Installation Instructions

Allen-Bradley

PowerFlex 700H, 700S, and 700AFE Drive Fan Systems

Frames 9...14 Drives

Important User Information

Read this document and the documents listed in the additional resources section about installation, configuration, and operation of this equipment before you install, configure, operate, or maintain this product. Users are required to familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.

Activities including installation, adjustments, putting into service, use, assembly, disassembly, and maintenance are required to be carried out by suitably trained personnel in accordance with applicable code of practice.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

	**WARNING:** Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
	**ATTENTION:** Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.

Labels may also be on or inside the equipment to provide specific precautions.

	**SHOCK HAZARD:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.
	**BURN HAZARD:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.
	**ARC FLASH HAZARD:** Labels may be on or inside the equipment, for example, a motor control center, to alert people to potential Arc Flash. Arc Flash will cause severe injury or death. Wear proper Personal Protective Equipment (PPE). Follow ALL Regulatory requirements for safe work practices and for Personal Protective Equipment (PPE).

This manual contains new and updated information.

New and Updated Information

This table contains the changes made to this revision.

Topic	Page
Added information on parts availability to Phase 3 - Starts January 1, 2015 in the Energy-related Products Fan Efficiency Directive section.	13
Add spare part information for the frame 9 drive fan bracket.	20
Updated the Frame 10 AFE Drive Configurations section to include a drawing and information on the IP20 NEMA / UL Type 1 (MCC) Cabinet.	186
Updated the DC Fan Systems spare parts table to include the new LCL filter fan DC power supply kit.	188
Updated the Frame 10 AFE (LCL Filter Section) DC Fan System Wiring Schematic Diagram to reflect the new LCL filter fan DC power supply kit.	191
Updated the LCL Filter Section table to include the new LCL filter fan DC power supply kit.	214
Added the LCL Filter DC Fan Power Supply Kit (SK-Y1-DCPS2-F10) Removal and Installation procedures for the new kit.	219
Added the LCL Filter DC Fan Power Supply Circuit Board (SK-H1-DCFANBD1) Removal and Installation procedures for the new kit.	225
Updated the LCL Filter Main DC Fan (SK-Y1-DCFAN1) Assembly Removal and Installation to include new steps.	230
Updated the DC Fan Systems spare parts table to include the new LCL filter fan DC power supply kit.	239
Updated the LCL Filter Fan DC Power Supply (SK-Y1-DCPS2-F13) Wiring Diagram - Newer Version to reflect the new LCL filter fan DC power supply kit.	247
Updated the LCL Filter Section table to include the new LCL filter fan DC power supply kit.	243
Added the LCL Filter Fan DC Power Supply (SK-Y1-DCPS2-F13) Removal and Installation procedures for the new kit.	247
Updated the Spare Part Kit Contents to include the new LCL filter fan DC power supply kits.	277

Notes:

Preface

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PowerFlex 700H and 700S Drives - Frame 9 Procedures

Chapter 2

PowerFlex 700H and 700S Drives - Frame 10 Procedures

Chapter 3

PowerFlex 700H and 700S Drives - Frame 11 Procedures

Chapter 4

PowerFlex 700H and 700S Drives - Frame 12 Procedures

Chapter 5

PowerFlex 700H and 700S Drives - Frame 13 Procedures

Appendix B

Available Fan System Kits

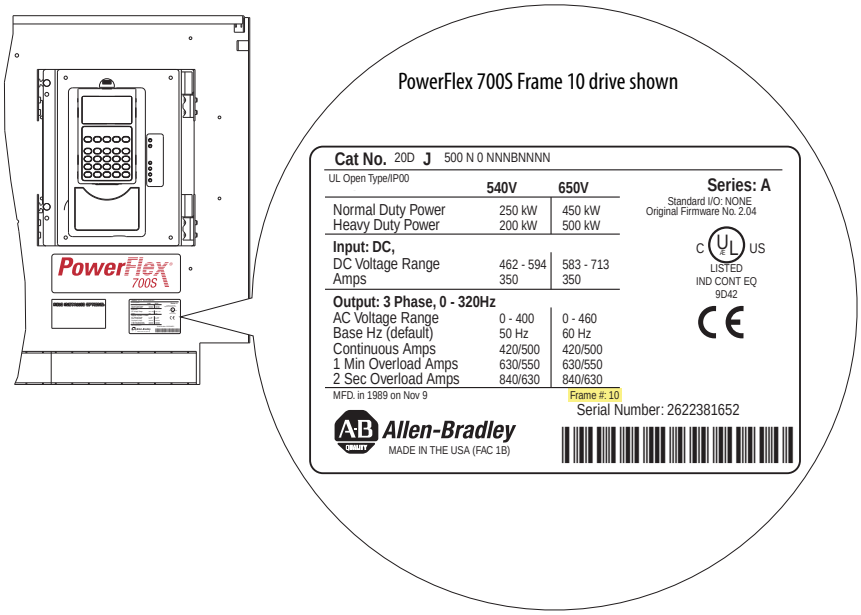
This manual contains fan system service information for frame 9...14 PowerFlex 700H and PowerFlex 700S AC drives, and the frame 10 and 13 PowerFlex 700AFE.

Who Should Use this Manual

This manual is intended for qualified service personnel responsible for troubleshooting and repairing frame 9...14 PowerFlex 700H and 700S and frame 10 and 13 PowerFlex 700AFE drives. You must have previous experience with, and a basic understanding of, electrical terminology, procedures, required troubleshooting equipment, equipment protection procedures and methods, and safety precautions to make repairs on these drives and use this manual.

Verify Your Drive Frame Size

You can verify your drive frame size by checking the data nameplate. This information is printed just above the serial number.



What is Not in this Manual

This manual does not contain information about parts and functions of the drive that are not related to fan system service within the drive. For more information and service procedures for your particular drive, see the applicable publication in this table.

Drive Type	Frame Size	Publication Title	Publication Number
PowerFlex 700H and 700S	9	PowerFlex 700H/S Drives, Frame 9 Hardware Service Manual	PFLEX-TG001
	10	PowerFlex 700H/S Drives, Frame 10 Hardware Service Manual	PFLEX-TG002
	11	PowerFlex 700H/S Drives, Frame 11 Hardware Service Manual	PFLEX-TG003
	12	PowerFlex 700H/S Drives, Frame 12 Hardware Service Manual	PFLEX-TG004
	13	PowerFlex 700H/S Drives, Frame 13 Hardware Service Manual	PFLEX-TG005
	14	PowerFlex 700H/S Drives, Frame 14 Hardware Service Manual	PFLEX-TG006
PowerFlex 700AFE	10	PowerFlex 700AFE Frame 10 Hardware Service Manual	20Y-TG001
	13	PowerFlex 700AFE Frame 13 Hardware Service Manual	20Y-TG002

You can view or download publications at http://www.rockwellautomation.com/literature/. To order paper copies of technical documentation, contact your local Allen-Bradley distributor or Rockwell Automation sales representative.

Energy-related Products Fan Efficiency Directive

The Energy-related Products (ErP) Directive (2012/27/EU on Energy Efficiency, 25, October 2012) is the European Commission Directive required for products sold and exported to the European Union (EU). This directive aims to protect the environment by increasing energy efficiency in the EU. This directive, among other things, defines the minimum efficiency for fans in the range of 0.125...500 kW.

For PowerFlex 700H and 700S drive fan systems, this directive will be implemented in multiple phases.

Phase 1 - Starts January 1, 2013

New products delivered within the EU (with a power structure manufacture date of January 1, 2013 and later) will have a DC fan system installed. Phase I includes PowerFlex 700H and 700S frame 9 and larger drives and PowerFlex 700AFE systems.

DC fan system kits have been developed to support the repair of damaged units and to provide retrofit solutions. However, the ErP Directive does not require drives with existing AC fan systems to be retrofitted.

Phase 2 - Starts January 1, 2013, and Ending December 31, 2014

According to the ErP Directive, delivering the existing AC fan systems as spare parts for PowerFlex 700H and 700S, frame 9 and larger, drives and PowerFlex 700AFE systems is allowed until the December 31, 2014 deadline within the EU. DC fan systems are available as spare parts.

Phase 3 - Starts January 1, 2015

Use DC fan systems as spare part kits for PowerFlex 700H and 700S, frame 9 and larger, drives, and PowerFlex 700AFE systems. DC fan system retrofit kits are available for drives that were originally manufactured with AC fan systems.

AC fan system kits that were manufactured before January 1, 2015 can still be used as a replacement spare part kit.

Fan System Replacement FAQs

Typical questions and solutions to fan system replacements can include:

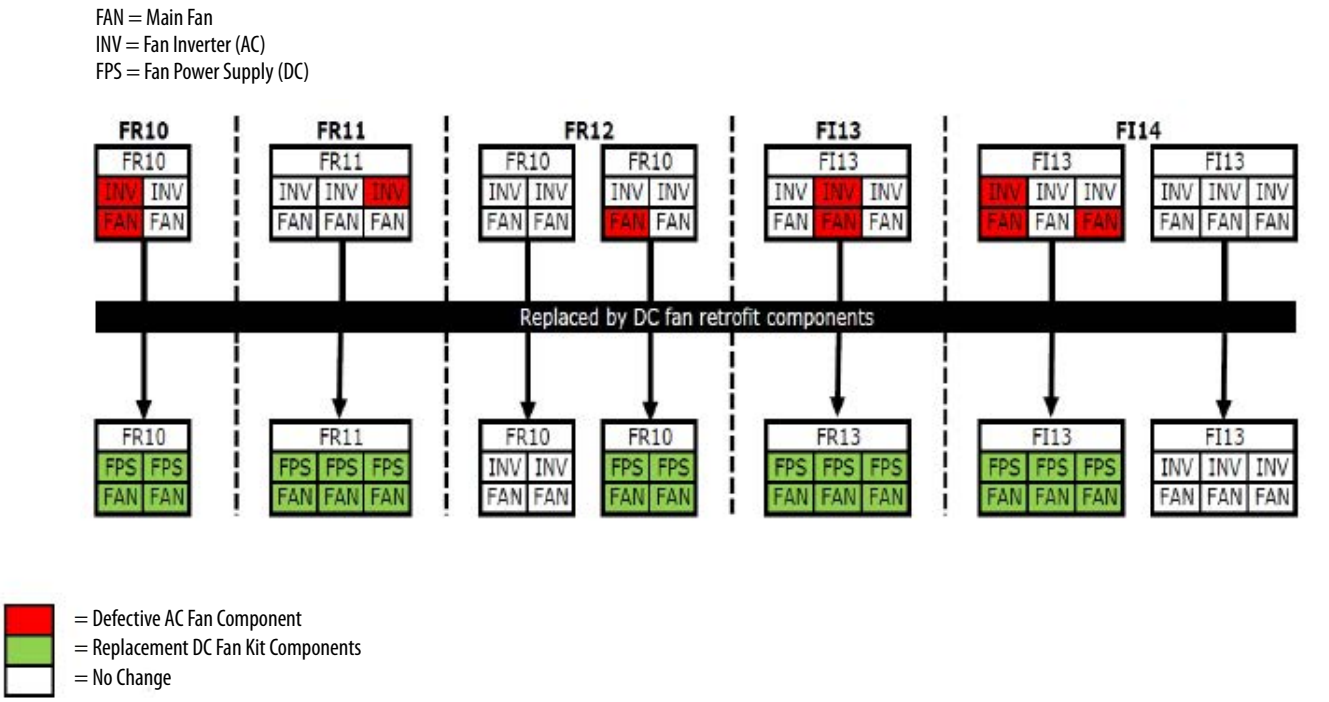
Question	Solution
Do all AC fans in a drive need to be replaced with a new DC fan if only one has failed?	It is recommended that a power structure always contains the same type of fan system, either all AC or all DC.
If only one AC fan inverter circuit board fails, can I replace only the damaged board with a new one?	Yes, if the other components of the AC fan unit are functioning properly, you can replace the circuit board only.
What does a DC fan kit include?	This kit includes the DC fan assembly.
What does a DC fan circuit board kit include?	This kit includes the DC fan power supply circuit board.
Are retrofit kits available?	Kits are available to retrofit an AC to DC fan power supply. These kits include the DC fan assembly, DC fan power supply, fan inverter circuit board, all wire harnesses, and required hardware.

Fan System Replacement Recommendations

This table provides recommendations for replacing a failed fan system on PowerFlex 700H and 700S frame 9 and larger drives and PowerFlex 700AFE systems. See Figure 1 on page 14 for more information.

Frame Size	Number of Fan Systems in the Drive	Recommendation for Replacement
9	1	Always replace the failed AC fan system with a new DC fan system.
10	2	If one AC fan system fails, replace both existing AC fan systems with new DC fan systems.
11	3	If one AC fan system fails, replace all three existing AC fan systems with new DC fan systems.
12	4	If one AC fan system fails, replace the existing two AC fan systems contained in the power structure that contains the failed AC fan system with new DC fan systems.
13	5 or 6	If one AC fan system fails, replace all existing AC fan systems with new DC fan systems.
14	9…12	If one AC fan system fails, replace all existing AC fan systems contained in the power structure that contains the failed AC fan system with new DC fan systems.
10 AFE	1 (LCL)	Replace the existing DC fan systems, as necessary.
	2 (Drive)	Always replace the failed AC fan system with a new DC fan system.
13 AFE	1 (LCL)	Replace the existing DC fan systems, as necessary.
	3 (Drive)	If one AC fan system fails, replace all three existing AC fan systems with new DC fan systems.

Figure 1 - DC Fan System Replacement Examples



How to Use this Manual

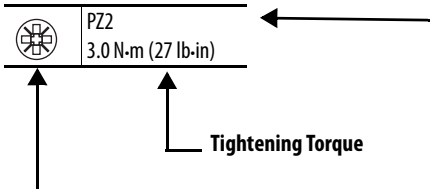
This manual contains a chapter for each drive type and frame size. Use this table to locate a list of available spare parts and the procedures for replacing fan system components for a specific drive and frame size.

Drive Type	Frame Size	Chapter / Appendix	Page Number
PowerFlex 700H and 700S	9	1	19
	10	2	55
	11	3	87
	12	4	117
	13	5	121
	14	6	179
PowerFlex 700AFE	10	7	185
	13	8	235
PowerFlex 700H, 700S, and 700AFE	9…14	A	255
		B	277

Fastener/Tool/Torque Information

The disassembly illustrations contained in this manual identify the type of fastener, tool, and tightening torque used for disassembly/assembly of components in the drive.

Fastener/Tool/Torque Information:



Tool Type and Size:

F	Flat nose screw driver
Px	Phillips screw driver/bit and size
PZx	POZIDRIV screw driver/bit and size
Txx	Hexalobular screw driver/bit and size
xx mm	Hexagonal socket wrench

Fastener Type:

	Flat head screw
	Hexagonal bolt
	Hexagonal nut or standoff
	Hexagonal screw
	Hexalobular head screw
	Phillips head screw (1)
	POZIDRIV head screw (1)
	Slotted Hexalobular head screw

(1) Phillips® and POZIDRIV® are registered trademarks of the Phillips Screw Company.

General Precautions

Read the following precautions before you begin testing components, performing maintenance, or repairing the drive.

Qualified Personnel

ATTENTION: Only qualified personnel familiar with adjustable frequency AC drives and associated machinery should plan or implement the installation, start-up and subsequent maintenance of the system. Failure to comply may result in personal injury and/or equipment damage.

Personal Safety

ATTENTION: To avoid an electric shock hazard, verify that the voltage on the bus capacitors has discharged before servicing the drive. Check the DC bus voltage at the Power Terminal Block by measuring between the +DC & -DC terminals, between the +DC terminal and the chassis, and between the -DC terminal and the chassis. The voltage must be zero for all three measurements.

ATTENTION: Potentially fatal voltages may result from improper usage of an oscilloscope and other test equipment. The oscilloscope chassis may be at a potentially fatal voltage if not properly grounded. If an oscilloscope is used to measure high voltage waveforms, use appropriately rated differential voltage probes. Be sure that they are set to the highest voltage scaling in order to achieve safe measurement resolution. Verify that the oscilloscope chassis is correctly grounded to an earth ground.

ATTENTION: The sheet metal cover and mounting screws on the ASIC board located on the inverters of the power structure are energized at (-) DC bus potential high voltage. Risk of electrical shock, injury, or death exists if someone comes into contact with the assembly.

Product Safety

ATTENTION: This drive contains ESD (Electrostatic Discharge) sensitive parts and assemblies. Static control precautions are required when installing, testing, servicing or repairing this assembly. Component damage may result if ESD control procedures are not followed. If you are not familiar with static control procedures, reference Guarding Against Electrostatic Damage, publication 8000-4.5.2 or any other applicable ESD protection handbook.

Class 1 LED Product

ATTENTION: Hazard of permanent eye damage exists when using optical transmission equipment. This product emits intense light and invisible radiation. Do not look into module ports or fiber-optic cable connectors.

Notes:

PowerFlex 700H and 700S Drives - Frame 9 Procedures

This chapter contains spare part information and procedures for testing and replacing fan system components for frame 9 PowerFlex 700H and 700S drives. See Appendix A PowerFlex 700H and 700S Diagnostic Procedures on page 255 for additional component test procedures.

Frame 9 Fan System Spare Parts

AC Fan Systems

See Available Fan System Kits starting on page 277 for an illustration of the spare part kit contents.

Cat. No.	Part Description	Quantity per Drive	Original Vendor and Model Number (3)
20-PP01049	50 mm cooling fan for fan inverter	1	Sinwan SD5012PT-24H
20-PP01068	80 mm x 80 mm x 32 mm internal stirring fan assembly	2 or 3 (2)	Japan Servo Co., LTD PUDC24H4C-049
20-PP01080	230 W Main AC fan assembly	1	–
20-PP09055	Output transformer for main fan inverter	1	–
20-PP20202	Fuse for fan system	2	Ferraz Shawmut ATQ8 (4)
20-PP20300	Fuse holder for main fan system fuses	1	Ferraz Shamut 30322
20-VB00299	Main fan inverter circuit board (1)	1	–
SK-H1-FANCAP-F9	Capacitor (7 μF) for main fan inverter	1	–
SK-H1-FR9BRKT	AC fan bracket	1	–

(1) The same part and catalog number is used for both 400/480V AC and 600/690V AC input drives.
(2) 2 for PowerFlex 700H drives and 3 for PowerFlex 700S drives.
(3) This part may not contain wires, connectors, or mounting hardware when bought directly from the vendor.
(4) The factory default fuses are Ferraz Shawmut ATQ8, 8 A fuses. Older drives may contain Bussman 6 A fuses.

DC Fan Systems

See Available Fan System Kits starting on page 277 for an illustration of the spare part kit contents.

Cat. No.	Part Description	Quantity per Drive	Original Vendor and Model Number
SK-Y1-DCFAN1	Main DC fan assembly	1	–
SK-H1-DCFANBD1	Main DC fan power supply circuit board (1)	1	–
SK-H1-DCFANRETROFIT-F9	AC to DC fan system retrofit kit	1	–

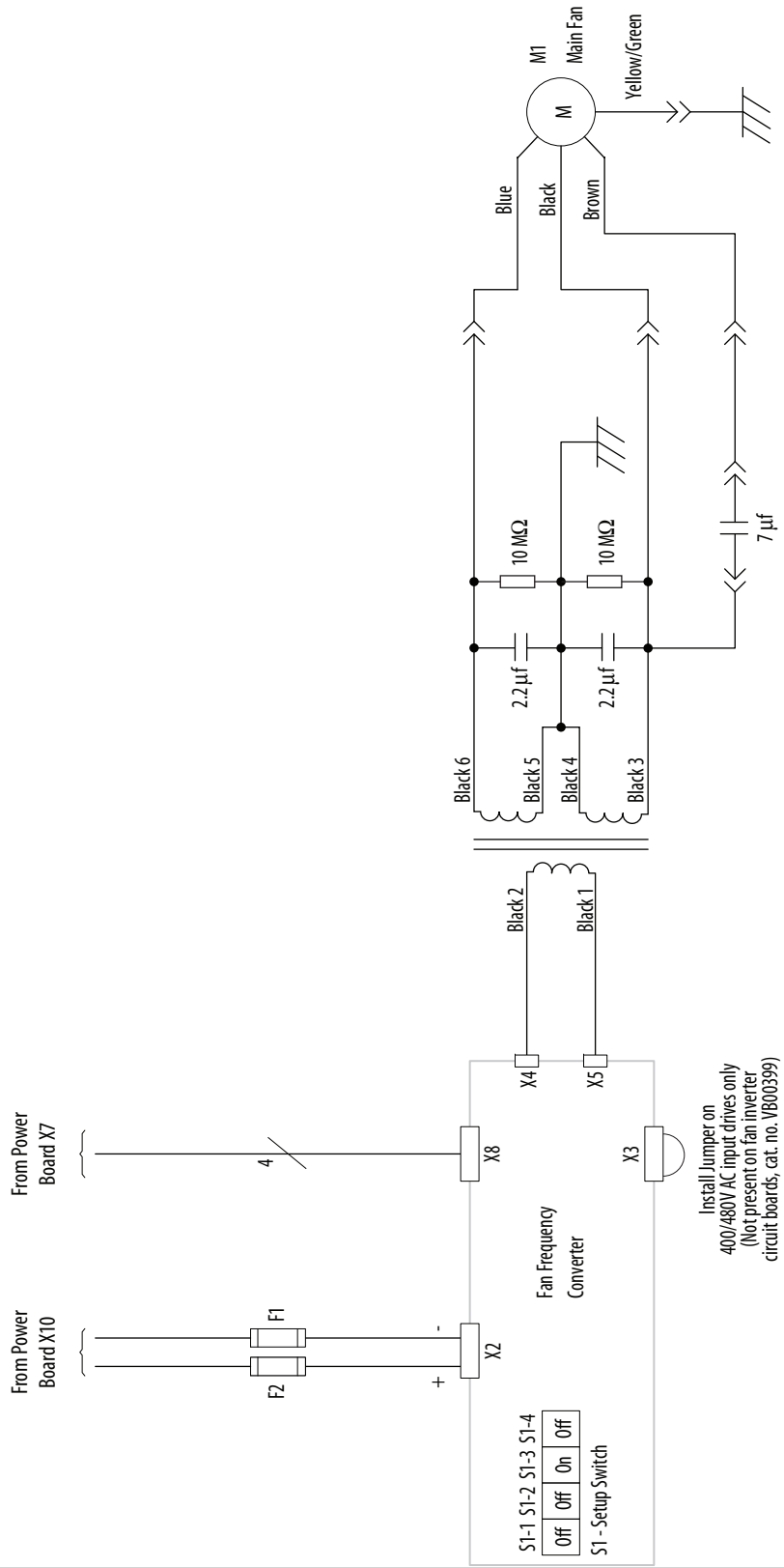
(1) Circuit Board only, no sheet metal bracket.

Tools Needed for Frame 9 Fan System Repairs

- #2 Phillips head screwdriver
- #2 POZIDRIV screwdriver
- Flat blade screwdriver
- 13 mm socket wrench
- 19 mm socket wrench
- T20 hexalobular screwdriver with a shaft length of at least 9 cm (3.54 in.)
- Cable ties
- Electrical tape
- Fuse puller
- Multi-meter
- Needle-nose pliers

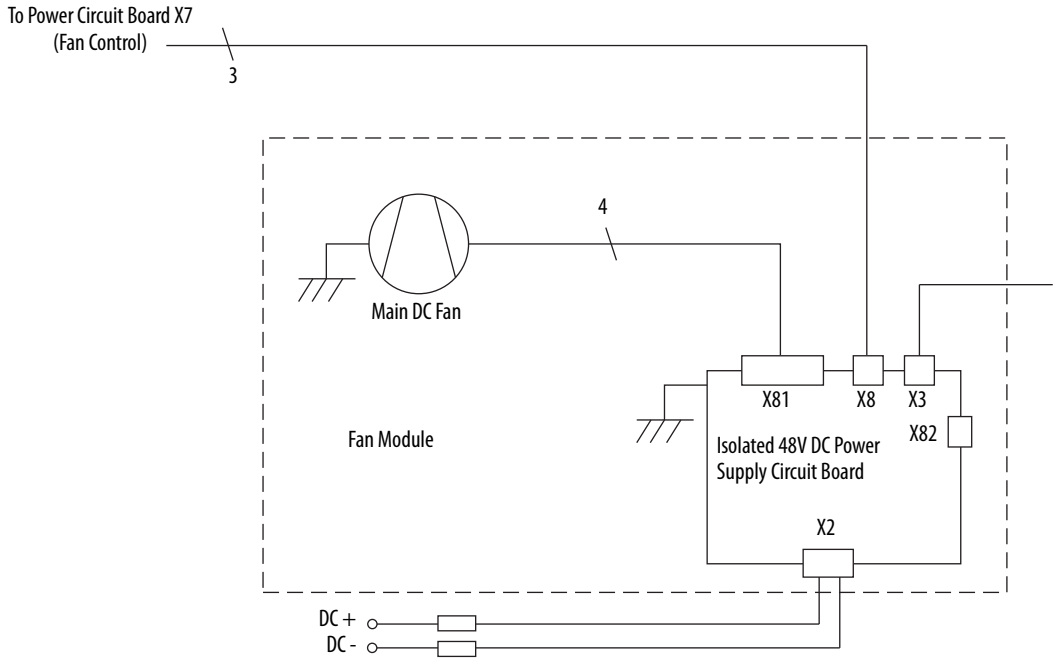
Frame 9 Schematic Diagrams

Figure 2 - Frame 9 AC Fan System Wiring Schematic Diagram



Switch	Setting	To indicate the following:
S1	Off	50 Hz fan motor frequency
S2	Off	220 V AC motor voltage
S3	On	230 V AC motor voltage
S4	Off	Frame size 9…14

Figure 3 - Frame 9 DC Fan System Wiring Schematic Diagram



Frame 9 Fan System Replacement Procedures

Replacement procedures for these frame 9 fan system parts are included in this chapter.

Cat. No.	Part Description	Page
20-PP20202	Fuse for fan system	29
20-PP20300	Fuse holder for main fan system fuses	29
20-PP01049	50 mm cooling fan for fan inverter	30
SK-H1-FANCAP-F9	Main AC fan capacitor (7 µF)	31
20-VB00299	Main AC fan inverter circuit board	33
SK-H1-DCFANBD1	Main DC fan power supply circuit board	36
SK-H1-DCFANRETROFIT-F9	AC to DC fan system retrofit kit	39
SK-Y1-DCFAN1	Main DC fan assembly	43
20-PP01080	230 W main AC fan assembly	43
20-PP09055	Main AC fan inverter output transformer	49
20-PP01068	80 mm x 80 mm x 32 mm internal stirring fan assembly	50
20-PP01068	Cross-plate stirring fan (80 mm x 80 mm x 32 mm)	51
20-PP01068	Internal stirring fan (80 mm x 80 mm x 32 mm)	52

Remove Power from the Drive

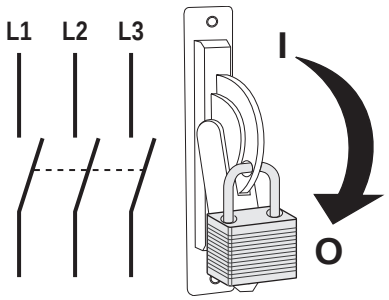
ATTENTION: To avoid an electric shock hazard, verify that the voltage on the bus capacitors has discharged completely before servicing. Check the DC bus voltage at the Power Terminal Block by measuring between the +DC and -DC terminals, between the +DC terminal and the chassis, and between the -DC terminal and the chassis. The voltage must be zero for all three measurements.

Remove power before making or breaking cable connections. When you remove or insert a cable connector with power applied, an electrical arc may occur. An electrical arc can cause personal injury or property damage by:

- sending an erroneous signal to your system's field devices, causing unintended machine motion
- causing an explosion in a hazardous environment

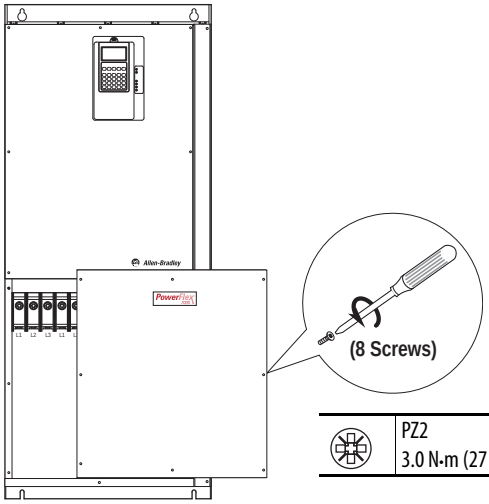
Electrical arcing causes excessive wear to contacts on both the module and its mating connector. Worn contacts may create electrical resistance.

1. Turn off and lock out input power.
2. Wait five minutes.
3. Check the DC bus voltage at the Power Terminal Block by measuring between the +DC and -DC terminals, between the +DC terminal and the chassis, and between the -DC terminal and the chassis. The voltage must be zero for all three measurements.



Remove the Lower Protective Cover

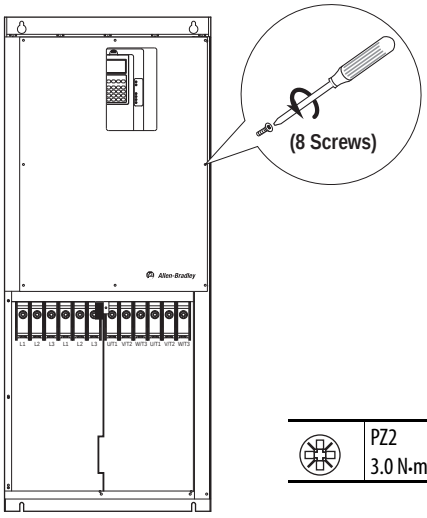
1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 23.
3. Remove the eight M4 x 8 mm POZIDRIV screws that secure the lower protective cover to the drive and remove the cover.



	PZ2 3.0 N•m (27 lb•in)

Remove the Upper Protective Cover

1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 23.
3. Remove the eight M4 x 8 mm POZIDRIV screws that secure the upper protective cover to the drive and remove the cover.

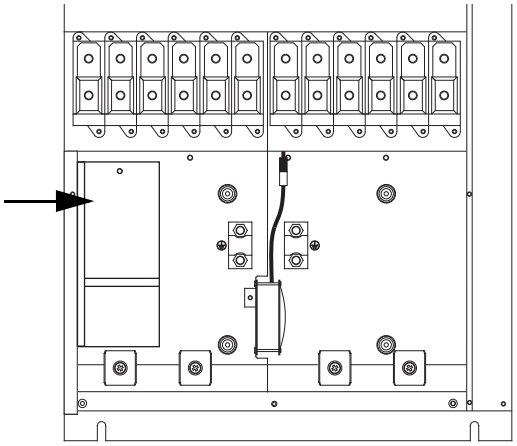


	PZ2 3.0 N•m (27 lb•in)

Removing the Main Fan Inverter Capacitor Bracket

In order to test and/or replace other fan system components in the drive, you must first remove the main fan inverter cooling fan capacitor bracket from the drive.

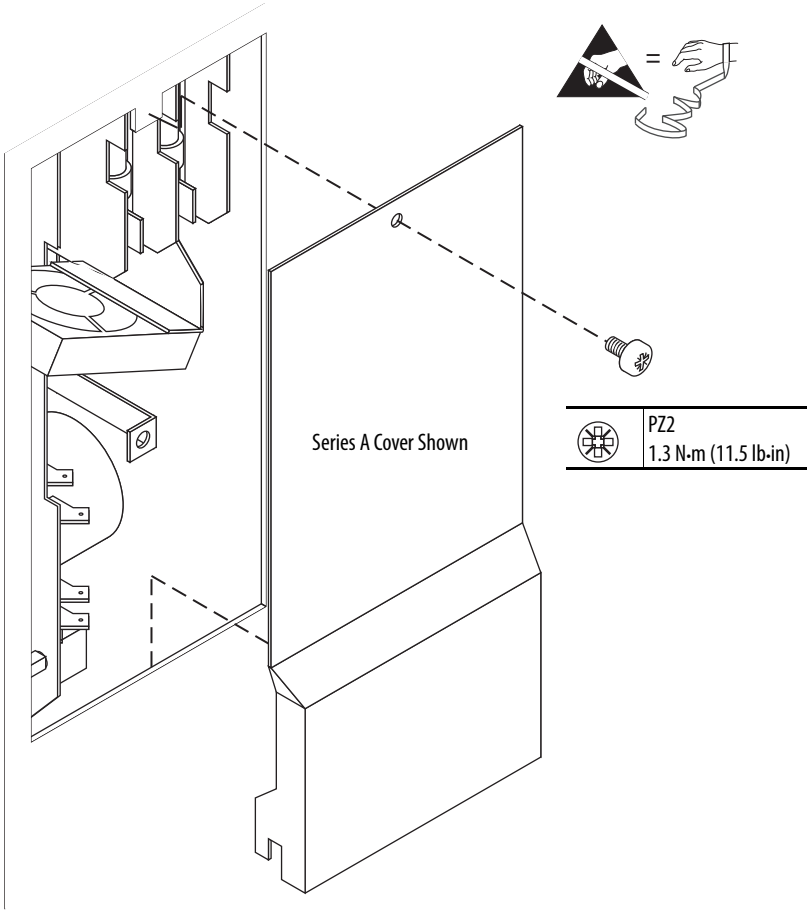
The main fan inverter compartment is located in the bottom, left-hand corner of the drive, under the connection plate.



Follow these steps to remove the main fan inverter capacitor bracket.

1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 23.
3. Remove the lower protective cover from the drive. See Remove the Lower Protective Cover on page 24.

4. Remove the M4 x 8 mm POZIDRIV screw that secures the fan inverter cover to the drive frame and remove the cover.



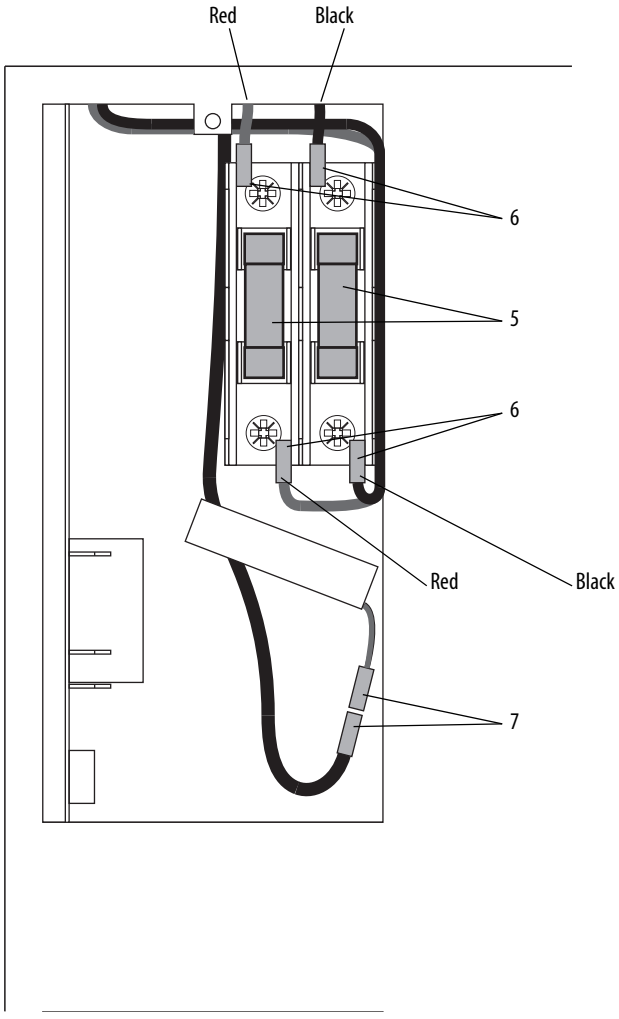
Series B Cover Series A Cover

IMPORTANT Mark all connections and wires before removing to avoid incorrect wiring during reassembly.

5. Remove the fuses from the fuse holder.
6. Disconnect the four fuse power wires (black and red pairs) from the top and bottom of the fuse holder.

IMPORTANT Note that the red wires connect to the left side terminal on the fuse holder and the black wires connect to the right side terminal on the fuse holder.

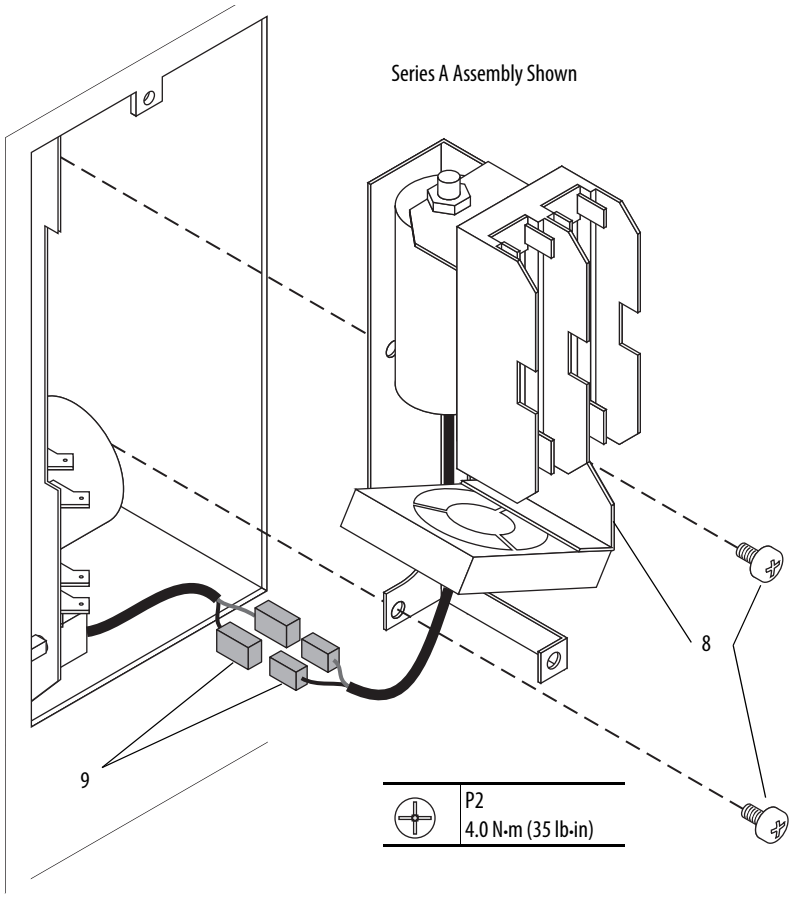
7. Disconnect the stirring fan power wires.



8. Remove the two M5 x 10 mm Phillips head screws that secure the fan capacitor, fuse holder, and cooling fan bracket to the drive frame and lift the bracket out of the drive.

   Note that the fan capacitor is still connected to the drive circuitry.

9. Disconnect the fan capacitor wires from the connectors labeled 'Blue' and 'Brown'.



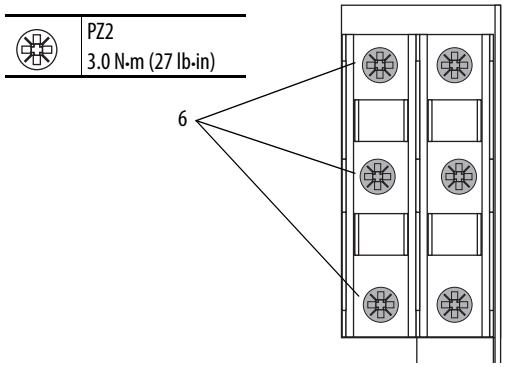
Series A Assembly

Series B Assembly (Note the Larger Capacitor)

Main Fan Fuses (20-PP20202) and Fuse Holder (20-PP20300) Removal and Installation

The main fan fuses and fuse holder are located on the fan inverter capacitor bracket below the fan inverter cover.

1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 23.
3. Remove the lower protective cover from the drive. See Remove the Lower Protective Cover on page 24.
4. Remove the main fan inverter capacitor bracket. See Removing the Main Fan Inverter Capacitor Bracket on page 25.
5. Remove and replace the fuses, if necessary. See Checking the Fan Inverter Fuses on page 263.
6. If, necessary, remove the two M4 x 8 mm POZIDRIV screws that secure the fuse block to the sheet metal.



7. Install the fuses and fuse block in the reverse order of removal.

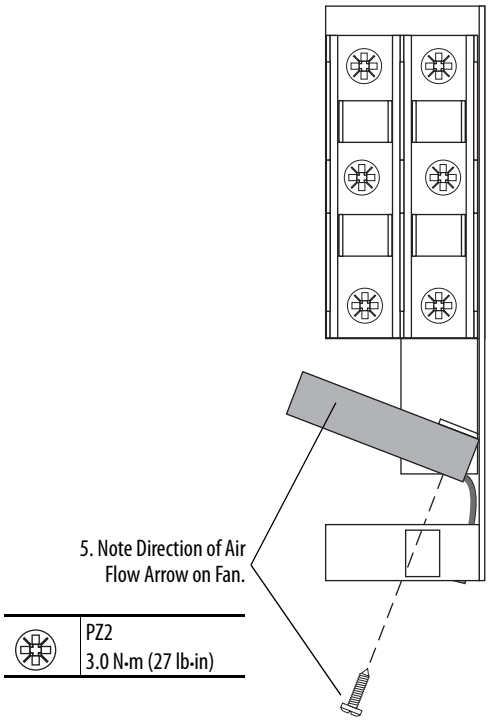
Main Fan Inverter Cooling Fan (20-PP01049) Removal and Installation

Note: This spare part kit includes a fan mounted on a piece of sheet metal. Remove the fan from the sheet metal and discard the sheet metal.

Follow these steps to remove and replace the main fan inverter cooling fan.

IMPORTANT Note the orientation of the air flow direction arrow on the cooling fan housing before removal. The fan must be installed facing the same direction when re-installed.

1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 23.
3. Remove the lower protective cover from the drive. See Remove the Lower Protective Cover on page 24.
4. Remove the main fan inverter capacitor bracket. See Removing the Main Fan Inverter Capacitor Bracket on page 25.
5. Remove the two M4 x 16 mm POZIDRIV screws that secure the cooling fan to the bracket and remove and discard the fan.

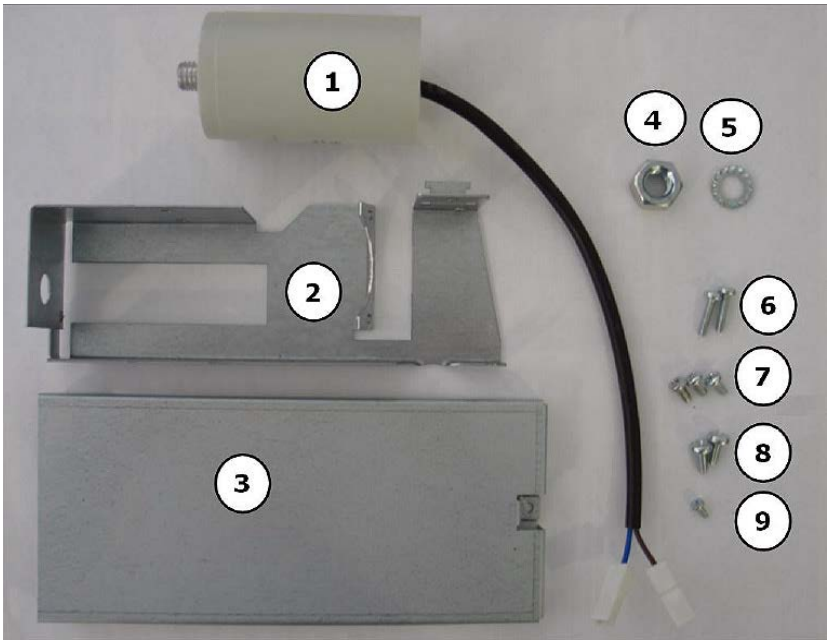


6. Install the new cooling fan in the reverse order of removal.

Main AC Fan Inverter Capacitor (SK-H1-FANCAP-F9) Removal and Installation

Note: The AC fan inverter capacitor replacement kit (SK-H1-FANCAP-F9) contains a new sheet metal bracket, hardware and fasteners, and a series B capacitor (identified in the table and shown below). The series B capacitor (50 mm dia. x 62 mm tall) is larger than the series A capacitor (35 mm dia. x 57 mm tall). If a series A capacitor is currently installed, always replace it with the new series B capacitor.

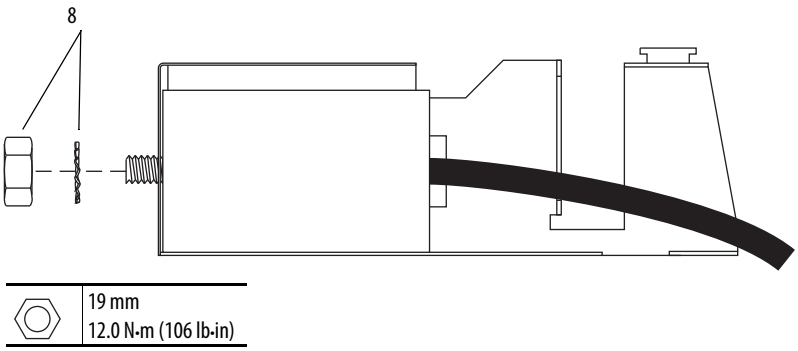
Photo ID#	Part Description	Quantity
1	Fan capacitor	1
2	Fan capacitor, fuse holder and fan bracket	1
3	Fan inverter compartment cover	1
4	Fan capacitor nut (M12)	1
5	Fan capacitor lock washer (M12)	1
6	Stirring fan screws (M4 x 16 mm)	2
7	Fuse holder and fan inverter cover screws (M4 x 8 mm)	3
8	Fan capacitor, fuse holder and fan bracket screws (M5 x 10 mm)	2
9	Connector screw (M3 x 8 mm - for SAF option only)	1



Follow these steps to remove, test, and replace the main AC fan inverter capacitor.

1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 23.

3. Remove the lower protective cover from the drive. See Remove the Lower Protective Cover on page 24.
4. Remove the main AC fan inverter capacitor bracket. See Remove the Removing the Main Fan Inverter Capacitor Bracket on page 25.
5. Remove the main AC fan inverter cooling fan from the bracket. Save the fan for reuse. See Main Fan Inverter Cooling Fan (20-PP01049) Removal and Installation on page 30.
6. Remove the two M4 x 8 mm POZIRDRIV screws that secure the fuse holder to the bracket and remove the fuse holder. Save the fuse holder for reuse.
7. If a series A capacitor is installed, continue with the next step. If a series B capacitor is installed, measure the value of the capacitor. If the value of the capacitor is less than 7 µF, continue with the next step.
8. Remove the M12 nut and lock washer that secures the capacitor to the bracket and remove the capacitor.



9. Install the new capacitor. If replacing a smaller series A capacitor with a larger series B capacitor, discard the existing fan capacitor bracket.
10. Install the existing AC cooling fan on the new capacitor bracket.
11. Install the existing fuse holder on the new capacitor bracket.
12. Install the new capacitor and new bracket in the reverse order of removal. Note: Take care to protect the fan power wires from damage during installation.
13. Install the new fan inverter compartment (series B) cover.

Main AC Fan Inverter Circuit Board Assembly (20-VB00299) Removal and Installation

See Checking the Main AC Fan Inverter Circuit Board Diagnostic LEDs on page 268 for test procedures used to determine if the circuit board requires replacement.

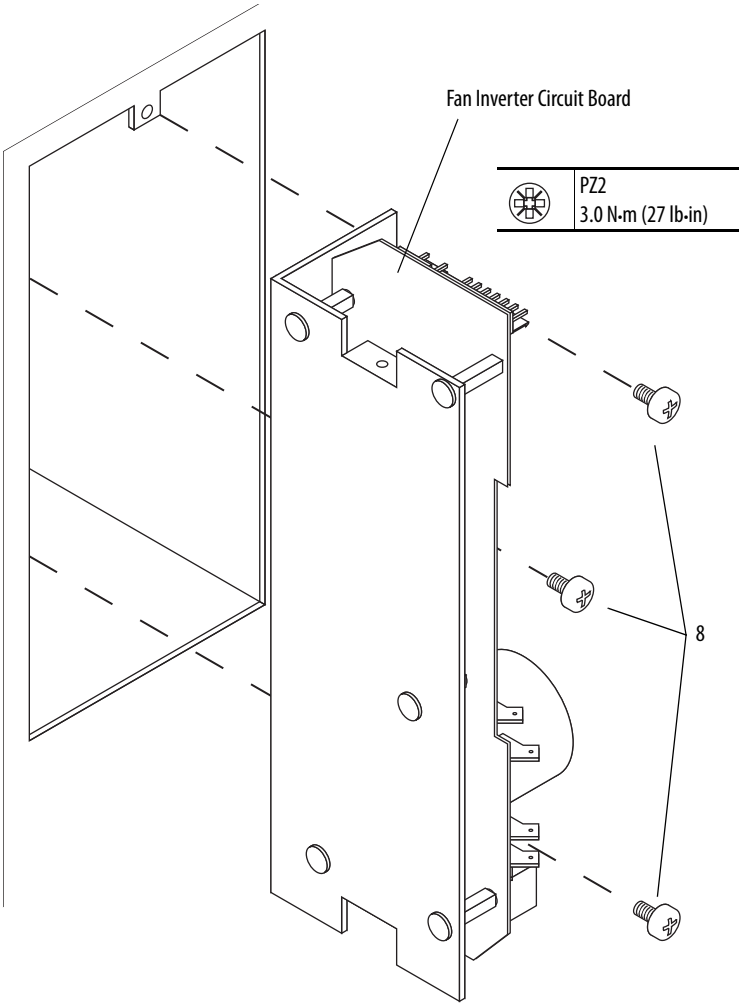
Follow these steps to replace the main AC fan inverter circuit board.

1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 23.
3. Remove the lower protective cover from the drive. See Remove the Lower Protective Cover on page 24.
4. Remove the main AC fan inverter capacitor bracket. See Removing the Main Fan Inverter Capacitor Bracket on page 25.

IMPORTANT Mark the existing isolation transformer wires so that you can identify them later in this procedure.

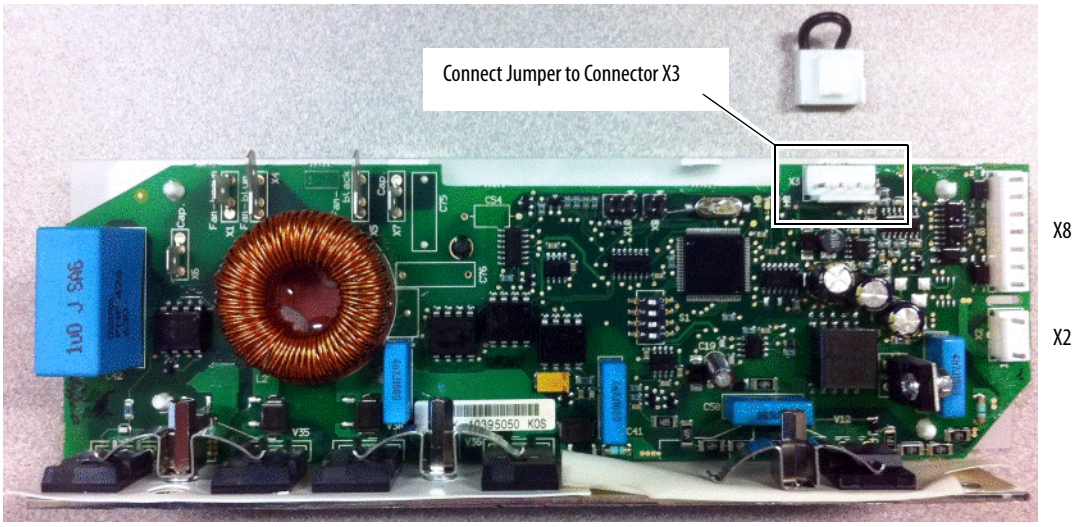
5. Reach into the fan inverter compartment and disconnect the isolation transformer wires from X4 and X5 on the fan inverter board.
6. Disconnect the wires from connector X8 on the fan inverter board.
7. Disconnect the wires from connector X2 on the fan inverter board. Retain these wires for reuse.

8. Remove the three M4 x 8 mm POZIDRIV screws that hold the fan inverter assembly to the drive and remove the fan inverter assembly.

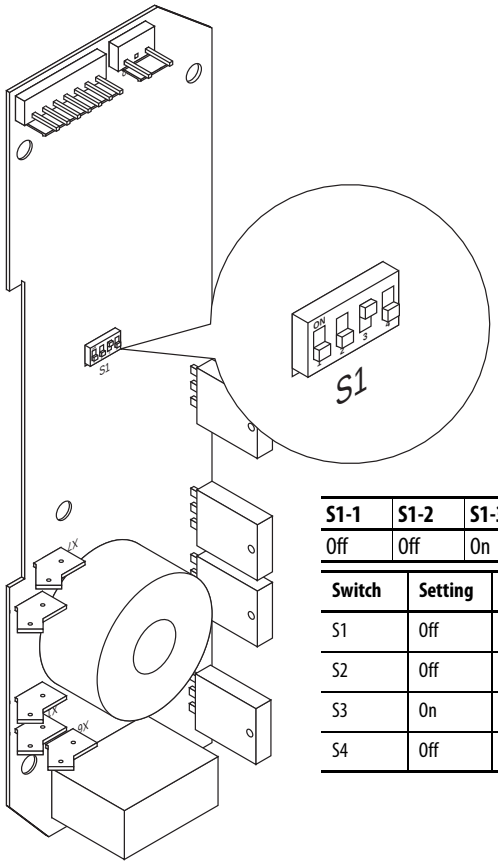


9. Install the new fan inverter assembly in the reverse order of removal.

IMPORTANT If you are servicing a 400V/480V Frame 9 drive, insert the jumper on connector X3 as shown here.



IMPORTANT Verify that dip switch S1 on the new fan iverter board is properly configured, as shown below.



S1-1	S1-2	S1-3	S1-4
Off	Off	On	Off

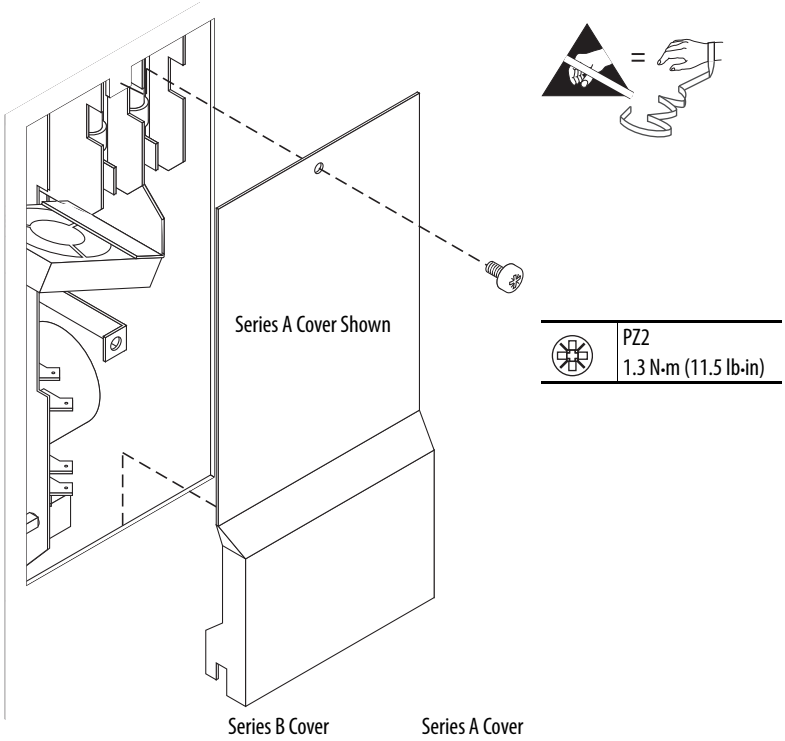
Switch	Setting	To Indicate the Following:
S1	Off	50 Hz Fan Motor Frequency
S2	Off	220 V AC Motor Voltage
S3	On	230 V AC Motor Voltage
S4	Off	Frame Size 9…14

Main DC Fan Power Supply Circuit Board (SK-H1-DCFANBD1) Removal and Installation

Note: You can retrofit an existing AC fan system or replace a DC fan system with a new DC fan system. See Energy-related Products Fan Efficiency Directive on page 12 for guidelines on replacing an existing fan system with a new DC fan system.

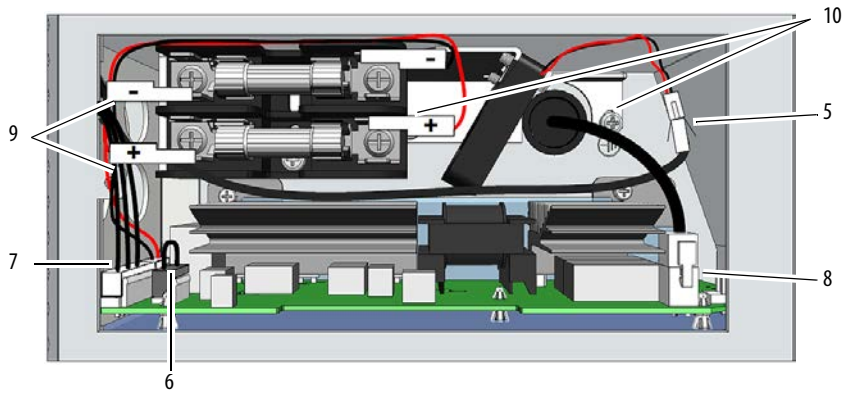
Follow these steps to remove and replace a DC fan system.

1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 23.
3. Remove the lower protective cover from the drive. See Remove the Lower Protective Cover on page 24.
4. Remove the M4 x 8 mm POZIDRIV screw that secures the fan power supply cover to the drive frame and remove the cover.

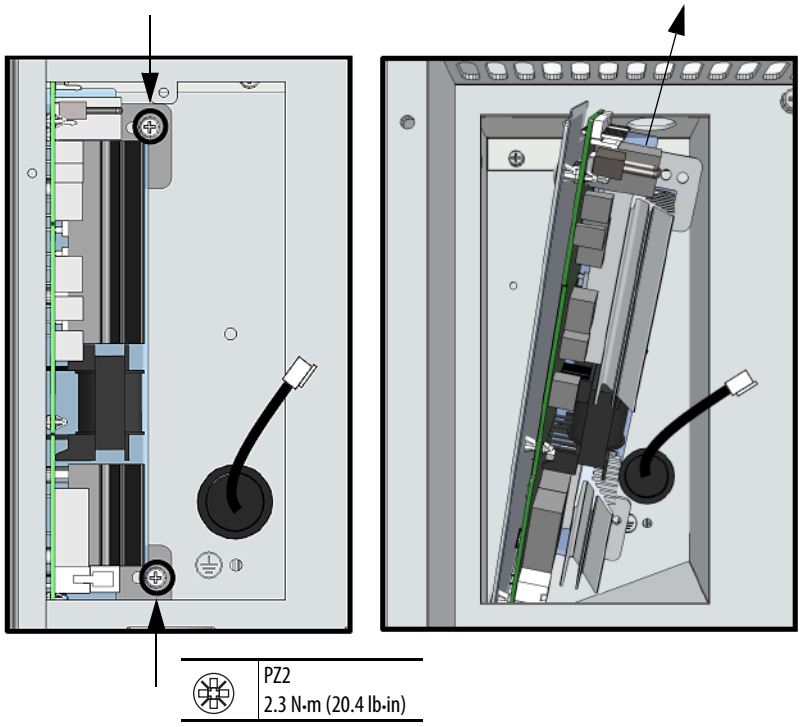


5. Disconnect the stirring fan power wires.
6. Disconnect the DC supply wire from fan inverter connector X2.
7. Disconnect the fan supply wire from fan inverter connector X8.
8. Disconnect the DC fan power supply wire from connector X81
9. Disconnect the four fuse power wires (black and red pairs) from the top and bottom of the fuse holder.
10. Remove the two M5 x 10 mm Phillips head screws that secure the fuse holder / cooling fan bracket to the frame and left the bracket out of the drive.

	P2 4.0 N•m (35 lb•in)



11. Remove the two M4 x 8 mm fan inverter mounting screws and, while turning the fan inverter slightly sideways, remove the DC fan power supply assembly.



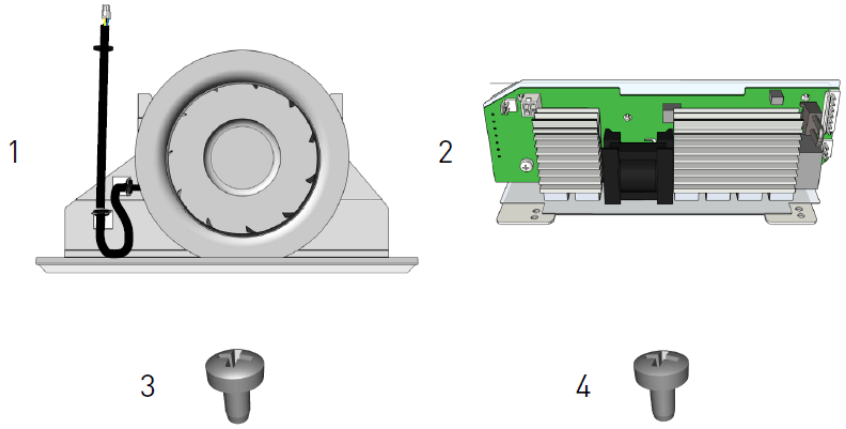
12. Install the main DC fan power supply system in the reverse order of removal.

IMPORTANT If you are servicing a 400V/480V Frame 9 drive, insert the jumper on connector X3.

AC to DC Fan System Retrofit Kit (SK-H1-DCFANRETROFIT-F9)

The frame 9 AC to DC main fan system retrofit kit contains the following parts:

Item Number	Description	Quantity
1	DC fan assembly	1
2	DC fan supply assembly	1
3	M4 x 8 mm POZIDRIV screw	2
4	M5 x 10 mm POZIDRIV screw	4



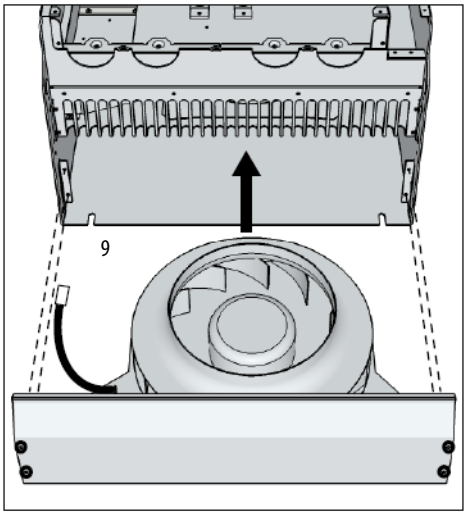
Follow these steps to remove the main AC fan inverter system and replace it with a main DC fan inverter system.

1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 23.
3. Remove the lower protective cover from the drive. See Remove the Lower Protective Cover on page 24.

IMPORTANT	Verify that the upper mounting bolts are secure and properly torqued so that they will hold the drive to the wall of the system enclosure.

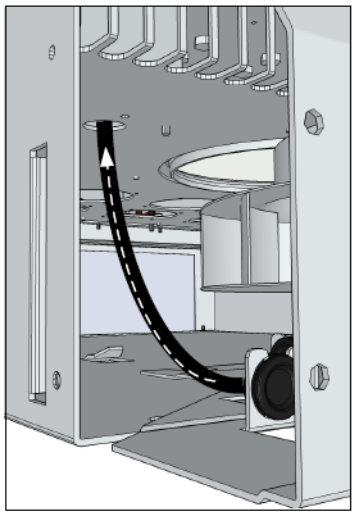
4. Remove the main AC fan inverter capacitor bracket. See Removing the Main Fan Inverter Capacitor Bracket on page 25.
5. Remove the AC fan inverter capacitor from the bracket and discard the capacitor. See Main AC Fan Inverter Capacitor (SK-H1-FANCAP-F9) Removal and Installation on page 31.
6. Remove the main AC fan inverter circuit board assembly and discard the assembly. See Main AC Fan Inverter Circuit Board Assembly (20-VB00299) Removal and Installation on page 33.

7. Remove the main AC fan from the drive and discard the old AC fan and bracket assembly. See Main AC Fan (20-PP01080) and Main DC Fan (SK-Y1-DCFAN1) Assembly Removal and Installation on page 43. Note: You do not need to complete the steps to measure the resistance of the fan supply wires or removing the main fan from the fan bracket.
8. Remove the main AC fan inverter output transformer assembly from the drive and discard the assembly. See Main AC Fan Inverter Output Transformer (20-PP09055) Removal and Installation on page 49.
9. Partially insert the new retrofit DC fan assembly into the bottom of the drive.
10. Insert the DC fan supply cable into the hole (inside the drive chassis) that leads to the fan circuit board assembly location.
11. Secure the retrofit DC fan assembly to the drive chassis using the four M5 x 10 mm POZIDRIV screws.
12. Position the grommet into the hole and ensure the ware harness doesn't contact any sheetmetal surface.

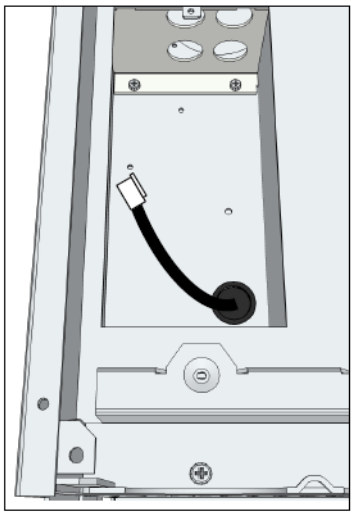


11

	PZ2 3.2 N•m (28.3 lb•in)

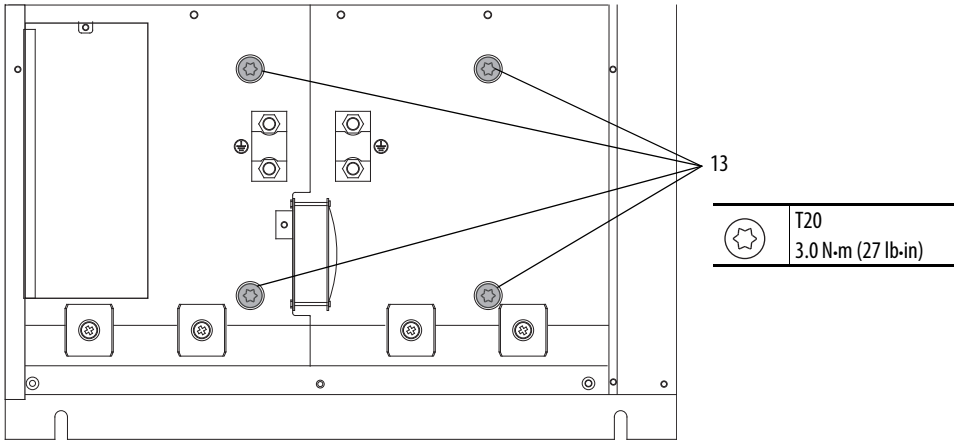


10

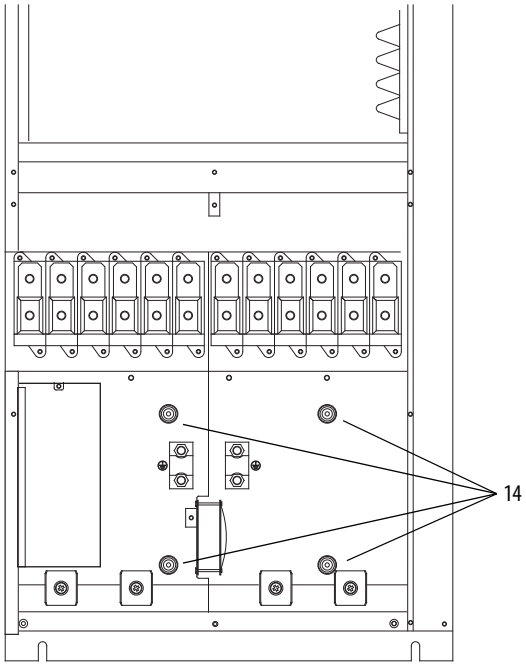


12

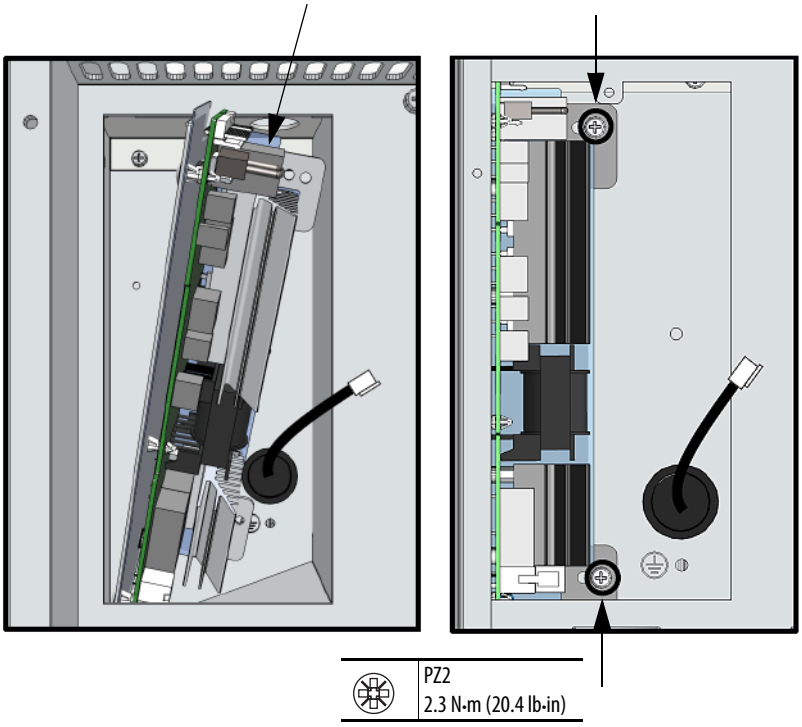
13. Using a 9 cm long T20 hexalobular screwdriver, tighten (approximately 12 full screw rotations) the four screws (accessible through the holes in the drive chassis) to secure the fan plenum sheet metal bracket against the fan assembly inside the drive.



14. Install the four rubber bushings in the four holes in the drive chassis.



15. Insert the DC fan inverter assembly into the fan inverter compartment and secure the assembly to the drive using the two M4 x 8 mm POZIDRIV screws.



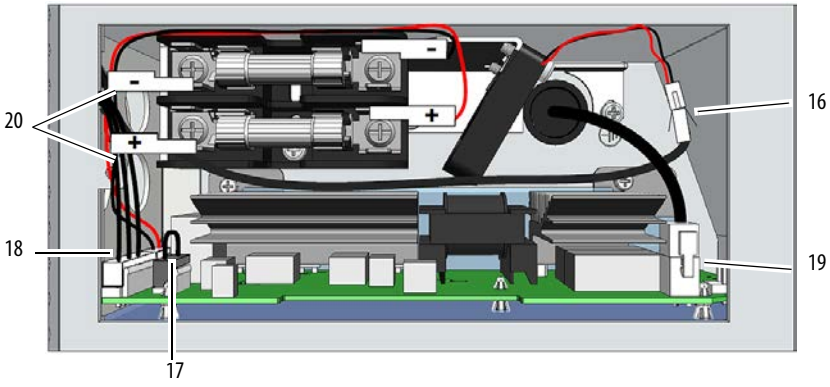
16. Connect the stirring fan power wires.

17. Connect the DC supply wire from fan inverter connector X2.

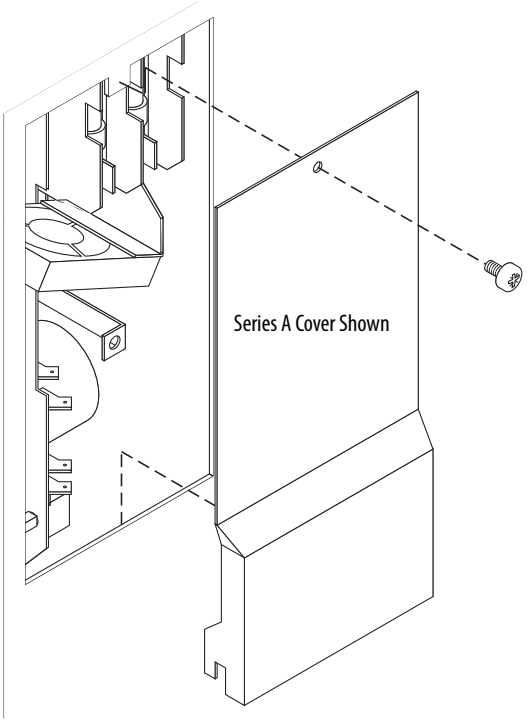
18. Connect the fan supply wire from fan inverter connector X8.

19. Connect the DC fan power supply wire from connector X81

20. Connect the four fuse power wires (black and red pairs) from the top and bottom of the fuse holder.



21. Secure the fan inverter cover to the drive using the M4 x 8 mm POZIDRIV screw.



22. Install the lower protective cover in the reverse order of removal. See Remove the Lower Protective Cover on page 24.
23. Remove the backing from the drive modification label and attach the label, in a clearly visible location, to the front of the drive.
24. Write “DC fan retrofit” and the installation date on the label.

Main AC Fan (20-PP01080) and Main DC Fan (SK-Y1-DCFAN1) Assembly Removal and Installation

Follow these steps to measure the resistance between the main fan supply wires and remove and replace the main fan, if necessary.

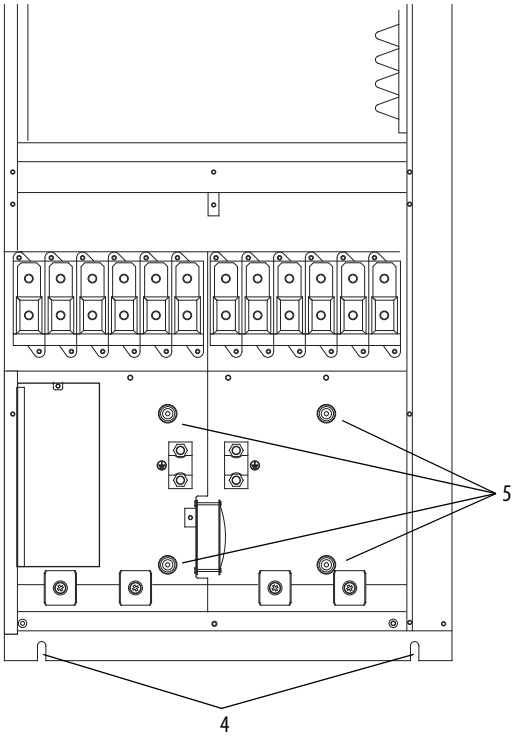
Notes:

- To identify which fan is installed in your drive, see Fan Inverter System Block Diagrams on page 257.
- For AC fan systems, the sheet metal bracket is available as a spare part (SK-H1-FR9BRKT). See page 288 for details. For DC fan systems, the sheet metal bracket is only available as part of the retrofit kit (SK-H1-DCFANRETROFIT-F9). See page 289 for details.
- The main fan replacement kit only contains the fan motor and impeller assembly. Therefore, if the sheet metal mounting bracket is not available as a spare part for your fan system, it must be reused.

1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 23.
3. Remove the lower protective cover from the drive. See Remove the Lower Protective Cover on page 24.

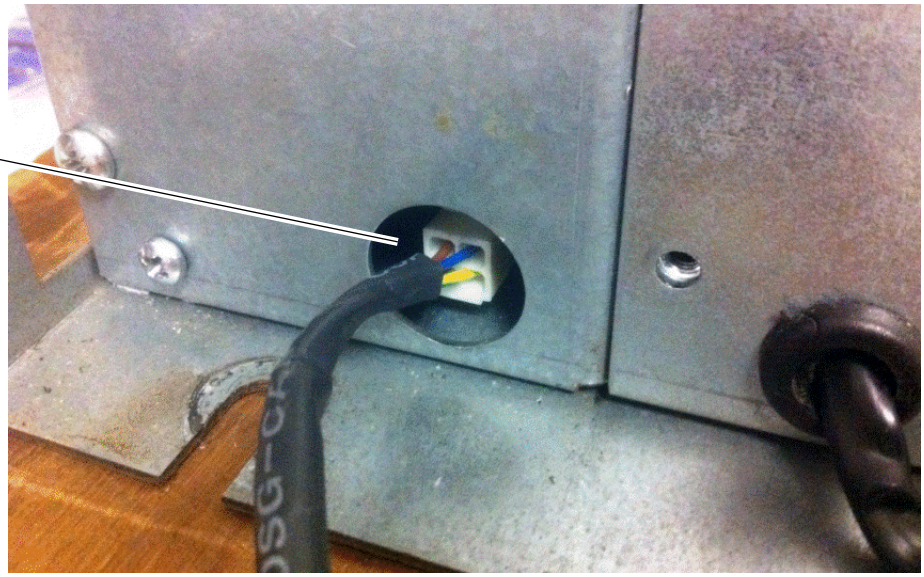
IMPORTANT Verify that the upper mounting bolts are secure and properly torqued so that they will hold the drive to the wall of the system enclosure.

4. Remove the lower mounting bolts from the bottom of the frame.
5. Remove the four rubber bushings that cover the mounting screws for the main fan assembly. Retain these bushings for reuse.



6. Remove the rubber bushing from the hole that covers the main fan motor power connector at the bottom of the drive.

7. Disconnect the main fan motor power connector from the output transformer.

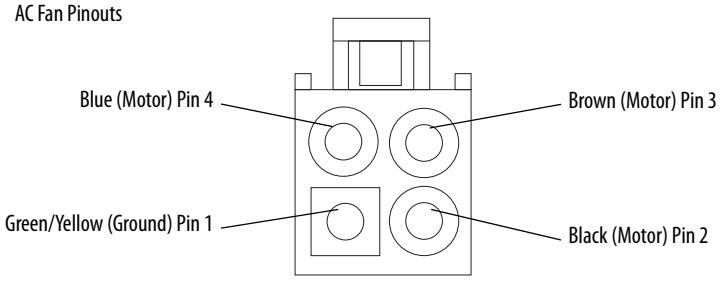


8. Using the appropriate table below, measure the resistance between the fan supply wires.

AC Fan: If the measurements are not similar to those in this table, replace the AC fan.

Connection wires	Resistance ±5%
Black-Brown	62 Ω
Brown-Blue	36 Ω
Blue-Black	27 Ω
Green-chassis	0 Ω

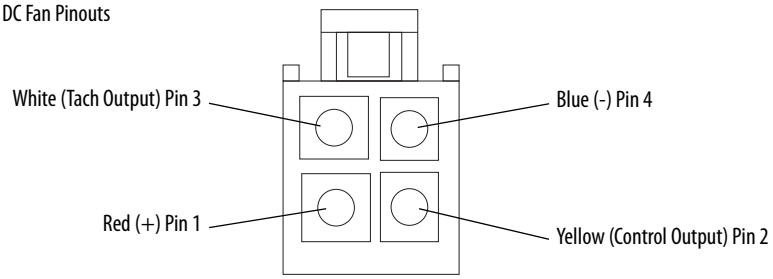
AC Fan Pinouts



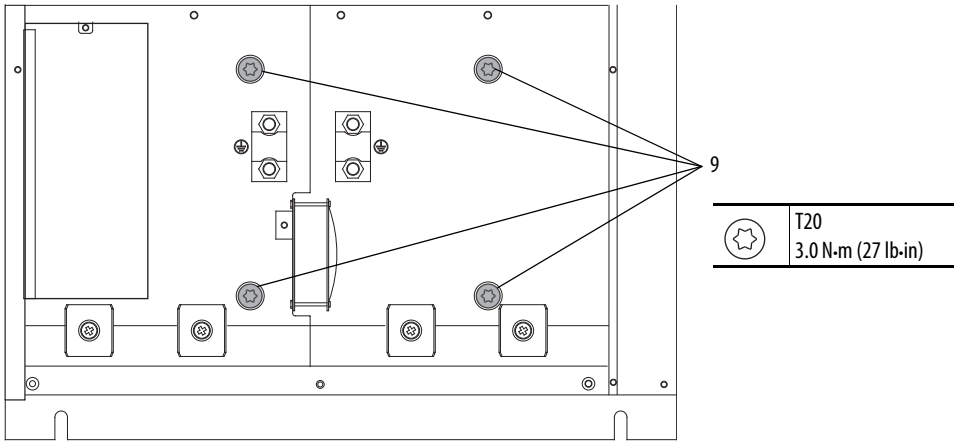
DC Fan: If the measurements are not similar to those in this table, replace the DC fan.

Connection wires	Resistance ±5%
Red-Blue	∞ Ω
Red-White	∞ Ω
White-Yellow	∞ Ω
Blue-White	∞ Ω

DC Fan Pinouts



9. Using the 9 cm long T20 hexalobular screwdriver, loosen (approximately 12 full screw rotations), but do not remove the four screws (accessible through the holes vacated by the rubber bushings) so that the fan assembly can be removed from the drive. Note: These screws secure a sheet metal plate against the fan assembly inside the drive chassis, effectively sealing the fan plenum chamber.

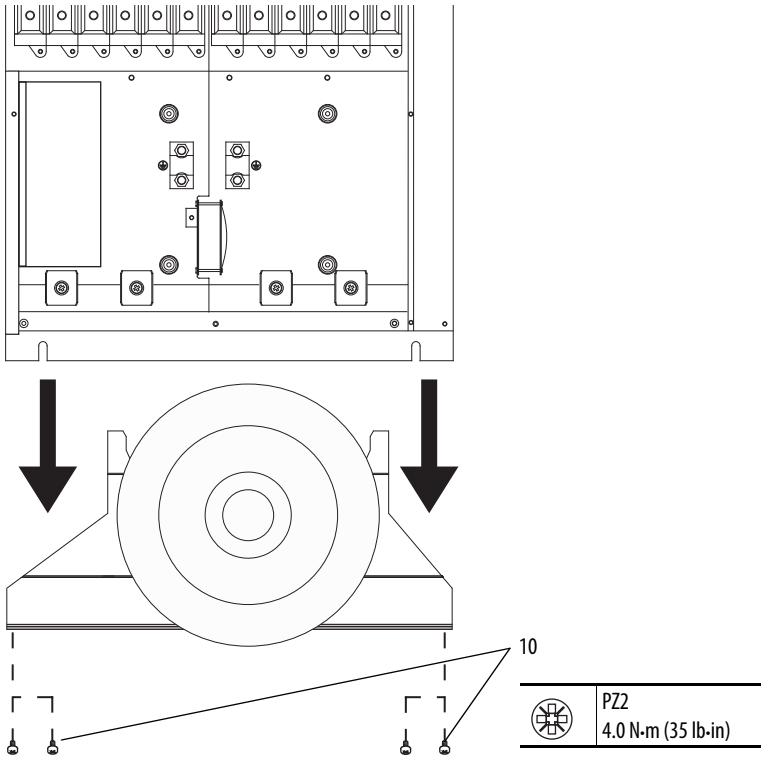


IMPORTANT The next step assumes that the drive is mounted in a vertical position. Once the screws that secure the main fan assembly to the drive are loosened, the fan will be free to slide out of the bottom of the drive chassis. Support the fan assembly when the screws are loosened.

10. Remove the four M5 x 10 mm POZIDRIV screws that secure the fan assembly to the bottom of the drive chassis and slide the fan assembly down and out of the drive.

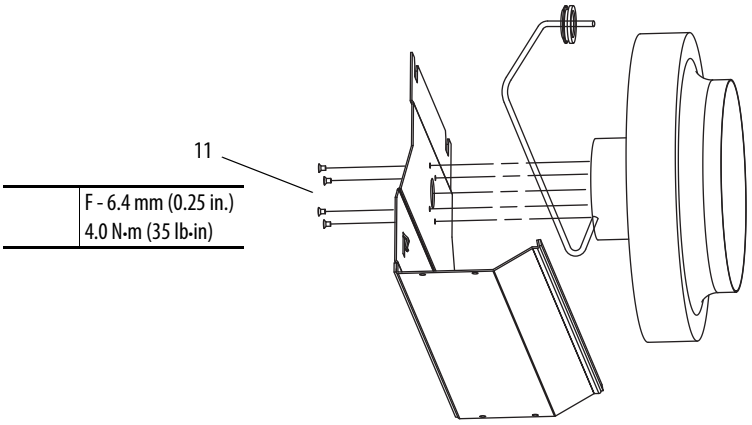
If the fan assembly does not easily come out of the dive chassis, loosen the front screws (as instructed in step 9) another turn and attempt to remove the fan assembly again. Continue loosening the screws until the fan assembly slides easily from the drive.

IMPORTANT Do not attempt to force the fan plate from the drive. This may bend the fan and surrounding sheet metal. The sheet metal bracket must be reused.



11. Remove the four screws that secure the main fan to the fan bracket and discard the fan. The sheet metal bracket must be reused.

Note: The Main AC and DC fans have different mounting hardware and hole dimensions. The AC fan uses four M4 x 8 mm screws that are spaced 40 mm apart on the bracket. The DC fan uses four M5 x 10 mm screws that are spaced 65 mm apart on the bracket. Based on the manufacturing date, the sheet metal mounting bracket was fabricated for either an AC fan, a DC fan, or both.



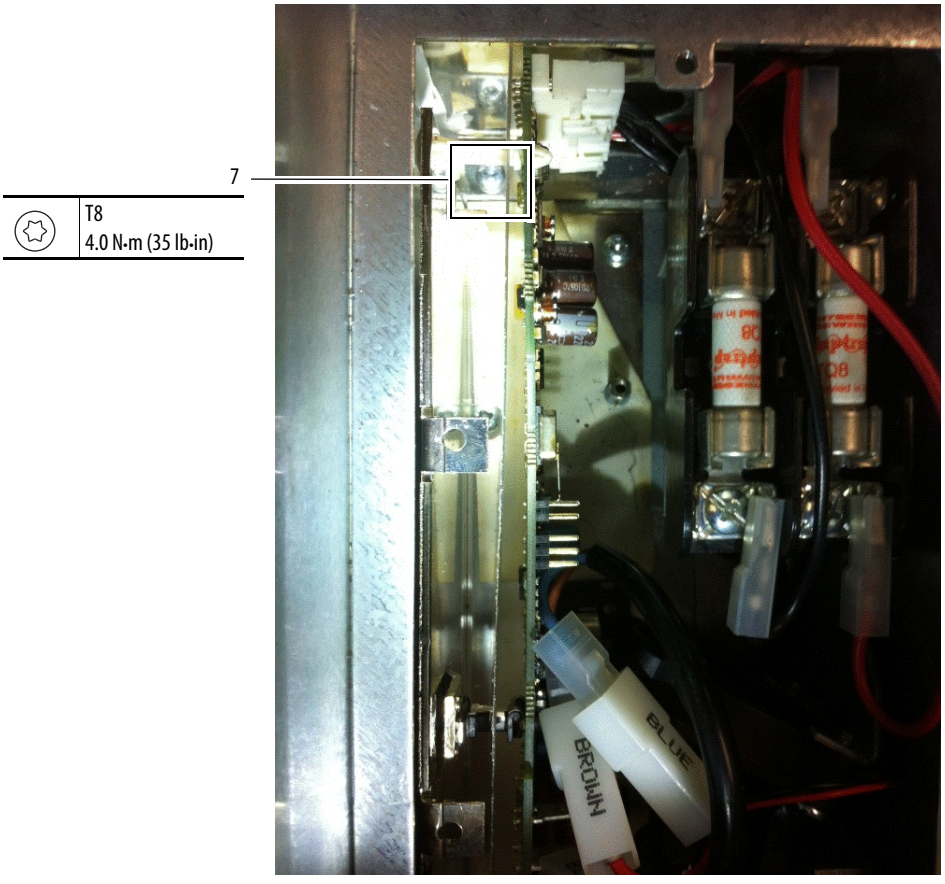
12. Install the main fan in the reverse order of removal.

IMPORTANT Verify that the fan turns easily on the bracket before installing it in the drive.

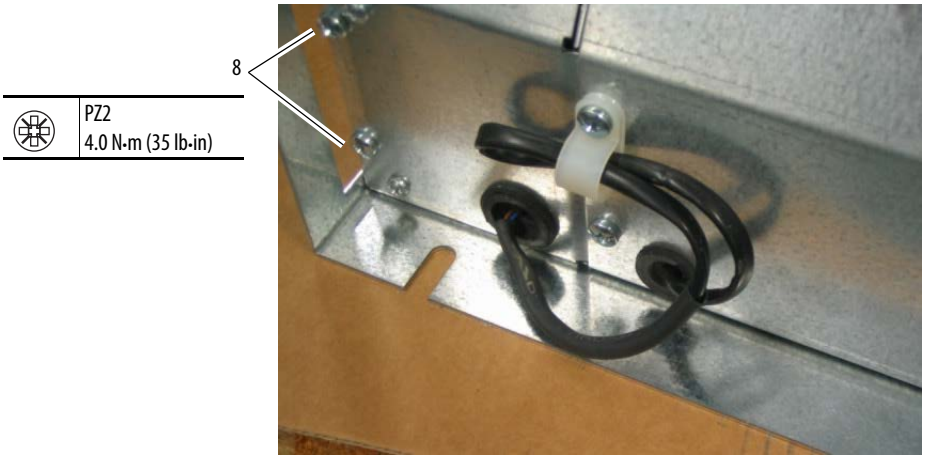
Main AC Fan Inverter Output Transformer (20-PP09055) Removal and Installation

Follow these steps to remove and replace the main AC fan inverter output transformer.

1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 23.
3. Remove the lower protective cover from the drive. See Remove the Lower Protective Cover on page 24.
4. Remove the main AC fan inverter cooling fan, fuses, and capacitor bracket. See Removing the Main Fan Inverter Capacitor Bracket on page 25.
5. Remove the main AC fan inverter circuit board assembly. See Main AC Fan Inverter Circuit Board Assembly (20-VB00299) Removal and Installation on page 33.
6. Remove the main AC fan from the drive. See Main AC Fan (20-PP01080) and Main DC Fan (SK-Y1-DCFAN1) Assembly Removal and Installation on page 43.
7. Remove the hexalobular screw, located at the back, left-hand corner of the fan inverter compartment, that secures the output transformer assembly to the drive frame.



8. Remove the two M5 x 10 POZIDRIV screws that secure the output transformer to the drive frame.



9. While pushing the output transformer wires and rubber bushing through the hole in the back of the fan inverter compartment, remove the output transformer from the bottom of the drive.
10. Install the new output transformer assembly in the reverse order of removal.

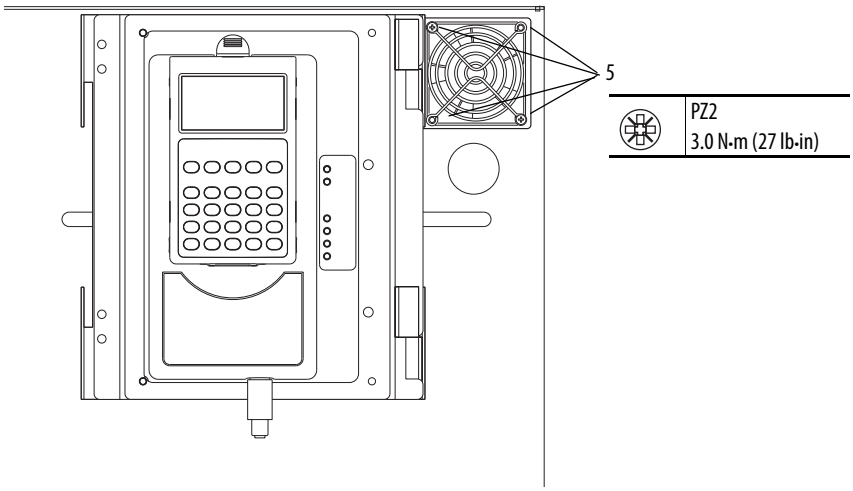
Chassis Stirring Fan (20-PP01068) Removal and Installation

Note: The chassis stirring fan is only installed on PowerFlex 700S Phase II drives.

Follow these steps to remove and replace the chassis stirring fan.

1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 23.
3. Remove the upper protective cover from the drive. See Remove the Upper Protective Cover on page 24.
4. Disconnect the fan power cable from connector J18 on the power interface circuit board.

5. Remove the two M5 x 45 mm POZIDRIV screws that secure the protective metal grate and stirring fan to the control frame and remove the fan.



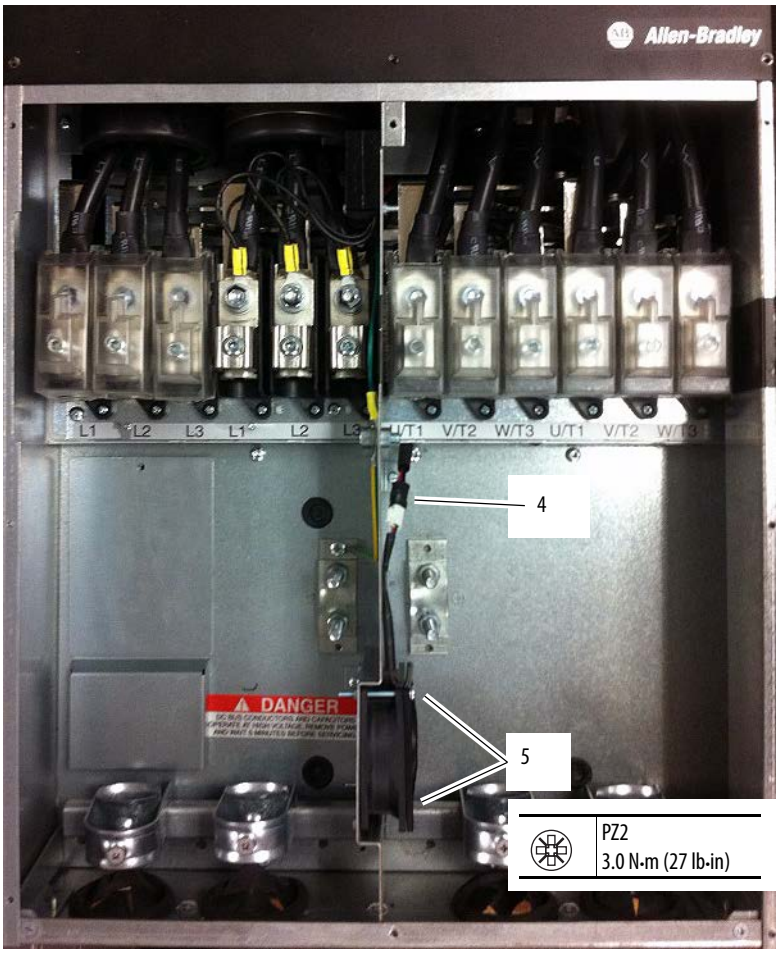
6. Install the chassis stirring fan in the reverse order of removal.

Cross-plate Stirring Fan (20-PP01068) Removal and Installation

Follow these steps to remove and replace the stirring fan located on the cross plate in the lower part of the drive.

1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 23.
3. Remove the lower protective cover from the drive. See Remove the Lower Protective Cover on page 24.
4. Disconnect the stirring fan power wire connector.

5. Remove the two M4 x 40 mm POZIDRIV screws that secure the fan to the cross-plate and remove the fan. Retain the fan grill plate for reuse.



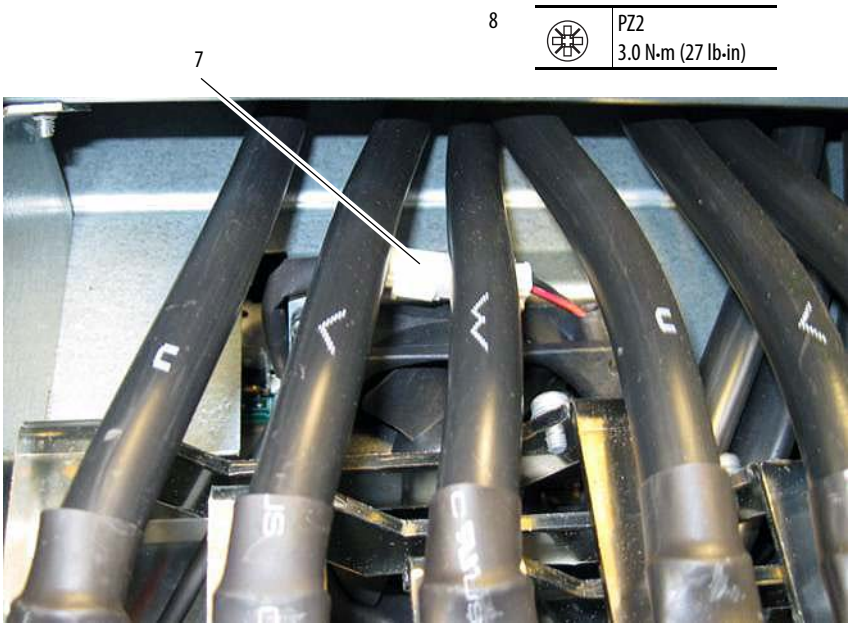
6. Install the fan in the reverse order of removal.

Internal Stirring Fan (20-PP01068) Removal and Installation

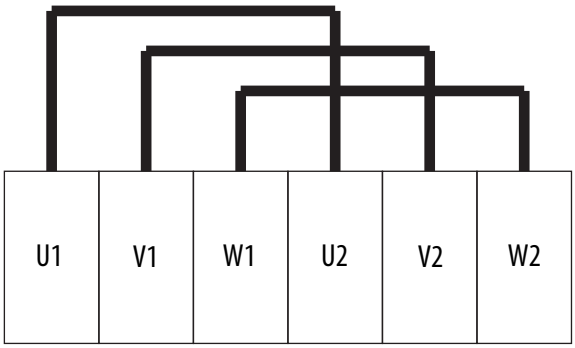
Follow these steps to remove and replace the internal stirring fan located on the drive frame in the lower part of the drive.

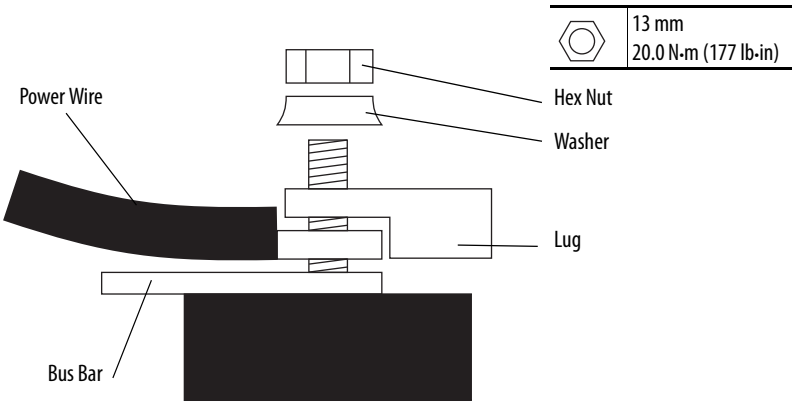
1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 23.
3. Remove the lower protective cover from the drive. See Remove the Lower Protective Cover on page 24.
4. Remove the covers or protective isolation barriers from the U/T1, V/T2, and W/T3 power terminals.
5. Remove the M8 nut and washer that secure the U/T1, V/T2, and W/T3 power wires to the terminals, to loosen the wires only. You do not need to remove the external wires from the terminals.

6. Push the power wires on terminals U/T1, V/T2, and W/T3 to the side in order to gain access to the stirring fan.
7. Disconnect the stirring fan power wire connector.
8. Remove the two M4 x 8 mm POZIDRIV screws that secure the fan to the drive frame and remove the fan.



9. Install the fan in the reverse order of removal. Refer to the motor terminal wire placement diagrams below during reassembly.





Notes:

PowerFlex 700H and 700S Drives - Frame 10 Procedures

This chapter contains spare part information and procedures for testing and replacing fan system components for frame 10 PowerFlex 700H and PowerFlex 700S drives. See Appendix A PowerFlex 700H and 700S Diagnostic Procedures on page 255 for additional component test procedures.

Frame 10 Fan System Spare Parts

AC Fan Systems

See Available Fan System Kits starting on page 277 for an illustration of the spare part kit contents.

Cat. No.	Part Description	Quantity per Drive	Original Vendor and Model Number
20-FR10844	Output transformer assembly for main AC fan inverter (left side)	1	–
20-FR10845	Output transformer assembly for main AC fan inverter (right side)	1	–
20-PP01080	230 W Main AC fan assembly	2	–
20-PP01096	60 mm internal fan for ASIC board	1	Sinwan SD5012PT-24H (2)
20-PP20202	Fuse for fan system	2	Ferraz Shawmut ATQ8 (3)
20-PP20300	Fuse holder for main fan system fuses	1	Ferraz Shawmut 30322
20-VB00299	Main AC fan inverter circuit board (1)	2	–
SK-H1-FANCAP-F1012	Capacitor (7 µF) for main AC fan inverter	2	–

(1) The same fan inverter circuit board is used for all drive voltage classes.
(2) The part may not contain wires, connectors, or mounting hardware when bought directly from vendor.
(3) The factory default fuses are Ferraz Shawmut ATQ8, 8 A fuses. Older drives may contain Bussman 6 A fuses.

DC Fan Systems

See Available Fan System Kits starting on page 277 for an illustration of the spare part kit contents.

Cat. No.	Part Description	Quantity per Drive	Original Vendor and Model Number
SK-Y1-DCFAN1	Main DC fan assembly	2	–
SK-H1-DCFANBD1	Main DC fan power supply circuit board (1)	2	–
SK-H1-DCFANRETROFIT-F10	AC to DC fan system retrofit kit	1	–

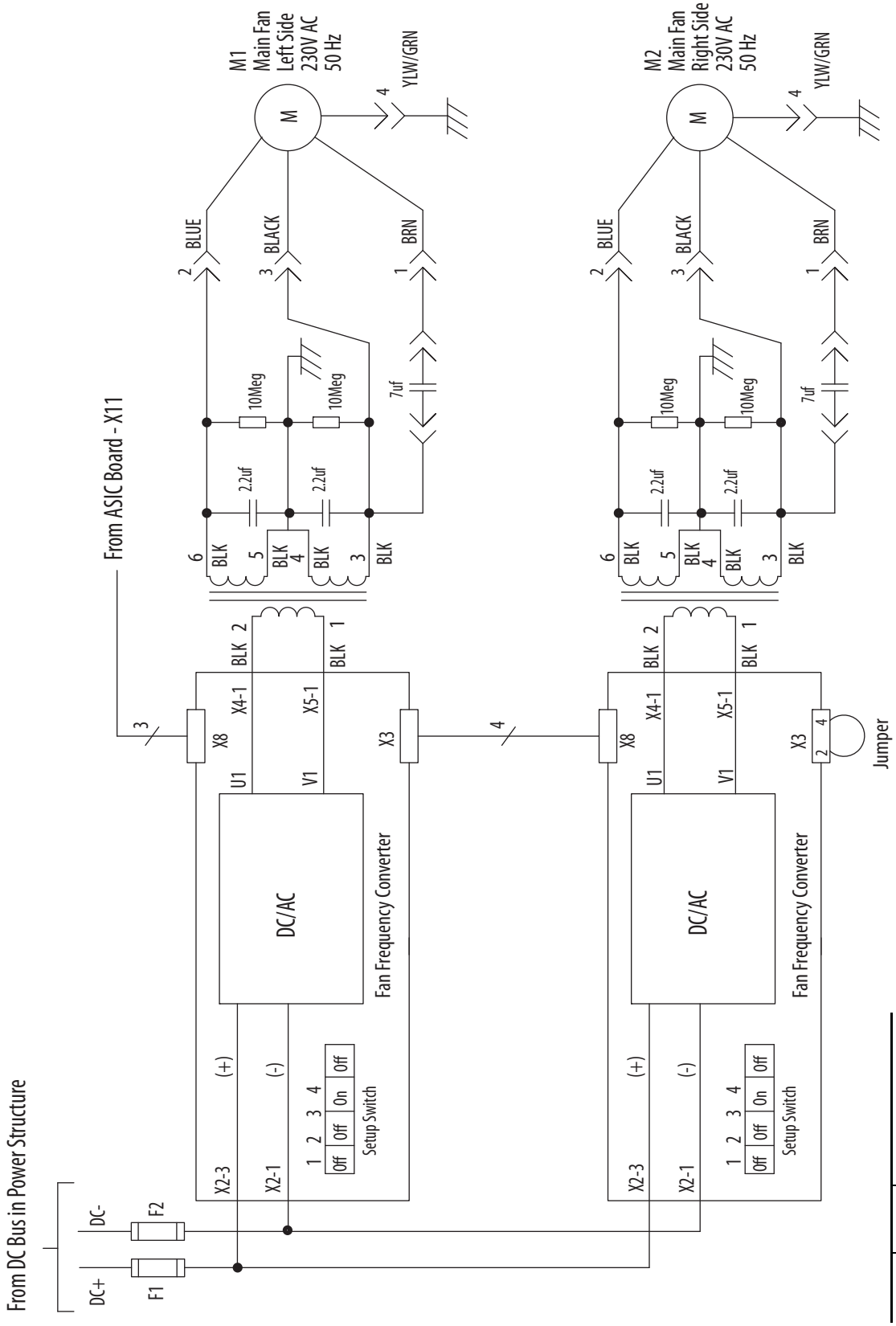
(1) Circuit board only, no sheet metal bracket.

Tools Needed for Frame 10 Fan System Repairs

- #1 POZIDRIV screwdriver
- #2 POZIDRIV screwdriver
- 6 mm hex key
- 19 mm socket wrench
- T15, T20, T25, and T30 hexalobular screwdriver
- Fuse puller
- Nose pliers
- Wire cutter
- Optional: PowerFlex 700H and 700S maintenance stand (cat. No. 20-MAINSTND)

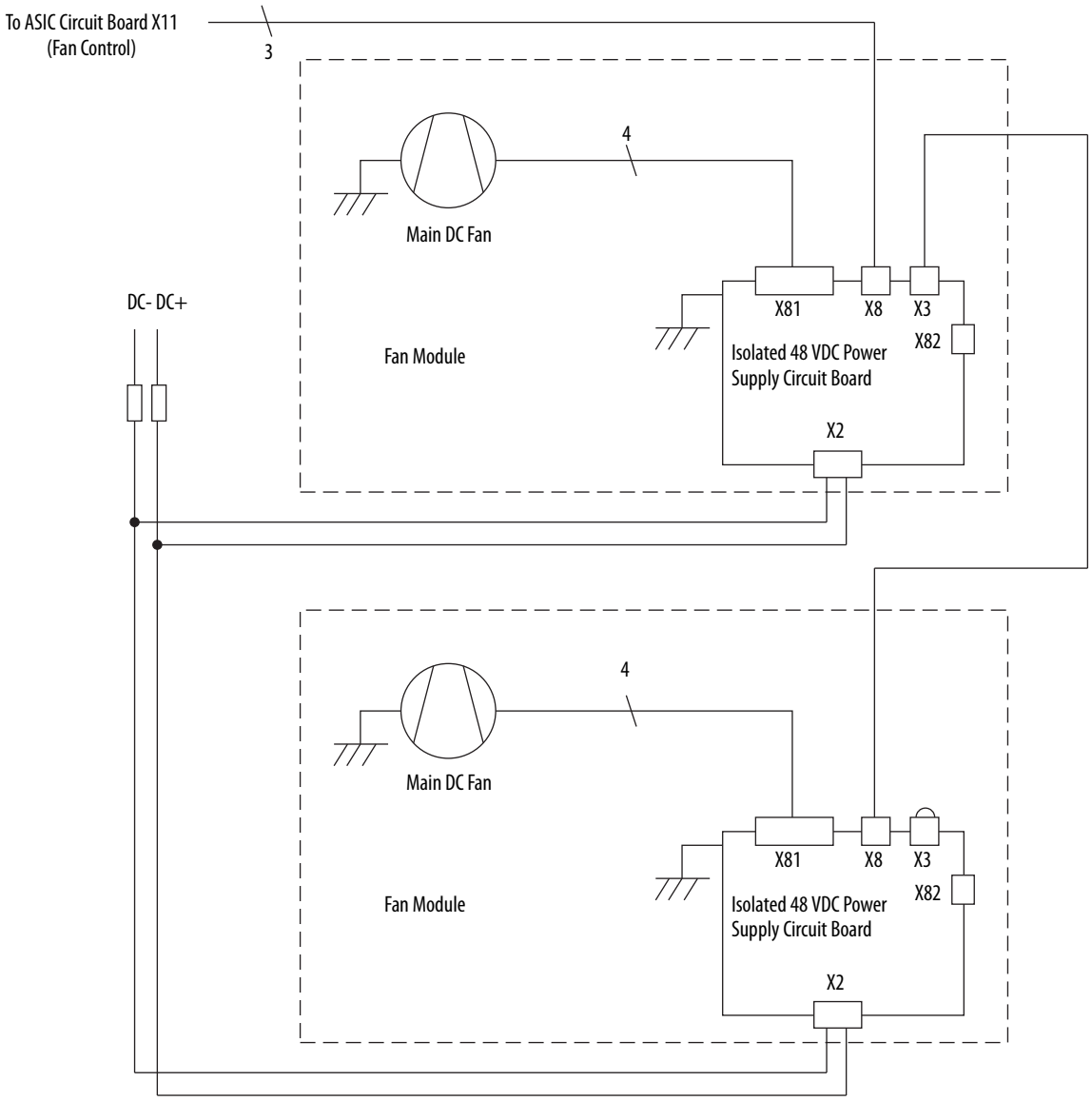
Frame 10 Schematic Diagrams

Figure 4 - Frame 10 AC Fan System Wiring Schematic Diagram



Switch	Setting	To indicate the following:
S1	Off	50 Hz fan motor frequency
S2	Off	220 V AC motor voltage
S3	On	230 V AC motor voltage
S4	Off	Frame size 9...14

Figure 5 - Frame 10 DC Fan System Wiring Schematic Diagram



Frame 10 Fan System Replacement Procedures

Replacement procedures for these frame 10 fan system parts are included in this chapter.

Cat. No.	Part Description	Page
20-FR10844	Output transformer assembly for AC fan inverter (left side) (1)	67
20-FR10845	Output transformer assembly for AC fan inverter (right side) (1)	67
20-VB00299	Main AC fan inverter circuit board	67
SK-H1-DCFANBD1	Main DC fan power supply circuit board	69
SK-H1-DCFANRETROFIT-F10	AC to DC fan system retrofit kit	70
SK-H1-FANCAP-F1012	Main AC fan capacitor (7 µF) Kit	74
20-PP01080	230 W main AC fan assembly	78
SK-Y1-DCFAN1	Main DC fan assembly	78
20-PP01096	60 mm internal fan for ASIC board	82
20-PP20202	Fuse for fan system	85
20-PP20300	Fuse holder for main fan system fuses	85

(1) This assembly does not include the main fan inverter circuit board.

Remove Power from the Drive

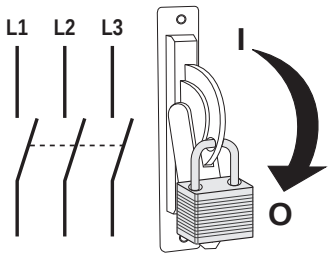
ATTENTION: To avoid an electric shock hazard, verify that the voltage on the bus capacitors has discharged completely before servicing. Check the DC bus voltage at the Power Terminal Block by measuring between the +DC and -DC terminals, between the +DC terminal and the chassis, and between the -DC terminal and the chassis. The voltage must be zero for all three measurements.

Remove power before making or breaking cable connections. When you remove or insert a cable connector with power applied, an electrical arc may occur. An electrical arc can cause personal injury or property damage by:

- sending an erroneous signal to your system's field devices, causing unintended machine motion
- causing an explosion in a hazardous environment

Electrical arcing causes excessive wear to contacts on both the module and its mating connector. Worn contacts may create electrical resistance.

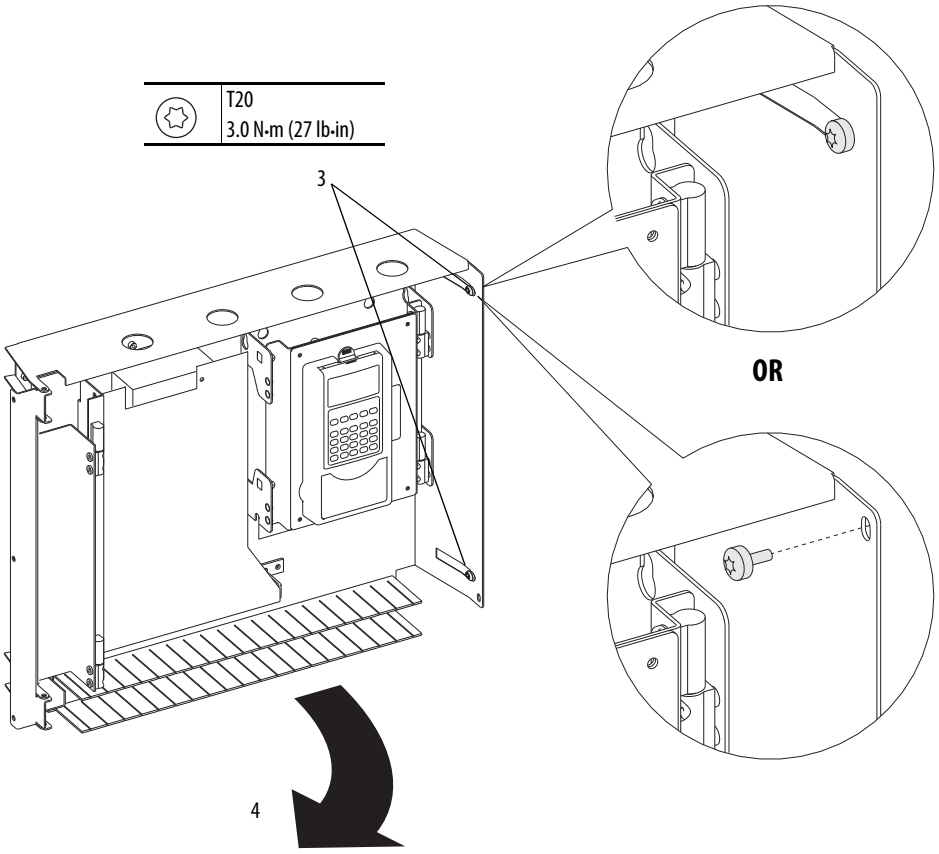
1. Turn off and lock out input power.
2. Wait five minutes.
3. Check the DC bus voltage at the Power Terminal Block by measuring between the +DC and -DC terminals, between the +DC terminal and the chassis, and between the -DC terminal and the chassis. The voltage must be zero for all three measurements.



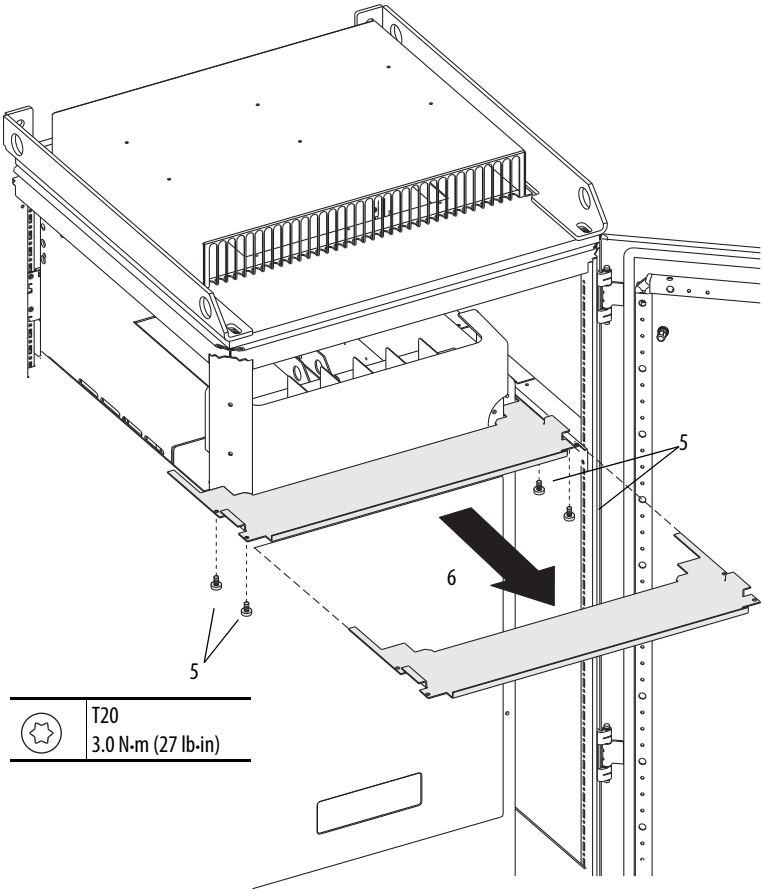
Move the Control Frame and Remove the Air Flow Plate and Protective Covers

You must move the control frame and remove the air flow plate and protective covers from the drive in order to access fan system components on the drive power structure. Follow these steps to move the control frame and remove the air flow plate and protective covers.

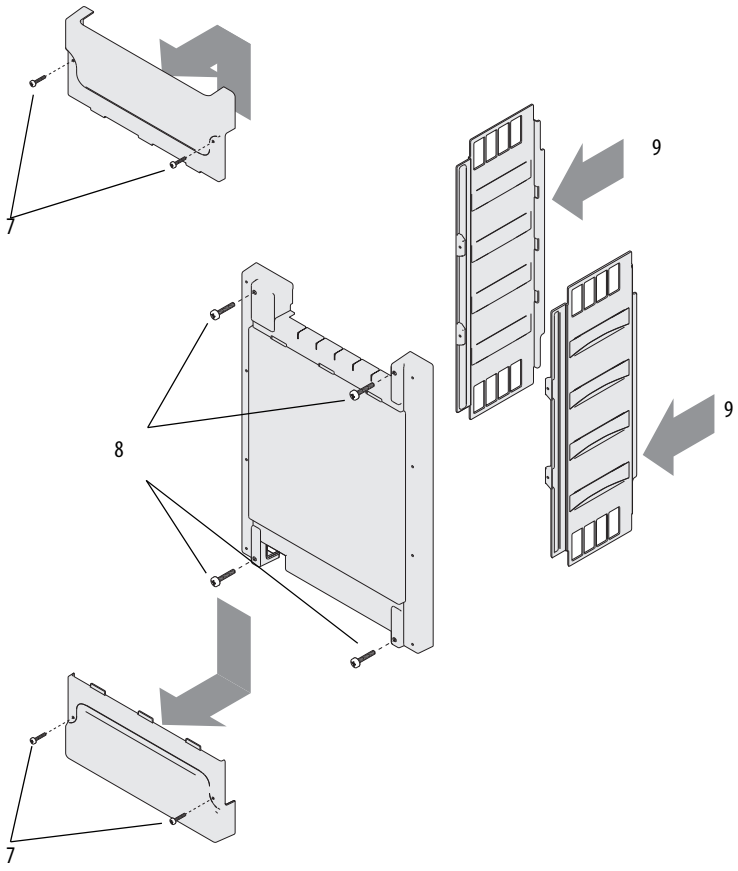
1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 59.
3. Loosen or remove the two hexalobular screws that secure the control frame to the drive enclosure.
4. Swing the control frame out and away from the power structure.



5. Remove the four M5 x 12 mm hexalobular, self-tapping, sheet metal screws that secure the air flow plate to the drive enclosure.
6. Slide the air flow plate off the drive.



7. Remove the four M5 x 16 mm POZIDRIV screws that secure the top and bottom protective covers to the main cover and remove the top and bottom covers.
8. Remove the four M5 x 16 mm POZIDRIV screws that secure the main protective cover to the drive power structure and remove the cover.
9. Slide the two side protective covers out of the drive enclosure.



	PZ2 1.5 N•m (13.3 lb•in)

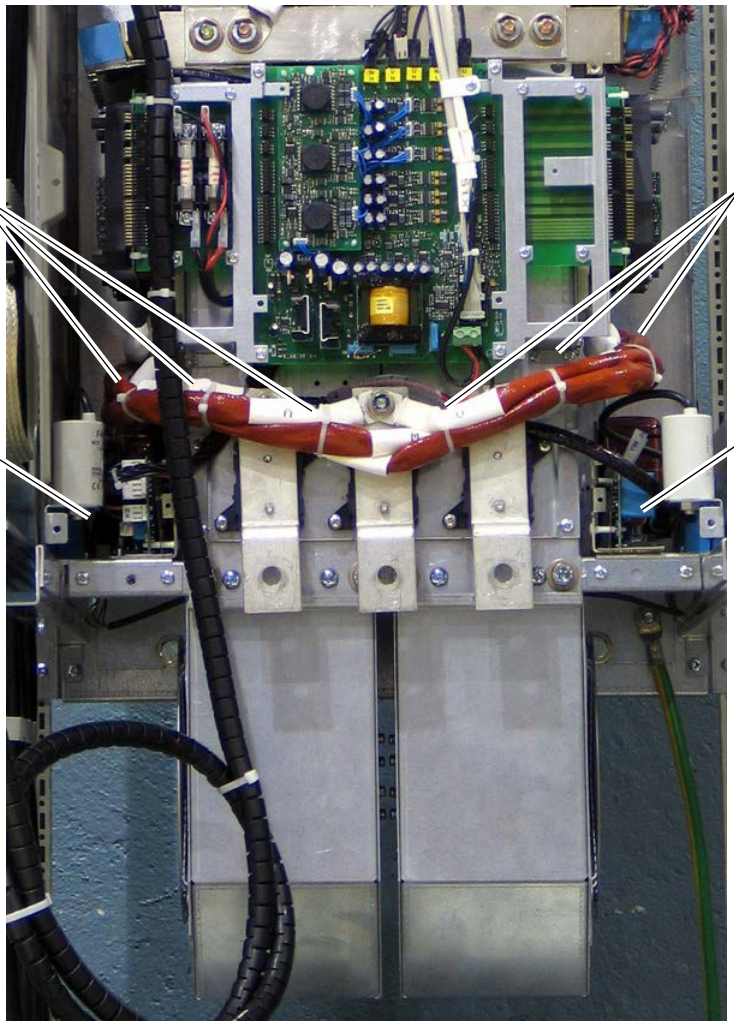
Remove the Main AC or DC Fan Power Supply Assemblies

You must remove the main fan power supply assemblies from the drive in order to replace the AC or DC fan power supply circuit board, AC fan inverter output transformer, and AC fan inverter capacitor. Follow these steps to remove the main fan power supply assemblies.

Note: If you are replacing only one fan power supply assembly, only complete the steps for the side of the drive that contains that assembly. When replacing a failed AC fan system with a DC fan system, remove and replace both AC fan systems.

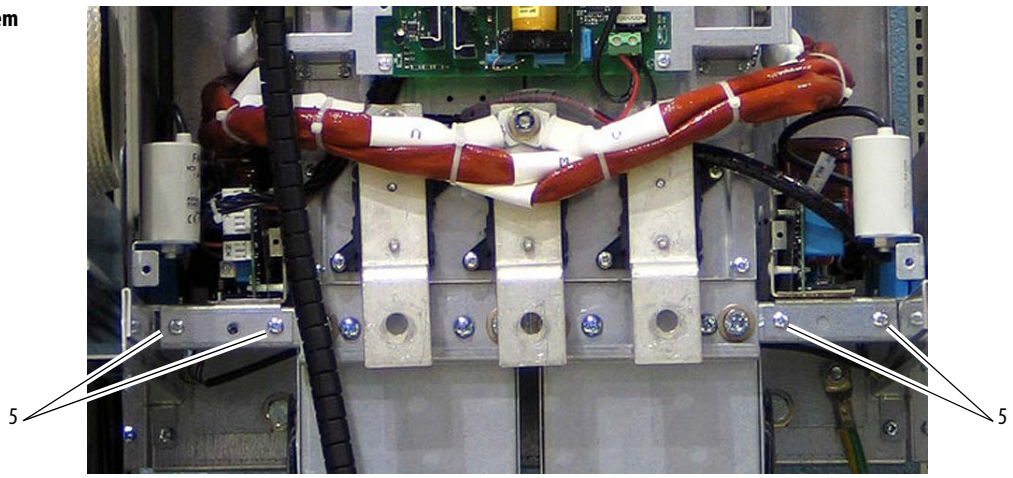
1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 59.
3. Move the control frame and remove the air flow plate and protective covers from the drive. See Move the Control Frame and Remove the Air Flow Plate and Protective Covers on page 60.
4. Remove the cable ties that secure the power cables with brown/orange insulation. Note: This will allow you to move the power cables while removing the fan inverter assemblies.

Note: AC fan systems shown



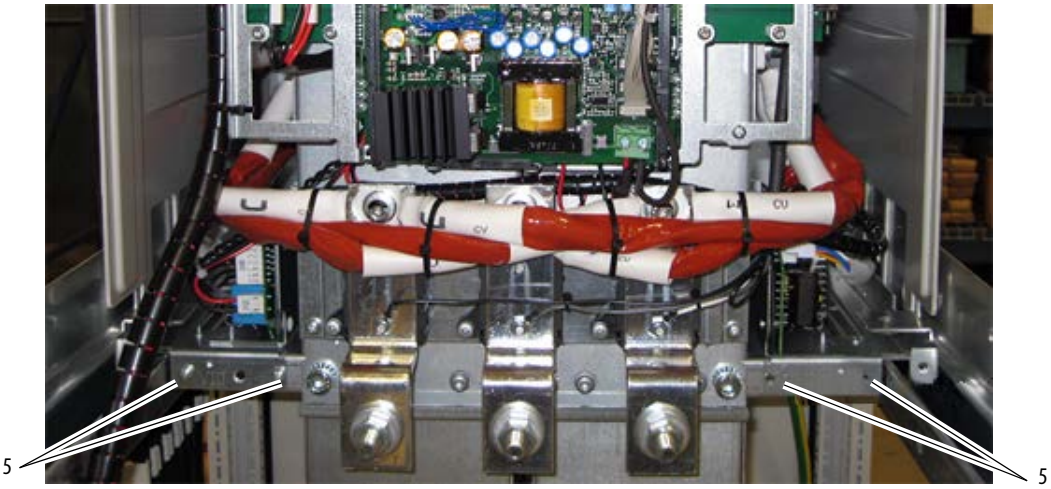
5. Remove the two M5 X 10 mm POZIDRIV screws that secure each of the fan assembly brackets to the front of the drive.

AC fan system



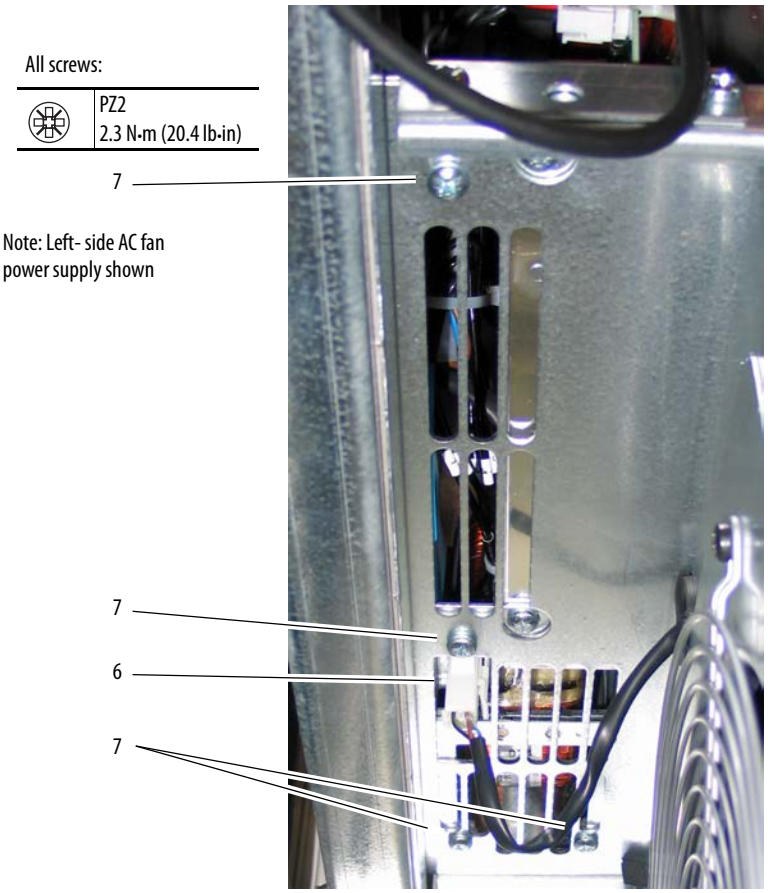
PZ2 2.3 N•m (20.4 lb•in)	PZ2 2.3 N•m (20.4 lb•in)

DC fan system



PZ2 2.3 N•m (20.4 lb•in)	PZ2 2.3 N•m (20.4 lb•in)

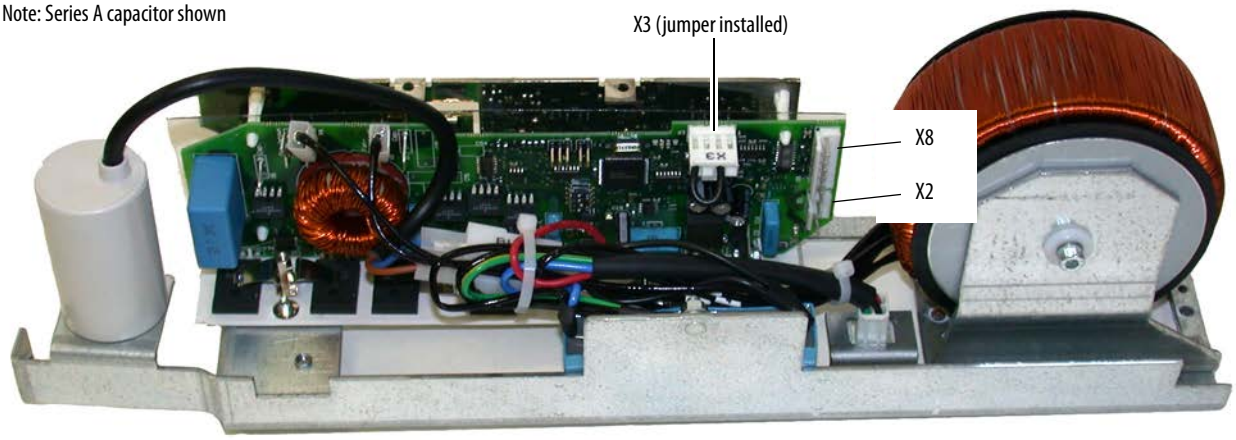
6. Disconnect the fan motor cables from the bottom of the fan power supply assembly.
7. Remove the four M5 x 10 mm POZIDRIV screws that secure the bottom of the fan power supply assemblies to the drive frame.



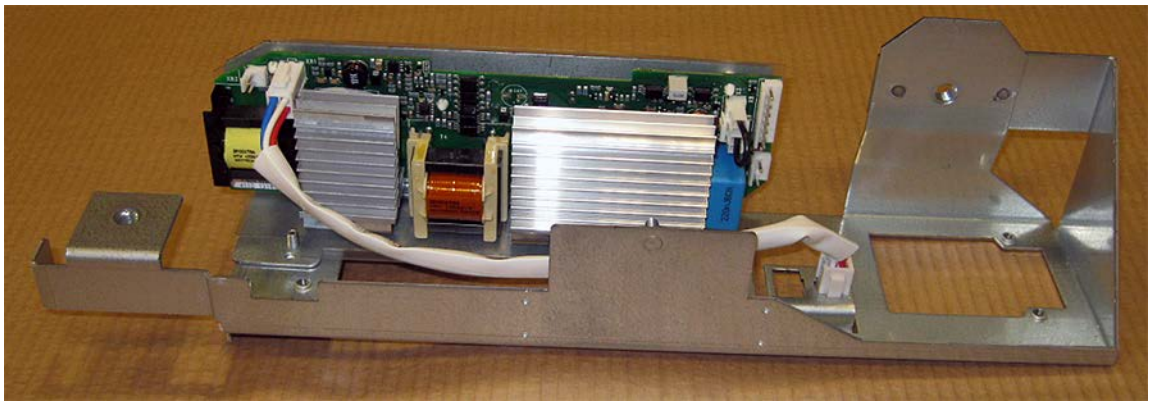
8. For the right-side fan power supply, disconnect the cables from connectors X2 and X8.
9. For the left-side fan power supply, disconnect the cables from connectors X2, X8, and X3.

Right-side AC fan power supply

Note: Series A capacitor shown



Right-side DC fan power supply



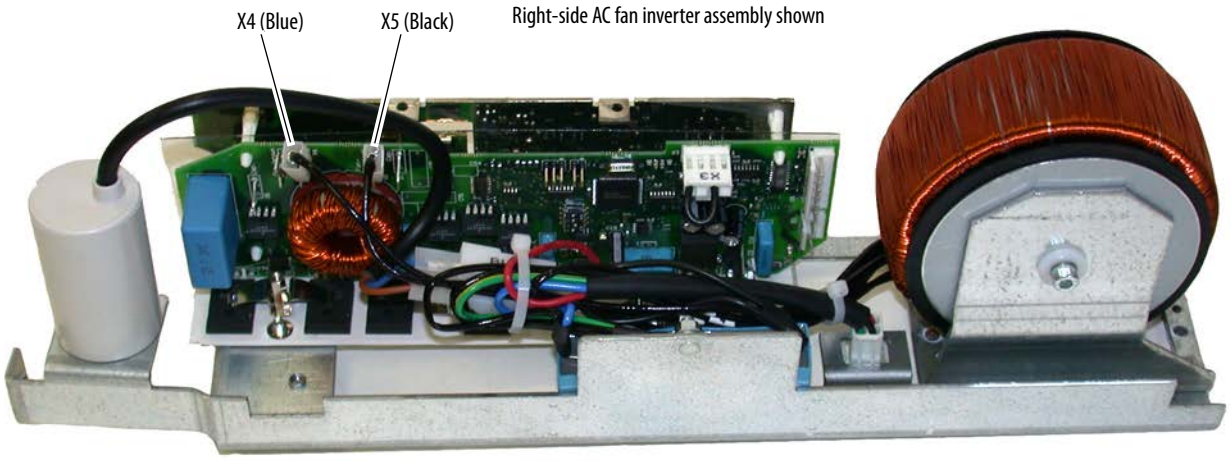
10. Carefully remove the fan power supply assemblies by pulling them out of the front of the drive.

Main AC Fan Inverter Circuit Board (20-VB00299) and AC Fan Output Transformer Assembly [20-FR10844 (Left) or 20-FR10845 (Right)] Removal and Installation

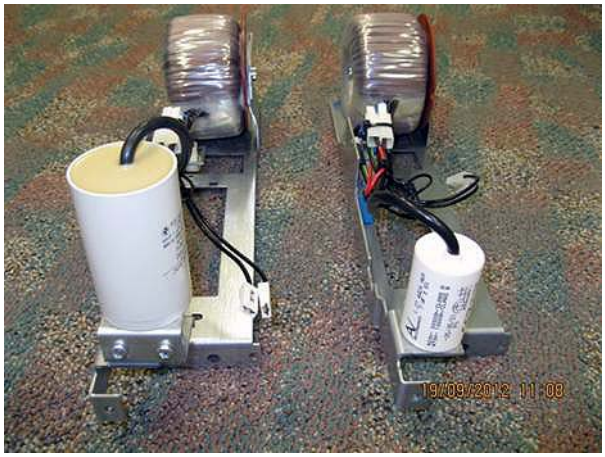
PowerFlex 700H and 700S frame 10 drives have two fan inverters. You can replace a fan inverter circuit board, or replace an output transformer assembly (includes the output transformer and fan capacitor on the assembly). See Isolating a Faulty Fan Inverter on page 265 for test procedures used to determine if the circuit board requires replacement.

Follow these steps to remove and replace a fan inverter circuit board or output transformer assembly.

1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 59.
3. Move the control frame and remove the air flow plate and protective covers from the drive. See Move the Control Frame and Remove the Air Flow Plate and Protective Covers on page 60.
4. Remove the appropriate main fan inverter assembly. See Remove the Main AC or DC Fan Power Supply Assemblies on page 63.
5. Disconnect the cables from connectors X4 and X5.



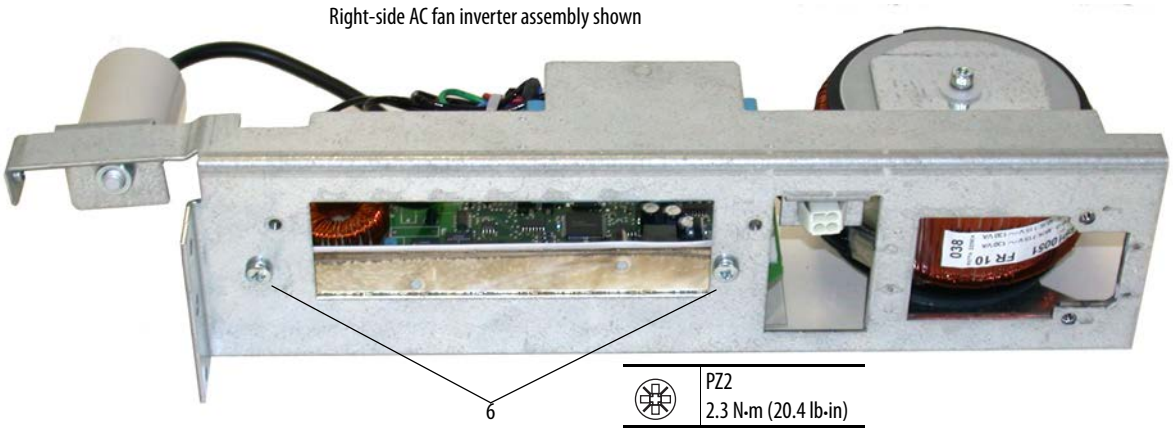
Right-side AC fan inverter assembly shown



Series B capacitor in a left-side AC fan inverter assembly shown.

Series A capacitor in a left-side AC fan inverter assembly shown

6. Remove two M5 x 10 mm POZIDRIV screws from the bottom of the assembly that secure the AC fan inverter board to the assembly and remove the AC fan inverter circuit board.



7. Complete the appropriate installation:
   - If you are replacing the AC fan inverter circuit board, install the new circuit board on the existing AC fan inverter assembly in the reverse order of removal.
   - If you are replacing the AC fan output transformer assembly, install the existing fan inverter circuit board on the new AC fan output transformer assembly in the reverse order of removal.
8. Install the AC fan inverter assembly in the reverse order of removal.

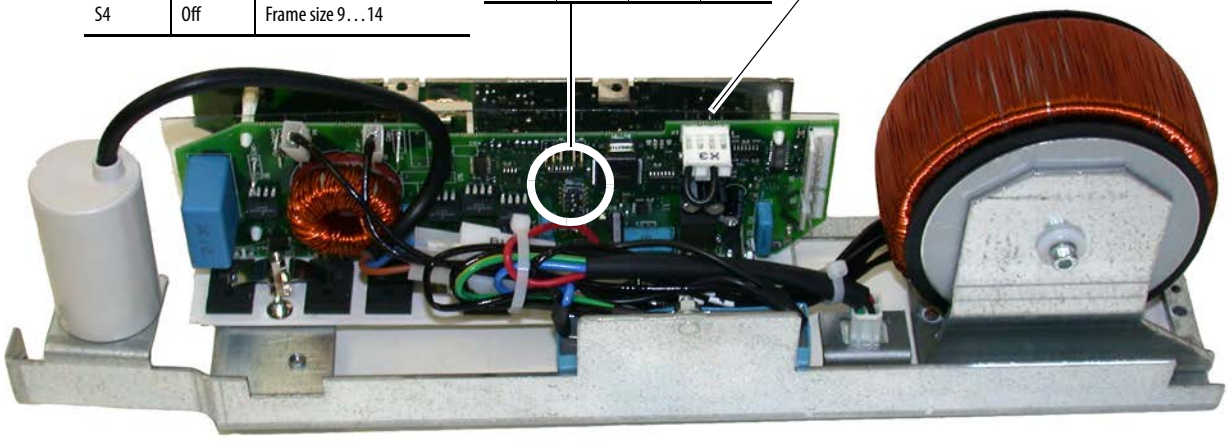
IMPORTANT Verify that dip switch S1 on the new AC fan inverter board is properly configured, as shown below.

IMPORTANT If you are replacing a right-side AC fan inverter circuit board, install the jumper on connector X3.

Switch	Setting	To indicate the following:
S1	Off	50 Hz fan motor frequency
S2	Off	220 V AC motor voltage
S3	On	230 V AC motor voltage
S4	Off	Frame size 9…14

Note: AC fan system shown

S1-1	S1-2	S1-3	S1-4
Off	Off	On	Off



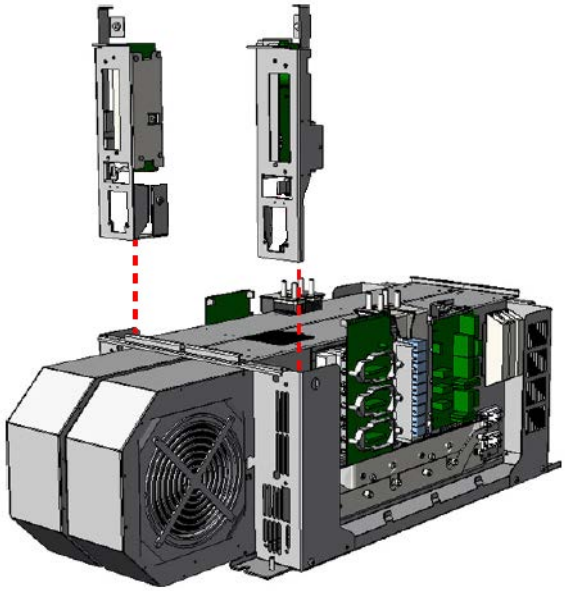
Main DC Fan Power Supply System (SK-H1-DCFANBD1) Removal and Installation

Note: PowerFlex 700H and 700S frame 10 drives have two fan power supplies. You can retrofit an existing AC fan system or replace a DC fan system with a new DC fan system. See Energy-related Products Fan Efficiency Directive on page 12 for guidelines on replacing an existing fan system with a new DC fan system.

Note: Retain the fan power supply sheet metal bracket for reuse.

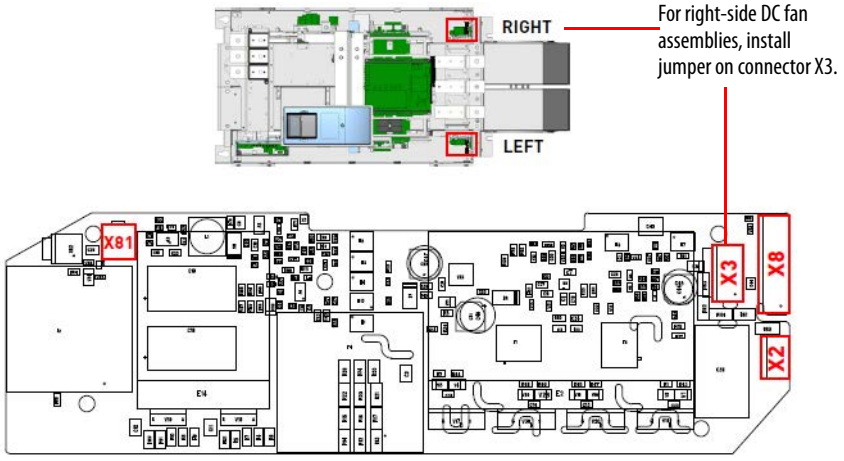
Follow these steps to remove and replace an existing fan system with a new DC fan system.

1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 59.
3. Move the control frame and remove the air flow plate and protective covers from the drive. See Move the Control Frame and Remove the Air Flow Plate and Protective Covers on page 60.
4. Remove the appropriate main fan assembly. See Remove the Main AC or DC Fan Power Supply Assemblies on page 63.



5. Install the new DC fan power supply assembly in the reverse order of removal, using the existing sheet metal housing.

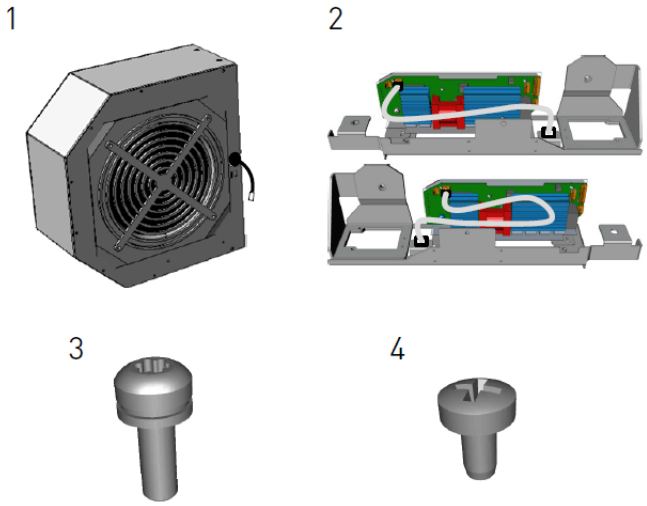
IMPORTANT If you are replacing a right-side DC fan power supply assembly, install the jumper on connector X3.



AC to DC Fan System Retrofit Kit (SK-H1-DCFANRETROFIT-F10)

The frame 10 main AC to DC fan system retrofit kit contains the following parts:

Item Number	Description	Quantity
1	Main DC fan assembly	2
2	DC fan power supply assembly	1
3	M6 x 20 mm POZIDRIV screw	4
4	M5 x 10 mm POZIDRIV screw	12

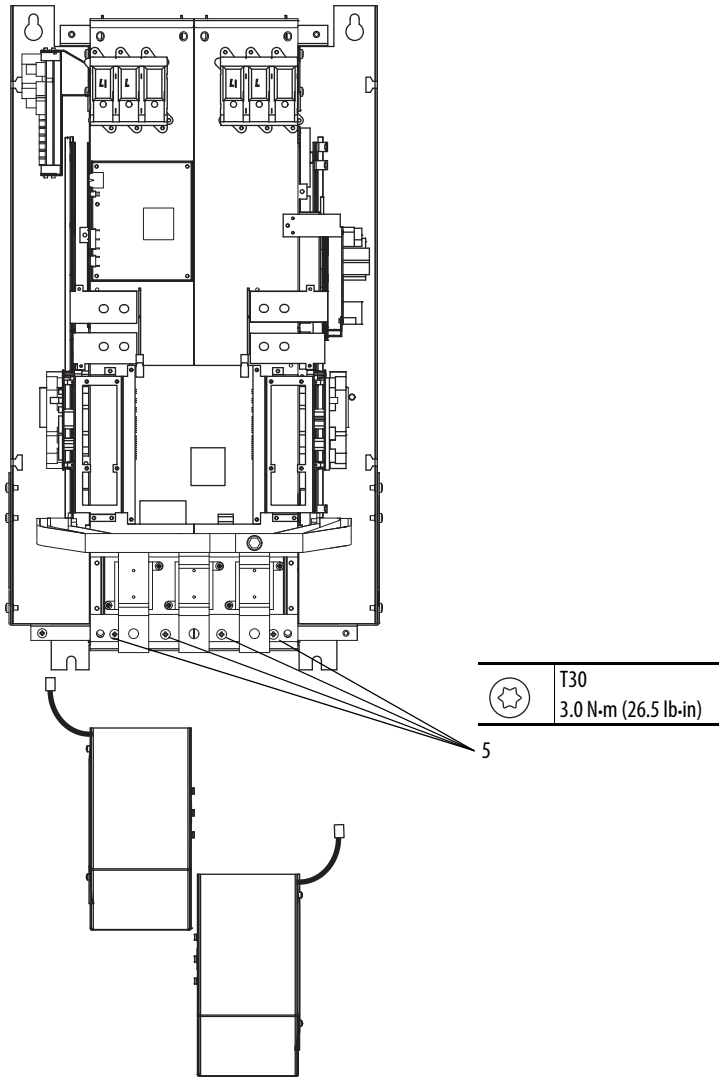


Follow these steps to remove the main AC fan system and replace it with a main DC fan system.

1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 59.
3. Move the control frame and remove the air flow plate and protective covers from the drive. See Move the Control Frame and Remove the Air Flow Plate and Protective Covers on page 60.
4. Remove the main AC fan power supply assemblies. See Remove the Main AC or DC Fan Power Supply Assemblies on page 63.

5. Remove the two M6 x 20 mm hexalobular screws that secure each of the main AC fan housings to the drive and remove the fan assemblies.

   Note: The back of the fan housing contains two holes in the sheet metal that fit onto positioning pins located on the drive frame. To remove the main fan assemblies, lower the front end of the assembly downward in order to clear the sheet metal on the frame, and pull the fan assembly off the positioning pins and out of the drive.



6. Install the new DC main fan assemblies in the reverse order of removal as instructed in step 5.

7. Install the new DC fan assemblies in the reverse order of removal as instructed in step 4, using the connection locations identified in Table 1.

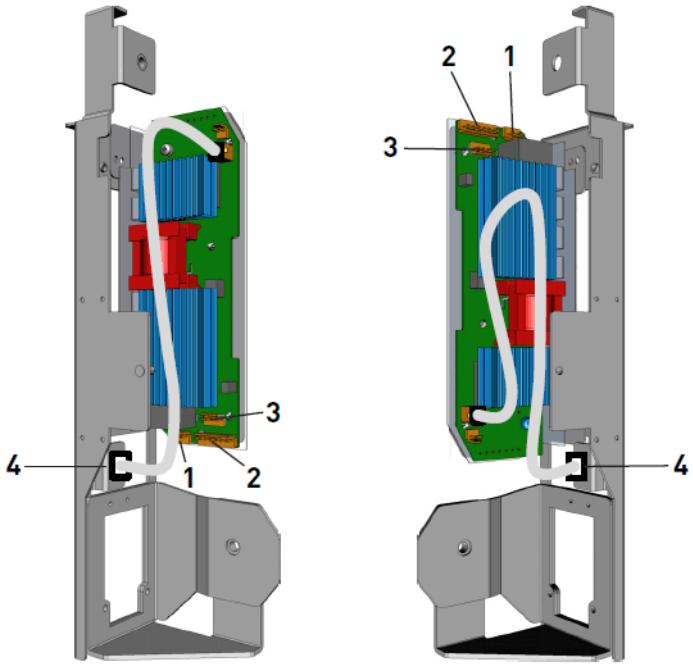


Table 1 - DC Fan Inverter Connections

Item	Description
1	DC supply wire to connector X2
2	Fan control wire to connector X8
3	Fan control FB wire/jumper to connector X3
4	Fan supply wire to DC fan extension wire connector

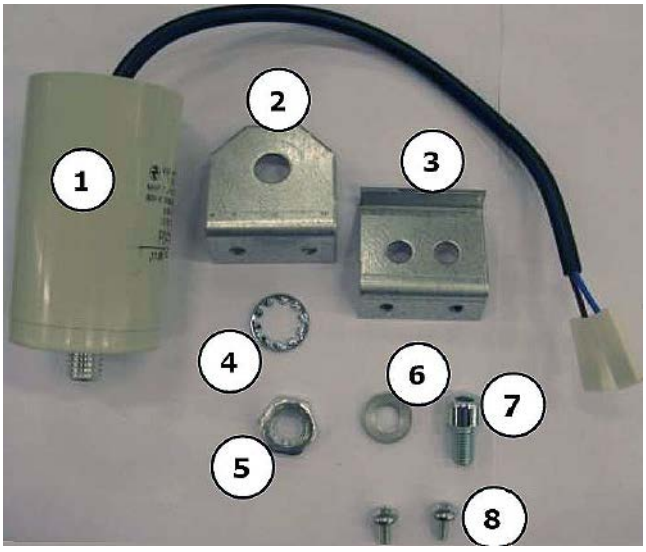
8. Remove the backing from the drive modification label and attach the label, in a clearly visible location, to the front of the drive.
9. Write “DC fan retrofit” and the installation date on the label.

Main AC Fan Inverter Capacitor (SK-H1-FANCAP-F1012) Removal and Installation

Note: The AC fan inverter capacitor replacement kit (SK-H1-FANCAP-F1012) contains a new sheet metal bracket, hardware and fasteners, and a series B capacitor (identified in the table and shown below). The series B capacitor (50 mm dia. x 62 mm tall) is larger than the series A capacitor (35 mm dia. x 57 mm tall). If a series A capacitor is currently installed, always replace it with the new series B capacitor.

Photo ID#	Part Description	Quantity
1	AC Fan capacitor	1
2	AC Fan capacitor bracket (1)	1
3	Adapter bracket (1)	1
4	M12 lock washer (for AC fan capacitor)	1
5	M12 fastening nut (for AC fan capacitor)	1
6	Spring washer (for adapter bracket) (1)	1
7	M8 x 16 mm hexagonal socket screw (for adapter bracket) (1)	1
8	M5 x 10 mm POZIDRIV screw (for adapter bracket) (1)	2

(1) If a series B AC fan inverter assembly is currently installed in the drive, the sheet metal frame has been modified to accommodate the series B (larger) capacitor. Therefore, in this case, the fan capacitor bracket, adapter bracket and adapter fastening hardware is not needed.

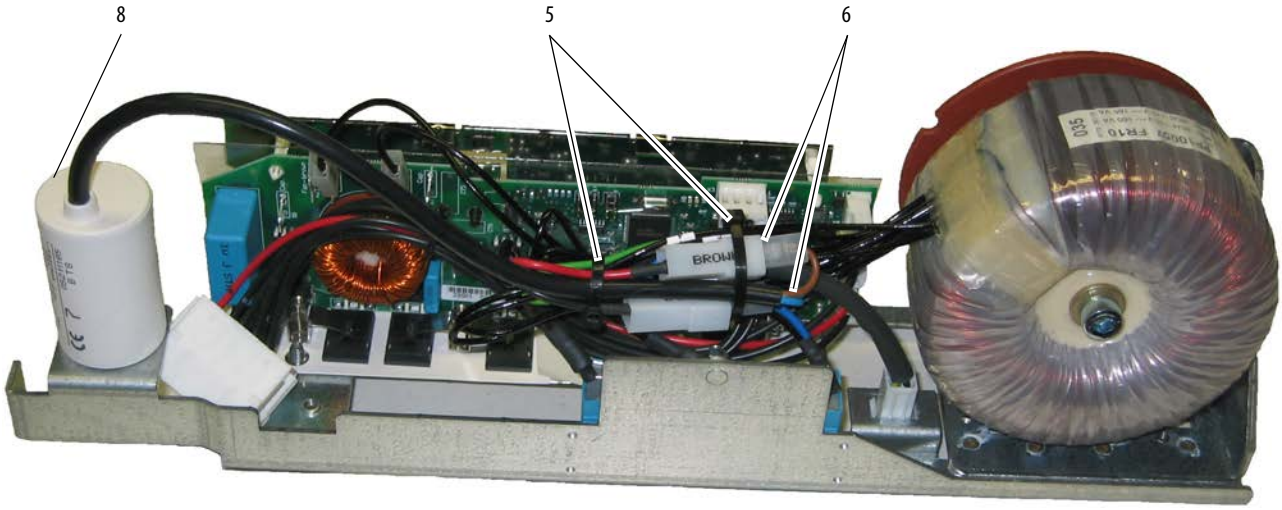


Follow these steps to remove, test, and replace the main AC fan inverter capacitor.

1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 59.

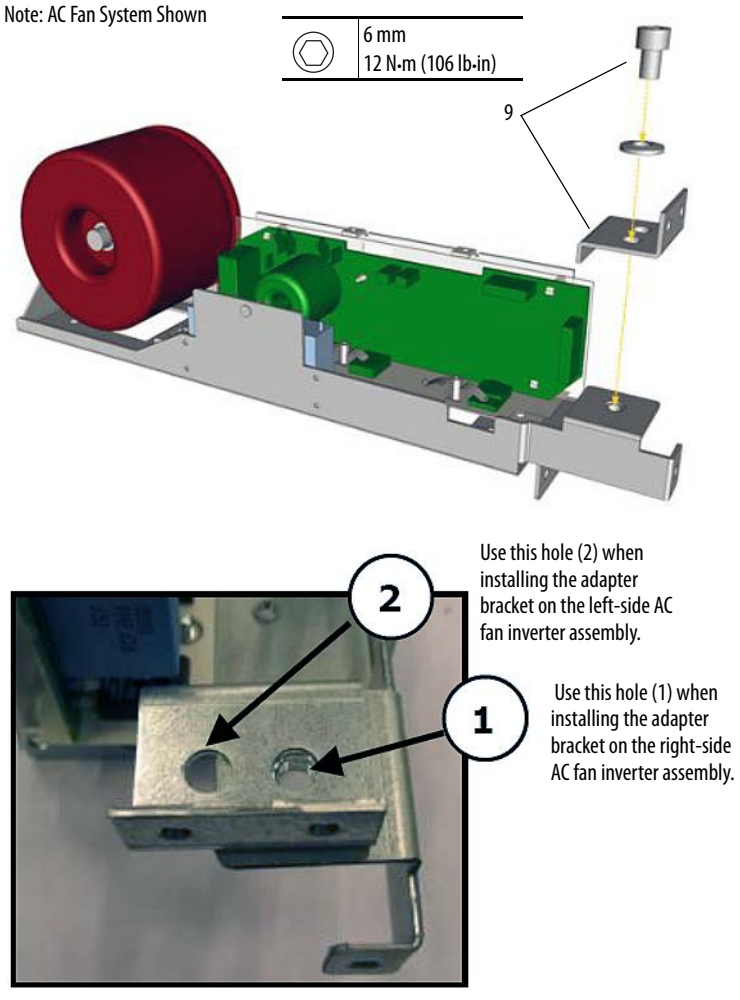
3. Move the control frame and remove the air flow plate and protective covers from the drive. See Move the Control Frame and Remove the Air Flow Plate and Protective Covers on page 60.
4. Remove the appropriate main fan inverter assembly. See Remove the Main AC or DC Fan Power Supply Assemblies on page 63.
5. Cut the cable ties securing the wires marked Brown and Blue.
6. Disconnect the AC fan capacitor wire connectors marked Brown and Blue.
7. If a series A capacitor is installed, continue with the next step. If a series B capacitor is installed, measure the value of the capacitor. If the value of the capacitor is less than 7 µF, continue with the next step.
8. Unscrew and remove the fan capacitor from the AC fan inverter assembly.

Note: AC fan system shown

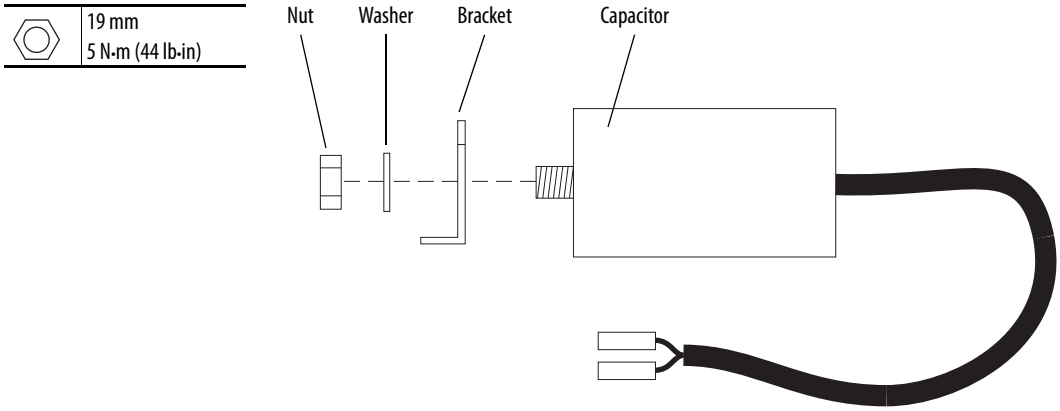


9. If the original, defective capacitor being replaced is series B, continue with the next step. If the original, defective capacitor being replaced is series A, secure the new fan capacitor adapter bracket to the AC fan inverter assembly using the new M8 x 16 mm hexagonal socket screw and washer provided in the replacement kit.

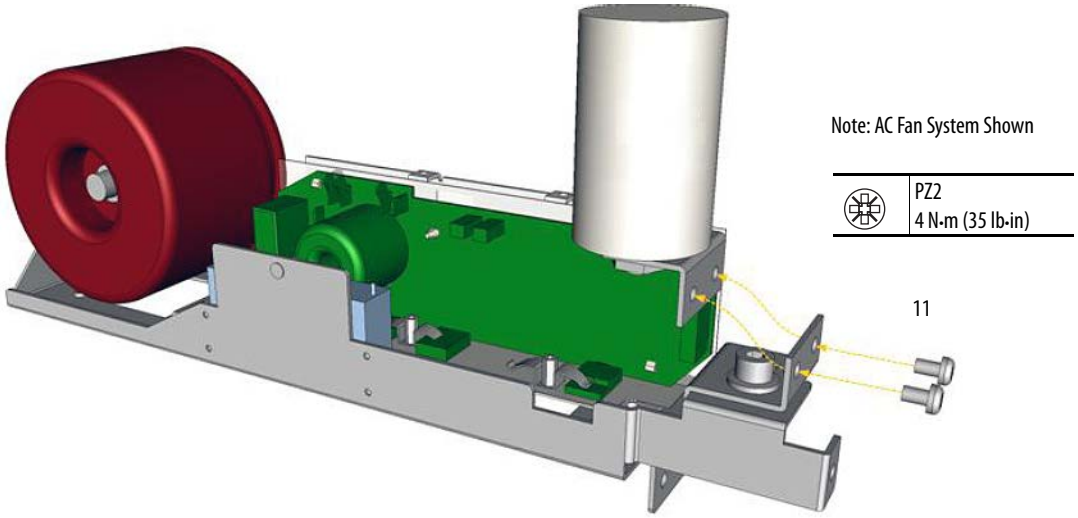
IMPORTANT	Assemble the adapter bracket using the appropriate mounting hole as shown in the illustration below.



10. Secure the new (series B) AC fan capacitor to the new AC fan capacitor bracket using the M12 nut and lock washer provided in the kit.



11. If necessary, secure the new AC fan capacitor bracket assembly to the AC fan inverter assembly using the two M5 x 10 mm POZIDRIV screws provided in the kit.



12. Install the AC fan inverter assembly in the reverse order of removal.

Main AC Fan (20-PP01080) and Main DC Fan (SK-Y1-DCFAN1) Assembly Removal and Installation

Follow these steps to measure the resistance between the main fan supply wires and remove and replace the main fan, if necessary.

Notes:

- The fan replacement kit only contains the fan motor and impeller assembly. Therefore, the sheet metal housing for the fan must be reused.
- To identify which fan is installed in your drive, see Fan Inverter System Block Diagrams on page 257.

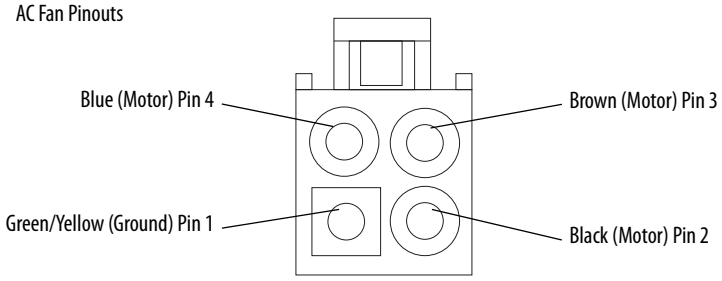
1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 59.
3. Remove the bottom protective cover only from the drive. See Move the Control Frame and Remove the Air Flow Plate and Protective Covers on page 60.
4. Disconnect the fan power supply cable from the bottom of the fan assembly for each main fan (see the illustration on the following page for connection location).

5. Using the appropriate table below, measure the resistance between the fan supply wires.

AC Fan: If the measurements are not similar to those in this table, replace the AC fan.

Connection wires	Resistance ±5%
Black-Brown	62 Ω
Brown-Blue	36 Ω
Blue-Black	27 Ω
Green-chassis	0 Ω

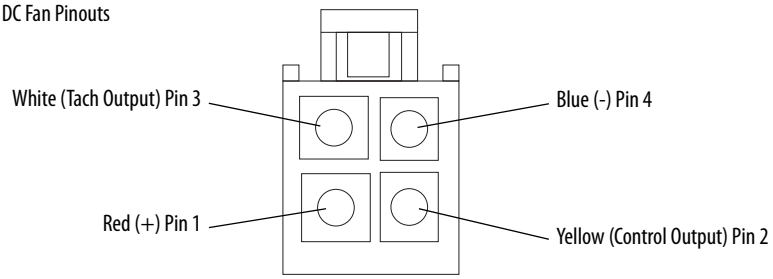
AC Fan Pinouts



DC Fan: If the measurements are not similar to those in this table, replace the DC fan.

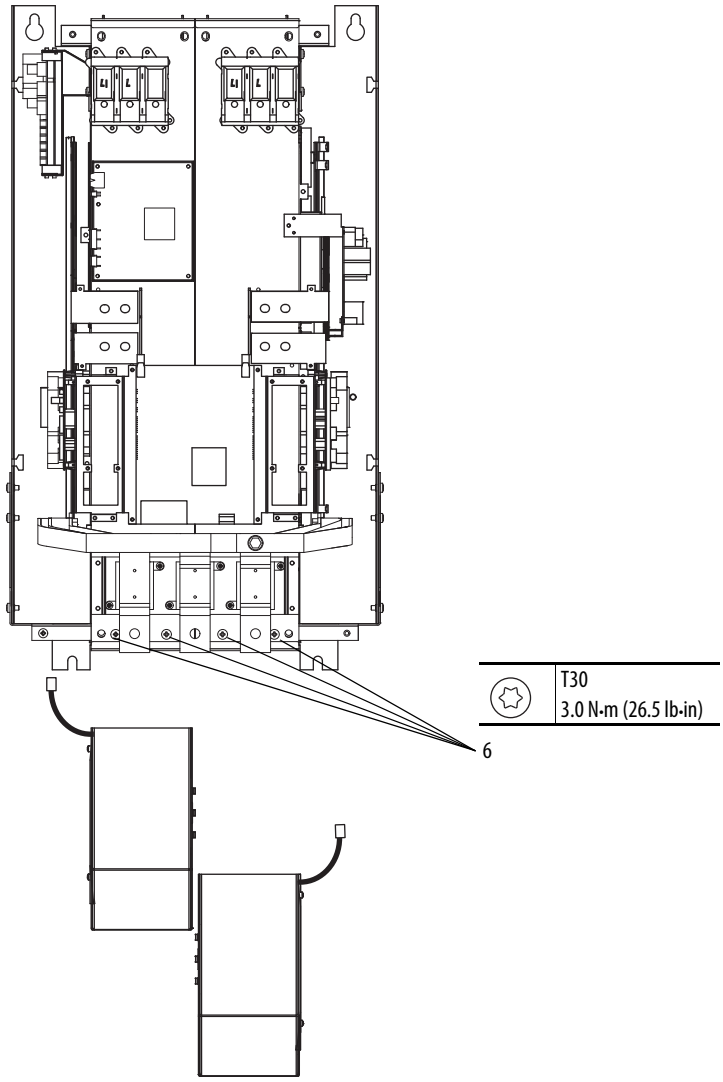
Connection wires	Resistance ±5%
Red-Blue	∞ Ω
Red-White	∞ Ω
White-Yellow	∞ Ω
Blue-White	∞ Ω

DC Fan Pinouts

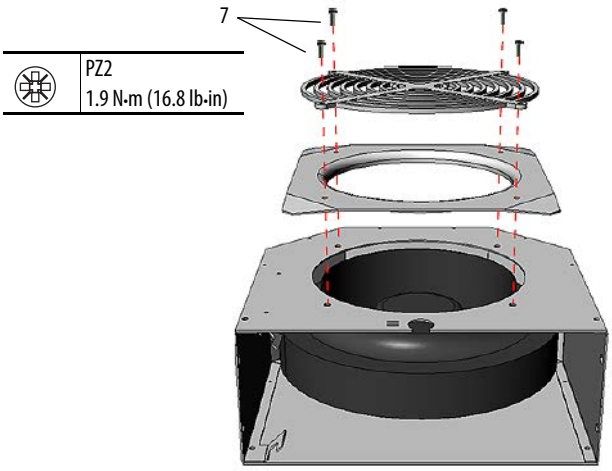


6. Remove the two M6 x 20 mm hexalobular screws that secure each of the fan assembly housings to the drive frame and remove the fan assemblies.

   Note: The back of the fan housing contains two holes in the sheet metal that fit onto positioning pins located on the drive frame. To remove the main fan assemblies, lower the front end of the assembly downward in order to clear the sheet metal on the frame, and pull the fan assembly off the positioning pins and out of the drive.

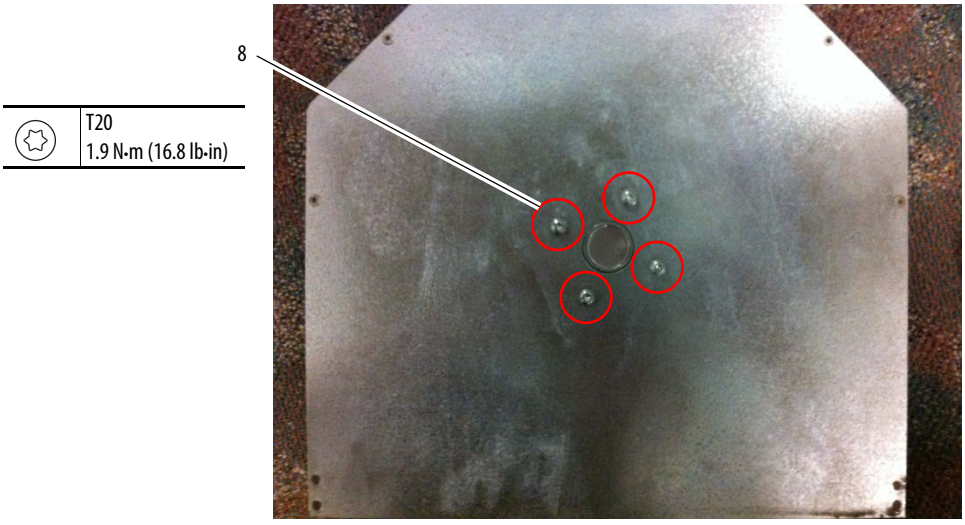


7. Remove the four M5 x 16 mm POZIDRIV screws that secure the finger guard and fan inlet ring to the fan housing and remove the guard and ring.

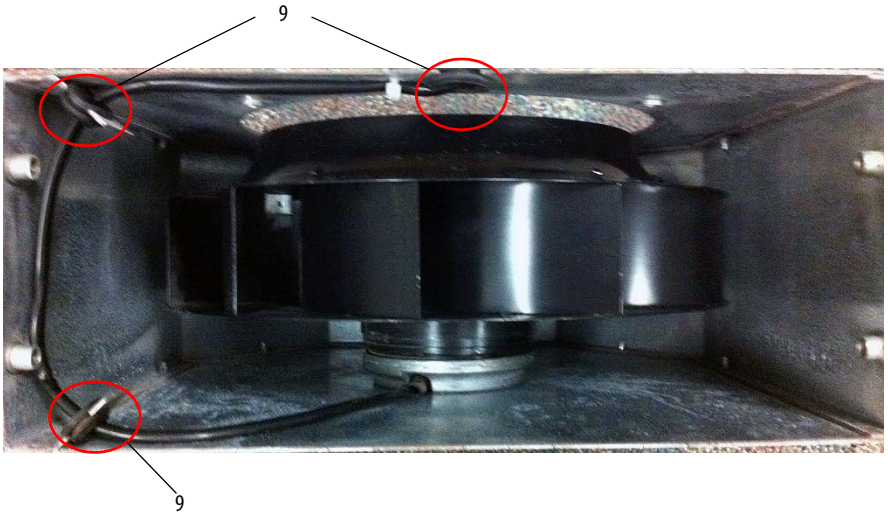


8. Remove the four hexalobular screws on the back of the fan assembly.

   Note: The main AC and DC fans have different mounting hardware and hole dimensions. The AC fan uses four M4 x 8 mm screws that are spaced 40 mm apart on the housing. The DC fan uses four M5 x 10 mm screws that are spaced 65 mm apart on the housing. Based on the manufacturing date, the sheet metal housing was fabricated for either an AC fan, a DC fan, or both.



9. Remove the three rubber bushings that hold the fan wiring to the sheet metal housing.



10. Slide the fan out of the sheet metal housing. Retain the sheet metal housing for reuse.
11. Install the new main fan in the reverse order of removal.

    Verify that the fan turns easily and does not make contact with the sheet metal housing before installing the fan assembly on the drive.

ASIC Circuit Board Assembly Cooling Fan (20-PP01096) Removal and Installation

The ASIC circuit board cooling fan is located on the ASIC board assembly on the upper, left-side of the drive. Follow these steps to remove and replace the cooling fan.

1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 59.
3. Move the control frame and remove the air flow plate and protective covers from the drive. See Move the Control Frame and Remove the Air Flow Plate and Protective Covers on page 60.

4. Remove the ASIC circuit board assembly from the drive:

- For earlier drives, remove the four M4 x 8 mm hexalobular screws that secure the ASIC assembly cover to the drive and remove the cover.
- For newer drives, remove the two M3 x 5 mm POZIDRIV screws that secure the cooling fan assembly to the ASIC assembly and rotate the fan assembly out of the ASIC assembly.

IMPORTANT After removing the fan assembly from the ASIC board assembly, the fan power cable will still be connected to the ASIC circuit board.

PZ2	3.0 N•m (27 lb•in)

T20	1.65 N•m (14.6 lb•in)

5. Disconnect the cable from connector X1 on the ASIC board and remove the fan assembly from the drive.

6. For newer drives only, remove the M4 x 15 mm hexalobular screw that secures the fan to the bracket.

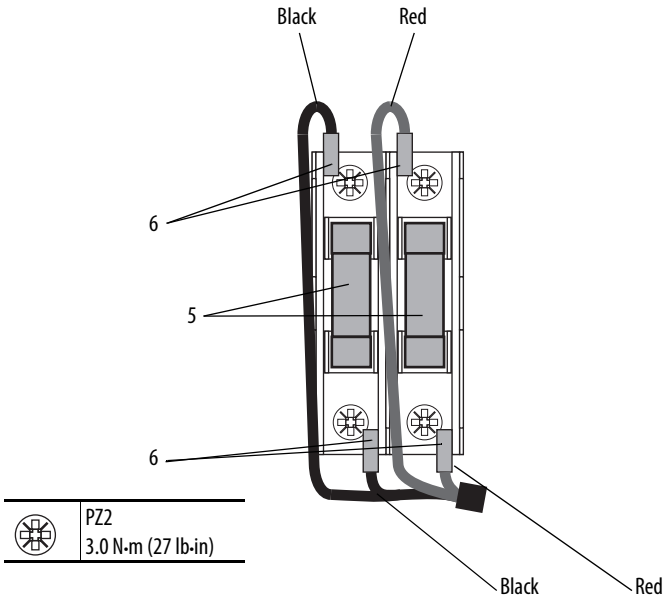
	T20 3.0 N•m (27 lb•in)

7. Install the ASIC cooling fan and assembly in the reverse order of removal.

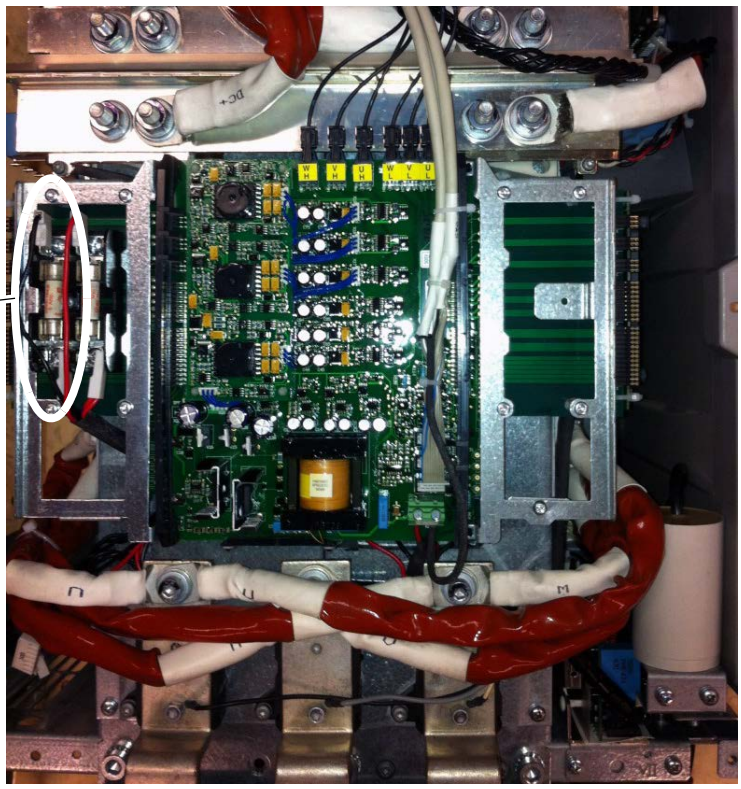
AC or DC Fan System Fuses (20-PP20202) and Fuse Holder (20-PP20300) Removal and Installation

The fan system fuses and fuse holder are located on the front of the drive, next to the gate driver board. Follow these steps to remove and replace the fan system fuse holder.

1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 59.
3. Move the control frame and remove the air flow plate and protective covers from the drive. See Move the Control Frame and Remove the Air Flow Plate and Protective Covers on page 60.
4. Remove the fuses from the fuse holder.
5. Check the fuses. See Checking the Fan Inverter Fuses on page 263.
6. Disconnect the four fuse power wires (black and red pairs) connected to the top and bottom of the fuse holder.



7. Remove the M4 x 8 mm POZIDRIV screw that secures the fuse holder to the drive frame and remove the fuse holder.



	PZ2 3.0 N•m (27 lb•in)

8. Install the new fan system fuses and fuse holder in the reverse order of removal.

PowerFlex 700H and 700S Drives - Frame 11 Procedures

This chapter contains spare part information and procedures for testing and replacing fan system components for frame 11 PowerFlex 700H and PowerFlex 700S drives. See Appendix A PowerFlex 700H and 700S Diagnostic Procedures on page 255 for additional component test procedures.

Frame 11 Fan System Spare Parts

AC Fan Systems

See Available Fan System Kits starting on page 277 for an illustration of the spare part kit contents.

Cat. No.	Part Description	Quantity per Drive	Original Vendor and Model Number
20-FR10845	Output transformer assembly for main AC fan inverter (right side)	3	–
20-PP01080	230 W main AC fan assembly	3	–
20-PP01096	Cooling fan for ASIC board assembly	1	Sinwan SD5012PT-24H (1)
20-PP20202	Fuse for fan system	2	Ferraz Shawmut ATQ8 (2)
20-PP20300	Fuse holder for main fan system fuses	1	Ferraz Shawmut 30322
20-VB00299	Main AC fan inverter circuit board	3	–
SK-H1-FANCAP-F11	Capacitor (7 μF) for main fan inverter	3	–

(1) The part may not contain wires, connectors, or mounting hardware when bought directly from vendor.
(2) The factory default fuses are Ferraz Shawmut ATQ8, 8 A fuses. Older drives may contain Bussman 6 A fuses.

DC Fan Systems

See Available Fan System Kits starting on page 277 for an illustration of the spare part kit contents.

Cat. No.	Part Description	Quantity per Drive	Original Vendor and Model Number
SK-Y1-DCFAN1	Main DC fan assembly	3	–
SK-H1-DCFANBD1	Main DC fan power supply circuit board (1)	3	–
SK-H1-DCFANRETROFIT-F11	AC to DC fan system retrofit kit	1	–

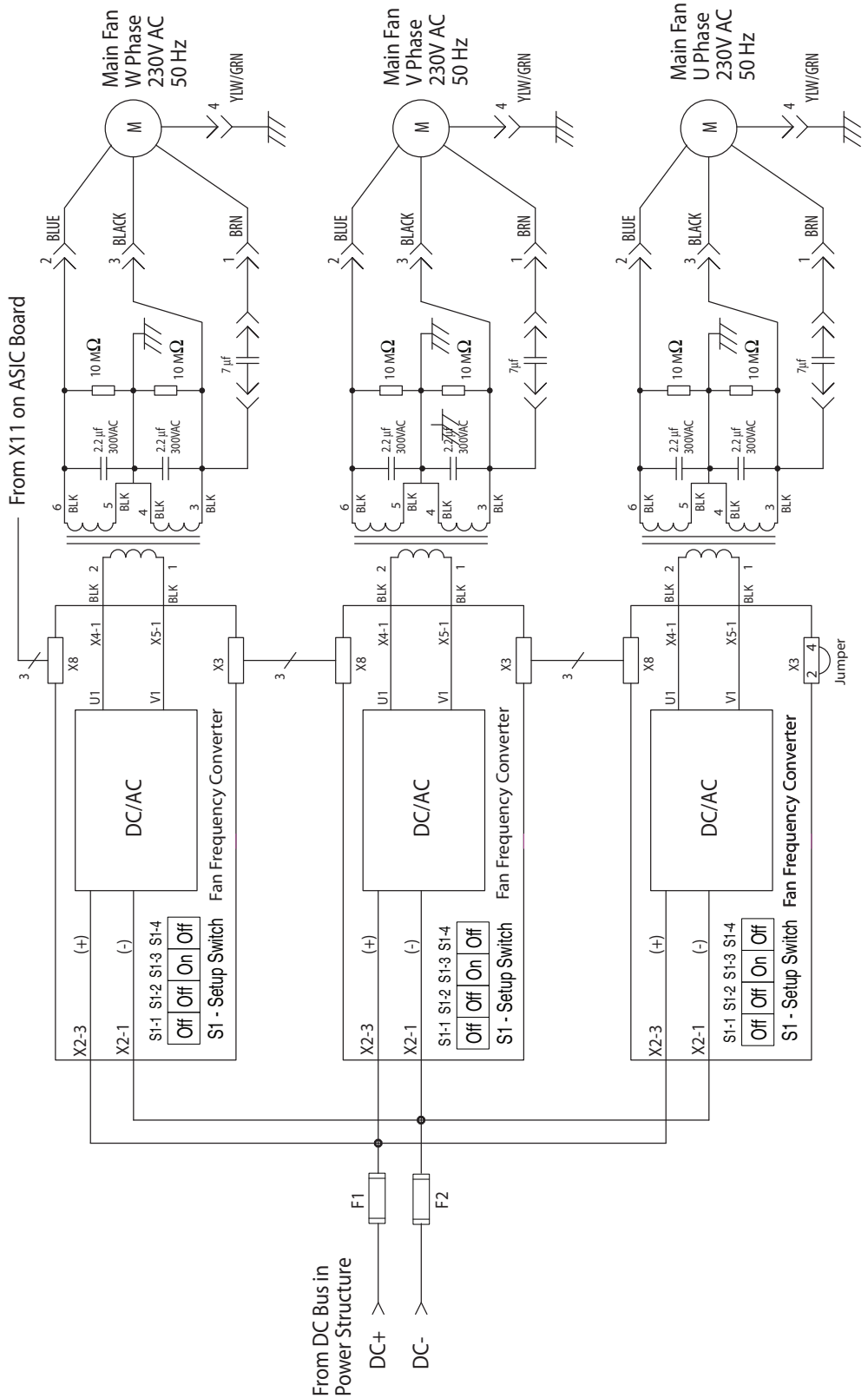
(1) Circuit board only, no sheet metal bracket.

Tools Needed for Frame 11 Fan System Repairs

- #2 POZIDRIV screwdriver
- 13 mm socket wrench
- 17 mm socket wrench
- 19 mm socket wrench
- T20 and T30 hexalobular screwdriver
- Multi meter
- Fuse puller
- Needle-nose pliers
- Wire cutter
- Cable ties
- Electrical tape
- Optional: PowerFlex 700H and 700S maintenance stand (cat. No. 20-MAINSTND)

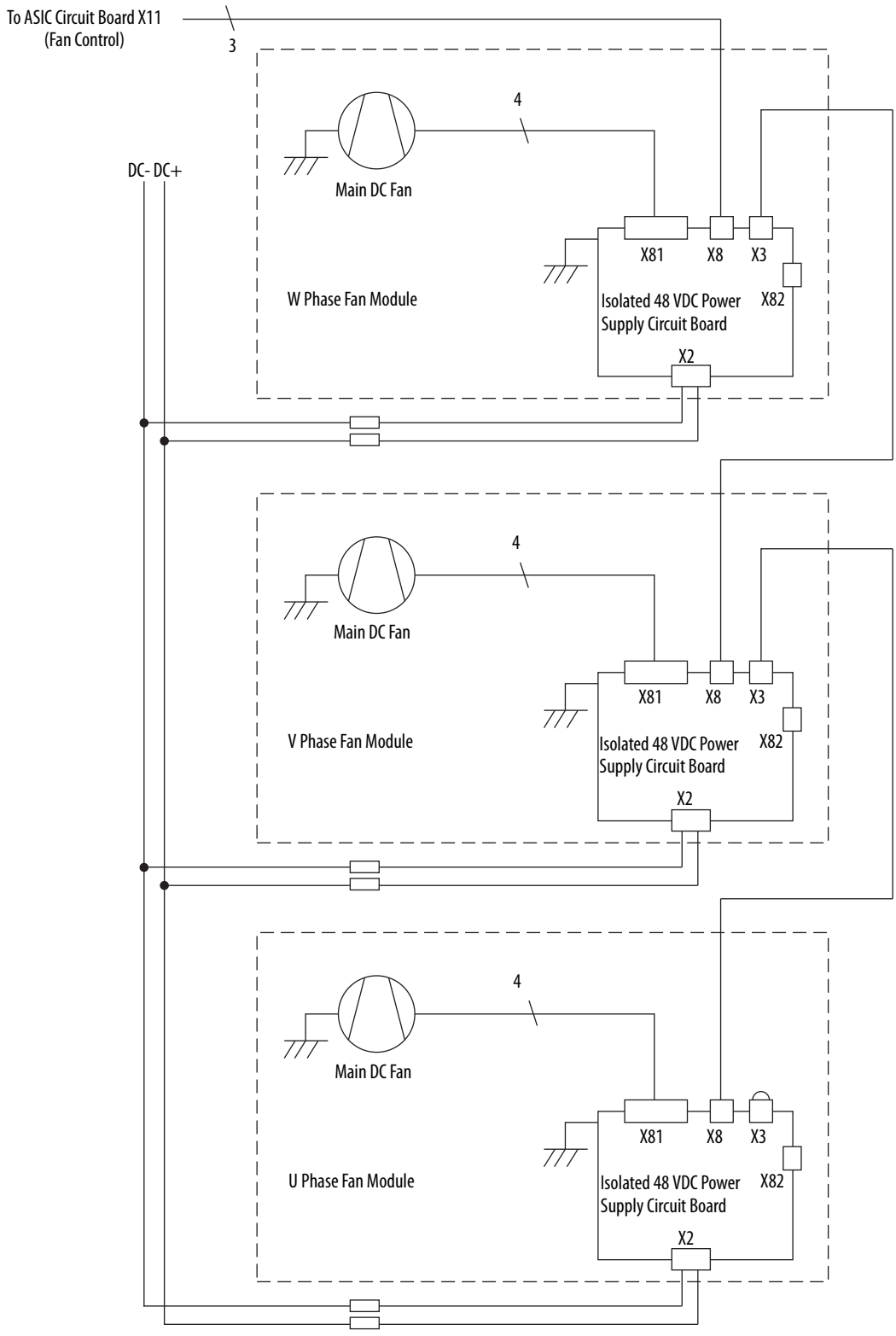
Frame 11 Schematic Diagrams

Figure 6 - Frame 11 AC Fan System Wiring Schematic Diagram



Switch	Setting	To indicate the following:
S1	Off	50 Hz fan motor frequency
S2	Off	220 V AC motor voltage
S3	On	230 V AC motor voltage
S4	Off	Frame size 9 . . . 14

Figure 7 - Frame 11 DC Fan System Wiring Schematic Diagram



Frame 11 Fan System Replacement Procedures

Replacement procedures for these frame 11 fan system parts are included in this chapter.

Cat. No.	Part Description	Page
20-VB00299	Main AC fan inverter circuit board	99
20-FR10845	Output transformer assembly for AC fan inverter (right side) (1)	99
SK-H1-DCFANBD1	Main DC fan power supply circuit board	101
SK-H1-DCFANRETROFIT-F11	AC to DC fan system retrofit kit	103
SK-H1-FANCAP-F1012	Main AC fan capacitor (7 µF) kit	105
20-PP01080	230 W main AC fan assembly	110
SK-Y1-DCFAN1	Main DC fan assembly	110
20-PP01096	60 mm cooling fan for the ASIC board assembly	113
20-PP20202	Fuse for fan system	115
20-PP20300	Fuse holder for main fan system fuses	115

(1) This assembly does not include the main fan inverter circuit board.

Remove Power from the Drive

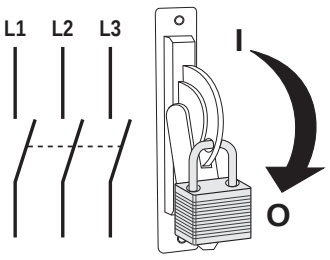
ATTENTION: To avoid an electric shock hazard, verify that the voltage on the bus capacitors has discharged completely before servicing. Check the DC bus voltage at the Power Terminal Block by measuring between the +DC and -DC terminals, between the +DC terminal and the chassis, and between the -DC terminal and the chassis. The voltage must be zero for all three measurements.

Remove power before making or breaking cable connections. When you remove or insert a cable connector with power applied, an electrical arc may occur. An electrical arc can cause personal injury or property damage by:

- sending an erroneous signal to your system's field devices, causing unintended machine motion
- causing an explosion in a hazardous environment

Electrical arcing causes excessive wear to contacts on both the module and its mating connector. Worn contacts may create electrical resistance.

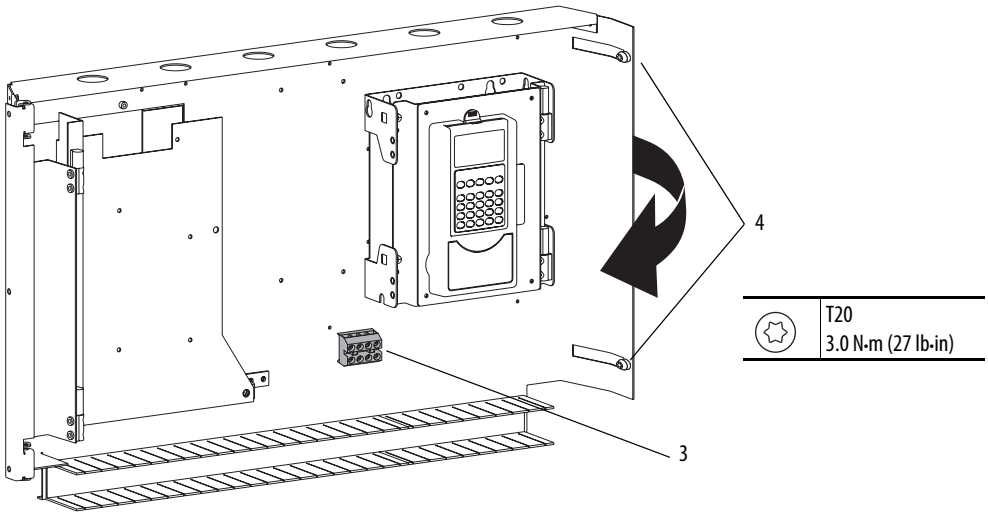
1. Turn off and lock out input power.
2. Wait five minutes.
3. Check the DC bus voltage at the Power Terminal Block by measuring between the +DC and -DC terminals, between the +DC terminal and the chassis, and between the -DC terminal and the chassis. The voltage must be zero for all three measurements.



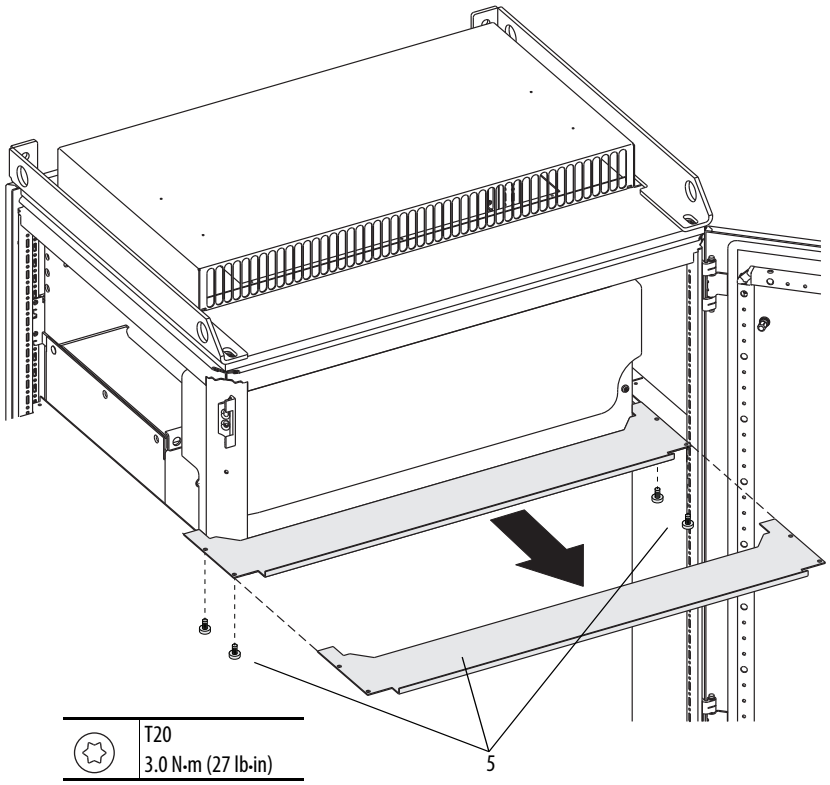
Move the Control Frame and Remove the Air Flow Plate and Protective Covers

You must move the control frame and remove the air flow plate and protective covers from the drive in order to access fan system components on the drive power structure. Follow these steps to move the control frame and remove the air flow plate and protective covers.

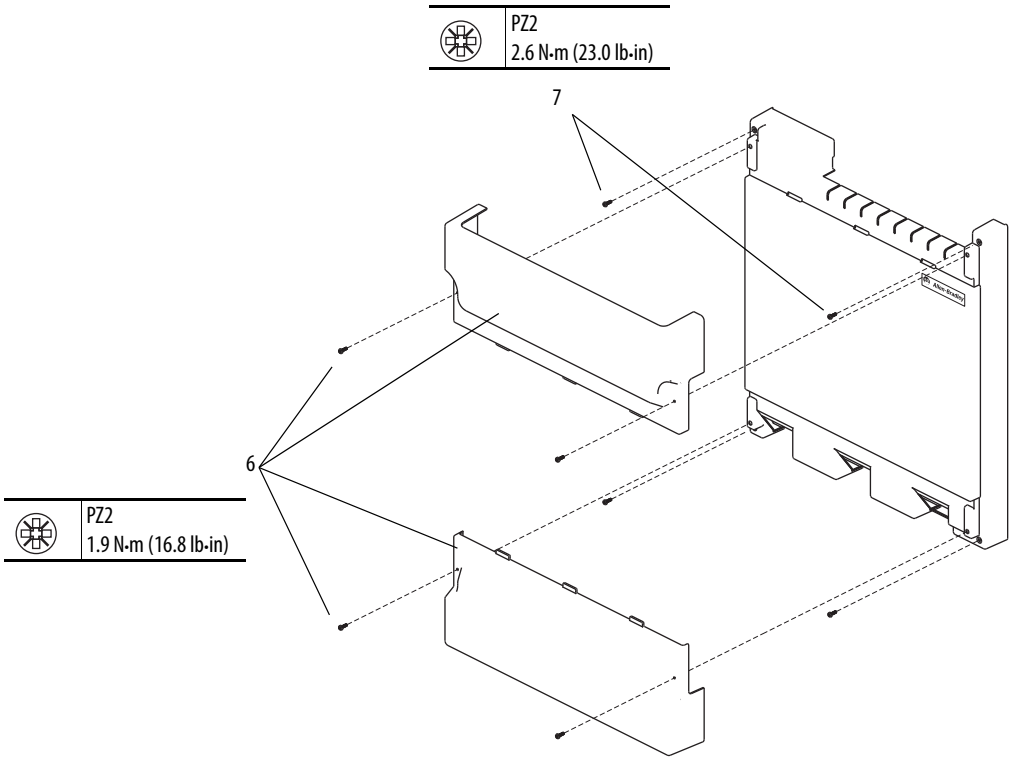
1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 91.
3. If moving the control frame from a DC input drive with pre-charge interlock, disconnect the wiring from terminal strip X50.
4. Loosen the two hexalobular screws that secure the control frame to the enclosure and swing the control frame away from the drive.



5. Remove the four M5 x 12 mm hexalobular, self-tapping, sheet metal screws that secure the air flow plate to the drive enclosure and slide the plate off the drive.



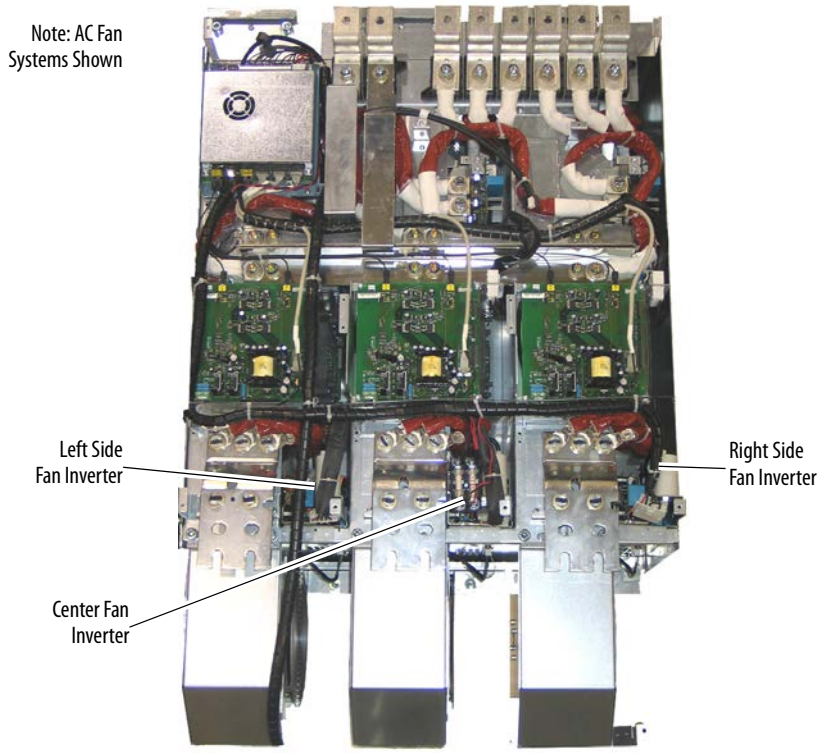
6. Remove the four M5 x 16 mm POZIDRIV screws that secure the top and bottom protective covers to the main front protective cover and remove the top and bottom protective covers.
7. Remove the four M5 x 16 mm POZIDRIV screws that secure the main front protective cover to the drive and remove the protective cover.



Removing the Main AC or DC Fan Power Supply Assemblies

You must remove the main fan power supply assemblies from the drive in order to test and/or replace the AC or DC fan power supply circuit board, AC fan inverter output transformer, and/or AC fan inverter capacitor. Follow these steps to remove the main fan inverter assemblies.

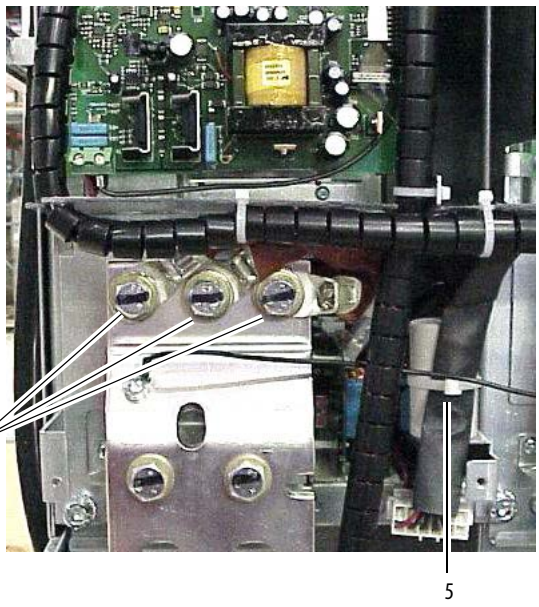
Note: You only need to complete the steps necessary to remove the fan assembly (left side, center, or right side) you are testing or replacing.



1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 91.
3. Move the control frame and remove the air flow plate and protective covers. See Move the Control Frame and Remove the Air Flow Plate and Protective Covers on page 92.

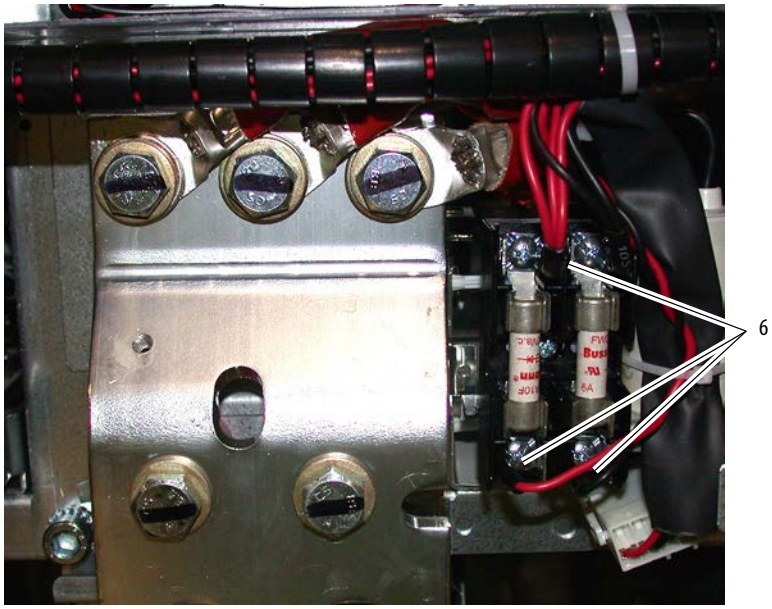
4. Using a 17mm wrench, loosen the three connections to the output terminal next to the inverter assembly.
5. If applicable, cut the cable-tie that secures the cable to the capacitor and disconnect the cable.

Note: AC Fan System Shown

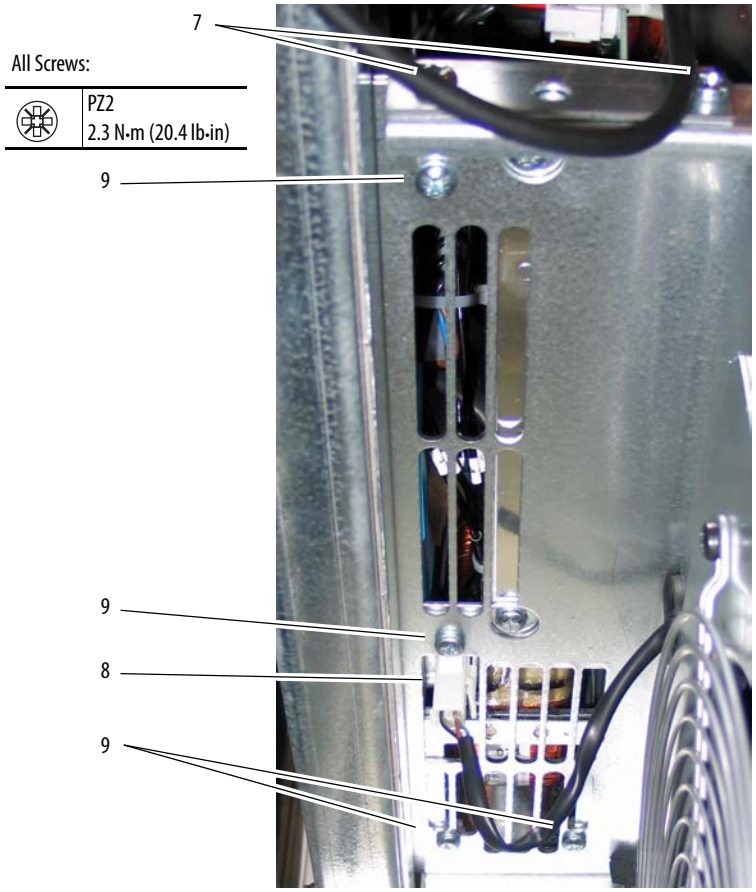


	17 mm 40 N•m (354 lb•in)

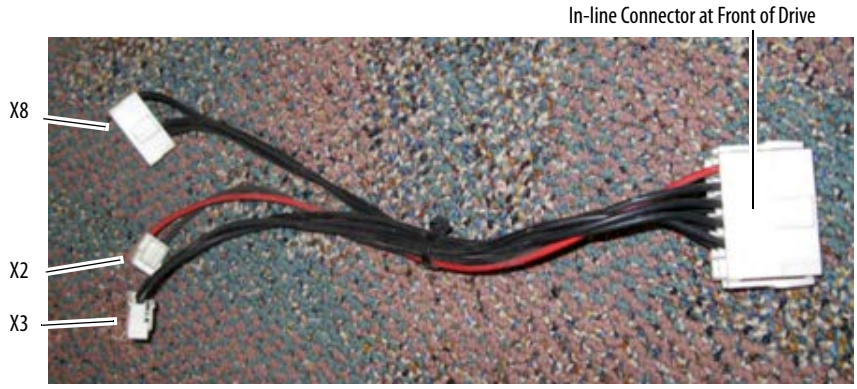
6. Disconnect the four wires from the top and bottom of the fuse block (located on the center drive inverter assembly).



7. Remove the two M5 x 10 mm POZIDRIV screws that secure the fan power supply assembly to the front of the drive. Tightening torque for reassembly is 1.9 N•m (16.8 lb•in).
8. Disconnect the fan motor cable from the bottom of the fan power supply assembly.
9. Remove the four M5 x 10 mm POZIDRIV screws that secure the bottom of the fan power supply assembly to the drive frame.

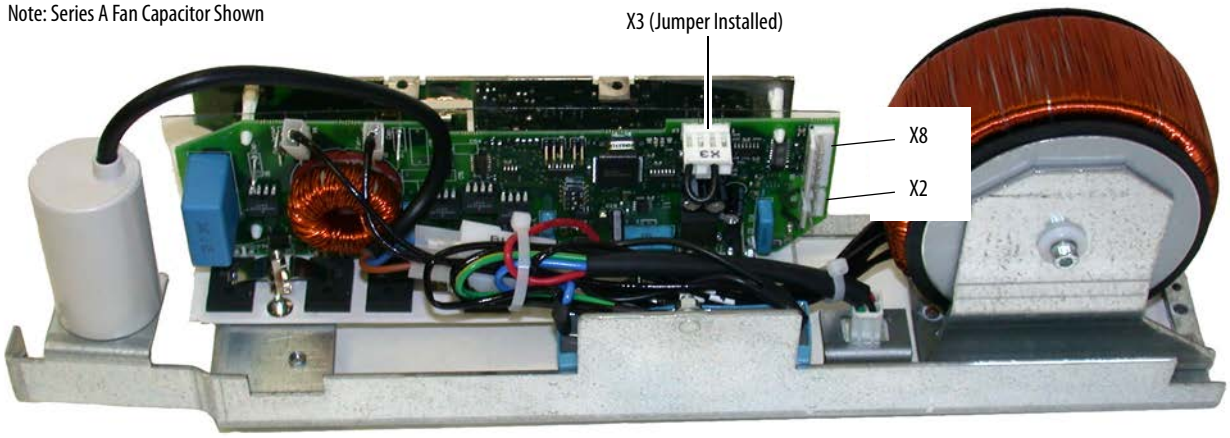


10. For the right-side fan assembly, disconnect the cables from connectors X2 and X8 on the fan power supply circuit board. If an in-line connector is present (as shown in the image below), disconnect the main connector from the front of the drive.
11. For the left-side and center fan assemblies, disconnect the cables from connectors X2, X8, and X3. If an in-line connector is present (as shown in the image below), disconnect the main connector from the front of the drive.

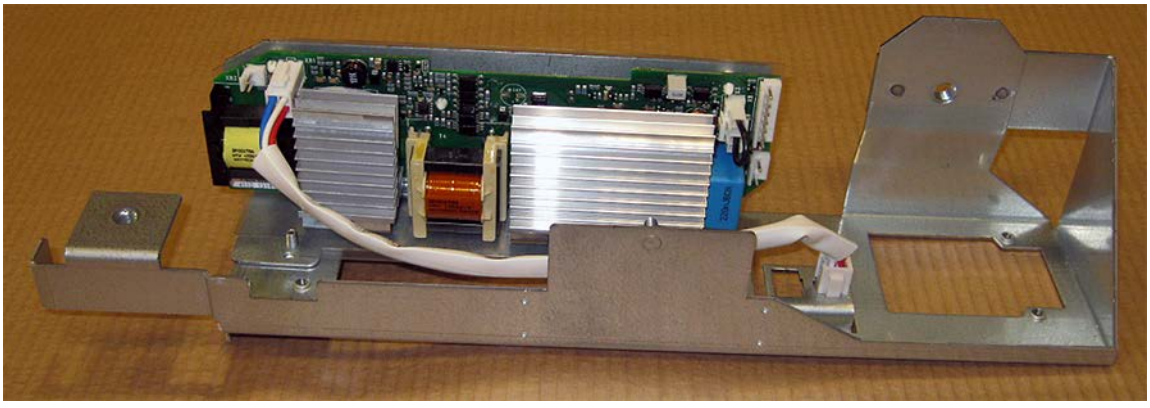


Right-side AC Fan Inverter System

Note: Series A Fan Capacitor Shown



Right-side DC Fan Power Supply



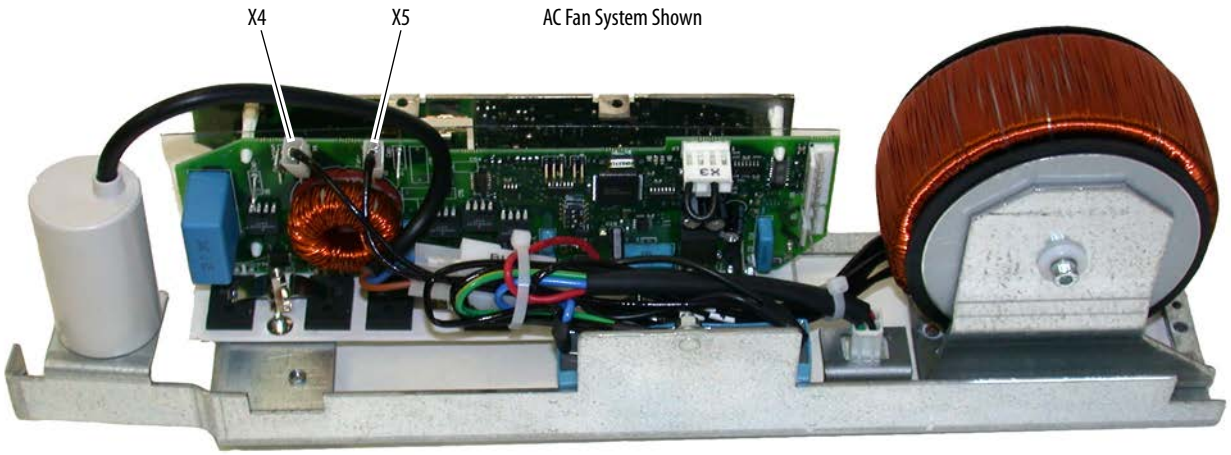
12. Carefully remove the fan power supply assemblies by pulling them out of the front of the drive.

Main AC Fan Inverter Circuit Board (20-VB00299) and AC Output Transformer Assembly (20-FR10845) Removal and Installation

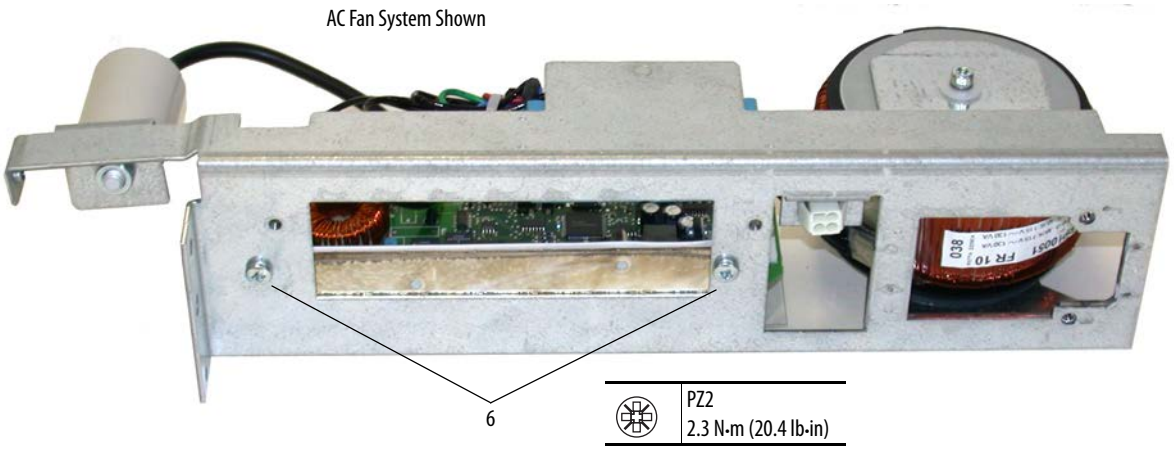
PowerFlex 700H and 700S frame 11 drives have three fan inverters. You can replace an AC or DC fan inverter circuit board, or replace an AC output transformer assembly (includes the AC output transformer and AC fan capacitor on the assembly). See Isolating a Faulty Fan Inverter on page 265 for test procedures used to determine if the circuit board requires replacement.

Follow these steps to remove and replace a main fan inverter circuit board or an AC output transformer assembly.

1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 91.
3. Move the control frame and remove the air flow plate and protective covers from the drive. See Move the Control Frame and Remove the Air Flow Plate and Protective Covers on page 92.
4. Remove the appropriate main fan inverter assembly. See 95 on page Removing the Main AC or DC Fan Power Supply Assemblies.
5. Disconnect the cables from connectors X4 and X5.



6. Remove two M5 x 10 mm POZIDRIV screws from the bottom of the assembly that secure the AC fan inverter board to the assembly and remove the AC fan inverter circuit board.



7. On center AC fan inverter assemblies, remove the capacitor and fuse block bracket assembly. You will re-use the fuse block on the new assembly.
8. Complete the appropriate installation:
   - If you are replacing the AC fan inverter circuit board, install the new circuit board on the existing AC fan inverter assembly in the reverse order of removal.
   - If you are replacing the AC output transformer assembly, install the existing AC fan inverter circuit board on the new AC output transformer assembly in the reverse order of removal.

9. Install the AC fan inverter assembly in the reverse order of removal.

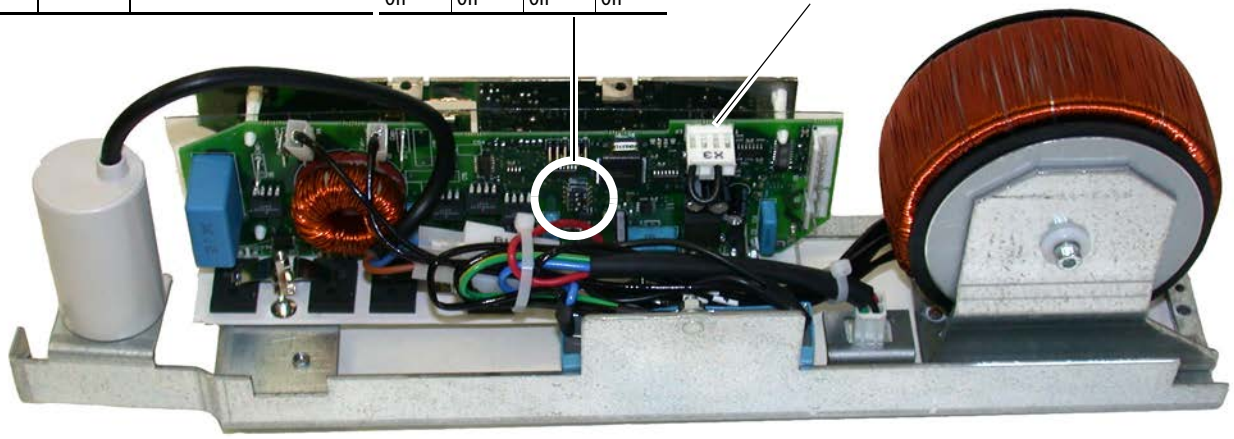
IMPORTANT Verify that dip switch S1 on the new AC fan inverter board is properly configured, as shown below.

IMPORTANT If you are replacing a right-side AC fan inverter circuit board, install the jumper on connector X3.

Switch	Setting	To indicate the following:
S1	Off	50 Hz fan motor frequency
S2	Off	220 V ac motor voltage
S3	On	230 V ac motor voltage
S4	Off	Frame size 9 - 13

AC Fan System Shown

S1-1	S1-2	S1-3	S1-4
Off	Off	On	Off



Main DC Fan Power Supply Circuit Board (SK-H1-DCFANBD1) Removal and Installation

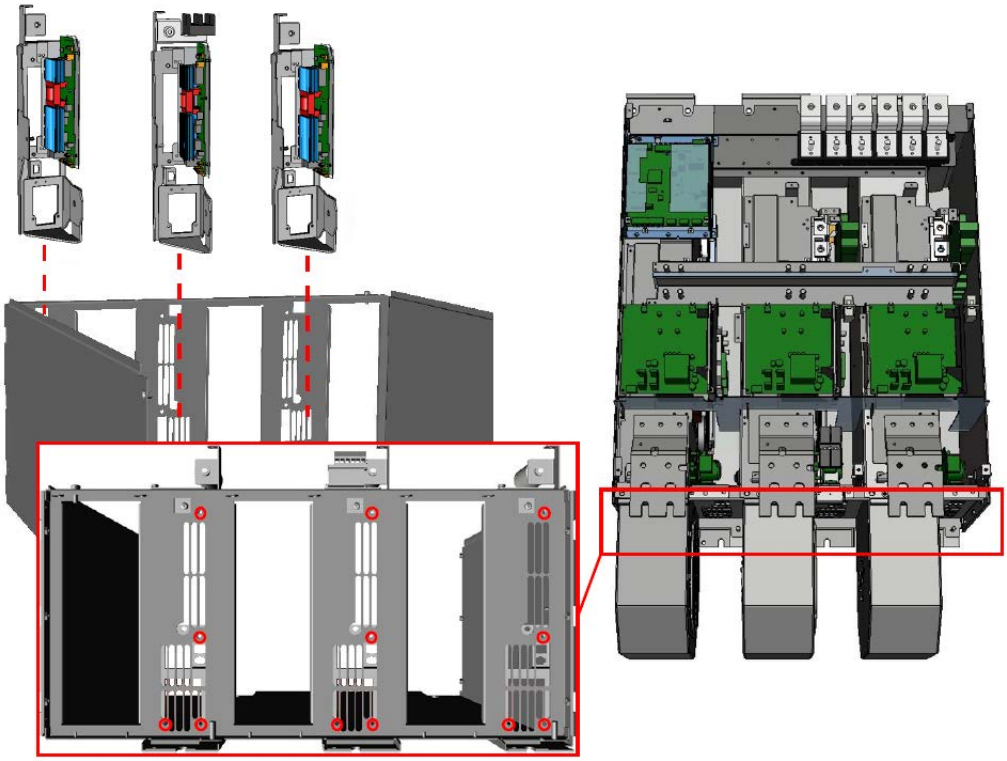
Note: PowerFlex 700H and 700S frame 11 drives have three fan power supplies. You can retrofit an existing AC fan system or replace a DC fan system with a new DC fan system. See Energy-related Products Fan Efficiency Directive on page 12 for guidelines on replacing an existing fan system with a new DC fan system.

Note: Retain the fan power supply sheet metal bracket for reuse.

Follow these steps to remove and replace an existing fan system with a DC fan system.

1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 91.
3. Move the control frame and remove the air flow plate and protective covers from the drive. See Move the Control Frame and Remove the Air Flow Plate and Protective Covers on page 92.

4. Remove the appropriate main fan power supply assembly. See 95 on page Removing the Main AC or DC Fan Power Supply Assemblies.



5. Install the new DC fan power supply in the reverse order of removal, using the existing sheet metal housing.

IMPORTANT If you are replacing a left-side AC fan inverter circuit board, install the jumper on connector X3.

AC to DC Fan System Retrofit Kit (SK-H1-DCFANRETROFIT-F11)

The frame 11 DC main fan system retrofit kit contains the following parts:

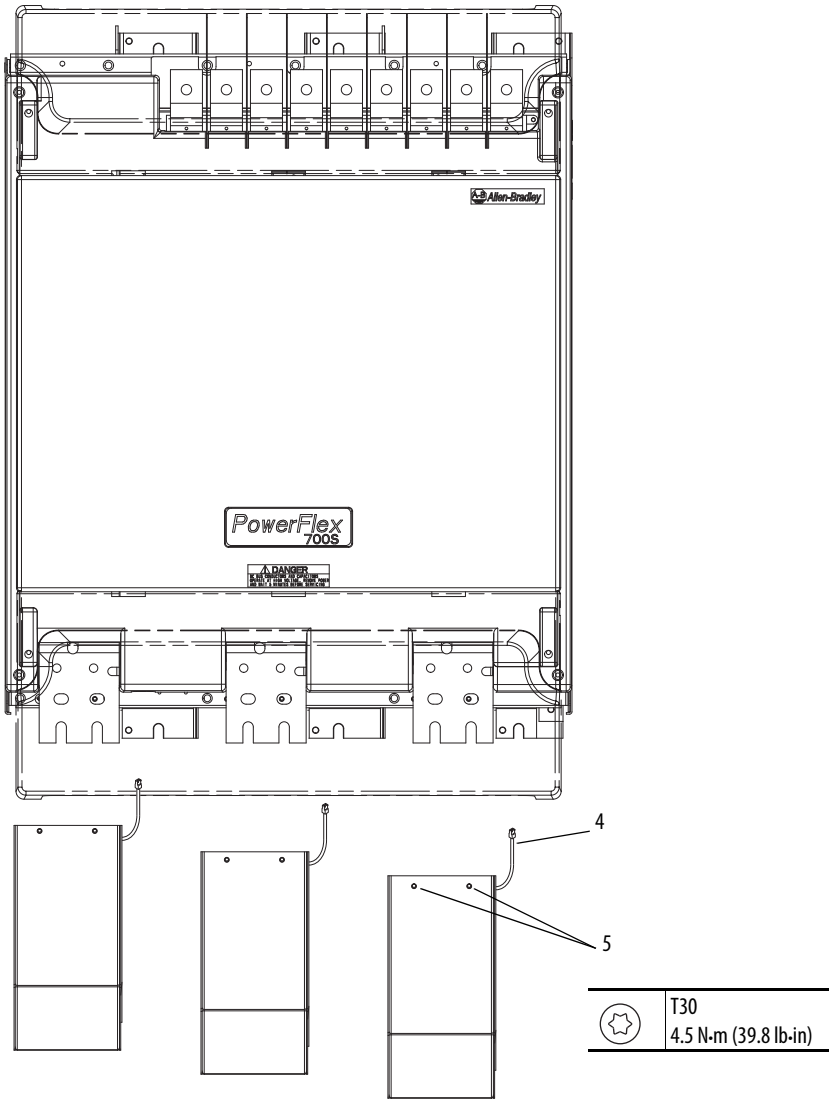
Item Number	Description	Quantity
1	DC main fan assembly	3
2	DC fan power supply assembly	3
3	M6 x 20 mm hexalobular screw	6
4	M5 x 10 mm POZIDRIV screw	12
5	M8 spring washer	1
6	M8 x 16 mm socket head screw	1

Follow these steps to remove the main AC fan system and replace it with a main DC fan system.

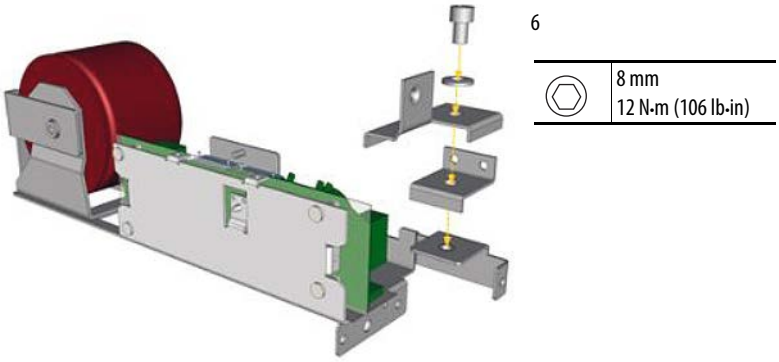
1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 91.
3. Move the control frame and remove the air flow plate and protective covers from the drive. See Move the Control Frame and Remove the Air Flow Plate and Protective Covers on page 92.
4. Remove the main AC fan power supply assemblies. See Removing the Main AC or DC Fan Power Supply Assemblies on page 95.
5. Remove the two M6 x 20 mm hexalobular screws that secure each of the main fan housings to the drive. Then remove the fan assemblies.

   Note: The back of the fan housing contains two holes in the sheet metal that fit onto positioning pins located on the drive frame. To remove the main fan assemblies, lower the front end of the assembly downward in

order to clear the sheet metal on the frame, and pull the fan assembly off the positioning pins and out of the drive.



6. Remove the M8 x 16 mm hexagonal socket screw that secures the fan capacitor and fuse holder adapter bracket to the Phase V AC fan inverter assembly and remove the bracket. Save this bracket for reuse.



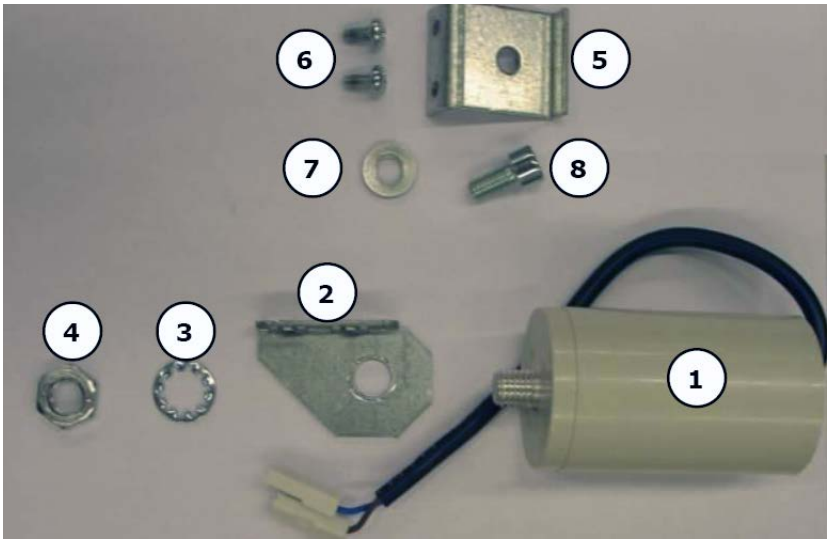
7. Install the fan capacitor and fuse holder adapter bracket to the new Phase V DC fan power supply assembly.
8. Install the DC fan power supply assemblies in the reverse order of removal, using the hardware supplied in the kit.
9. Remove the backing from the drive modification label and attach the label to the front of a main fan housing.
10. Write "DC fan retrofit" and the installation date on the label.

Main AC Fan Inverter Capacitor (SK-H1-FANCAP-F11) Removal and Installation

Note: The AC fan inverter capacitor replacement kit (SK-H1-FANCAP-F11) contains a new sheet metal bracket, hardware and fasteners, and a series B capacitor (identified in the table and shown below). The series B capacitor (50 mm dia. x 62 mm tall) is larger than the series A capacitor (35 mm dia. x 57 mm tall). If a series A capacitor is currently installed, always replace it with the new series B capacitor.

Photo ID#	Part Description	Quantity
1	AC Fan capacitor	1
2	Fan capacitor bracket (1)	1
3	M12 lock washer (for fan capacitor bracket)	1
4	M12 fastening nut (for fan capacitor bracket)	1
5	Adapter bracket (1)	1
6	M5 x 10 mm POZIDRIV screw (for adapter bracket) (1)	2
7	Spring washer (for adapter bracket) (1)	1
8	M8 x 12 mm hexagonal socket screw (for adapter bracket) (1)	1

(1) If a series B AC fan inverter assembly is currently installed in the drive, the sheet metal frame has been modified to accommodate the series B (larger) capacitor. Therefore, in this case, the fan capacitor bracket, adapter bracket and adapter fastening hardware is not needed.



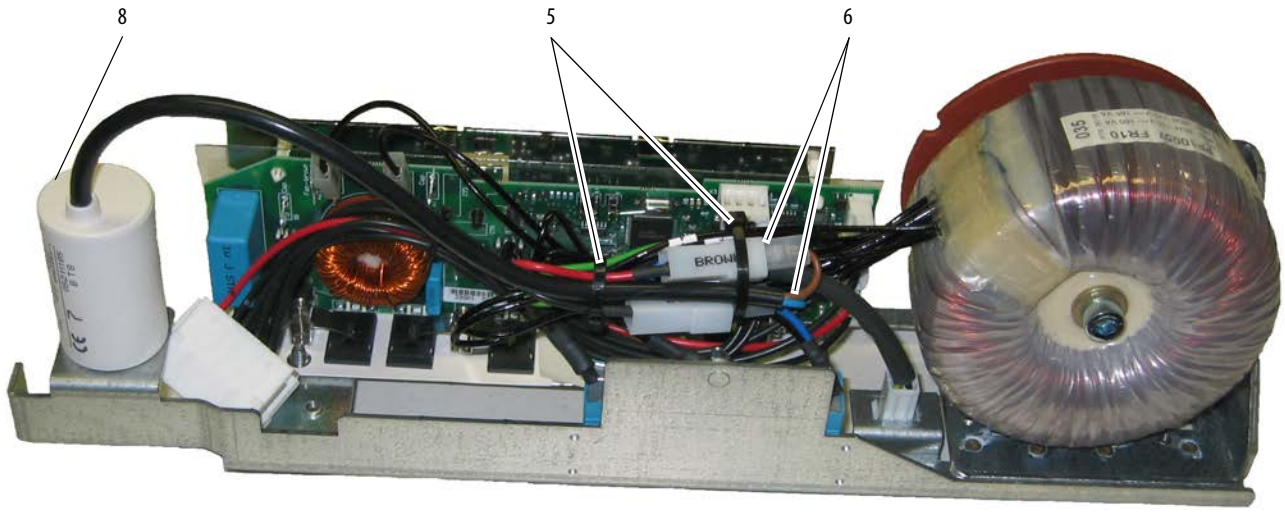
Follow these steps to remove, test, and replace the main AC fan inverter capacitor.

1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 91.
3. Move the control frame and remove the air flow plate and protective covers from the drive. See Move the Control Frame and Remove the Air Flow Plate and Protective Covers on page 92.
4. Remove the appropriate main AC fan inverter assembly. See Removing the Main AC or DC Fan Power Supply Assemblies on page 95.

5. Cut the cable ties securing the wires marked Brown and Blue.
6. Disconnect the AC fan capacitor wire connectors marked Brown and Blue.
7. If a series A capacitor is installed, continue with the next step. If a series B capacitor is installed, measure the value of the capacitor. If the value of the capacitor is <u>not</u> 7 µF, continue with the next step.
8. Unscrew and remove the fan capacitor from the AC fan inverter assembly.

Series A Capacitor Shown

Note: AC Fan System Shown



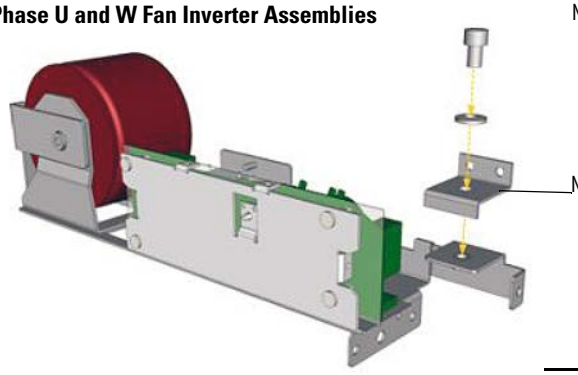
Series B Capacitor in a Right-side AC Fan Inverter Assembly Shown.

Series A Capacitor in a Right-side AC Fan Inverter Assembly Shown

9. If the original, defective capacitor being replaced is series B, continue with the next step. If the original, defective capacitor being replaced is series A, secure the new fan capacitor adapter bracket to the AC fan inverter assembly using the new M8 x 16 mm hexagonal socket screw and washer provided in the replacement kit.

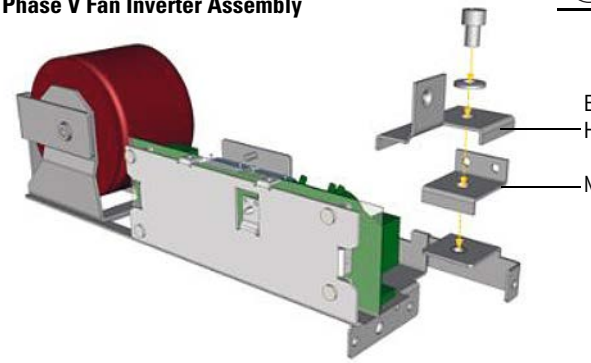
Phase U and W Fan Inverter Assemblies

Note: AC Fan System Shown



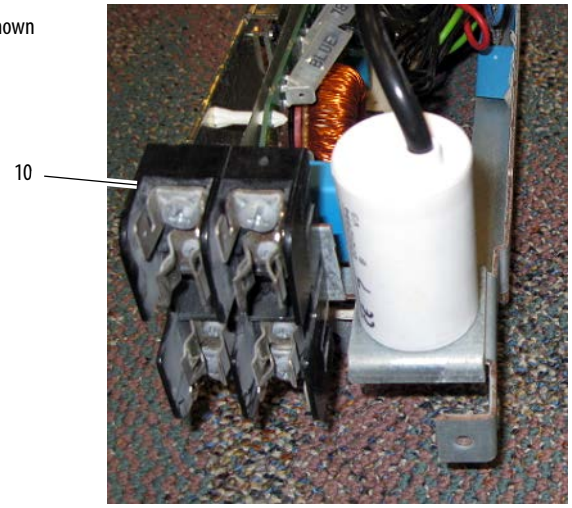
	8 mm 12 N•m (106 lb•in)

Phase V Fan Inverter Assembly

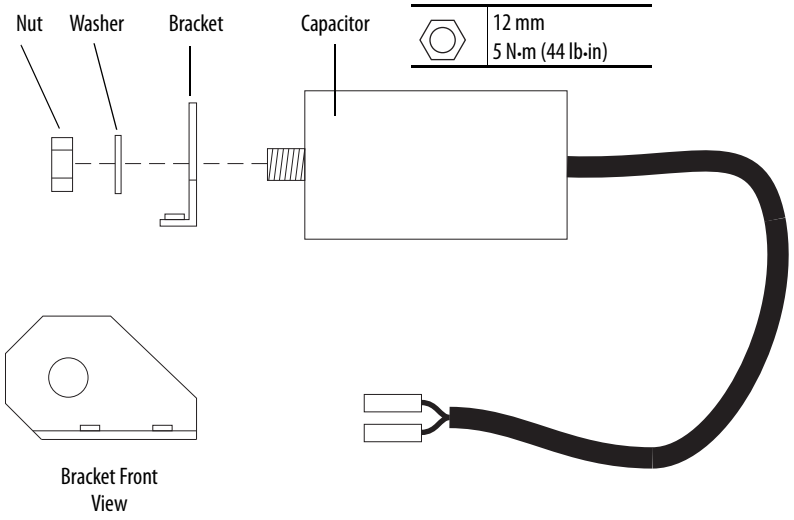


10. For the V phase AC fan inverter assembly, the fuse holder and bracket to which it is secured must be installed on top of the new adapter bracket.

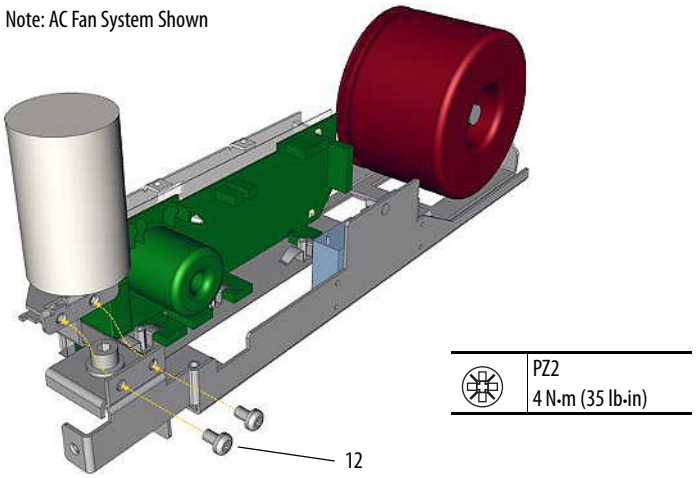
Note: AC Fan System Shown



11. Secure the new AC fan capacitor to the new bracket using the M12 nut and lock washer provided in the kit.



12. Secure the new capacitor bracket assembly to the AC fan inverter assembly using the two M5 x 10 mm POZIDRIV screws provided in the kit.



13. Install the AC fan inverter assembly in the reverse order of removal.

Main AC Fan (20-PP01080) and Main DC Fan (SK-Y1-DCFAN1) Assembly Removal and Installation

Follow these steps to measure the resistance between the main fan supply wires and remove and replace the main fan, if necessary.

Notes:

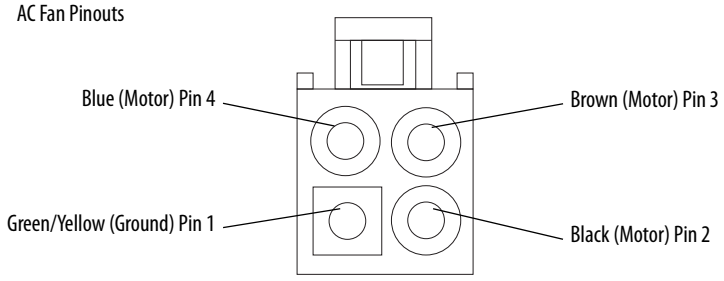
- The fan replacement kit only contains the fan motor and impeller assembly. Therefore, the sheet metal housing for the fan must be reused.
- To identify which fan is installed in your drive, see Fan Inverter System Block Diagrams on page 257.

1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 91.
3. Remove the bottom protective cover only from the drive. See Move the Control Frame and Remove the Air Flow Plate and Protective Covers on page 92.
4. Disconnect the fan power supply cable from the bottom of the fan power supply for the main fan.
5. Using the appropriate table below, measure the resistance between the fan supply wires.

   AC Fan: If the measurements are not similar to those in this table, replace the AC fan.

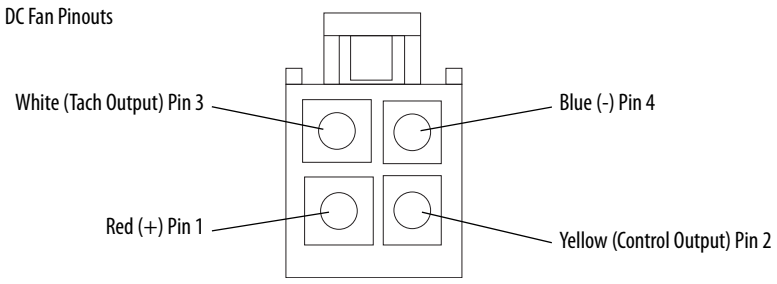
Connection wires	Resistance ±5%
Black-Brown	62 Ω
Brown-Blue	36 Ω
Blue-Black	27 Ω
Green-chassis	0 Ω

AC Fan Pinouts



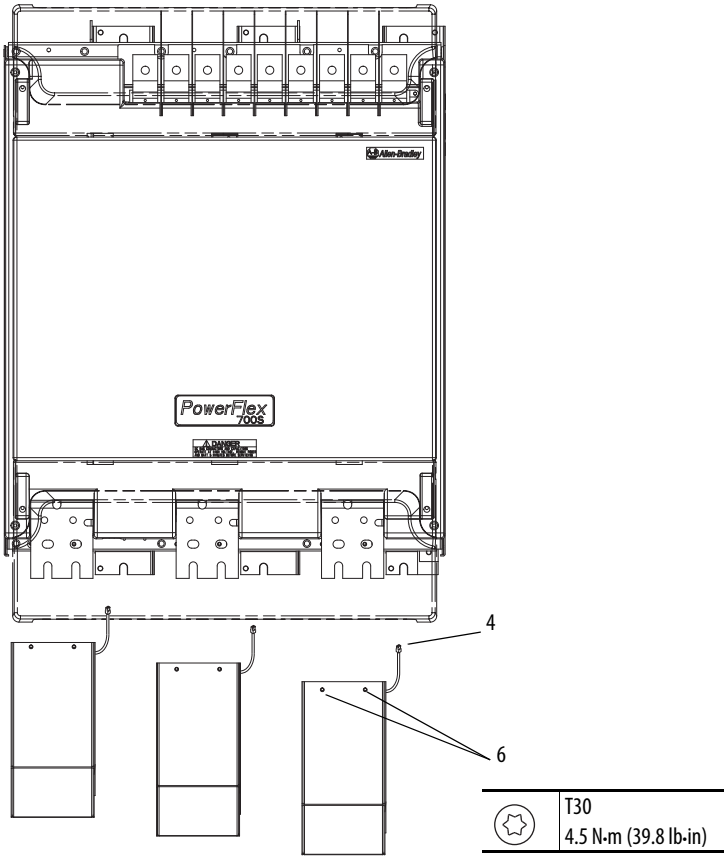
DC Fan: If the measurements are not similar to those in this table, replace the DC fan.

Connection wires	Resistance ±5%
Red-Blue	∞ Ω
Red-White	∞ Ω
White-Yellow	∞ Ω
Blue-White	∞ Ω

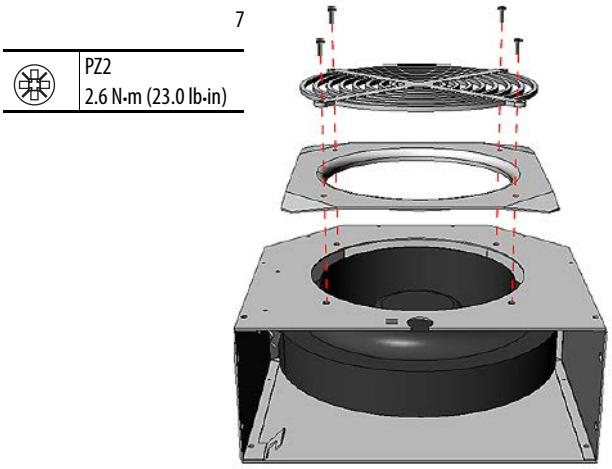


6. Remove the two M6 x 20 mm hexalobular screws that secure the fan to the drive. Then remove the fan.

   Note: The back of the fan housing contains two holes in the sheet metal that fit onto positioning pins located on the drive frame. To remove the main fan assemblies, lower the front end of the assembly downward in order to clear the sheet metal on the frame, and pull the fan assembly off the positioning pins and out of the drive.

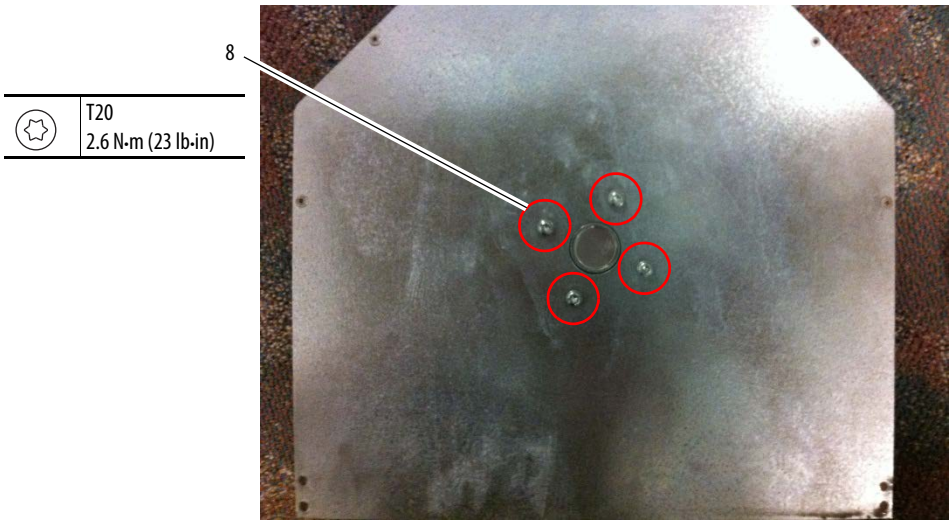


7. Remove the four M5 x 16 mm POZIDRIV screws that secure the finger guard and fan inlet ring to the fan housing and remove the guard and ring.

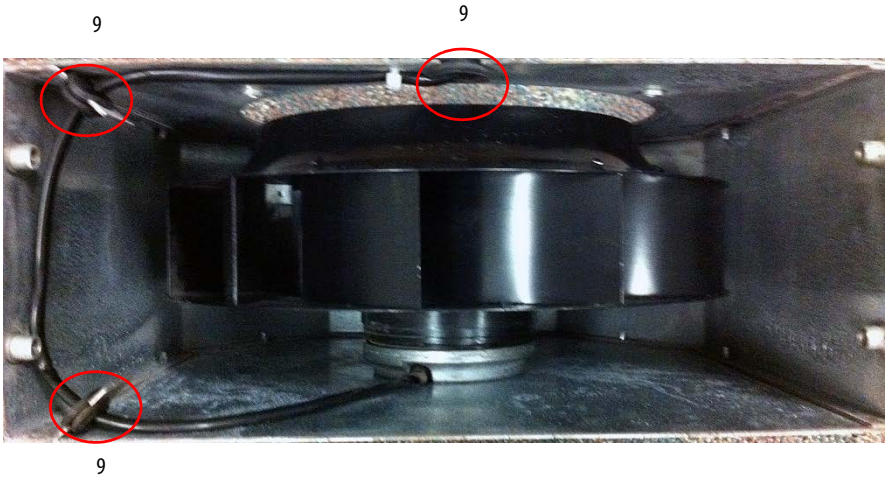


8. Remove the four hexalobular screws on the back of the fan assembly.

   Note: The Main AC and DC fans have different mounting hardware and hole dimensions. The AC fan uses four M4 x 8 mm screws that are spaced 40 mm apart on the housing. The DC fan uses four M5 x 10 mm screws that are spaced 65 mm apart on the housing. Based on the manufacturing date, the sheet metal housing was fabricated for either an AC fan, a DC fan, or both.



9. Remove the three rubber bushings that hold the fan wiring to the sheet metal housing.



10. Slide the fan out of the sheet metal housing. Retain the sheet metal housing for reuse.
11. Install the new main fan in the reverse order of removal.

    Verify that the fan turns easily and does not make contact with the sheet metal housing before installing the fan assembly on the drive.

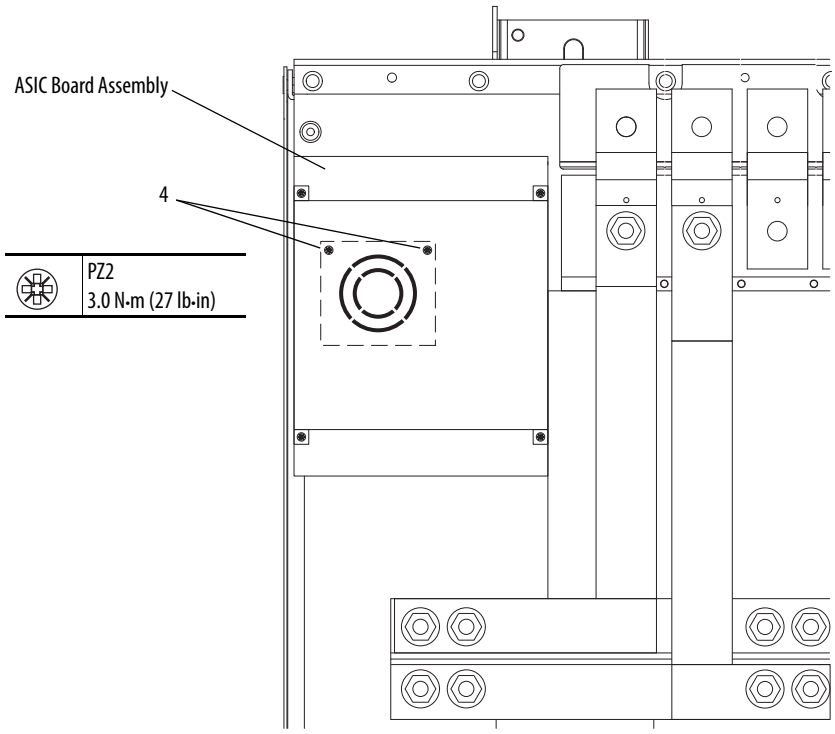
ASIC Circuit Board Assembly Cooling Fan (20-PP01096) Removal and Installation

The ASIC circuit board cooling fan is located on the ASIC board assembly on the upper, left-side of the drive. Follow these steps to remove and replace the cooling fan.

1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 91.
3. Move the control frame and remove the air flow plate and protective covers from the drive. See Move the Control Frame and Remove the Air Flow Plate and Protective Covers on page 92.

4. Remove the ASIC circuit board assembly from the drive:
   - For earlier drives, remove the four M4 x 8 mm hexalobular screws that secure the ASIC assembly cover to the drive and remove the cover.
   - For newer drives, remove the two M3 x 5 mm POZIDRIV screws that secure the cooling fan assembly to the ASIC assembly and rotate the fan assembly out of the ASIC assembly.

IMPORTANT After removing the cover from the ASIC board assembly, the fan power cable will still be connected to the ASIC circuit board.

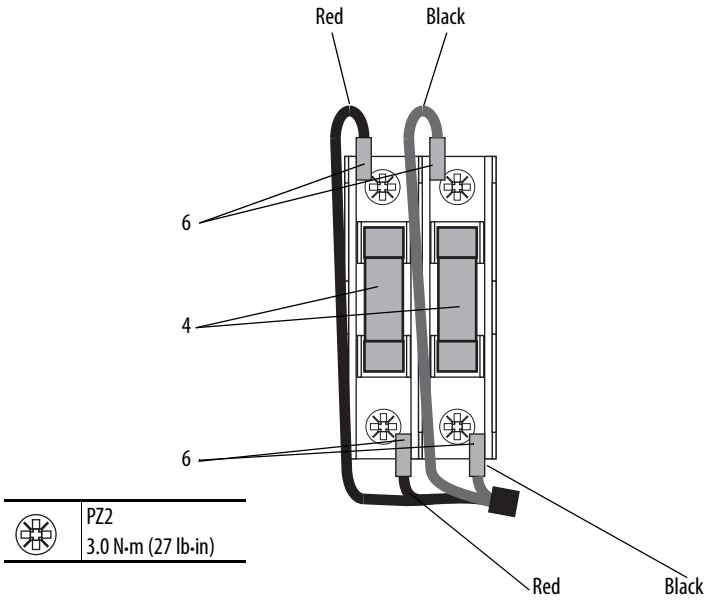


5. Disconnect the cable from connector X1 on the ASIC board and remove the fan assembly from the drive.
6. Remove the M4 x 15 mm screw(s) that secure the cooling fan to the ASIC assembly cover and remove the fan.
7. Install the ASIC cooling fan in the reverse order of removal.

AC or DC Fan System Fuses (20-PP20202) and Fuse Holder (20-PP20300) Removal and Installation

The fan system fuses and fuse holder are located on the V phase on the front of the drive. Follow these steps to remove and replace the fan system fuse holder.

1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 91.
3. Move the control frame and remove the air flow plate and protective covers from the drive. See Move the Control Frame and Remove the Air Flow Plate and Protective Covers on page 92.
4. Remove the fuses from the fuse holder.
5. Check the fuses. See Checking Fuse Integrity with no Power Applied on page 263.
6. Disconnect the four fuse power wires (black and red pairs) connected to the top and bottom of the fuse holder.



7. Remove the M5 x 10 mm POZIDRIV screw that secures the fuse holder to the drive frame and remove the fuse holder.
8. Install the new fan system fuse holder in the reverse order of removal.

Notes:

PowerFlex 700H and 700S Drives - Frame 12 Procedures

This chapter contains spare part information and procedures for testing and replacing fan system components for frame 12 PowerFlex 700H and PowerFlex 700S drives. See Appendix A PowerFlex 700H and 700S Diagnostic Procedures on page 255 for additional component test procedures.

Frame 12 Fan System Spare Parts

Frame 12 PowerFlex 700H and PowerFlex 700S drives are essentially two parallel frame10 drives. Therefore, the spare parts are identical to the frame 10, with the exception that there are twice as many parts required. The procedures for replacing frame 12 fan system components are also the same as those for frame 10 drives.

The spare parts for frame 12 drives are contained in this chapter. See Chapter 2 - PowerFlex 700H and 700S Drives - Frame 10 Procedures on page 55 for detailed replacement procedures. See Frame 12 AC Fan System Wiring Schematic Diagram on page 119 and Frame 12 DC Fan System Wiring Schematic Diagram on page 120 for more information.

AC Fan System Spare Parts

See Available Fan System Kits starting on page 277 for an illustration of the spare part kit contents.

Cat. No.	Part Description	Quantity per Drive	Original Vendor and Model Number
20-FR10844	Output transformer assembly for main AC fan inverter (left side)	2	–
20-FR10845	Output transformer assembly for main AC fan inverter (right side)	2	–
20-PP01080	230 W main AC fan assembly	4	–
20-PP01096	Cooling fan for ASIC board assembly	2	Sinwan SD5012PT-24H (2)
20-PP20202	Fuse for fan system	4	Ferraz Shawmut ATQ8 (3)
20-PP20300	Fuse holder for main fan system fuses	2	Ferraz Shawmut 30322
20-VB00299	Main AC fan inverter circuit board (1)	4	–
SK-H1-FANCAP-F1012	Capacitor (7 μF) for main AC fan inverter	4	–

(1) The same fan inverter circuit board is used for all drive voltage classes.
(2) The part may not contain wires, connectors, or mounting hardware when bought directly from vendor.
(3) The factory default fuses are Ferraz Shawmut ATQ8, 8 A fuses. Older drives may contain Bussman 6 A fuses.

DC Fan System Spare Parts

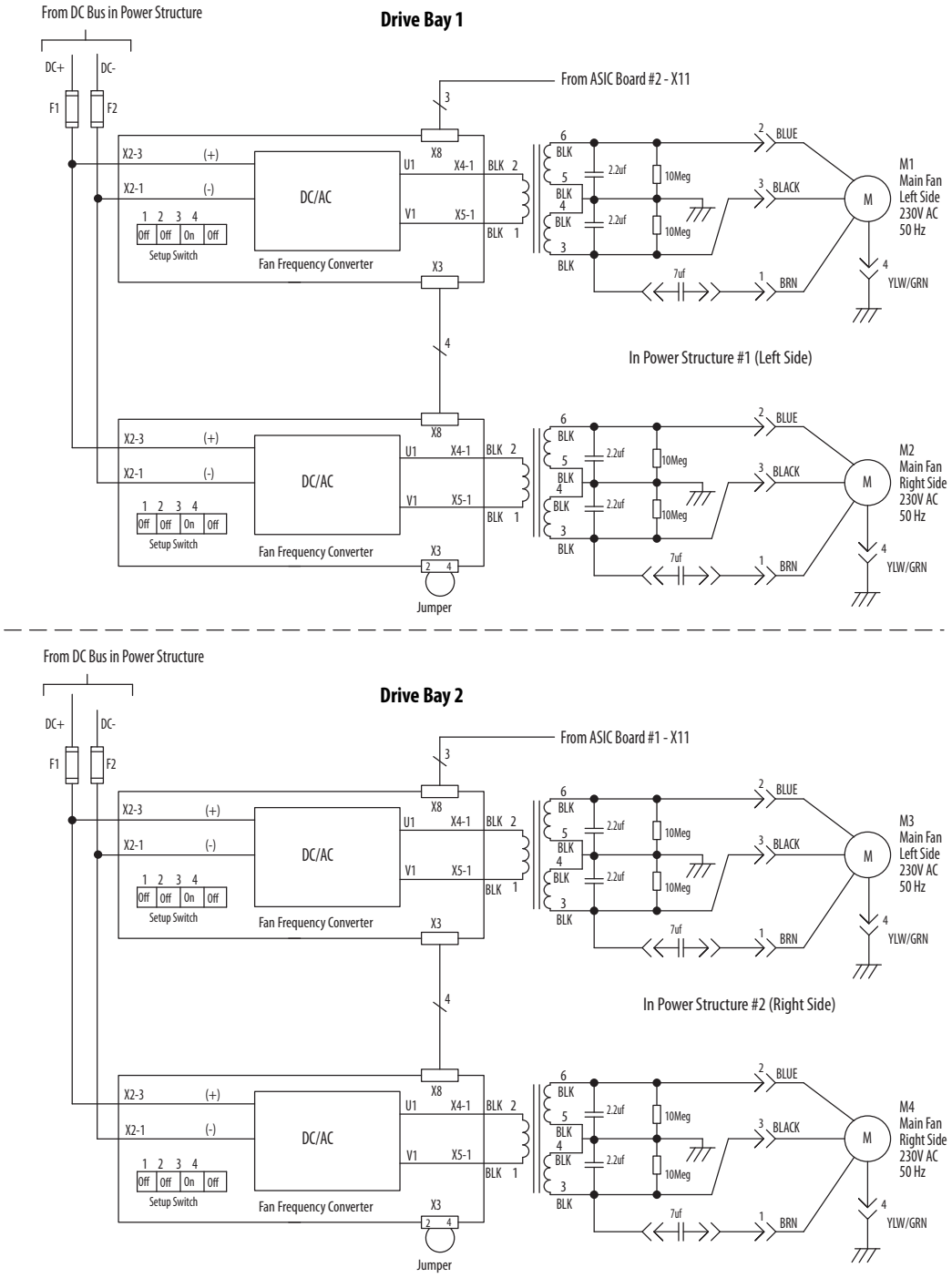
See Available Fan System Kits starting on page 277 for an illustration of the spare part kit contents.

Cat. No.	Part Description	Quantity per Drive	Original Vendor and Model Number
SK-Y1-DCFAN1	Main DC fan assembly	4	–
SK-H1-DCFANBD1	Main DC fan power supply circuit board(1)	4	–
SK-H1-DCFANRETROFIT-F10	AC to DC fan system retrofit kit	2	–

(1) Circuit board only, no sheet metal bracket.

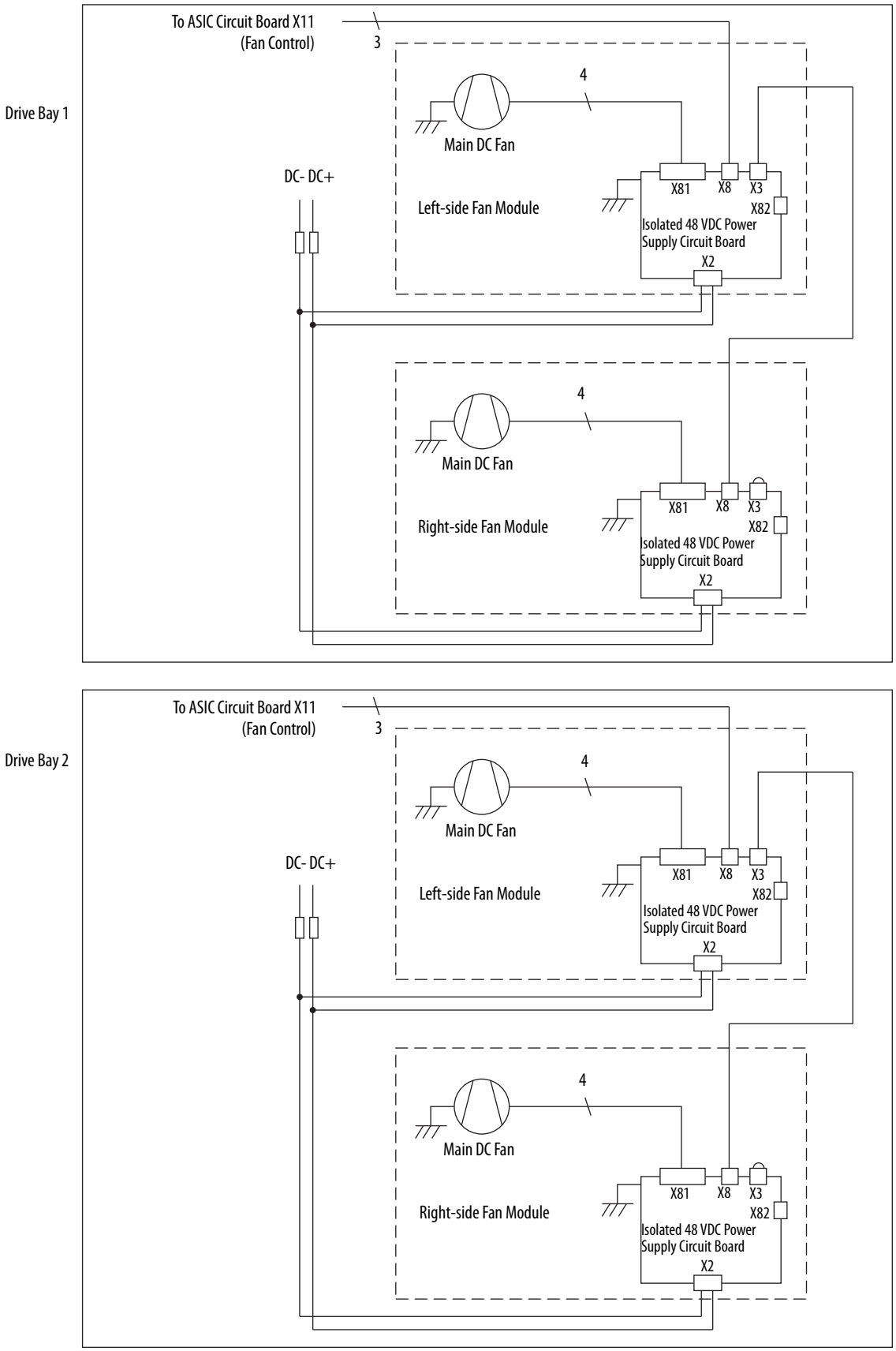
Frame 12 Schematic Diagrams

Figure 8 - Frame 12 AC Fan System Wiring Schematic Diagram



Switch	Setting	To indicate the following:
S1	Off	50 Hz fan motor frequency
S2	Off	220 V AC motor voltage
S3	On	230 V AC motor voltage
S4	Off	Frame size 9…14

Figure 9 - Frame 12 DC Fan System Wiring Schematic Diagram

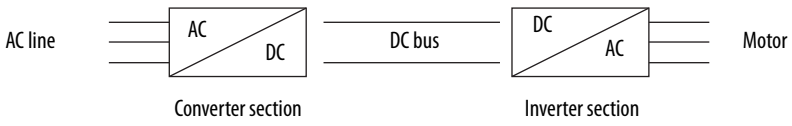


PowerFlex 700H and 700S Drives - Frame 13 Procedures

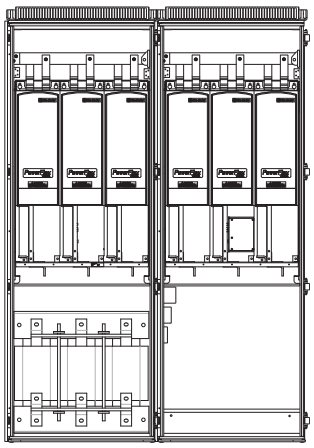
This chapter contains spare part information and procedures for testing and replacing fan system components for frame 13 PowerFlex 700H and PowerFlex 700S drives. See Appendix A PowerFlex 700H and 700S Diagnostic Procedures on page 255 for additional component test procedures.

Frame 13 Drive Configurations

Frame 13 drives consist of a converter section and an inverter section, as shown here.



For frame 13 drives, the converter section has two or three rectifier sections depending on the power rating, while the inverter section always has three power sections. The converter converts ac (fixed 50 / 60 Hz) to dc voltage. The inverter section inverts dc to variable ac frequency.



Frame 13 Fan System Spare Parts

AC Fan Systems

See Available Fan System Kits starting on page 277 for an illustration of the spare part kit contents.

Input Voltage:	Catalog Number:	Part Name:	Quantity Per Drive: (1)		Original Vendor and Model No.
400/480	20-FI13301	AC fan inverter assembly (includes circuit board, fuses, capacitor, isolation transformer, and mounting hardware)	DC Input	3	
			AC 1150 Amp	5	
			AC 1300 / 1450 Amp	6	
	20-VB00299	AC fan inverter circuit board	DC Input	3	
			AC 1150 Amp	5	
			AC 1300 / 1450 Amp	6	
	20-FI13300	Main AC fan assembly	DC Input	3	
			AC 1150 Amp	5	
			AC 1300 / 1450 Amp	6	
	SK-H1-FANCAP-F1314	Main AC fan capacitor kit	DC Input	3	
			AC 1150	5	
			AC 1300 / 1450 Amp	6	
	20-PP20300	Fuse holder for main fan system fuses	DC Input	3	Ferraz Shawmut 30322
			AC 1150 Amp	5	
			AC 1300 / 1450 Amp	6	
	20-PP20202	Fuse for fan system	DC Input	6	Ferraz Shawmut ATQ8 (2)
			AC 1150 Amp	10	
			AC 1300 / 1450 Amp	12	
	20-PP1096	Cooling fan for ASIC board assembly	all	1	Sinwan SD5012PT- 24H (3)
600/690	20-FI13301	AC fan inverter assembly (includes circuit board, fuses, capacitor, isolation transformer, and mounting hardware)	DC Input	3	
			AC Input	5	
	20-VB00299	AC fan inverter circuit board	DC Input	3	
			AC Input	5	
	20-FI13300	Main AC fan assembly	DC Input	3	
			AC Input	5	
	SK-H1-FANCAP-F1314	AC fan capacitor kit	DC Input	3	
			AC Input	5	
	20-PP20300	Fuse holder for main fan system fuses	DC Input	3	Ferraz Shawmut 30322
			AC Input	5	
	20-PP20202	Fuse for fan system	DC Input	6	Ferraz Shawmut ATQ8 (2)
			AC Input	10	
	20-PP1096	Cooling fan for ASIC board assembly	All	1	Sinwan SD5012PT- 24H (3)

(1) The drives are identified by voltage class (400/480 or 600/690) and then by the current rating - 920…1450 A

(2) The factory default fuses are Ferraz Shawmut ATQ8, 8 A fuses. Older drives may contain Bussman 6 A fuses.

(3) The part may not contain wires, connectors, or mounting hardware when bought directly from vendor.

DC Fan Systems

See Available Fan System Kits starting on page 277 for an illustration of the spare part kit contents.

Input Voltage:	Catalog Number:	Part Name:	Quantity Per Drive: (2)		Original Vendor and Model No.
400/480	SK-H1-DCFANBD1 (1)	Main DC fan power supply circuit board	DC Input	3	
			AC 1150 Amp	5	
			AC 1300 / 1450 Amp	6	
	SK-Y1-DCFAN1	Main DC fan assembly	DC Input	3	
			AC 1150 Amp	5	
			AC 1300 / 1450 Amp	6	
	20-PP20300	Fuse holder for fan system fuses	DC Input	3	Ferraz Shawmut 30322
			AC 1150 Amp	5	
			AC 1300 / 1450 Amp	6	
	20-PP20202	Fuse for fan system	DC Input	6	Ferraz Shawmut ATQ8 (3)
			AC 1150 Amp	10	
			AC 1300 / 1450	12	
	SK-Y1-DCFANRETROFIT-F13	AC to DC fan system retrofit kit for frame 13	DC Input	1	
	SK-H1-DCFANRETROFIT-F13A	AC to DC fan system retrofit kit for frame 13	AC Input 1150 Amp	1	
	SK-H1-DCFANRETROFIT-F13B	AC to DC fan system retrofit kit for frame 13	AC Input 1300A / 1450 Amp	1	
	20-PP1096	Cooling fan for ASIC board assembly	all	1	Sinwan SD5012PT-24H (4)
600/690	SK-1-DCFANBD1 (1)	Main DC fan power supply circuit board	DC Input	3	
			AC Input	5	
	SK-Y1-DCFAN1	Main DC fan assembly	DC Input	3	
			AC Input	5	
	20-PP20300	Fuse holder for fan system fuses	DC Input	3	Ferraz Shawmut 30322
			AC 1150 Amp	5	
			AC 1300 / 1450 Amp	6	
	20-PP20202	Fuse for fan system	DC Input	6	Ferraz Shawmut ATQ8 (3)
			AC 1150 Amp	10	
			AC 1300 / 1450 Amp	12	
	SK-Y1-DCFANRETROFIT-F13	AC to DC fan system retrofit kit for frame 13	DC Input	1	
	SK-H1-DCFANRETROFIT-F13A	AC to DC fan system retrofit kit for frame 13	AC Input	1	
	20-PP1096	Cooling fan for ASIC board assembly	All	1	Sinwan SD5012PT-24H (4)

(1) Circuit board only, no sheetmetal bracket.
(2) The drives are identified by voltage class (400/480 or 600/690) and then by the current rating - 920…1450 A
(3) The factory default fuses are Ferraz Shawmut ATQ8, 8 A fuses. Older drives may contain Bussman 6 A fuses.
(4) The part may not contain wires, connectors, or mounting hardware when bought directly from vendor.

Tools Needed for Frame 13 Fan System Repairs

- #2 POZIDRIV screwdriver
- 19 mm socket wrench
- 5.5 mm hex key or HOP6 bit
- T20 and T25 hexalobular screwdriver
- Multi meter
- Fuse puller
- Needle-nose pliers
- Wire cutter
- Cable ties
- Optional: PowerFlex 700H and 700S maintenance stand (cat. No. 20-MAINSTND)

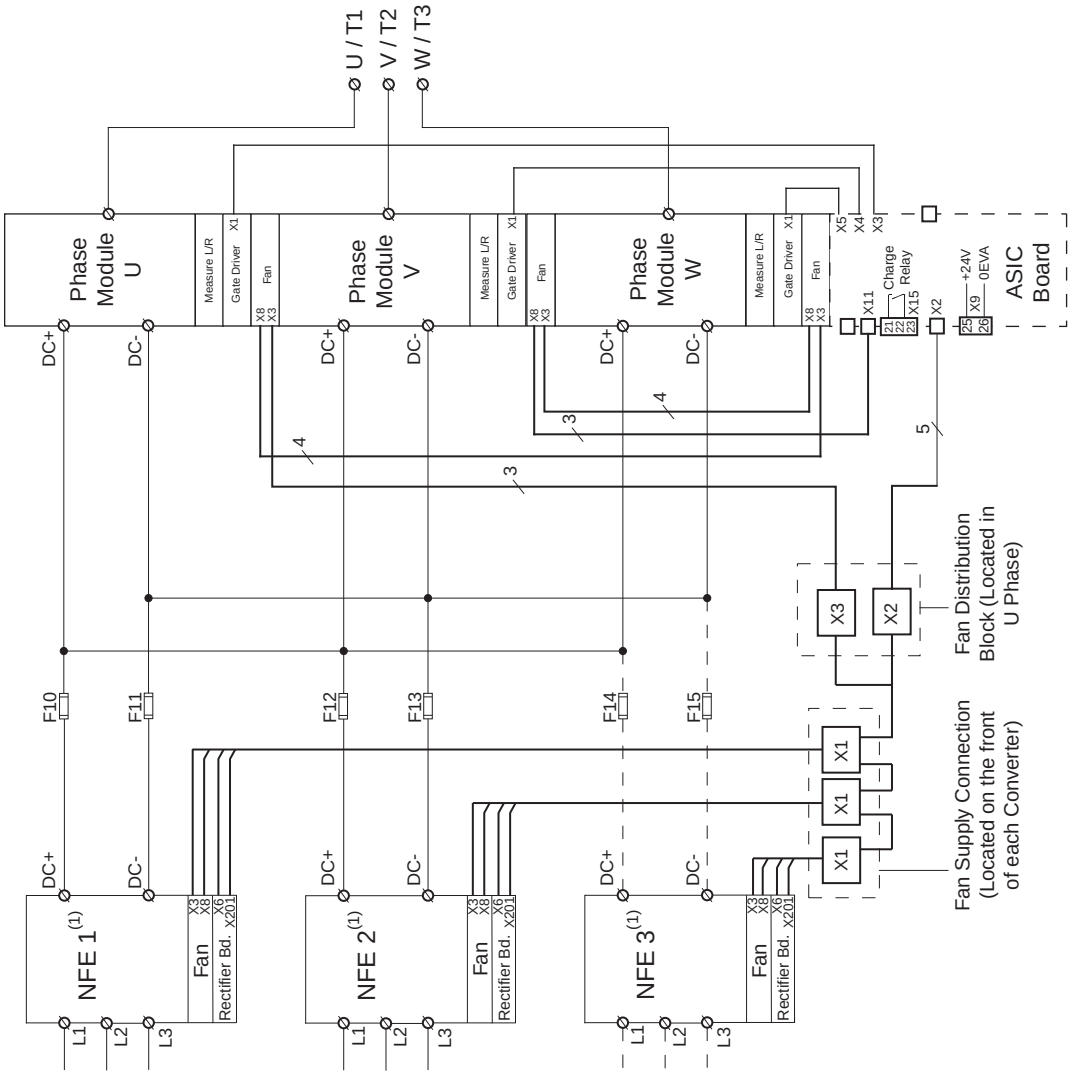
Frame 13 AFE Schematic Diagrams

The PowerFlex 700H and PowerFlex 700S frame 13 drive can be configured with either AC or DC (common bus) input voltage applied. The AC input drives have both converter and inverter sections, while the DC input drives have only an inverter. The schematics will change based on this hardware configuration. Table 2 provides a list of schematic diagrams applicable to each drive configuration.

Table 2 - Drive Configurations and Applicable Schematics

Drive Input Voltage	Drive Hardware Section	AC Fan Systems	DC Fan Systems
AC	System	Figure 10 on page 126	
	Converter	Figure 11 on page 127	Figure 12 on page 128
	Inverter	Figure 13 on page 129	Figure 14 on page 130
DC	System	Figure 15 on page 131	
	Converter	n/a	n/a
	Inverter	Figure 16 on page 132	Figure 17 on page 133

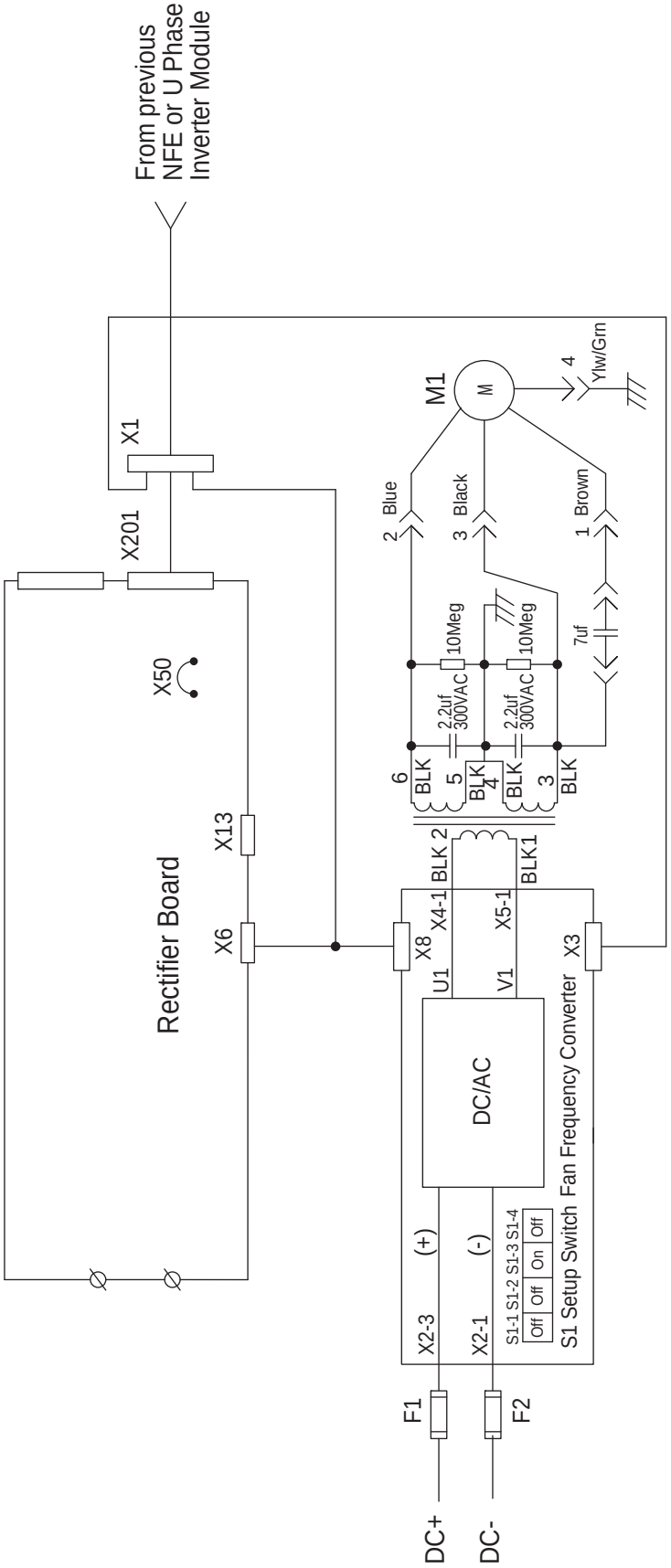
Figure 10 - Frame 13 AC Input Drive Converter and Inverter Sections



(1) The number of NFE's varies with the drive rating as shown in this table:

Voltage Class	Amps	# of Reactors	Reactor Connection	# of NFEs
400	1150	2	X2	2
400	1300	3	X2	3
400	1450	3	X2	3
600	920	2	X3	2
600	1030	2	X3	2
600	1180	2	X3	2

Figure 11 - Frame 13 AC Input Drive Converter AC Fan System



Switch	Setting	To indicate the following:
S1	Off	50 Hz fan motor frequency
S2	Off	220 V AC motor voltage
S3	On	230 V AC motor voltage
S4	Off	Frame size 9…14

Figure 12 - Frame 13 AC Input Drive Converter DC Fan System

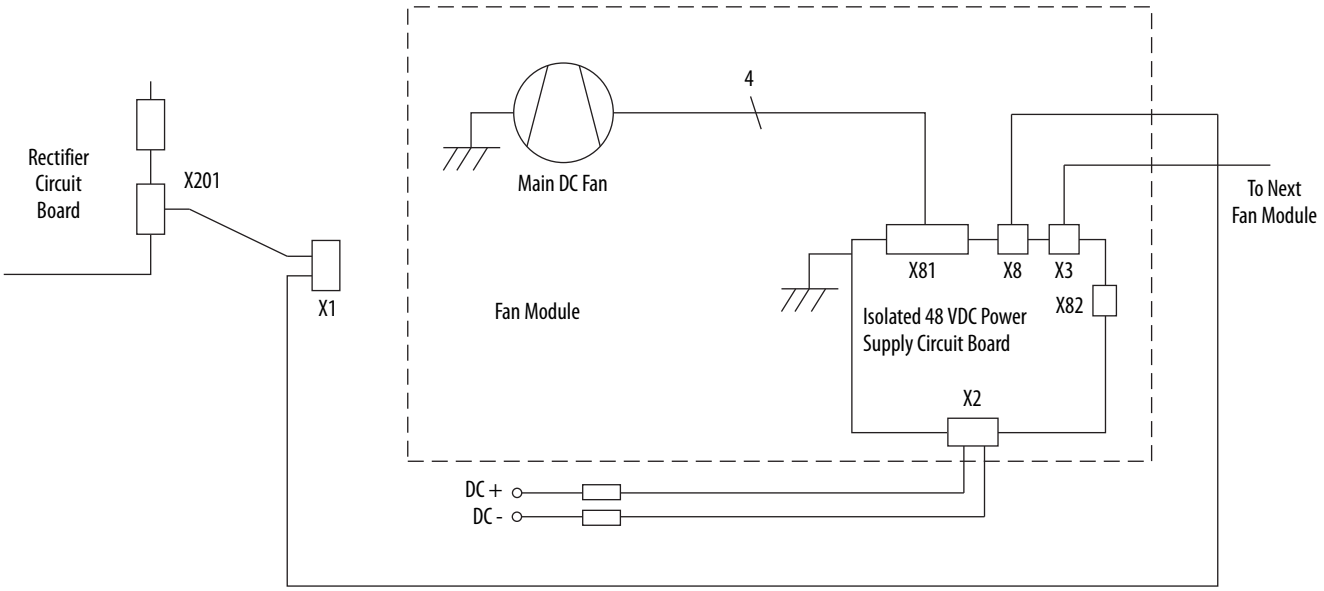
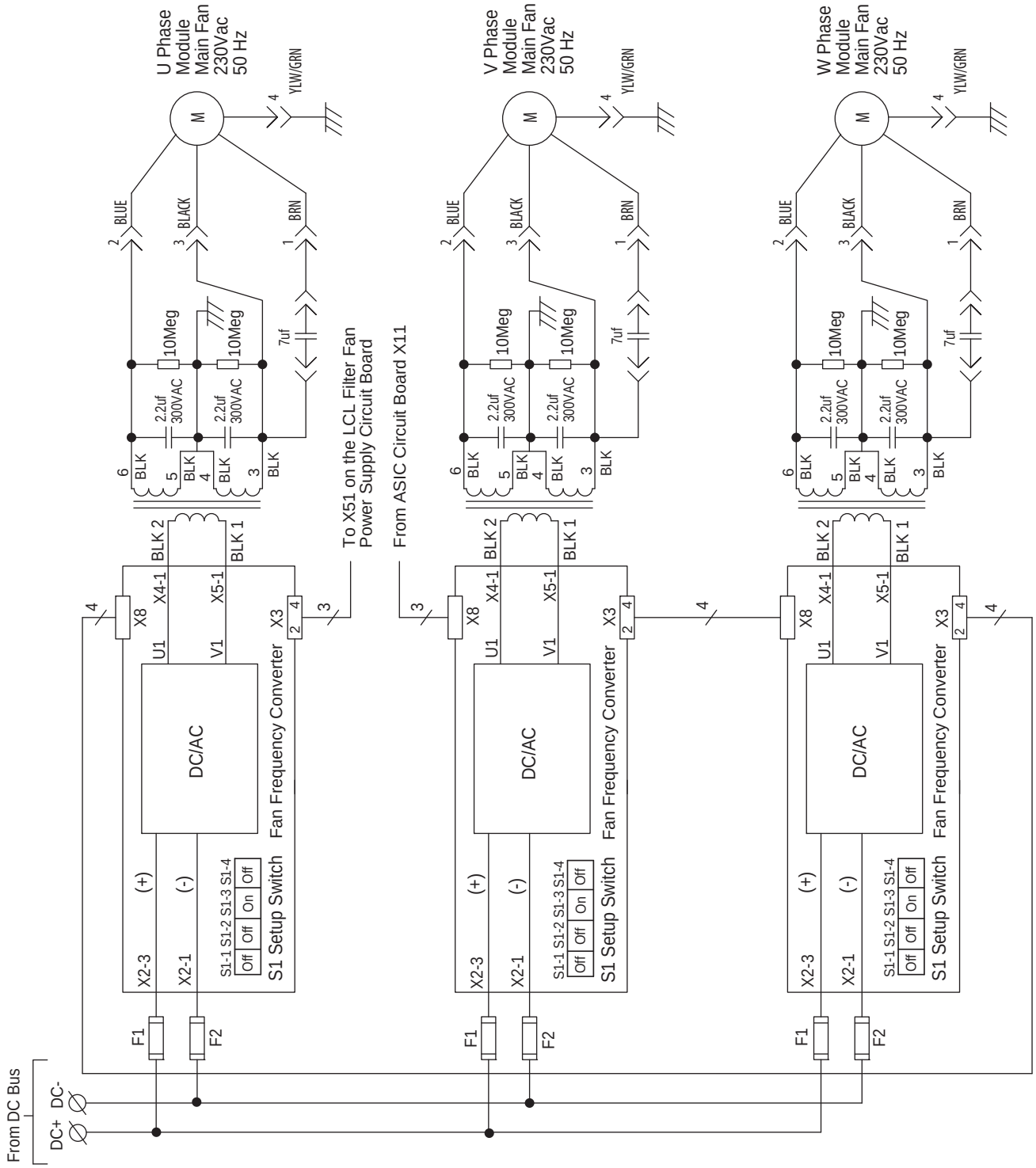


Figure 13 - Frame 13 AC Input Drive Inverter AC Fan System



Switch	Setting	To indicate the following:
S1	Off	50 Hz fan motor frequency
S2	Off	220 V AC motor voltage
S3	On	230 V AC motor voltage
S4	Off	Frame size 9…14

Figure 14 - Frame 13 AC Input Drive Inverter DC Fan System

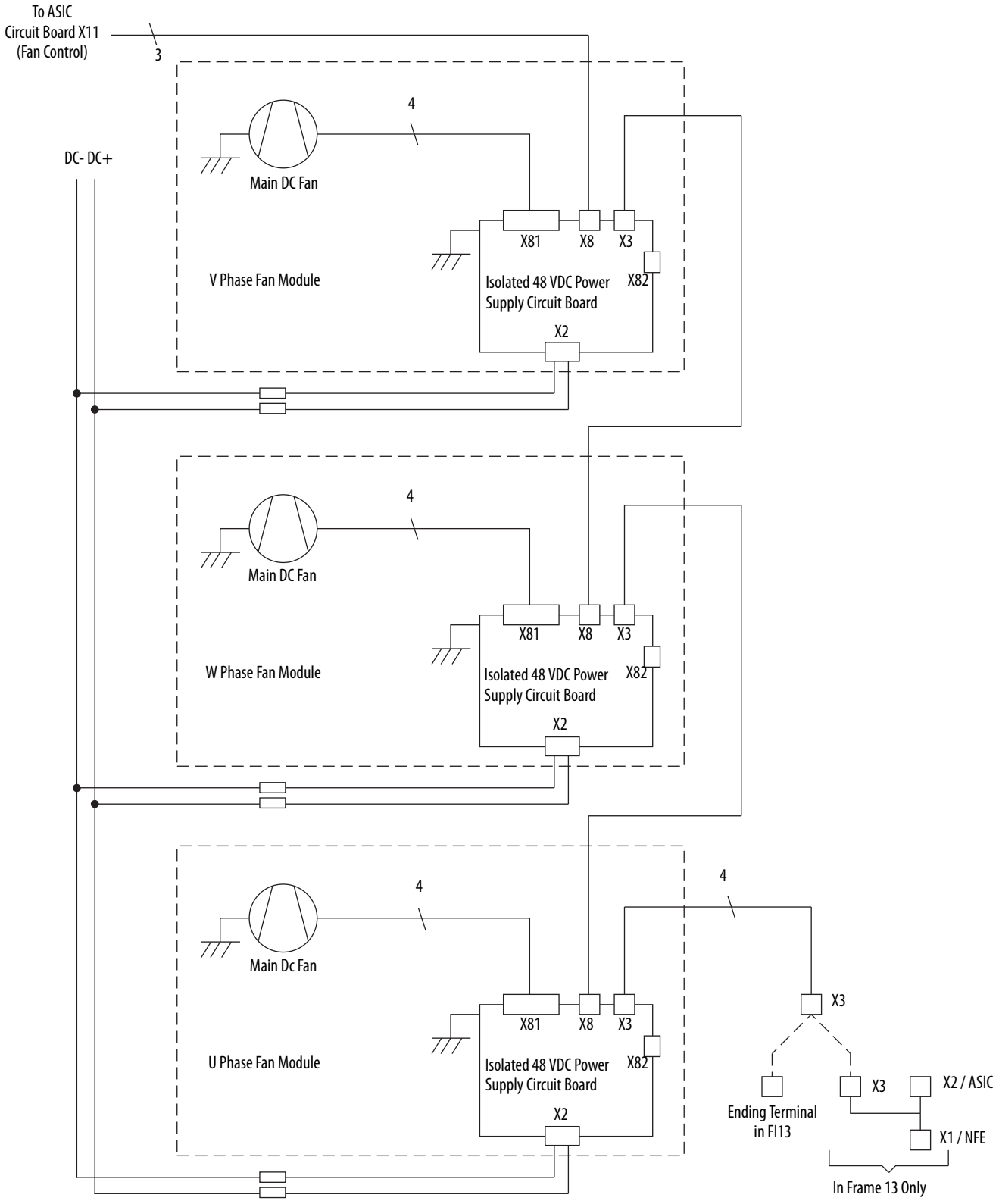


Figure 15 - Frame 13 DC Input Drive Inverter Section

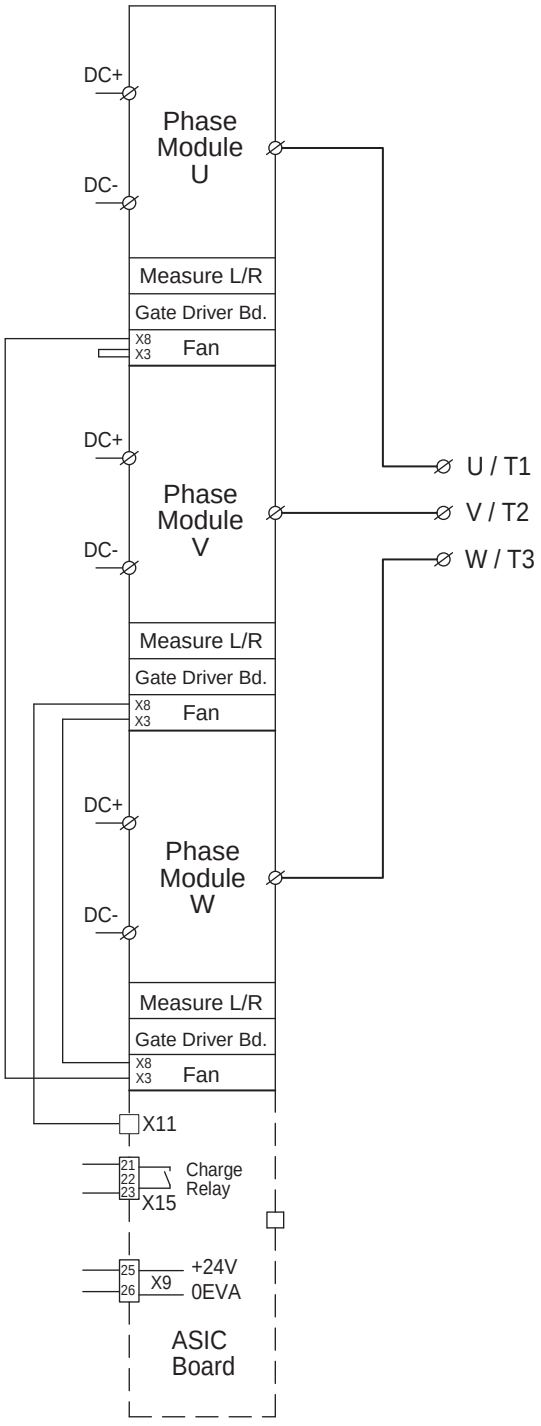
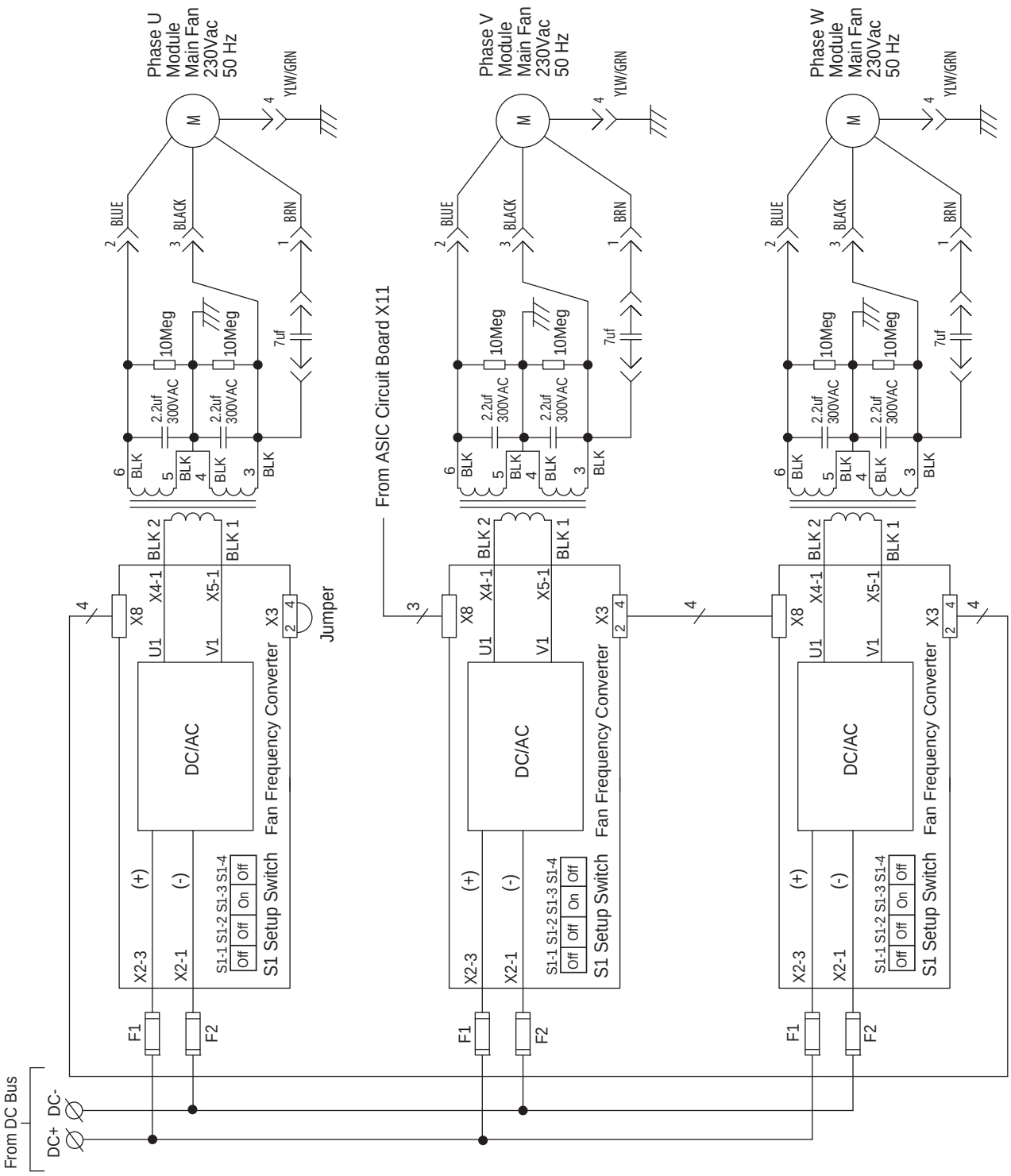
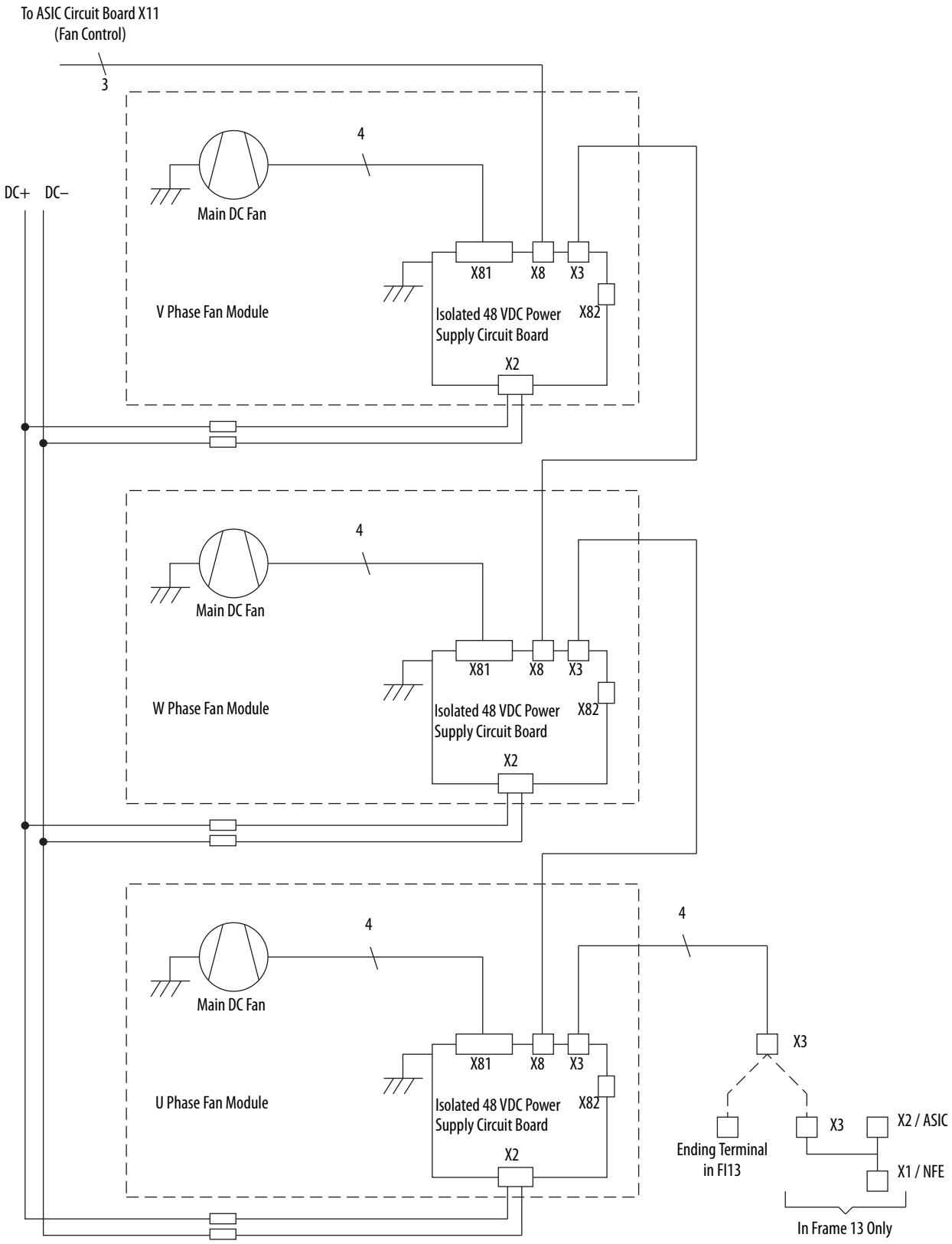


Figure 16 - Frame 13 DC Input Drive Inverter AC Fan System



Switch	Setting	To indicate the following:
S1	Off	50 Hz fan motor frequency
S2	Off	220 V AC motor voltage
S3	On	230 V AC motor voltage
S4	Off	Frame size 9…14

Figure 17 - Frame 13 AC Input Drive Inverter DC Fan System



Frame 13 Fan System Replacement Procedures

Replacement procedures for these frame 13 fan system parts are included in this chapter.

Remove Power from the Drive

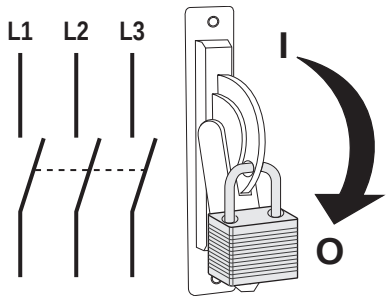
ATTENTION: To avoid an electric shock hazard, verify that the voltage on the bus capacitors has discharged completely before servicing. Check the DC bus voltage at the Power Terminal Block by measuring between the +DC and -DC terminals, between the +DC terminal and the chassis, and between the -DC terminal and the chassis. The voltage must be zero for all three measurements.

Remove power before making or breaking cable connections. When you remove or insert a cable connector with power applied, an electrical arc may occur. An electrical arc can cause personal injury or property damage by:

- sending an erroneous signal to your system's field devices, causing unintended machine motion
- causing an explosion in a hazardous environment

Electrical arcing causes excessive wear to contacts on both the module and its mating connector. Worn contacts may create electrical resistance.

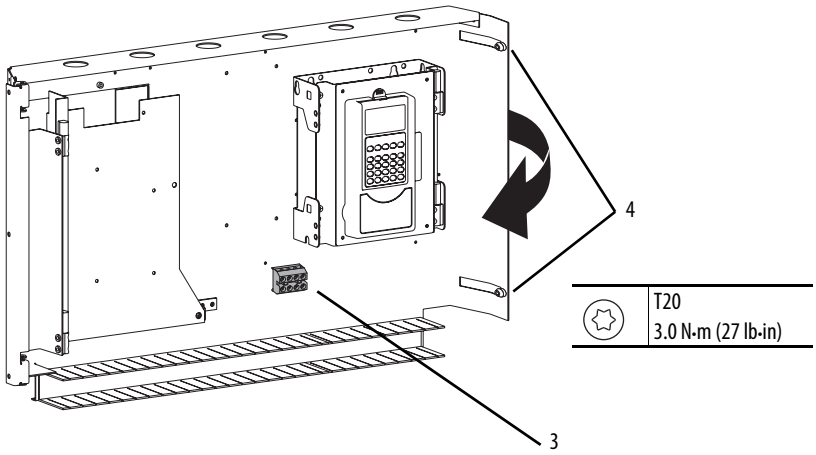
1. Turn off and lock out input power.
2. Wait five minutes.
3. Check the DC bus voltage at the Power Terminal Block by measuring between the +DC and -DC terminals, between the +DC terminal and the chassis, and between the -DC terminal and the chassis. The voltage must be zero for all three measurements.



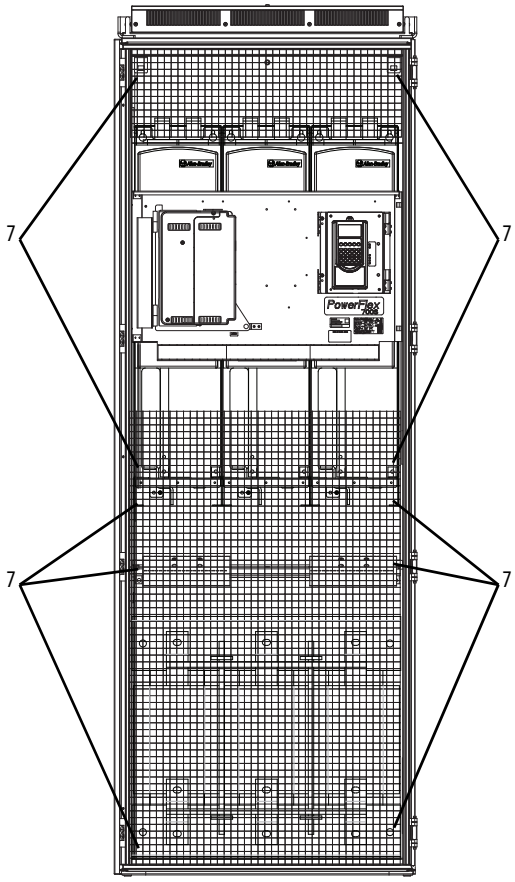
Move the Control Frame, and Remove the Screens, Airflow Plates, and Protective Covers

You may need to move the control frame based on the mounting location. You must remove the screens, air flow plate and protective covers from the drive in order to access fan system components on the drive power structure. Follow these steps to move the control frame and remove the screens, airflow plate and protective covers.

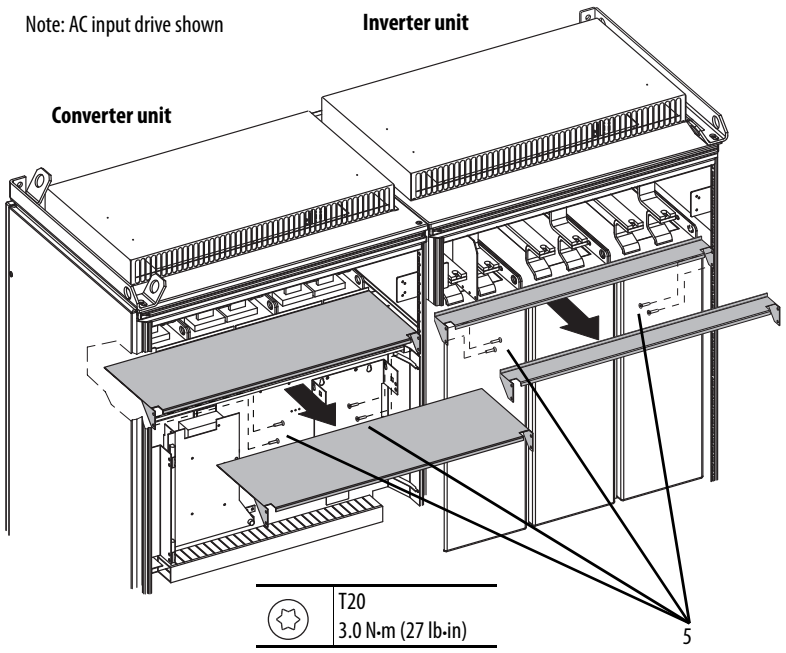
1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 134.
3. If moving the control frame from a DC input drive with pre-charge interlock, disconnect the wiring from terminal strip X50.
4. Loosen the two hexalobular screws that secure the control frame to the enclosure and swing the control frame away from the drive.



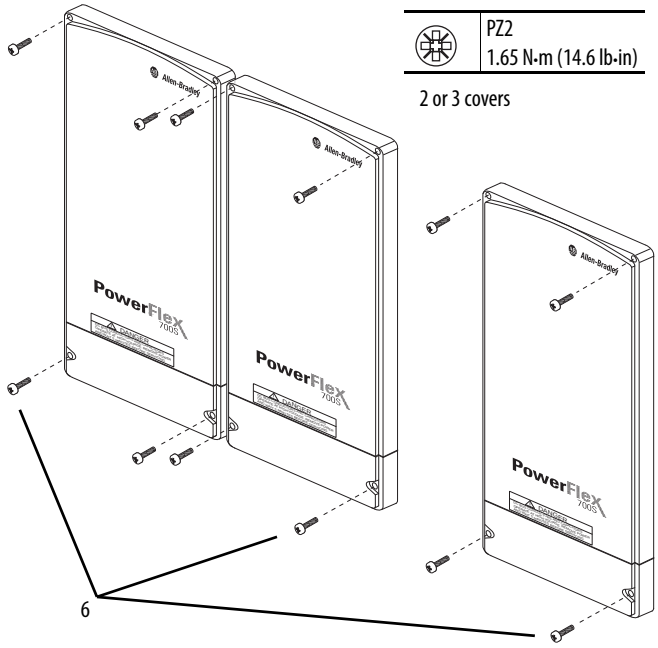
5. If the drive is installed inside an enclosure, remove the screws that secure the protective screens to the enclosure and remove the screens.



6. Remove the four hexalobular screws that secure the air flow plate to the drive enclosure and slide the plate off the drive.



7. If necessary, remove the four M5 x 16 mm POZIDRIV screws that secure the two or three protective covers to the drive, then remove the covers.



8. Replace the control frame, screens, airflow plates, and protective covers in the reverse order of removal.

Remove the Voltage Feedback Circuit Board Assembly (Inverter Only)

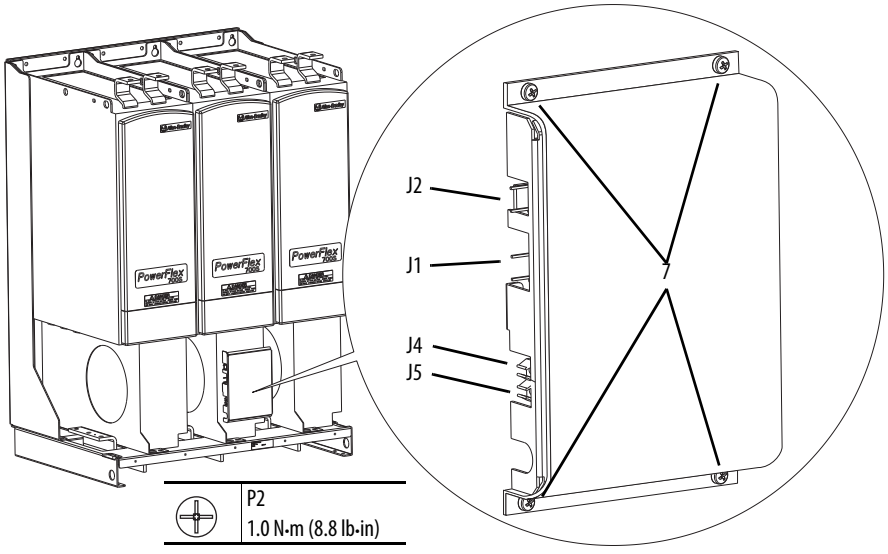
The PowerFlex 700S drive has a voltage feedback circuit board assembly located on the fan housing of the V phase inverter section. It must be removed to service the fan inverter circuit board and fans. Follow these steps to remove the voltage feedback circuit board assembly.

1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 134.
3. If necessary, remove the protective screens from the drive. See Move the Control Frame, and Remove the Screens, Airflow Plates, and Protective Covers on page 135.
4. Disconnect the DC bus connection cable from connector J2.
5. Disconnect the motor feedback connection cable from connector J1.
6. Carefully unplug the fiber-optic cables from sockets J4 and J5 and carefully move them aside.

ATTENTION: Hazard of permanent eye damage exists when using optical transmission equipment. This product emits intense light and invisible radiation. Do not look into fiber-optic ports or fiber-optic cable connectors.

IMPORTANT Minimum inside bend radius for fiber-optic cable is 25.4 mm (1 in.). Any bends with a shorter inside radius can permanently damage the fiber-optic cable. Signal attenuation increases with decreased inside bend radii.

7. Remove the four M4 x 8 mm Phillips head screws that secure the voltage feedback circuit board assembly to the fan housing on the drive and carefully remove the assembly.



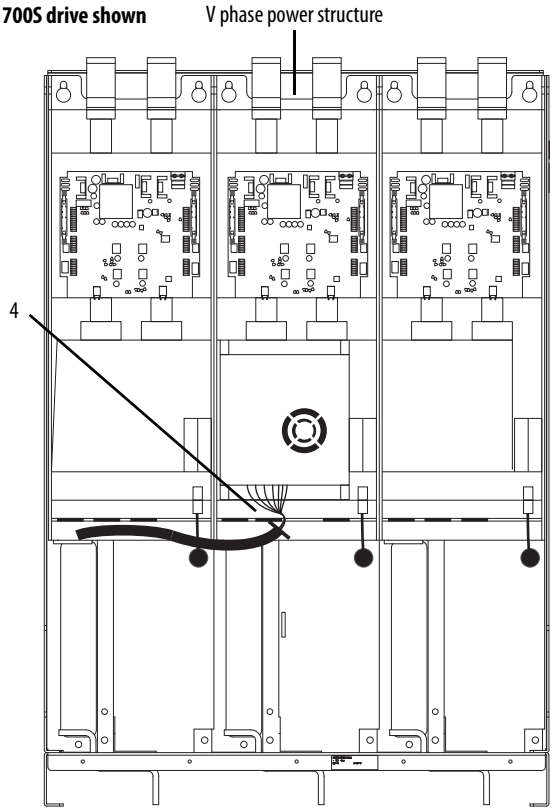
8. Install the voltage feedback circuit board assembly in the reverse order of removal.

ASIC Circuit Board Assembly Cooling Fan (20-PP01096) Removal and Installation (Inverter Only)

PowerFlex 700H and 700S drives have an ASIC circuit board located on the V phase inverter section. It may need to be removed to service the fan inverter circuit board and cooling fans. Follow these steps to remove the ASIC circuit board.

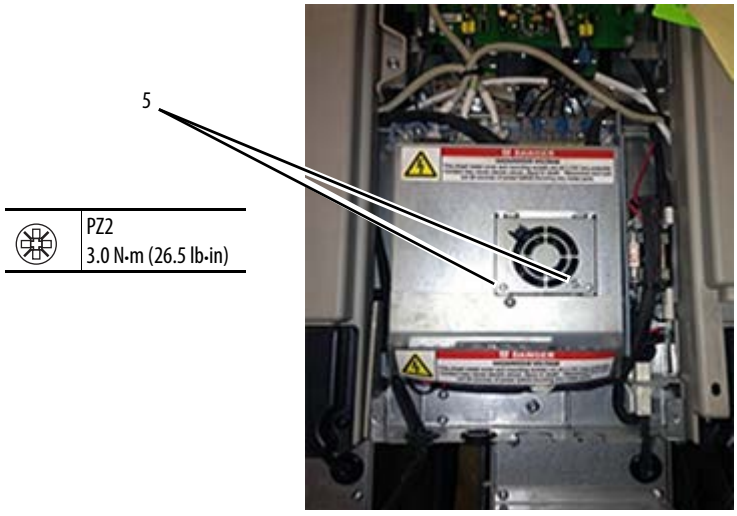
1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 134.
3. Move the control frame, and remove the screens, airflow plates, and protective covers from the drive. See Move the Control Frame, and Remove the Screens, Airflow Plates, and Protective Covers on page 135.
4. If you are accessing the electrical components within the V phase, cut the cable tie that secures the ASIC circuit board fiber-optic cable bundle to the fan housing (if present) and remove the fiber-optic bundle and rubber grommet from the support bracket in order to allow room for the fan housing to be removed from the unit.

PowerFlex 700S drive shown

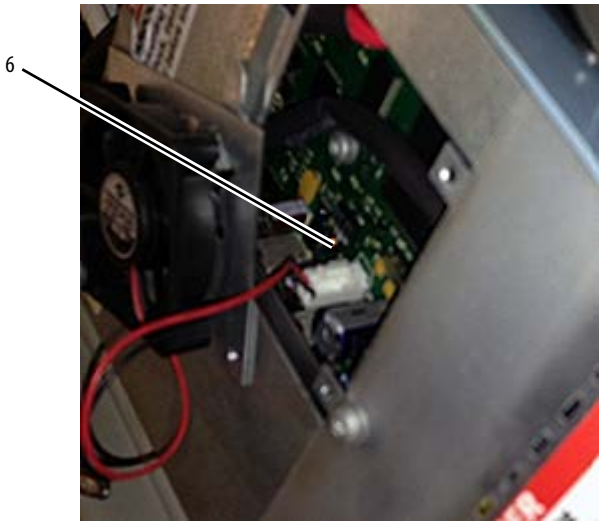


5. Remove the two M3 x 5 mm POZIDRIV screws that secure the cooling fan assembly to the ASIC circuit board assembly and rotate the fan assembly out of the assembly.

IMPORTANT After removing the fan assembly from the ASIC board assembly, the fan power cable will still be connected to the ASIC circuit board.



6. Disconnect the cable from connector X1 on the ASIC board and remove the fan assembly from the drive.



7. Remove the M4 x 15 mm hexalobular screw that secures the fan to the bracket.

	T20 3.0 N•m (27 lb•in)

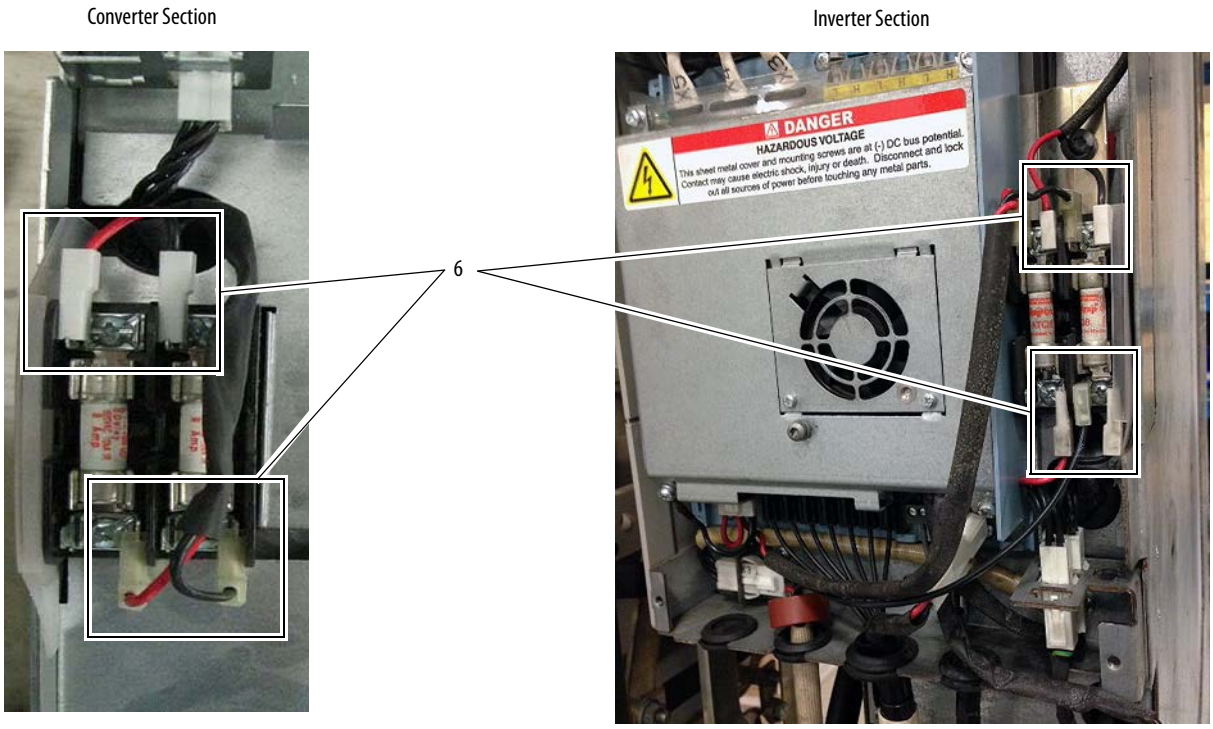
8. Install the ASIC circuit board cooling fan and assembly in the reverse order of removal.

AC or DC Fan System Fuses (20-PP20202) and Fuse Holder (20-PP20300) Removal and Installation

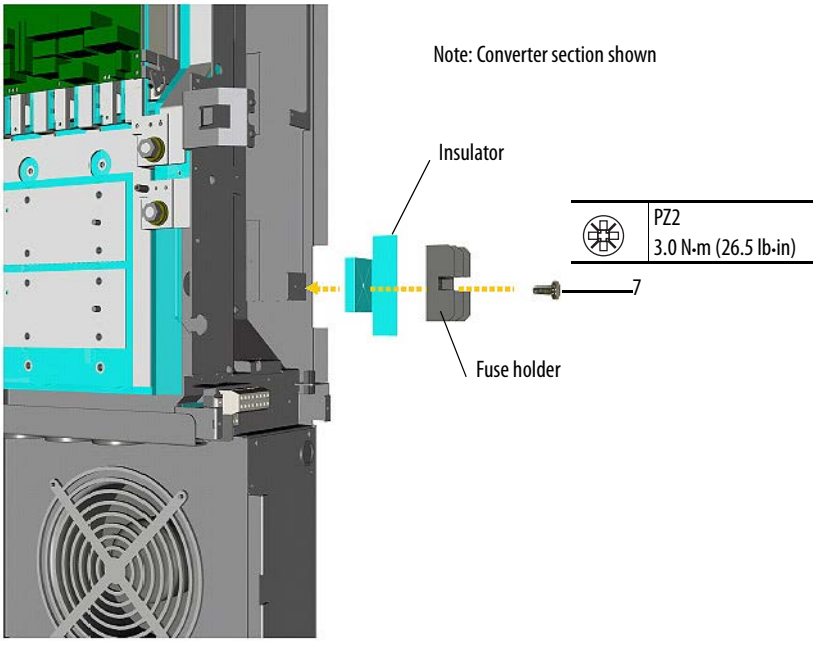
The fan system fuses and fuse holder are located on the front of the drive. There is one set of fuses for each drive converter and inverter section. Follow these steps to remove and replace the fan system fuse holder assemblies.

1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 134.
3. Move the control frame, and remove the screens, airflow plates, and protective covers from the drive. See Move the Control Frame, and Remove the Screens, Airflow Plates, and Protective Covers on page 135.
4. Remove the fuses from the fuse holder.
5. Check the fuses. See Checking the Fan Inverter Fuses on page 263.

6. Disconnect the fan power supply wires from the top and bottom of the fuse holder. Note that the red wires (+DC) are connected to the left side terminal and the black wires (-DC) are connected to the right side terminals.



7. Remove the M4 x 8 mm POZIDRIV screw that secures the fuse holder assembly.



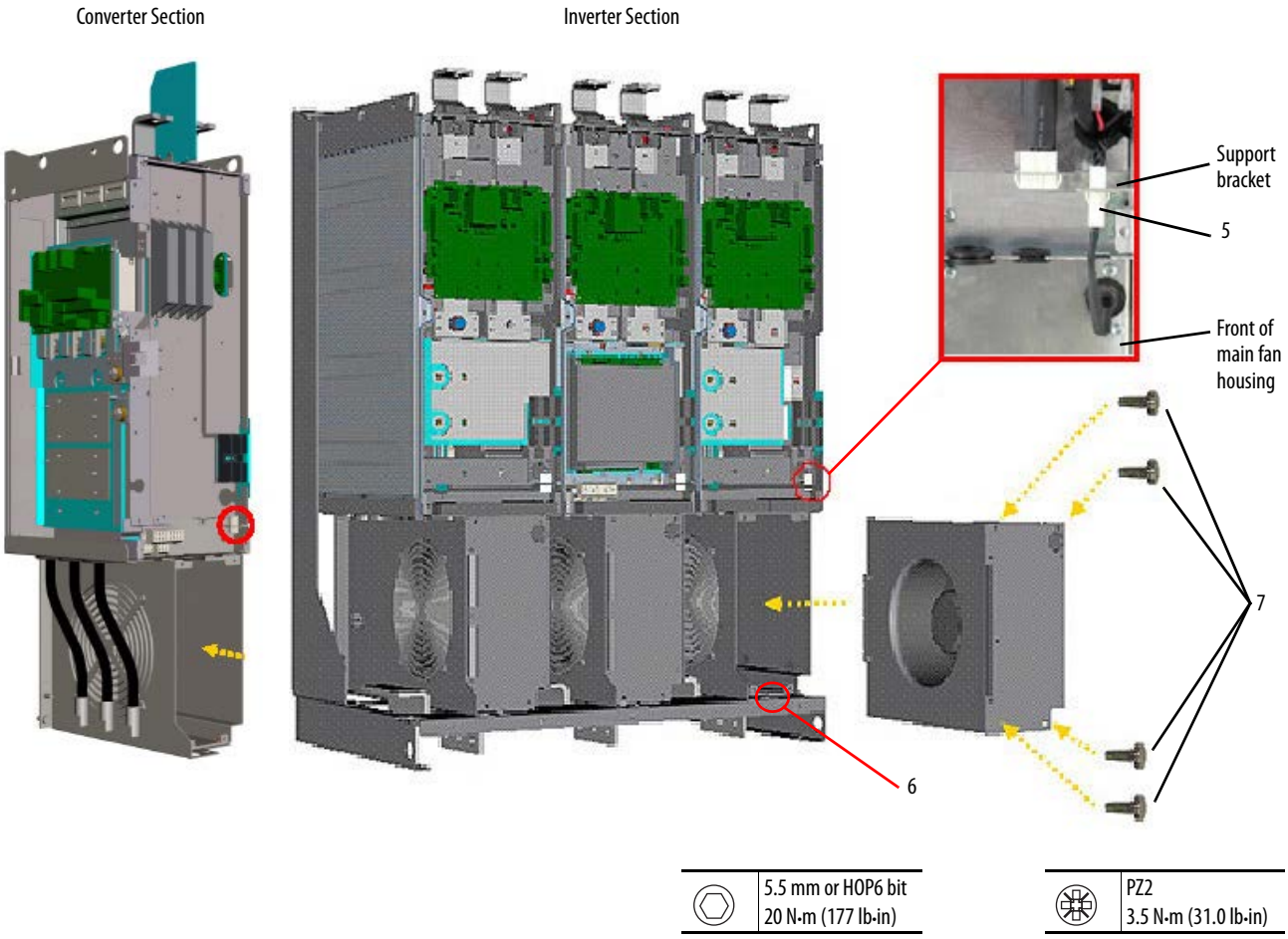
8. Install the AC or DC fan inverter fuses and fuse holder in the reverse order of removal.

Remove the Main Fan Assembly

The main fan assembly must be removed to gain access to the fan power supply circuit board. Follow these steps to remove the main fan assembly.

1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 134.
3. Move the control frame, and remove the screens, airflow plates, and protective covers from the drive. See Move the Control Frame, and Remove the Screens, Airflow Plates, and Protective Covers on page 135.
4. If necessary, remove the voltage feedback circuit board assembly. See Remove the Voltage Feedback Circuit Board Assembly (Inverter Only) on page 138.

5. Disconnect the main fan power supply connector from the connector on the support bracket and pull the connector out of the sheet metal support bracket.
6. Remove the M8 x 20 mm hexagonal socket screw from the chassis in front of the fan housing in order to allow room for the fan housing to be removed from the unit.
7. Remove the four M5 x 10 POZIDRIV screws that secure the main fan housing to the assembly and remove the fan housing.



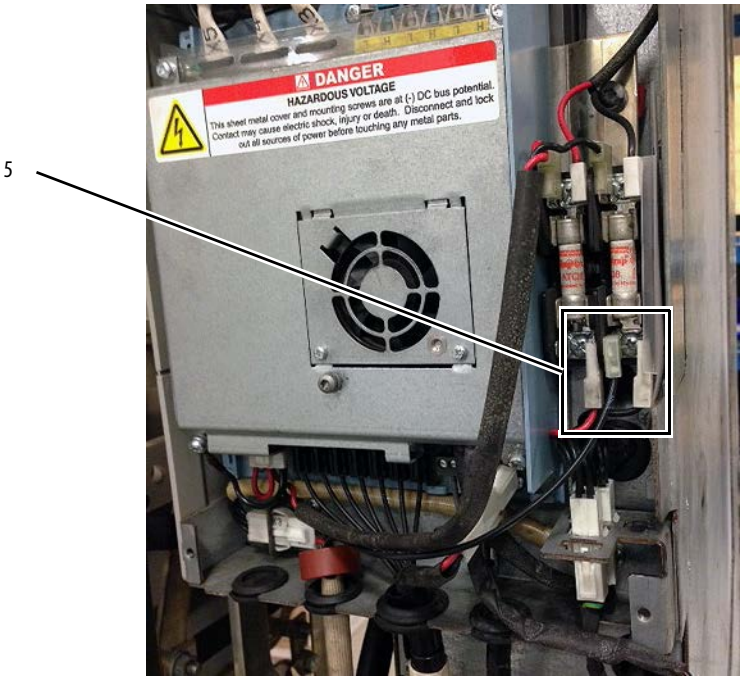
8. Install the main fan assembly in the reverse order of removal.

Removing the Main AC or DC Fan Power Supply Assemblies (Inverter Only)

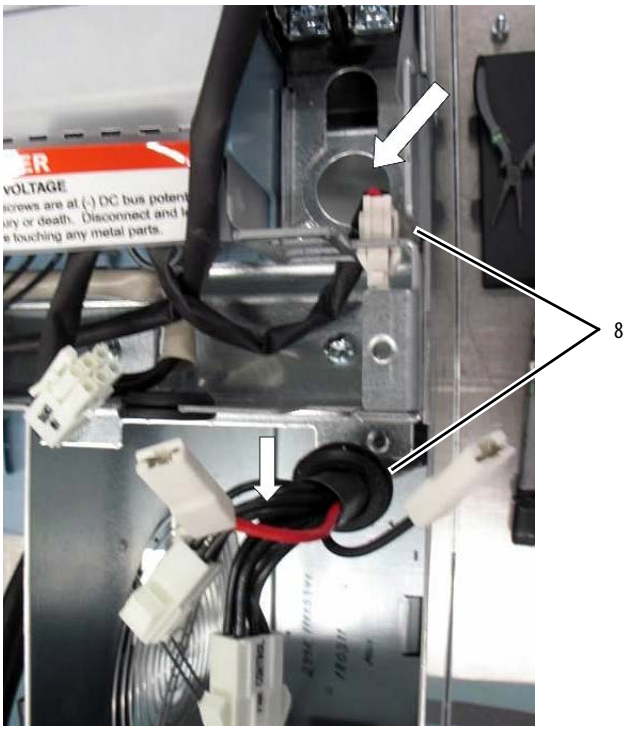
You must remove the main fan power supply assemblies from the drive in order to test and/or replace the AC or DC fan power supply circuit board, AC fan inverter output transformer, and/or AC fan inverter capacitor. Follow these steps to remove the main fan inverter assemblies. See Isolating a Faulty Fan Inverter on page 265 for test procedures used to determine if the fan inverter assembly requires replacement.

Follow these steps to remove and replace a main fan inverter assembly.

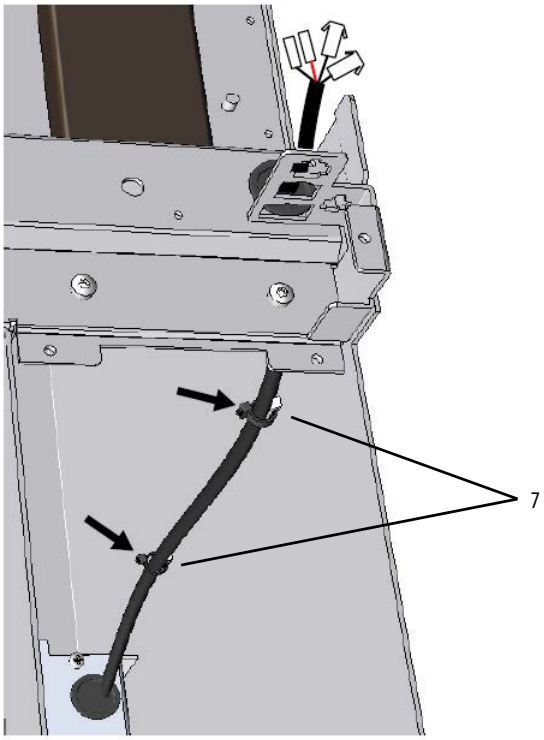
1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 134.
3. Move the control frame, and remove the screens, airflow plates, and protective covers from the drive. See Move the Control Frame, and Remove the Screens, Airflow Plates, and Protective Covers on page 135.
4. Remove the main fan assembly from the drive. See Remove the Main Fan Assembly on page 143.
5. Disconnect the fan power supply wires from the bottom of the fuse holder. Note that the red wire (+DC) is connected to the left side terminal and the black wire (-DC) is connected to the right side terminals.



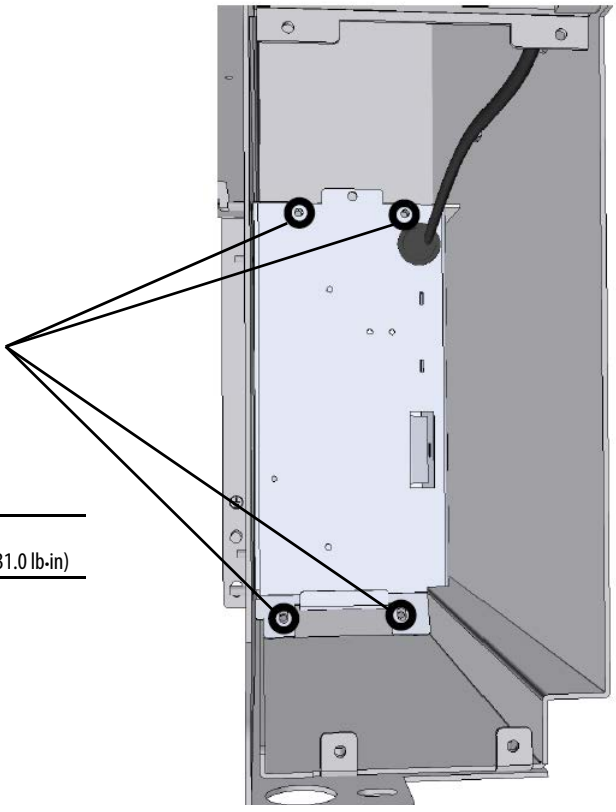
6. Remove the connectors by pinching the tabs together and sliding them out of the sheet metal bracket.
7. Carefully push the rubber grommet with the fan wires and connectors through the hole in the drive chassis.



8. Cut the cable ties that secure the fan wires to the inside of the main fan housing.



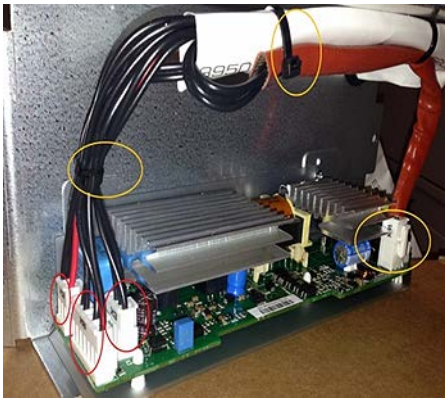
9. Remove the four M5 x 10 POZIDRIV screws that secure the fan power supply assembly to the fan housing, and using the handle provided at the base of the assembly, slide the fan assembly out of the housing.



	PZ2 3.5 N•m (31.0 lb•in)

AC Fan Inverter Assembly

DC Fan power Supply Assembly

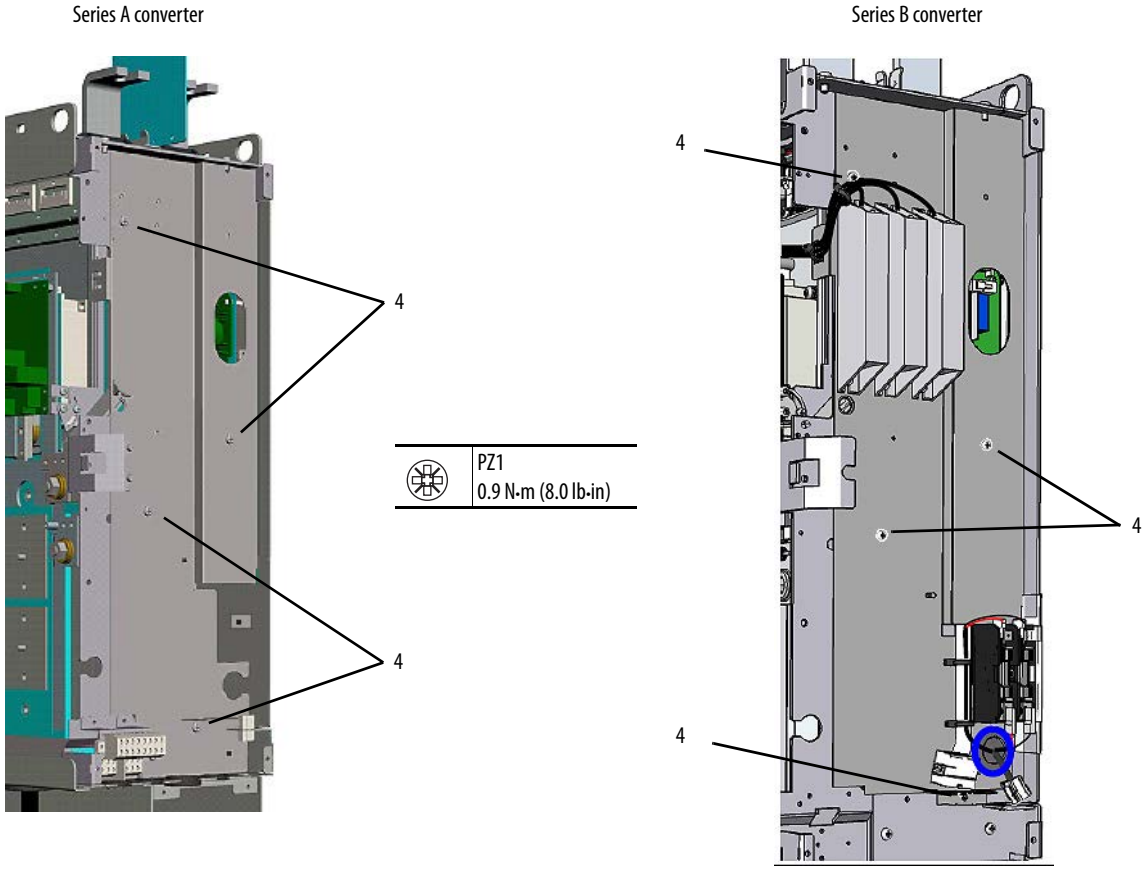


Main AC Fan Inverter Circuit Board (20-VB00299) and DC Fan Power Supply Circuit Board (SK-H1-DCFANBD1) Removal and Installation (Converter Only)

Follow these steps to remove and replace the main AC fan inverter or DC fan power supply circuit board.

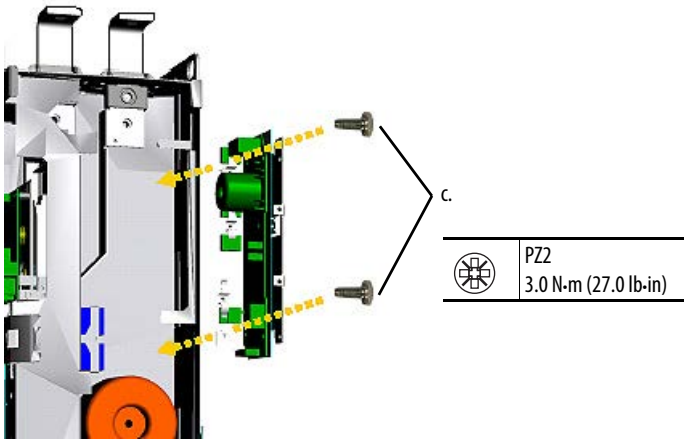
1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 134.
3. Move the control frame, and remove the screens, airflow plates, and protective covers from the drive. See Move the Control Frame, and Remove the Screens, Airflow Plates, and Protective Covers on page 135.
4. Remove the four M4 x 8 mm POZIDRIV screws that secure the fan circuit board protection cover to the drive. Press the rubber grommet through the hole in the cover and remove the cover.

IMPORTANT	Be sure to not damage the precharge resistors wires on the series B converter.



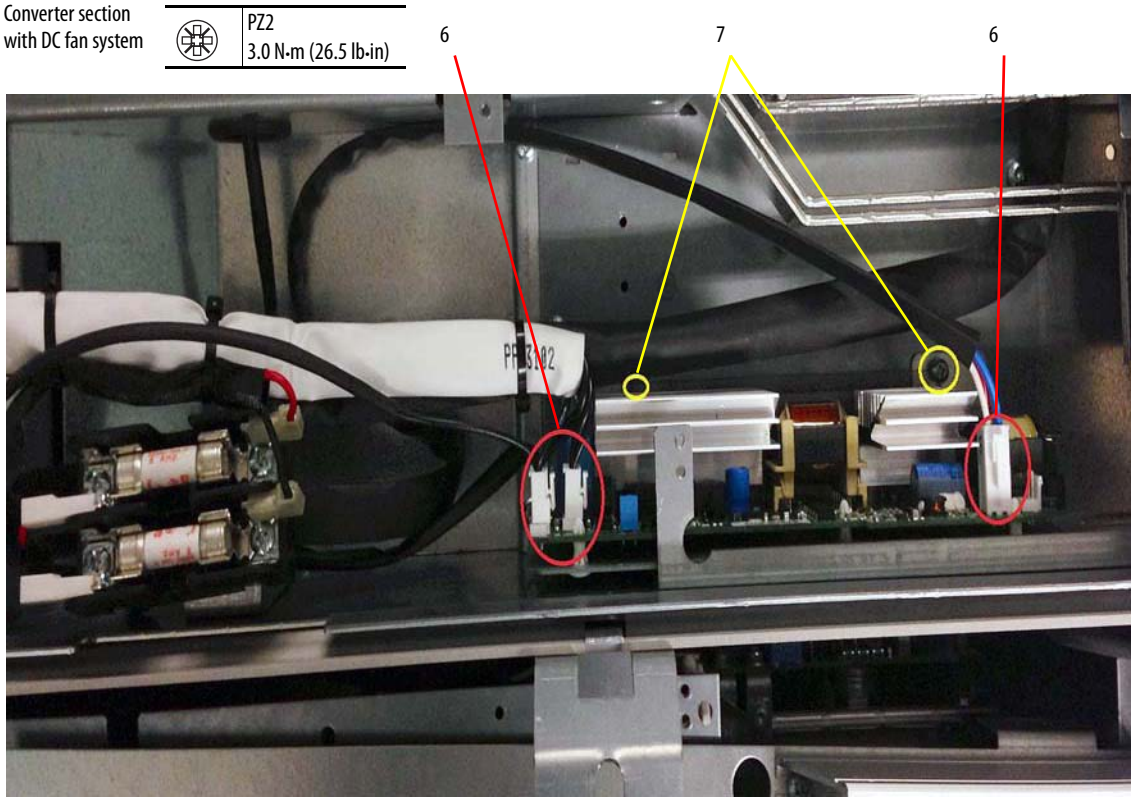
5. For drives with a DC fan system continue with step 6.
   For drives with an AC fan system, complete steps a...d.
   a. Disconnect the wires from connectors X2, X3, and X8 on the main AC fan circuit board.
   b. Disconnect the wires from connectors X4 and X5 on the AC fan circuit board.

c. Remove the two M4 x 8 mm POZIDRIV screws that secure the AC fan circuit board to the drive frame and carefully remove the circuit board.



d. Continue with step 8.

6. Disconnect the cable from connector X2, X3, X8, and X81 on the DC fan circuit board.
7. Remove the two M4 x 8 mm POZIDRIV screws that secure the main DC fan circuit board to the drive frame and carefully remove the circuit board.



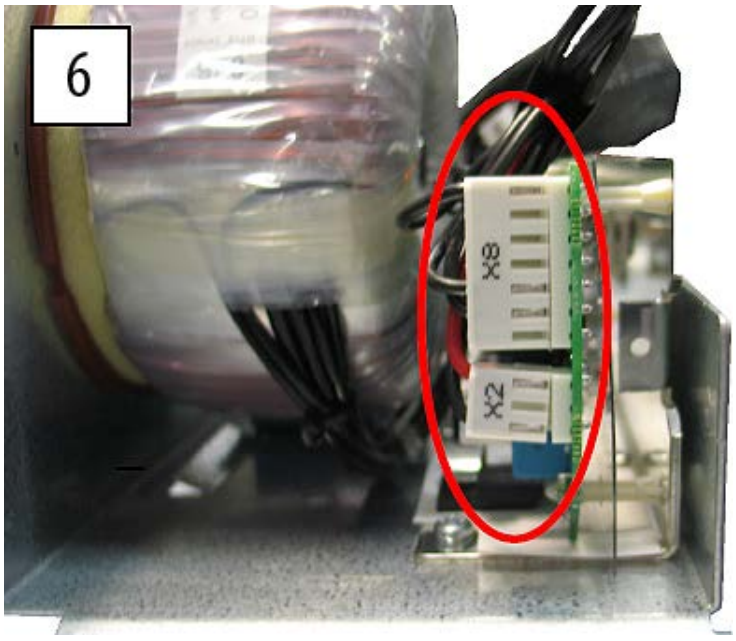
8. Install the fan circuit board in the reverse order of removal.

Main AC Fan Inverter Circuit Board (20-VB00299) Removal and Installation (Inverter Only)

Although not recommended, you may replace just the circuit board in the AC fan inverter assembly. Follow these steps to remove and replace the main AC fan inverter circuit board.

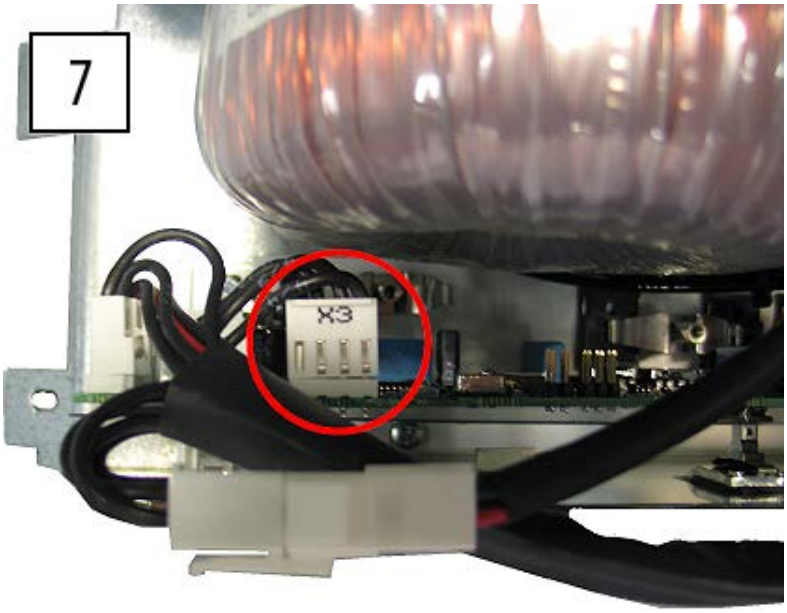
1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 134.
3. Move the control frame, and remove the screens, airflow plates, and protective covers from the drive. See Move the Control Frame, and Remove the Screens, Airflow Plates, and Protective Covers on page 135.
4. Remove the main fan assembly from the drive. See Remove the Main Fan Assembly on page 143.
5. Remove the AC fan inverter assembly from the drive. See Removing the Main AC or DC Fan Power Supply Assemblies (Inverter Only) on page 145.
6. Disconnect the cables from connectors X2 and X8.

AC fan system shown.



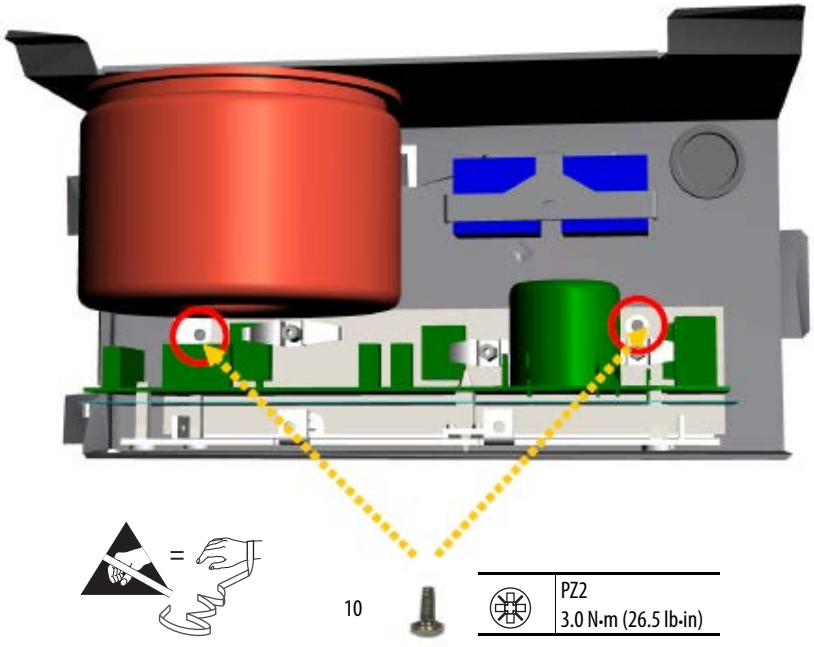
7. Disconnect the cable from connector X3.

AC fan inverter assembly shown.



8. Disconnect the cables from connectors X4 and X5 on the circuit board.
9. Cut any cables ties, as necessary.
10. Remove the two M4 x 8 mm POZIDRIV screws that secure the fan inverter circuit board to the assembly and carefully remove the circuit board.

AC fan inverter assembly shown.



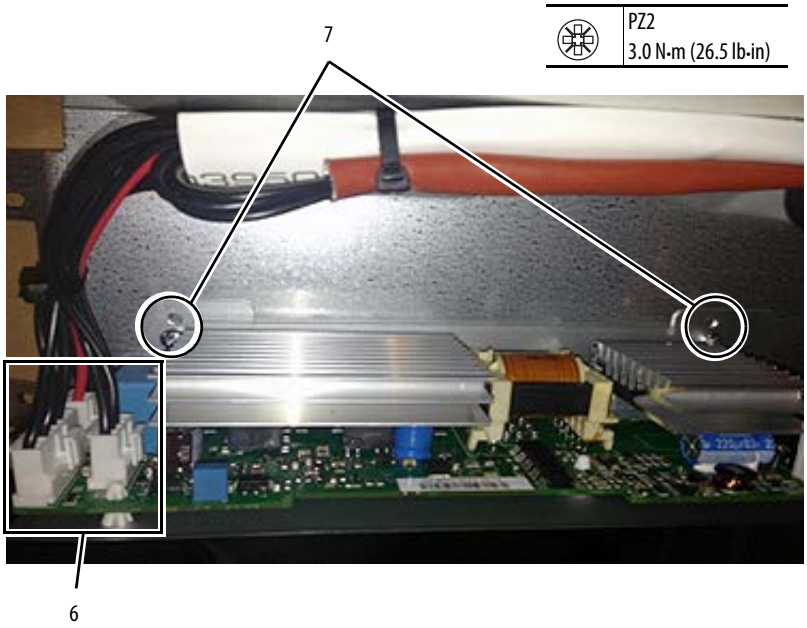
11. Install the fan inverter circuit board in the reverse order of removal.

Main DC Fan Power Supply Circuit Board (SK-H1-DCFANBD1) Removal and Installation (Inverter Only)

PowerFlex 700H and 700S frame 13 drives have multiple fans power supplies. You can retrofit an existing AC fan system or replace a DC fan system with a new DC fan system. See Energy-related Products Fan Efficiency Directive on page 12 for guidelines on replacing an existing fan system with a new DC fan system.

Follow these steps to remove and replace an existing DC fan power supply circuit board with a new DC fan power supply circuit board.

1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 134.
3. Move the control frame, and remove the screens, airflow plates, and protective covers from the drive. See Move the Control Frame, and Remove the Screens, Airflow Plates, and Protective Covers on page 135.
4. Remove the main fan assembly from the drive. See Remove the Main Fan Assembly on page 143.
5. Remove the DC fan power supply assembly from the drive. See Removing the Main AC or DC Fan Power Supply Assemblies (Inverter Only) on page 145.
6. Disconnect the wire cable harness from connectors X2, X3, X8, and X81 on the Dc fan power supply circuit board.
7. Remove two M4 x 8 mm POZIDRIV screws that secure the DC fan inverter circuit board and heatsink to the assembly carriage. Then carefully remove the circuit board from the assembly.



8. Install the DC fan power supply circuit board in the reverse order of removal.

AC to DC Main Fan System (SK-*x*1-DCFANRETROFIT-F13*x* and -14*x*) Retrofit

Table 3 lists the six AC to DC fan retrofit kits available for installation in frame 13 and 14 drives. See DC Fan Systems on page 124 to identify the correct kit for your drive.

Table 3 - Available AC to DC Main Fan Inverter Systems Retrofit Kits

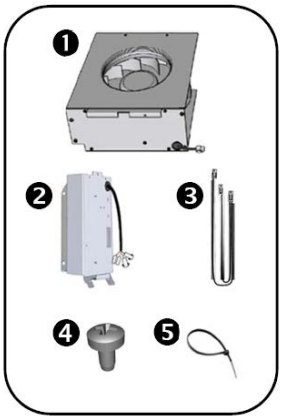
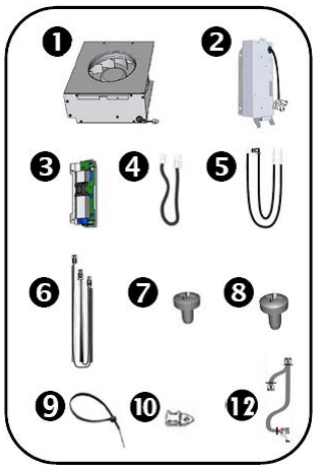
Cat. No.	Item	Description	Qty	Kit Contents
SK-Y1-DCFANRETROFIT-F13 - For DC input frame 13 drives				
	1	DC fan assembly	3	
	2	DC fan power supply assembly	3	
	3	Wire harness	1	
	4	M5 x 10 mm POZIDRIV screws	24	
	5	Wire ties	9	
SK-H1-DCFANRETROFIT-F13A - For AC input frame 13 drives w/2 NFEs				
	1	DC fan assembly	5	
	2	DC fan power supply assembly 1	3	
	3	DC fan power supply assembly 2	2	
	4	DC fan power supply wire harness 1	2	
	5	DC fan power supply wire harness 2	2	
	6	DC chaining wire harness	1	
	7	M4 x 8 mm POZIDRIV screws	4	
	8	M5 x 10 mm hexagonal socket screws	32	
	9	Wire ties	21	
	10	Wire tie mounting clamps	2	
	12	Wire harness for 2 NFE	1	

Table 3 - Available AC to DC Main Fan Inverter Systems Retrofit Kits (Continued)

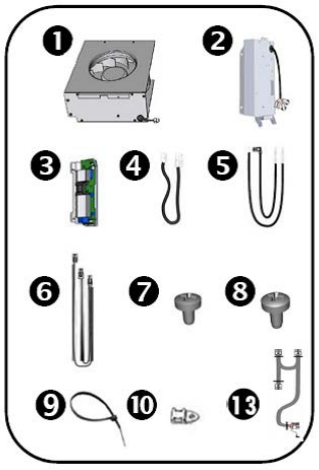
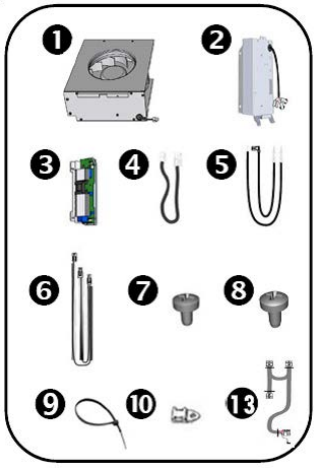
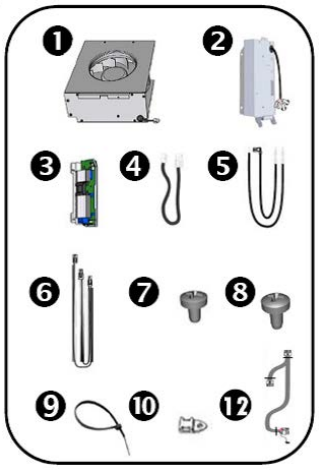
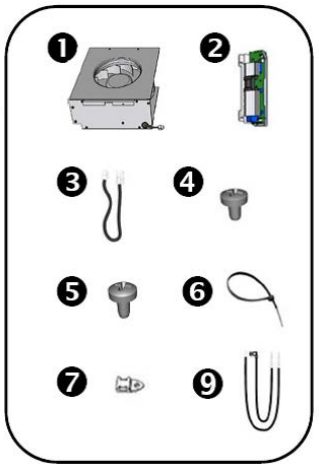
Cat. No.	Item	Description	Qty	Kit Contents
SK-H1-DCFANRETROFIT-F13B - For AC input frame 13 drives w/3 NFEs				
	1	DC fan assembly	6	
	2	DC fan power supply assembly 1	3	
	3	DC fan power supply assembly 2	3	
	4	DC fan power supply wire harness 1	3	
	5	DC fan power supply wire harness 2	3	
	6	DC chaining wire harness	1	
	7	M4 x 8 mm POZIDRIV screws	6	
	8	M5 x 10 mm hexagonal socket screws	36	
	9	Wire ties	27	
	10	Wire tie mounting clamps	3	
	13	Wire harness for 3 NFE	1	
SK-H1-DCFANRETROFIT-F14A - AC input frame 14 drives w/3 NFEs				
	1	DC fan assembly	9	
	2	DC fan power supply assembly 1	6	
	3	DC fan power supply assembly 2	3	
	4	DC fan power supply wire harness 1	3	
	5	DC fan power supply wire harness 2	3	
	6	DC chaining wire harness	2	
	7	M4 x 8 mm POZIDRIV screws	6	
	8	M5 x 10 mm hexagonal socket screws	60	
	9	Wire ties	36	
	10	Wire tie mounting clamps	3	
	13	Wire harness for 3 NFE	1	

Table 3 - Available AC to DC Main Fan Inverter Systems Retrofit Kits (Continued)

Cat. No.	Item	Description	Qty	Kit Contents
SK-H1-DCFANRETROFIT-F14B - For AC input frame 14 drives w/4 NFEs				
	1	DC fan assembly	10	
	2	DC fan power supply assembly 1	6	
	3	DC fan power supply assembly 2	4	
	4	DC fan power supply wire harness 1	4	
	5	DC fan power supply wire harness 2	4	
	6	DC chaining wire harness	2	
	7	M4 x 8 mm POZIDRIV screws	8	
	8	M5 x 10 mm hexagonal socket screws	64	
	9	Wire ties	42	
	10	Wire tie mounting clamps	4	
	12	Wire harness for 2 NFE	2	
SK-H1-DCFANRETROFIT-CONV - For frame 14 drive converter extension				
	1	DC fan assembly	1	
	2	DC fan power supply assembly	1	
	3	DC fan power supply wire harness 1	1	
	4	M4 x 8 mm POZIDRIV screws	2	
	5	M5 x 10 mm hexagonal socket screws	4	
	6	Wire ties	6	
	7	Wire tie mounting clamp	1	
	9	DC fan power supply wire harness 2	1	

Frame 13 drives can be configured for AC or DC input. A frame 13 AC input drive has both converter and inverter assemblies, while a frame 13 DC input, or common bus, drive has only an inverter assembly. Therefore, the procedures for installing the retrofit kits are detailed in these sections:

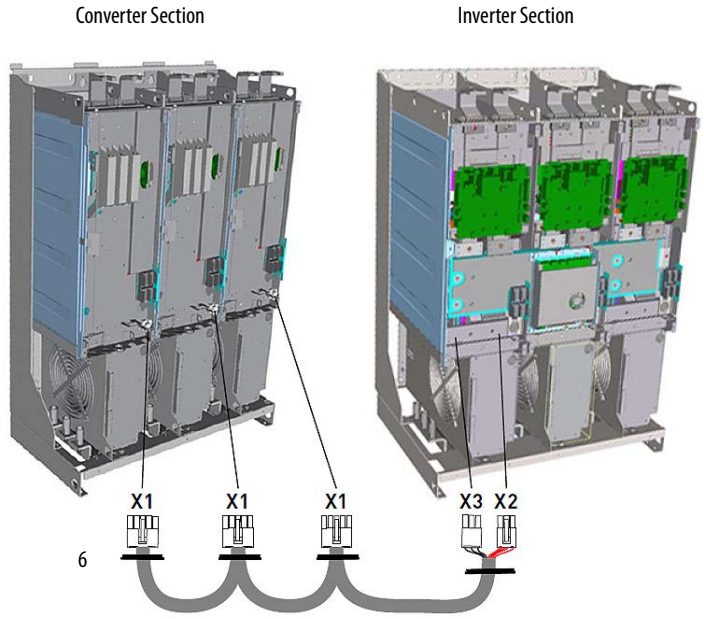
- Inverter Units on page 157
- Converter Units on page 162
- Fan Wire Harness Installation on page 165

Follow these steps to remove and replace an existing AC fan system with a new DC fan system.

Inverter Units

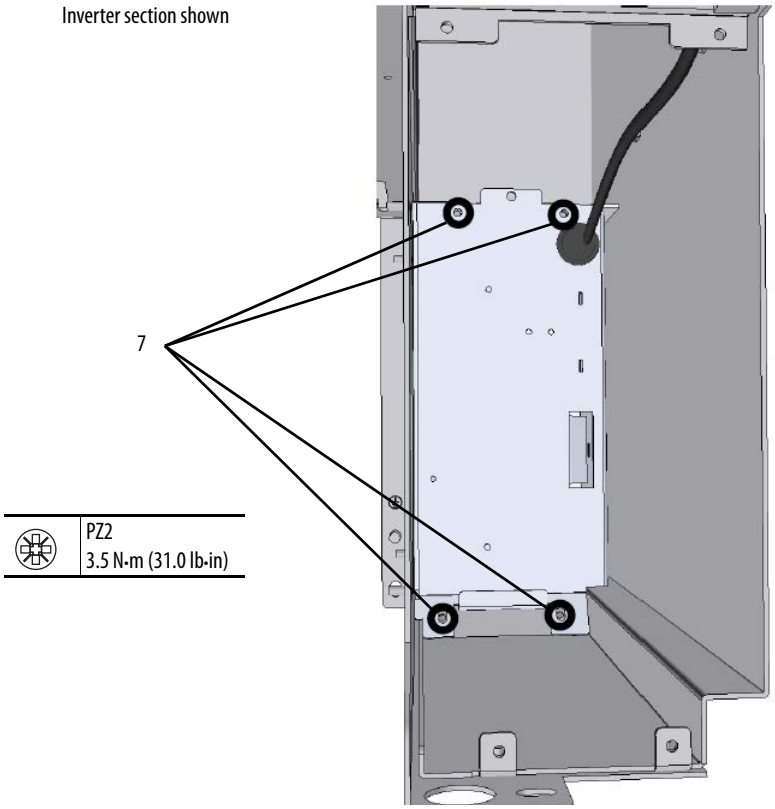
1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 134.
3. Move the control frame, and remove the screens, airflow plates, and protective covers. See Move the Control Frame, and Remove the Screens, Airflow Plates, and Protective Covers on page 135.
4. Remove the main fan assemblies. See Remove the Main Fan Assembly on page 143.
5. Remove the AC fan inverter assemblies. See Removing the Main AC or DC Fan Power Supply Assemblies (Inverter Only) on page 145.
6. For AC input standalone drives only, remove the wire harness that connects the fans on the converter and inverter units.

   Note: DC input drives do not have an converter section, so there is no converter to inverter interconnect wire harness.



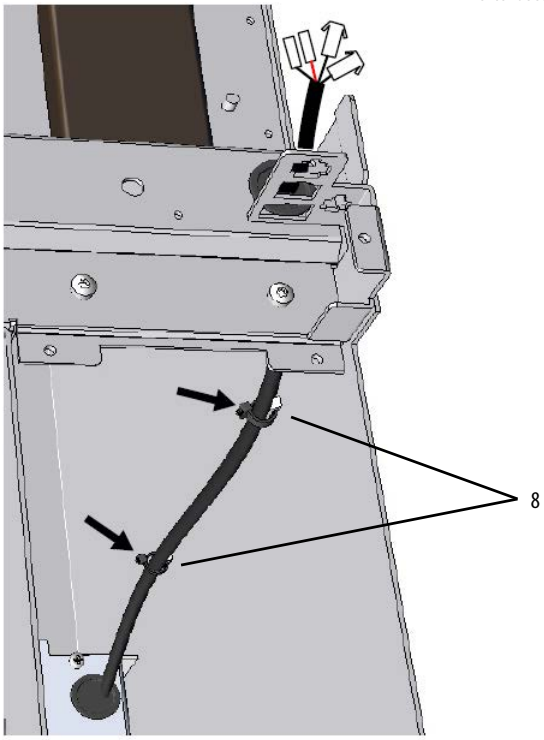
7. Install the DC fan inverter assemblies in the drive using the four M5 x10 mm POZIDRIV screws supplied in the kit. See Removing the Main AC or DC Fan Power Supply Assemblies (Inverter Only) on page 145 for details.

Inverter section shown



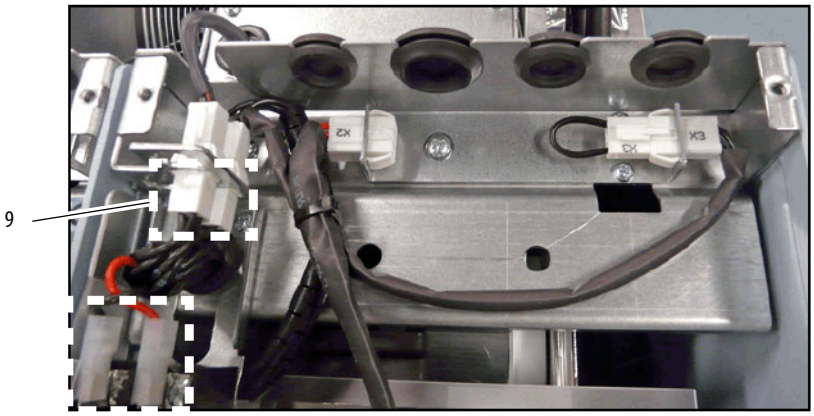
8. Secure the power supply cables to the inside of the main fan housings using the cable ties supplied with the kit.

Inverter section shown

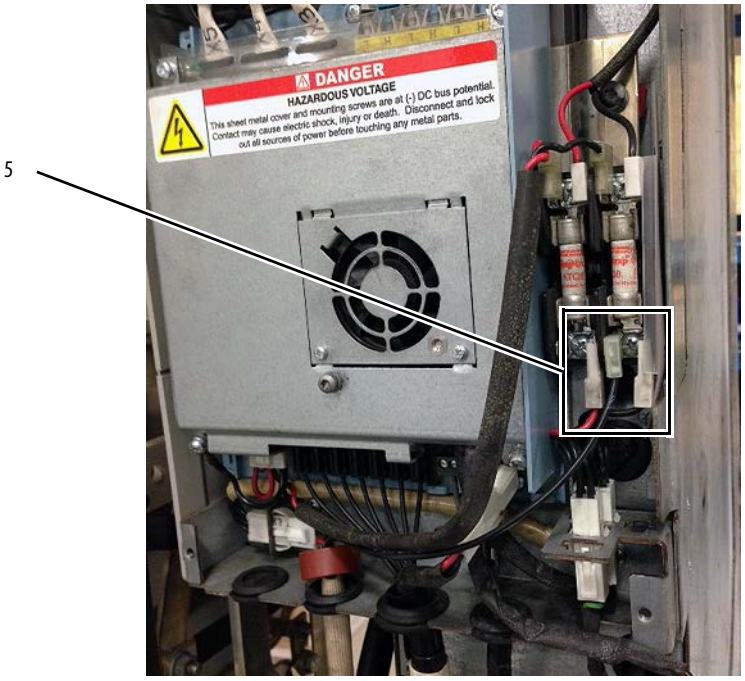


9. Route the fan inverter power supply cables through the hole in the drive chassis and insert them into the connector support bracket on the front of the drive chassis.

Inverter section shown



10. Connect the fan inverter power supply wires to the bottom of the fuse holders. Note that the red wire (+DC) is connected to the left side terminal and the black wire (-DC) is connected to the right side terminals.

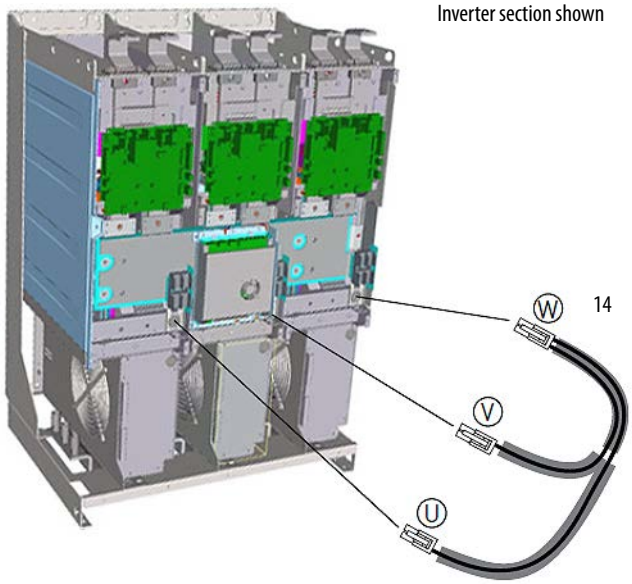


11. Install the new main DC fans in the fan housings using the M5 x 10 mm POZIDRIV screws supplied in the kit. Final torque is 3.5 N•m (31.0 lb•in). See Remove the Main Fan Assembly on page 143 for details.

12. Install the M8 x 20 mm hexagonal socket screws supplied with the kit in the front of the main fans. Final torque is 20 N•m (177 lb•in).

13. Connect the fan power supply cables to the connectors on the support brackets on the main chassis.

14. Connect the DC- chaining wire set provided in the kit between the DC power supply and DC- connectors from the DC fan inverter circuit board. Note the phase markings (U, V, W) on the DC- chaining wire connectors and verify they are connected to the correct phase.



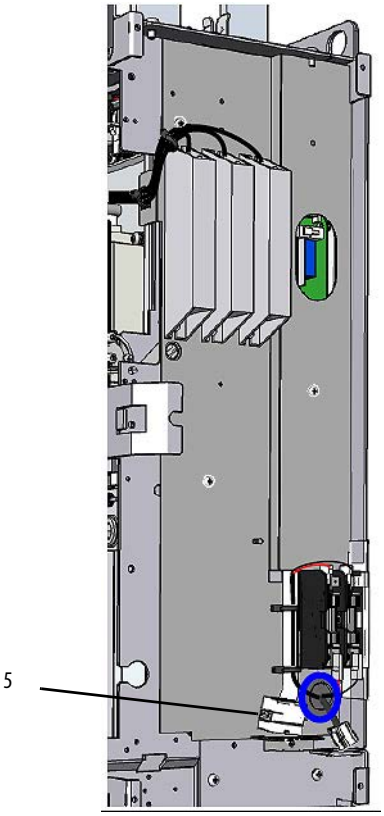
15. Remove the backing from the drive modification label and attach the label to the front of a main fan housing.

16. Write "DC fan retrofit" and the installation date on the label.

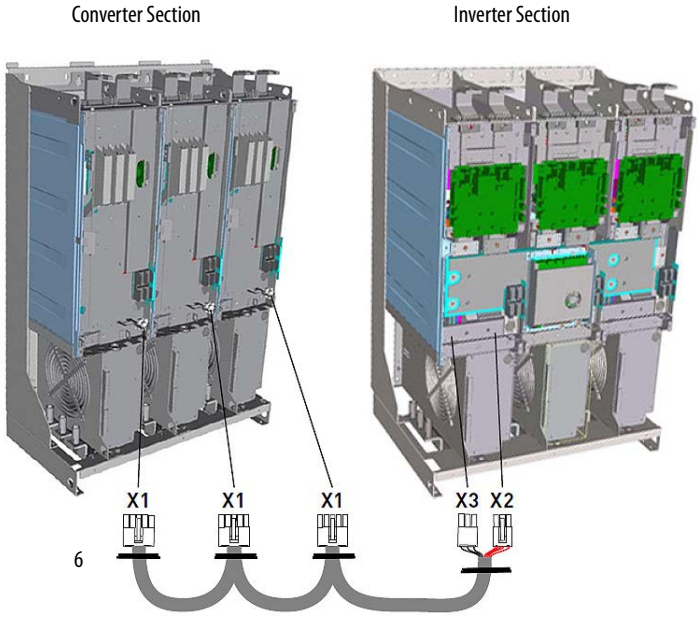
Converter Units

1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 134.
3. Move the control frame, and remove the screens, airflow plates, and protective covers. See Move the Control Frame, and Remove the Screens, Airflow Plates, and Protective Covers on page 135.
4. Remove the main fan assemblies. See Remove the Main Fan Assembly on page 143.
5. Disconnect the converter X1 wire harness (#1) from the connector and fan extension wire (#2) on the sheetmetal cover.

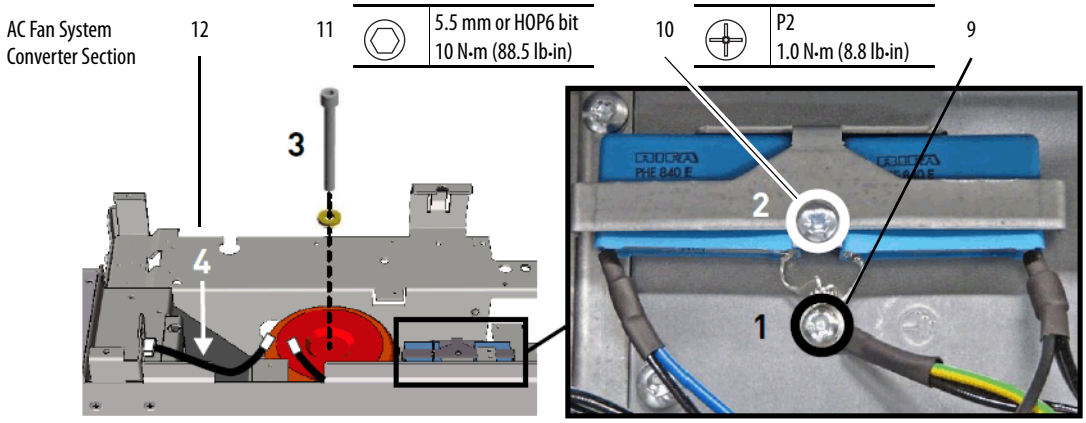
Series B converter shown



6. Remove the wire harness that connects the fans on the converter and inverter units.

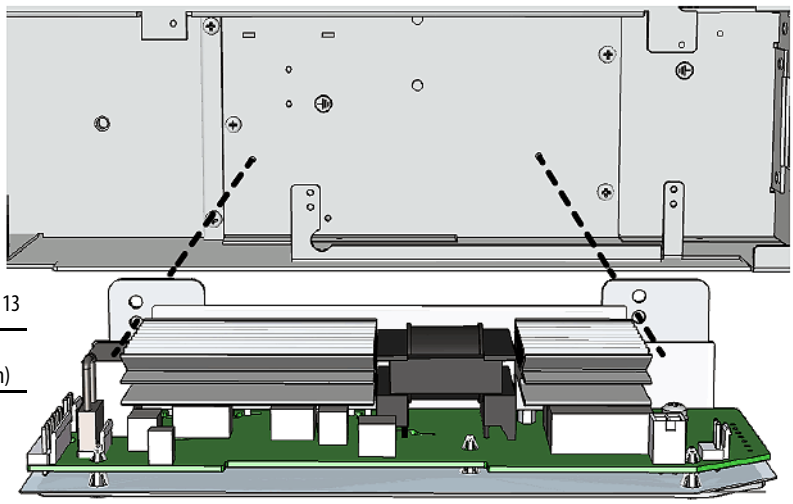


7. Remove the AC fan inverter assemblies. See Main AC Fan Inverter Circuit Board (20-VB00299) and DC Fan Power Supply Circuit Board (SK-H1-DCFANBD1) Removal and Installation (Converter Only) on page 148.
8. Remove the AC fan capacitor from the converter. See Main AC Fan Inverter Capacitor (SK-H1-FANCAP-F1314) Removal and Installation (Converter Only) on page 169.
9. Remove the M4 x 8 mm grounding screw (#1 in image) for the AC fan power conditioning capacitors from the drive.
10. Remove the M4 x 25 mm mounting screw (#2 in image) for the AC fan power conditioning capacitors from the drive.
11. Remove the M8 x 70 mm transformer mounting screw (#3 in image)
12. Remove the fan extension wire (#4 in image) and remove the power conditioning capacitors, transformer, and fan extension wire from the drive.



13. Install the DC fan inverter assemblies in the converter using the two M4 x 8 mm POZIDRIV screws supplied in the kit. See Main AC Fan Inverter Circuit Board (20-VB00299) and DC Fan Power Supply Circuit Board (SK-H1-DCFANBD1) Removal and Installation (Converter Only) on page 148 for details.

DC Fan System

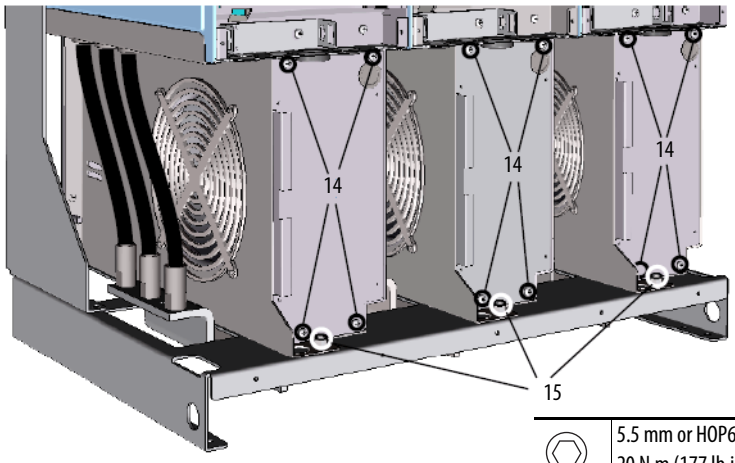


	PZ2 3.5 N•m (31.0 lb•in)

14. Install the main DC fans in the drive using the four M5 x 10 mm POZIDRIV screws.

15. Install the M8 x 20 mm hexagonal socket screws supplied with the kit in front of the main fans.

Note: Inverter section shown



14	PZ2 3.5 N•m (31.0 lb•in)
	5.5 mm or HOP6 bit 20 N•m (177 lb•in)

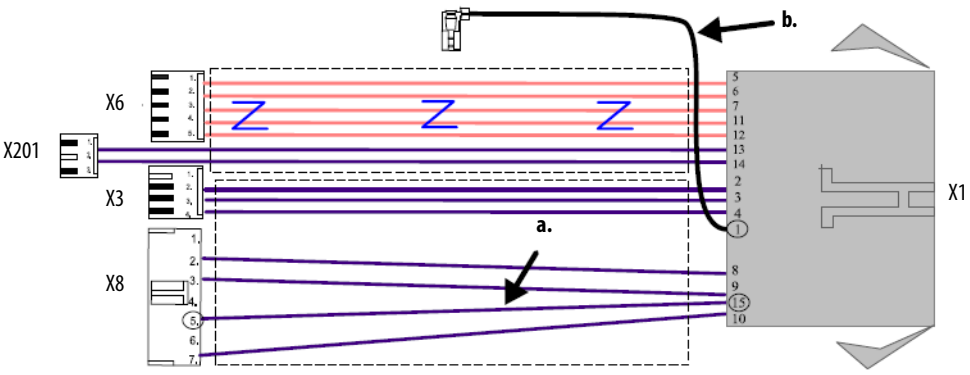
16. Connect the fan power supply cables to the connectors on the support brackets on the drive chassis.

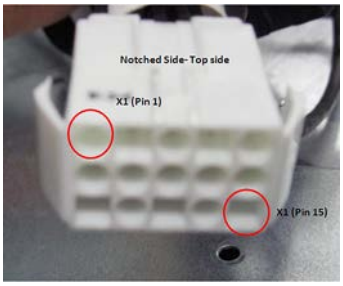
Fan Wire Harness Installation

17. Modify the fan wire harness.

a. Connect the 300 mm DC– wire between connectors X1, pin 15 and connector X8, pin 5.

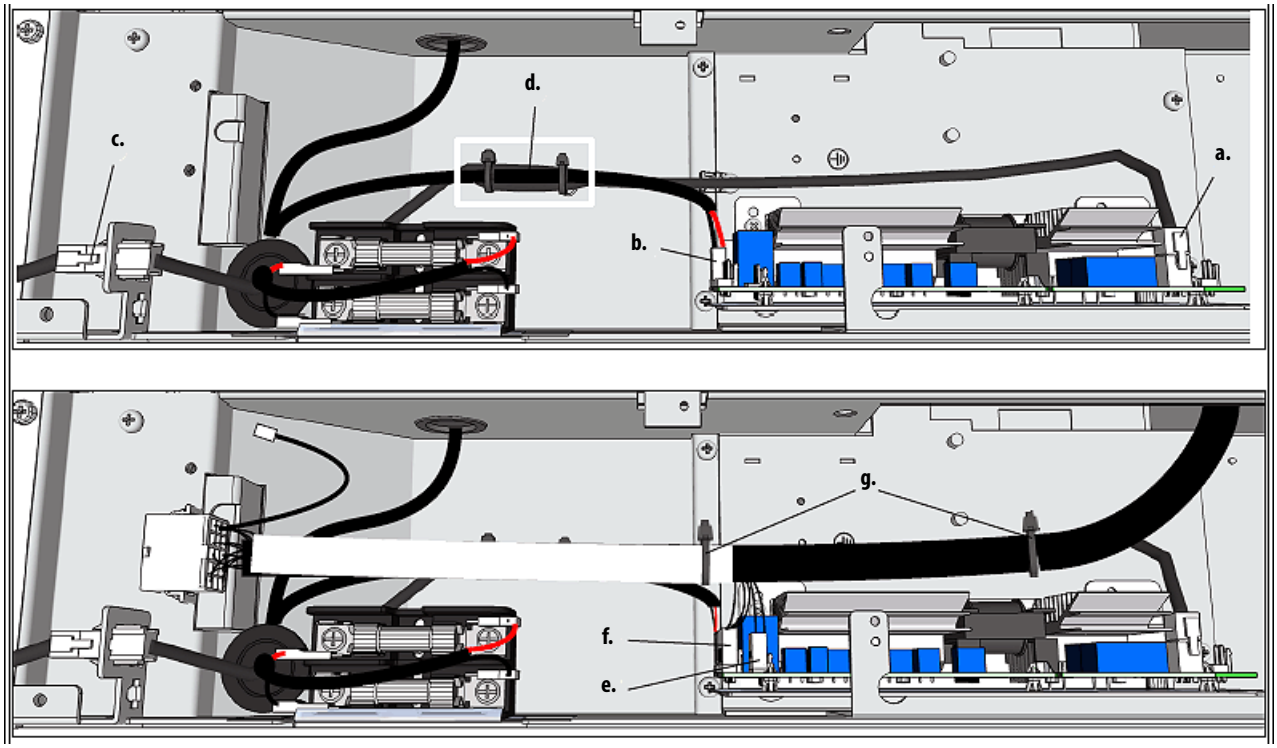
b. Connect the loose end of the 210 mm DC– wire to connector X1, pin 1.





18. Modify the converter internal wire connections.
    a. Connect the 48V DC fan extension wire supplied in the retrofit kit to connector X81 on the fan power supply.
    b. Connect the DC supply wire to connector X2 on the fan power supply.
    c. Connect the 48V DC fan extension wire to the fan supply cable.
    d. Use two of the cable ties supplied in the retrofit kit to tie together the excess 48VDC fan extension wire.
    e. Connect the fan control FB wire to connector X3 on the fan power supply.
    f. Connect the fan control wire to connector X8 on the fan power supply.
    g. Use two of the cable ties supplied in the retrofit kit to tie together the wire harness and fan power supply wire.

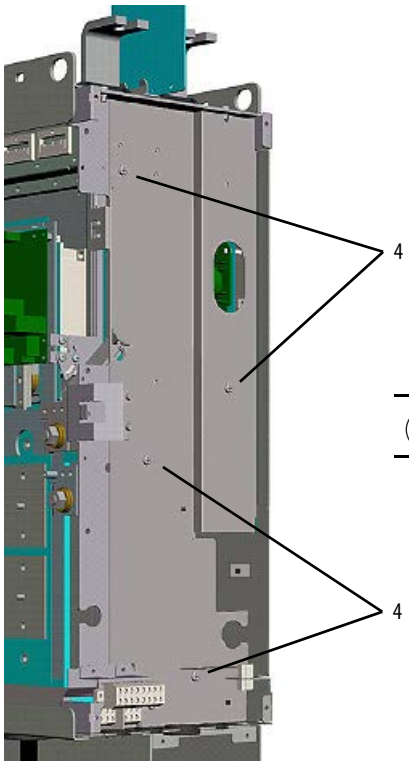
DC Fan System Converter Section



19. Reinstall the converter sheet metal cover.
20. Complete steps 5, 6, and 7 of this procedure in the reverse order.

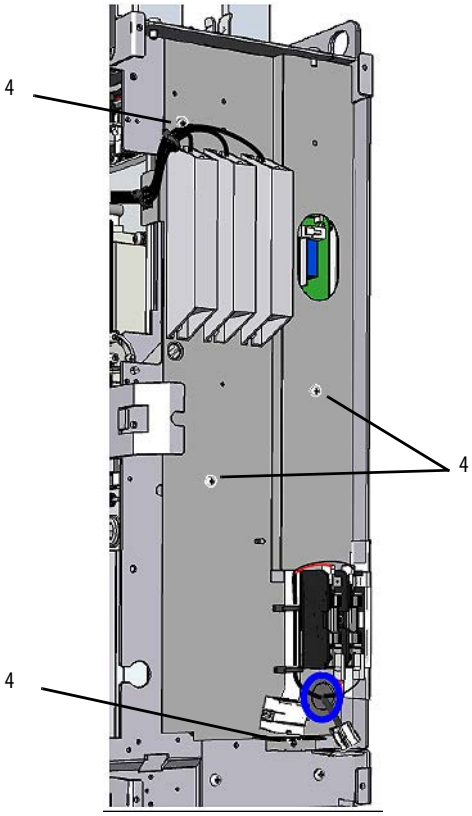
21. Install the fan circuit board protection cover using the four M4 x 8 mm POZIDRIV screws. Insert the rubber grommet into the hole in the cover.

Series A converter



	PZ1 0.9 N•m (8.0 lb•in)

Series B converter



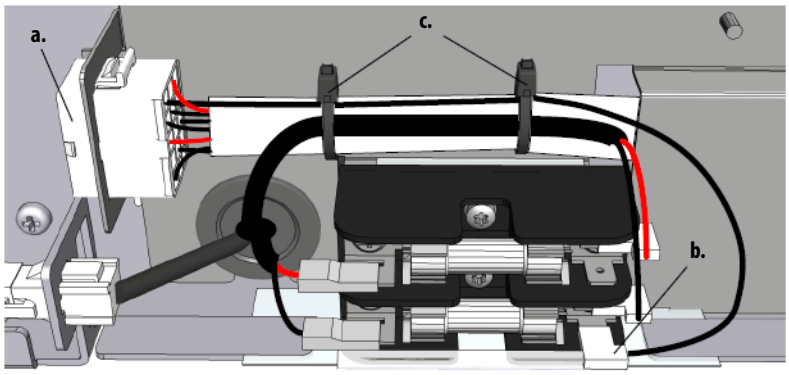
22. Modify and connect the converter external wire connections with the wires provided in the retrofit kit.

a. Place the converter wire harness connector X1 on the sheet cover connector holder.

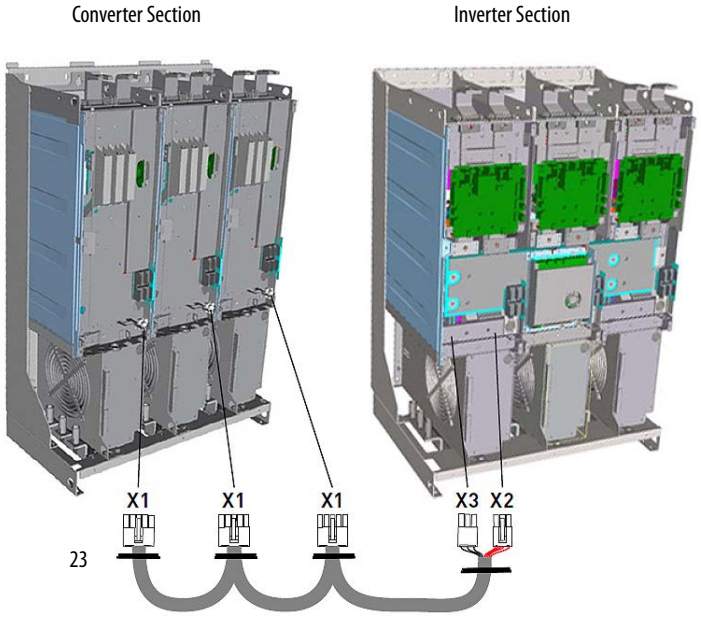
b. Connect the wire harness DC- wire on the fuse base.

c. Use two of the cable ties supplied in the retrofit kit to tie together the wire harness and DC wires.

Note: Converter section shown

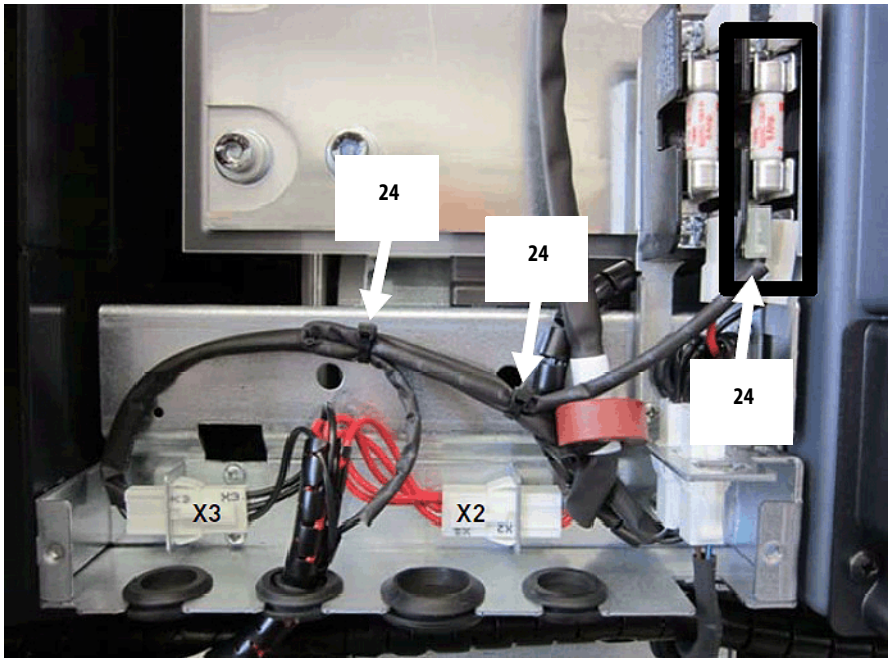


23. Connect the wire harness supplied in the retrofit kit that connects the fans on the converter and inverter units.



24. Connect the additional DC– wire on the new fan wire harness supplied in the retrofit kit to the DC– terminal on the inverter fuse base and secure the wire using two tie wraps.

Note: Converter section shown



25. Remove the backing from the drive modification label and attach the label to the front of a main fan housing.

26. Write “DC fan retrofit” and the installation date on the label.

Main AC Fan Inverter Capacitor (SK-H1-FANCAP-F1314) Removal and Installation (Converter Only)

Note: The AC fan inverter capacitor replacement kit (SK-H1-FANCAP-F1314) contains a new sheet metal bracket, hardware and fasteners, and a series B capacitor (identified in the table and shown below). The series B capacitor (50 mm dia. x 62 mm tall) is larger than the series A capacitor (35 mm dia. x 57 mm tall). If a series A capacitor is currently installed, always replace it with the new series B capacitor.

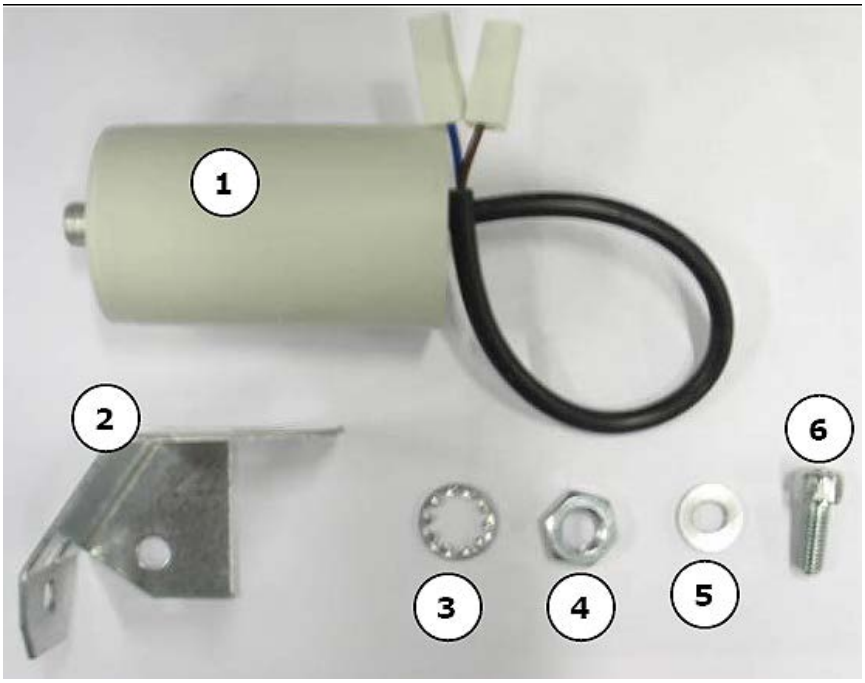
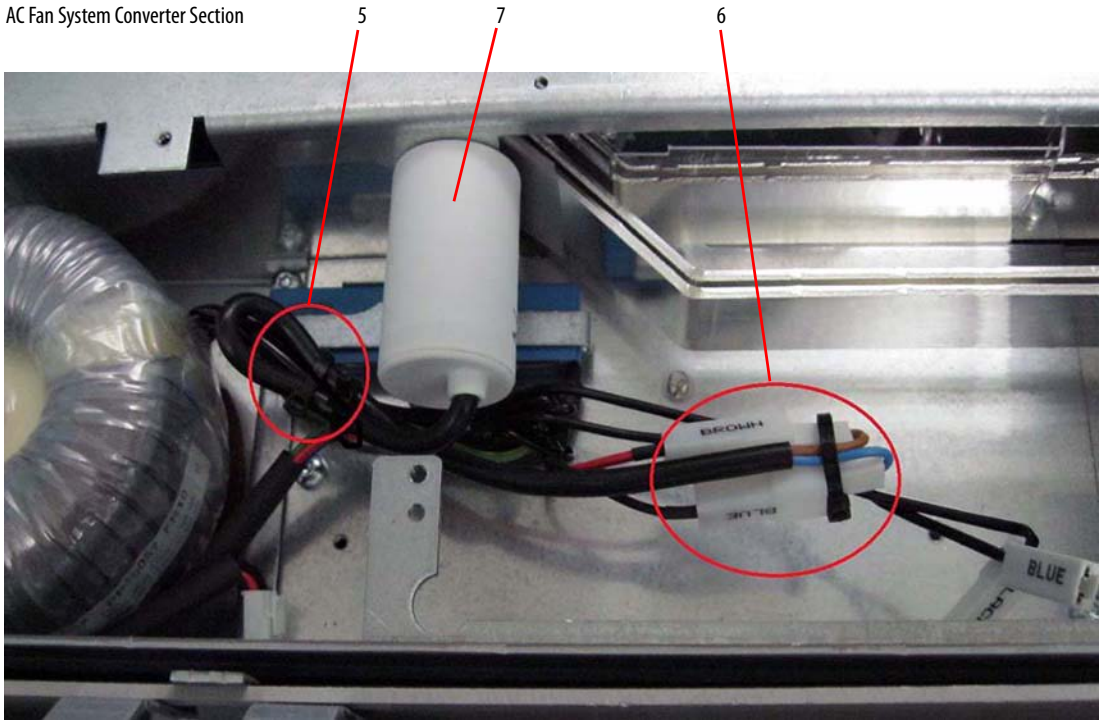


Photo ID#	Part Description	Quantity
1	Fan capacitor	1
2	Fan capacitor bracket	1
3	Bracket lock washer (M12)	1
4	Bracket nut (M12)	1
5	Bracket spring washer	1
6	Bracket hexagonal socket screw (M8 x 12 mm)	1

Follow these steps to remove and replace the main AC fan inverter capacitor.

1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 134.
3. Move the control frame, and remove the screens, airflow plates, and protective covers from the drive. See Move the Control Frame, and Remove the Screens, Airflow Plates, and Protective Covers on page 135.

4. Remove the main fan circuit board from the drive. See Main AC Fan Inverter Circuit Board (20-VB00299) and DC Fan Power Supply Circuit Board (SK-H1-DCFANBD1) Removal and Installation (Converter Only) on page 148.
5. Cut the cable ties that secure the fan capacitor wires to the wire bundle.
6. Disconnect the capacitor wires from the connectors marked “Blue” and “Brown”.
7. Unscrew the capacitor from the drive frame and remove the capacitor.



8. Install the main fan capacitor in the reverse order of removal.

Main AC Fan Inverter Capacitor (SK-H1-FANCAP-F1314) Removal and Installation (Inverter Only)

Note: The AC fan inverter capacitor replacement kit (SK-H1-FANCAP-F1314) contains a new sheet metal bracket, hardware and fasteners, and a series B capacitor (identified in the table and shown below). The series B capacitor (50 mm dia. x 62 mm tall) is larger than the series A capacitor (35 mm dia. x 57 mm tall). If a series A capacitor is currently installed, always replace it with the new series B capacitor.

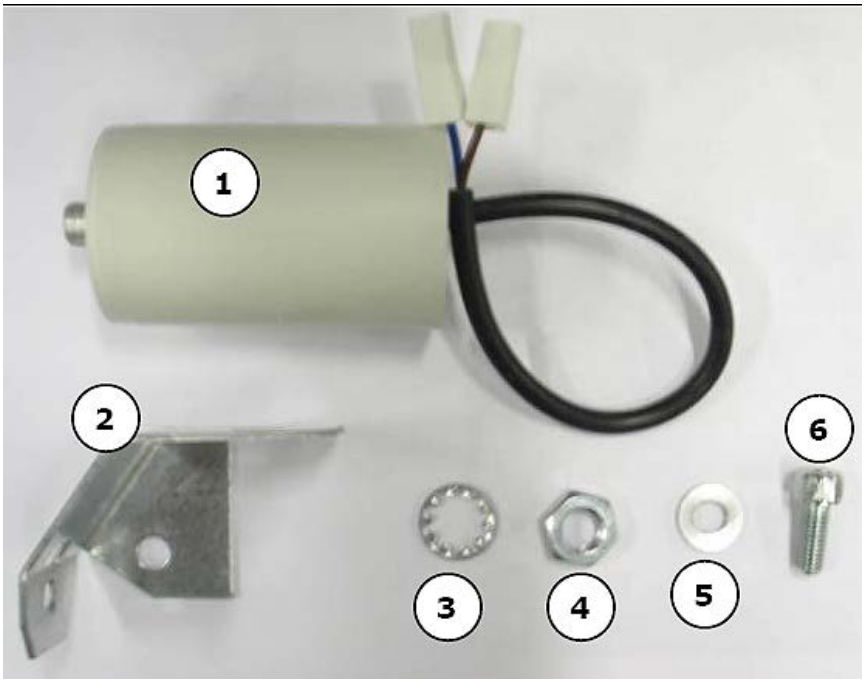


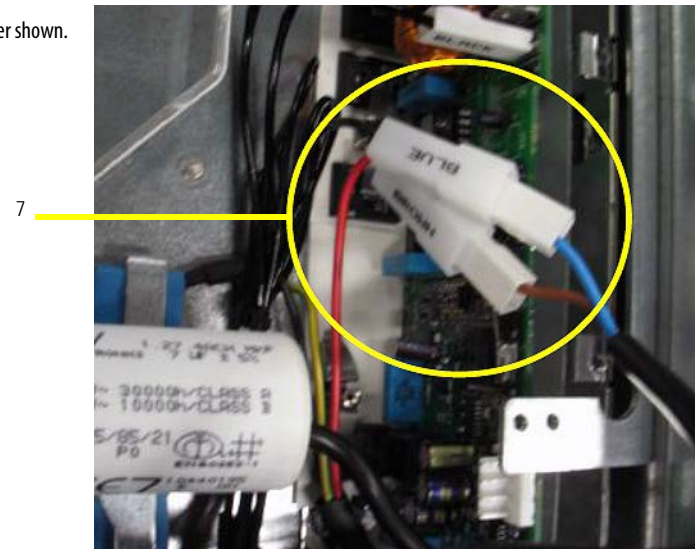
Photo ID#	Part Description	Quantity
1	Fan capacitor	1
2	Fan capacitor bracket	1
3	Bracket lock washer (M12)	1
4	Bracket nut (M12)	1
5	Bracket spring washer	1
6	Bracket hexagonal socket screw (M8 x 12 mm)	1

Follow these steps to remove and replace the main AC fan inverter capacitor.

1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 134.
3. Move the control frame, and remove the screens, airflow plates, and protective covers from the drive. See Move the Control Frame, and Remove the Screens, Airflow Plates, and Protective Covers on page 135.
4. Remove the main fan assemblies from the drive. See Remove the Main Fan Assembly on page 143.
5. Remove the AC fan inverter assemblies from the drive. See Removing the Main AC or DC Fan Power Supply Assemblies (Inverter Only) on page 145.
6. Cut the cable ties that secure the fan capacitor wires to the wire bundle.

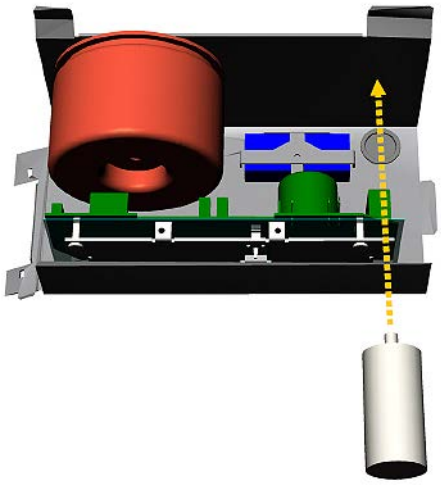
7. Disconnect the fan capacitor wires from the connectors marked “Brown” and “Blue.”

AC fan inverter shown.

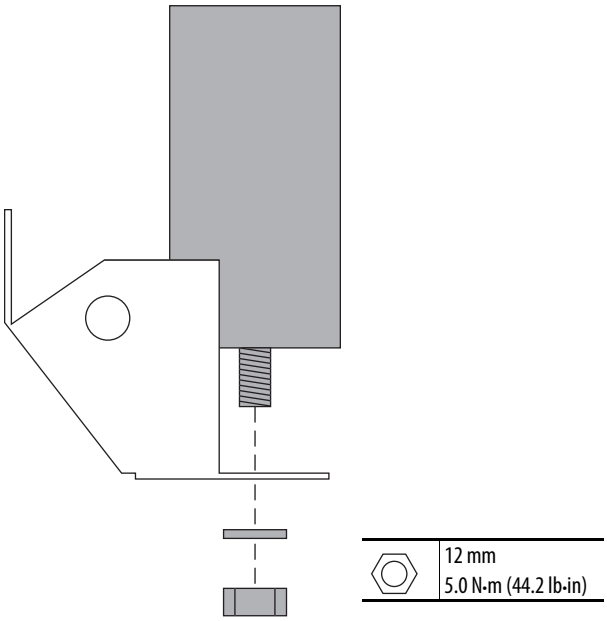


8. Unscrew and remove the existing fan capacitor from the inverter assembly.

AC fan inverter shown.



9. Secure the new fan capacitor to the bracket using the M12 hexagonal nut and lock washer provided.



10. If necessary, secure the fan capacitor bracket (and capacitor) to the drive chassis using the M8 x 12 mm hexagonal socket screw and spring washer provided. Tightening torque is 20 N•m (178 lb•in).

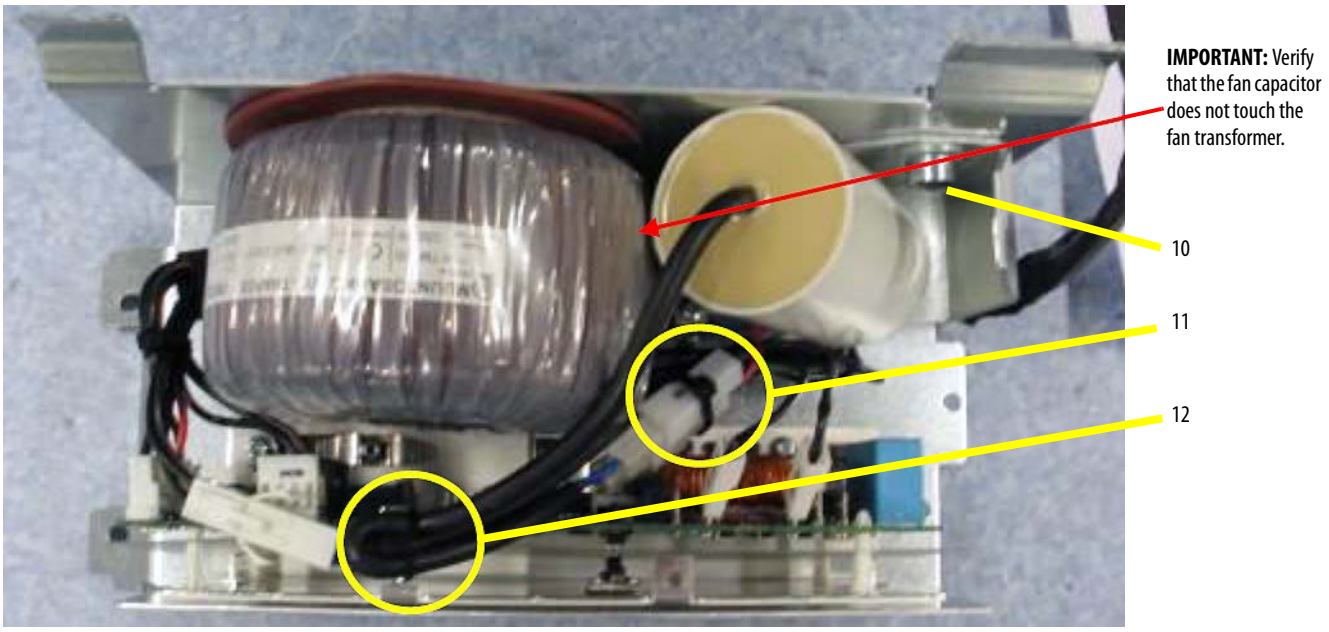
    Note: Secure the capacitor in a position that allows the maximum amount of clearance possible between the transformer and capacitor, ensuring that they DO NOT touch.

IMPORTANT	Verify that no wires are touching the sheet metal on the drive chassis.

11. Connect the new fan capacitor wires to the connectors marked “Brown” and “Blue.”
12. Secure the fan capacitor wires to the fan wire bundle using cable ties.

13. Complete the remaining installation in the reverse order of removal as detailed in the previous steps for the Inverter unit.

AC fan inverter system shown.



Main AC Fan (20-FI13300) and Main DC Fan (SK-Y1-DCFAN1) Assembly Removal and Installation

Follow these steps to measure the resistance between the main fan supply wires and remove and replace the main fan, if necessary.

Notes:

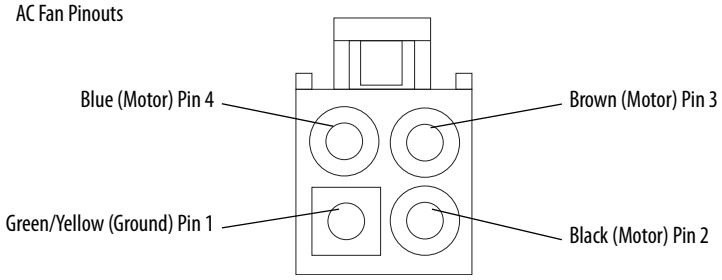
- The DC fan replacement kit only contains the fan motor and impeller assembly. Therefore, the sheet metal housing for the fan must be reused.
- To identify which fan is installed in your drive, see Fan Inverter System Block Diagrams on page 257.

1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 134.
3. Move the control frame, and remove the screens, airflow plates, and protective covers from the drive. See Move the Control Frame, and Remove the Screens, Airflow Plates, and Protective Covers on page 135.
4. Remove the main fan assemblies from the drive. See Remove the Main Fan Assembly on page 143.
5. Using the appropriate table below, measure the resistance between the fan supply wires.

AC Fan: If the measurements are not similar to those in this table, replace the AC fan.

Connection wires	Resistance ±5%
Black-Brown	62 Ω
Brown-Blue	36 Ω
Blue-Black	27 Ω
Green-chassis	0 Ω

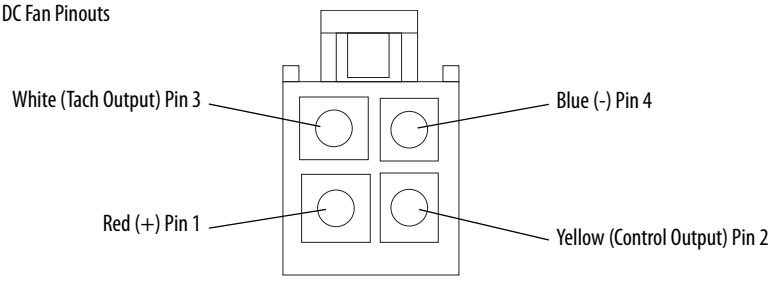
AC Fan Pinouts



DC Fan: If the measurements are not similar to those in this table, replace the DC fan.

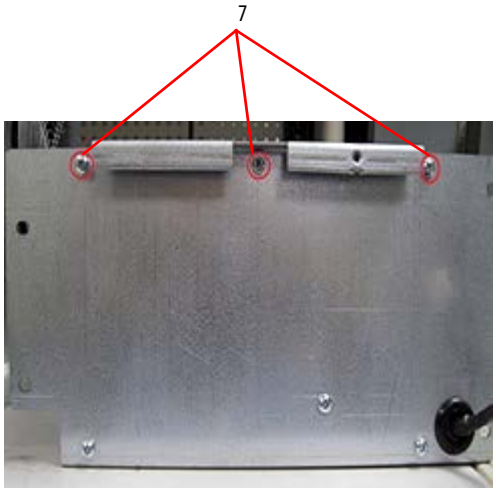
Connection wires	Resistance ±5%
Red-Blue	∞ Ω
Red-White	∞ Ω
White-Yellow	∞ Ω
Blue-White	∞ Ω

DC Fan Pinouts



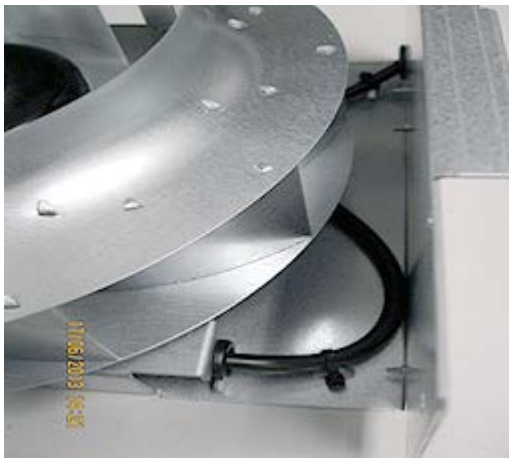
6. For AC fan systems, install the new fan assembly in the reverse order of removal. For DC fan systems, complete the remaining steps.

7. Remove the three M4 x 8 mm POZIDRIV screws from the front of the fan housing.



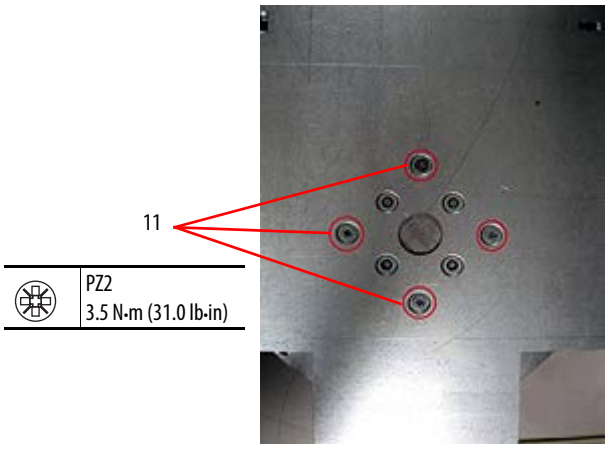
8. Remove the two M4 x 5 mm flathead POZIDRIV screws and remove the sheet metal side.

9. Cut the tie wraps that secure the fan cable to the sheet metal housing.
10. Remove the grommets from the holes in the sheet metal.



11. Remove the four screws that secure the fan to the sheet metal housing and remove the fan. Retain the sheet metal housing for reuse.

    Note: The Main AC and DC fans have different mounting hardware and hole dimensions. The AC fan uses four M4 x 8 mm screws that are spaced 40 mm apart on the housing. The DC fan uses four M5 x 10 mm screws that are spaced 65 mm apart on the housing. Based on the manufacturing date, the sheet metal housing was fabricated for either an AC fan, a DC fan, or both.



12. Install the new main DC fan in reverse order. Verify that the fan turns easily and does not make contact with the sheet metal housing or fan cable before installing the fan assembly in the drive.

Notes:

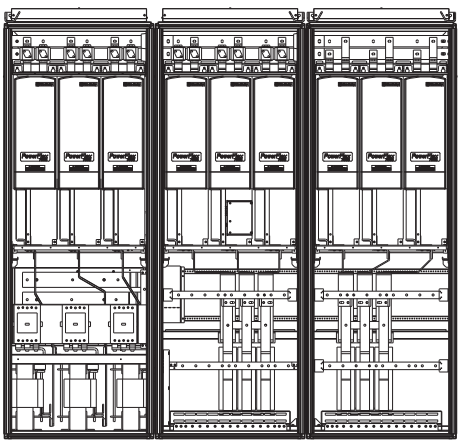
PowerFlex 700H and 700S Drives - Frame 14 Procedures

This chapter contains spare part information and procedures for testing and replacing fan system components for frame 14 PowerFlex 700H and PowerFlex 700S drives. See Appendix A PowerFlex 700H and 700S Diagnostic Procedures on page 255 for additional component test procedures.

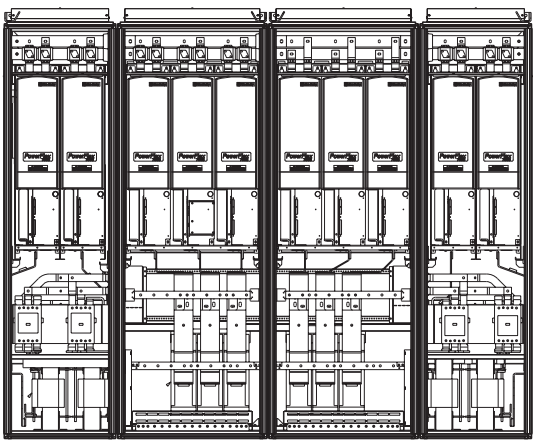
Frame 14 Drive Configurations

For frame 14 drives, there are different configurations based on the power rating. For drives with less than 1500A, there are 3 converter sections and 6 inverter sections. For drives greater than 1500A, there are 4 converter sections and 6 inverter sections.

Frame 14 1500A Drive



Frame 14 Drive Above 1500A



Frame 14 Fan System Spare Parts

Frame 14 PowerFlex 700H and PowerFlex 700S drives are essentially two parallel frame13 drives. Therefore, the spare parts are identical to the frame 13, with the exception that there are twice as many parts required. The procedures for replacing frame 14 fan system components are also the same as those for frame 13 drives.

See Frame 13 Fan System Replacement Procedures on page 134 for detailed replacement procedures. See Frame 14 System Diagrams on page 182 for more information.

AC Fan Systems

See Available Fan System Kits starting on page 277 for an illustration of the spare part kit contents.

Input Voltage:	Catalog Number:	Part Name:	Quantity Per Drive: (2)		Original Vendor and Model No.
400/480	20-FI13301	AC fan inverter assembly (includes circuit board, fuses, capacitor, isolation transformer, and mounting hardware)	DC Input	6	
			AC 1770/2150 Amp	10	
			AC 2700 Amp	12	
	20-VB00299	AC fan inverter circuit board (1)	DC Input	6	
			AC 1770/2150 Amp	10	
			AC 2700 Amp	12	
	20-FI13300	Main AC fan assembly	DC Input	6	
			AC 1770/2150 Amp	10	
			AC 2700 Amp	12	
	SK-H1-FANCAP-F1314	AC fan capacitor kit	DC Input	6	
			AC 1770/2150 Amp	10	
			AC 2700 Amp	12	
	20-PP20300	Fuse holder for main fan system fuses	DC Input	6	Ferraz Shawmut 30322
			AC 1770/2150 Amp	10	
			AC 2700 Amp	12	
	20-PP20202	Fuse for fan system	DC Input	12	Ferraz Shawmut ATQ8 (3)
			AC 1770/2150 Amp	20	
			AC 2700 Amp	24	
	20-PP1096	Cooling fan for ASIC board assembly	All	2	Sinwan SD5012PT- 24H (4)
600/690	20-FI13301	AC fan inverter assembly (includes circuit board, fuses, capacitors, isolation transformer, and mounting hardware)	DC Input	6	
			AC 1500 Amp	9	
			AC 1900/2250 Amp	10	
	20-VB00299	AC fan inverter circuit board (1)	DC Input	6	
			AC 1500 Amp	9	
			AC 1900/2250 Amp	10	
	20-FI13300	Main AC fan assembly	DC Input	6	
			AC 1500 Amp	9	
			AC 1900/2250 Amp	10	
	SK-H1-FANCAP-F1314	AC fan capacitor kit	DC Input	6	
			AC 1500 Amp	9	
			AC 1900/2250 Amp	10	
	20-PP20300	Fuse holder for fan inverter fuses	DC Input	6	Ferraz Shawmut 30322
			AC 1500 Amp	9	
			AC 1900/2250 Amp	10	
	20-PP20202	Fuse for fan system	DC Input	12	Ferraz Shawmut ATQ8 (3)
			AC 1500 Amp	18	
			AC 1900/2250 Amp	20	
	20-PP1096	Cooling fan for ASIC board assembly	All	2	Sinwan SD5012PT- 24H (4)

(1) The same fan inverter circuit board is used for all drive voltage classes.
(2) The drives are identified by voltage class (400/480 or 600/690) and then by the current rating - 1500…2700 A
(3) The factory default fuses are Ferraz Shawmut ATQ8, 8 A fuses. Older drives may contain Bussman 6 A fuses.
(4) The part may not contain wires, connectors, or mounting hardware when bought directly from vendor.

DC Fan Systems

See Available Fan System Kits starting on page 277 for an illustration of the spare part kit contents.

Input Voltage:	Catalog Number:	Part Name:	Quantity Per Drive: [3]		Original Vendor and Model No.
400/480	SK-H1-DCFANBD1 [1]	Main DC fan power supply circuit board	DC Input	6	
			AC 1770/2150 Amp	10	
			AC 2700 Amp	12	
	SK-Y1-DCFAN1	Main DC fan assembly	DC Input	6	
			AC 1770/2150 Amp	10	
			AC 2700 Amp	12	
	20-PP20300	Fuse holder for main fan system fuses	DC Input	6	Ferraz Shawmut 30322
			AC 1770/2150 Amp	10	
			AC 2700 Amp	12	
	20-PP20202	Fuse for fan system	DC Input	12	Ferraz Shawmut ATQ8 [4]
			AC 1770/2150 Amp	20	
			AC 2700 Amp	24	
	SK-Y1-DCFANRETROFIT-F13	AC to DC fan system retrofit kit for frame 14	DC Input	2	
	SK-H1-DCFANRETROFIT-F14B	AC to DC fan system retrofit kit for frame 14	AC 1770/2150 Amp	1	
	SK-H1-DCFANRETROFIT-F14B [2]	AC to DC fan system retrofit kit for frame 14	AC 2700 Amp	1	
	SK-H1-DCFANRETROFIT-CONV [2]		AC 2700 Amp	2	
	20-PP1096	Cooling fan for ASIC board assembly	All	2	Sinwan SD5012PT-24H [5]
600/690	SK-H1-DCFANBD1 [1]	Main DC fan power supply circuit board	DC Input	6	
			AC 1500 Amp	9	
			AC 1900/2250 Amp	10	
	SK-Y1-DCFAN1	Main DC fan assembly	DC Input	6	
			AC 1500 Amp	9	
			AC 1900/2250 Amp	10	
	20-PP20300	Fuse holder for fan system fuses	DC Input	6	Ferraz Shawmut 30322
			AC 1500 Amp	9	
			AC 1900/2250 Amp	10	
	20-PP20202	Fuse for fan system	DC Input	12	Ferraz Shawmut ATQ8 [4]
			AC 1500 Amp	18	
			AC 1900/2250 Amp	20	
	SK-Y1-DCFANRETROFIT-F13	AC to DC fan system retrofit kit for frame 14	DC Input	2	
	SK-H1-DCFANRETROFIT-F14A	AC to DC fan system retrofit kit for frame 14	AC 1500 Amp	1	
	SK-H1-DCFANRETROFIT-F14B	AC to DC fan system retrofit kit for frame 14	AC 1900/2250 Amp	1	
	20-PP1096	Cooling fan for ASIC board assembly	All	2	Sinwan SD5012PT-24H [5]

(1) Circuit board only, no sheetmetal bracket.
(2) For 400/480V AC Input, 2700 A drives, you must order both retrofit kits.
(3) The drives are identified by voltage class (400/480 or 600/690) and then by the current rating - 1500…2700 A.
(4) The factory default fuses are Ferraz Shawmut ATQ8, 8 A fuses. Older drives may contain Bussman 6 A fuses.
(5) The part may not contain wires, connectors, or mounting hardware when bought directly from vendor.

Frame 14 System Diagrams

The PowerFlex 700H and PowerFlex 700S frame 14 drive can be configured with either AC or DC (common bus) input voltage applied. The AC input drives have both parallel converter and parallel inverter sections, while the DC input drives have only parallel inverters. The schematics will change based on this hardware configuration. Table 4 provides a list of system diagrams applicable to each drive configuration.

Table 4 - Drive Configurations and Applicable System Diagrams

Drive Input Voltage	Drive Hardware Section	AC Fan Systems	DC Fan Systems
AC	System	Figure 18 on page 183	
	Converter	n/a	n/a
	Inverter	n/a	n/a
DC	System	Figure 19 on page 184	
	Converter	n/a	n/a
	Inverter	n/a	n/a

Please see Frame 13 AFE Schematic Diagrams on page 125 for more information.

Figure 18 - Frame 14 AC Input Drive Converter and Inverter Sections

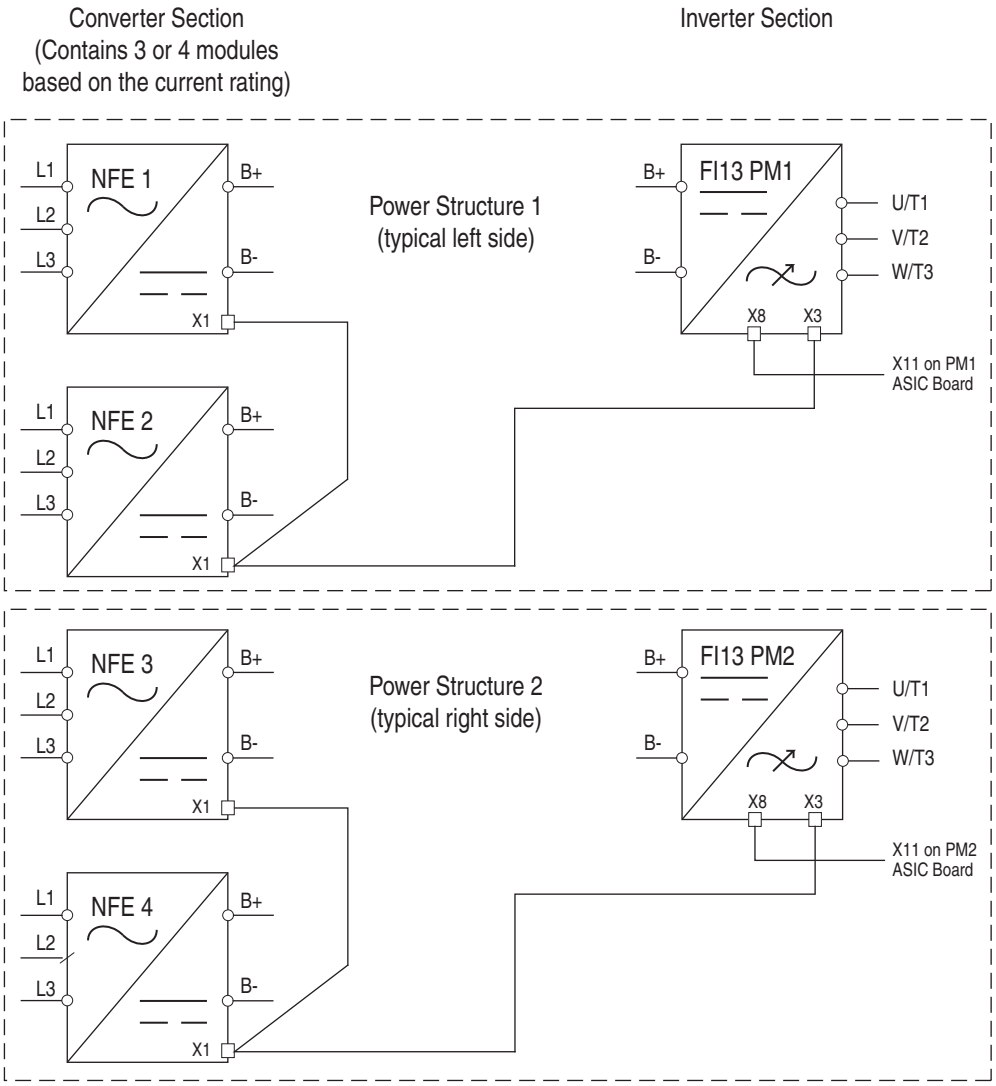
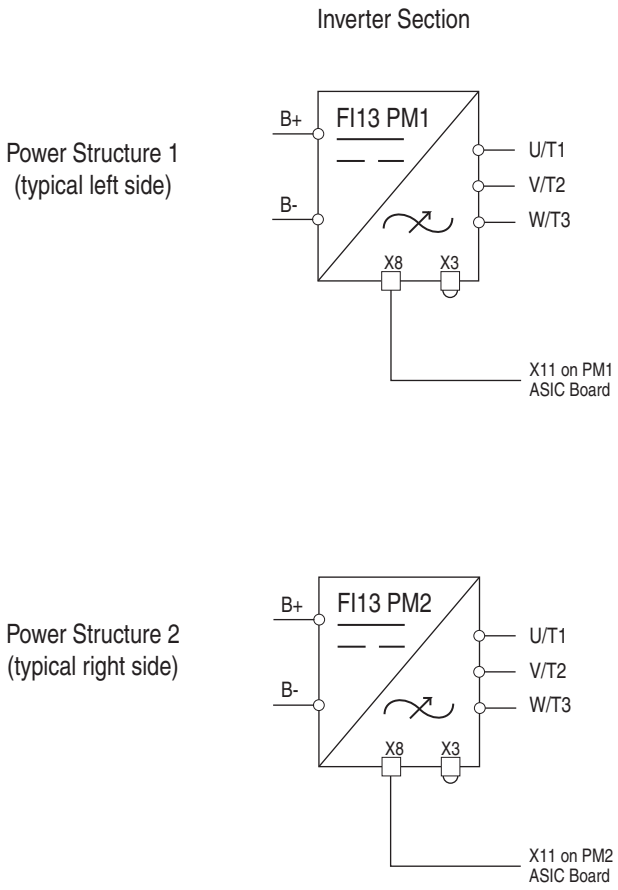


Figure 19 - Frame 14 DC Input Drive Inverter Sections



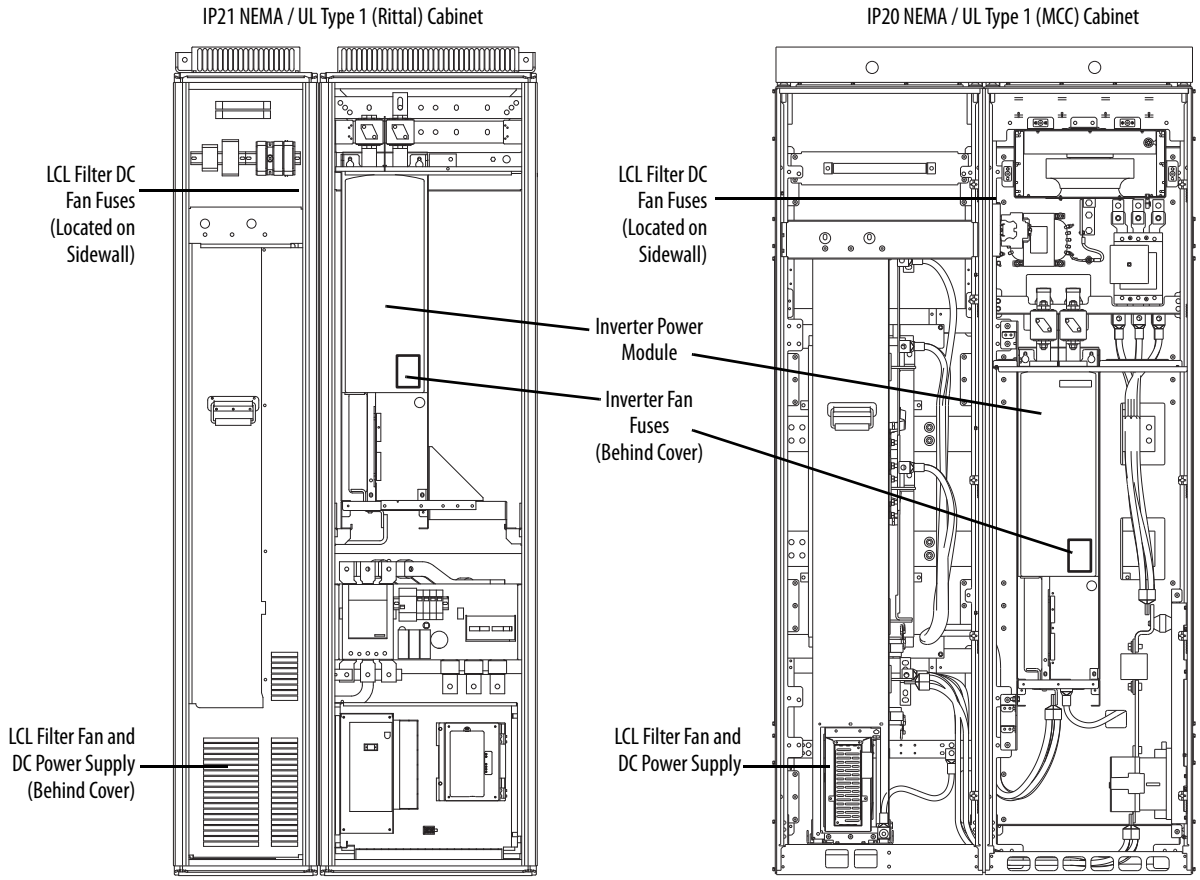
PowerFlex 700AFE Drive - Frame 10 Procedures

This chapter contains spare part information and procedures for testing and replacing fan system components for frame 10 PowerFlex 700AFE drives. See Appendix A PowerFlex 700H and 700S Diagnostic Procedures on page 255 for additional component test procedures.

Frame 10 AFE Drive Configurations

The frame 10 AFE drive consists mainly of a LCL filter section and a converter section. The converter section is actually an inverter section designed to either supply DC bus voltage or regenerate power back to the AC line. For clarity of instructions, the converter will be referred to as a power structure throughout this chapter.

Figure 20 - Frame 10 AFE System



The PowerFlex 700AFE is available in several configurations:

- The IP00 NEMA / UL Type Open drive is an open style frame that is available through the Rockwell Automation Systems and Solutions Business. This configuration is repackaged into a cabinet structure that is consistent with the system.
- The IP20 NEMA / UL Type 1 (MCC) enclosure (finger safe and dripping water protection).
- The IP21 NEMA / UL Type 1 (Rittal) enclosure (finger safe and no water protection).

The spare parts listed in this manual fit any of the cabinet types listed above. The procedures contained in this document pertain to each drive configuration listed above. Only the enclosure and method to get to the components may vary slightly. For IP20 and IP21 enclosures access procedures, see the PowerFlex 700AFE Frame 10 Hardware Service Manual, publication 20Y-TG001.

Frame 10 AFE Fan System Spare Parts

AC Fan Systems

See Available Fan System Kits starting on page 277 for an illustration of the spare part kit contents.

Voltage	Cat. No.	Part Description	Quantity per Drive	Original Vendor and Model Number
Power Structure	20-FI13300	Main AC fan assembly	1	
	20-FI13301	AC fan inverter assembly (includes PCB, fuses capacitor, isolation transformer, and mounting hardware)	1	
	20-PP1096	Cooling fan for ASIC board assembly	1	Sinwan SD5012PT-24H (1)
	20-PP20202 (2)	Fuse for fan system	2	Ferraz Shawmut ATQ8 (2)
	20-PP20300	Fuse holder for main fan system fuses	1	Ferraz Shawmut 30322
	20-VB00299	AC fan inverter circuit board	1	
	SK-H1-FANCAP-F1314	AC fan capacitor kit	1	

(1) The part may not contain wires, connectors, or mounting hardware when bought directly from vendor.
(2) The factory default fuses are Ferraz Shawmut ATQ8, 8 A fuses. Older drives may contain Bussman 6 A fuses.

DC Fan Systems

See Available Fan System Kits starting on page 277 for an illustration of the spare part kit contents.

Voltage	Cat. No.	Part Description	Quantity per Drive / Filter	Original Vendor and Model Number
Power Structure	SK-H1-DCFANBD1 (1)	Main DC fan power supply circuit board	1	
	SK-Y1-DCFAN1	Main DC fan assembly	1	
	20-PP20300	Fuse holder for main fan system fuses	1	Ferraz Shawmut 30322
	20-PP20202	Fuse for fan system	2	Ferraz Shawmut ATQ8 (4)
	SK-Y1-DCFANRETROFIT-F10	Retrofit fan kit for frame 10 AFE	1	
	20-PP1096	Cooling fan for ASIC board assembly	1	Sinwan SD5012PT-24H (5)
LCL Filter	SK-Y1-DCPS1-D460 (2)	DC fan power supply assembly (older version)	1	
	SK-Y1-DCPS1-F325 (2)		1	
	SK-Y1-DCPS2-F10	DC fan power supply circuit board upgrade kit (newer version)	1	
	SK-H1-DCFANBD1 (1)(3)	Main DC fan power supply circuit board	1	
	SK-Y1-HF1-DF	LCL DC fan system wire kit	1	
	SK-Y1-DCFAN1	Main DC fan assembly	1	
	20-PP20300	Fuse holder for fan system fuses	1	Ferraz Shawmut 30322
	20-PP20202 or SK-Y1-F11-F10	Fuse for fan system	2	Ferraz Shawmut ATQ8 (4)

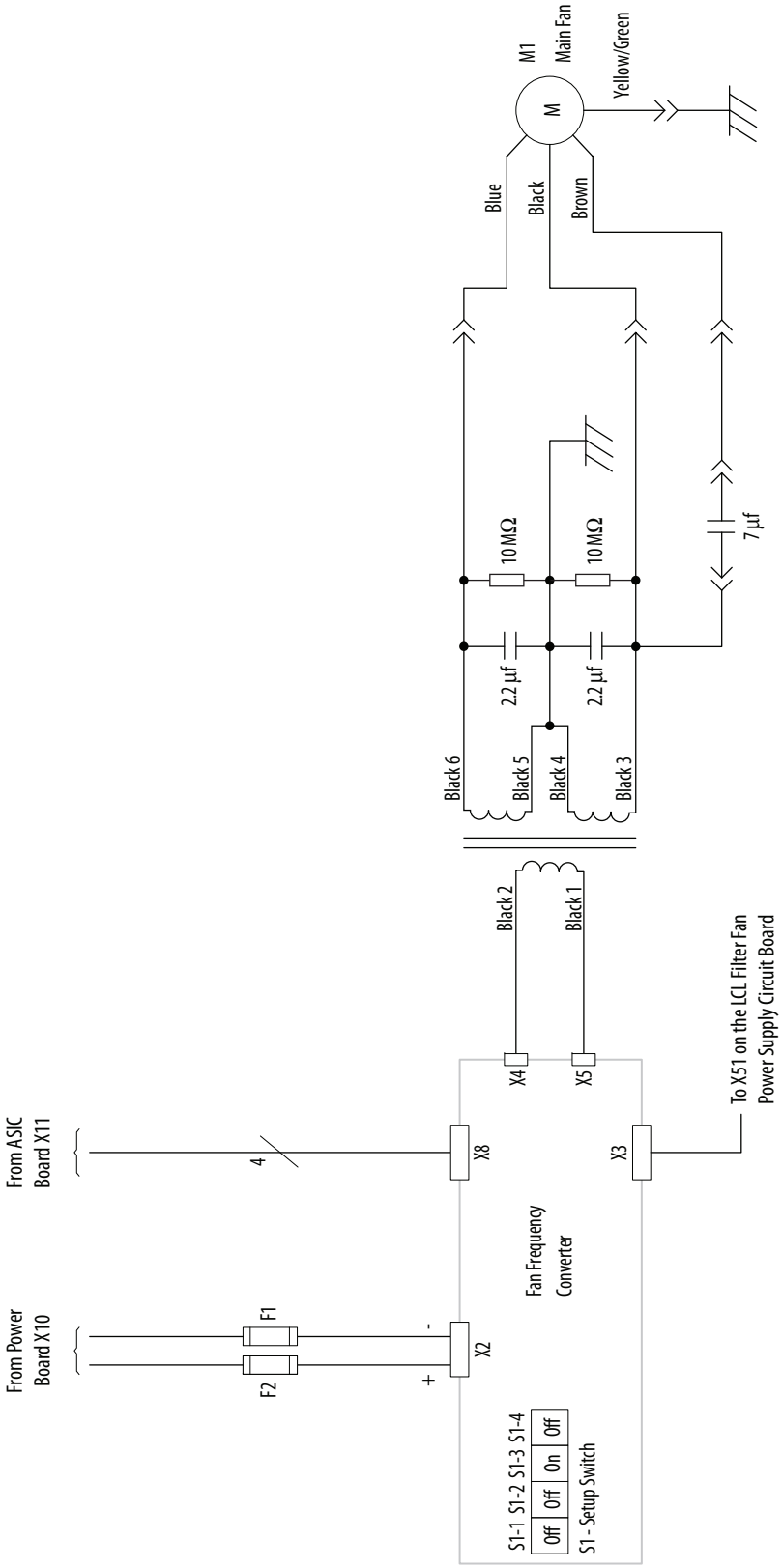
(1) Circuit board only, no sheet metal bracket.
(2) This kit is replaced by the SK-Y1-DCPS2-F10 kit.
(3) Only use this circuit board if you are replacing a newer version circuit board (same catalog number).
(4) The factory default fuses are Ferraz Shawmut ATQ8, 8 A fuses. Older drives may contain Bussman 6 A fuses.
(5) The part may not contain wires, connectors, or mounting hardware when bought directly from vendor.

Tools Needed for Frame 10 AFE Fan System Repairs

- #2 POZIDRIV screwdriver
- 5.5 mm hex key
- 10 mm and 19 mm socket wrench
- T20 and T25 hexalobular screwdriver
- Fuse puller
- Nose pliers
- Wire cutter
- Optional: PowerFlex 700H and 700S maintenance stand (cat. No. 20-MAINSTND)

Frame 10 AFE Fan System Schematic Diagrams

Figure 21 - Frame 10 AFE (Power Module Section) AC Fan System Wiring Schematic Diagram



Switch	Setting	To indicate the following:
S1	Off	50 Hz fan motor frequency
S2	Off	220 V AC motor voltage
S3	On	230 V AC motor voltage
S4	Off	Frame size 9…14

Figure 22 - Frame 10 AFE (Power Structure) DC Fan System Wiring Schematic Diagram

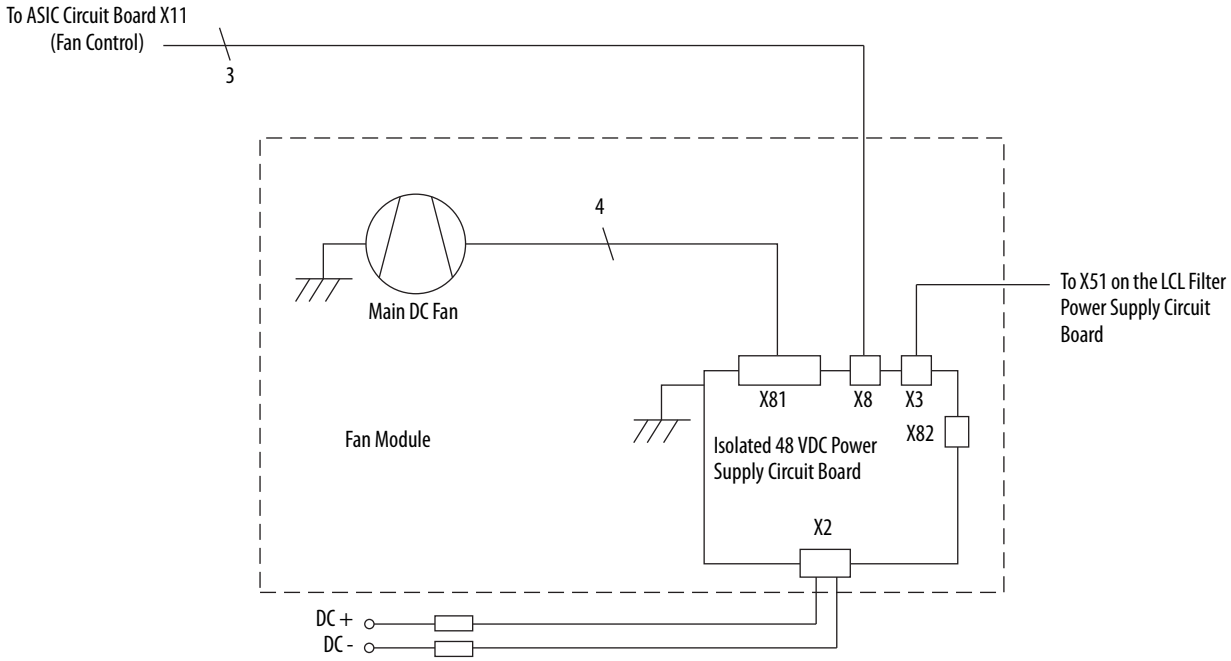
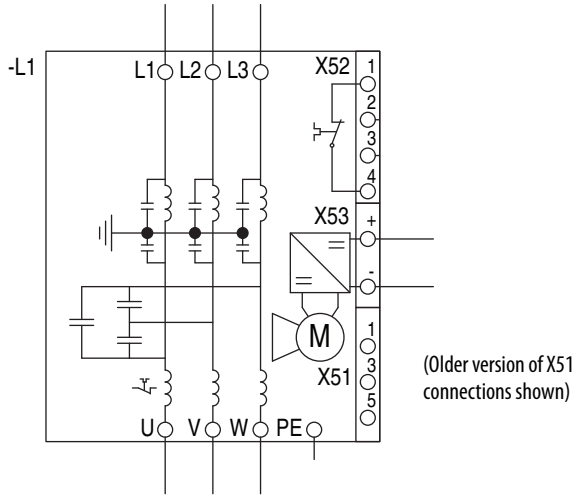
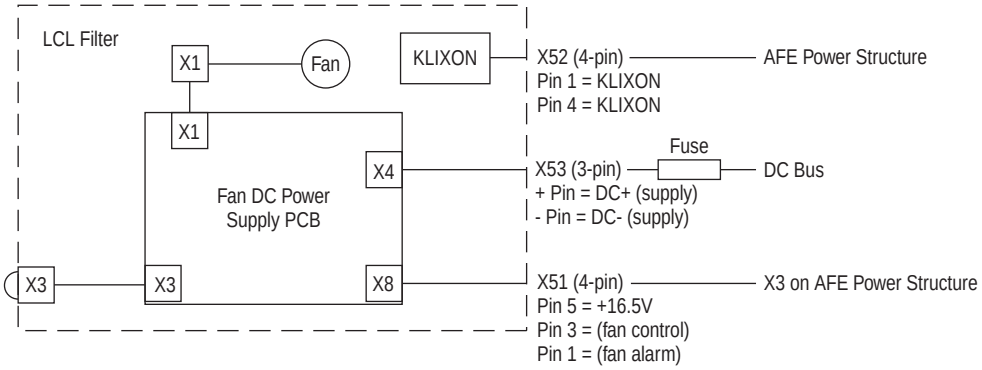


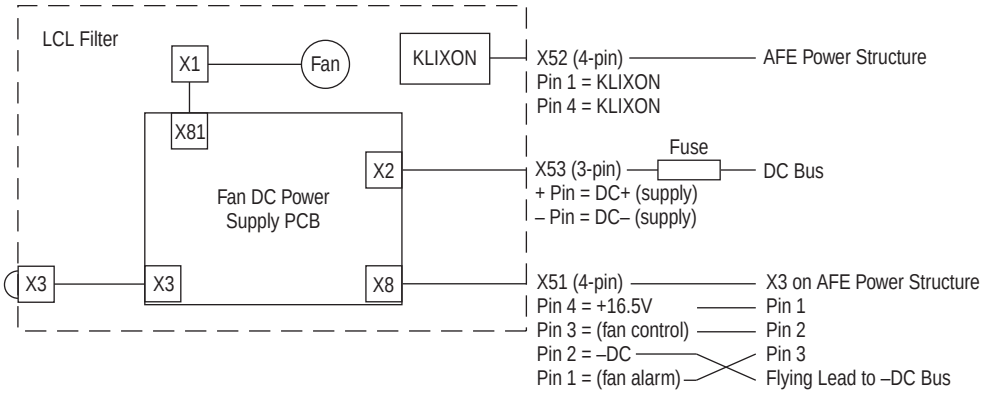
Figure 23 - Frame 10 AFE (LCL Filter Section) DC Fan System Wiring Schematic Diagram



LCL Filter DC Fan System Wiring -Older Version



LCL Filter DC Fan System Wiring -Newer Version



Frame 10 AFE Fan System Replacement Procedures

Replacement procedures for these frame 10 fan system parts are included in this chapter.

Power Structure Section

Replacement procedures for these frame 10 AFE power structure fan system parts are included in this chapter.

Cat. No.	Part Description	Page
20-PP01096	60 mm Cooling fan for ASIC board assembly	196
20-PP20202	Fuse for fan system	197
20-PP20300	Fuse holder for main fan system fuses	197
20-FI13300	Main AC fan inverter assembly	198
20-FI13301	Main AC fan inverter assembly	199
20-VB00299	Main AC fan inverter circuit board	201
SK-H1-DCFANBD1	Main DC fan power supply circuit board	202
SK-Y1-DCFANRETROFIT-F10	AC to DC fan system retrofit kit	203
SK-H1-FANCAPF1314	Main AC fan inverter capacitor	207
20-FI13300	Main AC fan assembly	210
SK-Y1-DCFAN1	Main DC fan assembly	210

Remove Power from the AFE

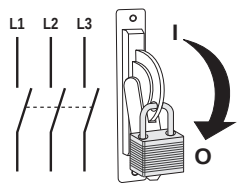
ATTENTION: To avoid an electric shock hazard, verify that the voltage on the bus capacitors has discharged completely before servicing. Check the DC bus voltage at the Power Terminal Block by measuring between the +DC and -DC terminals, between the +DC terminal and the chassis, and between the -DC terminal and the chassis. The voltage must be zero for all three measurements.

Remove power before making or breaking cable connections. When you remove or insert a cable connector with power applied, an electrical arc may occur. An electrical arc can cause personal injury or property damage by:

- sending an erroneous signal to your system's field devices, causing unintended machine motion
- causing an explosion in a hazardous environment

Electrical arcing causes excessive wear to contacts on both the module and its mating connector. Worn contacts may create electrical resistance.

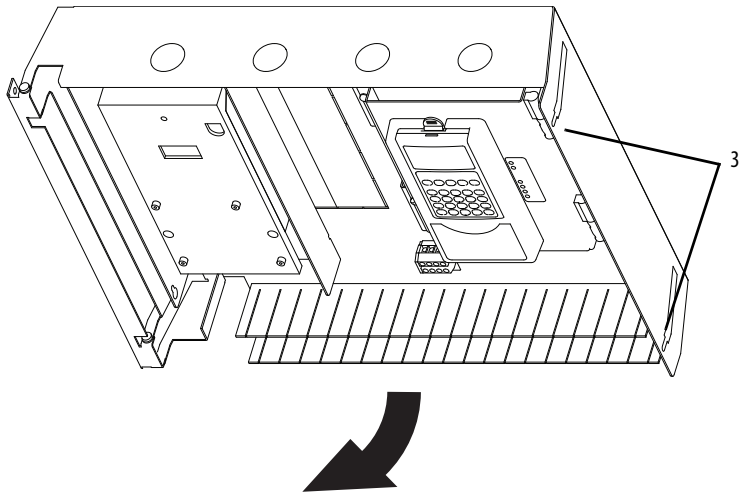
1. Turn off and lock out input power.
2. Wait five minutes.
3. Check the DC bus voltage at the power terminal block by measuring between the +DC and –DC terminals, between the +DC terminal and the chassis, and between the –DC terminal and the chassis. The voltage must be zero for all three measurements.



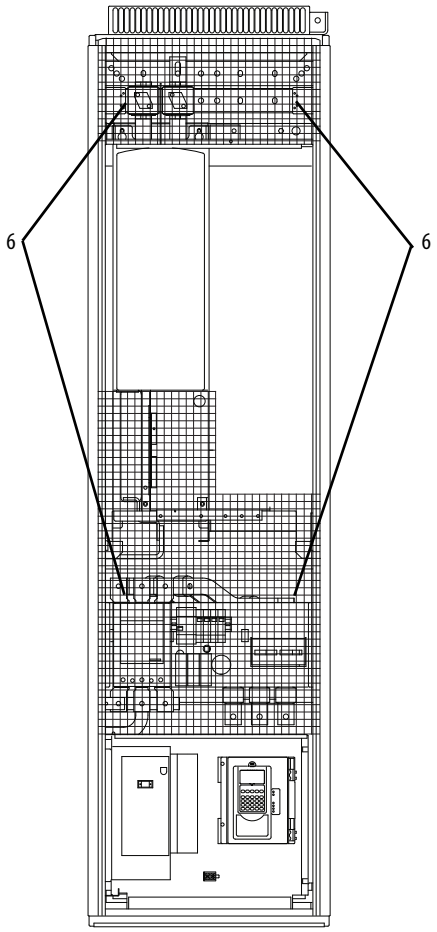
Move the Control Frame, and Remove the Screens, Airflow Plate, and Protective Covers (IP21 - Rittal Enclosure)

You may need to move the control frame based on the mounting location. You must remove the screens, air flow plate and protective covers from the AFE in order to access fan system components on the power structure. Follow these steps to move the control frame and remove the airflow plate and protective covers and screens.

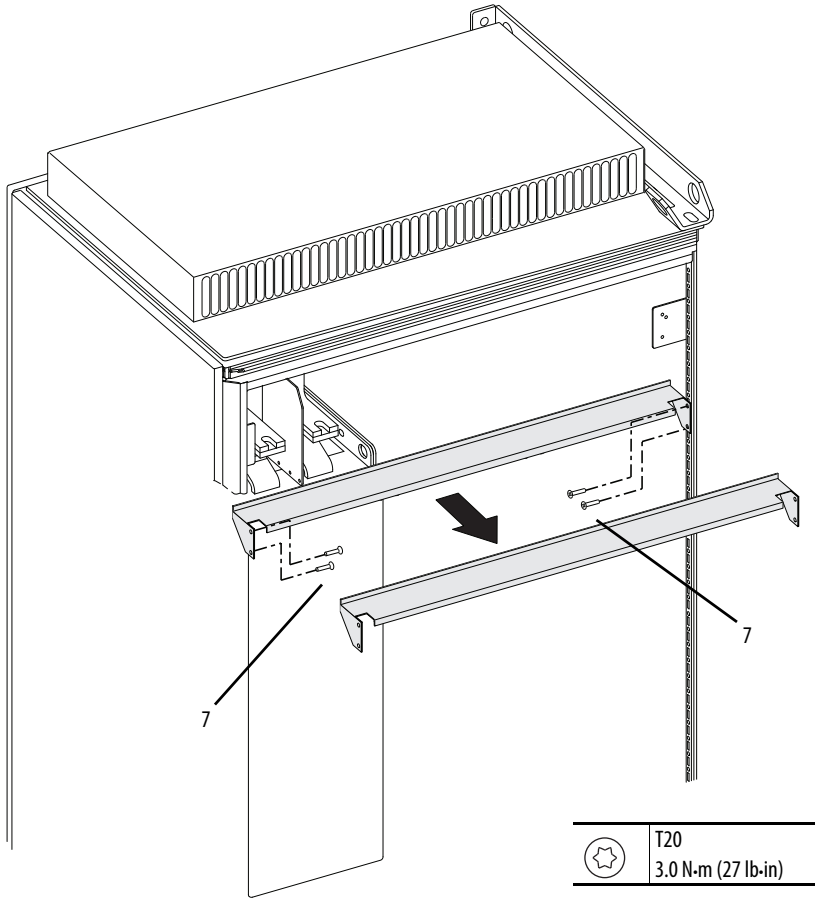
1. Review the General Precautions on page 17.
2. Remove power from the AFE. See Remove Power from the AFE on page 192.
3. If moving the control frame from a DC input drive with pre-charge interlock disconnect the wiring between terminals blocks X9 and X15.
4. If applicable, loosen the two hexalobular screws that secure the control frame to the AFE enclosure, lift up on the control frame, and swing it out and away from the power structure.



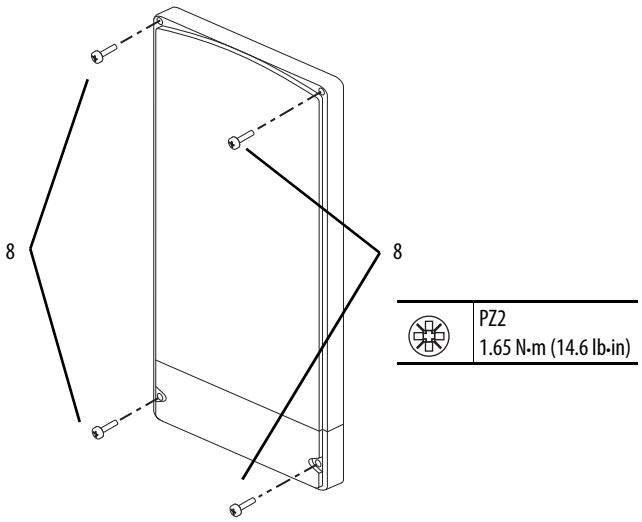
5. Remove the screws that secure the protective screens to the AFE enclosure. Then remove the screens.



6. Remove the four T8 hexalobular screws which secure the air flow plate to the AFE and slide the air flow plate off the AFE.



7. Remove the four M5 x 16 mm POZIDRIV screws that secure the protective front cover and terminal cover to the power structure and remove the covers.

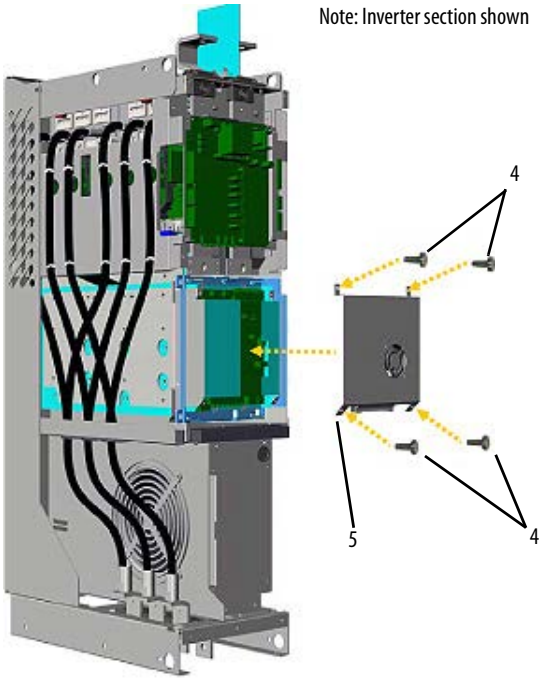


ASIC Circuit Board Assembly Cooling Fan (20-PP01096) Removal and Installation

PowerFlex 700AFE frame 10 drives have an ASIC circuit board located in the inverter section. Follow these steps to remove and replace the ASIC circuit board.

1. Review the General Precautions on page 17.
2. Remove power from the AFE. See Remove Power from the AFE on page 192.
3. If applicable, move the control frame, and remove the screens, airflow plate, and protective covers from the AFE. See Move the Control Frame, and Remove the Screens, Airflow Plate, and Protective Covers (IP21 - Rittal Enclosure) on page 193.
4. Remove the -DC bus connection from the ASIC cover.

   Note: When reinstalling the ASIC board, verify that the -DC bus connection has been made.
5. Remove the four screws that secure the ASIC cover to the ASIC assembly and remove the ASIC cover.
6. Disconnect the fan supply wire from connector X1 on the ASIC circuit board and remove the fan.

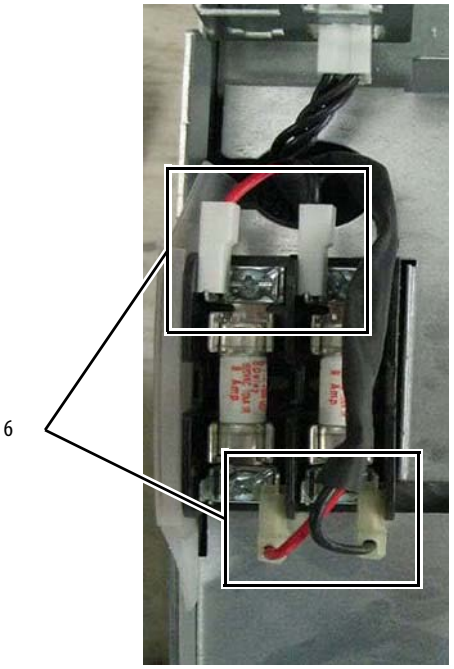


7. Install the ASIC cooling fan and assembly in the reverse order of removal.

AC or DC Fan Inverter Fuses (20-PP20202) and Fuse Holder (20-PP20300) Removal and Installation

The fan inverter fuses and fuse holder are located on the front of the inverter section. See Figure 20 on page 186 for details. Follow these steps to remove and replace the fan inverter fuse holder assembly.

1. Review the General Precautions on page 17.
2. Remove power from the AFE. See Remove Power from the AFE on page 192.
3. Move the control frame, and remove the screens, airflow plate, and protective covers from the AFE. See Move the Control Frame, and Remove the Screens, Airflow Plate, and Protective Covers (IP21 - Rittal Enclosure) on page 193.
4. Remove the fuses from the fuse holder.
5. Check the fuses. See Checking the Fan Inverter Fuses on page 263.
6. Disconnect the fan power supply wires from the top and bottom of the fuse holder. Note that the red wires (+DC) are connected to the left side terminal and the black wires (-DC) are connected to the right side terminals.

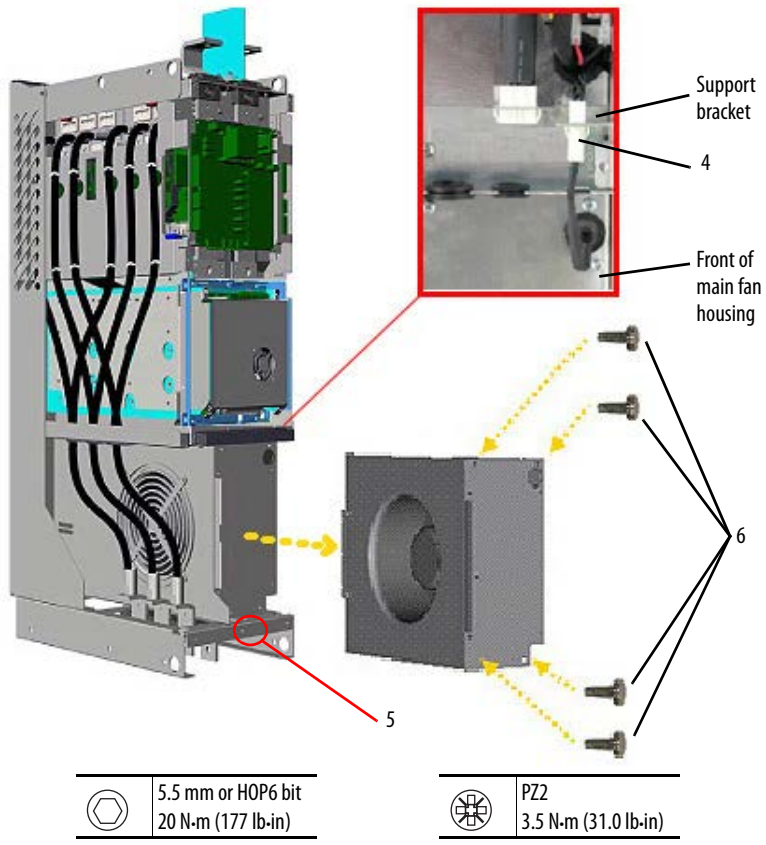


7. Remove the M4 x 8 mm POZIDRIV screw that secures the fuse holder and insulator to the assembly.
8. Install the AC or DC fan inverter fuses and fuse holder in the reverse order of removal.

Remove the Main Fan Assembly

The main fan assembly must be removed to gain access to the fan inverter circuit board. Follow these steps to remove the main fan assembly.

1. Review the General Precautions on page 17.
2. Remove power from the AFE. See Remove Power from the AFE on page 192.
3. If applicable, move the control frame, and remove the screens, airflow plate, and protective covers from the AFE. See Move the Control Frame, and Remove the Screens, Airflow Plate, and Protective Covers (IP21 - Rittal Enclosure) on page 193.
4. Disconnect the main fan supply connector from the connector on the support bracket and pull the connector out of the sheet metal support bracket.
5. Remove the M8 x 20 mm hexagonal socket screw from the chassis in front of the fan housing in order to allow room for the fan housing to be removed from the unit.
6. Remove the four M5 x 10 POZIDRIV screws that secure the main fan housing to the assembly and remove the fan housing.

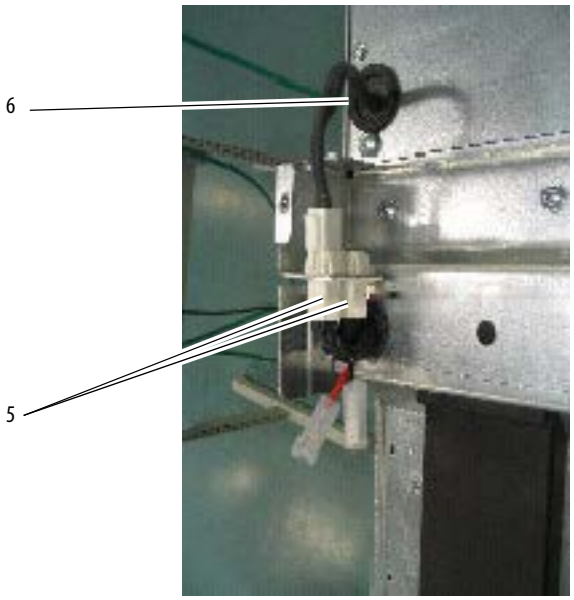


7. Install the main cooling fan assembly in the reverse order of removal.

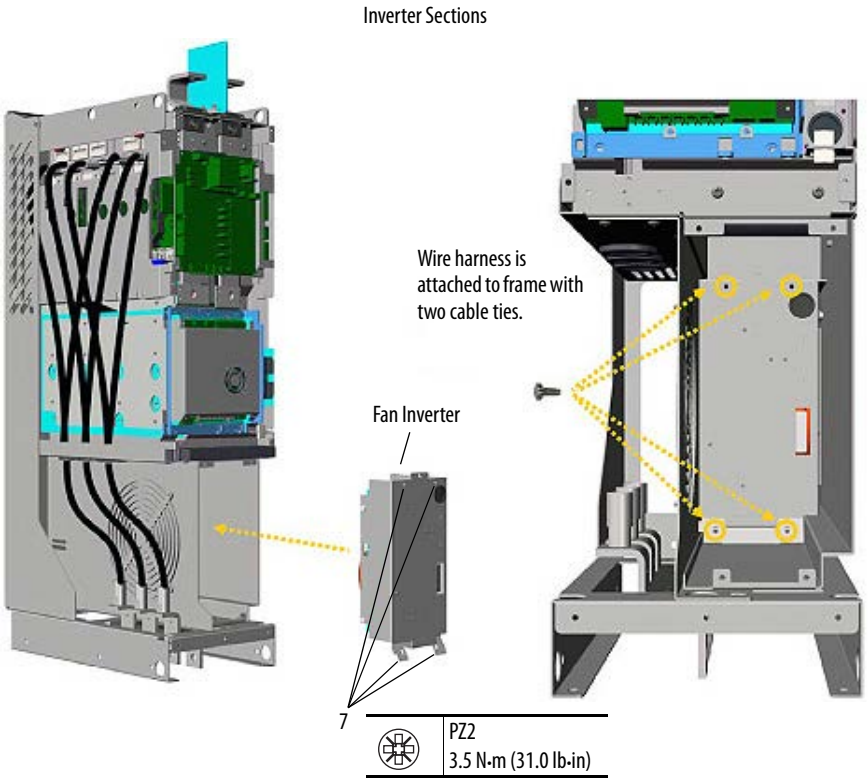
AC Fan Inverter Assembly (20-FI13301) Removal and Installation

PowerFlex 700AFE frame 10 drives have a single fan in the inverter section. The fan inverter assembly includes the AC fan inverter circuit board, output transformer, and fan capacitor. See Isolating a Faulty Fan Inverter on page 265 for test procedures used to determine if the fan inverter assembly requires replacement. Follow these steps to remove and replace an AC fan inverter assembly.

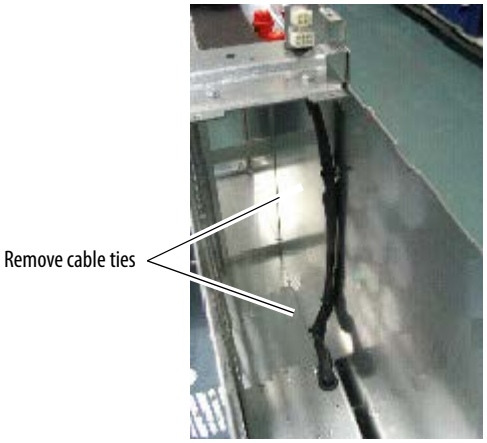
1. Review the General Precautions on page 17.
2. Remove power from the AFE. See Remove Power from the AFE on page 192.
3. If applicable, move the control frame, and remove the screens, airflow plate, and protective covers from the AFE. See Move the Control Frame, and Remove the Screens, Airflow Plate, and Protective Covers (IP21 - Rittal Enclosure) on page 193.
4. Remove the main fan assembly from the AFE. See Remove the Main Fan Assembly on page 198.
5. Disconnect the fan inverter cables from the connections on the front of the power structure.
6. Push the fan inverter cables and connectors, largest first, through the rubber grommet into the frame, where the main cooling fan was located.



7. Remove the four M5 x 10 mm POZIDRIV screws that secure the fan inverter to the power structure.



8. Remove the cable-ties that secure the cables with black insulation to the power structure frame and remove the fan inverter assembly from the power structure.



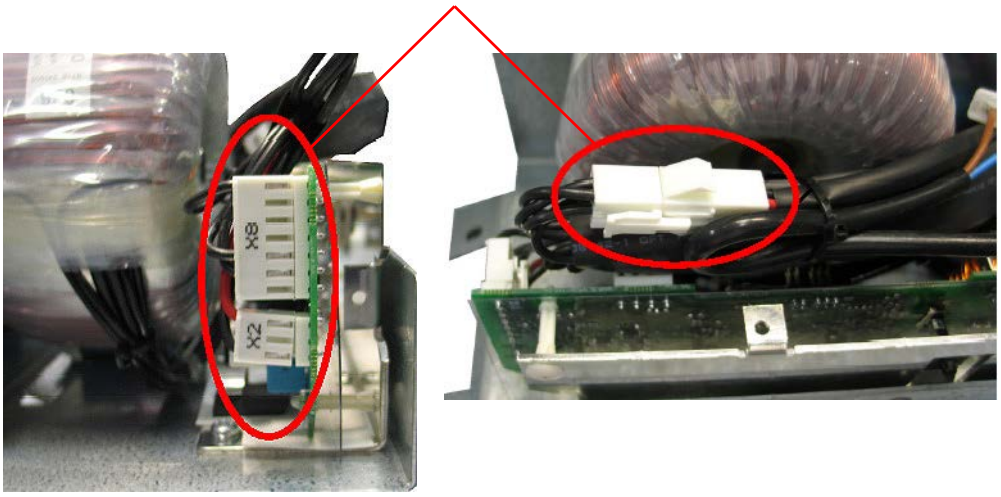
9. Install the AC fan inverter assembly in the reverse order of removal.

Main AC Fan Inverter Circuit Board (20-VB00299) Removal and Installation

Although not recommended, you may replace just the circuit board on the AC fan inverter assembly. Follow these steps to remove and replace the main AC fan inverter circuit board.

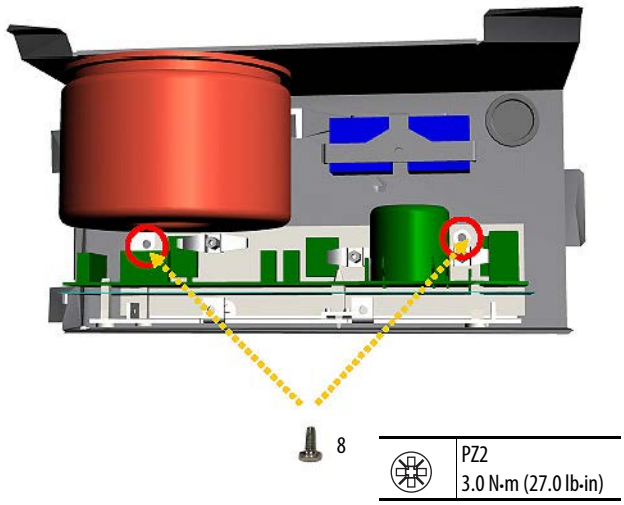
1. Review the General Precautions on page 17.
2. Remove power from the AFE. See Remove Power from the AFE on page 192.
3. If applicable, move the control frame, and remove the screens, airflow plate, and protective covers from the AFE. See Move the Control Frame, and Remove the Screens, Airflow Plate, and Protective Covers (IP21 - Rittal Enclosure) on page 193.
4. Remove the main fan assembly from the AFE. See Remove the Main Fan Assembly on page 198.
5. Remove the AC fan inverter assembly from the AFE. See AC Fan Inverter Assembly (20-FI13301) Removal and Installation on page 199.
6. Disconnect the wires from connectors X4 and X5 on the fan inverter circuit board. Note: These wires connect the fan capacitor to the fan inverter circuit board.
7. Disconnect the wires from connectors X8 and X2 on the fan inverter circuit board.

Note: AC fan system shown



8. Remove two M4 x 8 mm POZIDRIV screws that secure the fan inverter board and its heatsink to the assembly carriage and carefully remove the fan inverter board and its heatsink from the assembly carriage.

Note: AC fan system shown



9. Install the main AC fan inverter circuit board in the reverse order of removal.

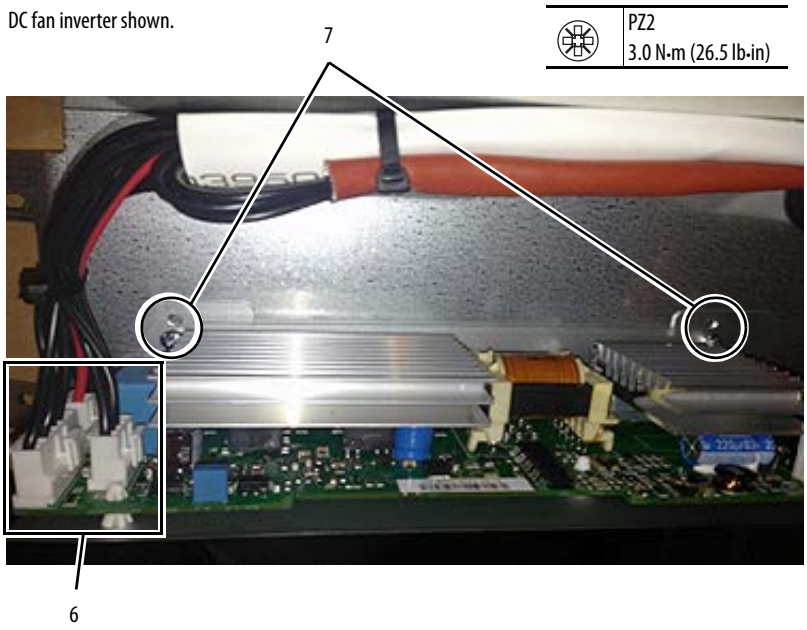
Main DC Fan Power Supply Circuit Board (SK-H1-DCFANBD1) Removal and Installation

PowerFlex 700AFE frame 10 drives have a single fan power supply. You can retrofit an existing AC fan system or replace a DC fan system with a new DC fan system. See Energy-related Products Fan Efficiency Directive on page 8 for guidelines on replacing an existing fan system with a new DC fan system.

Follow these steps to remove and replace an existing fan system with a new DC fan system.

1. Review the General Precautions on page 17.
2. Remove power from the AFE. See Remove Power from the AFE on page 192.
3. If applicable, move the control frame, and remove the screens, airflow plate, and protective covers from the AFE. See Move the Control Frame, and Remove the Screens, Airflow Plate, and Protective Covers (IP21 - Rittal Enclosure) on page 193.
4. Remove the main fan assembly from the AFE. See Remove the Main Fan Assembly on page 198.
5. Remove the AC fan inverter assembly from the AFE. See AC Fan Inverter Assembly (20-FI13301) Removal and Installation on page 199.

6. Disconnect the wire cable harness from connectors X2, X3, X8, and X81 on the fan inverter circuit board.
7. Remove two M4 x 8 mm POZIDRIV screws that secure the DC fan power supply circuit board and heatsink to the assembly carriage. Then carefully remove the DC fan power supply board from the assembly.

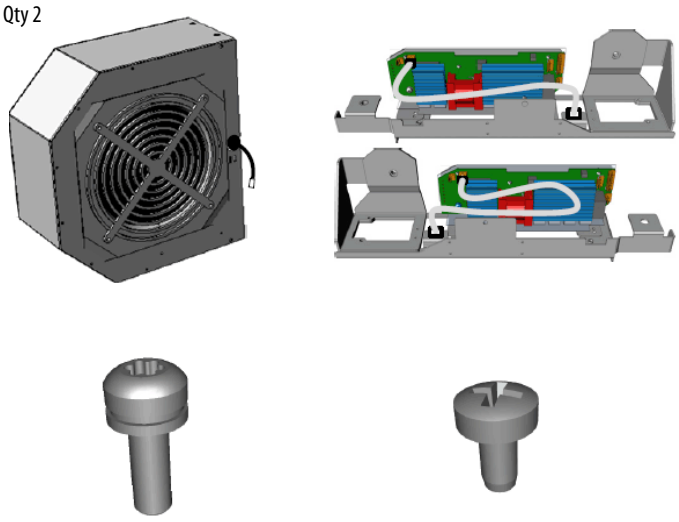


8. Install the DC fan power supply circuit board in the reverse order of removal.

AC to DC Main Fan System (SK-Y1-DCFANRETROFIT-F10) Retrofit

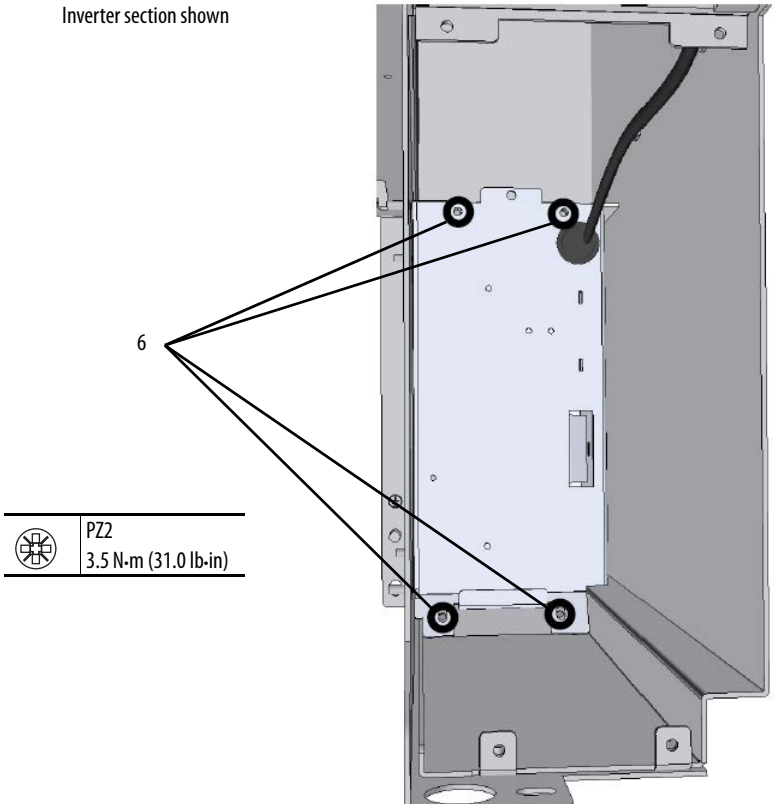
There are three different AC to DC fan retrofit kits available. The correct kit is identified in Figure 24.

Figure 24 - SK-Y1-DCFANRETROFIT-F10



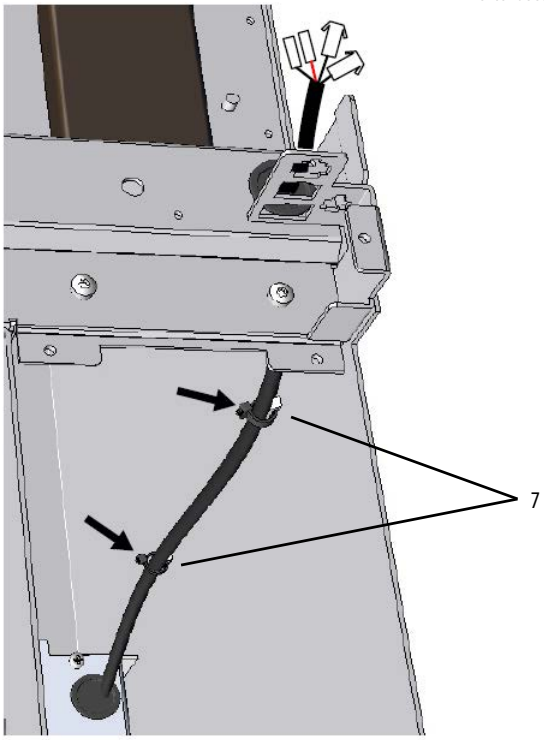
Follow these steps to remove and replace an existing AC fan system with a new DC fan system.

1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the AFE on page 192.
3. If applicable, move the control frame, and remove the screens, airflow plates, and protective covers. See Move the Control Frame, and Remove the Screens, Airflow Plate, and Protective Covers (IP21 - Rittal Enclosure) on page 193.
4. Remove the main fan assemblies. See Remove the Main Fan Assembly on page 198.
5. Remove the fan inverter assemblies. See AC Fan Inverter Assembly (20-FI13301) Removal and Installation on page 199.
6. Install the DC fan power supply assemblies in the drive using the four M5 x10 mm POZIDRIV screws supplied in the kit. See Main DC Fan Power Supply Circuit Board (SK-H1-DCFANBD1) Removal and Installation on page 202 for details.



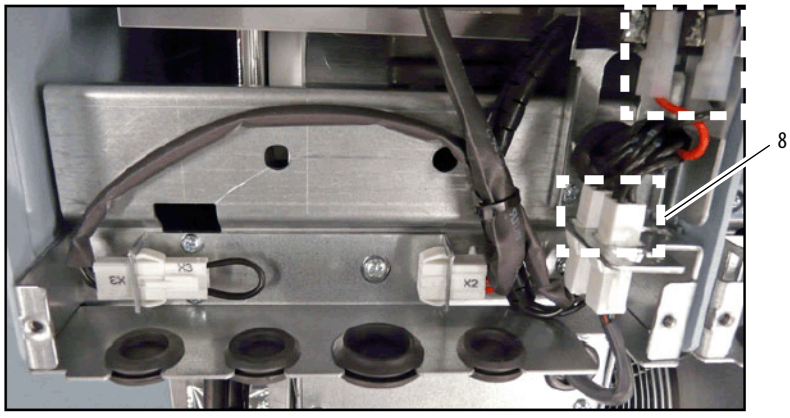
7. Secure the power supply cables to the inside of the main fan housings using the cable ties supplied with the kit.

Inverter section shown



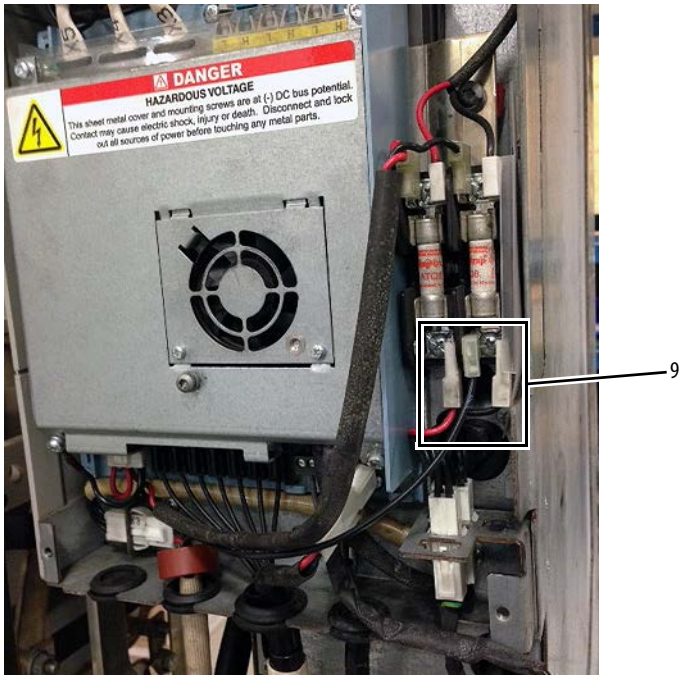
8. Route the fan power supply cables through the hole in the drive chassis and insert them into the connector support bracket on the front of the drive chassis.

Inverter section shown



9. Connect the fan power supply wires to the bottom of the fuse holders. Note that the red wire (+DC) is connected to the left side terminal and the black wire (-DC) is connected to the right side terminals.

Inverter section shown



10. Install the new main DC fans in the fan housings using the M5 x 10 mm POZIDRIV screws supplied in the kit. Final torque is 3.5 N•m (31.0 lb•in). See Remove the Main Fan Assembly on page 198 for details.
11. Remove the backing from the drive modification label and attach the label to the front of a main fan housing.
12. Write “DC fan retrofit” and the installation date on the label.

Main AC Fan Inverter Capacitor (SK-H1-FANCAPF1314) Removal and Installation

Note: The AC fan inverter capacitor replacement kit (SK-H1-FANCAP-F1314) contains a new sheet metal bracket, hardware and fasteners, and a series B capacitor (identified in the table and shown below). The series B capacitor (50 mm dia. x 62 mm tall) is larger than the series A capacitor (35 mm dia. x 57 mm tall). If a series A capacitor is currently installed, always replace it with the new series B capacitor.

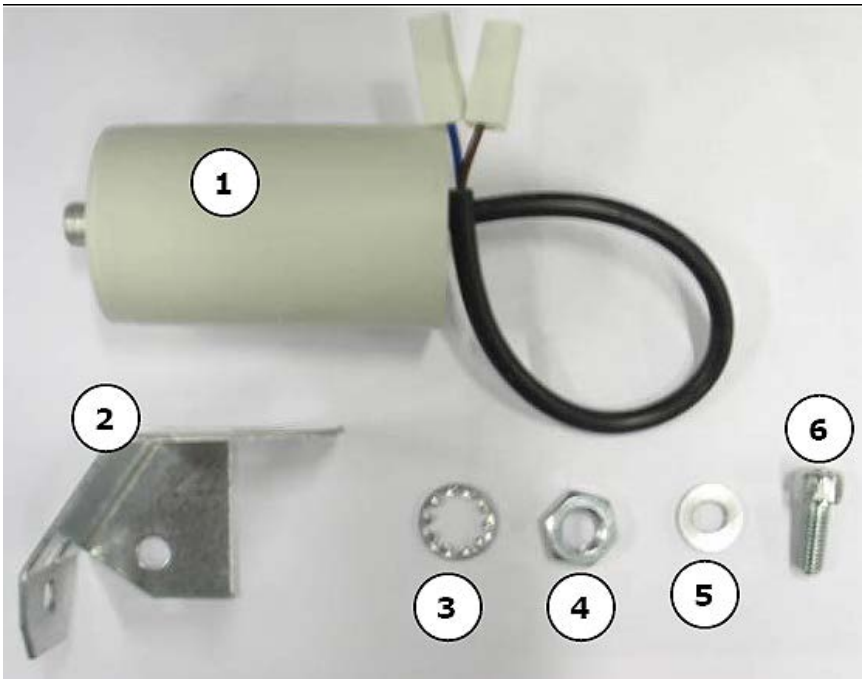


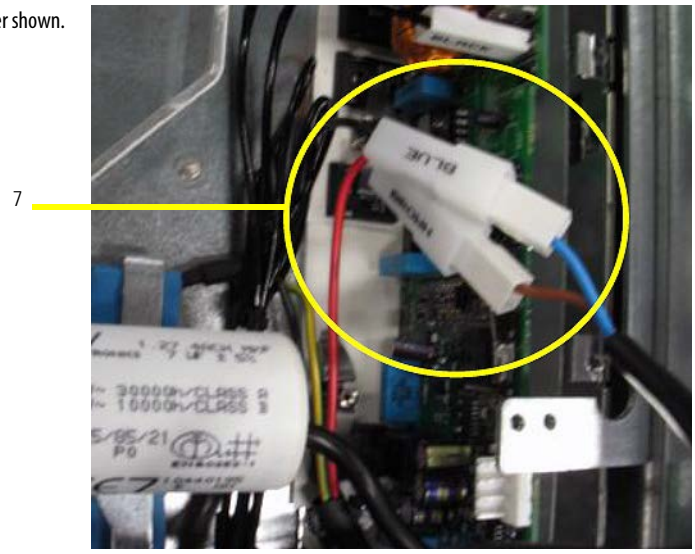
Photo ID#	Part Description	Quantity
1	AC fan capacitor	1
2	AC fan capacitor bracket	1
3	Bracket lock washer (M12)	1
4	Bracket nut (M12)	1
5	Bracket spring washer	1
6	Bracket hexagonal socket screw (M8 x 12 mm)	1

Follow these steps to remove and replace the main AC fan inverter capacitor.

1. Review the General Precautions on page 17.
2. Remove power from the AFE. See Remove Power from the AFE on page 192.
3. If applicable, move the control frame, and remove the screens, airflow plate, and protective covers from the AFE. See Move the Control Frame, and Remove the Screens, Airflow Plate, and Protective Covers (IP21 - Rittal Enclosure) on page 193.
4. Remove the main fan assembly from the AFE. See Remove the Main Fan Assembly on page 198.

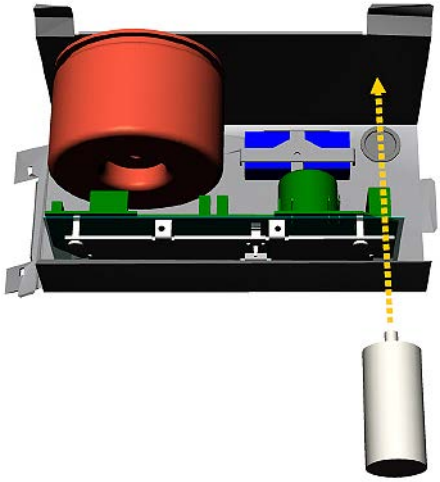
5. Remove the AC fan inverter assembly from the AFE. See AC Fan Inverter Assembly (20-FI13301) Removal and Installation on page 199.
6. Cut the cable ties that secure the fan capacitor wires to the wire bundle.
7. Disconnect the fan capacitor wires from the connectors marked “Brown” and “Blue.”

AC fan inverter shown.

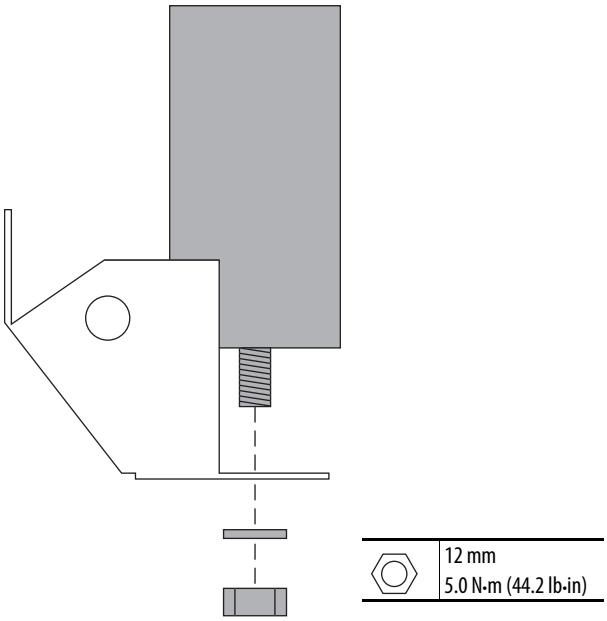


8. Unscrew and remove the existing fan capacitor from the inverter assembly.

AC fan inverter shown.



9. Secure the new fan capacitor to the bracket using the M12 hexagonal nut and lock washer provided.



10. If necessary, secure the fan capacitor bracket (and capacitor) to the drive chassis using the M8 x 12 mm hexagonal socket screw and spring washer provided. Tightening torque is 20 N•m (178 lb•in).

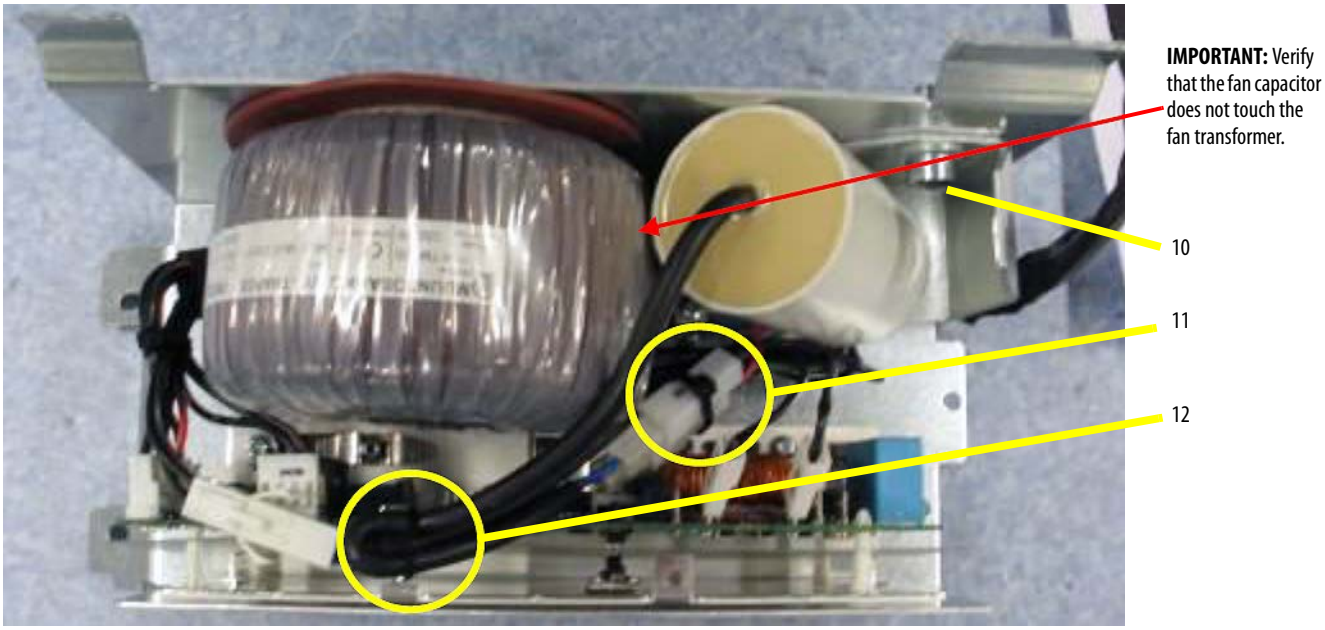
    Note: Secure the capacitor in a position that allows the maximum amount of clearance possible between the transformer and capacitor, ensuring that they DO NOT touch.

IMPORTANT	Verify that no wires are touching the sheet metal on the drive chassis.

11. Connect the new fan capacitor wires to the connectors marked “Brown” and “Blue.”
12. Secure the fan capacitor wires to the fan wire bundle using cable ties.

13. Complete the remaining installation in the reverse order of removal.

AC fan inverter system shown.



Main AC Fan (20-FI13300) and Main DC Fan (SK-Y1-DCFAN1) Assembly Removal and Installation

Follow these steps to measure the resistance between the main fan supply wires and remove and replace the main fan, if necessary.

Notes:

- The DC fan replacement kit only contains the fan motor and impeller assembly. Therefore, the sheet metal housing for the fan must be reused.
- To identify which fan is installed in your drive, see Fan Inverter System Block Diagrams on page 257.

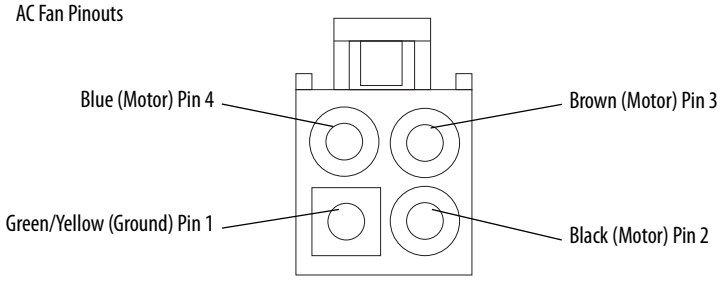
1. Review the General Precautions on page 17.
2. Remove power from the AFE. See Remove Power from the AFE on page 192.
3. If applicable, move the control frame, and remove the screens, airflow plate, and protective covers from the AFE. See Move the Control Frame, and Remove the Screens, Airflow Plate, and Protective Covers (IP21 - Rittal Enclosure) on page 193.
4. Remove the main fan assembly from the AFE. See Remove the Main Fan Assembly on page 198.

5. Using the appropriate table below, measure the resistance between the fan supply wires.

   AC Fan: If the measurements are not similar to those in this table, replace the AC fan.

Connection wires	Resistance ±5%
Black-Brown	62 Ω
Brown-Blue	36 Ω
Blue-Black	27 Ω
Green-chassis	0 Ω

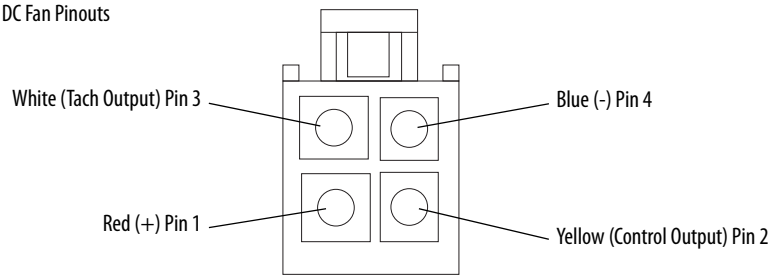
AC Fan Pinouts



   DC Fan: If the measurements are not similar to those in this table, replace the DC fan.

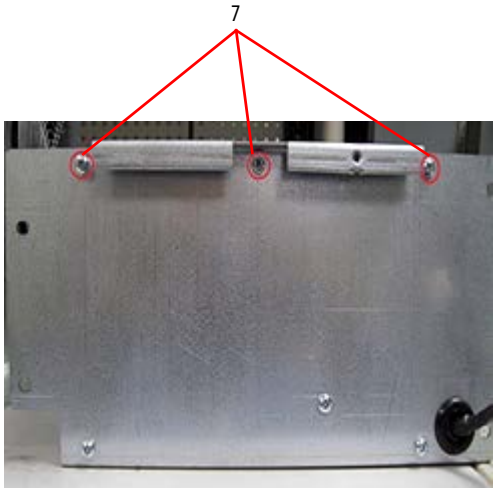
Connection wires	Resistance ±5%
Red-Blue	∞ Ω
Red-White	∞ Ω
White-Yellow	∞ Ω
Blue-White	∞ Ω

DC Fan Pinouts



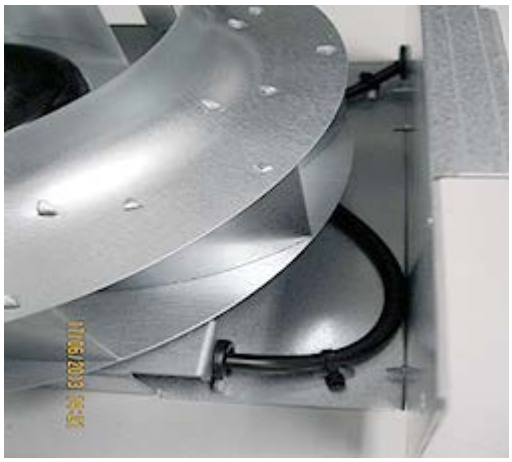
6. For AC fan systems, install the new fan assembly in the reverse order of removal. For DC fan systems, complete the remaining steps.

7. Remove the three M4 x 8 mm POZIDRIV screws from the front of the fan housing.

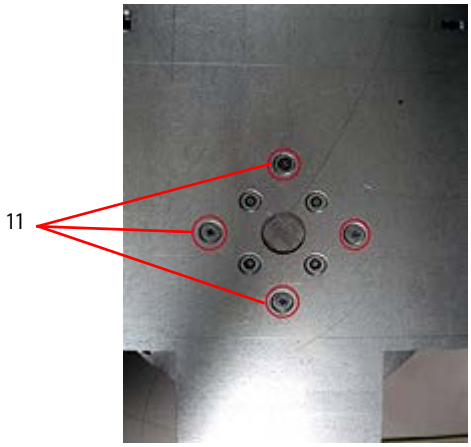


8. Remove the two M4 x 5 mm flathead POZIDRIV screws and remove the sheet metal side.

9. Cut the tie wraps that secure the fan cable to the sheet metal housing.
10. Remove the grommets from the holes in the sheet metal.



11. Remove the four M5 x 10 POZIDRIV screws that secure the fan to the sheet metal housing and remove the fan. Retain the sheet metal housing for reuse.



12. Install the new main DC fan in reverse order. Verify that the fan turns easily and does not make contact with the sheet metal housing or fan cable before installing the fan assembly in the drive.

LCL Filter Section

The LCL filter provides the filtering to minimize the harmonic content originating from the inverter section (PWM frequency) from interacting with the AC grid.

Replacement procedures for these frame 10 AFE LCL filter fan system parts are included in this chapter.

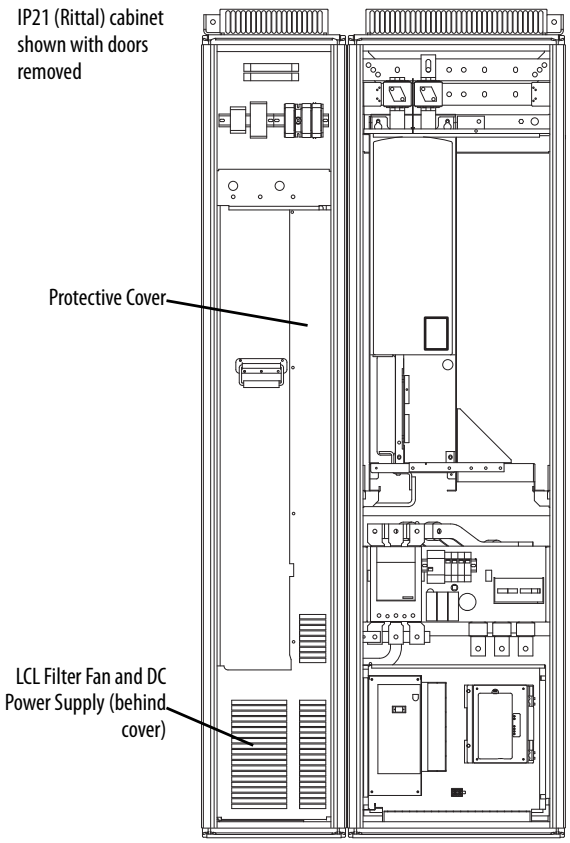
Cat. No.	Part Description	Page
20-PP20202 or SK-Y1-F11-F10	Fuse for fan system	215
SK-Y1-DCPS1-D460	DC fan power supply assembly - 400/480V (older version)	215
SK-Y1-DCPS1-F325	DC fan power supply assembly - 600/690V (older version)	215
SK-Y1-DCPS2-F10	DC fan power supply circuit board upgrade kit - (newer version)	219
SK-H1-DCFANBD1 (1)	Main DC fan power supply circuit board	225
SK-Y1-DCFAN1	Main DC fan assembly	230

(1) Only use this circuit board if you are replacing a newer version circuit board (same catalog number).

Removing the LCL Filter Protective Cover

1. Review the General Precautions on page 17.
2. Remove power from the AFE. See Remove Power from the AFE on page 192.
3. Remove the sixteen T25 Torx self-tapping cover screws.

4. Remove the protective cover in the LCL Filter cabinet.



LCL Filter DC Fan Fuses (20-PP20202) Removal and Installation

See Figure 20 on page 186 for the location of the LCL filter DC fan fuses.

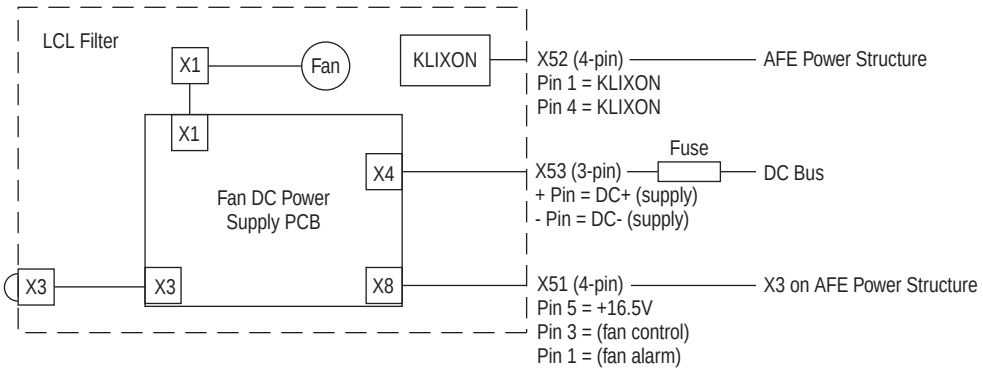
1. Review the General Precautions on page 17.
2. Remove power from the AFE. See Remove Power from the AFE on page 192.
3. Install the LCL filter DC fan fuses in the reverse order of removal.

LCL Filter Fan DC Power Supply (SK-Y1-DCPS1-D460 or SK-Y1-DCPS1-F325) Removal and Installation

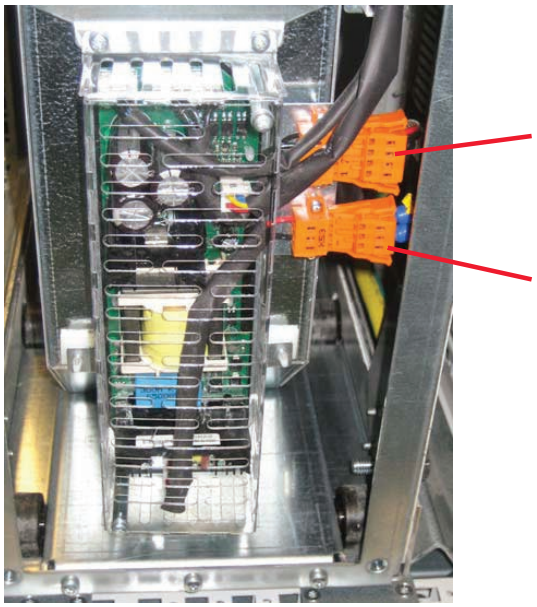
Note: It is not necessary to remove the fan assembly from the LCL filter, but by doing so, it may be easier to replace the fan DC power supply circuit board.

The LCL filter fan DC power supply wiring diagram is shown in Figure 25. The diagram shows the connections to the AFE power structure and DC bus.

Figure 25 - LCL Filter Fan DC Power Supply (SK-Y1-DCPS1-D460 or SK-Y1-DCPS1-F325) Wiring Diagram



IMPORTANT Before doing any work, disconnect the AFE power structure from the AC supply, and wait until the fan stops and the indicators on the keypad turn off. (If a keypad is not attached, see the indicator through the keypad base.) Wait 5 more minutes before doing any work on the DC-to-DC power supply. Do not even open the cover until after this time has expired.



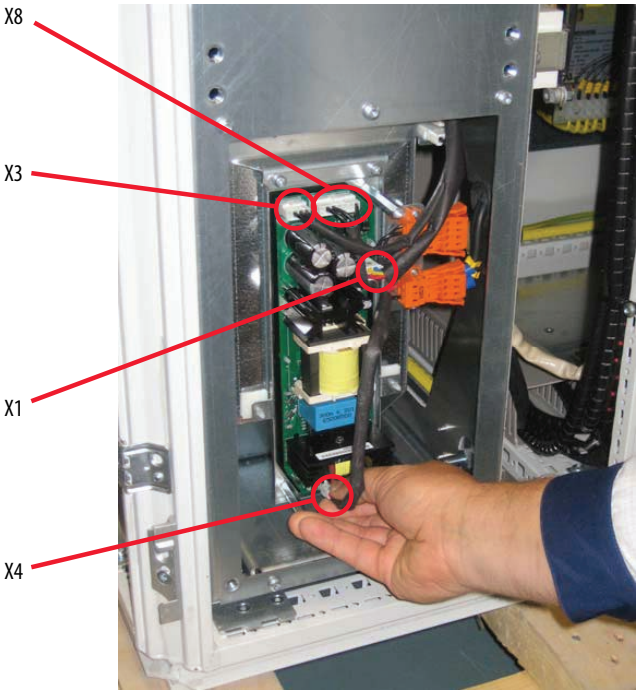
Note: Image for SK-Y1-DCPS1-D460 or SK-Y1-DCPS1-F325

1. Review the General Precautions on page 17.
2. Remove power from the AFE. See Remove Power from the AFE on page 192.
3. Remove the LCL filter fan assembly from the AFE. See LCL Filter Fan Assembly Removal and Installation on page 229.

4. Remove the two M4 x 10 mm POZIDRIV screws that secure the cover to the chassis and remove the cover.

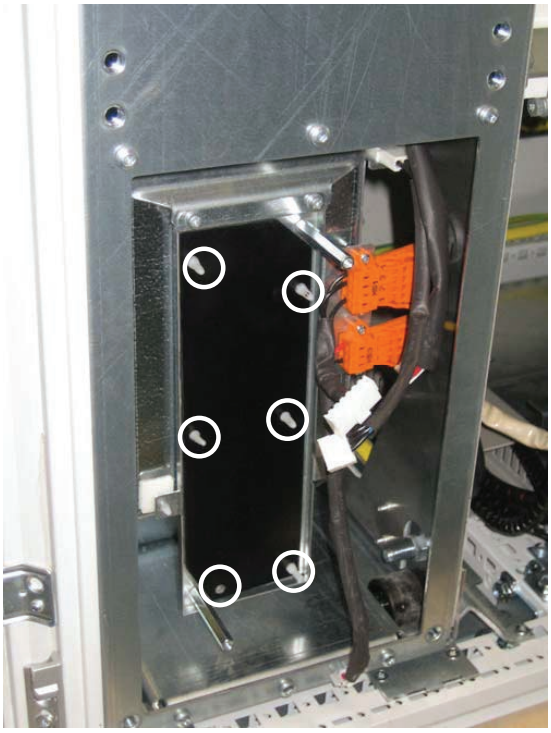
Note: Image for SK-Y1-DCPS1-D460 or SK-Y1-DCPS1-F325

5. Disconnect the cables from connectors X1, X3, X4, and X8.



Note: Image for SK-Y1-DCPS1-D460 or SK-Y1-DCPS1-F325

6. Remove the six fasteners that secure the DC power supply.



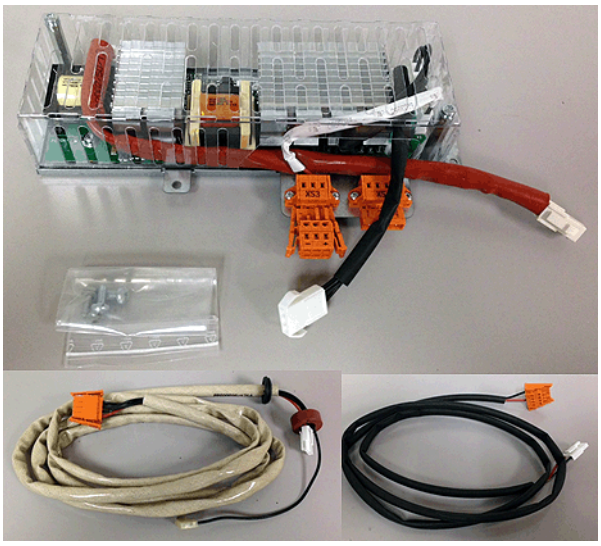
Note: Images for SK-Y1-DCPS1-D460
or SK-Y1-DCPS1-F325

7. Install the LCL filter fan DC power supply in the reverse order of removal.

LCL Filter DC Fan Power Supply Kit (SK-Y1-DCPS2-F10) Removal and Installation

This kit contains the following components.

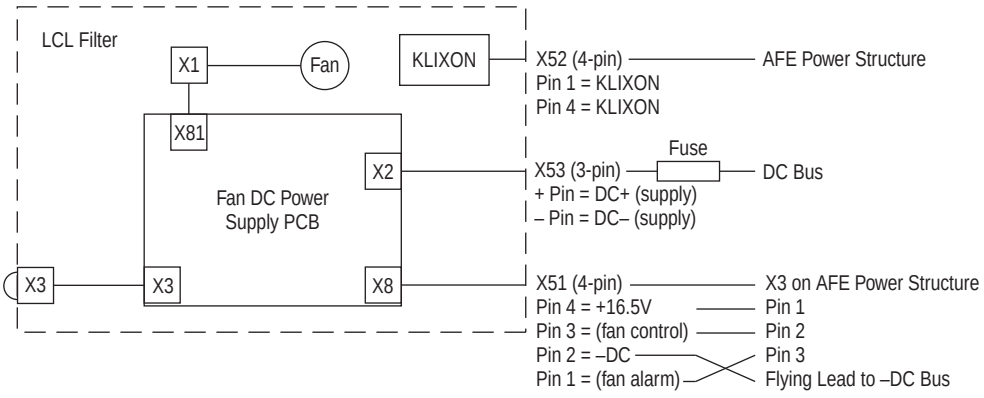
- Fan DC power supply circuit board
- New X51 cable (fan circuit board to AFE power structure connections)
- New X52 cable (fan motor thermal switch to AFE power structure connections)



Note: It is not necessary to remove the fan assembly from the LCL filter, but by doing so, it may be easier to replace the fan DC power supply circuit board.

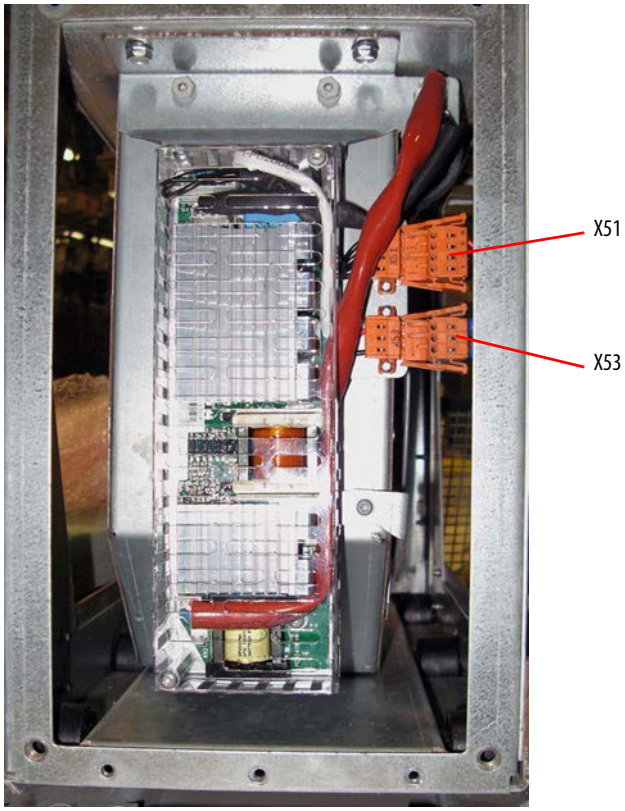
The LCL filter fan DC power supply wiring diagram is shown in Figure 26. The diagram shows the connections to the AFE power structure and DC bus.

Figure 26 - LCL Filter Fan DC Power Supply (SK-Y1-DCPS2-F10) Wiring Diagram



IMPORTANT Before doing any work, disconnect the AFE power structure from the AC supply, and wait until the fan stops and the indicators on the keypad turn off. (If a keypad is not attached, see the indicator through the keypad base.) Wait 5 more minutes before doing any work on the DC-to-DC power supply. Do not even open the cover until after this time has expired.

Image for SK-Y1-DCPS2-F10



1. Review the General Precautions on page 17.
2. Remove power from the AFE. See Remove Power from the AFE on page 192.
3. Remove the LCL filter fan. See LCL Filter Fan Assembly Removal and Installation on page 229.

4. Remove the two M4 x 8 mm POZIDRIV screws that secure the cover to the chassis and remove the cover.

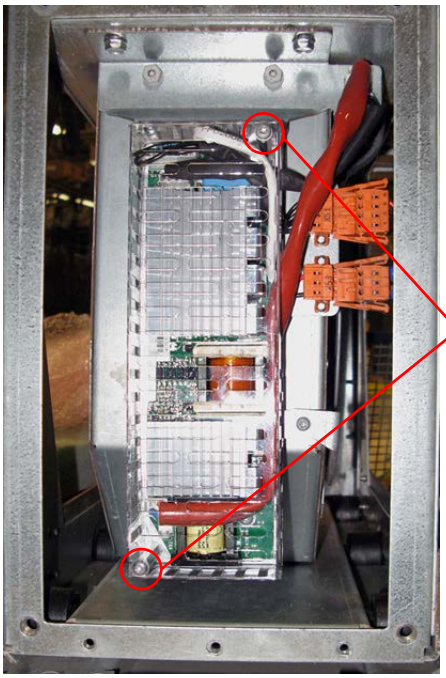
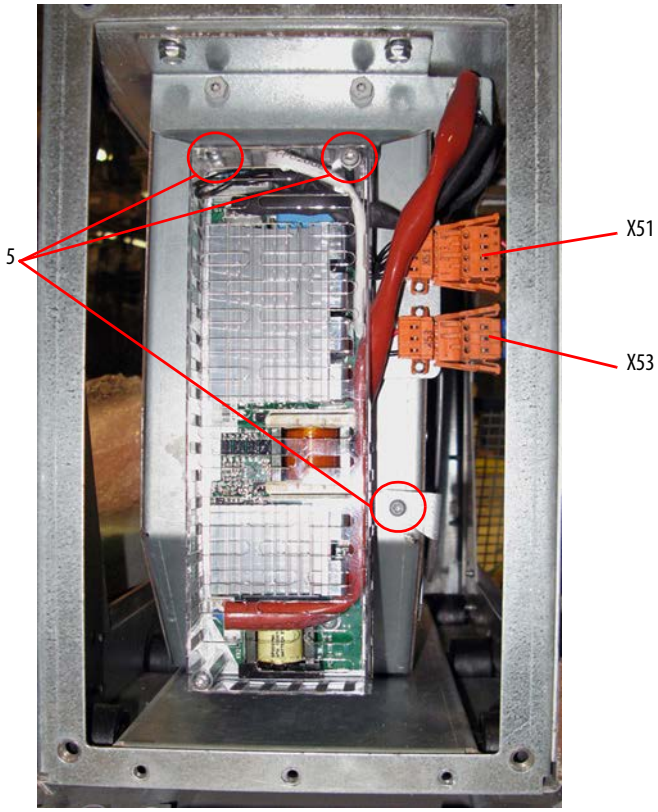


Image for SK-Y1-DCPS2-F10

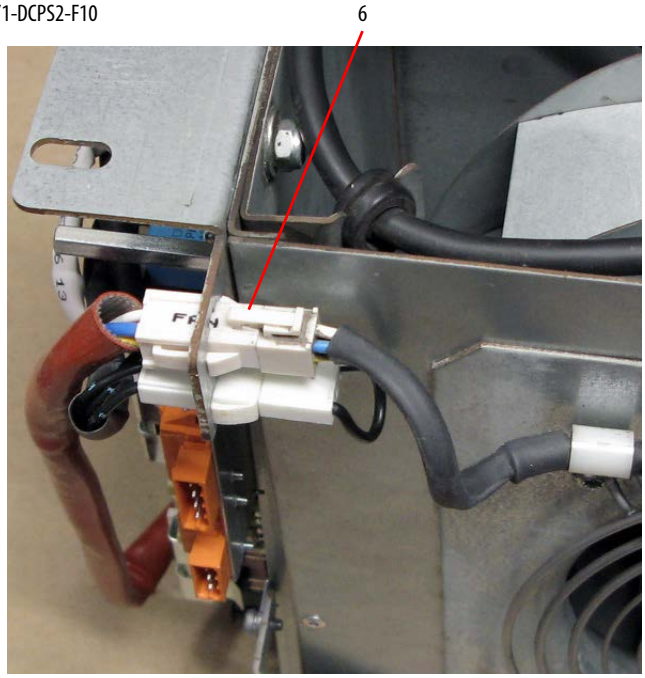
5. Remove the three M5 x 10 mm hexalobular screws that secure the assembly to the fan housing. Then shift the assembly sufficient to remove the X51 and X53 connectors.

Image for SK-Y1-DCPS2-F10



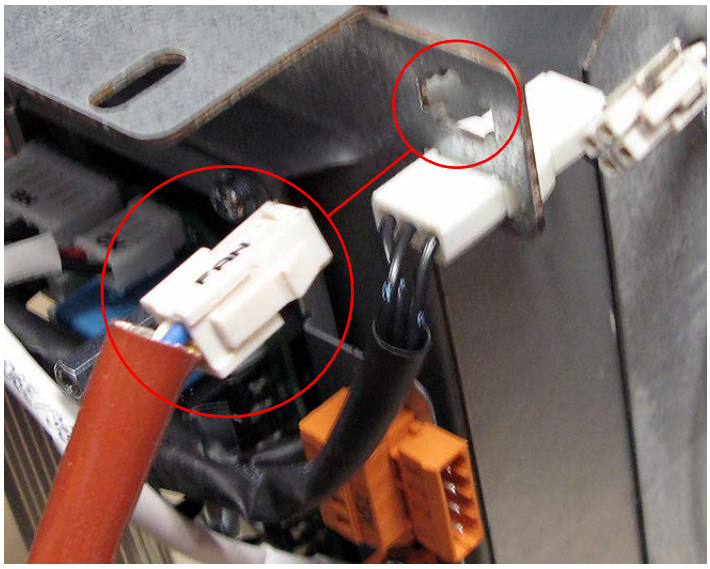
6. Disconnect the X1 fan cable from the connector on the fan sheet metal housing.

Image for SK-Y1-DCPS2-F10

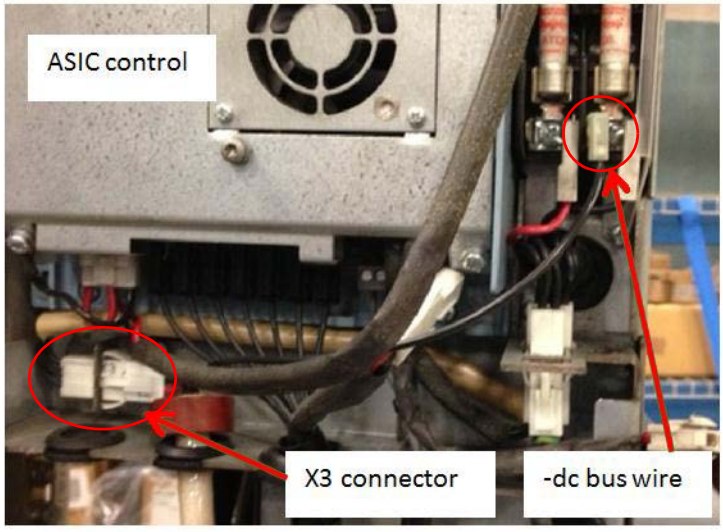


7. Remove the X1 cable from the sheet metal fan housing.

Image for SK-Y1-DCPS2-F10 7

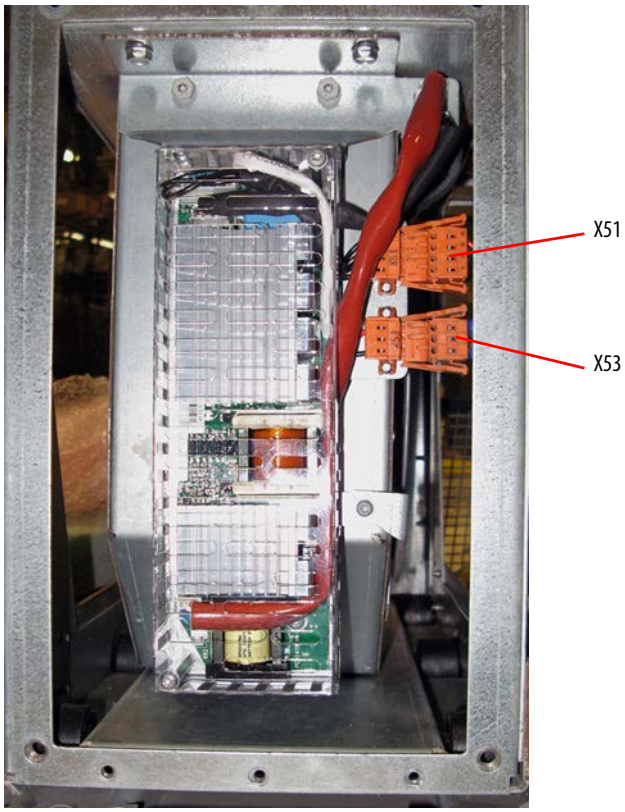


8. Disconnect the cable from X51 on the LCL filter fan power supply and X3 on the AFE power unit and discard the cable.
9. Connect the new cable to X51 on the LCL filter fan power supply and X3 on the AFE power module. The extra flying lead connects to the –DC bus terminal as shown here.



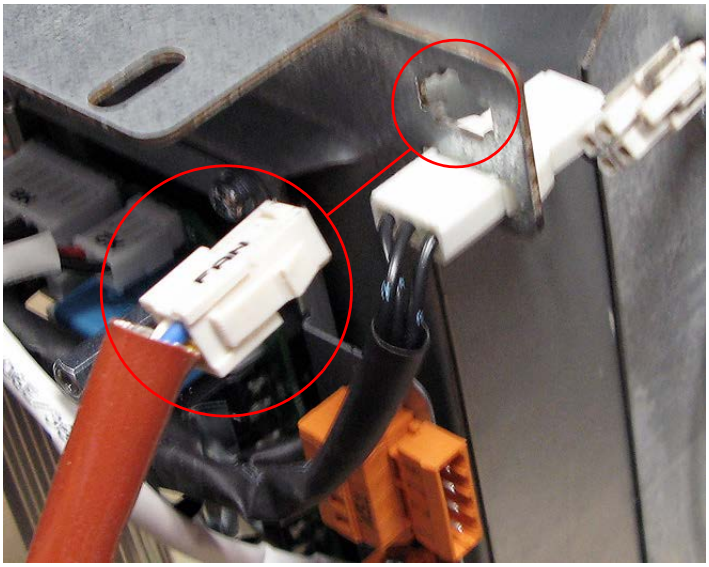
10. Install the new LCL filter fan power supply using the one M4 x 12 mm and two M5 x 10 mm screws provided.
11. Connect the X51 and X53 connectors to the fan power supply circuit board.

Image for SK-Y1-DCPS2-F10



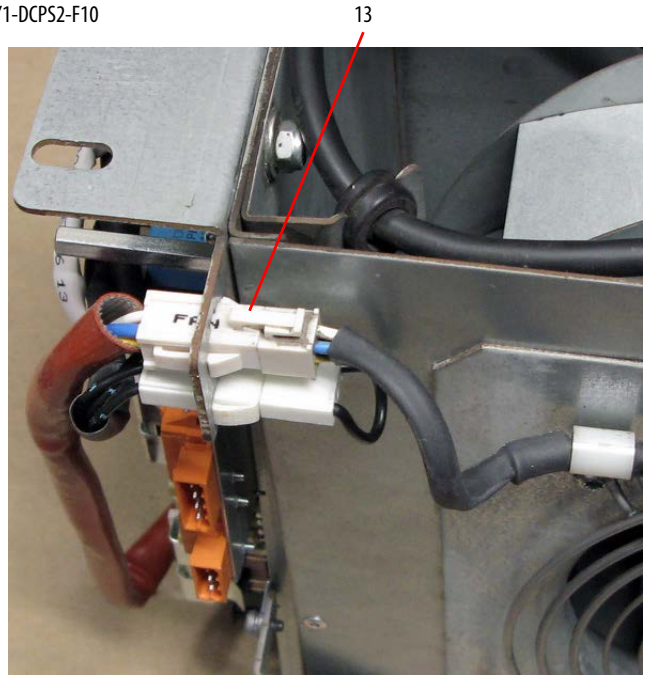
12. Insert the X1 fan cable connector into the receptacle on the fan sheet metal housing.

Image for SK-Y1-DCPS2-F10 12



13. Reconnect the X1 connector from the fan to the connector on the sheet metal housing.

Image for SK-Y1-DCPS2-F10



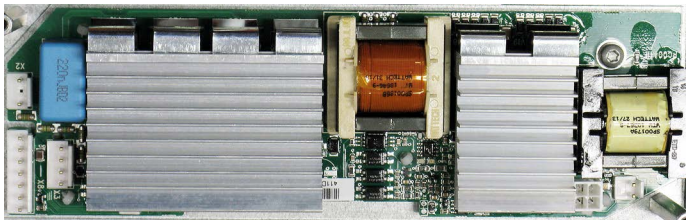
14. Install the fan housing the reverse order of removal.

LCL Filter DC Fan Power Supply Circuit Board (SK-H1-DCFANBD1) Removal and Installation

If the LCL filter already has a new fan power supply kit (SK-Y1-DCPS2-F10) installed, the DC fan power supply circuit board (SK-H1-DCFANBD1) can be installed as a replacement part.

Note: See Appendix B on page 277 to verify the version of the DC fan power supply circuit board installed in your system.

SK-H1-DCFANBD1



1. Review the General Precautions on page 17.
2. Remove power from the AFE. See Remove Power from the AFE on page 192.
3. Remove the LCL filter fan assembly from the AFE. See LCL Filter Fan Assembly Removal and Installation on page 229.

4. Remove the two M4 x 8 mm POZIDRIV screws that secure the cover to the chassis and remove the cover.

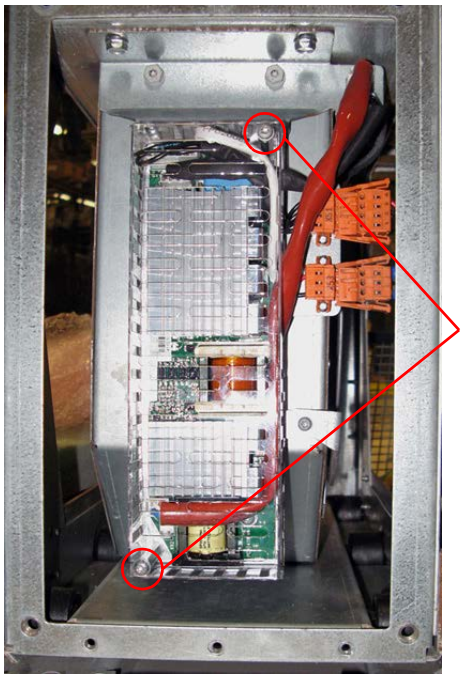


Image for SK-Y1-DCPS2-F10

5. Disconnect the cables from connectors X2, X3 and X8 at the top of the board.

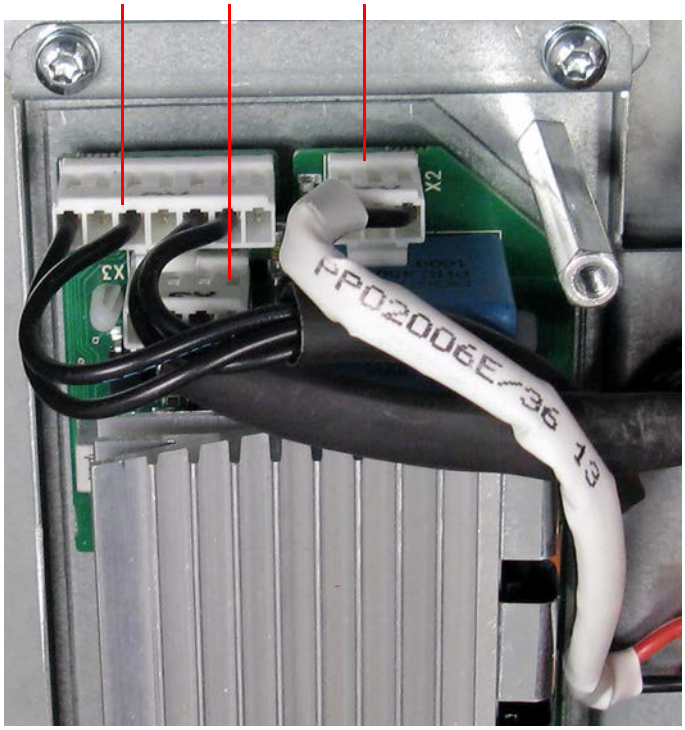
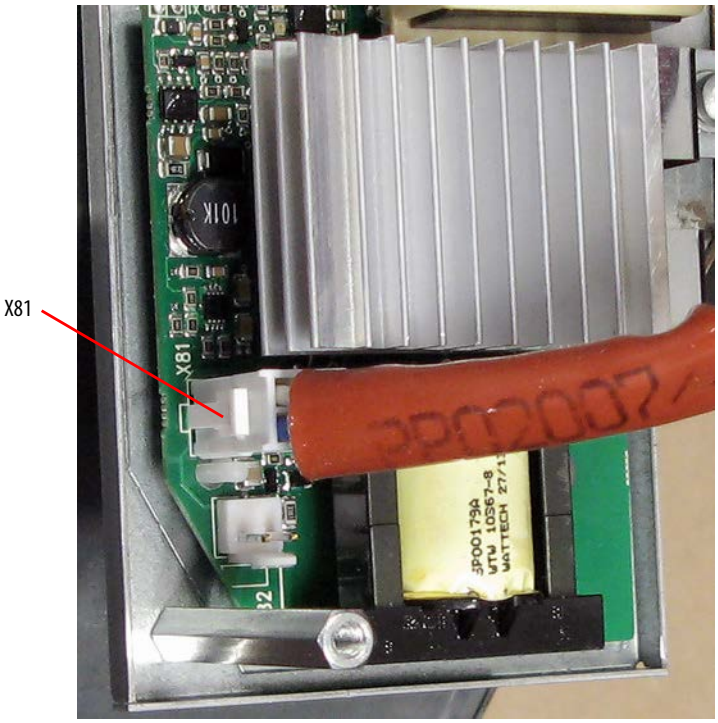


Image for SK-H1-DCFANBD1

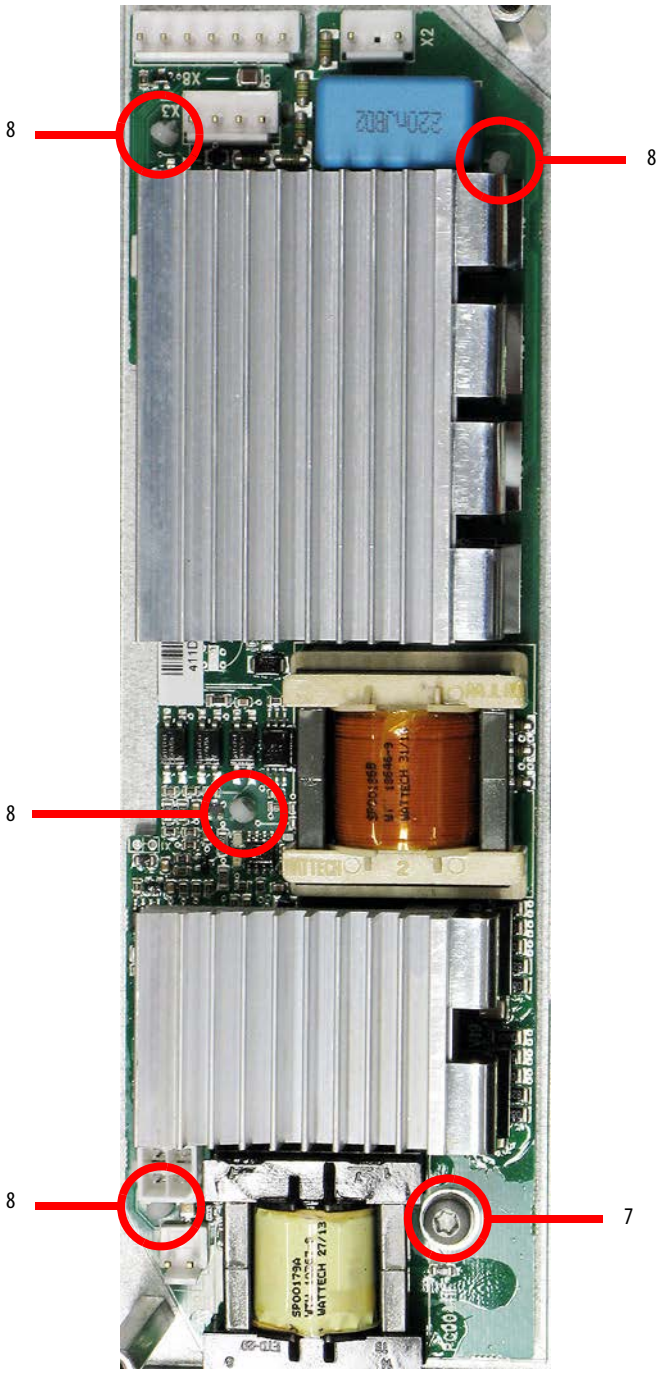
6. Disconnect the cable from connector X81 at the bottom of the board.

Image for SK-H1-DCFANBD1



7. Remove the M4 x 8 mm hexalobular screw that secures the DC power supply circuit board to the sheet metal support.
8. Remove the four fasteners that secure the DC power supply board to the chassis and remove the board.

Image for SK-H1-DCFANBD1

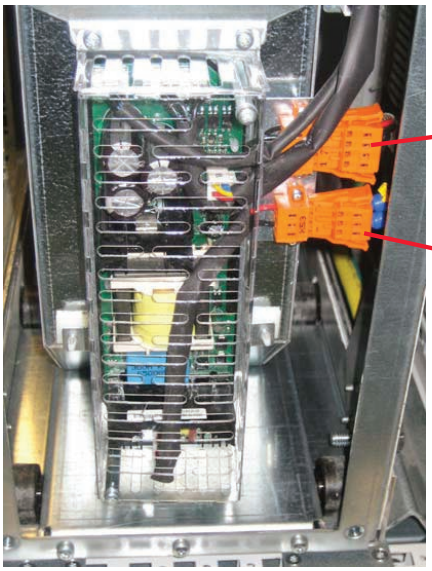


9. Install the new DC fan power supply circuit board in the reverse order of removal.

LCL Filter Fan Assembly Removal and Installation

Note: The fan replacement kit only contains the fan motor and impeller assembly. Therefore, the sheet metal housing for the fan must be reused.

1. Review the General Precautions on page 17.
2. Remove power from the AFE. See Remove Power from the AFE on page 192.
3. Disconnect terminal blocks X51 and X53.



Note: Image for SK-Y1-DCPS1-D460 or SK-Y1-DCPS1-F325

4. Remove the two M6 x 16 mm hexagonal bolts.

Image for SK-Y1-DCPS2-F10

5. Lower the front fan sheet metal edge and slide it forward to remove the alignment studs from their respective holes in the fan frame sheet metal.
6. Slide the fan assembly out of the chassis.
7. If required. remove the LCL filter fan DC power supply. See LCL Filter Fan DC Power Supply (SK-Y1-DCPS1-D460 or SK-Y1-DCPS1-F325) Removal and Installation on page 215, or LCL Filter DC Fan Power Supply Kit (SK-Y1-DCPS2-F10) Removal and Installation on page 219.
8. Install the LCL filter fan assembly in the reverse order of removal.

LCL Filter Main DC Fan (SK-Y1-DCFAN1) Assembly Removal and Installation

Follow these steps to measure the resistance between the main fan supply wires and remove and replace the main fan, if necessary.

Note: The DC fan replacement kit only contains the fan motor and impeller assembly. Therefore, the sheet metal housing for the fan must be reused. The Main AC and DC fans have different mounting hardware and hole dimensions. The AC fan uses four M4 x 8 mm screws that are spaced 40 mm apart on the bracket. The DC fan uses four M5 x 10 mm screws that are spaced 65 mm apart on the bracket. Based on the manufacturing date, the sheet metal mounting bracket was fabricated for either an AC fan, a DC fan, or both.

1. Review the General Precautions on page 17.
2. Remove power from the AFE. See Remove Power from the AFE on page 192.
3. Remove the LCL filter fan assembly from the AFE. See LCL Filter Fan Assembly Removal and Installation on page 229.
4. Disconnect the X1 connector from the sheet metal housing.

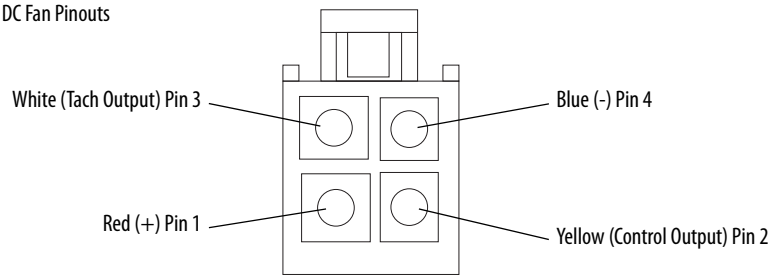
Image for SK-Y1-DCPS2-F10

5. Measure the resistance between the fan supply wires.

   DC Fan: If the measurements are not similar to those in this table, replace the DC fan.

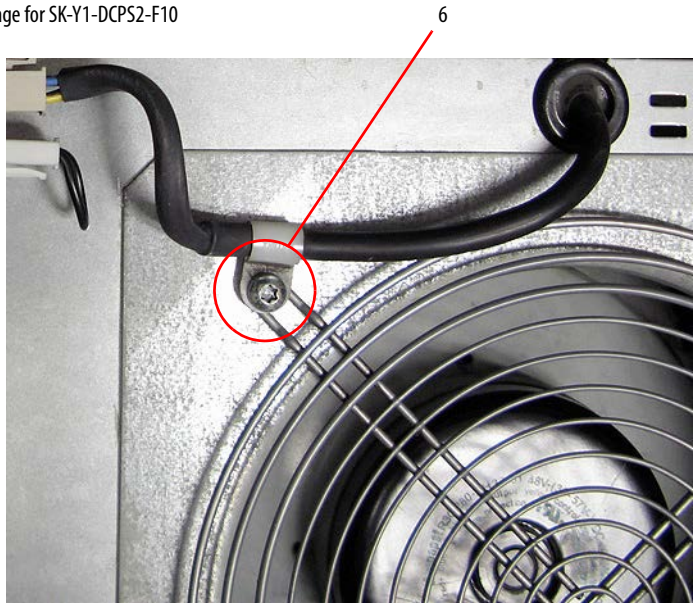
Connection wires	Resistance ±5%
Red-Blue	∞ Ω
Red-White	∞ Ω
White-Yellow	∞ Ω
Blue-White	∞ Ω

DC Fan Pinouts



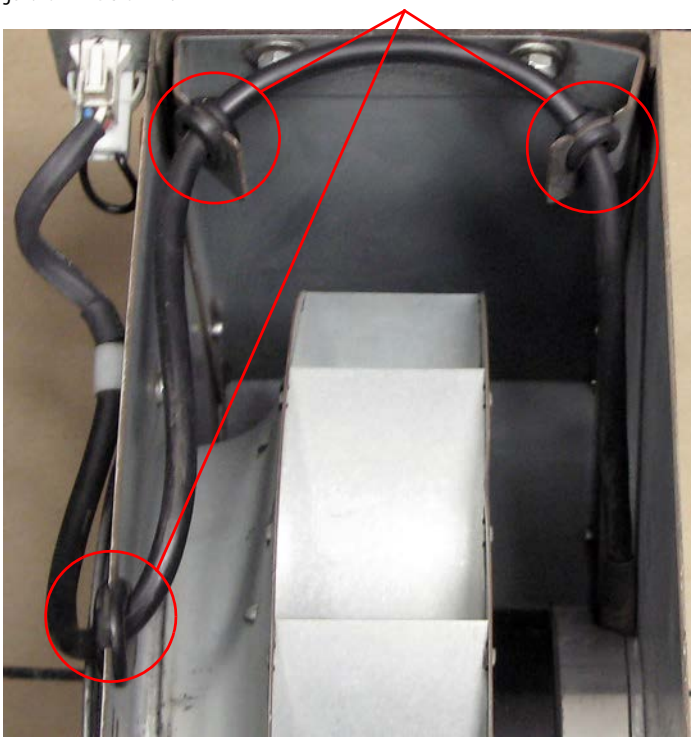
6. Remove the M5 x 16 mm hexalobular screw that secures the fan power cable to the fan housing.

Image for SK-Y1-DCPS2-F10



7. Remove the grommets from the holes in the sheet metal.

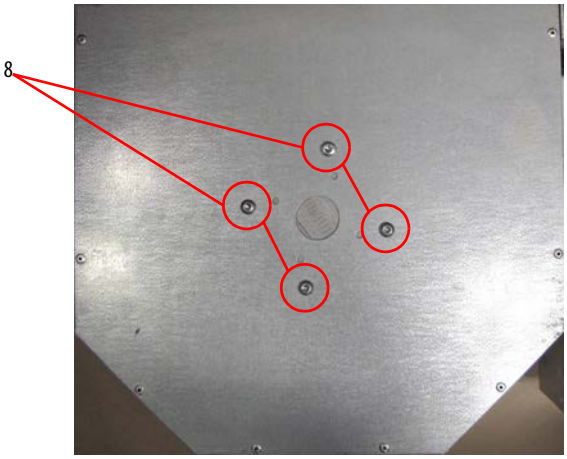
Image for SK-Y1-DCPS2-F10



8. Remove the four M5 x10 mm hexalobular screws that secure the fan to the sheet metal housing and remove the fan. Retain the sheet metal housing for reuse.

   Note: The Main AC and DC fans have different mounting hardware and hole dimensions. The AC fan uses four M4 x 8 mm screws that are spaced 40 mm apart on the housing. The DC fan uses four M5 x 10 mm screws that are spaced 65 mm apart on the housing. Based on the manufacturing date, the sheet metal housing was fabricated for either an AC fan, a DC fan, or both.

Image for SK-Y1-DCPS2-F10



	T25 3.5 N•m (31.0 lb•in)

9. Install the new main DC fan in reverse order. Verify that the fan turns easily and does not make contact with the sheet metal housing or fan cable before installing the fan assembly in the AFE.

Notes:

PowerFlex 700AFE Drive - Frame 13 Procedures

This chapter contains spare part information and procedures for testing and replacing fan system components for frame 13 PowerFlex 700AFE drives. See Appendix A PowerFlex 700H and 700S Diagnostic Procedures on page 255 for additional component test procedures.

Frame 13 AFE Drive Configurations

Frame 13 AFE drive consists of a LCL filter section and a converter section. The converter section is an inverter section designed to either supply DC bus voltage or regenerate power back to the AC line. For clarity of instructions, the converter will be referred to as a power structure throughout this chapter.

Figure 27 - Frame 13 AFE System - IP21 NEMA / UL Type 1 (Rittal) Cabinet

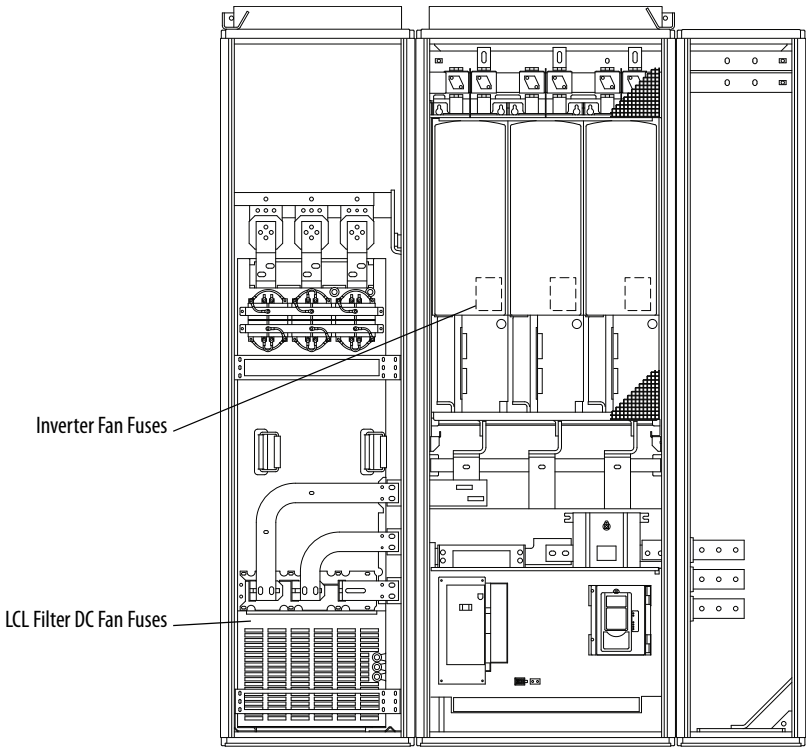
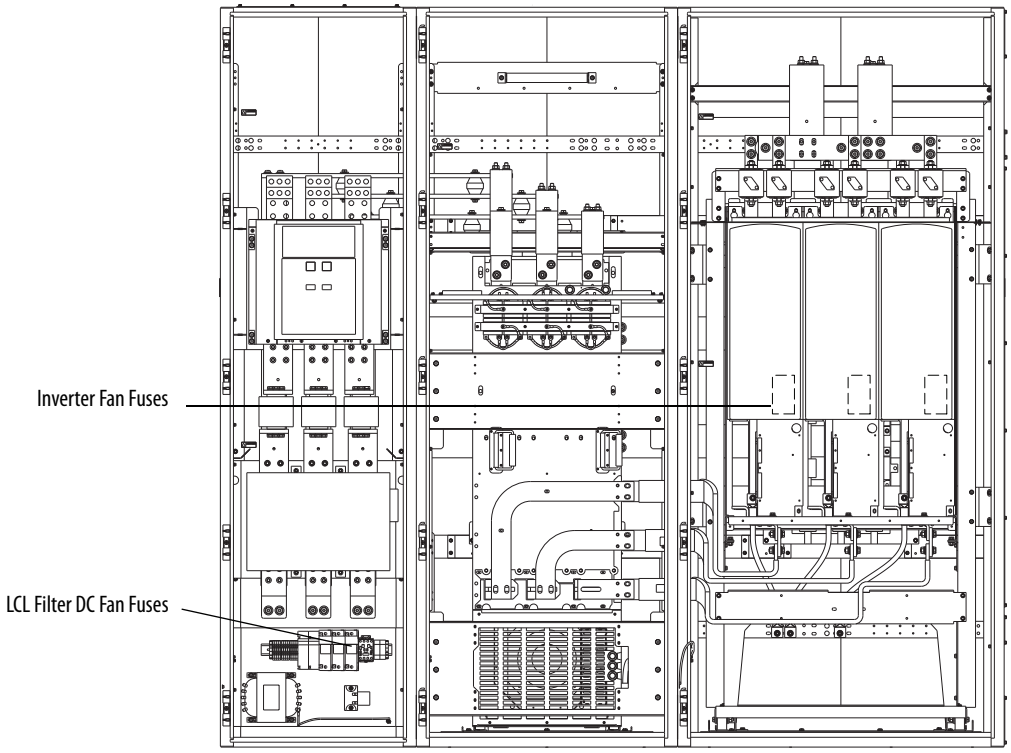


Figure 28 - Frame 13 AFE System - IP20 NEMA / UL Type 1 (MCC) Cabinet



The PowerFlex 700AFE is available in several configurations:

- The IP00 NEMA / UL Type Open drive is an open style frame that is available through the Rockwell Automation Systems and Solutions Business. This configuration is repackaged into a cabinet structure that is consistent with the system.
- The IP20 NEMA / UL Type 1 (MCC) enclosure (finger safe and dripping water protection).
- The IP21 NEMA / UL Type 1 (Rittal) enclosure (finger safe and no water protection).

The spare parts listed in this manual fit any of the cabinet types listed above. The procedures contained in this document pertain to each drive configuration listed above. Only the enclosure and method to get to the components may vary slightly. For IP20 and IP21 enclosures access procedures, see the PowerFlex 700AFE Frame 13 Hardware Service Manual, publication 20Y-TG002.

Frame 13 AFE Fan System Spare Parts

AC Fan Systems

See Available Fan System Kits starting on page 277 for an illustration of the spare part kit contents.

Voltage	Cat. No.	Part Description	Quantity per Drive	Original Vendor and Model Number
Inverter	20-FI13300	Main fan assembly	3	
	20-FI13301	Fan inverter assembly (includes PCB, fuses capacitor, isolation transformer, and mounting hardware)	3	
	20-PP1096	Cooling fan for ASIC board assembly	1	Sinwan SD5012PT-24H (1)
	20-PP20202 (2)	Fuse for fan system	2	Ferraz Shawmut ATQ8 (2)
	20-PP20300	Fuse holder for main fan system fuses	1	Ferraz Shawmut 30322
	20-VB00299	Fan inverter circuit board	3	
	SK-H1-FANCAP-F1314	Fan capacitor kit	3	

(1) The part may not contain wires, connectors, or mounting hardware when bought directly from vendor.
(2) The factory default fuses are Ferraz Shawmut ATQ8, 8 A fuses. Older drives may contain Bussman 6 A fuses.

DC Fan Systems

See Available Fan System Kits starting on page 277 for an illustration of the spare part kit contents.

Voltage	Cat. No.	Part Description	Quantity per Drive	Original Vendor and Model Number
Power Structure	SK-H1-DCFANBD1 (1)	Main DC fan power supply circuit board	3	
	SK-Y1-DCFAN1	Main DC fan assembly	3	
	20-PP20300	Fuse holder for main fan system fuses	1	Ferraz Shawmut 30322
	20-PP20202 (2)	Fuse for fan system	2	Ferraz Shawmut ATQ8 (4)
	SK-Y1-DCFANRETROFIT-F13	Retrofit fan kit for frame 13 AFE	1	
	20-PP1096	Cooling fan for ASIC board assembly	1	Sinwan SD5012PT-24H (5)
LCL Filter	SK-Y1-DCPS1-D1K3 (2)	LCL filter DC fan power supply assembly (older version)	1	
	SK-Y1-DCPS1-E1K0 (2)		1	
	SK-Y1-DCPS2-F13	LCL filter DC fan power supply circuit board upgrade kit (newer version)	1	
	SK-H1-DCFANBD1 (1)(3)	Main DC fan power supply circuit board	3	
	SK-Y1-HF1-DF	LCL DC fan system wire kit	1	
	SK-Y1-DCFAN1	Main fan assembly	1	
	20-PP20300	Fuse holder for fan system fuses	1	Ferraz Shawmut 30322
	20-PP20202 (2) or SK-Y1-F11-F10	Fuse for fan system	2	Ferraz Shawmut ATQ8 (4)

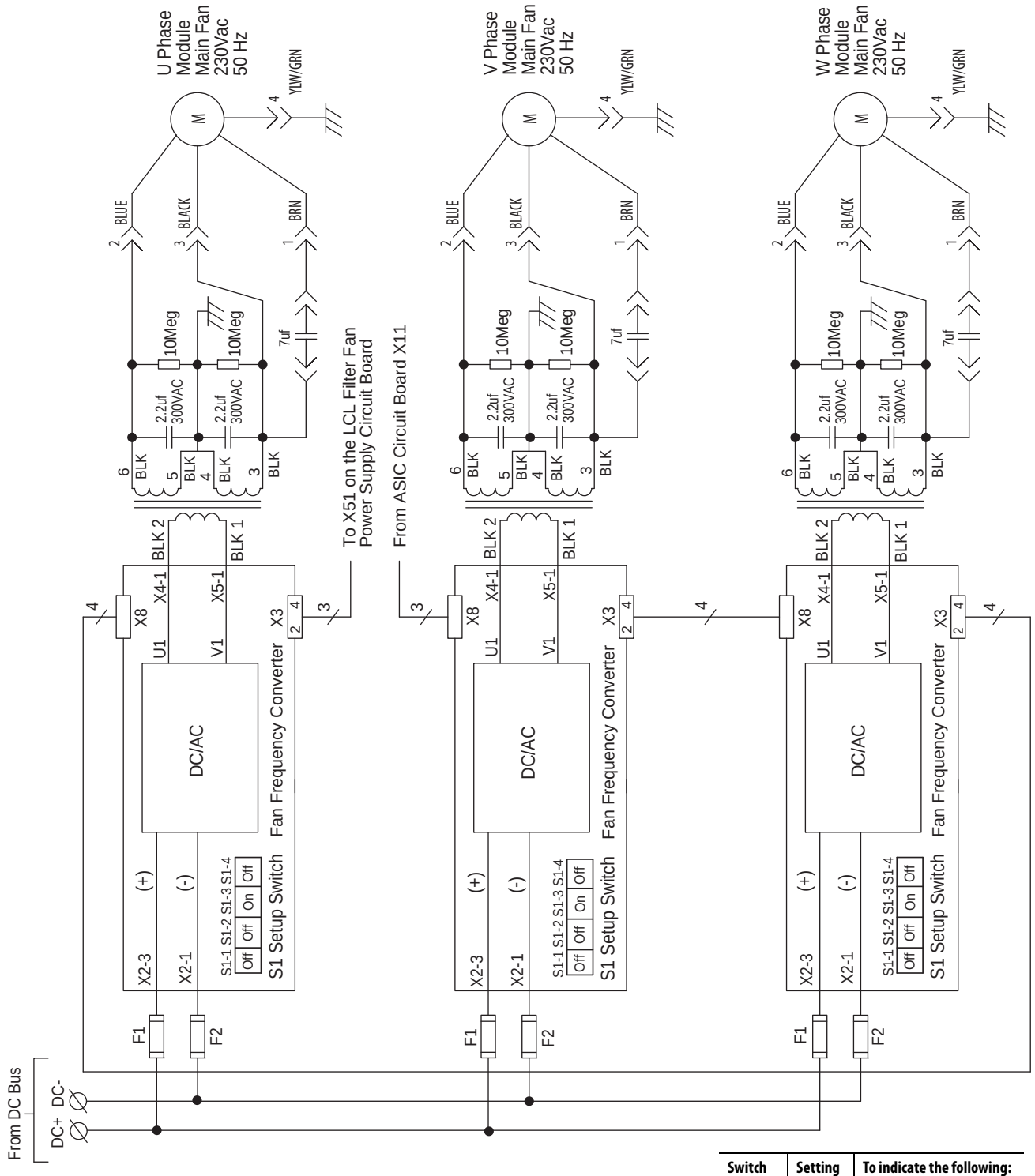
(1) Circuit board only, no sheet metal bracket.
(2) This kit is replaced by the SK-Y1-DCPS2-F13 kit.
(3) Only use this circuit board if you are replacing a newer version circuit board (same catalog number).
(4) The factory default fuses are Ferraz Shawmut ATQ8, 8 A fuses. Older drives may contain Bussman 6 A fuses.
(5) The part may not contain wires, connectors, or mounting hardware when bought directly from vendor.

Tools Needed for Frame 13 AFE Fan System Repairs

- #2 POZIDRIV screwdriver
- 5.5 mm hex key
- 19 mm socket wrench
- T20 and T25 hexalobular screwdriver
- Fuse puller
- Nose pliers
- Wire cutter
- Optional: PowerFlex 700H and 700S maintenance stand (cat. No. 20-MAINSTND)

Frame 13 AFE Schematic Diagrams

Figure 29 - Frame 13 AFE Power Structure AC Fan Connections



Switch	Setting	To indicate the following:
S1	Off	50 Hz fan motor frequency
S2	Off	220 V AC motor voltage
S3	On	230 V AC motor voltage
S4	Off	Frame size 9…14

Figure 30 - Frame 13 AFE Inverter DC Fan System

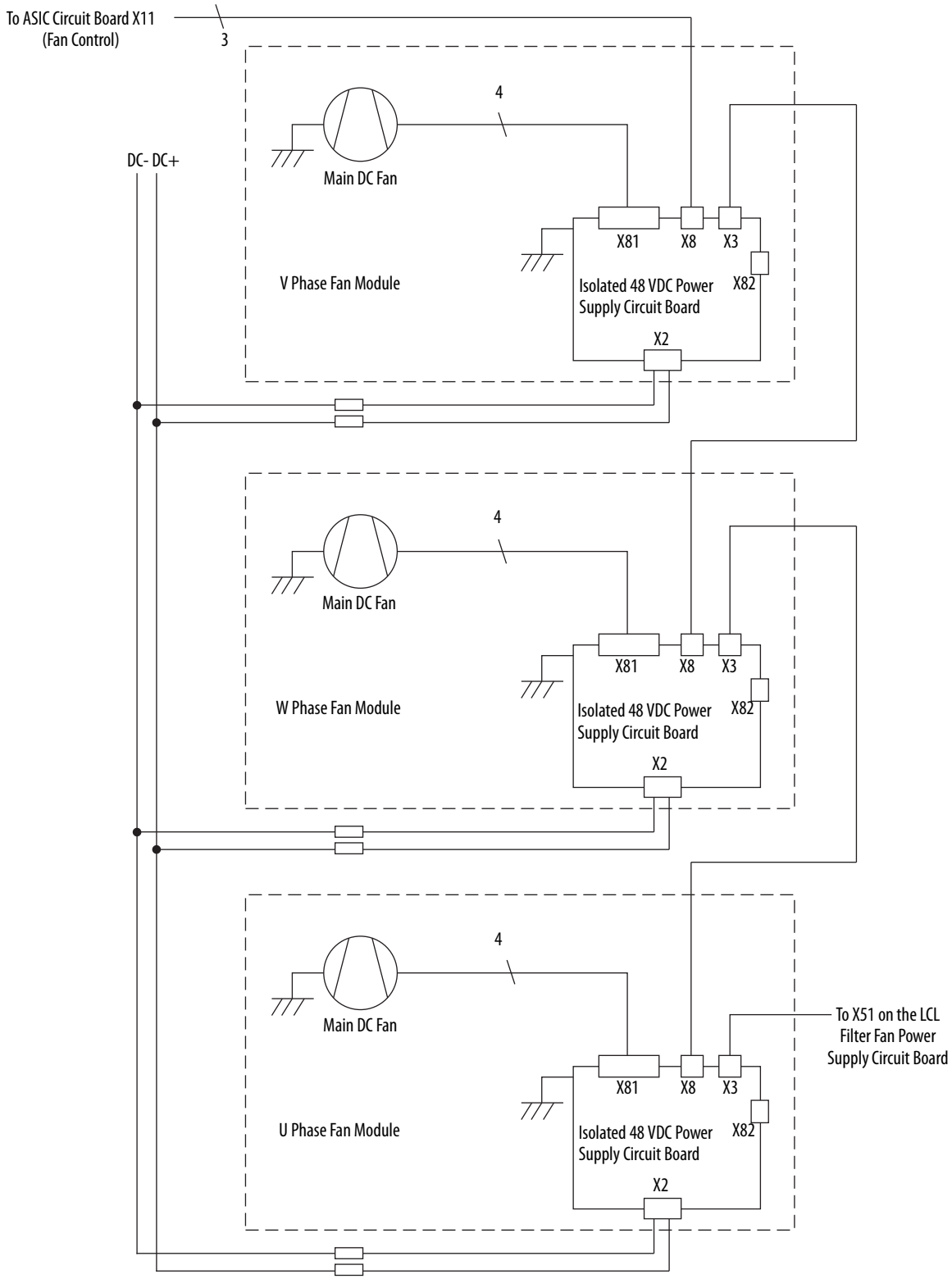
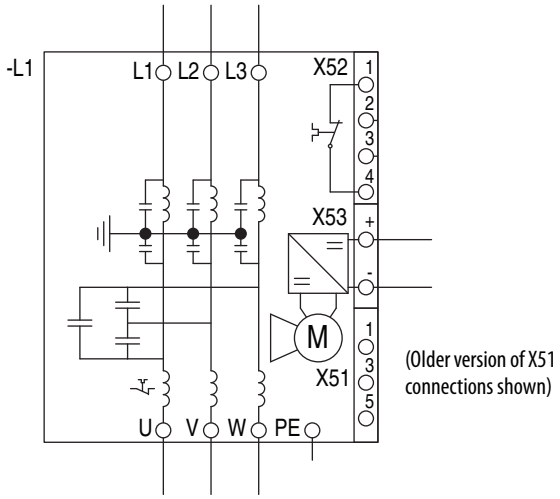
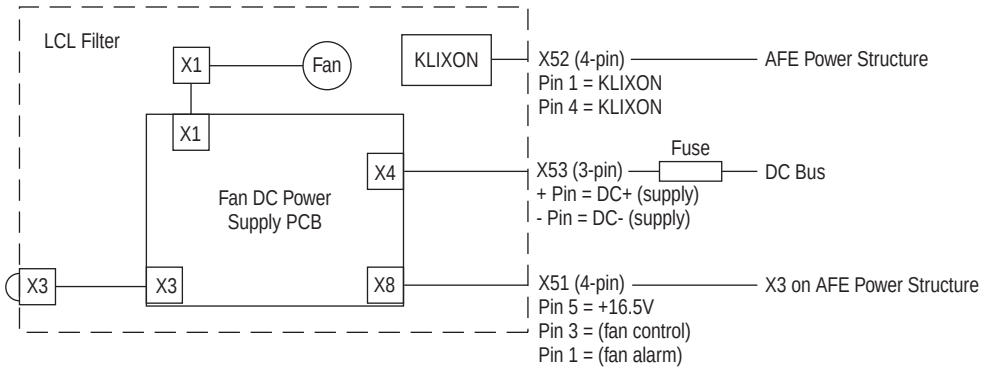


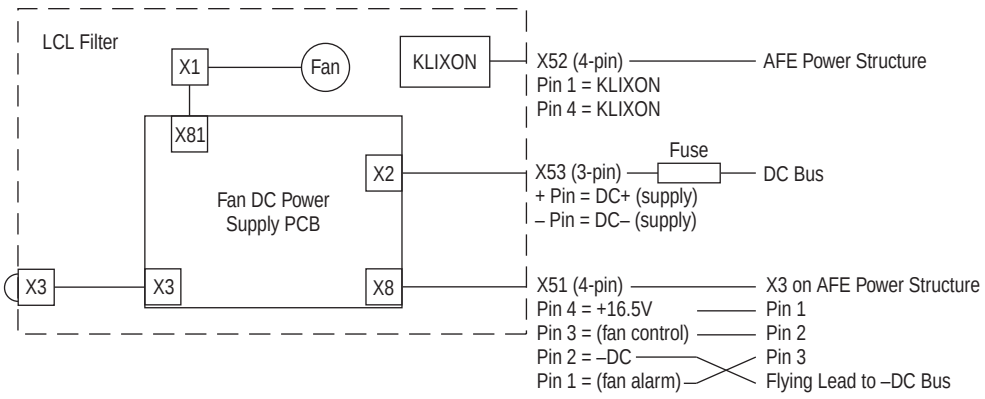
Figure 31 - Frame 13 AFE (LCL Filter Section) DC Fan System Wiring Schematic Diagram



LCL Filter DC Fan System Wiring -Older Version



LCL Filter DC Fan System Wiring -Newer Version



Frame 13 AFE Fan System Replacement Procedures

Replacement procedures for these frame 13 fan system parts are included in this chapter.

Power Structure Section

The frame 13 PowerFlex 700AFE power structure is essentially a PowerFlex 700H or PowerFlex 700S frame 13 DC input drive. The procedures for replacing PowerFlex 700AFE frame 13 fan system components are the same as those for frame 13 drives. See Frame 13 Fan System Replacement Procedures beginning on page 134 for detailed replacement procedures.

Cat. No.	Part Description	Page
20-PP01096	60 mm cooling fan for the ASIC board assembly	139
20-PP20202	Fuse for fan system	141
20-PP20300	Fuse holder for main fan system fuses	141
20-FR13301	Main AC fan inverter assembly	151
20-VB00299	Main AC fan inverter circuit board	151
SK-H1-DCFANBD1	Main DC fan power supply circuit board	153
SK-Y1-DCFANRETROFIT-F13	AC to DC fan system retrofit kit	154
SK-H1-FANCAP-F1314	Main AC fan capacitor (7 µF) kit	170
20-FI3300	230 W main AC fan assembly	174
SK-Y1-DCFAN1	Main DC fan assembly	174

LCL Filter Section

The LCL filter provides the filtering to minimize the harmonic content originating from the inverter section (PWM frequency) from interacting with the ac grid.

Replacement procedures for these frame 13 AFE LCL filter fan system parts are included in this chapter.

Cat. No.	Part Description	Page
20-PP20202	Fuse for fan system	245
SK-Y1-DCPS1-D460	DC fan power supply assembly - 400/480V (older version)	245
SK-Y1-DCPS1-F325	DC fan power supply assembly - 600/690V (older version)	
SK-H1-DCFANBD1 (1)	Main DC fan power supply circuit board	
SK-Y1-DCPS2-F13	DC fan power supply kit (newer version)	247
SK-Y1-DCFAN1	Main DC fan assembly	253

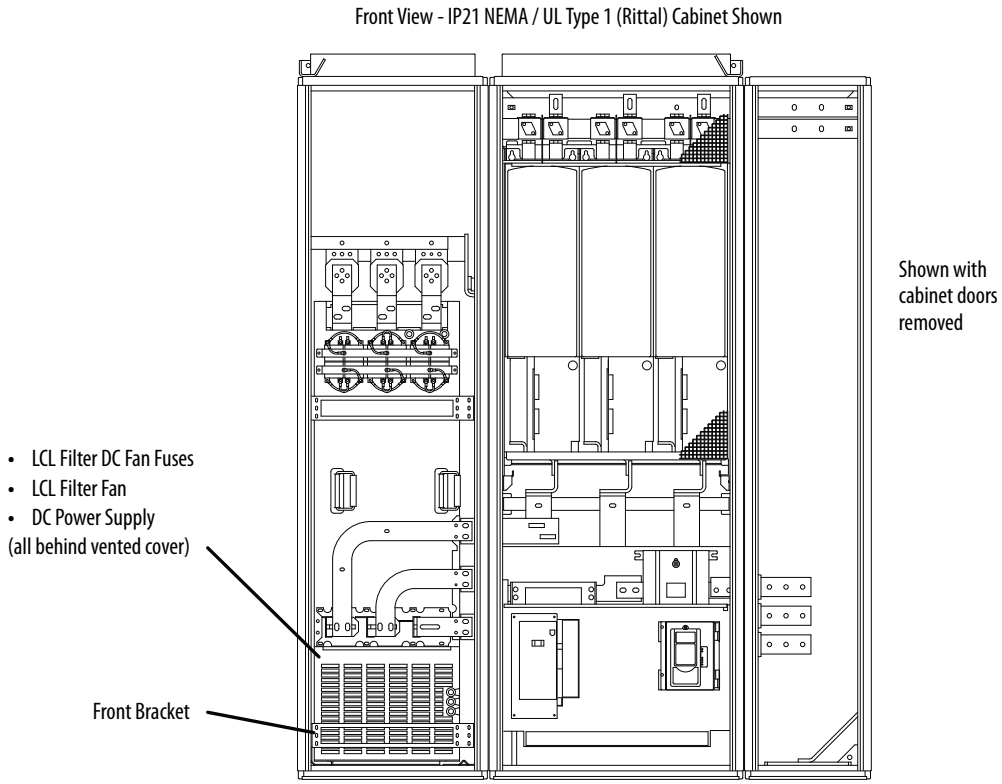
(1) Only use this circuit board if you are replacing a newer version circuit board (same catalog number).

Note: Additional procedures will be added to future revisions of this publication as they become available. Enter 'PFLEX-IN029' in the Search field on the Rockwell Automation Literature Library at:
http:/www.rockwellautomation.com/literature/

Removing the LCL Filter Protective Cover

1. Review the General Precautions on page 17.
2. Remove power from the AFE. See Remove Power from the AFE on page 192.
3. Remove the four T25 Torx self-tapping screws that secure the front bracket shown in Figure 32. This bracket holds the LCL filter in the cabinet.
4. Remove the vented cover from the bottom of the LCL filter to access the DC fan fuses, fan, and DC power supply.

Figure 32 - Removing LCL Filter Protective Covers



5. Install the protective covers in the reverse order of removal.

LCL Filter DC Fan Fuses (20-PP20202) Removal and Installation

The LCL filter DC fan fuses are located behind the vented cover at the bottom of the LCL filter. See Figure 27 on page 236 or Figure 28 on page 237 for details.

1. Review the General Precautions on page 17.
2. Remove power from the AFE. See Remove Power from the AFE on page 192.
3. Remove the LCL filter protective covers. See Removing the LCL Filter Protective Cover in page 244.
4. Replace the LCL Filter fan fuses.

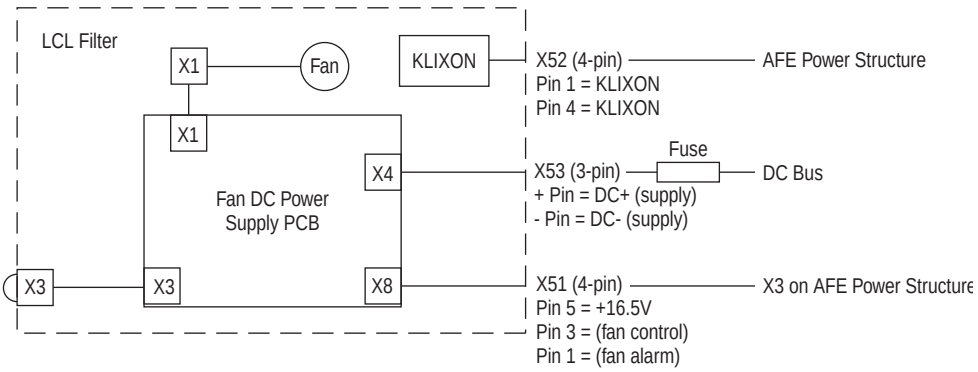
IMPORTANT Use only ATQ8 (Ferraz Shawmut) fuses.

LCL Filter DC Fan Power Supply (SK-Y1-DCPS1-D1K3 or SK-Y1-DCPS1-E1K0) Removal and Installation

Note: It is not necessary to remove the fan assembly from the LCL filter, but by doing so, it may be easier to replace the DC fan power supply circuit board.

The LCL filter DC fan power supply wiring diagram is shown in Figure 33. The diagram shows the connections to the AFE power structure and DC bus.

Figure 33 - LCL Filter Fan DC Power Supply Wiring Diagram

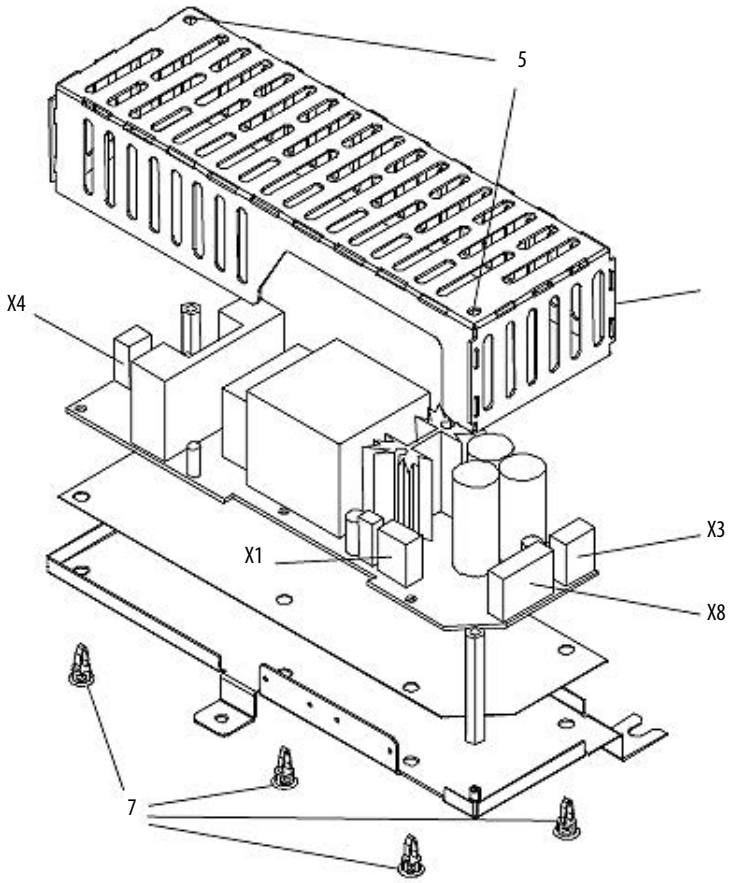


IMPORTANT Before doing any work, disconnect the AFE power structure from the AC supply, and wait until the fan stops and the indicators on the keypad turn off. (If a keypad is not attached, see the indicator through the keypad base.) Wait 5 more minutes before doing any work on the DC-to-DC power supply. Do not even open the cover until after this time has expired.

1. Review the General Precautions on page 17.
2. Remove power from the AFE. See Remove Power from the AFE on page 192.

3. Remove the LCL filter protective covers. See Removing the LCL Filter Protective Cover in page 244.
4. Remove the LCL filter DC fan assembly from the AFE. See LCL Filter Fan Assembly Removal and Installation on page 252.
5. Remove the two M4 x 10 mm POZIDRIV screws that secure the cover to the drive and remove the cover.
6. Remove the connectors X1, X3, X4, and X8.
7. Loosen the five nylon fasteners and remove the M4 x 8 mm hexalobular screw that secures the DC power supply to the fan housing and remove the DC power supply.

Note: Image for SK-Y1-DCPS1-D1K3 or SK-Y1-DCPS1-E1K0

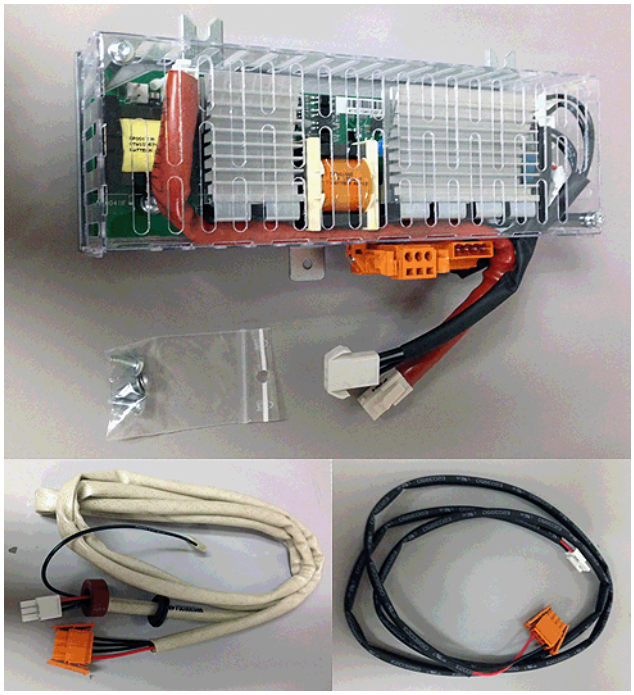


8. Install the LCL filter fan DC power supply in the reverse order of removal.

LCL Filter Fan DC Power Supply (SK-Y1-DCPS2-F13) Removal and Installation

This kit contains the following components.

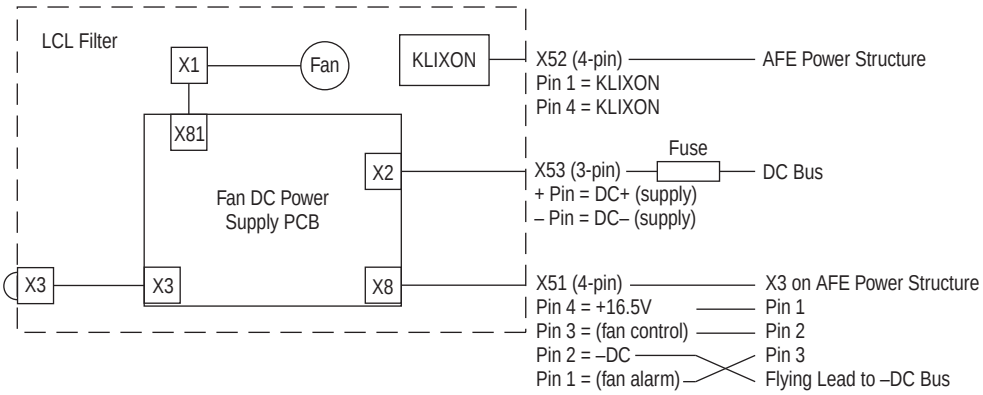
- Fan DC power supply circuit board
- New X51 cable (fan circuit board to AFE power structure connections)
- New X52 cable (fan motor thermal switch to AFE power structure connections)



Note: It is not necessary to remove the fan assembly from the LCL filter, but by doing so, it may be easier to replace the fan DC power supply circuit board.

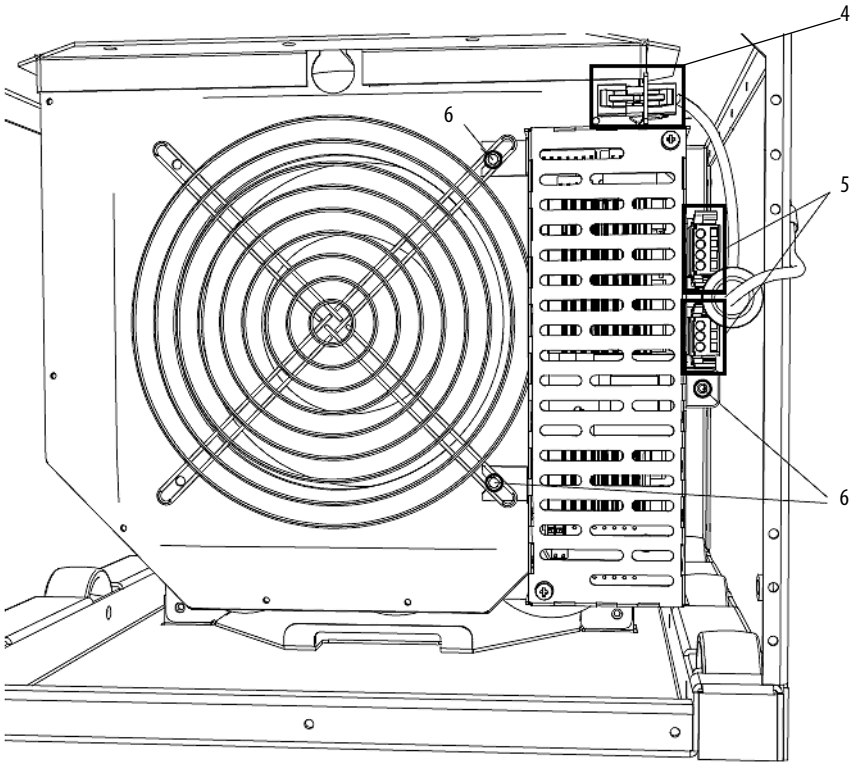
The LCL filter fan DC power supply wiring diagram is shown in Figure 34. The diagram shows the connections to the AFE power structure and DC bus.

Figure 34 - LCL Filter Fan DC Power Supply (SK-Y1-DCPS2-F13) Wiring Diagram - Newer Version



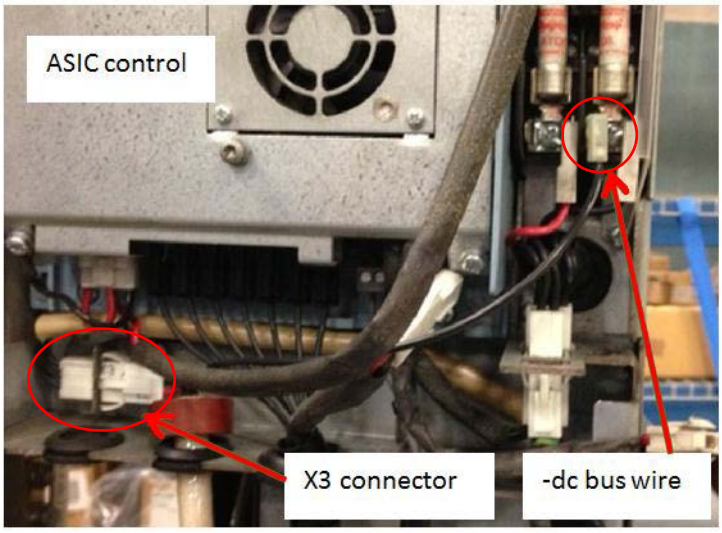
IMPORTANT Before doing any work, disconnect the AFE power structure from the AC supply, and wait until the fan stops and the indicators on the keypad turn off. (If a keypad is not attached, see the indicator through the keypad base.) Wait 5 more minutes before doing any work on the DC-to-DC power supply. Do not even open the cover until after this time has expired.

1. Review the General Precautions on page 17.
2. Remove power from the AFE. See Remove Power from the AFE on page 192.
3. If necessary, remove the LCL filter fan. See LCL Filter Fan Assembly Removal and Installation on page 252.
4. Disconnect the X1 connector from the fan sheet metal housing.
5. If necessary, disconnect the X51 and X53 connectors from the fan power supply.
6. Remove the three M5 x 16 mm hexalobular screws that secure the assembly to the fan housing.



7. Disconnect the cable from X51 on the LCL filter fan power supply and X3 on the AFE power unit and discard the cable.

8. Connect the new cable to X51 on the LCL filter fan power supply and X3 on the AFE power module. The extra flying lead connects to the –DC bus terminal as shown here.



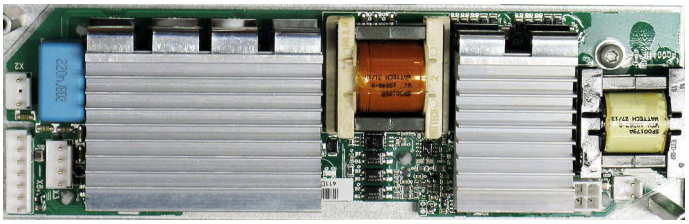
9. Install the new LCL filter fan power supply using the screws provided. See step 6 for details.
10. Connect the X51 and X53 connectors to the fan power supply circuit board.
11. Insert the X1 fan cable connector into the receptacle on the fan sheet metal housing.
12. If necessary, install the LCL filter fan in the reverse order of removal.

LCL Filter Fan DC Power Supply Circuit Board (SK-H1-DCFANBD1) Removal and Installation

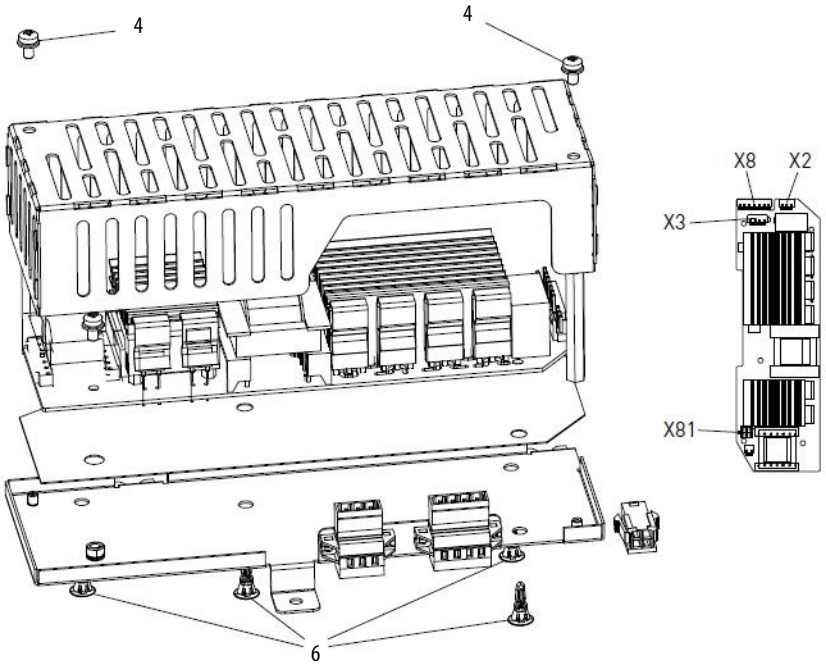
If the LCL filter already has a new fan power supply kit (SK-Y1-DCPS2-F13) installed, the DC fan power supply board (SK-H1-DCFANBD1) can be installed as a replacement part in the newer version DC power supply system.

Note: The DC fan replacement kit only contains the fan motor and impeller assembly. Therefore, the sheet metal housing for the fan must be reused. The Main AC and DC fans have different mounting hardware and hole dimensions. The AC fan uses four M4 x 8 mm screws that are spaced 40 mm apart on the bracket. The DC fan uses four M5 x 10 mm screws that are spaced 65 mm apart on the bracket. Based on the manufacturing date, the sheet metal mounting bracket was fabricated for either an AC fan, a DC fan, or both.

SK-H1-DCFANBD1

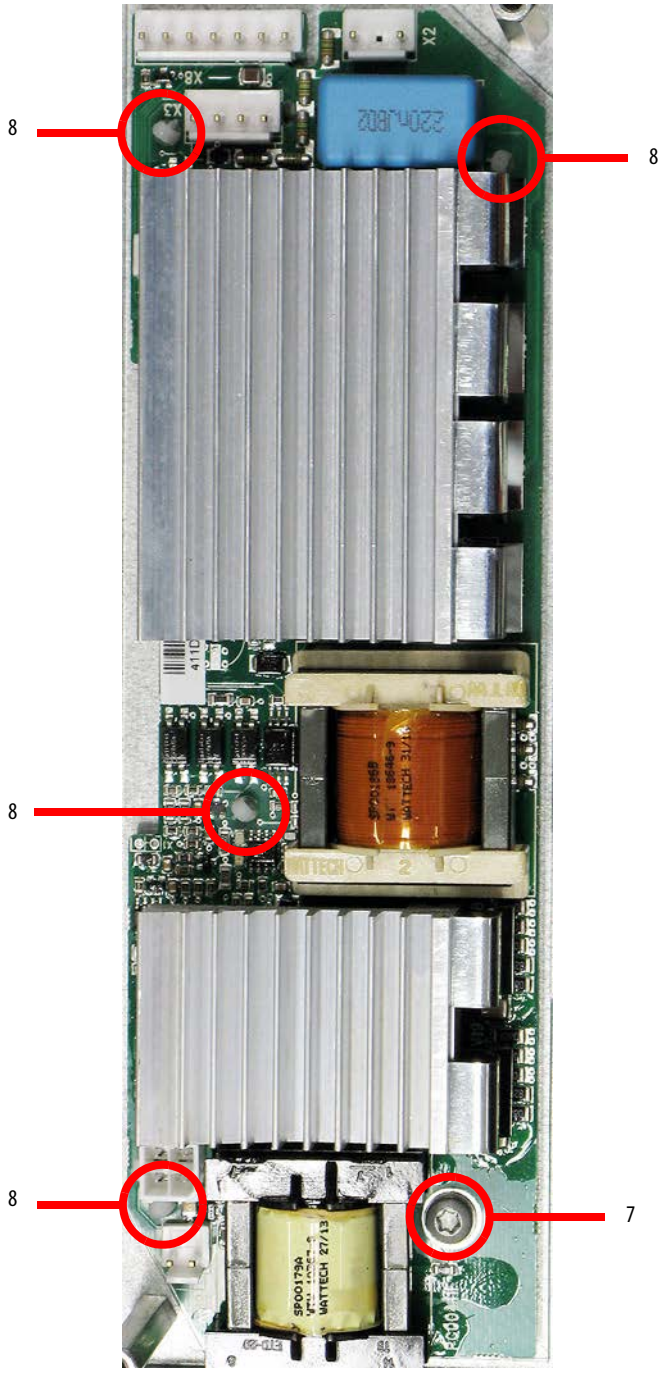


1. Review the General Precautions on page 17.
2. Remove power from the AFE. See Remove Power from the AFE on page 192.
3. Remove the LCL filter fan assembly from the AFE. See LCL Filter Fan Assembly Removal and Installation on page 252.
4. Remove the two M4 x 10 mm POZIDRIV screws that secure the cover to the chassis and remove the cover.
5. Disconnect the cables from connectors X2, X3 and X8 at the top of the board.
6. Disconnect the cable from connector X81 at the bottom of the board.



7. Remove the M4 x 8 mm hexalobular screw that secures the circuit board to the sheet metal support.
8. Remove the four fasteners that secure the DC power supply.

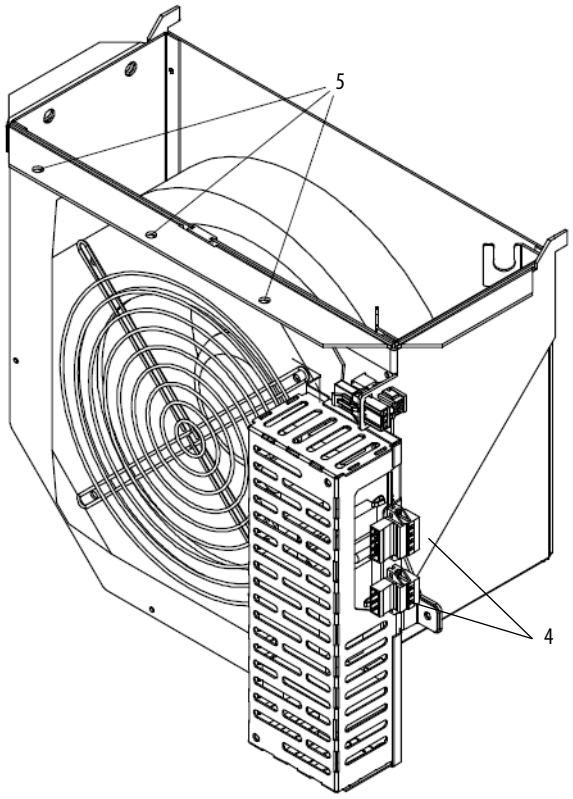
Image for SK-H1-DCFANBD1



9. Install the new DC fan power supply circuit board in the reverse order of removal.

LCL Filter Fan Assembly Removal and Installation

1. Review the General Precautions on page 17.
2. Remove power from the AFE. See Remove Power from the AFE on page 192.
3. Remove the LCL filter protective covers. See Removing the LCL Filter Protective Cover in page 244.
4. Disconnect terminal blocks X51 and X53.
5. Remove the three M4 x 8 mm hexalobular screws that secure the fan housing to the chassis. Note: Support the front of the fan housing as you remove the screws.



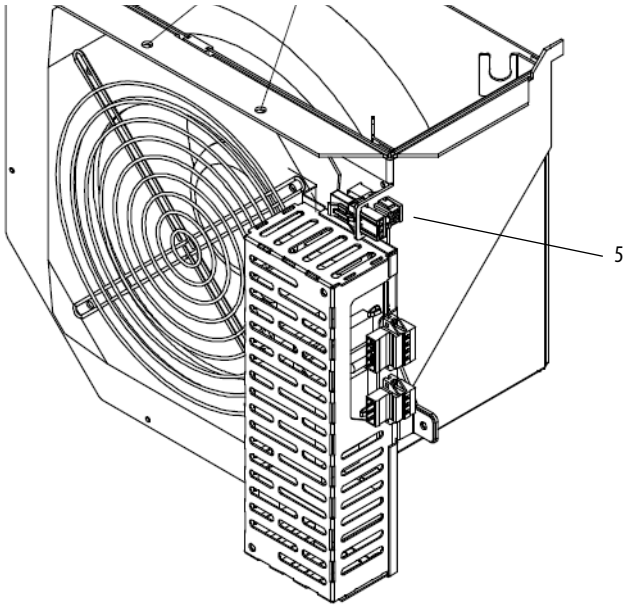
6. Lower the front of the fan assembly, slide it forward to remove the alignment tabs on the sheet metal housing from the slots on the back wall and pull the fan assembly out of the chassis.
7. Install the LCL filter fan assembly in reverse order of removal. Be sure that the alignment tabs are seated in the slots on the back wall as you slide the fan assembly back into place.

LCL Filter Main DC Fan (SK-Y1-DCFAN1) Assembly Removal and Installation

Follow these steps to measure the resistance between the main fan supply wires and remove and replace the main fan, if necessary.

Note: The DC fan replacement kit only contains the fan motor and impeller assembly. Therefore, the sheet metal housing for the fan must be reused.

1. Review the General Precautions on page 17.
2. Remove power from the AFE. See Remove Power from the AFE on page 192.
3. Remove the LCL filter protective covers. See Removing the LCL Filter Protective Cover in page 244.
4. Remove the LCL filter fan assembly from the AFE. See LCL Filter Fan Assembly Removal and Installation on page 252.
5. Disconnect the X1 connector from the sheet metal housing.

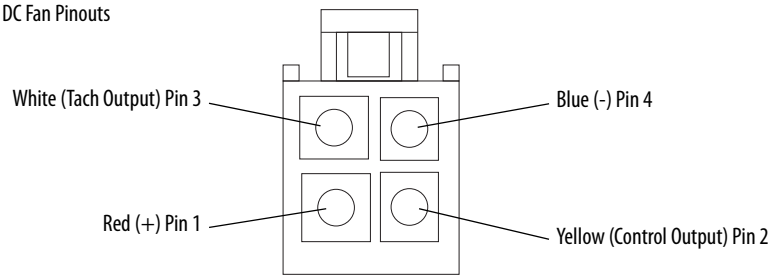


6. Measure the resistance between the fan supply wires.

   DC Fan: If the measurements are not similar to those in this table, replace the DC fan.

Connection wires	Resistance ±5%
Red-Blue	∞ Ω
Red-White	∞ Ω
White-Yellow	∞ Ω
Blue-White	∞ Ω

DC Fan Pinouts

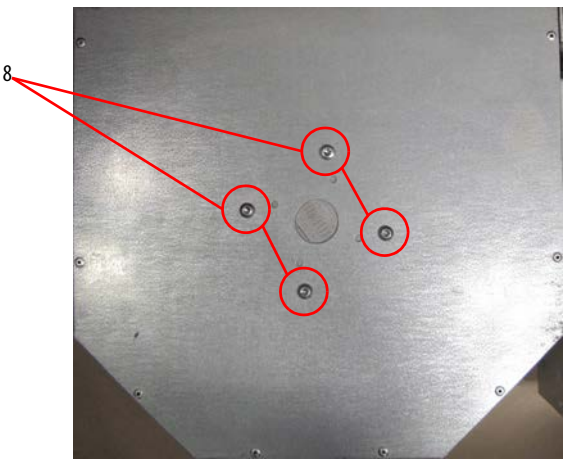


7. Remove the M5 x 16 mm hexalobular screw that secures the fan power cable to the fan housing.
8. Remove the grommets from the holes in the sheet metal.
9. Remove the four screws that secure the fan to the sheet metal housing and remove the fan. Retain the sheet metal housing for reuse.

   Note: The Main AC and DC fans have different mounting hardware and hole dimensions. The AC fan uses four M4 x 8 mm screws that are spaced 40 mm apart on the housing. The DC fan uses four M5 x 10 mm screws that are spaced 65 mm apart on the housing. Based on the manufacturing date, the sheet metal housing was fabricated for either an AC fan, a DC fan, or both.

Image for SK-Y1-DCPS2-F13

	T25 3.5 N•m (31.0 lb•in)



10. Install the new main DC fan in reverse order. Verify that the fan turns easily and does not make contact with the sheet metal housing or fan cable before installing the fan assembly in the AFE.

PowerFlex 700H and 700S Diagnostic Procedures

The following diagnostic procedures can be used to determine whether specific fan system components require replacement.

Qualified Personnel

ATTENTION: Only qualified personnel familiar with adjustable frequency AC drives and associated machinery should plan or implement the installation, start-up and subsequent maintenance of the system. Failure to comply may result in personal injury and/or equipment damage.

Personal Safety

ATTENTION: To avoid an electric shock hazard, verify that the voltage on the bus capacitors has discharged before servicing the drive. Check the DC bus voltage at the Power Terminal Block by measuring between the +DC & -DC terminals, between the +DC terminal and the chassis, and between the -DC terminal and the chassis. The voltage must be zero for all three measurements.

ATTENTION: Potentially fatal voltages may result from improper usage of a multimeter and other test equipment. The multimeter chassis may be at a potentially fatal voltage if not properly grounded. If a multimeter is used to measure high voltage waveforms, use appropriately rated differential voltage probes. Be sure that they are set to the highest voltage scaling in order to achieve safe measurement resolution. Verify that the multimeter chassis is correctly grounded to an earth ground.

Product Safety

ATTENTION: This drive contains ESD (Electrostatic Discharge) sensitive parts and assemblies. Static control precautions are required when installing, testing, servicing or repairing this assembly. Component damage may result if ESD control procedures are not followed. If you are not familiar with static control procedures, reference Guarding Against Electrostatic Damage, publication 8000-4.5.2 or any other applicable ESD protection handbook.

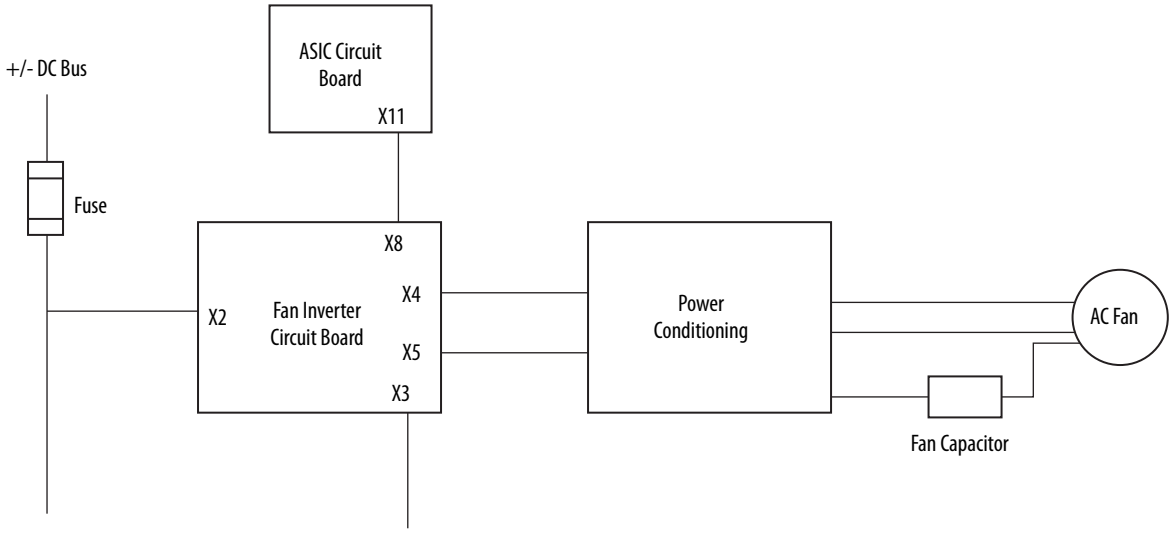
Class 1 LED Product

ATTENTION: Hazard of permanent eye damage exists when using optical transmission equipment. This product emits intense light and invisible radiation. Do not look into module ports or fiber-optic cable connectors.

Fan Inverter System Block Diagrams

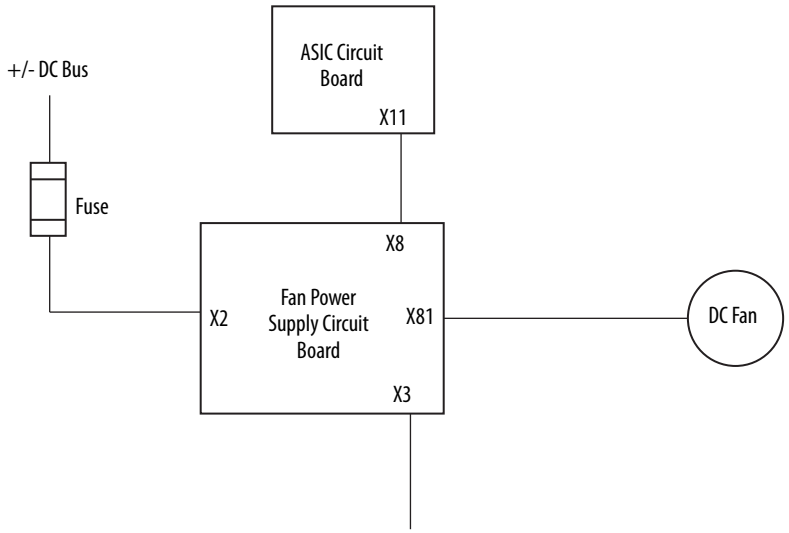
AC Fan Inverter System

The AC fan inverter system is summarized in the following block diagram.



DC Fan System

The DC fan system is summarized in the following block diagram.



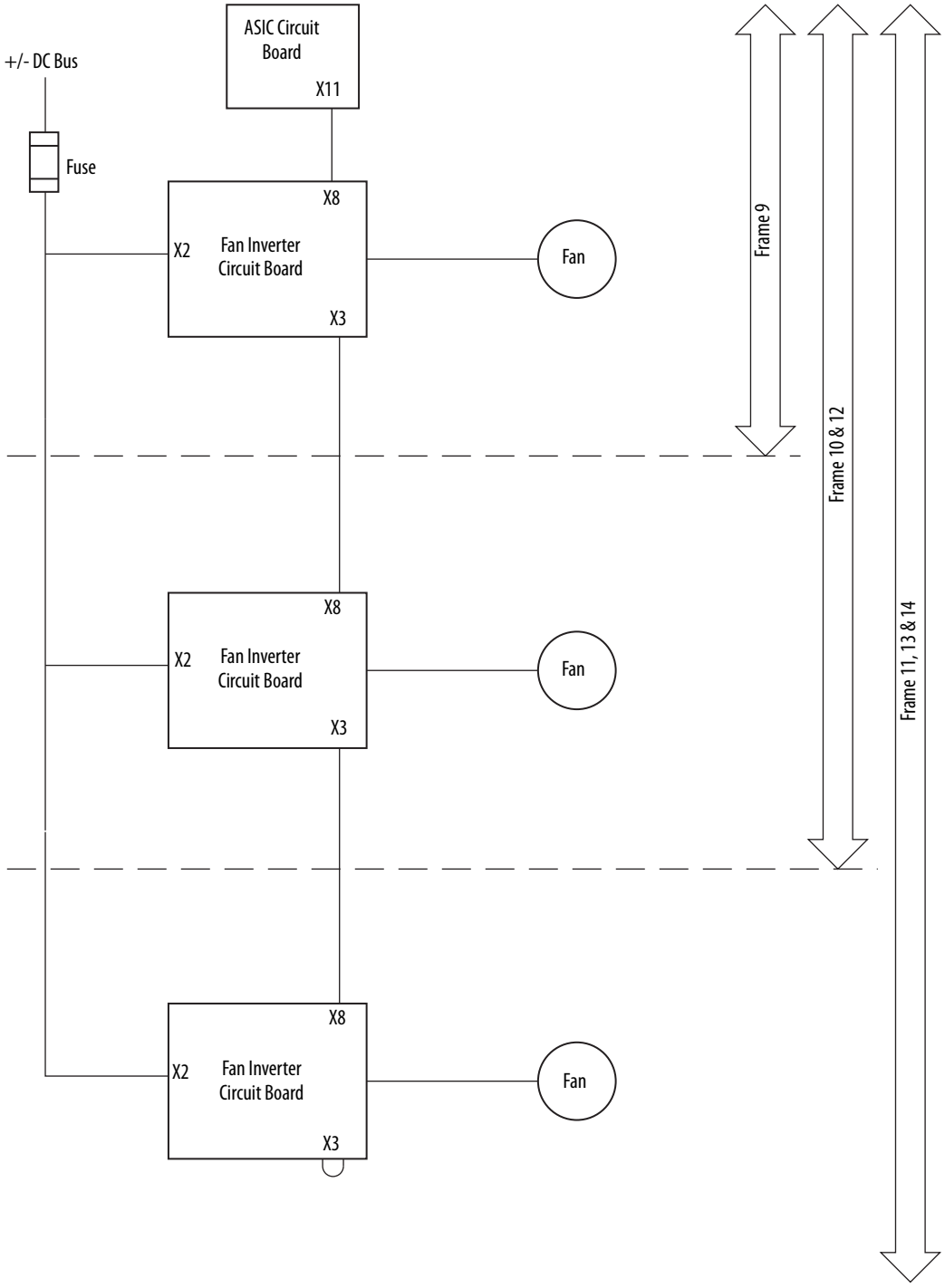
PowerFlex 700H and PowerFlex 700S Drives

The frame size for PowerFlex 700H and PowerFlex 700S drives determines the number of fan systems, as listed here:

- Frame 9 drives - one fan system
- Frame 10 drives - two fan systems
- Frame 11 drives - three fan systems
- Frame 12 drives - four fan systems, where the topology is parallel frame 10 drives

- Frame 13 drives - three fan systems for common DC bus drives, five or six fan systems for standalone AC input drives
- Frame 14 drives - six fan systems for common DC bus drives, nine, ten or twelve fan systems for standalone AC input drives

This drive topology and fan system distribution is shown here.



The fan system topology differs between the ac and dc versions, however, they contain the similar functions.

Function	AC Fan System	DC Fan System
Dc bus fuses (qty 2)	Early version Bussmann 6 A or present factory installed Ferraz ATQ8 fuses are in the +/- DC bus voltage input at all voltage classes.	Ferraz ATQ8 fuses are in the +/- DC bus voltage input at all voltage classes.
Fan motor	The 230V, three-phase, 225 W, 50 Hz, AC fan motor operates at 2700 RPM and 474 CFM (806 CMH) to provide cooling airflow to the power structure.	The 48V, 135 W, DC fan motor operates at 2360 RPM and 474 CFM (806 CMH) to provide cooling airflow to the power structure.
Power conditioning magnetics	An isolation transformer and snubber network are present to filter the PWM switching waveform on the fan motor and fan capacitor.	N/A
Fan capacitor	A 7 uF capacitor provides a phase shift that helps to start the fan motor and then to regulate the fan motor speed.	N/A
Fan control circuit board	Fan inverter circuit board - where the DC input voltage in converted to a 50 Hz PWM signal for controlling the fan speed. This circuit board also contains the on/off fan control signal and fan system fault detection.	Fan inverter circuit board - where the DC input voltage in converted to 48 VDC for controlling the fan speed. This circuit board also contains the on/off fan control signal and fan system fault detection.
ASIC circuit board	The ASIC circuit board provides fan control signal at connector X8 on the first fan inverter circuit board. Fan systems can be cascaded by connecting X3 to X8 of the next fan inverter circuit board. The fan inverter circuit board needs a terminating or loop back plug installed at connector X3 of the last fan system to provide individual fan system status, for fault detection.	

PowerFlex 700AFE

For PowerFlex 700AFE systems, only two frames (10 and 13) are available. The fan topology is shown here.

Figure 35 - Frame 10 AFE Fan System Topology (Older Style)

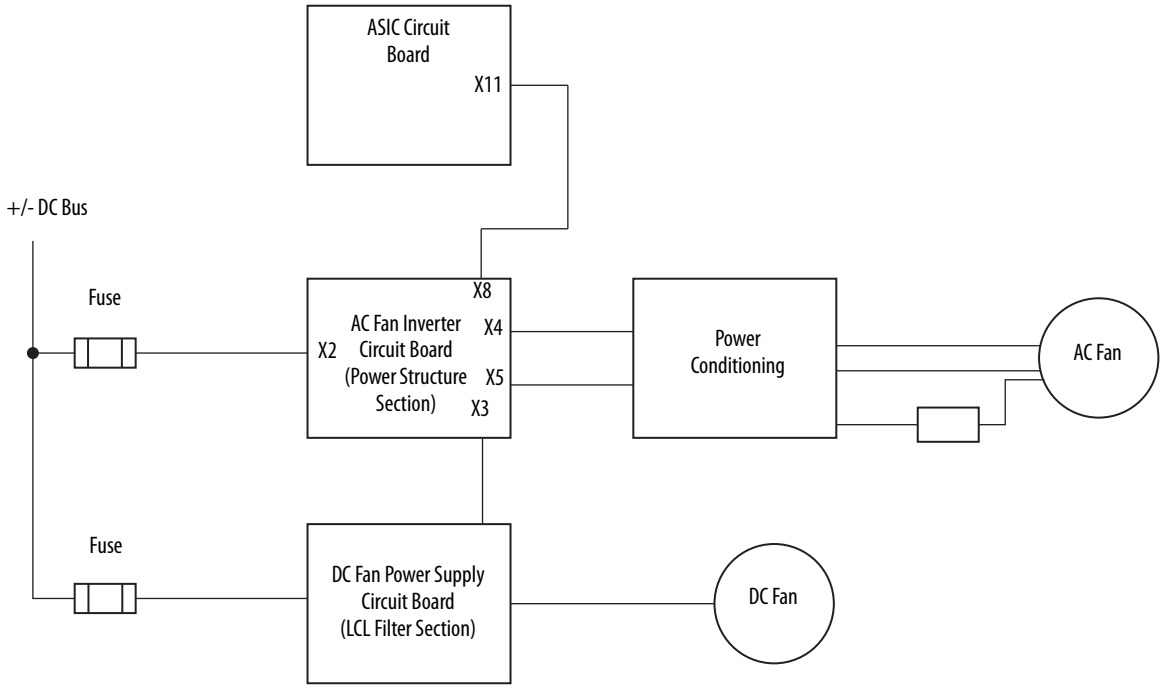


Figure 36 - Frame 10 AFE Fan System Topology (New Style)

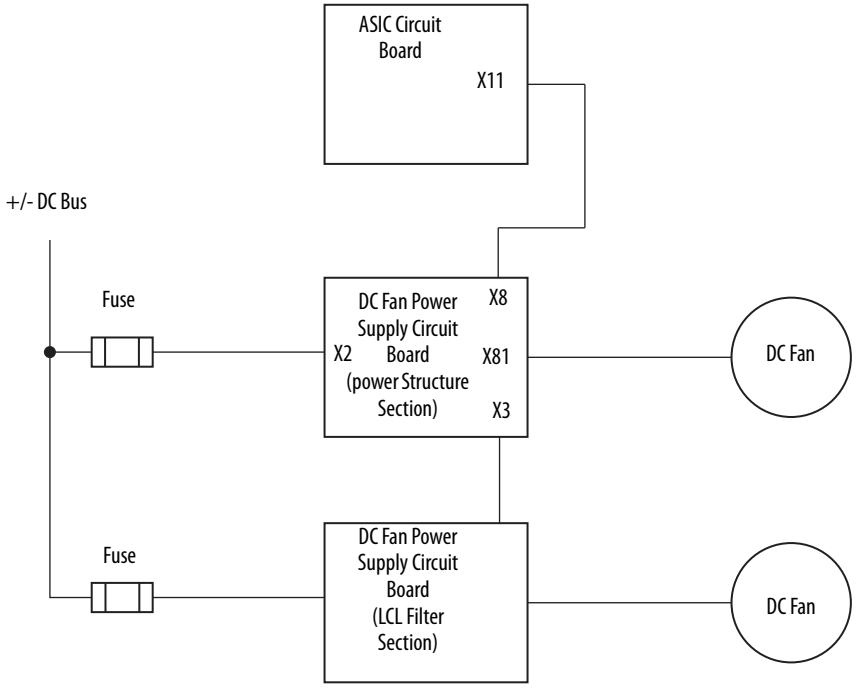


Figure 37 - Frame 13 AFE Fan System Topology (Older Style)

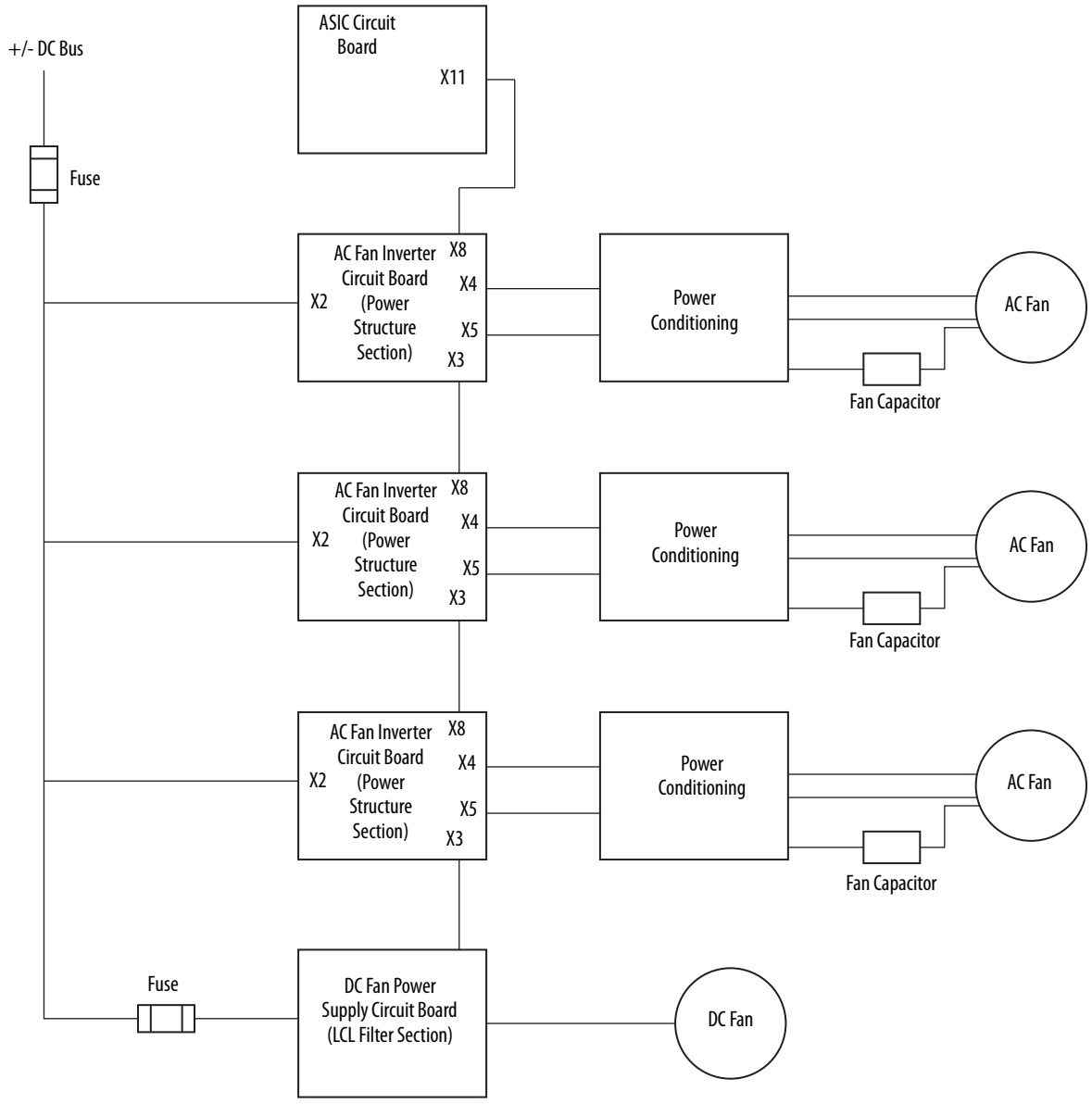
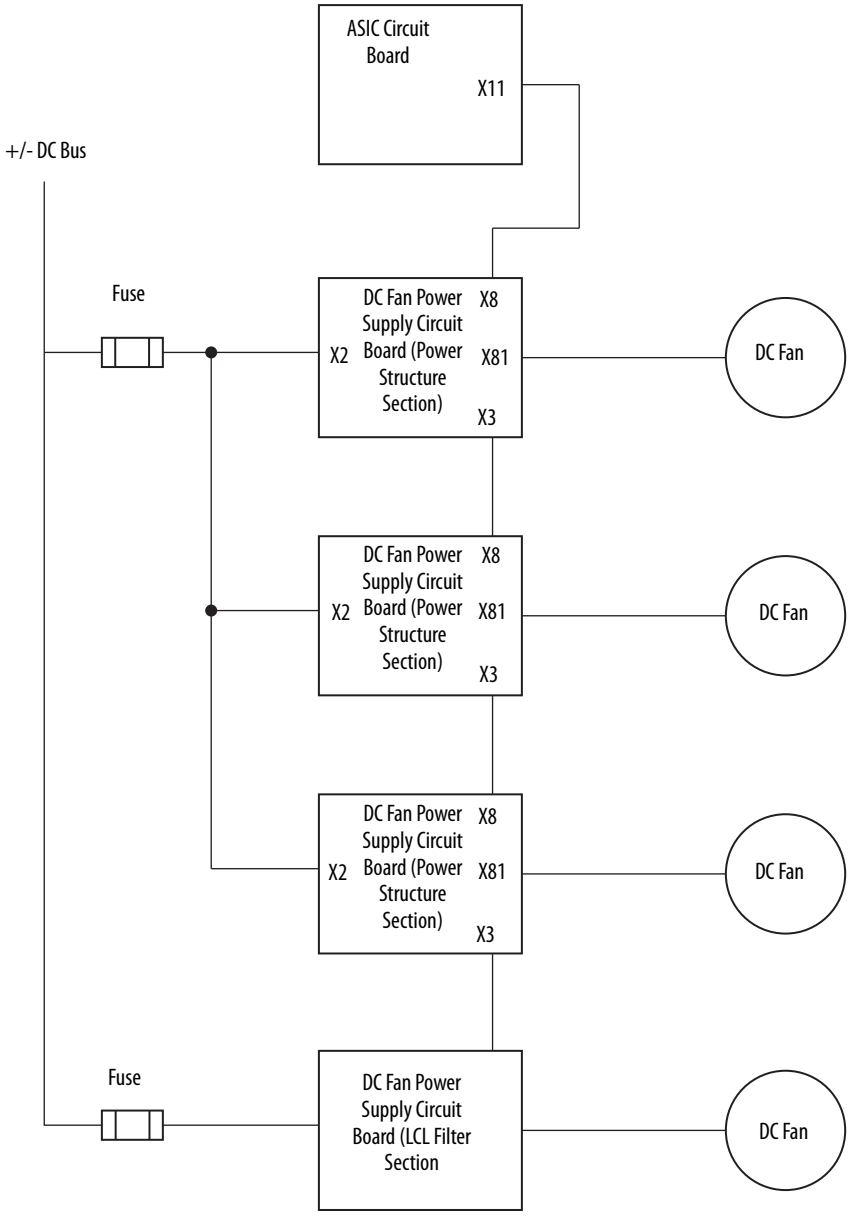


Figure 38 - Frame 13 AFE Fan System Topology (New Style)



The PowerFlex 700AFE frame 10 and 13 contain the same fan topology as the PowerFlex 700H/700S drives. In addition, there is a DC fan system in the LCL filter of each frame.

Checking the Fan Inverter Fuses

Two fuses are included in the circuit that provides DC bus power to the fan inverter circuit boards. See the diagrams on pages 258 and 259 for details. See the chapter in this manual that applies to your drive frame size for the fuse locations. Using an ohmmeter or a voltmeter to check the fan inverter fuses.

Checking Fuse Integrity with no Power Applied

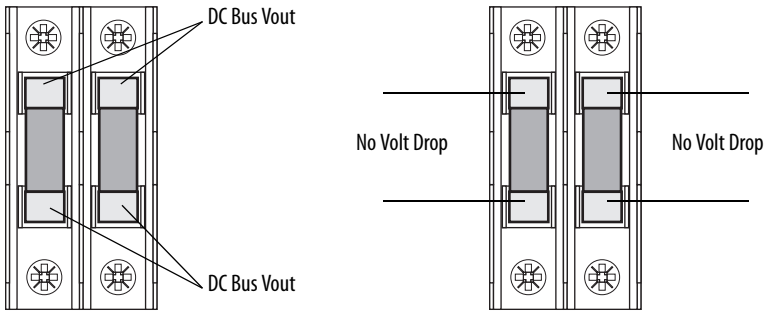
- Remove the fuse from the fuse holder and use an ohmmeter to verify that each fuse reads less than 1 Ω across the metal ferrule ends. If a higher reading is measured, replace both fuses.

Checking Fuse Integrity with Power Applied

IMPORTANT This procedure requires special equipment and training. Only qualified and trained personnel should perform these procedures.

ATTENTION: Potentially fatal voltages may result from improper usage of a multimeter and other test equipment. If a multimeter is used to measure high voltage waveforms, use appropriately rated probes and highest appropriate voltage scale.

- Using a voltmeter, measure the DC bus voltage across the fuse pair (top and bottom) to be the same voltage OR measure across the body of each fuse to have no voltage drop. If a voltage drop exists across the fuse body, replace both fuses.



Checking the Main Fan Supply Wires

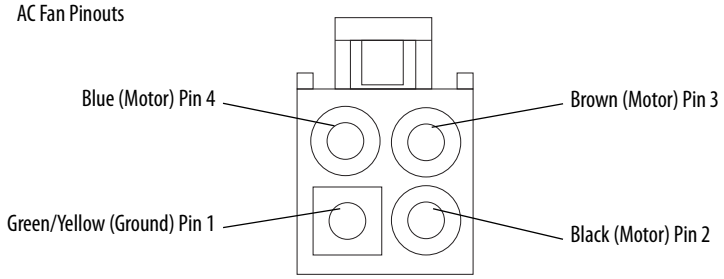
Verify that power has been removed from the drive. To disconnect the fan power wire connection, refer to the chapter in this manual that apply to your drive frame size.

- Disconnect the fan power supply connector from the drive and measure the resistance between the fan supply wires.

  AC Fan: If the measurements are not similar to those in this table, replace the AC fan.

Connection wires	Resistance ±5%
Black-Brown	62 Ω
Brown-Blue	36 Ω
Blue-Black	27 Ω
Green-chassis	0 Ω

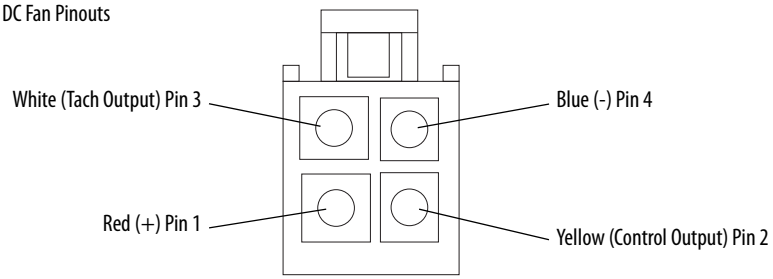
AC Fan Pinouts



  DC Fan: If the measurements are not similar to those in this table, replace the DC fan.

Connection wires	Resistance ±5%
Red-Blue	∞ Ω
Red-White	∞ Ω
White-Yellow	∞ Ω
Blue-White	∞ Ω

DC Fan Pinouts



Checking the AC Fan Inverter Capacitor

To measure the main AC fan inverter capacitor, you must remove the fan inverter assembly from the drive. Follow these steps to check the AC fan inverter capacitor.

1. Remove the main AC fan inverter assembly from the drive. See Main AC Fan Inverter Capacitor Removal and Installation in the corresponding chapter for your drive frame size.
2. Disconnect the AC fan capacitor wire connectors marked Brown and Blue from the AC fan inverter circuit board.
3. Measure the value of the capacitor.
4. If the value of the capacitor is less than 7 µF, replace the capacitor.

Isolating a Faulty Fan Inverter

Frame 9 PowerFlex 700H and 700S Drives

Since frame 9 drives only contain one fan system, there is nothing to isolate.

IMPORTANT These procedures require special equipment and training. Only qualified and trained personnel should perform these procedures.

Frames 10 and 12 PowerFlex 700H and 700S Drives

The ASIC board controls both left and right-side fan inverters. The fan connections include:

- X11 on the ASIC board to X8 on the left-side fan inverter board
- X3 on the left-side fan inverter to X8 on the right-side fan inverter
- X3 on the right-side fan inverter is terminated by a jumper

For more details, see:

- Frame 10 AC Fan System Wiring Schematic Diagram on page 57
- Frame 10 DC Fan System Wiring Schematic Diagram on page 58
- Frame 12 AC Fan System Wiring Schematic Diagram on page 119
- Frame 12 DC Fan System Wiring Schematic Diagram on page 120

Use the following procedure to isolate a faulty fan inverter board if the fans are not running.

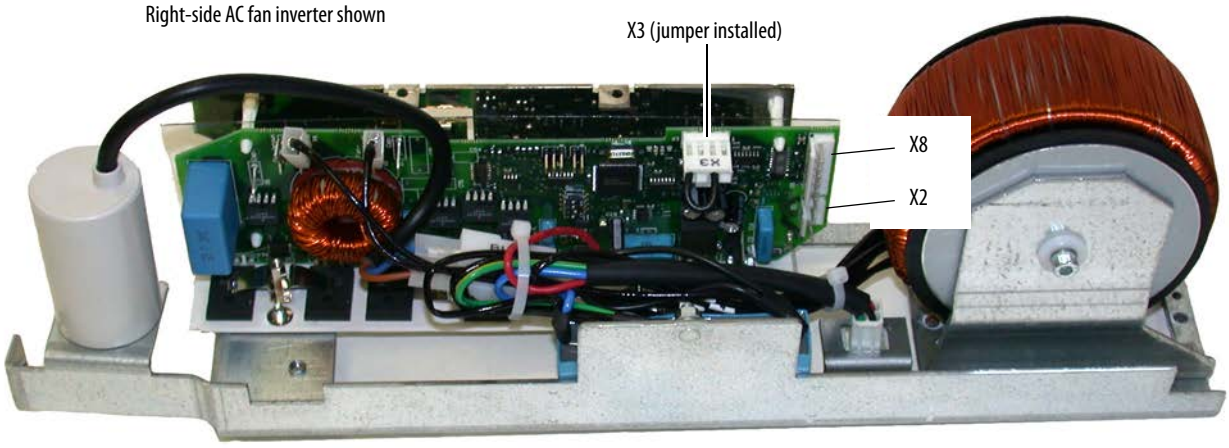
ATTENTION: The sheet metal cover and mounting screws on the ASIC circuit board located on the inverters of the power structure are energized at (-) DC bus potential high voltage. Risk of electrical shock, injury, or death exists if someone comes into contact with the assembly.

1. Review the General Precautions on page 17.
2. Remove power from the drive. See Remove Power from the Drive on page 59.
3. Move the control frame and remove the air flow plate and protective covers from the drive. See Move the Control Frame and Remove the Air Flow Plate and Protective Covers on page 60.

4. Remove the main fan inverter assemblies. See Remove the Main AC or DC Fan Power Supply Assemblies on page 63.

Isolate the Left-side Fan Inverter

5. Disconnect the cable from connector X3 of the left-side fan inverter.
6. Remove the jumper from connector X3 of the right-hand inverter, and install it on connector X3 of the left-hand inverter.



7. Energize the drive.

   If the left-side fan runs, then the right-side fan inverter circuit board is faulty and needs to be replaced. For AC fan systems, see Main AC Fan Inverter Circuit Board (20-VB00299) and AC Fan Output Transformer Assembly [20-FR10844 (Left) or 20-FR10845 (Right)] Removal and Installation on page 67. For DC fan systems, see Main DC Fan Power Supply System (SK-H1-DCFANBD1) Removal and Installation on page 69.

Isolate the Right-side Fan Inverter

8. Connect all cables in the original configuration.
9. Disconnect the cable from connector X8 on the right-side fan inverter.
10. Disconnect the cable from connector X8 on the left-side fan inverter and connect it to connector X8 on the right-side fan inverter.
11. Energize the drive.

    If the right-side fan runs, then the left-side fan inverter circuit board is faulty and needs to be replaced. For AC fan systems, see Main AC Fan Inverter Circuit Board (20-VB00299) and AC Fan Output Transformer Assembly [20-FR10844 (Left) or 20-FR10845 (Right)] Removal and Installation on page 67. For DC fan systems, see Main DC Fan Power Supply System (SK-H1-DCFANBD1) Removal and Installation on page 69.

Frame 11 PowerFlex 700H and 700S Drives

The ASIC board controls all three fan inverters.

- X11 on the ASIC board to X8 on the W phase inverter
- X3 on the W phase inverter to X8 on the V phase inverter
- X3 on the V phase inverter to X8 on the U phase inverter
- X3 on the U phase inverter is terminated by a jumper

Refer to the wiring schematics on page 89. Use the following procedure to isolate a faulty inverter if the main fans are not running. This procedure can only identify one faulty inverter board. If more than one board is faulty, this test will result in all boards being identified as faulty.

Checking the W Phase Fan Inverter

1. Disconnect the cable from X3 on the W phase fan inverter circuit board.
2. Remove the jumper on the U phase fan inverter circuit board and connect the jumper to X3 on the W phase fan inverter circuit board.
3. Energize the drive.
4. If the W phase fan inverter faults, then replace the W phase fan inverter circuit board. For AC fan systems, see Main AC Fan Inverter Circuit Board (20-VB00299) and AC Output Transformer Assembly (20-FR10845) Removal and Installation on page 99. For DC fan systems, see Main DC Fan Power Supply Circuit Board (SK-H1-DCFANBD1) Removal and Installation on page 101.
5. Restore original wiring configuration.

Checking the V Phase Fan Inverter

1. Verify the original wiring configuration.
2. Remove the cable from X3 on the V phase fan inverter circuit board.
3. Remove the jumper on the U phase fan inverter circuit board and connect the jumper to X3 on the V phase fan inverter circuit board.
4. Energize the drive.
5. If the W and V phase fan inverter circuit boards fault, then replace the V phase fan inverter circuit board. For AC fan systems, see Main AC Fan Inverter Circuit Board (20-VB00299) and AC Output Transformer Assembly (20-FR10845) Removal and Installation on page 99. For DC fan systems, see Main DC Fan Power Supply Circuit Board (SK-H1-DCFANBD1) Removal and Installation on page 101.
6. Restore original wiring configuration.

Checking the U Phase Fan Inverter

1. Verify the original wiring configuration.

2. Energize the drive.
3. If all three fan inverter circuit boards fault, then replace the U phase fan inverter circuit board. For AC fan systems, see Main AC Fan Inverter Circuit Board (20-VB00299) and AC Output Transformer Assembly (20-FR10845) Removal and Installation on page 99. For DC fan systems, see Main DC Fan Power Supply Circuit Board (SK-H1-DCFANBD1) Removal and Installation on page 101.

Frames 13 and 14 PowerFlex 700H and 700S Drives

For more details, see:

- Frame 13 AFE Schematic Diagrams on page 125
- Frame 14 System Diagrams on page 182

Additional procedures will be added to future revisions of this publication as they become available. Enter 'PFLEX-IN029' in the Search field on the Rockwell Automation Literature Library at:
http:/www.rockwellautomation.com/literature/.

Frames 10 and 13 PowerFlex 700AFE

For more details, see:

- Frame 10 AFE Fan System Schematic Diagrams on page 189
- Frame 13 AFE Schematic Diagrams on page 240

Additional procedures will be added to future revisions of this publication as they become available. Enter 'PFLEX-IN029' in the Search field on the Rockwell Automation Literature Library at:
http:/www.rockwellautomation.com/literature/.

Checking the Main AC Fan Inverter Circuit Board Diagnostic LEDs

PowerFlex 700H and 700S drives have one or more AC or DC fan inverters. To troubleshoot the fan inverter circuit board, you must remove it from the drive.

Remove the main AC or DC fan inverter circuit board from the drive. See:

- For frame 9 drives, Main AC Fan Inverter Circuit Board Assembly (20-VB00299) Removal and Installation on page 33
  or
  Main DC Fan Power Supply Circuit Board (SK-H1-DCFANBD1) Removal and Installation on page 36
- For frame 10 and 12 drives, Main AC Fan Inverter Circuit Board (20-VB00299) and AC Fan Output Transformer Assembly [20-FR10844 (Left) or 20-FR10845 (Right)] Removal and Installation on page 67
  or
  Main DC Fan Power Supply System (SK-H1-DCFANBD1) Removal and Installation on page 69

- For frame 11 drives, Main AC Fan Inverter Circuit Board (20-VB00299) and AC Output Transformer Assembly (20-FR10845) Removal and Installation on page 99
  or
  Main DC Fan Power Supply Circuit Board (SK-H1-DCFANBD1) Removal and Installation on page 101
- For frame 13 and 14 drives, Main AC Fan Inverter Circuit Board (20-VB00299) Removal and Installation (Inverter Only) on page 151
  or
  Main DC Fan Power Supply Circuit Board (SK-H1-DCFANBD1) Removal and Installation (Inverter Only) on page 153

ATTENTION: The inverter LEDs are only operational when the drive is energized, and only visible with the protective covers removed from the power structure. Servicing energized equipment can be hazardous. Severe injury or death can result from electrical shock, burn or unintended actuation of controlled equipment. Follow Safety related practices of NFPA 70E, ELECTRICAL SAFETY FOR EMPLOYEE WORKPLACES. DO NOT work alone on energized equipment!

AC Fan System LEDs

Each AC fan inverter has a red and green diagnostic LED. The diagnostic LEDs can be used to determine whether the AC fan inverter board must be replaced. These LEDs can only be viewed when the AC fan inverter board is removed from the drive and energized with an external power supply and control circuitry.

Red LED	Green LED	Status
Off	On	Inverter is idle (stopped)
Off	Flashing	Inverter is running
On	On	Inverter is faulted - replace the main fan inverter assembly

DC Fan System LEDs

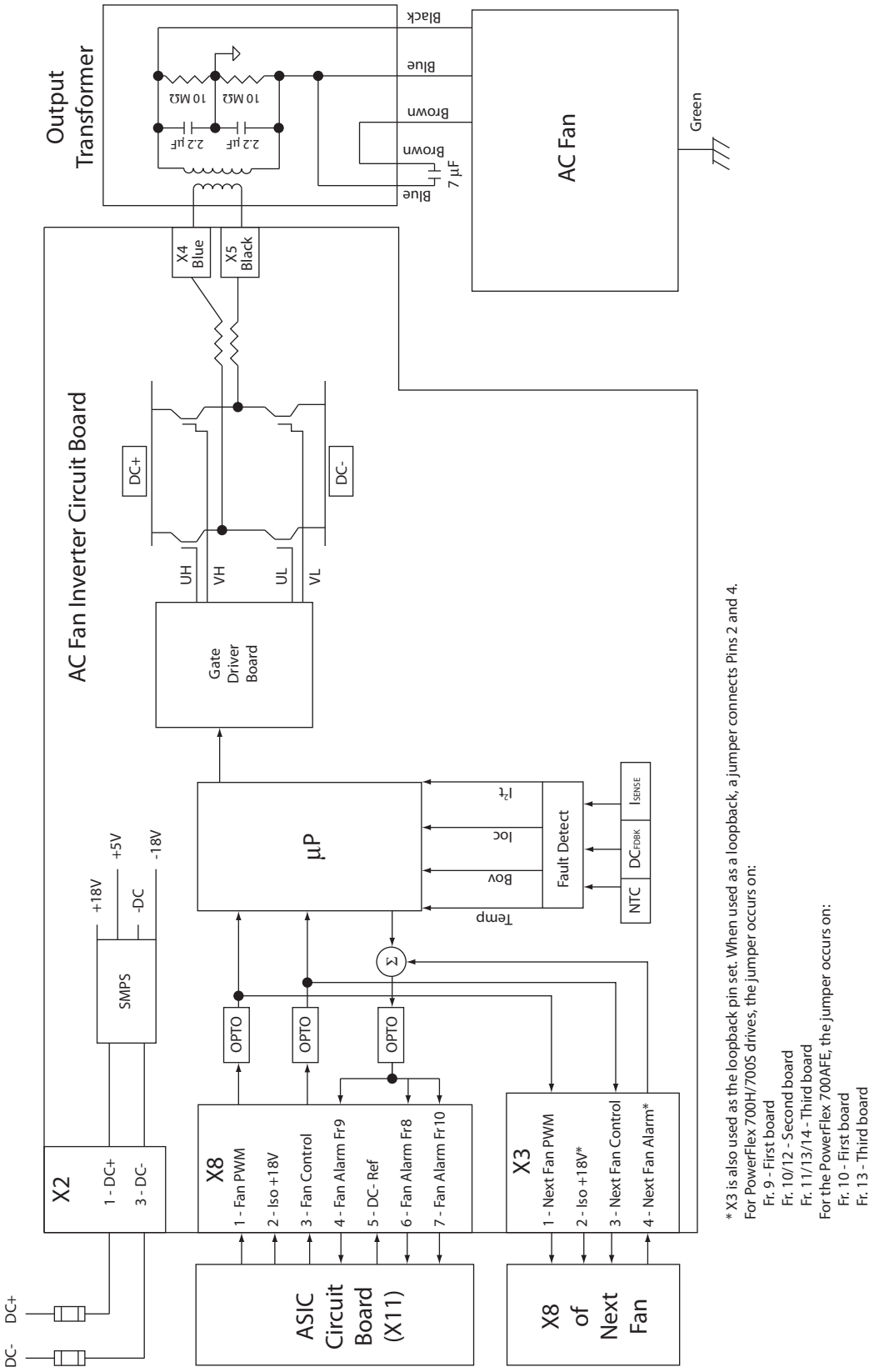
Each DC fan inverter has a red, yellow and green diagnostic LED. The diagnostic LEDs can be used to determine whether the DC fan inverter board must be replaced. These LEDs can only be viewed when the DC fan inverter board is removed from the drive and energized with an external power supply and control circuitry.

Component	LED Color	Description
H6	Green	Power On
H8	Yellow	Fan control enabled
H9	Red	Minimum fan rotation speed has not been reached

Fan System Wiring and Operation

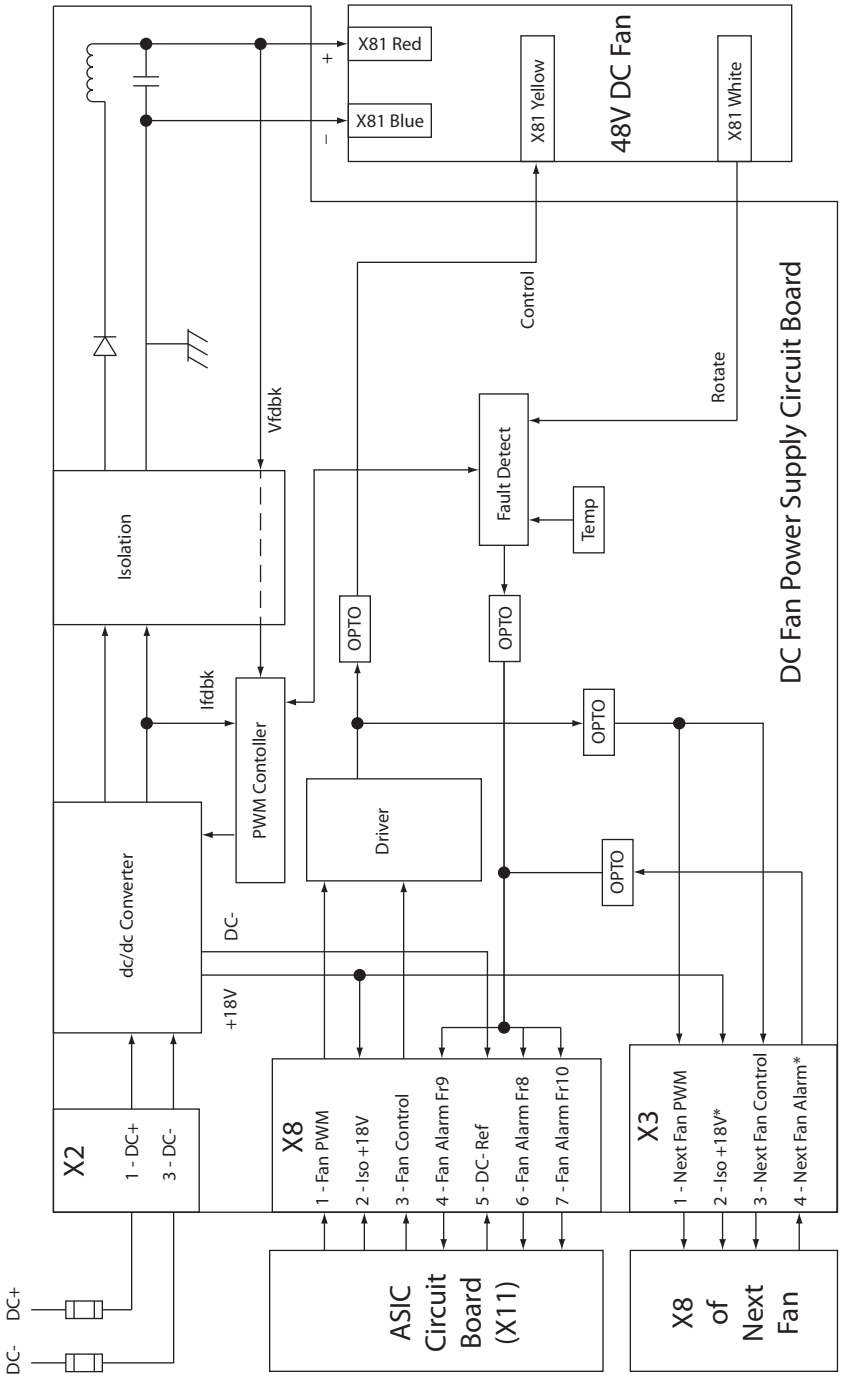
The following block diagrams show the logic power, fault detection, control, PWM gate drive, and fan power sections of the AC and DC fan inverter boards.

Figure 39 - AC Fan System Block Diagram



* X3 is also used as the loopback pin set. When used as a loopback, a jumper connects Pins 2 and 4.
For PowerFlex 700H/700S drives, the jumper occurs on:
Fr. 9 - First board
Fr. 10/12 - Second board
Fr. 11/13/14 - Third board
For the PowerFlex 700AFE, the jumper occurs on:
Fr. 10 - First board
Fr. 13 - Third board

Figure 40 - DC Fan System Block Diagram



Logic Power: DC bus voltage is connected to X2 on the AC or DC fan inverter board, which is routed to the SMPS that develops the logic power on the circuit board and DC bus to the "H" bridge.

Fault Detection: The AC or DC fan inverter board contains the fault detection scheme which includes current, temperature, and DC bus voltage feedback systems. A shunt resistor in the H-bridge provides current feedback, a NTC on the board provides temperature feedback, and a resistive-based voltage divider provides DC bus voltage feedback. These systems are summed in the microprocessor with an output status signal "fan alarm."

The microprocessor "fan alarm" signal is logically NANDed with the "fan alarm next" signal (X3, pin 4) and optically isolated to provide a fan status to the next fan inverter board at X8, pin 4, and pins 6 and 7, where a low signal is active and a high signal is faulted. If this is the first AC or DC fan inverter board, this fan alarm status output goes to the ASIC board. On the last fan inverter board in series, X3, pins 2 and 4 must be connected together to pull up the next fan alarm signal.

Fan control: The fan control signal originates on the ASIC circuit board and enters at X8, pin 3, and is optically isolated, before being routed to the microprocessor. When the fan control signal (X8, pin 3) is pulled low, the next fan control (X3, pin 1) is also pulled low, and the microprocessor fan control is enabled.

For the AC fan inverter system, the fan control is defined by the switch states as a 50 Hz, 230V AC motor for frames 9...14 drives and the inverter section of the frame 10 and 13 AFE.

Switch	Setting	To indicate the following:
S1	Off	50 Hz fan motor frequency
S2	Off	220 V AC motor voltage
S3	On	230 V AC motor voltage
S4	Off	Frame size 9…14

For the DC fan inverter system, the fan control serves to either enable or disable the main DC motor in the cooling fan.

PWM gate signals and fan power: If the fault detection status is OK and the fan control is enabled, then the microprocessor will generate the PWM signals to the gate drive circuitry and control the H bridge.

For the AC fan system, the PWM signal is a 50 Hz fundamental sinewave at the fan output terminals (X4 and X5). The AC fan inverter board output energizes the isolation transformer before supplying two of the three phases to the fan motor. The third phase is sourced through the 7 µF capacitor which provides the phase shift to start rotation and help to control the fan speed.

The DC fan system uses a 48V DC output that energizes the DC fan motor.

Testing the Main Fan Inverter Circuit Board Diagnostic LEDs

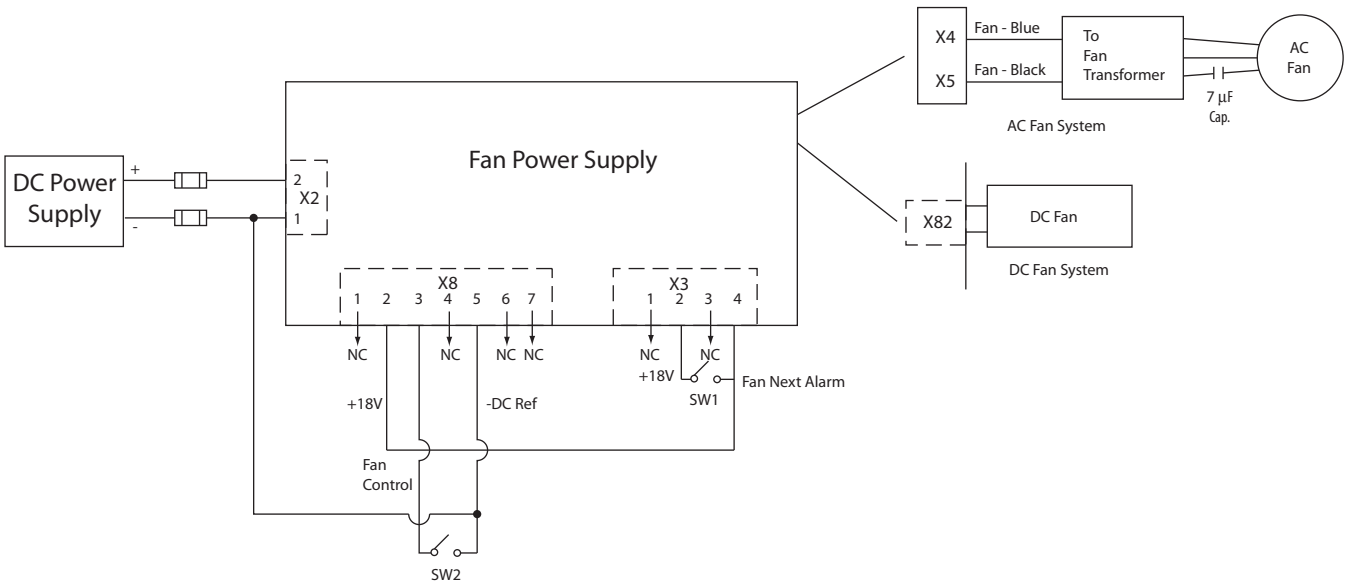
ATTENTION: Potentially fatal voltages may result from improper usage of a multimeter and other test equipment. The chassis may be at a potentially fatal voltage if not properly grounded. If a multimeter is used to measure high voltage waveforms, use appropriately rated differential voltage probes. Be sure that they are set to the highest voltage scaling in order to achieve safe measurement resolution.

ATTENTION: The fan control uses the -DC bus voltage reference as a common reference. Therefore, if the drive is used as the DC voltage source, the board common reference will be at -DC bus voltage and NOT at earth ground.

ATTENTION: If the fan motor and plenum chamber is removed from the drive for this test, it must be properly secured to the test fixture to ensure it will not move or shift when the fan is commanded to rotate.

ATTENTION: Severe injury or death can result from electrical shock, burn, or unintended actuation of controlled equipment. Follow safety related practices of NFPA 70E, ELECTRICAL SAFETY FOR EMPLOYEE WORKPLACES. DO NOT work alone on energized equipment!

Bench test fixture: With the fan system removed from the drive, a bench test can be completed to evaluate the status of the fan inverter board. The fan inverter board can be controlled with a simple test fixture. The following schematic illustrates the test fixture control that lets the fan inverter board exercise the LEDs and rotate the fan when commanded.



ATTENTION: If a drive is used as the DC power source, the circuit common reference will be at negative DC bus voltage and NOT at earth ground.

ATTENTION: If the fan motor and plenum chamber is removed from the drive for this test, it must be properly secured to the test fixture to ensure it will not move or shift when the fan is commanded to rotate. Failure to do so can result in equipment damage or personal injury.

AC Fan System Test

Complete the following steps to test the AC fan system.

1. Connect an external 500V DC source, through two fuses, similar to those on the drive power structure (Ferraz ATQ8), to connector X2 (+DC to pin 3 and –DC to pin 1) on the fan inverter circuit board.
2. Connect X3 and X8 to a test fixture that incorporates 2 switches and appropriate interconnection wires. SW1 between X3, pins 2 - 4 and SW2 between X8, pins 3 - 5.
3. Connect the fan inverter circuit board (terminals X4 and X5) to the fan power conditioning hardware, 7 µF capacitor and AC fan.
4. Carefully apply a 500V DC source.
5. Evaluate the AC fan inverter circuit board in each of the switch configurations and view the LED status and fan rotation against the states listed in Table 5. If the LED status and fan rotation is NOT consistent with the table, the circuit board is not functioning and must be replaced. If the LED status and fan rotation agrees with the table, the circuit board should be ok and can be used or further evaluated.

Figure 41 - LEDs and Fan Connections Locations

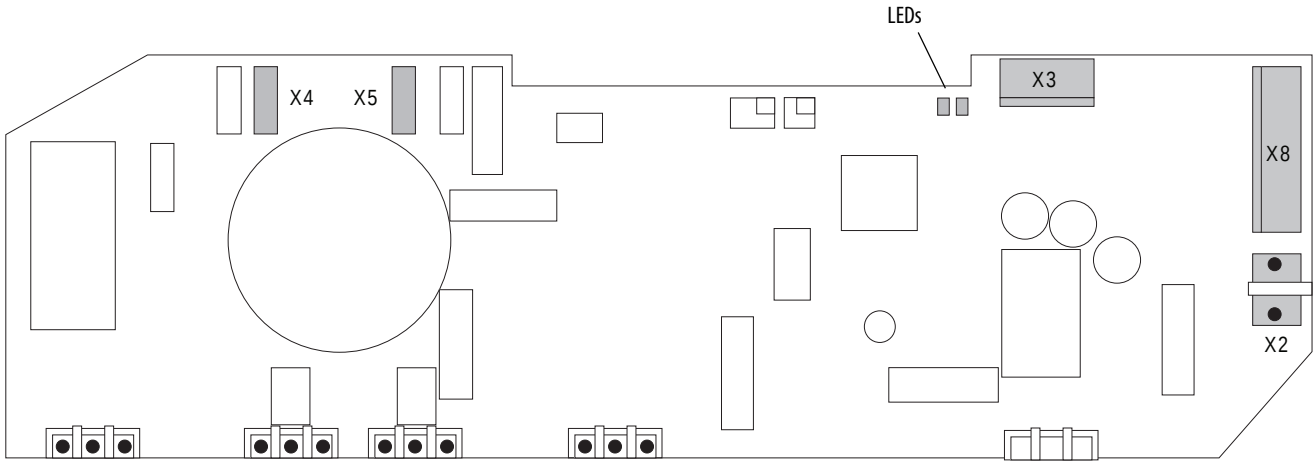


Table 5 - AC Fan System LED Status and Switch States

SW1 (Next Fan Inv)	SW2 (Fan Control Enable)	Red LED	Green LED	Comment
Open	Open	ON	ON	Faulted
Open	Closed	ON	ON	Faulted
Closed	Open	OFF	ON	Idle
Closed	Closed	OFF	Flashing	Running

6. Remove the 500V DC source power.
7. Wait a few minutes and verify power is not present with a DVM at the fuse input.
8. Remove the AC fan inverter circuit board from the test fixture.

DC Fan System Test

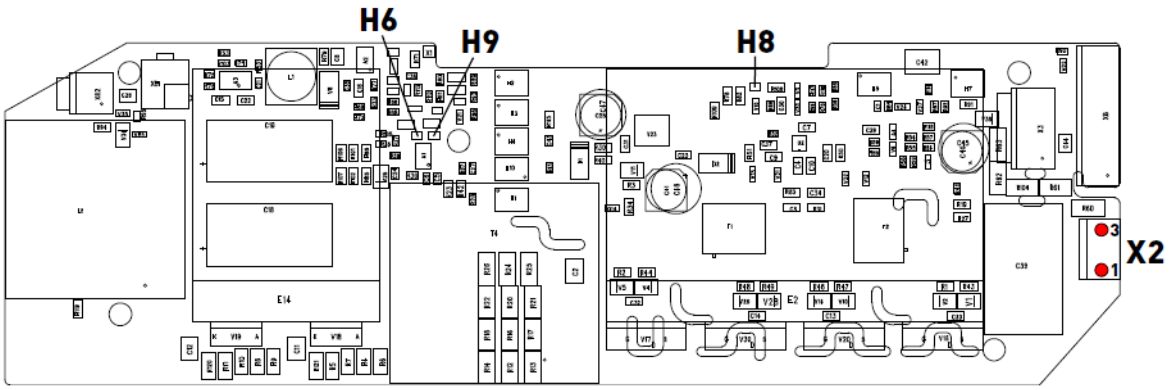
Complete the following steps to test the DC fan system.

1. Connect an external 500V DC source, through two fuses, similar to those on the drive power structure (Ferraz ATQ8), to connector X2 (+DC to pin 3 and –DC to pin 1) on the fan inverter circuit board.
2. Connect X3 and X8 to a test fixture that incorporates 2 switches and appropriate interconnection wires. SW1 between X3, pins 2 - 4 and SW2 between X8, pins 3 - 5.
3. Connect the fan inverter circuit board (terminal X81) to the DC fan.
4. Carefully apply the 500V DC source.
5. Evaluate the DC fan inverter circuit board in each of the switch configurations and view the LED status and fan rotation against the states in Table 6. If the LED status and fan rotation is NOT consistent with the table, the circuit board is not functioning and must be replaced. If the LED status and fan rotation agrees with the table, the circuit board should be ok and can be used or further evaluated.

Table 6 - DC Fan System LED Status and Switch States

Case #	SW1 (Next Fan Inv)	SW2 (Fan Control Enable)	Green LED	Yellow LED	Red LED	Comments
1	Closed	Closed	ON	ON	OFF	Fan running
2	Closed	Open	ON	OFF	ON	Fan stopped
3	Open	Closed	ON	OFF	ON	Fan stopped
4	Open	Open	ON	OFF	ON	Fan stopped

Figure 42 - LEDs and Fan Connections Locations



6. Remove the 500V DC source power.
7. Wait a few minutes and verify power is not present with a DVM at the fuse input.
8. Remove the DC fan inverter circuit board from the test fixture.

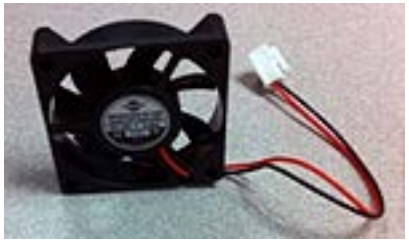
Available Fan System Kits

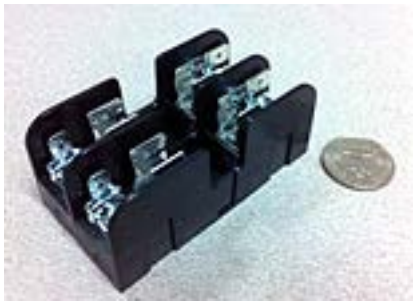
As stated in the Energy-related Products Fan Efficiency Directive section on page 12, new products delivered within the EU (with a power structure manufacturing date of January 1, 2013 and later) will have a DC fan system installed. This includes PowerFlex 700H and 700S frame 9 and larger drives and PowerFlex 700AFE systems.

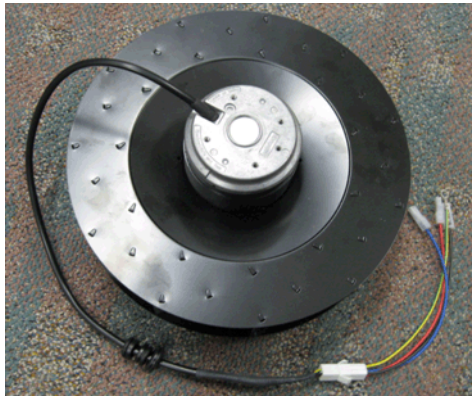
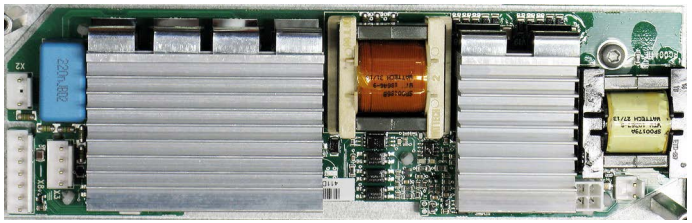
Spare Part Kit Contents

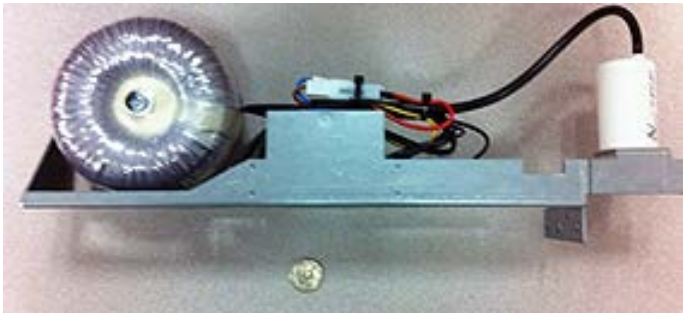
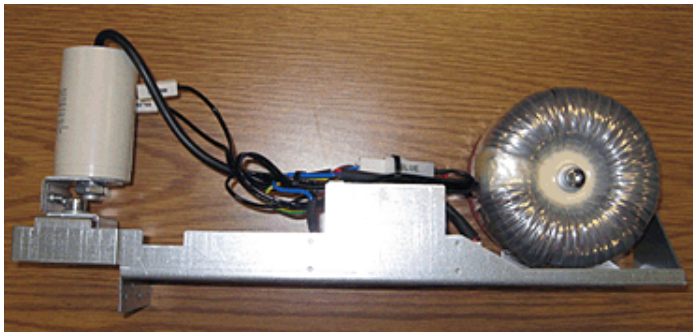
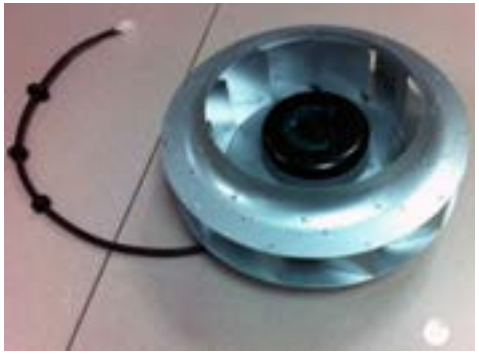
The following table describes and shows the contents of each available fan system spare part kit. For the number of kits to purchase, see the fan system spare part tables in the chapter corresponding with your drive frame size.

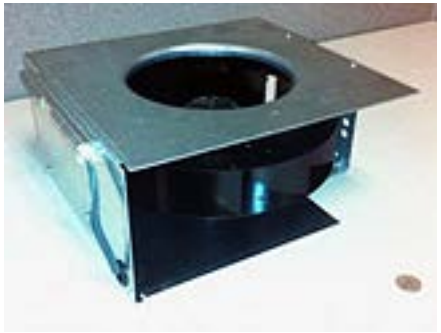
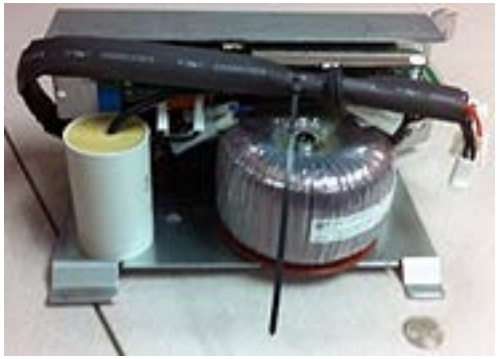
- Frame 9 Fan System Spare Parts on page 20
- Frame 10 Fan System Spare Parts on page 56
- Frame 11 Fan System Spare Parts on page 88
- Frame 12 Fan System Spare Parts on page 117
- Frame 13 Fan System Spare Parts on page 123
- Frame 14 Fan System Spare Parts on page 179
- Frame 10 AFE Fan System Spare Parts on page 187
- Frame 13 AFE Fan System Spare Parts on page 238

Kit Cat. No.	Description in Spare Parts Catalog	Drive Frame Size	Kit Contents Illustrated
20-PP01049	50 mm Cooling fan for fan inverter	9	
20-PP01068	80 mm x 80 mm x 32 mm internal stirring fan assembly	9	
20-PP01096	60 mm internal fan for ASIC board	10, 11, 12, 13, 14 10 AFE (Power Strctr) 13 AFE (Power Strctr)	

Kit Cat. No.	Description in Spare Parts Catalog	Drive Frame Size	Kit Contents Illustrated
20-PP20202	Fuse for fan system	9, 10, 11, 12, 13, 14, 10 AFE (LCL & Power Strctr), 13 AFE (LCL & Power Strctr)	
20-PP20300	Fuse holder for main fan system fuses	9, 10, 11, 12, 13, 14 10 AFE (LCL & Power Strctr) 13 AFE (LCL & Power Strctr)	
20-VB00299	AC fan inverter, frames 9 . . . 12	9, 10, 11, 12, 13, 14 10 AFE (Power Strctr) 13 AFE (Power Strctr)	

Kit Cat. No.	Description in Spare Parts Catalog	Drive Frame Size	Kit Contents Illustrated
20-PP01080	230 W main AC fan assembly	9, 10, 11, 12	
20-PP09055	Output transformer for AC fan inverter	9	
SK-H1-DCFANBD1	Main DC fan power supply circuit board	9, 10, 11, 12, 13, 14 10 AFE (Power Strctr & LCL) 13 AFE (Power Strctr & LCL)	

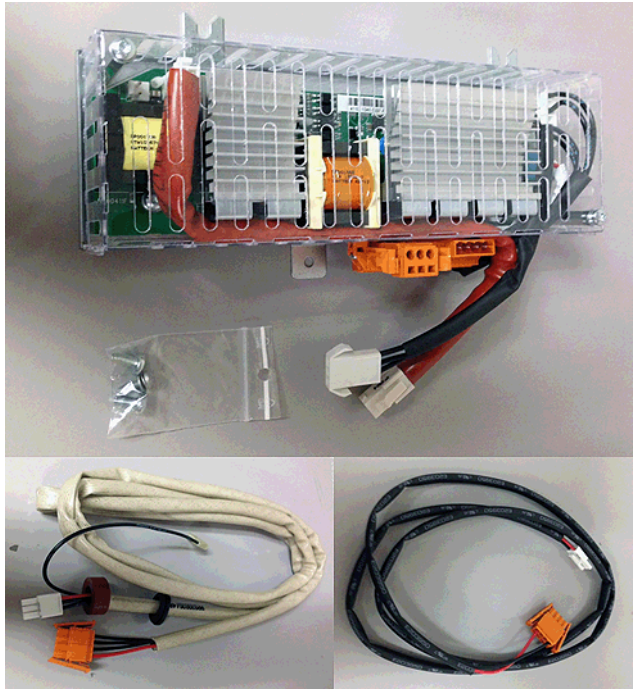
Kit Cat. No.	Description in Spare Parts Catalog	Drive Frame Size	Kit Contents Illustrated
20-FR10844	Output transformer assembly for AC fan inverter, left	10, 12	
20-FR10845	Output transformer assembly for AC fan inverter, right	10, 11, 12	
SK-Y1-DCFAN1	Main DC fan assembly	9, 10, 11, 12, 13, 14, 10 AFE (LCL & Power Strctr) 13 AFE (LCL & Power Strctr)	

Kit Cat. No.	Description in Spare Parts Catalog	Drive Frame Size	Kit Contents Illustrated
20-FI13300	AC and DC input main fan assembly	13, 14 10 AFE (Power Strctr) 13 AFE (Power Strctr	
20-FI13301	AC fan inverter (fan inverter includes circuit board, capacitor, isolation transformer, and mounting hardware)	13, 14 10 AFE (Power Strctr) 13 AFE (Power Strctr)	
SK-Y1-DCPS1-E1K0	DC fan power supply assembly for a 600/690V PowerFlex 700AFE (older version). Replaced by kit cat. no. SK-Y1-DCPS2-F13 (see page 286)	13 AFE (LCL)	

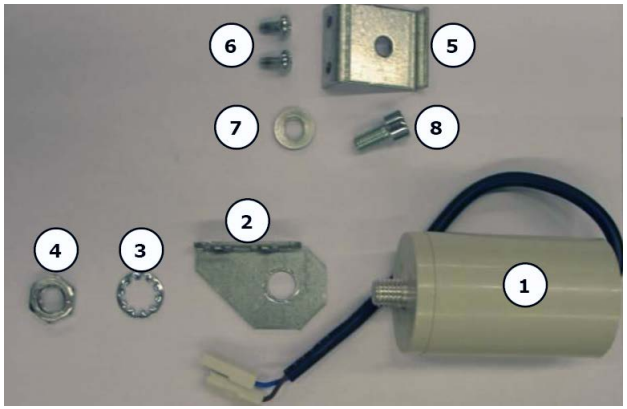
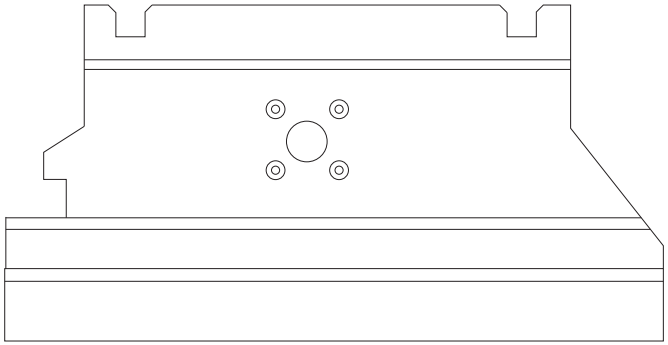
Kit Cat. No.	Description in Spare Parts Catalog	Drive Frame Size	Kit Contents Illustrated
SK-Y1-DCPS1-D1K3	DC fan power supply assembly for a 400/480V PowerFlex 700AFE (older version) Replaced by kit cat. no. SK-Y1-DCPS2-F13 (see page 286)	13 AFE (LCL)	
SK-Y1-DCPS1-D460	DC fan power supply assembly for a 400/480V PowerFlex 700AFE LCL filter (older version) Replaced by kit cat. no. SK-Y1-DCPS2-F10 (see page 285)	10 AFE (LCL)	

Kit Cat. No.	Description in Spare Parts Catalog	Drive Frame Size	Kit Contents Illustrated
SK-Y1-DCPS1-F325	DC fan power supply assembly for a 600/690V PowerFlex 700AFE LCL filter (older version) Replaced by kit cat. no. SK-Y1-DCPS2-F10 (see page 285)	10 AFE (LCL)	
SK-Y1-HF1-DF	Fan power supply wire kit for a PowerFlex 700AFE LCL filter (older version)	10 AFE (LCL)	

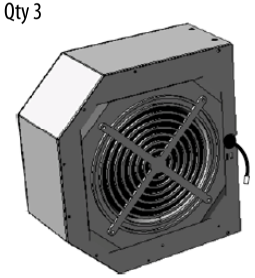
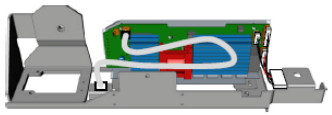
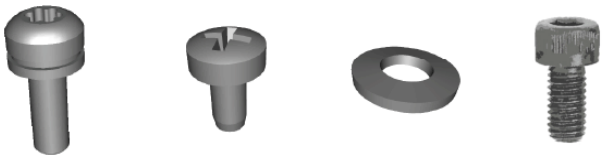
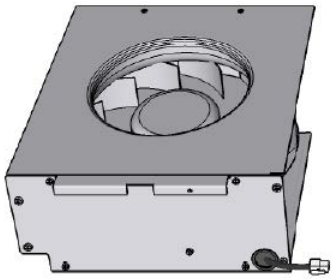
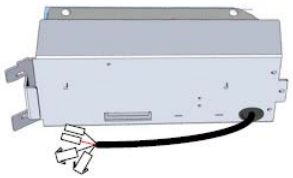
Kit Cat. No.	Description in Spare Parts Catalog	Drive Frame Size	Kit Contents Illustrated
SK-Y1-DCPS2-F10	DC fan power supply circuit board upgrade kit for a PowerFlex 700AFE LCL filter (newer version)	10 AFE (LCL)	

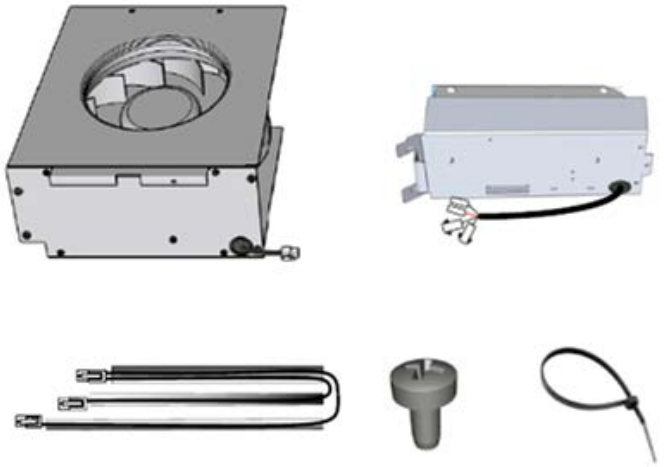
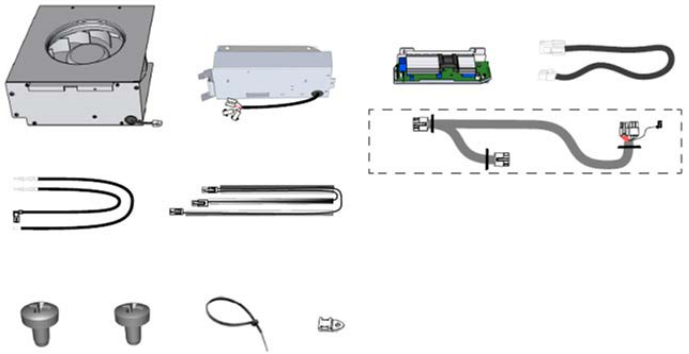
Kit Cat. No.	Description in Spare Parts Catalog	Drive Frame Size	Kit Contents Illustrated
SK-Y1-DCPS2-F13	Fan power supply circuit board upgrade kit for a PowerFlex 700AFE LCL filter (newer version)	13 AFE (LCL)	
SK-Y1-F11-F10 (same as 20-PP20202 on page 279)	Fan power supply fuse for a PowerFlex 700AFE LCL filter	10 AFE (LCL) 13 AFE (LCL)	

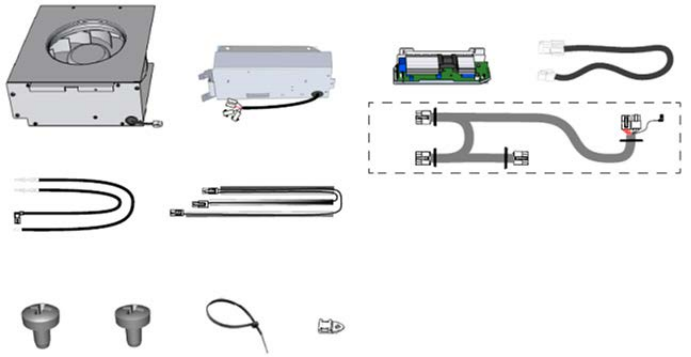
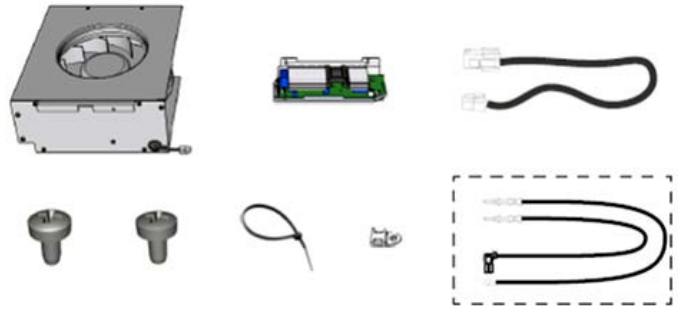
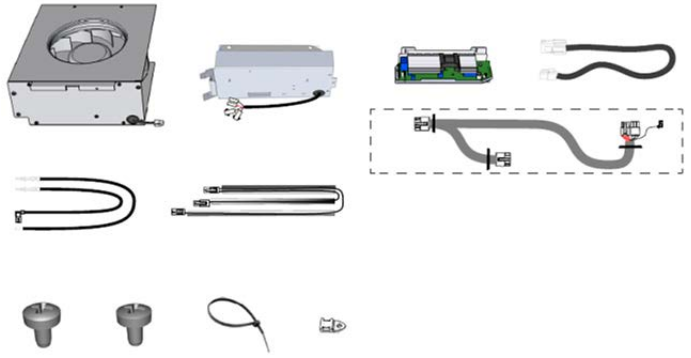
Kit Cat. No.	Description in Spare Parts Catalog	Drive Frame Size	Kit Contents Illustrated
SK-H1-FANCAP-F9	AC fan capacitor kit, 7 µF, PF700H/S	9	
SK-H1-FANCAP-F1012	AC fan capacitor kit, 7 µF, PF700H/S	10, 12	

Kit Cat. No.	Description in Spare Parts Catalog	Drive Frame Size	Kit Contents Illustrated
SK-H1-FANCAP-F11	AC fan capacitor kit, 7 µF, PF700H/S	11	
SK-H1-FANCAP-F1314	AC fan capacitor kit, 7 µF, PF700H/S	13, 14 10 AFE (Power Strctr) 13 AFE (Power Strctr)	
SK-H1-FR9BRKT	Main fan support bracket (short)	9	

Kit Cat. No.	Description in Spare Parts Catalog	Drive Frame Size	Kit Contents Illustrated
SK-H1-DCFANRETROFIT-F9	AC to DC fan system retrofit kit	9	
SK-H1-DCFANRETROFIT-F10	AC to DC fan system retrofit kit	10, 12	Qty 2

Kit Cat. No.	Description in Spare Parts Catalog	Drive Frame Size	Kit Contents Illustrated
SK-H1-DCFANRETROFIT-F11	AC to DC fan system retrofit kit	11	Qty 3  Qty 3  
SK-Y1-DCFANRETROFIT-F10	AC to DC fan system retrofit kit	10 AFE (Power Strctr)	   

Kit Cat. No.	Description in Spare Parts Catalog	Drive Frame Size	Kit Contents Illustrated
SK-Y1-DCFANRETROFIT-F13	AC to DC fan system retrofit kit for DC input drives	13 AFE (Power Strctr), and 13 & 14 DC Input	
SK-H1-DCFANRETROFIT-F13A	AC to DC fan system retrofit kit for AC input, 1150 A drives	13	

Kit Cat. No.	Description in Spare Parts Catalog	Drive Frame Size	Kit Contents Illustrated
SK-H1-DCFANRETROFIT-F13B	AC to DC fan system retrofit kit for AC input, 1300/1450 A drives	13	
SK-H1-DCFANRETROFIT-CONV	AC to DC fan system retrofit kit for 2700 A, AC input converter	13, 14	
SK-H1-DCFANRETROFIT-F14A	AC to DC fan system retrofit kit for AC input, 1500 A drives	14	

Kit Cat. No.	Description in Spare Parts Catalog	Drive Frame Size	Kit Contents Illustrated
SK-H1-DCFANRETROFIT-F14B	AC to DC fan system retrofit kit for AC input, 1770/2150 A drives	14	

Notes:

Rockwell Automation Support

Rockwell Automation provides technical information on the Web to assist you in using its products. At http://www.rockwellautomation.com/support, you can find technical manuals, technical and application notes, sample code and links to software service packs, and a MySupport feature that you can customize to make the best use of these tools. You can also visit our Knowledgebase at http://www.rockwellautomation.com/knowledgebase for FAQs, technical information, support chat and forums, software updates, and to sign up for product notification updates.

For an additional level of technical phone support for installation, configuration, and troubleshooting, we offer TechConnect^{SM} support programs. For more information, contact your local distributor or Rockwell Automation representative, or visit http://www.rockwellautomation.com/support/.

Installation Assistance

If you experience a problem within the first 24 hours of installation, review the information that is contained in this manual. You can contact Customer Support for initial help in getting your product up and running.

United States or Canada	1.440.646.3434
Outside United States or Canada	Use the Worldwide Locator at http://www.rockwellautomation.com/rockwellautomation/support/overview.page, or contact your local Rockwell Automation representative.

New Product Satisfaction Return

Rockwell Automation tests all of its products to help ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning and needs to be returned, follow these procedures.

United States	Contact your distributor. You must provide a Customer Support case number (call the phone number above to obtain one) to your distributor to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for the return procedure.

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