



INVERTER

Plug-in option

**FR-A8AR**

INSTRUCTION MANUAL

*Relay output function*

PRE-OPERATION INSTRUCTIONS

**1**

INSTALLATION

**2**

RELAY OUTPUT

**3**

Thank you for choosing this Mitsubishi inverter plug-in option.

This Instruction Manual provides handling information and precautions for use of this product. Incorrect handling might cause an unexpected fault. Before using this product, always read this Instruction Manual carefully to use this product correctly.

Please forward this Instruction Manual to the end user.

### Safety instructions

Do not attempt to install, operate, maintain or inspect the product until you have read through this Instruction Manual and appended documents carefully and can use the equipment correctly. Do not use this product until you have a full knowledge of the equipment, safety information and instructions. In this Instruction Manual, the safety instruction levels are classified into "Warning" and "Caution".




**Warning**

Incorrect handling may cause hazardous conditions, resulting in death or severe injury.



**Caution**

Incorrect handling may cause hazardous conditions, resulting in medium or slight injury, or may cause only material damage.

The  **Caution** level may even lead to a serious consequence according to conditions. Both instruction levels must be followed because these are important to personal safety.

#### ◆ Electric Shock Prevention



**Warning**

- While the inverter power is ON, do not open the front cover or the wiring cover. Do not run the inverter with the front cover or the wiring cover removed. Otherwise you may access the exposed high voltage terminals or the charging part of the circuitry and get an electric shock.
- Do not remove the inverter front cover even if the power supply is disconnected. The only exception for this would be when performing wiring and periodic inspection. You may accidentally touch the charged inverter circuits and get an electric shock.
- Before wiring or inspection, LED indication of the inverter unit operation panel must be switched OFF. Any person who is involved in wiring or inspection shall wait for at least 10 minutes after the power supply has been switched OFF and check that there is no residual voltage using a tester or the like. For some time after the power-OFF, a high voltage remains in the smoothing capacitor, and it is dangerous.
- Any person who is involved in wiring or inspection of this equipment shall be fully competent to do the work.
- The plug-in option must be installed before wiring. Otherwise you may get an electric shock or be injured.
- Do not touch the plug-in option or handle the cables with wet hands. Otherwise you may get an electric shock.
- Do not subject the cables to scratches, excessive stress, heavy loads or pinching. Otherwise you may get an electric shock.

#### ◆ Injury Prevention



**Caution**

- The voltage applied to each terminal must be the ones specified in the Instruction Manual. Otherwise a burst, damage, etc. may occur.
- The cables must be connected to the correct terminals. Otherwise a burst, damage, etc. may occur.
- The polarity (+ and -) must be correct. Otherwise a burst or damage may occur.
- While power is ON or for some time after power OFF, do not touch the inverter as it will be extremely hot. Touching these devices may cause a burn.

#### ◆ Additional Instructions

The following instructions must be also followed. If the product is handled incorrectly, it may cause unexpected fault, an injury, or an electric shock.

### Caution

#### Transportation and mounting

- Do not install or operate the plug-in option if it is damaged or has parts missing.
- Do not stand or rest heavy objects on the product.
- The mounting orientation must be correct.
- Foreign conductive objects must be prevented from entering the inverter. That includes screws and metal fragments or other flammable substance such as oil.
- If halogen-based materials (fluorine, chlorine, bromine, iodine, etc.) infiltrate into a Mitsubishi product, the product will be damaged. Halogen-based materials are often included in fumigant, which is used to sterilize or disinfest wooden packages. When packaging, prevent residual fumigant components from being infiltrated into Mitsubishi products, or use an alternative sterilization or disinfection method (heat disinfection, etc.) for packaging. Sterilization or disinfection of wooden package should also be performed before packaging the product.

#### Trial run

- Before starting operation, each parameter must be confirmed and adjusted. A failure to do so may cause some machines to make unexpected motions.

### Warning

#### Usage

- Do not modify the equipment.
- Do not perform parts removal which is not instructed in this manual. Doing so may lead to fault or damage of the product.

### Caution

#### Usage

- When parameter clear or all parameter clear is performed, the required parameters must be set again before starting operations. Because all parameters return to their initial values.
- Static electricity in your body must be discharged before you touch the product.

#### Maintenance, inspection and parts replacement

- Do not carry out a megger (insulation resistance) test.

#### Disposal

- The inverter must be treated as industrial waste.

### General instruction

- Many of the diagrams and drawings in this Instruction Manual show the inverter without a cover or partially open for explanation. Never operate the inverter in this manner. The cover must be reinstalled and the instructions in the Instruction Manual must be followed when operating the inverter.

## — CONTENTS —

<b>1</b>	<b>PRE-OPERATION INSTRUCTIONS</b>	<b>5</b>
1.1	Unpacking and checking the product.....	5
1.1.1	Product confirmation.....	5
1.2	Component names .....	6
1.3	Specifications .....	7
<b>2</b>	<b>INSTALLATION</b>	<b>8</b>
2.1	Pre-installation instructions .....	8
2.2	Installation procedure .....	8
2.3	Wiring .....	11
<b>3</b>	<b>RELAY OUTPUT</b>	<b>15</b>
3.1	Internal block diagram .....	15
3.2	Terminals.....	16
3.3	Parameter list.....	16
3.4	Parameter setting .....	17
3.5	Connection diagram when using electronic bypass sequence function .....	18



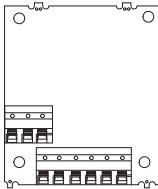

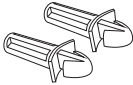
# 1 PRE-OPERATION INSTRUCTIONS

## 1.1 Unpacking and checking the product

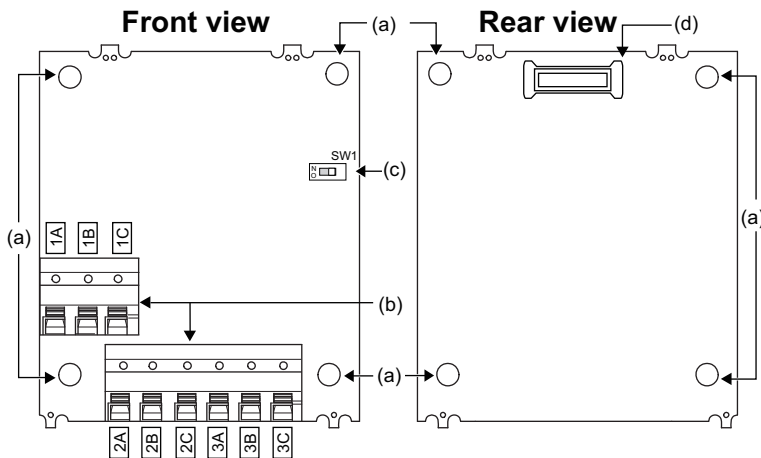
Take the plug-in option out of the package, check the product name, and confirm that the product is as you ordered and intact. The product is a plug-in option for the FR-A800/F800 series.


### 1.1.1 Product confirmation

Check the enclosed items.

<p>Plug-in option .....1</p>  A technical drawing of a rectangular plug-in option. It features a top edge with two circular mounting holes. The bottom edge has a series of electrical contacts and a larger rectangular component with multiple pins.	<p>Mounting screw (M3 × 8 mm) .....2 (Refer to <a href="#">page 8.</a>)</p>  Two screws with a cross-shaped head, representing M3 × 8 mm screws.	<p>Spacer .....2 (Refer to <a href="#">page 8.</a>)</p>  Two cylindrical spacers with a flange on one end and a smaller diameter section on the other.
---	---	--

## 1.2 Component names



Symbol	Name	Description	Refer to page
a	Mounting hole	Fixes the option to the inverter with screws, or installs spacers.	8
b	Terminal block	Connects to devices that receive signals from the inverter.	11
c	Switch for manufacturer setting (SW1)	Switch for manufacturer setting. Do not change the initial setting. (OFF  )	—
d	Connector	Connects to the option connector of the inverter.	8

## 1.3 Specifications

---

### ◆ **Type of output signal**

1 changeover contact output (three relays provided)

### ◆ **Contact capacity**

230 VAC...0.3 A

30 VDC...0.3 A



- Use contacts within the rated capacity. Failure to do so may cause contacts to wear out quickly or to be welded.

## 2 INSTALLATION

### 2.1 Pre-installation instructions

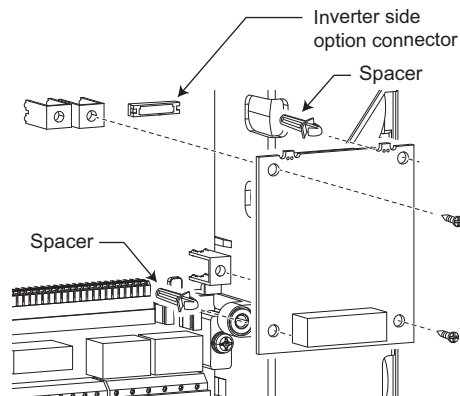
Check that the inverter's input power and the control circuit power are both OFF.

#### Caution

- With input power ON, do not install or remove the plug-in option. Otherwise, the inverter and plug-in option may be damaged.
- To avoid damage due to static electricity, static electricity in your body must be discharged before you touch the product.

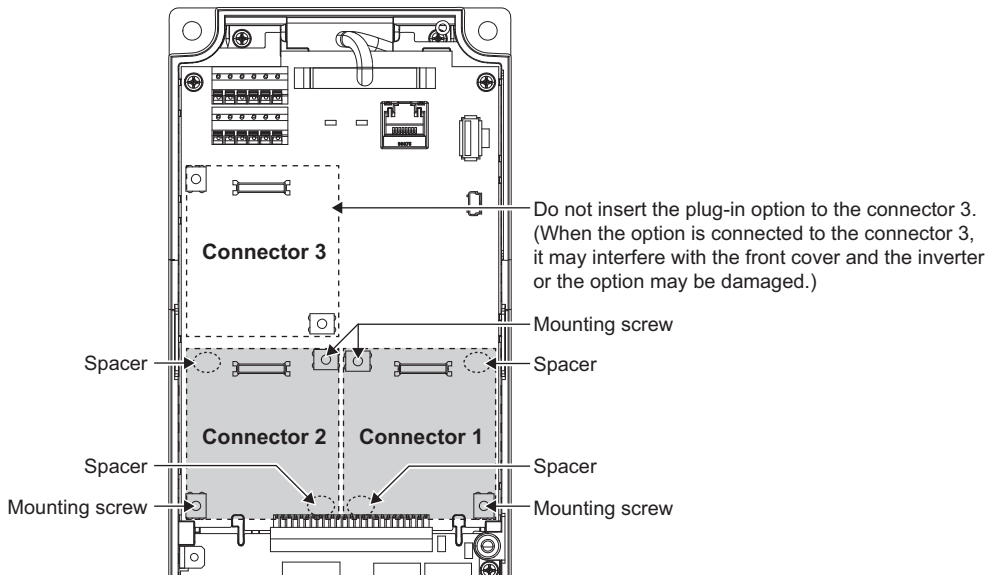
### 2.2 Installation procedure

- (1) Remove the inverter front cover. (Refer to Chapter 2 of the Instruction Manual (Detailed) of the inverter for details on how to remove the front cover.)
- (2) For the two mounting holes (as shown in the next page) that will not be tightened with mounting screws, insert spacers.
- (3) Fit the connector of the plug-in option to the guide of the connector on the inverter unit side, and insert the plug-in option as far as it goes. (Insert it to the inverter option connector 1 or 2.)
- (4) Fit the two locations, the left and right, of the plug-in option securely to the inverter unit by screwing in the supplied mounting screws. (tightening torque 0.33 N·m to 0.40 N·m) If the screw holes do not line up, the connector may not be inserted deep enough. Check the connector.



Example of installation to connector 1





**Insertion positions for screws and spacers**

 **NOTE**

- When mounting/removing the plug-in option, hold the sides of the option. Do not press on the parts on the option circuit board. Stress applied to the parts by pressing, etc. may cause a failure.
- Caution must be applied to mounting screws falling off when removing and mounting the plug-in option.
- Only one option can be used. When multiple options are mounted, priority is given to option connectors 1, 2 and 3 on the inverter in this order, and options having a lower priority do not function.
- When the inverter cannot recognize that the option unit is mounted due to improper installation, etc., the protective function (E.1 to E.3) is activated. A different indication will appear according to the mounted position (option connector 1 to 3).

Mounted position	Fault indication
Option connector 1	E. 1
Option connector 2	E. 2
Option connector 3	E. 3

- When removing the plug-in option, remove the two screws on the left and right, then pull it straight out. Pressure applied to the connector and to the option board may break the option.

## 2.3 Wiring

- (1) For the wiring, strip off the sheath of a cable, and use it with a blade terminal. For a single wire, strip off the sheath of the wire and apply directly. Insert the blade terminal or the single wire into a socket of the terminal.

Strip off the sheath for the below length. If the length of the sheath peeled is too long, a short circuit may occur with neighboring wires. If the length is too short, wires might come off.

Wire the stripped cable after twisting it to prevent it from becoming loose. In addition, do not solder it.

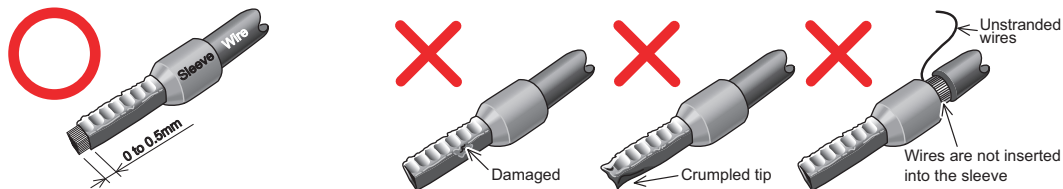
Cable sheath stripping length



Crimp the blade terminal.

Insert wires to a blade terminal, and check that the wires come out for about 0 to 0.5 mm.

Check the condition of the blade terminal after crimping. Do not use a blade terminal of which the crimping is inappropriate, or the face is damaged.



### Caution

- After wiring, wire offcuts must not be left in the inverter. They may cause a fault, failure or malfunction.

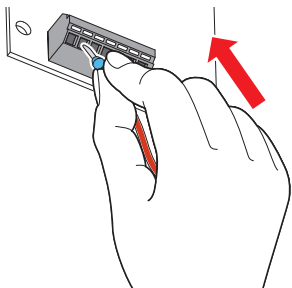
Blade terminals commercially available (as of February 2012. The product may be changed without notice.)

Cable gauge (mm <sup>2</sup> )	Ferrule terminal model			Manufacturer	Crimping tool name
	With insulation sleeve	Without insulation sleeve	For UL wire *1		
0.3	Al 0,5-10WH	—	—	Phoenix Contact Co., Ltd.	CRIMPFOX 6
0.5	Al 0,5-10WH	—	Al 0,5-10WH-GB		
0.75	Al 0,75-10GY	A 0,75-10	Al 0,75-10GY-GB		
1	Al 1-10RD	A 1-10	Al 1-10RD/1000GB		
1.25, 1.5	Al 1,5-10BK	A 1,5-10	—		
0.75 (for two cables)	Al-TWIN 2 × 0,75-10GY	—	—		

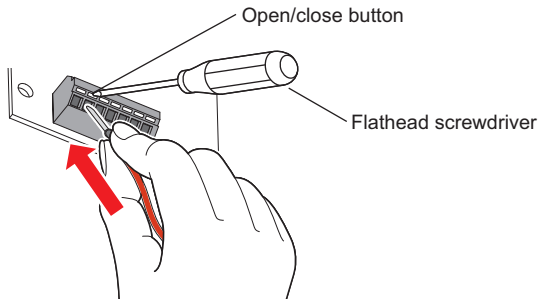
\*1 A ferrule terminal with an insulation sleeve compatible with the MTW wire which has a thick wire insulation.

Cable gauge (mm <sup>2</sup> )	Blade terminal product number	Insulation product number	Manufacturer	Crimping tool product number
0.3 to 0.75	BT 0.75-11	VC 0.75	NICHIFU Co.,Ltd.	NH 69

(2) Insert the cable into a socket.

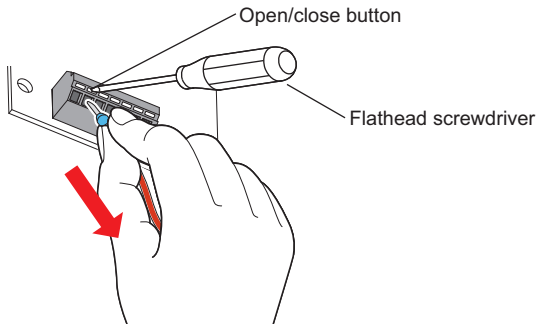


When using a single wire or stranded wires without a blade terminal, push the open/close button all the way down with a flathead screwdriver, and insert the wire.



- Wire removal

Pull the wire while pushing the open/close button all the way down firmly with a flathead screwdriver.



 **NOTE**

- When using stranded wires without a blade terminal, twist enough to avoid short circuit with a nearby terminals or wires.
- Pulling out the wire forcefully without pushing the open/close button all the way down may damage the terminal block.
- Use a small flathead screwdriver (tip thickness: 0.4 mm/tip width: 2.5 mm). If a flathead screwdriver with a narrow tip is used, terminal block may be damaged.

Commercially available product (as of February 2012. The product may be changed without notice.)

Name	Model	Manufacturer
Driver	SZF 0- 0,4 × 2,5	Phoenix Contact Co., Ltd.

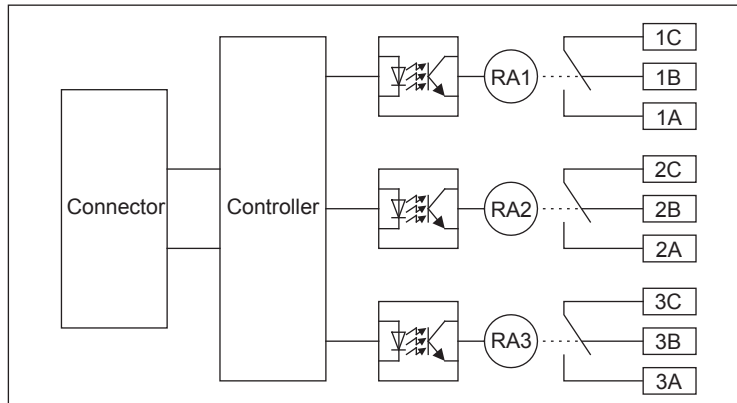
- Place the flathead screwdriver vertical to the open/close button. In case the blade tip slips, it may cause an inverter damage or injury.
- When wiring cables to the inverter's RS-485 terminals while a plug-in option is mounted, take caution not to let the cables touch the circuit board of the option or of the inverter. Otherwise, electromagnetic noises may cause malfunctions.

# 3 RELAY OUTPUT

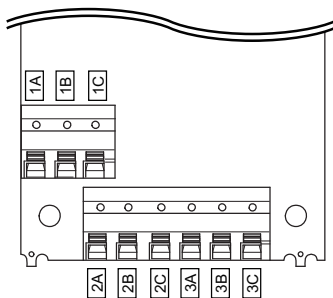
## 3.1 Internal block diagram

Three signals can be selected among inverter's standard signals (RUN, SU, FU, etc.) to be output as relay contact (1C) signals.

The following figure is the internal block diagram of the FR-A8AR.



## 3.2 Terminals



Terminal symbol	Description
1A	Normally open contact terminal of relay RA1
1B	Normally closed contact terminal of relay RA1
1C	Common contact terminal for relay RA1
2A	Normally open contact terminal of relay RA2
2B	Normally closed contact terminal of relay RA2
2C	Common contact terminal for relay RA2
3A	Normally open contact terminal of relay RA3
3B	Normally closed contact terminal of relay RA3
3C	Common contact terminal for relay RA3

\*1 The operation of each relay depends on the output signal selected.

## 3.3 Parameter list

When the FR-A8AR is mounted on the inverter, the following parameters are extended. Perform the settings as required.

Pr.	Pr. Group	Name	Initial value	Setting range
320	M420	RA1 output selection	0	The setting range depends on the inverter. For details, refer to <b>Pr.190 to Pr.196 (output terminal function selection)</b> in the Instruction Manual (Detailed) of the inverter.
321	M421	RA2 output selection	1	
322	M422	RA3 output selection	2	
418	M432	Extension output terminal filter	9999	5 to 50 ms, 9999



## 3.4 Parameter setting

### ◆ Setting output signals

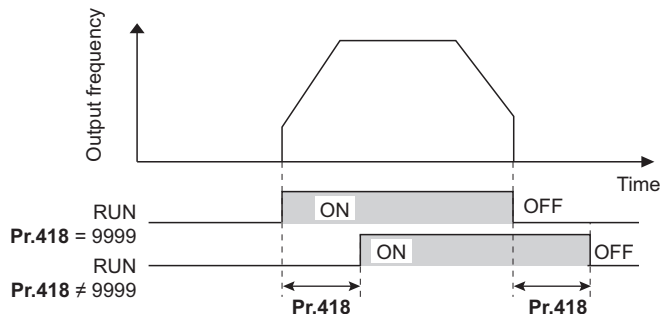
Use **Pr.320 to Pr.322** to assign signals to the terminals ABC (1 to 3). The settings of **Pr.320 to Pr.322** are the same as those of **Pr.190 to Pr.196 (output terminal function selection)**. For the details of **Pr.190 to Pr.196**, refer to the Instruction Manual (Detailed) of the inverter.

#### NOTE

- All the outputs are shut off when the protective functions (E.1 to E.3) are activated.
- Negative logic cannot be set.

### ◆ Adjusting the output terminal response level (Pr.418)

- The response level of the output terminals can be delayed in a range of 5 to 50 ms. (Operation example for the RUN signal.)



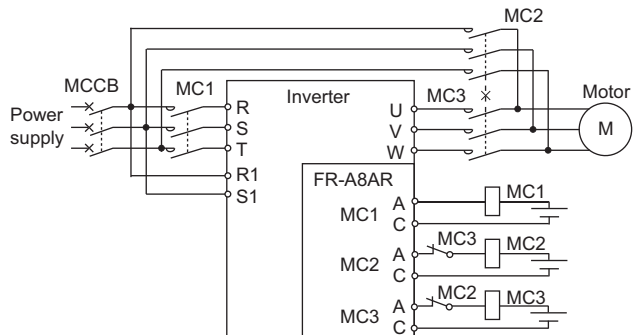
#### NOTE

- The response level is not adjusted while **Pr.418 = "9999"**.
- When **Pr.157 OL signal output timer** is set for the Overload warning (OL) signal output, the OL signal is output when the set time of (**Pr.157 + Pr.418**) elapses.

### 3.5 Connection diagram when using electronic bypass sequence function

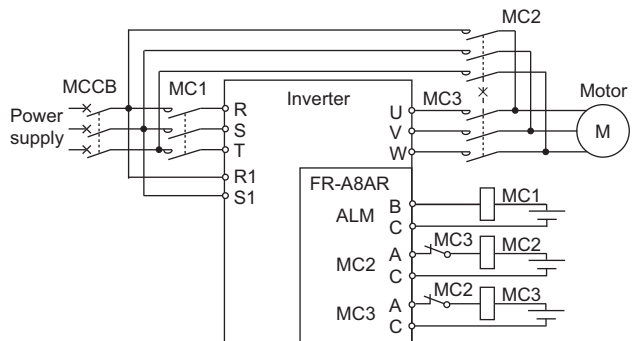
When using the electronic bypass sequence function with the FR-A8AR mounted to the FR-A800/F800 series inverter, the following connections are recommended.

- Recommended connection diagram 1



- Recommended connection diagram 2

When using the relay output of the FR-A8AR, instead of the MC1 signal, set the output signal to fault output signal (ALM) and output it from contacts B and C.



## REVISIONS

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

<b>Print Date</b>	<b>*Manual Number</b>	<b>Revision</b>
Aug. 2013	IB(NA)-0600499ENG-A	First edition
Oct. 2014	IB(NA)-0600499ENG-B	Addition • Compatibility with the FR-F800 series

# INVERTER

