



INVERTER

Plug-in option

FR-A7AX

FR-A7AX E kit

INSTRUCTION MANUAL

16-bit digital input function

PRE-OPERATION INSTRUCTIONS

1

INSTALLATION AND WIRING
(FR-A700/F700 SERIES)

2

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

3

CONNECTION DIAGRAM AND TERMINAL

4

PARAMETERS

5

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

This section is specifically about safety matters

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

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



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 personal safety.

SAFETY INSTRUCTIONS

1. Electric Shock Prevention



WARNING

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

2. Injury Prevention

CAUTION

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

3. Additional Instructions

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

1) Transportation and mounting

CAUTION

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

2) Trial run

CAUTION

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

3) Usage

WARNING

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

CAUTION

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

4) Maintenance, inspection and parts replacement

CAUTION

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

5) Disposal

CAUTION

- Treat as industrial waste.

6) General instruction

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

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1 PRE-OPERATION INSTRUCTIONS

1.1 Unpacking and Product Confirmation

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

FR-A7AX is a plug-in option for the FR-A700/F700/E700 series.

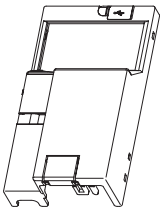
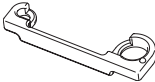
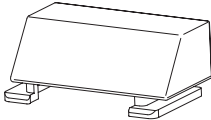
1.1.1 Product confirmation (FR-A700/F700 series)

Check the enclosed items.

Plug-in option 1 	Mounting screw (M3 × 6mm) 2 (Refer to page 6.) 	Hex-head screw for option mounting (5.5mm) 1 (Refer to page 6.) 
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1.1.2 Product confirmation (FR-E700 series (E kit))

Check the enclosed items.

Plug-in option 1 	Mounting screw (M3 × 6mm) 2 (Refer to page 14, 16) 	
Front cover for plug-in option 1 (Refer to page 14, 15) 	Option protective cover *1 1 (Refer to page 14) 	Option small cover *2 1 (Refer to page 15) 

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

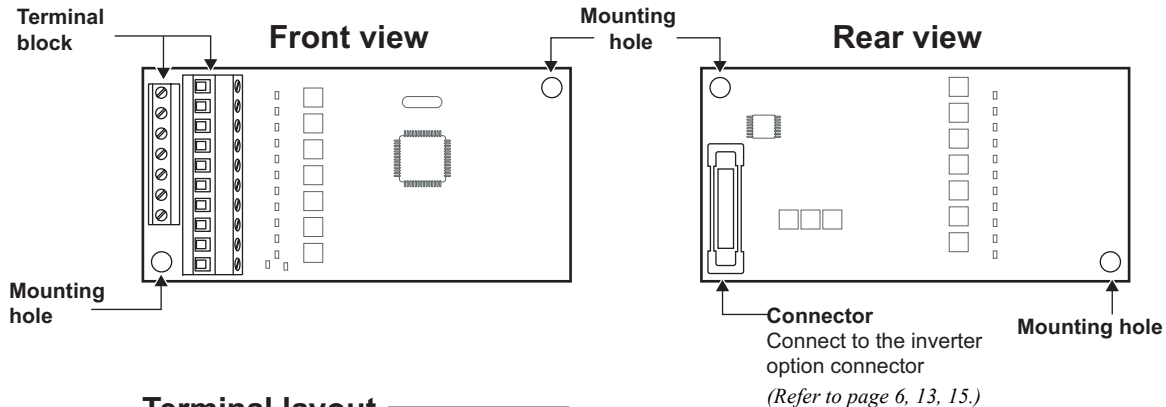
*2 Used with the FR-E720-5.5K (FR-E720-240) or more and FR-E740-11K (FR-E740-230) or more.

CAUTION

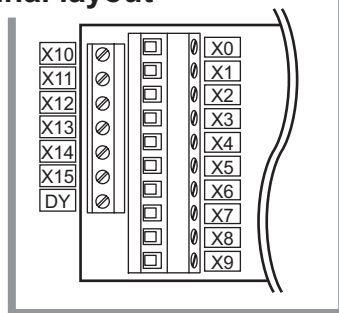
- Install a provided front cover for plug-in option, in place of the inverter front cover.

1.2 Parts

● FR-A7AX



Terminal layout



1.3 Specifications

- (1) Digital input signal type
BCD code 3-digit or 4-digit
Binary 12-bit or binary 16-bit
- (2) Selection of digital input signal
Select from the operation panel or parameter unit.
- (3) Input current
5mA(24VDC) for each circuit
- (4) Input specifications
Relay contact signal or open collector input
- (5) Adjustment function
 - Bias and gain
 - Analog compensation input (They can be set for the FR-A700/F700 series only.)
(Set using the operation panel)

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

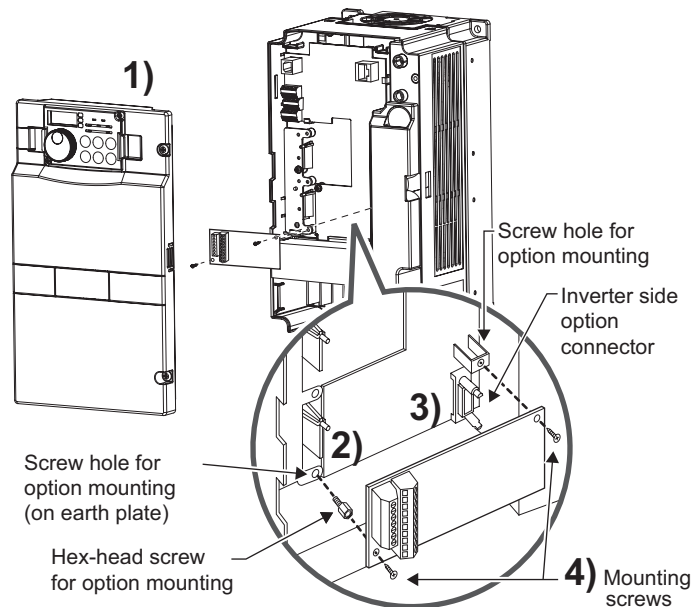
2.1 Pre-installation instructions

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

CAUTION

-  With input power ON, do not install or remove the plug-in option. Otherwise, the inverter and plug-in option may be damaged.
-  For prevention of damage due to static electricity, touch nearby metal before touching this product to eliminate static electricity from your body.

2.2 Installation procedure



- 1) Remove the inverter front cover.
- 2) Mount the hex-head screw for option mounting into the inverter screw hole (on earth plate). (size 5.5mm, tightening torque 0.56N·m to 0.75N·m)
- 3) Securely fit the connector of the plug-in option to the inverter connector along the guides.
- 4) Securely fix the both right and left sides of the plug-in option to the inverter with the accessory mounting screws . (Tightening torque 0.45N·m to 0.55N·m) If the screw holes do not line-up, the connector may not have been plugged securely. Check for loose plugging.

REMARKS

- Remove a plug-in option after removing two screws on both left and right sides.
(When the plug-in option is mounted in the connector 3 (connector 1 for the FR-F700 series), it is easier to remove the plug-in option after removing a control circuit terminal block.)



CAUTION

- Only one type of option per inverter may be used. When two or more options are mounted, priority is in the order of inverter option connectors 1, 2 and 3. The options having lower priority are inoperative.
- When the inverter cannot recognize that the option is mounted due to improper installation, etc., "E. 1 to E. 3" (option fault) are displayed for the FR-A700 series. The errors shown differ according to the mounting positions (connectors 1, 2, 3).

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

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

2.3 Wiring

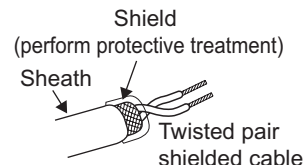
2.3.1 Wiring of FR-A7AX

Untwist the twisted pair shielded cables after stripping its sheath.

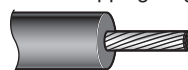
Also, perform protective treatment of the shield to ensure that it will not make contact with the conductive area.

Strip off the sheath for the below length. If the length of the sheath peeled is too long, a short circuit may occur with neighboring wires. If the length is too short, wires might come off.

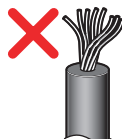
Wire the stripped cable after twisting it to prevent it from becoming loose. (Do not solder it.)



Cable stripping length



5mm



Use a blade type terminal as required.



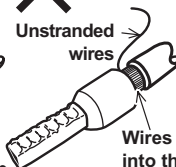
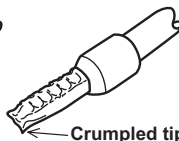
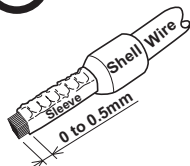
REMARKS

- Information on blade terminals
Commercially available product examples (as of March 2008)

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

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

Insert wires to a blade terminal, and check that the wires come out for about 0 to 0.5 mm from a sleeve.
Check the condition of the blade terminal after crimping. Do not use a blade terminal of which the crimping is inappropriate, or the face is damaged.



Wires are not inserted into the shell

- Loosen the terminal screw and insert the cable into the terminal.

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

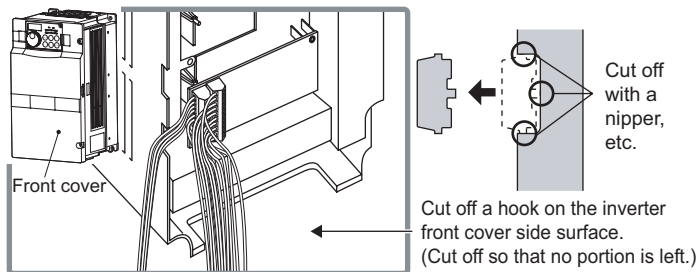
CAUTION

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

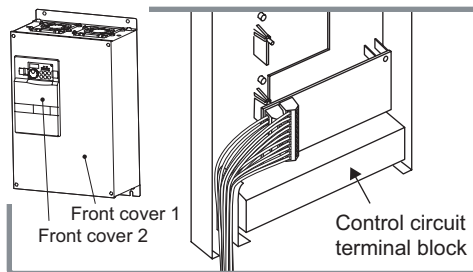
2.3.2 Wiring at inverter side

For wiring of **the inverter with one front cover**, route wires between the control circuit terminal block and front cover. If cables can not be routed between the control circuit terminal block and front cover due to the increased number of cables, remove a hook of the front cover and use a space become available.

For wiring of **the inverter which has front cover 1 and 2**, use the space on the left side of the control circuit terminal block.



Inverter with one front cover



Inverter which has front cover 1 and 2

REMARKS

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



CAUTION



When performing wiring using the space between the inverter front cover and control circuit terminal block, take caution not to subject the cable to stress.



After wiring, wire offcuts must not be left in the inverter. These may cause a fault, failure or malfunction.

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

3.1 Pre-Installation Instructions

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

⚠ CAUTION

- ⚠ With input power on, do not install or remove the plug-in option. Otherwise, the inverter and plug-in option may be damaged.
- ⚠ For prevention of damage due to static electricity, touch nearby metal before touching this product to eliminate static electricity from your body.

3.2 Installation Procedure

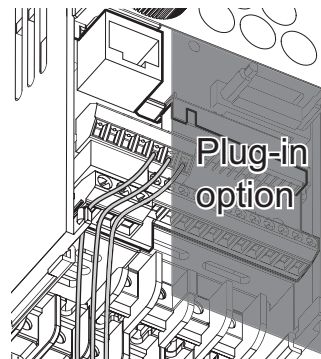
The FR-E700 series has one connection connector for the plug-in option.

CAUTION

- Always perform wiring to the main circuit terminals and control circuit terminals before installing the option. Wiring cannot be performed after installing the option.

For wiring to terminal RUN, FU, SE of control circuit terminal, run cables to prevent them from being caught between the option board and control circuit terminal block as shown in the right figure. In case cables are caught, the inverter may be damaged.

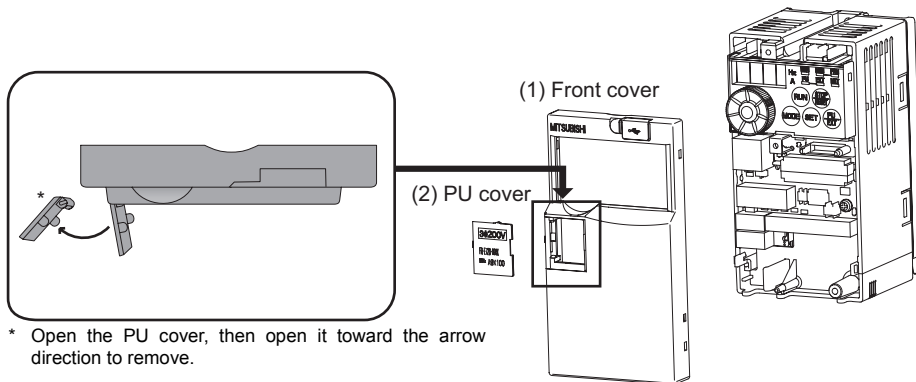
- When the inverter cannot recognize that the option is mounted due to improper installation, etc., "E. 1" (option alarm) is displayed.
- Take care not to drop a mounting screws during mounting and removal.
- Pull out the option straight to remove. Otherwise, the connector may be damaged.





- For FR-E720-3.7K (FR-E720-175) or less, FR-E740-7.5K (FR-E740-170) or less

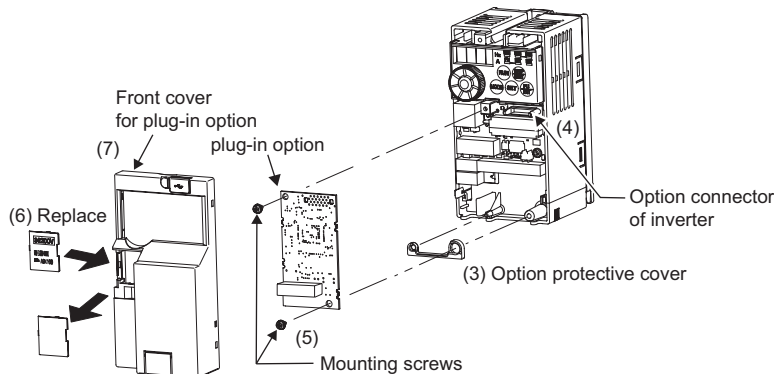
- (1) Remove the front cover from the inverter. (For removing the front cover, refer to the FR-E700 series instruction manual.)
- (2) Remove the PU cover from the front cover. Open the PU cover with a driver, etc. and remove it in the direction of arrow as shown below.



REMARKS

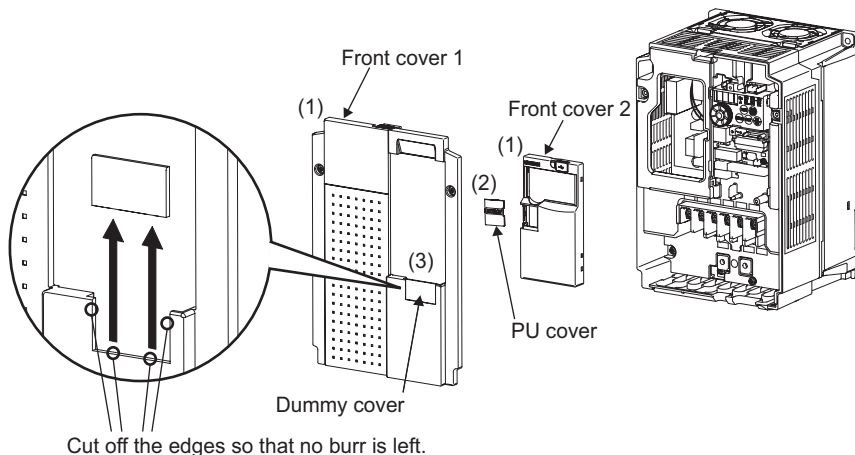
- Because the voltage class, model name and serial (only voltage class is labeled for the FR-E740-5.5K (FR-E740-120) or more) are stated on the PU cover, replace a PU cover of a plug-in option front cover with the removed PU cover from the inverter.

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





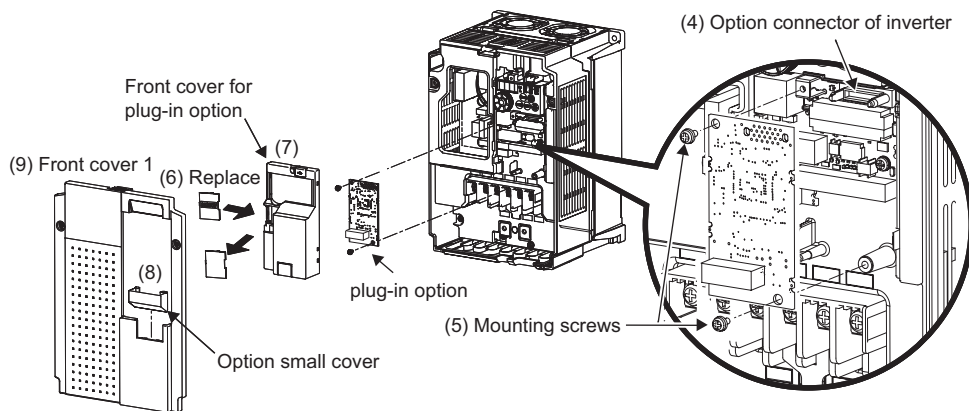
- For FR-E720-5.5K (FR-E720-240) or more, FR-E740-11K (FR-E740-230) or more
- (1) Remove the front cover 1 and 2 from the inverter. (For removing the front cover, refer to the FR-E700 series instruction manual.)
- (2) Remove the PU cover from the front cover 2. For removing the PU cover, refer to *page 13*.
- (3) Cut off the dummy cover of the front cover 1 with a nipper, etc. and make a space for installing the option small cover.



REMARKS

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

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





3.3 Wiring

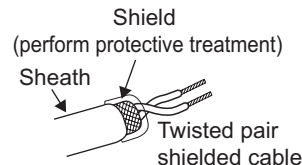
3.3.1 Wiring of FR-A7AX

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

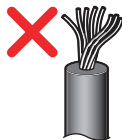
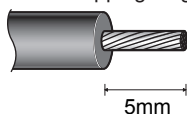
Also, perform protective treatment of the shield to ensure that it will not make contact with the conductive area.

Strip off the sheath about the size as in the right figure. If the length of the sheath peeled is too long, a short circuit may occur among neighboring wires. If the length is too short, wires might come off.

Wire the stripped cable after twisting it to prevent it from becoming loose. (Do not solder it.)



Cable stripping length



Use a blade type terminal as required.

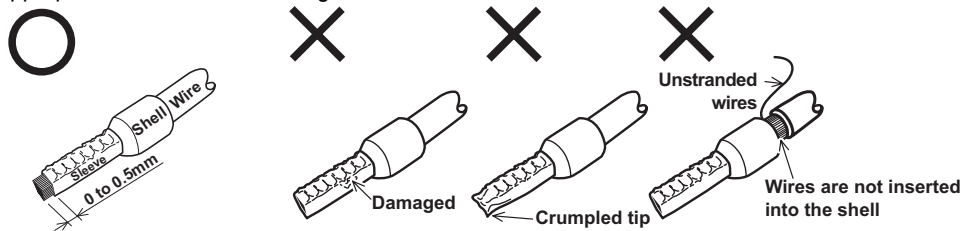
REMARKS

- Information on blade terminals
Commercially available product examples (as of March 2008)

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

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

Insert wires to a blade terminal, and check that the wires come out for about 0 to 0.5 mm from a sleeve.
Check the condition of the blade terminal after crimping. Do not use a blade terminal of which the crimping is inappropriate, or the face is damaged.



- Loosen the terminal screw and insert the cable into the terminal.

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

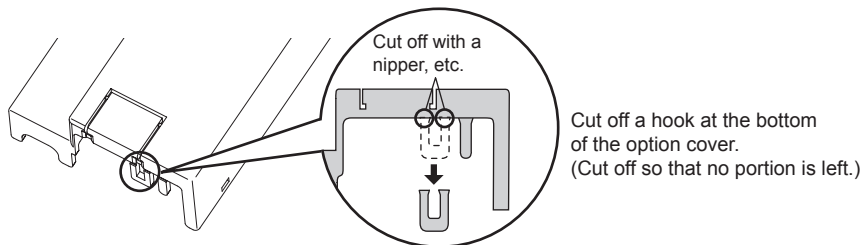
CAUTION

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



3.3.2 Wiring of inverter

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



REMARKS

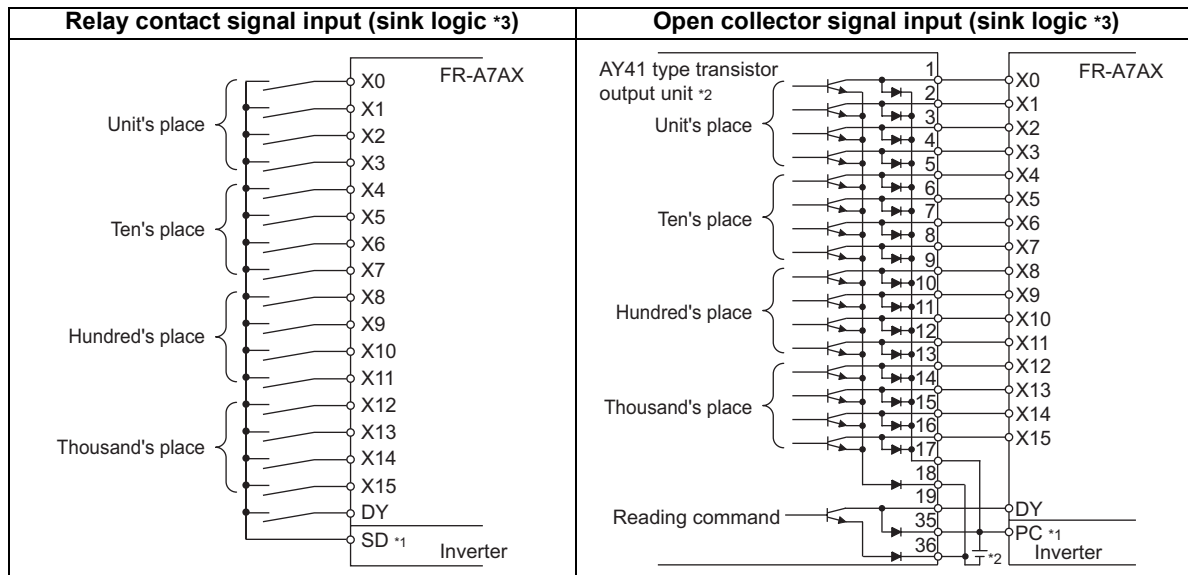
- When the option protective cover or option small cover is not fitted or wire is not passed through even if the hook of the front cover of the plug-in option has been cut off, the protective structure (JEM1030) changes to open type (IP00).

⚠ CAUTION

- ⚠ When wiring, take care not to subject the cable to stress.
- ⚠ After wiring, wire offcuts must not be left in the inverter. They may cause a fault, failure or malfunction.

4 CONNECTION DIAGRAM AND TERMINAL

4.1 Connection Diagram



*1 Use terminal SD or PC on the inverter.

*2 AY41 type unit requires 24VDC power.

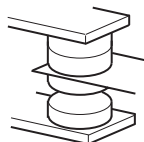
Example of connection with the output module (AY41 type) of Mitsubishi programmable controller. Refer to the output module manual for details of the output module.

*3 The control logic is the same as that of the inverter.

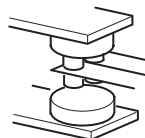
When the logic of the inverter is changed, the option logic also changes. For details of changing the control logic, refer to the inverter manual.

REMARKS

- As the input signals are at low level, use two parallel micro signal contacts or a twin contact for relay contact inputs to prevent a contact fault.



Micro signal contacts

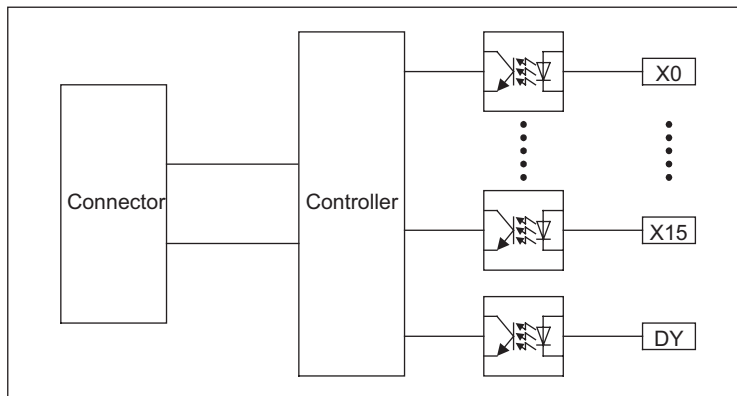


Twin contacts

- A transistor of the following specifications should be selected for the open collector signal:
Electrical characteristics of the transistor used
 - $I_c \geq 10\text{mA}$
 - Leakage current: $100\mu\text{A}$ maximum
 - $V_{CE} \geq 30\text{V}$
 - If $I_c \geq 10\text{mA}$, $V_{CE(\text{sat})}$ voltage is 3V maximum

4.2 Internal Block Diagram

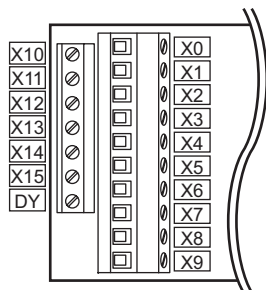
The following is the internal block diagram of the FR-A7AX.





4.3 Terminals

● FR-A7AX



Terminal Location	Terminal Symbol	Description
Plug-in option	X0 to X15	Digital signal input terminal (frequency setting signal terminal) Input the digital signal at the relay contact or open collector terminal. (Refer to page 20.) For the digital signal input, you can choose either the BCD code input or binary input. BCD code input..... 3-digit (999 maximum) or 4-digit (9999 maximum) Binary input..... binary 12-bit (X0 to X11, FFFH maximum) or binary 16-bit (X0 to X15, FFFFH maximum)
	DY	Data read timing input signal Use when a digital signal read timing signal is necessary. When Pr. 305 Read timing operation selection = "1", data is read only during the DY signal is on. In addition, the X0 to X15 data before signal-off is retained by switching the DY signal off. (Refer to page 29.)
Inverter	SD	Common terminal (sink) Common terminal for digital and data read timing signals. Use terminal SD of the inverter.
	PC	External transistor common terminal (sink), common terminal (source) When connecting the transistor output (open collector output) of a programmable controller, etc., connect the external power common (+) to this terminal to prevent a fault occurring due to leakage current. When you have selected the source logic, this terminal is used as a common terminal. Use terminal PC of the inverter.

4.4 Code Input Example

The following explains examples of terminal status and input value at BCD code input and binary input.

Example: when the input value is 6325

BCD Code Input			
Digit	Terminal name	Terminal input status	Input value
1	X0	ON	5
	X1	OFF	
	X2	ON	
	X3	OFF	
10	X4	OFF	2
	X5	ON	
	X6	OFF	
	X7	OFF	
100	X8	ON	3
	X9	ON	
	X10	OFF	
	X11	OFF	
1000	X12	OFF	6
	X13	ON	
	X14	ON	
	X15	OFF	

Example: when the input value is AB65_H

Binary Input			
Terminal name	Terminal input status	Input value (hexadecimal)	Input value (decimal)
X0	ON	5	43877
X1	OFF		
X2	ON		
X3	OFF		
X4	OFF	6	
X5	ON		
X6	ON		
X7	OFF		
X8	ON	B	
X9	ON		
X10	OFF		
X11	ON		
X12	OFF	A	
X13	ON		
X14	OFF		
X15	ON		

CAUTION

- For the BCD code input, the input value of each digit is from 0 to 9. When the value greater than 9 is input, it is made invalid and the last value is retained.

5 PARAMETERS

5.1 Parameter List

The following parameters are used for the plug-in option (FR-A7AX).

The FR-A7AX does not function with the factory setting. When a value other than "9999" is set in *Pr. 304*, digital input is enabled.

Set the following parameters according to applications.

Parameter Number	Name	Setting Range	Minimum Setting Increments	Initial Value	Refer to page
300 *1	BCD input bias	0 to 400Hz	0.01Hz	0Hz	31
301 *1	BCD input gain	0 to 400Hz, 9999	0.01Hz	60Hz (50Hz) *3	31
302 *1	BIN input bias	0 to 400Hz	0.01Hz	0Hz	31
303 *1	BIN input gain	0 to 400Hz, 9999	0.01Hz	60Hz (50Hz) *3	31
304 *1	Digital input and analog input compensation enable/disable selection	0 to 4, 10 to 14, 9999 *2	1	9999	27, 28, 35
305 *1	Read timing operation selection	0, 1, 10	1	0	29
329 *1, 4	Digital input unit selection	0, 1, 2, 3	1	1	34
447 *5	Digital torque command bias	0 to 400%	1%	0	35
448 *5	Digital torque command gain	0 to 400%, 9999	1%	150%	35
804 *5	Torque command source selection	0, 1, 3 to 6	1	0	35

7 PARAMETERS

- *1 Parameters which can be displayed when the plug-in option (FR-A7AX) is mounted.
- *2 The setting range of *Pr. 304* differs according to the inverter used.
 - FR-A700/F700 series*Refer to page 27*
 - FR-E700 series.....*Refer to page 28*
- *3 The initial value of the EC version is 50Hz.
- *4 For *Pr. 329*, write is disabled during operation even when "2" is set in *Pr. 77*. When changing the parameter setting, stop the operation. Also parameter clear is made invalid.
- *5 These parameters can be set for the FR-A700 series only.

REMARKS

- Binary input The input data is taken in hexadecimal
BCD code input The input data is taken in decimal



5.2 Parameter Setting

5.2.1 Selection of input method (Pr. 304) (FR-A700/F700 SERIES)

Parameter Number	Name	Setting Range	Initial Value
304	Digital input and analog input compensation enable/disable selection	0 to 4, 10 to 14, 9999	9999

Pr. 304 Setting	BCD Code Input	Binary Input	Availability of Analog Input Compensation *1 (○: enabled, ×: disabled)
0	3-digit	—	×
1	—	12-bit	×
2	3-digit	—	○
3	—	12-bit	○
4 *2	—	12-bit Torque command value input	—
10	4-digit	—	×
11	—	16-bit	×
12	4-digit	—	○
13	—	16-bit	○
14 *2	—	16-bit Torque command value input	—
9999 (initial value)	No function		

*1 Use terminal 1 for analog input compensation. Refer to the inverter instruction manual for details of terminal 1.

*2 These parameters can be set for the FR-A700 series only. Refer to *page 35* for details of torque command value input.

REMARKS

- Signal X12 to X15 become invalid when 0 to 4 are set in *Pr. 304*.
- Refer to *page 24* for BCD code/ binary input example.

5.2.2 Selection of input method (Pr. 304) (FR-E700 series)

Parameter Number	Name	Setting Range	Initial Value
304	Digital input and analog input compensation enable/disable selection *	0, 1, 10, 11, 9999	9999

Pr. 304 Setting	BCD Code Input	Binary Input
0	3-digit	—
1	—	12-bit
10	4-digit	—
11	—	16-bit
9999 (initial value)	No function	

* For the FR-E700 series, analog input compensation can not be performed.

REMARKS

- Signal X12 to X15 become invalid when "0, 1" are set in Pr. 304.
- Refer to *page 24* for BCD code/ binary input example.

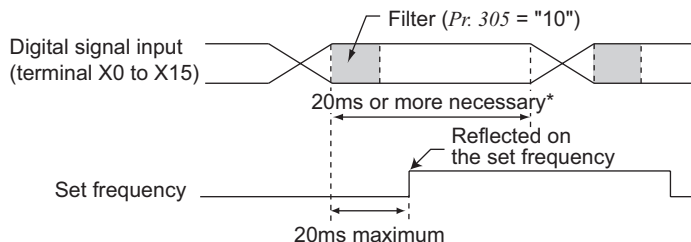


5.2.3 Read timing operation selection (Pr. 305)

Parameter Number	Name	Setting Range	Initial Value
305	Read timing operation selection	0, 1, 10	0

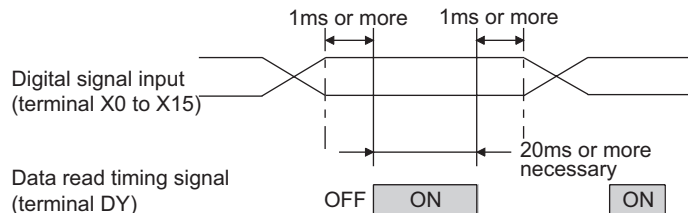
Pr. 305 Setting	Filter	Description
0 (initial value)	Without	The set frequency data entered from the digital signal input terminals (X0 to X15) is always imported independently of whether the DY signal is on or off.
1	Without	The set frequency data entered from the digital signal input terminals (X0 to X15) is imported only when the DY signal is on. The set frequency data is not imported when the DY signal is off. Therefore, even if the input status of the X0-X15 signal changes, the set frequency data before off of the DY signal is valid.
10	With	The set frequency data entered from the digital signal input terminals (X0 to X15) is always imported independently of whether the DY signal is on or off. The time lag when digital signals change can be compensated with a filter.

(1) When "0 or 10" is set in Pr. 305



* Hold the digital signal input (X0 to X15) status for 20ms or more. Changing the signal within 20ms may not reflect it on the set frequency.

(2) How to use the DY signal (when "1" is set in *Pr. 305*)

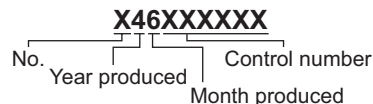


REMARKS

- When *Pr. 305* = "1", each terminal from X0 to X15 is all recognized as off when the inverter is turned on in terminal DY off status.
For example, when bias is set to 20Hz, turning the power supply on in the DY signal off status and then turning on the start signal will make the frequency command valid, starting the inverter to operate at 20Hz.

(3) SERIAL number check

The setting of "10" for *Pr. 305* can be used for the FR-A700/E700 series and FR-F700 series produced in June 2004 or later. Check the SERIAL number indicated on the inverter rating plate or package. Refer to the inverter manual for the location of the rating plate.



The SERIAL is made up of 1 version symbol, 2 numeric characters or 1 alphabet letter and 2 numeric characters indicating year and month, and 6 numeric characters indicating control number.
Month is indicated as 1 to 9, X (October), Y (November), and Z (December).



5.2.4 Bias and gain adjustment (Pr. 300, Pr. 301, Pr. 302, Pr. 303)

Parameter Number	Name	Setting Range	Initial Value
300	BCD input bias	0 to 400Hz	0Hz
301	BCD input gain	0 to 400Hz, 9999	60Hz (50Hz) *
302	BIN input bias	0 to 400Hz	0Hz
303	BIN input gain	0 to 400Hz, 9999	60Hz (50Hz) *

* The initial value of the EC version is 50Hz.

(1) Bias adjustment

Bias adjustments can be made for the digital input signal.

Set the set frequency at the digital input of 0.

- BCD code input.....Set using *Pr. 300*.
- Binary input.....Set using *Pr. 302*.

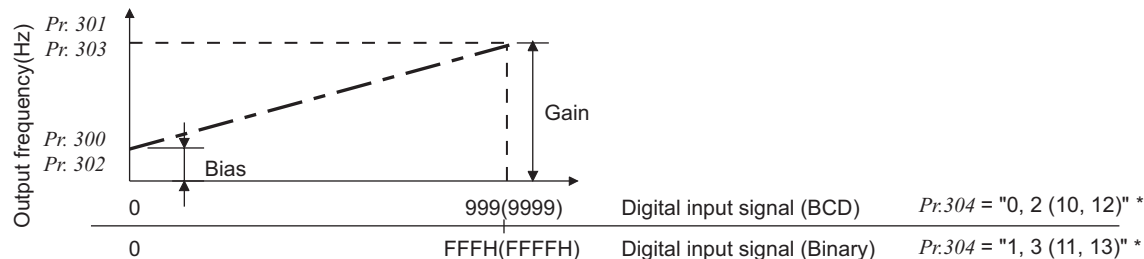
(2) Gain adjustment

The gain may be set in either of the following two ways:

How to set the output frequency when the digital input signal is "999 or 9999" (BCD code input), and "FFF_H or FFFF_H" (binary input).

- BCD code input .. Set using *Pr. 301*.
- Binary input Set using *Pr. 303*.

The output frequency is factory-set to 60Hz (EC version : 50Hz).



* For the FR-A700/F700 series only, "2, 3, 12, 13" can be set.

CAUTION

- The maximum output frequency for operation with the digital input signal is the "gain" value set in *Pr. 301* and *Pr. 303*.

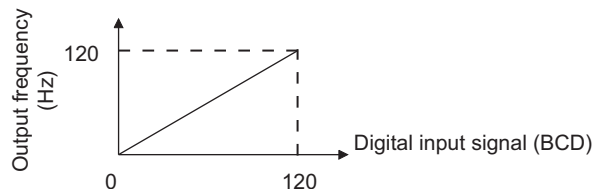
To set the maximum output frequency at 60Hz (EC version : 50Hz) or more, change "gain" with the operation panel.



How to set the BCD code or binary value as the output frequency setting

When "9999" is set in *Pr. 301* (BCD code input) or *Pr. 303* (binary input), the digital input value is set as the output frequency.

(For example, to set the output frequency to 120Hz when the BCD code input is "120")



REMARKS

- When this setting method is used, "bias" setting (*Pr. 300* or *Pr. 302*) cannot be made.

5.2.5 Digital input unit selection (Pr. 329)

Parameter Number	Name	Setting Range	Initial Value
329	Digital input unit selection *1	0, 1, 2, 3	1

When "9999" is set in *Pr. 301* or *Pr. 303*, the increments when the digital signal is set as output frequency can be set. (Refer to page 33)

Frequency = digital input signal value × *Pr. 329* input increments

<i>Pr. 329</i> Setting	Input Value Increments	Available Frequencies *			
		12-bit		16-bit	
		BCD code	Binary	BCD code	Binary
0	10	0 to 9990Hz	0 to 40950Hz	0 to 99990Hz	0 to 655350Hz
1 (factory setting)	1	0 to 999Hz	0 to 4095Hz	0 to 9999Hz	0 to 65535Hz
2	0.1	0 to 99.9Hz	0 to 409.5Hz	0 to 999.9Hz	0 to 6553.5Hz
3	0.01	0 to 9.99Hz	0 to 40.95Hz	0 to 99.99Hz	0 to 655.35Hz

* These are not the inverter maximum output frequencies.

REMARKS

- When the values other than "9999" are set in *Pr. 301* or *Pr. 303*, *Pr. 329* is made invalid.

<Example>

<i>Pr. 329</i> = 0	BCD code = 111	→	1110Hz
	Binary = 100H (256 in decimal)	→	2560Hz
<i>Pr. 329</i> = 1	BCD code = 111	→	111Hz
	Binary = 100H (256 in decimal)	→	256Hz
<i>Pr. 329</i> = 2	BCD code = 111	→	11.1Hz
	Binary = 100H (256 in decimal)	→	25.6Hz
<i>Pr. 329</i> = 3	BCD code = 111	→	1.11Hz
	Binary = 100H (256 in decimal)	→	2.56Hz



5.2.6 16-bit digital torque command (FR-A700 series only)

Parameter	Name	Setting Range	Initial Value
304	Digital input and analog input compensation enable/disable selection	0 to 4, 10 to 14, 9999	9999
447	Digital torque command bias	0 to 400%	0
448	Digital torque command gain	0 to 400%, 9999	150%
804	Torque command source selection	0, 1, 3 to 6	0

Digital torque command can be given under torque control using the FR-A7AX.

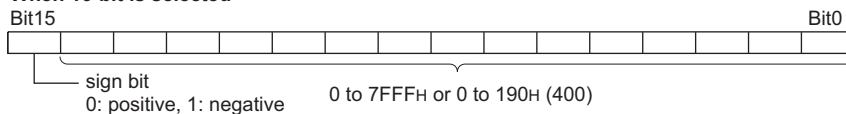
A digital command using the FR-A7AX can be given when "4 (12-bit)" or "14 (16-bit)" is set in *Pr. 304* and "4" is set in *Pr. 804 Torque command source selection*.

Pr.804 parameter setting	Description	Remarks
0	Torque command by terminal 1 analog input	Refer to the inverter manual for details.
1	Torque command by parameter setting Setting value of <i>Pr.805</i> or <i>Pr.806</i> (-400% to 400%)	
3	Torque command by CC-Link communication (FR-A7NC)	Refer to the instruction manual of the FR-A7NC for details.
4	12-bit digital input (FR-A7AX)	When "4" is set in <i>Pr. 304</i>
	16-bit digital input (FR-A7AX)	When "14" is set in <i>Pr. 304</i>
5	Refer to the inverter manual for details.	Refer to the instruction manual of the FR-A7NC for details.
6	Torque command by CC-Link communication (FR-A7NC)	

7 PARAMETERS

The input signal uses the last 15 (11) bits as torque command and the most significant bit as sign.

When 16-bit is selected



REMARKS

- The digital torque command is input only by binary input.



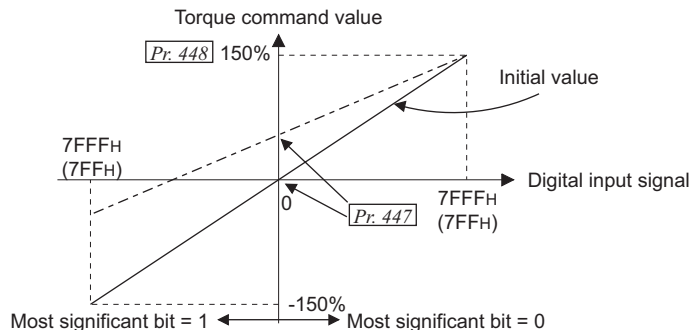
● Input method of torque command

Torque command may be input in either of the following two ways:

(1) How to set the torque command value when the input signal is 0 and 7FFF_H (7FF_H)

Set the torque command value when the input signal is "0" in *Pr. 447* and the torque command value when the input signal is "7FFF_H (7FF_H)" in *Pr. 448*.

The figure on the right shows the case when the torque command value is set using input signal 7FFF_H (7FF_H) when the torque command value is 150% (initial value at *Pr. 448*). When the most significant bit of input signal is positive, a negative torque command value (-150%) is set also at the same time.

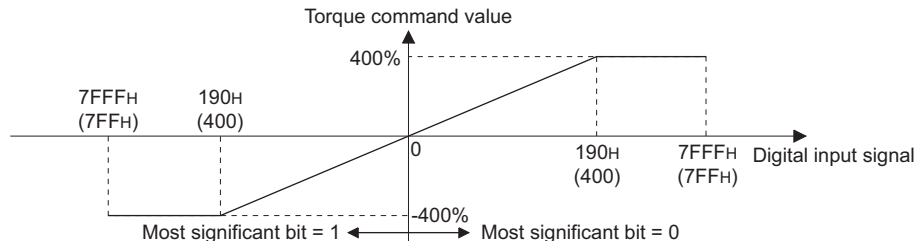


(2) How to set the digital input value as the torque command value

When "9999" is set in *Pr: 448*, the input signal is considered as a torque command value.

For example, the torque command value when the input signal is 190H (400) is 400% as shown below.

Even if a value higher than 190H (400) is input, the torque command value is clamped at 400%.





5.3 Instructions

- (1) Acceleration/deceleration time
When the frequency is set with the digital input signal, the acceleration/deceleration time is the period of time required to reach the *Acceleration/deceleration reference frequency* set in *Pr. 20*. This is the same as when using the analog signal input.
- (2) There are the following restrictions on the digital input signal:
When the signal is used to enter a BCD code, 0AH to 0FH entries are ignored during operation and the previous inputs are used to continue operation.
If binary input is changed to BCD code input with 0AH to 0FH input, the set frequency becomes 0Hz.
- (3) If 0 to 5V (0 to 10V) is input at the inverter terminal 1 from the external potentiometer with the FR-A7AX fitted in the FR-A700/F700 series, the inverter operates at the frequency obtained by adding the FR-A7AX BCD code input and the compensation input from terminal 1 only when "2, 3, 12 or 13" is set in *Pr. 304*.
When switching the inputs e.g. between volume input to perform manual operation and BCD code input to perform automatic operation, set the BCD code input to "0" under manual operation.
- (4) The priorities of the frequency setting are as follows.
JOG> Stop-on contact (RT, RL) > Multi-speed operation (RH, RM, RL) > PID (X14) > AU (terminal 4)
> Pulse train input > Digital command by the FR-A7AX > terminal 2*
* When digital input is valid, terminal 2 is invalid.

REVISIONS

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

Print Date	*Manual Number	Revision
May 2004	IB(NA)-0600164ENG-A	First edition
Sep. 2005	IB(NA)-0600164ENG-B	Additions Compatible with the FR-A700 series
Dec. 2007	IB(NA)-0600164ENG-C	Additions Compatible with the FR-E700 series
Oct. 2009	IB(NA)-0600164ENG-D	• Partial changes