



INVERTER

Plug-in option

FR-A7AY

FR-A7AY E kit

INSTRUCTION MANUAL

Analog output function

Digital output function

PRE-OPERATION INSTRUCTIONS

1

INSTALLATION AND WIRING
(FR-A700/F700 SERIES)

2

INSTALLATION AND WIRING
(FR-E700 SERIES (E kit))

3

PARAMETER LIST

4

EXTENSION ANALOG OUTPUT

5

DIGITAL OUTPUT

6

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 Inverter Type

The inverter type, 55K and 75K stated in this Instruction Manual differs according to each -NA, -EC, -CH(T) versions. Refer to the following correspondence table for each inverter type. (*Refer to the instruction manual of each inverter for the inverter type.*)

For example, "for the 75K or more" indicates "for the FR-A740-01440-NA or more" in the case of FR-A740 of NA version.

		NA	EC	CH
F700	FR-F720-55K	FR-F720-02330-NA	—	—
	FR-F720-75K	FR-F720-03160-NA	—	—
	FR-F740-55K	FR-F740-01160-NA	FR-F740-01160-EC	FR-F740-55K-CH(T)
	FR-F740-75K	FR-F740-01800-NA	FR-F740-01800-EC	FR-F740-S75K-CH(T)
A700	FR-A720-55K	FR-A720-02150-NA	—	—
	FR-A720-75K	FR-A720-02880-NA	—	—
	FR-A740-55K	FR-A740-01100-NA (FR-A760-00840-NA)	FR-A740-01800-EC	FR-A740-55K-CHT
	FR-A740-75K	FR-A740-01440-NA (FR-A760-01040-NA)	FR-A740-02160-EC	FR-A740-75K-CHT




1.2 Unpacking and Product Confirmation

Take the plug-in option out of the package, check the product 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/E700 series.



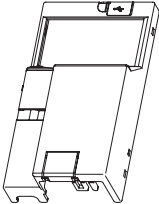
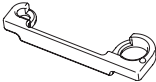
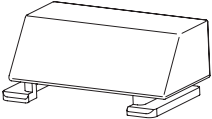
1.2.1 Packing confirmation (FR-A700/F700 series)

Check the enclosed items.

<p>Plug-in option 1</p> 	<p>Mounting screw (M3 × 6mm) 2 (Refer to page 7.)</p> 	<p>Hex-head screw for option mounting (5.5mm) 1 (Refer to page 7.)</p> 
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1.2.2 Packing confirmation (FR-E700 series (E kit))

Check the enclosed items.

<p>Plug-in option 1</p> 	<p>Mounting screw (M3 × 6mm) 2 (Refer to page 15, 17)</p> 	
<p>Front cover for plug-in option 1 (Refer to page 15, 17)</p> 	<p>Option protective cover *1 1 (Refer to page 15)</p> 	<p>Option small cover *2 1 (Refer to page 17)</p> 

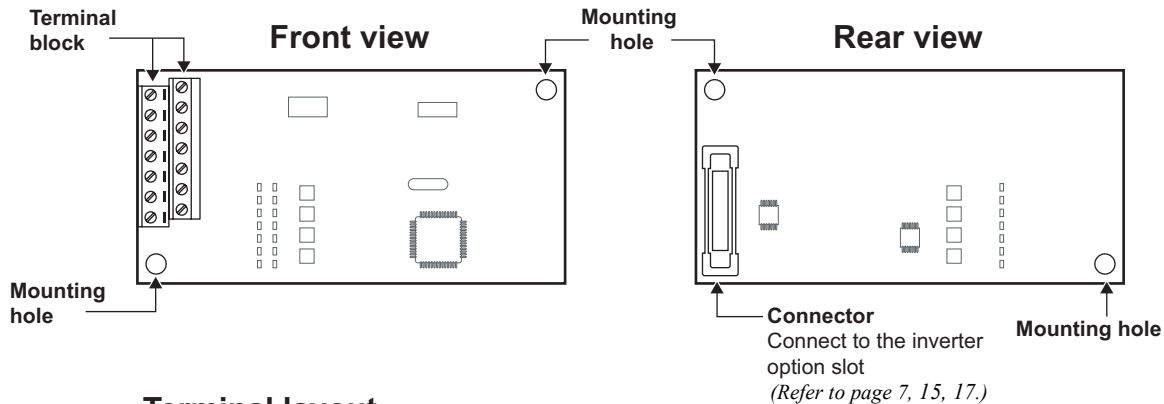
*1 Used with the FR-E720-3.7K (FR-E720-175) or less and FR-E740-7.5K (FR-E740-170) or less.

*2 Used with the FR-E720-5.5K (FR-E720-240) or more and FR-E740-11K (FR-E740-230) or more.

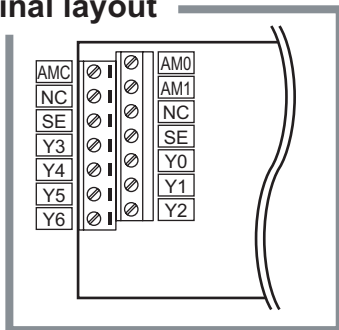
CAUTION

In place of the inverter front cover, install a provided front cover for plug-in option.

1.3 Parts



Terminal layout





1.4 Specifications

- (1) Output signals
Voltage output (across terminals AM0-AMC) 0 to 10VDCMAX
Current output (across terminals AM1-AMC) 0 to 20mADC

- (2) Output resolution
Voltage output 3mV
Current output 10 μ A

- (3) Output accuracy (reference value)
 $\pm 10\%$ of the full-scale output value
Depends on the output signal type.



- (4) Meters used
 - Voltmeter
DC voltmeter Full-scale 10V (internal impedance 10k Ω or more)
 - Ammeter
DC ammeter Full-scale 20mA (internal impedance 300 Ω or less)
 - Wiring length
Maximum 10m

2 **INSTALLATION AND WIRING (FR-A700/F700 SERIES)**

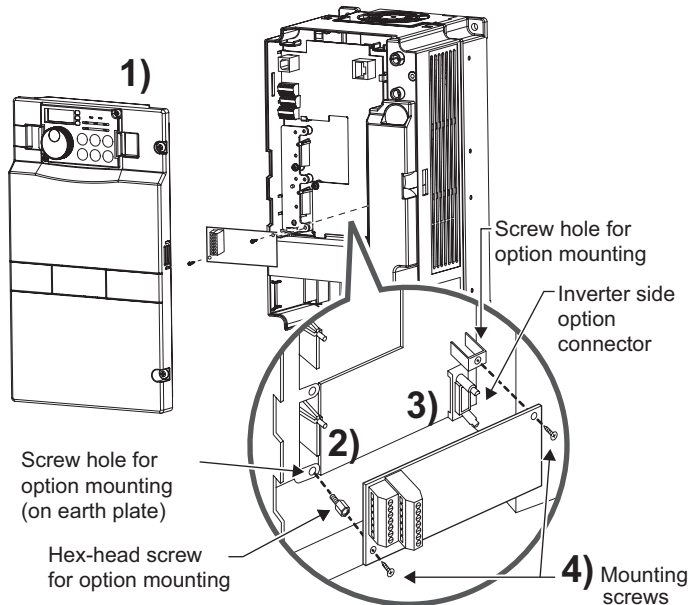
2.1 Pre-Installation Instructions

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.**
-  For prevention of damage due to static electricity, touch nearby metal before touching this product to eliminate static electricity from your body.**

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. (Tightening torque 0.45N·m to 0.55N·m) If the screw holes do not line-up, the connector may not have been plugged snugly. Check for loose plugging.

REMARKS

- Remove a plug-in option after removing two screws on both left and right sides. (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

- Only one type of option per inverter may be used. 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.
- 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.



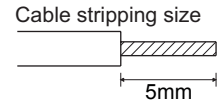
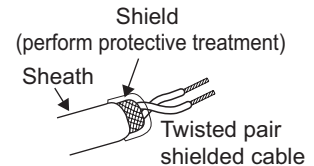
2.3 Wiring

- (1) Untwist the twisted pair shielded cables after stripping its sheath. Also, perform protective treatment of the shield to ensure that it will not make contact with the conductive area.

Strip off the sheath about the size as in the right figure. 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. (Do not solder it.)

Use a bar type terminal as required.



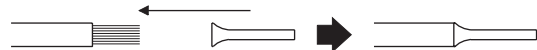
REMARKS

- Information on bar terminals
Commercially available product examples (as of September, 2006)

Terminal Screw Size	Wire Size (mm ²)	Bar Terminal Model		Maker
		With insulation sleeve	Without insulation sleeve	
M2	0.3 to 0.5	AI 0,5-6WH	A 0,5-6	Phoenix Contact Co.,Ltd.

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.



7 INSTALLATION AND WIRING (FR-A700/F700 SERIES)

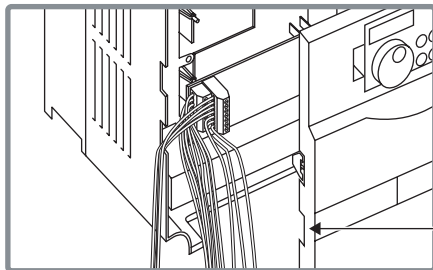
- (2) Loosen the terminal screw and insert the cable into the terminal.

Screw Size	Tightening Torque	Cable Size	Screwdriver
M2	0.22N·m to 0.25N·m	0.3mm ² to 0.75mm ²	Small ⊖ flat-blade screwdriver (Tip thickness: 0.4mm/tip width: 2.5mm)

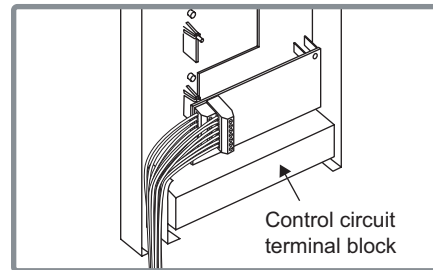
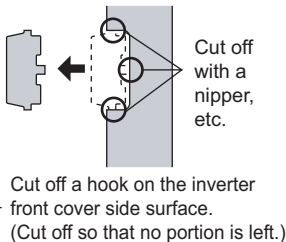
CAUTION

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

- (3) For wiring of **the FR-A700 series 22K* or less and the FR-F700 series 30K* 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* 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**




*The inverter type of 22K and 30K of FR-A700 series, 30K and 37K of FR-F700 series in each -NA, -EC versions are as follows.

		NA		EC	
A700	FR-A720-22K	FR-A720-00900-NA		—	
	FR-A740-22K	FR-A740-00440-NA (FR-A760-00330-NA)		FR-A740-00620-EC	
	FR-A720-30K	FR-A720-01150-NA		—	
	FR-A740-30K	FR-A740-00570-NA (FR-A760-00550-NA)		FR-A740-00770-EC	
F700	FR-F720-30K	FR-F720-01250-NA		—	
	FR-F740-30K	FR-F740-00620-NA		FR-F740-00620-EC	
	FR-F720-37K	FR-F720-01540-NA		—	
	FR-F740-37K	FR-F740-00770-NA		FR-F740-00770-EC	

REMARKS

- When the hook of the inverter front cover is cut off for wiring, the protective structure (JEM1030) changes to open type (IP00).

CAUTION



-  **Do not use empty terminals as junction terminals because they are used in the option unit. If they are used as the junction terminals, the option unit may be damaged.**
-  **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 INSTALLATION AND WIRING (FR-E700 SERIES (E kit))

3.1 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.
-  For prevention of damage due to static electricity, touch nearby metal before touching this product to eliminate static electricity from your body.

3.2 Installation Procedure

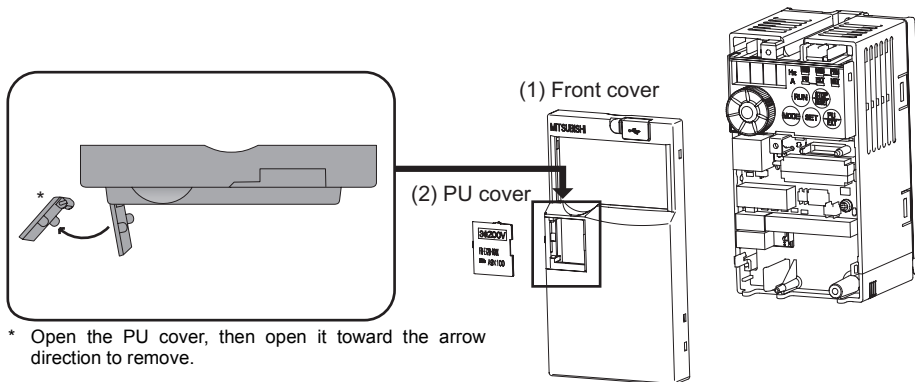
The FR-E700 series has one connection connector for the plug-in option.

CAUTION

- Always perform wiring to the main circuit terminals and control circuit terminals before installing the option. Wiring cannot be performed after installing the option.
- When the inverter cannot recognize that the option is mounted due to improper installation, etc., "E. 1" (option alarm) is displayed.
- Take care not to drop a mounting screws during mounting and removal.
- Pull out the option straight to remove. Otherwise, the connector may be damaged.

7 INSTALLATION AND WIRING (FR-E700 SERIES (E kit))

- For FR-E720-3.7K (FR-E720-175) or less, FR-E740-7.5K (FR-E740-170) or less
 - (1) Remove the front cover from the inverter. (For removing the front cover, refer to the FR-E700 series instruction manual.)
 - (2) Remove the PU cover from the front cover. Open the PU cover with a driver, etc. and remove it in the direction of arrow as shown below.

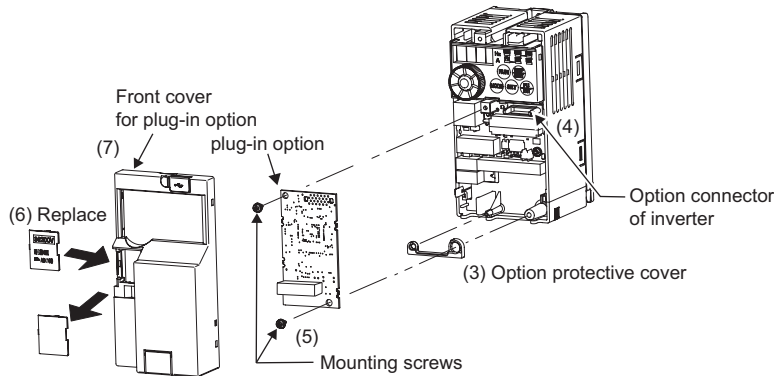


REMARKS

- Because the voltage class, model name and serial (only voltage class is labeled for the FR-E740-5.5K (FR-E740-120) or more) are stated on the PU cover, replace a PU cover of a plug-in option front cover with the removed PU cover from the inverter.

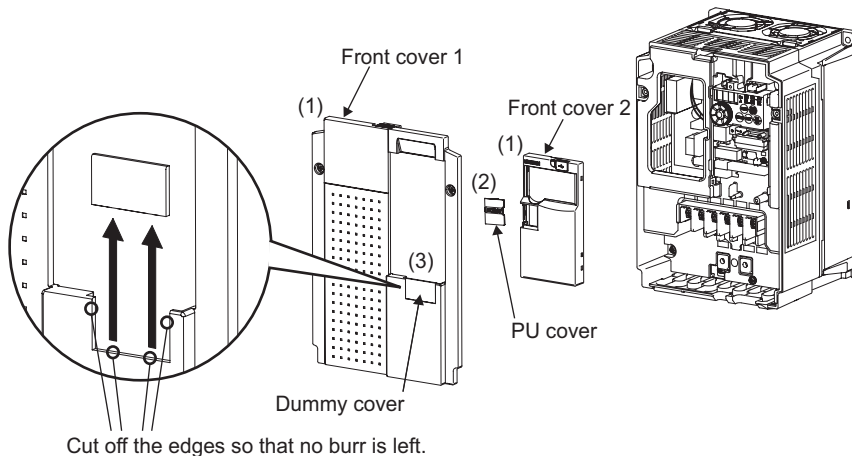


- (3) Install the option protective cover.
- (4) Securely fit the connector of the plug-in option to the inverter connector along the guides.
- (5) Securely fix the both top and bottom of the plug-in option to the inverter with the accessory mounting screws. (tightening torque 0.45N·m to 0.55N·m) If the screw holes do not line-up, the connector may not have been plugged snugly. Check for loose plugging.
- (6) Remove the PU cover provided on the front cover for plug-in option and install the other PU cover, which was removed in (2).
- (7) When wiring to the plug-in option is completed, install the front cover for plug-in option to the inverter.



7 INSTALLATION AND WIRING (FR-E700 SERIES (E kit))

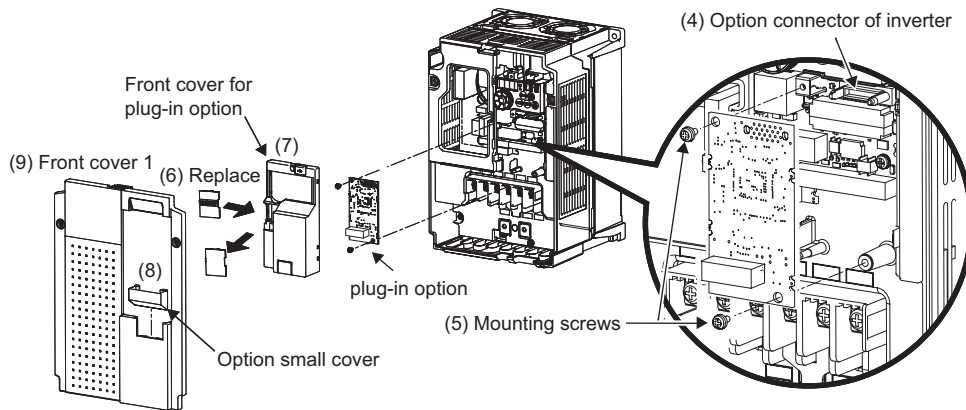
- For FR-E720-5.5K (FR-E720-240) or more, FR-E740-11K (FR-E740-230) or more
 - (1) Remove the front cover 1 and 2 from the inverter. (For removing the front cover, refer to the FR-E700 series instruction manual.)
 - (2) Remove the PU cover from the front cover 2. For removing the PU cover, refer to *page 14*.
 - (3) Cut off the dummy cover of the front cover 1 with a nipper, etc. and make a space for installing the option small cover.



REMARKS

- Because voltage is stated on the PU cover, replace a PU cover of a plug-in option front cover with the removed PU cover from the inverter.

- (4) Securely fit the connector of the plug-in option to the inverter connector along the guides.
- (5) Securely fix the both top and bottom of the plug-in option to the inverter with the accessory mounting screws. (tightening torque 0.45N·m to 0.55N·m) If the screw holes do not line-up, the connector may not have been plugged snugly. Check for loose plugging.
- (6) Remove the PU cover provided on the front cover for plug-in option and install the other PU cover, which was removed in (2).
- (7) When wiring to the plug-in option is completed, install the front cover for plug-in option to the inverter.
- (8) Install the option small cover to the front cover 1.
- (9) Install the front cover 1 to the inverter.



3.3 Wiring

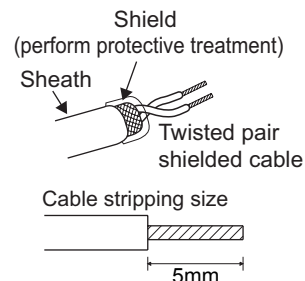
- (1) Untwist the twisted pair shielded cables after stripping its sheath.

Also, perform protective treatment of the shield to ensure that it will not make contact with the conductive area.

Strip off the sheath about the size as in the right figure. 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. (Do not solder it.)

Use a bar type terminal as required.



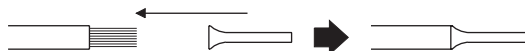
REMARKS

- Information on bar terminals
Commercially available product examples (as of September, 2006)

Terminal Screw Size	Wire Size (mm ²)	Bar Terminal Model		Maker
		With insulation sleeve	Without insulation sleeve	
M2	0.3 to 0.5	AI 0,5-6WH	A 0,5-6	Phoenix Contact Co.,Ltd.

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.

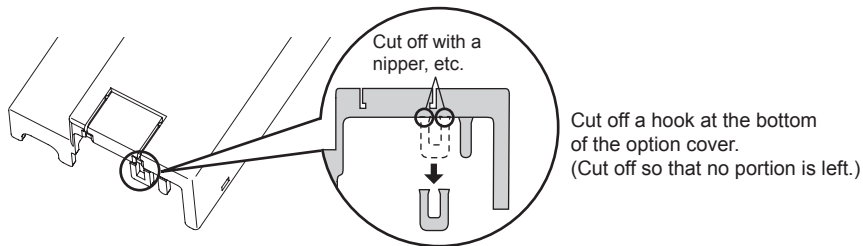
Screw Size	Tightening Torque	Cable Size	Screwdriver
M2	0.22N·m to 0.25N·m	0.3mm ² to 0.75mm ²	Small ⊖ flat-blade screwdriver (Tip thickness: 0.4mm/tip width: 2.5mm)

CAUTION

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

7 INSTALLATION AND WIRING (FR-E700 SERIES (E kit))

- (3) When wiring the FR-E700 series, if a hook of the front cover for the plug-in option impedes wiring, cut off the hook and perform wiring.



REMARKS

- When the option protective cover or option small cover is not fitted or wire is not passed through even if the hook of the front cover of the plug-in option has been cut off, the protective structure (JEM1030) changes to open type (IP00).

⚠ CAUTION

- ⚠ Do not use empty terminals as junction terminals because they are used in the option unit. If they are used as the junction terminals, the option unit may be damaged.
- ⚠ When wiring, 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.

4 PARAMETER LIST

When the FR-A7AY is mounted on the inverter, the following parameters are extended.

	Parameter Number	Name	Setting Range	Minimum Setting Increments	Initial Value	Refer to Page
EXTENSION ANALOG OUTPUT	306	Analog output signal selection	1 to 3, 5 to 14, 17, 18, 21, 24, 32 to 34, 50, 52, 53, 61, 62, 70 *1	1	2	23 and later
	307	Setting for zero analog output	0 to100%	0.1	0%	
	308	Setting for maximum analog output	0 to100%	0.1	100%	
	309	Analog output signal voltage/current switchover	0, 1, 10, 11	1	0	
	310	Analog meter voltage output selection	1 to 3, 5 to 14, 17, 18, 21, 24, 32 to 34, 50, 52, 53, 61, 62, 70 *1	1	2	
	311	Setting for zero analog meter voltage output	0 to100%	0.1	0%	
	312	Setting for maximum analog meter voltage output	0 to100%	0.1	100%	
	323	AM0 0V adjustment	900 to1100%	1	1000%	
	324	AM1 0mA adjustment	900 to 1100%	1	1000%	
	C0(900)	FM(CA) terminal calibration	—	—	—	
C1(901)	AM terminal calibration	—	—	—		

7 PARAMETER LIST

	Parameter Number	Name	Setting Range	Minimum Setting Increments	Initial Value	Refer to Page
DIGITAL OUTPUT	313	DO0 output selection	0 to 8, 10 to 20, 25 to 28, 30 to 36, 39, 41 to 47, 64, 70 to 78, 84 to 99, 100 to 108, 110 to 116, 120, 125 to 128, 130 to 136, 139, 141 to 147, 164, 170, 184 to 199, 9999 *2	1	9999	35 and later
	314	DO1 output selection				
	315	DO2 output selection				
	316	DO3 output selection				
	317	DO4 output selection				
	318	DO5 output selection				
	319	DO6 output selection				

*1 The setting range differs according to the inverter. For details refer to *page 30, 32*.

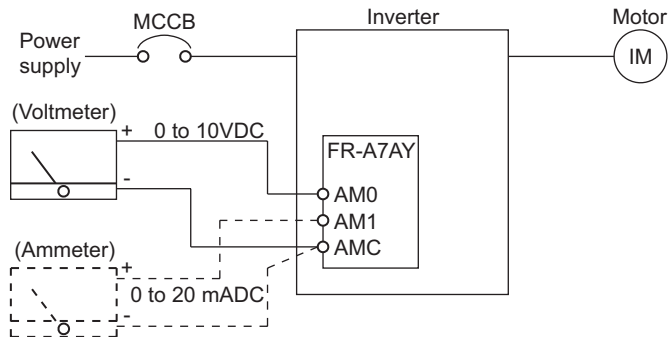
*2 The setting range differs according to the inverter. For details refer to *page 38, 40*.

5 EXTENSION ANALOG OUTPUT

5.1 Wiring Example

By setting the *Pr. 306* to *Pr. 312* values, analog signals such as the output frequency and output current can be output from the voltage output terminal (AM0) and current output terminal (AM1).

Connect the voltmeter or ammeter as shown below:

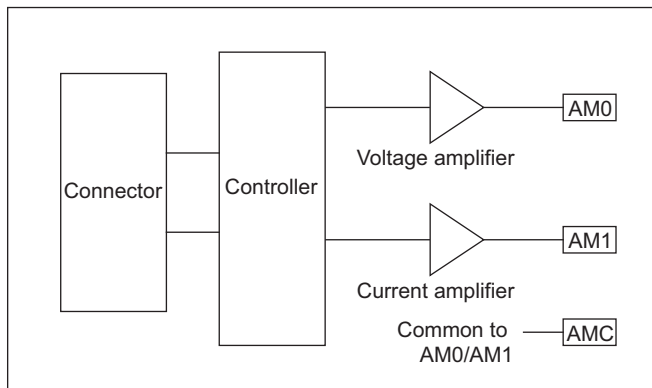


CAUTION

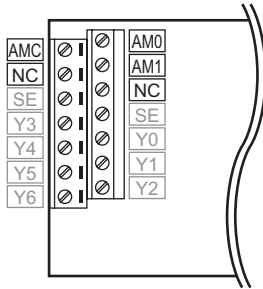
- The wiring length between the FR-A7AY and the voltmeter/ammeter should be 10m maximum.

5.2 Internal Block Diagram

The following is the internal block diagram about the FR-A7AY analog output function.



5.3 Terminals



Terminal Symbol	Terminal Name	Description
AM0	Voltage output terminal	Connect a DC voltmeter (10VDC).
AM1	Current output terminal	Connect a DC ammeter (20mADC).
AMC	Common terminal	Common to AM0 and AM1
Y0 to Y6		Used for digital output function. (<i>Refer to page 35</i>)
SE		
NC (empty)		Do not use.

5.4 Extension Analog Output Function Parameter List

Parameter Number	Name	Setting Range	Minimum Increments	Initial Value
306	Analog output signal selection	1 to 3, 5 to 14, 17, 18, 21, 24, 32 to 34, 50, 52, 53, 61, 62, 70 *	1	2
307	Setting for zero analog output	0 to 100%	0.1	0%
308	Setting for maximum analog output	0 to 100%	0.1	100%
309	Analog output signal voltage/current switchover	0, 1, 10, 11	1	0
310	Analog meter voltage output selection	1 to 3, 5 to 14, 17, 18, 21, 24, 32 to 34, 50, 52, 53, 61, 62, 70 *	1	2
311	Setting for zero analog meter voltage output	0 to 100%	0.1	0%
312	Setting for maximum analog meter voltage output	0 to 100%	0.1	100%
323	AM0 0V adjustment	900 to 1100%	1	1000%
324	AM1 0mA adjustment	900 to 1100%	1	1000%
C0(900)	FM terminal calibration	—	—	—
C1(901)	AM terminal calibration	—	—	—

* The setting range differs according to the inverter. For details refer to *page 30, 32*.

REMARKS

- For *Pr. 306* and *Pr. 310*, write is enabled even when the inverter is operating.



5.5 Adjustment Procedure

5.5.1 Setting of analog output signal voltage/current switchover (Pr. 309)

Use *Pr. 309 Analog output signal voltage/current switchover* to select whether to output the same signal or different signals from terminal AM0 (voltage output) and terminal AM1 (current output).

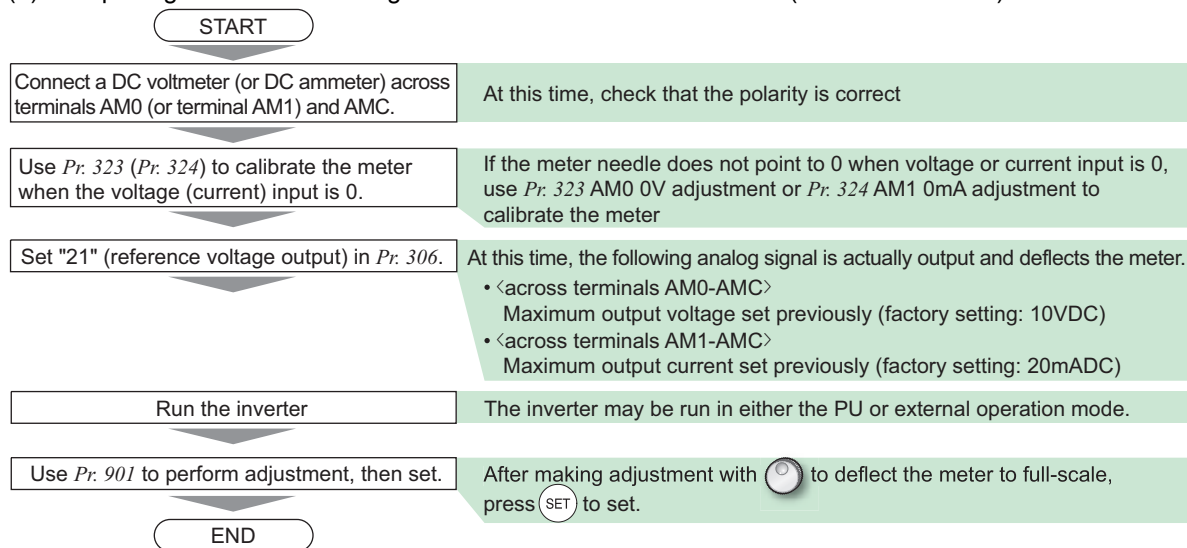
<i>Pr. 309</i> Setting	Description	Terminal	Parameters for Setting	Parameters for Adjustment
0 (initial value)	Same select signals are output from the voltage output terminal (AM0) and current output terminal (AM1). The signal set in <i>Pr. 306 Analog output signal selection</i> is made valid. (The setting of <i>Pr. 310</i> is made invalid.)	AM0	<i>Pr. 306</i> : Select the output signal.	<i>Pr. 323</i> <i>Pr. 324</i> <i>CI (Pr. 901)</i>
		AM1	<i>Pr. 307</i> : Output signal value for zero analog output <i>Pr. 308</i> : Output signal value for maximum analog output	
AM0		<i>Pr. 306</i> : Select the output signal.		
AM1		<i>Pr. 307</i> : Analog output value for zero output signal <i>Pr. 308</i> : Analog output value for maximum output signal		
10	Different select signals are output from voltage output terminal (AM0) and current output terminal (AM1).	AM0	<i>Pr. 310</i> : Select the output signal. <i>Pr. 311</i> : Output signal value for zero analog output <i>Pr. 312</i> : Output signal value for maximum analog output	<i>Pr. 323</i> <i>C0 (Pr. 900)</i> <i>Pr. 324</i> <i>CI (Pr. 901)</i>
		AM1	<i>Pr. 306</i> : Select the output signal. <i>Pr. 307</i> : Output signal value for zero analog output <i>Pr. 308</i> : Output signal value for maximum analog output	
AM0		<i>Pr. 310</i> : Select the output signal. <i>Pr. 311</i> : Analog output value for zero output signal <i>Pr. 312</i> : Analog output value for maximum output signal		
AM1		<i>Pr. 306</i> : Select the output signal. <i>Pr. 307</i> : Analog output value for zero output signal <i>Pr. 308</i> : Analog output value for maximum output signal		
11		AM0	<i>Pr. 310</i> : Select the output signal. <i>Pr. 311</i> : Analog output value for zero output signal <i>Pr. 312</i> : Analog output value for maximum output signal	<i>Pr. 323</i> <i>C0 (Pr. 900)</i> <i>Pr. 324</i> <i>CI (Pr. 901)</i>
		AM1	<i>Pr. 306</i> : Select the output signal. <i>Pr. 307</i> : Analog output value for zero output signal <i>Pr. 308</i> : Analog output value for maximum output signal	
AM0		<i>Pr. 310</i> : Select the output signal. <i>Pr. 311</i> : Analog output value for zero output signal <i>Pr. 312</i> : Analog output value for maximum output signal		
AM1		<i>Pr. 306</i> : Select the output signal. <i>Pr. 307</i> : Analog output value for zero output signal <i>Pr. 308</i> : Analog output value for maximum output signal		

REMARKS

- Analog output means voltage (0 to 10 V) and current (0 to 20mA) output from terminal AM0 and AM1, and output signal means the monitor signal (*refer to page 30, 32*) set in *Pr. 306* and *Pr. 310*.

5.5.2 Calibration of meter

(1) Outputting the same select signals from terminals AM0 and AM1 (*Pr. 309* = "0 or 10")

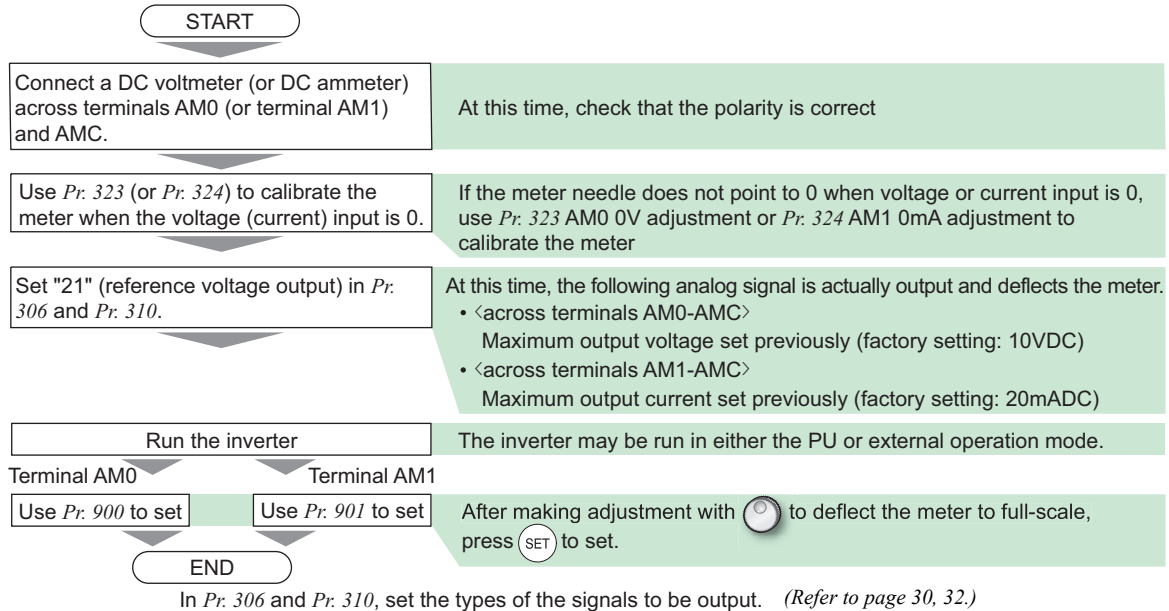


In *Pr. 306*, set the types of the signals to be output. (*Refer to page 30, 32.*)

CAUTION

- If calibration is made without "21" (reference voltage output) set in *Pr. 306*, terminals FM/AM/CA* of the inverter are calibrated. To calibrate the extension analog output, always set "21" in *Pr. 306*.
(* Terminals provided differ according to the inverter.)
- When the plug-in option used was remounted on other inverter, use *Pr. 323* and *Pr. 324* to calibrate again.

(2) Outputting different select signals from terminals AM0 and AM1 (Pr. 309 = "1 or 11")



CAUTION

- If calibration is made without "21" (reference voltage output) set in Pr. 306 or Pr. 310, terminals FM/AM/CA* of the inverter are calibrated. To calibrate the extension analog output, always set "21" in Pr. 306. (* Terminals provided differ according to the inverter.)
- When the plug-in option used was remounted on other inverter, use Pr. 323 and Pr. 324 to calibrate again.

5.5.3 Output signal setting (FR-A700/F700 series)

Set the output signals to be monitored. Set *Pr. 306* to output the same signal from terminals AM0 and AM1 and *Pr. 306* and *Pr. 310* to output different signals. For details of signal definitions, refer to *Pr. 54* and *Pr. 158* of the inverter (FR-A700/F700 series) manual.

<i>Pr. 306/ Pr. 310 Setting</i>	Types of Monitor	Increments	Full-Scale Value
1	Output frequency	0.01Hz	<i>Pr. 55</i>
2	Output current	0.01A/0.1A *2	<i>Pr. 56</i>
3	Output voltage	0.1V	200V class : 400V 400V class : 800V
5	Frequency setting	0.01Hz	<i>Pr. 55</i>
6	Running speed	1(r/min)	The value converted with the <i>Pr. 37</i> value from <i>Pr. 55</i> .
7 *3	Motor torque	0.1%	<i>Pr. 866</i>
8	Converter output voltage	0.1V	200V class : 400V 400V class : 800V
9 *1	Regenerative brake duty	0.1%	<i>Pr. 70</i>
10	Electronic thermal relay function load factor	0.1%	100%
11	Output current peak value	0.01A/0.1A *2	<i>Pr. 56</i>

<i>Pr. 306/ Pr. 310 Setting</i>	Types of Monitor	Increments	Full-Scale Value
12	Converter output voltage peak value	0.1V	200V class : 400V 400V class : 800V
13	Input power	0.01kW/0.1kW *2	Rated inverter power × 2
14	Output power	0.01kW/0.1kW *2	Rated inverter power × 2
17	Load meter	0.1%	<i>Pr. 866/Pr. 56 *4</i>
18 *3	Motor excitation current	0.01A/0.1A *2	<i>Pr. 56</i>
21	Reference voltage output	—	—
24	Motor load factor	0.1%	200%
32 *3	Torque command	0.1%	<i>Pr. 866</i>
33 *3	Torque current command	0.1%	<i>Pr. 866</i>
34 *3	Motor output	0.01kW/0.1kW *2	Rated motor capacity
50	Power saving effect	Variable according to parameters	Inverter capacity



Pr. 306/ Pr. 310 Setting	Types of Monitor	Increments	Full-Scale Value
52	PID set point	0.1%	100%
53	PID process value	0.1%	100%
70 *3	Programmable controller function output (-NA, -EC version only)	0.1%	100%

- *1 This parameter value is not available with the FR-F700 series 55K or less.
- *2 The setting depends on capacities. (55K or less/75K or more.)
The inverter type, 55K and 75K differ according to -NA and -EC version. (Refer to page 1.)
- *3 They can be set for the FR-A700 series only.
- *4 Full-scale value differs according to the inverter. (FR-A700 series/FR-F700 series)

5.5.4 Output signal setting (FR-E700 series)

Set the output signals to be monitored. Set *Pr. 306* to output the same signal from terminals AM0 and AM1 and *Pr. 306* and *Pr. 310* to output different signals. For details of signal definitions, refer to *Pr. 54* and *Pr. 158* of the inverter (FR-E700 series) manual.

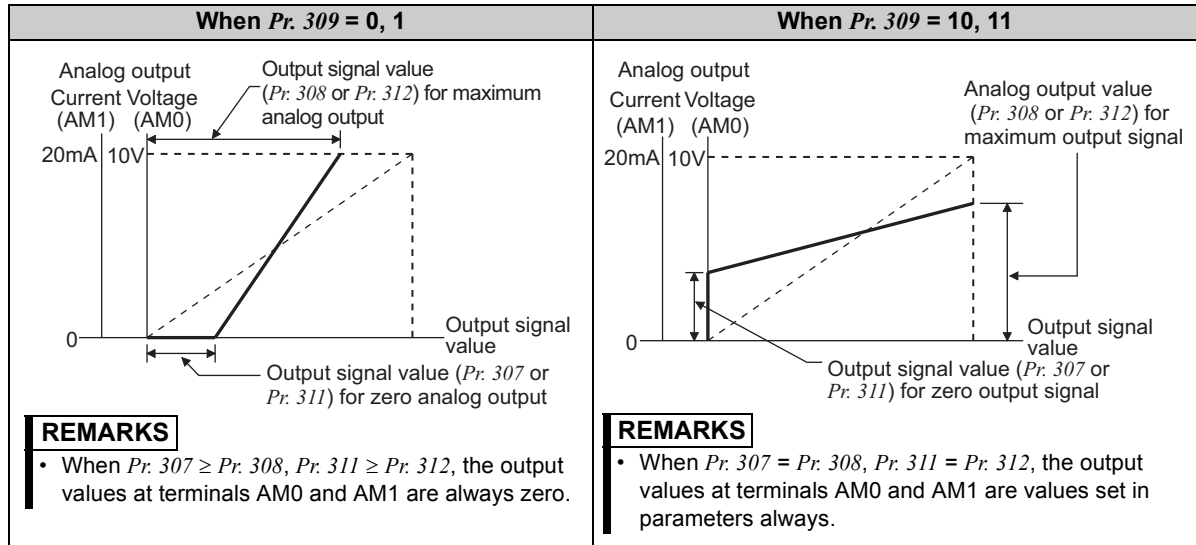
<i>Pr. 306/Pr. 310</i> Setting	Types of Monitor	Increments	Full-Scale Value
1	Output frequency	0.01Hz	<i>Pr. 55</i>
2	Output current	0.01A	<i>Pr. 56</i>
3	Output voltage	0.1V	200V class : 400V 400V class : 800V
5	Frequency setting	0.01Hz	<i>Pr. 55</i>
7	Motor torque	0.1%	Rated torque of the applied motor × 2
8	Converter output voltage	0.1V	200V class : 400V 400V class : 800V
9	Regenerative brake duty	0.1%	<i>Pr. 70</i>
10	Electronic thermal relay function load factor	0.1%	100%
11	Output current peak value	0.01	<i>Pr. 56</i>
12	Converter output voltage peak value	0.1V	200V class : 400V 400V class : 800V
14	Output power	0.01kW	Rated inverter power × 2
21	Reference voltage output	—	—
24	Motor load factor	0.1%	200%
52	PID set point	0.1%	100%
53	PID process value	0.1%	100%
61	Motor thermal load factor	0.1%	Thermal relay operation level (100%)
62	Inverter thermal load factor	0.1%	Thermal relay operation level (100%)

5.5.5 Analog signal adjustment [Pr. 307, Pr. 308, Pr. 311, Pr. 312]

Use *Pr. 307* or *Pr. 311* to set the value for zero analog output (meter points 0) and *Pr. 308* or *Pr. 312* for maximum analog output (full scale).

When outputting the same signal from terminals AM0 and AM1, use *Pr. 307* to set the value for zero analog output and *Pr. 308* for maximum analog output.


When outputting different signal from terminals AM0 and AM1, use *Pr. 307* (for terminal AM1) and *Pr. 311* (for terminal AM0) to set the value for zero analog output and *Pr. 308* (for terminal AM1) and *Pr. 312* (for terminal AM0) for maximum analog output. (Refer to page 27.)



5.6 Instructions

- (1) A voltmeter having smaller internal impedance (or an ammeter having larger internal impedance) than the value indicated in the Specifications (*page 4*) may not deflect to full-scale and may not be calibrated.
- (2) When calibrating a meter with a small full-scale value, set output of terminal AM0 and AM1 to minimum, then connect a meter.

CAUTION

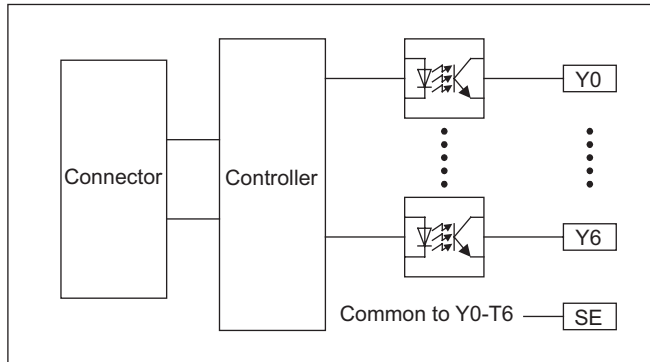
 **This option unit is factory-set to provide the full-scale output of 10VDC and 20mADC. Hence, a voltmeter (7VDC or less) or an ammeter (14mADC or less) with a small full-scale value may be damaged accidentally during calibration. This should be fully noted.**

- (3) Set "0%" in *Pr. 307* or *Pr. 311* and "100%" in *Pr. 308* or *Pr. 312* to prevent calibration value deviation when calibrating the meter using *Pr. 323*, *Pr. 324*, *C0 (Pr. 900)*, or *C1 (Pr. 901)* when *Pr. 309* = "10 or 11".
- (4) When an option error ($\bar{E}. \quad 1$ to $\bar{E}. \quad 3$) occurs, all outputs are off.

6 DIGITAL OUTPUT

6.1 Internal Block Diagram

The following is the internal block diagram about the FR-A7AY digital output function

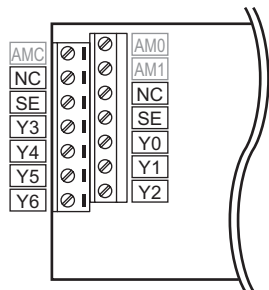


6.2 Terminals

By setting the *Pr. 313* to *Pr. 319* values, output signals (RUN, SU etc.) available with an inverter as standard can be output from the open collector terminals.

- (1) Open collector output specifications: Permissible load 24V, 0.1ADC
- (2) The circuit logic is the same as that of the inverter.

For details of changing the control logic, refer to *the inverter manual (basic)*.



Terminal Symbol	Terminal Name	Description
Y0	Digital output terminals	Use <i>Pr. 313</i> to assign functions.
Y1		Use <i>Pr. 314</i> to assign functions.
Y2		Use <i>Pr. 315</i> to assign functions.
Y3		Use <i>Pr. 316</i> to assign functions.
Y4		Use <i>Pr. 317</i> to assign functions.
Y5		Use <i>Pr. 318</i> to assign functions.
Y6		Use <i>Pr. 319</i> to assign functions.
SE	Common terminal	This is a common terminal (for sink and source).
AM0	Used for analog output function. (<i>Refer to page 23</i>)	
AM1		
AMC		
NC (empty)	Do not use.	



6.3 Digital Output Function Parameter List

Parameter Number	Name	Initial Value	Setting Range
313	DO0 output selection	9999	0 to 8, 10 to 20, 25 to 28, 30 to 36, 39, 41 to 47, 64, 70 to 78, 84 to 99, 100 to 108, 110 to 116, 120, 125 to 128, 130 to 136, 139, 141 to 147, 164, 170, 184 to 199, 9999 *
314	DO1 output selection	9999	
315	DO2 output selection	9999	
316	DO3 output selection	9999	
317	DO4 output selection	9999	
318	DO5 output selection	9999	
319	DO6 output selection	9999	

* The setting range differs according to the inverter. For details refer to *page 38, 40*.

REMARKS

- With this function, output signals can be set redundantly.

6.4 Output Signal List (FR-A700/F700 series)

For details of signal definitions, refer to Pr. 190 to Pr. 196 (Output terminal function selection) of the inverter (FR-A700/F700 series) manual.

Setting		Signal Name	Function
Positive Logic	Negative Logic		
0	100	RUN	Inverter running
1	101	SU	Up to frequency
2	102	IPF	Instantaneous power failure/undervoltage
3	103	OL	Overload alarm
4	104	FU	Output frequency detection
5	105	FU2	Second output frequency detection
6	106	FU3	Third output frequency detection *1
7	107	RBP	Regenerative brake prealarm *2
8	108	THP	Electronic thermal relay function prealarm
10	110	PU	PU operation mode
11	111	RY	Inverter operation ready
12	112	Y12	Output current detection
13	113	Y13	Zero current detection
14	114	FDN	PID lower limit
15	115	FUP	PID upper limit
16	116	RL	PID forward/reverse rotation output
17	—	MC1	Commercial power-supply switchover MC1
18	—	MC2	Commercial power-supply switchover MC2

Setting		Signal Name	Function
Positive Logic	Negative Logic		
19	—	MC3	Commercial power-supply switchover MC3
20	120	BOF	Brake opening request *1
25	125	FAN	Fan fault output
26	126	FIN	Heatsink overheat pre-alarm
27	127	ORA	Orientation in-position *1
28	128	ORM	Orientation error *1
30	130	Y30	Forward rotation output *1
31	131	Y31	Reverse rotation output *1
32	132	Y32	Regenerative status output *1
33	133	RY2	Operation ready 2 *1
34	134	LS	Low speed output *1
35	135	TU	Torque detection *1
36	136	Y36	In-position *1
39	139	Y39	Start time tuning completion *1
41	141	FB	Speed detection *1
42	142	FB2	Second speed detection *1
43	143	FB3	Third speed detection *1
44	144	RUN2	Inverter running 2 *1
45	145	RUN3	During inverter running and start command is on



Setting		Signal Name	Function
Positive Logic	Negative Logic		
46	146	Y46	During deceleration due to instantaneous power failure (retained until release)
47	147	PID	During PID control activated
64	164	Y64	During retry
70	170	SLEEP	During PID output suspension
71	—	RO1	Commercial-power supply side motor 1 connection RO1 *4
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
84	184	RDY	Position control preparation ready *1

Setting		Signal Name	Function
Positive Logic	Negative Logic		
85	185	Y85	DC current feeding *1
86	186	Y86	Control circuit capacitor life *3
87	187	Y87	Main circuit capacitor life *3
88	188	Y88	Cooling fan life *3
89	189	Y89	Inrush current limit circuit life *3
90	190	Y90	Life alarm
91	191	Y91	Alarm output 3 (power off signal)
92	192	Y92	Energy saving average value updated timing
93	193	Y93	Current average monitor signal
94	194	ALM2	Alarm output 2
95	195	Y95	Maintenance timer signal
96	196	REM	Remote output
97	197	ER	Minor fault output 2 *1
98	198	LF	Minor fault output
99	199	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-F720-03610, FR-F740-01800) or more.

*3 Pr. 190 to Pr. 196 can not be set.

*4 Setting can be made only for FR-F700 series EC and CH version.

REMARKS

- When an option error (E. I) occurs, all outputs are turned off.

6.5 Output Signal List (FR-E700 series)

For details of signal definitions, refer to Pr. 190 to Pr. 192 (Output terminal function selection) of the inverter (FR-E700 series) manual.

Setting		Signal Name	Function
Positive Logic	Negative Logic		
0	100	RUN	Inverter running
1	101	SU	Up to frequency
3	103	OL	Overload alarm
4	104	FU	Output frequency detection
7	107	RBP	Regenerative brake prealarm
8	108	THP	Electronic thermal relay function prealarm
11	111	RY	Inverter operation ready
12	112	Y12	Output current detection
13	113	Y13	Zero current detection
14	114	FDN	PID lower limit
15	115	FUP	PID upper limit
16	116	RL	PID forward/reverse rotation output
20	120	BOF	Brake opening request
25	125	FAN	Fan fault output

Setting		Signal Name	Function
Positive Logic	Negative Logic		
26	126	FIN	Heatsink overheat pre-alarm
46	146	Y46	During deceleration due to instantaneous power failure (retained until release)
47	147	PID	During PID control activated
64	164	Y64	During retry
90	190	Y90	Life alarm
91	191	Y91	Alarm output 3 (Power-off signal)
93	193	Y93	Current average monitor signal
95	195	Y95	Maintenance timer signal
96	196	REM	Remote output
98	198	LF	Minor fault output
99	199	ALM	Alarm output
9999		—	No function

REMARKS

- When an option error (E. !) occurs, all outputs are tuned off.

REVISIONS

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

Print Date	*Manual Number	Revision
May, 2004	IB(NA)-0600165ENG-A	First edition
Sep., 2005	IB(NA)-0600165ENG-B	<div data-bbox="544 239 671 267" style="border: 1px solid black; padding: 2px;">Additions</div> Compatible with the FR-F700 series 200V class Compatible with the FR-A700 series
Dec., 2007	IB(NA)-0600165ENG-C	<div data-bbox="544 349 671 377" style="border: 1px solid black; padding: 2px;">Additions</div> Compatible with the FR-E700 series