PowerFlex® 700S / 700H High Performance AC Drive - Frame 14

Allen-Bradley

Hardware Service Manual

1000…1600 kW (400V), 1500…2300 HP (480V),
1500…2000 kW (690V), 1600…2400 HP (600V)

Allen-Bradley • Rockwell Software

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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 **http://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 a hazard, and 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

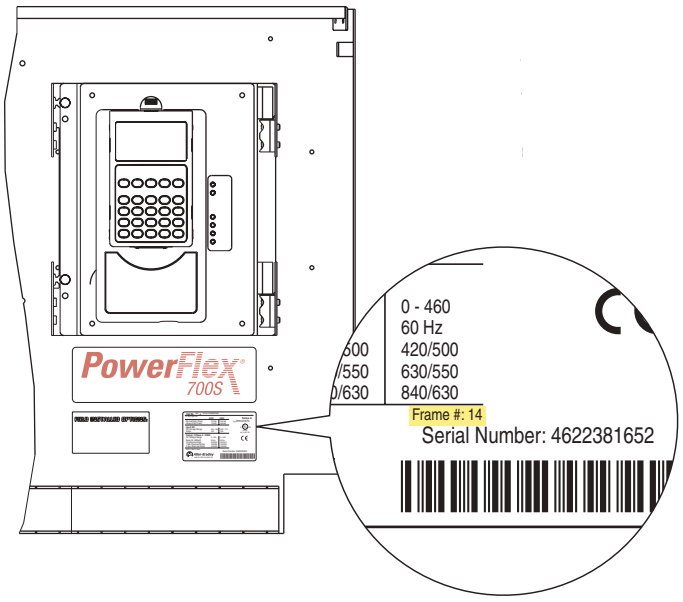
Overview

Who Should Use this Manual?

This manual is intended for qualified service personnel responsible for troubleshooting and repairing frame 14 PowerFlex 700S and 700H AC drives. You should have previous experience with, and an 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 14 PowerFlex 700S and 700H drives. Verify that you are working on a Frame 14 drive by checking the data nameplate on the control frame. The frame number is printed just above the serial number.



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
Installation Instructions - PowerFlex 700S and 700H Drives	PFLEX-IN006...
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 - SynchLink Board for PowerFlex 700S Drives with Phase II Control	20D-IN010…
Installation Instructions - PowerFlex 700S /700H High Power Maintenance Stand	20D-IN014...
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 (Examples)

"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/*).

Precautions

Qualified Personnel

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.

Personal Safety

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

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.

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.

Product Safety

ATTENTION: This drive contains **ESD** (Electrostatic Discharge) sensitive parts and assemblies. Static control precautions are required when installing, testing, servicing or repairing this assembly. Component damage may result if ESD control procedures are not followed. If you are not familiar with static control procedures, reference 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.

Troubleshooting and Error Codes

Viewing the 700S Diagnostic LEDs

The PowerFlex 700S contains a drive power and status LED, communication LEDs, and SynchLink LEDs (if the SynchLink option board is installed) that provide an indication of certain drive faults. See Table 1.A on page 1-2 for a description of the power and status LED indicators. 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] (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!

Figure 1.1 PowerFlex 700S HIM and Status LEDs

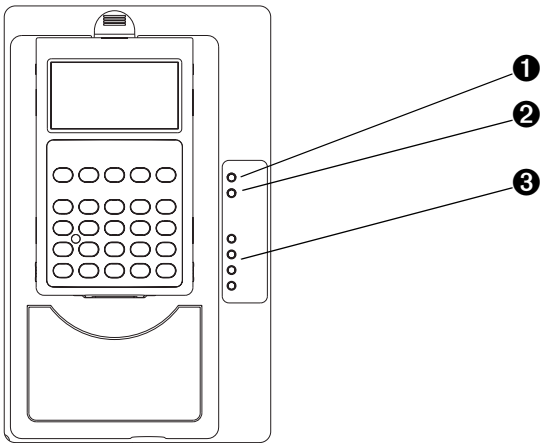


Table 1.A PowerFlex 700S Status Indicator Descriptions

			#	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 is ready but not running and no faults are present.
						Steady	Drive is running and no faults are present.
					Yellow	Flashing	When running, a Type 2 (non-configurable) alarm condition exists and the 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 and the 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 a flash upgrade.
	Control Assembly	Communications	❸	PORT	Refer to the *User Manual* for the appropriate Communication Adapter		Status of the DPI port internal communications (if present).
				MOD			Status of the communications module (when installed).
				NET A			Status of the network (if connected).
				NET B			Status of the 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.

Refer to Addressing 700S Faults on page 1-4 for more information.

Viewing the 700H Diagnostic LED

The control assembly on 700H drives contains a diagnostic LED which is visible through the cover and provides an indication of certain drive faults.

The control assembly is located in the upper, left-hand drive enclosure on the control frame.

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!

Figure 1.2 PowerFlex 700H Diagnostic LED

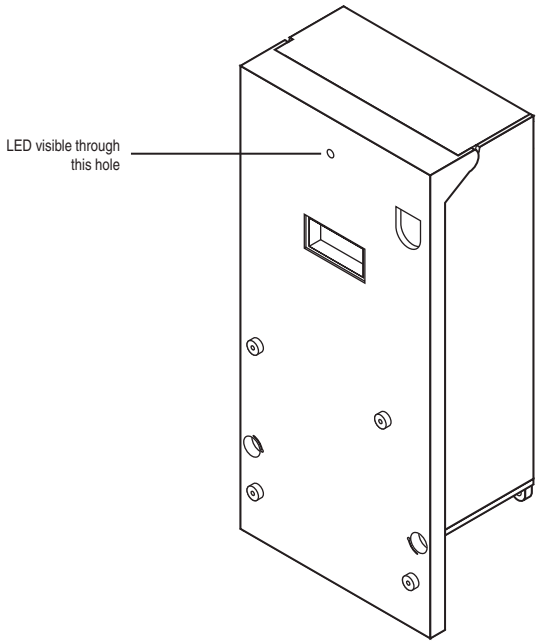


Table 1.B PowerFlex 700H Diagnostic LED Indications

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

Refer to Addressing 700H Faults on page 1-11 for more information on 700H drive faults.

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 700S Faults

No.	Name	Description	Action
1	Abs Ovespd Det	Motor speed has exceeded the limits set by Par 75 [Rev Speed Limit], Par 76[Fwd Speed Limit] and Par 335 [Abs OverSpd Lim]	1. Check to see if the encoder feedback polarity is correct. 2. Check to see if the drive is in torque mode, selected in Par 110 [Speed/TorqueMode] value 2 “Torque Ref”. If the drive is in torque mode, verify that there is a load present. 3. Verify min/max settings in Par 75 [Rev Speed Lim] and Par 76 [Fwd Speed Lim]. Check to see if the load is overhauling. If it is overhauling, turn the bus regulator off using Par 414 [Brake/Bus Cnfg] bit 2 “BusRef High”.
2	Vref Decel Fail	The value of Par 301 [Motor Spd Ref] has failed to decrease during a ramp to zero speed stop. This could possibly be due to a speed trim from Par 21 [Speed Trim 1], Par 22 [Speed Trim 2] or Par 23 [Speed Trim 3].	–
3	Encoder 0 Loss	One of the following has occurred on encoder 0: • missing encoder (broken wire) • quadrature error • phase loss	Reconnect encoder or replace encoder. Configured with Par 365 [Fdbk LsCnfg Pri], Par 366 [Fdbk LsCnfg Alt], and Par 367 [Fdbk LsCnfgPosit]
4	Encoder 1 Loss	One of the following has occurred on encoder 1: • missing encoder (broken wire) • quadrature error • phase loss	Reconnect encoder or replace encoder. Configured with Par 365 [Fdbk LsCnfg Pri], Par 366 [Fdbk LsCnfg Alt], and Par 367 [Fdbk LsCnfgPosit]
5	Opt Port 0 Loss	A fault on port 0 of the Hi-Resolution Encoder Feedback Option Card, MDI Option Card, Heidenhain, or Resolver Feedback Option Card has occurred. • Par 260 [Stegmann0 Status] displays the fault status for port 0 of the Hi-Resolution Encoder Feedback Option Card. • Par 264 [Heidenhain0 Stat] displays the fault status for port 0 of the Heidenhain Feedback Option Card. • Par 269 [Resolver0 Status] displays the fault status for port 0 of the Resolver Feedback Option Card.	1. Reconnect encoder or replace encoder 2. Reconnect option feedback card Configured with Par 365 [Fdbk LsCnfg Pri], Par 366 [Fdbk LsCnfg Alt], and Par 367 [Fdbk LsCnfgPosit]
6	Opt Port 1 Loss	The Linear sensor portion of the MDI feedback option card has detected a fault condition. • Par 286 [Linear1 Status] displays the fault status for linear portion of the MDI feedback Option Card.	1. Reconnect encoder or replace encoder 2. Reconnect option feedback card Configured with Par 365 [Fdbk LsCnfg Pri], Par 366 [Fdbk LsCnfg Alt], and Par 367 [Fdbk LsCnfgPosit]
7	Params Defaulted	All parameters are reset to default by user.	–

No.	Name	Description	Action
8	SLink HW Fail	A fault on loading SynchLink firmware into FPGA on Main Control board at power up.	Replace Main Control board
9	SLink Comm Fail	A SynchLink communication fault has occurred. • Par 902 [SL Error Status] displays SynchLink errors.	Verify the SynchLink configuration in: • Par 904 [SL Node Cnfg] • Par 905 [SL Rx CommFormat], and • Par 910 [SL Tx CommFormat] Reconnect SynchLink communication fibers Configured with par 384 [SL CommLoss Cnfg]
10	Drive Power Loss	• DC Bus voltage has fallen below the minimum value • Par 306 [DC Bus Voltage] displays bus voltage • Par 330 [Fault TP Data] displays the minimum value when Par 329 [Fault TP Sel] is set to five • The drive must first complete precharge before this check is made	Verify AC line power
11	Motor OLoad Trip	A motor overload trip has occurred. Par 308 [Output Current] is squared, scaled and integrated over time. When this integrated value exceeds 1.0, this Exception Event occurs. The integrator's output can be viewed in Par 330 [Fault TP Data] when Par 329 [Fault TP Sel] is set to 13 “Mtr OL Outpt”. The overload integration rate is affected by Par 336 [Motor OL Factor], Par 337 [Mtr I2T Curr Min], Par 338 [Mtr I2T Spd Min] and par 339 [Mtr I2T Calibrat].	1. Reduce mechanical load 2. Enter correct motor nameplate full load amps Par 2 [Motor NP FLA] Configured with Par 371 [Mtr OL Trip Cnfg]
12	Motor OLoad Pend	A motor overload is pending. Par 308 [Output Current] is squared, scaled and integrated over time. When this integrated value exceeds 0.5, this exception event occurs. The integrator's output can be viewed in Par 330 [Fault TP Data] when par 329 [Fault TP Sel] is set to 13 “Mtr OL Outpt”. The overload integration rate is affected by Par 336 [Motor OL Factor], Par 337 [Mtr I2T Curr Min], Par 338 [Mtr I2T Spd Min] and Par 339 [Mtr I2T Calibrat].	1. Reduce mechanical load 2. Enter correct motor nameplate full load amps Par 2 [Motor NP FLA] Configured with Par 371 [Mtr OL Trip Cnfg]
13	Motor Stalled	The motor has stalled. These three conditions have occurred at the same time for the amount of time specified in Par 373 [Motor Stall Time]: 1.) Drive is not stopped (Par 150 [Logic State Mach] not equal to zero) 2.) Drive is on limit (Par 304 [Limit Status] not equal to zero) 3.) Drive is at zero speed (Par 155 [Logic Status] / bit 13 “At Zero Spd” is set).	1. Increase torque limit 2. Reduce mechanical load Configured with Par 374 [Motor Stall Cnfg]
14	Inv OTemp Pend	Par 313 [Heatsink Temp] is within 10° C of maximum. View the maximum heat sink temperature in Par 348 [Drive OL TP Data] when Par 347 [Drive OL TP Sel] is set to 30 - “fMaxHsDegc”.	1. Reduce the mechanical load 2. Lower the ambient temperature Configured with Par 375 [Inv OT Pend Cnfg]
15	Inv OTemp Trip	Par 313 [Heatsink Temp] is above the maximum limit or temperature sensor has failed (shorted or open). See Par 346 [Drive OL Status] / bit 0 “NTC Shorted” and bit 1 “NTC Open”.	1. Reduce the mechanical load 2. Lower the ambient temperature
16	Inv OLoad Pend	The drive's operating point is approaching the intermittent current rating limitation. If output current remains at or above present levels, an inverter overload condition will occur.	Reduce the load on the drive Configured with Par 376 [Inv OL Pend Cnfg]
17	Inv OLoad Trip	The drive's operating point has exceeded the intermittent current rating and a foldback to the continuous rating in Par 400 [Rated Amps] has occurred.	Reduce the mechanical load Configured with Par 377 [Inv OL Trip Cnfg]

No.	Name	Description	Action
18	Ext Fault Input	A digital input has detected an external fault. Enter a value of 3 “Ext Fault” or 38 “ExtFault Inv” in one of the following parameters to configure an input to detect an external fault: Par 825 [Digin 1 Sel] Par 826 [Digin 2 Sel] Par 827 [Digin 3 Sel] Par 828 [Dig In4 Sel] Par 829 [Dig In5 Sel] Par 830 [Dig In6 Sel]	Configured with par 379 [Ext Flt/Alm Cnfg]
19	DSP Memory Error	Flash memory does not match the SRAM memory	1. Cycle the drive power 2. If the fault remains, replace the Main Control board
20	DSP Device Error	A DSP (Velocity Position Loop) interrupt task has not been completed in the allotted time.	1. Cycle the drive power 2. If the fault remains, replace the Main Control board
22	Over Frequency	Encoderless algorithm fails to converge on correct speed. Two possible causes: 1.) Velocity regulator is attempting to run below motor’s slip speed. 2.) Frequency regulator “pulls out” and commanded motor frequency slows to maximum frequency limit.	–
23	MC Commissn Fail	The drive has failed to complete either the Motor Autotuning procedure or the Power Circuits Diagnostics test. Par 463 [MC Diag Error 1], Par 464 [MC Diag Error 2], and Par 465 [MC Diag Error 3] display Motor Autotuning and Power Circuit Diagnostic faults. Par 465 [MC Diag Error 3] - Drive current, inductance, voltage and speed are not within motor nameplate specifications. This fault occur most frequently on low horsepower motors.	1. Verify that motor nameplate data is entered correctly into the drive. 2. Verify the motor is wired for the correction voltage entering into the drive. 3. Verify the encoder (if used) and velocity feedback is correct. 4. Change tuning mode in to Par 515 [FVC Tune Config] to 9 “NoRotate Tune”.
24	DC Bus Overvolt	Refer to “Protection” in Appendix A of the *PowerFlex 700S Phase II AC Drive User Manual*, publication 20D-UM006, for DC Bus Overvoltage Trip levels.	1. Verify the AC Line. 2. Verify that either the brake or bus regulator is enabled (Par 414 [Brake/Bus Cnfg], bit 0 “Brake Enable” or bit 3 “Bus Reg Enable”, respectively). 3. Verify that Par 128 [Regen Power Lim] is set properly. 4. If Par 414 [Brake/Bus Cnfg] bit 0 “Brake Enable” is set, verify braking resistor is properly sized.
25	Inv Trans Desat	The IGBT detects a transistor failure (Desat).	–
26	Ground Fault	A current to earth exceeds 35% of the peak drive rating.	Check the motor and external wiring to the drive output terminals for a grounded condition.
27	Inst Overcurrent	Instantaneous motor current exceeds 214% of rating	1. Reduce mechanical load. 2. Check the motor and external wiring to the motor.
28	VPL/MC Comm Fail	A communication failure has occurred between the Velocity Position Loop (VPL) processor and the Motor Control (MC) processor on the main control board. Possible causes are: • VPL is flashing MC firmware into the MC processor when HIM indicates "Loading Config". • MC has failed to complete or pass diagnostic tests. • MC has not detected VPL handshake activity for over 32 ms. • VPL has not detected MC handshake activity for over 32 ms. This is indicated when Fault Test Point 15 or 16 equals 1. This test point is viewed in Par 330 [Fault TP Data] when Par 329 [Fault TP Select] is set to value 15 or 16.	1. Cycle power 2. Reflash firmware 3. Replace Main Control board
29	PWM Signal Short	This fault is detected when ever the actual IGBT gate is different than the commanded IGBT states. This fault is detected by the Motor Control (MC) processor.	–

No.	Name	Description	Action
30	MC Firmware	One of the following Motor Control (MC) firmware errors has occurred: • MC Task Over Run • Illegal Interrupt • Self Diagnostic Fault • Data Error	1. Cycle power 2. Reflash firmware 3. Replace Main Control board
31	Precharge Error	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” off).	1. Verify the value in Par 410 [PreChrg TimeOut] 2. Verify the bit value in Par 411 [PreChrg Control] = 1 “Enbl PrChrg” 3. Configured with Par 381 [PreChrg Err Cnfg]
32	PWM Asynch	The Motor Control Processor is not synchronized with SynchLink.	–
33	+/- 15volt Power	The12V DC control voltage is outside the tolerance range. The positive voltage power must be within the band from +17.00 to +11.61V DC. The negative voltage power must be within the band from -17.00 to -11.61V DC.	Replace switch mode power supply. For smaller frames, replace drive.
35	Parameter Chksum	The checksum read from the EEPROM does not match the checksum calculated	1. Cycle power 2. Replace Main Control board
38	Brake OL Trip	The calculated temperature of the dynamic braking resistor is too high. The temperature is calculated by a thermal model. If the resistor is internal, the model uses resistor characteristic stored in the power structure EEPROM memory. If the resistor is external, the model uses values of Par 416 [Brake PulseWatts] and Par 417 [Brake Watts].	Verify actual temperature of brake: - If hot, wait for brake to cool - If cold, cycle power to the drive If cold, verify Par 416 [Brake PulseWatts] and Par 417 [Brake Watts] are correct. Configured with Par 369 [Brake OL Cnfg]
39	PowerEE CRC Fail	The Cycling Ring Checksum (CRC) of the data stored in the Power board EEPROM does not match the stored CRC.	1. Cycle power 2. Check communication bus lines - 10 pin connector in Main Control board, Fiber Optic Star Interface board, and fiber optic cable connections.
40	SLink Mult Oflow	A SynchLink Multiplier Overflow has occurred. Par 927 [SL Mult State] displays SynchLink multiplier overflow errors.	Configured with Par 390 [SL MultErr Cnfg]
41	Ridethru Timeout	The drive has been in a bus loss ridethrough condition for more than two seconds (default). The ridethrough timeout is configurable by Par 407 [Power Loss Time].	1. Verify the AC Line. 2. Verify the value in Par 407 [Power Loss Time].
42	DC Bus Undervolt	Bus voltage has fallen below the level configured by Par 409 [Line Undervolts].	1. Verify the AC Line. 2. Verify the precharge resistor is present. (With power off, there should be a resistance between DC+ and BR+). Configured with Par 393 [BusUndervoltCnfg]
43	VoltageFdbk Loss	Loss of Motor or DC Bus Voltage Feedback has occurred because of a communication failure between Motor Control and Voltage Feedback board.	1. Check the communication line between Motor Control (MC) and Voltage Feedback board. 2. Replace the Voltage Feedback board. Configured with Par 394 [VoltFdbkLossCnfg]
44	Runtime Data Rst	Runtime data (hours, energy) has been reset to zero due to a checksum error.	–
45	Enable Health	Safety circuit is active.	Check input signal to the Safety circuit.
46	Interp Out Synch	Interpolator for position feedback lost synchronization with Velocity Position Loop (VPL).	Configured with Par 378 [Interp Flt Cnfg]
47	MC CML Task Fail	Current Minor Loop (CML) task has been delayed or run with incorrect interval.	Cycle power.
48	No Ctrl Device	The controlling device (HIM or controller) has been disconnected while the drive was running.	–

No.	Name	Description	Action
49	DPI Loss Port 1	The device at DPI port 1 has stopped communicating with the drive. A SCANport device is connected to a drive operating DPI devices at 500k Baud	Verify DPI device is present and functional at port 1. Configured with Par 391 [DPI CommLoss Cfg]
50	DPI Loss Port 2	The device at DPI port 2 has stopped communicating with the drive. A SCANport device is connected to a drive operating DPI devices at 500k Baud	Verify DPI device is present and functional at port 2. Configured with Par 391 [DPI CommLoss Cfg]
51	DPI Loss Port 3	The device at DPI port 3 has stopped communicating with the drive. A SCANport device is connected to a drive operating DPI devices at 500k Baud	Verify DPI device is present and functional at port 3. Configured with Par 391 [DPI CommLoss Cfg]
52	DPI Loss Port 4	The device at DPI port 4 has stopped communicating with the drive. A SCANport device is connected to a drive operating DPI devices at 500k Baud	Verify DPI device is present and functional at port 4. Configured with Par 391 [DPI CommLoss Cfg]
53	DPI Loss Port 5	The device at DPI port 5 has stopped communicating with the drive. A SCANport device is connected to a drive operating DPI devices at 500k Baud	Verify DPI device is present and functional at port 5. Configured with Par 391 [DPI CommLoss Cfg]
54	DPI Loss Port 6	The device at DPI port 6 has stopped communicating with the drive. A SCANport device is connected to a drive operating DPI devices at 500k Baud	Verify DPI device is present and functional at port 6. Configured with Par 391 [DPI CommLoss Cfg]
55	Net Loss DPI P1	A communications fault has occurred between the communication adapter at DPI port 1 and the network.	1. Verify network connection. 2. Verify status of network. Configured with Par 392 [NetLoss DPI Cnfg]
56	Net Loss DPI P2	A communications fault has occurred between the communication adapter at DPI port 2 and the network.	1. Verify network connection. 2. Verify status of network. Configured with Par 392 [NetLoss DPI Cnfg]
57	Net Loss DPI P3	A communications fault has occurred between the communication adapter at DPI port 3 and the network.	1. Verify network connection. 2. Verify status of network. Configured with Par 392 [NetLoss DPI Cnfg]
58	Net Loss DPI P4	A communications fault has occurred between the communication adapter at DPI port 4 and the network.	1. Verify network connection. 2. Verify status of network. Configured with Par 392 [NetLoss DPI Cnfg]
59	Net Loss DPI P5	A communications fault has occurred between the communication adapter at DPI port 5 and the network.	1. Verify network connection. 2. Verify status of network. Configured with Par 392 [NetLoss DPI Cnfg]
60	Net Loss DPI P6	A communications fault has occurred between the communication adapter at DPI port 6 and the network.	1. Verify network connection. 2. Verify status of network. Configured with Par 392 [NetLoss DPI Cnfg]
61	Logix Out of Run	The DriveLogix controller is in a Non-Run mode. Non-Run modes include program, remote-program and faulted modes.	Clear fault Configured with Par 386 [Lgx OutOfRunCnfg]
62	Logix Timeout	The communication connection to the DriveLogix controller has timed out.	Configured with Par 387 [Lgx Timeout Cnfg]

No.	Name	Description	Action
63	Logix Closed	The DriveLogix controller has closed the Controller to Drive connection.	Verify drive is present in I/O Configured with Par 388 [Lgx Closed Cnfg]
64	Logix Link Chng	A required link in the Controller to Drive Communication Format has been modified.	Clear fault Configured with Par 389 [Lgx LinkChngCnfg]
65	HiHp In PhaseLs	AC Input Phase Loss - the AC input phase voltage has fallen.	1. Check for voltage on each AC input phase. 2. Check the status of each external AC input fuse. Configured with par 370 [HiHp InPhsLs Cfg]
66	HiHp Bus Com Dly	Bus Communication Time Delay - the communication bus has delayed feedback, or bad communication quality.	Check the communication bus lines - 10 pin connector on the Main Control board, Fiber Optic Star Interface board, and fiber connections.
67	HiHp Bus Link Ls	Bus Communication Link Loss - bus communication between the Fiber Optic Star Interface circuit board and the Voltage Feedback circuit board has stopped.	Check the communication bus lines - 10 pin connector on the Main Control board, Fiber Optic Star Interface board, and fiber connections.
68	HiHp Bus CRC Er	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 the communication bus lines - 10 pin connector on the Main Control board, Fiber Optic Star Interface board, and fiber connections.
69	HiHp Bus WtchDog	Bus Communication Watchdog Error - no message (packets) came through in the communication bus -a watchdog error was detected.	Check the communication bus lines - 10 pin connector on the Main Control board, Fiber Optic Star Interface board, and fiber connections.
70	HiHp Fan Fdbk Ls	Fan Feedback Loss - an inverter cooling fan did not send active feedback, or did not work.	1. Check the communication bus lines - 10 pin connector on the Main Control board, Fiber Optic Star Interface board, and fiber connections. 2. Check the inverter cooling fans.
71	HiHp Drv OvrLoad	Drive Overload - the drive's operating point has exceeded the intermittent current rating and a foldback to the continuous rating in Par 400 [Rated Amps] has occurred.	Reduce mechanical load.
72	HiHp PwrBd PrcEr	Power board Processor Error - a processor on the Fiber Optic Star Interface circuit board has detected a self diagnostic problem.	Replace the Fiber Optic Star Interface circuit board.
73	HiHp PrChrg Cntc	Precharge Contactor Fault - the precharge contactor did not send back the active feedback.	If the drive is an AC input model, check the precharge resistor and contactor. If the drive is a DC input model, check a jumper for precharge bypass switch on the Fiber Optic Star Interface circuit board.
74	HiHp PwrEE Error	Power EEPROM Error - the Cycling Ring Checksum (CRC) of the data stored in the Fiber Optic Star Interface circuit board EEPROM does not match the stored CRC.	1. Cycle power. 2. Check the communication bus lines - 10 pin connector on the Main Control board, Fiber Optic Star Interface board, and fiber connections.
75	HiHP PwrBd Otemp	Power board Over Temperature - the temperature of the Fiber Optic Star Interface circuit board has exceeded 85° C.	Lower the ambient temperature.
76	HiHP HardwareVer	The left and right side inverter units have different current ratings, or the ASIC board on the power-board is not functioning.	Check the version of each inverter (left and right units), then replace the unit.
77	HiHP CurrUnblnce	The output current between the left and right side inverter units are unbalanced (20% of current feedback rating, e.g. 184A = 920A * 0.2).	Check motor wiring for each unit.
78	HiHP VoltUnblnce	The bus voltage for the left and right side inverter units is unbalanced (6% of normal bus voltage, e.g. 41Vdc = 675Vdc * 0.06).	Check input power and wiring for each unit.
79	HiHP Bus Data	Communication Bus data are mismatched between left side unit and right side unit.	Check communication bus lines - 10 pin connector on Main Control board, Fiber Optic Star Interface board and fiber connections.
81	+ Soft Over Trvl	*(Motion Only)* Position feedback exceeds the maximum positive travel setting, Par 694 [Motn Mx Pos Trvl].	Configured with Par 395 [+Sft OvrTrvlCnfg]

No.	Name	Description	Action
82	- Soft Over Trvl	*(Motion Only)* Position feedback, exceeds the maximum negative travel setting, Par 695 [Motn Mx Neg Trvl].	Configured with Par 396 [-Sft OvrTrvlCnfg]
83	+ Hard Over Trvl	*(Motion Only)* Signal for the hardware positive over travel appears on a digital input.	Configured with Par 397 [+Hrd OvrTrvlCnfg]
84	- Hard Over Trvl	*(Motion Only)* Signal for the hardware negative over travel appears on a digital input.	Configured with Par 398 [-Hrd OvrTrvlCnfg]
85	Position Error	*(Motion Only)* Par 769 [Position Error] exceeded Par 696 [Motn PositErrTol].	Verify the value in Par 696 [Motn PositErrTol]. Configured with Par 399 [Position ErrCnfg]
86	Drive Homing	When the drive is in Drive Homing mode (Par 740 / bit 24 or bit 27 is On), the Drive Homing Alarm triggers and the drive moves to a home position automatically.	Check Par 740 / bit14 “Find Home” or bit 27 “Return Home”.
88	Stahl Optics	Linear Stahl Encoder detected a fault. Par 291 [Lin1Stahl Status] shows the details of the fault.	1. Reconnect encoder or replace encoder. 2. Reconnect option feedback card.
92	Ride Thru	The bus voltage has dropped to the Ride-Through level specified in Par 408 [Power Loss Level].	Check the AC input voltage and DC bus voltage.
93	+/- 12volt Power Alarm	The12V DC control voltage is outside the tolerance range (Alarm). The positive voltage power exceeds +15.50 V DC. The negative voltage power exceeds -15.50V DC.	–
94	Analog In 1 Loss	Analog Input channel 1 is lost. For configuration of Analog Input channel 1, see Par 1093 [Anlg In1LossCnfg].	Check condition of Analog Input channel 1. Change configuration for parameter 1093 [Anlg In1LossCnfg].
95	Analog In 2 Loss	Analog Input channel 2 is lost. For configuration of Analog Input channel 2, see Par 1094 [Anlg In2LossCnfg].	Check condition of Analog Input channel 2. Change configuration for parameter 1094 [Anlg In2LossCnfg].
96	Analog In 3 Loss	Analog Input channel 3 is lost. For configuration of Analog Input channel 3, see Par 1095 [Anlg In3LossCnfg].	Check condition of Analog Input channel 3. Change configuration for parameter 1095 [Anlg In3LossCnfg].
129	Faults Cleared	Indicates that all faults have been cleared.	*Informational only.
130	Fault Q Cleared	Indicates that the fault queue has been cleared.	*Informational only.
131	Alarm Cleared	Indicates that all alarms have been cleared.	*Informational only.
132	Alarm Q Cleared	indicates that the alarm queue has been cleared.	*Informational only.

Addressing 700H Faults

No.	Name	Description	Action *(if appropriate)*
1	PrechargeActv	The drive received a start command while in the DC bus precharge state. See Table 1.C on page 1-16 for more information on this fault.	–
2	Auxiliary In	Auxiliary input interlock is open.	Check remote wiring.
3	Power Loss	DC bus voltage remained below the value of parameter 186 [Power Loss Volts] for longer than the time in parameter 185 [Power Loss Time]. Enable/Disable this fault in parameter 238 [Fault Config 1]. See publication 20C-PM001…, *Programming Manual - PowerFlex 700H* for parameter descriptions.	Monitor the incoming AC line for low voltage or line power interruption.
4	UnderVoltage	DC bus voltage fell below the minimum value of 333V for 400/480V drives and 461V for 600/ 690V drives. See Table 1.D on page 1-16 for more information on this fault. Enable/ Disable this fault in parameter 238 [Fault Config 1]. See publication 20C-PM001…, *Programming Manual - PowerFlex 700H* for parameter descriptions.	Monitor the incoming AC line for low voltage or power interruption.
5	OverVoltage	DC bus voltage exceeded maximum value. See Table 1.E on page 1-16 for more information on this fault.	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 a dynamic brake option.
6	Motor Stall	The motor is operating at high current and low frequency and is not accelerating. See Table 1.F on page 1-16 for more information on this fault.	1. Run an Autotune. 2. Reduce the Load.
7	MotorOverload	Internal electronic overload trip. You can enable/disable this fault with parameter 238 [Fault Config 1].	1. Run an Autotune. 2. Verify the settings of parameters 48 [Motor OL Factor] and 47 [Motor OL Hertz]. 3. Reduce the load so that the drive output current does not exceed the current set by the value in parameter 42 [Motor NP FLA].
8	HeatsinkOvrTp	The heatsink temperature has exceeded the maximum allowable value. 85 degrees C = Alarm 90 degrees C = Fault See Table 1.G on page 1-16 for more information on this fault.	1. Verify that the maximum ambient temperature has not been exceeded. 2. Check the fans (including the ASIC board on frame 10 and higher drives). 3. Check for an excess load. 4. Check the carrier frequency.
9	IGBT OverTemp	The output transistors have exceeded their maximum operating temperature due to an excessive load. See Table 1.H on page 1-17 for more information on this fault.	1. Verify that the maximum ambient temperature has not been exceeded. 2. Check the fan(s). 3. Check for an excess load.
10	System Fault	A hardware problem exists in the power structure. See Table 1.I on page 1-17 for more information on this fault.	1. Cycle the power. 2. Verify the fiber optic connections. 3. Contact Technical Support. 4. If the problem persists, replace the drive.
12	OverCurrent	The drive output current has exceeded the hardware current limit. See Table 1.J on page 1-18 for more information on this fault.	Check programming for an excess load, improper DC boost setting, DC brake voltage set too high or other causes of excess current. Check for shorted motor leads or a shorted motor.
13	Ground Fault	A current path to earth ground exists that is greater than 50% of the drive's heavy duty rating. The current must appear for 800ms before the drive will fault. See Table 1.K on page 1-19 for more information on this fault.	Check the motor and external wiring to the drive output terminals for a grounded condition.
14	InverterFault	Hardware problem in the power structure.	1. Cycle the power. 2. Contact Technical Support. 3. If the problem persists, replace the drive.

No.	Name	Description	Action *(if appropriate)*
15	Load Loss	Do not use this fault in PowerFlex 700H applications. See Table 1.L on page 1-19 for more information on this fault.	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.
16	Motor Therm	The option board thermistor input is greater than the limit.	1. Check to ensure that the motor is cooling properly. 2. Check for an excess load. 3. Verify the thermistor connection. If the thermistor connection on the option board is not used, it must be shorted.
17	Input Phase	One input line phase is missing. See Table 1.M on page 1-19 for more information on this fault.	1. Check all user-supplied fuses 2. Check the AC input line voltage.
19	Unbalanced	An imbalance between the power modules exists.	1. Check for DC voltage imbalance between the power modules. 2. Check for current output imbalance between the power modules.
21	OutPhasMissng	There is zero current in one of the output motor phases. See Table 1.N on page 1-19 for more information on this fault.	1. Check the motor wiring. 2. Check the motor for an open phase.
22	NP Hz Cnflct	The "fan/pump" mode is selected in [Motor Cntl Sel] and the ratio of parameter 43 [Motor NP Hertz] to 55 [Maximum Freq] is greater than 26.	
23	MaxFreqCnflct	The sum of parameters 82 [Maximum Speed] and 83 [Overspeed Limit] exceeds 55 [Maximum Freq]. Raise [Maximum Freq] or lower [Maximum Speed] and/or [Overspeed Limit] so that the sum is less than or equal to [Maximum Freq].	
24	Decel Inhibit	The drive cannot follow the commanded decel due to bus limiting.	1. Verify that the input voltage is within the specified limits. 2. Verify that the system ground impedance follows the proper grounding techniques. 3. Disable bus regulation and/or add a dynamic brake resistor and/or extend the deceleration time.
25	OverSpd Limit	Functions such as Slip Compensation or Bus Regulation have attempted to add an output frequency adjustment greater than the value programmed in parameter 83 [Overspeed Limit].	Remove the excessive load or overhauling conditions or increase the value in [Overspeed Limit].
26	VHz Neg Slope	Parameter 53 [Motor Cntl Sel] = "Custom V/Hz" & the V/Hz slope is negative.	
27	SpdRef Cnflct	[Speed Ref x Sel] or [PI Reference Sel] is set to "Reserved".	
28	BrakResMissing	No brake resistor has been detected. See Table 1.O on page 1-19 for more information on this fault.	1. Program [Bus Reg Mode x] to not use the brake option. 2. Install a brake resistor and set parameter 163 [DB Resistor Type] to 1 "External Res" (frame 9 drives only).
29	Anlg In Loss	An analog input is configured to fault on a signal loss. A signal loss has occurred. Configure this fault with [Anlg In x Loss].	1. Check parameter settings. 2. Check for broken/loose connections at the inputs.
30	MicroWatchdog	A microprocessor watchdog timeout has occurred. See Table 1.P on page 1-19 for more information on this fault.	1. Cycle the power. 2. Replace the Main Control board.
31	IGBT Temp HW	The drive output current has exceeded the instantaneous current limit. See Table 1.Q on page 1-19 for more information on this fault.	1. Check for an excess load. 2. Raise the value set in either [Accel Time x] parameters. 3. Parameter 53 [Motor Cntl Sel] may need to be set to "Custom V/Hz". 4. Verify the values set in parameters 62 [IR Voltage Drop] and 63 [Flux Current Ref]. 5. Contact Technical Support.
32	Fan Cooling	Fan is not energized at start command. See Table 1.R on page 1-20 for more information on this fault.	1. Check the status LEDs on the fan inverter(s). 2. Check the fan(s).
33	AutoReset Lim	The drive unsuccessfully attempted to reset a fault and resumed running for the programmed number of [Auto Rstrt Tries]. You can enable/disable this fault with parameter 238 [Fault Config 1].	Correct the cause and manually clear the fault.

No.	Name	Description	Action *(if appropriate)*
34	CAN Bus Flt	A sent message was not acknowledged. See Table 1.S on page 1-20 for more information on this fault.	1. Cycle the power. 2. Replace the Main Control board.
37	HeatsinkUndTp	The ambient temperature is too low. See Table 1.T on page 1-20 for more information on this fault.	Raise the ambient temperature.
44	Device Change	The new power unit or option board installed is a different type. See Table 1.U on page 1-20 for more information on this fault.	Clear the fault and reset the drive to the factory defaults.
45	Device Add	A new option board was added. See Table 1.U on page 1-20 for more information on this fault.	Clear the fault.
47	NvsReadChksum	There was an error reading parameters 9 [Elapsed MWh] and 10 [Elapsed Run Time] from EEPROM. See Table 1.V on page 1-21 for more information on this fault.	1. Cycle the power. 2. Replace the Main Control board.
48	ParamsDefault	The drive was commanded to write default values to EEPROM.	1. Clear the fault or cycle power to the drive. 2. Program the drive parameters as needed.
54	Zero Divide	This event occurred because a mathematical function had a dividend of zero.	1. Cycle the power. 2. Replace the main Control board.
59	Gate Disable	Both of the digital gate disable inputs (SD-1 and SD-2) are not enabled on the 20C-DG1 option board.	1. Check the motor. 2. Verify that the option board is properly wired. 3. Replace the option board. See Appendix E - “Instructions for ATEX Approved PowerFlex 700H Drives in Group II Category (2) Applications with ATEX Approved Motors” in the *PowerFlex 700H/S High Power Drives Installation Manual*, publication PFLEX-IN006… for information on installing this option board.
60	Hrdwr Therm	The thermistor input is activated (>4 kΩ) on the 20C-DG1 option board.	1. Check the motor. 2. The resistance of the thermistor input must go below 2 kΩ before the drive can be reset.
63	Shear Pin	The value programmed in parameter 148 [Current Lmt Val] has been exceeded. You can enable/disable this fault with parameter 238 [Fault Config 1].	Check the load requirements and the value in [Current Lmt Val].
65	I/O Removed	An I/O option board has been removed.	Clear the fault.
70	Power Unit	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. See Table 1.X on page 1-21 for more information on this fault.	Clear fault.
71	Periph Loss	The communications card has a fault on the network side.	1. Check the DPI device event queue and corresponding fault information for the device.
81	Port DPI Loss	The DPI port has stopped communicating. A SCANport device was connected to a drive operating DPI devices at 500k baud.	1. If the adapter was not intentionally disconnected, check the wiring to the port. Replace the wiring, port expander, adapters, Main control board or complete drive as required. 2. Check the HIM connection. 3. If an adapter was intentionally disconnected and the [Logic Mask] bit for that adapter is set to “1”, this fault will occur. To disable this fault, set the bit in parameter 276 [Logic Mask] for the adapter to “0”.
94	Hardware Enbl	An enable signal is missing from the control terminal block. See Table 1.Y on page 1-22 for more information on this fault.	1. Check the control wiring. 2. Check the position of the hardware enable jumper. 3. Check the digital input programming.
95	AutoT Rs Stat	The Autotune Rs Static Test has failed.	1. Verify that the motor is not rotating when autotune is enabled. 2. Check the motor connections.

No.	Name	Description	Action *(if appropriate)*
96	AutoT Lm Rot	The Autotune Lm rotate test has failed.	1. Check the motor nameplate data. 2. Check the motor connections. 3. Verify that the Accel Time < (Base Speed/40) x 33 sec. Note: 33 sec. = time limit to bring motor to 40 Hz.
97	AutoT MagRot	The Autotune magnetizing current rotate test has failed.	1. Check the motor nameplate data. 2. Check the motor connections. 3. Verify that the Accel Time < (Base Speed/40) x 33 sec. (see Note above).
98	AutoT Saturat	The Autotune saturation curve test has failed.	1. Check the motor nameplate data. 2. Check the motor connections.
99	UserSet Timer	A User Set load or save was not completed in less than 5 seconds.	Attempt to save the User Set again. If this error occurs again, replace the Main Control board.
100	Param Chksum	The checksum read from the Main Control board does not match the checksum calculated. See Table 1.Z on page 1-22 for more information on this fault.	1. Restore the drive to the factory defaults. 2. Cycle the power. 3. Reload User Set if used.
104	PwrBrd Chksum	The checksum read from the EEPROM does not match the checksum calculated from the EEPROM data. See Table 1.U on page 1-20 for more information on this fault.	1. Cycle the power. 2. Contact Technical Support. 3. If the problem persists, replace the drive.
106	MCB-PB Config	The drive rating information stored on the power board is incompatible with the Main Control board. See Table 1.AA on page 1-22 for more information on this fault.	1. Reset the fault or cycle the power. 2. Replace the Main Control board.
107	New IO Option	A New option board was added to the Main Control board. See Table 1.U on page 1-20 for more information on this fault.	1. Restore the drive to the factory defaults. 2. Reprogram parameters as necessary.
113	Fatal App	A Fatal Application error has occurred.	Replace the Main Control board.
114	AutoT Enable	Autotune is enabled but has not started.	Press the Start key within 20 seconds of enabling autotune.
120	I/O Change	An option board has been replaced. See Table 1.U on page 1-20 for more information on this fault.	Reset the fault.
121	I/O Comm Loss	An I/O board lost communications with the Main Control board.	1. Check the connector. 2. Check for induced noise. 3. Replace I/O board or Main Control board.
133	DigIn CnflctA	Digital input functions are in conflict. Combinations marked with a "⚠" will cause an alarm.	

* Jog 1 and Jog 2

	Acc2/ Dec2	Accel 2	Decel 2	Jog*	Jog Fwd	Jog Rev	Fwd/ Rev
Acc2 / Dec2		⚠	⚠				
Accel 2	⚠						
Decel 2	⚠						
Jog*					⚠	⚠	
Jog Fwd				⚠			⚠
Jog Rev				⚠			⚠
Fwd/Rev					⚠	⚠	

<table>
<tr><th>No.</th><th>Name</th><th>Description</th><th>Action (if appropriate)</th></tr>
<tr><td>134</td><td>DigIn CnflctB</td><td colspan="2">A digital Start input has been configured without a Stop input or other functions are in conflict. Combinations that conflict are marked with a “ ” and will cause an alarm.

* Jog 1 and Jog 2
<table>
<tr><th></th><th>Start</th><th>Stop-CF</th><th>Run</th><th>Run Fwd</th><th>Run Rev</th><th>Jog*</th><th>Jog Fwd</th><th>Jog Rev</th><th>Fwd/ Rev</th></tr>
<tr><td>Start</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Stop-CF</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Run</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Run Fwd</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Run Rev</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Jog*</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Jog Fwd</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Jog Rev</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Fwd/Rev</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table></td></tr>
<tr><td>135</td><td>DigIn CnflctC</td><td colspan="2">More than one physical input has been configured to the same input function. Multiple configurations are not allowed for the following input functions.
Forward/ReverseRun ReverseBus Regulation Mode B
Speed Select 1Jog ForwardAcc2 / Dec2
Speed Select 2Jog ReverseAccel 2
Speed Select 3RunDecel 2
Run ForwardStop Mode B</td></tr>
<tr><td>136</td><td>BipolarCnflct</td><td colspan="2">Parameter [Direction Mode] is set to “Bipolar” or “Reverse Dis” and one or more of the following digital input functions is configured: “Fwd/Reverse,” “Run Forward,” “Run Reverse,” “Jog Forward” or “Jog Reverse.”</td></tr>
<tr><td>139</td><td>UserSetCflct</td><td colspan="2">Not all digital inputs and datalinks in the user set you are saving are the same. All user sets must be saved with the same settings for parameters 361-366, 300-307 and 310-317.</td></tr>
<tr><td>143</td><td>TB Man Conflict</td><td>Parameter 96 [TB Man Ref Sel] is using an analog input that is programmed for another function.</td><td>Check the parameter settings to avoid problem.</td></tr>
<tr><td>147</td><td>Start AtPwrUp</td><td colspan="2">Parameter 168 [Start At PowerUp] is enabled. The drive may start at any time within 10 seconds of drive powerup.</td></tr>
<tr><td>148</td><td>IntDB OvrHeat</td><td colspan="2">The drive has temporarily disabled the DB regulator because the resistor temperature has exceeded a predetermined value.</td></tr>
<tr><td>149</td><td>Waking</td><td colspan="2">The Wake timer is counting toward a value that will start the drive.</td></tr>
<tr><td>150</td><td>Sleep Config</td><td colspan="2">Sleep/Wake configuration error. With parameter 178 [Sleep Wake Mode] = “Direct,” possible causes include: drive is stopped and parameter 180 [Wake Level] < parameter 182 [Sleep Level]. “Stop=CF,” “Run,” “Run Forward,” or “Run Reverse” is not configured in [Digital Inx Sel].</td></tr>
</table>

PowerFlex 700H Fault Subcodes

Fault Subcodes can be viewed in parameters 543, 545, 547, 549, 551, 553, 555, 557 [Fault x Subcode]. Each of these parameters corresponds with parameters 243, 245, 247, 249, 251, 253, 255, 257 [Fault x Code]. For example, if parameter 243 [Fault 1 Code] displays "5" and parameter 543 [Fault 1 Subcode] displays "273", an over voltage fault (F5) has occurred in the power unit of the drive.

Table 1.C Precharge Active Fault (F1) Subcodes

Subcode	Description
273	The precharge circuit in the power unit is active
289	The precharge circuit in power unit 1 is active
305	The precharge circuit in power unit 2 is active

Table 1.D Under Voltage Fault (F4) Subcodes

Subcode	Description
273	The DC Bus voltage in the power unit is too low while the drive is in a run state
529	The DC Bus voltage in the power unit is too low while the drive is in a run state
545	The DC Bus voltage in power unit 1 is too low while the drive is in a run state
561	The DC Bus voltage in power unit 2 is too low while the drive is in a run state
785	The DC Bus voltage in the power unit fell too low during a fast stop

Table 1.E Over Voltage Fault (F5) Subcodes

Subcode	Description
273	There is an over voltage in the power unit
289	There is an over voltage in power unit 1
276	There is an over voltage in power unit 2
277	There is an over voltage in the power unit

Table 1.F Motor Stall Fault (F6) Subcode

Subcode	Description
400	The motor is operating at high current and low frequency and is not accelerating

Table 1.G Heatsink Over Temperature Fault (F8) Subcodes

Subcode	Description
272, 273	There is a heatsink over temperature in the power unit
274	There is a heatsink over temperature on the Power board of the power unit
275	There is a heatsink over temperature in the U phase of the power unit (typical of frame 11 and 13 drives)
276	There is a heatsink over temperature in the V phase of the power unit (typical of frame 11 and 13 drives)
277	There is a heatsink over temperature in the W phase of the power unit (typical of frame 11 and 13 drives)
288, 289	There is a heatsink over temperature in power unit 1 (typical of frame 12 and 14 drives)
290	There is a heatsink over temperature on the Power board of power unit 1 (typical of frame 12 and 14 drives)
291	There is a heatsink over temperature in the U phase of power unit 1 (typical of frame 12 and 14 drives)
292	There is a heatsink over temperature in the V phase of power unit 1 (typical of frame 12 and 14 drives)
293	There is a heatsink over temperature in the W phase of power unit 1 (typical of frame 12 and 14 drives)
304, 305	There is a heatsink over temperature in power unit 2 (typical of frame 12 and 14 drives)

Subcode	Description
306	There is a heatsink over temperature on the Power board of power unit 2 (typical of frame 12 and 14 drives)
307	There is a heatsink over temperature in the U phase of power unit 2 (typical of frame 12 and 14 drives)
308	There is a heatsink over temperature in the V phase of power unit 2 (typical of frame 12 and 14 drives)
309	There is a heatsink over temperature in the W phase of power unit 2 (typical of frame 12 and 14 drives)
530	There is a Thermistor over temperature on the Power board (typical of frame 12 and 14 drives)

Table 1.H IGBT Over Temperature Fault (F9) Subcode

Subcode	Description
273	The output transistors have exceeded their maximum operating temperature due to an excessive load

Table 1.I System Fault (F10) Subcodes

Subcode	Description	Action
273	There is an output phase feedback fault from the motor cables	
275	There is an output phase feedback fault from the U phase motor cable (typical of frame 11 and 13 drives)	
276	There is an output phase feedback fault from the V phase motor cable (typical of frame 11 and 13 drives)	
277	There is an output phase feedback fault from the W phase motor cable (typical of frame 11 and 13 drives)	
1042	There is a disturbance at the ASIC fault-input of the Power board - ribbon cable/software	
1058	There is a disturbance at the ASIC fault-input of the Power board in power unit 1 - ribbon cable/software (typical of frame 12 and 14 drives)	
1074	There is a disturbance at the ASIC fault-input of the Power board in power unit 2 - ribbon cable/software (typical of frame 12 and 14 drives)	
1090	There is a disturbance at the ASIC fault-input of the Control board - application software	
1298	There is too much disturbance in system bus traffic on the Power board	
1314	There is too much disturbance in system bus traffic on the Power board in power unit 1 (typical of frame 12 and 14 drives)	
1330	There is too much disturbance in system bus traffic on the Power board in power unit 2 (typical of frame 12 and 14 drives)	
1553	The charging relay feedback is not working	
1810	The charging relay control is not set on the Power board	
1826	The charging relay control is not set on the Power board on power unit 1 (typical of frame 12 and 14 drives)	
1827	The charging relay control is not set configured on the Power board on power unit 2 (typical of frame 12 and 14 drives)	
2065	The Gate Driver board is without auxiliary voltage (Power ASIC-TRIN)	
2067	The Gate Driver board for the U phase is without auxiliary voltage (typical of frame 11 and 13 drives)	
2068	The Gate Driver board for the V phase is without auxiliary voltage (typical of frame 11 and 13 drives)	
2069	The Gate Driver board for the W phase is without auxiliary voltage (typical of frame 11 and 13 drives)	
2080	The Gate Driver board in power unit 1 is without auxiliary voltage.	
2081	The Gate Driver board in power unit 1 is without auxiliary voltage (typical of frame 12 and 14 drives)	
2083	The Gate Driver board for the U phase in power unit 1 is without auxiliary voltage (typical of frame 14 drives)	
2084	The Gate Driver board for the V phase in power unit 1 is without auxiliary voltage (typical of frame 14 drives)	
2085	The Gate Driver board for the W phase in power unit 1 is without auxiliary voltage (typical of frame 14 drives)	
2097	The Gate Driver board in power unit 2 is without auxiliary voltage (typical of frame 12 and 14 drives)	
2099	The Gate Driver board for the U phase in power unit 2 is without auxiliary voltage (typical of frame 14 drives)	
2100	The Gate Driver board for the V phase in power unit 2 is without auxiliary voltage (typical of frame 14 drives)	
2101	The Gate Driver board for the W phase in power unit 2 is without auxiliary voltage (typical of frame 14 drives)	
2370	The TX fiber optic cable connected to H6 on the 700H Control board is broken	
2594	The fiber optic cable connected to TRIP on the Star Coupler board for power unit 1 is broken (typical of frame 12 and 14 drives)	
2610	The fiber optic cable connected to TRIP on the Star Coupler board for power unit 2 is broken (typical of frame 12 and 14 drives)	
2834	The fiber optic cable connected to H5 on the ASIC board is broken	
7767	The safe disable inputs on the 20C-DG1 option board have been in a different state for more than 5 seconds.	• Verify all connections to the 20C-DG01 option board • If this fault and subcode occurs again, replace the 20C-DG1 option board

Subcode	Description	Action
8023	A thermistor short circuit has been detected on the 20C-DG1 option board.	• Verify the thermistor connections and correct if necessary • Verify that the jumper at X10 is in the correct position
8279	The 20C-DG1 option board has been removed.	Set parameter 359 [20C-DG1 Status] to 1"Remove" and then back to 0 "Ready".
8535	There is an EEPROM error on the 20C-DG1 option board.	Replace the 20C-DG1 option board
8791	A supply voltage hardware problem has been detected on the 20C-DG1 option board.	Replace the 20C-DG1 option board
9047	A supply voltage hardware problem has been detected on the 20C-DG1 option board.	Replace the 20C-DG1 option board
9303	A supply voltage hardware problem has been detected on the 20C-DG1 option board.	Replace the 20C-DG1 option board
9559	A single hardware problem has been detected in the safe disable inputs on the 20C-DG1 option board.	Replace the 20C-DG1 option board. If this fault occurs again, replace the Main Control board.
9815	A single hardware problem has been detected in the safe disable inputs on the 20C-DG1 option board.	Replace the 20C-DG1 option board. If this fault occurs again, replace the Main Control board.
10071	A single hardware problem has been detected in the safe disable inputs on the 20C-DG1 option board.	Replace the 20C-DG1 option board. If this fault occurs again, replace the Main Control board.
10327	A single hardware problem has been detected in the safe disable inputs on the 20C-DG1 option board.	Replace the 20C-DG1 option board. If this fault occurs again, replace the Main Control board.
10583	A single hardware problem has been detected in the thermistor input on the 20C-DG1 option board.	Replace the 20C-DG1 option board
10839	A single hardware problem has been detected in the thermistor input on the 20C-DG1 option board.	Replace the 20C-DG1 option board
11096	A single hardware problem has been detected in the thermistor input on the 20C-DG1 option board.	Replace the 20C-DG1 option board
11351	A single hardware problem has been detected in the safe disable inputs or in the thermistor input on the 20C-DG1 option board.	Replace the 20C-DG1 option board. If this fault occurs again, replace the Main Control board.
11607	A single hardware problem has been detected in the safe disable inputs or in the thermistor input on the 20C-DG1 option board.	Replace the 20C-DG1 option board. If this fault occurs again, replace the Main Control board.
11863	A single hardware problem has been detected in the safe disable inputs or in the thermistor input on the 20C-DG1 option board.	Replace the 20C-DG1 option board. If this fault occurs again, replace the Main Control board.
12119	The 20C-DG1 option board has been mounted in an incompatible Main Control board that is not equipped with the Safe Disable function.	Replace the Main Control board.
12376	Parameter expander board, slot B, Therm Trip is set to OFF even if the jumper X12 is not cut.	

Table 1.J Over Current Fault (F12) Subcodes

Subcode	Description
272, 273	There is an over current in the power unit
275	There is an over current in the U phase of the power unit (typical of frame 11 and 13 drives)
276	There is an over current in the V phase of the power unit (typical of frame 11 and 13 drives)
277	There is an over current in the W phase of the power unit (typical of frame 11 and 13 drives)
288, 289	There is an over current in power unit 1 (typical of frame 12 drives)
291	There is an over current in the U phase of power unit 1 (typical of frame 14 drives)
292	There is an over current in the V phase of power unit 1 (typical of frame 14 drives)
293	There is an over current in the W phase of power unit 1(typical of frame 14 drives)
304, 305	There is an over current in power unit 2 (typical of frame 12 drives)
307	There is an over current in the U phase of power unit 2 (typical of frame 14 drives)
308	There is an over current in the V phase of power unit 2 (typical of frame 14 drives)
309	There is an over current in the W phase of power unit 2(typical of frame 14 drives)

Table 1.K Ground Fault (F13) Subcode

Subcode	Description
273	There is a ground fault in the power unit

Table 1.L Load Loss Fault (F15) Subcode

Subcode	Description
400	The motor underload protection has tripped

Table 1.M Input Phase Fault (F17) Subcodes

Subcode	Description
273	One input line phase in the power unit is missing
289	One input line phase in power unit 1 is missing
305	One input line phase in power unit 2 is missing
529	One input line phase in a regenerative power unit is missing

Table 1.N Output Phase Missing Fault (F21) Subcode

Subcode	Description
273	There is zero current in one of the output motor phases in the power unit

Table 1.O Brake Resistor Missing Fault (F28) Subcodes

Subcode	Description
273	No brake resistor has been detected (Frame 9 drives only)

Table 1.P Microprocessor Watchdog Fault (F30) Subcode

Subcode	Description
322	A microprocessor watchdog timeout has occurred on the Control board

Table 1.Q IGBT Temperature Hardware Fault (F31) Subcodes

Subcode	Description
272, 273	The output current has exceeded the instantaneous current limit in the power unit
275	The output current has exceeded the instantaneous current limit in the U phase of the power unit (typical of frame 11 and 13 drives)
276	The output current has exceeded the instantaneous current limit in the V phase of the power unit (typical of frame 11 and 13 drives)
277	The output current has exceeded the instantaneous current limit in the W phase of the power unit (typical of frame 11 and 13 drives)
288, 289	The output current has exceeded the instantaneous current limit in power unit 1 (typical of frame 14 drives)
291	The output current has exceeded the instantaneous current limit in the U phase of power unit 1 (typical of frame 14 drives)
292	The output current has exceeded the instantaneous current limit in the V phase of power unit 1 (typical of frame 14 drives)
293	The output current has exceeded the instantaneous current limit in the W phase of power unit 1 (typical of frame 14 drives)
304, 305	The output current has exceeded the instantaneous current limit in power unit 2 (typical of frame 12 and 14 drives)
307	The output current has exceeded the instantaneous current limit in the U phase of power unit 2 (typical of frame 14 drives)
308	The output current has exceeded the instantaneous current limit in the V phase of power unit 2 (typical of frame 14 drives)
309	The output current has exceeded the instantaneous current limit in the W phase of power unit 2 (typical of frame 14 drives)

Table 1.R Fan Cooling Fault (F32) Subcodes

Subcode	Description
273	The fan(s) in the power unit does not work according to feedback information
289	The fans in power unit 1 does not work according to feedback information (typical of frame 12 and 14 drives)
305	The fans in power unit 2 does not work according to feedback information (typical of frame 12 and 14 drives)

Table 1.S Communication Bus Fault (F34) Subcode

Subcode	Description
338	A sent message was not acknowledged.

Table 1.T Heatsink Under Temperature Fault (F37) Subcodes

Subcode	Description
272, 273	There is a heatsink under temperature in the power unit
275	There is a heatsink under temperature in the U phase of the power unit (typical of frame 11 and 13 drives)
276	There is a heatsink under temperature in the V phase of the power unit (typical of frame 11 and 13 drives)
277	There is a heatsink under temperature in the W phase of the power unit (typical of frame 11 and 13 drives)
288, 289	There is a heatsink under temperature in power unit 1 (typical of frame 12 and 14 drives)
291	There is a heatsink under temperature in the U phase of power unit 1 (typical of frame 14 drives)
292	There is a heatsink under temperature in the V phase of power unit 1 (typical of frame 14 drives)
293	There is a heatsink under temperature in the W phase of power unit 1 (typical of frame 14 drives)
304, 305	There is a heatsink under temperature in power unit 2 (typical of frame 12 and 14 drives)
307	There is a heatsink under temperature in the U phase of power unit 2 (typical of frame 14 drives)
308	There is a heatsink under temperature in the V phase of power unit 2 (typical of frame 14 drives)
309	There is a heatsink under temperature in the W phase of power unit 2 (typical of frame 14 drives)

Table 1.U Device Change (F44), Device Added (F45), I/O Option board Removed (F65), Power board Checksum (F104), New I/O Option board (F107) and I/O Option board Change (F120) Fault Subcodes

Subcode	Description
273	The power unit has been changed, added, removed, has experienced a checksum error, or is new and the parameters for the device/board remain unchanged.
274	The Power board has been changed, added, removed, has experienced a checksum error, or is new and the parameters for the device/board remain unchanged.
278	The circuit board in Slot A of the control unit has been changed, added, removed, has experienced a checksum error, or is new and the parameters for the device/board remain unchanged.
279	The circuit board in Slot B of the control unit has been changed, added, removed, has experienced a checksum error, or is new and the parameters for the device/board remain unchanged.
282	The circuit board in Slot E of the control unit has been changed, added, removed, has experienced a checksum error, or is new and the parameters for the device/board remain unchanged.
289	A device or circuit board in power unit 1 has been changed, added, removed, has experienced a checksum error, or is new and the parameters for the device/board remain unchanged. (typical of frame 12 and 14 drives)

Subcode	Description
290	The Power board in power unit 1 has been changed, added, removed, has experienced a checksum error, or is new and the parameters for the device/board remain unchanged. (typical of frame 12 and 14 drives)
294	The circuit board in Slot A of the control unit has been changed, added, removed, has experienced a checksum error, or is new and the parameters for the device/board remain unchanged. (typical of frame 12 and 14 drives)
295	The circuit board in Slot B of the control unit has been changed, added, removed, has experienced a checksum error, or is new and the parameters for the device/board remain unchanged. (typical of frame 12 and 14 drives)
298	The circuit board in Slot E of the control unit has been changed, added, removed, has experienced a checksum error, or is new and the parameters for the device/board remain unchanged. (typical of frame 12 and 14 drives)
305	A device or circuit board in power unit 2 has been changed, added, removed, has experienced a checksum error, or is new and the parameters for the device/board remain unchanged.
321	A device or circuit board has been changed, added, removed, has experienced a checksum error, or is new and the parameters for the device/board remain unchanged.
322	The Control board has been changed, added, removed, has experienced a checksum error, or is new and the parameters for the device/board remain unchanged.
326	The circuit board in Slot A of the control unit has been changed, added, removed, has experienced a checksum error, or is new and the parameters for the device/board remain unchanged.
327	The circuit board in Slot B of the control unit has been changed, added, removed, has experienced a checksum error, or is new and the parameters for the device/board remain unchanged.
330	The circuit board in Slot E of the control unit has been changed, added, removed, has experienced a checksum error, or is new and the parameters for the device/board remain unchanged.
369	The Star Coupler board on the control unit has been changed, added, removed, has experienced a checksum error, or is new and the parameters for the device/board remain unchanged. (typical of frame 12 and 14 drives)
370	The Star Coupler board has been changed, added, removed, has experienced a checksum error, or is new and the parameters for the device/board remain unchanged. (typical of frame 12 and 14 drives)
528	The power level in power unit 2 is not equal to the power level in power unit 1 after a microprocessor reset. (typical of frame 12 and 14 drives)
561	The power level in power unit 2 is not equal to the power level in power unit 1 after a microprocessor reset. (typical of frame 12 and 14 drives)

Table 1.V NVS Read Checksum Fault (F47) Subcode

Subcode	Description
322	An operating time or energy counter checksum error has occurred on the Control board

Table 1.W Motor Over Temperature Fault (F16) Subcode

Subcode	Description
400	The motor is operating at high current and low frequency and is not accelerating

Table 1.X Power Unit Fault (F70) Subcodes

Subcode	Description
272, 273	There is saturation in the power unit
275	There is saturation in the U phase of the power unit (typical of frame 11 and 13 drives)
276	There is saturation in the V phase of the power unit (typical of frame 11 and 13 drives)
277	There is saturation in the W phase of the power unit (typical of frame 11 and 13 drives)
288, 289	There is saturation in power unit 1 (typical of frame 12 and 14 drives)
291	There is saturation in the U phase of power unit 1 (typical of frame 14 drives)
292	There is saturation in the V phase of power unit 1 (typical of frame 14 drives)
293	There is saturation in the W phase of power unit 1 (typical of frame 14 drives)

Subcode	Description
304, 305	There is saturation in power unit 2 (typical of frame 12 and 14 drives)
307	There is saturation in the U phase of power unit 2 (typical of frame 14 drives)
308	There is saturation in the V phase of power unit 2 (typical of frame 14 drives)
309	There is saturation in the W phase of power unit 2 (typical of frame 14 drives)

Table 1.Y Hardware Enable Fault (F94) Subcode

Subcode	Description
338	An hardware enable signal is missing from the control terminal block

Table 1.Z Parameter Checksum Fault (F100) Subcodes

Subcode	Description
322	A firmware interface powerdown variable checksum error has occurred on the Control board
578	A firmware interface variable checksum error has occurred on the Control board
834	A system powerdown variable checksum error (panel menu index, fault history pointer) has occurred on the Control board
1090	A system parameter checksum error (multimonitor, panel default pages) has occurred on the Control board
1346	An application defined powerdown, variable checksum error has occurred on the Control board
1602	An application defined powerdown, variable checksum error has occurred on the Control board
2626	A system parameter checksum error (fault history entries, device valid, system menu parameters) has occurred on the Control board

Table 1.AA Main Control board - Power board Configuration Fault (F106) Subcode

Subcode	Description
385	The software and the power unit are incompatible

Common Drive Conditions and Corrective Actions

No Output Voltage

The drive has no output voltage to the motor, even though the drive indicates that the motor is running.

Diagnostic Procedure	Corrective Action
1. Measure the DC bus voltage.	If the DC bus is not within specification, repair or replace the Rectifying module as needed. Otherwise, continue with step 2.
2. Measure the AC output voltage at the motor terminals using a VAC RMS meter and compare the measurement to the AC output voltage displayed on the HIM (Par 307 [Output Voltage] for 700S drives, Par 6 [Output Voltage] for 700H drives).	If the AC output voltage at the motor terminals does not match the output voltage displayed on the HIM, repair or replace the Output Power modules as needed. Otherwise, continue with step 3.
3. Verify that there are no loose or missing connections between the Gate Driver board and ASIC board and the Gate Driver board and Adapter board.	If there are loose or missing connections, or a board has been damaged, replace the loose or missing connections, or repair or replace any of the boards as needed. Otherwise, continue with step 4.

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.

4. Complete the "Conducting Forward and Reverse Biased Diode Tests for Major Power Components" on page 2-2 for the Output Power modules.	If the test is not completed successfully, replace the Output Power modules. Otherwise, continue with step 5.
5. Check the motor windings and motor cables with a high resistance DVM (megger).	Repair or replace the motor as needed.

Blown Input Fuse

If the drive causes the AC input line fuse to open, complete the following tests to verify that the power structure is functioning properly before replacing the AC input line fuse and reapplying power to the drive.

Diagnostic Procedure	Corrective Action
1. Disconnect the motor leads.	Continue with step 2.
2. Complete the "Conducting Forward and Reverse Biased Diode Tests for Major Power Components" on page 2-2 for the Rectifier module.	If the test is not completed successfully, replace the Rectifying module. Continue with step 3.
3. Complete the "Conducting Forward and Reverse Biased Diode Tests for Major Power Components" on page 2-2 for the Output Power modules.	If the test is not completed successfully, replace the Output Power modules. Continue with step 4.
4. Examine the DC bus capacitors.	If there is evidence of charring and damaged reliefs, replace the DC bus capacitors. Otherwise, continue with step 5.
5. Check the motor windings and motor cables with a high resistance DVM (megger).	Repair or replace the motor as needed. Otherwise, continue with step 6.
6. Disconnect and check the AC choke with a high resistance DVM (megger). • Verify that the line to line is open • Verify that the line to ground is open • Verify that the input to output is low resistance, but not shorted	Repair or replace the AC choke as needed. Continue with step 7.
7. Reconnect the AC choke and motor leads.	

No HIM Display

If the HIM does not display, complete the following procedure to verify that power is available.

Diagnostic Procedure	Corrective Action
1. Measure the DC bus voltage.	If the DC bus is not within specification, repair or replace the Rectifying module as needed. Otherwise, continue with step 2.
2. Measure the DC voltage supply at connector X4 on the DPI circuit board on the back of the HIM cradle. The voltage should be approximately 12V DC.	If the DC voltage is incorrect: • PowerFlex 700S drives - Replace the High Power Fiber Optic Interface circuit board • PowerFlex 700H drives - Replace the output power modules Otherwise, continue with step 3.
3. Check for loose or missing connections between the DPI circuit board and the High Power Fiber Optic Interface circuit board.	If there are loose or missing connections, or a board has been damaged, replace the loose or missing connections, or repair or replace any of the boards as needed. Otherwise, Replace the HIM.

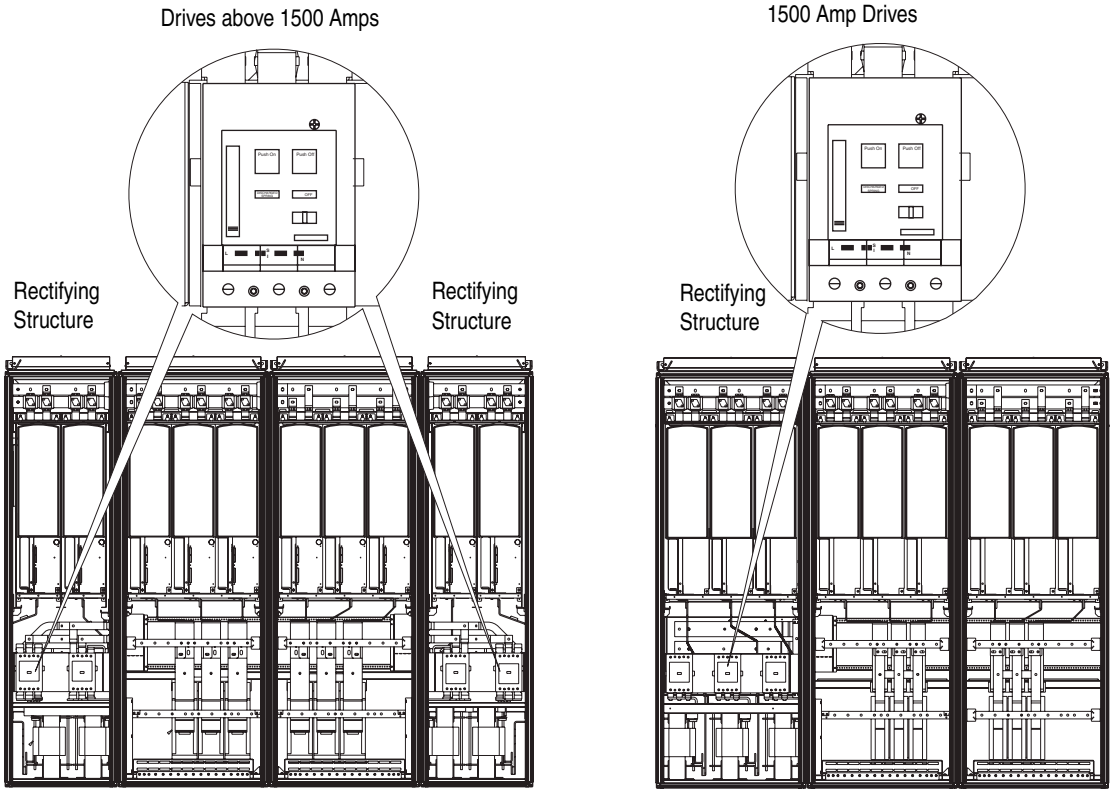
Molded Case Circuit Breakers (MCCBs) Trips

The electronic trip unit will open the circuit breaker in the case of a drive overload/overcurrent condition. When a voltage drop (U < 0.7 x Un) or loss of the main supply occurs, the undervoltage release coil of the circuit breakers will open. The trip indicator contacts of the circuit breakers are connected in series. Therefore, if one circuit breakers trips due to an undervoltage or overload/overcurrent condition, all circuit breakers will open/trip.

If the circuit breakers have opened due to an overcurrent fault, the condition that caused the fault must be corrected and the fault cleared before the circuit breakers can be reset and the drive started. In this case, refer to "Charging the MCCB Motor Operators" in the PowerFlex 700S / 700H AC Drive Installation Manual, publication PFLEX-IN006.

Also, refer Appendix E - MCCB Circuit Breakers for more information and to Figure B.6 on page B-7 for a schematic diagram of the MCCBs.

Figure 1.3 MCCB locations



Technical Support Options

Technical Support Wizards

If you are connected to a drive via DriveExplorer™ or DriveExecutive™, you can run a Tech Support wizard to gather information that will help diagnose problems with your drive and/or peripheral device. The information gathered by the wizard is saved as a text file and can be emailed to your remote technical support contact. (See What You Need When You Call Tech Support on page 1-26 for more information.)

To run a Tech Support wizard in DriveExplorer, select **Wizards** from the **Actions** menu. In DriveExecutive, select **Wizards** from the **Tools** menu. Or, click the  button. Follow the prompts to complete the wizard.

What You Need When You Call Tech Support

When you contact Technical Support, please be prepared to provide the following information:

- Order number
- Product catalog number and drives series number (if applicable)
- Product serial number
- Firmware revision level
- Most recent fault code
- Your application

The data contained in the following parameters will help in initial troubleshooting of a faulted PowerFlex 700H drive. You can use the table below to record the data provided in each parameter listed.

Param(s)	Name	Description	Parameter Data
224	Fault Frequency	Captures and displays the output speed of drive at time of last fault.	
225	Fault Amps	Captures and displays motor amps at time of last fault.	
226	Fault Bus Volts	Captures and displays the DC bus voltage of drive at time of last fault.	
227	Status 1 @ Fault	Captures and displays [Drive Status 1] bit pattern at time of last fault.	
228	Status 2 @ Fault	Captures and displays [Drive Status 2] bit pattern at time of last fault.	
229	Alarm 1 @ Fault	Captures and displays [Drive Alarm 1] bit pattern at time of last fault.	
230	Alarm 2 @ Fault	Captures and displays [Drive Alarm 2] bit pattern at time of last fault.	
243	Fault 1 Code	A code that represents the fault that tripped the drive.	
245	Fault 2 Code		
247	Fault 3 Code		
249	Fault 4 Code		
251	Fault 5 Code		
253	Fault 6 Code		
255	Fault 7 Code		
257	Fault 8 Code		
244	Fault 1 Time	Time stamp of the fault occurrence.	
246	Fault 2 Time		
248	Fault 3 Time		
250	Fault 4 Time		
252	Fault 5 Time		
254	Fault 6 Time		
256	Fault 7 Time		
258	Fault 8 Time		
262-269	Alarm Code 1-8	A code that represents a drive alarm. No time stamp available.	

Component Test Procedures

Important: Review all precautions beginning on page -3 prior to beginning any of the component test procedures contained in this chapter.

Performing Visual Inspections

Visually inspect the cooling tunnels and heatsinks and components on the NFE Converter and Inverter structures before energizing the drive.

Inspecting the Cooling Tunnels and Heatsinks

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-4.
2. Remove the main cooling fans from the bottom of the NFE converter (if present) and inverter structures. Refer to Removing the Main Cooling Fans from the NFE Converters on page 3-21 and Removing the Main Cooling Fans from the Inverters on page 3-51, respectively.
3. Inspect the cooling tunnels and heatsinks. Clean the heatsinks and tunnels if necessary.

Inspecting the Rectifying and Power Structures

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-4.
2. Remove the protective covers from the NFE Converters (if present) and Inverters. Refer to Removing the Protective Covers from the NFE Converters on page 3-18 and Removing the Protective Covers from the Inverters on page 3-42, respectively.
3. Check all components for burn marks, breakage or foil delamination on circuit boards. Check all the boards on the NFE Converters (if present) and Inverters, including those on the Rectifying modules (if present) and Output Power modules.

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

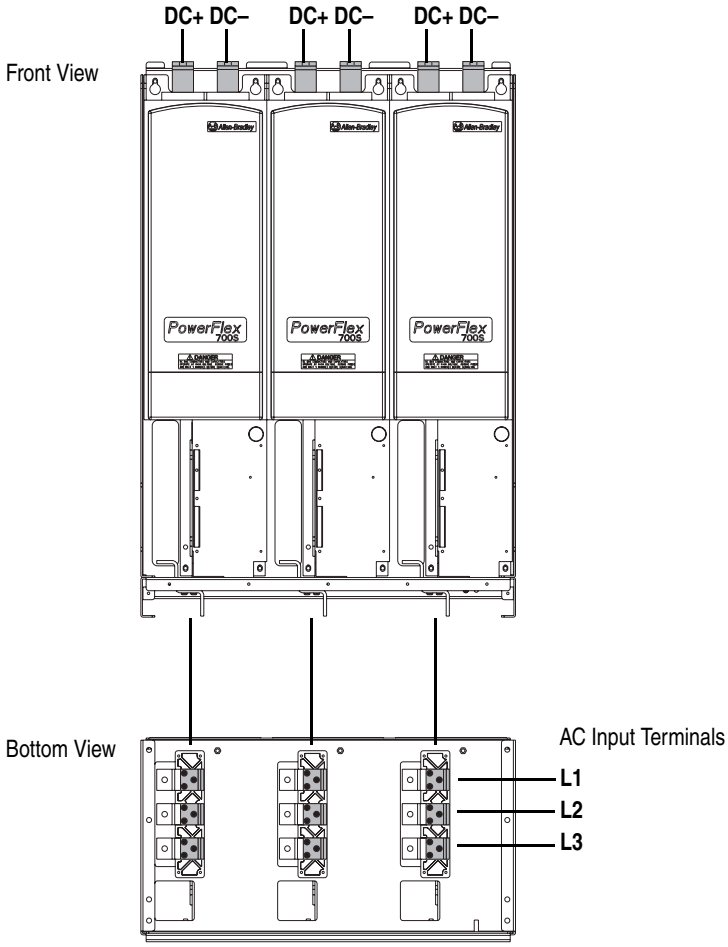
Conducting Forward and Reverse Biased Diode Tests for Major Power Components

A forward biased diode test checks the semiconductor junctions between the terminals and measures the voltage drop across those junctions. A reverse biased diode test should find an open circuit, and the meter should display a value close to zero (Ex. ".0L" = zero load).

Important: The actual voltage readings may vary depending upon your equipment. If your readings are not near the indicated values in the tables below, verify that the actual voltage measured is consistent for the Rectifying modules and Output Power modules.

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-4.
2. Remove the protective screens from the Rectifying structure enclosure (if present). Refer to Removing the Protective Screens from the Rectifying Structure Enclosure on page 3-19.
3. Remove the protective screens from the Power structure enclosure (if present). Refer to Removing the Protective Screens from the Power Structure Enclosure on page 3-48.
4. Disconnect the motor leads from the output power terminals. Refer to Figure 2.2 on page 2-4 for terminal location.
5. Conduct forward and reverse biased diode tests on the Rectifying Modules (if present) and the Output Power Modules.

Figure 2.1 Measurement Points on the Rectifying Units for Forward and Reverse Biased Diode Tests on the Rectifying Modules



Note: One Rectifying Unit shown for clarity only.

Table 2.A Forward Biased Diode Tests on Rectifying Modules

Meter Leads		Nominal meter reading
–	+	
DC+	L1	Meter should beep once and value should gradually rise to about 1.0V(1)
DC+	L2	
DC+	L3	
L1	DC–	The value should gradually rise to about 0.35V(2)
L2	DC–	
L3	DC–	

(1) The actual voltage reading may vary depending upon your equipment. If your readings are not near 1.0V, verify that the actual voltage measured is consistent for the Rectifying module and the Output Power modules.

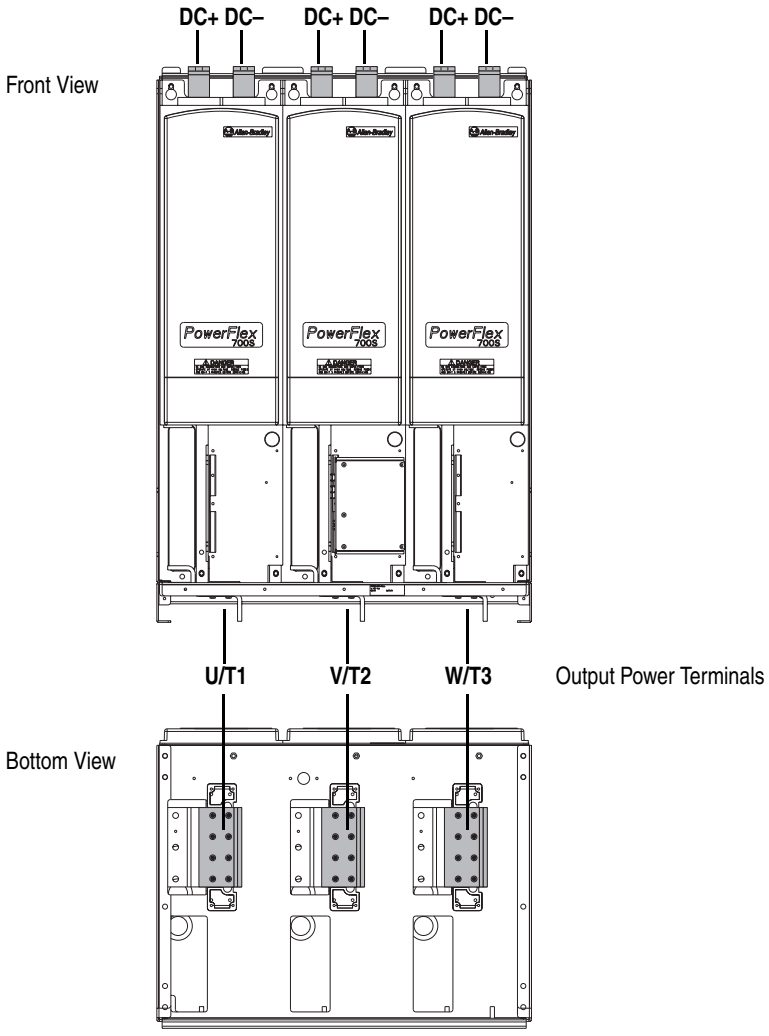
(2) The actual voltage reading may vary depending upon your equipment. If your readings are not near 0.35V, verify that the actual voltage measured is consistent for the Rectifying module and the Output Power modules.

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	

Important: If any one of the Rectifying modules fails these measurements, replace all Rectifying modules in a unit.

Figure 2.2 Measurement Points on the Inverter Units for Forward and Reverse Biased Diode Tests on the Output Power Modules



Note: One Inverter Unit shown for clarity only.

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

Meter Leads		
+	–	Nominal meter reading
DC–	U/T1	Meter should beep once and value should gradually rise to about 1.0V(1)
DC–	V/T2	
DC–	W/T3	
U/T1	DC+	The value should gradually rise to about 0.35V(2)
V/T2	DC+	
W/T3	DC+	

(1) The actual voltage reading may vary depending upon your equipment. If your readings are not near 1.0V, verify that the actual voltage measured is consistent for the Rectifying module and the Output Power modules.

(2) The actual voltage reading may vary depending upon your equipment. If your readings are not near 0.35V, verify that the actual voltage measured is consistent for the Rectifying module and the Output Power modules.

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

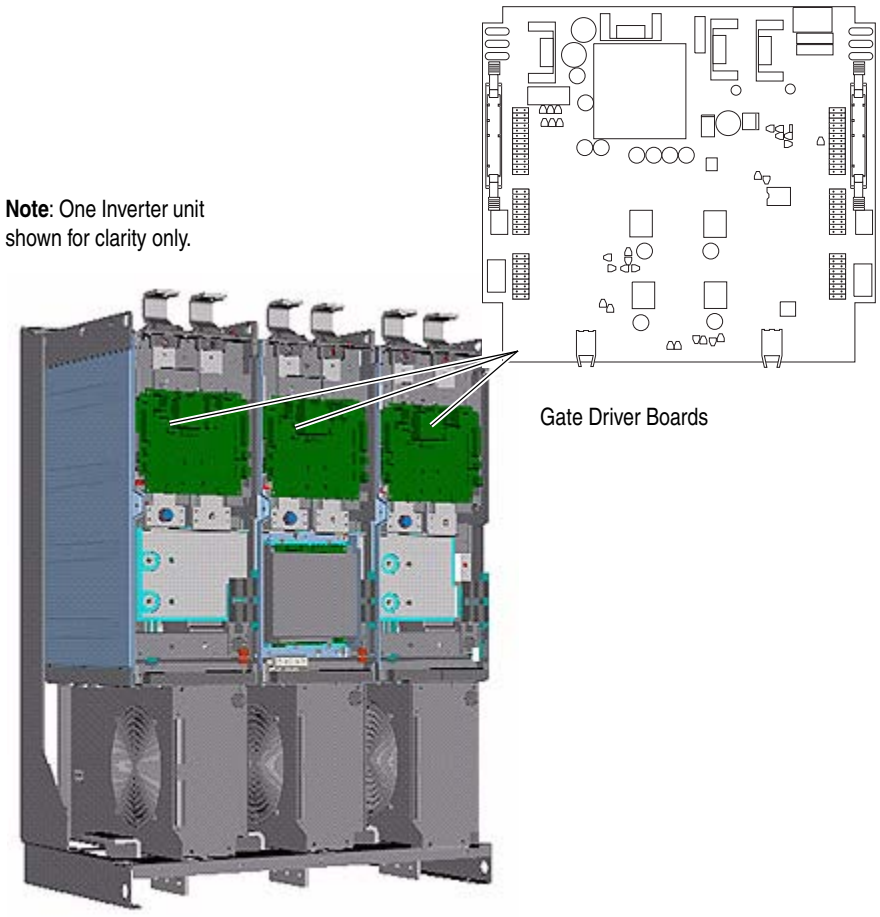
Meter Leads		
+	–	Nominal meter reading
U/T1	DC–	Meter should display ".0L" (zero load)
V/T2	DC–	
W/T3	DC–	
DC+	U/T1	
DC+	V/T2	
DC+	W/T3	

Important: If one of the Output Power modules fails any of these measurements, replace all three Output Power modules in a unit.

Conducting Gate Driver Board Gate Interface Resistance Measurements

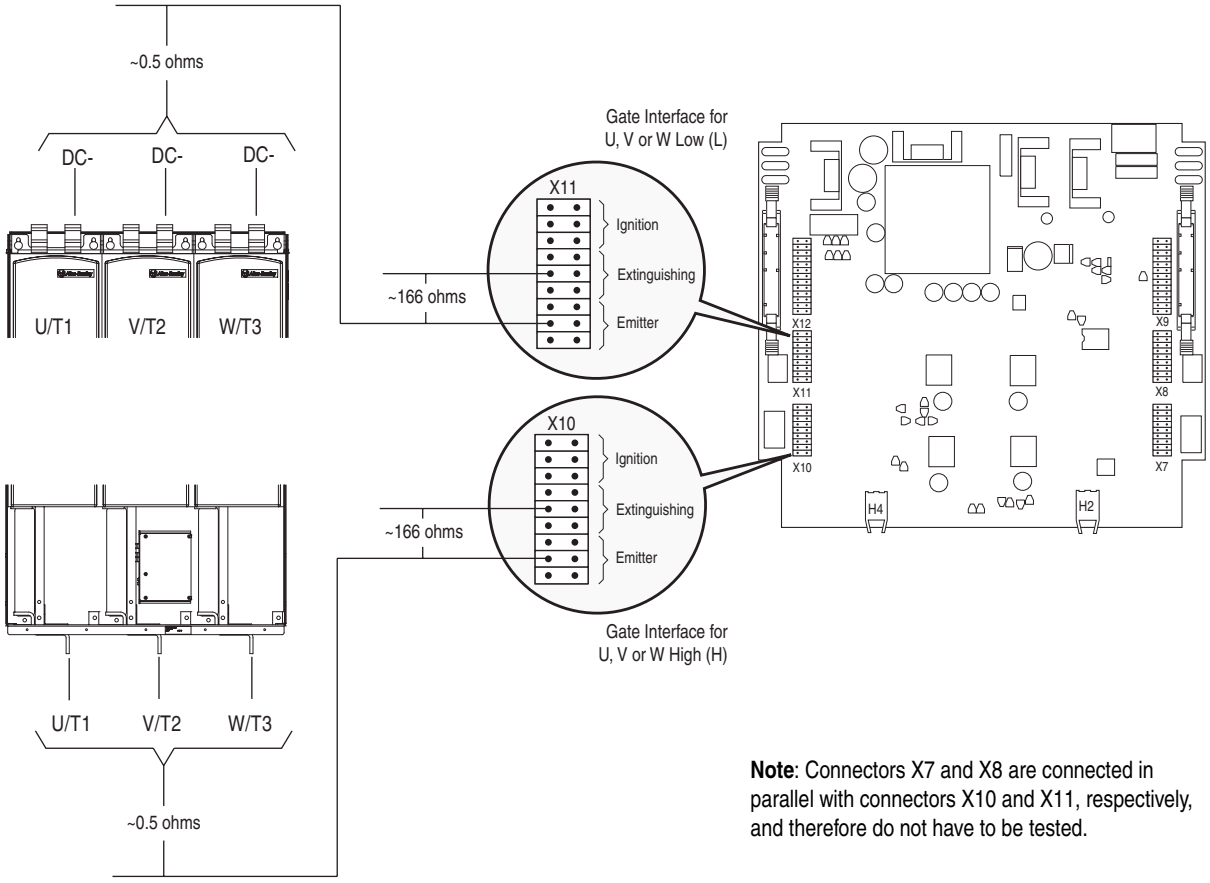
1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-4.
2. Remove the protective screens from the Rectifying structure enclosure (if present). Refer to Removing the Protective Screens from the Rectifying Structure Enclosure on page 3-19.
3. Remove the protective covers from the Inverters. Refer to Removing the Protective Covers from the Inverters on page 3-42.
4. There is one Gate Driver board per Output Power module. Locate the Gate Driver boards on the front of the Inverter units.

Note: One Inverter unit shown for clarity only.



5. 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 Ω
- 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 Ω
- The resistance from the X11 branch emitter to the same branch DC– bus terminal should be approximately 0.5 Ω



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

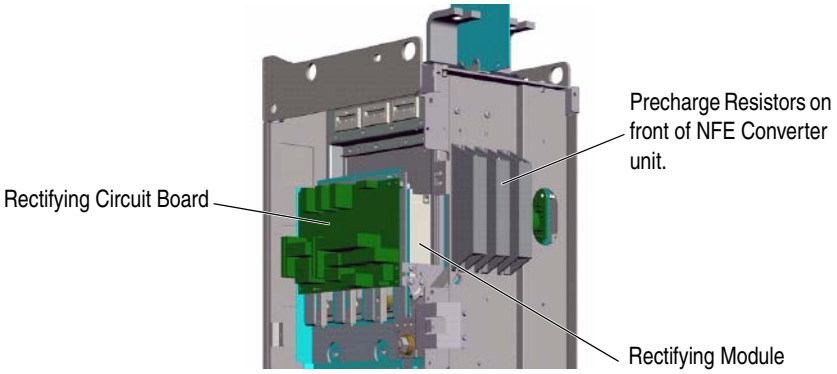
Important: If any of the gate interfaces fails this test, replace the appropriate (left, middle, or right) Output Power module. Refer to Removing the Output Power Modules from the Inverters on page 3-68.

Checking the Rectifying Modules (on AC Input Drives Only)

Complete the following tests on all Rectifying modules and connected components.

- 1500 A drives contain three Rectifying modules
- 1770, 1900, 2150 and 2250 A drives contain four Rectifying modules
- 2700 A drives contain six Rectifying modules

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-4.
2. Remove the protective screens from the Rectifying structure enclosure (if present). Refer to Removing the Protective Screens from the Rectifying Structure Enclosure on page 3-19.
3. Remove the protective covers from the NFE Converters. Refer to Removing the Protective Covers from the NFE Converters on page 3-18.
4. Each NFE Converter has three precharge resistors. Visually inspect the resistors.



5. If the precharge resistors are damaged:

   A.Check the rectifiers and external connections for short-circuits.

   B.Replace all Rectifying modules. Refer to Removing the Rectifying Modules from the NFE Converters on page 3-34.

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

Taking Resistance Measurements on the Precharge Resistors

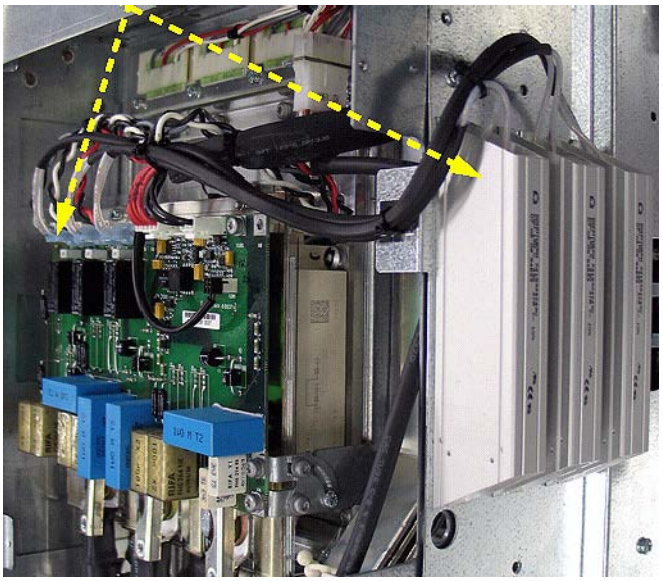
6. Disconnect the wires from connectors X13, X21 and X31, X22 and X32, and X23 and X33 on the Rectifying circuit board.

7. Perform resistance measurements, using a digital multimeter, on the resistor wires that you have disconnected from connectors X21 and X31, X22 and X32 and X23 and X33 on the Rectifying circuit board.

8. Verify that the resistance of each resistor is approximately 47 Ω

Important: If any of the precharge resistors fails this test, replace the resistor.

Disconnect precharge resistor wires from Rectifying circuit board.



Taking Resistance Measurements on the Rectifying Circuit Board

9. Perform resistance measurements, using a digital multimeter, on the points listed in Table 2.E below.

Table 2.E Rectifying Circuit Board Resistance Measurements

Measurement Points on Board	Resistance
X31 to X9	0 Ω
X32 to X9	
X33 to X9	

Important: If the Rectifying circuit board fails any of these tests, replace it. Refer to Removing the Rectifying Circuit Board on page 3-32.

Taking Resistance Measurements on the Rectifying Module

10. Disconnect the wires from connectors X10, X11, X12 and X13 on the Rectifying Circuit board.

11. Perform gate resistance measurements, using a digital multimeter, on the points listed in Table 2.F below. These points are on the back of the gate leads that you have disconnected from the board.

Table 2.F Rectifying Module Gate Lead Resistance Measurements

Measurement points on Gate Leads	Resistance
X10 gate lead: red to X10 gate lead: black	18 Ω ±1 Ω
X11 gate lead: red to X11 gate lead: black	
X12 gate lead: red to X12 gate lead: black	

Important: If the Rectifying module fails any of these tests, replace it. Refer to Removing the Rectifying Modules from the NFE Converters on page 3-34.

Checking the Main Fan Inverters and Fans

Checking the Fan Inverter LEDs

Each fan inverter has a red and a green diagnostic LED.

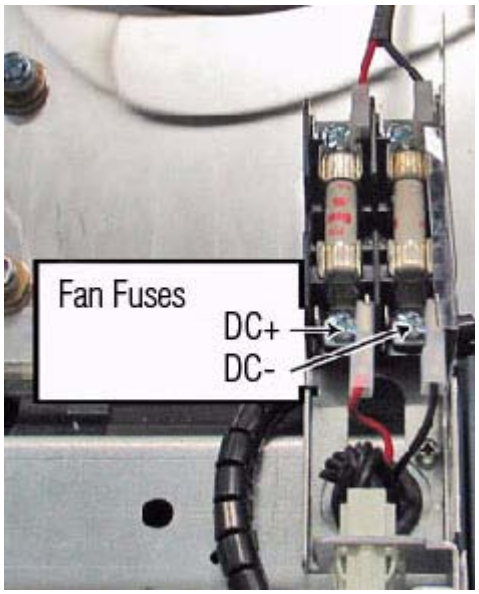
ATTENTION: The inverter LEDs are only operational when the drive is energized, and only visible with the covers removed from the power structure. Servicing energized equipment can be hazardous. Severe injury or death can result from electrical shock, burn or unintended actuation of controlled equipment. 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

1. Remove the protective covers from the NFE Converters and Inverters. Refer to Removing the Protective Covers from the NFE Converters on page 3-18 or Removing the Protective Covers from the Inverters on page 3-42.

2. Using a multi-meter, verify that the fuses are not open.

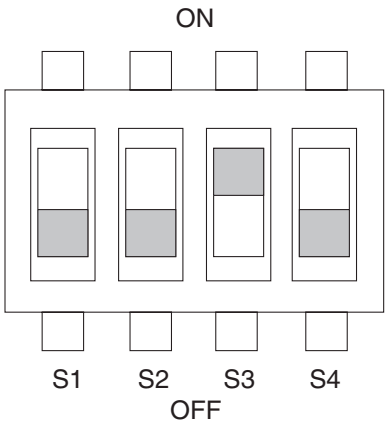


Fan Inverter DIP Switch Settings

1. The Fan Inverters must be removed from the drive in order to verify the DIP Switch settings. Refer to Removing the Fan Inverters from the NFE Converters on page 3-25 and Removing the Fan Inverters from the Inverters on page 3-52.

2. 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 NFE Unit

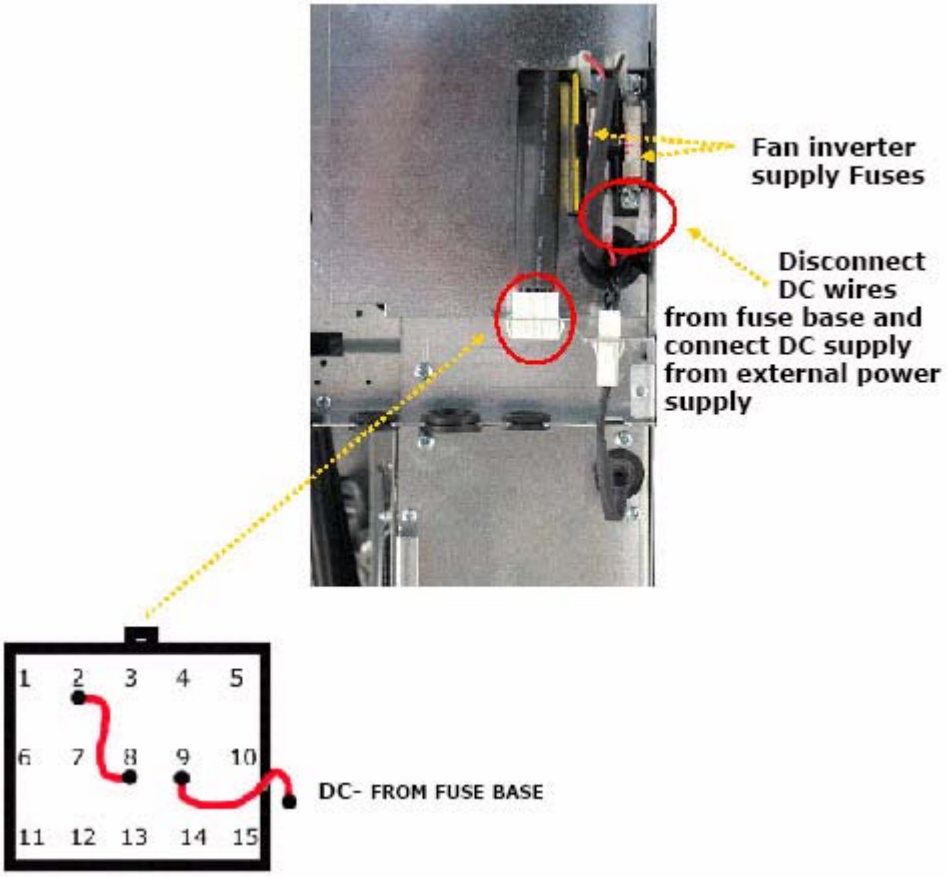
Important: This procedure requires special equipment and training. Only qualified and trained personnel should perform these procedures.

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 Main Fan Circuit for Drives with AC Input on page B-6 or Main Fan Connections for Drives with DC Input on page B-11 for more information.

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-4.
2. Remove the 6 A 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 1 A.

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.

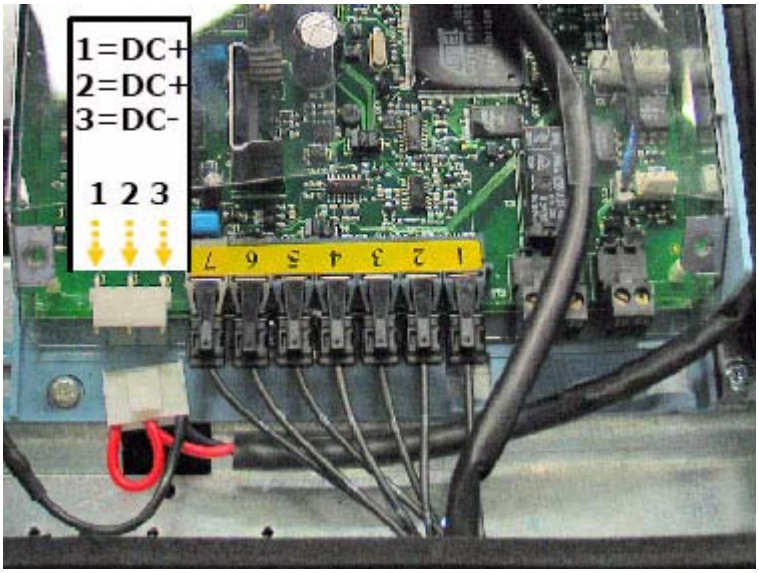
Isolating a Faulty Fan Inverter on the Inverter Unit

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

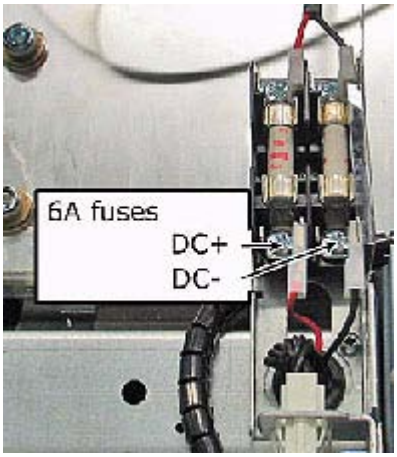
These tests require the recommended high voltage DC power supply.

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 Main Fan Circuit for Drives with AC Input on page B-6 for more information.

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-4.
2. Remove the 6 A 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 1 A.
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 3-4.
2. Remove the covers from the NFE Converter structure. Refer to Removing the Protective Covers from the NFE Converters on page 3-18.
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 NFE Converters on page 3-21.
5. Reconnect the fan motor to its inverter.
6. Repeat steps 3…5 for the remaining fan motor(s) on the NFE Converter structure.
7. Remove the covers from the power structure. Refer to Removing the Protective Covers from the Inverters on page 3-42.
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 Inverters on page 3-51.

Table 2.G Correct Fan Measurements

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

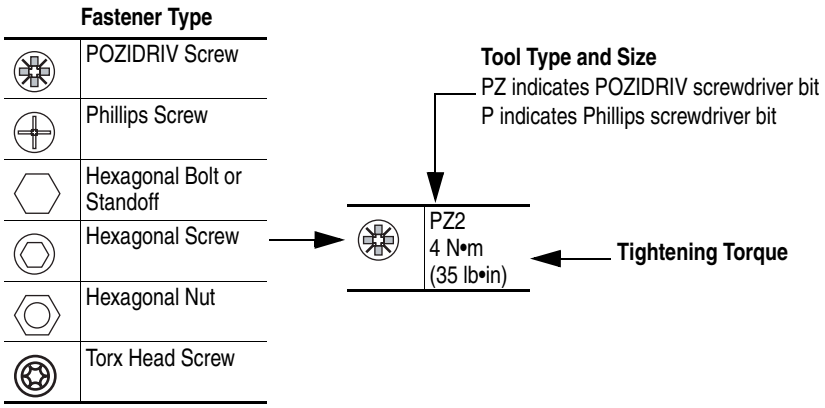
10. Reconnect the fan motor to its inverter.

11. Repeat steps 8 …10 for the remaining fan motor(s) on the power structure.

Access Procedures

Understanding Torque Figures in Assembly Diagrams

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



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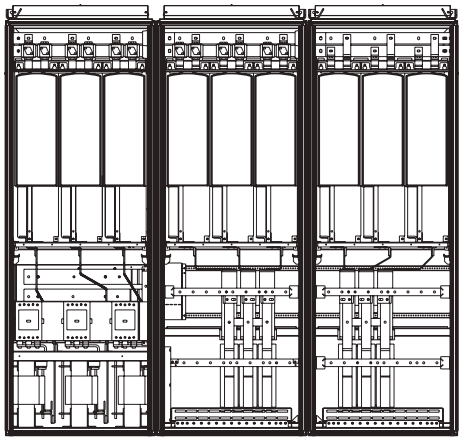
Rectifying and Power Structure Locations in Frame 14 Drives

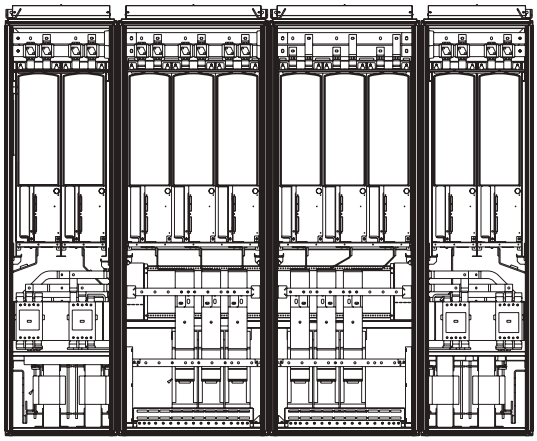
The Rectifying structures contain the Non-Regenerative Front End (NFE) Converters, which contain the Rectifying modules. The Power structures contain the Inverters, which contain the Output Power modules. The access procedures below are split into two main sections; one for the components contained in the Rectifying structures and one for the components contained in the Power structures. See: Rectifying Structure Access Procedures on page 3-5 or Power Structure Access Procedures on page 3-42.

1500A Drive



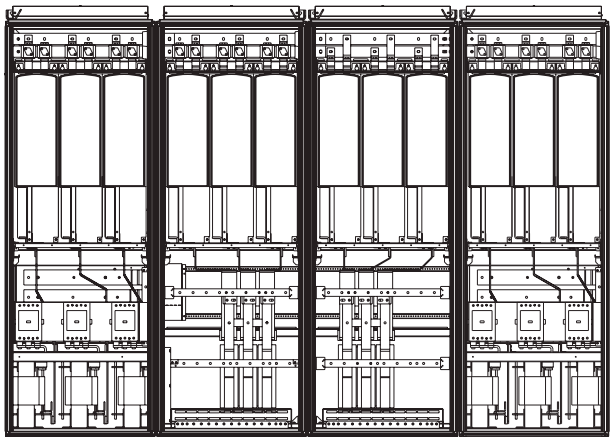
Rectifying Structure | Power Structure #1 | Power Structure #2

1770A, 1900A, 2150A & 2250A Drives



Rectifying Structure #1 | Power Structure #1 | Power Structure #2 | Rectifying Structure #2

2700A Drive



Rectifying Structure #1 | Power Structure #1 | Power Structure #2 | Rectifying Structure #2

Note: Shown with doors and control frames removed for clarity only.

Removing Power from the Drive

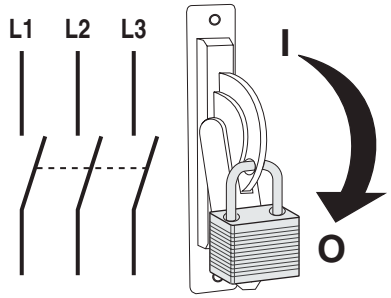
ATTENTION: To avoid an electric shock hazard, verify that the voltage on the bus capacitors has discharged completely before servicing. Check the DC bus voltage at the Power Terminal Block by measuring between the +DC and –DC terminals, between the +DC terminal and the chassis, and between the –DC terminal 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.

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

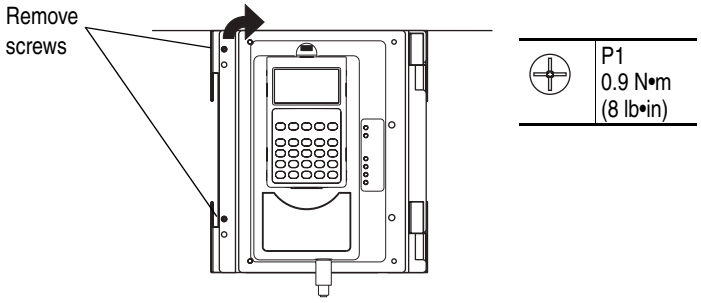
Below are the instructions for removing and installing components, including the rectifying modules, in or on the NFE Converters of the drive. For instructions on removing and installing components, including the output power modules, on the Inverters refer to Power Structure Access Procedures on page 3-42.

Removing the DPI / HIM Assembly

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-4.

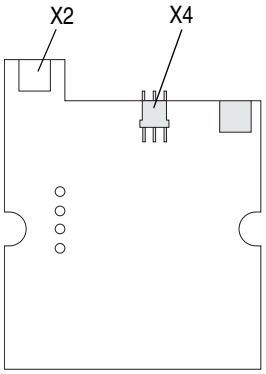
Important: Before removing connections and wires, mark the connections and wires to avoid incorrect wiring during assembly.

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



3. Open the metal plate that holds the DPI interface and HIM.

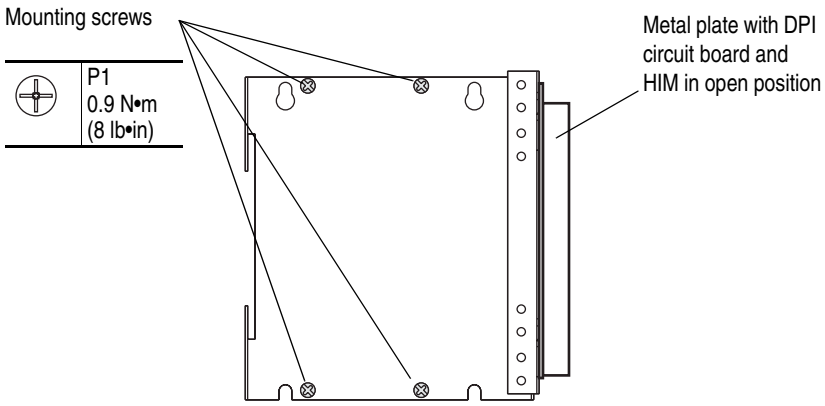
4. Unplug the DPI cable from the X2 connector on the DPI Interface circuit board.



Back view of the DPI circuit board which should remain mounted on the back of the metal plate.

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.

Moving the 700S Control Assembly Mounting Plate

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-4.

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

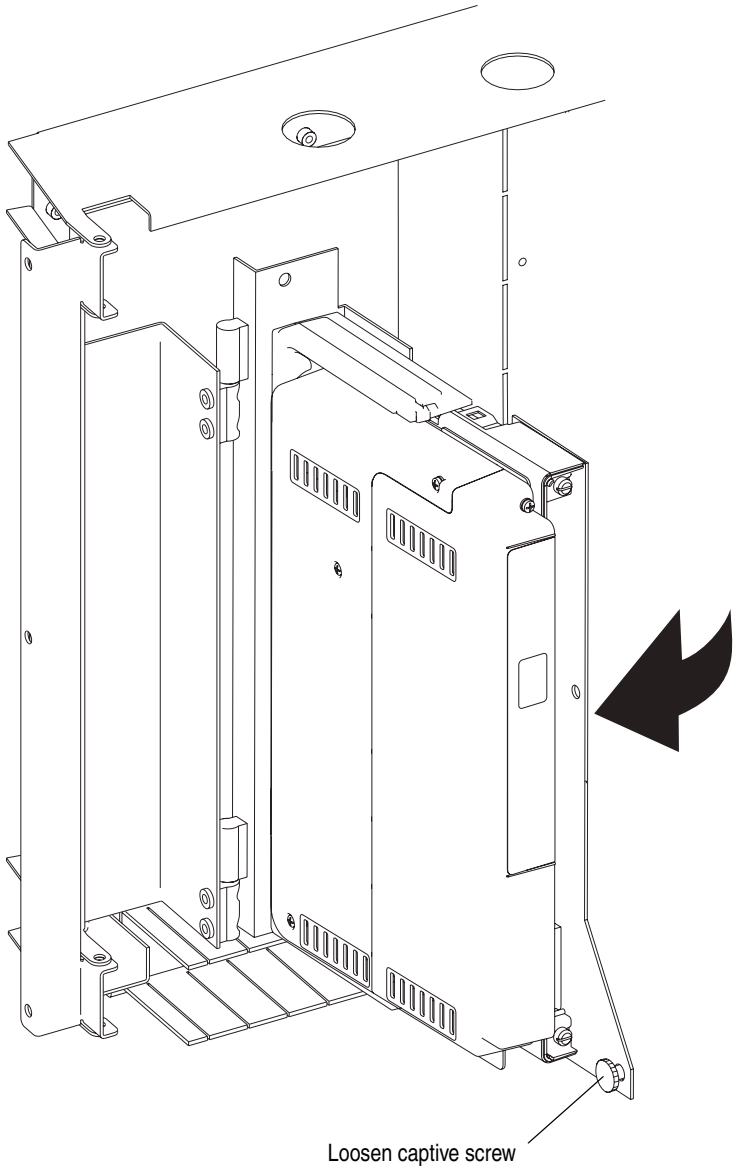
2. Disconnect any fiber optic ControlNet and SynchLink cables from the 700S control cassette.

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. Disconnect the 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 mounting plate away from the drive.

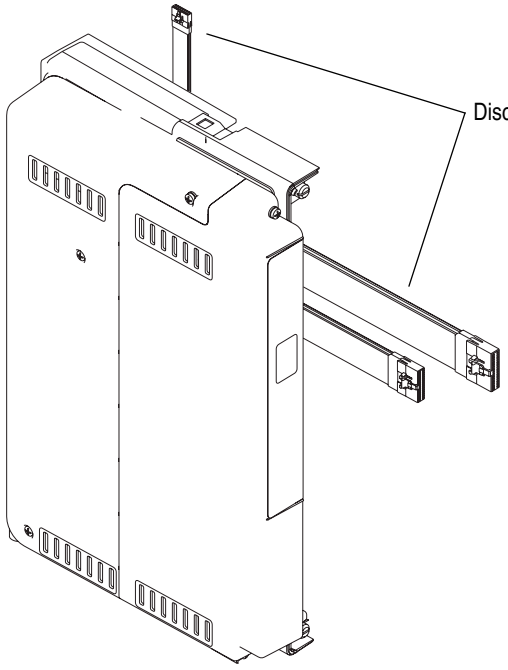


Replacing the 700S Control Assembly Mounting Plate

Replace the 700S control assembly mounting plate in the reverse order of moving.

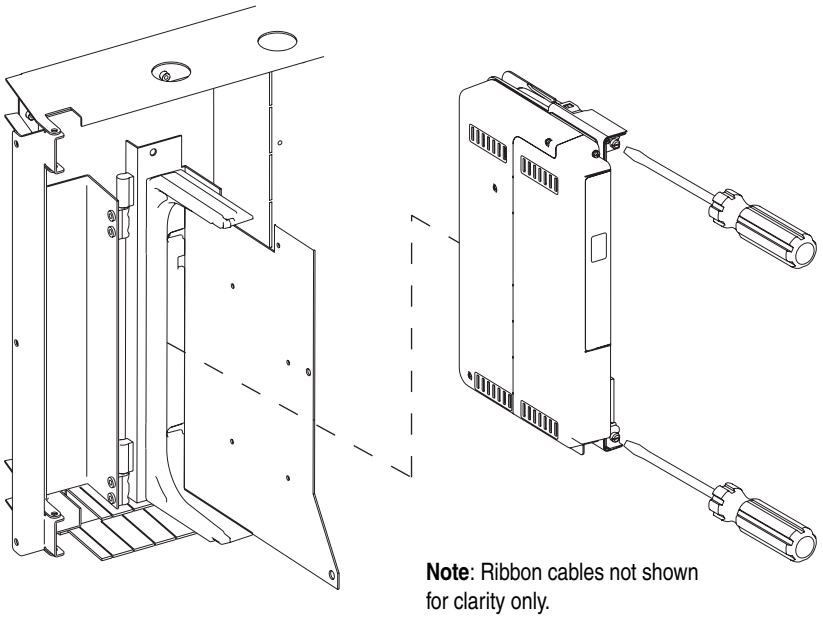
Removing the 700S Phase II Control Cassette

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-4.
2. Move the 700S control assembly mounting plate. Refer to Moving the 700S Control Assembly Mounting Plate on page 3-6
3. Carefully unplug the ribbon cables from the sockets on the Fiber Optic Star 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.

4. 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

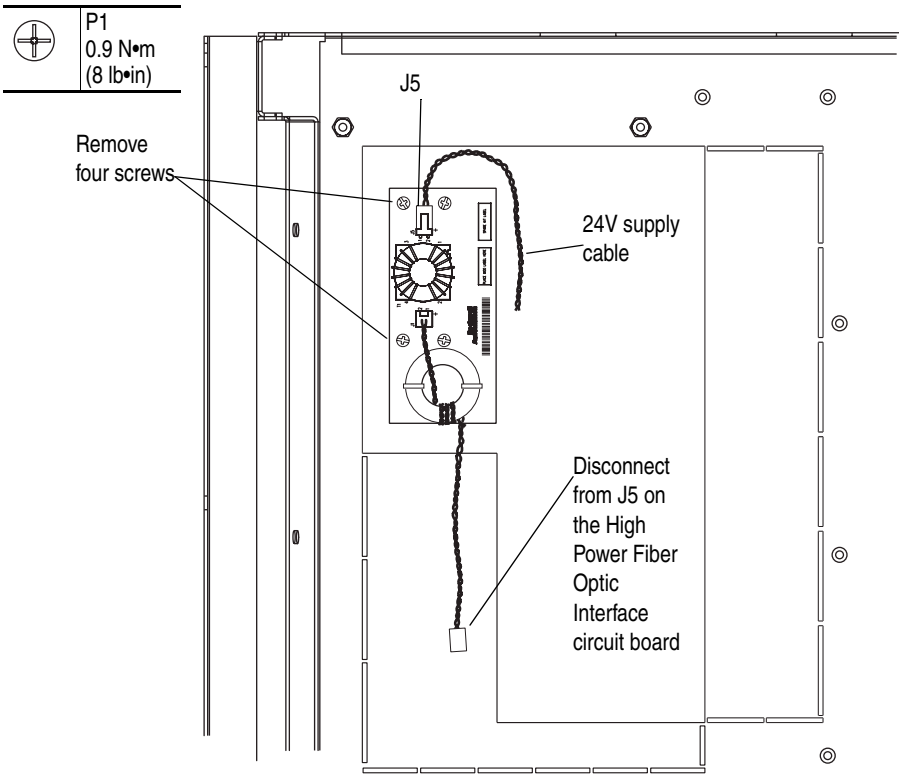
Install the control cassette in the reverse order of removal.

Removing the Common Mode Filter Circuit Board

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-4.
2. Move the 700S control assembly mounting plate. Refer to Moving the 700S Control Assembly Mounting Plate on page 3-6.

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 Fiber Optic Star Interface circuit board.



5. Remove the four screws that secure the Common Mode Filter board to the four standoffs on the control frame and remove the Common Mode Filter board.

Installing the Common Mode Filter Circuit Board

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

Removing the 700S Fiber Optic Interface Board

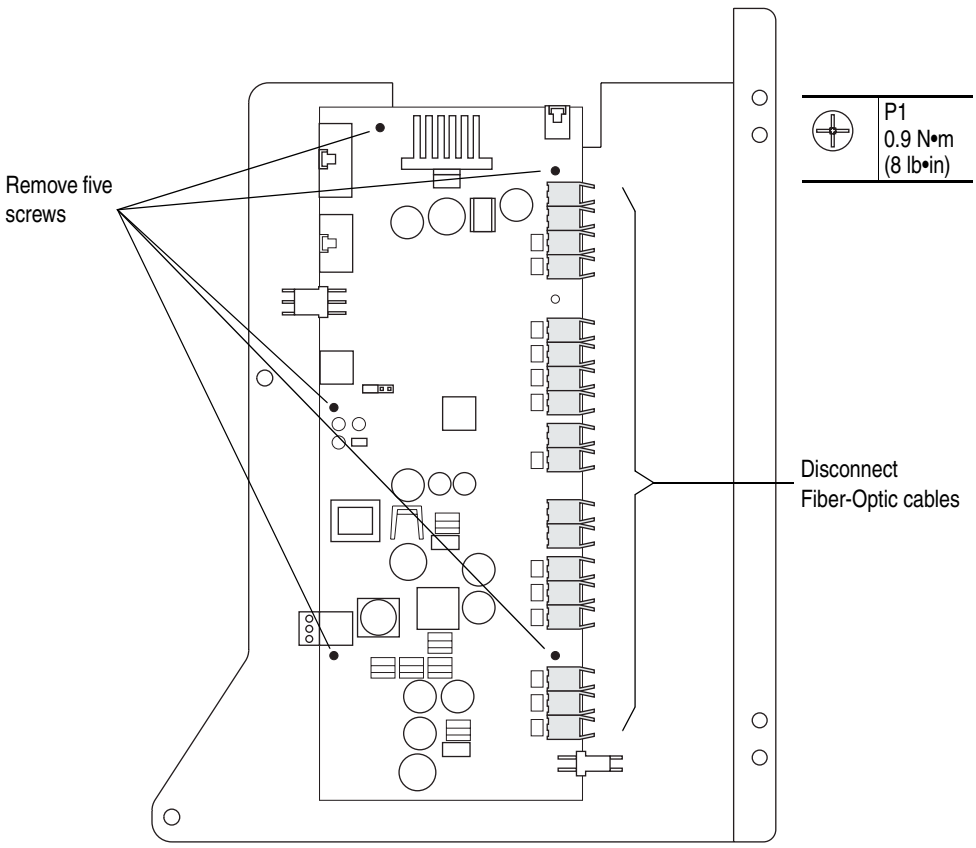
1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-4.
2. Move the 700S control assembly mounting plate. Refer to Moving the 700S Control Assembly Mounting Plate on page 3-6.

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

3. Carefully unplug the fiber-optic cables from the sockets along the right side of the 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.



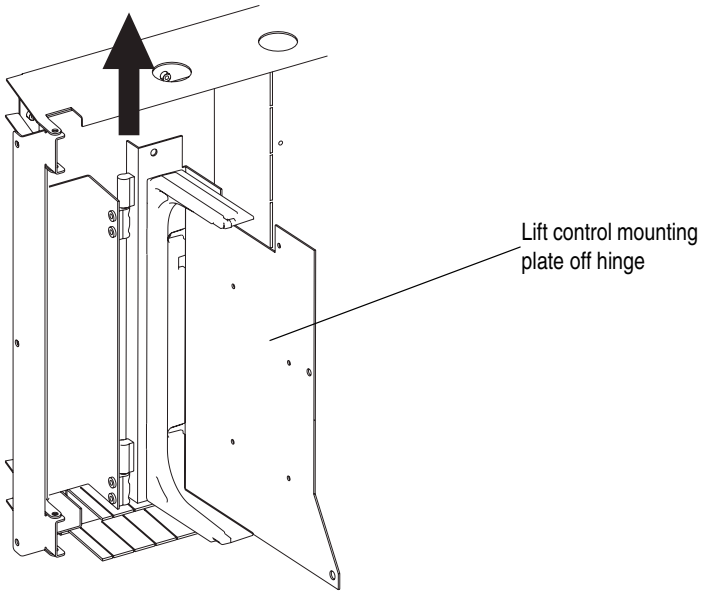
4. Carefully unplug the three ribbon cables from the sockets on the Fiber Optic Interface board, and carefully set them aside.
5. Disconnect the 24V Power Supply cable from connector J5 on the Fiber Optic Interface board.
6. Remove the five screws which secure the Fiber Optic Interface board to the mounting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

Installing the 700S Fiber Optic Interface Circuit Board

Install the Fiber Optic Interface circuit board in reverse order of removal.

Removing the 700S Phase II Control Mounting Plate

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-4.
2. Move the 700S control assembly mounting plate. Refer to Moving the 700S Control Assembly Mounting Plate on page 3-6.
3. Remove the 700S control cassette. Refer to Removing the 700S Phase II Control Cassette on page 3-8.
4. Remove the 700S Fiber Optic Interface circuit board. Refer to Removing the 700S Fiber Optic Interface Board on page 3-11.
5. Lift the control mounting plate up and off of the hinge.



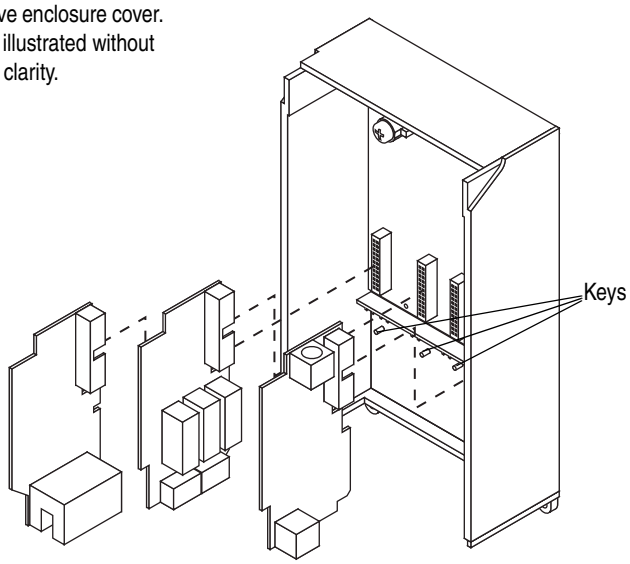
Installing the 700S Phase II Control Mounting Plate

Install the control mounting plate in reverse order of removal.

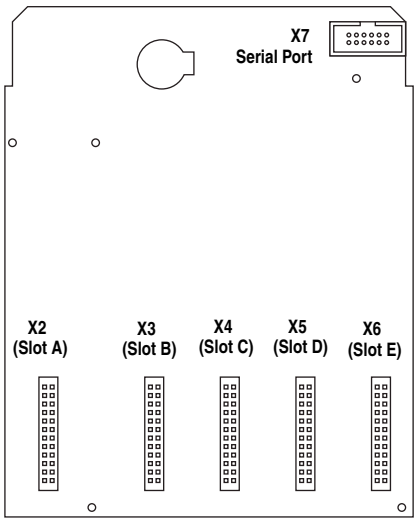
Removing the 700H I/O Circuit Boards and Control Assembly

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-4.
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.

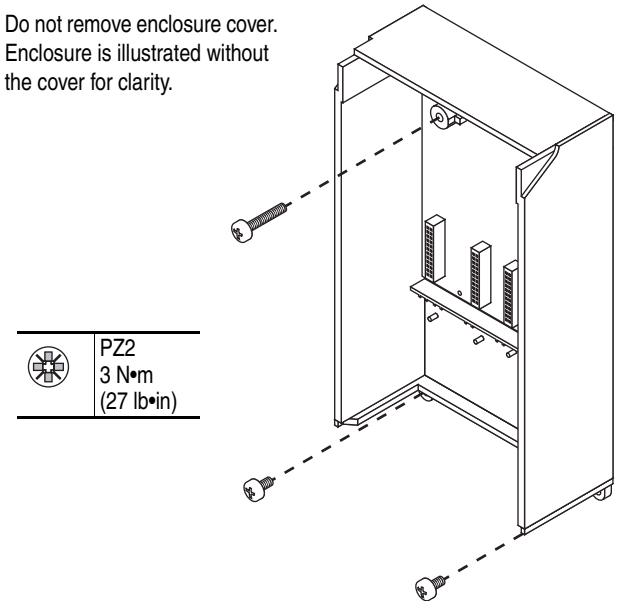
Do not remove enclosure cover. Enclosure is illustrated without the cover for clarity.



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

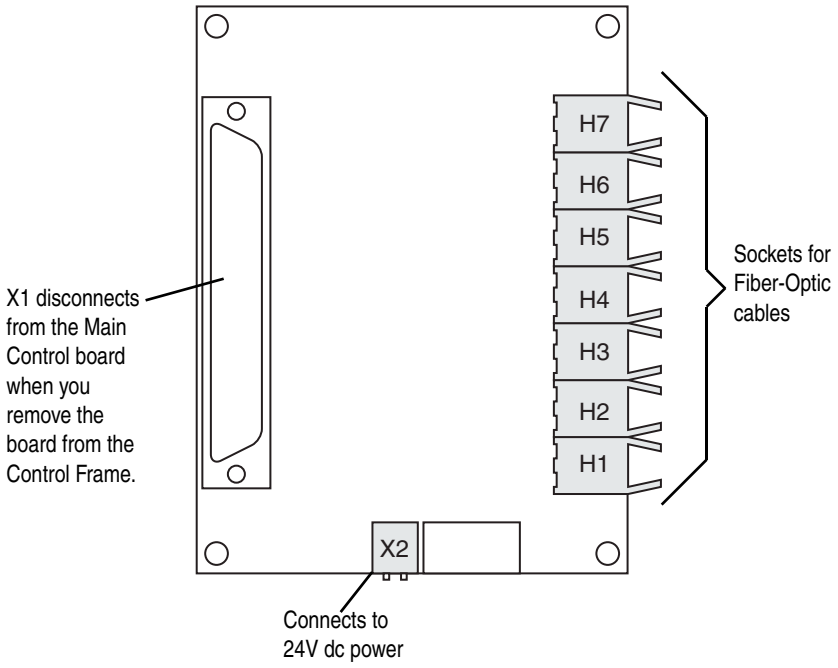
Install the 700H Control and I/O circuit boards in reverse order of removal.

Removing the 700H Fiber Optic Adapter Circuit Board

The Fiber Optic Adapter board is mounted on the back of the control assembly.

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-4.
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 3-13.
3. Move the Control frame to expose its back. Refer to Moving the Control Frame on page 3-17.

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

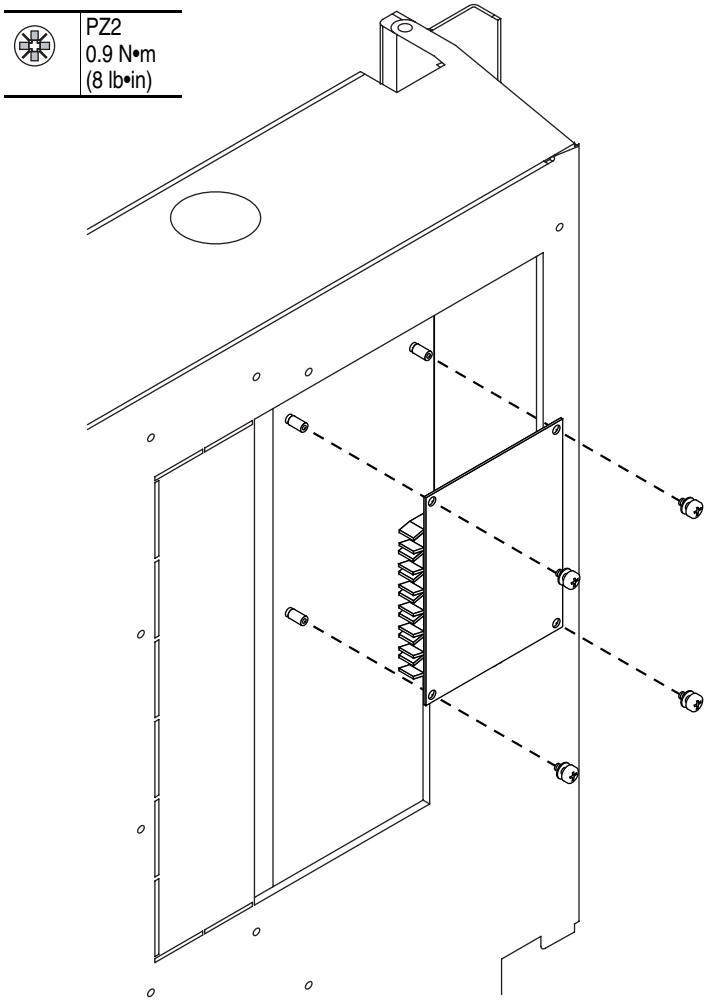


5. Carefully disconnect the fiber-optic cables from the right side of the circuit board, and carefully set them aside.

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.

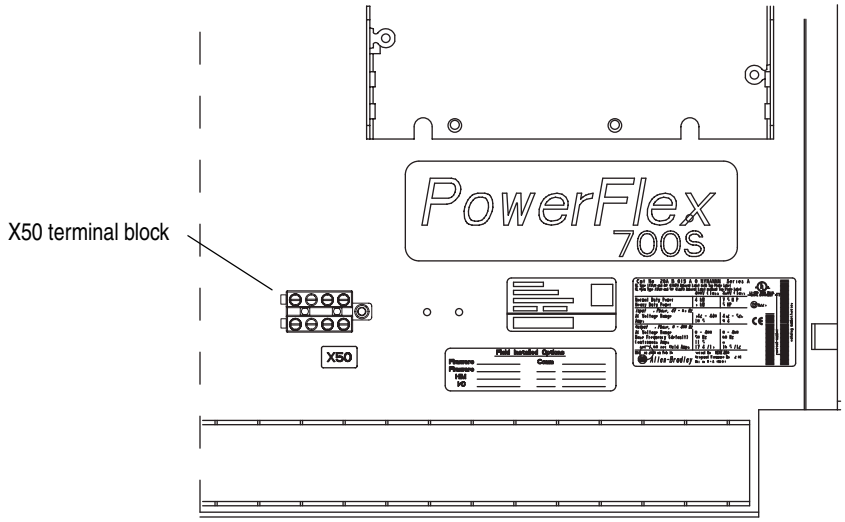


Installing the 700H Fiber Optic Adapter Circuit Board

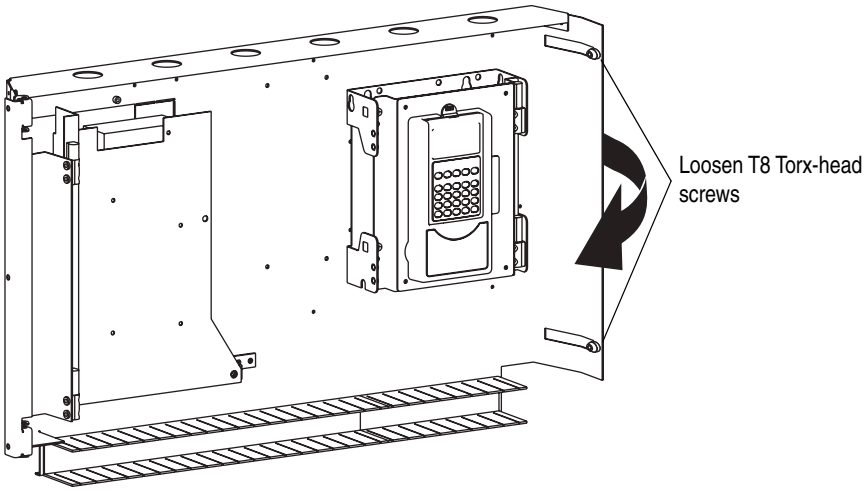
Install the 700H Fiber Optic Adapter circuit board in reverse order of removal.

Moving the Control Frame

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-4.
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 Rectifying structure.



Replacing the Control Frame

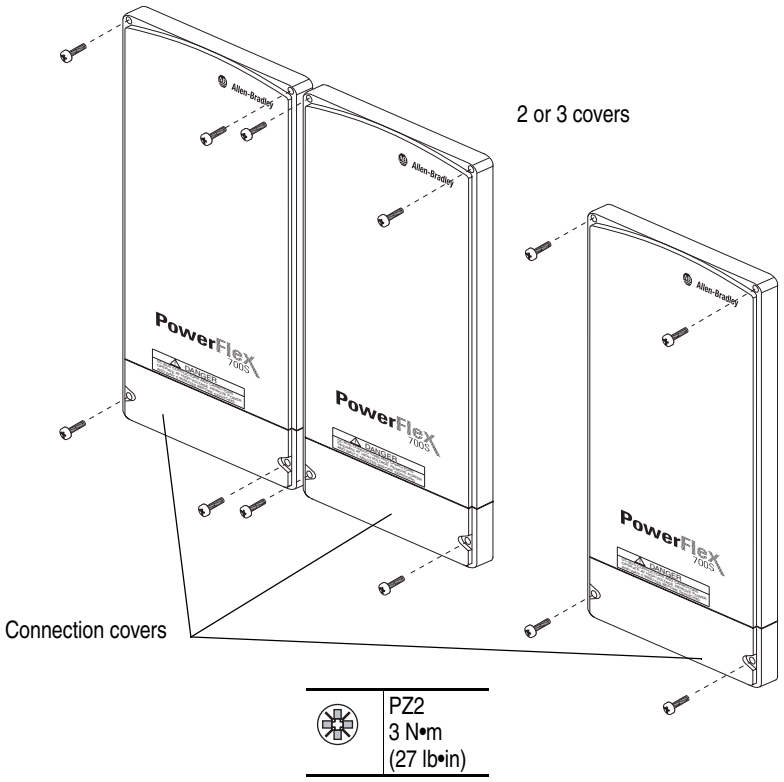
Replace the control frame in reverse order of removal.

Removing the Protective Covers from the NFE Converters

You must remove the protective covers to gain access to the NFE Converters.

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-4.
2. Move the control frame. Refer to Moving the Control Frame on page 3-17.
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.*



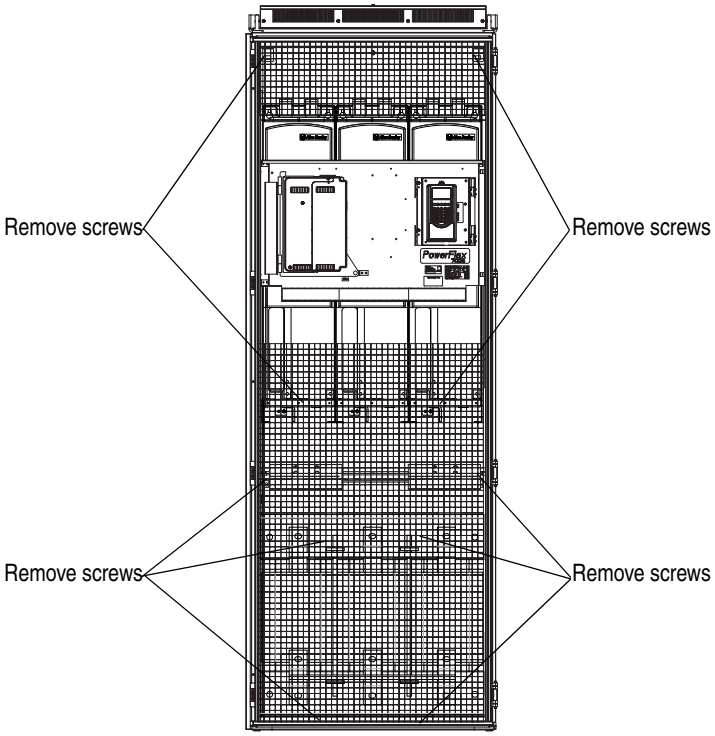
Installing the Protective Covers on the NFE Converters

Install the protective covers on the NFE Converters in reverse order of removal.

Removing the Protective Screens from the Rectifying Structure Enclosure

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 3-4.
2. Move the control frame. Refer to Moving the Control Frame on page 3-17.
3. Remove the protective covers. Refer to Removing the Protective Covers from the NFE Converters on page 3-18.
4. Remove the screws that secure the protective screens to the enclosure and remove the screens.



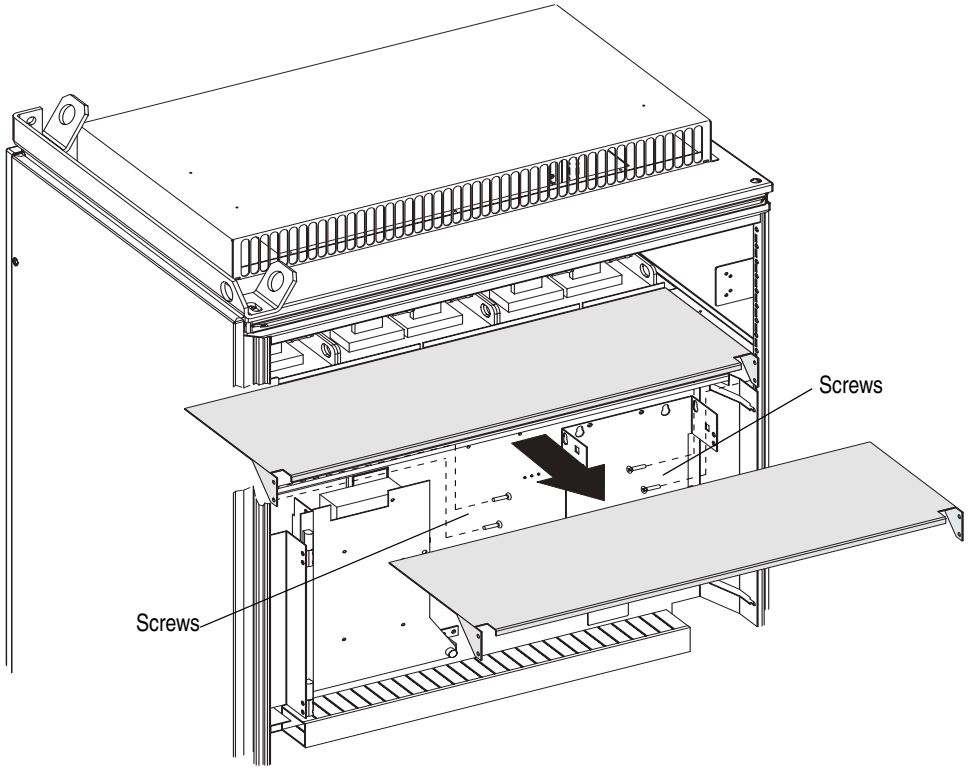
Installing the Protective Screens on the Rectifying Structure Enclosure

Install the protective screens in reverse order of removal.

Removing the Air Flow Plate from the Rectifying Structure Enclosure

You must remove the Air Flow Plate in order to remove the NFE Converters from the drive.

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-4.
2. Move the control frame. Refer to Moving the Control Frame on page 3-17.
3. Remove the protective covers. Refer to Removing the Protective Covers from the NFE Converters on page 3-18.
4. If present, remove the protective screens. Refer to Removing the Protective Screens from the Rectifying Structure Enclosure on page 3-19.
5. Remove the four T8 Torx-head screws which secure the Air Flow Plate to the drive frame.
6. Slide the Air Flow Plate off of the drive frame.



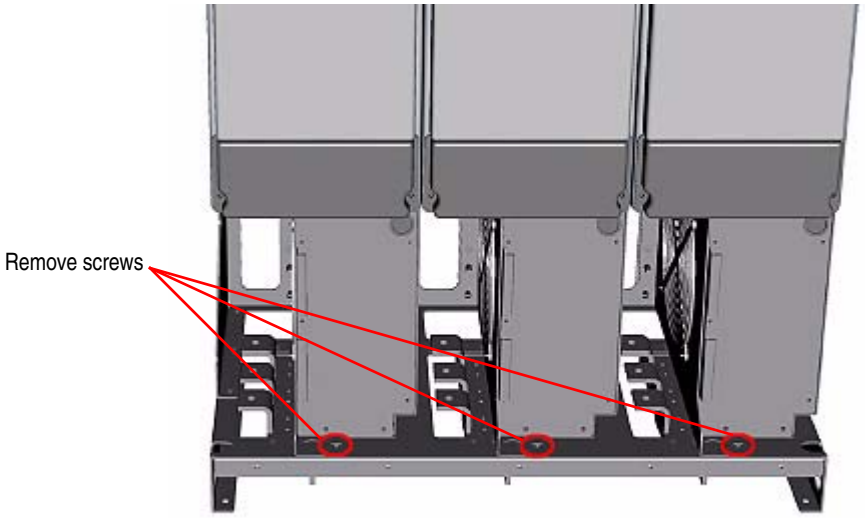
Installing the Airflow Plate on the Rectifying Structure

Install the Air Flow Plate in reverse order of removal.

Removing the Main Cooling Fans from the NFE Converters

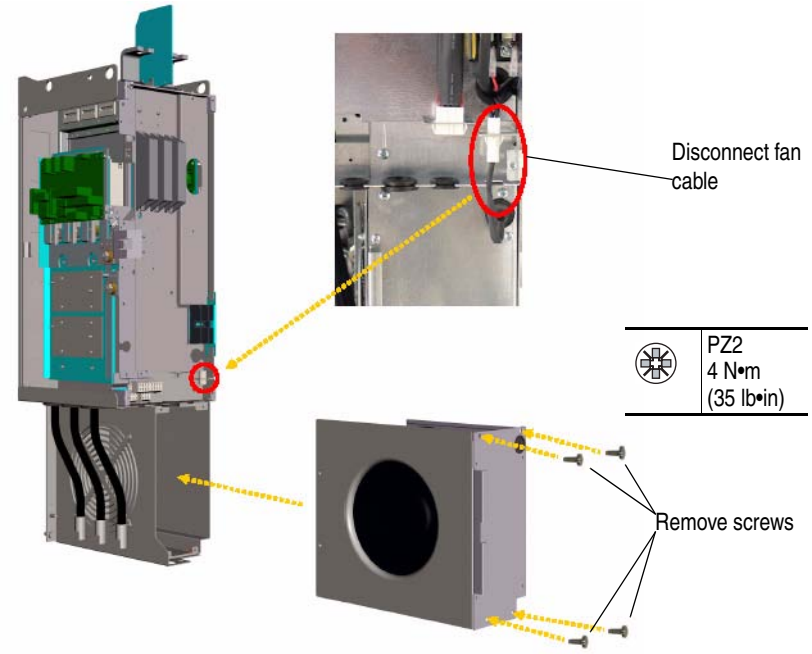
There is a Main Cooling Fan on each of the NFE Converters.

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-4.
2. Move the control frame. Refer to Moving the Control Frame on page 3-17.
3. Remove the protective covers. Refer to Removing the Protective Covers from the NFE Converters on page 3-18.
4. If present, remove the protective screens. Refer to Removing the Protective Screens from the Rectifying Structure Enclosure on page 3-19.
5. Remove the screw, located directly in front of the Main Cooling Fan housing, that secures the NFE Converter module to the drive frame.



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

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



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

Installing the Main Cooling Fans on the NFE Converters

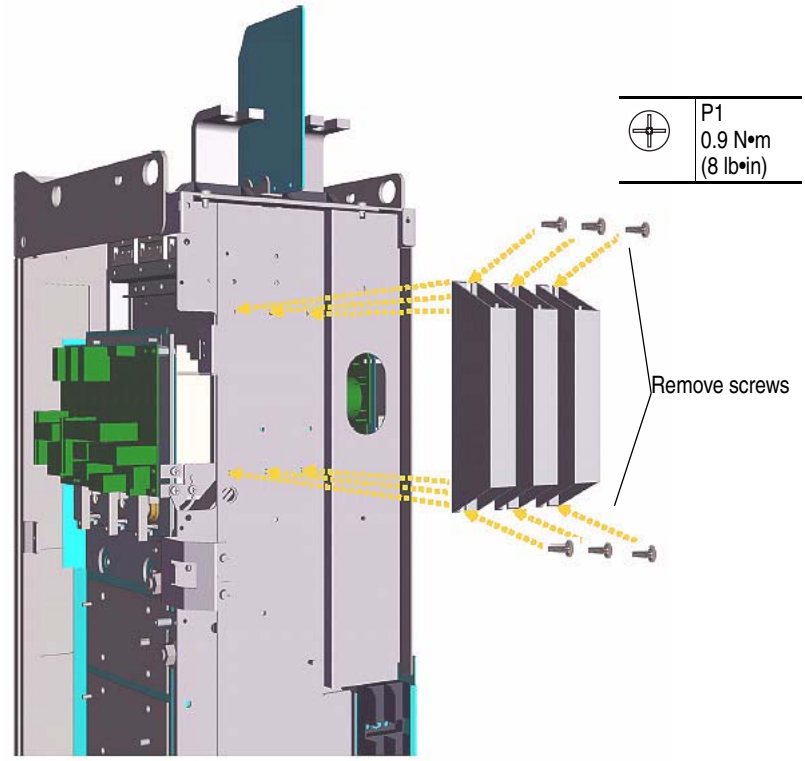
Install the Main Cooling Fans in reverse order of removal.

Removing the Precharge Resistors

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-4.
2. Move the control frame. Refer to Moving the Control Frame on page 3-17.
3. Remove the protective covers. Refer to Removing the Protective Covers from the NFE Converters on page 3-18.
4. If present, remove the protective screens. Refer to Removing the Protective Screens from the Rectifying Structure Enclosure on page 3-19.

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

5. Disconnect the precharge resistor wires from connectors X31, X32 and X33 on the Rectifying circuit board.
6. Remove the 4x8 screws that secure the precharge resistors to the drive frame, and remove the precharge resistors.



Installing the Precharge Resistors

Install the precharge resistors in reverse order of removal.

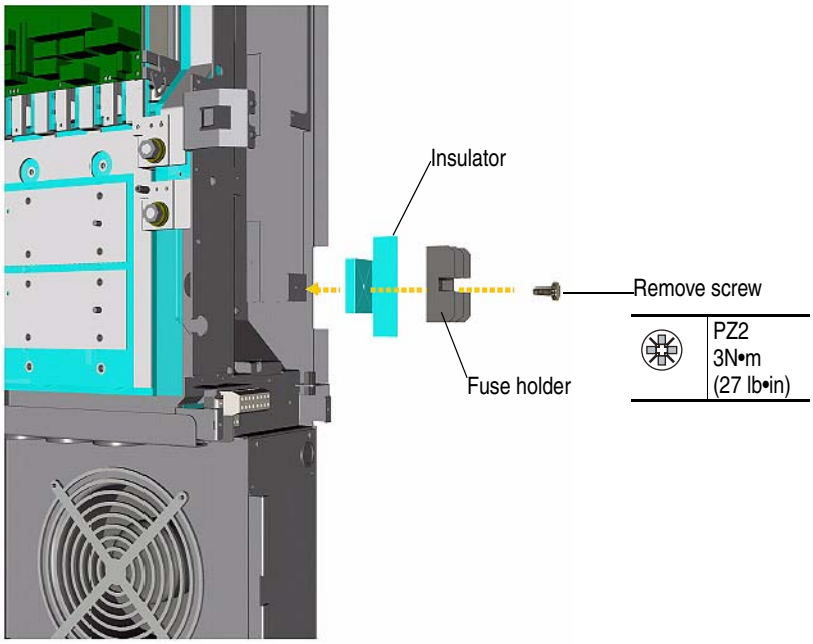
Removing the Fan Inverter Fuse Assemblies from the NFE Converters

There is a Fan Inverter Fuse Assembly for each NFE Converter Fan.

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-4.
2. Move the control frame. Refer to Moving the Control Frame on page 3-17.
3. Remove the protective covers. Refer to Removing the Protective Covers from the NFE Converters on page 3-18.
4. If present, remove the protective screens. Refer to Removing the Protective Screens from the Rectifying Structure Enclosure on page 3-19.
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.

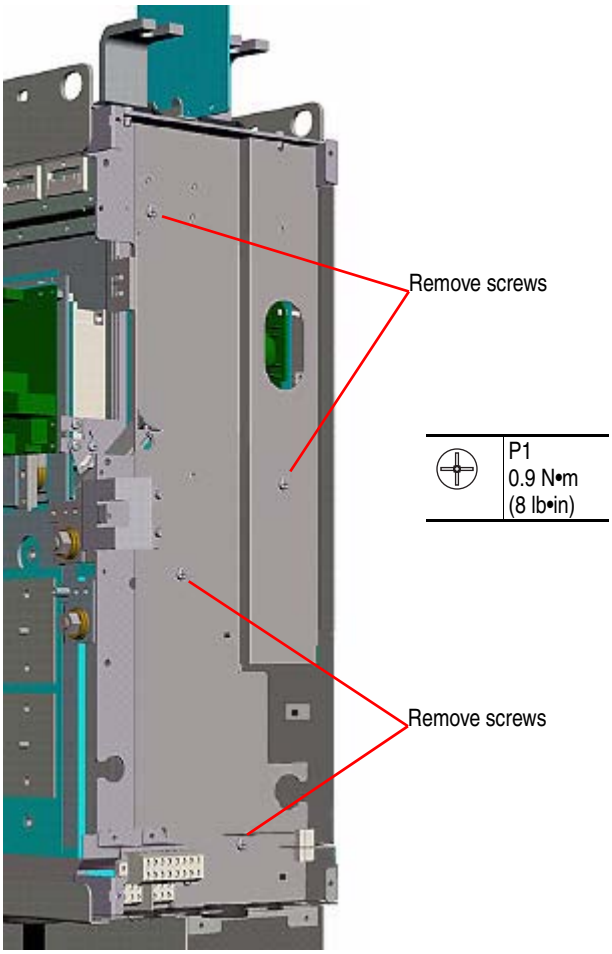
Installing the Fan Inverter Fuse Assemblies on the NFE Converters

Install the Fan Inverter fuse assemblies on the NFE Converters in reverse order of removal.

Removing the Fan Inverters from the NFE Converters

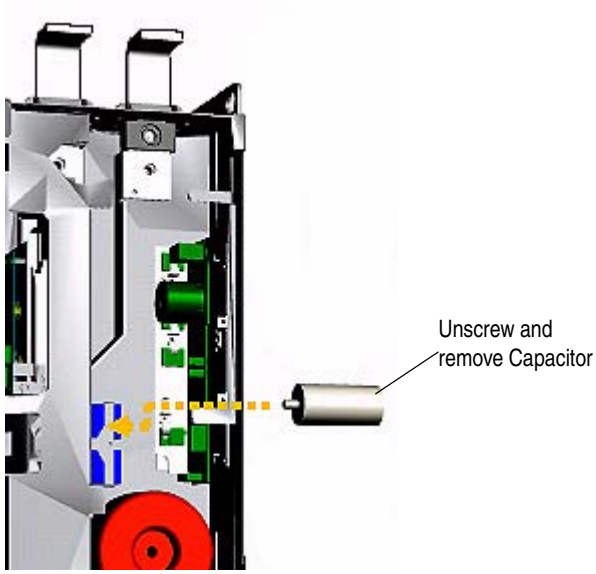
There is a Fan Inverter for each of the NFE Converters Fans.

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-4.
2. Move the control frame. Refer to Moving the Control Frame on page 3-17.
3. Remove the protective covers. Refer to Removing the Protective Covers from the NFE Converters on page 3-18.
4. If present, remove the protective screens. Refer to Removing the Protective Screens from the Rectifying Structure Enclosure on page 3-19.
5. Remove the Fan Inverter fuse assemblies. Refer to Removing the Fan Inverter Fuse Assemblies from the NFE Converters on page 3-24.
6. Remove the screws that the secure the fan inverter protection cover to the drive, and remove the cover.



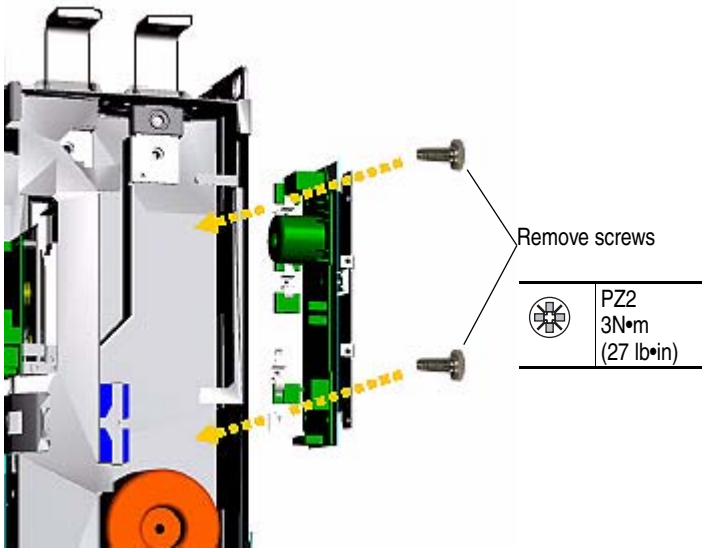
Important: Before removing connections and wires, mark the connections and wires to avoid incorrect wiring during assembly.

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 NFE Converters

Install the Fan Inverters in reverse order of removal.

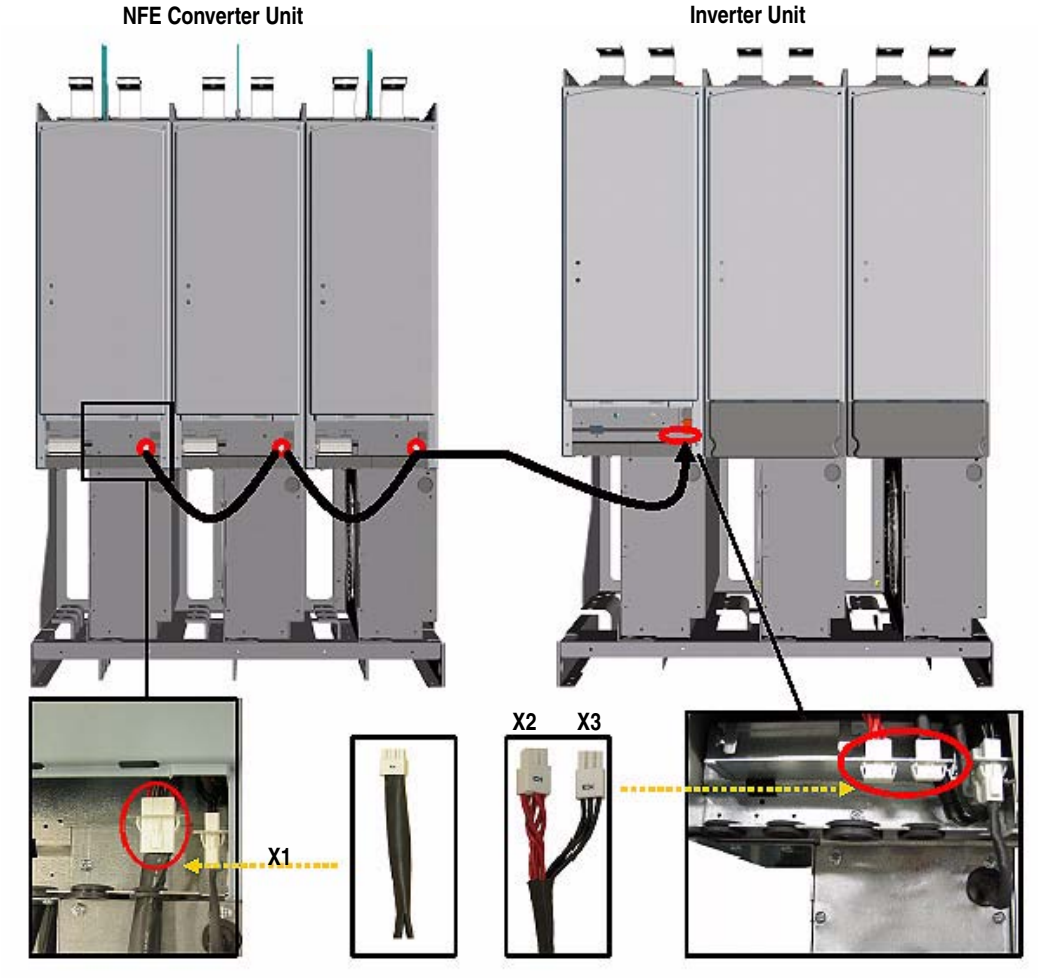
Removing the NFE Converter Unit from the Enclosure

Note: The NFE Converters are secured to a frame that is removed from the enclosure as a single unit. This unit must be removed from the enclosure before the individual NFE Converters and/or Rectifying modules can be removed.

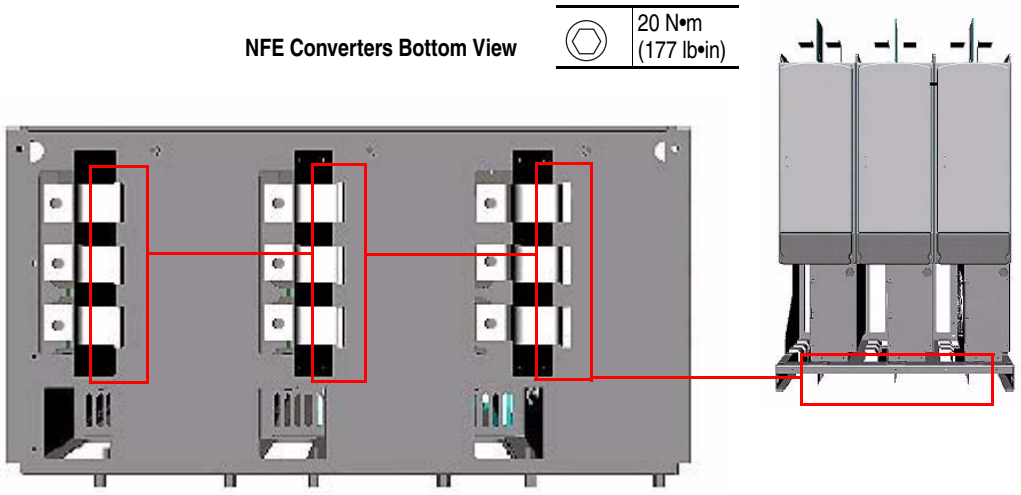
1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-4.
2. Move the control frame. Refer to Moving the Control Frame on page 3-17.
3. Remove the protective covers. Refer to Removing the Protective Covers from the NFE Converters on page 3-18.
4. If present, remove the protective screens. Refer to Removing the Protective Screens from the Rectifying Structure Enclosure on page 3-19.

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

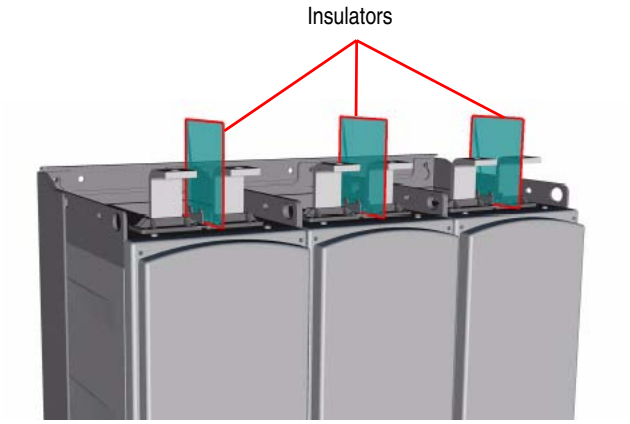
5. Disconnect the Fan Inverter cables from connector X1 on the NFE Converters and the pre-charge cables and Fan Inverter cables from connectors X2 and X3, respectively, on the Inverters.



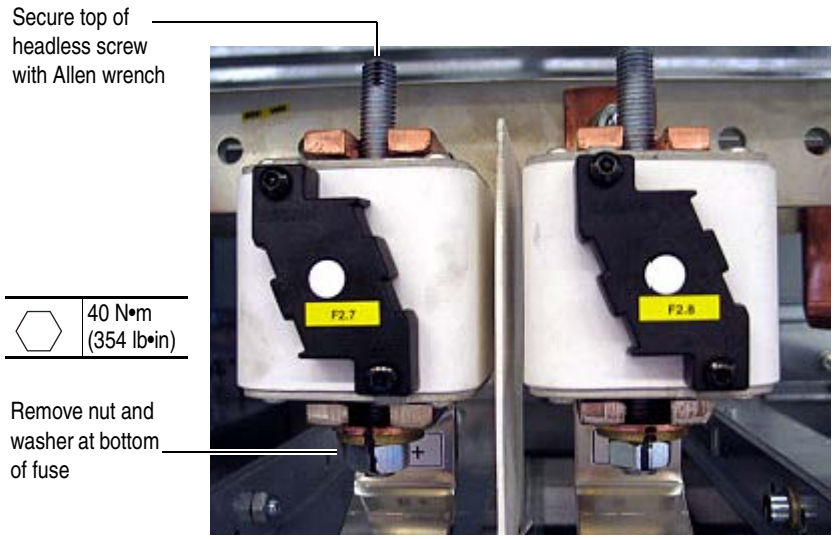
6. Remove the AC input wiring or bus bars from the terminals at the bottom of the NFE Converters.



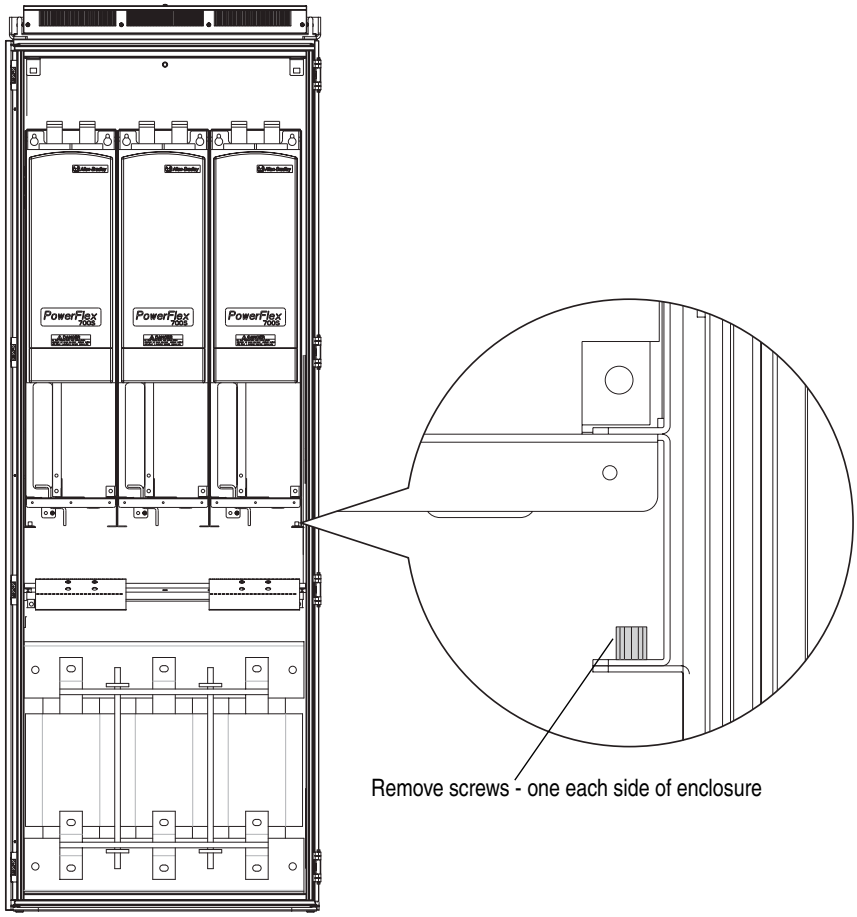
7. Remove the insulator material between the DC Bus Bar terminals at the top of the NFE Converters.



8. Remove the M10 nut and washer that secure the DC Link fuse to the DC Bus Bars at the top of the NFE Converters 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. Then remove the fuse.



9. Remove the two hexagonal screws that secure the NFE Converter unit to the enclosure frame.



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

Note: *The Maintenance Stand is designed for removing NFE Converter and Inverter units from drives supplied in Rittal TS8 enclosures. Alternate means of removal will be necessary for other types of enclosures.*

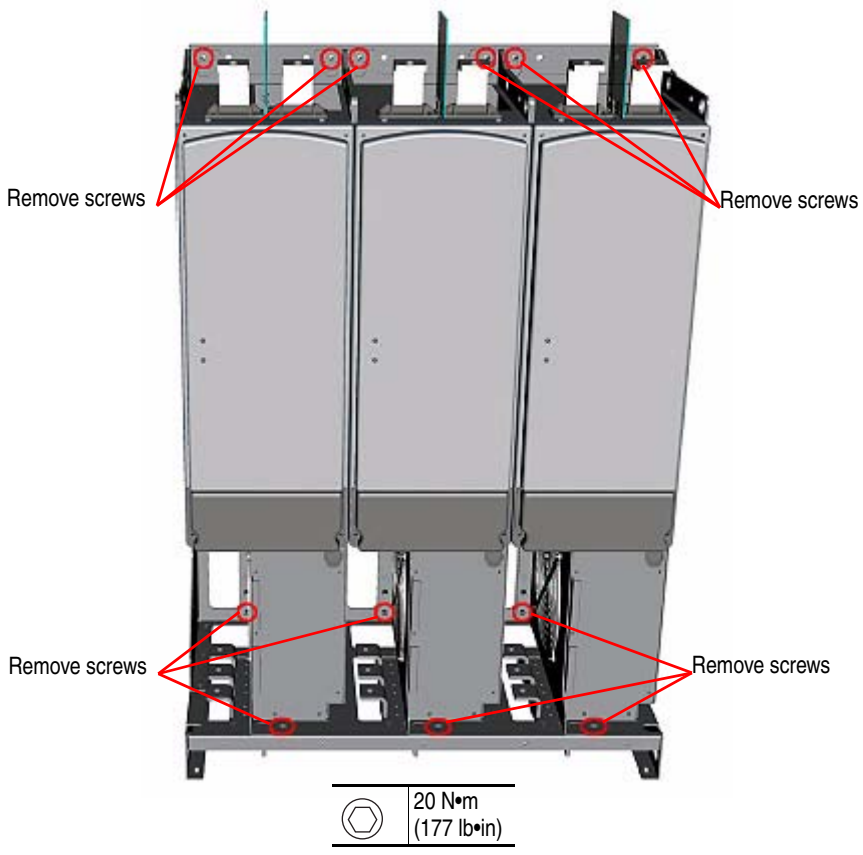
11. Follow the instructions in publication PFLEX-IN005…, *Installation Instructions - Lifting & Mounting PowerFlex 700S and 700H Drives (Frame 10 - 14)*, supplied with the new power structures, to lift the power structures off of the Maintenance Stand.

Installing the NFE Converter Unit

Install the NFE Converter unit in reverse order of removal. Refer to the publication PFLEX-IN006…, *Installation Instructions - PowerFlex 700S and 700H AC Drives*, for tightening torques of AC Input, DC bus input and ground connection terminations.

Removing the NFE Converters from the Frame

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-4.
2. Move the control frame. Refer to Moving the Control Frame on page 3-17.
3. Remove the protective covers. Refer to Removing the Protective Covers from the NFE Converters on page 3-18.
4. If present, remove the protective screens. Refer to Removing the Protective Screens from the Rectifying Structure Enclosure on page 3-19.
5. Remove the NFE Converter Unit. Refer to Removing the NFE Converter Unit from the Enclosure on page 3-27.
6. Remove the screws that secure the NFE Converters to the frame. Two socket extensions are stored on the underside of the NFE Converter frame for use when removing the screws at the back of the enclosure.



7. Lift the NFE Converters off of the frame.

Installing the NFE Converters

Install the NFE Converters in reverse order of removal.

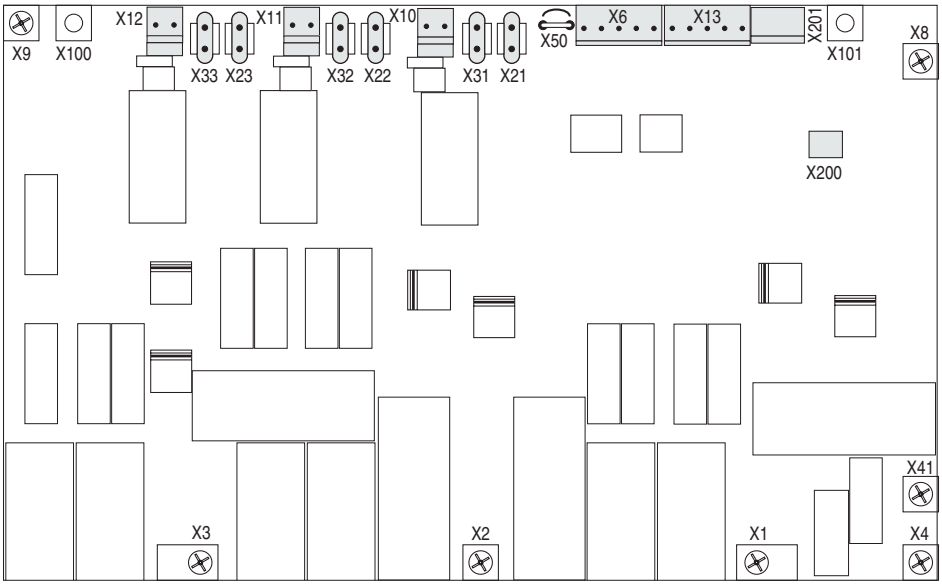
Removing the Rectifying Circuit Board

There is a Rectifying board for each NFE Converter in the drive.

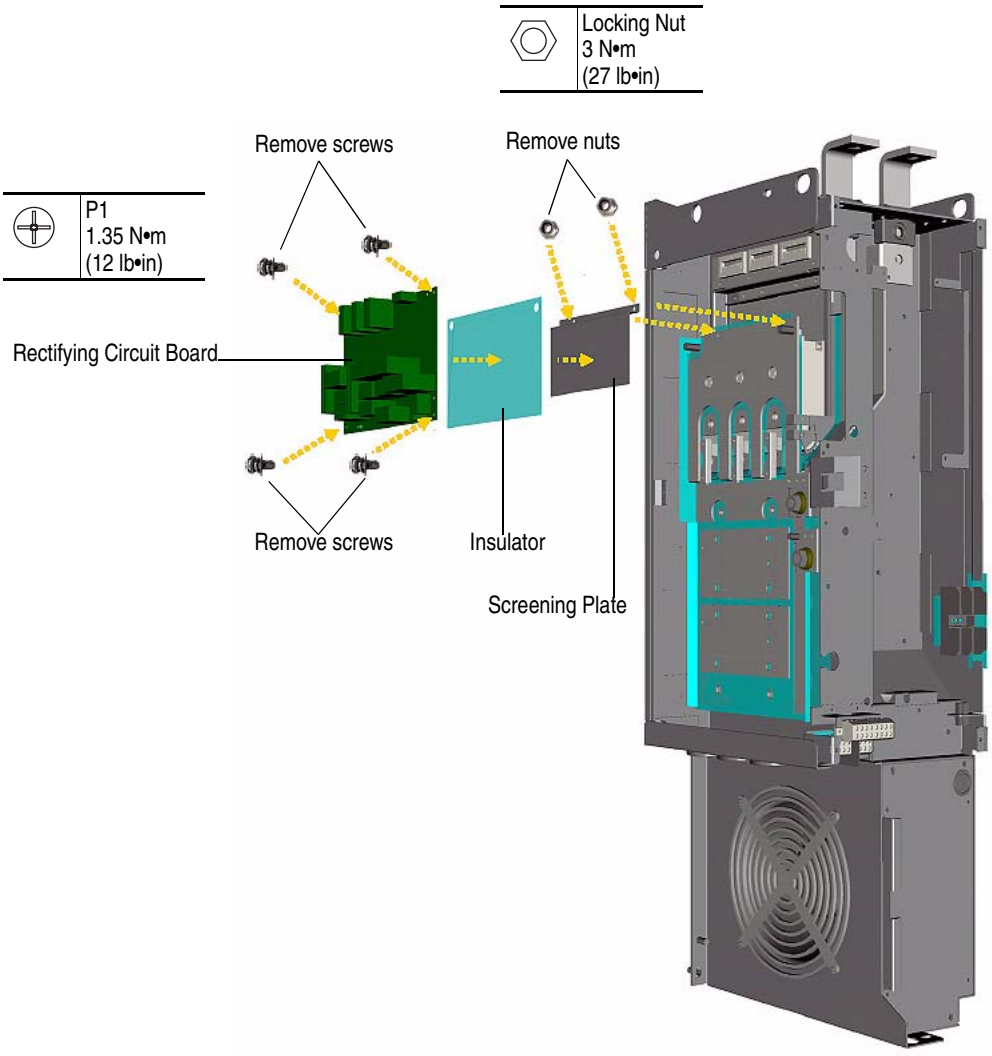
1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-4.
2. Move the control frame. Refer to Moving the Control Frame on page 3-17.
3. Remove the protective covers. Refer to Removing the Protective Covers from the NFE Converters on page 3-18.
4. If present, remove the protective screens. Refer to Removing the Protective Screens from the Rectifying Structure Enclosure on page 3-19.
5. Remove the NFE Converter Unit. Refer to Removing the NFE Converter Unit from the Enclosure on page 3-27.
6. Remove the NFE Converters. Refer to Removing the NFE Converters from the Frame 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.



9. If necessary, unscrew the M4 nuts that secure the EMC protection plate to the drive frame and remove the plate.

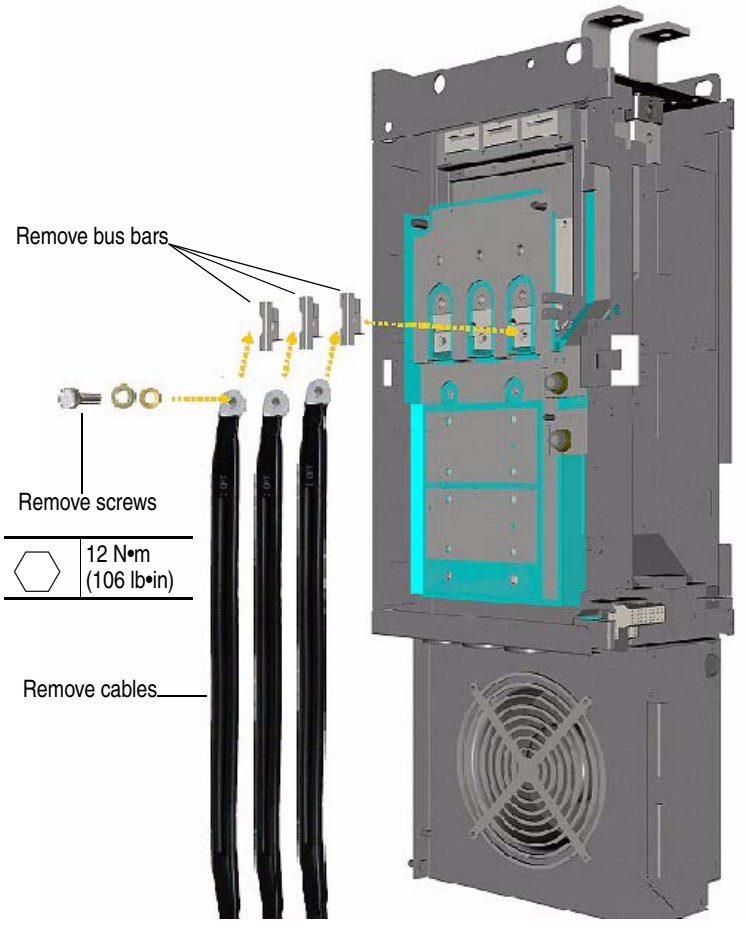
10. Repeat steps 7…9 for the remaining Rectifying circuit boards.

Installing the Rectifying Circuit Board

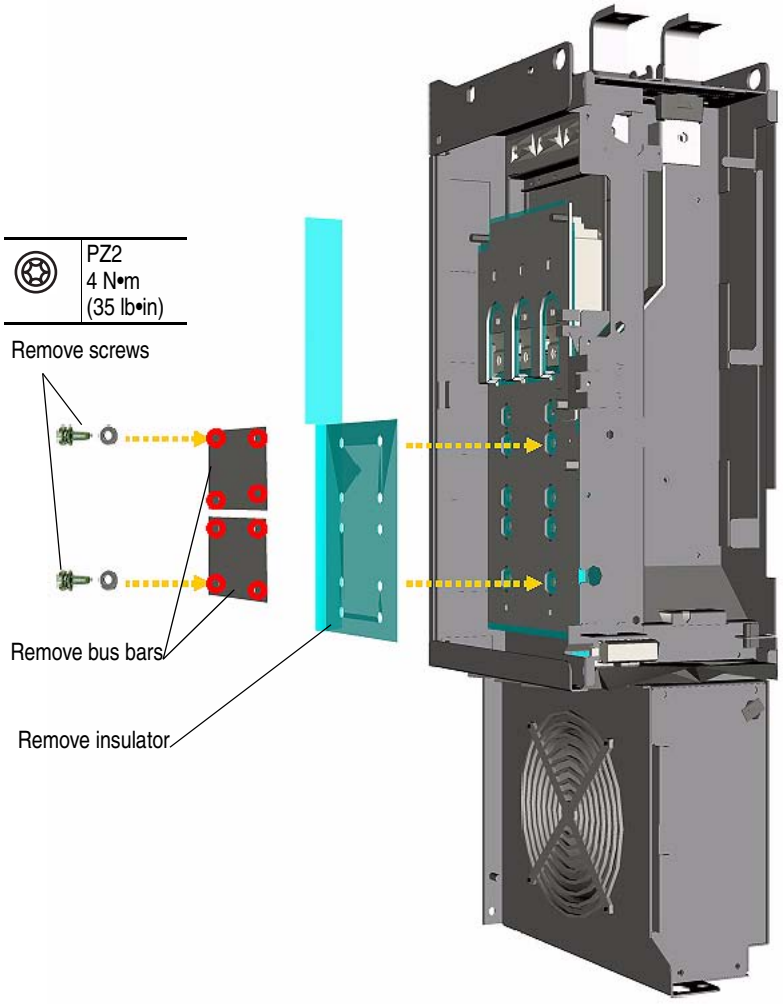
Install the Rectifying circuit board in reverse order of removal.

Removing the Rectifying Modules from the NFE Converters

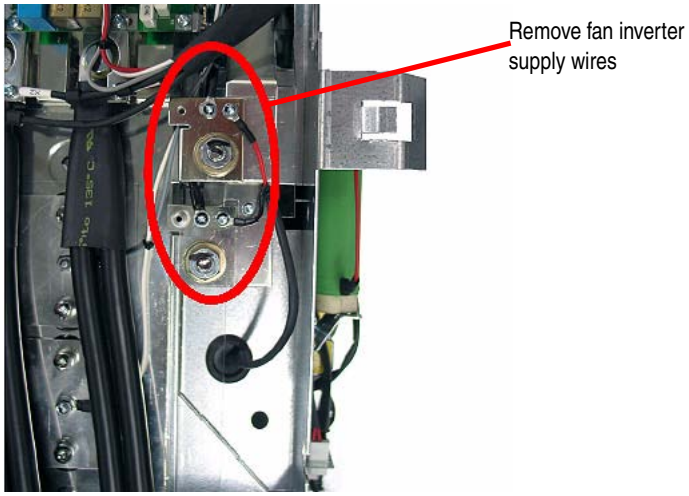
1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-4.
2. Move the control frame. Refer to Moving the Control Frame on page 3-17.
3. Remove the protective covers. Refer to Removing the Protective Covers from the NFE Converters on page 3-18.
4. If present, remove the protective screens. Refer to Removing the Protective Screens from the Rectifying Structure Enclosure on page 3-19.
5. Removing the NFE Converter Unit. Refer to Removing the NFE Converter Unit from the Enclosure on page 3-27.
6. Remove the NFE Converters. Refer to Removing the NFE Converters from the Frame on page 3-31.
7. Remove the Rectifying circuit board. Refer to Removing the Rectifying Circuit Board on page 3-32.
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 modules and remove the cables and bus bars.



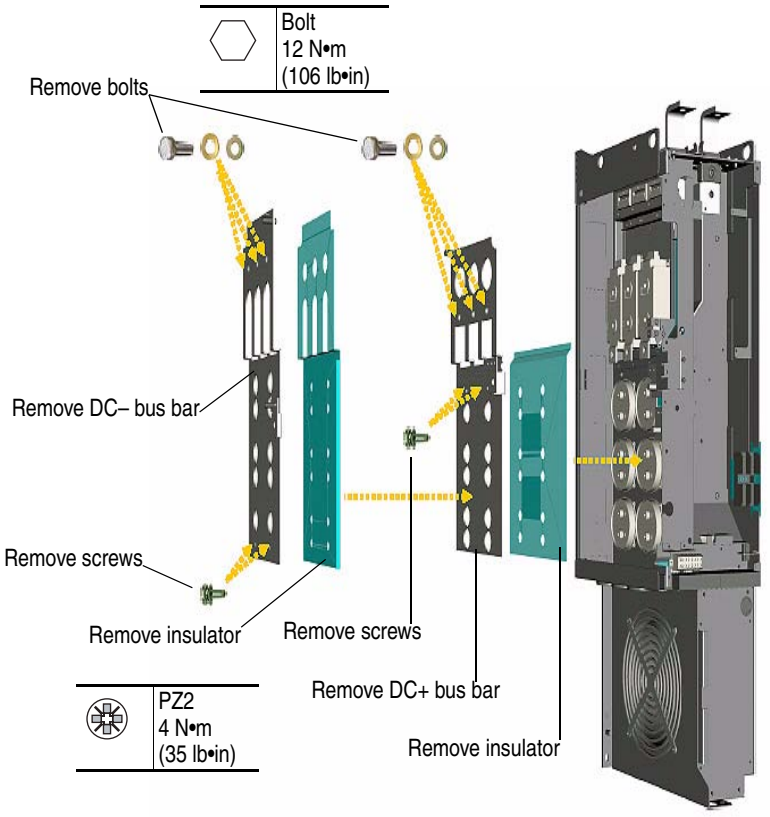
9. Remove the M6x25 torx head screws that secure the outer circuit Bus Bars and insulator to the drive frame and remove the bus bars and insulation.



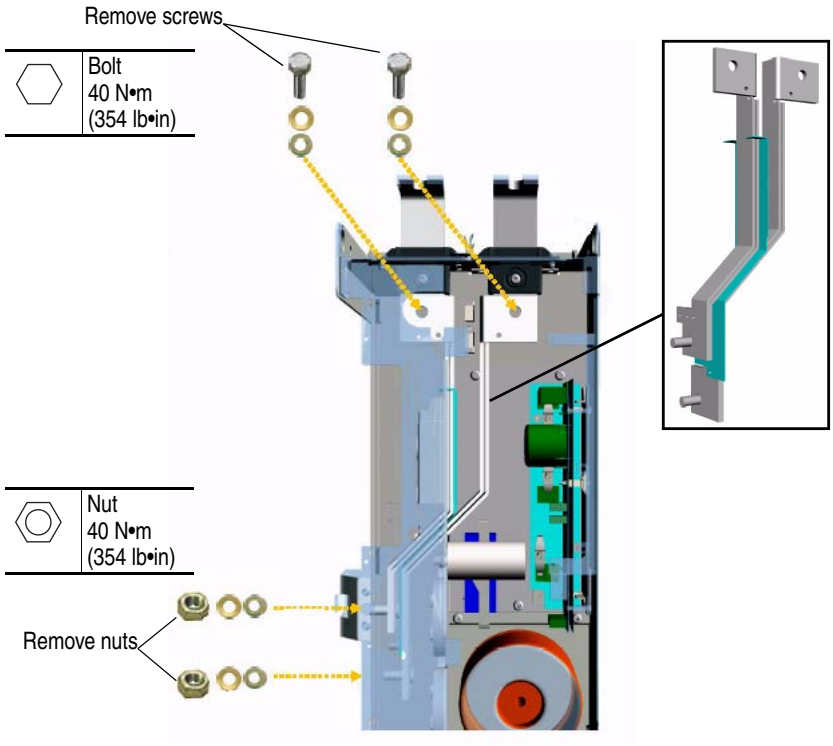
10. Remove the Fan Inverter supply wires from the Bus Bars at the front of the NFE Converters.



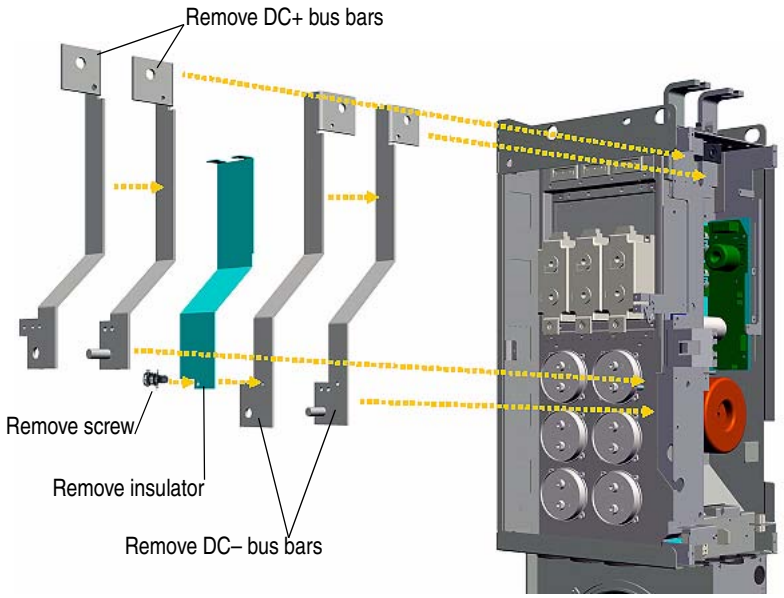
11. Remove the screws that secure the inner circuit Bus Bars and insulator to the drive and remove the bus bars and insulator.



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

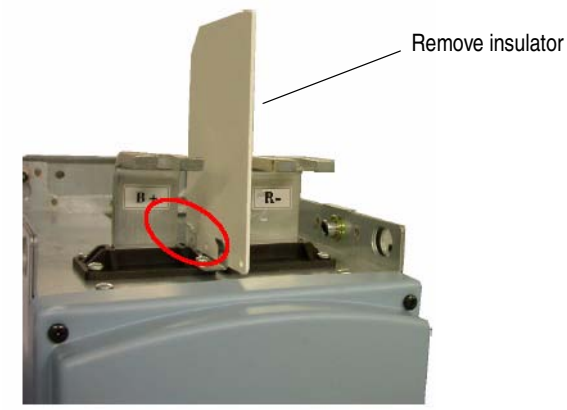


13. Remove the DC Feed Bus Bars and Insulator from the drive. If necessary, remove the screw that secures the insulator to the DC– Bus Bars and remove the insulator.

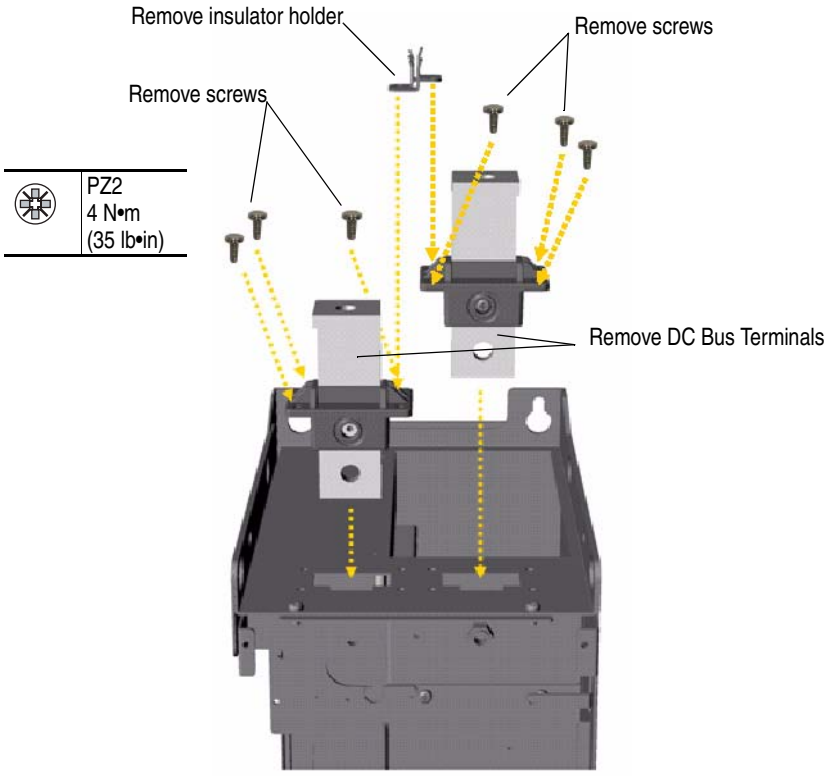


	PZ2 4 N•m (35 lb•in)

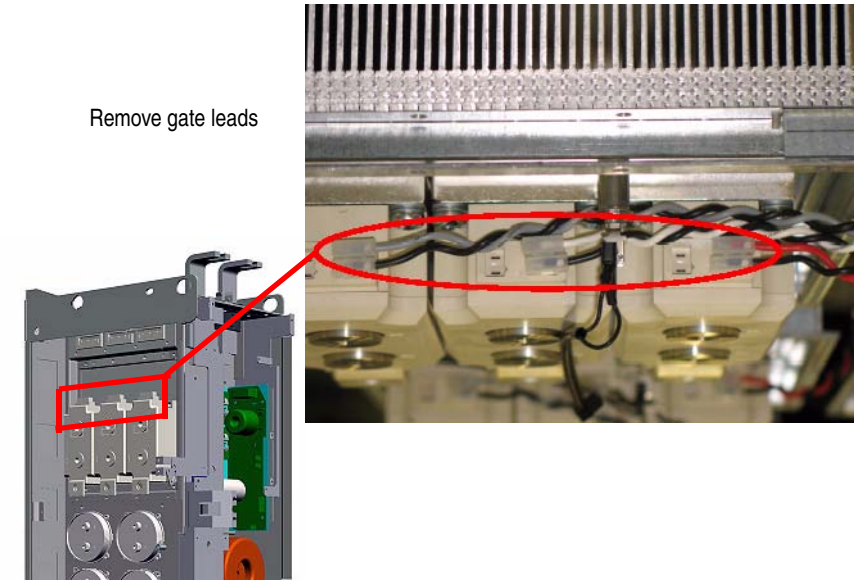
14. If necessary, remove the Insulator from the bracket between the DC Bus terminal assemblies.



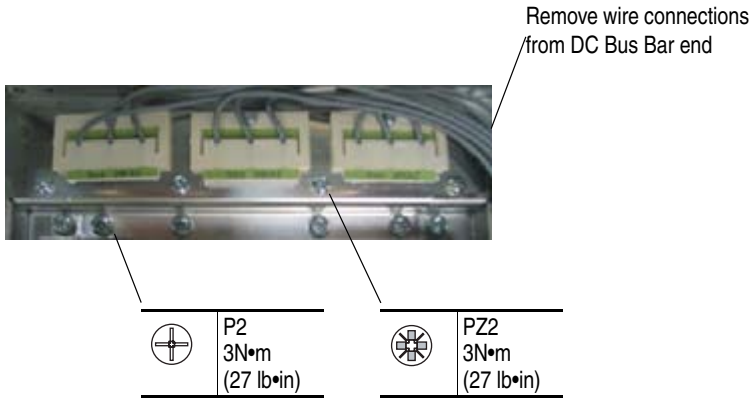
15. If necessary, remove the screws that secure the DC Bus terminal assemblies and Insulator bracket to the drive and remove the DC Bus terminal assemblies and Insulator bracket.



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

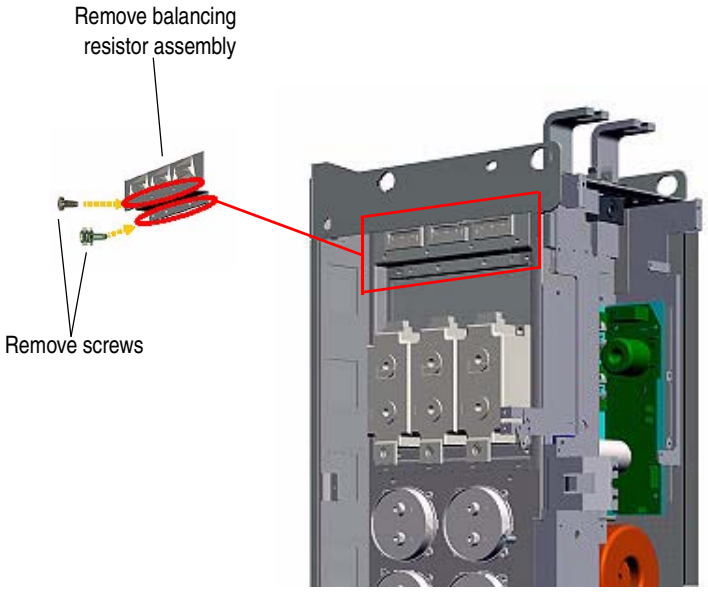


17. Remove the Balancing Resistor wires from the DC Bus Bars.

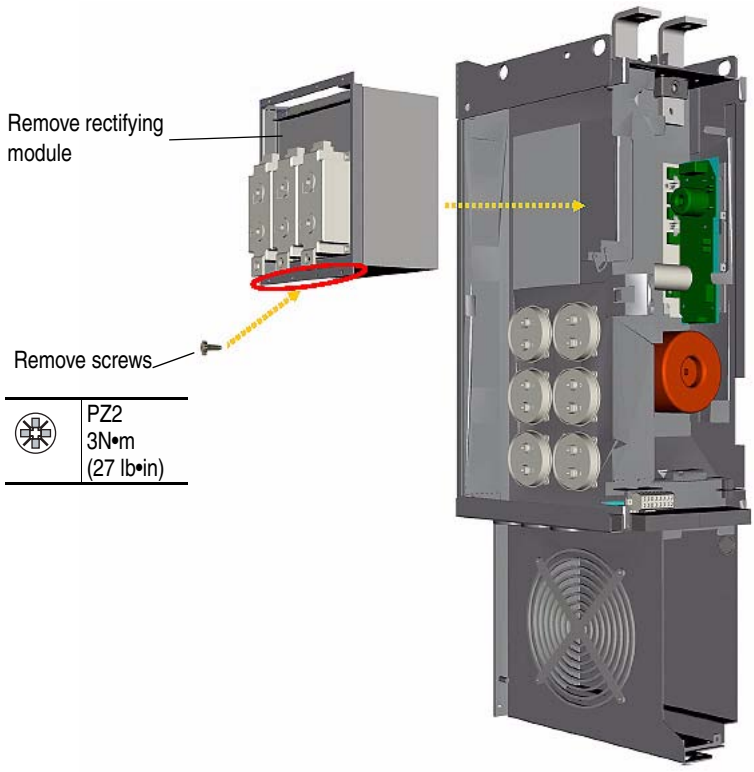


Balancing resistor assembly screws

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.



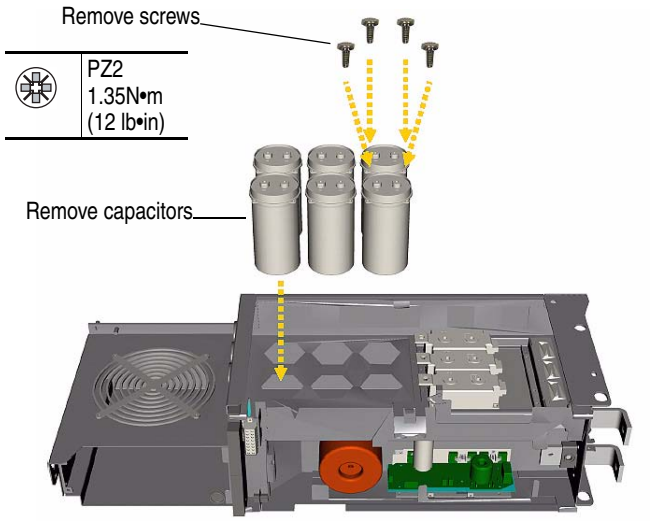
20. Repeat steps 8…19 to remove the remaining Rectifying module(s).

Installing the Rectifying Modules on the NFE Converters

- Install the Rectifying modules in reverse order of removal.
- Run the Performing the Power Circuit Diagnostic Test on a 700S Drive on page 4-3 before running the drive.

Removing the Bus Capacitors from the NFE Converters

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-4.
2. Move the control frame. Refer to Moving the Control Frame on page 3-17.
3. Remove the protective covers. Refer to Removing the Protective Covers from the NFE Converters on page 3-18.
4. If present, remove the protective screens. Refer to Removing the Protective Screens from the Rectifying Structure Enclosure on page 3-19.
5. Removing the NFE Converter Unit. Refer to Removing the NFE Converter Unit from the Enclosure on page 3-27.
6. Remove the NFE Converters. Refer to Removing the NFE Converters from the Frame on page 3-31.
7. Remove the Rectifying circuit board. Refer to Removing the Rectifying Circuit Board on page 3-32.
8. Remove the Rectifying modules. Refer to Removing the Rectifying Modules from the NFE Converters on page 3-34.
9. Remove the screws that secure the Capacitors to the drive frame and remove the capacitors.



Installing the Bus Capacitors on the NFE Converters

Install the bus capacitors in the reverse order of removal.

Power Structure Access Procedures

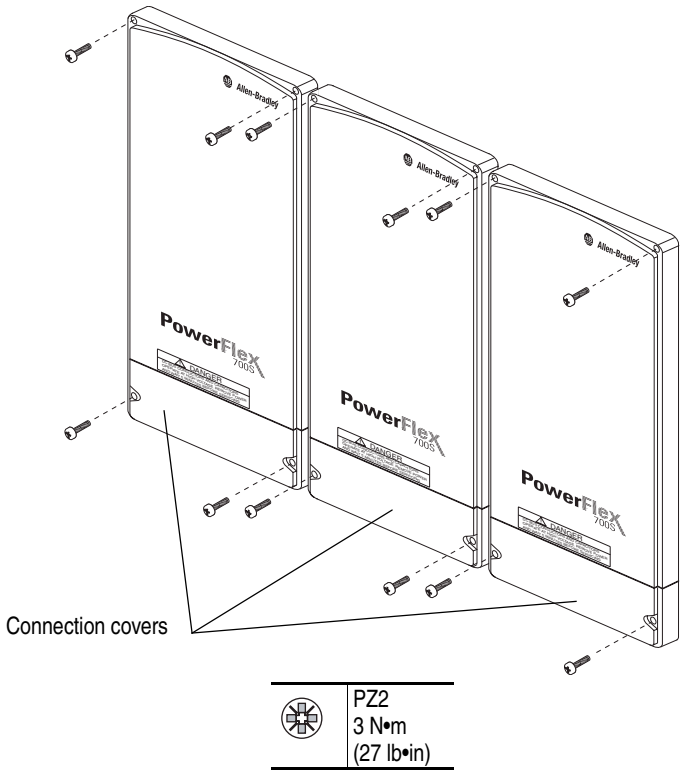
Below are the instructions for removing and installing components, including the output power modules, on the Inverters of the drive. For instructions on removing and installing components, including the rectifying modules, on the NFE Converters refer to Rectifying Structure Access Procedures on page 3-5.

Removing the Protective Covers from the Inverters

You must remove the protective covers to gain access to the Inverters.

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-4.
2. Remove the four M5 POZIDRIV screws which secure each of the three top and connection protective covers to the Inverters, 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 on the Inverters

Install the protective covers in reverse order of removal.

Removing the Gate Driver Circuit Boards

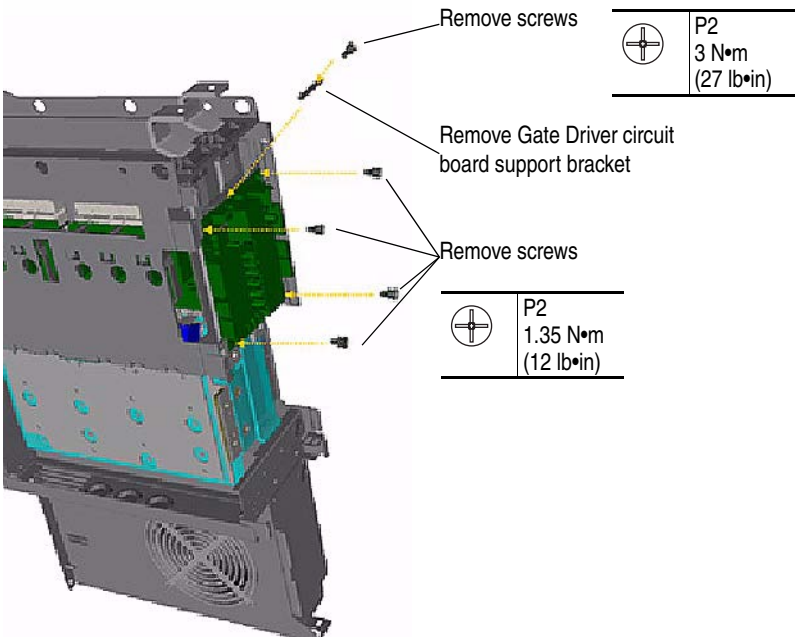
There is a Gate Driver board located on the front of each of the Inverters.

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-4.
2. Remove the protective covers. Refer to Removing the Protective Covers from the Inverters on page 3-42.
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.

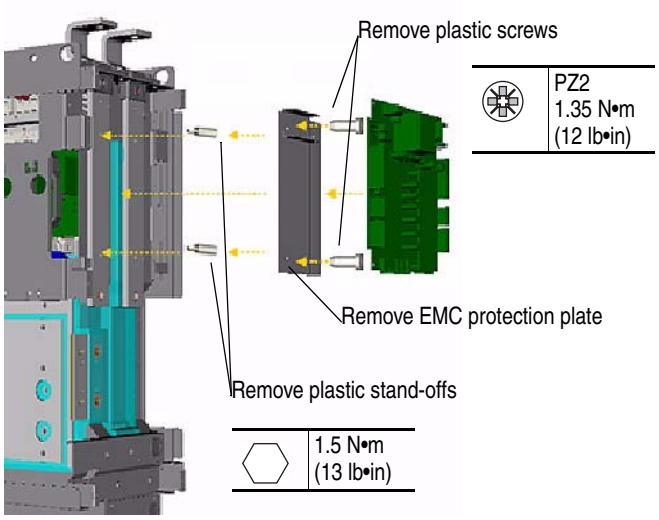
ATTENTION: Hazard of permanent eye damage exists when using optical transmission equipment. This product emits intense light and invisible radiation. Do not look into fiber-optic ports or fiber-optic cable connectors.

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 Inverter.



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 Inverter and remove the screening plate.
9. Remove the two plastic 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

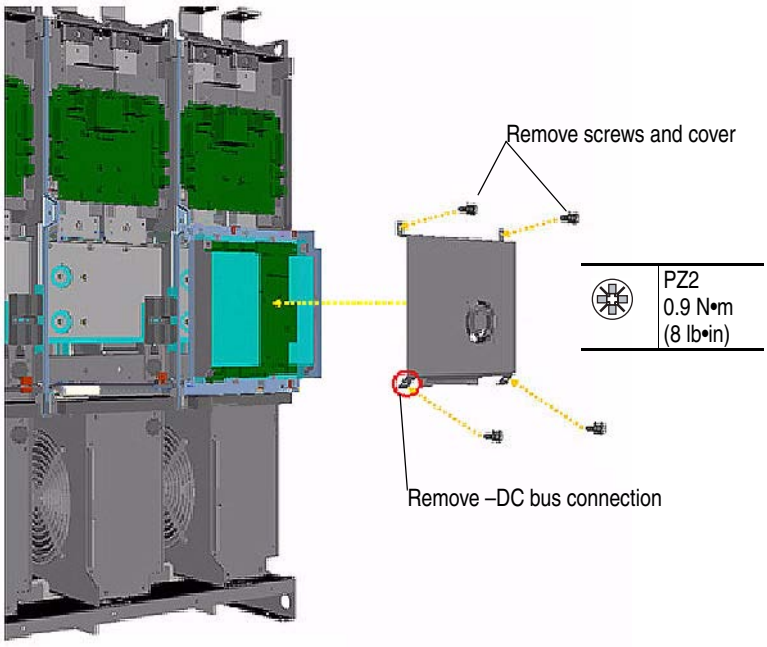
Install the Gate Driver circuit boards in the reverse order of removal.

Removing the ASIC Circuit Boards

There is an ASIC board mounted on the middle Inverter of each Power structure.

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 3-4.
2. Remove the protective covers. Refer to Removing the Protective Covers from the Inverters on page 3-42.
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.

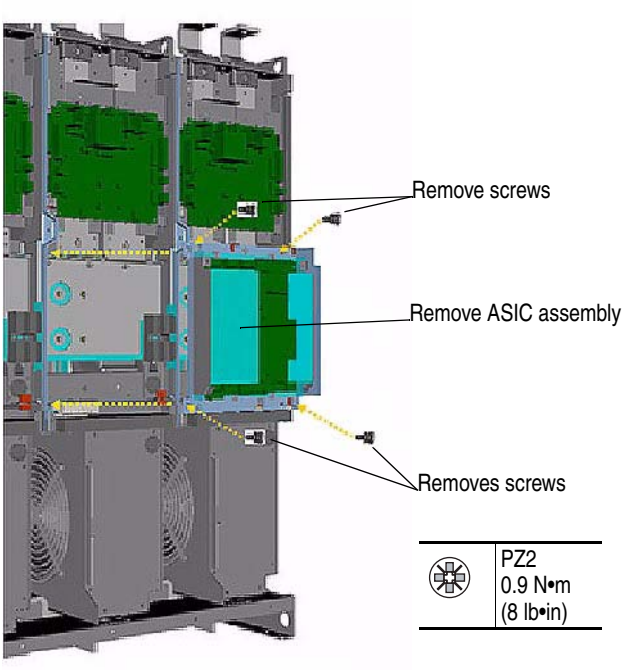
ATTENTION: Hazard of permanent eye damage exists when using optical transmission equipment. This product emits intense light and invisible radiation. Do not look into fiber-optic ports or fiber-optic cable connectors.

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.

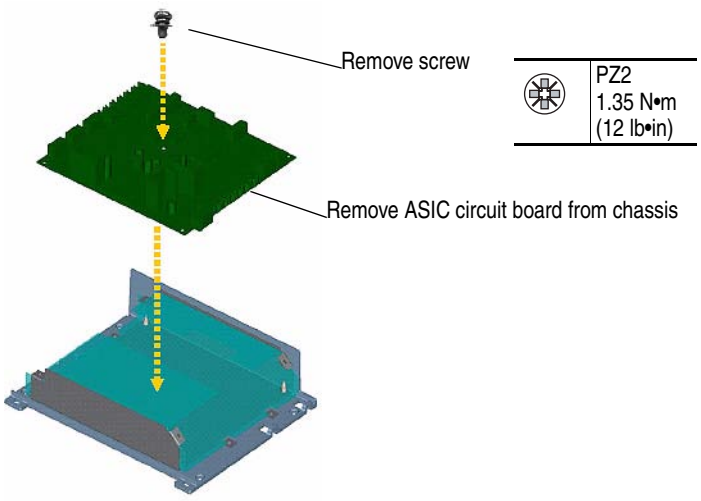
7. For drives with dc input, unplug the external precharge circuitry from connectors X9 and X15 from the ASIC board.

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

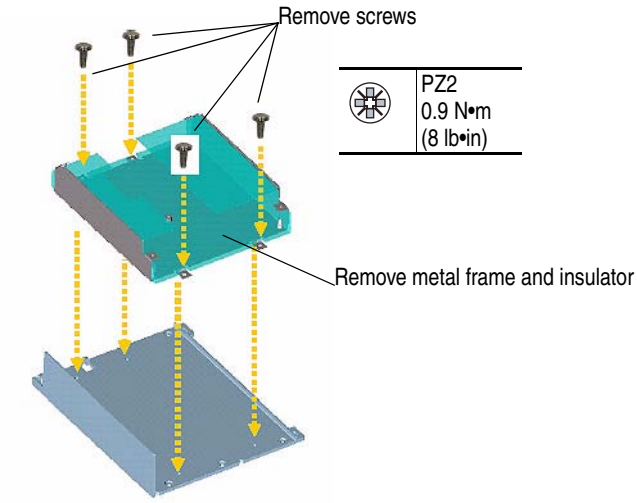
9. Remove the four screws that secure the ASIC assembly to the drive and remove the ASIC assembly.



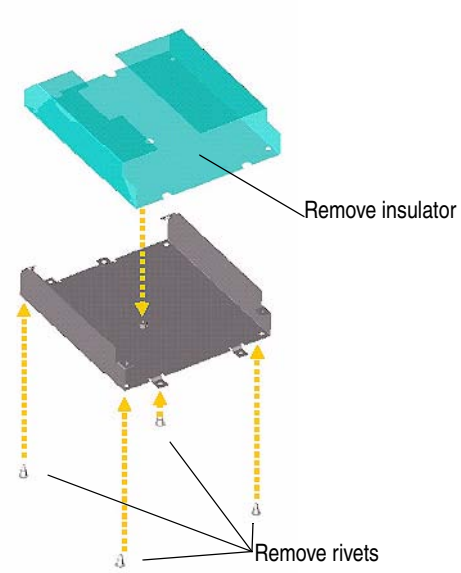
10. Remove the screw that secures the ASIC board to the ASIC chassis and remove the ASIC board.



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.



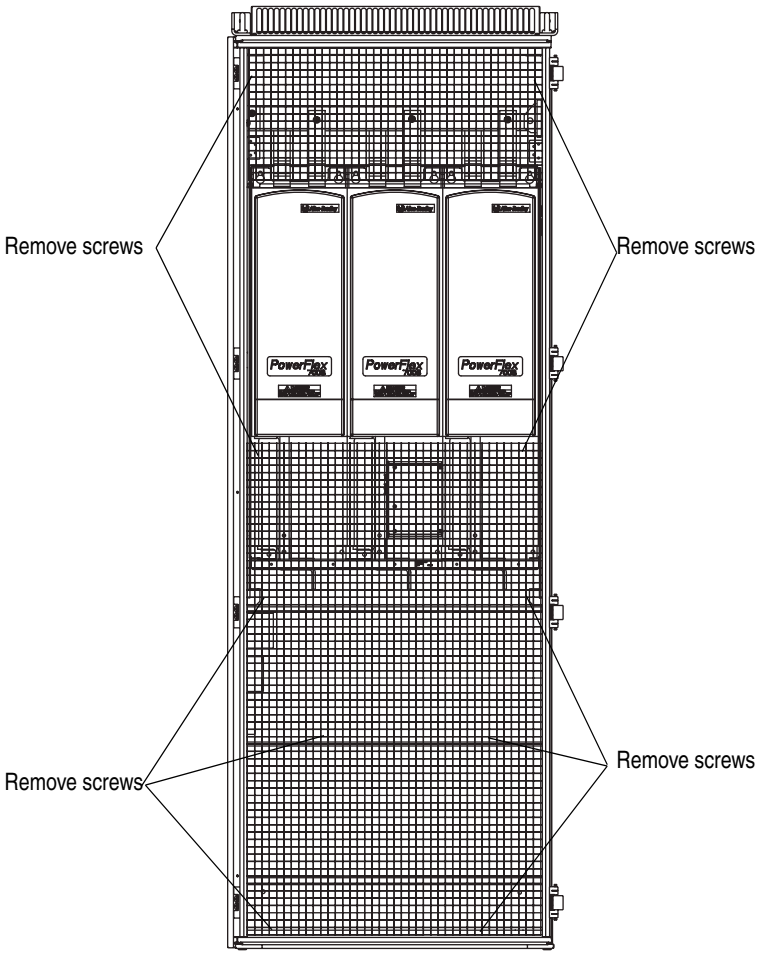
Installing the ASIC Circuit Boards

Install the ASIC circuit boards in reverse order of removal. Reconnect cables to ASIC board, while referring to Figure B.12 on page B-13).

Removing the Protective Screens from the Power Structure Enclosure

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 3-4.
2. Remove the screws that secure the protective screens to the enclosure and remove the screens.



Installing the Protective Screens on the Power Structure Enclosure

Install the protective screens in reverse order of removal.

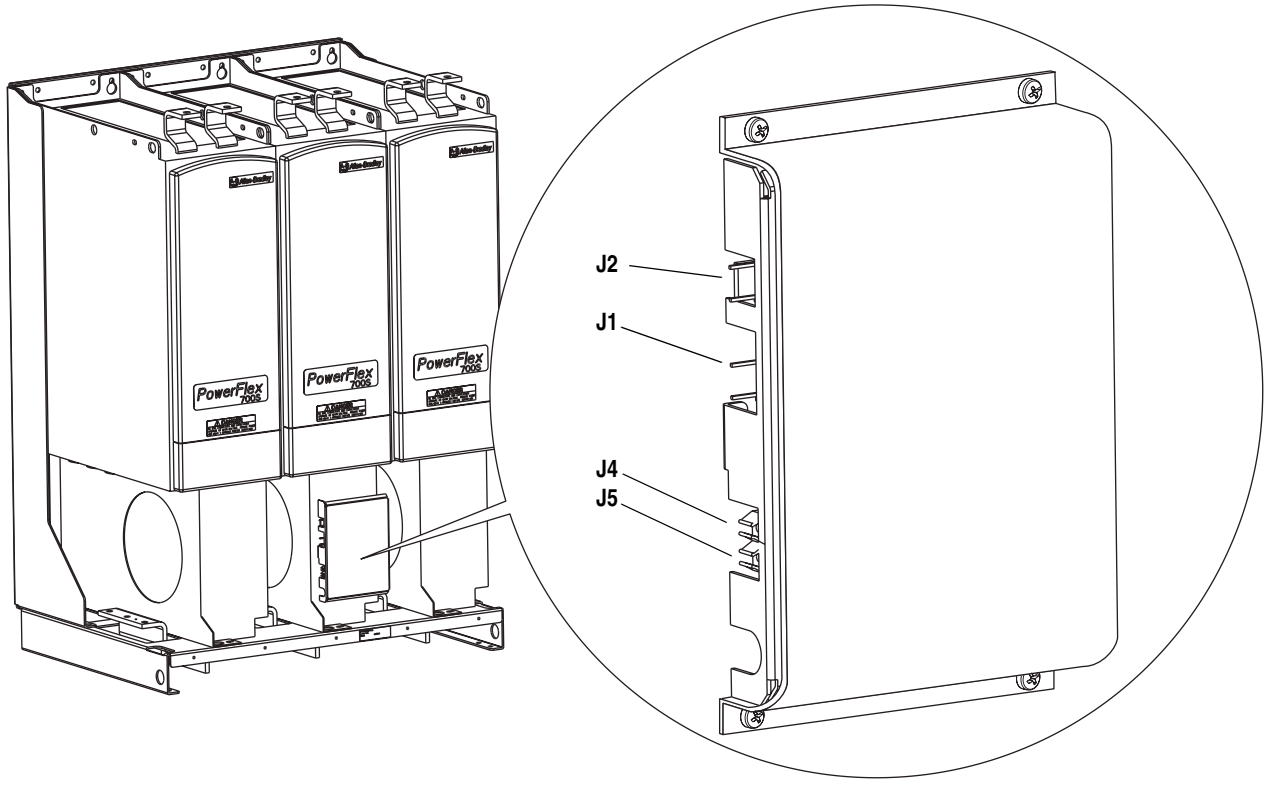
Removing the Voltage Feedback Circuit Board

The Voltage Feedback board is located near the bottom of the middle Inverter on Power Structure #1.

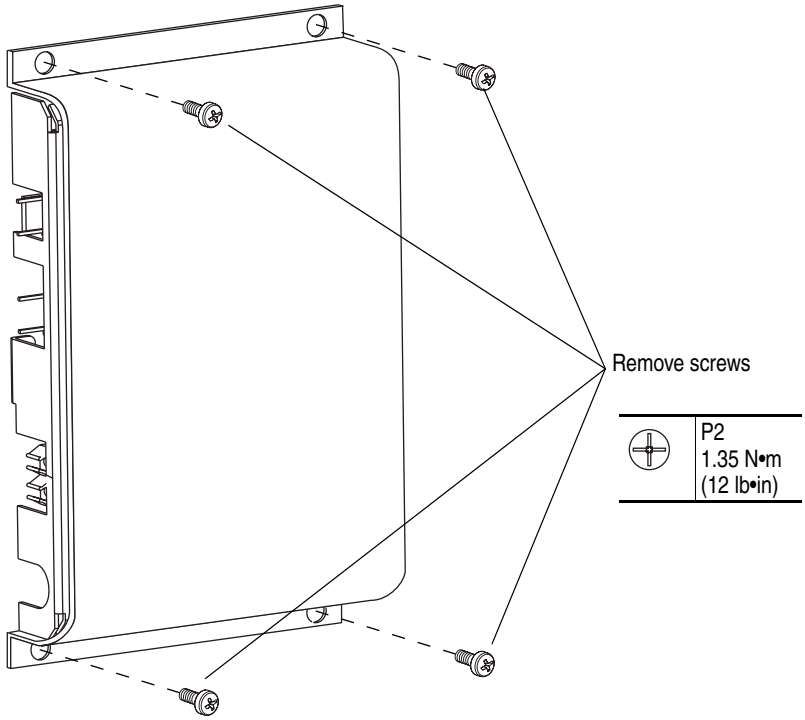
1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-4.
2. If present, remove the protective screens. Refer to Removing the Protective Screens from the Power Structure Enclosure on page 3-48.
3. Disconnect the DC bus connection cable from the J2 socket and the motor feedback connection cable from the J1 socket at the top of the Voltage Feedback board.
4. Carefully disconnect 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.

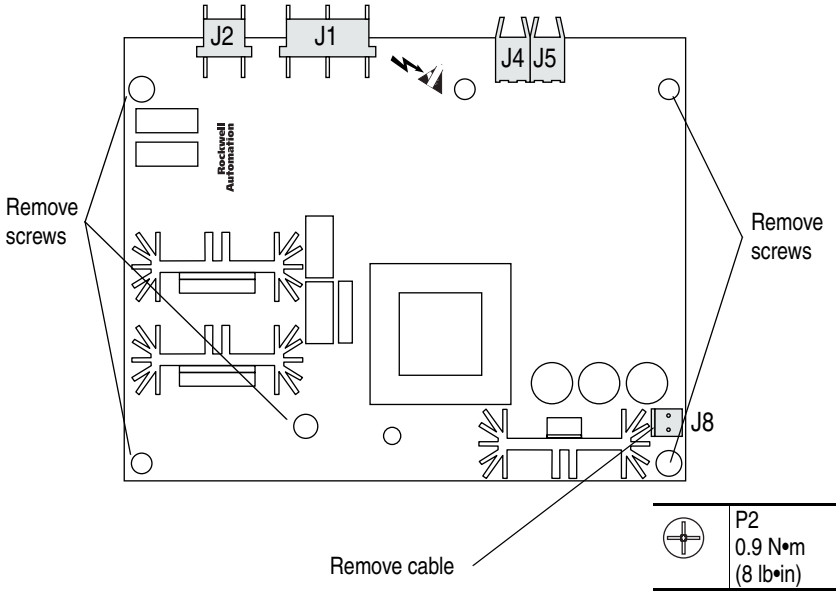
Important: Minimum inside bend radius for fiber-optic cable is 25.4 mm (1 in). Any bends with a shorter inside radius can permanently damage the fiber-optic cable. Signal attenuation increases with decreased inside bend radii.



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.

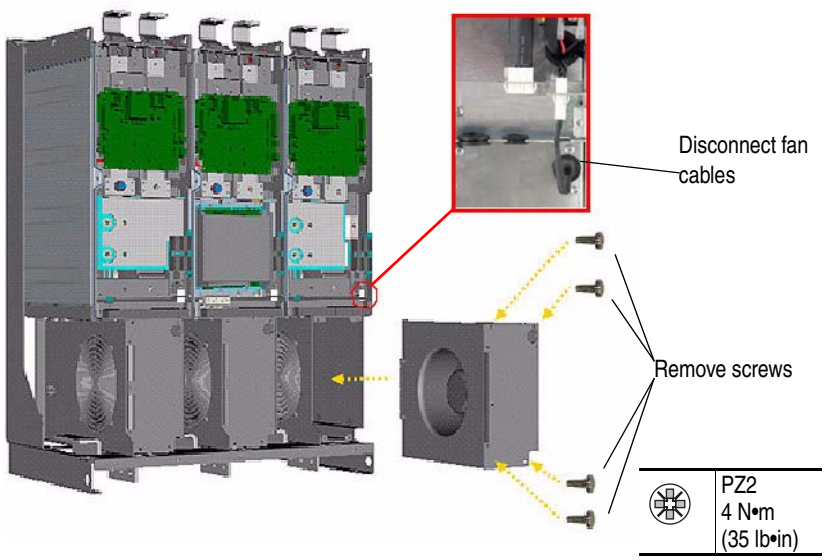
Installing the Voltage Feedback Circuit Board

- Install the Voltage Feedback circuit board in reverse order of removal.
- Run the Performing the Power Circuit Diagnostic Test on a 700S Drive on page 4-3 before running the drive.

Removing the Main Cooling Fans from the Inverters

There is a Main Cooling Fan on each of the Inverters.

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-4.
2. Remove the protective covers. Refer to Removing the Protective Covers from the Inverters on page 3-42.
3. If present, remove the protective screens. Refer to Removing the Protective Screens from the Power Structure Enclosure on page 3-48.
4. Disconnect the Main Cooling Fan cable connectors on the Inverters.
5. Remove the four screws that secure the fan to the Inverters. Then remove the fan from the inverter frame.



6. Repeat steps 4 and 5 or each remaining fan.

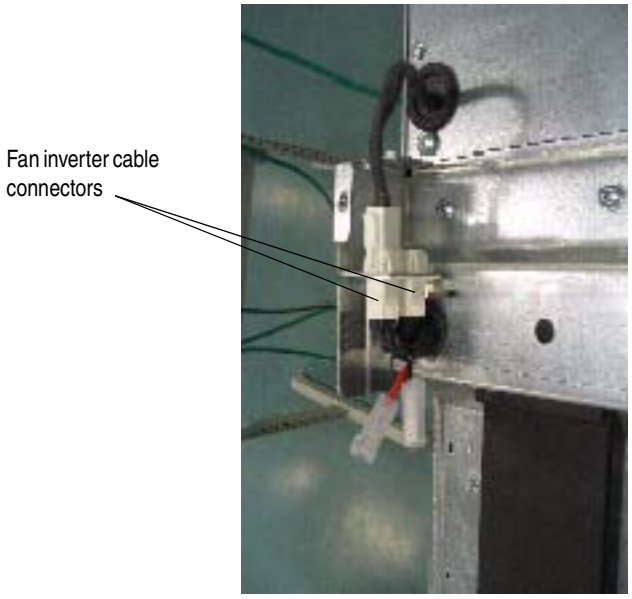
Installing the Main Cooling Fans on the Inverters

Install the Main Cooling Fans in reverse order of removal.

Removing the Fan Inverters from the Inverters

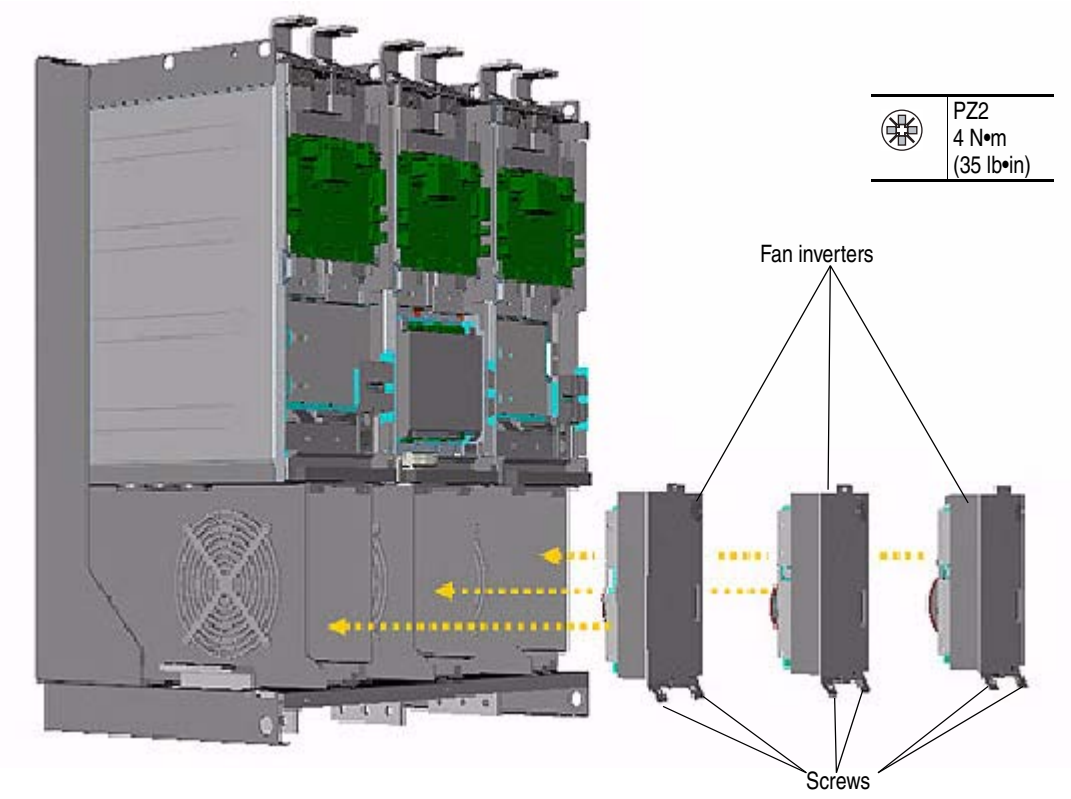
Each Fan Inverter is located behind a Main Cooling Fan on an Inverter.

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-4.
2. Remove the protective covers. Refer to Removing the Protective Covers from the Inverters on page 3-42.
3. If present, remove the protective screens. Refer to Removing the Protective Screens from the Power Structure Enclosure on page 3-48.
4. Remove the Voltage Feedback circuit board. Refer to Removing the Voltage Feedback Circuit Board on page 3-49.
5. Remove the Main Cooling Fans. Refer to Removing the Main Cooling Fans from the Inverters on page 3-51.
6. Disconnect the Fan Inverter cables from the connections on the front of the Inverters.

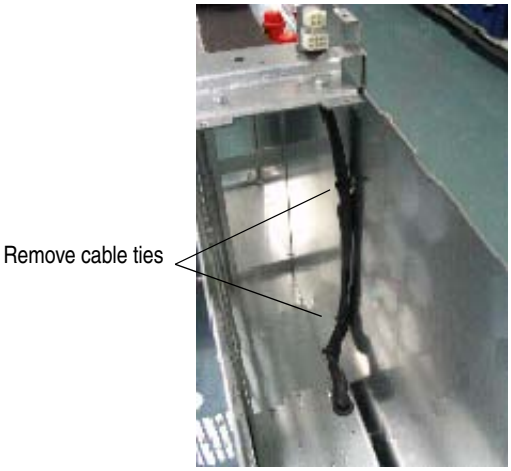


7. Push the Fan Inverter cables and connectors, largest first, through the rubber grommet into the frame, where the Main Cooling Fan was located.

8. Remove the two M5 POZIDRIV screws that secure the Fan Inverter to the drive.



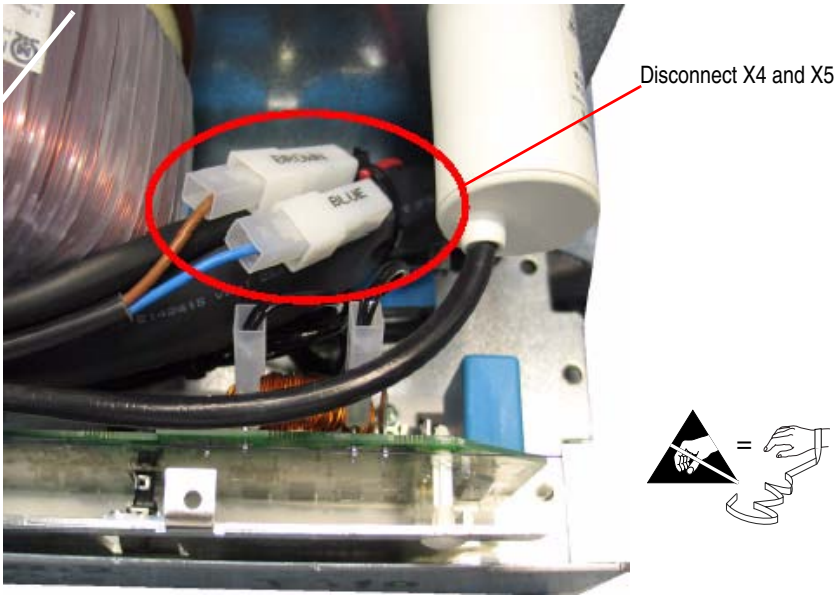
9. Remove the cable-ties that secure the cables with black insulation to the drive frame.



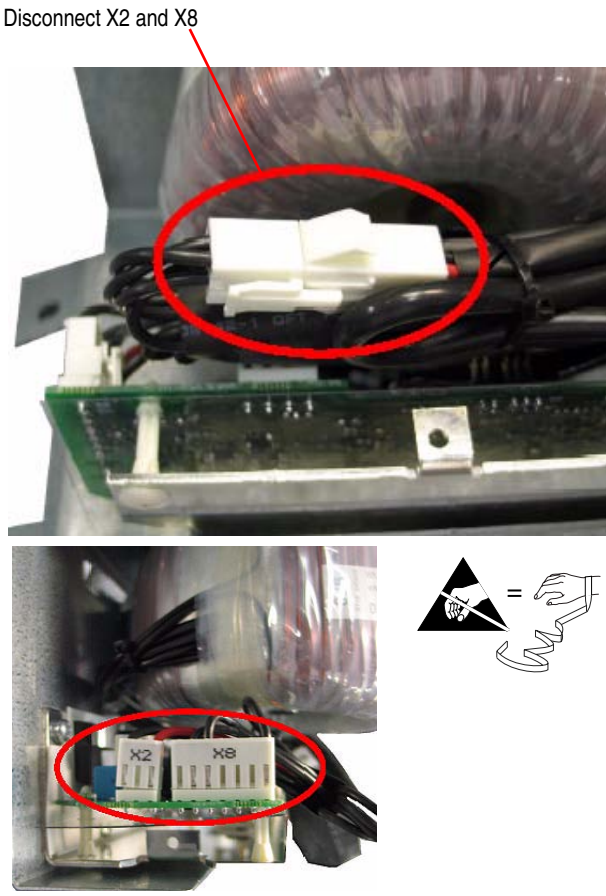
10. Remove the Fan Inverter assembly from the drive.

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

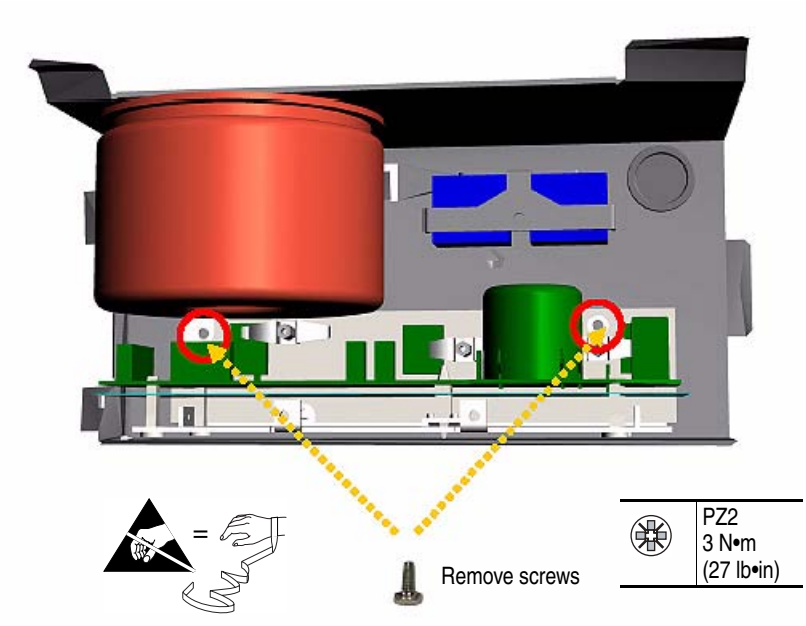
a. X4 and X5.



b. X8 and X2.



12. Remove the two M5 POZIDRIV screws that 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.



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

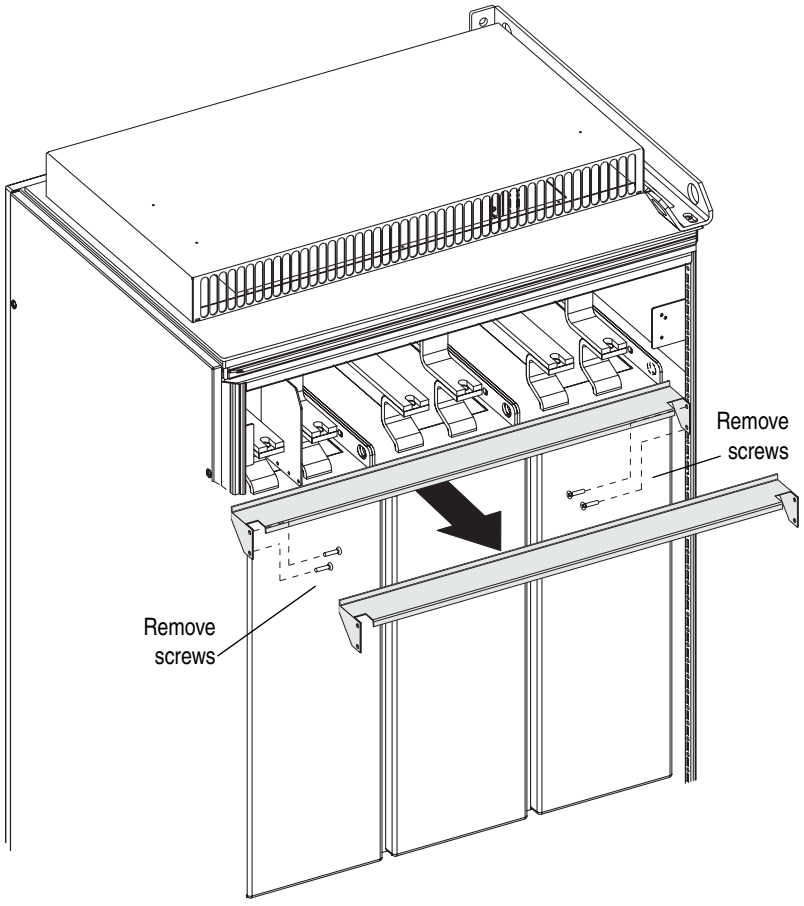
Installing the Fan Inverters

Install the Fan Inverters in reverse order of removal.

Removing the Air Flow Plate from the Power Structure Enclosure

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

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-4.
2. If present, remove the protective screens. Refer to Removing the Protective Screens from the Power Structure Enclosure on page 3-48.
3. Remove the four T8 Torx-head screws that secure the Air Flow Plate to the enclosure frame.
4. Slide the Air Flow Plate off of the enclosure frame.



Installing the Air Flow Plate on the Power Structure Enclosure

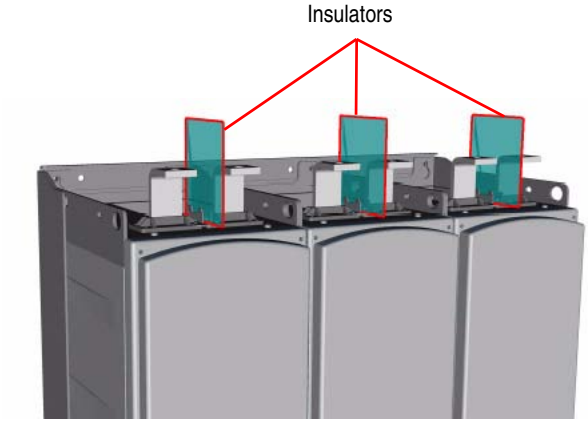
Install the Air Flow Plate in reverse order of removal.

Removing the Inverter Unit from the Enclosure

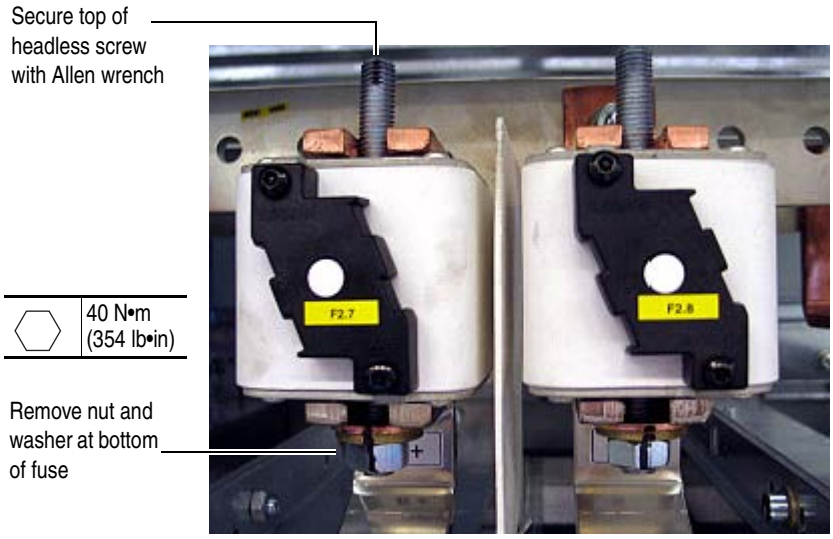
1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-4.
2. Remove the protective covers. Refer to Removing the Protective Covers from the Inverters on page 3-42.
3. Remove the ASIC boards from the drive. Refer to Removing the ASIC Circuit Boards on page 3-44.

   Note: It is not necessary to remove the ASIC board assembly from the Inverter. Only disconnect the fiber optic cables and other wires from the board that connect to boards in the Rectifying structure.
4. If present, remove the protective screens. Refer to Removing the Protective Screens from the Power Structure Enclosure on page 3-48.
5. If necessary, remove the Voltage Feedback board from the drive. Refer to Removing the Voltage Feedback Circuit Board on page 3-49.

   Note: It is net necessary to remove the Voltage Feedback board assembly from the Inverter. Only disconnect the fiber optic cables and other wires from the board that connect to boards in the Rectifying structure.
6. Remove the Air Flow Plate. Refer to Removing the Air Flow Plate from the Power Structure Enclosure on page 3-56.
7. Remove the insulator material between the DC Bus Bar terminals at the top of the Inverters.



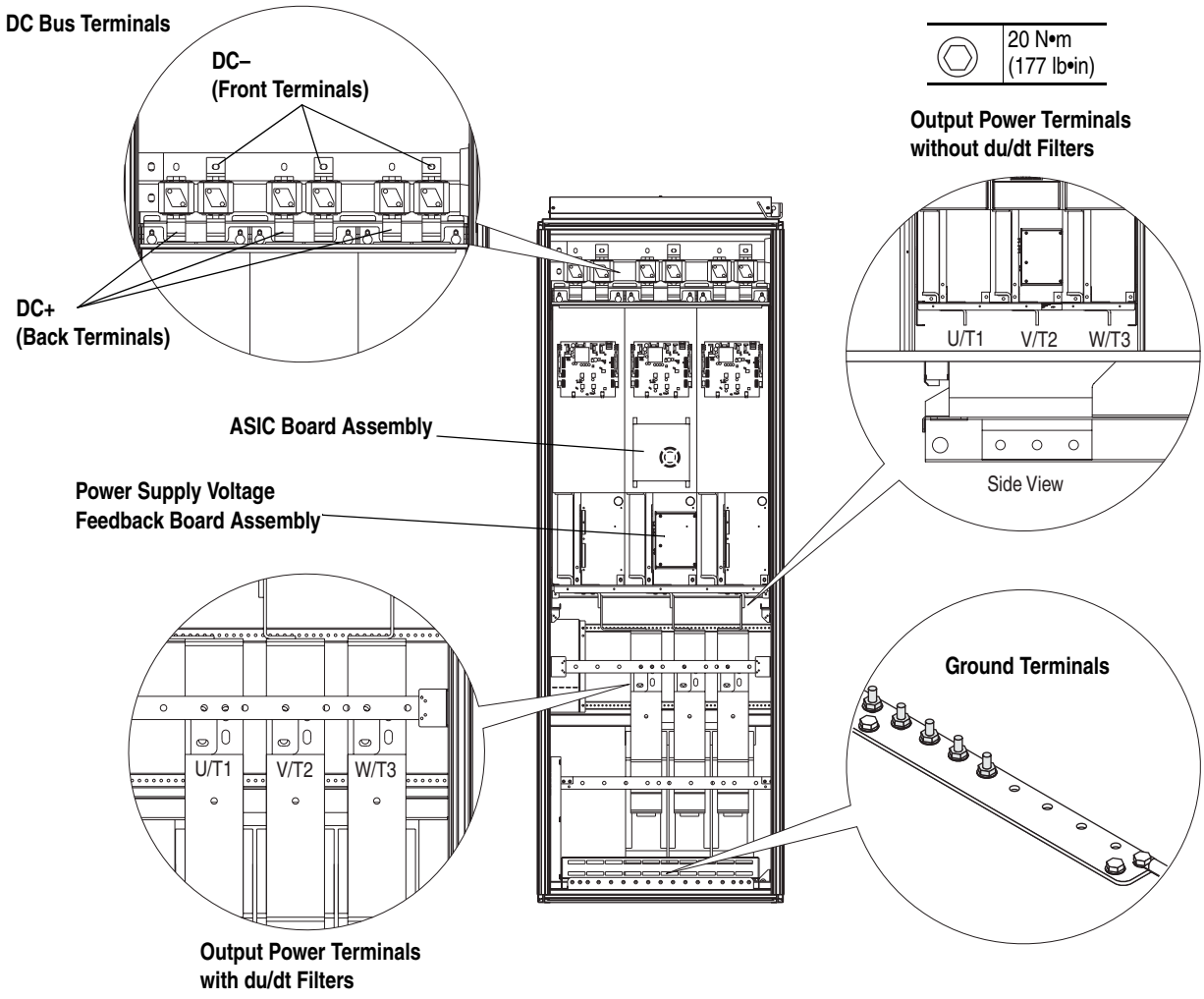
8. Remove the M10 nut and washer that secure the DC Link fuse to the DC Bus Bars at the top of the Inverters by securing the top of the M10 headless screw with an Allen wrench and removing the M10 nut and washer at the bottom of the fuse. Then remove the fuse.



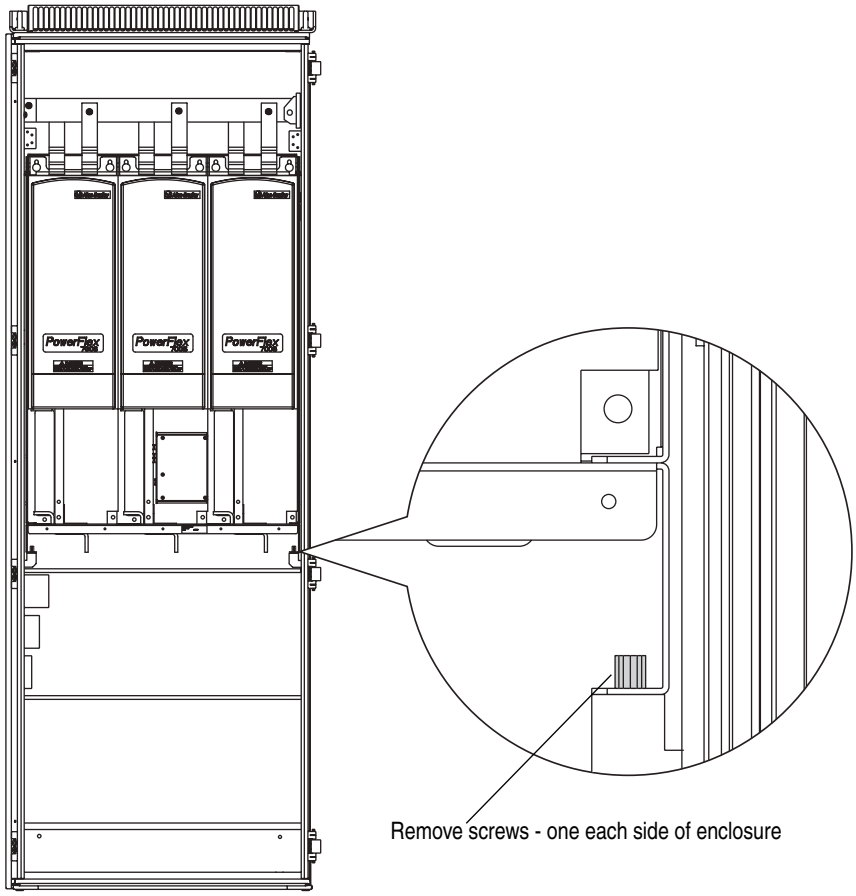
9. Remove the motor connections from the output power terminals on both of the power structures. Note: The terminals are located in different positions, depending on whether du/dt filters are installed or not.

10. Remove the ground connections from the bottom of the power structure enclosures.

11. Remove the input connections from the incoming DC bus terminals at the top of both power structures.



12. Remove the two hexagonal screws that secure each power structure to the enclosure frames.



13. Follow the instructions in publication PFLEX-IN014…, *Installation Instructions - PowerFlex 700S / 700H High Power Maintenance Stand*, to install the Maintenance Stand (part number 20-MAINSTND). Remove each Inverter unit by sliding it onto the rails of the Maintenance Stand.

Note: *The Maintenance Stand is designed for removing NFE Converter and Inverter units from drives supplied in Rittal TS8 enclosures. Alternate means of removal will be necessary for other types of enclosures.*

14. Follow the instructions in publication PFLEX-IN005…, *Installation Instructions - Lifting & Mounting PowerFlex 700S and 700H Drives (Frame 10 - 14)*, supplied with the new power structures, to lift the power structures off of the Maintenance Stand.

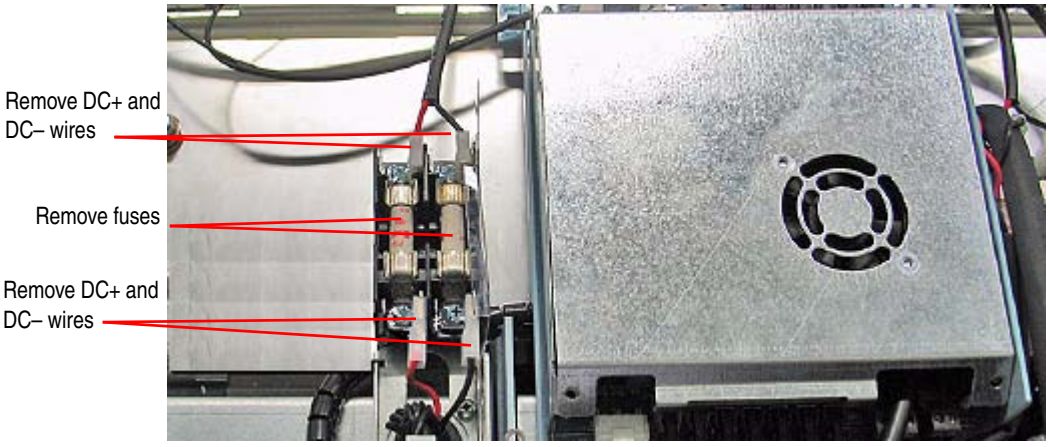
Installing the Inverter Unit

Install the Inverter unit in reverse order of removal. Refer to the publication PFLEX-IN006…, *Installation Instructions - PowerFlex 700S and 700H AC Drives*, for tightening torques of motor, DC bus input and ground connection terminations.

Removing the Fan Inverter Fuse Assemblies from the Inverters

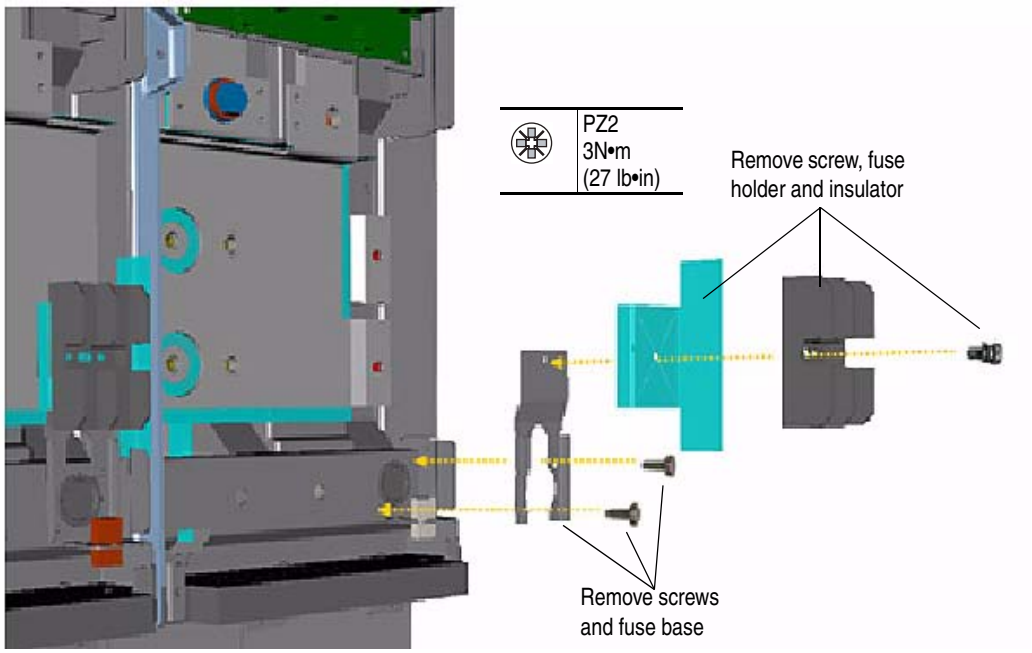
There is a Fan Inverter Fuse assembly for each Main Cooling Fan in the Power structure.

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-4.
2. Remove the protective covers. Refer to Removing the Protective Covers from the Inverters on page 3-42.
3. If present, remove the protective screens. Refer to Removing the Protective Screens from the Power Structure Enclosure on page 3-48.
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 Inverters

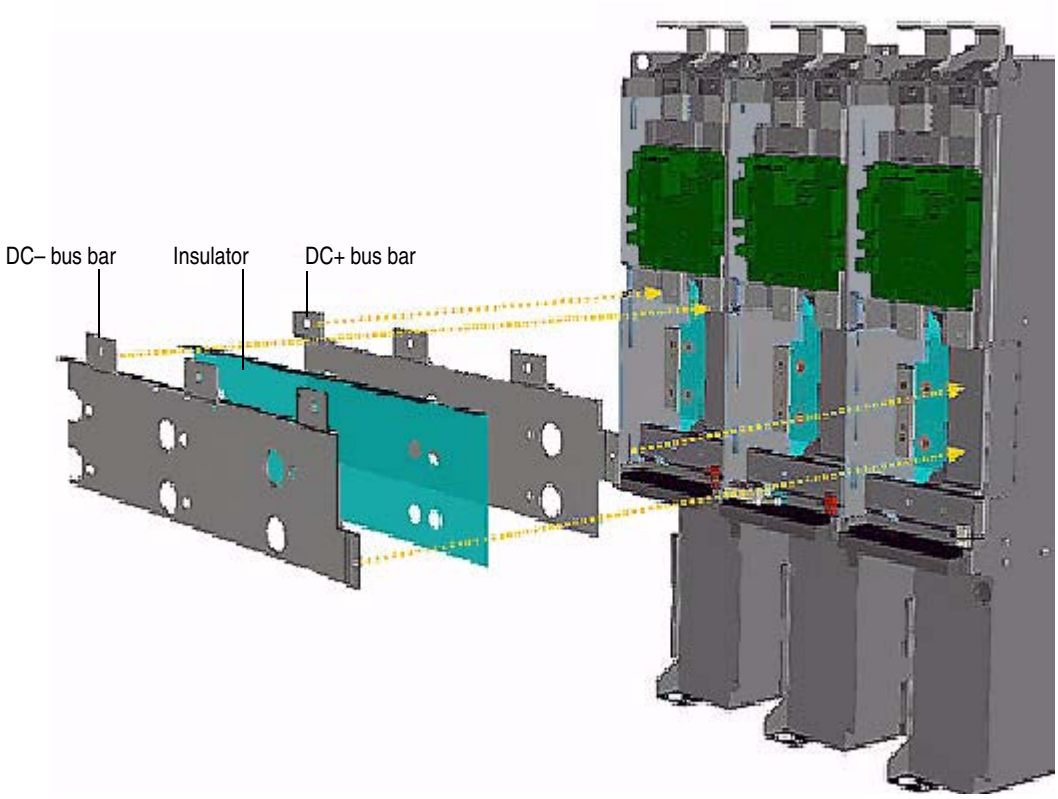
Install the Fan Inverter Fuse assemblies in reverse order of removal.

Removing the DC Connective Bus Bars from the Inverters

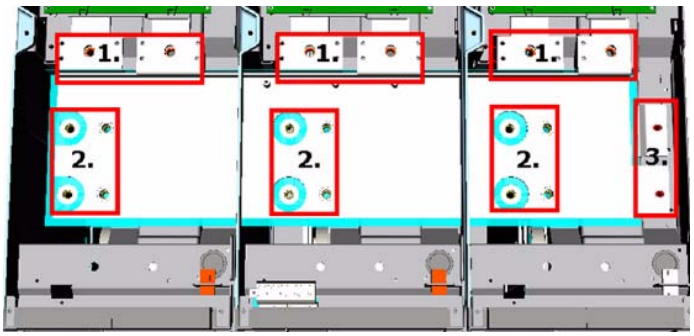
You must remove the DC Connective Bus Bars in order to remove the Inverters from the drive.

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-4.
2. Remove the protective covers. Refer to Removing the Protective Covers from the Inverters on page 3-42.
3. If present, remove the protective screens. Refer to Removing the Protective Screens from the Power Structure Enclosure on page 3-48.
4. Remove the ASIC circuit board. Refer to Removing the ASIC Circuit Boards on page 3-44.
5. Remove the Fan Inverter Fuse assemblies. Refer to Removing the Fan Inverter Fuse Assemblies from the Inverters on page 3-61.

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



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



Installing the DC Connective Bus Bars on the Inverters

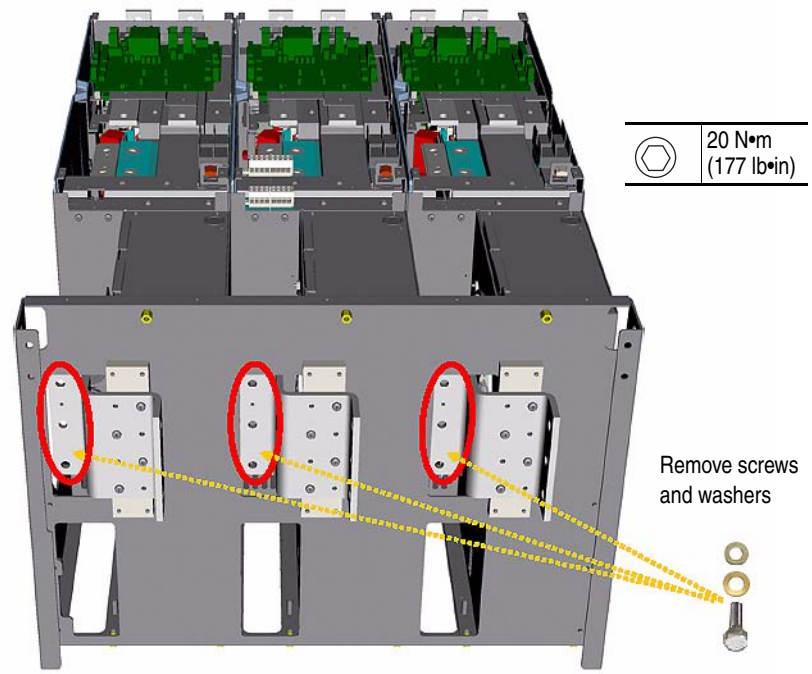
Install the DC Connective Bus Bars in reverse order of removal.

Removing the Inverters from the Frame

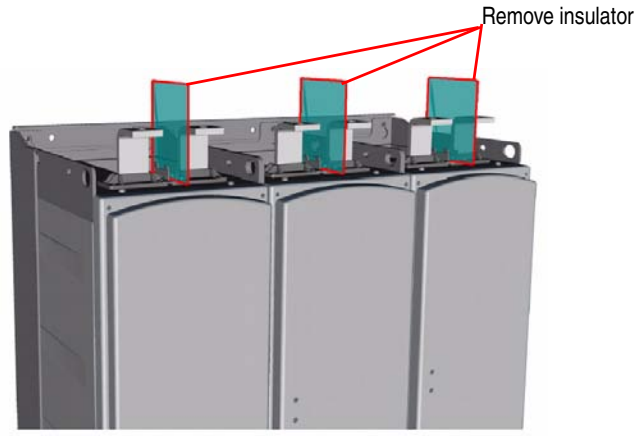
Note: The Inverters are secured to a frame that is removed from the enclosure as a single unit. This unit must be removed from the enclosure before the individual Inverters and/or Output Power modules can be removed.

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-4.
2. Remove the protective covers. Refer to Removing the Protective Covers from the Inverters on page 3-42.
3. If present, remove the protective screens. Refer to Removing the Protective Screens from the Power Structure Enclosure on page 3-48.
4. Remove the Fan Inverter Fuse assemblies. Refer to Removing the Fan Inverter Fuse Assemblies from the Inverters on page 3-61.
5. Remove the DC Connective Bus Bars. Refer to Removing the DC Connective Bus Bars from the Inverters on page 3-63.
6. Remove the Air Flow Plate. Refer to Removing the Air Flow Plate from the Power Structure Enclosure on page 3-56.
7. Remove the Inverter unit. Refer to Removing the Inverter Unit from the Enclosure on page 3-57.

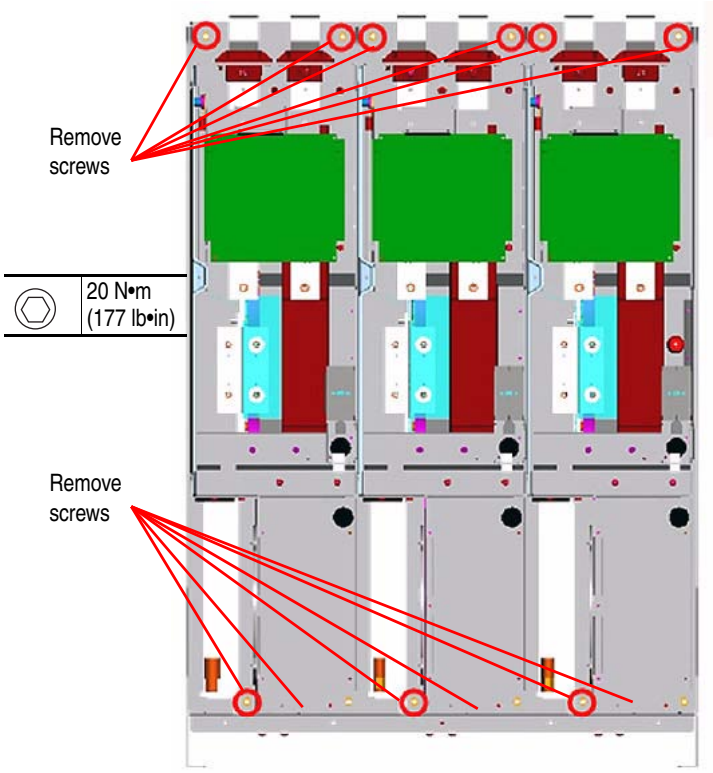
8. Remove the M10 x 25 hexagonal screws that secure the output power cables to the Output Power terminals.



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 Inverters off of the frame.

Installing the Inverters

Install the Inverters in the reverse order of removal.

Removing the Output Power Modules from the Inverters

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

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

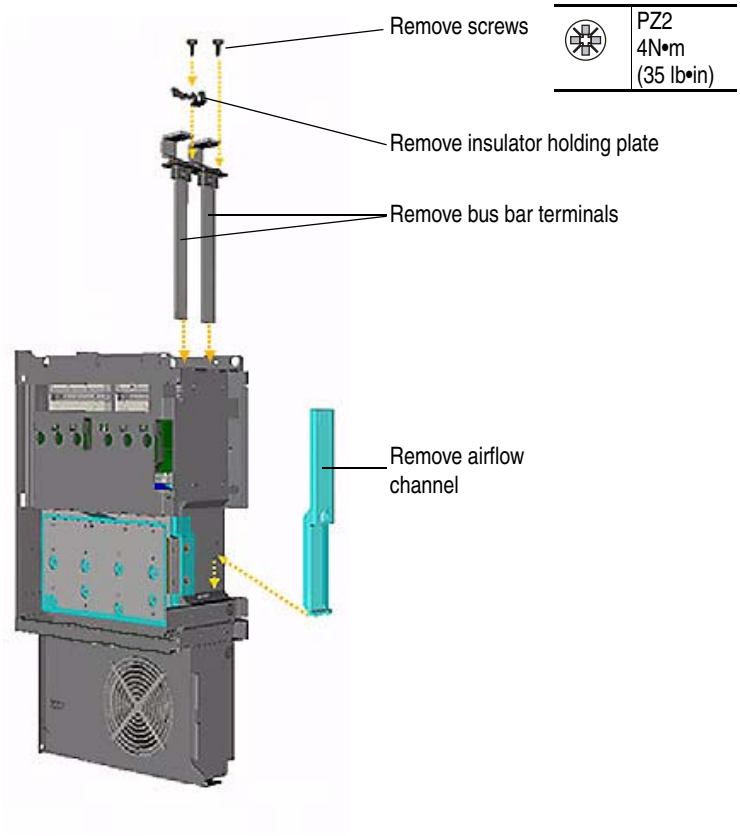
1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-4.
2. Remove the protective covers. Refer to Removing the Protective Covers from the Inverters on page 3-42.
3. If present, remove the protective screens. Refer to Removing the Protective Screens from the Power Structure Enclosure on page 3-48.
4. Remove the Gate Driver Circuit Boards. Refer to Removing the Gate Driver Circuit Boards on page 3-43.
5. On the V Phase Inverter only, remove the ASIC Circuit Board. Refer to Removing the ASIC Circuit Boards on page 3-44.
6. Remove the Fan Inverter Fuse assemblies. Refer to Removing the Fan Inverter Fuse Assemblies from the Inverters on page 3-61.
7. Remove the DC Connective Bus Bars. Refer to Removing the DC Connective Bus Bars from the Inverters on page 3-63.
8. Remove the Air Flow Plate. Refer to Removing the Air Flow Plate from the Power Structure Enclosure on page 3-56.
9. Remove the Inverter unit. Refer to Removing the Inverter Unit from the Enclosure on page 3-57.
10. Remove the Inverters. Refer to Removing the Inverters from the Frame on page 3-65.
11. On the V Phase Inverter only, remove the capacitor leads from the DC Input Bus Bars at the top of the Inverter.

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.

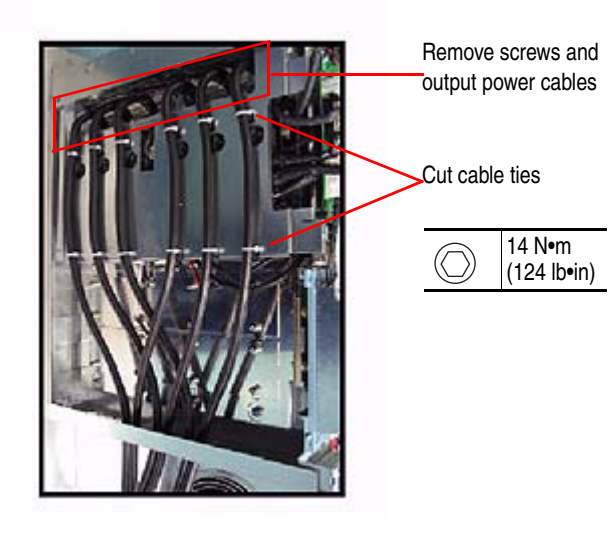
14. Slide the Bus Bar terminals out of the frame.

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



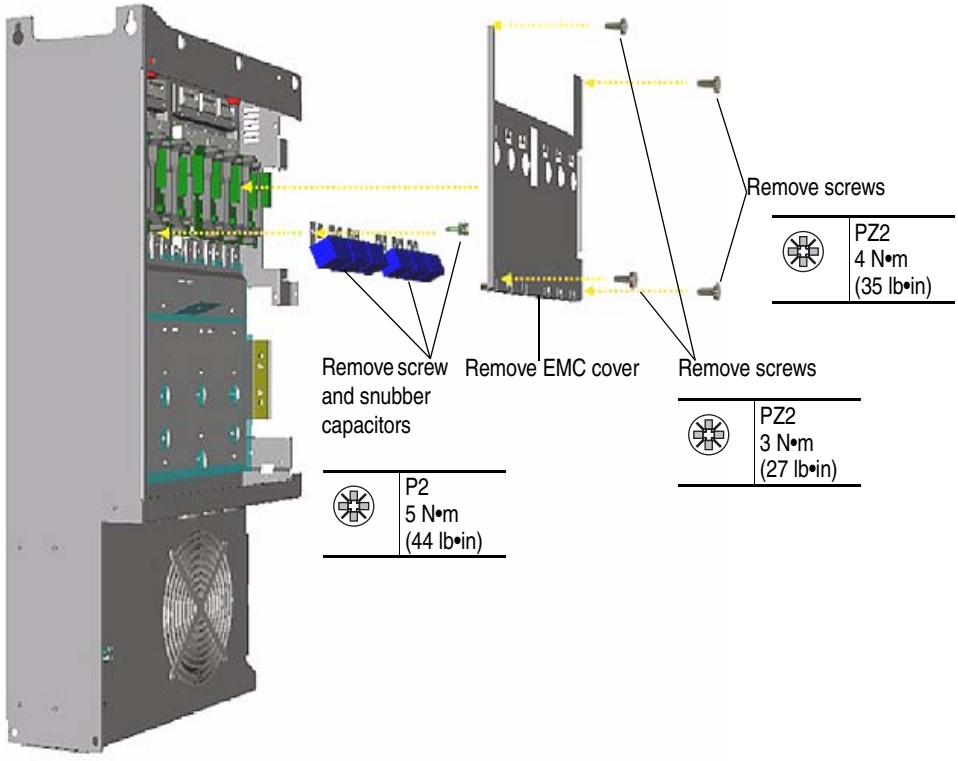
16. Remove the M8x20 hexagonal screws that secure the output power cables to the output power bus bar.

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

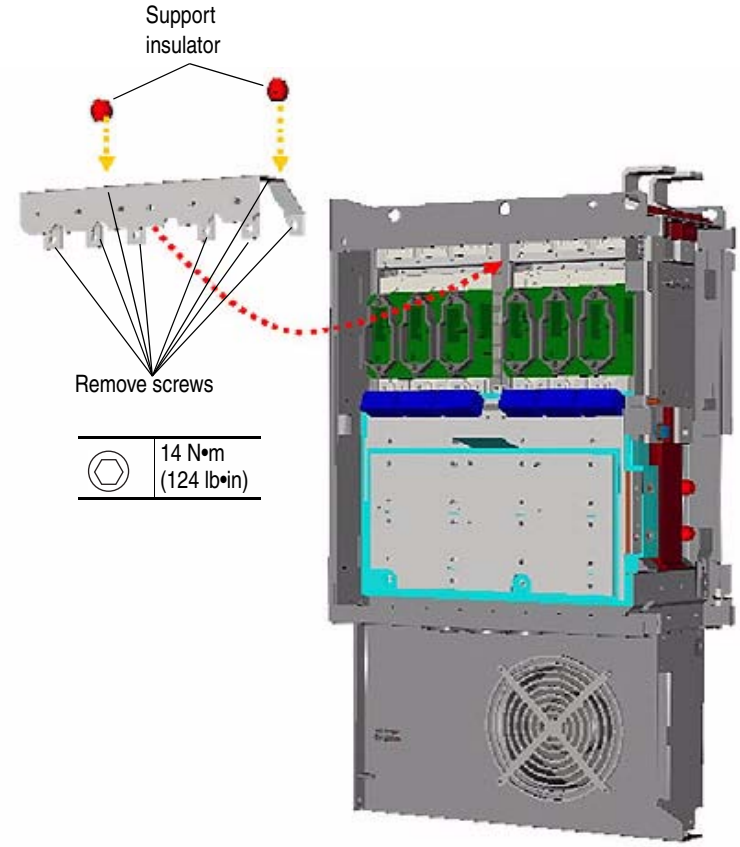


18. Remove the M5x10 POZIDRIV and M4x8 POZIDRIV screws that secure the EMC cover to the drive and remove the cover.

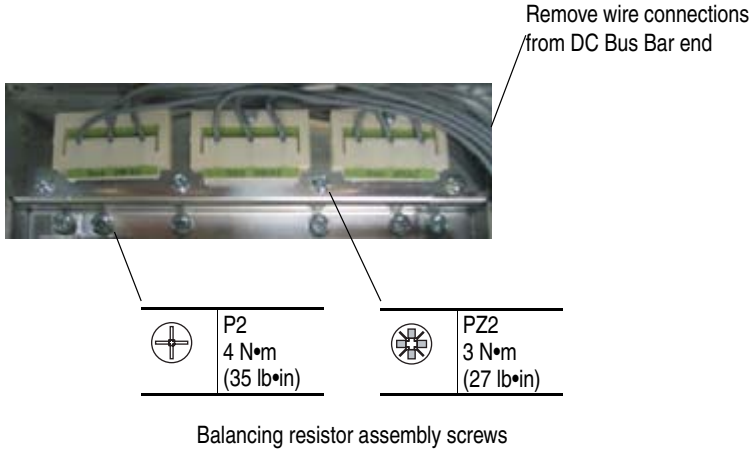
19. Remove the screws that secure the Snubber Capacitors to the Output Power module and remove the Snubber Capacitors.



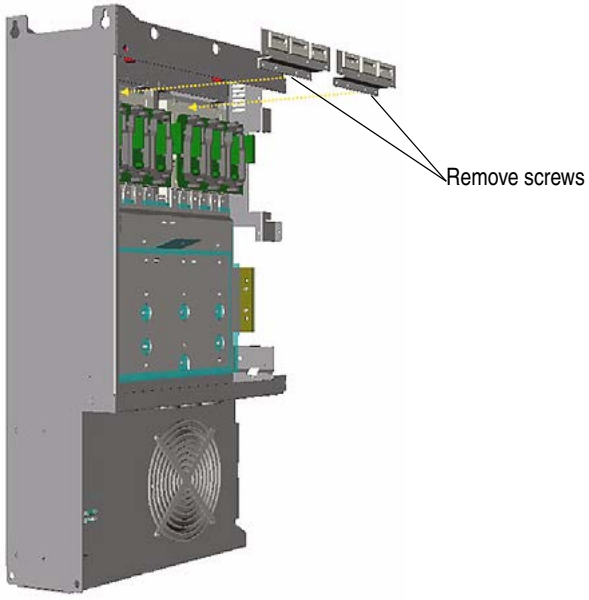
20. Remove the screws that secure the Power Bus Bar and support insulators to the drive and remove the Power Bus bar and insulators.



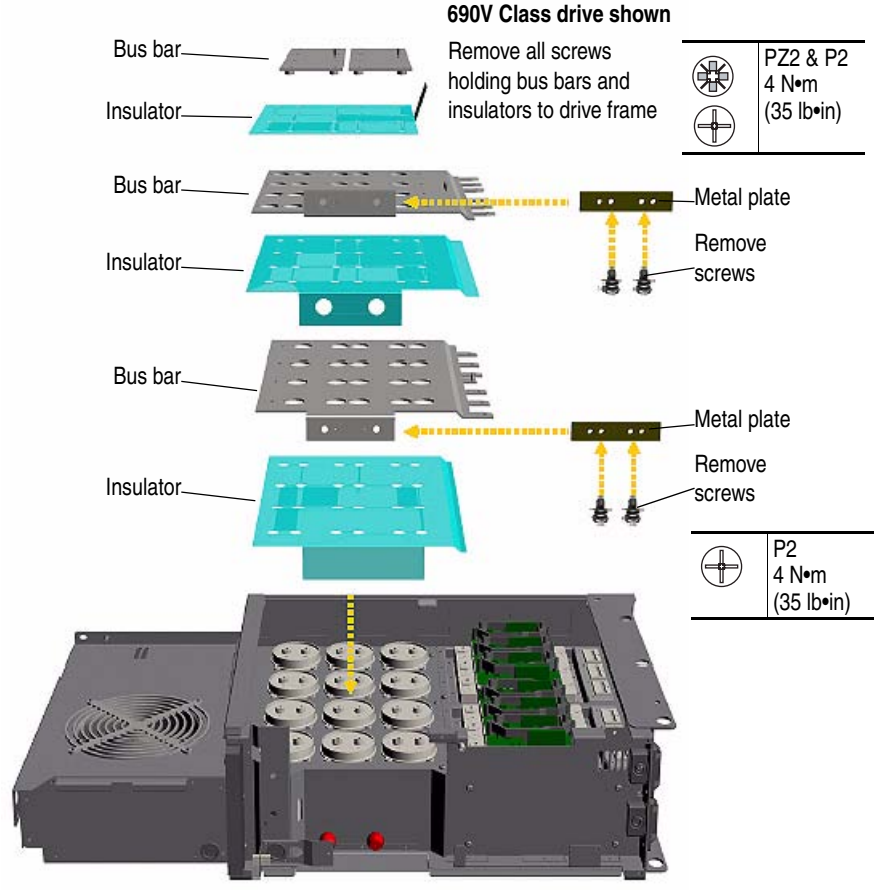
21. Disconnect the Balancing Resistor wires from the Main DC Bus Bars.



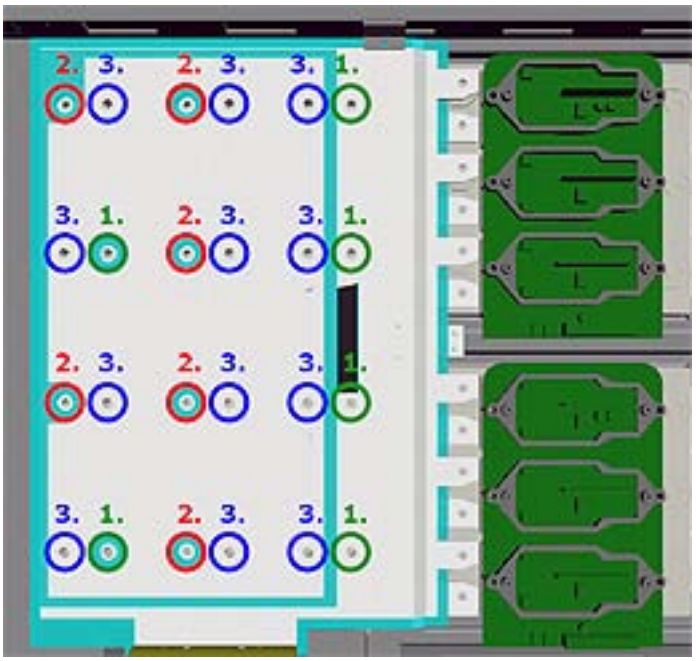
22. Remove the screws that secure the Balancing Resistor assemblies to the Output Power modules and remove the Balancing Resistor assemblies (see previous illustration for screw locations).



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.

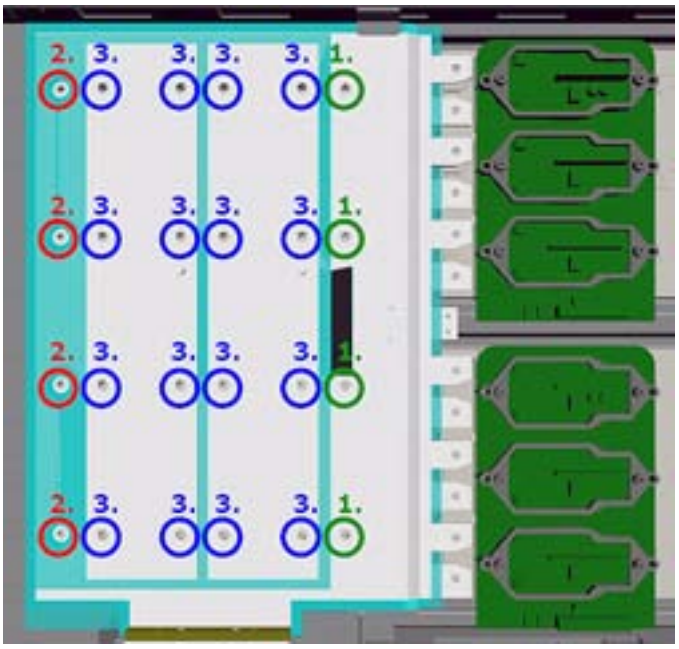


Bus Bar fastening screw locations - 400/480V drive:



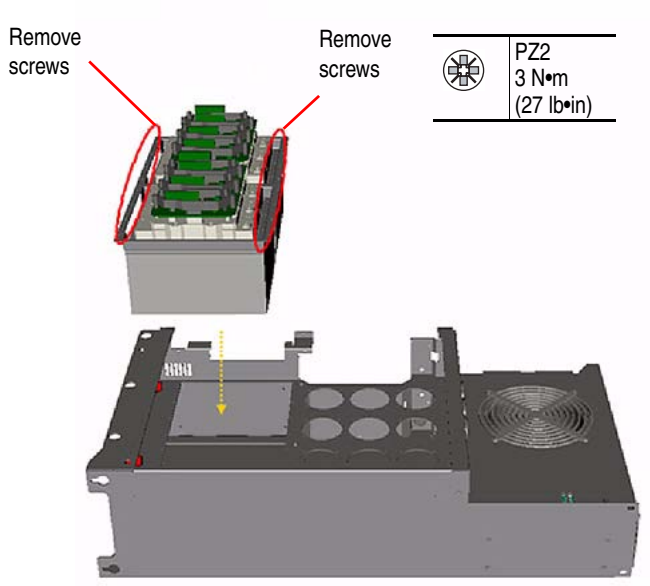
Location	Fasteners	Torque
1	M6 x 20 screws	4 N•m (35 lb•in)
2	M6 x 16 screws	4 N•m (35 lb•in)
3	M6 x 25 screws and M6 washers	4 N•m (35 lb•in)

Bus Bar fastening screw locations - 600/690V drive:



Location	Fasteners	Torque
1	M6 x 20 screws	4 N•m (35 lb•in)
2	M6 x 16 screws	4 N•m (35 lb•in)
3	M6 x 25 screws and M6 washers	4 N•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.
- Run the Performing the Power Circuit Diagnostic Test on a 700S Drive on page 4-3 before running the drive.

Removing the DC Bus Capacitors from the Inverters

1. Remove power from the drive. Refer to Removing Power from the Drive on page 3-4.
2. Remove the protective covers. Refer to Removing the Protective Covers from the Inverters on page 3-42.
3. If present, remove the protective screens. Refer to Removing the Protective Screens from the Power Structure Enclosure on page 3-48.
4. Remove the Gate Driver Circuit boards. Refer to Removing the Gate Driver Circuit Boards on page 3-43.
5. On the V Phase Inverter only, remove the ASIC Circuit Board. Refer to Removing the ASIC Circuit Boards on page 3-44.

6. Remove the Fan Inverter Fuse assemblies. Refer to Removing the Fan Inverter Fuse Assemblies from the Inverters on page 3-61.

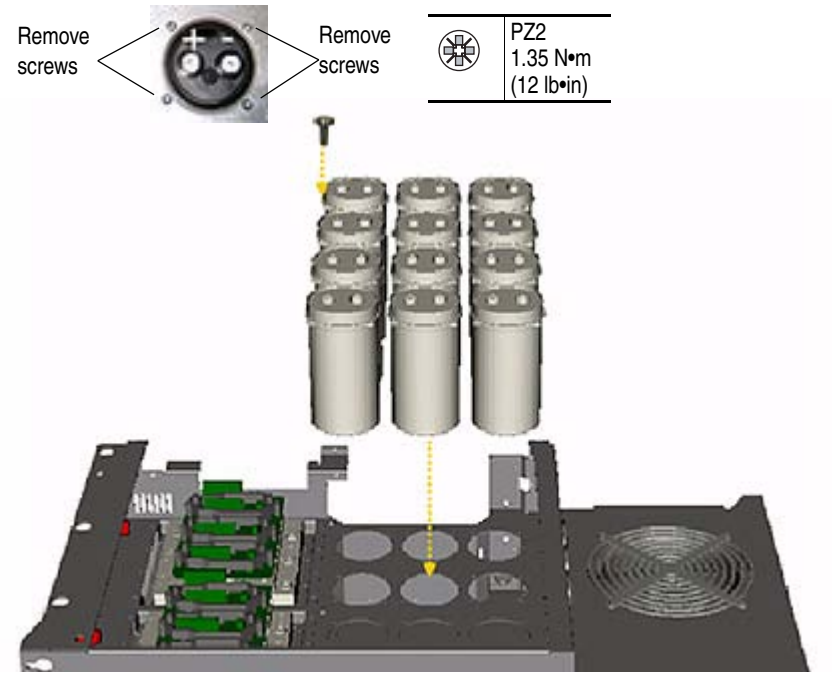
7. Remove the DC Connective Bus Bars. Refer to Removing the DC Connective Bus Bars from the Inverters on page 3-63.

8. Remove the Air Flow Plate. Refer to Removing the Air Flow Plate from the Power Structure Enclosure on page 3-56.

9. Remove the Inverter unit. Refer to Removing the Inverter Unit from the Enclosure on page 3-57.

10. Remove the Inverters. Refer to Removing the Inverters from the Frame on page 3-65.

11. Remove the four M4x8 screws that secure each of the capacitors to the power structure, and remove the capacitors.



Installing the DC Bus Capacitors in the Inverters

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.

Loading the 700H EEPROM

If you replace the Output Power Modules or Control Board in a 700H drive you must load information about the Power Modules or Control Board into the Power EEPROM. Contact Allen-Bradley Drives Technical Support for instructions and software tools for performing this operation.

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 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.
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 2-2.

Testing Without a Motor

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

1. Verify that the input power wiring and grounding is connected.
1. Verify that the motor cables are disconnected.
2. Energize the drive.
3. Measure the DC bus voltage and verify that the value is reflected in:
   - parameter 306 [DC Bus Voltage] (700S)
   - parameter 012 [DC Bus Voltage] (700H)
4. Make configuration changes that allow the HIM to issue start and speed commands.
5. Make configuration changes that allow operation without an encoder and motor.
6. Start the drive, by pressing  (the start button).
7. Increase the speed command from zero to base speed, by pressing  (the up button).
8. Measure the output voltage on each phase and verify that it is balanced. If it is unbalanced troubleshoot the drive.
9. Stop the drive, by pressing  (the stop button).
10. Re-configure the drive to suit the application.

Performing the Power Circuit Diagnostic Test on a 700S Drive

The Power Circuit Diagnostic Test on the 700S drive allows you to diagnose problems in the drive's power structure without applying large amounts of power.

1. Verify that the input power wiring and grounding is connected.
2. Verify that the motor cables are connected.
3. Energize the drive.
4. Measure the DC bus voltage and verify that the value is reflected in:
   - parameter 306 [DC Bus Voltage] (700S)
5. From the Monitor menu on the HIM press Esc (the escape button) to navigate to the Main menu.
6. Press ▼ (the down button) to move the cursor to the Start-Up selection, and press ↵ to select Start-Up. Then press ↵ again to verify your intention to continue with the Start-Up menu.
7. Press ▼ (the down button) to move the cursor to Power Circuit Diagnostics (Pwr Circuit Diag), and press ↵ to select Power Circuit Diagnostics.
8. Press | to begin the Power Circuit Diagnostic routine. Follow the indications and instructions displayed on the HIM.

Testing With the Motor Without a Mechanical Load

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

1. Verify that the 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. Measure the DC bus voltage and verify that the value is reflected in:
   - parameter 306 [DC Bus Voltage] (700S)
   - parameter 012 [DC Bus Voltage] (700H)
6. Start the drive and increase the speed from zero to base speed.
7. Measure drive output current and verify that the value is reflected in the following parameters:
   - 308 [Output Current] (700S)
   - 003 [Output Current] (700H)
8. 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	Multimeter	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

Figure B.1 Circuitry Diagram for Drives with AC Input - Power Structure 1

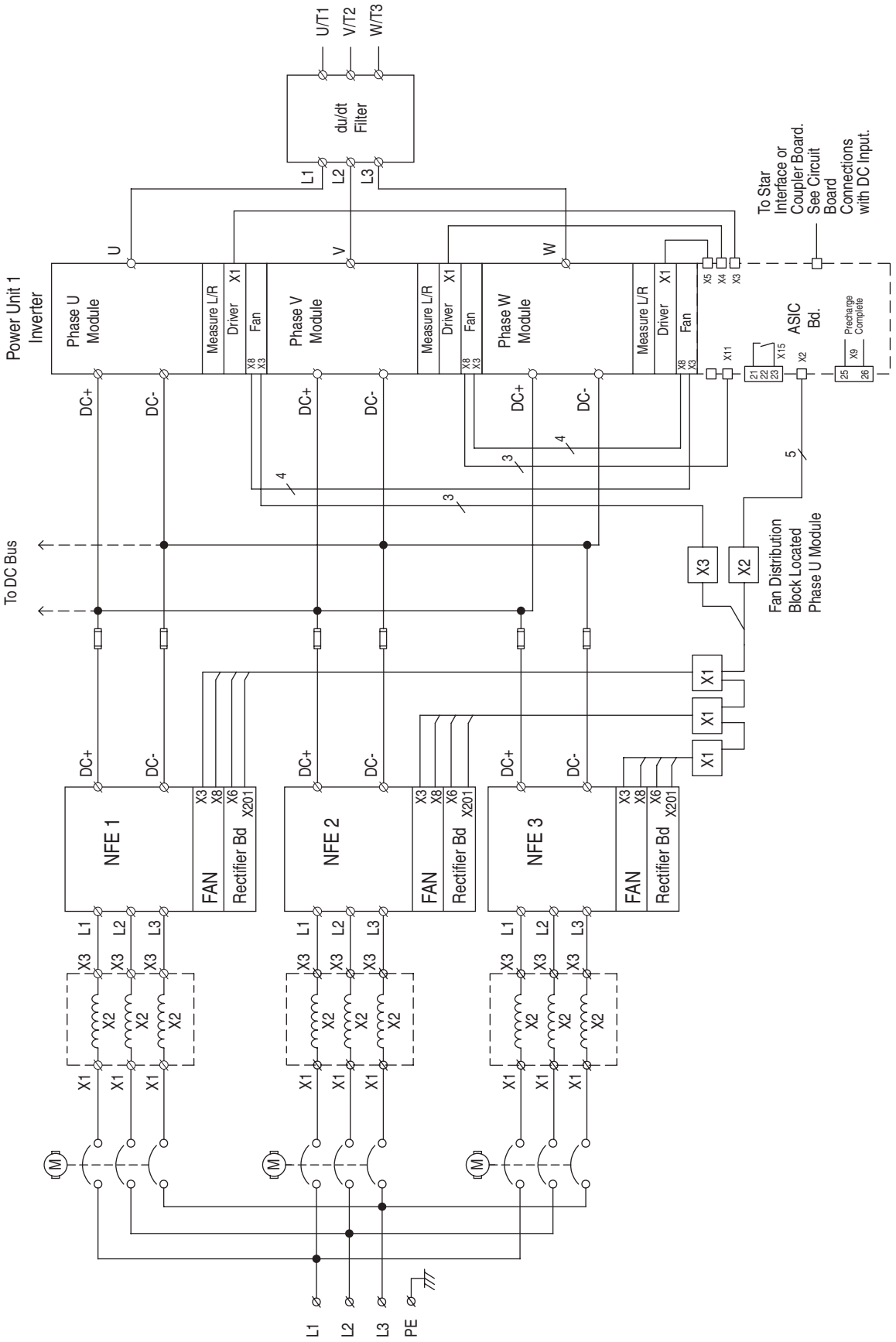


Figure B.2 Circuitry Diagram for Drives with AC Input - Power Structure 2

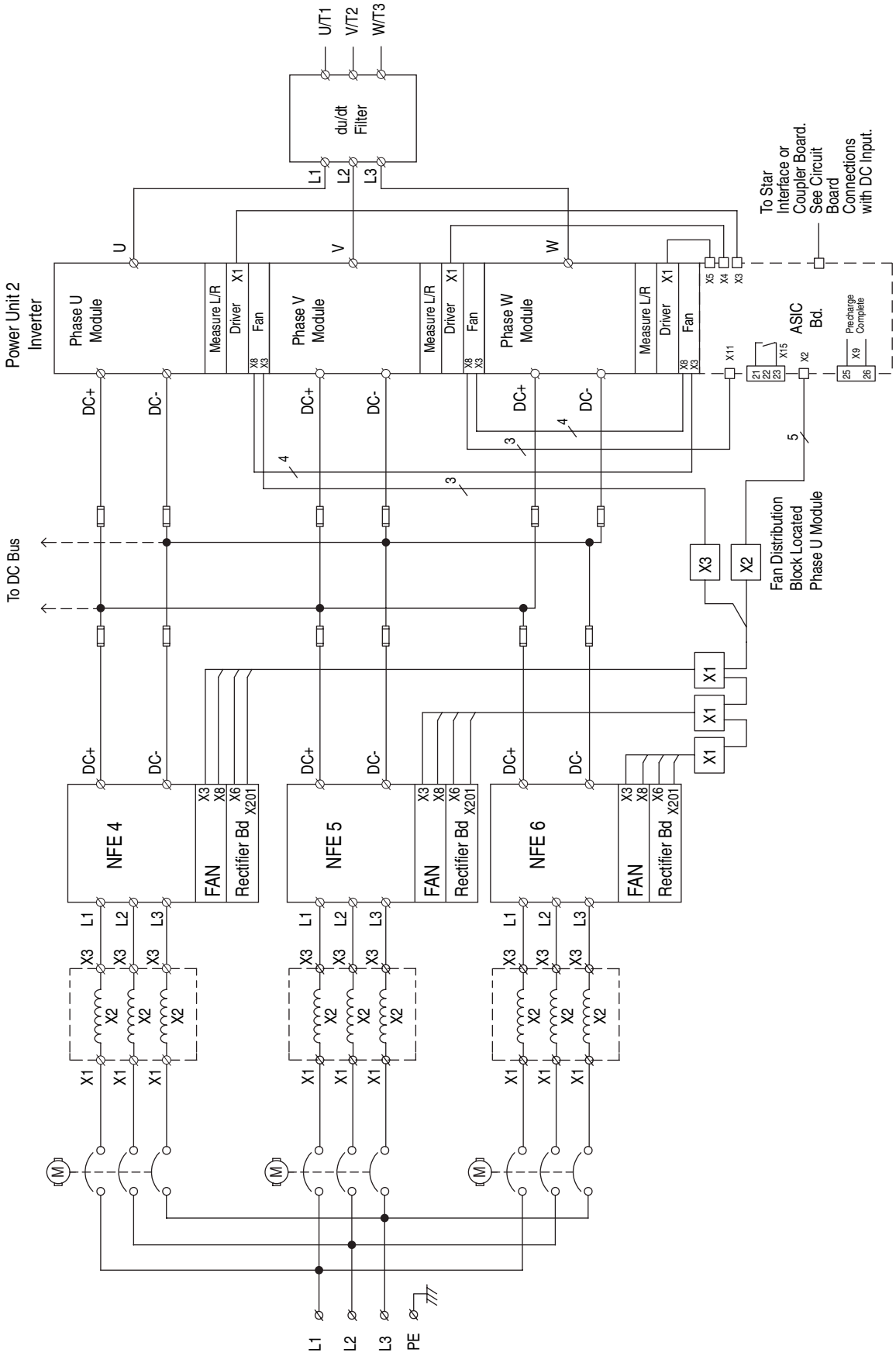


Figure B.3 NFE Converter Unit Circuitry for Drives with AC Input

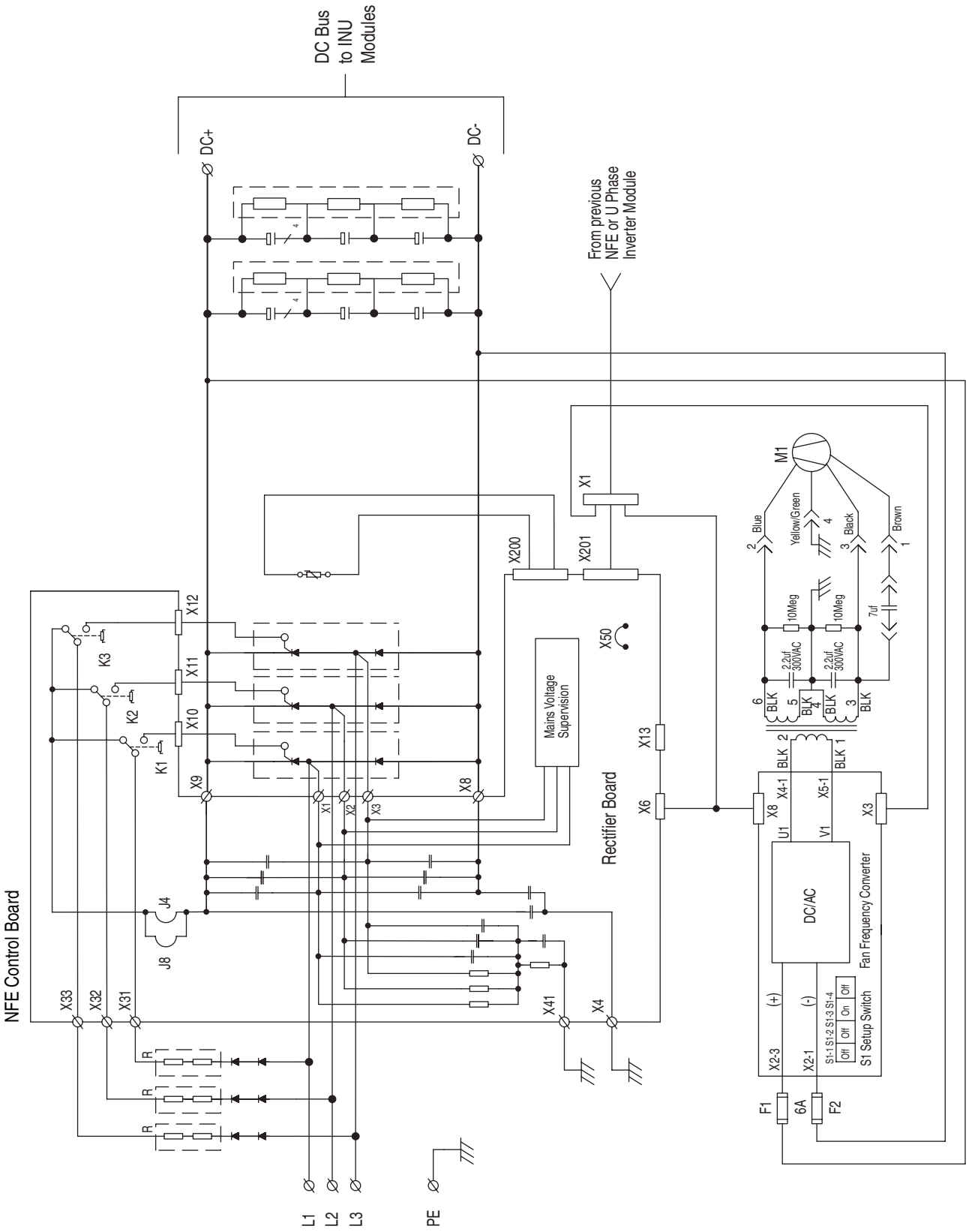


Figure B.4 Inverter Unit Circuitry for Drives with AC Input

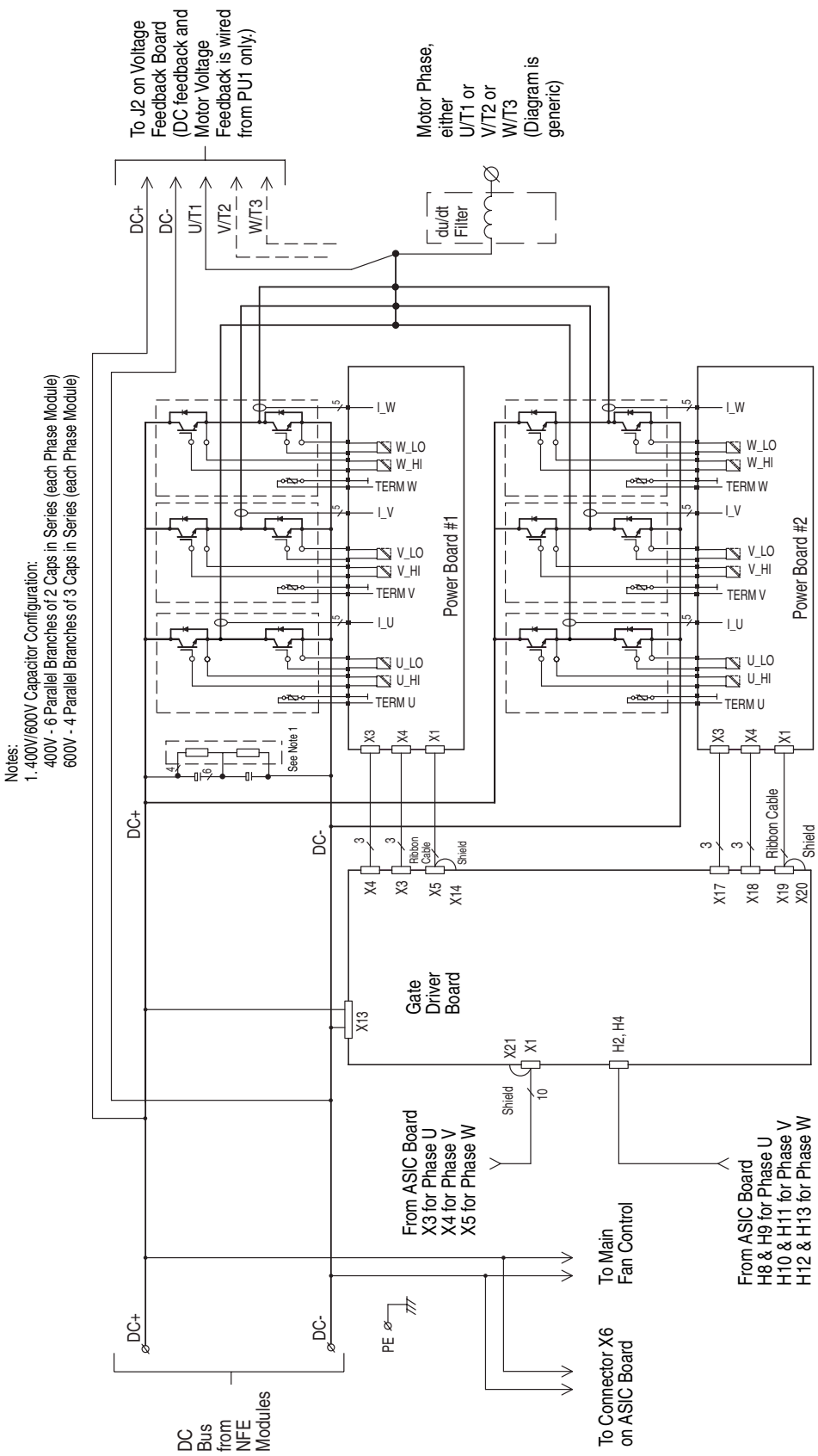


Figure B.5 Main Fan Circuit for Drives with AC Input

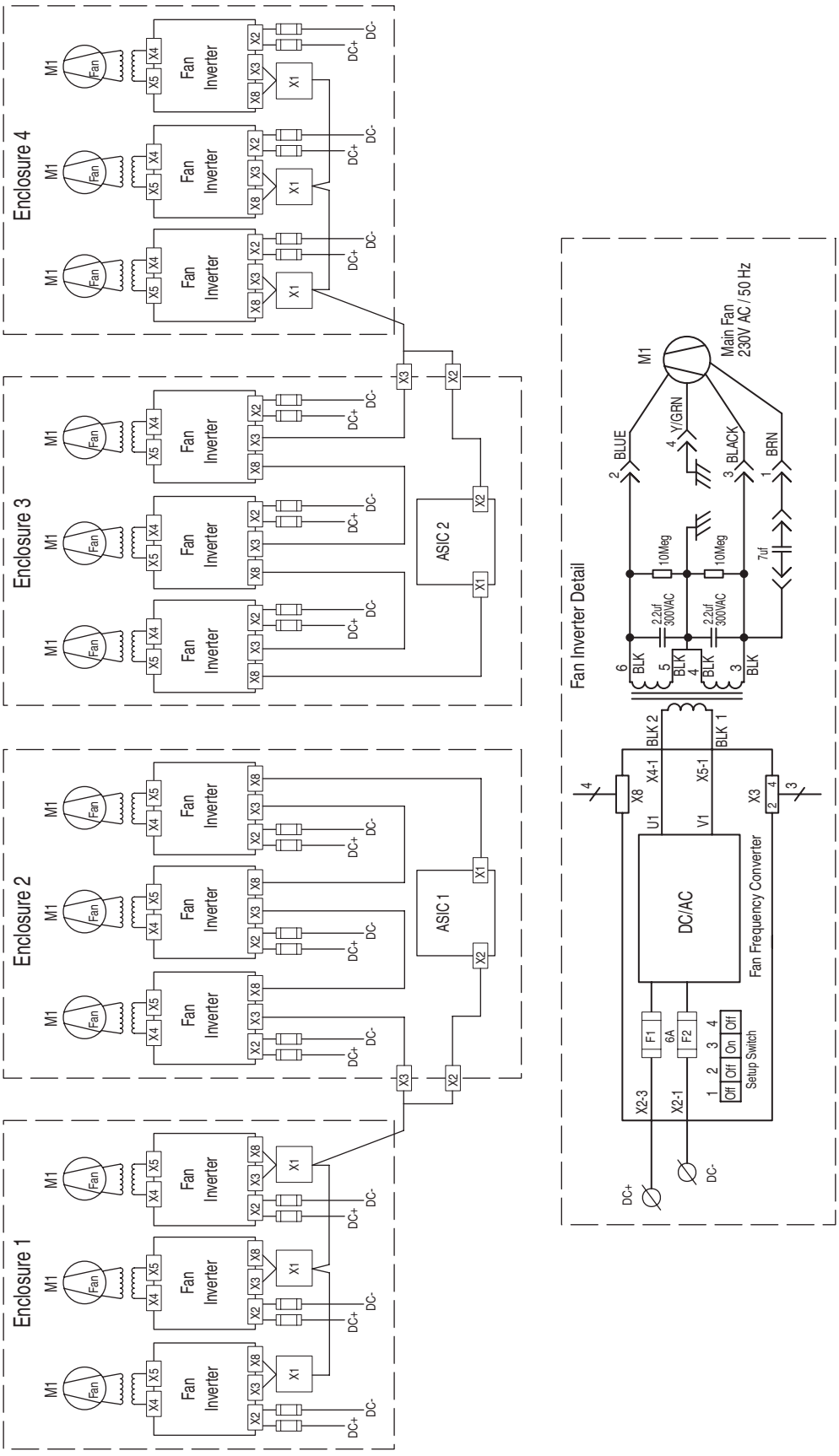


Figure B.6 MCCB Circuit Breaker Circuitry for Drives with AC Input

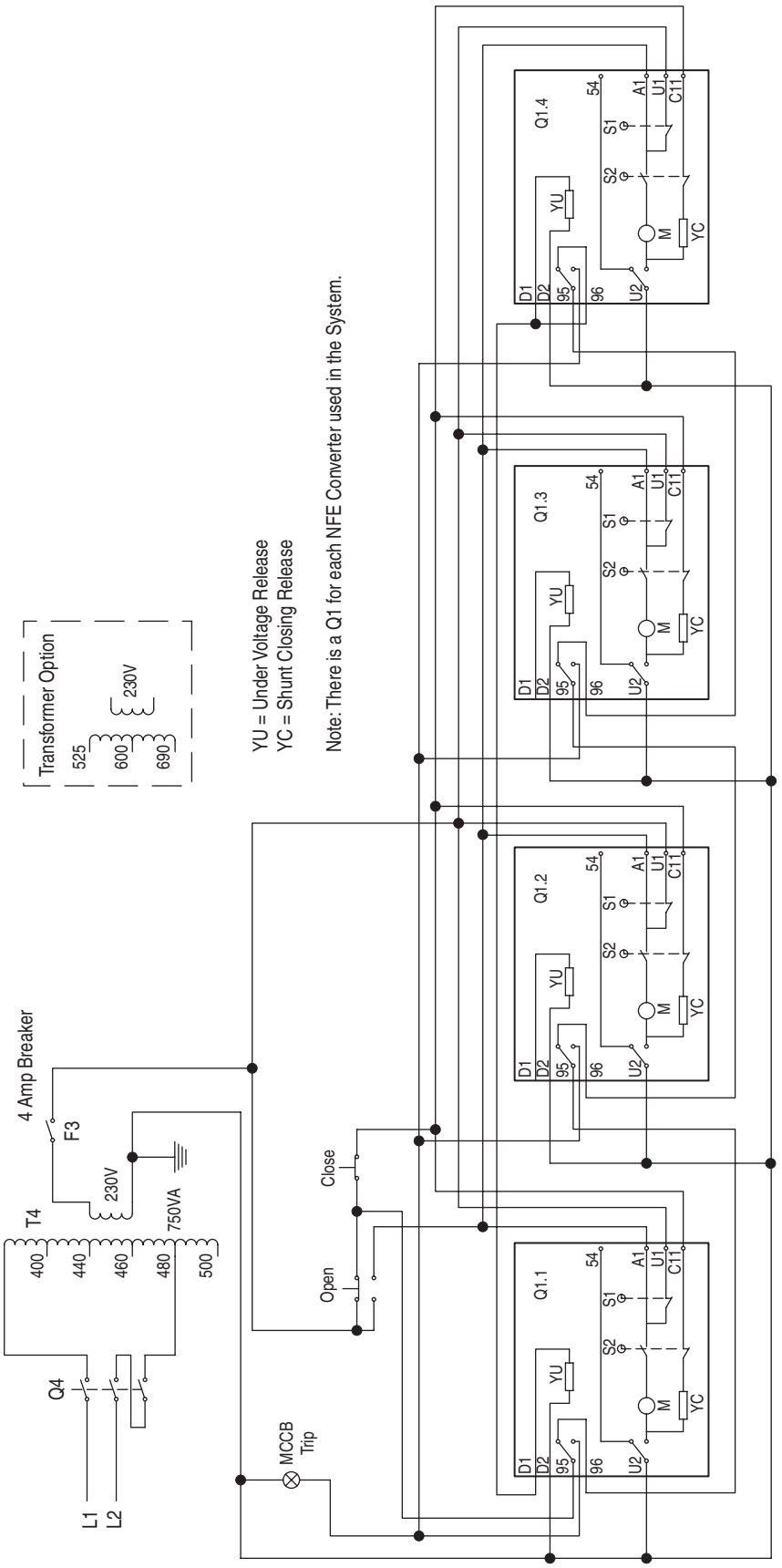


Figure B.7 Circuitry Diagram for Drives with DC Input - Power Structure 1

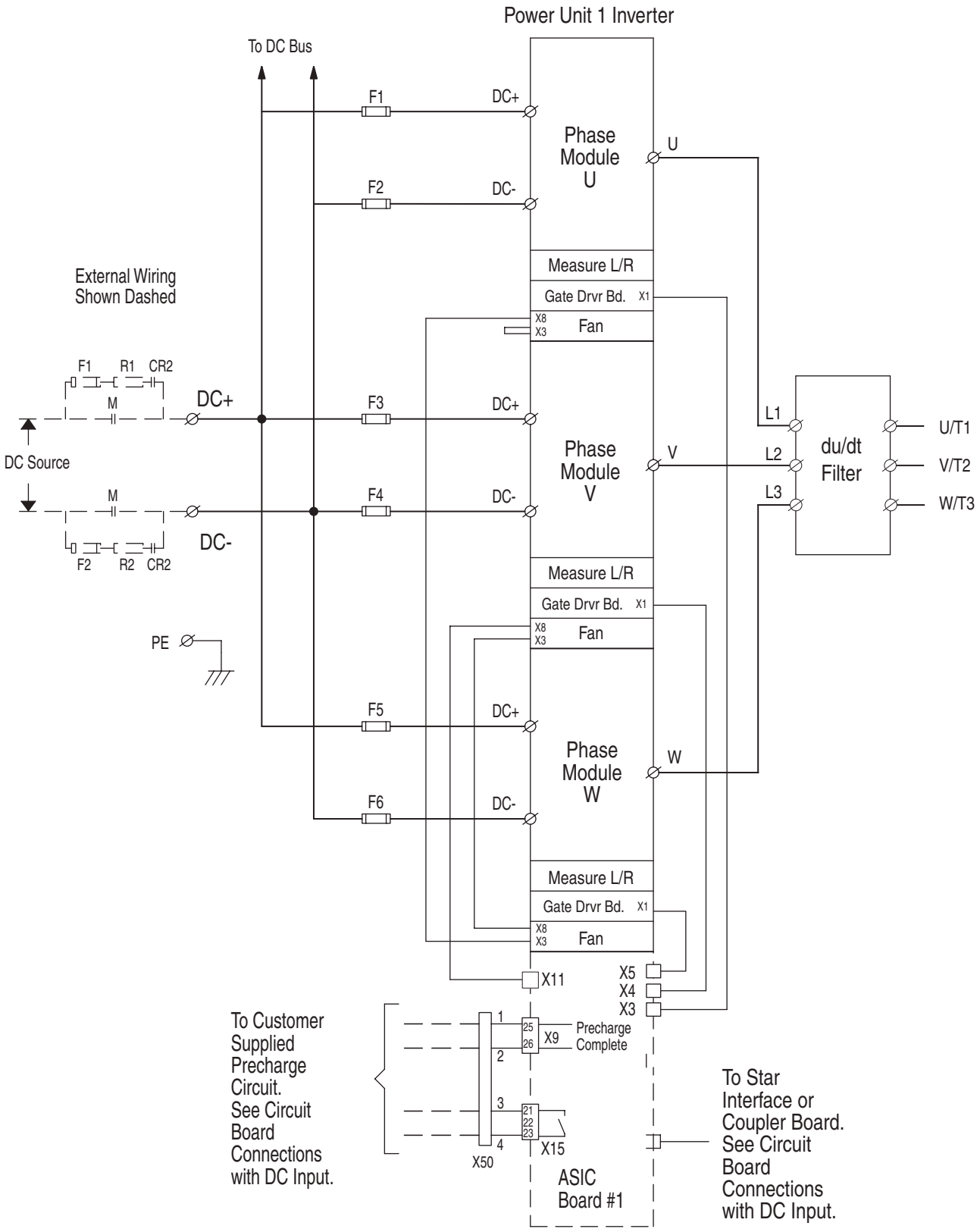


Figure B.8 Circuitry Diagram for Drives with DC Input - Power Structure 2

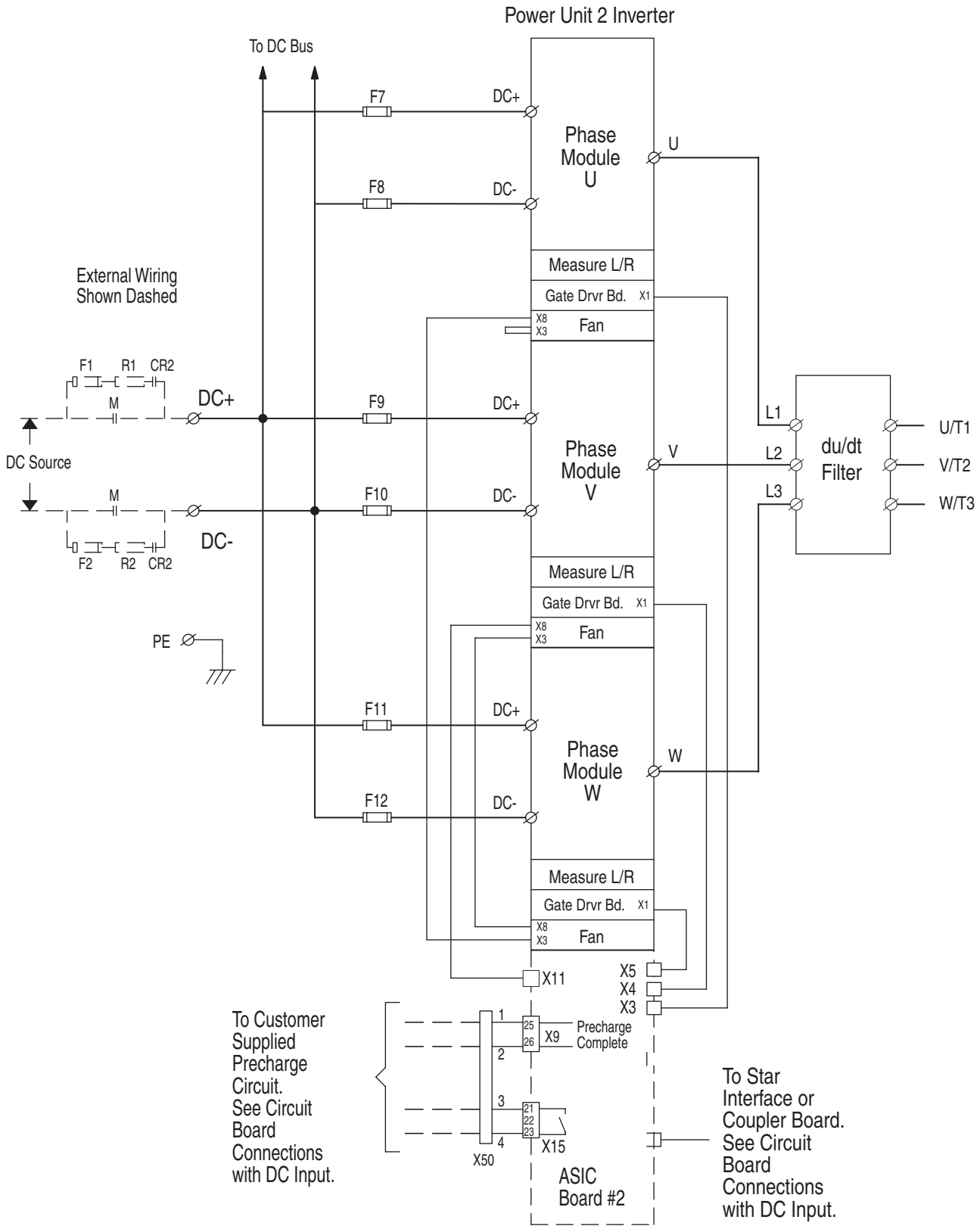


Figure B.9 Inverter Unit Circuitry for Drives with DC Input

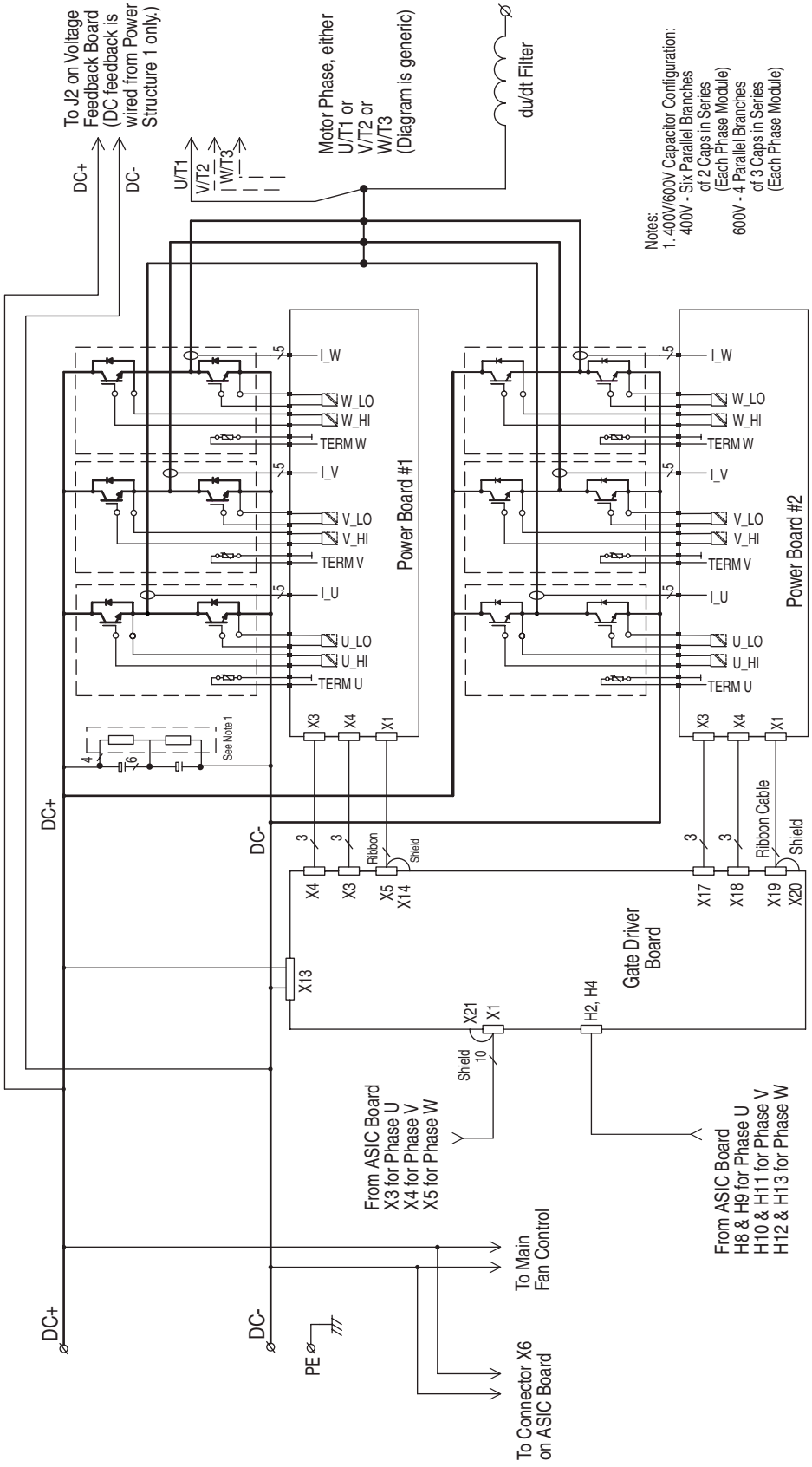


Figure B.10 Main Fan Connections for Drives with DC Input

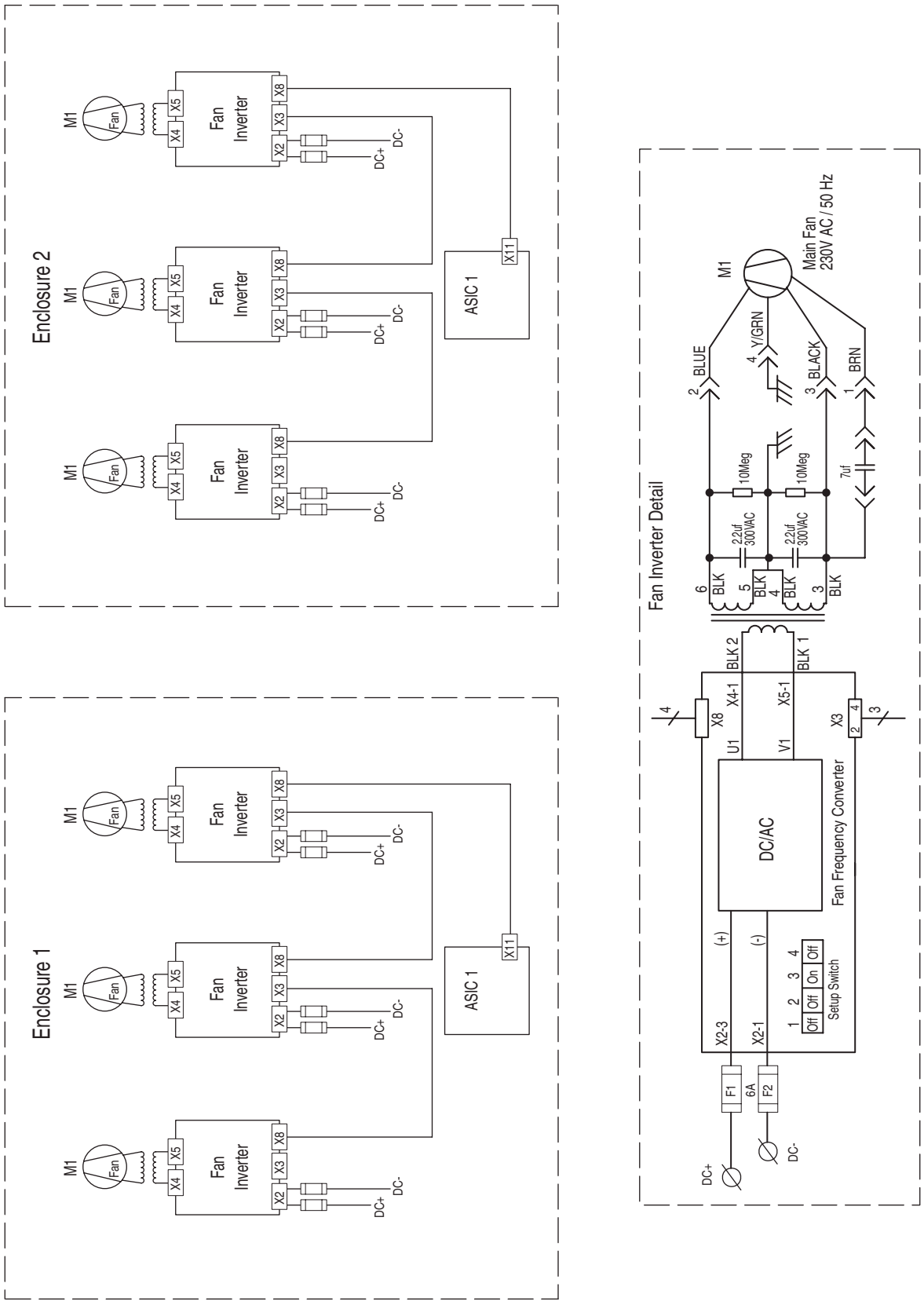


Figure B.11 ASIC Circuit Board Connections

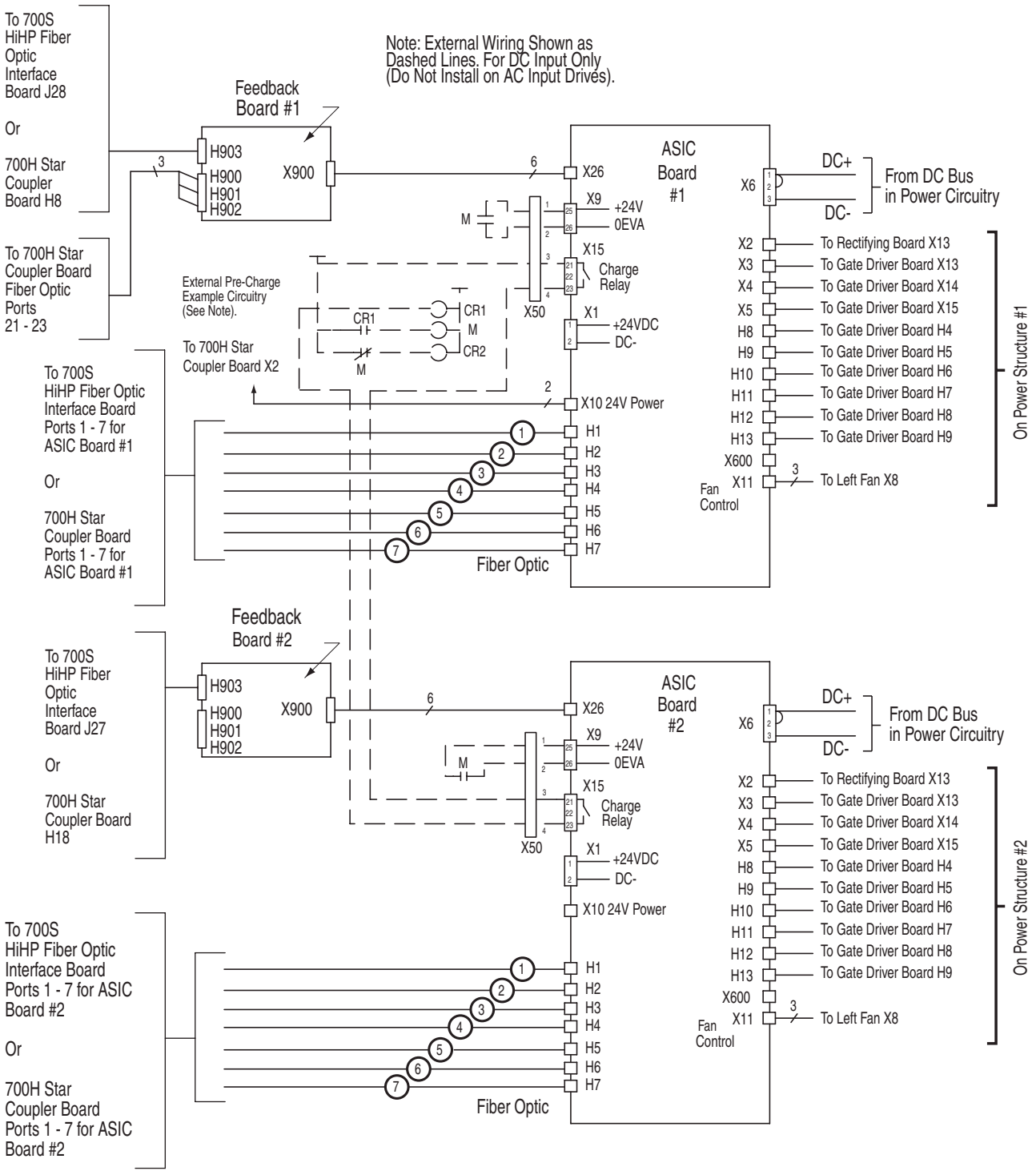


Figure B.12 Circuit Board Connections for 700S Drives with Phase II Control

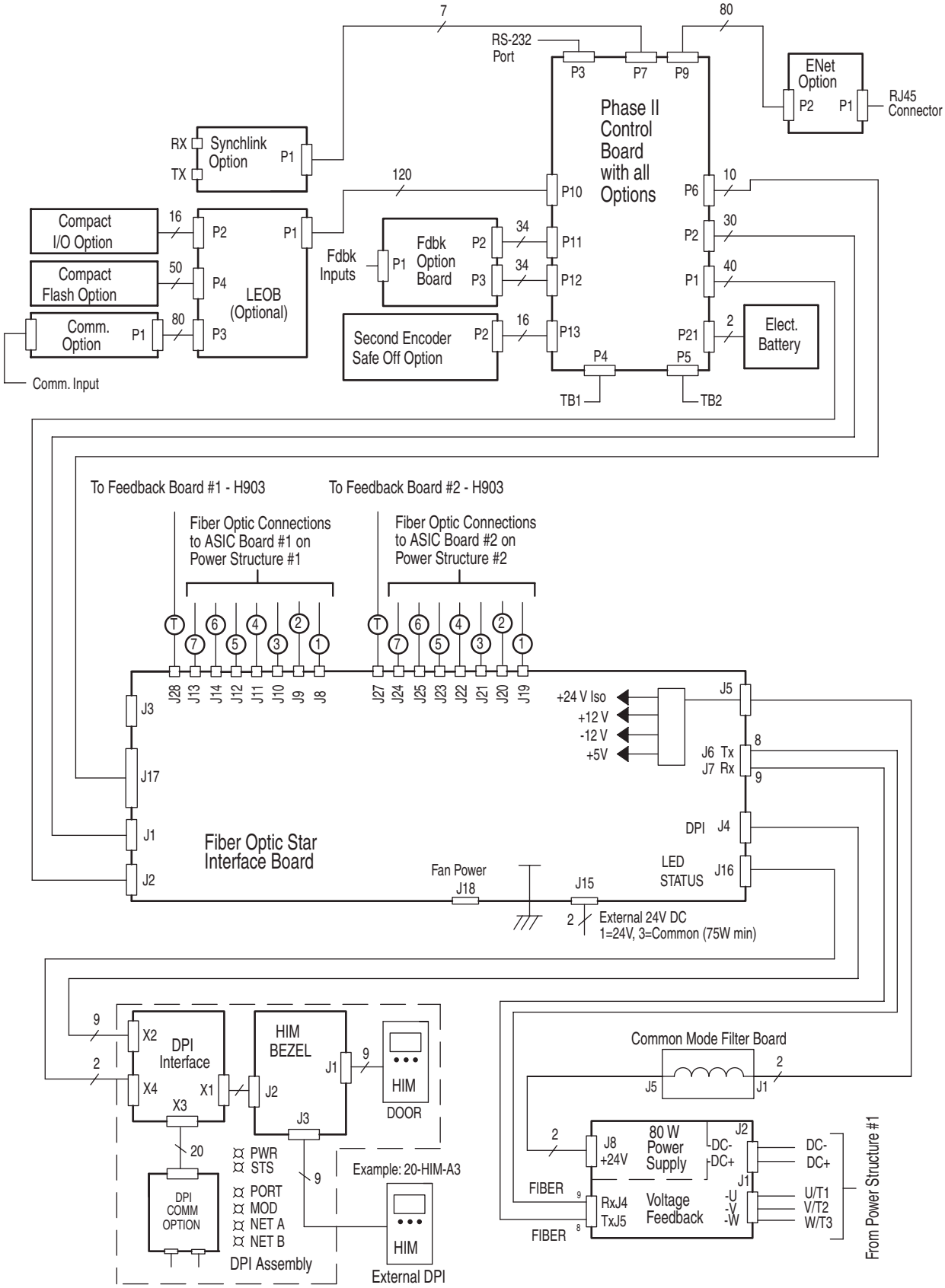
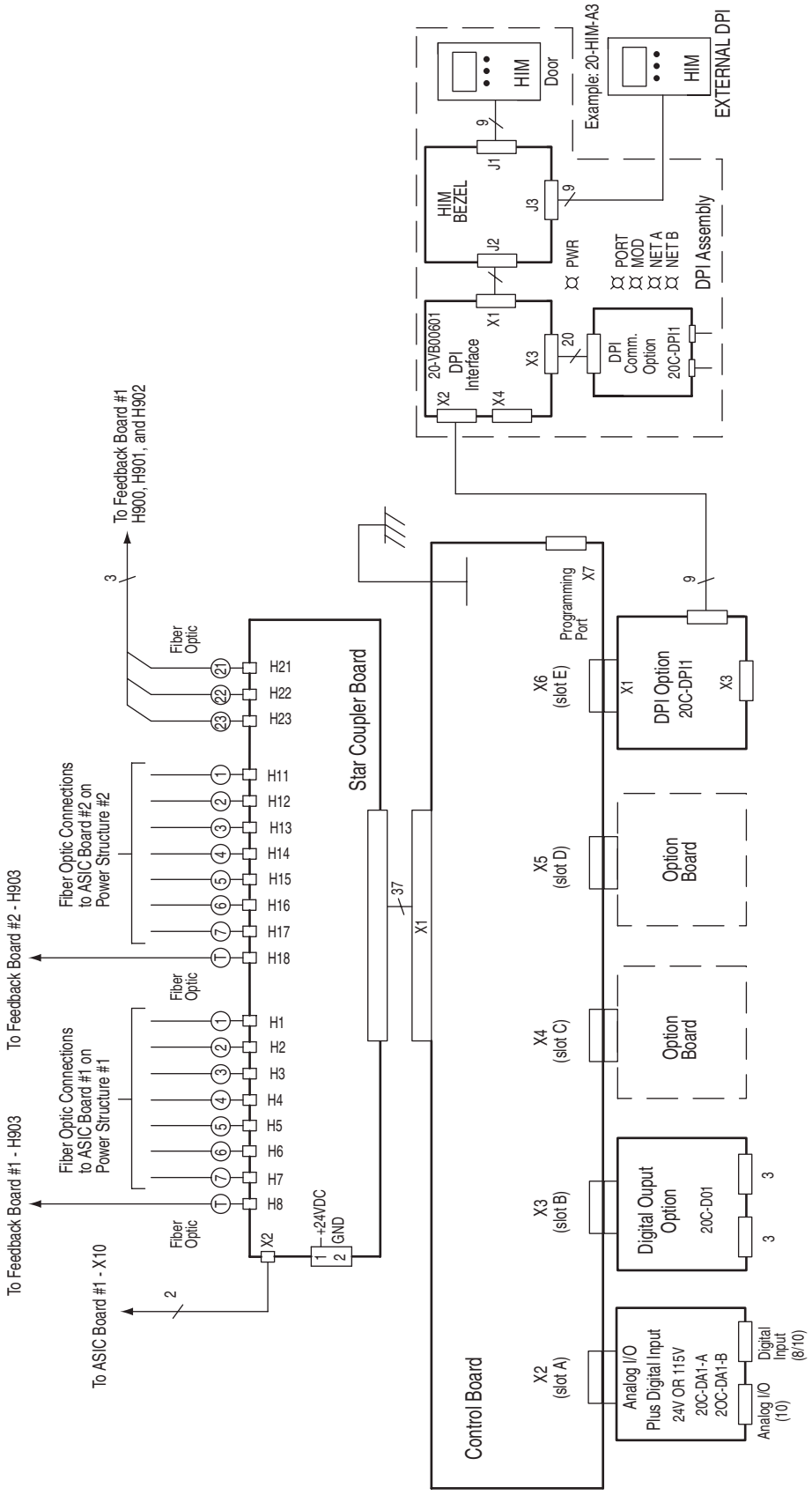


Figure B.13 Circuit Board Connections for 700H Drives



Connector Descriptions

Circuit Board Connections

The following tables detail the connection points for the frame 14 PowerFlex 700S and 700H drives circuit boards and components.

Figure C.1 ASIC Board Connectors

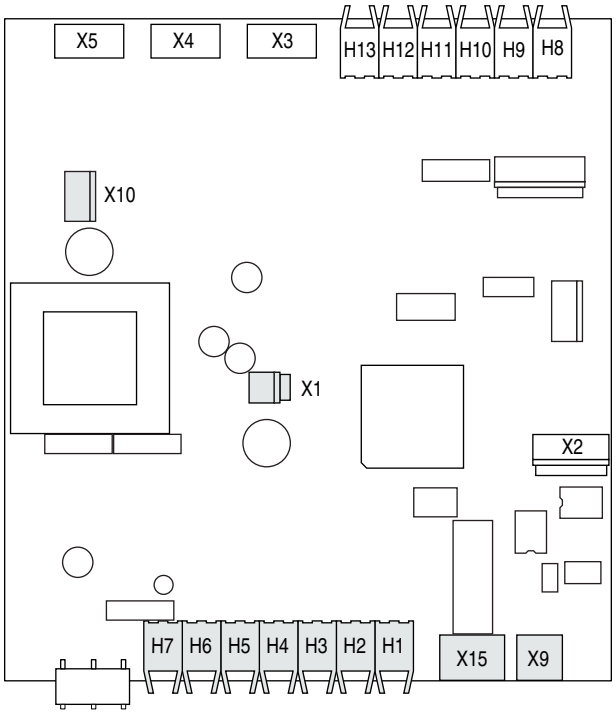


Figure C.2 Gate Driver Board Connectors

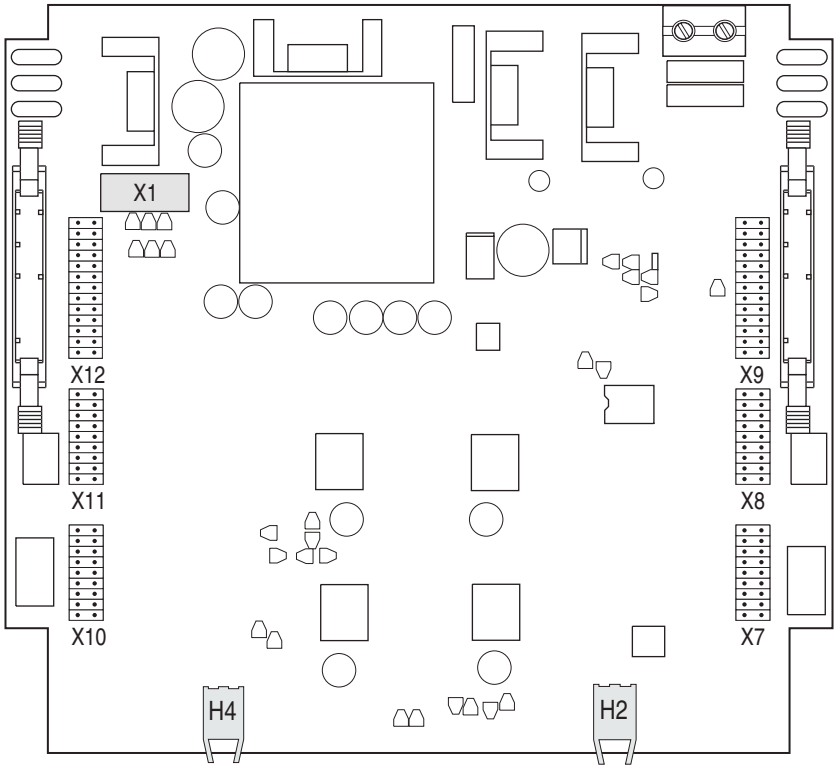


Table C.A ASIC Board to Gate Driver Board - Phase U Connections

From ASIC Board Connector - Pin	Signal Description	To Gate Driver Board Connector - Pin(4)
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)

(1) DTR = N Desat

(2) ETR = Phase I^2T

(3) ITR = Phase Overcurrent

(4) Cable labeled X13 at X1 connection on Gate Driver board for Phase U

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(4)
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)

(1) DTR = N Desat

(2) ETR = Phase I^2T

(3) ITR = Phase Overcurrent

(4) Cable labeled X14 at X1 connection on Gate Driver board for Phase V

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(4)
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

(4) Cable labeled X15 at X1 connection on Gate Driver board for Phase W

Figure C.3 Rectifier/Precharge Circuit Board Connectors

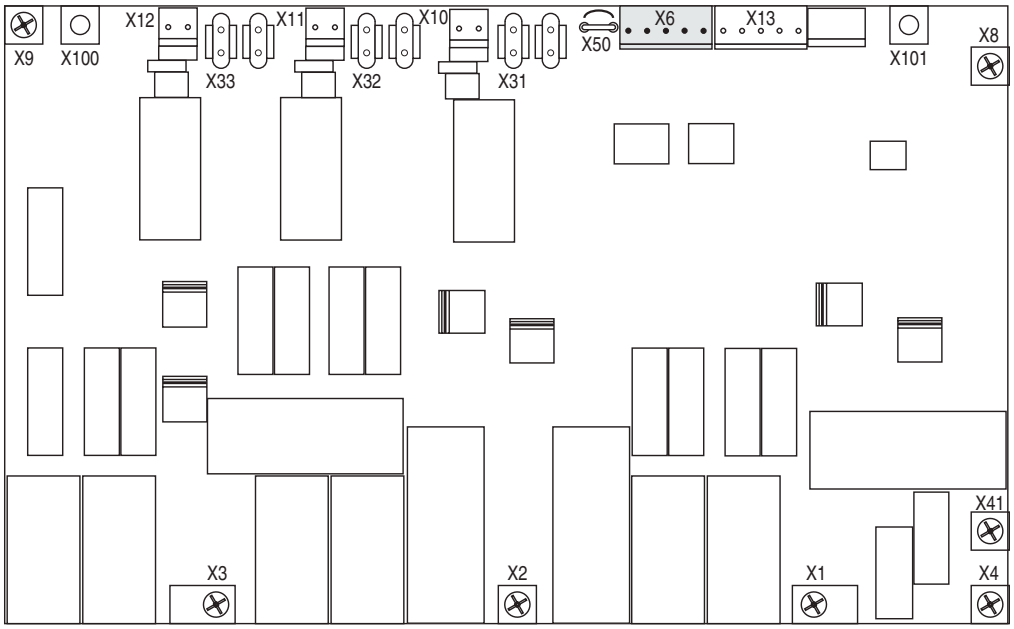


Table C.D ASIC Board to Rectifier/Precharge Circuit Board Connections

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

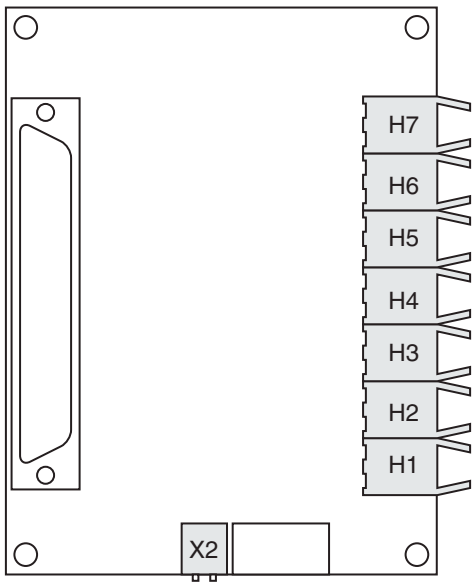


Table C.E PowerFlex 700H Fiber Optic Adapter Board to ASIC Circuit Board Connections

700H Fiber Optic Adapter 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 Star Coupler Fiber Optic Interface Circuit Board Connectors

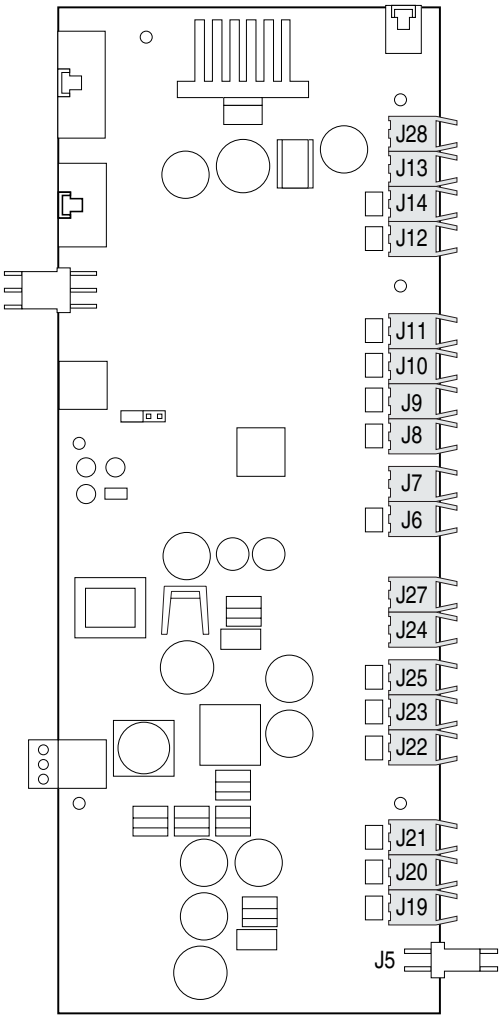


Figure C.6 PowerFlex 700H Star Couple Circuit Board

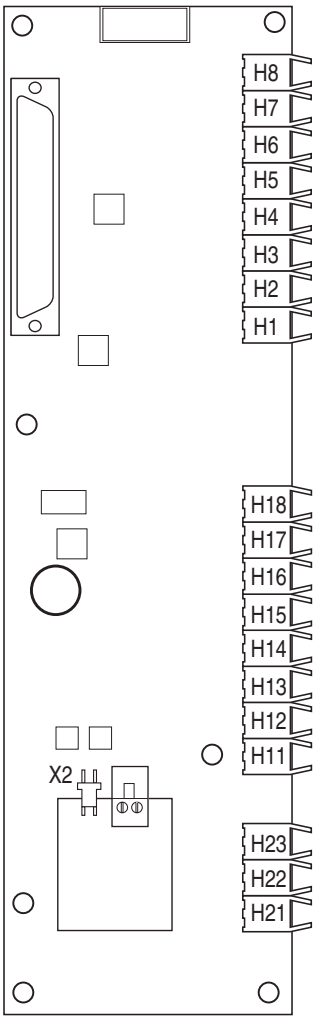


Table C.F PowerFlex 700H and 700S Interface Board to ASIC Board on Power Structure #1 Fiber Optic Connections

Interface Board Fiber Optic Connector					ASIC Board Fiber Connector (1)	Description: Reference to ASIC Board
700H	700S	Type	to	Type		
H1	J8	TX	. . .	RX	H1	Gate_Enable
H2	J9	TX	. . .	RX	H2	U_Gate
H3	J10	TX	. . .	RX	H3	V_Gate
H4	J11	TX	. . .	RX	H4	W_Gate
H5	J12	TX	. . .	RX	H5	A/D Convert
H6	J14	TX	. . .	RX	H6	VBUS_RX
H7	J13	RX	. . .	TX	H7	VBUS_TX

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

Table C.G PowerFlex 700H and 700S Interface Board to ASIC Board on Power Structure #2 Fiber Optic Connections

Interface Board Fiber Optic Connector					ASIC Board Fiber Connector (1)	Description: Reference to ASIC Board
700H	700S	Type	to	Type		
H11	J19	TX	. . .	RX	H1	Gate_Enable
H12	J20	TX	. . .	RX	H2	U_Gate
H13	J21	TX	. . .	RX	H3	V_Gate
H14	J22	TX	. . .	RX	H4	W_Gate
H15	J23	TX	. . .	RX	H5	A/D Convert
H16	J25	TX	. . .	RX	H6	VBUS_RX
H17	J24	RX	. . .	TX	H7	VBUS_TX

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

Figure C.7 ASIC Feedback Board Connectors

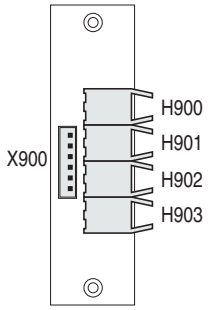


Table C.H ASIC Feedback Board on Power Structure #1 to ASIC Board on Power Structure #1 Connections

ASIC Feedback Board Connector	Pin	to	Pin	ASIC Board Connector	Description: Reference to ASIC Board
X900	1	. . .	1	X26	PHU
	2	. . .	2		PHV
	3	. . .	3		PHW
	4	. . .	4		Trip_Out
	5	. . .	5		+5V
	6	. . .	6		+5V

Table C.I ASIC Feedback Board on Power Structure #2 to ASIC Board on Power Structure #2 Connections

ASIC Feedback Board Connector	Pin	to	Pin	ASIC Board Connector	Description: Reference to ASIC Board
X900	1	. . .	1	X26	PHU
	2	. . .	2		PHV
	3	. . .	3		PHW
	4	. . .	4		Trip_Out
	5	. . .	5		+5V
	6	. . .	6		+5V

Table C.J ASIC Feedback Board to PowerFlex 700S Star Coupler Fiber Optic Interface Board Connections

ASIC Feedback Board Connector	to	Star Coupler FiberOptic Interface Board Connector	Description: Reference to Star Interface Board
H903 on Power Structure #1	. . .	J28	Trip_P1
H903 on Power Structure #2	. . .	J27	Trip_P2

Table C.K ASIC Feedback Board to PowerFlex 700H Star Coupler Board Connections

ASIC Feedback Board Connector	to	Star Coupler Board Connector	Description: Reference to Star Coupler Board
H900 on Power Structure #1	. . .	H21	PHU
H901 on Power Structure #1	. . .	H22	PHV
H902 on Power Structure #1	. . .	H23	PHW
H903 on Power Structure #1	. . .	H8	Trip_P1
H903 on Power Structure #2	. . .	H18	Trip_P2

Hardware Connections

Figure C.8 Fan Inverter Circuit Board Connectors

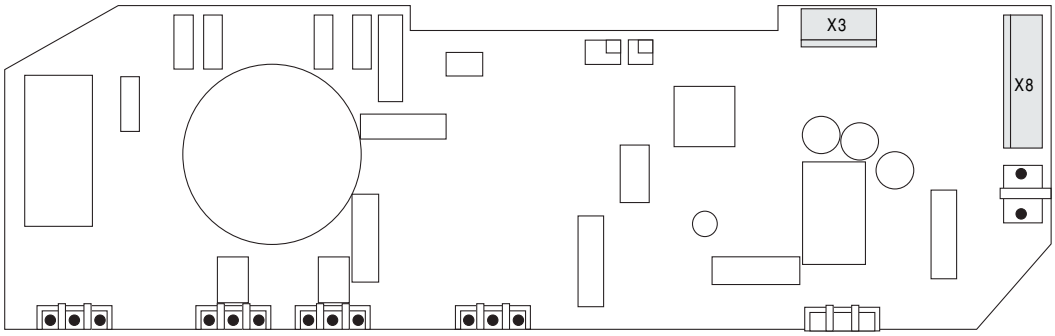


Table C.L ASIC Board - Phase V Fan Inverter Board Connections

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.M 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.N 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.O Phase U Fan Inverter Board - NFE Converter 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.P NFE 1 Fan Inverter Board - NFE Converter 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.Q NFE 2 Fan Inverter Board - NFE Converter 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.R NFE Converter 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.9 X50 Terminal Block Connectors

External precharge circuitry is shown as dashed lines.

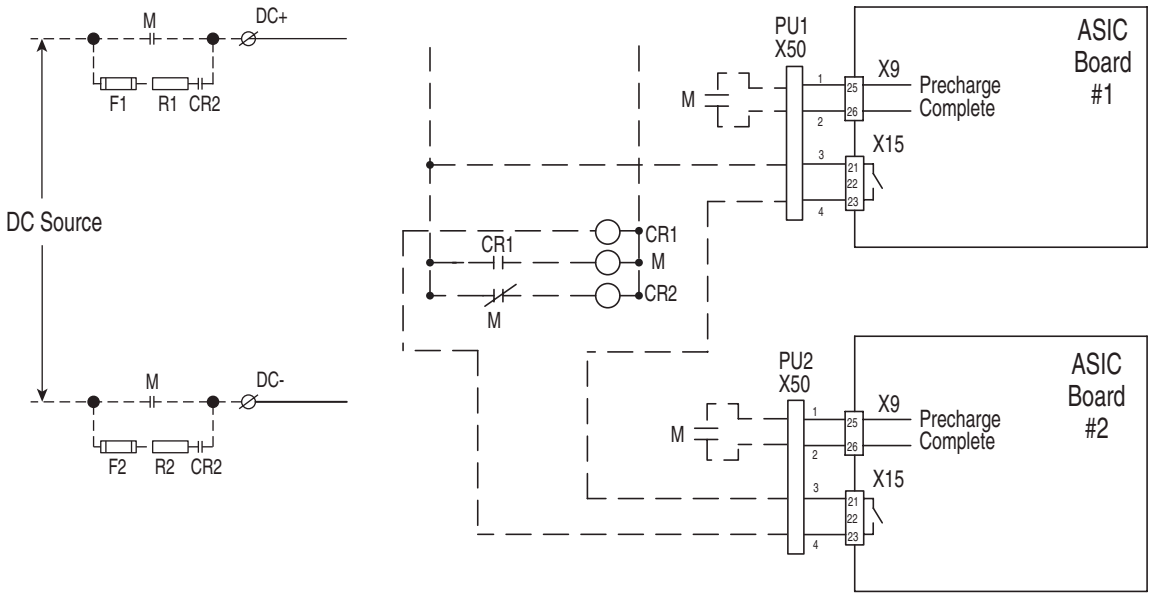


Table C.S X50 Terminal Block Precharge Circuit Connections

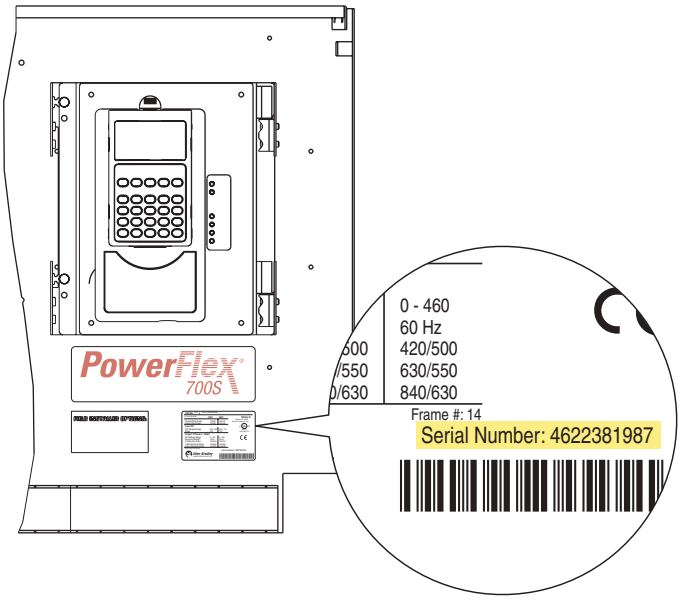
ASIC Board Connector	Terminal	to	X50 Terminal Block	Description
Power Module 1				
X9 on ASIC Board #1	25	. . .	1	Precharge Complete Signal (+24V DC)
	26	. . .	2	Precharge Complete Signal (Common)
X15 on ASIC Board #1	21	. . .	3	Charge Relay Contact (Jumper to Power Module 2 Terminal 4)
	23	. . .	4	Charge Relay Contact
Power Module 2				
X9 on ASIC Board #2	25	. . .	1	Precharge Complete Signal (+24V DC)
	26	. . .	2	Precharge Complete Signal (Common)
X15 on ASIC Board #2	21	. . .	3	Charge Relay Contact
	23	. . .	4	Charge Relay Contact (Jumper to Power Module 1 Terminal 21)

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.

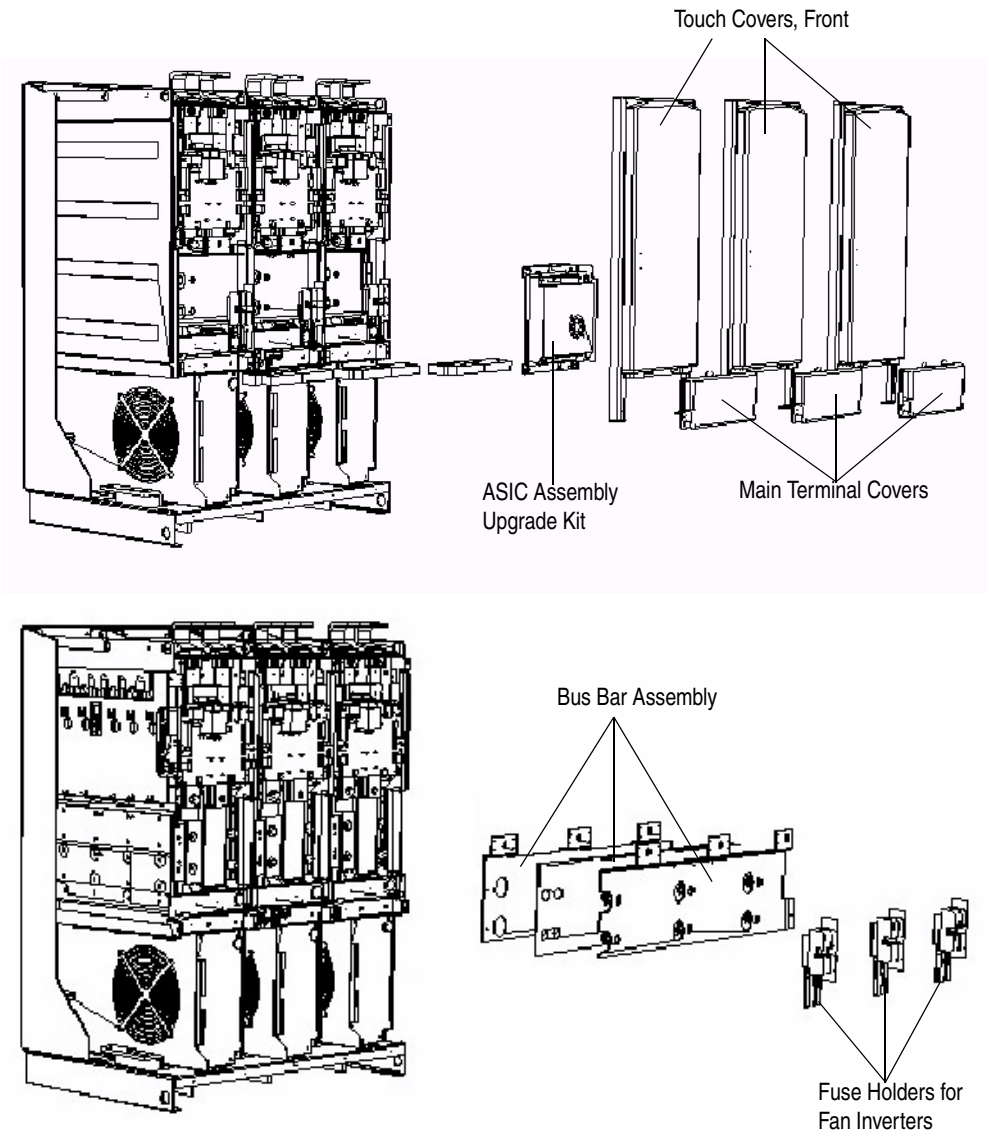


Table D.A Power Structure Assembly Part Numbers

Part Name	Part No.
ASIC Assembly Upgrade Kit (without ASIC Board)	20-FR10850
Bus Bar Assembly	NA
Fuse Holders for Fan Inverters	20-PP20300
Main Terminal Covers	NA
Touch Covers, Front	NA

Figure D.2 Power Structure Block Assembly

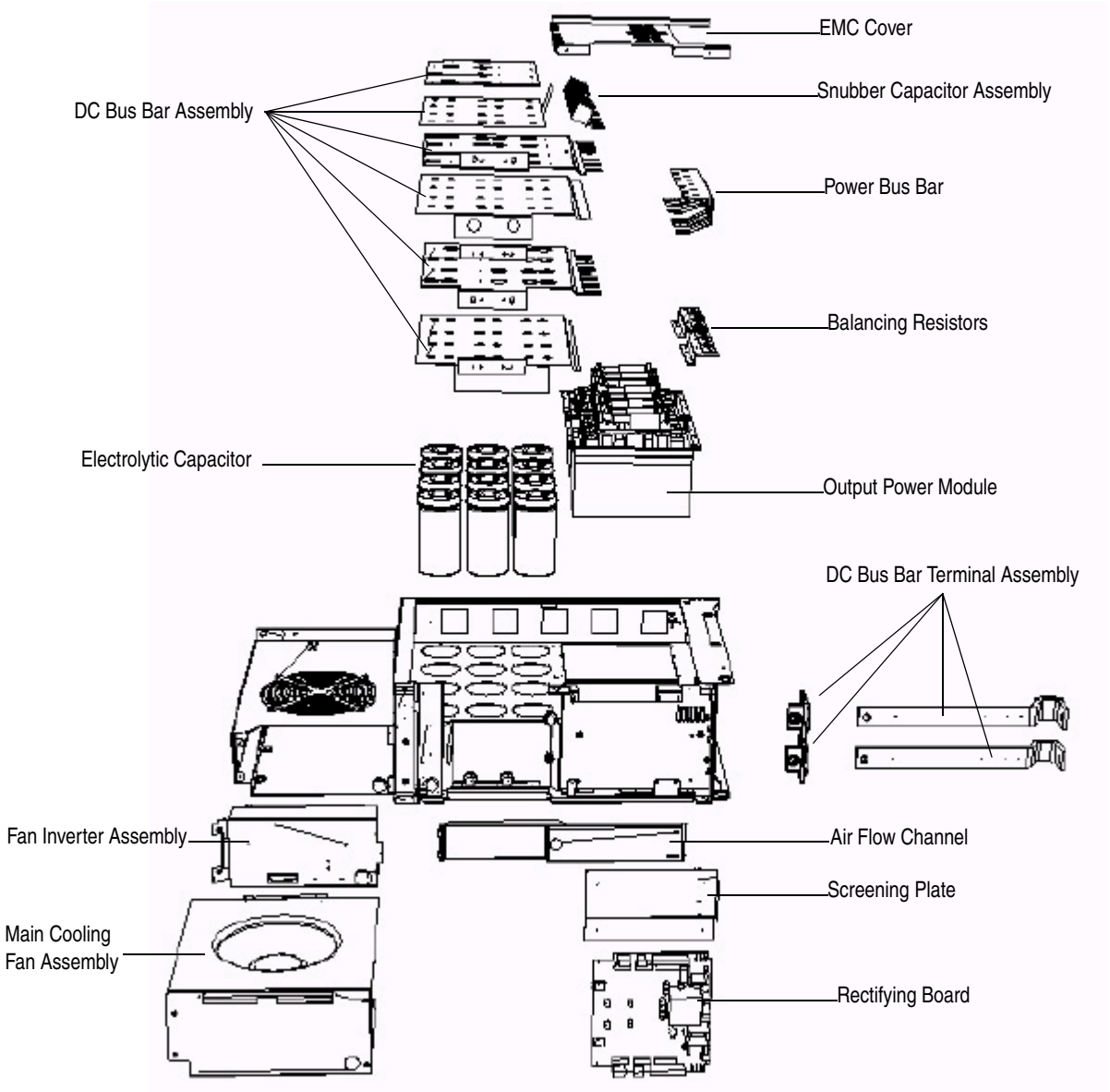


Table D.B Power Structure Block Assembly Part Numbers

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

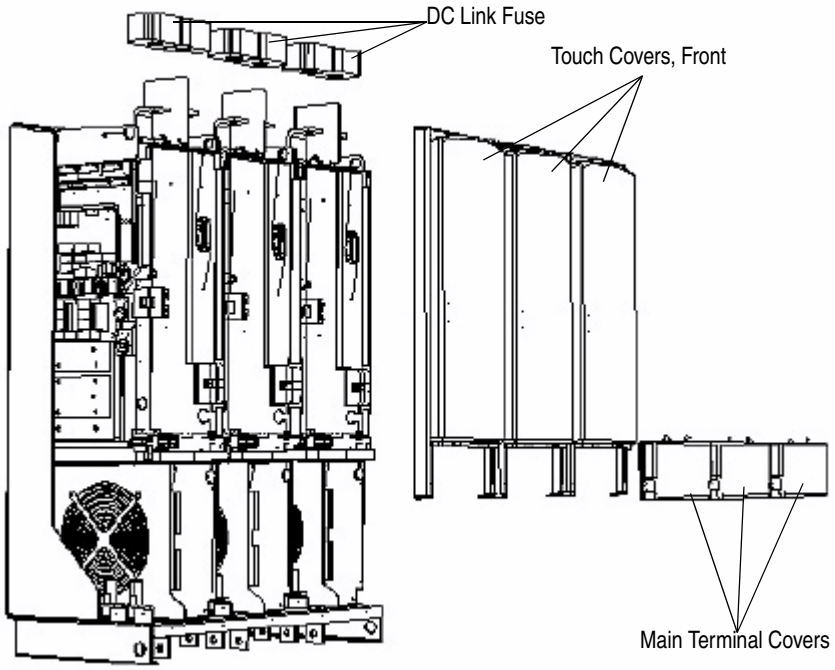


Table D.C Rectifying Structure Assembly Part Numbers

Part Name			Part No.
DC Link Fuse	400/480V	1770A	SK-H1-SFUSE1-F13
		2150A	
		2700A	
	600/690V	1500A	SK-H1-SFUSE2-F13
		1900A	
		2250A	
Main Terminal Covers			NA
Touch Covers, Front			NA

Figure D.4 Rectifying Structure Block Assembly

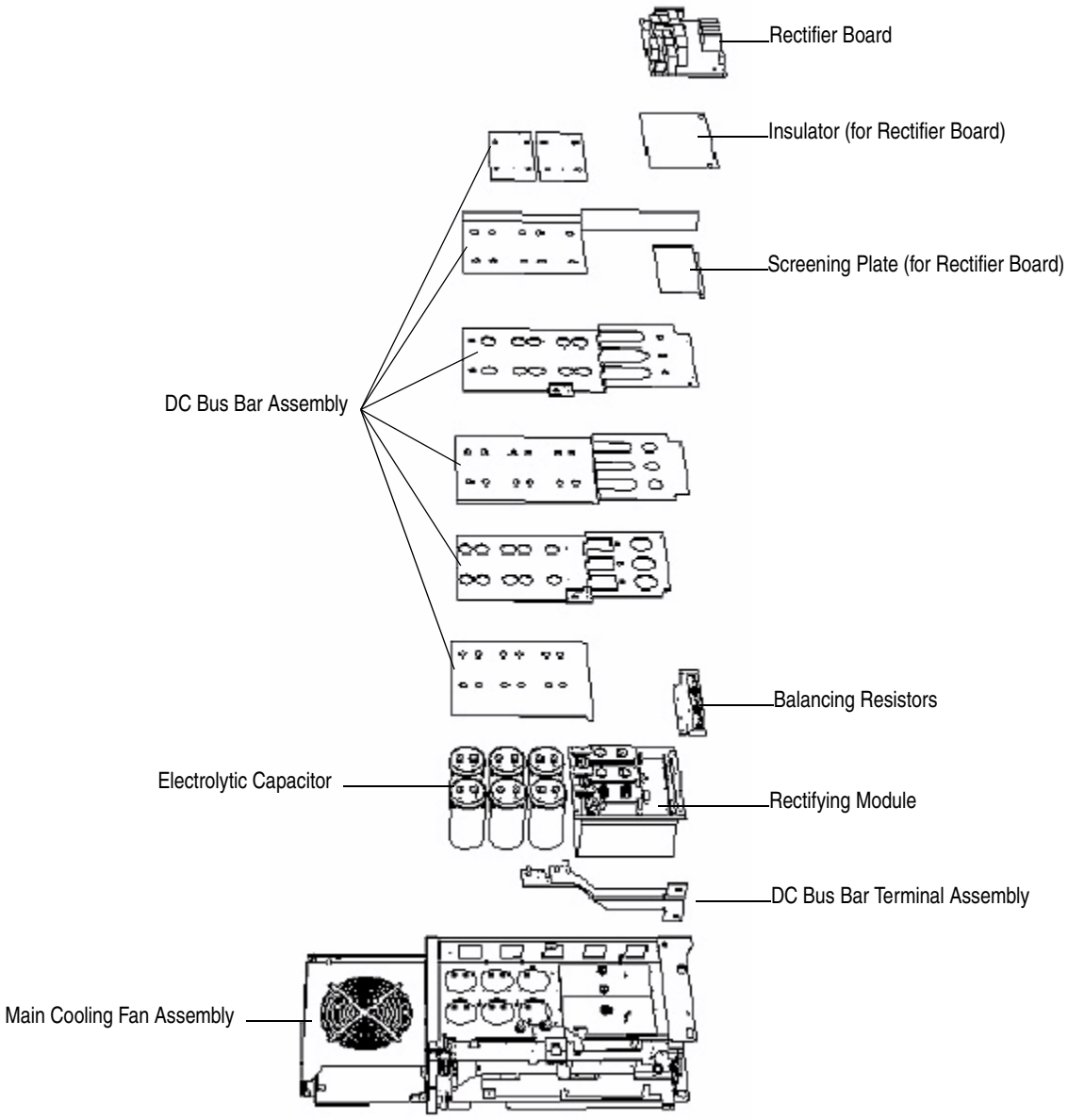


Table D.D Rectifying Structure Block Assembly Part Numbers

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 (Precharge) Board	400/480V	20-VB00462
	600/690V	
Rectifying Module	400/480V	20-FI13306
	600/690V	
Screening Plate (for Rectifier Board)		NA

Figure D.5 Fan Inverter Assembly for Power Structure

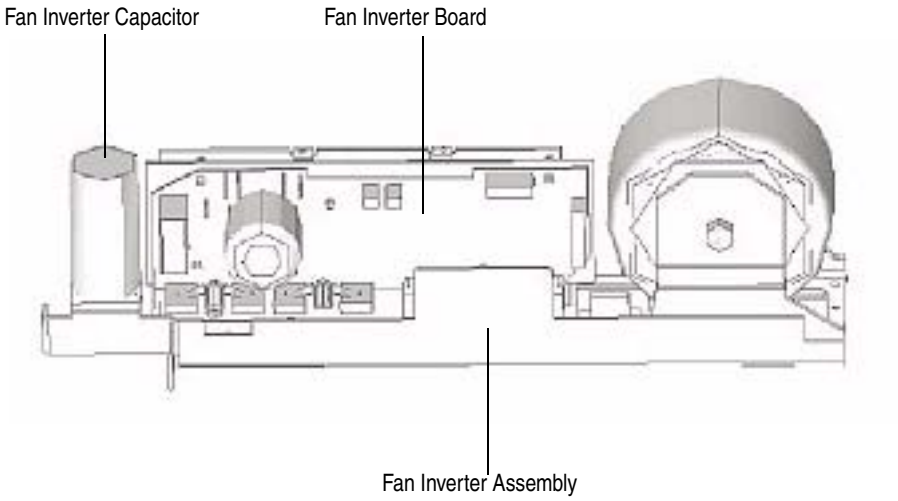


Table D.E Fan Inverter Assembly Part Numbers

Part Name	Part No.
Fan Inverter Assembly, Left	NA
Fan Inverter Board	20-FI13301
Fan Inverter Starting Capacitor 7µf 450V AC	20-PP0060

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.

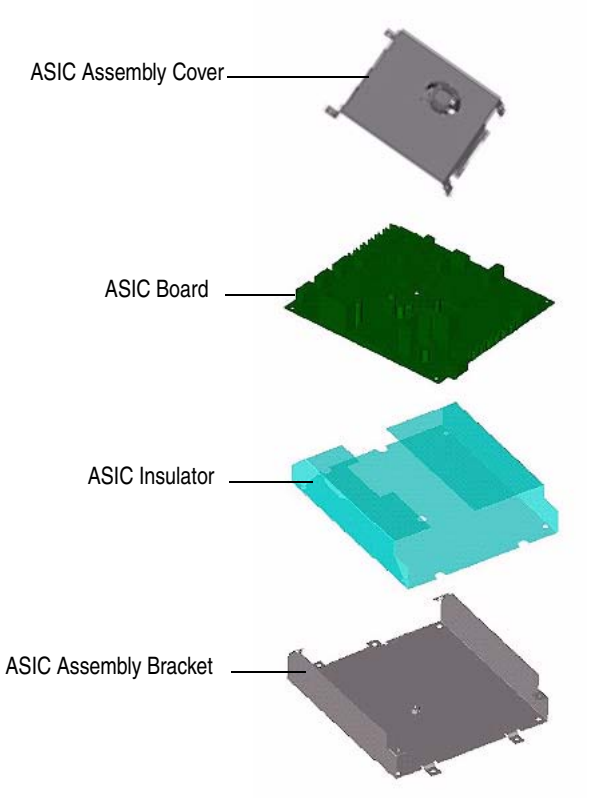


Table D.F ASIC Assembly Part Numbers

Part Name			Part No.
ASIC Assembly Bracket			Included in 20-FR10850
ASIC Assembly Cover			
ASIC Assembly Insulator			
ASIC Board	400/480V	1770A	SK-H1-ASICBD-D1770
		2150A	SK-H1-ASICBD-D2150
		2700A	SK-H1-ASICBD-D2700
	600/690V	1500A	SK-H1-ASICBD-E1500
		1900A	SK-H1-ASICBD-E1900
		2250A	SK-H1-ASICBD-E2250

Notes:

MCCB Circuit Breakers

Circuit Breaker Protection Functions

The circuit breakers (MCCB) used for frame 14 drives are equipped with electronic trip units. The trip units provide protection functions against overload L, and short-circuit S or I. With this version, you can choose between protection S or I simply by moving the DIP switch.

Figure E.1 Protection Function Settings

Protection functions		Trip threshold	Trip curves(1)		
L CANNOT BE EXCLUDED	Against overload with long inverse time delay trip and trip characteristic according to an inverse time curve (I^2t=constant)	I_1 = 0.40 - 0.44 - 0.48 - 0.52 - 0.56 - 0.60 - 0.64 - 0.68 - 0.72 - 0.76 - 0.80 - 0.84 - 0.88 - 0.92 - 0.96 - 1 x In Release between 1.1...1.3 x I_1 (IEC 60947-2 and UL 489)	at 6 x I_1 t_1 = 3s Tolerance:	at 6 x I_1 t_1 = 6s **only for T2** ± 10% up to 6 x In; ± 20% above 6 x In	at 6 x I_1 t_1 = 12s **only for T4, T5**
S CAN BE EXCLUDED	Against short-circuit with inverse short time delay trip and trip characteristic with inverse time (I^2t=constant) (selectable as an alternative to protection function I)	I_2 = 1 - 1,5 - 2 - 2,5 - 3 - 3,5 - 4,5 - 5,5 - 6,5 - 7 - 7,5 - 8 - 8,5 - 9 - 10 x In (2) Tolerance: ± 10% (T4-T5) ± 10% up to 2 x In (T2) ± 20% above 2 x In (T2)	at 8 x In t_2 = 0,1s	at 8 x In t_2 = 0,25s Tolerance: ± 10% up to 6 x In (T4-T5) ± 20% above 6 x In (T4-T5) ± 20% (T2)	
I CAN BE EXCLUDED	Against short-circuit with instantaneous trip (selectable as an alternative to protection function S)	I_3 = 1 - 1,5 - 2 - 2,5 - 3 - 3,5 - 4,5 - 5,5 - 6,5 - 7 - 7,5 - 8 - 8,5 - 9 - 10 x In (3) Tolerance: ± 10% (T4-T5) ± 20% (T2)	istantaneous		

(1) These tolerances hold in the following conditions:
– self-powered relay at full power and/or auxiliary supply;
– two or three-phase power supply.

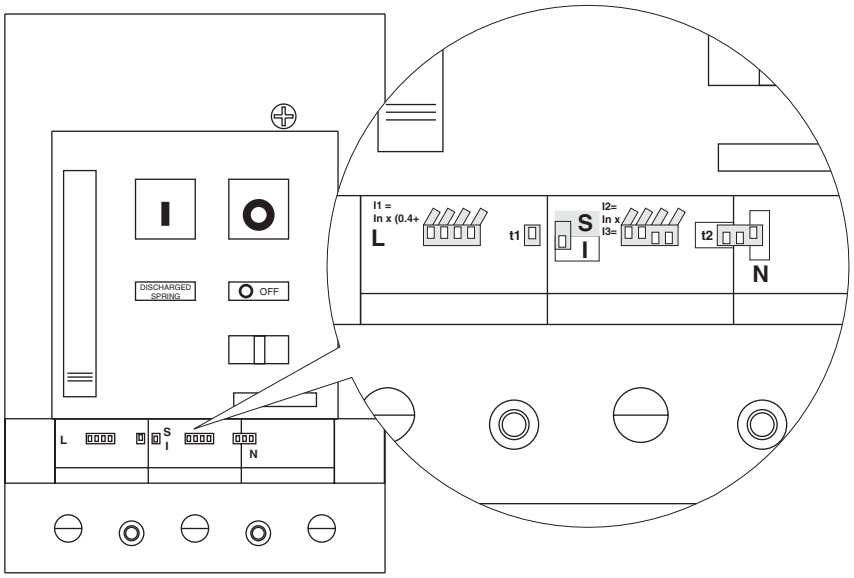
In conditions other than those considered, the following tolerances hold:

	Trip time
S	± 20 %
I	≤ 40ms

Circuit Breaker Factory DIP Switch Settings

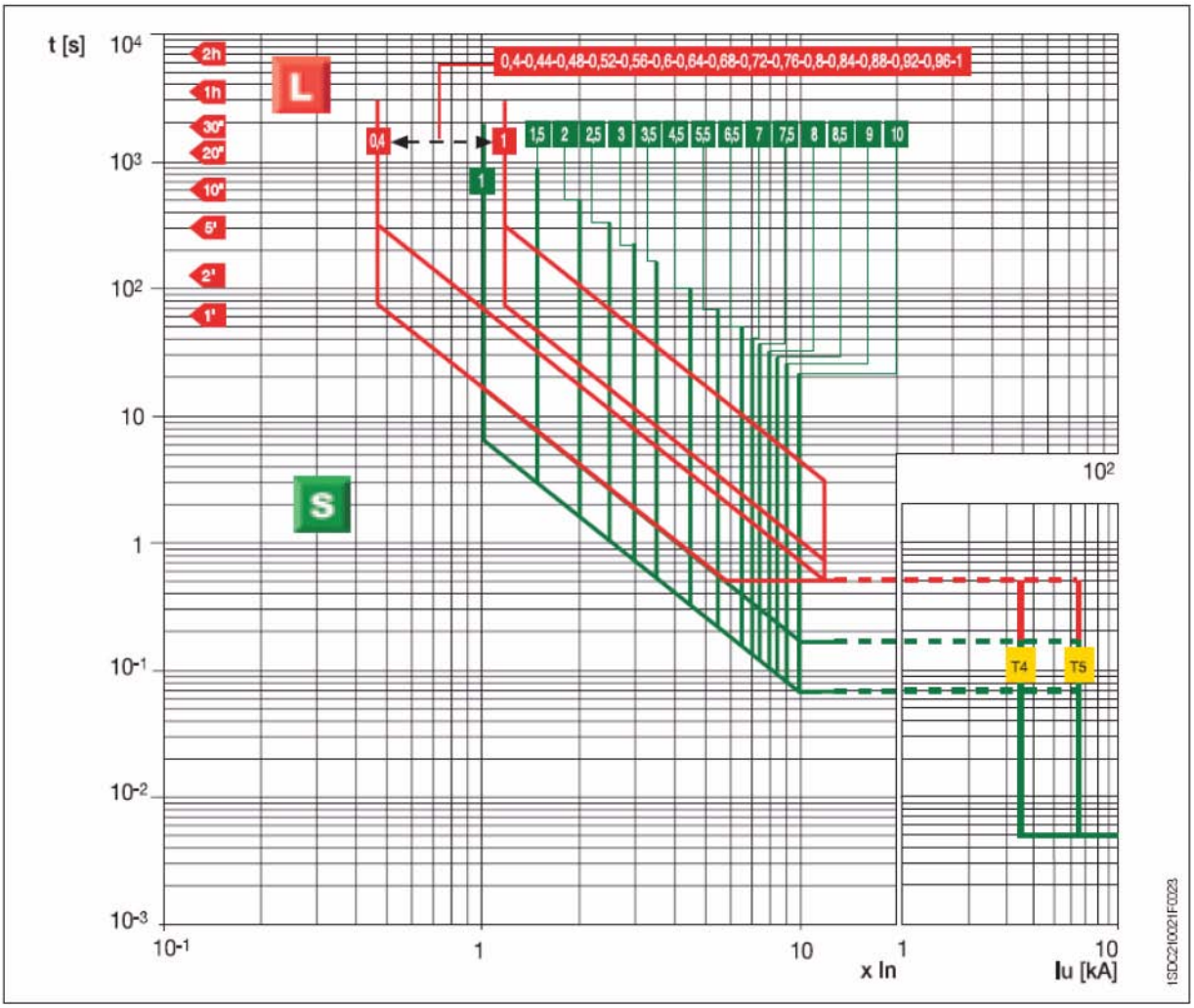
Voltage Class	Amp Rating	Quantity Per Drive	L		S/I			N	
			I1	t1	S/I	I3	t2	ON/OFF	50% / 100%
400V/480V AC	1770	4	0.76	3s	S	1.5	0.1s	OFF	na
	2150	4	0.92	3s	S	1.5	0.1s	OFF	na
600V/690V AC	1500	3	0.88	3s	S	1	0.1s	OFF	na
	1900	4	0.84	3s	S	1	0.1s	OFF	na
	2250	4	0.96	3s	S	1.5	0.1s	OFF	na

Figure E.2 Circuit Breaker Switch Locations



Trip Curves

Figure E.3 L-S Functions



Note: For In = 600 A => I_2max = 9.5 x In

Notes:

Numerics

A

B

C

D

F

G

H

I

L

M

N

O

P

R

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