

General-Purpose AC Servo

MITSUBISHI SERVO AMPLIFIERS & MOTORS  
**MELSERVO**

# EMC Installation Guidelines

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# 1. SUMMARY

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## 1. SUMMARY

We have carried out EMC standard compliance confirmation tests with the servo amplifier in the installation environment described in this manual. After incorporating the servo amplifier in the machine or equipment, confirm the EMC standard compliance of the entire machine or equipment on customer side.

For the EMC countermeasures, refer to this guideline or the instruction manual of the servo amplifier used.



## 2. EMC DIRECTIVE

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### 2. EMC DIRECTIVE

Mitsubishi general-purpose AC servo MELSERVO complies with products standard EN 61800-3. This directive largely regulates the following two withstand levels.

(1) Emission (EMI: Electromagnetic Interference)

Capacity to prevent output of obstructive noise that adversely affects external sources.

(2) Immunity (EMS: Electromagnetic Susceptibility)

Capacity to not malfunction due to obstructive noise from external source.

The details of each level are classified below.

Class	Name	Details	Products standard
Emission (EMI)	Radiated noise	Electromagnetic noise radiated through the air, etc.	EN 61800-3
	Conducted noise	Electromagnetic noise discharged from power supply line, etc.	
Immunity (EMS)	Electrostatic discharge immunity test IEC 61000-4-2	Noise from a charged human body, etc.	
	Radiated, radio-frequency, electromagnetic field immunity test IEC 61000-4-3	Electromagnetic noise from wireless transmitters or broadcasting companies, etc.	
	Electrical fast transient/burst immunity test IEC 61000-4-4	Relay noise or electromagnetic noise caused by live electricity being turned on or off, etc.	
	Immunity to conducted disturbances, induced by radio-frequency fields IEC 61000-4-6	Electromagnetic noise flowed from power supply wires or earthing wires, etc.	
	Power-frequency magnetic field immunity test IEC 61000-4-8	Electromagnetic noise of 50/60Hz power supply frequency, etc.	
	Voltage dips, short interruptions and voltage variations immunity tests IEC 61000-4-11	Power supply drop, etc.	
	Surge immunity test IEC 61000-4-5	Electromagnetic conducted noise discharged by thunder, etc.	



## 3. EMC COUNTERMEASURES

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### 3. EMC COUNTERMEASURES



**CAUTION** · The servo amplifier must be installed in the metal cabinet.

#### 3.1 Basic EMC countermeasures

Take the following measures firmly as EMC countermeasures.

- (1) Install the device in a sealed metal cabinet.
- (2) Install a noise filter.
- (3) Accurately earth the device.
- (4) Shield the cable and wire.
- (5) Separate the primary-side wiring and the secondary-side wiring as far as possible.
- (6) Install the surge protector. (Refer to section 4.6.)

#### 3.2 Cabinet design

The servo is a complex component incorporated into another machine. It must always be installed in a cabinet. The design of the cabinet is a very important factor for EMC countermeasures, so please take the following points into consideration.

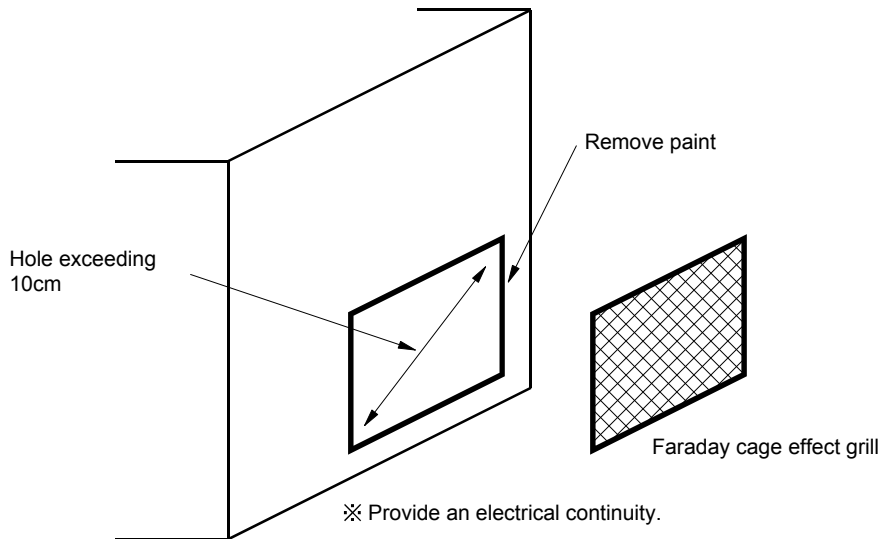
- (1) Use a metal cabinet.
- (2) Accurately earth the cabinet unit with a thick and short cable.



### 3. EMC COUNTERMEASURES

(3) Weld or screw close the joining sections of the cabinet's top plate and side plate. Keep the joining clearance to 10cm or less. The diameter of the openings on the cabinet such as the ventilation hole should be 10cm or less. If there are holes larger than this, plug them with metal plates or punched metal. In this case, such as when painted surfaces are to be connected, make sure that there is a good electrical connection to prevent antenna effect.

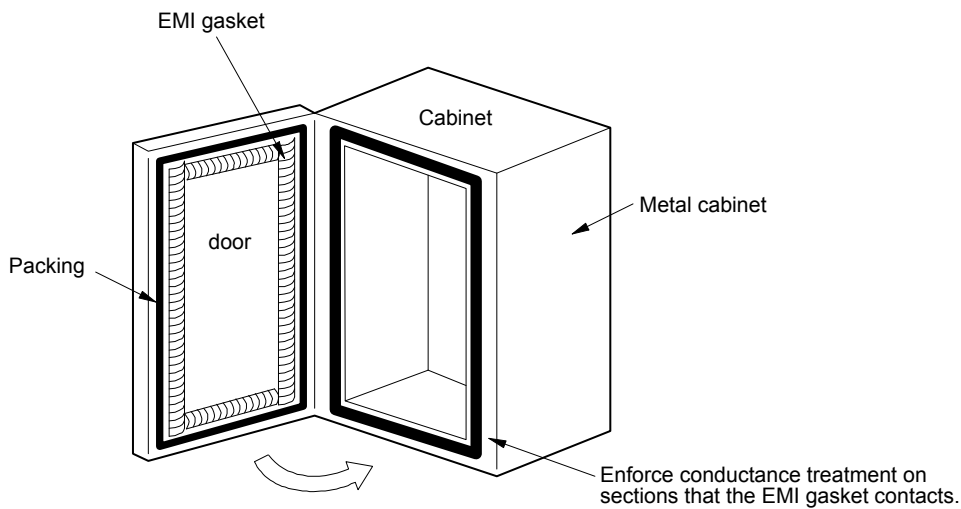
Example)



(4) The door of the cabinet must be accurately earthed with the cabinet. If the door earthing is insufficient, the door itself will act as a large antenna and will radiate noise.

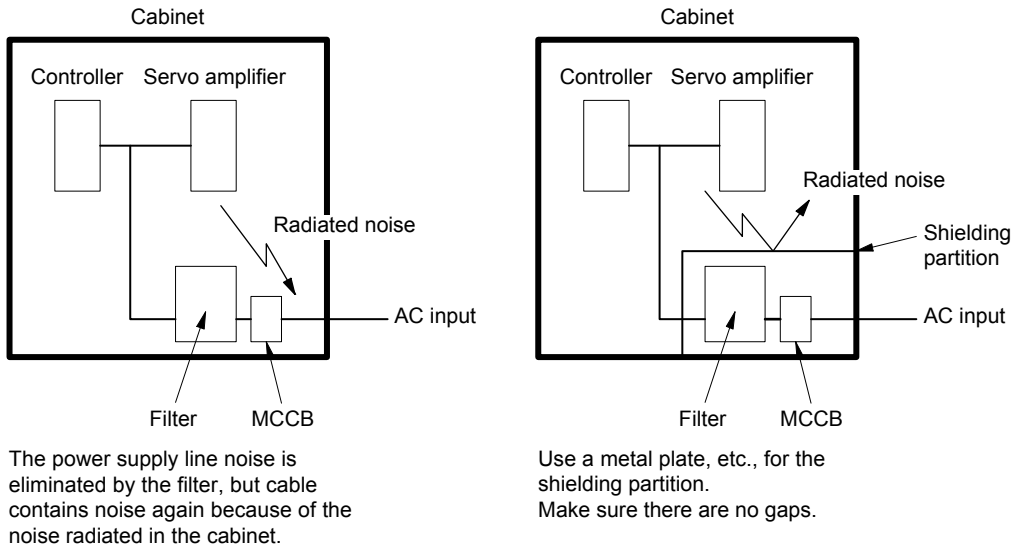
Take the following measures for this.

- 1) Use a metal door.
- 2) Connect the door and cabinet with thick braided wire at as many points as possible.
- 3) Use an EMI gasket or conductive packing for the contact between the door and cabinet.



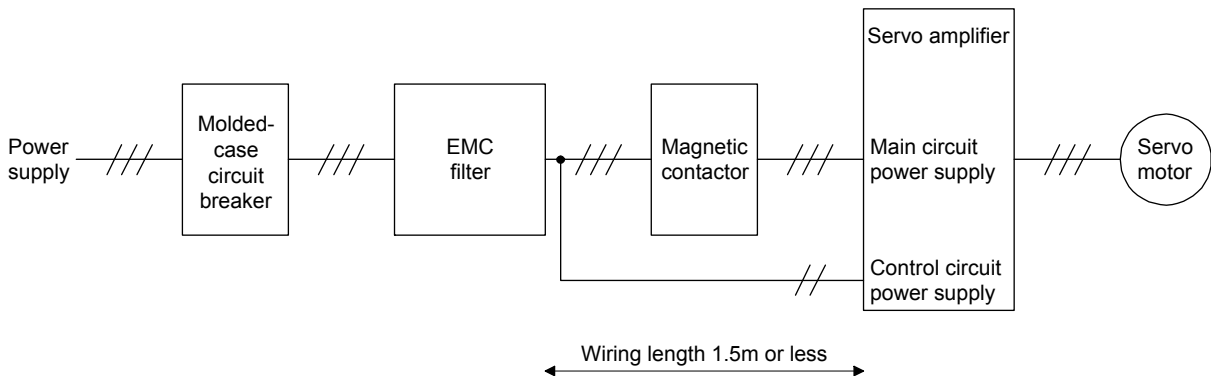
### 3. EMC COUNTERMEASURES

- (5) To take preventive measures against the noise of the input power source cable in the cabinet, install the shielding partition at nearby site where the power is input so that the input power cable does not receive harmful effects of the radiated noise.

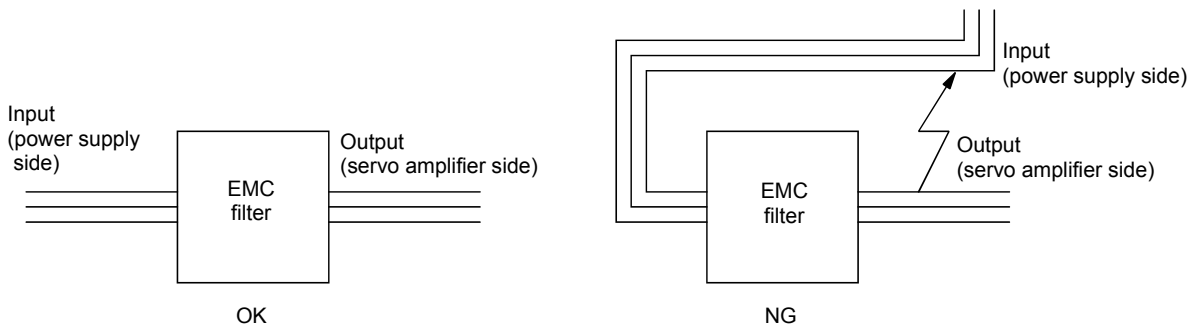


#### 3.3 Filter wiring and installation

- (1) Wire the servo and filter as shown below.



- (2) Arrange the EMC filter input cable and output cable as far apart as possible. If they are too close, the output line noise will be induced into the input cable, and effect of the filter will be lost. Separate these cables by at least 30cm or more.



The output side noise is induced to the input side.

### 3. EMC COUNTERMEASURES

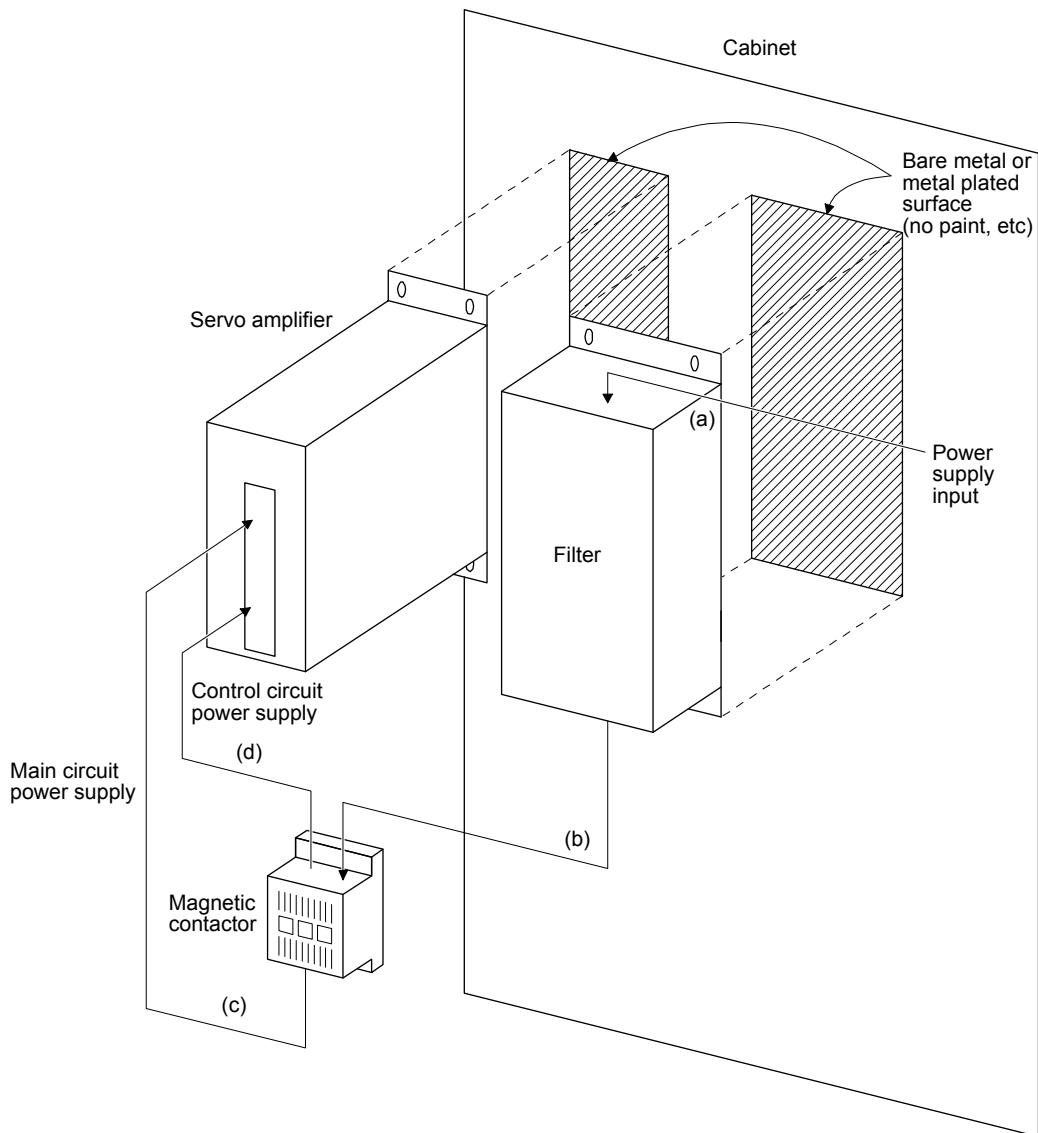
#### (3) Installation of filter.

The filter is installed on the right or left of the servo amplifier as shown below.

(For details of the EMC filter, refer to section 4.2.)

The surface inside the cabinet where the filter is to be installed must be bare metal or metal plated surface so that the rear surface of the filter electrically contacts the cabinet. Treat the surface where the servo amplifier is installed in the same manner. The filter input wire (a) must be kept as far apart from the output wires (b), (c) and (d). Keep the wiring ((b), (c), (d)) between the filter and servo amplifier as short as possible.

(The sum of (b) and (c) is 1.5m or less.)



### 3. EMC COUNTERMEASURES

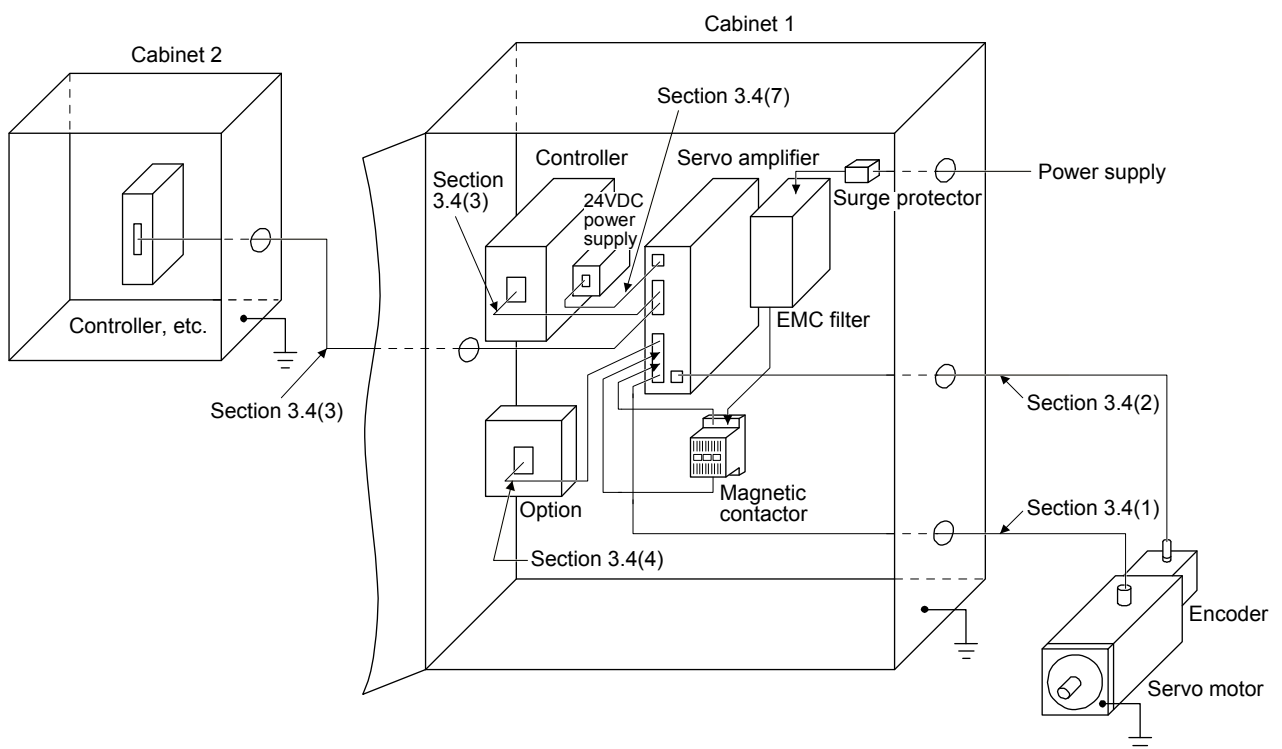
#### 3.4 Cable treatment

- (a) Securely earth the cabinets 1 and 2, and the servo motor.
- (b) Keep the main circuit power supply cable of the servo amplifier, power cable of the servo motor, and wire for the control circuit apart (30 cm or more). These cables must not be routed in close parallel or bundled.

The following drawing shows an example of the installation.

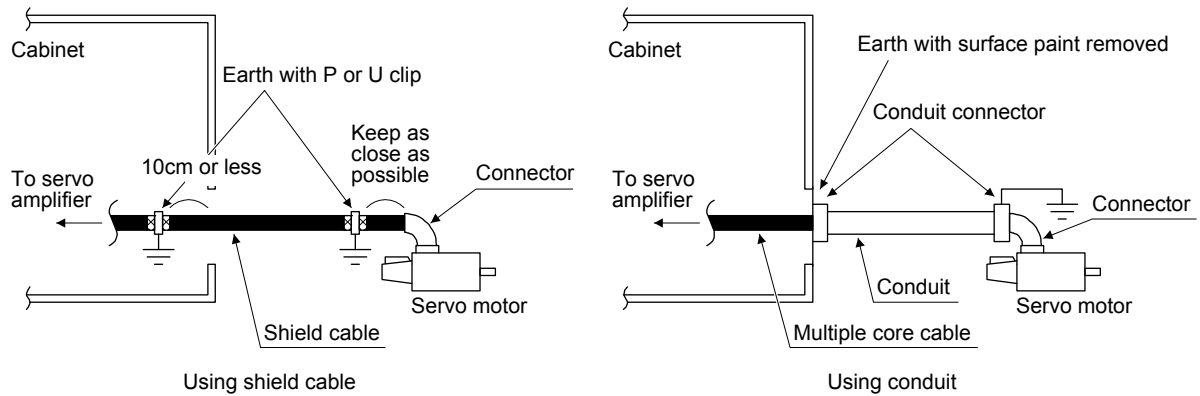
The methods for treating each cable are described separately.

(The numbers assigned to each cable in the drawing indicate section number of this manual where details are explained.)

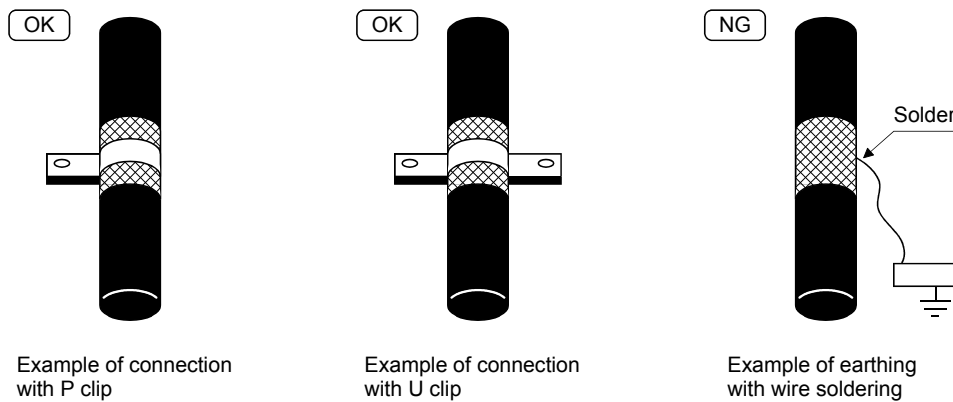


### 3. EMC COUNTERMEASURES

#### (1) Servo motor power cable



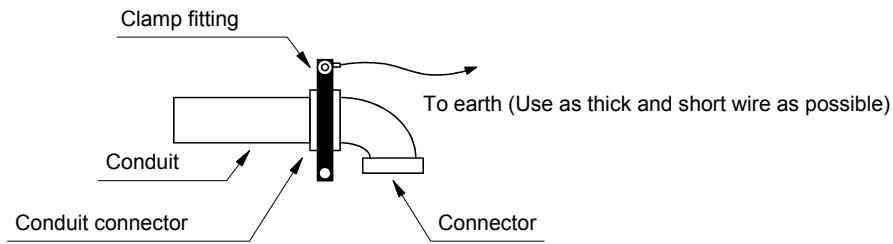
- 1) Use four wires (3-phase + earth), that is completely shielded and that has no breakage for the servo motor power cable. Connect the earth wire to the earth (⊕) terminal on the servo amplifier and servo motor.  
 ※Material of shield has to be copper.
- 2) Connect the shield of the cable to the earth on both the cabinet side and servo motor chassis side. Earth the shield on the servo amplifier side at a position 10cm or less from the cabinet.
- 3) Earth the shield with a metal P clip or U clip.
- 4) Directly earth the shield. Do not take a method of earthing with wire soldered onto the shield.



- 5) When not using a shield cable for the servo motor power cable, use a conventional multiple core cable. Put the cable into a metal conduit.
- 6) Earth the servo motor power cable on the cabinet side with the conduit connector and cabinet side wall. (Remove paint from the side wall of the cabinet.)

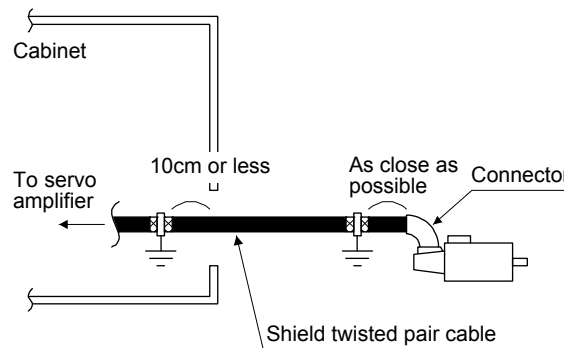
### 3. EMC COUNTERMEASURES

7) When grounding the servo motor power cable connected to the servo motor, take the following measure by fixing the cable clamp to the conduit connector shown in the following drawing.



8) Keep the cable length at 50m or less.

#### (2) Encoder cable

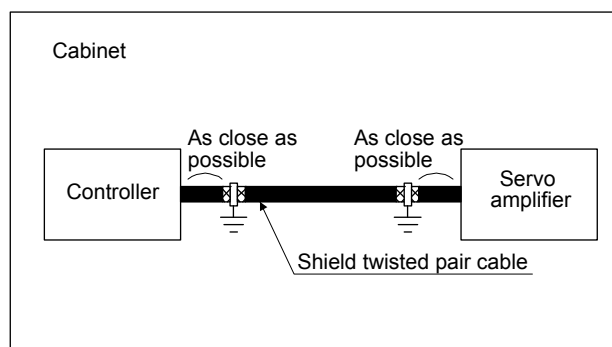


Use a shielded twisted pair cable, and earth on the servo amplifier and encoder side with a P clip or U clip. Keep the cable length at 50m or less.

#### (3) Controller connection (command) cable

1) If controller and servo amplifier are in the same cabinet

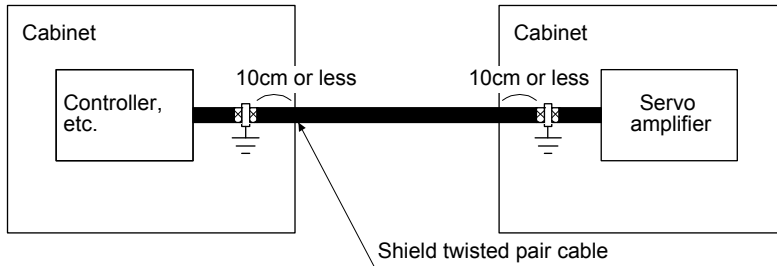
Use a shielded twisted pair cable, and earth on the controller and servo amplifier side with a P clip or U clip. If the cable length is 2m or less, the earthing can be done at one position on the controller side.



### 3. EMC COUNTERMEASURES

2) If controller, etc. is in the different cabinet from servo amplifier

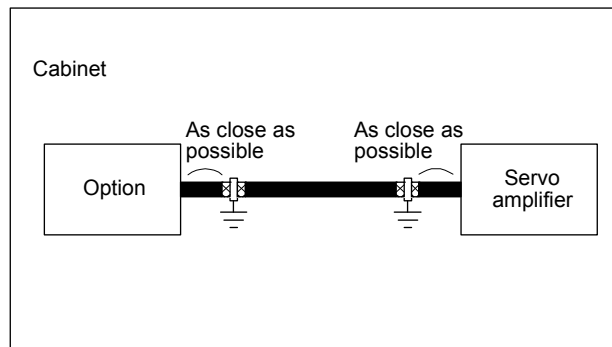
Use a shielded twisted pair cable and earth the shield on the controller, etc. and servo amplifier side with a P clip and U clip.



(4) Cable of the same cabinet

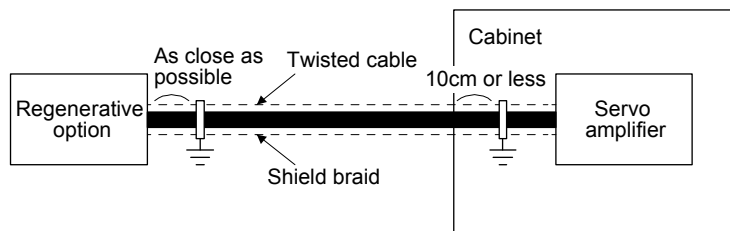
For the connection cables of the options such as the parameter unit or dynamic brake option, etc., arranged in the same cabinet as the servo amplifier, use a shielded cable (shielded twisted pair cable for parameter unit). Earth the shield on the option and servo amplifier side with a P clip or U clip.

If the cable length is 2m or less, the earthing can be done at one position on the servo amplifier side.



(5) Regenerative option connection cable

For the regenerative option cable, use a twisted cable with shield or a twisted cable covered with shield braid. Earth the shield on the option and servo amplifier with a P clip or U clip. The drawing shows the treatment for when the regenerative option is installed outside the cabinet.



(6) Input power supply cable

Use the conventional multiple core cable.

Using shielded input power cables increases the effect of EMC countermeasures.

(7) 24VDC cable (for servo amplifier)

Use a vinyl wire or multiple core cable.

## 4. EMC COUNTERMEASURE PARTS

### 4. EMC COUNTERMEASURE PARTS

This chapter explains parts used in EMC countermeasures. For details of the parts, contact the parts manufacturer.

#### 4.1 Noise filter (For controller power supply)

For the noise filter installed to the controller, refer to the manual of the controller used.

#### 4.2 EMC filter (For servo amplifier power supply)

<b>POINT</b>
<ul style="list-style-type: none"> <li>For connection with servo amplifiers, refer to each servo amplifier instruction manual.</li> </ul>

It is recommended to use the following filter. Some EMC filters are large in leakage current. Some EMC filters for servo amplifiers of special specifications (such as RJ, ED, PX, RU, and RZ) are also large in leakage current.

Select a molded-case circuit breaker in considering the increase of leakage current, so that the leakage current does not affect servo amplifiers, converter units and drive units.

Refer to instruction manuals of each product for the products other than series described in this section.

#### (1) Combination of 22kW or less servo amplifiers and filters

##### (a) For MR-J4 series

Servo amplifier	Recommended filter (SOSHIN Electric Co., Ltd)				Mass [kg](lb)
	Model	Rated current [A]	Rated voltage [VAC]	Leakage current [mA]	
MR-J4-10□ to MR-J4-100□ MR-J4W2-22B · MR-J4W3-222B	HF3010A-UN (Note)	10	250	5	3.5 (7.72)
MR-J4W2-44B	HF3010A-UN2 (Note)				
MR-J4-200□ · MR-J4-350□ MR-J4W2-77B · MR-J4W2-1010B MR-J4W3-444B	HF3030A-UN (Note)	30			
MR-J4-500□ · MR-J4-700□	HF3040A-UN (Note)	40	500	6.5	6 (13.23)
MR-J4-11K□ to MR-J4-22K□	HF3100A-UN (Note)	100		12 (26.46)	
MR-J4-60□4 · MR-J4-100□4	TF3005C-TX	5	500	5.5	6 (13.23)
MR-J4-200□4 to MR-J4-700□4	TF3020C-TX	20			
MR-J4-11K□4	TF3030C-TX	30			7.5 (16.54)
MR-J4-15K□4	TF3040C-TX	40			12.5 (27.56)
MR-J4-22K□4	TF3060C-TX	60			
MR-J4-10□1 to MR-J4-40□1	HF3010A-UN (Note)	10	250	5	3.5

Note. A surge protector is separately required to use any of these EMC filters. (Refer to section 4.6.)

##### (b) For MR-JN series

Servo amplifier	Recommended filter (SOSHIN Electric Co., Ltd)				Mass [kg](lb)
	Model	Rated current [A]	Rated voltage [VAC]	Leakage current [mA]	
MR-JN-10A(1) to MR-JN-20A(1) MR-JN-40A	HF3010A-UN (Note)	10	250	5	3.5 (7.72)

Note. A surge protector is separately required to use any of these EMC filters. (Refer to section 4.6.)



## 4. EMC COUNTERMEASURE PARTS

### (c) For MR-J3W series

Servo amplifier	Recommended filter (SOSHIN Electric Co., Ltd)				Mass [kg]([lb])
	Model	Rated current [A]	Rated voltage [VAC]	Leakage current [mA]	
MR-J3W-22B · MR-J3W-44B	HF3010A-UN (Note)	10	250	5	3.5 (7.72)
MR-J3W-77B · MR-J3W-1010B	HF3030A-UN (Note)	30			5.5 (12.13)

Note. A surge protector is separately required to use any of these EMC filters. (Refer to section 4.6.)

### (d) For MR-J3 series

Servo amplifier	Recommended filter (SOSHIN Electric Co., Ltd)				Mass [kg]([lb])
	Model	Rated current [A]	Rated voltage [VAC]	Leakage current [mA]	
MR-J3-10□ to MR-J3-100□ MR-J3-10□1 to MR-J3-40□1	HF3010A-UN (Note)	10	250	5	3.5 (7.72)
MR-J3-200□ · MR-J3-350□	HF3030A-UN (Note)	30			5.5 (12.13)
MR-J3-500□ · MR-J3-700□	HF3040A-UN (Note)	40		6.5	6.0 (13.23)
MR-J3-11K□ to MR-J3-22K□	HF3100A-UN (Note)	100			12 (26.46)
MR-J3-60□4 · MR-J3-100□4	TF3005C-TX	5	500	5.5	6.0 (13.23)
MR-J3-200□4 to MR-J3-700□4	TF3020C-TX	20			7.5 (16.54)
MR-J3-11K□4	TF3030C-TX	30			12.5 (27.56)
MR-J3-15K□4	TF3040C-TX	40			
MR-J3-22K□4	TF3060C-TX	60			

Note. A surge protector is separately required to use any of these EMC filters. (Refer to section 4.6.)

### (e) For MR-J2-Super series

Servo amplifier	Recommended filter (DEM Manufacturing Ltd.)				Mass [kg]([lb])
	Model	Rated current [A]	Rated voltage [VAC]	Leakage current [mA]	
MR-J2S-10□ to MR-J2S-100□ MR-J2S-10□1 to MR-J2S-40□1	SF1252	10.5	250	38	0.75 (1.65)
MR-J2S-200□ · MR-J2S-350□	SF1253	27.5		57	1.37 (3.02)

Servo amplifier	Recommended filter (SOSHIN Electric Co., Ltd)				Mass [kg]([lb])
	Model	Rated current [A]	Rated voltage [VAC]	Leakage current [mA]	
MR-J2S-500□	HF3040A-TM (Note)	40	250	1.5	5.5 (12.13)
MR-J2S-700□	HF3050A-TM (Note)	50			6.7 (14.77)
MR-J2S-11K□	HF3060A-TMA (Note)	60		3.0	10.0 (22.05)
MR-J2S-15K□	HF3080A-TMA (Note)	80			13.0 (28.66)
MR-J2S-22K□	HF3100A-TMA (Note)	100			14.5 (31.97)
MR-J2S-60□4 to MR-J2S-200□4	TF3005C-TX	5	500	5.5	6 (13.23)
MR-J2S-350□4 to MR-J2S-700□4	TF3020C-TX	20			7.5 (16.54)
MR-J2S-11K□4	TF3030C-TX	30			12.5 (27.56)
MR-J2S-15K□4	TF3040C-TX	40			
MR-J2S-22K□4	TF3060C-TX	60			

Note. A surge protector is separately required to use any of these EMC filters. (Refer to section 4.6)

## 4. EMC COUNTERMEASURE PARTS

### (2) Combination of 30kW or more converter unit, drive unit and filter

#### (a) For MR-J4 series

Converter unit	Drive unit	Recommended filter (SOSHIN Electric Co., Ltd)				Mass [kg] (lb)
		Model	Rated current [A]	Rated voltage [VAC]	Leakage current [mA]	
MR-CR55K	MR-J4-DU30K□ MR-J4-DU37K□	HF3200A-UN (Note)	200	250	9	18 (39.68)
MR-CR55K4	MR-J4-DU30K□4 MR-J4-DU37K□4 MR-J4-DU45K□4 MR-J4-DU55K□4	TF3150C-TX	150	500	5.5	31 (68.34)

Note. A surge protector is separately required to use any of these EMC filters. (Refer to section 4.6.)

#### (b) For MR-J3 series

Converter unit	Drive unit	Recommended filter (SOSHIN Electric Co., Ltd)				Mass [kg](lb)
		Model	Rated current [A]	Rated voltage [VAC]	Leakage current [mA]	
MR-J3-CR55K	MR-J3-DU30K□ MR-J3-DU37K□	HF3200A-UN (Note)	200	250	9	18 (39.68)
MR-J3-CR55K4	MR-J3-DU30K□4 to MR-J3-DU55K□4	TF3150C-TX	150	500	5.5	31 (68.34)

Note. A surge protector is separately required to use any of these EMC filters. (Refer to section 4.6.)

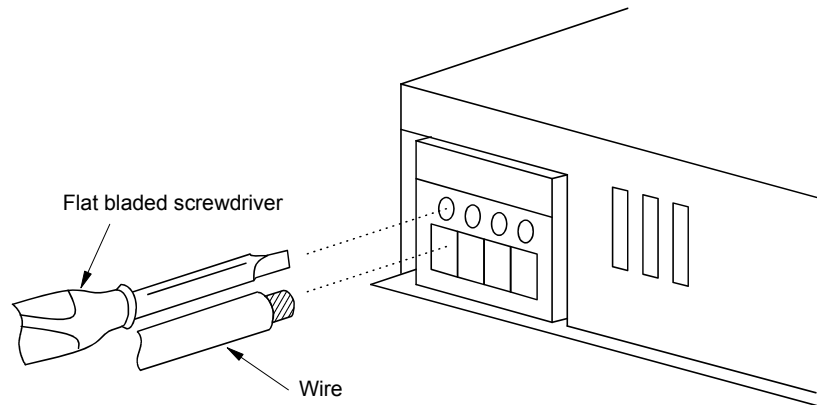
#### (c) For MR-J2-Super series

Converter unit	Drive unit	Recommended filter (SOSHIN Electric Co., Ltd)				Mass [kg](lb)
		Model	Rated current [A]	Rated voltage [VAC]	Leakage current [mA]	
MR-HP30KA	MR-J2S-30K□ MR-J2S-37K□	HF3200A-TMA (Note)	200	250	3	23.5 (51.81)
MR-HP55KA4	MR-J2S-30K□4 to MR-J2S-45K□4 MR-J2S-55K□4	TF3150C-TX	150	500	5.5	31 (68.34)

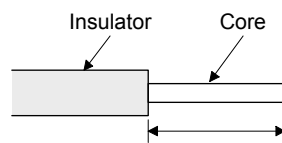
Note. A surge protector is separately required to use any of these EMC filters. (Refer to section 4.6.)

## 4. EMC COUNTERMEASURE PARTS

[SF1252, SF1253 wire connection method]



1) Peel the wire insulator.



9mm · · · Core length for SF1252  
14mm · · · Core length for SF1253

2) Insert the core of the cable into the opening, and tighten with the slotted screwdriver. In addition, connect the cables to the terminals of SF1252 or SF1253 in a one-to-one connection.

EMC filter	Screw size	Tightening torque
SF1252	2.5mm	0.598N · m
SF1253	3mm	0.794N · m

## 4. EMC COUNTERMEASURE PARTS

### 4.3 Ferrite core (Data line filter)

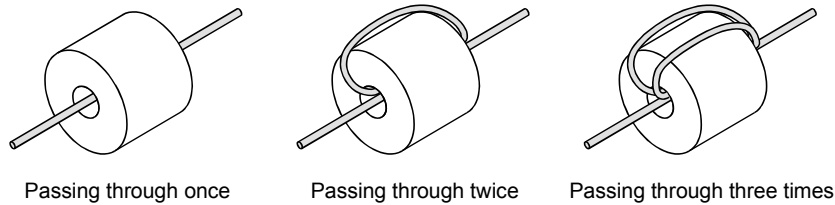
Noise can be prevented by installing a data line filter onto the cables connected to the servo amplifier. The data line filter in the following is one such example.

Model	(Note) Impedance ( $\Omega$ )	
ZCAT3035-1330	10 to 100MHz	100 to 500MHz
(Manufactured by TDK)	80	150

Note. The above values of impedance do not refer to the guaranteed values but the impedance values of the data line filter including those of the cable (measured reference values).

ESD-SR-250 by NEC TOKIN, E04SRM563218 by SEIWA ELECTRIC, etc. are also available.

[Usage example]

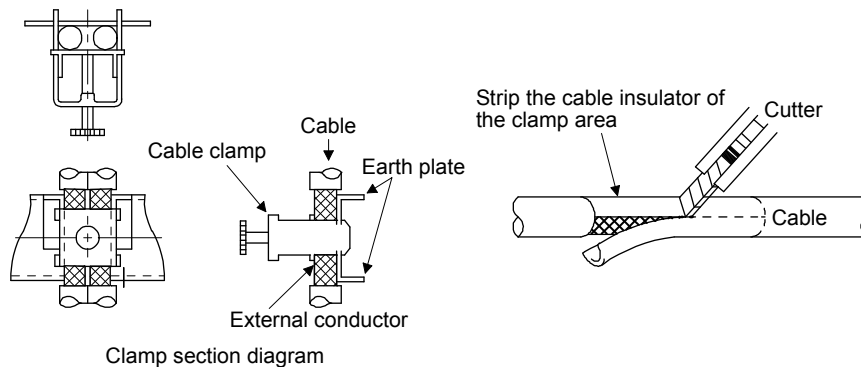


### 4.4 Shield clamp fitting

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

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

The clamp comes as a set with the earth plate.



Model	Accessory fittings
AERSBAN-DSET	2 cable cramps
AERSBAN-ESET	1 cable clamp

## 4. EMC COUNTERMEASURE PARTS

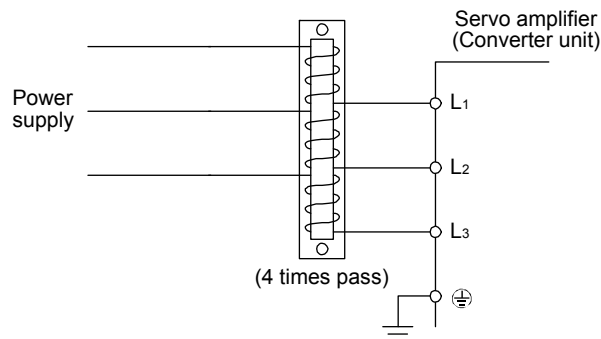
### 4.5 Line noise filter

The line noise filter is effective in suppressing noises radiated from the cables connected to the main circuit power in the servo amplifier (converter unit) and those connected to the servo amplifier power output, and also in suppressing high-frequency leakage current (zero-phase current) especially within 0.5MHz to 5MHz band.

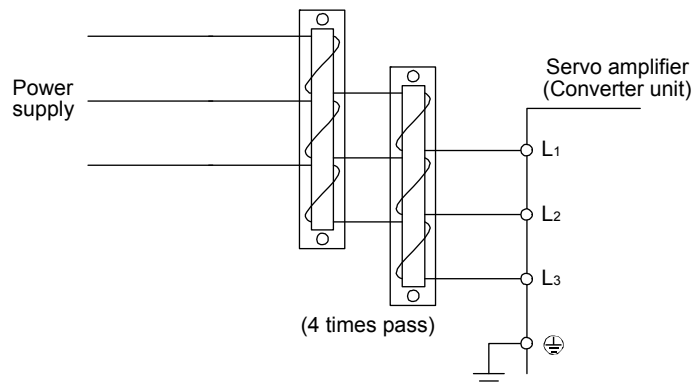
#### 4.5.1 Connection example

The line noise filters are used for the cables connected to (L<sub>1</sub>, L<sub>2</sub>, and L<sub>3</sub>) the main circuit power supply and for those connected to (U, V, and W) the servo amplifier power output. Pass each of 3-phase cables through line noise filters an equal number of times in the same direction.

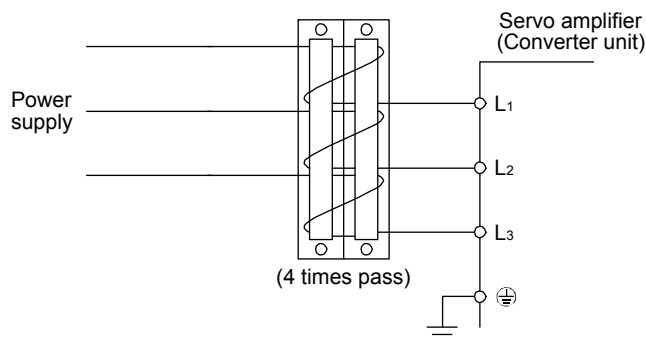
##### (1) For use of 1 line noise filter



##### (2) For use of 2 line noise filters separately

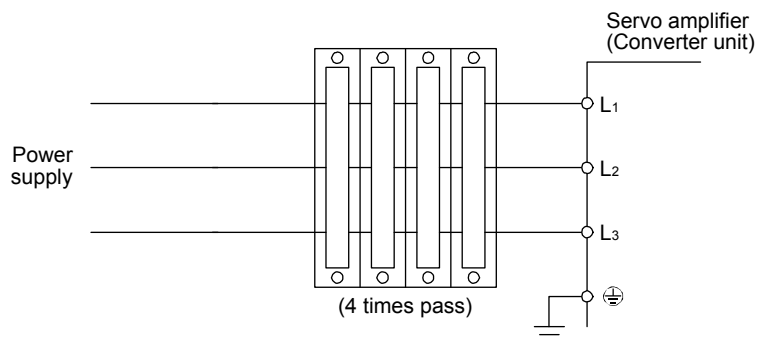


##### (3) For use of 2 line noise filters closely



## 4. EMC COUNTERMEASURE PARTS

(4) For use of 4 line noise filters closely



Use the following models of the line noise filter in accordance with the capacity of the servo amplifier, converter unit, and drive unit.

2kW or less : FR-BSF01 (for the wire size of 3.5mm<sup>2</sup> (AWG12) or less)

3.5kW or more: FR-BLF (for the wire size of 5.5mm<sup>2</sup> (AWG10) or less)

### 4.5.2 Precautions

- (1) When the line noise filter is used for the main circuit power side in the servo amplifier (converter unit), the effect of the filters is produced as the number of passes increases. The appropriate number of passage is four times.
- (2) When using the line noise filter for the cable connected to the servo amplifier power output, pass through four times or less.
- (3) Do not pass the earth wire through the line noise filter. Doing so may result in reducing the effect.
- (4) Place the line noise filter as close to the servo amplifier as possible so that the effect of suppressing noises can increase.
- (5) The line noise filter can be also used not only for the cables connected to the main circuit power supply in the servo amplifier (converter unit) or the cables connected to the servo amplifier power output but also the servo motor brake cable, encoder cable, and control signal cable. Pass through four times or less in this case. However, prevent the line noise filter from damaging the servo amplifier, converter unit, drive unit, and/or servo motor in considering the flexing life of the encoder cable.

## 4. EMC COUNTERMEASURE PARTS

### 4.6 Surge protector

<b>POINT</b>
<ul style="list-style-type: none"> <li>When you use a recommended EMC filter for a 400V class servo amplifier, the surge protector is not necessary.</li> </ul>

To prevent damage due to the applied surge to the AC power supply line (lightning, sparks, etc.), connect the following surge protector (Okaya Electric Industries) to the main circuit power supply (L<sub>1</sub>, L<sub>2</sub>, and L<sub>3</sub>).

#### (a) For MR-J4 series

Surge protector model	Max. continuous operating Voltage 50/60Hz	DC breakdown voltage	Voltage protection level	Normal discharge current 8/20 $\mu$ s	Max. discharge current 8/20 $\mu$ s	Surge current life 8/20 $\mu$ s-1000A
RSPD-250-U4	3AC 250V	700V $\pm$ 25%	1300V	2500A	5000A	Approx. 300 times

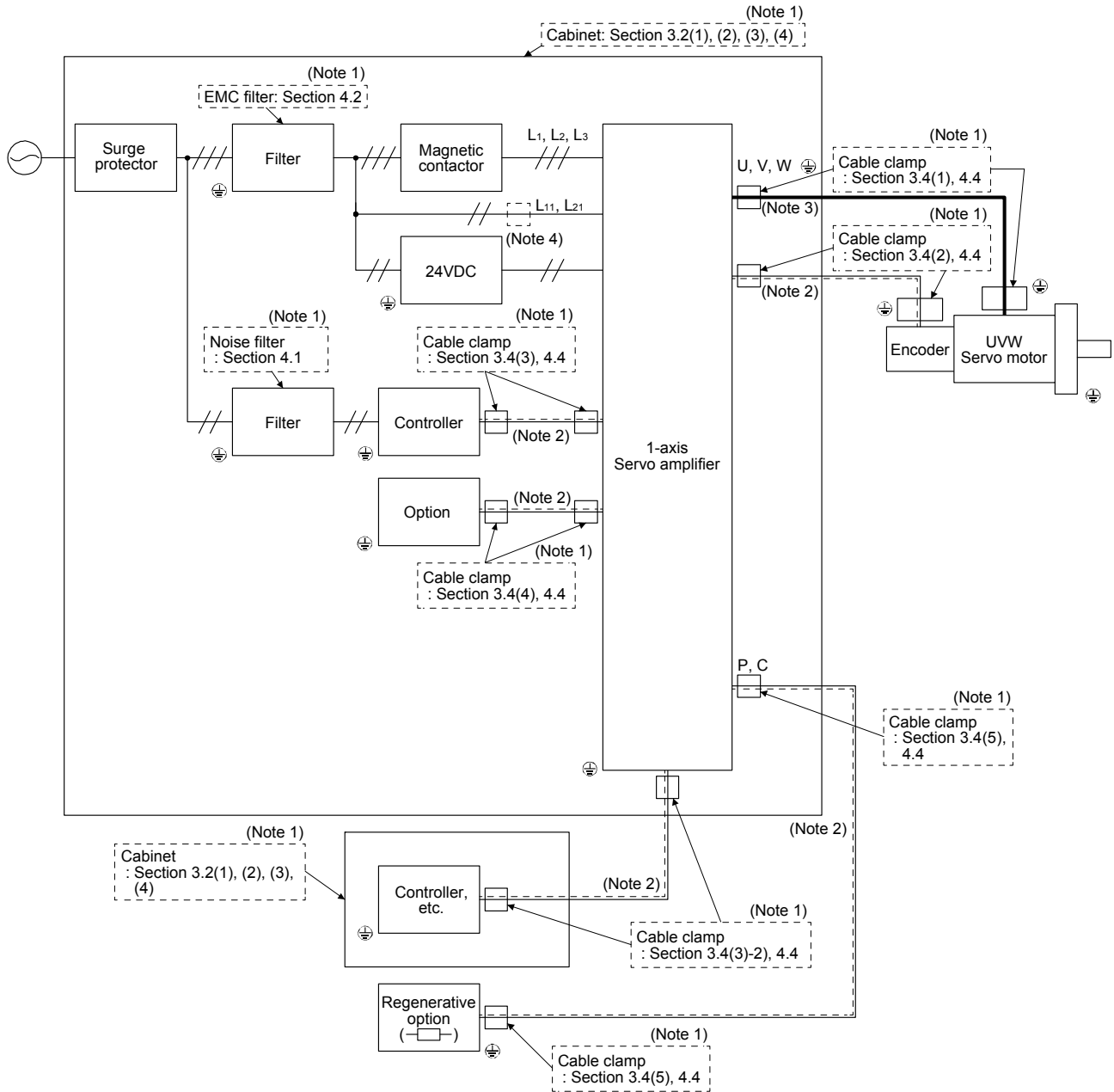
#### (b) For MR-JN · MR-J3W · MR-J3 · MR-J2-Super series

Surge protector model	Circuit voltage 50/60Hz	Maximum allowable circuit voltage	Clamp voltage	Surge immunity 8/20 $\mu$ s	Surge compression 1.2/50 $\mu$ s	Static capacity
RAV-781BYZ-2	3AC 250V	300V	783V $\pm$ 10%	2500A	20kV	75pF
RAV-781BXZ-4	3AC 250V	300V	1700V $\pm$ 10%	2500A	2kV	75pF

# 5. CONNECTION EXAMPLE FOR EMC COUNTERMEASURES

## 5. CONNECTION EXAMPLE FOR EMC COUNTERMEASURES

### 5.1 For 22kW or less of 1-axis



Note 1. Specific EMC countermeasures are shown as  

2. Shielded cables are shown as  

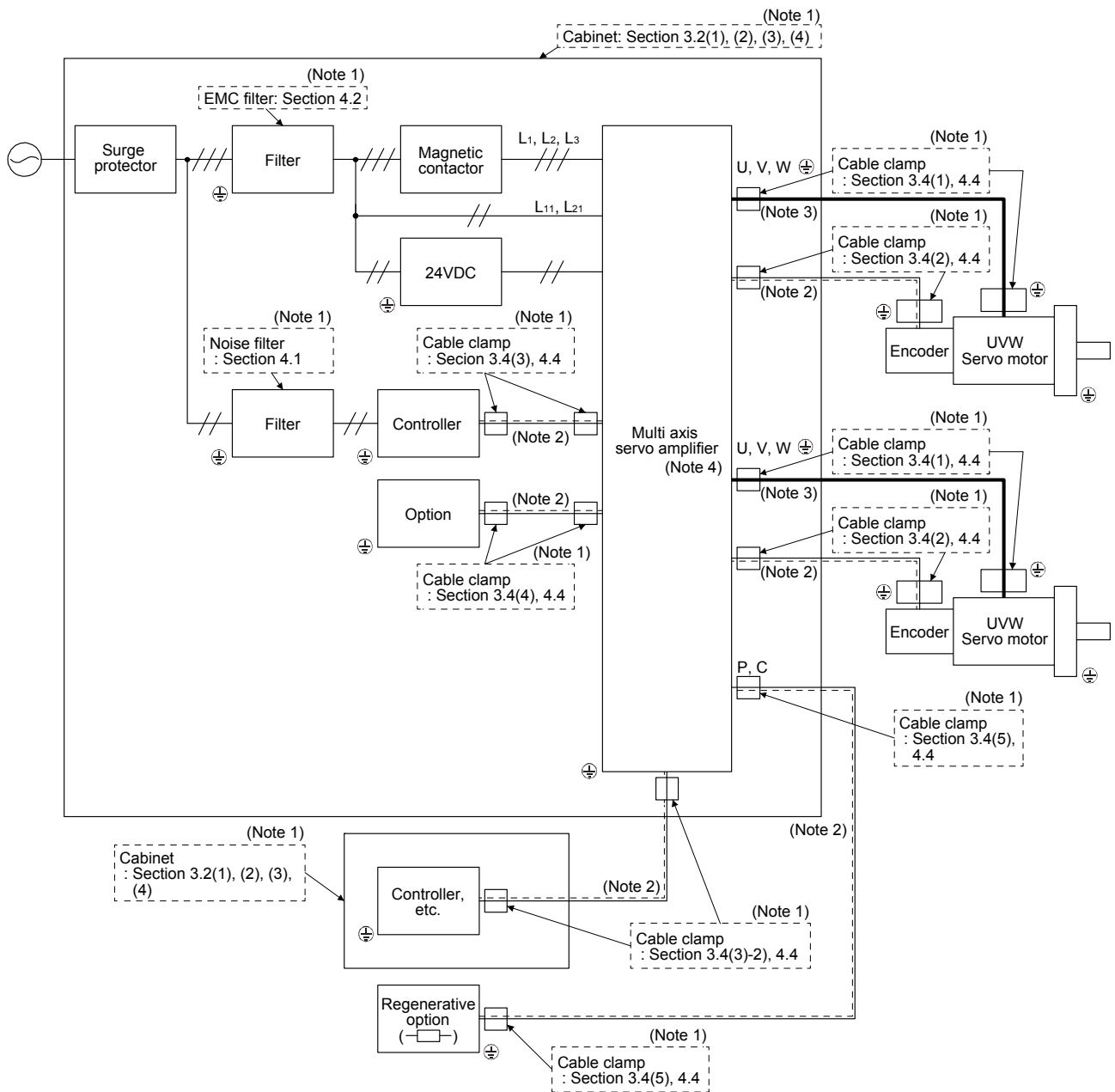
3. Shielded cables or conduits are shown as  

4. When the control circuit power supply ( $L_{11} \cdot L_{21}$ ) of the servo amplifier is 24VDC, connect AC/DC power supply.



# 5. CONNECTION EXAMPLE FOR EMC COUNTERMEASURES

## 5.2 For 1kW or less of multi axis



Note 1. Specific EMC countermeasures are shown as [dashed box].

2. Shielded cables are shown as [dashed line].

3. Shielded cables or conduits are shown as [solid line].



4. The figure is for the 2-axis servo amplifier.



## 5. CONNECTION EXAMPLE FOR EMC COUNTERMEASURES

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Note 1. Specific EMC countermeasures are shown as .

2. Shielded cables are shown as .
3. Shielded cables or conduits are shown as .
4. The abbreviations of the terminals are P and N for MR-HP30KA or MR-HP55KA4.
5. The abbreviations of the terminals are P and N for MR-J2S-□(4).
6. Connect the converter unit and drive unit with the provided bus bar.
7. The abbreviation of the terminal is P for MR-HP30KA or MR-HP55KA4.

# REVISIONS

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

Print Data	*Manual Number	Revision	
Apr. 1996	IB(NA)67310-*	First edition	
Nov. 1997	IB(NA)67310-A	Chapter 2 Chapter 5 Chapter 6	Table revisions Addition Addition
Nov. 2008	IB(NA)67310-B	All pages change	
Jul. 2009	IB(NA)67310-C	Chapter 2 Section 4.2 Section 4.2 (2)(b) Section 5.1	Change of table Part added Part changed Note 4 and 5 added
Jan. 2012	IB(NA)67310-D	Chapter 1 Chapter 3 Section 3.1 Section 3.2 Section 3.3 Section 3.4 Section 4.1 Section 4.2 Section 4.3 Section 4.5 Section 4.6 Section 5.1  Section 5.2  Section 5.3	All pages change CAUTION added Part changed Part changed Part changed Part changed Part changed Part added, part changed Part changed Part changed Added Title changed "For 22kW or less"→"For 22kW or less of 1-axis" Part change of diagram Added as "For 1kW or less of multi axis" Changes to section 5.3 to section 5.2 of the C version Part change of diagram
Feb. 2013	IB(NA)67310-E	Section 4.2 Section 4.2 (1)(a) Section 4.2 (1)(f) Section 4.2 (2)(c) Section 4.6	POINT is added Part added Deleted Deleted POINT is added
Mar. 2014	IB(NA)67310-F	100V class MR-J4 series servo amplifiers are added. Section 4.2 (1)(a) Section 4.3	MR-J4-10□1 to MR-J4-40□1 are added. E04SRM563218 is added.
Oct. 2014	IB(NA)67310-G	MR-J4-DU□ is added. Section 4.2 (2)(a) Section 5.3	MR-J4-DU30K□ to MR-J4-DU55K□ are added. MR-CR55K□ and MR-J4-DU□ are added.

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