

Altivar® 61/71

Adjustable Speed Drives

Spare Parts Kits

Instruction Bulletin

30072-452-79

Retain for future use.



For Frame Size 12:

ATV71HC16N4, ATV61HC22N4

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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 Kits¹

Kit Catalog No.	Description	For Use On Drive:	For Location of Parts, See:
VY1A1213	Front Cover Assembly	ATV71HC16N4, ATV61HC22N4	page 21
VY1A1402	Plastic Parts Kit	ATV71HC16N4, ATV61HC22N4	pages 13 and 15
VZ3V1213	Internal Fan	ATV71HC16N4, ATV61HC22N4	page 13
VX5A1300	Soft Charge Board	ATV71HC16N4, ATV61HC22N4	page 13
VX5A1400	Fan Control Board	ATV71HC16N4, ATV61HC22N4	page 15
VX4A1114	Filter Board	ATV71HC16N4, ATV61HC22N4	page 15
VX5A1HC1622	Power Board	ATV71HC16N4, ATV61HC22N4	page 13
VY1A1108	Motor Current Sensor	ATV71HC16N4, ATV61HC22N4	page 15
VX5A1201	Gate Driver Board	ATV71HC16N4, ATV61HC22N4	page 16
VZ3G1104	Temperature Sensors	ATV71HC16N4, ATV61HC22N4	pages 17 and 19
VZ3IM1402M1271	Power IGBT ² Module	ATV71HC16N4, ATV61HC22N4	page 18
VY1ADV1108	Screw Kit	ATV71HC16N4, ATV61HC22N4	—
VY1ADC1113	Capacitors	ATV71HC16N4, ATV61HC22N4	page 18
VX4A1200	SCR Snubber Board	ATV71HC16N4, ATV61HC22N4	page 18
VZ3TD1330M1601	SCR ³ Module	ATV71HC16N4, ATV61HC22N4	page 20
VZ3F1110	Dynamic Braking (DB) Kit	ATV71HC16N4, ATV61HC22N4	pages 14, 18, 19, 90, and 91
VZ3N1317	Wire Kit	ATV71HC16N4, ATV61HC22N4	—

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

² IGBT: Insulated-gate bipolar transistor

³ SCR: Silicon controlled rectifier

Related Documentation

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. 30072-451-50
- *Altivar[®] 61 Installation Manual 75 to 800 HP*, module no. 1760655
- *Addendum to ATV61 Variable Speed Drives Installation Manual—High Horsepower*, document no. 30072-451-57

- *Altivar® 71 Installation Manual 0.5 to 100 HP*, module no. 1755843
- *Altivar® 71 Installation Manual 75 to 700 HP*, module no. 1755849

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.

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

Qualified Personnel

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

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 the power terminal shield as specified on page 23, the filter board shield as specified on page 38, and the SCR snubber board shield as specified on page 103 of 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, 0–27 N•m (0–240 lb-in)
- Voltmeter, 1–1000 Vdc
- Driver bits:
 - T-10 Torx® driver
 - T-20 Torx® driver
 - T-30 Torx® driver
 - T-30 Torx® right-angled driver
 - Size 2 magnetic tip Phillips® driver
 - Size 3 magnetic tip Phillips® driver
- Socket wrenches:
 - 7 mm
 - 10 mm
 - 13 mm
 - 16 mm
- 21 mm open-end wrench

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

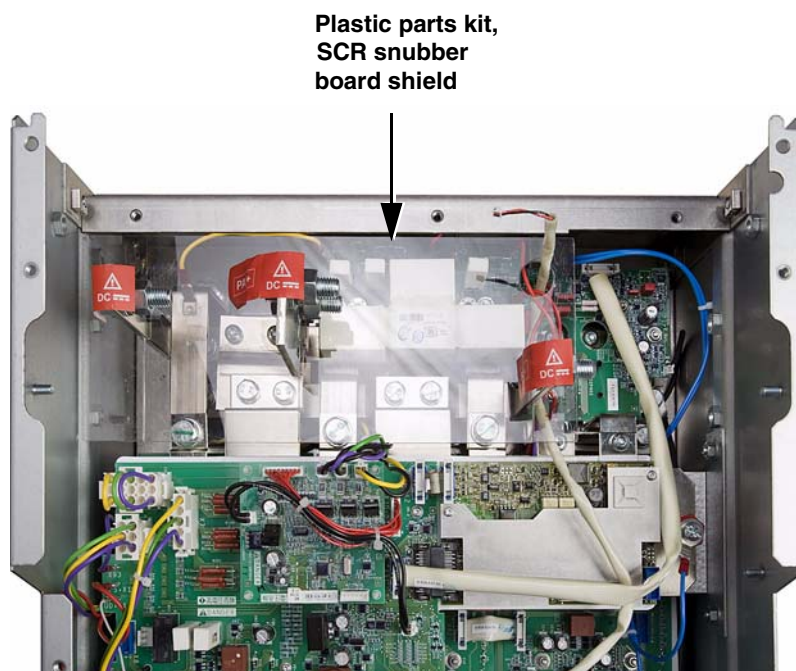
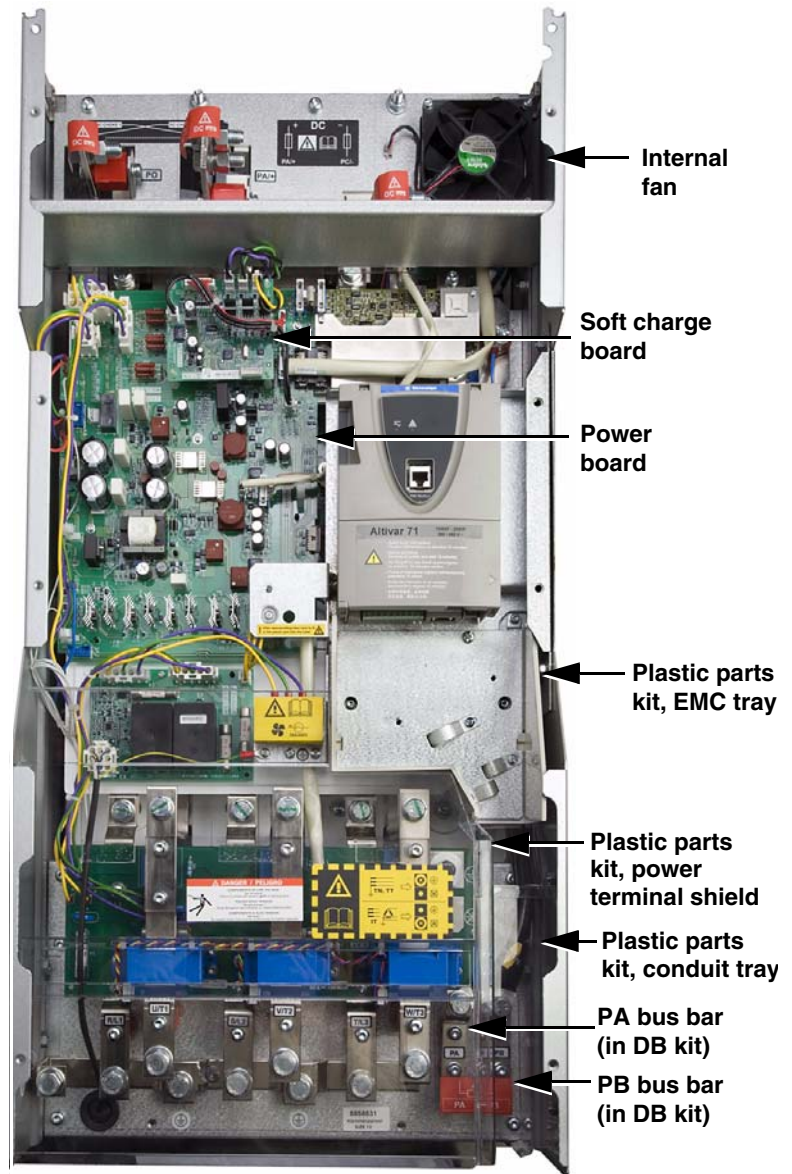
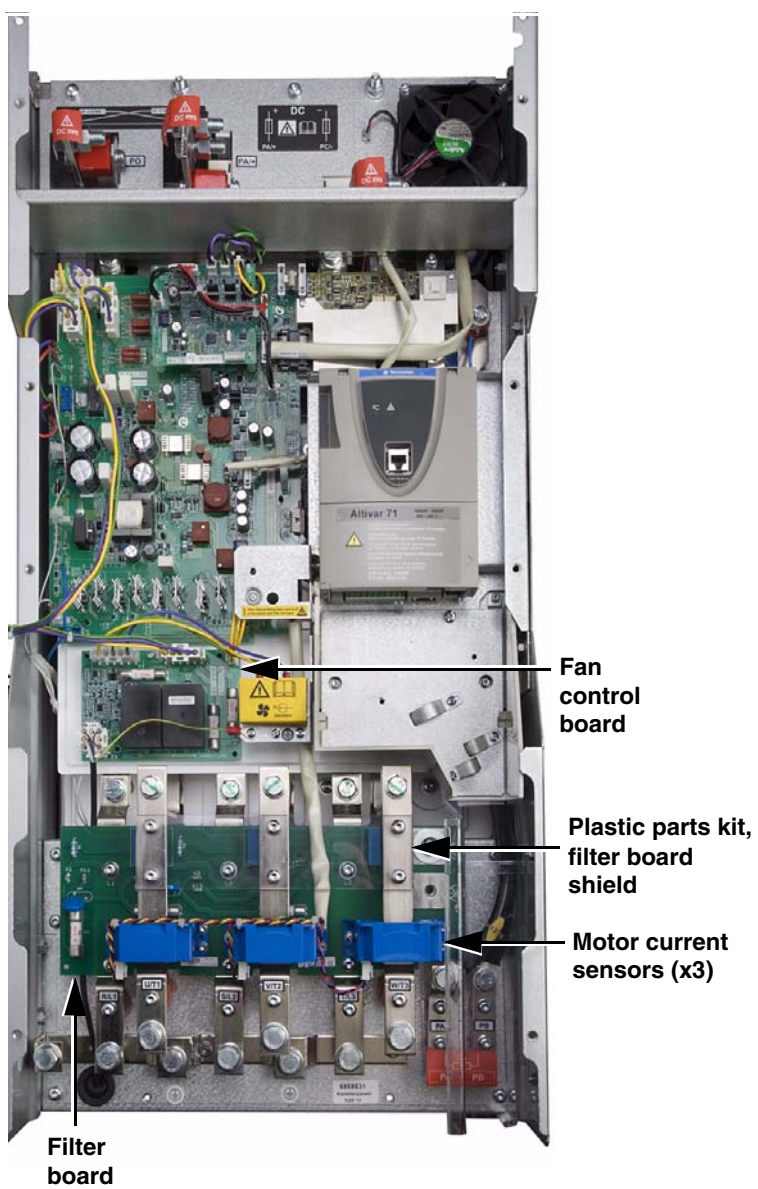


Figure 2: Level 1 Parts and Dynamic Braking Kit¹



¹ See pages 18, 19, 90, and 91 for more dynamic braking kit parts.

Figure 3: Level 1 Parts *(continued)*



Level 2 Parts

Figure 4: Gate Driver Boards

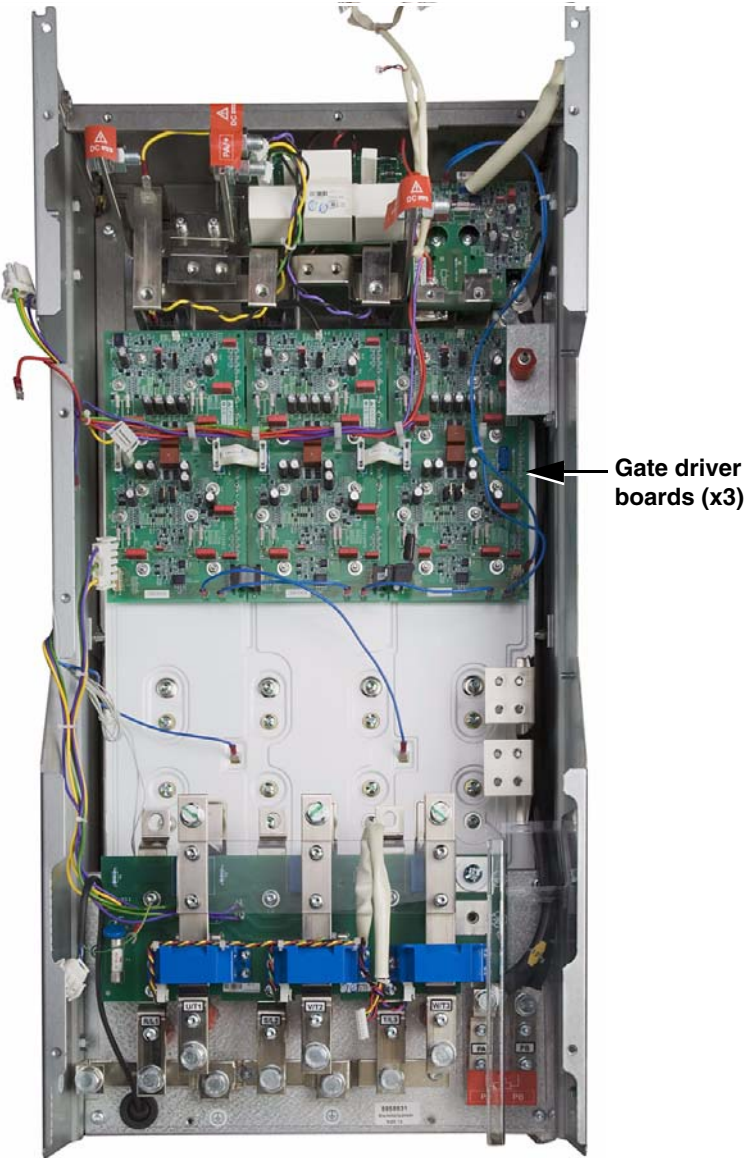
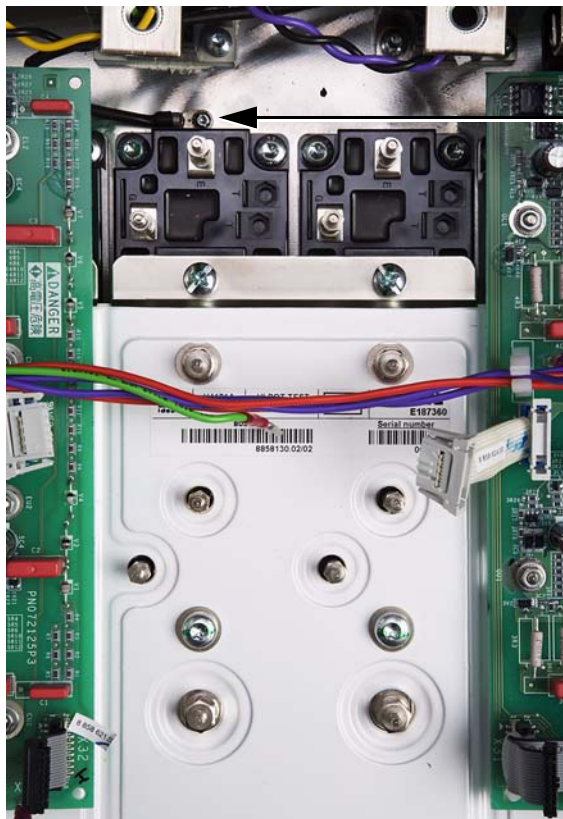
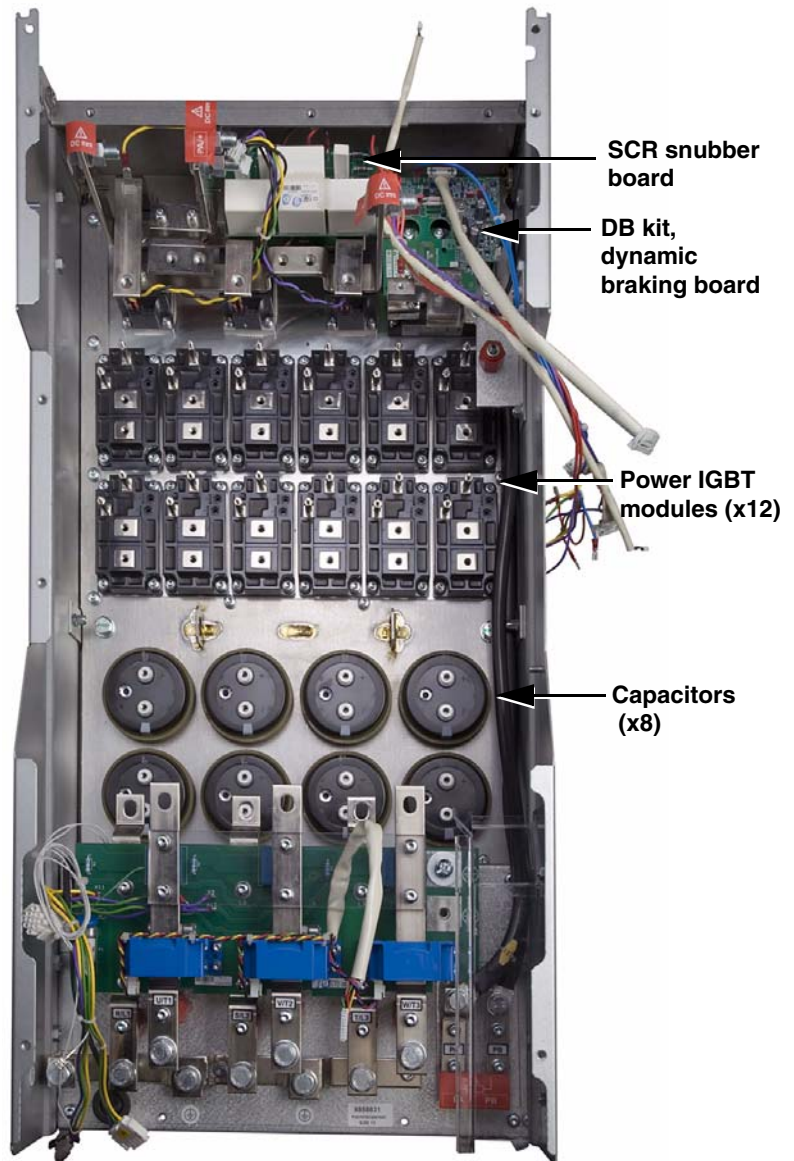


Figure 5: Temperature Sensor #1



Temperature
sensor #1
(under gate
driver board V)

Figure 6: SCR Snubber Board, Dynamic Braking Board¹, Power IGBT Modules, and Capacitors



¹ See pages 90 and 91 for bus bars included in the dynamic braking kit.

Figure 7: Braking IGBT Module, Diode Module, and Temperature Sensor #2

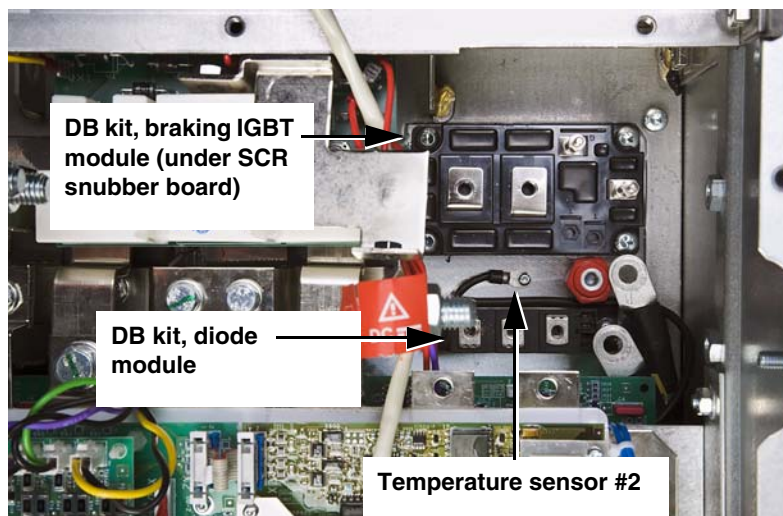


Figure 8: SCR Modules



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	Soft charge board
Power terminal shield (plastic kit)	Fan control board
Conduit tray (plastic kit)	Motor current sensors
EMC tray (plastic kit)	Filter board
Internal fan	Filter board shield (plastic kit)

Removing and Replacing the Front Cover VY1A1213

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

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

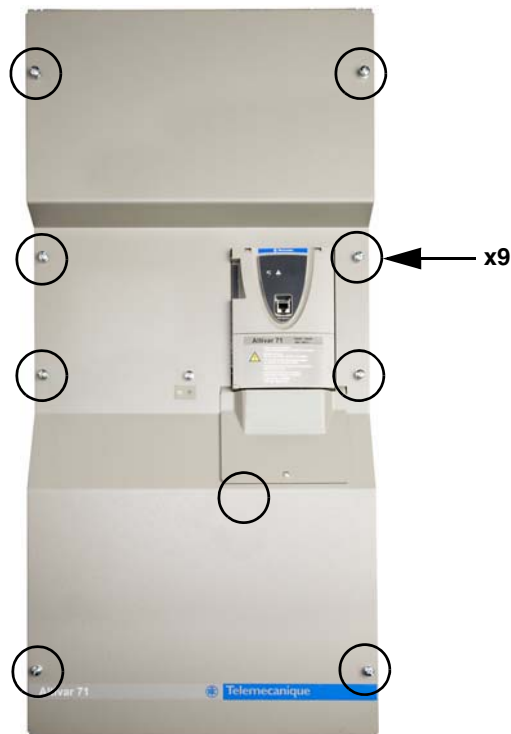
- Read and understand the precautions in "Before You Begin" starting on page 5 before performing this procedure.
- Before working on this equipment, turn off all power supplying it and perform the DC bus voltage measurement procedure on page 11.

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

All of the procedures in this manual require removal and replacement of the front cover. See Figure 9.

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

Figure 9: Front Cover



Replacing the Plastic Parts Kit VY1A1402

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 2.

Table 2: Plastic Kit Contents

Description	For replacement steps, see
Power terminal shield	“Replacing the Power Terminal Shield” beginning on page 22
Conduit tray	“Replacing the Conduit Tray” beginning on page 24
EMC tray	“Replacing the EMC Tray” beginning on page 25
Filter board shield	“Replacing the Filter Board VX4A1114 and Motor Current Sensors VY1A1108” beginning on page 29
SCR Snubber board shield	“Replace the SCR Snubber Board Shield” beginning on page 103

Remove the Front Cover

Using a size 2 Phillips driver, remove nine screws and take the front cover off the drive. See Figure 9 on page 21.

Replacing the Power Terminal Shield

If the transparent power terminal shield is cracked, broken, or damaged, replace it as follows.

1. The power terminal shield has two retaining tabs (**A**, Figure 10 on page 23) on the right that fit into slots on the conduit tray, and three mounting holes (**B**, Figure 10 on page 23) on the left that fit over posts on the side panel of the drive. Disengage the shield from the retaining tabs and mounting slots and remove it from the drive.

NEXT STEP: If you are also replacing the conduit tray or the EMC tray, replace these parts before installing the new power terminal shield. See pages 24 and 25.

2. If you are only replacing the power terminal shield, install the new shield as shown in Figures 10 and 11 on page 23.
Labels for the new shield are included in the plastic kit. Add the new labels in the same positions as on the old shield.
3. Replace the front cover. Using a size 2 Phillips driver, secure the front cover with nine screws. See Figure 9 on page 21. Tighten the screws to 5.5 N•m (48.7 lb-in).

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Install the power terminal shield as shown in Figures 10 and 11.
- 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 22.
- Do not install a damaged shield.

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

Figure 10: Power Terminal Shield

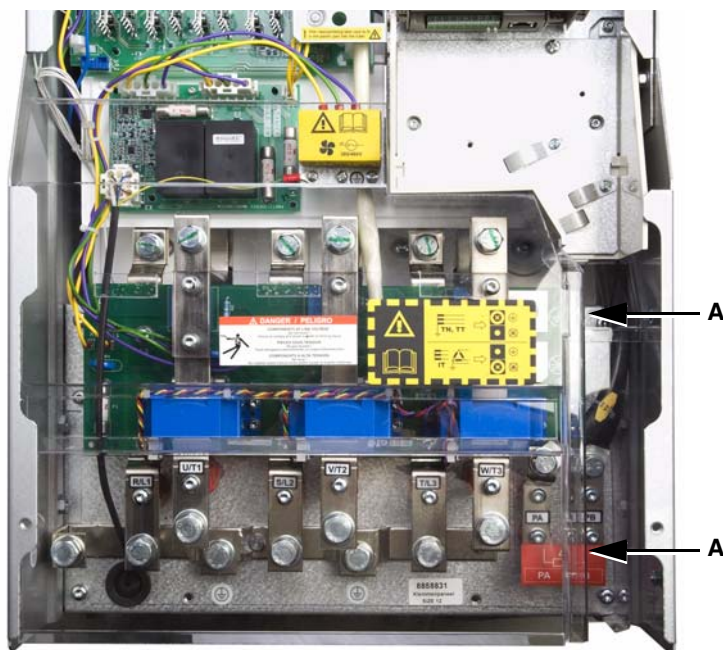


Figure 11: Power Terminal Shield Retaining Posts



Replacing the Conduit Tray

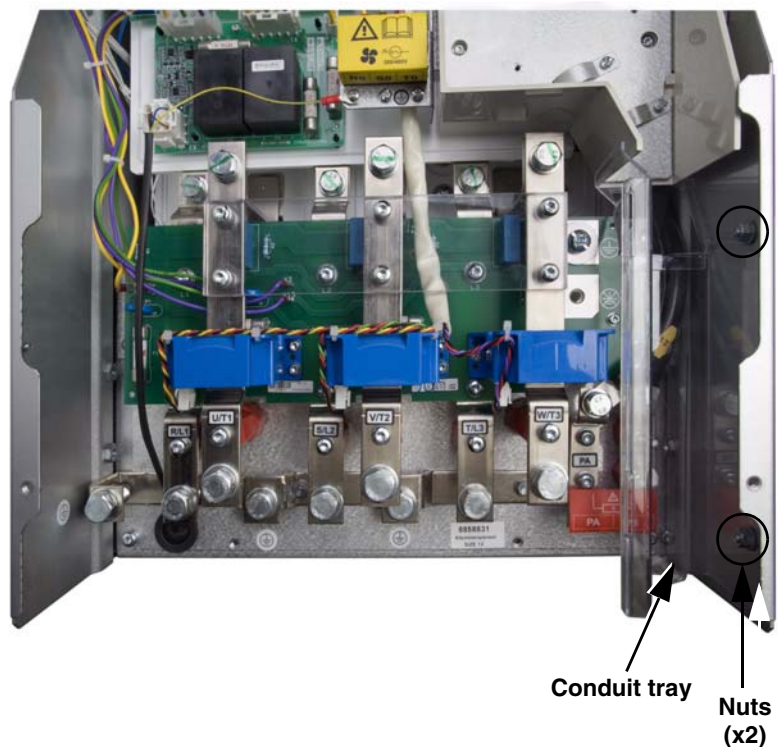
Replace the conduit tray as follows.

1. Remove the power terminal shield. See Step 1 on page 22.
2. Using a 10 mm socket wrench, remove two nuts securing the conduit tray to the drive frame. See Figure 12.
3. Install the new conduit tray and secure it with the two 10 mm nuts as illustrated in Figure 12. Tighten the nuts to 5.5 N•m (48.7 lb-in).

NEXT STEP: If you are also replacing the EMC tray, install it before replacing the power terminal shield. See page 25.

4. If you are only replacing the conduit tray, replace the power terminal shield as illustrated in Step 2 on page 22.
5. Replace the front cover. Using a size 2 Phillips driver, secure the front cover with nine screws. See Figure 9 on page 21. Tighten the screws to 5.5 N•m (48.7 lb-in).

Figure 12: Conduit Tray



Replacing the EMC Tray

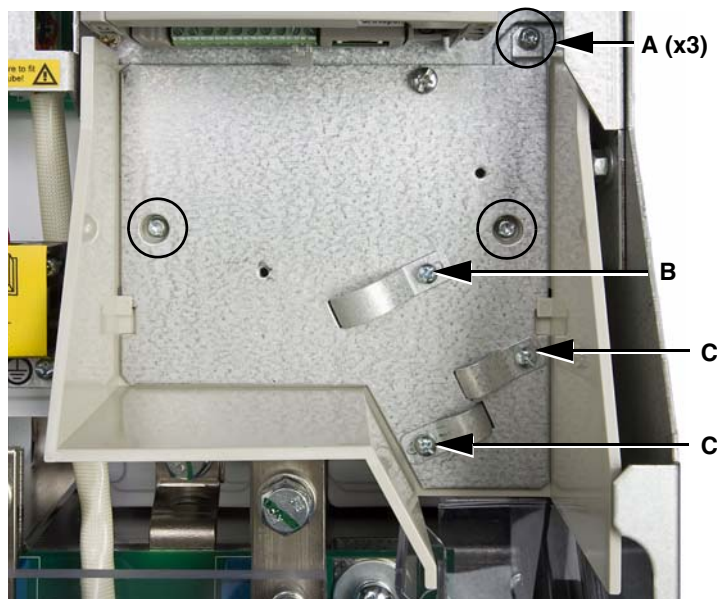
Replace the EMC tray as follows.

1. 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 13.

Figure 13: EMC Tray)

Table 3: 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



2. 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 13.

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.

3. Remove the metal EMC plate from the plastic tray and discard the plastic tray.
4. Place the metal EMC plate into the new plastic tray.
5. Using a size 2 Phillips driver, install the cable clamps on the EMC plate with three screws (**B** and **C**). See Figure 13. Tighten the screws to the torque values listed in Table 3.
6. Using a T-20 Torx driver, secure the plastic EMC tray to the control module mounting plate with mounting three screws (**A**). See Figure 13. Tighten the screws to the torque values listed in Table 3.
7. Replace the power terminal shield as illustrated in Step 2 of “Replacing the Power Terminal Shield” on page 22.
8. Replace the front cover. Using a size 2 Phillips driver, secure the front cover with nine screws. See Figure 9 on page 21. Tighten the screws to 5.5 N•m (48.7 lb-in).

Replacing the Internal Fan VZ3V1213

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

Remove the Front Cover

Replace the Internal Fan

⚠ DANGER

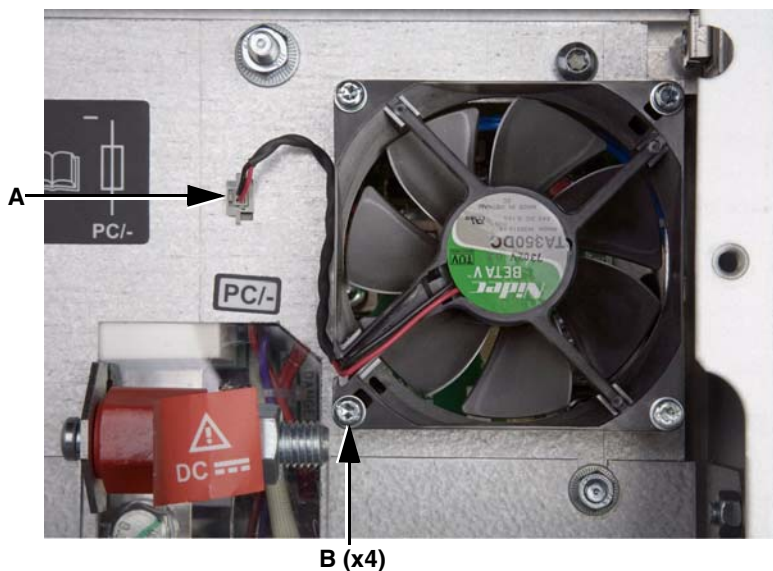
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- 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 nine screws and take the front cover off the drive. See Figure 9 on page 21.
2. Remove the internal fan as follows. See Figure 14.
 - Using needle-nose pliers, carefully unplug the 2-pin connector (**A**) from the top bracket.
 - Using a T-20 Torx driver, remove four screws (**B**) securing the fan to the top bracket and remove the fan from the drive.

Figure 14: Internal Fan



3. Install the new fan as follows. See Figure 14.
 - Using a T-20 Torx driver, secure the fan to the top bracket with four screws (**B**). Tighten the screws to 1.1–1.7 N•m (9.7–15 lb-in).
 - Plug the 2-pin connector (**A**) into the terminal on the top bracket.
4. Replace the front cover. Using a size 2 Phillips driver, secure the front cover with nine screws. See Figure 9 on page 21. Tighten the screws to 5.5 N•m (48.7 lb-in).

Replace the Front Cover

Replacing the Soft Charge Board VX5A1300

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.

Table 4: Soft Charge Board Wiring

Wire No. ¹	Terminal No.	Description	To:
E110	CN2A	9-pin, red	PB ² X30 (7-pin) PB X30 (2-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

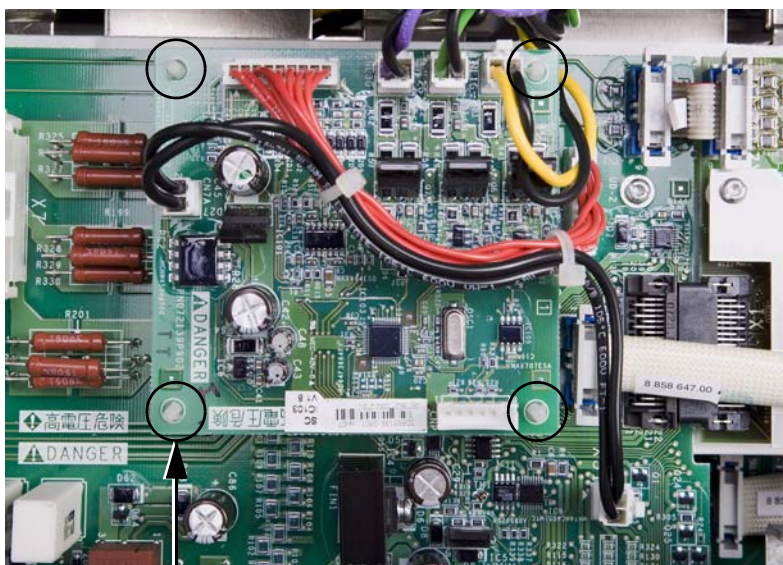
¹ See schematic on page 110 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

² PB: Power board

³ SCR: Silicon controlled rectifier

1. Using a size 2 Phillips driver, remove nine screws and take the front cover off the drive. See Figure 9 on page 21.
2. Using needle-nose pliers, carefully remove the following connections from the soft charge board. See Table 4 and Figure 15 for connector locations.
 - At the top of the 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 15: Soft Charge Board



A (x4)

3. Using needle-nose pliers, compress the four plastic mounting posts (**A**, Figure 15), 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 15) until it is securely seated.
5. Install five connections to the new soft charge board. See Table 4 and Figure 15 for connector locations.
6. Replace the front cover. Using a size 2 Phillips driver, secure the front cover with nine screws. See Figure 9 on page 21. Tighten the screws to 5.5 N•m (48.7 lb-in).

Replacing the Fan Control Board VX5A1400

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

Table 5: Fan Control Board Wiring

Wire No. ¹	Terminal No.	Description	To:
E124	X4	5-pin, violet/green/yellow	Fan control terminal block TB1
E118	X1	5-pin, violet/green/yellow	FB ² X1, X2, X3
E105	X2	3-pin, yellow	PB ³ X14
E125	X3	9-pin, black/white/brown/blue with yellow and green ground wire	Heatsink fan

¹ See schematic on page 109 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 FB: Filter board

³ PB: Power board.

⚠ DANGER

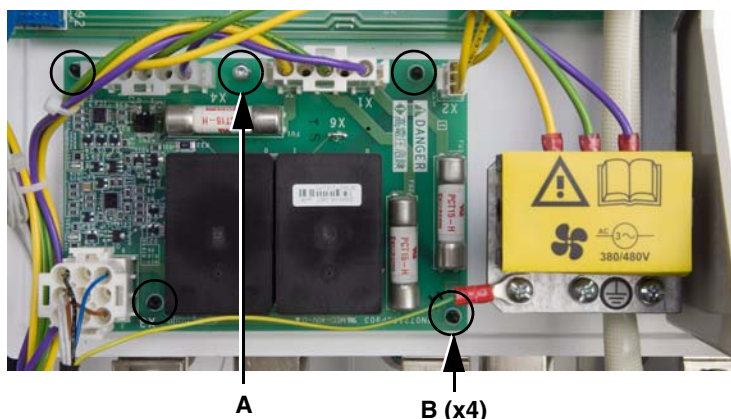
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- 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.

1. Using a size 2 Phillips driver, remove nine screws and take off the front cover of the drive. See Figure 9 on page 21.
2. Remove the power terminal shield as described in Step 1 of “Replacing the Power Terminal Shield” on page 22.
3. Remove the following connections from the fan control board. See Table 5 and Figure 16 for connector locations.
 - From the top of the board, remove from left to right: the 5-pin connector from terminal X4, the 5-pin connector from terminal X1, and the 3-pin connector from terminal X2.
 - From the bottom left of the board, remove the 9-pin connector from terminal X3.
4. Using a T-10 Torx driver, remove 1 screw (**A**, Figure 16) from the board between connectors X1 and X4.
5. Using needle-nose pliers, compress the four plastic mounting posts (**B**, Figure 16), one at a time, while lifting the board off the posts. Remove the board from the drive.

Figure 16: Fan Control Board



6. Press the new fan control board down over the four mounting posts until it is securely seated.
7. Using a T-10 Torx driver secure the board with one screw (**A**, Figure 16). Tighten the screw to 0.8 N•m (7.1 lb-in).
8. Install the four connections on the new fan control board. See Table 5 and Figure 16 for connector locations.
9. Replace the power terminal shield as illustrated in Step 2 on page 28.
10. Replace the front cover. Using a size 2 Phillips driver, secure the front cover with nine screws. See Figure 9 on page 21. Tighten the screws to 5.5 N•m (48.7 lb-in).

Replacing the Filter Board VX4A1114 and Motor Current Sensors VY1A1108

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 24 on page 34.
- 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 nine screws and take the front cover off the drive. See Figure 9 on page 21.

Remove the Power Terminal Shield

2. The power terminal shield has two retaining tabs (**A**, Figure 17) on the right that fit into slots on the conduit tray, and three mounting holes (**B**, Figure 18) on the left that fit over posts on the side panel of the drive. Disengage the shield from the retaining tabs and mounting slots and remove it from the drive.

Figure 17: Power Terminal Shield

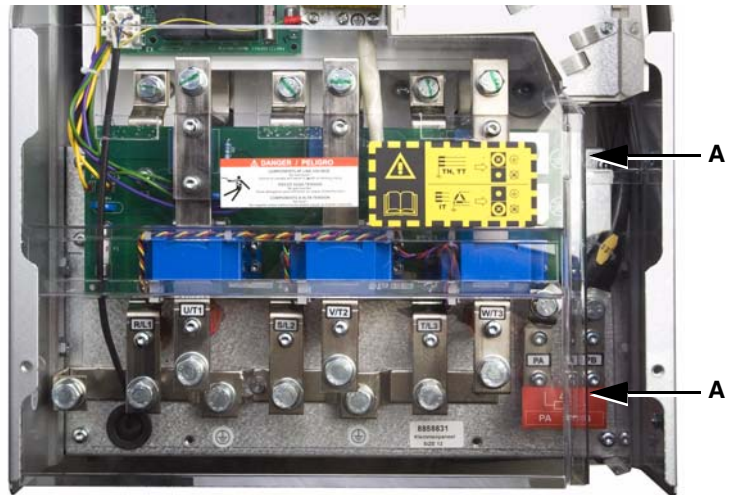


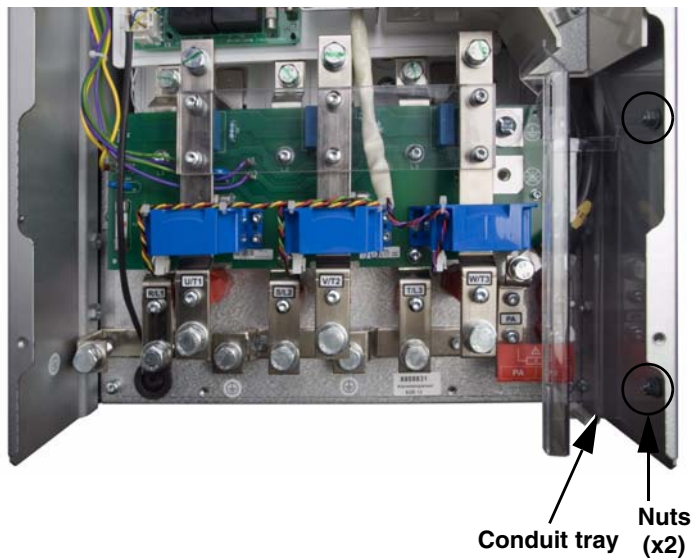
Figure 18: Power Terminal Shield Retaining Posts



Remove the Conduit Tray

3. Using a 10 mm socket wrench, remove two nuts securing the conduit tray to the drive frame and remove the tray from the drive. See Figure 19.

Figure 19: Conduit Tray



Remove the Filter Board Shield

Remove the Output Bus Bars

4. Using a T-30 Torx driver, remove six screws (A, Figure 20) securing the filter board shield to the output bus bars and remove the shield.
5. Remove the output bus bars as follows:
- Using a 16 mm socket, remove three bolts (B, Figure 20) securing the output bus bars to the DC bus plate.
 - Using a T-30 Torx driver, remove three screws and washers (C, Figure 20) securing the output bus bars to the red insulators at terminals U/T1, V/T2, and W/T3.
 - Slide the bus bars out of the motor current sensors (D, Figure 21).

NOTE: Turn the bus bars 90° to the right, if necessary, to remove them from the motor current sensors.

Table 6: Filter Board Shield and Output Bus Bar Hardware Torque Values

Item	Description	Torque Range	
		N•m	lb-in
A	(6) T-30 screws	5.5	48.7
B	(3) 16 mm bolts	27	239
C	(3) T-30 screws and washers	5.5	48.7

Figure 20: Filter Board Shield and Output Bus Bars

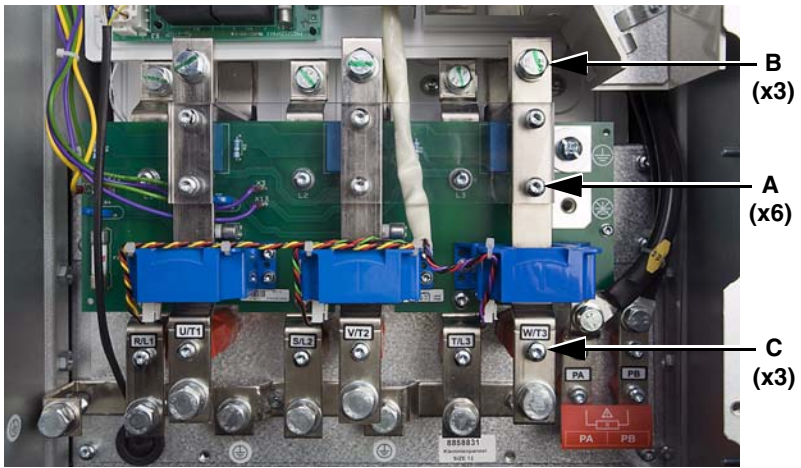
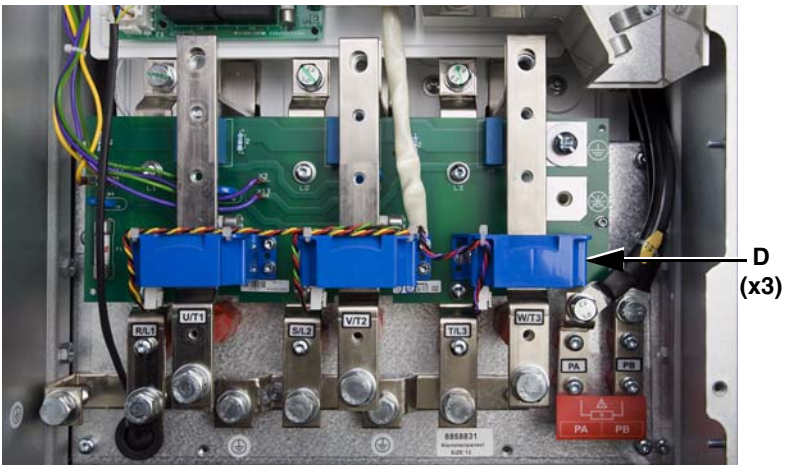


Figure 21: Motor Current Sensors



Remove Power Board Connection X11 and the Filter Board Connections

Table 7: Filter Board Wiring

Wire No. ¹	Terminal No.	Description	To:
E118	X1	Yellow, 1/4 in. connector	FCB ² X1
	X2	Green, 1/4 in. connector	
	X3	Violet, 1/4 in. connector	
E120	X11	Yellow, 3/16 in. connector	PB ³ X7
	X12	Green, 3/16 in. connector	
	X13	Violet, 3/16 in. connector	

¹ See schematic on page 109 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

6. Remove power board connection X11 and the filter board connections as follows.

- Using needle-nose pliers, remove the six 1-pin connections from the filter board. See Table 7 and Figure 22 for connector locations.
- Disconnect the cable (wire E103) from terminal X11 of the power board and route it from under the TB1 bracket and out of the way. See Figure 23.

Figure 22: Filter Board Connections

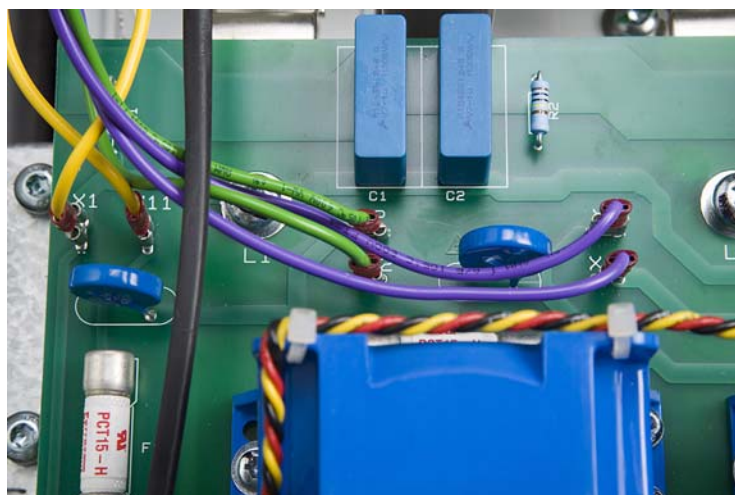
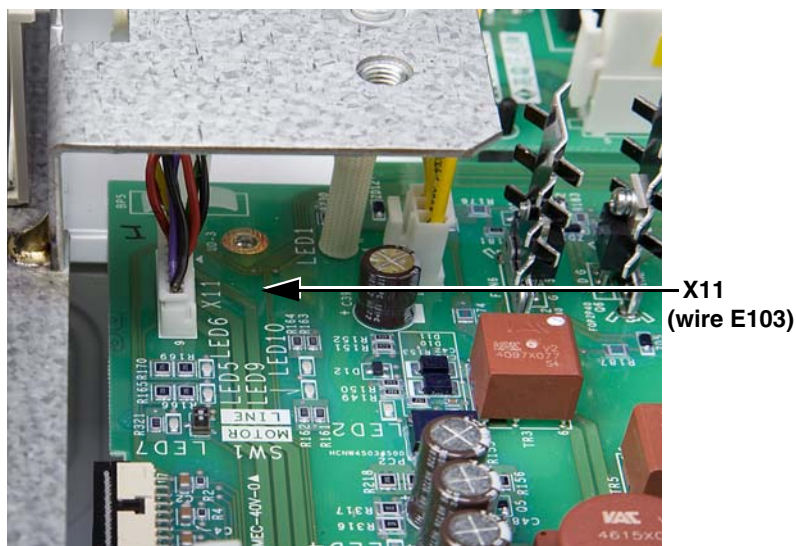


Figure 23: Power Board Connection X11



Remove the Filter Board

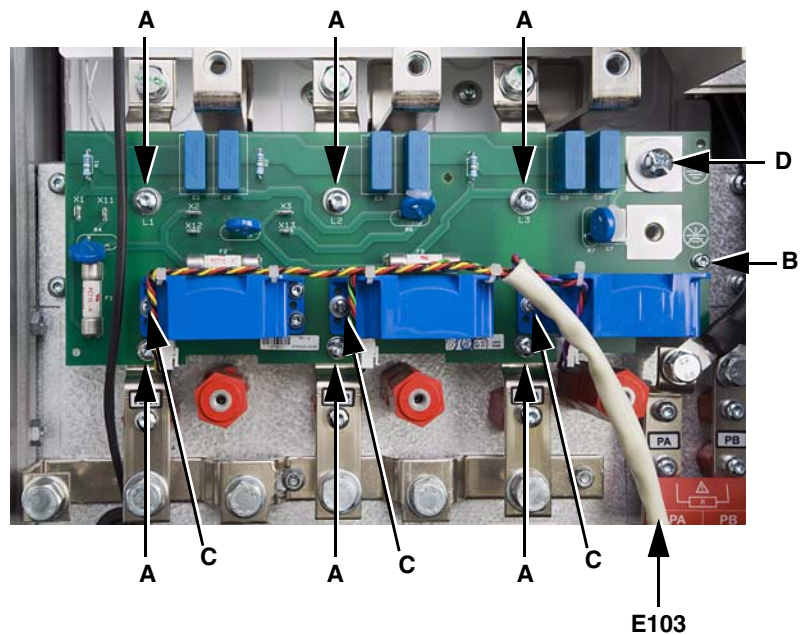
7. Remove the filter board as follows.

- Using a T-30 Torx driver, remove six screws (**A**, Figure 24) securing the filter board to the input bus bars.
- Using a T-20 Torx driver, remove one screw and washer (**B**, Figure 24) securing the right edge of the filter board to the drive frame.
- Using a size 2 Phillips driver, remove three screws with two washers each (**C**, Figure 24) securing the current sensors to the input bus bars.
- Using a size 3 Phillips driver, remove one screw, two washers, and one lock washer (**D**, Figure 24) securing the top right corner of 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



Remove the Motor Current Sensors

8. Remove the motor current sensors from the filter board as follows:
- Remove the connections from the current sensors.
 - Using a T-20 Torx driver, remove six screws (**E**, Figure 25) securing the current sensors to the filter board, and remove the 7 mm nuts (**F**, Figure 26) from the back of the board.

Figure 25: Filter Board Front

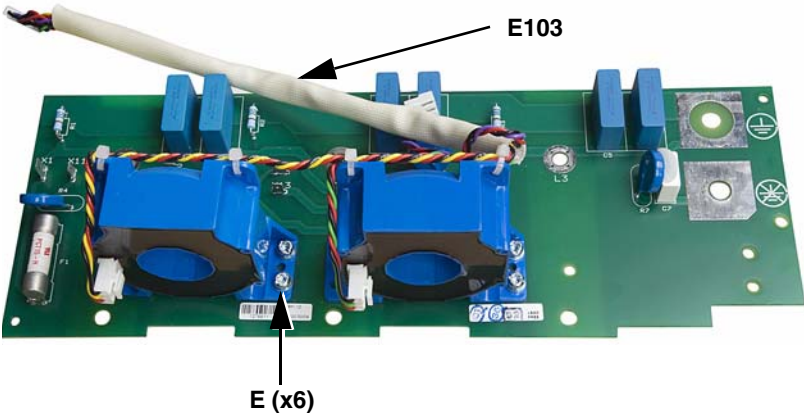
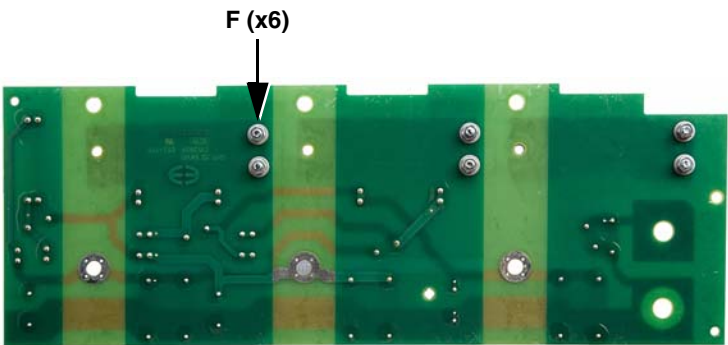


Figure 26: Filter Board Back



NOTE: In the next steps you can install a new filter board, install new motor current sensors, or both. If you are installing new motor current sensors, you must replace all three of the current sensors.

Install the Motor Current Sensors

9. Install the motor current sensors as follows.
- Install the motor current sensors on the filter board and secure them with six T-20 Torx screws (**E**, Figure 25) and six 7 mm nuts (**F**, Figure 26) each. Tighten the hardware to the values specified in Table 8.
 - Connect wire E103 (See Figure 25) to the motor current sensors.

NOTE: Note the position of the wires.
T1: yellow/red/black; T2: green/red/black; T3: violet/red/black.

Table 8: Motor Current Sensor
Hardware Torque Values

Item	Description	Torque Range	
		N•m	lb-in
E	(6) T-20 screws	1.2	10.6
F	(6) 7 mm nuts	1.2	10.6

Install the Filter Board

10. Install the filter board as follows:
- Using a T-30 Torx driver, secure the filter board to the input bus bars with six screws (**A**, Figure 27).
 - Using a size 2 Phillips driver, secure the current sensors to the input bus bars with three screws (**C**, Figure 27).
 - Using a T-20 Torx driver, secure the right edge of the filter board to the drive frame with one screw and washer (**B**, Figure 27).
 - Using a size 3 Phillips driver, secure the filter board to the drive frame with one screw and washer (**D**, Figure 27).

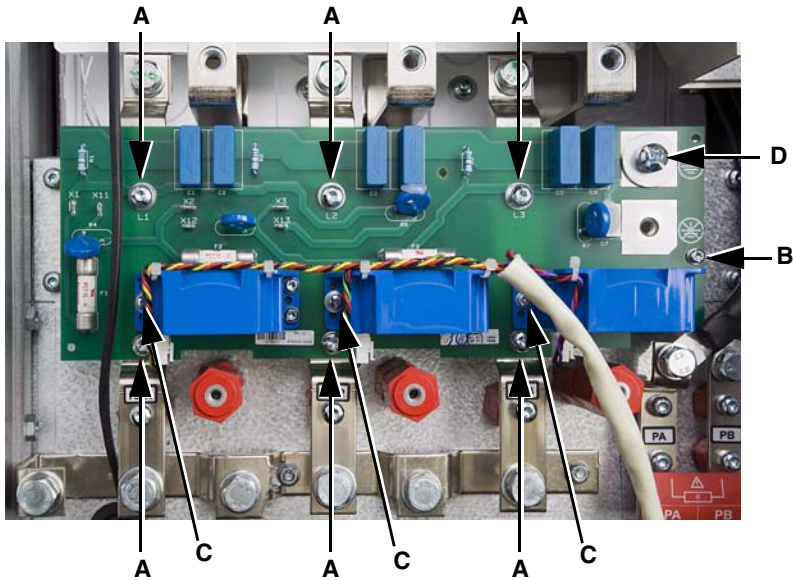
NOTE: Be sure to install the size 3 Phillips screw and washer (**D**) in the original position. Figure 27 shows the screw in the grounded position.

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

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) T-20 screw	1.2	10.6
C	(3) Size 2 Phillips screws and washers	5.5	48.7
D	(1) Size 3 Phillips screw and washers	5.5	48.7

Figure 27: Filter Board



Replace Power Board Connection X11 and the Filter Board Connections

11. Replace power board connection X11 (wire E103) and the filter board connections as follows.

- Route the cable from the motor current sensors under the TB1 bracket and connect it to power board terminal X11. See Figure 28.
- Replace the six 1-pin connections to the filter board. See Table 10 and Figure 29 for connector locations.

Figure 28: Power Board Connection X11

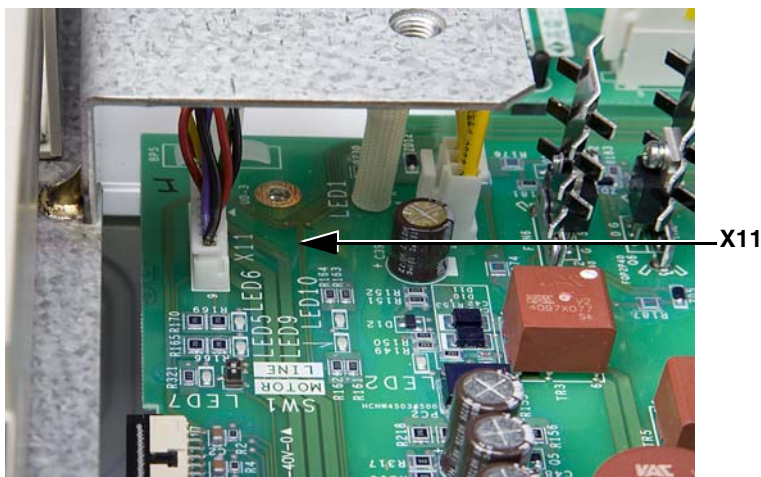


Table 10: Filter Board Wiring

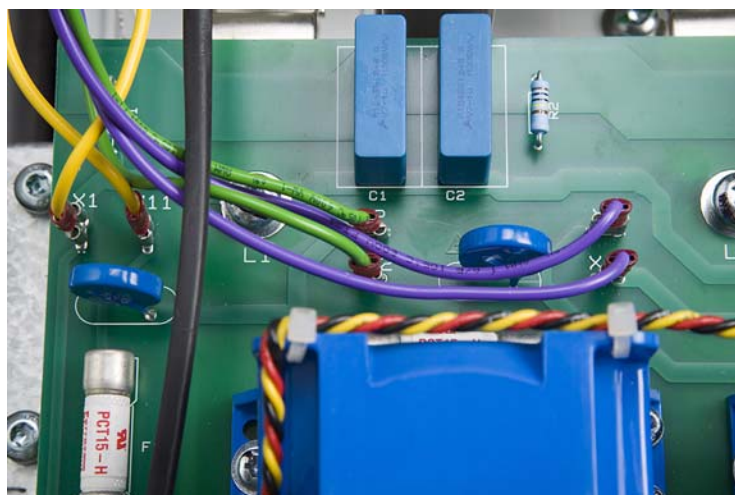
Wire No. ¹	Terminal No.	Description	To:
E118	X1	Yellow, 1/4 in. connector	FCB ² X1
	X2	Green, 1/4 in. connector	
	X3	Violet, 1/4 in. connector	
E120	X11	Yellow, 3/16 in. connector	PB ³ X7
	X12	Green, 3/16 in. connector	
	X13	Violet, 3/16 in. connector	

¹ See schematic on page 109 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

Figure 29: Filter Board Connections



Replace the Output Bus Bars

12. Replace the output bus bars as follows:
- Slide the output bus bars into place through the current sensors (D, Figure 30).
 - Using a 16 mm socket, secure the output bus bars to the DC bus plate with three bolts (B, Figure 31).
 - Using a Torx T-30 driver, secure the output bus bars to the red insulators at terminals U/T1, V/T2, and W/T3 with three screws (C, Figure 31).
 - Tighten the hardware to the torque values specified in Table 11.

Replace the Filter Board Shield

13. Replace the transparent filter board shield as follows.
- If the shield is cracked, broken, or damaged, replace it with a new piece from the plastic kit. See page 22.
 - Using a T-30 Torx driver, secure the filter board shield to the output bus bars with six screws (A, Figure 31). Tighten the screws to the torque values specified in Table 11.

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Install the filter board shield as shown in Figure 31.
- 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 22.
- Do not install a damaged shield.

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

Figure 30: Motor Current Sensors

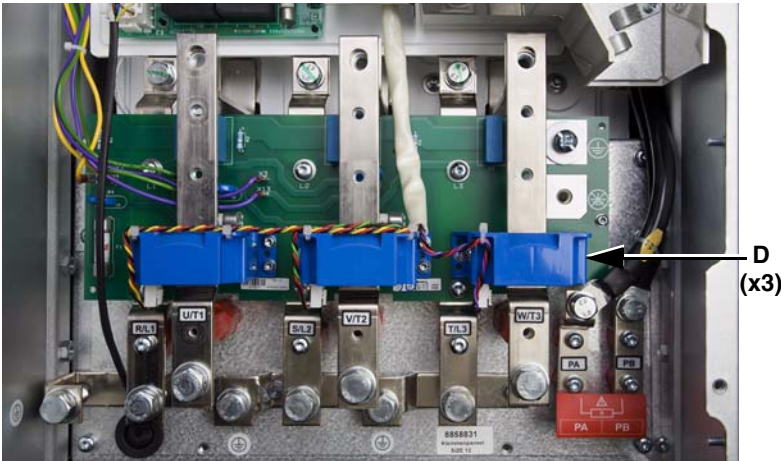
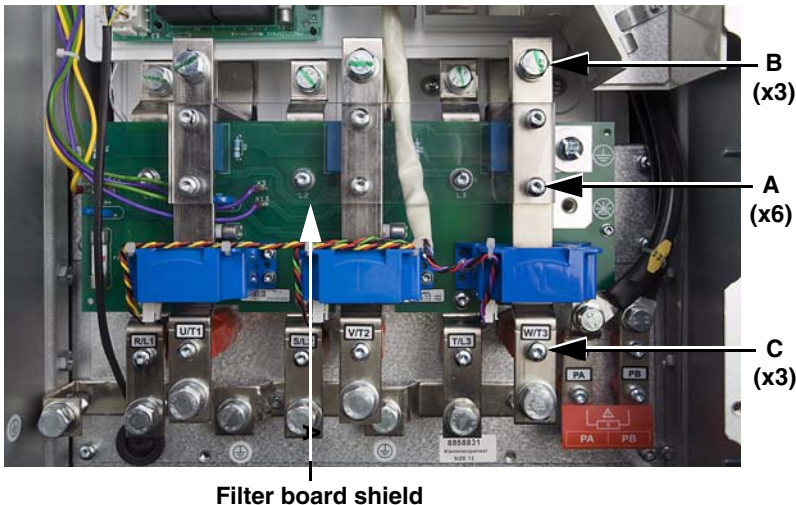


Figure 31: Filter Board Shield and Output Bus Bars

Table 11: Filter Board Shield and Output Bus Bar Hardware Torque Values

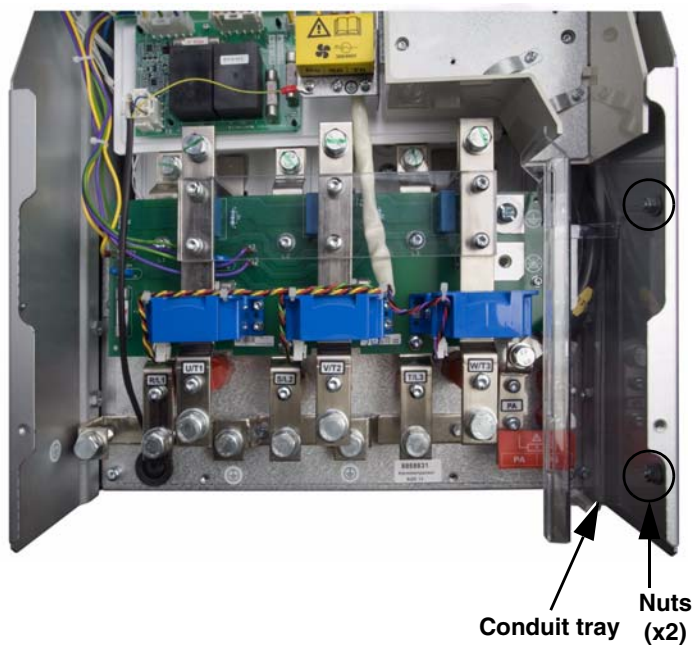
Item	Description	Torque Range	
		N•m	lb-in
A	(6) T-30 screws (20 mm length)	5.5	48.7
B	(3) 16 mm bolts	27	239
C	(3) T-30 screws (16 mm length) and washers	5.5	48.7



Replace the Conduit Tray

14. Using a 10 mm socket wrench, secure the conduit tray to the drive frame with two nuts. See Figure 32. Tighten the nuts to 5.5 N•m (48.7 lb-in).

Figure 32: Conduit Tray



Replace the Power Terminal Shield

15. Replace the power terminal shield as follows.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Install the power terminal shield as shown in Figures 33 and 34.
- 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 22.
- Do not install a damaged shield.

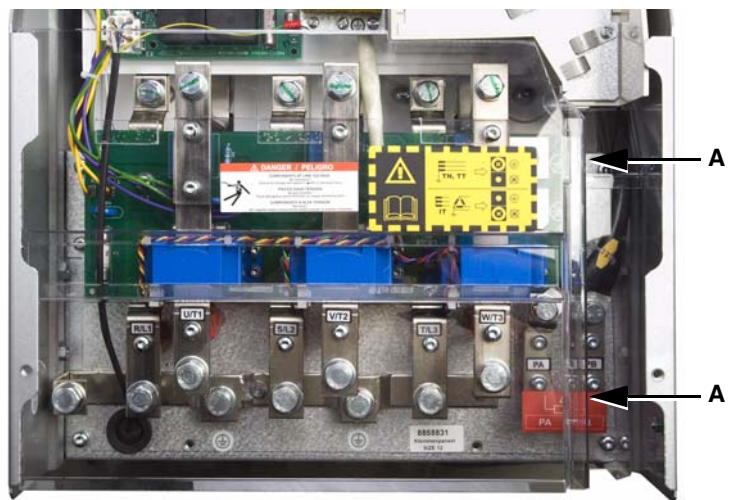
Failure to follow these instructions will result in death or serious injury.

- Hook the mounting holes on the left side of the shield over the posts on the side panel of the drive (**B**, Figure 33).
- Insert the retaining tabs on the right side of the shield in the slots on the conduit tray (**A**, Figure 34).

Figure 33: Power Terminal Shield Retaining Posts



Figure 34: Power Terminal Shield



Replace the Front Cover

16. Replace the front cover. Using a size 2 Phillips driver, secure the front cover with nine screws. See Figure 9 on page 21. 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:

Measuring board	Capacitors
Power board	SCR snubber board
Gate driver boards	SCR modules
Temperature sensor #1	Dynamic braking kit
Power IGBT modules	Temperature sensor #2

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
- ☐ Power terminal shield
- ☐ EMC tray
- ☐ Control module assembly
- ☐ Top crossbrace
- ☐ Fan plate
- ☐ SCR snubber board shield
- ☐ Power board connections
- ☐ Soft charge board connections
- ☐ Fan control board connections
- ☐ Bus plate assembly
- ☐ Gate driver boards
- ☐ DC bus plate assembly

You must perform some or all of the steps in this section to access the level 2 parts. Consult Table 12 for the disassembly steps that must be performed to access the spare parts you are replacing.

Table 12: Disassembly Steps

If you are replacing:	Perform disassembly steps:	Then follow procedure:
Power board VX5A1HC1622	Steps 1–6	“Replacing the Power Board VX5A1HC1622” beginning on page 56
Gate driver board VX5A1201	Steps 1–17	“Replacing the Gate Driver Boards VX5A1201” beginning on page 61
Temperature sensor #1 VZ3G1104	Steps 1–19	“Replacing Temperature Sensor #1 VZ3G1104” beginning on page 65
Power IGBT modules VZ3IM1402M1271	Steps 1–20	“Replacing the Power IGBT Modules VZ3IM1402M1271” beginning on page 67
Capacitors VY1ADC1113	Steps 1–20	“Replacing the Capacitors VY1ADC1113” beginning on page 70
SCR snubber board VX4A1200	Steps 1–11	“Replacing the SCR Snubber Board VX4A1200 and SCR Modules VZ3TD1330M1601” beginning on page 72
SCR modules VZ3TD1330M1601	Steps 1–11	
Dynamic braking kit VZ3F1110	Steps 1–11	“Replacing the Dynamic Braking Kit VZ3F1110 and Temperature Sensor #2” beginning on page 83
Temperature sensor #2 VZ3G1104	Steps 1–11	

Remove the Front Cover

1. Using a size 2 Phillips driver, remove nine screws and take the front cover off the drive. See Figure 9 on page 21.

Remove the Power Terminal Shield

2. The power terminal shield has two retaining tabs (**A**, Figure 35) on the right that fit into slots on the conduit tray, and three mounting holes (**B**, Figure 36) on the left that fit over posts on the side panel of the drive. Disengage the shield from the retaining tabs and mounting slots and remove it from the drive.

Figure 35: Power Terminal Shield

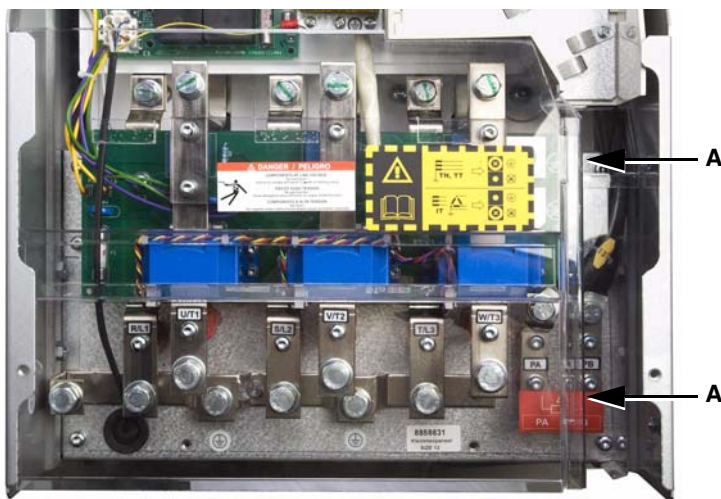


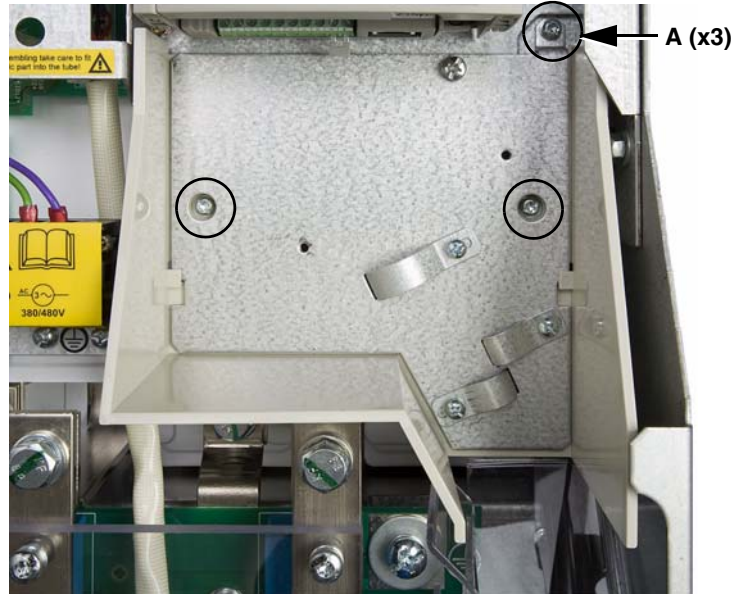
Figure 36: Power Terminal Shield Retaining Posts



Remove the EMC Tray

- 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 37.

Figure 37: EMC Tray



Remove the Control Module Assembly

- Remove the following connections.
 - Using a size 2 Phillips driver, loosen one screw (A, Figure 38) and remove the ground wire from the control module TB1 bracket.
 - Remove the 5-pin connector (B, Figure 38) from fan control board terminal X4.
 - Remove the 26-pin ribbon cable (C, Figure 39 on page 45) from motor control board terminal X3.

Figure 38: Fan Control Board Connections

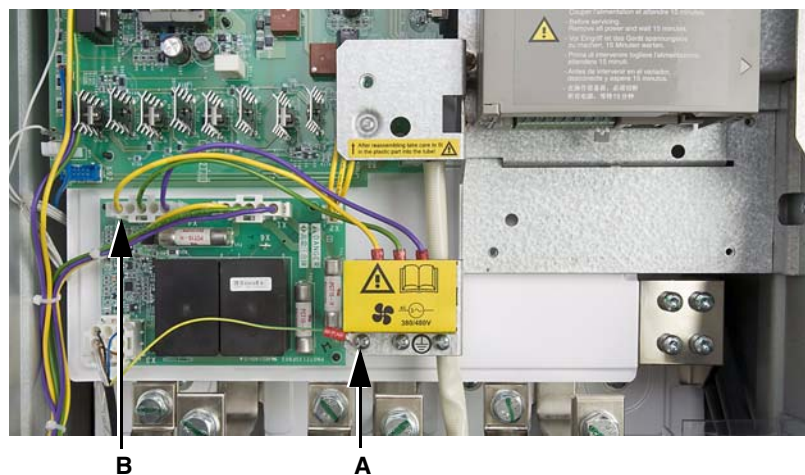
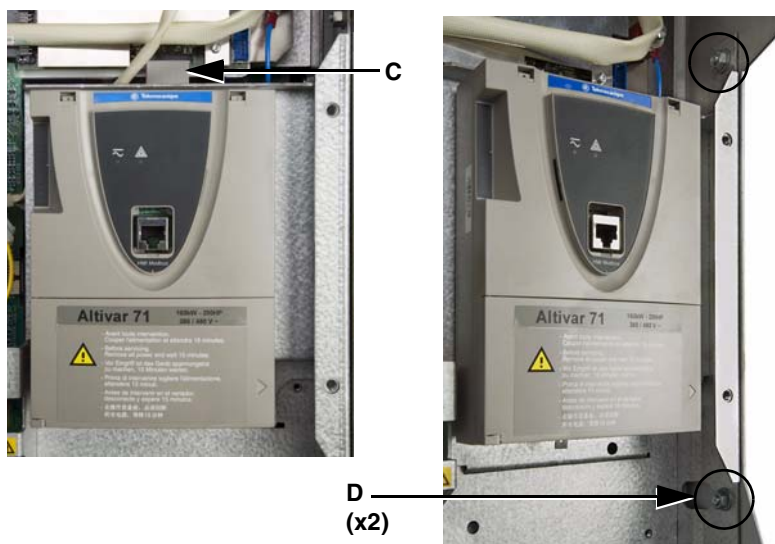


Figure 39: Control Module Assembly Front



5. Using a 10 mm socket wrench, remove two nuts (**D**, Figure 39) securing the control module assembly to the drive frame.
6. Turn the assembly over, disconnect the ribbon cable from the back (**E**, Figure 40), and remove the assembly from the drive.

Figure 40: Control Module Assembly Back

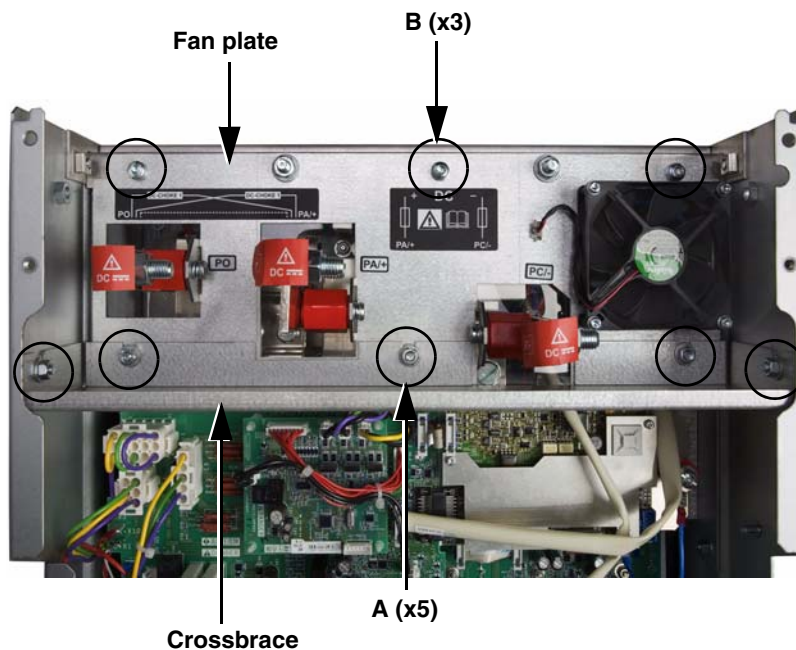


NEXT STEP: If you are replacing the power board, skip to “Replacing the Power Board VX5A1HC1622” beginning on page 56.

Remove the Top Crossbrace

7. Using a 10 mm socket wrench, remove five nuts (**A**, Figure 41) securing the top crossbrace to the drive frame and remove the crossbrace.

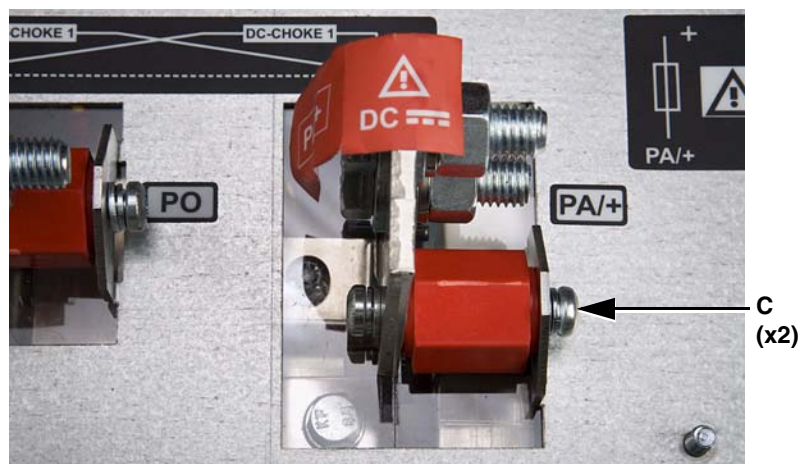
Figure 41: Top Crossbrace and Fan Plate



Remove the Fan Plate

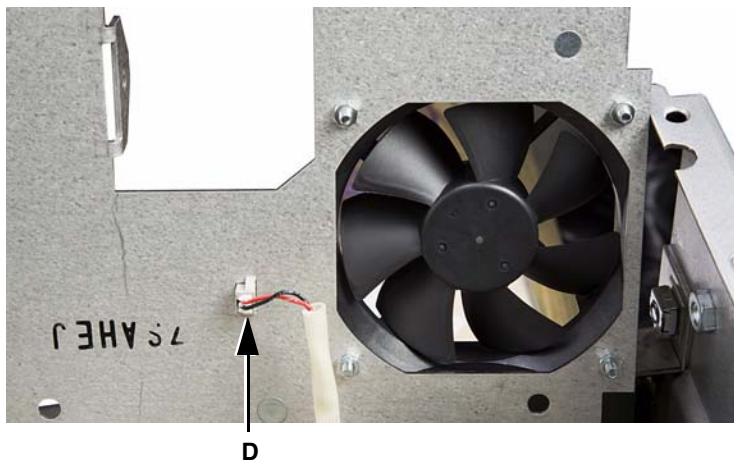
8. Using a T-30 Torx driver, remove three screws (**B**, Figure 41) securing the fan plate to the drive frame.
9. Using a T-30 Torx right-angled driver, remove two screws (**C**, Figure 42) from the sides of the three red insulators at the PO, PA/+, and PC/- terminals and remove the insulators from the drive.

Figure 42: Insulator Detail



10. Remove the connection (**D**, Figure 43) from the back of the fan plate, and remove the fan plate from the drive.

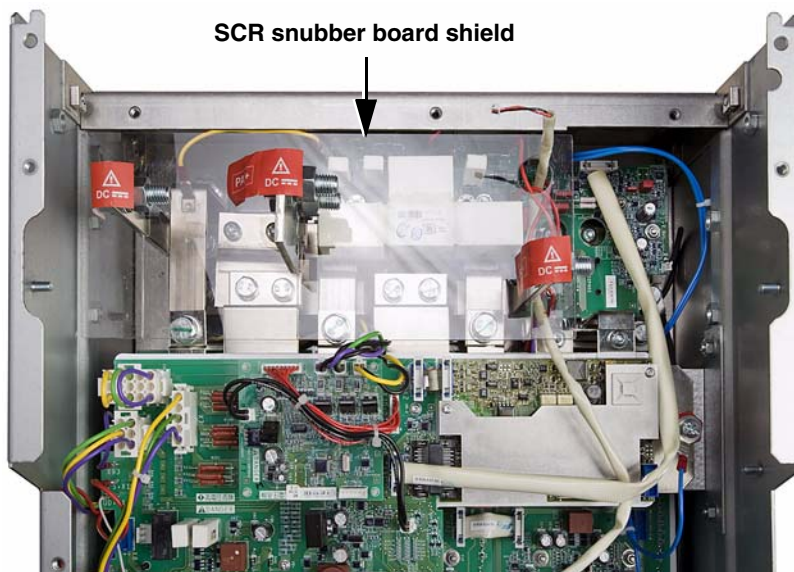
Figure 43: Fan Plate Connection



Remove the SCR Snubber Board Shield

11. Remove the transparent shield over the SCR snubber board. See Figure 44.

Figure 44: SCR Snubber Board Shield



NEXT STEP: If you are replacing the SCR snubber board or SCR modules, skip to “Replacing the SCR Snubber Board VX4A1200 and SCR Modules VZ3TD1330M1601” beginning on page 72.

If you are replacing the dynamic braking kit, skip to “Replacing the Dynamic Braking Kit VZ3F1110 and Temperature Sensor #2” beginning on page 83.

Remove the Power Board Connections

Table 13: Power Board Wiring

Wire No. ¹	Terminal No.	Description	To:
E103	X11	9-pin, multi color	Motor current sensors
E136	UD0	1-pin, blue	DC bus plate
E141	UD -R1	1-pin, white	Bleeder resistor
E139	UD +R1	1-pin, white	Bleeder resistor
E171	RFS +X11	1-pin, red	SCR ² snubber board X11
E126	RFS +X10	1-pin, red	SCR snubber board X10
E172	X93	1-pin, violet	Dynamic braking board X2
E143	X5	6-pin, yellow/green/violet	GDB ³ U X2, GDB V X2, GDB W X2
E120	X7	6-pin, green/yellow/violet	Filter board X11, X12, X13
E134	X91	10-pin, white	Dynamic braking board X1
E142	X3	18-pin, gray	GDB W X31
E100	X8	10-pin, white	GDB U X81
E106	X21	2-pin, red/black	Internal fan
E112	X4	10-pin, gray	Control module

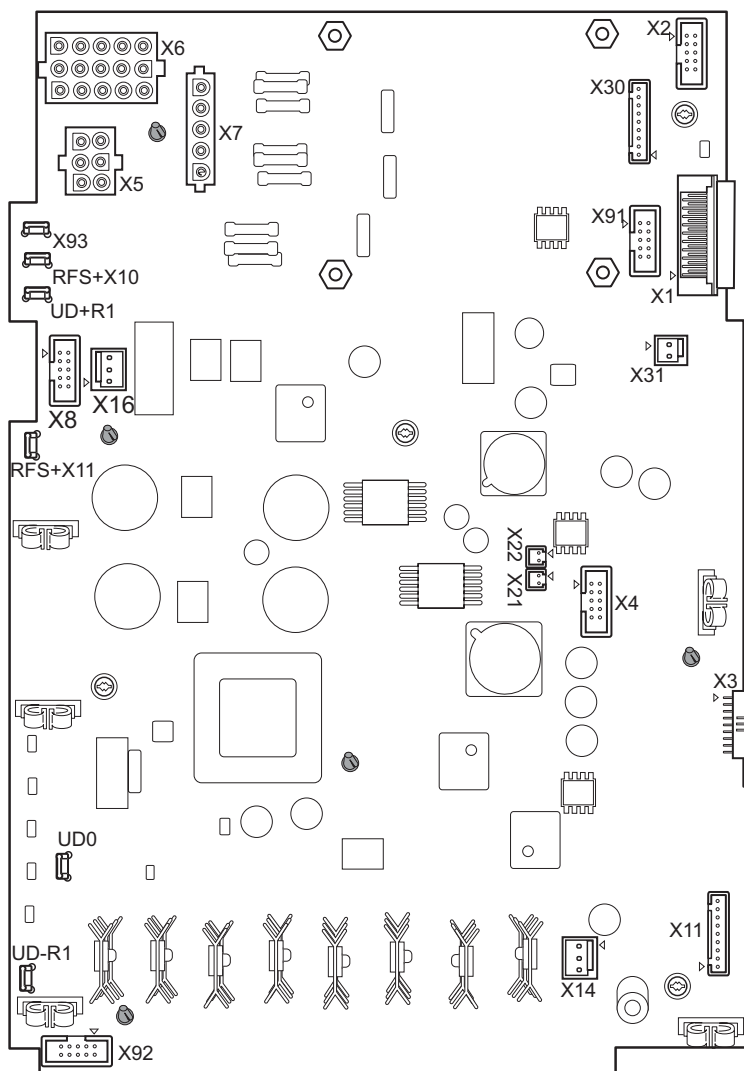
¹ See schematic on page 110 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

² SCR: Silicon controlled rectifier

³ GDB: Gate driver board

12. Using needle-nose pliers, remove the power board connections listed in Table 13. See Figure 45 for the connection locations.

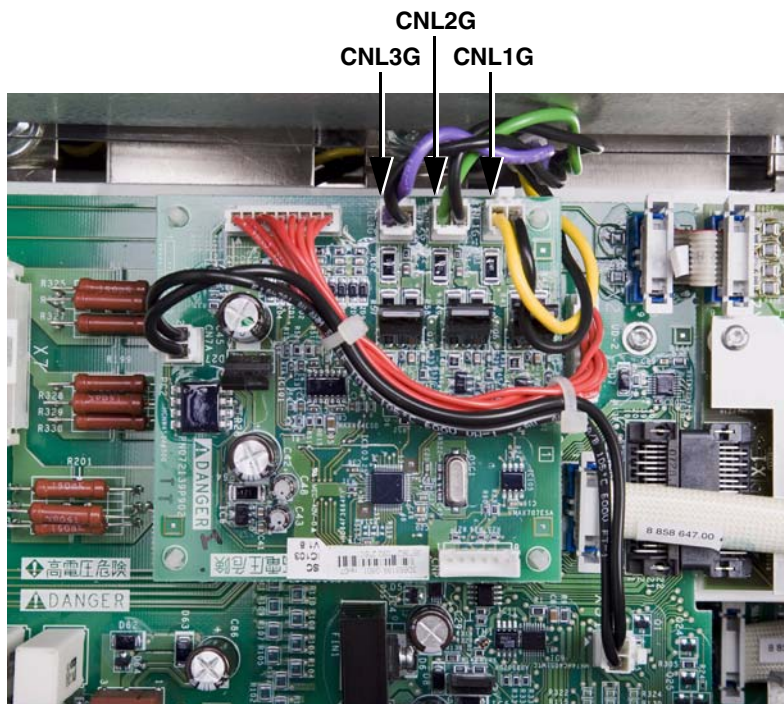
Figure 45: Power Board Connections



Remove the Soft Charge Board Connections

13. Using needle-nose pliers, remove soft charge board connections CNL1G, CNL2G, and CNL3G. See Figure 46 for terminal locations.

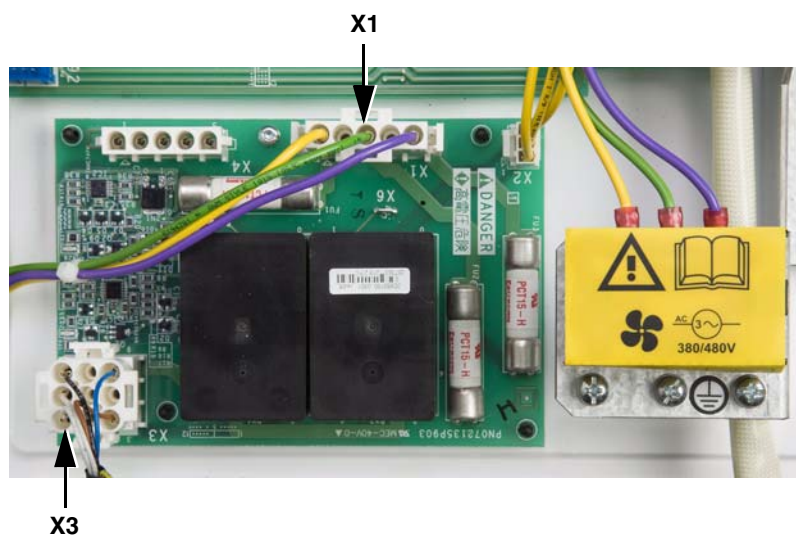
Figure 46: Soft Charge Board Connections



Remove the Fan Control Board Connections

14. Remove the connections at terminals X1 and X3 of the fan control board. See Figure 47 for terminal locations.

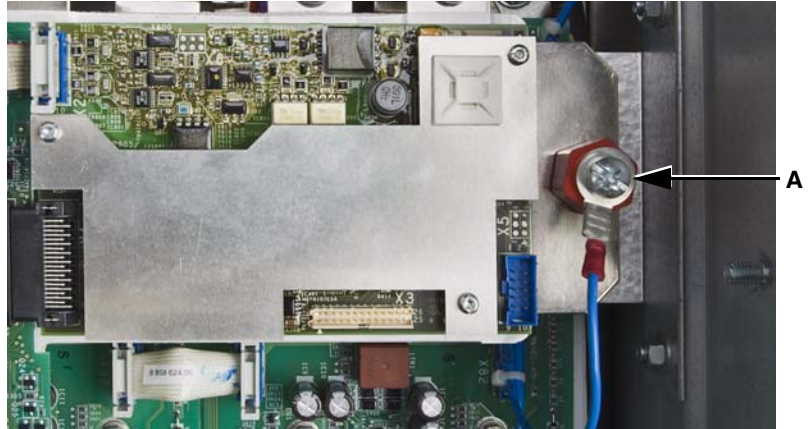
Figure 47: Fan Control Board Connections



Remove the Bus Plate Assembly

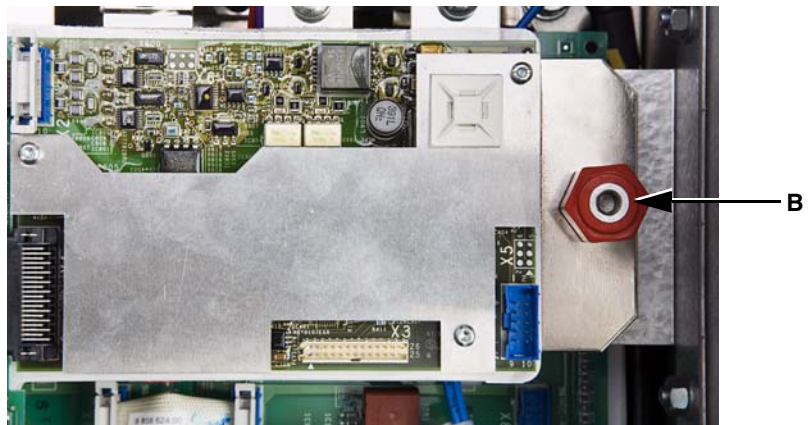
15. Using a size 2 Phillips driver, remove one screw (**A**, Figure 48) securing the blue wire (E122) to the red insulator near the motor control board. The wire originates from dynamic braking board terminal X5.

Figure 48: Wire E122 Connection



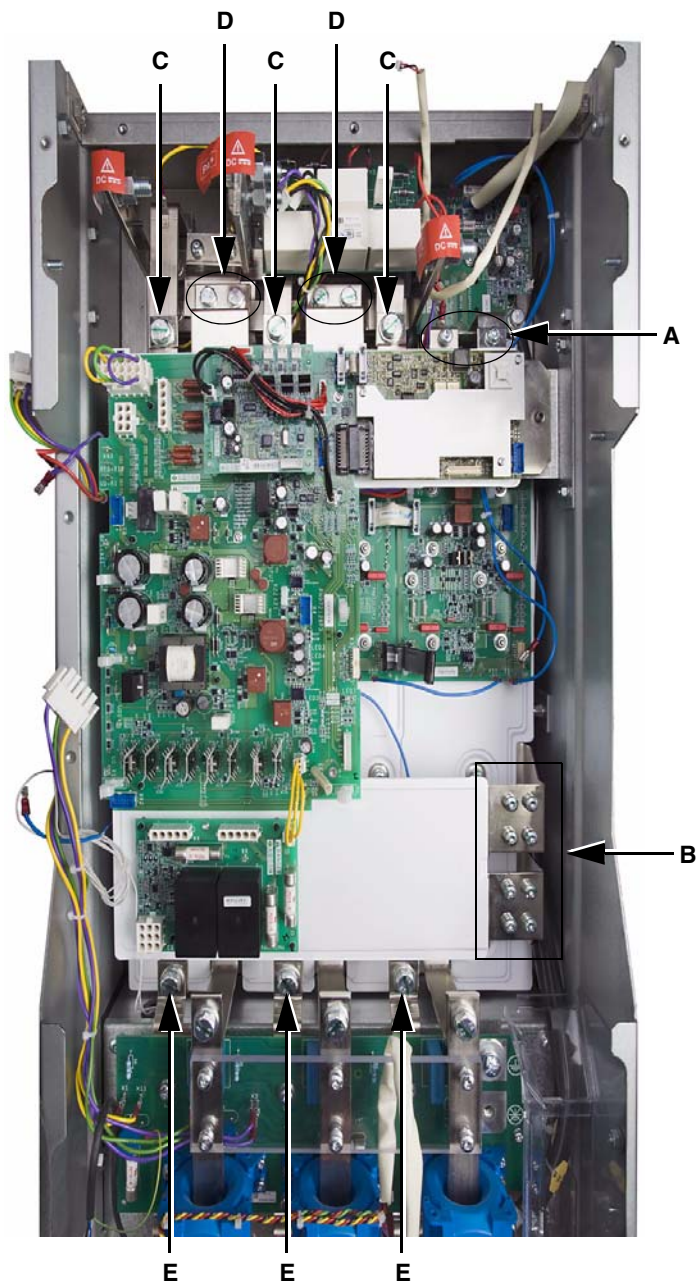
16. Using a 21 mm wrench, remove the top half of the red insulator (**B**, Figure 49). Retain the washer for reassembly.

Figure 49: Insulator



17. Remove the bus plate assembly as follows.
- Using a T-30 Torx driver, remove two screws (**A**, Figure 50 on page 51) securing the bus plate assembly to the bus bars connecting the IGBT module and the diode module.
 - Using a T-30 Torx driver, remove eight screws (**B**, Figure 50) securing the bus plate assembly to the positive (top) and negative (bottom) bus.
 - Using a 16 mm socket wrench, remove three bolts (**C**, Figure 50) securing the bus plate assembly to terminal 1 of the SCR modules.
 - Using a 13 mm socket wrench, remove four bolts (**D**, Figure 50) securing the bus plate assembly to the positive (left) and negative (right) bus.
 - Using a 16 mm socket, remove three bolts (**E**, Figure 50) securing the bus plate assembly to the AC input bus bars.
 - Remove the bus plate assembly from the drive.

Figure 50: Bus Plate Assembly



NEXT STEP: If you are replacing a gate driver board, skip to “Replacing the Gate Driver Boards VX5A1201” on page 61.

Remove the Gate Driver Boards

NOTE: Perform the steps in this section only 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 VX5A1201” on page 61.

18. Remove gate driver board connections as follows.

- From gate driver board V (**center board**), unplug all connections from the board. See Table 14 and Figure 51 on page 53 for connection locations.

NEXT STEP: If you are replacing temperature sensor #1, remove gate driver board V (center board) according to the instructions in Step 19 below, then skip to “Replacing Temperature Sensor #1 VZ3G1104” on page 65. Temperature sensor #1 is under gate driver board V.

- From gate driver board U (**left board**), unplug the yellow 1-pin connection from terminal X2. See Figure 51 on page 53.
- From the DC bus plate, unplug the blue 1-pin connection that originates at gate driver board U terminal X51 (wire stays connected to the gate driver board). See Figure 52 on page 53.
- From gate driver board W (**right board**), remove the blue 1-pin connection from terminal X52 and the violet 1-pin connection from terminal X2. See Figure 51 on page 53.

19. Using a 7 mm socket wrench, remove 12 nuts each from the gate driver boards and remove the boards from the drive. See Figure 51 on page 53.

Table 14: Gate Driver Board Wiring

Wire No. ¹	Terminal No.	Description	To:
Gate Driver Board U (Left)			
E143	X2	1-pin, yellow	Power board X5
E129	X51	1-pin, blue	Neutral bus
E127	X52	1-pin, blue	GDB V, X51
E100	X81	10-pin, white	Power board X8
E101	X82	10-pin, white	GDB V X81
E138	X32	18-pin, gray	GDB V X31
Gate Driver Board V (Center)			
E143	X2	1-pin, green	Power board X5
E127	X51	1-pin, blue	GDB U, X52
E123	X52	1-pin, blue	GDB W, X51
E101	X81	10-pin, white	GDB U, X82
E102	X82	10-pin, white	GDB W, X81
E138	X31	18-pin, gray	GDB U, X32
E142	X32	18-pin, gray	GDB W, X31
E128	X4	2-pin, black	Temperature sensor #1
Gate Driver Board W (Right)			
E143	X2	1-pin, violet	Power board X5
E123	X51	1-pin, blue	GDB V, X52
E132	X52	1-pin, blue	Dynamic braking board, X5
E102	X81	10-pin, white	GDB V, X82
E142	X31	18-pin, gray	Power board, X3

¹ See schematic on page 110 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.

Figure 51: Gate Driver Boards

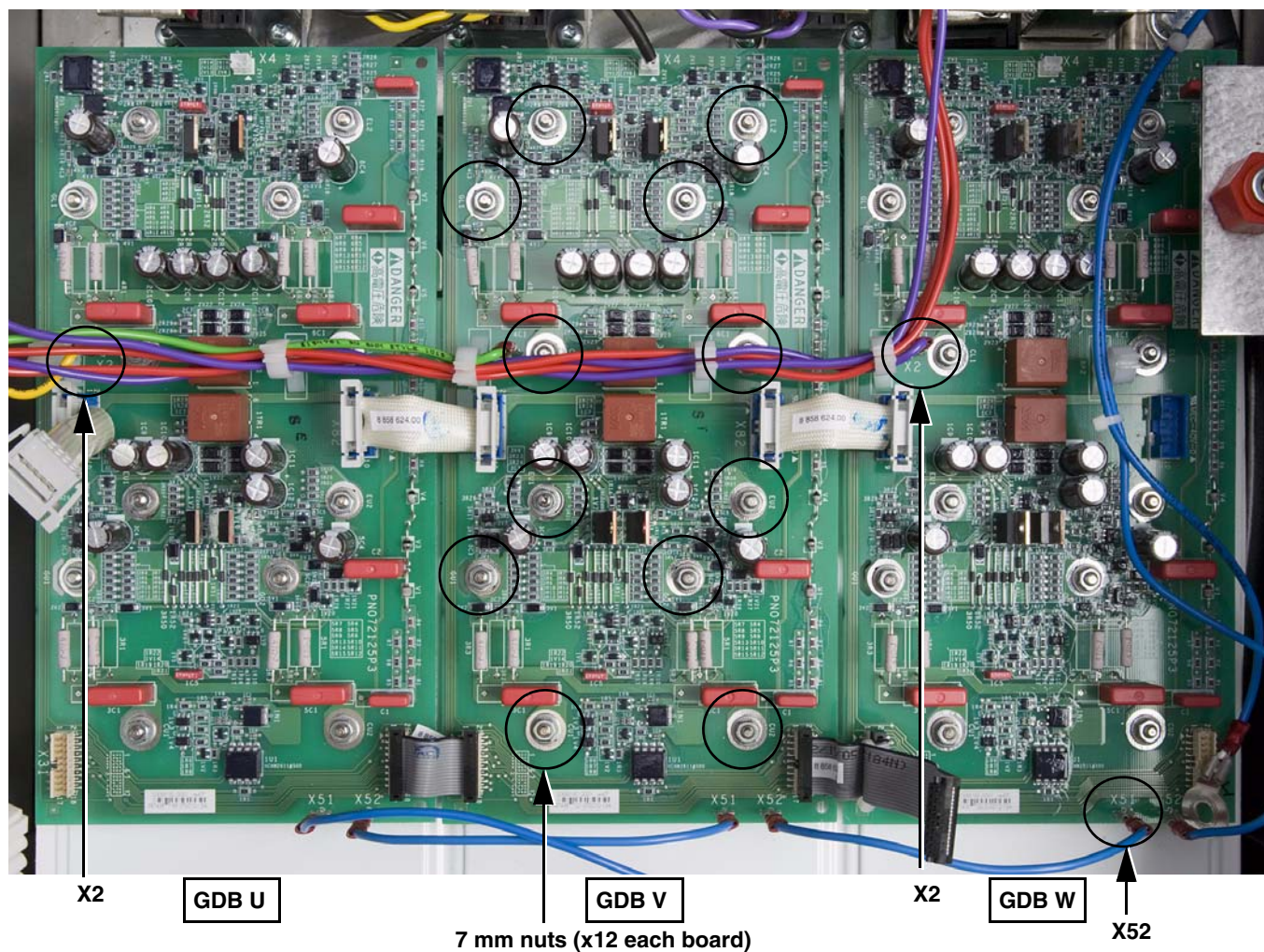
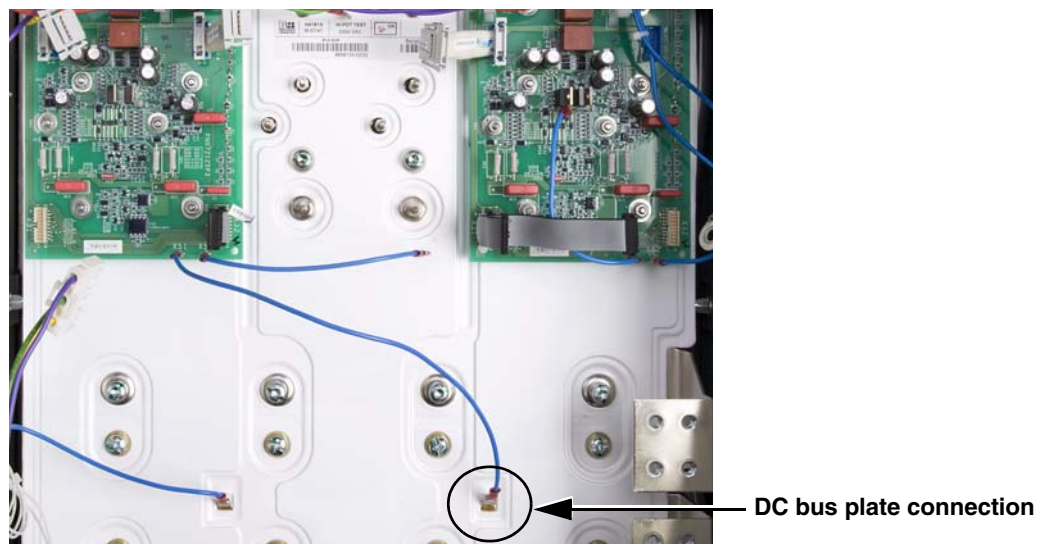


Figure 52: DC Bus Plate Connection



Remove the DC Bus Plate

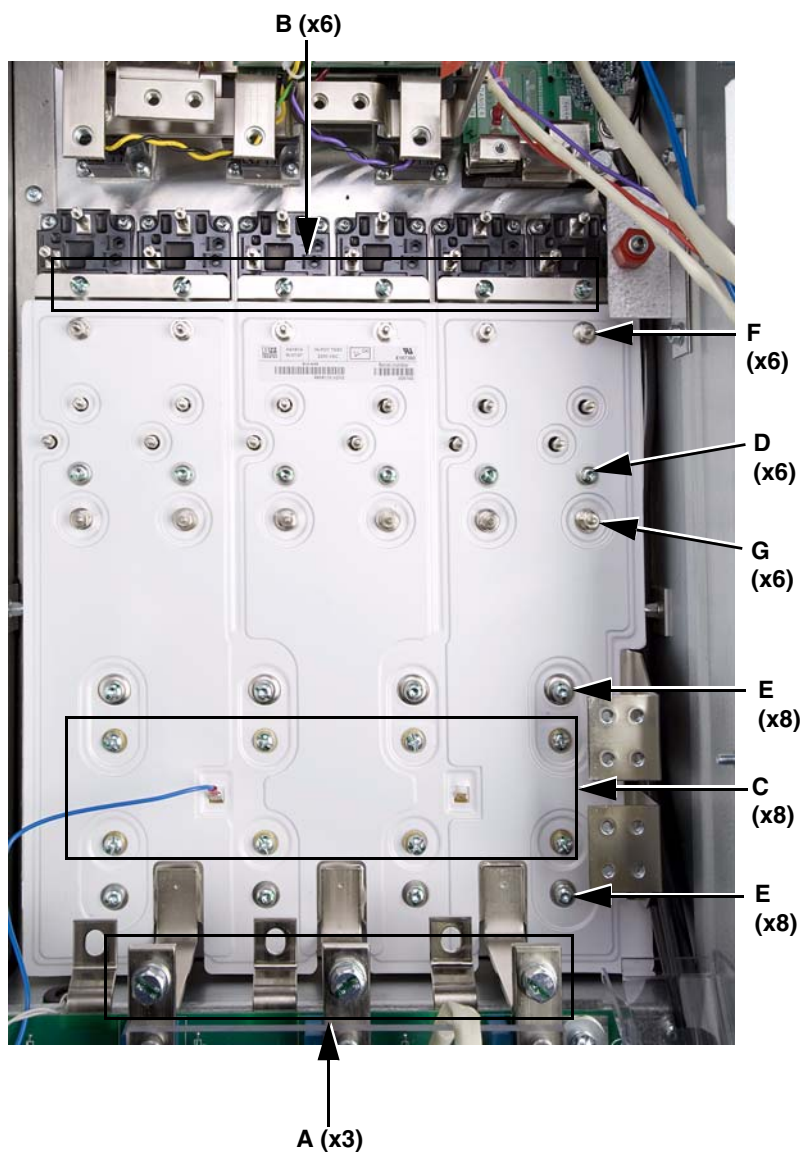
20. Remove the DC bus plate as follows.

- Using a 16 mm socket, remove three bolts (**A**, Figure 53 on page 55) securing the DC bus plate to the output bus bars.
- Using a size 2 Phillips driver, remove six screws securing the DC bus plate to the IGBT modules (**B**, Figure 53) and eight screws securing the bus plate to the capacitors (**C**, Figure 53).
- Using a T-30 Torx driver, remove six 20 mm screws securing the DC bus plate to the IGBT modules (**D**, Figure 53) and eight 14 mm screws securing the bus plate to the capacitors (**E**, Figure 53).
- Using a 10 mm socket wrench, remove six 6-mm standoffs (**F**, Figure 53) and six 11-mm standoffs (**G**, Figure 53)
- Remove the bus plate from the drive.

NEXT STEP: If you are replacing the power IGBT modules, skip to “Replacing the Power IGBT Modules VZ3IM1402M1271” beginning on page 67.

If you are replacing the capacitors, skip to “Replacing the Capacitors VY1ADC1113” beginning on page 70.

Figure 53: DC Bus Plate



Replacing the Power Board VX5A1HC1622

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 1–6 of “Disassembly Steps for Accessing Level 2 Parts” on page 41 to remove the following parts from the drive:

- ☐ The front cover
- ☐ The power terminal shield
- ☐ The EMC tray
- ☐ The control module assembly

Remove the Soft Charge Board

Table 15: Soft Charge Board Wiring

Wire No. ¹	Terminal No.	Description	To:
E107	CNL1G	2-pin, yellow/black	SCR ² 1 Terms. 4 & 5
E108	CNL2G	2-pin, green/black	SCR 2 Terms. 4 & 5
E109	CNL3G	2-pin, violet/black	SCR 3 Terms. 4 & 5
E110	CN2A	9-pin, red	PB ³ X30 (9-pin)
E111	CN7A	2-pin, black	PB X31

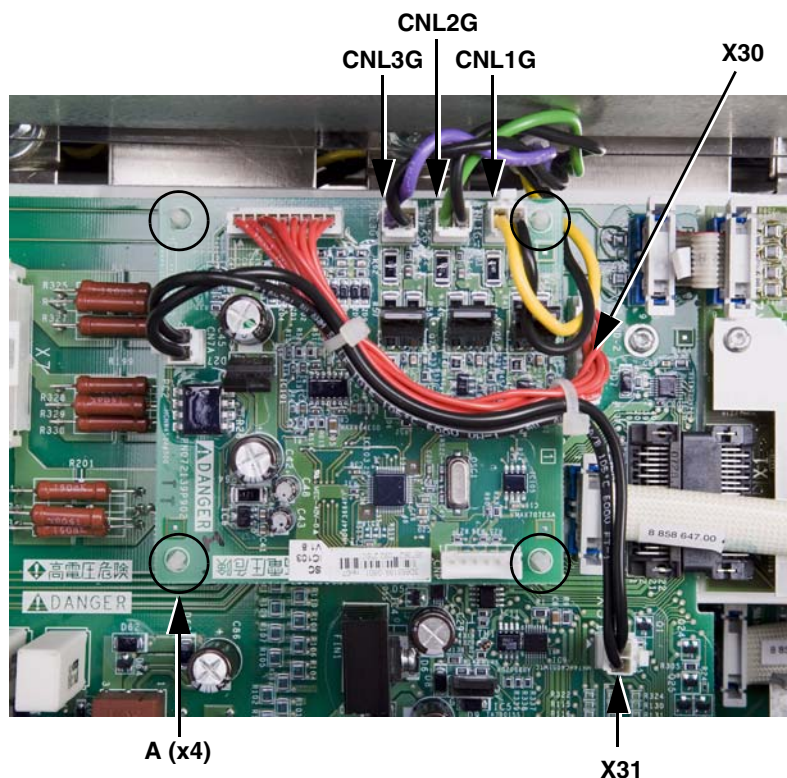
¹ See schematic on page 109 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

² SCR: Silicon controlled rectifier

³ PB: Power board

- Using needle-nose pliers, carefully remove the following connections. See Table 15 and Figure 54 for connector locations.
 - From the power board, remove the 9-pin connection from terminal X30 and the 2-pin connection from terminal X31.
 - From the soft charge board, remove: the 2-pin connector from terminal CNL1G, the 2-pin connector from terminal CNL2G, and the 2-pin connector from terminal CNL3G.
- Using needle-nose pliers, compress the four plastic mounting posts (A, Figure 54), one at a time, while lifting the soft charge board off the posts. Remove the soft charge board from the drive.

Figure 54: Soft Charge Board and Power Board Connections



Remove the Power Board Connections

Table 16: Power Board Wiring

Wire No. ¹	Terminal No.	Description	To:
E103	X11	9-pin, multi color	Motor current sensors
E105	X14	3-pin, yellow	Fan control board X2
E136	UD0	1-pin, blue	DC bus plate
E141	UD -R1	1-pin, white	Bleeder resistor
E139	UD +R1	1-pin, white	Bleeder resistor
E171	RFS +X11	1-pin, red	SCR ² snubber board X11
E126	RFS +X10	1-pin, red	SCR snubber board X10
E172	X93	1-pin, violet	Dynamic braking board X2
E143	X5	6-pin, yellow/green/violet	GDB ³ U X2, GDB V X2, GDB W X2
E120	X7	6-pin, green/yellow/violet	Filter board X11, X12, X13
—	X6	15-pin jumper assembly	
—	X2	10-pin, white	Motor control board X2
E134	X91	10-pin, white	Dynamic braking board X1
E110	X30	9-pin, red	Soft charge board CN2A
E111	X31	2-pin, black	Soft charge board CN7A
E142	X3	18-pin, gray	GDB W X31
E100	X8	10-pin, white	GDB U X81
E106	X21	2-pin, red/black	Internal fan
E112	X4	10-pin, gray	Control module

¹ See schematic on page 110 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.

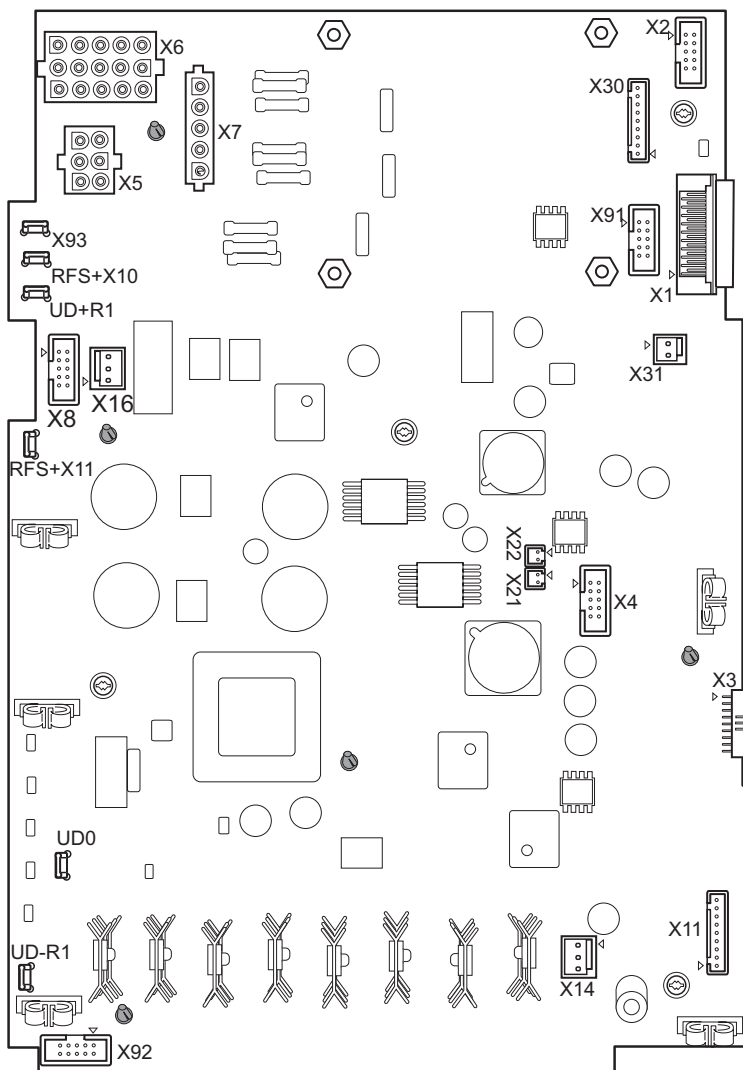
² SCR: Silicon controlled rectifier

³ GDB: Gate driver board

- Using needle-nose pliers, carefully remove all connections from the power board **except** the 15-pin connector at terminal X6. See Table 16 and Figure 55 for the connections.

NOTE: You removed the connections at terminals X30 and X31 in the previous step.

Figure 55: Power Board Connections



NOTE: There are no wiring connections at terminals X16, X22, and X92.

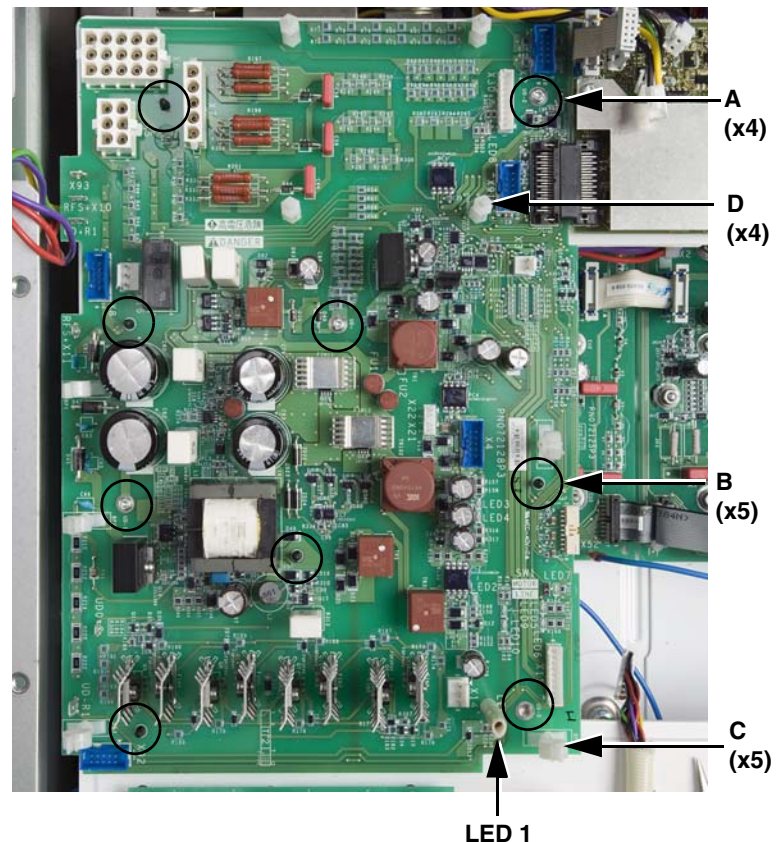
Remove the Old Power Board

NOTE: Take care not to damage LED 1 when removing, handling, or installing the power board. See Figure 56.

4. Remove the old power board as follows.

- Using a T-10 Torx driver, remove four screws (**A**, Figure 56) securing the power board to the laminated bus assembly.
- Using needle-nose pliers, gently compress the five plastic mounting posts (**B**, Figure 56), one at a time, while lifting the power board off the posts.

Figure 56: Power Board



Install the New Power Board

5. Transfer the 15-pin jumper assembly from terminal X6 of the old power board to terminal X6 of the new board. See Figure 55 on page 58 for terminal location.
6. Transfer the five plastic cable clamps (**C**, Figure 56) from the old power 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.
7. Transfer the four soft charge board mounting posts (**D**, Figure 56) 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 plastic 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 five plastic mounting posts (**B**, Figure 56) until it is securely seated.

Replace the Soft Charge Board

Table 17: Soft Charge Board Wiring

Wire No. ¹	Terminal No.	Description	To:
E107	CNL1G	2-pin, yellow/black	SCR ² 1 Terms. 4 & 5
E108	CNL2G	2-pin, green/black	SCR 2 Terms. 4 & 5
E109	CNL3G	2-pin, violet/black	SCR 3 Terms. 4 & 5
E110	CN2A	9-pin, red	PB ³ X30 (9-pin)
E111	CN7A	2-pin, black	PB X31

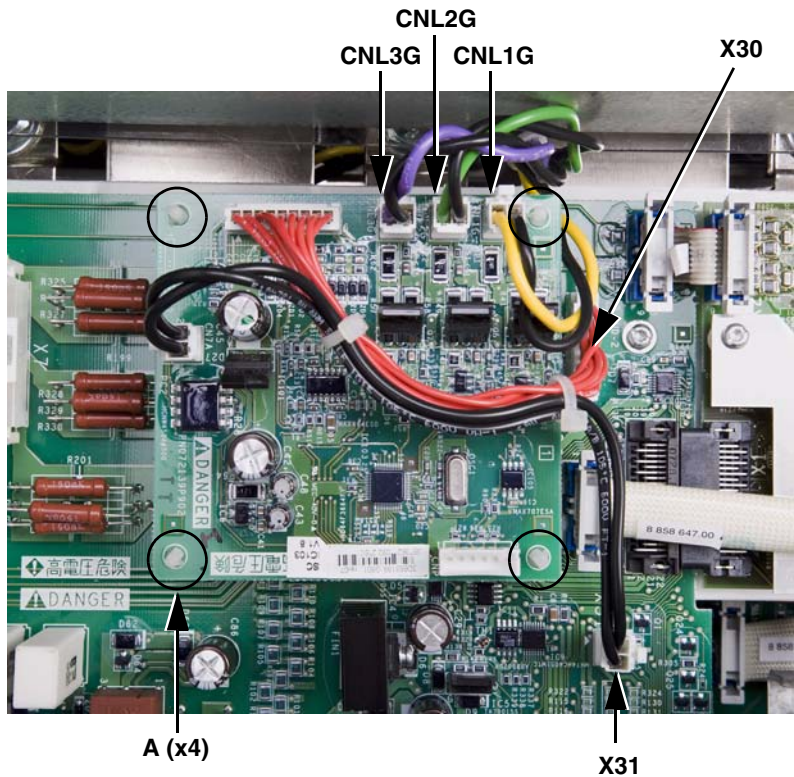
¹ See schematic on page 109 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

² SCR: Silicon controlled rectifier

³ PB: Power board

9. Using a T-10 Torx driver, secure the power board to the laminated bus assembly with four screws (**A**, Figure 56). Tighten the screws to 0.5–0.7 N•m (4.4–6.2 lb-in).
10. Replace the power board wiring. See Table 16 and Figure 55 on page 58 for the connection locations.
11. Press the soft charge board down over the four mounting posts (**A**, Figure 57) until it is securely seated over the power board.
12. Install the following connections. See Table 17 and Figure 57 for connector locations.
 - On the soft charge board, install: the 2-pin connection at terminal CNL1G, the 2-pin connection at terminal CNL2G, and the 2-pin connection at terminal CNL3G.
 - On the power board, install the 9-pin connection at terminal X30 and the 2-pin connection at terminal X31.

Figure 57: Soft Charge Board and Power Board Connections



NOTE: There is no wiring connection at terminal CNP.

Reassemble the Drive

If you are only replacing the power board, perform Steps 15–20 of “Reassembly Steps for Level 2 Parts” beginning on page 94 to replace the following parts:

- ☐ The control module assembly
- ☐ The EMC tray
- ☐ The power terminal shield
- ☐ The front cover

Replacing the Gate Driver Boards VX5A1201

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 1–17 of “Disassembly Steps for Accessing Level 2 Parts” on page 41 to remove the following parts from the drive:

- ☐ Front cover
- ☐ Power terminal shield
- ☐ EMC tray
- ☐ Control module assembly
- ☐ Top crossbrace
- ☐ Fan plate
- ☐ SCR snubber board shield
- ☐ Power board connections
- ☐ Soft charge board connections
- ☐ Fan control board connections
- ☐ Bus plate assembly

Remove the Gate Driver Board Connections

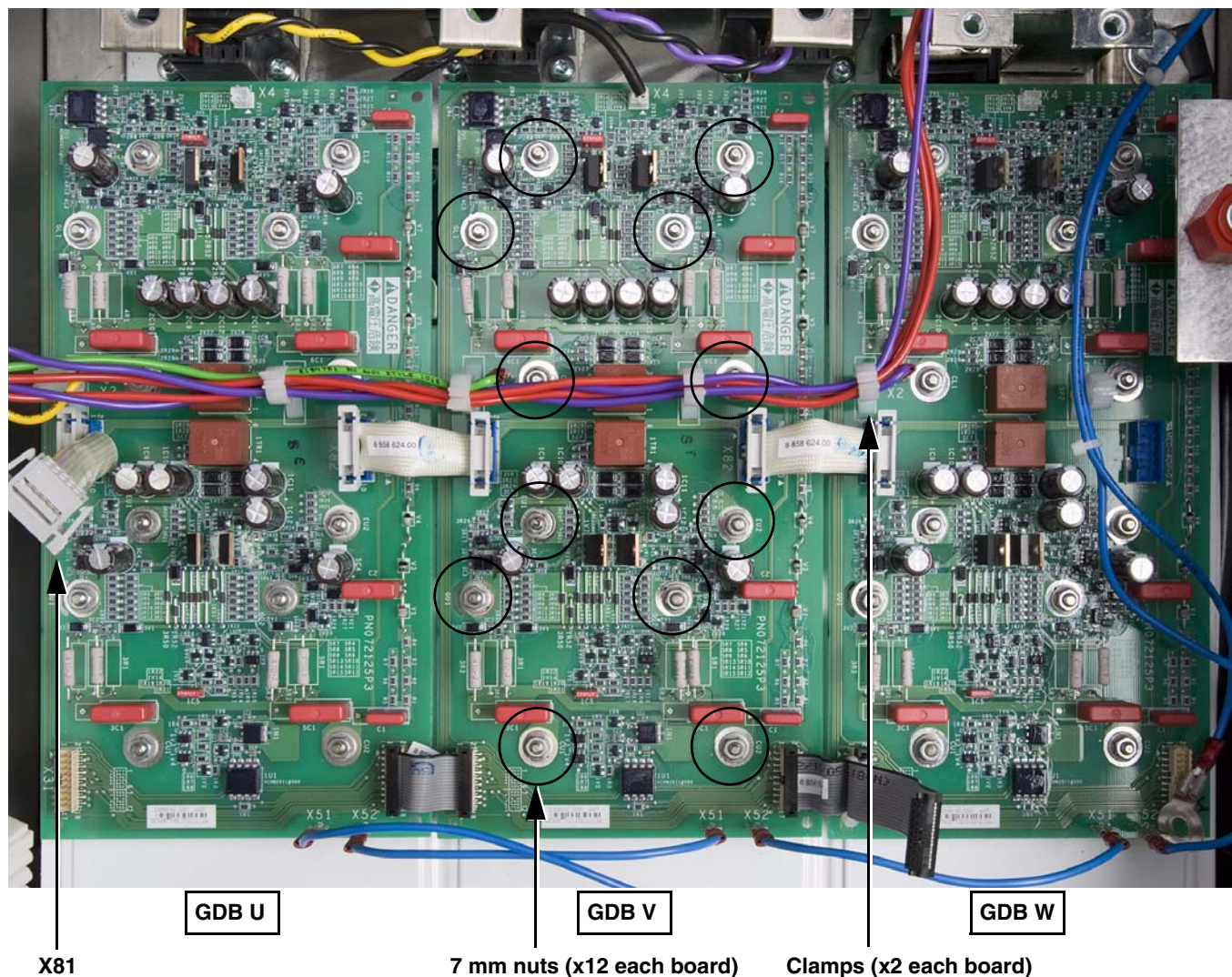
1. Using needle-nose pliers, carefully remove the connections from the gate driver board you are replacing. See Table 18 and Figure 58 on page 63 for connection locations.

Table 18: Gate Driver Board Wiring

Wire No. ¹	Terminal No.	Description	To:
Gate Driver Board U (Left)			
E143	X2	1-pin, yellow	Power board X5
E129	X51	1-pin, blue	Neutral bus
E127	X52	1-pin, blue	GDB V, X51
E100	X81	10-pin, white	Power board X8
E101	X82	10-pin, white	GDB V X81
E138	X32	18-pin, gray	GDB V X31
Gate Driver Board V (Center)			
E143	X2	1-pin, green	Power board X5
E127	X51	1-pin, blue	GDB U, X52
E123	X52	1-pin, blue	GDB W, X51
E101	X81	10-pin, white	GDB U, X82
E102	X82	10-pin, white	GDB W, X81
E138	X31	18-pin, gray	GDB U, X32
E142	X32	18-pin, gray	GDB W, X31
E128	X4	2-pin, black	Temperature sensor #1
Gate Driver Board W (Right)			
E143	X2	1-pin, violet	Power board X5
E123	X51	1-pin, blue	GDB V, X52
E132	X52	1-pin, blue	Dynamic braking board, X5
E102	X81	10-pin, white	GDB V, X82
E142	X31	18-pin, gray	Power board, X3

¹ See schematic on page 110 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.

Figure 58: Gate Driver Boards



Remove the Old Gate Driver Board

2. Using a 7 mm socket wrench, remove 12 nuts from the gate driver board and remove the board from the drive. See Figure 58.
3. Transfer the two cable clamps from the old gate driver board onto the new one as follows. See Figure 58.
 - 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.

Install the New Gate Driver Board

NOTE: The white ribbon cable from terminal X81 of GDB U (see Figure 58) connects to the power board. When reinstalling the bus plate assembly, be sure to route this cable up over the assembly.

4. Seat the gate driver board on the DC bus plate standoffs.
5. Using a 7 mm socket wrench, secure the board with 12 nuts. Tighten the nuts to 1.2 N•m (10.6 lb-in).
6. Replace the gate driver board wiring. See Table 18 and Figure 58 for the connections.

Reassemble the Drive

If you are only replacing a gate driver board, perform Steps 4–20 of “Reassembly Steps for Level 2 Parts” beginning on page 94 to replace the following parts:

- ☐ Bus plate assembly
- ☐ Fan control board connections
- ☐ Soft charge board connections
- ☐ Power board connections
- ☐ SCR snubber board shield
- ☐ Fan plate
- ☐ Top crossbrace
- ☐ Control module assembly
- ☐ EMC tray
- ☐ Power terminal shield
- ☐ Front cover

Replacing Temperature Sensor #1 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.

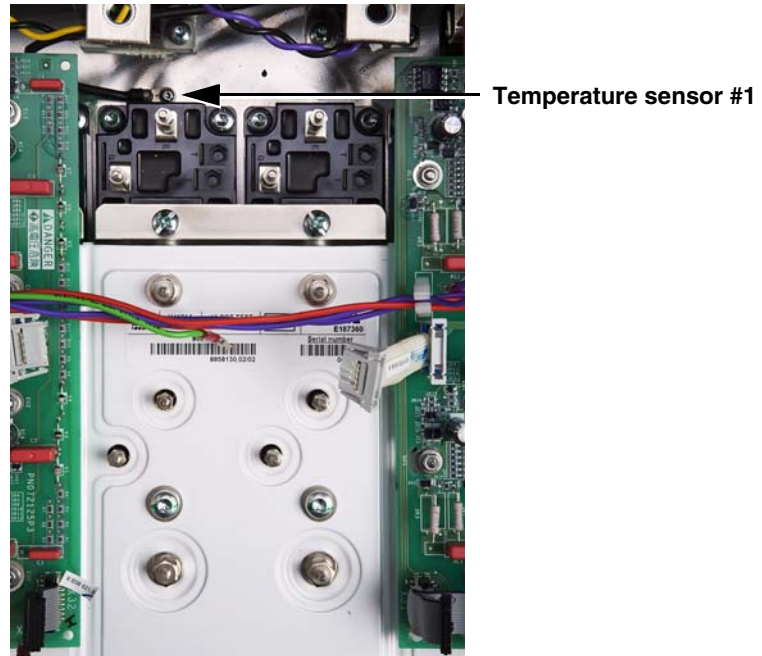
Temperature sensor wire #1 is on the DC bus plate under the center gate driver board (V).

Before performing the steps in this procedure, perform Steps 1–19 of “Disassembly Steps for Accessing Level 2 Parts” on page 41 to remove the following parts from the drive:

- ☐ Front cover
- ☐ Power terminal shield
- ☐ EMC tray
- ☐ Control module assembly
- ☐ Top crossbrace
- ☐ Fan plate
- ☐ SCR snubber board shield
- ☐ Power board connections
- ☐ Soft charge board connections
- ☐ Fan control board connections
- ☐ Bus plate assembly
- ☐ Gate driver board V (center board)

1. Using a T-10 Torx driver, remove one screw securing the temperature sensor to the DC bus plate. See Figure 59.
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 59: Temperature Sensor #1



Reassemble the Drive

If you are only replacing temperature sensor #1, perform Steps 2–20 of “Reassembly Steps for Level 2 Parts” beginning on page 94 to replace the following parts:

- ☐ Gate driver board V (center board)
- ☐ Bus plate assembly
- ☐ Fan control board connections
- ☐ Soft charge board connections
- ☐ Power board connections
- ☐ SCR snubber board shield
- ☐ Fan plate
- ☐ Top crossbrace
- ☐ Control module assembly
- ☐ EMC tray
- ☐ Power terminal shield
- ☐ Front cover

Replacing the Power IGBT Modules VZ3IM1402M1271

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

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

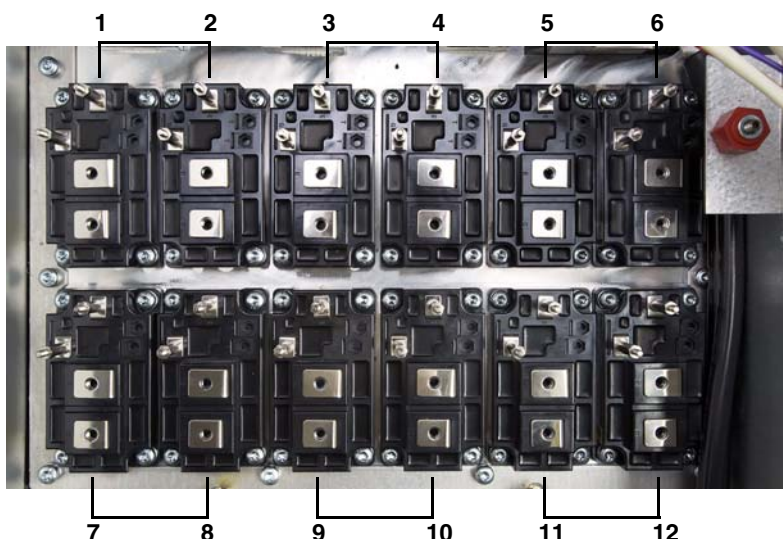
- Read and understand the precautions in “Before You Begin” starting on page 5 before performing this procedure.
- Before working on this equipment, turn off all power supplying it and perform the DC bus voltage measurement procedure on page 11.

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

This kit contains two power IGBT modules. You must replace the power IGBT modules in pairs as follows:

- Top row: Replace as pairs modules 1 and 2, 3 and 4, 5 and 6.
- Bottom row: Replace as pairs modules 7 and 8, 9 and 10, 11 and 12.

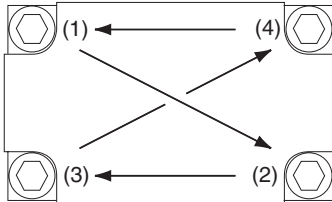
Figure 60: Power IGBT Module Pairs



Before performing the steps in this procedure, perform Steps 1–20 of “Disassembly Steps for Accessing Level 2 Parts” beginning on page 41 to remove the following parts from the drive:

- ☐ Front cover
- ☐ Power terminal shield
- ☐ EMC tray
- ☐ Control module assembly
- ☐ Top crossbrace
- ☐ Fan plate
- ☐ SCR snubber board shield
- ☐ Power board connections
- ☐ Soft charge board connections
- ☐ Fan control board connections
- ☐ Bus plate assembly
- ☐ Gate driver boards
- ☐ DC bus plate assembly

Figure 61: Torque Sequence

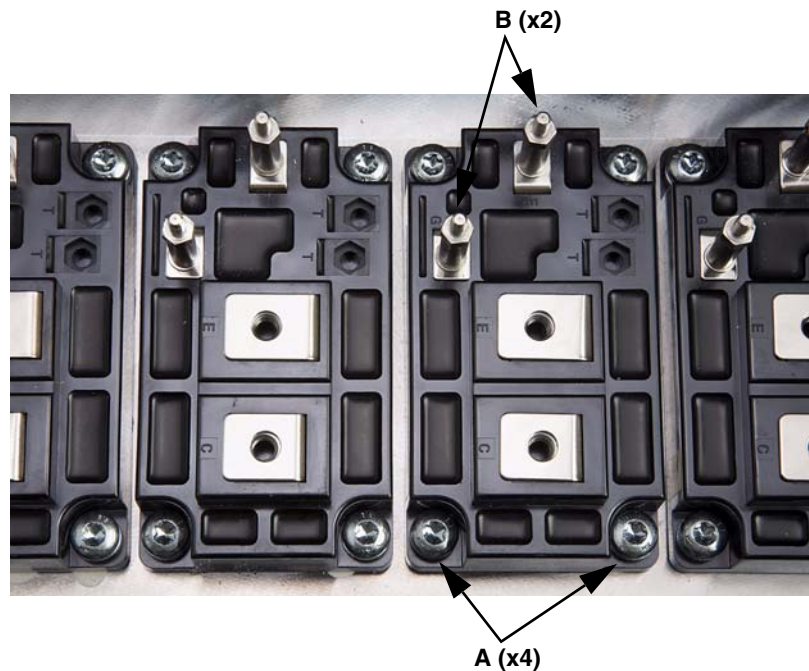


1. Replace a power IGBT module as follows. See Figure 62.
 - Using a T-30 Torx driver, remove four screws (**A**) securing the module to the heatsink and remove the module from the drive.
 - Using a 7 mm socket wrench, remove two standoffs (**B**) from the old IGBT module, and install them on terminals E and G of the new module. Tighten the standoffs to 1.2 N•m (10.6 lb-in).
 - Clean the portion of the heatsink that makes contact with the power IGBT module.
 - 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.
 - Using a T-30 Torx driver, secure the module to the heatsink with four screws (**A**). Initially tighten the screws, in the sequence shown in Figure 61, 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 VY1ADC1113” beginning on page 70.

If you are only replacing the power IGBT modules, continue with “Reassemble the Drive” on page 69.

Figure 62: Power IGBT Modules



Reassemble the Drive

If you are only replacing the IGBT modules, perform Steps 1–20 of “Reassembly Steps for Level 2 Parts” beginning on page 94 to replace the following parts:

- ☐ DC bus plate assembly
- ☐ Gate driver boards
- ☐ Bus plate assembly
- ☐ Fan control board connections
- ☐ Soft charge board connections
- ☐ Power board connections
- ☐ SCR snubber board shield
- ☐ Fan plate
- ☐ Top crossbrace
- ☐ Control module assembly
- ☐ EMC tray
- ☐ Power terminal shield
- ☐ Front cover

Replacing the Capacitors VY1ADC1113

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 eight capacitors. You must replace all of the capacitors in the drive with the new ones in the kit.

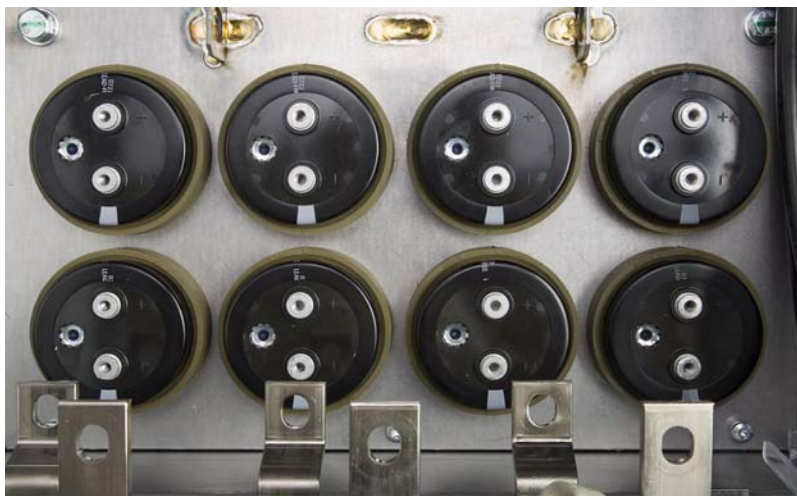
Before performing the steps in this procedure, perform Steps 1–20 of “Disassembly Steps for Accessing Level 2 Parts” on page 41 to remove the following parts from the drive:

- ☐ Front cover
- ☐ Power terminal shield
- ☐ EMC tray
- ☐ Control module assembly
- ☐ Top crossbrace
- ☐ Fan plate
- ☐ SCR snubber board shield
- ☐ Power board connections
- ☐ Soft charge board connections
- ☐ Fan control board connections
- ☐ Bus plate assembly
- ☐ Gate driver boards
- ☐ DC bus plate assembly

1. Replace each of the eight capacitors as follows. See Figure 63.
 - 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 63: Capacitors



Reassemble the Drive

If you are only replacing the capacitors, perform Steps 1–20 of “Reassembly Steps for Level 2 Parts” beginning on page 94 to replace the following parts:

- ☐ DC bus plate assembly
- ☐ Gate driver boards
- ☐ Bus plate assembly
- ☐ Fan control board connections
- ☐ Soft charge board connections
- ☐ Power board connections
- ☐ SCR snubber board shield
- ☐ Fan plate
- ☐ Top crossbrace
- ☐ Control module assembly
- ☐ EMC tray
- ☐ Power terminal shield
- ☐ Front cover

Replacing the SCR Snubber Board VX4A1200 and SCR Modules VZ3TD1330M1601

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 65 on page 73.
- 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 1–11 of “Disassembly Steps for Accessing Level 2 Parts” on page 41 to remove the following parts from the drive:

- ☐ Front cover
- ☐ Power terminal shield
- ☐ EMC tray
- ☐ Control module assembly
- ☐ Top crossbrace
- ☐ Fan plate
- ☐ SCR snubber board shield

Remove the SCR Snubber Board Connections

Table 19: SCR Snubber Board Wiring

Wire No. ¹	Terminal No.	Description	To:
E119	X1	Yellow	L1 bus bar
E121	X4	Red	PO/+ bus bar
E122	X5	Black	PC/- bus bar
E126	X10	Red, 1/4 in. 1-pin	PB ² RFS+X10
E127	X11	Red, 3/16 in. 1-pin	PB RFS+X10

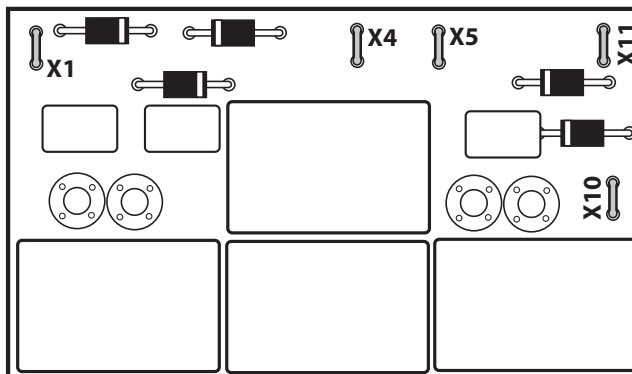
¹ See schematic on page 110 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

² PB: Power board

Remove the SCR Snubber Board

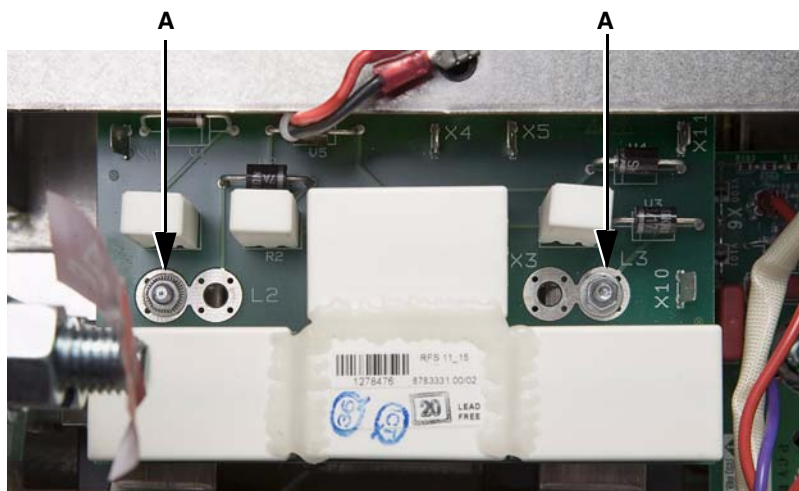
- Using needle-nose pliers, carefully remove all connections from the SCR snubber board. See Table 19 and Figure 64 for the connection locations.

Figure 64: SCR Snubber Board Layout



- Using a 7 mm socket wrench, remove two nuts (**A**, Figure 65) securing the SCR snubber board to the standoffs on the SCR L2 and L3 bus bars and remove the board from the drive.

Figure 65: SCR Snubber Board



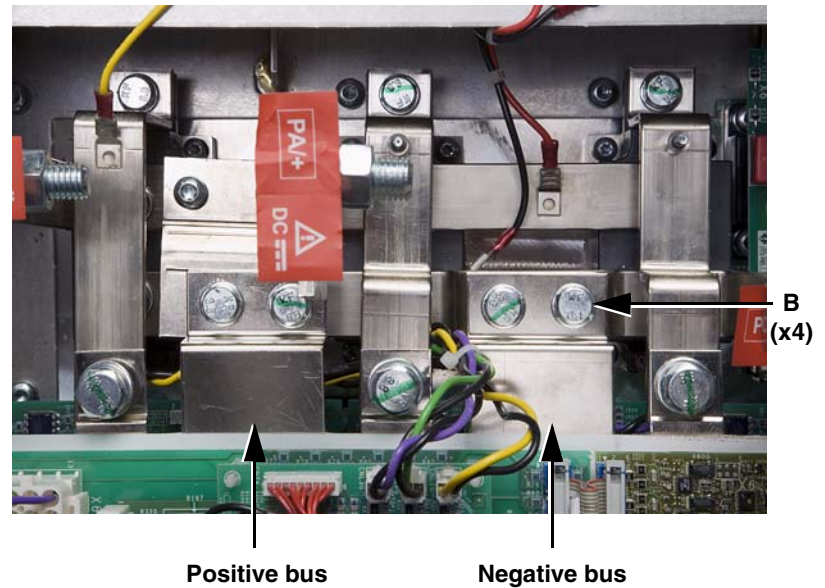
NEXT STEP: If you are replacing the SCR modules, continue with Step 3 (page 74) to remove the SCR bus bars.

If you are only replacing the SCR snubber board, skip to Step 20 on page 81 to install the new snubber board.

Remove the SCR L1, L2, and L3 Bus Bars

- Using a 13 mm socket wrench, remove four 13 mm bolts (**B**, Figure 66) connecting the positive bus (left) and the negative bus (right) to the bus plate assembly.

Figure 66: Bus Plate Assembly



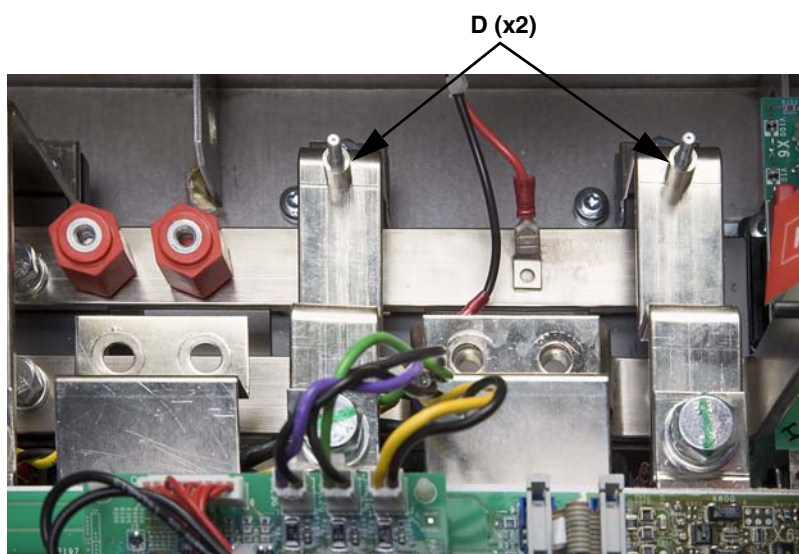
- Using a T-30 Torx driver, remove two screws (**C**, Figure 67) securing the PA/+ bus bar to the red standoffs on the PO bus bar and remove the bar.

Figure 67: PA/+ Bus Bar



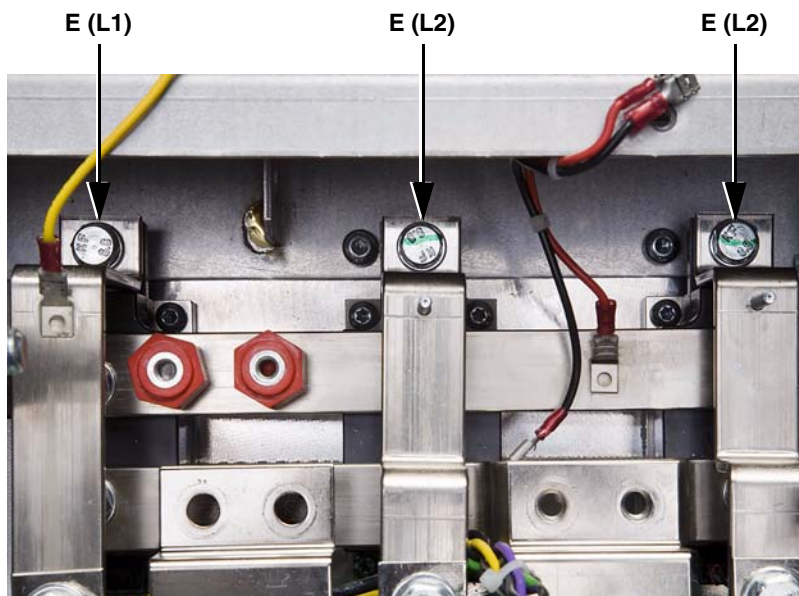
5. Remove the spacers (D, Figure 68) from the SCR L2 and L3 bus bars.

Figure 68: Spacers



6. Using a 13 mm socket wrench, remove three bolts (E, Figure 69) securing the SCR L1, L2, and L3 bus bars to terminal 1 of SCR modules 1, 2, and 3.

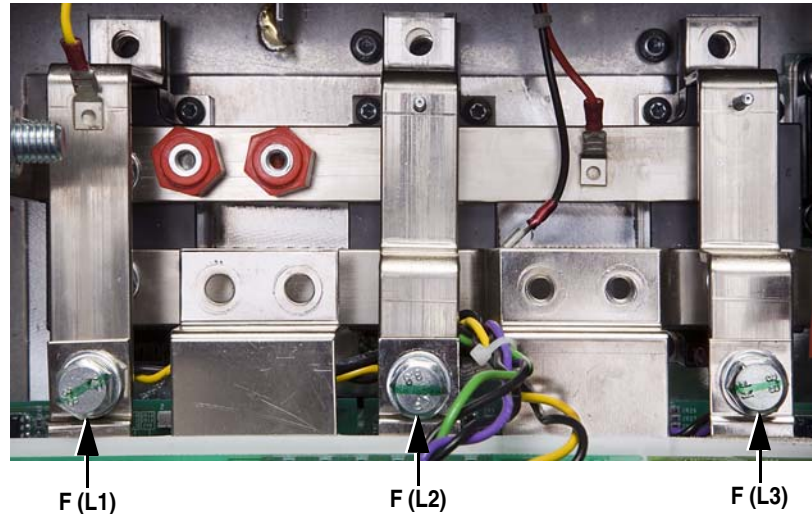
Figure 69: SCR L1, L2, L3 Bus Bars Top Connections



7. Using a 16 mm socket wrench, remove three screws (**F**, Figure 70) securing the SCR L1, L2, and L3 bus bars to the bus plate assembly, and remove the bus bars from the drive.

NOTE: Note the differences between the SCR bus bars: The L1 bar has a yellow wire attached; the L2 and L3 bars are interchangeable.

Figure 70: SCR L1, L2, L3 Bus Bars Bottom Connections

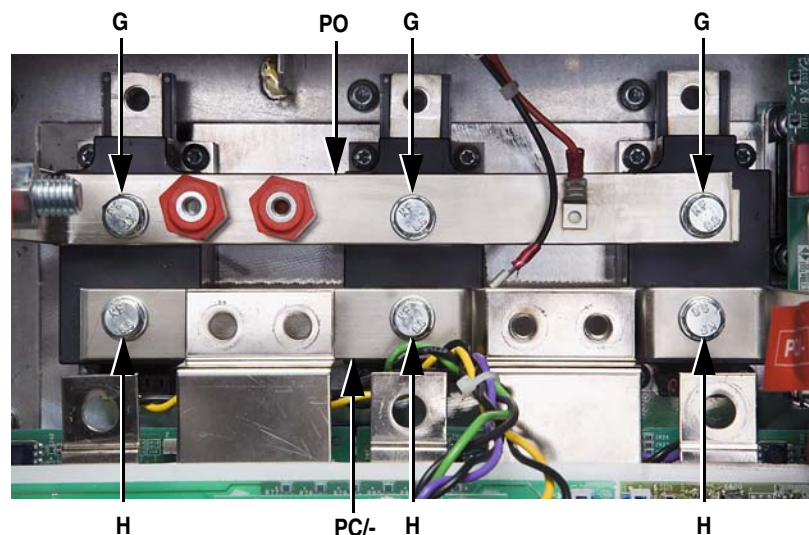


Remove the PO and PC/- Bus Bars

8. Using a 13 mm socket wrench, remove three bolts (**G**, Figure 71) securing the PO bus bar to terminal 2 on the SCR modules.
9. Using a 13 mm socket wrench, remove three bolts (**H**, Figure 71) securing the PC/- bus bar to terminal 3 on the SCR modules.
10. Remove bus bars PO and PC/-.

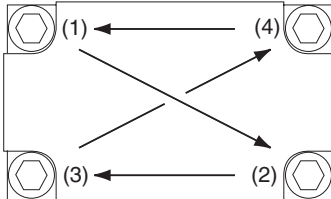
NOTE: A red wire is attached to bus bar PO and a black wire is attached to bus bar PC/-. The wires are tie-wrapped together and come out with the bus bars.

Figure 71: PO and PC/- Bus Bars



Replace the SCR Module

Figure 72: Torque Sequence



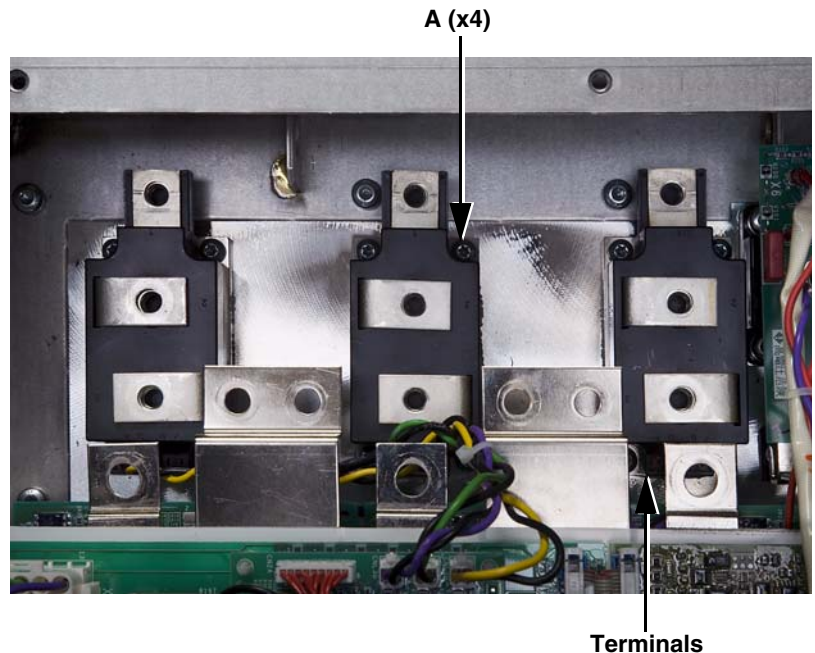
11. Replace an SCR module as follows.

- Remove the connections from terminals 4 and 5 of the SCR module. See Figure 73.

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.

- Using a T-20 Torx driver, remove four screws (**A**) securing the SCR module to the heatsink and remove the SCR module from the drive. See Figure 73.
- Clean the portion of the heatsink that makes contact with the SCR module.
- Evenly coat the bottom of the new SCR module with a thin layer of thermal compound included in the kit.
- Position the new SCR module on the heatsink under the input bus bar.
- Using a T-20 Torx driver, secure the SCR module with four screws (**A**). See Figure 73. Initially tighten the screws, in the sequence shown in Figure 72, 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).
- Replace the connections to SCR terminals 4 and 5. See Figure 73.

Figure 73: SCR Modules



Replace the PO and PC/- Bus Bars

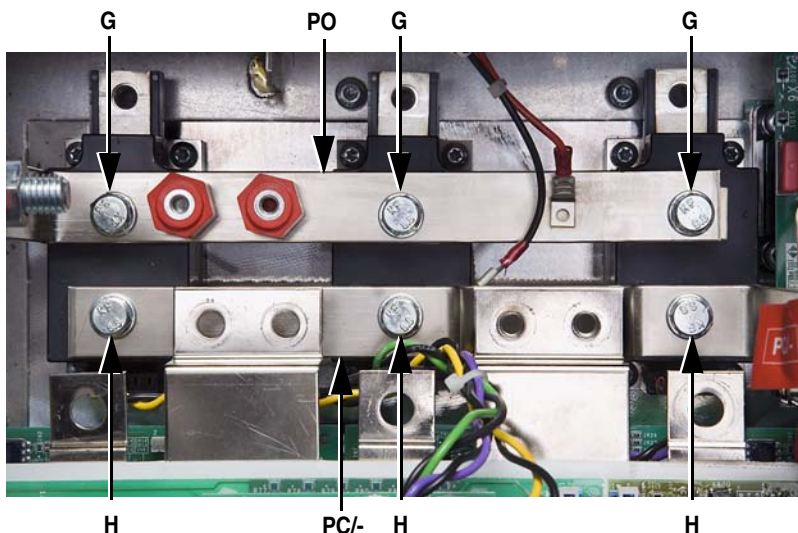
Table 20: PO and PC/- Bus Bar Hardware Torque Values

Item	Description	Torque Range	
		N•m	lb-in
G	(3) 13 mm bolts	13.5	119.5
H	(3) 13 mm bolts	13.5	119.5

12. Replace the PO and PC/- bus bars as follows.

- Place the PO and PC/- bus bars in the drive as illustrated in Figure 74.
- Using a 13 mm socket wrench, secure the PO bus bar to terminal 2 on the SCR modules with three bolts (G, Figure 74).
- Using a 13 mm socket wrench, secure the PC/- bus bar to terminal 3 on the SCR modules with three bolts (H, Figure 74).
- Tighten bolts G and H to the torque values specified in Table 20.

Figure 74: PO and PC/- Bus Bars



Replace the SCR L1, L2, and L3 Bus Bars

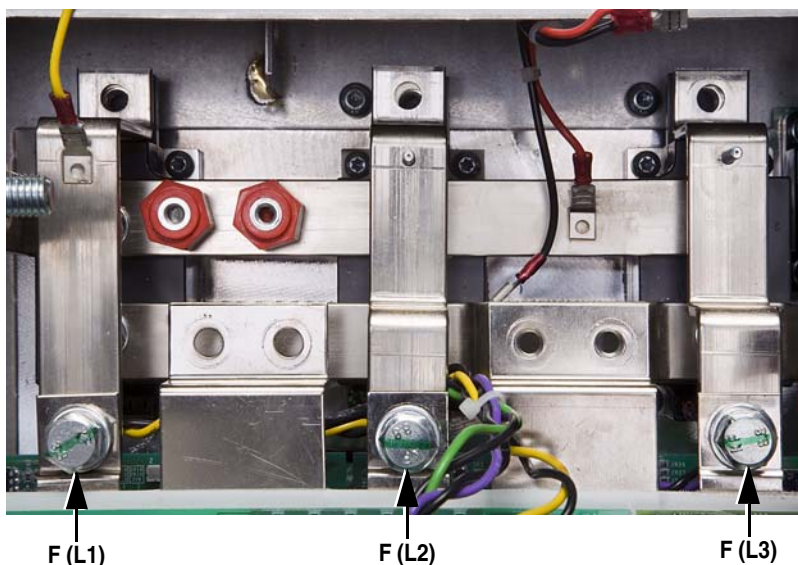
Table 21: SCR Bus Bar Hardware Torque Values

Item	Description	Torque Range	
		N•m	lb-in
F	(3) 16 mm bolts	27	239
E	(3) 13 mm bolts	13.5	119.5

13. Using a 16 mm socket wrench, secure the SCR L1, L2, and L3 bus bars to the bus plate assembly with three bolts (F, Figure 75).

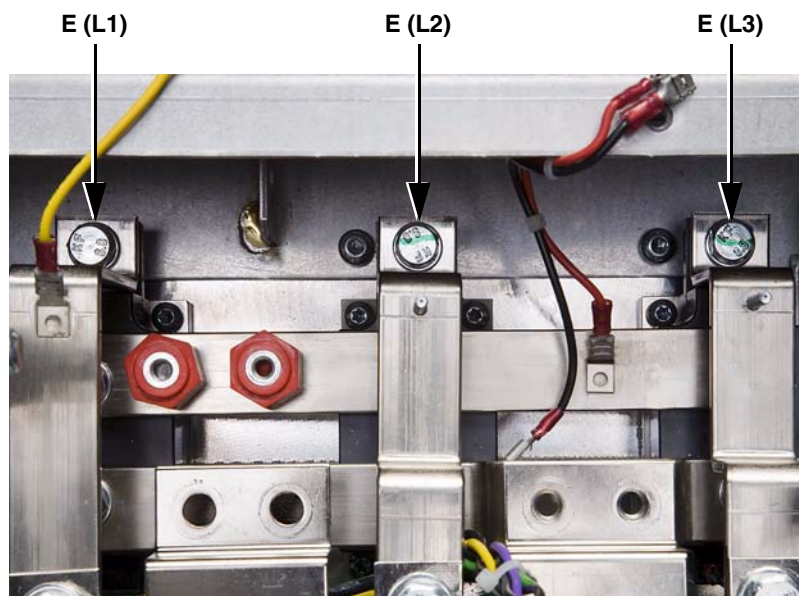
NOTE: Note the differences between the SCR bus bars: The L1 bar has a yellow wire attached; the L2 and L3 bars are interchangeable.

Figure 75: SCR L1, L2, L3 Bus Bars Bottom Connections



14. Using a 13 mm socket wrench, secure the SCR L1, L2, and L3 bus bars to terminal 1 of SCR modules 1, 2, and 3 with three bolts (E, Figure 76).
15. Tighten bolts E and F to the torque values specified in Table 21 on page page 78.

Figure 76: SCR L1, L2, L3 Bus Bars Top Connections



16. Replace the spacers (D, Figure 77) on the SCR L2 and L3 bus bars.

Figure 77: Spacers

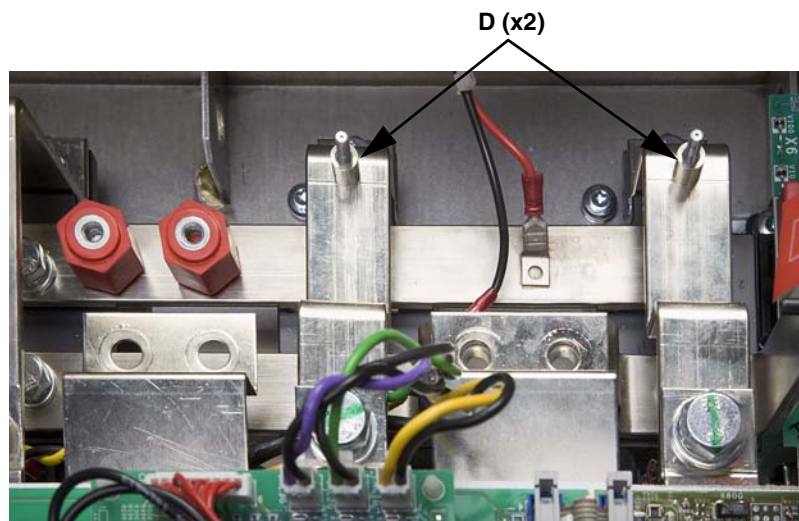
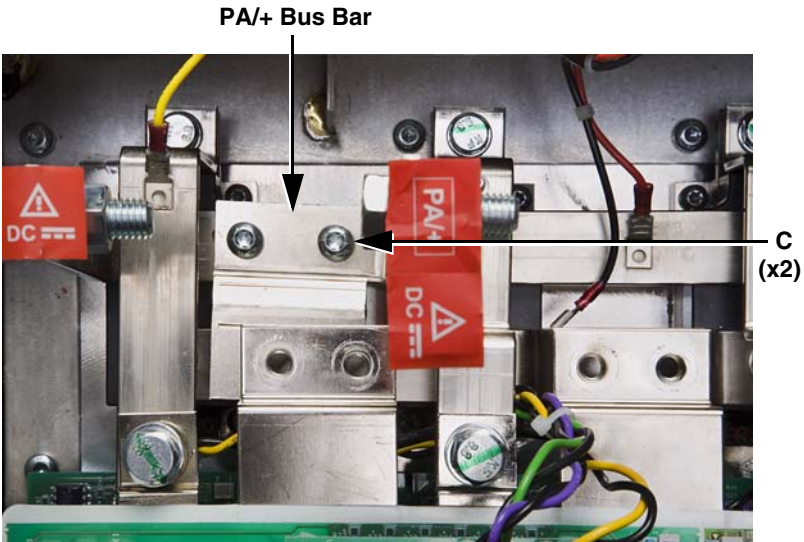


Table 22: Bus Bar Hardware Torque Values

Item	Description	Torque Range	
		N•m	lb-in
B	(4) 13 mm bolts	13.5	119.5
C	(2) T-30 screws	5.5	48.7

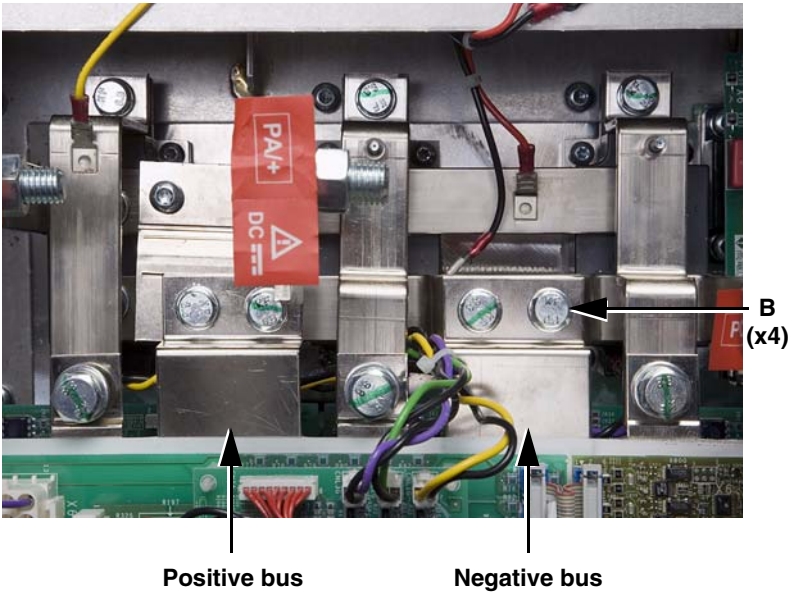
17. Using a T-30 Torx driver, secure the PA/+ bus bar to the red standoffs on the PO bus bar with two screws (C, Figure 78).

Figure 78: PA/+ Bus Bar



18. Using a 13 mm socket wrench, secure the positive bus (left) and the negative bus (right) to the bus plate assembly with four 13 mm bolts (B, Figure 79).

Figure 79: Bus Plate Assembly



19. Tighten hardware B and C to the torque values specified in Table 22.

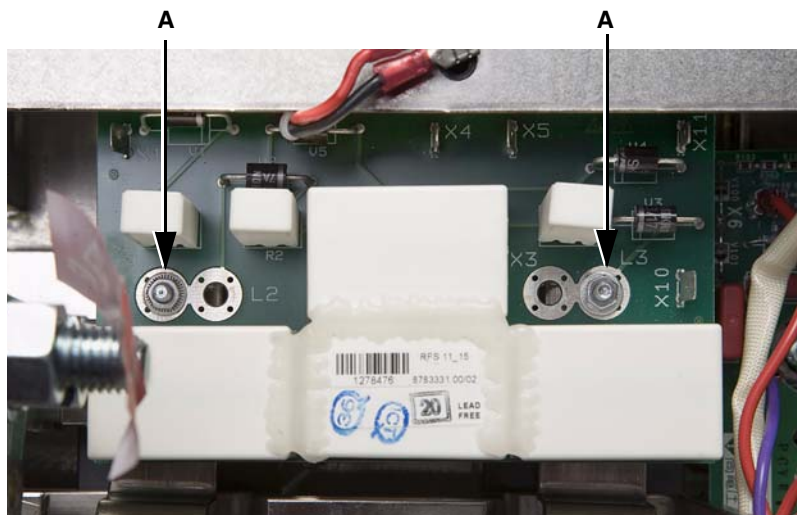
Install the SCR Snubber Board

Table 23: SCR Snubber Board Hardware Torque Values

Item	Description	Torque Range	
		N•m	lb-in
A	(2) 7 mm nuts	1.1–1.7	9.7–15

20. Using a 7 mm socket wrench, secure the SCR snubber board to the standoffs on the SCR L2 and L3 bus bars with two nuts (**A**, Figure 80). Tighten the nuts to the torque values specified in Table 23.

Figure 80: SCR Snubber Board



Replace the SCR Snubber Board Connections

Table 24: SCR Snubber Board Wiring

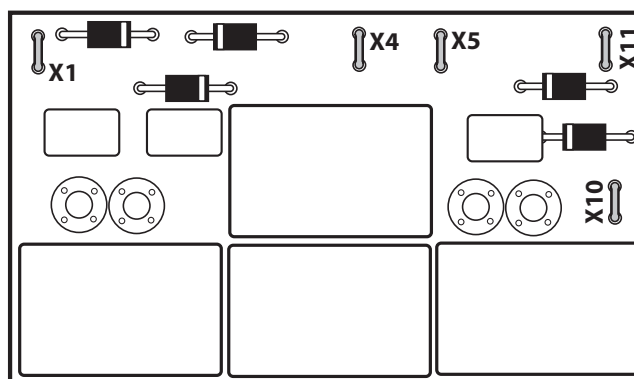
Wire No. ¹	Terminal No.	Description	To:
E119	X1	Yellow	L1 bus bar
E121	X4	Red	PO/+ bus bar
E122	X5	Black	PC/- bus bar
E126	X10	Red, 1/4 in. 1-pin	PB ² RFS+X10
E171	X11	Red, 3/16 in. 1-pin	PB RFS+X10

¹ See schematic on page 110 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

21. Replace all connections to the SCR snubber board. See Table 24 and Figure 81 for the connection locations.

Figure 81: SCR Snubber Board Layout



Reassemble the Drive

If you are only replacing the SCR snubber board or the SCR modules, perform Steps 10–20 of “Reassembly Steps for Level 2 Parts” beginning on page 94 to replace the following parts:

- ☐ SCR snubber board shield
- ☐ Fan plate
- ☐ Top crossbrace
- ☐ Control module assembly
- ☐ EMC tray
- ☐ Power terminal shield
- ☐ Front cover

Replacing the Dynamic Braking Kit VZ3F1110 and Temperature Sensor #2

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 dynamic braking kit includes the following parts. You must replace the dynamic braking board, the braking IGBT module, and the diode module. Replace the bus bars if necessary.

- 1 dynamic braking board
- 1 braking IGBT module
- 1 diode module
- Replacement bus bars

Before performing the steps in this procedure, perform Steps 1–11 of “Disassembly Steps for Accessing Level 2 Parts” on page 41 to remove the following parts from the drive:

- ☐ Front cover
- ☐ Power terminal shield
- ☐ EMC tray
- ☐ Control module assembly
- ☐ Top crossbrace
- ☐ Fan plate
- ☐ SCR snubber board shield

Remove the Dynamic Braking Board Connections

1. Using needle-nose pliers, carefully remove all connections from the dynamic braking board. See Table 25 and Figure 82 for the connection locations.

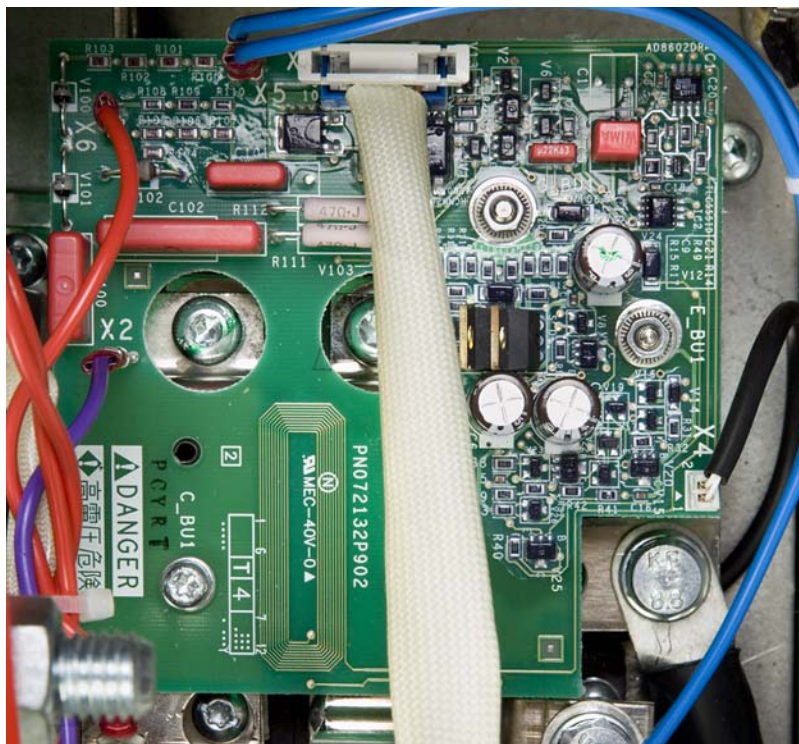
Table 25: Dynamic Braking Board Wiring

Wire No. ¹	Terminal No.	Description	To:
E134	X1	10- pin, white ribbon	PB ² X91
E105	X2	1-pin, violet	PB X93
E130	X4	2-pin, black	Temperature sensor #2
E133, E132	X5	1-pin, blue wires	GDB W X52 & red insulator on DC bus plate
E131	X6	1-pin, red	PA/+ bus bar

¹ See schematic on page 109 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

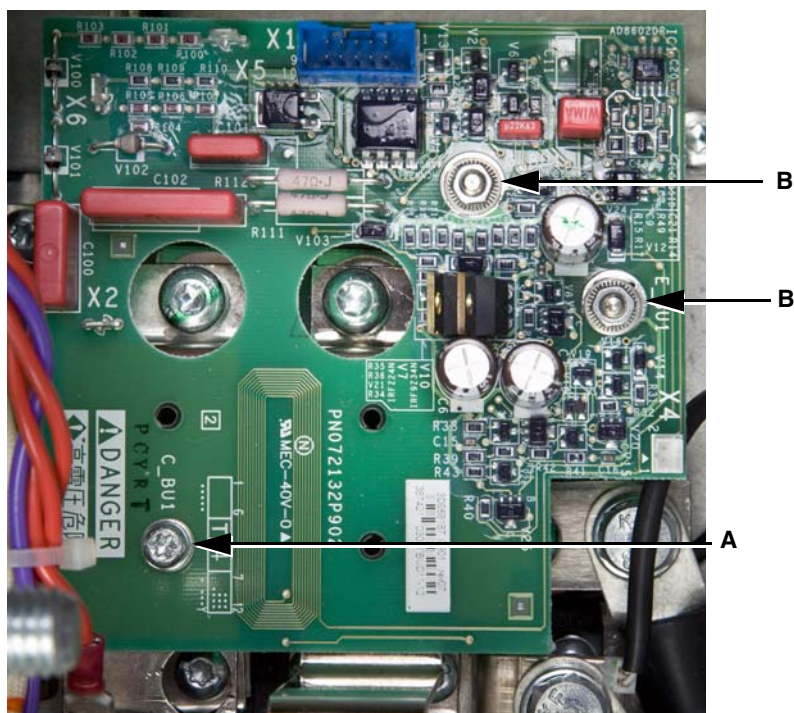
Figure 82: Dynamic Braking Board Connections



Remove the Dynamic Braking Board

2. Remove the dynamic braking board as follows.
 - Using a T-20 Torx driver, remove one screw (**A**, Figure 83) securing the dynamic braking board to the braking IGBT bus bar.
 - Using a 7 mm socket wrench, remove two nuts (**B**, Figure 83) securing the dynamic braking board to the braking IGBT module and remove the board from the drive.

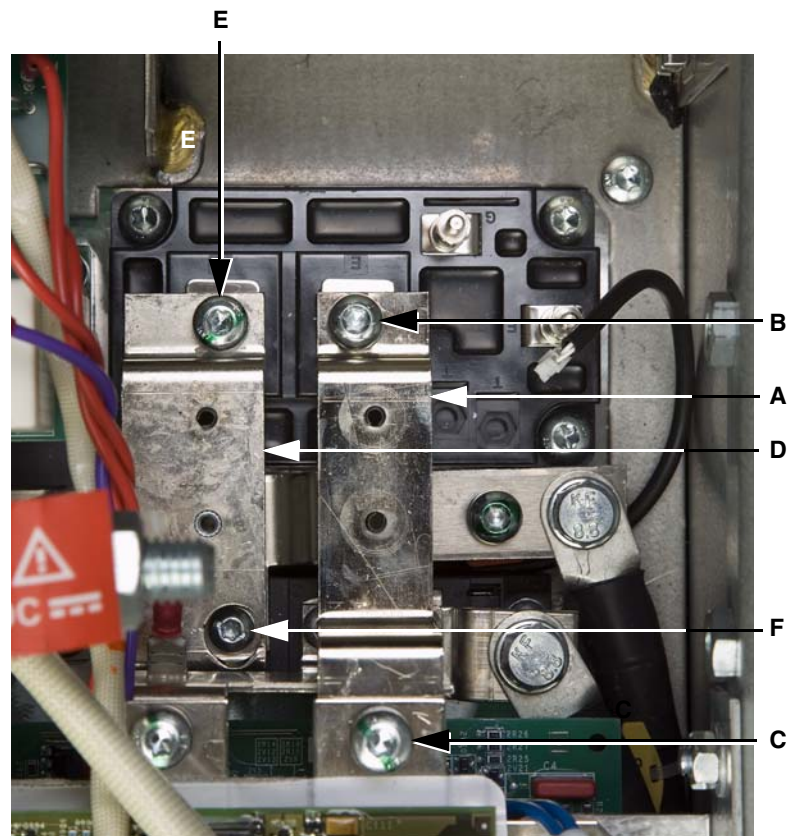
Figure 83: Dynamic Braking Board



Remove the Bus Bars from the Braking IGBT Module

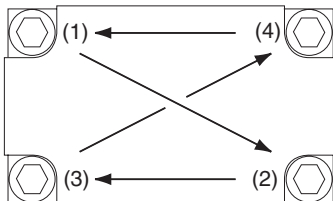
3. Remove the bus bars from the braking IGBT module as follows. See Figure 84.
 - Using a T-30 Torx driver, remove two screws securing the bus bar (A) to terminal E (B) on the braking IGBT module and to the bus plate negative terminal (C). See Figure 84. Remove the bar from the drive.
 - Using a T-30 Torx driver, remove the screw securing the bus bar (D) to terminal C (E) on the braking IGBT module.
 - Using a T-20 Torx driver, remove the screw securing the bus bar to terminal 1 (F) on the diode module and remove the bar from the drive.

Figure 84: Braking IGBT Bus Bars



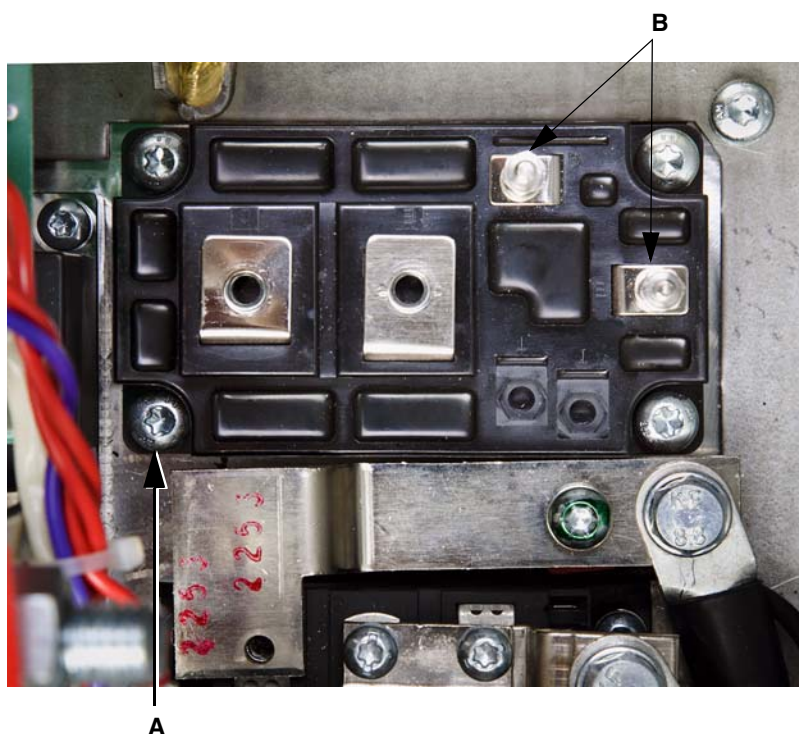
Replace the Braking IGBT Module

Figure 85: Torque Sequence



4. Replace the braking IGBT module as follows. See Figure 86.
 - Using a T-30 Torx driver, remove four screws (**A**) securing the module to the heatsink and remove the module from the drive.
 - Using a 7 mm socket wrench, remove the two standoffs (**B**) from the old braking IGBT module, and install them on terminals E and G of the new module. Tighten the standoffs to 1.1–1.7 N•m (9.7–15 lb-in).
 - Clean the portion of the heatsink that makes contact with the power IGBT module.
 - Install the thermal pad included in the kit on the heatsink, and position the module over the thermal pad.
 - Using a T-30 Torx driver, secure the module to the heatsink with four screws (**A**). Initially tighten the screws, in the sequence shown in Figure 85, 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).

Figure 86: Braking IGBT Module



Remove the Bus Bars from the Diode Module

5. Remove the bus bars on the diode module as follows.
 - Using a 13 mm socket wrench, remove one bolt (**A**, Figure 87) securing the PB cable to the top bus bar.
 - Using a T-30 Torx driver, remove one screw (**B**, Figure 87) securing the top bus bar to the insulator on the heatsink and remove the bus bar.
 - Using a 13 mm socket wrench, remove one bolt (**C**, Figure 88) securing the PA cable to the bottom bus bar.
 - Using a T-20 Torx driver, remove two screws (**D**, Figure 88) securing the bottom bus bar to terminals 2 and 3 of the diode module.
 - Using a T-30 Torx driver, remove one screw (**E**, Figure 88) securing the bottom bus bar to the bus plate, and remove the bus bar.

NOTE: A red wire is attached to this bus bar and comes out with it.

Figure 87: Diode Module Top Bus Bar

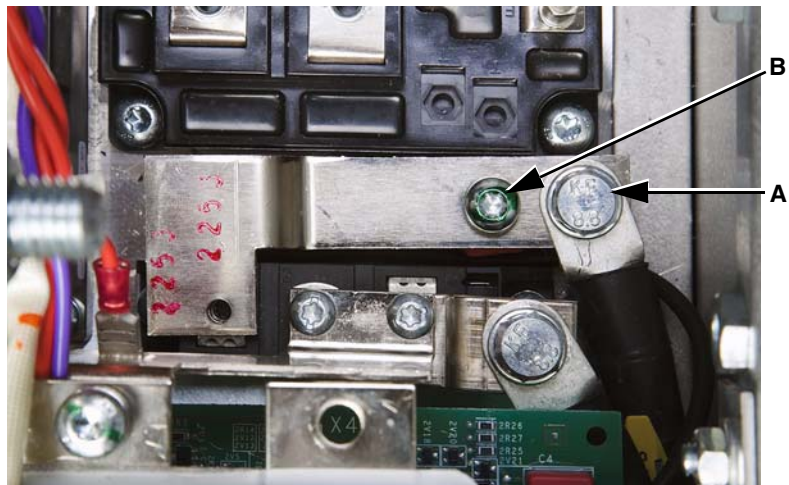
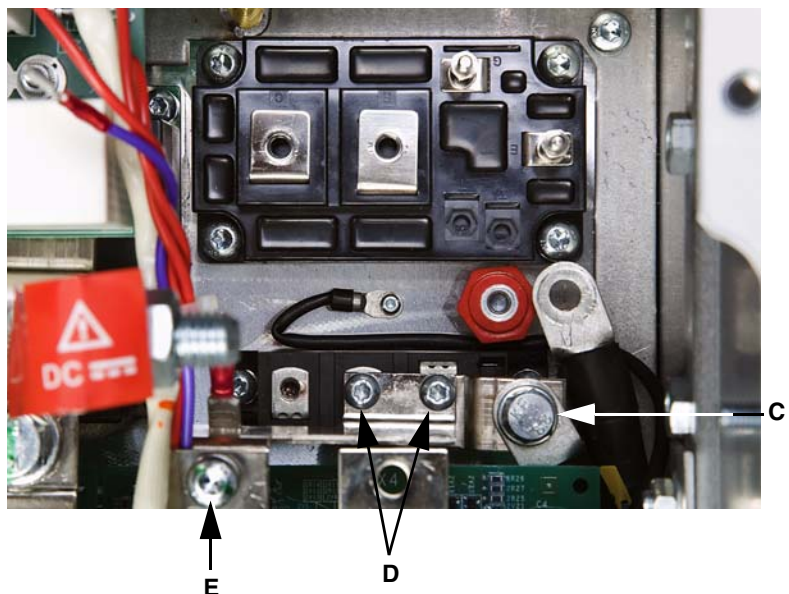


Figure 88: Diode Module Bottom Bus Bar

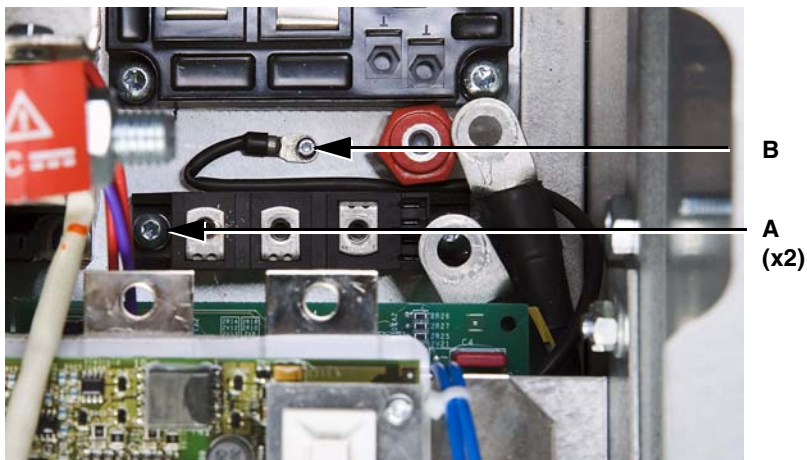


Replace the Diode Module

6. Replace the diode module as follows. See Figure 89.
 - Using a T-20 Torx driver, remove two screws (**A**) securing the diode module to the heatsink.
 - Clean the portion of the heatsink that makes contact with the power IGBT module.
 - Install the thermal pad included in the kit on the heatsink, and position the module over the thermal pad.
 - Using a T-20 Torx driver, secure the module to the heatsink with two screws (**A**). Tighten the screws to 3 N•m (26.6 lb-in).
7. Using a T-10 Torx driver, remove one screw securing the temperature sensor wire (**B**, Figure 89) to the heat sink. Replace the wire and tighten the T-10 screw to 0.4–0.6 N•m (3.5–5.3 lb-in).

Replacing Temperature Sensor Wire #2 VZ3G1104

Figure 89: Diode Module



Replace the Bus Bars on the Diode Module

Table 26: Diode Module Bus Bar Hardware Torque Values

Item	Description	Torque Range	
		N•m	lb-in
A	(1) 13 mm bolt	13.5	119.5
B	(1) T-30 screw	5.5	48.7
C	(1) 13 mm bolt	13.5	119.5
D	(2) T-20 screws	5.5	48.7
E	(1) T-30 screw	5.5	48.7

NOTE: Replacement PA and PB input bus bars are supplied in the dynamic braking kit. See Figure 2 on page 14 for their location.

If it is necessary to replace the bars, secure them to the red insulators on the terminal plate with two T-30 Torx screws each. Attach the PA cable to the PA bus bar and the PB cable to the PB bus bar with one 16 mm bolt each. Tighten the hardware to the torque values specified in Table 27.

Table 27: PA and PB Bus Bar Hardware Torque Values

Item	Description	Torque Range	
		N•m	lb-in
—	(4) T-30 screws	5.5	48.7
—	(2) 16 mm bolts	27	239

8. Replace the bus bars on the diode module as follows.
- Using a T-30 Torx driver, secure the bottom diode bus bar (1, Figure 90) to the bus plate with one screw (E, Figure 90). This bus bar is supplied in the dynamic braking kit. Replace it if necessary.
 - Using a T-20 Torx driver, secure the bottom diode bus bar (1, Figure 90) to terminals 2 and 3 of the diode module with two screws (D, Figure 90).
 - Using a 13 mm socket wrench, secure the PA cable to the bottom diode bus bar with one bolt (C, Figure 90).
 - Using a T-30 Torx driver, secure the top diode bus bar (2, Figure 91) to the insulator on the heatsink with one screw (B, Figure 91). This bus bar is supplied in the dynamic braking kit. Replace it if necessary.
 - Using a 13 mm socket wrench, secure the PB cable to the top diode bus bar with one bolt (A, Figure 91).
 - Tighten the hardware to the torque values specified in Table 26.

Figure 90: Diode Module Bottom Bus Bar

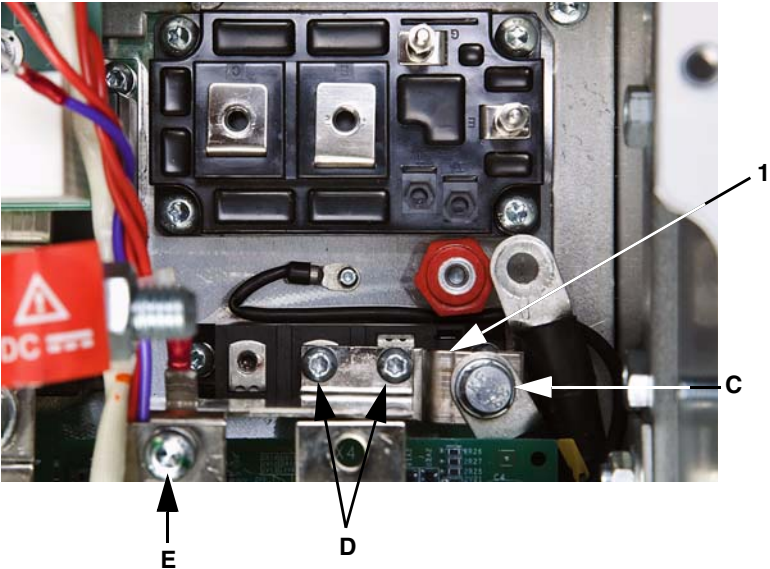
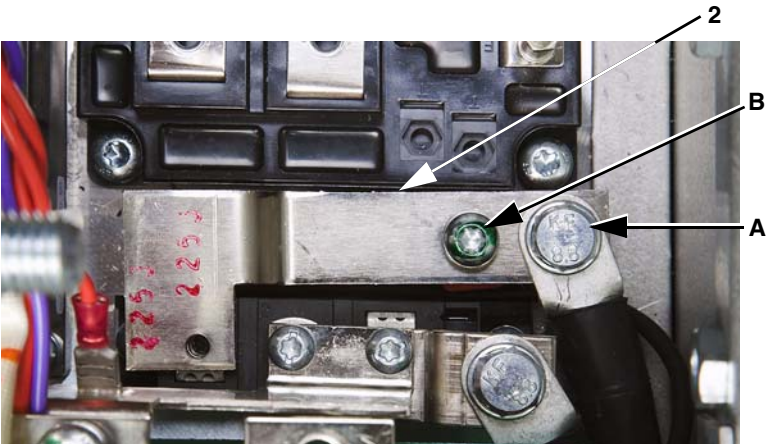


Figure 91: Diode Module Top Bus Bar



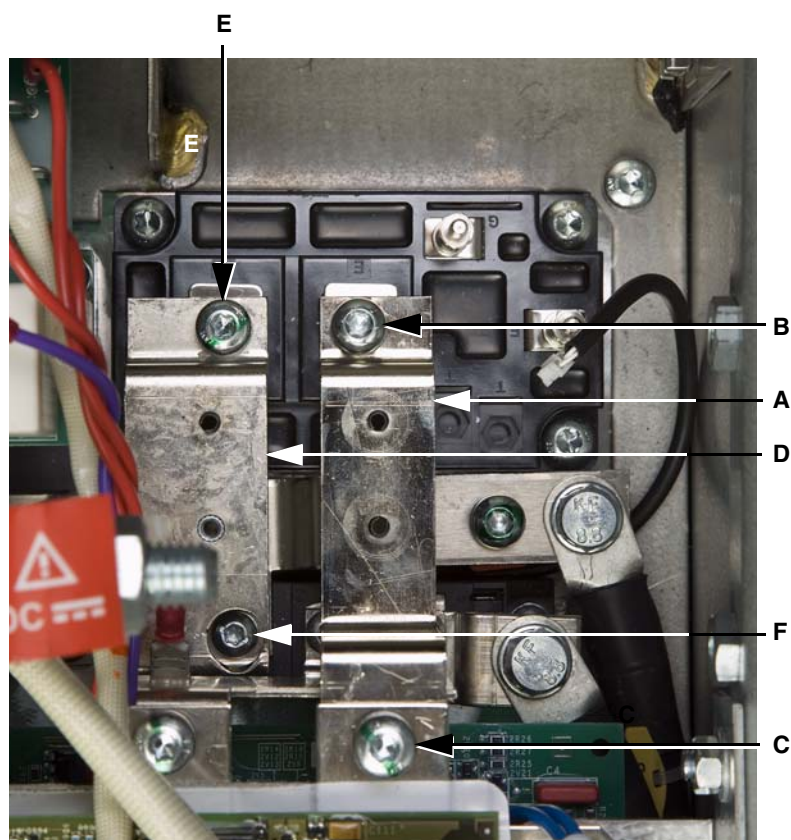
Replace the Bus Bars on the Braking IGBT Module

Table 28: Braking IGBT Bus Bar Hardware Torque Values

Item	Description	Torque Range	
		N•m	lb-in
B	(1) T-30 screw	5.5	48.7
C	(1) T-30 screw	5.5	48.7
E	(1) T-30 screw	5.5	48.7
F	(1) T-20 screw	5.5	48.7

9. Replace the bus bars on the braking IGBT module as follows. See Figure 92.
 - Using a T-20 Torx driver, secure bus bar (D) to terminal 1 on the diode module with one screw (F). This bus bar is supplied in the dynamic braking kit. Replace it if necessary.
 - Using a T-30 Torx driver, secure bus bar (D) to terminal C on the braking IGBT module with one screw (E).
 - Using a T-30 Torx driver, secure bus bar (A) to terminal E (B) on the braking IGBT module and to the bus plate negative terminal (C) with two screws. This bus bar is supplied in the dynamic braking kit. Replace it if necessary.
 - Tighten the hardware to the torque values specified in Table 28.

Figure 92: Braking IGBT Bus Bars



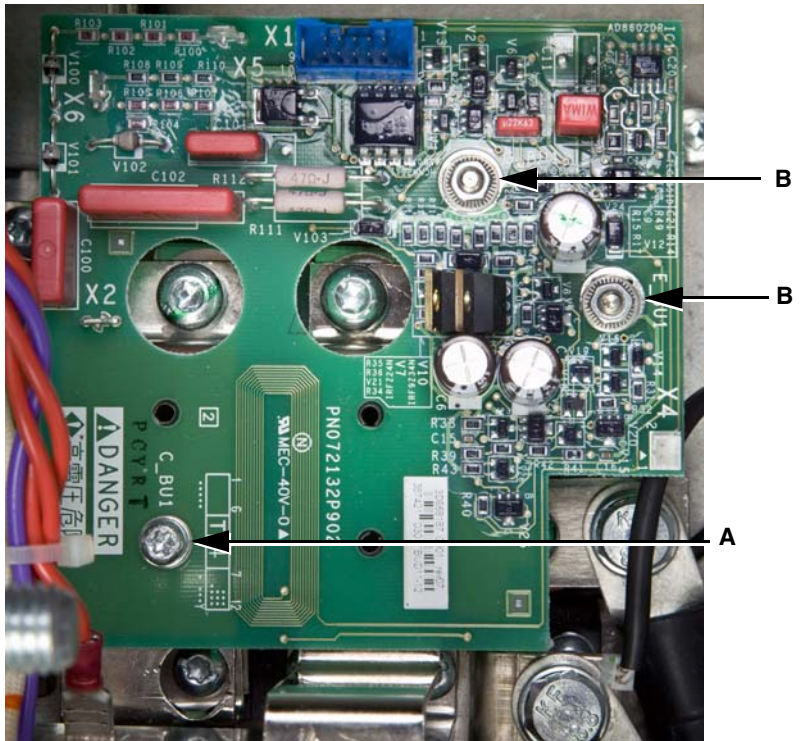
Replace the Dynamic Braking Board

Table 29: Dynamic Braking Board
Hardware Torque Values

Item	Description	Torque Range	
		N•m	lb-in
A	(1) T-20 screw	0.8	7.1
B	(2) 7 mm nuts	1.2	10.6

10. Replace the dynamic braking board as follows.
- Using a 7 mm socket wrench, secure the dynamic braking board to the braking IGBT module with two nuts (**B**, Figure 93).
 - Using a T-20 Torx driver, securing the dynamic braking board to the braking IGBT bus bar with one screw (**A**, Figure 93).
 - Tighten the hardware to the torque values specified in Table 29.

Figure 93: Dynamic Braking Board



Replace the Dynamic Braking Board Connections

11. Replace all connections to the dynamic braking board. See Table 30 and Figure 94 for the connection locations.

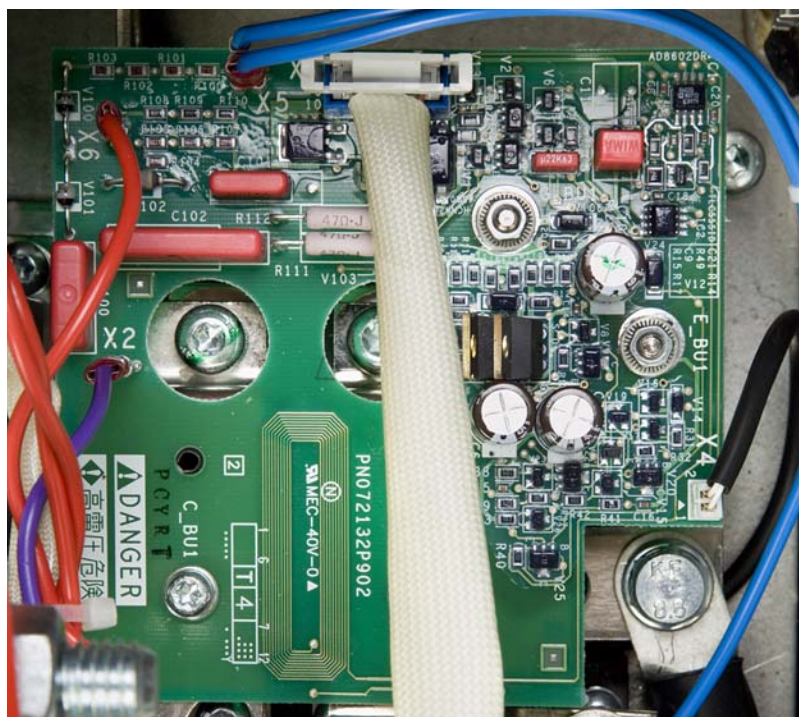
Table 30: Dynamic Braking Board Wiring

Wire No. ¹	Terminal No.	Description	To:
E134	X1	10- pin, white ribbon	PB ² X91
E105	X2	1-pin, violet	PB X93
E130	X4	2-pin, black	Temperature sensor #2
E132, E133	X5	2-pin, blue	GDB W X52 & red insulator on DC bus plate
E131	X6	1-pin, red	PA/+ bus bar

¹ See schematic on page 110 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

Figure 94: Dynamic Braking Board Connections



Reassemble the Drive

If you are only replacing the dynamic braking kit or temperature sensor #2, perform Steps 10–20 of “Reassembly Steps for Level 2 Parts” beginning on page 94 to replace the following parts:

- ☐ SCR snubber board shield
- ☐ Fan plate
- ☐ Top crossbrace
- ☐ Control module assembly
- ☐ EMC tray
- ☐ Power terminal shield
- ☐ 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:

- | | |
|--|--|
| <input type="checkbox"/> DC bus plate assembly | <input type="checkbox"/> Fan plate |
| <input type="checkbox"/> Gate driver boards | <input type="checkbox"/> Top crossbrace |
| <input type="checkbox"/> Bus plate assembly | <input type="checkbox"/> Control module assembly |
| <input type="checkbox"/> Fan control board connections | <input type="checkbox"/> The EMC tray |
| <input type="checkbox"/> Soft charge board connections | <input type="checkbox"/> The power terminal shield |
| <input type="checkbox"/> Power board connections | <input type="checkbox"/> The front cover |
| <input type="checkbox"/> SCR snubber board shield | |

You must perform some or all of the procedures in this section after replacing the spare parts identified in Table 30. Consult Table 30 for the reassembly steps that must be performed for the corresponding spare parts.

Table 31: Reassembly Steps

If you replaced	Perform reassembly steps:
Power board VZ5A1HC1622	Steps 15–20
Gate driver board VZ5A1201	Steps 4–20
Temperature sensor #1 VZ3G1104	Steps 2–20
Power IGBT modules VZ3IM1600M1271	Steps 1–20
Capacitors VY1ADC1113	Steps 1–20
SCR snubber board VX4A1200	Steps 10–20
SCR modules VZ3TD1330M1601	Steps 10–20
Dynamic braking kit VZ3F1110	Steps 10–20
Temperature sensor #2 VZ3G1104	Steps 10–20

Replace the DC Bus Plate

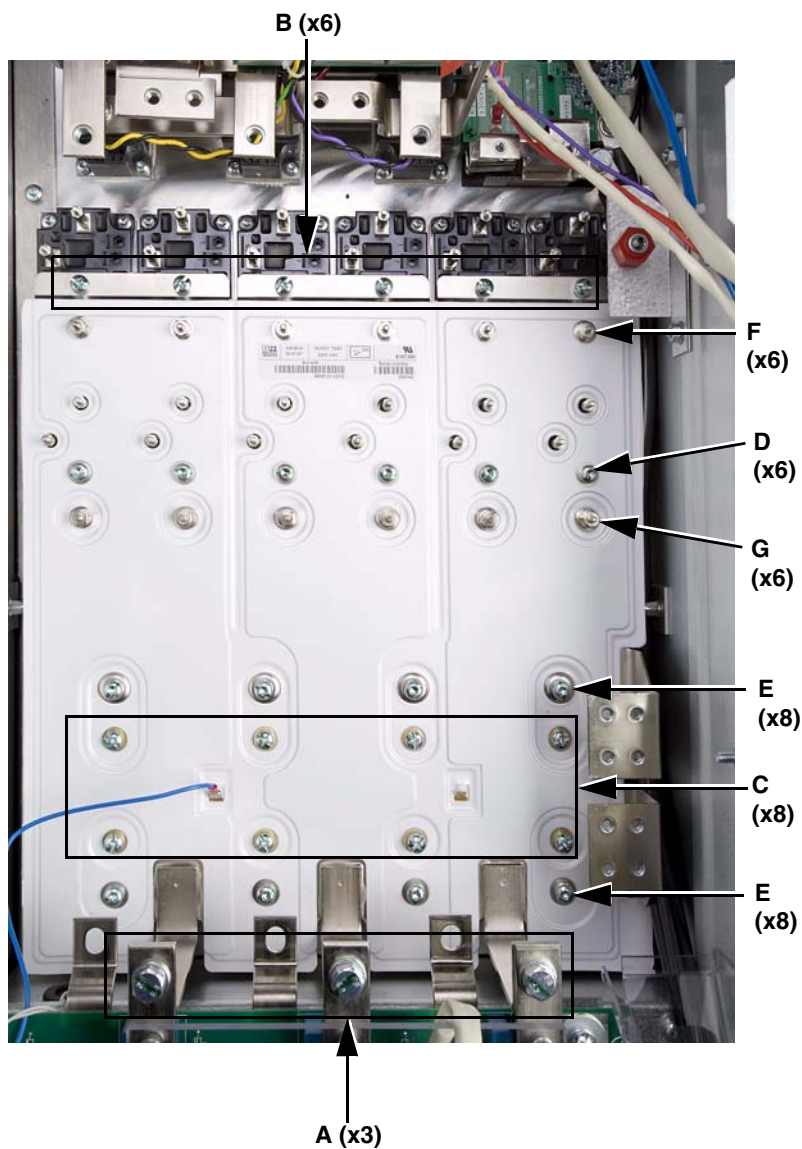
1. Replace the DC bus plate as follows.
 - Position the DC bus plate in the drive as illustrated in Figure 95 on page 95.
 - Using a 10 mm socket wrench, install six short standoffs (F, Figure 95) and six long standoffs (G, Figure 95).
 - Using a T-30 Torx driver, secure the DC bus plate to the IGBT modules with six screws (D, Figure 95) and secure it to the capacitors with eight screws (E, Figure 95).

- Using a size 2 Phillips driver, secure the DC bus plate to the IGBT modules with six screws (**B**, Figure 95) and secure it to the capacitors with eight screws (**C**, Figure 95).
- Using a 16 mm socket, secure the DC bus plate to the output bus bars with three bolts (**A**, Figure 95).
- Tighten the hardware to the torque values specified in Table 32.

Figure 95: DC Bus Plate

Table 32: DC Bus Plate Hardware Torque Values

Item	Description	Torque Range	
		N•m	lb-in
A	(3) 16 mm bolts	27	239
B	(6) Size 2 Phillips screws	3.3	29.2
C	(8) Size 2 Phillips screws	3.3	29.2
D	(6) Long T-30 screws (20 mm length)	3.3	29.2
E	(8) Short T-30 screws (14 mm length)	3.3	29.2
F	(6) Short 10-mm standoffs (6 mm length)	3.3	29.2
G	(6) Long 10 mm standoffs (11 mm length)	3.3	29.2



Replace the Gate Driver Boards

2. Install the gate driver boards as follows.
 - Using a 7 mm socket wrench, secure the gate driver boards to the DC bus plate with 12 nuts each. See Figure 96 on page 97.
 - Tighten the nuts to 1.2 N•m (10.6 lb-in).
3. Replace the gate driver board connections as follows. See Table 33.

NOTE: The white ribbon cable from terminal X81 of GDB U (see Figure 96 on page 97) connects to the power board. When installing the bus plate assembly, be sure to route this cable up over the assembly.

- On gate driver board W (**right board**), install the blue 1-pin connection at terminal X52 and the violet 1-pin connection at terminal X2. See Figure 96 on page 97.
- On the DC bus plate, install the blue 1-pin connection that originates from gate driver board U terminal X51. See Figure 97 on page 97.
- On gate driver board U (**left board**), install the yellow 1-pin connection at terminal X2. See Figure 96 on page 97.
- Install all of the connections on gate driver board V (**center board**). See Figure 96 on page 97 for connection locations.

Table 33: Gate Driver Board Wiring

Wire No. ¹	Terminal No.	Description	To:
Gate Driver Board U (Left)			
E143	X2	1-pin, yellow	Power board X5
E129	X51	1-pin, blue	Neutral bus
E127	X52	1-pin, blue	GDB V, X51
E100	X81	10-pin, white	Power board X8
E101	X82	10-pin, white	GDB V X81
E138	X32	18-pin, gray	GDB V X31
Gate Driver Board V (Center)			
E143	X2	1-pin, green	Power board X5
E127	X51	1-pin, blue	GDB U, X52
E123	X52	1-pin, blue	GDB W, X51
E101	X81	10-pin, white	GDB U, X82
E102	X82	10-pin, white	GDB W, X81
E138	X31	18-pin, gray	GDB U, X32
E142	X32	18-pin, gray	GDB W, X31
E128	X4	2-pin, black	Temperature sensor #1
Gate Driver Board W (Right)			
E143	X2	1-pin, violet	Power board X5
E123	X51	1-pin, blue	GDB V, X52
E132	X52	1-pin, blue	Dynamic braking board, X5
E102	X81	10-pin, white	GDB V, X82
E142	X31	18-pin, gray	Power board, X3

¹ See schematic on page 110 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.

Figure 96: Gate Driver Boards

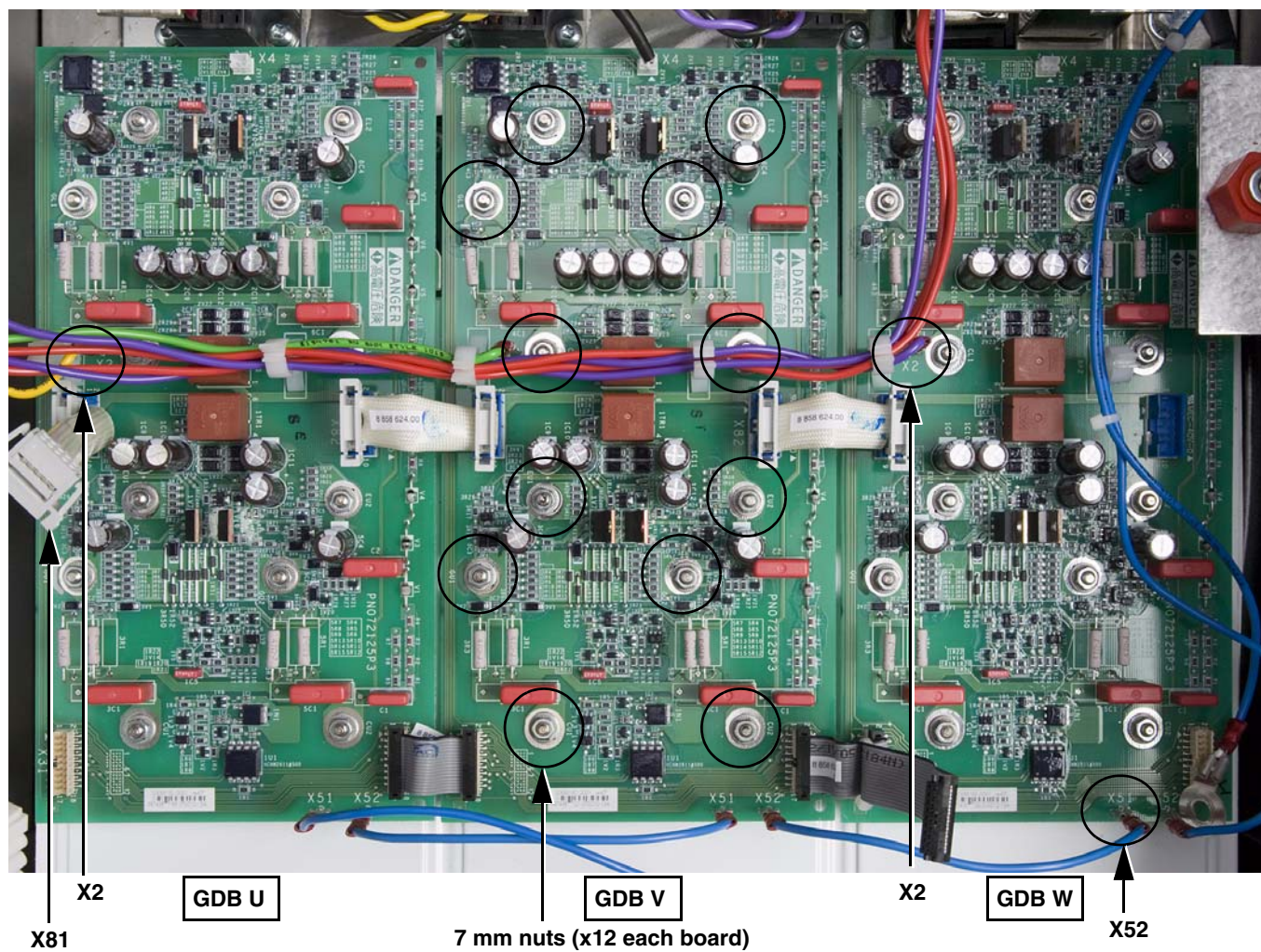
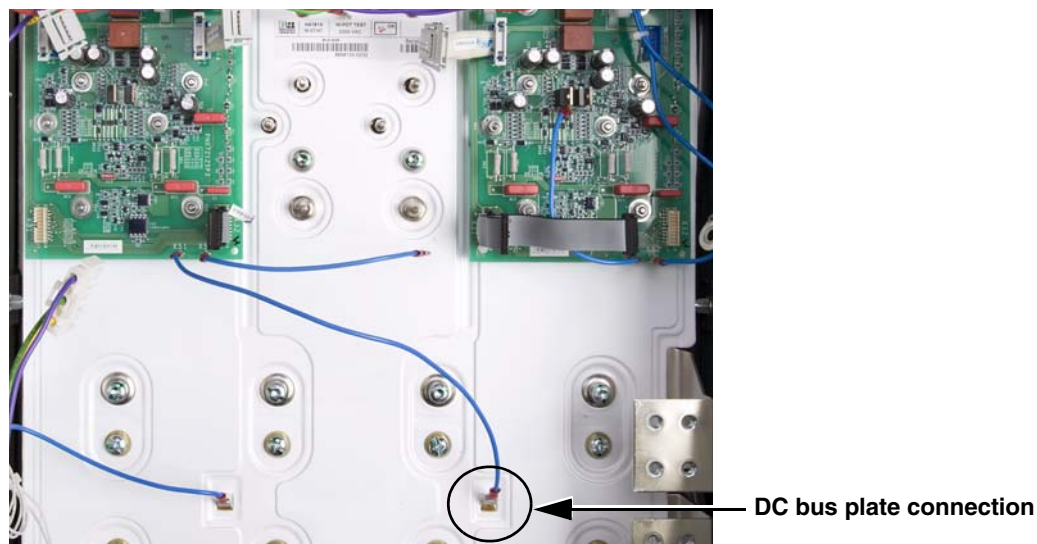


Figure 97: DC Bus Plate Connection



Replace the Bus Plate Assembly

4. Replace the bus plate assembly as follows.

- Position the bus plate assembly in the drive as illustrated in Figure 98 on page 99.

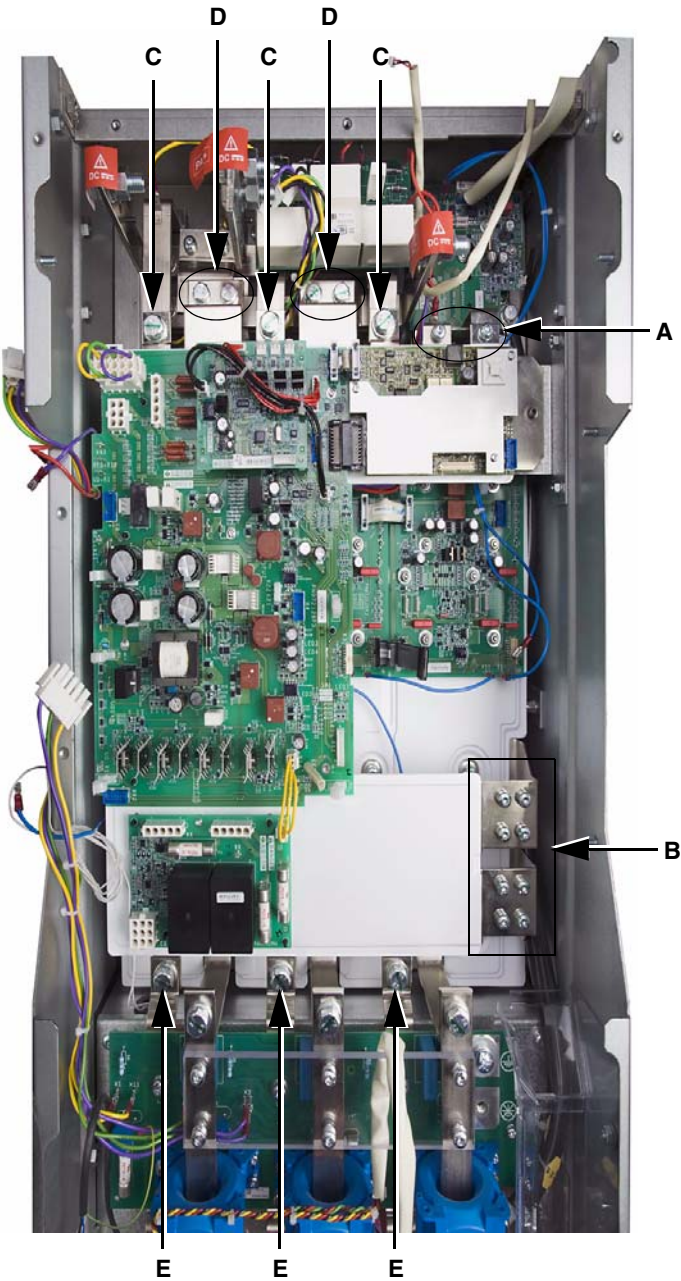
NOTE: The white ribbon cable from terminal X81 of GDB U (see Figure 96 on page 97) connects to the power board. When installing the bus plate assembly, be sure to route this cable up over the assembly.

- Using a 16 mm socket, secure the bus plate assembly to the AC input bus bars with three bolts (**E**, Figure 98).
- Using a 13 mm socket wrench, secure the bus plate assembly to the positive (left) and negative (right) bus with four bolts (**D**, Figure 98).
- Using a 16 mm socket wrench, secure the bus plate assembly to terminal 1 of the SCR modules with three bolts (**C**, Figure 98).
- Using a T-30 Torx driver, secure the bus plate assembly to the positive (top) and negative (bottom) bus with eight screws (**B**, Figure 98).
- Using a T-30 Torx driver, secure the bus plate assembly to the bus bars between the IGBT module and the diode module with two screws (**A**, Figure 98).
- Tighten the hardware to the torque values specified in Table 34 on page 99.

Figure 98: Bus Plate Assembly

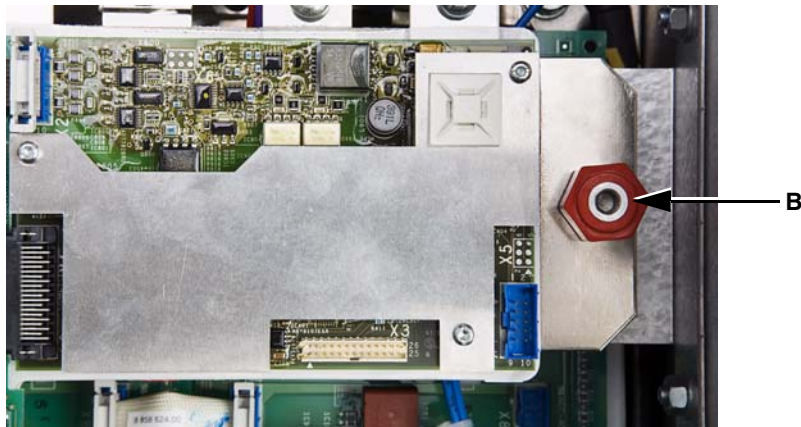
Table 34: Bus Plate Assembly Hardware
Torque Values

Item	Description	Torque Range	
		N•m	lb-in
A	(2) T-30 screws	5.5	48.7
B	(8) T-30 screws	5.5	48.7
C	(3) 16 mm bolts	27	239
D	(4) 13 mm bolts	13.5	119.5
E	(3) 16 mm bolts	27	239



5. Using a 21 mm wrench, secure the top half of the red insulator and washer (**B**, Figure 99) to the bus plate assembly. Tighten the insulator to 5.5 N•m (48.7 lb-in).

Figure 99: Insulator



6. Using a size 2 Phillips driver, secure the blue wire (E122) to the red insulator with one screw (**A**, Figure 100). The wire originates from dynamic braking board terminal X5. Tighten the screw to 5.5 N•m (48.7 lb-in).

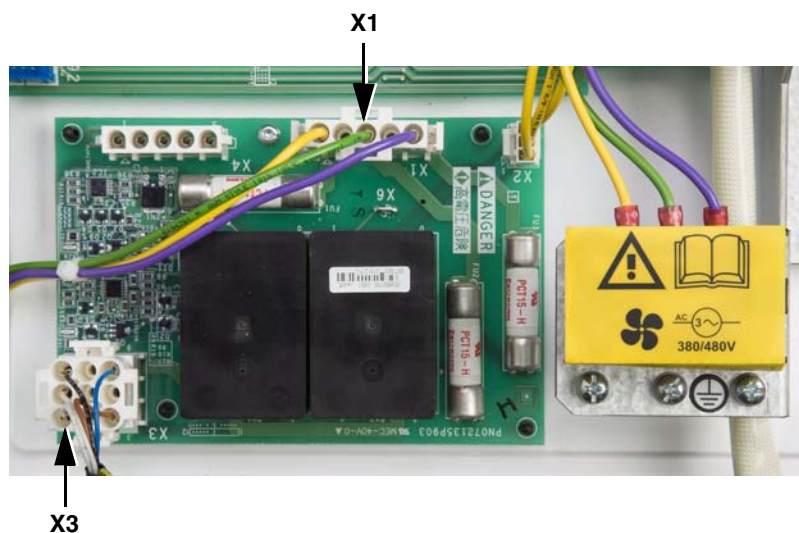
Figure 100: Wire E122 Connection



Replace the Fan Control Board Connections

7. Replace the connections at terminals X1 and X3 of the fan control board.
See Figure 101 for terminal locations.

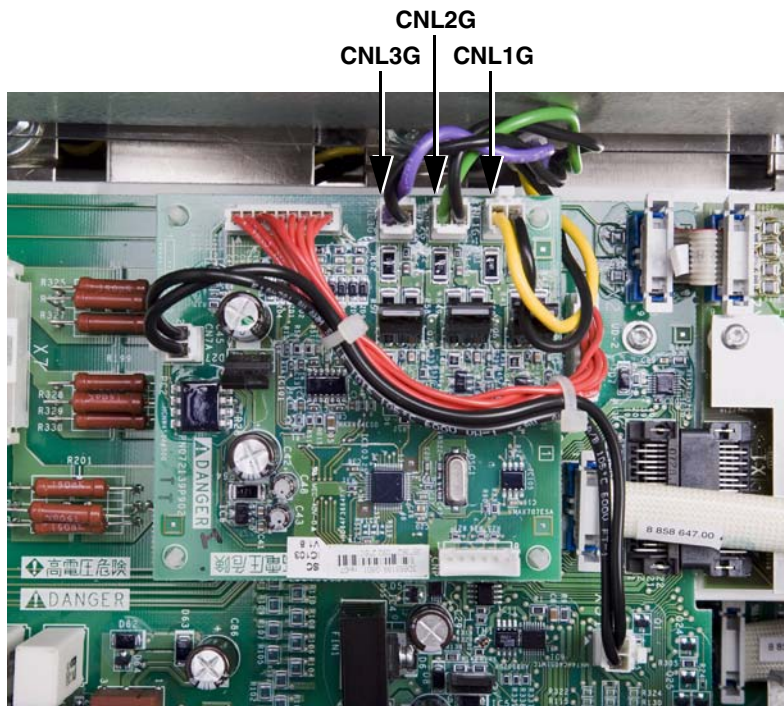
Figure 101: Fan Control Board Connections



Replace the Soft Charge Board Connections

8. Replace soft charge board connections CNL1G, CNL2G, and CNL3G.
See Figure 102 for terminal locations.

Figure 102: Soft Charge Board Connections



Replace the Power Board Connections

9. Replace the power board connections listed in Table 35. See Figure 103 for the connection locations.

Table 35: Power Board Wiring

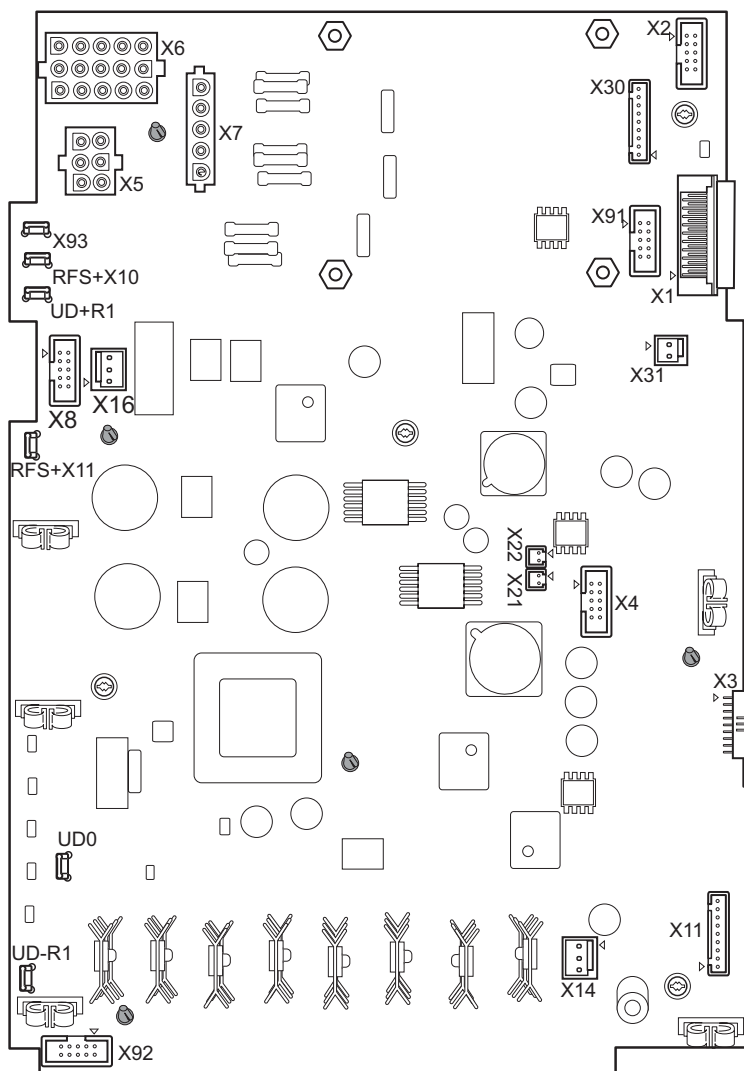
Wire No. ¹	Terminal No.	Description	To:
E103	X11	9-pin, multi color	Motor current sensors
E136	UD0	1-pin, blue	DC bus plate
E141	UD -R1	1-pin, white	Bleeder resistor
E139	UD +R1	1-pin, white	Bleeder resistor
E171	RFS +X11	1-pin, red	SCR ² snubber board X11
E126	RFS +X10	1-pin, red	SCR snubber board X10
E172	X93	1-pin, violet	Dynamic braking board X2
E143	X5	6-pin, yellow/green/violet	GDB ³ U X2, GDB V X2, GDB W X2
E120	X7	6-pin, green/yellow/violet	Filter board X11, X12, X13
E134	X91	10-pin, white	Dynamic braking board X1
E142	X3	18-pin, gray	GDB W X31
E100	X8	10-pin, white	GDB U X81
E106	X21	2-pin, red/black	Internal fan
E112	X4	10-pin, gray	Control module

¹ See schematic on page 110 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 SCR: Silicon controlled rectifier

³ GDB: Gate driver board

Figure 103: Power Board Connections



NOTE: There are no wiring connections at terminals X16, X22, and X92.

Replace the SCR Snubber Board Shield

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

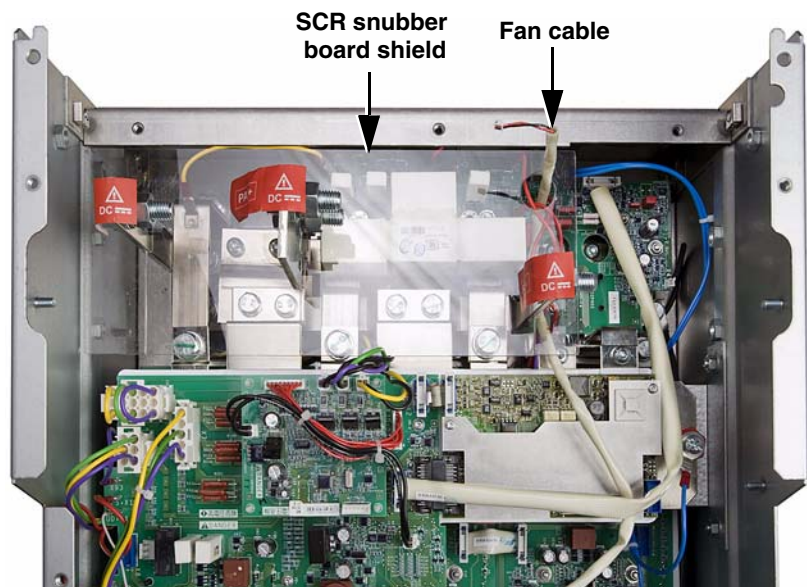
- Install the SCR snubber board shield as shown in Figure 104.
- Before installing the shield, ensure that it has no tears or cracks. If the shield is damaged, install a new piece from the plastic kit. See page 22.
- Do not install a damaged shield.

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

10. Replace the transparent shield over the SCR snubber board. The shield rests on top of the dowel pins on the bus bar. Route the internal fan cable from power board terminal X21 up through the hole in the shield as shown in Figure 104.

If the shield is cracked, broken, or damaged, replace it with a new piece from the plastic kit (page 22).

Figure 104: SCR Snubber Board Shield



Replace the Fan Plate

11. Plug the fan cable (Figure 105) into the back of the fan plate, and position the fan plate into the drive as illustrated in Figure 106 on page 104.

Figure 105: Fan Plate Connection

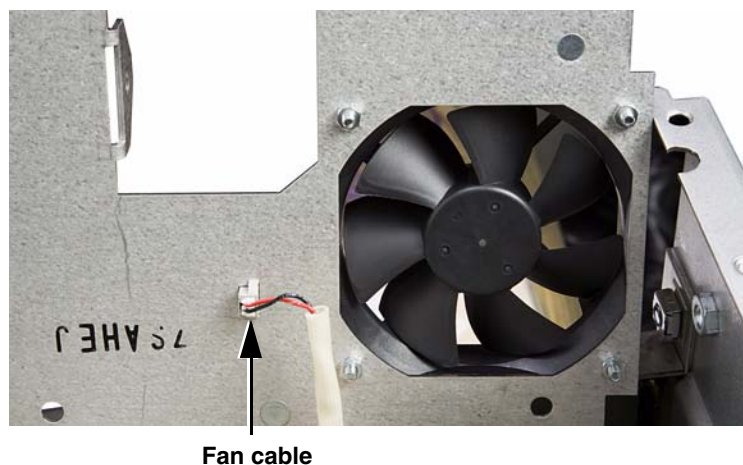
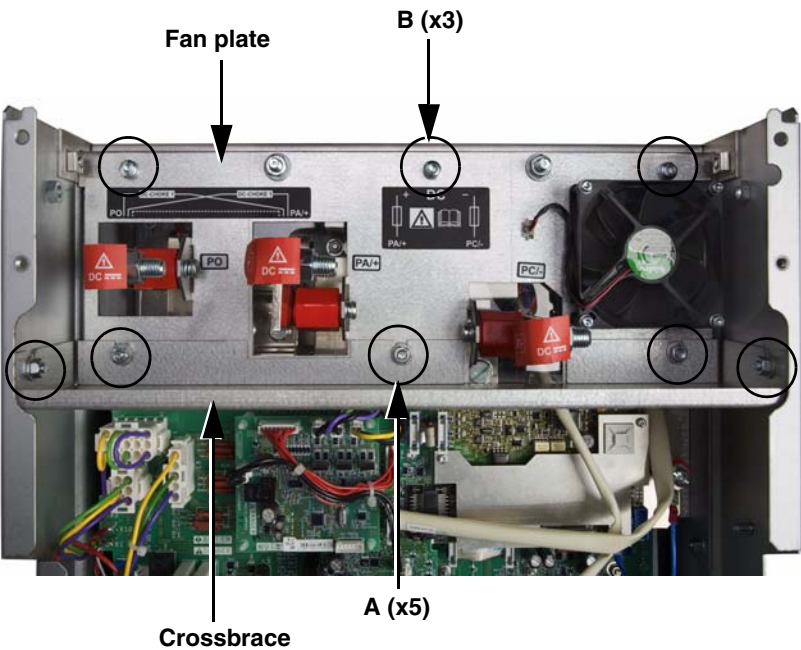


Table 36: Crossbrace and Fan Plate Hardware Torque Values

Item	Description	Torque Range	
		N•m	lb-in
A	(5) 10 mm nuts	5.5	48.7
B	(3) T-30 screws	5.5	48.7
C	(6) T-30 screws	5.5	48.7

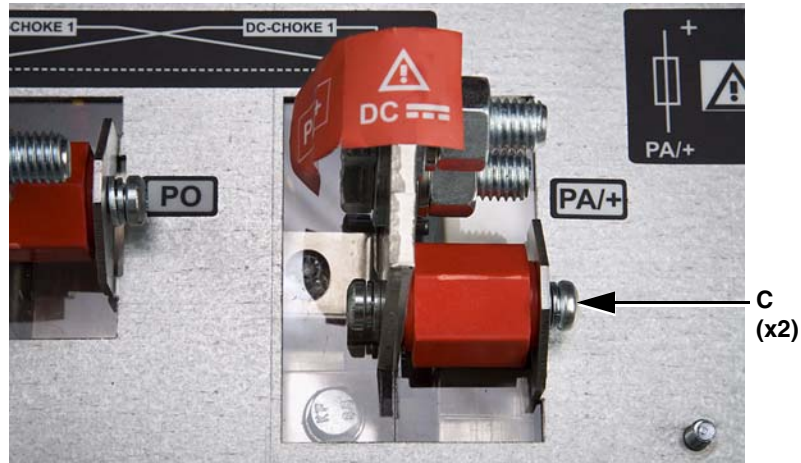
12. Using a T-30 Torx driver, secure the fan plate to the drive frame with three screws (**B**, Figure 106).

Figure 106: Top Crossbrace and Fan Plate



13. Using a T-30 Torx right-angled driver, install the three red insulators at the PO, PA/+, and PC/- terminals and secure them with two screws each (**C**, Figure 107). Tighten the screws to the torque values specified in Table 36.

Figure 107: Insulator Detail



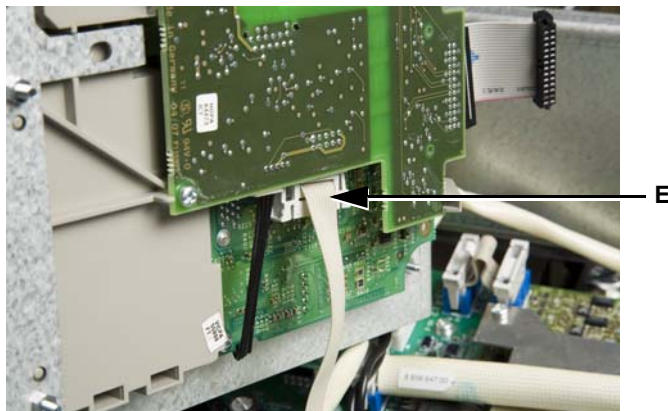
Replace the Top Crossbrace

14. Replace the top crossbrace as follows.
- Using a 10 mm socket wrench, secure the top crossbrace to the drive frame and secure with five nuts (**A**, Figure 106).
 - Tighten hardware **A** and **B** to the torque values specified in Table 36.

Replace the Control Module Assembly

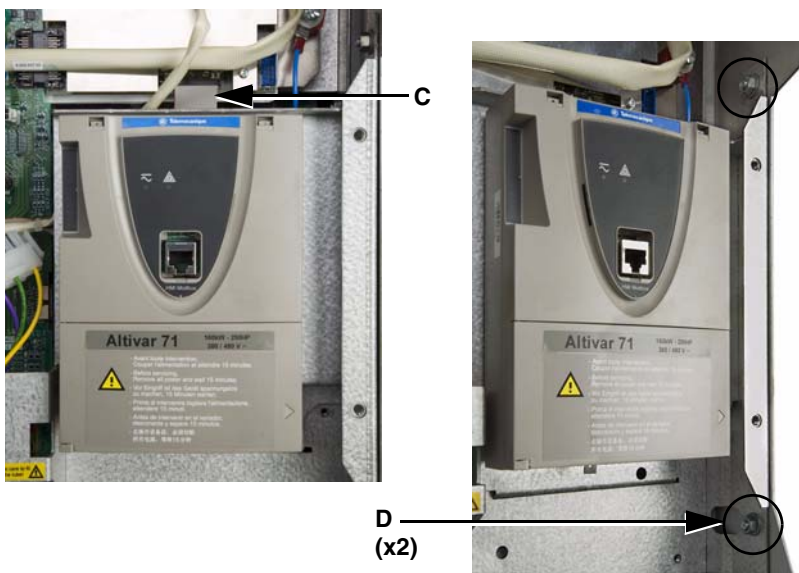
15. Connect the ribbon cable (**E**, Figure 108) from power board terminal X4 to the back of the control module assembly.

Figure 108: Back of Control Module Assembly



16. Using a 10 mm socket wrench, secure the control module assembly to the drive frame with two nuts (**D**, Figure 109). Tighten the nuts to 5.5 N•m (48.7 lb-in).

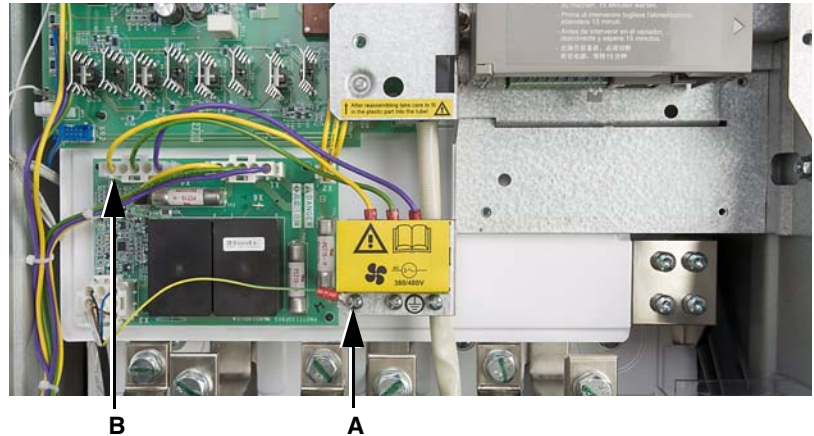
Figure 109: Control Module Assembly



17. Replace the following connections.

- Install the 26-pin ribbon cable (**C**, Figure 109 on page 105) from motor control board terminal X3.
- Install the 5-pin connector (**B**, Figure 110) from fan control board terminal X4.
- Using a size 2 Phillips driver, secure the ground wire to the control module TB1 bracket with one screw (**A**, Figure 110). Tighten the screw to 1.2 N•m (10.6 lb-in).

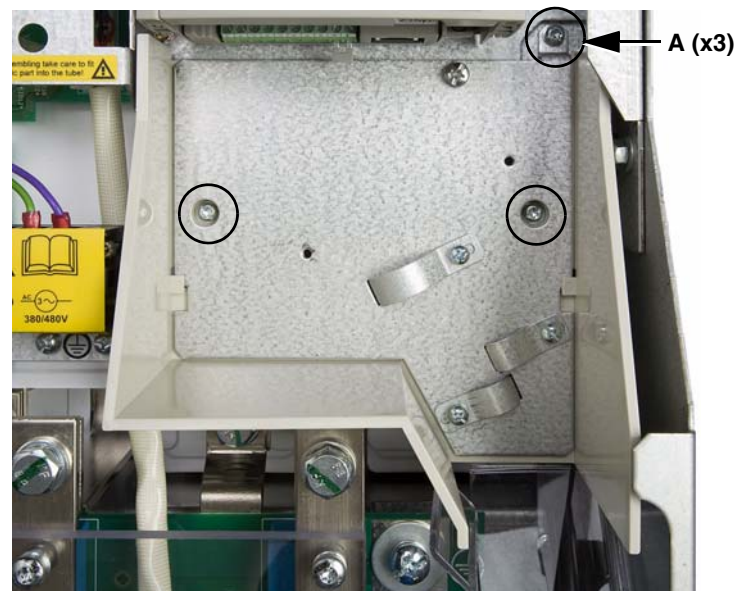
Figure 110: TB1 and Fan Control Board Connections



Replace the EMC Tray

18. Using a T-20 Torx driver, securing the EMC tray to the control module plate with three screws. See Figure 111. Tighten the screws to 1.1–1.7 N•m (9.7–15.0 lb-in).

Figure 111: EMC Tray



Replace the Power Terminal Shield

19. Replace the power terminal shield as follows.

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- Install the power terminal shield as shown in Figures 112 and 113.
- 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 22.
- Do not install a damaged shield.

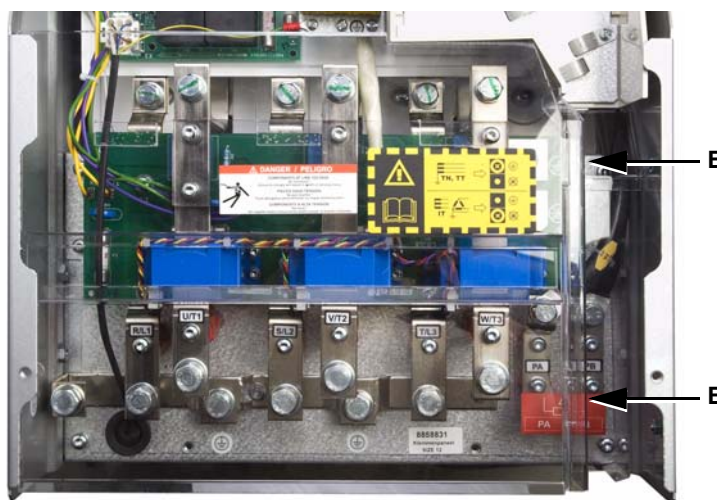
Failure to follow these instructions will result in death or serious injury.

- Hook the mounting holes on the left side of the shield over the posts on the side panel of the drive (**A**, Figure 112).
- Insert the retaining tabs on the right side of the shield in the slots on the conduit tray (**B**, Figure 113).

Figure 112: Power Terminal Shield Retaining Posts



Figure 113: Power Terminal Shield



Replace the Front Cover

20. Replace the front cover. Using a size 2 Phillips driver, secure the front cover with nine screws. See Figure 9 on page 21. Tighten the screws to 5.5 N•m (48.7 lb-in).

Wiring

Table 37: Wiring Table

Wire No. ¹	Description	From:		To:	
		Component	Terminal No.	Component	Terminal No.
E100	10-pin, white	Power board	X8	GBD U	X81
E101	10-pin, white	Gate driver board U	X82	Gate driver board V	X81
E102	10-pin, white	Gate driver board V	X82	Gate driver board W	X81
E103	9-pin, multi-color	Power board	X11	Motor current sensors	T1
					T2
					T3
E105	3-pin, yellow	Fan control board	X2	Power board	X14
E106	2-pin, red/black	Power board	X21	Internal fan	—
E107	2-pin, yellow/black	Soft charge board	CNL1G	SCR 1	4, 5
E108	2-pin, green/black	Soft charge board	CNL2G	SCR 2	4, 5
E109	2-pin, violet/black	Soft charge board	CNL3G	SCR 3	4, 5
E110	9-pin, red	Soft charge board	CN2A	Power board	X30 (2-pin)
					X30 (7-pin)
E111	2-pin, black	Soft charge board	CN7A	Power board	X31
E112	10-pin, gray	Power board	X4	Control module	—
E118	5-pin, yellow/green/violet	Fan control board	X1	Filter board	X1
					X2
					X3
E119	1-pin, yellow	SCR snubber board	X1	SCR L1 bus bar	—
E120	6-pin, yellow/green/violet	Power board	X7	Filter board	X11
				Filter board	X12
				Filter board	X13
E121	1-pin, red	SCR snubber board	X4	PO bus bar	—
E122	1-pin, black	SCR snubber board	X5	PC/- bus bar	—
E123	1-pin, blue	Gate driver board V	X52	Gate driver board W	X51
E124	5-pin, violet/green/yellow	Fan control board	X4	Fan control terminal block TB1	—
E125	9-pin, black/white/brown/blue with yellow/green ground wire	Fan control board	X3	Heatsink fan	—

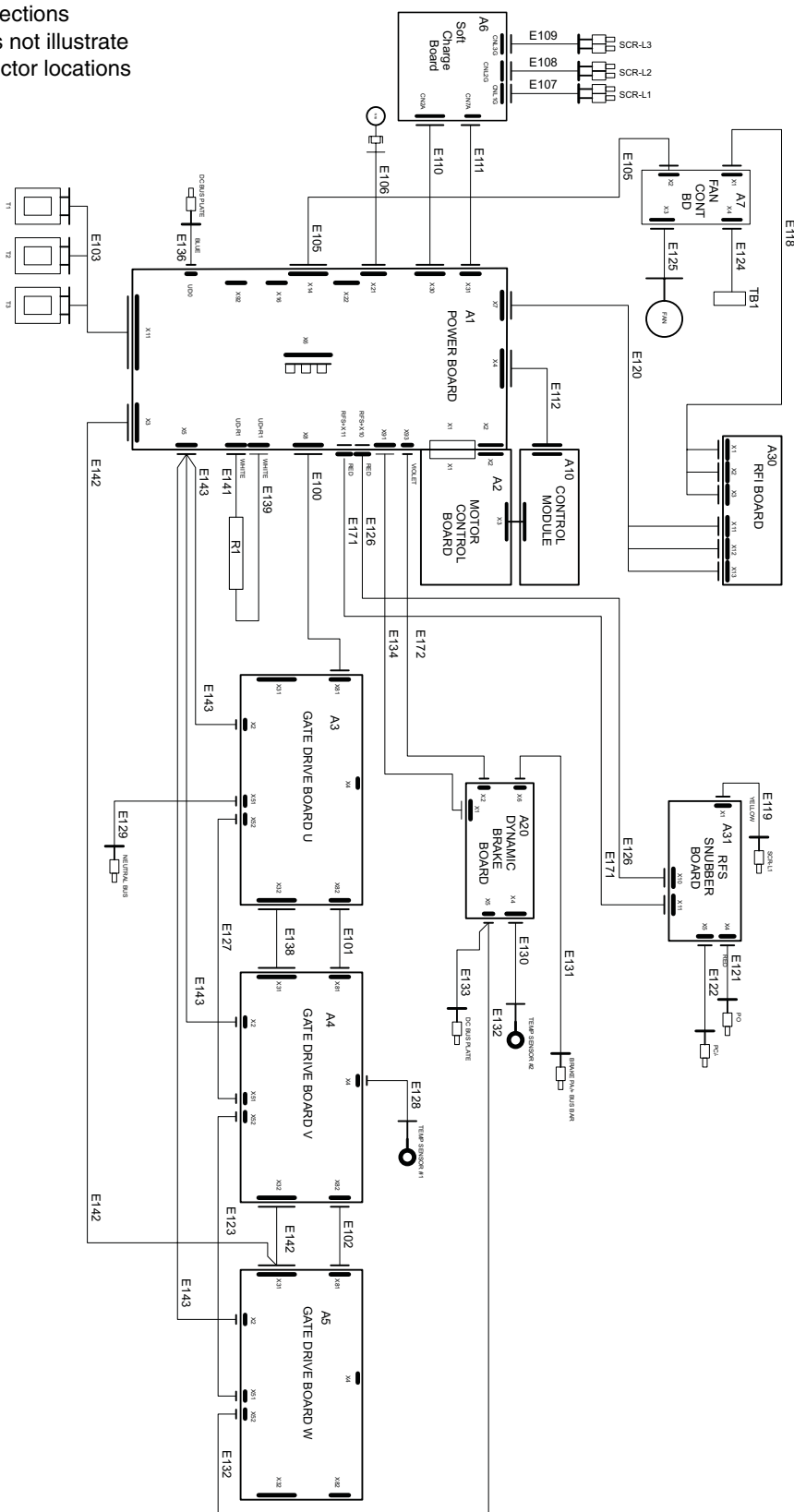
Table 37: Wiring Table *(continued)*

Wire No. ¹	Description	From:		To:	
		Component	Terminal No.	Component	Terminal No.
E126	1-pin, red	Power board	RFS +X10	SCR snubber board	X10
E127	1-pin, blue	Gate driver board U	X52	Gate driver board V	X51
E128	2-pin, black	Gate driver board V	X4	Temperature Sensor #1	—
E129	1-pin, blue	Gate driver board U	X51	Neutral bus	—
E130	2-pin, black	Dynamic braking board	X4	Temperature sensor #2	—
E131	1-pin, red	Dynamic braking board	X6	Brake assy PA bus bar	—
E132	1-pin, blue	Gate driver board W	X52	Dynamic braking board	X5
E133	1-pin, blue	Dynamic braking board	X5	DC bus plate	—
E134	10-pin, white	Power board	X91	Dynamic braking board	X1
E136	1-pin, blue	Power board	UD0	DC Bus plate	—
E138	18-pin, gray	Gate driver board U	X32	Gate driver board V	X31
E139	1-pin, white	Power board	UD +R1	Bleeder resistor	—
E141	1-pin, white	Power board	UD -R1	Bleeder resistor	—
E142	18-pin, gray	Power board	X3	GDB W	X31
E142	18-pin, gray	Gate driver board V	X32	Gate driver board W	X31
E143	6-pin, yellow/green/violet	Power board	X5	GBD U	X2
				GBD V	X2
				GDB W	X2
E171	1-pin, red	Power board	RFS +X11	SCR ² snubber board	X11
E172	1-pin, violet	Power board	X93	Dynamic braking board	X2

¹ Wire numbers are given for cross referencing the wires with the schematic on page 110. The numbers do not appear on the wires.

² SCR: Silicon controlled rectifier

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.



Spare Parts Kits for Altivar® 61/71 Drives, Frame Size 12
Instruction Bulletin

Schneider Electric USA

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