Allen-Bradley

PowerFlex®

700S and 700H High Performance AC Drive

Frame 13
630-800KW, 400V
1000-1250HP, 480V
900-1150KW, 690V
900-1150HP, 600V

Hardware Service Manual

Rockwell Automation

Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. *Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls* (Publication SGI-1.1 available from your local Rockwell Automation sales office or online at **www.rockwellautomation.com/literature**) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

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.

Important: Identifies information that is critical for successful application and understanding of the product.

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 the hazard
- recognize the consequences

Shock Hazard labels may be located on or inside the equipment (e.g., drive or motor) to alert people that dangerous voltage may be present.

Burn Hazard labels may be located on or inside the equipment (e.g., drive or motor) to alert people that surfaces may be at dangerous temperatures.

Chapter 3 Access Procedures

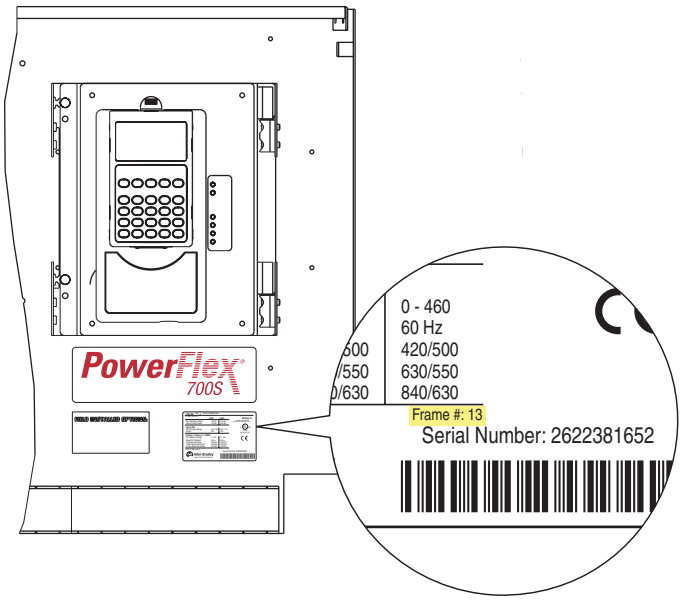
Overview

Who Should Use this Manual?

This manual is intended for qualified service personnel responsible for troubleshooting and repairing high power PowerFlex 700S and 700H AC drives. You should have previous experience with, and basic understanding of, electrical terminology, procedures, required troubleshooting equipment, equipment protection procedures and methods, and safety precautions. Refer to safety related practices contained in publication NFPA 70E, *Standard for Electrical Safety in the Work Place*.

What is in this Manual

This manual contains hardware service information for Frame 13 PowerFlex 700S and 700H drives. Verify that you are working on a Frame 13 drive by checking the data nameplate on the Control Frame. The frame number is printed just above the serial number.



What is Not in this Manual

This manual does not contain in depth fault information for troubleshooting. Fault information is available in publication PFLEX-IN006…, *Installation Instructions - PowerFlex 700S and 700H Adjustable Frequency AC Drive*, 20D-UM006…, *User Manual - PowerFlex 700S High Performance AC Drive Phase II Control* and 20C-PM001…, *Programming Manual - PowerFlex 700H Adjustable AC Drive*.

Reference Materials

Allen-Bradley publications are available on the internet at: www.rockwellautomation.com/literature.

The following publications provide general drive information.

Title	Publication
Wiring and Grounding Guide, (PWM) AC Drives	DRIVES-IN001...
Safety Guidelines for the Application, Installation and Maintenance of Solid State Control	SGI-1.1
A Global Reference Guide for Reading Schematic Diagrams	100-2.10
Guarding Against Electrostatic Damage	8000-4.5.2

The following publications provide specific PowerFlex drive information.

Title	Publication
Programming Manual - PowerFlex 700H Adjustable AC Drive	20C-PM001…
User Manual - PowerFlex 700S High Performance Drive Phase II Control	20D-UM006...
Installation Instructions - Hi-Resolution Feedback Option Card for PowerFlex 700S Drives	20D-IN001...
Installation Instructions - Multi Device Interface Option for PowerFlex 700S Drives	20D-IN004...
Installation Instructions - Main Control Board PowerFlex 700S Drives	20D-IN005...
Installation Instructions - Control Assembly Cover for PowerFlex 700S Drives	20D-IN006...
Installation Instructions - PowerFlex 700S /700H High Power Maintenance Stand	20D-IN014...
Installation Instructions - PowerFlex 700S and 700H Drives	PFLEX-IN006...
Reference Manual - PowerFlex 700S Adjustable Frequency Drive Phase II Control	PFLEX-RM003...

The following publications provide information that is necessary when applying the DriveLogix™ Controller for PowerFlex 700S drives.

Title	Publication
User Manual - DriveLogix System	20D-UM002...
Installation Instructions - DriveLogix Controller	20D-IN002...
Installation Instructions - Memory Expansion for DriveLogix Controller	20D-IN007...
ControlNet Daughtercard Installation Instructions	1788-IN002...
ControlNet Daughtercard Installation Instructions	1788-IN005...

Understanding Manual Conventions

Terms

The following words are used throughout the manual to describe an action:

Word	Meaning
Can	Possible, able to do something
Cannot	Not possible, not able to do something
May	Permitted, allowed
Must	Unavoidable, you must do this
Shall	Required and necessary
Should	Recommended
Should Not	Not recommended

Cross References

"Figure 2.2 on page 2-6" is a cross reference to figure 2.2 on page 5 of Chapter 2.

"Figure C.1 on page C-2" is a cross reference to figure C.1 on page 2 of Appendix C.

Additional Support Available on Internet

Additional troubleshooting information and software tools are available on the Allen-Bradley Drives Support Website (*http://www.ab.com/support/abdrives/*).

General Precautions

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.

ATTENTION: The sheet metal cover and mounting screws on the ASIC Board located on 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.

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 A-B publication 8000-4.5.2, “Guarding Against Electrostatic Damage” or any other applicable ESD protection handbook.

ATTENTION: An incorrectly applied or installed drive can result in component damage or a reduction in product life. Wiring or application errors, such as, undersizing the motor, incorrect or inadequate AC supply, or excessive ambient temperatures may result in malfunction of the system.

ATTENTION: Only **qualified personnel** familiar with high power PowerFlex 700S and 700H 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.

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.

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 only a dual channel oscilloscope in the differential mode with X 100 probes. It is recommended that the oscilloscope be used in the A minus B Quasi-differential mode with the oscilloscope chassis correctly grounded to an earth ground.

Troubleshooting and Error Codes

ATTENTION: To avoid an electric shock hazard, ensure that all power to the drive has been removed before performing the following.

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.

ATTENTION: HOT surfaces can cause severe burns. **Do not** touch the heatsink surface during operation of the drive. After disconnecting power allow time for cooling.

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 A-B publication 8000-4.5.2, “Guarding Against Electrostatic Damage” or any other applicable ESD protection handbook.

Creating Fault Reports

Complete fault reports are critical for analysis and repair of modules returned to the factory.

At a minimum, perform and record the following:

- Record the contents of the fault queue (faults and times of occurrence)
- Make record of any burn marks on the rectifying module, DC-capacitors, inverter bridge, charging resistors, balancing/precharging resistors, printed circuit boards, bus bars, cabling and fiber-optic cabling
- Make record of any liquid and condensation marks on printed circuit boards, components and mechanical parts
- Make record of the amount of dust and other additional particles on drive and drive components
- Make record of any mechanical damage to the drive and drive components
- Record the size and type of main fuses
- Record any other important marks and damage

Addressing 700H Hardware Faults

Name	No.	Description	Action *(if appropriate)*
Auxiliary In	2	Auxiliary input interlock is open.	Check remote wiring.
Power Loss	3	DC bus voltage remained below parameter 186 [Power Loss Volts] for longer than parameter 185 [Power Loss Time]. Enable/Disable with parameter 238 [Fault Config 1]. For more information refer to publication 20C-PM001, *Programming Manual - PowerFlex 700H*.	Monitor the incoming AC line for low voltage or line power interruption.
UnderVoltage	4	DC bus voltage fell below the minimum value of 333V for 400/480V drives and 461V for 600/ 690V drives. Enable/Disable with parameter 238 [Fault Config 1]. For more information refer to publication 20C-PM001, *Programming Manual - PowerFlex 700H*.	Monitor the incoming AC line for low voltage or power interruption.
OverVoltage	5	DC bus voltage exceeded maximum value.	Monitor the AC line for high line voltage or transient conditions. Bus overvoltage can also be caused by motor regeneration. Extend the decel time or install and external dynamic brake option.
Input Phase	17	One input line phase missing.	Check user-supplied fuses Check AC input line voltage.
OutPhasMissng	21	Zero current in one output motor phase.	Check motor wiring. Check motor for open phase.
Ground Fault	13	A current path to earth ground greater than 25% of drive rating. Ground fault level is 50% of the drive's heavy duty current rating. The current must appear for 800ms before the drive will fault.	Check the motor and external wiring to the drive output terminals for a grounded condition.
InverterFault	14	Hardware problem in the power structure.	Cycle power. Replace drive.
System Fault	10	Hardware problem exists in the power structure.	Cycle power. Replace drive.

Name	No.	Description	Action *(if appropriate)*
Load Loss	15	Do not use this fault in 700H applications	Check that parameter 238 [Fault Config 1] / bit 0 “Power Loss” and parameter 259 [Alarm Config 1] / bit 13 “Load Loss” are set to zero.
Precharge Error	31	The precharge function has failed to complete within 30 seconds (default) of the precharge request. The precharge time out is configurable by Par 410 [PreChrg TimeOut] A precharge request is initiated when the DC Bus voltage is above the Undervoltage Trip level and the precharge input is high (the requirement for the precharge being high can be bypassed by setting Par 411 [PreChrg Control] / bit 01 “PreChrg Enable” to be off.	Verify the value in parameter 410 [PreChrg TimeOut] Verify the bit value in parameter 411 [PreChrg Control] / bit 01 “PreChrg Enable”.
Power Unit	70	One or more of the output transistors were operating in the active region instead of desaturation. This can be caused by excessive transistor current or insufficient base drive voltage.	Clear fault.

Addressing 700S Hardware Faults

Fault	No.	Description	Action *(if appropriate)*
HiHp In PhaseLs	65	AC Input Phase Loss - AC voltage is not present on one or two input phases.	1. Check for voltage on each input phase. 2. Check the status of each external input fuse.
HiHp Bus Com Dly	66	Bus Communication Time Delay - the processor has not received proper periodic feedback information.	Check fiber-optic connections between the Power Interface Circuit Board and Circuit Board.
HiHp Bus Link Ls	67	Bus Communication Link Loss - bus communication between the Power Interface Circuit Board and Circuit Board has halted.	Check fiber-optic connections between the Power Interface Circuit Board and Circuit Board.
HiHp Bus CRC Er	68	Bus Communication CRC Error - too many Cycling Ring Checksum (CRC) errors have occurred in the communication bus. A fast power cycle may cause the 700S Main Control Board to attempt to communicate with the ASIC Board before the ASIC Board is energized.	Check fiber-optic connections between the Power Interface Circuit Board and Circuit Board. Wait five minutes before re-energizing the drive.
HiHp Bus WtchDog	69	Bus Communication Watchdog Error - communication has halted in the communication bus, causing the watch dog timer to expire.	1. Check fiber-optic connections between the Power Interface Circuit Board and Circuit Board. 2. Check connections between the Main Control Board and the Power Interface Circuit Board. 3. Replace the Circuit Board. 4. Replace the Power Interface Circuit Board. 5. Replace the Main Control Board.

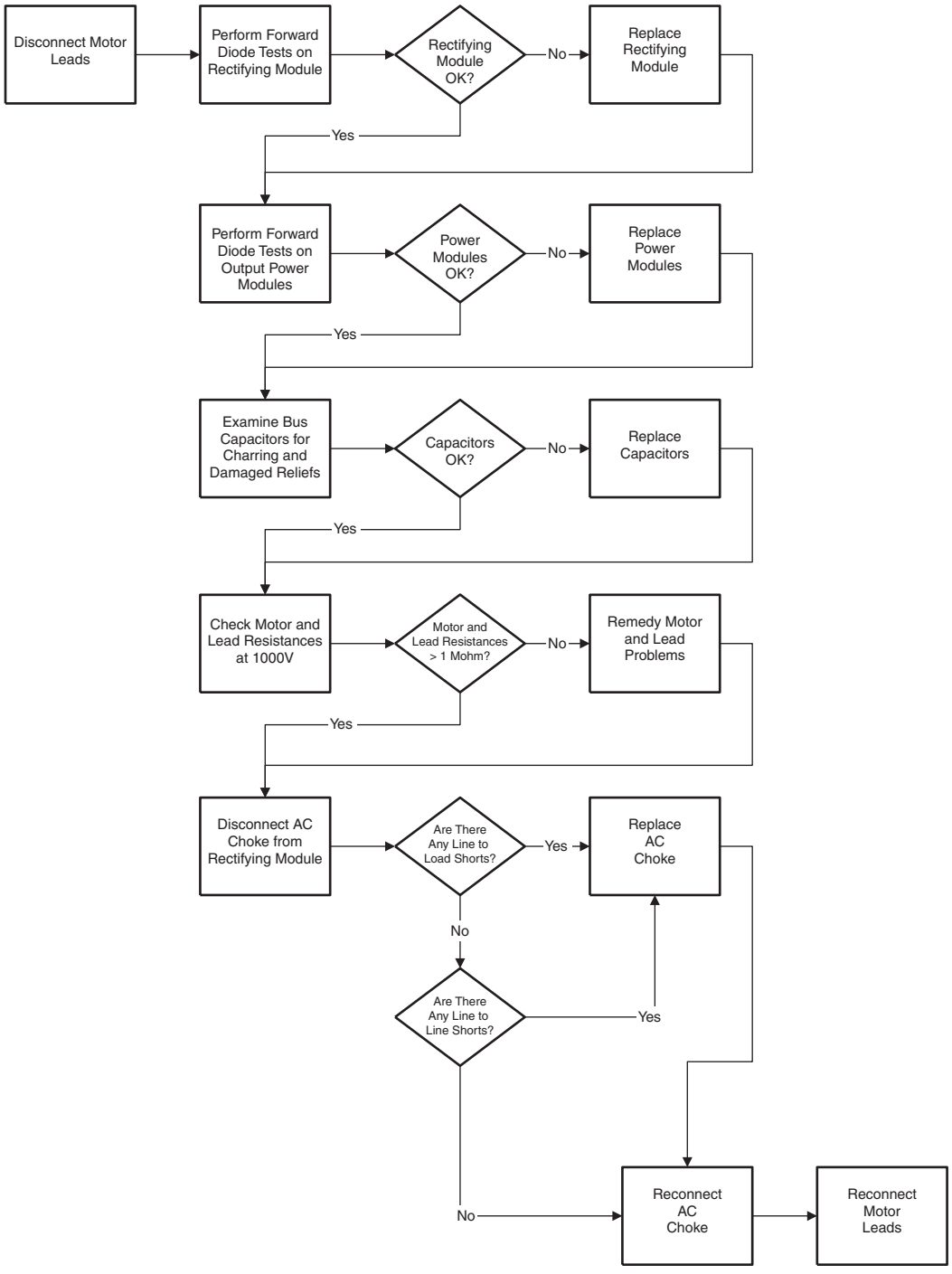
Fault	No.	Description	Action *(if appropriate)*
HiHp Fan Fdbk Ls	70	Fan Feedback Loss - a fan feedback signal has been lost.	1. Check the main cooling fan. 2. Check the Main Control Board cooling fan.
HiHp Drv OvrLoad	71	Drive Overload - the circuit board on the Power module has detected an overload.	Measure output current of the drive. If the level is ever greater than the maximum drive rated output current level reduce the load. If the levels are always well below the drive rated levels, then replace the power module.
HiHp PwrBd PrcEr	72	Power Board Processor Error - a microprocessor on the Power Board has detected a communication error.	1. Check fiber-optic connections between the Power Interface Circuit Board and Circuit Board. 2. Check connections between the Main Control Board and the Power Interface Circuit Board. 3. Replace the Circuit Board 4. Replace the Power Interface Circuit Board. 5. Replace the Main Control Board.
HiHp PrChrg Cntc	73	Precharge Contactor Fault - proper contactor feedback has not occurred. The precharge contactor has probably failed to pick up or the feedback signal has failed. This fault only applies to DC input drives.	• Check precharge circuit wiring. • Check for loose connections on X50 terminal block and/or the X9 and X15 connectors on the ASIC Board.
HiHp PwrEE Error	74	Power EEPROM Error - the rating of the drive and data in the Power EEPROM on the Power Board do not match.	Replace output power module or program a new power board.
HiHP PwrBd OTemp	75	Power Board Over-Temperature - temperature of the Power Board on has exceeded 85° C.	Check the main cooling fan and fan power supply, replace if necessary.

Diagnostic Procedures by Symptom

The following charts list drive symptoms, symptom descriptions and recommended actions.

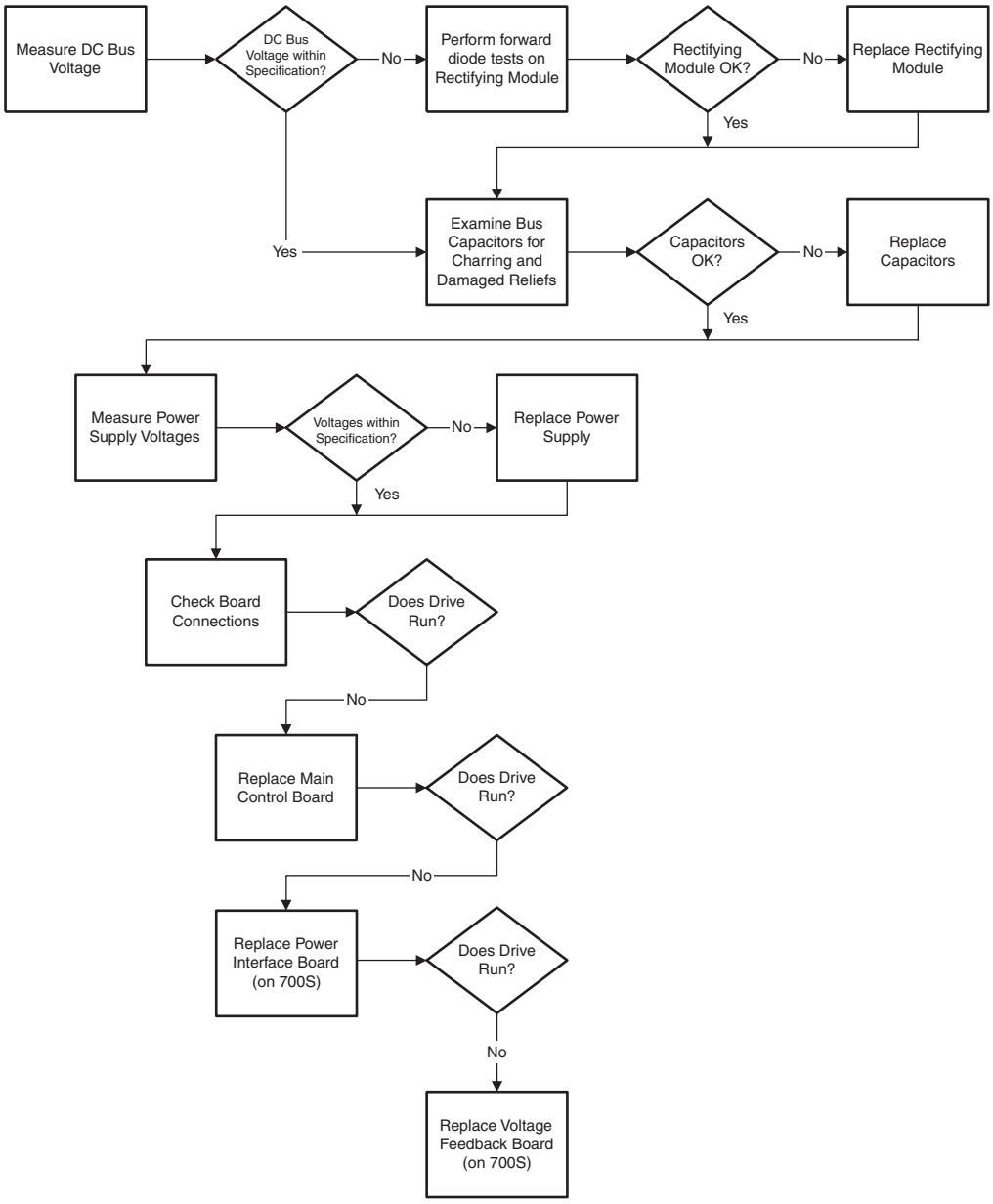
Blown Input Fuses

Use this procedure when a drive clears any of its external circuit breaker or power fuses:



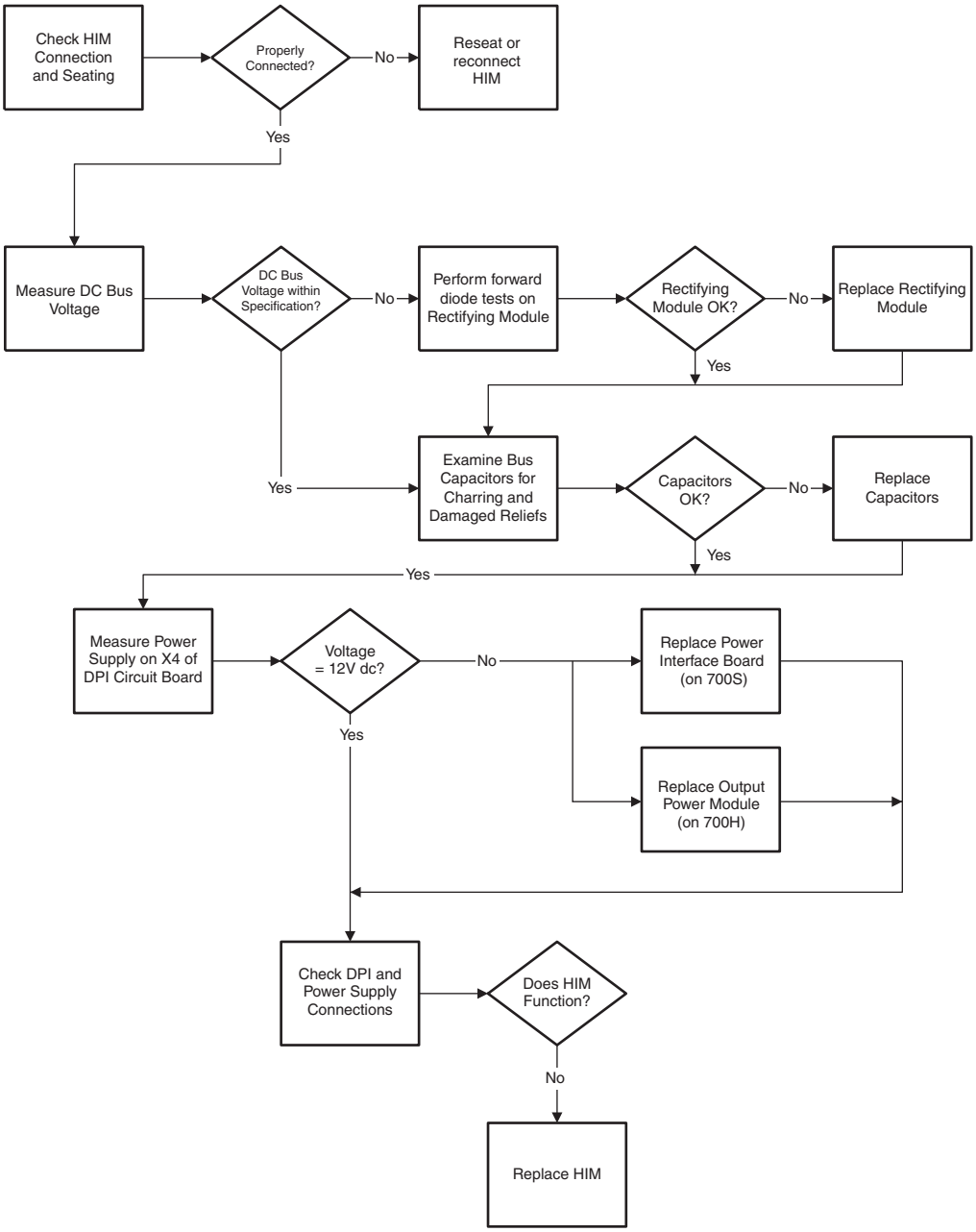
No Output Voltage

Use this procedure when there is no voltage present at the drive output terminals, even though the drive indicates the motor is running:



No HIM Display

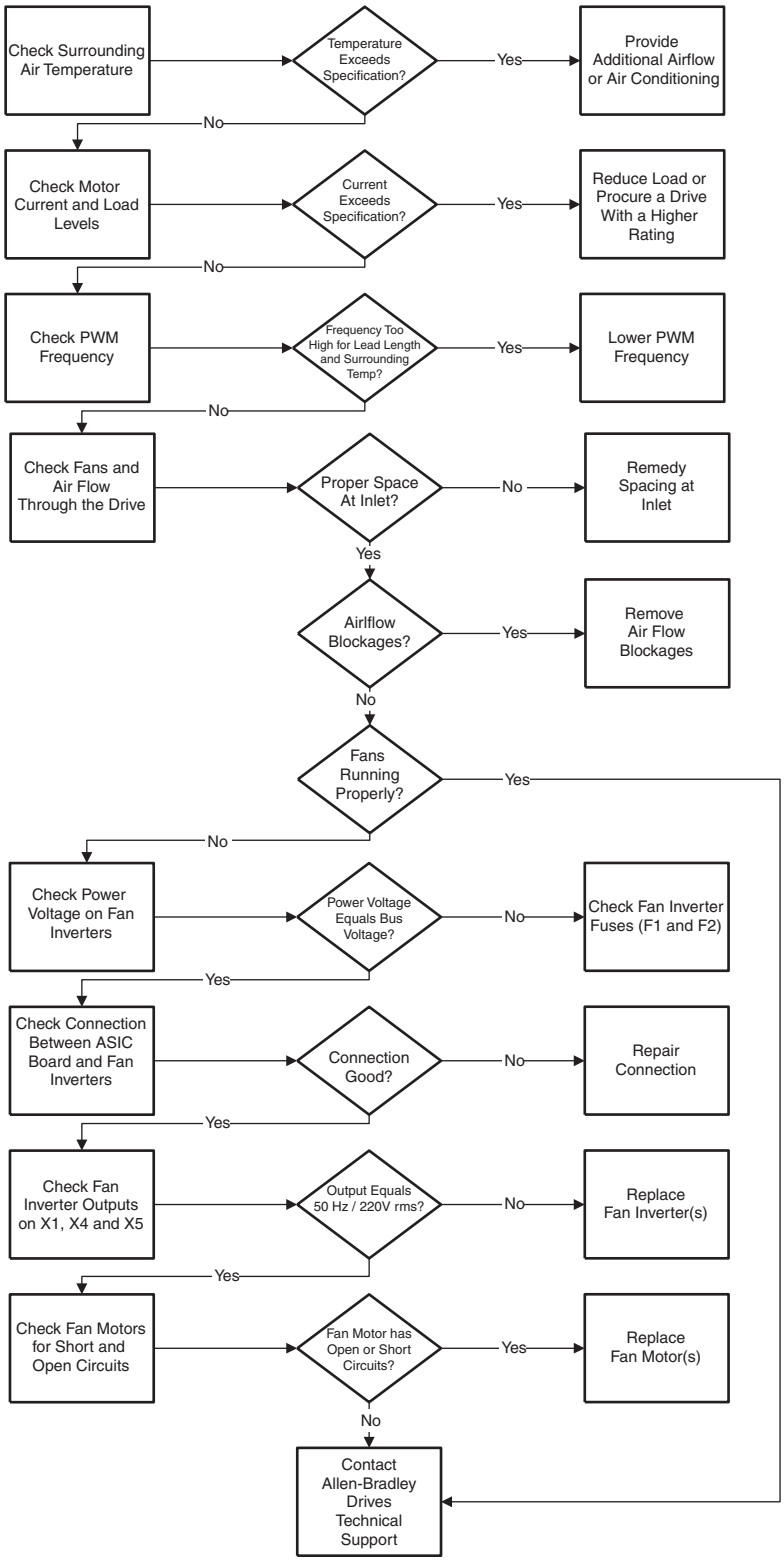
Use this procedure when the HIM does not function:



Over-Temperature Faults

Use this procedure to troubleshoot drive over-temperature faults.

- 700S drives: 14 “Inv Otemp Pend” and 15 “Inv Otemp Trip”
- 700H drives: 8 “Heatsink OvrTemp” and 9 “Trnsistr OvrTemp”



Component Test Procedures

ATTENTION: To avoid an electric shock hazard, ensure that all power to the drive has been removed before performing the following.

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.

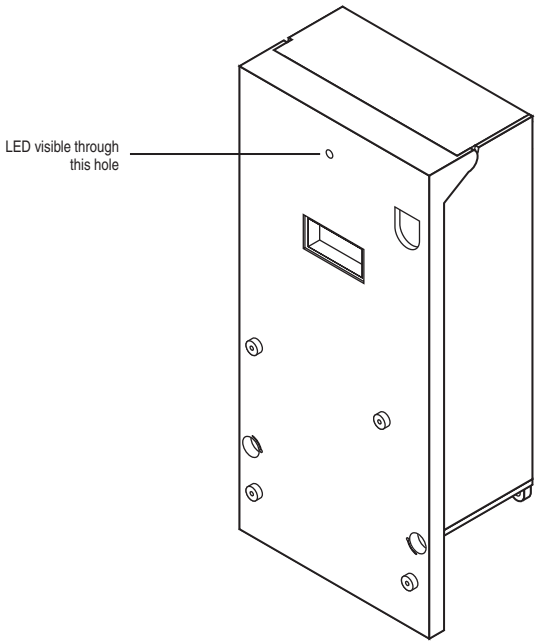
ATTENTION: HOT surfaces can cause severe burns. **Do not** touch the heatsink surface during operation of the drive. After disconnecting power allow time for cooling.

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 A-B publication 8000-4.5.2, “Guarding Against Electrostatic Damage” or any other applicable ESD protection handbook.

Viewing the 700H Diagnostic LED

The Control Assembly on 700H drives contains a diagnostic LED which is visible through the cover of the Control Assembly. The Control Assembly is located in the upper, left-hand drive enclosure.

ATTENTION: The Control Assembly LED is only operational when the drive is energized, and only visible with the door of the drive enclosure is open. 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!



LED	Indication
Steady	The drive is operational and has no faults
Flashing Quickly	• Switching power supply overload • Rectifier Board fault • Fan or fan inverter fault • Brake Chopper fault • Fiber Optic Adapter Board Fault
Flashing Slowly	Bad connection between circuit boards, check all connections

Viewing the 700S Diagnostic LEDs

The PowerFlex 700S contains a Run LED, controller LEDs, and SynchLink LEDs. These LEDs are only operational when the drive is energized and are only visible when the drive door is open. The status of these LEDs can also be viewed from the HIM or from an application program (e.g., DriveExplorer™) in parameter 554 [LED Status]. This feature is only available with DriveLogix version 15.03 or later.

ATTENTION: The RUN LED and the controller LEDs are only operational when the drive is energized. 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!

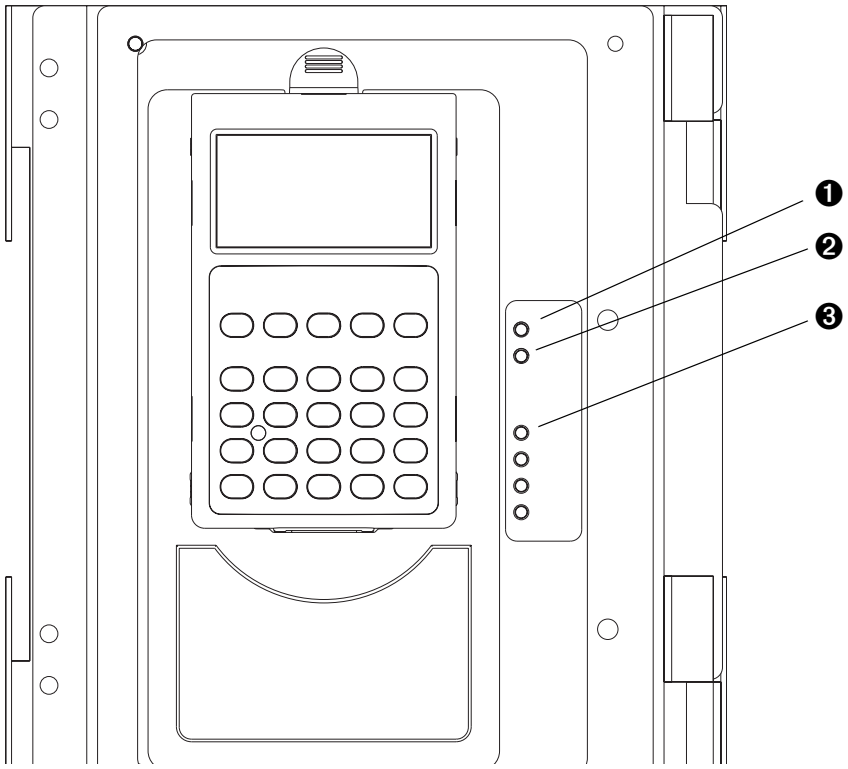


Table C Drive Status Indicator Descriptions

			#	Name	Color	State	Description
DRIVE	Power Structure		❶	PWR (Power)	Green	Steady	Illuminates when power is applied to the drive.
			❷	STS (Status)	Green	Flashing	Drive ready, but not running & no faults are present.
						Steady	Drive running, no faults are present.
					Yellow	Flashing	When running, a type 2 (non-configurable) alarm condition exists, drive continues to run. When stopped, a start inhibit exists and the drive cannot be started.
						Steady	A type 1 (user configurable) alarm condition exists, but drive continues to run.
					Red	Flashing	A fault has occurred.
						Steady	A non-resettable fault has occurred.
					Red / Yellow	Flashing Alternately	The drive is in flash recovery mode. The only operation permitted is flash upgrade.
	Control Assembly	Communications	❸	PORT	Refer to the *Communication Adapter User Manual*		Status of DPI port internal communications (if present).
				MOD			Status of communications module (when installed).
				NET A			Status of network (if connected).
				NET B			Status of secondary network (if connected).
		Control	(1)	SYNCHLINK	Green	Steady	The module is configured as the time keeper. or The module is configured as a follower and synchronization is complete.
					Green	Flashing	The follower(s) are not synchronized with the time keeper.
					Red	Flashing	The module is configured as a time master on SynchLink and has received time information from another time master on SynchLink.
				ENABLE	Green	On	The drive's enable input is high.
					Green	Off	The drive's enable input is low.

(1) SynchLink LEDS are located on the SynchLink daughtercard on the main circuit board in the control cassette.

Performing Visual Inspections

Visually inspect the cooling tunnels and rectifying (if present) and power structures before energizing the drive.

Inspecting the Cooling Tunnels

1. Remove the main cooling fans from the bottom of the rectifying structure (if present) and power structure. Refer to Removing the Main Cooling Fans from the Rectifying Structure on page 3-20 and Removing the Main Cooling Fans from the Power Structure on page 3-53, respectively.
2. Inspect the tunnels. Clean the heatsinks and tunnels if necessary.

Inspecting the Rectifying and Power Structures

1. Remove the covers from the rectifying (if present) and power structures. Refer to Removing the Protective Covers from the Rectifying Structure on page 3-17 and Removing the Protective Covers from the Power Structure on page 3-44, respectively.
2. Check components for burn marks, breakage or foil delamination on circuit boards. Check all the boards on the rectifying (if present) and power structures, including those on the Output Power modules and the Rectifying module(s) (if present).

   Replace any of these components without further testing if they show evidence of burn marks, breakage or foil delamination.

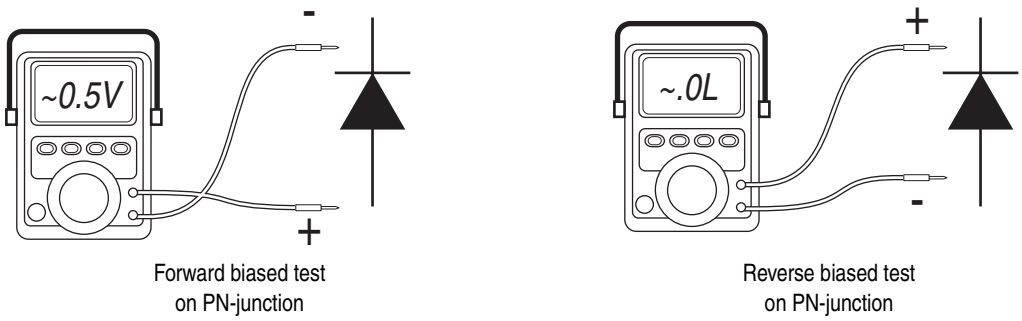
Conducting Forward and Reverse Biased Diode Tests for Major Power Components

A forward biased diode test checks the semiconductor junctions between the terminals and measures the voltage drop across those junctions. To pass each test, the meter must display a voltage near 0.5V. If the test finds a short, the meter will display ".000." If the test finds an open circuit or reversed polarity, the meter will display ".0L" (zero load).

A reverse biased diode test should find an open circuit, and the meter should display ".0L" (zero load).

Important: 400V ac input, 1150A and 600V ac input frame 13 drives have two Rectifying modules. 400V ac input, 1300A and 1450A

frame 13 drives have two or three Rectifying modules. You must complete these procedures for all Rectifying modules.



1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-3.
2. Disconnect the motor leads from the drive.
3. On ac input drives, conduct forward and reverse biased diode tests on the Rectifying modules.

Figure 2.1 Measurement Points for Forward and Reverse Diode Tests

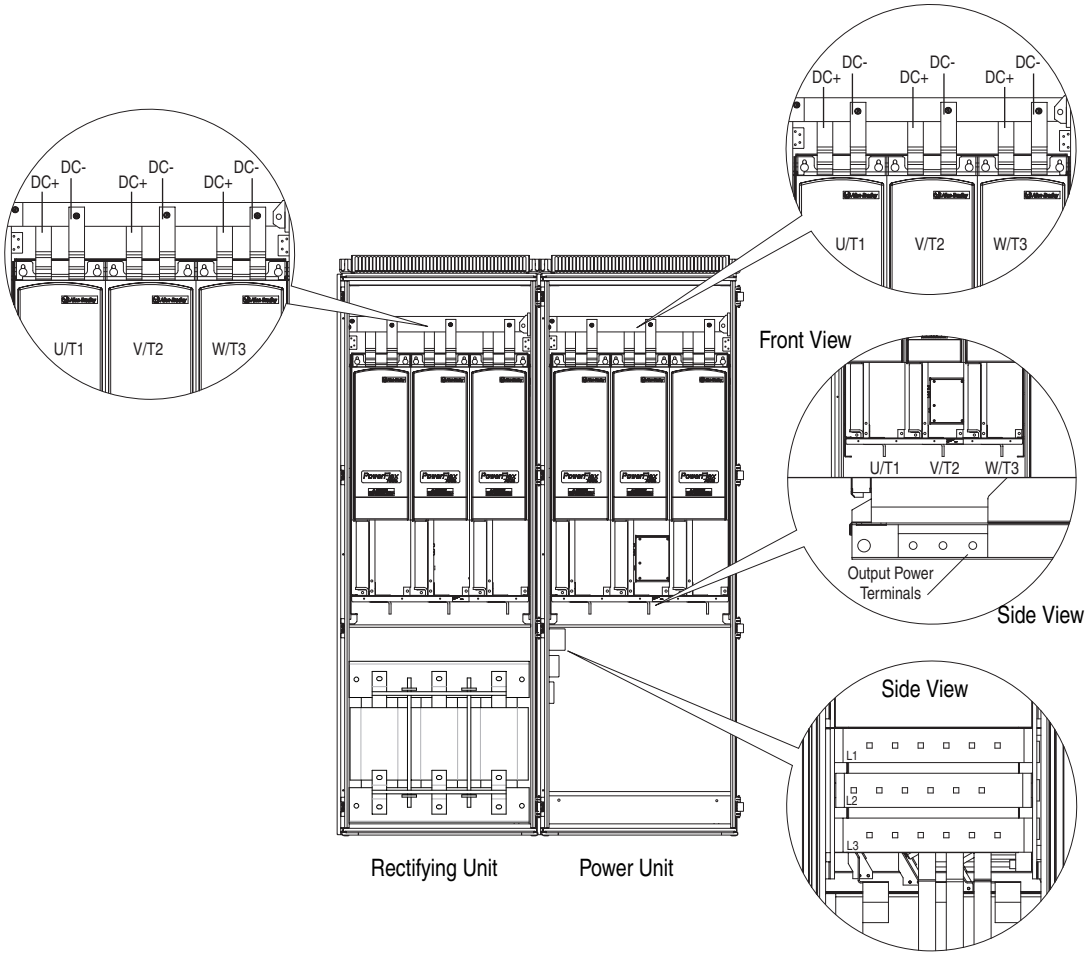


Table 2.A Forward Biased Diode Tests on Rectifying Modules

Meter Leads		
+	-	Nominal meter reading
L1	DC+	Value should gradually rise to about 0.5V
L2	DC+	
L3	DC+	
DC-	L1	
DC-	L2	
DC-	L3	

Table 2.B Reverse Biased Diode Tests on Rectifying Modules

Meter Leads		
+	-	Nominal meter reading
L1	DC-	Meter should display ".0L" (zero load)
L2	DC-	
L3	DC-	
DC+	L1	
DC+	L2	
DC+	L3	

If the drive fails any of these measurements, replace all Rectifying modules.

4. Conduct forward and reverse biased diode tests on the Output Power modules.

Table 2.C Forward Biased Diode Tests on Output Power Modules

Meter Leads		
+	-	Nominal meter reading
DC-	U/T1	Value should gradually rise to about 0.5V
DC-	V/T2	
DC-	W/T3	
U/T1	DC+	
V/T2	DC+	
W/T3	DC+	

Table 2.D Reverse Biased Diode Tests on Output Power Modules

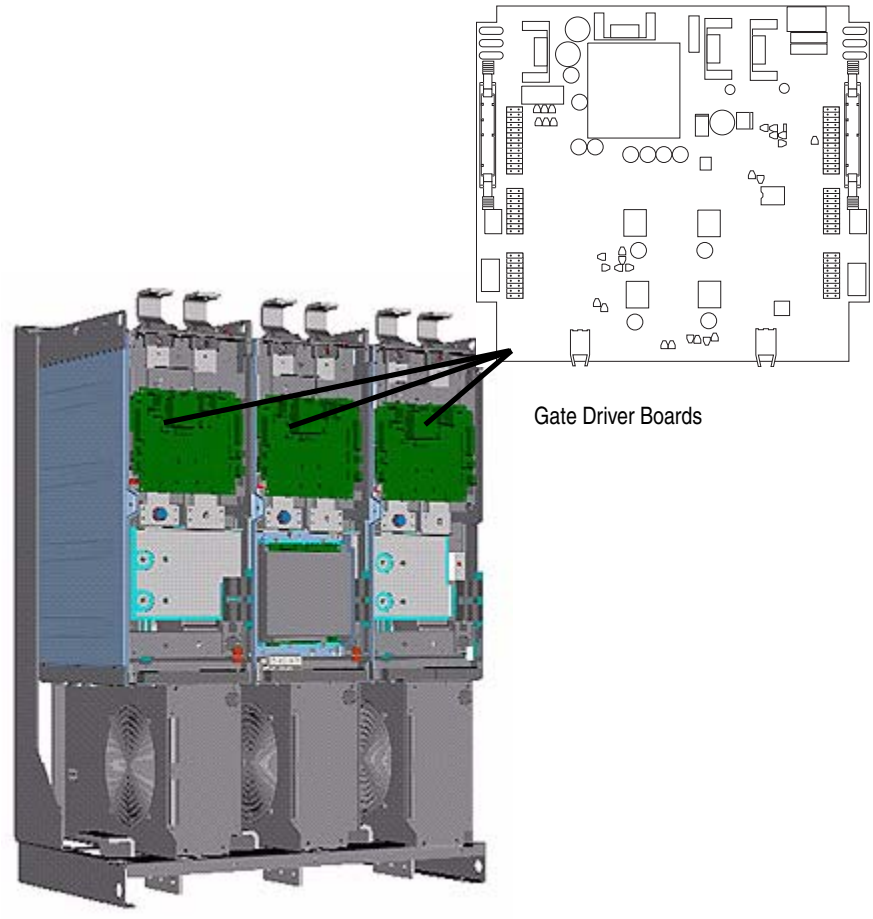
Meter Leads		
+	-	Nominal meter reading
U/T1	DC-	Meter should display ".0L" (zero load)
V/T2	DC-	
W/T3	DC-	
DC+	U/T1	
DC+	V/T2	
DC+	W/T3	

If the drive fails any of these measurements, replace all three Output Power modules.

Checking Fiber Optic Connections to the Gate Driver Boards

Damaged or improperly connected fiber optic cables can cause apparent Gate Driver board malfunctions.

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-3.
2. Remove the covers from the power structure. Refer to Removing the Protective Covers from the Power Structure on page 3-44.
3. Locate the three Gate Driver boards on the front of the power structure (right-hand enclosure).



4. Verify that the fiber optic cables are properly connected between the Gate Driver boards and the ASIC board (refer to Figure B.5 on page B-6).
5. Disconnect the cables and inspect them for scratches and cracks.
6. Reconnect the cables, replacing any damaged cables.

Conducting Gate Driver Board Measurements

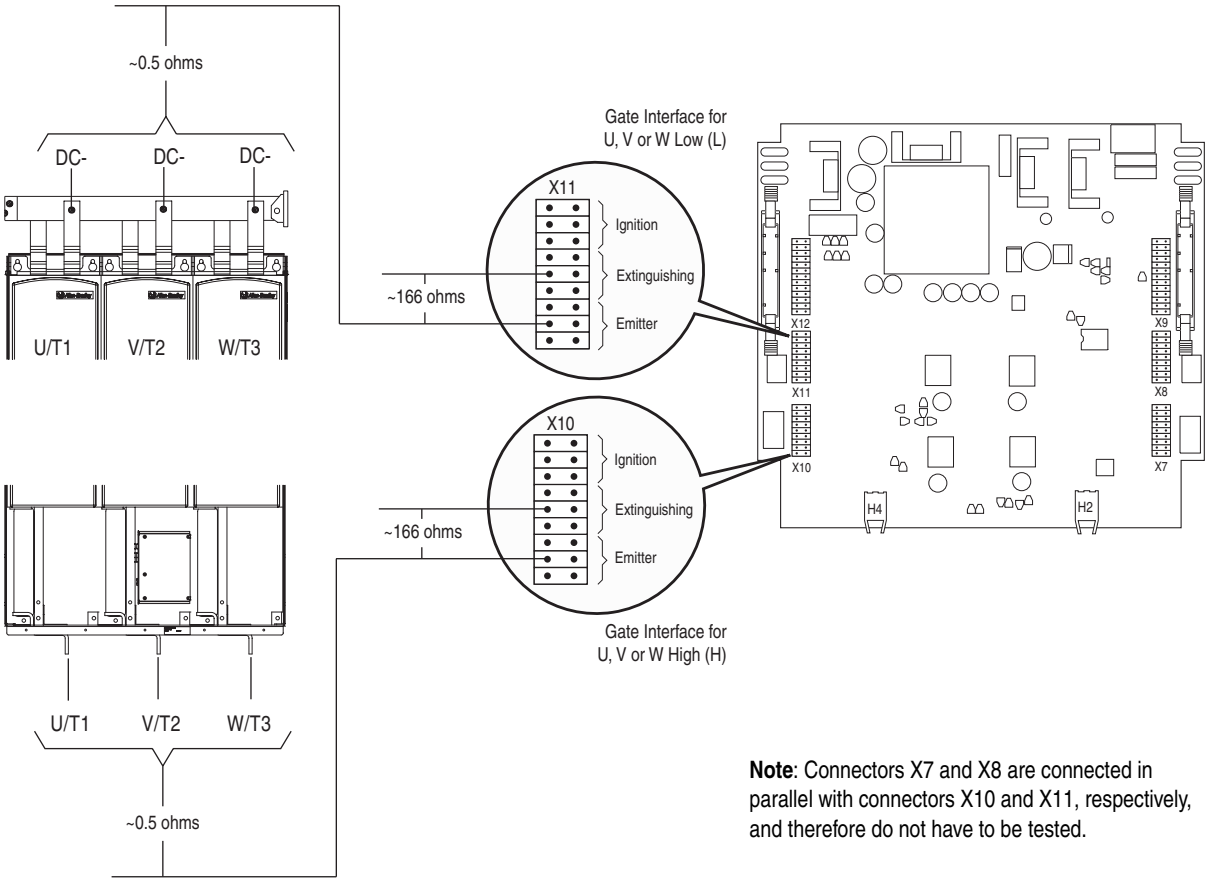
1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-3.
2. Remove the covers from the power structure. Refer to Removing the Protective Covers from the Power Structure on page 3-44.

Gate Interface Resistance

There are three Gate Driver boards, one per Output Power module. Measure the gate interface resistance for each (U, V, and W phase) Output Power transistor:

- The resistance from each extinguishing pin to the branch emitter pin (connectors X10 and X11) should be approximately 166 ohms.
- The resistance from the X10 branch emitter pin to the same branch output power terminal (U/T1, V/T2, and W/T3) should be approximately 0.5 ohms.
- The resistance from the X11 branch emitter to the same branch DC- bus terminal should be approximately 0.5 ohms.

If any of the gate interfaces fails this test, replace the appropriate (left, middle, or right) Output Power module. Refer to Removing the Output Power Modules on page 3-68.



Note: Connectors X7 and X8 are connected in parallel with connectors X10 and X11, respectively, and therefore do not have to be tested.

Preparing the Drive for Active Measurements on the Gate Driver Board

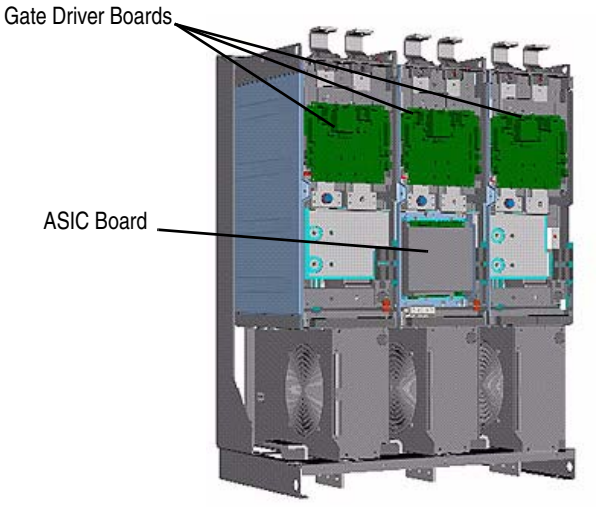
Important: This procedure requires special equipment and training. Only qualified and trained personnel should perform these procedures. *If you do not have the special equipment, replace the Gate Driver board to determine if the board is malfunctioning.*

Important: A High Voltage DC Test Power Supply is required to perform these tests.

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-3.
2. Remove the covers from the power structure. Refer to Removing the Protective Covers from the Power Structure on page 3-44.
3. Disconnect the Fan Inverters power supply cables in order to prevent them from running during these tests.

ATTENTION: Running the drive without the Fan Inverters could cause the drive to overheat or fault. Possible equipment damage could occur. You must replace the fuses before running the drive.

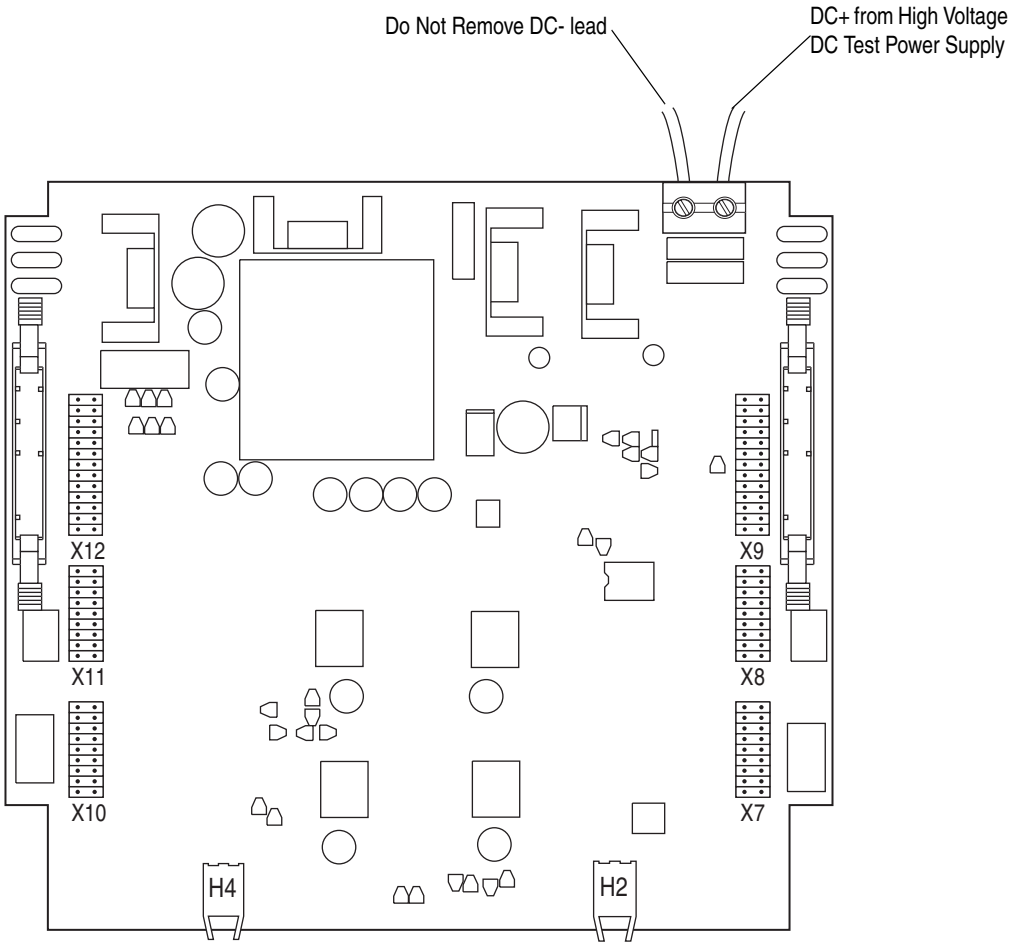
4. Disconnect the fiber optic cables that connect the ASIC board to the three Gate Driver boards at the Gate Driver board ends.



5. Disconnect the plug from the X6 connector on the ASIC board.
6. Make the following connections from a High Voltage DC Test Power Supply to X6 on the ASIC board using a new connector plug.

From High Voltage DC Test Power Supply	To this pin on the X6 on ASIC Board
DC+	1
DC-	3
	Jumper pin 1 to pin 2 on connector

7. Disconnect the DC+ wire only from each of the three Gate Driver boards.



8. Connect the High Voltage DC Test Power Supply DC- to the DC- Bus Bar.

9. Connect the High Voltage DC Test Power Supply DC+ to the DC+ on each Gate Driver board.

ATTENTION: The sheet metal cover and mounting screws on the ASIC board located on 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. 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, *Standard for Electrical Safety in the Workplace*. DO NOT work alone on energized equipment!

ATTENTION: Certain pins in connectors X9 and X12 on the Gate Driver board will be energized at DC bus potential high voltage. Risk of electrical shock, personal injury or death, property damage, or economic loss exists if personnel or equipment comes into contact with these pins.

10. Set the current limit on the High Voltage DC Test Power Supply to less than or equal to 1A. Energize the Supply and increase its output to the drive's nominal DC bus voltage (650V dc for drives with 380-500V ac input or 775V dc for drives with 600-690V ac input).

Checking the Opto-Couplers

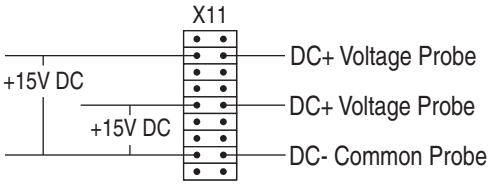
Class 1 LED Product

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.

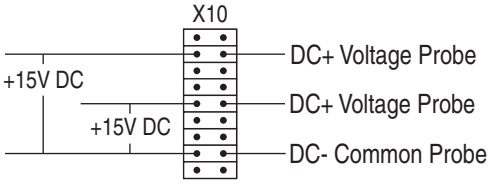
1. Locate the fiber optic receiver (H4) which transmits the signals for the U Low (UL) gate interface and connector X11 on the Gate Driver board. X11 provides the gate interface for the UL output power transistor in the U Phase Output Power module.

2. While shining an intense light (like a flashlight) into the fiber optic receiver (H4) for the UL cable, measure the DC voltage at each UL extinguishing pin and the emitter pin on X11 with respect to DC-. It

should be +15V DC. If the drive fails any of these tests, replace the fiber optic cable or the Gate Driver board.



3. Repeat steps 1 and 2 for connector X10 and the UH fiber optic cable (H2 fiber optic receiver). X10 provides the gate interface for the UH output power transistor in the U Phase Output Power module. If the drive fails any of these tests, replace the U Phase Gate Driver board.



4. Repeat steps 1 - 3 for the V Low (VL) and V High (VH) fiber optic cables. X11 provides the gate interface for the VL output power transistor in the V Phase Output Power module. X10 provides the gate interface for the VH output power transistor in the V Phase Output Power module. If the drive fails any of these tests, replace the V Phase Gate Driver board.

5. Repeat steps 1 - 3 for connector X11 and the W Low (WL) and W High (WH) fiber optic cables. X11 provides the gate interface for the WL output power transistor in the W Phase Output Power module. X10 provides the gate interface for the WH output power transistor in the W Phase Output Power module. If the drive fails any of these tests, replace the Gate Driver board.

6. Connect the multi-meter (ohms) black test lead to the DC- Bus Bar and the red test lead from the multi-meter to the output terminal on the U Phase.

7. Shine an intense light into the UL fiber optic receiver (H4) on the Gate Driver board. This should gate the IGBT and the multi-meter should indicate that the IGBT is short-circuited. This will happen if the circuit from the fiber optic receiver to the output terminal is functioning properly.

8. Connect the multi-meter red test lead to the DC+ Bus Bar and the black test lead to the UH output terminal.

9. Shine an intense light into the UH fiber optic receiver (H2) on the Gate Driver board. This should gate the IGBT and the multi-meter should indicate that the IGBT is short-circuited. This will happen if the circuit

from the fiber optic receiver to the output terminal is functioning properly.

10. Repeat steps 6 - 9 for the VL and VH fiber optic receivers on the V Phase Gate Driver board.

11. Repeat steps 6 - 9 for the WL and WH fiber optic receivers on the W Phase Gate Driver board.

Important: The test does not verify that both blocks are operating. If one block is not operating, the drive will indicate an I^2T hardware fault.

Checking the Rectifying Module(s) on AC Input Drives

All 600V ac input and the 400V, 1150A ac input frame 13 drives have two Rectifying modules. The 400V, 920A and 1030A ac input frame 13 drives have three Rectifying modules. Complete the following tests on all Rectifying modules.

Important: This procedure requires special equipment and training. Only qualified and trained personnel should perform these procedures.

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-3.

2. Remove the covers from the rectifying structure. Refer to Removing the Protective Covers from the Rectifying Structure on page 3-17.

3. Visually inspect the pre-charging resistors. If the pre-charging resistors are damaged:

   A. Replace all Rectifying modules. Refer to Removing the Rectifying Modules on page 3-35.

   B. Check the capacitors, rectifier(s) and external connections for short-circuits. Refer to Checking the DC Bus Capacitors on page 2-16.

   C. Check the Output Power modules. Refer to Conducting Forward and Reverse Biased Diode Tests for Major Power Components on page 2-4.

4. Verify that the jumper at X50 on the Rectifying board is in place.

Taking Measurements on the Rectifying Modules

5. Disconnect connectors X10, X11, X12, X13, X31, X32, and X33 from the Rectifying Circuit board.

6. Perform resistance measurements, using a digital multimeter, on the points listed in Table 2.E below. These points are on the back of the X10, X11 and X12 plugs which you have disconnected from the board. **If the Rectifying module fails any of these tests, replace it.** Refer to Removing the Rectifying Modules on page 3-35.

Table 2.E Rectifying Module Resistance Measurements

Measurement points	Resistance
X10: red to X10: black	18Ω ± 1Ω
X11: red to X11: black	
X12: red to X12: black	

7. Without applying power to X13 verify that there is no resistance between the following points: X31 and X9, X32 and X9, and X33 and X9. Refer to Table 2.F on page 2-15. **If the Rectifying module fails any of these tests, replace it.** Refer to Removing the Rectifying Modules on page 3-35.

Important: Power supply polarity is critical during these tests. Reversing the polarity will damage components on the circuit board.

8. Connect the DC Test Power Supply to X13 (positive to pin 5 and common to pin 1 and pin 3). Raise the output of the DC Test Power Supply to 24V dc.

9. Verify that the voltage and resistance between the following points is zero: X31 and X10: Pin 1, X32 and X11: Pin 1, and X33 and X12: Pin 1. Refer to Table 2.F on page 2-15 below. **If the Rectifying module fails any of these tests, replace it.** Refer to Removing the Rectifying Modules on page 3-35.

Figure 2.2 Rectifying Board Layout and Measurement Points

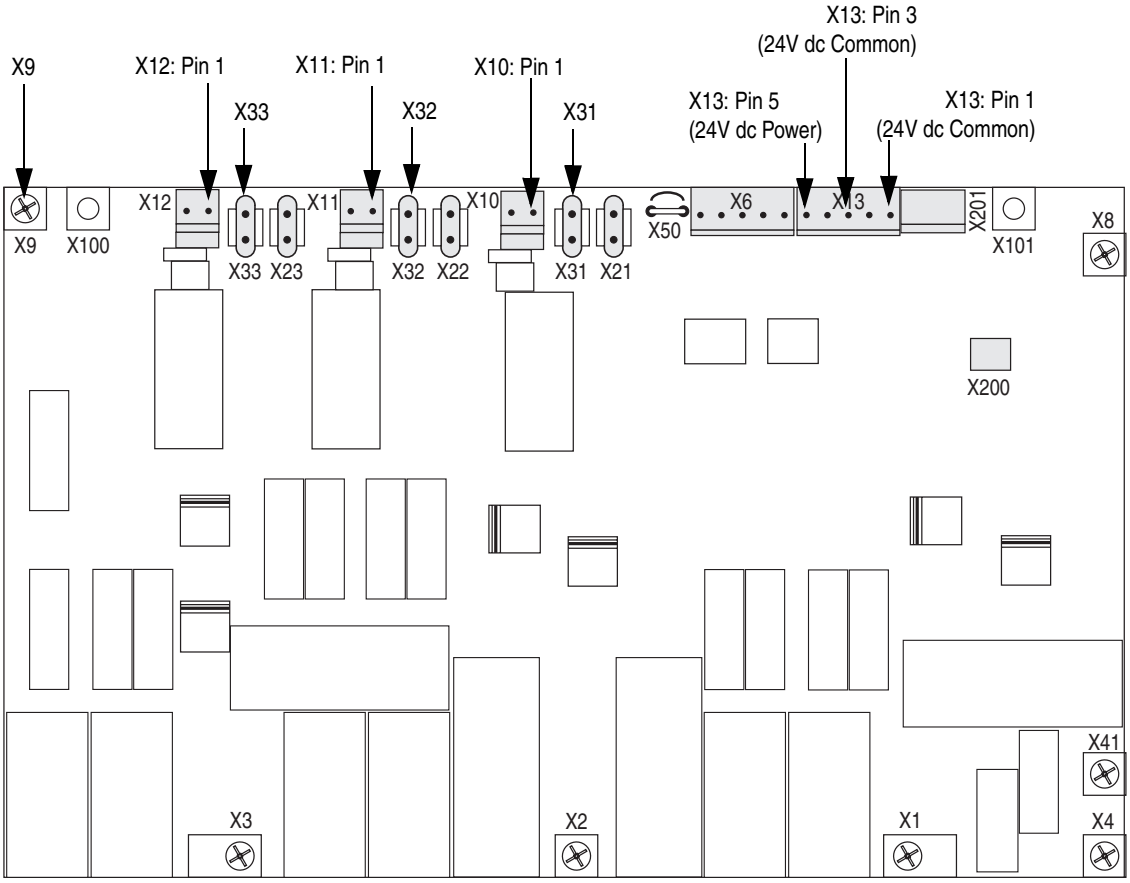


Table 2.F Rectifying Board Charge Relay Test Results

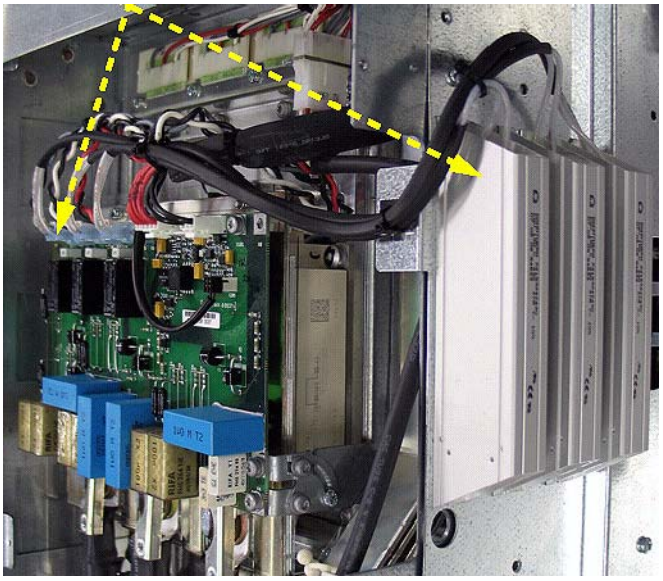
No Power on X13			24V dc Power on X13		
Meter Leads			Meter Leads		
+	-	Results	+	-	Results
X31	X9	0Ω	X31	X10: Pin 1	0Ω / 0V
X32	X9		X32	X11: Pin 1	
X33	X9		X33	X12: Pin 1	

Checking the Precharge Resistors on the Rectifying Modules

Each Rectifying module has three precharge resistors. Check the resistance of each resistor.

1. Unplug the resistor wires from connectors X21 and X31, X22 and X32, and X23 and X33 on the Rectifying circuit board.
2. Verify that the resistance of each resistor is approximately 47Ω. **If any of the precharge resistors fails this test, replace the resistor**.

Disconnect precharge resistor wires from Rectifying circuit board.



Checking the DC Bus Capacitors

Important: This procedure requires special equipment and training. Only qualified and trained personnel should perform these procedures.

These tests require the recommended high voltage DC power supply.

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-3.
2. Set the current limit of the DC power supply to less than 50mA.
3. Connect the power supply's DC+ to the drive's DC+ terminal and the power supply's DC- to the drive's DC- terminal.
4. Set the power supply voltage setting to zero.
5. Switch on the external DC power supply.
6. Slowly increase the external DC power supply output voltage to the drive's nominal DC bus voltage (650V dc for drives with 380-500V ac input or 775V dc for drives with 600-690V ac input).

7. Monitor the current while testing. Leakage current should be less than 3mA when voltage has stabilized.
8. Abort test if current leakage is significantly higher when voltage has stabilized.
9. Decrease the DC power supply output voltage to zero. Wait until DC bus voltage has decreased to zero. Switch off the external DC power supply.
10. As a precaution, use a resistor to discharge each capacitor after testing. Use a resistor with the proper resistance and power handling capability for the discharge current.
11. If any capacitor has failed. Replace all the capacitors in the same series connection. Refer to Removing the DC Bus Capacitors from the Power Structure on page 3-74.

Checking the Main Fan Inverters and Fans

Checking the Fan Inverter LEDs

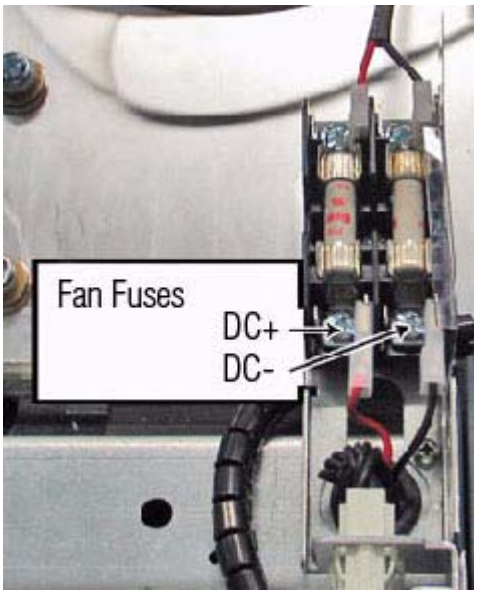
A frame 13 drive has five or six fans and fan inverters. Each fan inverter has a red and a green diagnostic LED.

ATTENTION: The inverter LEDs are only operational when the drive is energized, and only visible with the 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!

LED		
Red	**Green**	**Indication**
Steady	Steady	Inverter Idle
Off	Flashing	Inverter Running
Flashing	Steady	Inverter Faulted or No Control from ASIC board

Checking Fan Inverter Fuses

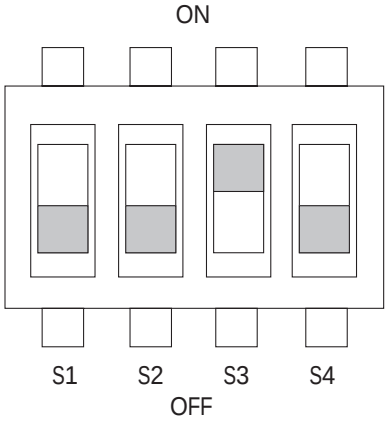
A pair of fuses (F1 and F2) feed DC Bus power to the fan inverters. Locate these fuses (illustrated below) and, using a multi-meter, verify that they are not open.



Fan Inverter DIP Switch Settings

Verify the following DIP switch settings on each Fan Inverter.

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



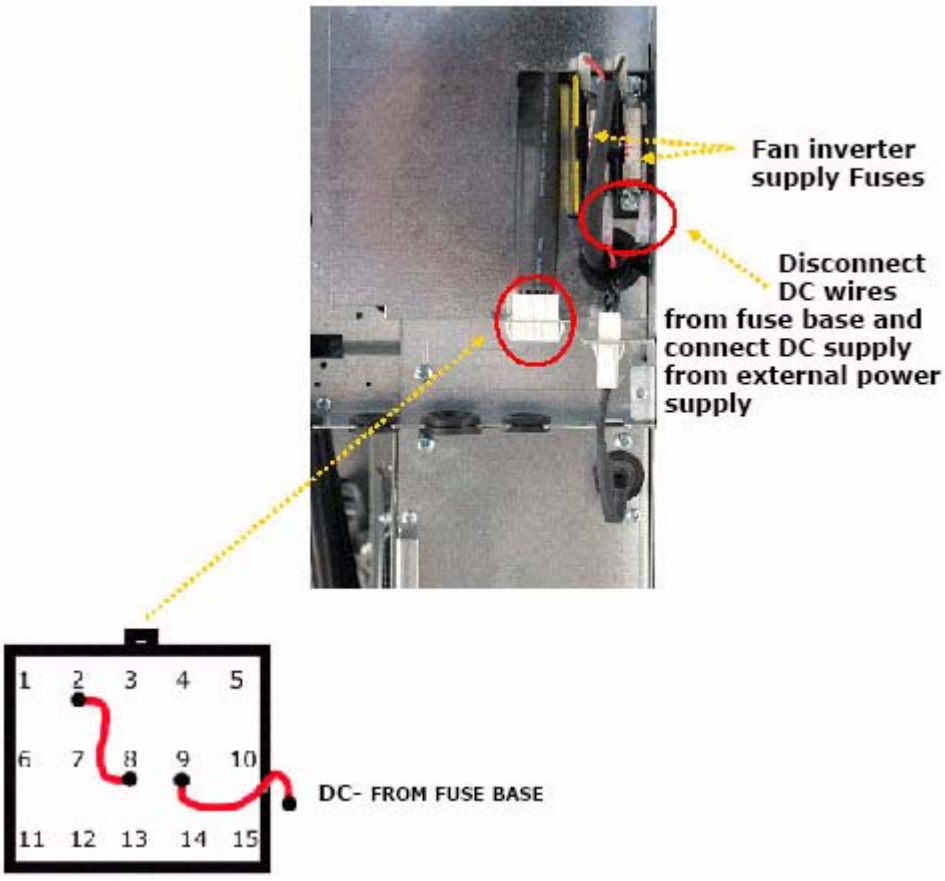
Isolating a Faulty Fan Inverter on the Rectifying Structure

Important: This procedure requires special equipment and training. Only qualified and trained personnel should perform these procedures.

These tests require the recommended high voltage DC power supply.

Use the following procedure to isolate a faulty inverter if the main fans are not running. Each fan inverter should be tested individually. Refer to Circuitry Block Diagram for Drives with AC Input on page B-2 for more information.

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-3.
2. Remove the 6A fuses from the fan inverter fuse base.
3. Unplug the fan inverter wire harness from the X1 connector and connect one jumper between pin 2 and pin 8 on the X1 connector and a second jumper between pin 9 on the X1 connector and the DC- terminal on the fan inverter fuse base.



4. Connect the power supply's DC+ to the DC+ terminal on the fuse base and the power supply's DC- to the DC- terminal on the fuse base.
5. Set the external DC power supply voltage to a nominal value and the current limit to 1A.
6. Switch on the external DC power supply. If the fan fails to run, then the fan inverter is faulty and should be replaced.
7. Repeat steps 2 - 6 for the remaining fan inverters.

Isolating a Faulty Fan Inverter on the Power Structure

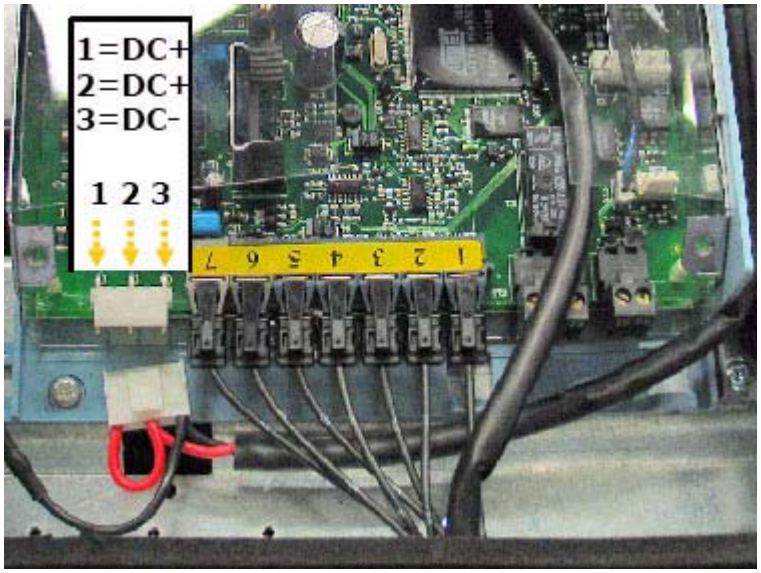
Important: This procedure requires special equipment and training. Only qualified and trained personnel should perform these procedures.

These tests require the recommended high voltage DC power supply.

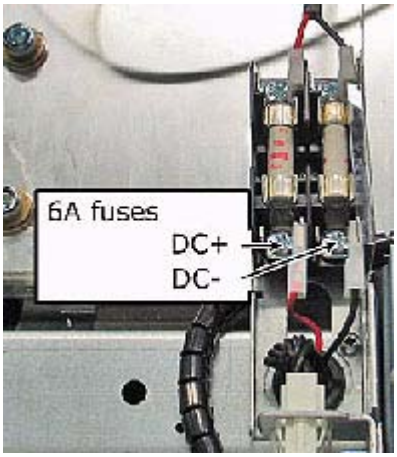
Use the following procedure to isolate a faulty inverter if the main fans are not running. Each fan inverter should be tested individually. Refer to Circuitry Block Diagram for Drives with AC Input on page B-2 and Circuitry Block Diagram for Drives with DC Input on page B-8 for more information.

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-3.
2. Remove the 6A fuses from the fan inverter fuse base.
3. Disconnect the DC Bus supply from the X6 connector on the ASIC board.

4. Connect the power supply's DC+ and DC- to the X6 connector on the ASIC board.



5. Connect the power supply's DC+ to the DC+ terminal on the fuse base and the power supply's DC- to the DC- terminal on the fuse base.



6. Set the external DC power supply voltage to a nominal value and the current limit to 1A.

7. Switch on the external DC power supply. If you receive a fault, reset the fault. If the fan fails to run, then the fan inverter is faulty and should be replaced.

8. Repeat steps 2 - 7 for the remaining fan inverters.

Checking the Main Fan Motors

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-3.
2. Remove the covers from the rectifying structure. Refer to Removing the Protective Covers from the Rectifying Structure on page 3-17.
3. Disconnect the fan motor from its inverter.
4. Measure the resistance of the fan windings. If the resulting measurements are not similar to those in Table 2.G below, replace the fan. Refer to Removing the Main Cooling Fans from the Rectifying Structure on page 3-20.
5. Reconnect the fan motor to its inverter.
6. Repeat steps 3 - 5 for the remaining fan motor(s).
7. Remove the covers from the power structure. Refer to Removing the Protective Covers from the Power Structure on page 3-44.
8. Disconnect the fan motor from its inverter.
9. Measure the resistance of the fan windings. If the resulting measurements are not similar to those in Table 2.G below, replace the fan. Refer to Removing the Main Cooling Fans from the Power Structure on page 3-53.

Table 2.G Correct Fan Measurements

Connection Wires	Resistance ± 5%
Brown-Black	60Ω
Blue-Black	26Ω
Blue-Brown	34Ω
Resistance to ground	∞ (infinity)

10. Reconnect the fan motor to its inverter.
11. Repeat steps 8 and 9 for the remaining fan motor(s).

Access Procedures

ATTENTION: To avoid an electric shock hazard, ensure that all power to the drive has been removed before performing the following.

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.

ATTENTION: The sheet metal cover and mounting screws on the ASIC Board located on 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.

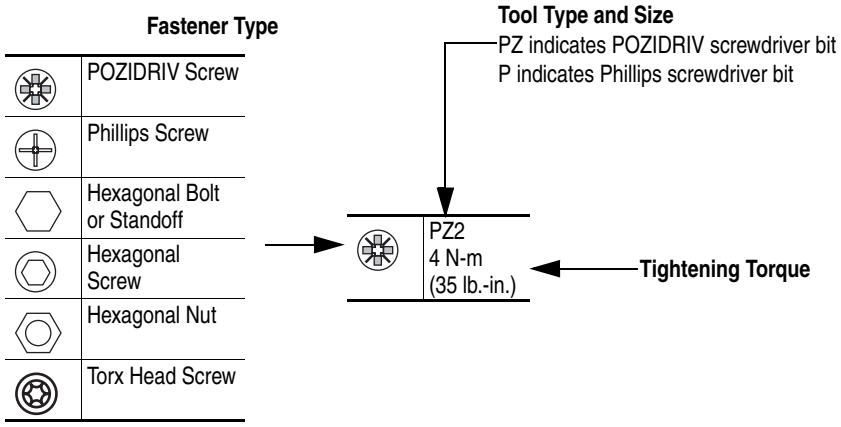
ATTENTION: HOT surfaces can cause severe burns. **Do not** touch the heatsink surface during operation of the drive. After disconnecting power allow time for cooling.

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.

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 A-B publication 8000-4.5.2, “Guarding Against Electrostatic Damage” or any other applicable ESD protection handbook.

Understanding Torque Figures in Assembly Diagrams

Icons and numbers in the assembly diagrams indicate how to tighten hardware:



Torque Specifications

The following table lists fastener torque specifications for the circuit boards and main components of the drive:

Item	Screw	Final Torque
700S Power Interface Circuit Board (mounting)	M3 x 6 Phillips	0.9 N-m (8 lb.-in.)
700S Voltage Feedback Circuit Board (mounting)	M3 x 6 Phillips	0.9 N-m (8 lb.-in.)
AC Input Terminals	M10 nut	40 N-m (354 lb.-in.)
ASIC Circuit Board (Mounting)	M4 x 8 POZIDRIV	0.9 N-m (8 lb.-in.)
ASIC Circuit Board Cover	M4 x 8 POZIDRIV	0.9 N-m (8 lb.-in.)
ASIC Fan	M4 x 16 POZIDRIV	0.4 N-m (3.5 lb.-in.)
Capacitor	M4 x 8 self tapping	1 N-m (9 lb.-in.)
DC- / DC+ Terminals	M6 x 20 POZIDRIV	5 N-m (44 lb.-in.)
DC Connective Bus Bars	M10 x 20 hexagonal screw	8 N-m (71 lb.-in.)
	M8 x 25 hexagonal socket-head screw	8 N-m (71 lb.-in.)
	M6 x 12 POZIDRIV	4 N-m (35 lb.-in.)
DPI / HIM Assembly Door	M3 x 6 Phillips®	0.9 N-m (8 lb.-in.)
DPI / HIM Assembly (Mounting)	M3 x 6 Phillips	0.9 N-m (8 lb.-in.)
Fan Inverter Assembly	M5 x 10 POZIDRIV	4 N-m (35 lb.-in.)
Fan Inverter Fuse Base	M4 x 8 POZIDRIV	3 N-m (27 lb.-in.)
Fan Inverter Fuse Holder	M4 x 8 POZIDRIV	3 N-m (27 lb.-in.)
Gate Driver Circuit Board Mounting)	M4 x 8 POZIDRIV	1.35 N-m (12 lb.-in.)
Main Cooling Fan (Mounting)	M5 x 10 POZIDRIV	3 N-m (27 lb.-in.)
Motor Output Terminals on Power Structure	M8 x 20 hexagonal screw	20 N-m (177 lb.-in.)
Output Power Module Output Terminals (U,V,W)	M8 x 20 hexagonal screw	14 N-m (124 lb.-in.)
Power Structure Block (Mounting)	M10 x 12 hexagonal screw	20 N-m (177 lb.-in.)
Power Structure DC Bus Input Terminals	M6 x 16 POZIDRIV	4 N-m (35 lb.-in.)
Protective Covers - Front Touch (Power Unit and NFE Unit)	M5 x 10 POZIDRIV	3 N-m (27 lb.-in.)
Protective Covers - Connection Touch (Power Unit and NFE Unit)	M5 x 16 POZIDRIV	3 N-m (27 lb.-in.)

Item	Screw	Final Torque
Rectifier Circuit Board (Mounting)	M4 x 8 POZIDRIV	1 N-m (9 lb.-in.)
Rectifying Module Input Terminals (L1,L2,L3)	M10 x 20 hexagonal screw	12 N-m (106 lb.-in.)
Rectifying Structure Block (Mounting)	M10 x 12 hexagonal screw	20 N-m (177 lb.-in.)
Rectifying Structure DC Bus Bars	M6 x 16 POZIDRIV	4 N-m (35 lb.-in.)

POZIDRIV® is a registered trademark of the Phillips Screw Company

Phillips® is a registered trademark of Phillips Screw Company

Removing 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.

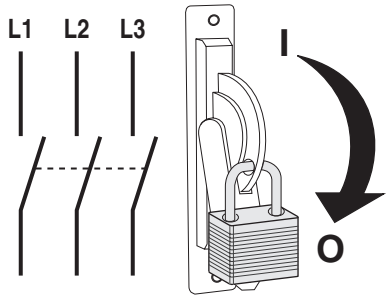
Remove power before making or breaking cable connections. When you remove or insert a cable connector with power applied, an electrical arc may occur. An electrical arc can cause personal injury or property damage by:

- 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.

Removing Power from the Drive

1. Turn off and lock out input power. Wait five minutes.
2. Verify that there is no voltage at the drive's input power terminals.
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.



Rectifying Structure Access Procedures

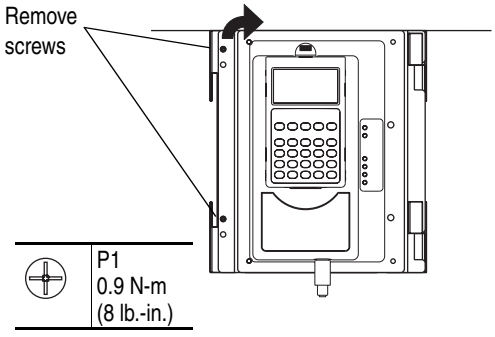
Following are the instructions for removing and installing components on the rectifying structure and for removing the Rectifying modules from the drive. For instructions on removing and installing components on the power structure and removing the Output Power modules from the drive, refer to Power Structure Access Procedures on page 3-44.

Removing the DPI / HIM Assembly

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-3.

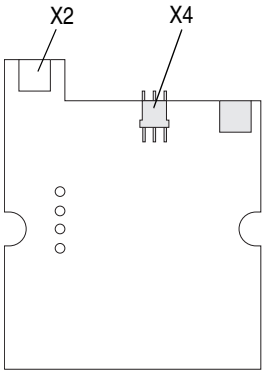
Important: Before removing connections and wires, mark the connections and wires to avoid incorrect wiring during assembly.

2. Remove the two screws from the front of the DPI / HIM assembly.



3. Open the door, which holds the DPI interface and HIM.

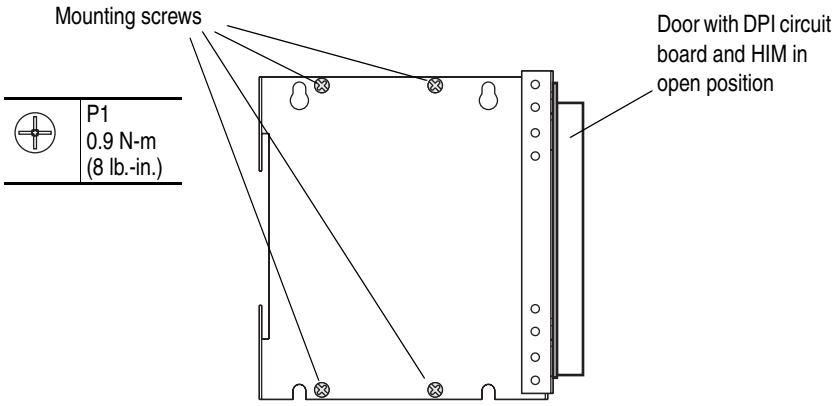
4. Unplug the DPI cable from the X2 connector on the DPI Interface circuit board.



Back view of the DPI Circuit board which should remain mounted on the back of the assembly

5. On 700S drives only, unplug the cable from the X4 connector on the circuit board.

6. Remove the four mounting screws and the assembly from the control frame.



Installing the DPI / HIM Assembly

Install the DPI / HIM assembly in the reverse order of removal, while referring to Torque Specifications on page 3-2.

Removing the 700S Phase II Control Cassette

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-3.

Important: Before removing connections and wires, mark the connections and wires to avoid incorrect wiring during assembly.

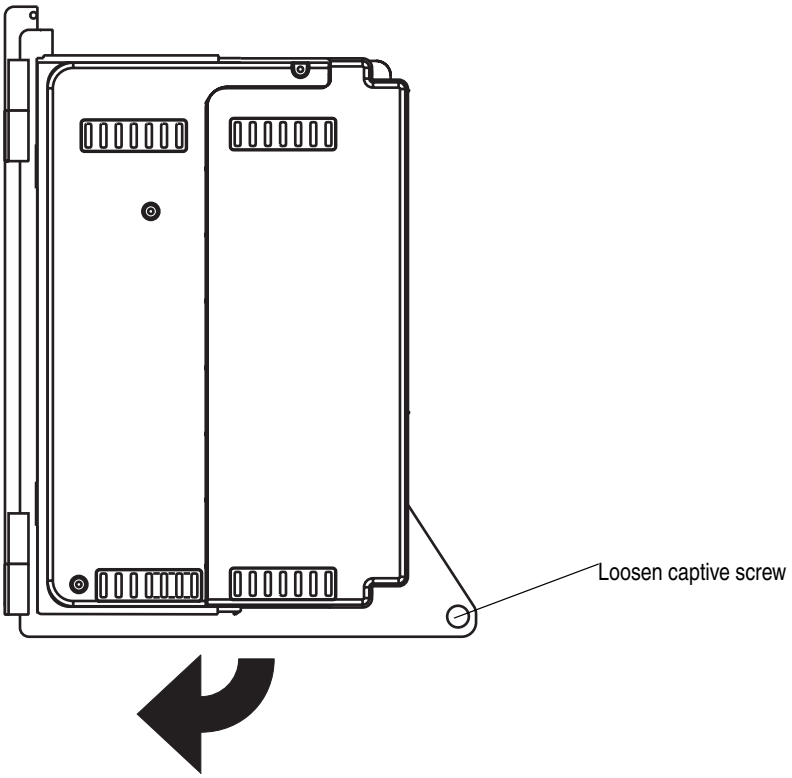
2. Unplug any fiber optic ControlNet and SynchLink cables from the control cassette.

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.

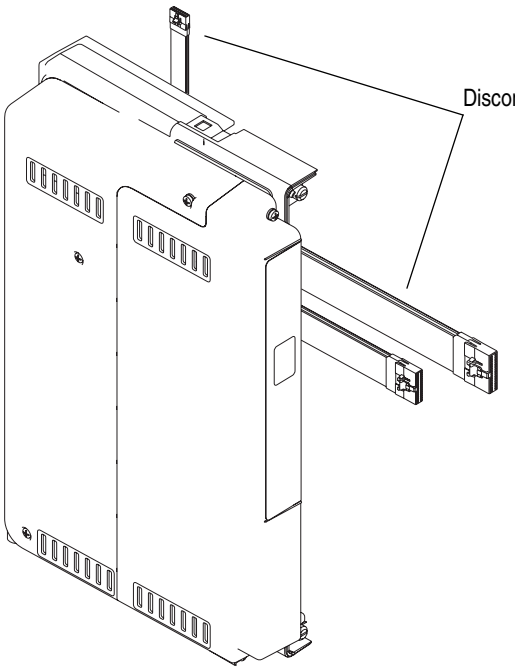
Important: Minimum inside bend radius for SynchLink and ControlNet fiber-optic cable is 25.4 mm (1 in.). Any bends with a shorter inside radius can permanently damage the fiber-optic cable. Signal attenuation increases with decreased inside bend radii.

3. Unplug any remaining I/O and communications cables from the control cassette and set them aside.

4. Loosen the captive screw on the control assembly mounting plate and swing the control assembly and control cassette away from the drive.

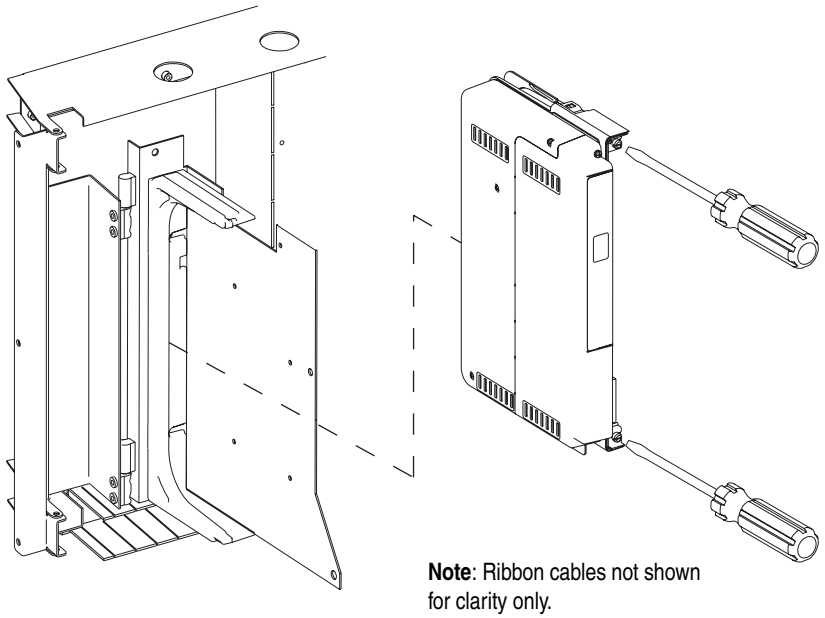


5. Carefully unplug the ribbon cables from the sockets on the High Power Fiber Optic Interface circuit board on the back of the control mounting plate, and carefully set them aside.



Note: Control mounting plate not shown for clarity only.

6. Loosen the two mounting screws on the front of the control cassette and slide the cassette off of the mounting bracket.



Note: Ribbon cables not shown for clarity only.

Installing the 700S Phase II Control Cassette

Install the control cassette in the reverse order of removal, while referring to Torque Specifications on page 3-2.

Removing the Common Mode Filter Circuit Board

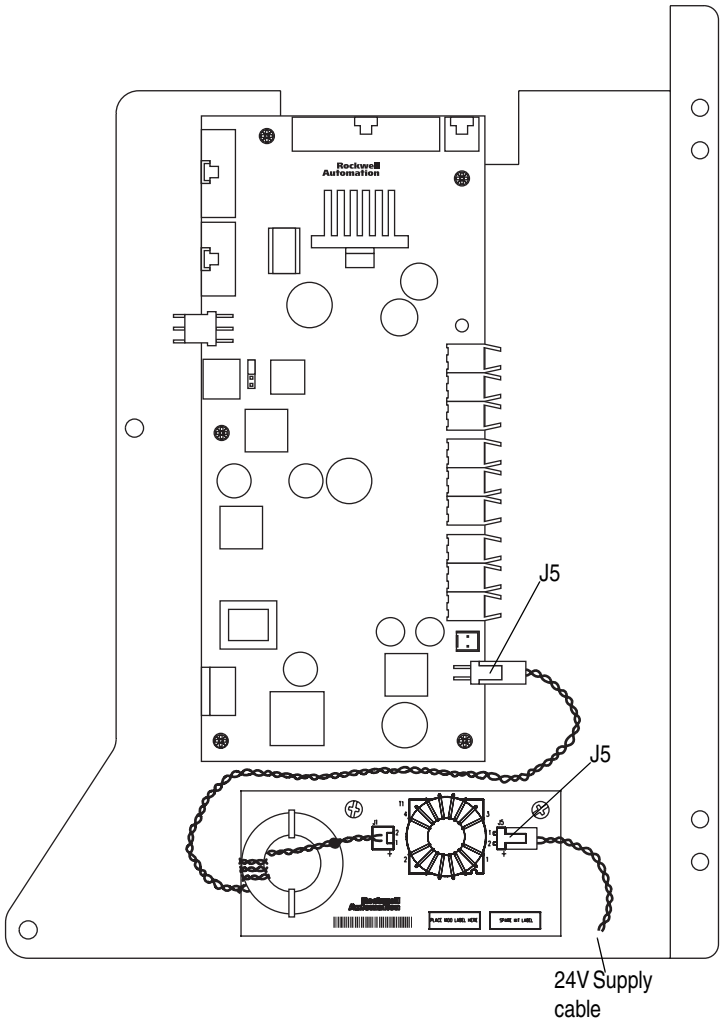
1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-3.

2. Loosen the captive screw on the control assembly mounting plate and swing the control assembly and control cassette away from the drive.

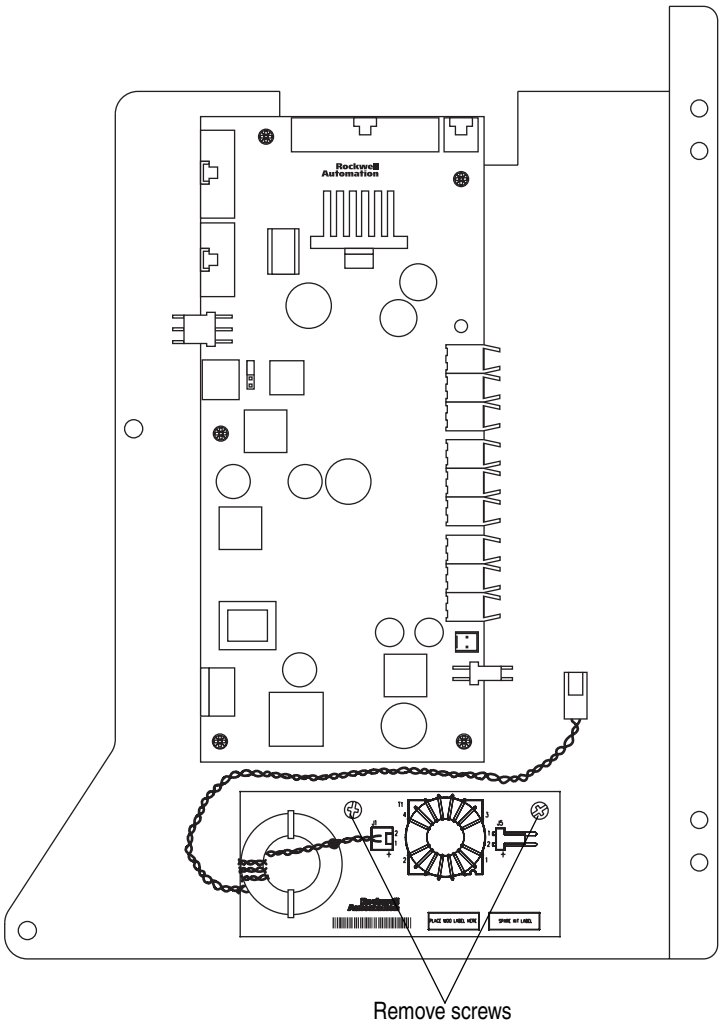
Important: Before removing connections and wires, mark the connections and wires to avoid incorrect wiring during assembly.

3. Disconnect the 24V power supply cable from connector J5 on the Common Mode Filter circuit board.

4. Disconnect the twisted pair wires from connector J5 on the High Power Fiber Optic Interface circuit board.



5. Remove the four screws that secure the Common Mode Filter circuit board to the four standoffs on the control assembly mounting plate and remove the Common Mode Filter circuit board.



Installing the Common Mode Filter Circuit Board

Install the Common Mode Filter Circuit Board in the reverse order of removal.

Removing the High Power Fiber Optic Interface Circuit Board

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-3.

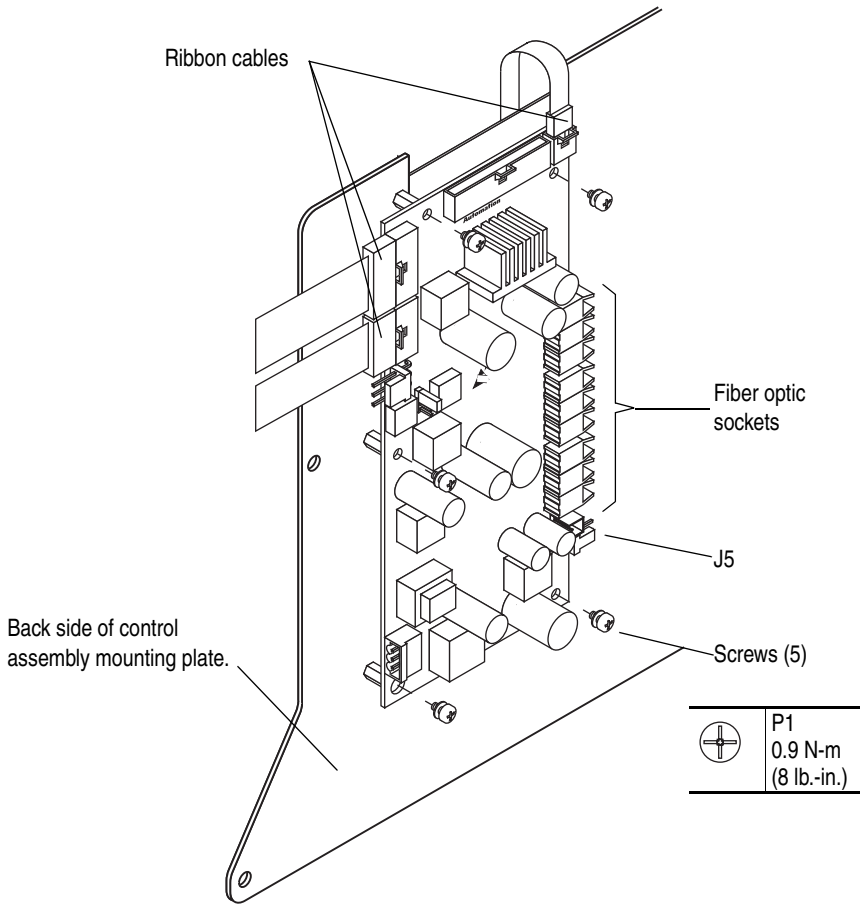
Important: Before removing connections and wires, mark the connections and wires to avoid incorrect wiring during assembly.

2. Loosen the captive screw on the control assembly mounting plate and swing the control assembly and control cassette away from the drive.

3. Carefully unplug the fiber-optic cables from the sockets along the right side of the High Power Fiber Optic Interface circuit board (on the backside of the control assembly mounting plate), and carefully set 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.



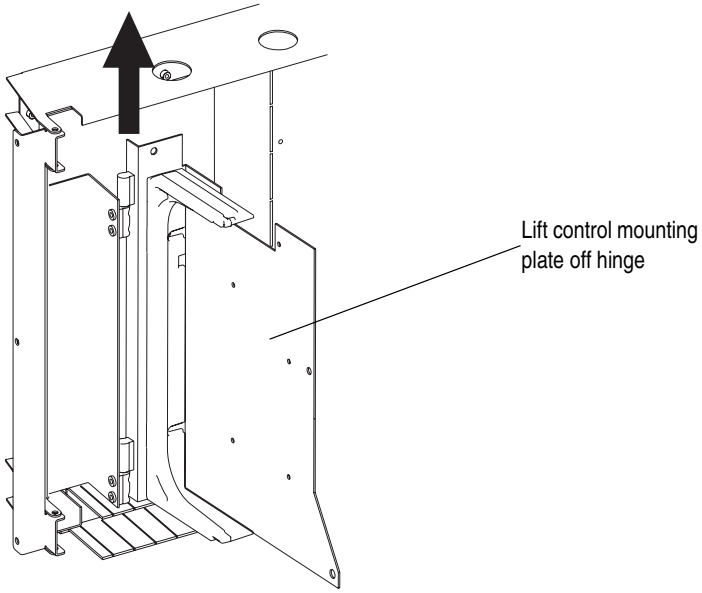
4. Carefully unplug the three ribbon cables from the sockets on the High Power Fiber Optic Interface board, and carefully set them aside.
5. Disconnect the 24V Power Supply cable from connector J5 on the High Power Fiber Optic Interface board.
6. Remove the five screws which secure the High Power Fiber Optic Interface board to the mounting plate.
7. Remove the High Power Fiber Optic Interface board from the mounting plate.

Installing the High Power Fiber Optic Interface Circuit Board

Install the High Power Fiber Optic Interface circuit board in reverse order of removal, while referring to Torque Specifications on page 3-2.

Removing the 700S Phase II Control Mounting Plate

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-3.
2. Remove the 700S control cassette. Refer to Removing the 700S Phase II Control Cassette on page 3-5.
3. Remove the 700S High Power Fiber Optic Interface circuit board. Refer to Removing the High Power Fiber Optic Interface Circuit Board on page 3-10.
4. Lift the control mounting plate up and off of the hinge.



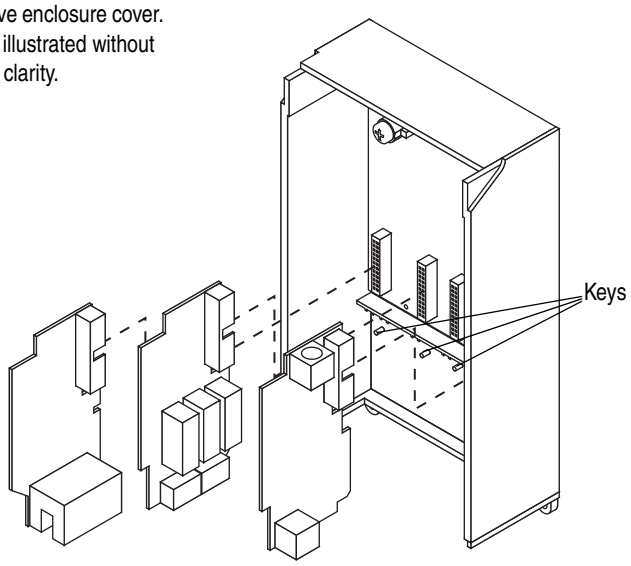
Installing the 700S Phase II Control Mounting Plate

Install the control mounting plate in reverse order of removal.

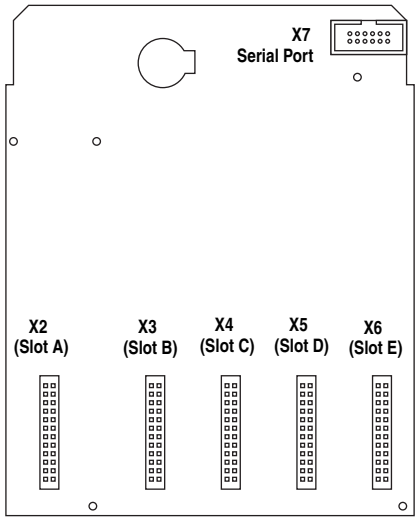
Removing the 700H I/O Circuit Boards and Control Assembly

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-3.
2. Open the enclosure that contains the Control and I/O circuit boards and carefully unplug the DPI cable and any I/O cables.
3. Remove the I/O boards from the Control board and enclosure. Note the order of the boards and the keys which prevent placement of boards in incorrect slots.

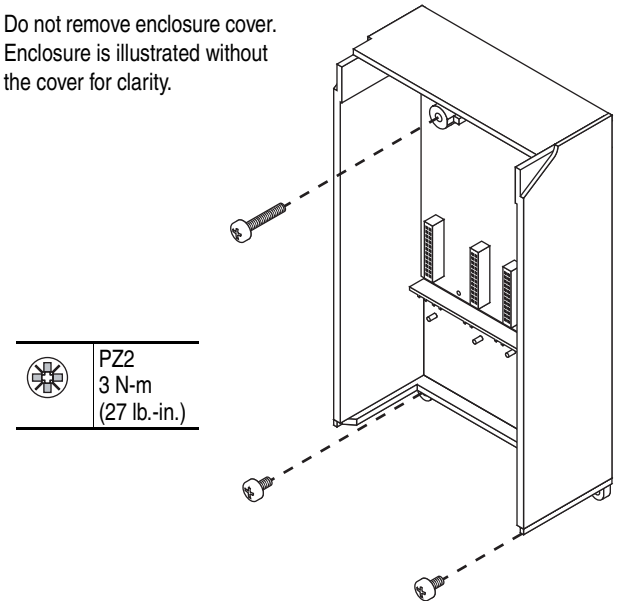
Do not remove enclosure cover. Enclosure is illustrated without the cover for clarity.



4. Unplug the serial connection from X7 of the Control board.



5. Remove the three screws which secure the Control assembly to the drive and remove the Control assembly.



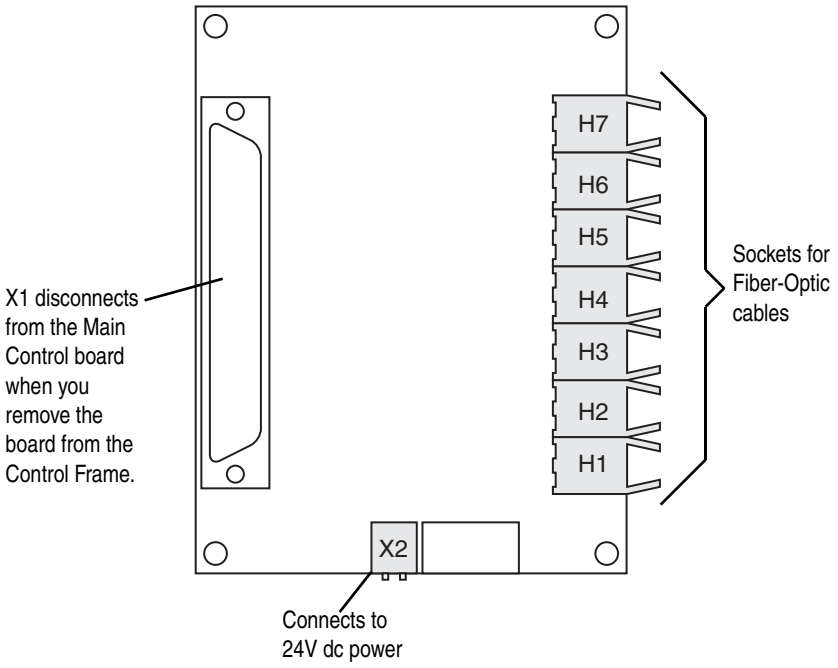
Installing the 700H I/O Circuit Boards and Control Assembly

Install the 700H Control and I/O circuit boards in reverse order of removal, while referring to Torque Specifications on page 3-2.

Removing the 700H Fiber Optic Adapter Circuit Board

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-3.
2. Remove the 700H I/O circuit boards and Control assembly. Refer to Removing the 700H I/O Circuit Boards and Control Assembly on page 3-12.
3. Move the Control frame to expose its back. Refer to Moving the Control Frame on page 3-16.

4. Disconnect the control power cable from X2 of the Fiber Optic Adapter board.

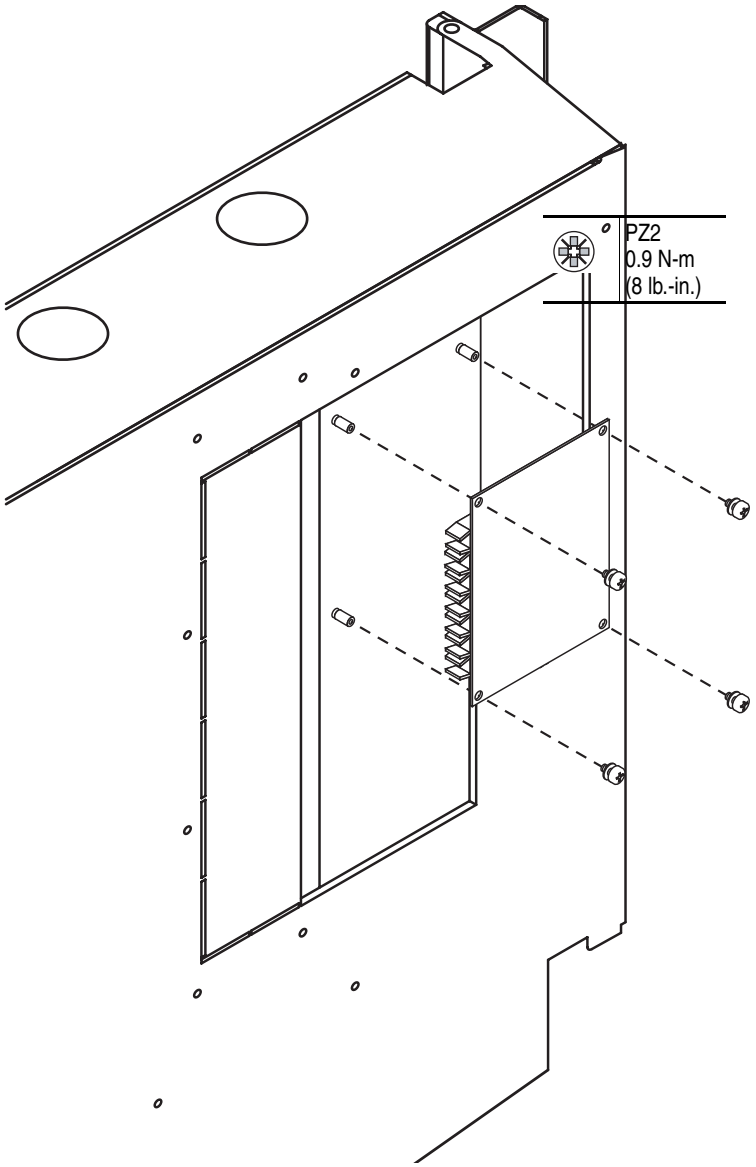


5. Carefully disconnect the fiber-optic cables from the right side of the circuit board, and carefully set them aside.

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.

6. Remove the four screws which secure the Fiber Optic Adapter board to the stand-offs on the back of the Control frame and remove the Fiber Optic Adapter board.

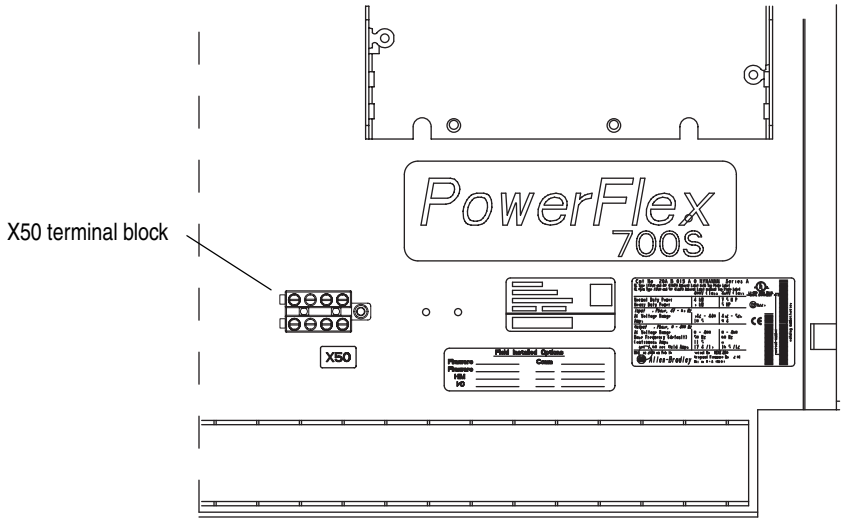


Installing the 700H Fiber Optic Adapter Circuit Board

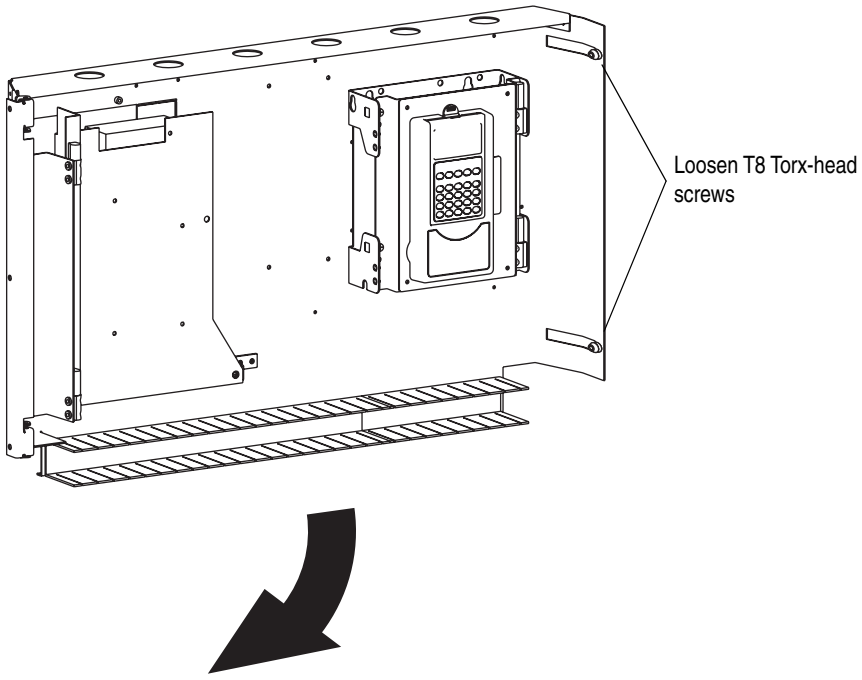
Install the 700H Fiber Optic Adapter circuit board in reverse order of removal, while referring to Torque Specifications on page 3-2.

Moving the Control Frame

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-3.
2. If moving the control frame from a DC input drive with precharge interlock, disconnect the wiring from terminal strip X50.



3. Loosen the T8 Torx-head screws, which secure the control frame to the drive enclosure.
4. Swing the control frame out and away from the power structure.



Replacing the Control Frame

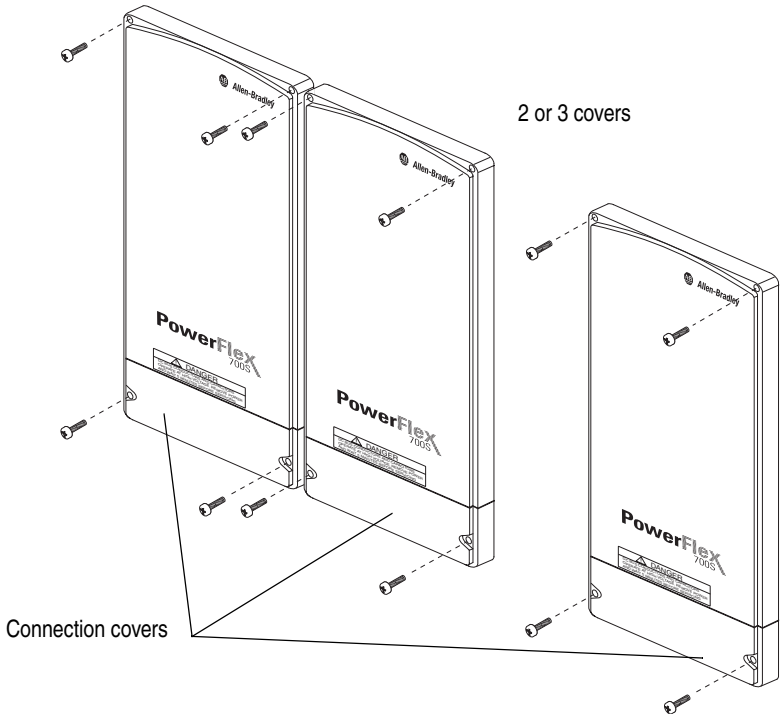
Replace the control frame in reverse order of removal, while referring to Torque Specifications on page 3-2.

Removing the Protective Covers from the Rectifying Structure

You must remove the protective covers to gain access to the rectifying structure.

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-3.
2. Move the control frame. Refer to Moving the Control Frame on page 3-16.
3. Remove the four M5 Pozi-drive screws which secure each of the two or three top and connection protective covers to the drive, then remove the covers.

   Note: *You only need to remove the connection covers to gain access to the cooling fan connetors.*



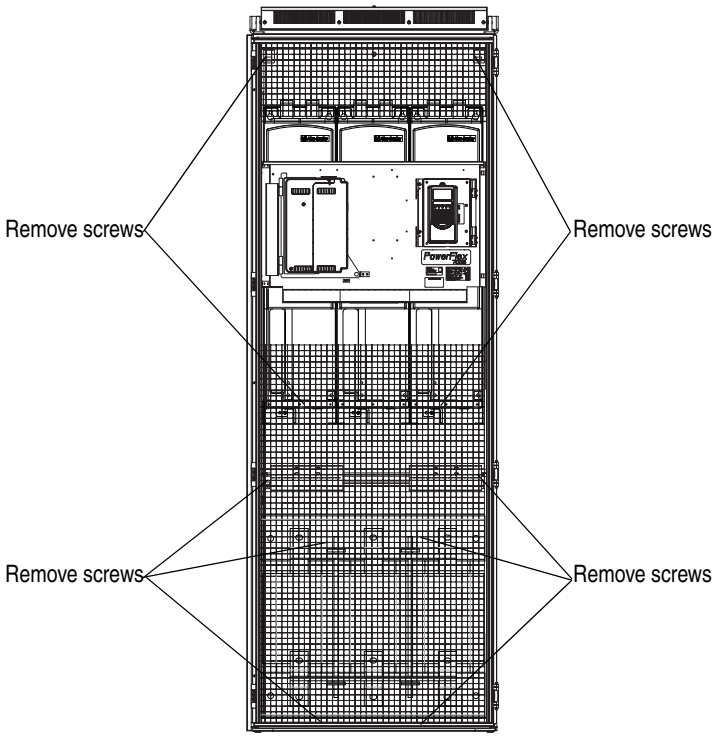
Installing the Protective Covers on the Rectifying Structure

Install the protective covers on the rectifying structure in reverse order of removal, while referring to Torque Specifications on page 3-2.

Removing the Protective Screens from the Rectifying Structure

This procedure is only necessary for drives installed in NEMA/UL Type 1 / IP21 enclosures.

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-3.
2. Move the control frame. Refer to Moving the Control Frame on page 3-16.
3. Remove the protective covers from the rectifying structure. Refer to Removing the Protective Covers from the Rectifying Structure on page 3-17.
4. Remove the screws that secure the protective screens to the enclosure and remove the screens.



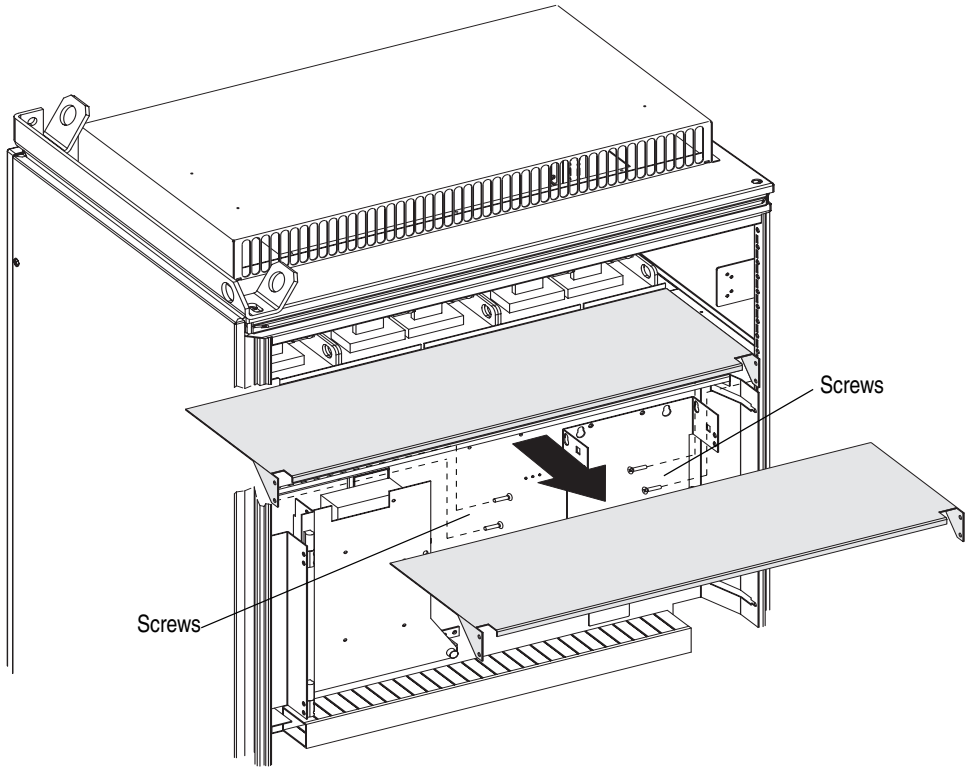
Installing the Protective Screens on the Rectifying Structure

Install the protective screens in reverse order of removal.

Removing the Air Flow Plate from the Rectifying Structure

You must remove the Air Flow Plate in order to remove the rectifying structure from the drive.

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-3.
2. Move the control frame. Refer to Moving the Control Frame on page 3-16.
3. Remove the protective covers from the rectifying structure. Refer to Removing the Protective Covers from the Rectifying Structure on page 3-17.
4. If present, remove the protective screens from the rectifying structure. Refer to Removing the Protective Screens from the Rectifying Structure on page 3-18.
5. Remove the four T8 Torx-head screws which secure the Air Flow Plate to the drive.
6. Slide the Air Flow Plate off of the drive.



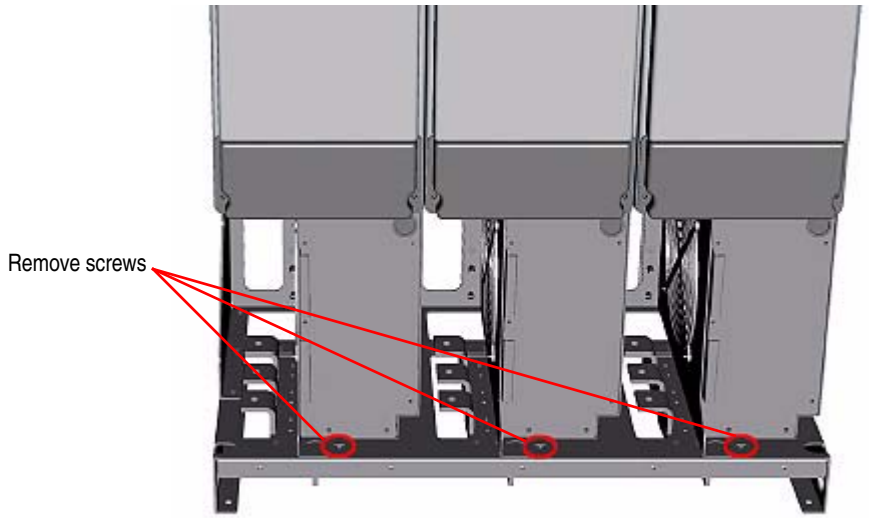
Installing the Airflow Plate on the Rectifying Structure

Install the Air Flow Plate in reverse order of removal, while referring to Torque Specifications on page 3-2.

Removing the Main Cooling Fans from the Rectifying Structure

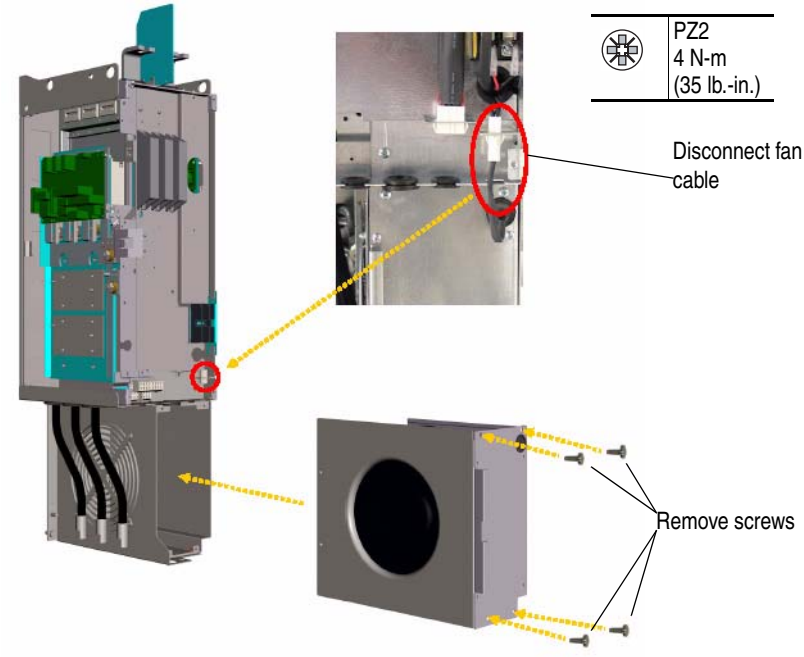
There are two or three Main Cooling Fans on the rectifying structure.

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-3.
2. Move the control frame. Refer to Moving the Control Frame on page 3-16.
3. Remove the protective covers from the rectifying structure. Refer to Removing the Protective Covers from the Rectifying Structure on page 3-17.
4. If present, remove the protective screens from the rectifying structure. Refer to Removing the Protective Screens from the Rectifying Structure on page 3-18.
5. Remove the screw, located directly in front of the Main Cooling Fan housing, that secures the rectifying module blocks to the drive frame.



6. Disconnect the Main Cooling Fan cable connector on the rectifying structure (see illustration below for location).

7. Remove the four screws that secure the fan housing to the drive. Then remove the fan from the drive frame.



8. Repeat steps 5 - 7 for each remaining fan.

Installing the Main Cooling Fans on the Rectifying Structure

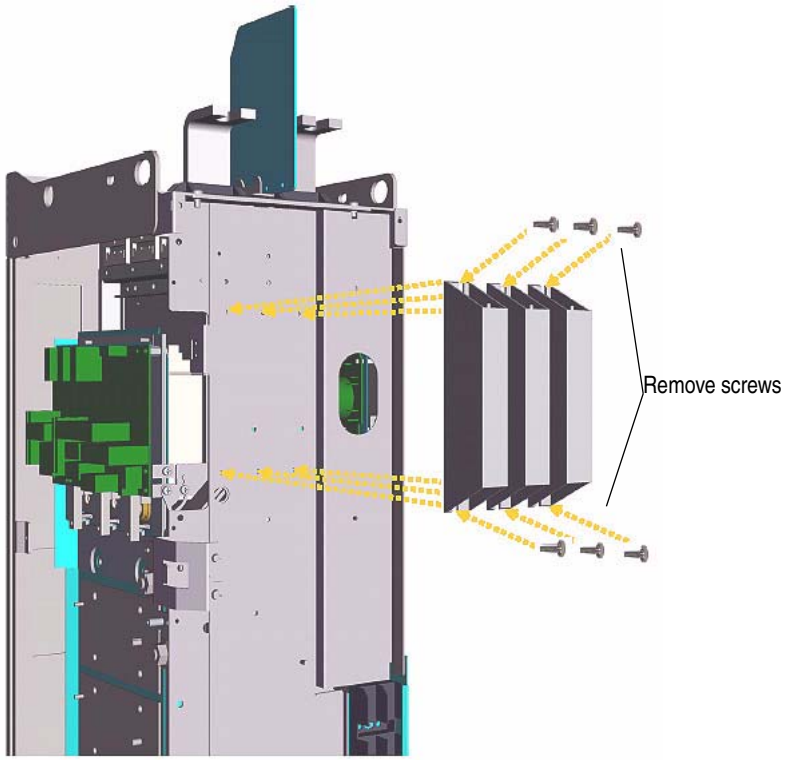
Install the Main Cooling Fans in reverse order of removal, while referring to Torque Specifications on page 3-2.

Removing the Pre-Charging Resistors

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-3.
2. Move the control frame. Refer to Moving the Control Frame on page 3-16.
3. Remove the protective covers from the rectifying structure. Refer to Removing the Protective Covers from the Rectifying Structure on page 3-17.
4. If present, remove the protective screens from the rectifying structure. Refer to Removing the Protective Screens from the Rectifying Structure on page 3-18.

Important: Before removing connections and wires, mark the connections and wires to avoid incorrect wiring during assembly.

5. Disconnect the pre-charging resistor wires from connectors X31, X32 and X33 on the Rectifying circuit board.
6. Remove the 4x8 screws that secure the pre-charging resistors to the drive frame, and remove the pre-charging resistors. Proper tightening torque for reassembly is 0.9 N-m (8 lb.-in.).



Installing the Pre-Charging Resistors

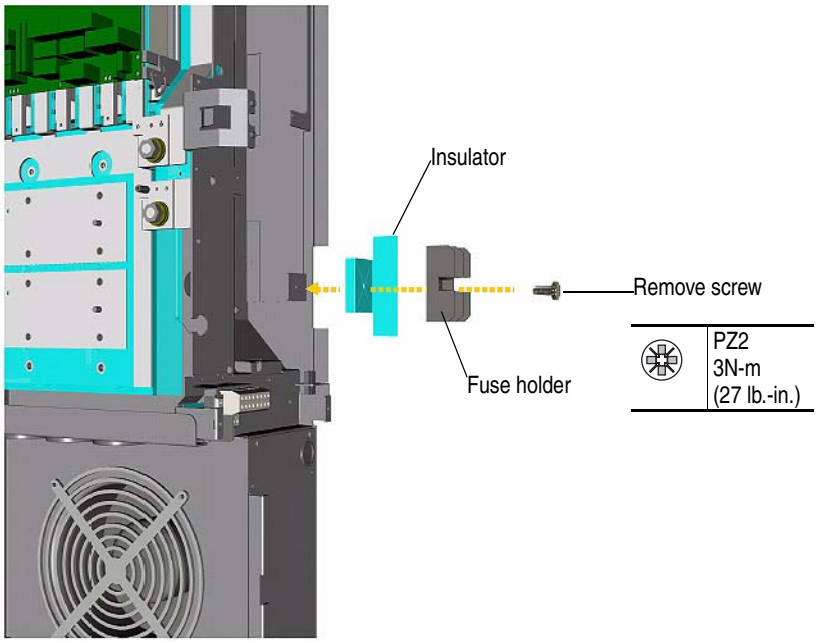
Install the pre-charging resistors in reverse order of removal.

Removing the Fan Inverter Fuse Assemblies from the Rectifying Structure

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-3.
2. Move the control frame. Refer to Moving the Control Frame on page 3-16.
3. Remove the protective covers from the rectifying structure. Refer to Removing the Protective Covers from the Rectifying Structure on page 3-17.
4. If present, remove the protective screens from the rectifying structure. Refer to Removing the Protective Screens from the Rectifying Structure on page 3-18.
5. Remove the Fan Inverter fuses from the fuse holder.

Important: Before removing connections and wires, mark the connections and wires to avoid incorrect wiring during assembly.

6. Disconnect the DC+ and DC- wire connectors from both ends of the fuse assembly.
7. Remove the M4 POZIDRIV screw that secures the fuse holder and insulator to the fuse base and remove the fuse holder and insulator.



8. Repeat steps 5 - 7 for each remaining Fan Inverter fuse assembly.

Installing the Fan Inverter Fuse Assemblies on the Rectifying Structure

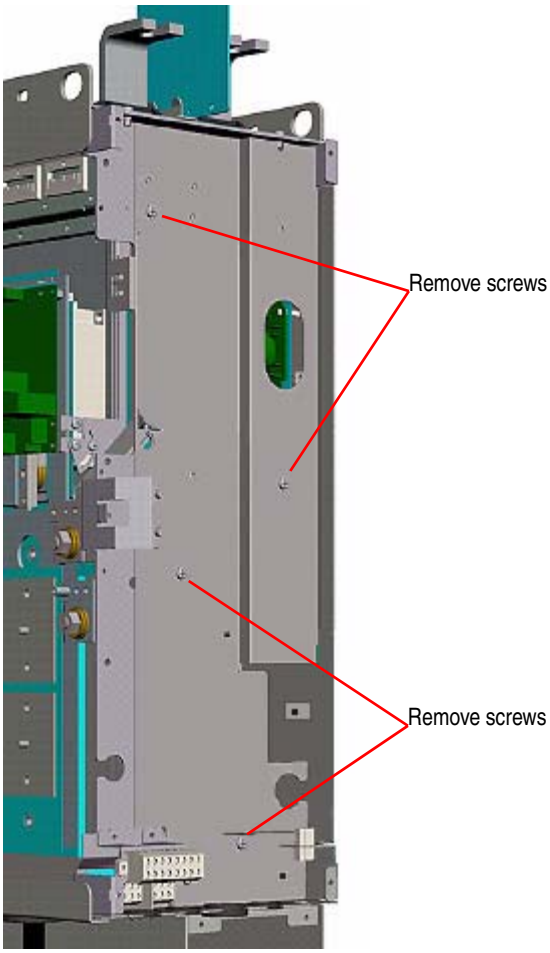
Install the Fan Inverter fuse assemblies on the rectifying structure in reverse order of removal.

Removing the Fan Inverters from the Rectifying Structure

There are two or three Fan Inverters on the rectifying structure.

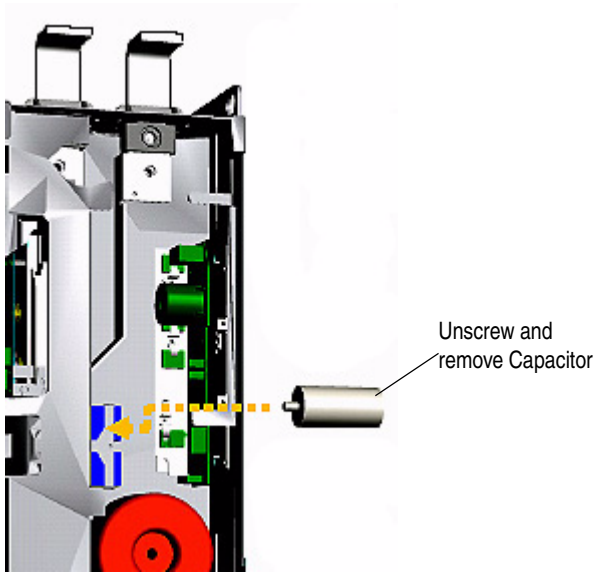
1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-3.
2. Move the control frame. Refer to Moving the Control Frame on page 3-16.
3. Remove the protective covers from the rectifying structure. Refer to Removing the Protective Covers from the Rectifying Structure on page 3-17.
4. If present, remove the protective screens from the rectifying structure. Refer to Removing the Protective Screens from the Rectifying Structure on page 3-18.
5. Remove the Fan Inverter fuse assemblies from the rectifying structure. Refer to Removing the Fan Inverter Fuse Assemblies from the Rectifying Structure on page 3-23.

6. Remove the screws that the secure the fan inverter protection cover to the drive, and remove the cover.



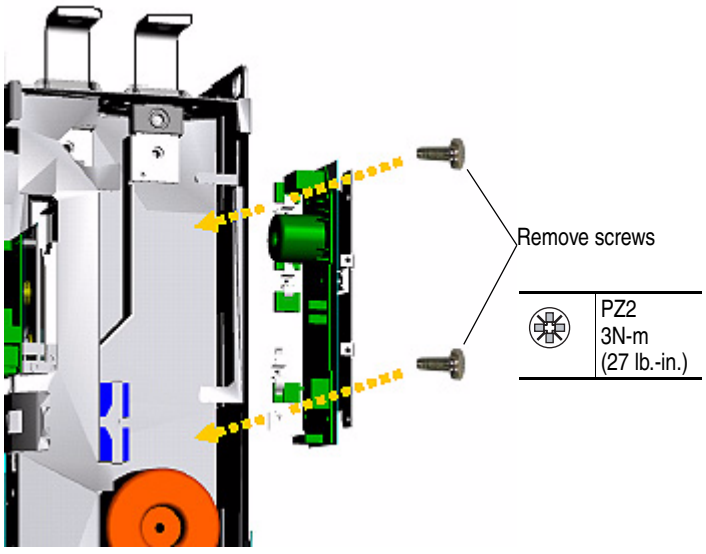
Important: Before removing connections and wires, mark the connections and wires to avoid incorrect wiring during assembly.

7. To replace the Fan Inverter capacitor, disconnect the capacitor wires from connectors X4 and X5 and unscrew (turning counter clockwise) the capacitor from the drive frame.



8. Disconnect the wires from connectors X2 and X8 on the Fan Inverter circuit board.1

9. Remove the M4x8 screws that secure the Fan Inverter circuit board to the drive frame.



10. Repeat steps 6 - 9 for each of the remaining Fan Inverters.

Installing the Fan Inverters on the Rectifying Structure

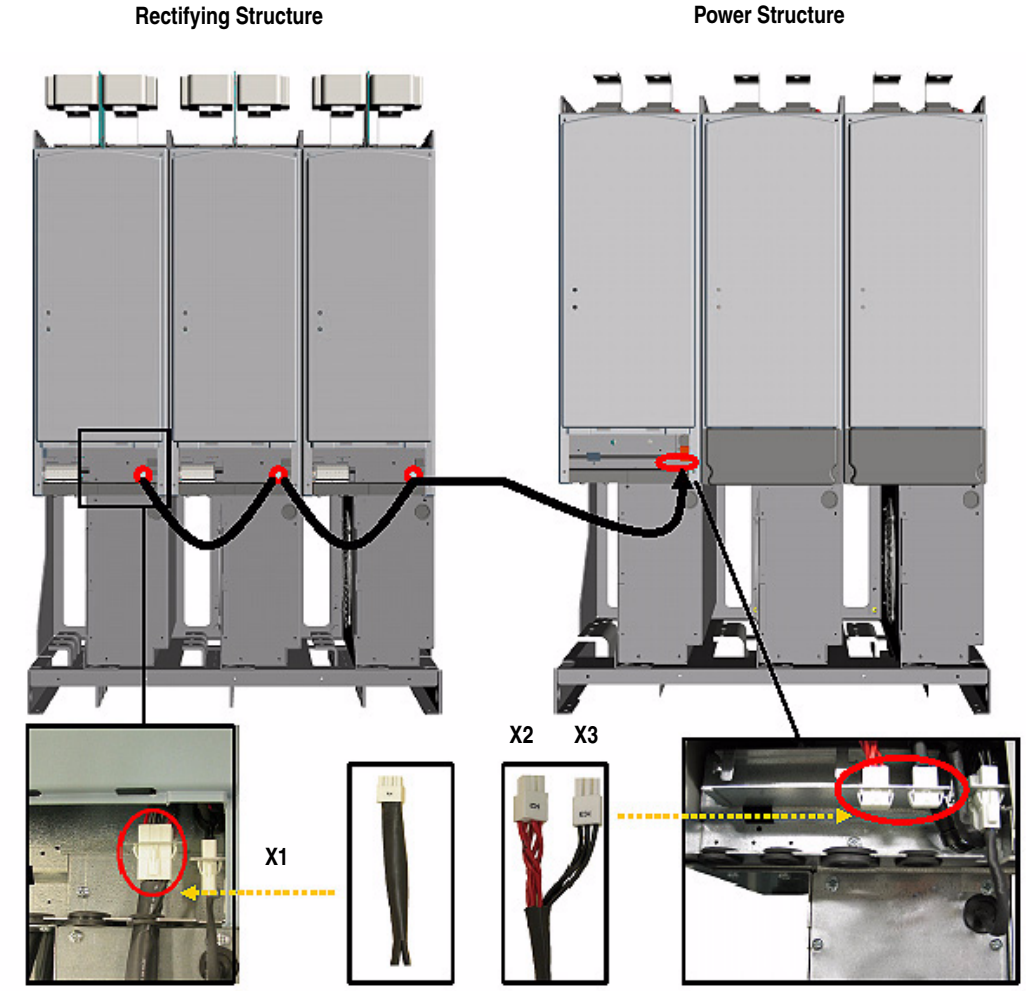
Install the Fan Inverters in reverse order of removal.

Removing the Rectifying Structure from the Drive Enclosure

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-3.
2. Move the control frame. Refer to Moving the Control Frame on page 3-16.
3. Remove the protective covers from the rectifying structure. Refer to Removing the Protective Covers from the Rectifying Structure on page 3-17.
4. If present, remove the protective screens from the rectifying structure. Refer to Removing the Protective Screens from the Rectifying Structure on page 3-18.

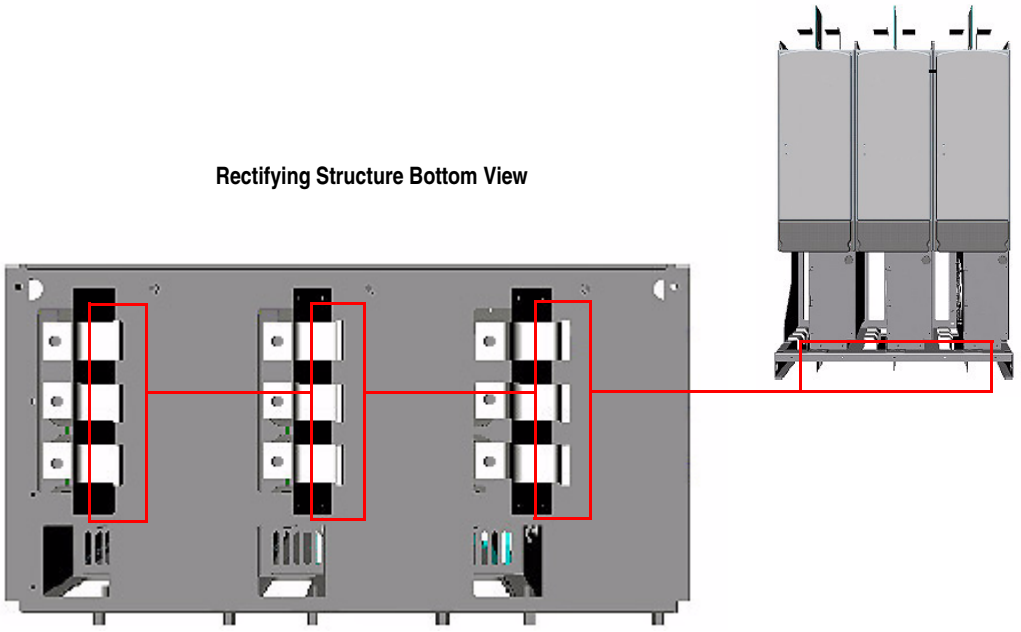
Important: Before removing connections and wires, mark the connections and wires to avoid incorrect wiring during assembly.

5. Disconnect the Fan Inverter cables from connector X1 on the rectifying structure and the pre-charge cables and Fan Inverter cables from connectors X2 and X3, respectively, on the power structure.

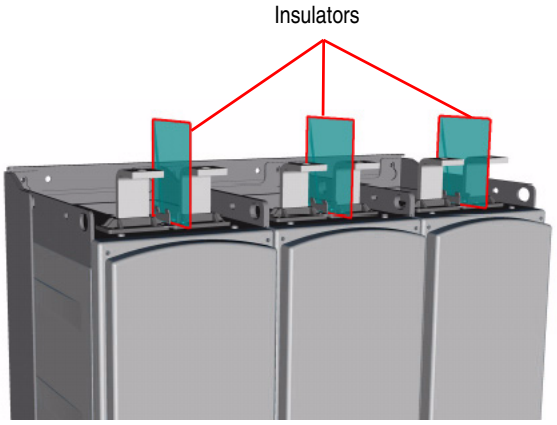


6. Remove the ac input wiring from the terminals at the bottom of the rectifying structure.

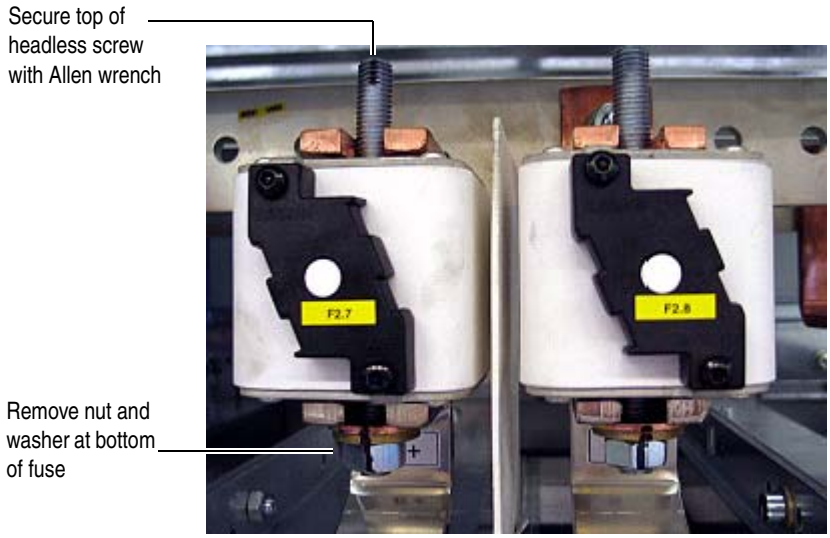
Rectifying Structure Bottom View



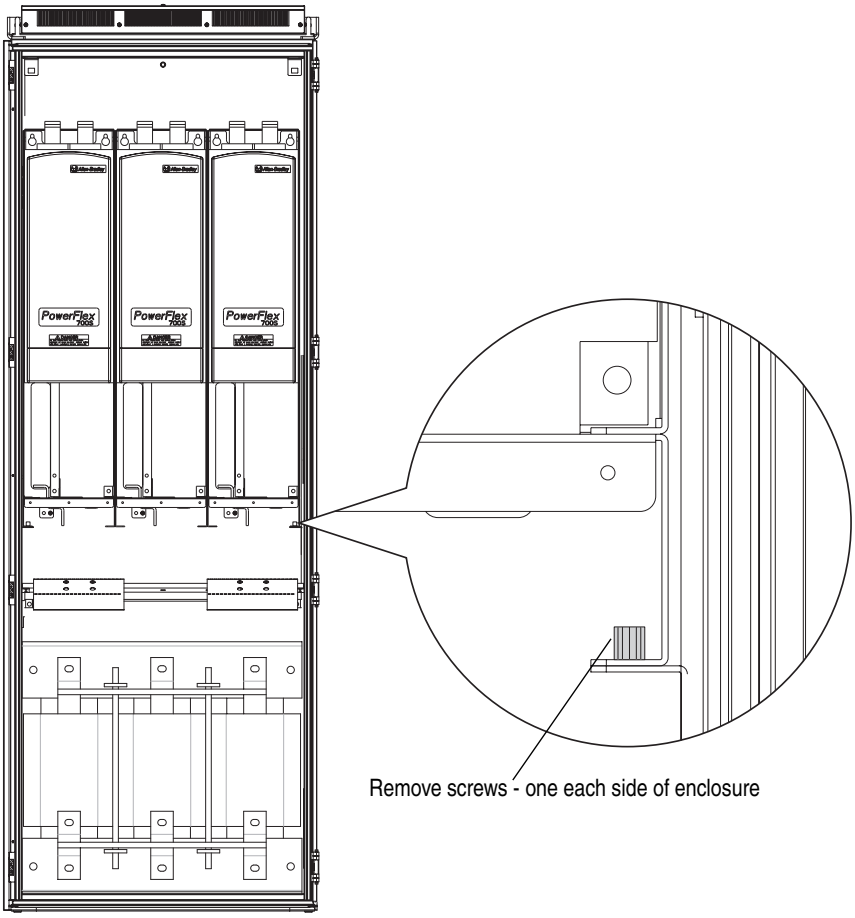
7. Remove the insulator material between the DC Bus Bar terminals at the top of the rectifying structure.



8. Remove the M10 nut and washer that secure the DC Link fuse to the DC Bus Bars at the top of the rectifying structure by securing the top of the M10 headless screw with an Allen wrench and removing the M10 nut and washer at the bottom of the fuse. Proper tightening torque for reassembly is 40 N-m (354 lb.-in.).



9. Remove the two hexagonal screws that secure the rectifying structure to the drive enclosure.



10. Follow the instructions in publication PFLEX-IN014, *Installation Instructions - PowerFlex 700S /700H High Power Maintenance Stand*, to install the Maintenance Stand. Remove the rectifying structure by sliding it onto the rails of the Maintenance Stand.

    Note: *The Maintenance Stand is designed for removing rectifying or power structures from drives supplied in Rittal TS8 enclosures. Alternate means of removal will be necessary for other types of enclosures.*

Installing the Rectifying Structure

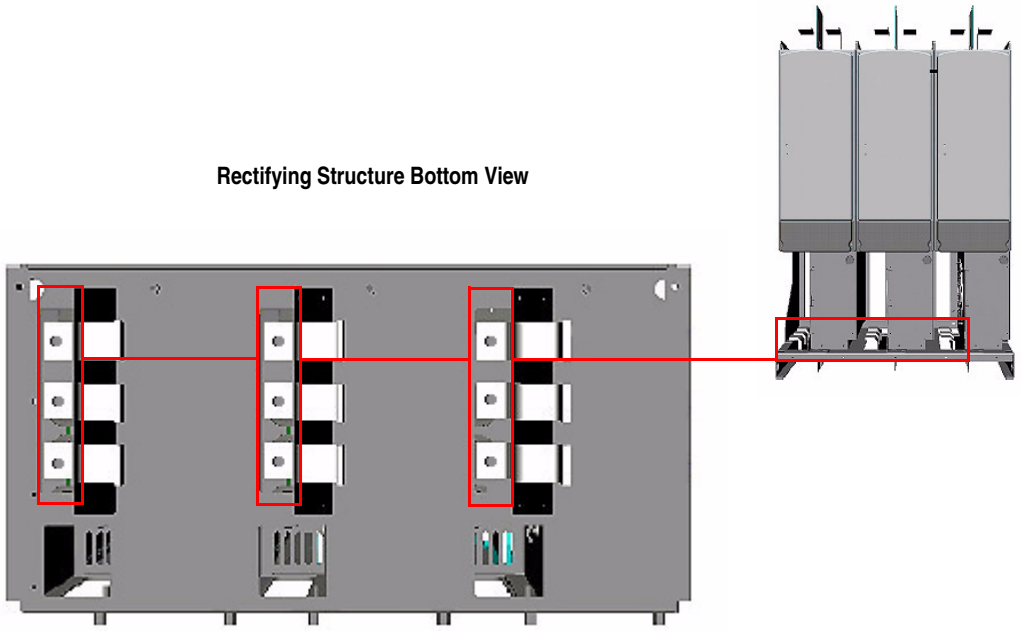
Install the rectifying structure in reverse order of removal. Refer to the publication PFLEX-IN006…, *Installation Instructions - PowerFlex 700S and 700H High Power Drives*, for tightening torques of motor, dc bus input and ground connection terminations.

Removing the Rectifying Module Blocks from the Drive

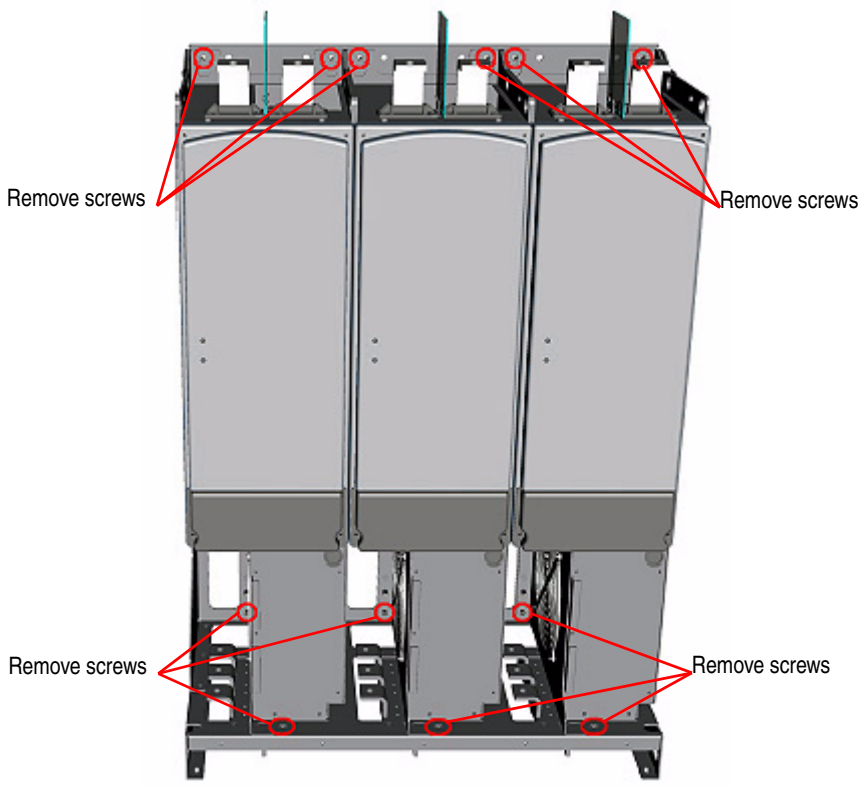
1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-3.
2. Move the control frame. Refer to Moving the Control Frame on page 3-16.
3. Remove the protective covers from the rectifying structure. Refer to Removing the Protective Covers from the Rectifying Structure on page 3-17.
4. If present, remove the protective screens from the rectifying structure. Refer to Removing the Protective Screens from the Rectifying Structure on page 3-18.
5. Remove the rectifying structure from the drive. Refer to Removing the Rectifying Structure from the Drive Enclosure on page 3-27.

6. Remove the screws that secure the input power cables to the terminals at the bottom of the rectifying structure.

Rectifying Structure Bottom View



7. Remove the screws that secure the rectifying module blocks to the frame. Two socket extensions are stored on the underside of the rectifying structure frame for use when removing the screws at the back of the drive enclosure.



8. Lift the rectifying structure off of the frame.

Installing the Rectifying Module Blocks

Install the rectifying module blocks in reverse order of removal.

Removing the Rectifying Circuit Board

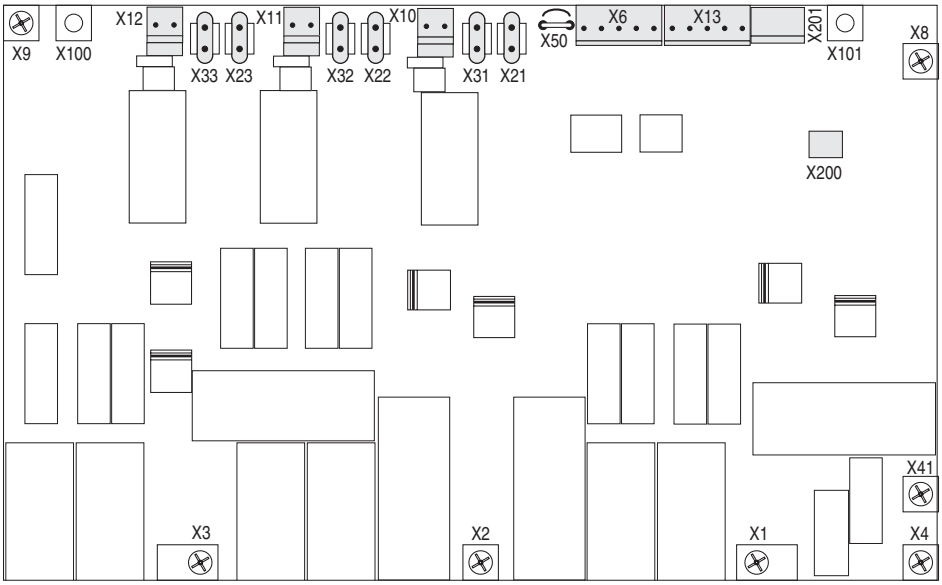
1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-3.
2. Move the control frame. Refer to Moving the Control Frame on page 3-16.
3. Remove the protective covers from the rectifying structure. Refer to Removing the Protective Covers from the Rectifying Structure on page 3-17.
4. If present, remove the protective screens from the rectifying structure. Refer to Removing the Protective Screens from the Rectifying Structure on page 3-18.

5. Remove the rectifying structure from the drive. Refer to Removing the Rectifying Structure from the Drive Enclosure on page 3-27.

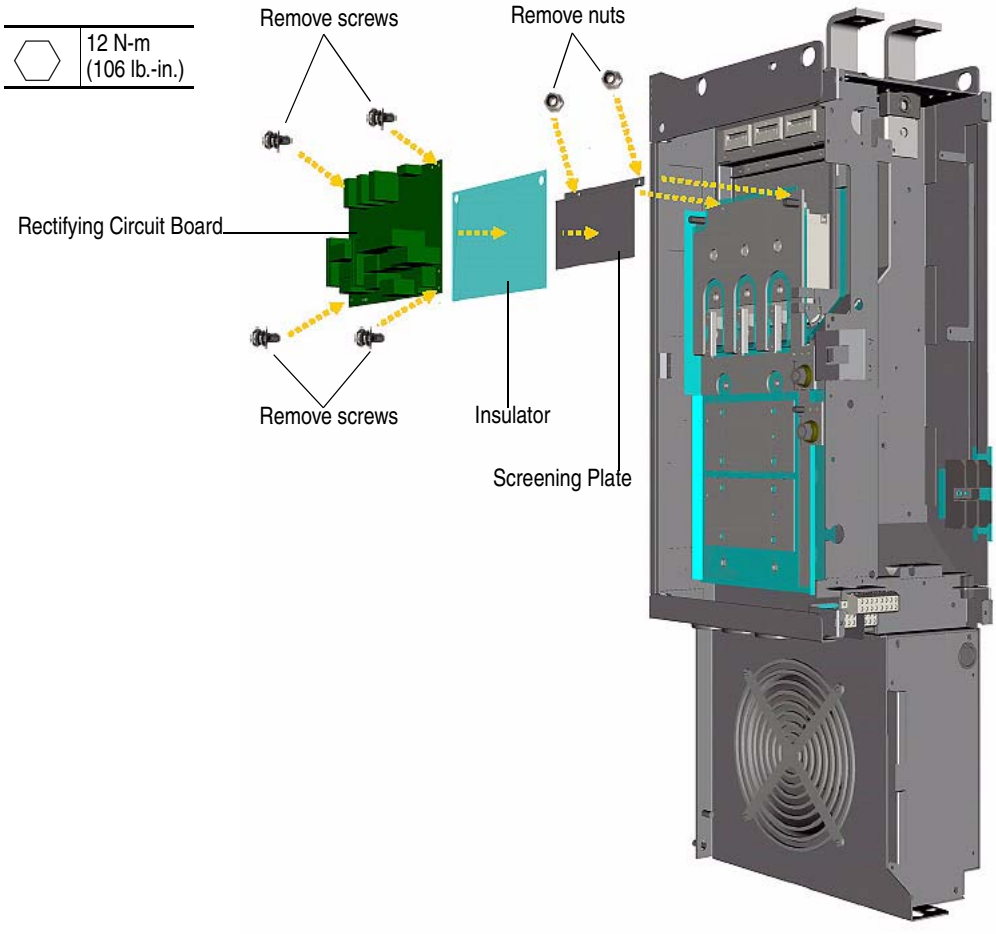
6. Remove the rectifying module blocks from the drive. Refer to Removing the Rectifying Module Blocks from the Drive on page 3-31.

Important: Before removing connections and wires, mark the connections and wires to avoid incorrect wiring during assembly.

7. Unplug all cables and wires from the Rectifying circuit board and set them aside.



8. Remove the M4x8 screws that secure the Rectifying circuit board to the drive frame and remove the board and insulator. Proper tightening torque for reassembly is 1.35 N-m (12 lb.-in.).



9. If necessary, unscrew the M4 nuts that secure the screening plate to the drive frame and remove the screening plate. Proper tightening torque for reassembly is 3 N-m (27 lb.-in.).

10. Repeat steps 7 - 9 for the remaining Rectifying circuit boards.

Installing the Rectifying Circuit Board

Install the Rectifying circuit board in reverse order of removal.

Removing the Rectifying Modules

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-3.

2. Move the control frame. Refer to Moving the Control Frame on page 3-16.

3. Remove the protective covers from the rectifying structure. Refer to Removing the Protective Covers from the Rectifying Structure on page 3-17.

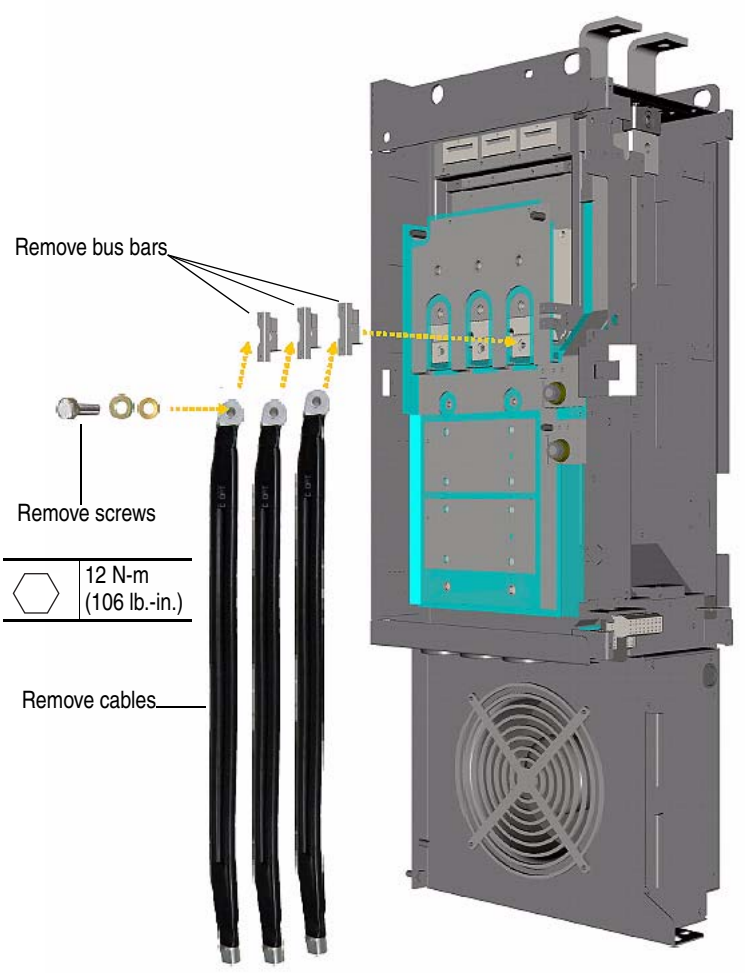
4. If present, remove the protective screens from the rectifying structure. Refer to Removing the Protective Screens from the Rectifying Structure on page 3-18.

5. Removing the rectifying structure from the drive. Refer to Removing the Rectifying Structure from the Drive Enclosure on page 3-27.

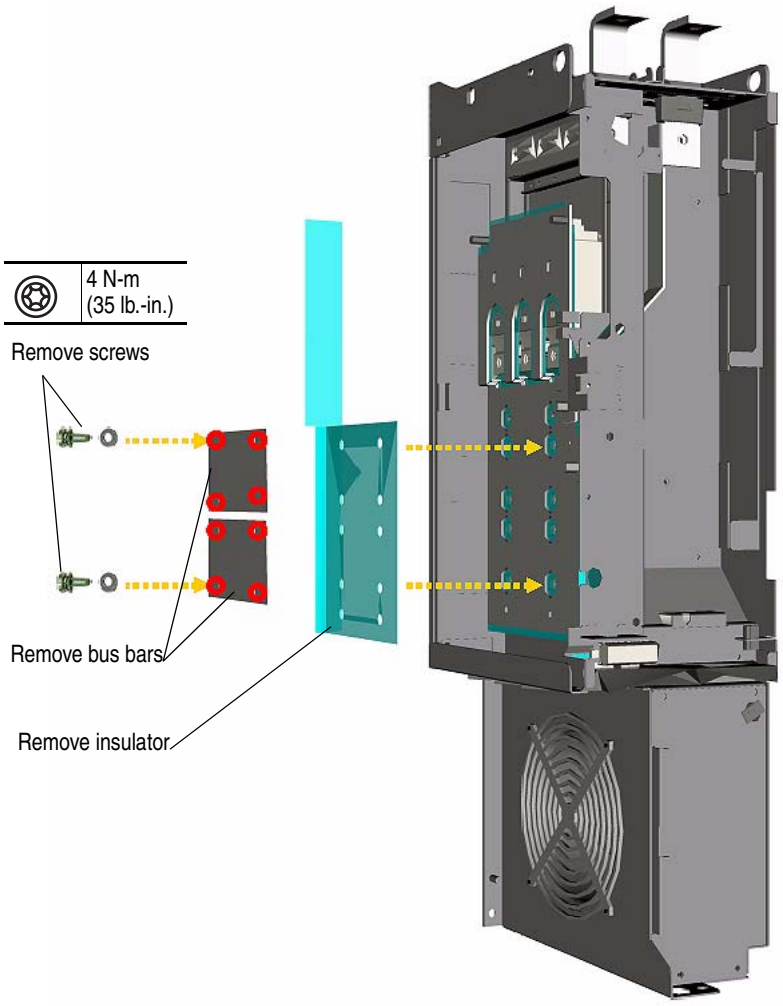
6. Remove the rectifying module blocks from the drive. Refer to Removing the Rectifying Module Blocks from the Drive on page 3-31.

7. Remove the Rectifying circuit board. Refer to Removing the Rectifying Circuit Board on page 3-33.

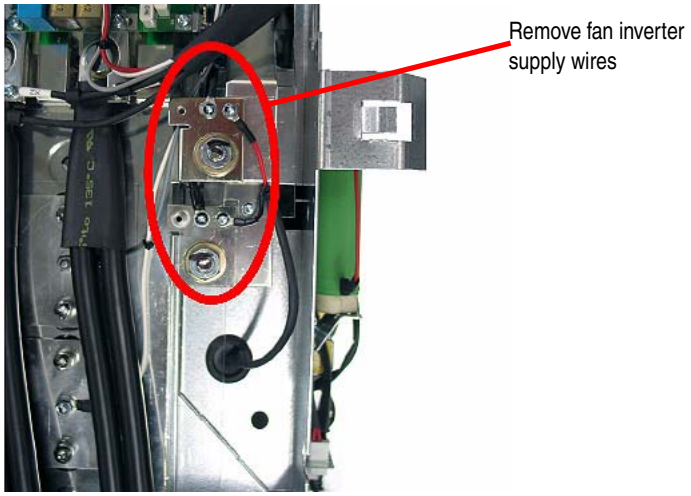
8. Remove the M10x20 hexagonal screws that secure the input power cables and the Rectifier circuit board bus bars to the terminals at the top of the Rectifying structure and remove the cables and bus bars.



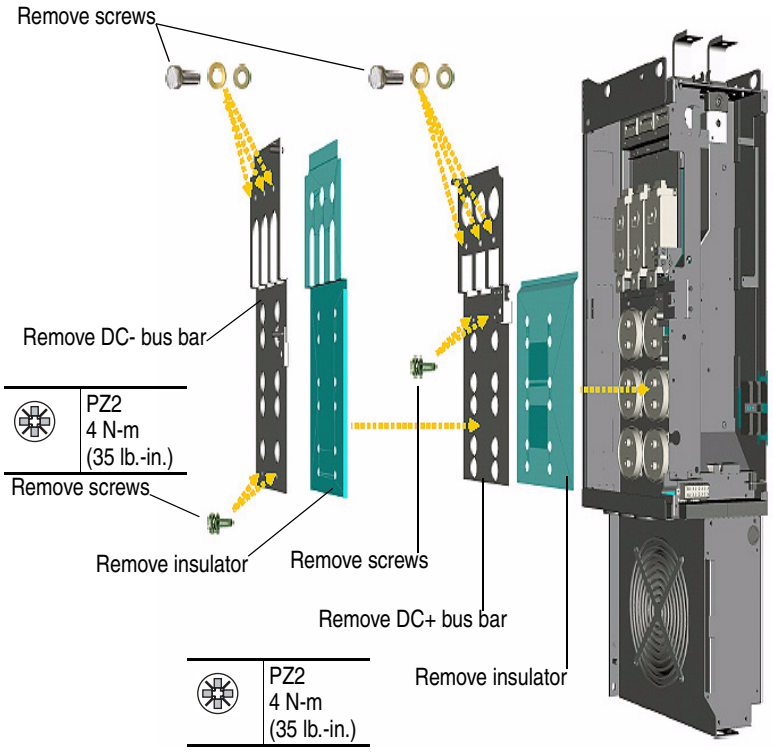
9. Remove the M6x25 torx head screws that secure the outer circuit Bus Bars and insulator to the drive frame and remove the bus bars and insulation.



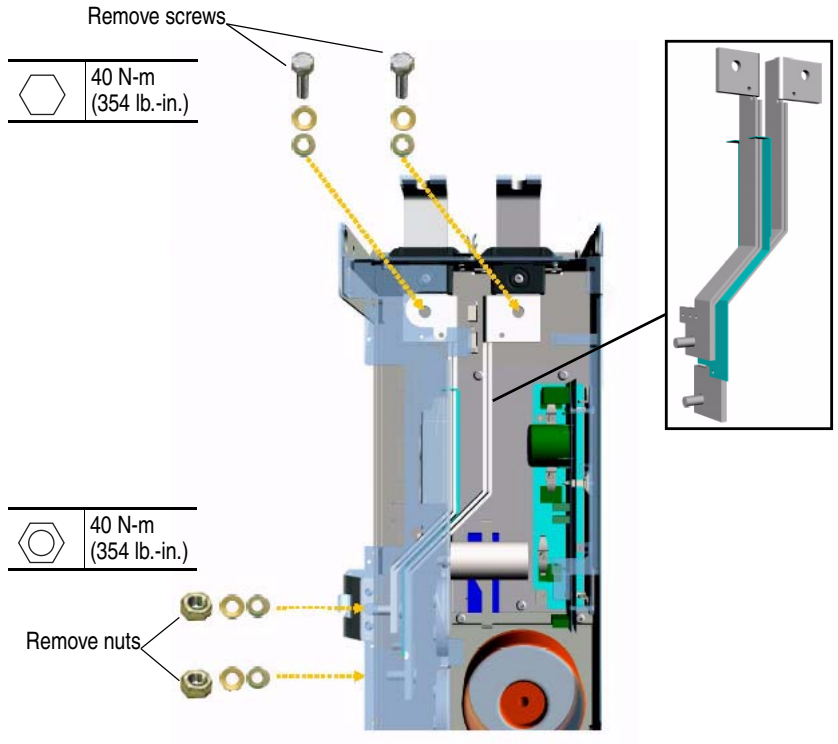
10. Remove the Fan Inverter supply wires from the Bus Bars at the front of the rectifying structure.



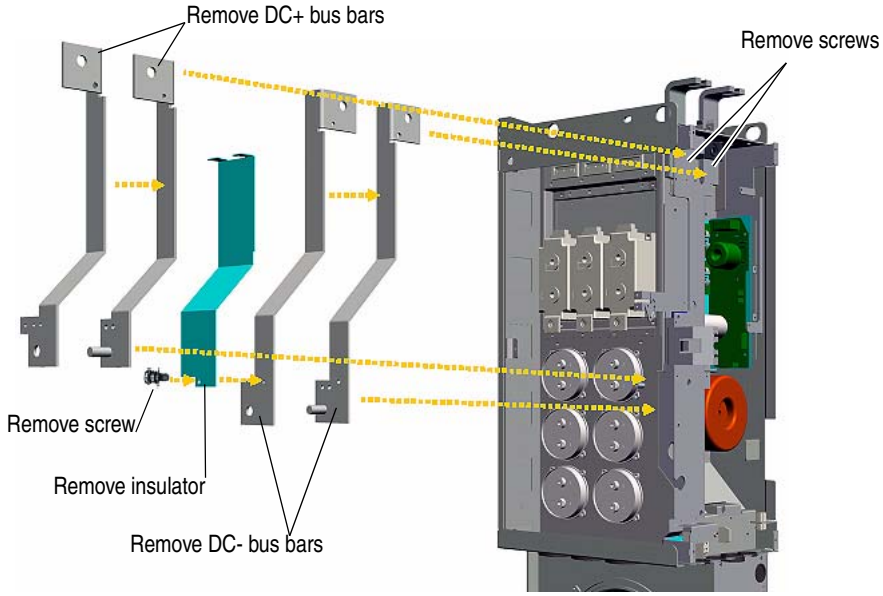
11. Remove the screws that secure the inner circuit Bus Bars and insulator to the drive and remove the bus bars and insulator.



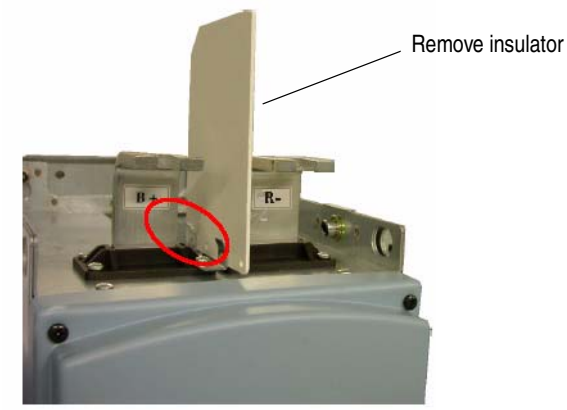
12. Remove screws and nuts that secure the DC Feed Bus Bars and Insulator to the drive.



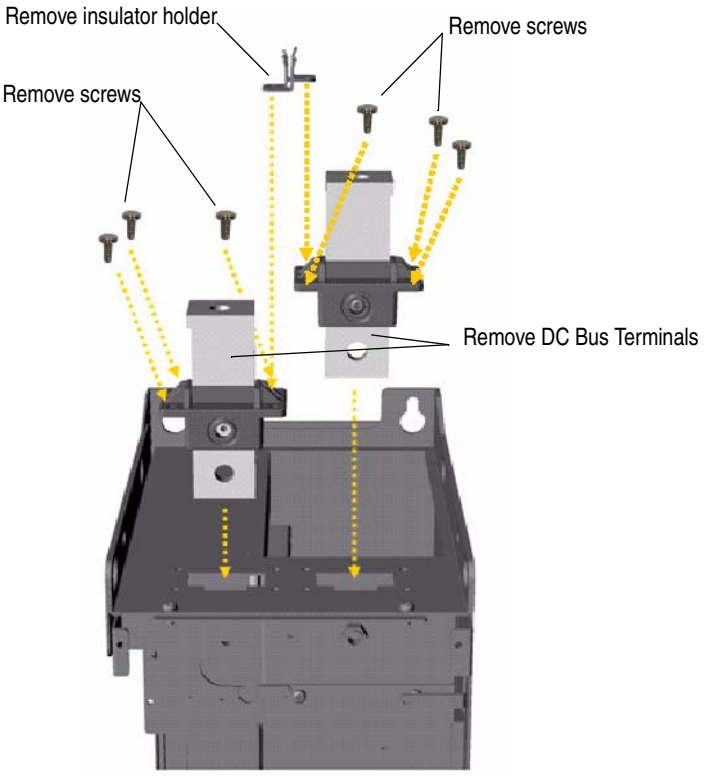
13. Remove the DC Feed Bus Bars and Insulator from the drive. If necessary, remove the screw that secures the insulator to the DC- Bus Bars and remove the insulator.



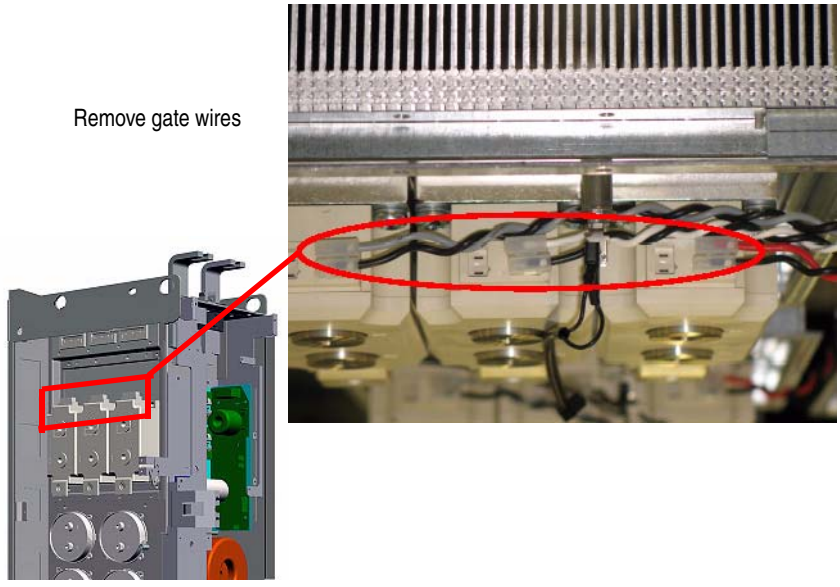
14. If necessary, remove the Insulator from the bracket between the DC Bus terminal assemblies.



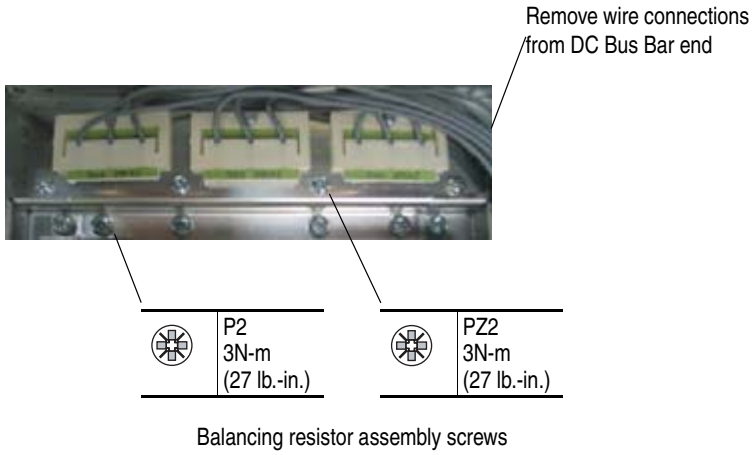
15. If necessary, remove the screws that secure the DC Bus terminal assemblies and Insulator bracket to the drive and remove the DC Bus terminal assemblies and Insulator bracket.



16. Remove the gate wires from the top of the Rectifying module.

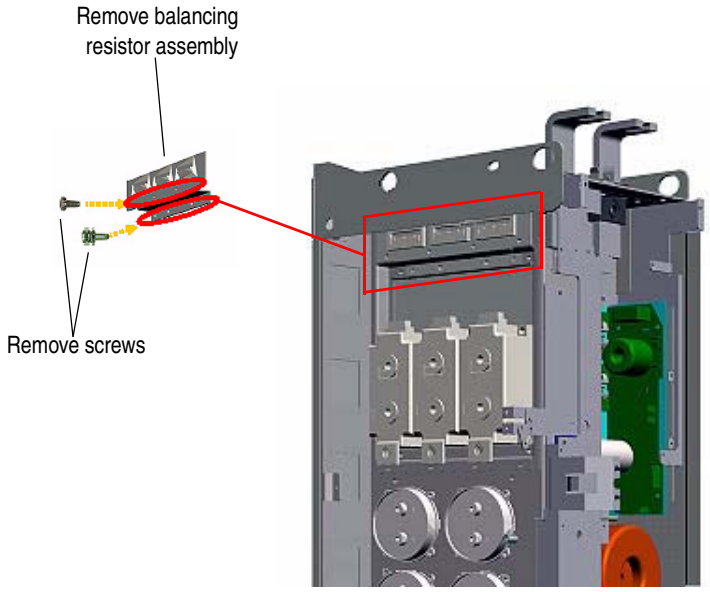


17. Remove the Balancing Resistor wires from the DC Bus Bars.

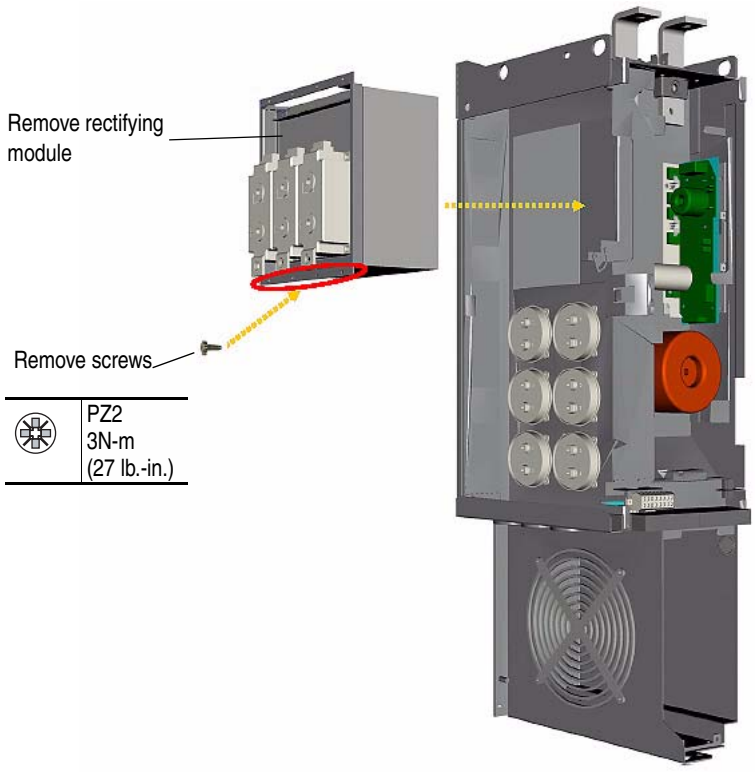


Balancing resistor assembly screws

18. Remove the screws that secure the Balancing Resistor assembly to the Rectifying module and remove the Balancing Resistor assembly (see previous illustration for screw locations).



19. Remove the screws that secure the Rectifying module to the drive and remove the Rectifying module.



20. Repeat steps 8 - 19 to remove the remaining Rectifying module(s).

Installing the Rectifying Modules

Install the Rectifying modules in reverse order of removal.

Removing the Bus Capacitors from the Rectifying Structure

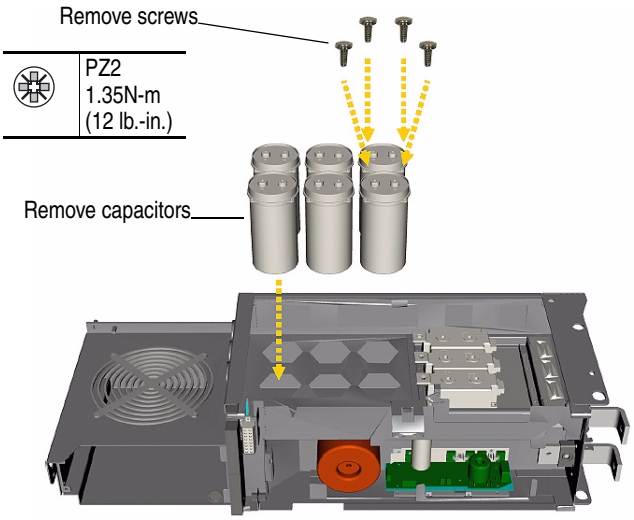
1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-3.
2. Move the control frame. Refer to Moving the Control Frame on page 3-16.
3. Remove the protective covers from the rectifying structure. Refer to Removing the Protective Covers from the Rectifying Structure on page 3-17.
4. If present, remove the protective screens from the rectifying structure. Refer to Removing the Protective Screens from the Rectifying Structure on page 3-18.
5. Removing the rectifying structure from the drive. Refer to Removing the Rectifying Structure from the Drive Enclosure on page 3-27.

6. Remove the rectifying module blocks from the drive. Refer to Removing the Rectifying Module Blocks from the Drive on page 3-31.

7. Remove the Rectifying circuit board. Refer to Removing the Rectifying Circuit Board on page 3-33.

8. Remove the Rectifying modules. Refer to Removing the Rectifying Modules on page 3-35.

9. Remove the screws that secure the Capacitor to the drive frame and remove the capacitor.



10. Repeat step 9 for each remaining Capacitor.

Installing the Bus Capacitors on the Rectifying Structure

Install the rectifying circuit bus capacitors in the reverse order of removal.

Power Structure Access Procedures

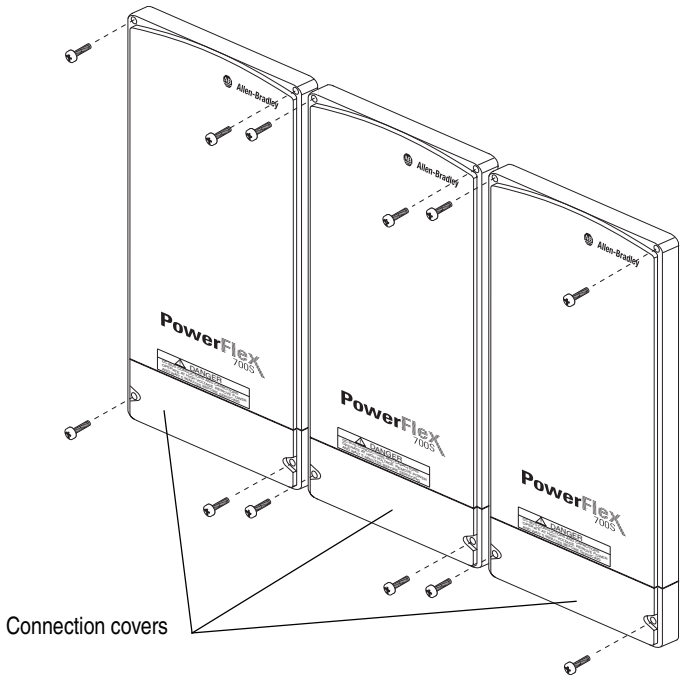
Following are the instructions for removing and installing components on the power structure and removing the Output Power modules from the drive. For instructions on removing and installing components on the rectifying structure and removing the Rectifying modules from the drive, refer to Rectifying Structure Access Procedures on page 3-4.

Removing the Protective Covers from the Power Structure

You must remove the protective covers to gain access to the power structure.

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-3.
2. Remove the four M5 POZIDRIV screws which secure each of the three top and connection protective covers to the power structure, then remove the covers.

   Note: *You only need to remove the connection covers to gain access to the cooling fan connections.*



Installing the Protective Covers

Install the protective covers on the power structure in reverse order of removal, while referring to Torque Specifications on page 3-2.

Removing the Gate Driver Circuit Boards

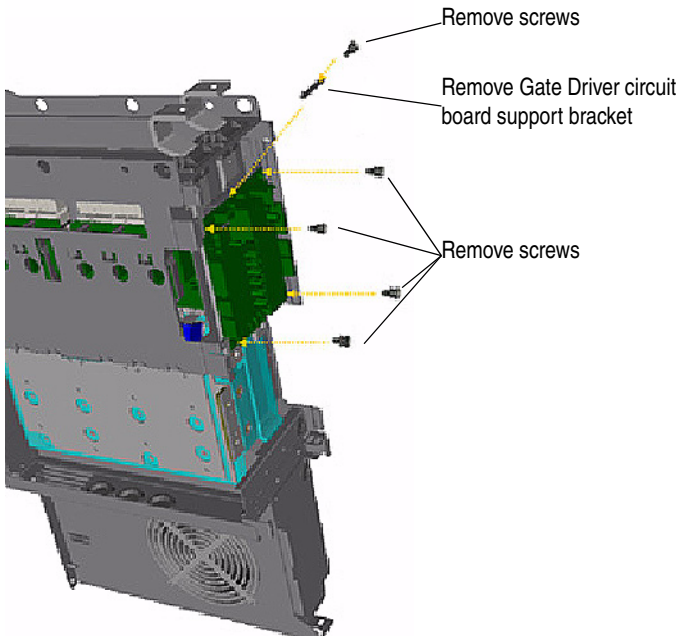
There are three Gate Driver circuit boards on the front of the power structure.

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-3.
2. Remove the covers from the power structure. Refer to Removing the Protective Covers from the Power Structure on page 3-44.
3. Unplug the DC +/- supply from X1 of the first Gate Driver board.
4. Carefully unplug the fiber-optic cables from sockets along the top of the Gate Driver board, and carefully set them aside.

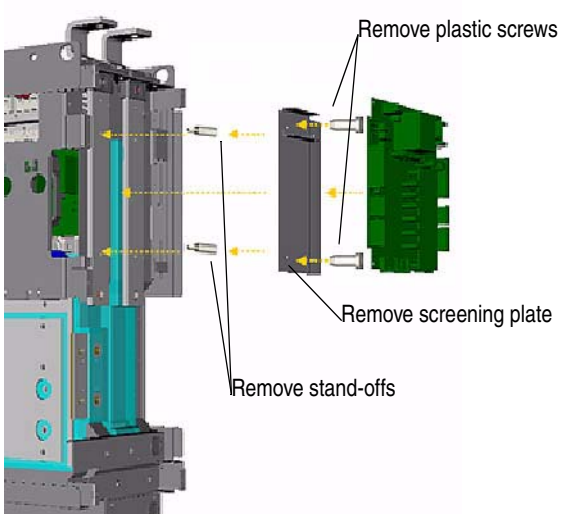
ATTENTION: Hazard of permanent eye damage exists when using optical transmission equipment. This product emits intense light and invisible radiation. Do not look into fiber-optic ports or fiber-optic cable connectors.

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.

5. Disconnect the other cables from sockets of the Gate Driver board, and set them aside.
6. Remove the five screws that secure the Gate Driver board and support bracket to the power structure.



7. Carefully remove the Gate Driver board and the board support bracket.
8. Carefully remove the two plastic screws that secure the Gate Driver board screening plate to the power structure and remove the screening plate.
9. Remove the two stand-offs that support the Gate Driver board.



10. Repeat steps 3 - 9 for the remaining Gate Driver board(s).

Installing the Gate Driver Circuit Boards

Install the Gate Driver circuit boards in the reverse order of removal.

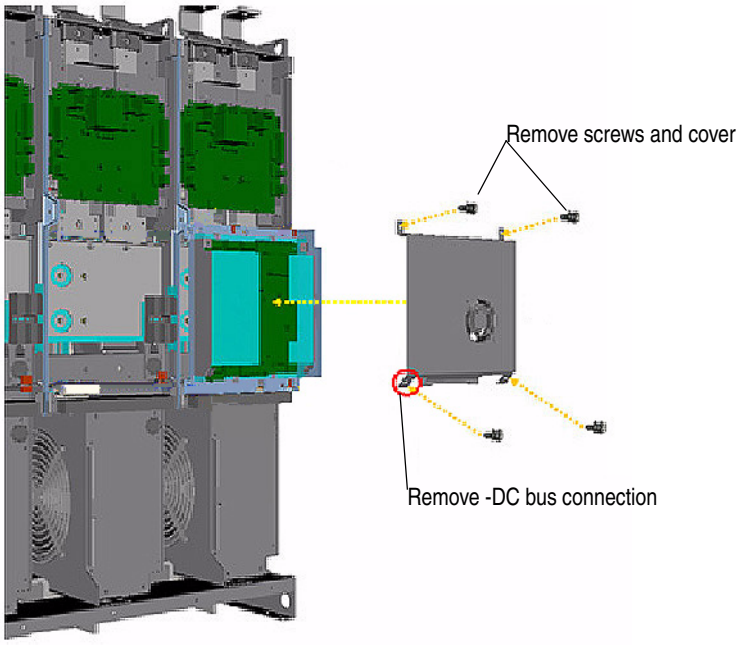
Removing the ASIC Circuit Board

ATTENTION: The sheet metal cover and mounting screws on the ASIC circuit board located on 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. Remove power from the drive. Refer to Removing Power from the Drive on page 3-3.
2. Remove the covers from the power structure. Refer to Removing the Protective Covers from the Power Structure on page 3-44.

3. Remove the four screws that secure the ASIC cover to the ASIC assembly and remove the ASIC cover.

4. Remove the -DC bus connection from the ASIC cover.



5. Unplug the fan, which mounts on the cover, from connector X1 of the ASIC circuit board.

6. Carefully unplug the fiber-optic cables from sockets of the ASIC board, and carefully set them aside.

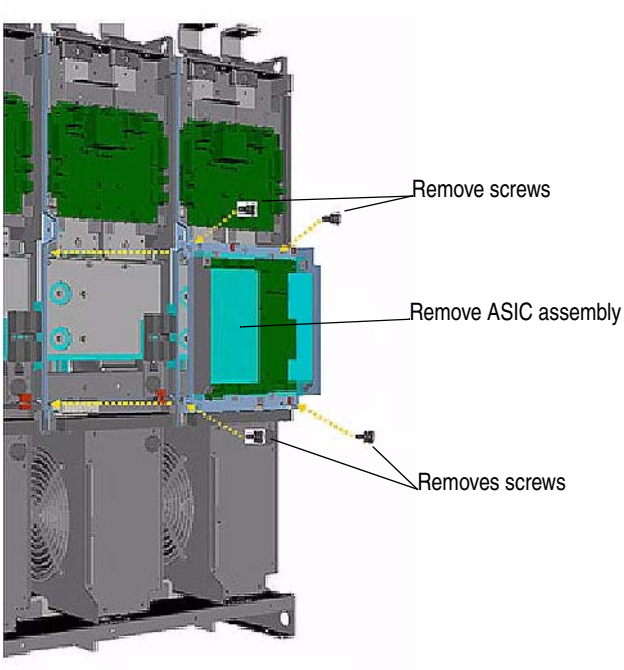
ATTENTION: Hazard of permanent eye damage exists when using optical transmission equipment. This product emits intense light and invisible radiation. Do not look into fiber-optic ports or fiber-optic cable connectors.

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.

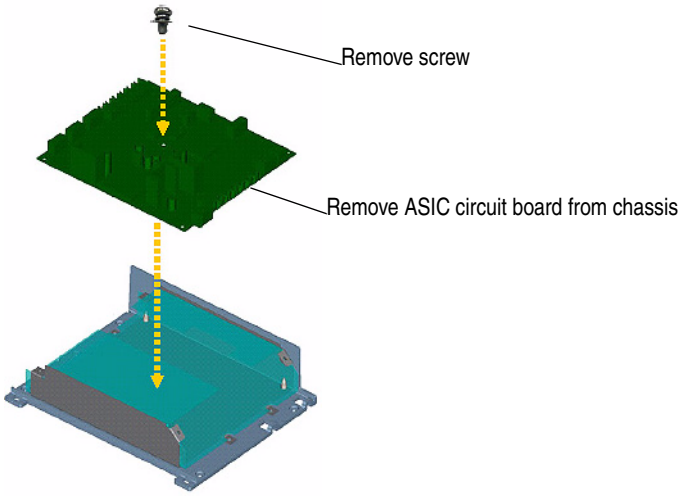
7. For drives with dc input, unplug the external precharge circuitry from connectors X9 and X15 from the ASIC board.

8. Disconnect the other cables from sockets on the front of the ASIC board, and set them aside.

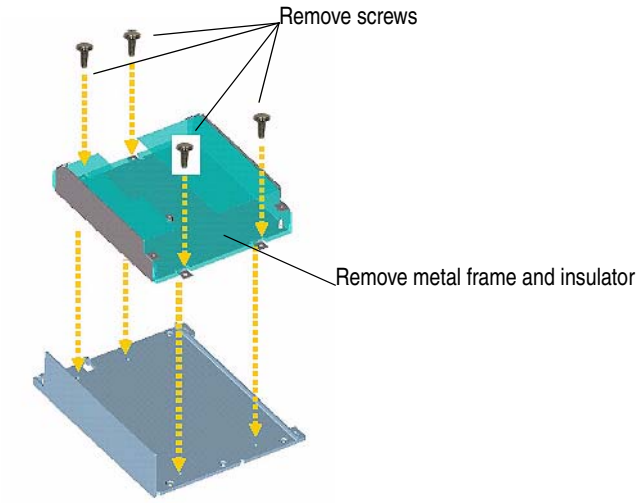
9. Remove the four screws that secure the ASIC assembly to the drive and remove the ASIC assembly.



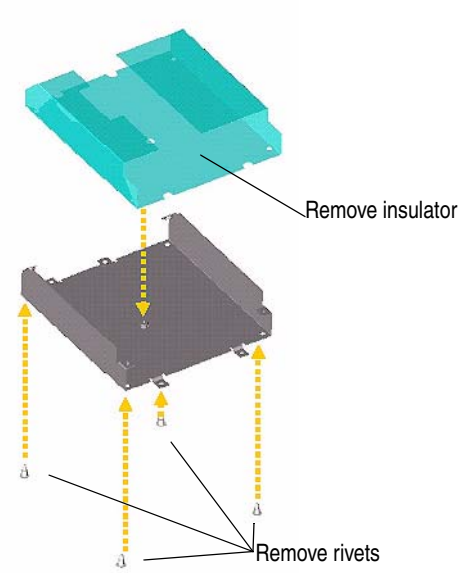
10. Remove the screw that secures the ASIC board to the ASIC chassis and remove the ASIC board.



11. Remove the four screws that secure the plastic board holder to the metal frame and insulator and remove the metal frame and insulator.



12. Carefully remove the four rivets that secure the insulator to the metal frame and remove the insulator.



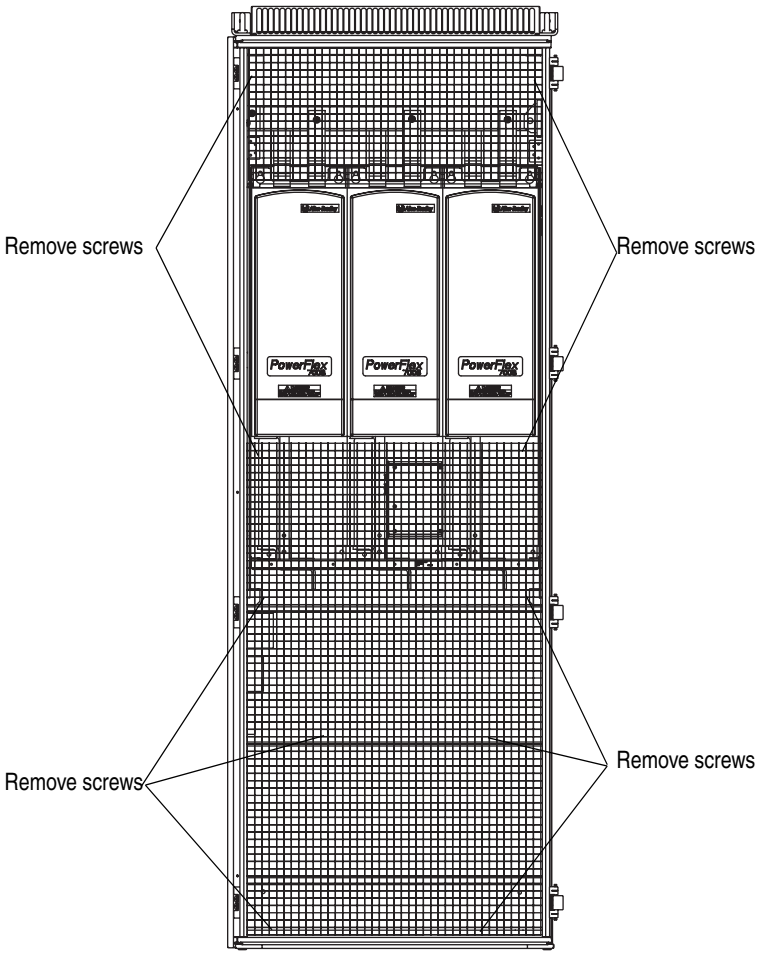
Installing the ASIC Circuit Board

Install the ASIC circuit board in reverse order of removal, while referring to Torque Specifications on page 3-2. Reconnect cables to ASIC board, while referring to on page B-6).

Removing the Protective Screens from the Power Structure

This procedure is only necessary for drives installed in NEMA/UL Type 1 / IP21 enclosures.

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-3.
2. Remove the screws that secure the protective screens to the enclosure and remove the screens.



Installing the Protective Screens on the Power Structure

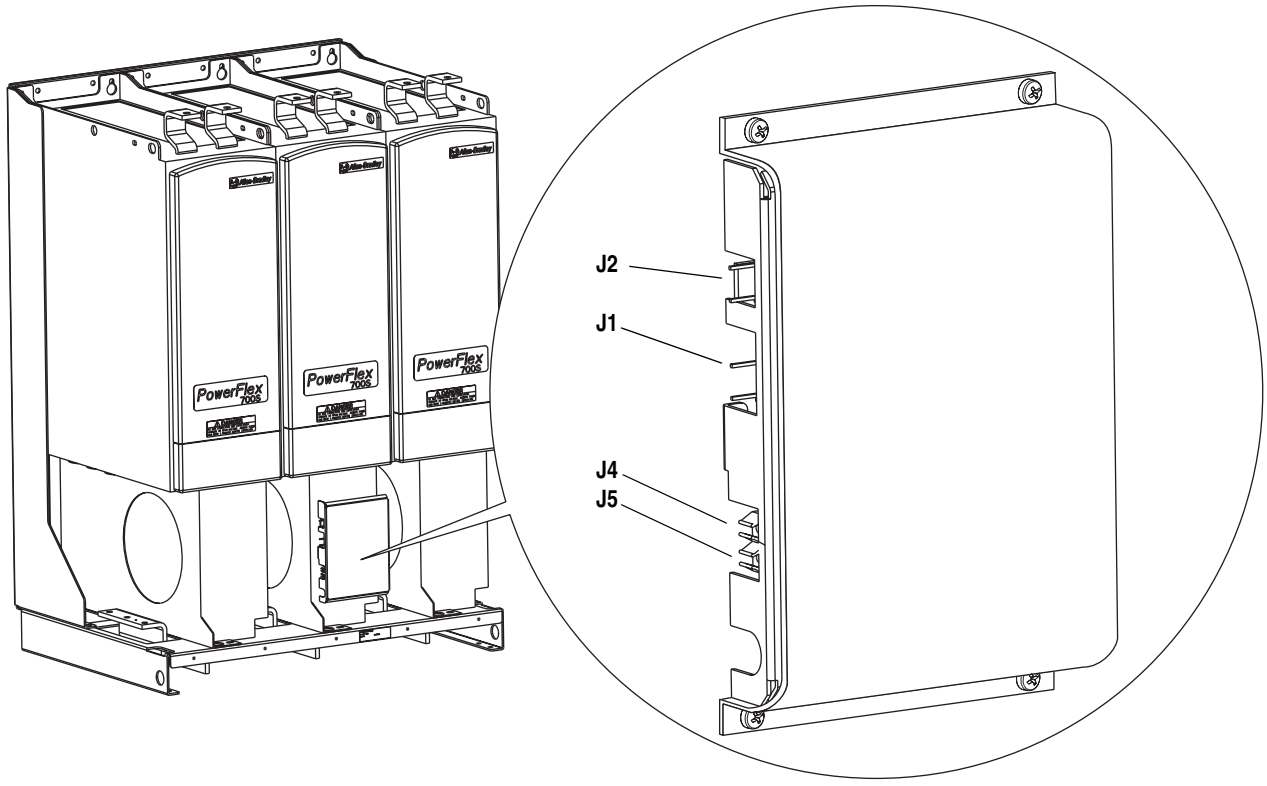
Install the protective screens in reverse order of removal.

Removing the Voltage Feedback Circuit Board

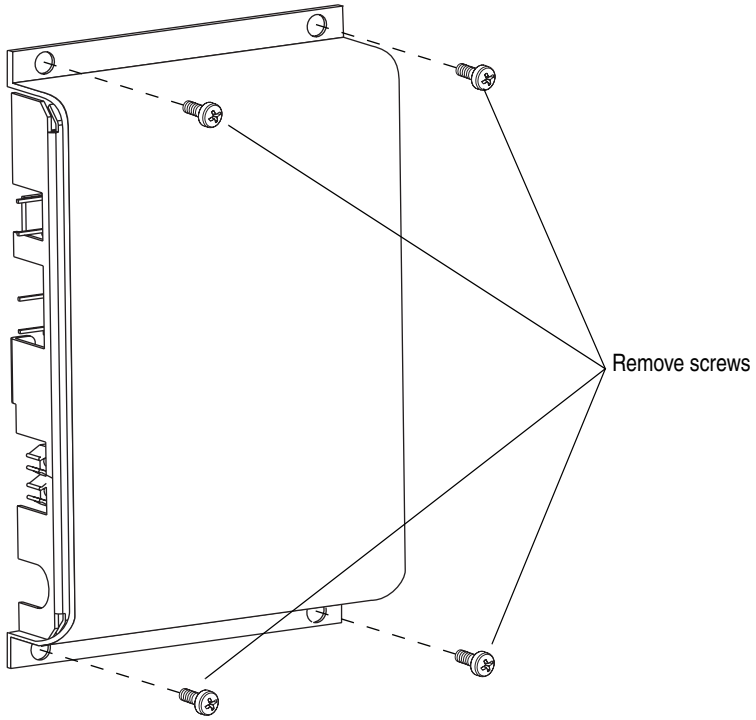
1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-3.
2. If present, remove the protective screens. Refer to Removing the Protective Screens from the Power Structure on page 3-50.
3. Disconnect the DC bus connection cable from the J2 socket and the motor feedback connection cable from the J1 socket at the top of the Voltage Feedback board.
4. Carefully unplug the fiber-optic cables from sockets J4 and J5 on the side of the Voltage Feedback circuit board and carefully set them aside (see illustration below for location).

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.

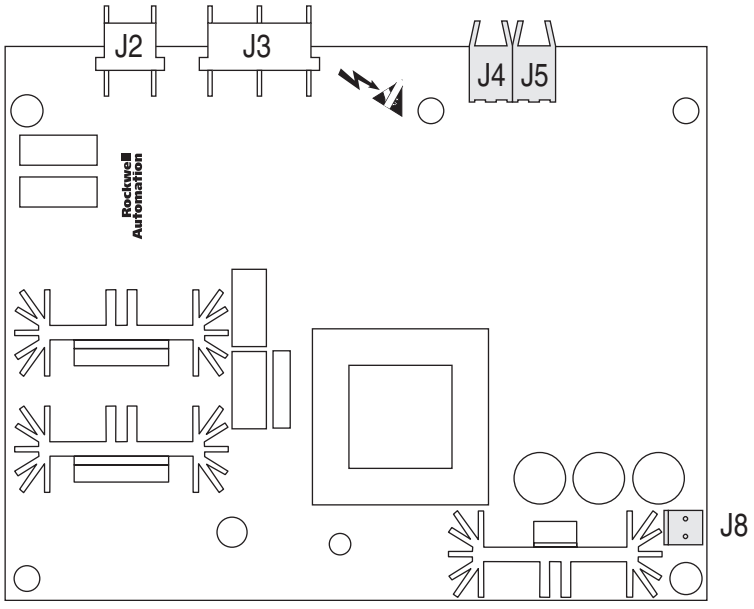
Important: Minimum inside bend radius for fiber-optic cable is 25.4 mm (1 in.). Any bends with a shorter inside radius can permanently damage the fiber-optic cable. Signal attenuation increases with decreased inside bend radii.



5. Remove the four screws that secure the protective cover, insulator and Voltage Feedback Circuit board to the fan housing on the drive and carefully remove the protective cover, insulator and Voltage Feedback board.



6. Disconnect the cable from J8 socket of the Voltage Feedback board, and set it aside.



7. Remove the five screws that secure the insulator and Voltage Feedback board to the protective cover and remove the insulator and Voltage Feedback board.

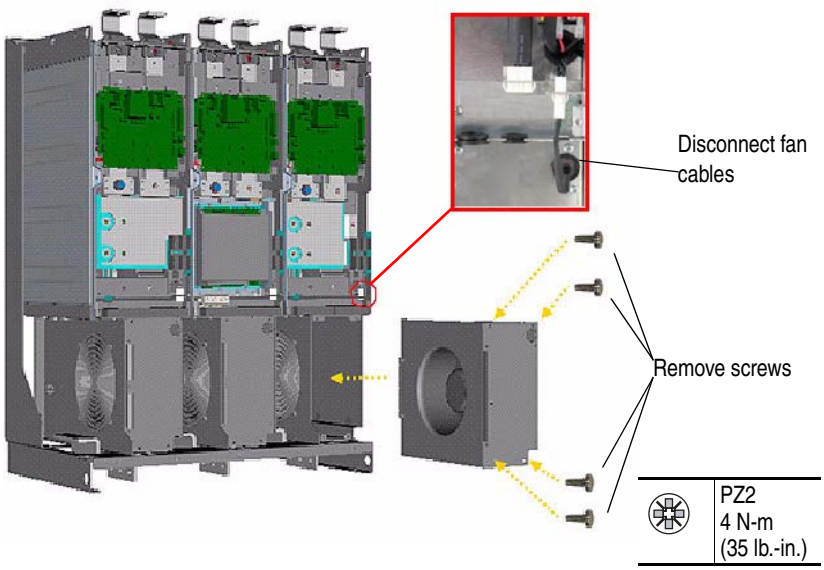
Installing the Voltage Feedback Circuit Board

Install the Voltage Feedback circuit board in reverse order of removal, while referring to Torque Specifications on page 3-2.

Removing the Main Cooling Fans from the Power Structure

There are three Main Cooling Fans on the power structure.

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-3.
2. If present, remove the protective screens. Refer to Removing the Protective Screens from the Power Structure on page 3-50.
3. Remove the covers from the power structure. Refer to Removing the Protective Covers from the Power Structure on page 3-44.
4. Disconnect the Main Cooling Fan cable connectors on the power structure.
5. Remove the four screws that secure each fan to the power structure. Then remove the fans from the drive frame.



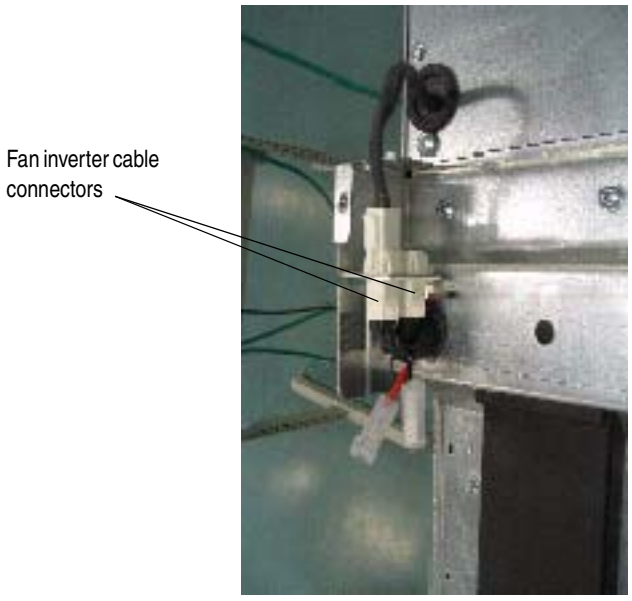
Installing the Main Cooling Fans on the Power Structure

Install the Main Cooling Fans in reverse order of removal, while referring to Torque Specifications on page 3-2.

Removing the Fan Inverters from the Power Structure

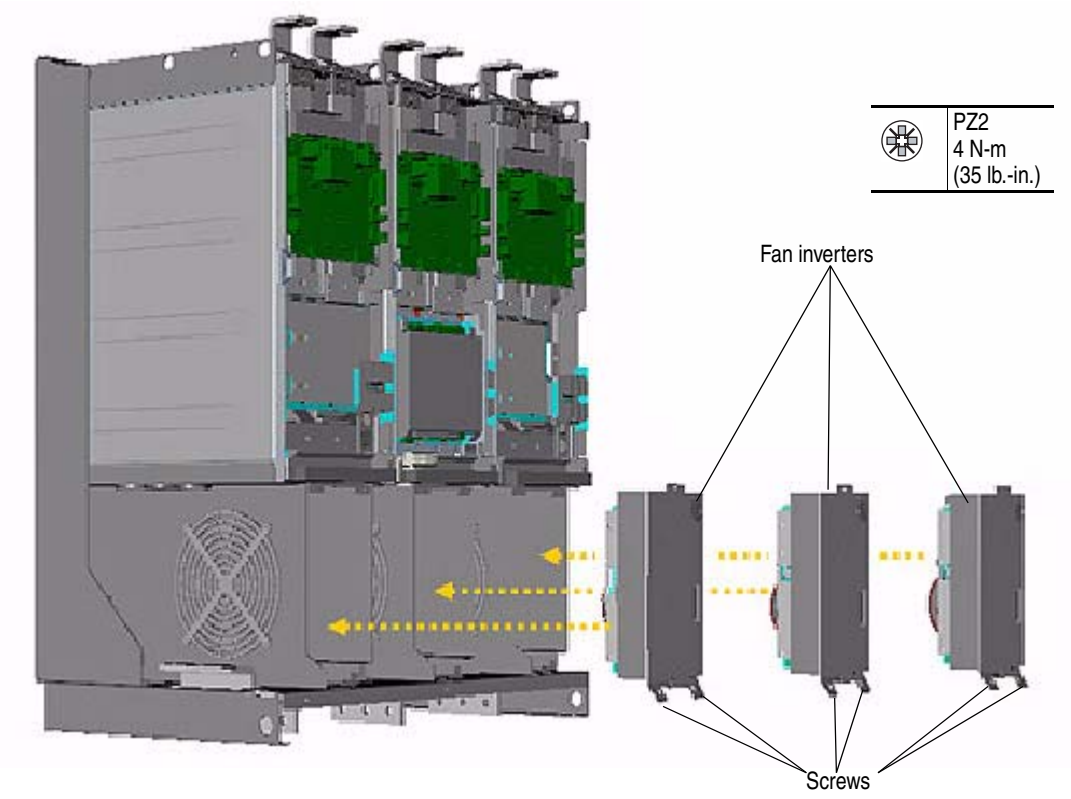
Each Fan Inverter is located behind a Main Cooling Fan on the power structure.

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-3.
2. If present, remove the protective screens. Refer to Removing the Protective Screens from the Power Structure on page 3-50.
3. Remove the covers from the Power structures. Refer to Removing the Protective Covers from the Power Structure on page 3-44.
4. Remove the Voltage Feedback circuit board. Refer to Removing the Voltage Feedback Circuit Board on page 3-51.
5. Remove the Main Cooling Fans. Refer to Removing the Main Cooling Fans from the Power Structure on page 3-53.
6. Disconnect the Fan Inverter cables from the connections on the front of the power structure.

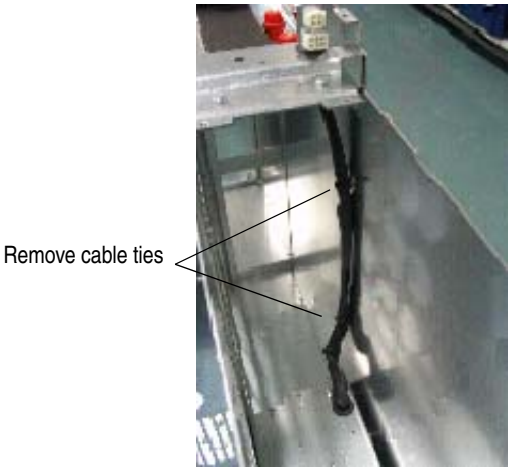


7. Push the Fan Inverter cables and connectors, largest first, through the rubber grommet into the frame, where the Main Cooling Fan was located.

8. Remove the two M5 POZIDRIV screws that secure the Fan Inverter to the drive. Proper tightening torque for reassembly is 4 N-m (35 lb.-in.).



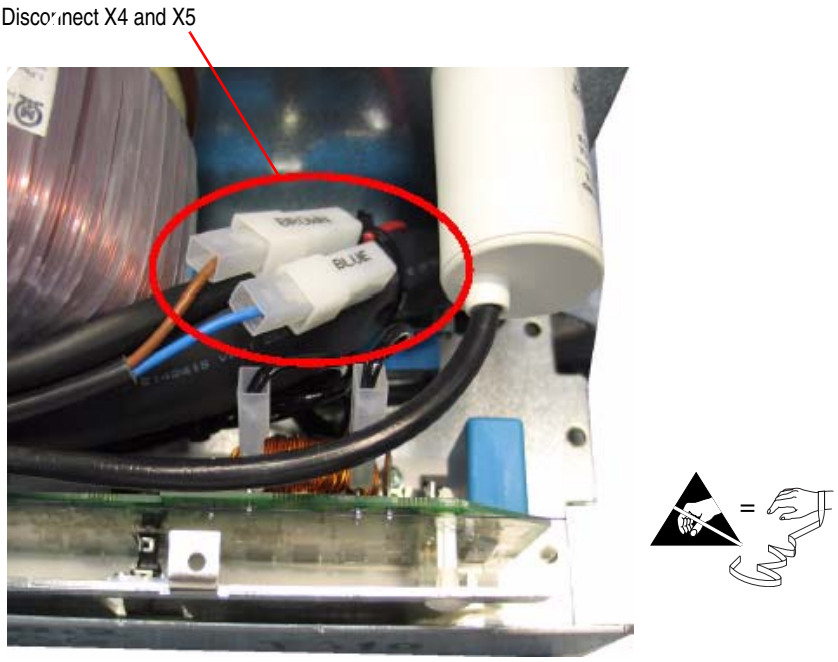
9. Remove the cable-ties that secure the cables with black insulation to the drive frame.



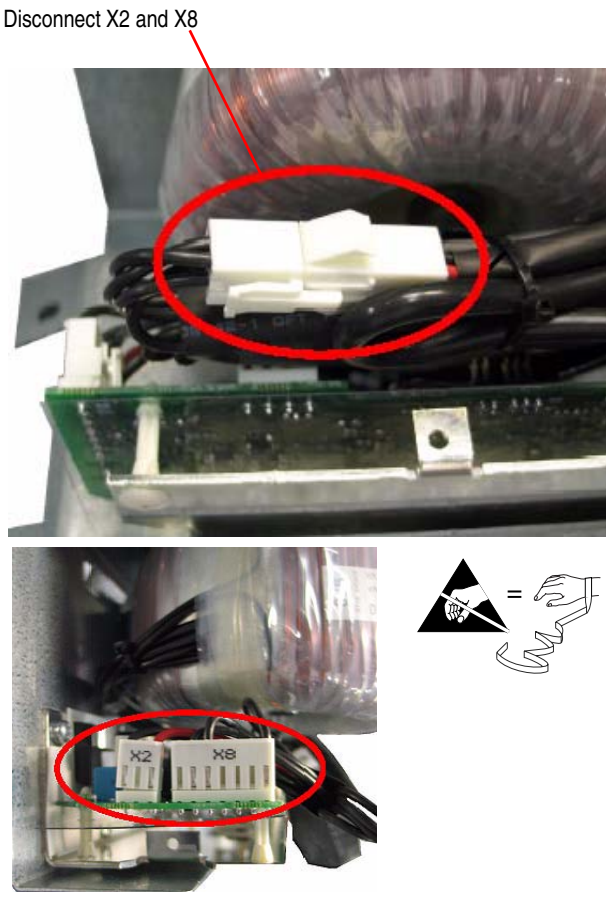
10. Remove the Fan Inverter assembly from the drive.

11. To remove the Fan Inverter circuit board from the old inverter assembly, unplug the cables from the following connectors:

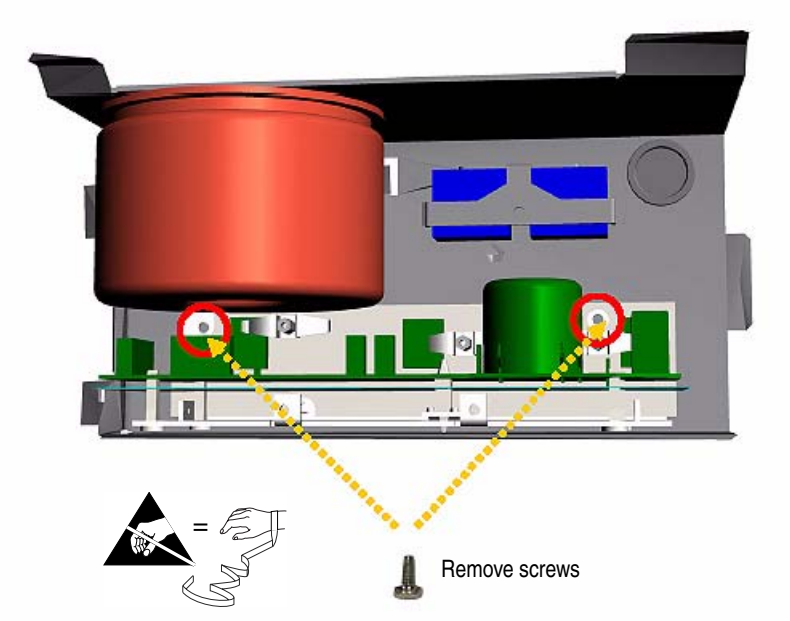
a. X4 and X5.



b. X8 and X2.



12. Remove two M5 POZIDRIV screws, which secure the Fan Inverter board and its heatsink to the assembly carriage. Then, carefully remove the Fan Inverter board and its heatsink from the assembly carriage. Proper tightening torque for reassembly is 4 N-m (35 lb.-in.).



13. Repeat steps 6 - 12 for the remaining Fan Inverter assemblies.

Installing the Fan Inverters on the Power Structure

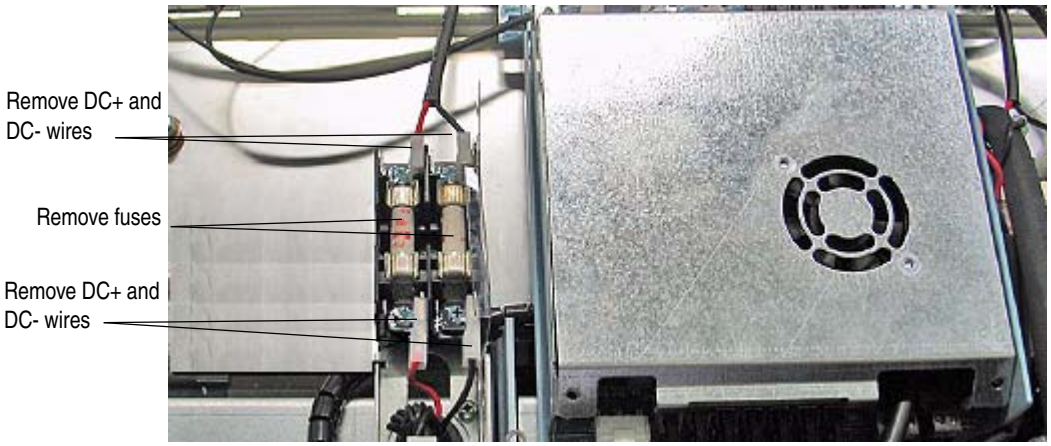
Install the Fan Inverters in reverse order of removal, while referring to Torque Specifications on page 3-2.

Removing the Fan Inverter Fuse Assemblies from the Power Structure

You must remove the Fan Inverter Fuse assemblies in order to remove the power structure from the drive.

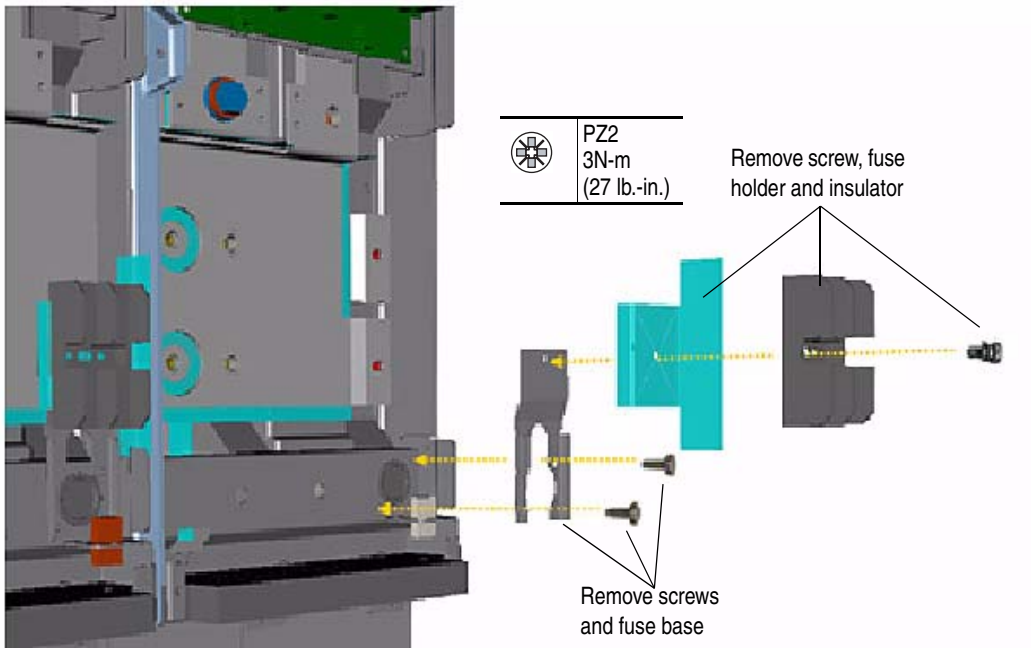
1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-3.
2. If present, remove the protective screens. Refer to Removing the Protective Screens from the Power Structure on page 3-50.
3. Remove the covers from the power structure. Refer to Removing the Protective Covers from the Power Structure on page 3-44.
4. Remove the Fan Inverter Fuses from the fuse assembly.

5. Disconnect the DC+ and DC- wire connectors from both ends of the fuse assembly.



6. Remove the M4 POZIDRIV screw that secures the fuse holder and insulator to the fuse base and remove the fuse holder and insulator.

7. Remove the two M4 POZIDRIV screws that secure the fuse base to the drive and remove the fuse base.



8. Repeat steps 4 - 7 for the remaining Fan Inverter Fuse assemblies.

Installing the Fan Inverter Fuse Assemblies on the Power Structure

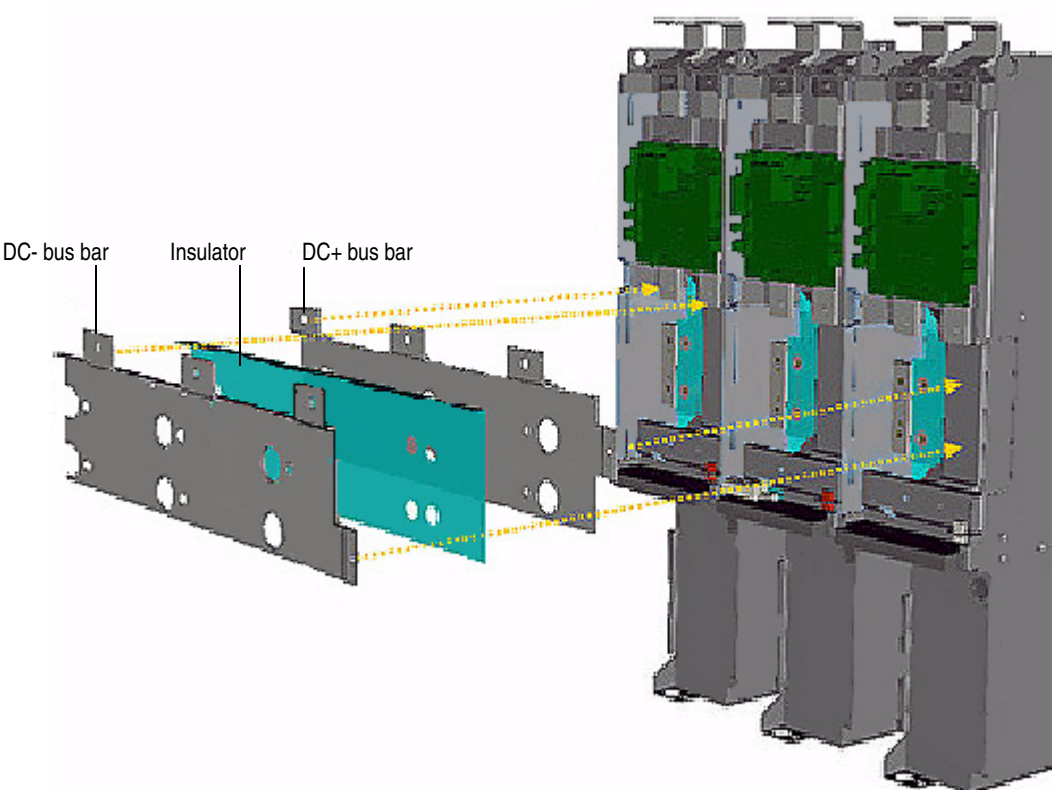
Install the Fan Inverter Fuse assemblies in reverse order of removal, while referring to Torque Specifications on page 3-2.

Removing the DC Connective Bus Bars from the Power Structure

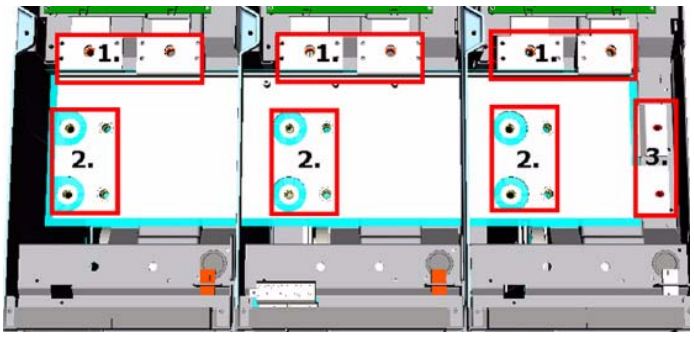
You must remove the DC Connective Bus Bars in order to remove the power structure from the drive.

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-3.
2. If present, remove the protective screens. Refer to Removing the Protective Screens from the Power Structure on page 3-50.
3. Remove the covers from the power structure. Refer to Removing the Protective Covers from the Power Structure on page 3-44.
4. Remove the ASIC circuit board. Refer to Removing the ASIC Circuit Board on page 3-46.
5. Remove the Fan Inverter Fuse assemblies. Refer to Removing the Fan Inverter Fuse Assemblies from the Power Structure on page 3-57.

6. Remove the screws that secure the DC Connective Bus Bars and insulator to the drive.



Location	Fasteners	Torque
1	M10 x 20 hexagonal screws, M10 spring washers and M10 washers	8 N-m (70 lbs.-in.)
2	M8 x 25 hexagonal screws, M8 spring washers and M8 washers	8 N-m (70 lbs.-in.)
3	M6 x 12 screws	4N-m (35 lbs.-in.)



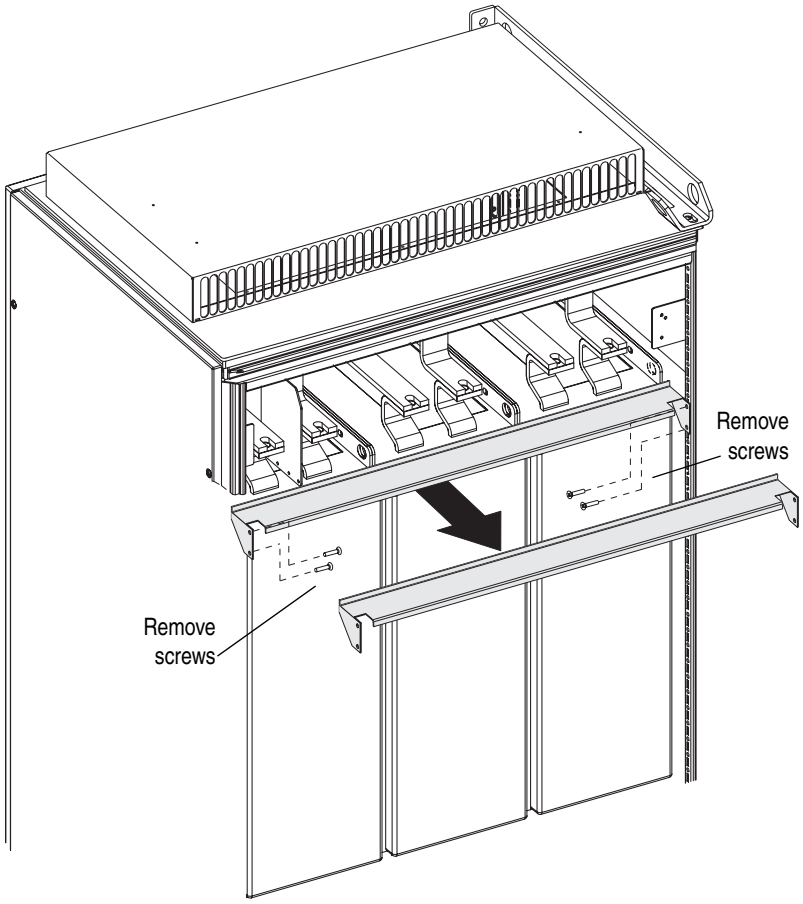
Installing the DC Connective Bus Bars on the Power Structure

Install the DC Connective Bus Bars in reverse order of removal.

Removing the Air Flow Plate from the Power Structure

You must remove the Air Flow Plate in order to remove the power structure from the drive.

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-3.
2. If present, remove the protective screens. Refer to Removing the Protective Screens from the Power Structure on page 3-50.
3. Remove the four T8 Torx-head screws which secure the Air Flow Plate to the drive.
4. Slide the Air Flow Plate off of the drive.



Installing the Air Flow Plate on the Power Structure

Install the Air Flow Plate in reverse order of removal.

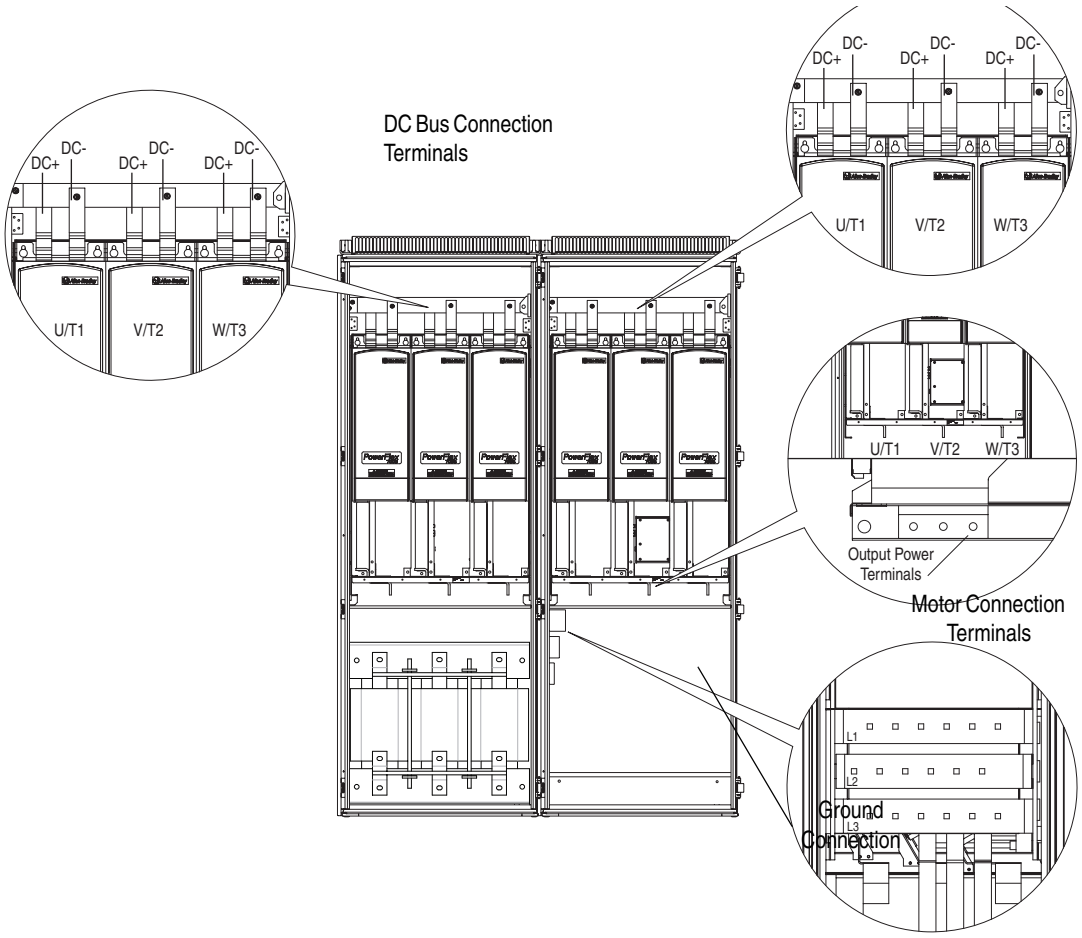
Removing the Power Structure from the Drive Enclosure

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-3.
2. If present, remove the protective screens. Refer to Removing the Protective Screens from the Power Structure on page 3-50.
3. Remove the covers from the power structure. Refer to Removing the Protective Covers from the Power Structure on page 3-44.
4. Remove the ASIC Circuit board from the drive. Refer to Removing the ASIC Circuit Board on page 3-46.
5. Remove the Voltage Feedback Circuit board from the drive. Refer to Removing the Voltage Feedback Circuit Board on page 3-51.
6. Remove the Fan Inverter Fuse assemblies. Refer to Removing the Fan Inverter Fuse Assemblies from the Power Structure on page 3-57.
7. Remove the DC Connective Bus Bars. Refer to Removing the DC Connective Bus Bars from the Power Structure on page 3-59.
8. Remove the Air Flow Plate. Refer to Removing the Air Flow Plate from the Power Structure on page 3-61.

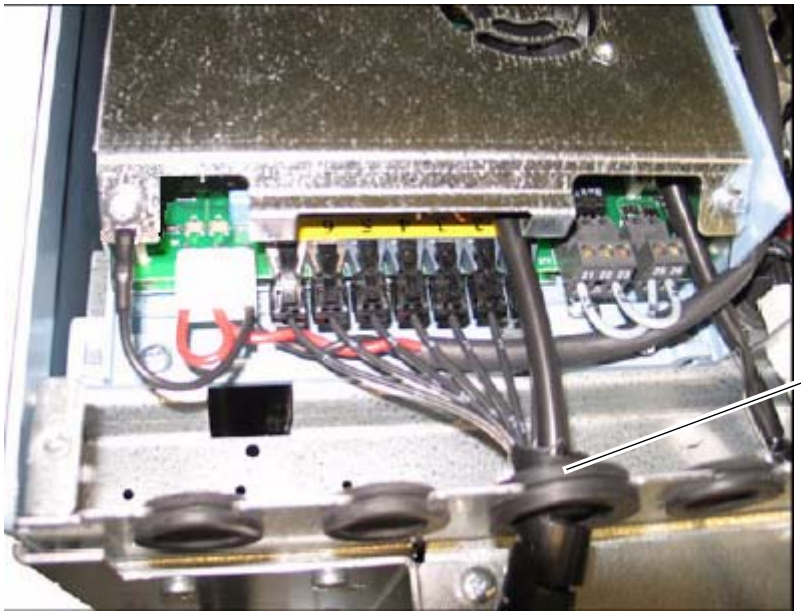
9. Remove the connections from the incoming dc bus terminals at the top of the power structure.

10. Remove the motor wiring from the power structure at the front of the power structure.

11. Remove the ground connection from the lower right corner of the power structure.



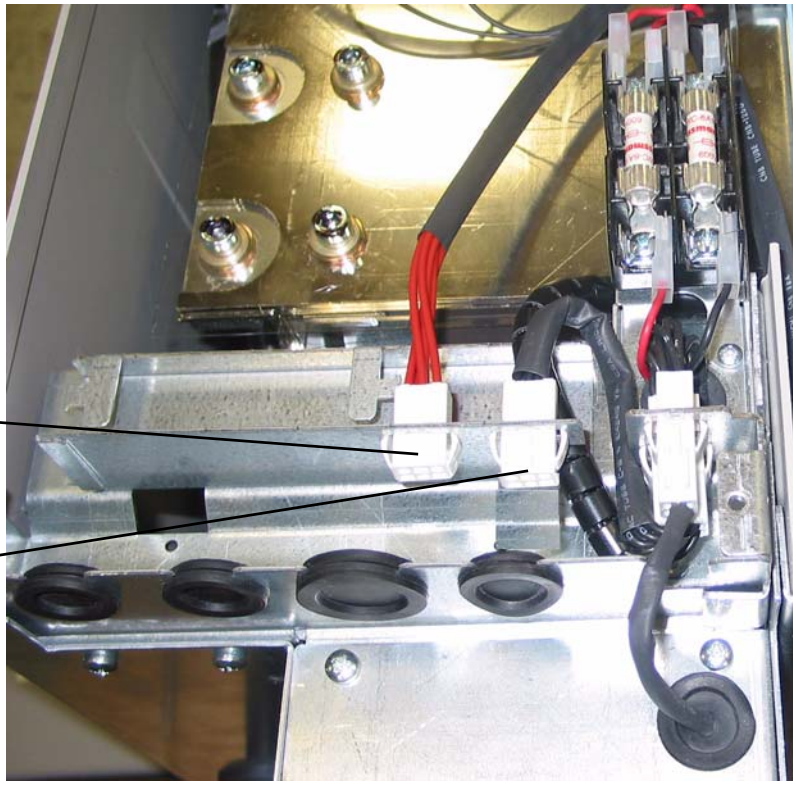
12. Pull the rubber grommet, through which the ASIC board and Voltage Feedback board wire bundles are routed, out of the drive frame and secure the wire bundles in the left-hand enclosure of the drive.



Rubber grommet and wire bundles

Important: Move wire bundles to left-hand enclosure.

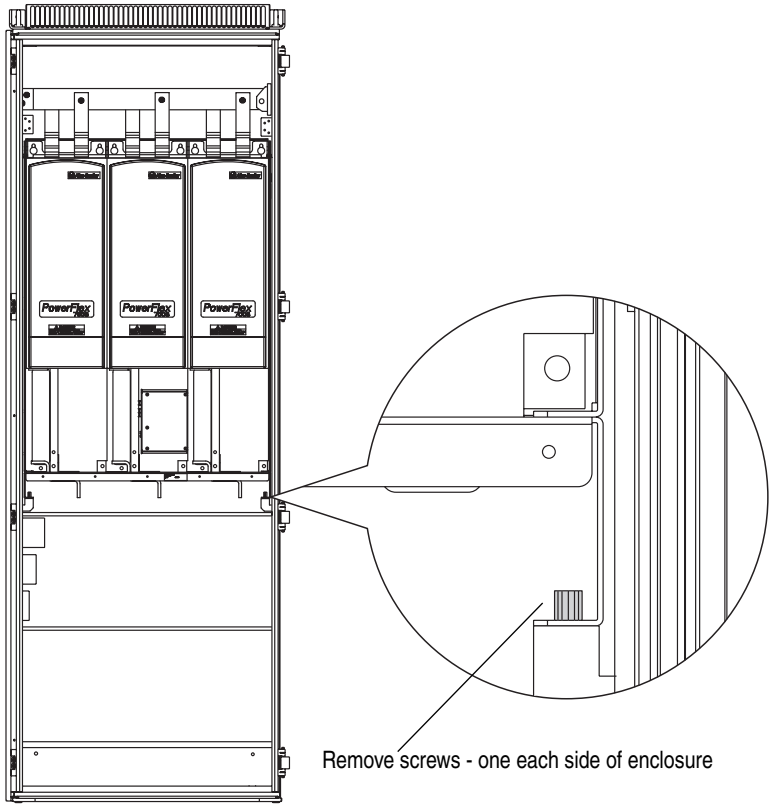
13. For drives with ac input, disconnect the precharge cable from the Rectifying modules and the fan control cables, located in the power structure to the left of the ASIC board.



Precharge cables. Shown disconnected

Fan control cables. Shown disconnected

14. Remove the two hexagonal screws that secure the power structure to the drive frame.



15. Follow the instructions in publication PFLEX-IN014, *Installation Instructions - PowerFlex 700S / 700H High Power Maintenance Stand*, to install the Maintenance Stand. Remove the power structure by sliding it onto the rails of the Maintenance Stand.

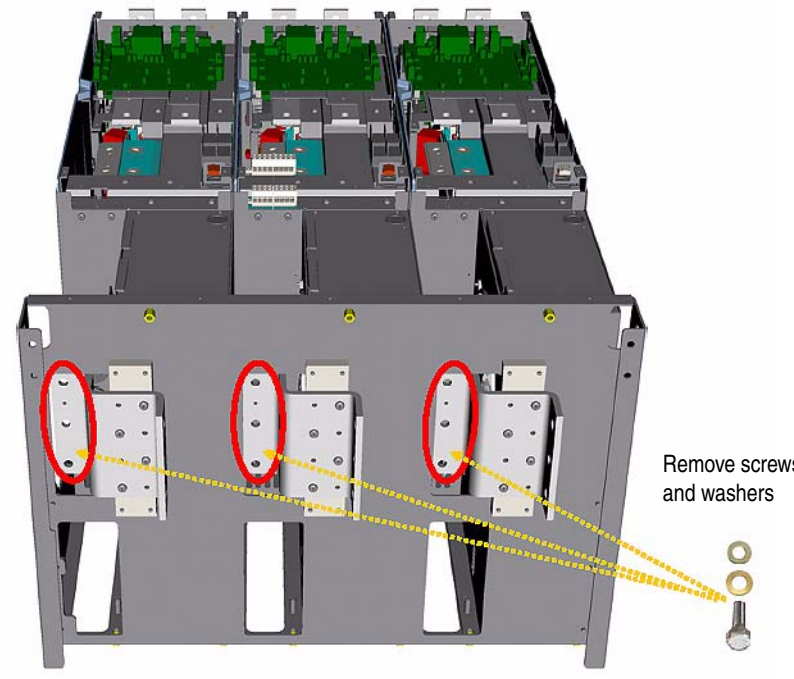
Note: *The Maintenance Stand is designed for removing rectifying or power structures from drives supplied in Rittal TS8 enclosures. Alternate means of removal will be necessary for other types of enclosures.*

Installing the Power Structure

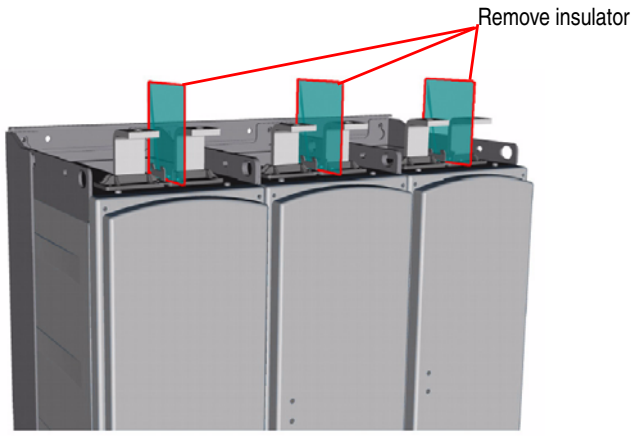
Install the power structure in reverse order of removal. Refer to the publication PFLEX-IN006…, *Installation Instructions - PowerFlex 700S and 700H High Power Drives*, for tightening torques of motor, dc bus input and ground connection terminations.

Removing the Power Module Blocks from the Drive

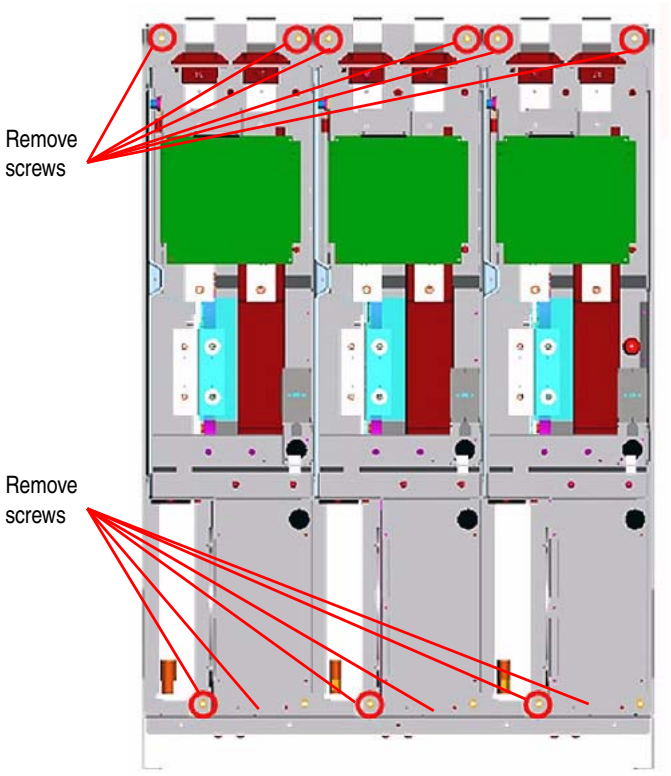
1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-3.
2. If present, remove the protective screens. Refer to Removing the Protective Screens from the Power Structure on page 3-50.
3. Remove the covers from the power structure. Refer to Removing the Protective Covers from the Power Structure on page 3-44.
4. Remove the Fan Inverter Fuse assemblies. Refer to Removing the Fan Inverter Fuse Assemblies from the Power Structure on page 3-57.
5. Remove the DC Connective Bus Bars. Refer to Removing the DC Connective Bus Bars from the Power Structure on page 3-59.
6. Remove the Air Flow Plate. Refer to Removing the Air Flow Plate from the Power Structure on page 3-61.
7. Remove the power structure from the drive enclosure. Refer to Removing the Power Structure from the Drive Enclosure on page 3-62.
8. Remove the M10 x 25 hexagonal screws that secure the output power cables to the Output Power terminals.



9. Remove the insulator from between the DC Input Bus Bars.



10. Remove the M8x20 hexagonal screws that secure the power module blocks to the drive frame.



11. Lift the power module blocks off of the frame.

Installing the Power Module Blocks

Install the power module blocks in reverse order of removal.

Removing the Output Power Modules

Important: Do not attempt to disassemble the Output Power modules.

Important: Always replace all three Output Power modules (do not replace just one module).

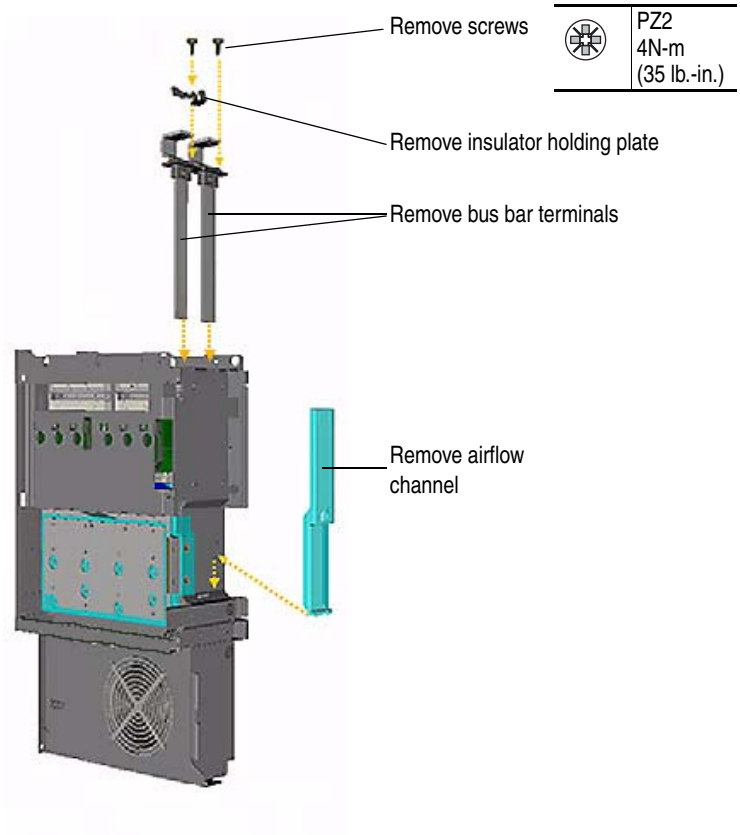
1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-3.
2. If present, remove the protective screens. Refer to Removing the Protective Screens from the Power Structure on page 3-50.
3. Remove the covers from the power structure. Refer to Removing the Protective Covers from the Power Structure on page 3-44.
4. Remove the Gate Driver Circuit Boards. Refer to Removing the Gate Driver Circuit Boards on page 3-45.
5. On the V Phase Output Power block only, remove the ASIC Circuit Board. Refer to Removing the ASIC Circuit Board on page 3-46.
6. Remove the Fan Inverter Fuse assemblies. Refer to Removing the Fan Inverter Fuse Assemblies from the Power Structure on page 3-57.
7. Remove the DC Connective Bus Bars. Refer to Removing the DC Connective Bus Bars from the Power Structure on page 3-59.
8. Remove the Air Flow Plate. Refer to Removing the Air Flow Plate from the Power Structure on page 3-61.
9. Remove the power structure from the drive enclosure. Refer to Removing the Power Structure from the Drive Enclosure on page 3-62.
10. Remove the power module blocks from the drive. Refer to Removing the Power Module Blocks from the Drive on page 3-66.
11. On the V Phase Output Power block only, remove the capacitor leads from the DC Input Bus Bars at the top of the power structure.

12. Remove the insulator holding plate from between the Bus Bar terminals.

13. Remove the M5 POZIDRIV screws that secure the Bus Bar terminals to the power structure.

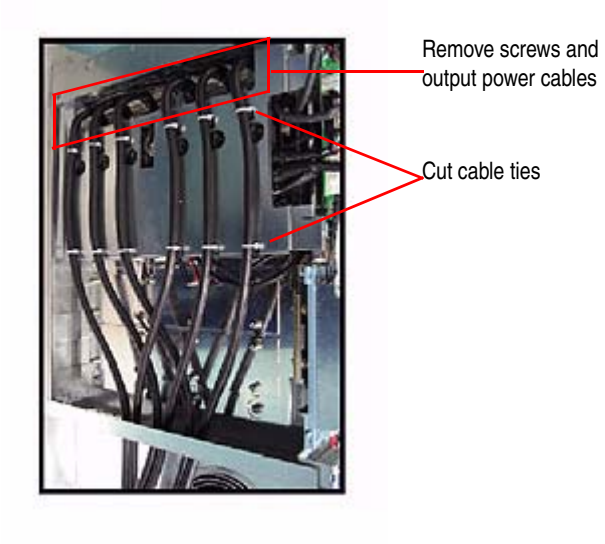
14. Slide the Bus Bar terminals out of the frame.

15. Remove the bus bar Airflow Channel from the frame.



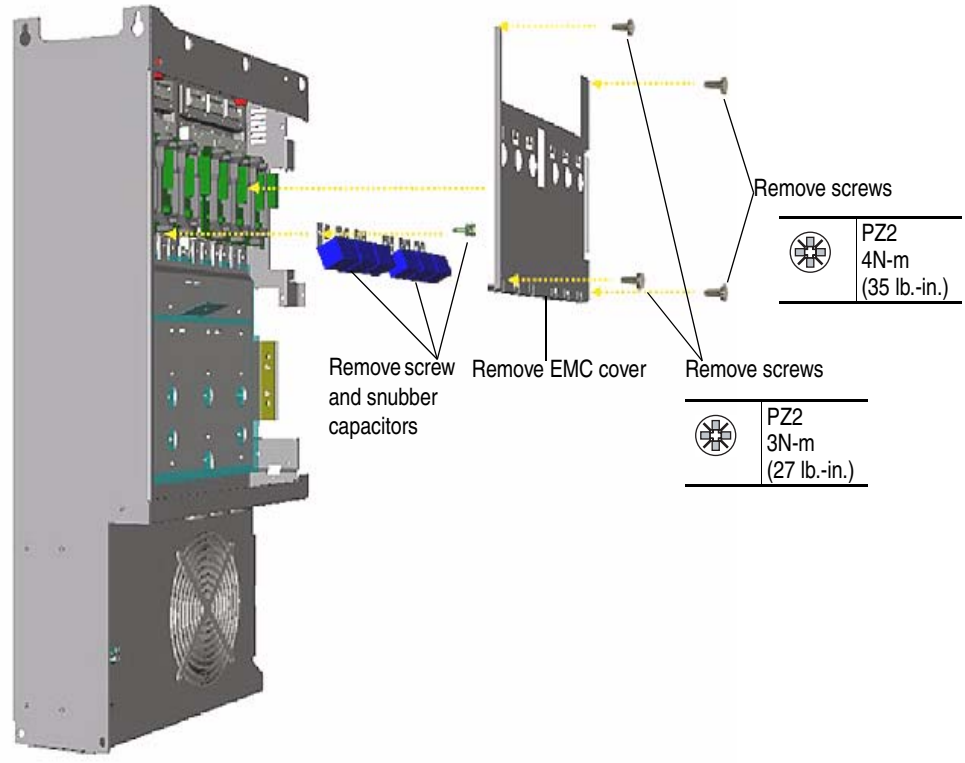
16. Remove the M8x20 hexagonal screws that secure the output power cables to the output power bus bar. Tightening torque is 14N-m (124 lb.-in.).

17. Cut and remove the cable ties that secure the output power cables to the EMC cover plate and remove the cables.

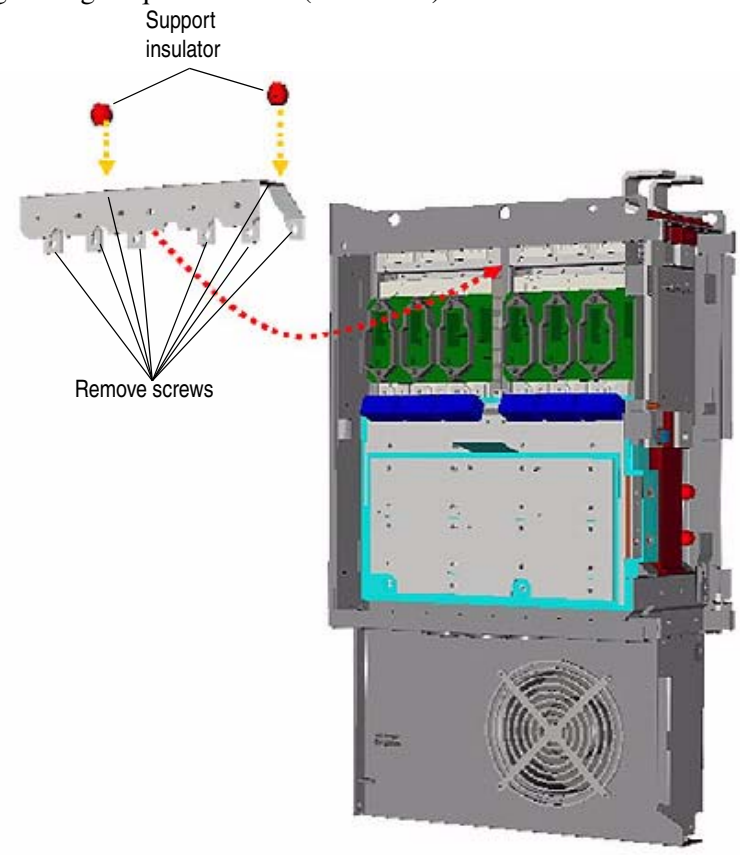


18. Remove the M5x10 POZIDRIV and M4x8 POZIDRIV screws that secure the EMC cover to the drive and remove the cover.

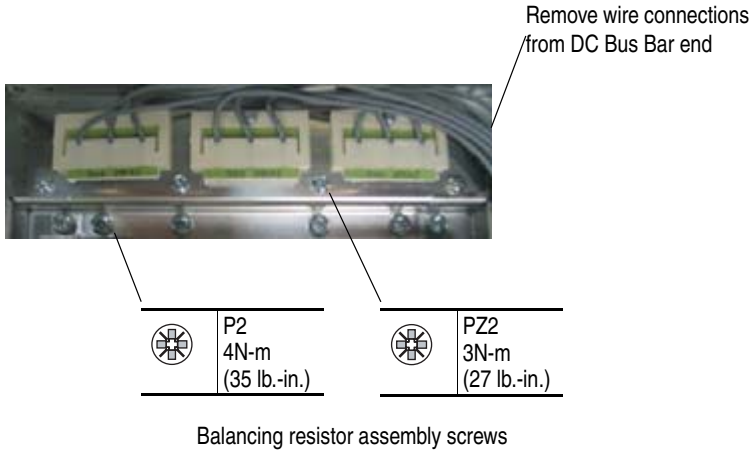
19. Remove the screws that secure the Snubber Capacitors to the Output Power module and remove the Snubber Capacitors.



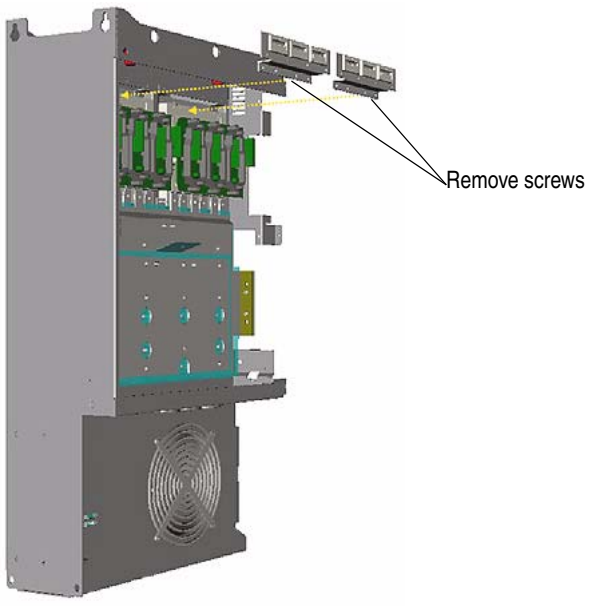
20. Remove the screws that secure the Power Bus Bar and support insulators to the drive and remove the Power Bus bar and insulators. Tightening torque is 14N-m (124 lb.-in.).



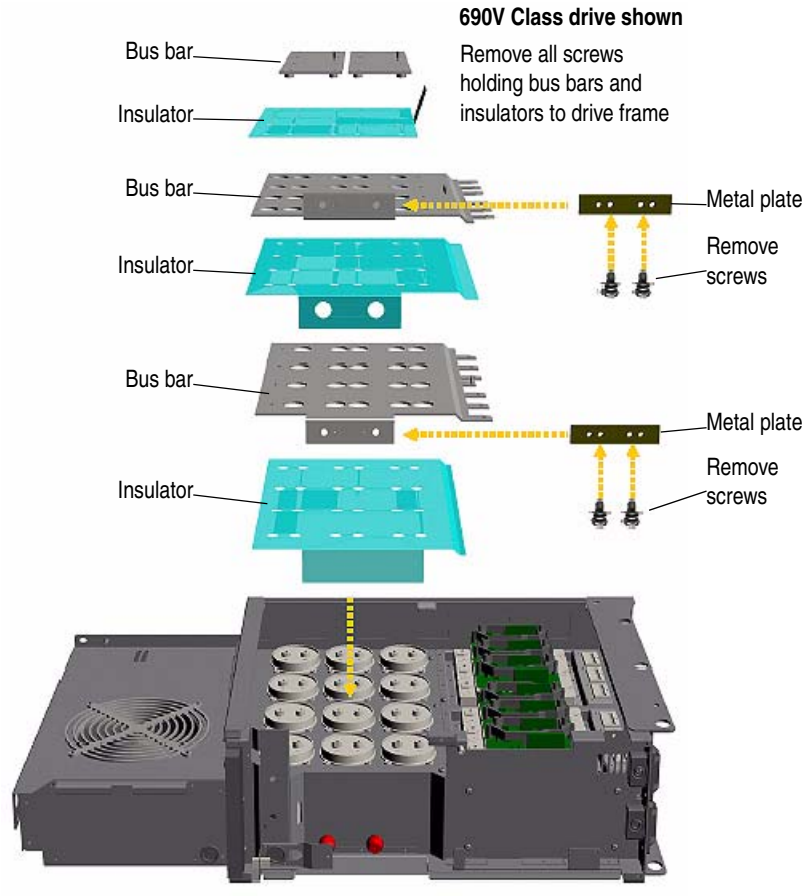
21. Disconnect the Balancing Resistor wires from the Main DC Bus Bars.



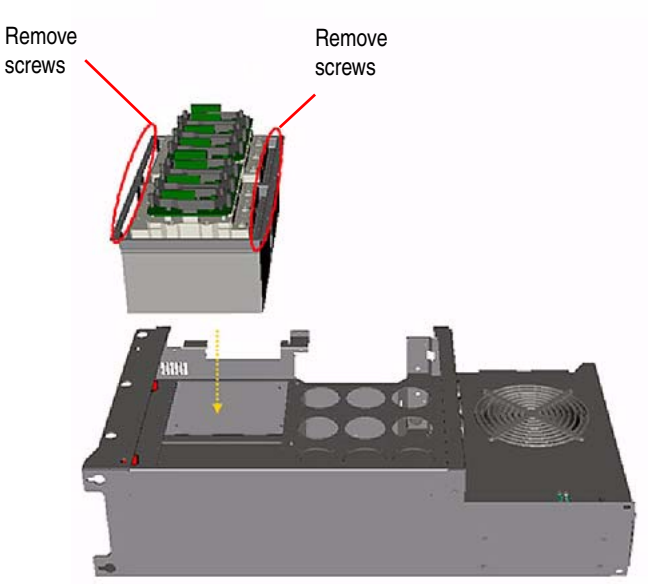
22. Remove the screws that secure the Balancing Resistor assemblies to the Output Power modules and remove the Balancing Resistor assemblies (see previous illustration for screw locations).



23. Remove the M4x8 screws that secure the Main DC Bus Bars and insulators to the drive and remove the Main DC Bus Bars and insulators. Tightening torque is 4N-m (35 lb.-in.).



24. Remove the M4x8 screws that secure the Output Power module to the drive and remove the Output Power module.



25. Repeat steps 11 - 24 for the remaining Output Power module(s).

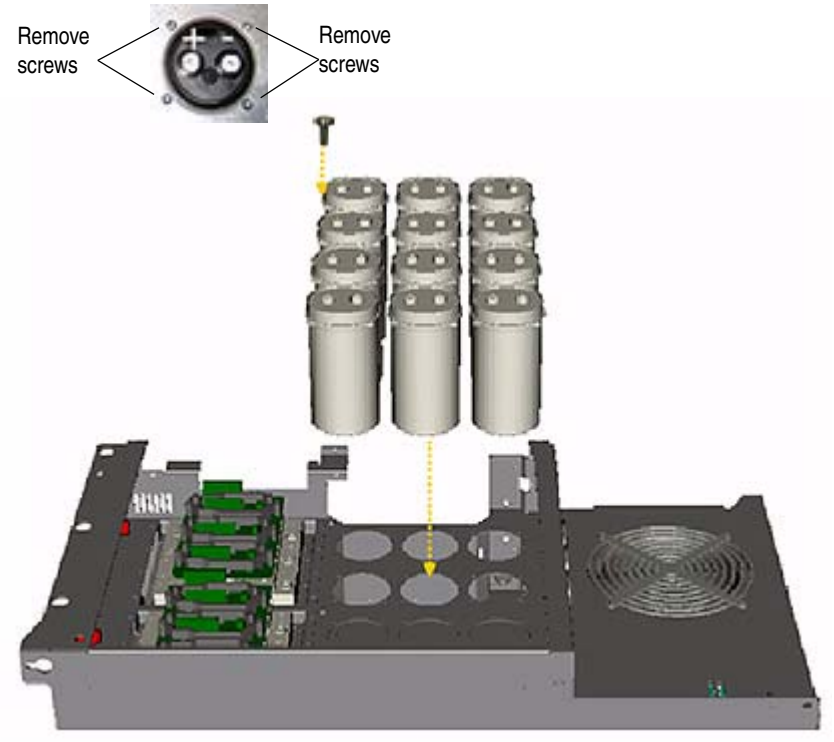
Installing the Output Power Modules

Install the Output Power module in reverse order of removal, while referring to Torque Specifications on page 3-2.

Removing the DC Bus Capacitors from the Power Structure

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-3.
2. If present, remove the protective screens. Refer to Removing the Protective Screens from the Power Structure on page 3-50.
3. Remove the covers from the power structure. Refer to Removing the Protective Covers from the Power Structure on page 3-44.
4. Remove the Gate Driver Circuit boards. Refer to Removing the Gate Driver Circuit Boards on page 3-45.
5. On the V Phase Output Power block only, remove the ASIC Circuit Board. Refer to Removing the ASIC Circuit Board on page 3-46.
6. Remove the Fan Inverter Fuse assemblies. Refer to Removing the Fan Inverter Fuse Assemblies from the Power Structure on page 3-57.
7. Remove the DC Connective Bus Bars. Refer to Removing the DC Connective Bus Bars from the Power Structure on page 3-59.
8. Remove the Air Flow Plate. Refer to Removing the Air Flow Plate from the Power Structure on page 3-61.
9. Remove the power structure from the drive enclosure. Refer to Removing the Power Structure from the Drive Enclosure on page 3-62.
10. Remove the power module blocks from the drive. Refer to Removing the Power Module Blocks from the Drive on page 3-66.

11. Remove the four M4x8 screws that secure the capacitor to the power structure, and remove the capacitor. Tightening torque is 1.35 N-m (12 lb.-in.).



12. Repeat step 11 for the remaining DC Bus Capacitors.

Installing the DC Bus Capacitors on the Power Structure

Install the capacitors in reverse order of removal.

Notes:

Start-Up After Repair

ATTENTION: Power must be applied to the drive to perform the following start-up procedure. Some of the voltages present are at incoming line potential. To avoid electric shock hazard or damage to equipment, only qualified service personnel should perform the following procedure. Thoroughly read and understand the procedure before beginning. If an event does not occur while performing this procedure, Do Not Proceed. Remove Power including user supplied control voltages. User supplied voltages may exist even when main AC power is not applied to then drive. Correct the malfunction before continuing.

Phone	United States/ Canada	1.262.512.8176 (7 AM - 6 PM CST) 1.440.646.5800 (24 hour support)
	Outside United States/Canada	You can access the phone number for your country via the Internet: Go to http://www.ab.com Click on *Support* (http://support.rockwellautomation.com/) Under *Contact Customer Support*, click on *Phone Support*
Internet	⇒	Go to http://www.ab.com/support/abdrives/
E-mail	⇒	support@drives.ra.rockwell.com

Be prepared to provide the following information when you contact support:

- Product Catalog Number
- Product Serial Number
- Firmware Revision Level

Before Applying Power to the Drive

1. Check for zero volts between DC+ and DC-.
2. Perform forward and reverse biased diode tests, using a digital multimeter. Refer to Conducting Forward and Reverse Biased Diode Tests for Major Power Components on page 2-4.

Testing with the External DC Power Supply Without Load (Optional)

This is a low current - low risk test for the Output Power Module and drive Control board. It requires the recommended High Voltage DC Test Power Supply.

1. Verify that the DC Test Power Supply is de-energized.
2. Connect the power supply's DC+ to the drive's DC+ terminal and the power supply's DC- to the drive's DC- terminal.
3. Set the power supply voltage setting to zero.
4. Switch on the external DC Test Power Supply.
5. Slowly increase the DC Test Power Supply output voltage to the drive's nominal DC bus voltage (650V dc for drives with 380-500V ac input or 775V dc for drives with 600-690V ac input).
6. Measure the DC bus voltage and verify that the value is reflected in the following parameters:
   - 306 [DC Bus Voltage] (700S)
   - 012 [DC Bus Voltage] (700H)
7. Make configuration changes which allow the HIM to issue start and speed commands.
8. Make configuration changes which allow operation without an encoder and motor.
9. Start the drive, by pressing  (the start button).
10. Increase the speed command from zero to base speed, by pressing  (the up button).
11. Stop the drive, by pressing  (the stop button).
12. Re-configure the drive to suit the application.
13. Decrease the DC Test Power Supply output voltage to zero. Wait until DC bus voltage has decreased to zero. Switch off the external DC power supply.

Testing Without a Motor

This test allows you to measure several operating parameters and diagnose problems without connecting the motor.

1. Verify that input power wiring and grounding is connected.

1. Verify that the motor cables are disconnected.

2. Energize the drive.

3. Make configuration changes which allow the HIM to issue start and speed commands.

4. Make configuration changes which allow operation without an encoder and motor.

5. Start the drive, by pressing  (the start button).

6. Increase the speed command from zero to base speed, by pressing  (the up button).

7. Measure the output voltage on each phase and verify that it is balanced. If it is unbalanced troubleshoot the drive.

8. Stop the drive, by pressing  (the stop button).

9. Re-configure the drive to suit the application.

Performing the Power Circuit Diagnostic Test

The Power Circuit Diagnostic Test allows you to diagnose problems in the drive's power structure without applying large amounts of power.

1. Verify that input power wiring and grounding is connected.

2. Verify that the motor cables are connected.

3. Energize the drive.

4. From the Monitor menu on the HIM press  (the escape button) to navigate to the Main menu.

5. Use  (the down button) to move the cursor to the Start-Up selection, and  to select Start-Up. Then press  again to verify your intention to continue with the Start-Up menu.

6. Use  (the down button) to move the cursor to Power Circuit Diagnostics (Pwr Circuit Diag), and  to select Power Circuit Diagnostics.

7. Press  to begin the Power Circuit Diagnostic routine. Follow indications and instructions on the HIM.

Testing With the Motor

This test allows you to measure several operating parameters and diagnose problems without connecting the motor to its mechanical load.

1. Verify that input power wiring and grounding is connected.
2. Verify that the motor cables are connected.
3. Verify that the motor load is disconnected.
4. Energize the drive.
5. Start the drive and increase the speed from zero to base speed.
6. Measure drive output current and verify that the value is reflected in the following parameters:
   - 308 [Output Current] (700S)
   - 003 [Output Current] (700H)
7. Stop the drive.

Service Tools and Equipment

Software Tools

DriveTools™ SP, DriveExecutive, DriveExplorer™ and DriveObserver™ are software tools that can be used for uploading, downloading and monitoring system parameters.

Service Tools

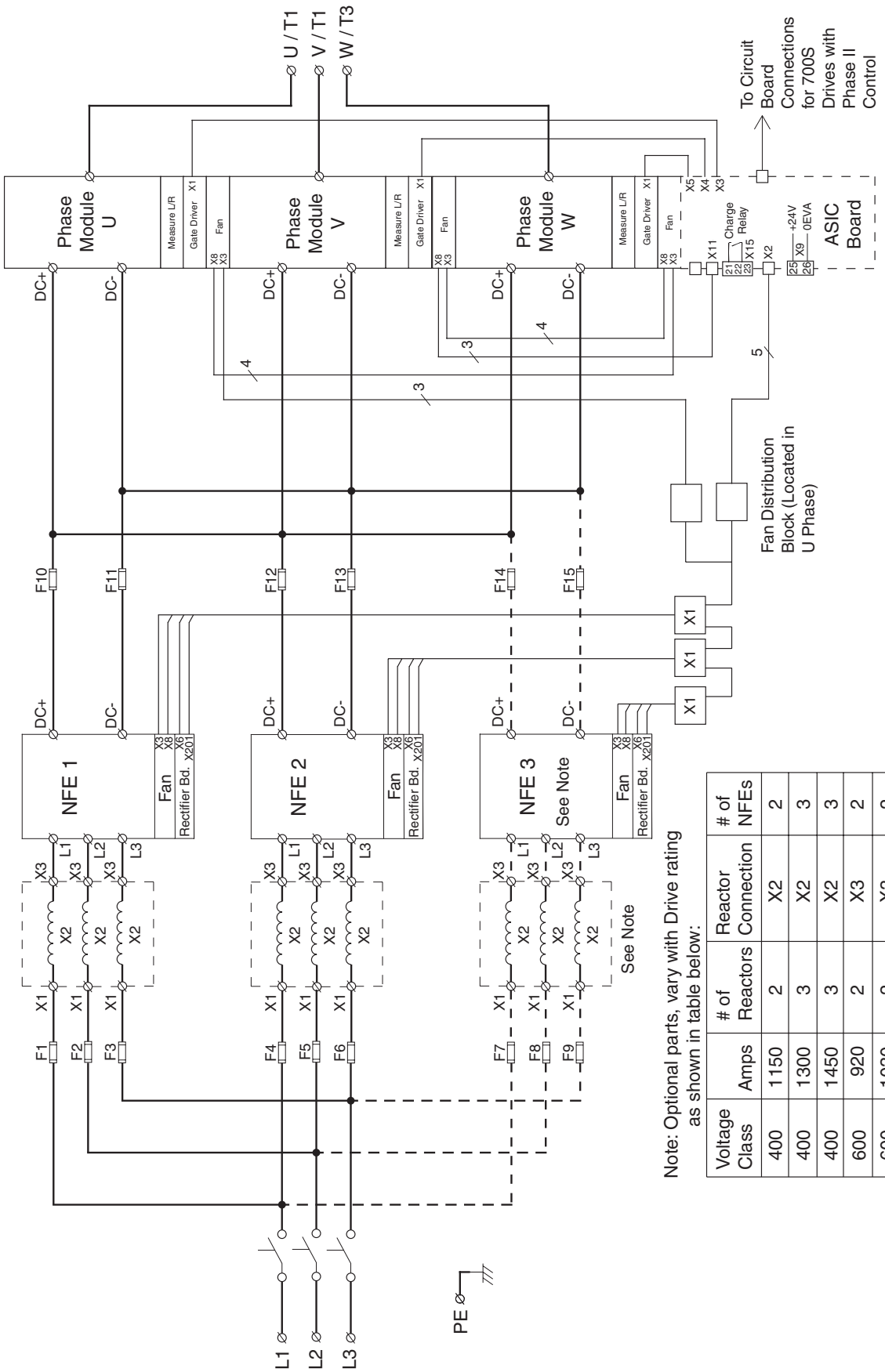
The following list contains the basic service tools needed for repair and maintenance measurements.

Item	Description	Details
1	Oscilloscope	Portable, digitizing, dual channel scope, with isolation
2	Current clamp	1000A(ac, rms), signal output
3	Soldering station	Soldering / de soldering
4	Adjustable power supply	0...1300Vdc, 1A, adjustable current limit. Efore LPS 750-HV or equivalent.
5	Adjustable power supply	0...690Vac (+10%), 10A, three phase, galvanic isolation
6	Multi meter	Digital multi meter, capable of ac and dc voltage, continuity, resistance, capacitance measurements, and forward diode bias tests. Fluke model 87 III or equivalent.
7	Insulation tester	1000Vdc
8	Torque wrench	1...12Nm
9	Torque wrench	6...50Nm
10	box wrench	7mm, 8mm, 10mm, 13mm, 17mm, 19mm, 22mm
11	socket extension	230mm
12	Wrench	7mm, 8mm, 10mm, 13mm, 17mm, 19mm, 22mm
13	Allen wrench	
14	Wire cutter	
15	Nose pliers	
16	Crimping tools	For cable terminals 1,5...240
17	Angle wrench	
18	Screw driver	
19	*Flat nose	7*2(mm)
20	*POZIDRIV	1, 2, 3
21	*Phillips	1, 2, 3
22	*Torx	25
23	Hexagonal wrench	4, 5, 6
24	ESD-protected place of work	Working surface, Floor covering, seat and ground connections
25	ESD-protective clothing	Wrist wrap, shoes, overall clothing (coat)

Item	Description	Details
26	Power supply (service)	Capacity of three phase service 400/500/690Vac, 30A
27	20-MAINSTND maintenance stand	Maintenance stand for removing power structure from drive cabinet
28	Fiber-optic repair kit	Agilent HFBR-4593 Polishing Kit, consisting of a Polishing Fixture, 600 grit abrasive paper and 3 mm pink lapping film (3M Company, OC3-14). For Agilent HFBR-4532 latching connectors and HFBR-RL cable. Refer to Agilent publications 5988-9777EN and 5988-3625EN.

Schematics

List of Schematic Diagrams



Note: Optional parts, vary with Drive rating as shown in table below:

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 B.1 Circuitry Block Diagram for Drives with AC Input

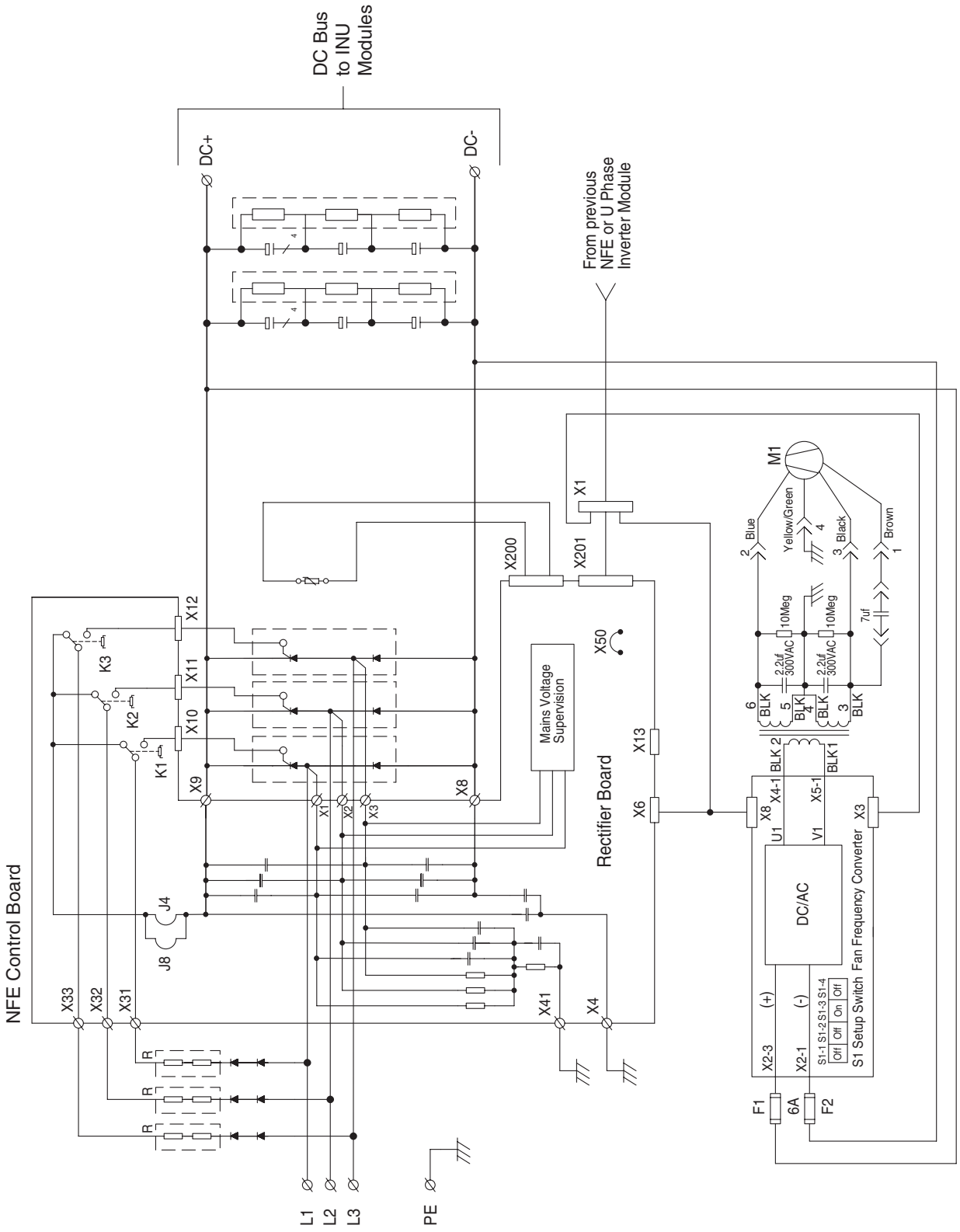


Figure B.2 Rectifying Module Circuitry for Drives with AC Input

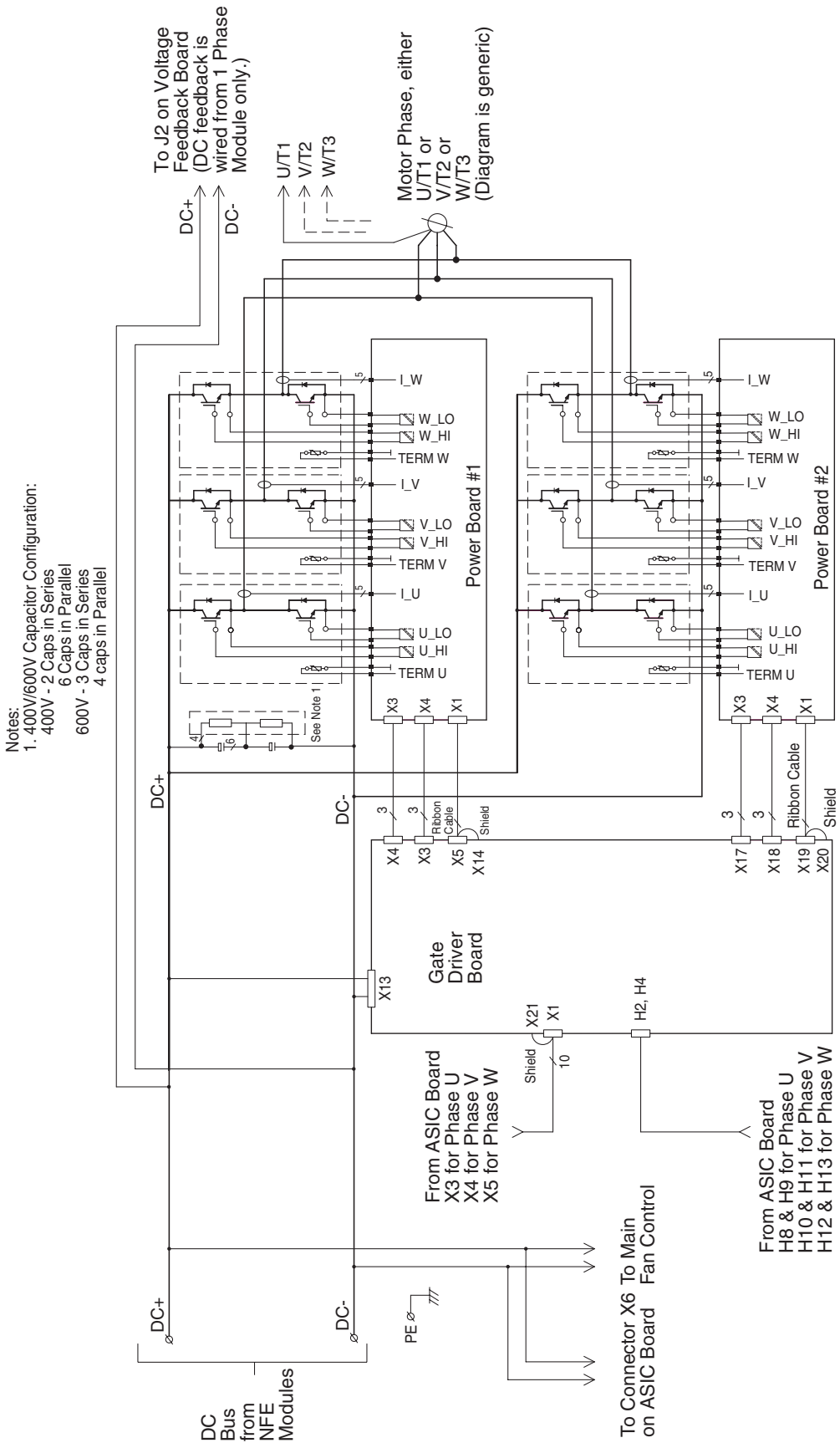


Figure B.3 Power Module Circuitry for Drives with AC Input

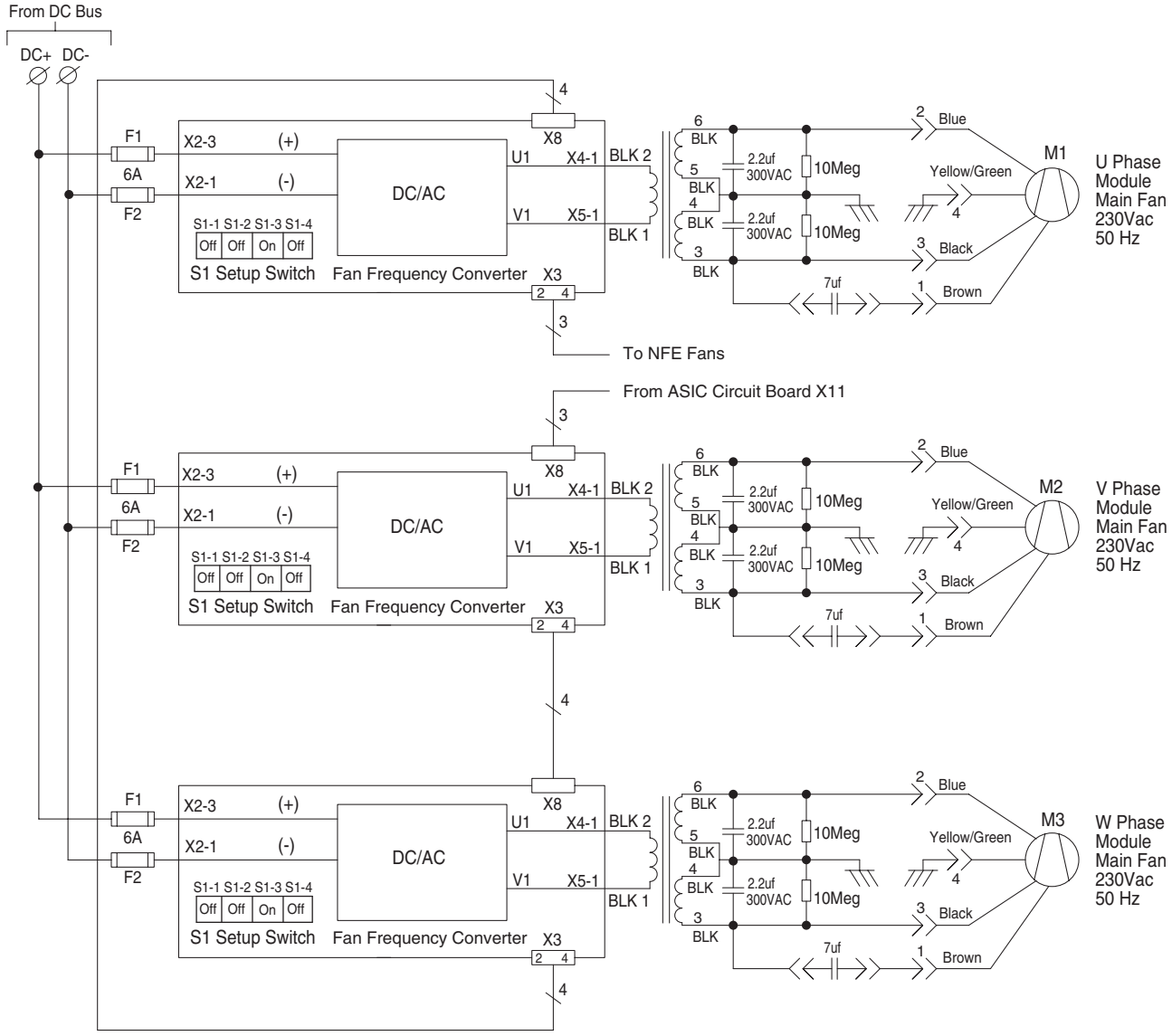


Figure B.4 Power Module Main Fan Connections for Drives with AC Input

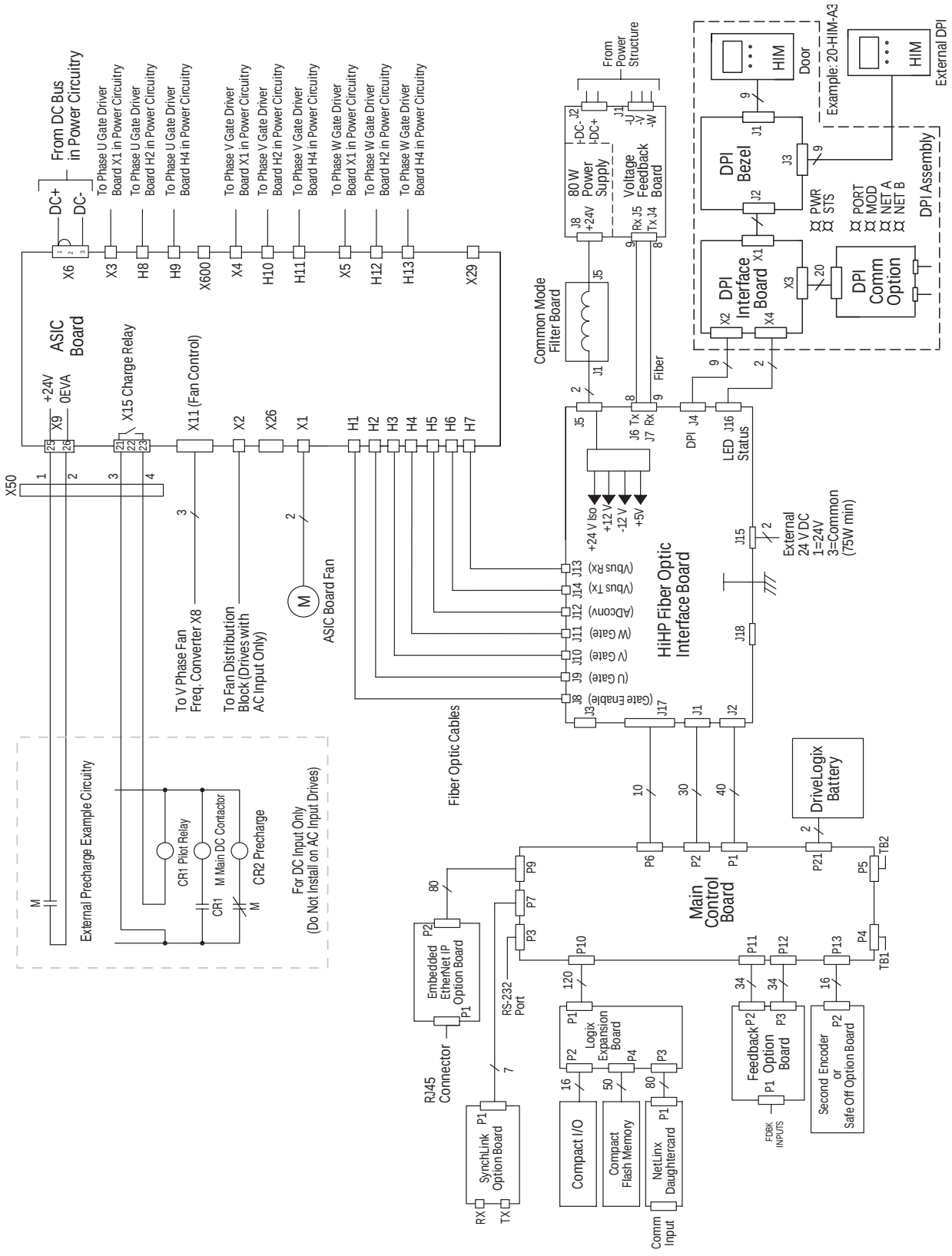


Figure B.5 Circuit Board Connections for 700S Drives with Phase II Control

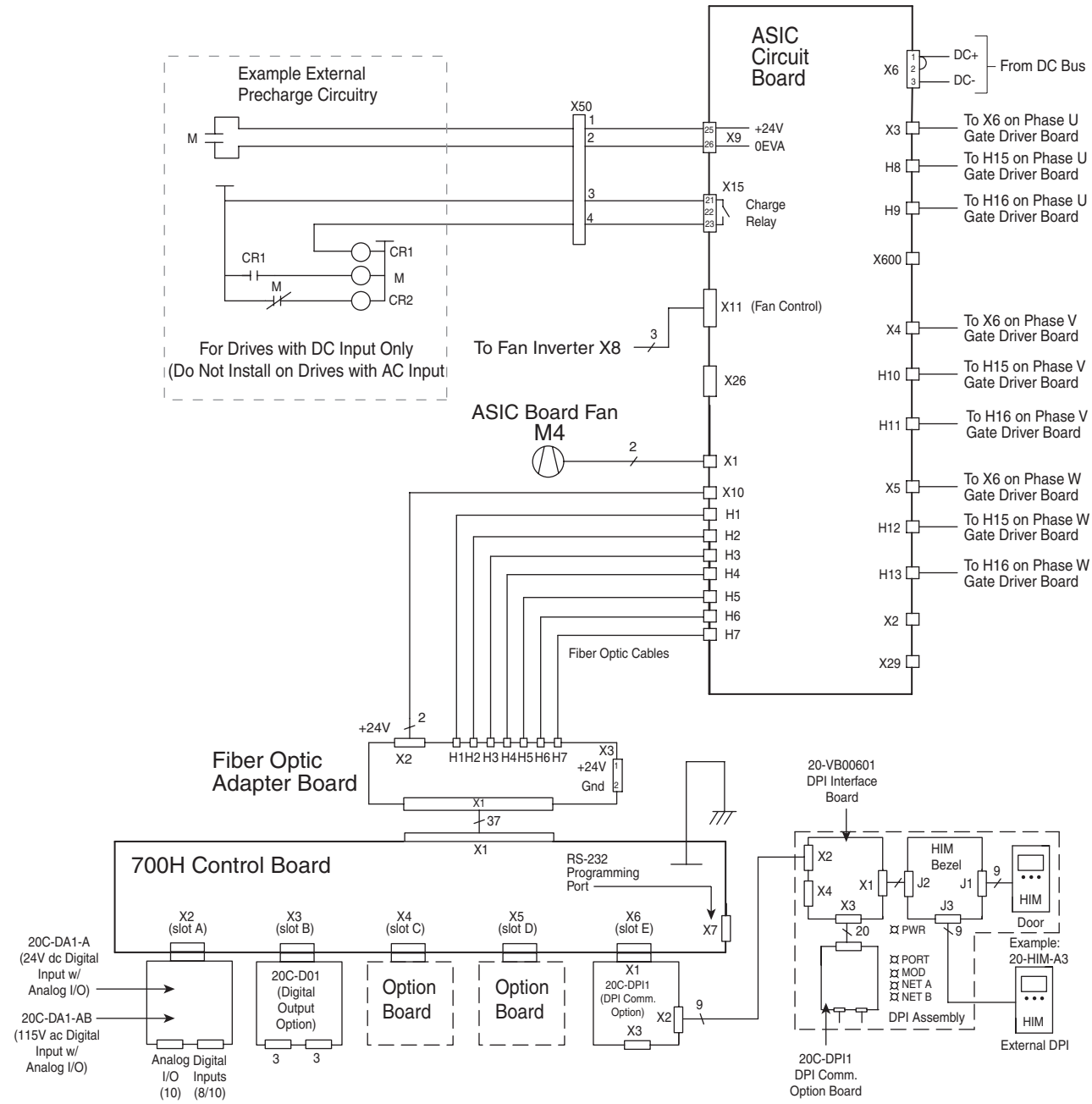


Figure B.6 Circuit Board Connections for 700H Drives

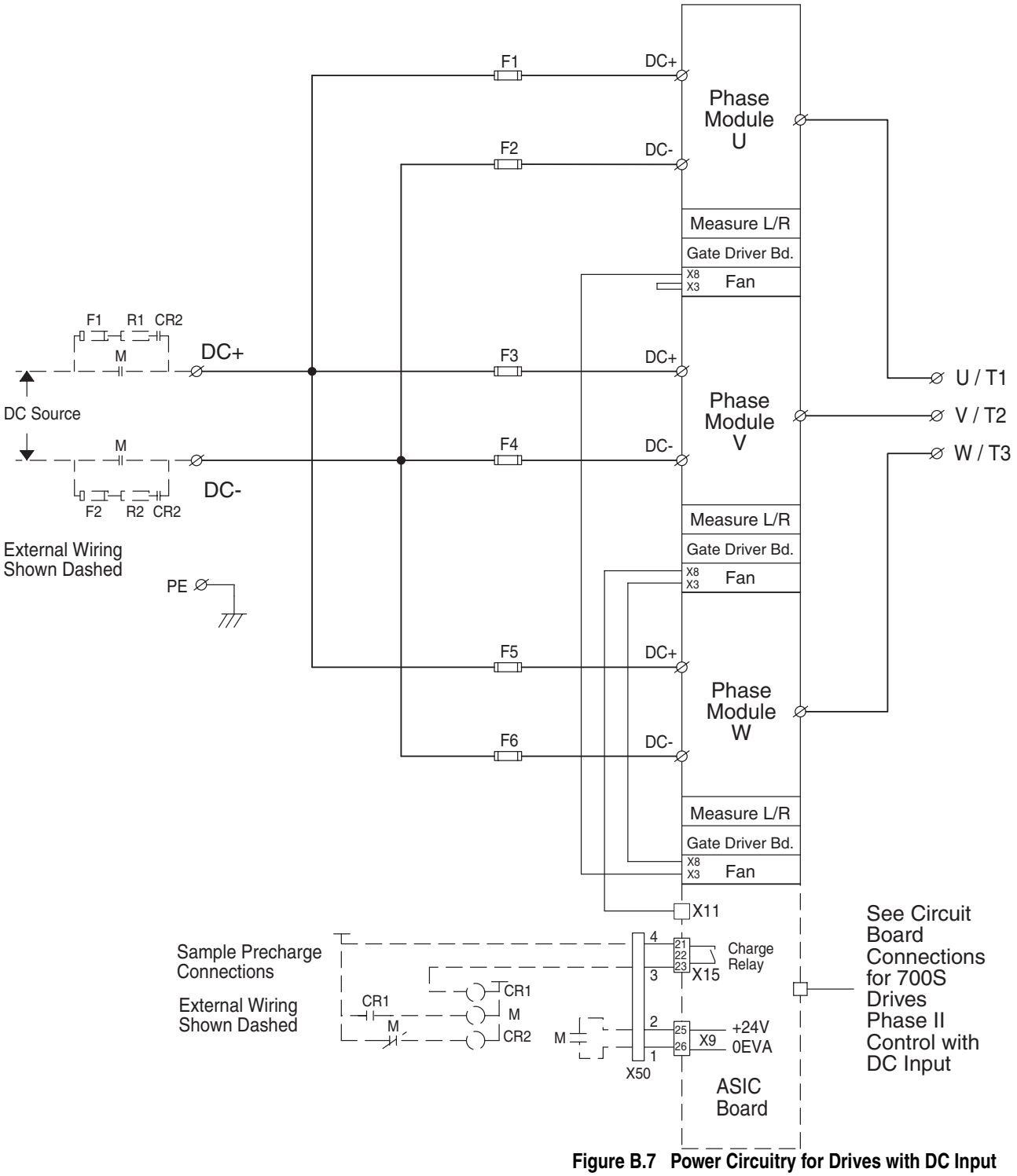


Figure B.7 Power Circuitry for Drives with DC Input

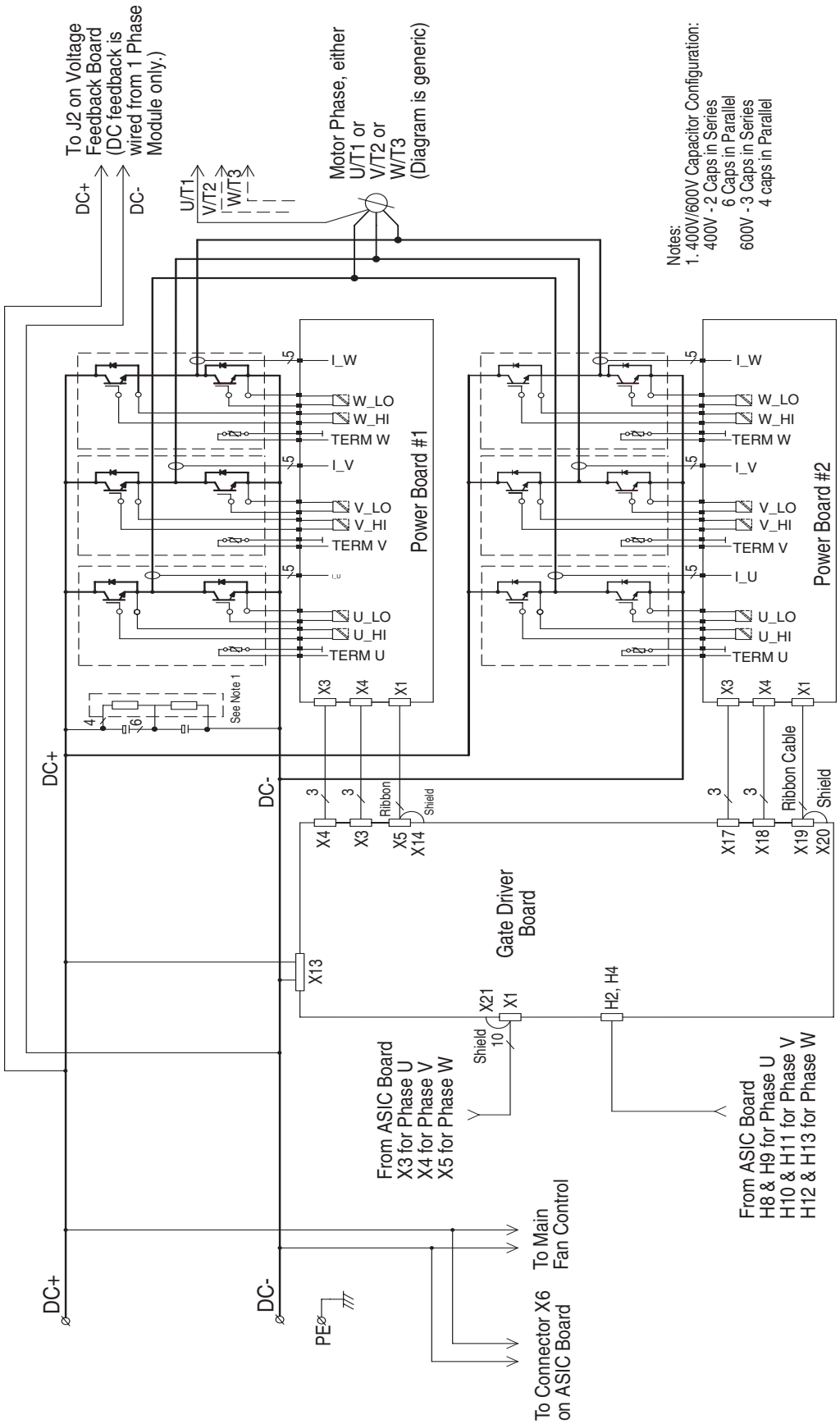


Figure B.8 Power Module Circuitry for Drives with DC Input

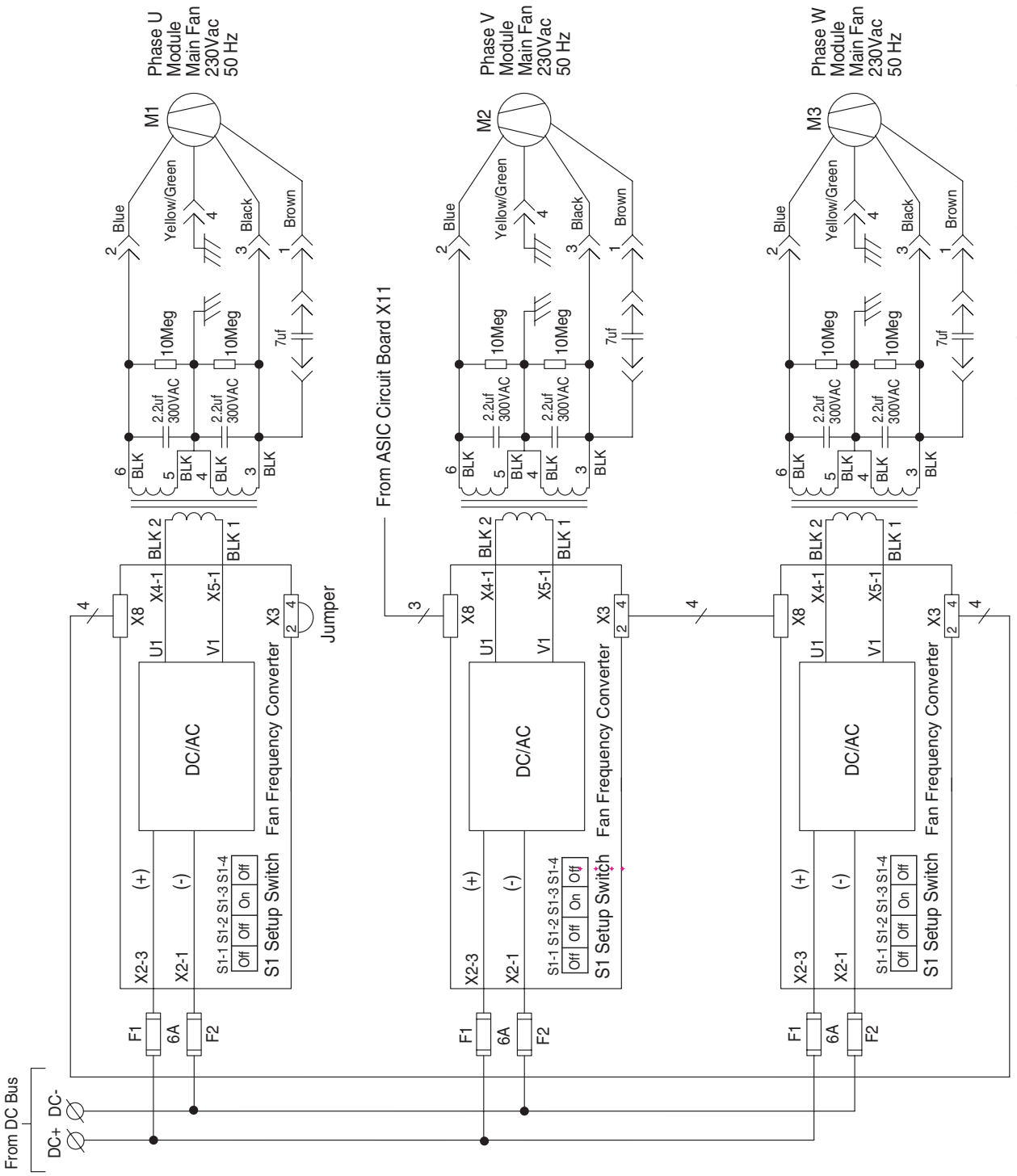


Figure B.9 Main Fan Connections for Drives with DC Input

Connector Descriptions

Circuit Board Connections

The following tables detail the connection points for the frame 13 PowerFlex 700S and 700H ac input drives circuit boards and components.

Figure C.1 ASIC Board Connectors

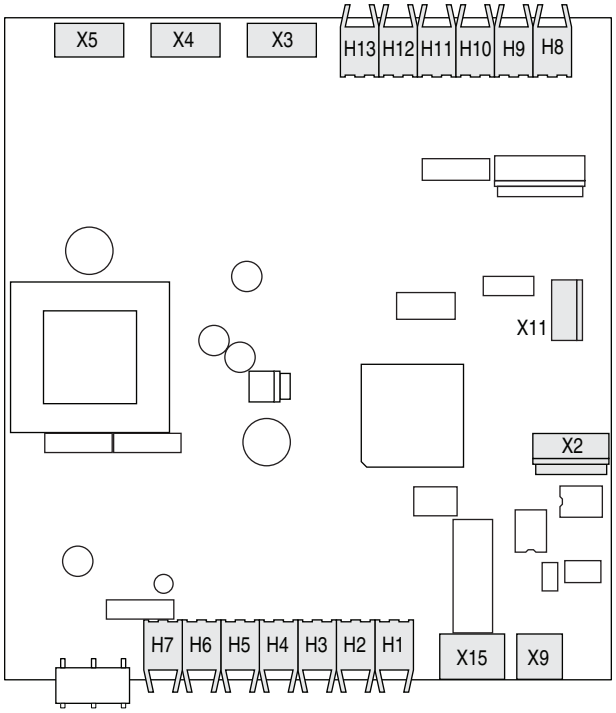
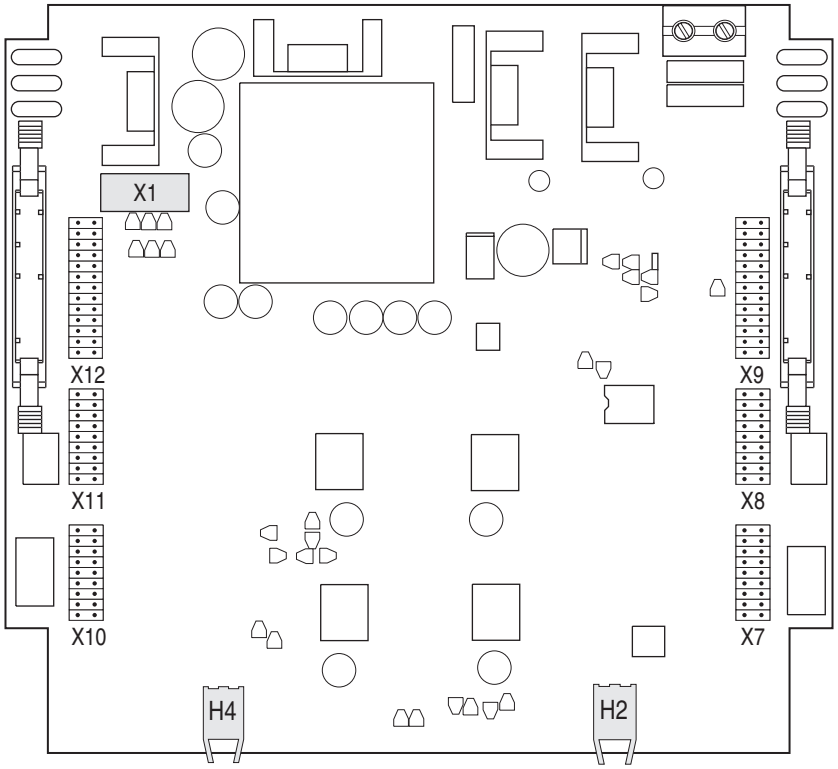


Figure C.2 Gate Driver Board Connectors



Note: For Footnotes, see page C-3.

Table C.A ASIC Board to Gate Driver Board - Phase U Connections

From ASIC Board Connector - Pin	Signal Description	To Gate Driver Board Connector - Pin
X3-1	U_Feedback	X1-1
X3-2	U_Power_OK	X1-2
X3-3	U_DTR(1)	X1-3
X3-4	U_ETR(2)	X1-4
X3-5	U_ITR(3)	X1-5
X3-6	U_DC-	X1-6
X3-7	UI	X1-7
X3-8	U_DC-_I	X1-8
X3-9	U_TEMP	X1-9
X3-10	U_DC-T	X1-10
H8 (fiber optic)	UH or Gate Top	H2 (fiber optic)
H9 (fiber optic)	UL or Gate Bottom	H4 (fiber optic)

Table C.B ASIC Board to Gate Driver Board - Phase V Connections

From ASIC Board Connector - Pin	Signal Description	To Gate Driver Board Connector - Pin
X4-1	V_Feedback	X1-1
X4-2	V_Power_OK	X1-2
X4-3	V_DTR(1)	X1-3
X4-4	V_ETR(2)	X1-4
X4-5	V_ITR(3)	X1-5
X4-6	V_DC-	X1-6
X4-7	VI	X1-7
X4-8	V_DC-_I	X1-8
X4-9	V_TEMP	X1-9
X4-10	V_DC-T	X1-10
H10 (fiber optic)	VH or Gate Top	H2 (fiber optic)
H11 (fiber optic)	VL or Gate Bottom	H4 (fiber optic)

Table C.C ASIC Board to Gate Driver Board - Phase W Connections

From ASIC Board Connector - Pin	Signal Description	To Gate Driver Board Connector - Pin
X5-1	W_Feedback	X1-1
X5-2	W_Power_OK	X1-2
X5-3	W_DTR(1)	X1-3
X5-4	W_ETR(2)	X1-4
X5-5	W_ITR(3)	X1-5
X5-6	W_DC-	X1-6
X5-7	WI	X1-7
X5-8	W_DC-_I	X1-8
X5-9	W_TEMP	X1-9
X5-10	W_DC-T	X1-10
H12 (fiber optic)	WH or Gate Top	H2 (fiber optic)
H13 (fiber optic)	WL or Gate Bottom	H4 (fiber optic)

(1) DTR = N Desat

(2) ETR = Phase I^2T

(3) ITR = Phase Overcurrent

Figure C.3 Rectifier/Precharge Circuit Board Connectors

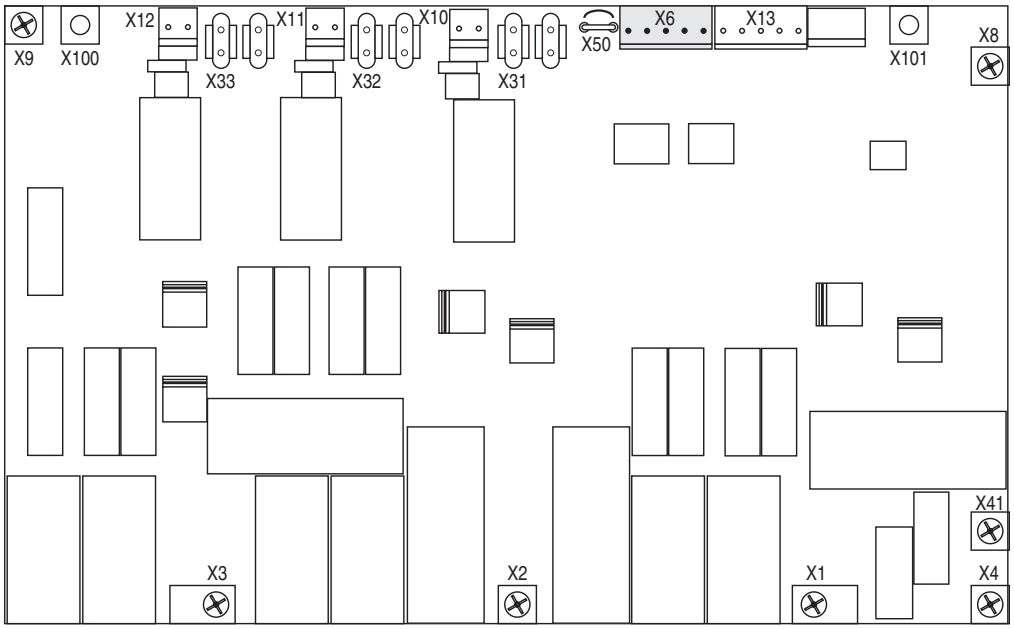


Table C.D ASIC Board to Rectifier/Precharge Circuit Board Connections

From ASIC Board Connector - Pin	Signal Description	Through Connector - Pin[(1)]	To Rectifier/Precharge Board Connector - Pin
X2-1	SWTS_DRV	X1-5	X6-1
X2-2	SWTS_FB	X1-6	X6-2
X2-3	W_DTR	X1-7	X6-3
X2-4	Mains Fault	X1-11	X6-4
X2-5	+24V	X1-12	X6-5

(1) The signals enter connector X1 for NFE1 and on to it's Rectifier/Precharge Circuit board, and also feeds connector X1 for NFE2 and onto it's Rectifier/Precharge Circuit board, and also feeds connector X1 for NFE3 and onto it's Rectifier/Precharge Circuit board (if present).

Figure C.4 PowerFlex 700H Fiber Optic Adapter Circuit Board Connectors

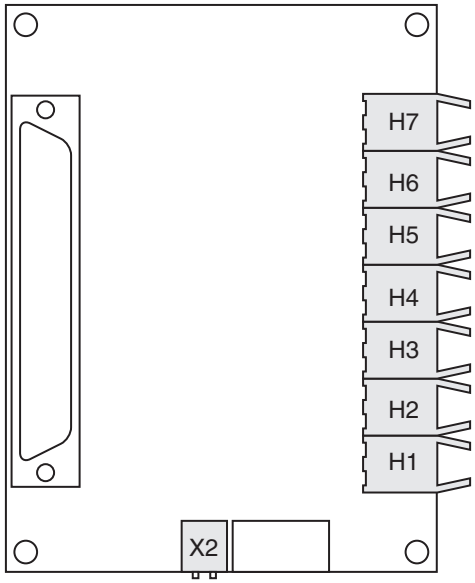


Table C.E PowerFlex 700H Fiber Optic Adapter Board to ASIC Circuit Board Connections

700H Fiber Optic Aspater Connector	Type	Signal Description: Reference to ASIC Board	Type	ASIC Board Fiber Connector (1)
H1	TX	Gate_Enable	RX	H1
H2	TX	U_Gate	RX	H2
H3	TX	V_Gate	RX	H3
H4	TX	W_Gate	RX	H4
H5	TX	A/D Convert	RX	H5
H6	TX	VBUS_RX	RX	H6
H7	RX	VBUS_TX	TX	H7
X2	From	+24V DC Power	To	X10

(1) Refer to Figure C.1 on page C-1 for ASIC board fiber-optic connectors.

Figure C.5 PowerFlex 700S High Power Fiber Optic Interface Circuit Board Connectors

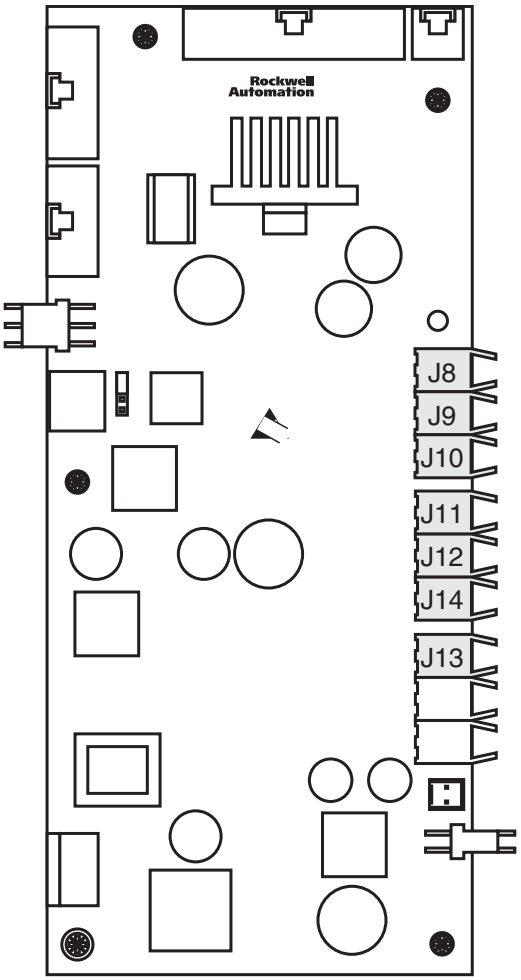


Table C.F PowerFlex 700S High Power Fiber Optic Interface Circuit Board to ASIC Circuit Board Fiber Optic Connections

Interface Board Fiber Optic Connector	Type	Signal Description: Reference to ASIC Board	Type	ASIC Board Fiber Connector (1)
J8	TX	Gate_Enable	RX	H1
J9	TX	U_Gate	RX	H2
J10	TX	V_Gate	RX	H3
J11	TX	W_Gate	RX	H4
J12	TX	A/D Convert	RX	H5
J14	TX	VBUS_RX	RX	H6
J13	RX	VBUS_TX	TX	H7

(1) Refer to Figure C.1 on page C-1 for ASIC board fiber-optic connectors.

Hardware Connections

Figure C.6 Fan Inverter Circuit Board Connectors

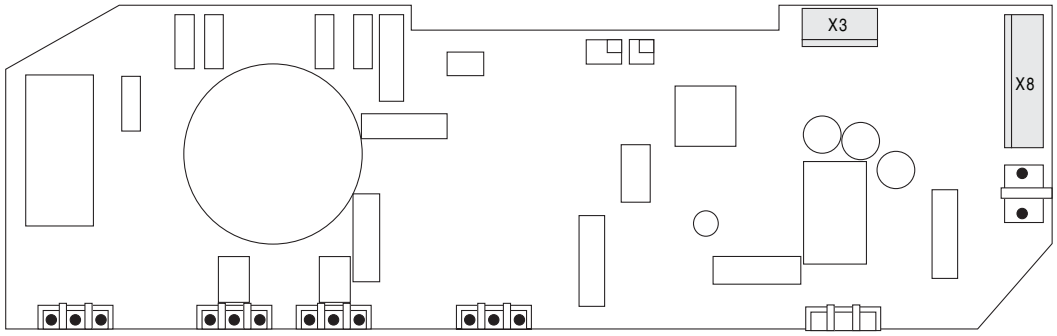


Table C.G ASIC Board - Phase V Fan Inverter Board Connections

ASIC Board Connector(1)		Pin Number	Signal Description		Pin Number	Phase V Fan Inverter Board Connector
X11	From	2	ASIC_+15V	To	2	X8
	From	3	FAN_CONTROL	To	3	
	To	4	FAN_ALARM	From	7	

(1) Refer to Figure C.1 on page C-1 for ASIC board connectors.

Table C.H Phase V Fan Inverter Board - Phase W Fan Inverter Board Connections

Phase V Fan Inverter Board Connector		Pin Number	Signal Description		Pin Number	Phase W Fan Inverter Board Connector
X3	From	2	+15V	To	2	X8
	From	3	FAN_CONTROL NEXT	To	3	
	To	4	FAN_ALARM	From	7	

Table C.I Phase W Fan Inverter Board - Phase U Fan Inverter Board Connections

Phase W Fan Inverter Board Connector		Pin Number	Signal Description		Pin Number	Phase U Fan Inverter Board Connector
X3	From	2	+15V	To	2	X8
	From	3	FAN_CONTROL NEXT	To	3	
	To	4	FAN_ALARM	From	7	

Table C.J Phase U Fan Inverter Board - NFE 1 Fan Inverter Board Connections

Phase U Fan Inverter Board Connector		Pin Number	Signal Description	NFE 1 Connector - Pin		Pin Number	NFE 1 Fan Inverter Board Connector
X3	From	2	+15V	X1-8	To	2	X8
	From	3	FAN_CONTROL NEXT	X1-9	To	3	
	To	4	FAN_ALARM	X1-10	From	7	

Table C.K NFE 1 Fan Inverter Board - NFE 2 Fan Inverter Board Connections

NFE 1 Fan Inverter Board Connector		Pin Number	Signal Description		NFE 1 Connector - Pin		NFE 2 Connector - Pin		Pin Number	NFE 2 Fan Inverter Board Connector
X3	From	2	+15V	To	X1-2	To	X1-8	To	2	X8
	From	3	FAN_CONTROL NEXT	To	X1-3	To	X1-9	To	3	
	To	4	FAN_ALARM	From	X1-13	From	X1-10	From	7	

Table C.L NFE 2 Fan Inverter Board - NFE 3 Fan Inverter Board Connections

NFE 2 Fan Inverter Board Connector		Pin Number	Signal Description		NFE 2 Connector - Pin		NFE 3 Connector - Pin		Pin Number	NFE 3 Fan Inverter Board Connector
X3	From	2	+15V	To	X1-2	To	X1-8	To	2	X8
	From	3	FAN_CONTROL NEXT	To	X1-3	To	X1-9	To	3	
	To	4	FAN_ALARM	From	X1-13	From	X1-10	From	7	

Table C.M NFE 3 Fan Inverter Board Connections

Signal Description	NFE 3 Fan Inverter Board Connector	Pin Number	Through NFE 3 Connector - Pin	Pin Number	NFE 3 Fan Inverter Board Connector	Signal Description
+15V	X3	2	X1-2	4	X3	FAN_ALARM
FAN_ALARM		4	X1-13	2		+15V

Figure C.7 X50 Terminal Block Connectors

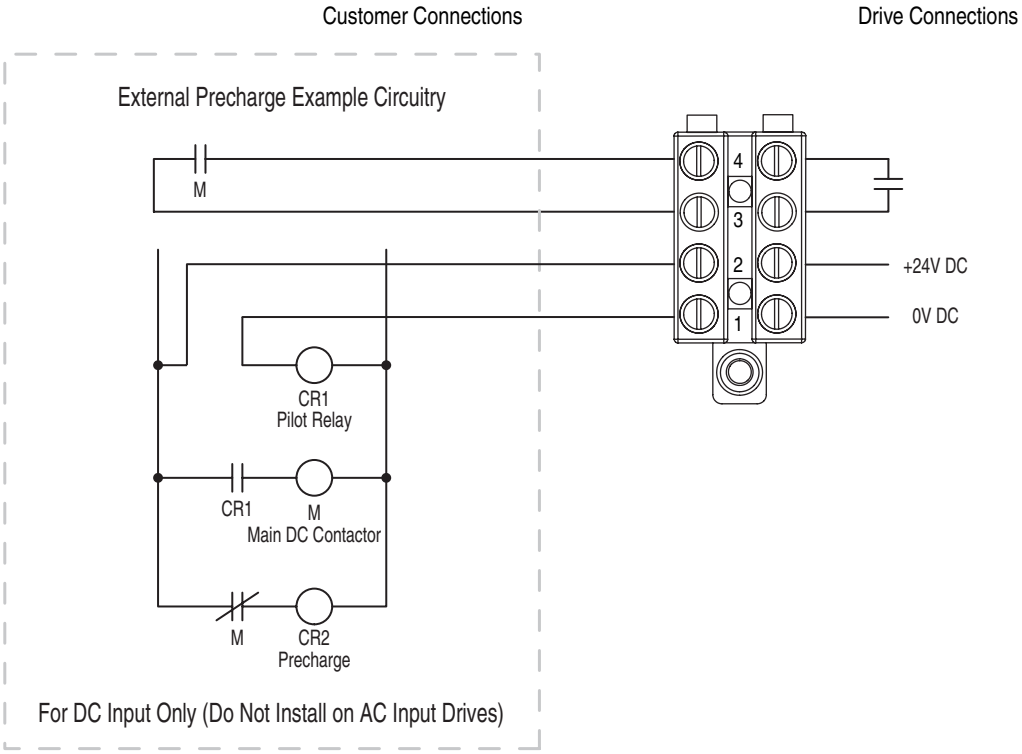


Table C.N ASIC Circuit board to X50 Terminal Block Connections

ASIC Board Connector[1]	Pin	X50 Terminal Terminal Block	Precharge Circuit Connection
X15	21	4	Charge Relay Contact
	23	3	Charge Relay Contact
X9	25	2	Precharge Complete Signal
	26	1	Precharge Complete Signal

(1) Refer to Figure C.1 on page C-1 for ASIC board connectors.

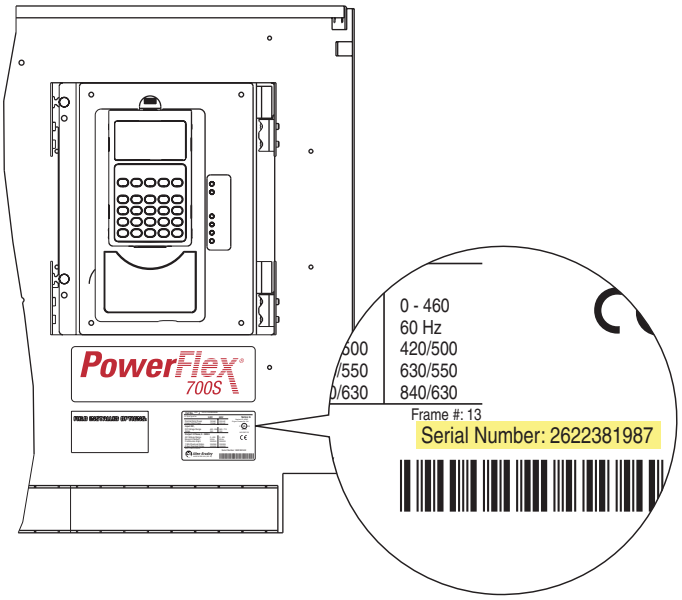
Notes:

Disassembly / Assembly Diagrams

Disassembly/Assembly Diagrams and Spare Parts Numbers

Diagrams on the following pages illustrate disassembly and assembly of the drive and its sub-systems and are followed by a list of spare part numbers where applicable.

When ordering spare parts, you must provide the serial number of the drive. The serial number is located on the data nameplate on the Control Frame just above the bar code.



A complete list of spare parts for PowerFlex 700S drives is available on the Allen-Bradley web site at:
http://www.ab.com/support/abdrives/powerflex70/PF7ReleasedParts.pdf

Figure D.1 Power Structure Assembly

ATTENTION: The sheet metal cover and mounting screws on the ASIC Board located on 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.

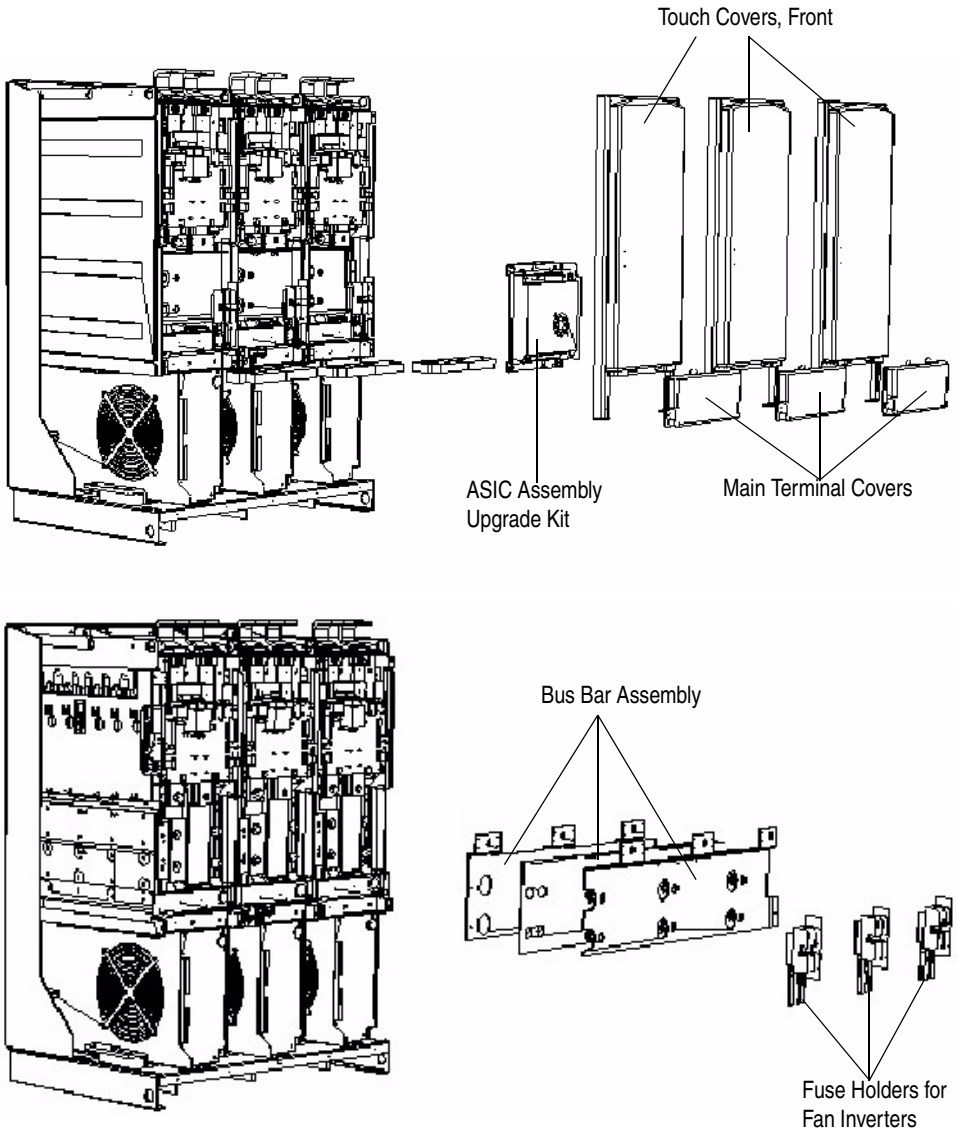


Table D.A Power Structure Assembly Part Numbers

Part Name	Part No.
ASIC Assembly Upgrade Kit (without ASIC Board)	20-FR10850
Bus Bar Assembly	NA
Fuse Holders for Fan Inverters	20-PP01094
Main Terminal Covers	NA
Touch Covers, Front	NA

Figure D.2 Power Structure Block Assembly

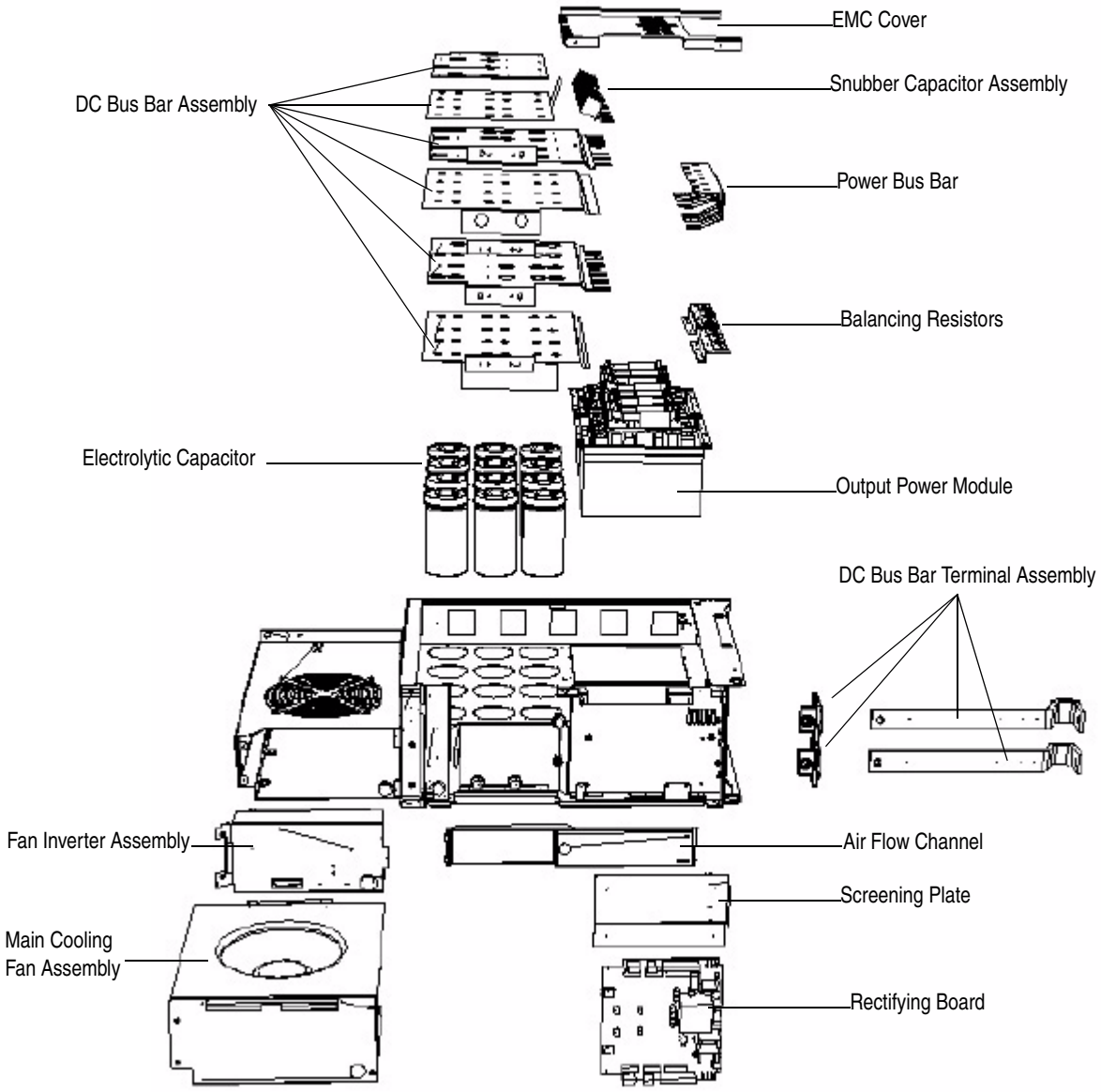


Table D.B Power Structure Block Assembly Part Numbers

Part Name		Part No.
Air Flow Channel		NA
Balancing Resistors		NA
DC Bus Bar Assembly		NA
DC Bus Bar Terminal Assembly		NA
Electrolytic Capacitor	ELKO 3300μf 420V for 400/480V Drives	20-PP01005
	ELKO 5600μf 420V for 600/690V Drives	20-PP01099
EMC Cover		NA
Fan Inverter		20-FI13301
Gate Driver Board	400/480V	SK-H1-GDB1-F13D
	600/690V	SK-H1-GDB1-F13E
Main Cooling Fan Assembly		20-FI13300

Part Name		Part No.
Output Power Module	400/480V	NA
	600/690V	NA
Power Bus Bar		NA
Screening Plate (for Gate Driver Board)		NA
Snubber Capacitor Assembly		NA

Figure D.3 Rectifying Structure Assembly

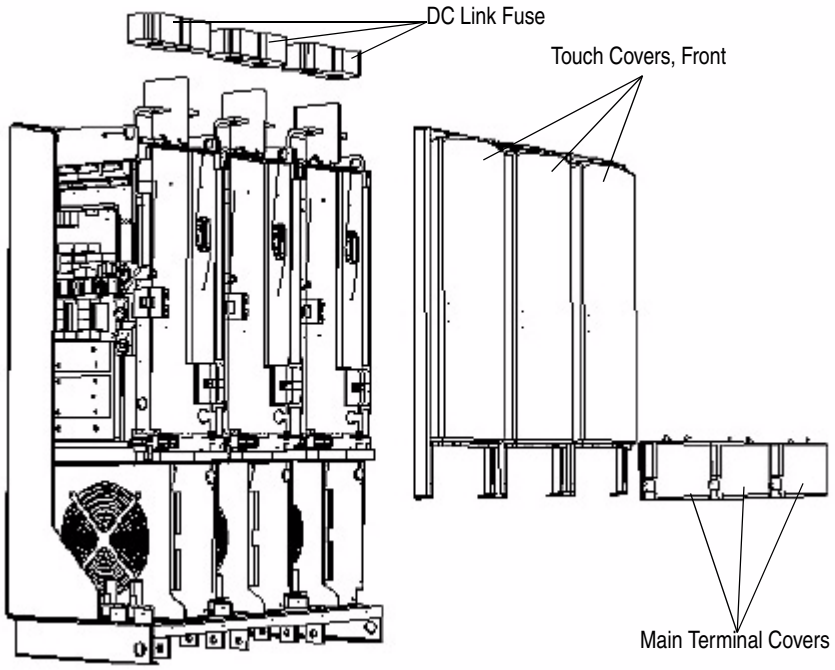


Table D.C Rectifying Structure Assembly Part Numbers

Part Name			Part No.
DC Link Fuse	400/480V	1150A	SK-H1-SFUSE1-F13
		1300A	SK-H1-SFUSE1-F13
		1450A	SK-H1-SFUSE1-F15
	600/690V	920A	SK-H1-SFUSE2-F13
		1030A	SK-H1-SFUSE2-F13
		1180A	SK-H1-SFUSE2-F13
Main Terminal Covers			NA
Touch Covers, Front			NA

Figure D.4 Rectifying Structure Block Assembly

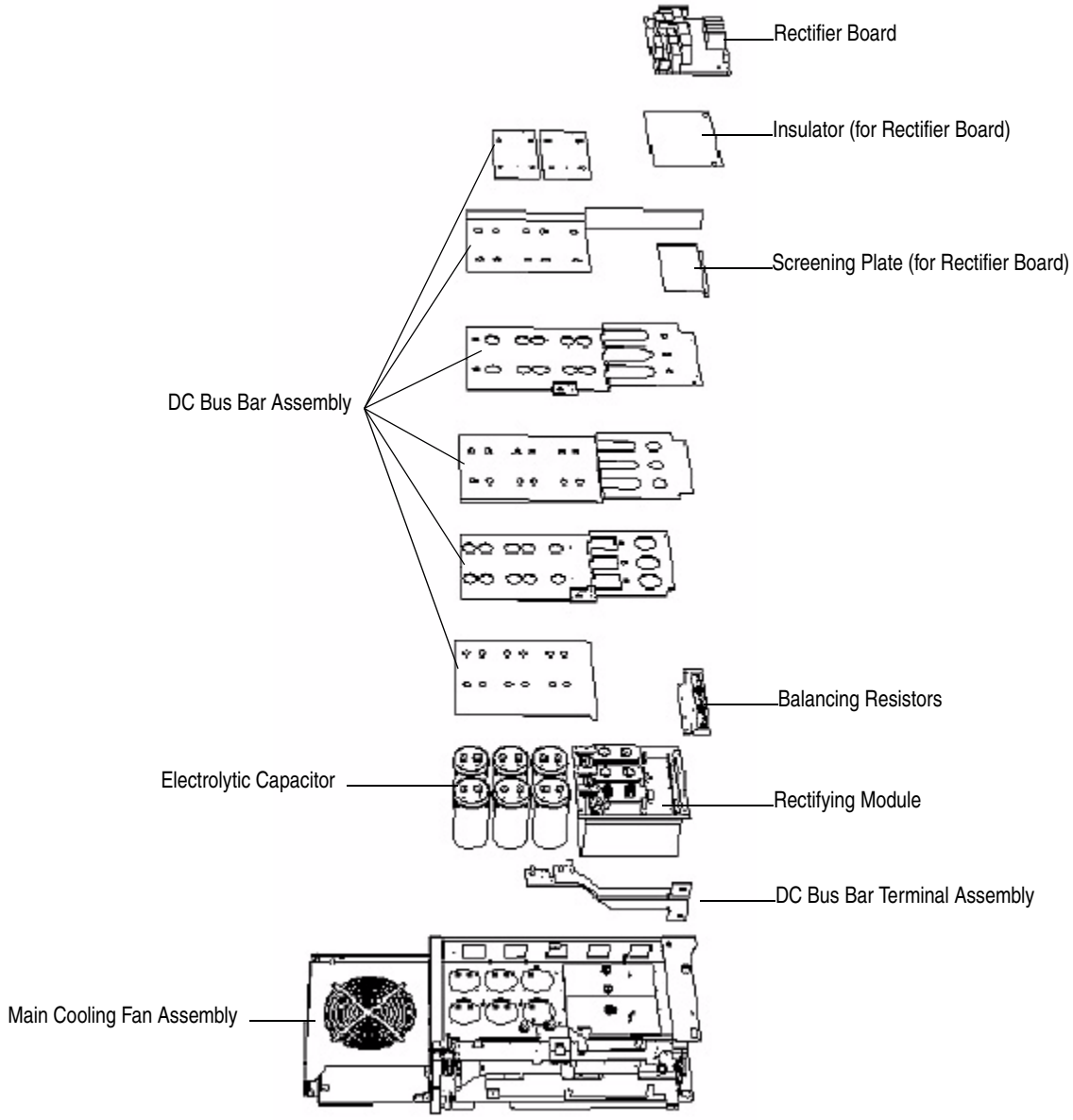


Table D.D Rectifying Structure Block Assembly Part Numbers

Part Name		Part No.
Balancing Resistors		NA
DC Bus Bar Assembly		NA
DC Bus Bar Terminal Assembly		NA
Electrolytic Capacitor	ELKO 3300μf 420V for 400/480V Drives	20-PP01005
	ELKO 5600μf 420V for 600/690V Drives	20-PP01099
Insulator (for Rectifier Board)		NA
Main Cooling Fan Assembly		20-FI13300
Rectifier Board	400/480V	SK-H1-GDB1-F13D
	600/690V	SK-H1-GDB1-F13E
Rectifying Module	400/480V	20-FI13306
	600/690V	20-FI13306
Screening Plate (for Rectifier Board)		NA

Figure D.5 Fan Inverter Assembly for Power Structure

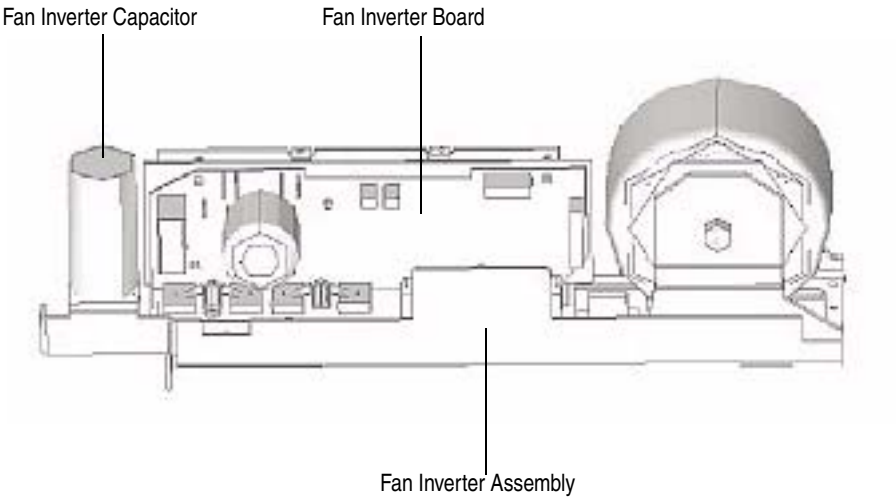


Table D.E Fan Inverter Assembly Part Numbers

Part Name	Part No.
Fan Inverter Assembly, Left	NA
Fan Inverter Board	20-FI13301
Fan Inverter Capacitor 7μf 450V ac	NA

Figure D.6 ASIC Assembly

ATTENTION: The sheet metal cover and mounting screws on the ASIC Board located on 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.

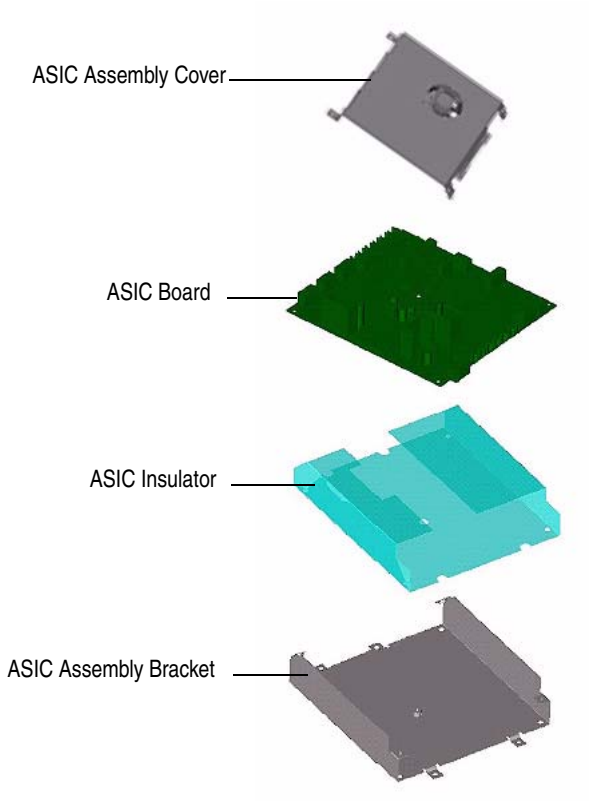


Table D.F ASIC Assembly Part Numbers

Part Name	Part No.
ASIC Assembly Bracket	Included in 20-FR10850
ASIC Assembly Cover	
ASIC Assembly Insulator	
ASIC Board for 400/480V Drives	SK-H1-ASICBD-D1150 SK-H1-ASICBD-D1300 SK-H1-ASICBD-D1450
ASIC Board for 600/690V Drives	SK-H1-ASICBD-E920 SK-H1-ASICBD-E1030 SK-H1-ASICBD-E1180

Figure D.7 Main Fan Assembly

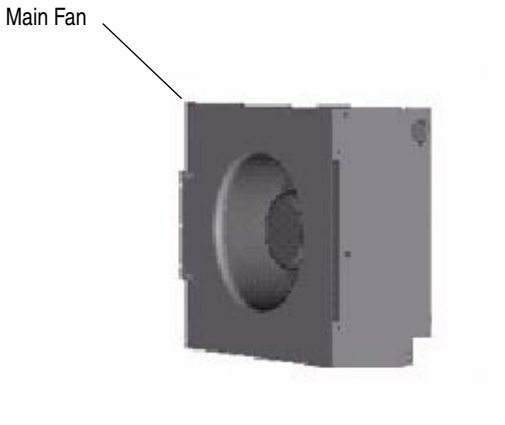


Table D.G Main Fan Assembly Part Numbers

Part Name	Part No.
Main Fan 230W	NA

Numerics

A

B

C

D

F

G

H

S

T

U

V

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