



INVERTER

Plug-in option

FR-A7AR

INSTRUCTION MANUAL

Relay output function

PRE-OPERATION INSTRUCTIONS

1

INSTALLATION AND WIRING

2

RELAY OUTPUT

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Thank you for choosing this Mitsubishi Inverter plug-in option. This instruction manual gives handling information and precautions for use of this equipment. Incorrect handling might cause an unexpected fault. Before using the equipment, please read this manual carefully to use the equipment to its optimum. Please forward this manual to the end user.

This section is specifically about safety matters

Do not attempt to install, operate, maintain or inspect this 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".



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



Assumes that incorrect handling may cause hazardous conditions, resulting in medium or slight injury, or may cause physical damage only.

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

SAFETY INSTRUCTIONS

1. Electric Shock Prevention

WARNING

- While power is on or when the inverter is running, do not open the front cover. You may get an electric shock.
- Do not run the inverter with the front cover or wiring cover removed. Otherwise, you may access the exposed high-voltage terminals and charging part and get an electric shock.
- If power is off, do not remove the front cover except for wiring or periodic inspection. You may access the charged inverter circuits and get an electric shock.
- Before starting wiring or inspection, check to make sure that the indication of the inverter operation panel is off, wait for at least 10 minutes after the power supply has been switched off, and check that there are no residual voltage using a tester or the like. The capacitor is charged with high voltage for some time after power off and it is dangerous.
- Any person who is involved in the wiring or inspection of this equipment should be fully competent to do the work.
- Always install the plug-in option before wiring. Otherwise, you may get an electric shock or be injured.
- Do not touch the plug-in option 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.

2. Injury Prevention

CAUTION

- Apply only the voltage specified in the instruction manual to each terminal. Otherwise, burst, damage, etc. may occur.
- Ensure that the cables are connected to the correct terminals. Otherwise, burst, damage, etc. may occur.
- Always make sure that polarity is correct to prevent damage, etc. Otherwise, burst, damage may occur.
- While power is on or for some time after power-off, do not touch the inverter as it is hot and you may get burnt.

3. Additional Instructions

Also note the following points to prevent an accidental failure, injury, electric shock, etc.

1) Transportation and mounting

CAUTION

- 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.
- Check that the mounting orientation is correct.
- Prevent other conductive bodies such as screws and metal fragments or other flammable substance such as oil from entering the inverter.

2) Trial run

CAUTION

- Before starting operation, confirm and adjust the parameters. A failure to do so may cause some machines to make unexpected motions.

3) Usage

WARNING

- 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 inverter.

CAUTION

- When parameter clear or all parameter clear is performed, reset the required parameters before starting operations. Each parameter returns to the initial value.
- For prevention of damage due to static electricity, touch nearby metal before touching this product to eliminate static electricity from your body.

4) Maintenance, inspection and parts replacement

CAUTION

- Do not test the equipment with a megger (measure insulation resistance).

5) Disposal

CAUTION

- Treat as industrial waste.

6) General instruction

All illustrations given in this manual may have been drawn with covers or safety guards removed to provide in-depth description. Before starting operation of the product, always return the covers and guards into original positions as specified and operate the equipment in accordance with the manual.

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1 PRE-OPERATION INSTRUCTIONS




1.1 Unpacking and Product Confirmation

Take the plug-in option out of the package, check the unit name, and confirm that the product is as you ordered and intact.

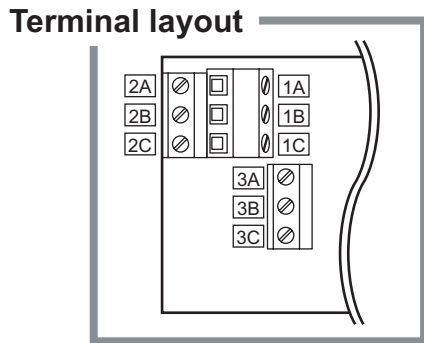
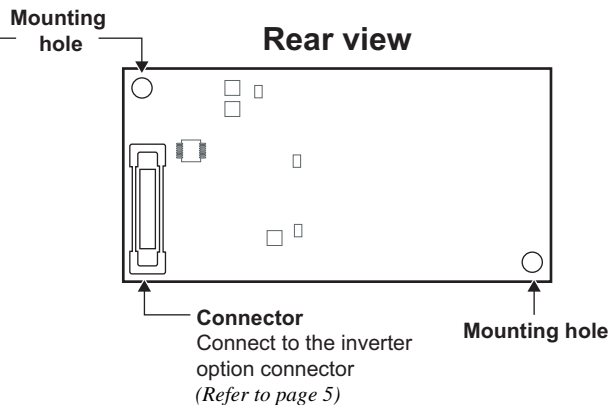
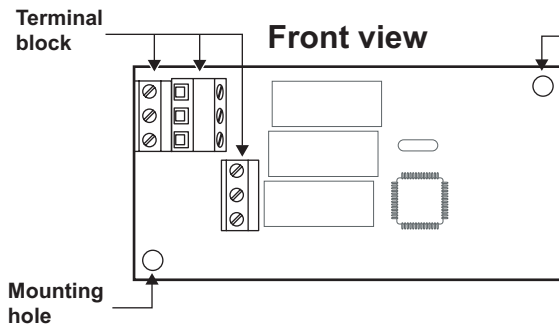
This product is a plug-in option dedicated for the FR-A700/F700 series.

1.1.1 Packing confirmation

Check the enclosed items.

<p>Plug-in option 1</p> 	<p>Mounting screw (M3 × 6mm) 2 (Refer to page 5.)</p> 	<p>Hex-head screw for option mounting (5.5mm) 1 (Refer to page 5.)</p> 
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1.1.2 Parts



1.1.3 Specifications

- (1) Types of output signal
 - 1 changeover contact output (three relays are provided)

- (2) Contact capacity
 - 230VAC 0.3A
 - 30VDC 0.3A

CAUTION

The contacts should be used within the rated capacity to prevent contacts weld resulting from faster contacts wearing.

2 / **INSTALLATION AND WIRING**

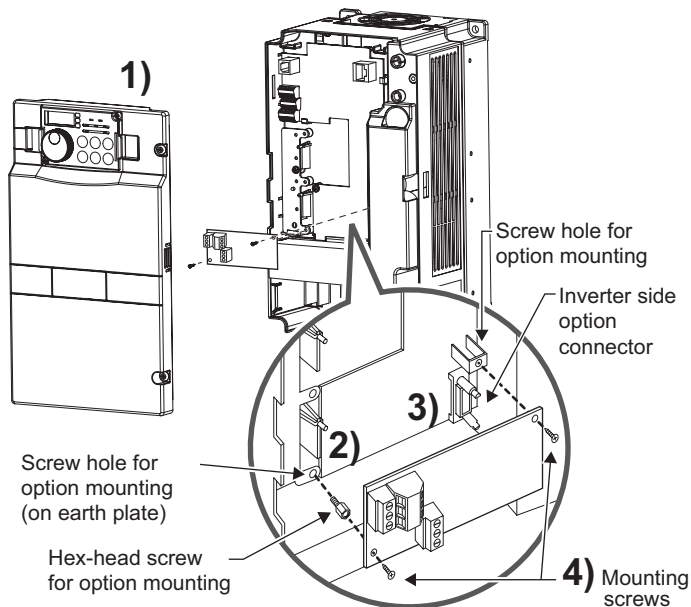
2.1 Pre-Installation Instructions

Make sure that the input power of the inverter is 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.**

2.2 Installation Procedure



- 1) Remove the inverter front cover.
- 2) Mount the hex-head screw for option mounting into the inverter screw hole (on earth plate). (size 5.5mm, tightening torque 0.56N·m to 0.75N·m)
- 3) Securely fit the connector of the plug-in option to the inverter connector along the guides.
- 4) Securely fix the both right and left sides of the plug-in option to the inverter with the accessory mounting screws. If the screw holes do not line-up, the connector may not have been plugged snugly. Check for loose plugging.

REMARKS

After removing two screws on the right and left places, remove the plug-in option.

(When the plug-in option is mounted in the connector 3 (connector 1 for the FR-F700 series), it is easier to remove the plug-in option after removing a control circuit terminal block.)

CAUTION

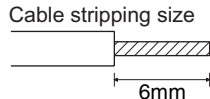
- When used with other plug-in options, always connect the FR-A7AR to the connector 1 to prevent malfunction.
- When two or more options are mounted, priority is in order of inverter option connectors 1, 2 and 3, the options having lower priority are inoperative (FR-A700 series).
- When the inverter cannot recognize that the option is mounted due to improper installation, etc., "E. 1 to E. 3" (option alarm) are displayed for the FR-A700 series. The errors shown differ according to the mounting positions (connectors 1, 2, 3).

Mounting Position	Error Display
Connector 1	E. 1
Connector 2	E. 2
Connector 3	E. 3

- The FR-F700 series has one connection connector for the plug-in option. When the inverter can not recognize that the option unit is mounted due to improper installation, etc., "E. 1" (option alarm) is displayed.
- Take care not to drop a hex-head screw for option mounting or mounting screw during mounting and removal.
- Pull out the option straight to remove. Otherwise, the connector may be damaged by some applied force.

2.3 Wiring

- (1) Strip off the sheath of the cable to wire.
Strip off the sheath about the size below. If the length of the sheath peeled is too long, a short circuit may occur among 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. Use a bar type terminal as required.

REMARKS

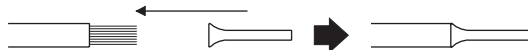
Information on bar terminals

Introduced products (as of October, 2003): Phoenix Contact Co.,Ltd.

Terminal Screw Size	Bar Terminal Model (with insulation sleeve)	Bar Terminal Model (without insulation sleeve)	Wire Size (mm ²)
M3	AI 0.5-6WH	A 0.5-6	0.3 to 0.5
	AI 0.75-6GY	A 0.75-6	0.5 to 0.75

· Bar terminal crimping tool: CRIMPFOX ZA3 (Phoenix Contact Co., Ltd.)

When using the bar terminal (without insulation sleeve), use care so that the twisted wires do not come out.



- (2) Loosen the terminal screw and insert the cable into the terminal.

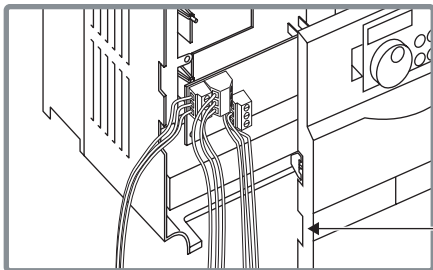
Screw Size	Tightening Torque	Cable Size	Screwdriver
M3	0.5N·m to 0.6N·m	0.3mm ² to 0.75mm ²	Small ⊖ flat-blade screwdriver (Tip thickness: 0.4mm/tip width: 2.5mm)

CAUTION

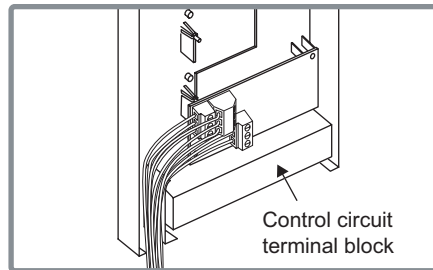
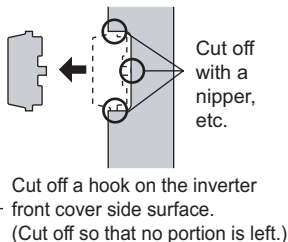
Undertightening can cause cable disconnection or malfunction. Overtightening can cause a short circuit or malfunction due to damage to the screw or unit.

INSTALLATION AND WIRING

- (3) For wiring of the **FR-A700 series 22K or less** and the **FR-F700 series 30K (FR-F720-01250, FR-F740-00620) or less**, route wires between the control circuit terminal block and front cover. If cables can not be routed between the control circuit terminal block and front cover due to the increased number of cables, remove a hook of the front cover and use a space become available.
For wiring of the **FR-A700 series 30K or more** and the **FR-F700 series 37K (FR-F720-01540, FR-F740-00770) or more**, use the space on the left side of the control circuit terminal block.



**FR-A700 series 22K or less
and FR-F700 series 30K or less**





**FR-A700 series 30K or more
and FR-F700 series 37K or more**

REMARKS

When the hook of the inverter front cover is cut off for wiring, the protective structure (JEM1030) changes to open type (IP00 (The structure of the NA version is no longer NEMA 1.)).

CAUTION

-  When performing wiring using the space between the inverter front cover and control circuit terminal block, take care not to subject the cable to stress.
-  After wiring, wire offcuts must not be left in the inverter. They may cause a fault, failure or malfunction.

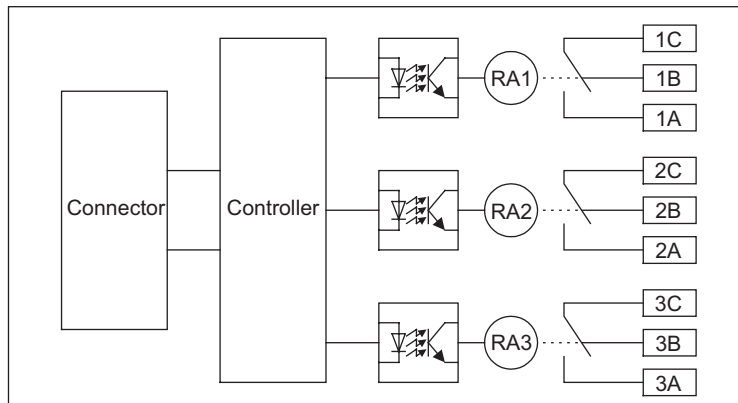
3 RELAY OUTPUT

3.1 Internal Block Diagram

You can select any three output signals available with an inverter as standard, and output them as relay contact signals.

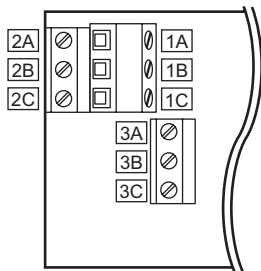
Refer to *page 11* of the Instruction Manual (detailed) for details.

The following is the internal block diagram of the FR-A7AR.





3.2 Terminals



Terminal Symbol	Description
1A	Relay RA1's normally open contact terminal
1B	Relay RA1's normally closed contact terminal
1C	Relay RA1's contact common terminal
2A	Relay RA2's normally open contact terminal
2B	Relay RA2's normally closed contact terminal
2C	Relay RA2's contact common terminal
3A	Relay RA3's normally open contact terminal
3B	Relay RA3's normally closed contact terminal
3C	Relay RA3's contact common terminal

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

3.3 Parameter List

By installing this plug-in option, the parameters below are extended.

Set the values according to need.

Parameter Number	Name	Setting Range	Initial Value
320	RA1 output selection	0 to 8, 10 to 20, 25 to 28,	0
321	RA2 output selection	30 to 36, 39, 41 to 47, 64, 70,	1
322	RA3 output selection	85 to 91, 94 to 99, 9999	2

Use *Pr. 320* to *Pr. 322* to select signals used for relay output. (Refer to *page 11* for signal types.)

REMARKS

- For *Pr.320* to *Pr.322*, write is disabled during operation even when "2" is set in *Pr.77 Parameter write selection*. When changing the parameter setting, stop the operation.
- When an option alarm (E. 1 to E. 3) occurs, all outputs are tuned off.

3.4 Output Signal List

For details of signal definitions, refer to *Pr. 190 to Pr. 196 (Output terminal function selection)* of the inverter manual (applied).

Setting Positive logic	Signal Name	Function
0	RUN	Inverter running
1	SU	Up to frequency
2	IPF	Instantaneous power failure/ undervoltage
3	OL	Overload alarm
4	FU	Output frequency detection
5	FU2	Second output frequency detection
6	FU3	Third output frequency detection *1
7	RBP	Regenerative brake prealarm *2
8	THP	Electronic thermal relay function prealarm
10	PU	PU operation mode
11	RY	Inverter operation ready
12	Y12	Output current detection
13	Y13	Zero current detection
14	FDN	PID lower limit
15	FUP	PID upper limit
16	RL	PID forward/reverse rotation output
17	MC1	Commercial power-supply switchover MC1
18	MC2	Commercial power-supply switchover MC2
19	MC3	Commercial power-supply switchover MC3
20	BOF	Brake opening request *1
25	FAN	Fan fault output
26	FIN	Heatsink overheat pre-alarm

Setting Positive logic	Signal Name	Function
27	ORA	Orientation completion *3
28	ORM	Orientation error *3
30	Y30	Forward rotation output *3
31	Y31	Reverse rotation output *3
32	Y32	Regenerative status output *3
33	RY2	Operation ready 2 *1
34	LS	Low speed output *1
35	TU	Torque detection *1
36	Y36	In-position *3
39	Y39	Start-time tuning completion signal *1
41	FB	Speed detection *1
42	FB2	Second speed detection *1
43	FB3	Third speed detection *1
44	RUN	Inverter running *1
45	RUN3	During inverter running and start command is on
46	Y46	During deceleration at occurrence of power failure (retained until release)
47	PID	During PID control activated
64	Y64	During retry
70	SLEEP	During PID output suspension
71	RO1	Commercial-power supply side motor 1 connection RO1 *4



Setting Positive logic	Signal Name	Function
72	RO2	Commercial-power supply side motor 2 connection RO2 *4
73	RO3	Commercial-power supply side motor 3 connection RO3 *4
74	RO4	Commercial-power supply side motor 4 connection RO4 *4
75	RIO1	Inverter side motor 1 connection RIO1 *4
76	RIO2	Inverter side motor 2 connection RIO2 *4
77	RIO3	Inverter side motor 3 connection RIO3 *4
78	RIO4	Inverter side motor 4 connection RIO4 *4
85	Y85	DC current feeding *1
86	Y86	Control circuit capacitor life

Setting Positive logic	Signal Name	Function
87	Y87	Main circuit capacitor life
88	Y88	Cooling fan life
89	Y89	Inrush current limit circuit life
90	Y90	Life alarm
91	Y91	Input MC shut off signal
94	ALM2	Alarm output 2
95	Y95	Maintenance timer signal
96	REM	Remote output
97	ER	Minor fault output 2 *1
98	LF	Minor fault output
99	ALM	Alarm output
9999	—	No function

*1 They can be set for the FR-A700 series only.

*2 For the FR-F700 series, this function is available with the 75K (FR-F720-03160, FR-F740-01800) or more.

*3 These functions can be set only when the FR-A7AP is mounted on the FR-A700 series.

*4 Setting can be made only for NA, EC and CH version.

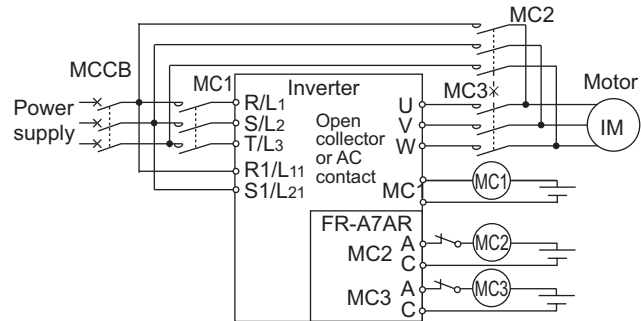
REMARKS

Negative logic can not be set.

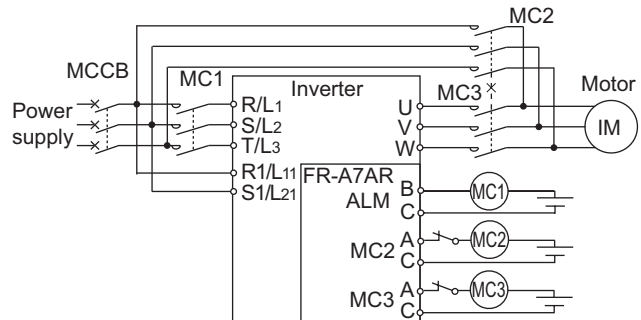
3.5 The Commercial Power Supply-Inverter Switchover Sequence Function

When using the commercial power supply-inverter switchover sequence function with the FR-A7AR mounted, it is recommended to use either connection shown below.

- (1) Recommended connection example 1
 Use inverter output terminals (contact signal, open collector signal) instead of MC1 signal.
 The phenomenon where magnetic contactor switches alternate between ON and OFF occurs when relay output of the FR-A7AR is used as MC1 signal.



- (2) Recommended connection example 2
 When using relay output of the FR-A7AR, set the alarm output signal (ALM) instead of the MC1 signal and output it from contacts B and C.



REVISIONS

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

Print Date	*Manual Number	Revision		
May, 2004	IB(NA)-0600166ENG-A	First edition		
Dec., 2004	IB(NA)-0600166ENG-B	<table border="1"><tr><td>Partial modification</td></tr></table> Board shape change <table border="1"><tr><td>Addition</td></tr></table> Compatible with the FR-F700-NA series	Partial modification	Addition
Partial modification				
Addition				
Sep., 2005	IB(NA)-0600166ENG-C	<table border="1"><tr><td>Addition</td></tr></table> Compatible with the FR-A700 series	Addition	
Addition				