenerative brake option faulty.	Change regenerative brake option.
		Regenerative transistor fault	6. Regenerative transistor faulty. <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 5px auto;"> <p style="text-align: center;">Checking method</p> <p>1) The regenerative brake option has overheated abnormally. 2) The alarm occurs even after removal of the built-in regenerative brake resistor or regenerative brake option.</p> </div>	Change the drive unit.	

9. TROUBLESHOOTING

Display		Name	Definition	Cause	Action
IFU	DRU				
	@A.31#	Overspeed	Speed has exceeded the instantaneous permissible speed.	1. Small acceleration/deceleration time constant caused overshoot to be large.	Increase acceleration/ deceleration time constant.
				2. Servo system is instable to cause overshoot.	1. Reset servo gain to proper value. 2. If servo gain cannot be set to proper value: 1) Reduce load inertia moment ratio; or 2) Reexamine acceleration/ deceleration time constant.
				3. Encoder faulty.	Change the servo motor.
	@A.32#	Overcurrent	Current that flew is higher than the permissible current of the drive unit.	1. Short occurred in drive unit output U, V and W.	Correct the wiring.
				2. Transistor of the servo drive unit faulty.	Change the drive unit.
				Checking method Alarm (A.32) occurs if power is switched on after disconnection of the U, V, W power cables.	
				3. Ground fault occurred in servo amplifier output U, V and W.	Correct the wiring.
FA.33		Overvoltage	Converter bus voltage exceeded 400VDC.	1. Regenerative brake option is not used.	Use the regenerative brake option.
				2. Though the regenerative brake option is used, the DRU parameter No. 2 setting is "□□00 (not used)".	Make correct setting.
				3. Regenerative brake option is open or disconnected.	1. Change lead. 2. Connect correctly.
				4. Regenerative transistor faulty.	Change drive unit.
				5. Wire breakage of regenerative brake option.	For wire breakage of regenerative brake option, change regenerative brake option.
				6. Power supply voltage high.	Review the power supply.
FA.34		CRC error	Bus cable is faulty.	1. Bus cable disconnected.	Connect correctly.
				2. Bus cable fault.	Change the cable.
				3. Noise entered bus cable.	Take measures against noise.
				4. Termination connector disconnected.	Connect termination connector.
				5. The same No. exists in the interface unit side axis setting.	Set correctly.
	@A.35#	Command frequency error	Input frequency of command pulse is too high.	1. Command given is greater than the maximum speed of the servo motor.	Review operation program.
				2. Noise entered bus cable.	Take action against noise.
				3. Servo system controller failure.	Change the servo system controller.
FA.36		Transfer error	Bus cable or printed board is faulty.	1. Bus cable is disconnected.	Connect the connector of the bus cable.
				2. Bus cable fault.	Change the cable.
				3. Printed board is faulty.	Change the interface unit
				4. Termination connector disconnected	Connect termination connector.

9. TROUBLESHOOTING

Display		Name	Definition	Cause	Action
IFU	DRU				
FA.37		IFU parameter error	IFU parameter setting is wrong.	1. Interface unit fault caused the IFU parameter setting to be rewritten.	Change the interface unit.
				2. There is a IFU parameter whose value was set to outside the setting range by the controller.	Change the IFU parameter value to within the setting range.
				3. The number of write times to EEPROM exceeded 100,000 due to parameter write, etc	Change the servo amplifier.
	@A.37#	DRU parameter error	DRU parameter setting is wrong.	1. Drive unit fault caused the DRU parameter setting to be rewritten.	Change the drive unit.
				2. There is a DRU parameter whose value was set to outside the setting range by the controller.	Change the DRU parameter value to within the setting range.
FA.38		DRU parameter adjustment error	In some drive unit, the parameter which requires all axes to be set for the same value differs from those of the other axes.	There is a drive unit whose DRU parameter No. 2 or 23 setting is different from others.	Make correct setting.
	@A.45#	Main circuit device overheat	Main circuit device overheat.	1. Drive unit faulty.	Change the drive unit.
				2. The power supply was turned on and off continuously by overloaded status.	The drive method is reviewed.
				3. Air cooling fan of drive unit stops.	1. Change the drive unit or cooling fan. 2. Reduce ambient temperature.
	@A.46#	Servo motor overheat	Servo motor temperature rise actuated the thermal sensor.	1. Ambient temperature of servo motor is over 40°C.	Review environment so that ambient temperature is 0 to 40°C.
				2. Servo motor is overloaded.	1. Reduce load. 2. Review operation pattern. 3. Use servo motor that provides larger output.
				3. Thermal sensor in encoder is faulty.	Change servo motor.
	@A.50#	Overload 1	Load exceeded overload protection characteristic of servo amplifier.	1. Drive unit is used in excess of its continuous output current.	1. Reduce load. 2. Review operation pattern. 3. Use servo motor that provides larger output.
				2. Servo system is instable and hunting.	1. Repeat acceleration/ deceleration to execute auto tuning. 2. Change auto tuning response level setting. 3. Set auto tuning to OFF and make gain adjustment manually.
				3. Machine struck something.	1. Review operation pattern. 2. Install limit switches.
				4. Wrong connection of servo motor. Drive unit's output U, V, W do not match servo motor's input U, V, W.	Connect correctly.
				5. Encoder faulty.	Change the servo motor.
				<p style="text-align: center;">Checking method</p> <p>When the servo motor shaft is rotated with the servo off, the cumulative feedback pulses do not vary in proportion to the rotary angle of the shaft but the indication skips or returns midway.</p>	

9. TROUBLESHOOTING

Display		Name	Definition	Cause	Action
IFU	DRU				
	@A.51#	Overload 2	Machine collision or the like caused max. output current to flow successively for several seconds. Servo motor locked: 0.3s or more During rotation: 2.5s or more	1. Machine struck something.	1. Review operation pattern. 2. Install limit switches.
				2. Wrong connection of servo motor. Drive unit's output U, V, W do not match servo motor's input U, V, W.	Connect correctly.
				3. Servo system is instable and hunting.	1. Repeat acceleration/ deceleration to execute auto tuning. 2. Change auto tuning response level setting. 3. Set auto tuning to OFF and make gain adjustment manually.
				4. Encoder faulty. <div style="border: 1px solid black; padding: 5px; width: fit-content;"> <p style="text-align: center;">Checking method</p> <p>When the servo motor shaft is rotated with the servo off, the cumulative feedback pulses do not vary in proportion to the rotary angle of the shaft but the indication skips or returns midway.</p> </div>	Change the servo motor.
	@A.52#	Error excessive	The deviation between the model position and the actual servo motor position exceeds the DRU parameter No.31 setting value (initial value: 2 revolutions	1. Acceleration/deceleration time constant is too small.	Increase the acceleration/ deceleration time constant.
				2. Torque limit value is too small.	Increase the torque limit value.
				3. Motor cannot be started due to torque shortage caused by power supply voltage drop.	1. Review the power supply capacity. 2. Use servo motor which provides larger output.
				4. Position control gain 1 (DRU parameter No.13) value is small.	Increase set value and adjust to ensure proper operation.
				5. Servo motor shaft was rotated by external force.	1. When torque is limited, increase the limit value. 2. Reduce load. 3. Use servo motor that provides larger output.
				6. Machine struck something.	1. Review operation pattern. 2. Install limit switches.
				7. Encoder faulty.	Change the servo motor.
				8. Wrong connection of servo motor. Drive unit's output U, V, W do not match servo motor's input U, V, W.	Connect correctly.

9. TROUBLESHOOTING

Display		Name	Definition	Cause	Action
IFU	DRU				
FA.53		Multiple axis overload	Drive unit whose effective load factor is 85% or more is adjacent.	1. Drive unit having large load is adjacent.	1. Change the slot of the drive unit whose load is large. 2. Reduce the load. 3. Reexamine the operation pattern. 4. Use a servo motor whose output is large.
				2. Servo system is instable and hunting.	1. Repeat acceleration/ deceleration and perform auto tuning. 2. Change the response setting of auto tuning. 3. Turn off auto tuning and make gain adjustment manually.
				3. Encoder cable and power cable (U, V, W) coming out of one drive unit are connected to the incorrect servo motor.	Make correct connection.
FA.54		Drive unit alarm	Alarm occurred in one or more axes of drive units installed to the base unit.	Alarm occurred in one or more axes of drive units installed to the base unit.	Remove the alarm causes of all drive units where alarm has occurred.
FA.78		Option slot fault	Extension IO unit is faulty.	1. Extension IO unit is not inserted properly.	Insert correctly.
				2. Incompatibility with the extension IO unit.	Change the interface unit for the one compatible with the extension IO unit.
				3. Extension IO unit is faulty.	Change the extension IO unit.
				4. Base unit is faulty.	Change the base unit.
FA.79		Option slot loading error	Extension IO unit is connected improperly.	Extension IO unit is disconnected.	Switch power off and reinsert the extension IO unit.
FA.8A		Serial communication time-out	Serial communication stopped for longer than the time set in IFU parameter No. 1.	1. Communication cable fault. (Wire break or short circuit)	Repair or change the cable.
				2. Communication cycle is longer than the IFU parameter No. 1 setting.	Set the IFU parameter value correctly.
				3. Protocol is incorrect.	Correct the protocol.
FA.8E		Serial communication error	Serial communication error occurred between interface unit and communication device (e.g. personal computer).	1. Communication cable fault. (Open cable or short circuit)	Repair or change the cable.
				2. Communication device (e.g. personal computer) faulty.	Change the communication device (e.g. personal computer).
88888		Watchdog	CPU, parts faulty	Fault of parts in interface unit. <div style="border: 1px solid black; padding: 5px; width: fit-content;"> — Checking method — Alarm (8888) occurs if power is switched on after disconnection of all cables but the control circuit power supply cables. </div>	Change interface unit.

9. TROUBLESHOOTING

9.3 Remedies for warnings

POINT
<ul style="list-style-type: none"> ▪ When any of the following alarms has occurred, do not resume operation by switching power of the servo amplifier OFF/ON repeatedly. The servo amplifier and servo motor may become faulty. If the power of the servo amplifier is switched OFF/ON during the alarms, allow more than 30 minutes for cooling before resuming operation. ▪ Excessive regenerative warning (A.E0) ▪ Overload warning 1 (A.E1)

If A.E6, A.E7 or A.E9 occurs, the servo off status is established. If any other warning occurs, operation can be continued but an alarm may take place or proper operation may not be performed. Eliminate the cause of the warning according to this section. Use the optional MR Configurator (servo configuration software) to refer to the cause of warning.

@ in the Indication field denotes the slot number of the base unit and # the axis number of the drive unit.

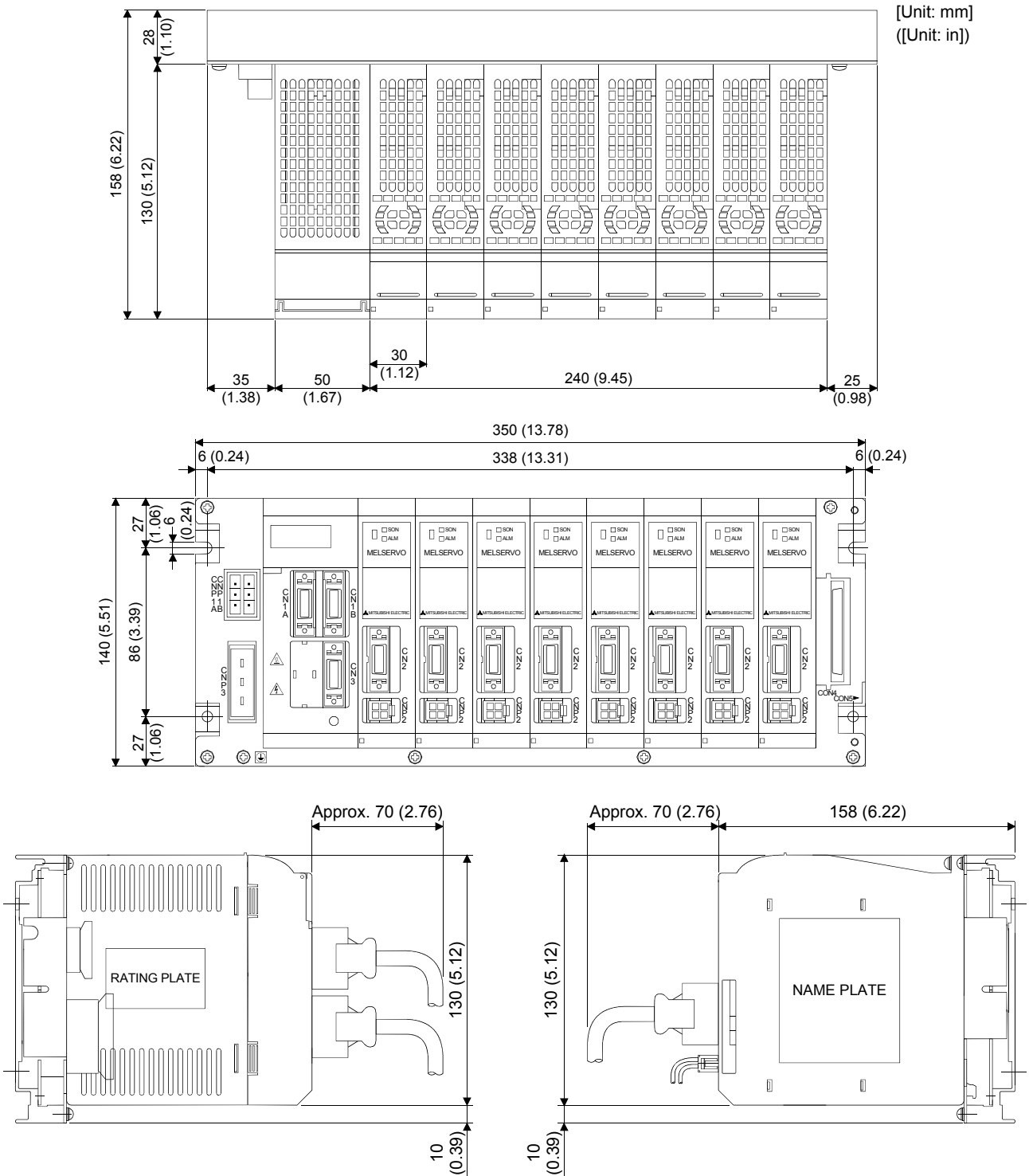
Display		Name	Definition	Cause	Action
IFU	DRU				
	@A.92#	Open battery cable warning	Absolute position detection system battery voltage is low.	1. Battery cable is open.	Repair cable or changed.
				2. Battery voltage supplied from the battery unit to the encoder fell to about 3.2V or less. (Detected with the encoder)	Change battery.
				3. Encoder cable is open.	Change the encoder cable.
	@A.96#	Home position setting warning	Home position return could not be made in the precise position.	1. Droop pulses remaining are greater than the in-position range setting.	Remove the cause of droop pulse occurrence.
				2. Home position return was executed during operation command.	Reduce creep speed.
				3. Creep speed high.	
FA.9F		Battery warning	Voltage of battery for absolute position detection system reduced.	Battery voltage fell to 3.2V or less. (Detected with the servo amplifier)	Change the battery.
FA.E0		Excessive regenerative warning	There is a possibility that regenerative power may exceed permissible regenerative power of regenerative brake option.	Regenerative power increased to 85% or more of permissible regenerative power of regenerative brake option. <div style="border: 1px solid black; padding: 2px; width: fit-content;"> Checking method Call the status display and check regenerative load ratio. </div>	1. Reduce frequency of positioning. 2. Change regenerative brake option for the one with larger capacity. 3. Reduce load.
	@A.E1#	Overload warning	There is a possibility that overload alarm 1 or 2 may occur.	Load increased to 85% or more of overload alarm 1 or 2 occurrence level. <div style="border: 1px solid black; padding: 2px; width: fit-content;"> Cause, checking method Refer to A.50, A.51. </div>	Refer to A.50, A.51.
	@A.E3#	Absolute position counter warning	Absolute position encoder pulses faulty.	1. Noise entered the encoder.	Take noise suppression measures.
				2. Encoder faulty.	Change servo motor.
	@A.E4#	Parameter warning	Parameter outside setting range.	Parameter value set from servo system controller is outside setting range.	Set it correctly.
FA.E6		Servo forced stop warning	EM1-SG are open.	External forced stop was made valid. (EM1-SG opened.)	Ensure safety and deactivate forced stop.
FA.E7		Controller forced stop warning		Forced stop signal was entered into the servo system controller.	Ensure safety and deactivate forced stop.
FA.E9		Main circuit off warning	Servo-on command was issued with main circuit power off.		Switch on main circuit power.

10. OUTLINE DRAWINGS

10. OUTLINE DRAWINGS

10.1 MELSERVO-J2M configuration example

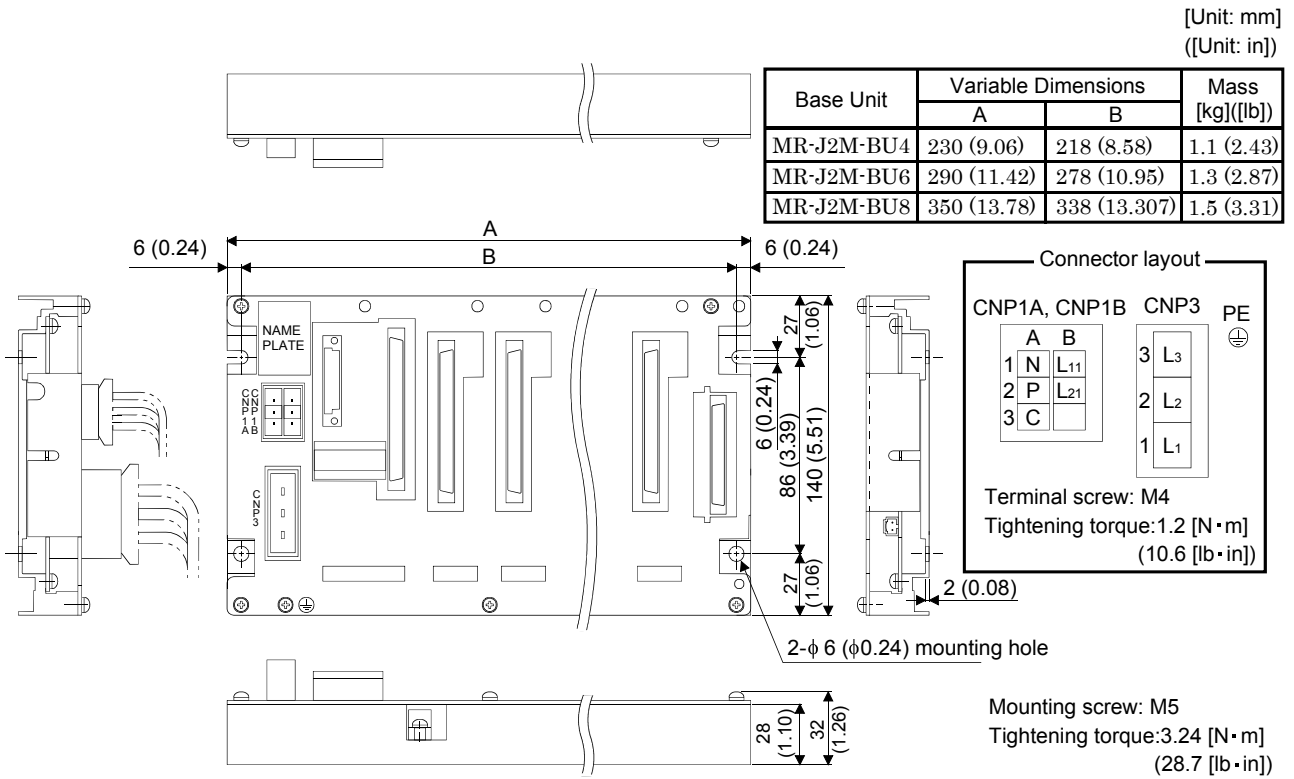
The following diagram shows the MR-J2M-BU8 base unit where one interface unit and eight drive units are installed.



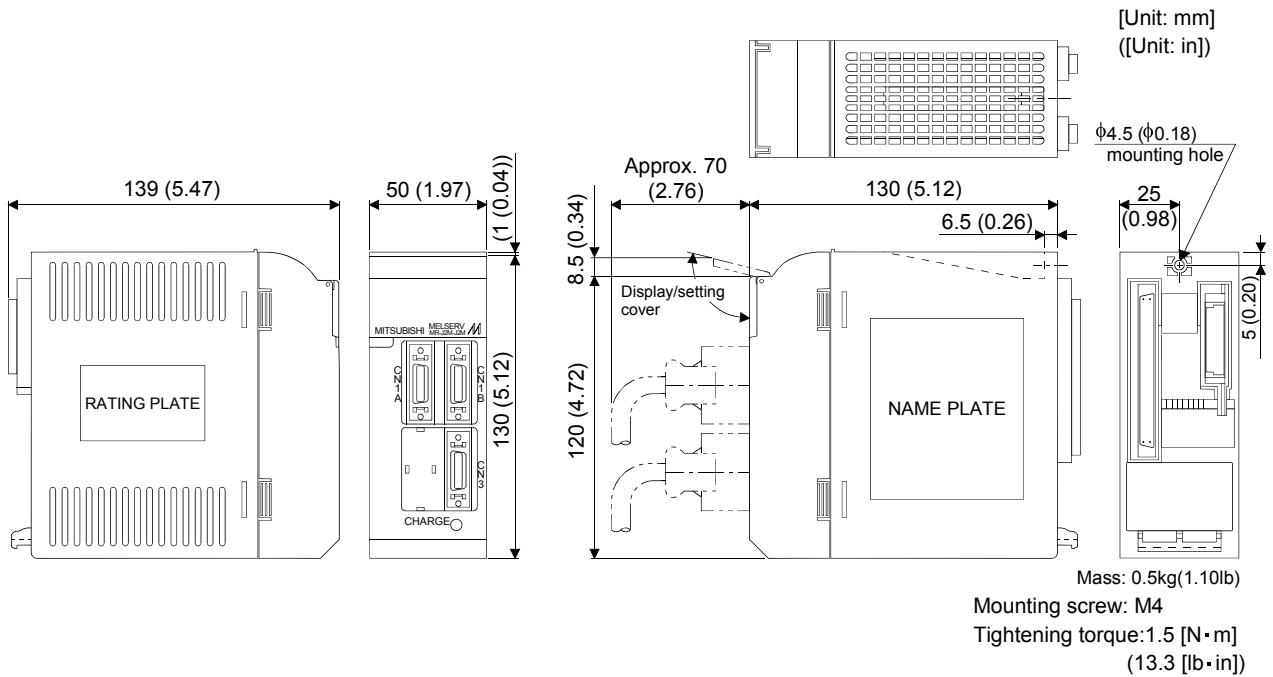
10 OUTLINE DRAWINGS

10.2 Unit outline drawings

10.2.1 Base unit (MR-J2M-BU□)



10.2.2 Interface unit (MR-J2M-P8B)

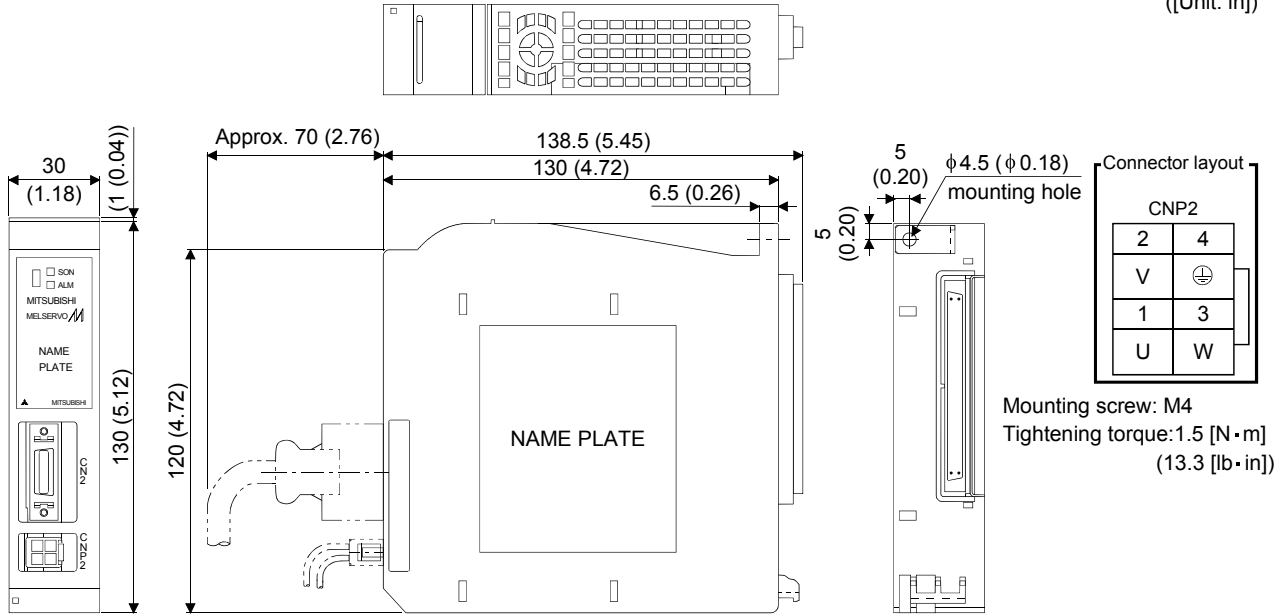


10 OUTLINE DRAWINGS

10.2.3 Drive unit (MR-J2M-□DU)

(1) MR-J2M-10DU to MR-J2M-40DU

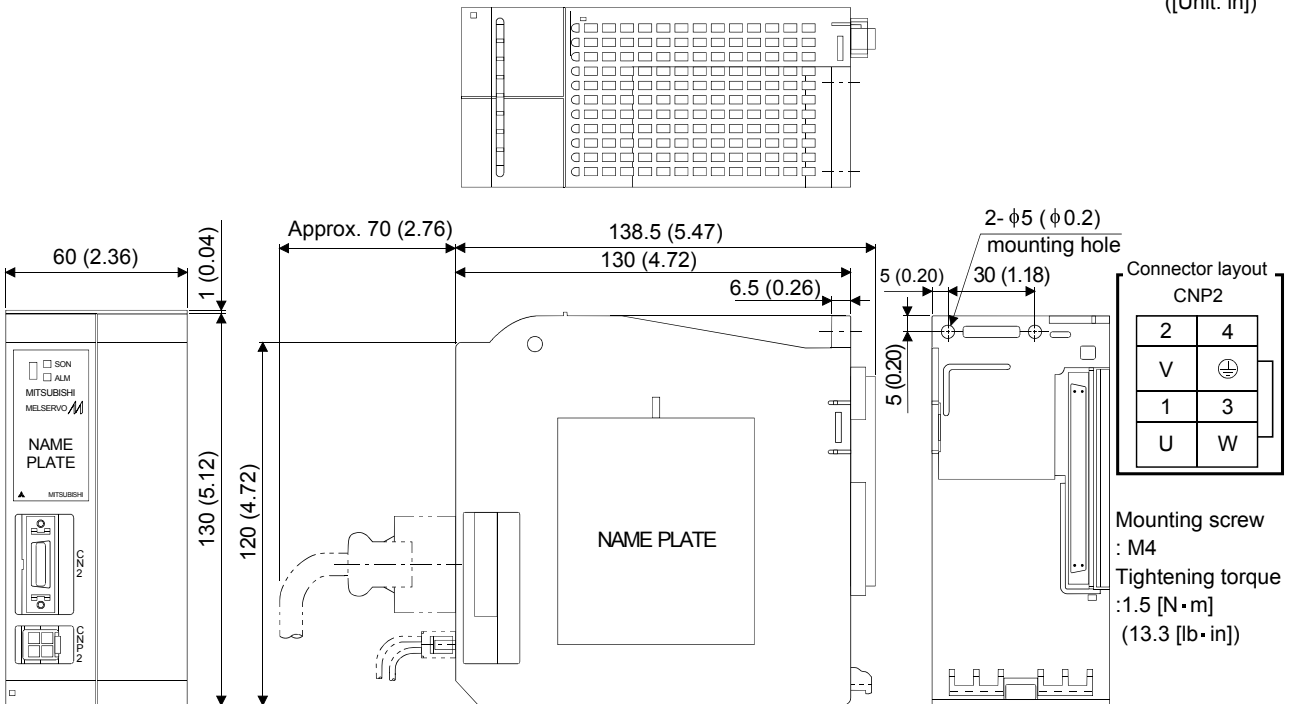
[Unit: mm]
([Unit: in])



Mass: 0.4kg (0.88lb)

(2) MR-J2M-70DU

[Unit: mm]
([Unit: in])

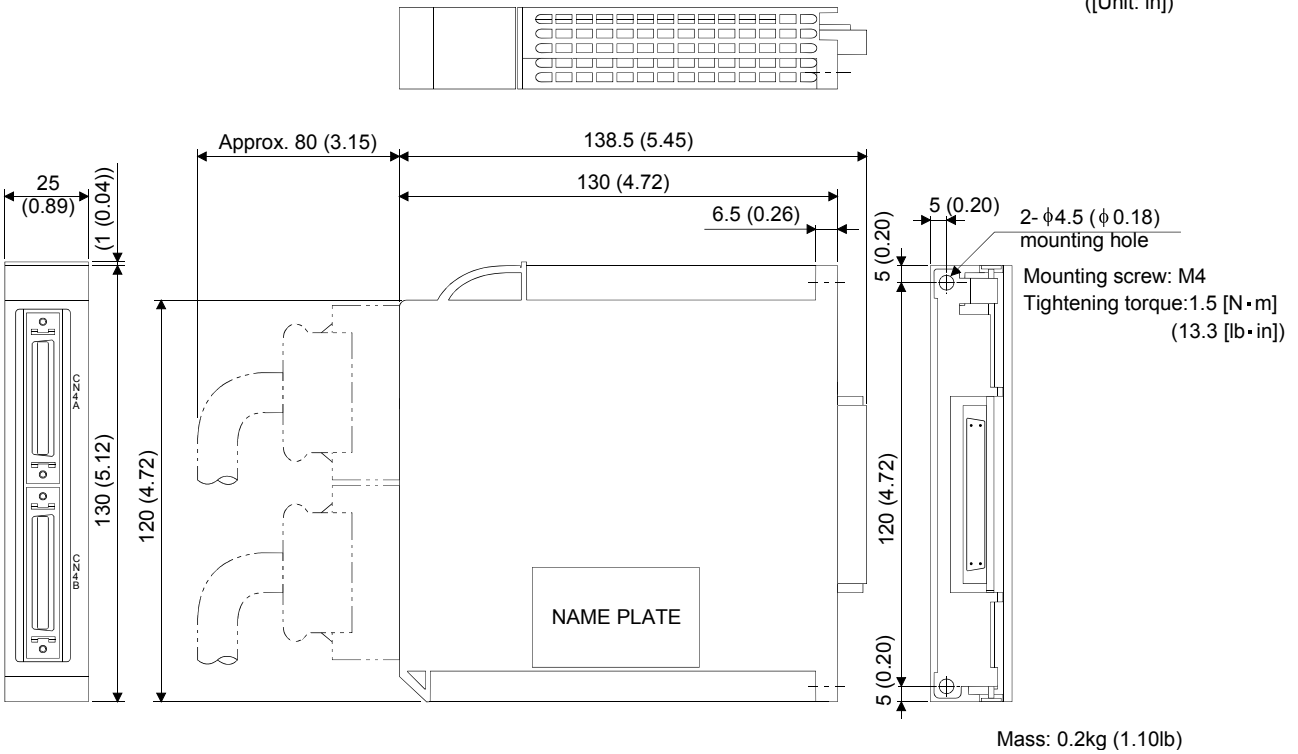


Mass: 0.7kg (1.54lb)

10 OUTLINE DRAWINGS

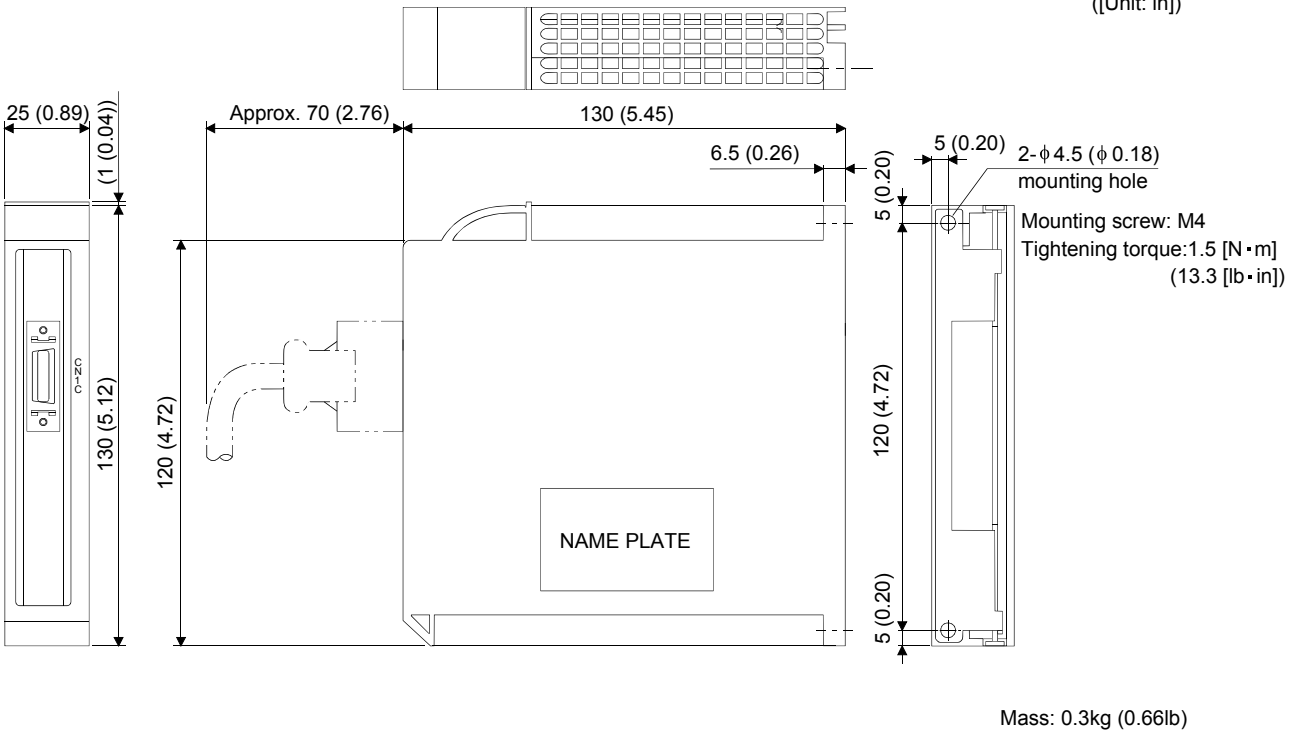
10.2.4 Extension IO unit (MR-J2M-D01)

[Unit: mm]
 ([Unit: in])



10.2.5 Battery unit (MR-J2M-BT)

[Unit: mm]
 ([Unit: in])



10 OUTLINE DRAWINGS

10.3 Connector

(1) CN1A · CN1B · CN2 · CN3 connector

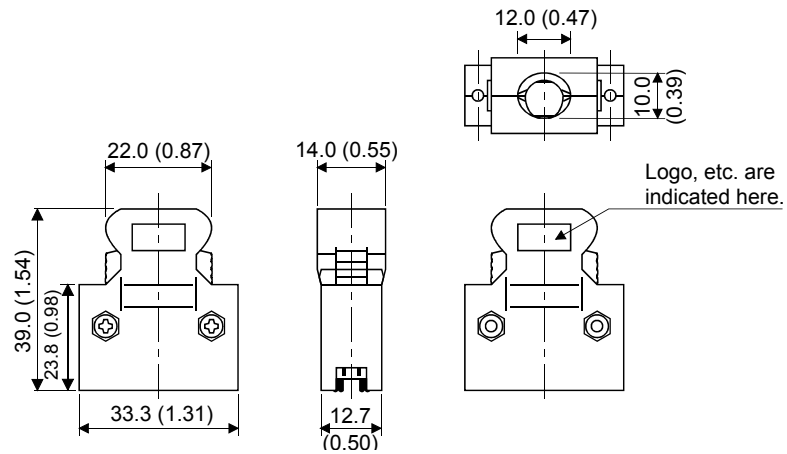
<3M>

(a) Soldered type

Model Connector : 10120-3000VE

Shell kit : 10320-52F0-008

[Unit: mm]
([Unit: in])



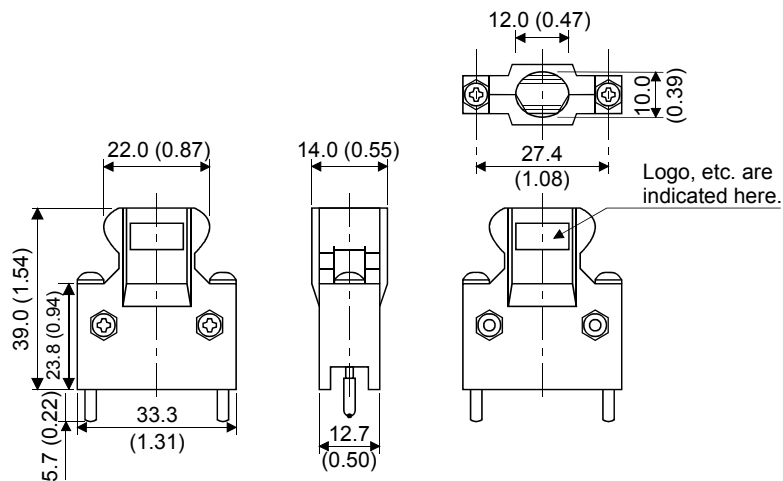
(b) Threaded type

Model Connector : 10120-3000VE

Shell kit : 10320-52A0-008

Note. This is not available as option and should be user-prepared.

[Unit: mm]
([Unit: in])

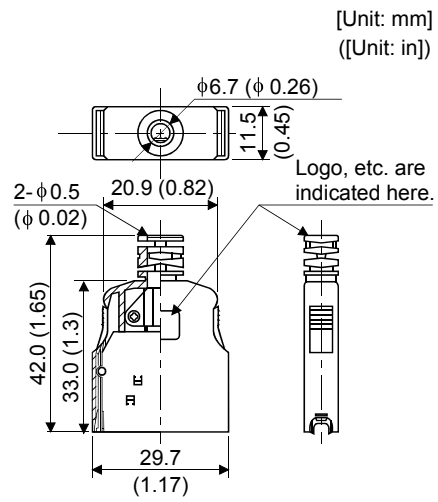


10 OUTLINE DRAWINGS

(c) Insulation displacement type

Model Connector : 10120-6000EL

Shell kit : 10320-3210-000

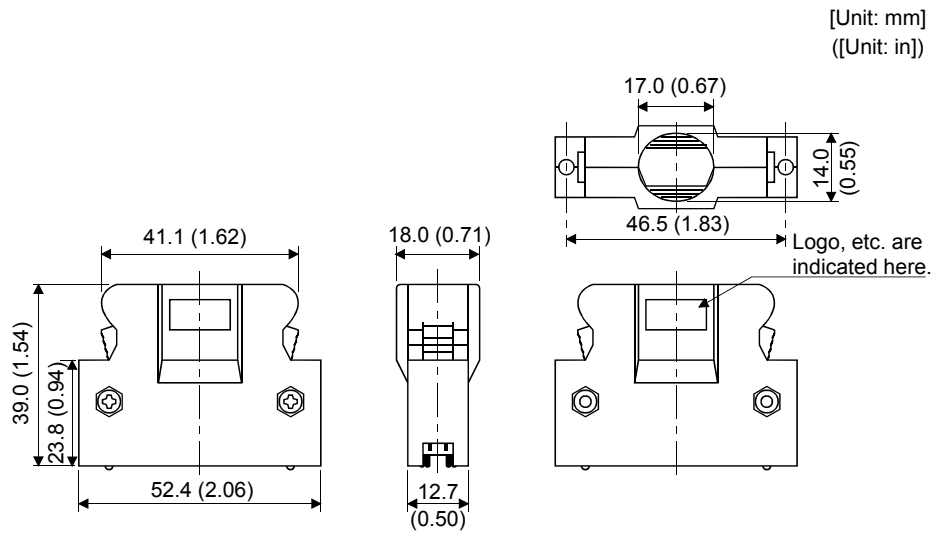


10 OUTLINE DRAWINGS

(2) CN4A - CN4B connector <3M>

(a) Soldered type

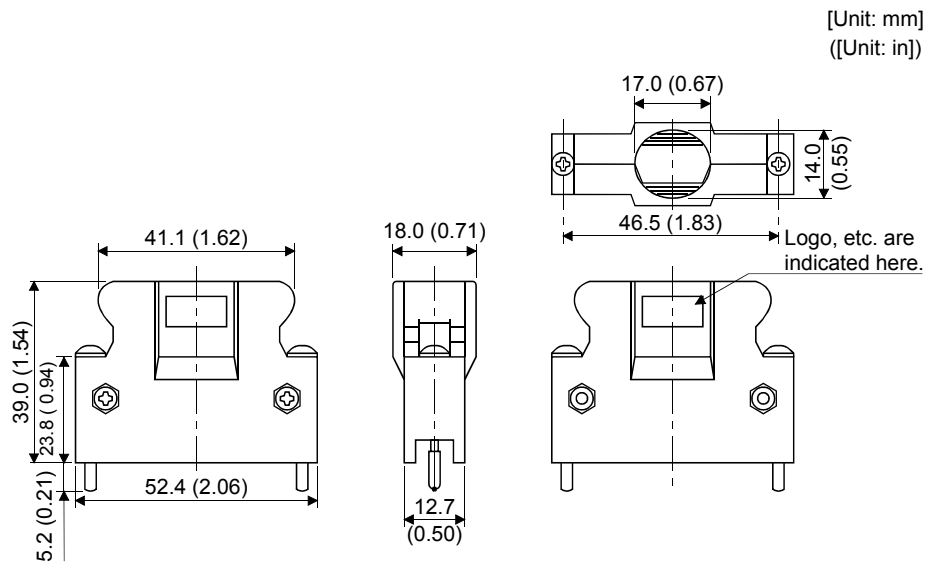
Model Connector : 10150-3000VE
Shell kit : 10350-52F0-008



(b) Threaded type

Model Connector : 10150-3000VE
Shell kit : 10350-52A0-008

Note. This is not available as option and should be user-prepared.

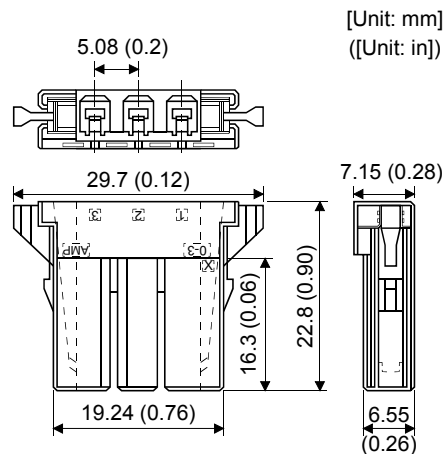


10 OUTLINE DRAWINGS

(3) CNP1A · CNP1B connector

<Tyco Electronics>

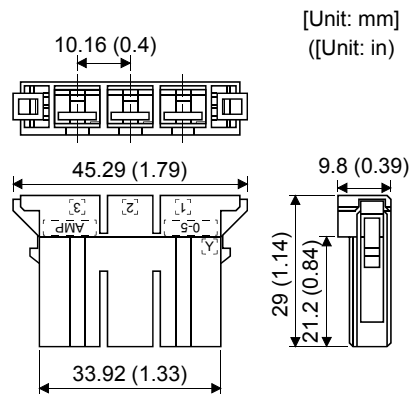
Model CNP1A housing	: 1-178128-3
CNP1B housing	: 2-178128-3
Contact	: 917511-2 (max. sheath OD: ϕ 2.8 [mm]) 353717-2 (max. sheath OD: ϕ 3.4 [mm])
Applicable tool	: 91560-1 (for 917511-2) 937315-1 (for 353717-2)



(4) CNP3 connector

< Tyco Electronics >

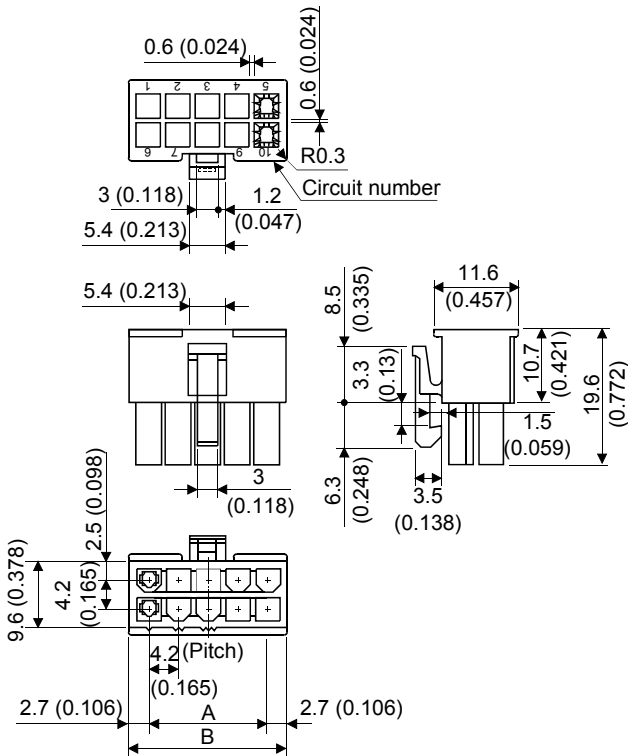
Model Housing	: 1-179958-3
Contact	: 316041-2
Applicable tool	: 234171-1



10 OUTLINE DRAWINGS

(5) CNP1 • CNP2 • CNP3 connector

<molex>



[Unit: mm]
([Unit: in])

Layout diagrams classified by the number of poles

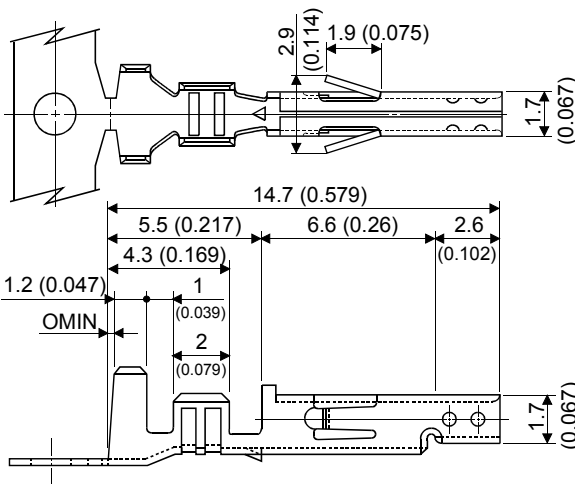


4 poles

Model	Variable Dimensions	
	A	B
5557-04R	4.2 (0.165)	9.6 (0.378)

Terminal
Model: 5556

[Unit: mm]
([Unit: in])



Applicable wire

Core size : AWG#18 to #24 (5556-PBTL)
AWG28 (5556-PBT2L)
Sheath OD: ϕ 3.1mm (ϕ 0.122 in) max.
Strip length: 3.0 to 3.5 [mm] (0.118 to 0.138 [in])

Exclusive tools

Terminal	Wire specifications		Tool number
	Core size	Sheath OD [mm(inch)]	
5556-PBL	AWG18 to AWG24	1.5 to 2.2 (0.06 to 0.09)	57026-5000
		2.3 to 3.1 (0.06 to 0.12)	57027-5000
5556-PBT2L	AWG28		57064-5000
5556-PBT3L	AWG16		57022-5300

10 OUTLINE DRAWINGS

(6) Bus cable connector

Honda Tsushin Industry HDR type

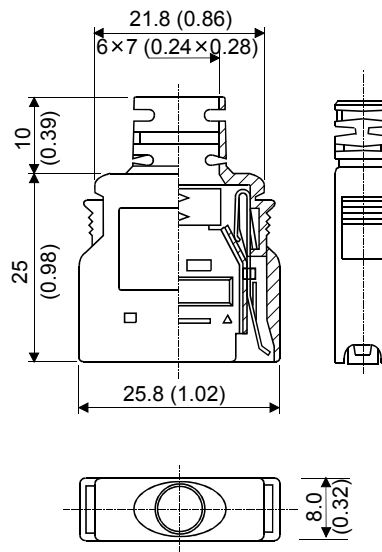
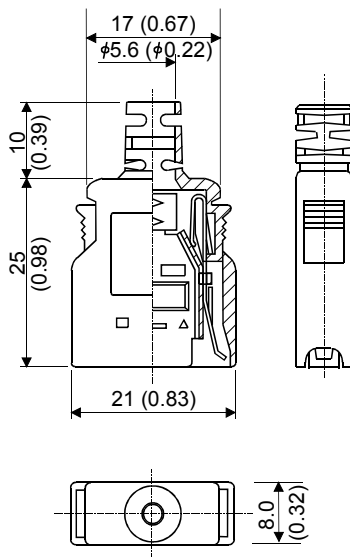
Number of Pins	Model HDR		
	Connector	Connector case	(Note) Crimping terminal
14	HDR-E14MG1	HDR-E14LPA5	Wire straightening tool : FHAT-0029
26	HDR-E26MG1	HDR-E26LPA5	Insulation displacement tool : FHPT-0004C

Note. Not available from us and to be supplied by the customer.

Model Connector : HDR-E14MG1
Connector case : HDR-E14LPA5

Model Connector : HDR-E26MG1
Connector case : HDR-E26LPA5

[Unit: mm]
([Unit: in])



11. CHARACTERISTICS

11. CHARACTERISTICS

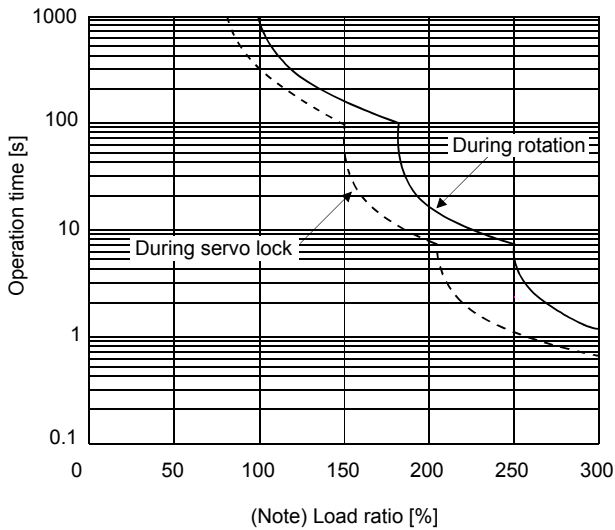
11.1 Overload protection characteristics

An electronic thermal relay is built in the drive unit to protect the servo motor and drive unit from overloads.

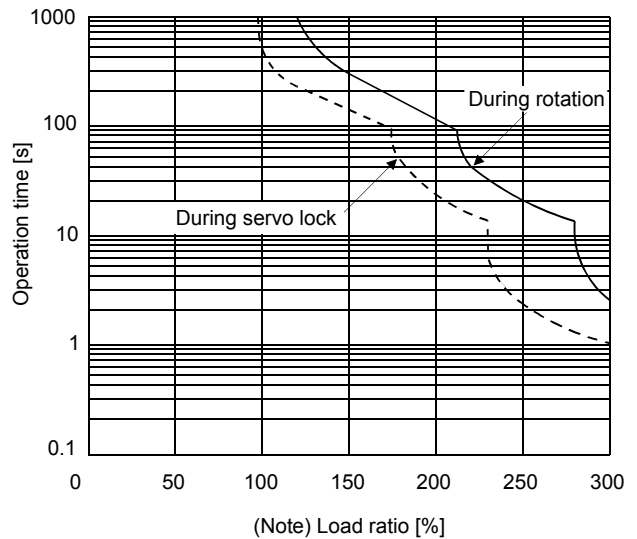
Overload 1 alarm (A.50) occurs if overload operation performed is above the electronic thermal relay protection curve shown in any of Figs. 13.1, or overload 2 alarm (A.51) occurs if the maximum current flows continuously for several seconds due to machine collision, etc. Use the equipment on the left-hand side area of the continuous or broken line in the graph.

In a machine like the one for vertical lift application where unbalanced torque will be produced, it is recommended to use the machine so that the unbalanced torque is 70% or less of the rated torque.

The overload protection characteristic is about 20% lower than that of the MELSERVO-J2-Super series. However, operation at the 100% continuous rating can be performed.



a. MR-J2M-10DU to MR-J2M-40DU



b. MR-J2M-70DU

Note. If operation that generates torque more than 100% of the rating is performed with an abnormally high frequency in a servo motor stop status (servo lock status) or in a 30r/min or less low-speed operation status, the servo amplifier may fail even when the electronic thermal relay protection is not activated.

Fig 11.1 MR-J2M multiple axis overload curve

11. CHARACTERISTICS

11.2 Power supply equipment capacity and generated loss

(1) Amount of heat generated by the drive unit

Table 11.1 indicates drive unit's power supply capacities and losses generated under rated load. For thermal design of an enclosure, use the values in Table 11.1 in consideration for the worst operating conditions. The actual amount of generated heat will be intermediate between values at rated torque and servo off according to the duty used during operation. When the servo motor is run at less than the maximum speed, the power supply capacity will be smaller than the value in the table, but generated heat will not change.

Table 11.1 Power supply capacity and generated heat at rated output

Unit	Servo motor	(Note 1) Power supply capacity[kVA]	(Note 2) Generated heat[W]		Area required for heat dissipation	
			At rated torque	At servo off	[m ²]	[ft ²]
MR-J2M-10DU	HC-KFS053 · 13	0.3	11	6	0.2	2.16
	HC-MFS053 · 13	0.3	11	6	0.2	2.16
	HC-UFS13	0.3	11	6	0.2	2.16
MR-J2M-20DU	HC-KFS23	0.5	14	6	0.3	3.24
	HC-MFS23	0.5	14	6	0.3	3.24
	HC-UFS23	0.5	14	6	0.3	3.24
MR-J2M-40DU	HC-KFS43	0.9	20	6	0.4	4.32
	HC-MFS43	0.9	20	6	0.4	4.32
MR-J2M-70DU	HC-KFS73	1.3	40	6	0.7	7.54
	HC-MFS73	1.3	40	6	0.7	7.54
	HC-UFS73	1.3	40	6	0.7	7.54
MR-J2M-P8B		0.1	9	9	0.2	2.16
MR-J2M-BU4		0	4	4	0.1	1.08
MR-J2M-BU6		0	4	4	0.1	1.08
MR-J2M-BU8		0	4	4	0.1	1.08

Note 1. Note that the power supply capacity will vary according to the power supply impedance.

This value applies to the case where the power factor improving reactor is not used.

- Heat generated during regeneration is not included in generated heat. To calculate heat generated by the regenerative brake option, use Equation 12.1 in Section 12.1.1.

11. CHARACTERISTICS

(2) Heat dissipation area for enclosed drive unit

The enclosed control box (hereafter called the control box) which will contain the drive unit should be designed to ensure that its temperature rise is within +10°C at the ambient temperature of 40°C. (With a 5°C (41°F) safety margin, the system should operate within a maximum 55°C (131°F) limit.) The necessary enclosure heat dissipation area can be calculated by Equation 11.1:

$$A = \frac{P}{K \cdot \Delta T} \dots\dots\dots (11.1)$$

- where, A : Heat dissipation area [m²]
- P : Loss generated in the control box [W]
- ΔT : Difference between internal and ambient temperatures [°C]
- K : Heat dissipation coefficient [5 to 6]

When calculating the heat dissipation area with Equation 11.1, assume that P is the sum of all losses generated in the enclosure. Refer to Table 11.1 for heat generated by the drive unit. "A" indicates the effective area for heat dissipation, but if the enclosure is directly installed on an insulated wall, that extra amount must be added to the enclosure's surface area.

The required heat dissipation area will vary with the conditions in the enclosure. If convection in the enclosure is poor and heat builds up, effective heat dissipation will not be possible. Therefore, arrangement of the equipment in the enclosure and the use of a fan should be considered.

Table 11.1 lists the enclosure dissipation area for each drive unit when the drive unit is operated at the ambient temperature of 40°C (104°F) under rated load.

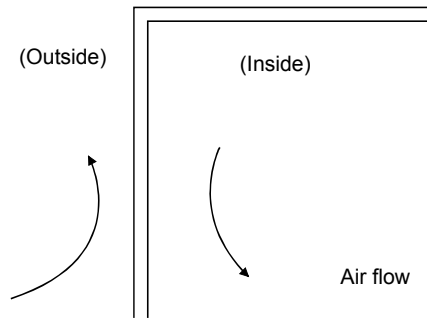


Fig. 11.2 Temperature distribution in enclosure

When air flows along the outer wall of the enclosure, effective heat exchange will be possible, because the temperature slope inside and outside the enclosure will be steeper.

11. CHARACTERISTICS

11.3 Dynamic brake characteristics

Fig. 11.3 shows the pattern in which the servo motor comes to a stop when the dynamic brake is operated. Use Equation 11.2 to calculate an approximate coasting distance to a stop. The dynamic brake time constant τ varies with the servo motor and machine operation speeds. (Refer to Fig. 11.4)

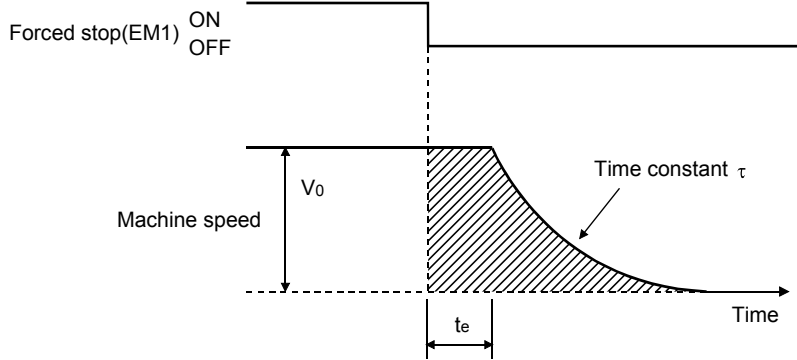
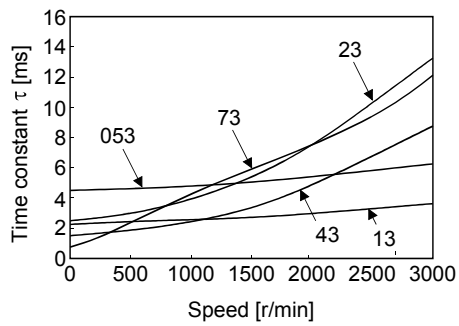


Fig. 11.3 Dynamic brake operation diagram

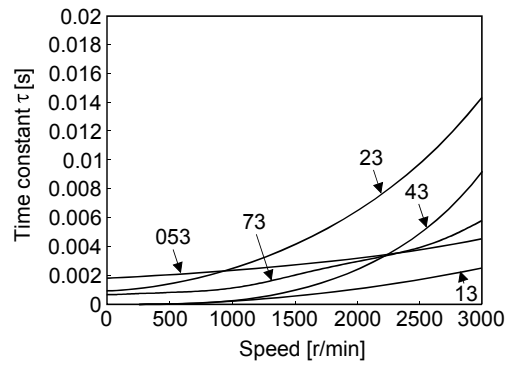
$$L_{max} = \frac{V_0}{60} \cdot \left\{ t_e + \tau \left[1 + \frac{J_L}{J_M} \right] \right\} \dots \dots \dots (11.2)$$

- L_{max} : Maximum coasting distance[mm][in]
- V_0 : Machine rapid feedrate [mm/min][in/min]
- J_M : Servo motor inertial moment..... [kg · cm²][oz · in²]
- J_L : Load inertia moment converted into equivalent value on servo motor shaft..... [kg · cm²][oz · in²]
- τ : Brake time constant [s]
- t_e : Delay time of control section [s]
(There is internal relay delay time of about 30ms.)

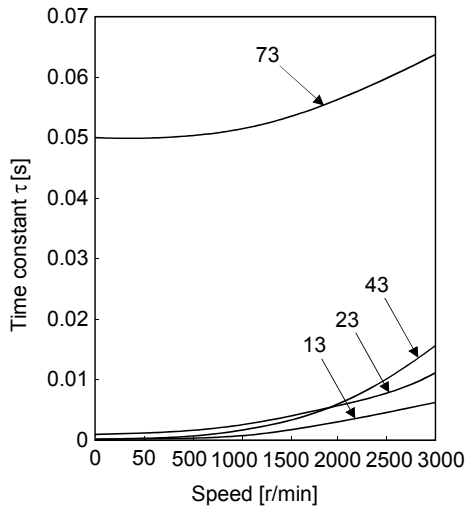
11. CHARACTERISTICS



a. HC-KFS series



b. HC-MFS series



c. HC-UFS3000r/min series

Fig. 11.4 Dynamic brake time constant

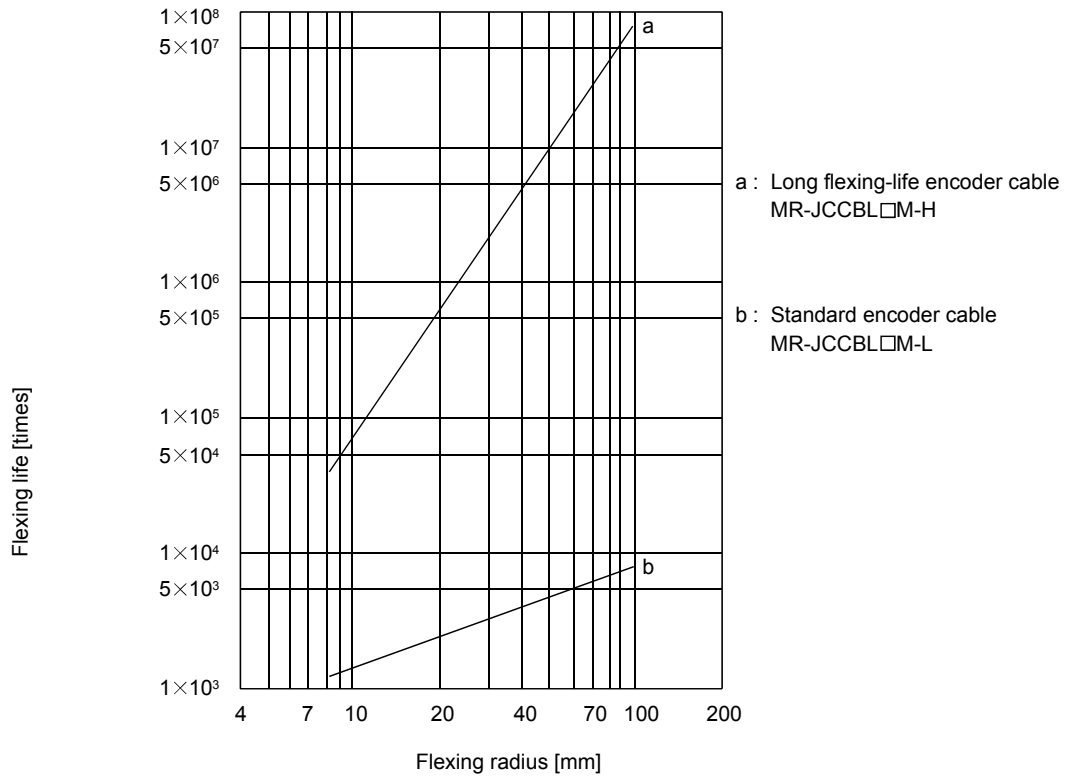
Use the dynamic brake at the load inertia moment indicated in the following table. If the load inertia moment is higher than this value, the built-in dynamic brake may burn. If there is a possibility that the load inertia moment may exceed the value, contact Mitsubishi.

Drive unit	Load inertia moment ratio [times]
MR-J2M-10DU	30
MR-J2M-20DU	
MR-J2M-40DU	
MR-J2M-70DU	

11. CHARACTERISTICS

11.4 Encoder cable flexing life

The flexing life of the cables is shown below. This graph calculated values. Since they are not guaranteed values, provide a little allowance for these values.



12. OPTIONS AND AUXILIARY EQUIPMENT

12. OPTIONS AND AUXILIARY EQUIPMENT



WARNING

• Before connecting any option or auxiliary equipment, make sure that the charge lamp is off more than 15 minutes after power-off, then confirm the voltage with a tester or the like. Otherwise, you may get an electric shock.



CAUTION

• Use the specified auxiliary equipment and options. Unspecified ones may lead to a fault or fire.

12.1 Options

12.1.1 Regenerative brake options



CAUTION

• The specified combinations of regenerative brake options and base units may only be used. Otherwise, a fire may occur.

(1) Combinations and regenerative powers

The power values in the table are resistor-generated regenerative powers and not rated powers.

Base unit	Regenerative power [W]			
	MR-RB032 [40Ω]	MR-RB14 [26Ω]	MR-RB34 [26Ω]	MR-RB54 [26Ω]
MR-J2M-BU4 MR-J2M-BU6 MR-J2M-BU8	30	100	300	500

(2) Selection of regenerative brake option

(a) Simple judgment of regenerative brake option necessity

The MELSERVO-J2M series does not contain a regenerative brake resistor. Check whether the regenerative brake option is needed or not in the following method.

1) Requirements

The drive units mounted to the same base unit are all horizontal axes.

The operation pattern is clear and the load inertia moments of the axes to be decelerated simultaneously are clear.

2) Checking method

The following table gives the permissible load inertia moment that does not require the regenerative brake option when speed is reduced from 3000r/min.

Drive unit	Permissible Load Inertia Moment
MR-J2M-10DU MR-J2M-20DU MR-J2M-40DU	1.42kg · cm ²
MR-J2M-70DU	4.94kg · cm ²

Calculate the 3000r/min-equivalent inertia moment of each drive unit.

$$(\text{Load inertia moment equivalent for 3000r/min}) = (J_L + J_M) \times (\text{running speed}/3000)^2$$

12. OPTIONS AND AUXILIARY EQUIPMENT

Calculate the total of the 3000r/min-equivalent inertia moments of the axes to be decelerated simultaneously, and find the maximum total of 3000r/min-equivalent inertia moments.

Also find the sum total of permissible load inertia moments of the drive units installed on the same base unit.

(Maximum total of 3000r/min-equivalent inertia moments) < (Sum total of permissible load inertia moments of drive units) × 1.42

→Regenerative brake option is unnecessary.

(Maximum total of 3000r/min-equivalent inertia moments) > (Sum total of permissible load inertia moments of drive units) × 1.42

→Regenerative brake option is necessary.

3) Confirmation example

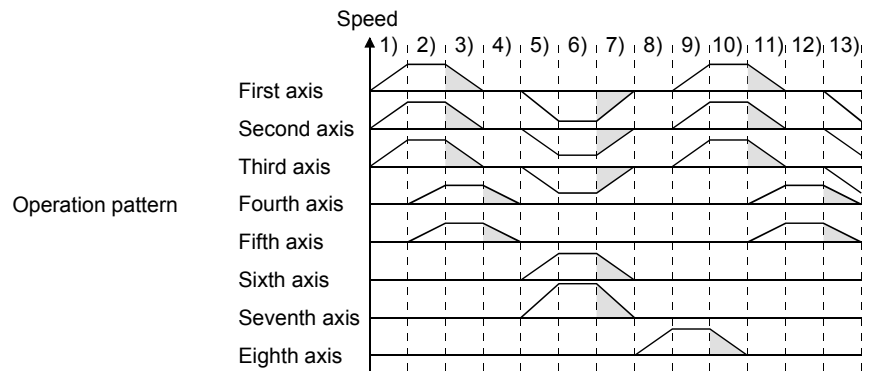
In the following 8-axis system, the total 3000r/min-equivalent inertia moment is maximum (9.75kg · cm) at the timing of 7). The permissible inertia moment of this 8-axis system is 11.36[kg · cm²] as indicated by the following expression.

$$8 [\text{axes}] \times 1.42 [\text{kg} \cdot \text{cm}^2] = 11.36 [\text{kg} \cdot \text{cm}^2]$$

Hence,

$$(\text{Maximum total of 3000r/min-equivalent load inertia moments} = 9.75) < 11.36 [\text{kg} \cdot \text{cm}^2]$$

The regenerative brake option is unnecessary.



Axis No.	Servo Motor Model	Servo Motor Inertia Moment kg/cm ²	Load Inertia Moment (Servo motor shaft equivalent) kg/cm ²	Total inertia moment kg/cm ²	Running speed r/min	3000r/min-equivalent Total Inertia Moment kg/cm ²												
First axis	HC-KFS13	0.084	1.3	1.384	3000	1.38		1.38		1.38				1.38				
Second axis	HC-KFS23	0.42	2.1	2.52	3000	2.52		2.52		2.52				2.52				
Third axis	HC-KFS43	0.67	2.0	2.67	3000	2.67		2.67		2.67				2.67				
Fourth axis	HC-KFS13	0.084	0.8	0.884	2500	0.61		0.61										0.61
Fifth axis	HC-MFS13	0.03	0.9	0.93	2500	0.65		0.65										0.65
Sixth axis	HC-MFS23	0.088	2.5	2.588	3000	2.59				2.59								
Seventh axis	HC-KFS13	0.084	0.4	0.484	3300	0.59				0.59								
Eighth axis	HC-KFS43	0.67	5.83	6.5	3000	6.5												6.5
3000r/min-equivalent total inertia moment			kg/cm ²					6.57	1.26	9.75				6.5	6.57	1.26		

Simultaneous deceleration total inertia moment maximum value

12. OPTIONS AND AUXILIARY EQUIPMENT

(b) To make selection according to regenerative energy

Use the following method when regeneration occurs continuously in vertical motion applications or when it is desired to make an in-depth selection of the regenerative brake option:

1) Regenerative energy calculation

Use the following table to calculate the regenerative energy.

Formulas for calculating torque and energy in operation

Regenerative power	Torque applied to servo motor [N · m]	Energy [J]
1)	$T_1 = \frac{(J_L + J_M) \cdot N_0}{9.55 \times 10^4} \cdot \frac{1}{T_{psa1}} + T_U + T_F$	$E_1 = \frac{0.1047}{2} \cdot N_0 \cdot T_1 \cdot T_{psa1}$
2)	$T_2 = T_U + T_F$	$E_2 = 0.1047 \cdot N_0 \cdot T_2 \cdot t_1$
3)	$T_3 = \frac{(J_L + J_M) \cdot N_0}{9.55 \times 10^4} \cdot \frac{1}{T_{psd1}} + T_U + T_F$	$E_3 = \frac{0.1047}{2} \cdot N_0 \cdot T_3 \cdot T_{psd1}$
4), 8)	$T_4 = T_U$	$E_4 \geq 0$ (No regeneration)
5)	$T_5 = \frac{(J_L + J_M) \cdot N_0}{9.55 \times 10^4} \cdot \frac{1}{T_{psa2}} - T_U + T_F$	$E_5 = \frac{0.1047}{2} \cdot N_0 \cdot T_5 \cdot T_{psa2}$
6)	$T_6 = T_U + T_F$	$E_6 = 0.1047 \cdot N_0 \cdot T_6 \cdot t_3$
7)	$T_7 = \frac{(J_L + J_M) \cdot N_0}{9.55 \times 10^4} \cdot \frac{1}{T_{psd2}} - T_U + T_F$	$E_7 = \frac{0.1047}{2} \cdot N_0 \cdot T_7 \cdot T_{psd2}$

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

2) Losses of servo motor and drive unit in regenerative mode

The following table lists the efficiencies and other data of the servo motor and drive unit in the regenerative mode.

Drive unit	Inverse efficiency [%]	C charging [J]
MR-J2M-10DU	55	5.5
MR-J2M-20DU	70	
MR-J2M-40DU	85	
MR-J2M-70DU	80	18

Using the following expression, find the total of C charging [J] of the MELSERVO-J2M.

Number of drive unit axes $\times 5.5J$

Then, find the energy at each timing in a single-cycle operation pattern. The energy is positive in the driving mode and negative in the regenerative mode. Enter signed driving/regenerative energy values into the following calculation table. The shaded areas indicate negative values.

12. OPTIONS AND AUXILIARY EQUIPMENT

<Entry example>

Timing	1)	2)	3)	4)	5)	6)	7)	8)
First axis	E1	E2	E3	E4	E1	E2	E3	E4
Second axis	E1	E2	E3	E4	E1	E2	E3	E4
Third axis	E1	E2	E3	E4	E5	E6	E7	E8
Fourth axis	E4	E4	E1	E2	E3	E4	E4	E4
Fifth axis	E4	E4	E4	E4	E4	E1	E2	E3
Sixth axis	E1	E2	E2	E3	E4	E4	E1	E2
Seventh axis	E1	E2	E2	E3	E4	E4	E1	E2
Eighth axis	E1	E2	E2	E3	E4	E4	E1	E2
Total	E 1)	E 2)	E 3)	E 4)	E 5)	E 6)	E 7)	E 8)
Regenerative ES			ES 3)	ES 4)				
ES - EC			ER	ER				
PR(W)			ER/t _f					

Calculate the total of energies at each timing. Only when the total is negative (timings 3), 4) in the example), use the following expression for calculation.

Energy total ER = regenerative energy ES (absolute value) – C charging total (EC)

If the subtraction results are negative at all timings, the regenerative brake option is not needed. From the total of ER's whose subtraction results are positive and a single-cycle period, the power consumption of the regenerative brake option can be calculated with the following expression.

Power consumption PR [W] = (total of positive ER's)/1-cycle operation period (t_f)

12. OPTIONS AND AUXILIARY EQUIPMENT

(3) Connection of the regenerative brake option

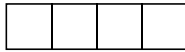
POINT

- When using the MR-RB54, cooling by a fan is required. Please obtain a cooling fan at your discretion.

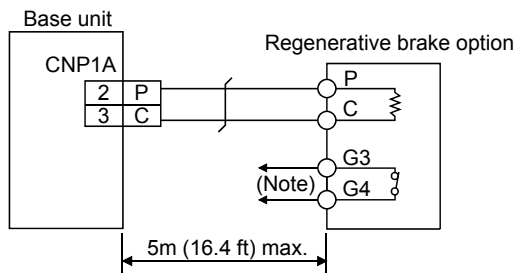
Set DRU parameter No.2 according to the option to be used. The regenerative brake option will cause a temperature rise of 100 degrees relative to the ambient temperature. Fully examine heat dissipation, installation position, used cables, etc. before installing the option. For wiring, use flame-resistant cables and keep them clear of the regenerative brake option body. Always use twisted cables of max. 5m(16.4ft) length for connection with the base unit.

The G3 and G4 terminals act as a thermal sensor. G3-G4 are disconnected when the regenerative brake option overheats abnormally.

DRU parameter No.2



- Selection of regenerative
 00: Not used.
 06: MR-RB34
 07: MR-RB54
 10: MR-RB032
 12: MR-RB14



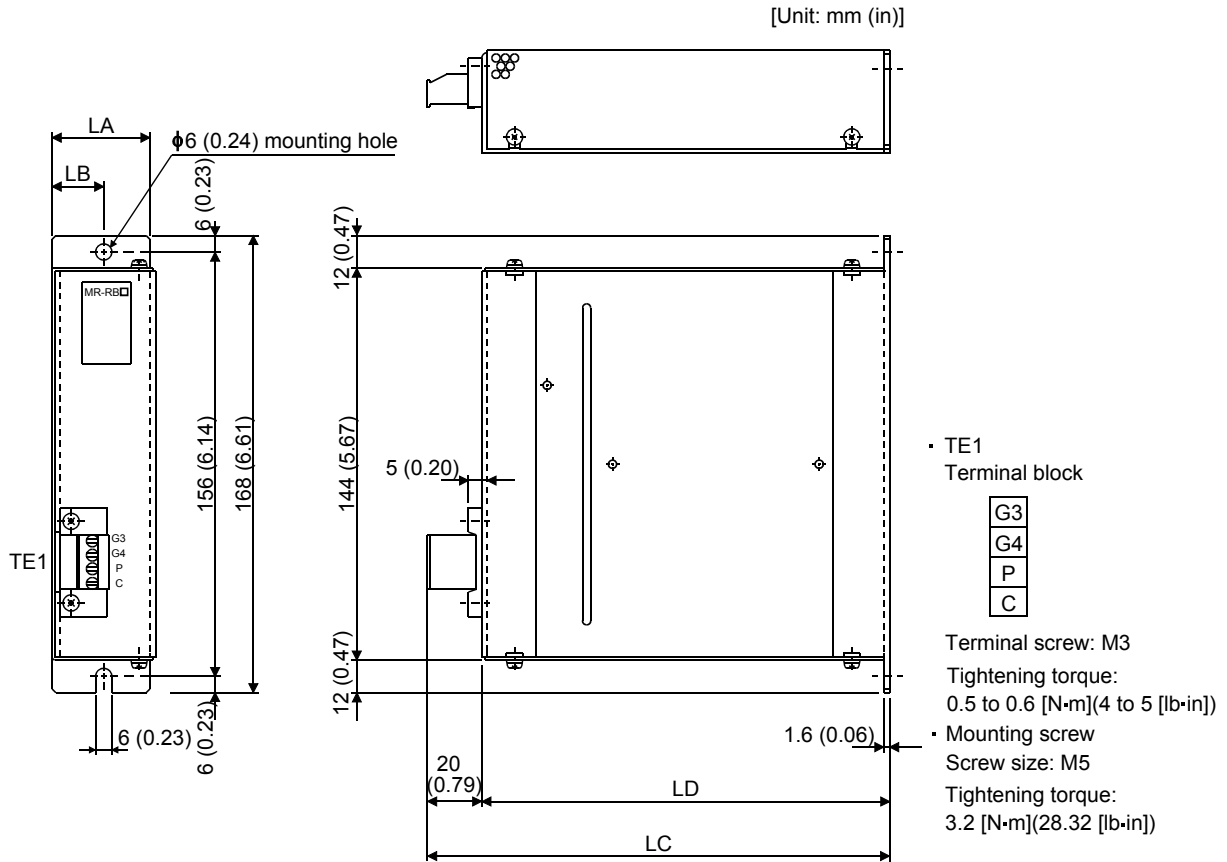
Note. Make up a sequence which will switch off the magnetic contactor (MC) when abnormal heating occurs.

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

12. OPTIONS AND AUXILIARY EQUIPMENT

(4) Outline drawing

(a) MR-RB032 · MR-RB14

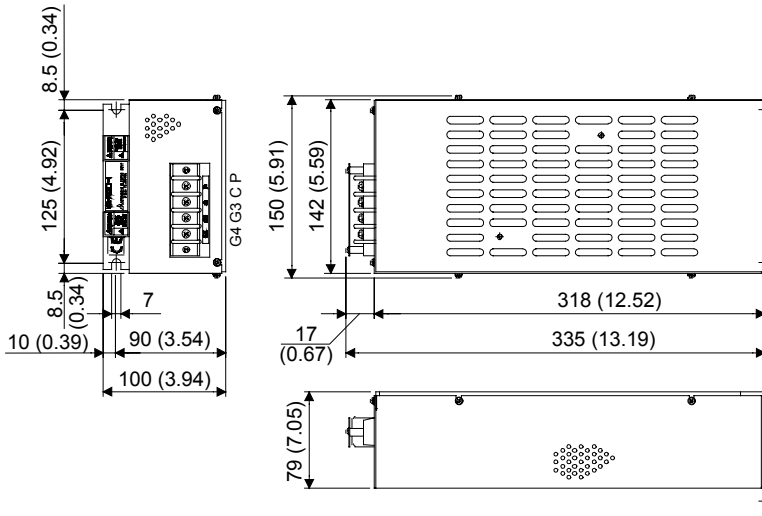


Regenerative brake option	Variable dimensions				Mass	
	LA	LB	LC	LD	[kg]	[lb]
MR-RB032	30 (1.18)	15 (0.59)	119 (4.69)	99 (3.9)	0.5	1.1
MR-RB14	40 (1.57)	15 (0.59)	169 (6.69)	149 (5.87)	1.1	2.4

12. OPTIONS AND AUXILIARY EQUIPMENT

(b) MR-RB34

[Unit: mm (in)]



- Terminal block

P
C
G3
G4

Terminal screw: M4
Tightening torque: 1.2 [N·m] (10.6 [lb·in])

- Mounting screw

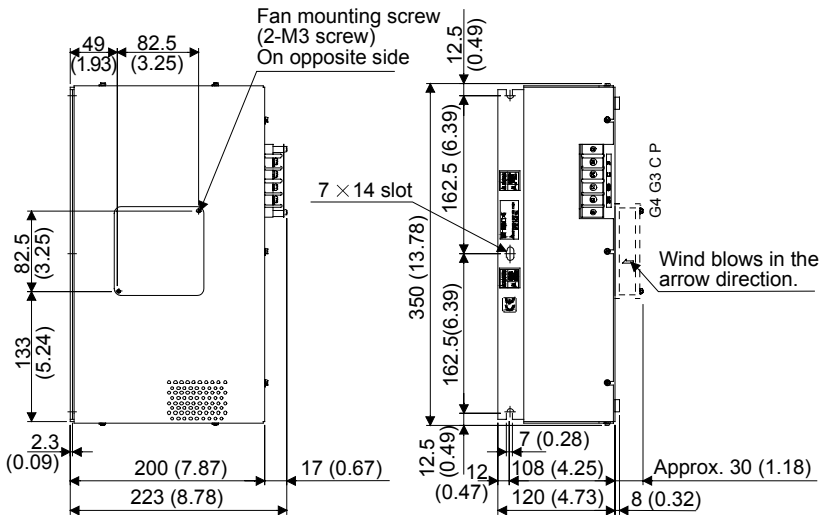
Screw : M6

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

Regenerative Brake Option	Mass [kg(lb)]
MR-RB34	2.9 (6.393)

(c) MR-RB54

[Unit: mm (in)]



- Terminal block

P
C
G3
G4

Terminal screw: M4
Tightening torque: 1.2 [N·m](10.6 [lb·in])

- Mounting screw

Screw : M6

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

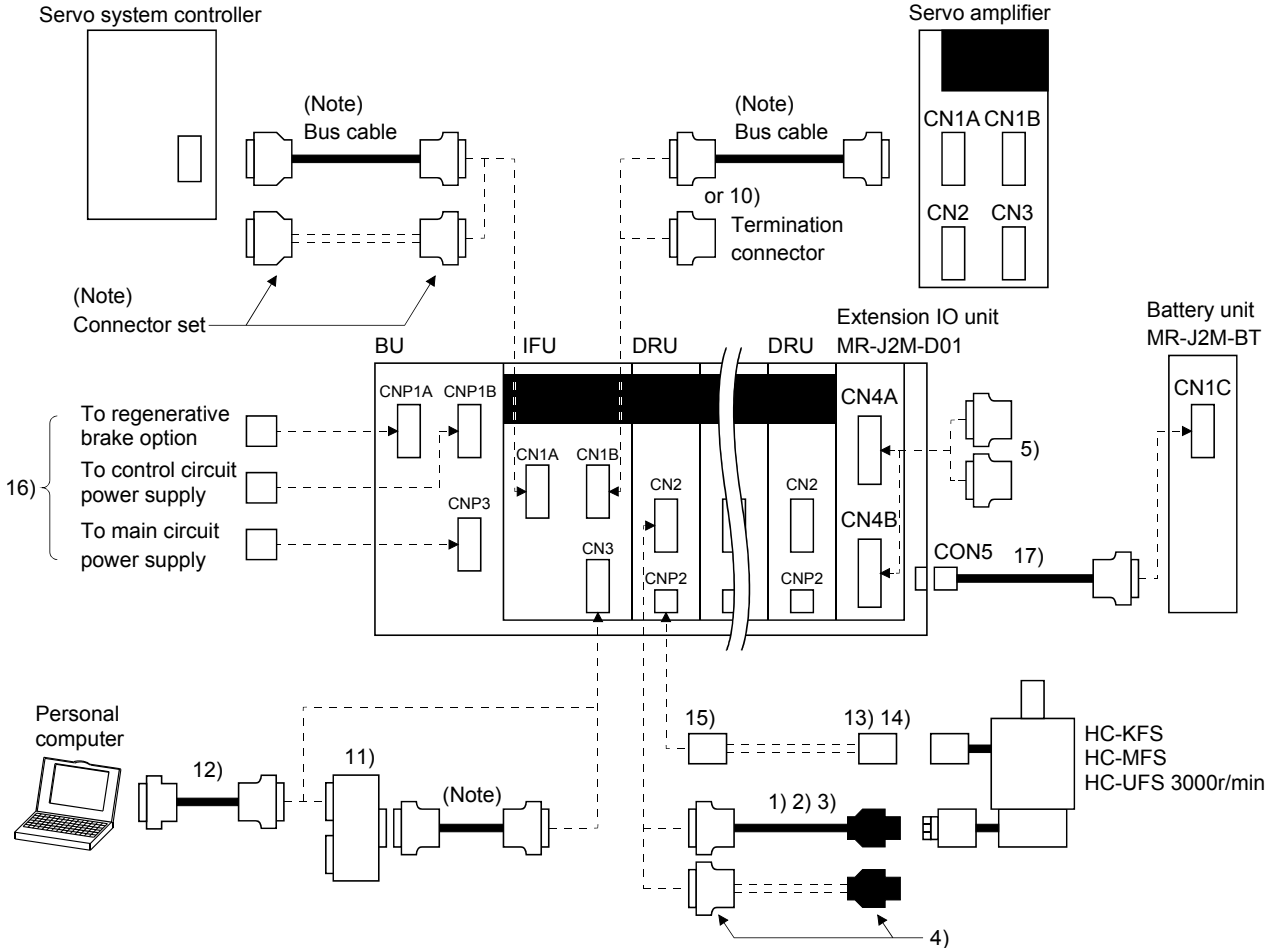
Regenerative Brake Option	Mass [kg(lb)]
MR-RB54	5.6 (12.346)

12. OPTIONS AND AUXILIARY EQUIPMENT

12.1.2 Cables and connectors

(1) Cable make-up












The following cables are used for connection with the servo motor and other models.
The broken line areas in the diagram are not options.








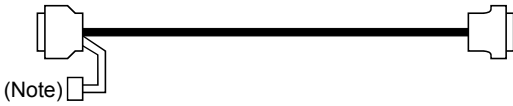

Note. The bus cable used with the SSCNET depends on the preceding or subsequent controller or servo amplifier connected.
Refer to the following table and choose the bus cable.

	MR-J2M-P8B	MR-J2S-□B	MR-J2-03B5
QD75M	7) Bus cable :MR-J2HBUS □ M	9) Connector set:MR-J2CN1	
Motion controller	Q172CPU(N)	18) Bus cable :Q172J2BCBL □ M(-B)	
	Q173CPU(N)	19) Bus cable :Q173J2B △ CBL □ M	
	A motion	6) Bus cable :MR-J2HBUS □ M-A	8) Connector set:MR-J2CN1-A
MR-J2M-P8B MR-J2S-□B MR-J2-03B5 Maintenance junction card	7) Bus cable :MR-J2HBUS □ M	9) Connector set:MR-J2CN1	

12. OPTIONS AND AUXILIARY EQUIPMENT

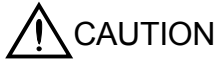
No.	Product	Model	Description		Application	
1)	Standard encoder cable	MR-JCCBL□M-L Refer to (2) (a) in this section.		Connector: 10120-3000VE Shell kit: 10320-52F0-008 (3M or equivalent)	Housing: 1-172161-9 Pin: 170359-1 (Tyco Electronics or equivalent) Cable clamp: MTI-0002 (Toa Electric Industry)	Standard flexing life IP20
2)	Long flexing life encoder cable	MR-JCCBL□M-H Refer to (2) (a) in this section.				Long flexing life IP20
3)		MR-JC4CBL□M-H Refer to (2) (b) in this section.				4 line type Long flexing life IP20
4)	Encoder connector set	MR-J2CNM		Connector: 10120-3000VE Shell kit: 10320-52F0-008 (3M or equivalent)	Housing: 1-172161-9 Pin: 170359-1 (Tyco Electronics or equivalent) Cable clamp: MTI-0002 (Toa Electric Industry)	IP20
5)	Connector set	MR-J2MCN1		 Qty: 2 each		
6)	Bus cable	MR-J2HBUS□M-A Refer to (4) in this section.		Connector: PCR-S20FS Case: PCR-LS20LA1 (Honda Tsushin)	Connector: 10120-6000EL Shell kit: 10320-3210-000 (3M or equivalent)	
7)	Bus cable	MR-J2HBUS□M Refer to (4) in this section.		Connector: 10120-6000EL Shell kit: 10320-3210-000 (3M or equivalent)	Connector: 10120-6000EL Shell kit: 10320-3210-000 (3M or equivalent)	
8)	Connector set	MR-J2CN1-A Refer to (4) in this section		Connector: PCR-S20FS Case: PCR-LS20LA1 (Honda Tsushin)	Connector: 10120-3000EL Shell kit: 10320-52F0-008 (3M or equivalent)	
9)	Control signal connector set	MR-J2CN1		 Qty: 2 each		
10)	Termination connector	MR-A-TM				
11)	Maintenance junction card	MR-J2CN3TM	Refer to Section 12.1.3.			
12)	Communication cable	MR-CPCATCBL3M Refer to (3) in this section.		Connector: DE-9SF-N Case: DE-C1-J6-S6 (Japan Aviation Electronics)	Connector: 10120-6000EL Shell kit: 10320-3210-000 (3M or equivalent)	For connection with PC-AT-compatible personal computer
13)	Power supply connector set	MR-PWCNK1		Plug: 5559-04P-210 Terminal: 5558PBT3L (For AWG16)(6 pcs.) (Molex)		IP20
14)	Power supply connector set	MR-PWCNK2		Plug: 5559-06P-210 Terminal: 5558PBT3L (For AWG16)(8 pcs.) (Molex)		For motor with brake IP20

12. OPTIONS AND AUXILIARY EQUIPMENT

No.	Product	Model	Description	Application
15)	Power supply connector	MR-PWCNK3	 Plug: 5557-04R-210 Terminal: 5556PBT3L (for AWG16) (6 pcs.) (Molex)	Servo motor power cable
16)	Base unit connector set	MR-J2MCNM	 Housing: 2-178128-3 (5 pcs.) Contact: 917511-2 (max. sheath OD ϕ 2.8 [mm]) 15 pcs.) (Tyco Electronics)	For CNP1B
			 Housing: 1-178128-3 (5 pcs.) Contact: 917511-2 (max. sheath OD ϕ 2.8 [mm]) 15 pcs.) (Tyco Electronics)	For CNP1A
			 Housing: 1-179958-3 (5 pcs.) Contact: 316041-2 (20 pcs.) (Tyco Electronics)	For CNP3
17)	Battery cable	MR-J2MBTCBL□M	Housing: 51030-0230 Terminal: 50083-8160 (Molex)  Connector: 10120-3000VE Shell kit: 10320-52F0-008 (3M or equivalent)	
18)	Bus cable	Q172J2BCBL□M (-B) Refer to (4) in this section	Connector: HDR-E14MG1 Shell kit: HDR-E14LPA5 (Honda Tsushin)  (Note) Connector: 10120-6000EL Shell kit: 10320-3210-000 (3M or equivalent) Socket: HCN2-2.5S-2 Terminal: HCN2-2.5S-D-B (Hirose Electric) Note. When using the battery unit Q170BAT, use the Q172J2BCBL□M-B.	
19)	Bus cable	Q173J2B△CBL□M Refer to (4) in this section	Connector: HDR-E26MG1 Shell kit: HDR-E26LPA5 (Honda Tsushin)  Connector: 10120-6000EL Shell kit: 10320-3210-000 (3M or equivalent)	

12. OPTIONS AND AUXILIARY EQUIPMENT

(2) Encoder cable



CAUTION

- If you have fabricated the encoder cable, connect it correctly. Otherwise, misoperation or explosion may occur.

POINT

- The encoder cable is not oil resistant.
- Refer to Section 11.4 for the flexing life of the encoder cable.
- When the encoder cable is used, the sum of the resistance values of the cable used for P5 and the cable used for LG should be within 2.4Ω.
- When soldering the wire to the connector pin, insulate and protect the connection portion using heat-shrinkable tubing.

Generally use the encoder cable available as our options. If the required length is not found in the options, fabricate the cable on the customer side.

(a) MR-JCCBL□M-L/H

1) Model explanation

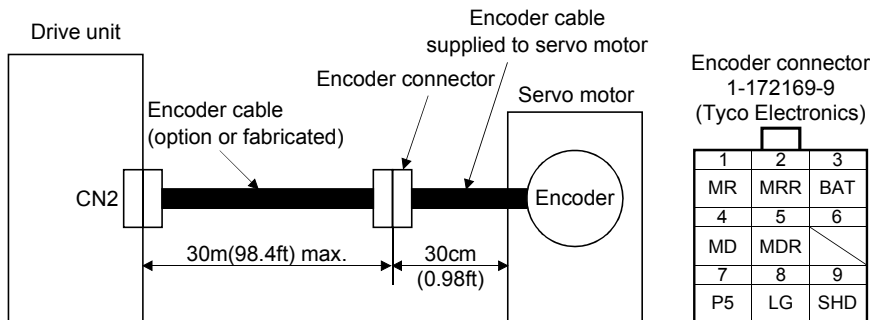
Model: MR-JCCBL□M-□

Symbol	Specifications
L	Standard flexing life
H	Long flexing life

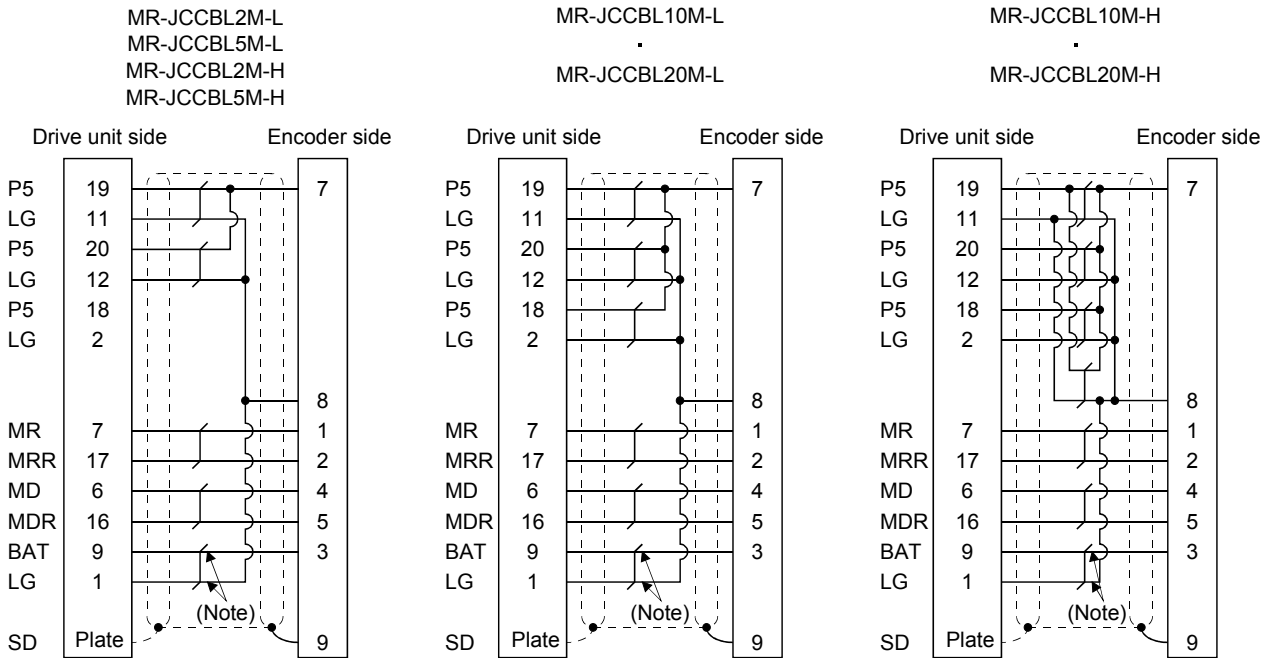
Symbol	Cable length [m(ft)]
2	2 (6.56)
5	5 (16.4)
10	10 (32.8)
20	20 (65.6)

2) Connection diagram

The signal assignment of the encoder connector is as viewed from the pin side. For the pin assignment on the drive unit side, refer to Section 3.5.3



12. OPTIONS AND AUXILIARY EQUIPMENT

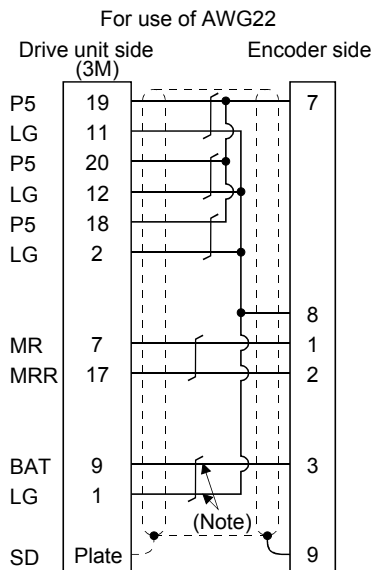


Note. Always make connection for use in an absolute position detection system.
This wiring is not needed for use in an incremental system.

When fabricating an encoder cable, use the recommended wires given in Section 12.2.1 and the MR-J2CNM connector set for encoder cable fabrication, and fabricate an encoder cable as shown in the following wiring diagram. Referring to this wiring diagram, you can fabricate an encoder cable of up to less than 30m (98.4ft) length including the length of the encoder cable supplied to the servo motor.

When the encoder cable is to be fabricated by the customer, the wiring of MD and MDR is not required.

Refer to Chapter 3 of the servo motor instruction manual and choose the encode side connector according to the servo motor installation environment.



Note. Always make connection for use in an absolute position detection system.
This wiring is not needed for use in an incremental system.

12. OPTIONS AND AUXILIARY EQUIPMENT

(b) MR-JC4CBL□M-H

POINT
<ul style="list-style-type: none"> When using this encoder cable, set " □ 1 □ □ " in DRU parameter No. 23.

1) Model explanation

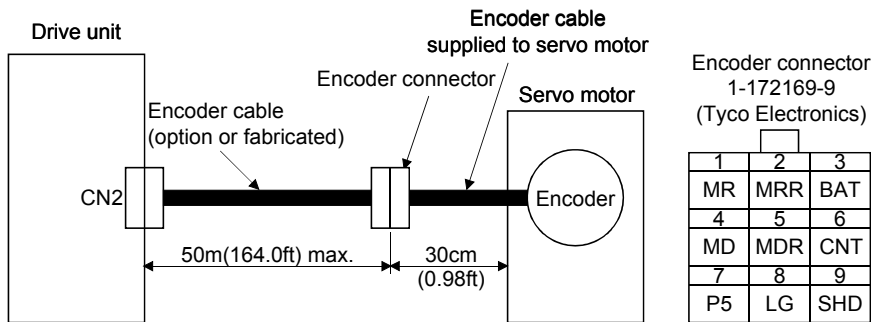
Model: MR-JC4CBL□M-H

Symbol	Cable Length [m(ft)]
30	30 (98.4)
40	40 (131.2)
50	50 (164.0)

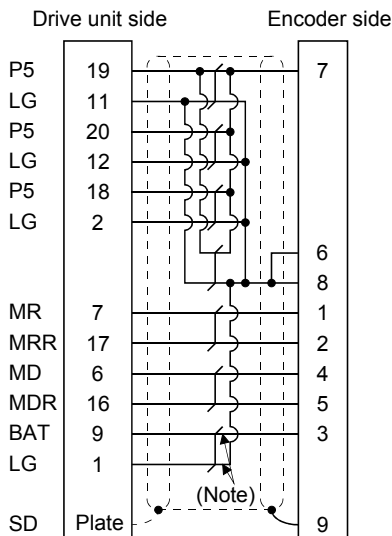
Long flexing life

2) Connection diagram

The signal assignment of the encoder connector is as viewed from the pin side. For the pin assignment on the drive unit side, refer to Section 3.5.3



MR-JC4CBL30M-H to MR-JC4CBL50M-H



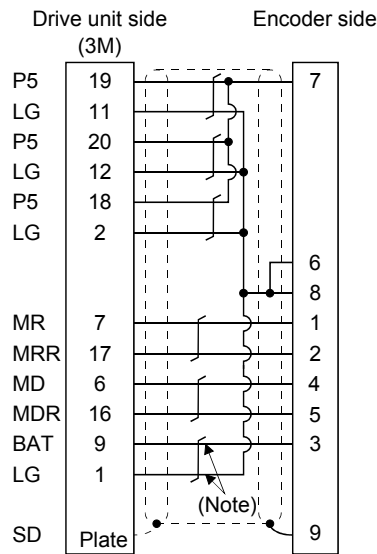
Note. Always make connection for use in an absolute position detection system. This wiring is not needed for use in an incremental system.

12. OPTIONS AND AUXILIARY EQUIPMENT

When fabricating an encoder cable, use the recommended wires given in Section 12.2.1 and the MR-J2CNM connector set for encoder cable fabrication, and fabricate an encoder cable as shown in the following wiring diagram. Referring to this wiring diagram, you can fabricate an encoder cable of up to 50m (164.0ft) length.

When the encoder cable is to be fabricated by the customer, the wiring of MD and MDR is not required.

Refer to Chapter 3 of the servo motor instruction manual and choose the encode side connector according to the servo motor installation environment.



Note. Always make connection for use in an absolute position detection system.
This wiring is not needed for use in an incremental system.

12. OPTIONS AND AUXILIARY EQUIPMENT

(3) Communication cable

POINT
<ul style="list-style-type: none"> This cable may not be used with some personal computers. After fully examining the signals of the RS-232C connector, refer to this section and fabricate the cable.

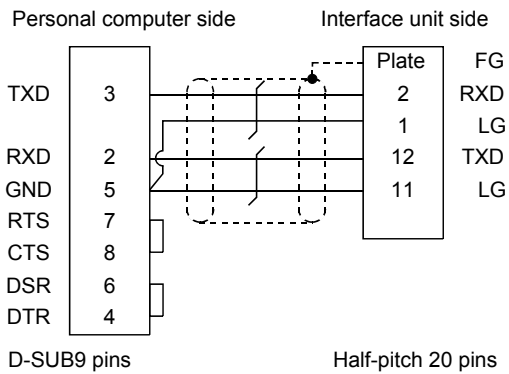
(a) Model definition

Model : MR-CPCATCBL3M

└── Cable length 3[m](10[ft])

(b) Connection diagram

• MR-CPCATCBL3M



When fabricating the cable, refer to the connection diagram in this section.

The following must be observed in fabrication:

- 1) Always use a shielded, multi-core cable and connect the shield with FG securely.
- 2) The optional communication cable is 3m(10ft) long. When the cable is fabricated, its maximum length is 15m(49ft) in offices of good environment with minimal noise.

12. OPTIONS AND AUXILIARY EQUIPMENT

(4) Bus cable



CAUTION

When fabricating the bus cable, do not make incorrect connection. Doing so can cause misoperation or explosion.

When fabricating this cable, use the recommended cable given in Section 12.2.1 and fabricate it in accordance with the connection diagram shown in this section. The overall distance of the bus cable on the same bus is 30m(98.4ft).

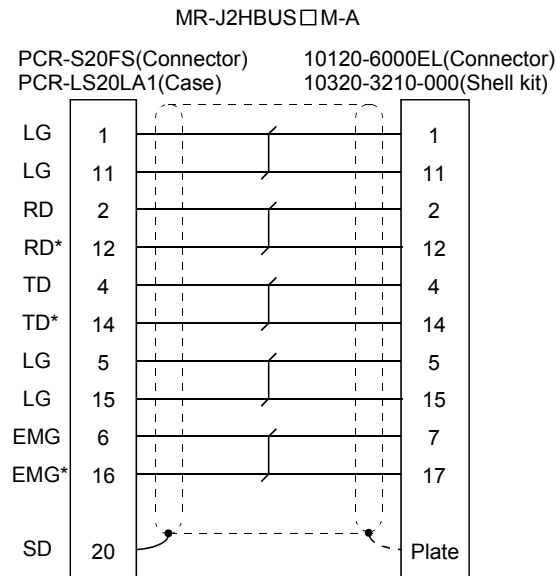
(a) MR-J2HBUS□M-A

1) Model definition

Model:MR-J2HBUS□M-A

Symbol	Cable Length [m(ft)]
05	0.5 (1.64)
1	1 (3.28)
5	5 (16.4)

2) Connection diagram



12. OPTIONS AND AUXILIARY EQUIPMENT

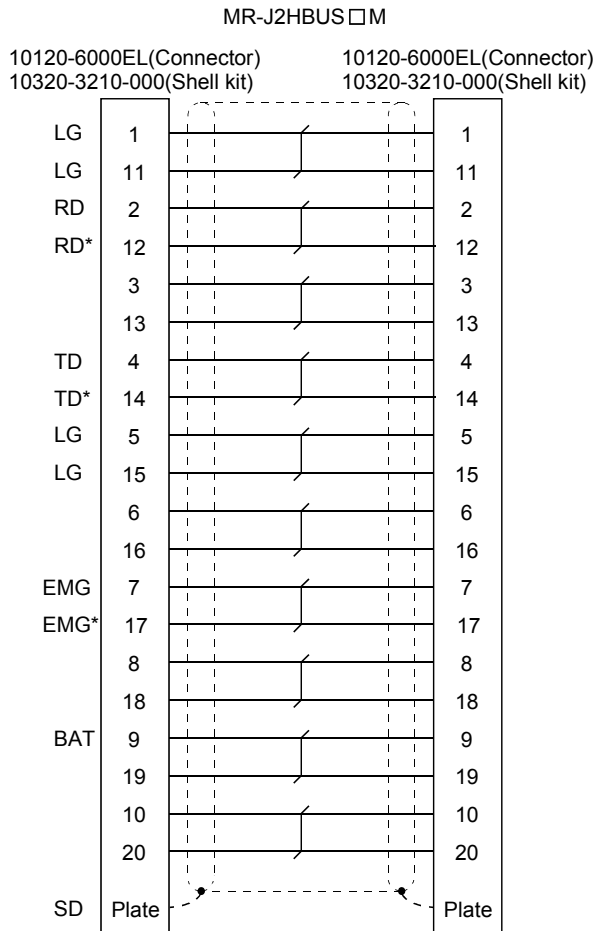
(b) MR-J2HBUS□M

1) Model definition

Model:MR-J2HBUS□M

Symbol	Cable Length [m(ft)]
05	0.5 (1.64)
1	1 (3.28)
5	5 (16.4)

2) Connection diagram



12. OPTIONS AND AUXILIARY EQUIPMENT

(c) Q172J2BCBL□M(-B)

When using the battery unit Q170BAT, use the Q172J2BCBL□M-B. For the Q170BAT, refer to the Motion Controller Q Series User's Manual (IB(NA)0300021).

1) Model definition

Model:Q172J2BCBL□M-□

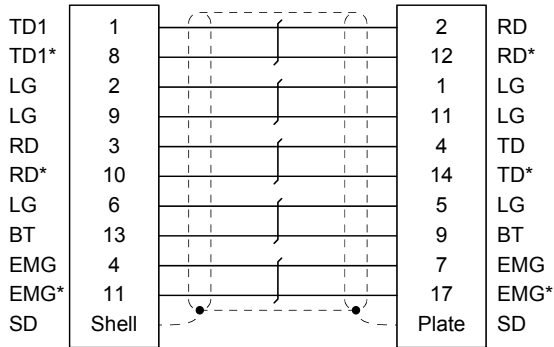
Symbol	Connection of Battery Unit
No	No
-B	Yes

Symbol	Cable Length [m(ft)]
05	0.5 (1.64)
1	1 (3.28)
5	5 (16.4)

2) Connection diagram

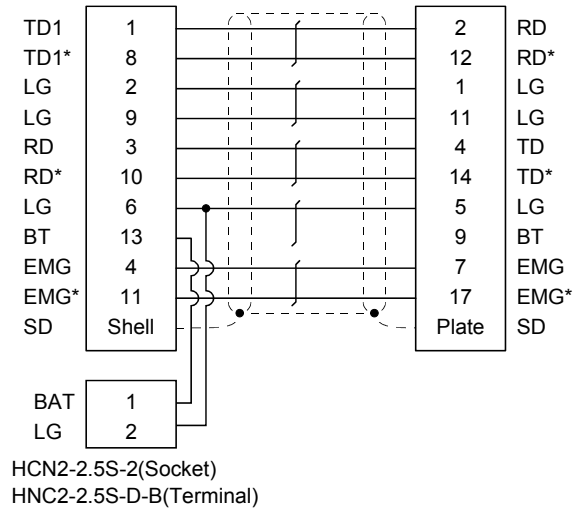
Q172J2BCBL□M

HDR-E14MG1(Connector) 10120-6000EL(Connector)
HDR-E14-LPA5(Connector case) 10320-3210-000(Shell kit)



Q172J2BCBL□M-B

HDR-E14MG1(Connector) 10120-6000EL(Connector)
HDR-E14-LPA5(Connector case) 10320-3210-000(Shell kit)



(d) Q173J2B△CBL□M

1) Model definition

Model:Q173J2B△CBL□M

Symbol	Cable Length [m(ft)]
05	0.5 (1.64)
1	1 (3.28)
5	5 (16.4)

Symbol	SSCNET Line Number
No	SSCNET1 Line
2	SSCNET2 Line
3	SSCNET3 Line
4	SSCNET4 Line

12. OPTIONS AND AUXILIARY EQUIPMENT

2) Connection diagram

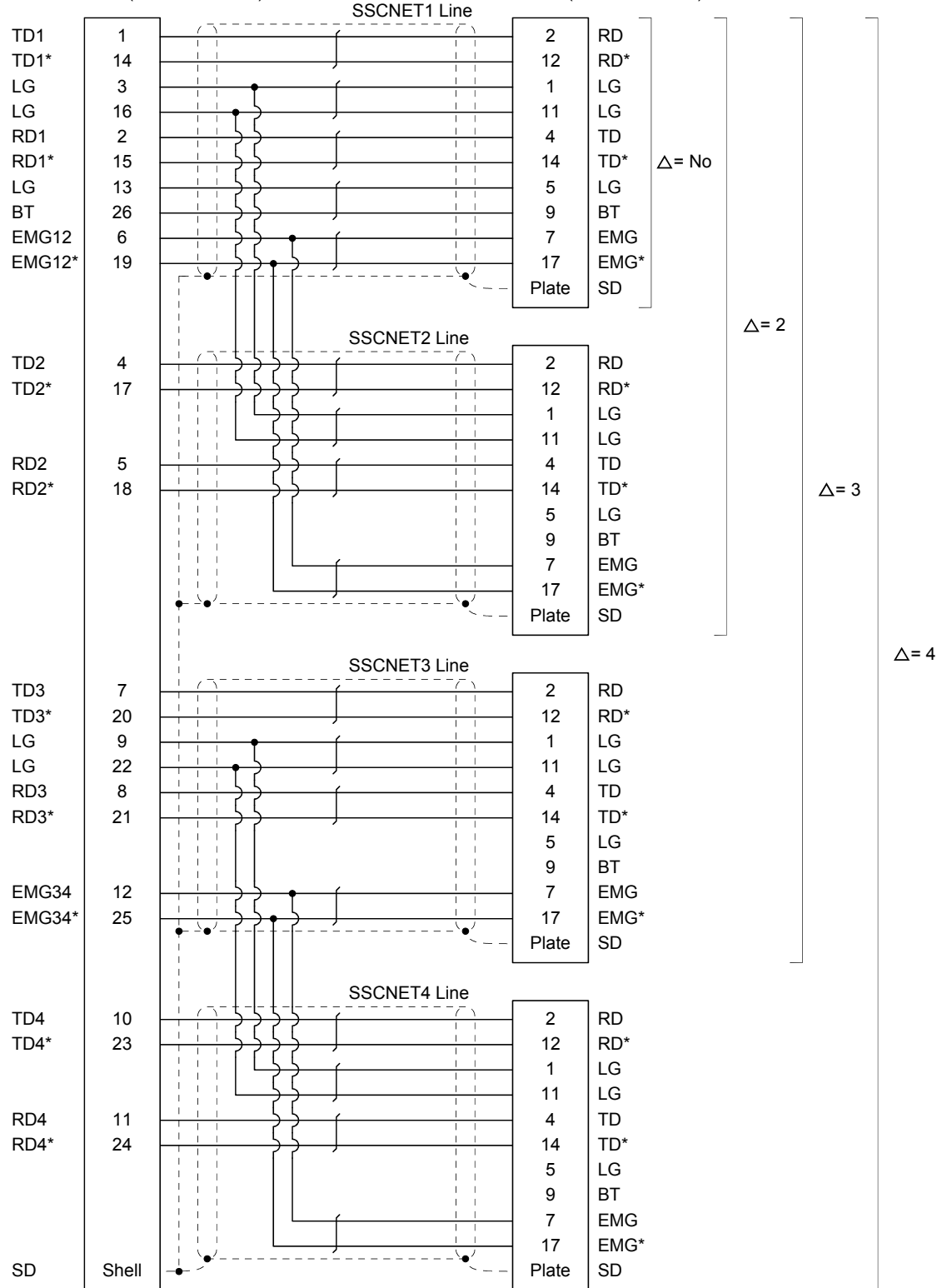
Q173J2B Δ CBL \square M When $\Delta=4$

HDR-E26MG1(Connector)

10120-6000EL(Connector)

HDR-E26-LPA5(Connector case)

10320-3210-000(Connector case)



12. OPTIONS AND AUXILIARY EQUIPMENT

(5) Battery cable

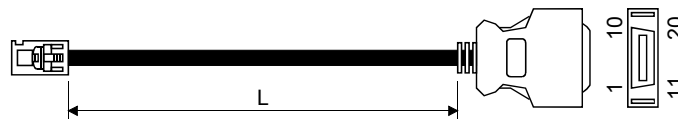
When fabricating, use the recommended wire given in Section 12.2.1 and fabricate as in the connection diagram shown in this section.

(a) Definition of model

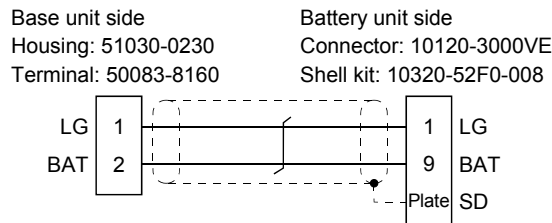
Model: MR-J2MBTCBL□M

Symbol	Cable Length L [m(ft)]
03	0.3 (0.1)
1	1 (3.28)

(b) Outline drawing



(c) Connection diagram

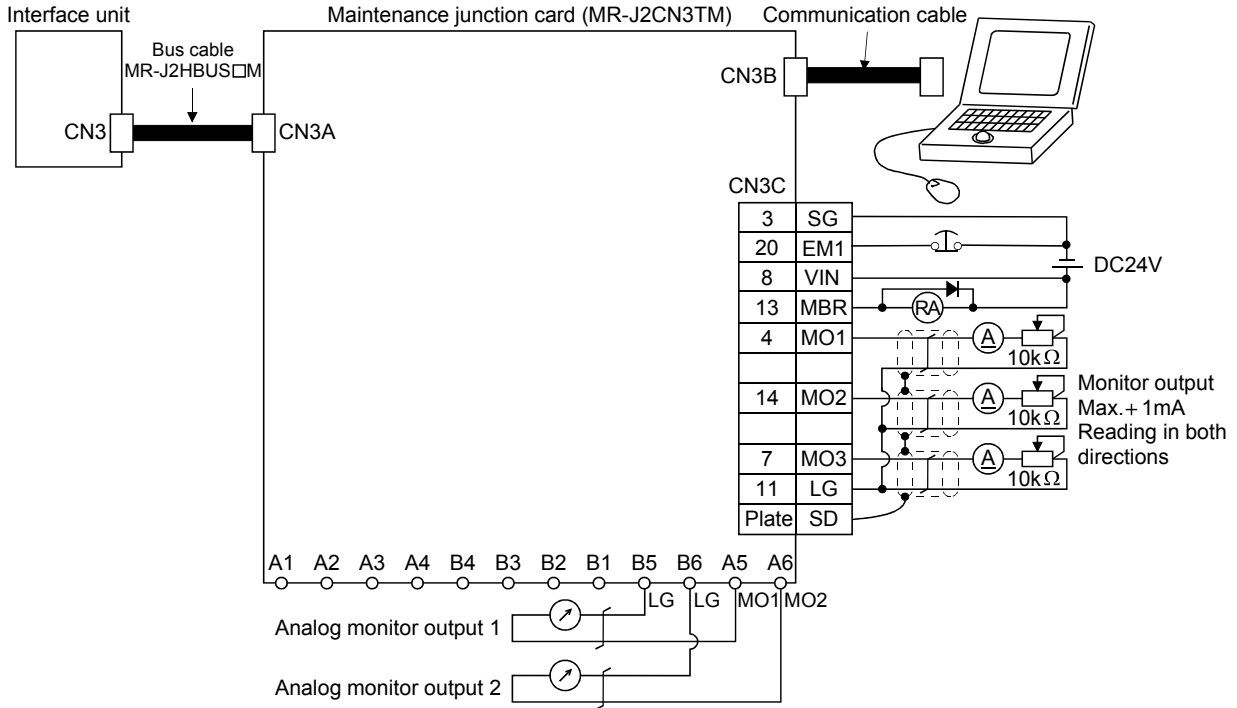


12. OPTIONS AND AUXILIARY EQUIPMENT

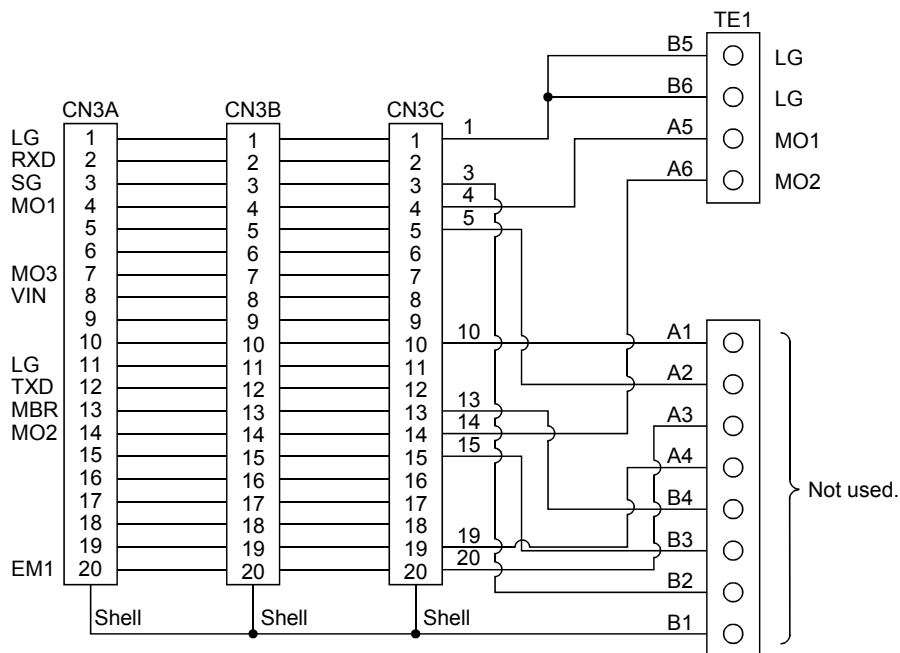
12.1.3 Maintenance junction card (MR-J2CN3TM)

(1) Usage

The maintenance junction card (MR-J2CN3TM) is designed for use when a personal computer and analog monitor are used at the same time.

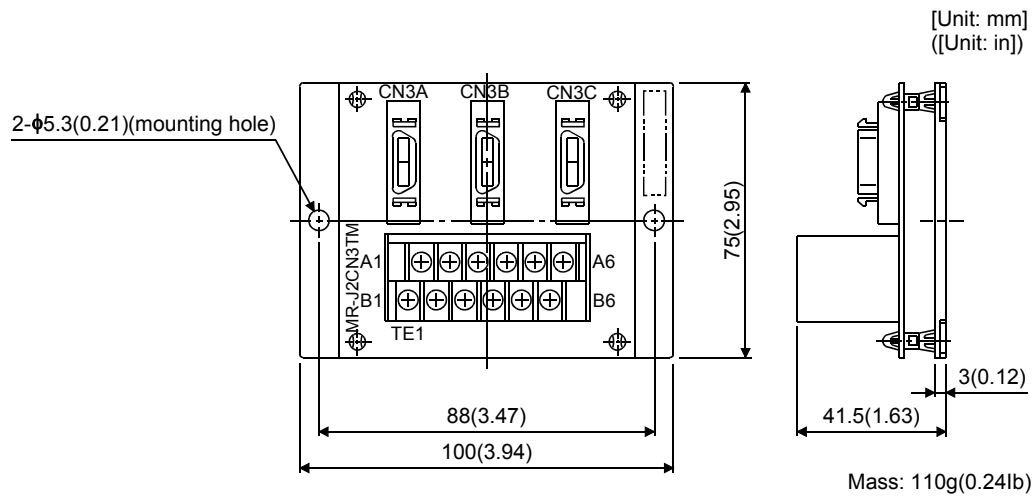


(2) Connection diagram



12. OPTIONS AND AUXILIARY EQUIPMENT

(3) Outline drawing



12. OPTIONS AND AUXILIARY EQUIPMENT

12.1.4 MR Configurator (servo configurations software)

POINT	<ul style="list-style-type: none"> Required to assign devices to the pins of CN4A and CN4B of the MR-J2M-D01 extension IO unit.
-------	--

The MR Configurator (servo configuration software) uses the communication function of the interface unit to perform parameter setting changes, graph display, test operation, etc. on a personal computer.

(1) Specifications

Item	Description
Communication signal	Conforms to RS-232C.
Baudrate [bps]	57600, 38400, 19200, 9600
Monitor	Batch display, high-speed display, multiple axis display, graph display Minimum resolution changes with the processing speed of the personal computer.
Alarm	Alarm display, alarm history, alarm occurrence time
Diagnostic	I/O display, function device display no-rotation reason display, cumulative power-on time display, software number display, motor information display, tuning data display, ABS data display, shaft name setting, unit composition list display.
Parameters	Parameter setting, list display, change list display, detailed display, turning, Device setting, parameter (IFU), parameter (DRU).
Test operation	Jog operation, positioning operation, motor-less operation, DO forced output, program operation.
Advanced function	Machine analyzer, gain search, machine simulation.
File operation	Data read, save, print
Others	Automatic operation, help display

(2) System configuration

(a) Components

To use this software, the following components are required in addition to MELSERVO-J2M and servo motor:

Model	(Note 1) Description
(Note 2) Personal computer	IBM PC-AT compatible where the English version of Windows® 95, Windows® 98, Windows® Me, Windows NT® Workstation 4.0 or Windows® 2000 Professional operates Processor: Pentium® 133MHz or more (Windows® 95, Windows® 98, Windows NT® Workstation 4.0, Windows® 2000 Professional) Pentium® 150MHz or more (Windows® Me) Memory: 16MB or more (Windows® 95), 24MB or more (Windows® 98) 32MB or more (Windows® Me, Windows NT® Workstation 4.0, Windows® 2000 Professional) Free hard disk space: 60MB or more Serial port used
OS	Windows® 95, Windows® 98, Windows® Me, Windows NT® Workstation 4.0, Windows® 2000 Professional (English version)
Display	One whose resolution is 800×600 or more and that can provide a high color (16 bit) display. Connectable with the above personal computer.
Keyboard	Connectable with the above personal computer.
Mouse	Connectable with the above personal computer. Note that a serial mouse is not used.
Printer	Connectable with the above personal computer.
Communication cable	MR-CPCATCBL3M When this cannot be used, refer to (3) Section 12.1.2 and fabricate.

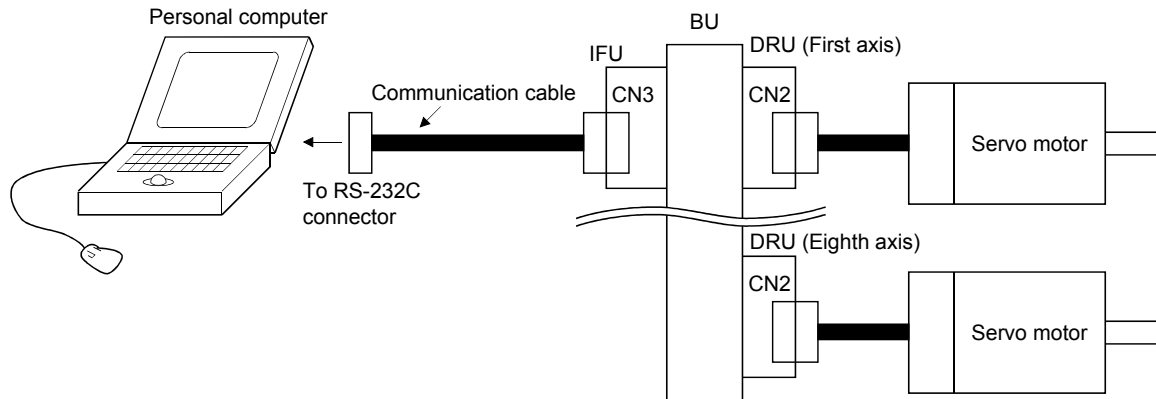
Note 1. Windows and Windows NT are the registered trademarks of Microsoft Corporation in the United State and other countries.

Pentium is the registered trademarks of Intel Corporation.

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

12. OPTIONS AND AUXILIARY EQUIPMENT

(b) Configuration diagram



12. OPTIONS AND AUXILIARY EQUIPMENT

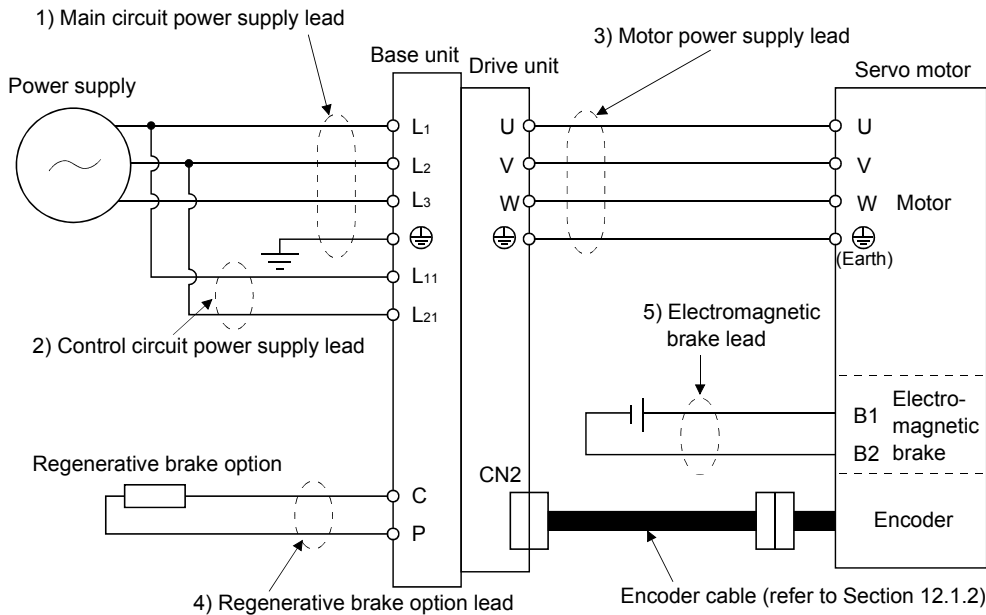
12.2 Auxiliary equipment

Always use the devices indicated in this section or equivalent. To comply with the EN Standard or UL/C-UL(CSA) Standard, use the products which conform to the corresponding standard.

12.2.1 Recommended wires

(1) Wires for power supply wiring

The following diagram shows the wires used for wiring. Use the wires given in this section or equivalent.



The following table lists wire sizes. The wires used assume that they are 600V vinyl wires and the wiring distance is 30m(98.4ft) max. If the wiring distance is over 30m(98.4ft), choose the wire size in consideration of voltage drop.

The servo motor side connection method depends on the type and capacity of the servo motor. Refer to Section 3.5.3.

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

Table 12.1 Recommended wires

Unit	Wires [mm ²]				
	1) L1 · L2 · L3 · ⊕	2) L11 · L21	3) U · V · W · ⊕	4) P · C	5) B1 · B2
MR-J2M-BU4	2 (AWG14)	2 (AWG14)	/	2 (AWG14)	/
MR-J2M-BU6	3.5 (AWG12)				
MR-J2M-BU8	5.5 (AWG10)				
MR-J2M-10DU	/	/	1.25 (AWG16)	/	1.25 (AWG16)
MR-J2M-20DU					
MR-J2M-40DU					
MR-J2M-70DU					

12. OPTIONS AND AUXILIARY EQUIPMENT

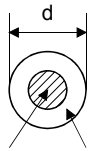
(2) Wires for cables

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

Table 12.2 Wires for option cables

Type	Model	Length [m(ft)]	Core size [mm ²]	Number of Cores	Characteristics of one core			(Note 3) Finishing OD [mm]	Wire model
					Structure [Wires/mm]	Conductor resistance[Ω/mm]	Insulation coating ODd[mm] (Note 1)		
Encoder cable	MR-JCCBL□M-L	2 to 10 (6.56 to 32.8)	0.08	12 (6 pairs)	7/0.127	222	0.38	5.6	UL20276 AWG#28 6pair (BLACK)
		20•30 (65.6•98.4)	0.3	12 (6 pairs)	12/0.18	62	1.2	8.2	UL20276 AWG#22 6pair (BLACK)
	MR-JCCBL□M-H	2•5 (6.56•16.4)	0.2	12 (6 pairs)	40/0.08	105	0.88	7.2	(Note 2) A14B2343 6P
		10 to 50 (32.8 to 164)	0.2	14 (7 pairs)	40/0.08	105	0.88	8.0	(Note 2) A14B0238 7P
	MR-JC4CBL□M-H	30 to 50 (98.4 to 164)	0.2	14 (7 pairs)	40/0.08	105	0.88	8.0	(Note 2) A14B0238 7P
Communication cable	MR-CPCATCBL3M	3 (9.84)	0.08	6 (3 pairs)	7/0.127	222	0.38	4.6	UL20276 AWG#28 3pair (BLACK)
Bus cable	MR-J2HBUS□□	0.5 to 5 (1.64 to 16.4)	0.08	20 (10 pairs)	7/0.127	222	0.38	6.1	UL20276 AWG#28 10pair (CREAM)
	MR-J2HBUS□□-A			14 (7 pairs)					UL20276 AWG#28 7pair (CREAM)
	Q172J2BCBL□□								
	Q173J2B△CBL□□								
Battery unit cable	MR-J2MBATCBL□ M	0.3•1 (0.98•3.28)	0.3	2 (1 pairs)	12/0.18	63	1.5	5.1	MVVS IP×0.3mm ²

Note 1. d is as shown below:



Conductor Insulation sheath

2. Purchased from Toa Electric Industry
3. Standard OD. Max. OD is about 10% greater.

12.2.2 No-fuse breakers, fuses, magnetic contactors

Always use one no-fuse breaker and one magnetic contactor with one drive unit. Make selection as indicated below according to the total output value of the servo motors connected to one base unit. When using a fuse instead of the no-fuse breaker, use the one having the specifications given in this section.

(1) No-fuse breaker

Servo motor output total	No-fuse breaker	Rated current [A]
550W max.	30A frame5A	5
More than 550W to 1100W max.	30A frame10A	10
More than 1100W to 1650W max.	30A frame15A	15
More than 1650W to 2200W max.	30A frame20A	20
More than 2200W to 3300W max.	30A frame30A	30

(2) Fuse

Servo motor output total	Fuse		
	Class	Current [A]	Voltage [V]
800W max.	K5	15	AC250
More than 800W to 1100W max.	K5	20	AC250
More than 1100W to 1650W max.	K5	30	AC250
More than 1650W to 2200W max.	K5	40	AC250
More than 2200W to 3300W max.	K5	70	AC250

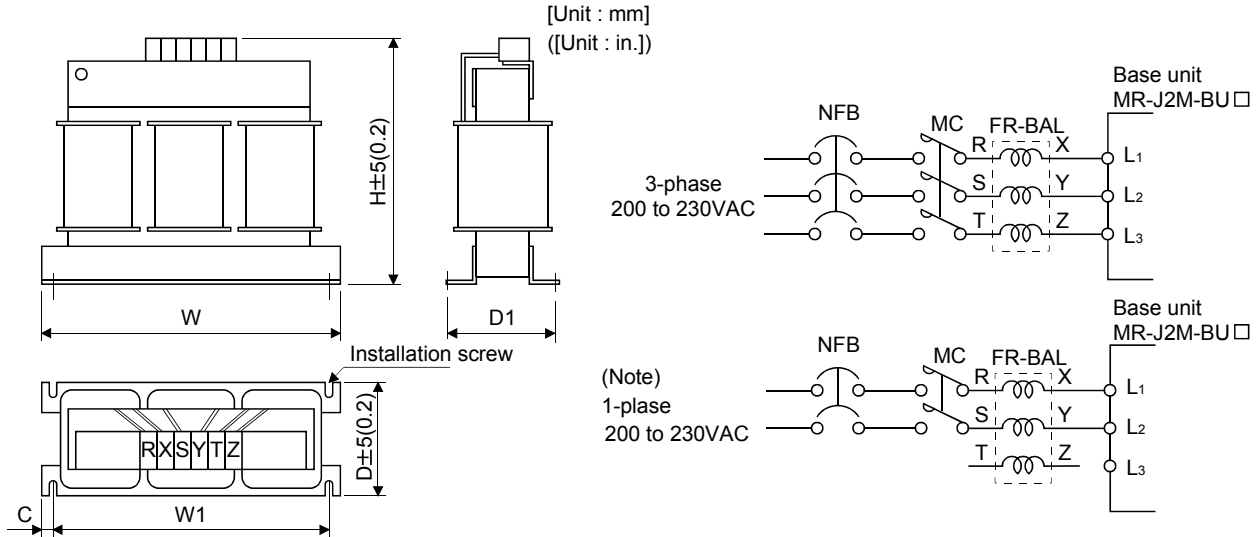
(3) Magnetic contactor

Servo motor output total	Magnetic contactor
1700W max.	S-N10
More than 1700W to 2800W max.	S-N18
More than 2800W to 3300W max.	S-N20

12. OPTIONS AND AUXILIARY EQUIPMENT

12.2.3 Power factor improving reactors

The input power factor is improved to be about 90%. Make selection as described below according to the sum of the outputs of the servo motors connected to one base unit.



Note. Connect a 1-phase 200 to 230VAC power supply to L₁/L₂ and keep L₃ open.

Servo motor output total	Model	Dimensions [mm (in)]						Mounting screw size	Terminal screw size	Mass [kg (lb)]
		W	W1	H	D	D1	C			
300W max.	FR-BAL-0.4K	135 (5.31)	120 (4.72)	115 (4.53)	59 (2.32)	45 ⁻⁰ _{-2.5} (1.77 ⁻⁰ _{-0.098})	7.5 (0.29)	M4	M3.5	2.0 (4.4)
More than 300W to 450W max.	FR-BAL-0.75K	135 (5.31)	120 (4.72)	115 (4.53)	69 (2.72)	57 ⁻⁰ _{-2.5} (2.24 ⁻⁰ _{-0.098})	7.5 (0.29)	M4	M3.5	2.8 (6.17)
More than 450W to 750W max.	FR-BAL-1.5K	160 (6.30)	145 (5.71)	140 (5.51)	71 (2.79)	55 ⁻⁰ _{-2.5} (2.17 ⁻⁰ _{-0.098})	7.5 (0.29)	M4	M3.5	3.7 (8.16)
More than 750W to 1100W max.	FR-BAL-2.2K	160 (6.30)	145 (5.71)	140 (5.51)	91 (3.58)	75 ⁻⁰ _{-2.5} (2.95 ⁻⁰ _{-0.098})	7.5 (0.29)	M4	M3.5	5.6 (12.35)
More than 1100W to 1900W max.	FR-BAL-3.7K	220 (8.66)	200 (7.87)	192 (7.56)	90 (3.54)	70 ⁻⁰ _{-2.5} (2.76 ⁻⁰ _{-0.098})	10 (0.39)	M5	M4	8.5 (18.74)
More than 1900W to 2500W max.	FR-BAL-5.5K	220 (8.66)	200 (7.87)	192 (7.56)	96 (3.78)	75 \pm 5(2.95 \pm 0.2)	10 (0.39)	M5	M4	9.5 (20.94)
More than 2500W to 3800W max.	FR-BAL-7.5K	220 (8.66)	200 (7.87)	194 (7.64)	120 (4.72)	100 \pm 5(3.94 \pm 0.2)	10 (0.39)	M5	M5	14.5 (32.0)

12. OPTIONS AND AUXILIARY EQUIPMENT

12.2.4 Relays

The following relays should be used with the interfaces:

Interface	Selection example
Relay used for digital input signals (interface DI-1)	To prevent defective contacts , use a relay for small signal (twin contacts). (Ex.) Omron : type G2A , MY
Relay used for digital output signals (interface DO-1)	Small relay with 12VDC or 24VDC of 40mA or less (Ex.) Omron : type MY

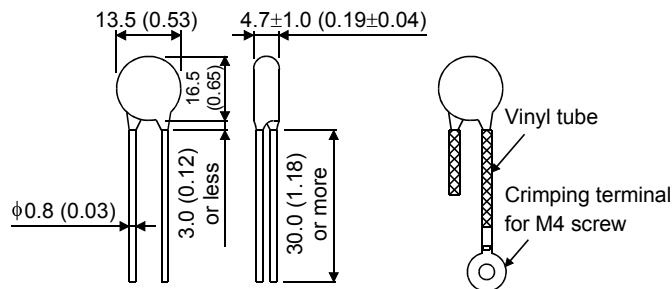
12.2.5 Surge absorbers

A surge absorber is required for the electromagnetic brake. Use the following surge absorber or equivalent. Insulate the wiring as shown in the diagram.

Maximum rating					Maximum limit voltage		Static capacity (reference value)	Varistor voltage rating (range) V1mA
Permissible circuit voltage		Surge immunity	Energy immunity	Rated power				
AC[Vma]	DC[V]	[A]	[J]	[W]	[A]	[V]	[pF]	[V]
140	180	(Note) 500/time	5	0.4	25	360	300	220 (198 to 242)

Note. 1 time = $8 \times 20\mu\text{s}$

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



12.2.6 Noise reduction techniques

Noises are classified into external noises which enter MELSERVO-J2M to cause it to malfunction and those radiated by MELSERVO-J2M to cause peripheral devices to malfunction. Since MELSERVO-J2M is an electronic device which handles small signals, the following general noise reduction techniques are required.

Also, the drive unit can be a source of noise as its outputs are chopped by high carrier frequencies. If peripheral devices malfunction due to noises produced by the drive unit, noise suppression measures must be taken. The measures will vary slightly with the routes of noise transmission.

(1) Noise reduction techniques

(a) General reduction techniques

- Avoid laying power lines (input cables) and signal cables side by side or do not bundle them together. Separate power lines from signal cables.
- Use shielded, twisted pair cables for connection with the encoder and for control signal transmission, and connect the shield to the SD terminal.
- Ground the base unit, servo motor, etc. together at one point (refer to Section 3.8).

12. OPTIONS AND AUXILIARY EQUIPMENT

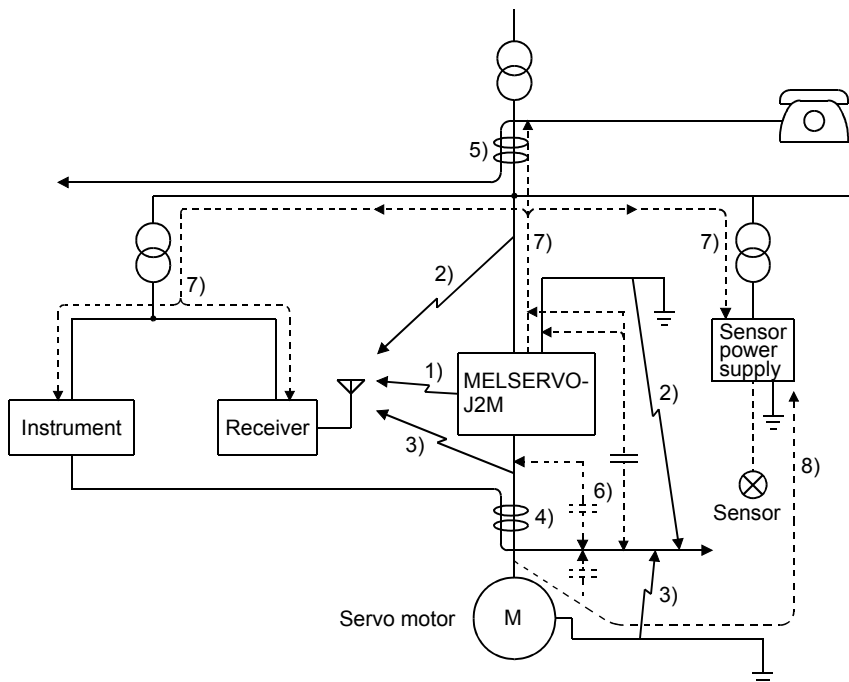
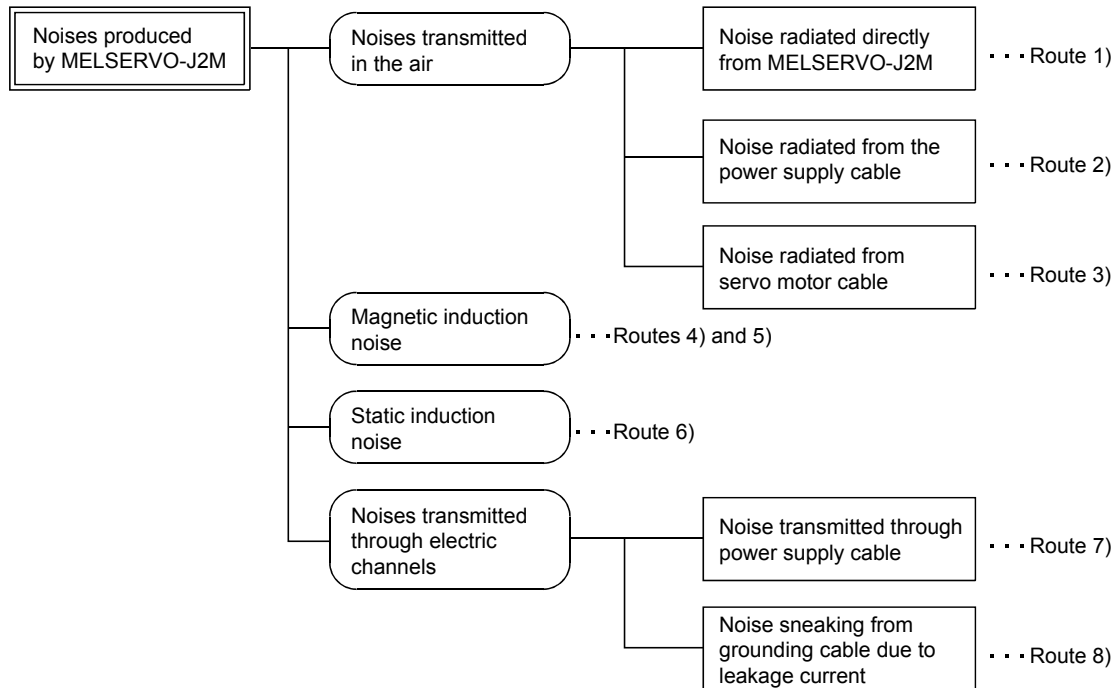
(b) Reduction techniques for external noises that cause MELSERVO-J2M to malfunction

If there are noise sources (such as a magnetic contactor, an electromagnetic brake, and many relays which make a large amount of noise) near MELSERVO-J2M and MELSERVO-J2M may malfunction, the following countermeasures are required.

- Provide surge absorbers on the noise sources to suppress noises.
- Attach data line filters to the signal cables.
- Ground the shields of the encoder connecting cable and the control signal cables with cable clamp fittings.

(c) Techniques for noises radiated by MELSERVO-J2M that cause peripheral devices to malfunction

Noises produced by MELSERVO-J2M are classified into those radiated from the cables connected to MELSERVO-J2M and its main circuits (input and output circuits), those induced electromagnetically or statically by the signal cables of the peripheral devices located near the main circuit cables, and those transmitted through the power supply cables.



12. OPTIONS AND AUXILIARY EQUIPMENT

Noise transmission route	Suppression techniques
1) 2) 3)	<p>When measuring instruments, receivers, sensors, etc. which handle weak signals and may malfunction due to noise and/or their signal cables are contained in a control box together with the MELSERVO-J2M or run near MELSERVO-J2M, such devices may malfunction due to noises transmitted through the air. The following techniques are required.</p> <ol style="list-style-type: none"> 1. Provide maximum clearance between easily affected devices and MELSERVO-J2M. 2. Provide maximum clearance between easily affected signal cables and the I/O cables of MELSERVO-J2M. 3. Avoid laying the power lines (I/O cables of MELSERVO-J2M) and signal cables side by side or bundling them together. 4. Insert a line noise filter to the I/O cables or a radio noise filter on the input line. 5. Use shielded wires for signal and power cables or put cables in separate metal conduits.
4) 5) 6)	<p>When the power lines and the signal cables are laid side by side or bundled together, magnetic induction noise and static induction noise will be transmitted through the signal cables and malfunction may occur. The following techniques are required.</p> <ol style="list-style-type: none"> 1. Provide maximum clearance between easily affected devices and MELSERVO-J2M. 2. Provide maximum clearance between easily affected signal cables and the I/O cables of MELSERVO-J2M. 3. Avoid laying the power lines (I/O cables of MELSERVO-J2M) and signal cables side by side or bundling them together. 4. Use shielded wires for signal and power cables or put the cables in separate metal conduits.
7)	<p>When the power supply of peripheral devices is connected to the power supply of MELSERVO-J2M system, noises produced by MELSERVO-J2M may be transmitted back through the power supply cable and the devices may malfunction. The following techniques are required.</p> <ol style="list-style-type: none"> 1. Insert the radio noise filter (FR-BIF) on the power cables (input cables) of MELSERVO-J2M. 2. Insert the line noise filter (FR-BSF01 · FR-BLF) on the power cables of MELSERVO-J2M.
8)	<p>When the cables of peripheral devices are connected to MELSERVO-J2M to make a closed loop circuit, leakage current may flow to malfunction the peripheral devices. If so, malfunction may be prevented by disconnecting the grounding cable of the peripheral device.</p>

(2) Noise reduction products

(a) Data line filter

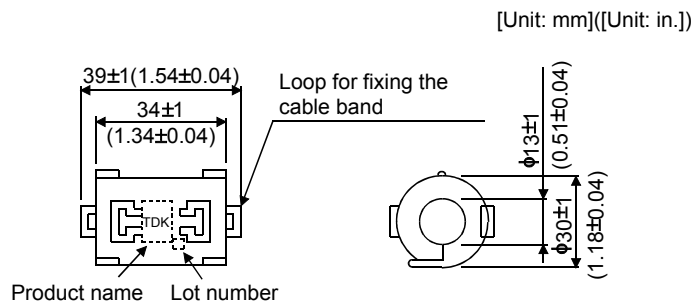
Noise can be prevented by installing a data line filter onto the encoder cable, etc.

For example, the ZCAT3035-1330 of TDK and the ESD-SR-25 of NEC TOKIN are available as data line filters.

As a reference example, the impedance specifications of the ZCAT3035-1330 (TDK) are indicated below.

This impedances are reference values and not guaranteed values.

Impedance[Ω]	
10 to 100MHZ	100 to 500MHZ
80	150

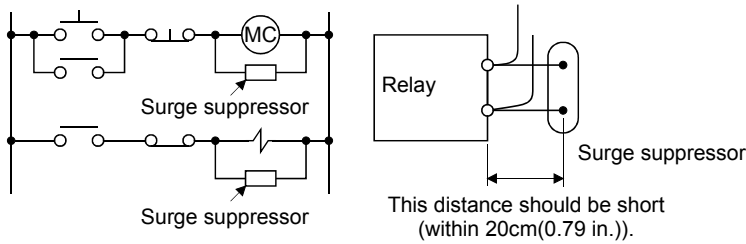


Outline drawing (ZCAT3035-1330)

12. OPTIONS AND AUXILIARY EQUIPMENT

(b) Surge suppressor

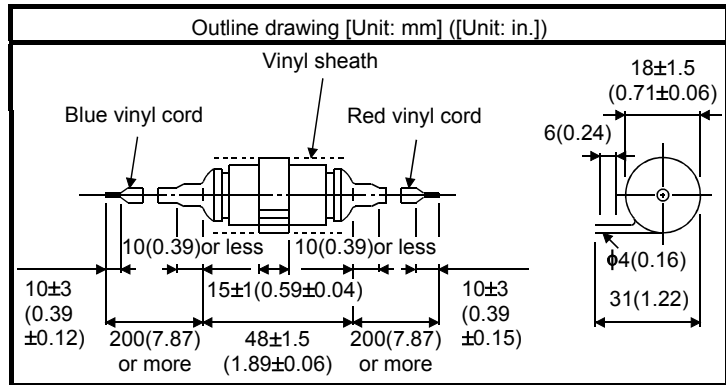
The recommended surge suppressor for installation to an AC relay, AC valve, AC electromagnetic brake or the like near MELSERVO-J2M is shown below. Use this product or equivalent.



(Ex.) 972A.2003 50411

(Matsuo Electric Co.,Ltd. -200VAC rating)

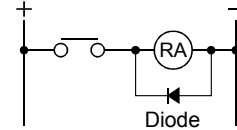
Rated voltage AC[V]	C [μ F]	R [Ω]	Test voltage AC[V]
200	0.5	50 (1W)	Across T-C 1000(1 to 5s)



Note that a diode should be installed to a DC relay, DC valve or the like.

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

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

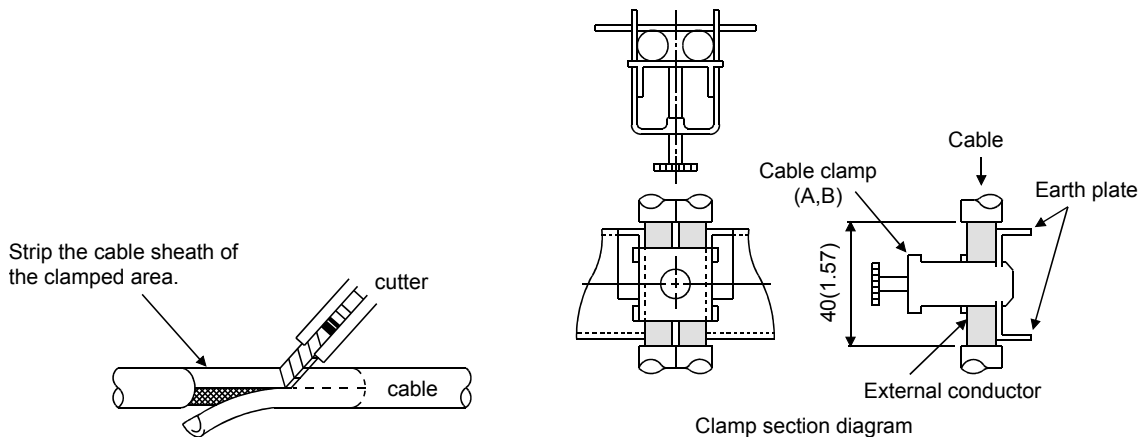


(c) Cable clamp fitting (AERSBAN □-SET)

Generally, the earth of the shielded cable may only be connected to the connector's SD terminal. However, the effect can be increased by directly connecting the cable to an earth plate as shown below.

Install the earth plate near the drive unit for the encoder cable. Peel part of the cable sheath to expose the external conductor, and press that part against the earth plate with the cable clamp. If the cable is thin, clamp several cables in a bunch.

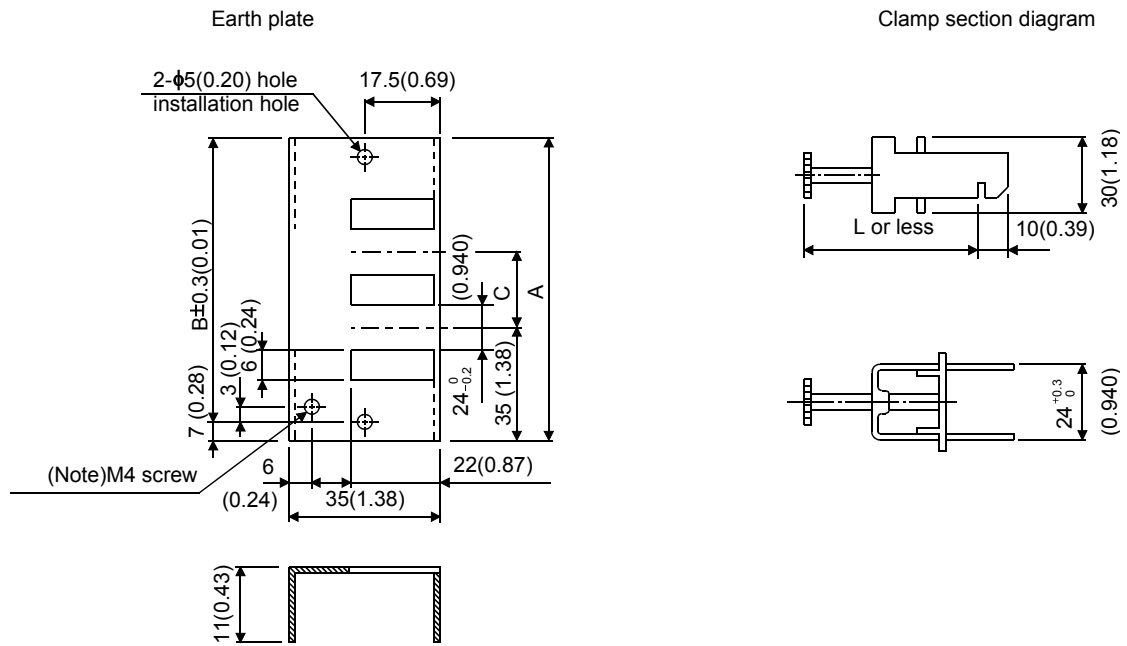
The clamp comes as a set with the earth plate.



12. OPTIONS AND AUXILIARY EQUIPMENT

- Outline drawing

[Unit: mm]
([Unit: in.])



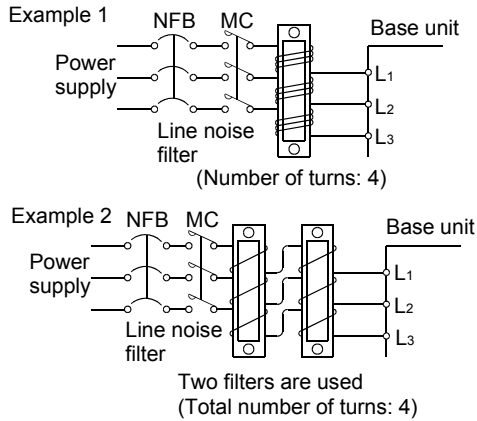
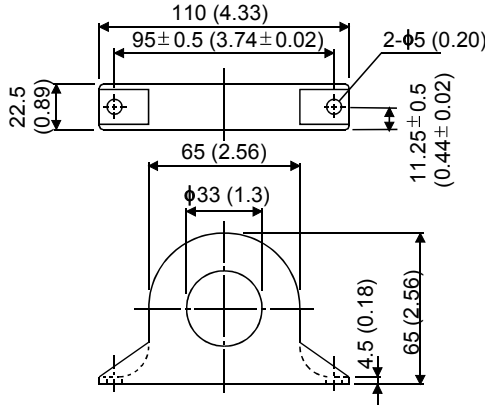
Type	A	B	C	Accessory fittings
AERSBAN-DSET	100 (3.94)	86 (3.39)	30 (1.18)	clamp A: 2pcs.
AERSBAN-ESET	70 (2.76)	56 (2.20)	/	clamp B: 1pc.

Clamp fitting	L
A	70 (2.76)
B	45 (1.77)

12. OPTIONS AND AUXILIARY EQUIPMENT

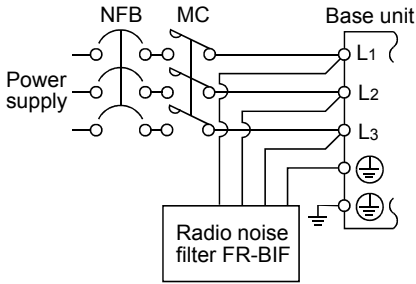
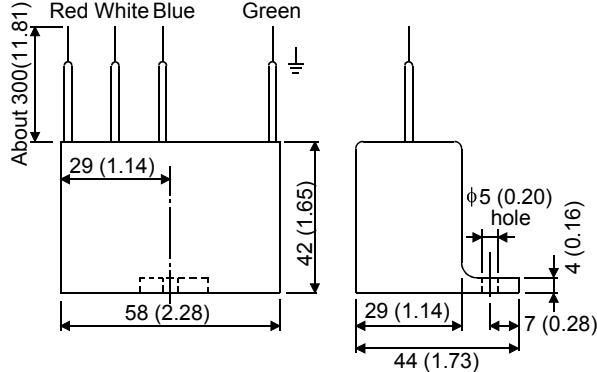
(d) Line noise filter (FR-BSF01)

This filter is effective in suppressing noises radiated from the power supply side and output side of MELSERVO-J2M and also in suppressing high-frequency leakage current side (zero-phase current) especially within 0.5MHz to 5MHz band.

Connection diagram	Outline drawing [Unit: mm] ([Unit: in.])
<p>Wind the 3-phase wires by the equal number of times in the same direction, and connect the filter to the power supply side and output side of MELSERVO-J2M</p> <p>The effect of the filter on the power supply side is higher as the number of winds is larger. The number of turns is generally four. If the wires are too thick to be wound, use two or more filters and make the total number of turns as mentioned above.</p> <p>On the output side, the number of turns must be four or less.</p> <p>Do not wind the grounding wire together with the 3-phase wires. The filter effect will decrease. Use a separate wire for grounding.</p>  <p>Example 1 NFB MC Base unit Power supply L1 L2 L3 Line noise filter (Number of turns: 4)</p> <p>Example 2 NFB MC Base unit Power supply L1 L2 L3 Line noise filter Two filters are used (Total number of turns: 4)</p>	<p>FR-BSF01</p>  <p>110 (4.33) 95 ± 0.5 (3.74 ± 0.02) 2-φ5 (0.20) 22.5 (0.89) 11.25 ± 0.5 (0.44 ± 0.02) 65 (2.56) φ33 (1.3) 4.5 (0.18) 65 (2.56)</p>

(e) Radio noise filter (FR-BIF)...for the input side only

This filter is effective in suppressing noises radiated from the power supply side of MELSERVO-J2M especially in 10MHz and lower radio frequency bands. The FR-BIF is designed for the input side only.

Connection diagram	Outline drawing (Unit: mm) ([Unit: in.])
<p>Make the connection cables as short as possible. Grounding is always required. When using the FR-BIF with a single-phase wire, always insulate the wires that are not used for wiring.</p>  <p>NFB MC Base unit Power supply L1 L2 L3 Radio noise filter FR-BIF</p>	<p>Leakage current: 4mA</p>  <p>Red White Blue Green About 300(11.81) 29 (1.14) 58 (2.28) 42 (1.65) φ5 (0.20) hole 7 (0.28) 4 (0.16) 29 (1.14) 44 (1.73)</p>

12. OPTIONS AND AUXILIARY EQUIPMENT

12.2.7 Leakage current breaker

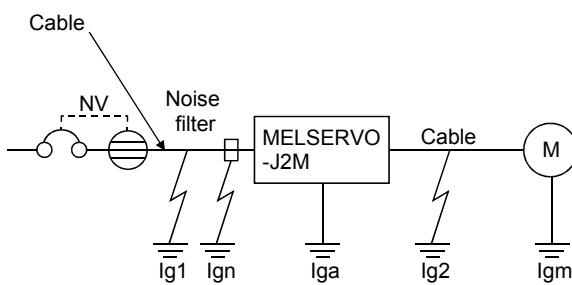
(1) Selection method

High-frequency chopper currents controlled by pulse width modulation flow in the AC servo circuits. Leakage currents containing harmonic contents are larger than those of the motor which is run with a commercial power supply.

Select a leakage current breaker according to the following formula, and ground the base unit, servo motor, etc. securely.

Make the input and output cables as short as possible, and also make the grounding cable as long as possible (about 30cm (11.8 in)) to minimize leakage currents.

$$\text{Rated sensitivity current} \geq 10 \cdot \{I_{g1} + I_{gn} + I_{ga} + K \cdot (I_{g2} + I_{gm})\} \text{ [mA]} \dots\dots\dots(12.1)$$



K: Constant considering the harmonic contents

Leakage current breaker		
Type	Mitsubishi products	K
Models provided with harmonic and surge reduction techniques	NV-SP NV-SW NV-CP NV-CW NV-HW	1
General models	BV-C1 NFB NV-L	3

- Ig1: Leakage current on the electric channel from the leakage current breaker to the input terminals of the base unit (Found from Fig. 12.1.)
- Ig2: Leakage current on the electric channel from the output terminals of the drive unit to the servo motor (Found from Fig. 12.1.)
- Ign: Leakage current when a filter is connected to the input side (4.4mA per one FR-BIF)
- Iga: Leakage current of the drive unit (Found from Table 12.4.)
- Igm: Leakage current of the servo motor (Found from Table 12.3.)

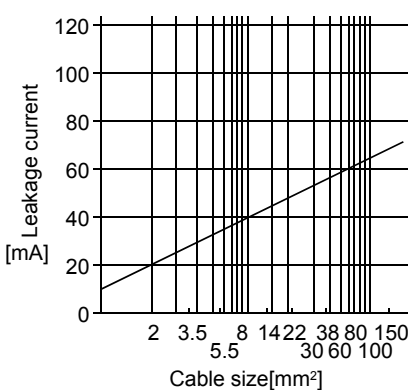


Table 12.3 Servo motor's leakage current example (Igm)

Servo motor output [kW]	Leakage current [mA]
0.05 to 0.4	0.1

Table 12.4 Drive unit's leakage current example (Iga)

Drive unit capacity [kW]	Leakage current [mA]
0.1 to 0.4	0.3
0.75	0.6

Fig. 12.1 Leakage current example (Ig1, Ig2) for CV cable run in metal conduit

12. OPTIONS AND AUXILIARY EQUIPMENT

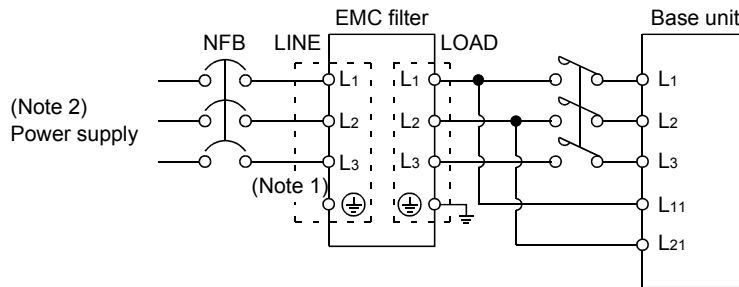
12.2.8 EMC filter

For compliance with the EMC directive of the EN standard, it is recommended to use the following filter:

(1) Combination with the base unit

Base unit	Recommended filter		Mass [kg(lb)]
	Model	Leakage current [mA]	
MR-J2M-BU4 MR-J2M-BU6 MR-J2M-BU8	SF1253	57	1.37 (3.02)

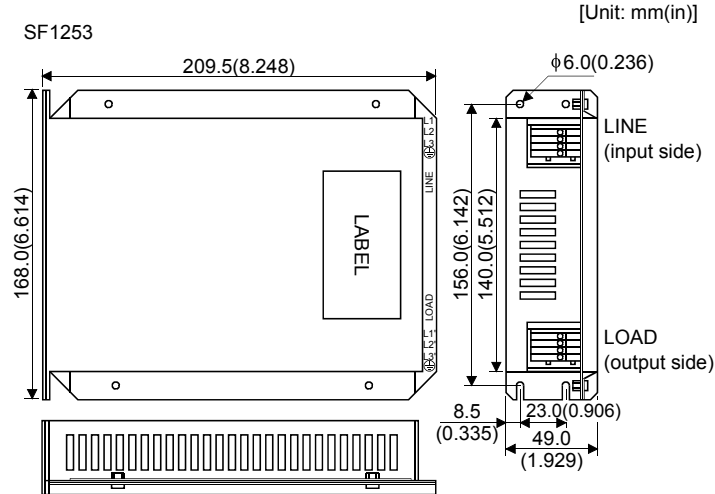
(2) Connection example



Note 1. Connect when the power supply has earth.

2. Connect a 1-phase 200 to 230VAC power supply to L₁/L₂ and keep L₃ open.

(3) Outline drawing



13. ABSOLUTE POSITION DETECTION SYSTEM

13. ABSOLUTE POSITION DETECTION SYSTEM



CAUTION

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

13.1 Features

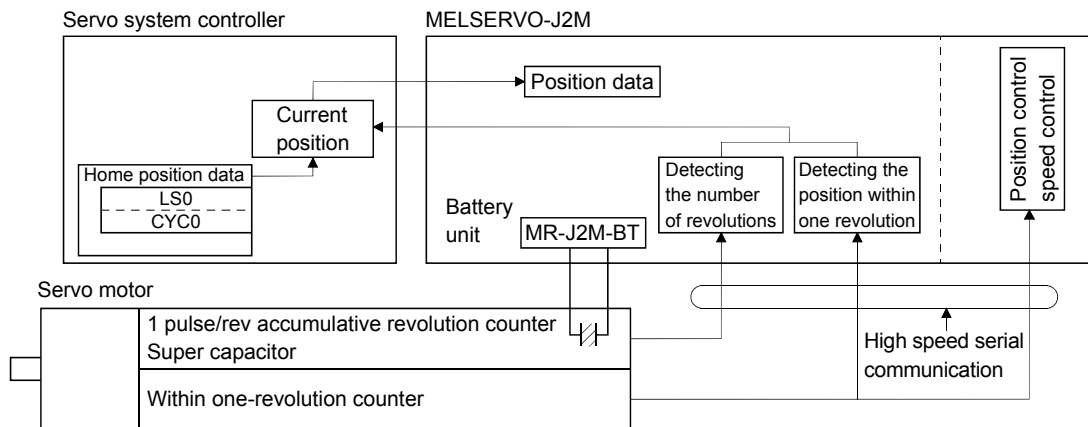
For normal operation, as shown below, the encoder consists of a detector designed to detect a position within one revolution and a cumulative revolution counter designed to detect the number of revolutions.

The absolute position detection system always detects the absolute position of the machine and keeps it battery-backed, independently of whether the servo system controller power is on or off.

Therefore, once home position return is made at the time of machine installation, home position return is not needed when power is switched on thereafter.

If a power failure or a fault occurs, restoration is easy.

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



13. ABSOLUTE POSITION DETECTION SYSTEM

13.2 Specifications

(1) Specification list

POINT
<ul style="list-style-type: none"> The revision (Edition 44) of the Dangerous Goods Rule of the International Air Transport Association (IATA) went into effect on January 1, 2003 and was enforced immediately. In this rule, "provisions of the lithium and lithium ion batteries" were revised to tighten the restrictions on the air transportation of batteries. However, since this battery is dangerous goods (Class 9), requires packing compliant with the Packing Standard 903. When a self-certificate is necessary for battery safety tests, contact our branch or representative. For more information, consult our branch or representative. (As of October, 2005).

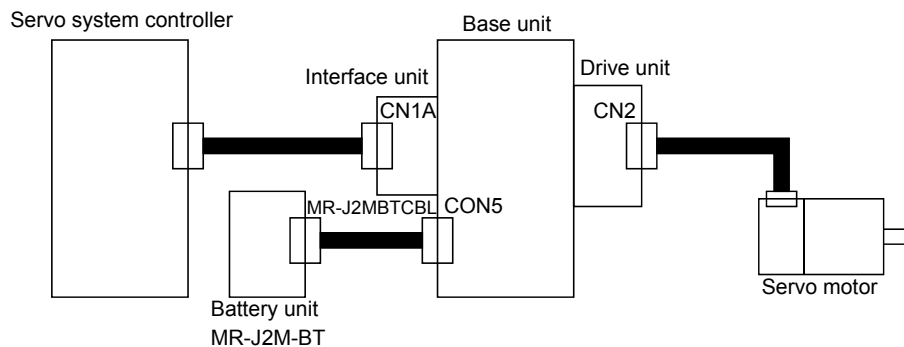
Item	Description
Model	MR-J2M-BT
System	Electronic battery backup system
Battery unit	Lithium battery (primary battery, nominal + 3.6V)
Maximum revolution range	Home position ± 32767 rev.
(Note 1) Maximum speed at power failure	500r/min
(Note 2) Battery backup time	Approx. 10,000 hours (battery life with power off)
(Note 3) Data holding time during battery replacement	2 hours at delivery, 1 hour in 5 years after delivery
Battery storage period	5 years from date of manufacture

Note 1. Maximum speed available when the shaft is rotated by external force at the time of power failure or the like.

2. Time to hold data by a battery with power off. It is recommended to replace the battery in three years independently of whether power is kept on or off.

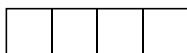
3. Period during which data can be held by the super capacitor in the encoder after power-off, with the battery unit voltage low or the battery unit removed, or during which data can be held with the encoder cable disconnected. Battery replacement should be finished within this period.

(2) Configuration



(3) Parameter setting

Set "0001" in DRU parameter No.1 to make the absolute position detection system valid.



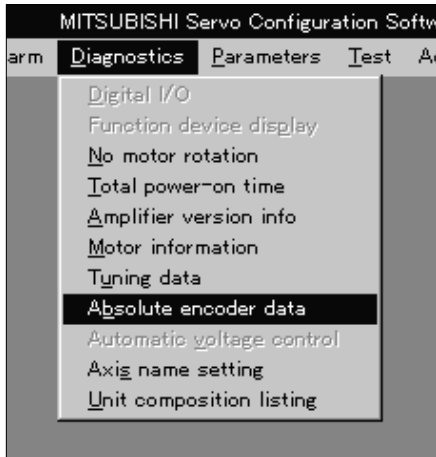
Absolute position detection selection
 0: Valid (used in incremental system.)
 1: Invalid (used in absolute position detection system.)

13. ABSOLUTE POSITION DETECTION SYSTEM

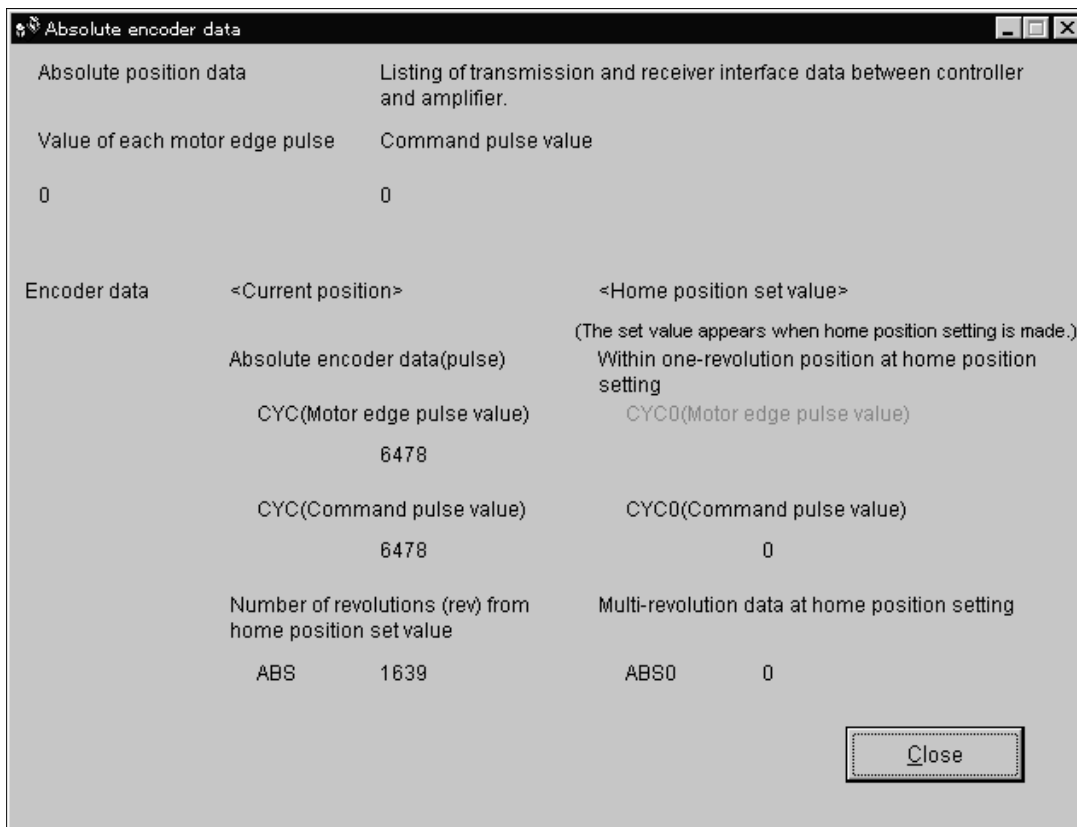
13.3 Confirmation of absolute position detection data

You can confirm the absolute position data with MR Configurator (servo configuration software). Choose "Diagnostics" and "Absolute Encoder Data" to open the absolute position data display screen.

(1) Click "Diagnostics" in the menu and click "Absolute Encoder Data" in the menu:



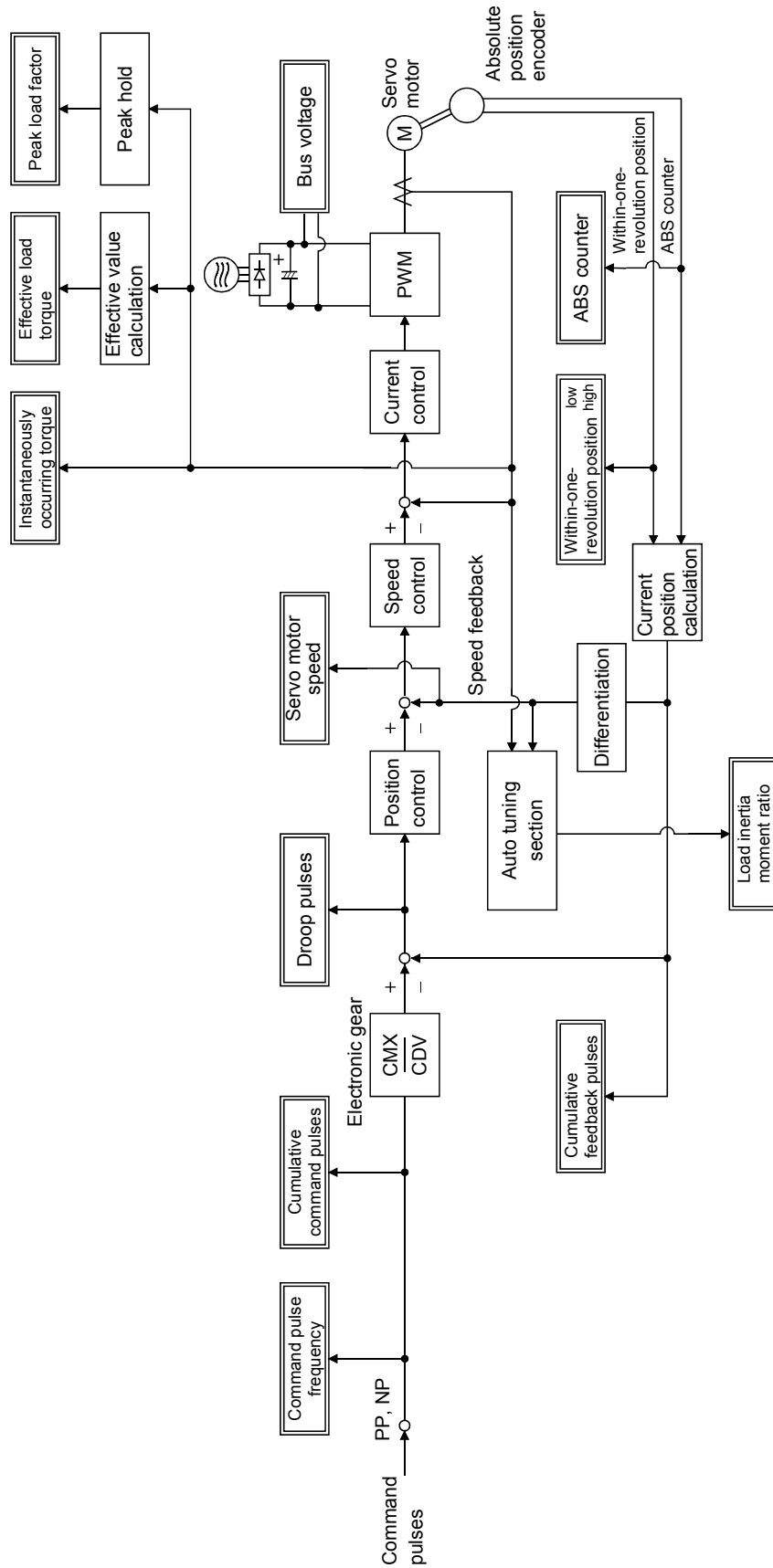
(2) Clicking "Absolute Encoder Data" displays the following window.



(3) Click the "Close" button to close the window.

APPENDIX

App 1. Status indication block diagram



REVISIONS

*The manual number is given on the bottom left of the back cover.

Print Data	*Manual Number	Revision
Apr., 2001	SH(NA)030012-A	First edition
Jan., 2002	SH(NA)030012-B	<p>Addition of FOR MAXIMUM SAFETY CONFORMANCE WITH UL/C-UL STANDARD: Capacitor discharge time changed to 1[min]</p> <p>Addition of (6) Attachment of a servo motor</p> <p>Section 1.2: Addition of the case with 1-phase 200 to 230VAC power supply</p> <p>Section 1.3: Addition of MR-J2M-70DU</p> <p>Addition of the case with 1-phase 200 to 230VAC power supply</p> <p>Section 1.5: Addition of MR-J2M-70DU</p> <p>Section 1.6: Addition of MR-J2M-70DU</p> <p>Addition of HC-KFS73, HC-MFS73 and HC-UFS73 servo motors</p> <p>Section 1.8: Addition of the case with 1-phase 200 to 230VAC power supply</p> <p>Section 2.5 (3): Addition</p> <p>Section 3.2.3 (1): Overall modification to common line</p> <p>Section 3.2.3 (2) (c): Maximum output current changed to 0.5mA</p> <p>Section 3.3: Addition of extension IO unit signals and wiring</p> <p>Section 3.4.1 (2): Addition of the case with 1-phase 200 to 230VAC power supply</p> <p>Section 3.4.3: Addition of the case of using 1-phase power supply</p> <p>Section 3.7 (3): Overall modification</p> <p>Section 3.8: Addition of the case with 1-phase 200 to 230VAC power supply</p> <p>Section 5.1.2 (1): Reexamination of sentence for parameter No. 12</p> <p>Modification to parameter No. 19</p> <p>Addition of POINT to parameter No. 38</p> <p>Section 9.2: Reexamination of sentence for investigation method</p> <p>Section 10.2: Outline drawing modification</p> <p>Section 10.2.2: Outline drawing modification</p> <p>Section 10.2.3 (2): Addition of MR-J2M-70DU drive unit outline drawing</p> <p>Section 10.2.4: Outline drawing modification</p> <p>Section 10.2.5: Outline drawing modification</p> <p>Section 11.1 (2): Addition of the case with MR-J2M-70DU</p> <p>Addition of sentence</p> <p>Section 11.2: Addition of MR-JM-70DU</p> <p>Addition of HC-KFS73, HC-MFS73 and HC-UFS73 servo motors</p> <p>Section 11.3: Addition of dynamic brake time constants of HC-KFS73, HC-MFS73 and HC-UFS73 servo motors</p> <p>Addition of load inertia moment ratio table of MR-J2M-70DU</p> <p>Section 12.1.1 (2) (a) 1), 2): Overall modification</p> <p>Section 12.1.1 (2) (b) 2): Addition of MR-J2M-70DU</p> <p>Section 12.1.4: Addition of POINT</p> <p>Section 12.1.4 (1): Partial addition to table</p> <p>Section 12.1.4 (2) (a): Overall modification to table</p> <p>Section 12.2.1 (1): Addition of MR-J2M-70DU</p> <p>Section 12.2.2 (2): No-fuse breaker model name changing</p> <p>Section 12.2.3: Addition of the case with 1-phase 200 to 230VAC power supply</p>

Print Data	*Manual Number	Revision
Jan., 2002	SH(NA)030012-B	<p>Section 12.2.6 (2) (b): Diode mounting diagram modification</p> <p>Section 12.2.7 (1): Our leakage current breaker product model name changing Addition of MR-J2M-70DU to Table 12.4</p> <p>Section 12.2.8 (2): Addition of the case with 1-phase 200 to 230VAC power supply</p> <p>Section 13.2 (1): Reexamination of table</p>
Sept., 2002	SH(NA)030012-C	<p>Safety Instructions: Addition of About wiring protection Addition of EEPROM life</p> <p>Section 1.5 (2) (a): Change of rating plate</p> <p>Section 2.4 (2): Reexamination of description</p> <p>Section 2.6 (1) (d): Reexamination of sentence</p> <p>Section 3.4.2: Addition of cable side connector 353717-2 Addition of Note</p> <p>Section 3.5.1: Addition of POINT</p> <p>Section 3.6: Addition of Note to timing chart</p> <p>Section 5.1.2 (2): Addition of DRU parameter No. 23 encoder cable selection</p> <p>Section 5.2.2 (1): Addition of IFU parameter No. 9 SSCNET type selection</p> <p>Section 5.2.2 (2): Addition of IFU parameter No. 9 SSCNET type selection</p> <p>Section 6.2.2: Addition of POINT</p> <p>Section 9.1: Addition of A. 78 and A. 79</p> <p>Section 9.2: Addition of A. 78 and A. 79</p> <p>Section 10.3 (3): Addition of contact 353717-2 Addition of applicable tool 937315-1</p> <p>Section 11.1: Layout change Addition of Note</p> <p>Section 12.1.1 (1): Addition of sentence Deletion of Note</p> <p>Section 12.1.1 (4): Addition of terminal block, terminal screw and tightening torque</p> <p>Section 12.1.2 (1): Addition of encoder cable MR-JC4CBL□M-H</p> <p>Section 12.1.2 (2) (a): Addition of POINT</p> <p>Section 12.1.2 (2) (b): Addition</p> <p>Section 12.1.3 (1): Change of Usage and Connection diagram</p> <p>Section 12.1.4 (2): Reexamination of display description and representation</p> <p>Section 12.2.1 (2): Addition of encoder cable MR-JC4CBL□M-H</p> <p>Section 13.3: Change of representation</p>
Apr., 2003	SH(NA)030012-D	<p>CONFORMANCE WITH UL/C-UL STANDARD (2) Installation: Addition of air volume 2.8m³/min</p> <p>Section 1.3 (1): Addition of inrush current</p> <p>Section 3.1: Partial reexamination of connection diagram Reexamination of motion controller-compatible bus cable in Note 13</p> <p>Section 3.4: Partial change of CAUTION sentence</p> <p>Section 3.4.4 (3): Partial reexamination of connection diagram</p> <p>Section 3.5.3 (2): Reexamination of diagram</p> <p>Section 4.2.4 (2): Partial reexamination of sentence</p> <p>Section 5.1.2 (2): Addition of "When built-in regenerative brake resistor is used" to DRU parameter No. 2</p>

Print Data	*Manual Number	Revision
Apr., 2003	SH(NA)030012-D	<p>Section 9.2: Reexamination of cause and action in FA. 12 to 15 Addition of cause and action to FA. 37 Reexamination of A.50# definition Addition of "During rotation: 2.5s or more" to A.51#</p> <p>Section 10.3 (3): Change to applicable tool 91560-1 Section 10.3 (6): Addition Section 12.1.2 (1): Reexamination of motion controller-compatible bus cable in Note Bus cable addition Section 12.1.2 (4): Reexamination of contents Section 12.2.1 (2): Bus cable addition</p>
Mar., 2004	SH(NA)030012-E	<p>Reexamination of description on configuration software Safety Instructions: 1. To prevent electric shock: Addition of sentence 3. To prevent injury: Change of sentence 4. Additional instructions (1): Change of sentence COMPLIANCE WITH EC DIRECTIVES: Modified to IEC60664-1 in (3) Modified to IEC60664-1 in (4).</p> <p>Section 2.7: Partial modification of CAUTION sentence Section 3.7 (4) (a): Partial change of timing chart Section 5.1.2: Change of POINT sentence Section 5.2.1: Change of POINT sentence : Addition of IFU parameter No.9 and POINT Section 9.2: Reexamination of A.52# content Section 12.1.1 (3): Partial reexamination of sentence Section 12.1.1 (4): Reexamination of outline drawing Section 12.1.4 (2) (a): Reexamination of content Section 12.2.6 (2) (d): Modification of FR-BSF01 outline drawing Section 12.2.6 (2) (e): Reexamination of connection diagram Section 13.2 (1): Addition of POINT</p>
Feb., 2005	SH(NA)030012-F	Section 13.2 (1): Error in writing correction of POINT
Oct., 2005	SH(NA)030012-G	<p>Safety Instructions : 1. To prevent electric shock: Description is corrected as 15 minutes. 4. Additional instructions (2) - (4): Caution sentence addition Usage: Sentence change</p> <p>Compliance with EC Directives: Partial sentence change Conformance with UL/C-UL Standard (4): Partial sentence change Chapter 2: CAUTION sentence addition Section 3.6: CAUTION sentence addition Section 3.6 (3): Sentence change Section 3.7: CAUTION sentence addition Section 5.2.1 (1) (2): Addition of parameter No. 49 to 55, 60, 61 Section 5.2.3: (2): Note addition Section 7.5: Addition of gain changing function Chapter 8: WARNING sentence partial change Section 9.1: Note addition in the table for alarm code No. A45, A46 Section 9.2: CAUTION sentences addition Addition of the contents of DRU parameter No.@A. 17#</p>

Print Data	*Manual Number	Revision
Oct., 2005	SH(NA)030012-G	Section 9.3: Reexamination of Cause 2 of DRU parameter No.@A. 92# Partial addition of the cause of IFU parameter No.FA. 9F Correction of the contents of IFU parameter No.FA. E9 Section 10.2: Addition of mounting screw and tightening torque Section 11.1: Reexamination of CAUTION sentence Chapter 12: WARNING sentence partial change Section 12.1.1 (4) (b): Reexamination of outline dimension drawing Section 12.1.4 (2): Partial reexamination of table value Section 12.2.6 (2) (d): Reexamination of outline dimension drawing of FR-BSF01 Section 12.2.6 (2) (c): Sentence addition Chapter 13: Reexamination of CAUTION sentence

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