Instruction Manual

DB Unit

Dynamic Braking Unit

200V Series
37kW /BU37-2C
to 90kW /BU90-2C
400V Series
37kW /BU37-4C
to 220kW /BU220-4C

⚠ CAUTION

- Ensure that this instruction manual is made available to the final user of the DB unit.
- Read and understand all operating instructions before installing, connecting (wiring), operating, maintaining or inspecting the DB unit.
- Keep this manual up to disposing the DB unit carefully.
- The product is subject to change without notice.

Fuji Electric FA Components & Systems Co., Ltd.

INR-HF51196c-E

Preface

Thank you for purchasing our dynamic braking unit (DB unit). This product is a device to discharge the braking power to a resistor in a braking operation of the Fuji's inverter for general industry. The applicable inverter models should be referred to Table A.

Read this manual carefully before using, understand the treatment method and use the DB unit correctly. Incorrect use may result in obstruction of normal operation, shortening of the life or cause of failure. Keep this manual carefully even after using.

As this manual does not cover the use of inverter, refer to relevant manuals for the inverter to be used.

Table A Applicable inverter models

Series	Model	
200V	General-purpose inverter	FRENIC5000 G5/P5,G7/P7,G9S/P9S,G11S/P11S series FRENIC-Eco series
	Vector inverter	FRENIC5000 VG3,VG5,VG7S series
400V	General-purpose inverter	FRENIC5000 G9S/P9S,G11S/P11S series FRENIC-Eco series
	Vector inverter	FRENIC5000 VG5,VG7S series

As following the old model is applicable to DB unit by special tuning before shipment, please contact your local distributor or nearest Fuji Electric's sales office.

Series	Model	
200V	Vector inverter	FRENIC5000 VG series
400V	General-purpose inverter	FRENIC5000 G5/P5, G7/P7 series
	Vector inverter	FRENIC5000 VG,VG3 series

Safety instructions

Read this manual carefully before installing, connecting (wiring), operating, maintaining, or inspecting the DB unit and use it correctly.

Familiarize yourself with all knowledge of the device, safety information and instructions before using.

In this manual, safety messages are classified as follows.

⚠ **WARNING**	Denotes operating procedures and practices that may result in personal injury or loss of life if not correctly followed.
⚠ **CAUTION**	Denotes operating procedures and practices that may result in slight to medium personal injury or property damage if not correctly followed.

Situation more serious than those covered by CAUTION will depend on prevailing circumstances.

Always follow the instructions as important contents are described in these.

Instruction on use

⚠ WARNING

- This DB unit is designed to discharge the braking power to a resistor in a braking operation of the Fuji's inverter for general industry. It cannot be used for others.
  Fire may result.
- This DB unit may not be used (as is) as a component of a life-support system or other medical device directly affecting the personal welfare of the user.
- This product is manufactured under strict quality control standards. However, safety equipment must be installed if the failure of this device may result in heavy accident and/or property damage.
  There is a risk of accident.

Instruction on installation

⚠ WARNING

- Mount this DB unit on an material such as metal.
  Fire may result.
- Do not place combustible or flammable material near this DB unit。
  Fire may result.
- Contain the DB unit into a panel etc. so as not to be able to touch it easily.
  Electric shock or accident may result.
- Ensure that the specified bolts are used when installing the DB unit.
  There is a risk of accident or injury.

⚠ CAUTION

- Do not hold the front cover when carrying the DB unit.
  Injury by dropping may result.
- Ensure that the DB unit and cooling fins are kept free if foreign matters such as lint, paper, small chips of wood or metal, or dust.
  Fire or accident may result.
- Do not install or operate a damaged DB unit or a DB unit missing parts.
  Injury may result.

Instruction on wiring

⚠ WARNING

- Use wires of the specified size for wiring.
  Fire may result.
- Do not connect the DC terminals (P(+) and N(-)) to the connection terminals on the inverter side in mistake for the polarity（+ and –）.
  Fire may result.
- Ensure that the grounding wire is connected.
  Electric shock or fire may result.
- A licensed specialist must perform the wiring works.
  Electric shock may result.
- Turn off the power before starting the wiring work.
  Electric shock may result.
- Wire after the installation of the DB unit is complete.
  Electric shock or fire may result.

⚠ CAUTION

- Check that the rated voltage of the product complies with that of the inverter.
  Injury may result.
- Do not directly connect DC terminals (P(+) and N(-)) to the braking resistor.
  Fire may result.
- The DB unit and wiring generate noise. Take care the malfunction of the sensors and devices in surroundings.
  Accident may occur.

Instruction on operation

⚠ WARNING

- Ensure that the power is turned on (close) after attaching the front cover. In energized status, do not remove the cover.
  Electric shock may result.
- Do not touch the terminals of the DB unit in energized state of the inverter even if the inverter has stopped.
  Electric shock may result.

⚠ CAUTION

- Do not start and stop the inverter by turning on/off the main circuit power supply.
  Failure may result.
- Do not touch the cooling fins and braking resistor since they become very hot.
  Burns may result.
- The braking with this DB unit cannot function as mechanical holding.
  Injury may result.

Instruction on maintenance, inspection, and parts replacement

⚠ WARNING

- Wait a minimum ten minutes after the power has been turned off (open) before starting inspection.
  Further, check that the charge lamp is turned off and that the DC voltage between the terminals P(+) and N(-) do not exceed 25V.
  Electric shock may result.
- Only authorized personnel should perform maintenance, inspection, and replacement operations.
  Take off metal jewelry such as watches and rings.
  Use insulated tools.
  Electric shock or injury may result.

Instruction on disposal

⚠ CAUTION

- Treat the DB unit as industrial waste when disposing it.
  Injury may result.

Other instructions

⚠ WARNING

- Never modify the product.
  Electric shock or injury may result.

Conformity to Low Voltage Directive in Europe

⚠ CAUTION

- Ensure that the DB unit is grounded.
- When wiring to the main circuit terminals and terminal for grounding of the inverter, use round terminals for the cable.
- Use a single cable to connect the grounding terminal ⏚ G of the DB unit. (Do not use two or more wires for the wiring.)
- Use the DB unit under overvoltage category III conditions and maintain Pollution degree 2 or better as specified in IEC 664. To maintain Pollution degree 2 or better, install the DB unit in a control panel (IP54 or higher level) having a structure free from water, oil, carbon, dust, etc.
- For the input-output wiring of the DB unit, use cable (wire diameter and type) as specified in Appendix C in EN 60204.
- To prevent electric shock at terminals or live parts, install the braking resistor as follows:
  1) Install inside an IP4X cabinet or a barrier if electrical parts are exposed.
  2) Install inside an IP2X cabinet or a barrier if electrical parts are not exposed.

GENERAL ATTENTION

Some illustrations in this manual are drawn in the status with removed cover or block for safety to describe in detail. When operating the product, ensure that the cover or block is returned to the original as the specification, and operate in accordance with the manual.

Compliance with UL/cUL standards [Applicable to products with UL/cUL mark]

1. General

UL(Underwriters Laboratories Inc.) standards is safety standards for prevention of fire and other accident, and protect user, maintenance man and people.

UL standards

cUL standards is fixed standards conform with CSA standards. The products approved by cUL is equivalent to approval of CSA.

2. Notice

When using DB unit according to UL／cUL standards, please refer to following notice.

CAUTION for UL/cUL requirements

⚠ CAUTION

- Hazard of electrical shock. Disconnect incoming power before working on this control.
- Dangerous voltage exists until charge lights is off.
- More than one live circuit.
- Use 60/75℃ or 90℃ copper wire only.
- A Class 2 circuit wired with class1 wire.
- Field wiring connection must be made by a UL Listed and CSA Certified closed-loop terminal connector sized for the wire gauge involved. connector must be fixed using the crimp tool specified by the connector manufacturer.
- For use with 3ph 200-220V/50Hz, 200-230V/60Hz Inverter Drives for models with suffix -2C.
- For use with 3ph 380-440V/50Hz, 380-480V/60Hz Inverter Drives for models with suffix -4C.

⚠ CAUTION

Tightening torque and wire range

1. 60℃/75℃ copper wire

Voltage	Applied Motor (kW)	DB Unit		Braking resistor			Required torque [lb-inch](N·m)			Wire range [AWG] (mm^2)	
		TYPE	Q'ty	TYPE	Resistance value(Ω)	Q'ty	Main terminal	Ground -ing	Control	Main terminal	Control
200V	30	BU37-2C	1	DB30-2C	4.0	1	31.0 (3.5)	31.0 (3.5)	6.2 (0.7)	10 (5.3)	24 (0.2)
	37		1	DB37-2C	3.0	1					
	45	BU55-2C	1	DB45-2C	2.5	1	119 (13.5)	119 (13.5)		8 (8.4)	
	55		1	DB55-2C	2.0	1					
	75	BU90-2C	1	DB75-2C	1.6	1				4 (21.2)	
	90		1	DB110-2C	1.2	1					
400V	30	BU37-4C	1	DB30-4C	15	1	15.9 (1.8)	31.0 (3.5)		14 (2.1)	
	37		1	DB37-4C	12	1					
	45	BU55-4C	1	DB45-4C	10	1	51.3 (5.8)			12 (3.3)	
	55		1	DB55-4C	7.5	1					
	75	BU90-4C	1	DB75-4C	6.5	1		51.3 (5.8)		10 (5.3)	
	90		1	DB110-4C	4.7	1					
	110	BU132-4C	1			1	119 (13.5)	119 (13.5)		6 (13.3)	
	132		1	DB132-4C	3.9	1					
	160	BU220-4C	1	DB160-4C	3.2	1	239 (27)	239 (27)		3 (26.7)	
	200		1	DB200-4C	2.6	1					
	220		1	DB220-4C	2.2	1					

2. 90℃ copper wire

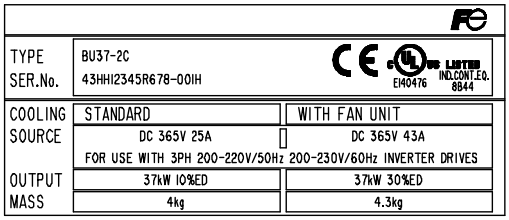
Voltage	Applied Motor (kW)	DB Unit		Braking resistor			Required torque [lb-inch](N·m)			Wire range [AWG] (mm^2)	
		TYPE	Q'ty	TYPE	Resistance value(Ω)	Q'ty	Main terminal	Ground -ing	Control	Main terminal	Control
200V	30	BU37-2C	1	DB30-2C	4.0	1	31.0 (3.5)	31.0 (3.5)	6.2 (0.7)	14 (2.1)	24 (0.2)
	37		1	DB37-2C	3.0	1					
	45	BU55-2C	1	DB45-2C	2.5	1	119 (13.5)	119 (13.5)		10 (5.3)	
	55		1	DB55-2C	2.0	1					
	75	BU90-2C	1	DB75-2C	1.6	1				6 (13.3)	
	90		1	DB110-2C	1.2	1					
400V	30	BU37-4C	1	DB30-4C	15	1	15.9 (1.8)	31.0 (3.5)		14 (2.1)	
	37		1	DB37-4C	12	1					
	45	BU55-4C	1	DB45-4C	10	1	51.3 (5.8)				
	55		1	DB55-4C	7.5	1					
	75	BU90-4C	1	DB75-4C	6.5	1		51.3 (5.8)		12 (3.3)	
	90		1	DB110-4C	4.7	1					
	110	BU132-4C	1			1	119 (13.5)	119 (13.5)		8 (8.4)	
	132		1	DB132-4C	3.9	1					
	160	BU220-4C	1	DB160-4C	3.2	1	239 (27)	239 (27)		4 (21.2)	
	200		1	DB200-4C	2.6	1					
	220		1	DB220-4C	2.2	1					

Contents

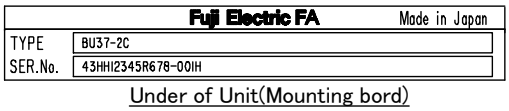
1 Before Using This Product

1-1 Inspection at receiving the unit

Unpack and inspect the unit for the following items.
If there are doubtable or complained items, contact the distributor where the unit was purchased or the Company's sales office nearby.



Front cover



Under of Unit(Mounting bord)

Fig. 1-1-1 Ratings nameplate

① Check for the unit to be the ordered product by inspecting the ratings nameplate.

TYPE : Type of the dynamic braking unit

BU 37 – 4 C

- C → Standard series: C
- 4 → AC power supply voltage series: 2→200V series、4→400V series
- 37 → Rated output of the applied motor for the inverter as standard: 37→37kW
- BU → Product type

COOLING: Cooling system
SOURCE : Power rating
OUTPUT : Output rating
MASS : Mass of the product
SER.No. : Serial number

4 3 HH12345R678-001H

- HH12345R678-001H → Production lot serial number:
- 3 → Production month: 1--9 →Jan. --Sep. X→Oct. Y→Nov. Z→Dec.
- 4 → Production year : Last digit of year 8→1998

② Inspect if shipping damage such as damage or fall-off of the parts and depression of the cover or body.
③ Braking resistor is not attached. Prepare a resistor conforming with the specification separately.

1-2 Appearance

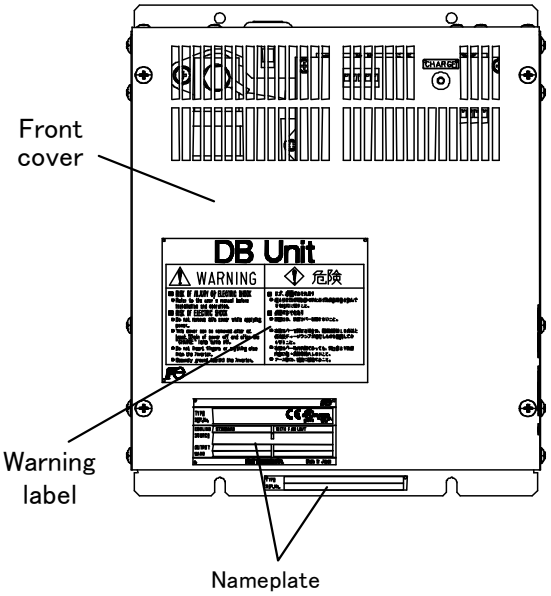


Fig. 1-2-1 Appearance

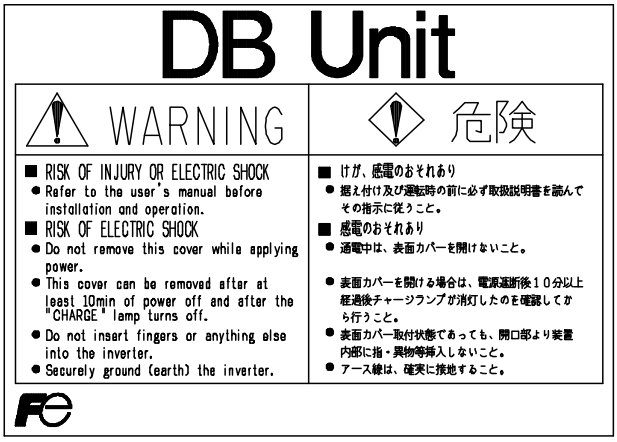


Fig. 1-2-2 Warning label

1-3 Handling of the product

(1) Removing the front cover

Loosen the mounting screws of front cover and remove the front cover by holding its upper part with hands as shown in Fig. 1-3-1.

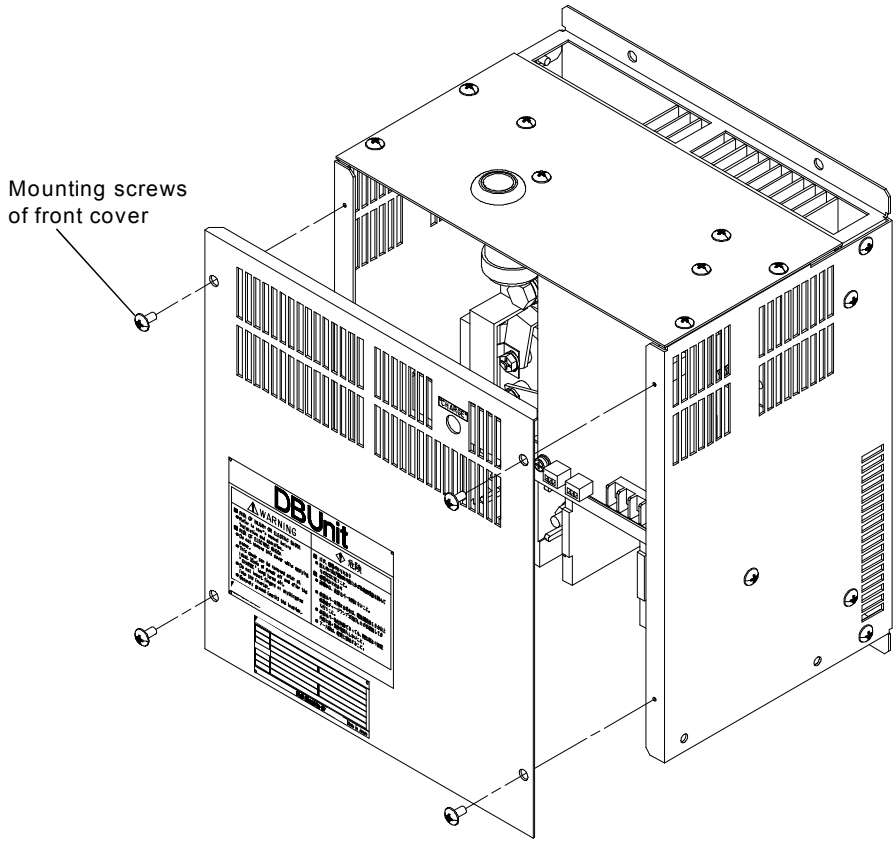


Fig. 1-3-1 Removing the front cover

1-4 Carrying

When carrying the product, hold only the main body of the product surely.
If holding the cover or parts, it may result in damage or fall-off.

1-5 Storage

Storage the products in the environment as shown in Table 1-5-1.

Table 1-5-1 Storage environment

Item	Specification	
Ambient. temperature	–10 to +50°C	The location without condensation or freezing by sharp temperature change
Storage temperature *1	–25 to +65°C	
Relative humidity	5 to 95% *2	
Atmosphere	Without dust, direct sunlight, corrosive gas, inflammable gas, oil mist, vapor, water drop and vibration Not including too much of salt	

∗1: The storage temperature means in a case of a short time such as transport.

∗2: Although the humidity conforms to the specified value, condensation or freezing occurs in a location of large temperature change. Avoid such location.

① Do not put the product directly on a floor.

② If the surrounding atmosphere is not good, store the product packed with a vinyl sheet etc.

③ If the humidity may affect the product, put a desiccant (such as silica gel) into the package as shown in .

2 Installation and Connection

2-1 Operating environment

Install the DB unit in the environment shown in Table 2-1-1.

Table 2-1-1 Operating environment

Item	Specifications
Location	Indoor
Ambient temperature	–10 to +50℃
Relative humidity	5 to 95% (no condensation)
Atmosphere	Without dust, direct sunlight, corrosive gas, oil mist and vapor, water drop Not including too much of salt Without condensation by sharp temperature change
Altitude	1,000m or less (When exceeding 1,000m, decrease the inverter output in accordance with Instruction Manual of the inverter.)
Vibration	3.0mm at 2 to 9Hz, 9.8m/s^2 at 10 to 20Hz, 4.9m/s^2 at 20 to 55Hz, 1.0m/s^2 at 55 to 200Hz

2-2 Installation Method

① Securly fasten the DB unit in an upright position on a solid structure such that the characters of the label is facing the front. Do not turn the DB unit
upside down or install in a horizontal position.

② As heat is generated during DB unit operation, the spaces shown in Fig. 2-2-1 are required to ensure sufficient cooling pass. As heat radiates upward, do not install the DB unit beneath a device sensitive to heat.

③ As the cooling fins may reach a temperature of 90℃ during DB unit operation, ensure that the material of the attaching face at back of the DB unit can withstand this temperature.

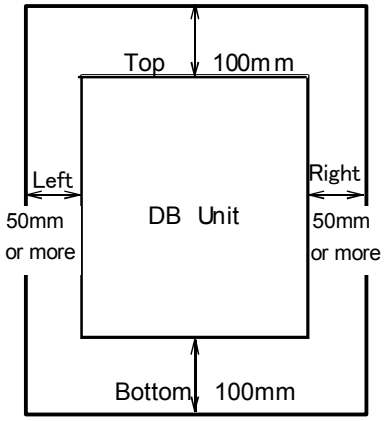


Fig. 2-2-1

▪ **WARNING**	Install the DB uint on nonflammable material such as metal. **Fire may result.**

④ When installing the DB unit in a control panel, consider sufficient ventilation to prevent ambient temperature of the DB unit from exceeding the specified value. Do not install in a small tightly closed box.

⑤ If installing two or more inverters or DB units in the same device or control panel, arrange them horizontally to minimize the effect of heat. If they must be installed vertically, place isolation plates between them to minimize the effect of heat.

▪ **CAUTION**	Ensure that the DB unit and cooling fins are kept free of foreign matter such as lint, paper dust, small chips of wood or metal, and dust. **Fire or accident may result.**

2-3 Connection

When removing the front cover, the terminal blocks appear (see Fig. 2-3-1). Connect the cables without mistake caring the following items.

2-3-1 Basic connection

① Connect the link circuit connection terminals (P(+), N(-)) of the DB unit to the link circuit connection terminals (P(+), N(-)) of the inverter. If mistaking the polarity or connecting to the other terminal, the DB unit may be damaged. Further, check the power supply voltage for conforming to the inverter specification.

② Ensure to ground the grounding terminal to prevent disasters such as electric shock and fire and to minimize noise.

③ Use a reliable crimp terminal for connection between a terminal and a cable.

④ After terminating the connection (wiring), check the followings:
   a. Check that the connection is correct.
   b. Check that all necessary connections have been made.
   c. Check that there is no short-circuit or ground fault between terminals and cables.

⑤ Connection modification after power-on
   The smoothing capacitor in the direct current portion of the main circuit cannot be discharged immediately after the power is turned off. To ensure safety, use a multimeter to check that the voltage of the direct current (DC) is lowered to the safety range (25V DC or less) after the charge lamp goes off. Also, check that the voltage is zero before short-circuiting. The residual voltage (electric charge) may causes sparks.

▪ **WARNING**	・Always connect a grounding wire. **Electric shock or fire may result.** ・Ensure that a licensed specialist performs all wiring works. ・Check that the power is turned off (open) before commencing wiring operations. **Electric shock may result.**

Front view of inside the unit

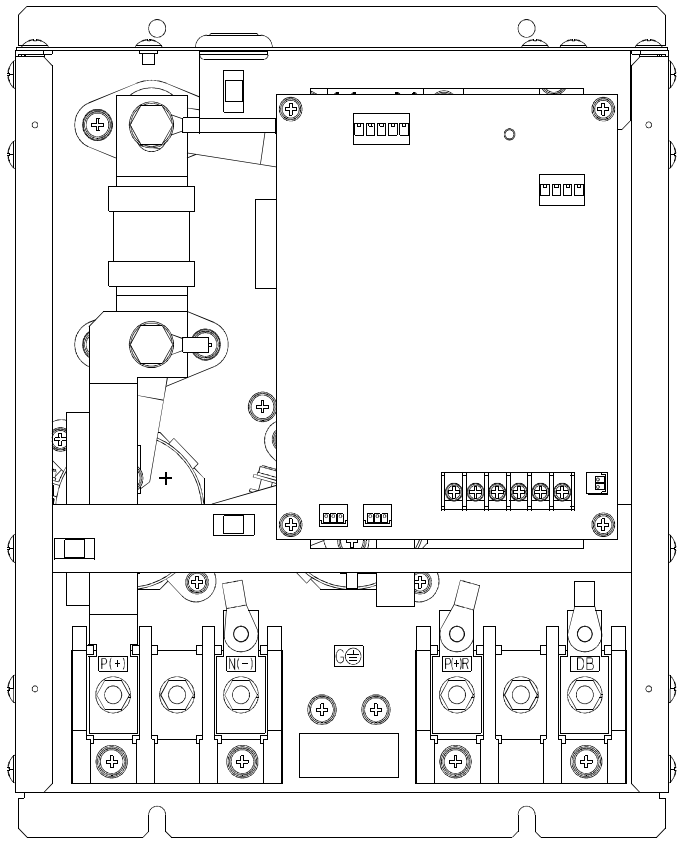


Fig. 2-3-1 Front view after removing the front cover

■ Basic connection diagram

1) In case of using one DB unit and one braking resistor

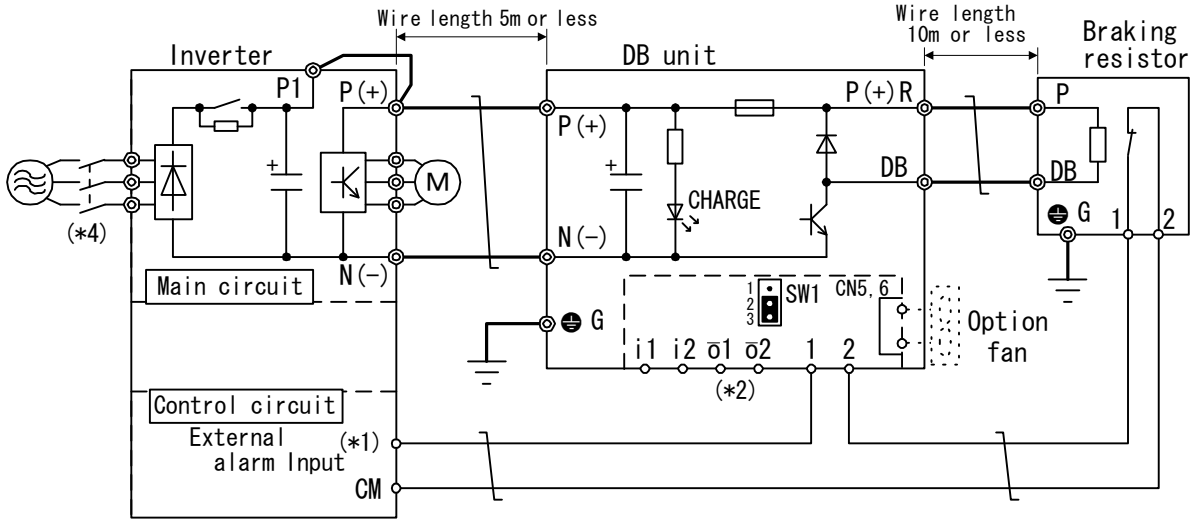
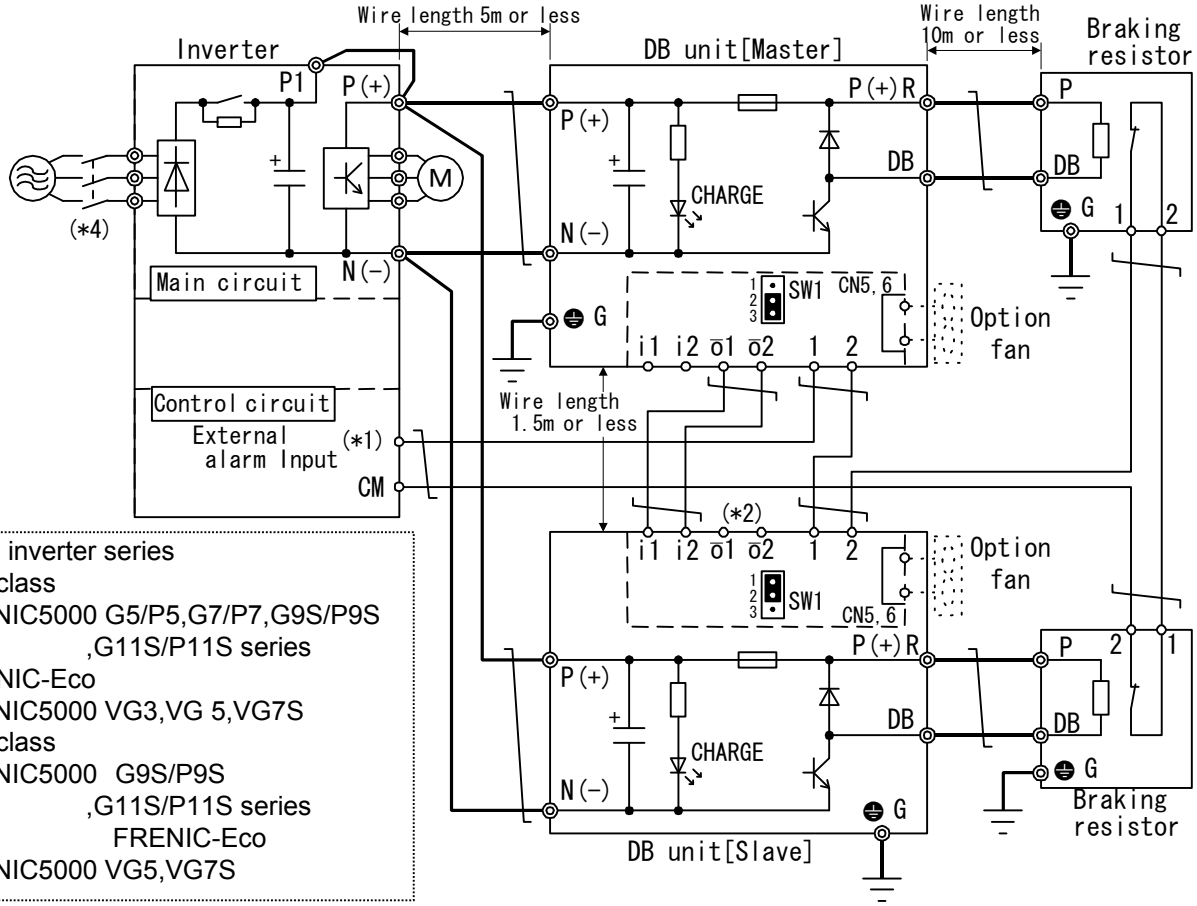


Fig. 2-3-2-1

2) In case of using two DB units and two braking resistors (∗3)



・Applied inverter series
200V class
FRENIC5000 G5/P5,G7/P7,G9S/P9S
,G11S/P11S series
FRENIC-Eco
FRENIC5000 VG3,VG 5,VG7S
400V class
FRENIC5000 G9S/P9S
,G11S/P11S series
FRENIC-Eco
FRENIC5000 VG5,VG7S

Fig. 2-3-2-2

(∗1) Among the inverters. assignment to the digital input terminals can be arbitrarily changed in some inverters. Select the external alarm input by function setting.
(∗2) Do not short-circuit the not using terminals of the control PCB in the DB unit.
(∗3) The parallel connection of the DB units is up to two units.
When necessary to connect 3 or more DB units, contact us separately.
(∗4) Connect a lump-sum alarm output of the DB unit and braking resistor to the external alarm input, and construct a sequence to open the electromagnetic contactor by the lump-sum alarm output of the inverter.

2-3-2 Connecting the main circuit and grounding terminals

Table 2-3-1Functions of the main circuit terminals and grounding terminal

Terminal marking	Name of terminal	Description
P(+), N(-)	DC link circuit terminals	Connecting to the DC link circuit voltage of the inverter
P(+)R, DB	Connection terminals for braking resistor	Connecting to the braking resistor
⏚ G	Terminal for grounding DB unit	Grounding terminal of the chassis (case) of the DB unit

(1) DC link circuit terminals (P(+) and N(-))

① Connect the DC link circuit terminals P(+) and N(-) of the inverter to the terminals P(+) and N(-) of the DB unit.

② Arrange the wire rout so that the wire length is less than 5m. Further, arrange the two wires to be twisted or closely contacted (parallel) wiring.

③ Do not connect to an AC power supply.

(2) Connection terminals for braking resistor (P(+)R and DB)

① Connect the terminals P and DB of the braking resistor to the terminals P(+)R and DB of the DB unit.

② Arrange the wire rout so as the wire length is less than 10m. Further, arrange the two wires to be twisted or closely contacted (parallel) wiring.

③ Do not connect to an AC power supply.

(3) Terminal for grounding DB unit (⏚ G)

Ensure that the terminal ⏚ G for grounding DB unit is grounded because of safety and countermeasure for noise. To prevent disasters such as electric shock and fire, the Electric Facility Technical Standard specifies on the grounding work for a metallic frame of electrical equipment.

Perform the connection as follows:

① In accordance with the Electric Facility Technical Standard, connect the terminal to a grounding pole made by type D grounding for 200V series and to a grounding pole made by type C grounding for 400V series.

② Use a suitable cable (thick and short) to connect the grounding terminal to the grounding pole specific for the inverter system.

Table 2-3-2

Voltage series	Sort of the grounding work	Grounding resistance
200V	Type D grounding	100Ω or less
400V	Type C grounding	10Ω or less

▪ **CAUTION**	・Do not connect an AC power supply to the DC link circuit terminals (P(+) and N(-)). **Damage may result.** ・Do not directly connect the braking resistor to the DC link circuit terminals (P(+) and N(-)). ・Check that the product specification complies with the inverter to be connected. ・When the DB unit is damaged, the braking resistor may abnormally heated. Make a sequence to interrupt the power supply on the inverter side by an alarm signal. **Fire may result.**

2-3-3 Connecting the control terminals

Function descriptions of the control terminals are shown in Table 2-3-3.

Table 2-3-3

Terminal marking	Name of terminal	Function description
i1, i2	DB driving signal input terminals	Connecting the DB drive signal wire of the unit on the slave unit (∗1) side when using the units in parallel
$\overline{o}$1, $\overline{o}$2	DB driving signal output terminals	Connecting the DB drive signal wire of the unit on the master unit (∗2) side when using the units in parallel
1, 2	DB unit lump-sum alarm output	Outputting the alarm for overheat and blown fuse of DB driving IGBT and braking resistor, and conduction abnormal of DB driving IGBT
CN5, CN6	Connectors for power supply of option fans	Connecting power supply of option fans when installing them

(∗1) The unit operating by receiving DB driving signal from the unit on the master side

(∗2) The unit operating by detecting DB operation level by itself from the link circuit voltage

(1) DB driving signal input terminals (i1 and i2)

DB driving signal output terminals ($\overline{o}$1 and $\overline{o}$2)

① These terminals connect between master and slave when using 2 DB units.

② To reduce the noise effect from outside, use twisted wires as short as possible (1.5m or less).

③ Change over the settings of master and slave in the DB units with SW1 on the PCB as shown in Fig. 2-3-3.

④ When using single DB unit, set the SW1 as shown in a).

⑤ Do not short-circuit not used terminals.

(2) DB unit lump-sum alarm output (1 and 2)

① Connect the terminals of the DB units and braking resistors in series in the order of 1⇨2⇨1⇨2 to the contact input terminals of the inverter which are assigned external alarm input to.
When used a short-circuit conductor on the contact input terminals to be connected on the inverter side, remove the short-circuit conductor.

(3) Connectors for power supply of option fans (CN5 and CN6)

① When using option fans, the power supply lines of the fans are connected to these terminals.

② Connectors CN5 and CN6 have a same function.

③ Do not short-circuit these connectors because of power supply connection.

(4) Others

① Perform the wiring of the control terminals separating from the wiring of the main circuit as far as possible. Otherwise, malfunction by noise may be caused.

② Fix the control wiring inside the unit so as not to directly contact with a live part of the main circuit (e. g. main circuit terminal block).

③ The parallel connection of the DB units is up to two units. When necessary to connect 3 or more DB units, contact us separately.

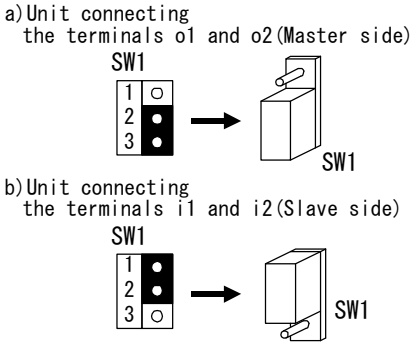


Fig. 2-3-3 Changeover of SW1

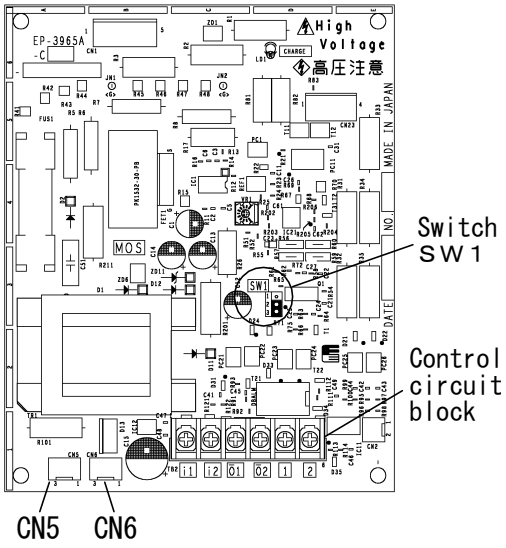


Fig 2-3-4 Control PCB

⚠ **WARNING**	• Since the insulation of control cable is generally not of reinforced insulation, high voltage may intrude into the control signal if insulation sheath is broken by any cause. **Electric shock may result.**
⚠ **CAUTION**	• A noise is generated from inverter, motor,wiring. etc. Take care on malfunction of sensors and devices in the surroundings. • Be sure not to move the setting of the variable resistor VR1 on the control PCB since it has been adjusted. **Accident may result.**

(5) Wiring of the control circuit

① Lead out the cable along the left side panel as shown in Fig. 2-3-5.

② Secure the cable to cable-tie holder on the left wall of the main circuit terminal block on the way of lead out using a cable-tie (e. g. insulock). The cable-tie must not exceed 3.5mm or less in width and 1.5 mm or less in thickness to pass through a rectangular hole (3.8×1.5).

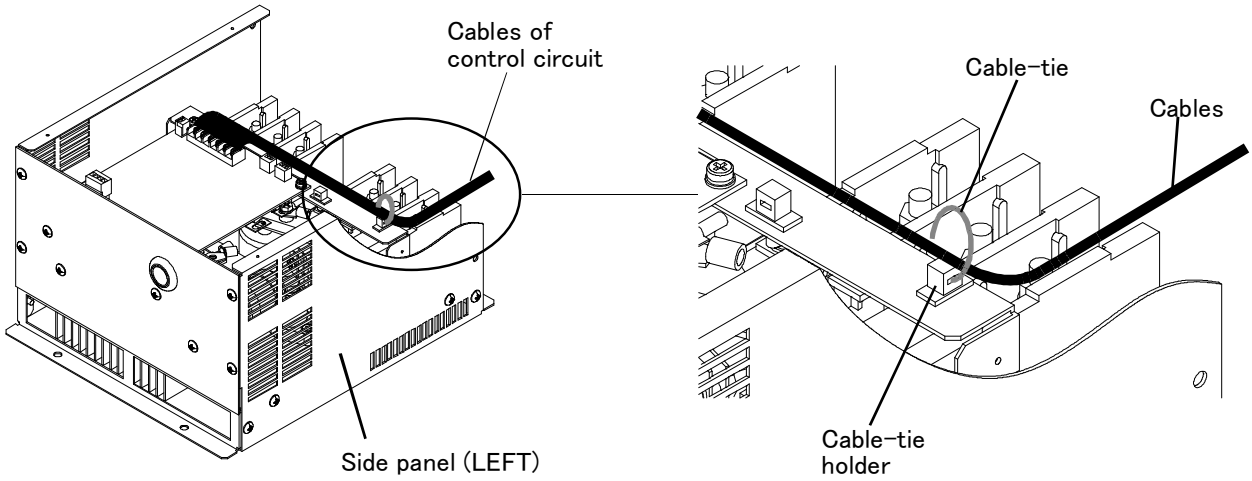
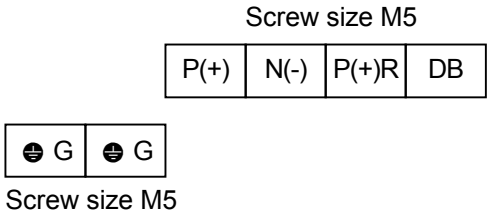


Fig. 2-3-5 Route of control circuit wiring

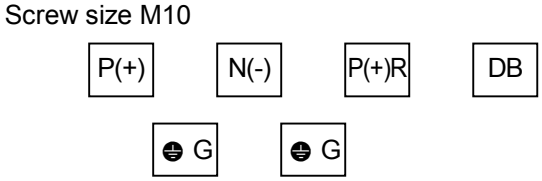
2-3-4 Terminal arrangement

(1) Main circuit terminals

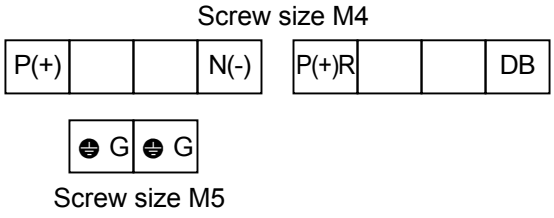
BU37-2C



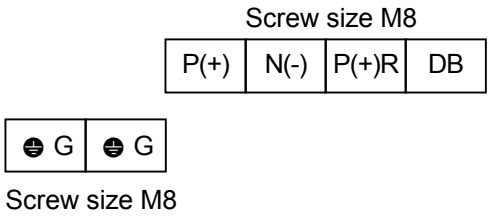
BU220-4C



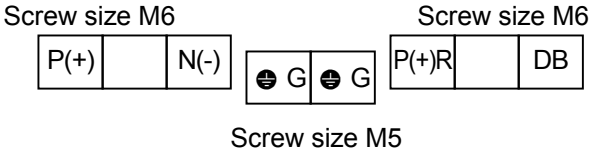
BU37-4C



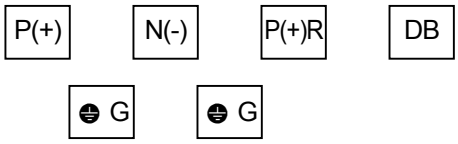
BU55-2C



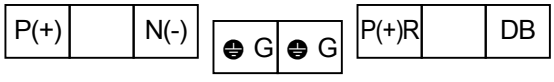
BU55-4C



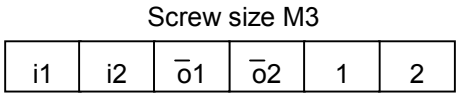
BU90-2C
BU-132-4C



BU90-4C



(2) Control terminals



2-3-5 Applicable devices and wire size as standard

Voltage	Applied motor (kW)	DB unit		Braking resistor			Tightening torque (N·m)			Recommended wire size (mm^2) ∗1)		
		Type	No.	Type	Resistance value (Ω)	No.	Main circuit	Grounding	Control	DB cct.(P(+), N(-),P(+)R,DB)	Ground. (⏚ G)	Control
200V	30	BU37-2C	1	DB30-2C	4.0	1	3.5		0.7	2		1.25
	37		1	DB37-2C	3.0	1				3.5		
	45	BU55-2C	1	DB45-2C	2.5	1	13.5					
	55		1	DB55-2C	2.0	1				5.5		
	75	BU90-2C	1	DB75-2C	1.6	1				8		
	90		1	DB110-2C	1.2	1				14		
400V	30	BU37-4C	1	DB30-4C	15	1	1.8	3.5	0.7	2		1.25
	37		1	DB37-4C	12	1						
	45	BU55-4C	1	DB45-4C	10	1	5.8					
	55		1	DB55-4C	7.5	1						
	75	BU90-4C	1	DB75-4C	6.5	1						
	90		1	DB110-4C	4.7	1				3.5		
	110	BU132-4C	1			1	13.5			5.5		
	132		1	DB132-4C	3.9	1						
	160	BU220-4C	1	DB160-4C	3.2	1	27			8		
	200		1	DB200-4C	2.6	1				14		
	220		1	DB220-4C ∗2)	2.2	1						

∗1) The type of using wire is 75°C 600V Grade heat-resistant polyvinyl chloride insulated wire (HIV).
The above-mentioned wire sizes are the recommended size under the condition of the ambient temperature 50°C or lower.

∗2) A DB220-4C set is constructed by 2 cabinets.
These 2 resistors are used connecting in parallel.

3 Operation

3-1 Inspection and preparation before operation

Inspect the following items before operation

① Check that the connection is correct.
In particular, check the following points:

a. Check that the AC power supply is not connected to any of DC link circuit terminals P(+) and N(-) or connection terminals for braking resistor P(+)R and DB.

b. Check that the DC link circuit voltage is not connected to the connection terminals for braking resistor P(+)R and DB.

c. Check that the grounding terminal is securely grounded.

② Check for short-circuits and ground faults between the terminals and live sections.

③ Check for loose terminals, connectors, or screws.

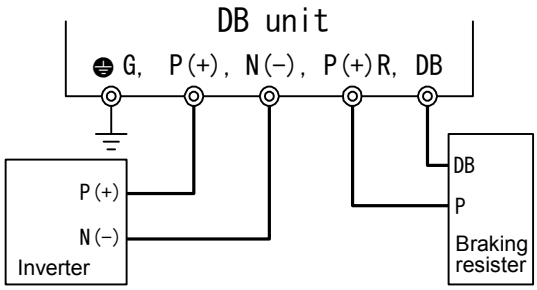


Fig. 3-1-1 DB unit connection diagram

Check the followings after power-on.

① Check that no external alarm message is displayed on the inverter.

② Check that the CHARGE lamp is turned off.

③ Check that the fans are rotating (when using option fans).

⚠ WARNING	• Be sure to put on the front cover before turning on the power (close). Never remove the cover while the power is applied to the inverter. **Electric shock may result.**

4 Protective Operation

4-1 Protective operations

In the event of abnormality as shown in Table 4-1, the DB unit stops DB driving signal and outputs a lump-sum alarm signal from the terminals 1 and 2 (The lump-sum alarm signal has no distinction of the abnormality contents.).
By this alarm signal, the protective function of the inverter will be immediately activated to trip the inverter and display the external alarm on the keypad panel, and the motor coasts-to-a stop.
Since the braking resistor may be overheated when the DB unit is out of order, construct a sequence to trip the power supply in the case of activation of the inverter protective function.

Table 4-1

Abnormality	Contents
Blown fuse	If the fuse in the main circuit of the DB unit is blown out following a short-circuit in the circuit or damage, the protective function is activated.
Overheating of the cooling fins	If the cooling fins overheat following frequent use of braking exceeding the specification, high ambient temperature or clog of the fins, the protective function is activated.
Conduction abnormal of IGBT(switching element)	If detecting conduction of IGBT (switching element) although stopping of the DB driving signal, the protective function is activated.
Overheating of the braking resistor	If the braking resistor overheats following high-frequent use of the braking resistor, the protective function is activated.

4-2 Alarm reset

If becoming the trip status, release the trip in accordance with the instruction of the inverter Instruction Manual after removing the cause of the trip.
When releasing the trip status, set the operation command to OFF. Take care, if the operation command is set to ON, the inverter starts operation after resetting.

⚠ **WARNING**	If the alarm reset is activated with the operation signal ON, the inverter will restart suddenly, which may be dangerous. To ensure safety, release the trip status after checking the operation signal OFF. **Accident may result.**

5 Maintenance and Inspection

Proceed with the daily inspection and periodic inspection to prevent malfunction and ensure long-term reliability. Note the followings in the inspection works.

5-1 Daily inspection

During operation of the inverter, a visual inspection for abnormality is performed externally without removing the covers.
The inspection usually covers the followings:

① The performance (satisfying the standard specification) is as expected.
② The environment satisfies the standard specification.
③ There are abnormal sounds, vibrations, or odors.
④ There are no indications of overheating or no discoloration.

5-2 Periodical inspection

Periodical inspection must be performed after stopping operations, turning off the power supply, and removing the front cover.
Note that after turning off the power supply, the smoothing capacitor in the DC section in the main circuit takes the time to discharge. To prevent electric shock, check that the voltage has dropped below the safety value (25V DC or below) using a multimeter after the charge lamp (CHARGE) goes off.

⚠ WARNING	• Start the inspection at least ten minutes after turning off the power supply. Further check that the charge lamp (CHARGE) goes off, and that the voltage is 25V DC or below between the terminals P(+) and N(-). **Electric shock may result.** • Only authorized personnel should perform maintenance and component replacement operation. Take off metal jewelry such as watches and rings. Use insulated tools. Never modify the product. **Electric shock or injury may result.**

Table 5-2-1 Periodical inspection list

Check part		Check items	How to inspect	Evaluation criteria
Environment		Check the ambient temperature, humidity, vibration, atmosphere (dust, gas, oil mist, water drops).	Conduct visual inspection and use the meter.	The specified standard value must be satisfied.
		Is the area surrounding the equipment is clear without left foreign body such as tool or dangerous body.	Visual inspection	The area is clear.
Voltage		Are the voltages in the main and control circuits normal?	Measure using the multimeter.	The specified standard value must be satisfied.
Structure such as a frame or cover		Is there abnormal sound or vibration?	Visual and aural inspection	Not abnormal
		Are nuts or bolts loose?	Tighten.	Not abnormal
		Is there deformation or damage? Is there discoloration as a result of overheating? Are there stains and dust?	Visual inspection	Not abnormal
Main circuit	Common	Are there loose or missing nuts or bolts?	Tighten.	Not abnormal
		Are there deformation, crack, damage, and discoloration due to overheating or deterioration in the equipment and insulation? Are there stains and dust?	Visual inspection	Not abnormal Note: Discoloration of the bus bar does not indicate a problem.
	Conductor and wire	Is there discoloration or distortion a conductor due to overheating? Are there cracks, crazing or discoloration of the cable sheath?	Visual inspection	Not abnormal
	Terminal block	Is there damage?	Visual inspection	Not abnormal
	Smoothing capacitor	Is there electrolyte leakage, discoloration, crazing or swelling of the case? Is the safety valve not protruding or are valves protruding too far?	Visual inspection	Not abnormal

(continued)

Main circuit	Resistor	Is there unusual odor or damage to the insulation by overheating?	Olfactory and visual inspection	Not abnormal
		Is there an open circuit?	Conduct a visual inspection or use a multimeter by removing the connection on one side.	Less than about ±10% of the indicated resistance value
Control circuit	Control PCB and connector	Are there any loose screws or connectors? Is there unusual odor or discoloration? Are there cracks, damage, deformation, or excessive rust? Is there electrolyte leakage or deformation to the capacitor?	Tighten Olfactory and visual inspection Visual inspection	Not abnormal
Cooling circuit	Cooling fan	Is there abnormal sound or vibration?	Aural and visual inspection. Turn it manually. (Check the power supply is off.)	The fan must rotate smoothly.
		Are nuts or bolts loose?	Tighten	Not abnormal
		Is there discoloration due to overheating?	Visual inspection	Not abnormal
	Ventilation	Is there foreign matter on the fins or intake and exhaust ports?	Visual inspection	Not abnormal

Note: If the equipment stained, wipe with a cleaning cloth of chemical neutrality. Vacuum the dust.

5-3 Insulation test

Avoid testing the DB unit with a megger because an insulation test is completed at the factory. If a megger test must be conducted, proceed as described below. Use of an incorrect test method may result in product damage. If the specifications for dielectric strength test are not followed, the product may be damaged. If a dielectric strength test must be performed, contact your local distributor or nearest Fuji Electric's sales office.

(1) Megger test for the main circuit

① Use a 500V DC type megger and isolate the main power supply before commencing measurement.
② If the test voltage is applicable to the control circuit, remove all connection cables to the control circuit.
③ Connect the main circuit terminals using common cables as shown in Fig. 5-3-1.
④ Execute the megger test only between the common cables connected to the main circuit and the ground (terminal ⏚ G).
⑤ A megger indicating 5MΩ or more is normal. (This is the value measured with a DB unit only.)

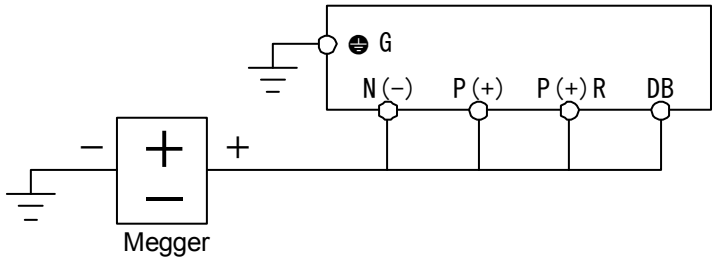


Fig. 5-3-1 Megger test

(2) Insulation test for the control circuit

A megger test and a dielectric test must not be performed in the control circuit. Prepare a high resistance range multimeter for the control circuit.

① Remove all external cables from the control circuit terminals.
② Conduct a continuity test between the control circuits and the ground. A result of 1 MΩ or more is normal.

(3) Exterior main circuit and sequence control circuit

Remove all cables from the terminals to ensure the test voltage is not applied to the DB unit.

5-4 Parts replacement

Each part has a life determined by the sort of the part.
Since the life expectancy of a part differs depending on the environment and using conditions. It is recommended to replace parts at the timing shown in Table 5-4-1 as standard.
As for replacement method, contact your local distributor or nearest Fuji Electric's sales office separately.

Table 5-4 Parts replacement

Part name	Standard period for replacement	Comments
Cooling fan	3 years	Exchange for a new part
Smoothing capacitor	5 years	Exchange for a new part (determined after checking)
Electrolytic capacitor on the PCB	7 years	Exchange for a new part (determined after checking)
Fuse	10 years	Exchange for a new part
Other parts	—	Determined after checking

5-5 Inquiries about product and product guarantee

(1) Inquiries
If there is damage or failure in the product, or questions concerning the product, contact your local distributor or nearest Fuji Electric's sales office with following items.
a. DB unit type
b. SER NO.(Manufacturer's serial number))
c. Purchased time
d. Inquiry details (e. g. location and extent of damage, questions, and status of failure)

(2) Product guarantee
The product guarantee term is one year after purchase or 18 month from the year and month of manufacture on the nameplate, whichever expires first. However, the guarantee will not apply in the following cases, even if the guarantee term has not expired.
① Damage was caused by incorrect use or inappropriate repair and modification.
② The product was used outside the standard specified range.
③ Damage was caused by dropping the product or damage during transportation after purchasing.
④ Damage was caused by an earthquake, fire, storm and flooding, lightening, abnormal voltage or other natural calamities and their secondary disasters.

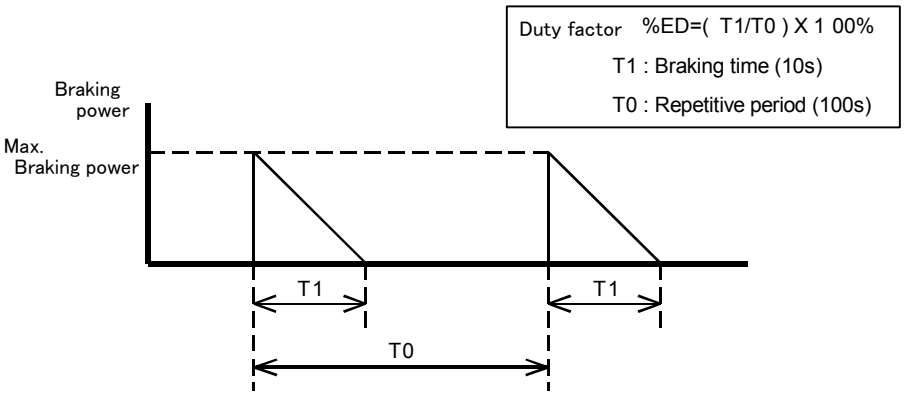
6 Specifications

6-1 Standard specifications

6-1-1 DB unit

Series	200V			400V				
Type	BU37-2C	BU55-2C	BU90-2C	BU37-4C	BU55-4C	BU90-4C	BU132-4C	BU220-4C
Min. connectable resistance (Ω)	3.0	2.0	1.2	12	7.5	4.7	3.0	1.9
Max. braking power (kW)	37	56	90	37	56	90	135	240
Generated loss (10%ED) (W)	40	50	60	35	40	50	60	80
Rated current (A r.m.s)	25	37	61	12	19	31	47	79
Mass (kg)	4	6	9	4	5.5	5.5	9	13
Braking torque	100% (at standard applying to G11S)							
Duty factor	10%ED (30%ED when using option fans) ∗1, ∗2							
Braking time	10s: Period of 100s (30s when using option fans) ∗1, ∗2							
Operating voltage (V)	365			758				
Protection function	• Blown fuse • Cooling fin overheat • Abnormal operation of IGBT (Switching element) • Braking resistor overheat			When detecting abnormalities described left, the operation of the IGBT in the DB unit is stopped, and an alarm is output to the inverter unit				
Cooling system	Self-ventilation (forced ventilation when using option fans)							
Installation location	Indoor Altitude of 1000m or less Free from corrosive gas. dust and direct sunlight							
Ambient temperature	−10℃ to +50℃							

∗1) Duty factor (%ED) and braking time are converted into the condition of deceleration braking as shown below.



The rated current value is an r.m.s value of the current in TD section.

∗2) When using the option fans, the duty factor (%ED) is calculated making the braking time (T1) 30s.

※ This DB unit are applicable to the following inverter units.

・200V series: FRENIC5000 G5/P5,G7/P7,G9S/P9S,G11S/P11S series
FRENIC-Eco series, FRENIC5000 VG3,VG 5, VG7S series

・400V series: RENIC5000 G9S/P9S,G11S/P11S series, FRENIC-Eco series
FRENIC5000 VG5 series

6-1-2 Braking resistor

200V series

Type	DB30-2C	DB37-2C	DB45-2C	DB55-2C	DB75-2C	DB110-2C
Nominal applied motor (kW)	30	37	45	55	75	90,110
Resistance value (Ω)	4.0	3.0	2.5	2.0	1.6	1.2
Max. capacity (kW)	30	37	45	55	83	113
Flowing current (A)	19	25	30	37	48	61
Mass (kg)	10	13	18	22	35	32

400Vseries

Type	DB30-4C	DB37-4C	DB45-4C	DB55-4C	DB75-4C	DB110-4C	DB132-4C	DB160-4C	DB200-4C	DB220-4C
Nominal applied motor (kW)	30	37	45	55	75	90,110	132	160	200	220
Resistance value (Ω)	15	12	10	7.5	6.5	4.7	3.9	3.2	2.6	2.2
Max. capacity (kW)	30	37	45	55	83	113	135	165	200	240
Flowing current (A)	10	12	15	19	24	34	41	50	62	71
Mass (kg)	11	14	19	21	26	30	41	57	43	74

Duty factor	10%ED (refer to DB unit standard specifications ∗1) ∗3
Braking time	10s: Period of 100s (refer to DB unit standard specifications ∗1) ∗4
Ambient temperature	−10°C to +50°C

∗3) When using option fans, the duty factor become 30%ED.
∗4) When using option fans, the braking time becomes 30s.

6-2 Outline dimensions

6-2-1 DB unit

FIG. A
図 A

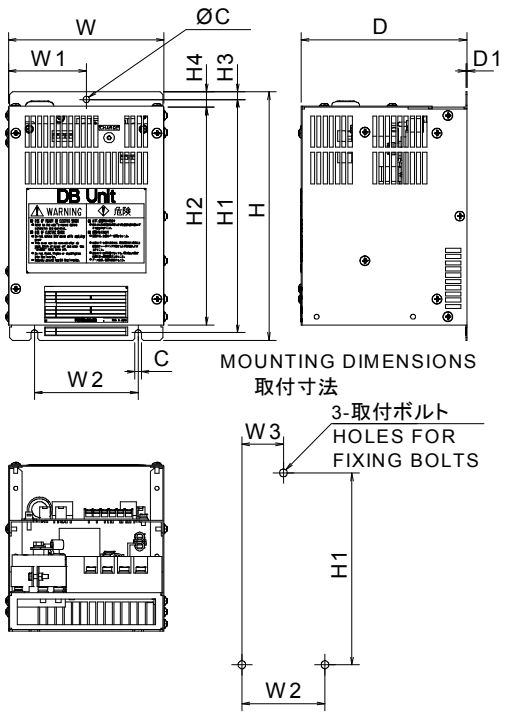
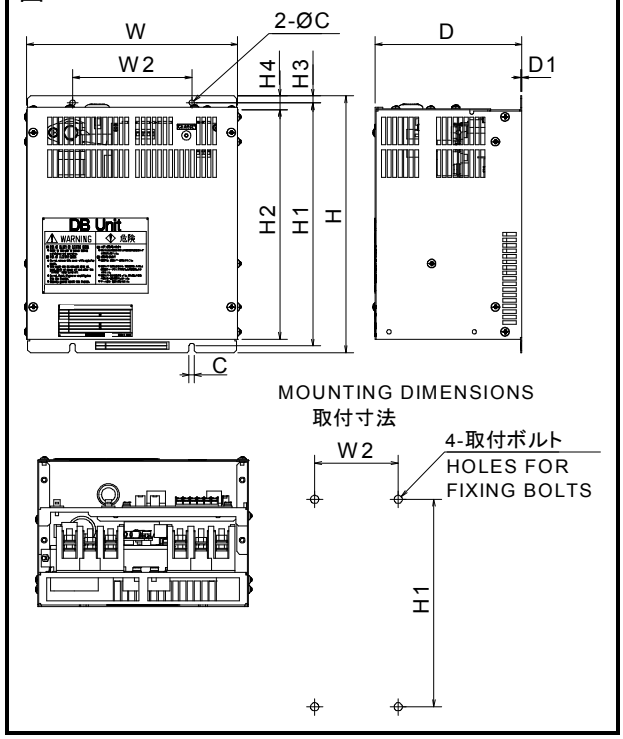


FIG. B
図 B



[200 V series]

TYPE	FIG	DIMENSIONS [mm]												BOLT	MASS (kg)
		W	W1	W2	W3	H	H1	H2	H3	H4	D	D1	C		
BU37-2C	A	150	75	100	50	240	225	210	7.5	15	160	1.2	6	M5	4
BU55-2C	B	230	—	130	—										6
BU90-2C		250		150		370	355	340				2.4			9

[400 V series]

TYPE	FIG	DIMENSIONS [mm]												BOLT	MASS (kg)
		W	W1	W2	W3	H	H1	H2	H3	H4	D	D1	C		
BU37-4C	B	150	—	100	—	280	265	250	7.5	15	160	1.2	6	M5	4
BU55-4C		230		130											5.5
BU90-4C															
BU132-4C		250		150		370	355	340				2.4			9
BU220-4C						450	435	420							13

6-2-2 Braking resistor

FIG. A

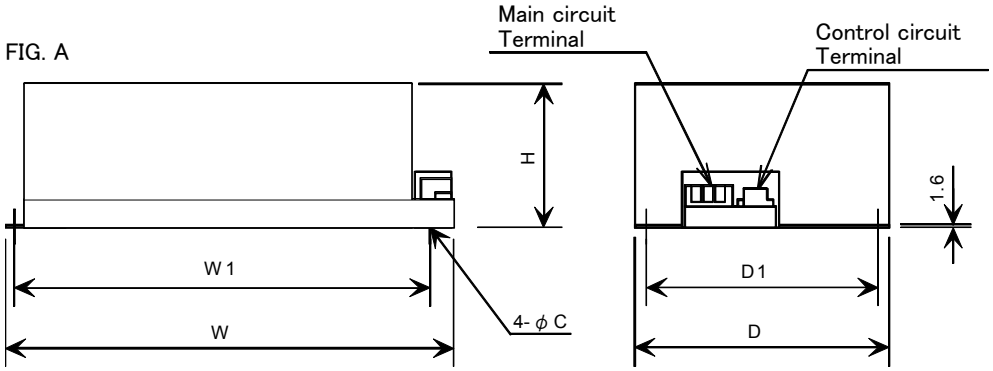
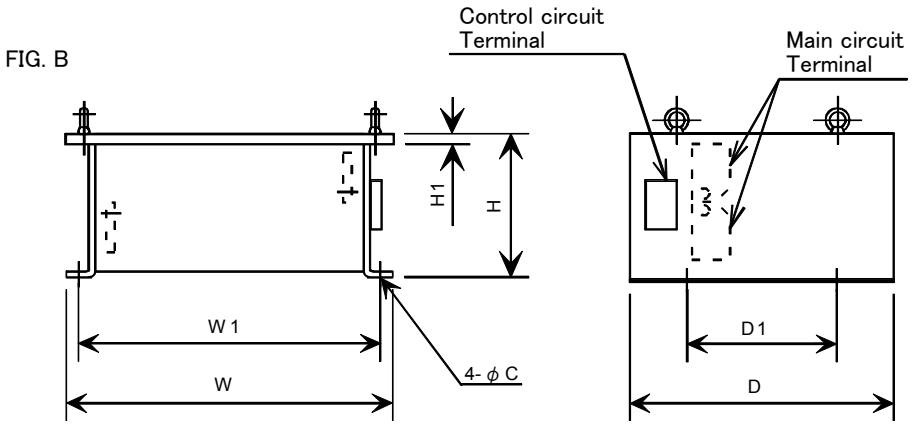


FIG. B



[200V series]

TYPE	FIG	DIMMENSIONS [mm]							SCREW		BOLT	MASS [kg]
		W	W1	H	H1	D	D1	C	MAIN CIRCUIT	CONTROL CIRCUIT		
DB30-2C	A	660	628	140	—	400	368	10	M5	M4	M8	10
DB37-2C				240								13
DB45-2C									M6			18
DB55-2C		750	718									22
DB75-2C	B	450	420	283	43	440	250	12	M8	M3.5	M10	35
DB110-2C		550	520									32

[400V series]

TYPE	FIG	DIMMENSIONS [mm]							SCREW		BOLT	MASS [kg]
		W	W1	H	H1	D	D1	C	MAIN CIRCUIT	CONTROL CIRCUIT		
DB30-4C	A	660	628	140	—	420	388	10	M4	M4	M8	11
DB37-4C				240								14
DB45-4C									M5			19
DB55-4C		750	718			425						21
DB75-4C	B	550	520	283	43	440	250	12	M8	M3.5	M10	26
DB110-4C									M10			30
DB132-4C		650	620									41
DB160-4C		750	720									57
DB200-4C												43
DB220-4C※		600	570									74(37×2)

※ DB220-4C becomes a product with two blocks of the above-mentioned size.

7 Option Fan

In this DB unit, the braking time and duty factor can be rise by using option fans.

	Standard specification	When using option fans
Braking time	10s	30s
Duty factor	10%ED	30%ED

(Refer to Chapter 6 DB unit standard specifications, ∗1 and ∗2)

7-1 Specification

Type	BU-F
Mass	230g
Ambient temperature	−10°C to +50°C

7-2 Attachment

7-2-1 Attachment (Fig. 7-2-1)

① Fix a fan unit on the upper part of the UB unit with fixing screws for the fan unit (at 2 positions). (The fixing screws for the fan unit are attached on the upper part of the fan unit.)
② Since the wiring hole is closed, open the hole so that the cable can pass through.

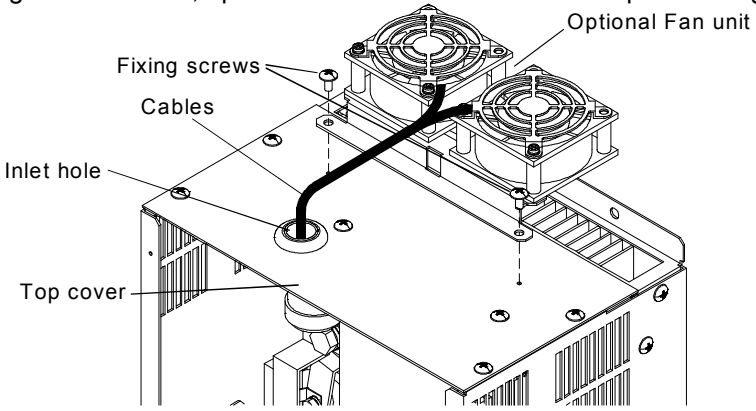


Fig. 7-2-1 Attaching the option fan unit

7-2-2 Wiring (Fig. 7-2-2)

① Pull in power supply connectors for the fans with cables through the wiring hole on the upper part of the UB unit.
② Connect the power supply connectors for the fans to connectors CN5 and CN6 on the control PCB.
③ Secure the cable to a cable-tie holders at near the wiring hole and left lower part of the control PCB using cable-ties (e.g. insulock).
The cable-tie must not exceed 3.5 mm or less in width and 1.5mm or less in thickness to pass through a rectangular hole (3.8×1.5).

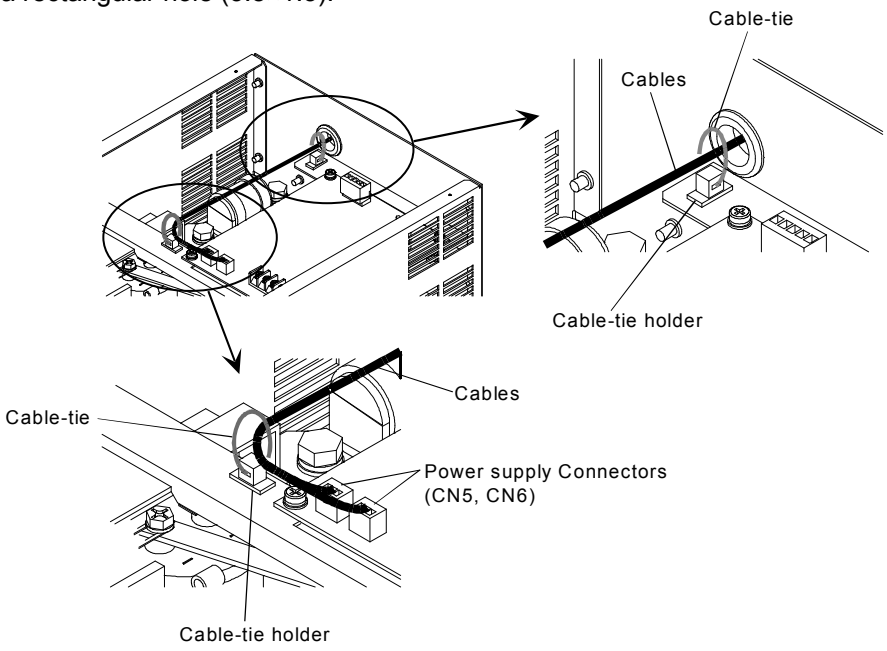
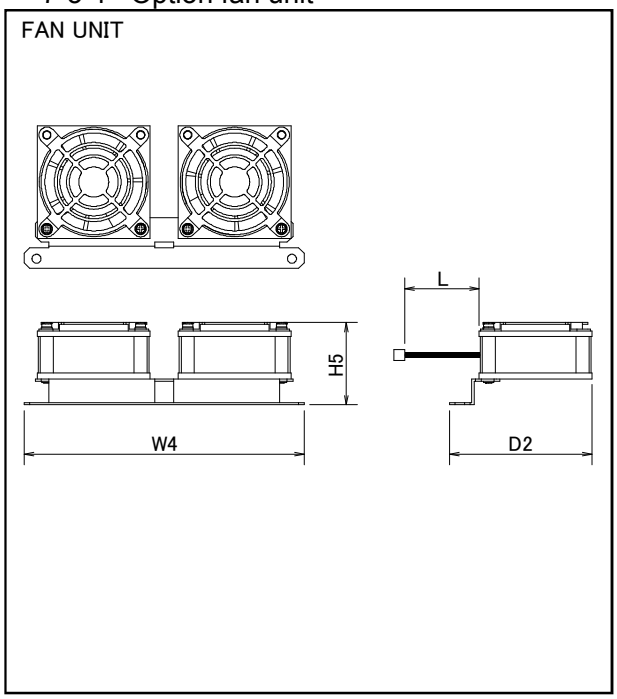
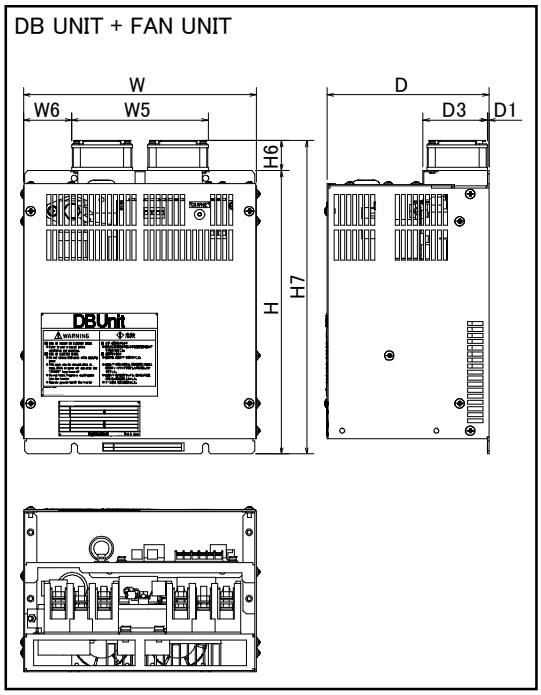


Fig. 7-2-2 Wiring of the option fans

7-3 Dimensions

7-3-1 Option fan unit





[Fan unit]

TYPE	DIMENSIONS [mm]			
	W4	H5	D2	L(Power supply)
BU-F	149	44	76	320

[DBunit + Fan unit]

[200V series]

TYPE	DIMENSIONS [mm]								
	W	W5	W6	H	H6	H7	D	D1	D3
BU37-2C+BU-F	150	135	7.5	240	30	270	160	1.2	64
BU55-2C+BU-F	230		47.5						
BU90-2C+BU-F	250		57.5	370		400			

[400V series]

TYPE	DIMENSIONS [mm]								
	W	W5	W6	H	H6	H7	D	D1	D3
BU37-4C+BU-F	150	135	7.5	280	30	310	160	1.2	64
BU55-4C+BU-F	230		47.5						
BU90-4C+BU-F									
BU132-4C+BU-F	250		57.5	370		400			
BU220-4C+BU-F				450		480			

Edition history

Edition	Date of issue	Content
–	Sep. 1999	First edition
a	Oct. 2001	Correct : Section 2 Fig 2-3-3(Terminal Name)
b	Oct. 2003	Change the corporation name
c	May 2004	Change the corporation logotype Change the “Table A Applicable inverter models” Add the “Compliance with UL/cUL standards［Applicable to products with UL/cUL mark］” Correct : Section 2-3-1 Fig.No. Fig.2-3-2 → Fig.2-3-2-1, Fig.2-3-3 → Fig.2-3-2-2 Section 6-2-2 FIG. B(Terminal Name) Preface, Section 2, Section 5, Section 6, Section 7 Misprint

e-Front runners

Fuji Electric FA Components & Systems Co., Ltd.

Gate City Ohsaki, East Tower, 11-2, Osaki 1-chome
Shinagawa-ku, Tokyo 141-0032, Japan
Phone: +81-3-5435-7139 Fax: +81-3-5435-7458