



INVERTER

Control terminal option

FR-A7PS

INSTRUCTION MANUAL

*12V control circuit terminal
block with encoder power supply*

PRE-OPERATION INSTRUCTIONS

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INSTALLATION

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WIRING OF A PLUG-IN OPTION
AND MOTOR WITH ENCODER

3

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Thank you for choosing this Mitsubishi Inverter control terminal option.

This instruction manual gives handling information and precautions for use of this equipment. Incorrect handling might cause an unexpected fault. Before using the equipment, please read this manual carefully to use the equipment to its optimum performance.

Please forward this manual to the end user.

This section is specifically about safety matters

Do not attempt to install, operate, maintain or inspect this product until you have read through this instruction manual and appended documents carefully and can use the equipment correctly. Do not use this product until you have a full knowledge of the equipment, safety information and instructions.

In this instruction manual, the safety instruction levels are classified into "WARNING" and "CAUTION".




WARNING

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



CAUTION

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

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

Safety Precautions

1. Electric Shock Prevention

WARNING

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

2. Injury Prevention

CAUTION

- Apply only the voltage specified in the instruction manual to each terminal. Otherwise, burst, damage, etc. may occur.
- Ensure that the cables are connected to the correct terminals. Otherwise, burst, damage, etc. may occur.
- Always make sure that polarity is correct to prevent damage, etc. Otherwise, burst, damage may occur.
- While power is on or for some time after power-off, do not touch the inverter as they will be extremely hot. Doing so can cause burns.

3. Additional Instructions

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

(1) Transportation and mounting

CAUTION

- Do not install or operate the terminal block option unit if it is damaged or has parts missing.
- Do not stand or rest heavy objects on the product.
- Check that the mounting orientation is correct.
- Prevent other conductive bodies such as screws and metal fragments or other flammable substance such as oil from entering the inverter.

(2) Trial run

CAUTION

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

(3) Usage

WARNING

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

CAUTION

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

(4) Maintenance, inspection and parts replacement

CAUTION

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

(5) Disposal

CAUTION

- Treat as industrial waste.

(6) General instruction

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

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1 PRE-OPERATION INSTRUCTIONS

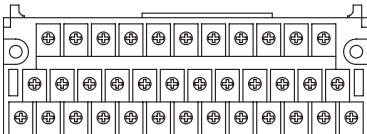


1.1 Unpacking and Product Confirmation

Take the control terminal option out of the package, check the product name on the reverse side, and confirm that the product is as you ordered and intact.

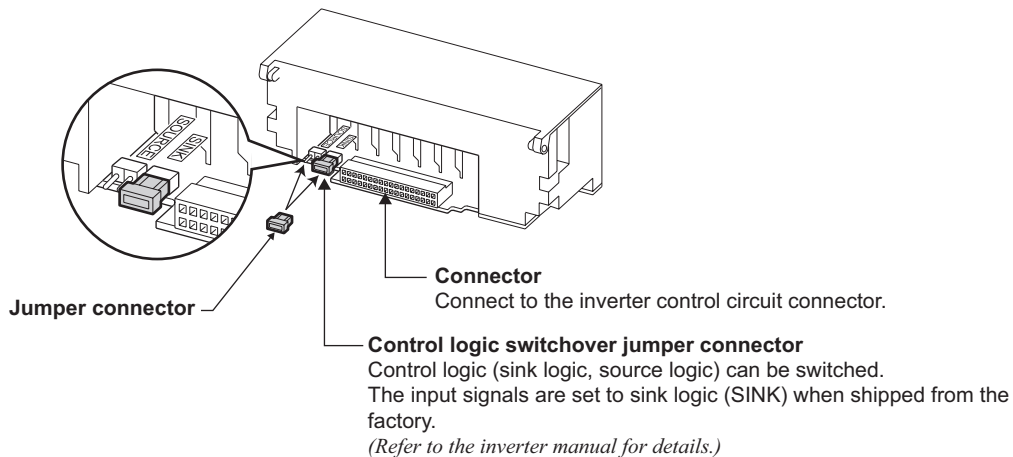
This product is a control terminal option unit dedicated for the FR-A700 series.

1.1.1 Packing confirmation

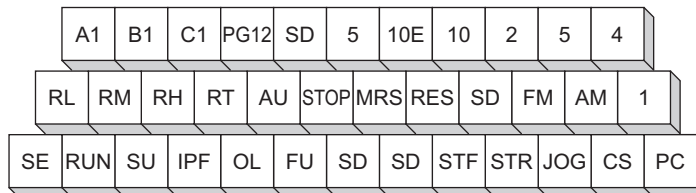
Check the enclosed items.

<p>Control terminal option 1</p>  A detailed line drawing of a control terminal option unit. It features a long horizontal row of 16 terminal blocks, each with a circular screw terminal. On the left and right sides, there are additional components including a circular terminal and a rectangular connector.	<p>Instruction manual 1</p>  A simple line drawing of a folded instruction manual. The top cover is labeled "Instruction manual".	<p>Connection cable for FR-A7AP and FR-A7AL 1 (refer to page 15)</p>  A line drawing of a curved connection cable. One end has a small rectangular connector, and the other end has a circular terminal with a screw.
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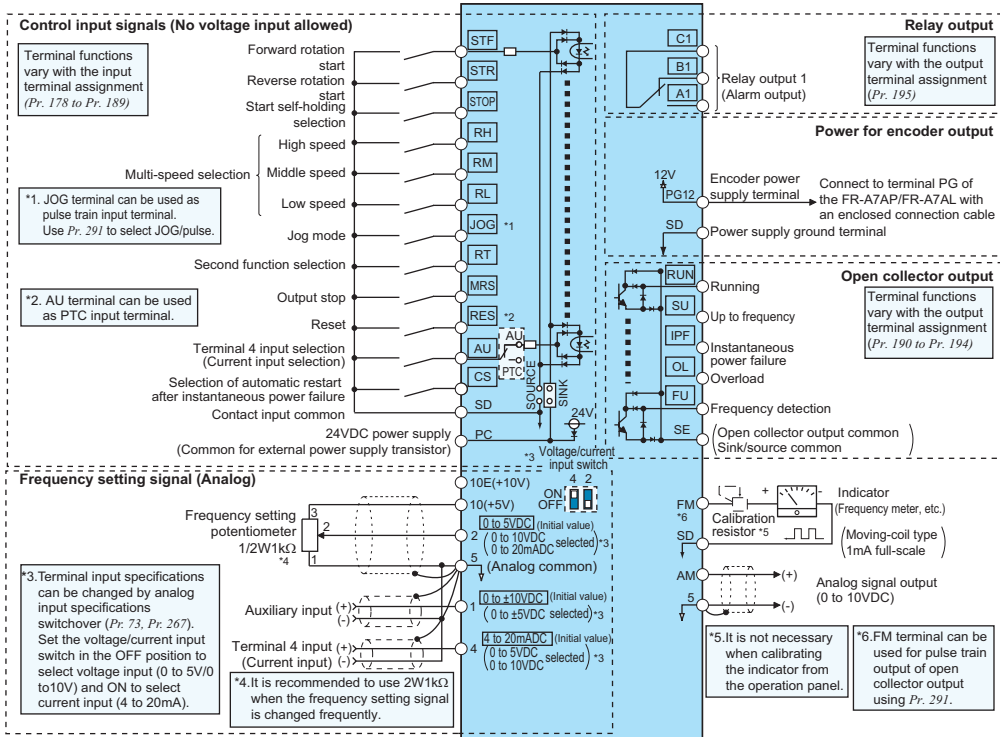
1.1.2 Parts



1.1.3 Terminal layout



1.2 Terminal connection diagram



1.3 Control terminal specifications

(1) Power for encoder output

Terminal Symbol	Terminal Name	Description	Rated Specifications
PG12	Encoder power supply terminal (Positive side)	12VDC power supply for encoder. Connect to terminal PG of the FR-A7AP/FR-A7AL with an enclosed connection cable	12VDC \pm 10% Permissible maximum load current 150mA
SD	Contact input common (sink), Power supply ground terminal	Common terminal for contact input or encoder power supply. Isolated from terminals 5 and SE. Do not ground. * Terminal SDs are connected inside.	Power supply common



(2) Contact input

indicates that input signal functions can be selected using *Pr. 178 to Pr. 189 (input terminal function selection)*

(Refer to section 4 of the inverter manual for details of Pr. 178 to Pr. 189)

Terminal Symbol	Terminal Name	Description		Rated Specifications
STF	Forward rotation start	Turn on the STF signal to start forward rotation and turn it off to stop.	When the STF and STR signals are turned on simultaneously, the stop command is given.	Input resistance 4.7kΩ Voltage at opening: 21 to 27VDC Contacts at short-circuited: 4 to 6mADC
STR	Reverse rotation start	Turn on the STR signal to start reverse rotation and turn it off to stop.		
STOP	Start self-holding selection	Turn on the STOP signal to self-hold the start signal.		
RH, RM, RL	Multi-speed selection	Multi-speed can be selected according to the combination of RH, RM and RL signals.		
JOG	Jog mode selection	Turn on the JOG signal to select Jog operation (initial setting) and turn on the start signal (STF or STR) to start Jog operation.		
	Pulse train input	JOG terminal can be used as pulse train input terminal. To use as pulse train input terminal, the <i>Pr. 291</i> setting needs to be changed. (maximum input pulse: 100kpulses/s)		
RT	Second function selection	Turn on the RT signal to select second function. When the second function such as "second torque boost" and "second V/F (base frequency)" are set, turning on the RT signal selects these functions.		Input resistance 4.7kΩ Voltage at opening: 21 to 27VDC Contacts at short-circuited: 4 to 6mADC

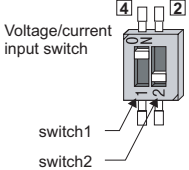
7 PRE-OPERATION INSTRUCTIONS

Terminal Symbol	Terminal Name	Description	Rated Specifications
MRS	Output stop	Turn on the MRS signal (20ms or more) to stop the inverter output. Use to shut off the inverter output when stopping the motor by electromagnetic brake.	Input resistance 4.7kΩ Voltage at opening: 21 to 27VDC Contacts at short-circuited: 4 to 6mADC
RES	Reset	Used to reset alarm output provided when protective circuit is activated. Turn on the RES signal for more than 0.1s, then turn it off. Initial setting is for reset always. By setting <i>Pr: 75</i> , reset can be set to enabled only at an inverter alarm occurrence. Recover about 1s after reset is cancelled.	
AU	Terminal 4 input selection	Terminal 4 is made valid only when the AU signal is turned on. (The frequency setting signal can be set between 4 and 20mADC.) Turning the AU signal on makes terminal 2 (voltage input) invalid.	
	PTC input	AU terminal is used as PTC input terminal (thermal protection of the motor). When using it as PTC input terminal, set the AU/PTC switch to PTC.	
CS	Selection of automatic restart after instantaneous power failure	When the CS signal is left on, the inverter restarts automatically at power restoration. Note that restart setting is necessary for this operation. In the initial setting, a restart is disabled. (Refer to <i>Pr. 57 Restart coasting time</i> in section 4 of Instruction Manual.)	



Terminal Symbol	Terminal Name	Description	Rated Specifications
SD	Contact input common (sink)	<p>Common terminal for contact input terminal (sink logic) and terminal FM.</p> <p>Common output terminal for 24VDC 0.1A power supply (PC terminal).</p> <p>Isolated from terminals 5 and SE.</p> <p>* Terminal SDs are connected inside.</p>	—
PC	External transistor common, 24VDC power supply, contact input common (source)	<p>When connecting the transistor output (open collector output), such as a programmable controller, when sink logic is selected, connect the external power supply common for transistor output to this terminal to prevent a malfunction caused by undesirable currents.</p> <p>Can be used as 24VDC 0.1A power supply.</p> <p>When source logic has been selected, this terminal serves as a contact input common.</p>	<p>Power supply voltage range 19.2 to 28.8VDC</p> <p>Current consumption 100mA</p>

(3) Frequency setting

Terminal Symbol	Terminal Name	Description	Rated Specifications
10E	Frequency setting power supply	When connecting the frequency setting potentiometer at an initial status, connect it to terminal 10.	10VDC Permissible load current 10mA
10		Change the input specifications of terminal 2 when connecting it to terminal 10E. (Refer to Pr. 73 Analog input selection in section 4 of Instruction Manual.)	5VDC Permissible load current 10mA
2	Frequency setting (voltage)	Inputting 0 to 5VDC (or 0 to 10V, 0 to 20mA) provides the maximum output frequency at 5V (10V, 20mA) and makes input and output proportional. Use Pr. 73 to switch from among input 0 to 5VDC (initial setting), 0 to 10VDC, and 0 to 20mA. Set the voltage/current input switch in the ON position to select current input (0 to 20mA). *	Voltage input: Input resistance $10k\Omega \pm 1k\Omega$ Maximum permissible voltage 20VDC Current input: Input resistance $245\Omega \pm 5\Omega$ Maximum permissible current 30mA
4	Frequency setting (current)	Inputting 4 to 20mADC (or 0 to 5V, 0 to 10V) provides the maximum output frequency at 20mA makes input and output proportional. This input signal is valid only when the AU signal is on (terminal 2 input is invalid). Use Pr. 267 to switch from among input 4 to 20mA (initial setting), 0 to 5VDC, and 0 to 10VDC. Set the voltage/current input switch in the OFF position to select voltage input (0 to 5V/0 to 10V). * Use Pr. 858 to switch terminal functions.	

* Refer to section 4 of the inverter manual for details of Pr. 73 and Pr. 267



Terminal Symbol	Terminal Name	Description	Rated Specifications
1	Frequency setting auxiliary	Inputting 0 to ± 5 VDC or 0 to ± 10 VDC adds this signal to terminal 2 or 4 frequency setting signal. Use <i>Pr. 73</i> to switch between the input 0 to ± 5 VDC and 0 to ± 10 VDC (initial setting). Use <i>Pr. 868</i> to switch terminal functions.	Input resistance $10k\Omega \pm 1k\Omega$ Maximum permissible voltage ± 20 VDC
5	Frequency setting common	Common terminal for frequency setting signal (terminal 2, 1 or 4) and analog output terminal AM. Do not earth (ground).	—

(4) Output signals

indicates that output signal functions can be selected using *Pr. 190 to Pr. 195 (output terminal function selection)*.

(Refer to section 4 of the inverter manual for details of Pr. 190 to Pr. 195)

Terminal Symbol	Terminal Name	Description	Rated Specifications
A1, B1, C1	Relay output 1 (alarm output)	1 changeover contact output indicates that the inverter protective function has activated and the output stopped. Abnormal: No conduction across B-C (Across A-C Continuity), Normal: Across B-C Continuity (No conduction across A-C)	Contact capacity: 230VAC 0.3A (Power factor=0.4) 30VDC 0.3A

7 PRE-OPERATION INSTRUCTIONS

Terminal Symbol	Terminal Name	Description	Rated Specifications
RUN	Inverter running	Switched low when the inverter output frequency is equal to or higher than the starting frequency (initial value 0.5Hz). Switched high during stop or DC injection brake operation. *	Permissible load 24VDC (27VDC maximum) 0.1A (A voltage drop is 2.8V maximum when the signal is on.) * Low indicates that the open collector output transistor is on (conducts). High indicates that the transistor is off (does not conduct).
SU	Up to frequency	Switched low when the output frequency reaches within the range of $\pm 10\%$ (initial value) of the set frequency. Switched high during acceleration/ deceleration and at a stop. *	
OL	Overload warning	Switched low when stall prevention is activated by the stall prevention function. Switched high when stall prevention is cancelled. *	
IPF	Instantaneous power failure	Switched low when an instantaneous power failure and under voltage protections are activated. *	
FU	Frequency detection	Switched low when the inverter output frequency is equal to or higher than the preset detected frequency and high when less than the preset detected frequency. *	
SE	Open collector output common	Common terminal for terminals RUN, SU, OL, IPF, FU	—



Terminal Symbol	Terminal Name	Description		Rated Specifications
FM	For meter	Select one e.g. output frequency from monitor items. (Not output during inverter reset.) The output signal is proportional to the magnitude of the corresponding monitoring item.	Output item: Output frequency (initial setting)	Permissible load current 2mA 1440pulses/s at 60Hz
	NPN open collector output		Signals can be output from the open collector terminals by setting <i>Pr. 291</i> .	Maximum output pulse: 50kpulses/s Permissible load current: 80mA
AM	Analog signal output		Output item: Output frequency (initial setting)	Output signal 0 to 10VDC Permissible load current 1mA (load impedance 10kΩ or more) Resolution 8 bit

(5) Main differences and compatibilities with the standard terminal block

Item	Standard Terminal Block	FR-A7PS
Changed /cleared functions	Without 12VDC power supply for encoder	With 12VDC power supply for encoder
	Relay contact 2 points (terminal A1, B1, C1, A2, B2, C2)	Relay contact 1 point (terminal A1, B1, C1)
	<i>Pr. 196</i> <i>ABC2 terminal function selection</i>	The <i>Pr. 196</i> setting is invalid.
	Terminal 5 1 point	Terminal 5 2 points



1

2 **INSTALLATION**

2.1 Pre-Installation Instructions

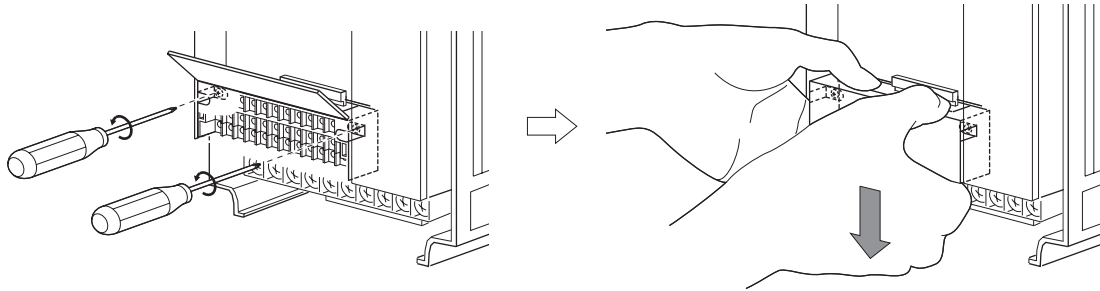
Make sure that the input power of the inverter is off.

CAUTION

-  **Do not install or remove a control terminal option while input supply is on. Otherwise, the inverter and option may be damaged.**
-  **For prevention of damage due to static electricity, touch nearby metal before touching this product to eliminate static electricity from your body.**

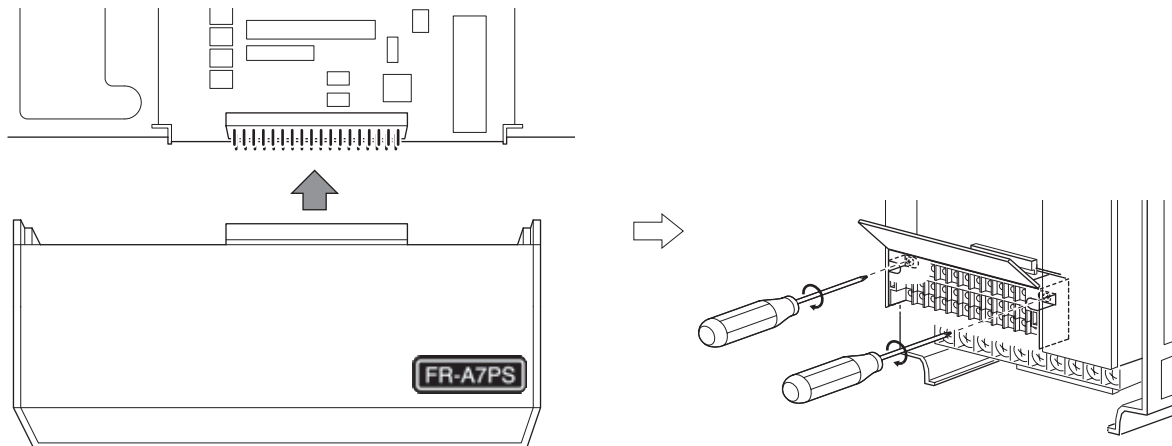
2.2 Installation procedure

- (1) Remove the inverter front cover.
(Refer to the inverter instruction manual for removing the front cover.)
- (2) Loosen the two installation screws in both ends of the control circuit terminal block. (These screws cannot be removed.)
Pull down the terminal block from behind the control circuit terminals.



7 INSTALLATION

- (3) Using care not to bend the pins of the inverter's control circuit connector, reinstall the control terminal option and fix it with the mounting screws.



CAUTION

1. Make sure that the control circuit connector is fitted correctly.
2. While power is on, never disconnect the standard control circuit terminal option (FR-A7PS).

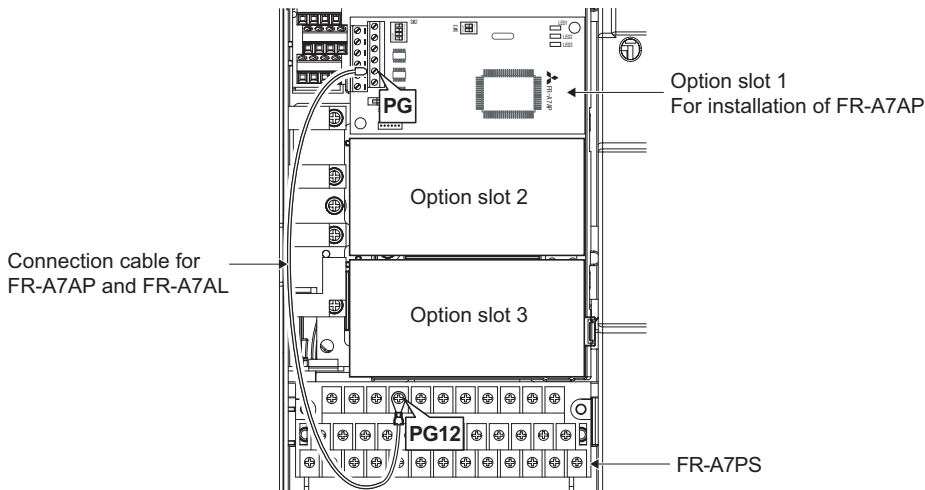
- (4) Install the inverter front cover.
(Refer to the inverter instruction manual for installing the front cover.)

3 WIRING OF A PLUG-IN OPTION AND MOTOR WITH ENCODER

3.1 Connection diagram

When using 12VDC power for encoder of this option, connect terminal PG12 and terminal PG of a plug-in option FR-A7AP or FR-A7AL with an enclosed connection cable.

<Wiring example of the FR-A7AP>

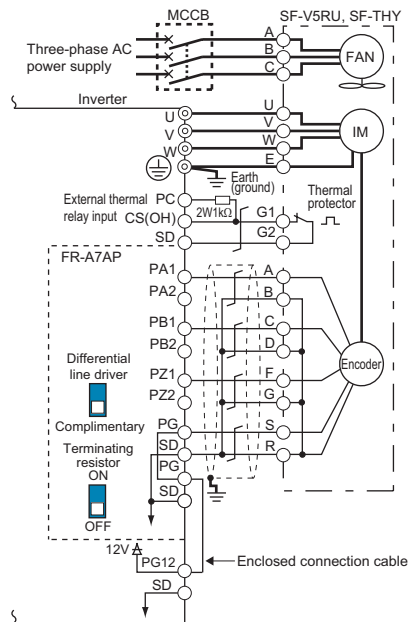


CAUTION

When terminal PG12 and terminal SD are shorted, power is not supplied to the encoder. Therefore, a signal from the encoder can not be received (fault display due to terminal short circuit is not output). Operating the inverter in such status may activate stall prevention (OL), activating protective function such as overcurrent shutoff (E.OC□) and electronic thermal relay function (E.THT, E.THM). In addition, it could cause the inverter to fail.

7 WIRING OF A PLUG-IN OPTION AND MOTOR WITH ENCODER

<Wiring example of the FR-A7AP>



REMARKS

- Since terminal SDs are connected inside the inverter, it is not necessary to connect this option and terminal SD of the plug-in option FR-A7AP or FR-A7AL.

4 PRECAUTIONS

- (1) When fitting the FR-A7PS to the inverter, insert it using care not to bend pins of a connector for control circuit connection of the inverter.
- (2) To receive a signal from encoder, connect terminal PG12 of the FR-A7PS and terminal PG of the FR-A7AP with an enclosed connection cable.
- (3) When terminal PG12 and terminal SD are shorted, power is not supplied to the encoder. Therefore, a signal from the encoder can not be received (fault display due to terminal short circuit is not output). Operating the inverter in such status may activate stall prevention (OL), activating protective function such as overcurrent shutoff (E.OC□) and electronic thermal relay function (E.THT, E.THM). In addition, it could cause the inverter to fail.

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REVISIONS

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

Print Date	*Manual Number	Revision
Nov., 2007	IB-0600348ENG-A	First edition