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 Produced by : - CTC  
 Travellers Lane, Hatfield, Herts, AL10 8XB, UK  
 Author: Matt Wills

## Databank - Technical Bulletin

**This Data Sheet covers the physical wiring & Installation of the MR-J310B to MR-J370B Servo Amplifier.**

### Servo Amp standard Specifications

Item		Servo Amplifier MR-J3-□													
		10B	20B	40B	70B	100B	200B	350B	500B	700B	10B1	20B1	40B1		
Power supply	Voltage/frequency	3-phase 200 to 230VAC, 50/60Hz or 1-phase 230VAC, 50/60Hz				3-phase 200 to 230VAC, 50/60Hz				1-phase 100V to 120VAC, 50/60Hz					
	Permissible voltage fluctuation	3-phase 200 to 230VAC: 170 to 253VAC 1-phase 230VAC: 207 to 253VAC				3-phase 170 to 253VAC				1-phase 85 to 132VAC					
	Permissible frequency fluctuation	Within ±5%													
	Power supply capacity	Refer to Section 10.2													
	Inrush current	Refer to Section 10.5													
Control circuit power supply	Voltage, frequency	1-phase 200 to 230VAC, 50/60Hz								1-phase 100 to 120VAC, 50/60Hz					
	Permissible voltage fluctuation	1-phase 170 to 253VAC								1-phase 85 to 132VAC					
	Permissible frequency fluctuation	Within ±5%													
	Input	30W				45W				30W					
	Inrush current	Refer to Section 11.5													
Interface power supply	Voltage, frequency	DC24V±10%													
	Power supply capacity	(Note 1) 150mA or more													
Control System	Sine-wave PWM control, current control system														
Dynamic brake	Built-in														
Protective functions	Overcurrent shut-off, regenerative overvoltage shut-off, overload shut-off (electronic thermal relay), servo motor overheat protection, encoder error protection, regenerative brake error protection, undervoltage, instantaneous power failure protection, overspeed protection, excessive error protection														
Structure	Self-cooled, open (IP00)				Force-cooling, open (IP00)				Self-cooled, open (IP00)						
Environment	Ambient temperature	During operation	[°C]	(Note 2) 0 to +55 (non-freezing)											
			[°F]	32 to +131 (non-freezing)											
		In storage	[°C]	-20 to +65 (non-freezing)											
			[°F]	-4 to +149 (non-freezing)											
	Ambient humidity	In operation	90%RH or less (non-condensing)												
		In storage													
	Ambient	Indoors (no direct sunlight) Free from corrosive gas, flammable gas, oil mist, dust and dirt													
	Altitude	Max. 1000m (3280ft) above sea level													
Vibration	5.9 [m/s <sup>2</sup> ] or less														
Mass	[kg]	0.8	0.8	1.0	1.4	1.4	2.3	2.3	4.6	6.2	0.8	0.8	1.0		
	[lb]	1.8	1.8	2.2	3.1	3.1	5.071	5.071	10.1	13.7	1.8	1.8	2.2		

Note 1. 150mA is the value applicable when all I/O signals are used. The current capacity can be decreased by reducing the number of I/O points.

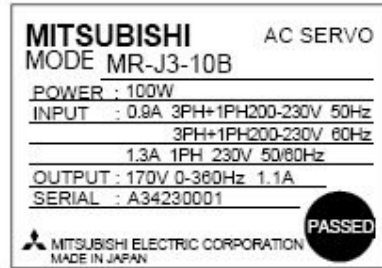
2. When mounting the servo amplifiers closely, operate them at the ambient temperatures of 0 to 45°C or at 75% or a smaller effective load ratio.

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### Model Code Definition

#### Rating Plate:



- Model
- Capacity
- Applicable power supply
- Rated output current
- Serial number

#### Model:

MR-J3-□□

Series

Power supply

Symbol	Power supply
None	3-phase 200 to 230VAC
(Note 1)	1-phase 230VAC
(Note 2)	1-phase 100 to 120VAC
1	

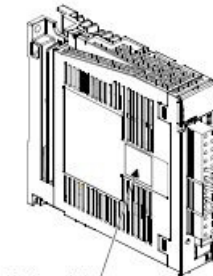
Note 1. 1-phase 230V is supported by the MR-J3-70B or less.  
 Note 2. No supplied to the servo amplifier of MR-J3-60B or more.

SSCNET III compatible

Rated output

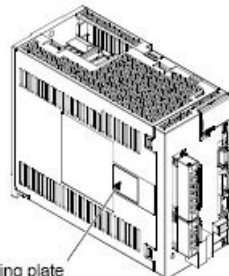
Symbol	Rated output [kW]
10	0.1
20	0.2
40	0.4
60	0.6
70	0.75
100	1
200	2
300	3.5
500	5
700	7

MR-J3-100B or less



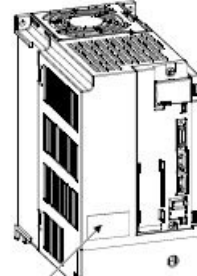
Rating plate

MR-J3-200B • 350B



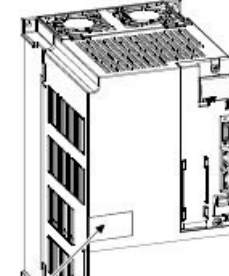
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MR-J3-500B



Rating plate

MR-J3-700B

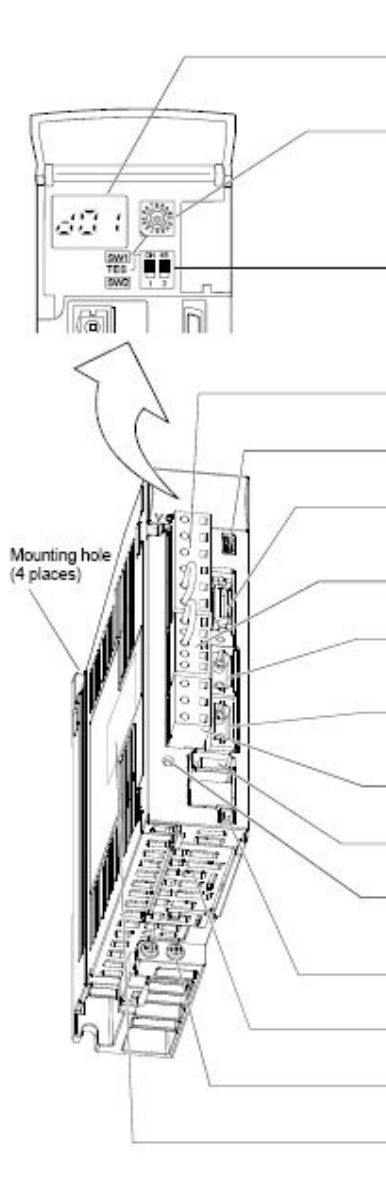



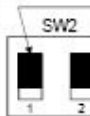
Rating plate

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**Parts Identification:**



Name/Application	Detailed Explanation
Display The 3-digit, seven-segment LED shows the servo status and alarm number.	Chapter 4
Rotary axis setting switch (SW1)  Used to set the axis No. of servo amplifier.	Section 3.13
Test operation select switch (SW2-1)  Used to perform the test operation mode by using MR Configurator (Setup software). Spare (Be sure to set to the "Down" position).	Section 3.13
Main circuit power supply connector (CNP1) Connect the input power supply.	Section 3.1 Section 3.3
USB communication connector (CN5) Connect with the personal computer.	Section 11.5
I/O signal connector (CN3) Used to connect digital I/O signals. More over an analog monitor is output	Section 3.2 Section 3.4
Control circuit connector (CNP2) Connect the control circuit power supply/regenerative brake option.	Section 3.1 Section 3.3
SSCNET III cable connector (CN1A) Used to connect the servo system controller or the front axis servo amplifier.	Section 3.2 Section 3.4
SSCNET III cable connector (CN1B) Used to connect the rear axis servo amplifier. For the final axis, puts a cap.	Section 3.2 Section 3.4
Motor power supply connector (CNP3) Connect the servo motor.	Section 3.1 Section 3.3
Encoder connector (CN2) Connector for connection of the servo motor encoder.	Section 3.4 Section 11.1
Charge lamp Lit to indicate that the main circuit is charged. While this lamp is lit, do not reconnect the cables.	
Battery connector (CN4) Used to connect the battery for absolute position data backup.	Section 11.6 Chapter 12
Battery holder Contains the battery for absolute position data backup.	Section 12.3
Protective earth (PE) terminal (⊕) Ground terminal.	Section 3.1 Section 3.3
Name plate	Section 1.5

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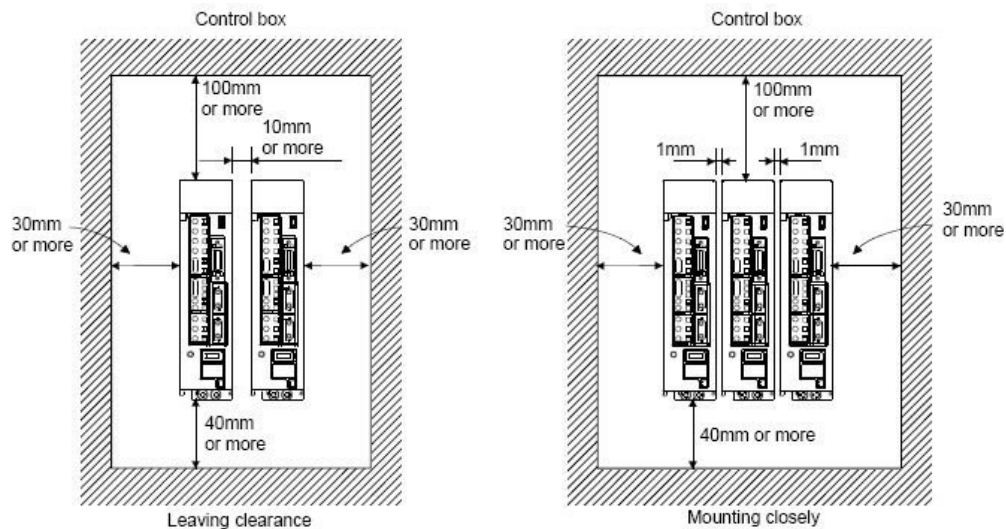
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### Installation

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


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

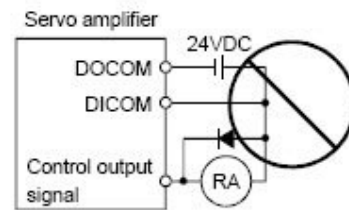
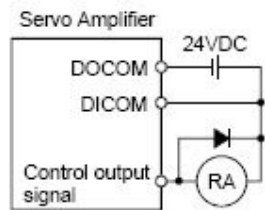
In this case, bring the ambient temperature within 0 to 45 , or use it at 75% or a smaller effective load ratio.



### Wiring

- Connect cables to correct terminals to prevent a burst, fault, etc.
- Ensure that polarity (+, -) is correct. Otherwise, a burst, damage, etc. may occur.
- The surge absorbing diode installed to the DC relay designed for control output should be fitted in the specified direction. Otherwise, the signal is not output due to a fault, disabling the forced stop (EM1) and other protective circuits.

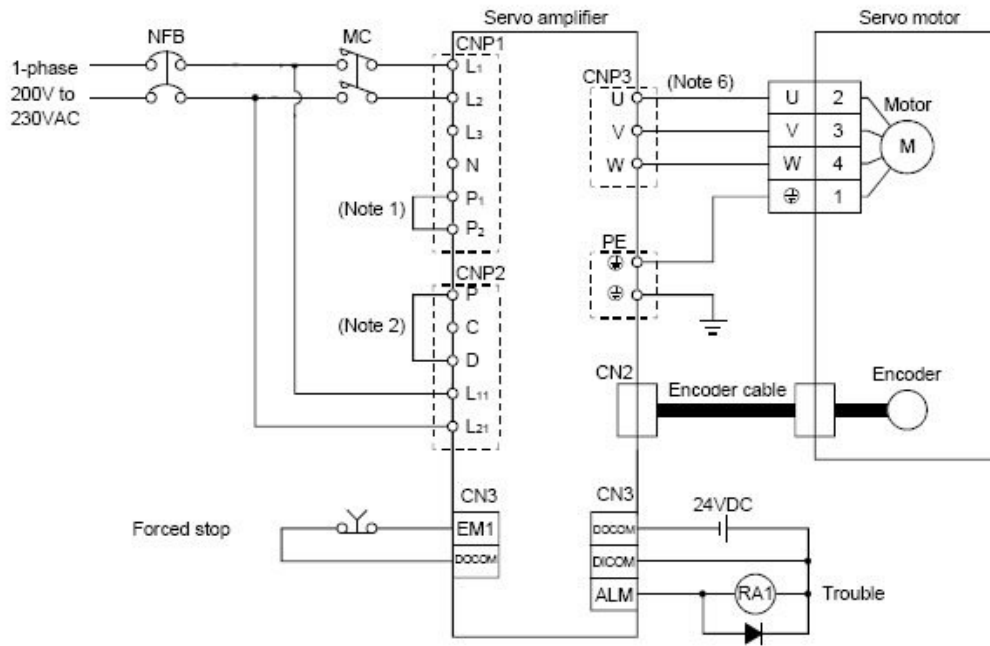
 CAUTION



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### Amplifier Power Circuit wiring:



**Note:**

1. Always connect P1-P2. (Factory-wired.) When using the power factor improving DC reactor
2. Always connect P-D. (Factory-wired.) When using the regenerative brake option

### Explanation of Power supply connections

Abbreviation	Connection Target (Application)	Description																				
L <sub>1</sub> L <sub>2</sub> L <sub>3</sub>	Main circuit power supply	Supply the following power to L <sub>1</sub> , L <sub>2</sub> , L <sub>3</sub> . For the 1-phase 230VAC power supply, connect the power supply to L <sub>1</sub> , L <sub>2</sub> , and keep L <sub>3</sub> open. <table border="1" style="margin: 10px auto;"> <thead> <tr> <th>Servo amplifier</th> <th>MR-J3-10B to 70B</th> <th>MR-J3-100B to 700B</th> <th>MR-J3-10B1 to 40B1</th> </tr> </thead> <tbody> <tr> <td>Power supply</td> <td></td> <td></td> <td></td> </tr> <tr> <td>3-phase 200 to 230VAC, 50/60Hz</td> <td>L<sub>1</sub> • L<sub>2</sub> • L<sub>3</sub></td> <td></td> <td></td> </tr> <tr> <td>1-phase 230VAC, 50/60Hz</td> <td>L<sub>1</sub> • L<sub>2</sub></td> <td></td> <td></td> </tr> <tr> <td>1-phase 100 to 120VAC, 50/60Hz</td> <td></td> <td></td> <td>L<sub>1</sub> • L<sub>2</sub></td> </tr> </tbody> </table>	Servo amplifier	MR-J3-10B to 70B	MR-J3-100B to 700B	MR-J3-10B1 to 40B1	Power supply				3-phase 200 to 230VAC, 50/60Hz	L <sub>1</sub> • L <sub>2</sub> • L <sub>3</sub>			1-phase 230VAC, 50/60Hz	L <sub>1</sub> • L <sub>2</sub>			1-phase 100 to 120VAC, 50/60Hz			L <sub>1</sub> • L <sub>2</sub>
Servo amplifier	MR-J3-10B to 70B	MR-J3-100B to 700B	MR-J3-10B1 to 40B1																			
Power supply																						
3-phase 200 to 230VAC, 50/60Hz	L <sub>1</sub> • L <sub>2</sub> • L <sub>3</sub>																					
1-phase 230VAC, 50/60Hz	L <sub>1</sub> • L <sub>2</sub>																					
1-phase 100 to 120VAC, 50/60Hz			L <sub>1</sub> • L <sub>2</sub>																			
P <sub>1</sub> P <sub>2</sub>	Power factor improving DC reactor	When not using the power factor improving DC reactor, connect P <sub>1</sub> -P <sub>2</sub> . (Factory-wired.) When using the power factor improving DC reactor, disconnect the wiring across P <sub>1</sub> -P <sub>2</sub> and connect the power factor improving DC reactor across P <sub>1</sub> -P <sub>2</sub> . (Refer to Section 11.10.)																				

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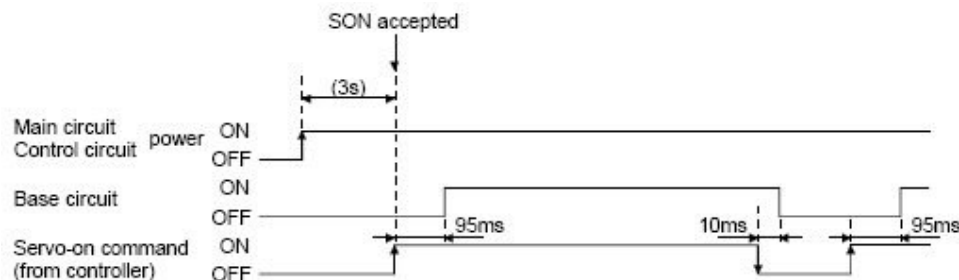
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P C D	Regenerative brake option	<p>1) MR-J3-350B or less                      When using servo amplifier built-in regenerative brake resistor, connect between P-D terminals. (Wired by default)                      When using regenerative brake option, disconnect between P-D terminals and connect regenerative brake option to P terminal and C terminal.</p> <p>2) MR-J3-500B, 700B                      MR-J3-500B and 700B do not have D terminal.                      When using servo amplifier built-in regenerative brake resistor, connect P terminal and C terminal. (Wired by default)                      When using regenerative brake option, disconnect P terminal and C terminal and connect regenerative brake option to P terminal and C terminal. (Refer to Section 11.2)</p>												
L11 L21	Control circuit power supply	<table border="1" style="margin: auto; border-collapse: collapse;"> <tr> <td style="text-align: center;">Servo amplifier</td> <td style="text-align: center;">MR-J3-10B to 700B</td> <td style="text-align: center;">MR-J3-10B1 to 40B1</td> </tr> <tr> <td style="text-align: center;">Power supply</td> <td style="text-align: center;">L11 • L21</td> <td style="text-align: center;">L11 • L21</td> </tr> <tr> <td style="text-align: center;">1-phase 200 to 230VAC, 50/60Hz</td> <td style="text-align: center;">L11 • L21</td> <td style="text-align: center;">L11 • L21</td> </tr> <tr> <td style="text-align: center;">1-phase 100 to 120VAC, 50/60Hz</td> <td style="text-align: center;">L11 • L21</td> <td style="text-align: center;">L11 • L21</td> </tr> </table>	Servo amplifier	MR-J3-10B to 700B	MR-J3-10B1 to 40B1	Power supply	L11 • L21	L11 • L21	1-phase 200 to 230VAC, 50/60Hz	L11 • L21	L11 • L21	1-phase 100 to 120VAC, 50/60Hz	L11 • L21	L11 • L21
Servo amplifier	MR-J3-10B to 700B	MR-J3-10B1 to 40B1												
Power supply	L11 • L21	L11 • L21												
1-phase 200 to 230VAC, 50/60Hz	L11 • L21	L11 • L21												
1-phase 100 to 120VAC, 50/60Hz	L11 • L21	L11 • L21												
U V W	Servo motor power	Connect to the servo motor power supply terminals (U, V, W).												
N	Return converter Brake unit	When using return converter/brake unit, connect to P terminal and N terminal. Do not connect to servo amplifier MR-J3-350B or less. For details, refer to Section 11.3, 11.4.												
⊕	Protective earth (PE)	Connect to the earth terminal of the servo motor and to the protective earth (PE) of the control box to perform grounding.												

### Power ON Sequence

- 1) Always wire the power supply as shown in above Section 3.1 using the magnetic contactor with the main circuit power supply (Single-phase 230V L1, L2). Configure up an external sequence to switch off the magnetic contactor as soon as an alarm occurs.
- 2) Switch on the control circuit power supply L11, L21 simultaneously with the main circuit power supply or before switching on the main circuit power supply. If the main circuit power supply is not on, the display shows the corresponding warning. However, by switching on the main circuit power supply, the warning disappears and the servo amplifier will operate properly.
- 3) The servo amplifier can accept the servo-on command within 3s the main circuit power supply is switched on.

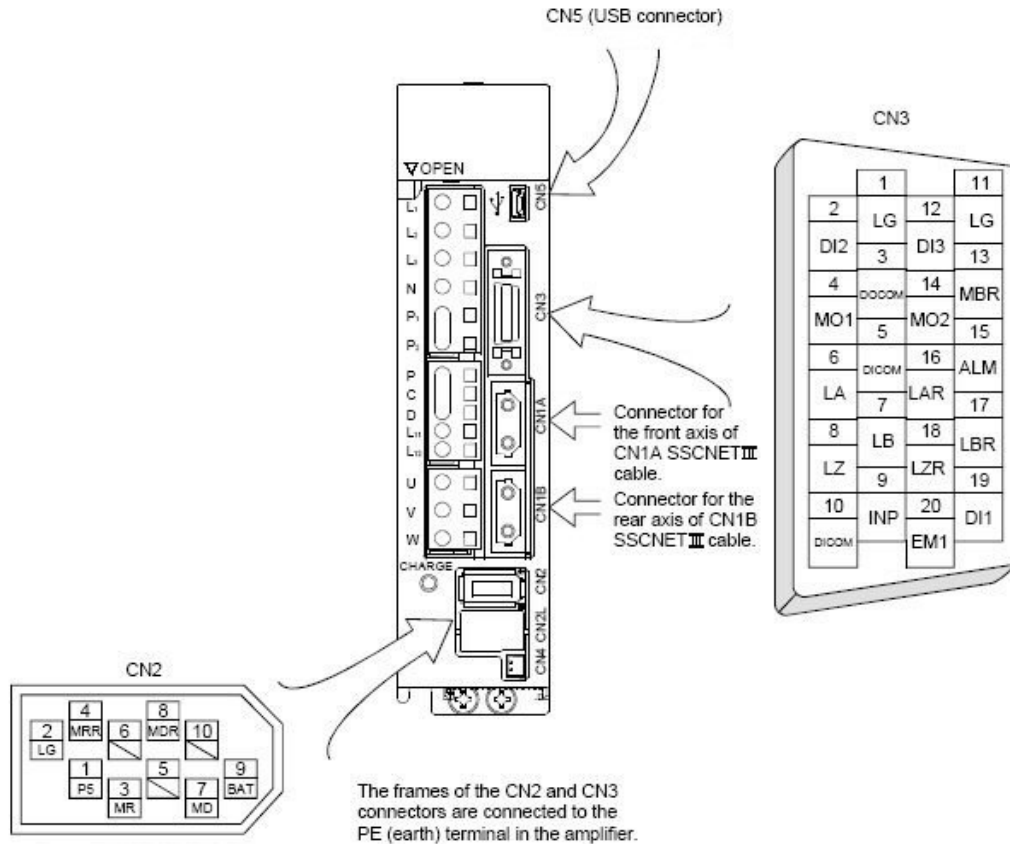
### Power ON Sequence Timing Chart:



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### Signals and Wiring



### Connectors:

Connector	Name	Function/Application
CN1A	Connector for bus cable from preceding axis.	Used for connection with the controller or preceding-axis servo amplifier.
CN1B	Connector for bus cable to next axis	Used for connection with the next-axis servo amplifier or for connection of the cap.
CN2	Encoder connector	Used for connection with the servo motor encoder.
CN4	Battery connection connector	When using as absolute position detection system, connect to battery (MR-J3BAT). For setting battery, make sure that charge lamp is off more than 15 minutes after main circuit power is switched off. Then, confirm that the voltage between P-N terminals in the tester or the like. Replace the battery with main circuit power OFF and with control circuit power ON. Replacing the battery with the control circuit power OFF results in losing absolute position data.
CN5	Communication connector	The personal computer is connected.

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### I/O Devices:

#### Input Devices

Device	Symbol	Connector Pin No.	Function/Application	I/O division
Forced stop	EM1	CN3-20	Turn EM1 off (open between commons) to bring the motor to an forced stop state, in which the base 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. When parameter No.PA.04 is set to "□1□□", automatically ON (always ON) can be set inside.	DI-1
	DI1	CN3-19	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 QD75MH. DI1: upper stroke limit (FLS) DI2: lower stroke limit (RLS) DI3: near-point dog (DOG)	DI-1
	DI2	CN3-2		DI-1
	DI3	CN3-12		DI-1

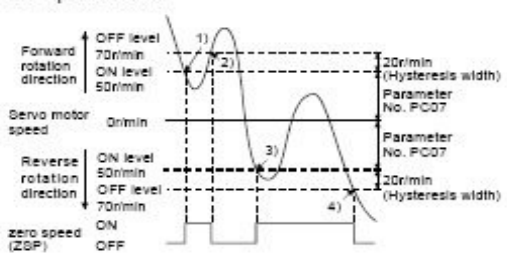
#### Output Devices

Device	Symbol	Connector Pin No.	Function/Application	I/O division
Trouble	ALM	CN3-15	ALM turns off when power is switched off or the protective circuit is activated to shut off the base circuit. Without alarm occurring, ALM turns on within about 1.5s after power-on.	DO-1
Electromagnetic brake interlock	MBR	CN3-13	When using this signal, set operation delay time of the electromagnetic brake in parameter No.PC02. In the servo-off or alarm status, MBR turns off.	DO-1
In-position (Positioning completed)	INP	CN3-9	INP turns on when the number of droop pulses is in the preset in-position range. The in-position range can be changed using parameter No. PA10. When the in-position range is increased, INP may be on conductive status during low-speed rotation. INP turns on when servo on turns on. This signal cannot be used in the speed loop mode.	DO-1
Ready	RD		When using the signal, make it usable by the setting of parameter No.PD07 to PD09. RD turns on when the servo is switched on and the servo amplifier is ready to operate.	DO-1

Device	Symbol	Connector Pin No.	Function/Application	I/O division
Speed reached	SA		When using this signal, make it usable by the setting of parameter No.PD07 to PD09. When the servo is off, SA will be turned OFF. When servo motor rotation speed becomes approximately setting speed, SA will be turned ON. When the preset speed is 20r/min or less, SA always turns on. This signal cannot be used in position loop mode.	DO-1
Limiting torque	TLC		When using this signal, make it usable by the setting of parameter No.PD07 to PD09. When torque is produced level of torque set with controller, TLC will be turned ON. When the servo is off, TLC will be turned OFF.	DO-1

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Zero speed	ZSP		<p>When using this signal, make it usable by the setting of parameter No.PD07 to PD09.                  When the servo is off, SA will be turned OFF.                  ZSP turns on when the servo motor speed is zero speed (50r/min) or less. Zero speed can be changed using parameter No. PC07.                  Example                  Zero speed is 50r/min</p>  <p>ZPS turns on 1) when the servo motor is decelerated to 50r/min, and ZPS turns off 2) when the servo motor is accelerated to 70r/min again.                  ZPS turns on 3) when the servo motor is decelerated again to -50r/min, and turns off 4) when the servo motor speed has reached -70r/min.                  The range from the point when the servo motor speed has reached ON level, and ZPS turns on, to the point when it is accelerated again and has reached OFF level is called hysteresis width.                  Hysteresis width is 20r/min for the MR-J3-B servo amplifier.</p>	DO-1
Warning	WNG		<p>When using this signal, make it usable by the setting of parameter No.PD07 to PD09.                  When warning has occurred, WNG turns on. When there is no warning, WNG turns off within about 1.5s after power-on.</p>	DO-1
Battery warning	BWNG		<p>When using this signal, make it usable by the setting of parameter No.PD07 to PD09.                  BWNG turns on when battery cable breakage warning (92) or battery warning (9F) has occurred.                  When there is no battery warning, BWNG turns off within about 1.5s after power-on.</p>	DO-1
Variable gain selection	CDPS		<p>When using this signal, make it usable by the setting of parameter No.PD07 to PD09.                  CDPS is on during variable gain.</p>	DO-1
Absolute position erasing	ABSV		<p>When using this signal, make it usable by the setting of parameter No.PD07 to PD09.                  ABSV turns on when the absolute position erased.                  This signal cannot be used in position loop mode.</p>	DO-1

Signal name	Symbol	Connector Pin No.	Function/Application
Encoder A-phase pulse (Differential line driver)	LA LAR	CN3-6 CN3-16	Outputs pulses per servo motor revolution set in parameter No. PA15 in the differential line driver system. In CCW rotation of the servo motor, the encoder B-phase pulse lags the encoder A-phase pulse by a phase angle of $\pi/2$ . The relationships between rotation direction and phase difference of the A- and B-phase pulses can be changed using parameter No. PC03.
Encoder B-phase pulse (Differential line driver)	LB LBR	CN3-7 CN3-17	Output pulse specification and dividing ratio setting can be set. (Refer to Section 5.1.9.)
Encoder Z-phase pulse (Differential line driver)	LZ LZR	CN3-8 CN3-18	Outputs the zero-point signal in the differential line driver system of the encoder. One pulse is output per servo motor revolution, turns on when the zero-point position is reached. The minimum pulse width is about 400 $\mu$ s. For home position return using this pulse, set the creep speed to 100r/min. or less.
Analog monitor 1	MO1	CN3-4	Used to output the data set in parameter No. PC09 to across MO1-LG in terms of voltage. Resolution 10 bits
Analog monitor 2	MO2	CN3-14	Used to output the data set in parameter No. PC10 to across MO2-LG in terms of voltage. Resolution 10 bits

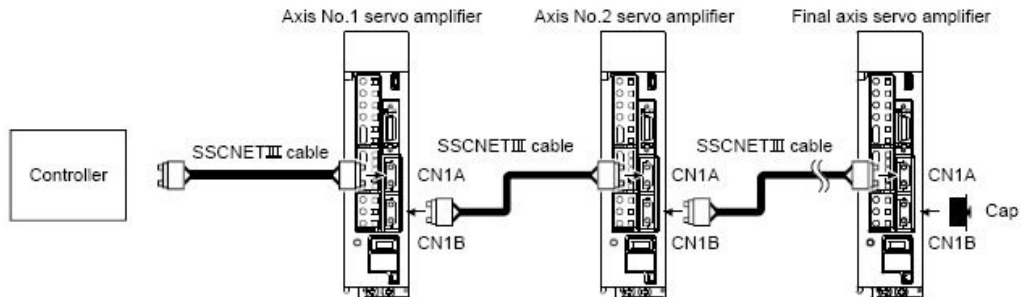
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### Power Supply

Signal name	Symbol	Connector Pin No.	Function/Application
Digital I/F power supply input	DICOM	CN3-5 CN3-10	Used to input 24VDC (150mA) for input interface. The power supply capacity changes depending on the number of I/O interface points to be used. Connect the positive terminal of the 24VDC external power supply. 24VDC±10% Pins are connected internally.
Digital I/F common	DOCOM	CN1-46 CN1-47	Connect $\ominus$ of DC24V external power supply. Common terminal for input signals such as EM1. Pins are connected internally. Separated from LG.
Monitor common	LG	CN3-1 CN3-11	Common terminal of M01 · M02 Pins are connected internally.
Shield	SD	Plate	Connect the external conductor of the shield cable.

### SSCNET III Cable Connection



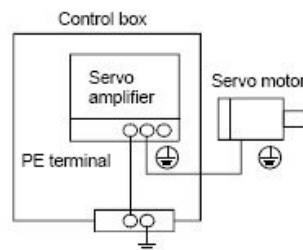
For CN1A connector of the first Axis, connect to the controller SSCNET III output.  
 For CN1B connector, connect the SSCNET III Cable to the next Axis CN1A.  
 For CN1A connector of subsequent Axis, connect to the CN1B connector of previous axis.  
 For CN1B connector of the final Axis, fit the Cap which was supplied with the amp.

#### Note:

The Cap is not a terminating device, but is to protect the light device from dust. For this reason do not remove the Cap until just before mounting the SSCNET III Cable.

### Connection of the Servo Amp and Servo Motor

- (1) For grounding, connect the earth cable of the servo motor to the protective earth (PE) terminal of the servo amplifier and connect the ground cable of the servo amplifier to the earth via the protective earth of the control box. Do not connect them directly to the protective earth of the control panel.

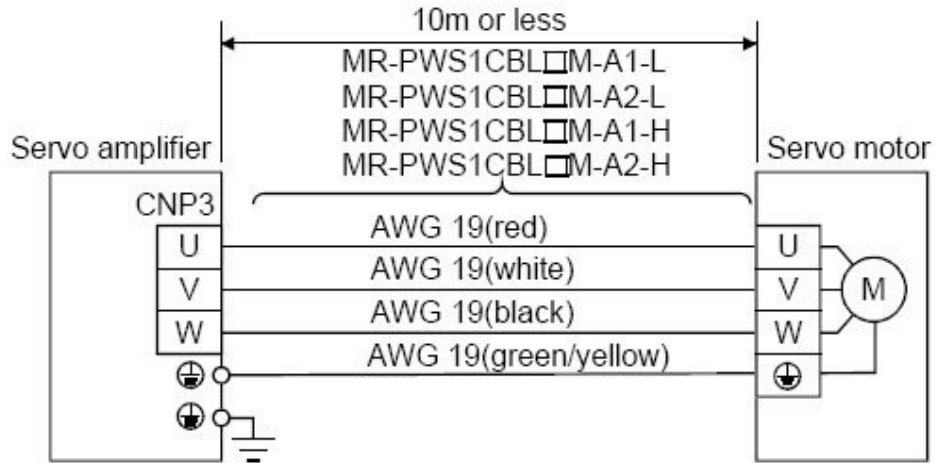


- (2) Do not share the 24VDC interface power supply between the interface and electromagnetic brake. Always use the power supply designed exclusively for the electromagnetic brake.

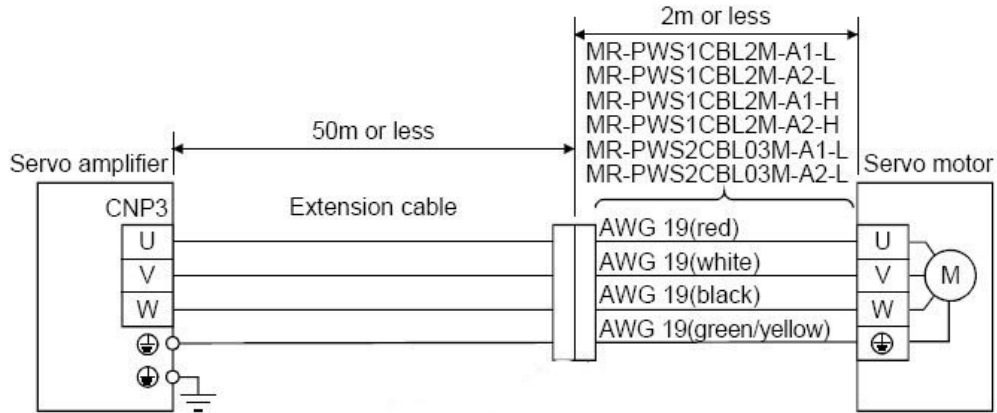
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**Motor Power Supply Wiring**

**HC-KP series (When cable length is 10m or less)**



**HC-KP series (When Cable length exceeds 10m)**



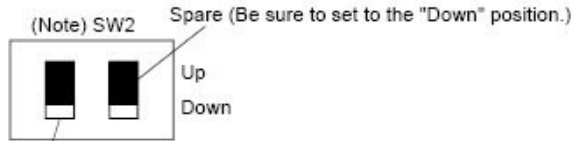
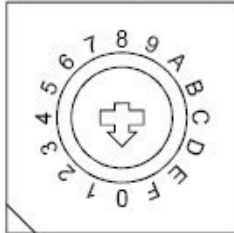
**Control Axis Selection**

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 cable connection sequence.

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Rotary axis setting switch (SW1)

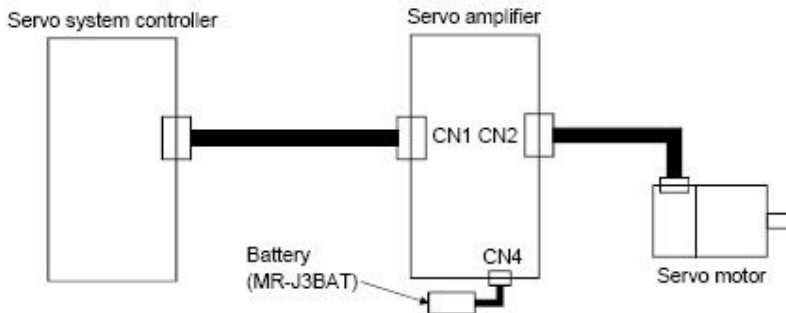


Test operation select switch (SW2-1)  
 Set the test operation select switch to the "Up" position, when performing the test operation mode by using MR Configurator (Servo configuration).

Note. This table indicates the status when the switch is set to "Down".  
 (Default)

Spare	Rotary axis setting switch (SW1)	Description	Display
Down (Be sure to set to the "Down" position.)	0	Axis No.1	01
	1	Axis NO.2	02
	2	Axis NO.3	03
	3	Axis NO.4	04
	4	Axis NO.5	05
	5	Axis NO.6	06
	6	Axis NO.7	07
	7	Axis NO.8	08
	8	Axis NO.9	09
	9	Axis NO.10	10
	A	Axis NO.11	11
	B	Axis NO.12	12
	C	Axis NO.13	13
	D	Axis NO.14	14
	E	Axis NO.15	15
	F	Axis NO.16	16

### Absolute Position Detection – Battery Installation



**Note:**


Replace the battery with only the Control Power Circuit ON. Removal of the battery with the control circuit power off will erase the absolute position Data.

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Item	Description
System	Electronic battery backup system
Battery	1 piece of lithium battery ( primary battery, nominal + 3.6V) Type: MR-J3BAT
Maximum revolution range	Home position ± 32767 rev.
(Note 1) Maximum speed at power failure	3000r/min
(Note 2) Battery backup time	Approx. 10,000 hours (battery life with power off)
Battery storage period	5 years from date of manufacture

Note 1. Maximum speed available when the shaft is rotated by external force at the time of power failure or the like.  
 2. Time to hold data by a battery with power off. It is recommended to replace the battery in three years independently of whether power is kept on or off.



**WARNING**

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

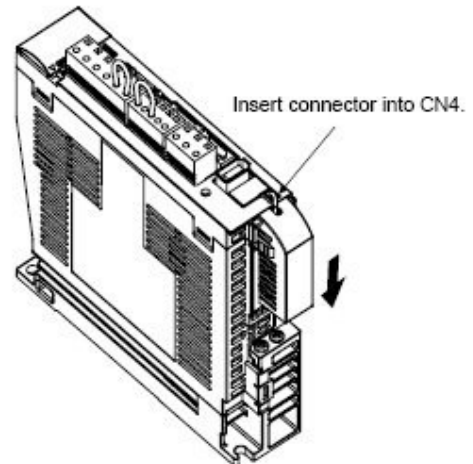
### (3) Parameter setting

Set "□□□1" in parameter No.PA03 to make the absolute position detection system valid.

Parameter No. PA03

□	□	□	1
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Absolute position detection system selection  
 0: Used in incremental system  
 1: Used in absolute position detection system

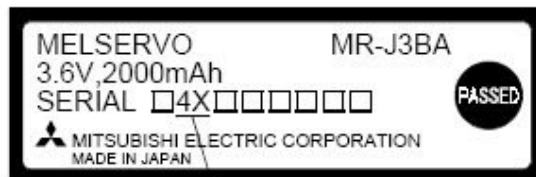


### Battery Serial and Date of Manufacture:

The year a month when the MR-J3BAT was manufactured is written down in the serial number on the name plate of the battery pack face.

The Year and month of manufacture is indicated by the last one digit of the year and for the month, 1-9 for Jan to Sept and X(10) for October, Y(11) for November and Z(12) for December.

Therefore for October 2004 the serial number is like: 4 X



The year and month of manufacture