Altivar® 61/71
Adjustable Speed Drives
Spare Parts Kits

Instruction Bulletin

30072-452-81

Retain for future use.

For Frame Size 14A:

ATV61HC40N4 and ATV71HC31N4

Schneider Electric

Contents

Hazard Categories and Special Symbols

The following symbols and special messages may appear in this document or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

A lightning bolt or ANSI man symbol in a “Danger” or “Warning” safety label on the equipment indicates an electrical hazard which, as indicated below, can or will result in personal injury if the instructions are not followed.

The exclamation point symbol in a safety message in a manual indicates potential personal injury hazards. Obey all safety messages introduced by this symbol to avoid possible injury or death.

Symbol	Name
	Lightning Bolt
	ANSI Man
	Exclamation Point

⚠ DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, **can result in** death or serious injury.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, **can result in** minor or moderate injury.

CAUTION

CAUTION, used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, **can result in** property damage.

Product Support

For support and assistance, contact the Product Support Group. The Product Support Group is staffed from Monday through Friday, 8:00 am until 6:00 pm Eastern time, to assist with product selection, start-up, and diagnosis of product or application problems. Emergency phone support is available 24 hours a day, 365 days a year.

Toll free: 888-SquareD (888-778-2733)
E-Mail: drive.products.support@us.schneider-electric.com
Fax: 919-217-6508

Before You Begin

Read and follow these precautions before performing any procedure with this drive.

The word “drive” as used in this bulletin refers to the controller portion of the adjustable speed drive as defined in the National Electrical Code (NEC).

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Read and understand this manual before installing or operating the Altivar 61 or 71 drive. Installation, adjustment, repair, and maintenance must be performed by qualified personnel.
- The user is responsible for compliance with all international and national electrical code requirements with respect to grounding of all equipment.
- Many parts of this drive, including the printed circuit boards, operate at the line voltage. DO NOT TOUCH. Use only electrically insulated tools.
- DO NOT touch unshielded components or terminal strip screw connections with voltage present.
- DO NOT short across terminals PA/+ and PC/– or across the DC bus capacitors.
- Before servicing the drive:
  - — Disconnect all power, including external control power that may be present.
  - — Place a “DO NOT TURN ON” label on all power disconnects.
  - — Lock all power disconnects in the open position.
  - — WAIT 15 MINUTES to allow the DC bus capacitors to discharge. Then follow the “Bus Voltage Measurement Procedure” on page 11 to verify that the DC voltage is less than 42 V. The drive LED is not an indicator of the absence of DC bus voltage.
- Install and close all covers before applying power or starting and stopping the drive.

Failure to follow these instructions will result in death or serious injury.

Introduction

This instruction bulletin contains replacement procedures for the Altivar® 61 and 71 spare parts kits identified in Table 1. Read and understand the instructions in this document and other referenced documents before installing the kits.

Table 1: Altivar® 61 and 71 Spare Parts Kits[1]

Kit Catalog No.	**Description**	**For Use On Drive:**	**For Location of Parts, See:**
VY1A1216	Front Cover Assembly	ATV61HC40N4, ATV71HC31N4	
VY1A1406	Plastic Parts Kit	ATV61HC40N4, ATV71HC31N4	pages 13, 14, 23
VZ3V1213	Internal Fan	ATV61HC40N4, ATV71HC31N4	page 13
VX5A1300	Soft Charge Board	ATV61HC40N4, ATV71HC31N4	page 13
VX5A1400	Fan Control Board	ATV61HC40N4, ATV71HC31N4	page 13
VZ3F1113	Brake Board	ATV61HC40N4, ATV71HC31N4	page 13
VX4A1118	Filter Board	ATV61HC40N4, ATV71HC31N4	page 13
VX5A1HC3140	Power Board	ATV61HC40N4, ATV71HC31N4	page 13
VY1A1109	Motor Current Sensor	ATV61HC40N4, ATV71HC31N4	page 15
VX5A1203	Gate Driver Board	ATV61HC40N4, ATV71HC31N4	page 16
VZ3G1104	Temperature Sensors	ATV61HC40N4, ATV71HC31N4	page 16
VZ3IM1603M1271	Power IGBT[2] Module	ATV61HC40N4, ATV71HC31N4	page 17
VY1ADV1110	Screw Kit	ATV61HC40N4, ATV71HC31N4	—
VY1ADC1114	Capacitors	ATV61HC40N4, ATV71HC31N4	page 17
VX4A1200	SCR Snubber Board	ATV61HC40N4, ATV71HC31N4	page 18
VZ3TM1600M1671	SCR[3] Module	ATV61HC40N4, ATV71HC31N4	page 18
VZ3DM1600M1671	Diode Module	ATV61HC40N4, ATV71HC31N4	page 18
VZ3N1333	Wire Kit	ATV61HC40N4, ATV71HC31N4	—

[1] For kit contents, refer to document 30072-452-44.

[2] IGBT: Insulated-gate bipolar transistor

[3] SCR: Silicon controlled rectifier

Related Documentation

NOTE: All documentation referenced in this bulletin is provided with the drive or on the CD-ROM included with the spare parts kits. You can also download the documentation from the Technical Library at www.schneider-electric.us.

For drive installation instructions, refer to the following documents:

- *Altivar® 61 Installation Manual 0.5 to 100 HP*, module no. 1760643.
- *Supplementary Instructions to ATV61 Variable Speed Drives Installation Manual—Low Horsepower*, document no. 30072-452-63.
- *Altivar® 61 Installation Manual 75 to 900 HP*, module no. 1760655.
- *Supplementary Instructions to ATV61 Variable Speed Drives Installation Manual—High Horsepower*, document no. 30072-452-49.
- *Altivar® 71 Installation Manual 0.5 to 100 HP*, module no. 1755843.
- *Altivar® 71 Installation Manual 75 to 700 HP*, module no. 1755849.
- *Altivar® 71 Drive Controllers Errata to Bulletin atv71e_installation_manual_en_v3,* document no. 30072-452-25.

Receiving, Handling, and Storage

Electrostatic Precautions

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Circuit boards and option cards can be damaged by static electricity. Observe the electrostatic precautions below when handling controller circuit boards or testing components.

Failure to follow these instructions can result in injury or equipment damage.

Observe the following precautions for handling static-sensitive components:

- Keep static-producing material such as plastic, upholstery, and carpeting out of the immediate work area.
- Store static-sensitive components in protective packaging when they are not installed in the drive.
- When handling a static-sensitive component, wear a conductive wrist strap connected to the component or drive through a minimum of 1 megohm resistance.
- Avoid touching exposed conductors and component leads with skin or clothing.

Inspecting the Spare Part Kits

After receiving the ATV61/ATV71 spare parts kit:

- Ensure that the catalog number printed on the kit label is the same as that on the packing slip and corresponding purchase order. Contact your Schneider Electric representative if there are any errors.
- Remove the kit from its packaging and inspect it for damage. If any damage is found, notify the carrier and your Schneider Electric representative.
- To store the kit, replace any static-sensitive parts in their protective packaging and store them at -25 to +70 °C (-13 to +158 °F).

⚠ WARNING

DAMAGED EQUIPMENT

Do not install or operate any equipment that appears damaged.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Preliminary Recommendations

Before beginning the installation procedures, read and understand all the information in this section.

Qualified Personnel

For the protection of personnel and equipment, a qualified person must perform the procedures detailed in this instruction bulletin.

A qualified person is one who has skills and knowledge related to the construction and operation of this electrical equipment and the installation, and has received safety training to recognize and avoid the hazards involved. Refer to the most current release of NFPA 70E®, “Standard for Electrical Safety in the Workplace,” for safety training requirements.

In addition, the person must be:

- Able to read, interpret, and follow the instructions and precautions in this instruction bulletin and the other documentation referenced.
- Able to use the required tools listed in this instruction bulletin in a safe and correct manner.

Working Procedures

Observe the following working procedures:

- Use only the components provided with the kits listed in Table 1 beginning on page 7. Do not attempt to repair the drive with other spare parts or equipment.
- If the part being replaced includes labels, ensure that the labels are applied to the replacement part. If the labels are not available in the kit, contact your Schneider Electric representative.
- Mount the spare parts only in the locations specified in the installation procedures.
- Route and position the wires as shown in the instructions. Use the wires and cables provided with the spare parts kits or with the drive. Do not modify the wires and cables. Do not route wires and cables outside of the drive enclosure.
- Install all shields as described in the installation procedures.
- Observe the hardware and torque requirements specified in the installation procedures. Do not substitute hardware. Carefully segregate and label all removed hardware and parts for use in reassembly of the drive.
- Mount all panels and covers as specified in the installation procedures.

Tools Required

- Needle-nose pliers
- Torque wrench, 0–45 N•m (0–398 lb-in)
- Voltmeter, 1–1000 Vdc
- Driver bits:
  - T-10 Torx® driver
  - T-20 Torx® driver
  - T-30 Torx® driver
  - Size 2 magnetic tip Phillips® driver
  - Size 3 magnetic tip Phillips® driver
- Socket wrenches:
  - 7 mm
  - 10 mm
  - 16 mm
  - 18 mm
  - 21 mm

Power Removal and Bus Voltage Measurement

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Read and understand the precautions in “Before You Begin” starting on page 5 before performing this procedure.

Failure to follow these instructions will result in death or serious injury.

The DC bus voltage can exceed 1,000 Vdc. Use a properly rated voltage-sensing device when performing this procedure. To measure the DC bus voltage:

1. Disconnect all power.
2. Wait 15 minutes to allow the DC bus to discharge.
3. Measure the voltage of the DC bus between the PA/+ and PC/– terminals to ensure that the voltage is less than 42 Vdc.These terminals are clearly labeled on each drive.
4. If the DC bus capacitors do not discharge completely, contact your local Schneider Electric representative. Do not repair or operate the drive.

⚠ CAUTION

IMPROPER DRIVE OPERATION

- If no power is applied to the drive for a long period, the performance of its electrolytic capacitors will be reduced.
- If the drive is not in active service, apply power to the drive every two years using the following procedure. Do not initially connect the drive directly to full line voltage. Without a motor connected to the drive, gradually increase the voltage using an adjustable AC source connected between drive terminals L1 and L2:
  - — 25% of rated voltage for 30 minutes
  - — 50% of rated voltage for 30 minutes
  - — 75% of rated voltage for 30 minutes
  - — 100% of rated voltage for at least 5 hours
- Check drive operation before placing the drive into service.

Failure to follow these instructions can result in injury or equipment damage.

Discharging Stored Energy in Capacitors

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- When the controller is damaged, voltage may remain on certain energy storage capacitors after de-energization of the controller and discharge of the main capacitor bank.
- Before working on or near assemblies containing energy storage capacitors, verify that the capacitor voltages are less than 42 Vdc.
- The following assemblies have energy-storing capacitors:
  - — Filter board
  - — SCR snubber board
- Always check for the presence of voltage using a voltmeter set to the 1000 Vdc scale. When voltage is present, allow the voltmeter to discharge the capacitor's stored charge.

Failure to follow these instructions will result in death or serious injury.

Capacitors are used throughout the drive as energy storage devices. Some of the capacitors can store potentially lethal amounts of energy during normal controller operation.

When power is removed from an undamaged controller, the stored energy in these capacitors is automatically discharged to nonhazardous levels. However, the discharge mechanisms in a damaged controller may not be operating properly, and stored energy may be present on printed circuit boards.

Do not touch traces on printed circuit boards, such as the line filter board and SCR snubber board, unless you have first checked for voltage with a voltmeter!

To discharge the filter board and SCR snubber board capacitors, use a voltmeter set to the 1000 Vdc scale. It will take approximately 6.6 minutes for a 10 megohm input impedance voltmeter to discharge a 10 microfarad capacitor from 700 V to less than 42 V. It will take approximately 40 seconds for a 1 megohm input impedance voltmeter to discharge a 10 microfarad capacitor from 700 V to less than 50 V.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Do not use a voltmeter to discharge stored energy on the DC bus capacitors.
- If the energy on the DC bus capacitors remains greater than 42 Vdc after 15 minutes, contact Product Support.

Failure to follow these instructions will result in death or serious injury.

Parts Locations

Refer to the figures in this section to familiarize yourself with the layout of the drive and the location of the parts before performing the installation procedures.

Level 1 Parts

Figure 1: Level 1 Parts and Power Board

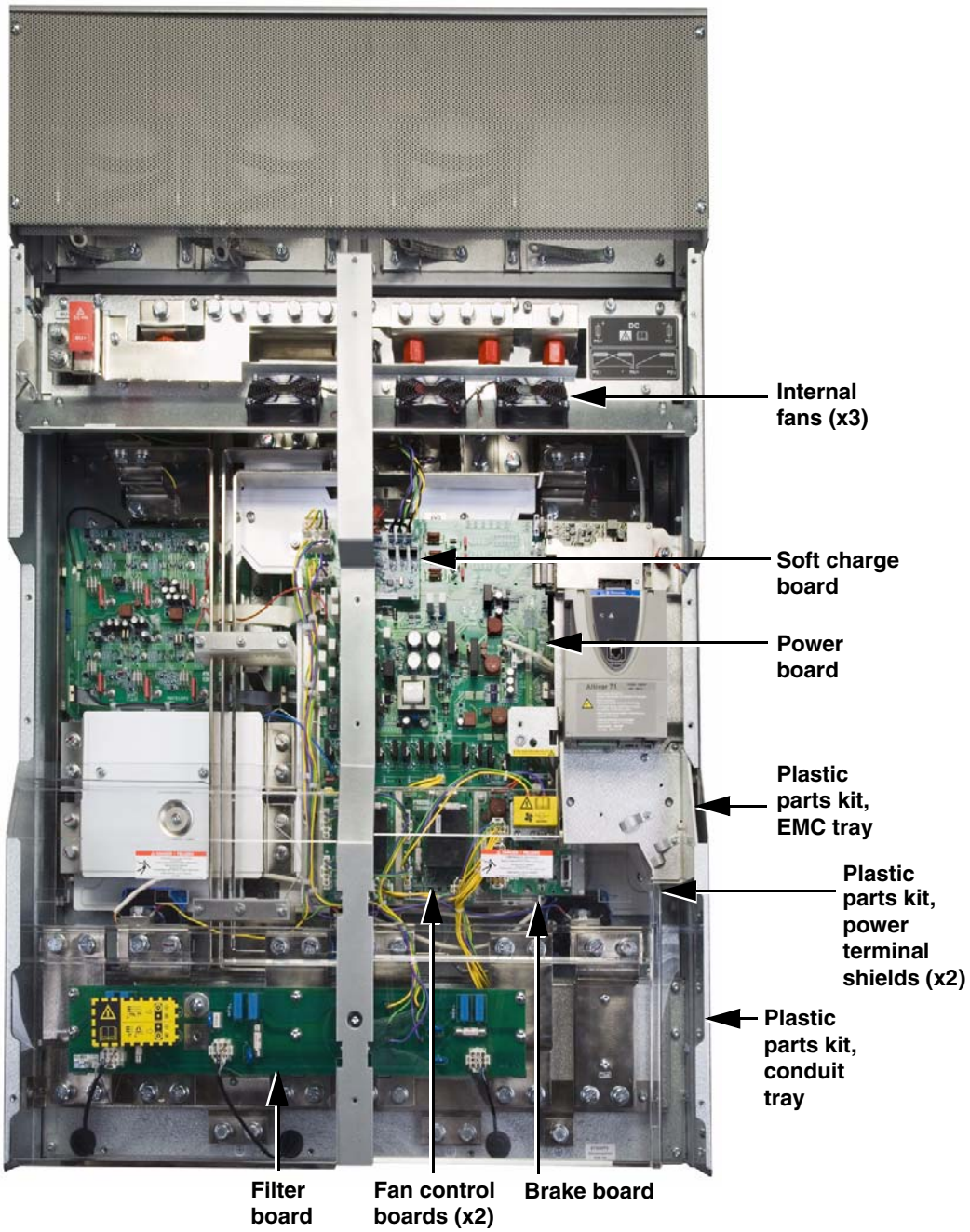
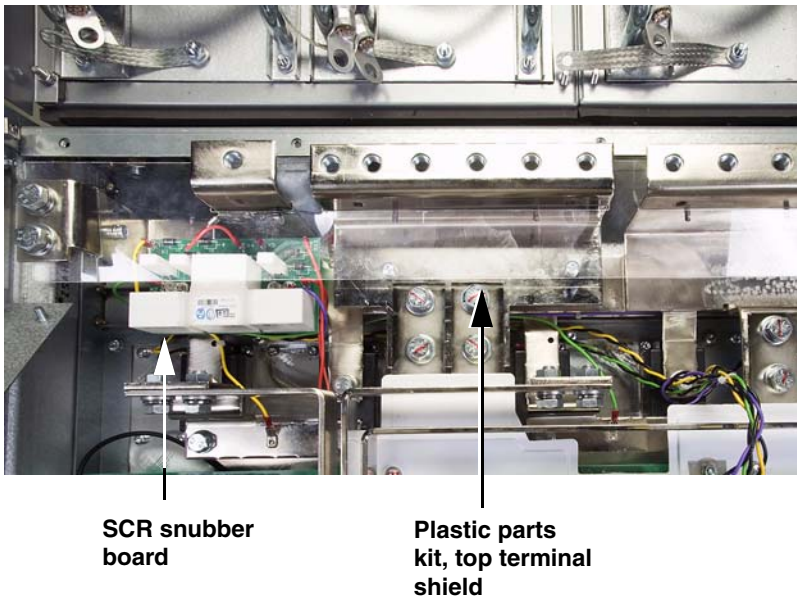


Figure 2: SCR Snubber Board and Top Terminal Shield



Level 2 Parts

Figure 3: Motor Current Sensors

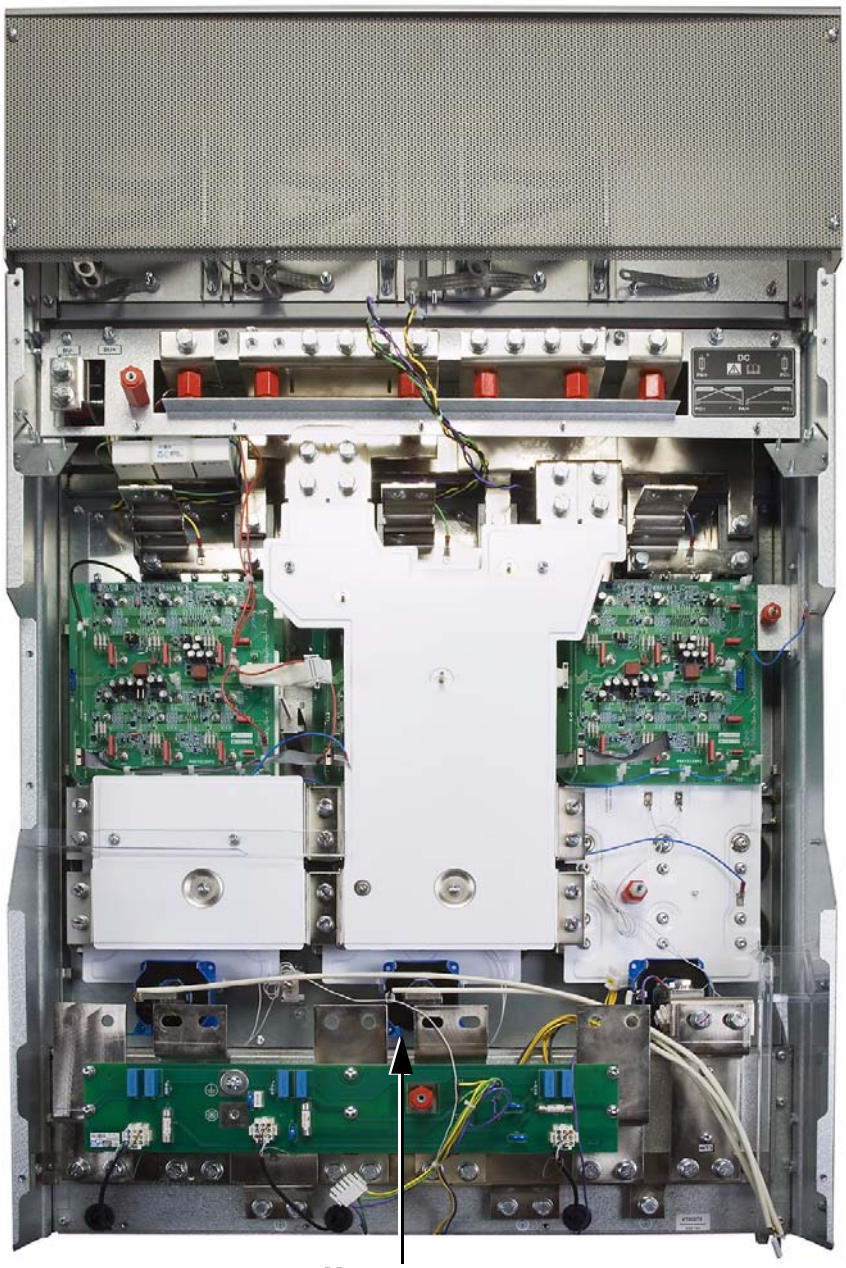


Figure 4: Gate Driver Boards and Temperature Sensors

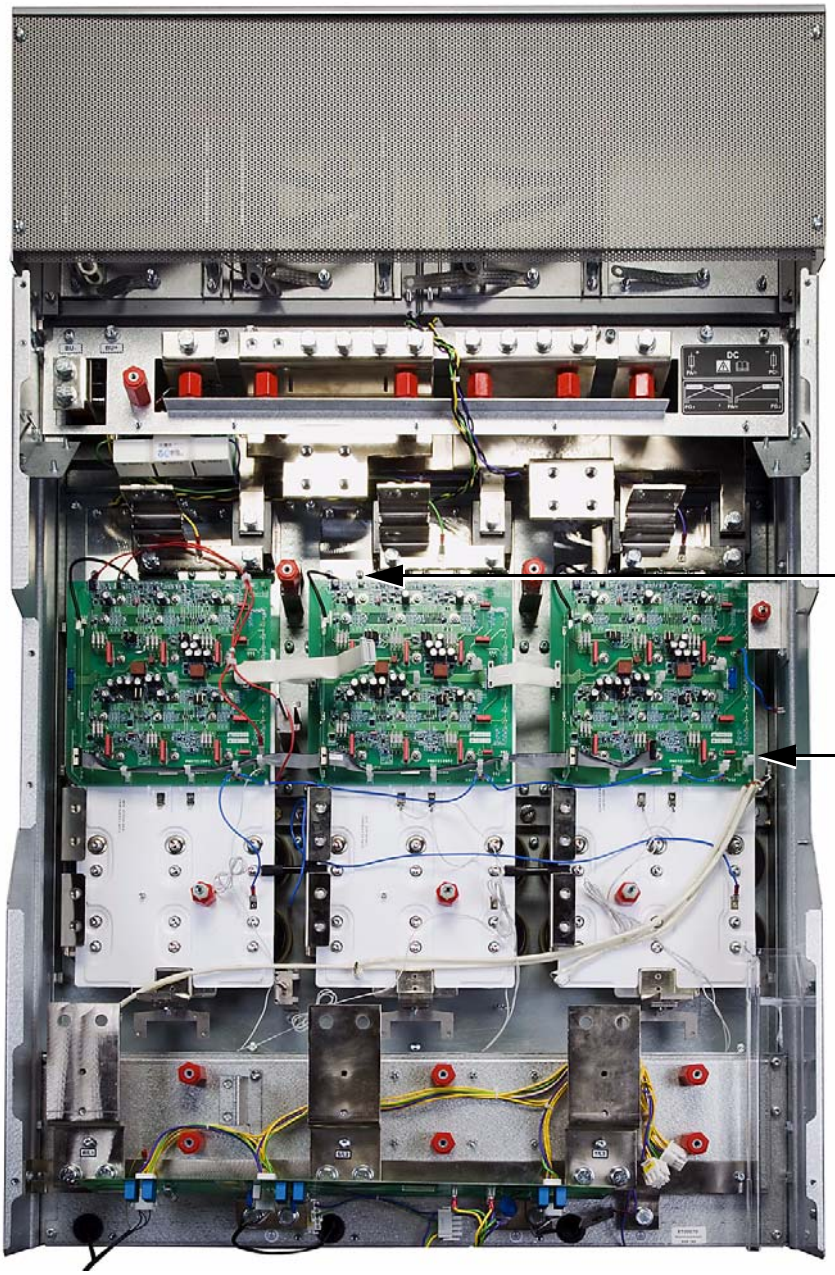


Figure 5: Power IGBT Modules and Capacitors

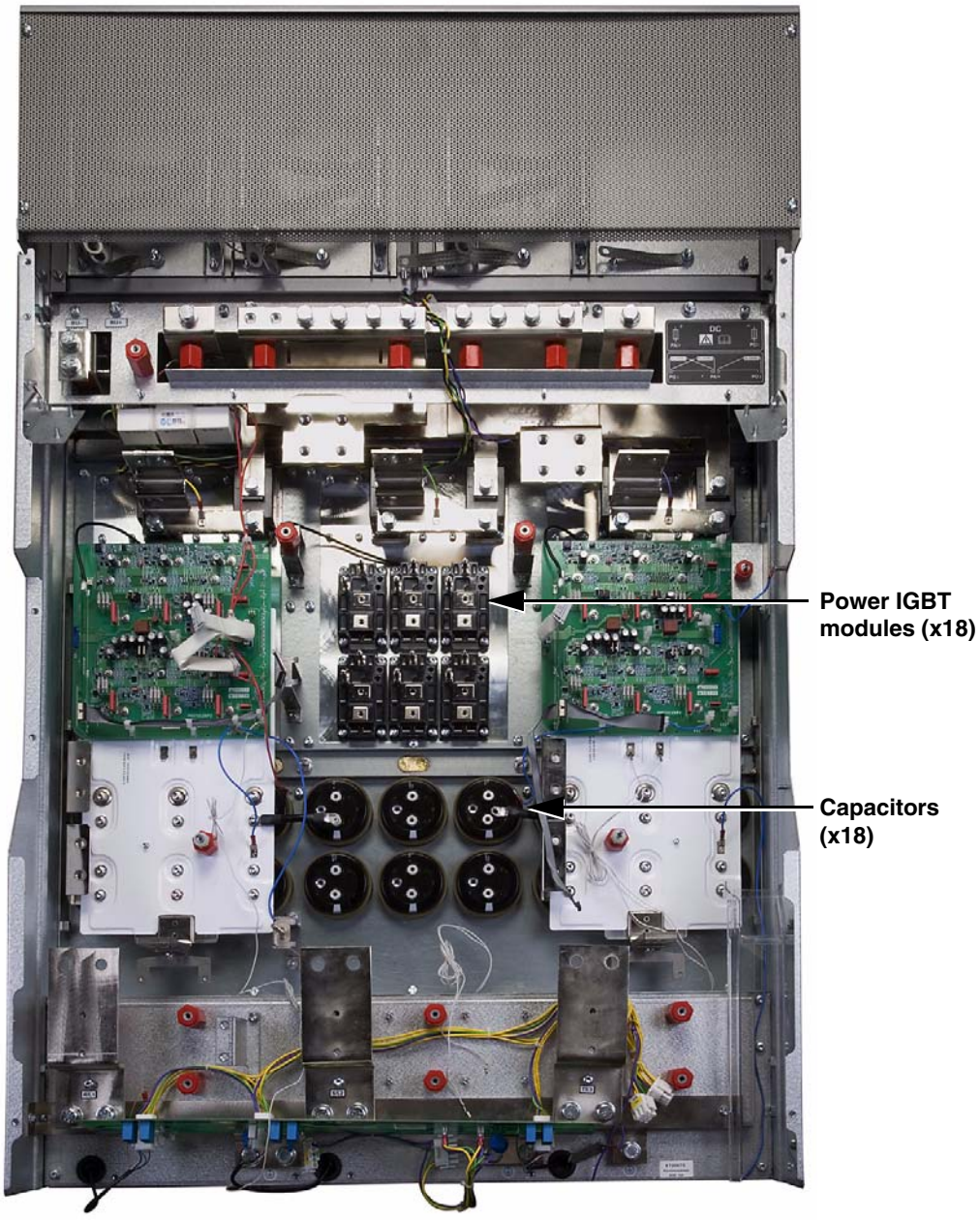


Figure 6: SCR Snubber Board

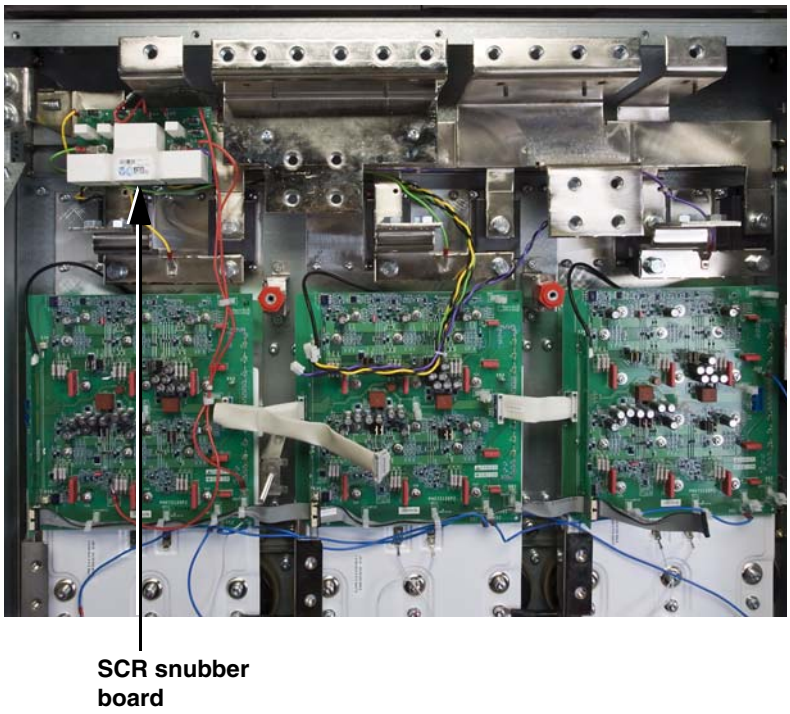
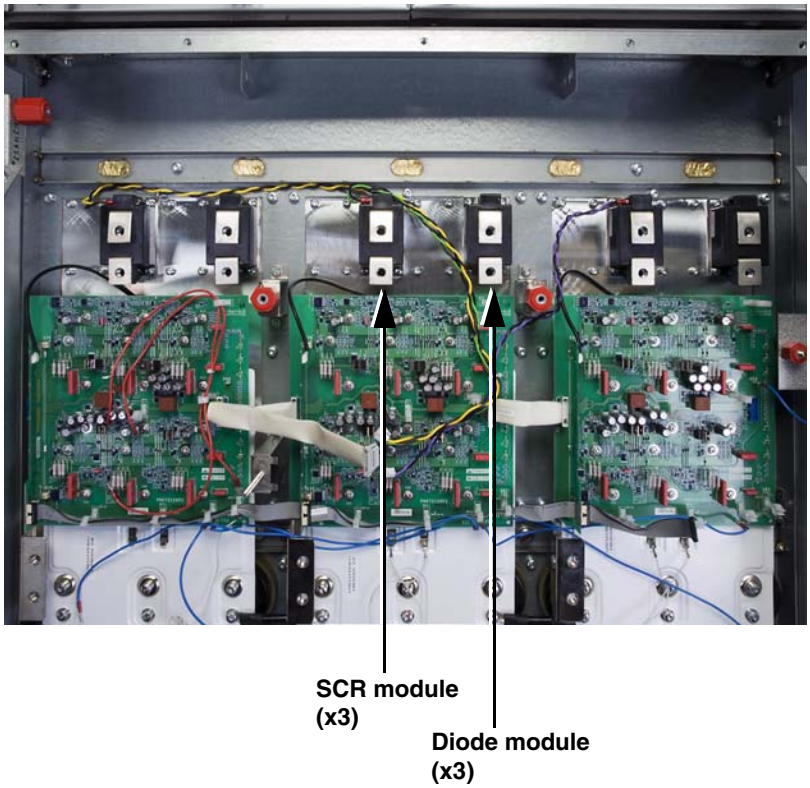


Figure 7: SCR Modules and Diode Modules



Installation Procedures for Level 1 Parts

Level 1 parts consist of the front cover and parts that are accessible directly under the front cover. They are:

Front cover	Internal fans
Power terminal shield (plastic kit)	Soft charge board
Conduit tray (plastic kit)	Fan control board
EMC tray (plastic kit)	Filter board

Removing and Replacing the Front Cover VY1A1216

IMPORTANT: Label and retain all removed hardware and cables for use in reassembly.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Read and understand the precautions in “Before You Begin” starting on page 5 before performing this procedure.
- Before working on this equipment, turn off all power supplying it and perform the DC bus voltage measurement procedure on page 11.

Failure to follow these instructions will result in death or serious injury.

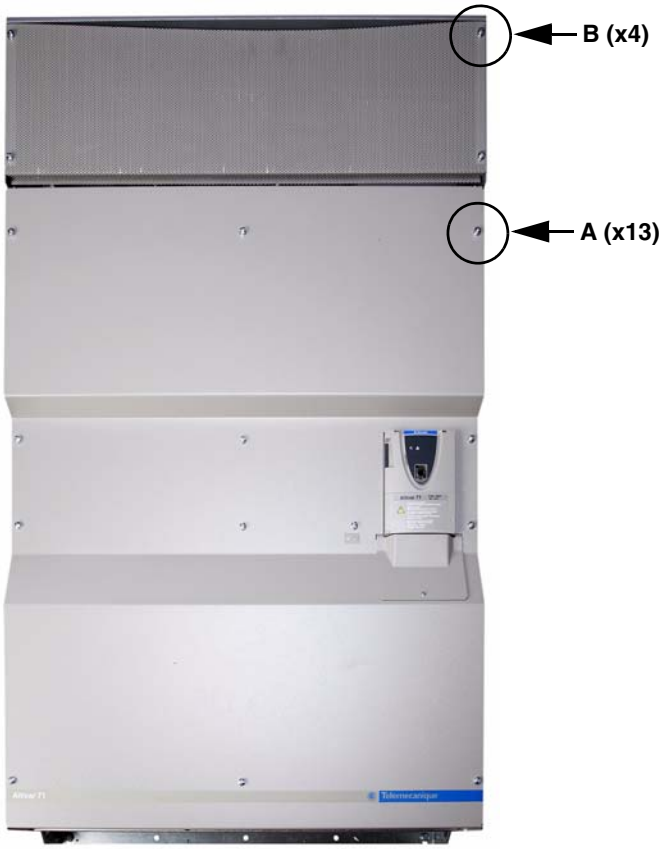
The procedures in this manual require removal and replacement of the front cover. See Figure 8 on page 20.

- To remove the front cover, using a size 2 Phillips driver, remove thirteen screws (**A**) and take the front cover off the drive.
- To replace the front cover, using a size 2 Phillips driver secure the front cover with thirteen screws (**A**). Tighten the screws to 5.5 N•m (48.7 lb-in).

If you are replacing the rectifier snubber board, SCR modules, or diode modules, you may also need to remove the top grille as follows.

- Using a size 2 Phillips driver, remove four screws (**B**) securing the top grille to the drive frame.
- To replace the top grille, using a size 2 Phillips driver secure the grille to the drive frame with four screws (**B**). Tighten the screws to 5.5 N•m (48.7 lb-in).

Figure 8: Front Cover



Replacing the Internal Fans VZ3V1213

IMPORTANT: Label and retain all removed hardware and cables for use in reassembly.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Read and understand the precautions in "Before You Begin" starting on page 5 before performing this procedure.
- Before working on this equipment, turn off all power supplying it and perform the DC bus voltage measurement procedure on page 11.

Failure to follow these instructions will result in death or serious injury.

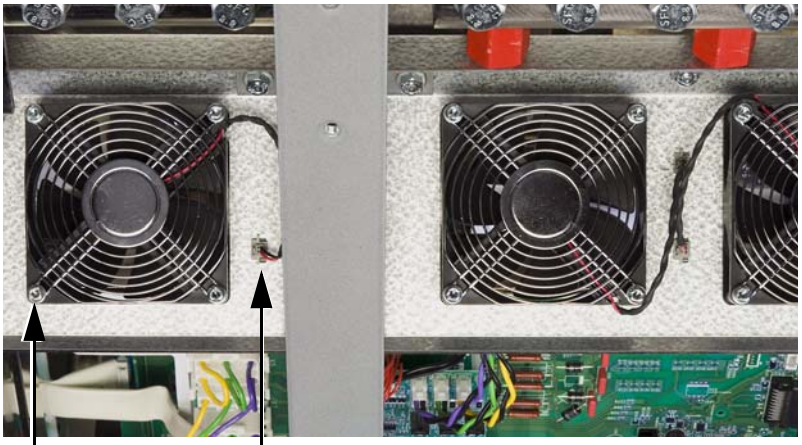
Remove the Front Cover

1. Using a size 2 Phillips driver, remove thirteen screws and take the front cover off the drive. See Figure 8 on page 20.

Replace the Internal Fan

2. Remove the internal fan you are replacing as follows. See Figure 9.
   - — Using needle-nose pliers, carefully unplug the fan's 2-pin connector (**A**) from the fan bracket.
   - — Using a T-20 Torx driver, remove four screws (**B**) securing the fan to the fan bracket, and remove the fan from the drive.

Figure 9: Internal Fans



3. Install the new fan as follows. See Figure 9.
   - — Using a T-20 Torx driver, secure the fan to the fan bracket with four screws (**B**). Tighten the screws to 1.1–1.7 N•m (9.7–15 lb-in).
   - — Plug the fan's 2-pin connector (**A**) into the terminal on the fan bracket.

Replace the Front Cover

4. Replace the front cover. Using a size 2 Phillips driver, secure the front cover with thirteen screws. See Figure 8 on page 20. Tighten the screws to 5.5 N•m (48.7 lb-in).

Replacing the Soft Charge Board VX5A1300

IMPORTANT: Label and retain all removed hardware and cables for use in reassembly.

Table 2: Soft Charge Board Wiring

Wire No.[1]	Terminal No.	Description	To:
E110	**CN2A**	9-pin, red	PB[2] X30 (9-pin)
E109	**CNL3G**	2-pin, violet/black	SCR[3] 3 Terms. 4 & 5
E108	**CNL2G**	2-pin, green/black	SCR 2 Terms. 4 & 5
E107	**CNL1G**	2-pin, yellow/black	SCR 1 Terms. 4 & 5
E111	**CN7A**	2-pin, black	PB X31
—	**CNP**	Not used	—

1 See the schematic on page 152 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

2 PB: Power board

3 SCR: Silicon controlled rectifier

⚠ DANGER

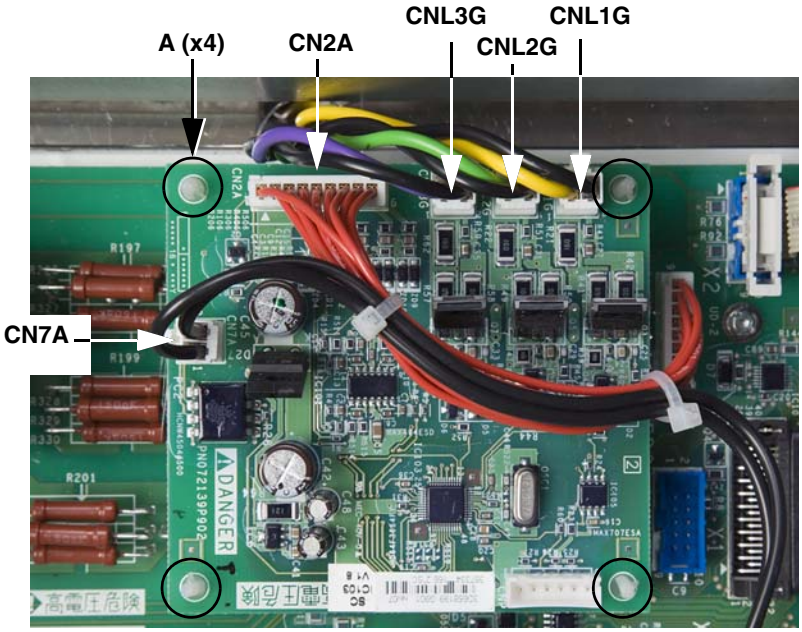
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Read and understand the precautions in "Before You Begin" starting on page 5 before performing this procedure.
- Before working on this equipment, turn off all power supplying it and perform the DC bus voltage measurement procedure on page 11.

Failure to follow these instructions will result in death or serious injury.

1. Using a size 2 Phillips driver, remove thirteen screws and take the front cover off the drive. See Figure 8 on page 20.
2. Using needle-nose pliers, carefully remove the following connections from the soft charge board. See Table 2 and Figure 10 for connector locations.
   - — At the top of the soft charge board, from left to right remove: the 9-pin connector from terminal CN2A, the 2-pin connector from terminal CNL3G, the 2-pin connector from terminal CNL2G, and the 2-pin connector from terminal CNL1G.
   - — At the left side of the board, remove the 2-pin connector from terminal CN7A.

Figure 10: Soft Charge Board



3. Using needle-nose pliers, compress the four plastic mounting posts (**A,** Figure 10), one at a time, while lifting the soft charge board off the posts. Remove the soft charge board from the drive.
4. Press the new soft charge board down over the four mounting posts (**A,** Figure 10) until it is securely seated.
5. Install five connections on the new soft charge board. See Table 2 and Figure 10 for connector locations.
6. Replace the front cover. Using a size 2 Phillips driver, secure the front cover with thirteen screws. See Figure 8 on page 20. Tighten the screws to 5.5 N•m (48.7 lb-in).

Replacing the Plastic Parts Kit VY1A1406

IMPORTANT: Label and retain all removed hardware and cables for use in reassembly.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Read and understand the precautions in "Before You Begin" starting on page 5 before performing this procedure.
- Before working on this equipment, turn off all power supplying it and perform the DC bus voltage measurement procedure on page 11.

Failure to follow these instructions will result in death or serious injury.

The replacement steps for some parts of the plastic kit are covered in other procedures. See Table 3.

Table 3: Plastic Kit Contents

Description	For replacement steps, see
Power terminal shields	"Replacing the Power Terminal Shields" beginning on page 23
EMC tray	"Replacing the EMC Tray" beginning on page 26
Conduit tray	"Replacing the Conduit Tray" beginning on page 27
Top rectifier shield	"Replace the Top Rectifier Shield" on page 42
Phase-U DC bus plate shield	"Replace the Phase-U DC Bus Plate" on page 125
Input bus bar brackets	"Replace the Input Bus Bar Brackets (Bottom)" on page 132 and "Replace the Input Bus Bar Brackets (Top)" on page 139
Power board assembly shields	"Replacing the Power Board Assembly Shields" beginning on page 82

Replacing the Power Terminal Shields

If the transparent terminal shields are cracked, broken, or damaged, replace them as follows.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Install the power terminal shields as shown in Figures 11 and 12 on pages 24 and 25.
- Before installing the shields, ensure that they have no tears or cracks. If the shields are damaged, install new pieces from the plastic kit. See page 21.
- Do not install a damaged shield.

Failure to follow these instructions will result in death or serious injury.

1. Using a size 2 Phillips driver, remove thirteen screws and take the front cover off the drive. See Figure 8 on page 20.
2. The right terminal shield has two tabs (**A**) on the right side that fit into slots on the conduit tray, and two tabs (**B**) on the left side that fit into slots on the middle crossbrace. See Figure 11 on page 24.

   The left terminal shield has two tabs on the right (**C**) that fit into retaining slots in the middle crossbrace and two mounting holes (**D**) on the left that fit over posts on the side panel of the drive. See Figures 12 and 13 on page 25. Disengage the shields and remove them from the drive.

NEXT STEP: If you are also replacing the EMC tray, perform the steps in "Replacing the EMC Tray" beginning on page 26 before installing the new power terminal shields.

If you are replacing the conduit tray, perform the steps in "Replacing the Conduit Tray" on page 27 before installing the new power terminal shields.

3. If you are only replacing the power terminal shields, install the new shields as shown in Figures 11 and 12 (page 25).

   Labels for the new shield are included in the plastic kit. Add the new labels in the same positions as on the old shield.

4. Replace the front cover. Using a size 2 Phillips driver, secure the front cover with thirteen screws. See Figure 8 on page 20. Tighten the screws to 5.5 N•m (48.7 lb-in).

Figure 11: Right Terminal Shield

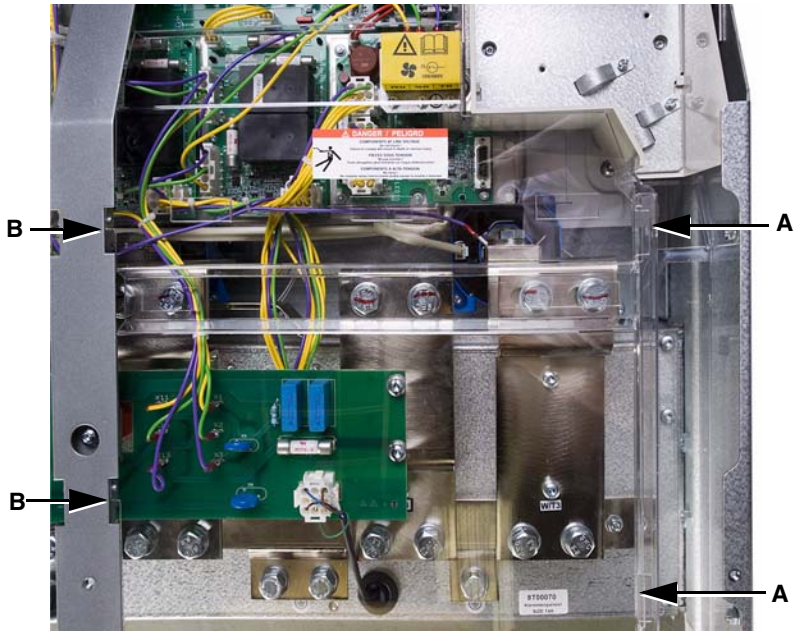


Figure 12: Left Terminal Shield

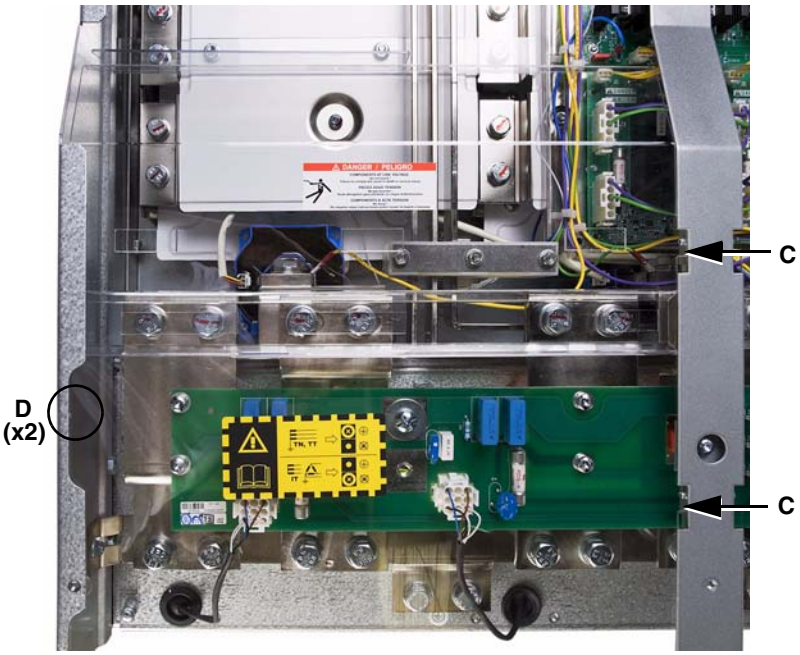


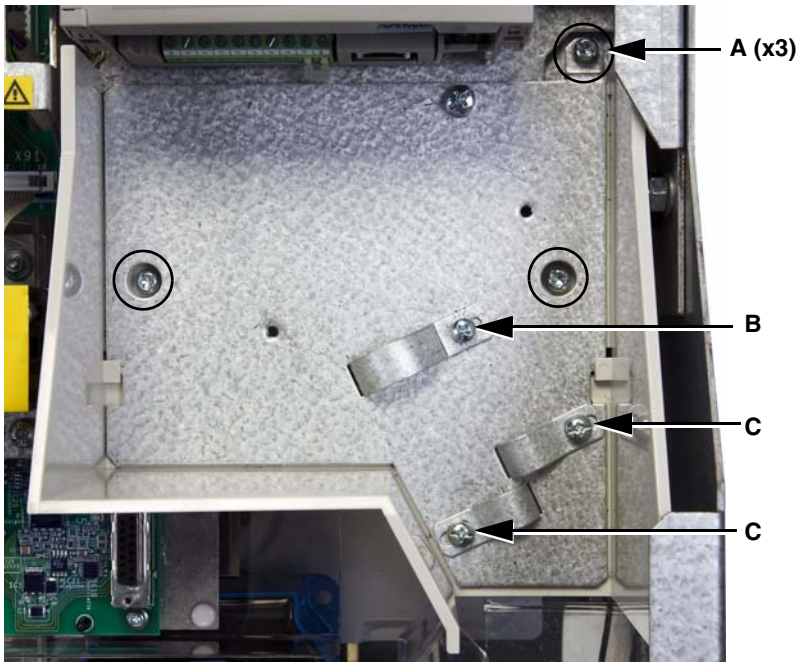
Figure 13: Terminal Shield Retaining Posts

Replacing the EMC Tray

Replace the EMC tray as follows.

1. Using a size 2 Phillips driver, remove thirteen screws and take the front cover off the drive. See Figure 8 on page 20.
2. Remove the right power terminal shield. See Step 2 on page 23.
3. Using a T-20 Torx driver, remove three screws (**A**) securing the EMC tray to the control module mounting plate and remove the tray from the drive. See Figure 14.

Figure 14: EMC Tray



4. Using a size 2 Phillips driver, remove three screws (**B** and **C**) securing the cable clamps to the metal EMC plate, and remove the clamps from the plate. See Figure 14.

> **NOTE:** Note the differences in the cable clamps and screws. The screw (**B**) in the large clamp is longer than the screws (**C**) in the two shorter clamps.

5. Remove the metal EMC plate from the plastic tray and discard the plastic tray.
6. Place the metal EMC plate into the new plastic tray.
7. Using a size 2 Phillips driver, install the cable clamps on the EMC plate with three screws (**B** and **C**). See Figure 14.
8. Using a T-20 Torx driver, secure the plastic EMC tray to the control module mounting plate with mounting three screws (**A**). See Figure 14.
9. Tighten the hardware to the torque values listed in Table 4.

> **NEXT STEP:** If you are also replacing the conduit tray, install it before replacing the power terminal shields. See page 27.

10. Replace the right terminal shield as illustrated in Step 3 on page 24.
11. Replace the front cover. Using a size 2 Phillips driver, secure the front cover with thirteen screws. See Figure 8 on page 20. Tighten the screws to 5.5 N•m (48.7 lb-in).

Table 4: EMC Tray Hardware Torque Values

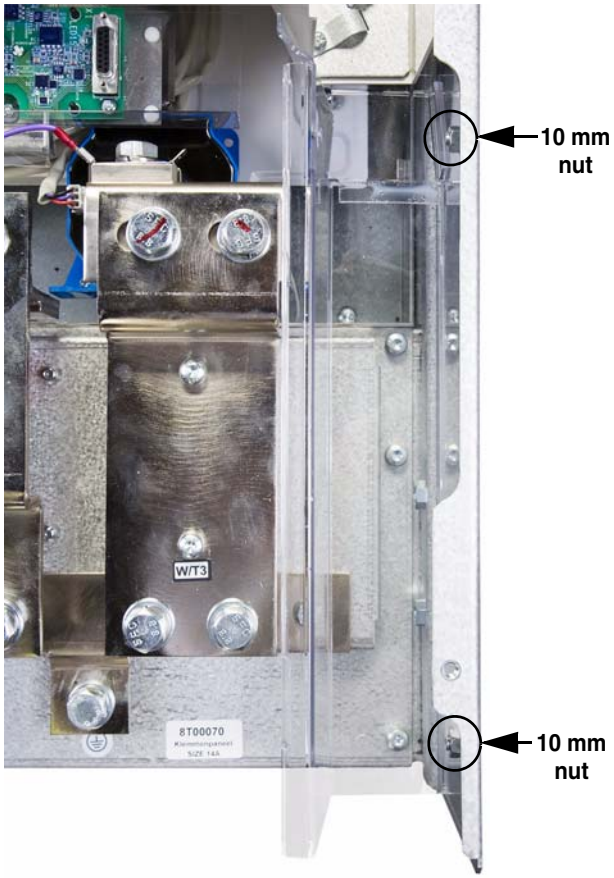
Item	Description	Torque Range	
		N•m	lb-in
A	(3) T-20 screws	0.4–0.6	3.5–5.3
B	(1) Size 2 Phillips screw (20 mm length)	0.4–0.6	3.5–5.3
C	(2) Size 2 Phillips screws (10 mm length)	0.4–0.6	3.5–5.3

Replacing the Conduit Tray

Replace the conduit tray as follows.

1. Using a size 2 Phillips driver, remove thirteen screws and take the front cover off the drive. See Figure 8 on page 20.
2. Remove the right power terminal shield. See Step 2 on page 23.
3. Using a 10 mm socket wrench, remove two nuts securing the conduit tray to the drive frame. See Figure 15.
4. Install the new conduit tray and secure it with the two 10 mm nuts as illustrated in Figure 15. Tighten the nuts to 5.5 N•m (48.7 lb-in).
5. Replace the right terminal shield as illustrated in Step 3 on page 24.
6. Replace the front cover. Using a size 2 Phillips driver, secure the front cover with thirteen screws. See Figure 8 on page 20. Tighten the screws to 5.5 N•m (48.7 lb-in).

Figure 15: Conduit Tray



Replacing the Fan Control Boards VX5A1400

IMPORTANT: Label and retain all removed hardware and cables for use in reassembly.

Table 5: Crossbrace Hardware Torque Values

Item	Description	Torque Range	
		N•m	lb-in
A	(2) 10 mm nuts	5.5	48.7
B	(1) T-30 screw	5.5	48.7

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Read and understand the precautions in "Before You Begin" starting on page 5 before performing this procedure.
- Before working on this equipment, turn off all power supplying it and perform the DC bus voltage measurement procedure on page 11.

Failure to follow these instructions will result in death or serious injury.

1. Using a size 2 Phillips driver, remove thirteen screws and take off the front cover of the drive. See Figure 8 on page 20.
2. Remove the power terminal shields as illustrated in "Replacing the Power Terminal Shields" on page 23.
3. Remove the middle crossbrace as follows.
   - — Using a 10 mm socket wrench, remove two nuts (**A**) securing the crossbrace to the fan bracket. See Figure 16.
   - — Using a T-30 Torx driver, remove one screw (**B**) securing the crossbrace to the filter board and remove the crossbrace from the drive. See Figure 17.

Figure 16: Middle Crossbrace Top

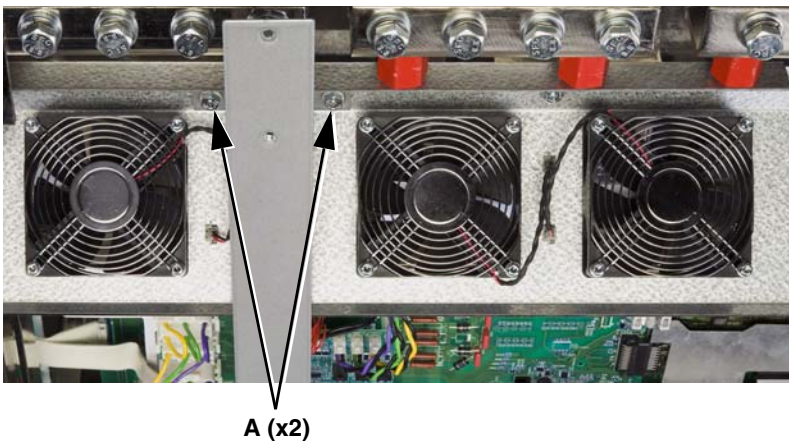
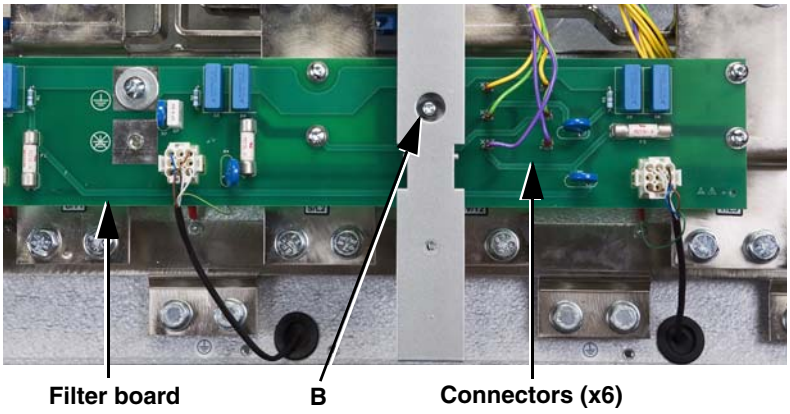


Figure 17: Middle Crossbrace Bottom



4. The drive has two fan control boards. Remove the following connections from the fan control board you are replacing.

> **NOTE:** If you are replacing fan control board 1, see Table 6 and Figure 18. If you are replacing fan control board 2, see Table 7 and Figure 19 on page 30.

— From top to bottom, remove: the 3-pin connector from terminal X2, the 5-pin connector from terminal X1, and the 5-pin connector from terminal X4.

— From the bottom right of the board, remove the 9-pin connector from terminal X3.

Table 6: Fan Control Board 1 Wiring

Wire No.[1]	Terminal No.	Description	To:
E105	**X2**	3-pin, yellow	PB[2] X14
E120	**X1**	5-pin, 2 wire, violet/green	FCB[3]2 X1
E124	**X4**	5-pin, 2 wire, violet/green	FCB2 X4
E114	**X3**	9-pin, green/yellow/ violet with yellow and green ground wire	FB[4] X11, X12, X13, and BB[5] X33
—	**X6**	Not used	—

1 See the schematic on page 152 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

2 PB: Power board

3 FCB: Fan control board

4 FB: Filter board

5 BB: Brake board

Figure 18: Fan Control Board 1

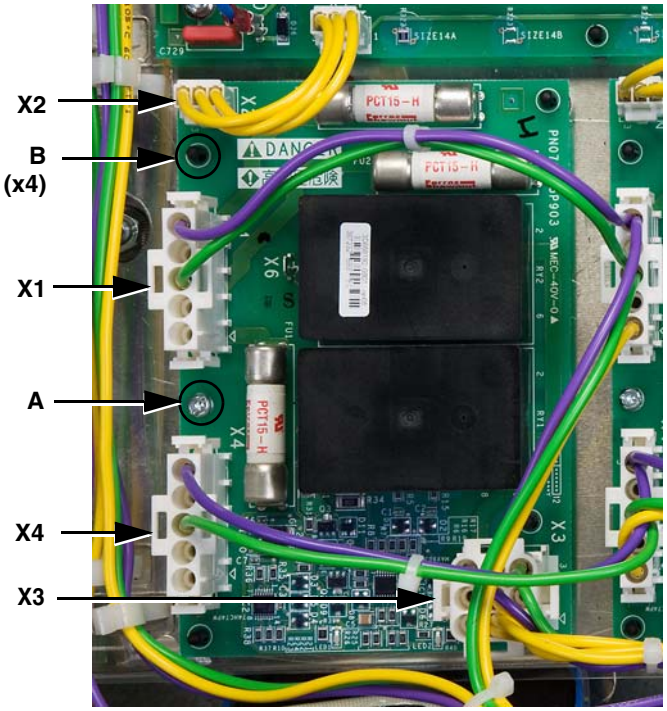


Table 7: Fan Control Board 2 Wiring

Wire No.[1]	Terminal No.	Description	To:
E147	**X2**	3-pin, yellow	PB[2] X15
E120	**X1**	5-pin, violet/green/ yellow	FCB[3]1 X1 and FB[4] X1, X2, X3
E124	**X4**	5-pin, 2 wire, green/yellow/ violet	TB1 and FCB1 X4
E151	**X3**	9-pin, green/yellow/ violet with yellow and green ground wire	BB[5] X3
—	**X6**	Not used	—

1 See the schematic on page 152 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

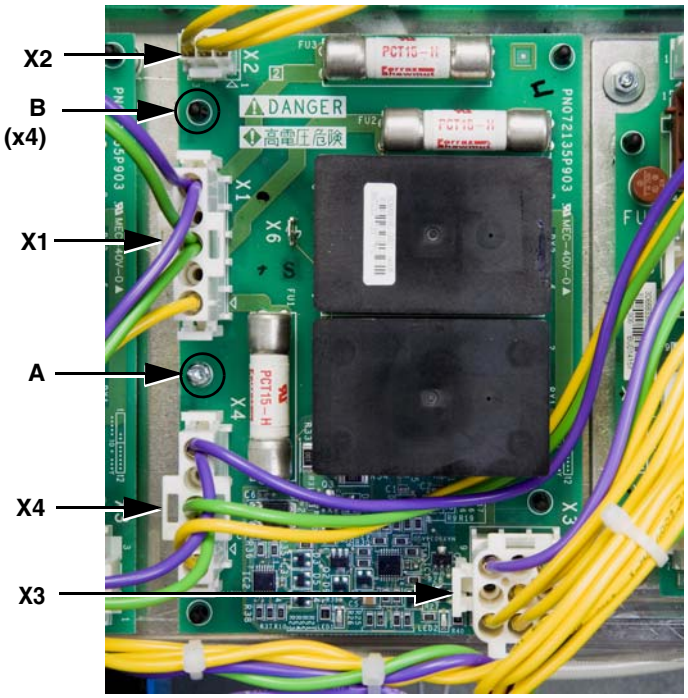
2 PB: Power board

3 FCB: Fan control board

4 FB: Filter board

5 BB: Brake board

Figure 19: Fan Control Board 2



5. Using a T-10 Torx driver, remove 1 screw (**A,** Figure 18 or 19) from the board between connectors X1 and X4.
6. Using needle-nose pliers, compress the four plastic mounting posts (**B,** Figure 18 or 19), one at a time, while lifting the board off the posts. Remove the board from the drive.
7. Press the new fan control board down over the four mounting posts until it is securely seated.
8. Using a T-10 Torx driver secure the board with one screw (**A,** Figure 18 or 19). Tighten the screw to 0.8 N•m (7.1 lb-in).
9. Install the four connections on the new fan control board. For fan control board 1, see Table 6 and Figure 18 on page 29. For fan control board 2, see Table 7 and Figure 19.
10. Replace the middle crossbrace as follows.
    - — Using a 10 mm socket wrench, secure the crossbrace to the fan bracket with two nuts (**A**). See Figure 16 on page 28.
    - — Using a T-30 Torx driver, secure the crossbrace to the filter board with one screw (**B**). See Figure 17 on page 28.
    - — Tighten the hardware to the torque values specified in Table 5 on page 28.
11. Replace the power terminal shield as illustrated in “Replacing the Power Terminal Shields” on page 23.
12. Replace the front cover. Using a size 2 Phillips driver, secure the front cover with thirteen screws. See Figure 8 on page 20. Tighten the screws to 5.5 N•m (48.7 lb-in).

Replacing the Filter Board VX4A1118

IMPORTANT: Label and retain all removed hardware and cables for use in reassembly.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Read and understand the precautions in "Before You Begin" starting on page 5 before performing this procedure.
- Before working on this equipment, turn off all power supplying it and perform the DC bus voltage measurement procedure on page 11.

Failure to follow these instructions will result in death or serious injury.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- When the controller is damaged, voltage may remain on certain energy storage capacitors after de-energization of the controller and discharge of the main capacitor bank.
- Before working on or near assemblies containing energy storage capacitors, verify that the capacitor voltages are less than 42 Vdc.
- The following assemblies have energy-storing capacitors:
  - — Filter board. See Figure 21 on page 32.
- Always check for the presence of voltage using a voltmeter set to the 1000 Vdc scale. When voltage is present, allow the voltmeter to discharge the capacitor's stored charge. Refer to "Discharging Stored Energy in Capacitors" on page 12.

Failure to follow these instructions will result in death or serious injury.

Remove the Front Cover

1. Using a size 2 Phillips driver, remove thirteen screws and take the front cover off the drive. See Figure 8 on page 20.

Remove the Power Terminal Shields

2. Remove the power terminal shields as illustrated in “Replacing the Power Terminal Shields” on page 23.

Remove the Middle Crossbrace

3. Remove the middle crossbrace as follows.
   - — Using a 10 mm socket wrench, remove two nuts (**A**) securing the crossbrace to the fan bracket. See Figure 20.
   - — Using a T-30 Torx driver, remove one screw (**B**) securing the crossbrace to the filter board. See Figure 21.
   - — Remove the crossbrace from the drive.

Figure 20: Middle Crossbrace Top

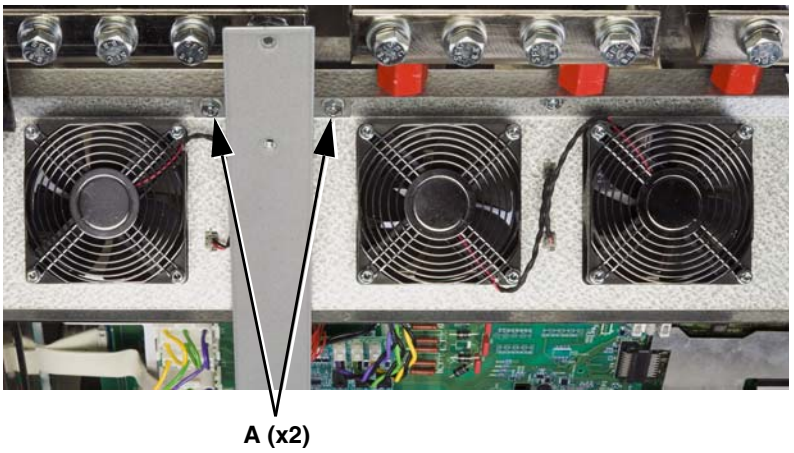
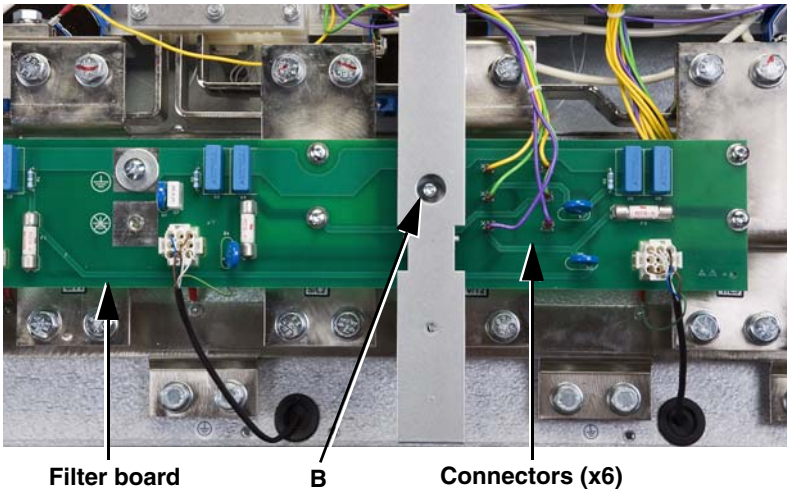


Figure 21: Middle Crossbrace Bottom



Remove the Filter Board and Fan Connections

Table 8: Filter Board Wiring

Wire No.[1]	Terminal No.	Description	To:
E120	**X1**	Yellow, 0.25 in. connector	FCB[2] 2 X1
	X2	Green, 0.25 in. connector	
	X3	Violet, 0.25 in. connector	
E120	**X11**	Yellow, 0.19 in. connector	PB[3] X7
	X12	Green, 0.19 in. connector	
	X13	Violet, 0.19 in. connector	
E115	**X11**	Black sleeve, 9-pin	Heatsink fan 1
E125	**X12**	Black sleeve, 9-pin	Heatsink fan 2
E165	**X13**	Black sleeve, 9-pin	Heatsink fan 3

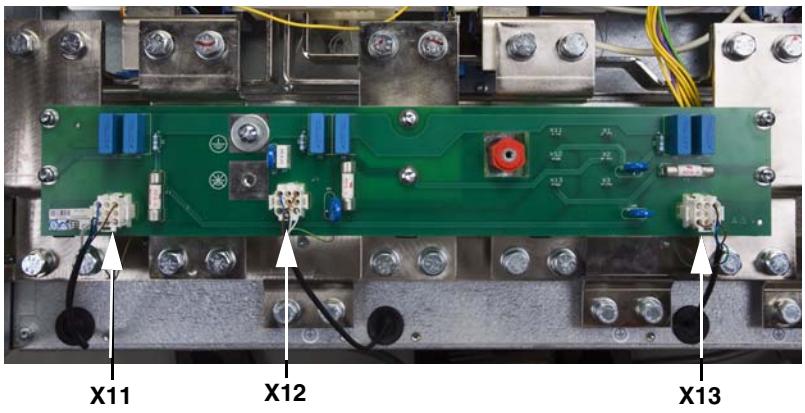
1 See the schematic on page 152 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

2 FCB: Fan control board

3 PB: Power board

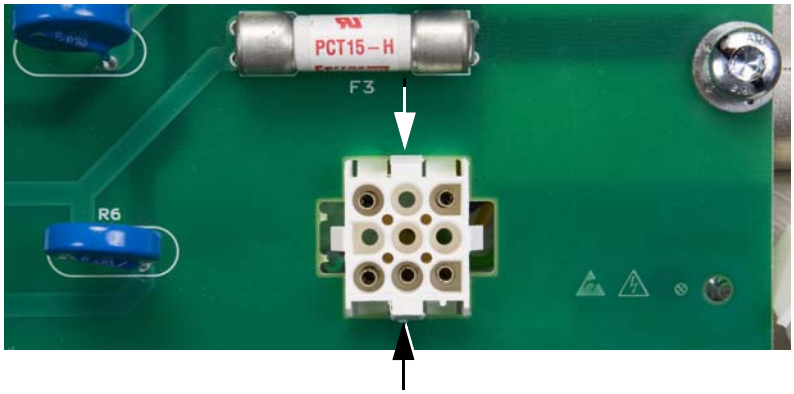
4. Using needle-nose pliers, remove the six 1-pin connections from the filter board. See Table 8 and Figure 21 on page 32 for connector locations.
5. Disconnect the three 9-pin fan connectors from terminals X11, X12, and X13. See Figure 22.

Figure 22: Filter Board Fan Connections



6. Gently press in on the tabs at the top and bottom of the fan connectors and push the three connectors down through the cutouts in the filter board. See Figure 23.

Figure 23: Fan Connector Detail



Remove the Filter Board

7. Remove the filter board as follows.
   - — Using a T-30 Torx driver, remove six screws (**A**, Figure 24) securing the filter board to input bus bars R/L1, S/L2, and T/L3.
   - — Using a size 3 Phillips driver, remove the grounding screw and washer (**B,** Figure 24) securing the filter board to the drive frame.

> **NOTE:** Note whether the screw is installed in the grounded or non-grounded position for reinstallation. Figure 24 shows the screw in the grounded position.

   - — Remove the filter board from the drive.

Figure 24: Filter Board Mounting Hardware

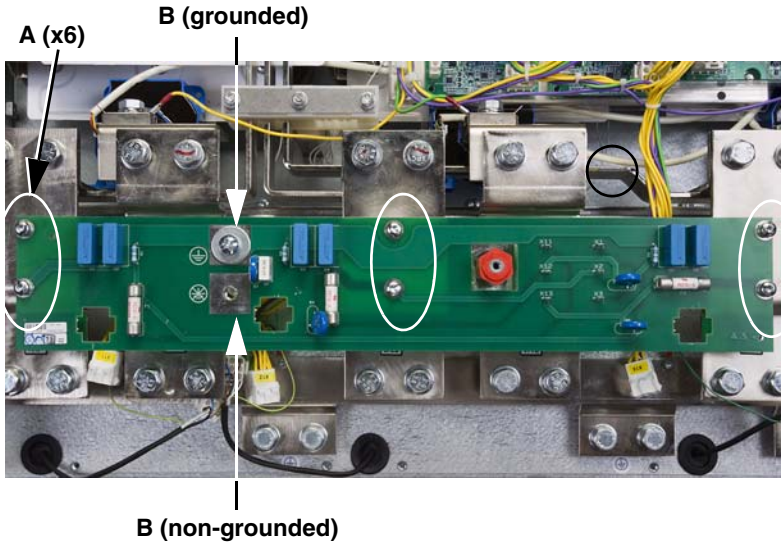


Table 9: Filter Board Hardware Torque Values

Item	Description	Torque Range	
		N•m	lb-in
A	(6) T-30 screws	5.5	48.7
B	(1) Size 3 Phillips screw and washer	5.5	48.7

Install the New Filter Board

8. Install the new filter board as follows:
   - — Position the filter board in the drive as shown in Figure 24.
   - — Using a T-30 Torx driver, secure the filter board to the input bus bars R/L1, S/L2, and T/L3 with six screws (**A**, Figure 24).
   - — Using a size 3 Phillips driver, install the grounding screw and washer (**B,** Figure 24).

> **NOTE:** Be sure to install the size 3 Phillips screw and washer (**B**) in the original position. Figure 24 shows the screw in the grounded position.

   - — Tighten the hardware to the torque values specified in Table 9.

Replace the Filter Board and Fan Connections

Table 10: Filter Board Wiring

Wire No.[1]	Terminal No.	Description	To:
E120	**X1**	Yellow, 0.25 in. connector	FCB[2] 2 X1
	X2	Green, 0.25 in. connector	
	X3	Violet, 0.25 in. connector	
E120	**X11**	Yellow, 0.19 in. connector	PB[3] X7
	X12	Green, 0.19 in. connector	
	X13	Violet, 0.19 in. connector	
E115	**X11**	Black sleeve, 9-pin	Heatsink fan 1
E125	**X12**	Black sleeve, 9-pin	Heatsink fan 2
E165	**X13**	Black sleeve, 9-pin	Heatsink fan 3

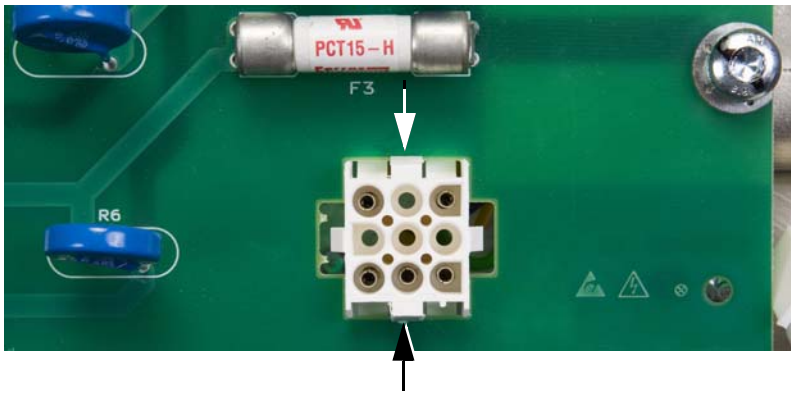
1 See the schematic on page 152 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

2 FCB: Fan control board

3 PB: Power board

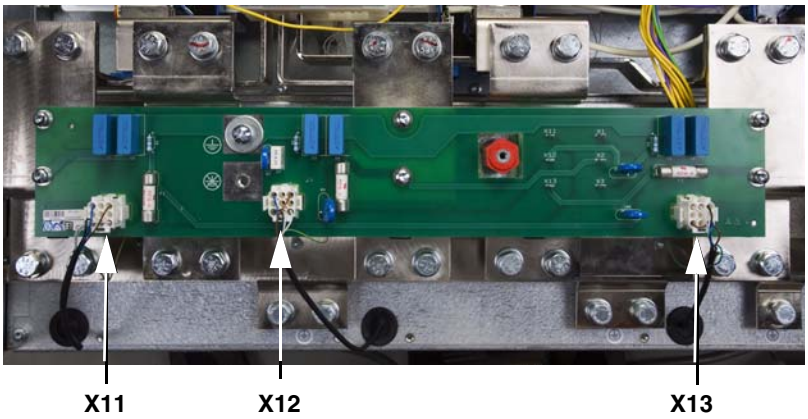
9. Gently press the top and bottom tabs on the fan connectors (see Figure 25) and push the three connectors up through the cutouts on the filter board.

Figure 25: Fan Connector Detail



10. Connect the three 9-pin fan connectors at terminals X11, X12, and X13. See Figure 26.

Figure 26: Filter Board Fan Connections



11. Replace the six 1-pin connections on the filter board. See Table 10 and Figure 28 (page 36) for connector locations.

Replace the Middle Crossbrace

12. Replace the middle crossbrace as follows.
    - — Using a 10 mm socket wrench, secure the crossbrace to the fan bracket with two nuts (**A**). See Figure 27.
    - — Using a T-30 Torx driver, secure the crossbrace to the filter board with one screw (**B**). See Figure 28.
    - — Tighten the hardware to the torque values specified in Table 11.

Table 11: Crossbrace Hardware Torque Values

Item	Description	Torque Range	
		N•m	lb-in
A	(2) 10 mm nuts	5.5	48.7
B	(1) T-30 screw	5.5	48.7

Figure 27: Middle Crossbrace Top

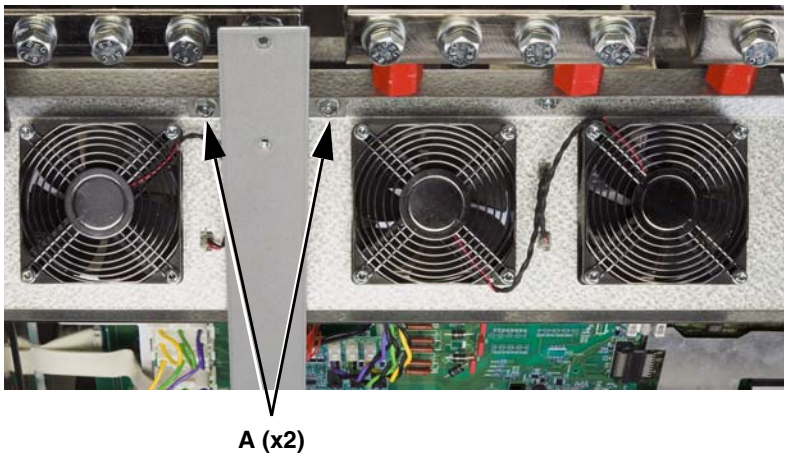
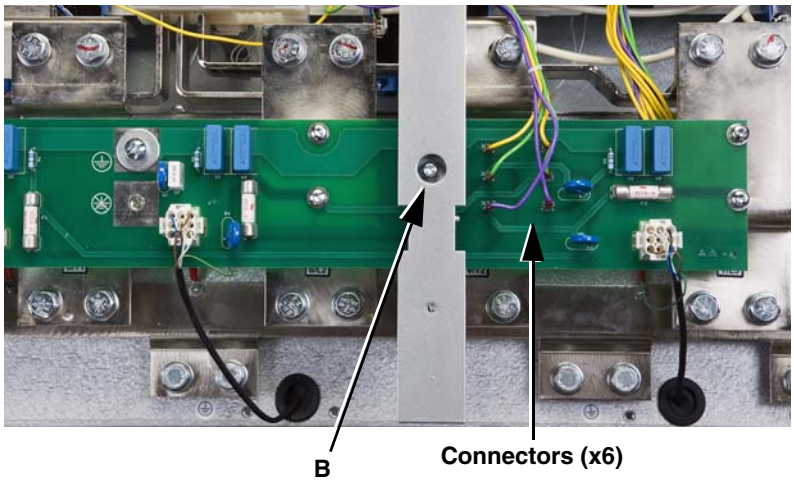


Figure 28: Middle Crossbrace Bottom



Replace the Power Terminal Shields

13. Replace the power terminal shields as illustrated in “Replacing the Power Terminal Shields” on page 23.

Replace the Front Cover

14. Replace the front cover. Using a size 2 Phillips driver, secure the front cover with thirteen screws. See Figure 8 on page 20. Tighten the screws to 5.5 N•m (48.7 lb-in).

Replacing the SCR Snubber Board VX4A1200

IMPORTANT: Label and retain all removed hardware and cables for use in reassembly.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Read and understand the precautions in "Before You Begin" starting on page 5 before performing this procedure.
- Before working on this equipment, turn off all power supplying it and perform the DC bus voltage measurement procedure on page 11.

Failure to follow these instructions will result in death or serious injury.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- When the controller is damaged, voltage may remain on certain energy storage capacitors after de-energization of the controller and discharge of the main capacitor bank.
- Before working on or near assemblies containing energy storage capacitors, verify that the capacitor voltages are less than 42 Vdc.
- The following assemblies have energy-storing capacitors:
  - — Filter board. See Figure 30 on page 38.
  - — SCR snubber board. See Figure 37 on page 41.
- Always check for the presence of voltage using a voltmeter set to the 1000 Vdc scale. When voltage is present, allow the voltmeter to discharge the capacitor's stored charge. Refer to "Discharging Stored Energy in Capacitors" on page 12.

Failure to follow these instructions will result in death or serious injury.

Remove the Front Cover

1. Using a size 2 Phillips driver, remove thirteen screws and take the front cover off the drive. See Figure 8 on page 20.

Remove the Power Terminal Shields

2. Remove the power terminal shields as illustrated in “Replacing the Power Terminal Shields” on page 23.

Remove the Middle Crossbrace

3. Remove the middle crossbrace as follows.
   - — Using a 10 mm socket wrench, remove two nuts (**A**) securing the crossbrace to the fan bracket. See Figure 29.
   - — Using a T-30 Torx driver, remove one screw (**B**) securing the crossbrace to the filter board. See Figure 30.
   - — Remove the crossbrace from the drive.

Figure 29: Middle Crossbrace Top

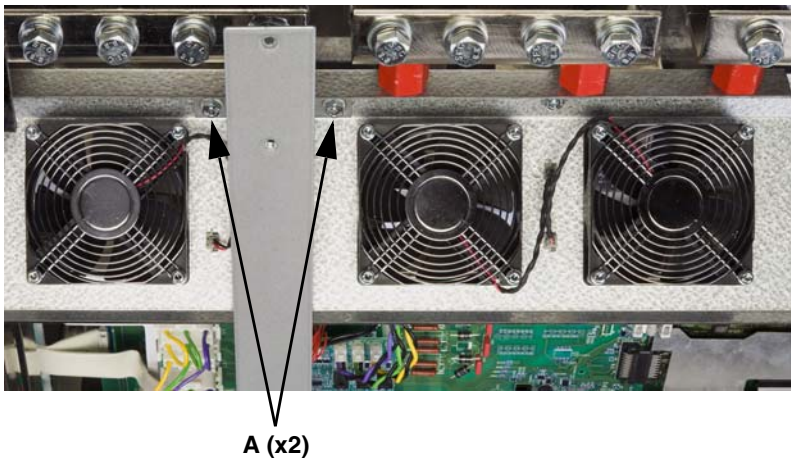
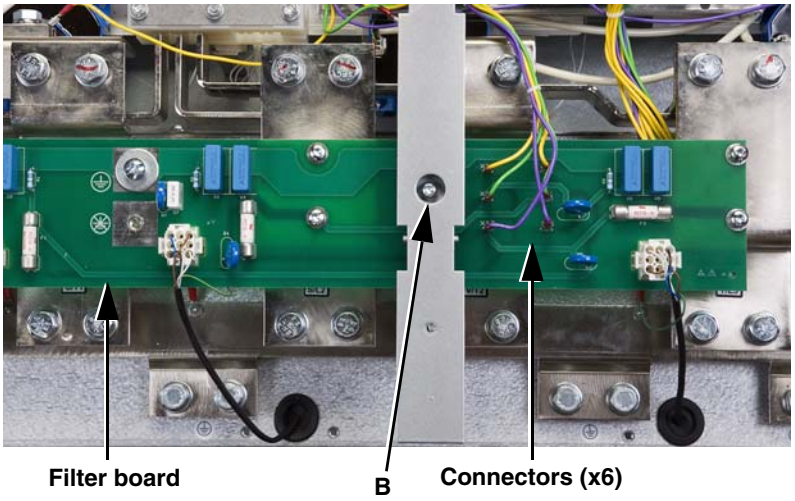


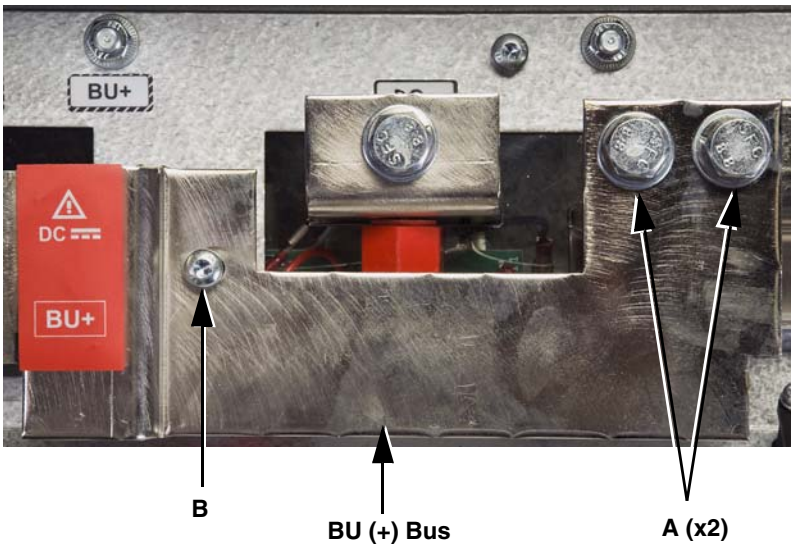
Figure 30: Middle Crossbrace Bottom



Remove the BU (+) Bus

4. Remove the BU (+) bus (located at the top of the drive) as follows. See Figure 31.
   - — Using an 18 mm socket wrench, remove two bolts and washers (**A**) securing the BU (+) bus to the PA/+ bus.
   - — Using a T-30 Torx driver, remove one screw (**B**) securing the BU (+) bus to the red insulator on the top terminal bracket.

Figure 31: BU (+) Bus

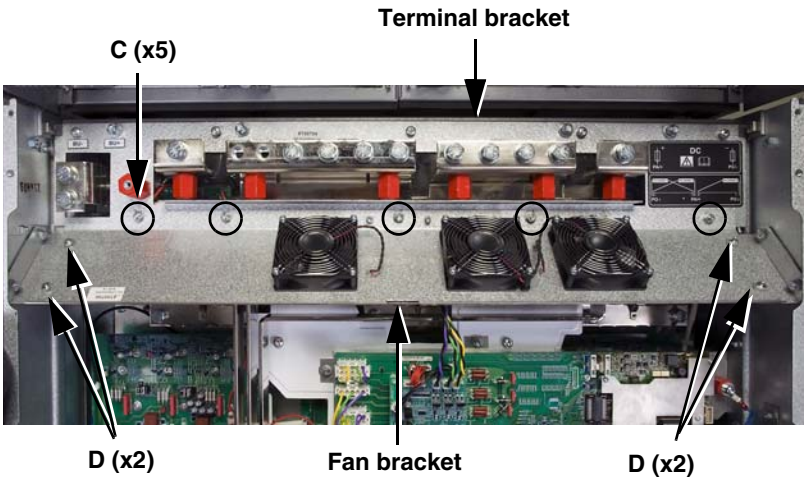


Remove the Fan Bracket

5. Using a 10 mm socket wrench, remove nine nuts (**C** and **D**, Figure 32) securing the fan bracket to the top terminal bracket and the drive frame.

   Disconnect the wires from the fan connectors on the back of the bracket, and remove the bracket from the drive.

Figure 32: Fan Bracket



Remove the Top Terminal Bracket

6. Remove the terminal bracket as follows.
   - — Using an 18 mm socket wrench, remove ten bolts (**A**) from the PO.1, PA/+, PC/-, and PO.2 bus bars. See Figure 33.
   - — Using a T-30 Torx driver, remove six screws (**B**) securing the PO.1, PA/+, PC/-, and PO.2 bus bars to the red insulators on the terminal brackets. See Figure 34.
   - — Using a T-30 Torx driver, remove five screws (**C**) securing the terminal bracket to the drive frame and remove the terminal bracket from the drive. See Figure 35.

Figure 33: Bus Bar Hardware, Front

Figure 34: Bus Bar Hardware, Top

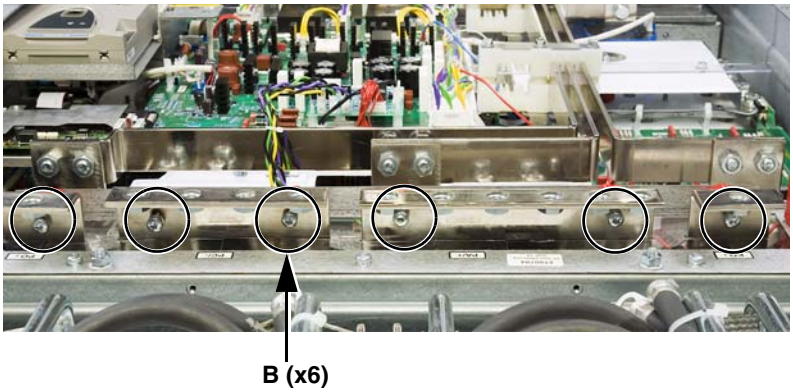
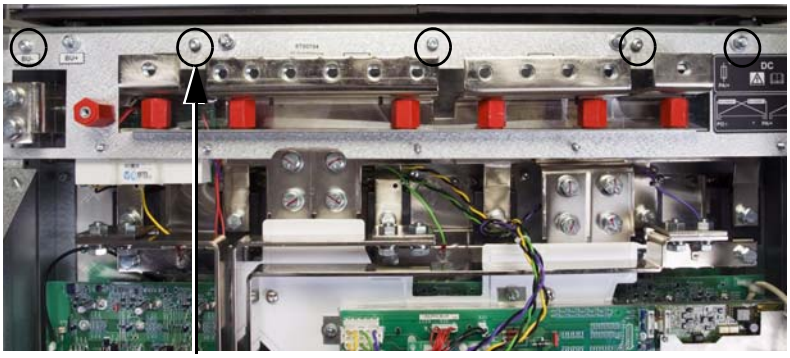


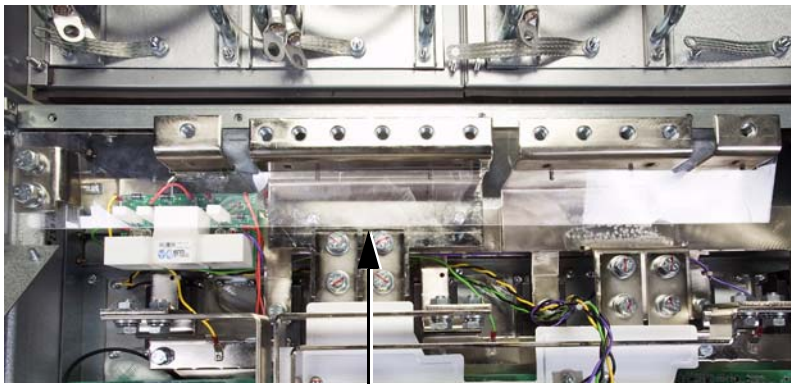
Figure 35: Top Terminal Bracket Hardware



Remove the Top Rectifier Shield

7. Remove the plastic rectifier shield from the bus bars. See Figure 36.

Figure 36: Top Rectifier Shield



Rectifier shield

Remove the SCR Snubber Board

Table 12: SCR Snubber Board Wiring

Wire No.[1]	Terminal No.	Description	To:
E131	**X1**	Yellow, 1-pin	U Line input bar
E130	**X4**	Red, 1-pin	PO.1 bus bar
E133	**X5**	Black, 1-pin	PC/- bus bar
E126	**X10**	Red, 0.25 in., 1-pin	GDB[2] U X61
E126	**X11**	Red, 0.19 in., 1-pin	PB[3] RFS31 + X11
E167	**L2**	Green	V Line input bar
E168	**X3**	Violet	W Line input bar

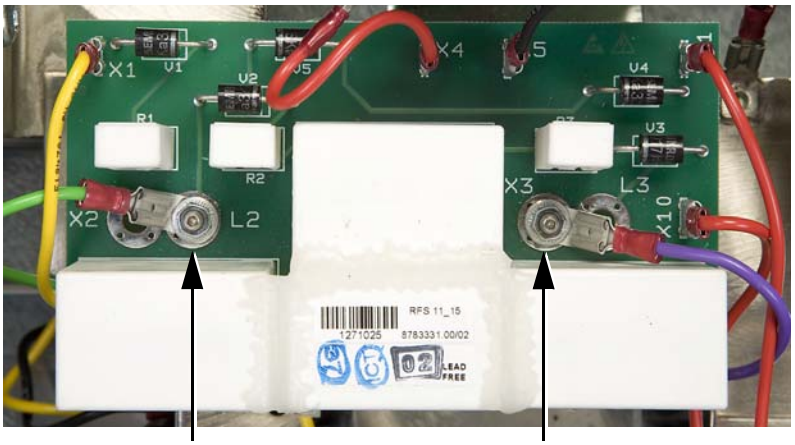
[1] See the schematic on page 152 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

[2] GDB: Gate driver board

[3] PB: Power board

8. Using needle-nose pliers, carefully remove the connections from SCR snubber board terminals X1, X4, X5, X10, and X11. See Table 12 and Figure 37 for the connection locations.

Figure 37: SCR Snubber Board

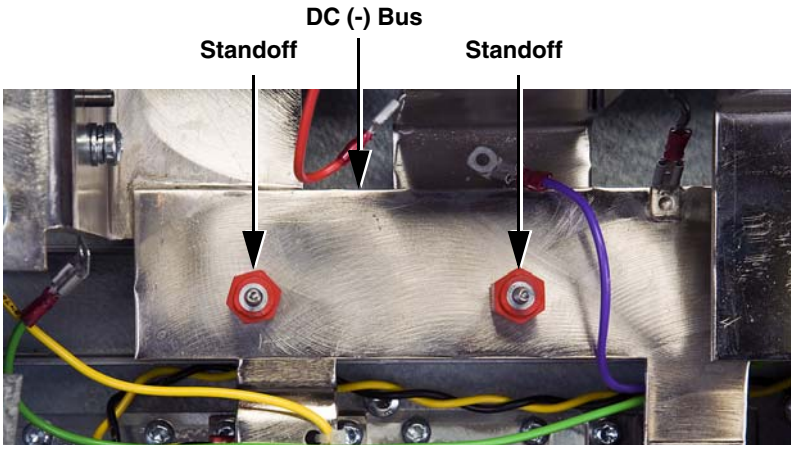


9. Using a 7 mm socket wrench, remove two bolts securing the snubber board to the insulators on the DC (-) bus and remove the wires from terminals L2 and X3. See Figure 37.
10. Remove the SCR snubber board from the drive.

Replace the SCR Snubber Board

11. Seat the SCR snubber board on the DC (-) bus standoffs. See Figure 38.

Figure 38: DC (-) Bus



12. Replace the wires at terminals L2 and X3. Using a 7 mm socket wrench, secure the wires and the snubber board to the DC (-) bus with two bolts. See Figure 37 on page 41. Tighten the bolts to 1.2 N•m (10.6 lb-in).
13. Replace the connections on SCR snubber board terminals X1, X4, X5, X10, and X11. See Table 12 and Figure 37 on page 41 for the terminal locations.

Replace the Top Rectifier Shield

14. Replace the plastic rectifier shield over the bus bars. See Figure 36 on page 41. If the rectifier shield is cracked, broken, or damaged, replace it with a piece from the plastic kit. See “Replacing the Plastic Parts Kit VY1A1406” on page 23.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Install the rectifier shield as shown in Figure 36 on page 41.
- Before installing the shield, ensure that it has no tears or cracks. If the shield is damaged, install a new piece from the plastic kit. See page 23.
- Do not install a damaged shield.

Failure to follow these instructions will result in death or serious injury.

Replace the Top Terminal Bracket

15. Replace the terminal bracket as follows.

— Using a T-30 Torx driver, secure the terminal bracket to the drive frame with five screws (**C**). See Figure 39. Tighten the screws to the torque values specified in Table 13.

— Using a T-30 Torx driver, secure the PO.1, PA/+, PC/-, and PO.2 bus bars to the red insulators on the terminal bracket with six screws (**B**). See Figure 40. Tighten the screws to the torque values specified in Table 13.

— Using an 18 mm socket wrench, replace ten bolts (**A**) in the PO.1, PA/+, PC/-, and PO.2 bus bars. See Figure 41. Tighten the bolts to the torque values specified in Table 13.

Table 13: Top Terminal Bracket and Bus Bar Hardware Torque Values

Item	Description	Torque Range	
		N•m	lb-in
A	(10) 18-mm bolts	45	398
B	(6) T-30 screws	5.5	48.7
C	(5) T-30 screws	5.5	48.7

Figure 39: Top Terminal Bracket Hardware

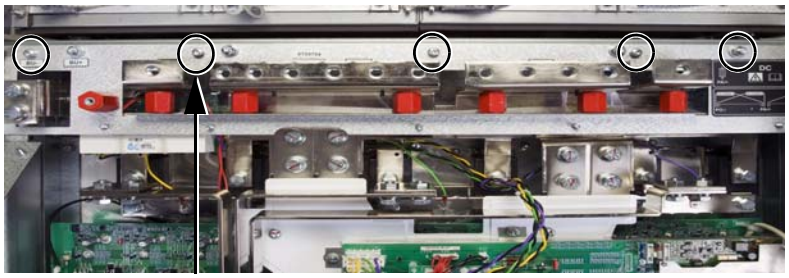


Figure 40: Bus Bar Hardware, Top

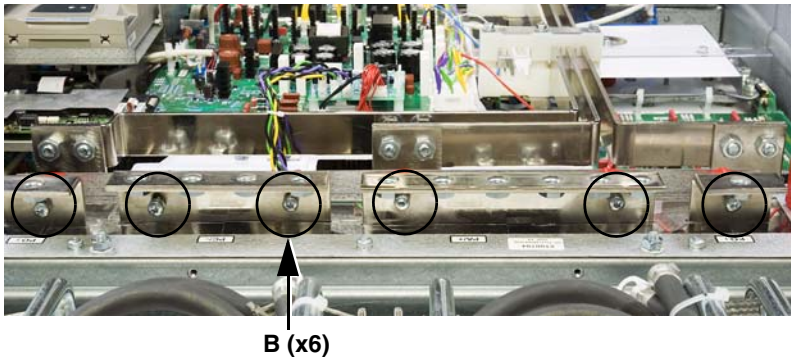
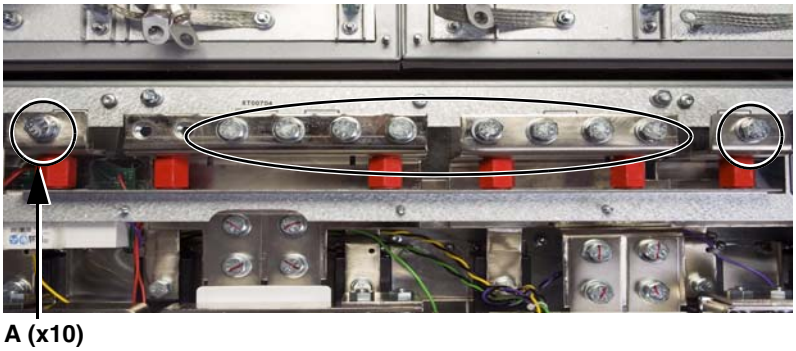


Figure 41: Bus Bar Hardware, Front



Replace the Fan Bracket

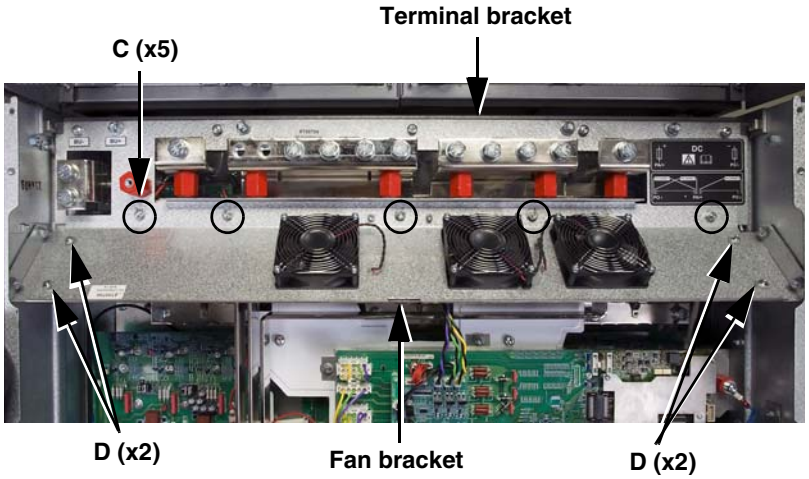
16. Connect wire E106 from power board terminals X21 and X22 to the fan connectors on the back of the fan bracket.

    Using a 10 mm socket wrench, secure the fan bracket to the top terminal bracket and the drive frame with nine nuts (**C** and **D**, Figure 42). Tighten the nuts to the torque values specified in Table 14.

Table 14: Fan Bracket and BU (+) Bus Hardware Torque Values

Item	Description	Torque Range	
		N•m	lb-in
A	(2) 18-mm bolts and washers	45	398
B	(1) T-30 screw	5.5	48.7
C	(5) 10-mm nuts	5.5	48.7
D	(4) 10-mm nuts	5.5	48.7

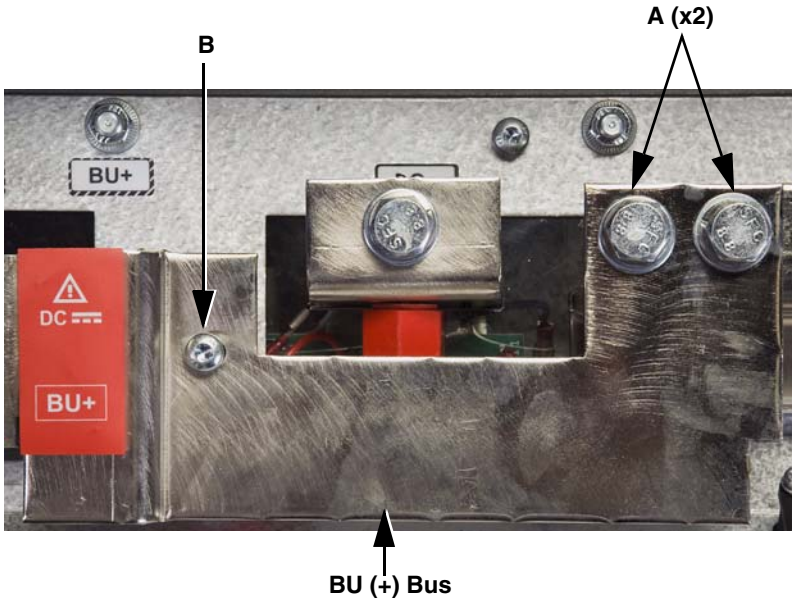
Figure 42: Fan Bracket



Replace the BU (+) Bus

17. Replace the BU (+) bus as follows. See Figure 43.
    - — Using an 18 mm socket wrench, secure the BU (+) bus to the PA/+ bus with two bolts and washers (**A**).
    - — Using a T-30 Torx driver, secure the BU (+) bus to the red insulator on the top terminal bracket with one screw (**B**).
    - — Tighten the hardware to the torque values specified in Table 14.

Figure 43: BU (+) Bus



Replace the Middle Crossbrace

18. Replace the middle crossbrace as follows.
    - — Using a 10 mm socket wrench, secure the crossbrace to the fan bracket with two nuts (**A**). See Figure 44.
    - — Using a T-30 Torx driver, secure the crossbrace to the filter board with one screw (**B**). See Figure 45.
    - — Tighten the hardware to the torque values specified in Table 15.

Table 15: Crossbrace Hardware Torque Values

Item	Description	Torque Range	
		N•m	lb-in
A	(2) 10 mm nuts	5.5	48.7
B	(1) T-30 screw	5.5	48.7

Figure 44: Middle Crossbrace Top

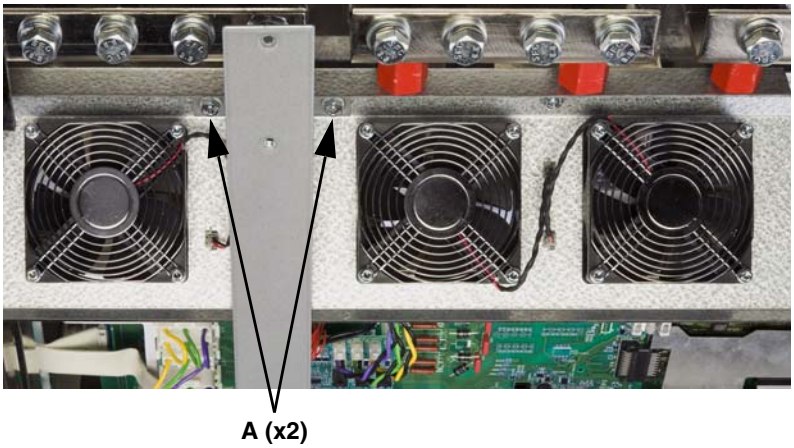
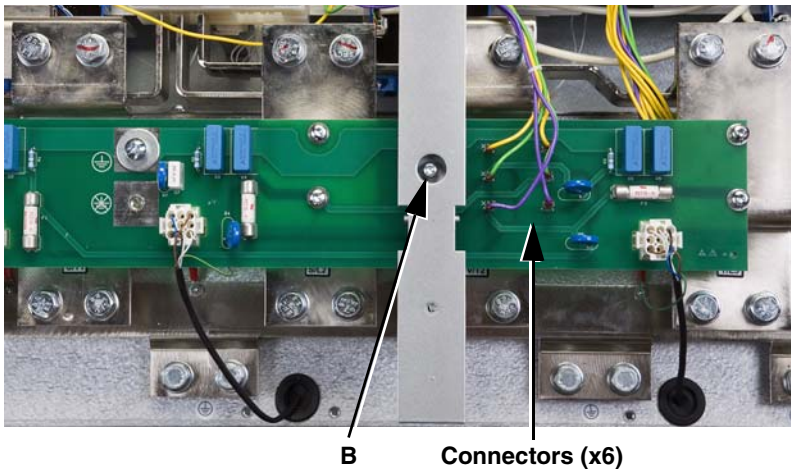


Figure 45: Middle Crossbrace Bottom



Replace the Power Terminal Shields

19. Replace the power terminal shields as illustrated in “Replacing the Power Terminal Shields” on page 23.

Replace the Front Cover

20. Replace the front cover. Using a size 2 Phillips driver, secure the front cover with thirteen screws. See Figure 8 on page 20. Tighten the screws to 5.5 N•m (48.7 lb-in).

Installation Procedures for Level 2 Parts

The level 2 parts are under the control module assembly, the bus assembly, or the fan plate. They are:

Power board	Power IGBT modules
Power board assembly shields	Capacitors
Motor current sensors	SCR modules
Gate driver boards	Diode modules
Temperature sensors	

You must remove equipment from the drive as described in the following section to access the level 2 parts.

Disassembly Steps for Accessing Level 2 Parts

IMPORTANT: Label and retain all removed hardware and cables for use in reassembly.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Read and understand the precautions in "Before You Begin" starting on page 5 before performing this procedure.
- Before working on this equipment, turn off all power supplying it and perform the DC bus voltage measurement procedure on page 11.

Failure to follow these instructions will result in death or serious injury.

This section contains instructions for removing the following parts from the drive:

❑ Front cover	❑ Input bus bar brackets
❑ Power terminal shields	❑ L1, L2, L3 input bus bars
❑ EMC tray	❑ Filter board
❑ Middle crossbrace	❑ Motor current sensors
❑ Control module assembly	❑ BU (+) bus
❑ Soft charge board connections	❑ Fan bracket
❑ Power board connections	❑ Top DC bus plate
❑ Fan control board connections	❑ Gate driver boards
❑ Power board assembly	❑ Bottom DC bus plate

You must perform some or all of the steps in this section to access the level 2 parts. Consult Table 16 for the disassembly steps that must be performed to access the spare parts you are replacing.

Table 16: Disassembly Steps

If you are replacing:	Perform disassembly steps:	Then follow procedure:
Power board VX5A1HC3140	**Steps 1–5**	"Replacing the Power Board VX5A1HC3140" beginning on page 77
Brake board VZ3F1113	**Steps 1–5**	"Replacing the Brake Board VZ3F1113" beginning on page 81

Table 16: Disassembly Steps *(continued)*

If you are replacing:	Perform disassembly steps:	Then follow procedure:
Power board assembly shields (Plastic Parts Kit VY1A1406)	**Steps 1–9**	"Replacing the Power Board Assembly Shields" beginning on page 82
Motor current sensors VY1A1109	**Steps 1–19**	"Replacing the Motor Current Sensors VY1A1109" beginning on page 92
Gate driver boards VX5A1203	**Steps 1–23**	"Replacing the Gate Driver Boards VX5A1203" beginning on page 94
SCR modules VZ3TM1600M1671	**Steps 1–23**	"Replacing the SCR Modules and Diode Modules (VZ3TM1600M1671 and VZ3DM1600M1671)" beginning on page 105
Diode modules VZ3DM1600M1671		
Temperature sensors VZ3G1104	**Steps 1–24**	"Replacing the Temperature Sensors, VZ3G1104" beginning on page 98
Power IGBT modules VZ3IM1603M1271	**Steps 1–25**	"Replacing the Power IGBT Modules VZ3IM1603M1271" beginning on page 100
Capacitors VY1ADC1114		"Replacing the Capacitors VY1ADC1114" beginning on page 103

Remove the Front Cover

1. Using a size 2 Phillips driver, remove thirteen screws and take the front cover off the drive. See Figure 8 on page 20.

Remove the Power Terminal Shields

2. Remove the power terminal shields as follows:
   - The right terminal shield has two tabs (**B**) on the right side that fit into slots on the conduit tray, and two tabs (**C**) on the left side that fit into slots on the middle crossbrace. See Figure 46.
   - The left terminal shield has two tabs on the right (**D**) that fit into retaining slots in the middle crossbrace and two mounting holes (**E**) on the left that fit over posts on the side panel of the drive. See Figures 47 and 48 on page 49.
   - Disengage the shields and remove them from the drive.

Figure 46: Right Terminal Shield

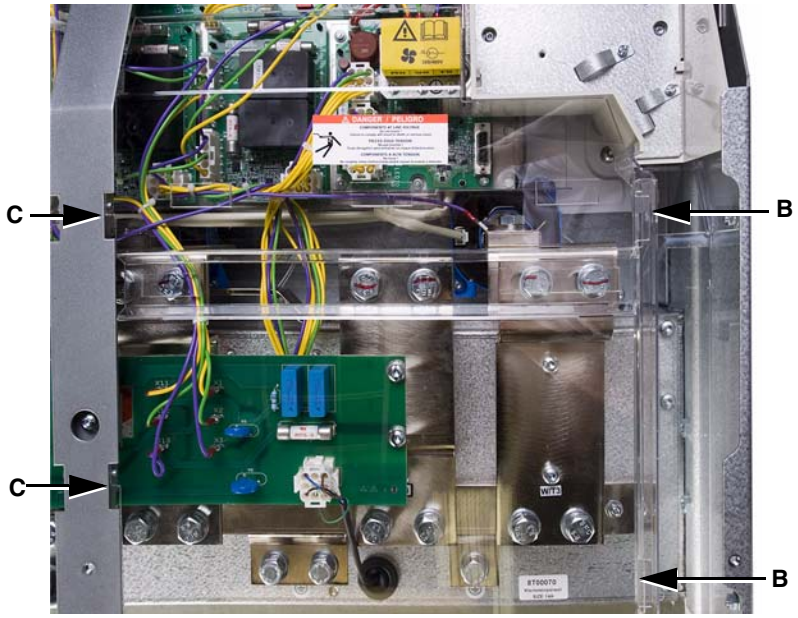


Figure 47: Left Terminal Shield

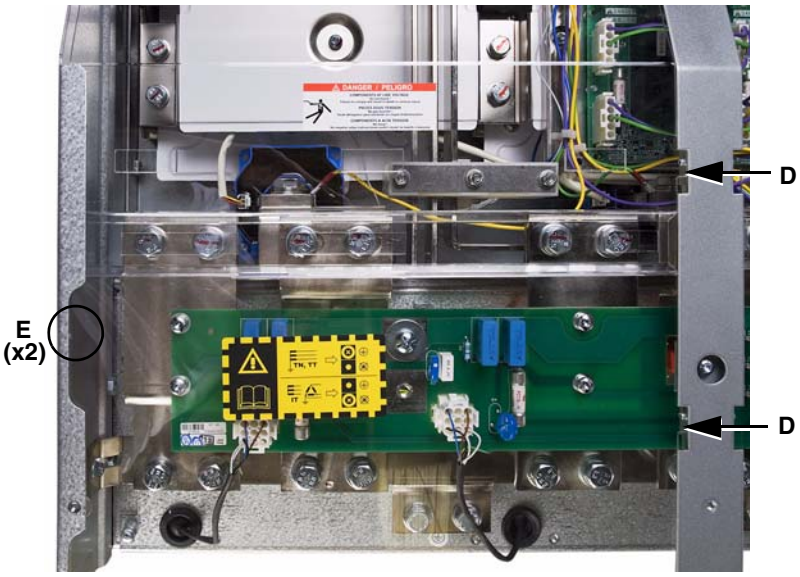
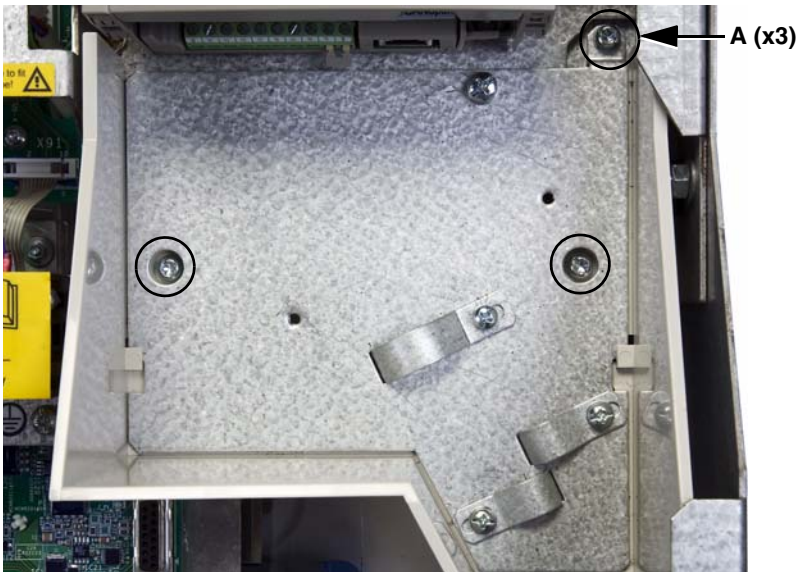


Figure 48: Terminal Shield Retaining Posts

Remove the EMC Tray

3. Using a T-20 Torx driver, remove three screws (**A**) securing the EMC tray to the control module mounting plate and remove the tray from the drive. See Figure 49.

Figure 49: EMC Tray



Remove the Middle Crossbrace

4. Remove the middle crossbrace as follows.
   - — Using a 10 mm socket wrench, remove two nuts (**A**) securing the crossbrace to the fan bracket. See Figure 50.
   - — Using a T-30 Torx driver, remove one screw (**B**) securing the crossbrace to the filter board. See Figure 51.
   - — Remove the crossbrace from the drive.

Figure 50: Middle Crossbrace, Top

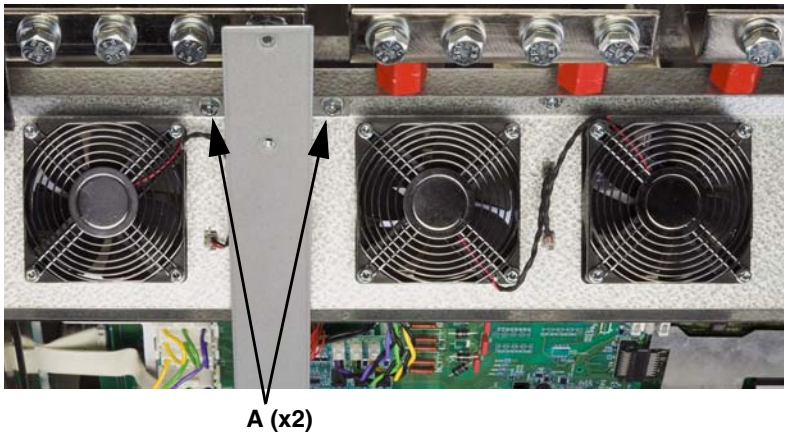
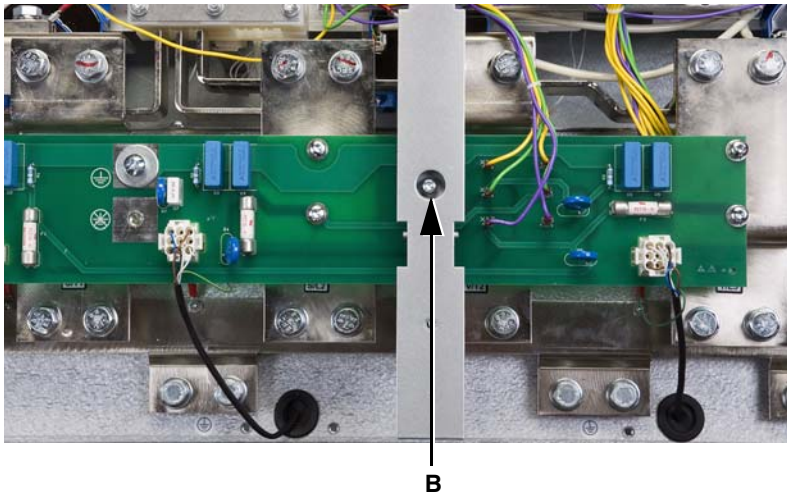


Figure 51: Middle Crossbrace, Bottom



Remove the Control Module Assembly

5. Remove the control module assembly as follows.
   - — Remove the 5-pin connector from terminal X4 of fan control boards 1 and 2. See Figure 52.
   - — Remove the 26-pin ribbon cable from motor control board terminal X3. See Figure 53.

Figure 52: Fan Control Boards 1 and 2, Terminal X4

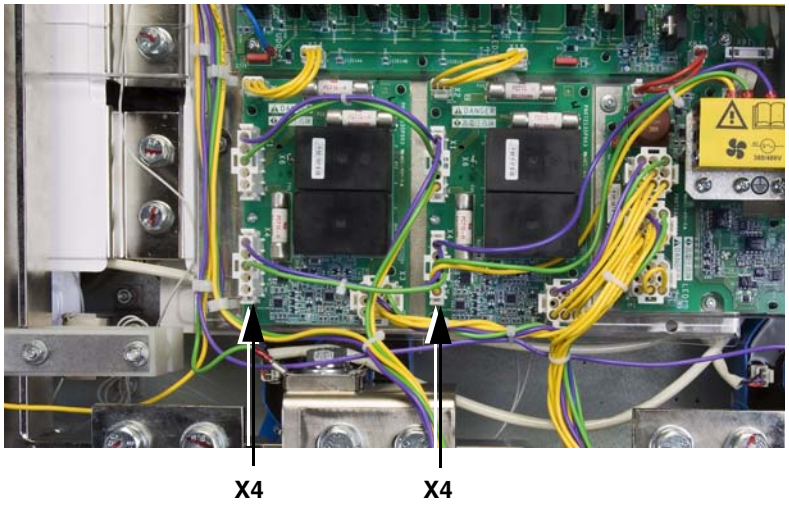
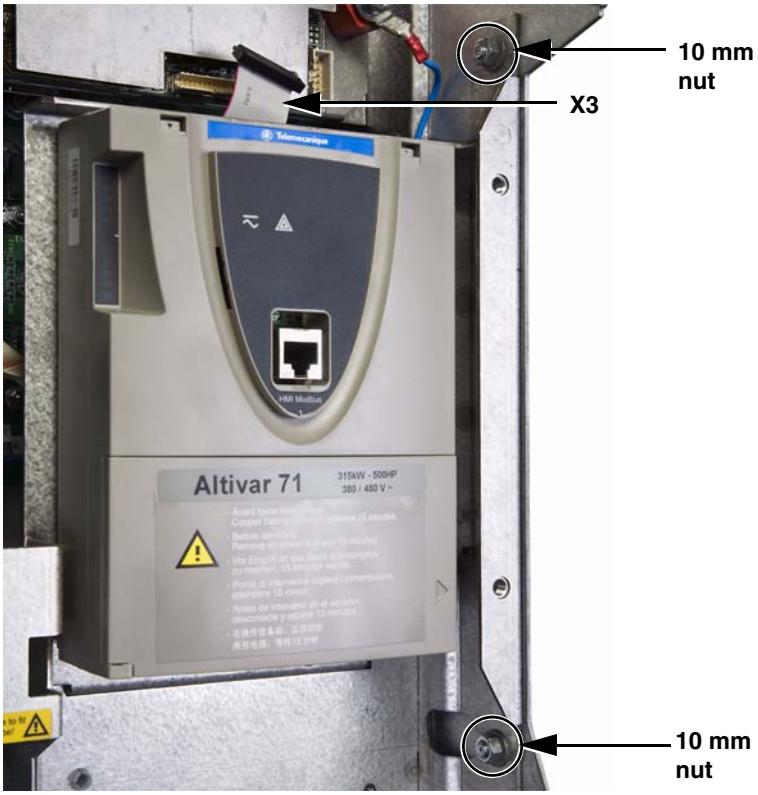


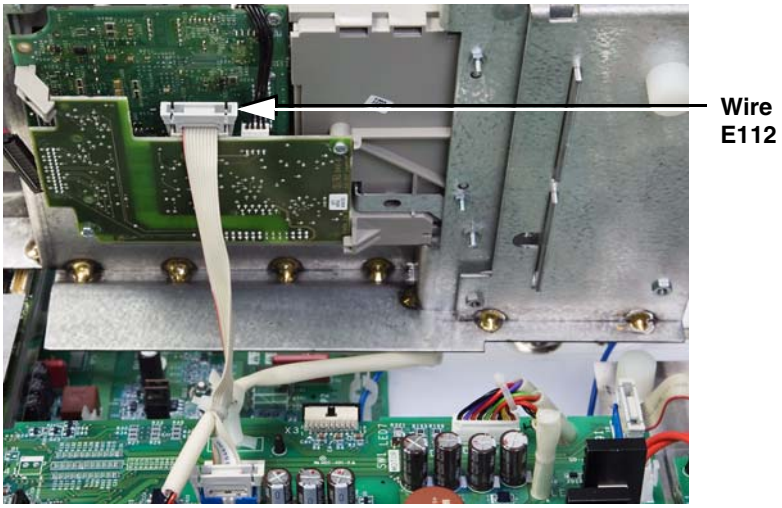
Figure 53: Control Module Assembly, Front



— Using a 10 mm socket wrench, remove two nuts securing the control module assembly to the drive frame. See Figure 53 on page 51.

— Turn the assembly over, disconnect the ribbon cable from the back (wire E112**,** Figure 54), and remove the assembly from the drive.

Figure 54: Control Module Assembly Back



NEXT STEP: If you are replacing the power board, skip to “Replacing the Power Board VX5A1HC3140” beginning on page 77.

If you are replacing the brake board, skip to “Replacing the Brake Board VZ3F1113” beginning on page 81.

Remove the Soft Charge Board Connections

Table 17: Soft Charge Board Wiring

Wire No.[1]	Terminal No.	Description	To:
E110	**CN2A**	9-pin, red	PB[2] X30 (9-pin)
E109	**CNL3G**	2-pin, violet/black	SCR[3] 3 Terms. 4 & 5
E108	**CNL2G**	2-pin, green/black	SCR 2 Terms. 4 & 5
E107	**CNL1G**	2-pin, yellow/black	SCR 1 Terms. 4 & 5
E111	**CN7A**	2-pin, black	PB X31
—	**CNP**	Not used	—

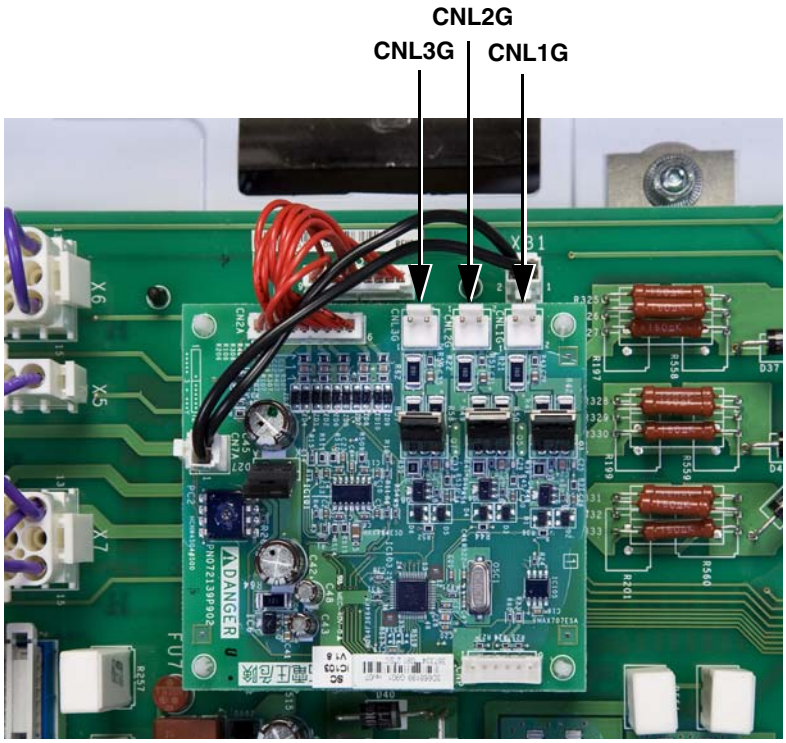
1 See the schematic on page 152 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

2 PB: Power board

3 SCR: Silicon controlled rectifier

6. Using needle-nose pliers, remove soft charge board connections CNL1G, CNL2G, and CNL3G. See Figure 55 for terminal locations.

Figure 55: Soft Charge Board Connections



Remove the Power Board Connections

NOTE: Take care not to damage the LED (see Figure 56) when removing, handling, or installing the power board.

Table 18: Power Board Wiring

Wire No.[1]	Terminal No.	Description	To:
E103	**X11**	9-pin, multi color	Motor current sensors
E136	**UD0**	1-pin, blue	Phase W DC bus plate
E126	**RFS 31+ X11**	1-pin, red	SB[2] X11
E141	**UD -R1**	1-pin, white	Bleeder resistor 1
E142	**X3**	18-pin, gray	GDB[3] W X32
E112	**X4**	10-pin, gray	Control module
E150	**X5**	5-pin, yellow/green/ violet	Output bus bars T1, T2, T3
E120	**X7**	15-pin, yellow/green/ violet	Filter board X11, X12, X13
E100	**X8**	14-pin, white	GDB U X82
E106	**X21**	2-pin, red/black	Internal fan
E106	**X22**	2-pin, red/black	Internal fan

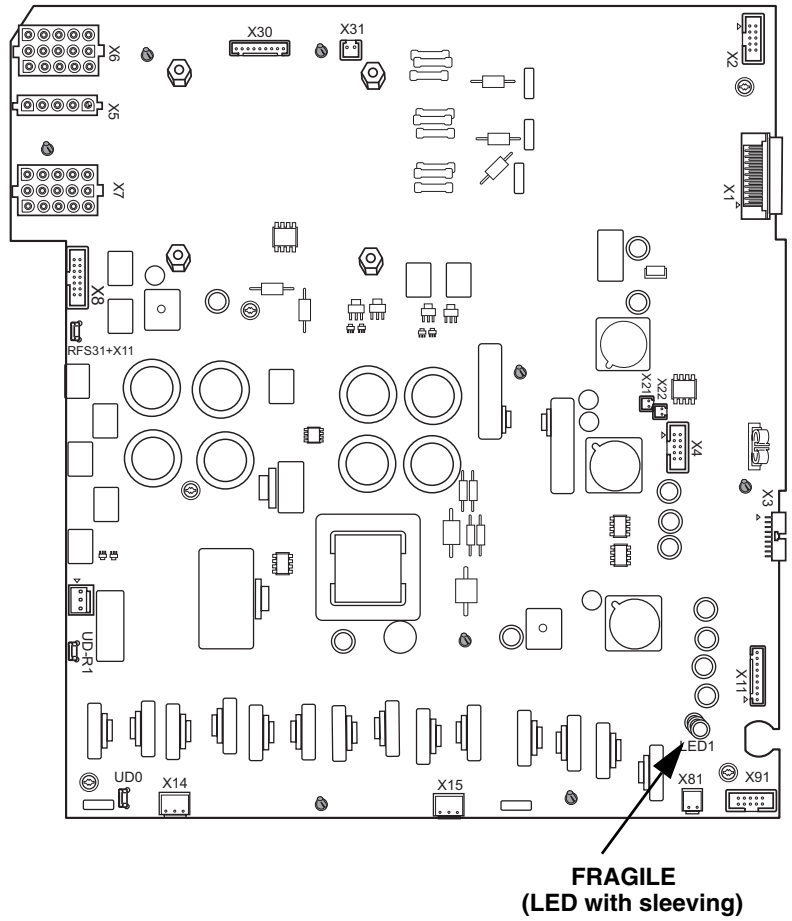
1 See the schematic on page 152 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

2 SB: SCR snubber board

3 GDB: Gate driver board

7. Using needle-nose pliers, carefully remove the power board connections listed in Table 18. See Figure 56 for the connection locations.

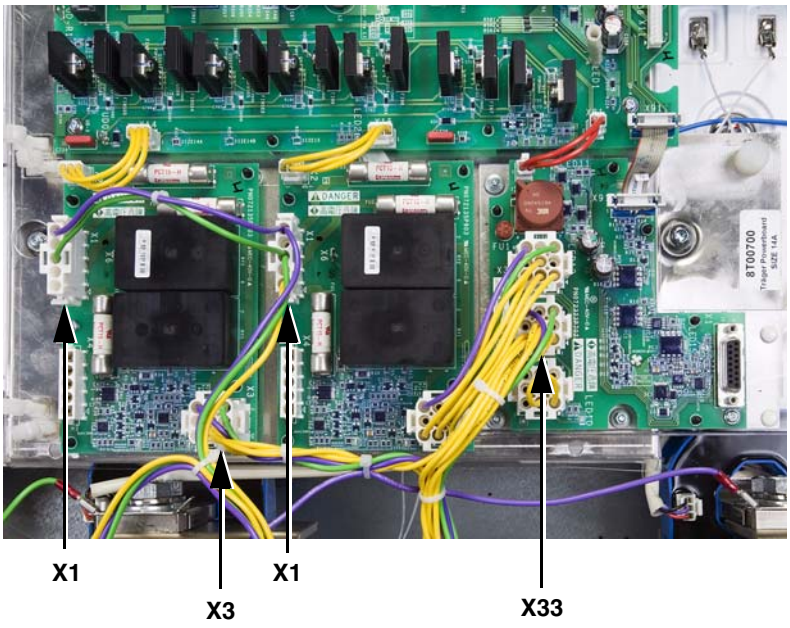
Figure 56: Power Board Connections



Remove the Fan Control Board Connections

8. Remove the following connections. See Figure 57 for terminal locations.
   - — Remove the connections from terminal X1 of fan control boards 1 and 2.
   - — Remove the connection from terminal X3 of fan control board 1.
   - — Remove the connection from terminal X33 of the brake board.

Figure 57: Fan Control Board and Brake Board Connections

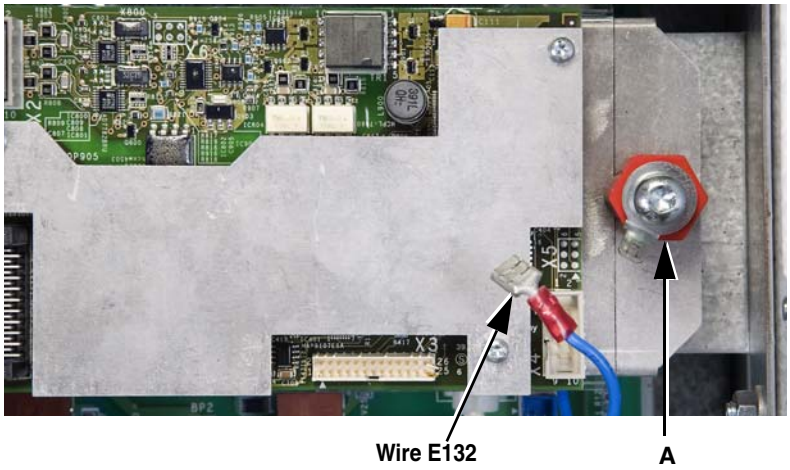


Remove the Power Board Assembly

NOTE: The power board assembly consists of the power board, the motor control board, fan control boards 1 and 2, and the brake board.

9. Remove the power board assembly as follows.
   - — Disconnect wire E132 (see Figure 58) near the motor control board. The wire originates from terminal X53 on gate driver board W.
   - — Using a 21 mm socket wrench, remove the red insulator (**A,** Figure 58).

Figure 58: Wire E132 Connection



   - — Using a T-10 Torx driver, remove one screw (**B**, Figure 59) from power board terminal UD+1.
   - — Using a 10 mm socket wrench, remove three nuts (**C**, Figure 60 on page 57) securing the power board assembly to the bus plate assembly.
   - — Using a T-30 Torx driver, remove one screw and washer (**D**, Figure 60) securing the power board assembly to the phase W DC bus plate.
   - — Remove the power board assembly from the drive.

Figure 59: Power Board, Terminal UD+1

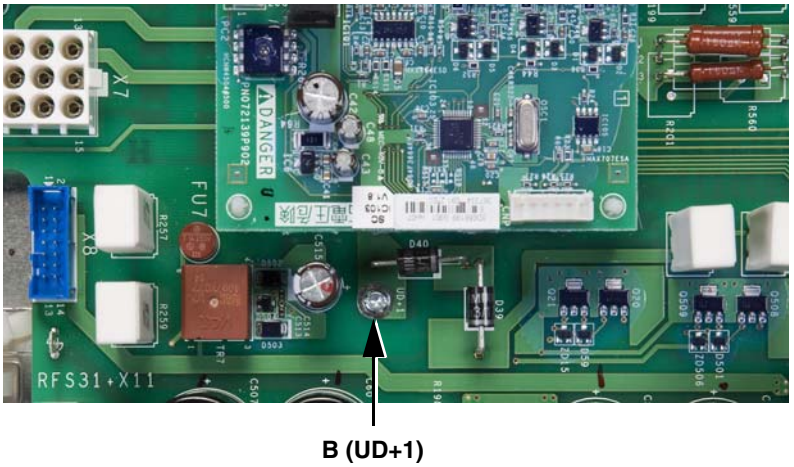
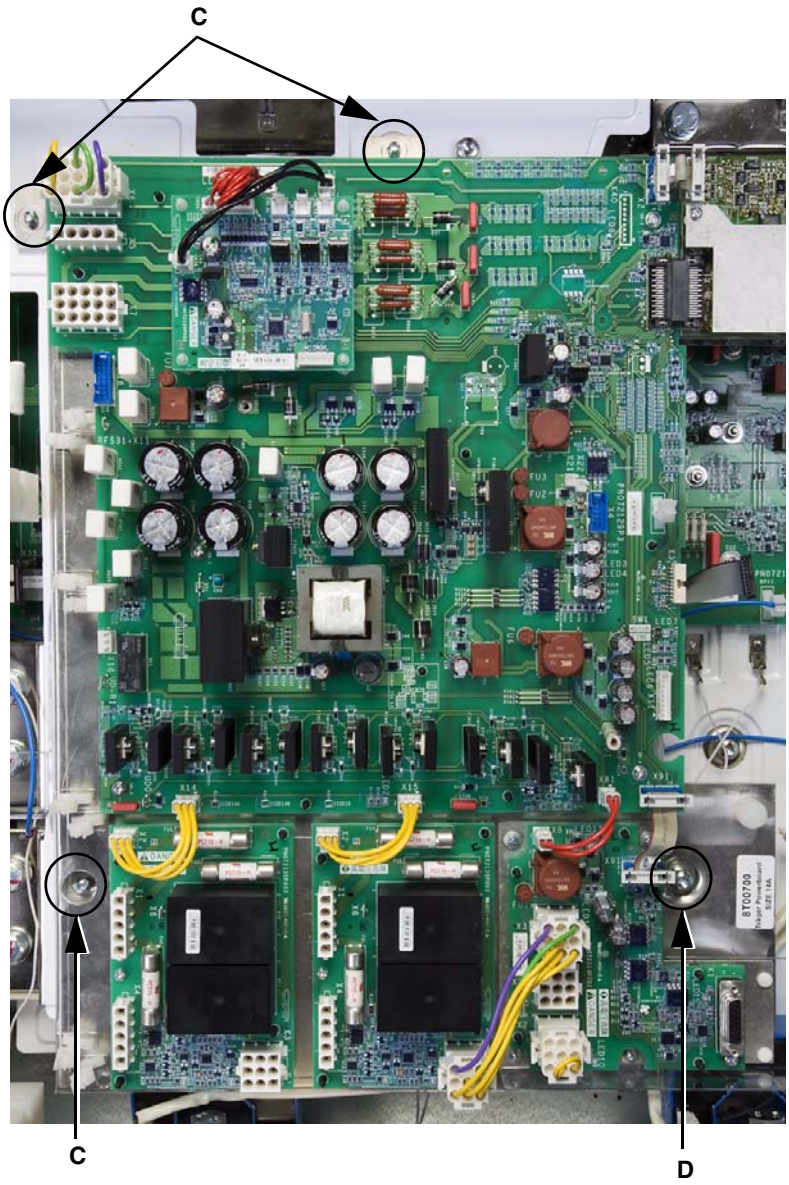


Figure 60: Power Board Assembly

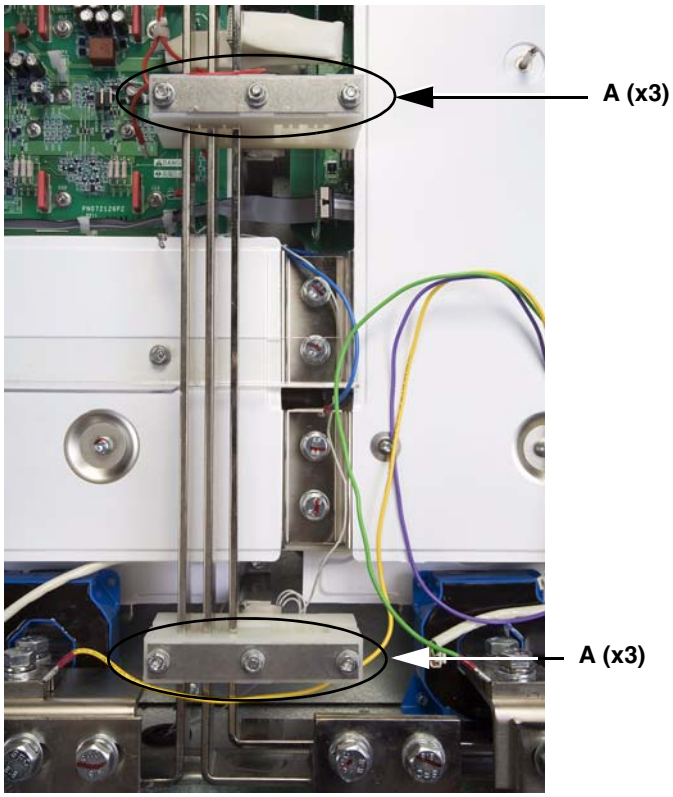


NEXT STEP: If you are replacing the power board assembly plastic shields, skip to “Replacing the Power Board Assembly Shields” beginning on page 82.

Remove the Input Bus Bar Brackets

10. Using a 10 mm socket wrench, remove six nuts (**A**) securing the two halves of the input bus bar brackets, and remove the top part of the brackets. See Figure 61.

Figure 61: Input Bus Bar Brackets (Top)



Remove the L3 Input Bus Bar

11. Remove the L3 input bus bar as follows.

— Using an 18 mm socket wrench, remove four bolts and washers securing the L3 bus bar to the rectifier line input (**B**, Figure 62) and the L3 line input **(C**, Figure 63).

Figure 62: L3 Bus Bar Rectifier Line Input Connections

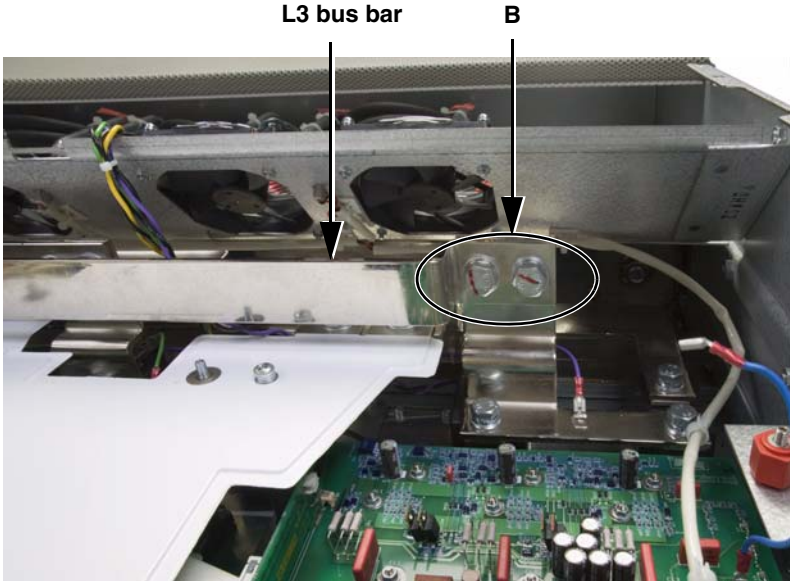
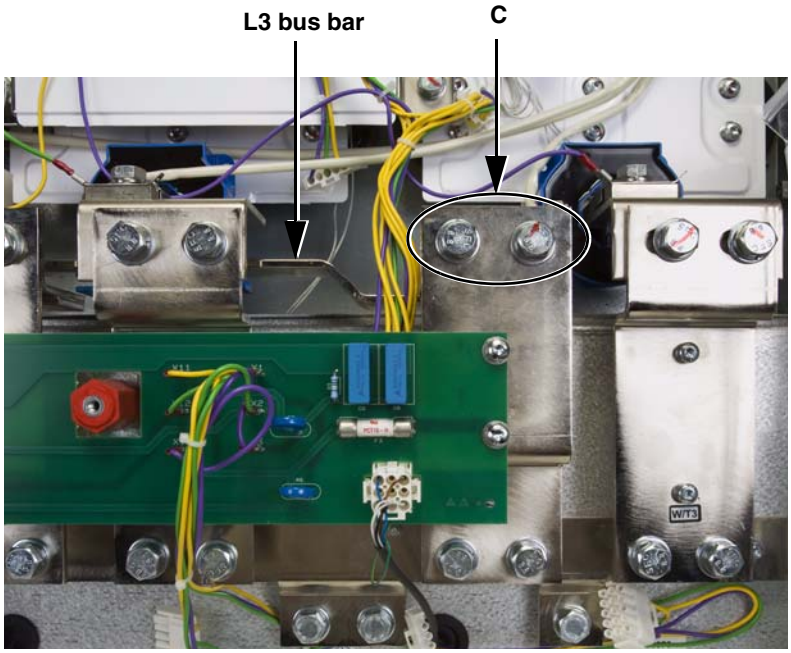


Figure 63: L3 Bus Bar Line Input Connections



— Using an 18 mm socket wrench, remove two bolts and washers (**D,** Figure 64) securing the V-phase DC bus plate to the L-shaped bracket on the V/T2 output.

NOTE: An output sensor plate (**E,** Figure 64) with a green lead is under the front bolt. Remove the sensor plate.

— Using an 18 mm socket wrench, remove two bolts and washers (**F,** Figure 65) securing the L -shaped bracket to the V/T2 output and remove the bracket.

— Remove the L3 input bus bar from the drive.

Figure 64: V/T2 Output and L-Bracket, Top

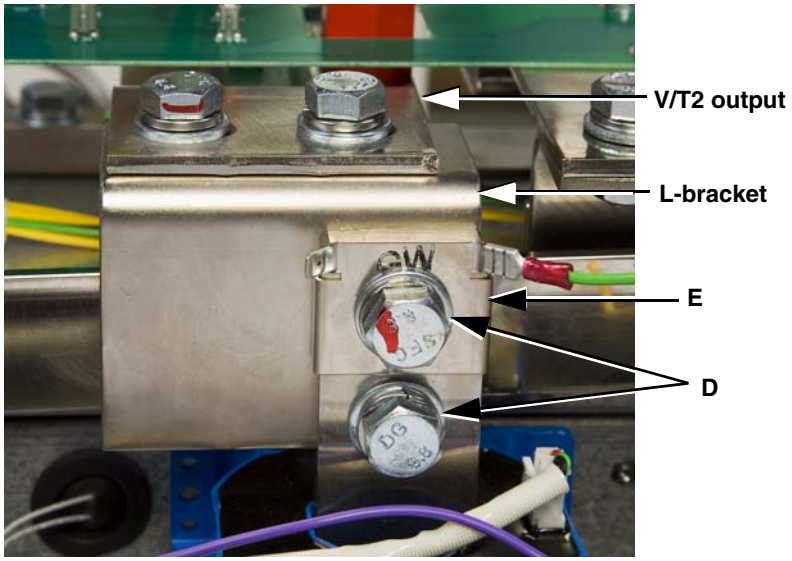
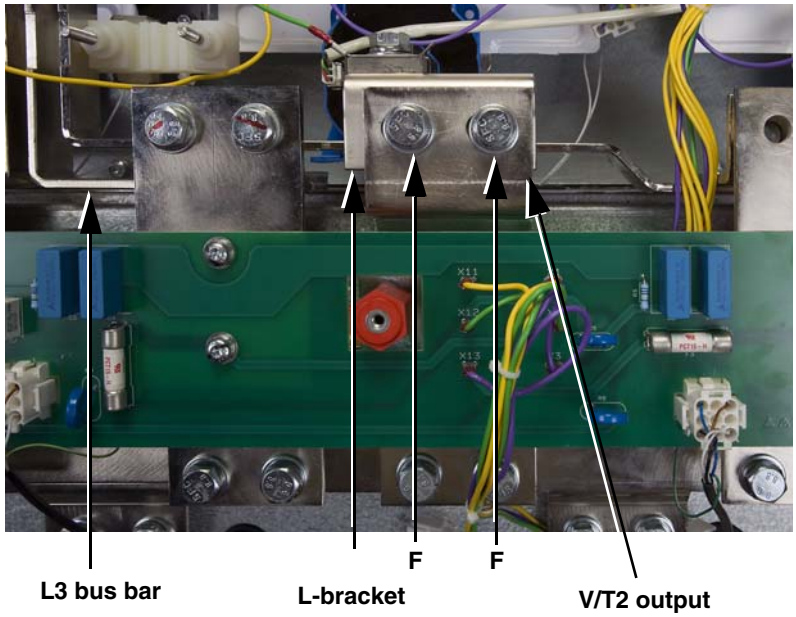


Figure 65: V/T2 Output and L-Bracket, Front



Remove the L2 Input Bus Bar

12. Remove the L2 input bus bar as follows.

— Using an 18 mm socket wrench, remove four bolts and washers securing the L2 input bus bar to the rectifier line input (**A**, Figure 66) and the L2 line input (**B**, Figure 67).

— Remove the L2 input bus bar from the drive.

Figure 66: L2 Bus Bar Rectifier Line Input Connections

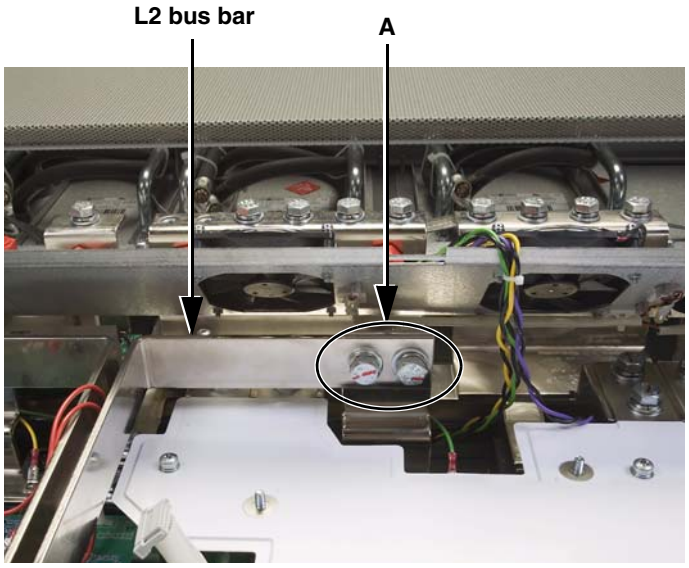
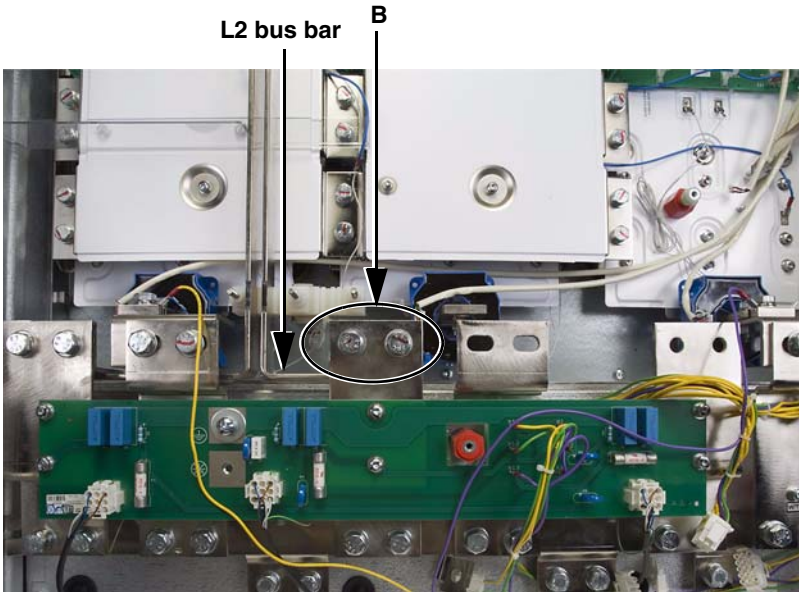


Figure 67: L2 Bus Bar Line Input Connections



Remove the L1 Input Bus Bar

13. Remove the L1 input bus bar as follows.

    — Using an 18 mm socket wrench, remove four bolts and washers securing the L1 input bus bar to the rectifier line input (**A**, Figure 68) and the L1 line input (**B**, Figure 69).

Figure 68: L1 Bus Bar Rectifier Line Input Connections

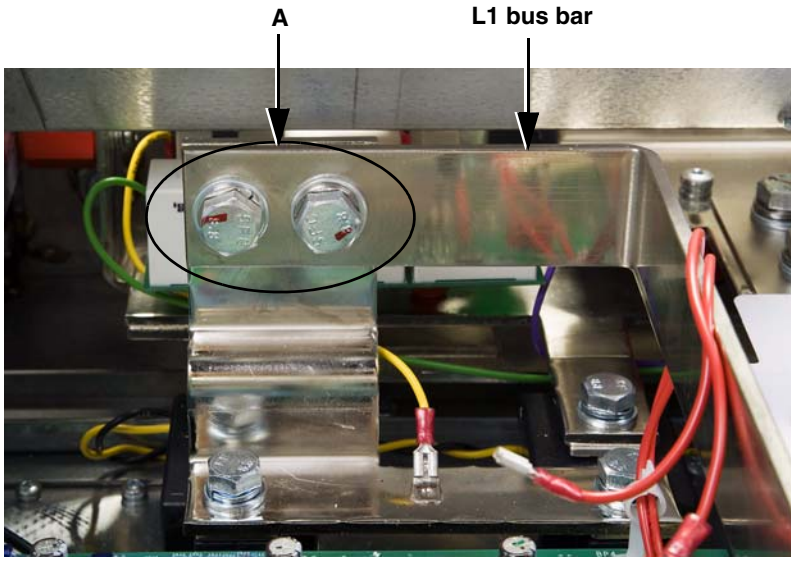
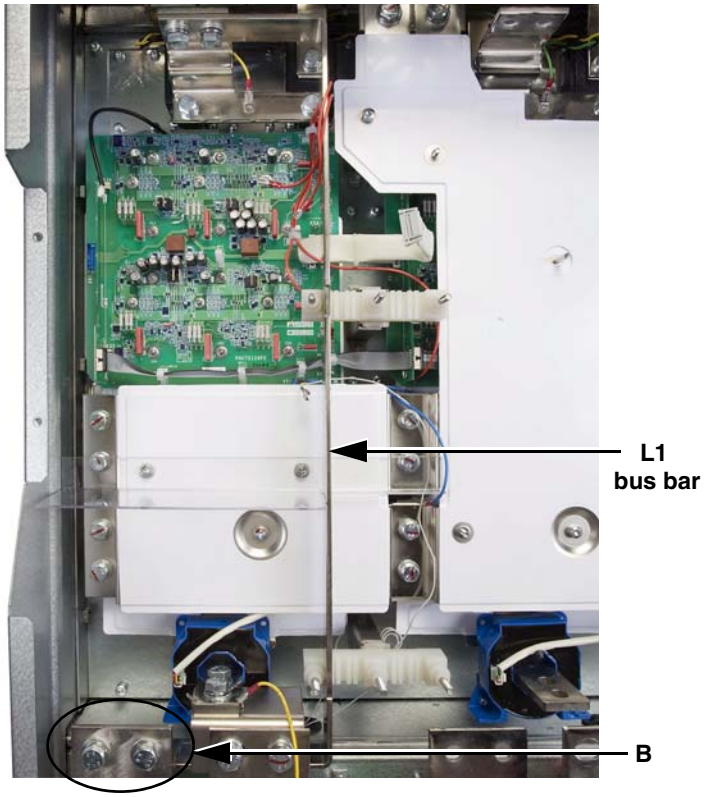


Figure 69: L1 Bus Bar Line Input Connections



— Using an 18 mm socket wrench, remove two bolts and washers (**D,** Figure 70) securing the U-phase DC bus plate to the L-shaped bracket on the U/T1 output.

NOTE: An output sensor plate (**E,** Figure 70) with a yellow lead is under the front bolt. Remove the sensor plate.

— Using an 18 mm socket wrench, remove two bolts and washers (**F,** Figure 71) securing the L -shaped bracket to the U/T1 output and remove the bracket.

— Remove the L1 input bus bar from the drive.

Figure 70: U/T1 Output and L-Bracket, Top

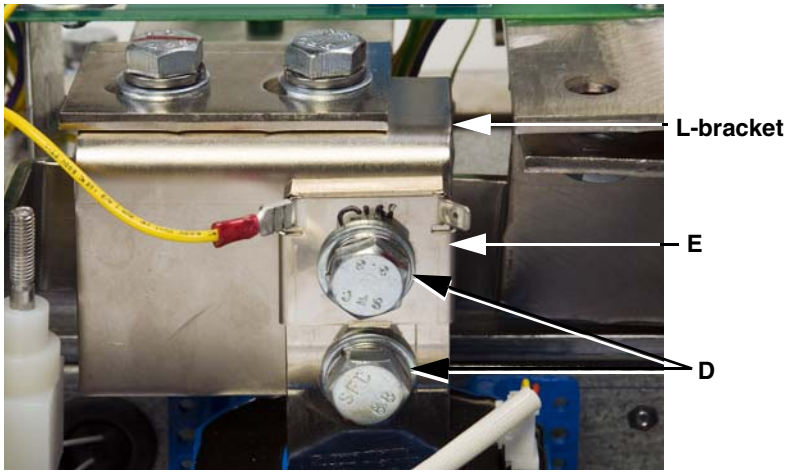
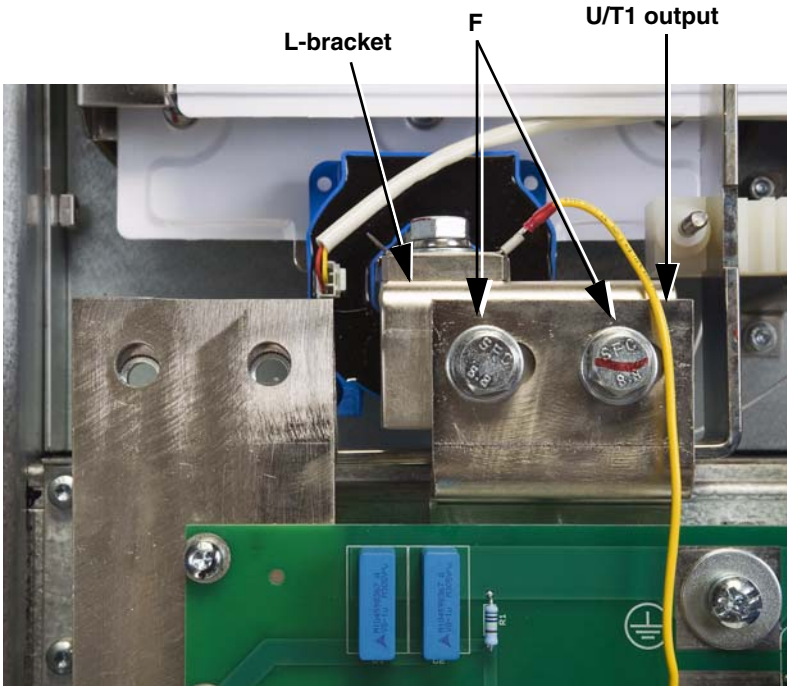


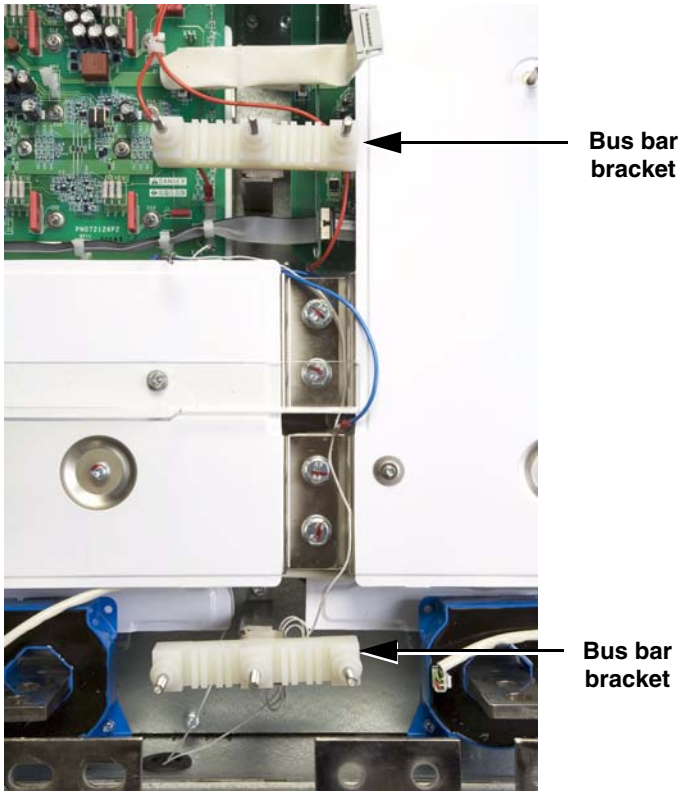
Figure 71: U/T1 Output and L-Bracket, Front



Remove the Input Bus Bar Brackets (Bottom)

14. Remove the bottom half of the bus bar mounting brackets from the mounting posts on the drive frame. See Figure 72.

Figure 72: Input Bus Bar Brackets, Bottom



Remove the Filter Board

15. Remove the filter board as follows.

— Using a T-30 Torx driver, remove six screws (**A**, Figure 73) securing the filter board to input bus bars R/L1, S/L2, and T/L3.

— Using a size 3 Phillips driver, remove the grounding screw and washer (**B,** Figure 73) securing the filter board to the drive frame.

> **NOTE:** Note whether the screw (**B**) is installed in the grounded or non-grounded position for reinstallation. Figure 73 shows the screw in the grounded position.

— Move the filter board under the terminals and out of the way. See Figure 74.

Figure 73: Filter Board

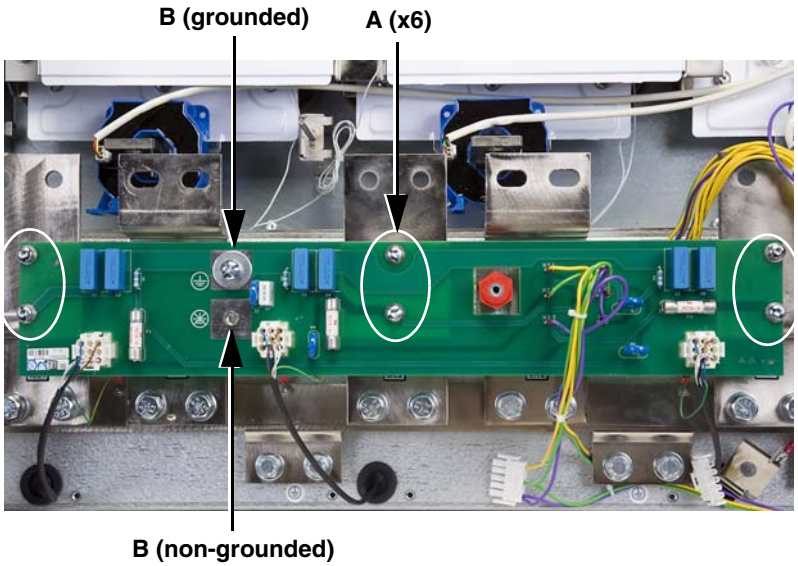
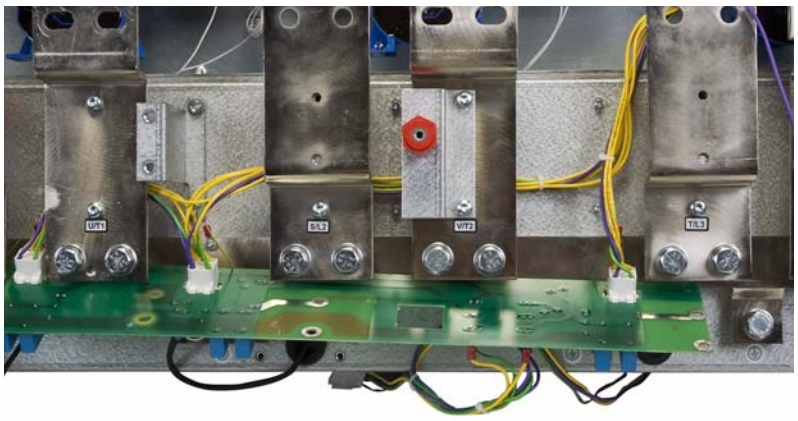


Figure 74: Filter Board Removed



Remove the Motor Current Sensor Connections

16. Using needle-nose pliers, remove the 3-wire connectors from the motor current sensors. See Table 19.

Table 19: Motor Current Sensor Connections

Wire No.[1]	Terminal No.	Description	To:
E103	**U/T1**	3-pin, yellow/black/red	PB[2] X11
E103	**V/T2**	3-pin, green/black/red	PB X11
E103	**W/T3**	3-pin, violet/black/red	PB X11

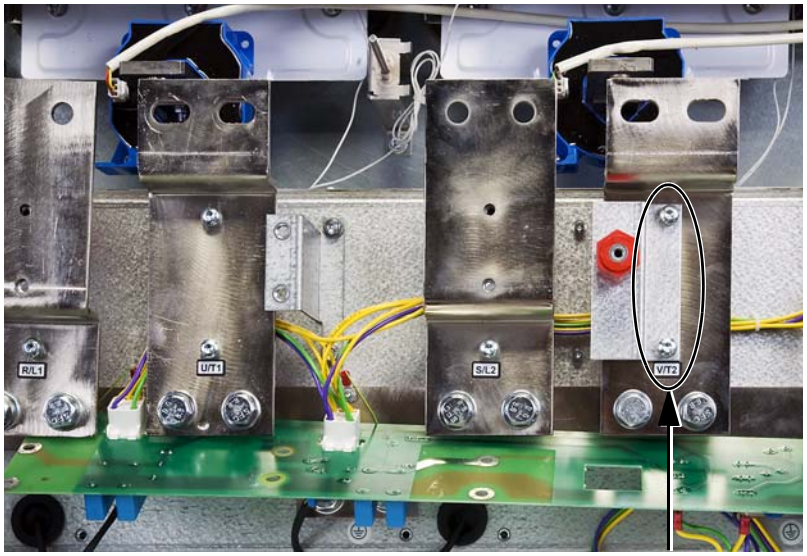
[1] See the schematic on page 152 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

[2] PB: Power board

Remove the Phase V Motor Current Sensor

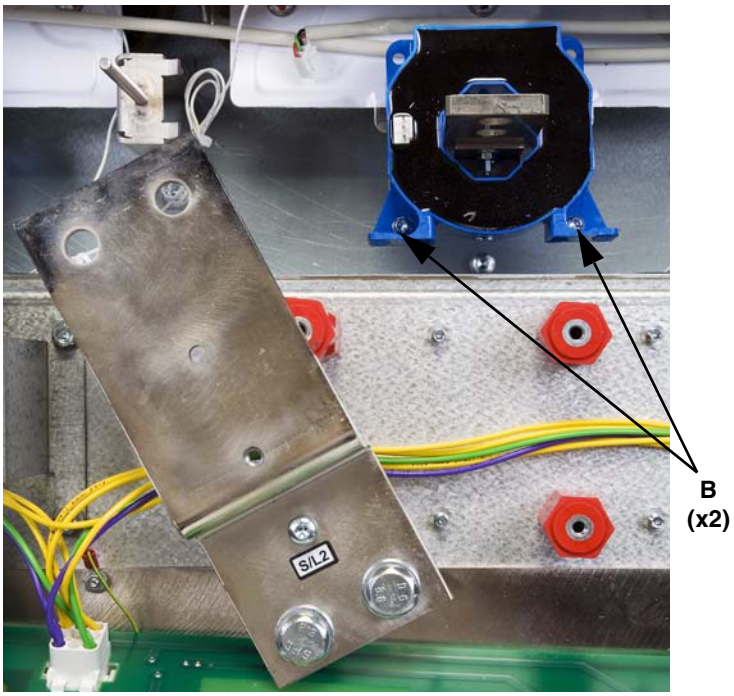
17. Remove the phase V motor current sensor as follows.
    - — Using a T-30 Torx driver, remove two screws (**A**) securing the insulator bracket and the V/T2 bus bar to the insulators on the drive frame. See Figure 75.
    - — Rotate the S/L2 bus bar to the left for clearance. See Figure 76 on page 67.
    - — Using a T-20 Torx driver, remove two screws (**B**) securing the phase V motor current sensor to the brace on the bus plate. See Figure 76 on page 67.

Figure 75: V/T2 Bus Bar



A (x2)

Figure 76: S/L2 Bus Bar and Motor Current Sensor



Remove the Phase U Motor Current Sensor

18. Remove the phase U motor current sensor as follows.
    - — Using a T-30 Torx driver, remove two screws (**C**) securing the U/T1 bus bar to the insulators on the drive frame. See Figure 77.
    - — Rotate the R/L1 bus bar to the left for clearance. See Figure 78.
    - — Using a T-20 Torx driver, remove two screws (**D**) securing the phase U motor current sensor to the brace on the bus plate and remove the sensor. See Figure 78.

Figure 77: U/T1 Bus Bar

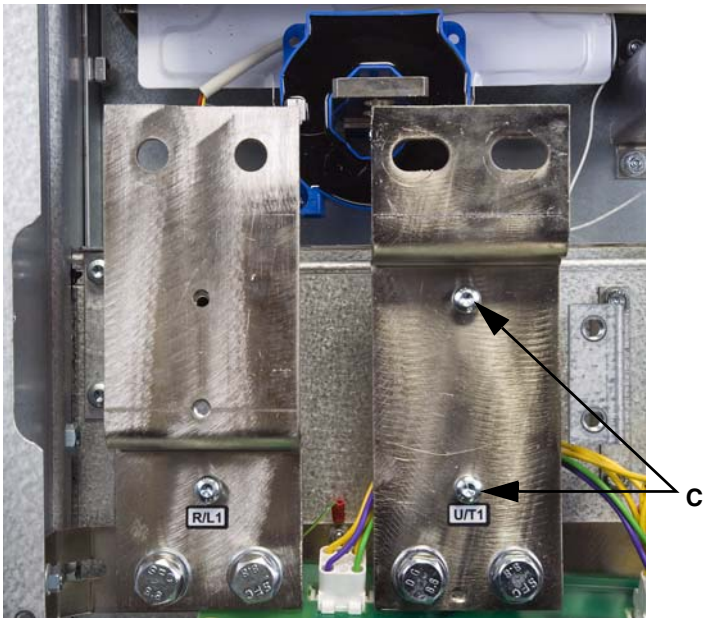
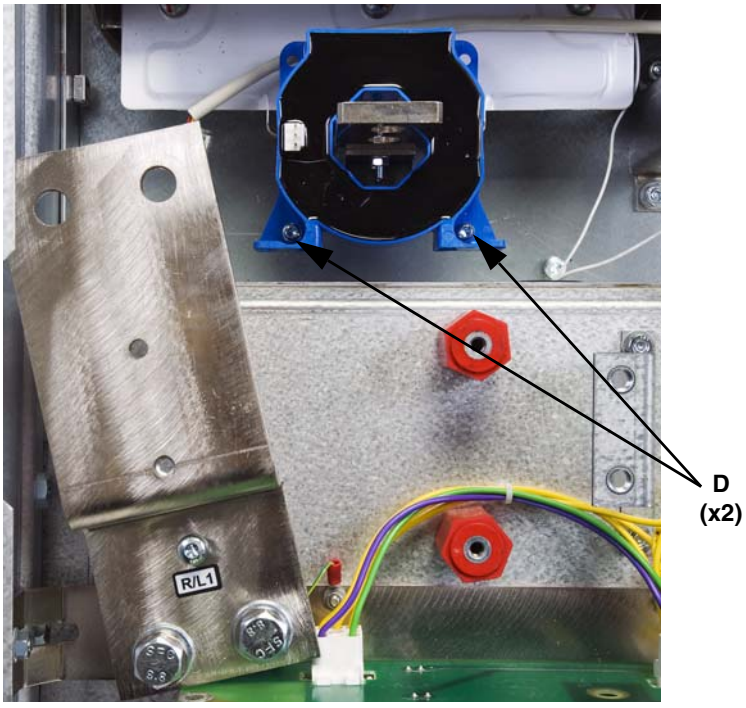


Figure 78: R/L1 Bus Bar and Motor Current Sensor



Remove the Phase W Motor Current Sensor

19. Remove the phase W motor current sensor as follows.

— Using an 18 mm socket wrench, remove two bolts and washers (**E**) securing the phase-W DC bus plate to the L-shaped bracket on the W/T3 output. See Figure 79.

NOTE: An output sensor plate (**F,** Figure 79) with a violet lead is under the front bolt. Remove the sensor plate.

— Using an 18 mm socket wrench, remove two bolts and washers (**G**) securing the L-shaped bracket to the W/T3 output and remove the bracket. See Figure 80 on page 70.

— Using a T-30 Torx driver, remove two screws (**H**) securing the W/T3 bus bar to the insulators on the drive frame and remove bus bar. See Figure 80 on page 70.

— Rotate the T/L3 bus bar to the left for clearance. See Figure 81 on page 70.

— Using a T-20 Torx driver, remove two screws (**J**) securing the phase W motor current sensor to the brace on the bus plate. See Figure 81 on page 70.

NEXT STEP: If you are replacing the motor current sensors, skip to "Replacing the Motor Current Sensors VY1A1109" beginning on page 92.

Figure 79: W/T3 Output and L-Bracket, Top

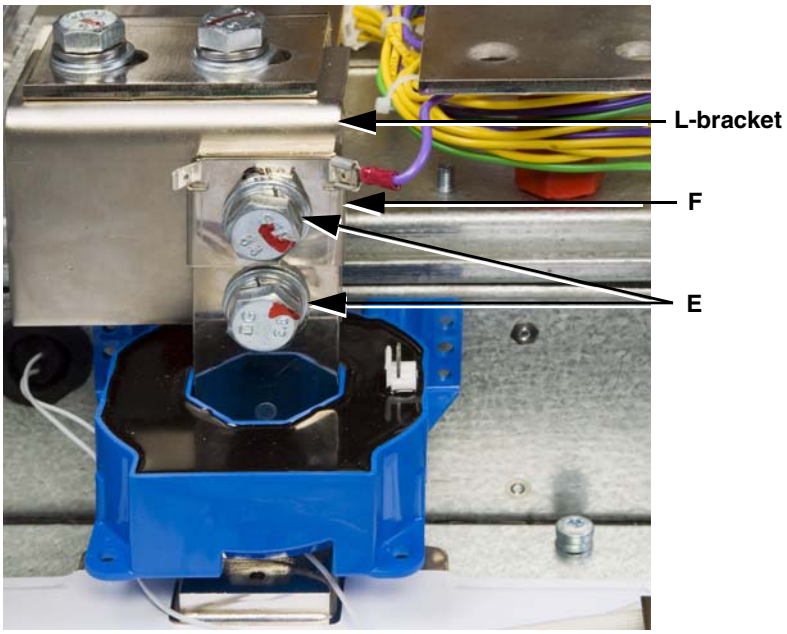


Figure 80: W/T3 Output and L-Bracket, Front

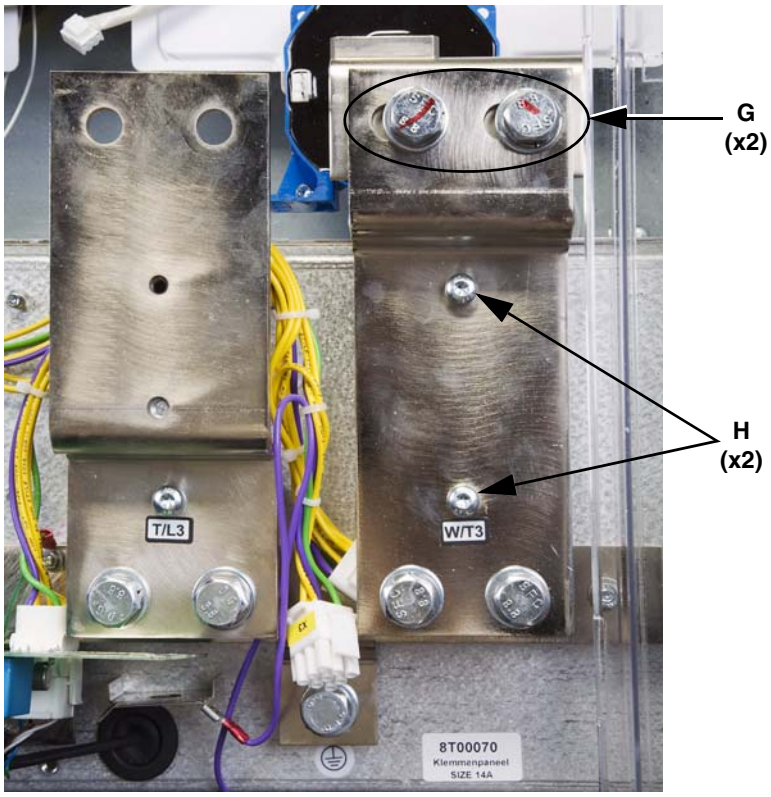
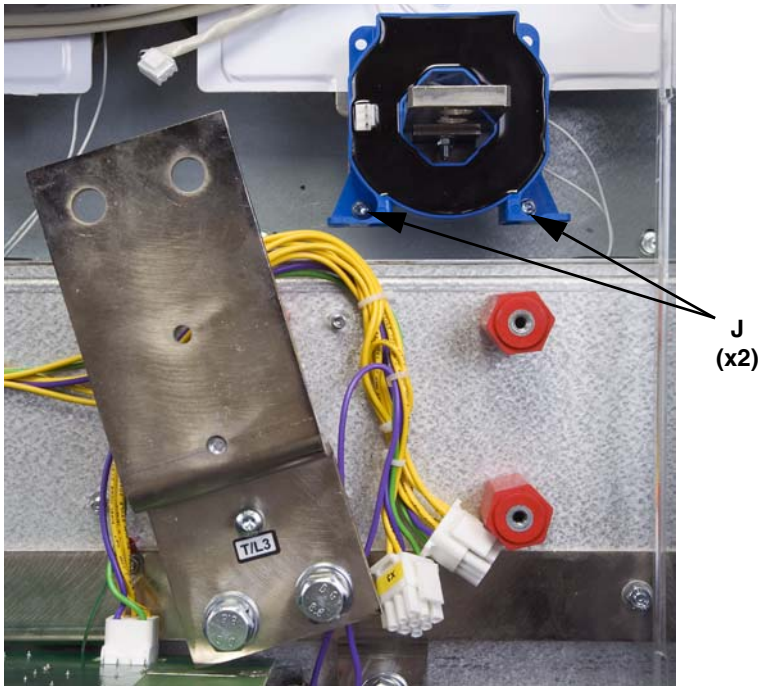


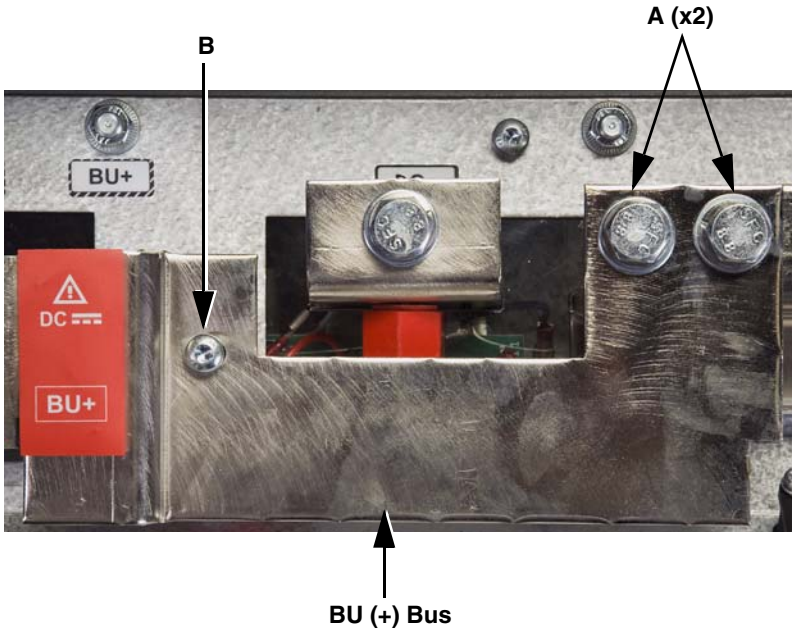
Figure 81: T/L3 Bus Bar and Motor Current Sensor



Remove the BU (+) Bus

20. Remove the BU (+) bus as follows. See Figure 82.
    - — Using an 18 mm socket wrench, remove two bolts (**A**) securing the BU (+) bus to the PA/+ bus.
    - — Using a T-30 Torx driver, remove one screw (**B**) securing the BU (+) bus to the red insulator on the top terminal bracket.

Figure 82: BU (+) Bus

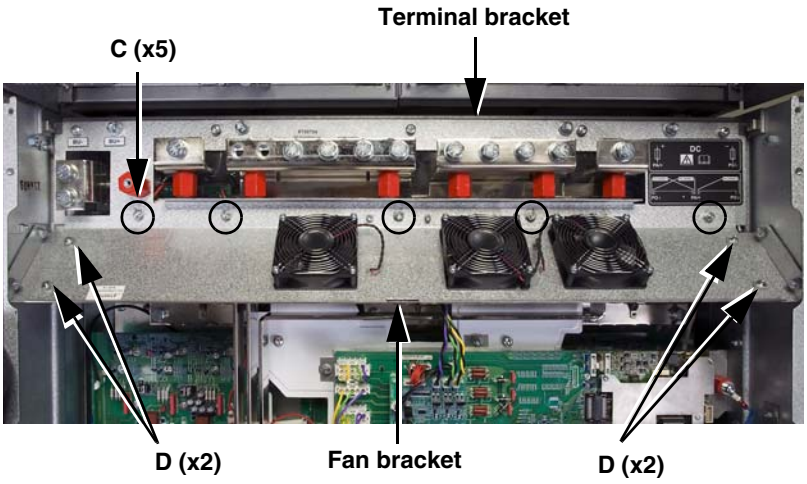


Remove the Fan Bracket

21. Using a 10 mm socket wrench, remove nine nuts (**C** and **D**, Figure 83) securing the fan bracket to the top terminal bracket and the drive frame.

    Disconnect the wires from the fan connectors on the back of the bracket, and remove the bracket from the drive.

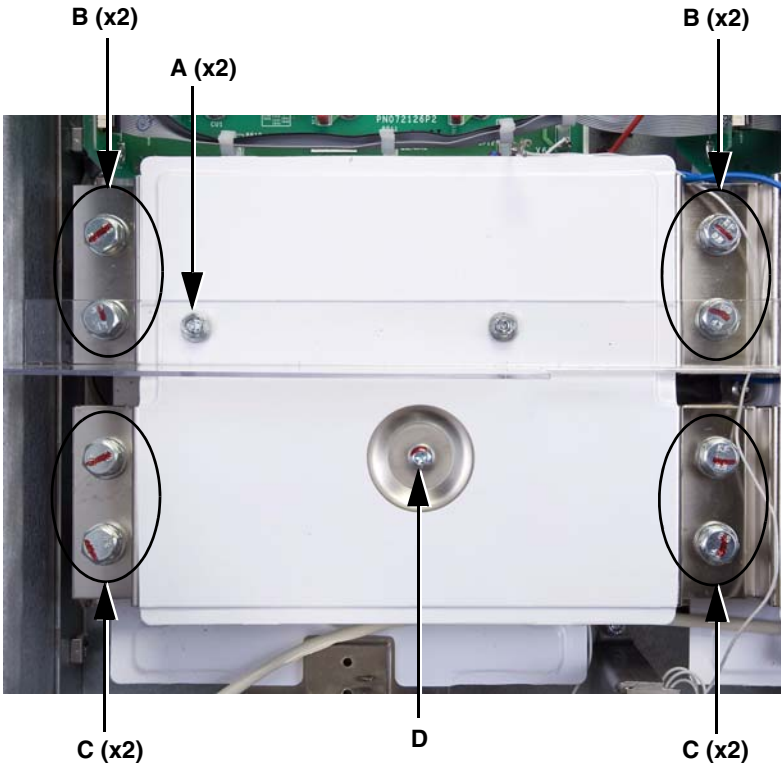
Figure 83: Fan Bracket



Remove the Phase-U DC Bus Plate

22. Remove the phase-U DC bus plate as follows. See Figure 84.
    - — Using a 10 mm socket wrench, remove two screws (**A**) securing the plastic shield to the bus plate and remove the shield. See Figure 84.
    - — Using a 16 mm socket wrench, remove eight bolts securing the bus plate to the positive (+) bus at the top (**B**) and to the negative (-) bus (**C**) at the bottom.
    - — Using a T-30 Torx driver, remove one screw (**D**) securing the bus plate to the insulator on the top DC bus plate.
    - — Remove the bus plate from the drive.

Figure 84: Phase-U DC Bus Plate



Remove the Top DC Bus Plate

23. Remove the top DC bus plate as follows. See Figure 85.

— Using a 16 mm socket wrench, remove two bolts securing the bus plate to the positive (+) bus (**A**).

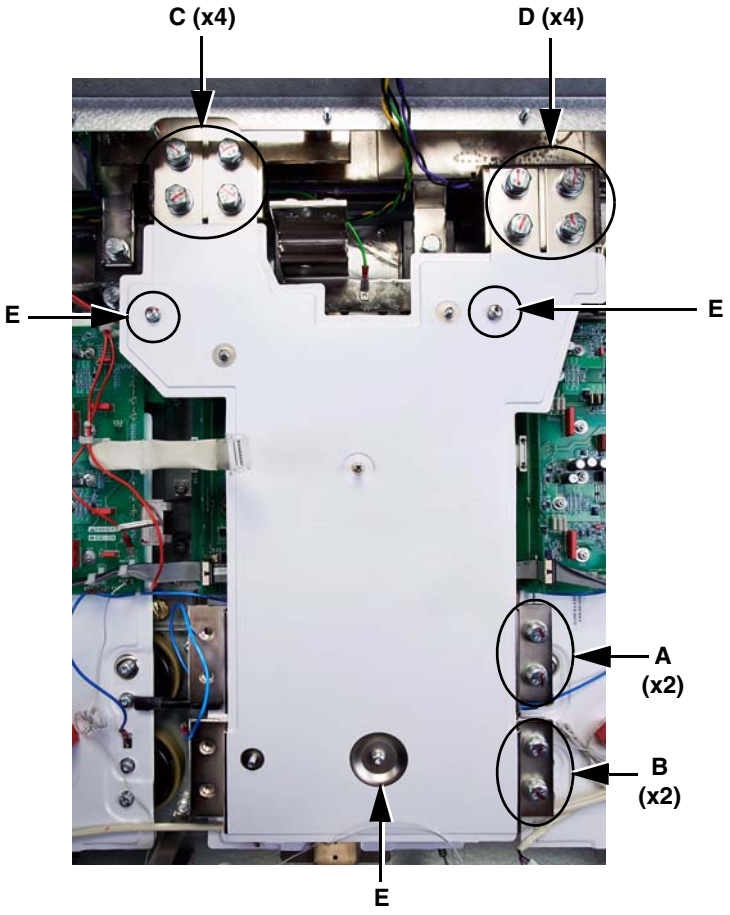
— Using a 16 mm socket wrench, remove two bolts securing the bus plate to the negative (-) bus (**B**).

— Using an 18 mm socket wrench, remove four bolts securing the bus plate to the positive (+) rectifier bus (**C**).

— Using an 18 mm socket wrench, remove four bolts securing the bus plate to the negative (-) rectifier bus (**D**).

— Using a T-30 Torx driver, remove three screws (**E**) securing the bus plate to the red insulators on the heatsink and remove the bus plate.

Figure 85: Top DC Bus Plate



NEXT STEP: If you are replacing a gate driver board, skip to “Replacing the Gate Driver Boards VX5A1203” beginning on page 94.

If you are replacing an SCR or diode module, skip to “Replacing the SCR Modules and Diode Modules (VZ3TM1600M1671 and VZ3DM1600M1671)” beginning on page 105.

Remove the Gate Driver Boards

NOTE: Perform the steps in this section if you are removing a gate driver board to access parts under the DC bus plate.

If you are replacing a gate driver board, skip to "Replacing the Gate Driver Boards VX5A1203" on page 94.

If you are removing equipment to make repairs in **phase U**, remove the left gate driver board.

If you are removing equipment to make repairs in **phase V**, remove the center gate driver board.

If you are removing equipment to make repairs in p**hase W**, remove the right gate driver board.

24. Remove the gate driver board in the phase that you are repairing as follows.
    - — Remove the connections from the gate driver board in the phase you are replacing. See Table 20 and Figure 86 on page 75.
    - — Using a 7 mm socket wrench, remove 18 nuts securing the gate driver board to the power IGBT modules and the DC bus plate and remove the board from the drive. See Figure 86 on page 75.

NEXT STEP: If you are replacing a temperature sensor, skip to "Replacing the Temperature Sensors, VZ3G1104" beginning on page 98.

Table 20: Gate Driver Board Wiring[1]

Wire No.[2]	Terminal No.	Description	To:
Gate Driver Board U (Left)			
E144	**X4**	2-pin, black	Temperature sensor U
E138	**X32**	18-pin, gray	GDB[3] V X31
E129	**X51**	1-pin, blue	UD0 (neutral) on DC bus plate
E127	**X52**	1-pin, blue	GDB V, X51
E126	**X61**	1-pin, red	SB[4] X10
E139	**X62**	1-pin, white	Bleeder resistor
E100	**X82**	14-pin, white	GDB V, X81 and PB[5] X8
Gate Driver Board V (Center)			
E128	**X4**	2-pin, black	Temperature sensor V
E138	**X31**	18-pin, gray	GDB U, X32
E146	**X32**	18-pin, gray	GDB W, X31
E127	**X51**	1-pin, blue	GDB U, X52
E123	**X52**	1-pin, blue	GDB W, X51
E100	**X81**	14-pin, white	GDB U, X82
E102	**X82**	14-pin, white	GDB W, X81
Gate Driver Board W (Right)			
E145	**X4**	2-pin, black	Temperature sensor W
E146	**X31**	18-pin, gray	GDB V, X32
E142	**X32**	18-pin, gray	PB, X3
E123	**X51**	1-pin, blue	GDB V, X52
E102	**X81**	14-pin, white	GDB V, X82
E132	**X53**	1-pin, blue	Insulator near MCB

1 Terminals X4, X81, and X82 are connected to a daughter board on the gate driver board assembly.

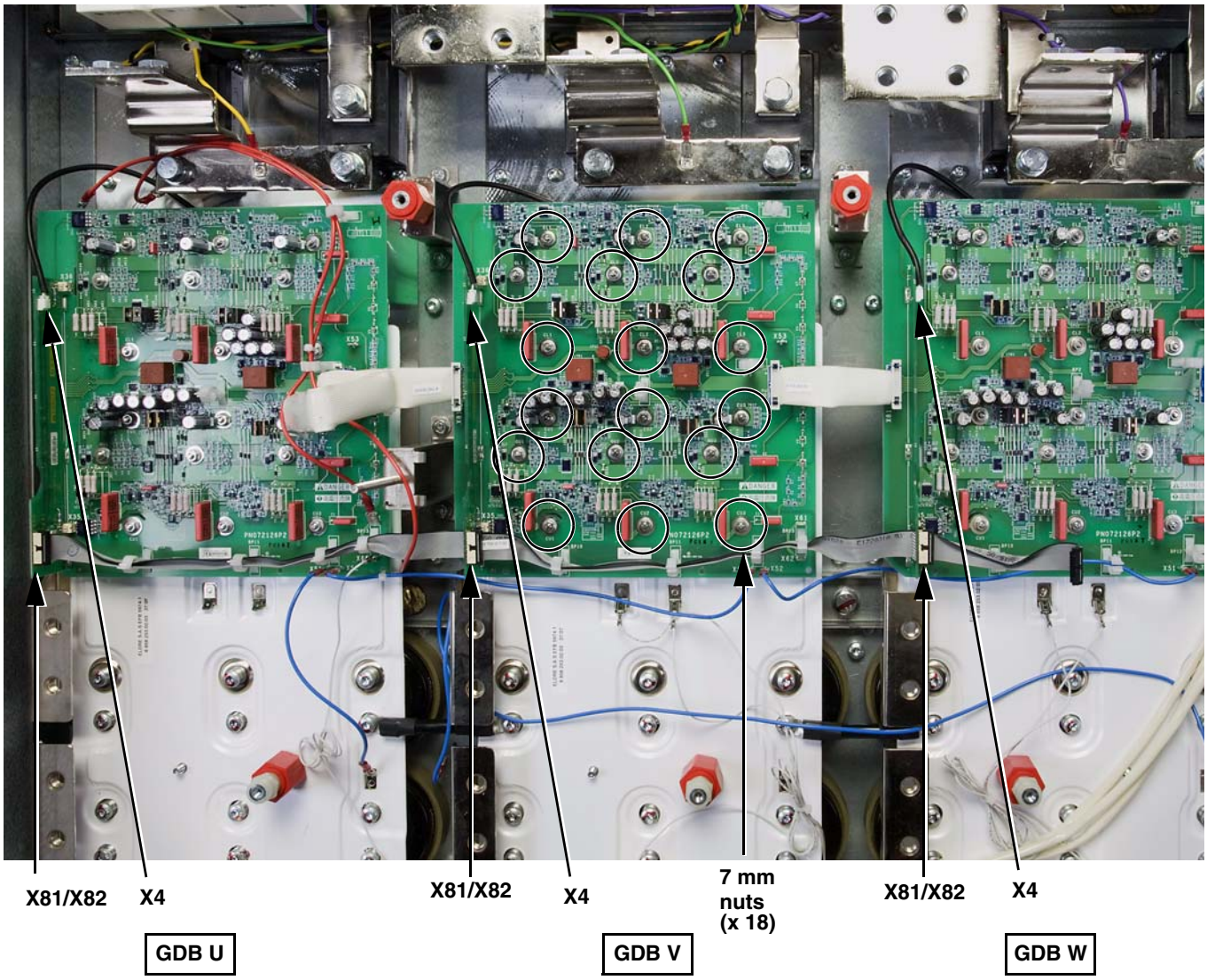
2 See the schematic on page 152 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

3 GDB: Gate driver board

4 SB: SCR snubber board

5 PB: Power board

Figure 86: Gate Driver Boards



Remove the Bottom DC Bus Plate

NOTE: If you are removing equipment to make repairs in **phase U**, remove the left DC bus plate.

If you are removing equipment to make repairs in **phase V**, remove the center DC bus plate.

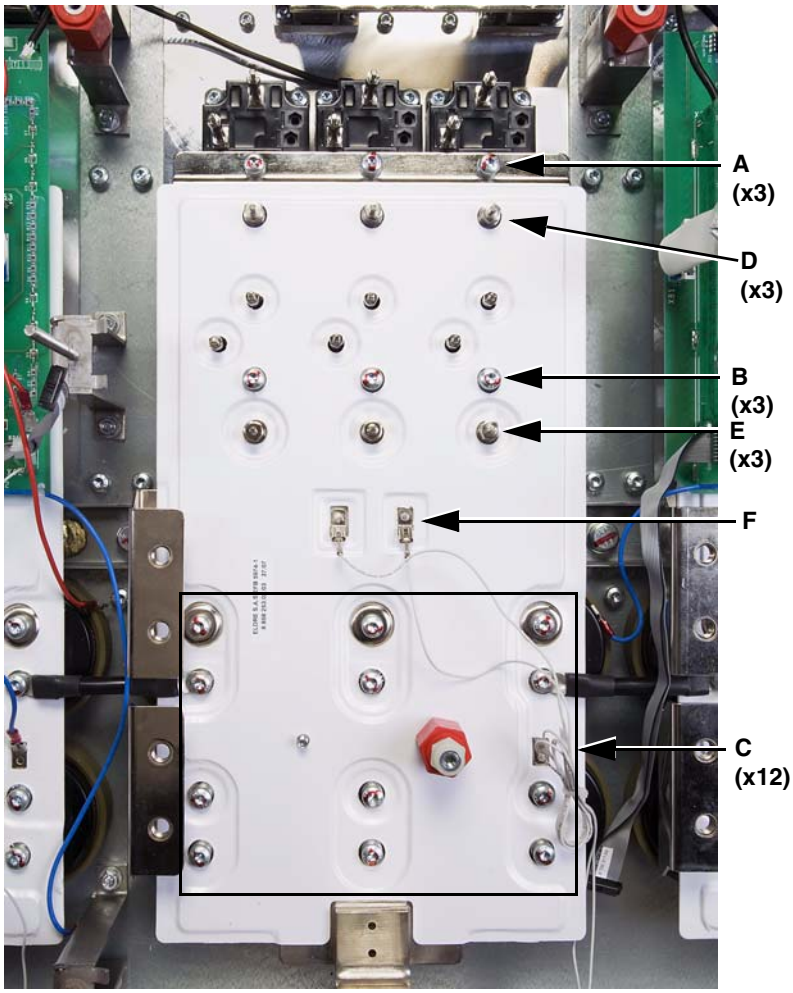
If you are removing equipment to make repairs in **phase W**, remove the right DC bus plate.

25. Remove the bottom DC bus plate as follows. See Figure 87.
    - — Using a T-30 Torx driver, remove three 20 mm screws (**B**) securing the DC bus plate to terminal E on the IGBT modules.
    - — Using a T-30 Torx driver, remove fifteen 14 mm screws securing the DC bus plate to terminal E on the IGBT modules (**A**) and to the capacitors (**C**).
    - — Using a 10 mm socket wrench, remove three 6 mm standoffs (**D**) and three 11 mm standoffs (**E**).
    - — Unplug the bleeder resistor connections (**F**). Note: In phase U, the bleeder resistors are connected to phase-U gate driver board terminal X62 and power board terminal UD-R1.
    - — Remove the bottom DC bus plate from the drive.

NEXT STEP: If you are replacing the power IGBT modules, skip to “Replacing the Power IGBT Modules VZ3IM1603M1271” beginning on page 100.

If you are replacing the capacitors, skip to “Replacing the Capacitors VY1ADC1114” beginning on page 103.

Figure 87: DC Bus Plate (Phase V Shown)



Replacing the Power Board VX5A1HC3140

IMPORTANT: Label and retain all removed hardware and cables for use in reassembly.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Read and understand the precautions in "Before You Begin" starting on page 5 before performing this procedure.
- Before working on this equipment, turn off all power supplying it and perform the DC bus voltage measurement procedure on page 11.

Failure to follow these instructions will result in death or serious injury.

Before performing the steps in this procedure, perform Steps 1–5 of "Disassembly Steps for Accessing Level 2 Parts" beginning on page 46 to remove the following parts from the drive:

- ❏ Front cover
- ❏ Power terminal shields
- ❏ EMC tray
- ❏ Middle crossbrace
- ❏ Control module assembly

Remove the Soft Charge Board

Table 21: Soft Charge Board Wiring

Wire No.[1]	Terminal No.	Description	To:
E110	**CN2A**	9-pin, red	PB[2] X30 (9-pin)
E109	**CNL3G**	2-pin, violet/black	SCR[3] 3 Terms. 4 & 5
E108	**CNL2G**	2-pin, green/black	SCR 2 Terms. 4 & 5
E107	**CNL1G**	2-pin, yellow/black	SCR 1 Terms. 4 & 5
E111	**CN7A**	2-pin, black	PB X31
—	**CNP**	Not used	—

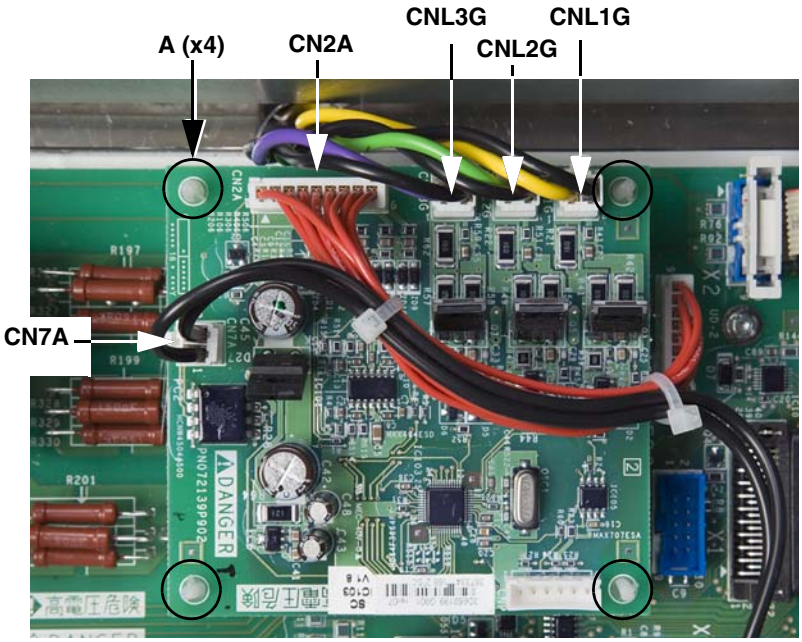
1 See the schematic on page 152 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

2 PB: Power board

3 SCR: Silicon controlled rectifier

1. Using needle-nose pliers, carefully remove the following connections from the soft charge board. See Table 21 and Figure 88 for connector locations.
   - — At the top of the soft charge board, from left to right remove: the 9-pin connector from terminal CN2A, the 2-pin connector from terminal CNL3G, the 2-pin connector from terminal CNL2G, and the 2-pin connector from terminal CNL1G.
   - — At the left side of the board, remove the 2-pin connector from terminal CN7A.

Figure 88: Soft Charge Board



2. Using needle-nose pliers, compress the four plastic mounting posts (**A,** Figure 88), one at a time, while lifting the soft charge board off the posts. Remove the soft charge board from the drive.

Remove the Power Board Connections

NOTE: Take care not to damage the LED (see Figure 89) when removing, handling, or installing the power board.

3. Using needle-nose pliers, carefully remove all connections from the power board **except** the connections at terminals X6, X30, and X31. See Table 22 and Figure 89 for the connections.

Table 22: Power Board Wiring

Wire No.[1]	Terminal No.	Description	To:
E103	**X11**	9-pin, multi color	Motor current sensors
E105	**X14**	3-pin, yellow	FCB[2] 1 X2
E136	**UD0**	1-pin, blue	Phase W DC bus plate
E126	**RFS 31+ X11**	1-pin, red	SB[3] X11
E141	**UD -R1**	1-pin, white	Bleeder resistor 1
—	**X2**	10-pin, white	MCB[4] X2
E142	**X3**	18-pin, gray	GDB[5] W X32
E112	**X4**	10-pin, gray	Control module
E150	**X5**	5-pin, yellow/green/ violet	Output bus bars T1, T2, T3
—	**X6**	15-pin, yellow/green/ violet	Retain jumper plug and install in new board
E120	**X7**	15-pin, yellow/green/ violet	Filter board X11, X12, X13
E100	**X8**	14-pin, white	GDB U X82
E106	**X21**	2-pin, red/black	Internal fan
E106	**X22**	2-pin, red/black	Internal fan
E110	**X30**	9-pin, red	SCB[6] CN2A
E111	**X31**	2-pin, black	SCB CN7A
E148	**X81**	2-pin, red	BB[7] X8
E149	**X91**	10-pin, gray	BB X91
E147	**X15**	3-pin, yellow	FCB 2 X2

1 See the schematic on page 152 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

2 FCB: Fan control board

3 SB: SCR Snubber board

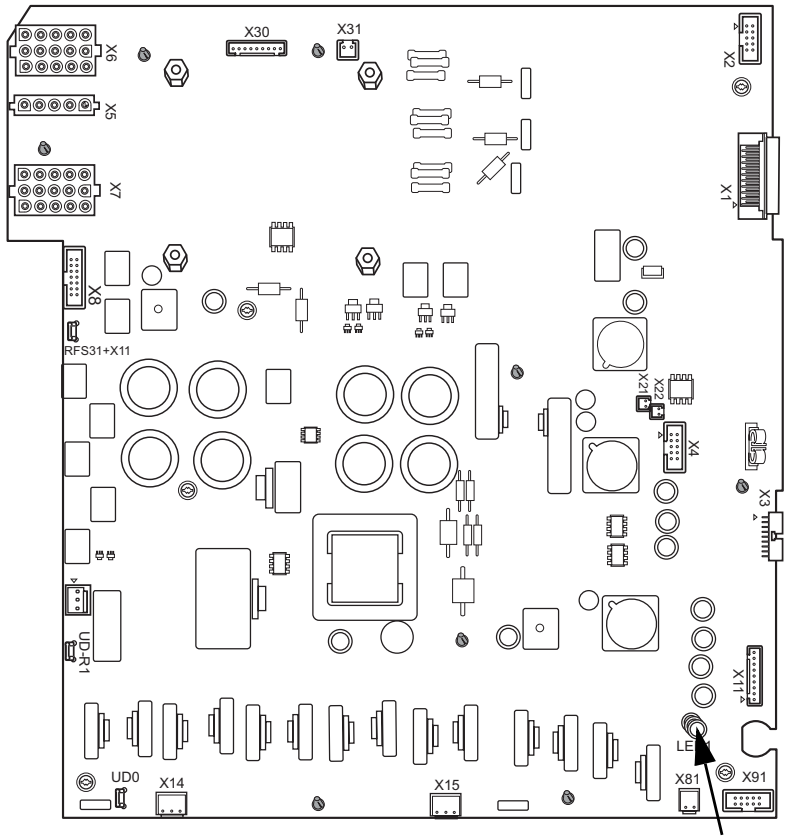
4 MCB: Motor control board

5 GDB: Gate driver board

6 SCB: Soft charge board

7 BB: Brake board

Figure 89: Power Board Connections

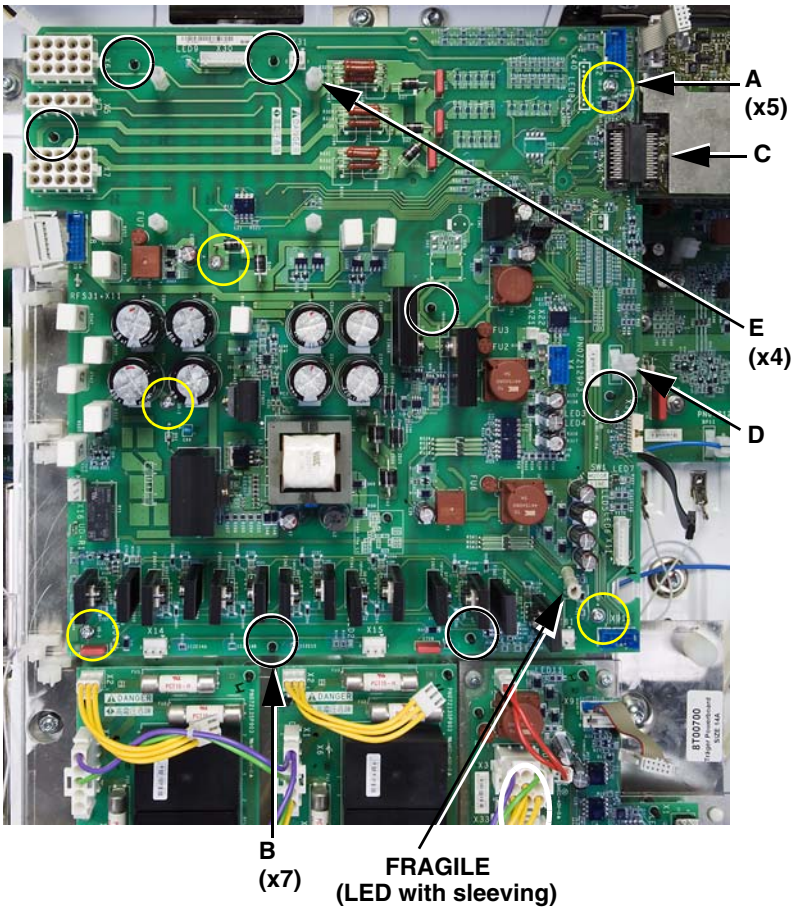


Remove the Power Board

NOTE: Take care not to damage the LED (see Figure 90) when removing, handling, or installing the power board.

4. Remove the old power board as follows. See Figure 90.
   - — Using a T-10 Torx driver, remove five screws (**A**) securing the power board to the assembly plate.
   - — Using needle-nose pliers, gently compress the seven plastic mounting posts (**B**), one at a time, while lifting the power board off the posts. Carefully disconnect the power board from the motor control board (**C**) as you remove the power board.

Figure 90: Power Board



Install the New Power Board

5. Transfer the connections from terminals X6, X30, and X31of the old power board to the corresponding terminals on the new board. See Figure 89 on page 78 for terminal locations.
6. Transfer the plastic cable clamp (**D,** Figure 90) from the old power board onto the new one as follows.
   - — Pinch the clamp on the bottom side of the board and push it up through the mounting hole.
   - — Snap the cable clamp into the mounting holes on the new board.

7. Transfer the four soft charge board mounting posts (**E**, Figure 90 on page 79) from the old power board onto the new one as follows:
   — Using a 7 mm socket wrench, remove the plastic nuts securing the soft charge board mounting posts to the power board. The nuts are on the back of the board.
   — Push the posts into the corresponding mounting holes from the front of the new power board and secure them at the back with the 7 mm nuts. Tighten the nuts to 0.4–0.6 N•m (3.5–5.3 lb-in).
8. Gently push the new power board down over the seven plastic mounting posts (**B**, Figure 90 on page 79) until it is securely seated. Carefully connect the power board to the motor control board (**C**) as you push it into place.
9. Using a T-10 Torx driver, secure the power board to the assembly plate with five screws (**A,** Figure 90 on page 79). Tighten the screws to 0.5–0.7 N•m (4.4–6.2 lb-in).
10. Replace the power board wiring. See Table 22 and Figure 89 on page 78 for the connection locations.

Replace the Soft Charge Board

11. Replace the soft charge board as follows.
   — Press the new soft charge board down over the four mounting posts (**A,** Figure 91) until it is securely seated.
   — Install five connections to the new soft charge board. See Table 23 and Figure 91 for connector locations.

Table 23: Soft Charge Board Wiring

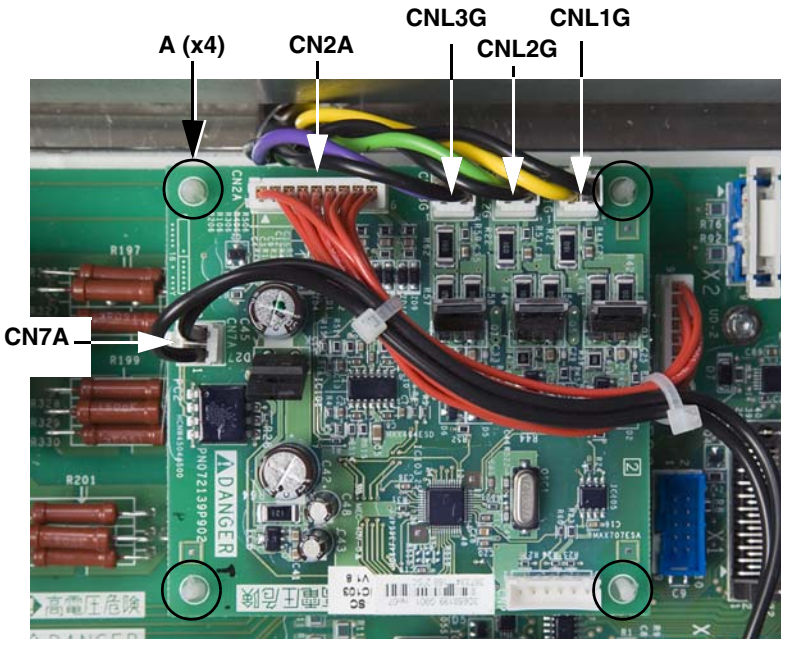
Wire No.[1]	Terminal No.	Description	To:
E110	**CN2A**	9-pin, red	PB[2] X30 (9-pin)
E109	**CNL3G**	2-pin, violet/black	SCR[3] 3 Terms. 4 & 5
E108	**CNL2G**	2-pin, green/black	SCR 2 Terms. 4 & 5
E107	**CNL1G**	2-pin, yellow/black	SCR 1 Terms. 4 & 5
E111	**CN7A**	2-pin, black	PB X31
—	**CNP**	Not used	—

1 See the schematic on page 152 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

2 PB: Power board

3 SCR: Silicon controlled rectifier

Figure 91: Soft Charge Board



Reassemble the Drive

If you are only replacing the power board, perform Steps 21–25 of "Reassembly Steps for Level 2 Parts" beginning on page 120 to replace the following parts.

- ❑ Control module assembly
- ❑ Middle crossbrace
- ❑ EMC tray
- ❑ Power terminal shields
- ❑ Front cover

Replacing the Brake Board VZ3F1113

IMPORTANT: Label and retain all removed hardware and cables for use in reassembly.

Table 24: Brake Board Wiring

Wire No.[1]	Terminal No.	Description	To:
E149	**X91**	10-pin, gray	PB[2] X91
E148	**X8**	2-pin, red	PB X81
E151	**X3**	9-pin, violet/ green/yellow	FCB[3]2 X3
E114	**X33**	9-pin, violet/green/ yellow	Fan harness to FB[4]
—	**X2**	9-pin, yellow jumper	Retain and install in new board
—	**X1**	15-pin	Not used

1 See the schematic on page 152 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

2 PB: Power board

3 FCB: Fan control board

4 FB: Filter board

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Read and understand the precautions in "Before You Begin" starting on page 5 before performing this procedure.
- Before working on this equipment, turn off all power supplying it and perform the DC bus voltage measurement procedure on page 11.

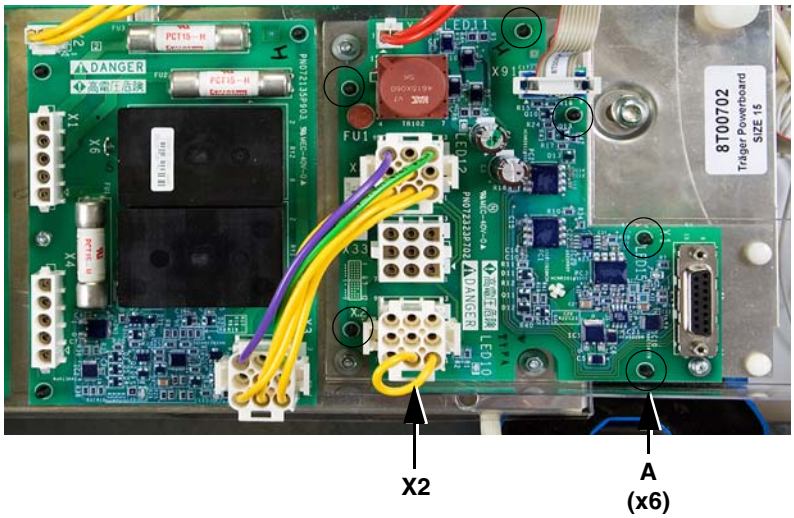
Failure to follow these instructions will result in death or serious injury.

Before performing the steps in this procedure, perform Steps 1–5 of "Disassembly Steps for Accessing Level 2 Parts" beginning on page 46 to remove the following parts from the drive:

- ❑ Front cover
- ❑ Power terminal shields
- ❑ EMC tray
- ❑ Middle crossbrace
- ❑ Control module assembly

1. Using needle-nose pliers, carefully remove all connections from the brake board. See Table 24 and Figure 92 for connector locations.
2. Using needle-nose pliers, gently compress the six plastic mounting posts (**A**), one at a time, while lifting the brake board off the posts.
3. Transfer the jumper at terminal X2 from the old board to the new one.
4. Gently push the new brake board down over the six plastic mounting posts (**A**) until it is securely seated.
5. Replace the brake board wiring. See Table 24 and Figure 92 for the connection locations.

Figure 92: Brake Board



Reassemble the Drive

If you are only replacing the brake board, perform Steps 21–25 of "Reassembly Steps for Level 2 Parts" beginning on page 120 to replace the following parts.

- ❑ Control module assembly
- ❑ Middle crossbrace
- ❑ EMC tray
- ❑ Power terminal shields
- ❑ Front cover

Replacing the Power Board Assembly Shields

IMPORTANT: Label and retain all removed hardware and cables for use in reassembly.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Read and understand the precautions in "Before You Begin" starting on page 5 before performing this procedure.
- Before working on this equipment, turn off all power supplying it and perform the DC bus voltage measurement procedure on page 11.

Failure to follow these instructions will result in death or serious injury.

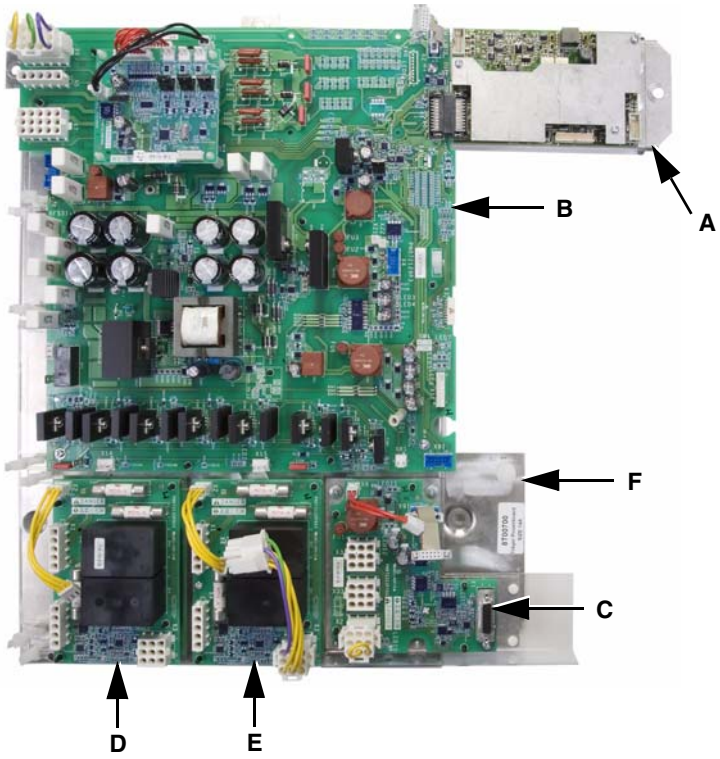
Before performing the steps in this procedure, perform Steps 1–9 of "Disassembly Steps for Accessing Level 2 Parts" beginning on page 46 to remove the following parts from the drive:

- ❑ Front cover
- ❑ Power terminal shields
- ❑ EMC tray
- ❑ Middle crossbrace
- ❑ Control module assembly
- ❑ Soft charge board connections
- ❑ Power board connections
- ❑ Fan control board connections
- ❑ Power board assembly

The power board assembly consists of the motor control board (**A**), the power board (**B**), the brake board assembly (**C**), fan control boards 1 (**D**) and 2 (**E**), and the power board assembly plate (**F**). See Figure 93.

There are three plastic shields in the power board assembly: one under the power board, one under the motor control board, and one under the brake board. This section describes how to replace the plastic shields.

Figure 93: Power Board Assembly



Remove the Power Board Assembly Connections

1. Remove the connections listed in Table 25, if present.

Table 25: Power Board Assembly Wiring

Wire No.[1]	Terminal No.	Description	To:
—	**MCB[2] X2**	10-pin, white	PB, X2
E105	**PB[3] X14**	3-pin, yellow	FCB 1, X2
E147	**PB X15**	3-pin, yellow	FCB 2, X2
E148	**PB X81**	2-pin, red	BB[4], X8
E149	**PB X91**	10-pin, gray	BB, X91
E151	**FCB[5]2 X3**	9-pin, green/yellow/violet with yellow and green ground wire	BB, X3

[1] See the schematic on page 152 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

[2] MCB: Motor control board

[3] PB: Power board

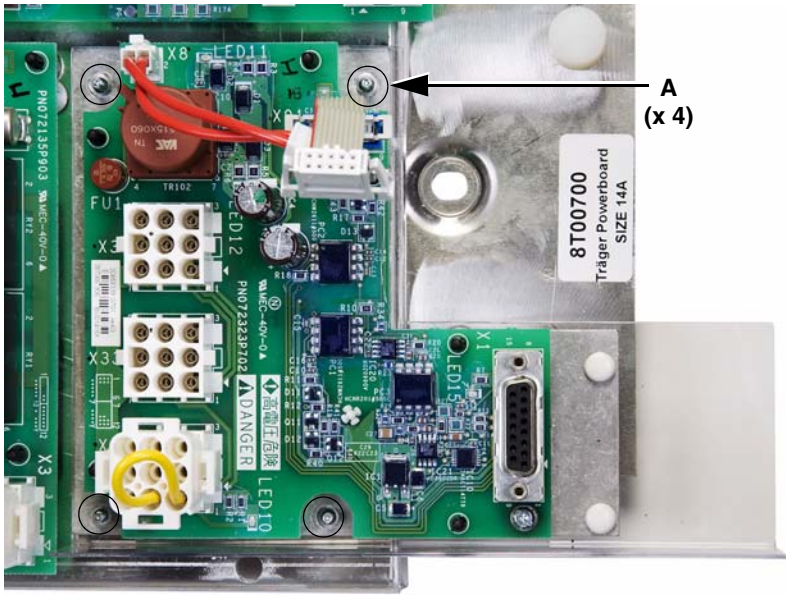
[4] BB: Brake board

[5] FCB: Fan control board

Replace the Plastic Shield Under the Brake Board

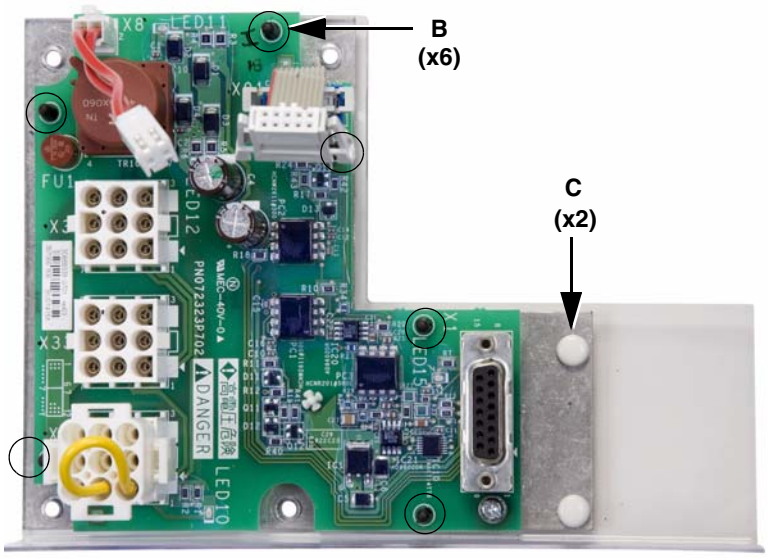
2. Using a 7/32 in. socket wrench, remove four nuts (**A**) securing the brake board assembly to the power board assembly plate, and remove the brake board assembly. See Figure 94.

Figure 94: Brake Board Assembly



3. Using needle-nose pliers, gently compress the six plastic mounting posts (**B**), one at a time, while lifting the brake board off the posts. See Figure 95.

Figure 95: Brake Board



4. Remove the two white fasteners (**C,** Figures 95 and 96) securing the plastic shield to the metal plate, and remove the shield from the plate.
5. Replace the shield with a new piece from the plastic kit and secure it with the two fasteners (**C,** Figures 95 and 96).
6. Gently push the brake board down over the plastic mounting posts on the shield assembly (**B**, Figure 95) until it is securely seated.

NEXT STEP: Set the brake board assembly aside and continue with Step 7 on page 85 to replace the other plastic shields.

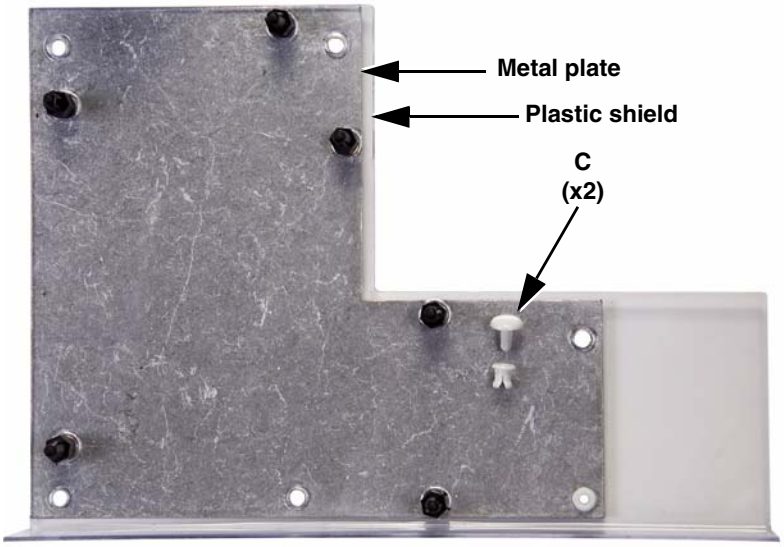
⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Install the shield as shown in Figure 96.
- Before installing the shield, ensure that it has no tears or cracks. If the shield is damaged, install a new piece from the plastic kit.
- Do not install a damaged shield.

Failure to follow these instructions will result in death or serious injury.

Figure 96: Brake Board Plate



Remove the Motor Control Board

7. Remove the motor control board as follows.
   - — Using a T-10 Torx driver, remove three screws (**D,** Figure 97) securing the metal plate to the standoffs on the motor control board.
   - — Using a 7/32 in. socket wrench, remove the three standoffs (**E,** Figure 98) securing the motor control board to the power board assembly plate, and remove the motor control board.
   - — Carefully disconnect the motor control board from the power board (**F,** Figure 98) as you remove the motor control board.

Figure 97: Motor Control Board Plate

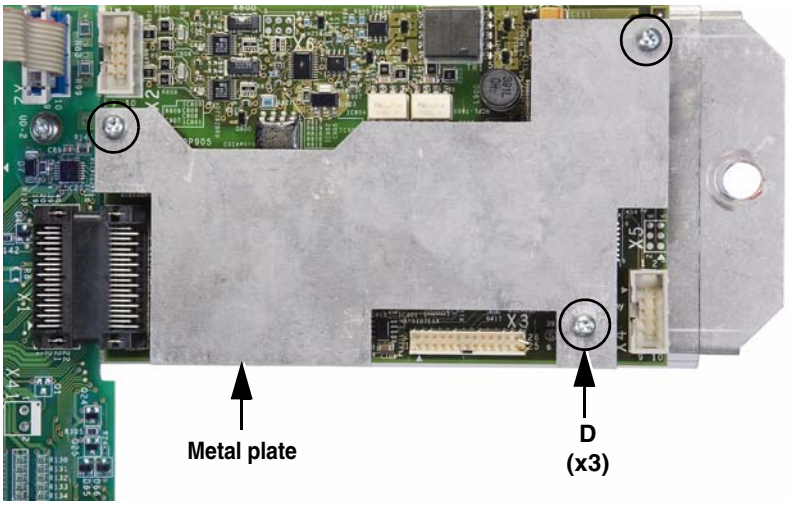
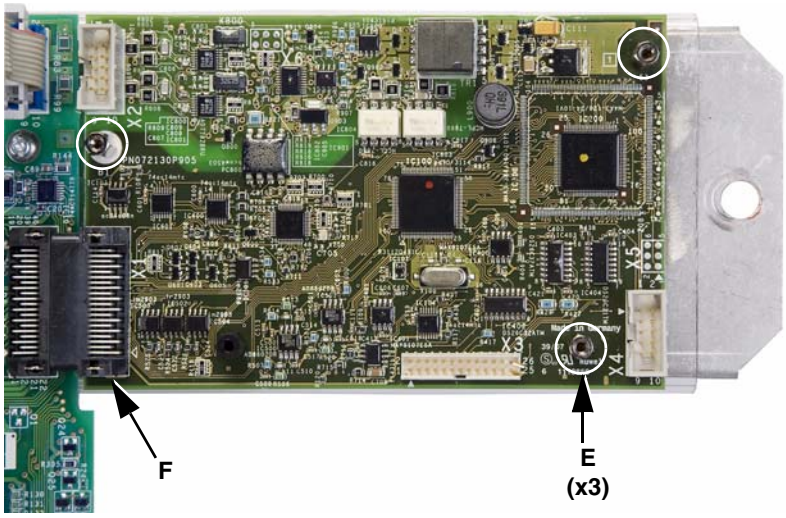


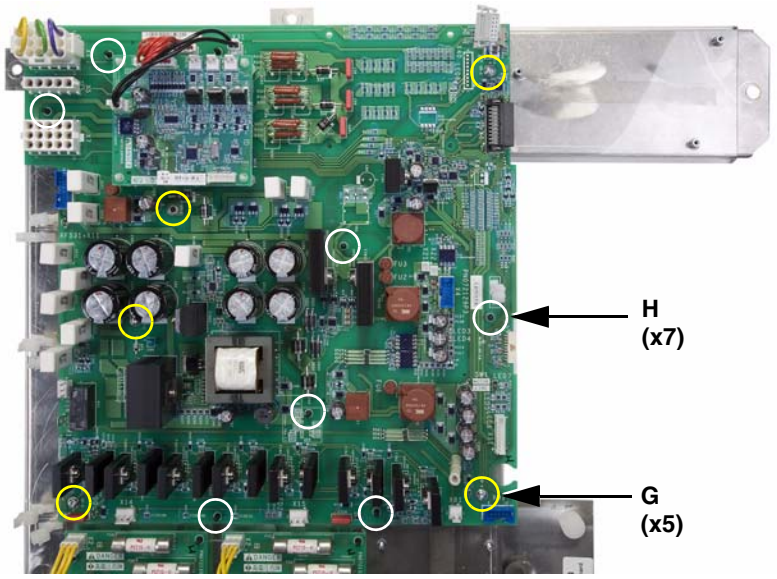
Figure 98: Motor Control Board



Remove the Power Board

8. Remove the power board as follows. See Figure 99.
   - — Using a T-10 Torx driver, remove five screws (**G**) securing the power board to the assembly plate.
   - — Using needle-nose pliers, gently compress the seven plastic mounting posts (**H**), one at a time, while lifting the power board off the posts.

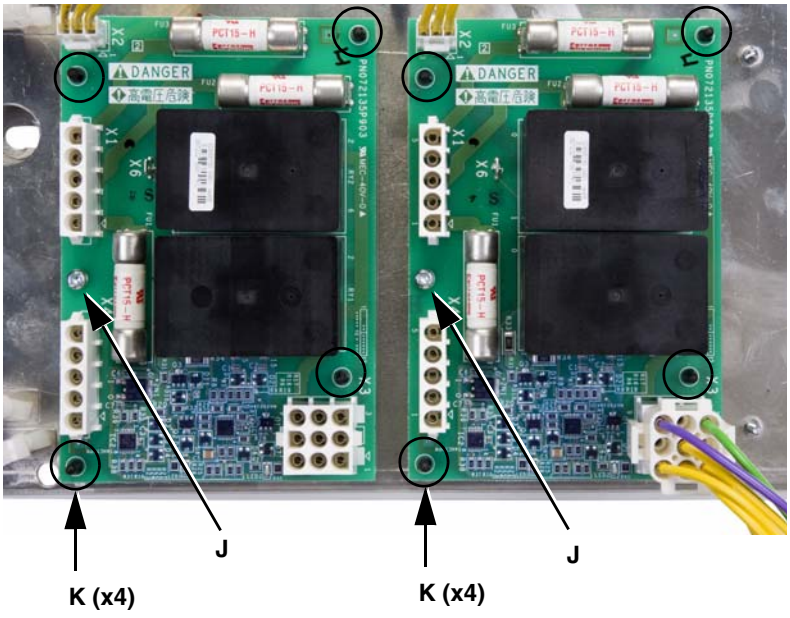
Figure 99: Power Board



Remove Fan Control Boards 1 and 2

9. Remove fan control boards 1 and 2 from the assembly plate as follows. See Figure 100.
   - — Using a T-10 Torx driver, remove 1 screw (**J**) from each board.
   - — Using needle-nose pliers, compress the four plastic mounting posts (**K**), one at a time, while lifting the board off the posts. Remove the boards from the assembly plate.

Figure 100: Fan Control Boards



Replace the Plastic Shields

⚠ DANGER

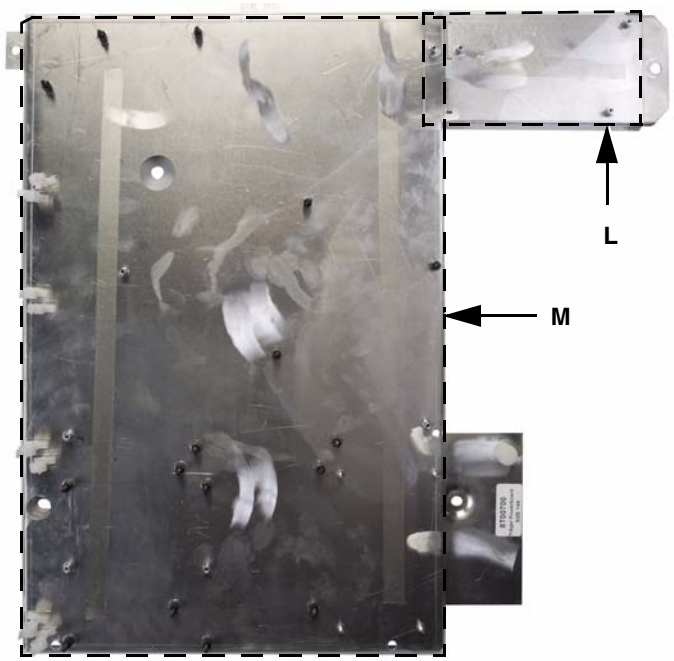
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Install the shields as shown in Figure 101.
- Before installing the shield, ensure that it has no tears or cracks. If the shield is damaged, install a new piece from the plastic kit.
- Do not install a damaged shield.

Failure to follow these instructions will result in death or serious injury.

10. Remove the two plastic shields (**L** and **M**) from the assembly plate and replace them with new pieces from the plastic kit. See Figure 101.

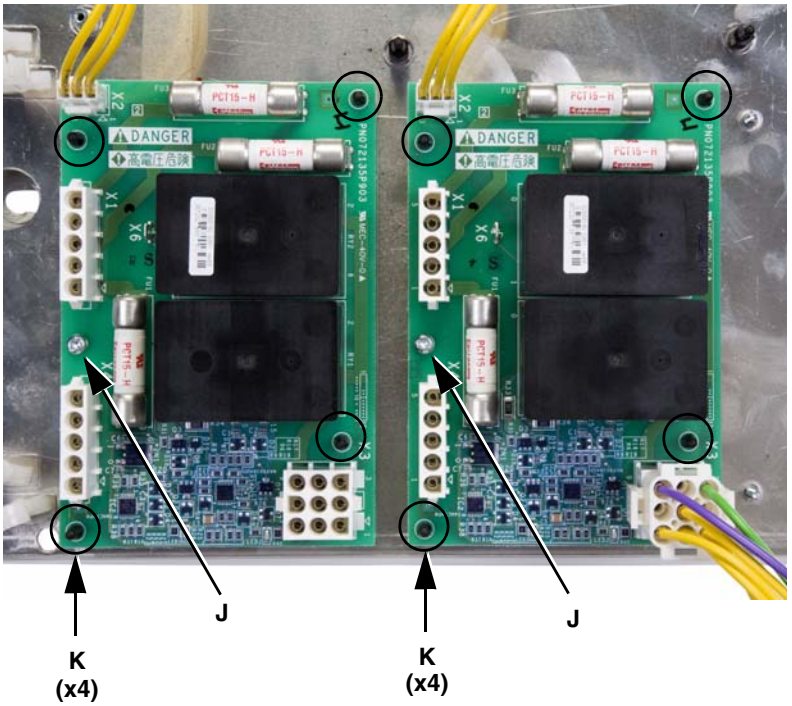
Figure 101: Power Board Assembly Plate



Reinstall Fan Control Boards 1 and 2

11. Reinstall fan control boards 1 and 2 on the assembly plate as follows. See Figure 102.
    - — Gently push the fan control boards down over the four plastic mounting posts (**K**) until they are securely seated.
    - — Using a T-10 Torx driver, secure the fan control boards to the assembly plate with one screw each (**J**).
    - — Tighten the screws to 0.8 N•m (7.1 lb-in).

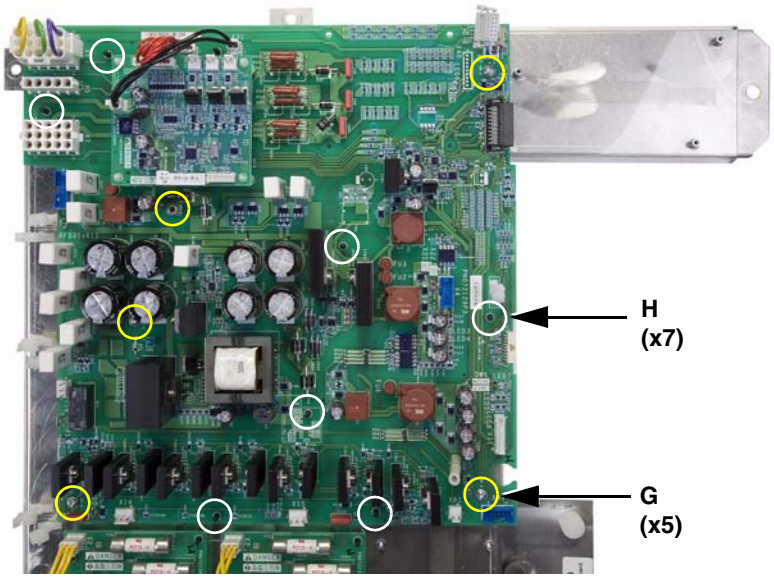
Figure 102: Fan Control Boards



Reinstall the Power Board

12. Reinstall the power board as follows. See Figure 103.
    - — Gently push the new power board down over the seven plastic mounting posts (**H**) until it is securely seated.
    - — Using a T-10 Torx driver, secure the power board to the assembly plate with five screws (**G**). Tighten the screws to 0.5–0.7 N•m (4.4–6.2 lb-in).

Figure 103: Power Board



Reinstall the Motor Control Board

13. Reinstall the motor control board as follows.

    — Carefully connect the motor control board to the power board (**F,** Figure 104).

    — Using a 7/32 in. socket wrench, secure the motor control board to the power board assembly plate with the three standoffs (**E,** Figure 104). Tighten the standoffs to 0.8 N•m (7.1 lb-in).

    — Using a T-10 Torx driver, secure the metal plate to the standoffs on the motor control board with three screws. Tighten the screws to 0.8 N•m (7.1 lb-in).

Figure 104: Motor Control Board

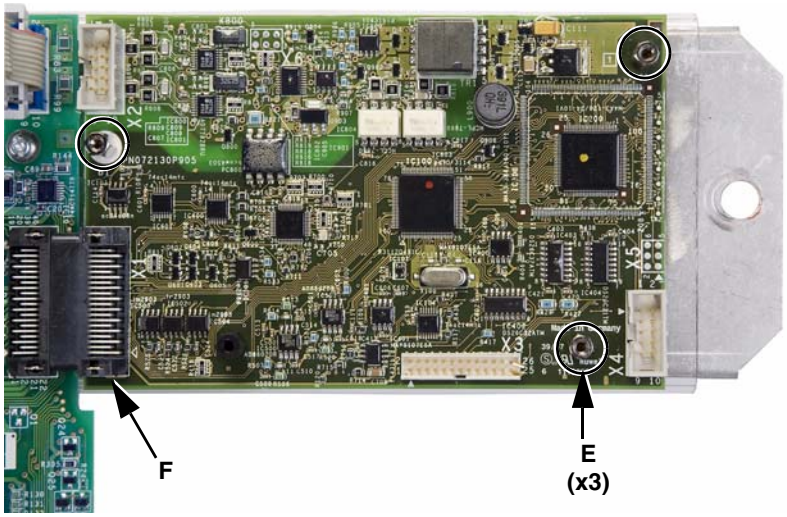
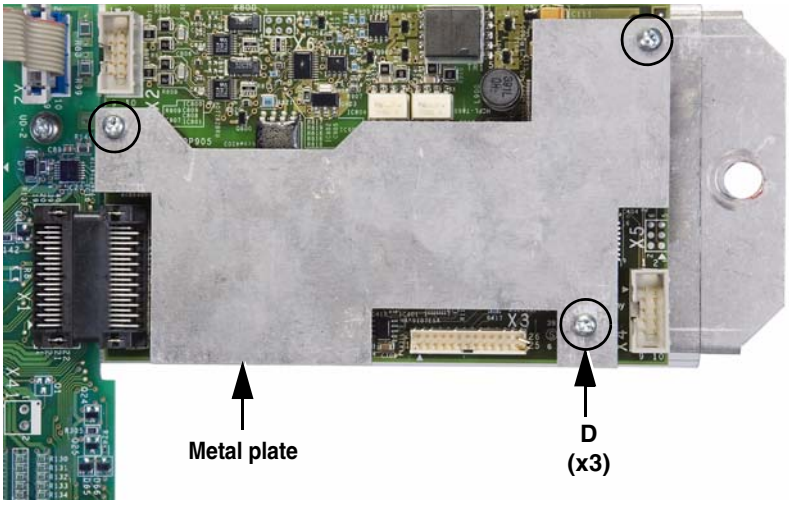


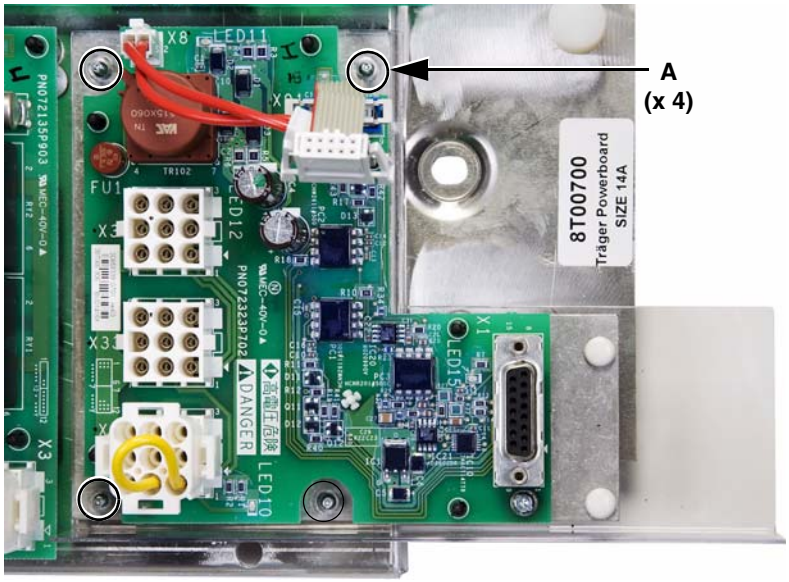
Figure 105: Motor Control Board Plate



Reinstall the Brake Board Assembly

14. Using a 7/32 in. socket wrench, secure the brake board assembly to the power board assembly plate with four nuts (**A**). See Figure 106. Tighten the nuts to 0.8 N•m (7.1 lb-in).

Figure 106: Brake Board Assembly



Replace the Power Board Assembly Connections

15. Replace the connections listed in Table 26.

Table 26: Power Board Assembly Wiring

Wire No.[1]	Terminal No.	Description	To:
—	**MCB[2] X2**	10-pin, white	PB, X2
E105	**PB[3] X14**	3-pin, yellow	FCB 1, X2
E147	**PB X15**	3-pin, yellow	FCB 2, X2
E148	**PB X81**	2-pin, red	BB[4], X8
E149	**PB X91**	10-pin, gray	BB, X91
E151	**FCB[5]2 X3**	9-pin, green/yellow/violet with yellow and green ground wire	BB, X3

[1] See the schematic on page 152 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

[2] MCB: Motor control board

[3] PB: Power board

[4] BB: Brake board

[5] FCB: Fan control board

Reassemble the Drive

If you are only replacing the power board assembly shields, perform Steps 17–25 of “Reassembly Steps for Level 2 Parts” beginning on page 120 to replace the following parts:

- ❏ Power board assembly
- ❏ Fan control board connections
- ❏ Power board connections
- ❏ Soft charge board connections
- ❏ Control module assembly
- ❏ Middle crossbrace
- ❏ EMC tray
- ❏ Power terminal shields
- ❏ Front cover

Replacing the Motor Current Sensors VY1A1109

IMPORTANT: Label and retain all removed hardware and cables for use in reassembly.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Read and understand the precautions in "Before You Begin" starting on page 5 before performing this procedure.
- Before working on this equipment, turn off all power supplying it and perform the DC bus voltage measurement procedure on page 11.

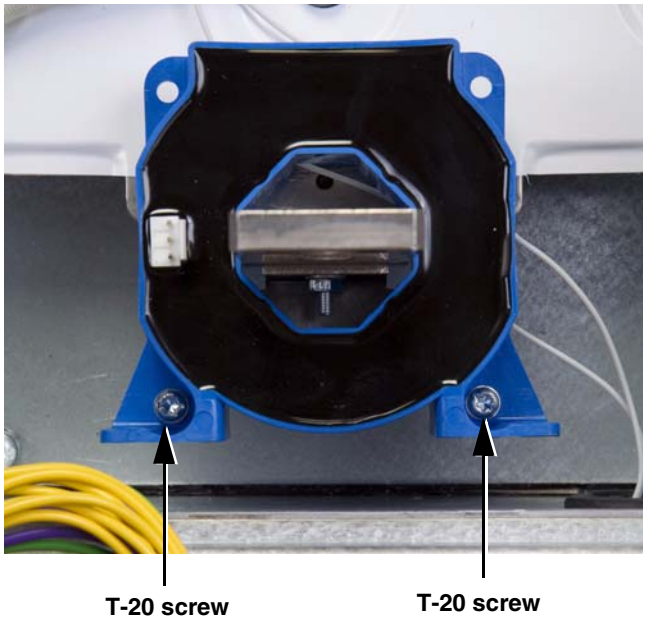
Failure to follow these instructions will result in death or serious injury.

Before performing the steps in this procedure, perform Steps 1–19 of "Disassembly Steps for Accessing Level 2 Parts" beginning on page 46 to remove the following parts from the drive:

- ❑ Front cover
- ❑ Power terminal shields
- ❑ EMC tray
- ❑ Middle crossbrace
- ❑ Control module assembly
- ❑ Soft charge board connections
- ❑ Power board connections
- ❑ Fan control board connections
- ❑ Power board assembly
- ❑ Input bus bar brackets
- ❑ L1, L2, L3 input bus bars
- ❑ Filter board
- ❑ Motor current sensors

1. Replace the motor current sensors as follows:
   — Install the new motor current sensor to the brace on the bus plate in the phase you are repairing, and secure it with two T-20 screws. Tighten the screws to 1.2 N•m (10.6 lb-in).

Figure 107: Motor Current Sensor



Reassemble the Drive

If you are only replacing the motor current sensors, perform Steps 7–25 of "Reassembly Steps for Level 2 Parts" beginning on page 120 to replace the following parts:

- ❑ Motor current sensors
- ❑ Filter board
- ❑ L1, L2, L3 input bus bars
- ❑ Input bus bar brackets
- ❑ Power board assembly
- ❑ Fan control board connections
- ❑ Power board connections
- ❑ Soft charge board connections
- ❑ Control module assembly
- ❑ Middle crossbrace
- ❑ EMC tray
- ❑ Power terminal shields
- ❑ Front cover

Replacing the Gate Driver Boards VX5A1203

IMPORTANT: Label and retain all removed hardware and cables for use in reassembly.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Read and understand the precautions in "Before You Begin" starting on page 5 before performing this procedure.
- Before working on this equipment, turn off all power supplying it and perform the DC bus voltage measurement procedure on page 11.

Failure to follow these instructions will result in death or serious injury.

Before performing the steps in this procedure, perform Steps 1–23 of "Disassembly Steps for Accessing Level 2 Parts" beginning on page 46 to remove the following parts from the drive:

- ❑ Front cover
- ❑ Power terminal shields
- ❑ EMC tray
- ❑ Middle crossbrace
- ❑ Control module assembly
- ❑ Soft charge board connections
- ❑ Power board connections
- ❑ Fan control board connections
- ❑ Power board assembly
- ❑ Input bus bar brackets
- ❑ L1, L2, L3 input bus bars
- ❑ Filter board
- ❑ Motor current sensors
- ❑ BU (+) bus
- ❑ Fan bracket
- ❑ Top DC bus plate

Remove the Gate Driver Board

1. Remove the connections from the gate driver board that you are replacing. See Table 27.
2. Using a 7 mm socket wrench, remove 18 nuts securing the gate driver board to the DC bus plate and the power IGBT modules, and remove the board from the drive. See Figure 108 on page 96.

Table 27: Gate Driver Board Wiring[1]

Wire No.[2]	Terminal No.	Description	To:
Gate Driver Board U (Left)			
E144	**X4**	2-pin, black	Temperature sensor U
E138	**X32**	18-pin, gray	GDB[3] V X31
E129	**X51**	1-pin, blue	UD0 (neutral) on DC bus plate
E127	**X52**	1-pin, blue	GDB V, X51
E126	**X61**	1-pin, red	SB[4] X10
E139	**X62**	1-pin, white	Bleeder resistor
E100	**X82**	14-pin, white	GDB V, X81 and PB[5] X8
Gate Driver Board V (Center)			
E128	**X4**	2-pin, black	Temperature sensor V
E138	**X31**	18-pin, gray	GDB U, X32
E146	**X32**	18-pin, gray	GDB W, X31
E127	**X51**	1-pin, blue	GDB U, X52
E123	**X52**	1-pin, blue	GDB W, X51
E100	**X81**	14-pin, white	GDB U, X82
E102	**X82**	14-pin, white	GDB W, X81
Gate Driver Board W (Right)			
E145	**X4**	2-pin, black	Temperature sensor W
E146	**X31**	18-pin, gray	GDB V, X32
E142	**X32**	18-pin, gray	PB, X3
E123	**X51**	1-pin, blue	GDB V, X52
E102	**X81**	14-pin, white	GDB V, X82
E132	**X53**	1-pin, blue	Insulator near MCB

1 Terminals X4, X81, and X82 are connected to a daughter board on the gate driver board assembly.

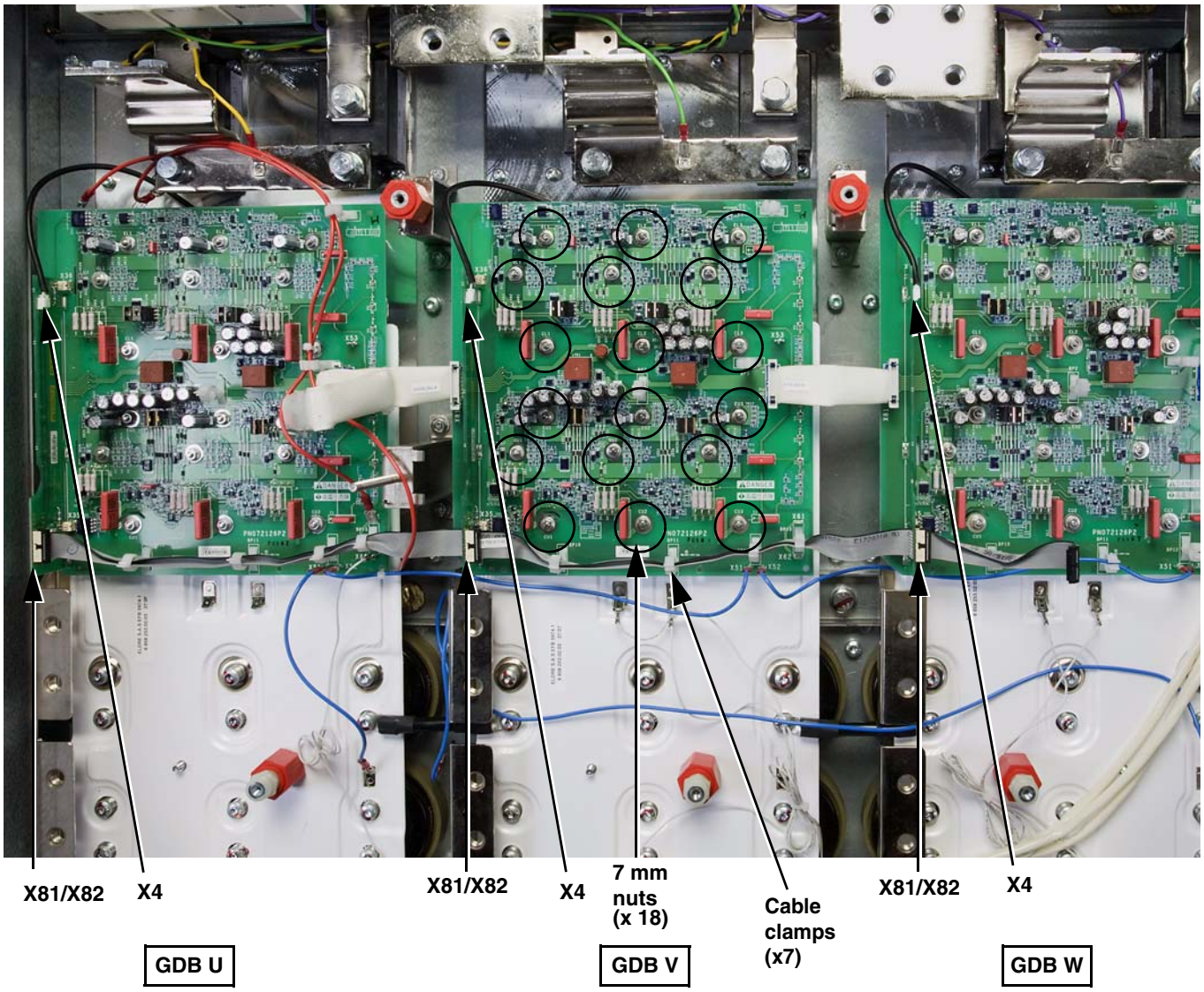
2 See the schematic on page 152 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

3 GDB: Gate driver board

4 SB: SCR Snubber board

5 PB: Power board

Figure 108: Gate Driver Boards



Install the New Gate Driver Board

3. Transfer the seven plastic cable clamps (see Figure 108) from the old gate driver board onto the new one as follows.
   - — To remove a clamp, pinch the clamp on the bottom side of the board and push it up through the mounting hole.
   - — Snap the cable clamps into the mounting holes on the new board.
4. Seat the gate driver board on the DC bus plate standoffs.
5. Using a 7 mm socket wrench, secure the board with 18 nuts. See Figure 108. Tighten the nuts to 1.2 N•m (10.6 lb-in).
6. Replace the gate driver board wiring. See Table 27 on page 95 for the connections.

Reassemble the Drive

If you are only replacing a gate driver board, perform Steps 3–25 of "Reassembly Steps for Level 2 Parts" beginning on page 120 to replace the following parts:

- ❑ Top DC bus plate
- ❑ Fan bracket
- ❑ BU (+) bus
- ❑ Motor current sensors
- ❑ Filter board
- ❑ L1, L2, L3 input bus bars
- ❑ Input bus bar brackets
- ❑ Power board assembly
- ❑ Fan control board connections
- ❑ Power board connections
- ❑ Soft charge board connections
- ❑ Control module assembly
- ❑ Middle crossbrace
- ❑ EMC tray
- ❑ Power terminal shields
- ❑ Front cover

Replacing the Temperature Sensors, VZ3G1104

IMPORTANT: Label and retain all removed hardware and cables for use in reassembly.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Read and understand the precautions in "Before You Begin" starting on page 5 before performing this procedure.
- Before working on this equipment, turn off all power supplying it and perform the DC bus voltage measurement procedure on page 11.

Failure to follow these instructions will result in death or serious injury.

There is one temperature sensor for each phase in the drive. The sensors are located under the gate driver boards on the DC bus plate.

Before performing the steps in this procedure, perform Steps 1–24 of "Disassembly Steps for Accessing Level 2 Parts" beginning on page 46 to remove the following parts from the drive:

- ❑ Front cover
- ❑ Power terminal shields
- ❑ EMC tray
- ❑ Middle crossbrace
- ❑ Control module assembly
- ❑ Soft charge board connections
- ❑ Power board connections
- ❑ Fan control board connections
- ❑ Power board assembly
- ❑ Input bus bar brackets
- ❑ L1, L2, L3 input bus bars
- ❑ Filter board
- ❑ Motor current sensors
- ❑ BU (+) bus
- ❑ Fan bracket
- ❑ Top DC bus plate
- ❑ Gate driver boards

1. Using a T-10 Torx driver, remove one screw securing the temperature sensor to the DC bus plate. See Figure 109.
2. Replace the temperature sensor and secure it with the T-10 screw. Tighten the screw to 0.4–0.6 Nm (3.5–5.3 lb-in).

Figure 109: Temperature Sensor

Reassemble the Drive

If you are only replacing a temperature sensor, perform Steps 2–25 of "Reassembly Steps for Level 2 Parts" beginning on page 120 to replace the following parts:

- ❑ Gate driver boards
- ❑ Top DC bus plate
- ❑ Fan bracket
- ❑ BU (+) bus
- ❑ Motor current sensors
- ❑ Filter board
- ❑ L1, L2, L3 input bus bars
- ❑ Input bus bar brackets
- ❑ Power board assembly
- ❑ Fan control board connections
- ❑ Power board connections
- ❑ Soft charge board connections
- ❑ Control module assembly
- ❑ Middle crossbrace
- ❑ EMC tray
- ❑ Power terminal shields
- ❑ Front cover

Replacing the Power IGBT Modules VZ3IM1603M1271

IMPORTANT: Label and retain all removed hardware and cables for use in reassembly.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Read and understand the precautions in "Before You Begin" starting on page 5 before performing this procedure.
- Before working on this equipment, turn off all power supplying it and perform the DC bus voltage measurement procedure on page 11.

Failure to follow these instructions will result in death or serious injury.

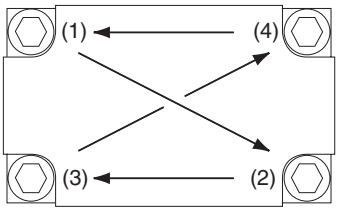
Before performing the steps in this procedure, perform Steps 1–25 of "Disassembly Steps for Accessing Level 2 Parts" beginning on page 46 to remove the following parts from the drive:

- ❑ Front cover
- ❑ Power terminal shields
- ❑ EMC tray
- ❑ Middle crossbrace
- ❑ Control module assembly
- ❑ Soft charge board connections
- ❑ Power board connections
- ❑ Fan control board connections
- ❑ Power board assembly
- ❑ Input bus bar brackets
- ❑ L1, L2, L3 input bus bars
- ❑ Filter board
- ❑ Motor current sensors
- ❑ BU (+) bus
- ❑ Fan bracket
- ❑ Top DC bus plate
- ❑ Gate driver boards
- ❑ Bottom DC bus plate

You must replace the power IGBT modules in sets of three as follows. See Figure 111 on page 101.

- Replace modules 1, 2, and 3 together.
- Replace modules 4, 5, and 6 together.

Figure 110: Torque Sequence

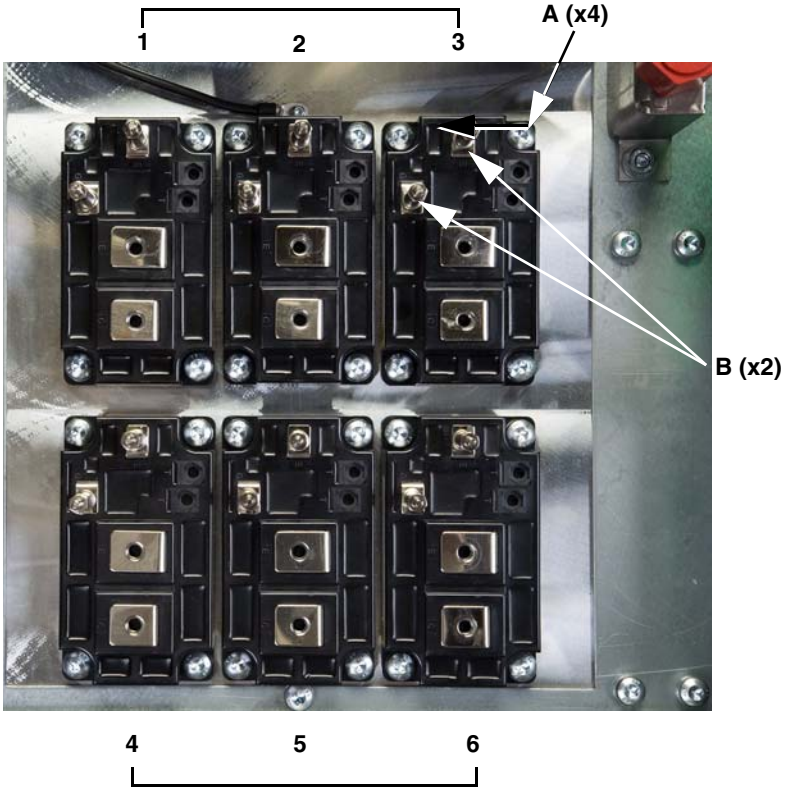


1. Using a T-30 Torx driver, remove four screws (**A,** Figure 111) securing the module to the heatsink and remove the module from the drive.
2. Using a 7 mm socket wrench, remove two standoffs (**B**) from the old IGBT module, and install them on terminals E and G of the new module. Tighten the standoffs to 1.2 N•m (10.6 lb-in).
3. Clean the portion of the heatsink that makes contact with the power IGBT module.
4. Evenly coat the bottom of the new power IGBT module with a thin layer of thermal compound, included in the kit, and position the module on the heatsink.
5. Using a T-30 Torx driver, secure the module to the heatsink with four screws (**A,** Figure 111). Initially tighten the screws, in the sequence shown in Figure 110, to 0.7–1.0 N•m (6.2–8.9 lb-in), and then to a final torque of 3.3–4.4 N•m (29.2–38.9 lb-in).

NEXT STEP: If you are also replacing the capacitors, skip to "Replacing the Capacitors VY1ADC1114" beginning on page 103.

If you are only replacing the power IGBT modules, continue with "Reassemble the Drive" on page 102.

Figure 111: Power IGBT Modules, Phase V Shown



Reassemble the Drive

If you are only replacing the power IGBT modules, perform Steps 1–25 of "Reassembly Steps for Level 2 Parts" beginning on page 120 to replace the following parts:

- ❑ Bottom DC bus plate
- ❑ Gate driver boards
- ❑ Top DC bus plate
- ❑ Fan bracket
- ❑ BU (+) bus
- ❑ Motor current sensors
- ❑ Filter board
- ❑ L1, L2, L3 input bus bars
- ❑ Input bus bar brackets
- ❑ Power board assembly
- ❑ Fan control board connections
- ❑ Power board connections
- ❑ Soft charge board connections
- ❑ Control module assembly
- ❑ Middle crossbrace
- ❑ EMC tray
- ❑ Power terminal shields
- ❑ Front cover

Replacing the Capacitors VY1ADC1114

IMPORTANT: Label and retain all removed hardware and cables for use in reassembly.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Read and understand the precautions in "Before You Begin" starting on page 5 before performing this procedure.
- Before working on this equipment, turn off all power supplying it and perform the DC bus voltage measurement procedure on page 11.

Failure to follow these instructions will result in death or serious injury.

This kit contains six capacitors. If a capacitor has shorted, you must replace **all** of the capacitors in the drive.

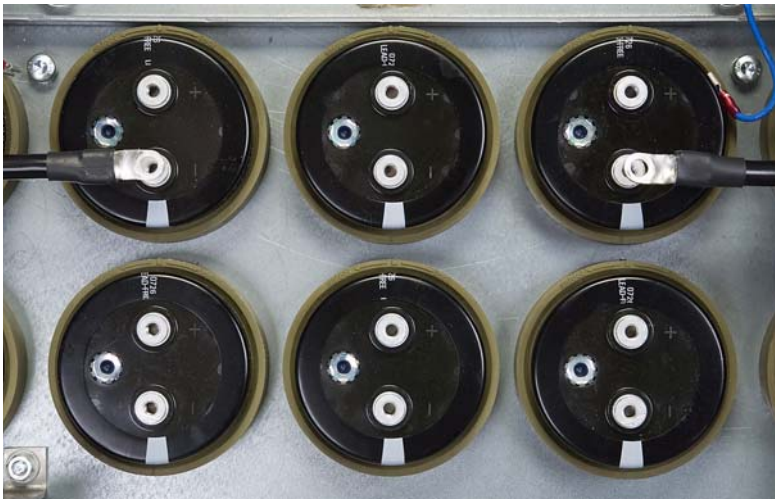
Before performing the steps in this procedure, perform Steps 1–25 of "Disassembly Steps for Accessing Level 2 Parts" beginning on page 46 to remove the following parts from the drive:

- ❑ Front cover
- ❑ Power terminal shields
- ❑ EMC tray
- ❑ Middle crossbrace
- ❑ Control module assembly
- ❑ Soft charge board connections
- ❑ Power board connections
- ❑ Fan control board connections
- ❑ Power board assembly
- ❑ Input bus bar brackets
- ❑ L1, L2, L3 input bus bars
- ❑ Filter board
- ❑ Motor current sensors
- ❑ BU (+) bus
- ❑ Fan bracket
- ❑ Top DC bus plate
- ❑ Gate driver boards
- ❑ Bottom DC bus plate

1. Replace a capacitor as follows. See Figure 112 on page 104.
   - — Unlock the capacitor by turning it counterclockwise, and remove it from the drive.
   - — Install the new capacitor and lock it into place.

NOTE: Ensure that the positive terminal (**+**) is oriented toward the top of the drive and negative terminal (**-**) toward the bottom.

Figure 112: Capacitors, Phase V Shown



Reassemble the Drive

If you are only replacing the capacitors, perform Steps 1–25 of “Reassembly Steps for Level 2 Parts” beginning on page 120 to replace the following parts:

- ❑ Bottom DC bus plate
- ❑ Gate driver boards
- ❑ Top DC bus plate
- ❑ Fan bracket
- ❑ BU (+) bus
- ❑ Motor current sensors
- ❑ Filter board
- ❑ L1, L2, L3 input bus bars
- ❑ Input bus bar brackets
- ❑ Power board assembly
- ❑ Fan control board connections
- ❑ Power board connections
- ❑ Soft charge board connections
- ❑ Control module assembly
- ❑ Middle crossbrace
- ❑ EMC tray
- ❑ Power terminal shields
- ❑ Front cover

Replacing the SCR Modules and Diode Modules (VZ3TM1600M1671 and VZ3DM1600M1671)

IMPORTANT: Label and retain all removed hardware and cables for use in reassembly.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Read and understand the precautions in "Before You Begin" starting on page 5 before performing this procedure.
- Before working on this equipment, turn off all power supplying it and perform the DC bus voltage measurement procedure on page 11.

Failure to follow these instructions will result in death or serious injury.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- When the controller is damaged, voltage may remain on certain energy storage capacitors after de-energization of the controller and discharge of the main capacitor bank.
- Before working on or near assemblies containing energy storage capacitors, verify that the capacitor voltages are less than 42 Vdc.
- The following assemblies have energy-storing capacitors:
  - — SCR snubber board. See Figure 116 on page 107.
- Always check for the presence of voltage using a voltmeter set to the 1000 Vdc scale. When voltage is present, allow the voltmeter to discharge the capacitor's stored charge. Refer to "Discharging Stored Energy in Capacitors" on page 12.

Failure to follow these instructions will result in death or serious injury.

Before performing the steps in this procedure, perform Steps 1–23 of "Disassembly Steps for Accessing Level 2 Parts" beginning on page 46 to remove the following parts from the drive:

- ❑ Front cover
- ❑ Power terminal shields
- ❑ EMC tray
- ❑ Middle crossbrace
- ❑ Control module assembly
- ❑ Soft charge board connections
- ❑ Power board connections
- ❑ Fan control board connections
- ❑ Power board assembly
- ❑ Input bus bar brackets
- ❑ L1, L2, L3 input bus bars
- ❑ Filter board
- ❑ Motor current sensors
- ❑ BU (+) bus
- ❑ Fan bracket
- ❑ Top DC bus plate

Remove the Top Terminal Bracket

1. Remove the top terminal bracket as follows.
   - — Using an 18 mm socket wrench, remove ten bolts (**A,** Figure 113) from the PO.1, PA/+, PC/-, and PO.2 bus bars.
   - — Using a T-30 Torx driver, remove six screws (**B,** Figure 114) securing the PO.1, PA/+, PC/-, and PO.2 bus bars to the red insulators on the terminal brackets.
   - — Using a T-30 Torx driver, remove five screws (**C,** Figure 115) securing the terminal bracket to the drive frame and remove the terminal bracket from the drive.

Figure 113: Bus Bar Hardware, Front

Figure 114: Bus Bar Hardware, Top

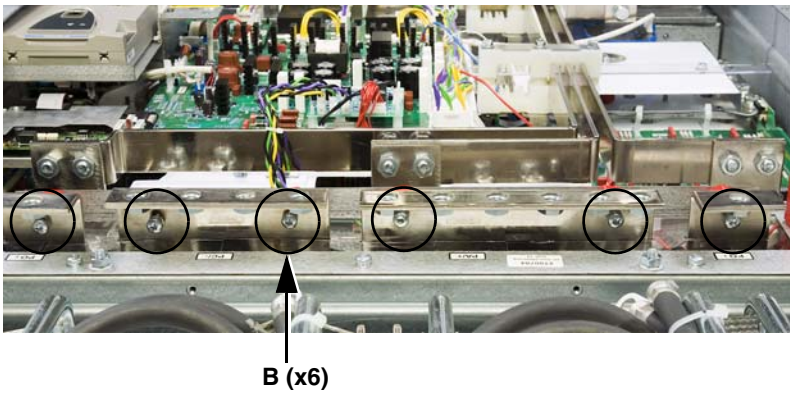
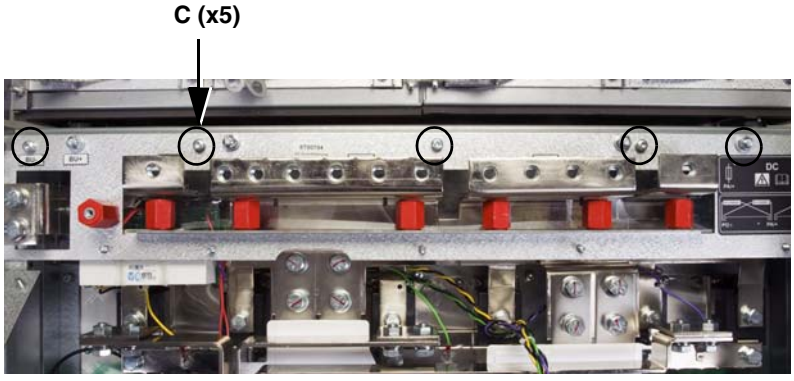


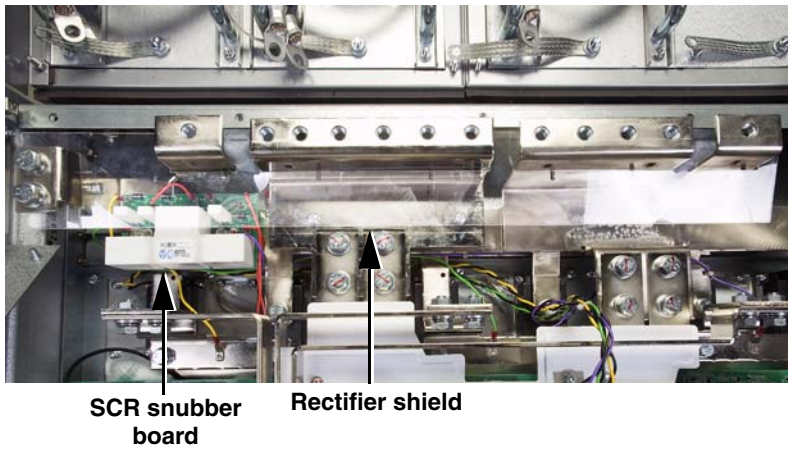
Figure 115: Top Terminal Bracket Hardware



Remove the Top Rectifier Shield

2. Remove the plastic rectifier shield from the bus bars. See Figure 116.

Figure 116: Top Rectifier Shield



Remove the SCR Snubber Board

3. Using needle-nose pliers, carefully remove the connections from SCR snubber board terminals X1, X4, X5, X10, and X11. See Table 28 and Figure 117 for the connection locations.

Table 28: SCR Snubber Board Wiring

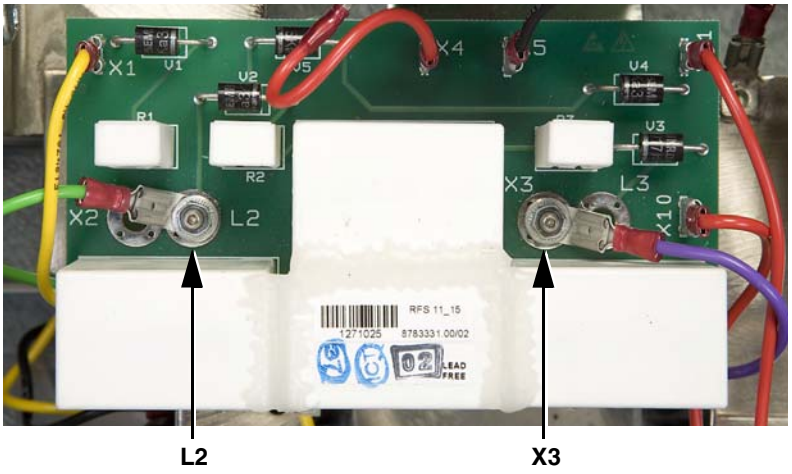
Wire No.[1]	Terminal No.	Description	To:
E131	**X1**	Yellow, 1-pin	U Line input bar
E130	**X4**	Red, 1-pin	PO.1 bus bar
E133	**X5**	Black, 1-pin	PC/- bus bar
E126	**X10**	Red, 0.25 in., 1-pin	GDB[2] U X61
E126	**X11**	Red, 0.19 in., 1-pin	PB[3] RFS31 + X11
E167	**L2**	Green	V Line input bar
E168	**X3**	Violet	W Line input bar

[1] See the schematic on page 152 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

[2] GDB: Gate driver board

[3] PB: Power board

Figure 117: SCR Snubber Board



4. Using a 7 mm socket wrench, remove two bolts securing the snubber board to the insulators on the DC (-) bus and remove the wires from terminals L2 and X3. See Figure 117.
5. Remove the SCR snubber board from the drive.

Remove the SCR Bus Work

6. Using a T-30 Torx driver, remove two screws (**A,** Figure 118) securing the PA/+ bus bar to the red insulators on the PC/- bus.
7. Using a T-30 Torx driver, remove one screw (**B**, Figure 118) securing the BU (-) bus to the red insulator on the drive frame.
8. Using a 16 mm socket wrench, remove three bolts (**C**, Figure 119) securing the PC/- bus to diode modules 1, 2, and 3 and remove the bus bar.

Figure 118: PA/+ Bus Connections

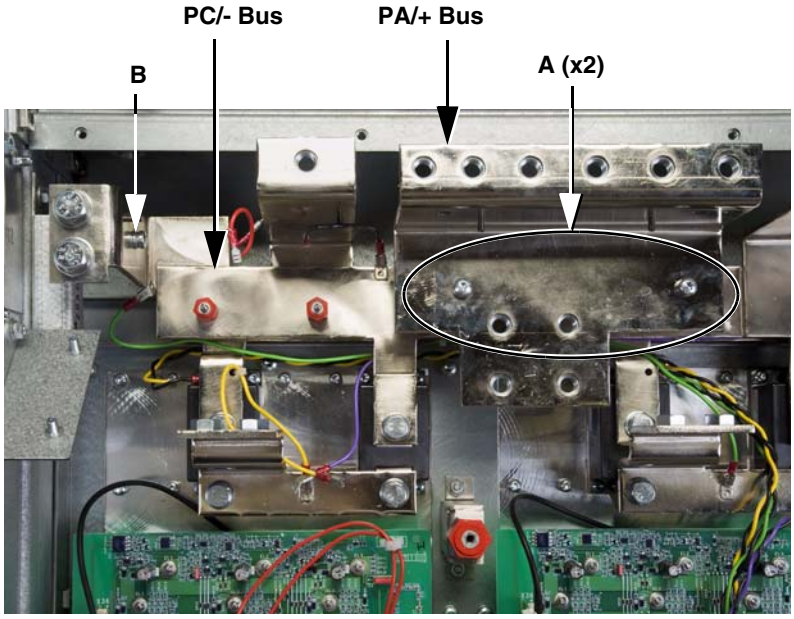
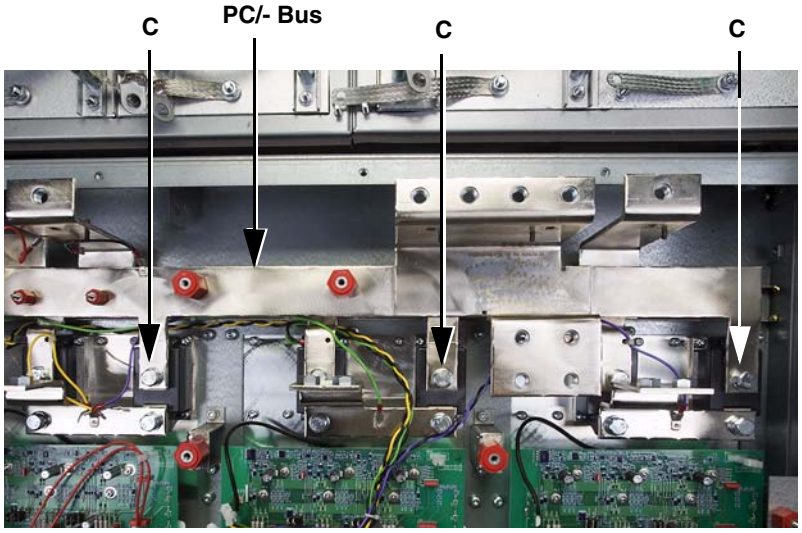


Figure 119: PA/+ Bus Bar



9. Remove the 1-pin yellow wire from AC bus bar L1 (Figure 120), the 1-pin green wire from AC bus bar L2 (Figure 121), and the 1-pin violet wire from AC bus bar L3 (Figure 122).
10. Using a 16 mm socket wrench, remove two screws (**D**) securing the jumper bar between the SCR and diode module that you are replacing, and remove the jumper bar. See Figures 120, 121, and 122.

Figure 120: AC Bus Bar L1

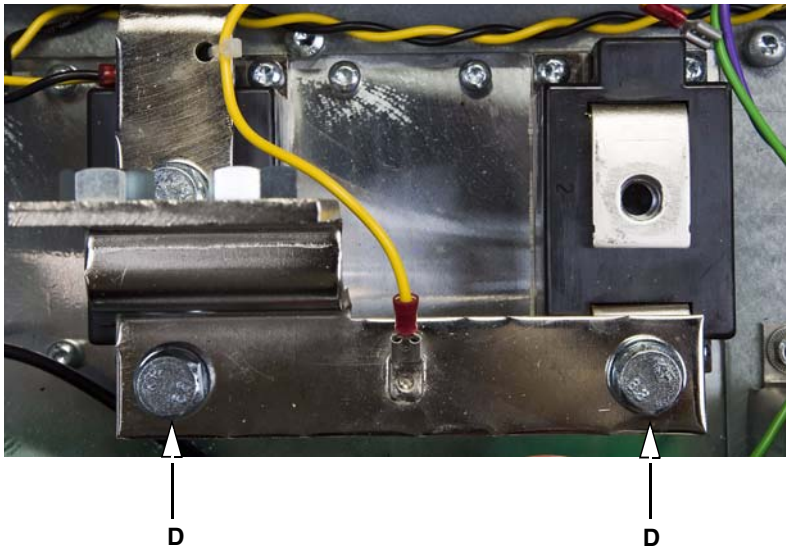


Figure 121: AC Bus Bar L2

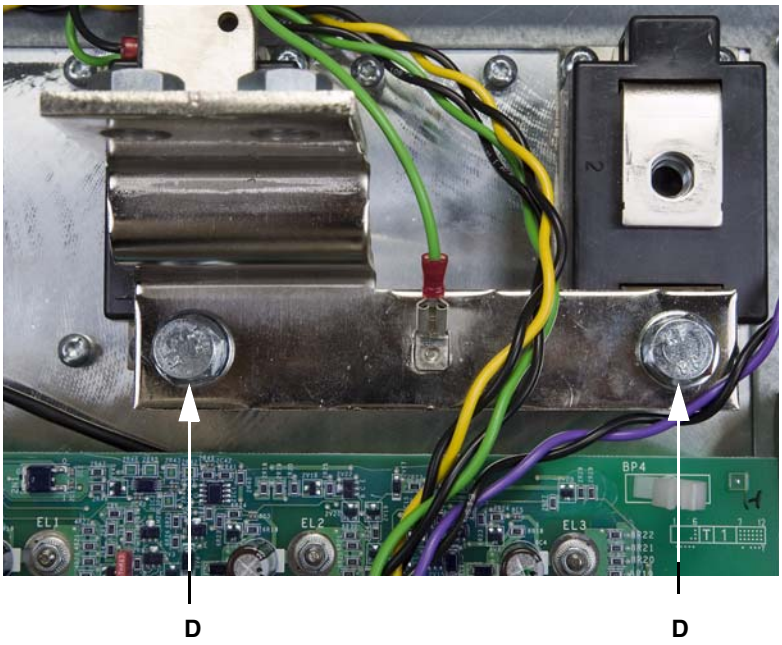
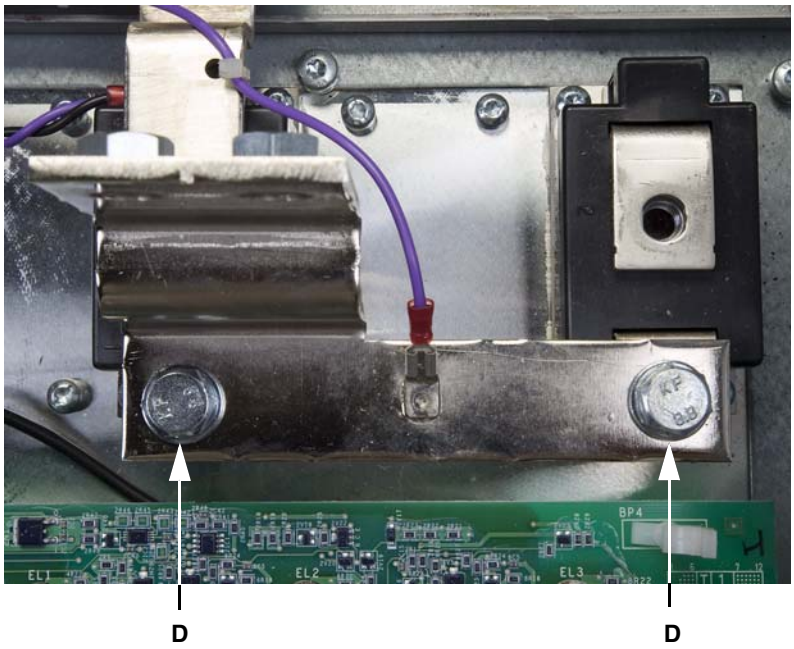
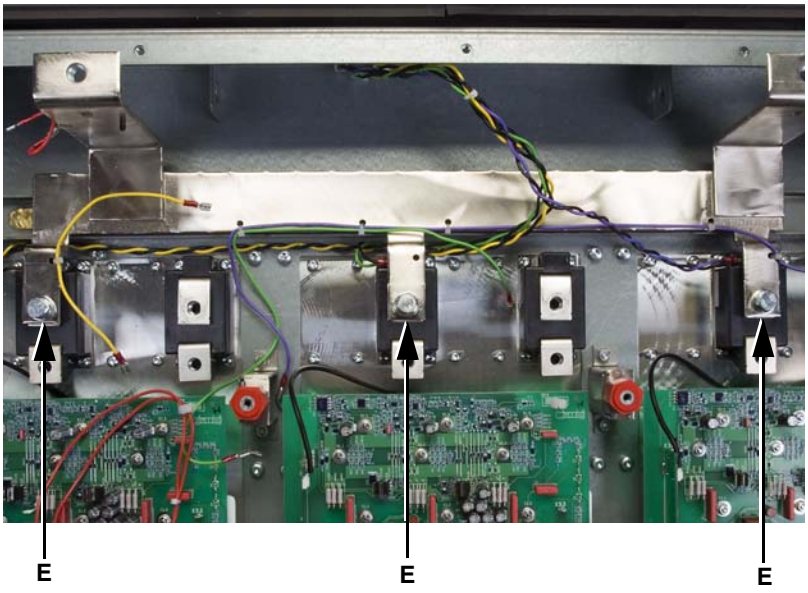


Figure 122: AC Bus Bar L3



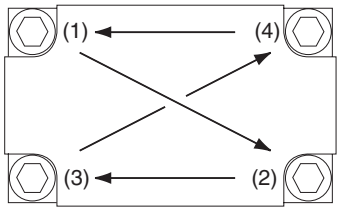
11. Using a 16 mm socket wrench, remove three screws (**E**) securing the PO.1 and PO.2 bus bars to SCR modules 1, 2, and 3 and remove the bus bars. See Figure 123.

Figure 123: PO.1 and PO.2 Bus Bars



Replace the SCR Module

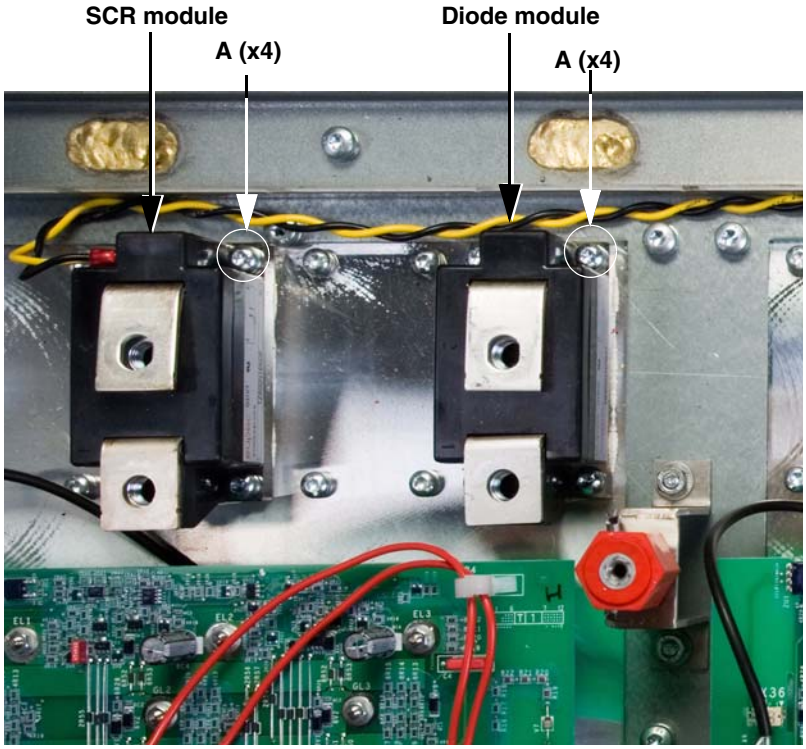
Figure 124: Torque Sequence



12. Replace an SCR module or diode module as follows.
    - — If you are replacing an SCR module, remove the connections from terminals 4 (black wire) and 5 (color wire). See Figure 125.
    - — Using a T-20 Torx driver, remove four screws (**A**) securing the SCR or diode module to the heatsink and remove the module from the drive. See Figure 125.
    - — Clean the portion of the heatsink that makes contact with the SCR or diode module.
    - — Evenly coat the bottom of the new module with a thin layer of thermal compound included in the kit.
    - — Position the new SCR or diode module on the heatsink under the input bus bar.
    - — Using a T-20 Torx driver, secure the module with four screws (**A**). See Figure 125. Initially tighten the screws, in the sequence shown in Figure 124, to 0.7–1.0 N•m (6.2–8.9 lb-in), and then to a final torque of 3.3–4.4 N•m (29.2–38.9 lb-in).
    - — If you are replacing an SCR module, replace the connections to terminals 4 and 5. See Figure 125.

NOTE: Note the cable positions. The yellow and black twisted cable goes to SCR module 1, the green and black cable goes to SCR module 2, and the violet and black cable goes to SCR module 3. The black wire goes on the top terminal of each SCR module.

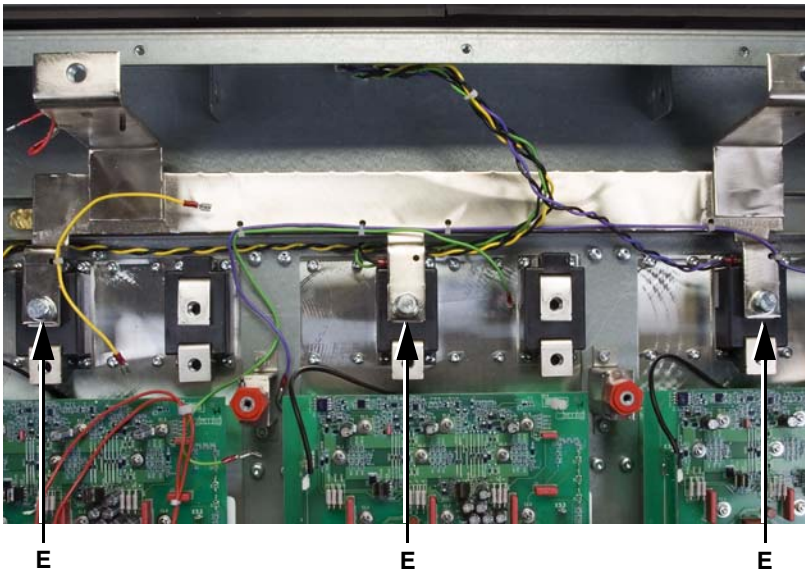
Figure 125: SCR and Diode Modules



Reinstall the SCR Buswork

13. Using a 16 mm socket wrench, secure the PO.1 and PO.2 bus bars to SCR modules 1, 2, and 3 with three screws (**E**). See Figure 126. Tighten the screws to the torque values specified in Table 29 on page 114.

Figure 126: PO.1 and PO.2 Bus Bars



14. Using a 16 mm socket wrench, secure the jumper bar between the SCR and diode module that you replaced with two bolts (**D**). See Figures 127, 128, and 129. Tighten the bolts to the torque values specified in Table 29 on page 114.

Figure 127: AC Bus Bar L1

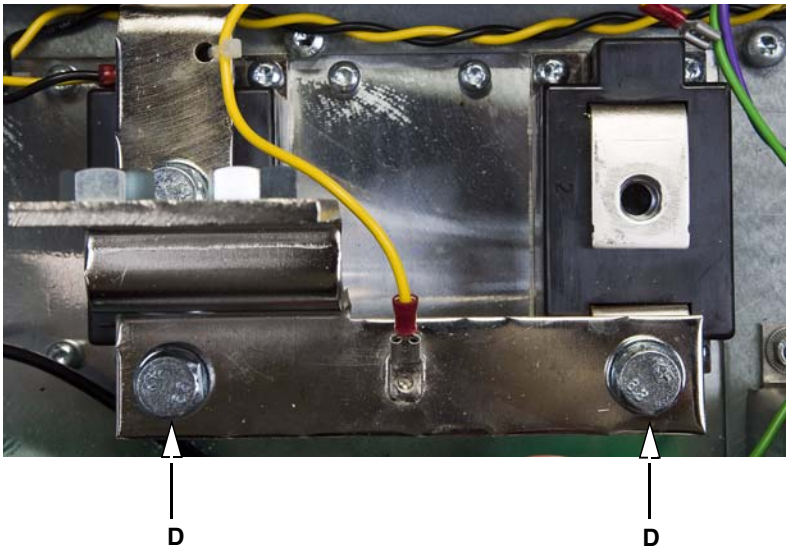


Figure 128: AC Bus Bar L2

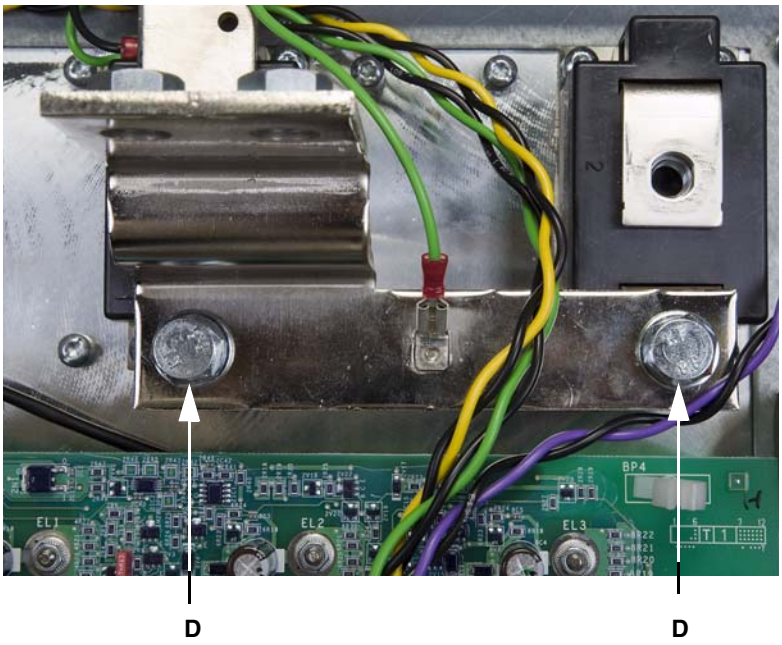
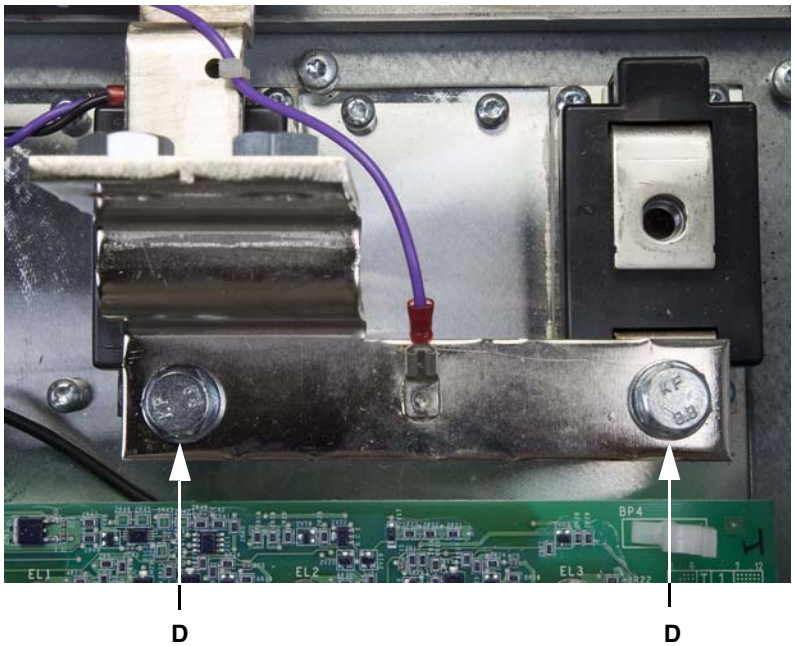


Figure 129: AC Bus Bar L3



15. Reinstall the 1-pin yellow wire on AC bus bar L1 (Figure 127), the 1-pin green wire on AC bus bar L2 (Figure 128), and the 1-pin violet wire on AC bus bar L3 (Figure 129).

16. Using a 16 mm socket wrench, secure the PC/- bus to diode modules 1, 2, and 3 with three bolts (**C**, Figure 130).
17. Using a T-30 Torx driver, secure the BU (-) bus to the red insulator on the drive frame with one screw (**B**, Figure 131.
18. Using a T-30 Torx driver, secure the PA/+ bus bar to the red insulators on the PC/- bus with two screws (**A,** Figure 131).
19. Tighten hardware items **A**, **B**, and **C** to the torque values specified in Table 29.

Figure 130: PA/+ Bus Bar

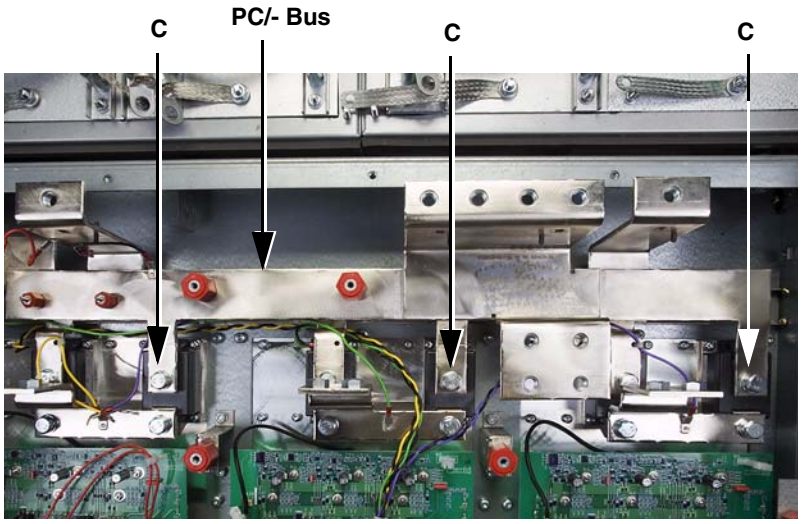
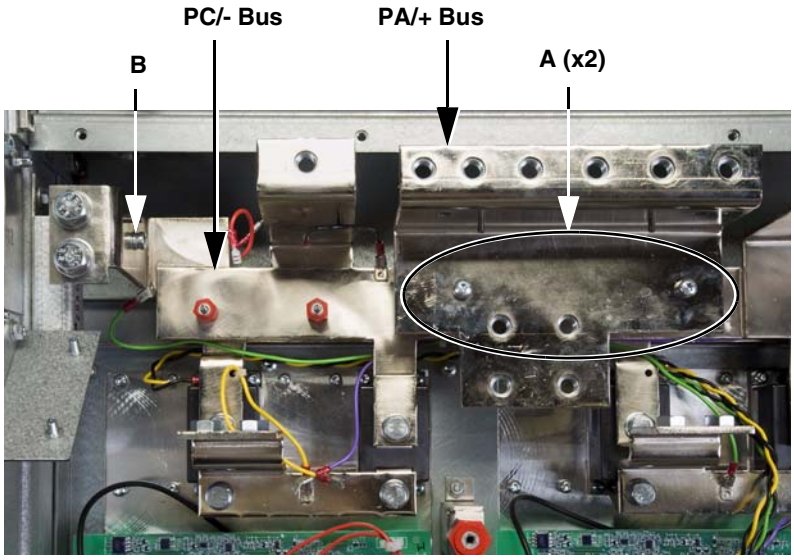


Table 29: PC/-, BU (-), and PA/+ Bus Bar Hardware Torque Values

Item	Description	Torque Range	
		N•m	lb-in
A	(2) T-30 screws	5.5	48.7
B	(1) T-30 screw	5.5	48.7
C	(3) 16-mm bolts	13.5	119.5
D	(6) 16-mm bolts	13.5	119.5
E	(3) 16-mm bolts	13.5	119.5

Figure 131: PA/+ Bus Connections



Replace the SCR Snubber Board

Table 30: SCR Snubber Board Wiring

Wire No.[1]	Terminal No.	Description	To:
E131	**X1**	Yellow, 1-pin	U Line input bar
E130	**X4**	Red, 1-pin	PO.1 bus bar
E133	**X5**	Black, 1-pin	PC/- bus bar
E126	**X10**	Red, 0.25 in., 1-pin	GDB[2] U X61
E126	**X11**	Red, 0.19 in., 1-pin	PB[3] RFS31 + X11
E167	**L2**	Green	V Line input bar
E168	**X3**	Violet	W Line input bar

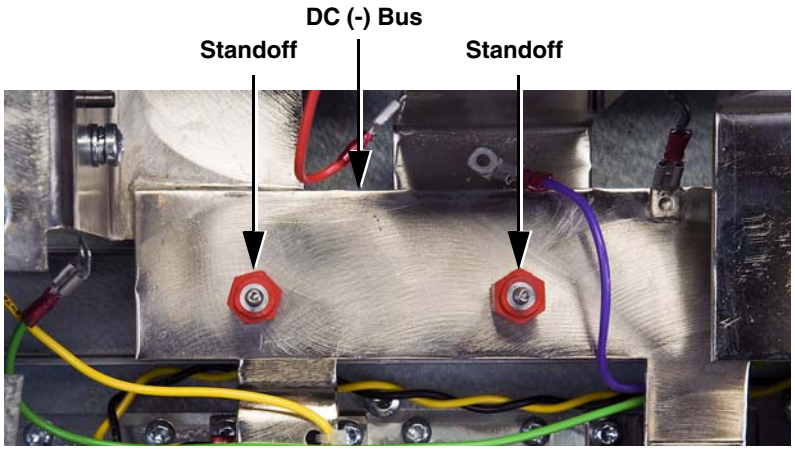
[1] See the schematic on page 152 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

[2] GDB: Gate driver board

[3] PB: Power board

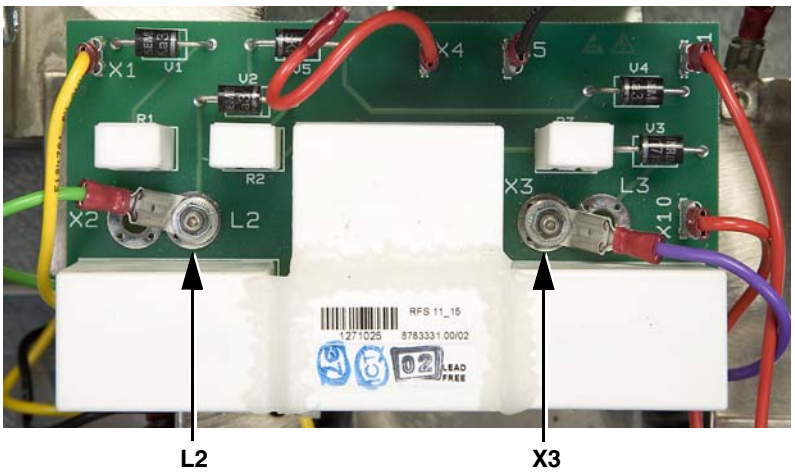
20. Seat the SCR snubber board on the DC (-) bus standoffs. See Figure 132.

Figure 132: DC (-) Bus



21. Replace the wires at terminals L2 and X3. Using a 7 mm socket wrench, secure the wires and the snubber board to the DC (-) bus with two bolts. See Figure 133. Tighten the bolts to 1.2 N•m (10.6 lb-in).
22. Replace the connections on SCR snubber board terminals X1, X4, X5, X10, and X11. See Table 30 and Figure 133 for the terminal locations.

Figure 133: SCR Snubber Board



Replace the Top Rectifier Shield

23. Replace the plastic shield over the bus bars. See Figure 134. If the rectifier shield is cracked, broken, or damaged, replace it with a piece from the plastic kit. See “Replacing the Plastic Parts Kit VY1A1406” on page 23.

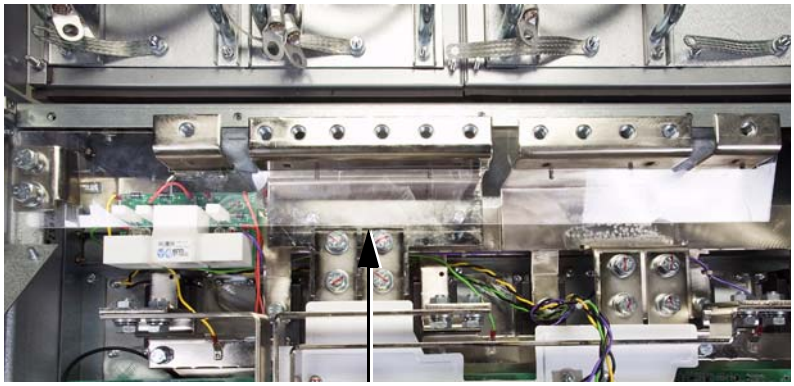
⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Install the rectifier shield as shown in Figure 134.
- Before installing the shield, ensure that it has no tears or cracks. If the shield is damaged, install a new piece from the plastic kit. See page 23.
- Do not install a damaged shield.

Failure to follow these instructions will result in death or serious injury.

Figure 134: Top Rectifier Shield



Rectifier shield

Replace the Top Terminal Bracket

24. Replace the top terminal bracket as follows.

— Using a T-30 Torx driver, secure the terminal bracket to the drive frame with five screws (**C**). See Figure 135. Tighten the screws to the torque values specified in Table 31.

— Using a T-30 Torx driver, secure the PO.1, PA/+, PC/-, and PO.2 bus bars to the red insulators on the terminal bracket with six screws (**B**). See Figure 136. Tighten the screws to the torque values specified in Table 31.

— Using an 18 mm socket wrench, replace ten bolts (**A**) in the PO.1, PA/+, PC/-, and PO.2 bus bars. See Figure 137. Tighten the bolts to the torque values specified in Table 31.

Table 31: Top Terminal Bracket and Bus Bar Hardware Torque Values

Item	Description	Torque Range	
		N•m	lb-in
A	(10) 18-mm bolts	45	398
B	(6) T-30 screws	5.5	48.7
C	(5) T-30 screws	5.5	48.7

Figure 135: Top Terminal Bracket Hardware

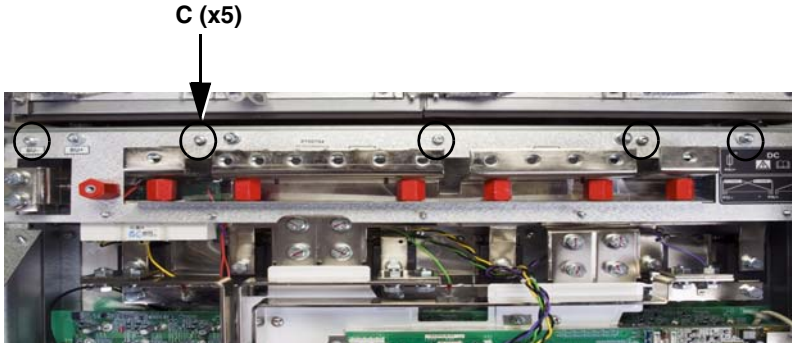


Figure 136: Bus Bar Hardware, Top

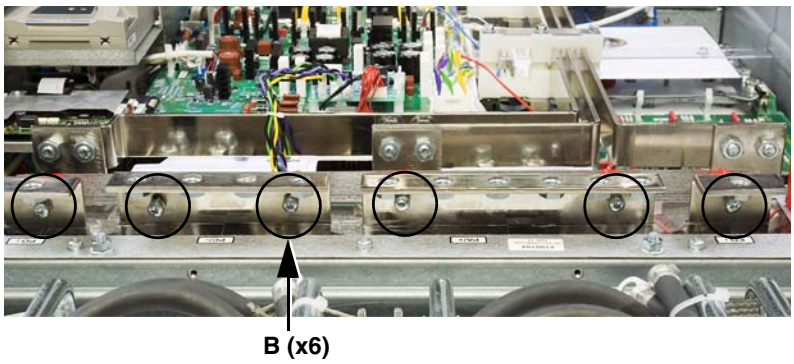
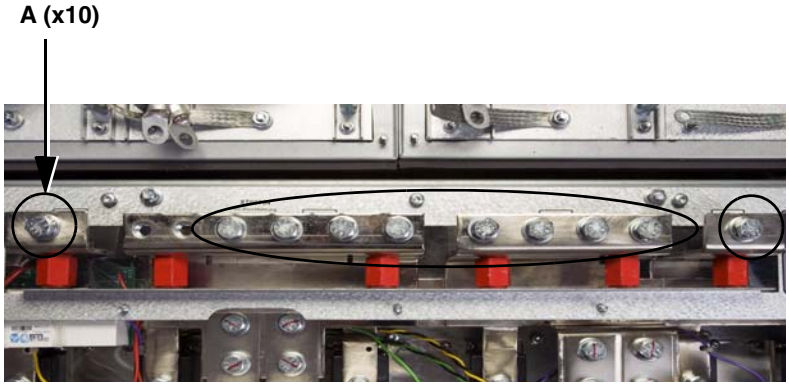


Figure 137: Bus Bar Hardware, Front



Replace the Fan Bracket

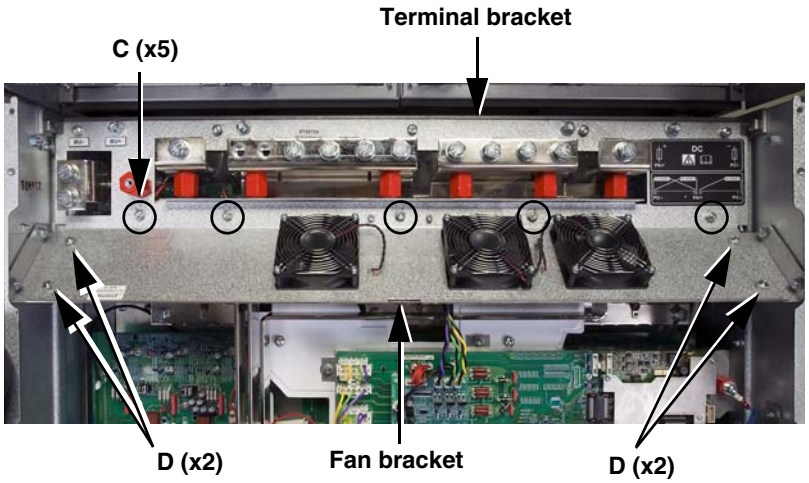
Table 32: Fan Bracket and BU (+) Bus Hardware Torque Values

Item	Description	Torque Range	
		N•m	lb-in
A	(2) 18-mm bolts	45	398
B	(1) T-30 screw	5.5	48.7
C	(5) 10-mm nuts	5.5	48.7
D	(4) 10-mm nuts	5.5	48.7

25. Connect wire E106 from power board terminals X21 and X22 to the fan connectors on the back of the fan bracket.

    Using a 10 mm socket wrench, secure the fan bracket to the top terminal bracket and the drive frame with nine nuts (**C** and **D**, Figure 138). Tighten the nuts to the torque values specified in Table 32.

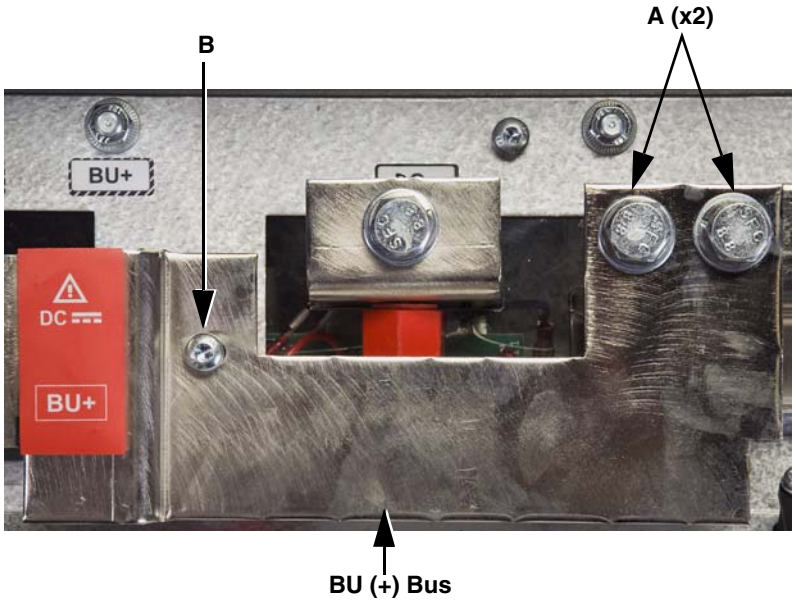
Figure 138: Fan Bracket



Replace the BU (+) Bus

26. Replace the BU (+) bus as follows. See Figure 139.
    - — Using an 18 mm socket wrench, secure the BU (+) bus to the PA/+ bus with two bolts (**A**).
    - — Using a T-30 Torx driver, secure the BU (+) bus to the red insulator on the top terminal bracket with one screw (**B**).
    - — Tighten the hardware to the torque values specified in Table 32.

Figure 139: BU (+) Bus



Replace the Front Cover

27. Replace the front cover. Using a size 2 Phillips driver, secure the front cover with thirteen screws. See Figure 8 on page 20. Tighten the screws to 5.5 N•m (48.7 lb-in).

Reassemble the Drive

If you are only replacing the SCR modules or the diode modules, perform Steps 3–25 of “Reassembly Steps for Level 2 Parts” beginning on page 120 to replace the following parts:

- ❏ Top DC bus plate
- ❏ Fan bracket
- ❏ BU (+) bus
- ❏ Motor current sensors
- ❏ Filter board
- ❏ L1, L2, L3 input bus bars
- ❏ Input bus bar brackets
- ❏ Power board assembly
- ❏ Fan control board connections
- ❏ Power board connections
- ❏ Soft charge board connections
- ❏ Control module assembly
- ❏ Middle crossbrace
- ❏ EMC tray
- ❏ Power terminal shields
- ❏ Front cover

Reassembly Steps for Level 2 Parts

IMPORTANT: Label and retain all removed hardware and cables for use in reassembly.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Read and understand the precautions in "Before You Begin" starting on page 5 before performing this procedure.
- Before working on this equipment, turn off all power supplying it and perform the DC bus voltage measurement procedure on page 11.

Failure to follow these instructions will result in death or serious injury.

This section contains instructions for replacing the following parts in the drive:

- ❑ Front cover
- ❑ Power terminal shields
- ❑ EMC tray
- ❑ Middle crossbrace
- ❑ Control module assembly
- ❑ Soft charge board connections
- ❑ Power board connections
- ❑ Fan control board connections
- ❑ Power board assembly
- ❑ Input bus bar brackets
- ❑ L1, L2, L3 input bus bars
- ❑ Filter board
- ❑ Motor current sensors
- ❑ BU (+) bus
- ❑ Fan bracket
- ❑ Top DC bus plate
- ❑ Gate driver boards
- ❑ Bottom DC bus plate

You must perform some or all of the procedures in this section after replacing the spare parts identified in Table 33. Consult Table 33 for the reassembly steps that must be performed for the corresponding spare parts.

Table 33: Reassembly Steps

If you replaced:	Perform reassembly steps:
Power board VX5A1HC3140	**Steps 21–25**
Brake board VZ3F1113	**Steps 21–25**
Power board assembly shields (Plastic Parts Kit VY1A1406)	**Steps 17–25**
Motor current sensors VY1A1109	**Steps 7–25**
Gate driver boards VX5A1203	**Steps 3–25**
SCR modules VZ3TM1600M1671	**Steps 3–25**
Diode modules VZ3DM1600M1671	
Temperature sensors VZ3G1104	**Steps 2–25**
Power IGBT modules VZ3IM1603M1271	**Steps 1–25**
Capacitors VY1ADC1114	

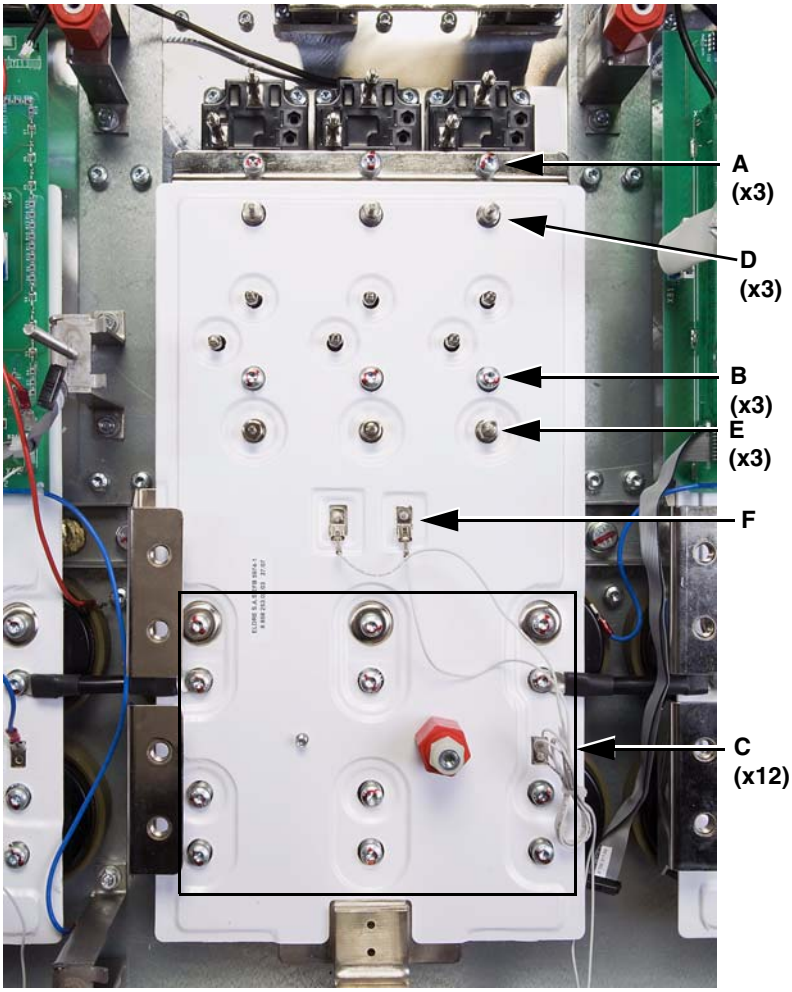
Replace the Bottom DC Bus Plate

1. Replace the Bottom DC bus plate as follows. See Figure 140.
   - — Position the DC bus plate in the drive as illustrated in Figure 140.
   - — Using a T-30 Torx driver, secure the DC bus plate to terminal E on the IGBT modules with three 14 mm screws (**A**).
   - — Using a T-30 Torx driver, secure the DC bus plate to terminal E on the IGBT modules (**B**) with three 20-mm screws.
   - — Replace the bus neutral jumpers as shown in Figure 140. Using a T-30 Torx driver, secure the DC bus plate to the capacitors (**C**) with twelve 14 mm screws.
   - — Using a 10 mm socket wrench, install three short standoffs (**D**) and three long standoffs (**E**).
   - — Replace the bleeder resistor connections (**F**). Note: In phase U, the bleeder resistors are connected to phase-U gate driver board terminal X62 and power board terminal UD-R1.
   - — Tighten the hardware to the torque values specified in Table 34.

Table 34: Bottom DC Bus Plate Hardware Torque Values

Item	Description	Torque Range	
		N•m	lb-in
A	(3) Long T-30 screws (20 mm length)	5.5	48.7
B	(3) Short T-30 screws (14 mm length)	5.5	48.7
C	(12) Short T-30 screws (14 mm length)	3.3	29.2
D	(3) Short 10-mm standoffs (6 mm barrel length)	5.5	48.7
E	(3) Long 10-mm standoffs (11 mm barrel length)	5.5	48.7

Figure 140: Bottom DC Bus Plate (Phase V Shown)



Replace the Gate Driver Boards

2. Replace the gate driver board(s) as follows.
   — Using a 7 mm socket wrench, secure the gate driver board(s) to the power IGBT modules and the DC bus plate with 18 nuts each. See Figure 141 on page 123. Tighten the nuts to 1.2 N•m (10.6 lb-in).
   — Replace the gate driver board connections. See Table 35 and Figure 141 on page 123.

Table 35: Gate Driver Board Wiring[1]

Wire No.[2]	Terminal No.	Description	To:
Gate Driver Board U (Left)			
E144	**X4**	2-pin, black	Temperature sensor U
E138	**X32**	18-pin, gray	GDB[3] V X31
E129	**X51**	1-pin, blue	UD0 (neutral) on DC bus plate
E127	**X52**	1-pin, blue	GDB V, X51
E126	**X61**	1-pin, red	SB[4] X10
E139	**X62**	1-pin, white	Bleeder resistor
E100	**X82**	14-pin, white	GDB V, X81 and PB[5] X8
Gate Driver Board V (Center)			
E128	**X4**	2-pin, black	Temperature sensor V
E138	**X31**	18-pin, gray	GDB U, X32
E146	**X32**	18-pin, gray	GDB W, X31
E127	**X51**	1-pin, blue	GDB U, X52
E123	**X52**	1-pin, blue	GDB W, X51
E100	**X81**	14-pin, white	GDB U, X82
E102	**X82**	14-pin, white	GDB W, X81
Gate Driver Board W (Right)			
E145	**X4**	2-pin, black	Temperature sensor W
E146	**X31**	18-pin, gray	GDB V, X32
E142	**X32**	18-pin, gray	PB, X3
E123	**X51**	1-pin, blue	GDB V, X52
E102	**X81**	14-pin, white	GDB V, X82
E132	**X53**	1-pin, blue	Insulator near MCB

1 Terminals X4, X81, and X82 are connected to a daughter board on the gate driver board assembly.

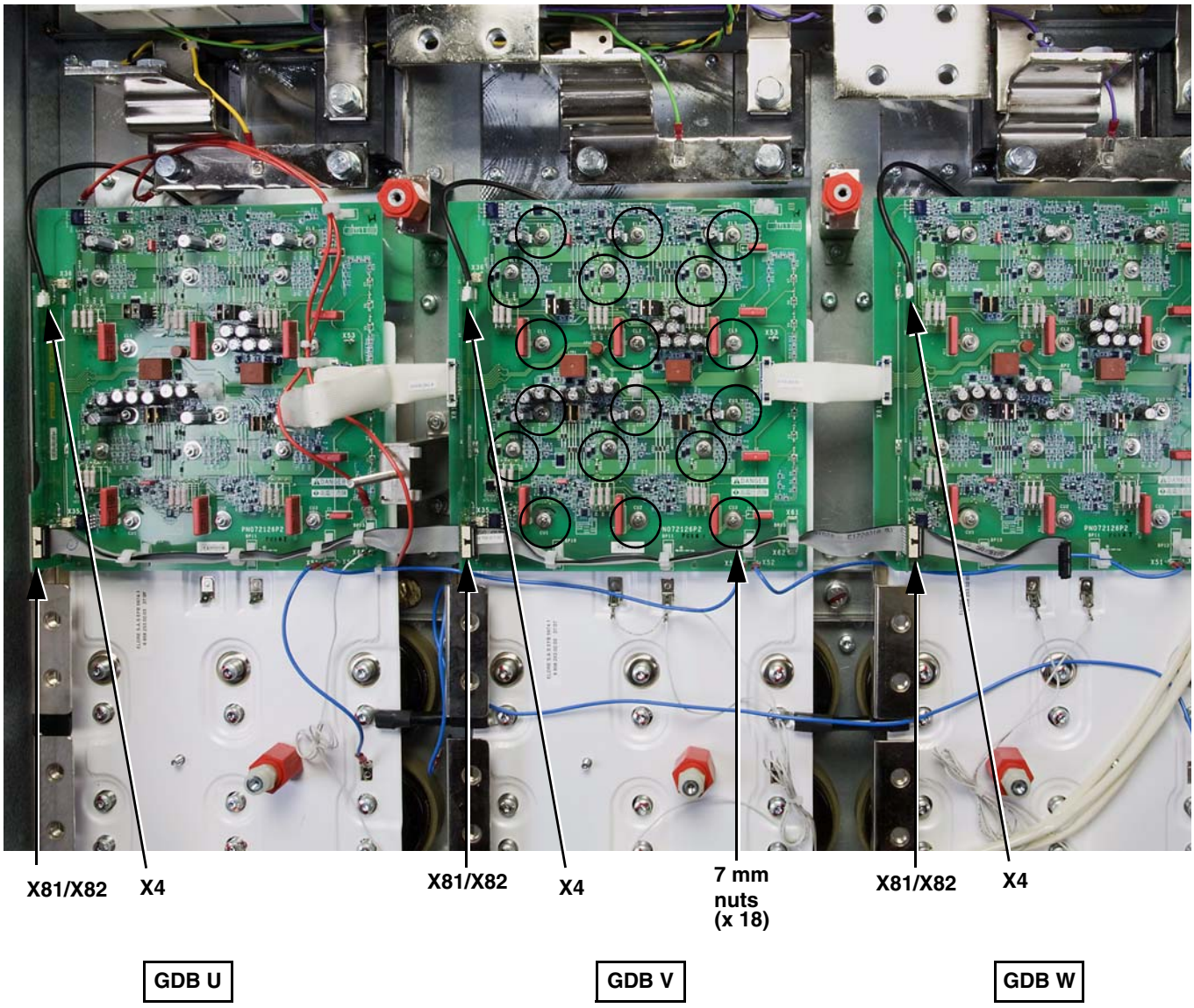
2 See the schematic on page 152 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

3 GDB: Gate driver board

4 SB: SCR Snubber board

5 PB: Power board

Figure 141: Gate Driver Boards



Replace the Top DC Bus plate

3. Replace the top DC bus plate as follows. See Figure 142.
   - — Position the bus plate in the drive as illustrated in Figure 142.
   - — Using an 18 mm socket wrench, secure the bus plate to the positive (+) rectifier bus with four bolts (**C**).
   - — Using an 18 mm socket wrench, secure the bus plate to the negative (-) rectifier bus with four bolts (**D**).
   - — Using a T-30 Torx driver, secure the bus plate to the red insulators on the heatsink with three screws (**E**).
   - — Using a 16 mm socket wrench, secure the bus plate to the positive (+) bus with two bolts (**A**).
   - — Using a 16 mm socket wrench, secure the bus plate to the negative (-) bus with two bolts (**B**).
   - — Tighten the hardware to the torque values specified in Table 36.

Figure 142: Top DC Bus Plate

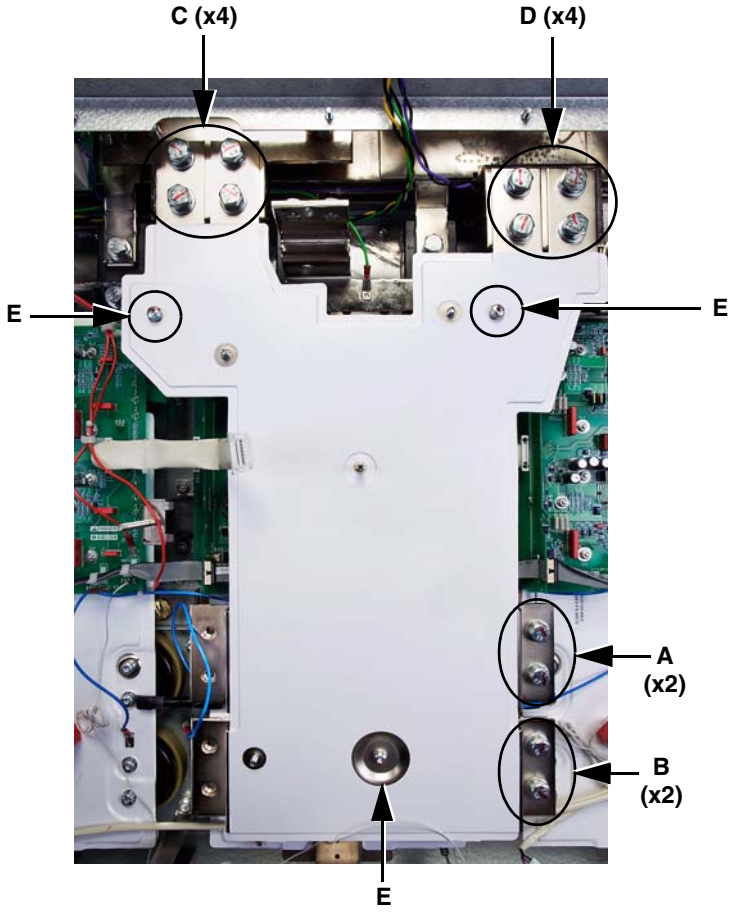


Table 36: Top DC Bus Plate Hardware Torque Values

Item	Description	Torque Range	
		N•m	lb-in
A	(2) 16-mm bolts	27	239
B	(2) 16-mm bolts	27	239
C	(4) 18-mm bolts	45	398
D	(4) 18-mm bolts	45	398
E	(3) T-30 screws	5.5	48.7

Replace the Phase-U DC Bus Plate

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Install the bus plate shield as shown in Figure 143.
- Before installing the shield, ensure that it has no tears or cracks. If the shield is damaged, install a new piece from the plastic kit. See page 23.
- Do not install a damaged shield.

Failure to follow these instructions will result in death or serious injury.

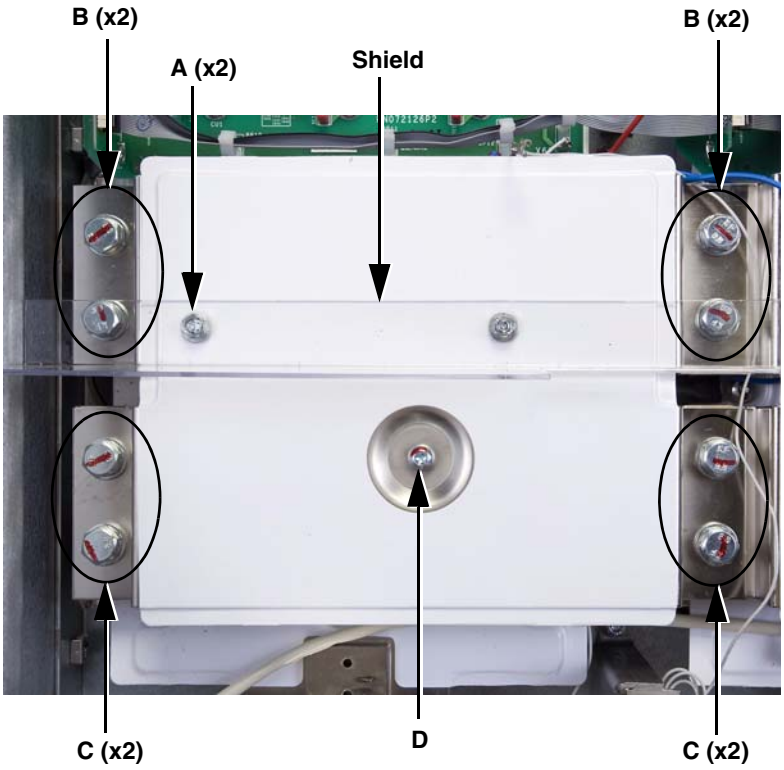
Table 37: Phase-U DC Bus Plate Hardware Torque Values

Item	Description	Torque Range	
		N•m	lb-in
A	(2) 10-mm bolts	5.5	48.7
B	(4) 16-mm bolts	27	239
C	(4) 16-mm bolts	27	239
D	(1) T-30 screw	5.5	48.7

4. Replace the phase-U DC bus plate as follows. See Figure 143.
   - — Position the bus plate in the drive as illustrated in Figure 143.
   - — Using a 16 mm socket wrench, secure the bus plate to the positive (+) bus with eight bolts (**B**).
   - — Using a 16 mm socket wrench, secure the bus plate to the negative (-) bus with eight bolts (**C**).
   - — Using a T-30 Torx driver, secure the bus plate to the insulator on the top DC bus plate with one screw (**D**).
   - — Using a 10 mm socket wrench, secure the plastic shield to the bus plate with two bolts (**A**).

     If the shield is torn, cracked, or damaged, replace it with a new piece from the plastic parts kit. See “Replacing the Plastic Parts Kit VY1A1406” beginning on page 23.
   - — Tighten the hardware to the torque values specified in Table 37.

Figure 143: Phase-U DC Bus Plate



Replace the Fan Bracket

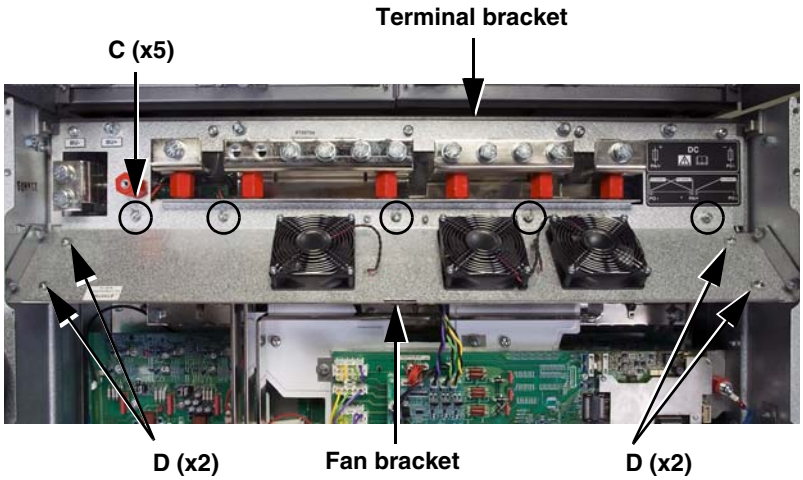
5. Connect wire E106 from power board terminals X21 and X22 to the fan connectors on the back of the fan bracket.

   Using a 10 mm socket wrench, secure the fan bracket to the top terminal bracket and the drive frame with nine nuts (**C** and **D**). See Figure 144. Tighten the nuts to the torque values specified in Table 38.

Table 38: Fan Bracket and BU (+) Bus Hardware Torque Values

Item	Description	Torque Range	
		N•m	lb-in
A	(2) 18-mm bolts	45	398
B	(1) T-30 screw	5.5	48.7
C	(5) T-30 screws	5.5	48.7
D	(4) T-30 screws	5.5	48.7

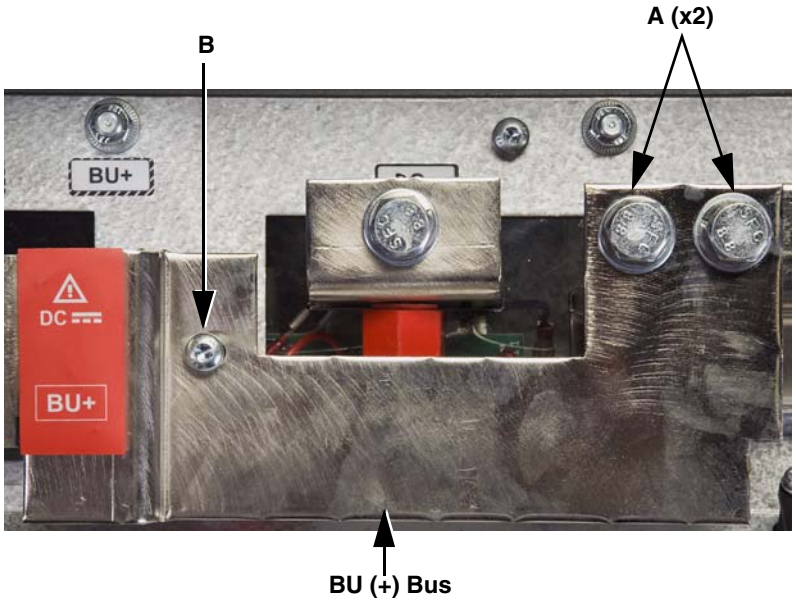
Figure 144: Fan Bracket



Replace the BU (+) Bus

6. Replace the BU (+) bus as follows. See Figure 145.
   - — Using an 18 mm socket wrench, secure the BU (+) bus to the PA/+ bus with two bolts (**A**).
   - — Using a T-30 Torx driver, secure the BU (+) bus to the red insulator on the top terminal bracket with one screw (**B**).
   - — Tighten the hardware to the torque values specified in Table 38.

Figure 145: BU (+) Bus



Replace the Phase W Motor Current Sensors

7. Replace the phase W motor current sensor as follows.
   - — Rotate the T/L3 bus bar to the left for clearance. See Figure 146.
   - — Using a T-20 Torx driver, secure the motor current sensor to the brace on the phase W bus plate with two screws (**J**). See Figure 146. Tighten the screws to 1.2 N•m (10.6 lb-in).
   - — Using a T-30 Torx driver, secure the W/T3 bus bar to the insulators on the drive frame with two screws (**H**). See Figure 147.
   - — Using an 18 mm socket wrench, secure the L-shaped bracket to the W/T3 output with two bolts and washers (**G**). See Figure 147.
   - — Using an 18 mm socket wrench, secure the W-phase DC bus plate to the L-shaped bracket on the W/T3 output with two bolts and washers (**E**). See Figure 148.

NOTE: Replace the output sensor plate (**F**) under the front bolt. See Figure 148.

   - — Tighten the hardware to the torque values specified in Table 39.

Figure 146: T/L3 Bus Bar and Motor Current Sensor

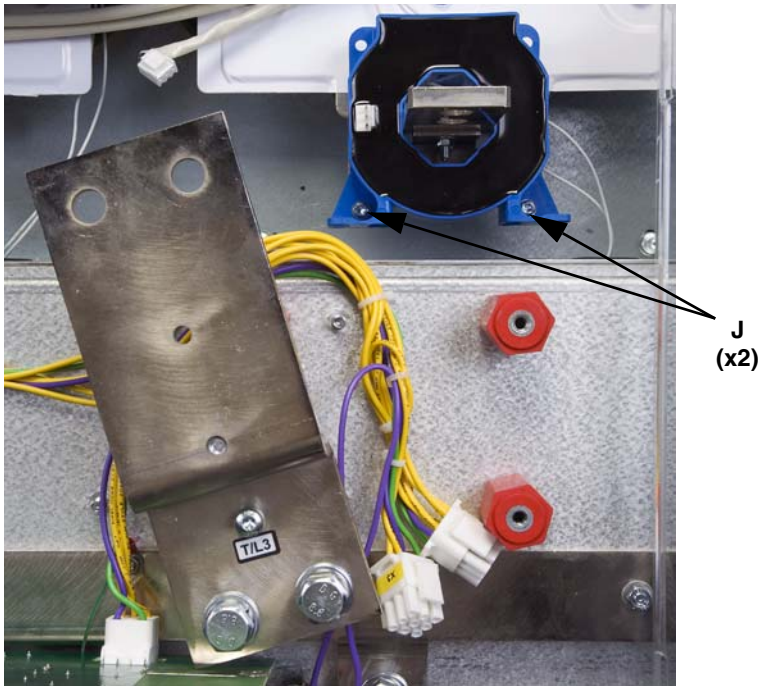


Table 39: W/T3 Output Hardware Torque Values

Item	Description	Torque Range	
		N•m	lb-in
E	(2) 18-mm bolts and washers	45	398
G	(2) 18-mm bolts and washers	45	398
H	(2) T-30 screws	5.5	48.7

Figure 147: W/T3 Output

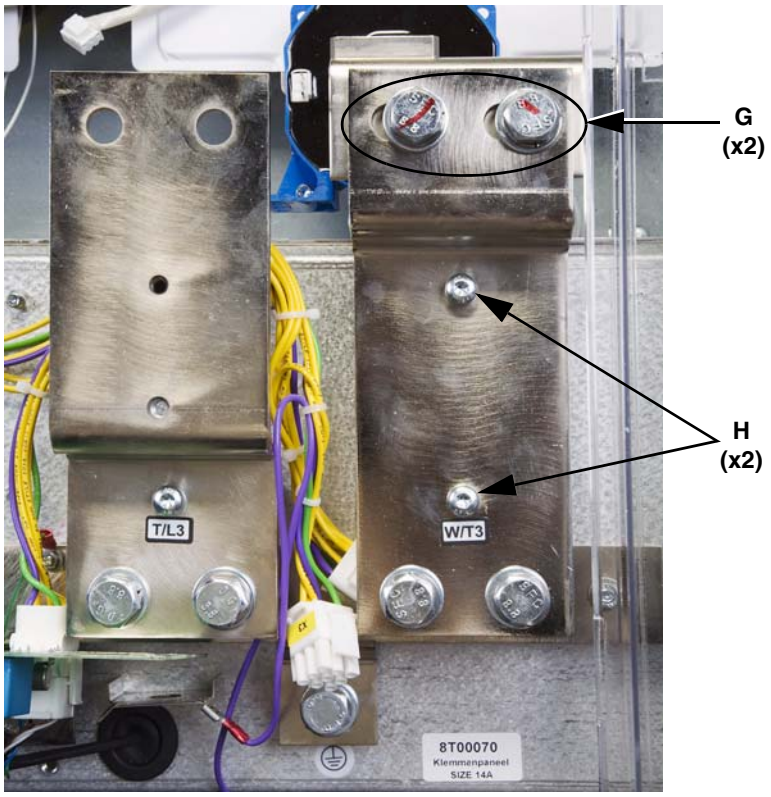
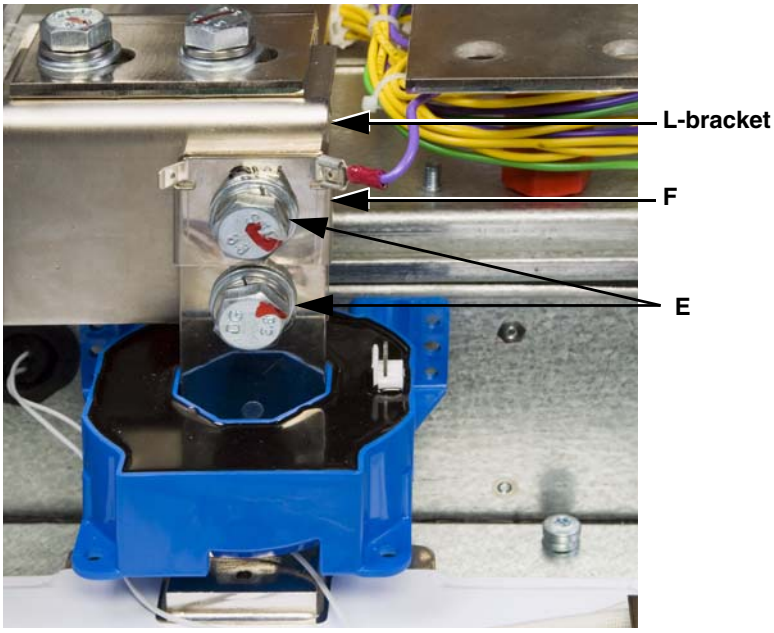


Figure 148: W/T3 Output and L-Bracket, Top



Replace the Phase U Motor Current Sensor

8. Replace the phase U motor current sensor as follows.
   - — Rotate the R/L1 bus bar to the left for clearance. See Figure 149.
   - — Using a T-20 Torx driver, secure the motor current sensor to the brace on the phase U bus plate with two screws (**D**). See Figure 149. Tighten the screws to the torque values specified in Table 40.
   - — Using a T-30 Torx driver, secure the U/T1 bus bar to the insulators on the drive frame with two screws (**C**). See Figure 150. Tighten the screws to the torque values specified in Table 40.

Table 40: Motor Current Sensor and U/T1 Bus Bar Hardware Torque Values

Item	Description	Torque Range	
		N•m	lb-in
C	(2) T-30 screws	5.5	48.7
D	(2) T-20 screws	1.2	10.6

Figure 149: R/L1 Bus Bar and Motor Current Sensor

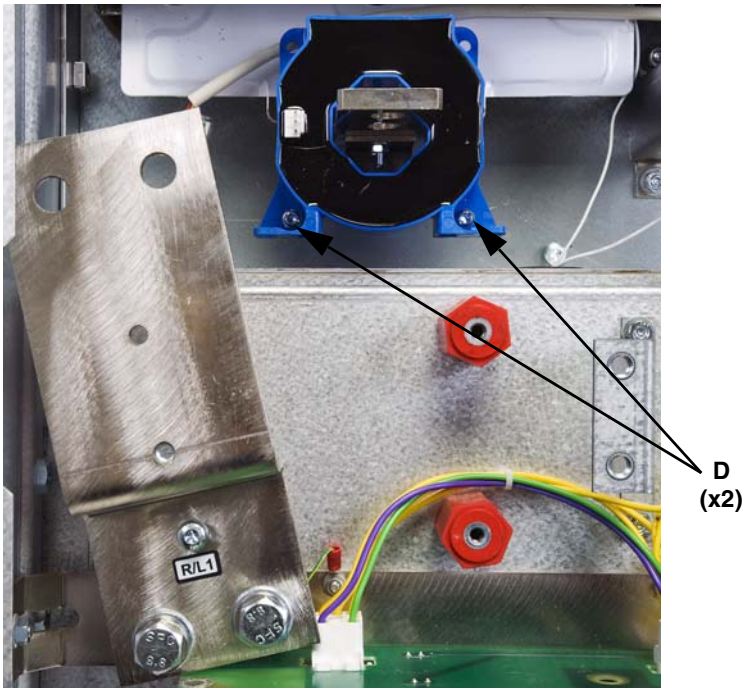
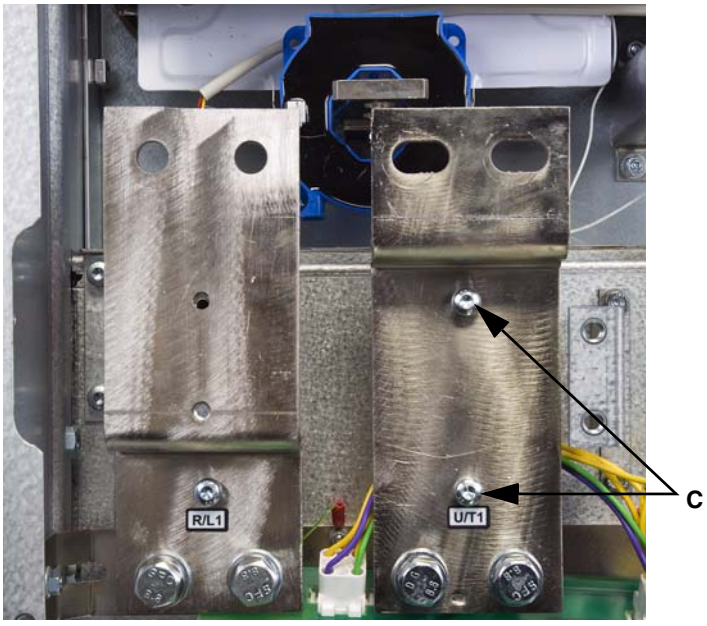


Figure 150: U/T1 Bus Bar



Replace the Phase V Motor Current Sensor

9. Replace the phase V motor current sensor as follows.
   - — Rotate the S/L2 bus bar to the left for clearance. See Figure 151.
   - — Using a T-20 Torx driver, secure the motor current sensor to the brace on the phase V bus plate with two screws (**B**). See Figure 151. Tighten the screws to the torque values specified in Table 41.
   - — Using a T-30 Torx driver, secure the insulator bracket and the V/T2 bus bar to the insulators on the drive frame with two screws (**A**). See Figure 152. Tighten the screws to the torque values specified in Table 41.

Table 41: W/T3 Output Hardware Torque Values

Item	Description	Torque Range	
		N•m	lb-in
A	(2) T-30 screws	5.5	48.7
B	(2) T-20 screws	1.2	10.6

Figure 151: S/L2 Bus Bar and Motor Current Sensor

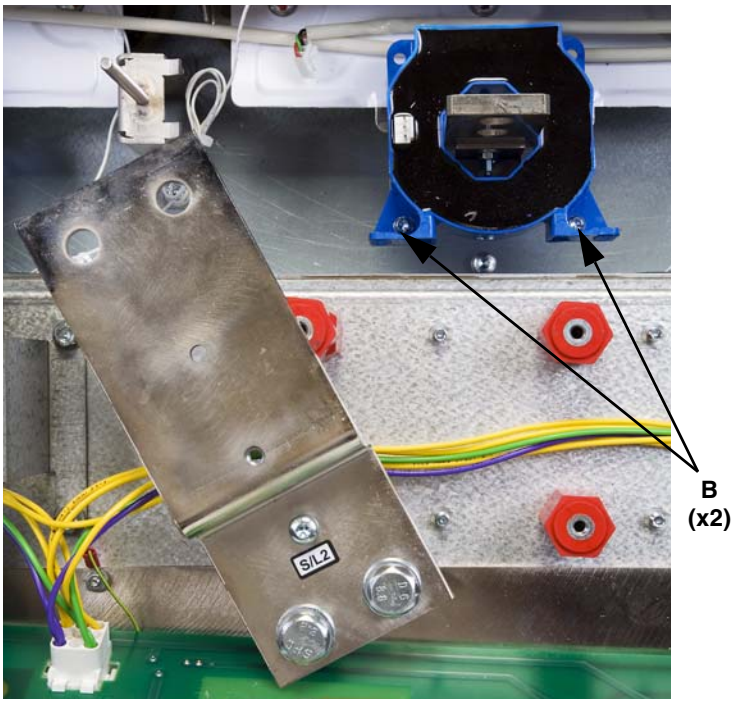
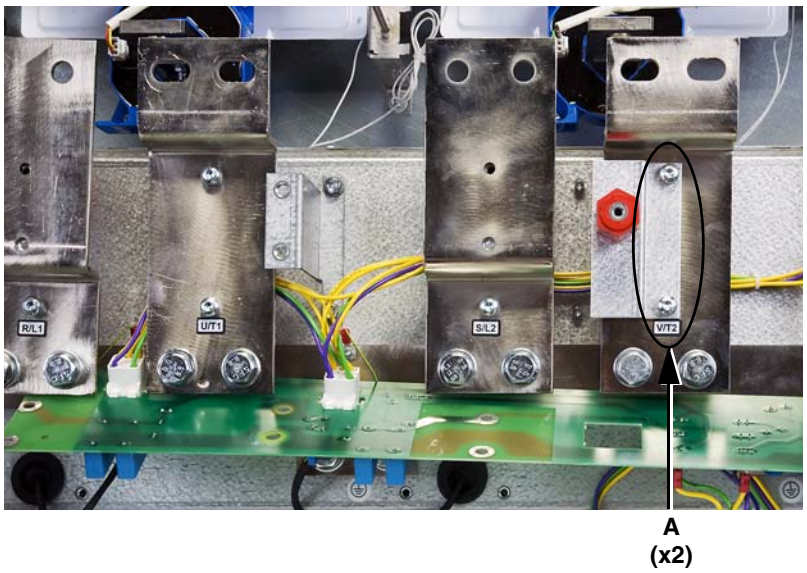


Figure 152: V/T2 Bus Bar



Replace the Motor Current Sensor Connections

10. Replace the 3-wire connectors on the motor current sensors. See Table 42.

Table 42: Motor Current Sensor Connections

Wire No.[1]	Terminal No.	Description	To:
E103	**U/T1**	3-pin, yellow/black/red	PB[2] X11
E103	**V/T2**	3-pin, green/black/red	PB X11
E103	**W/T3**	3-pin, violet/black/red	PB X11

[1] See the schematic on page 152 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

[2] PB: Power board

Replace the Filter Board

11. Replace the filter board as follows:

— Position the filter board in the drive as shown in Figure 153.

— Using a T-30 Torx driver, secure the filter board to the input bus bars R/L1, S/L2, and T/L3 with six screws (**A**, Figure 153).

— Using a size 3 Phillips driver, install the grounding screw and washer (**B,** Figure 153).

> **NOTE:** Be sure to install the size 3 Phillips screw and washer (**B**) in the original position. Figure 153 shows the screw in the grounded position.

— Tighten the hardware to the torque values specified in Table 43.

Figure 153: Filter Board

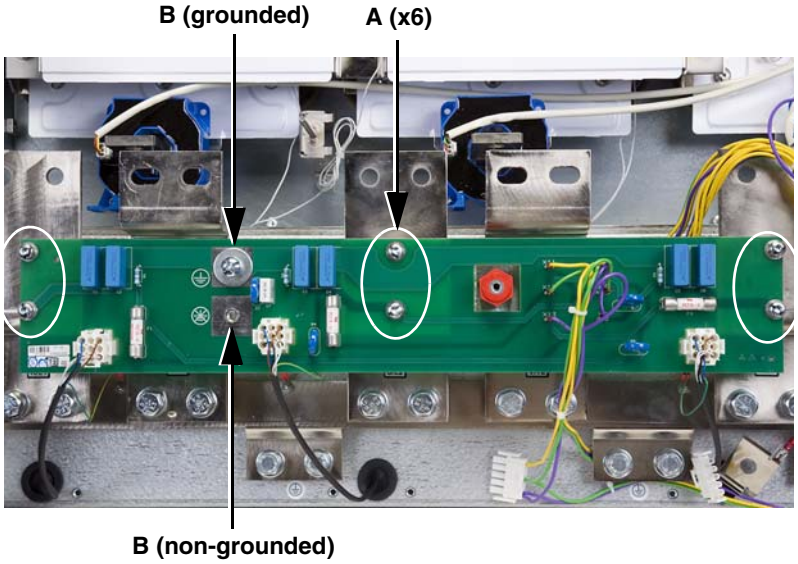


Table 43: Filter Board Hardware Torque Values

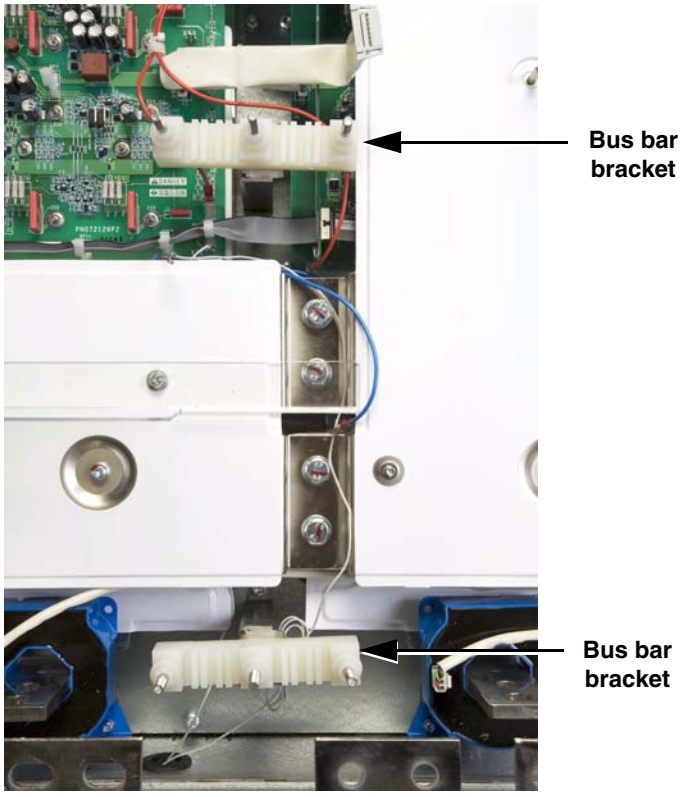
Item	Description	Torque Range	
		N•m	lb-in
A	(6) T-30 screws	5.5	48.7
B	(1) Size 3 Phillips screw and washer	5.5	48.7

Replace the Input Bus Bar Brackets (Bottom)

12. Install the bottom half of the input bus bar brackets on the mounting posts on the drive frame.

    Before installing the brackets, ensure that they have no tears or cracks. If the brackets are damaged, install a new piece from the plastic kit. See page 23.

Figure 154: Input Bus Bar Brackets, Bottom



Replace the L1 Input Bus Bar

13. Replace the L1 input bus bar as follows.

— Position the L1 bus bar in the drive as shown in Figure 155.

— Using an 18 mm socket wrench, secure the L -shaped bracket to the U/T1 output with two bolts and washers (**F**). See Figure 156.

— Using an 18 mm socket wrench, secure the U-phase DC bus plate to the L-shaped bracket on the U/T1 output with two bolts and washers (**D**). See Figure 157 on page 134.

NOTE: Replace the output sensor plate (**E**) with the yellow lead under the front bolt. See Figure 157 on page 134.

Figure 155: L1 Input Bus Bar

Table 44: L1 Input Bus Bar Hardware Torque Values

Item	Description	Torque Range	
		N•m	lb-in
A	(2) 18-mm bolts and washers	45	398
B	(2) 18-mm bolts and washers	45	398
D	(2) 18-mm bolts and washers	45	398
F	(2) 18-mm bolts and washers	45	398

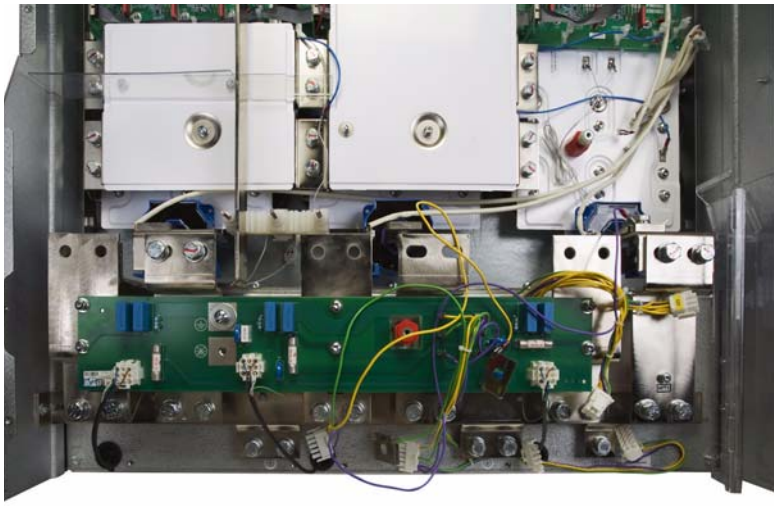


Figure 156: U/T1 Output and L-Bracket, Front

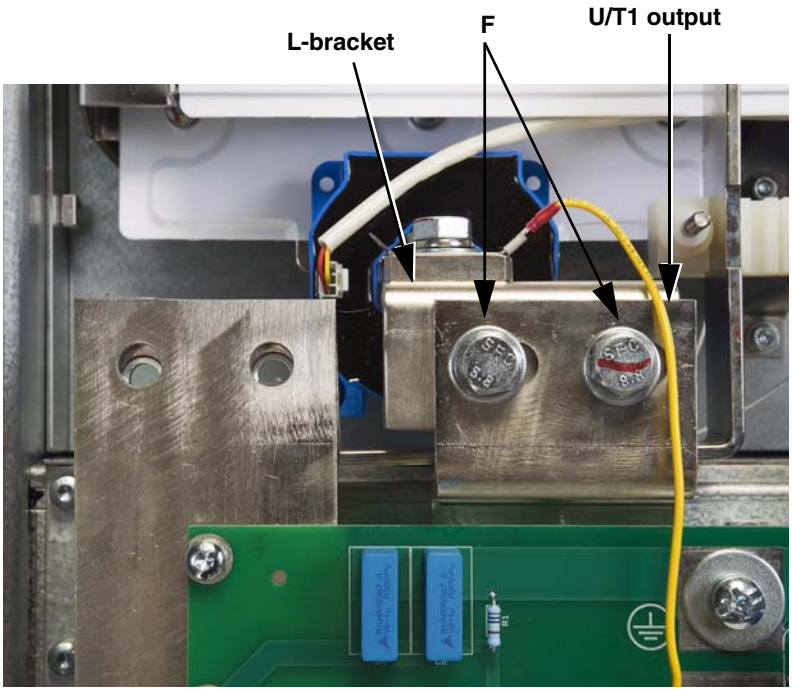
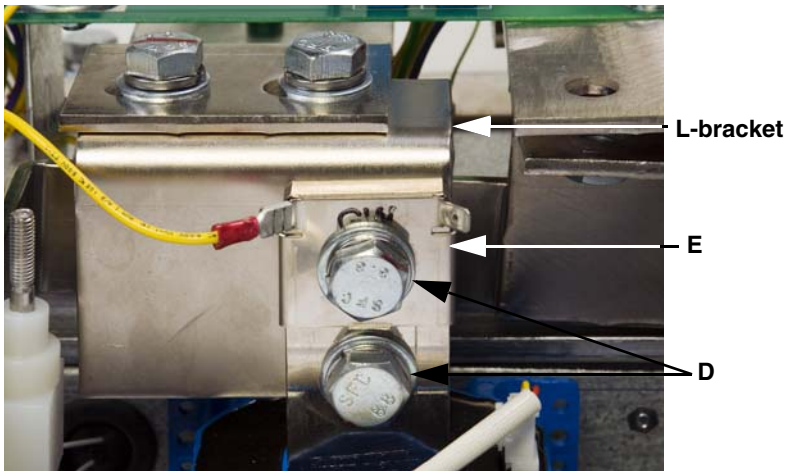


Figure 157: U/T1 Output and L-Bracket, Top



— Using an 18 mm socket wrench, secure the L1 bus bar to the rectifier line input (**A**, Figure 158) and the L1 line input **(B**, Figure 159 on page 135) with four bolts and washers.

— Tighten the hardware to the torque values specified in Table 44 on page 133.

Figure 158: L1 Bus Bar Rectifier Line Input Connections

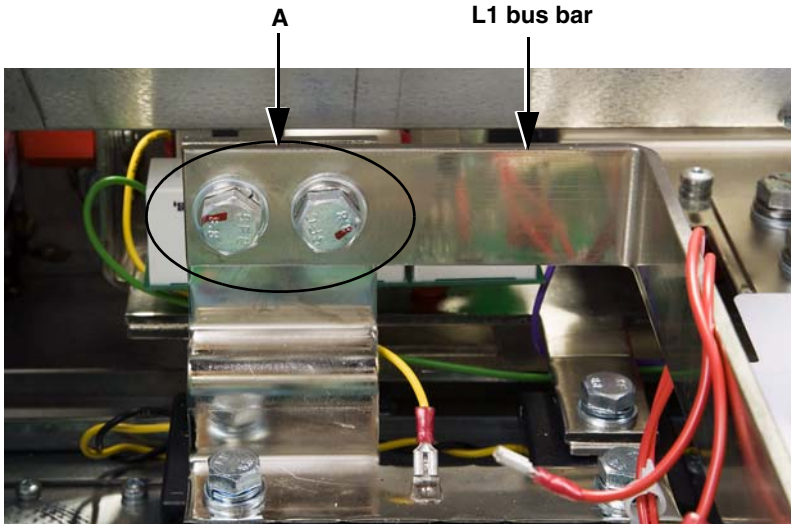
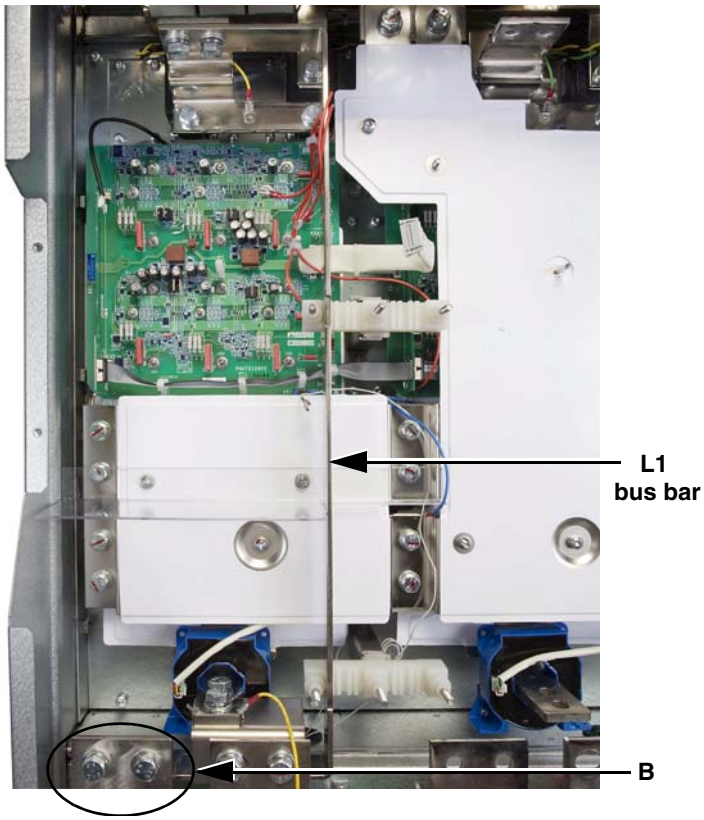


Figure 159: L1 Bus Bar Line Input Connections



Replace the L2 Input Bus Bar

14. Replace the L2 input bus bar as follows.
    - — Position the L2 bus bar in the drive as shown in Figures 160 and 161.
    - — Using an 18 mm socket wrench, secure the L2 bus bar to the rectifier line input (**A**, Figure 160) and the L2 line input **(B**, Figure 161) with four bolts and washers.
    - — Tighten the hardware to the torque values specified in Table 45.

Table 45: L2 Input Bus Bar Hardware Torque Values

Item	Description	Torque Range	
		N•m	lb-in
A	(2) 18-mm bolts and washers	45	398
B	(2) 18-mm bolts and washers	45	398

Figure 160: L2 Bus Bar Rectifier Line Input Connections

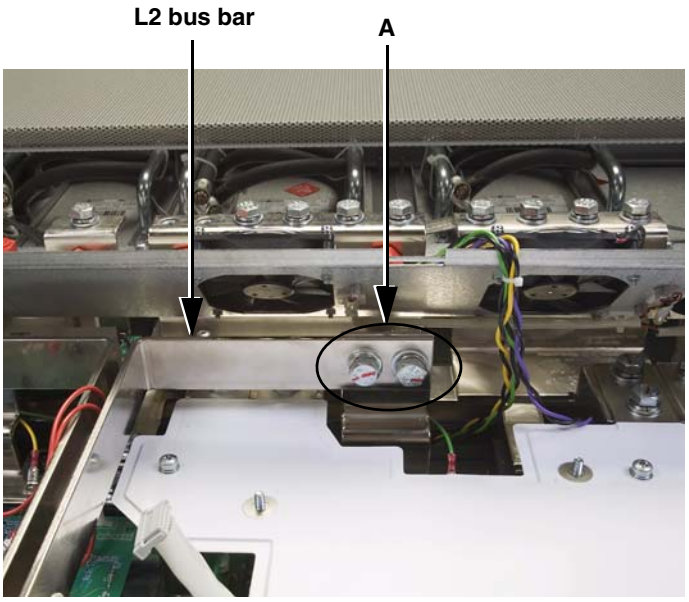
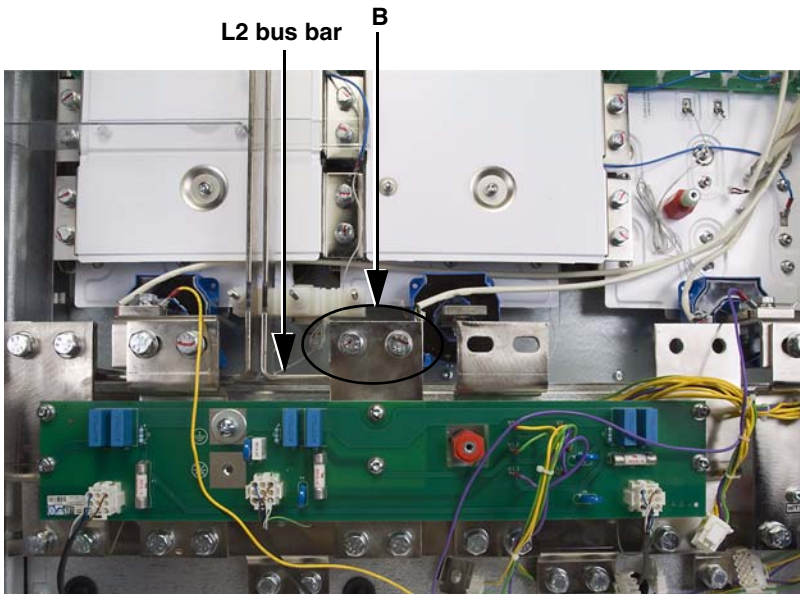


Figure 161: L2 Bus Bar Line Input Connections



Replace the L3 Input Bus Bar

15. Replace the L3 input bus bar as follows.

— Position the L3 bus bar in the drive as shown in Figure 162.

— Using an 18 mm socket wrench, secure the L -shaped bracket to the V/T2 output with two bolts and washers (**F**). See Figure 162.

— Using an 18 mm socket wrench, secure the V-phase DC bus plate to the L-shaped bracket on the V/T2 output with two bolts and washers (**D**) See Figure 163.

NOTE: Replace the output sensor plate (**E**) with the green lead under the front bolt. See Figure 163.

Figure 162: V/T2 Output and L-Bracket, Front

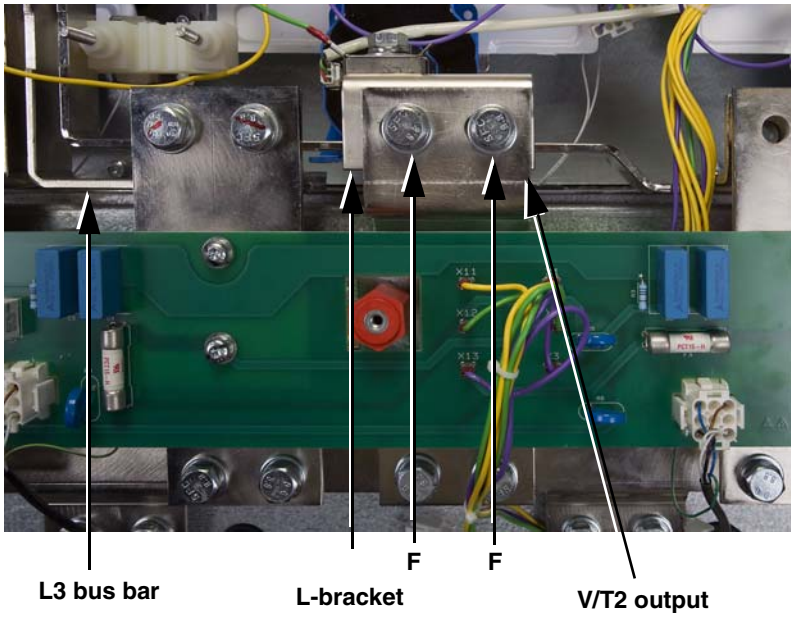
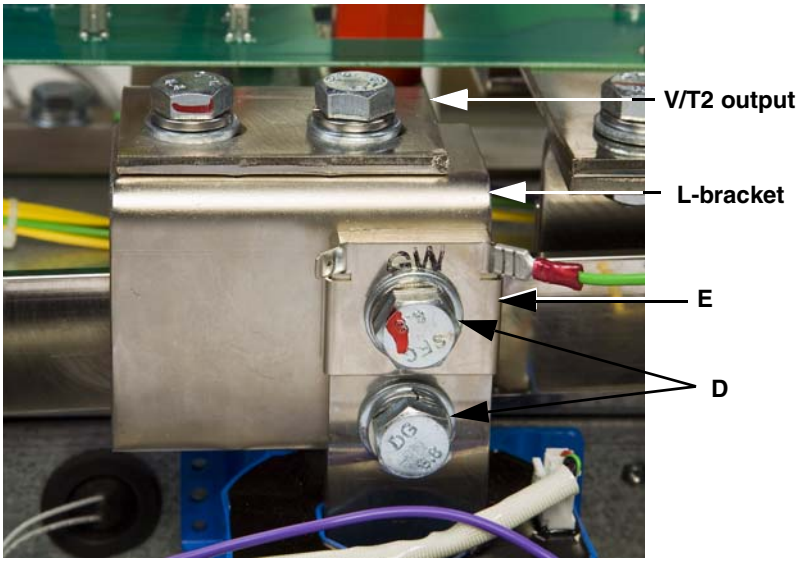


Table 46: L3 Input Bus Bar Hardware Torque Values

Item	Description	Torque Range	
		N•m	lb-in
B	(2) 18-mm bolts and washers	45	398
C	(2) 18-mm bolts and washers	45	398
D	(2) 18-mm bolts and washers	45	398
F	(2) 18-mm bolts and washers	45	398

Figure 163: V/T2 Output and L-Bracket, Top



— Using an 18 mm socket wrench, secure the L3 bus bar to the rectifier line input (**B**, Figure 165) and to the L3 line input (**C**, Figure 164) with four bolts and washers.

— Tighten the hardware to the torque values specified in Table 46 on page 137.

Figure 164: L3 Bus Bar Line Input Connections

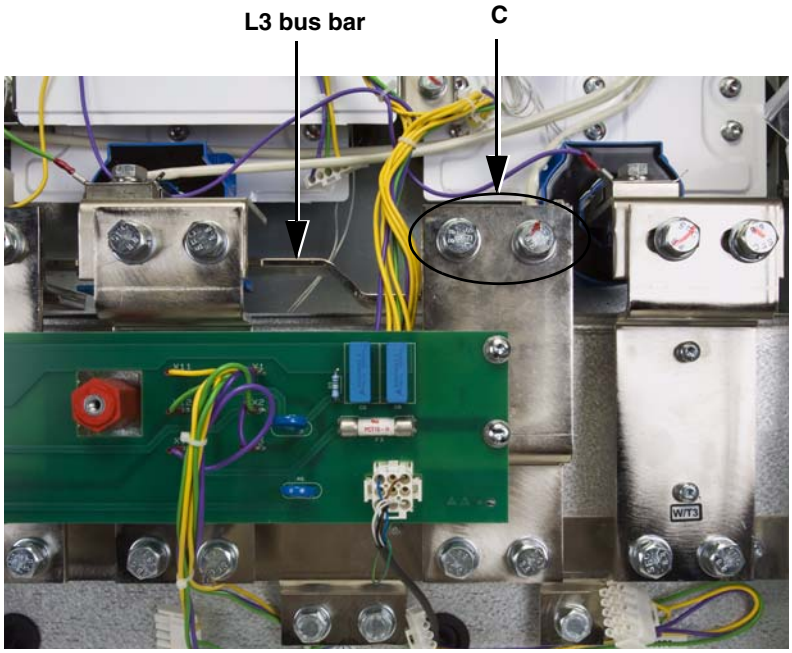
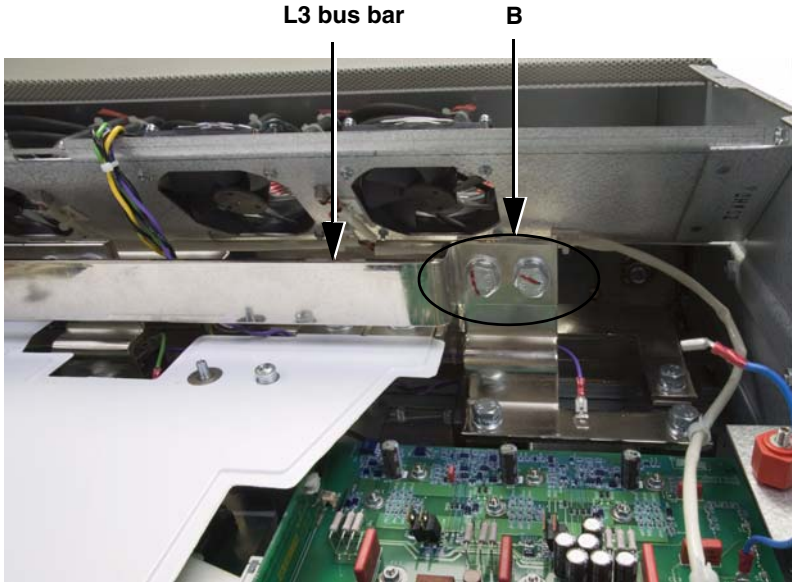


Figure 165: L3 Bus Bar Rectifier Line Input Connections

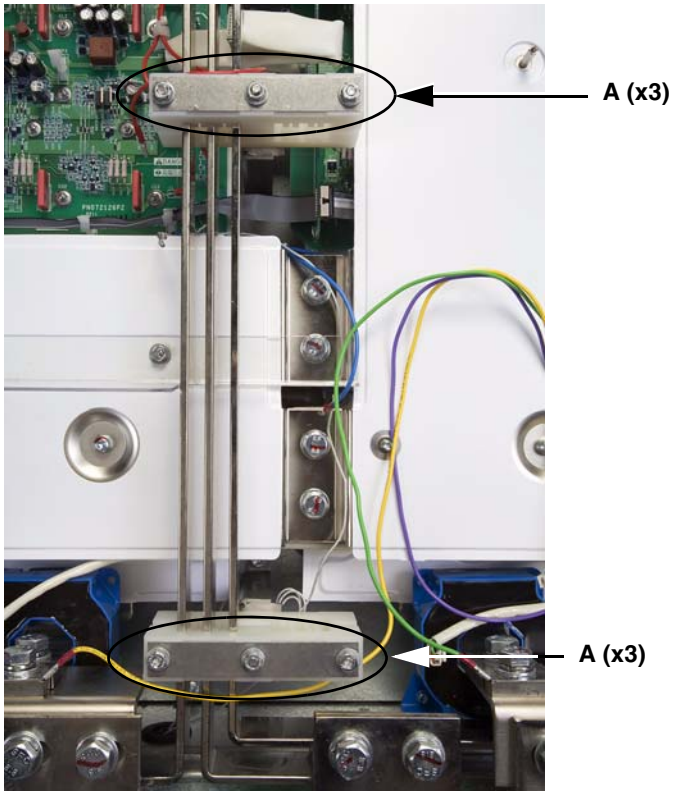


Replace the Input Bus Bar Brackets (Top)

16. Using a 10 mm socket wrench, secure the top half of the input bus bar brackets to the bottom half with six nuts (**A**). See Figure 166. Tighten the nuts to 5.5 N•m (48.7 lb-in).

    Before installing the brackets, ensure that they have no tears or cracks. If the brackets are damaged, install a new piece from the plastic kit. See page 23.

Figure 166: Input Bus Bar Brackets, Top

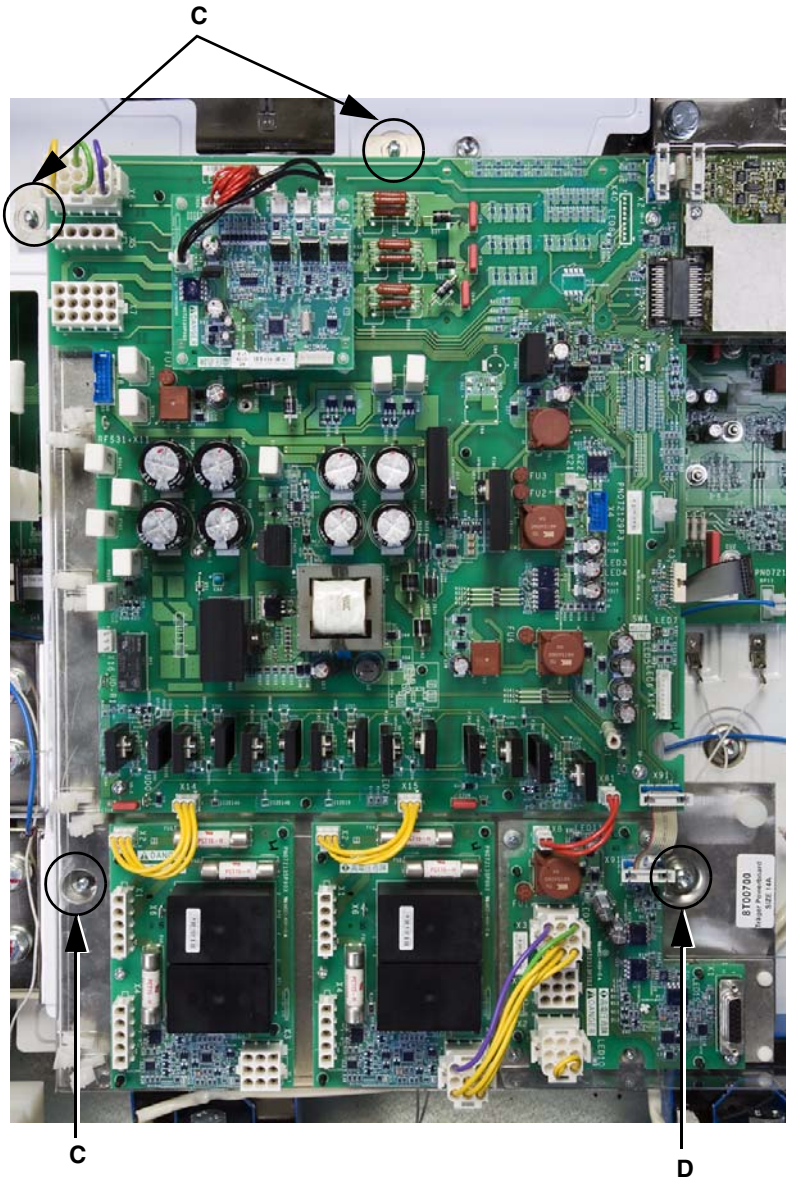


Replace the Power Board Assembly

NOTE: The power board assembly consists of the power board, the motor control board, fan control boards 1 and 2, and the brake board.

17. Replace the power board assembly as follows.
    - — Position the assembly in the drive as shown in Figure 167.
    - — Using a T-30 Torx driver, secure the power board assembly to the phase W DC bus plate with one screw and washer (**D**, Figure 167).
    - — Using a 10 mm socket wrench, secure the power board assembly to the bus plate assembly with three nuts (**C**, Figure 167).

Figure 167: Power Board Assembly



— Using a T-10 Torx driver, replace one screw (**B**, Figure 168) in power board terminal UD+1.

— Using a 21 mm socket wrench, replace the red insulator (**A**) on the assembly plate. See Figure 169.

— Connect wire E132 to the lug on the insulator. See Figure 169. The wire originates from terminal X53 on gate driver board W.

— Tighten the hardware to the torque values specified in Table 47.

Figure 168: Power Board, Terminal UD+1

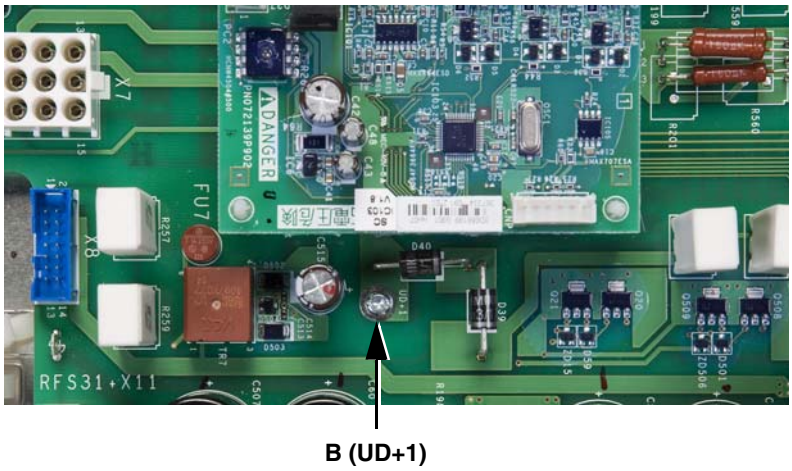
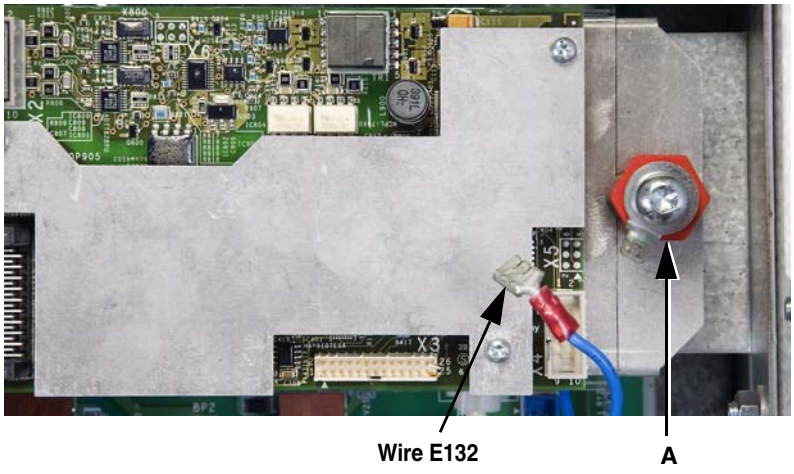


Table 47: Power Board Assy Hardware Torque Values

Item	Description	Torque Range	
		N•m	lb-in
A	(1) 21-mm insulator	5.5	48.7
B	(1) T-10 screw	0.8	7.1
C	(3) 10-mm nuts	5.5	48.7
D	(1) T-30 screw and washer	5.5	48.7

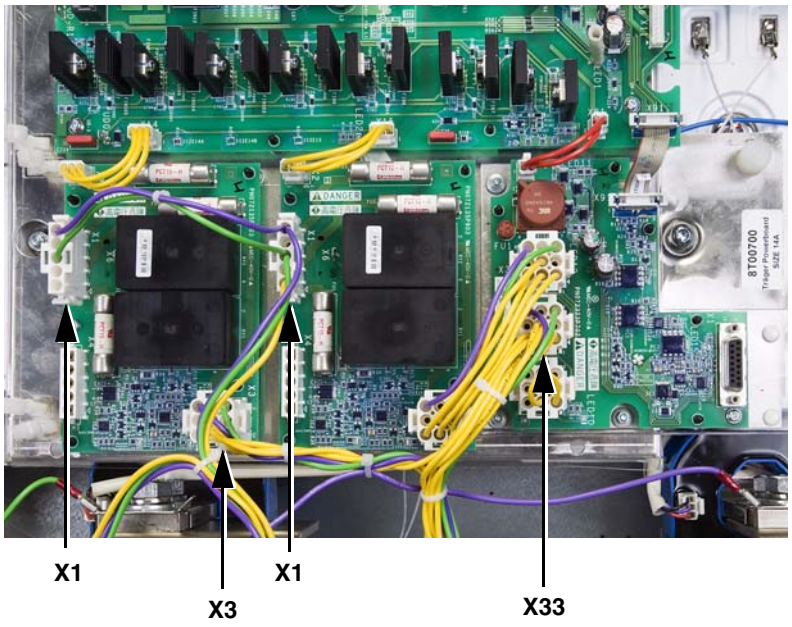
Figure 169: Wire E132 Connection



Replace the Fan Control Board Connections

18. Replace the following connections. See Figure 170 for terminal locations.
    - — Replace the connections on terminal X1 of fan control boards 1 and 2.
    - — Replace the connection on terminal X3 of fan control board 1.
    - — Replace the connection on terminal X33 of the brake board.

Figure 170: Fan Control Board and Brake Board Connections



Replace the Power Board Connections

NOTE: Take care not to damage the LED (see Figure 171) when removing, handling, or installing the power board.

Table 48: Power Board Wiring

Wire No.[1]	Terminal No.	Description	To:
E103	**X11**	9-pin, multi color	Motor current sensors
E136	**UD0**	1-pin, blue	Phase W DC bus plate
E126	**RFS 31+ X11**	1-pin, red	SB[2] X11
E141	**UD -R1**	1-pin, white	Bleeder resistor 1
E142	**X3**	18-pin, gray	GDB[3] W X32
E112	**X4**	10-pin, gray	Control module
E150	**X5**	5-pin, yellow/green/ violet	Output bus bars T1, T2, T3
—	**X6**	15-pin, yellow/green/ violet	Retain jumper plug and install in new board
E120	**X7**	15-pin, yellow/green/ violet	Filter board X11, X12, X13
E100	**X8**	14-pin, white	GDB U X82
E106	**X21**	2-pin, red/black	Internal fan
E106	**X22**	2-pin, red/black	Internal fan

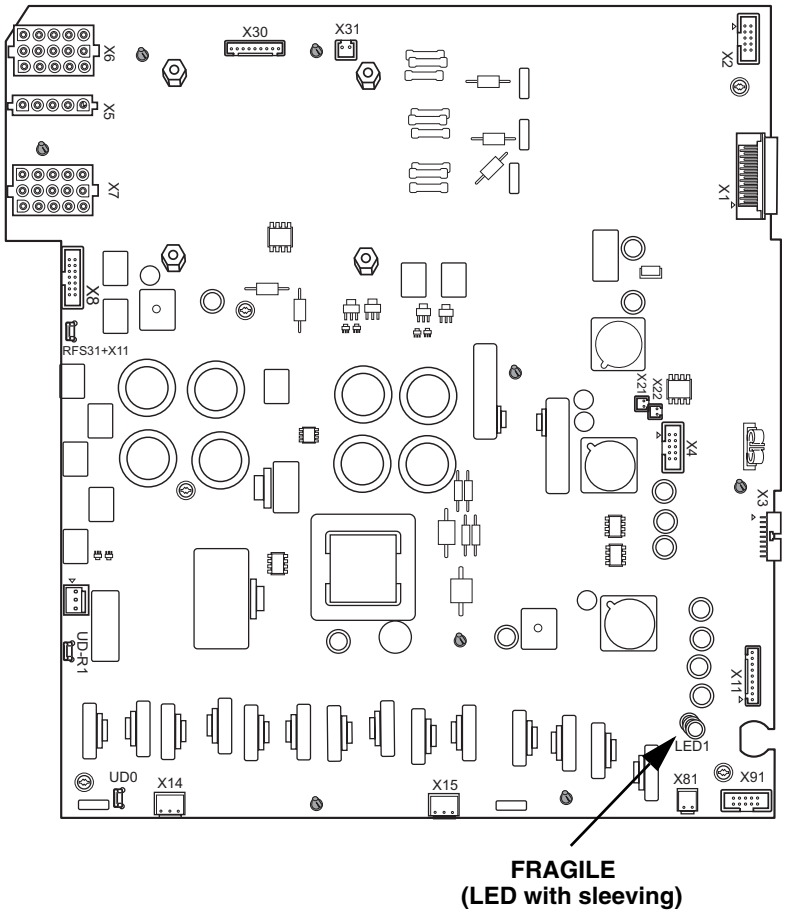
1 See the schematic on page 152 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

2 SB: SCR Snubber board

3 GDB: Gate driver board

19. Replace the power board connections listed in Table 48. See Figure 171 for the connection locations.

Figure 171: Power Board Connections



Replace the Soft Charge Board Connections

Table 49: Soft Charge Board Wiring

Wire No.[1]	Terminal No.	Description	To:
E110	**CN2A**	9-pin, red	PB[2] X30 (9-pin)
E109	**CNL3G**	2-pin, violet/black	SCR[3] 3 Terms. 4 & 5
E108	**CNL2G**	2-pin, green/black	SCR 2 Terms. 4 & 5
E107	**CNL1G**	2-pin, yellow/black	SCR 1 Terms. 4 & 5
E111	**CN7A**	2-pin, black	PB X31
—	**CNP**	Not used	—

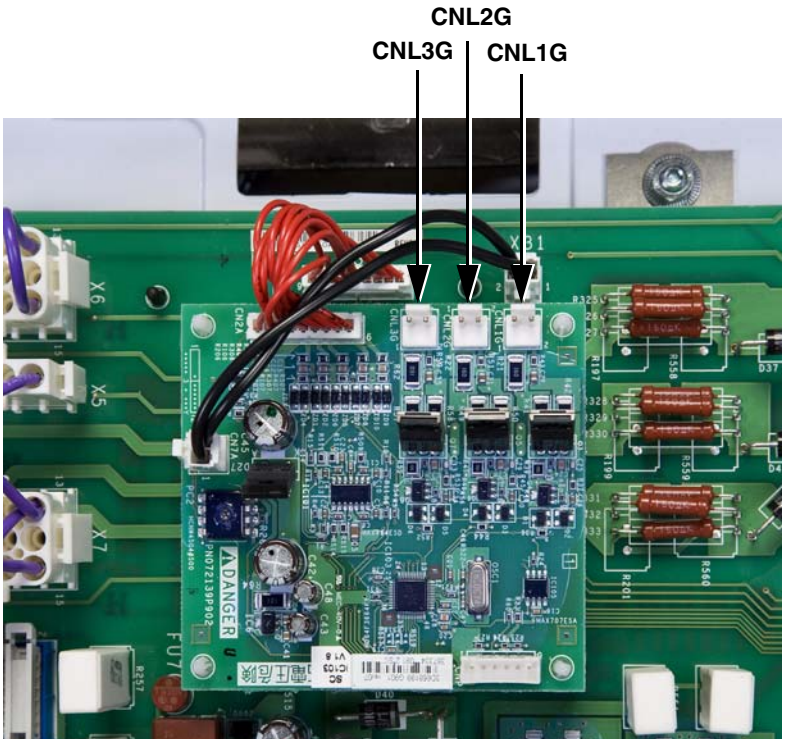
1 See the schematic on page 152 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

2 PB: Power board

3 SCR: Silicon controlled rectifier

20. Replace soft charge board connections CNL1G, CNL2G, and CNL3G. See Figure 172 for terminal locations.

Figure 172: Soft Charge Board Connections

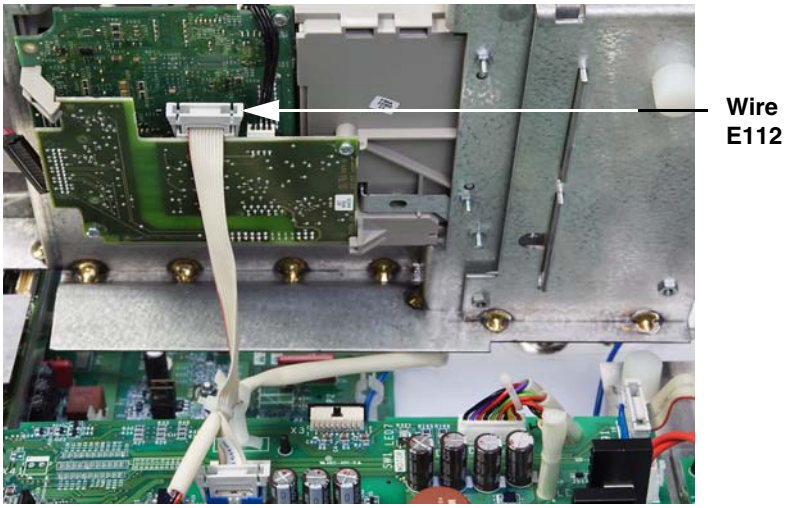


Replace the Control Module Assembly

21. Replace the control module assembly as follows.

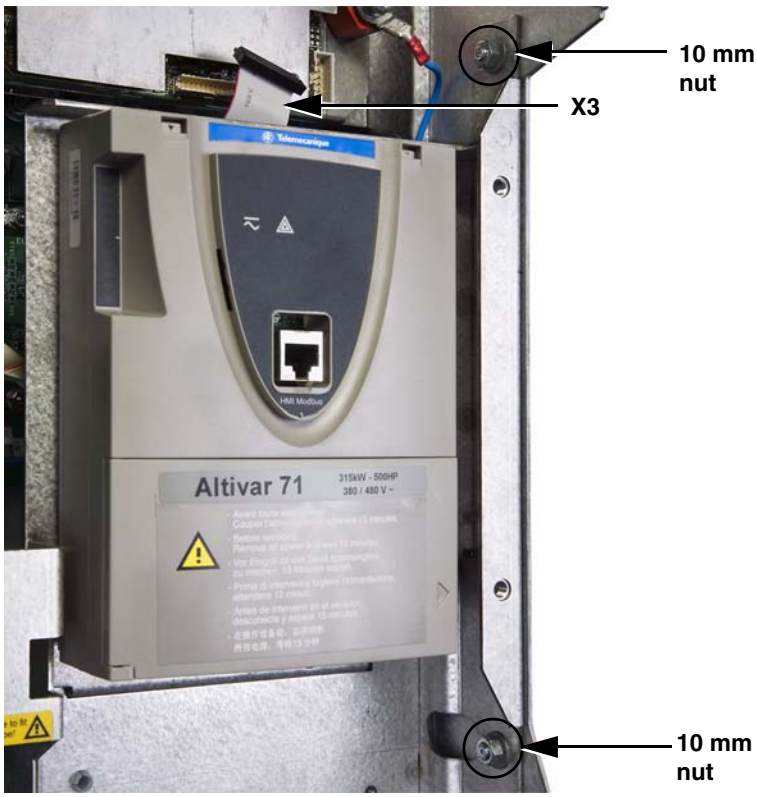
— Connect the ribbon cable (wire **E112,** Figure 173) from power board terminal X11 to the back of the control module assembly.

Figure 173: Control Module Assembly Back



— Using a 10 mm socket wrench, secure the control module assembly to the drive frame with two nuts (Figure 174). Tighten the nuts to 5.5 N•m (48.7 lb-in).

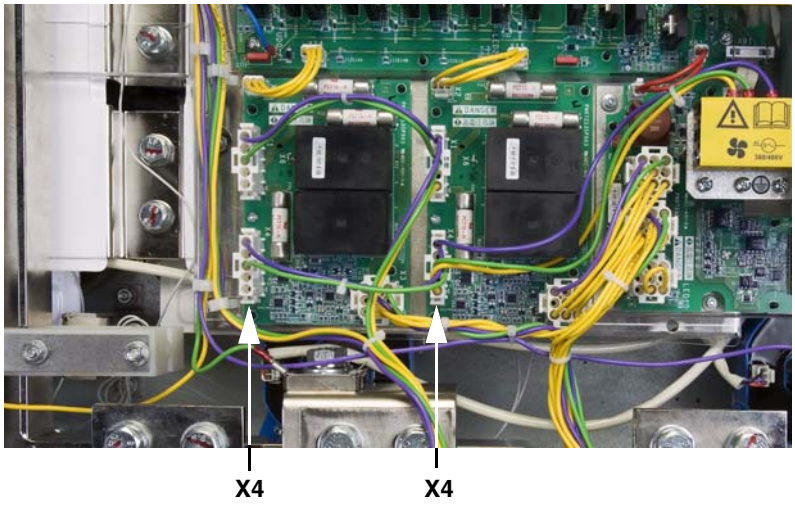
Figure 174: Control Module Assembly, Front



— Install the 26-pin ribbon cable from the control module assembly to motor control board terminal X3. See Figure 174 on page 145.

— Install the 5-pin connectors at terminal X4 of fan control boards 1 and 2. See Figure 175.

Figure 175: Fan Control Boards 1 and 2, Terminal X4



Replace the Middle Crossbrace

22. Replace the middle crossbrace as follows.

— Using a 10 mm socket wrench, secure the crossbrace to the fan bracket with two nuts (**A**). See Figure 176.

— Using a T-30 Torx driver, secure the crossbrace to the filter board with one screw (**B**). See Figure 177 on page 147.

— Tighten the hardware to the torque values specified in Table 50.

Table 50: Crossbrace Hardware Torque Values

Item	Description	Torque Range	
		N•m	lb-in
A	(2) 10 mm nuts	5.5	48.7
B	(1) T-30 screw	5.5	48.7

Figure 176: Middle Crossbrace Top

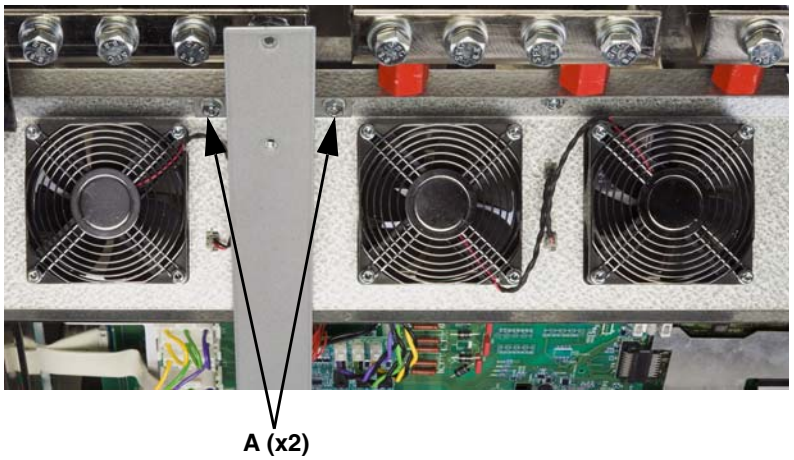
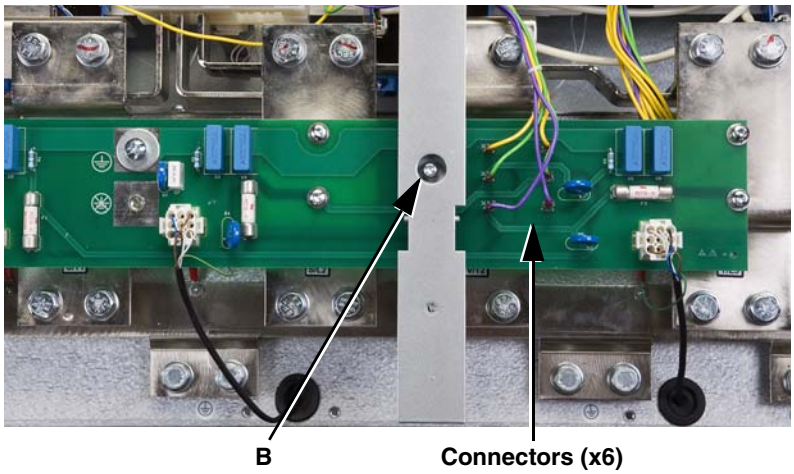


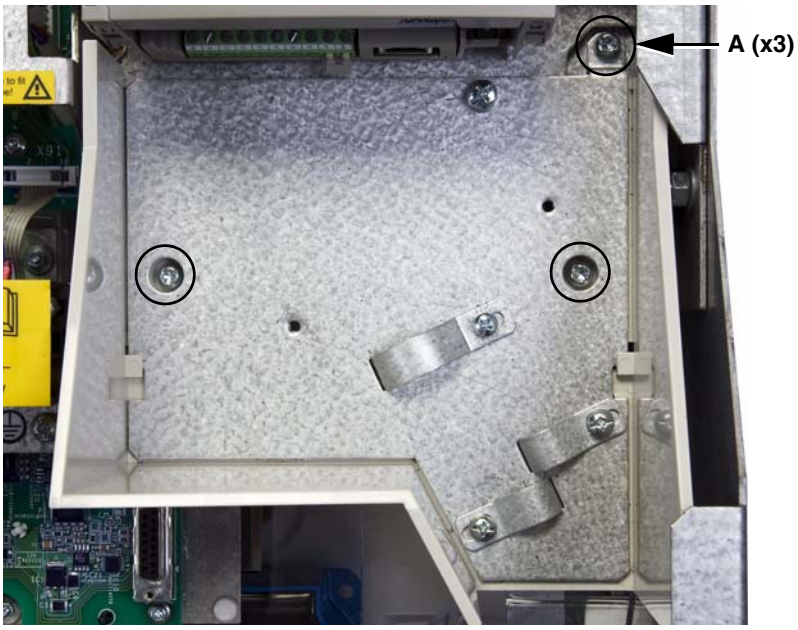
Figure 177: Middle Crossbrace Bottom



Replace the EMC Tray

23. Using a T-20 Torx driver, secure the EMC tray to the control module plate with three screws. See Figure 178. Tighten the screws to 1.1–1.7 N•m (9.7–15.0 lb-in).

Figure 178: EMC Tray



Replace the Power Terminal Shields

24. Replace the power terminal shields as follows:

— The right terminal shield has two tabs (**B**) on the right side that fit into slots on the conduit tray, and two tabs (**C**) on the left side that fit into slots on the middle crossbrace. See Figure 179.

— The left terminal shield has two tabs on the right (**D**) that fit into retaining slots in the middle crossbrace and two mounting holes (**E**) on the left that fit over posts on the side panel of the drive. See Figures 180 and 181 on page 149.

Figure 179: Right Terminal Shield

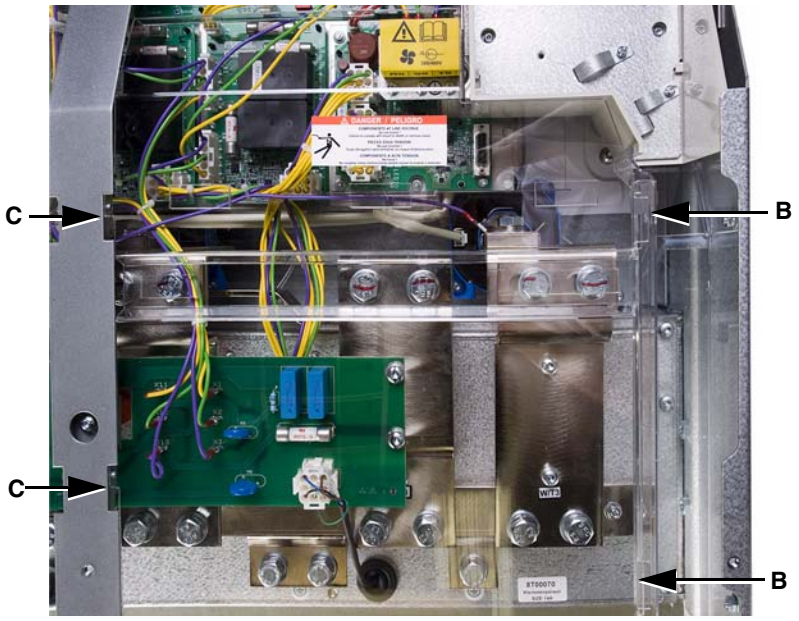


Figure 180: Left Terminal Shield

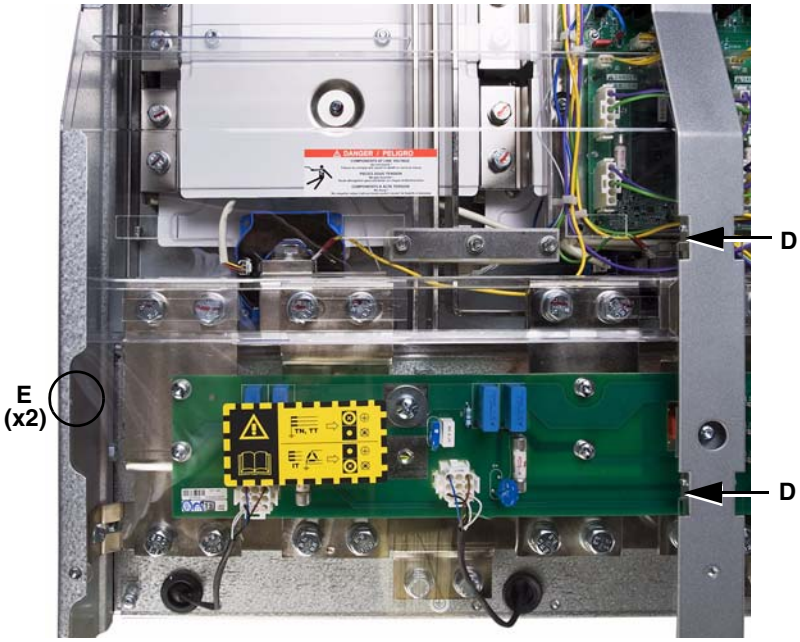


Figure 181: Terminal Shield Retaining Posts

Replace the Front Cover

25. Replace the front cover. Using a size 2 Phillips driver, secure the front cover with thirteen screws. See Figure 8 on page 20. Tighten the screws to 5.5 N•m (48.7 lb-in).

Wiring

NOTE: See page 151 for the notes to the table.

Table 51: Wiring Table

Wire No.[1]	Description	From:		To:	
		Component	Terminal No.	Component	Terminal No.
E103	9-pin, multi color	PB[2]	**X11**	Motor current sensors	
E105	3-pin, yellow	PB	**X14**	FCB[3] 1	**X2**
E136	1-pin, blue	PB	**UD0**	Phase W DC bus plate	—
E126	1-pin, red	PB	**RFS 31+X11**	SB[4]	**X11**
E141	1-pin, white	PB	**UD -R1**	Bleeder resistor 1	—
—	10-pin, white	PB	**X2**	MCB[5]	**X2**
E142	18-pin, gray	PB	**X3**	GDB[6] W	**X32**
E112	10-pin, gray	PB	**X4**	Control module	—
E150	5-pin, yellow/green/ violet	PB	**X5**	Output bus bars T1, T2, T3	—
—	15-pin, yellow/green/ violet	PB	**X6**	—	—
E120	15-pin, yellow/green/ violet	PB	**X7**	FB[7]	**X11, X12, X13**
E100	14-pin, white	PB	**X8**	GDB U	**X82**
E106	2-pin, red/black	PB	**X21**	Internal fan	—
	2-pin, red/black	PB	**X22**	Internal fan	—
E110	9-pin, red	PB	**X30**	SCB[8]	**CN2A**
E111	2-pin, black	PB	**X31**	SCB	**CN7A**
E148	2-pin, red	PB	**X81**	BB[9]	**X8**
E149	10-pin, gray	PB	**X91**	BB	**X91**
E147	3-pin, yellow	PB	**X15**	FCB 2	**X2**
E124	5-pin, 2-wire, violet/green	FCB 1	**X4**	FCB 2	**TB1, X4**
E114	9-pin, yellow/green/ violet	FCB 1	**X3**	FB	**X11, X12, X13**
				BB	**X33**
E120	5-pin, yellow/green/ violet	FCB 2	**X1**	FCB 1	**X1**
				FB	**X1, X2, X3**
E151	9-pin, yellow/green/ violet	FCB 2	**X3**	BB	**X3**
E115	9-pin, black	FB	**X11**	Heatsink fan 1	—
E125	9-pin, black	FB	**X12**	Heatsink fan 2	—
E165	9-pin, black	FB	**X13**	Heatsink fan 3	—
E131	1-pin, yellow	SB	**X1**	Phase U input bar	—

Table 51: Wiring Table *(continued)*

Wire No.[1]	Description	From:		To:	
		Component	Terminal No.	Component	Terminal No.
E130	1-pin, red	SB	**X4**	PO.1 bus bar	**—**
E133	1-pin, black	SB	**X5**	PC/- bus bar	**—**
E126	1-pin, red	SB	**X10**	GDB U	**X61**
E167	x-pin, green	SB	**L2**	Phase V input bar	**—**
E168	x-pin, violet	SB	**X3**	Phase W input bar	**—**
E109	2-pin, violet/black	SCB	**CNL3G**	SCR[10] 3	**4 & 5**
E108	2-pin, green/black	SCB	**CNL2G**	SCR 2	**4 & 5**
E107	2-pin, yellow/black	SCB	**CNL1G**	SCR 1	**4&5**
E144	2-pin, black	GDB U	**X4**	Temp sensor U	**—**
E138	18-pin, gray	GDB U	**X32**	GDB V	**X31**
E129	1-pin, blue	GDB U	**X51**	DC bus plate	**UD0**
E127	1-pin, blue	GDB U	**X52**	GDB V	**X51**
E139	1-pin, white	GDB U	**X62**	Bleeder resistor	**—**
E100	14-pin, white	GDB U	**X82**	GBD V	**X81**
E128	2-pin, black	GDB V	**X4**	Temp sensor V	**—**
E146	18-pin, gray	GDB V	**X32**	GDB W	**X31**
E123	1-pin, blue	GDB V	**X52**	GDB W	**X51**
E102	14-pin, white	GDB V	**X82**	GDB W	**X81**
E145	2-pin, black	GDB W	**X4**	Temp sensor W	**—**
E132	1-pin, blue	GDB W	**X53**	Insulator near MCB[11]	**—**
E161	1-pin, white	Bleeder resistor 2	—	UD- Bus	—
E162	1-pin, white	Bleeder resistor 2	—	UD+ Bus	—
E163	1-pin, white	Bleeder resistor 3	—	UD- Bus	—
E164	1-pin, white	Bleeder resistor 3	—	UD+ Bus	—

[1] Wire numbers are given for cross referencing the wires with the schematic on page 152. The numbers do not appear on the wires.

[2] PB: Power board

[3] FCB: Fan control board

[4] SB: SCR snubber board

[5] MCB: Motor control board

[6] GDB: Gate driver board

[7] FB: Filter board

[8] SCB: Soft charge board

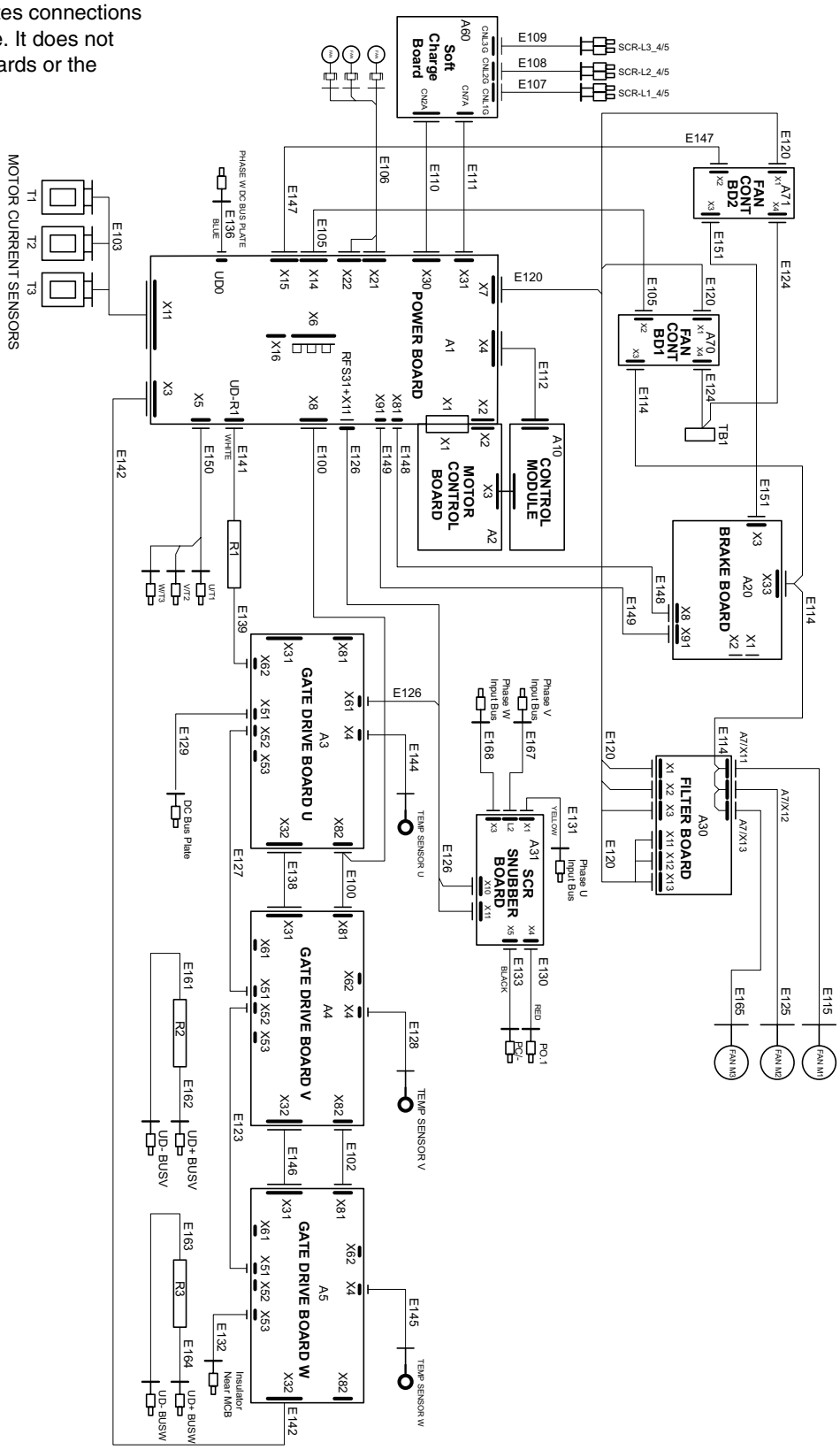
[9] BB: Brake board

[10] SCR: Silicon controlled rectifier

[11] MCB: Motor control board

Figure 182: Wiring Schematic

NOTE: The wiring schematic illustrates connections between the components in the drive. It does not illustrate the layout of the various boards or the connector locations on them.



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