



INVERTER

Plug-in option

FR-E8DS E KIT INSTRUCTION MANUAL

24 VDC input

PRE-OPERATION INSTRUCTIONS

1

INSTALLATION

2

CONNECTING THE 24 V EXTERNAL
POWER SUPPLY

3

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 appended 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, as the exposed high voltage terminals or the charging part of the circuitry can be touched. Doing so may cause an electric shock.
 - Even if power is OFF, do not remove the front cover of the inverter except for wiring or periodic inspection, as the inside of the inverter is charged. Doing so may cause an electric shock.
 - Before wiring or inspection, check that the LED display of the operation panel is 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 as 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.
- Prevent conductive items such as screws and metal fragments, or flammable substances such as oil from entering this product.
- 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 operation

- Before starting operation, confirm or adjust the parameter settings. 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 in this manual. Doing so may lead to fault or damage of the product.

CAUTION

Usage

- As all parameters return to their initial values after 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

- The inverter 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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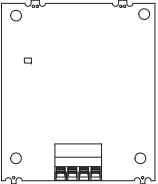

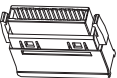
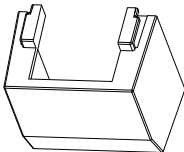
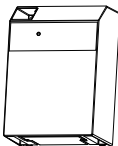



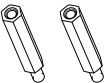
1 PRE-OPERATION INSTRUCTIONS

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

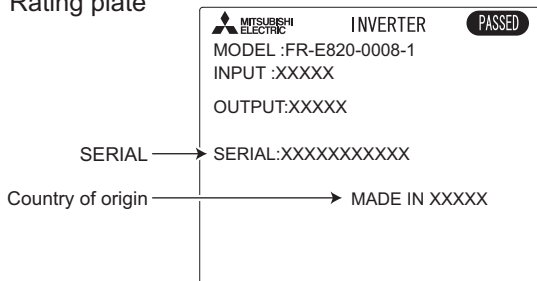
Check the enclosed items.

<p>Plug-in option: 1</p> 	<p>Mounting screw (M3 × 8 mm): 2 (Refer to page 13, page 15.)</p> 	<p>Junction connector: 1 (Refer to page 13, page 15.)</p> 	<p>Option small cover: 1 (Refer to page 15.)</p> 	<p>Front cover for plug-in option: 1 (Refer to page 13, page 15.)</p> 
<p>Recessed neck screw (M3 × 7): 1 (Refer to page 13, page 15.)</p> 	<p>Straight spacer: 1 (Refer to page 13, page 15.)</p> 	<p>L-shaped spacer: 1 (Refer to page 13, page 15.)</p> 	<p>Hexagon spacer: 2 (Refer to page 13, page 15.)</p> 	

1.1.2 Checking the SERIAL number of the inverter

The FR-E8DS is available for the inverters (standard model, Ethernet model, and safety communication model) manufactured in December 2021 or later. Availability of the function in the following table depends on the inverter to be used with the FR-E8DS. Check the SERIAL number printed on the rating plate or on the package of the inverter.

Rating plate



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.

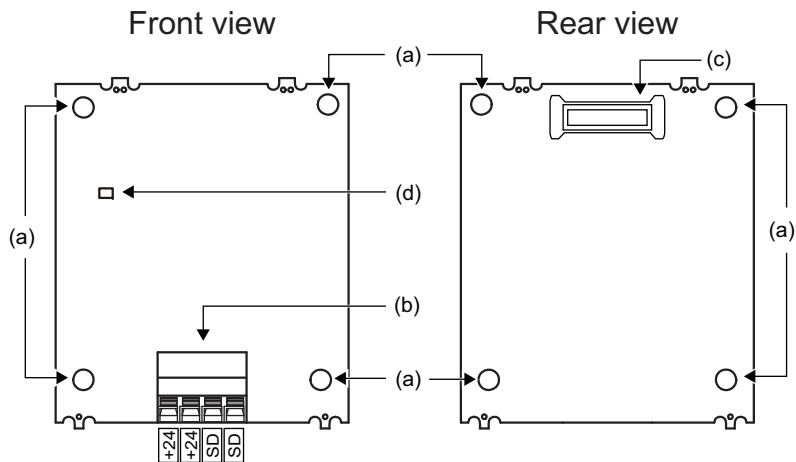
The last two digits of the production year are indicated as the Year, and the Month is indicated by 1 to 9, X (October), Y (November), or Z (December).

Function	Model	Firmware version
Selection between resetting or not resetting during power supply to main circuit (Pr.30 = "100 to 102")	Standard model Ethernet model	13 or later

NOTE

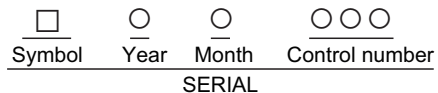
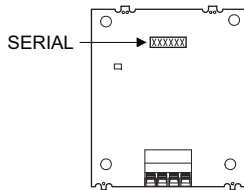
- When the FR-E8DS is installed to an incompatible inverter, operation cannot be guaranteed.
- The inverter firmware can be updated by using Firmware Update Tool of FR Configurator2. For details on firmware update, refer to the FR Configurator2 Instruction Manual.
- The FR-E8DS can be used by updating the inverter firmware to version 7 or later.
- Selection between resetting or not resetting during power supply to main circuit (**Pr.30** = "100 to 102") is available by updating the inverter firmware to version 13 or later.

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.	12
b	Terminal block	Connected to a 24 V external power supply.	20
c	Board mounted option connector	Used to connect this product to the option connector of the inverter.	12
d	LED (operation status indicator)	ON while the 24 V external power is supplied.	25

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

1.3.1 Input terminal specifications

Terminal symbol	Common	Terminal function description	Rated specification ^{*1}
+24	SD	Use the 24 V external power supply to turn ON/OFF I/O terminals, keep the operation panel ON, and carry out communication with other devices even at power-OFF state of inverter's main circuit power supply.	Input voltage: 23.5 to 26.5 VDC Input current: 0.7 A or less

*1 Prepare a 24 V external power supply according to the rated specification.

1.3.2 Availability of the inverter functions during 24 V external power supply operation

Function	Availability
Reading/writing parameters	Enabled (The option parameters are available even when a compatible option is not installed.)
Monitor display	Enabled (The monitor items related to the main circuit power supply are not available. *1)
Operation panel indication / key operation	Enabled (The RUN key is disabled.)
Input terminals	Enabled (Terminals 2, 4, and 10 and the start signals (STF and STR) are disabled.)
Output terminals	Enabled (Terminals FM and AM and the output signals related to the main circuit power supply are disabled. *1*2)
Fault indication	Enabled
USB connector	Enabled
Others	<ul style="list-style-type: none">• Parameter unit (FR-PU07), LCD operation panel (FR-LU08), and enclosure surface operation panel (FR-PA07) are available.• Terminal PC cannot be used for 24 VDC power supply.• Terminal 10 cannot be used for 5 VDC power supply.

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

*2 Terminal FM is provided in the FM type inverter. Terminal AM is provided in the AM type inverter.



NOTE

- During the 24 V external power supply operation, the inverter operation is disabled.
- Up to four inverters can be connected in parallel.

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.
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2.2 Installation procedure

◆ Installing the option

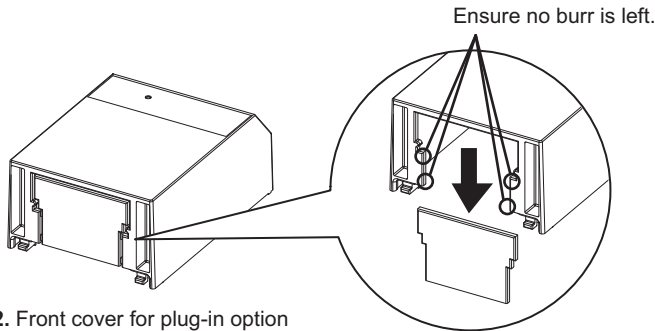
The FR-E800 series inverter has only one plug-in option connector.

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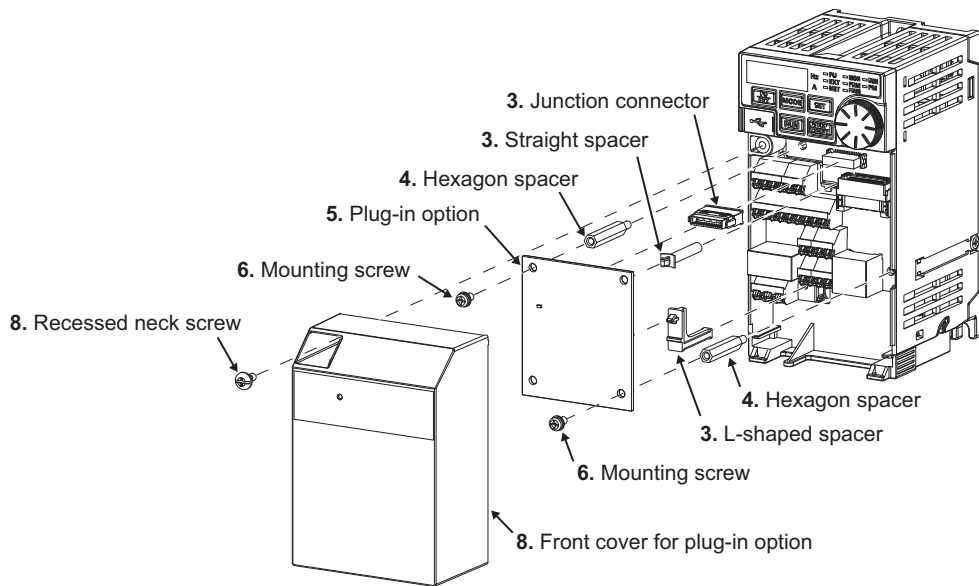
■ For the FR-E820-0175(3.7K) or lower, FR-E840-0170(7.5K) or lower, and FR-E860-0120(7.5K) or lower

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.



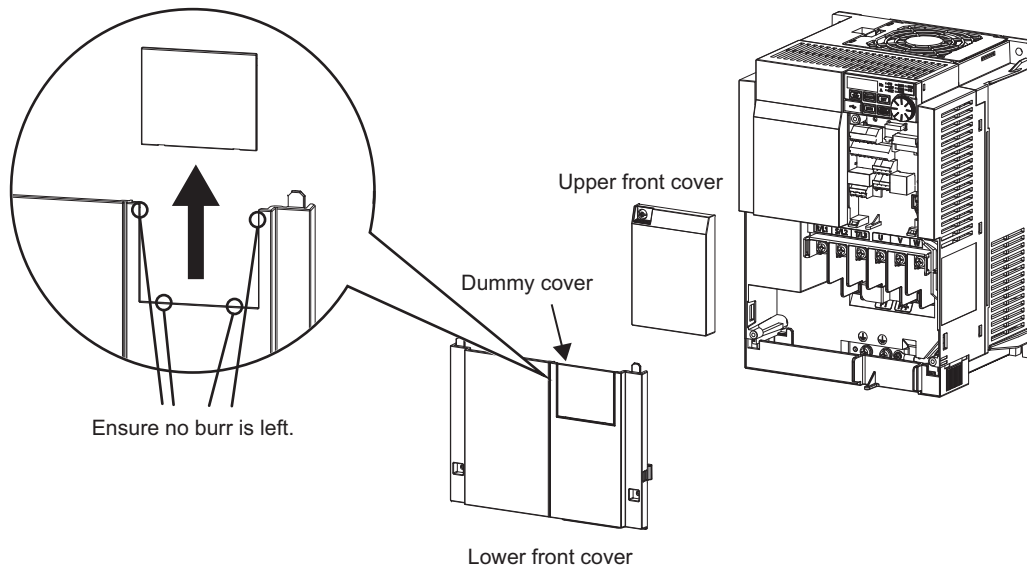
2. Front cover for plug-in option
3. Fit the L-shaped spacer, straight spacer, and junction connector to the plug-in option as shown in the figure on the [page 14](#). Fit the junction connector to the guide of the connector of the plug-in option, and insert the junction connector as far as it goes. 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 at the upper left and lower right (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 20](#) 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.



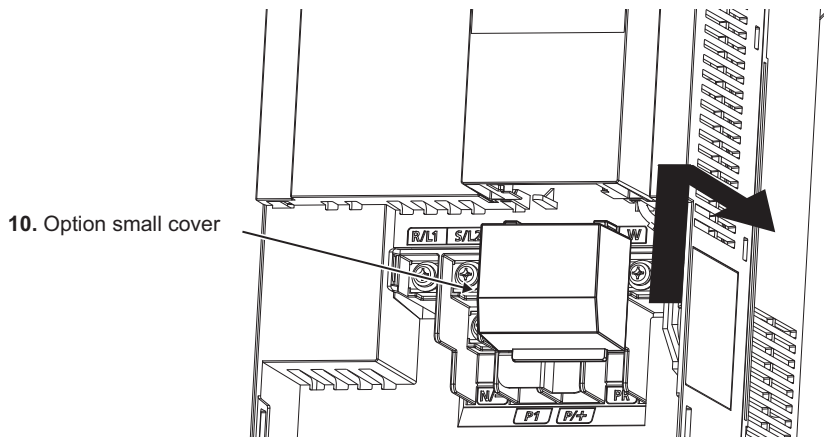
■ For the FR-E820-0240(5.5K) or higher and FR-E840-0230(11K) or higher

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.

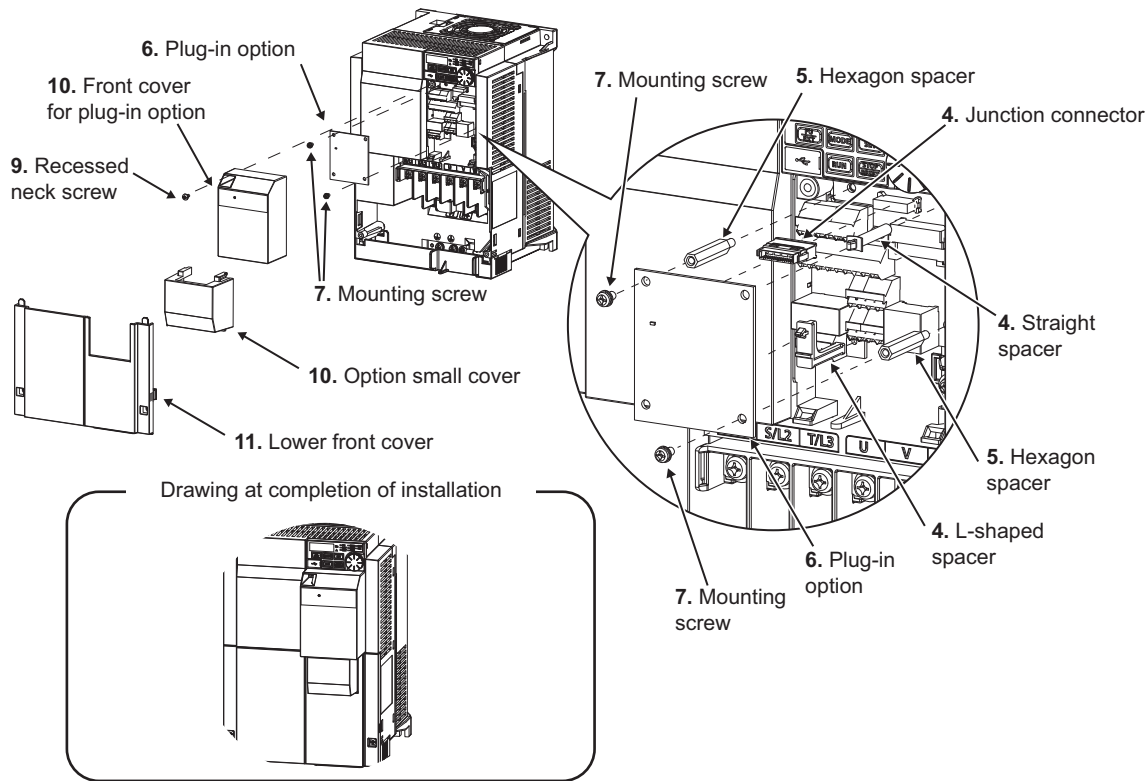


3. Use a nipper or the like to cut off the bottom of the front cover for plug-in option. (For details, refer to [page 13](#).)
4. Fit the L-shaped spacer, straight spacer, and junction connector to the plug-in option as shown in the figure on the [page 17](#). Fit the junction connector to the guide 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.

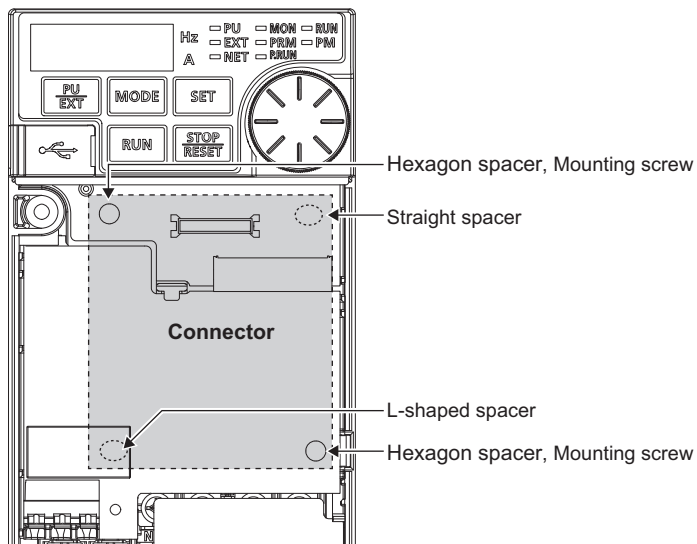
5. Remove the body screws of the inverter, then install the hexagon spacers to the inverter (tightening torque 0.56 to 0.75 N·m).
6. Fit the junction connector, which has been connected to the plug-in option, to the guide of the option connector on the inverter, and insert the junction connector as far as it goes.
7. Fasten this product to the inverter using the two mounting screws through the holes at the upper left and lower right (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 20](#) 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.



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 the body screws of the inverter are removed to install the hexagon spacers (in Step 4 on [page 14](#) or Step 5 on [page 16](#)), make sure that the control circuit board does not fall off due to the weight of cables.
- 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.

Mounted position	Fault indication
Option connector	E. 1

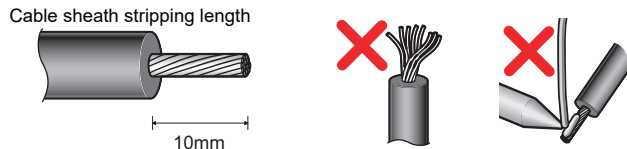
- When removing the plug-in option, remove the two screws at the upper left and lower right, and then pull it straight out. Pressure applied to the option connector and to the option board may break the option.

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.

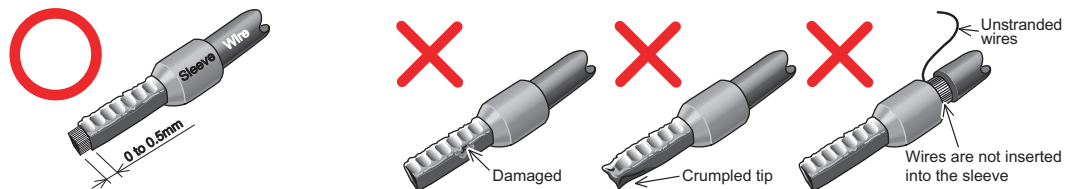
Strip the signal wires as follows. If too much of the wires is stripped, a short circuit may occur with neighboring wires. If not enough of the wire is stripped, wires may become loose and fall out.

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

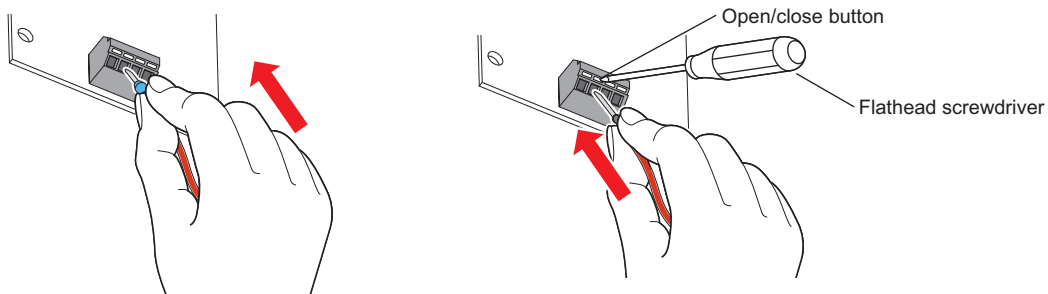
Crimp terminals commercially available (as of October 2020. The product may be changed without notice.)

Cable gauge (mm ²)	Ferrule terminal model			Manufacturer	Crimping tool name
	With insulation sleeve	Without insulation sleeve	For UL wire ^{*1}		
0.3	Al 0,34-10TQ	—	—	Phoenix Contact Co., Ltd.	CRIMPFOX 6
0.5	Al 0,5-10WH	—	Al 0,5-10WH-GB		
0.75	Al 0,75-10GY	A 0,75-10	Al 0,75-10GY-GB		
1	Al 1-10RD	A 1-10	Al 1-10RD/1000GB		
1.25, 1.5	Al 1,5-10BK	A 1,5-10	—		
0.75 (for two cables)	Al-TWIN 2 × 0,75-10GY	—	—		

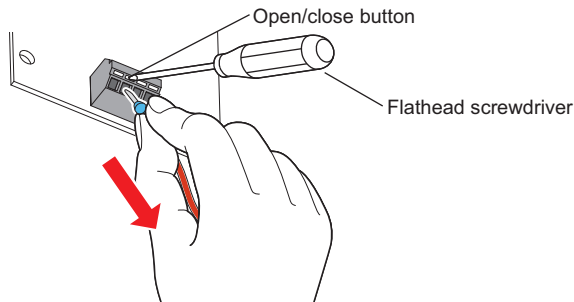
*1 A ferrule terminal with an insulation sleeve compatible with the MTW wire which has a thick wire insulation.

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

- 2.** Insert the cable into a socket.
When using a single wire or stranded wires without a 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 × 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 CONNECTING THE 24 V EXTERNAL POWER SUPPLY

Connect the 24 V external power supply across terminals +24 and SD to turn the I/O terminal ON/OFF operation, keep the operation panel ON, and carry out communication with other devices even at power-OFF state of inverter's main circuit power supply. When the main circuit power supply is turned ON, the power supply is switched from the 24 V external power supply to the main circuit power supply.

◆ Specification of the applied 24 V external power supply

Item	Rated specification*1
Input voltage	23.5 to 26.5 VDC
Input current	0.7 A or less

*1 Prepare a 24 V external power supply according to the rated specification.

◆ Starting and stopping the 24 V external power supply operation

- Supplying 24 V external power across terminals +24 and SD while the main circuit power is OFF starts the 24 V external power supply operation. Likewise, turning OFF the main circuit power while supplying 24 V external power starts the 24 V external power supply operation.
- Turning ON the main circuit power stops the 24 V external power supply operation and enables the normal operation.

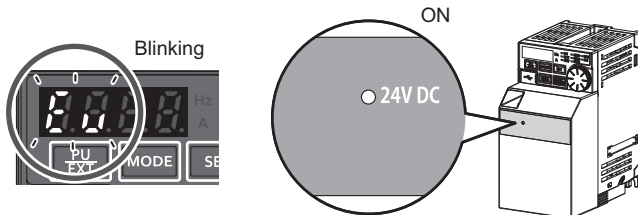


NOTE

- During the 24 V external power supply operation, the inverter operation is disabled.
- In the initial setting, when the main circuit power supply is turned ON during the 24 V external power supply operation, a reset is performed in the inverter, then the power supply changes to the main circuit power supply. (The reset can be disabled using **Pr.30 Regenerative function selection**. For details, refer to the FR-E800 Instruction Manual (Function).)

◆ Confirming the 24 V external power supply input

- The "24V DC" LED on the front cover for plug-in option is ON while the 24 V external power is supplied. When the main circuit power is turned OFF and the 24 V external power supply operation starts, "EV" blinks on the operation panel.



- During the 24 V external power supply operation, the 24 V external power supply operation (EV) signal is output. To use the EV signal, set "68 (positive logic)" or "168 (negative logic)" in any parameter from **Pr.190 to Pr.196 (Output terminal function selection)** to assign the function to the output terminal.

◆ Operation while the 24 V external power is supplied

- The operation stops when the power supply changes to the 24 V external power supply from the main circuit power supply regardless of the operating status (in a stop, in running, in automatic restart after instantaneous power failure, in offline tuning, in main circuit capacitor life measurement).
- Fault records and parameters can be read and parameters can be written (when the parameter write is enabled).
- The safety stop function is also valid while the 24 V external power is supplied. When the safety stop function is active, however, "SA" is not displayed because "EV" is displayed. The "EV" display has priority over the "SA" display.
- While the 24 V external power is supplied, monitoring function and signals related to the main circuit power supply are not available. (For details, refer to the FR-E800 Instruction Manual (Function).)
- The alarms, which have occurred when the main circuit power supply is ON, continue to be output after the power supply is changed to the 24 V external power supply. Perform the inverter reset or turn OFF then ON the power to reset the faults.
- The retry function is invalid for all faults while the 24 V external power is supplied.
- If the power supply changes from the main circuit power supply to the 24 V external power supply while measuring the main circuit capacitor's life, the measurement completes after the power supply changes back to the main circuit power supply (**Pr.259 = "3"**).

- The output data is retained when "1 or 11" is set in **Pr.495 Remote output selection**.

NOTE

- Inrush current equal to or higher than the 24 V external power supply specification may flow at power-ON. Confirm that the power supply and other devices are not affected by the inrush current and the voltage drop caused by it. Depending on the power supply, the overcurrent protection may be activated to disable the power supply. Select the power supply and capacity carefully.
- When the wiring length between the external power supply and the inverter is long, the voltage often drops. Select the appropriate wiring size and length to keep the voltage in the rated input voltage range.
- In a serial connection of several inverters, the current increases when it flows through the inverter wiring near the power supply. The increase of the current causes voltage to drop further. When connecting different inverters to different power supplies, use the inverters after confirming that the input voltage of each inverter is within the rated input voltage range. Depending on the power supply, the overcurrent protection may be activated to disable the power supply. Select the power supply and capacity carefully.
- When an external 24 V power supply is used, "E.SAF" may appear if the power supply start-up time is too long (less than 1.5 V/s).
- Do not touch the option board while the 24 V external power is supplied (when conducted). Doing so may cause an electric shock or burn.

REVISIONS

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

Revision date	*Manual number	Revision
Oct. 2021	IB(NA)-0600958ENG-A	First edition
Jul. 2023	IB(NA)-0600958ENG-B	Added • Selection between resetting or not resetting during power supply to main circuit (Pr.30 = "100 to 102")

INVERTER

mitsubishi **ELECTRIC CORPORATION**

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