MELSERVO

Servo Amplifiers and Motors

Beginners Manual

MR-J3-A/A4
MR-J3-B/B4

Art. no.
04 11 2009
Version A

About this manual

The texts, illustration, diagrams and examples in this manual are provided for information purposes only. They are intended as aids to help explain the installation, operation, programming and use of the servo drives and amplifiers of the series MELSERVO J3-A and MELSERVO J3-B.

If you have any questions about the installation and operation of any of the products described in this manual please contact your local sales office or distributor (see back cover). You can find the latest information and answers to frequently asked questions on our website at www.mitsubishi-automation.com.

Beginners manual for servo amplifiers series MR-J3-A and MR-J3-B
Art. no.:

Version	Revisions/Additions/Corrections
A 11/2009 pdp - rw	—

Safety guidelines

General safety information and precautions

For use by qualified staff only

This manual is only intended for use by properly trained and qualified electrical technicians who are fully acquainted with the relevant automation technology safety standards. All work with the hardware described, including system design, installation, configuration, maintenance, service and testing of the equipment, may only be performed by trained electrical technicians with approved qualifications who are fully acquainted with all the applicable automation technology safety standards and regulations. Any operations or modifications to the hardware and/or software of our products not specifically described in this manual may only be performed by authorised MITSUBISHI ELECTRIC staff.

Proper use of the products

The amplifiers of the MELSERVO-J3 series are only intended for the specific applications explicitly described in this manual. All parameters and settings specified in this manual must be observed. The products described have all been designed, manufactured, tested and documented in strict compliance with the relevant safety standards. Unqualified modification of the hardware or software or failure to observe the warnings on the products and in this manual may result in serious personal injury and/or damage to property. Only peripherals and expansion equipment specifically recommended and approved by MITSUBISHI ELECTRIC may be used in combination with amplifiers of the MELSERVO-J3 series.

All and any other uses or application of the products shall be deemed to be improper.

Relevant safety regulations

All safety and accident prevention regulations relevant to your specific application must be observed in the system design, installation, configuration, maintenance, servicing and testing of these products. The regulations listed below are particularly important in this regard.

This list does not claim to be complete, however; you are responsible for being familiar with and conforming to the regulations applicable to you in your location.

- VDE Standards
  - VDE 0100
    Regulations for the erection of power installations with rated voltages below 1000 V
  - VDE 0105
    Operation of power installations
  - VDE 0113
    Electrical installations with electronic equipment
  - VDE 0160
    Electronic equipment for use in power installations
  - VDE 0550/0551
    Regulations for transformers
  - VDE 0700
    Safety of electrical appliances for household use and similar applications
  - VDE 0860
    Safety regulations for mains-powered electronic appliances and their accessories for household use and similar applications.

- Fire safety regulations
- Accident prevention regulations
  - VBG Nr.4
    Electrical systems and equipment

Safety warnings in this manual

In this manual warnings that are relevant for safety are identified as follows:

DANGER:

Failure to observe the safety warnings identified with this symbol can result in health and injury hazards for the user.

WARNING:

Failure to observe the safety warnings identified with this symbol can result in damage to the equipment or other property.

Failure to observe notes can result in serious consequences too. To prevent injury of persons all safety and accident prevention regulations must be observed.

NOTE

means that incorrect handling can result in misoperation of servo amplifier and motor. However failure to observe notes does not result in health and injury hazards for the user or damage to the equipment or other property.

Note also indicates a different setting of parameters, a different function or a different use or provides information about the use of peripherals and expansion equipment respectively.

Compliance with EC directives

EU directives exist to facilitate free trade within the EU. They lay down "fundamental protective regulations" to ensure the removal of technical barriers to trade between the EU member states. In the member states of the EU basic safety requirements and the qualifications for bearing the CE mark are regulated by the Machinery Directive (in force since January 1995), the EMC Directive (in force since January 1996) and the Low Voltage Directive (in force since January 1997).

Conformity with the EU directives is demonstrated with a declaration of conformity and displaying the CE mark on the product, its packaging or its operating manual.

The directives listed above apply to appliances, machinery and systems but not to individual components, unless the components perform a direct function for the end user. Since a servo amplifier must be installed together with a servo motor, a control device and other mechanical parts to perform a useful function for the end user, servo amplifiers cannot be said to perform such a direct function. This means that they can be declared as complex components for which a declaration of conformity and the CE mark are not required. This opinion is also upheld by CEMEP, the European Committee of Manufacturers of Electrical Machines and Power Electronics.

However, the servo amplifiers do fulfil the requirements for the CE mark for the machines or accessories in which the servo amplifiers are deployed, in accordance with the Low Voltage Directive. In order to help users ensure conformity with the EMC Directive Mitsubishi Electric has published a manual titled *EMC Installation Guidelines* (Art. no. 103944), which describes the proper installation of the servo amplifiers, construction of the switchgear cabinet and other important installation tasks. Please contact your dealer for this publication.

Specific safety information

The following safety precautions are intended as a general guideline for using servo drives together with other equipment. These precautions must always be observed in the design, installation and operation of all control systems.

DANGER:

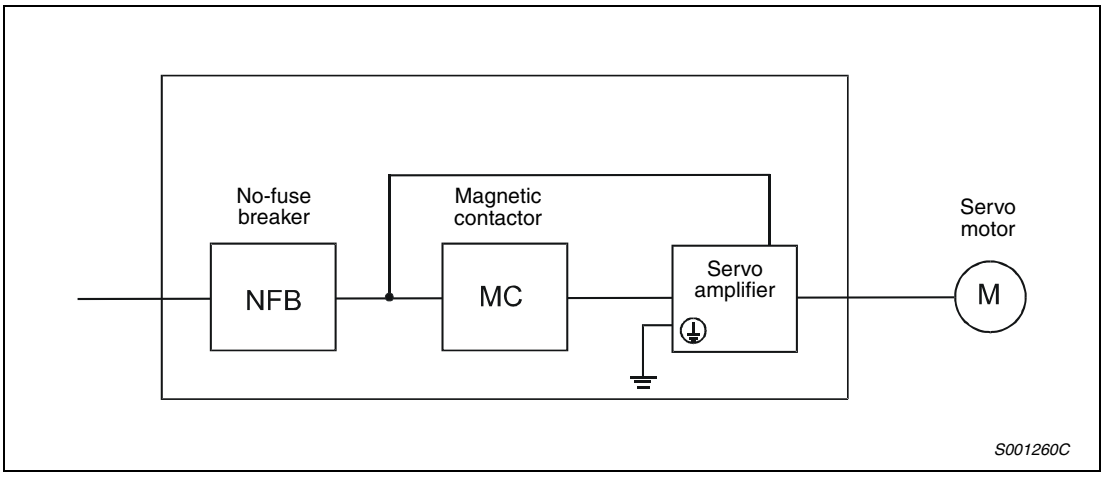
- ***Observe all safety and accident prevention regulations applicable to your specific application. Always disconnect all power supplies before performing installation and wiring work or opening any of the assemblies, components and devices.***
- ***Before installation, wiring and opening of modules, components and devices, 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.***
- ***Take safety measures, e.g. provide covers, to prevent accidental contact of hands and parts (cables, etc.) with the servo amplifier heat sink, regenerative resistor, servo motor, etc. since they may be hot while power is on or for some time after power-off. Their temperatures may be high and you may get burnt or a parts may damaged.***
- ***Assemblies, components and devices must always be installed in a shockproof housing fitted with a proper cover and fuses or circuit breakers.***
- ***Devices with a permanent connection to the mains power supply must be integrated in the building installations with an all-pole disconnection switch and a suitable fuse.***
- ***Ground the servo amplifier and servo motor securely.***
- ***Check power cables and lines connected to the equipment regularly for breaks and insulation damage. If cable damage is found immediately disconnect the equipment and the cables from the power supply and replace the defective cabling.***
- ***Before using the equipment for the first time check that the power supply rating matches that of the local mains power.***
- ***EMERGENCY OFF facilities conforming to EN 60204/IEC 204 and VDE 0113 must remain fully operative at all times and in all PLC operating modes. The EMERGENCY OFF facility reset function must be designed so that it cannot ever cause an uncontrolled or undefined restart.***
- ***Configure the electromagnetic brake circuit so that it is activated by the EMERGENCY OFF facility.***
- ***Residual current protective devices pursuant to DIN VDE Standard 0641 Parts 1-3 are not adequate on their own as protection against indirect contact for installations with PLC systems. Additional and/or other protection facilities are essential for such installations.***
- ***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.***

Specific safety precautions

WARNING:

- ***Install the servo eqipment with full consideration of heat generation during operation. Leave specified clearances between the servo amplifier and control box inside walls or other equipment. Take measures to prevent the internal temperature of the control box from exceeding the environmental conditions.***
- ***Do not install the servo amplifier, servo motor and regenerative resistor on or near combustibles. Otherwise a fire may cause.***
- ***When using servo drives always ensure that all electrical and mechanical specifications and requirements are observed exactly.***
- ***When the servo amplifier, the servo motor or the rgenerative option has become faulty, switch off the main servo amplifier power side. Continuous flow of a large current may cause a fire.***

Structure

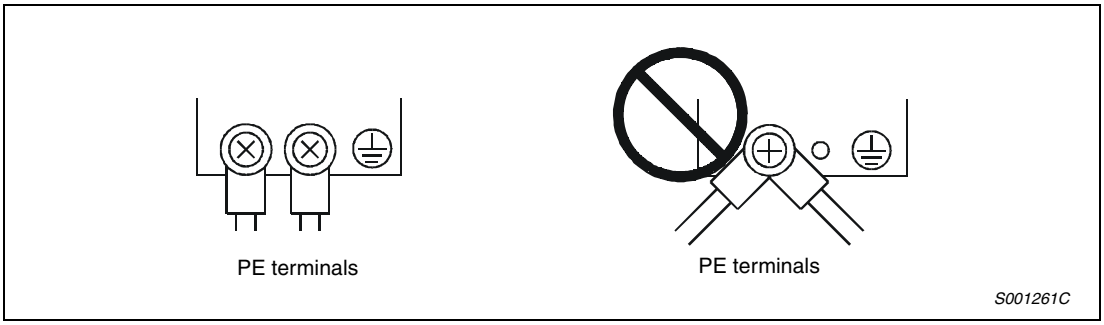


Environment

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

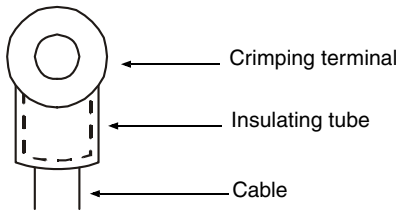
Grounding

To prevent an electric shock, always connect the protective earth (PE) terminals of the servo amplifier to the protective earth (PE) of the control box. Do not connect two or more ground cables to the same protective earth (PE) terminal. Always connect the cables to the terminals one-to-one.



Wiring

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



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

NOTE

This beginners manual is based on the instruction manuals of the servo amplifier series MR-J3-A and MR-J3-B. For further functions which are not described in this manual or further questions, please refer to the following manuals:

SH(NA)030038: Instruction Manual Model MR-J3-□A Servo Amplifier
SH(NA)030051: Instruction Manual Model MR-J3-□B Servo Amplifier

These manuals are available free of charge through the internet (www.mitsubishi-automation.com).

Content

1 Introduction

1.1 What is a servo amplifier?

1.1.1 The servo amplifier in the motion control system

Servo amplifiers are components of a so-called motion control system. This concept represents different types of motion control such as single-axis positioning in micro-installations but also for the solution of sophisticated tasks like multiple-axis positioning in large-scale installations. With a motion control system you are able to solve different positioning applications from positioning with one axis in small production lines up to multi axis positioning in large-scale systems.
The Motion CPU controls different more or less complex motion sequences via the connected servo amplifiers and motors.

Typical aplications of a motion control systems are:

- Plastics and textile processing,
- Packaging,
- Printing and paper converting,
- Forming,
- Wood and glas working,
- Production of semiconductors.

The following diagram schows the components of a motion control system with CPUs, moduls, servo amplifiers and motors.

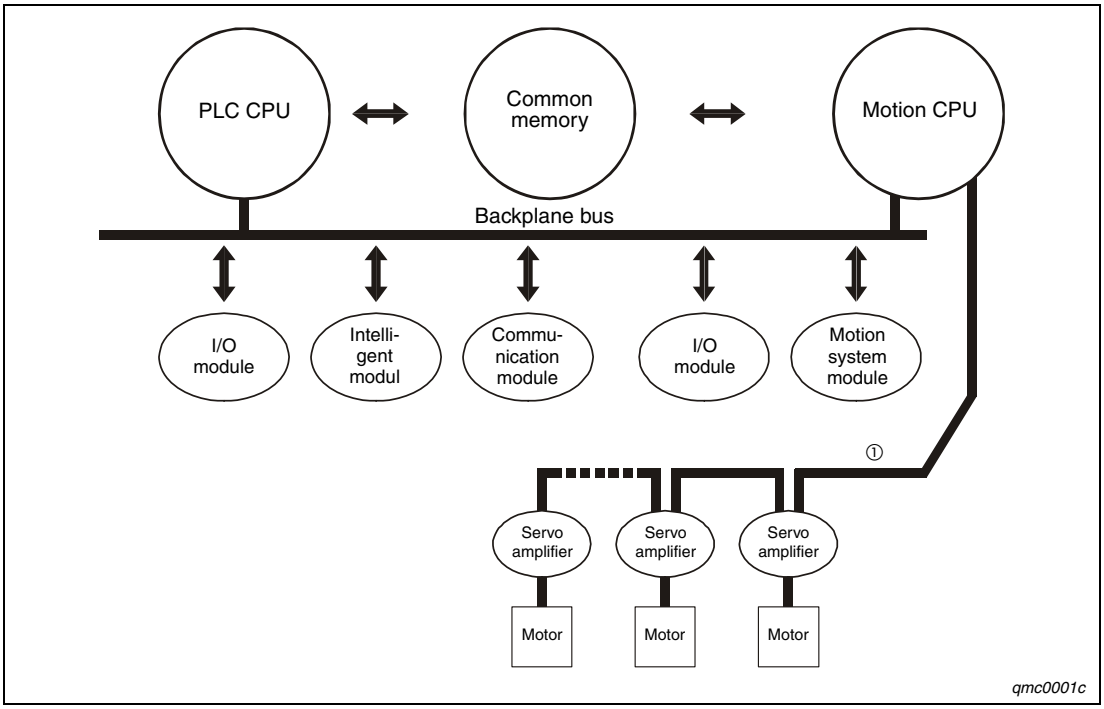


Fig. 1-1: *Block diagram of a motion control system*

① The bus system for control depends on the used servo amplifier series MR-J3-□A or MR-J3-□B.

1.1.2 Function of a servo amplifier

Servo amplifiers are specially designed frequency inverters for driving servo motors for dynamic movements.

The block diagram in fig. 1-2 shows the two main components:

- the power rail (top) and
- the electrinics for control and monitoring (bottom).

The power supply loads the capacitor C of the current source via the rectifier with a DC voltage U_z. The power inverter generates from this DC voltage U_z a 3-phase AC voltage with variable frequency to drive the servo motor. In the case, the drive works as a brake, the brake chopper inside the current source limits the voltage U_z and dissipates the braking energy via the resistor R by heat. If there is needed a higher dissipation of braking energy or if the brake events are more frequent, an external resistor R is used to remove a higher quantity of heat.

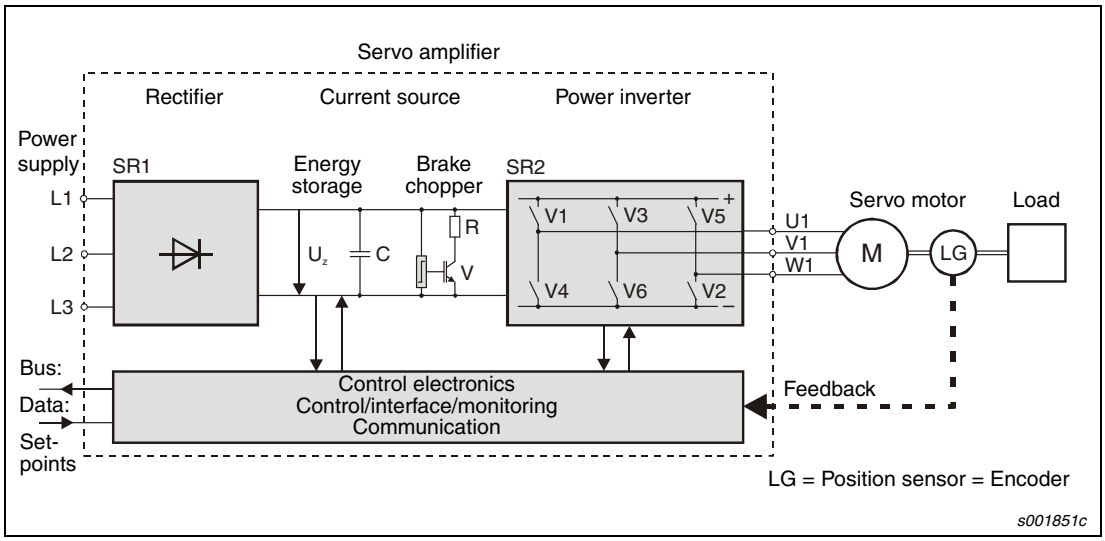


Fig. 1-2: *Block diagram of a servo amplifier*

1.1.3 Servo motors

Today servo motors are generally used to execute high dynamic movements. The motors work on the principle of a synchronous machine, which is permanently magnetic excited.

The motors provide the torque or the power directly and are extremely effective in doing so. Driven by servo amplifiers they work at variable, process-optimizing speed and do precise positioning without delay for the machine. An encoder (position sensor) on the motor shaft reports the position of the rotor back to the servo amplifier. To fix the reached position even in the event of power failure, the motors are equipped with an optional electromagnetic brake. This ensures an perfect adaptation to every needed application (e.g. hanging loads).

The cabeling of the power supply of the motor and of the encoder is done by pre-assembled cables. Most of the connections are done with connectors so that the cabeling is easy, quick and safe.

1.1.4 Features of servo amplifiers and motors of the MELSERVO-J3 series

The motion CPU controls the connected servo amplifiers which drive the servo motors for movement and position. The servo motor is tuned to a certain shaft position, direction of rotation, speed or a certain torque.

All servo motors from the MELSERVO-J3 series are equipped by default with a single-turn absolute position encoder. Due to the high encoder resolution of 262 144 pulses per revolution, accurate positioning and high speed stability are possible. The encoder is rigidly coupled to the motor shaft of the servo motor and gives the motor shaft position via the encoder cable back to the servo amplifier (actual position value). The servo amplifier controls position deviations by comparing the actual position value and the position setpoint (command value of the motion CPU). This position deviation or error is also called droop pulse.

By connecting a buffer battery to the servo amplifier, the reference position of the servo motor, also called zero position or home position, can be stored. By supplying the memory with the battery voltage the data of the reference position are kept in the servo amplifier even if the power supply to the servo amplifier fails, is switched off or in case of an alarm. This function is called absolute position detection system.

You can connect the servo amplifier to a PC for configuration. For this purpose Mitsubishi offers the setup software "MR Configurator". The connection between servo amplifier and PC is done by the built-in USB interface (MR-J3-A and MR-J3-B) and additionally by RS-422 interface (only MR-J3-A).

The MR-J3-A servo amplifiers were developed for multiple applications and are equipped with inputs for analog and pulse signals. MR-J3-B servo amplifiers with SSCNET III bus network are designed for operation with Mitsubishi motion controllers of MELSEC System Q.

The SSCNET III bus system is an optical communication system with serial data exchange via optical fibre optics based on light. This optical bus system offers high transmission speed and cannot be influenced by electromagnetic interfering signals from other products.

Servo amplifiers of the MR-J3 series are available with an output power range from 100 W up to 22 kW. Depending on the model they are suitable for one-phase power supply (output power of 700 W or less) and three-phase power supply of 200–230 V AC or for three-phase power supply of 380–480 V AC.

1.2 Environmental conditions

Store and use the sevo amplifier and servo motor in the following environmental conditions.

Environment	Conditions		
	Servo amplifier	**Servo motor**	
Ambient temperature	0 to +55 C (With no freezing))	0 to +40 C (With no freezing))	
Ambient humidity	max. 90 % (With no dew condensation)	max. 80 % (With no dew condensation)	
Storage temperature	−20 to +65 C	−15 to +70 C	
Sorage humidity	max. 90 % (With no dew condensation)	max. 90 % (With no dew condensation)	
Atmosphere	Indoors (where not subject to direct sunlight). No corrosive gases, flammable gases, oil mist or dust must exist		
Altitude	max. 1000 m		
Protective structure	IP00	HF-MP, HF-PP, HC-RP	IP65
		HF-SP	IP67
Vibration	max. 5.9 m/s (0.6 g)	HF-MP, HF-PP	X, Y: 49 m/s^2 (5 g)
		HF-SP52 to 152	X, Y: 24.5 m/s^2 (2.5 g)
		HF-SP202 to 352	X: 24.5 m/s^2 (2.5 g), Y: 49 m/s^2 (5 g)
		HF-SP502/702	X: 24.5 m/s^2 (2.5 g), Y: 29.4 m/s^2 (3 g)
		HC-RP	X, Y: 24.5 m/s^2 (2.5 g)

Tab. 1-1: *Environmental conditions*

1.3 Terminology

The terms and abbreviations below are important for servo amplifiers and are used frequently in this guide.

Direction of rotation of electric motors

The direction (or sense) of rotation of electric motors is defined looking at the end of the motor shaft. If the motor has two shaft ends the direction is defined looking at the main drive shaft end, which is defined as the shaft end away from the end where the cooling fan or the brake are installed.

- Forward

  Counterclockwise (CCW)/ Left

- Reverse

  Clockwise (CW)/ Right

Operating modes of the servo amplifier

The MR-J3-A servo amplifier can be set to three different operating modes by parameter setting.

- Position control mode

  An up to 1Mpps high-speed pulse train is used to control the speed and direction of a motor and execute precision positioning of 262 144 pulses/rev resolution.
  A torque limit is imposed on the servo amplifier by the clamp circuit to protect the power transistor in the main circuit from overcurrent due to sudden acceleration/deceleration or overload. This torque limit value can be changed to any value with an external analog input or the parameter.

- Speed control mode

  An external analog speed command (0–±10 V DC) or parameter-driven internal speed command (max. 7 speeds) is used to control the speed and direction of a servo motor smoothly. There are also the acceleration/deceleration time constant setting in response to speed command, the servo lock function at a stop time, and automatic offset adjustment function in response to external analog speed command.

- Torque control mode

  An external analog torque command (0–±8 V DC) or parameter-driven internal torque command is used to control the torque output by the servo motor.
  To protect misoperation under no load, the speed limit function (external or internal setting) is also available for application to tension control, etc.

2 Introduction of the Devices

2.1 Servo amplifier series MR-J3-A

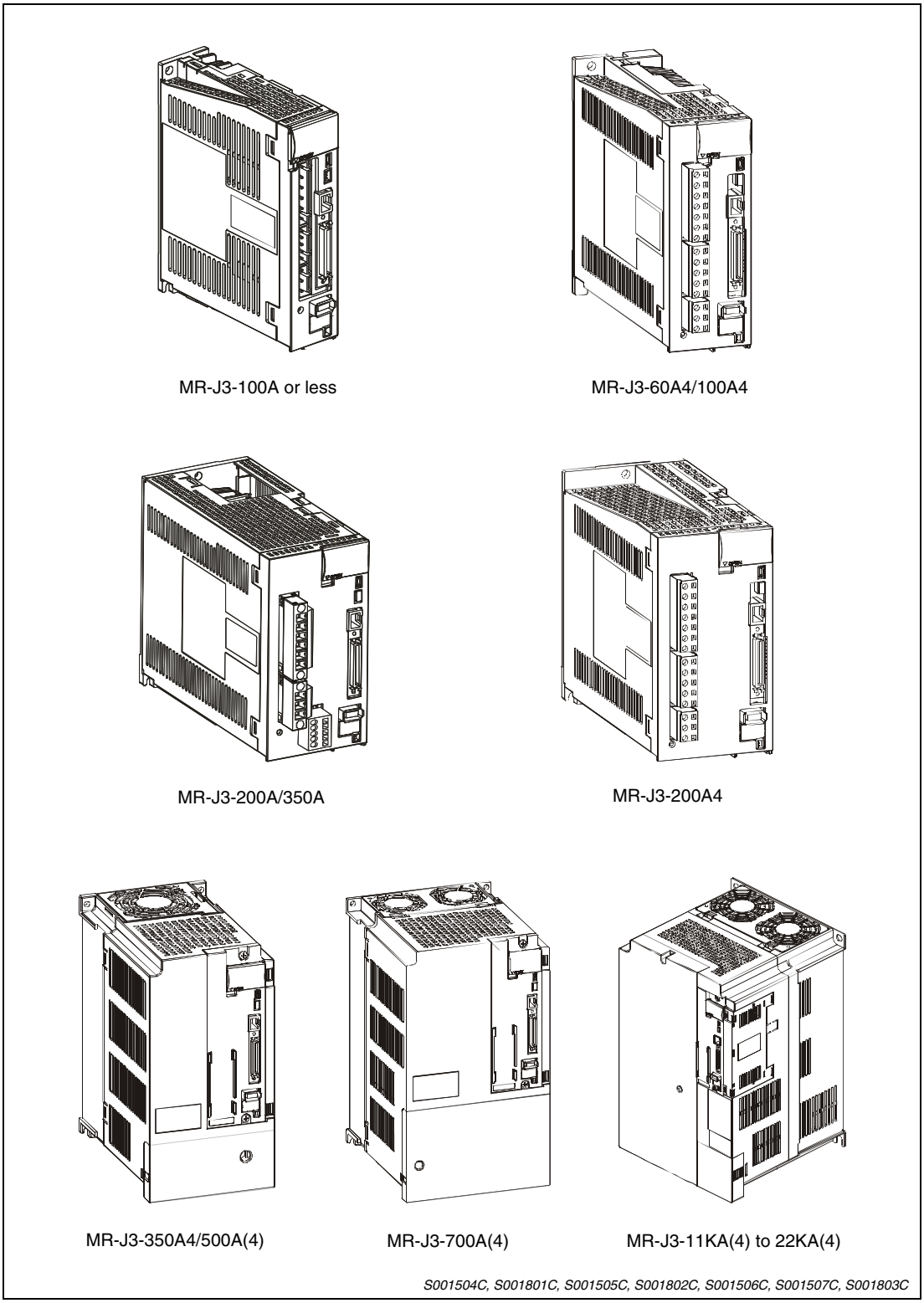


Fig. 2-1: *Model overview of the servo amplifiers MR-J3-A*

2.2 Servo amplifier series MR-J3-B

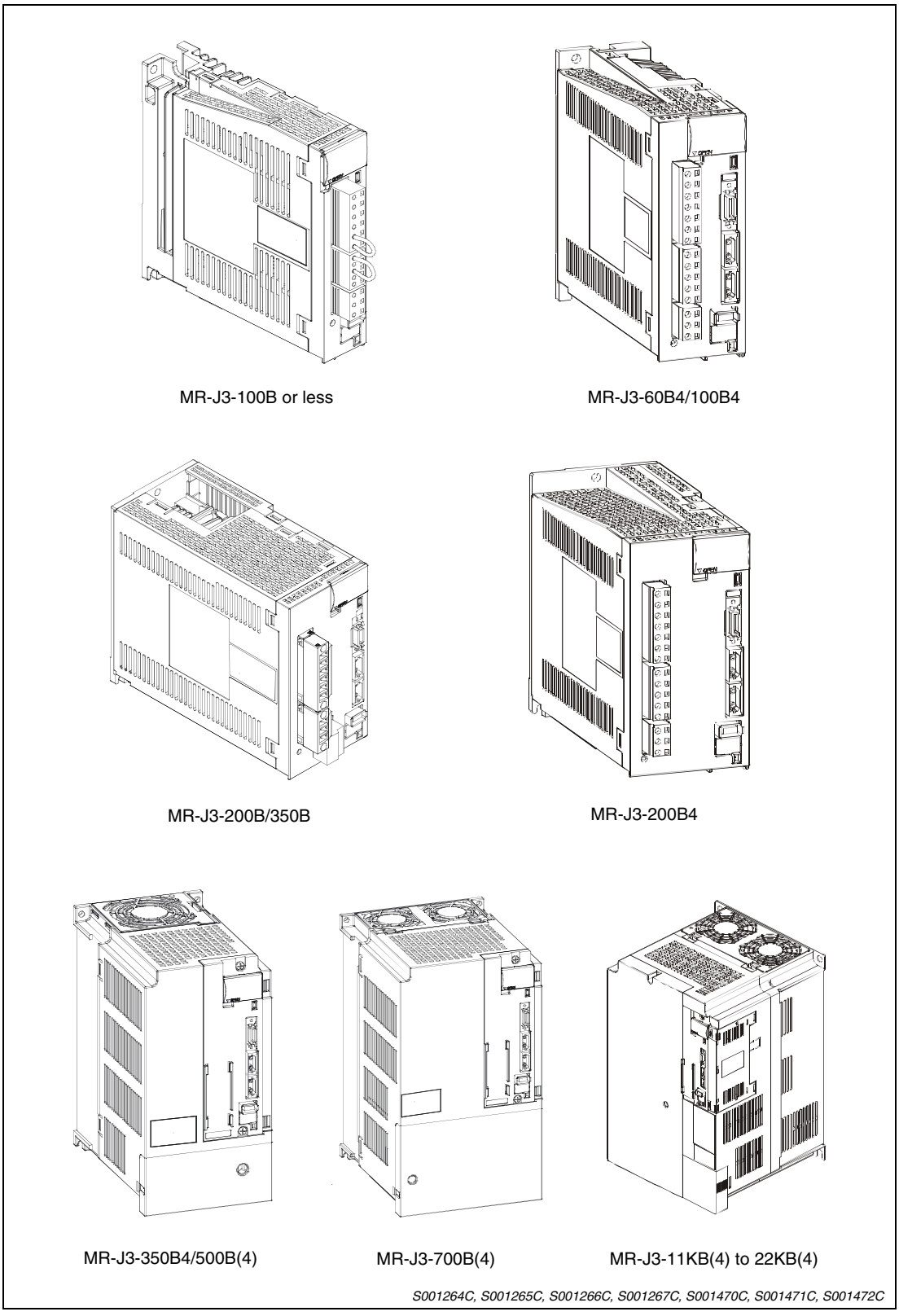


Fig. 2-2: *Model overview of the servo amplifiers MR-J3-B*

NOTE

The number "4" in the model designation of the servo amplifier indicates the version for 400 V. If the number 4 is inside brackets, the model is also available in the version 200 V.

2.3 Model designation, output power and applicable servo motors

MR-J3-□A□□
MR-J3-□B□□

Series

-PX This marking on the models MR-J3-11KA(4)–MR-J3-22KA(4) or MR-J3-11KB(4)–MR-J3-22KB(4) indicates that does not use a regenerative resistor as standard accessory.

Code	Power supply
—	200–230 V AC, 1-phase or 3-phase ①
4	380–480 V AC, 3-phase

A: General purpose interface
B: SSCNET III compatible

Code	Rated output [kW]	Applicable servo motors				
		HF-MP	HF-PP	HF-SP	HC-RP	HA-LP
10	0.1	053/13	053/13	—	—	—
20	0.2	23	23	—	—	—
40	0.4	43	43	—	—	—
60	0.6	—	—	52	—	—
60(□4) ②		—	—	524	—	—
70	0.75	73	73	—	—	—
100	1	—	—	102	—	—
100(□4) ②		—	—	1024	—	—
200	2	—	—	152/202	103/153	—
200(□4) ②		—	—	1524/ 2024	—	—
350	3.5	—	—	352	203	—
350(□4) ②		—	—	3524	—	—
500	5	—	—	502	353/503	—
500(□4) ②		—	—	5024	—	—
700	7	—	—	702	—	—
700(□4) ②		—	—	7024	—	—
11K	11	—	—	—	—	11K2
11K(□4) ②		—	—	—	—	11K24
15K	15	—	—	—	—	15K2
15K(□4) ②		—	—	—	—	15K24
22K	22	—	—	—	—	22K
22K(□4) ②		—	—	—	—	22K24

Fig. 2-3: *Model designation and rated output of the servo amplifiers*
Possible combinations between servo amplifiers and servo motors

① Servo amplifiers up to MR-J3-70A or MR-J3-70B (included), can be connected 1-phase.

② □4: Servo amplifier models in version 400 V (supply voltage 380–480 V AC)
The symbol □ represents the designation A or B of the model series.

2.4 Removal and reinstallation of the front cover

With the models MR-J3-350A4/B4 and higher or MR-J3-500A/B and higher the front cover must be removed before the terminal blocks TE1, TE2 and TE3 (or TE) become accessible to connect the supply voltage, the motor, the control voltage etc.

DANGER:

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

NOTE The MR-J3-A series will be used hereinafter as an example for the removal and attachmentof the front cover. The procedure for the MR-J3-B series is identical.

2.4.1 Removal of the front cover of MR-J3-350A4, MR-J3-500A(4) and MR-J3-700A(4)

① Hold the ends of lower side of the front cover with both hands.

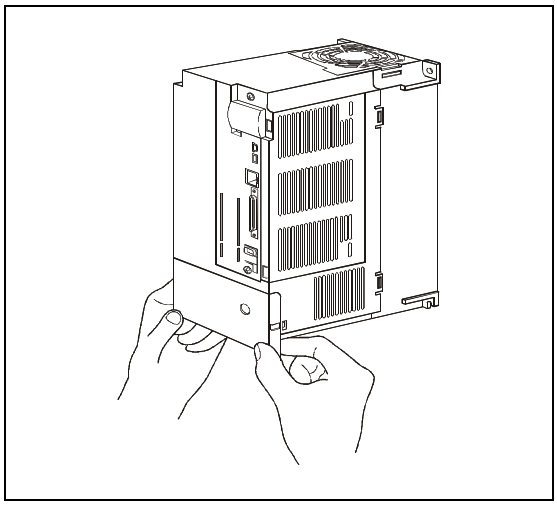


Fig. 2-4:
Step ①: Removing the front cover

S001515C

② Pull up the cover, supporting at point A.

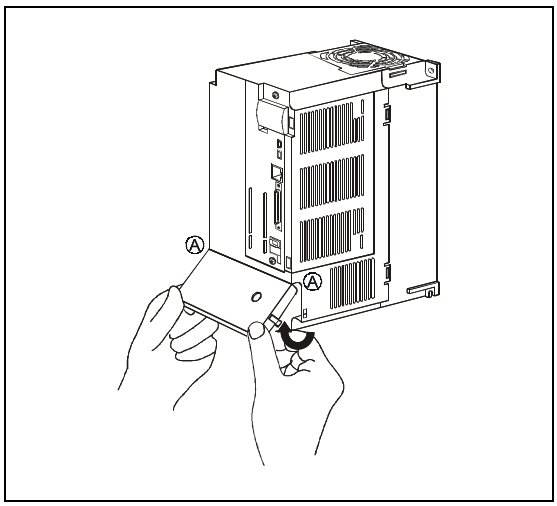


Fig. 2-5:
Step ②: Removing the front cover

S001516C

③ Pull out the front cover to remove.

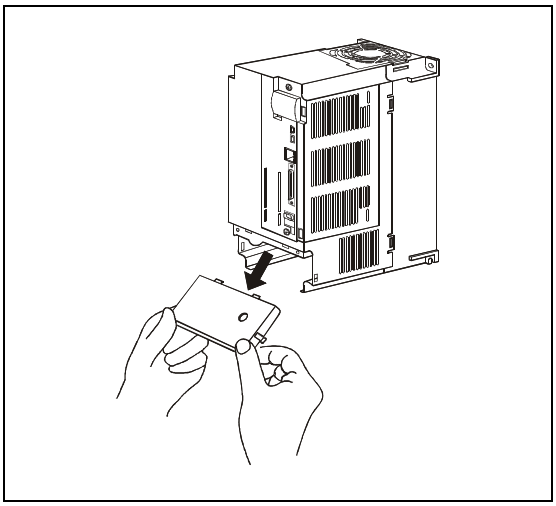


Fig. 2-6:
Step ③: Removing the front cover

S001517C

2.4.2 Reinstallation of the front cover of MR-J3-350A4, MR-J3-500A(4) and MR-J3-700A(4)

① Insert the front cover setting tabs into the sockets of servo amplifier (2 places).

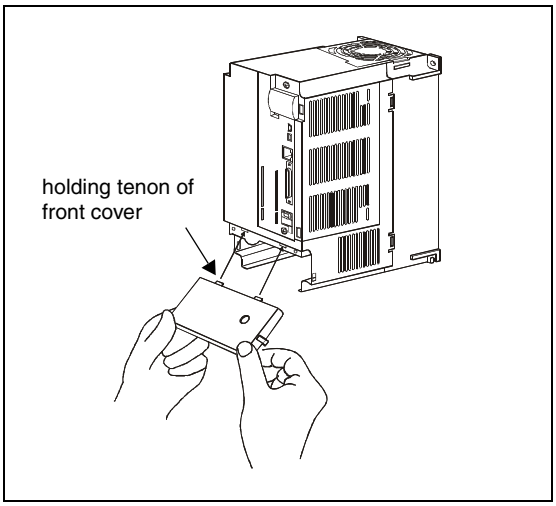


Fig. 2-7:
Step ①: Reinstalling the front cover

S001518C

② Pull up the cover, supporting at point A.

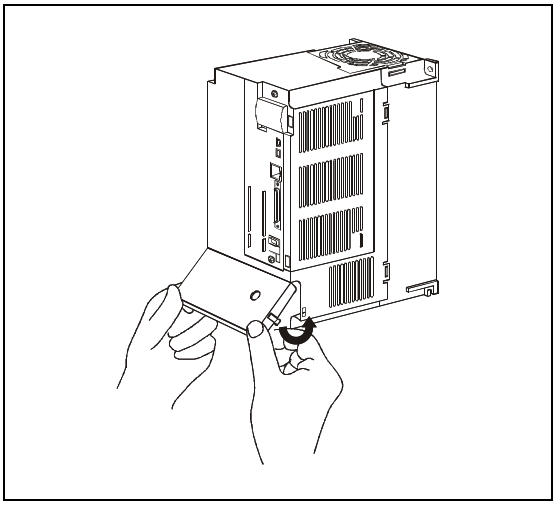


Fig. 2-8:
Step ②: Reinstalling the front cover

S001519C

③ Push the setting tabs until they click.

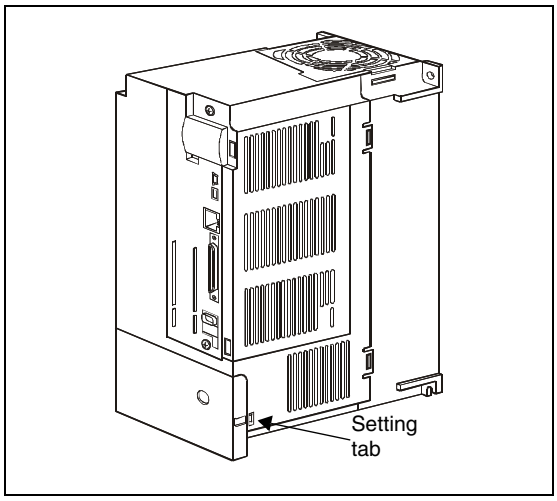


Fig. 2-9:
Step ③: Reinstalling the front cover

S001520C

2.4.3 Removal of the front cover of MR-J3-11KA(4) to MR-J3-22KA(4)

① Press the removing knob on the lower side of the front cover ❶ and ❷ and release the installation hook. Press the removing knob of ❸ and release the external hook.

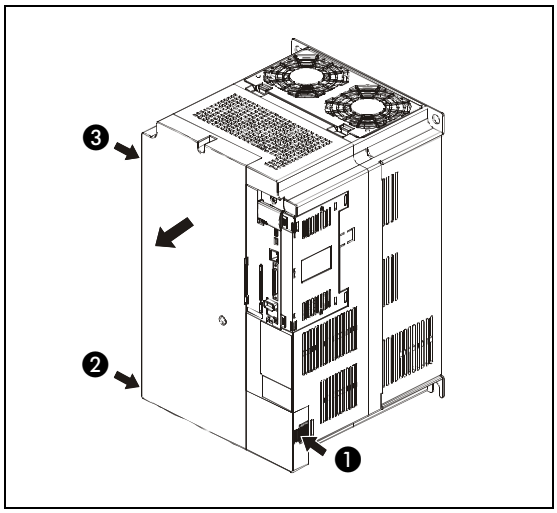


Fig. 2-10:
Step ①: Removing the front cover

S001804C

② Pull it to remove the front cover.

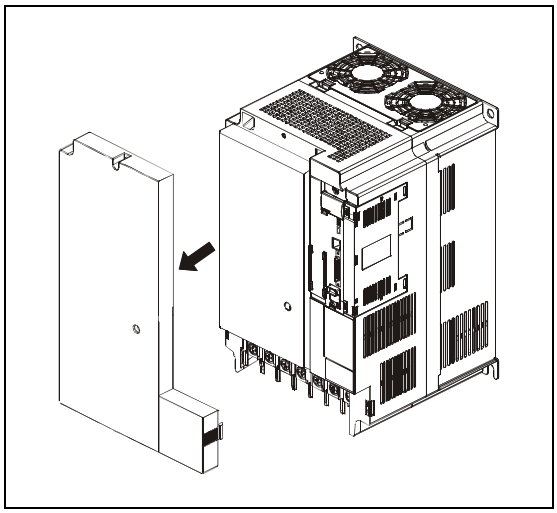


Fig. 2-11:
Step ②: Removing the front cover

S001805C

2.4.4 Reinstallation of the front cover of MR-J3-11KA(4) to MR-J3-22KA(4)

① Fit the front cover installation hooks on the sockets of body cover ❶ to ❸ to reinstall it.

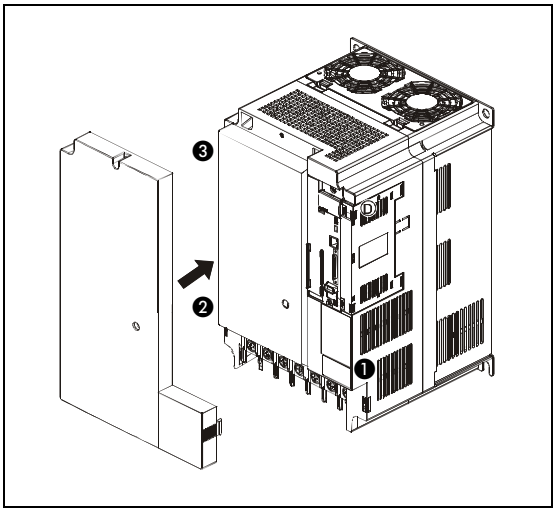


Fig. 2-12:
Step ①: Reinstalling the front cover

S001806C

② Push the front cover until your hear the clicking noise of the installation hook.

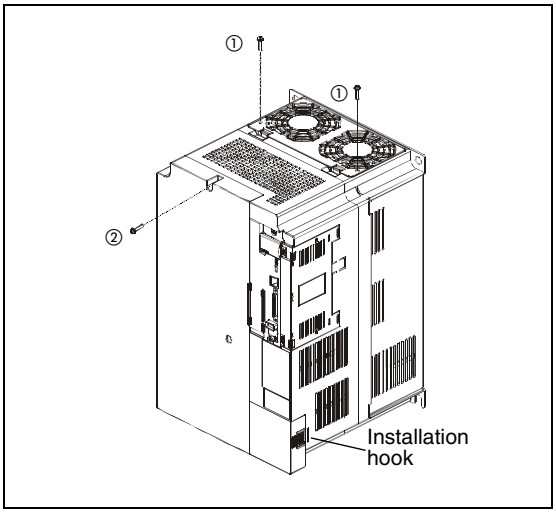


Fig. 2-13:
Step ②: Reinstalling the front cover

S001807C

① The fan cover can be locked with enclosed screws (M4x40).

② By drilling approximately Ø 4 mm of a hole on the front cover, the front cover can be locked on the body with an enclosed screw (M4x14).

2.5 Rating plate

The rating plate of the servo amplifier MR-J3-10A is shown below.
This rating plate is representative for all other servo amplifier models.

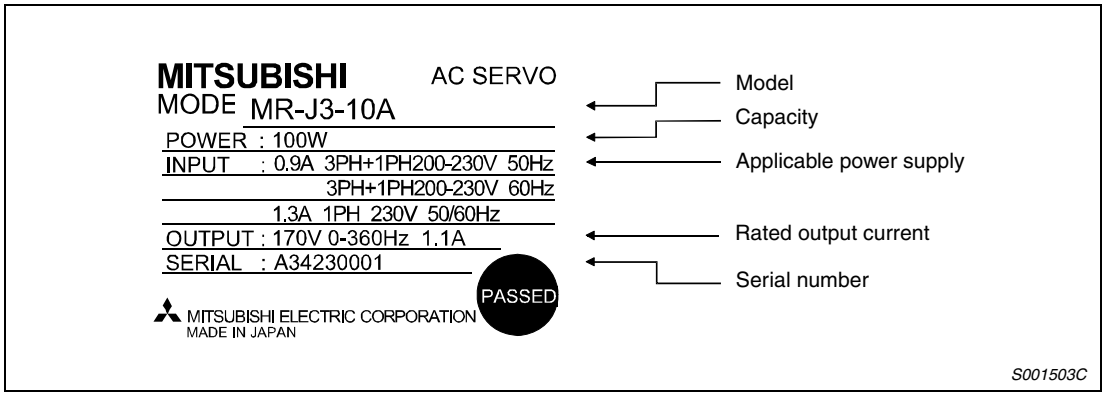


Fig. 2-14: *Rating plate*

3 Introduction of servo motors

This chapter shows the various servo motors that are availible for the servo amplifier series MR-J3-A and MR-J3-B.

All servo motors are fitted with an absolute encoder and optionally available with an electromagnetic brake.

The recommended combinations of servo amplifiers and servo motors are listed in fig. 2-3.

3.1 Model overview

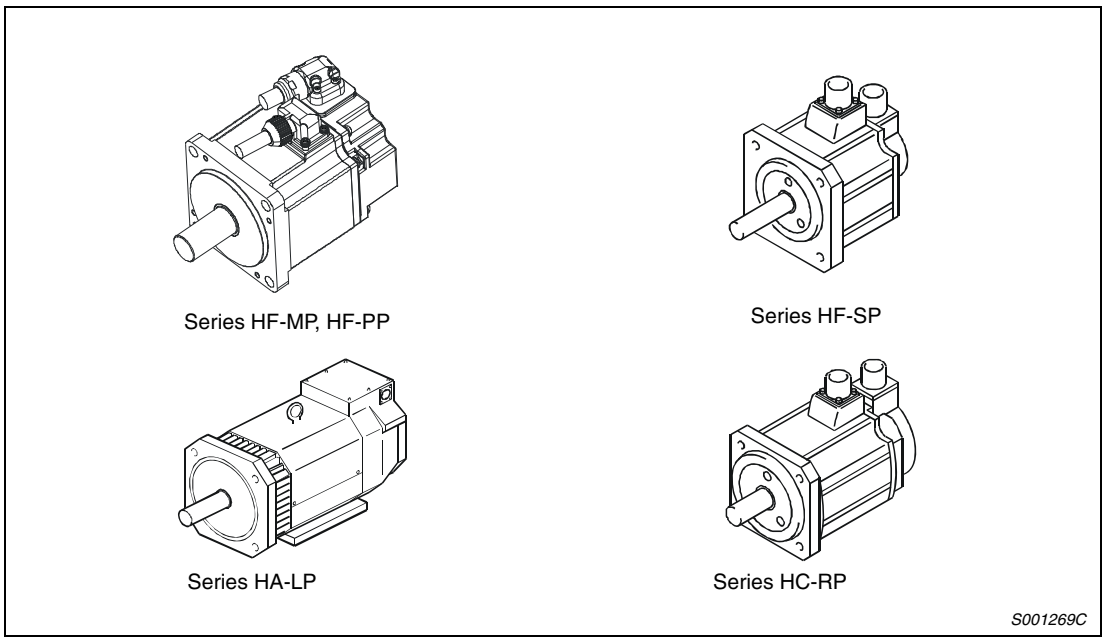
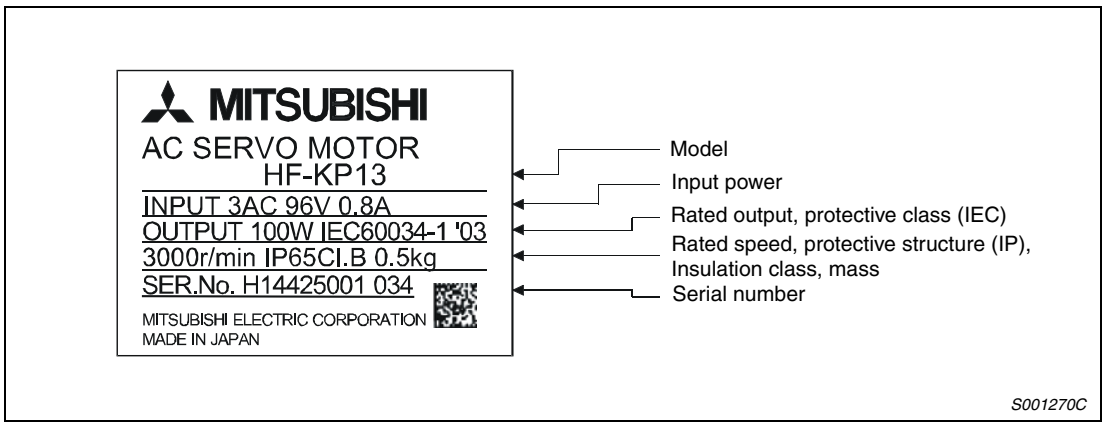


Fig. 3-1: *Servo motors*

3.2 Rating plate

The rating plate of the servo motor HF-KP13 is shown below.
This rating plate is representative of all other servo motor models.



NOTE All motors meet the standards CE and UL/cUL.

3.3 Servo motor series HF-MP, HF-KP

3.3.1 Model HF-MP – Ultra low inertia

Small motor inertia moment makes this unit well suited for high-dynamic positioning operations with extra small cycle times.

Application example

- Inserters, mounters, bonders
- Printed board hole openers
- In-circuit testers
- Label printers
- Knitting and embroidery machinery
- Ultra-small robots and robot tips

3.3.2 Model HF-KP – Low inertia

Larger motor inertia moment makes this unit well suited for machines with fluctuating load inertia moment or machines with low rigidity such as conveyors.

Application example

- Conveyors
- Food preparationmachinery
- Printers
- Small loaders and unloaders
- Small robots and component assembly devices
- Small X-Y tables
- Small press feeders

3.3.3 Model designation

HF-MP □ 3 □

Code	Electromagnetic brake
—	—
B	✔

Code	Rated speed [1/min]
3	3000

Code	Rated output [W]
05	50
1	100
2	200
4	400
7	750

Series name	Feature
HF-MP	Low inertia, small capacity
HF-KP	Ultra low inertia, small capacity

Fig. 3-2: *Model designation of the servo motor series HF-MP, HF-KP*

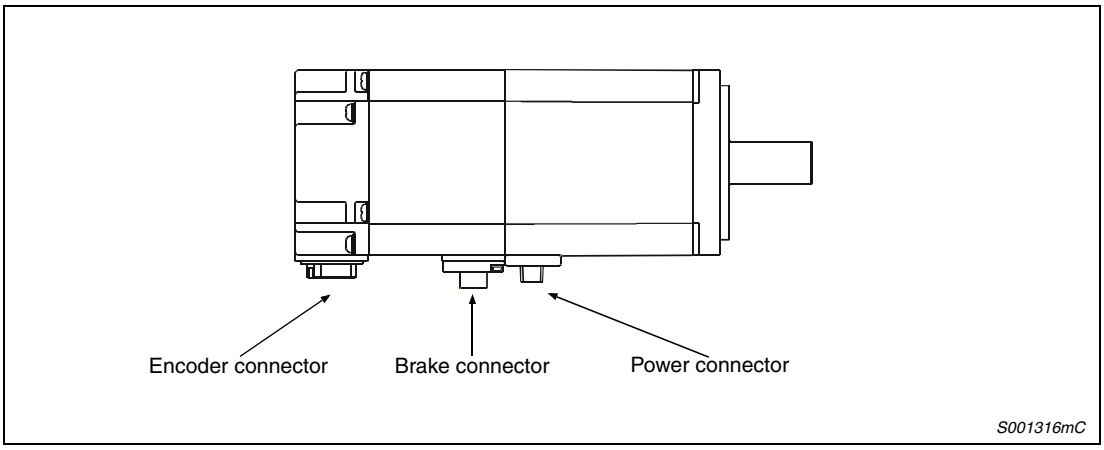


Fig. 3-3: *Servo motor series HF-MP and HF-KP*

NOTE Servo motors without electromagnetic brake have no brake connector.

3.4 Servo Motors Series HF-SP

3.4.1 Model HF-SP – Medium inertia

Stable control is performed from low to high speeds, enabling this unit to handle a wide range of applications (e.g. direct connection to ball screw components).

Application example

- Conveyor machinery
- Specialisedmachinery
- Robots
- Loaders and unloaders
- Winders and tension devices
- Turrets
- X-Y tables
- Test devices

3.4.2 Model designation

HF-SP □ 2 □ □

Series name
HF-SP

Code	Electromagnetic brake
—	—
B	✔

Code	Voltage [V]
—	200–230 V AC, 3-phase
4	380–460 V AC, 3-phase

Code	Rated speed [1/min]
2	2000

Code	Rated output [W]
5	500
10	1000
15	1500
20	2000
35	3500
50	5000
70	7000

Fig. 3-4: *Model designation of servo motors series HF-SP*

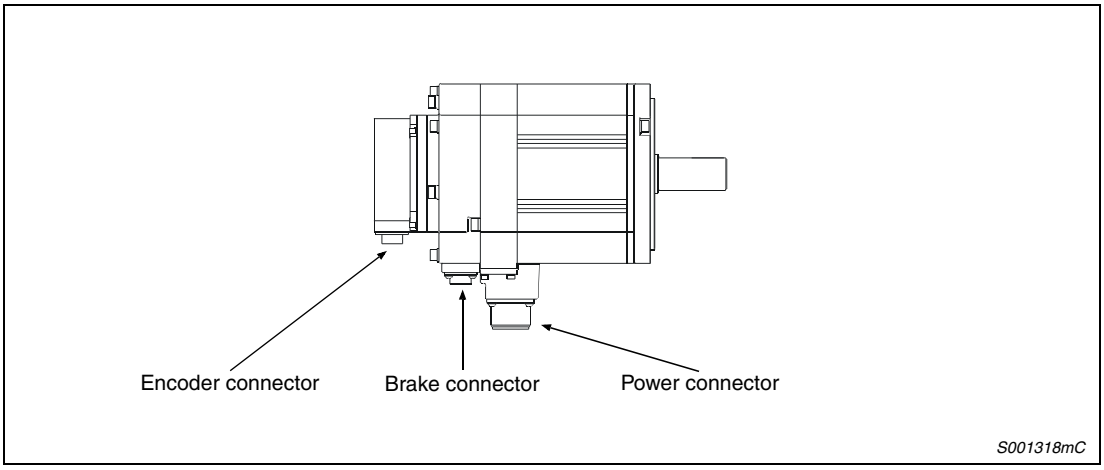


Fig. 3-5: *Servo motor series HF-SP*

NOTE Servo motors without electromagnetic brake have no brake connector.

3.5 Servo Motors Series HA-LP

3.5.1 Model HA-LP – Low inertia

A motor with low inertia and high power output.

3.5.2 Model designation

HA-LP □ 2 □ □

Series name
HA-LP

Code	Electromagnetic brake
—	—
B	✔

Code	Voltage [V]
—	200–230 V AC, 3-phase
4	380–460 V AC, 3-phase

Code	Rated speed [1/min]
2	2000

Code	Rated output [W]
11K	11000
15K	15000
22K	22000

Fig. 3-6: *Model designation of the servo motors series HA-LP*

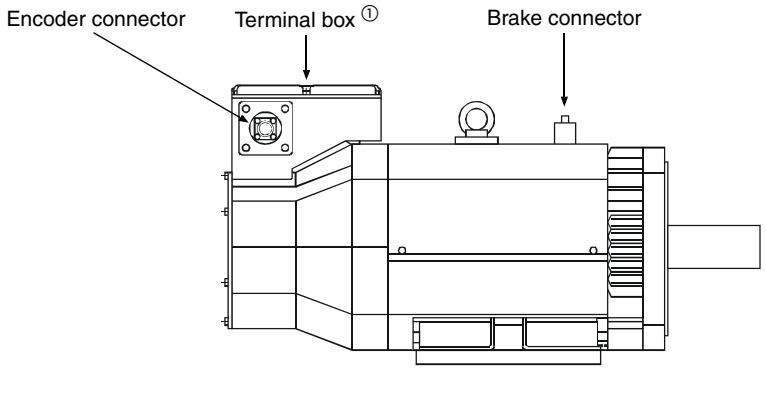


Fig. 3-7: *Servo motor series HA-LP*

① The terminal block for motor power supply is located in the terminal box.

NOTE Servo motors without electromagnetic brake have no brake connector.

3.6 Servo motors series HC-RP

3.6.1 Model HC-RP – Low inertia

A compact sized low-inertia moment model with medium capacity. Well suited for high frequency operation.

Application example

- Roll feeders
- Loaders and unloaders
- High-frequency conveyor machinery

3.6.2 Model designation

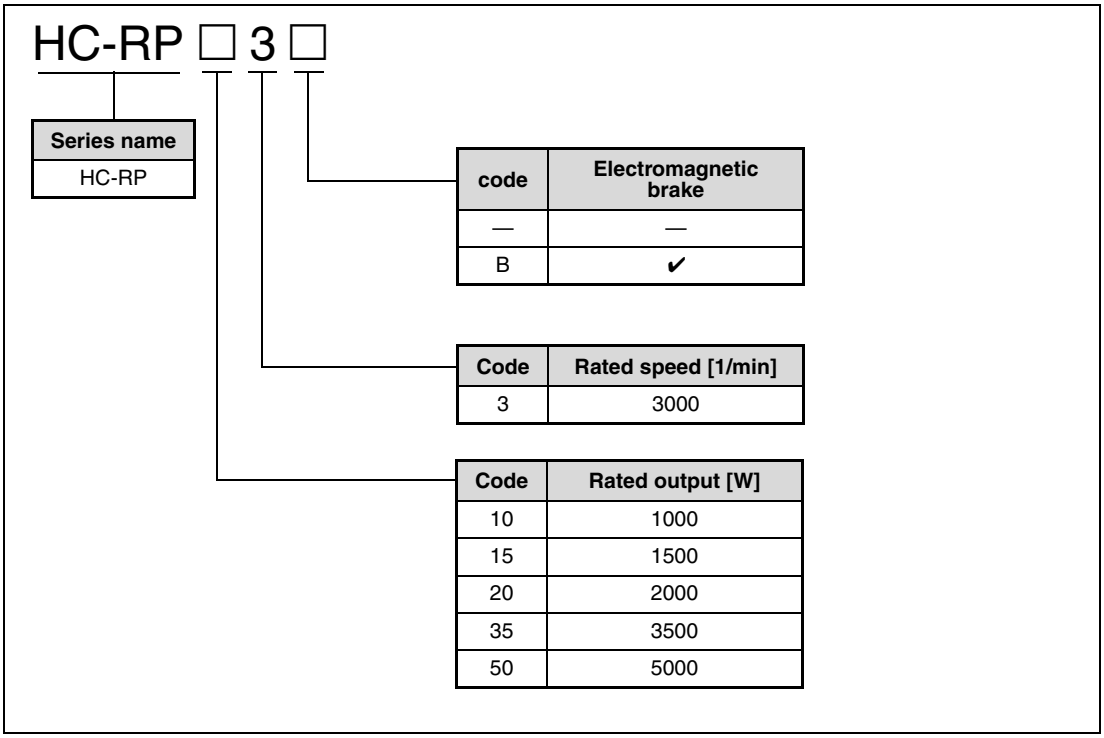


Fig. 3-8: *Model designation of the servo motors series HC-RP*

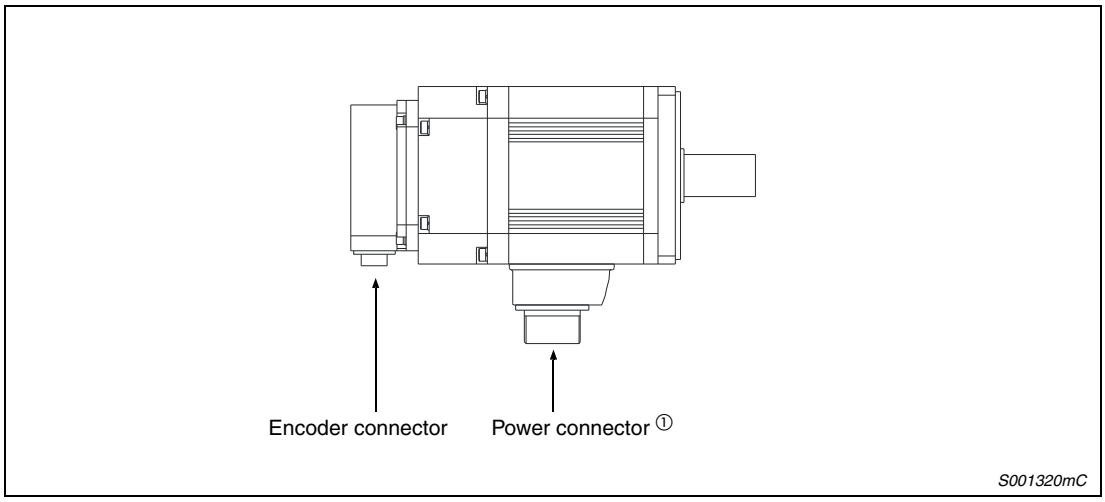


Fig. 3-9: *Servo motor series HC-RP*

① The brake connector is combined with the power connector.

NOTE Servo motors without electromagnetic brake have no brake connector.

4 Installation and wiring

DANGER:

Before starting wiring, switch power off, then wait for more than 15 minutes, and after the charge lamp has gone off, make sure that the voltage is safe with a tester or like. Otherwise, you may get an electric shock

4.1 Wiring of power supply, motor and PE terminal

The power supply of some models of the servo amplifier series MR-J3 can either be 1-phase or 3-phase AC voltage (230 V AC), while others can only be powered by 3-phase power supply.

Power supply of MR-J3-10A/B to MR-J3-70A/B

Item	1-phase	3-phase
Main circuit power supply	L1, L2	L1, L2, L3
Control circuit power supply	L11, L21 ①	
Voltage	200–230 V AC	
Permissible voltage fluctuation	170–253 V AC	
Frequency	50/60 Hz ±5 %	

Power supply of MR-J3-100A/B to MR-J3-22KA/B

Item	3-phase ②
Main circuit power supply	L1, L2, L3
Control circuit power supply	L11, L21 ①
Voltage	200–230 V AC
Permissible voltage fluctuation	170–253 V AC
Frequency	50/60 Hz ±5 %

Power supply of MR-J3-60A4/B4, MR-J3-100A4/B4 to MR-J3-22KA4/B4

Item	3-phase ②
Main circuit power supply	L1, L2, L3
Control circuit power supply	L11, L21 ①
Voltage	380–480 V AC
Permissible voltage fluctuation	323–528 V AC
Frequency	50/60 Hz ±5 %

① The power supply of the control circuit is connected to L11 and L21. L11 should be in phase with L1 and L21 in phase with L2.

② It is not possible, to connect these models only to one phase.

NOTE

Even if the servo amplifiers is supplied with an 1-phase AC voltage of 200 to 230 V the servo motor is connected in the same way to the output of the servo amplifier as with a 3-phase power supply. The power supply from the servo amplifier to the servo motor is always 3 phase.

The power supply with 1-phase is connected to the terminals L1 and L2 , with 3-phase to terminals L1, L2 and L3.

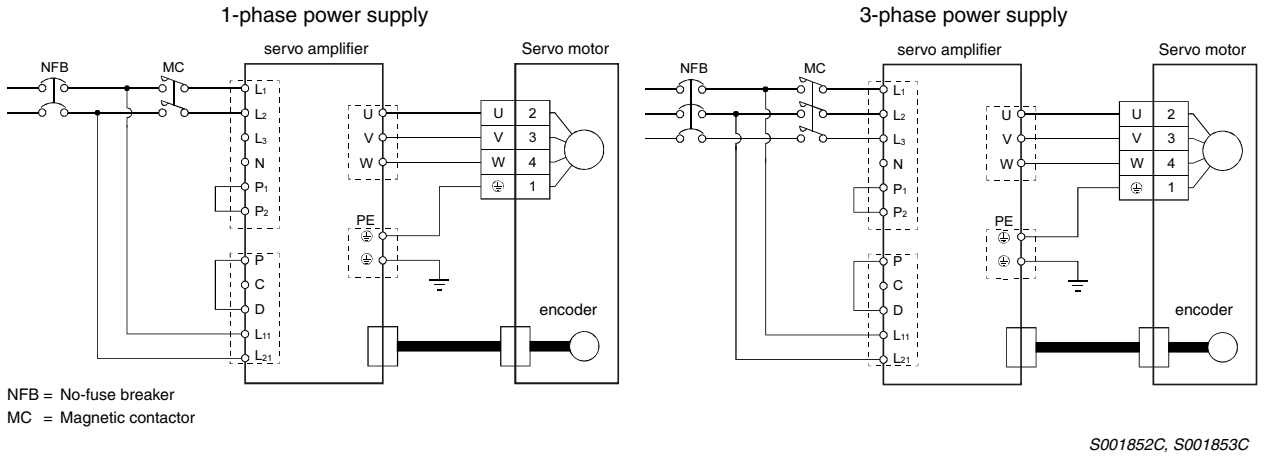
The motor is connected to terminals U, V and W.

Additionally the servo amplifier must be grounded via the PE terminal (Protective Earth).

WARNING:

Do not connect AC power supply directly to the output terminals U, V and W of the servo amplifier. Permanent damage of the servo amplifier as well as an immediate danger to the operator would be the consequence.

The following schematic diagram shows the wiring of the inputs and outputs of the servo amplifier.



The following table gives an overview of the power terminals of the servo amplifier:

Abbreviation	Terminals	Description
L1, L2	Main circuit power supply (1-phase)	Power supply of the servo amplifier (main circuit)
L1, L2, L3	Main circuit power supply (3-phase)	
U, V, W	Servo motor power	Voltage output of the servo amplifier
L11, L21	Control circuit power supply	Power supply of the control circuit
P, C, D	Regenerative option	Terminals P–D are wired by default. When using regenerative resitor, disconnect the P–D terminals and connect the regenerative resistor to P terminal and C terminal.
P1, P2	Power factor improving DC reactor	When not using the power factor improving DC reactor, connect P1–P2. (Factory-wired.) When using the power factor improving DC reactor, disconnect the wiring across P1–P2 and connect the power factor improving DC reactor across P1–P2.
⏚	PE	Ground terminal of the servo amplifier (Protective earth)

NOTE Please refer to the respective instruction manual of the servo amplifier series MR-J3-A and MR-J3-B for details about different terminal designations of specific servo amplifier models.

4.2 Connectors and signal arrangements

Apart from the terminals of the power unit for supply voltage and motor, a servo amplifier is equipped with even more terminals for controlling the servo amplifier. These additional terminals are used to connect an optional PC, for monitoring and diagnosis.

4.2.1 Servo amplifier series MR-J3-A

The shown front view is that of the servo amplifier MR-J3-20A. For all models of the MR-J3-A series is the terminal configuration the same.

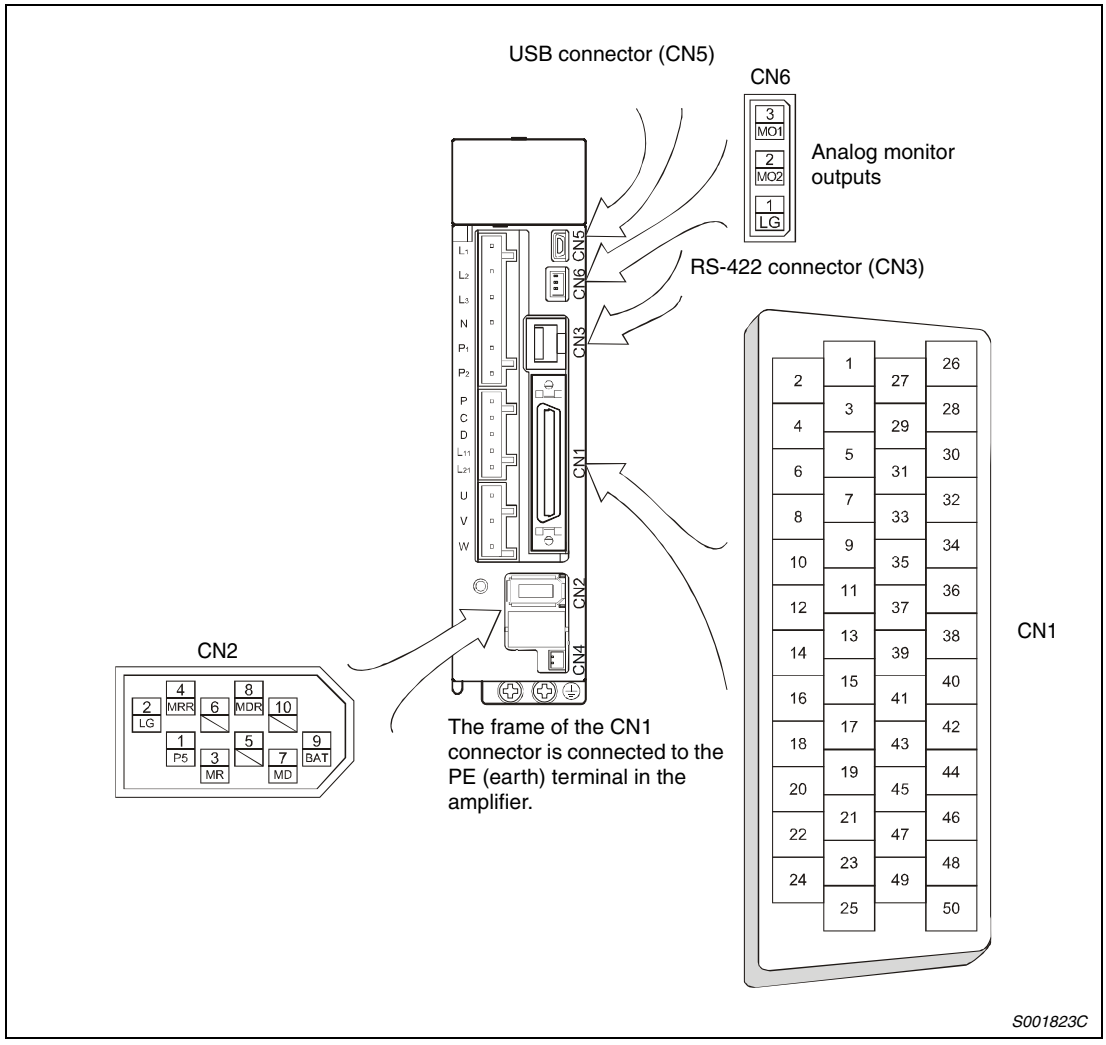


Fig. 4-1: *MR-J3-A signal arrangement*

NOTE The pin configurations of the connectors in fig. 4-1 are as viewed from the cable connector wiring section.

Signal assignment

Connector	Name	Description
CN1	I/O devices	Control interface (see tab. 4-2)
CN2	Encoder connector	Connector for the servo motor encoder
CN3	Communication (RS-422)	Connector for a personal computer (PC)
CN4	Battery terminal	For connecting the battery (MR-J3BAT) to store the data of the absolute position detection. When you want to connect the battery, disconnect the power supply of the main circuit and wait for more than 15 minutes, after the charge lamp has gone off. When replacing the battery, leave the power supply of the control circuit on and disconnect only the supply voltage of the main circuit. Otherwise, the absolute position data will be lost.
CN5	Communication (USB)	Connector for a personal computer (PC)
CN6	Analog monitor outputs	For connecting instruments for recording analog measurements.

Tab. 4-1: *Description of CN1, CN2, CN3, CN4, CN5 and CN6*

The signal configuration of connector CN1 changes with the control function.
For more details, please refer to the following table.

Pin No.	Signal I/O①	I/O Signals in Control Modes②						Pr.
		P	P/S	S	S/T	T	T/P	
1	—	P15R	P15R	P15R	P15R	P15R	P15R	—
2	I	—	—/VC	VC	VC/VLA	VLA	VLA/—	—
3	—	LG	LG	LG	LG	LG	LG	—
4	O	LA	LA	LA	LA	LA	LA	—
5	O	LAR	LAR	LAR	LAR	LAR	LAR	—
6	O	LB	LB	LB	LB	LB	LB	—
7	O	LBR	LBR	LBR	LBR	LBR	LBR	—
8	O	LZ	LZ	LZ	LZ	LZ	LZ	—
9	O	LZR	LZR	LZR	LZR	LZR	LZR	—
10	I	PP	PP/—	—	—	—	—/PP	—
11	I	PG	PG/—	—	—	—	—/PG	—
12	—	OPC	OPC/—	—	—	—	—/OPC	—
13	—	—	—	—	—	—	—	—
14	—	—	—	—	—	—	—	—
15	I	SON	SON	SON	SON	SON	SON	PD03
16	I	—	—/SP2	SP2	SP2/SP2	SP2	SP2/—	PD04
17	I	PC	PC/ST1	ST1	ST1/RS2	RS2	RS2/PC	PD05
18	I	TD	TD/ST2	ST2	ST2/RS1	RS1	RS1/TD	PD06
19	I	RES	RES	RES	RES	RES	RES	PD07
20	—	DICOM	DICOM	DICOM	DICOM	DICOM	DICOM	—
21	—	DICOM	DICOM	DICOM	DICOM	DICOM	DICOM	—
22	O	INP	INP/SA	SA	SA/—	—	—/INP	PD13
23	O	ZSP	ZSP	ZSP	ZSP	ZSP	ZSP	PD14
24	O	INP	INP/SA	SA	SA/—	—	—/INP	PD15
25	O	TLC	TLC	TLC	TLC/VLC	VLC	VLC/TLC	PD16
26	—	—	—	—	—	—	—	—
27	I	TLA	TLA	TLA	TLA/TC	TC	TC/TLA	—
28	—	LG	LG	LG	LG	LG	LG	—
29	—	—	—	—	—	—	—	—

Tab. 4-2: *Signal arrangemant of CN1 in MR-J3-A (1)*

Pin No.	Signal I/O①	I/O Signals in Control Modes②						Pr.
		P	P/S	S	S/T	T	T/P	
30	—	LG	LG	LG	LG	LG	LG	—
31	—	—	—	—	—	—	—	—
32	—	—	—	—	—	—	—	—
33	O	OP	OP	OP	OP	OP	OP	—
34	—	LG	LG	LG	LG	LG	LG	—
35	I	NP	NP/—	—	—	—	—/NP	—
36	I	NG	NG/—	—	—	—	—/NG	—
37	—	—	—	—	—	—	—	—
38	—	—	—	—	—	—	—	—
39	—	—	—	—	—	—	—	—
40	—	—	—	—	—	—	—	—
41	O	CR	CR/SP1	SP1	SP1/SP1	SP1	SP1/CR	PD08
42	O	EMG	EMG	EMG	EMG	EMG	EMG	—
43	O	LSP	LSP	LSP	LSP/—	—	—/LSP	PD10
44	O	LSN	LSN	LSN	LSN/—	—	—/LSN	PD11
45	O	LOP	LOP	LOP	LOP	LOP	LOP	PD12
46	—	DOCOM	DOCOM	DOCOM	DOCOM	DOCOM	DOCOM	—
47	—	DOCOM	DOCOM	DOCOM	DOCOM	DOCOM	DOCOM	—
48	O	ALM	ALM	ALM	ALM	ALM	ALM	—
49	O	RD	RD	RD	RD	RD	RD	PD18
50	—	—	—	—	—	—	—	—

Tab. 4-2: *Signal arrangement of CN1 in MR-J3-A (2)*

① I: Input signal
O: Output signal

② P: Position control
S: Speed control
T: Torque control
P/S: Position/speed control changeover mode,
S/T: Speed/torque control changeover mode
T/P: Torque/position control changeover mode

Meaning of the symbols

The most important signals are explained in the table below. You will find detailed information about all signals in the instruction manual of the respective servo amplifier.

Signal		Symbol	Name	Description	
Signal inputs	Control terminals	RES	Reset	Turn RES on for more than 50 ms to reset the alarm.	
		LSP	Forward rotation stroke end	To start the Servo motor in both directions of rotation both inputs must be switched on. If one input switches off because the limit switch has been reached, rotary movement is possible only in the opposite direction of the activated limit switch.	
		LSN	Reverse rotation stroke end		
		SON	Servo-on	Turn SON on to power on the main circuit and make the servo amplifier ready to operate (servo-on).	
		ST1	Forward rotation start	If there is a signal on terminal ST1, the motor turns in clockwise rotation.	If both ST1 and ST2 are switched on or off during operation, the servo motor will be decelerated to a stop.
		ST2	Reverse rotation start	If there is a signal on terminal ST2, the motor turns in counter-clockwise rotation.	
		EMG	Forced stop	Turn EMG off (open between commons) to bring the motor to an forced stop state, in which the main circuit is shut off and the dynamic brake is operated. Turn EMG on (short between commons) in the forced stop state to reset that state.	
	Common	DICOM	Common negative reference point (GND) of the input terminals in positive logic		
			Common positive reference point (+24 V) of the input terminals in negative logic		
Signal outputs	Control terminals	ALM	Alarm	ALM turns off when power is switched off or the protective circuit is activated to shut off the main circuit. Without alarm occurring, ALM turns on within 1.5 s after power-on.	
		RD	Ready	RD turns on when the servo is switched on and the servo amplifier is ready to operate.	
		INP	In position	INP turns on when the number of droop pulses is in the preset inposition range. INP turns on when servo-on turns on.	
		WNG	Warning	When warning has occurred, WNG turns on. To use this signal, assign the connector pin CN1 for output using parameter PD13 to PD16, PD18.	
		ACD0 ACD1 ACD2	Alarm code	The alarm code is output as a 3-Bit signal depending on the alarm that occurs. The output of the alarm code has to be activated by parameter PD24.	
	Common	DOCOM	Common positive reference point (+24 V) of the output terminals in positive logic		
			Common negative reference point (GND) of the output terminals in negative logic		
Analog	Command inputs	TC	Analog torque command	Used to control torque in the full servo motor output torque range. Apply 0 to ±8 V DC across TC–LG. Maximum torque is generated at ±8 V.	
		VC	Analog speed command	Apply 0 to ±10 V DC across VC–LG. Speed set in parameter PC12 is provided at ±10 V.	
		VLA	Analog speed limit	Setting of speed limit in torque control mode by applying 0 to +10 V. The maximum speed set in parameter PC12 is output at +10 V.	
	Analog output	MO1	Analog monitor 1	Used to output the data set in parameter PC14 to across MO1–LG in terms of voltage.	Resolution: 10 Bit
		MO2	Analog monitor 2	Used to output the data set in parameter No. PC15 to across MO2–LG in terms of voltage.	
	Common	P15R	The pin outputs a voltage of +15 V DC to supply the analog inputs.		
		LG	Reference point for analog input and output signals		
SD			Shielding, housing		

Tab. 4-3: *Selection of the most important input and output signals of CN1*

4.2.2 Servo amplifier series MR-J3-B

The shown front view is that of servo amplifier MR-J3-20B. The terminal configuration is the same for all models of the MR-J3-B series.

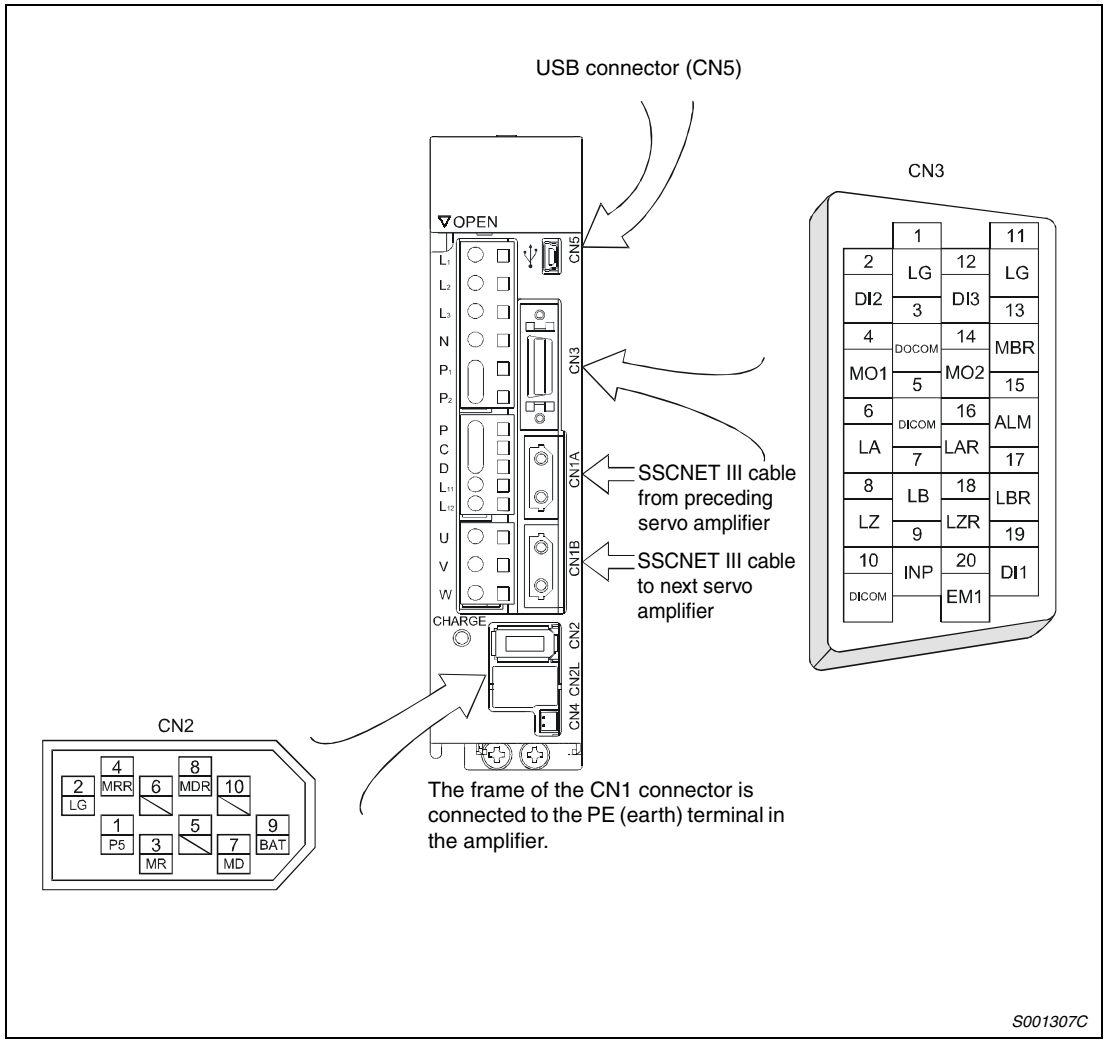


Fig. 4-2: *MR-J3-B signal arrangement*

NOTE The pin configurations of the connectors in fig. 4-2 are as viewed from the cable connector wiring section.

Signal assignment

Connector	Name	Description
CN1A	Connector for bus cable from preceding axis (SSCNET III)	Used for connection with the controller or preceding-axis servo amplifier.
CN1B	Connector for bus cable to next axis (SSCNET III)	Used for connection with the next-axis servo amplifier or for connection of the cap.
CN2	Encoder connector	Used for connection with the servo motor encoder.
CN4	Battery connector	For connecting the battery (MR-J3BAT) to store the data of the absolute position detection. When you want to connect the battery, disconnect thepower supply of the main circuit and wait for more than 15 minutes, after the charge lamp has gone off. When replacing the battery, leave the power supply of the control circuit on and disconnect only the supply voltage of the main circuit. Otherwise, the absolute position data will be lost.
CN5	Communication connector	Connector for a personal computer (PC)

Tab. 4-4: *Description of CN1A, CN1B, CN2, CN4 and CN5*

Signal arrangement of CN3

Pin No.	Signal I/O	Symbols of I/O signals	Pin No.	Signal I/O	Symbols of I/O signals
1	—	LG	11	—	LG
2	I	DI1	12	I	DI2
3	—	DOCOM	13	O	Assignment with parameter PD07 ①
4	—	MO1	14	—	MO2
5	—	DICOM	15	O	Assignment with parameter PD09 ①
6	—	LA	16	—	LAR
7	—	LB	17	—	LBR
8	—	LZ	18	—	LZR
9	O	Assignment with parameter PD08 ①	19	I	DI3
10	—	DICOM	20	I	EM1

Tab. 4-5: *Signal arrangement of CN3 in MR-J3-B*

① Assignable symbols:

RD	ALM	INP	MBR
DB	TLC	WNG	BWNG
ZSP	CDPS	ABSV	SA

Meaning of symbols

The most important signals are explained in the table below. You will find detailed information about all signals in the instruction manual of the respective servo amplifier.

Signal		Symbol	Name	Description	
Signal inputs	Control terminals	DI1	—	Devices can be assigned for DI1 DI2 DI3 with controller setting. For devices that can be assigned, refer to the controller instruction manual. The following devices can be assigned for Q172HCPU, Q173HCPU and QD75MH: DI1: upper stroke limit (FLS) DI2: lower stroke limit (RLS) DI3: near-point dog (DOG)	
		DI2			
		DI3			
		EM1	External forced stop	Turn EM1 off (open between commons) to bring the motor to an forced stop state, in which the main circuit is shut off and the dynamic brake is operated. Turn EM1 on (short between commons) in the forced stop state to reset that state.	
	Common	DICOM	Common negative reference point (GND) of the input terminals in positive logic		
			Common positive reference point (+24 V) of the input terminals in negative logic		
Signal outputs	Control terminals	ALM	Alarm	ALM turns off when power is switched off or the protective circuit is activated to shut off the main circuit.Without alarm occurring, ALM turns on within about 1 s after power-on.	The signal must first be assigned to a certain output terminal of plug CN3 via parameter setting PD07–PD09.
		RD	Ready	RD turns on when the servo is switched on and the servo amplifier is ready to operate.	
		INP	In position	INP turns on when the number of droop pulses is in the preset in-position range. INP turns on when servo on turns on.	
		WNG	Warning	When warning has occurred, WNG turns on. When there is no warning, WNG turns off within about 1.5 s after power-on.	
	Common	DOCOM	Common positive reference point (+24 V) of the output terminals in positive logic		
			Common negative reference point (GND) of the output terminals in negative logic		
Analog	Analog output	MO1	Analog monitor 1	Used to output the data set in parameter PC09 to across MO1–LG in terms of voltage.	Resolution: 10 Bit
		MO2	Analog monitor 2	Used to output the data set in parameter PC10 to across MO2–LG in terms of voltage.	
	Common	LG	Reference point for analog output signals		
			Reference point for encoder on CN2		
SD			Shielding, housing		

Tab. 4-6: *Selection of the most important input and output signals of CN3*

4.3 Wiring the interfaces

4.3.1 I/O interfaces in negative logic (sink type)

Digital input interface DI

Give a signal with a relay or open collector transistor.

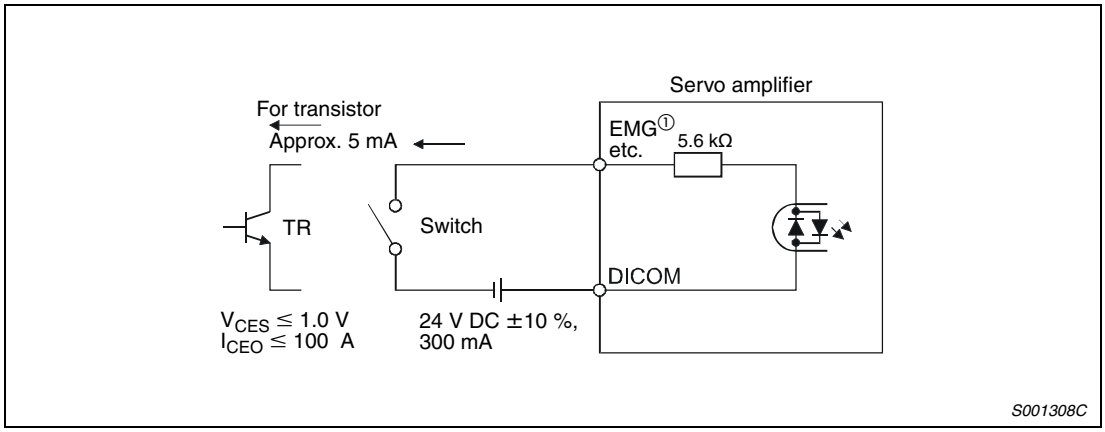


Fig. 4-3: *Example*

① Servo amplifier MR-J3-A
With servo amplifier MR-J3-B is the symbol for the external forced stop input EM1.

Digital output interface DO

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

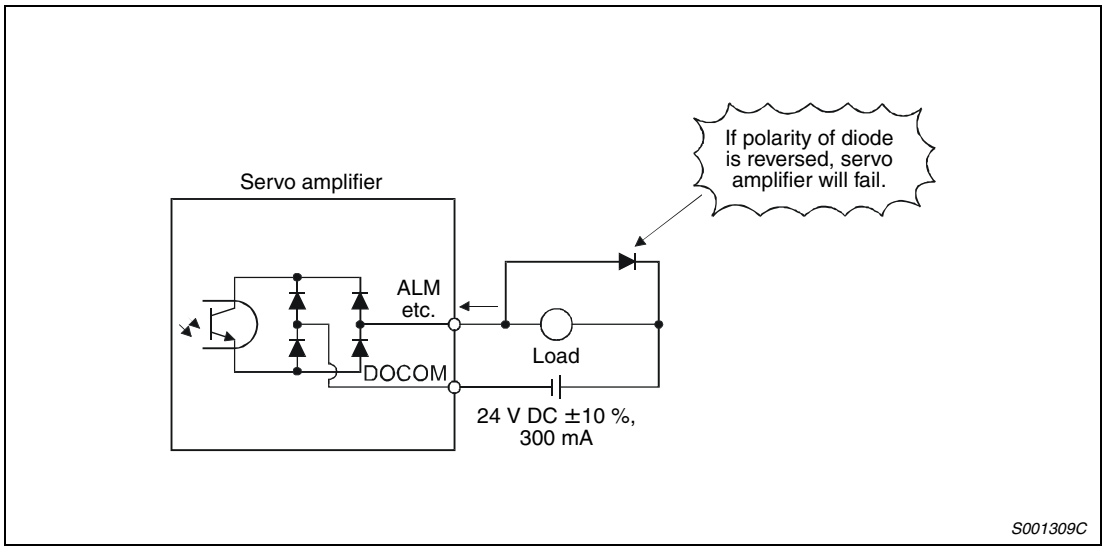


Fig. 4-4: *Example*

WARNING:

When connecting an inductive load, please observe the right polarity of the recovery diode. Wrong polarity of the diode can damage the servo amplifier.

4.3.2 I/O interfaces in positive logic (source type)

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

Digital input interface DI

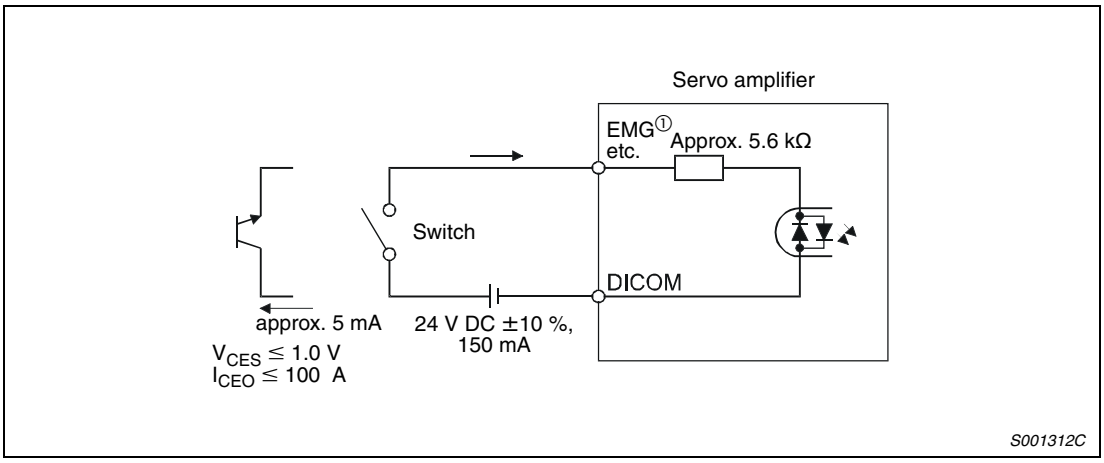


Fig. 4-5: *Example*

① Servo amplifier MR-J3-A
With servo amplifier MR-J3-B is the symbol for the external forced stop input EM1.

Digital output interface DO

A maximum of 2.6 V voltage drop occurs in the servo amplifier (Output–DOCOM).

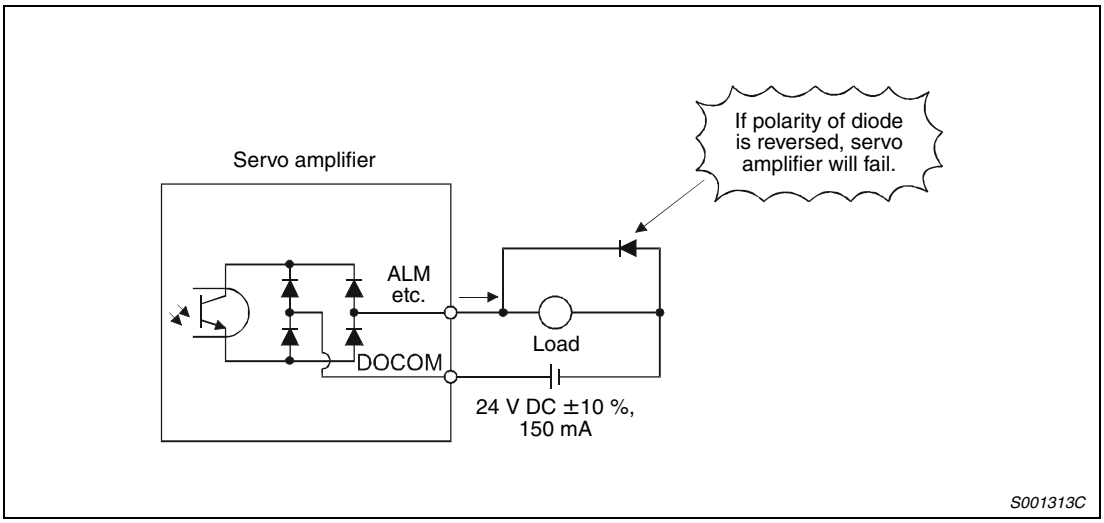


Fig. 4-6: *Example*

WARNING:
When connecting an inductive load, please observe the right polarity of the recovery diode. Wrong polarity of the diode can damage the servo amplifier.

4.3.3 Analog interfaces

Analog input (only MR-J3-A)

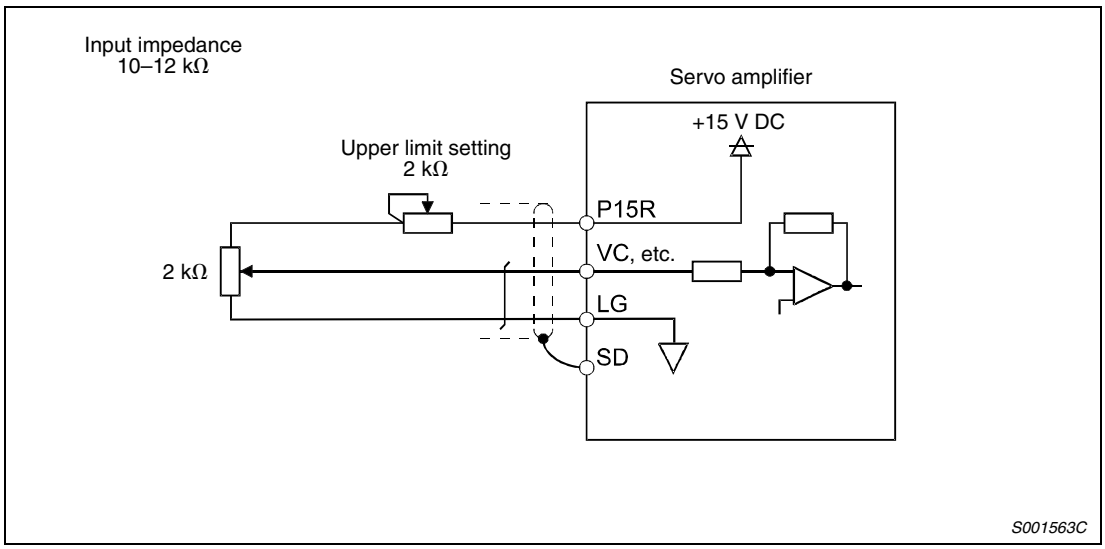


Fig. 4-7: *Example*

Analog output

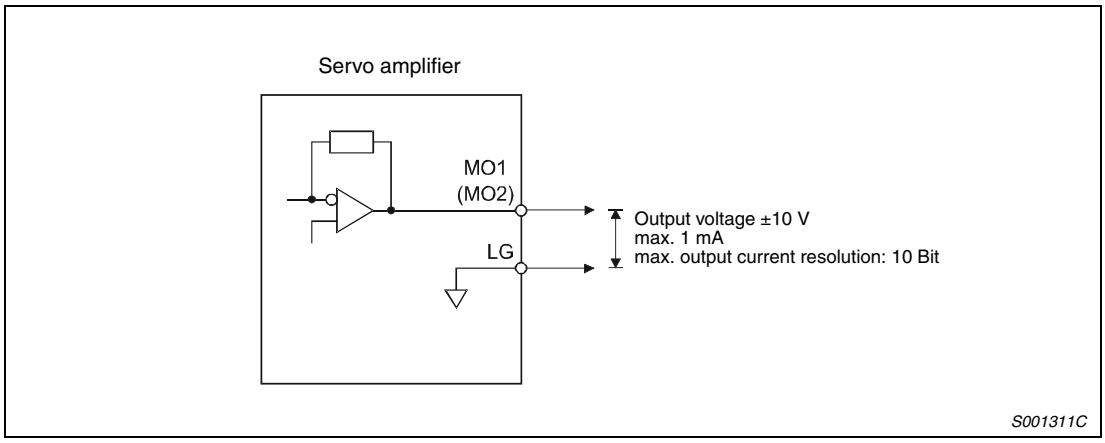


Fig. 4-8: *Example*

4.4 Serial interface RS422 (only MR-J3-A)

The servo amplifier MR-J3-A has a serial interface RS422 (CN3). This allows operation and monitoring of the servo amplifier as well as setting of parameters using a computer (e.g. PC).

- Operation with one axis

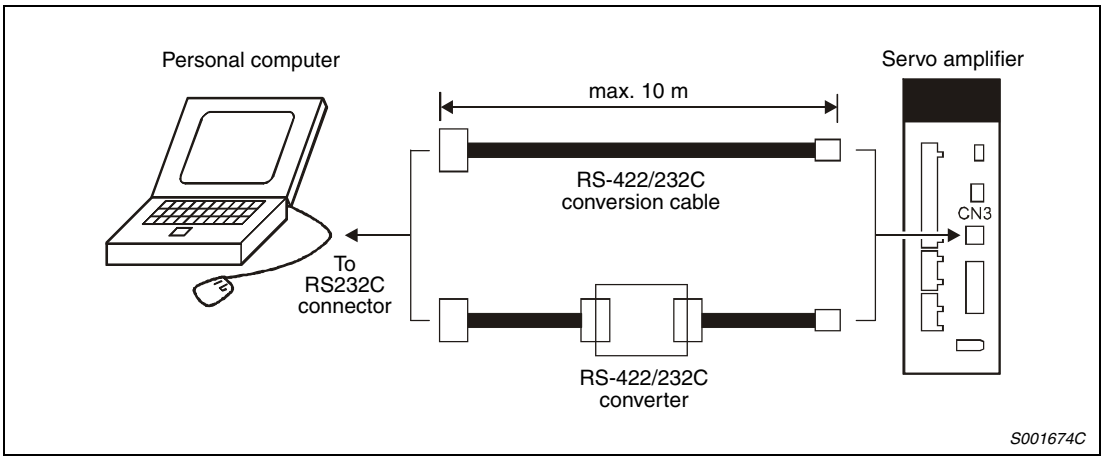


Fig. 4-9: *System configuration with the RS422 interface for operation with one axis*

- Operation with several axes

Up to 32 servo amplifiers (station number 0 to 31) can be operated on one bus.

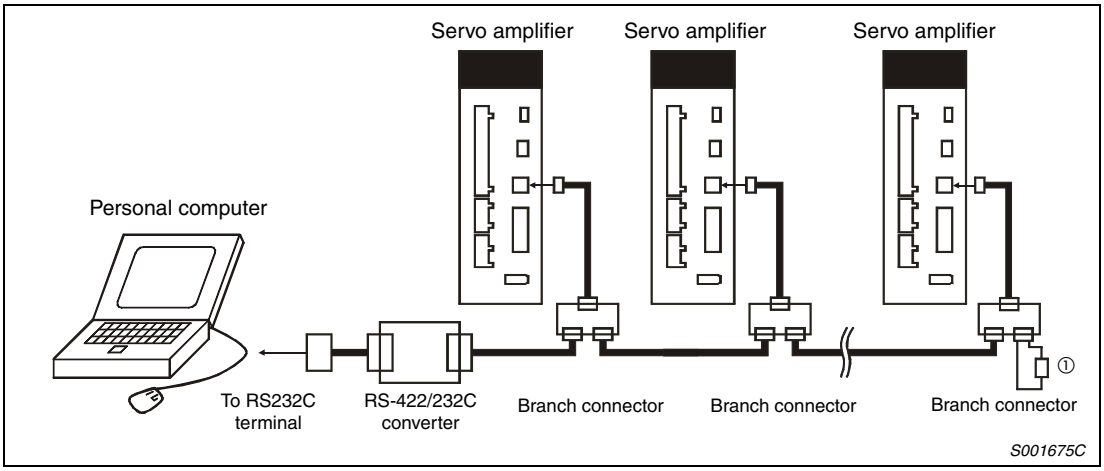


Fig. 4-10: *System configuration with the RS422 interface for operation with multiple axes*

① The final axis must be terminated between RDP (pin 3) and RDN (pin 6) on the receiving side (servo amplifier) with a 150 Ω resistor.

4.5 Optical interface SSCNET III (only MR-J3-B)

The servo amplifier MR-J3-B has an optical interface SSCNET III (CN1A, CN1B). Operation and monitoring of the servo amplifier can be done by the the motion CPU.

WARNING:

Do not see directly the light generated from CN1A CN1B connector of servo amplifier or the end of SSCNET III cable. When the light gets into eye, may feel something is wrong for eye. (The light source of SSCNET III complies with class1 defined in JIS C6802 or IEC60825-1.)

For CN1A connector, connect SSCNET III cable connected to controller in host side or servo amplifier. For CN1B, connect SSCNET cable connected to servo amplifier in lower side. For CN1B connector of the final axis, put the cap on, which came with the servo amplifier. The SSCNET III cable of the HOST controller (motion CPU) or of the preceding servo amplifier is plugged into connector CN1A . The SSCNET III cable to the next servo amplifier is plugged into terminal CN1B. Put a cap on the connector CN1B of the last servo amplifier.

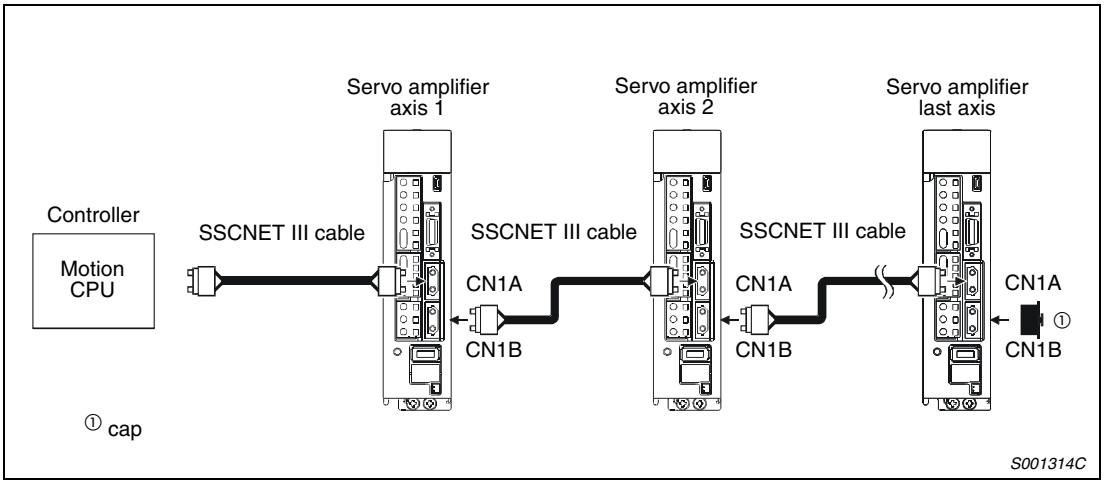


Fig. 4-11: *SSCNET cable connection*

NOTES

Put a cap on CN1A and CN1B connector to protect the light device inside the connector from dust. For this reason, do not remove a cap until just before mounting the SSCNET III cable. Then, when removing SSCNET III cable, make sure to put a cap on.

Keep the cap for CN1A and CN1B connector and the tube for protecting the end of SSCNET III cable in a plastic bag with a zipper to prevent them from becoming dirty.

When asking repair of servo amplifier for some troubles, make sure to put a cap on CN1A and CN1B connector. When the connector is not protected by a cap, the light device may be damaged at the transit. In this case, exchange and repair of light device is required.

SSCNET III cable with open ends (e.g. after disassembly of a defective servo amplifier) should be covered immediately with the protective tube to prevent damage.

4.6 Setting the station number (only MR-J3-B)

Use the rotary axis setting switch (SW1) to set the control axis number for the servo. If the same numbers are set to different control axes in a single communication system, the system will not operate properly. The control axes may be set independently of the SSCNET III cable connection sequence.

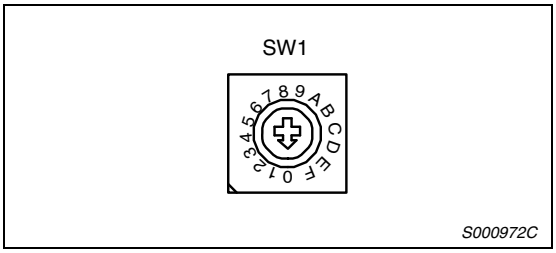


Fig. 4-12: *Rotary axis setting switch*

SW1 setting	Assignment	Display	SW1 setting	Assignment	Display
0	Station No. 1	01	8	Station No. 9	09
1	Station No. 2	02	9	Station No. 10	10
2	Station No. 3	03	A	Station No. 11	11
3	Station No. 4	04	B	Station No. 12	12
4	Station No. 5	05	C	Station No. 13	13
5	Station No. 6	06	D	Station No. 14	14
6	Station No. 7	07	E	Station No. 15	15
7	Station No. 8	08	F	Station No. 16	16

Tab. 4-7: *Setting of station number*

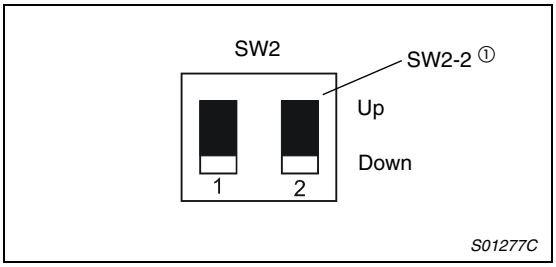


Fig. 4-13: *DIP switch SW2*

① Make sure that switch SW2-2 is always in "Down" position.

NOTES

The control axis number set to rotary axis setting switch (SW1) should be the same as the one set to the servo system controller.

Section 6.2.1 shows the location of the switches SW1 and SW2 on the front panel of the servo amplifier MR-J3-B.

4.7 Servo motor

4.7.1 Connecting the servo motor

WARNING:

- ***Ground the servo amplifier and servo motor securely.***
  To prevent an electric shock, always connect the protective earth (PE) terminal (terminal marked with ⏚) of the servo amplifier with the protective earth (PE) of the control box.
- ***Connect the wires to the correct phase terminals (U, V, W) of the servo amplifier and servo motor. Otherwise, the servo motor will operate improperly.***
- ***Do not connect AC power supply directly to the servo motor. Otherwise, a fault may occur.***

① Connect the servo motors using the corresponding power connectors.

② Connect the earth cable of the servo motor to the protective earth (PE) terminal of the servo amplifier and connect the ground cable of the servo amplifier to the earth via the protective earth of the control box.

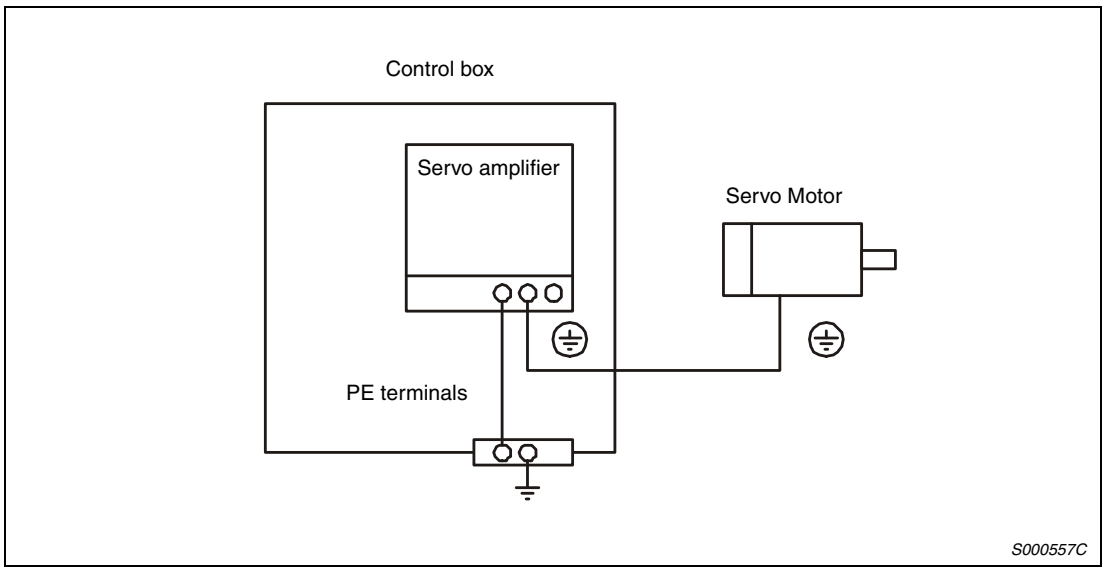


Fig. 4-14: *Grounding to protective earth*

4.7.2 Servo motor with electromagnetic brake

WARNING:

- ***Configure the electromagnetic brake circuit so that it is activated not only by the interface unit signals (EM1) but also by an external forced stop.***
- ***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.***

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

① Do not share the 24 V DC 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 (24 V DC) switches off.

③ In vertical applications such as with suspended loads use the signal MBR to activate electromagnetic brake automatically. The signal MBR will be switched off when the signal SON (Servo-on) is off or if an alarm occurs (signal ALM).

④ Switch off the servo-on command after the servo motor has stopped.

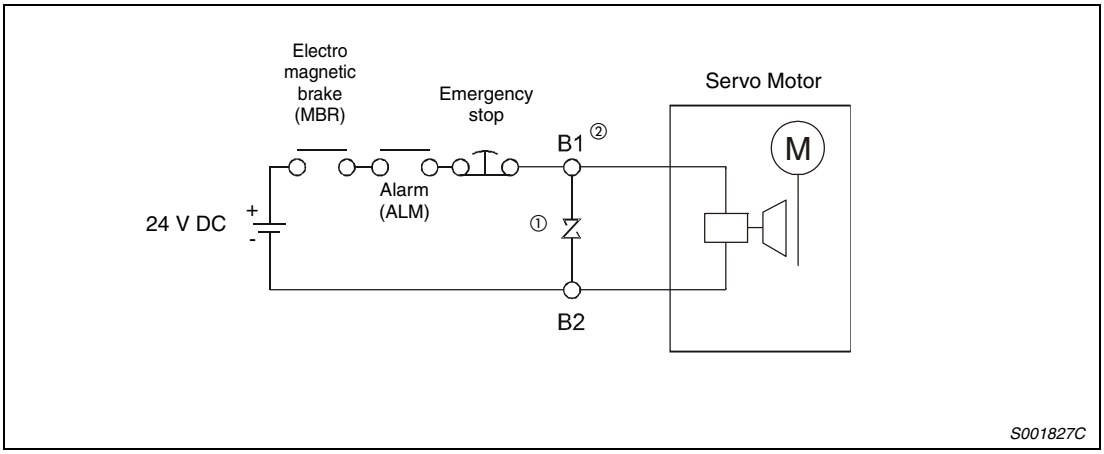


Fig. 4-15: *Circuit diagram*

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

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

4.8 Forced stop

If the controller does not have a forced stop function, make up a circuit that switches off main circuit power as soon as EMG is turned off at a forced stop. When EMG② is turned off, the dynamic brake (regenerative unit) is operated to stop the servo motor. At this time, the display shows the servo forced stop warning (AL.E6/ E6).

During ordinary operation, do not use forced stop (EMG) to alternate stop and run. The life time of the servo amplifier may be shortened.

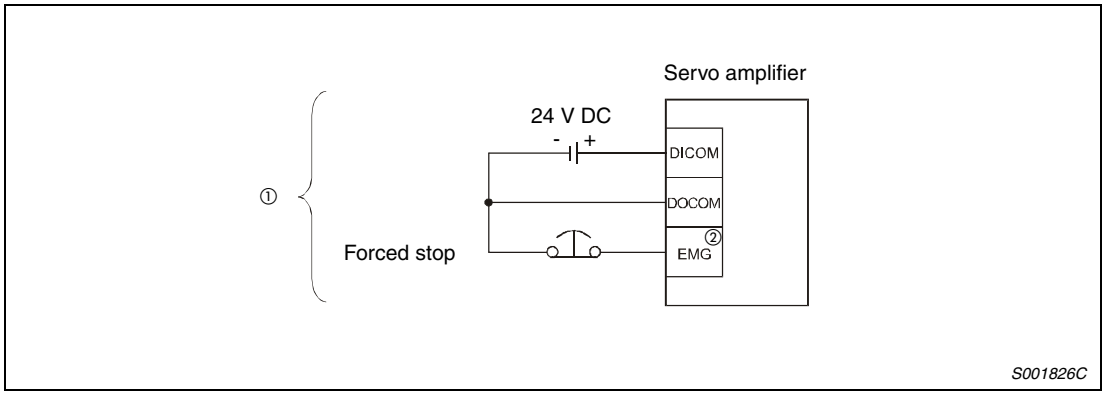


Fig. 4-16: *Emergency switch*

① Use of the I/O interface in negative logic. When using in positive logic see section 4.3.2.

② Servo amplifier MR-J3-A
With servo amplifier MR-J3-B is the symbol for the external forced stop input EM1.

4.9 Wiring examples

Wire the power supply/ main circuit as shown below. As soon as an alarm occurs, the power supply voltage and the "servo ON" signal must be switched off.

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

The forced stop function must be possible for the servo amplifier and for the controller.

Connection examples of single-phase and three-phase power supply are shown in the following diagrams. The digital in- and outputs for control are wired in negative signal logic (NPN).

NOTE One model of the servo amplifier series MR-J3-A and MR-J3-B is only shown in the wiring examples. Please refer to the respective user manual for the wiring of other servo amplifier models.

4.9.1 Wiring of the servo amplifier MR-J3-A

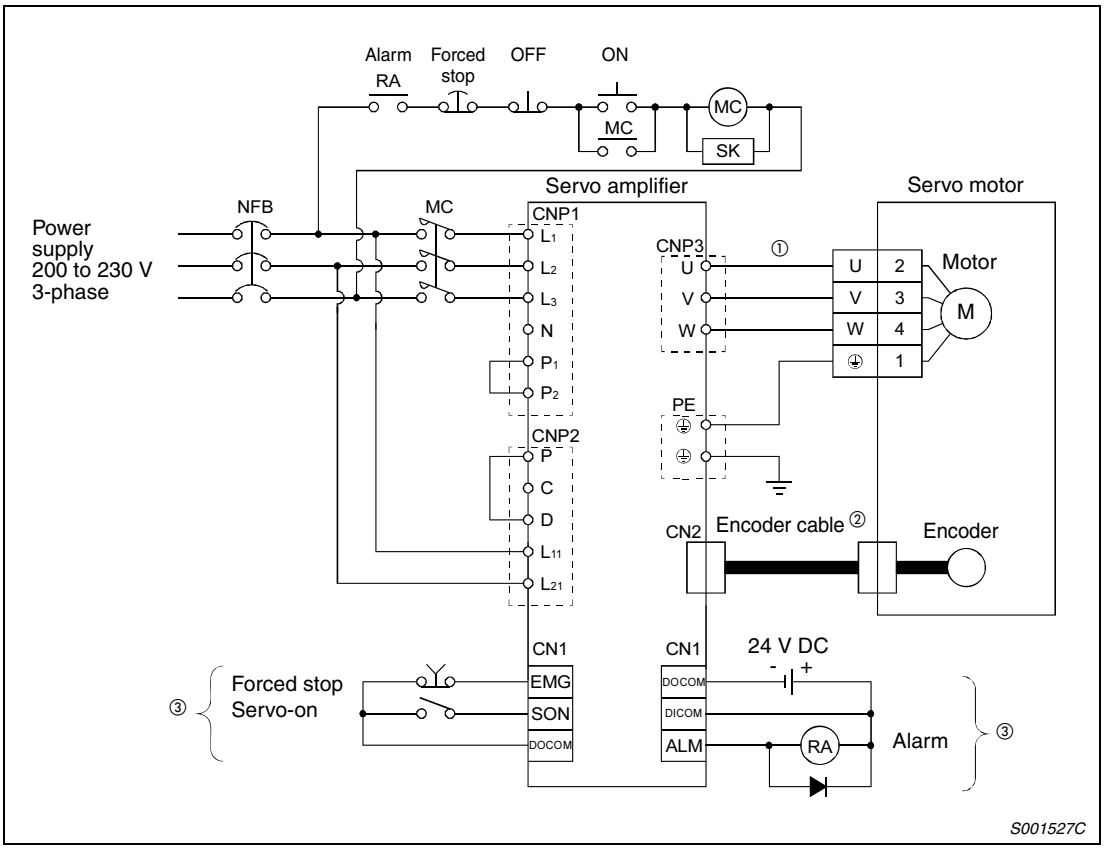


Fig. 4-17: *Wiring of servo amplifier MR-J3-10A to MR-J3-70A*

① Use the recommended motor cable.

② Use the recommended encoder cable.

③ The logic of the I/O interface is negative (sink type).

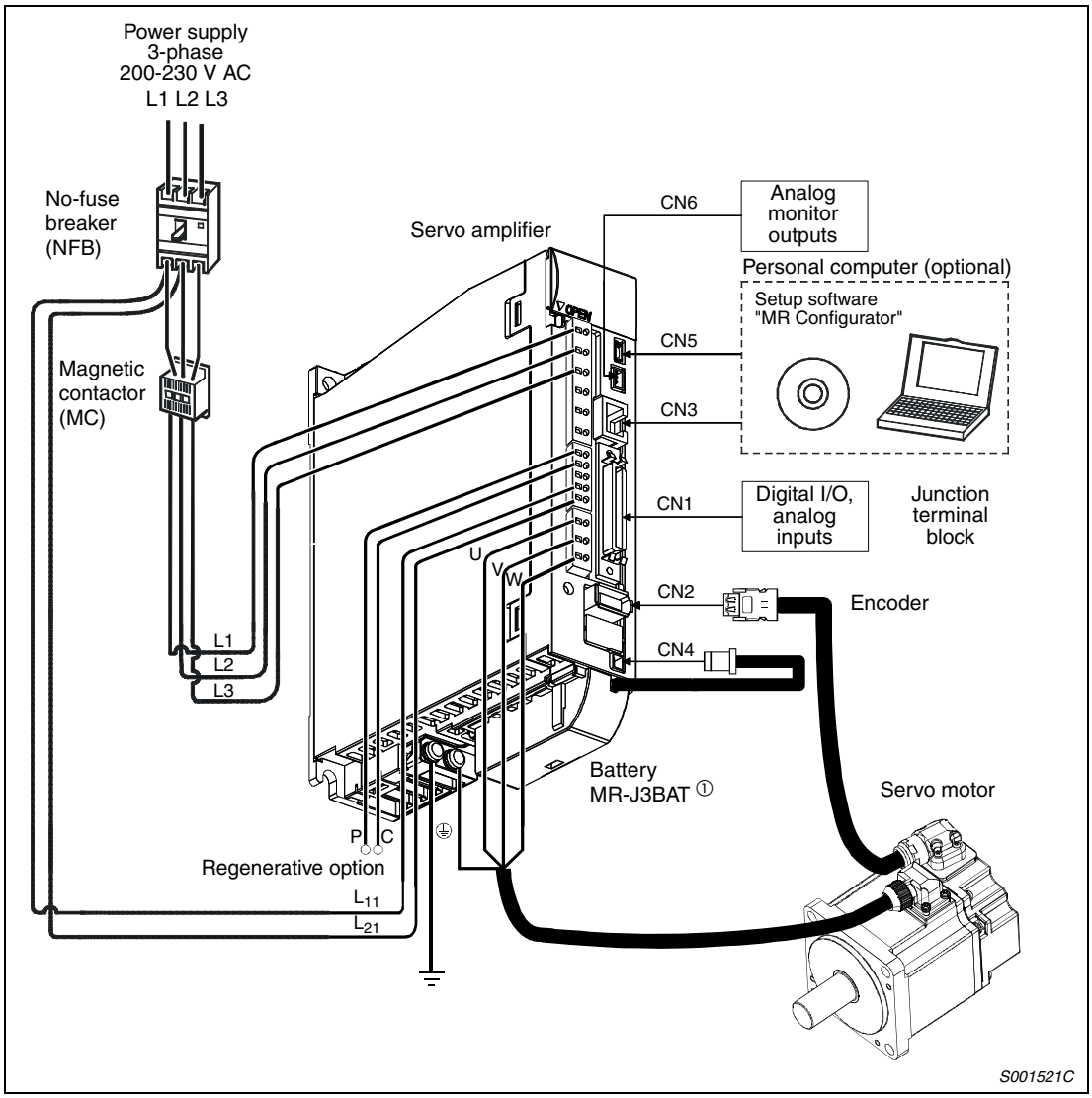


Fig. 4-18: *System configuration for MR-J3-100A or less*

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

4.9.2 Wiring of the servo amplifier MR-J3-B

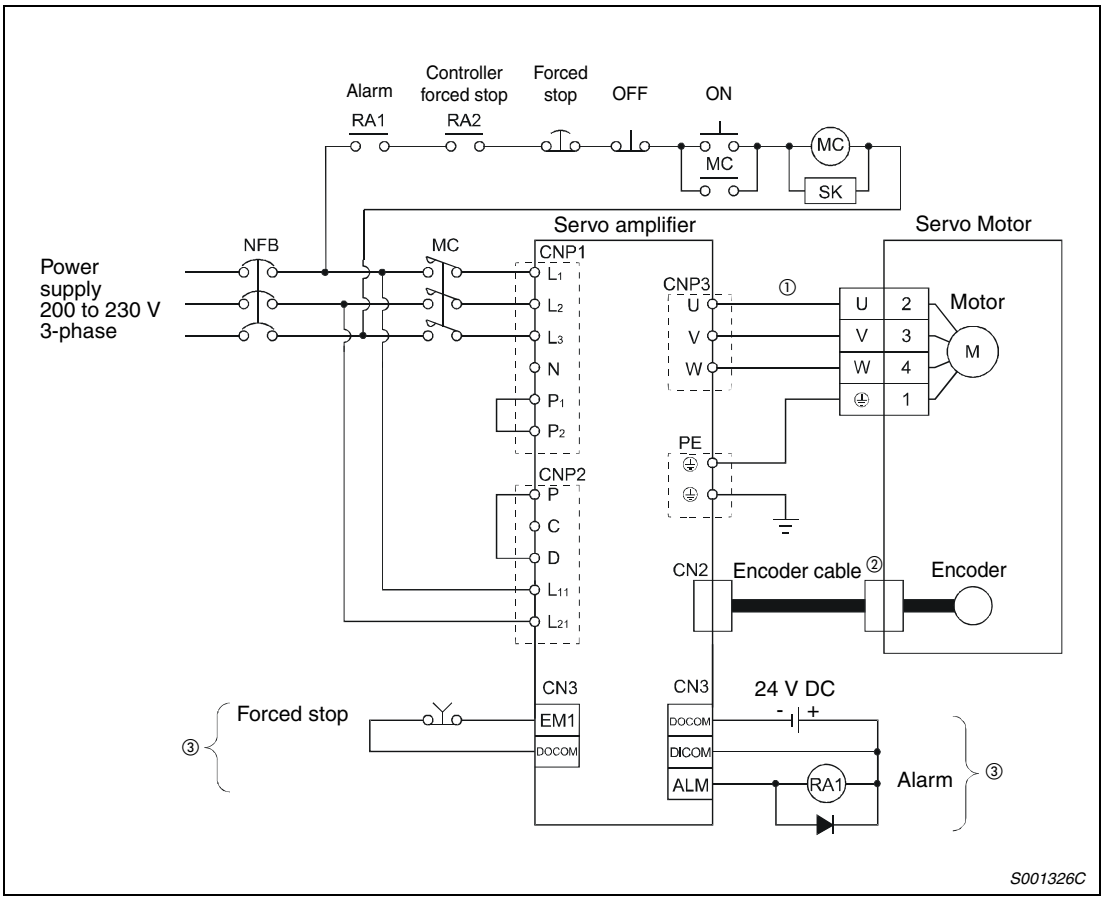


Fig. 4-19: *Wiring of servo amplifier MR-J3-10B to MR-J3-70B*

① Use the recommended motor cable.

② Use the recommended encoder cable.

③ The logic of the I/O interface is negative (sink type).

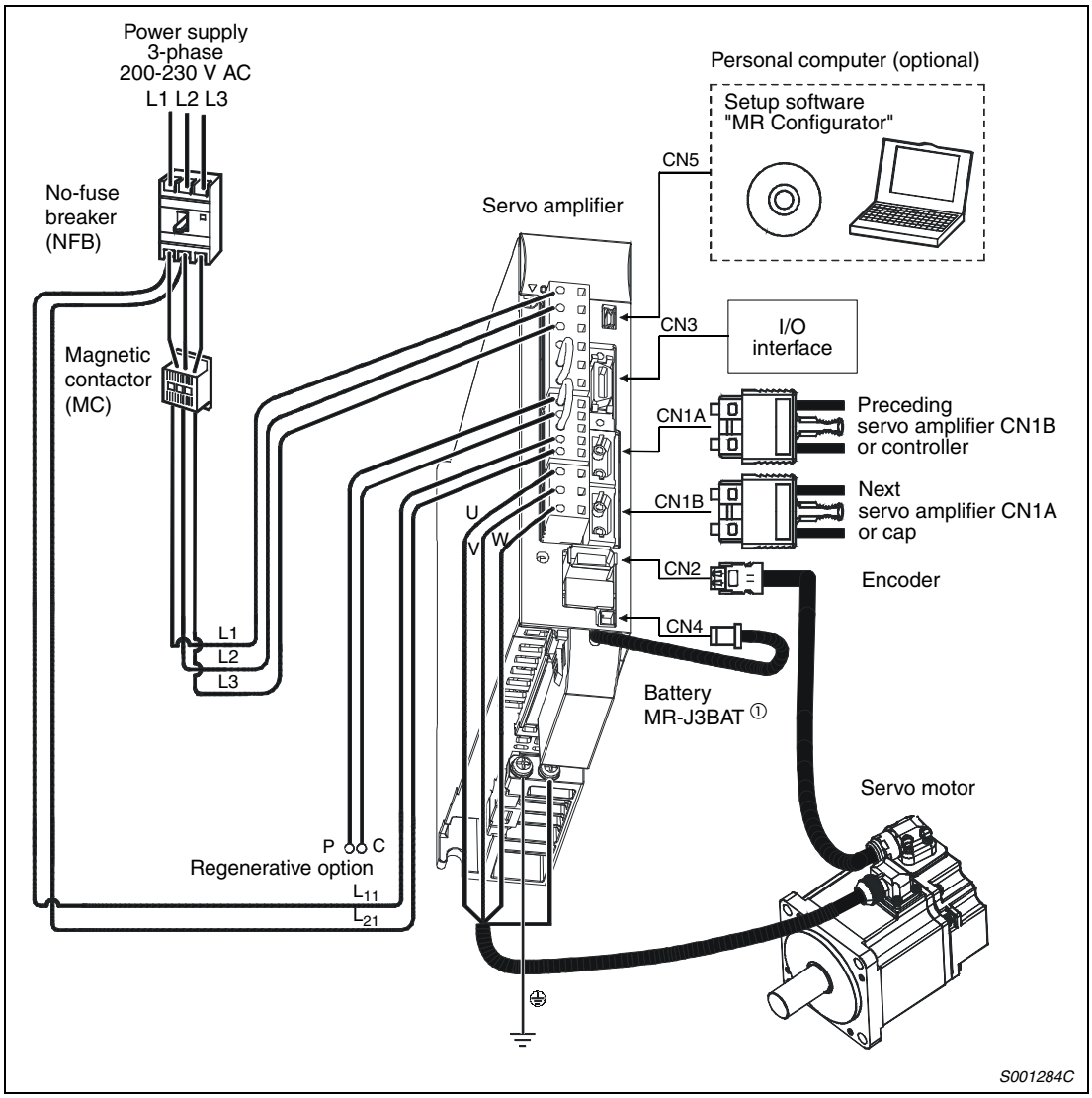


Fig. 4-20: *System configuration for MR-J3-100B or less*

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

4.10 EM-Compatible Installation

Fast switching of electrical currents and voltages, which naturally also occurs when servo amplifiers are used, generates radio frequency interference (RF noise) that can be propagated both along cables and through the air. The power and signal cables of the servo amplifier can act as noise transmission antennas. Because of this the cabling work needs to be performed with the utmost care. The cables connecting the servo amplifier and the motor are a particularly powerful source of potential interference.

In the European Union several EMC (electromagnetic compatibility) directives have been passed with regulations for the limitation of interference generated by variable-speed drive systems. To conform to these regulations you must observe some basic guidelines when you are planning, installing and wiring your systems:

- To reduce noise radiation install the equipment in a closed and properly earthed switchgear cabinet made of metal.
- Ensure that everything is properly earthed.
- Use shielded cables.
- Install sensitive equipment as far away as possible from interference sources or install the interference sources in a separate switchgear cabinet.
- Keep signal and power cables separate. Avoid routing interference-suppressed cables (e.g. power supply cables) and interference-prone cables (e.g. shielded motor cables) together for more than short distances.

4.10.1 EM-compatible switchgear cabinet installation

The design of the switchgear cabinet is critical for compliance with the EMC directives. Please follow the following guidelines:

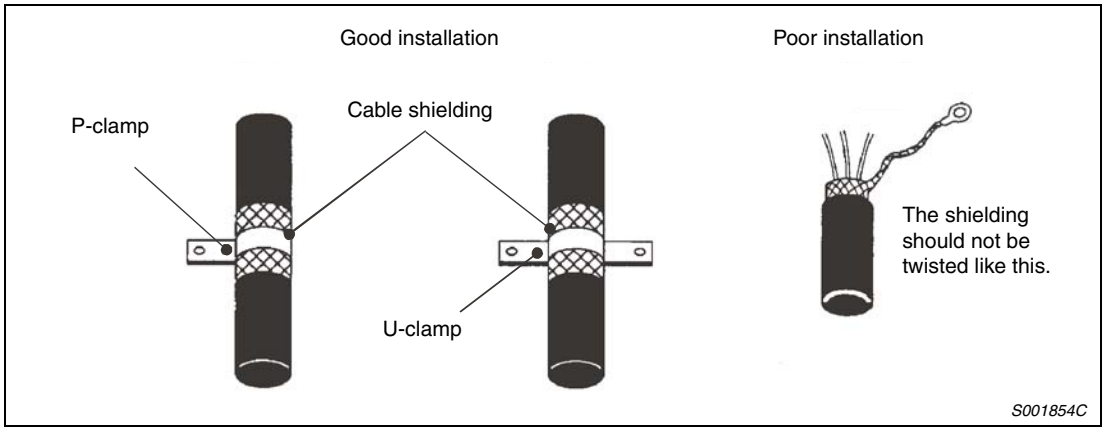
- Use an earthed cabinet made of metal.
- Use conductive seals between the cabinet door and chassis and connect the door and the chassis with a thick, braided earth cable.
- If an EMC filter is installed make sure that it has a good electrically conductive connection to the installation panel (remove paint etc).Ensure that the base on which the equipment is installed is also properly connected to the switchgear cabinet earth.
- All cabinet plates should be welded or screwed together not more than 10 cm apart to limit transparency to RF noise. The diameters of any openings and cable glands in the cabinet should not exceed 10 cm and there should not be any unearthed components anywhere in the cabinet. If larger openings are required they must be covered with wire mesh. Always remove paint etc. between all metal-on-metal contacts to ensure good conductivity – for example between the wire mesh covers and the cabinet.
- If servo amplifiers and controllers must be installed in the same cabinet they should be kept as far away from one another as possible. It is better to use separate cabinets if possible. If you must install everything in a single cabinet you can separate the servo amplifiers and controllers with a metal panel.
- Earth the installed equipment with short, thick earth conductors or suitable earthing strips. Earthing strips with a large surface area are better for earthing RFI signals than equipotential bonding conductors with large cross-sections.

4.10.2 Wiring

All analog and digital signal cables should be shielded or routed in metal cable conduits.

At the entrance point to the chassis run the cable through a metal cable gland or fasten it with a P or U type cable clamp, connecting the shielding to the earth either with the gland or the clamp (see illustration below). If you use a cable clamp install it as near as possible to the cable entry point to keep the distance to the earthing point as short as possible. To keep the unshielded portion of the cable (RFI transmission antenna!) as short as possible ensure that the end of the motor cable shielding is as close as possible to the connection terminal without causing a risk of earth faults or short circuits.

When using a P or U clamp make sure that the clamp is installed cleanly and that it does not pinch the cable more than necessary.



Route control signal cables at least 30 cm away from all power cables. Do not route the power supply cables or the cables connecting the servo amplifier and the motor in parallel to control signal cables, telephone cables or data cables.

If possible, all control signal cables to and from the servo amplifier should only be routed inside the earthed switchgear cabinet. If routing control signal cables outside the cabinet is not possible always use shielded cables, as signal cables can also function as antennas. The shielding of the cables must always be earthed. To prevent corruption of sensitive analog signals (e.g. the 0–5 V analog frequency setting signal) by currents circulating in the earthing system it may be necessary to earth only one end of the cable shielding. In such cases always earth the shielding at the servo amplifier end of the cable.

Installation of standard ferrite cores on the signal cables can further improve RFI suppression. The cable should be wound around the core several times and the core should be installed as close to the servo amplifier as possible.

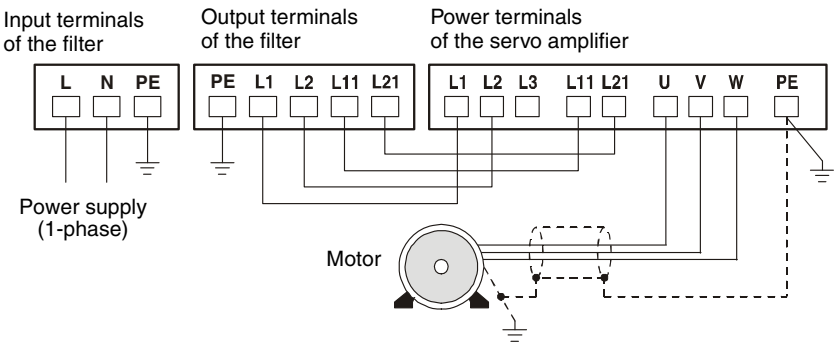
Motor connection cables should always be as short as possible. Long cables can sometimes trigger earth fault protection mechanisms. Avoid unnecessarily long cables and always use the shortest possible route for the cables.

It should go without saying that the motor itself should also be properly earthed.

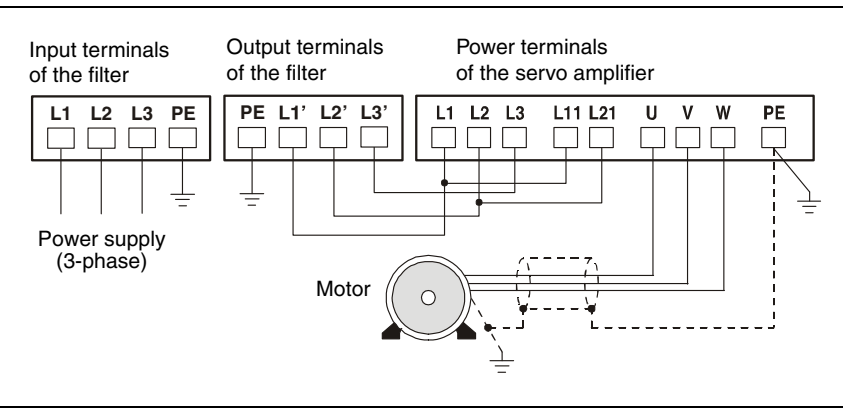
4.10.3 Optional EMC filters

EMC filters (mains RFI suppression filters) significantly reduce interference. They are installed between the mains power supply and the servo amplifier.

Wiring 1-phase



Wiring 3-phase



WARNING:

These filters are NOT designed for use in power networks (IT type). When the noise filters are operated leakage currents are discharged to earth. This can trigger upstream protective devices (as RCDs), particularly when there are unbalanced mains voltages, mains phase failures or switching activities on the input side of the filter.
For further information please refer to the Mitsubishi manual for servo amplifiers and the EMC Installation Guidelines which contain detailed information about EM-compatible installation.

5 Startup

5.1 Preparations

Before switching on the inverter for the first time

Check all the following points carefully before switching on a servo amplifier for the first time:

- Has all the wiring been performed correctly? Check the power supply connections particularly carefully: Single-phase to L1 and L2, 3-phase to L1, L2 and L3.
- Double-check for damaged cables and insufficiently insulated terminals to eliminate any possibility of short circuits.
- Is the servo amplifier properly earthed? Double-check for possible earth faults and short circuits in the output circuit.
- Check that all screws, connection terminals and other cable connections are connected correctly and firmly.

Cable routing

- The wiring cables are free from excessive force.
- The encoder cable should not be used in excess of its flex life.
- The connector part of the servo motor should not be strained.

Environment

Check the following point before initial startup:

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

Parameters

Check the setting of parameters by the display of the controller or setup software.

WARNING:

Incorrect parameter settings can damage or (in extreme cases) even destroy the connected motor. Take great care when you are setting the parameters and double-check the electrical and mechanical specifications of the motor, your entire drive system and the connected machine before proceeding.

5.2 Startup of servo amplifier series MR-J3-A

5.2.1 Power on and off the servo amplifier

The following procedure decribes how to power on and off the servo amplifier for position control.

Always follow this procedure at power-on.

Power-on

① SON (Servo-on): OFF

② PP, NP: OFF
No pulse train signal for forward rotation

③ PG, NG: OFF
No pulse train signal for reverse rotation

④ Switch on the main circuit power supply and control circuit power supply.
At power-on, "88888" appears instantaneously, but it is not an error. When main circuit power/ control circuit power is switched on, the display shows "C (Cumulative feedback pulses)", and shows data two second later.

Cumulative feedback pulses (C)

Power-off

① Switch off pulse train signal for forward rotation (PP, NP)

② Switch off pulse train signal for reverse rotation (PG, NG)

③ Switch off SON (Servo-on)

④ Switch off the main circuit (L1, L2, (L3)) power supply and control circuit (L11, L21) power supply.

NOTES

The power on and off procedure for the operating modes speed control and torque control are not described here. For details about this please refer to the respective instruction manuals of the servo amplifier series.

In the absolute position detection system, first power-on causes erase of absolute position data (alarm AL.25) and the servo system cannot be switched on. The alarm can be deactivated when 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 3000 1/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.

5.2.2 Stop of operation

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

Event	Position control
Servo-on (SON signal) OFF	The main circuit is shut off and the servo motor coasts.
Alarm occurence	When an alarm occurs, the main circuit is shut off and the dynamic brake is operated to bring the servo motor to a sudden stop.
Forced stop (EMG signal OFF)	The main circuit is shut off and the dynamic brake is operated to bring the servo motor to a sudden stop. Alarm AL.E6 occurs.
Forward rotation stroke end (LSP), reverse rotation stroke end (LSN) OFF	The droop pulse value is erased and the servo motor is stopped and servo-locked. It can be run in the opposite direction.

Tab. 5-1: *Stop of operation by the servo amplifier*

NOTE

Sudden stop of the servo motor means stopping the servo motor with a deceleration time of 0 ms.

5.2.3 Test operation

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

Test operation of servo motor alone in JOG operation of test operation mode	In this step, confirm that the servo amplifier and servo motor operate normally. With the servo motor disconnected from the machine, use the test operation mode and check whether the servo motor correctly rotates at the slowest speed.
Test operation of servo motor alone by commands	In this step, confirm that the servo motor correctly rotates at the slowest speed under the commands from the command device. Make sure that the servo motor rotates in the following procedure. • Switch on the Forced stop (EMG) and Servo-on (SON). When the servo amplifier is put in a servo-on status, the Ready (RD) switches on. • Switch on the Forward rotation stroke end (LSP) or Reverse rotation stroke end (LSN). • When a pulse train is input from the command device, the servo motor starts rotating. Give a low speed command at first and check the rotation direction, etc. of the servo motor. If the servo motor does not operate in the intended direction, check the input signal.
Test operation with servo motor and machine connected	In this step, connect the servo motor with the machine and confirm that the machine operates normally under the commands from the command device. Make sure that the servo motor rotates in the following procedure. • Switch on the Forced stop (EMG) and Servo-on (SON). When the servo amplifier is put in a servo-on status, the Ready (RD) switches on. • Switch on the Forward rotation stroke end (LSP) or Reverse rotation stroke end (LSN). • Give a low speed command at first. • When a pulse train is input from the command device, the servo motor starts rotating. Check the operation direction, etc. of the machine. If the machine does not operate in the intended direction, check the input signal. • In the status display, check for any problems of the servo motor speed, command pulse frequency, load ratio, etc. • Then, check automatic operation with the program of the command device.

Tab. 5-2: *Test operation of the servo amplifier MR-J3-A at position control*

5.2.4 Parameter setting

WARNING:

Change settings and parameters only in small steps and make afterwards at first sure whether the desired effect occurs before doing any more changes. Excessive adjustment or change of parameter setting must not be made as it will make operation instable.

In the position control mode, the servo amplifier can be used by merely changing the basic setting parameters (PA□□) mainly .
As necessary, set the gain filter parameters (PB□□), extension setting parameters (PC□□) and I/O setting parameters (PD□□).

Parameter group	Description
Basic setting parameter (No. PA□□)	Set the basic setting parameters first. Generally, operation can be performed by merely setting this parameter group. In this parameter group, set the following items. • Control mode selection (select the position control mode) • Regenerative option selection • Absolute position detection system selection • Setting of command input pulses per revolution • Electronic gear setting • Auto tuning selection and adjustment • In-position range setting • Torque limit setting • Command pulse input form selection • Servo motor rotation direction selection • Encoder output pulse setting
Gain filter parameter (No. PB□□)	If satisfactory operation cannot be achieved by the gain adjustment made by auto tuning, execute indepth gain adjustment using this parameter group. This parameter group must also be set when the gain switching function is used.
Extension setting parameter (No. PC□□)	This parameter group must be set when multiple electronic gears, analog monitor outputs or analog inputs are used.
I/O setting parameter ① (No. PD□□)	Used when changing the I/O devices of the servo amplifier.

Tab. 5-3: *Parameter groups in position control*

① The setting of parameter PA19 must be changed when this parameter group is used.

5.2.5 Start of operation

After checking the basic setting with the help of the test mode and after setting the corresponding parameters, start the operation. Execute a home position return if necessary.

NOTE If there are any problems during startup, you find instructions for troubleshooting in section 8.1.

5.3 Startup of servo amplifier series MR-J3-B

5.3.1 Power on and off the servo amplifier

Power on

When the main and control circuit power supplies are switched on, "b01" (for the first axis) appears on the servo amplifier display.

Parameter setting

Set the parameters according to the structure and specifications of the machine.

Pr. No.	Meaning	Setting	Description
PA14	Rotation direction setting	0	Increase in positioning address rotates the motor in the CCW direction
PA08	Auto tuning mode	□□□1	Activated
PA09	Auto tuning response	12	Slow response (initial value) is selected.

Tab. 5-4: *Parameter settings for startup*

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

Servo on

Switch the servo on in the following procedure:

① Switch on main circuit and control circuit power supply.

② The controller transmits the servo-on command.

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

Home position return

Always perform home position return before starting positioning operation.

NOTES

In the absolute position detection system, first power-on causes erase of absolute position data (alarm 25) and the servo system cannot be switched on. This alarm is caused by the uncharged capacity of the encoder and is not an error. The alarm can be deactivated by keeping the servo amplifier switched on for several minutes during the alarm and then switching power off once and on again.

In the absolute position detection system, if power is switched on at the servo motor speed of 3000 1/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.

5.3.2 Stop of operation

If any of the following situations occurs, the servo amplifier suspends the rotation of the servo motor and brings it to a stop.

Triggered by	Condition	Stopping condition
Servo system controller (motion CPU)	Servo off command	The main circuit is shut off and the servo motor coasts.
	Forced stop command	The main circuit is shut off and the dynamic brake operates to bring the servo motor to stop. The controller forced stop warning (E7) occurs.
Servo amplifier	Alarm occurrence	The main circuit is shut off and the dynamic brake operates to bring the servo motor to stop.
	Forced stop (EM1) OFF	The main circuit is shut off and the dynamic brake operates to bring the servo motor to stop. The servo forced stop warning (E6) occurs.

Tab. 5-5: *Stop of operation by motion CPU or servo amplifier*

5.3.3 Test operation

Before starting normal operation, perform test operation to make sure that the machine operates normally.
Refer to section 5.3.1 for the power on and off methods of the servo amplifier.

NOTE If necessary, verify controller program by using motor-lessmotor-less operation.

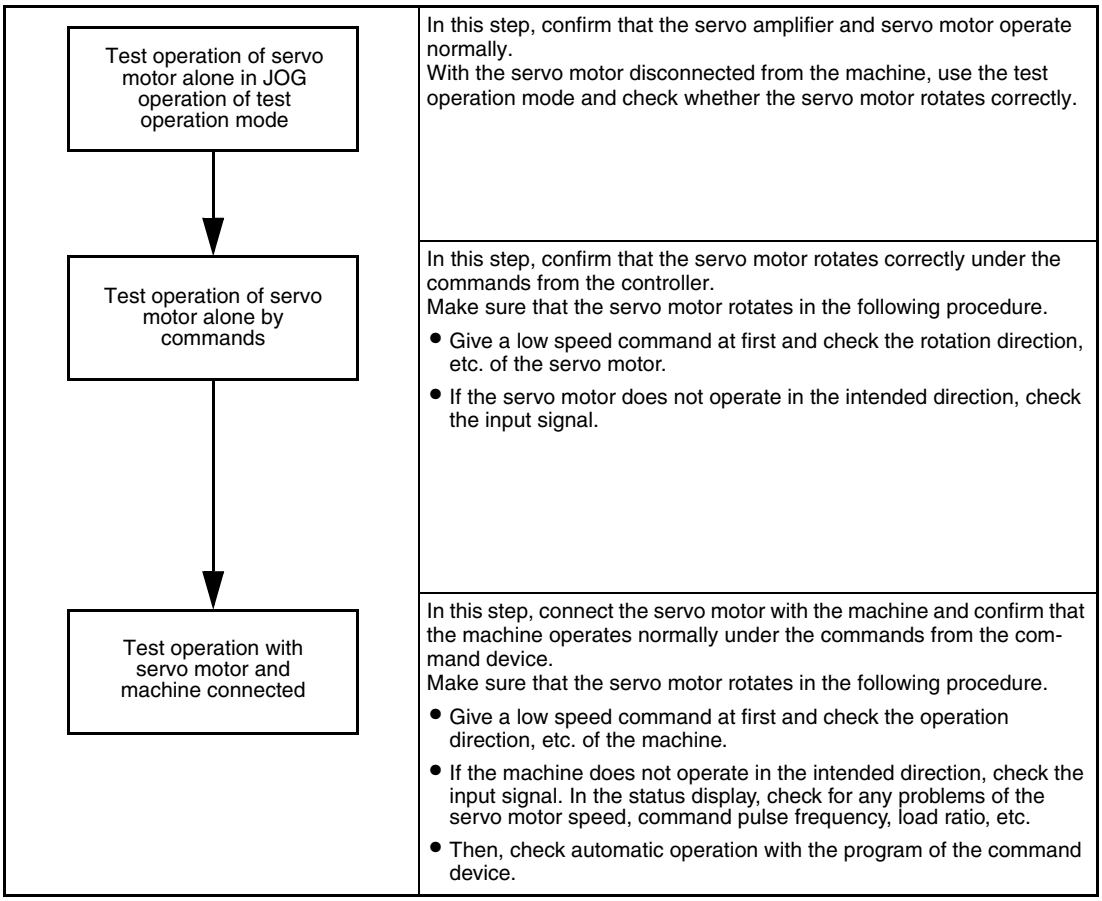


Fig. 5-1: *Test operation of servo amplifier MR-J3-B*

6 Operation and Settings

6.1 Display and operation section of MR-J3-A series

The MR-J3-A servo amplifier has a display section (5-digit, 7-segment LED) to display servo amplifier status, alarms, parameter settings, etc. and an operation section (4 pushbuttons). Display mode and function can be changed with four pushbuttons MODE, UP, DOWN and SET.

6.1.1 Overview

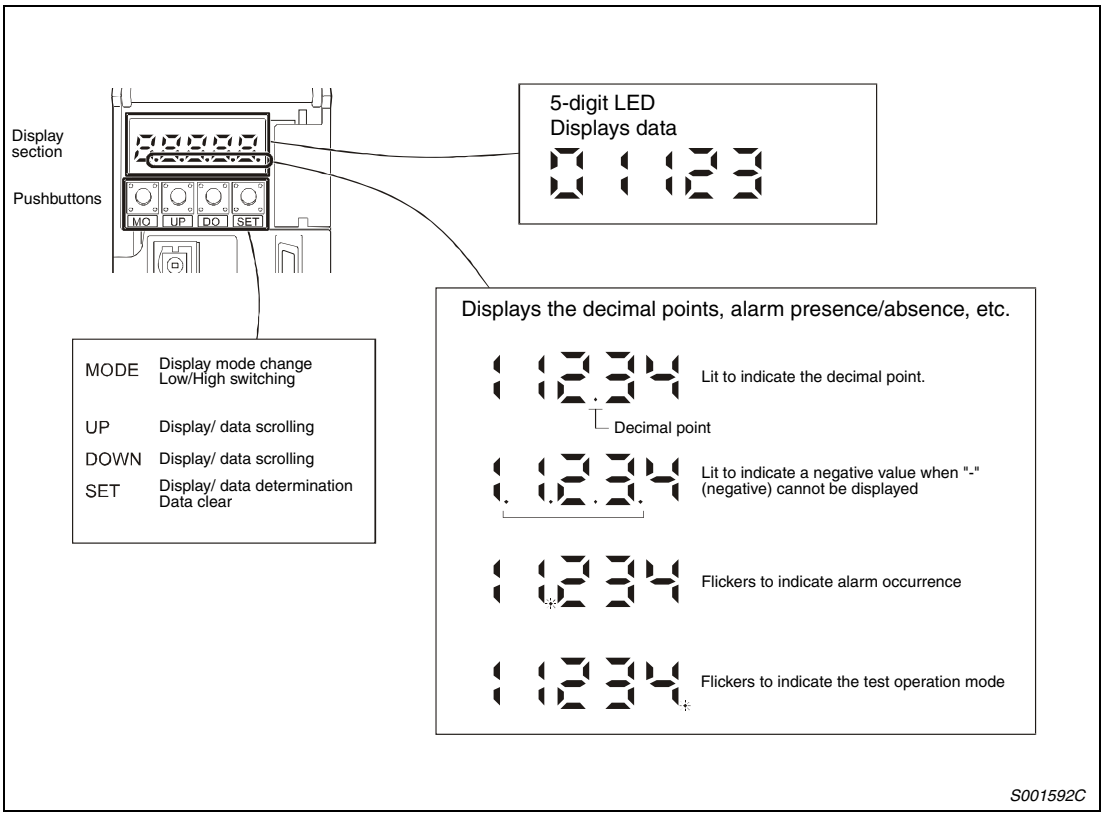
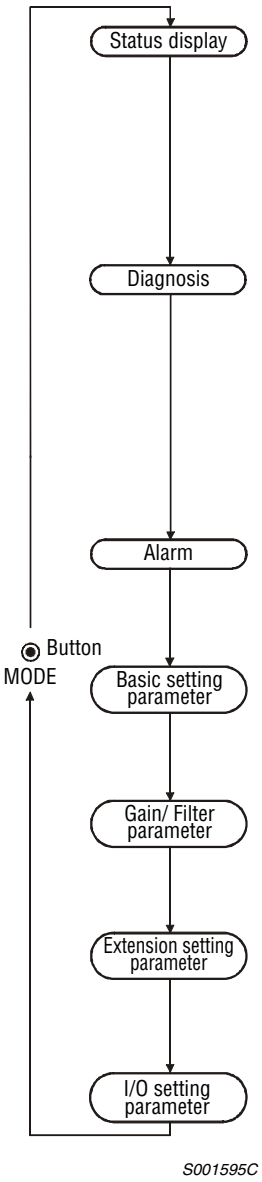
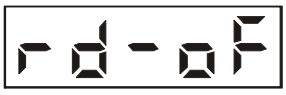


Fig. 6-1: *Display and pushbuttons of MR-J3-A*

6.1.2 Display sequence of MODE button

Press the "MODE" button once to shift to the next display mode. Refer to the following sections for the description of the corresponding display mode.

To refer to or set the gain filter parameters (PB□□), extension setting parameters (PC□□) and I/O setting parameters (PD□□), make them valid with parameter No. PA19 (parameter write disable).

Display mode transition	Initial screen	Function	Reference
		Servo status display  appears at power-on①.	Section 6.1.3
		Sequence display of: • external signal • output signal (DO) • forced output • test operation • software version • VC automatic offset • motor series and type ID • motor encoder ID • parameter write inhibit	Servo amplifier manual
		Display of: • current alarm • alarm history • parameter error No. • point table error No.	Servo amplifier manual
		Display and setting of basic setting parameters.	Section 6.1.7
		Display and setting of gain filter parameters.	
		Display and setting of extension setting parameters.	
		Display and setting of I/O setting parameters.	

Tab. 6-1: *Display sequence via activation of the MODE button*

① When the axis name is set to the servo amplifier using MR Configurator, the axis name is displayed and the servo status is then displayed.

6.1.3 Status display

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

Display transition

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

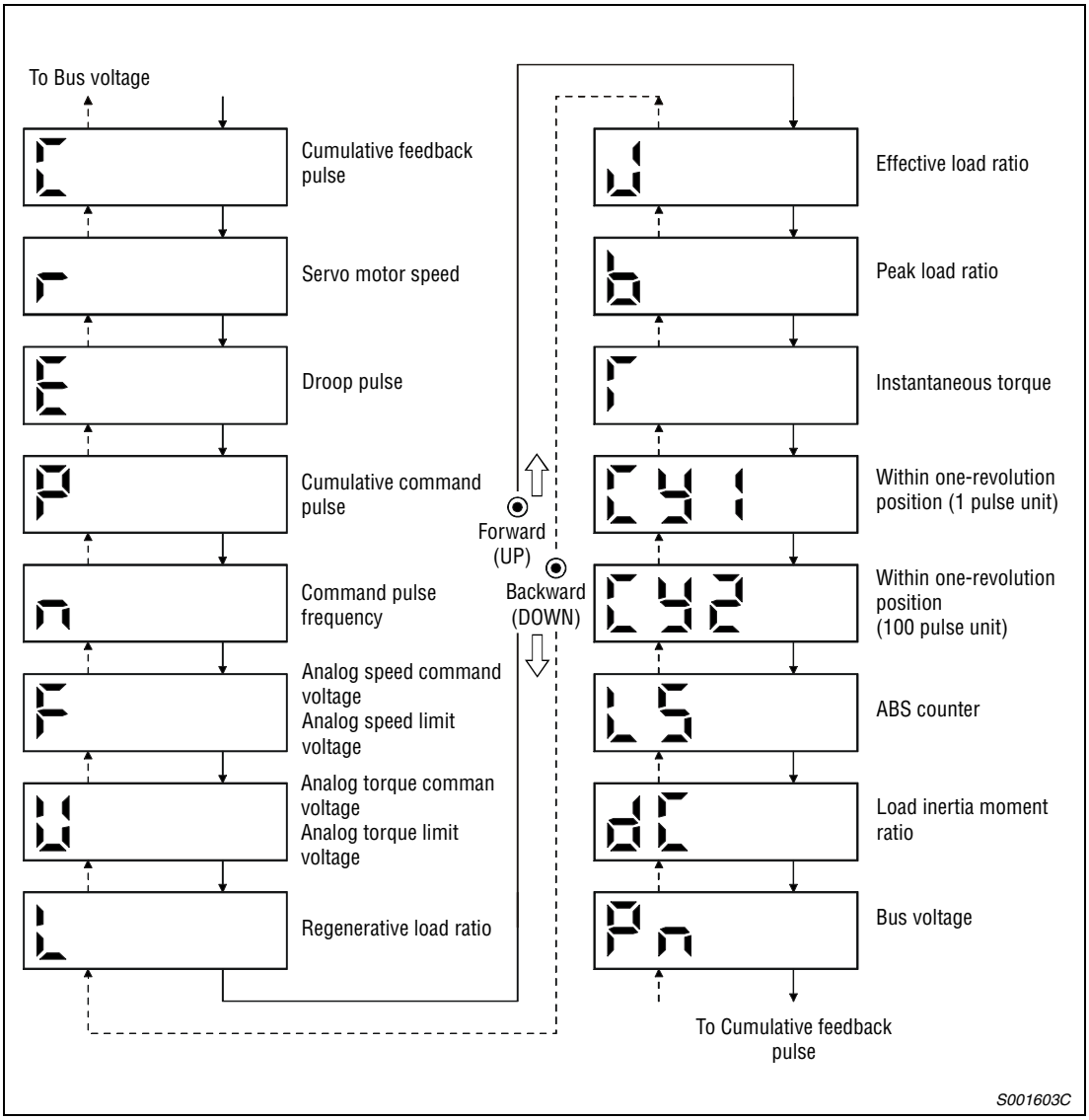


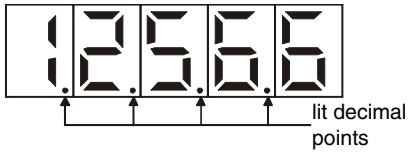
Fig. 6-2: *Display transition of status display*

NOTE The status display item of the servo amplifier display shown at power-on can be changed by changing the parameter PC36. The symbol is displayed for two seconds at power on and then appears the value.

Control mode	Status display at power-on
Position	Cumulative feedback pulses
Position/speed	Cumulative feedback pulses/servo motor speed
Speed	Servo motor speed
Speed/torque	Servo motor speed/analog torque command voltage
Torque	Analog torque command voltage
Torque/position	Analog torque command voltage/cumulative feedback pulses

Tab. 6-2: *Display of initial status*

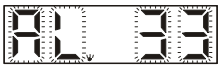
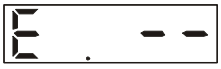
6.1.4 Display examples of status display

Item	Status	Display
Servo motor speed	Forward rotation at 2500 min^{-1}	 S001604C
	Reverse rotation at 3000 min^{-1} The reverse rotation is marked with a minus sign.	 S001605C
Load inertia moment	15.5 times	 S001606C
ABScounter	11252 revolutions	 S001607C
	−12566 revolutions A negative value is indicated by lit decimal points.	 S001608C

Tab. 6-3: *Display examples*

6.1.5 Alarm mode

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

Name	Display	Description
Current alarm	 S001625C	Indicates no occurrence of an alarm.
	 S001626C	Indicates the occurrence of overvoltage (AL.33). Flickers at occurrence of the alarm.
Alarm history	 S001627C	Indicates that the last alarm is overload 1 (AL.50).
	 S001628C	Indicates that the second alarm in the past is overvoltage (AL.33).
	 S001629C	Indicates that the third alarm in the past is undervoltage (AL.10).
	 S001630C	Indicates that the fourth alarm in the past is overspeed (AL.31).
	 S001631C	Indicates that there is no fifth alarm in the past.
	 S001632C	Indicates that there is no sixth alarm in the past.
Parameter error No.	 S001633C	Indicates no occurrence of parameter error (AL.37).
	 S001634C	Indicates that the data of parameter No. PA12 is faulty.

Tab. 6-4: *Alarm examples*

NOTES

Any mode screen displays the current alarm.

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.

For any alarm, remove its cause and clear it in any of the following methods:
- Switch power OFF then ON.
- Press the "SET" button during the current alarm screen.
- Turn on the alarm reset (RES-Signal).

Use parameter PC18 to clear the alarm history.

6.1.6 Test operation

WARNING:

- ***The test operation mode is designed to confirm servo motor operation. Do not use it for actual operation.***
- ***If any operational fault has occurred, stop operation using the external emergency stop (EMG) signal.***

NOTE The test operation mode cannot be used in the absolute position detection system.
Test operation cannot be performed if the servo-on (SON) is not turned OFF.

- JOG operation

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

Proceed as follows (see fig. 6-3):

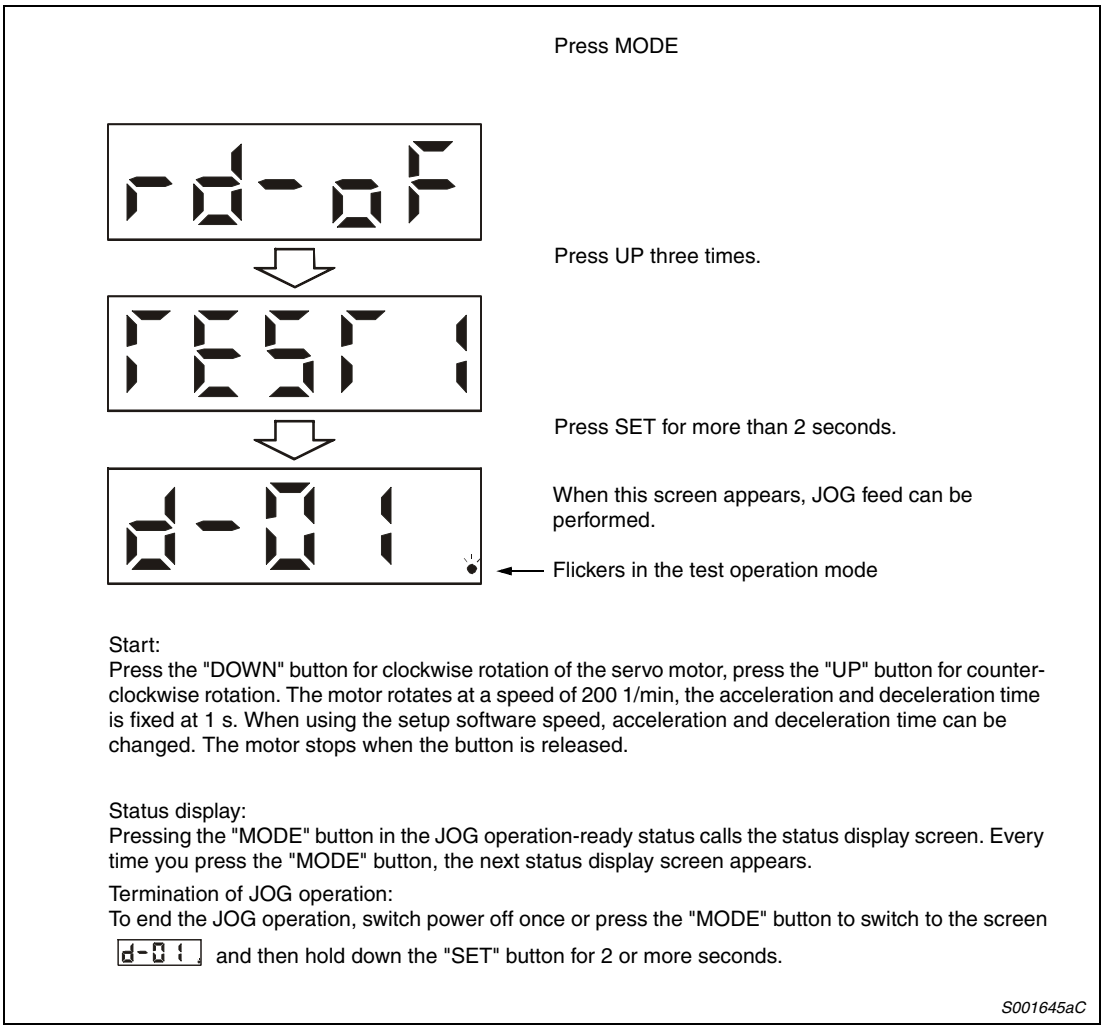


Fig. 6-3: *JOG operation*

NOTE When performing JOG operation, turn ON EMG, LSP and LSN. LSP and LSN can be set to automatic ON by setting parameter PD01 to "□C□□".

- Positioning operation

NOTE

MR Configurator is required to perform positioning operation.
Turn ON EMG when performing positioning operation.

With no command given from the external command device, positioning operation can be executed once.

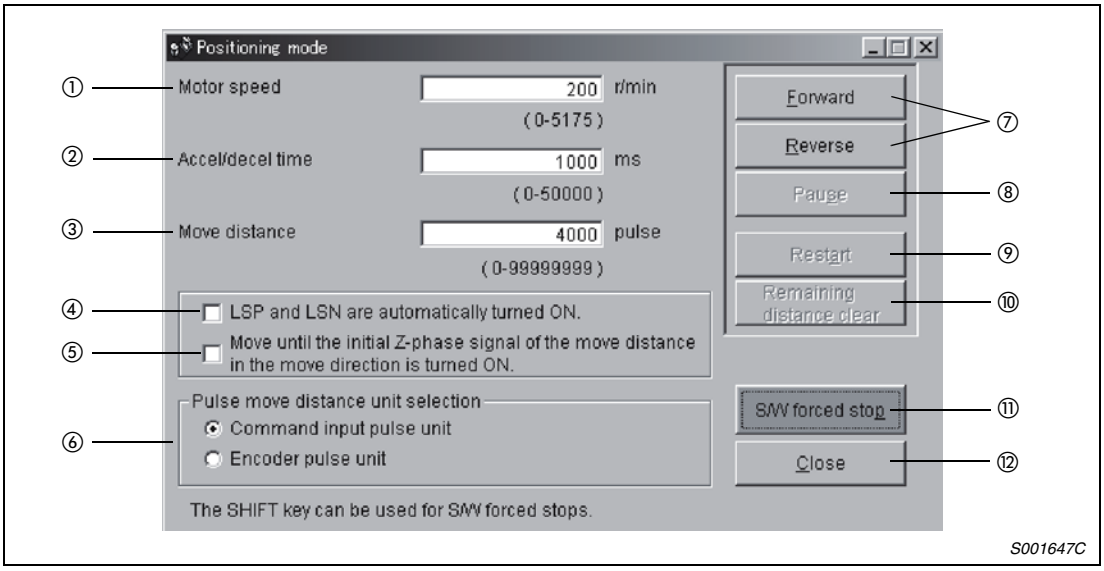


Fig. 6-4: *Setting menu of setup software for positioning*

① Speed [1/min]
Enter the motor speed here.

② Acceleration and deceleration time [ms]
Enter the time constant for acceleration and deceleration here.

③ Move distance [pulse]
Enter the move distance here.

④ LSP/LSN automatically turned ON
When setting the external stroke signal to automatic ON, click the check box to make it valid. When it is not checked, turn ON LSN/LSP externally.

⑤ Move till a first Z-phase signal turned ON in the moving direction
Movement is made until the moving distance is reached and the first Z-phase signal in the moving direction turns ON.

⑥ Pulse move distance unit selection/Command input pulse unit/Encoder pulse unit
Select with the option buttons whether the moving distance set in ③ is in the command pulse unit or in the encoder pulse unit. When the encoder pulse unit is selected, the moving distance is regarded as the value before multiplication of the electronic gear (CMX/CDV). When the command pulse unit is selected, the moving distance is regarded as the value after multiplication of the electronic gear.

⑦ Forward/Reverse
Click the "Forward" button to rotate the servo motor in the forward rotation direction (CCW). Click the "Reverse" button to rotate the servo motor in the reverse rotation direction (CW).

⑧ Pause
Click the "Pause" button during servo motor rotation to temporarily stop the servo motor. This button is valid during servo motor rotation.

⑨ Restart
Click the "Restart" button during a temporary stop to restart the servo motor rotation. This button is valid during a temporary stop of the servo motor.

⑩ Remaining move distance clear
Click the "Remaining distance clear" button during a temporary stop to erase the remaining distance. This button is valid during a temporary stop of the servo motor.

⑪ Forced stop
Click the "S/W forced stop" button during servo motor rotation to make a hard stop. This button is valid during servo motor rotation.

⑫ Close
Click the "Close" button to cancel the positioning operation mode and close the window.

NOTE The status display can be monitored during positioning operation.

● Motor-less operation

Without connecting the servo motor, you can provide output signals or monitor the status display as if the servo motor is running in response to external input signals. This operation can be used for example to check the sequence programm of a positionining module.

For motor-less operation the signal SON has to be OFF.

Proceed as follows (see fig. 6-5):

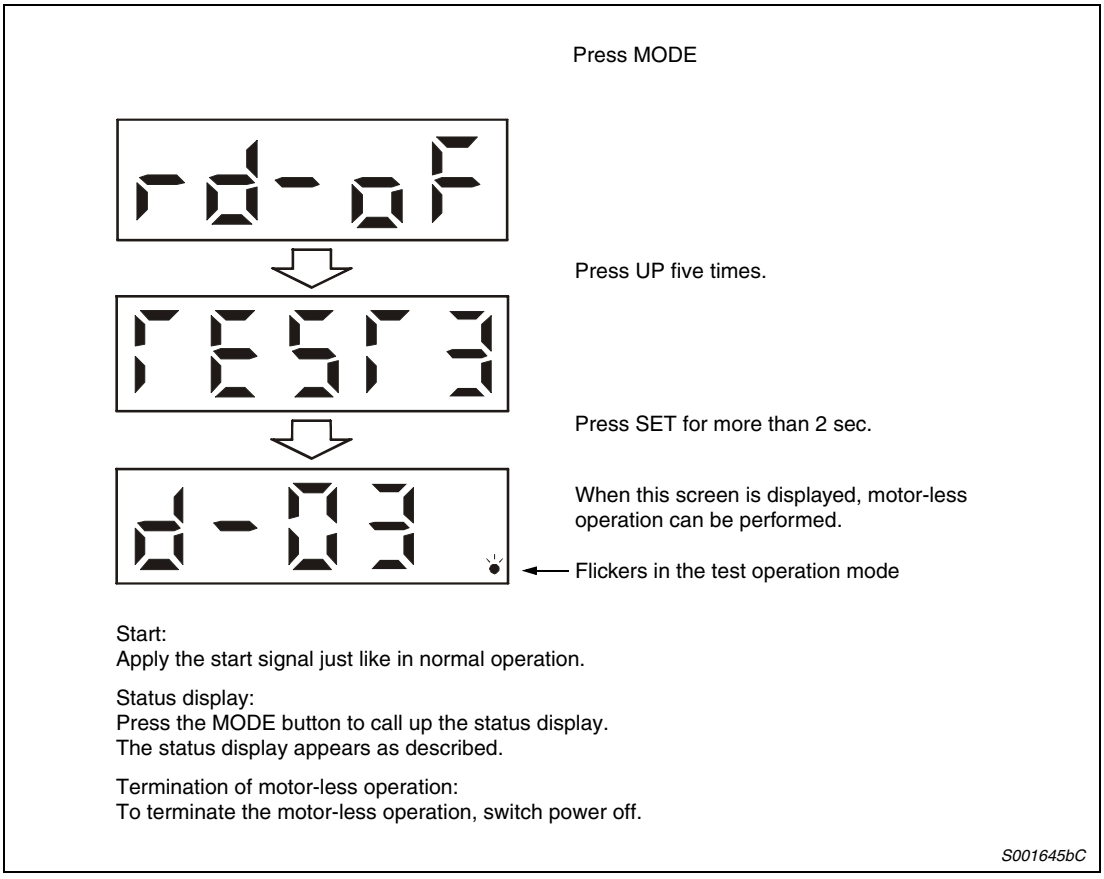


Fig. 6-5: *Motor-less operation*

6.1.7 Parameter display and setting

WARNING:

Change settings and parameters only in small steps and make afterwards at first sure whether the desired effect occurs before doing any more changes. Excessive adjustment or change of parameter setting must not be made as it will make operation instable.

NOTES

To use the I/O setting parameters, change the parameter PA19 (parameter write inhibit value).

The I/O signal settings can be changed using the I/O setting parameter PD03 to PD08, PD10 to PD18.

Parameter display

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

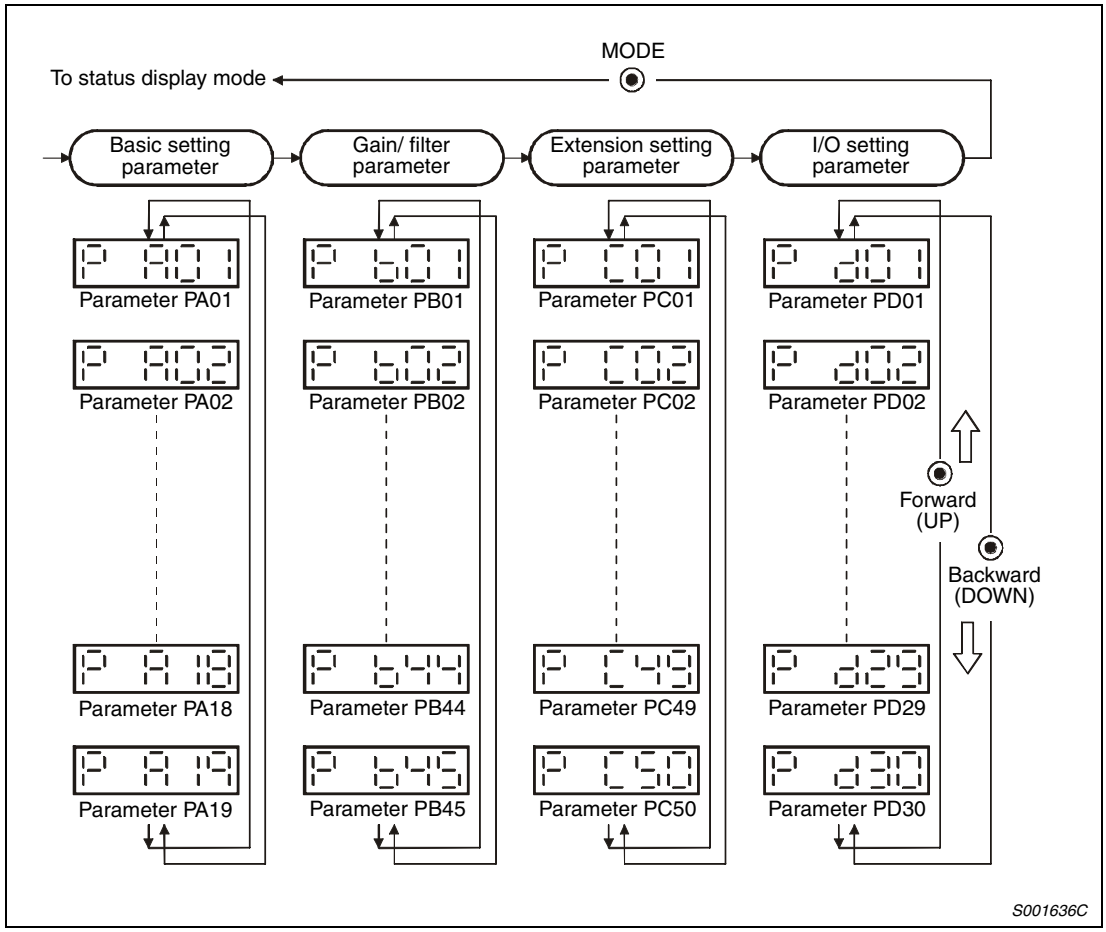


Fig. 6-6: *Parameter setting*

Operation example of a parameter with up to five digits

The following example shows the operation procedure performed after power-on to change the control mode (Parameter PA01) into the speed control mode:

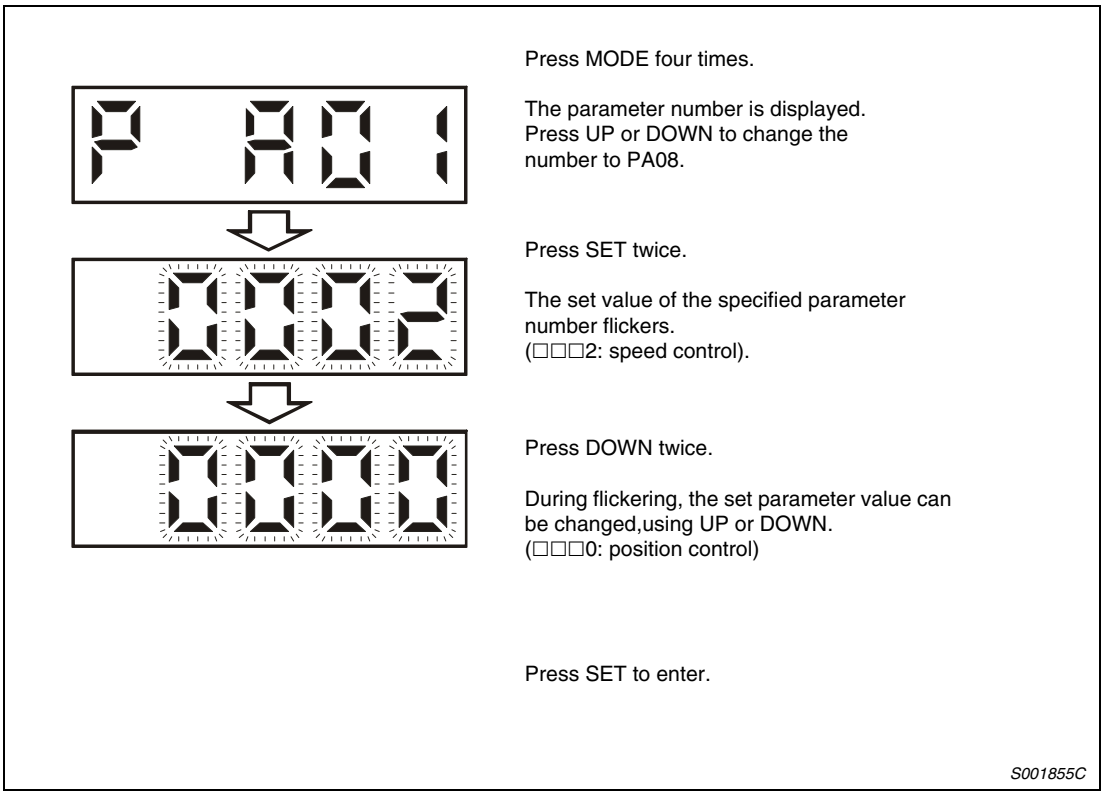


Fig. 6-7: *Setting of speed control function*

NOTES

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

When changing the parameter PA01 setting, change its set value, then switch power off once and switch it on again to make the new value valid.

6.2 Display and operation section of MR-J3-B series

The front panel of the servo amplifier MR-J3-B has a display section (3-digit, 7-segment LED) to show the servo amplifier status, station number and alarmcode. The switches SW1 and SW2 are for setting the station number and test operation.

6.2.1 Overview

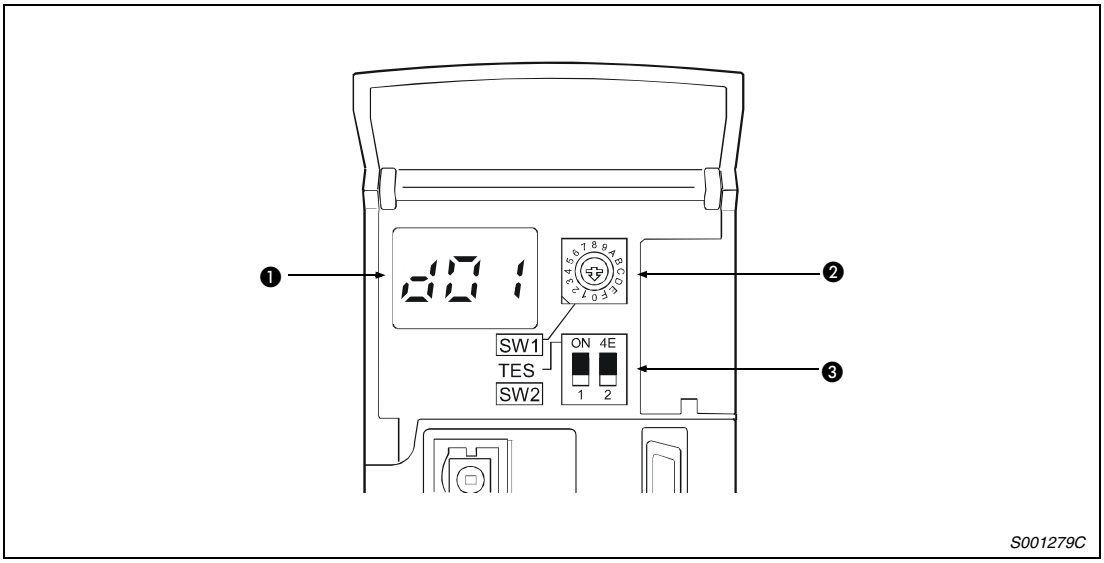
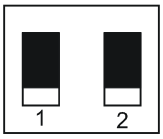
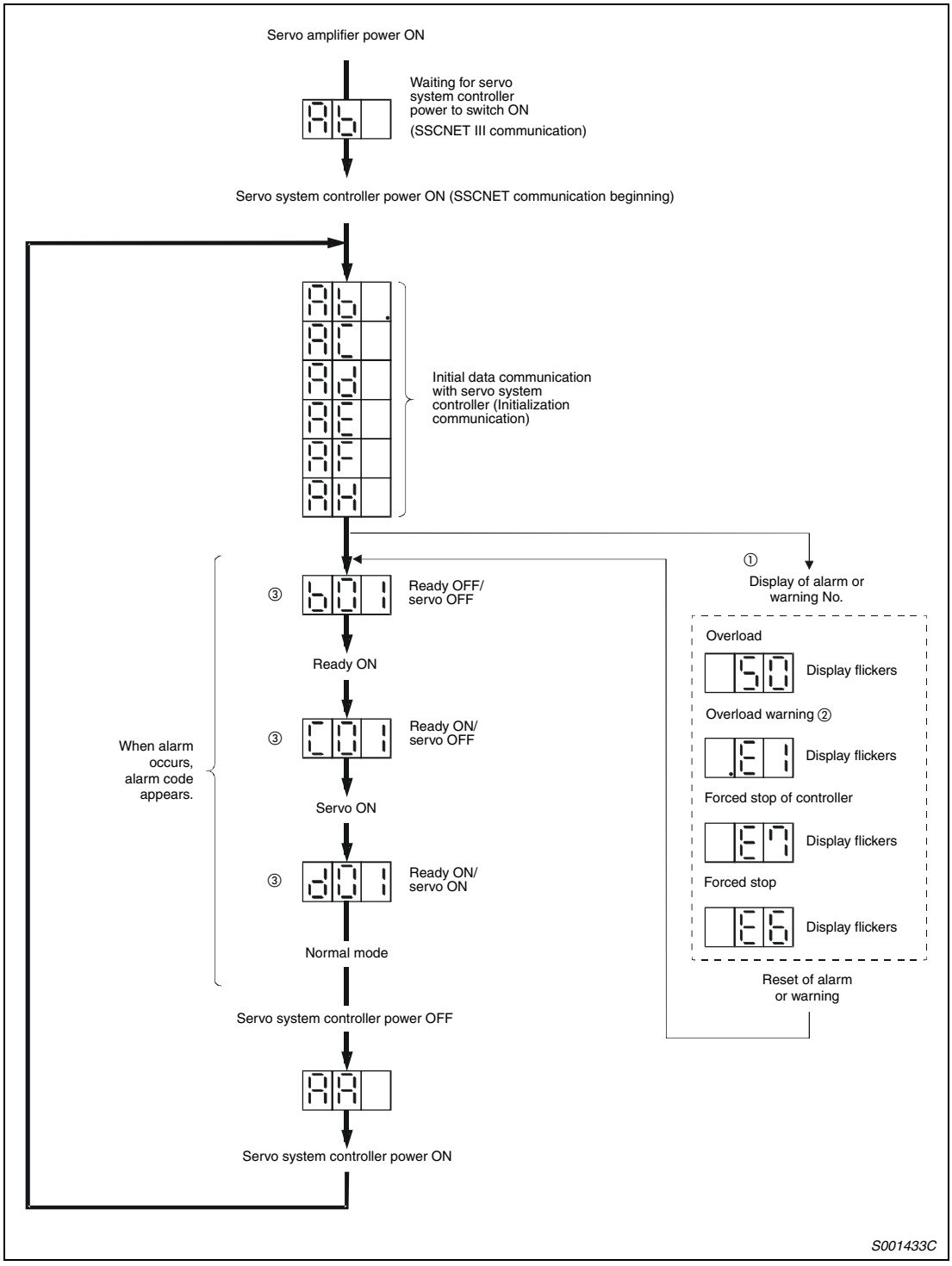


Fig. 6-8: *Display and controls of MR-J3-B*

No.	Name	Description	Reference
❶	Display section	The 3-digit, seven-segment LED shows the servo status and alarm number.	Section 6.2.2
❷	Station number (SW1) 	Rotary axis setting switch (SW1) for setting the axis No. of the servo amplifier.	Section 4.6
❸	Selection test operation (SW2) 	Test operation select switch (SW2-1) is used to perform the test operation mode by using MR Configurator SW2-2 has no function and should always be in "Down" position.	Section 6.2.3

Tab. 6-5: *Controls and function*

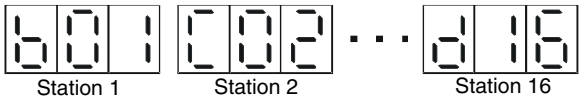
6.2.2 Display sequence



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

② If a warning other than E6 or E7 appears, the flickering of the decimal point at the second display digit shows that the status is "servo-on".

③ The right-hand segments of b01, c02 and d16 indicate the station number.



S001435C

6.2.3 Test operation

WARNING:

- ***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 occurs, use the forced stop (EM1) to make a stop.***

By using a personal computer and the MR Configurator, you can execute JOG operation, positioning operation, DO forced output program operation without connecting the servo system controller.

NOTE For full information, refer to the MR Configurator Installation Guide.

6.2.4 Procedure for test operation

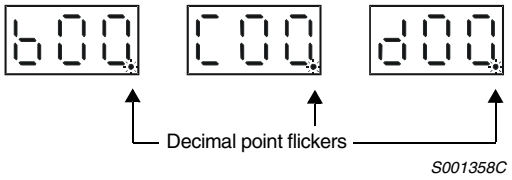
JOG operation, positioning operation, program operation, motor-less operation

① Switch power off.

② Set SW2-1 to "UP".

When SW1 is set to the axis number, SW2-1 is set to UP-position and operation is performed by the servo system controller, the test operation mode screen is displayed on the personal computer, but no function is performed.

③ Power on the servo amplifier.
When initialization is over, the display shows the following screen:



④ Perform operation with the personal computer.

● JOG operation

JOG operation can be performed without using the servo system controller. Use this operation to reset the servo motor after forced stop. 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.

Item	Initial value	Setting range
Speed [1/min]	200	0 to maximum speed
Acceleration/deceleration time constant [ms]	1000	0 to 50000

Tab. 6-6: *Settings of JOG operation*

Operation	Screen control
Start forward rotation	"Forward"
Start reverse rotation	"Reverse"
Stop	"Stop"

Tab. 6-7: *Control of JOG operation*

● Positioning operation

Positioning operation can be performed without using the servo system controller. Use this operation to reset the position after forced stop. 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.

Item	Initial value	Setting range
Distance [pulses]	4000	0 to 99999999
Speed [1/min]	200	0 to maximum speed
Acceleration/deceleration time [ms]	1000	0 to 50000

Tab. 6-8: *Settings of positioning operation*

Operation	Screen control
Start forward rotation	"Forward"
Start reverse rotation	"Reverse"
Pause	"Pause"

Tab. 6-9: *Control of positioning operation*

● Program operation

Positioning operation can be performed in two or more operation patterns combined, without using the servo system controller. 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.

Operation	Screen control
Start	"Start"
Stop	"Reset"

Tab. 6-10: *Control of program operation*

● Motor-less operation

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. Use this operation to reset after forced stop. This operation may be used to check the servo system controller sequence. Use this operation with the servo amplifier connected to the servo system controller.

For stopping the motor-less operation, set the selection of motor-less operation to [Invalid] in servo parameter setting of servo system controller. Motor-less operation will be invalid condition after switching on power supply next time.

For motor-less operation it is sufficient to apply only the control voltage supply to the terminals L11 and L21 of the servo amplifier.

For stopping the motor-less operation, set the selection of motor-less operation to [Invalid] in servo parameter setting of servo system controller. Motor-less operation will be deactivated after switching on power supply next time.

NOTE

Motor-less operation can be executed by the setup software. Set the parameter for motor-less operation in the servo system controller.

Control of motor-less operation is done by the setup software menu.

Load	Setting
Load torque	0
Load inertia moment ratio	Same as servo motor inertia moment

Tab. 6-11: *Settings for the load*

The following error and warning message cannot occur during motor-less operation:

– Encoder error 1 (16)

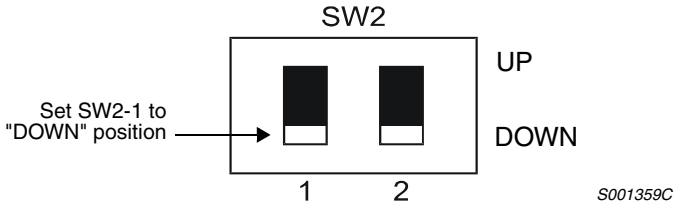
– Encoder error 2 (20)

– Absolute position erasure (25)

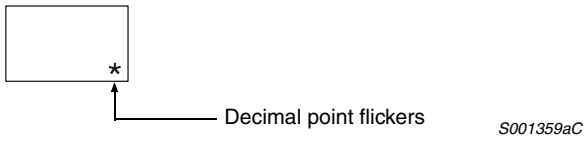
– Battery cable breakage warning (92)

The other alarms and warnings occur as when the servo motor is connected.

① Switch power off.



② Perform motor-less operation with the personal computer. The display shows the following screen:



7 Parameters

WARNING:

Change settings and parameters only in small steps and make afterwards at first sure whether the desired effect occurs before doing any more changes. Excessive adjustment or change of parameter setting must not be made as it will make operation instable.

7.1 Introduction

In the servo amplifiers from the MR-J3 series, the parameters are classified into the following groups on a function basis.

Parameter group	Description	
	MR-J3-A series	**MR-J3-B series**
Basic setting parameters① (No. PA□□)	Make basic setting with these parameters. Generally, the operation is possible only with these parameter settings.	
Gain/filter parameters (No. PB□□)	Use these parameters when making gain adjustment manually.	
Extension setting parameters (No. PC□□)	When using this servo amplifier in the speed control mode or torque control mode, mainly use these parameters.	When changing settings such as analog monitor output signal or encoder electromagnetic brake sequence output, use these parameters.
I/O setting parameters (No. PD□□)	Use these parameters when changing the I/O signals of the servo amplifier.	

Tab. 7-1: *Parameter groups*

① Mainly setting the basic setting parameters (PA□□) allows the setting of the basic parameters at the time of delivery (factory setting).

NOTE Never change parameters for manufacturer setting.

7.2 Parameter write inhibit

In the factory setting, this servo amplifier allows changes to the basic setting parameter, gain/ filter parameter and extension setting parameter settings. With the setting of parameter No. PA19, write can be disabled to prevent accidental changes.

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

The following table indicates the parameters which are enabled for reference and write by the setting of parameter No. PA19. Operation can be performed for the parameters marked(✔).

Parameter PA19 Setting	Operation	Basic setting parameter No. PA□□	Gain/ Filter parameter No. PB□□	Extension setting parameter No. PC□□	I/O setting parameter No. PD□□
0000H	read	✔	—	—	—
	write	✔	—	—	—
000BH (initial value)	read	✔	✔	✔	—
	write	✔	✔	✔	—
000CH	read	✔	✔	✔	✔
	write	✔	✔	✔	✔
100BH	read	✔	—	—	—
	write	only PA19	—	—	—
100CH	read	✔	✔	✔	✔
	write	only PA19	—	—	—

Tab. 7-2: *Access to parameters*

7.3 Parameters of the MR-J3-A servo amplifier

7.3.1 Basic setting parameters (PA□□)

No.	Symbol	Description	Control mode ②	Initial value	Unit	User setting
PA01	STY ①	Control mode	P S T	0000H	—	
PA02	REG ①	Regenerative option	P S T	0000H	—	
PA03	ABS ①	Absolute position detection system	P	0000H	—	
PA04	AOP1 ①	Function selection A-1	P S T	0000H	—	
PA05	FBP ①	Number of command input pulses per revolution	P	0	—	
PA06	CMX	Electronic gear numerator	P	1	—	
PA07	CDV	Electronic gear denominator	P	1	—	
PA08	ATU	Auto-tuning	P S	0001H	—	
PA09	RSP	Auto tuning response	P S	12	—	
PA10	INP	In-position range	P	100	pulse	
PA11	TLP	Forward torque limit	P S T	100.0	%	
PA12	TLN	Reverse torque limit	P S T	100.0	%	
PA13	PLSS ①	Command pulse input from	P	0000H	—	
PA14	POL ①	Rotation direction selection	P	0	—	
PA15	ENR ①	Encoder output pulses	P S T	4000	pulse/rev	
PA16	—	Manufacturer setting	-	0	—	
PA17	—		-	0000H	—	
PA18	—		-	0000H	—	
PA19	BLK ①	Parameter write inhibit (see section 7.2)	P S T	000BH	—	

Tab. 7-3: *List of basic setting parameters*

① For the setting to become active, these parameters require the power supply to be switched off and switched on again after setting.

② The symbols in the column "control mode" column refers to the corresponding control function the parameter is effective:
P: Position control
S: Speed control
T: Torque control

7.3.2 Description of basic setting parameters

Number	Symbol	Initial value	Unit	Setting range	Control mode ②
PA01	**STY** ①	**0000H**		**Refer to text**	**P S T**

Setting the control mode

0	0	0	

Control mode
- 0: Position control
- 1: Position and speed control
- 2: Speed control
- 3: Speed and torque control
- 4: Torque control
- 5: Torque and position control

PA02	REG ②	0000H		Refer to text	P S T

Regenerative option

Servo amplifier

0	0		

Selection of regenerative option
- 00: Regenerative option is not used
  - -.For servo amplifier MR-J3-10A, regenerative resistor is not used.
  - - For servo amplifiers MR-J3-20A to MR-J3-700A, built-in regenerative resistor is used.
- 01: FR-BU(-H), FR-RC(-H), FR-CV(-H)
- 02: MR-RFH75-40
- 03: MR-RFH75-40
- 04: MR-RFH220-40
- 05: MR-RFH400-13
- 06: MR-RFH400-13
- 08: MR-RFH400-6.7
- 09: MR-RFH400-6.7
- 81: MR-PWR-R T 400-120
- 83: MR-PWR-R T 600-47
- 85: MR-PWR-R T 600-26

CAUTION:
Wrong setting may cause the regenerative option to burn. Risk of fire!

NOTE:
If the regenerative option selected is not for use with the servo amplifier, parameter error (AL. 37) occurs.

PA03	ABS ①	0000H		Refer to text	P

Absolute position detection system

Selection of absolute position detection system.

0	0	0	

Positioning system
- 0: Used in incremental system
- 1: Used in absolute position detection system (ABS-data transfer by digital I/O-interface DI0)
- 2: Used in absolute position detection system (ABS-data transfer by serial interface)

Set this parameter when using the absolute position detection system in the position control mode.

Tab. 7-4: *Detailed overview of parameters PA□□ (1)*

Number	Symbol	Initial value	Unit	Setting range	Control mode ②
PA04	**AOP1** ①	**0000H**		**Refer to text**	**P S T**

Function selection A-1

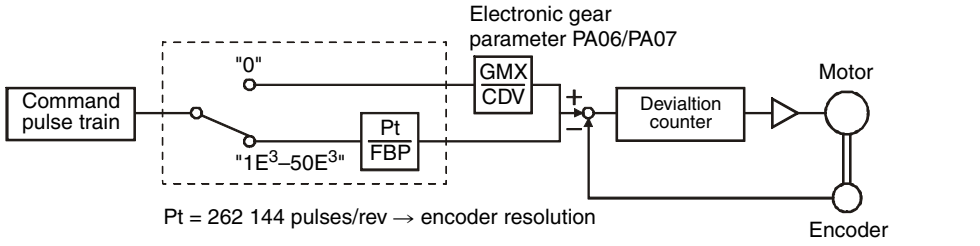
0	0	0	

Function of pin CN1-23
0: Function of parameter PD14 setting
1: Electromagnetic brake

Set this parameter when assigning the electromagnetic brake to pin 23 of connector CN1.

PA05	FBP ①	0		0 or 1000–50000	P

Number of command input pulses per revolution



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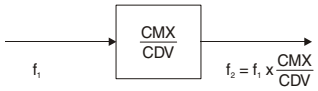
Setting	Description
0	The electronic gear (parameter PA06, PA07) is made valid
1000–50000	Number of command input pulses necessary to rotate the servo motor one turn.

PA06	CMX	1		1–1048576	P

Electronic gear numerator (command pulse multiplying factor numerator))



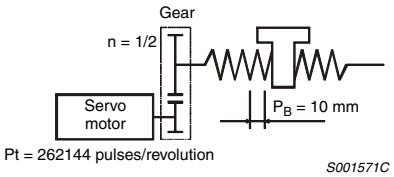
NOTE:
The electronic gear setting range is 1/10 < CMx/CDV < 2000.

CAUTION:
Wrong setting can lead to unexpected fast rotation, causing injury.

PA07	CDV	1		1–1048576	P

Electronic gear denominator (command pulse multiplying factor denominator), (see parameter PA06)

Example: For motion in increments of 10 µm per pulse.
Ballscrew lead: P_B = 10 [mm]
Reduction ratio: n = 1/2
Encoder resolution: Pt = 262144 [pulses/revolution]
Travel per command pulse: $\Delta\ell_0 = 10x10^{-3}$ [mm/pulse]
Travel per servo motor revolution: $\Delta S = nxP_B$ [mm/rev]
The calculation of the electronic gear is done according to the following formula:



S001571C

$$\frac{CMX}{CDV} = \Delta\ell_0 \times \frac{Pt}{\Delta S} = \Delta\ell_0 \times \frac{Pt}{n \times P_B}$$

Numerical example:

$$\frac{CMX}{CDV} = 10 \times 10^{-3} \times \frac{262144}{1/2 \times 10} = \frac{10 \times 2 \times 262144}{10^3 \times 10} = \frac{2 \times 262144}{10^3} = \frac{524288}{1000} = \frac{524288}{1000} \times \frac{8}{8} = \frac{65536}{125}$$

Set CMX = 65536 and CDV = 125.

Tab. 7-4: *Detailed overview of parameters PA□□ (2)*

Number	Symbol	Initial value	Unit	Setting range	Control mode ②
PA08	ATU	0001H		Refer to text	P S

Auto tuning mode
Gain adjustment mode setting

0 0 0 ☐

Setting	Gain adjustment mode	Automatically set parameter (NOTE)
0	Interpolation	PB06, PB08, PB09, PB10
1	Auto-tuning 1	PB06, PB07, PB08, PB09, PB10
2	Auto-tuning 2	PB07, PB08, PB09, PB10
3	Manual	—

NOTE: Parameters PB□□ have the following meaning:

Parameter No.	Meaning
PB06	Ratio of load inertia moment to servo motor inertia moment
PB07	Model loop gain
PB08	Position loop gain
PB09	Speed loop gain
PB10	Speed integral compensation

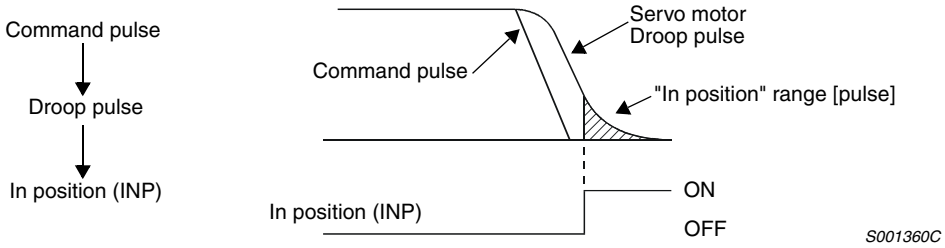
PA09	RSP	12		1–32	P S

Auto tuning response

Value	Response	Machine Resonance Frequency [Hz]	Value	Response	Machine Resonance Frequency [Hz]
1	low	10.0	17	middle	67.1
2	↑	11.3	18	↑	75.6
3	↑	12.7	19	↑	85.2
4	↑	14.3	20	↑	95.9
5	↑	16.1	21	↑	108.0
6	↑	18.1	22	↑	121.7
7	↑	20.4	23	↑	137.1
8	↑	23.0	24	↑	154.4
9	↑	25.9	25	↑	173.9
10	↑	29.2	26	↑	195.9
11	↑	32.9	27	↑	220.6
12	↑	37.0	28	↑	248.6
13	↑	41.7	29	↑	279.9
14	↑	47.0	30	↑	315.3
15	↑	52.9	31	↑	355.1
16	middle	59.6	32	high	400.0

NOTE:
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.

Tab. 7-4: *Detailed overview of parameters PA□□ (3)*

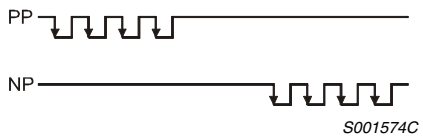
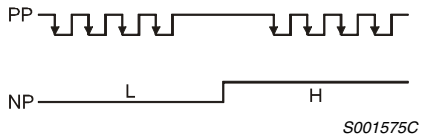
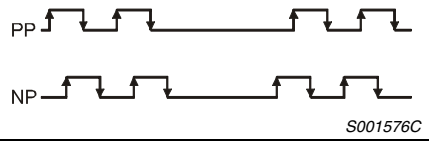
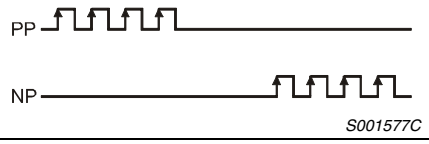
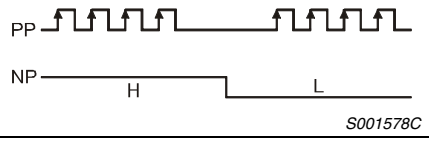
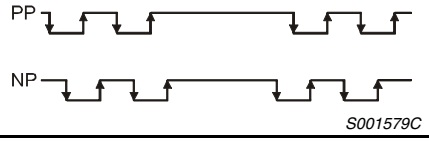
Number	Symbol	Initial value	Unit	Setting range	Control mode ②
PA10	**INP**	**100**	**pulses**	**0–10000**	**P**
In-position range Set the range, where the signal "In position" (INP) is output to the controller.  NOTE: Set the range, where the signal "In position" (INP) is output in command pulse units before calculation of the electronic gear.					
PA11	**TLP**	**100.0**	**%**	**0–100.0**	**P S T**
Forward rotation torque limit Set this parameter on the assumption that the maximum torque is 100 [%]. Set this parameter when limiting the torque of the servo motor in the CCW driving mode or CW regeneration mode. Set this parameter to "0.0" to generate no torque. When torque is output with the analog monitor output, the value set here corresponds to the output voltage of +8 V.					
PA12	**TLN**	**100.0**	**%**	**0–100.0**	**P S T**
Reverse rotation torque limit Set this parameter on the assumption that the maximum torque is 100 [%]. Set this parameter when limiting the torque of the servo motor in the CCW driving mode or CW regeneration mode. Set this parameter to "0.0" to generate no torque. When torque is output with the analog monitor output, the value set here corresponds to the output voltage of +8 V.					

Tab. 7-4: *Detailed overview of parameters PA□□ (4)*

Number	Symbol	Initial value	Unit	Setting range	Control mode ②
PA13	**PLSS** ①	**0000H**		**Refer to text**	**P**

Command pulse input form

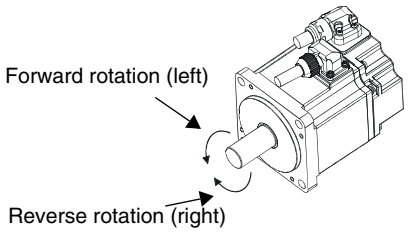
Select the input form of the pulse train input signal. Command pulses may be input in any of three different forms, for which positive or negative logic can be chosen.
The table below shows the possible signals.
The arrows on the signal in the table indicate the timing of importing a pulse train.
A- and B-phase pulse trains are imported after they have been multiplied by 4.

Setting of PA13	Pulse train form		Forward rotation command	Reverse rotation command
0010H	Negative logic	Forward rotation pulse train Reverse rotation pulse train	 S001574C	
0011H	Negative logic	Pulse train + sign	 S001575C	
0012H	Negative logic	A-phase pulse train B-phase pulse train	 S001576C	
0000H	Positive logic	Forward rotation pulse train Reverse rotation pulse train	 S001577C	
0001H	Positive logic	Pulse train + sign	 S001578C	
0002H	Positive logic	A-phase pulse train B-phase pulse train	 S001579C	

PA14	POL ①	0		Refer to text	P

Rotation direction selection

Select servo motor rotation direction.



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Setting of PA14	Servo Motor Rotation Direction	
	Increasing addresses	Decreasing addresses
0	left	right
1	right	left

Tab. 7-4: *Detailed overview of parameters PA□□ (5)*

Number	Symbol	Initial value	Unit	Setting range	Control mode ②
PA15	**ENR** ①	**4000**	**pulses/ rev**	**1–100000**	**P S T**

Encoder output pulses

Used to set the encoder pulses (A-phase, B-phase) output by the servo amplifier.

Since the number the output pulses is only one fourth of the entered value, set the command value for times greater, than the desired pulse. You can use parameter PC19 to choose the output pulse setting or output division ratio setting. The maximum frequency of the output pulses is 4.6 Mpps (after multiplication with 4).

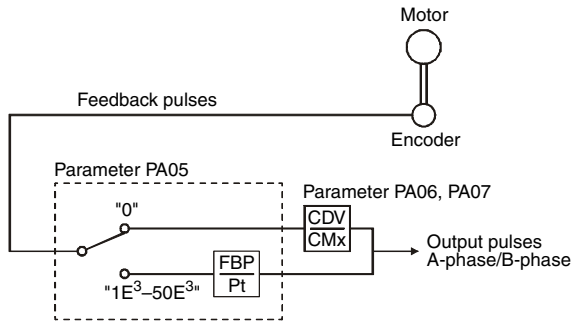
Examples of setting:

For direct output pulse designation set parameter PC19 to □□0□). If the setting in parameter PA15 is "5600", 5600 / 4 = 1400 pulses are output during one revolution of the motor.

When parameter PC19 is set to □□1□), the number of pulses per servo motor revolution is divided by the set value in PA15.

If, for example, the value "8" is specified in parameter PA15,
(262144 / 8) x 1 / 4 = 8192 pulses are output during one motor revolution.

When parameter PC19 is set to □□2□ the feedback pulses of the servo motor encoder are processed as shown below. The feedback pulses can be output in the same pulse unit as the command pulses.



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PA16		0			

For manufacturer setting

The content of this parameter may not be changed.

PA17		0000H			

For manufacturer setting

The content of this parameter may not be changed.

PA18		0000H			

For manufacturer setting

The content of this parameter may not be changed.

PA19	BLK ①	000BH		Refer to text	P S T

Parameter write inhibit

See section 7.2 and tab. 7-2 for more details of the setting.

Tab. 7-4: *Detailed overview of parameters PA□□ (6)*

① For the setting to become active, these parameters require the power supply to be switched off and switched on again after setting.

② The symbols in the column "control mode" column refers to the corresponding control function the parameter is effective:
P: Position control
S: Speed control
T: Torque control

7.4 Parameters of the MR-J3-B servo amplifier

7.4.1 Basic setting parameters (PA□□)

No.	Symbol	Description	Initial value	Unit	User setting
PA01	—	For manufacturer setting	0000H	—	
PA02	REG ②	Regenerative option	0000_H	—	
PA03	ABS ①	Absolute position detection system	0000H	—	
PA04	AOP1 ①	Function selection A-1	0000H	—	
PA05	—	For manufacturer setting	0	—	
PA06	—		1	—	
PA07	—		1	—	
PA08	ATU	Auto tuning mode	0001H	—	
PA09	RSP	Auto tuning response	12	—	
PA10	INP	In-position range	100	pulse	
PA11	—	For manufacturer setting	1000.0	%	
PA12	—		1000.0	%	
PA13	—		0000H	—	
PA14	POL ①	Rotation direction selection	0	—	
PA15	ENR ①	Encoder output pulses	4000	pulse/rev	
PA16	—	For manufacturer setting	0	—	
PA17	—		0000H	—	
PA18	—		0000H	—	
PA19	BLK ①	Parameter write inhibit (see section 7.2)	000BH	—	

Tab. 7-5: *List of basic setting parameters*

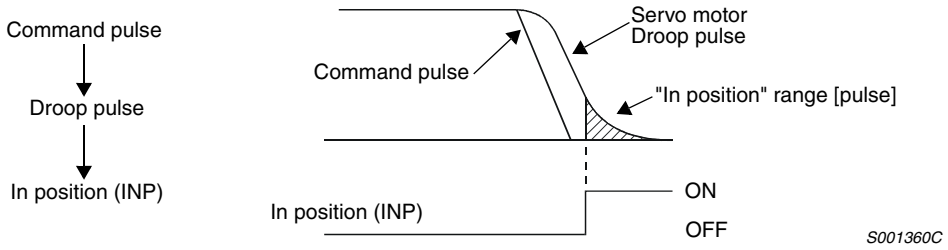
① For the setting to become active, these parameters require the power supply to be switched off and switched on again after setting or to reset the controller.

② For the setting to become active, these parameters require the power supply to be switched off and switched on again after setting.

7.4.2 Description of basic setting parameters

Number	Symbol	Initial value	Unit	Setting range
PA01		**0**		
For manufacturer setting The content of this parameter may not be changed.				
PA02	**REG** ②	**0000_H**		**Refer to text**
Regenerative option For selection of regenerative option see: Basic setting parameters of MR-J3-A servo amplifier, tab. 7-4.				
PA03	**ABS** ①	**0000H**		**Refer to text**
Absolute position detection system 0 0 0 □ Positioning system: 0: Used in incremental system (standard) 1: Used in absolute position detection system Selection of absolute position detection system.				
PA04	**AOP1** ①	**0000H**		
Function selection A-1: Selection of forced stop function of the servo amplifier 0 □ 0 0 Selection of servo forced stop 0: Valid (Forced stop is switched by input EM1) 1: Invalid (Forced stop is not switched by input EM1) (The input is switched to ON internally) Set this parameter to deactivated (□1□□) if you don't want to use the forced stop input (EM1) of the servo amplifier.				
PA05		**0**		
For manufacturer setting The content of this parameter may not be changed.				
PA06		**1**		
For manufacturer setting The content of this parameter may not be changed.				
PA07		**1**		
For manufacturer setting The content of this parameter may not be changed.				
PA08	**ATU**	**0001H**		**Refer to text**
Auto tuning mode See: Basic setting parameter of MR-J3-A servo amplifier, tab. 7-4				
PA09	**RSP**	**12**		**Refer to text**
Auto tuning response See: Basic setting parameter in the MR-J3-A servo amplifier, tab. 7-4				

Tab. 7-6: *Detailed overview of parameters PA□□ (1)*

Number	Symbol	Initial value	Unit	Setting range
PA10	**INP**	**100**	**pulses**	**Refer to text**
In-position range Set the range, where the signal "In position" (INP) is output to the controller.  NOTE: Set the range, where the signal "In position" (INP) is output in command pulse units before calculation of the electronic gear.				
PA11		**1000.0**	**%**	
For manufacturer setting The content of this parameter may not be changed.				
PA12		**1000.0**	**%**	
For manufacturer setting The content of this parameter may not be changed.				
PA13		**0000H**		
For manufacturer setting The content of this parameter may not be changed.				
PA14	**POL** ①	**0**		**Refer to text**
Rotation direction selection See: Basic setting parameter of MR-J3-A servo amplifier, tab. 7-4				
PA15	**ENR** ①	**4000**	**pulses/ rev**	**1-65535**
Encoder output pulse Used to set the encoder pulses (A-phase, B-phase) output by the servo amplifier. Since the number the output pulses is only one fourth of the entered value, set the command value for times greater, than the desired pulse. You can use parameter PC03 to choose the output pulse setting or output division ratio setting. The maximum frequency of the output pulses is 4.6 Mpps (after multiplication with 4). Examples of setting: For direct output pulse designation set parameter PC03 to □□0□). If the setting in parameter PA15 is "5600", 5600 / 4 = 1400 pulses are output during one revolution of the motor. When parameter PC19 is set to □□1□), the number of pulses per servo motor revolution is divided by the set value in PA15. If, for example, the value "8" is specified in parameter PA15, (262144 / 8) x 1 / 4 = 8192 pulses are output during one motor revolution.				
PA16		**0**		
For manufacturer setting The content of this parameter may not be changed.				

Tab. 7-6: *Detailed overview of parameters PA□□ (2)*

Number	Symbol	Initial value	Unit	Setting range
PA17		**0000H**		
For manufacturer setting The content of this parameter may not be changed.				
PA18		**0000H**		
For manufacturer setting The content of this parameter may not be changed.				
PA19	**BLK** ①	**000BH**		
Write protection for parameter See section 7.2 and tab. 7-2 for more details of the setting.				

Tab. 7-6: *Detailed overview of parameters PA□□ (3)*

① For the setting to become active, these parameters require the power supply to be switched off and switched on again after setting or to reset the controller.

② For the setting to become active, these parameters require the power supply to be switched off and switched on again after setting.

7.5 Gain/filter, extension and I/O setting parameters

Only the basic setting parameters PA□□ are described in this manual for beginners.

The Appendix shows more ables about

- Gain/filter parameters PB□□ (Section A.1.3 or section A.2.3)
- Extension setting parameters PC□□ (Section A.1.4 or section A.2.4)
- I/O setting parameters PD□□ (Section A.1.5 or section A.2.5)

Please refer to the respective instruction manual of the servo amplifier series MR-J3-A and MR-J3-B for more detailed settings and descriptions of these parameters.

8 Troubleshooting

8.1 Alarms and warnings

NOTE If an alarm occurs, set the status to "Servo OFF" and switch off the power supply of the main circuit.

8.1.1 List of alarm and warning messages

When a fault occurs during operation, the corresponding alarm or warning is displayed. If any alarm or warning has occurred, refer to section 8.1.2 or section 8.1.3 and take the appropriate action. When an alarm occurs, the signal ALM turns OFF.

	Display		Error		Alarm code ①, ③			Alarm deactivation				
					Pin CN1-				Press SET on alarm screen	Error reset (Command)	Alarm reset (RES-signal)	CPU reset
	MR-J3-				22	23	24	Power OFF → ON				
	A	B			Bit 2	Bit 1	Bit 0		MR-J3-A	MR-J3-B	MR-J3-A	MR-J3-B
Alarms	AL.10	10	Undervoltage		0	1	0	✔	✔		✔	
	AL.12	12	Memory error 1 (RAM)		0	0	0	✔	—		—	
	AL.13	13	Clock error		0	0	0	✔	—		—	
	AL.15	15	Memory error 2 (E²PROM)		0	0	0	✔	—		—	
	AL.16	16	Encoder error 1 (At power on)		1	1	0	✔	—		—	
	AL.17	17	Board error		0	0	0	✔	—		—	
	AL.19	19	Memory error 3 (Flash-ROM)		0	0	0	✔	—		—	
	AL.1A	1A	Motor combination error		1	1	0	✔	—		—	
	AL.20	20	Encoder error 2		1	1	0	✔	—		—	
	AL.24	24	Main circuit error		1	0	0	✔	✔		✔	
	AL.25	25	Absolute position erase		1	1	0	✔	—		—	
	AL.30	30	Regenerative error		0	0	1	✔ ②	✔ ②		✔ ②	
	AL.31	31	Overspeed		1	0	1	✔	✔		✔	
	AL.32	32	Overcurrent		1	0	0	✔	—		—	
	AL.33	33	Overvoltage		0	0	1	✔	✔		✔	
	—	34	Receive error 1 (SSCNET III)		—			✔	—	✔ ④	—	✔
	AL.35	35	Command frequency error		1	0	1	✔	✔		✔	
	—	36	Receive error 1 (SSCNET III)		—			✔	—	✔	—	✔
	AL.37	37	Parameter error		0	0	0	✔	—		—	
	AL.45	45	Main circuit device overheat		0	1	1	✔ ②	✔ ②		✔ ②	
	AL.46	46	Servo Motor overheat		0	1	1	✔ ②	✔ ②		✔ ②	
	AL.47	47	Cooling fan error		0	1	1	✔	—		—	
	AL.50	50	Overload 1		0	1	1	✔ ②	✔ ②		✔ ②	
	AL.51	51	Overload 2		0	1	1	✔ ②	✔ ②		✔ ②	
	AL.52	52	Error excessive		1	0	1	✔	✔		✔	
	AL.8A	—	communication time-out error	serial	0	0	0	✔	✔	—	✔	—
	—	8A		USB	—				—	✔	—	✔
	AL.E8	—	Communication error	serial	0	0	0	✔	✔	—	✔	—
	—	E8		USB	—				—	✔	—	✔
	88888	888	Watchdog		—			✔	—		—	

Tab. 2-1: *Overview of alarm and warning messages (1)*

	Display		Error	Alarm code ①, ③			Warning deactivation				
				Pin CN1-			Power OFF → ON	Press SET on alarm screen	Error reset (Command)	Alarm reset (RES-signal)	CPU reset
	MR-J3-			22	23	24					
	A	B		Bit 2	Bit 1	Bit 0		MR-J3-A	MR-J3-B	MR-J3-A	MR-J3-B
Warnings	AL.92	92	Open battery cable warning	—	—	—	The warning is automatically canceled after removing the cause of occurrence.				
	AL.96	96	Home position setting warning	—	—	—					
	AL.99	—	Stoke limit warning	—	—	—					
	AL.9F	9F	Battery warning	—	—	—					
	AL.E0	E0	Excessive regeneration warning	—	—	—					
	AL.E1	E1	Overload warning 1	—	—	—					
	AL.E3	E3	Absolute position counter warning	—	—	—					
	—	E4	Parameter warning	—							
	AL.E5	-	ABS time-out warning	—	—	—					
	AL.E6	E6	Servo forced stop warning	—	—	—					
	—	E7	Controller forced stop warning	—							
	AL.E8	E8	Cooling fan speed reduction warning	—	—	—					
	AL.E9	E9	Main circuit off warning	—	—	—					
	AL.EA	—	ABS servo on warning	—	—	—					
	AL.EC	EC	Overload warning 2	—	—	—					
	AL.ED	ED	Output watt excess warning	—	—	—					

Tab. 8-1: *Overview of alarm and warning messages (2)*

① 0: Pin is switched off
1: Pin is switched on

② Deactivate the alarm about 30 minutes of cooling time after removing the cause of occurrence. Afterwards resume operation.

③ **Only servo amplifier series MR-J3A**
Set "□□□1" in parameter PD24 to output the alarm code by ON/OFF of Bit 0 to Bit 2. Warnings (AL.92 to AL.EA) have no alarm code. Any alarm code is output at occurrence of the corresponding alarm. In the normal status, no alarm code is output at pins CN1-22, CN1-23 and CN1-24, but the standard status signals (like speed, etc.).

④ In some controller communication status, the alarm may not be removed.

8.1.2 Alarm messages

DANGER:

When any alarm has occurred, eliminate its cause, ensure safety, then reset the alarm, and restart operation.

If an absolute position erase occurred, always make home position setting again (AL.25 or 25). Otherwise, misoperation may occur.

As soon as an alarm occurs, set the status to "servo-off" and power off the main circuit and control circuit.

Details in tab. 8-2

Protective measures when an alarm message occurs:

WARNING:

When any of the following alarms has occurred, do not deactivate the alarm and resume operation repeatedly. To do so will cause the servo amplifier/ servo motor to fail. Remove the cause of occurrence, and leave a cooling time of more than 30 minutes before resuming operation.

- ***Regenerative error (AL.30 or 30)***
- ***Overload 1 (AL.50 or 50)***
- ***Overload 2 (AL.51 or 51)***

If the alarm is reset by switching off and on the power supply and the operation is continued at once, this can cause damage of the servo amplifier, the servo motor and the regenerative option.

DANGER:

Short voltage drop

If a voltage drop occurs for longer than 60 ms, the voltage drop alarm (AL.10 or 10) is output. If the voltage drop continues for longer than additional 20 ms, the control circuit will be switched off. If in this case the voltage would rise again and the status is "servo-on", the servo motor would restart without control. To avoid such a behaviour, you must provide a circuit which immediately switches off the "servo-on" signal as soon as an alarm occurs.

NOTE When an alarm occurs, the trouble (ALM) switches off and the display indicates the alarm code. The servo motor comes to a stop. The optional setup software MR Configurator may be used to find the cause.

Display	Error	Definition	Cause	Remedy
AL.10/ 10	Undervoltage	Power supply voltage dropped: MR-J3-□A/B: ≤160 V AC MR-J3-□A4/B4: ≤280 V AC	1. Power supply voltage is low.	Check power supply.
			2. Voltage cutoff of at least 60 ms.	
			3. The impedance of the power supply is too high.	
			4. The power supply voltage of the control circuit dropped to: MR-J3-□A/B: 200 V DC MR-J3-□A4/B: 380 V DC	
			5. Defective servo amplifier. Checking method: Alarm AL.10/10 occurs if power is switched on after disconnection of all cables but the control circuit power supply cables.	Replace servo amplifier.
AL.12/ 12	Memory error 1 (RAM)	RAM memory fault.	Faulty parts in the servo amplifier. Checking method: Alarm AL.12/12 and AL.13/13 occurs if power is switched on after disconnection of all cables but the control circuit power supply cables.	Replace servo amplifier.
AL.13/ 13	Clock error	Defective control PCB.		
		Clock error transmitted from the controller (only MR-J3-B).	Defective controller. Checking method: Alarm 13 occurs if the servo control is used in a multiple CPU system.	Replace servo system controller.
AL.15/ 15	Memory error 2 (E²PROM)	E²PROM error.	Defective parts in the servo amplifier. Checking method: Alarm AL.15/15 occurs if power is switched on after disconnection of all cables but the control circuit power supply cables.	Replace servo amplifier.
			The number of write times to E²PROM exceeded 100000.	
AL.16/ 16	Encoder error 1 (at power on)	Communication error occurred between encoder and servo amplifier.	1. Encoder connector (CN2) disconnected.	Connect correctly.
			2. Encoder fault	Replace servo motor.
			3. Encoder cable faulty (Wire breakage or shorted).	Repair or replace cable.
			4. Encoder cable type (2-wire, 4-wire) selection was wrong in parameter setting.	Correct the setting in the fourth digit of parameter PC22 (PC04).
AL.17/ 17	Board error	CPU/parts fault.	Faulty parts in the servo amplifier. Checking method: Alarm (AL.17/17 or AL.19/19) occurs if power is switched on after disconnection of all cables but the control circuit power supply cable.	Replace servo amplifier.
AL.19/ 19	Memory error 3 (Flash ROM)	ROM memory fault.		
AL.1A 1A	Motor combination error	Wrong combination of servo amplifier and servo motor.	Wrong combination of servo amplifier and servo motor connected.	Use correct combination.
AL.20/ 20	Encoder error 2	Communication error occurred between encoder and servo amplifier.	1. Encoder connector (CN2) disconnected.	Connect correctly.
			2.Encoder cable faulty (Wire breakage or shorted).	Repair or replace cable.
			3. Encoder fault.	Replace servo motor.

Tab. 8-2: *Remedies for alarms (1)*

Display	Error	Definition	Cause	Remedy
AL.24/ 24	Main circuit error	Ground fault occurred at the servo motor power (U, V and W phases) of the servo amplifier.	1. Power input wires and servo motor power wires are in contact.	Connect correctly.
			2. Insulation resistance between cable or motor and ground potential is too small.	Replace cable.
			3: Main circuit of servo amplifier failed. Checking method: AL.24/24 occurs if the servo is switched on after disconnecting the U, V, W power cables from the servo amplifier.	Replace servo amplifier.
AL.25/ 25	Absolute position erase	Absolute position data faulty.	1. Voltage drop in encoder. (Battery disconnected)	After leaving the alarm occurring for a few minutes, switch power off, then on again. Always make home position setting again.
			2. Battery voltage low.	Replace battery. Always make home position setting again.
			3. Battery cable or battery faulty.	
		Power was switched on for the first time in the absolute position detection system.	4. Home position not set.	After leaving the alarm occurring for a few minutes, switch power off, then on again. Always make home position setting again.
AL.30 30	Regenerative alarm	Permissible regenerative power of the built-in regenerative resistor or regenerative option is exceeded.	1. Wrong setting of parameter PA02.	Set correctly.
			2. Built-in regenerative resistor or regenerative option is not connected.	Connect correctly.
			3. High-duty operation or continuous regenerative operation caused the permissible regenerative power of the regenerative option to be exceeded. Checking method: Call the status display and check the regenerative load ratio.	1. Reduce the frequency of positioning.
				2. Use the regenerative option of larger capacity.
				3. Reduce the load.
			4. Power supply voltage is abnormal: MR-J3-□A/B: ≥260 V AC MR-J3-□A4/B4: ≥535 V AC	Review the power supply.
			5. Built-in regenerative resistor or regenerative option faulty.	Replace servo amplifier or regenerative option.
		Regenerative transistor fault.	6. Regenerative transistor faulty. Checking method: 1. The regenerative option has overheated abnormally. 2. The alarm occurs even after removal of the built-in regenerative resistor or regenerative option.	Replace servo amplifier.

Tab. 8-2: *Remedies for alarms (2)*

Display	Error	Definition	Cause	Remedy
AL.31/ 31	Overspeed	Speed has exceeded the instantaneous permissible speed.	1. Input command pulse frequency exceeded the permissible instantaneous speed frequency.	Set command pulses correctly.
			2. Small acceleration/deceleration time constant caused overshoot to be large.	Increase acceleration/deceleration time constant.
			3. Unstable servo system causes overshoot.	1. Re-set servo gain to proper value. 2. If servo gain cannot be set to proper value: 1) Reduce load inertia moment ratio; or 2) Reexamine acceleration/ deceleration time constant.
			4. Electronic gear ratio is large (parameters PA06, PA07). (only MR-J3-A)	Set correctly.
			5. Encoder faulty.	Replace servo motor.
AL.32/ 32	Overcurrent	Current that flew is higher than the permissible current of the servo amplifier. (When the alarm (AL.32/32) occurs, switch the power OFF and then ON to reset the alarm. Do not switch the power OFF/ON repeatedly.This can cause malfunction.	1. Short occurred in servo motor power (U, V, W).	Correct wiring.
			2. Output transistor of the servo amplifier faulty. Checking method: Alarm (AL.32/32) occurs if power is switched on after U, V and W are disconnected.	Replace servo amplifier.
			3. Ground fault occurred in servo motor power (U, V, W).	Correct wiring.
			4. External noise caused the overcurrent detection circuit to misoperate.	Take noise suppression measures.
AL.33/ 33	Overvoltage	Converter bus voltage input value has become the following: MR-J3-□A/B: 400 V DC MR-J3-□A4/B4: 800 V DC	1. Regenerative option is not used.	Use the regenerative option.
			2. Though the regenerative option is used, the parameter No.PA02 setting is "□□00 (not used)".	Set parameter correctly.
			3. Lead of built-in regenerative resistor or regenerative option is open or disconnected.	1. Change lead. 2. Connect correctly.
			4. Regenerative transistor faulty.	Change servo amplifier.
			5. Wire breakage of built-in regenerative resistor or regenerative option.	1. Change servo amplifier. 2. Change optional regenerative option.
			6. Capacity of built-in regenerative resistor or regenerative option is too low.	Add regenerative option or increase capacity.
			7. Power supply voltage high.	Review the power supply.
			8. Ground fault occurred in servo motor power (U, V, W).	Correct the wiring.

Tab. 8-2: *Remedies for alarms (3)*

Display	Error	Definition	Cause	Remedy
—/ 34 (only MR-J3-B)	Receive error 1 (SSCNET III)	SSCNET III communication error. (Continuously communication error with about 3.5 ms interval.)	1. SSCNET III cable is disconnected.	Connect it after turning off the control circuit power supply for servo amplifier.
			2. The surface at the end of SSCNET III cable got dirty.	Wipe dirt at the surface away. (see MR-J3-B instruction manual)
			3. The SSCNET III cable is broken or severed.	Replace cable.
			4. Noise entered the servo amplifier.	Take noise suppression measures.
AL.35/ — (only MR-J3-A)	Command pulse frequency error	Input pulse frequency of the command pulse is too high.	1.Pulse frequency of the command pulse is too high.	Change the command pulse frequency to a proper value.
			2. Noise entered command pulses.	Take action against noise.
			3. Manual pulse generator fault.	Replace manual pulse generator.
—/ 35 (only MR-J3-B)	Command frequency error	Input pulse frequency of the command pulse is too high.	1. Command given is greater than the maximum speed of the servo motor.	Review operation program.
			2. Servo system controller failure.	Replace the servo system controller.
			3. Noise entered the servo amplifier.	Take noise suppression measures for I/O signals.
—/ 36 (only MR-J3-B)	Receive error 2 (SSCNET III)	SSCNET III communication error. (Intermittently communication error with about 70 ms interval.)	1. The SSCNET III cable is disconnected.	Connect it after turning off the control circuit power supply for servo amplifier.
			2. The surface at the end of SSCNET III cable got dirty.	Wipe dirt at the surface away. (see MR-J3-B instruction manual)
			3. The SSCNET III cable is broken or severed.	Replace cable.
			4. Noise entered the servo amplifier.	Take noise suppression measures.
AL.37/ 37	Parameter error	Parameter setting is wrong.	1. Servo amplifier fault caused the parameter setting to be rewritten.	Replace servo amplifier.
			2. Regenerative option not used with servo amplifier was selected in parameter PA02.	Set parameter PA02 correctly.
			3. There is a parameter whose value was set to outside the setting range by the controller.	Set parameter within the setting range.
			4. The number of write times to E²PROM exceeded 100000 due to parameter write, etc.	Replace servo amplifier.

Tab. 8-2: *Remedies for alarms (4)*

Display	Error	Definition	Cause	Remedy
AL.45/ 45	Main circuit device overheat	Main circuit device overheat.	1. Servo amplifier faulty.	Replace servo amplifier.
			2. The power supply was turned on and off continuously by overloaded status.	Review the drive mode.
			3. Ambient temperature of the servo amplifier is over 55° C.	Review environment so that ambient temperature is 0 to 55° C.
			4. Servo amplifiers are mounted too close to each other.	Use within the range of specifications.
AL.46/ 46	Servo Motor overheat	Servo motor temperature rise actuated the thermal sensor.	1. Ambient temperature of the 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.	Replace servo motor.
AL.47/ 47	Cooling fan alarm	The cooling fan of the servo amplifier stopped, or its speed decreased to or below the alarm level.	Cooling fan life expired.	Replace the fan of the servo amplifier.
			Foreign object blocks the fan.	Remove foreign object.
			The power supply of the cooling fan failed.	Replace servo amplifier.

Tab. 8-2: *Remedies for alarms (5)*

Display	Error	Definition	Cause	Remedy
AL.50/ 50	Overload 1	Load exceeded overload protection characteristic of servo amplifier. Load ratio 300% : > 2.5 s Load ratio 200% : > 100 s	1. Servo amplifier is used in excess of its continuous output current.	1. Reduce load. 2. Review operation pattern. 3. Use servo motor that provides larger output.
			2.Servo system is instable and hunting.	1. Repeat acceleration/ deceleration to execute auto tuning. 2. Change auto tuning response setting. 3. Set auto tuning to OFF and make gain adjustment manually.
			3. Mechanical overload.	1. Review operation pattern. 2. Install limit switches.
			4. Wrong connection of servo motor. Servo amplifier's output terminals U, V, W do not match servo motor's input terminals U, V, W.	Connect correctly.
			5. Encoder faulty.	Replace servo motor.
AL.51 51	Overload 2	The max. output current flows for several seconds. Servo Motor is mechanically locked: 1 s or longer.	1. Mechanical overload.	1. Review operation pattern. 2. Install limit switches.
			2. Wrong connection of servo motor. Servo amplifier's output terminals U, V, W do not match servo motor's input terminals U, V, W.	Connect correctly.
			3. Servo system is instable and hunting.	1. Repeat acceleration/ deceleration to execute auto tuning. 2. Change auto tuning response setting. 3. Set auto tuning to OFF and make gain adjustment manually.
			4. Encoder faulty.	Replace servo motor.

Tab. 8-2: *Remedies for alarms (6)*

Display	Error	Definition	Cause	Remedy
AL.52/ 52	Error excessive	The deviation between the model position and the actual servo motor position exceeds the parameter PC01 setting value (initial value: 3 revolutions).	1. Acceleration/deceleration time constant is too small.	Increase the acceleration/deceleration time constant.
			2. Torque limit value set with controller is too small. (At MR-J3-A set with parameters PA11 and PA12.)	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 loop gain 1 (parameter PB08) value is small.	Increase set value and adjust to ensure proper operation.
			5. Servo motor shaft was rotated by external force.	1. When torque is limited, increase the limit value. 2. Reduce load. 3. Use servo motor that provides larger output.
			6. Mechanical overload.	1. Review operation pattern. 2. Install limit switches.
			7. Encoder faulty.	Replace servo motor.
			8. Wrong connection of servo motor. Servo amplifier's output terminals U, V, W do not match servo motor's input terminals U, V, W.	Connect correctly.
AL.8A/ — (MR-J3-A)	Serial communication time-out error	Communication stopped for longer than the specified time.	1. Communication cable breakage.	Repair or replace cable.
			2. Communication cycle longer than time setting.	Shorten the communication cycle.
			3. Wrong protocol.	Correct protocol.
—/ 8A (MR-J3-B)	USB communication time-out error	Communication in test operation mode stopped for longer than the specified time.	USB cable breakage.	Replace USB cable.
AL.E8/ — (MR-J3-A)	Serial communication error	Serial communication error occurred between servo amplifier and communication device.	1. Communication cable fault. (Open cable or short circuit)	Repair or replace cable.
			2. Communication device (e.g. personal computer) faulty.	Replace the communication device.
—/ E8 (MR-J3-B)	USB communication error	Serial communication error occurred between servo amplifier and communication device.	1. USB cable fault. (Open cable or short circuit)	Replace USB cable.
			2. Communication device (e.g. personal computer) faulty	Replace the communication device.
88888/ 888①	Watchdog	CPU, parts faulty.	Fault of parts in servo amplifier. Checking method: Alarm (88888/888) occurs if power is switched on after disconnection of all cables but the control circuit power supply cable.	Replace servo amplifier.

Tab. 8-2: *Remedies for alarms (7)*

① At power-on "88888" or "888" appears instantaneously, but it is not an error.

8.1.3 Warning messages

Remedies

WARNING:

If an absolute position counter warning (AL.E3 or E3) occurred, always make home position setting again. Otherwise, misoperation may occur.

NOTE

When any of the following alarms has occurred, do not resume operation by switching power of the servo amplifier OFF/ON repeatedly. The servo amplifier and servo motor may become faulty. If the power of the servo amplifier is switched OFF/ON during the alarms, allow more than 30 minutes for cooling before resuming operation.

- Excessive regenerative warning (AL.E0 or E0)
- Overload warning 1 (AL.E1 or E1)

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

Remove the cause of warning according to the following table.

Display	Error	Definition	Cause	Remedy
AL.92/ 92	Open battery cable warning	Absolute position detection system battery voltage is low.	1. Battery cable is open.	Repair cable or replace battery.
			2. Battery voltage supplied from the servo amplifier to the encoder fell to about 3 V or less. (Detected with the encoder)	Replace battery.
AL.96/ 96	Home position setting warning	Home position setting could not be made.	1. Droop pulses remaining are greater than the in-position range setting.	Remove the cause of droop pulse occurrence.
			2. Command pulse entered after clearing of droop pulses.	Do not enter command pulse after clearing of droop pulses.
			3. Creep speed high.	Reduce creep speed.
AL.99/ — (only MR-J3-A)	Stroke limit warning	The stroke end (LSP or LSN) of the commanded direction was turned off.	The limit switch became valid.	Reexamine the operation pattern to avoid reaching the stroke limit.
AL.9F/ 9F	Battery warning	Voltage of battery for absolute position detection system reduced.	Battery voltage drops to 3.2 V or lower.	Replace battery.
AL.E0/ E0	Excessive regenerative warning	There is a possibility that regenerative alarm (AL.30/ 30) may occur.	Regenerative power increased to 85% or more of permissible regenerative load. Checking method: Call the status display and check regenerative load ratio.	1. Reduce frequency of positioning. 2. Replace regenerative option by one with larger capacity. 3. Reduce load.
AL.E1 E1	Overlfoad warning 1	There is a possibility that overload alarms 1 or 2 (AL.50/50 or AL.51/51) may occur.	Load increased to 85% or more of overload alarm 1 or 2 occurrence level.	Refer to AL.50/50 or AL.51/51.
AL.E3 E3	Absolute position counter warning	Absolute position encoder pulses faulty.	1. Noise entered the encoder.	Take noise suppression measures.
			2. Encoder faulty.	Replace servo motor.
—/ E4 (only MR-J3-B)	Parameter warning	Parameter outside setting range.	Parameter value set from servo system controller is outside setting range.	Correct setting.
AL.E5 — (only MR-J3-A)	ABS time out warning	—	1. PC ladder program wrong.	Correct program.
			2. Signals ST2 and TLC wired incorrectly.	Connect correctly.
AL.E6/ E6	Servo forced stop warning	EMG or EM1 signal is OFF.	External forced stop was made valid.	Ensure safety and deactivate forced stop.
—/ E7 (only MR-J3-B)	Controller forced stop warning	—	Forced stop signal was entered into the servo system controller.	Ensure safety and deactivate forced stop.
AL.E8/ E8	Cooling fan speed reduction warning	The cooling fan speed of the servo amplifier decreased to or below the warning level. This warning is only displayed by servo amplifiers equipped with a cooling fan.	Cooling fan life expiration (see instruction manual).	Replace cooling fan of the servo amplifier.
			The power supply of the cooling fan is broken.	Replace servo amplifier.
AL.E9/ E9	Main circuit off warning	Servo-on (SON) was switched on with main circuit power off.	—	Switch on main circuit power.

Tab. 8-3: *Remedies for warnings (1)*

Display	Error	Definition	Cause	Remedy
AL.EA/ — (only MR-J3-A)	ABS servo-on warning	Servo-on (SON) turned on more than 1s after servo amplifier had entered absolute position data transfer mode.	1. PC ladder program wrong.	Correct the program.
			2. Servo-on (SON) improper wiring.	Connect correctly.
AL.EC/ EC	Overload warning 2	Operation, in which a current exceeding the rating flew intensively in any of the U, V and W phases of the servo motor, was repeated.	The current flowing intensively in any of the U, V and W phases of the servo motor is exceeding the warning level.	1. Reduce the positioning frequency at the specific positioning address. 2. Reduce the load. 3. Replace the servo amplifier/servo motor by one of larger capacity.
AL.ED/ ED	The status, in which the output power (speed x torque) of the servo motor exceeded the rated output, continued steadily.	The rated output power (speed x torque) of the servo motor was regularly exceeded.	Continuous operation was performed with the output power (speed x torque) of the servo motor exceeding 150 % of the rated output.	1. Reduce the servo motor speed. 2. Reduce load.

Tab. 8-3: *Remedies for warnings (2)*

8.2 Trouble at start-up

The following faults may occur at start-up. If any of such faults occurs, take the corresponding action.

8.2.1 MR-J3-A servo amplifier during position control

Errors at start-up

Start-up sequence	Error	Investigation	Possible cause
Power on	LED is not lit LED flickers	Not improved if connectors CN1, CN2 and CN3 are disconnected.	1. Power supply voltage fault. 2. Servo amplifier is faulty.
		Improved when connectors CN1 is disconnected.	Power supply of CN1 cabling is shorted.
		Improved when connector CN2 is disconnected.	1. Power supply of encoder cabling is shorted. 2. Encoder is faulty.
		Improved when connector CN3 is disconnected.	Power supply of CN3 cabling is shorted.
	Alarm occurs.	See section 8.1	
Switch on "servo-on" (SON)	Alarm occurs.	See section 8.1	
	Servo motor shaft is not servo-locked (no torque).	1. Check the display to see if the servo amplifier is ready to operate. 2. Check the external I/O signal indication to see if the servo-on (SON) is ON. (Refer to the instruction manual.)	1. Servo-on (SON) is not input. (Wrong wiring) 2. External 24 V DC power is not supplied to DICOM.
Enter input command. (Test operation)	Servo motor does not rotate.	Check cumulative command pulses for the status display. (Section 6.1.3)	1. Wiring mostake: • For open collector pulse train input, 24 V DC power is not supplied to OPC. • LSP and LSN are not on. 2. No pulses are input.
	Servo motor rotates in reverse direction.		1. Mistake in wiring to controller. 2. Mistake in setting of parameter PA14.

Tab. 8-4: *Troubleshooting (1)*

Start-up sequence	Error	Investigation	Possible cause
Gain adjustment	Rotation ripples (speed fluctuations) are large at low speed.	Make gain adjustment in the following procedure: 1. Increase the auto tuning response level. 2. Repeat acceleration and deceleration several times to complete auto tuning.	Gain adjustment fault. (Chap. 7)
	Large load inertia moment causes the servo motor shaft to oscillate side to side.	If the servo motor may be run with safety, repeat acceleration and deceleration several times to complete auto tuning.	Gain adjustment fault (Chap. 7)
Cyclic operation	Position deviations appear.	Confirm the cumulative command pulses, cumulative feedback pulses and actual servo motor position. (Section 6.1.3)	Pulse counting error, etc. due to noise.

Tab. 8-4: *Troubleshooting (2)*

How to find the cause of position shift

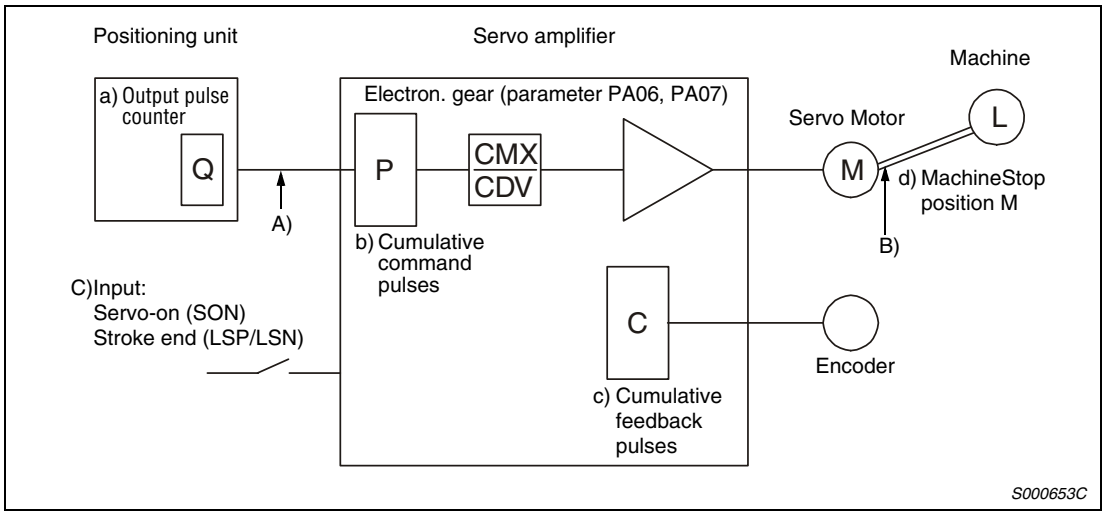


Fig. 8-1: *Block diagram*

When a position shift occurs, check:

a) output pulse counter,

b) cumulative command pulse display,

c) cumulative feedback pulse display and

d) machine stop position, see fig. 8-1.

A), B) and C) indicate position shift causes. For example, A) indicates that noise entered the wiring between positioning unit and servo amplifier, causing pulses to be mis-counted.

In a normal status without position shift, there are the following relationships:

1. Q = P (positioning unit's output counter servo amplifier's cumulative command pulses)
2. P x CMx (parameter PA06) / CDV (parameter PA07) = C
   C = (cumulative command pulses x electronic gear = cumulative feedback pulses)
3. When using parameter PA05 to set the number of pulses per servo motor one rotation the relationship is:

   P x 262144 / FBP (parameter PA05) = C
4. C x Δl = M (cumulative feedback pulses x travel per pulse = machine position)

Check for a position shift whether the above equations are met.

If equation 1 is not met, noise entered the pulse train signal wiring between positioning unit and servo amplifier, causing pulses to be miss-counted (cause A)).

Do the following checks or take the following measures:

- Check how the shielding is done.
- Change from the open collector system to the differential line driver system.
- Place the signal wiring away from the power circuit wiring.
- Install a data line filter.

If equation 2 is not met, the signals servo-on (SON) or forward/reverse rotation stroke end were switched off or the signals clear (CR) and reset (RES) were switched on during operation (cause C)). If a malfunction may occur due to much noise, increase the input filter setting (parameter PD19).

If equation 3 is not met, mechanical slip may be occurred between servo motor and machine (cause B)).

A Appendix

A.1 Additional information about the series MR-J3-A

A.1.1 Status Display

Name	Symbol	Display range	Unit	Description
Cumulative feedback pulses	c	−99999 to +99999	pulse	Feedback pulses from the servo motor encoder are counted and displayed. The value in excess of ±99999 is counted, but since the servo amplifier display is five digits, it shows the lower five digits of the actual value. Press the "SET" button to reset the display value to zero. The value of minus is indicated by the lit decimal points in the upper four digits.
Servo Motor speed	r	−7200 to +7200	1/min	The servo motor speed is displayed. The value rounded off is displayed in x 0.1 r/min.
Droop pulses	E	−99999 to +99999	pulse	The number of droop pulses in the deviation counter is displayed. When the servo motor is rotating in the reverse direction, the decimal points in the upper four digits are lit. The value in excess of ±99999 is counted. Since the servo amplifier display is five digits, it shows the lower five digits of the actual value. The number of pulses displayed is in the encoder pulse unit.
Cumulative command pulses	P	−99999 to +99999	pulse	The position command input pulses are counted and displayed. As the value displayed is not yet multiplied by the electronic gear (CMX/CDV), it may not match the indication of the cumulative feedback pulses. The value in excess of ±99999 is counted, but since the servo amplifier display is five digits, it shows the lower five digits of the actual value. Press the "SET" button to reset the display value to zero. When the servo motor is rotating in the reverse direction, the decimal points in the upper four digits are lit.
Command pulse frequency	n	−1500 to +1500	kpps	The frequency of the position command input pulses is displayed. The value displayed is not multiplied by the electronic gear (CMX/CDV).
Analog speed command voltage Analog speed limit voltage	F	−10.00 to +10.00	V	Torque control mode: Analog speed limit (VLA) voltage is displayed.
				Speed control mode: Analog speed command (VC) voltage is displayed.
Analog torque command voltage Analog torque limit voltage	U	0 to +10.00	V	Position control mode and speed control mode: Analog torque limit (TLA) voltage is displayed.
		−8.00 to +8.00	V	Torque control mode: Analog torque command (TC) voltage is displayed.
Regenerative load ratio	L	0 to 100	%	The ratio of regenerative power to permissible regenerative power is displayed in %.
Effective load ratio	J	0 to 300	%	The continuous effective load current is displayed. The effective value in the past 15 seconds is displayed relative to the rated current of 100 %.
Peak load ratio	b	0 to 400	%	The maximum torque generated during acceleration/deceleration, etc. The highest value in the past 15 seconds is displayed relative to the rated torque of 100 %.

Overview of values shown (1)

Name	Symbol	Display range	Unit	Description
Instantaneous torque	T	0 to 400	%	Torque that occurred instantaneously is displayed. The value of the torque that occurred is displayed in real time relative to the rate torque of 100 %.
Within one-revolution position low	Cy1	0 to 99999	pulse	Position within one revolution is displayed in encoder pulses. The value returns to 0 when it exceeds the maximum number of pulses. The value is incremented in the CCW direction of rotation.
Within one-revolution position high	Cy2	0 to 2621	pulse	The within one-revolution position is displayed in 100 pulse increments of the encoder. The value returns to 0 when it exceeds the maximum number of pulses. The value is incremented in the CCW direction of rotation.
ABS counter	LS	−32768 to +32767	rev	Travel value from the home position in the absolute position detection systems is displayed in terms of the absolute position detectors counter value.
Load inertia moment ratio	dC	0.0 to +300.0	0.1 times	The estimated ratio of the load inertia moment to the servo motor shaft inertia moment is displayed.
Bus voltage	Pn	0 to +900	V	The voltage (across P–N) of the main circuit converter is displayed.

Tab. A-0: *Overview of values shown (2)*

A.1.2 Basic setting parameters (PA□□)

No.	Symbol	Description	Control mode ②	Initial value	Unit	User setting
PA01	STY ①	Control mode	P S T	0000H	—	
PA02	REG ①	Regenerative option	P S T	0000H	—	
PA03	ABS ①	Absolute position detection system	P	0000H	—	
PA04	AOP1 ①	Function selection A-1	P S T	0000H	—	
PA05	FBP ①	Number of command input pulses per revolution	P	0	—	
PA06	CMx	Electronic gear numerator	P	1	—	
PA07	CDV	Electronic gear denominator	P	1	—	
PA08	ATU	Auto-tuning	P S	0001H	—	
PA09	RSP	Auto tuning response	P S	12	—	
PA10	INP	In-position range	P	100	pulse	
PA11	TLP	Forward torque limit	P S T	100.0	%	
PA12	TLN	Reverse torque limit	P S T	100.0	%	
PA13	PLSS ①	Command pulse input from	P	0000H	—	
PA14	POL ①	Rotation direction selection	P	0	—	
PA15	ENR ①	Encoder output pulses	P S T	4000	pulse/rev	
PA16	—	Manufacturer setting	—	0	—	
PA17	—		—	0000H	—	
PA18	—		—	0000H	—	
PA19	BLK ①	Parameter write inhibit (see section 7.2)	P S T	000BH	—	

Tab. A-1: *List of basic setting parameters*

① For the setting to become active, these parameters require the power supply to be switched off and switched on again after setting.

② The symbols in the column "control mode" column refers to the corresponding control function the parameter is effective:
P: Position control
S: Speed control
T: Torque control

A.1.3 Gain/filter parameters (PB□□)

No.	Symbol	Description	Control mode ②	Initial value	Unit	User setting
PB01	FILT	Adaptive tuning mode (Adaptive filter)	P S	0000H	—	
PB02	VRFT	Vibration suppression control filter tuning mode (Advanced vibration suppression control)	P	0000_H	—	
PB03	PST	Position command acceleration/deceleration time constant (Position smoothing)	P	0	ms	
PB04	FFC	Feed forward gain	P	0	%	
PB05	—	Manufacturer setting	—	500	—	
PB06	GD2	Ratio of load inertia moment to servo motor inertia moment	P S	7.0	times	
PB07	PG1	Model loop gain	P S	24	rad/s	
PB08	PG2	Position loop gain	P	37	rad/s	
PB09	VG2	Speed loop gain	P S	823	rad/s	
PB10	VIC	Speed integral compensation	P S	33.7	ms	
PB11	VDC	Speed differential compensation	S T	980	—	
PB12	—	Manufacturer setting parameter	—	0	—	
PB13	NH1	Machine resonance suppression filter 1	P S	4500	Hz	
PB14	NHQ1	Notch form selection 1	P S	0000H	—	
PB15	NH2	Machine resonance suppression filter 2	P S	4500	Hz	
PB16	NHQ2	Notch form selection 2	P S	0000H	—	
PB17	—	Automatic setting parameter	—	—	—	
PB18	LPF	Low-pass filter	P S	3141	rad/s	
PB19	VRF1	Vibration suppression control vibration frequency setting	P	100.0	Hz	
PB20	VRF2	Vibration suppression control resonance frequency setting	P	100.0	Hz	
PB21	—	Manufacturer setting	—	0.00	—	
PB22	—		—	0.00	—	
PB23	VFBF	Low-pass filter selection	P S	0000H	—	
PB24	MVS ①	Slight vibration suppression control selection	P	0000H	—	
PB25	BOP1 ①	Function selection B-1	P	0000H	—	
PB26	CDP ①	Gain changing selection	P S	0000H	—	
PB27	CDL	Gain changing condition	P S	10	—	
PB28	CDT	Gain changing time constant	P S	1	ms	
PB29	GD2B	Gain changing ratio of load inertia moment to servo motor inertia moment	P S	7.0	times	
PB30	PG2B	Gain changing position loop gain	P	37	rad/s	
PB31	VG2B	Gain changing speed loop gain	P S	823	rad/s	
PB32	VICB	Gain changing speed integral compensation	P S	33.7	ms	
PB33	VRF1B	Gain changing vibration suppression control vibration frequency setting	P	100.0	Hz	

Tab. A-2: *List of gain/filter parameters (1)*

No.	Symbol	Description	Control mode ②	Initial value	Unit	User setting
PB34	VRF2B	Gain changing vibration suppression control resonance frequency setting	P	100.0	Hz	
PB35	—	Manufacturer setting	—	0.00	—	
PB36	—		—	0.00	—	
PB37	—		—	100	—	
PB38	—		—	0.00	—	
PB39	—		—	0.00	—	
PB40	—		—	0.00	—	
PB41	—		—	1125	—	
PB42	—		—	1125	—	
PB43	—		—	0004H	—	
PB44	—		—	0.00	—	
PB45	—		—	0000H	—	

Tab. A-2: *List of gain/filter parameters (2)*

① For the setting to become active, these parameters require the power supply to be switched off and switched on again after setting.

② The symbols in the column "control mode" column refers to the corresponding control function the parameter is effective:
P: Position control
S: Speed control
T: Torque control

A.1.4 Extension setting parameters (PC□□)

No.	Symbol	Description	Control mode ②	Initial value	Unit	User setting
PC01	STA	Acceleration time constant	S T	0	ms	
PC02	STB	Deceleration time constant	S T	0	ms	
PC03	STC	S-pattern acceleration/deceleration time constant	S T	0	ms	
PC04	TQC	Torque command time constant	T	0	ms	
PC05	SC1	Internal speed command 1	S	100	1/min	
		Internal speed limit 1	T			
PC06	SC2	Internal speed command 2	S	500	1/min	
		Internal speed limit 2	T			
PC07	SC3	Internal speed command 3	S	1000	1/min	
		Internal speed limit 3	T			
PC08	SC4	Internal speed command 4	S	200	1/min	
		Internal speed limit 4	T			
PC09	SC5	Internal speed command 5	S	300	1/min	
		Internal speed limit 5	T			
PC10	SC6	Internal speed command 6	S	500	1/min	
		Internal speed limit 6	T			
PC11	SC7	Internal speed command 7	S	800	1/min	
		Internal speed limit 7	T			
PC12	VCM	Analog speed command maximum speed	S	0	1/min	
		Analog speed limit maximum speed	T			
PC13	TLC	Analog torque command maximum output	T	100.0	%	
PC14	MOD1	Analog monitor output 1	P S T	0000H	—	
PC15	MOD2	Analog monitor output 2	P S T	0001H	—	
PC16	MBR	Electromagnetic brake sequence output	PST	100	ms	
PC17	ZSP	Zero speed	P S T	50	1/min	
PC18	BPS ①	Alarm history clear	P S T	0000H	—	
PC19	ENRS ①	Encoder output pulses selection	P S T	0000H	—	
PC20	SN0 ①	Station number setting	P S T	0	—	
PC21	SOP ①	Communication function selection	P S T	0000H	—	
PC22	COP1 ①	Function selection C-1	P S T	0000H	—	
PC23	COP2 ①	Function selection C-2	S T	0000H	—	
BC24	COP3 ①	Function selection C-3	P	0000H	—	
PC25	—	Manufacturer setting	—	0000H	—	
PC26	COP5 ①	Function selection C-5	—	0000H	—	
PC27	—	Manufacturer setting	—	0000H	—	
PC28	—		—	0000H	—	
PC29	—		—	0000H	—	
PC30	STA	Acceleration time constant 2	S T	0	ms	
PC31	STB	Deceleration time constant 2	S T	0	ms	

Tab. A-3: *List of extension setting parameters (1)*

No.	Symbol	Description	Control mode ②	Initial value	Unit	User setting
PC32	CMx	Command pulse multiplying factor numerator 2	P	1	—	
PC33	CMx	Command pulse multiplying factor numerator 3	P	1	—	
PC34	CMx	Command pulse multiplying factor numerator 4	P	1	—	
PC35	TD2	Internal torque limit 2	P S T	100.0	%	
PC36	DMD ①	Status display selection	P S T	0000H	—	
PC37	VCO	Analog speed command offset	S	0	mV	
		Analog speed limit offset	T			
PC38	TPO	Analog torque command offset	T	0	mV	
		Analog torque limit offset	S			
PC39	MO1	Analog monitor 1 offset	P S T	0	mV	
PC40	MO2	Analog monitor 2 offset	P S T	0	mV	
PC41	—	Manufacturer setting	—	0	—	
PC42	—		—	0	—	
PC43	—		—	0	—	
PC44	—		—	0	—	
PC45	—		—	0	—	
PC46	—		—	0	—	
PC47	—		—	0	—	
PC48	—		—	0	—	
PC49	—		—	0	—	
PC50	—		—	0	—	

Tab. A-3: *List of extension setting parameters (2)*

① For the setting to become active, these parameters require the power supply to be switched off and switched on again after setting.

② The symbols in the column "control mode" column refers to the corresponding control function the parameter is effective:
P: Position control
S: Speed control
T: Torque control

A.1.5 I/O setting parameters (PD□□)

No.	Symbol	Description	Control mode ②	Initial value	Unit	User setting
PD01	DIA1 ①	Input signal automatic ON selection 1	P S T	0000H	—	
PD02	—	Manufacturer setting	—	0000H	—	
PD03	DI1 ①	Input signal device selection 1 (CN1-15)	P S T	00020202H	—	
PD04	DI2 ①	Input signal device selection 2 (CN1-16)	P S T	00212100H	—	
PD05	DI3 ①	Input signal device selection 3 (CN1-17)	P S T	00070704H	—	
PD06	DI4 ①	Input signal device selections 4 (CN1-18)	P S T	00080805H	—	
PD07	DI5 ①	Input signal device selection 5 (CN1-19)	P S T	00030303H	—	
PD08	DI6 ①	Input signal device selection 6 (CN1-41)	P S T	00202006H	—	
PD09	—	Manufacturer setting	—	00000000H	—	
PD10	DI8 ①	Input signal device selection 8 (CN1-43)	P S T	00000A0AH	—	
PD11	DI9 ①	Input signal device selection 9 (CN1-44)	P S T	00000B0BH	—	
PD12	DI10 ①	Input signal device selection 10 (CN1-45)	P S T	00232323H	—	
PD13	DO1 ①	Output signal device selection 1 (CN1-22)	P S T	0004H	—	
PD14	DO2 ①	Output signal device selection 2 (CN1-23)	P S T	000CH	—	
PD15	DO3 ①	Output signal device selection 3 (CN1-24)	P S T	0004H	—	
PD16	DO4 ①	Output signal device selection 4 (CN1-25)	P S T	0007H	—	
PD17	—	Manufacturer setting	—	0003H	—	
PD18	DO6 ①	Output signal device selection 6 (CN1-49)	P S T	0002H	—	
PD19	DIF ①	Response level setting	P S T	0002H	—	
PD20	DOP1 ①	Function selection D-1	P S T	0000H	—	
PD21	—	Manufacturer setting	—	0000H	—	
PD22	DOP3 ①	Function selection D-3	P	0000H	—	
PD23	—	Manufacturer setting	—	0000H	—	
PD24	DOP5 ①	Function selection D-5	P S T	0000H	—	
PD25	—	Manufacturer setting	—	0	—	
PD26	—		—	0	—	
PD27	—		—	0	—	
PD28	—		—	0	—	
PD29	—		—	0	—	
PD30	—		—	0	—	

Tab. A-4: *List of I/O setting parameter*

① For the setting to become active, these parameters require the power supply to be switched off and switched on again after setting..

② The symbols in the column "control mode" column refers to the corresponding control function the parameter is effective:
P: Position control S: Speed control T: Torque control

A.2 Additional information about the series MR-J3-B

A.2.1 Status display

Display	Status	Description
	Initializing	• Power of the servo amplifier was switched on at the condition that the power of servo system controller is OFF. • The axis No. set to the servo system controller does not match the axis No. set with the rotary axis setting switch (SW1) of the servo amplifier. • A servo amplifier 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.
	Initializing	During initial setting for communication specifications.
	Initializing	Initial setting for communication specifications completed, and then it synchronized with servo system controller.
	Initializing	During initial parameter setting communication with servo system controller.
	Initializing	Exchange of motor and encoder data with the controller.
	Initializing	During initial signal data communication with servo system controller.
	Initializing completion	During the completion process for initial data communication with servo system controller.
	Initializing standby	The power supply of servo system controller is turned off during the power supply of servo amplifier is on.
① 	Ready OFF	The ready off signal from the servo system controller was received.
① 	Servo ON	The ready off signal from the servo system controller was received.
① 	Servo OFF	The ready off signal from the servo system controller was received.
② 	Alarm / warning	The alarm No./ warning No. that occurred is displayed. (Section 8.1.1)
	CPU error	CPU watchdog error has occurred.
③ 	Test operation mode ③	JOG operation, positioning operation, programmed operation, DO forced output.
①   		Motor-less operation

Tab. A-5: *Status display MR-J3-B*

① The characters "##" denote any of numerals 00 to 16. The meaning is listed in tab. A-6.

② The characters "✻✻" denote the warning No./ alarm No.

③ Requires the setup software "MR-Configurator".

#	Description
0	Test operation
1	Station 1
2	Station 2
3	Station 3
4	Station 4
5	Station 5
6	Station 6
7	Station 7
8	Station 8
9	Station 9
10	Station 10
11	Station 11
12	Station 12
13	Station 13
14	Station 14
15	Station 15
16	Station 16

Tab. A-6: *Meaning of the character "#"*

A.2.2 Basic setting parameters (PA□□)

No.	Symbol	Description	Initial value	Unit	User setting
PA01	—	Control mode	0000H	—	
PA02	REG ②	Regenerative option	0000H	—	
PA03	ABS ①	Absolute position detection system	0000H	—	
PA04	AOP1 ①	Function selection A-1	0000H	—	
PA05	—	Number of command input pulses per revolution	0	—	
PA06	—	Electronic gear numerator	1	—	
PA07	—	Electronic gear denominator	1	—	
PA08	ATU	Auto-tuning	0001H	—	
PA09	RSP	Auto tuning response	12	—	
PA10	INP	In-position range	100	pulse	
PA11	—	Forward torque limit	1000.0	%	
PA12	—	Reverse torque limit	1000.0	%	
PA13	—	Command pulse input from	0000H	—	
PA14	POL ①	Rotation direction selection	0	—	
PA15	ENR ①	Encoder output pulses	4000	pulse/rev	
PA16	—	Manufacturer setting	0	—	
PA17	—		0000H	—	
PA18	—		0000H	—	
PA19	BLK ①	Parameter write inhibit (see section 7.2)	000BH	—	

Tab. A-7: *List of basic setting parameters*

① For the setting to become active, these parameters require the power supply to be switched off and switched on again after setting or to reset the controller.

② For the setting to become active, these parameters require the power supply to be switched off and switched on again after setting.

A.2.3 Gain/filter parameters (PB□□)

No.	Symbol	Description	Initial value	Unit	User setting
PB01	FILT	Adaptive tuning mode (Adaptive filter)	0000H	—	
PB02	VRFT	Vibration suppression control filter tuning mode (advanced vibration suppression control)	0000H	—	
PB03	—	Manufacturer setting	0	—	
PB04	FFC	Feed forward gain	0	%	
PB05	—	Manufacturer setting	500	—	
PB06	GD2	Ratio of load inertia moment to servo motor inertia moment	7.0	times	
PB07	PG1	Model loop gain	24	rad/s	
PB08	PG2	Position loop gain	37	rad/s	
PB09	VG2	Speed loop gain	823	rad/s	
PB10	VIC	Speed integral compensation	33.7	ms	
PB11	VDC	Speed differential compensation	980	—	
PB12	—	Manufacturer setting	0	—	
PB13	NH1	Machine resonance suppression filter 1	4500	Hz	
PB14	NHQ1	Notch form selection 1	0000H	—	
PB15	NH2	Machine resonance suppression filter 2	4500	Hz	
PB16	NHQ2	Notch form selection 2	0000H	—	
PB17	—	Automatic setting parameter	0000	—	
PB18	LPF	Low-pass filter	3141	rad/s	
PB19	VRF1	Vibration suppression control vibration frequency setting	100.0	Hz	
PB20	VRF2	Vibration suppression control resonance frequency setting	100.0	Hz	
PB21	—	Manufacturer setting	0.00	—	
PB22	—		0.00	—	
PB23	VFBF	Low-pass filter selection	0000H	—	
PB24	MVS ①	Slight vibration suppression control selection	0000H	—	
PB25	—	Manufacturer setting	0000H	—	
PB26	CDP ①	Gain changing selection	0000H	—	
PB27	CDL	Gain changing condition	10	—	
PB28	CDT	Gain changing time constant	1	ms	
PB29	GD2B	Gain changing ratio of load inertia moment to servo motor inertia moment	7.0	times	
PB30	PG2B	Gain changing position loop gain	37	rad/s	
PB31	VG2B	Gain changing speed loop gain	823	rad/s	
PB32	VICB	Gain changing speed integral compensation	33.7	ms	
PB33	VRF1B	Gain changing vibration suppression control vibration frequency setting	100.0	Hz	
PB34	VRF2B	Gain changing vibration suppression control resonance frequency setting	100.0	Hz	

Tab. A-8: *List of gain/filter parameters (1)*

No.	Symbol	Description	Initial value	Unit	User setting
PB35	—	Manufacturer setting	0.00	—	
PB36	—		0.00	—	
PB37	—		0.00	—	
PB38	—		0.00	—	
PB39	—		0.00	—	
PB40	—		0.00	—	
PB41	—		1125	—	
PB42	—		1125	—	
PB43	—		0004H	—	
PB44	—		0.00	—	
PB45	—		0000H	—	

Tab. A-8: *List of gain/filter parameters (2)*

① For the setting to become active, these parameters require the power supply to be switched off and switched on again after setting or to reset the controller.

A.2.4 Extension setting parameters (PC□□)

No.	Symbol	Description	Initial value	Unit	User setting
PC01	ERZ ①	Error excessive alarm level	3	U	
PC02	MBR	Electromagnetic brake sequence output	0	ms	
PC03	ENRS ①	Encoder output pulses selection	0000H	—	
PC04	COP1 ②	Function selection C-1	0000H	—	
PC05	COP2 ②	Function selection C-2	0000H	—	
PC06	—	Manufacturer setting	0000H	—	
PC07	ZSP	Zero speed	50	1/min	
PC08	—	Manufacturer setting	0	—	
PC09	MOD1	Analog monitor 1 output	0000H	—	
PC10	MOD2	Analog monitor 2 output	0001H	—	
PC11	MO1	Analog monitor 1 offset	0	mV	
PC12	MO2	Analog monitor 2 offset	0	mV	
PC13	MOSDL	Analog monitor feedback position output standard data Low	0	pulse	
PC14	MOSDH	Analog monitor feedback position output standard data High	0	10000 pulse	
PC15	—	Manufacturer setting	0	—	
PC16	—		0000H	—	
PC17	COP4 ②	Function selection C-4	0000H	—	
PC18	—	Manufacturer setting	0000H	—	
PC19	—		0000H	—	
PC20	—		0000H	—	
PC21	BPS ①	Alarm history clear	0000H	—	
PC22	—	Manufacturer setting	0000H	—	
PC23	—		0000H	—	
BC24	—		0000H	—	
PC25	—		0000H	—	
PC26	—		0000H	—	
PC27	—		0000H	—	
PC28	—		0000H	—	
PC29	—		0000H	—	
PC30	—		0000H	—	
PC31	—		0000H	—	
PC32	—		0000H	—	

Tab. A-9: *List of extension setting parameters*

① For the setting to become active, these parameters require the power supply to be switched off and switched on again after setting or to reset the controller.

② For the setting to become active, these parameters require the power supply to be switched off and switched on again after setting.

A.2.5 I/O setting parameters (PD□□)

No.	Symbol	Description	Initial value	Unit	User setting
PD01	—	Manufacturer setting	0000H	—	
PD02	—		0000H	—	
PD03	—		0000H	—	
PD04	—		0000H	—	
PD05	—		0000H	—	
PD06	—		0000H	—	
PD07	DO1 ①	Output signal device selection 1 (pin CN3-13)	0005H	—	
PD08	DO2 ①	Output signal device selection 2 (pin CN3-9)	0004H	—	
PD09	DO3 ①	Output signal device selection 3 (pin CN3-15)	0003H	—	
PD10	—	Manufacturer setting	0000H	—	
PD11	—		0004H	—	
PD12	—		0000H	—	
PD13	—		0000H	—	
PD14	DOP3 ①	Function selection D-3	0000H	—	
PD15	—	Manufacturer setting	0000H	—	
PD16	—		0000H	—	
PD17	—		0000H	—	
PD18	—		0000H	—	
PD19	—		0000H	—	
PD20	—		0000H	—	
PD21	—		0000H	—	
PD22	—		0000H	—	
PD23	—		0000H	—	
BC24	—		0000H	—	
PD25	—		0000H	—	
PD26	—		0000H	—	
PD27	—		0000H	—	
PD28	—		0000H	—	
PD29	—		0000H	—	
PD30	—		0000H	—	
PD31	—		0000H	—	
PD32	—		0000H	—	

Tab. A-10: *List of I/O setting parameters*

① For the setting to become active, these parameters require the power supply to be switched off and switched on again after setting or to reset the controller.

NOTE

This beginners manual is based on the instruction manuals of the servo amplifier series MR-J3-A and MR-J3-B. For further functions which are not described in this manual or further questions, please refer to the following manuals:

SH(NA)030038: Instruction Manual Model MR-J3-□A Servo Amplifier
SH(NA)030051: Instruction Manual Model MR-J3-□B Servo Amplifier

These manuals are available free of charge through the internet (www.mitsubishi-automation.com).

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