



INVERTER

Plug-in option

FR-E8AXY E KIT

INSTRUCTION MANUAL

*Additional control circuit
input/output*

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Safety instructions


Thank you for choosing this Mitsubishi Electric 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, read all relevant instruction manuals carefully to ensure proper use.

Please forward this Instruction Manual to the end user.

Do not attempt to install, operate, maintain or inspect this product until you have read this Instruction Manual and supplementary documents carefully. Do not use this product until you have a full knowledge of this product mechanism, 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.

Note that even the  **CAUTION** level may lead to a serious consequence depending on conditions. Be sure to follow the instructions of both levels as they are critical to personnel safety.

◆ Electric Shock Prevention

WARNING

- Do not remove the front cover or the wiring cover while the power of the inverter is ON, and 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 product 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. Doing so may cause an electric shock.
- Do not subject the cables to scratches, excessive stress, heavy loads or pinching. Doing so may cause an electric shock.

◆ Injury Prevention

CAUTION

- The voltage applied to each terminal must be the ones specified in the Instruction Manual. Otherwise an explosion or damage may occur.
- The cables must be connected to the correct terminals. Otherwise an explosion or damage may occur.
- The polarity (+ and -) must be correct. Otherwise an explosion 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. Doing so may cause burns.

◆ 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 installation

- 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.
- Ensure the mounting orientation of this product is 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 halogens (including fluorine, chlorine, bromine, and iodine) contained in fumigants for wood packages enter this product, the product may be damaged. Prevent the entry of fumigant residuals or use an alternative method such as heat disinfection. Note that sterilization or disinfection of wood packages should be performed before packing 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 remove any part which is not instructed to be removed in the Instruction Manuals. Doing so may lead to failure or damage of the product.

CAUTION

Usage

- As all parameters return to their initial values after the Parameter clear or All parameter clear is performed, the parameters must be set again as required before the operation is started.
- 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

- This product must be treated as industrial waste.

General instruction

- For clarity, illustrations in this Instruction Manual may be drawn with covers or safety guards removed. Ensure all covers and safety guards are properly installed prior to starting operation.

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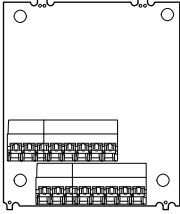

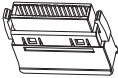
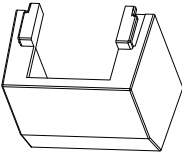
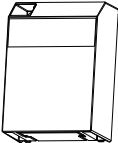



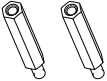
1 PRE-OPERATION INSTRUCTIONS

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. This product is a plug-in option made for the FR-E800 series inverters.

1.1.1 Product confirmation

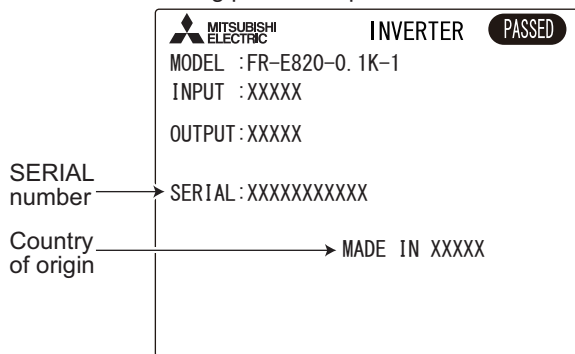
Check the enclosed items.

<p>Plug-in option: 1</p> 	<p>Mounting screw (M3 × 8 mm): 2 (Refer to page 12, page 14.)</p> 	<p>Junction connector: 1 (Refer to page 12, page 14.)</p> 	<p>Option small cover: 1 (Refer to page 14.)</p> 	<p>Front cover for plug-in option: 1 (Refer to page 12, page 14.)</p> 
<p>Recessed neck screw (M3 × 7): 1 (Refer to page 12, page 14.)</p> 	<p>Straight spacer: 1 (Refer to page 12, page 14.)</p> 	<p>L-shaped spacer: 1 (Refer to page 12, page 14.)</p> 	<p>Hexagon spacer: 2 (Refer to page 12, page 14.)</p> 	

1.1.2 Checking the SERIAL number of the inverter

The FR-E8AXY can be used with the models of inverters listed below which have the following SERIAL number. Check the SERIAL number indicated on the inverter rating plate or package.

Rating plate example



□□	○○	○	○○○○○○
Symbol	Year	Month	Control number
SERIAL			

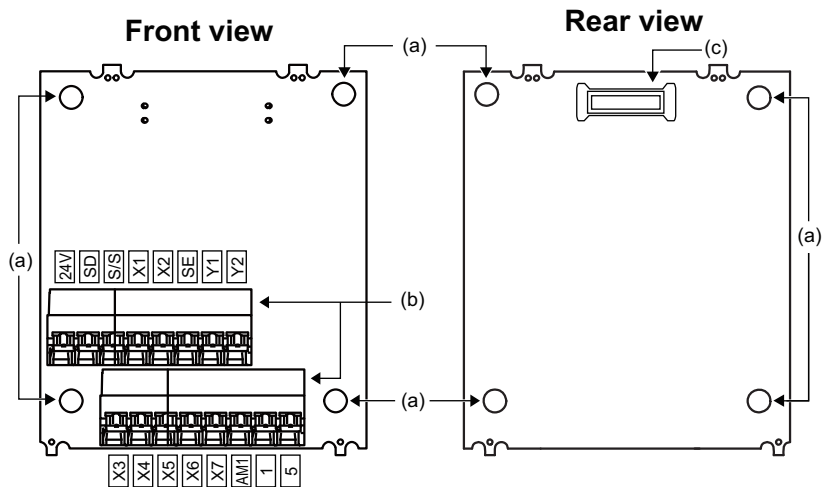
The SERIAL consists of two symbols, three characters indicating the production year and month, and six characters indicating the control number. The last two digits of the production year is indicated as the Year, and the Month is indicated by 1 to 9, X (October), Y (November), or Z (December).

Model	Country of origin indication	SERIAL number
Standard model Ethernet model Safety communication model	MADE in Japan	□□ 237 ○○○○○○ or later
	MADE in China	□□ 238 ○○○○○○ or later

NOTE

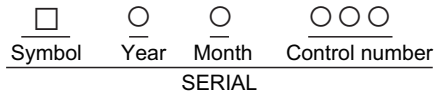
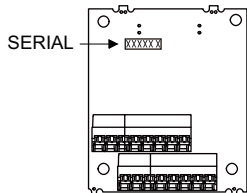
- The inverter firmware can be updated by using Firmware Update Tool of FR Configurator2. Even for an inverter which has a SERIAL number earlier than the above, the FR-E8AXY can be used by updating the inverter firmware to version 12 or later. For details on firmware update, refer to the FR Configurator2 Instruction Manual.

1.2 Component names



Symbol	Name	Description	Refer to page
a	Mounting hole	Used to fix this product to the inverter by inserting a mounting screw or a spacer.	11
b	Terminal block	Connected to the device to input the signal to the inverter, and the device to receive the signal from the inverter.	19
c	Board mounted option connector	Connected to the junction connector, which is connected to the option connector on the inverter.	11

1.2.1 Checking the SERIAL number of the plug-in option



The SERIAL consists of one symbol, two characters indicating the production year and month, and three characters indicating the control number.

The last digit of the production year is indicated as the Year, and the Month is indicated by 1 to 9, X (October), Y (November), or Z (December).

1.3 Specifications

◆ Input signal

■ Digital input

Item	Description
Number of terminals	7
Rated specification	Input resistance: 4.7 k Ω Voltage when contacts are open: 21 to 26 VDC Current when contacts are short-circuited: 4 to 6 mADC

■ Pulse train input

Item	Description
Number of terminals	1 (dual purpose with one digital input terminal)
Rated specification	Input resistance: 2 k Ω Current when contacts are short-circuited: 8 to 13 mADC Maximum input pulse: 100k pulses/s

■ Analog input

Item	Description
Number of terminals	1
Rated specification	0 to ± 10 VDC Input resistance: 10 to 11 k Ω Permissible maximum voltage: ± 20 VDC

◆ Output signal

■ Digital output

Item	Description
Number of terminals	2
Rated specification	Permissible load: 24 VDC (27 VDC at maximum) 0.1 A (The voltage drop is 3.4 V at maximum while the signal is ON.)

■ Analog output

Item	Voltage output
Output signal	0 to ± 10 VDC max. (across terminals AM1 and 5)
Output resolution	3 mV
Applicable meter	DC voltmeter Full-scale ± 10 V (internal impedance: 10 k Ω or more)
	Wiring length: maximum 10 m

2 INSTALLATION

2.1 Pre-installation instructions

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

CAUTION

- Do not install or remove this product while the inverter power is ON. Doing so may damage the inverter or this product.
- To avoid damage due to static electricity, static electricity in your body must be discharged before you touch the product.

2.2 Installation procedure

◆ Installing the option

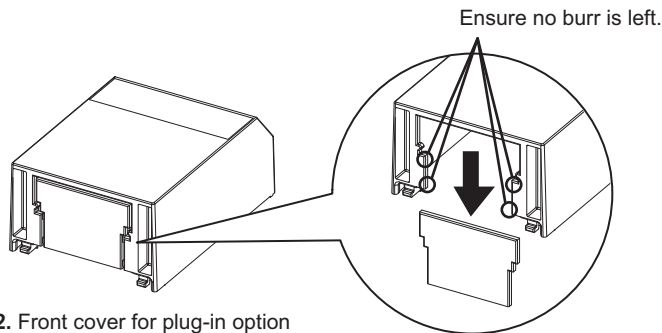
The FR-E800 series inverter has only one plug-in option connector.

NOTE

- Ensure the control circuit terminals are wired before installing the plug-in option. They cannot be wired after the plug-in option is installed.
- When installing the plug-in option, prevent cables being caught between parts. Otherwise the inverter and the option may be damaged.

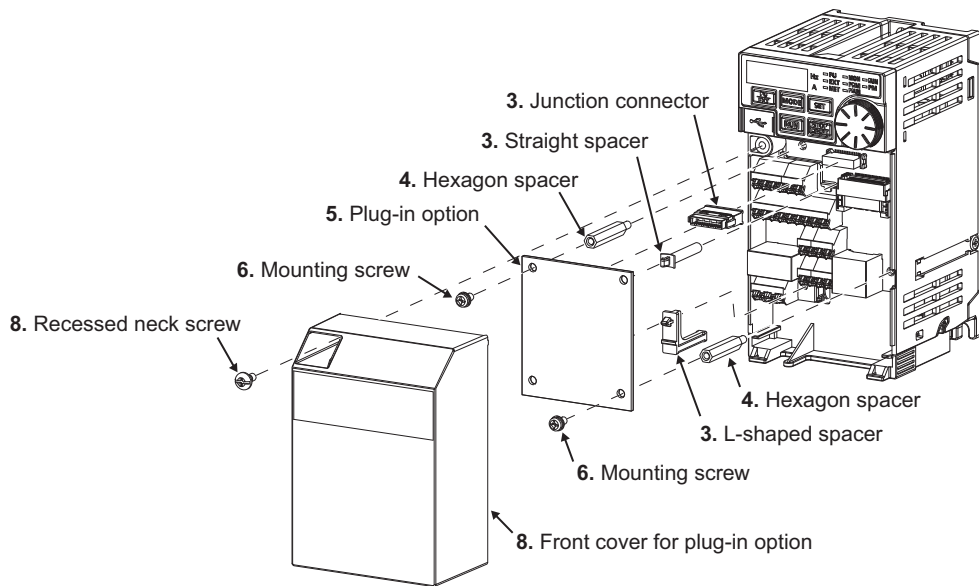
■ For the **FR-E820-0175(3.7K) or lower, FR-E840-0170(7.5K) or lower, and FR-E860-0120(7.5K) or lower**

1. Remove the inverter front cover. (Refer to the FR-E800 Instruction Manual (Connection) for instructions to remove the cover.)
2. Use a nipper or the like to cut off the bottom of the front cover for plug-in option.



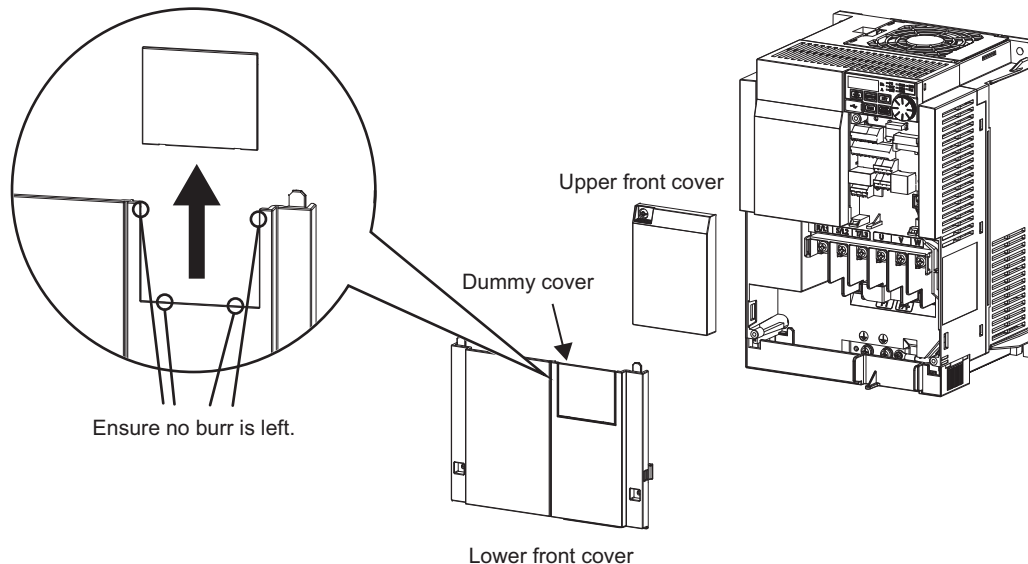
2. Front cover for plug-in option
3. Fit the L-shaped spacer, straight spacer, and junction connector to the plug-in option as shown in the figure on the [page 13](#). Fit the junction connector to the guide of the connector of the plug-in option, and insert the junction connector as far as it goes. Fit the L-shaped spacer to the plug-in option so that the lower edge of the option placed on the ridge of the spacer.
4. Remove the body screws of the inverter, then install the hexagon spacers to the inverter (tightening torque 0.56 to 0.75 N·m).

5. Fit the junction connector, which has been connected to the plug-in option, to the guide of the option connector on the inverter, and insert the junction connector as far as it goes.
6. Fasten this product to the inverter using the two mounting screws through the holes on either side (tightening torque 0.33 to 0.40 N·m). If the connector is not inserted deep enough, the screws cannot be tightened properly. Check the connector.
7. Connect cables to the terminal block of the plug-in option. (Refer to [page 19](#) for the wiring.)
8. After wiring of the plug-in option has been completed, mount the front cover for the plug-in option to the inverter.



■ For the FR-E820-0240(5.5K) or higher

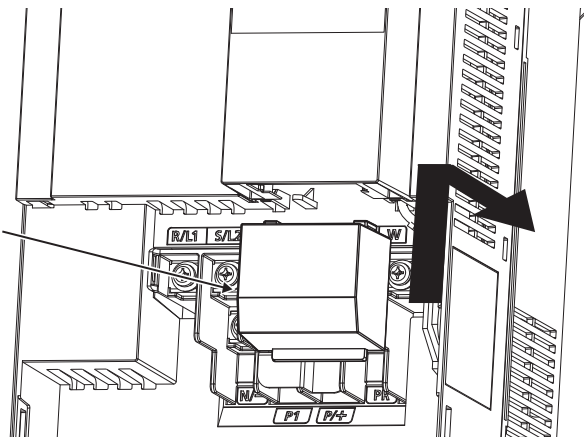
1. Remove the upper front cover and the lower front cover from the inverter. (Refer to the FR-E800 Instruction Manual (Connection) for instructions to remove the covers.)
2. Use a nipper or the like to cut off the dummy cover of the lower front cover in order to install the option small cover.



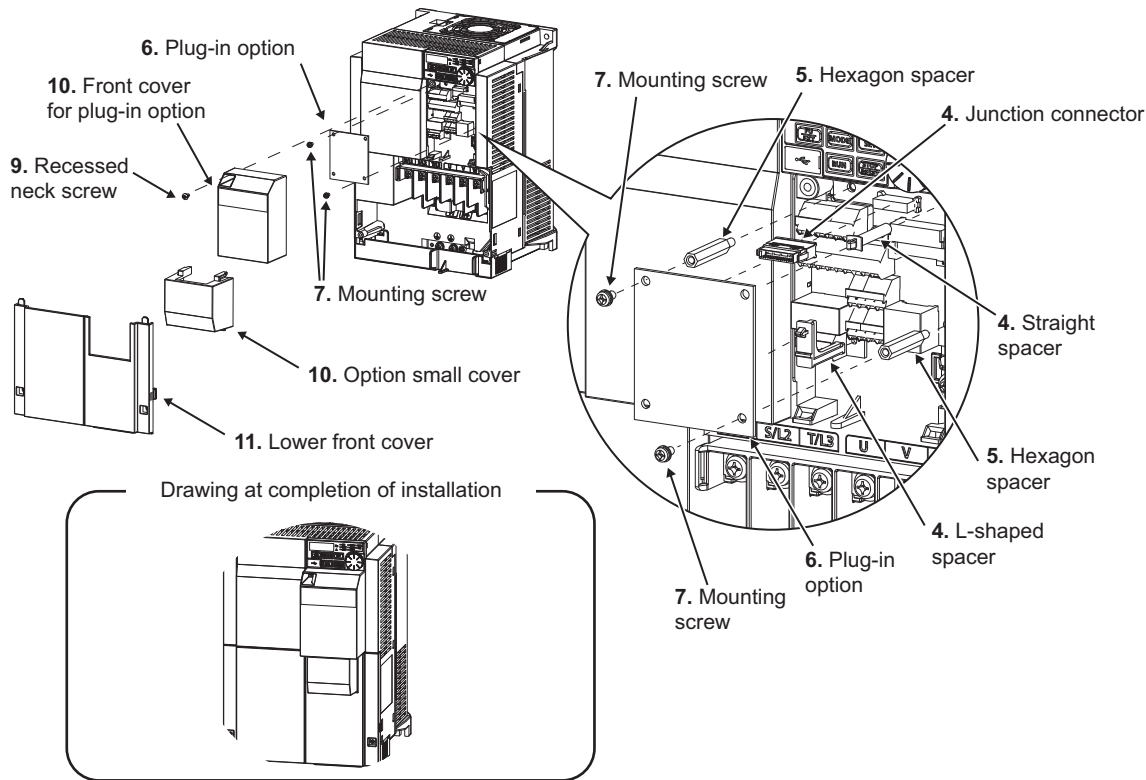
3. Use a nipper or the like to cut off the bottom of the front cover for plug-in option. (For details, refer to [page 12](#).)
4. Fit the L-shaped spacer, straight spacer, and junction connector to the plug-in option as shown in the figure on the [page 16](#). Fit the junction connector to the guide of the connector of the plug-in option, and insert the junction connector as far as it goes. Fit the L-shaped spacer to the plug-in option so that the lower edge of the option placed on the ridge of the spacer.

5. Remove the body screws of the inverter, then install the hexagon spacers to the inverter (tightening torque 0.56 to 0.75 N·m).
6. Fit the junction connector, which has been connected to the plug-in option, to the guide of the option connector on the inverter, and insert the junction connector as far as it goes.
7. Fasten this product to the inverter using the two mounting screws through the holes on either side (tightening torque 0.33 to 0.40 N·m). If the connector is not inserted deep enough, the screws cannot be tightened properly. Check the connector.
8. Connect cables to the terminal block of the plug-in option. (Refer to [page 19](#) for the wiring.)
9. After wiring of the plug-in option has been completed, mount the front cover for the plug-in option to the inverter.
10. Install the option small cover to the front cover for plug-in option by inserting the small cover into the front cover and slide it toward the rear of the inverter.

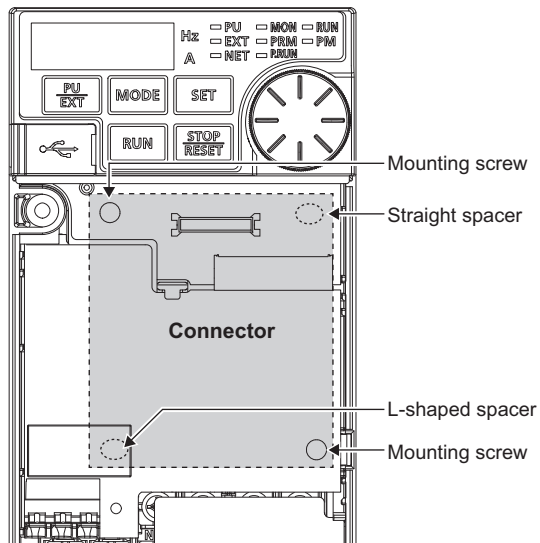
10. Option small cover



11. Install the lower front cover to the inverter.



◆ Insertion positions for screws and spacers



NOTE

- When the junction connector is installed to the plug-in option, the option is fixed with the hooks of the connector. The junction connector cannot be removed from the plug-in option.
- When removing the front cover for plug-in option from the inverter, note that the recessed neck screw cannot be removed from the front cover for plug-in option.
- When installing/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.
- Be careful not to drop mounting screws during the installation or removal of the plug-in option.
- When the inverter cannot recognize the option due to improper installation or any other reason, the protective function (E.1) is activated and the inverter cannot be operated. All the outputs are shut off when E.1 is activated.

Mounted position	Fault indication
Option connector	E. 1

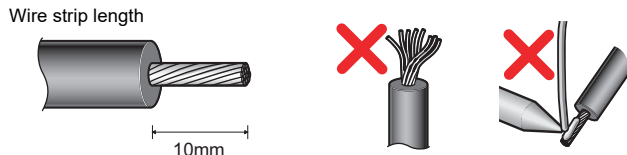
- When removing the plug-in option, remove the two screws on either side, and then pull it straight out. Pressure applied to the option connector and to the option board may break the option.

2.3 Wiring

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

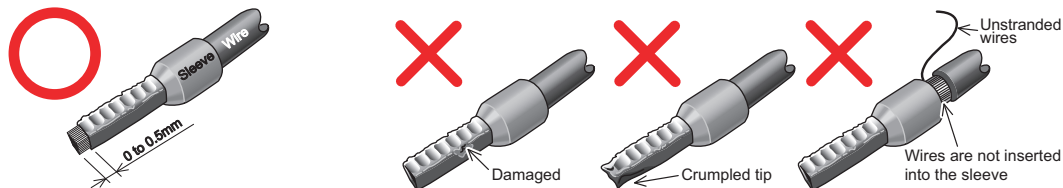
Strip the signal wires as follows. If too much of the wire is stripped, a short circuit may occur with neighboring wires. If not enough of the wire is stripped, wires may become loose and fall out.

Twist the stripped end of wires to prevent them from fraying. Do not solder them.



Crimp the terminals on the wire.

Insert the wire into a crimp terminal, making sure that 0 to 0.5 mm of the wire protrudes from the end of the sleeve. Check the condition of the crimp terminals after crimping. Do not use the crimp terminals of which the crimping is inappropriate, or the face is damaged.



CAUTION

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

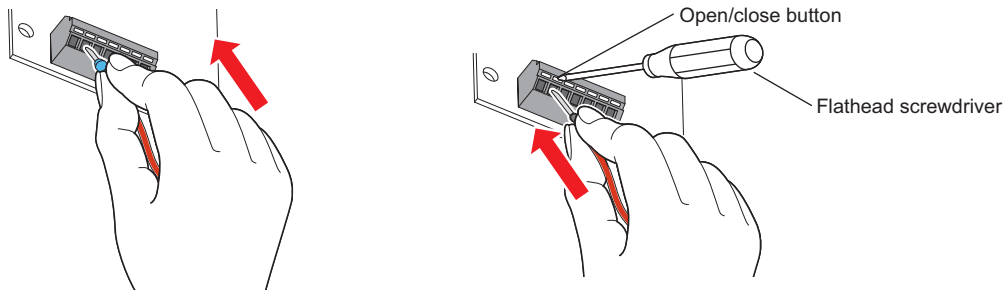
Crimp terminals commercially available (as of October 2020. The product may be changed without notice.)

Wire gauge (mm ²)	Ferrule part No.			Manufacturer	Crimping tool model No.
	With insulation sleeve	Without insulation sleeve	For UL wire *1		
0.3	AI 0,34-10TQ	—	—	Phoenix Contact Co., Ltd.	CRIMPFOX 6
0.5	AI 0,5-10WH	—	AI 0,5-10WH-GB		
0.75	AI 0,75-10GY	A 0,75-10	AI 0,75-10GY-GB		
1	AI 1-10RD	A 1-10	AI 1-10RD/ 1000GB		
1.25, 1.5	AI 1,5-10BK	A 1,5-10	—		
0.75 (for two cables)	AI-TWIN 2×0,75-10GY	—	—		

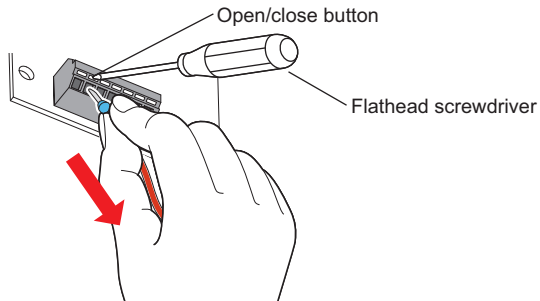
*1 A ferrule terminal with an insulation sleeve compatible with the MTW wire which has a thick wire insulation.

Wire gauge (mm ²)	Blade terminal part No.	Insulation cap part No.	Manufacturer	Crimping tool model No.
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 crimp 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 crimp 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 October 2020. The product may be changed without notice.)

Name	Model	Manufacturer
Screwdriver	SZF 0- 0,4 x 2,5	Phoenix Contact Co., Ltd.

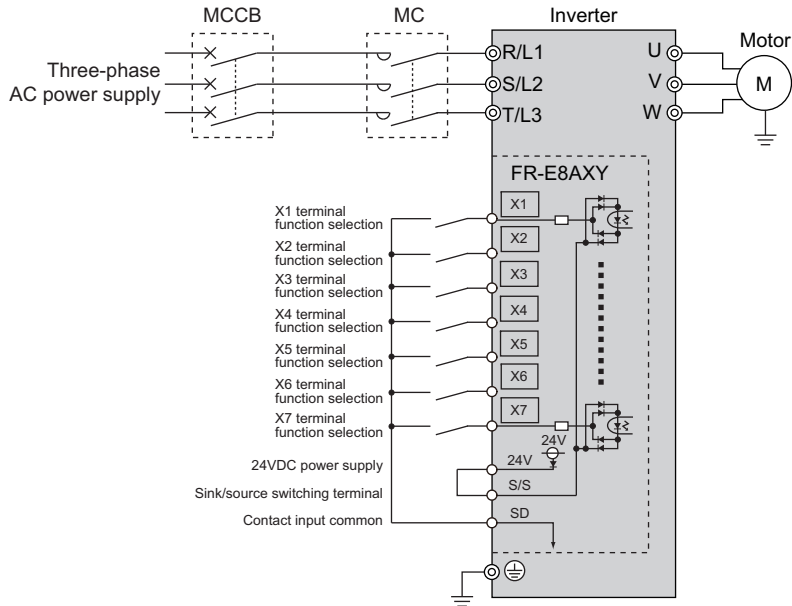
- Place the flathead screwdriver vertical to the open/close button. In case the blade tip slips, it may cause an inverter damage or injury.

3 CONTROL CIRCUIT INPUT SIGNAL

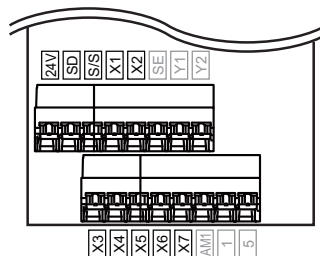
3.1 Digital input

The input terminal functions can be selected by using parameters.

3.1.1 Connection example



3.1.2 Terminals



Type	Terminal symbol	Terminal function	Specifications
Digital input	X1 to X7	Contact input terminal	Input resistance: 4.7 kΩ Input signal current: 5 mA _{DC} / 24 VDC
	X7 (dual-purpose)	Pulse train input terminal	Input resistance: 2 kΩ Input signal current: 12 mA _{DC} / 24 VDC
Common terminal	S/S	Sink/source switching terminal	When the sink logic is selected When using internal power supply: Connected to terminal 24V When using external power supply: Connected to the positive terminal of the external power supply When the source logic is selected When using internal power supply: Connected to terminal SD When using external power supply: Connected to the negative terminal of the external power supply
	SD	<ul style="list-style-type: none"> Common terminal for the 24 VDC power supply terminal (terminal 24V) Common terminal for the contact input terminal (sink logic) 	—
	24V	<ul style="list-style-type: none"> 24 VDC power supply terminal Common terminal for the contact input terminal (source logic) 	Power supply voltage range: 22 to 26.5 VDC Permissible load current: 100 mA

3.1.3 Control logic (sink/source) change

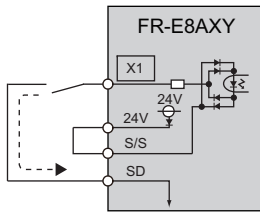
The control logic of digital input signals of the FR-E8AXY can be switched by wiring of terminal S/S. Terminal S/S of the FR-E8AXY is separated from the contact input circuit of the inverter. This allows the control logic different from that of the inverter.

◆ Switching the control logic of the FR-E8AXY

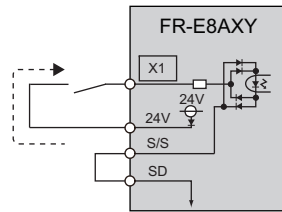
The control logic is switched by connecting terminal S/S to terminal 24V or terminal SD of the FR-E8AXY.

- Sink logic: Connect terminal S/S to terminal 24V. When terminal SD and the contact input terminal are shorted, the signal turns ON.
- Source logic: Connect terminal S/S to terminal SD. When terminal 24V and the contact input terminal are shorted, the signal turns ON.

Sink logic

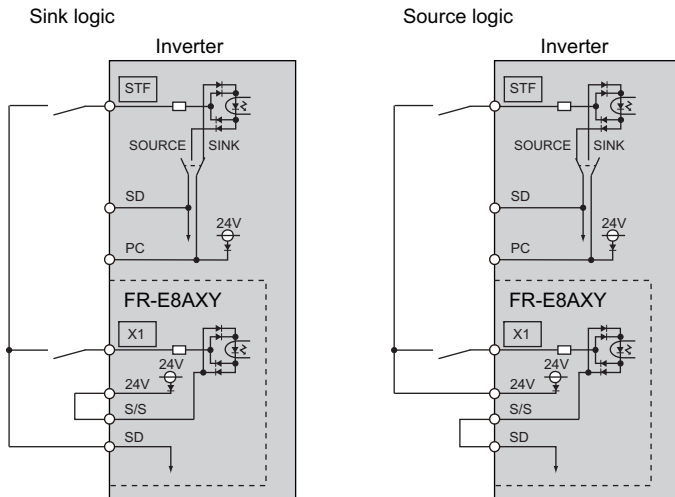


Source logic



-----▶ Current flow

◆ Connection diagram



NOTE

- Terminal PC of the inverter is separated from the FR-E8AXY.
- Change the control logic of the inverter before installing the FR-E8AXY. For details, refer to the FR-E800 Instruction Manual (Connection).
- The connection diagrams in this Instruction Manual appear with the control logic as sink logic (using the internal power supply), unless otherwise specified.

3.1.4 Digital input function parameter list

Use **Pr.525 to Pr.531** to assign signals to terminal X1 to X7. The settings of **Pr.525 to Pr.531** are the same as those of **Pr.178 to Pr.189 (Input terminal function selection)**. For details of **Pr.178 to Pr.189**, refer to the FR-E800 Instruction Manual (Function).

Pr.	Name	Initial value	Setting range
525 T761	X1 terminal function selection	9999	0 to 5, 7, 8, 12 to 16, 18, 22, 23, 25 ^{*1} , 26, 27, 30, 37, 42, 43, 46, 47, 50 to 52, 54, 62, 65 to 67, 72, 74, 76, 84 ^{*1} , 87 to 89, 92, 9999
526 T762	X2 terminal function selection	9999	
527 T763	X3 terminal function selection	9999	
528 T764	X4 terminal function selection	9999	
529 T765	X5 terminal function selection	9999	
530 T766	X6 terminal function selection	9999	
531 T767	X7 terminal function selection	9999	

*1 Available for the standard model and the Ethernet model.



NOTE

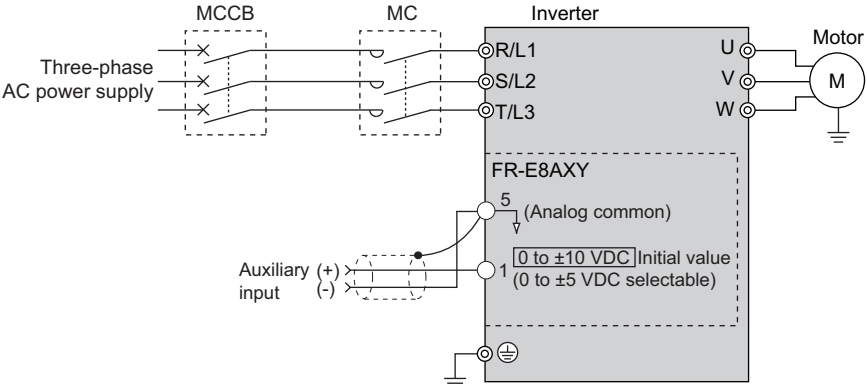
- The signals assigned to terminals X1 to X7 can be input only via physical terminals.

3.2 Analog input

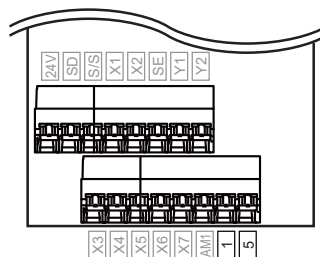
Analog input via terminal 1 is available.

Auxiliary frequency (speed) setting and torque limit command are available by inputting a voltage of 0 to ±10 VDC.

3.2.1 Connection example



3.2.2 Terminals



Type	Terminal symbol	Terminal function	Specifications
Analog input	1	Analog voltage input terminal	Input resistance: 10 to 11 kΩ Input voltage range: 0 to ±10 VDC Permissible maximum voltage: ±20 VDC Resolution: 10 bits
Common terminal	5	Common terminal for terminal 1	—

3.2.3 Analog input selection

The functions to switch the analog input terminal specifications, override function, and forward/reverse rotation by the input signal polarity are selectable.

Pr.	Name	Initial value	Setting range	Description
73 T000	Analog input selection	1	0 to 7, 10 to 17	The terminal 1 input specification (0 to ± 5 V, 0 to ± 10 V) of the FR-E8AXY and the terminal 2 input specification (0 to 10 V, 0 to 5 V, 0 to 20 mA) of the inverter are selectable. Also the override and reversible operation settings are selectable.

◆ Analog input specification selection

- To change the input specification, change the setting of **Pr.73** and the voltage/current input selection switch (switch 2) of the inverter.

Set **Pr.73** and the switch 2 according to the following table.

Pr.73 setting	Terminal 1 input	Terminal 2 input	Switch 2	Compensation input terminal and compensation method	Reversible polarity
0	0 to ±10 V	0 to 10 V ^{*1}	V	Terminal 1 addition compensation	Not applied (state in which a negative polarity frequency command signal is not accepted)
1 (initial value)	0 to ±10 V	0 to 5 V ^{*1}	V		
2	0 to ±5 V	0 to 10 V ^{*1}	V		
3	0 to ±5 V	0 to 5 V ^{*1}	V		
4	0 to ±10 V ^{*1}	0 to 10 V	V	Terminal 2 override	Applied
5	0 to ±5 V ^{*1}	0 to 5 V	V	Terminal 1 addition compensation	
6 ^{*2}	0 to ±10 V	0 to 20 mA ^{*1}	I		
7 ^{*3}	0 to ±5 V	0 to 20 mA ^{*1}	I		
10	0 to ±10 V	0 to 10 V ^{*1}	V		
11	0 to ±10 V	0 to 5 V ^{*1}	V	Terminal 2 override	Applied
12	0 to ±5 V	0 to 10 V ^{*1}	V		
13	0 to ±5 V	0 to 5 V ^{*1}	V		
14	0 to ±10 V ^{*1}	0 to 10 V	V		
15	0 to ±5 V ^{*1}	0 to 5 V	V	Terminal 1 addition compensation	Applied
16 ^{*4}	0 to ±10 V	0 to 20 mA ^{*1}	I		
17 ^{*5}	0 to ±5 V	0 to 20 mA ^{*1}	I		

*1 The main speed setting is indicated.

*2 When the FR-E8TR or FR-E8TE7 (control terminal option) is installed, the operation is the same as the one when the setting is "1".

*3 When the FR-E8TR or FR-E8TE7 (control terminal option) is installed, the operation is the same as the one when the setting is "3".

*4 When the FR-E8TR or FR-E8TE7 (control terminal option) is installed, the operation is the same as the one when the setting is "11".

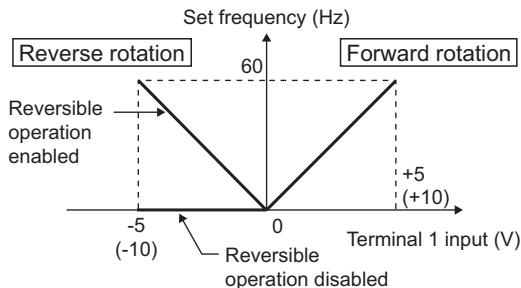
*5 When the FR-E8TR or FR-E8TE7 (control terminal option) is installed, the operation is the same as the one when the setting is "13".

NOTE

- For details on the addition compensation and override function, refer to [page 36](#).
- Use **C14 (Pr.918) Terminal 1 gain frequency (speed)** to change the maximum output frequency at the input of the maximum output frequency command voltage. At this time, the command voltage need not be input. The acceleration/ deceleration time is shown as a slope up/down to the acceleration/deceleration reference frequency. The acceleration/ deceleration time is not affected by the change in **Pr.73** setting.
- To input frequency through terminal 1, set "0" (initial value) in **Pr.868**.
- Always calibrate the input after changing the input specification using **Pr.73**.

◆ Performing forward/reverse rotation with the analog input (polarity reversible operation)

- Setting "10 to 17" in **Pr.73** enables the polarity reversible operation.
- Set a positive or negative input (0 to ± 5 V or 0 to ± 10 V) to terminal 1 to allow the operation of forward/reverse rotation according to the polarity of the input value.



**Compensation input characteristics
when the STF signal is ON**

3.2.4 Analog input terminal (terminal 1) function assignment

The analog input terminal 1 function can be selected by using a parameter.

Pr.	Name	Initial value	Setting range	Description
868 T010	Terminal 1 function assignment	9999	0, 2, 4, 9999	Select the terminal 1 function.

Functions such as auxiliary frequency (speed) setting and torque limit are selectable for terminals 1 used for analog input. The functions available are different depending on the control method and control mode as shown in the following table. (For details on the control method and control mode, refer to the FR-E800 Instruction Manual (Function).)

Pr.868 setting	V/F control Advanced magnetic flux vector control	Real sensorless vector control / PM sensorless vector control		
		Speed control	Torque control	Position control
0	Auxiliary frequency setting	Auxiliary speed setting	Speed limit assistance	—
2	—	Regenerative driving torque limit (Pr.810 = "1")	—	Regenerative driving torque limit (Pr.810 = "1")
4	—	Torque limit (Pr.810 = "1")	—	Torque limit (Pr.810 = "1")
9999 (initial value)	—	—	—	—

—: No function



NOTE

- When "4" (torque limit) is set in both **Pr.858** and **Pr.868**, the function of terminal 1 has higher priority, and no function is assigned to terminal 4.

◆ Changing the control mode with external terminals (MC signal)

- To use ON/OFF of the MC signal to switch the control mode, set **Pr.800** or **Pr.451**. Refer to the FR-E800 Instruction Manual (Function) and set **Pr.800** or **Pr.451**. To input the MC signal, set "26" in any parameter from **Pr.178 to Pr.189**, or **Pr.525 to Pr.531 (Input terminal function selection)** to assign the function.
- When an analog input terminal (terminal 1) is used for auxiliary speed setting or torque limit, switching of the control mode changes the terminal function as follows:

Pr.868 setting	Speed control / torque control switchover ^{*1}		Speed control / position control switchover ^{*2}	
	Speed control (MC signal-OFF)	Torque control (MC signal-ON)	Speed control (MC signal-OFF)	Position control (MC signal-ON)
0	Auxiliary speed setting	Speed limit assistance	Auxiliary speed setting	—
2	Regenerative driving torque limit (Pr.810 = "1")	—	Regenerative driving torque limit (Pr.810 = "1")	Regenerative driving torque limit (Pr.810 = "1")
4	Torque limit (Pr.810 = "1")	—	Torque limit (Pr.810 = "1")	Torque limit (Pr.810 = "1")
9999 (initial value)	—	—	—	—

—: No function

*1 Available under Real sensorless vector control (Pr.800 = "12").

*2 Available under PM sensorless vector control (Pr.800 = "14").

 **NOTE**

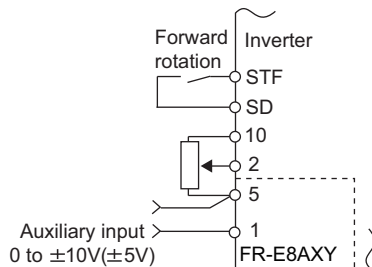
- Switching between the speed control and the torque control is always enabled regardless of the motor status: in a stop, in running, or in DC injection brake (during pre-excitation).
- During operation, the control mode is switched between speed control and position control when the output frequency reaches **Pr.865 Low speed detection** or lower with no position command given. Switching is disabled when either of the following signals is ON: Sudden stop (X87) signal (normally open input), Forward stroke end (LSP) signal (normally open input), or Reverse stroke end (LSN) signal (normally open input).
- Changing the terminal assignment using **Pr.178 to Pr.189, or Pr.525 to Pr.531 (Input terminal function selection)** may affect the other functions. Set parameters after confirming the function of each terminal.

3.2.5 Analog input compensation

The analog input for multi-speed operation or speed setting (main speed) through terminal 2 or 4 of the inverter can be compensated by adding an input, or terminal 2 can be used for an auxiliary input to compensate the analog input at a fixed ratio using the override function.

Pr.	Name	Initial value	Setting range	Description
73 T000	Analog input selection	1	0 to 3, 6, 7, 10 to 13, 16, 17	Compensation by addition
			4, 5, 14, 15	Compensation using the override function
242 T021	Terminal 1 added compensation amount (terminal 2)	100%	0% to 100%	Set the percentage of addition when terminal 2 is used to set the main speed.
243 T041	Terminal 1 added compensation amount (terminal 4)	75%	0% to 100%	Set the percentage of addition when terminal 4 is used to set the main speed.
252 T050	Override bias	50%	0% to 200%	Set the bias compensation value for the override function.
253 T051	Override gain	150%	0% to 200%	Set the gain compensation value for the override function.

◆ Compensation by addition (Pr.242, Pr.243)

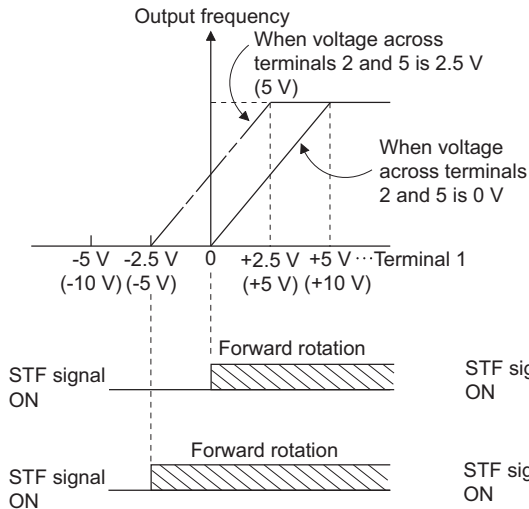


Example of addition compensation connection

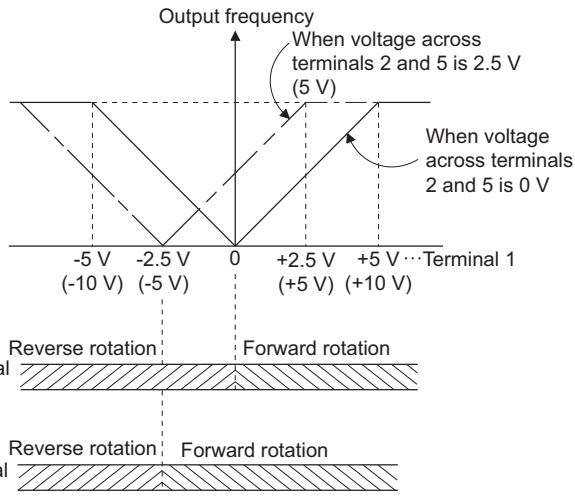
- A compensation signal can be added to the main speed setting for such as synchronous or continuous speed control operation.
- Set "0 to 3, 6, 7, 10 to 13, 16, or 17" in **Pr.73** to add the voltage determined by the terminal 1 input when the main speed setting is input through terminal 2.
- When a negative voltage is obtained from the addition, it is regarded as 0 and the operation is stopped when **Pr.73** = "0 to 3, 6, or 7", and the operation is reversed (polarity reversible operation) after the STF signal is turned ON when **Pr.73** = "10 to 13, 16, or 17".
- The terminal 1 compensation input can be added to the multi-speed setting or terminal 4 (initial value: 4 to 20 mA).
- The degree of addition to terminal 2 is adjustable with **Pr.242** and the degree of addition to terminal 4 is adjustable with **Pr.243**.

Analog command value with use of terminal 2 = terminal 2 input + terminal 1 input $\times \frac{\text{Pr.242}}{100(\%)}$

Analog command value with use of terminal 4 = terminal 4 input + terminal 1 input $\times \frac{\text{Pr.243}}{100(\%)}$



(a) When **Pr.73** setting is 0 to 3

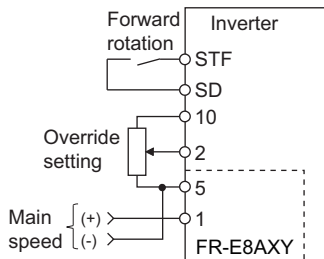


(b) When **Pr.73** setting is 10 to 13

Auxiliary input characteristics

NOTE

- When **Pr.868** ≠ "0", the compensation is not performed.
- When terminal 1 is not used for the compensation, apply 0 V to terminal 1.
- After changing the **Pr.73** setting, check the setting of the voltage/current input selection switch. Incorrect setting may cause a fault, failure, or malfunction. (Refer to [page 30.](#))

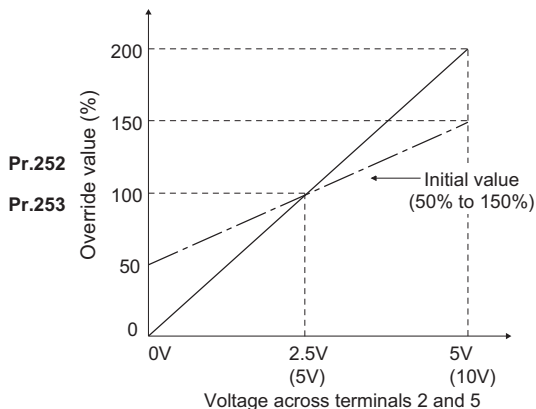
◆ Override function (Pr.252, Pr.253)

Connection example for the
override function

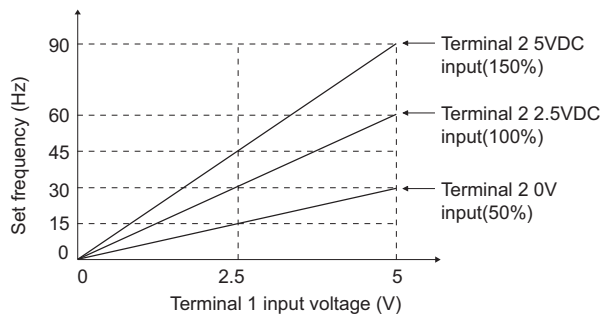
- Use the override function to make the main speed changed at a specified rate.
- Set **Pr.73** = "4, 5, 14, or 15" to select the override function.
- When the override function is selected, terminal 1 or 4 is used for the main speed setting, and terminal 2 is used for the override signal. (If the main speed signal is not input through terminal 1 or 4, the compensation by terminal 2 is disabled.)
- Specify the scope of override by using **Pr.252** and **Pr.253**.

- How to calculate the set frequency when the override function is used:
 Main speed setting frequency (Hz): Terminal 1 or 4 input, multi-speed setting
 Compensation (%): Terminal 2 input

$$\text{Set frequency (Hz)} = \text{Main speed setting frequency (Hz)} \times \frac{\text{Compensation (\%)}}{100(\%)}$$



- Example) When **Pr.73** = "5"
 By the terminal 1 (main speed) and terminal 2 (auxiliary) input, the set frequency is set as shown in the figure below.



NOTE

- When **Pr.868** ≠ "0", the override function does not operate.
- To use terminal 4, the AU signal needs to be turned ON.
- After changing the **Pr.73** setting, check the setting of the voltage/current input selection switch. Incorrect setting may cause a fault, failure, or malfunction. (Refer to [page 30](#).)

3.2.6 Frequency setting voltage bias and gain

The magnitude (slope) of the output frequency can be set as desired in relation to the frequency setting signal (0 to 5 VDC or 0 to 10 VDC). Use **Pr.73 Analog input selection** to switch between input 0 to 5 VDC and 0 to 10 VDC. (Refer to [page 30](#).)

Pr.	Name	Initial value	Setting range	Description	
C12 (917) T100*1	Terminal 1 bias frequency (speed)	0 Hz	0 to 590 Hz	Set the bias frequency (speed) for the terminal 1 input. (Speed limit)	
C13 (917) T101*1	Terminal 1 bias (speed)	0%	0% to 300%	Set the converted % of the bias voltage for the terminal 1 input. (Speed limit)	
C14 (918) T102*1	Terminal 1 gain frequency (speed)	60 Hz / 50 Hz*2	0 to 590 Hz	Set the gain (maximum) frequency (speed) for the terminal 1 input. (Speed limit)	
C15 (918) T103*1	Terminal 1 gain (speed)	100%	0% to 300%	Set the converted % of the gain voltage for the terminal 1 input. (Speed limit)	
241 M043	Analog input display unit switchover	0	0	% display	Select the unit for analog input display.
			1	V display	

*1 The parameter number in parentheses is the one for use with the LCD operation panel and the parameter unit.

*2 Initial values of parameters differ depending on the parameter initial value group (1 or 2).

◆ Relationship between the analog input terminal function and the calibration parameter

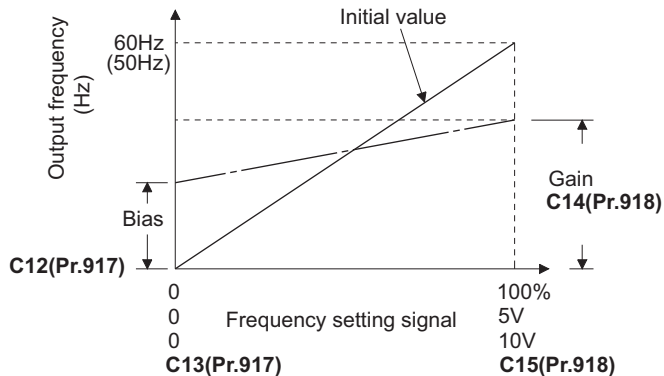
Pr.868 setting	Terminal function	Calibration parameter	
		Bias setting	Gain setting
0	Auxiliary frequency (speed) setting	C12 (Pr.917) Terminal 1 bias frequency (speed) C13 (Pr.917) Terminal 1 bias (speed)	C14 (Pr.918) Terminal 1 gain frequency (speed) C15 (Pr.918) Terminal 1 gain (speed)
2	Regenerative driving torque limit	C16 (Pr.919) Terminal 1 bias command (torque)	C18 (Pr.920) Terminal 1 gain command (torque)
4	Torque limit	C17 (Pr.919) Terminal 1 bias (torque)	C19 (Pr.920) Terminal 1 gain (torque)
9999 (Initial value)	No function	—	—

◆ Changing the frequency for the maximum analog input (C14 (Pr.918))

- Use **C14 (Pr.918)** to only change the frequency setting (gain) for the maximum analog input voltage. (The **C12 (Pr.917)**, **C13 (Pr.917)**, and **C15 (Pr.918)** settings need not be changed.)

◆ **Analog input bias/gain calibration (C12 (Pr.917) to C15 (Pr.918))**

- The "bias"/"gain" function can adjust the relation between the output frequency and the setting input signal. Examples of setting input signals are 0 to 5 VDC or 0 to 10 VDC, and they are externally input.
- Set the bias frequency of the terminal 1 input using **C12 (Pr.917)**. (The initial value is the frequency at 0 V.)
- Set the gain frequency of the terminal 1 input using **C14 (Pr.918)**. (The initial value is the frequency at 10 V.)



- There are three methods to adjust the bias/gain frequency setting voltage.
 - Adjustment by applying voltage between terminals 1 and 5 to set the voltage at the bias/gain frequency.
 - ☞ [page 45](#)
 - Adjustment by selecting the voltage at the bias/gain frequency without applying voltage between terminals 1 and 5.
 - ☞ [page 46](#)
 - Adjustment by only changing the frequency without adjusting the voltage.
 - ☞ [page 47](#)

NOTE

- When the slope of the frequency is changed after calibration of terminal 2 of the inverter, the slope of the frequency is also changed for terminal 1 of the FR-E8AXY.
- When voltage is applied to terminal 1 while calibration of terminal 2 or terminal 4 is in progress, the terminal 1 input value is added to the terminal 2 (4) input value.
- Always calibrate the input after changing the input specification using **Pr.73**.

◆ Display unit changing for analog input (Pr.241)

- The analog input display unit (%/V) can be changed for analog input bias/gain calibration.
- Depending on the terminal input specification setting of **Pr.73**, the units of the displayed values of **C13 (Pr.917)** and **C15 (Pr.918)** change as shown below:

Analog command (terminal 1)	Pr.241 = "0 (initial value)"	Pr.241 = "1"
0 to 5 V input	0% to 100% (0.1%)	0 to 5 V (0.01 V)
0 to 10 V input	0% to 100% (0.1%)	0 to 10 V (0.01 V)

◆ Frequency setting voltage bias/gain adjustment method

■ Adjustment by applying voltage between terminals 1 and 5 to set the voltage at the bias/gain frequency (Example of adjustment at the gain frequency)

Operating procedure

1. Turning ON the power of the inverter
The operation panel is in the monitor mode.
2. Changing the operation mode
Press the PU/EXT key to choose the PU operation mode. The [PU] indicator turns ON.
3. Selecting the parameter setting mode
Press the MODE key to choose the parameter setting mode. (The parameter number read previously appears.)
4. Selecting a calibration parameter
Turn the setting dial or press the UP/DOWN key until "C..." appears. Press the SET key to display "C---".
5. Selecting a parameter
Turn the setting dial or press the UP/DOWN key until "C15" (**C15 (Pr.918) Terminal 1 gain (speed)**) appears.
6. Displaying the analog voltage value
Press the SET key to display the analog voltage value (%) currently applied to terminal 1.
Do not touch the setting dial and UP/DOWN key until calibration is completed.
7. Applying voltage
Apply 5 V. (Turn the external potentiometer connected between terminals 1 and 5 to a desired position.)
8. Setting completed
Press the SET key to confirm the setting. The analog voltage value (%) blinks when it is applied.
 - Turn the setting dial or press the UP/DOWN key to read another parameter.
 - Press the SET key to return to the "C---" display.
 - Press the SET key twice to show the next parameter.

■ Adjustment by selecting the voltage at the bias/gain frequency without applying voltage between terminals 1 and 5 (Example of adjustment at the gain frequency)

Operating procedure

1. Turning ON the power of the inverter
The operation panel is in the monitor mode.
2. Changing the operation mode
Press the PU/EXT key to choose the PU operation mode. The [PU] indicator turns ON.
3. Selecting the parameter setting mode
Press the MODE key to choose the parameter setting mode. (The parameter number read previously appears.)
4. Selecting a calibration parameter
Turn the setting dial or press the UP/DOWN key until "C..." appears. Press the SET key to display "C---".
5. Selecting a parameter
Turn the setting dial or press the UP/DOWN key until "C15" (**C15 (Pr.918) Terminal 1 gain (speed)**) appears.
6. Displaying the analog voltage value
Press the SET key to display the analog voltage value (%) currently applied to terminal 1.
7. Adjusting the analog voltage value
After the setting dial is turned or the UP/DOWN key is pressed, the gain voltage value (%) currently set to the parameter appears.
Turn the setting dial or press the UP/DOWN key until the gain voltage to be adjusted appears.
8. Setting completed
Press the SET key to confirm the setting. The analog voltage value (%) blinks when it is applied.
 - Turn the setting dial or press the UP/DOWN key to read another parameter.
 - Press the SET key to return to the "C---" display.
 - Press the SET key twice to show the next parameter.

NOTE

- The present frequency setting bias/gain setting can be checked by pressing the setting dial or pressing the UP/DOWN key one time after step 6. The setting cannot be checked after step 7.

■ Adjustment by only changing the frequency without adjusting the voltage (Example of changing the gain frequency from 60 Hz to 50 Hz)

Operating procedure

1. Selecting the parameter
Turn the setting dial or press the UP/DOWN key until "C14" (**C14 (Pr.918) Terminal 1 gain frequency (speed)**) appears.
Press the SET key to show the present set value. (60.00 Hz)
2. Changing the maximum frequency
Turn the setting dial or press the UP/DOWN key to change the value to "50.00". (50.00 Hz)
Press the SET key to confirm the setting. "50.00" blinks.
3. Selecting the mode and the monitor item
Press the MODE key three times to select the monitor mode and to monitor a frequency.
4. Start
Turn ON the start switch (STF/STR signal), and turn the frequency setting potentiometer clockwise slowly to full.
The motor is operated at 50 Hz.

NOTE

- If the frequency meter (display meter) connected to terminal FM or terminal AM of the standard model does not indicate exactly 60 Hz, set the calibration parameter C0 or C1. (Refer to the FR-E800 Instruction Manual (Function).)
- If the voltage values at the gain and bias frequencies are too close to each other, an error "Er3" may be indicated.
- Changing **C15 (Pr.918)** (gain adjustment) will not change **Pr.20**.
- To set the value to 120 Hz or higher, **Pr.18 High speed maximum frequency** needs to be 120 Hz or higher. (Refer to the FR-E800 Instruction Manual (Function).)
- Use the calibration parameter **C12 (Pr.917)** to set the bias frequency.
- For operation outline of the parameter unit (FR-PU07), refer to the FR-PU07 Instruction Manual.

CAUTION

- When setting a value other than "0" as the bias frequency at 0 V, note that simply turning ON the start signal will start the motor at the preset frequency even if a speed command is not given.

3.2.7 Setting the torque limit level

Limit the output torque not to exceed the specified value.

The torque limit level can be set in a range of 0% to 400%.

The torque limit level can be selected by using the analog input terminal (terminal 1).

Pr.	Name	Initial value	Setting range	Description
22 H500	Stall prevention operation level (torque limit level)	150% / 200%*1	0% to 400%	Set the torque limit level as a percentage with regards to the rated torque as 100%.
810 H700	Torque limit input method selection	0	0	Internal torque limit 1 (torque limited by parameter settings)
			1	External torque limit (torque limited by terminal 1)
			2	Internal torque limit 2 (torque limited via communication)

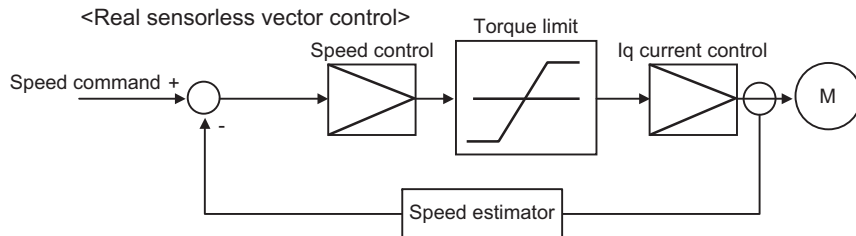
*1 Initial values differ according to the inverter capacity and the control method. For details, refer to the FR-E800 Instruction Manual (Function).



NOTE

- The lower limit for the torque limit level under Real sensorless vector control is set to 30% even if a value lower than 30% is set.
- Under PM sensorless vector control, the torque limit is not activated in a low-speed range with a rated frequency of less than 10%.
- Under PM sensorless vector control, the torque limit level is reduced inversely proportional to the output frequency in the constant output range of the rated motor frequency or higher.

◆ Block diagram of torque limit



◆ Selecting the torque limit input method (Pr.810)

- Use **Pr.810 Torque limit input method selection** to select the method to limit the output torque for speed control. The method in the initial setting is use of the parameter settings.

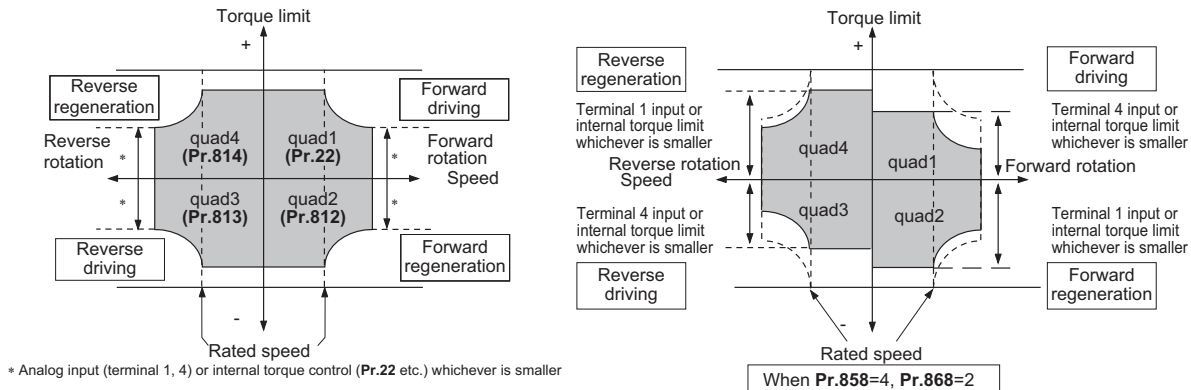
Pr.810 setting	Torque limit input method	Operation
0 (initial value)	Internal torque limit 1 ^{*1}	Perform the torque limit operation using the parameter (Pr.22, Pr.812 to Pr.814) settings. If changing the torque limit parameters via communication is enabled, the torque limit input can be performed via communication.
1	External torque limit	Torque limit using analog voltage to terminal 1 is valid.
2	Internal torque limit 2 ^{*1}	<ul style="list-style-type: none"> The setting value of Pr.805 or Pr.806 is used as the torque limit value. The torque limit via communication is enabled.

*1 For details, refer to the FR-E800 Instruction Manual (Function).

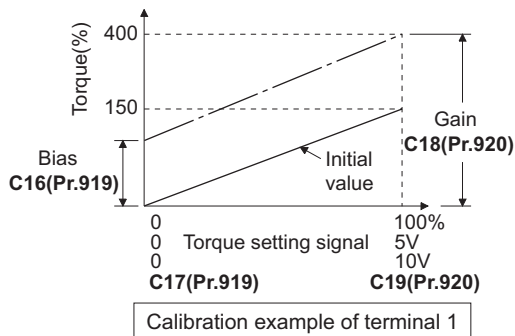
◆ Torque limit level using analog input (terminal 1) (Pr.810 = "1", Pr.868)

- The torque is limited with the analog input of terminal 1. (External torque limit)
- Torque limit using analog input is valid with a limit value lower than the internal torque limit (**Pr.22, Pr.812 to Pr.814**). (If the torque limit using analog input exceeds the internal torque limit, the internal torque limit is valid.)
- When inputting the torque limit value from terminal 1, set **Pr.868 Terminal 1 function assignment** = "4".

- When **Pr.858 Terminal 4 function assignment = "4"** and **Pr.868 = "2"**, the torque for regenerative driving is limited with the terminal 1 analog input of the FR-E8AXY, and the torque for power driving is limited with the terminal 4 analog input of the inverter.



- The torque limit using analog input can be calibrated by the calibration parameters **C16 (Pr.919)** to **C19 (Pr.920)**. (Refer to [page 52.](#))



NOTE

- When inputting an analog signal to terminal 1, give a positive voltage (0 to +10 V (+5 V)). When a negative voltage (0 to -10 V (-5 V)) is input, the torque limit value set by the analog signal becomes "0".

3.2.8 Torque setting voltage bias and gain

The magnitude (slope) of the torque can be set as desired in relation to the torque setting signal (0 to 5 VDC or 0 to 10 VDC).

Pr.	Name	Initial value	Setting range	Description	
C16 (919) T110*1	Terminal 1 bias command (torque)	0%	0% to 400%	Set the bias torque for the terminal 1 input.	
C17 (919) T111*1	Terminal 1 bias (torque)	0%	0% to 300%	Set the converted % of the bias voltage for the terminal 1 input.	
C18 (920) T112*1	Terminal 1 gain command (torque)	150%	0% to 400%	Set the gain (maximum) torque for the terminal 1 input.	
C19 (920) T113*1	Terminal 1 gain (torque)	100%	0% to 300%	Set the converted % of the gain voltage for the terminal 1 input.	
241 M043	Analog input display unit switchover	0	0 1	% display V display	Select the unit for analog input display.

*1 The parameter number in parentheses is the one for use with the LCD operation panel and the parameter unit.

◆ Changing the function of analog input terminal

In the initial setting, no function is assigned to terminal 1 used for analog input. To use the analog input terminal to input the torque limit, set **Pr.868 Terminal 1 function assignment** to change the function. (Refer to [page 33](#).)

◆ Relationship between the analog input terminal function and the calibration parameter

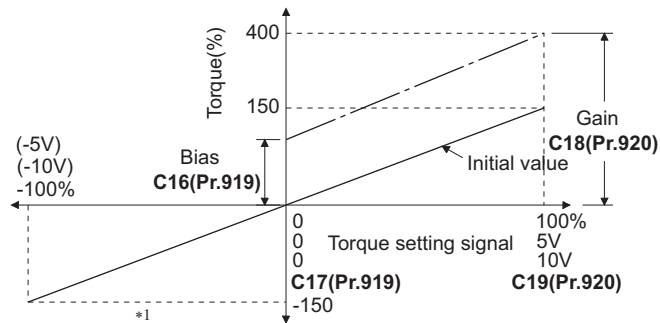
Pr.868 setting	Terminal function	Calibration parameter	
		Bias setting	Gain setting
0	Auxiliary frequency (speed) setting	C12 (Pr.917) Terminal 1 bias frequency (speed) C13 (Pr.917) Terminal 1 bias (speed)	C14 (Pr.918) Terminal 1 gain frequency (speed) C15 (Pr.918) Terminal 1 gain (speed)
2	Regenerative driving torque limit	C16 (Pr.919) Terminal 1 bias command (torque)	C18 (Pr.920) Terminal 1 gain command (torque)
4	Torque limit	C17 (Pr.919) Terminal 1 bias (torque)	C19 (Pr.920) Terminal 1 gain (torque)
9999 (Initial value)	No function	—	—

◆ Changing the torque for the maximum analog input (C18 (Pr.920))

- Use **C18 (Pr.920)** to only change the torque setting (gain) for the maximum analog input voltage. (The **C16 (Pr.919)**, **C17 (Pr.919)**, and **C19 (Pr.920)** settings need not be changed.)

◆ Analog input bias/gain calibration (C16 (Pr.919) to C19 (Pr.920))

- The "bias"/"gain" function can adjust the relation between the torque and the torque limit setting input signal. Examples of setting input signals are 0 to 5 VDC or 0 to 10 VDC, and they are externally input.
- Set the bias torque of the terminal 1 input using **C16 (Pr.919)**. (The initial value is the torque at 0 V.)
- Use **C18 (Pr.920)** to set the torque to the torque setting voltage set by **Pr.73 Analog input selection**. (The initial value is the torque at 10 V.)



Calibration example of terminal 1

*1 When a negative voltage (0 to -10 V (-5 V)) is input, the torque limit value becomes "0".

- There are three methods to adjust the bias/gain torque setting voltage.
 - Adjustment by applying voltage between terminals 1 and 5 to set the voltage at the bias/gain torque.
 - ☞ [page 56](#)
 - Adjustment by selecting the voltage at the bias/gain torque without applying voltage between terminals 1 and 5.
 - ☞ [page 57](#)
 - Adjustment by only changing the torque without adjusting the voltage.
 - ☞ [page 58](#)

NOTE

- Always calibrate the input after changing the input specification using **Pr.73**.

◆ Display unit changing for analog input (Pr.241)

- The analog input display unit (%/V) can be changed for analog input bias/gain calibration.
- Depending on the terminal input specification setting of **Pr.73**, the units of the displayed values of **C17 (Pr.919)** and **C19 (Pr.920)** change as shown below:

Analog command (terminal 1)	Pr.241 = "0 (initial value)"	Pr.241 = "1"
0 to 5 V input	0% to 100% (0.1%)	0 to 5 V (0.01 V)
0 to 10 V input	0% to 100% (0.1%)	0 to 10 V (0.01 V)

◆ Torque setting voltage bias/gain adjustment method

■ Adjustment by applying voltage between terminals 1 and 5 to set the voltage at the bias/gain torque

Operating procedure

1. Turning ON the power of the inverter
The operation panel is in the monitor mode.
2. Changing the operation mode
Press the PU/EXT key to choose the PU operation mode. The [PU] indicator turns ON.
3. Selecting the parameter setting mode
Press the MODE key to choose the parameter setting mode. (The parameter number read previously appears.)
4. Selecting a calibration parameter
Turn the setting dial or press the UP/DOWN key until "C..." appears. Press the SET key to display "C---".
5. Selecting a parameter
Turn the setting dial or press the UP/DOWN key until "C19" (**C19 (Pr.920) Terminal 1 gain (torque)**) appears.
6. Displaying the analog voltage value
Press the SET key to display the analog voltage value (%) currently applied to terminal 1.
Do not touch the setting dial and UP/DOWN key until calibration is completed.
7. Applying voltage
Apply 5 V. (Turn the external potentiometer connected between terminals 1 and 5 to a desired position.)
8. Setting completed
Press the SET key to confirm the setting. The analog voltage value (%) blinks when it is applied.
 - Turn the setting dial or press the UP/DOWN key to read another parameter.
 - Press the SET key to return to the "C---" display.
 - Press the SET key twice to show the next parameter.

■ Adjustment by selecting the voltage at the bias/gain torque without applying voltage between terminals 1 and 5

Operating procedure

1. Turning ON the power of the inverter
The operation panel is in the monitor mode.
2. Changing the operation mode
Press the PU/EXT key to choose the PU operation mode. The [PU] indicator turns ON.
3. Selecting the parameter setting mode
Press the MODE key to choose the parameter setting mode. (The parameter number read previously appears.)
4. Selecting a calibration parameter
Turn the setting dial or press the UP/DOWN key until "C..." appears. Press the SET key to display "C---".
5. Selecting a parameter
Turn the setting dial or press the UP/DOWN key until "C19" (**C19 (Pr.920) Terminal 1 gain (torque)**) appears.
6. Displaying the analog voltage value
Press the SET key to display the analog voltage value (%) currently applied to terminal 1.
7. Adjusting the analog voltage value
After the setting dial is turned or the UP/DOWN key is pressed, the gain voltage value (%) currently set to the parameter appears.
Turn the setting dial or press the UP/DOWN key until the gain voltage to be adjusted appears.
8. Setting completed
Press the SET key to confirm the setting. The analog voltage value (%) blinks when it is applied.
 - Turn the setting dial or press the UP/DOWN key to read another parameter.
 - Press the SET key to return to the "C---" display.
 - Press the SET key twice to show the next parameter.

NOTE

- The present torque setting bias/gain setting can be checked by pressing the setting dial or pressing the UP/DOWN key one time after step 6. The setting cannot be checked after step 7.

■ **Adjustment by only changing the torque without adjusting the gain voltage (Example of changing the gain torque from 150% to 130%)**

Operating procedure

1. Selecting the parameter
Turn the setting dial or press the UP/DOWN key until "C18" (**C18 (Pr.920)**) appears.
Press the SET key to show the present set value. (150.0%)
2. Changing the torque settings
Turn the setting dial or press the UP/DOWN key to change the value to "130.0". (130.0%)
Press the SET key to confirm the setting. "130.0" blinks.
3. Selecting the mode and the monitor item
Press the MODE key three times to select the monitor mode and to monitor a frequency.
4. Start
Turn ON the start switch (STF or STR) to apply voltage across terminals 1 and 5.
Operation is performed with 130% torque.



NOTE

- If the voltage values at the gain and bias torques are too close to each other, an error "Er3" may be indicated.
- For operation outline of the parameter unit (FR-PU07), refer to the FR-PU07 Instruction Manual.
- Use the calibration parameter **C16 (Pr.919)** to set the bias torque.

CAUTION

- When setting a value other than "0" as the bias torque at 0 V, note that simply turning ON the start signal will supply torque to the motor even if a torque command is not given.

3.2.9 Response level of analog input and noise elimination

The response level and stability of frequency command or torque command using the analog signal input via terminal 1 of the FR-E8AXY can be adjusted as well as signal input via terminal 2 or 4 of the inverter.

For details, refer to the description of **Pr.74, Pr.822, Pr.826, Pr.832, and Pr.836 (Analog input filter)** in the FR-E800 Instruction Manual (Function).

3.3 Frequency setting using pulse train input

A pulse train input via terminal X7 can be used to set the inverter's speed command.

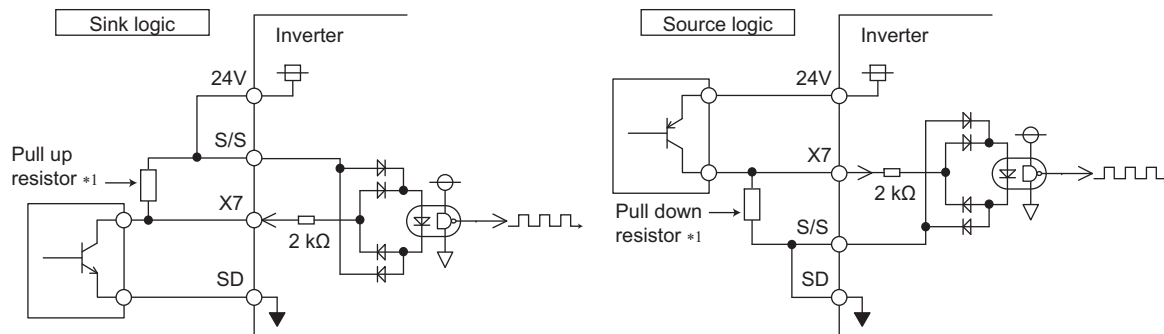
Pr.	Name	Initial value	Setting range	Description
291 D100	Pulse train input selection	0	0	X7 signal ^{*1}
			1	Pulse train input
384 D101	Input pulse division scaling factor	0	0	Pulse train input disabled
			1 to 250	Division ratio on the input pulse. The frequency resolution on the input pulse changes according to this setting.
385 D110	Frequency for zero input pulse	0 Hz	0 to 590 Hz	Set the frequency applicable to the time when the input pulse is zero (bias).
386 D111	Frequency for maximum input pulse	60 Hz / 50 Hz ^{*2}	0 to 590 Hz	Set the frequency applicable to the time when the input pulse is maximum (gain).

*1 The function is assigned in **Pr.531 X7 terminal function selection**.

*2 Initial values of parameters differ depending on the parameter initial value group (1 or 2).

◆ Selection of pulse train input (Pr.291)

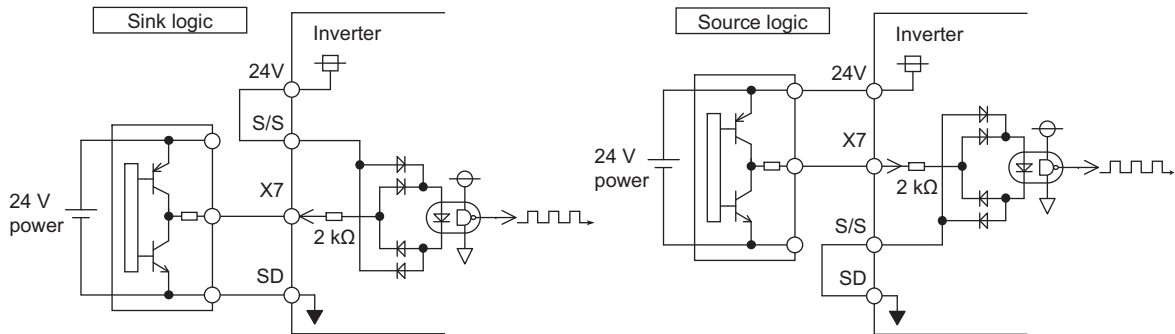
- Setting **Pr.291 Pulse train input selection = "1"** and **Pr.384 Input pulse division scaling factor ≠ "0"** allows the function of terminal X7 to change into a pulse train input for setting of the inverter frequency. In the initial setting, no function is assigned to terminal X7. A maximum pulse train of 100k pulses/s can be input.
- Connection with an open collector output system pulse generator



- *1 When the wiring length is long with open collector outputs, the influence of stray capacitance causes the pulse to flatten out and prevents the input pulse from being recognized. When the wiring length is long (10 m or longer of shielded twisted pair cable with a recommended cable gauge of 0.75 mm²), connect the open collector output signal to the power supply by an external pull-up resistor. The following table shows the reference resistance values for wiring length. The stray capacitance of the wiring changes considerably according to what kind of cable is used how the cable is laid, thus the following wiring lengths are not guaranteed values. When using a pull-up/down resistor, check the permissible power of the resistor and the permissible load current of the output transistor, and use within the permissible range.

Wiring length	Less than 10 m	10 to 50 m	50 to 100 m
Pull-up/down resistor	Not required	1 kΩ	470 Ω
Load current (reference)	10 mA	35 mA	65 mA

- Connection with a complementary output system pulse generator



NOTE

- When pulse train input is selected, the function assigned to terminal X7 by **Pr.531 X7 terminal function selection** is invalid.

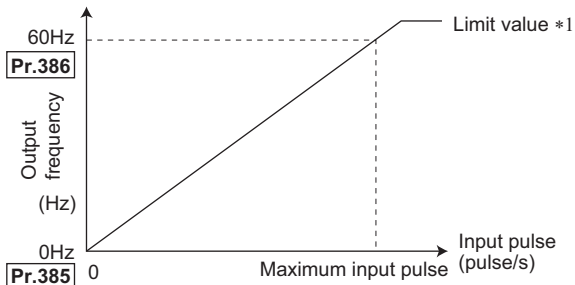
◆ Pulse train input specification

Item		Specification
Supported pulse method		Open collector output Complementary output (24 V power supply voltage)
HIGH input level		20 V or more (voltage between X7 and SD)
LOW input level		5 V or less (voltage between X7 and SD)
Maximum input pulse rate		100k pulses/s
Minimum input pulse width		2.5 μ s
Input resistance/load current		2 k Ω (typ) / 10 mA (typ)
Maximum wiring length (reference value)	Open collector output method	10 m (0.75 mm ² /twisted pair)
	Complementary output method	100 m (output resistance 50 Ω)* ¹

*1 The wiring length of complementary output is dependent on the output wiring specification of the complementary output unit. The stray capacitance of the wiring changes considerably according to what kind of cable is used and how the cable is laid, so the maximum wiring length is not a guaranteed value.

◆ Adjustment of pulse train and frequency (Pr.385, Pr.386)

- The frequency during zero input pulse and maximum input pulse can be set with **Pr.385 Frequency for zero input pulse** and **Pr.386 Frequency for maximum input pulse**, respectively.



*1 Limit value = $(\text{Pr.386} - \text{Pr.385}) \times 1.1 + \text{Pr.385}$

◆ How to calculate the input pulse division scaling factor (Pr.384)

The maximum number of input pulses can be calculated by the following formula with **Pr.384 Input pulse division scaling factor**:

Maximum number of input pulses (pulse/s) = $\text{Pr.384} \times 400$ (100k pulses/s maximum)
 (number of detectable pulses = 11.45 pulses/s)

For example, to run the invert at 0 Hz when pulse train input is zero and at 30 Hz when pulse train is 4000 pulses/sec, set the inverter as follows:

Pr.384 = "10" (maximum number of input pulses 4000 pulses/s)

Pr.385 = 0 Hz, **Pr.386** = 30 Hz (pulse train limit value 33 Hz)

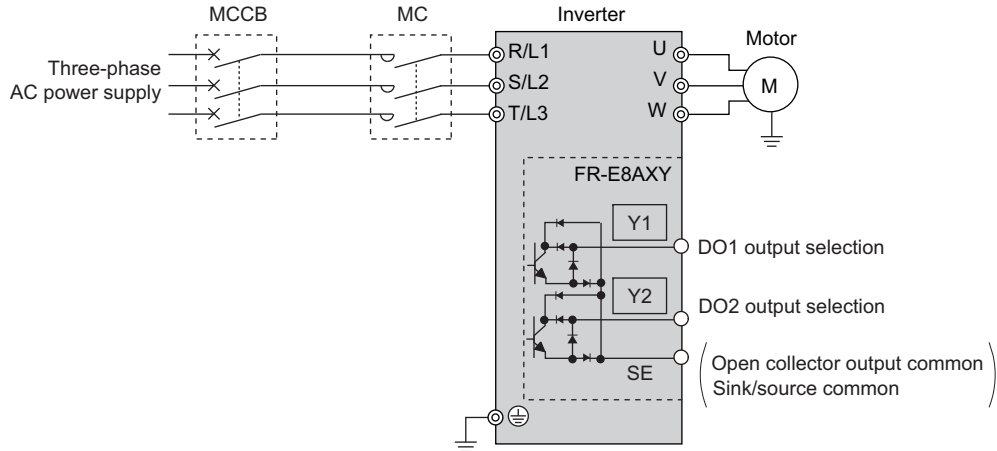
 **NOTE**

- The priority of the frequency command given by the external signals is as follows: JOG operation (JOG/JOG2 signal) > stop-on-contact control (RL/RT signal) > multi-speed operation (RL/RM/RH/REX signal) > PID control (X14 signal) > terminal 4 analog input (AU signal) > pulse train input (option FR-E8AXY) > 16-bit digital input (option FR-A8AX) > terminal 2 analog input. Note that stop-on-contact control is disabled when PID control is enabled. When pulse train input is enabled (**Pr.291** = "1" and **Pr.384** ≠ "0"), terminal 2 analog input of the inverter becomes invalid.

4 CONTROL CIRCUIT OUTPUT SIGNAL

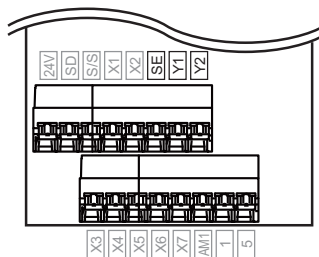
4.1 Digital output

4.1.1 Connection example



4.1.2 Terminals

Use **Pr.314** and **Pr.315** to output inverter signals (RUN, SU, etc.) from the open collector.



Terminal symbol	Terminal name	Description
Y1	Digital output terminal	Assign the function using Pr.314 .
Y2		Assign the function using Pr.315 .
SE	Common terminal	Common terminal for terminals Y1 and Y2. Isolated from terminal SE of the inverter.

4.1.3 Digital output function parameter list

Pr.	Name	Initial value	Setting range
314 M411	DO1 output selection	9999	For details of the setting range, refer to the description of Pr.190 to Pr.196 (Output terminal function selection) in the FR-E800 Instruction Manual (Function).
315 M412	DO2 output selection	9999	
418 M432	Extension output terminal filter	9999	5 to 50 ms, 9999

4.1.4 Parameter setting

◆ Setting output signals

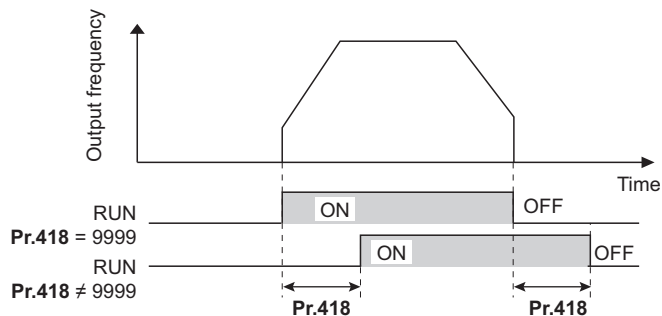
Use **Pr.314** and **Pr.315** to assign signals to terminals Y1 and Y2. The settings of **Pr.314** and **Pr.315** are the same as those of **Pr.190 to Pr.196 (Output terminal function selection)**. For details of **Pr.190 to Pr.196**, refer to the FR-E800 Instruction Manual (Function).

NOTE

- Output terminal functions can be set concurrently.

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

The responsivity of the output terminals can be delayed in a range from 5 to 50 ms. (The following is the operation example of the RUN signal.)



NOTE

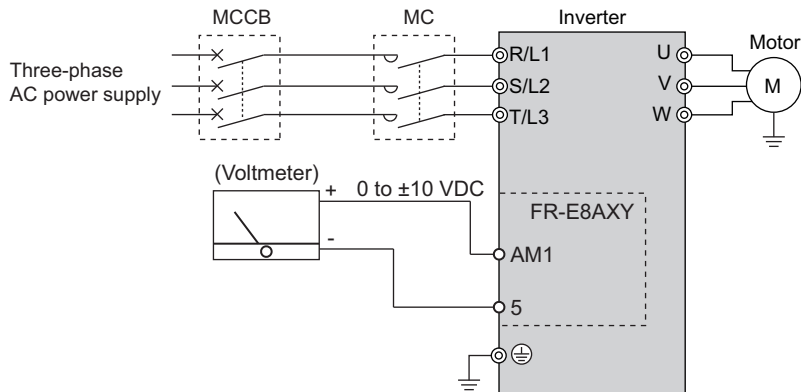
- The response level is not adjusted when **Pr.418** = "9999".
- When **Pr.157 OL signal output timer** is set for the Overload warning (OL) signal output, the OL signal is output after the time period calculated by adding the **Pr.418** setting to the **Pr.157** setting elapsed.

4.2 Analog output

4.2.1 Connection example

Use **Pr.306 to Pr.309** to output analog signals, such as output frequency and output current, from the analog output terminal (AM1).

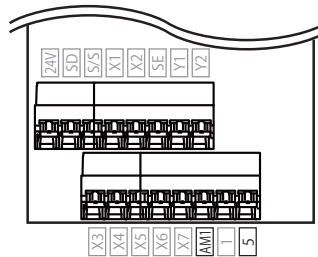
Connect the voltmeter as follows.



NOTE

- The wiring distance to the voltmeter should be 10 m at maximum.

4.2.2 Terminals



Terminal symbol	Terminal name	Description
AM1	Voltage output terminal	Connect the DC voltmeter (± 10 VDC).
5	Common terminal	Common terminal for terminal AM1

4.2.3 Extended analog output function parameter list

Pr.	Name	Initial value	Setting range
306 M303	Analog output signal selection	2	For details of the setting range, refer to the description of Pr.158 AM terminal function selection in the FR-E800 Instruction Manual (Function).
307 M340	Setting for zero analog output	0%	0% to 100%
308 M341	Setting for maximum analog output	100%	0% to 100%
309 M342	Analog output signal voltage/current switchover	0	0, 1, 10, 11
323 M346	AM0 (A8AY) 0 V adjustment / AM1 (E8AXY) 0 V adjustment	1000%	900% to 1100%
C1 (901) M320	AM terminal calibration	—	—
290 M044	AM terminal calibration	0	0, 1, 4, 5, 8, 9, 12, 13

NOTE

- **Pr.306** can be written even when the inverter is operating.

4.2.4 Adjustment procedure

◆ Analog output voltage/current signal switchover (Pr.309) setting

To output the output signal with analog output, set values for zero analog output and maximum analog output.

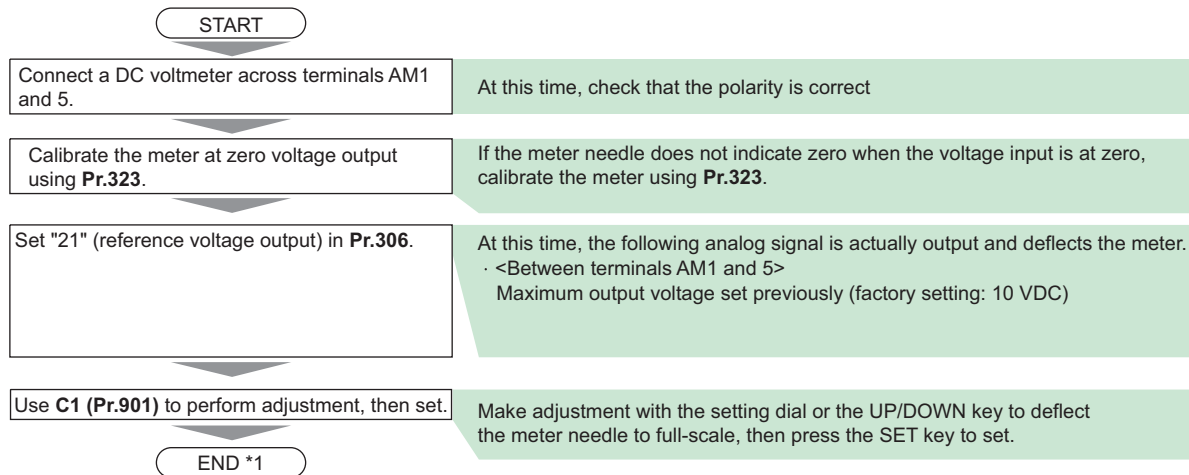
Pr.309 setting	Description	Parameter for setting	Parameter for adjustment
0 (initial value), 1	Analog output is performed using the analog output value as the reference.	Pr.306: Select the output signal. Pr.307: Output signal value when analog output is zero Pr.308: Output signal value when analog output is at maximum	Pr.323 C1 (Pr.901)
10, 11	Analog output is performed using the output signal value as the reference.	Pr.306: Select the output signal. Pr.307: Analog output value when output signal is zero Pr.308: Analog output value when output signal is at maximum	



NOTE

- "Analog output" means the voltage (0 to ± 10 V) output from terminal AM1 and "output signal" indicates the monitor signal set in **Pr.306** (refer to [page 74](#)).

◆ Calibration of meter



*1 Specify the output signal by setting **Pr.306**. (Refer to [page 74](#).)

NOTE

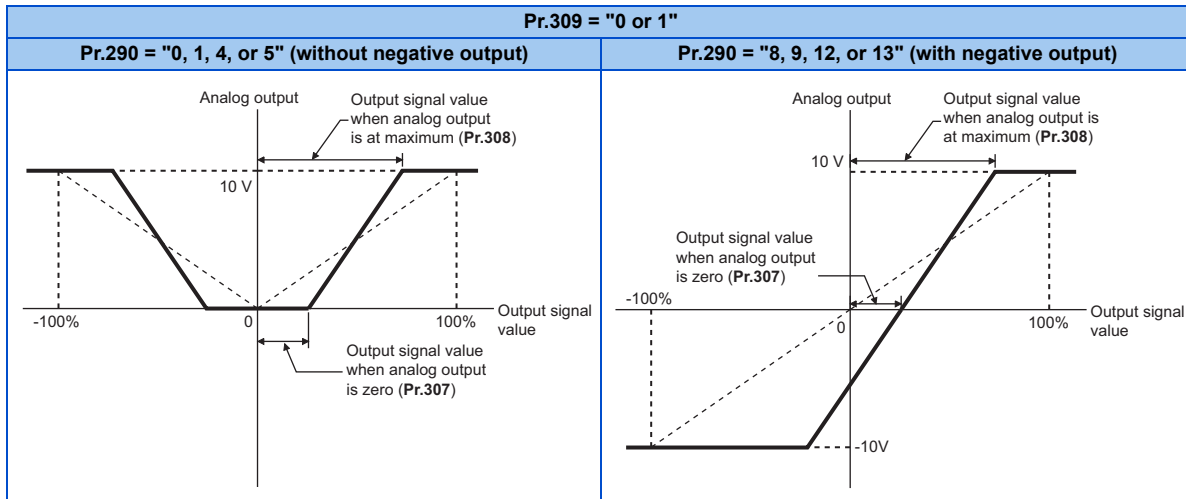
- If calibration is performed without setting **Pr.306** = "21 (reference voltage output)", terminal AM of the inverter is calibrated. To calibrate extended analog output, always set to "21".
- When the plug-in option is remounted on another inverter, use **Pr.323** to calibrate again.

◆ Setting output signals

Set the output signals to be monitored. Negative values can be used for indication via terminal AM1 (output range: -10 to +10 VDC). The setting of **Pr.306** is the same as that of **Pr.158 AM terminal function selection**. For details of **Pr.158**, refer to the FR-E800 Instruction Manual (Function).

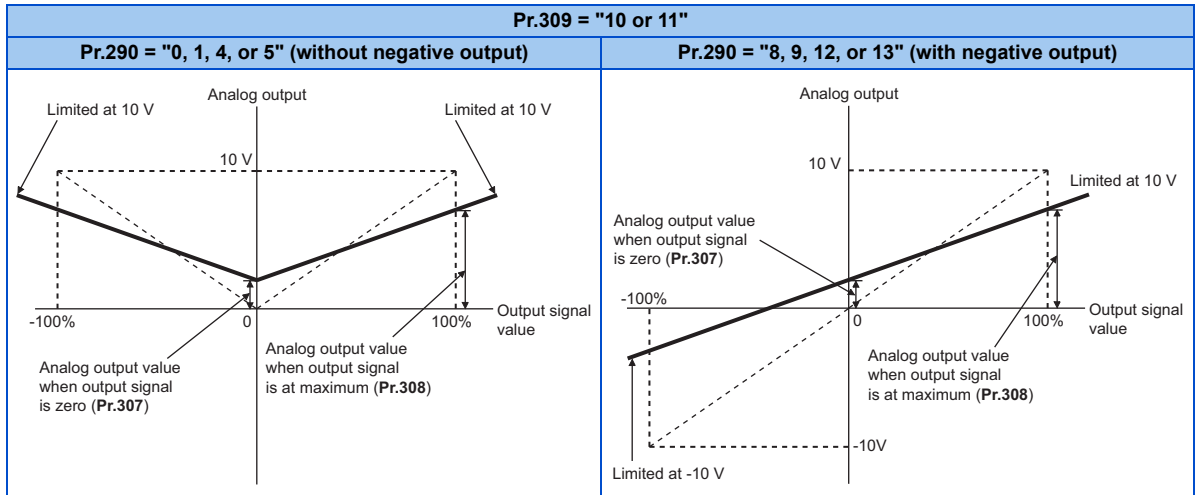
◆ Adjusting the analog signal (Pr.307, Pr.308)

Use **Pr.307** to set the value for zero analog output (meter zero) and **Pr.308** for maximum analog output (full scale). (Refer to page 72.)



NOTE

- When the **Pr.307** setting value is equal to or larger than the **Pr.308** setting value, the output value for terminal AM1 will always be zero.



4

NOTE

- When the **Pr.307** setting value is equal to the **Pr.308** setting value, the output value for terminal AM1 will always be the parameter setting value.

4.2.5 Precautions

- When using a voltmeter with a lower internal impedance than the value indicated in the Specifications (refer to [page 9](#)), the indicator may not go to full-scale, making it unable to calibrate in some cases.
- When calibrating a meter with small full scale, first adjust the output from terminal AM1, then connect the meter.

CAUTION

- In the initial setting, the full-scale output is set to 10 VDC. A small full-scale voltmeter (7 VDC or less) may be damaged by calibration. This should be fully noted.
- When calibrating the meter using **Pr.323 and C1 (Pr.901)** when **Pr.309** = "10 or 11", set "0%" in **Pr.307** and "100%" in **Pr.308** to prevent calibration value deviation.

MEMO

REVISIONS

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

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