YASKAWA

GA800 Drive

IP55/UL Type 12 Heatsink External Mounting
Installation Manual

Catalog Code: GA80UxxxxxWxx
240 V class: 1 to 150 HP
480 V class: 1 to 600 HP
600 V class: 400 to 500 HP

PDF

Simplify drive start-up
Get DriveWizard Mobile
https://www.yaskawa.com/dwm

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1 Preface and General Precautions

This chapter gives information about important safety precautions for the use of this product. Failure to obey these precautions can cause serious injury or death, or damage to the product or related devices and systems. Yaskawa must not be held responsible for any injury or equipment damage as a result of the failure to observe these precautions and instructions.

◆ Overview

An IP55/UL Type 12 Heatsink External Mounting drive lets you install the drive in a Type 12 enclosure or panel with the heatsink external and keep the Type 12 rating.

◆ Applicable Documentation

Document	Description
GA800 Series IP55/UL Type 12 Heatsink External Mounting Installation Manual	Read this manual before you install this drive. This manual gives information about how to install the IP55/UL Type 12 Heatsink External Mounting drive.
GA800 Series AC Drive for Industrial Applications Installation & Primary Operation	For information about drive settings, refer to the manuals. The manuals provide information about basic installation, wiring, operation procedures, functions, troubleshooting, and maintenance. The manuals also include important information about parameter settings and tuning the drive. You can download drive manuals from the Yaskawa product and technical information website shown on the back cover of this manual.
GA800 Series AC Drive for Industrial Applications Technical Reference	

◆ Safety

Read the safety instructions carefully before you install, wire, or operate this product.

■ Explanation of Signal Words

DANGER *This signal word identifies a hazard that will cause serious injury or death if you do not prevent it.*

WARNING *This signal word identifies a hazard that can cause death or serious injuries if you do not prevent it.*

CAUTION *Identifies a hazardous situation, which, if not avoided, can cause minor or moderate injury.*

NOTICE *This signal word identifies a property damage message that is not related to personal injury.*

■ General Safety Instructions

Yaskawa Electric manufactures and supplies electronic components for a variety of industrial applications. The selection and application of Yaskawa products is the responsibility of the designer of the equipment or the customer who assembles the final product. Yaskawa is not responsible for how our products are incorporated into the final system design. In all cases, Yaskawa products should not be incorporated into a product or design as the exclusive or sole safety control function. All control functions are designed to dynamically detect failures and operate safely without exception. All products that are designed to incorporate parts manufactured by Yaskawa must be provided to the end user and include proper warnings and instructions regarding their safe use and operation. All warnings from Yaskawa must be promptly issued to the end user. Yaskawa offers warranties only for the quality of our products, in compliance with standards and specifications that are described in the manual. Yaskawa does not offer other warranties, either explicit or implied. Injuries, property damage, and lost business opportunities caused by improper storage or handling and negligence oversight on the part of your company or your customers will void Yaskawa's warranty for the product.

Note:

- Read this manual carefully when mounting, operating, and repairing AC drives.
- Obey all warnings, cautions, and notices.
- Approved personnel must perform all work.
- Install the drive according to this manual and local codes.

⚠ DANGER *Electrical Shock Hazard. Do not examine, connect, or disconnect wiring on an energized drive. Before servicing, disconnect all power to the equipment and wait for the time specified on the warning label at a minimum. The internal capacitor stays charged after the drive is de-energized. The charge indicator LED extinguishes when the DC bus voltage decreases below 50 Vdc. When all indicators are OFF, remove the covers before measuring for dangerous voltages to make sure that the drive is safe. If you do work on the drive when it is energized, it will cause serious injury or death from electrical shock.*

⚠ WARNING *Fire Hazard. Do not connect main power supply wiring to drive motor terminals U/T1, V/T2, and W/T3. Connect main power supply wiring to main circuit input terminals R/L1, S/L2, and T/L3. Incorrect wiring can cause serious injury or death from fire.*

⚠ WARNING *Electrical Shock Hazard. Do not modify the drive body or drive circuitry. Modifications to drive body and circuitry can cause serious injury or death, will cause damage to the drive, and will void the warranty. Yaskawa is not responsible for modifications of the product made by the user.*

⚠ WARNING *Crush Hazard. Only approved personnel can operate a crane or hoist to move the drive. If unapproved personnel operate a crane or hoist, it can cause serious injury or death from falling equipment.*

⚠ WARNING *Electrical Shock Hazard. Only let approved personnel install, wire, maintain, examine, replace parts, and repair the drive. If personnel are not approved, it can cause serious injury or death.*

⚠ WARNING *Electrical Shock Hazard. Always ground the motor-side grounding terminal. If you do not ground the equipment correctly, it can cause serious injury or death if you touch the motor case.*

⚠ WARNING *Electrical Shock Hazard. Do not wear loose clothing or jewelry when you do work on the drive. Tighten loose clothing and remove all metal objects, for example watches or rings. Loose clothing can catch on the drive and jewelry can conduct electricity and cause serious injury or death.*

⚠ WARNING *Sudden Movement Hazard. Before you do Auto-Tuning, remove all personnel and objects from the area around the drive, motor, and load. The drive and motor can start suddenly during Auto-Tuning and cause serious injury or death.*

⚠ WARNING *Sudden Movement Hazard. Remove all personnel and objects from the area around the drive, motor, and machine and attach covers, couplings, shaft keys, and machine loads before you energize the drive. If personnel are too close or if there are missing parts, it can cause serious injury or death.*

⚠ WARNING *Damage to Equipment. Do not apply incorrect voltage to the main circuit of the drive. Operate the drive in the specified range of the input voltage on the drive nameplate. Voltages that are higher than the permitted nameplate tolerance can cause damage to the drive.*

⚠ WARNING *Fire Hazard. Do not put flammable or combustible materials on top of the drive and do not install the drive near flammable or combustible materials. Attach the drive to metal or other noncombustible material. Flammable and combustible materials can start a fire and cause serious injury or death.*

⚠ WARNING *Fire Hazard. Tighten all terminal screws to the correct tightening torque. Connections that are too loose or too tight can cause incorrect operation and damage to the drive. Incorrect connections can also cause death or serious injury from fire.*

⚠ WARNING *Fire Hazard. Tighten screws at an angle in the specified range shown in this manual. If you tighten the screws at an angle not in the specified range, you can have loose connections that can cause damage to the terminal block or start a fire and cause serious injury or death.*

⚠ WARNING *Crush Hazard. Use a crane or hoist to move large drives when necessary. If you try to move a large drive without a crane or hoist, it can cause serious injury or death.*

⚠ WARNING *Electrical Shock Hazard. Do not cause a short circuit on the drive output circuit. A short circuit on the output can cause serious injury or death.*

⚠ WARNING *Electrical Shock Hazard. When there is a DC component in the protective earthing conductor, the drive can cause a residual current. When a residual current operated protective or monitoring device prevents direct or indirect contact, always use a type B Ground Fault Circuit Interrupter (GFCI) as specified by IEC/EN 60755. If you do not use the correct GFCI, it can cause serious injury or death.*

⚠ WARNING *Electrical Shock Hazard. Ground the neutral point on the power supply of drive models 2xxxB/C and 4xxxB/C to comply with the EMC Directive before you turn on the EMC filter. If you turn ON the EMC filter, but you do not ground the neutral point, it can cause serious injury or death.*

⚠ WARNING *Crush Hazard. Test the system to make sure that the drive operates safely after you wire the drive and set parameters. If you do not test the system, it can cause damage to equipment or serious injury or death.*

⚠ WARNING *Electrical Shock Hazard. After the drive blows a fuse or trips a GFCI, do not immediately energize the drive or operate peripheral devices. Wait for the time specified on the warning label at a minimum and make sure that all indicators are OFF. Then check the wiring and peripheral device ratings to find the cause of the problem. If you do not know the cause of the problem, contact Yaskawa before you energize the drive or peripheral devices. If you do not fix the problem before you operate the drive or peripheral devices, it can cause serious injury or death.*

⚠ WARNING *Crush Hazard. Only approved personnel can operate a crane or hoist to move the drive. If unapproved personnel operate a crane or hoist, it can cause serious injury or death from falling equipment.*

⚠ WARNING *Fire Hazard. Install sufficient branch circuit short circuit protection as specified by applicable codes and this manual. The drive is suitable for circuits that supply not more than 100,000 RMS symmetrical amperes, 240 Vac maximum (200 V Class), 480 Vac maximum (400 V Class). Incorrect branch circuit short circuit protection can cause serious injury or death.*

⚠ CAUTION *Crush Hazard. Tighten terminal cover screws and hold the case safely when you move the drive. If the drive or covers fall, it can cause moderate injury.*

⚠ CAUTION *Burn Hazard. Do not touch a hot drive heatsink. De-energize the drive, wait for a minimum of 15 minutes, then make sure that the heatsink is cool before you replace the cooling fans. If you touch a hot drive heatsink, it can burn you.*

NOTICE *Damage to Equipment. When you touch the drive and circuit boards, make sure that you observe correct electrostatic discharge (ESD) procedures. If you do not follow procedures, it can cause ESD damage to the drive circuitry.*

NOTICE *Do not break the electrical connection between the drive and the motor when the drive is outputting voltage. Incorrect equipment sequencing can cause damage to the drive.*

NOTICE *Damage to Equipment. Do not do a withstand voltage test or use a megohmmeter or megger insulation tester on the drive. These tests can cause damage to the drive.*

NOTICE *Do not operate a drive or connected equipment that has damaged or missing parts. You can cause damage to the drive and connected equipment.*

NOTICE *Install branch circuit protection, for example fuses or ground fault circuit interrupters (GFCIs) as specified in the drive instructions. If you do not install these components, it can cause damage to the drive and connected equipment.*

NOTICE *Damage to Equipment. Before you connect a dynamic braking option to the drive, make sure that qualified personnel read and obey the Braking Unit and Braking Resistor Unit Installation Manual (TOBPC72060001). If you do not read and obey the manual or if personnel are not qualified, it can cause damage to the drive and braking circuit.*

NOTICE *Make sure that all connections are correct after you install the drive and connect peripheral devices. Incorrect connections can cause damage to the drive.*

NOTICE *Do not connect phase-advancing capacitors, LC/RC noise filters, or leakage breakers (GFCI) to the motor circuit. If you connect these devices to the output circuits, it can cause damage to the drive and connected equipment.*

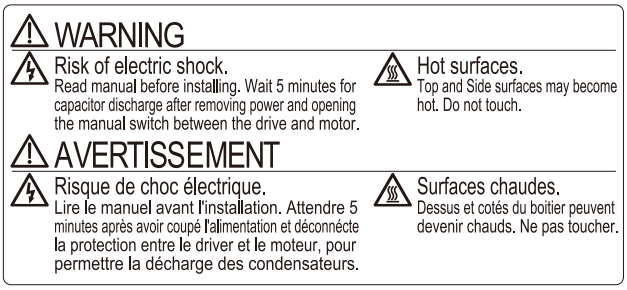
NOTICE *Use an inverter-duty motor or vector-duty motor with reinforced insulation and windings applicable for use with an AC drive. If the motor does not have the correct insulation, it can cause a short circuit or ground fault from insulation deterioration.*

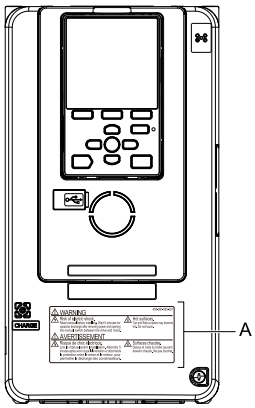
Note:

Do not use unshielded wire for control wiring. Use shielded, twisted-pair wires and ground the shield to the ground terminal of the drive. Unshielded wire can cause electrical interference and unsatisfactory system performance.

◆ Warning Label Content and Location

The drive warning label is in the location shown in Figure 1.1. Use the drive as specified by this information.





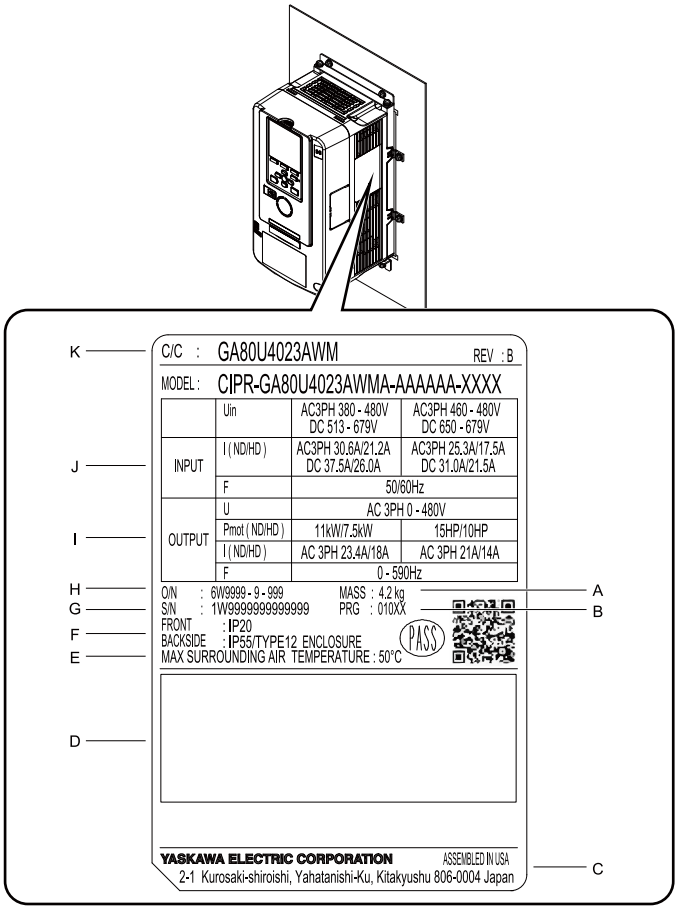
A - Warning label

Figure 1.1 Warning Label Content and Location

2 Receiving

1. Inspect the product for damage and missing parts. Immediately contact the shipping company if the drive is damaged. The Yaskawa warranty does not cover damage from shipping.
2. Check the catalog code in the "C/C" section of the drive nameplate to make sure that you received the correct model.
3. If you did not receive the correct drive or if your drive does not operate correctly, contact your supplier.
4. Check drive and motor compatibility for systems with more than one drive.

NOTICE *Damage to Equipment. Do not install or use damaged parts or damaged motors into the drive system.*



A - Weight
B - Drive software version
C - The address of the head office of Yaskawa Electric Corporation
D - Standards compliance
E - Surrounding air temperature
F - Enclosure protection design
G - Serial number
H - Lot number
I - Output specifications
J - Input specifications
K - Catalog code

Figure 2.1 Nameplate Example

◆ How to Read the Catalog Code

Use the information in Figure 2.2 and Table 2.1 to read the drive catalog codes.

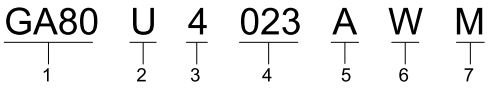


Figure 2.2 Drive Catalog Code

Table 2.1 Catalog Code Details

No.	Description
1	GA800 Series
2	Region code • U: Americas
3	Input power supply voltage • 2: Three-Phase AC 240 V • 4: Three-Phase AC 480 V • 5: Three-Phase AC 600 V

No.	Description
4	Rated output current **Note:** Refer to the rated output current list for more information.
5	EMC noise filter A: No built-in EMC filter B: built-in C3 filter
6	Protection design A: IP00/UL Open Type B: IP20/UL Open Type F: IP20/UL Type 1 T: IP55/UL Type 12 W: IP55/UL Type 12 Heatsink External Mounting
7	Environmental specification M: Resistant to dust/humidity

3 Mechanical Installation

This section gives information about the standard environment for correct installation.

◆ Installation Environment

The installation environment is important for the lifespan of the product and to make sure that the drive performance is correct. Make sure that the installation environment agrees with these specifications.

Environment	Conditions
Area of Use	Indoors
Power Supply	Overvoltage Category III
Ambient Temperature Setting	IP00/UL Open Type: -10 °C to +50 °C (14 °F to 122 °F) IP20/UL Open Type/Heatsink External Mounting: -10 °C to +50 °C (14 °F to 122 °F) IP20/UL Type 1: -10 °C to +40 °C (14 °F to 104 °F) IP55/UL Type 12 Heatsink External Mounting; front side: -10°C to +50 °C (14 °F to 122 °F) IP55/UL Type 12 Heatsink External Mounting; back side: -10°C to +40 °C (14 °F to 104 °F) • When installing the drive in an enclosure, use a cooling fan or air conditioner to keep the internal air temperature in the permitted range. • Do not let the drive freeze. • You can use IP20/UL Open Type drives at a maximum of 60 °C (140 °F) when you derate the output current. • You can use IP20/UL Type 1 drives at a maximum of 50 °C (122 °F) when you derate the output current.
Humidity	95%RH or less Do not let condensation form on the drive.
Storage Temperature	-20 °C to +70 °C (-4 °F to +158 °F) (short-term temperature during transportation)
Surrounding Area	Pollution degree 2 or less Install the drive in an area without: • Oil mist, corrosive or flammable gas, or dust • Metal powder, oil, water, or other unwanted materials • Radioactive or flammable materials. • Harmful gas or fluids • Salt • Direct sunlight Keep wood and other flammable materials away from the drive.
Altitude	1000 m (3281 ft) maximum **Note:** Derate the output current by 1% for each 100 m (328 ft) to install the drive in altitudes between 1000 m to 4000 m (3281 ft to 13123 ft). It is not necessary to derate the rated voltage in these conditions: • Installing the drive at 2000 m (6562 ft) or lower • Installing the drive between 2000 m to 4000 m (6562 ft to 13123 ft) and grounding the neutral point on the power supply. Contact Yaskawa or your nearest sales representative when not grounding the neutral point.
Vibration	• 10 to 20 Hz: 1 G (9.8 m/s^2, 32.15 ft/s^2) • 20 Hz to 55 Hz: 2004 to 2211, 4002 to 4168: 0.6 G (5.9 m/s^2, 19.36 ft/s^2) 2257 to 2415, 4208 to 4720, 5382 to 5472: 0.2 G (2.0 m/s^2, 6.56 ft/s^2)
Installation Orientation	Install the drive vertically for sufficient airflow to cool the drive.

NOTICE *Do not let unwanted objects, for example metal shavings or wire clippings, fall into the drive during drive installation. Put a temporary cover over the drive during installation. Remove the temporary cover before start-up. Unwanted objects inside of the drive can cause damage to the drive.*

Note:

Do not put drive peripheral devices, transformers, or other electronics near the drive. Shield the drive from electrical interference if components must be near the drive. The drive or the devices around the drive may malfunction due to electrical interference.

◆ IP55/UL Type 12 Heatsink External Mounting Drive and Cut-Out Dimensions and Installation

Model	Exterior and Mounting Dimension Diagram		Panel Cut-Out Dimension Diagram		Installation Procedure	
2004 - 2082 4002 - 4060	Exterior and Mounting Dimension Diagram 1	12	Panel Cut-Out Dimension Diagram 1	18	Procedure A	23
2110 4075					Procedure B	24
2138 4089, 4103	Exterior and Mounting Dimension Diagram 2	13	Panel Cut-Out Dimension Diagram 2	19	Procedure C	26
2169, 2211 4140, 4168	Exterior and Mounting Dimension Diagram 3	14	Panel Cut-Out Dimension Diagram 3	19		
2257, 2313 4208 - 4302	Exterior and Mounting Dimension Diagram 4	15	Panel Cut-Out Dimension Diagram 4	20	Procedure D	27
2360, 2415 4371, 4414	Exterior and Mounting Dimension Diagram 5	16	Panel Cut-Out Dimension Diagram 5	20		
4477 - 4720 5382 - 5472	Exterior and Mounting Dimension Diagram 6	17	Panel Cut-Out Dimension Diagram 6	21	Procedure E	28

◆ IP55/UL Type 12 Heatsink External Mounting Drive Dimensions

■ Models 2004 to 2110, 4002 to 4075

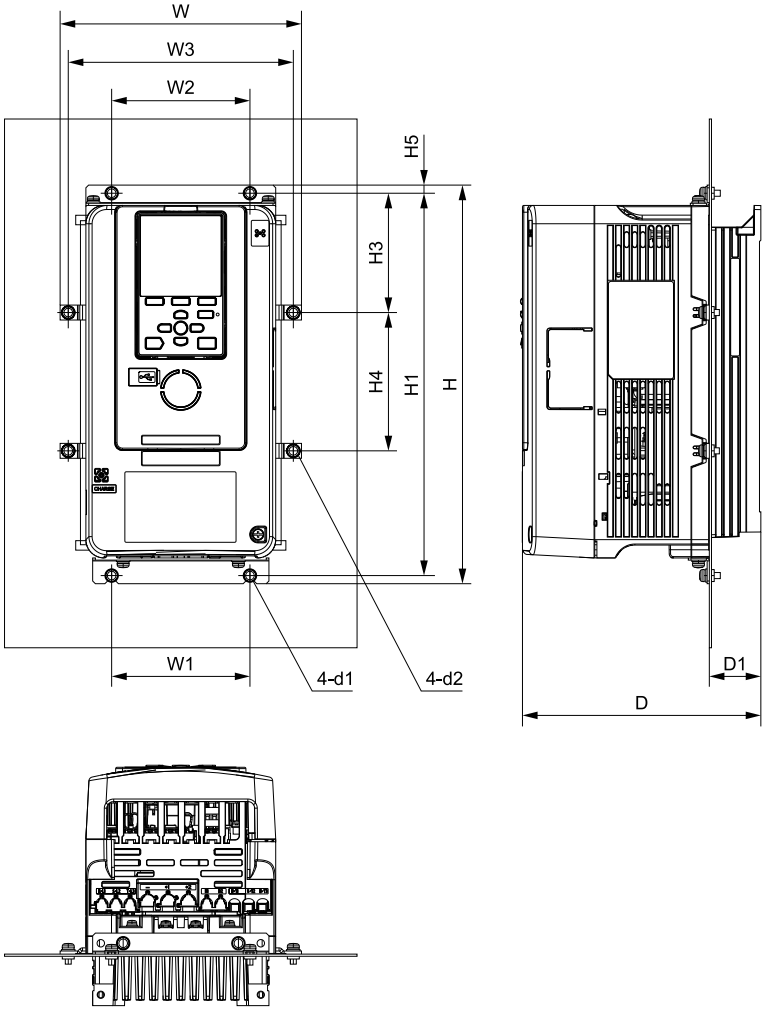


Figure 3.1 Dimension Diagram 1

Table 3.1 200 V Class (IP55/UL Type 12 Heatsink External Mounting)

Model	Dimensions mm (in)												
	W	H	D	D1	W1	W2	W3	H1	H3	H4	H5	d1	d2
2004 - 2012	178 (7.01)	294 (11.57)	176 (6.93)	38 (1.50)	102 (4.02)	102 (4.02)	166 (6.54)	282 (11.10)	88 (3.46)	102 (4.02)	6 (0.24)	M5	M5
2018 - 2042	178 (7.01)	294 (11.57)	211 (8.31)	73 (2.87)	102 (4.02)	102 (4.02)	166 (6.54)	282 (11.10)	88 (3.46)	102 (4.02)	6 (0.24)	M5	M5
2056	218 (8.58)	329 (12.95)	202 (7.95)	68 (2.68)	140 (5.51)	140 (5.51)	206 (8.11)	318 (12.52)	81.9 (3.22)	129 (5.08)	5 (0.20)	M5	M5
2070, 2082	258 (10.16)	384 (15.12)	227 (8.94)	87 (3.43)	192 (7.56)	192 (7.56)	246 (9.69)	371 (14.61)	114.5 (4.51)	150 (5.91)	7 (0.28)	M6	M5
2110	277.5 (10.93)	400 (15.75)	280 (11.02)	114 (4.49)	195 (7.68)	204 (8.03)	265.5 (10.45)	385 (15.16)	112.5 (4.43)	160 (6.30)	7.5 (0.30)	M6	M5

Table 3.2 400 V Class (IP55/UL Type 12 Heatsink External Mounting)

Model	Dimensions mm (in)												
	W	H	D	D1	W1	W2	W3	H1	H3	H4	H5	d1	d2
4002 - 4005	178 (7.01)	294 (11.57)	176 (6.93)	38 (1.50)	102 (4.02)	102 (4.02)	166 (6.54)	282 (11.10)	88 (3.46)	102 (4.02)	6 (0.24)	M5	M5
4007 - 4023	178 (7.01)	294 (11.57)	211 (8.31)	73 (2.87)	102 (4.02)	102 (4.02)	166 (6.54)	282 (11.10)	88 (3.46)	102 (4.02)	6 (0.24)	M5	M5
4031, 4038	218 (8.58)	329 (12.95)	202 (7.95)	68 (2.68)	140 (5.51)	140 (5.51)	206 (8.11)	318 (12.52)	81.9 (3.22)	129 (5.08)	5 (0.20)	M5	M5
4044	258 (10.16)	384 (15.12)	227 (8.94)	87 (3.43)	192 (7.56)	192 (7.56)	246 (9.69)	371 (14.61)	114.5 (4.51)	150 (5.91)	7 (0.28)	M6	M5
4060	258 (10.16)	384 (15.12)	246 (9.69)	106 (4.17)	192 (7.56)	192 (7.56)	246 (9.69)	371 (14.61)	114.5 (4.51)	150 (5.91)	7 (0.28)	M6	M5
4075	277.5 (10.93)	400 (15.75)	280 (11.02)	114 (4.49)	195 (7.68)	204 (8.03)	265.5 (10.45)	385 (15.16)	112.5 (4.43)	160 (6.30)	7.5 (0.30)	M6	M5

■ Models 2138, 4089, 4103

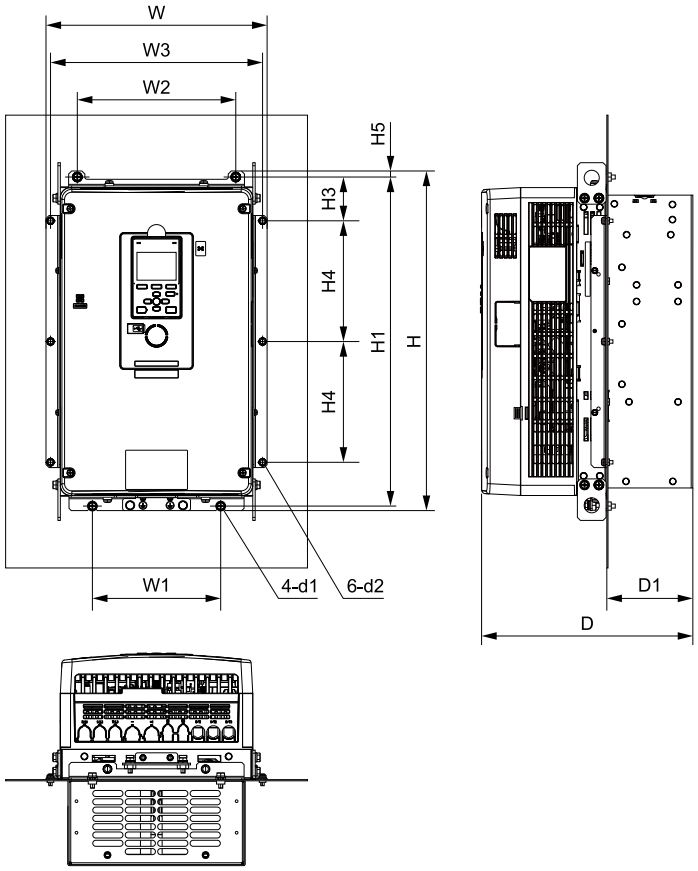


Figure 3.2 Dimension Diagram 2

Table 3.3 200 V Class (IP55/UL Type 12 Heatsink External Mounting)

Model	Dimensions mm (in)												
	W	H	D	D1	W1	W2	W3	H1	H3	H4	H5	d1	d2
2138	293 (11.54)	450 (17.72)	280 (11.02)	114 (4.49)	170 (6.69)	210 (8.27)	281 (11.06)	436 (17.17)	58 (2.28)	160 (6.30)	8 (0.31)	M6	M5

Table 3.4 400 V Class (IP55/UL Type 12 Heatsink External Mounting)

Model	Dimensions mm (in)												
	W	H	D	D1	W1	W2	W3	H1	H3	H4	H5	d1	d2
4089, 4103	293 (11.54)	450 (17.72)	280 (11.02)	114 (4.49)	170 (6.69)	210 (8.27)	281 (11.06)	436 (17.17)	58 (2.28)	160 (6.30)	8 (0.31)	M6	M5

■ Models 2169, 2211, 4140, 4168

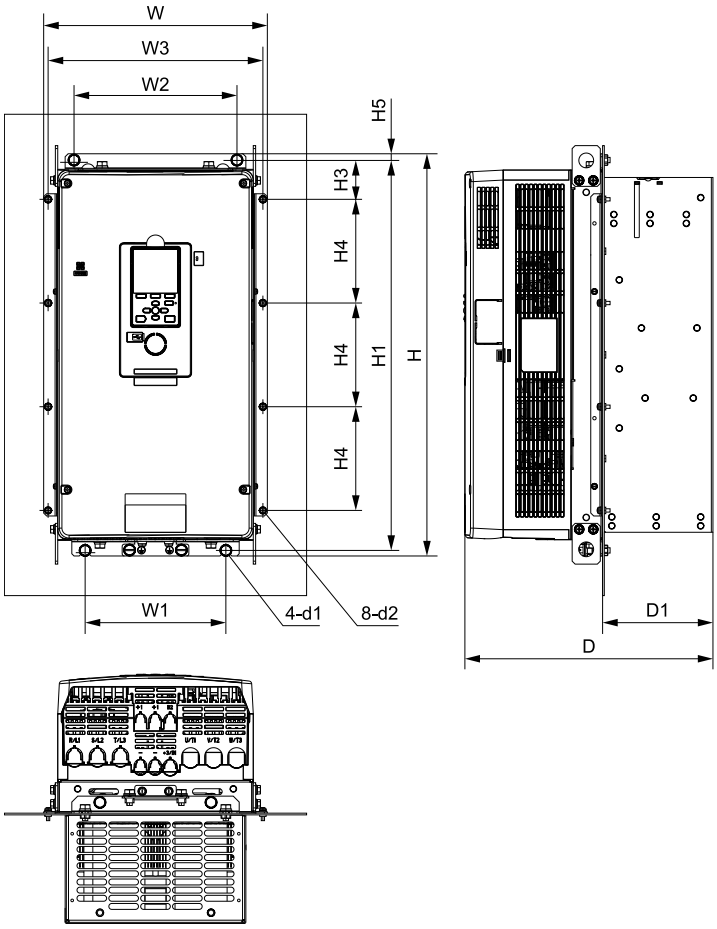


Figure 3.3 Dimension Diagram 3

Table 3.5 200 V Class (IP55/UL Type 12 Heatsink External Mounting)

Model	Dimensions mm (in)												
	W	H	D	D1	W1	W2	W3	H1	H3	H4	H5	d1	d2
2169, 2211	302 (11.89)	543 (21.38)	335 (13.19)	149 (5.87)	190 (7.48)	220 (8.66)	290 (11.42)	527 (20.75)	53 (2.09)	140 (5.51)	8.5 (0.33)	M8	M5

Table 3.6 400 V Class (IP55/UL Type 12 Heatsink External Mounting)

Model	Dimensions mm (in)												
	W	H	D	D1	W1	W2	W3	H1	H3	H4	H5	d1	d2
4140, 4168	302 (11.89)	543 (21.38)	335 (13.19)	149 (5.87)	190 (7.48)	220 (8.66)	290 (11.42)	527 (20.75)	53 (2.09)	140 (5.51)	8.5 (0.33)	M8	M5

■ Models 2257, 2313, 4208 to 4302

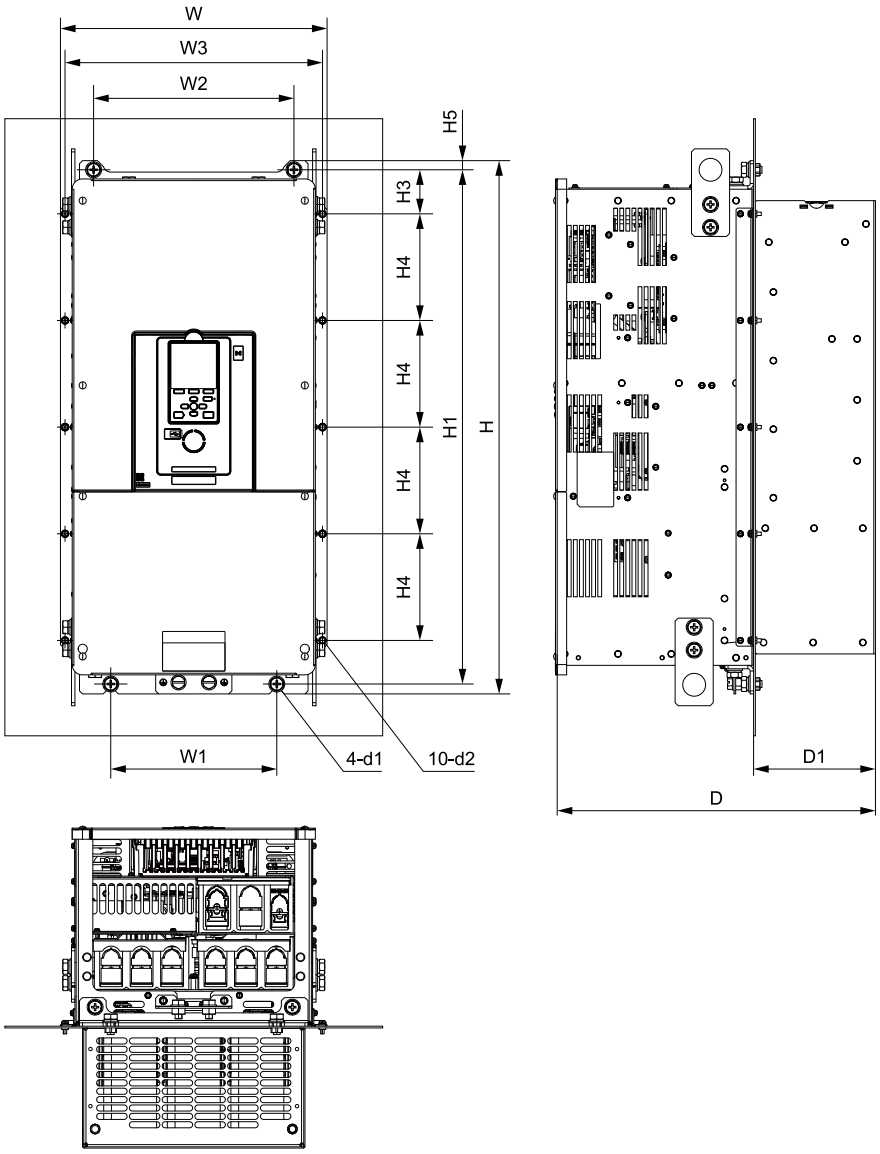


Figure 3.4 Dimension Diagram 4

Table 3.7 200 V Class (IP55/UL Type 12 Heatsink External Mounting)

Model	Dimensions mm (in)												
	W	H	D	D1	W1	W2	W3	H1	H3	H4	H5	d1	d2
2257, 2313	350 (13.78)	700 (27.56)	420 (16.54)	160 (6.30)	218 (8.58)	263 (10.35)	338 (13.31)	675 (26.56)	60 (2.36)	139 (5.47)	12 (0.47)	M10	M5

Table 3.8 400 V Class (IP55/UL Type 12 Heatsink External Mounting)

Model	Dimensions mm (in)												
	W	H	D	D1	W1	W2	W3	H1	H3	H4	H5	d1	d2
4208 - 4302	350 (13.78)	700 (27.56)	420 (16.54)	160 (6.30)	218 (8.58)	263 (10.35)	338 (13.31)	675 (26.56)	60 (2.36)	139 (5.47)	12 (0.47)	M10	M5

■ Models 2360, 2415, 4371, 4414

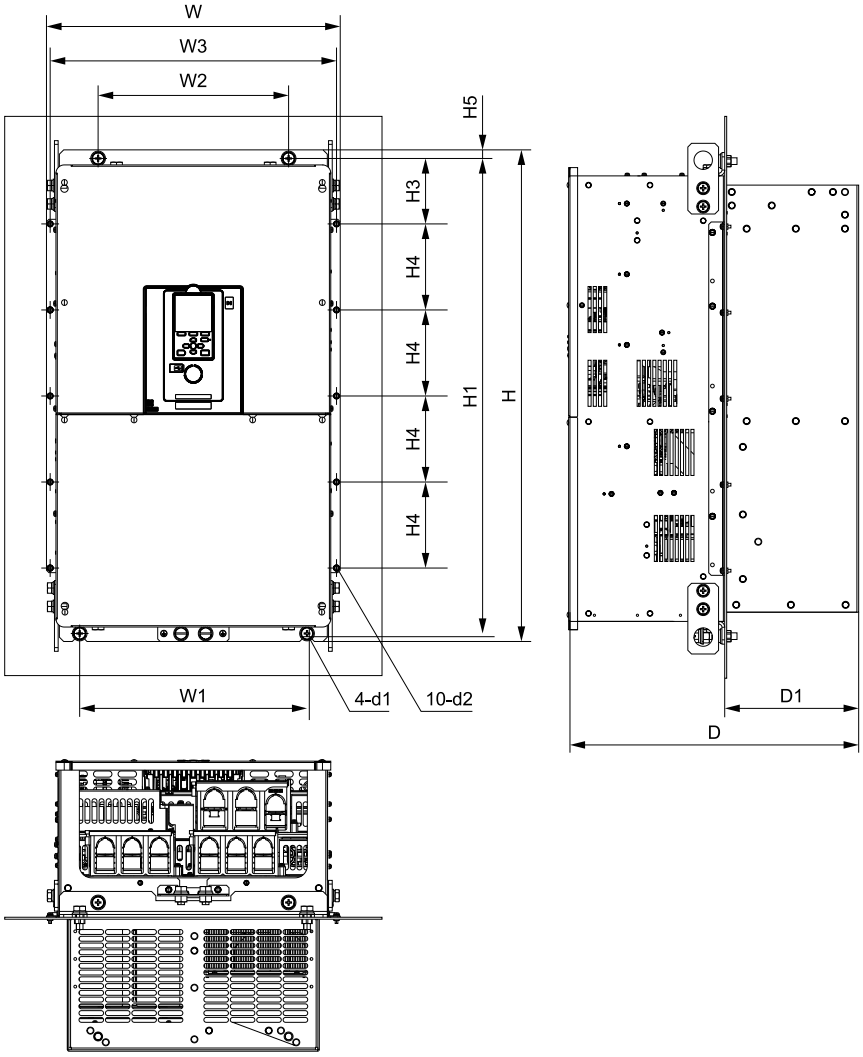


Figure 3.5 Dimension Diagram 5

Table 3.9 200 V Class (IP55/UL Type 12 Heatsink External Mounting)

Model	Dimensions mm (in)												
	W	H	D	D1	W1	W2	W3	H1	H3	H4	H5	d1	d2
2360, 2415	478 (18.82)	800 (31.50)	472 (18.58)	218 (8.58)	370 (14.57)	310 (12.20)	466 (18.35)	773 (30.43)	106.5 (4.19)	140 (5.51)	14 (0.55)	M12	M5

Table 3.10 400 V Class (IP55/UL Type 12 Heatsink External Mounting)

Model	Dimensions mm (in)												
	W	H	D	D1	W1	W2	W3	H1	H3	H4	H5	d1	d2
4371, 4414	478 (18.82)	800 (31.50)	472 (18.58)	218 (8.58)	370 (14.57)	310 (12.20)	466 (18.35)	773 (30.43)	106.5 (4.19)	140 (5.51)	14 (0.55)	M12	M5

■ Models 4477 to 4720, 5382 to 5472

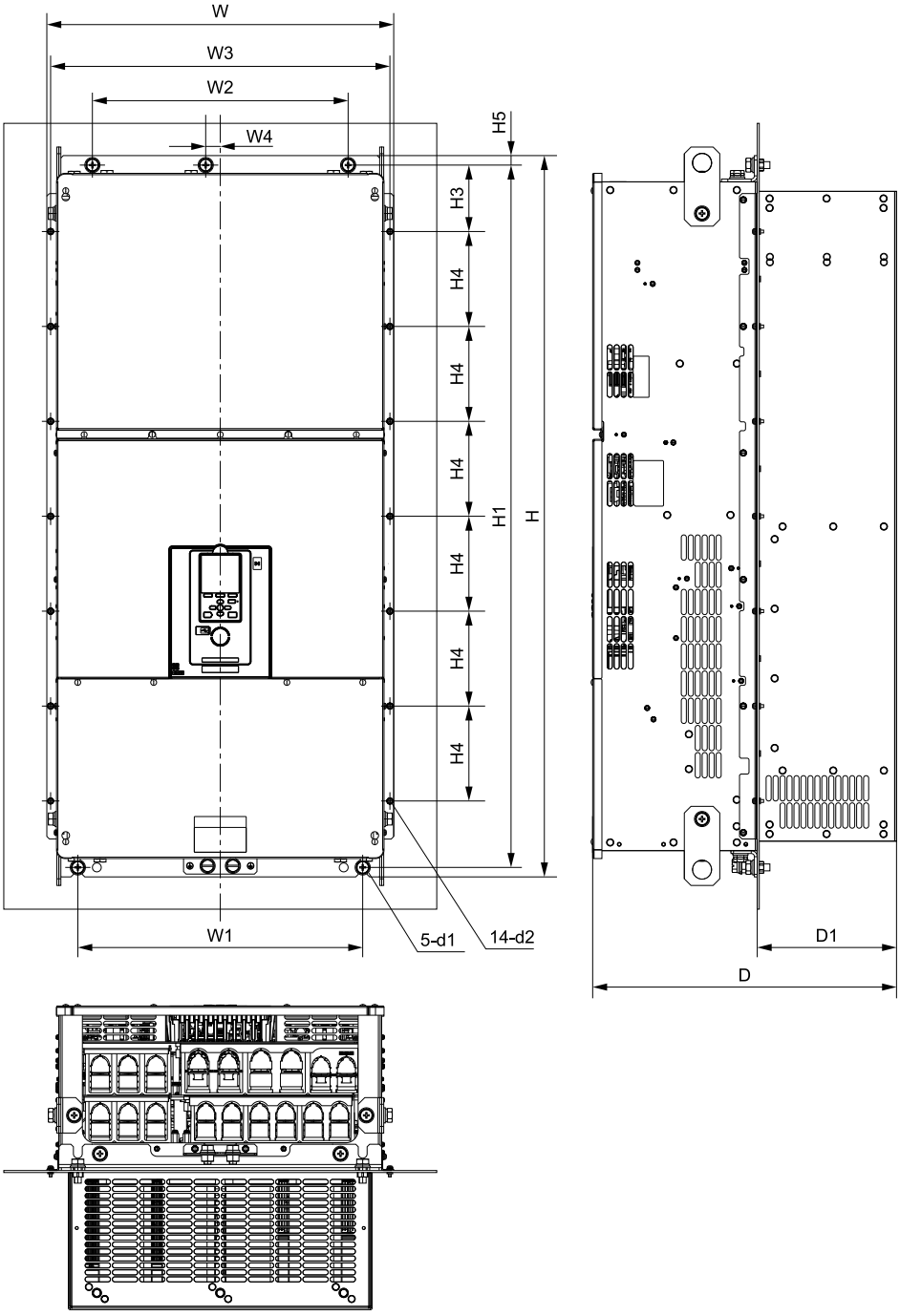


Figure 3.6 Dimension Diagram 6

Table 3.11 400 V Class (IP55/UL Type 12 Heatsink External Mounting)

Model	Dimensions mm (in)													
	W	H	D	D1	W1	W2	W3	W4	H1	H3	H4	H5	d1	d2
4477 - 4720	548 (21.57)	1140 (44.88)	480 (18.90)	220 (8.66)	450 (17.72)	404 (15.91)	536 (21.10)	23 (0.91)	1110 (43.70)	105 (4.13)	150 (5.91)	15 (0.59)	M12	M5

Table 3.12 600 V Class (IP55/UL Type 12 Heatsink External Mounting)

Model	Dimensions mm (in)													
	W	H	D	D1	W1	W2	W3	W4	H1	H3	H4	H5	d1	d2
5382 - 5472	548 (21.57)	1140 (44.88)	480 (18.90)	220 (8.66)	450 (17.72)	404 (15.91)	536 (21.10)	23 (0.91)	1110 (43.70)	105 (4.13)	150 (5.91)	15 (0.59)	M12	M5

◆ Panel Cut-Out Dimensions (IP55/UL Type 12 Heatsink External Mounting)

■ Drive Model and Panel Cut-Out Dimension Diagram

Model	Reference
2004 - 2110 4002 - 4075	18
2138 4089, 4103	19
2169, 2211 4140, 4168	19
2257, 2313 4208 - 4302	20
2360, 2415 4371, 4414	20
4477 - 4720 5382 - 5472	21

■ Models 2004 to 2110, 4002 to 4075

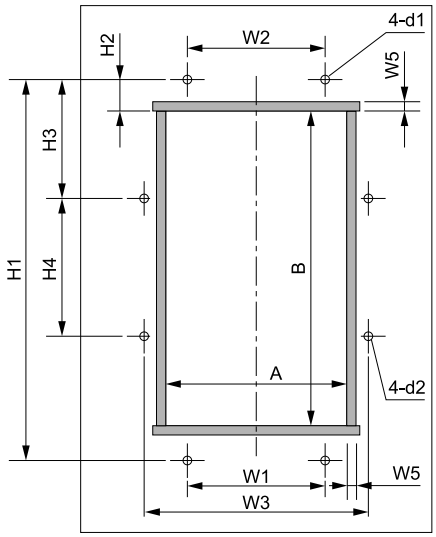


Figure 3.7 Panel Cut-Out Dimension Diagram 1

Model	Dimensions mm (in)											
	W1	W2	W3	W5	H1	H2	H3	H4	A	B	d1	d2
2004 - 2042 4002 - 4023	102 (4.02)	102 (4.02)	166 (6.54)	7 (0.28)	282 (11.10)	23 (0.91)	88 (3.46)	102 (4.02)	134 (5.28)	233 (9.17)	M5	M5
2056 4031, 4038	140 (5.51)	140 (5.51)	206 (8.11)	7 (0.28)	318 (12.52)	23.5 (0.93)	81.9 (3.22)	129 (5.08)	174 (6.85)	270 (10.63)	M5	M5
2070, 2082 4044, 4060	192 (7.56)	192 (7.56)	246 (9.69)	7 (0.28)	371 (14.61)	27 (1.06)	114.5 (4.51)	150 (5.91)	214 (8.43)	319 (12.56)	M6	M5
2110 4075	195 (7.68)	204 (8.03)	265.5 (10.45)	10 (0.39)	385 (15.16)	19.5 (0.77)	112.5 (4.43)	160 (6.30)	224 (8.82)	346 (13.62)	M6	M5

■ Models 2138, 4089, 4103

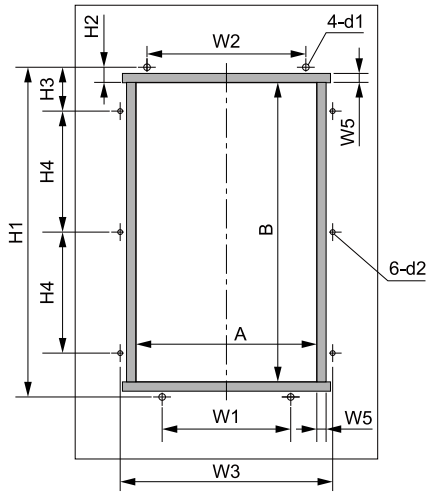


Figure 3.8 Panel Cut-Out Dimension Diagram 2

Model	Dimensions mm (in)											
	W1	W2	W3	W5	H1	H2	H3	H4	A	B	d1	d2
2138 4089, 4103	170 (6.69)	210 (8.27)	281 (11.06)	7 (0.28)	436 (17.17)	20 (0.79)	58 (2.28)	160 (6.30)	239 (9.41)	396 (15.59)	M6	M5

■ Models 2169, 2211, 4140, 4168

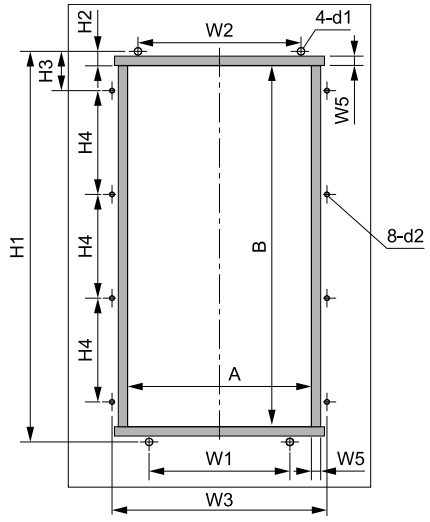


Figure 3.9 Panel Cut-Out Dimension Diagram 3

Model	Dimensions mm (in)											
	W1	W2	W3	W5	H1	H2	H3	H4	A	B	d1	d2
2169, 2211 4140, 4168	190 (7.48)	220 (8.66)	290 (11.42)	7 (0.28)	527 (20.75)	19.5 (0.77)	53 (2.09)	140 (5.51)	248 (9.76)	487 (19.17)	M8	M5

■ Models 2257, 2313, 4208 to 4302

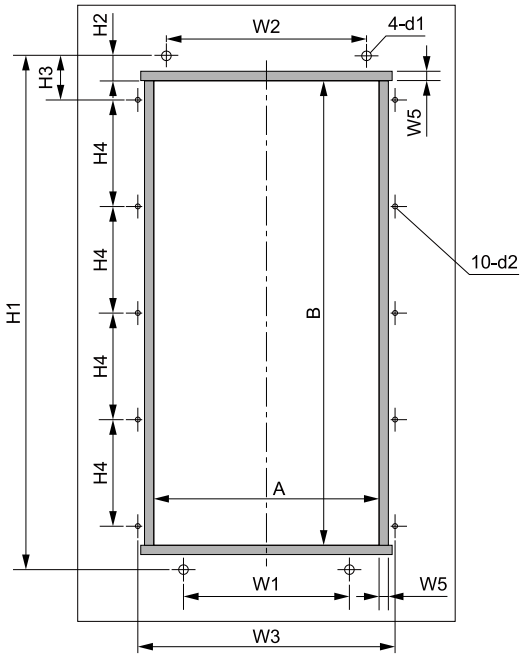


Figure 3.10 Panel Cut-Out Dimension Diagram 4

Model	Dimensions mm (in)											
	W1	W2	W3	W5	H1	H2	H3	H4	A	B	d1	d2
2257, 2313 4208 - 4302	218 (8.58)	263 (10.35)	338 (13.31)	7 (0.28)	675 (26.56)	33 (1.30)	60 (2.36)	139 (5.47)	296 (11.65)	610 (24.02)	M10	M5

■ Models 2360, 2415, 4371, 4414

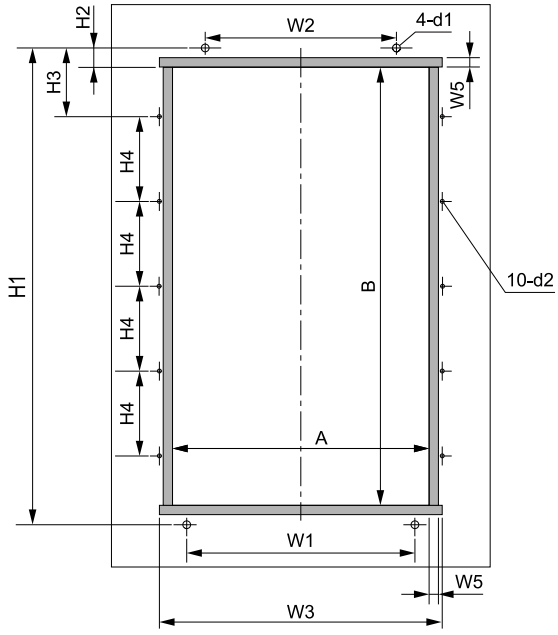


Figure 3.11 Panel Cut-Out Dimension Diagram 5

Model	Dimensions mm (in)											
	W1	W2	W3	W5	H1	H2	H3	H4	A	B	d1	d2
2360, 2415 4371, 4414	370 (14.57)	310 (12.20)	466 (18.35)	7 (0.28)	773 (30.43)	31.5 (1.24)	106.5 (4.19)	140 (5.51)	414 (16.30)	710 (27.95)	M12	M5

■ Models 4477 to 4720, 5382 to 5472

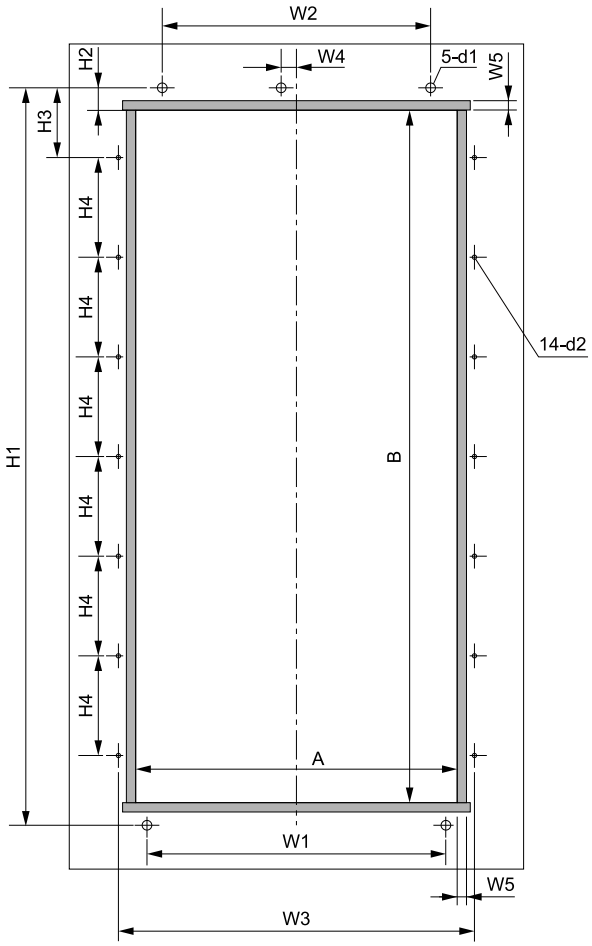


Figure 3.12 Panel Cut-Out Dimension Diagram 6

Model	Dimensions mm (in)												
	W1	W2	W3	W4	W5	H1	H2	H3	H4	A	B	d1	d2
4477 - 4720 5382 - 5472	450 (17.72)	404 (15.91)	536 (21.10)	23 (0.91)	7 (0.28)	1110 (43.70)	34 (1.34)	105 (4.13)	150 (5.91)	484 (19.06)	1042 (41.02)	M12	M5

◆ Estimated Weights (IP55/UL Type 12 Heatsink External Mounting)

Table 3.13 200 V Class (IP55/UL Type 12 Heatsink External Mounting)

Model	Est. Weight kg (lb)	Model	Est. Weight kg (lb)
2004	3.5 (7.72)	2018	3.9 (8.6)
2006	3.5 (7.72)	2021	3.9 (8.6)
2008	3.5 (7.72)	2030	4.2 (9.26)
2010	3.5 (7.72)	2042	4.2 (9.26)
2012	3.5 (7.72)	2056	6.0 (13.23)

Model	Est. Weight kg (lb)
2070	8.5 (18.74)
2082	9.5 (20.94)
2110	22.0 (48.5)
2138	25.0 (55.11)
2169	39.0 (85.98)

Model	Est. Weight kg (lb)
2211	40.0 (88.18)
2257	69.0 (152.12)
2313	69.0 (152.12)
2360	117.0 (257.94)
2415	120.0 (264.55)

Table 3.14 400 V Class (IP55/UL Type 12 Heatsink External Mounting)

Model	Est. Weight kg (lb)
4002	3.5 (7.72)
4004	3.5 (7.72)
4005	3.5 (7.72)
4007	3.9 (8.6)
4009	3.9 (8.6)
4012	3.9 (8.6)
4018	4.2 (9.26)
4023	4.2 (9.26)
4031	6.0 (13.23)
4038	6.0 (13.23)
4044	8.0 (17.64)
4060	13.0 (28.66)
4075	17.0 (37.48)

Model	Est. Weight kg (lb)
4089	22.0 (48.5)
4103	27.0 (59.52)
4140	41.0 (90.39)
4168	42.0 (92.59)
4208	74.0 (163.14)
4250	74.0 (163.14)
4302	74.0 (163.14)
4371	123.0 (271.16)
4414	127.0 (279.98)
4477	200.0 (440.92)
4568	200.0 (440.92)
4605	200.0 (440.92)
4720	213.0 (469.58)

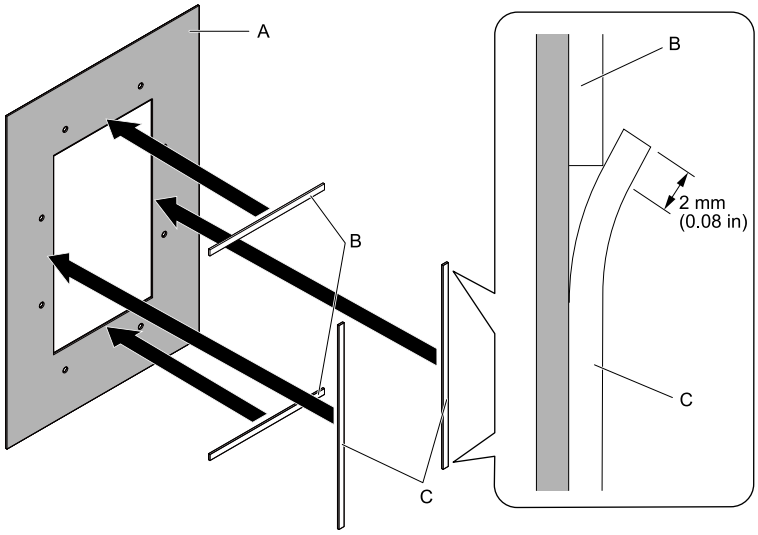
Table 3.15 600 V Class (IP55/UL Type 12 Heatsink External Mounting)

Model	Est. Weight kg (lb)
5382	212.0 (467.38)
5412	212.0 (467.38)
5472	212.0 (467.38)

◆ Install the Gasket

Cut an opening in the enclosure panel before you install the gasket. Refer to *Panel Cut-Out Dimensions (IP55/UL Type 12 Heatsink External Mounting) on page 18* for more information.

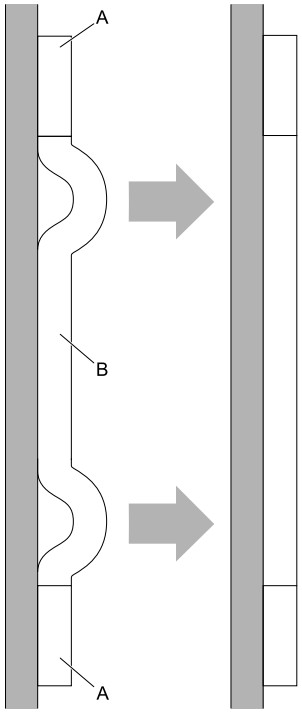
1. Install the upper and lower gaskets around the cut opening of the enclosure panel and then install the left and right gaskets.
   Overlap the ends of the left and right gaskets by 2 mm (0.08 in) over the upper and lower gaskets.



A - Enclosure panel
B - Upper and lower gasket
C - Left and right gasket

Figure 3.13 Install the Gasket

2. Push the overlapped part of the gasket and make a flat surface.
   Make sure that there are no gaps between the gaskets.



A - Upper and lower gasket
B - Left and right gasket

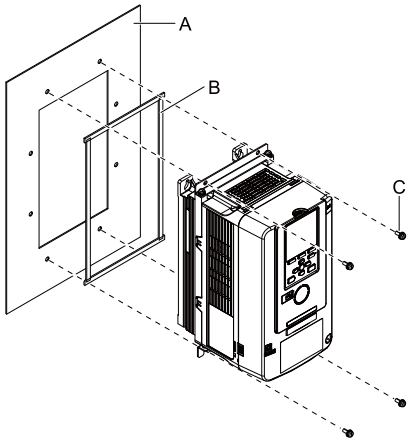
Figure 3.14

◆ Installation Procedure

■ Install the Drive (Procedure A)

Cut an opening in the enclosure panel before you install the attachment. Refer to *Panel Cut-Out Dimensions (IP55/UL Type 12 Heatsink External Mounting) on page 18* for more information.

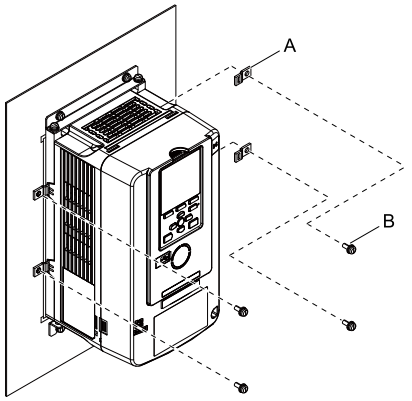
1. Install the drive in the cut opening of the enclosure panel and use screws to safety it to the enclosure panel.
   Tighten the screws to a correct tightening torque:
   - M5 screws: 1.96 N·m to 2.53 N·m (17.35 in·lb to 22.39 in·lb)
   - M6 screws: 3.92 N·m to 4.90 N·m (34.70 in·lb to 43.37 in·lb)



A - Enclosure panel
B - Gasket
C - M5 screws or M6 screws

Figure 3.15 Install the Drive into the Opening of the Enclosure Panel

2. Use screws to safety the panel supports.
   Tighten the screws to a correct tightening torque:
   - M5 screws: 1.96 N·m to 2.53 N·m (17.35 in·lb to 22.39 in·lb)

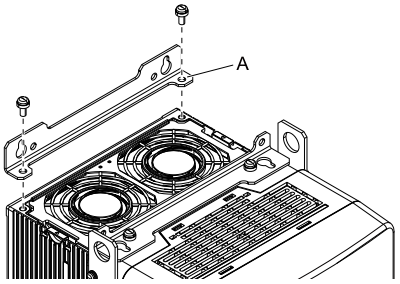


A - Panel supports
B - M5 screws

■ Install the Drive (Procedure B)

Cut an opening in the enclosure panel before you install the attachment. Refer to *Panel Cut-Out Dimensions (IP55/UL Type 12 Heatsink External Mounting) on page 18* for more information.

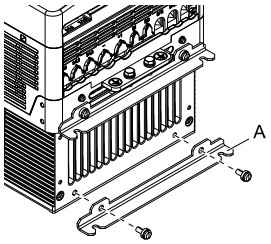
1. Remove the shipping attachment from the top of the drive.



A - Shipping attachment

Figure 3.16 Remove the Shipping Attachment

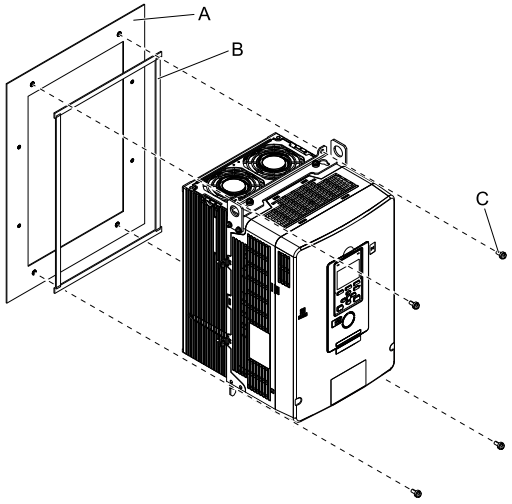
2. Remove the shipping attachment from the bottom of the drive.



A - Shipping attachment

Figure 3.17 Remove the Shipping Attachment

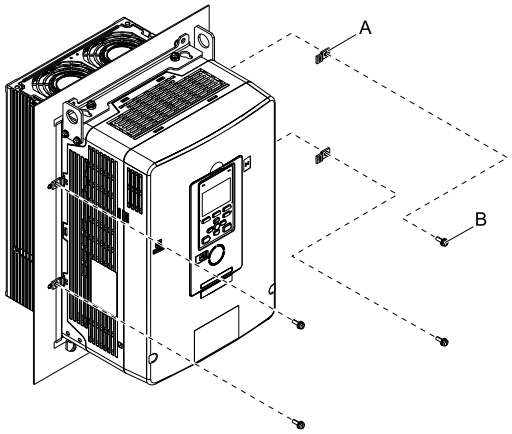
3. Install the drive in the cut opening of the enclosure panel and use screws to safety it to the enclosure panel.
   Tighten the screws to a correct tightening torque:
   - M6 screws: 3.92 N·m to 4.90 N·m (34.70 in·lb to 43.37 in·lb)



A - Enclosure panel
B - Gasket
C - M6 screws

Figure 3.18 Install the Drive into the Opening of the Enclosure Panel

4. Use screws to safety the panel supports.
   Tighten the screws to a correct tightening torque:
   - M5 screws: 1.96 N·m to 2.53 N·m (17.35 in·lb to 22.39 in·lb)

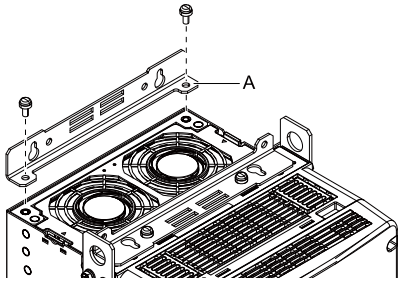


A - Panel supports **B - M5 screws**

■ Install the Drive (Procedure C)

Cut an opening in the enclosure panel before you install the attachment. Refer to *Panel Cut-Out Dimensions (IP55/UL Type 12 Heatsink External Mounting) on page 18* for more information.

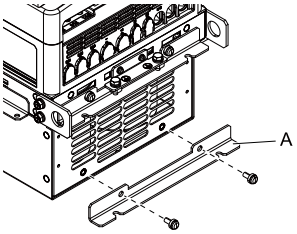
1. Remove the shipping attachment from the top of the drive.



A - Shipping attachment

Figure 3.19 Remove the Shipping Attachment

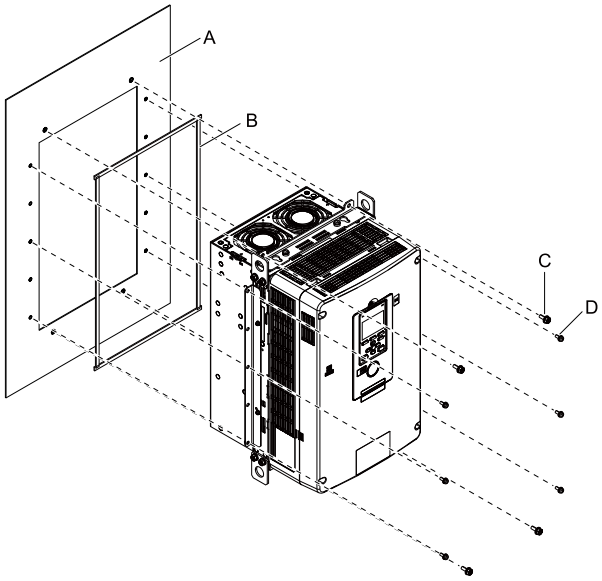
2. Remove the shipping attachment from the bottom of the drive.



A - Shipping attachment

Figure 3.20 Remove the Shipping Attachment

3. Install the drive in the cut opening of the enclosure panel and use screws to safety it to the enclosure panel. Tighten the screws to a correct tightening torque:
   - M5 screws: 1.96 N·m to 2.53 N·m (17.35 in·lb to 22.39 in·lb)
   - M6 screws: 3.92 N·m to 4.90 N·m (34.70 in·lb to 43.37 in·lb)
   - M8 screws: 8.83 N·m to 10.79 N·m (78.15 in·lb to 95.49 in·lb)



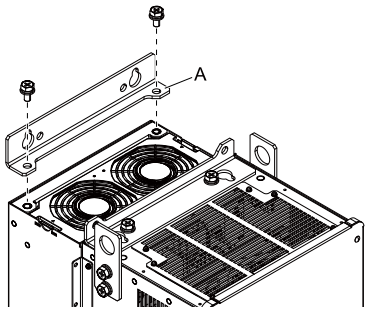
A - Enclosure panel
B - Gasket
C - M6 screws or M8 screws
D - M5 screws

Figure 3.21 Install the Drive into the Opening of the Enclosure Panel

■ Install the Drive (Procedure D)

Cut an opening in the enclosure panel before you install the attachment. Refer to *Panel Cut-Out Dimensions (IP55/UL Type 12 Heatsink External Mounting) on page 18* for more information.

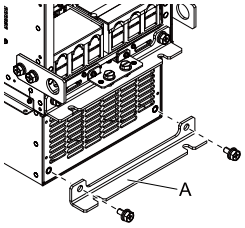
1. Remove the shipping attachment from the top of the drive.



A - Shipping attachment

Figure 3.22 Remove the Shipping Attachment

2. Remove the shipping attachment from the bottom of the drive.

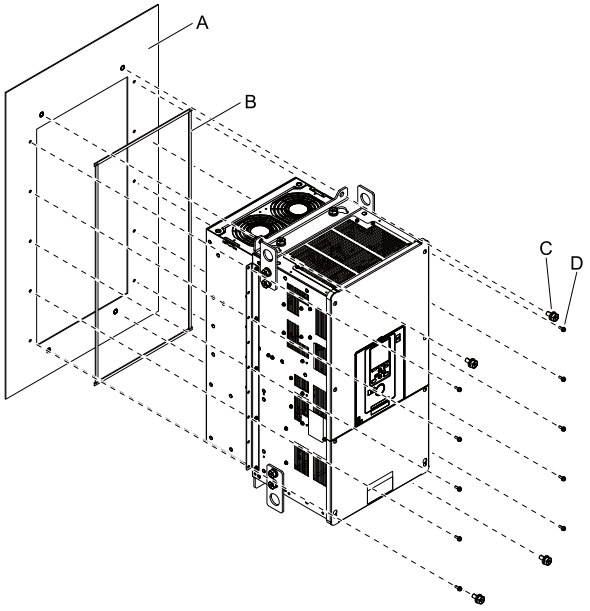


A - Shipping attachment

Figure 3.23 Remove the Shipping Attachment

3. Install the drive in the cut opening of the enclosure panel and use screws to safety it to the enclosure panel. Tighten the screws to a correct tightening torque:
   - M5 screws: 1.96 N·m to 2.53 N·m (17.35 in·lb to 22.39 in·lb)

- M10 screws: 17.65 N·m to 22.56 N·m (156.22 in·lb to 199.67 in·lb)
- M12 screws: 31.38 N·m to 39.23 N·m (277.74 in·lb to 347.22 in·lb)



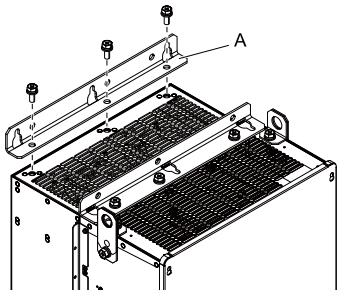
A - Enclosure panel
B - Gasket
C - M10 screws or M12 screws
D - M5 screws

Figure 3.24 Install the Drive into the Opening of the Enclosure Panel

■ Install the Drive (Procedure E)

Cut an opening in the enclosure panel before you install the attachment. Refer to *Panel Cut-Out Dimensions (IP55/UL Type 12 Heatsink External Mounting) on page 18* for more information.

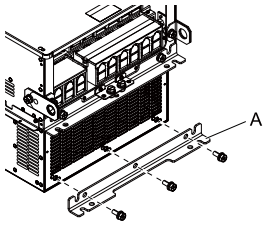
1. Remove the shipping attachment from the top of the drive.



A - Shipping attachment

Figure 3.25 Remove the Shipping Attachment

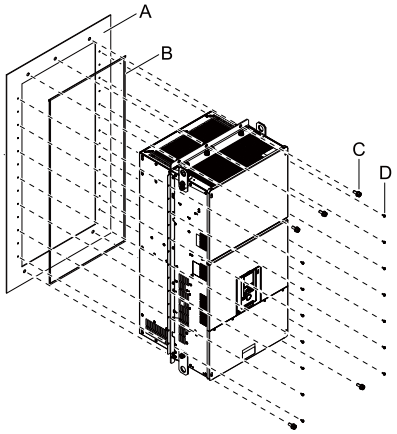
2. Remove the shipping attachment from the bottom of the drive.



A - Shipping attachment

Figure 3.26 Remove the Shipping Attachment

3. Install the drive in the cut opening of the enclosure panel and use screws to safety it to the enclosure panel. Tighten the screws to a correct tightening torque:
   - M5 screws: 1.96 N·m to 2.53 N·m (17.35 in·lb to 22.39 in·lb)
   - M12 screws: 31.38 N·m to 39.23 N·m (34.70 in·lb to 43.37 in·lb)



A - Enclosure panel
B - Gasket
C - M12 Screws
D - M5 screws

Figure 3.27 Install the Drive into the Opening of the Enclosure Panel

◆ Gasket Models

Table 3.16 Gasket Models (200 V Class)

Drive Model	Gasket (Vertical Side)	Gasket (Horizontal)
2004 - 2042	400-098-548-002	400-098-548-001
2056	400-098-548-004	400-098-548-003
2070, 2082	400-098-548-006	400-098-548-005
2110	400-105-823-002	400-105-823-001
2138	400-098-548-008	400-098-548-007
2169, 2211	400-098-548-010	400-098-548-009
2257, 2313	400-098-548-012	400-098-548-011
2360, 2415	400-098-548-014	400-098-548-013

Table 3.17 Gasket Models (400 V Class)

Drive Model	Gasket (Vertical Side)	Gasket (Horizontal)
4002 - 4023	400-098-548-002	400-098-548-001
4031, 4038	400-098-548-004	400-098-548-003
4044, 4060	400-098-548-006	400-098-548-005
4075	400-105-823-002	400-105-823-001
4089, 4103	400-098-548-008	400-098-548-008
4140, 4168	400-098-548-010	400-098-548-009
4208 - 4302	400-098-548-012	400-098-548-011
4371, 4414	400-098-548-014	400-098-548-013
4477 - 4720	400-098-548-016	400-098-548-015

Table 3.18 Gasket Models (600 V Class)

Drive Model	Gasket (Vertical Side)	Gasket (Horizontal)
5382 - 5472	400-098-548-016	400-098-548-015

4 Maintenance

Refer to the Maintenance & Troubleshooting Manual (TOEPYAIGA8001) for more information.

Only let authorized persons do maintenance, examine, or replace components on the drive.

Read this manual carefully and know all the precautions and safety information before installing, wiring, repairing, or examining the drive or replacing components.

Examine and maintain the drive and peripheral devices regularly to extend the life of the drive and decrease performance deterioration, decrease early wear, and decrease drive failures.

Regular examinations and maintenance will also decrease system downtime.

Refer to the Technical Reference (SIEPC71061737) for more information about maintenance and examinations.

Examine the drive one time each year at a minimum.

The operating conditions, environmental conditions, and use conditions will have an effect on the examination frequency for connected equipment.

Examine the drive more frequently if you use the drive in bad conditions or in these conditions:

- High ambient temperatures
- Frequent starting and stopping
- Changes in the AC power supply or load
- Too much vibration or shock loading
- Dust, metal dust, salt, sulfuric acid, or chlorine atmospheres
- Unsatisfactory storage conditions.

The drive has Maintenance Monitors that keep track of component wear and warn maintenance period when the estimated performance life is approaching. This Maintenance Monitor eliminates the need to shut down the entire system for unexpected problems.

Users can set alarm notifications to inform the maintenance periods for a specific drive component.

◆ Replace Cooling Fans and Circulation Fans

⚠ CAUTION *Injury to Personnel. Some fan units are not easily accessible from a standing position. Make sure that you can safely and comfortably remove and replace the fan. If you try to remove a fan that you cannot easily access, the fan unit can fall and cause minor to moderate injury.*

NOTICE *Use the instructions in this manual to replace the cooling fans. When you do maintenance on the fans, replace all the fans to increase product life. If you install the fans incorrectly, it can cause damage to the drive.*

■ Cooling Fans and Circulation Fans by Drive Model

Table 4.1 Cooling Fans and Circulation Fans (Three-Phase 200 V Class)

Model	Cooling Fan	Circulation fan	Procedure	Reference
2004 - 2012	-	-	-	-
2018, 2021	1	-	Procedure A	31
2030, 2042	2	-	Procedure B	33
2056 - 2082	2	-	Procedure C	35
2110 - 2211	2	-	Procedure D	37
2257 - 2313	2	-	Procedure E	40
2360, 2415	3	1	Procedure F	42

Table 4.2 Cooling Fans and Circulation Fans (Three-Phase 400 V Class)

Model	Cooling Fan	Circulation fan	Circuit Board Cooling Fan	Procedure	Reference
4002 - 4005	-	-	-	-	-
4007 - 4012	1	-	-	Procedure A	31
4018, 4023	2	-	-	Procedure B	33

Model	Cooling Fan	Circulation fan	Circuit Board Cooling Fan	Procedure	Reference
4031 - 4060	2	-	-	Procedure C	35
4075 - 4168	2	-	-	Procedure D	37
4208 - 4302	2	-	-	Procedure E	40
4371	2	1	-	Procedure F	42
4414	3	1	-	Procedure F	42
4477 - 4605	2	1	2	Procedure G	49
4720	3	1	2	Procedure H	57

Table 4.3 Cooling Fans and Circulation Fans (Three-Phase 600 V Class)

Model	Cooling Fan	Circulation fan	Circuit Board Cooling Fan	Procedure	Reference
5382 - 5472	3	1	2	Procedure H	57

■ Replace a Fan (Procedure A)

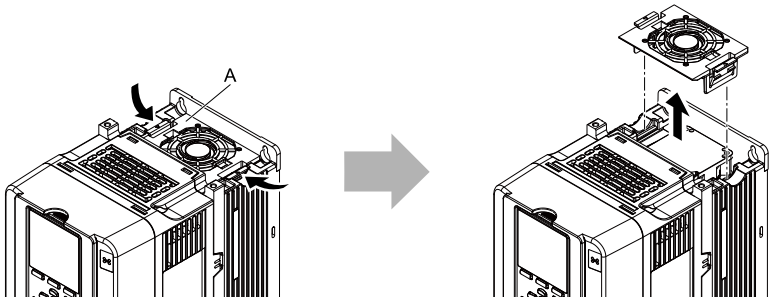
DANGER *Electrical Shock Hazard. Do not examine, connect, or disconnect wiring on an energized drive. Before servicing, disconnect all power to the equipment and wait for the time specified on the warning label at a minimum. The internal capacitor stays charged after the drive is de-energized. The charge indicator LED extinguishes when the DC bus voltage decreases below 50 Vdc. When all indicators are OFF, remove the covers before measuring for dangerous voltages to make sure that the drive is safe. If you do work on the drive when it is energized, it will cause serious injury or death from electrical shock.*

CAUTION *Burn Hazard. Do not touch a hot drive heatsink. De-energize the drive, wait for a minimum of 15 minutes, then make sure that the heatsink is cool before you replace the cooling fans. If you touch a hot drive heatsink, it can burn you.*

NOTICE *Use the instructions in this manual to replace the cooling fans. When you do maintenance on the fans, replace all the fans to increase product life. If you install the fans incorrectly, it can cause damage to the drive.*

Remove a Fan

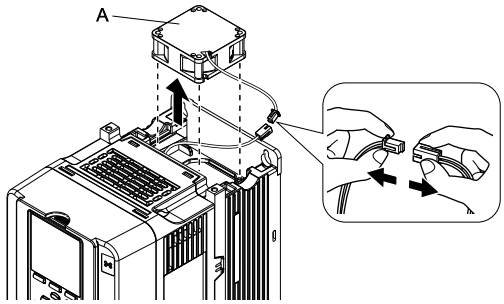
1. To remove the fan finger guard from the drive, push the hooks on the left and right sides of it and pull up.



A - Fan finger guard

Figure 4.1 Remove the Fan Finger Guard

2. Pull the cooling fan straight up from the drive. Disconnect the power supply connector and remove the fan from the drive.



A - Cooling fan

Figure 4.2 Remove the Cooling Fans

Install Fans

Reverse the removal procedure to install a cooling fan.

1. Connect the power supply connector between the drive and cooling fan.

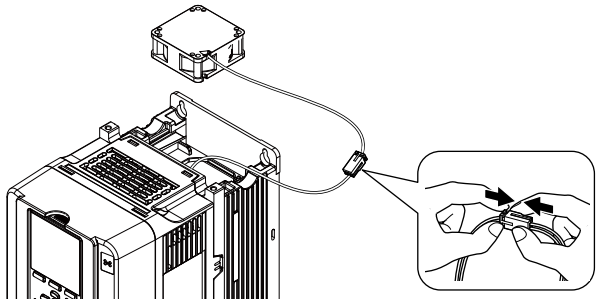
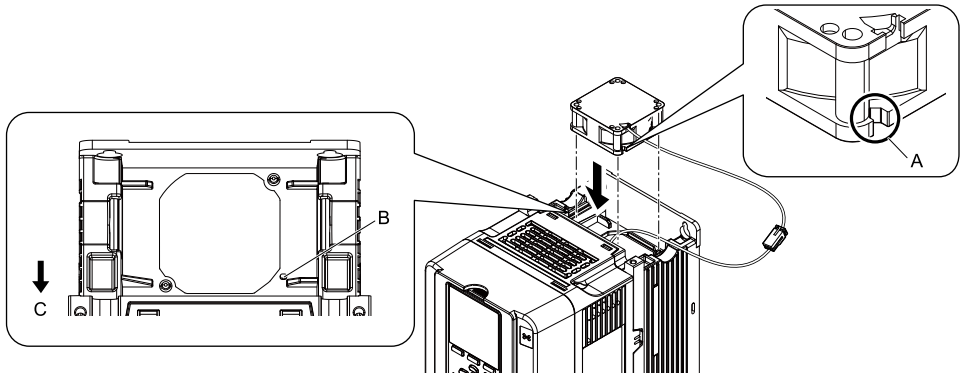


Figure 4.3 Connect the Power Supply Connector

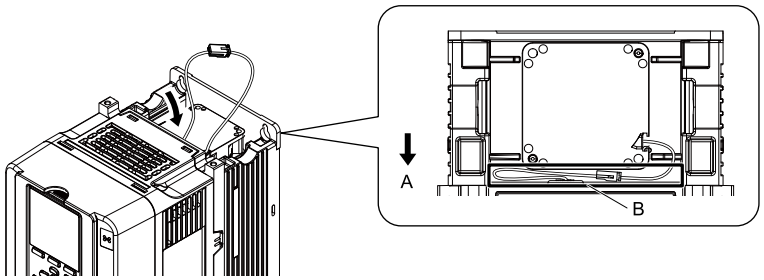
2. Align the notches on the fans with the pins on the drive and install the cooling fan in the drive.



A - Notch on fan
B - Alignment pins on drive
C - Front of drive

Figure 4.4 Install the Cooling Fan

3. Put the cable and connector in the recess of the drive.



A - Front of drive
B - Space for cable *1

Figure 4.5 Put the Cable and Connector in the Drive Recess

*1 Make sure that the cable and connector are in the correct space.

4. Insert the fan finger guard straight until the hook clicks into place.

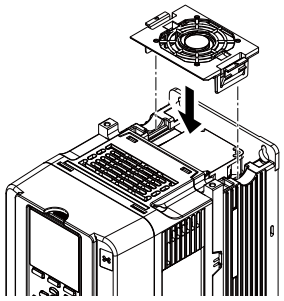


Figure 4.6 Reattach the Fan Finger Guard

5. Energize the drive and set *o4-03 = 0 [Fan Operation Time Setting = 0 h]* to reset the cooling fan operation time.

■ Replace a Fan (Procedure B)

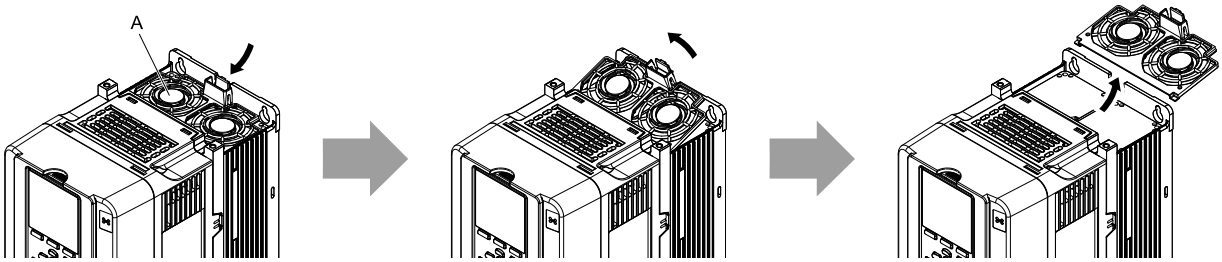
DANGER *Electrical Shock Hazard. Do not examine, connect, or disconnect wiring on an energized drive. Before servicing, disconnect all power to the equipment and wait for the time specified on the warning label at a minimum. The internal capacitor stays charged after the drive is de-energized. The charge indicator LED extinguishes when the DC bus voltage decreases below 50 Vdc. When all indicators are OFF, remove the covers before measuring for dangerous voltages to make sure that the drive is safe. If you do work on the drive when it is energized, it will cause serious injury or death from electrical shock.*

CAUTION *Burn Hazard. Do not touch a hot drive heatsink. De-energize the drive, wait for a minimum of 15 minutes, then make sure that the heatsink is cool before you replace the cooling fans. If you touch a hot drive heatsink, it can burn you.*

NOTICE *Use the instructions in this manual to replace the cooling fans. When you do maintenance on the fans, replace all the fans to increase product life. If you install the fans incorrectly, it can cause damage to the drive.*

Remove a Fan

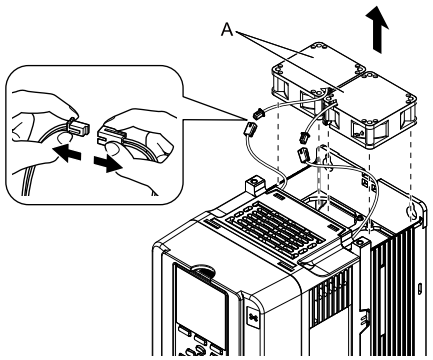
1. To remove the fan finger guard from the drive, push the hook on the back side of the fan finger guard and pull up.



A - Fan finger guard

Figure 4.7 Remove the Fan Finger Guard

2. Pull the cooling fan straight up from the drive. Disconnect the power supply connector and remove the fan from the drive.



A - Cooling fan

Figure 4.8 Remove the Cooling Fans

Install Fans

Reverse the removal procedure to install a cooling fan.

1. Connect the power supply connector between the drive and cooling fan.

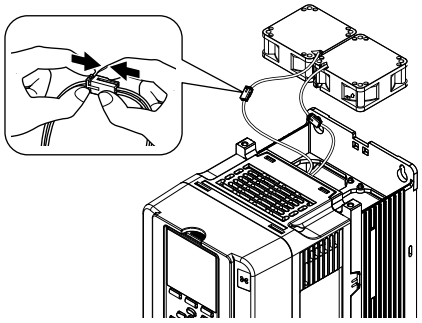
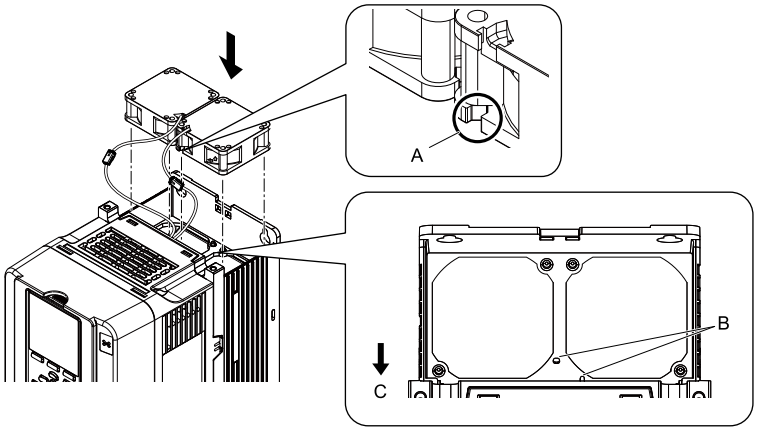


Figure 4.9 Connect the Power Supply Connector

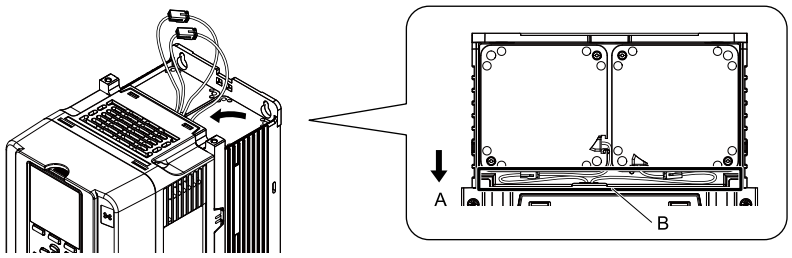
2. Align the notches on the fans with the pins on the drive and install the cooling fan in the drive.



A - Notch on fan
B - Alignment pins on drive
C - Front of drive

Figure 4.10 Install the Cooling Fan

3. Put the cable in the recess of the drive.

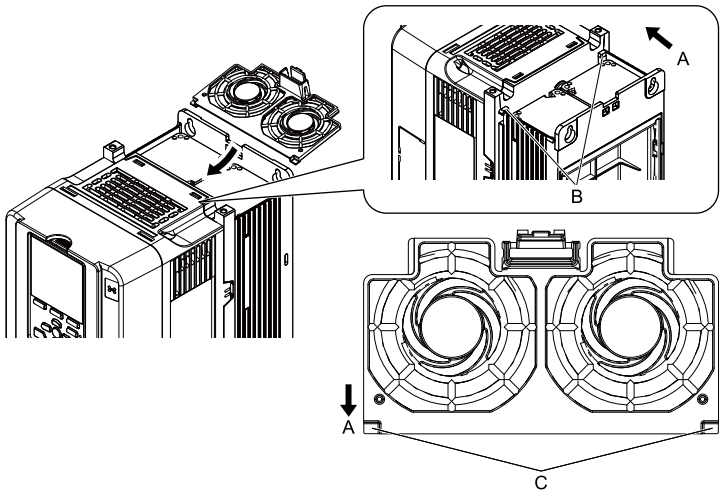


A - Front of drive **B - Space for cable** *1

Figure 4.11 Put the Cable and Connector in the Drive Recess

*1 Make sure that the cable and connector are in the correct space.

4. Hold the fan finger guard at an angle and put the connector tabs on the fan finger guard into the holes on the drive.



A - Front of drive **C - Connector tabs**
B - Drive holes

Figure 4.12 Reattach the Fan Finger Guard

5. Push the hook on the back side of the fan finger guard and click it into place on the drive.

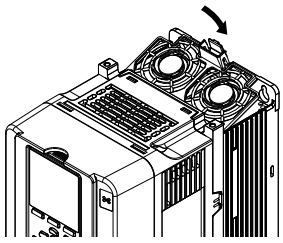


Figure 4.13 Reattach the Fan Finger Guard

6. Energize the drive and set *o4-03 = 0 [Fan Operation Time Setting = 0 h]* to reset the cooling fan operation time.

■ Replace a Fan (Procedure C)

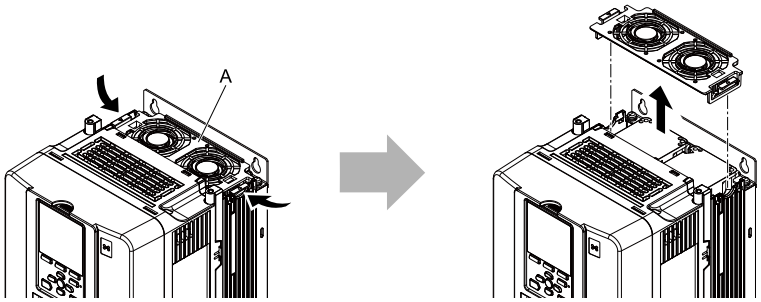
DANGER *Electrical Shock Hazard. Do not examine, connect, or disconnect wiring on an energized drive. Before servicing, disconnect all power to the equipment and wait for the time specified on the warning label at a minimum. The internal capacitor stays charged after the drive is de-energized. The charge indicator LED extinguishes when the DC bus voltage decreases below 50 Vdc. When all indicators are OFF, remove the covers before measuring for dangerous voltages to make sure that the drive is safe. If you do work on the drive when it is energized, it will cause serious injury or death from electrical shock.*

⚠ CAUTION *Burn Hazard. Do not touch a hot drive heatsink. De-energize the drive, wait for a minimum of 15 minutes, then make sure that the heatsink is cool before you replace the cooling fans. If you touch a hot drive heatsink, it can burn you.*

NOTICE *Use the instructions in this manual to replace the cooling fans. When you do maintenance on the fans, replace all the fans to increase product life. If you install the fans incorrectly, it can cause damage to the drive.*

Remove a Fan

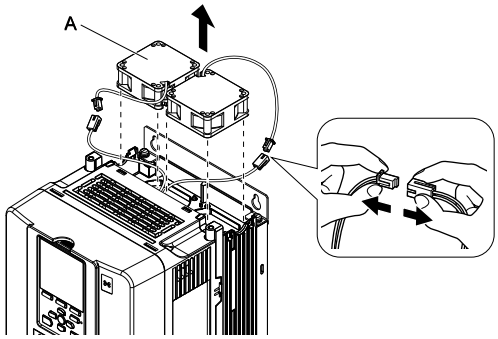
1. To remove the fan finger guard from the drive, push the hooks on the left and right sides of it and pull up.



A - Fan finger guard

Figure 4.14 Remove the Fan Finger Guard

2. Pull the cooling fan straight up from the drive. Disconnect the power supply connector and remove the fan from the drive.



A - Cooling fan

Figure 4.15 Remove the Cooling Fans

Install Fans

Reverse the removal procedure to install a cooling fan.

1. Connect the power supply connector between the drive and cooling fan.

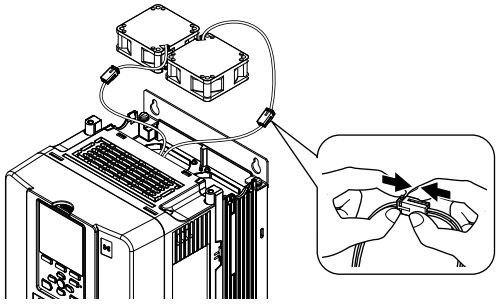
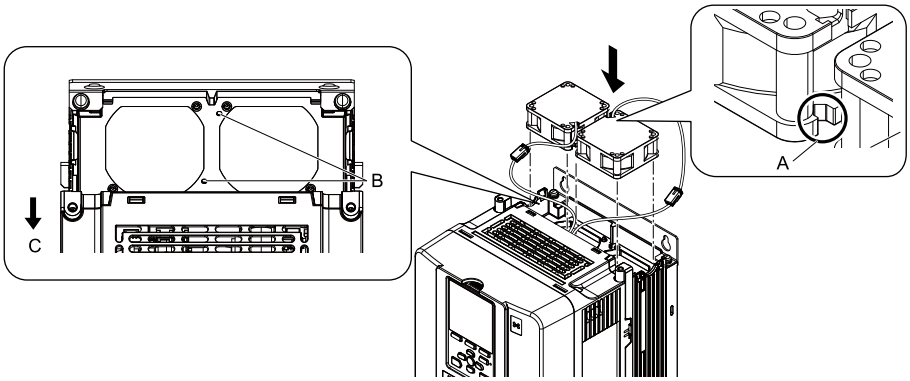


Figure 4.16 Connect the Power Supply Connector

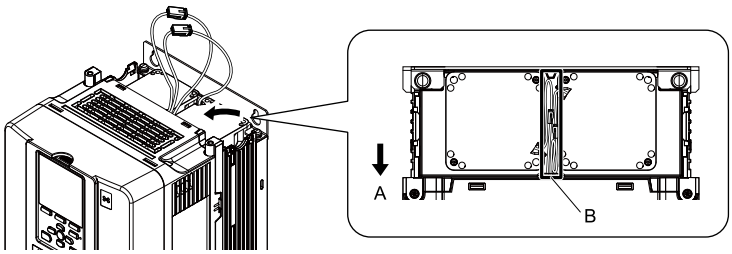
2. Align the notches on the fans with the pins on the drive and install the cooling fan in the drive.



A - Notch on fan
B - Alignment pins on drive
C - Front of drive

Figure 4.17 Install the Cooling Fan

3. Put the cable and connector in the recess of the drive.



A - Front of drive
B - Space for cable *1

Figure 4.18 Put the Cable and Connector in the Drive Recess

*1 Make sure that the cable and connector are in the correct space.

4. Insert the fan finger guard straight until the hook clicks into place.

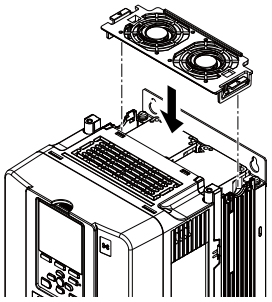


Figure 4.19 Reattach the Fan Finger Guard

5. Energize the drive and set *o4-03 = 0 [Fan Operation Time Setting = 0 h]* to reset the cooling fan operation time.

■ Replace a Fan (Procedure D)

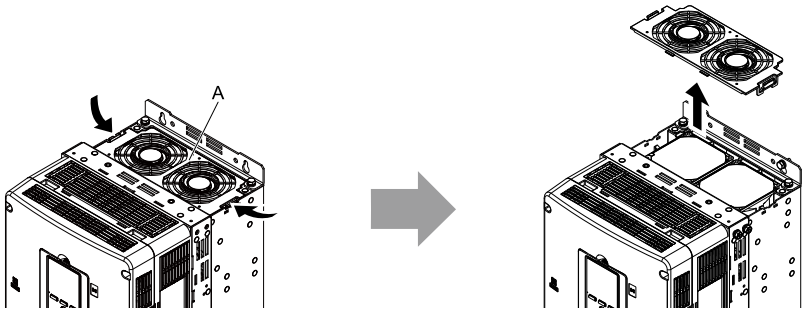
DANGER *Electrical Shock Hazard. Do not examine, connect, or disconnect wiring on an energized drive. Before servicing, disconnect all power to the equipment and wait for the time specified on the warning label at a minimum. The internal capacitor stays charged after the drive is de-energized. The charge indicator LED extinguishes when the DC bus voltage decreases below 50 Vdc. When all indicators are OFF, remove the covers before measuring for dangerous voltages to make sure that the drive is safe. If you do work on the drive when it is energized, it will cause serious injury or death from electrical shock.*

CAUTION *Burn Hazard. Do not touch a hot drive heatsink. De-energize the drive, wait for a minimum of 15 minutes, then make sure that the heatsink is cool before you replace the cooling fans. If you touch a hot drive heatsink, it can burn you.*

NOTICE *Use the instructions in this manual to replace the cooling fans. When you do maintenance on the fans, replace all the fans to increase product life. If you install the fans incorrectly, it can cause damage to the drive.*

Remove a Fan

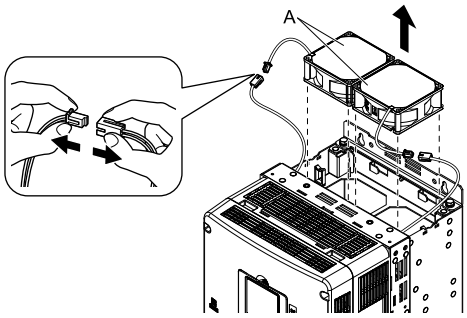
1. To remove the fan finger guard from the drive, push the hooks on the left and right sides of it and pull up.



A - Fan finger guard

Figure 4.20 Remove the Fan Finger Guard

2. Pull the cooling fan straight up from the drive. Disconnect the power supply connector and remove the fan from the drive.



A - Cooling fan

Figure 4.21 Remove the Cooling Fan

Install Fans

Reverse the removal procedure to install a cooling fan.

1. Connect the power supply connector between the drive and cooling fan.

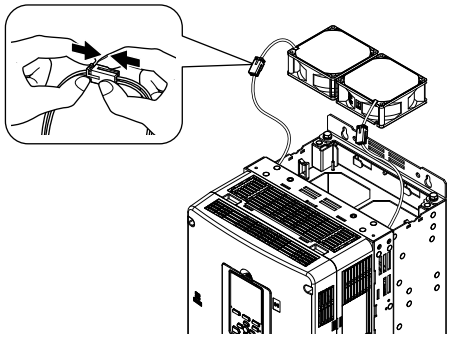
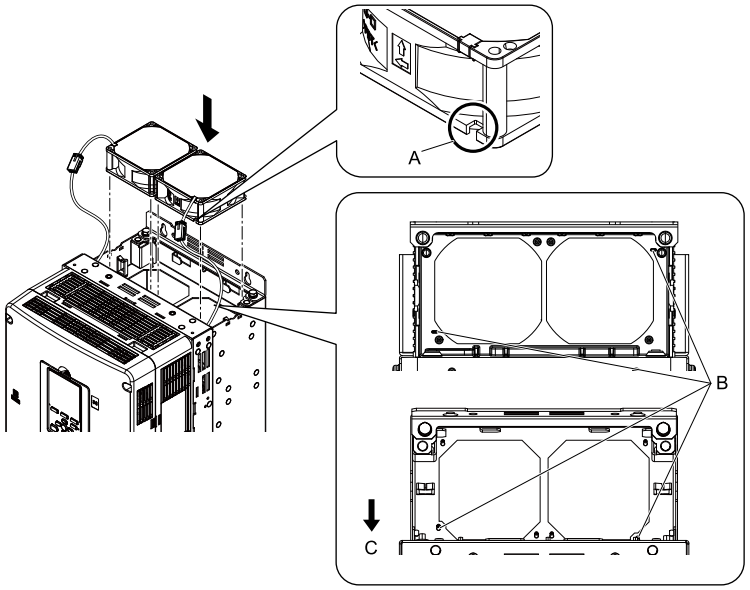


Figure 4.22 Connect the Power Supply Connector

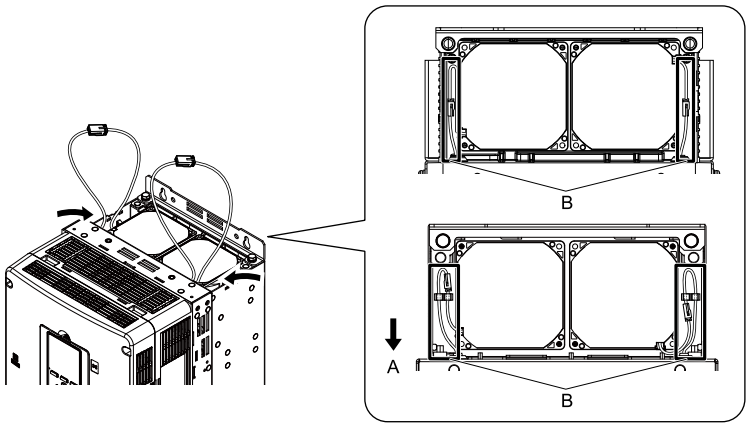
2. Align the notches on the fans with the pins on the drive and install the cooling fan in the drive.



A - Notch on fan
B - Alignment pins on drive
C - Front of drive

Figure 4.23 Install the Cooling Fan

3. Put the cable and connector in the recess of the drive.



A - Front of drive
B - Space for cable *1

Figure 4.24 Put the Cable and Connector in the Drive Recess

*1 Make sure that the cable and connector are in the correct space.

4. Push the hooks on the left and right sides of the fan finger guard and click it into place on the drive.

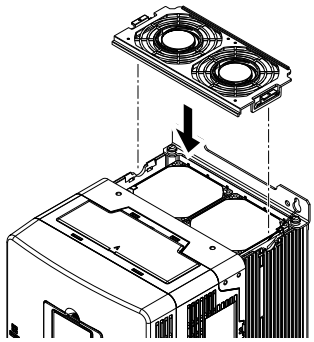


Figure 4.25 Reattach the Fan Finger Guard

5. Energize the drive and set *o4-03 = 0 [Fan Operation Time Setting = 0 h]* to reset the cooling fan operation time.

■ Replace a Fan (Procedure E)

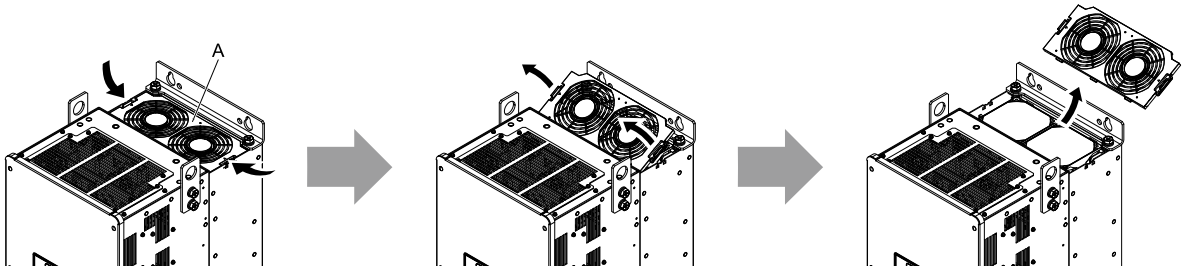
DANGER *Electrical Shock Hazard. Do not examine, connect, or disconnect wiring on an energized drive. Before servicing, disconnect all power to the equipment and wait for the time specified on the warning label at a minimum. The internal capacitor stays charged after the drive is de-energized. The charge indicator LED extinguishes when the DC bus voltage decreases below 50 Vdc. When all indicators are OFF, remove the covers before measuring for dangerous voltages to make sure that the drive is safe. If you do work on the drive when it is energized, it will cause serious injury or death from electrical shock.*

CAUTION *Burn Hazard. Do not touch a hot drive heatsink. De-energize the drive, wait for a minimum of 15 minutes, then make sure that the heatsink is cool before you replace the cooling fans. If you touch a hot drive heatsink, it can burn you.*

NOTICE *Use the instructions in this manual to replace the cooling fans. When you do maintenance on the fans, replace all the fans to increase product life. If you install the fans incorrectly, it can cause damage to the drive.*

Remove a Fan

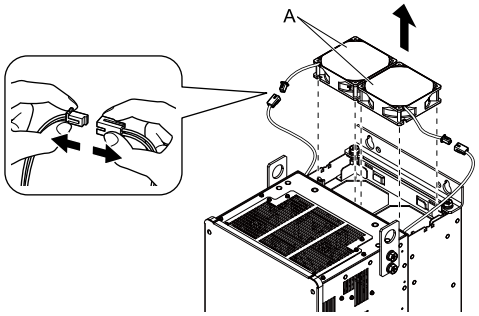
1. To remove the fan finger guard from the drive, push the tabs on the left and right sides of it and pull up the back side of the guard.



A - Fan finger guard

Figure 4.26 Remove the Fan Finger Guard

2. Pull the cooling fan straight up from the drive. Disconnect the power supply connector and remove the fan from the drive.



A - Cooling fan

Figure 4.27 Remove the Cooling Fans

Install Fans

Reverse the removal procedure to install a cooling fan.

1. Connect the power supply connector between the drive and cooling fan.

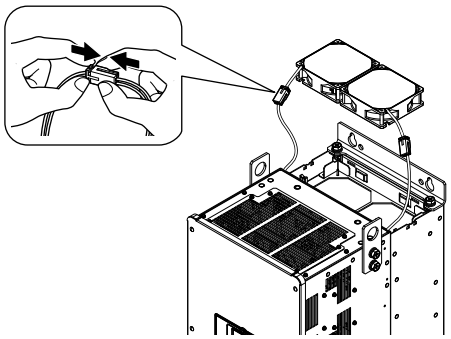
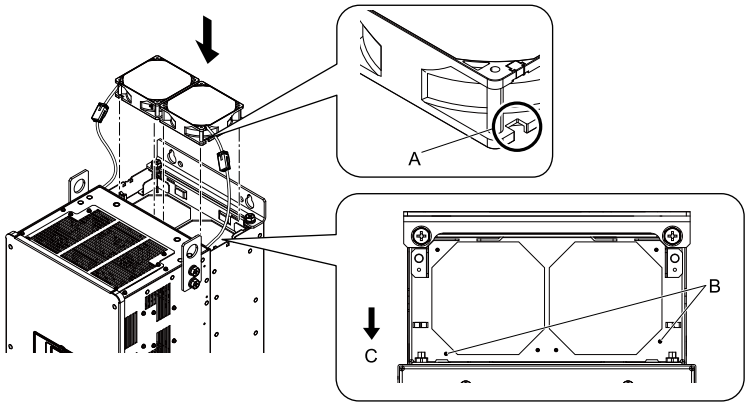


Figure 4.28 Connect the Power Supply Connector

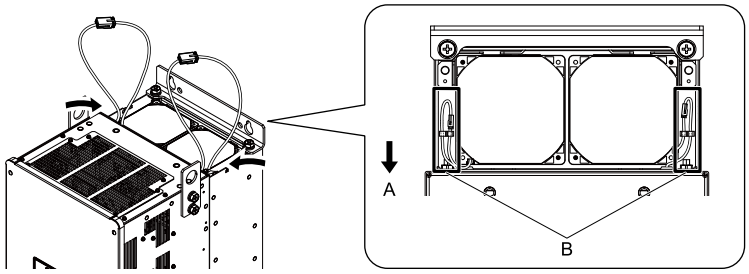
2. Align the notches on the fans with the pins on the drive and install the cooling fan in the drive.



A - Notch on fan
B - Alignment pins on drive
C - Front of drive

Figure 4.29 Install the Cooling Fan

3. Put the cable and connector in the recess of the drive.

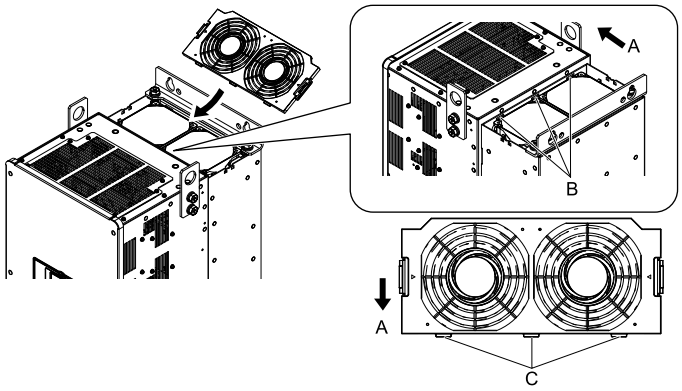


A - Front of drive
B - Space for cable *1

Figure 4.30 Put the Cable and Connector in the Drive Recess

*1 Make sure that the cable and connector are in the correct space.

4. Hold the fan finger guard at an angle and put the connector tabs on the fan finger guard into the holes on the drive.



A - Front of drive
B - Drive holes
C - Connector tabs

Figure 4.31 Reattach the Fan Finger Guard

5. Push the hooks on the left and right sides of the fan finger guard and click it into place on the drive.

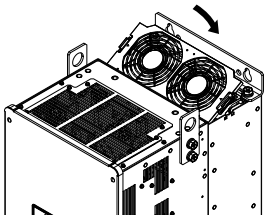


Figure 4.32 Reattach the Fan Finger Guard

6. Energize the drive and set *o4-03 = 0 [Fan Operation Time Setting = 0 h]* to reset the cooling fan operation time.

■ Replace Fans (Procedure F)

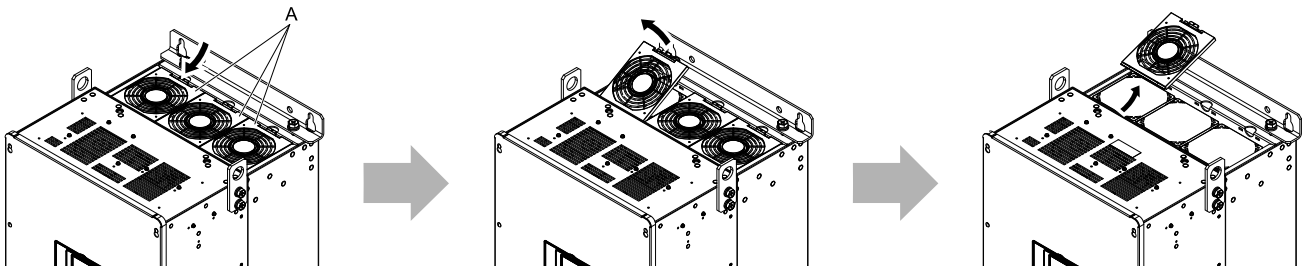
DANGER *Electrical Shock Hazard. Do not examine, connect, or disconnect wiring on an energized drive. Before servicing, disconnect all power to the equipment and wait for the time specified on the warning label at a minimum. The internal capacitor stays charged after the drive is de-energized. The charge indicator LED extinguishes when the DC bus voltage decreases below 50 Vdc. When all indicators are OFF, remove the covers before measuring for dangerous voltages to make sure that the drive is safe. If you do work on the drive when it is energized, it will cause serious injury or death from electrical shock.*

CAUTION *Burn Hazard. Do not touch a hot drive heatsink. De-energize the drive, wait for a minimum of 15 minutes, then make sure that the heatsink is cool before you replace the cooling fans. If you touch a hot drive heatsink, it can burn you.*

NOTICE *Use the instructions in this manual to replace the cooling fans. When you do maintenance on the fans, replace all the fans to increase product life. If you install the fans incorrectly, it can cause damage to the drive.*

Remove a Fan

1. To remove the fan finger guards from the drive, push the hook on the back side of each guard and pull up.

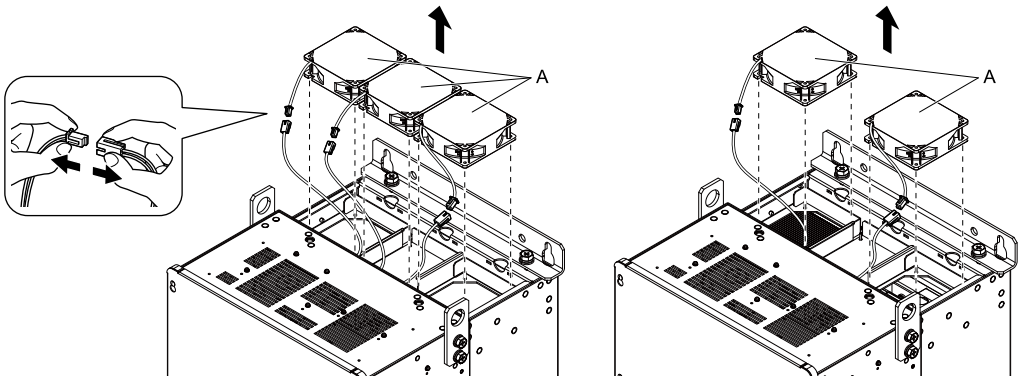


A - Fan finger guard

Figure 4.33 Remove the Fan Finger Guard

2. Pull the cooling fan straight up from the drive. Disconnect the power supply connector and remove the fan from the drive.

Note:
The number of fans is different for different drive models.



A - Cooling fan

Figure 4.34 Remove the Cooling Fans

Install the Cooling Fans

Reverse the removal procedure to install a fan unit.

1. Connect the power supply connector.

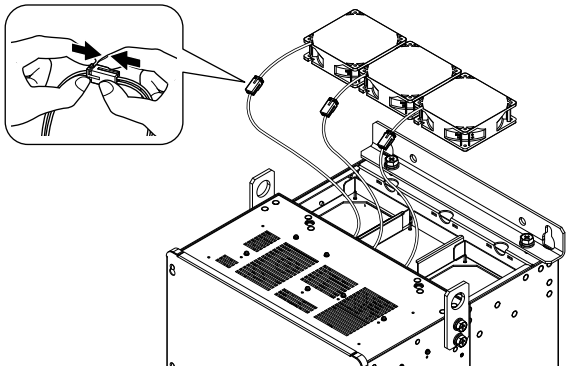
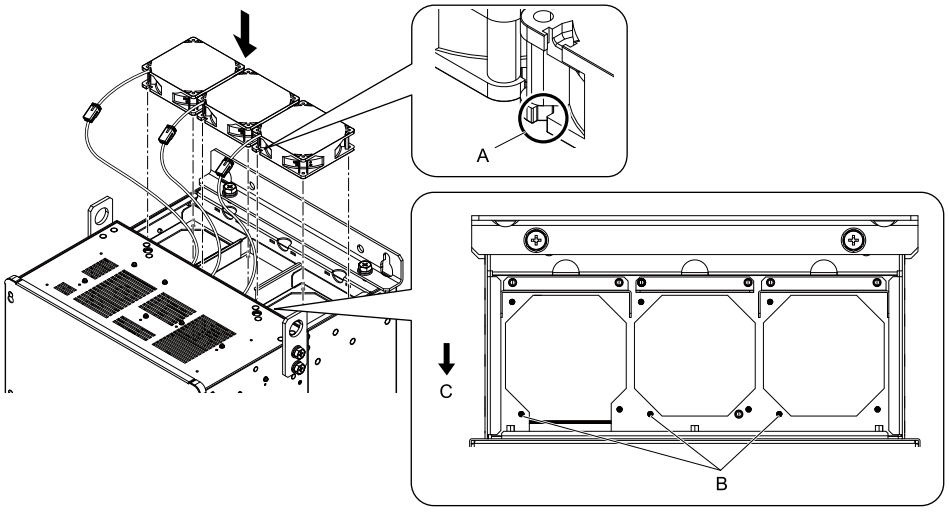


Figure 4.35 Connect the Power Supply Connector

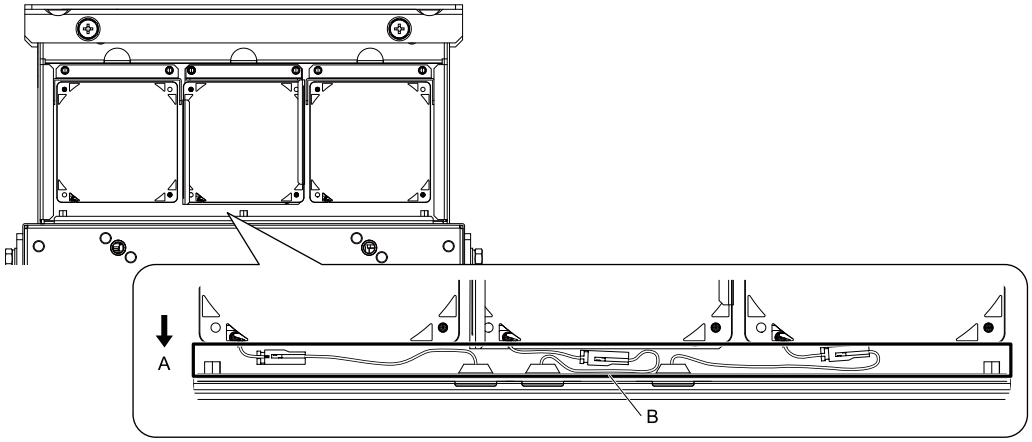
2. Align the notches on the fans with the pins on the drive and install the cooling fan in the drive.



A - Notch on fan
B - Alignment pins on drive
C - Front of drive

Figure 4.36 Install the Cooling Fans

3. Put the cable and connector in the recess of the drive.



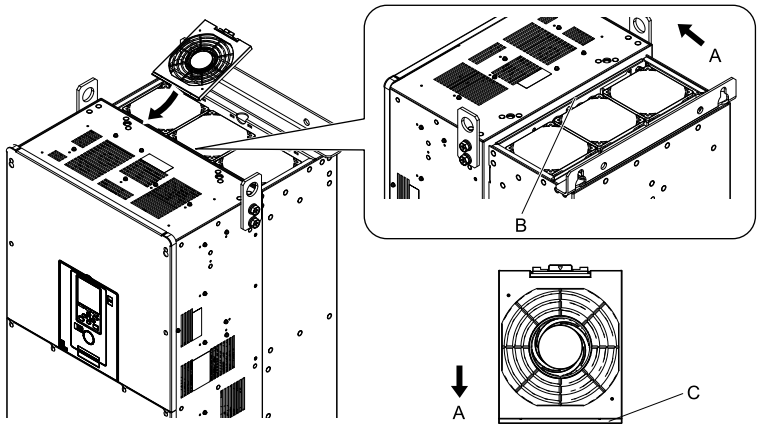
A - Front of drive
B - Space for cable *1

Figure 4.37 Put the Cable and Connector in the Drive Recess

*1 Make sure that the cable and connector are in the correct space.

4. Hold the fan finger guard at an angle and put the connector tabs on the fan finger guard into the holes on the drive.

Note:
When you install the cooling fan, make sure that you do not pinch cables between the fan finger guard and the drive.



A - Front of drive
B - Insertion area
C - Tab

Figure 4.38 Reattach the Fan Finger Guard

5. Push the hook on the back side of the fan finger guard and click it into place on the drive.

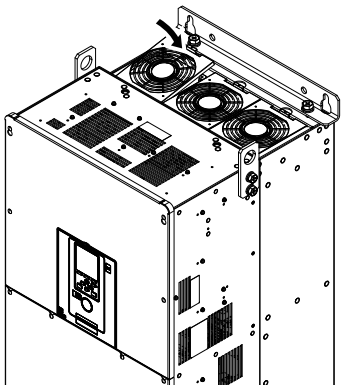


Figure 4.39 Reattach the Fan Finger Guard

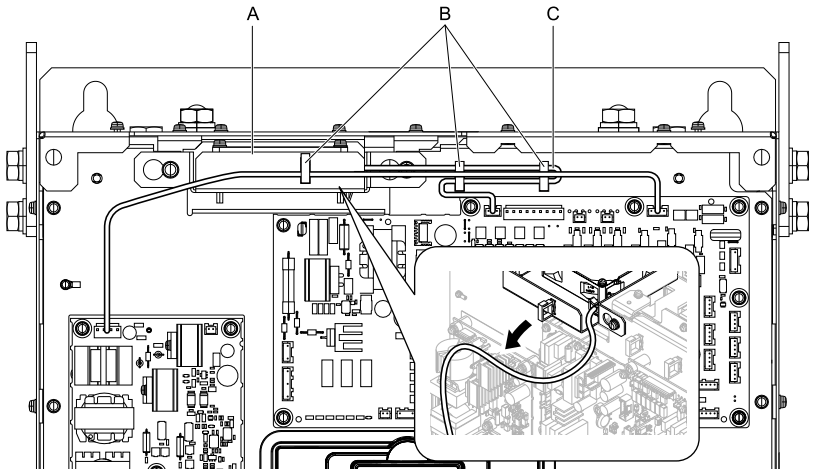
6. Energize the drive and set *o4-03 = 0 [Fan Operation Time Setting = 0 h]* to reset the cooling fan operation time.

Remove a Circulation Fan

Remove the drive cover before you start this procedure.

⚠ CAUTION *Crush Hazard. Loosen the cover screws. Do not fully remove them. If you fully remove the cover screws, the terminal cover can fall and cause moderate injury.*

1. Remove the cables from the clamps.

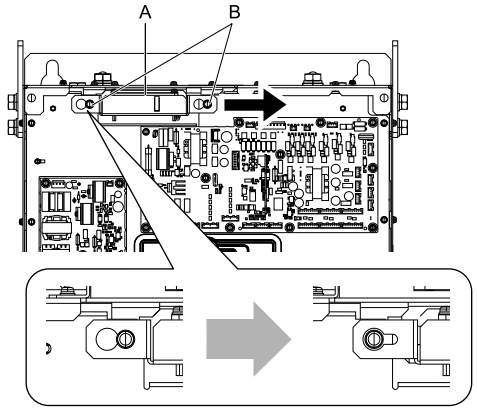


A - Fan unit
B - Clamps
C - Fan cable

Figure 4.40 Remove the Fan Cables

2. Loosen the fan unit screws and slide the fan unit to the right.

Note:
To remove the fan unit, it is only necessary to loosen the screws.



A - Fan unit
B - Screws

Figure 4.41 Slide the Fan Unit

3. Disconnect the relay connector and remove the fan unit.

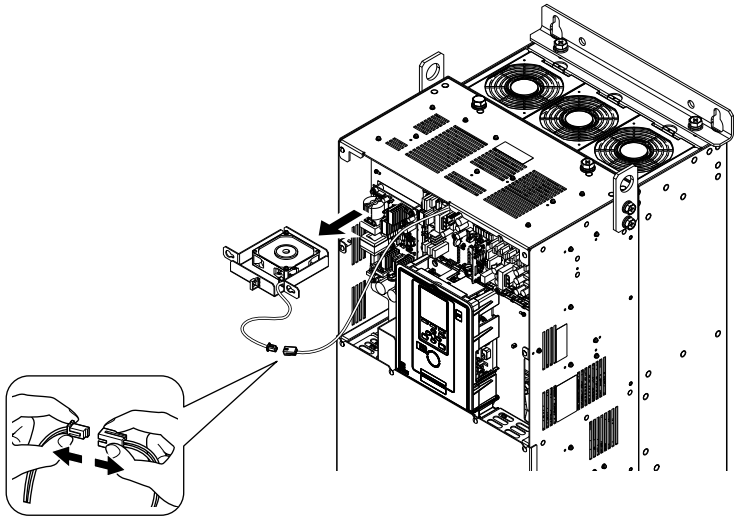
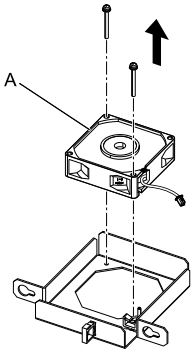


Figure 4.42 Remove the Fan Unit

4. Remove the screws that safety the cooling fan and remove the fan.



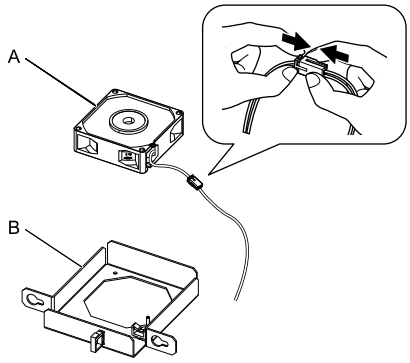
A - Cooling fan

Figure 4.43 Remove the Cooling Fan

Install a Circulation Fan

Reverse the removal procedure to install a circulation fan.

1. Connect the power supply connector.

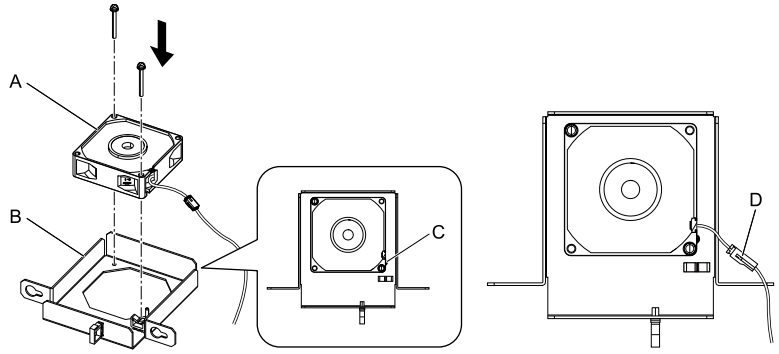


A - Cooling fan **B - Fan unit base**

Figure 4.44 Connect the Power Supply Connector

2. Align the pins on the fan unit base with the notches on the fan and put the fan unit base in the fan unit, then use the screws to safety it.
   Tighten the screws to a correct tightening torque:

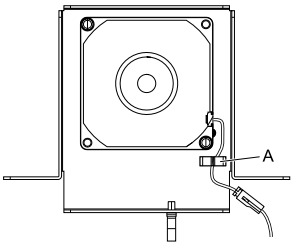
- 0.98 N·m to 1.33 N·m (8.67 in·lb to 11.77 in·lb)



A - Cooling fan
B - Fan unit base
C - Alignment pin on fan unit base
D - Circulation fan connector

Figure 4.45 Install the Cooling Fan

3. Safety the fan cable through the clamp.



A - Clamp

Figure 4.46 Safety the Fan Cable

4. Put the fan unit into the specified location and slide it to the left, then use screws to safety it to the drive. Tighten the screws to a correct tightening torque:
   - 0.98 N·m to 1.33 N·m (8.67 in·lb to 11.77 in·lb)

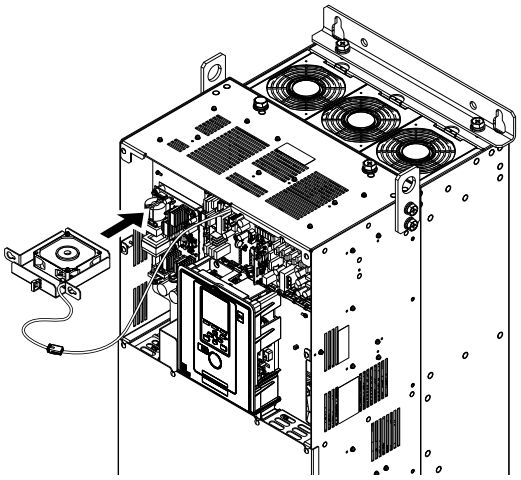
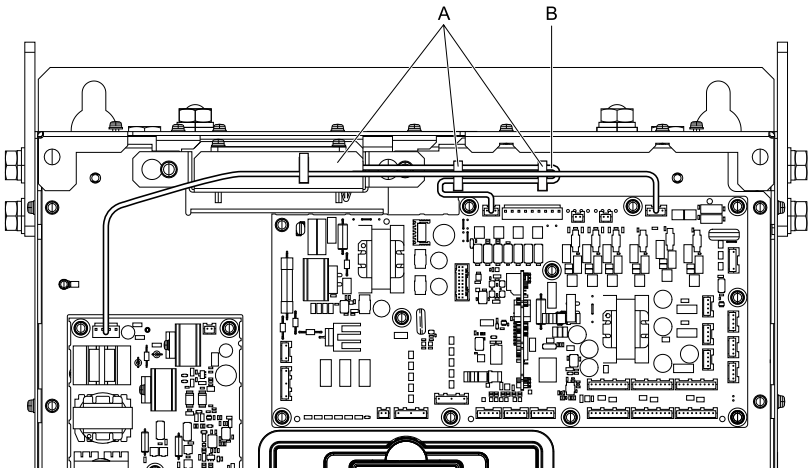


Figure 4.47 Install the Fan Unit

5. Safety the cables through the clamps.



A - Clamps **B - Fan cable**

Figure 4.48 Safety the fan cable through the clamps.

6. Install the drive cover.
7. Energize the drive and set *o4-03 = 0 [Fan Operation Time Setting = 0 h]* to reset the cooling fan operation time.

■ Replace Fans (Procedure G)

DANGER *Electrical Shock Hazard. Do not examine, connect, or disconnect wiring on an energized drive. Before servicing, disconnect all power to the equipment and wait for the time specified on the warning label at a minimum. The internal capacitor stays charged after the drive is de-energized. The charge indicator LED extinguishes when the DC bus voltage decreases below 50 Vdc. When all indicators are OFF, remove the covers before measuring for dangerous voltages to make sure that the drive is safe. If you do work on the drive when it is energized, it will cause serious injury or death from electrical shock.*

CAUTION *Burn Hazard. Do not touch a hot drive heatsink. De-energize the drive, wait for a minimum of 15 minutes, then make sure that the heatsink is cool before you replace the cooling fans. If you touch a hot drive heatsink, it can burn you.*

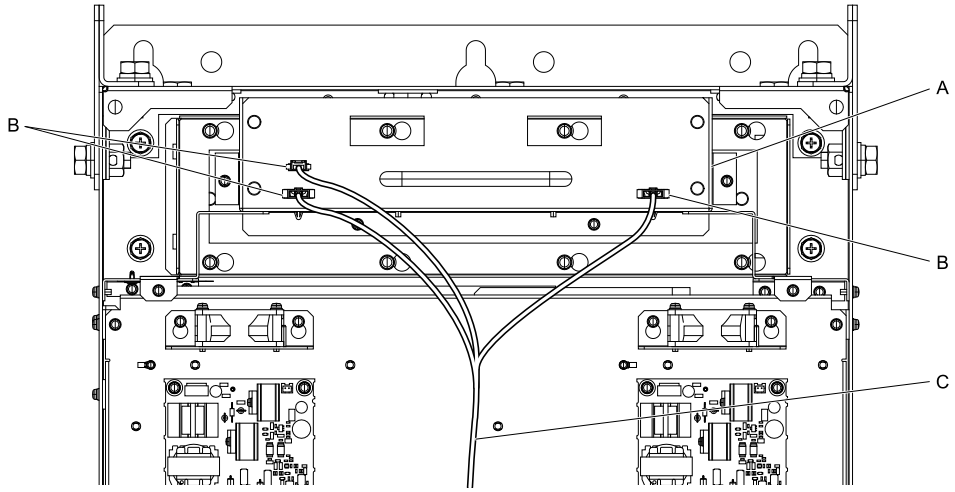
NOTICE *Use the instructions in this manual to replace the cooling fans. When you do maintenance on the fans, replace all the fans to increase product life. If you install the fans incorrectly, it can cause damage to the drive.*

Remove a Fan

1. Remove the drive cover.

   CAUTION *Crush Hazard. Loosen the cover screws. Do not fully remove them. If you fully remove the cover screws, the terminal cover can fall and cause moderate injury.*

2. Unplug the fan cables from the fan connectors.

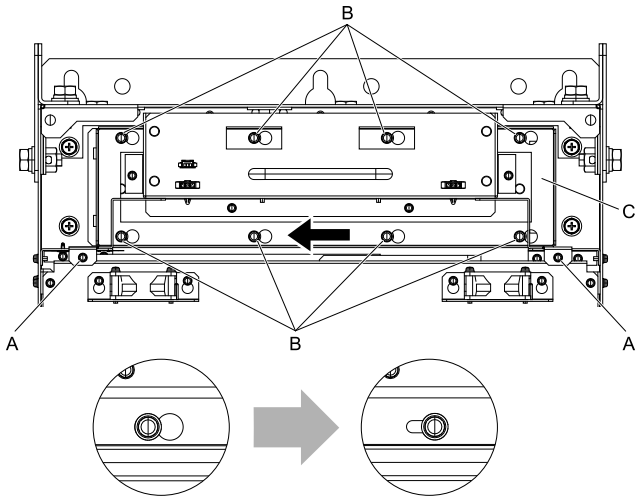


A - Fan unit
B - Fan connector
C - Fan cable

Figure 4.49 Components

3. Loosen the fan unit screws and slide the slide panel to the left.

Note:
To remove the fan unit, it is only necessary to loosen the Screws B.
Remove screws A.



A - Screws A
B - Screws B
C - Slide panel

Figure 4.50 Slide the Slide Panel

4. Remove the fan unit and the slide panel at the same time.

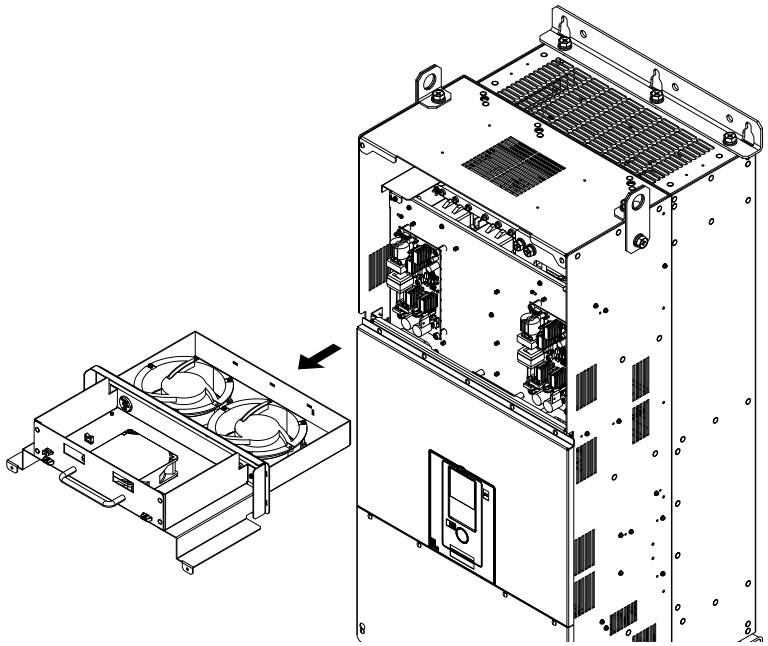
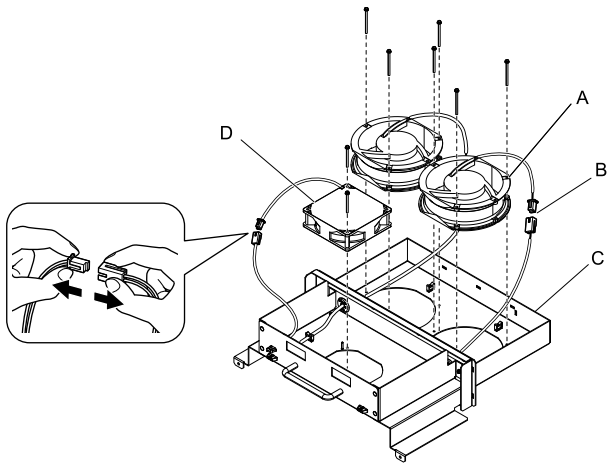


Figure 4.51 Remove the Fan Unit

5. Unplug the power supply connector, remove the screws that safety the cooling fan and circulation fan, and then remove the fans.



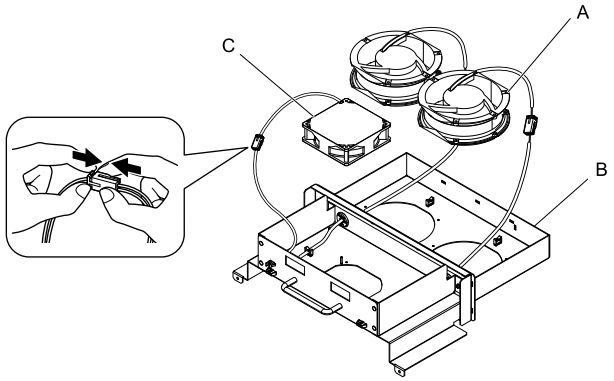
A - Cooling fan
B - Relay connector
C - Fan unit base
D - Circulation fan

Figure 4.52 Remove the Cooling Fans

Install the Cooling Fans

Reverse the removal procedure to install a cooling fan.

1. Connect the power supply connector between the drive and cooling fan.



A - Cooling fan
B - Fan unit base
C - Circulation fan

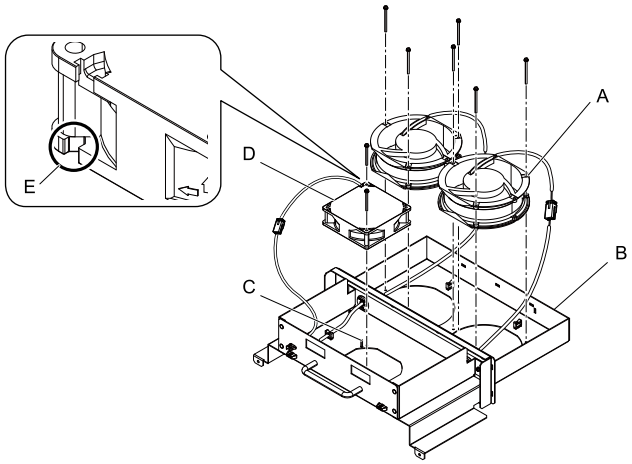
Figure 4.53 Connect the Power Supply Connector

2. Align the pins on the fan unit base with the notches on the fan and put the fan unit base in the fan unit, then use the screws to safety it.

   Tighten the screws to a correct tightening torque:

   • M4 screws: 0.98 N·m to 1.33 N·m (8.67 in·lb to 11.77 in·lb)

Note:
Make sure that you do not pinch cables between the cooling fan and the fan unit base.

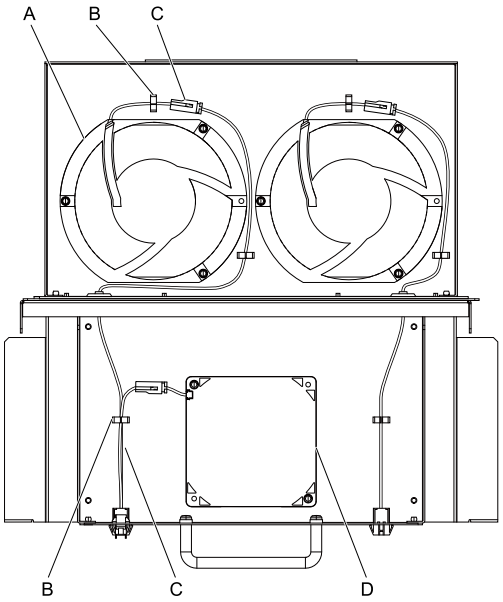


A - Cooling fan
B - Fan unit base
C - Alignment pin on fan unit base
D - Circulation fan
E - Notches

Figure 4.54 Install the Cooling Fans

3. Put the cable and connector in the recess of the drive.

Note:
Safety the relay cable to the hook.



A - Cooling fan
B - Cable hook
C - Relay connector
D - Circulation fan

Figure 4.55 Put the Cable and Connector in the Drive Recess

4. Put the fan unit into the specified location.

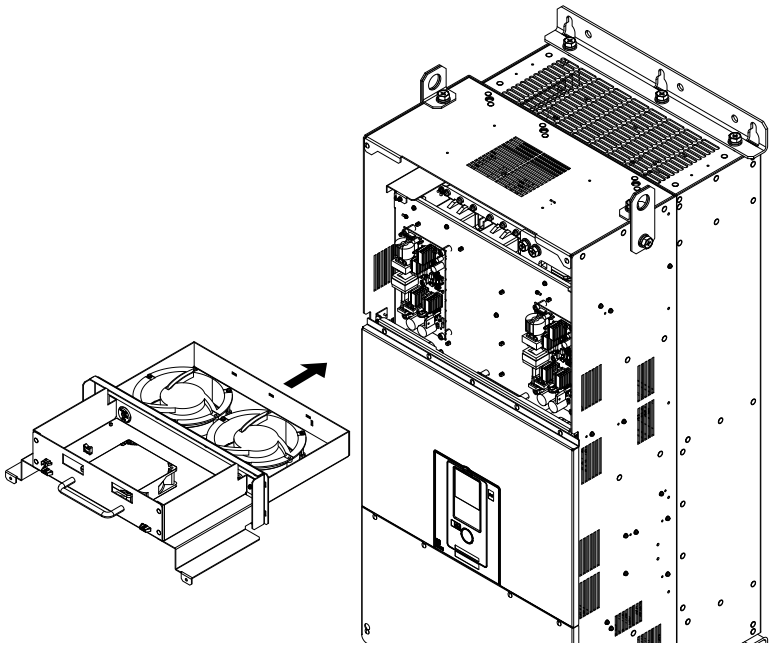
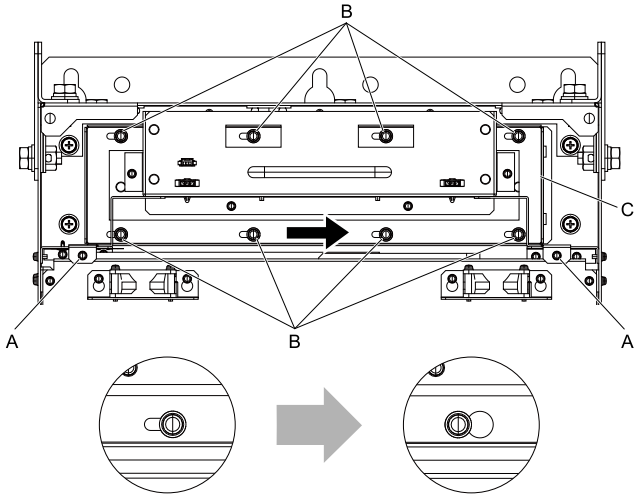


Figure 4.56 Install the Fan Unit

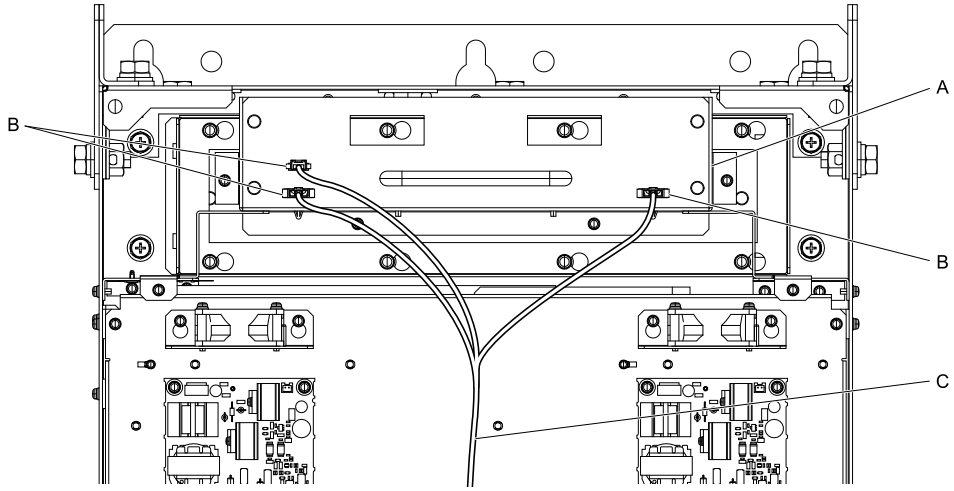
5. Slide the fan unit to the right and use the mounting screws to safety it to the drive.
   Tighten the screws to a correct tightening torque:
   - 1.96 N·m to 2.53 N·m (17.35 in·lb to 22.39 in·lb)



A - Screw A
B - Screw B
C - Fan unit

Figure 4.57 Slide the Fan Unit

6. Connect the fan cable to the fan connector.



A - Fan unit
B - Fan connector
C - Fan cable

Figure 4.58 Connect Cooling Fan Connectors

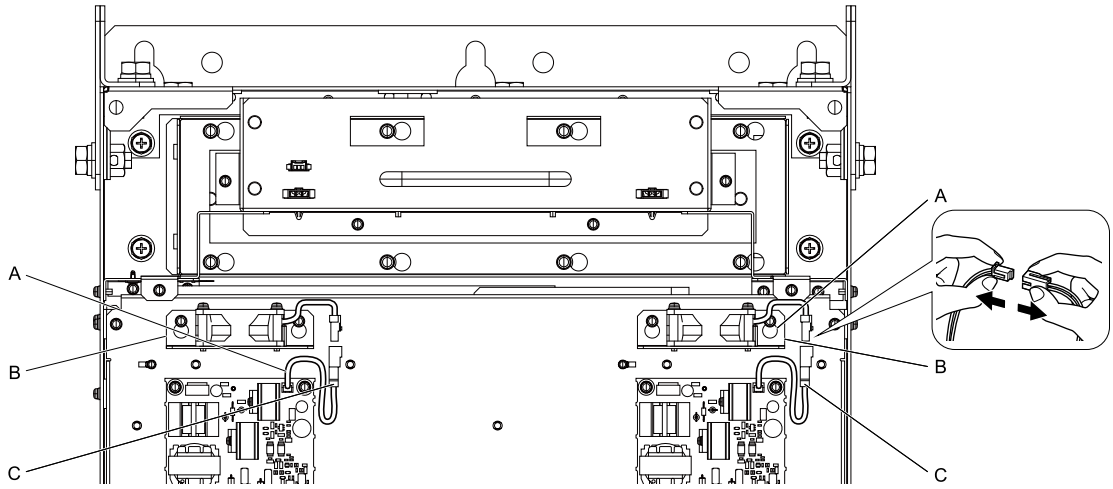
7. Install the drive cover.
8. Energize the drive and set *o4-03 = 0 [Fan Operation Time Setting = 0 h]* to reset the cooling fan operation time.

Remove the Circuit Board Cooling Fan

Remove the drive cover before you start this procedure.

⚠ CAUTION *Crush Hazard. Loosen the cover screws. Do not fully remove them. If you fully remove the cover screws, the terminal cover can fall and cause moderate injury.*

1. Unplug the fan cables from the fan connectors.

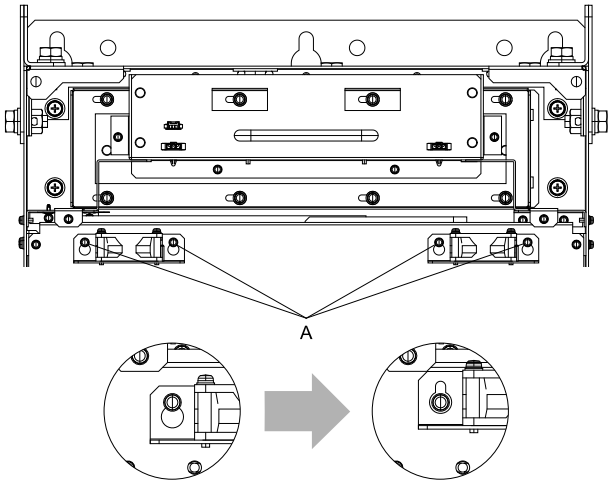


A - Fan cable
B - Circuit board cooling fan unit
C - Relay connector

Figure 4.59 Components

2. Loosen the circuit board cooling fan unit screws and slide the circuit board cooling fan unit up.

Note:
To remove the fan unit, it is only necessary to loosen the screws.



A - Screws

Figure 4.60 Slide the Circuit Board Cooling Fan Unit

3. Remove the circuit board cooling fan unit.

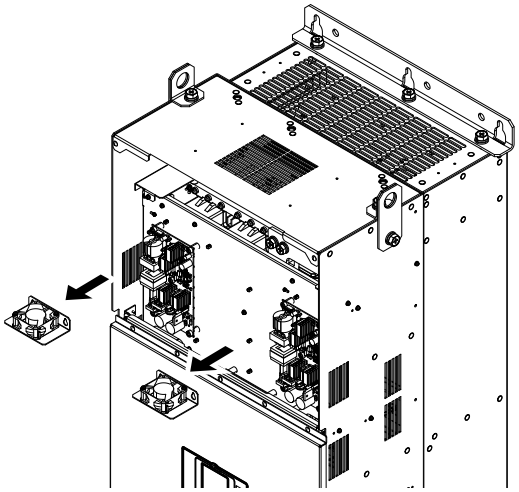
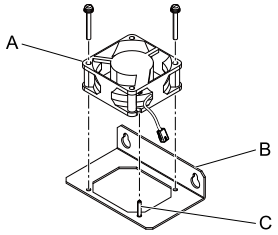


Figure 4.61 Remove the Circuit Board Cooling Fan Unit

4. Remove the screws that safety the circuit board cooling fan and remove the fan.



A - Circuit board cooling fan
B - Fan unit base
C - Alignment pin on fan unit base

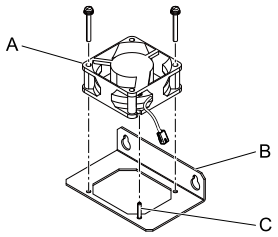
Figure 4.62 Remove the Circuit Board Cooling Fan

Install the Circuit Board Cooling Fan

Reverse the removal procedure to install a cooling fan.

1. Align the pins on the fan unit base with the notches on the fan and put the circuit board cooling fan in the fan unit, then use the screws to safety the circuit board cooling fan to the fan unit base.
   Tighten the screws to a correct tightening torque:
   - 0.98 N·m to 1.33 N·m (8.67 in·lb to 11.77 in·lb)

Note:
Make sure that you do not pinch cables between the circuit board cooling fan and the fan unit base.



A - Circuit Board Cooling Fan
B - Fan unit base
C - Alignment pin on fan unit base

Figure 4.63 Install the Circuit Board Cooling Fan

2. Put the circuit board cooling fan unit into the specified location and slide it down, then use the screws to safety it to the drive.
   Tighten the screws to a correct tightening torque:
   - 0.98 N·m to 1.33 N·m (8.67 in·lb to 11.77 in·lb)

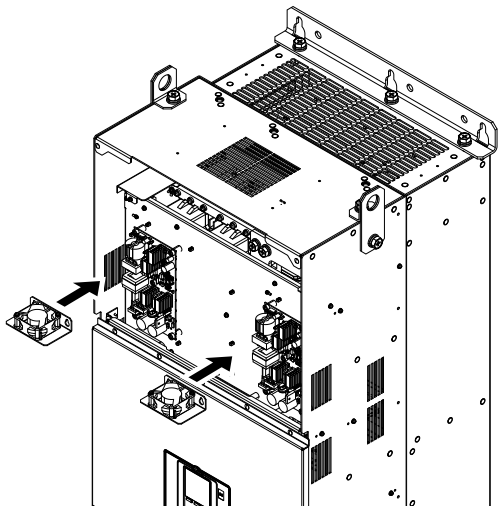
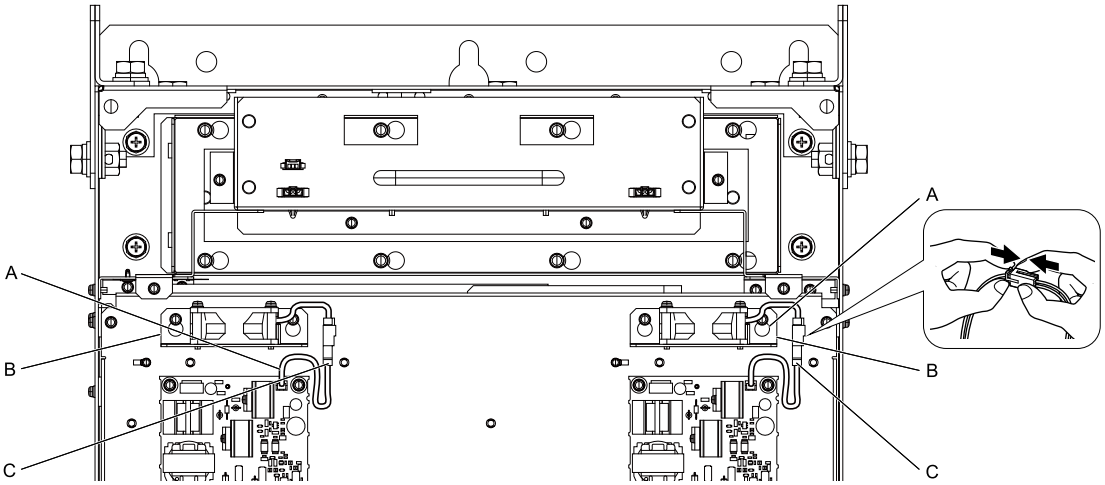


Figure 4.64 Install the Circuit Board Cooling Fan Unit

3. Connect the fan cable to the fan connector.



A - Fan cable
B - Circuit board cooling fan unit
C - Fan connector

Figure 4.65 Connect Cooling Fan Connectors

4. Install the drive cover.
5. Energize the drive and set *o4-03 = 0 [Fan Operation Time Setting = 0 h]* to reset the cooling fan operation time.

■ Replace Fans (Procedure H)

DANGER *Electrical Shock Hazard. Do not examine, connect, or disconnect wiring on an energized drive. Before servicing, disconnect all power to the equipment and wait for the time specified on the warning label at a minimum. The internal capacitor stays charged after the drive is de-energized. The charge indicator LED extinguishes when the DC bus voltage decreases below 50 Vdc. When all indicators are OFF, remove the covers before measuring for dangerous voltages to make sure that the drive is safe. If you do work on the drive when it is energized, it will cause serious injury or death from electrical shock.*

CAUTION *Burn Hazard. Do not touch a hot drive heatsink. De-energize the drive, wait for a minimum of 15 minutes, then make sure that the heatsink is cool before you replace the cooling fans. If you touch a hot drive heatsink, it can burn you.*

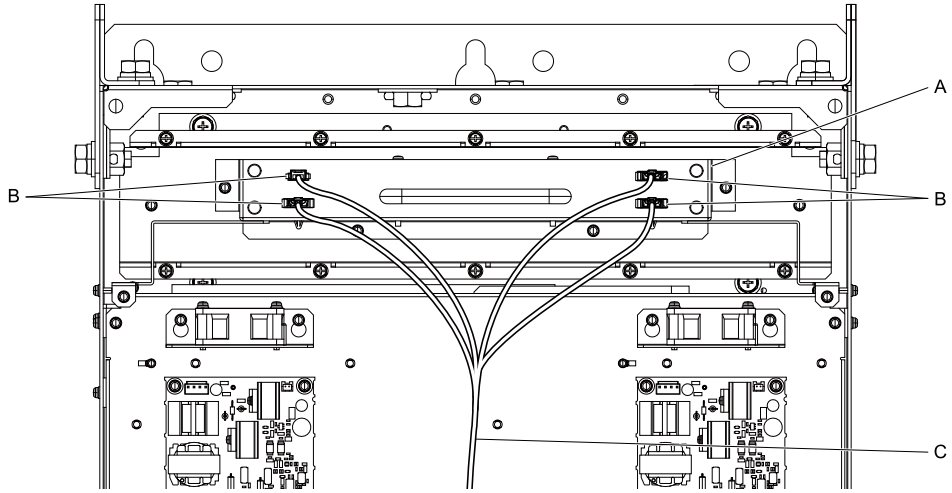
NOTICE *Use the instructions in this manual to replace the cooling fans. When you do maintenance on the fans, replace all the fans to increase product life. If you install the fans incorrectly, it can cause damage to the drive.*

Remove a Fan

1. Remove the drive cover.

   ⚠ CAUTION *Crush Hazard. Loosen the cover screws. Do not fully remove them. If you fully remove the cover screws, the terminal cover can fall and cause moderate injury.*

2. Unplug the fan cables from the fan connectors.

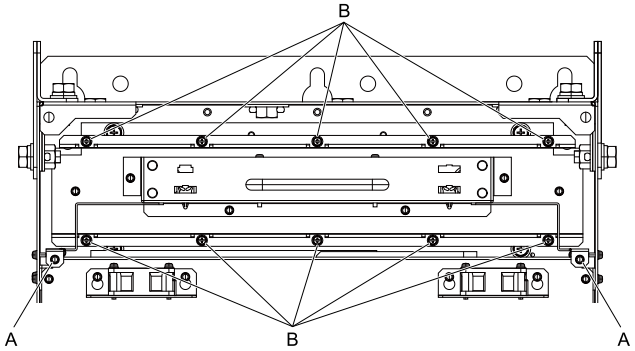


A - Fan unit
B - Fan connector
C - Fan cable

Figure 4.66 Components

3. Loosen the fan unit screws.

Note:
To remove the fan unit, it is only necessary to loosen the Screws B.
Remove screws A.



A - Screws A
B - Screws B

Figure 4.67 Loosen the Screws

4. Remove the fan unit.

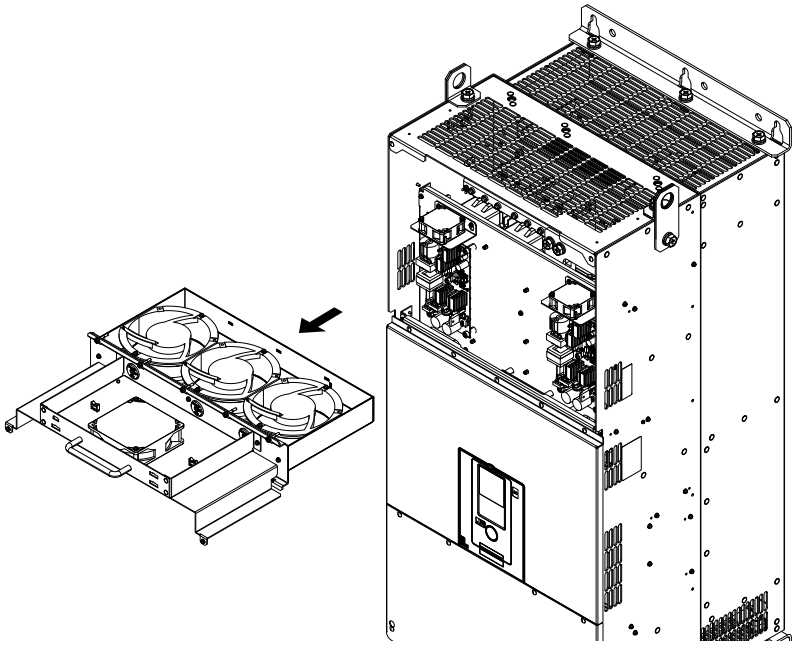
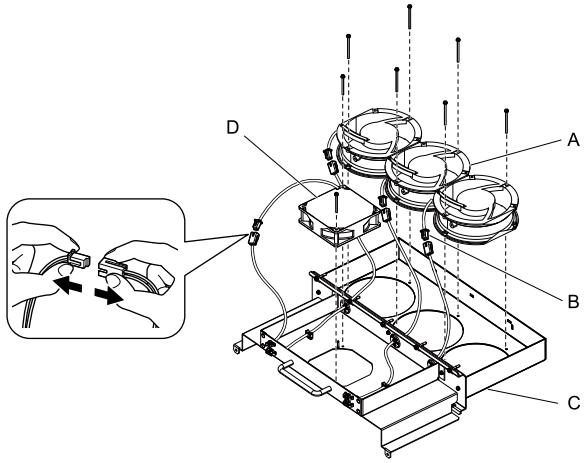


Figure 4.68 Remove the Fan Unit

5. Unplug the power supply connector, remove the screws that safety the cooling fan and circulation fan, and then remove the fans.



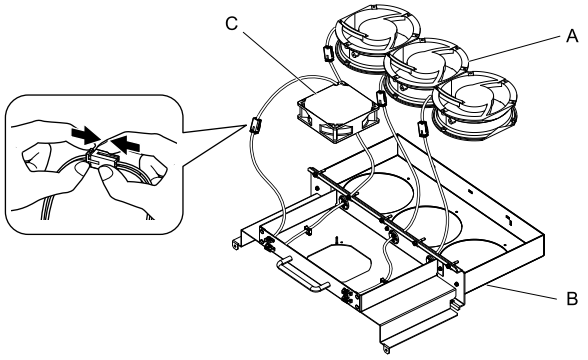
A - Cooling fan
B - Relay connector
C - Fan unit base
D - Circulation fan

Figure 4.69 Remove the Cooling Fans

Install Fans

Reverse the removal procedure to install a cooling fan.

1. Connect the power supply connector between the drive and cooling fan.

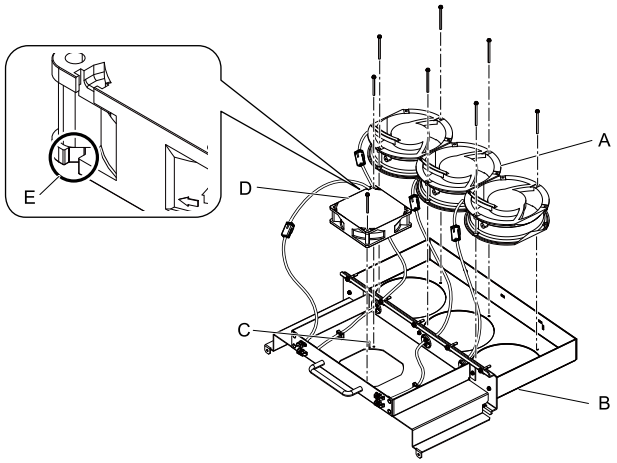


A - Cooling fan
B - Fan unit base
C - Circulation fan

Figure 4.70 Connect the Power Supply Connector

2. Align the pins on the fan unit base with the notches on the fan and put the fan unit base in the fan unit, then use the screws to safety it.
   Tighten the screws to a correct tightening torque:
   - 0.98 N·m to 1.33 N·m (8.67 in·lb to 11.77 in·lb)

Note:
Make sure that you do not pinch cables between the cooling fan and the fan unit base.

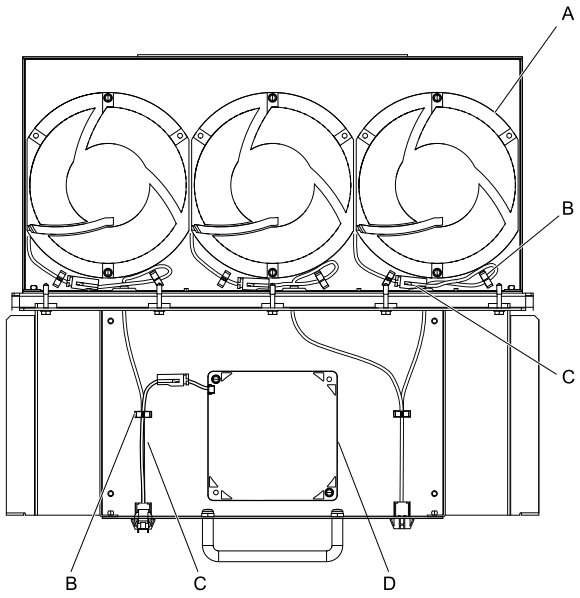


A - Cooling fan
B - Fan unit base
C - Alignment pin on fan unit base
D - Circulation fan
E - Notches

Figure 4.71 Install the Cooling Fan

3. Put the cable and connector in the recess of the drive.

Note:
Safety the relay cable to the hook.



A - Cooling fan
B - Cable hook
C - Relay connector
D - Circulation fan

Figure 4.72 Put the Cable and Connector in the Drive Recess

4. Put the fan unit into the specified location and use screws to safety it to the drive. Tighten the screws to a correct tightening torque:
   - 1.96 N·m to 2.53 N·m (17.35 in·lb to 22.39 in·lb)

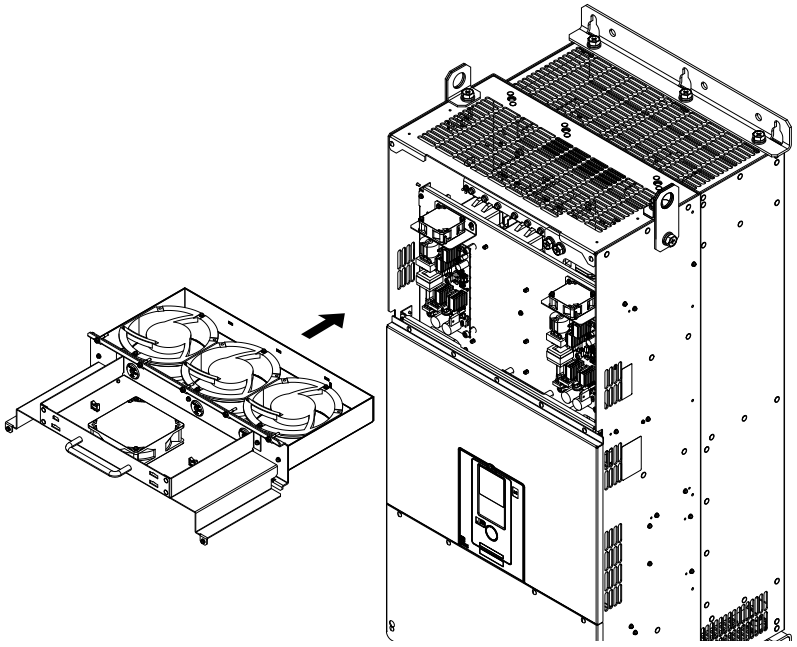
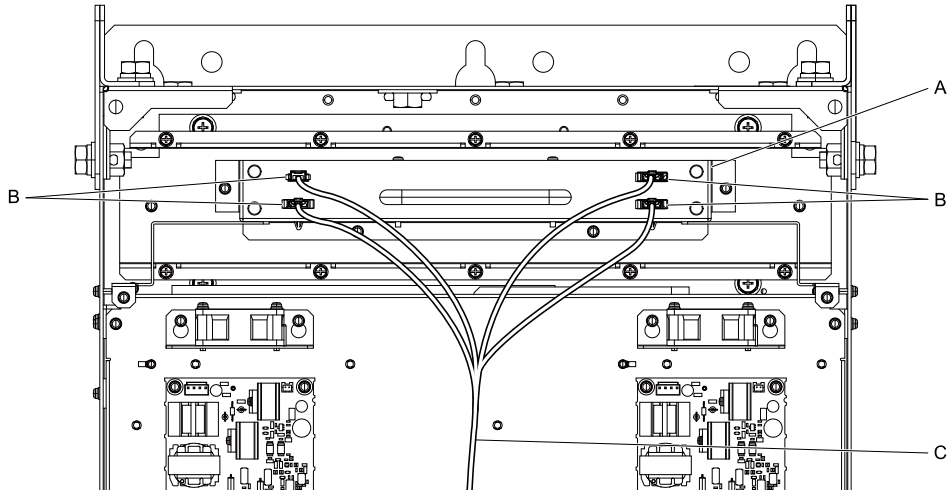


Figure 4.73 Install the Fan Unit

5. Connect the fan cable to the fan connector.



A - Fan unit
B - Fan connector
C - Fan cable

Figure 4.74 Connect Cooling Fan Connectors

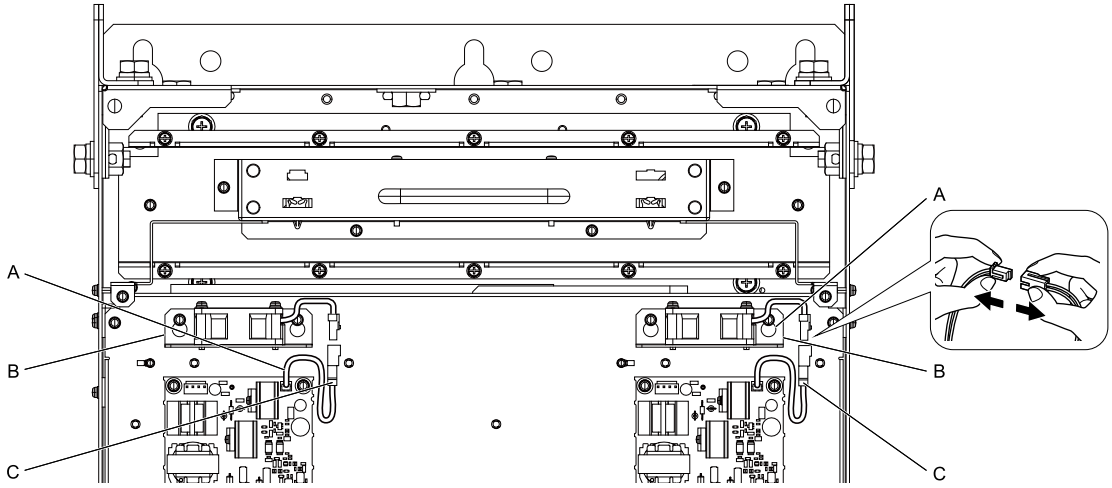
6. Install the drive cover.
7. Energize the drive and set *o4-03 = 0 [Fan Operation Time Setting = 0 h]* to reset the cooling fan operation time.

Remove the Circuit Board Cooling Fan

Remove the drive cover before you start this procedure.

⚠ CAUTION *Crush Hazard. Loosen the cover screws. Do not fully remove them. If you fully remove the cover screws, the terminal cover can fall and cause moderate injury.*

1. Unplug the fan cables from the fan connectors.

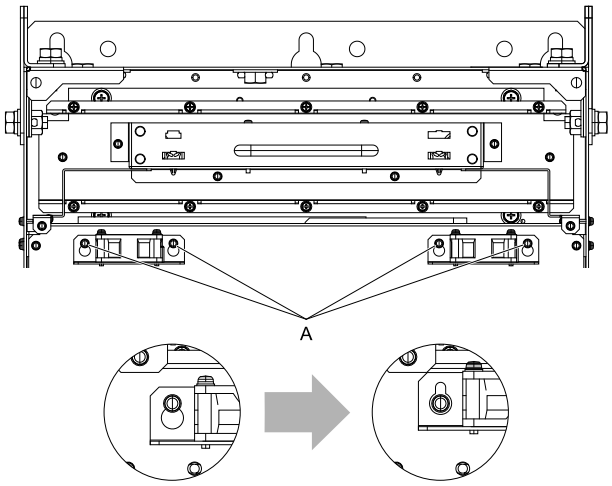


A - Fan cable
B - Circuit board cooling fan unit
C - Relay connector

Figure 4.75 Components

2. Loosen the circuit board cooling fan unit screws and slide the circuit board cooling fan unit up.

Note:
To remove the fan unit, it is only necessary to loosen the screws.



A - Screws

Figure 4.76 Slide the Circuit Board Cooling Fan Unit

3. Remove the circuit board cooling fan unit.

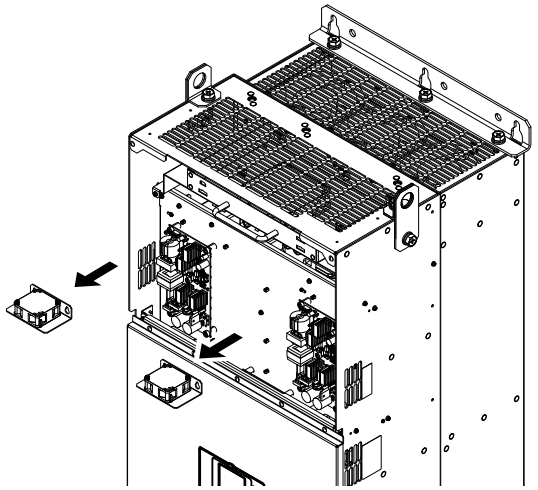
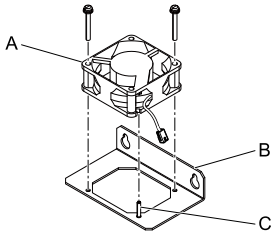


Figure 4.77 Remove the Circuit Board Cooling Fan Unit

4. Remove the screws that safety the circuit board cooling fan and remove the fan.



A - Circuit board cooling fan
B - Fan unit base
C - Alignment pin on fan unit base

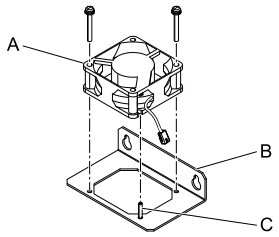
Figure 4.78 Remove the Circuit Board Cooling Fan

Install the Circuit Board Cooling Fan

Reverse the removal procedure to install a cooling fan.

1. Align the pins on the fan unit base with the notches on the fan and put the circuit board cooling fan in the fan unit, then use the screws to safety the circuit board cooling fan to the fan unit base.
   Tighten the screws to a correct tightening torque:
   - 0.98 N·m to 1.33 N·m (8.67 in·lb to 11.77 in·lb)

Note:
Make sure that you do not pinch cables between the circuit board cooling fan and the fan unit base.



A - Circuit Board Cooling Fan
B - Fan unit base
C - Alignment pin on fan unit base

Figure 4.79 Install the Circuit Board Cooling Fan

2. Put the fan unit into the specified location and use screws to safety it to the drive.
   Tighten the screws to a correct tightening torque:
   • 0.98 N·m to 1.33 N·m (8.67 in·lb to 11.77 in·lb)

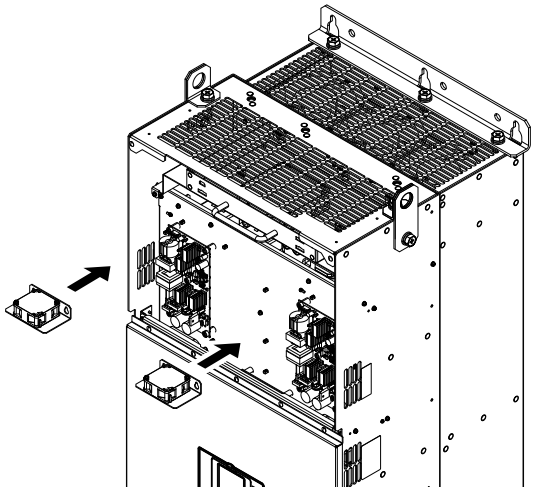
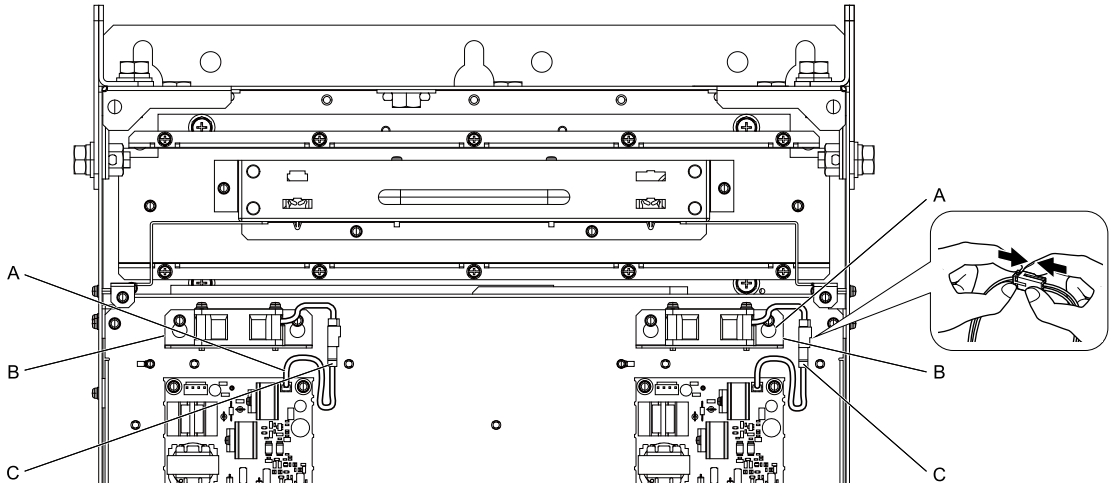


Figure 4.80 Install the Circuit Board Cooling Fan Unit

3. Connect the fan cable to the fan connector.



A - Fan cable
B - Circuit board cooling fan unit
C - Fan connector

Figure 4.81 Connect Cooling Fan Connectors

4. Install the drive cover.

5. Energize the drive and set *o4-03 = 0 [Fan Operation Time Setting = 0 h]* to reset the cooling fan operation time.

◆ Replace Gasket

If there is damage to the gasket, replace it with the replacement gasket.

1. Use a plastic scraper to remove the damaged gasket.

Note:
Do not scratch the mounting surfaces.

2. Remove the adhesive cover from the replacement gasket.
3. Install the replacement gasket.
   Align the screw holes on the replacement gasket with the holes on the enclosure panel or a fan replacement service panel.

5 Specifications

◆ Common Drive Specifications

Note:
- To get the OLV, CLV, and AOLV specifications, do Rotational Auto-Tuning.
- To get the longest product life, install the drive in an environment that meets the necessary specifications.

Table 5.1 Control Characteristics

Item	Specification
Control Methods	• V/f Control (V/f) • V/f Control with Encoder (CL-V/f) • Open Loop Vector (OLV) • Closed Loop Vector (CLV) • Advanced Open Loop Vector (AOLV) • PM Open Loop Vector (OLV/PM) *1 • PM Advanced Open Loop Vector (AOLV/PM) *1 • PM Closed Loop Vector (CLV/PM) *1 • EZ Vector Control (EZOLV) *1
Carrier Frequency	• Models 2004 to 2415, and 4002 to 4103: HD: 8 kHz without derating the drive capacity. ND: 2 kHz without derating the drive capacity. Derate the drive capacity to use values to 15 kHz maximum. • Models 4140 to 4720: HD: 5 kHz without derating the drive capacity. ND: 2 kHz without derating the drive capacity. Derate the drive capacity to use values to 10 kHz maximum. • Models 5382 to 5472: 2 kHz without derating the drive capacity.
Maximum Output Voltage	• 200 V Class: Three-phase 200 V to 240 V • 400 V Class: Three-phase 380 V to 480 V • 600 V Class: Three-phase 500 V to 600 V **Note:** The maximum output voltage is proportional to the input voltage.
Frequency Control Range	• AOLV and EZOLV: 0.01 Hz to 120 Hz • CL-V/f, CLV, AOLV/PM, and CLV/PM: 0.01 Hz to 400 Hz • V/f, OLV, and OLV/PM: 0.01 Hz to 590 Hz
Frequency Accuracy (Temperature Fluctuation)	Digital inputs: Within ±0.01% of the maximum output frequency (-10 °C to +40 °C (14 °F to 104 °F)) Analog inputs: Within ±0.1% of the maximum output frequency (25 °C ±10 °C (77 °F ±18 °F))
Frequency Setting Resolution	Digital inputs: 0.01 Hz Analog inputs: 1/2048 of the maximum output frequency (11-bit signed)
Output Frequency Resolution	0.001 Hz
Frequency Setting Signal	Main speed frequency reference: -10 Vdc to +10 Vdc (20 kΩ), 0 Vdc to 10 Vdc (20 kΩ), 4 mA to 20 mA (250 Ω), 0 mA to 20 mA (250 Ω) Main speed reference: Pulse train input (maximum 32 kHz)

Item	Specification
Starting Torque	• V/f: 150%/3 Hz • CL-V/f: 150%/3 Hz • OLV: 200%/0.3 Hz • CLV: 200%/0 min^{-1} (r/min) • AOLV: 200%/0.3 Hz • OLV/PM: 100%/5% speed • AOLV/PM: 200%/0 min^{-1} (r/min) • CLV/PM: 200%/0 min^{-1} (r/min) • EZOLV: 100%/1% speed **Note:** Correctly select the drive and motor capacity for this starting torque in these control methods: • OLV • CLV • AOLV • AOLV/PM • CLV/PM
Speed Control Range	• V/f: 1:40 • CL-V/f: 1:40 • OLV: 1:200 • CLV: 1:1500 • AOLV: 1:200 • OLV/PM: 1:20 • AOLV/PM: 1:100 (when high frequency injection is enabled) • CLV/PM: 1:1500 • EZOLV: 1:100
Zero Speed Control	Possible in these control methods: • CLV • AOLV/PM • CLV/PM
Torque Limits	Parameter settings allow different limits in four quadrants in these control methods: • OLV • CLV • AOLV • AOLV/PM • CLV/PM • EZOLV
Accel/Decel Time	0.0 s to 6000.0 s The drive can set four pairs of different acceleration and deceleration times.
Braking Torque	Approximately 20% Approximately 125% with a dynamic braking option • Short-time average deceleration torque Motor output 0.4/0.75 kW: over 100% Motor output 1.5 kW: over 50% Motor output 2.2 kW and larger: over 20%, Overexcitation Braking/High Slip Braking allow for approximately 40% • Continuous regenerative torque: Approximately 20%. Dynamic braking option allows for approximately 125%, 10%ED, 10 s **⚠ WARNING** *Set L3-04 = 0 [Stall Prevention during Decel = Disabled] when you operate the drive with:* • *a regenerative converter* • *regenerative unit* • *braking unit* • *braking resistor* • *braking resistor unit.* *If you set the parameter incorrectly, the drive can decelerate for too long and cause serious injury or death.* **Note:** • Models 2004 to 2138 and 4002 to 4168 have a braking transistor. • Short-time average deceleration torque refers to the torque needed to decelerate the motor (uncoupled from the load) from the rated speed to zero. Motor characteristics can change the actual specifications. • Motor characteristics change the continuous regenerative torque and short-time average deceleration torque for motors 2.2 kW and larger.
V/f Characteristics	Select from 15 pre-defined V/f patterns, or a user-set V/f pattern.
Main Control Functions	Torque Control, Droop Control, Speed/Torque Control Switching, Feed Forward Control, Zero Servo Function, Restart After Momentary Power Loss, Speed Search, Overtorque/Undertorque Detection, Torque Limit, 17 Step Speed (max.), Accel/Decel Switch, S-curve Acceleration/Deceleration, 3-wire Sequence, Auto-Tuning (Rotational and Stationary), Dwell Function, Cooling Fan ON/OFF Switch, Slip Compensation, Torque Compensation, Frequency Jump, Upper/Lower Limits for Frequency Reference, DC Injection Braking at Start and Stop, Overexcitation Braking, High Slip Braking, PID Control (with Sleep Function), Energy Saving Control, MEMOBUS/Modbus Communication (RS-485 max, 115.2 kbps), Auto Restart, Application Presets, DriveWorksEZ (customized functions), Removable Terminal Block, Online Tuning, KEB, Overexcitation Deceleration, Inertia (ASR) Tuning, Overvoltage Suppression, High Frequency Injection

*1 PM control methods are not available on 600 V models.

Table 5.2 Protection Functions

Item	Specification
Motor Protection	Electronic thermal overload protection
Momentary Overcurrent Protection	Drive stops when the output current is more than 200% of the HD output current.
Overload Protection	Drive stops when the output current is more than these overload tolerances: • HD: 150% of the rated output current for 60 seconds. The permitted frequency of overload is one time each 10 minutes. • ND: 110% of the rated output current for 60 seconds. The permitted frequency of overload is one time each 10 minutes. **Note:** • If output frequency < 6 Hz, the drive can trigger the overload protection function when the output current is in the overload tolerance range. • Derating may be necessary for applications that start and stop frequently.
Overvoltage Protection	200 V class: Stops when the DC bus voltage is more than approximately 410 V 400 V class: Stops when the DC bus voltage is more than approximately 820 V 600 V class: Stops when the DC bus voltage is more than approximately 1040 V
Undervoltage Protection	200 V class: Stops when the DC bus voltage decreases to less than approximately 190 V 400 V class: Stops when the DC bus voltage decreases to less than approximately 380 V 600 V class: Stops when the DC bus voltage decreases to less than approximately 460 V
Momentary Power Loss Ride-thru	Stops when power loss is longer than 15 ms. Continues operation if power loss is shorter than 2 s (depending on parameter settings). **Note:** • Stop time may be shortened depending on the load and motor speed. • Drive capacity will change the continuous operation time. A Momentary Power Loss Recovery Unit is necessary to continue operation through a 2 s power loss on models 2004 to 2056 and 4002 to 4031.
Heatsink Overheat Protection	The drive stops when the thermistor detects an IGBT temperature more than approximately 100 °C (212 °F). The trip temperature level is different for different drive models.
Braking Resistor Overheat Protection	Overheat detection for braking resistor (optional ERF-type, 3% ED)
Stall Prevention	Stall prevention is available during acceleration, deceleration, and during run.
Ground Fault Protection	Electronic circuit protection **Note:** This protection detects ground faults during run. The drive will not provide protection when: • There is a low-resistance ground fault for the motor cable or terminal block • Energizing the drive when there is a ground fault.
DC Bus Charge LED	Charge LED illuminates when DC bus voltage is more than 50 V.
Braking Transistor	Built-in to models 2004 to 2138 and 4002 to 4168
DC Link Choke	Built-in to models 2110 to 2415, 4060 to 4720, and 5382 to 5472

Table 5.3 Environment

Item	Specification
Area of Use	Indoors
Power Supply	Overvoltage Category III
	Permitted Frequency Fluctuation: ±5%
	Permitted Voltage Fluctuation: -15% to +10%
	200 V class: • Three-phase AC power supply 200 V to 240 V at 50/60 Hz • DC power supply 270 V to 340 V 400 V class: • Three-phase AC power supply 380 V to 480 V at 50/60 Hz • DC power supply 513 V to 679 V 600 V class: • Three-phase AC power supply 500 V to 600 V at 50/60 Hz • DC power supply 675 V to 848 V

Item	Specification
Ambient Temperature Setting	IP00/UL Open Type: -10 °C to +50 °C (14 °F to 122 °F) IP20/UL Open Type/Heatsink External Mounting: -10 °C to +50 °C (14 °F to 122 °F) IP20/UL Type 1: -10 °C to +40 °C (14 °F to 104 °F) IP55/UL Type 12 Heatsink External Mounting; front side: -10°C to +50 °C (14 °F to 122 °F) IP55/UL Type 12 Heatsink External Mounting; back side: -10°C to +40 °C (14 °F to 104 °F) • When installing the drive in an enclosure, use a cooling fan or air conditioner to keep the internal air temperature in the permitted range. • Do not let the drive freeze. • You can use IP00/IP20/UL Open Type drives at a maximum of 60 °C (140 °F) when you derate the output current. • You can use IP20/UL Type 1 drives at a maximum of 50 °C (122 °F) when you derate the output current.
Humidity	95% RH or less Do not let condensation form on the drive.
Storage Temperature	-20 °C to +70 °C (-4 °F to +158 °F) (short-term temperature during transportation)
Surrounding Area	Pollution degree 2 or less Install the drive in an area without: • Oil mist, corrosive or flammable gas, or dust • Metal powder, oil, water, or other unwanted materials • Radioactive materials or flammable materials, including wood • Harmful gas or fluids • Salt • Direct sunlight
Altitude	1000 m (3281 ft) maximum **Note:** Derate the output current by 1% for each 100 m (328 ft) to install the drive in altitudes between 1000 m to 4000 m (3281 ft to 13123 ft). It is not necessary to derate the rated voltage in these conditions: • Installing the drive at 2000 m (6562 ft) or lower • Installing the drive between 2000 m to 4000 m (6562 ft to 13123 ft) and grounding the neutral point on the power supply. Contact Yaskawa or your nearest sales representative when not grounding the neutral point.
Vibration	• 10 Hz to 20 Hz: 1 G (9.8 m/s², 32.15 ft/s²) • 20 Hz to 55 Hz: 2004 to 2211, 4002 to 4168: 0.6 G (5.9 m/s², 19.36 ft/s²) 2257 to 2415, 4208 to 4720, 5382 to 5472: 0.2 G (2.0 m/s², 6.56 ft/s²)
Installation Orientation	Install the drive vertically for sufficient airflow to cool the drive.

Table 5.4 Standard

Item	Specification
Standard	200 V class and 400 V class: • UL 508C • EN61800-3 • IEC/EN61800-5-1 • Two Safe Disable inputs and one EDM output according to EN ISO 13849-1:2015 (PL e (Cat.3)), IEC/EN61508 SIL3 600 V class: • UL 508C
Protection Design	IP00/IP20/UL Open Type IP20/UL Type 1 IP55/UL Type 12 Heatsink External Mounting **Note:** To change an IP00/IP20/UL Open Type drive to an IP20/UL Type 1 drive, install a UL Type 1 kit.

■ Drive Derating

You must derate the drive capacity to operate the drive above the rated temperature, altitude, and default carrier frequency.

Carrier Frequency Settings and Rated Current Values

These tables show how the drive rated output current changes when the *C6-02 [Carrier Frequency Selection]* value changes.

- Table 5.5
- Table 5.8
- Table 5.11

The output current value changes linearly as the carrier frequency changes. You can use the values from the tables to calculate a frequency that is not shown. When *A1-02 = 4 [Control Method Selection = AOLV]*, refer to the tables;

- Table 5.6
- Table 5.9

When *A1-02 = 6 [AOLV/PM]*, refer to the tables;

- Table 5.7
- Table 5.10

Three-Phase 200 V Class

Table 5.5 Carrier Frequency and Rated Current Derating

Model	Rated Current (A)											
	Heavy Duty Rating (HD) Parameter C6-01 = 0						Normal Duty Rating (ND) Parameter C6-01 = 1					
	2 kHz	5 kHz	8 kHz	10 kHz	12.5 kHz	15 kHz	2 kHz	5 kHz	8 kHz	10 kHz	12.5 kHz	15 kHz
2004	3.5	3.5	3.5	3.4	3.2	3.06	4.2	4.0	3.6	3.4	3.1	2.77
2006	5.0	5.0	5.0	4.8	4.6	4.3	6	5.6	5	4.6	4.1	3.6
2008	6.9	6.9	6.9	6.5	5.9	5.4	8	7.6	6.9	6.5	5.9	5.4
2010	8.0	8.0	8.0	7.4	6.6	5.8	9.6	9.0	8	7.4	6.6	5.8
2012	11.0	11.0	11.0	10.4	9.6	8.8	12	11.7	11	10.5	9.9	9.3
2018	14.0	14.0	14.0	12.6	10.8	9.1	17.5	16.1	14	12.6	10.8	9.1
2021	17.5	17.5	17.5	16.1	14.3	12.6	21	19.6	17	16.1	14.3	12.5
2030	25.0	25.0	25.0	23.0	20.5	18.0	30	28.0	25	23.0	20.5	18.0
2042	33.0	33.0	33.0	29.3	24.8	20.2	42	38.4	33	29.4	24.9	20.4
2056	47.0	47.0	47.0	43.4	38.9	34.4	56	52.4	47	43.4	38.9	34.4
2070	60.0	60.0	60.0	56.0	51.0	46	70	66.0	60	56.0	51.0	46.0
2082	75.0	75.0	75.0	68.6	60.5	53	82	82.0	75	68.8	61.0	53.1
2110	88.0	88.0	88.0	80.5	71.0	62	110	102.7	92	84.3	75.2	66.0
2138	115.0	115.0	115.0	105.1	92.8	81	138	128.8	115	105.8	94.3	82.8
2169	145.0	145.0	125.2	112.0	-	-	169	152.7	128.3	112.0	-	-
2211	180.0	180.0	155.2	138.6	-	-	211	190.2	158.9	138.1	-	-
2257	215.0	215.0	184.8	164.7	-	-	257	230.4	190.5	163.9	-	-
2313	283.0	283.0	249.0	226.4	-	-	313	288.5	251.7	227.1	-	-
2360	346.0	346.0	294.3	259.8	-	-	360	330.8	287.6	258.8	-	-
2415	415.0	415.0	365.2	332.0	-	-	-	-	-	-	-	-

Table 5.6 AOLV Carrier Frequency and Rated Current Derating

Model	Rated Current (A)									
	Heavy Duty Rating (HD) Parameter C6-01 = 0					Normal Duty Rating (ND) Parameter C6-01 = 1				
	2 kHz	5 kHz	8 kHz	10 kHz	12.5 kHz	2 kHz	5 kHz	8 kHz	10 kHz	12.5 kHz
2004	3.5	3.5	3.2	3.1	2.8	4.2	3.7	3.1	2.8	2.3
2006	5.0	5.0	4.6	4.3	4.0	6	5.1	4	3.6	2.8
2008	6.9	6.9	6.0	5.4	4.5	8	7.0	6.0	5.4	4.5
2010	8.0	8.0	6.7	5.8	4.5	9.6	8.2	7	5.8	4.6
2012	11.0	11.0	9.8	8.8	7.7	12	11.1	10	9.3	8.4
2018	14.0	14.0	11.2	9.1	6.4	17.5	14.3	11	9.1	6.4
2021	17.5	17.5	14.7	12.6	9.9	21	17.8	15	12.5	9.9

Model	Rated Current (A)									
	Heavy Duty Rating (HD) Parameter C6-01 = 0					Normal Duty Rating (ND) Parameter C6-01 = 1				
	2 kHz	5 kHz	8 kHz	10 kHz	12.5 kHz	2 kHz	5 kHz	8 kHz	10 kHz	12.5 kHz
2030	25.0	25.0	21.0	18.0	14.3	30	25.5	21	18.0	14.3
2042	33.0	33.0	25.7	20.2	13.3	42	33.9	26	20.4	13.7
2056	47.0	47.0	39.8	34.4	27.7	56	47.9	40	34.4	27.6
2070	60.0	60.0	52.0	46.0	38.5	70	61.0	52	46.0	38.5
2082	75.0	75.0	62.1	52.5	40.4	82	76.7	63	53.1	41.4
2110	88.0	88.0	72.9	61.6	47.5	110	93.5	77	66.0	52.3
2138	115.0	115.0	95.3	80.5	62.0	138	117.3	97	82.8	65.6
2169	145.0	128.5	98.8	78.9	-	169	132.3	95.7	71.2	-
2211	180.0	159.3	122.0	97.2	-	211	164.1	117.2	86.0	-
2257	215.0	189.8	144.5	114.3	-	257	197.2	137.3	97.4	-
2313	283.0	254.7	203.8	169.8	-	313	257.8	202.6	165.8	-
2360	346.0	302.9	225.3	173.6	-	360	294.8	230.0	186.8	-
2415	415.0	373.5	298.8	249.0	-	-	-	-	-	-

Table 5.7 AOLV/PM Carrier Frequency and Rated Current Derating

Model	Rated Current (A)											
	Heavy Duty Rating (HD) Parameter C6-01 = 0						Normal Duty Rating (ND) Parameter C6-01 = 1					
	2 kHz	4 kHz	6 kHz	8 kHz	10 kHz	12 kHz	2 kHz	4 kHz	6 kHz	8 kHz	10 kHz	12 kHz
2004	3.5	3.5	3.4	3.2	3.1	2.9	4.2	3.8	3.5	3.1	2.8	2.4
2006	5.0	5.0	4.9	4.6	4.3	4.1	6.0	5.4	4.8	4.2	3.6	3.0
2008	6.9	6.9	6.7	6.0	5.4	4.7	8.0	7.3	6.7	6.0	5.4	4.7
2010	8.0	8.0	7.7	6.7	5.8	4.8	9.6	8.6	7.7	6.7	5.8	4.8
2012	11.0	11.0	10.7	9.8	8.8	7.9	12.2	11.5	10.7	10.0	9.3	8.6
2018	14.0	14.0	13.3	11.2	9.1	6.9	17.5	15.4	13.3	11.2	9.1	6.9
2021	17.5	17.5	16.8	14.7	12.6	10.4	21.0	18.9	16.8	14.6	12.5	10.4
2030	25.0	25.0	24.0	21.0	18.0	15.0	30.0	27.0	24.0	21.0	18.0	15.0
2042	33.0	33.0	31.2	25.7	20.2	14.7	42.0	36.6	31.2	25.8	20.4	15.0
2056	47.0	47.0	45.2	39.8	34.4	29.0	56.0	50.6	45.2	39.8	34.4	29.0
2070	60.0	60.0	58.0	52.0	46.0	40.0	70.0	64.0	58.0	52.0	46.0	40.0
2082	75.0	75.0	71.8	62.1	52.5	42.9	82.0	81.4	72.0	62.6	53.1	43.7
2110	88.0	88.0	84.2	72.9	61.6	50.3	110.0	99.0	88.0	77.0	66.0	55.0
2138	115.0	115.0	110.1	95.3	80.5	65.7	138.0	124.2	110.4	96.6	82.8	69.0
2169	145.0	138.4	118.6	98.8	78.9	-	169.0	144.6	120.1	95.7	71.2	-
2211	180.0	171.7	146.9	122.0	97.2	-	211.0	179.7	148.5	117.2	86.0	-
2257	215.0	204.9	174.7	144.5	114.3	-	257.0	217.1	177.2	137.3	97.4	-
2313	283.0	271.7	237.7	203.8	169.8	-	313.0	276.2	239.4	202.6	165.8	-
2360	346.0	328.8	277.0	225.3	173.6	-	359.6	316.4	273.2	230.0	186.8	-
2415	415.0	398.4	348.6	298.8	249.0	-	-	-	-	-	-	-

Three-Phase 400 V Class

Table 5.8 Carrier Frequency and Rated Current Derating

Model	Rated Current (A)											
	Heavy Duty Rating (HD) Parameter C6-01 = 0						Normal Duty Rating (ND) Parameter C6-01 = 1					
	2 kHz	5 kHz	8 kHz	10 kHz	12.5 kHz	15 kHz	2 kHz	5 kHz	8 kHz	10 kHz	12.5 kHz	15 kHz
4002	1.8	1.8	1.8	1.6	1.3	1.0	2.1	2.0	1.8	1.7	1.5	1.4
4004	3.4	3.4	3.4	2.9	2.3	1.7	4.1	3.8	3.4	3.1	2.8	2.4
4005	4.8	4.8	4.8	4.3	3.7	3.0	5.4	5.2	4.8	4.6	4.3	3.9
4007	5.5	5.5	5.5	4.9	4.1	3.2	7.1	6.5	5.5	4.8	4.0	3.2
4009	7.2	7.2	7.2	6.5	5.6	4.8	8.9	8.2	7.2	6.5	5.6	4.8
4012	9.2	9.2	9.2	8.1	6.8	5.4	11.9	10.8	9.2	8.1	6.7	5.4
4018	14.8	14.8	14.8	13.1	11.0	8.9	17.5	17.3	14.8	13.1	11.0	8.9
4023	18.0	18.0	18.0	15.9	13.4	10.8	23	21.5	18.3	16.2	13.6	11.0
4031	24.0	24.0	24.0	21.2	17.7	14.1	31	28.2	24.0	21.1	17.6	14.1
4038	31.0	31.0	31.0	27.5	23.0	18.6	38	36.3	31.0	27.5	23.0	18.6
4044	39.0	39.0	39.0	34.5	29.0	23.4	44	43.6	37.5	33.5	28.4	23.4
4060	45.0	45.0	45.0	39.1	31.8	24.4	60	53.7	44.9	39.1	31.7	24
4075	60.0	60.0	60.0	53.1	44.6	36.0	75	73.8	62.9	55.6	46.5	37
4089	75.0	75.0	75.0	66.4	55.7	45.0	89	88.8	75.8	67.2	56.4	46
4103	91.0	91.0	91.0	80.6	67.6	54.6	103	103.0	90.3	80.1	67.3	55
4140	112.0	112.0	91.8	78.4	-	-	140	122.8	96.7	79	-	-
4168	150.0	150.0	123.0	105.0	-	-	168	150.5	124.4	107	-	-
4208	180.0	180.0	147.6	126.0	-	-	208	179.7	137.2	109	-	-
4250	216.0	216.0	177.1	151.2	-	-	250	221.8	179.4	151	-	-
4302	260.0	260.0	213.2	182.0	-	-	302	268.8	218.9	186	-	-
4371	304.0	304.0	249.3	212.8	-	-	371	327.2	261.6	218	-	-
4414	371.0	371.0	304.2	259.7	-	-	414	371	304.7	261	-	-
4477	414.0	345.7	-	-	-	-	477	367	-	-	-	-
4568	477.0	398.3	-	-	-	-	568	437	-	-	-	-
4605	605.0	505.2	-	-	-	-	675	529	-	-	-	-
4720	605.0	505.2	-	-	-	-	720	564	-	-	-	-

Table 5.9 AOLV Carrier Frequency and Rated Current Derating

Model	Rated Current (A)									
	Heavy Duty Rating (HD) Parameter C6-01 = 0					Normal Duty Rating (ND) Parameter C6-01 = 1				
	2 kHz	5 kHz	8 kHz	10 kHz	12.5 kHz	2 kHz	5 kHz	8 kHz	10 kHz	12.5 kHz
4002	1.8	1.8	1.3	1.0	0.6	2.1	1.8	1.6	1.4	1.2
4004	3.4	3.4	2.4	1.7	0.8	4.1	3.5	2.8	2.4	1.9
4005	4.8	4.8	3.8	3.0	2.1	5.4	4.9	4.3	3.9	3.5
4007	5.5	5.5	4.2	3.2	2.0	7.1	5.7	4.2	3.2	2.0
4009	7.2	7.2	5.8	4.8	3.5	8.9	7.4	5.8	4.8	3.5
4012	9.2	9.2	7.0	5.4	3.3	11.9	9.5	7.0	5.4	3.3
4018	14.8	14.8	11.4	8.9	5.7	17.5	15.2	11.4	8.9	5.7
4023	18.0	18.0	13.9	10.8	6.9	23	18.8	14.1	11.0	7.1

Model	Rated Current (A)									
	Heavy Duty Rating (HD) Parameter C6-01 = 0					Normal Duty Rating (ND) Parameter C6-01 = 1				
	2 kHz	5 kHz	8 kHz	10 kHz	12.5 kHz	2 kHz	5 kHz	8 kHz	10 kHz	12.5 kHz
4031	24.0	24.0	18.4	14.1	8.8	31	24.7	18.3	14.1	8.8
4038	31.0	31.0	23.9	18.6	12.0	38	31.9	23.9	18.6	12.0
4044	39.0	39.0	30.1	23.4	15.0	44	38.5	29.5	23.4	15.8
4060	45.0	45.0	33.3	24.4	13.4	60	46.4	33.2	24.4	13.4
4075	60.0	60.0	46.3	36.0	23.1	75	64.7	48.4	37.5	23.8
4089	75.0	75.0	57.9	45.0	28.9	89	78.0	58.6	45.6	29.4
4103	91.0	91.0	70.2	54.6	35.1	103	92.8	69.9	54.6	35.5
4140	112.0	95.2	65.0	44.8	-	140	101.1	62.0	36	-
4168	150.0	127.5	87.0	60.0	-	168	128.7	89.5	63	-
4208	180.0	153.0	104.4	72.0	-	208	144.3	80.6	38	-
4250	216.0	183.6	125.3	86.4	-	250	186.5	123.0	81	-
4302	260.0	221.0	150.8	104.0	-	302	227.2	152.5	103	-
4371	304.0	258.4	176.3	121.6	-	371	272.5	174.0	108	-
4414	371.0	315.4	215.2	148.4	-	414	316	216.9	151	-
4477	414.0	259.8	-	-	-	477	230	-	-	-
4568	477.0	299.3	-	-	-	568	274	-	-	-
4605	605.0	379.6	-	-	-	675	345	-	-	-
4720	605.0	379.6	-	-	-	720	368	-	-	-

Table 5.10 AOLV/PM Carrier Frequency and Rated Current Derating

Model	Rated Current (A)											
	Heavy Duty Rating (HD) Parameter C6-01 = 0						Normal Duty Rating (ND) Parameter C6-01 = 1					
	2 kHz	4 kHz	6 kHz	8 kHz	10 kHz	12 kHz	2 kHz	4 kHz	6 kHz	8 kHz	10 kHz	12 kHz
4002	1.8	1.8	1.7	1.3	1.0	0.6	2.1	1.9	1.7	1.6	1.4	1.2
4004	3.4	3.4	3.2	2.4	1.7	1.0	4.1	3.7	3.3	2.8	2.4	2.0
4005	4.8	4.8	4.5	3.8	3.0	2.3	5.4	5.0	4.7	4.3	3.9	3.6
4007	5.5	5.5	5.2	4.2	3.2	2.3	7.1	6.1	5.2	4.2	3.2	2.3
4009	7.2	7.2	6.9	5.8	4.8	3.8	8.9	7.9	6.8	5.8	4.8	3.7
4012	9.2	9.2	8.7	7.0	5.4	3.8	11.9	10.3	8.6	7.0	5.4	3.8
4018	14.8	14.8	14.0	11.4	8.9	6.3	17.5	16.5	14.0	11.4	8.9	6.3
4023	18.0	18.0	17.0	13.9	10.8	7.7	23.4	20.4	17.3	14.1	11.0	7.8
4031	24.0	24.0	22.6	18.4	14.1	9.9	31.0	26.8	22.6	18.3	14.1	9.9
4038	31.0	31.0	29.2	23.9	18.6	13.3	38.0	34.5	29.2	23.9	18.6	13.3
4044	39.0	39.0	36.8	30.1	23.4	16.7	44.0	41.6	35.5	29.5	23.4	17.3
4060	45.0	45.0	42.1	33.3	24.4	15.6	59.6	50.8	42.0	33.2	24.4	15.6
4075	60.0	60.0	56.6	46.3	36.0	25.7	74.9	70.2	59.3	48.4	37.5	26.5
4089	75.0	75.0	70.7	57.9	45.0	32.1	89.2	84.5	71.5	58.6	45.6	32.7
4103	91.0	91.0	85.8	70.2	54.6	39.0	103.0	100.5	85.2	69.9	54.6	39.3
4140	112.0	105.3	85.1	65.0	44.8	-	140.0	114.1	88.1	62.0	36.0	-
4168	150.0	141.0	114.0	87.0	60.0	-	168.0	141.8	115.6	89.5	63.3	-
4208	180.0	169.2	136.8	104.4	72.0	-	208.0	165.5	123.1	80.6	38.1	-

Model	Rated Current (A)											
	Heavy Duty Rating (HD) Parameter C6-01 = 0						Normal Duty Rating (ND) Parameter C6-01 = 1					
	2 kHz	4 kHz	6 kHz	8 kHz	10 kHz	12 kHz	2 kHz	4 kHz	6 kHz	8 kHz	10 kHz	12 kHz
4250	216.0	203.0	164.2	125.3	86.4	-	250.0	207.7	165.3	123.0	80.6	-
4302	260.0	244.4	197.6	150.8	104.0	-	302.0	252.2	202.3	152.5	102.6	-
4371	304.0	285.8	231.0	176.3	121.6	-	371.0	305.3	239.7	174.0	108.3	-
4414	371.0	348.7	282.0	215.2	148.4	-	414.0	348.6	282.8	216.9	151.1	-
4477	414.0	311.3	-	-	-	-	477.0	312.4	-	-	-	-
4568	477.0	358.7	-	-	-	-	568.0	372.0	-	-	-	-
4605	605.0	455.0	-	-	-	-	675.0	455.0	-	-	-	-
4720	605.0	455.0	-	-	-	-	720.0	485.3	-	-	-	-

Three-Phase 600 V Class

Table 5.11 Carrier Frequency and Rated Current Derating

Model	Rated Current (A)											
	Heavy Duty Rating (HD) Parameter C6-01 = 0						Normal Duty Rating (ND) Parameter C6-01 = 1					
	2 kHz	5 kHz	8 kHz	10 kHz	12.5 kHz	15 kHz	2 kHz	5 kHz	8 kHz	10 kHz	12.5 kHz	15 kHz
5382	336	-	-	-	-	-	382	-	-	-	-	-
5412	382	-	-	-	-	-	412	-	-	-	-	-
5472	412	-	-	-	-	-	472	-	-	-	-	-

Derating Depending on Ambient Temperature

When you install drives in a place where ambient temperatures are higher than the rated conditions or install drives side-by-side in the enclosure panel, set *L8-12 [Ambient Temperature] and L8-35 [Installation Method Selection]*. Derate the output current as specified in Figure 5.1.

No. (Hex.)	Name	Description	Default (Range)
L8-12 (04B8)	Ambient Temperature Setting	V/f CL-V/f OLV CLV AOLV OLV/PM AOLV/PM CLV/PM EZOLV Sets the ambient temperature of the drive installation area.	40 °C (-10 °C - +50 °C)

No. (Hex.)	Name	Description	Default (Range)
L8-35 (04EC)	Installation Method Selection	V/f CL-V/f OLV CLV AOLV OLV/PM AOLV/PM CLV/PM EZOLV Sets the type of drive installation.	Determined by the drive (0 - 3)

0 : IP20/OpenChassis Enc/Ex Heatsink

You can use the drive within the rated output current range of -10 °C to 50 °C 100%. Use this setting to install an IP20/UL Open Type drive or when the heatsink (cooling fin) is outside the enclosure panel.

Make sure that there is 30 mm (1.18 in) minimum of space between drives or between the drive and side of the enclosure panel.

1 : Side-by-Side Mounting

Derates the drive rated output current from "-10 °C to 30 °C 100%" to "30 °C 100%" to "50 °C 70%". Use this setting to install more than one drive Side-by-Side.

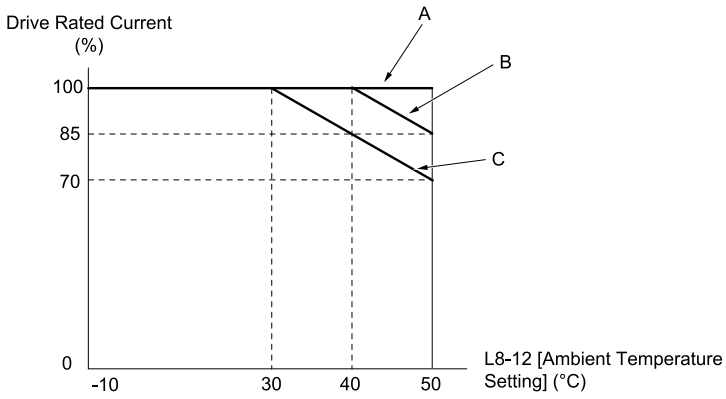
Make sure that there is 2 mm (0.08 in) minimum of space between drives.

2 : IP20/NEMA Type 1/IP55

Derates the drive rated output current from "-10 °C to 40 °C 100%" to "40 °C 100%" to "50 °C 85%". Use this setting to install IP55/UL Type 12 Heatsink External Mounting drives.

3 : Finless

Derates the drive rated output current from "-10 °C to 40 °C 100%" to "40 °C 100%" to "50 °C 85%". Use this setting to install a finless drive.



A - ***L8-35 = 0***
B - ***L8-35 = 2, L8-35 = 3***
C - ***L8-35 = 1***

Figure 5.1 Derating Depending on Drive Installation Method

Altitude Derating

Install the drive in a location that has an altitude of 1000 m (3281 ft) or lower.

Derate the output current by 1% for each 100 m (328 ft) to install the drive in altitudes between 1000 to 4000 m (3281 to 13123 ft).

It is not necessary to derate the rated voltage in these conditions:

- Installing the drive at 2000 m (6562 ft) or lower
- Installing the drive between 2000 to 4000 m (6562 to 13123 ft) and grounding the neutral point on the power supply.
  If you do not ground the drive with a neutral network, contact Yaskawa or your nearest sales representative.

Revision History

Date of Publication	Revision Number	Section	Revised Content
July 2020	2	2, 3, 4, 5	Addition: 600 V models and corresponding data. • Three-Phase 600 V: CIPR-GA80x5382 to 5472
August 2019	1	3	Revision: Drive Dimensions and Estimated Weights for IP55/UL Type 12 drives
May 2019	–	–	First Edition

GA800 Drive

Installation Manual

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In the event that the end user of this product is to be the military and said product is to be employed in any weapons systems or the manufacture thereof, the export will fall under the relevant regulations as stipulated in the Foreign Exchange and Foreign Trade Regulations. Therefore, be sure to follow all procedures and submit all relevant documentation according to any and all rules, regulations and laws that may apply.
Specifications are subject to change without notice for ongoing product modifications and improvements.

Original instructions.

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