Altivar® 61/71
Adjustable Speed Drives
Spare Parts Kits

Instruction Bulletin

30072-452-78

Retain for future use.

For Frame Size 11:

ATV61HC16N4, ATV71HC13N4

Schneider Electric

Contents

Hazard Categories and Special Symbols

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

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

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

Symbol	Name
	Lightning Bolt
	ANSI Man
	Exclamation Point

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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

CAUTION

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

Product Support

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

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

Before You Begin

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

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

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

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

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

Introduction

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

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

Kit Catalog No.	Description	For Use On Drive:	For Location of Parts, See:
VY1A1212	Front Cover Assembly	ATV61HC16N4 ATV71HC13N4	page 19
VY1A1401	Plastic Parts Kit	ATV61HC16N4 ATV71HC13N4	pages 13, 14, 17
VZ3V1213	Internal Fan	ATV61HC16N4 ATV71HC13N4	page 13
VX5A1300	Soft Charge Board	ATV61HC16N4 ATV71HC13N4	page 13
VX5A1400	Fan Control Board	ATV61HC16N4 ATV71HC13N4	page 14
VX4A1113	Filter Board	ATV61HC16N4 ATV71HC13N4	page 14
VX5A71HC13N4	Measuring Board	ATV61HC16N4 ATV71HC13N4	page 13
VX5A1HC1316	Power Board	ATV61HC16N4 ATV71HC13N4	page 15
VY1A1107	Motor Current Sensor	ATV61HC16N4 ATV71HC13N4	page 14
VX5A1200	Gate Driver Board	ATV61HC16N4 ATV71HC13N4	page 15
VZ3G1104	Temperature Sensor Wire	ATV61HC16N4 ATV71HC13N4	pages 16 and 18
VZ3IM1600M1271	Power IGBT[2] Module	ATV61HC16N4 ATV71HC13N4	page 16
VY1ADV1107	Screw Kit	ATV61HC16N4 ATV71HC13N4	—
VY1ADC1112	Capacitors	ATV61HC16N4 ATV71HC13N4	page 16
VX4A1200	SCR Snubber Board	ATV61HC16N4 ATV71HC13N4	page 17
VZ3TD1285M1671	SCR[3] Module	ATV61HC16N4 ATV71HC13N4	page 17
VZ3F1110	Dynamic Braking (DB) Kit	ATV61HC16N4 ATV71HC13N4	pages 14, 17, 18, 96, and 97
VZ3N1316	Wire Kit	ATV61HC16N4 ATV71HC13N4	—

[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

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

Qualified Personnel

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

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

In addition, the person must be:

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

Working Procedures

Observe the following working procedures:

- Use only the components provided with the kits listed in Table 1 beginning on page 7. Do not attempt to repair the drive with other spare parts or equipment.
- If the part being replaced includes labels, ensure that the labels are applied to the replacement part. If the labels are not available in the kit, contact your Schneider Electric representative.
- Mount the spare parts only in the locations specified in the installation procedures.
- Route and position the wires as shown in the instructions. Use the wires and cables provided with the spare parts kits or with the drive. Do not modify the wires and cables. Do not route wires and cables outside of the drive enclosure.
- Install the power terminal shield as specified on pages 20–21, the filter board shield as specified on page 32, and the DC reactor terminal shield as specified on page 100 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 (0–239 lb-in)
- Voltmeter, 1–1000 Vdc
- Driver bits:
  - — T-10 Torx® driver
  - — T-20 Torx® driver
  - — T-30 Torx® driver
  - — Size 2 magnetic tip Phillips® driver
  - — Size 3 magnetic tip Phillips® driver
- Socket wrenches:
  - — 5 mm
  - — 7 mm
  - — 10 mm
  - — 13 mm
  - — 16 mm
  - — 7/32 in.
- 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 capacitors 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

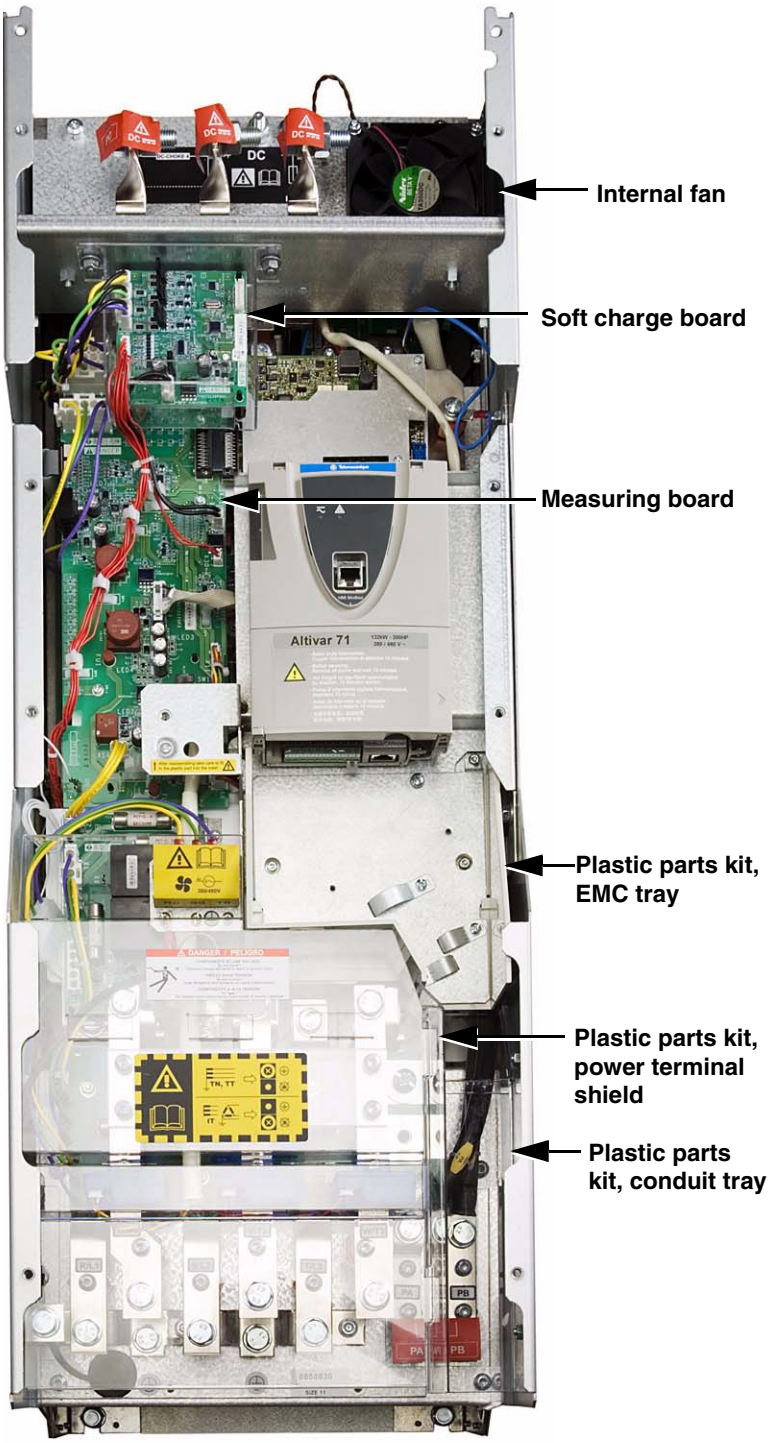
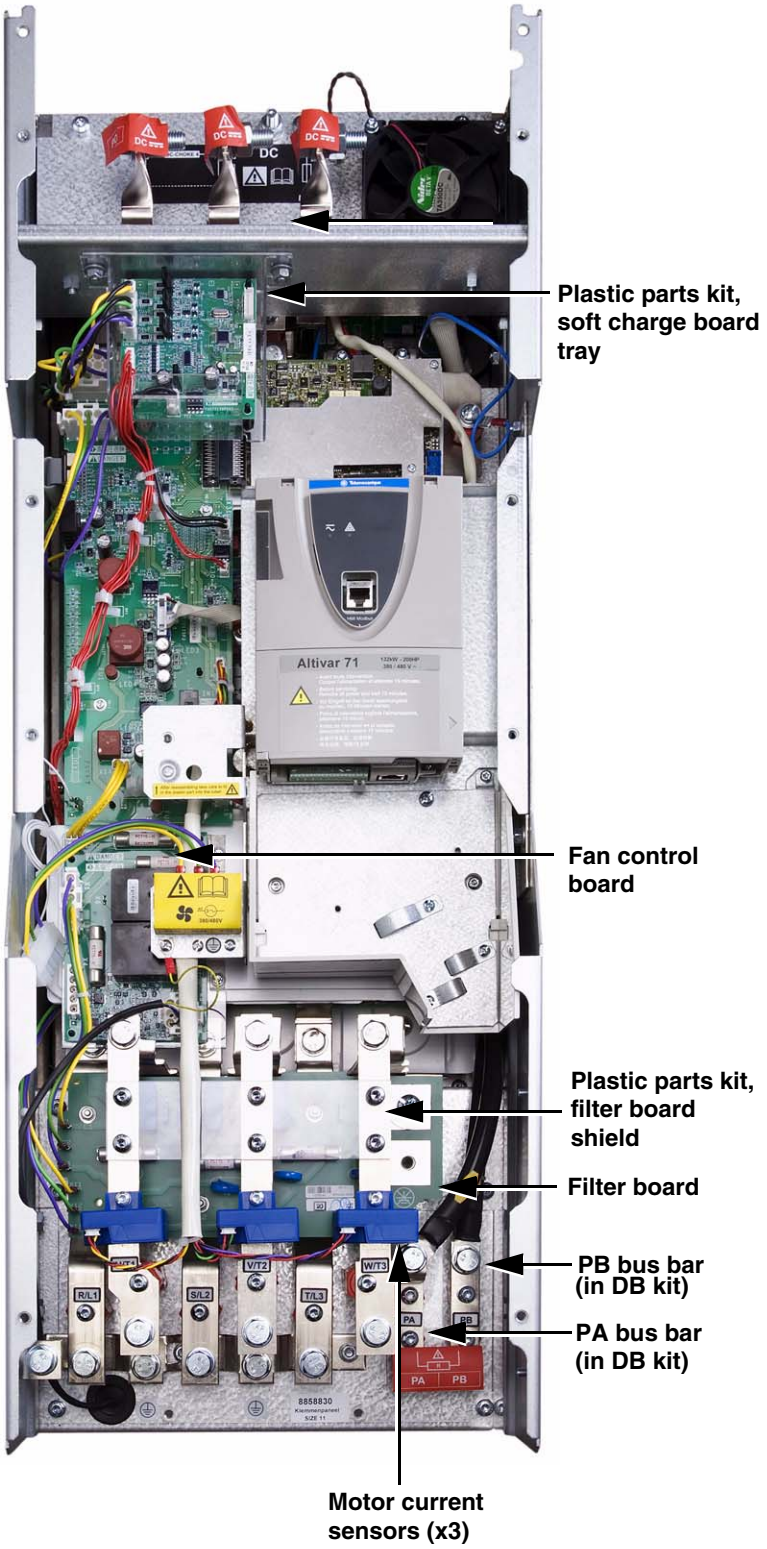


Figure 2: Level 1 Parts and Dynamic Braking Kit[1]



[1] See pages 17, 18, 96, and 97 for more dynamic braking kit parts.

Bottom Section Parts

Figure 3: Gate Driver Board and Power Board

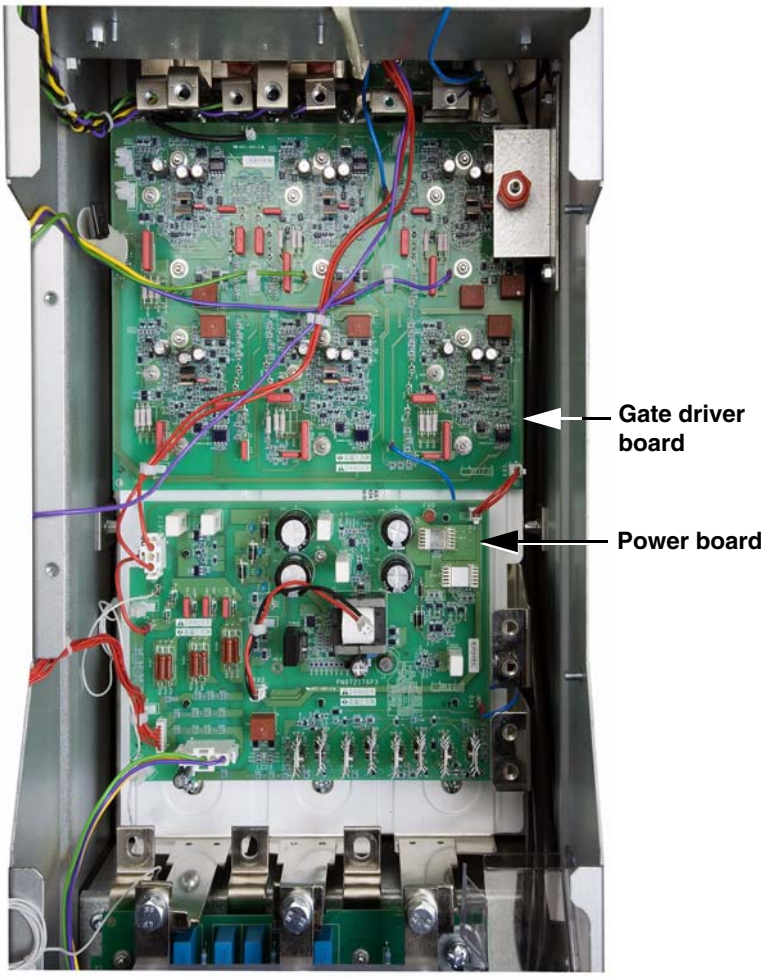
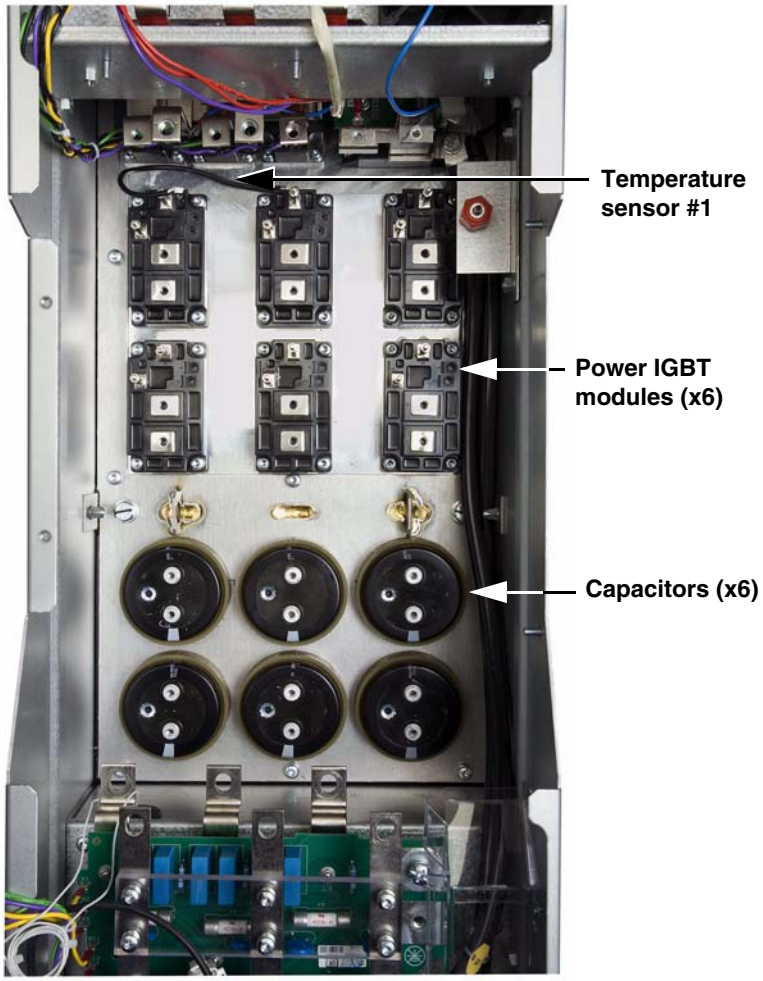
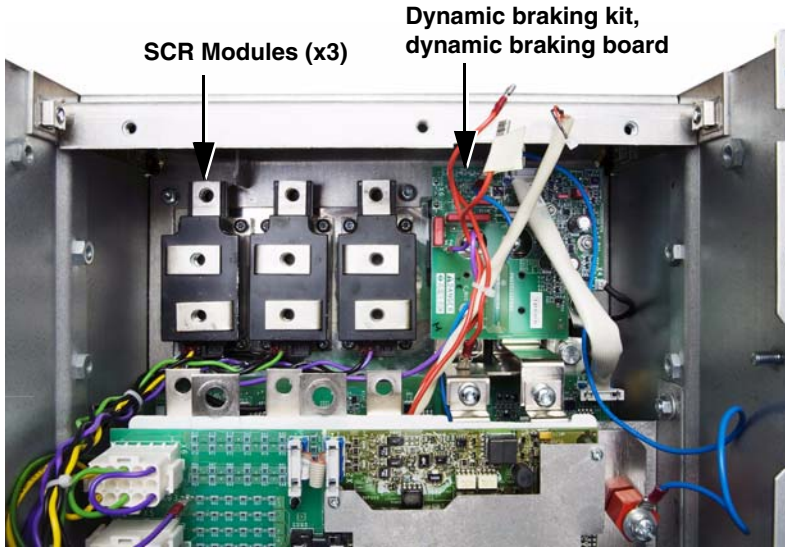


Figure 4: Temperature Sensor #1, Power IGBT Modules, and Capacitors



Top Section Parts

Figure 5: Dynamic Braking Kit[1] and SCR Modules



[1] See pages 96 and 97 for bus bars included in the dynamic braking kit.

Figure 6: Dynamic Braking Kit, SCR Snubber Board, Plastic Kit

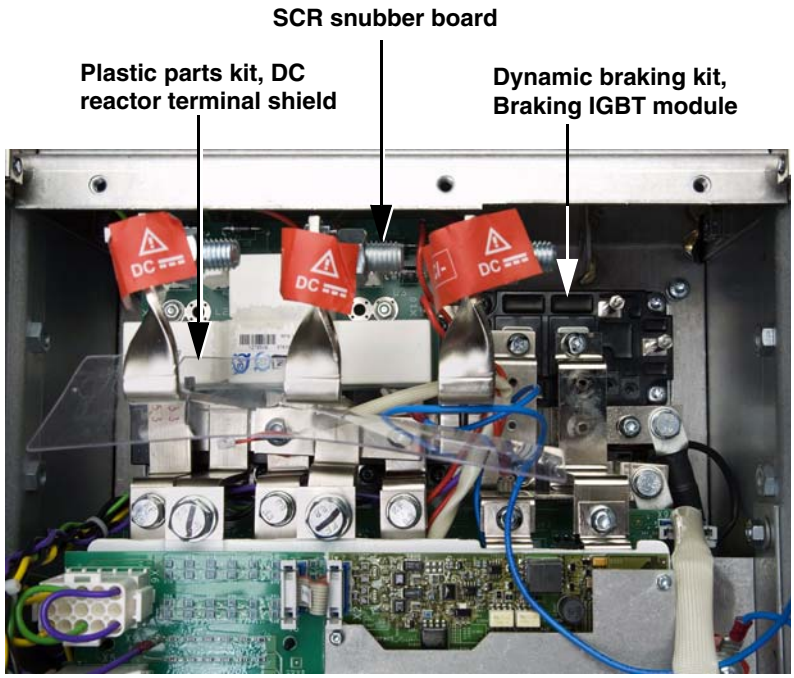
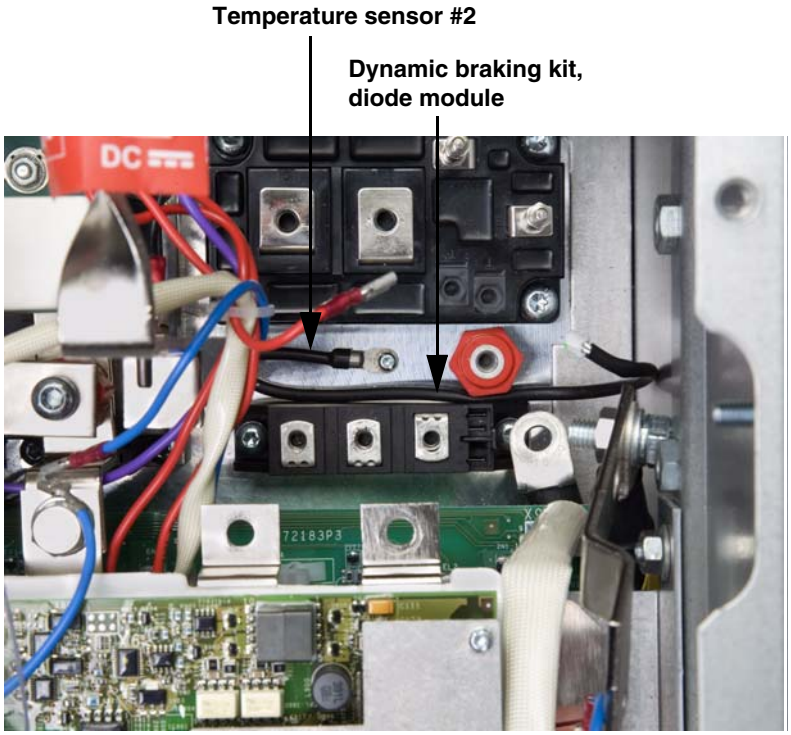


Figure 7: Dynamic Braking Kit and Temperature Sensor #2



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

Removing and Replacing the Front Cover VY1A1212

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

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

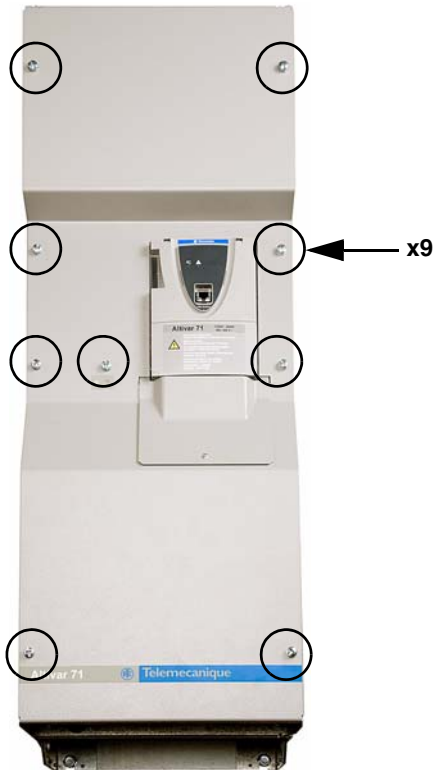
- Read and understand the precautions in "Before You Begin" starting on page 5 before performing this procedure.
- Before working on this equipment, turn off all power supplying it and perform the DC bus voltage measurement procedure on page 11.

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 8.

- 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 8: Front Cover



Replacing the Plastic Parts Kit VY1A1401

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 20
Conduit tray	"Replacing the Conduit Tray" beginning on page 22
EMC tray	"Replacing the Plastic EMC Tray" beginning on page 23
Soft charge board tray	"Replacing the Soft Charge Board VX5A1300" beginning on page 25
Fan control board plate	"Replacing the Fan Control Board VX5A1400" beginning on page 27
Filter board shield	"Replacing the Motor Current Sensors VY1A1107" beginning on page 30
DC reactor terminal shield	"Replace the DC Reactor Terminal Shield" beginning on page 100

Remove the Front Cover

Using a size 2 Phillips driver, remove nine screws and take the front cover off the drive. See Figure 8 on page 19.

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 9 on page 21) on the right that fit into slots on the conduit tray, and three mounting holes (**B,** Figure 10 on page 21) on the left that fit over posts on the side panel of the drive. Disengage the retaining tabs and mounting slots and remove the shield.
2. If you are only replacing the power terminal shield, install the new shield as shown in Figures 9 and 10. Labels for the new shield are included in the plastic kit. Add the new labels in the same positions as on the old shield.

   If you are also replacing the conduit tray or the EMC tray, replace these parts before installing the new power terminal shield. See pages 22 and 23.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Install the power terminal shield as shown in Figures 9 and 10.
- 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 20.
- Do not install a damaged shield.

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

Figure 9: Power Terminal Shield

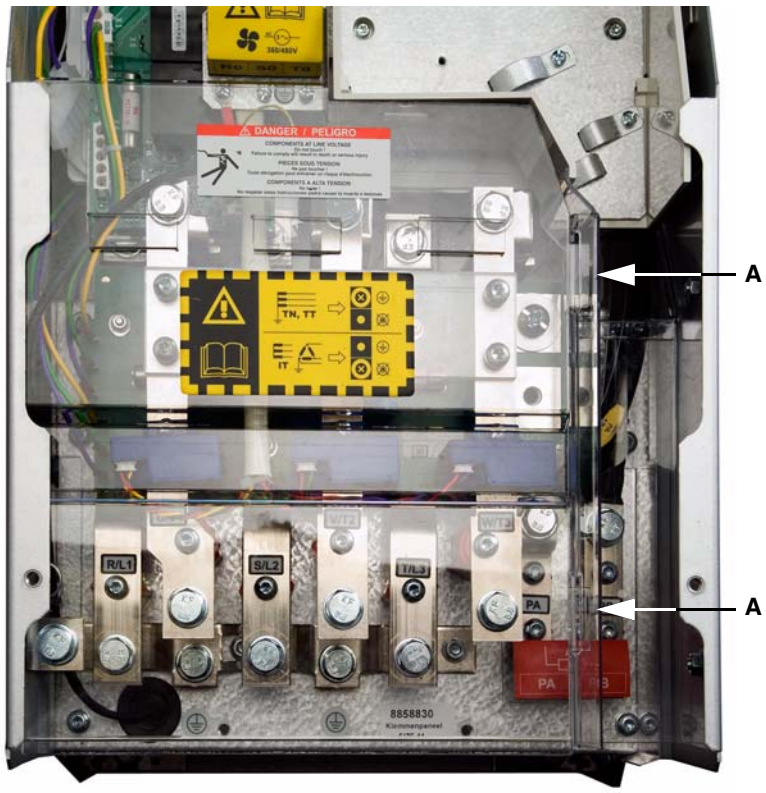
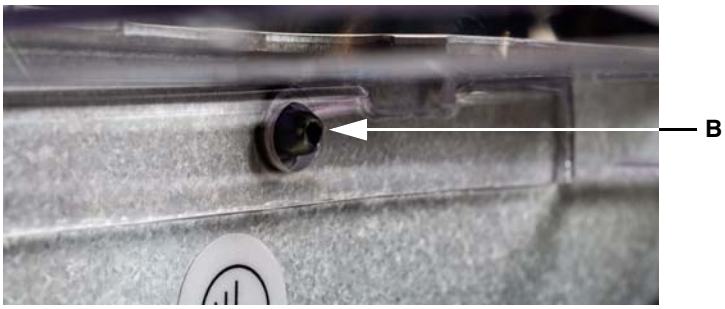


Figure 10: Power Terminal Shield Retaining Post



Replacing the Conduit Tray

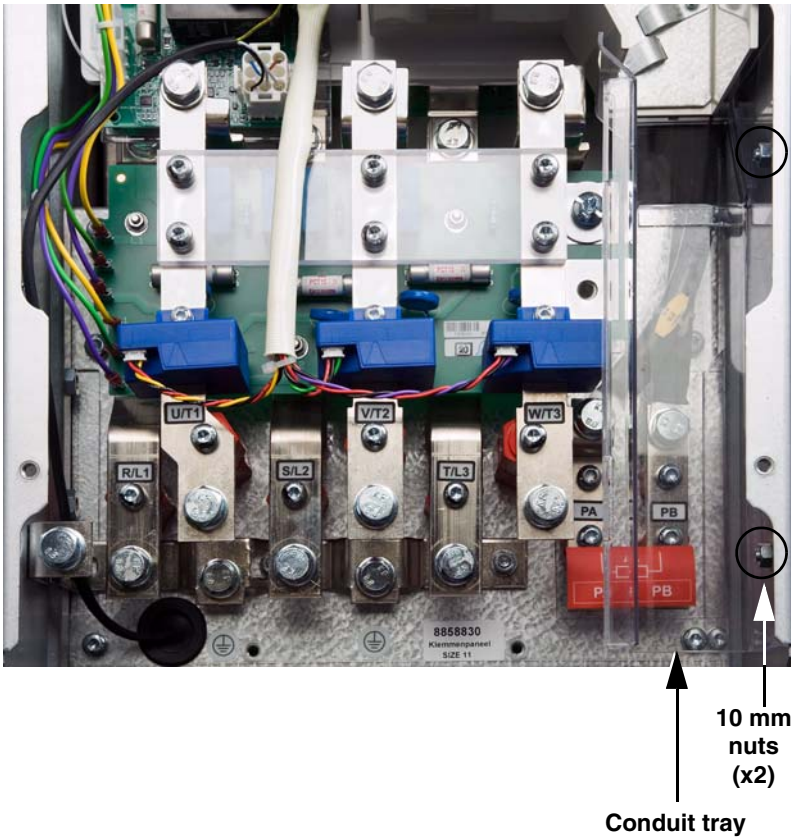
Replace the conduit tray as follows.

1. Remove the power terminal shield. See Step 1 on page 20.
2. Using a 10 mm socket wrench, remove two nuts securing the conduit tray to the drive frame. See Figure 11.
3. Install the new conduit tray and secure it with two 10 mm nuts as illustrated in Figure 11. Tighten the nuts to 5.5 N•m (48.7 lb-in).

NEXT STEP: If you are only replacing the conduit tray, replace the power terminal shield as illustrated in Step 2 on page 20.

If you are also replacing the EMC tray, replace the EMC tray before installing the power terminal shield. See page 23.

Figure 11: Conduit Tray

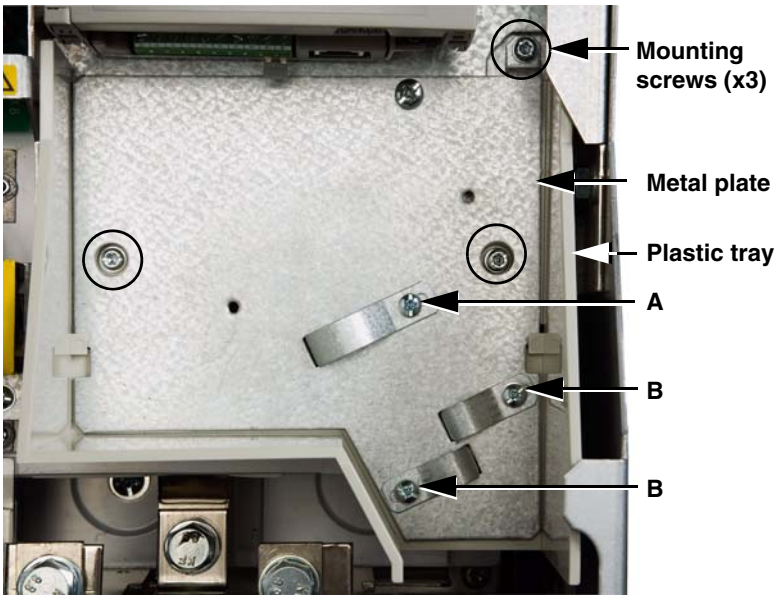


Replacing the Plastic EMC Tray

Replace the plastic EMC tray as follows.

1. Using a T-20 Torx driver, remove three screws securing the EMC tray to the control module mounting plate and remove the tray from the drive. See Figure 12.

Figure 12: Plastic EMC Tray



2. Using a size 2 Phillips driver, remove three screws (**A** and **B**) securing the cable clamps to the metal EMC plate, and remove the clamps from the plate. See Figure 12.

> **NOTE:** Note the differences in the three screws that secure the cable clamps to the EMC plate. The screw (**A**) in the large clamp is longer than the screws (**B**) in the two shorter clamps.

3. Remove the metal EMC plate from the plastic EMC tray and discard the plastic tray.
4. Place the metal EMC plate into the new plastic EMC ray.
5. Using a size 2 Phillips driver, install the cable clamps on the EMC plate with three screws (**A** and **B**). See Figure 12. Tighten the screws to 0.4–0.6 N•m (3.5–5.3 lb-in).
6. Using a T-20 Torx driver, secure the plastic EMC tray to the control module mounting plate with mounting three screws. See Figure 12. Tighten the screws to 0.4–0.6 N•m (3.5–5.3 lb-in).
7. Replace the power terminal shield as illustrated in Step 2 of “Replacing the Power Terminal Shield” on page 20.
8. Replace the front cover. Using a size 2 Phillips driver, secure the front cover with nine screws. See Figure 8 on page 19. 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.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

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

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

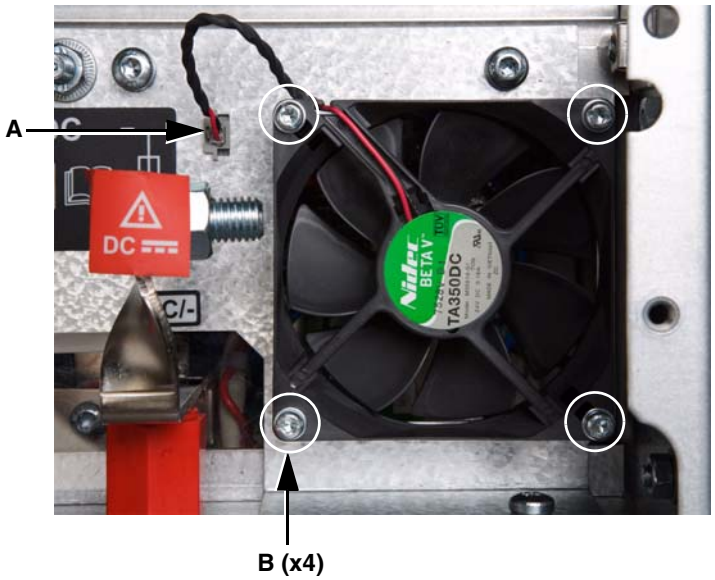
Remove the Front Cover

1. Using a size 2 Phillips driver, remove nine screws and take the front cover off the drive. See Figure 8 on page 19.

Replace the Internal Fan

2. Remove the internal fan as follows. See Figure 13.
   - — 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 13: Internal Fan



3. Install the new fan as follows. See Figure 13.
   - — 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.

Replace the Front Cover

4. Replace the front cover. Using a size 2 Phillips driver, secure the front cover with nine screws. See Figure 8 on page 19. Tighten the screws to 5.5 N•m (48.7 lb-in).

Replacing the Soft Charge Board VX5A1300

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

Table 3: 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
E104	**CN2A**	9-pin, red	PB[3] X30 (7-pin)
E110			MB[4] X30 (2-pin)
E111	**CN7A**	2-pin, black	MB X31

1 See schematic on page 106 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

4 MB: Measuring board

⚠ DANGER

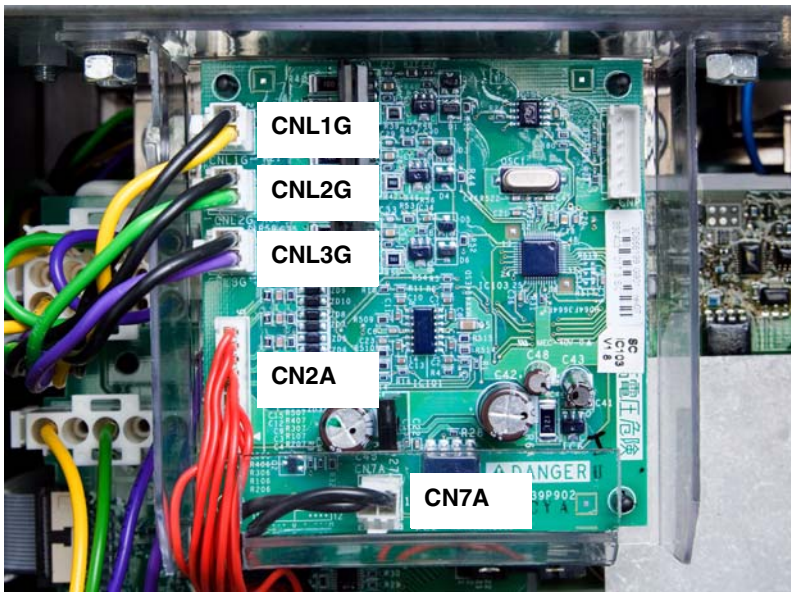
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- 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.

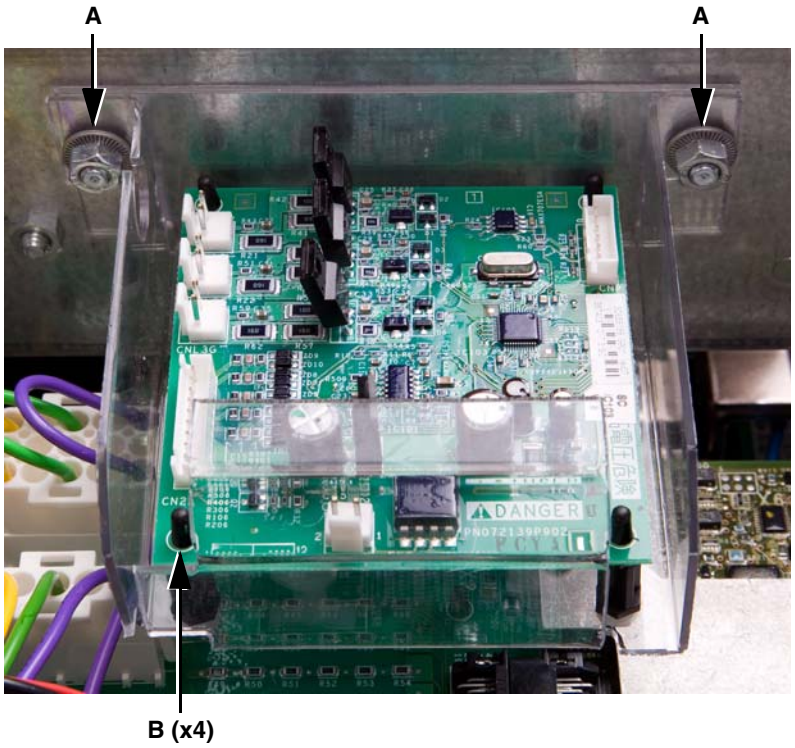
1. Using a size 2 Phillips driver, remove nine screws and take the front cover off the drive. See Figure 8 on page 19.
2. Using needle-nose pliers, carefully remove the following connections from the soft charge board. See Table 3 and Figure 14 for connector locations.
   - — At the left side of the board, from top to bottom remove: the 2-pin connector from terminal CNL1G, the 2-pin connector from terminal CNL2G, the 2-pin connector from terminal CNL3G, and the 9-pin connector from terminal CN2A.
   - — At the bottom of the board, remove the 2-pin connector from terminal CN7A.

Figure 14: Soft Charge Board Connections



3. Using a 10 mm socket wrench, remove the two nuts (**A**) securing the soft charge board plastic tray to the top crossbrace and remove the tray and board from the drive. See Figure 15.
4. Using needle-nose pliers, gently compress the four plastic mounting posts (**B,** Figure 15), one at a time, while lifting the soft charge board off the posts. Remove the soft charge board from the plastic tray.
5. If you are replacing the tray with a new piece from the plastic kit:
   — Using a 7 mm socket wrench remove four bolts securing the plastic standoffs to the old tray and install the standoffs on the new piece. Tighten the standoff bolts to 5.5 N•m (48.7 lb-in).
6. Gently press the new soft charge board down over the four mounting posts (**B,** Figure 15) until it is securely seated.
7. Using a 10 mm socket wrench, secure the plastic tray housing the board to the top crossbrace and secure it with two nuts (**A,** Figure 15). Tighten the nuts to 5.5 N•m (48.7 lb-in).
8. Install five connections to the new soft charge board. See Table 3 and Figure 14 on page 25 for connector locations.
9. Replace the front cover. Using a size 2 Phillips driver, secure the front cover with nine screws. See Figure 8 on page 19. Tighten the screws to 5.5 N•m (48.7 lb-in).

Figure 15: Soft Charge Board



Replacing the Fan Control Board VX5A1400

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

Table 4: Fan Control Board Wiring

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

[1] See schematic on page 106 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] MB: Measuring board

[3] FB: Filter board

⚠ DANGER

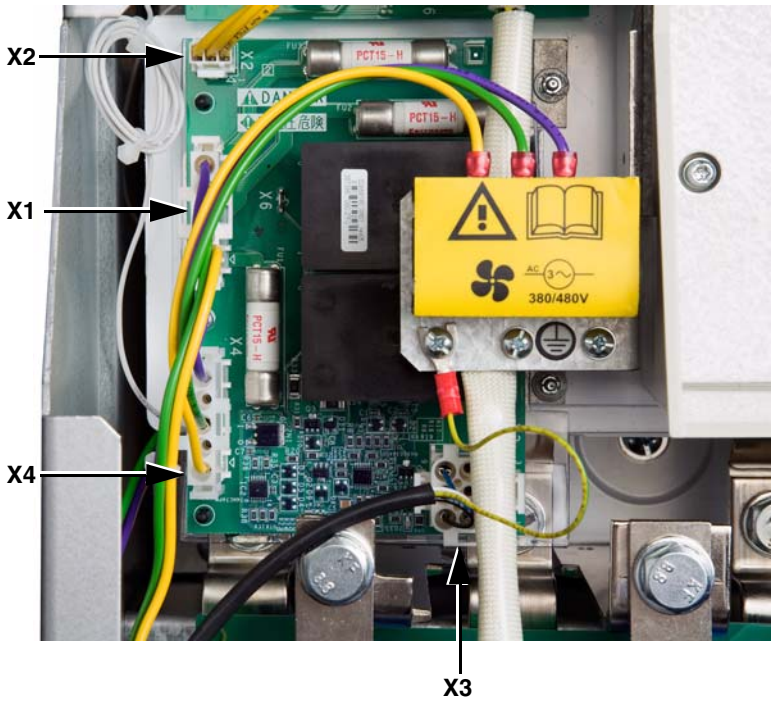
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

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

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

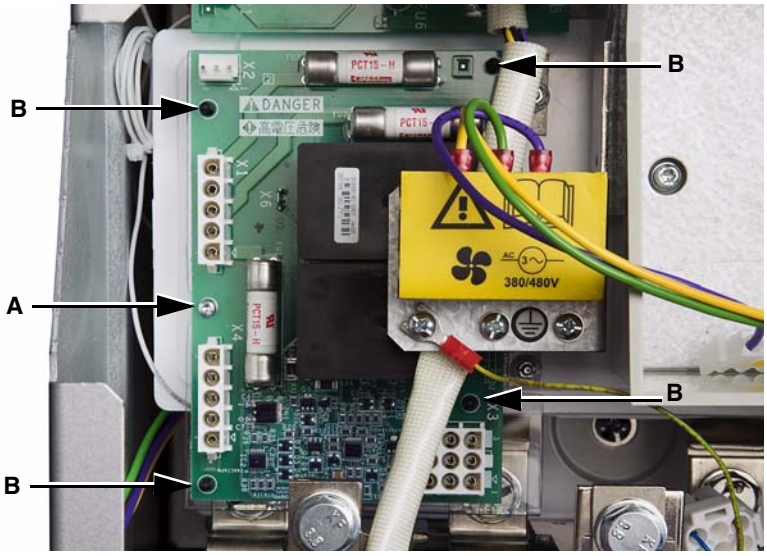
1. Using a size 2 Phillips driver, remove nine screws and take off the front cover of the drive. See Figure 8 on page 19.
2. Remove the power terminal shield as described in Step 1 of "Replacing the Power Terminal Shield" on page 20.
3. Remove the following connections from the fan control board. See Table 4 and Figure 16 for connector locations.
   - — From the left side, remove from top to bottom: the 3-pin connector from terminal X2, the 5-pin connector from terminal X1, and the 5-pin connector from terminal X4.
   - — From the bottom right, remove the 9-pin connector from terminal X3.

Figure 16: Fan Control Board Connections



4. Using a T-10 Torx driver, remove 1 screw (**A,** Figure 17) from the board between connectors X1 and X4.
5. Using needle-nose pliers, gently compress the four plastic mounting posts (**B,** Figure 17), one at a time, while lifting the board off the posts. Remove the board from the drive.

Figure 17: Fan Control Board



6. If you are replacing the plastic plate under the fan control board with a new piece from the plastic kit (see page 20), perform these steps.
   - — Using a 7/32 in. socket wrench, remove two nuts (**C**) securing the plastic and metal mounting plates to the bus assembly, and remove the plates from the drive. See Figure 18 on page 29.
   - — The four plastic standoffs that secure the plastic plate to the metal plate screw off. Remove the standoffs and use them to secure the new plastic piece to the metal mounting plate.
   - — Reinstall the plastic and metal mounting plates on the bus assembly and secure with the two 7/32 in. nuts (**C**, Figure 18 on page 29). Tighten the nuts to 0.8 N•m (7.1 lb-in).

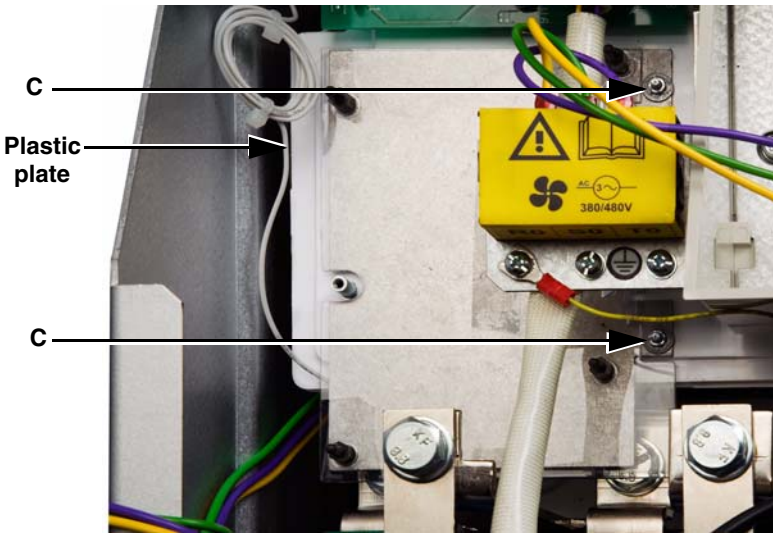
⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Install the fan control board plastic plate as shown in Figure 18 on page 29.
- Before installing the plate, ensure that it has no tears or cracks. If the plate is damaged, install a new piece from the plastic kit. See page 20.
- Do not install a damaged plate.

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

Figure 18: Fan Control Board Plastic Plate



7. Press the new fan control board down over the four mounting posts until it is securely seated.
8. Using a T-10 Torx driver secure the board with one screw (**A,** Figure 17 on page 28). Tighten the screw to 0.8 N•m (7.1 lb-in).
9. Install four connections on the new fan control board. See Table 4 and Figure 16 (page 27) for connector locations.
10. Replace the power terminal shield as illustrated in Step 2 of “Replacing the Power Terminal Shield” on page 20.
11. Replace the front cover. Using a size 2 Phillips driver, secure the front cover with nine screws. See Figure 8 on page 19. Tighten the screws to 5.5 N•m (48.7 lb-in).

Replacing the Motor Current Sensors VY1A1107

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.

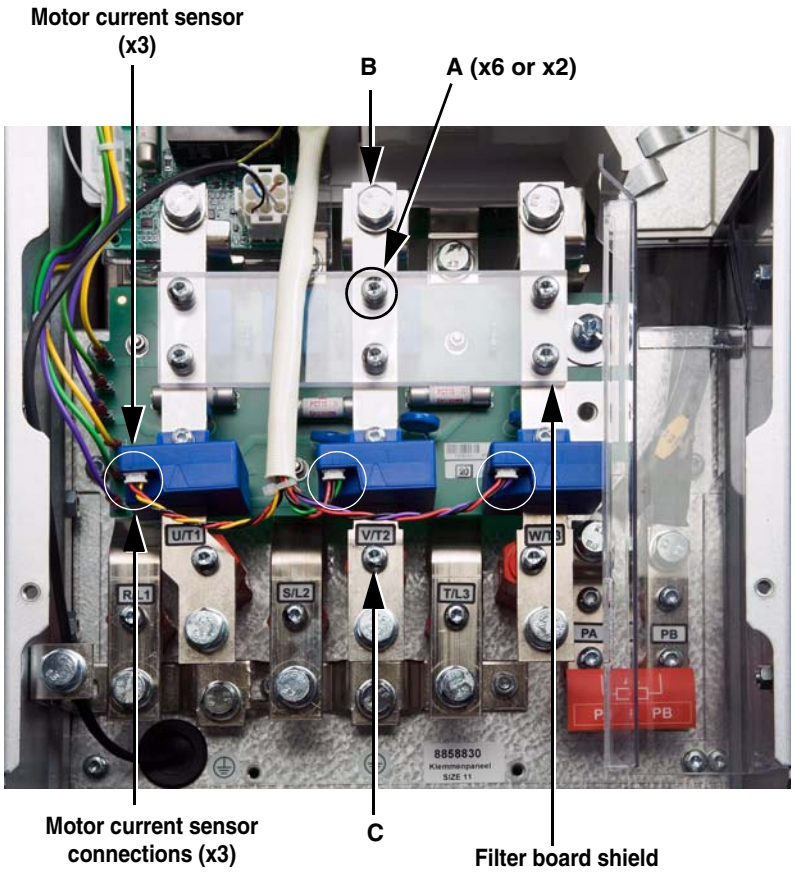
Failure to follow these instructions will result in death or serious injury.

1. Using a size 2 Phillips driver, remove nine screws and take off the front cover of the drive. See Figure 8 on page 19.
2. Remove the power terminal shield as described in Step 1 of "Replacing the Power Terminal Shield" on page 20.
3. Remove the plastic shield over the filter board as follows. See Figure 19.
   - — If you are replacing the shield with a new piece from the plastic kit (see page 20): Using a T-30 Torx driver, remove six screws (**A**) securing the shield to the output bus bars and remove the shield.
   - — If you are not replacing the plastic shield, remove only the two screws securing the plastic shield to the output bus bar with the current sensor that you are replacing.

Table 5: Filter Board and Output Bus Bar Hardware Torque Values

Item	Description	Torque Range	
		N•m	lb-in
A	(6 or 2) T-30 screws	5.5	48.7
B	(1) 16 mm bolt	27	239
C	(1) T-30 screw	5.5	48.7

Figure 19: Motor Current Sensors

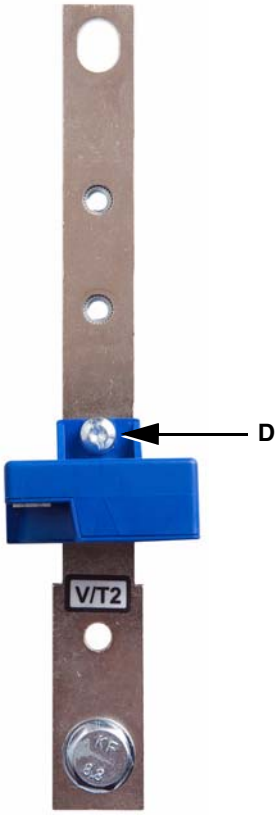


4. Using needle-nose pliers, unplug the three-wire connector from the current sensor that you are replacing. See Figure 19 on page 30.

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

5. Remove the output bus bar as follows. See Figure 19 on page 30.
   - — Using a 16 mm socket wrench, remove one bolt (**B**) securing the top of the bar to the output bus assembly.
   - — Using a T-30 Torx driver, remove one screw (**C**) securing the bottom of the bar to the red insulator and remove the bar from the drive.
6. Replace the motor current sensor as follows. See Figure 20.
   - — Using a T-20 Torx driver, remove one screw (**D**) and slide the motor current sensor off of the output bus bar.
   - — Replace the motor current sensor, secure it with the T-20 screw (**D**), and tighten the screw to 1.1–1.4 N•m (9.7–12.4 lb-in).

Figure 20: Output Bus Bar with Motor Current Sensor



7. Reinstall the output bus bar as follows. See Figure 19 on page 30.
   - — Using a 16 mm socket wrench, attach the top of the bus bar to the output bus assembly with one bolt (**B**).
   - — Using a T-30 Torx driver, attach the bottom of the bus bar to the red insulator with one screw (**C**).
   - — Tighten the hardware to the torque values specified in Table 5 on page 30.

8. Plug the three-wire connector into the motor current sensor. See Figure 19 on page 30.

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

9. Reinstall the plastic shield over the filter board as follows. See Figure 19 on page 30.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Install the filter board shield as shown in Figure 19 on page 30.
- 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 20.
- Do not install a damaged shield.

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

   — If you are replacing the shield with a new piece from the plastic kit (see page 20): Using a T-30 Torx driver, secure the new plastic shield to the output bus bars with six screws (**A)**.

   — If you are not replacing the plastic shield: Using a T-30 Torx driver, secure the shield to the bus bar with the current sensor you replaced with two screws (**A**).

   — Tighten the screws to the torque values specified in Table 5 on page 30.

10. Replace the power terminal shield as illustrated in Step 2 of “Replacing the Power Terminal Shield” on page 20.
11. Replace the front cover. Using a size 2 Phillips driver, secure the front cover with nine screws. See Figure 8 on page 19. Tighten the screws to 5.5 N•m (48.7 lb-in).

Replacing the Filter Board VX4A1113

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 22 on page 35.
- 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.

1. Using a size 2 Phillips driver, remove nine screws and take the front cover off the drive. See Figure 8 on page 19.
2. Remove the power terminal shield as described in Step 1 of "Replacing the Power Terminal Shield" on page 20.
3. Unplug the three-wire connectors from the motor current sensors. See Figure 21 on page 34.

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

4. Remove the output bus bars, with the plastic filter board shield attached, as follows. See Figure 21 on page 34.
   - — Using a 16 mm socket wrench, remove three bolts (**A**) securing the output bus bars to the output bus assembly.
   - — Using a T-30 Torx driver, remove three screws (**B**) securing the output bus bars to the red insulators.
   - — Remove the output bus bars from the drive. The plastic shield comes out attached to the bus bars.

Figure 21: Output Bus Bars

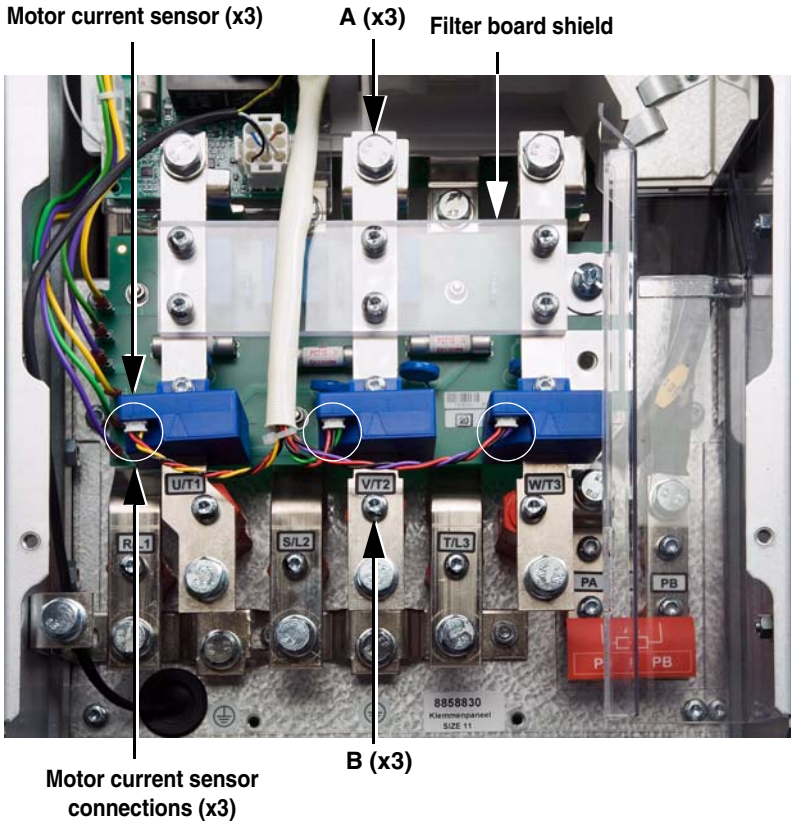


Table 6: Filter Board Wiring

Wire No.[1]	Terminal No.	Description	To:
E118	**X1**	Yellow	FCB[2] X1
	X2	Green	
	X3	Violet	
E120	**X11**	Yellow	PB[3] X7
	X12	Green	
	X13	Violet	

1 See schematic on page 106 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

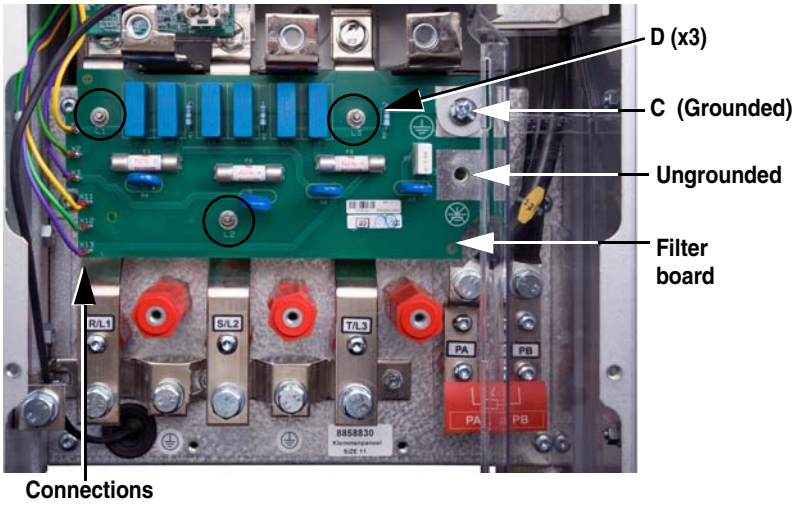
3 PB: Power board

Table 7: Filter Board Hardware Torque Values

Item	Description	Torque Range	
		N•m	lb-in
A	(3) 16 mm bolts	27	239
B	(3) T-30 screws	5.5	48.7
C	(1) #3 Phillips screw with washer	5.5	48.7
D	(3) 7 mm nuts	1.17	10.36

5. Using needle-nose pliers, remove the six connections on the left side of the filter board. See Table 6 and Figure 22 for connector locations.
6. Remove the filter board as follows.
   - — Using a size 3 Phillips driver, remove one screw and washer (**C,** Figure 22) securing the top right corner of the filter board to the drive frame. Note whether the screw is installed in the grounded or non-grounded position for reinstallation. Figure 22 shows the screw in the grounded position.
   - — Using a 7 mm socket wrench, remove three nuts (**D,** Figure 22) securing the filter board to the input bus bars and remove the filter board.

Figure 22: Filter Board



7. Install the new filter board as follows. See Figure 22.
   - — Install the new filter board and secure it to the input bus bars with three 7 mm nuts (**D**).
   - — Secure the filter board to the drive frame with one size 3 Phillips screw and washer (**C**).

NOTE: Be sure to install the size 3 Phillips screw and washer (**C**) in the original position. Figure 22 shows the screw in the grounded position.

   - — Tighten the hardware to the torque values specified in Table 7.
8. Replace the six connections on the left side of the filter board. See Table 6 and Figure 22 for connector locations.

NOTE: Note the differences in the terminal sizes. X1, X2, and X3 are 0.25 in. terminals; X11, X12, and X13 are 0.19 in. terminals.

9. Replace the output bus bars, with the plastic filter board shield attached, as follows. See Figure 21 on page 34.
   - — Using a 16 mm socket wrench, secure the output bus bars to the output bus assembly with three bolts (**A**).
   - — Using a T-30 Torx driver, securing the output bus bars to the red insulators with three screws (**B**).
   - — Tighten the hardware to the torque values specified in Table 7.

10. Plug the three-wire connectors into the motor current sensors. See Figure 21 on page 34.

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

11. Replace the power terminal shield as illustrated in Step 2 of “Replacing the Power Terminal Shield” on page 20.
12. Replace the front cover. Using a size 2 Phillips driver, secure the front cover with nine screws. See Figure 8 on page 19. Tighten the screws to 5.5 N•m (48.7 lb-in).

Installation Procedures for Bottom Section Parts

The bottom section parts are under the control module assembly or the bus assembly. They are:

Measuring board	Temperature sensor #1
Power board	Power IGBT modules
Gate driver boards	Capacitors

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

Disassembly Steps for Accessing Bottom Section 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 equipment from the drive:

- ❏ The front cover
- ❏ The power terminal shield
- ❏ The soft charge board
- ❏ The EMC tray
- ❏ The control module assembly
- ❏ The fan control board
- ❏ The bus assembly

You must perform some or all of the procedures in this section to access the bottom section spare parts. Consult Table 8 for the disassembly steps that must be performed to access the spare parts you are replacing.

Table 8: Disassembly Steps

If you are replacing:	Perform disassembly steps:	Then follow procedure:
Measuring board VX5A71HC13N4	**Steps 1–7**	"Replacing the Measuring Board VX5A71HC13N4" beginning on page 47
Power board VX5A1HC1316	**Steps 1–12**	"Replacing the Power Board VX5A1HC1316" beginning on page 51
Gate driver board VX5A1200	**Steps 1–12**	"Replacing Gate Driver Board VX5A1200 and Temperature Sensor #1 VZ3G1104" beginning on page 55
Temperature sensor #1 VZ3G1104	**Steps 1–12**	
Power IGBT modules VZ3IM1600M1271	**Steps 1–12**	"Replacing the Power IGBT Modules VZ3IM1600M1271 and Capacitors VY1ADC1112" beginning on page 59
Capacitors VY1ADC1112		

Remove the Front Cover

1. Using a size 2 Phillips driver, remove nine screws and take off the front cover. See Figure 8 on page 19.

Remove the Power Terminal Shield

2. The power terminal shield has two retaining tabs (**A,** Figure 23) on the right that fit into slots on the conduit tray, and three mounting holes (**B,** Figure 24) 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 23: Power Terminal Shield

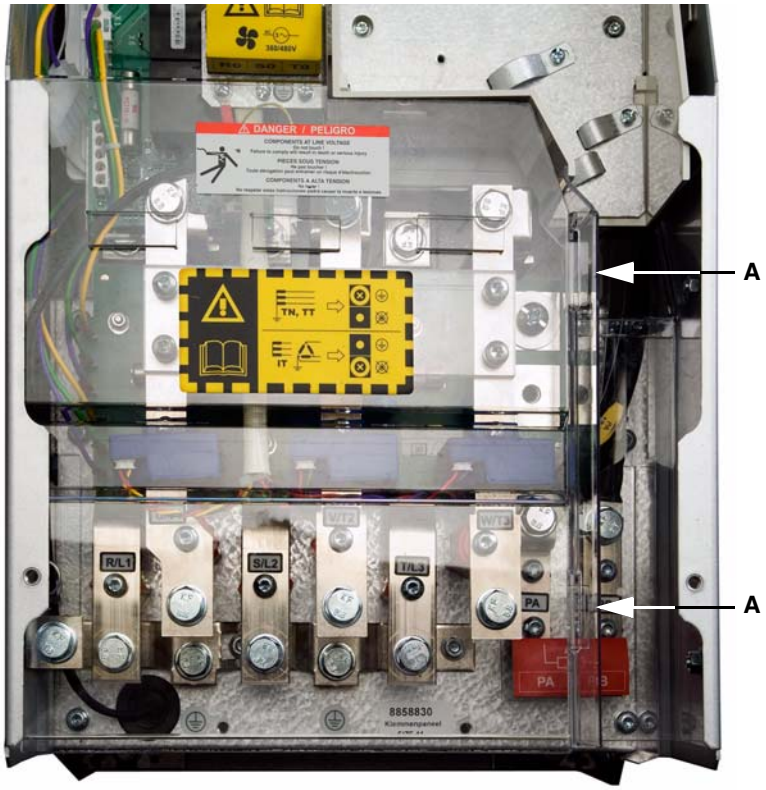
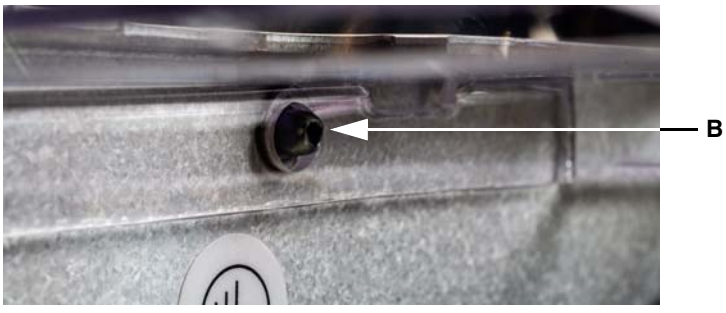


Figure 24: Power Terminal Shield Retaining Post



Remove the Soft Charge Board

Table 9: 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
E104	**CN2A**	9-pin, red	PB[3] X30 (7-pin)
E110			MB[4] X30 (2-pin)
E111	**CN7A**	2-pin, black	MB X31

1 See schematic on page 106 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.

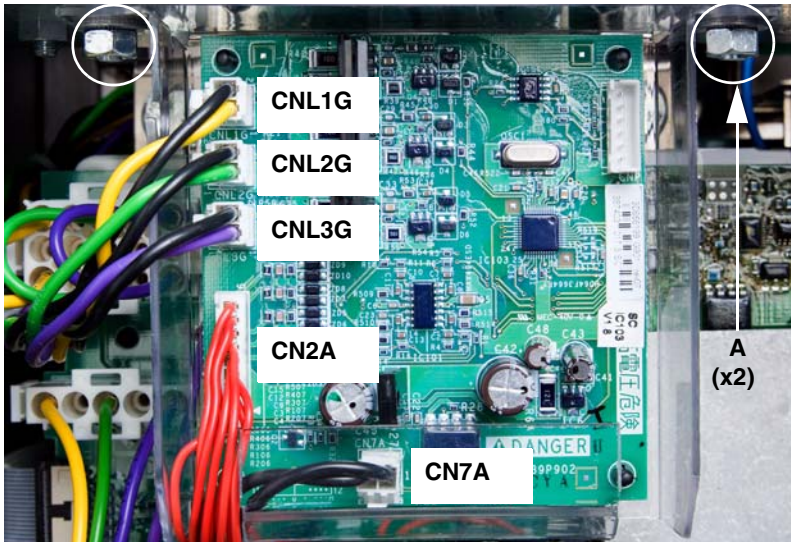
2 SCR: Silicon controlled rectifier

3 PB: Power board

4 MB: Measuring board

3. Using needle-nose pliers, carefully remove the following connections from the soft charge board. See Table 9 and Figure 25 for connector locations.
   - — At the left side of the board, from top to bottom remove: the 2-pin connector from terminal CNL1G, the 2-pin connector from terminal CNL2G, the 2-pin connector from terminal CNL3G, and the 9-pin connector from terminal CN2A.
   - — At the bottom of the board, remove the 2-pin connector from terminal CN7A.
4. Using a 10 mm socket wrench, remove the two nuts (**A**) securing the soft charge board plastic tray to the top crossbrace, and remove the tray and board from the drive. See Figure 25.

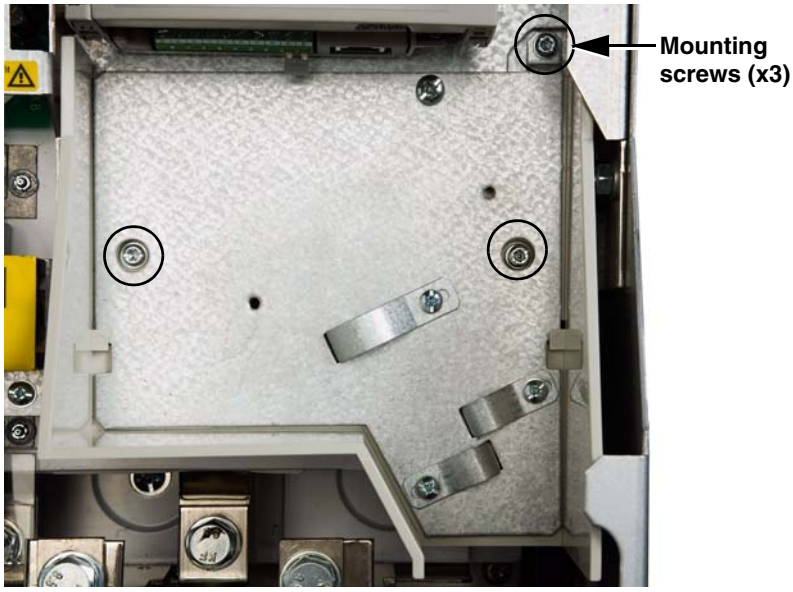
Figure 25: Soft Charge Board



Remove the EMC Tray

5. Using a T-20 Torx driver, remove three screws securing the EMC tray to the control module plate and remove the EMC tray from the drive. See Figure 26.

Figure 26: EMC Tray



Remove the Control Module Assembly

6. Remove the following connections.
   - — Using a size 2 Phillips driver, loosen one screw (**A,** Figure 27) and remove the ground wire from the control module TB1 bracket.
   - — Remove the 5-pin connector (**B,** Figure 27) from fan control board terminal X4.
   - — Remove the 26-pin ribbon cable (**C,** Figure 28 on page 41) from motor control board terminal X3.

Figure 27: TB1 and Fan Control Board Connections

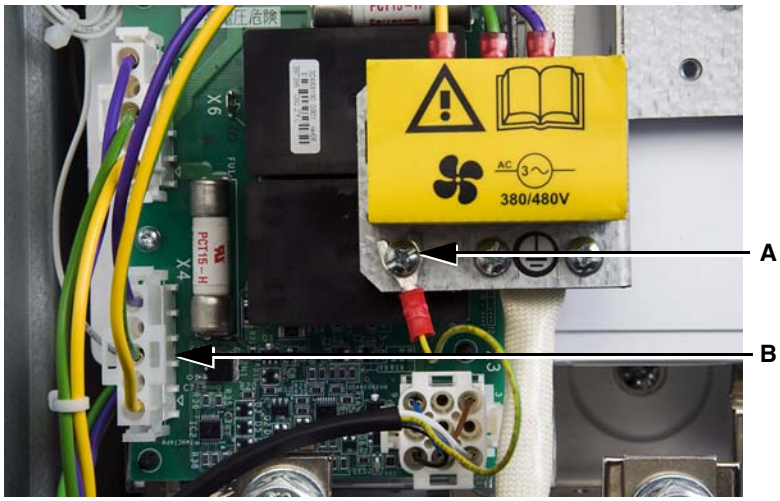
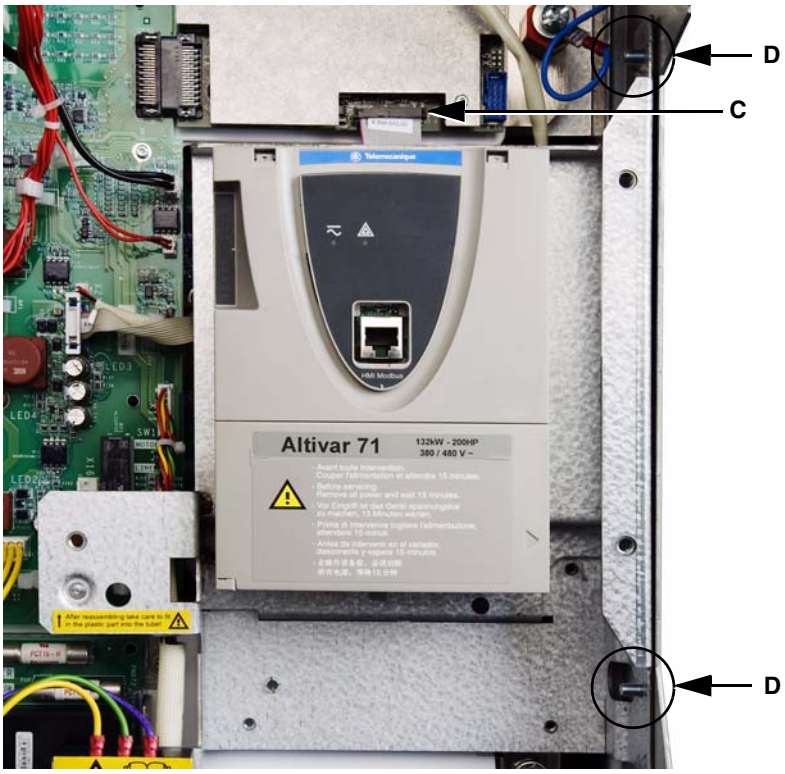


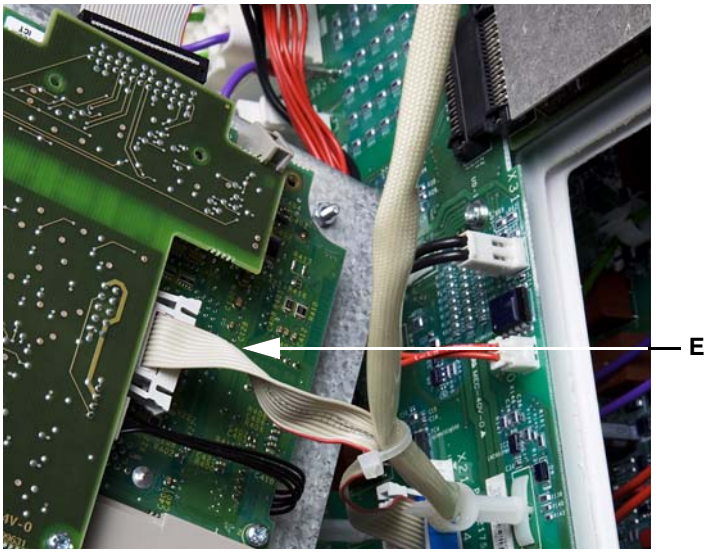
Figure 28: Control Module Assembly



7. Using a 10 mm socket wrench, remove two nuts (**D,** Figure 28) securing the control module assembly to the drive frame.

   Turn the assembly over, disconnect the ribbon cable from the back (**E,** Figure 29), and remove the assembly from the drive.

Figure 29: Back of Control Module Assembly

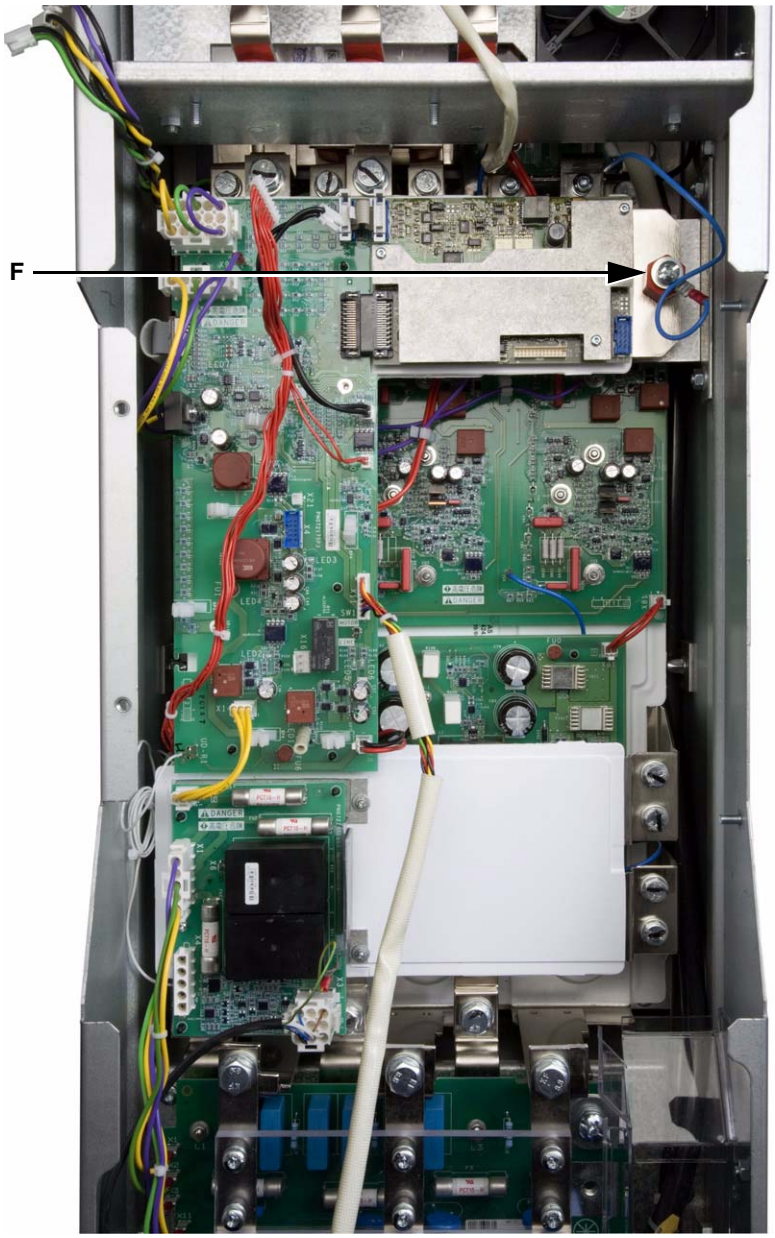


NEXT STEP: If you are replacing the measuring board, skip to “Replacing the Measuring Board VX5A71HC13N4” on page 47.

Remove the Bus Assembly Connection

8. Using a size 2 Phillips driver, remove one screw (**F,** Figure 30) securing the blue wire to the red insulator on the bus assembly.

Figure 30: Bus Assembly Connection



Remove the Measuring Board Connections

Table 10: Measuring Board Wiring

Wire No.[1]	Terminal No.	Description	To:
—	**X2**	10-pin, gray ribbon	MCB[2]
E111	**X31**	2-pin, black	SCB[3] CN7A
E110	**X30**	2-pin, red	SCB CN2A
E106	**X21**	2-pin, red/black	Internal fan
E112	**X4**	10-pin, white ribbon	Control module
E103	**X11**	9-pin, multi-color	Output current sensors T1, T2, T3
E100	**X8**	2-pin, black/red	PB[4] X82
E141	**UD-R1**	1-pin, white	Bleeder resistor
E105	**X14**	3-pin, yellow	FCB[5] X2
E142	**X3**	18-pin, gray	GDB[6] X31
E143	**X5**	5-pin, 3-wires, violet/green/ yellow	GDB X21, X22, X23
E128	**X93**	1-pin, violet	DBB[7] X2
—	**X6**	15-pin jumper assembly, violet/green/ yellow	—

1 See schematic on page 106 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

2 MCB: Motor control board

3 SCB: Soft charge board

4 PB: Power board

5 FCB: Fan control board

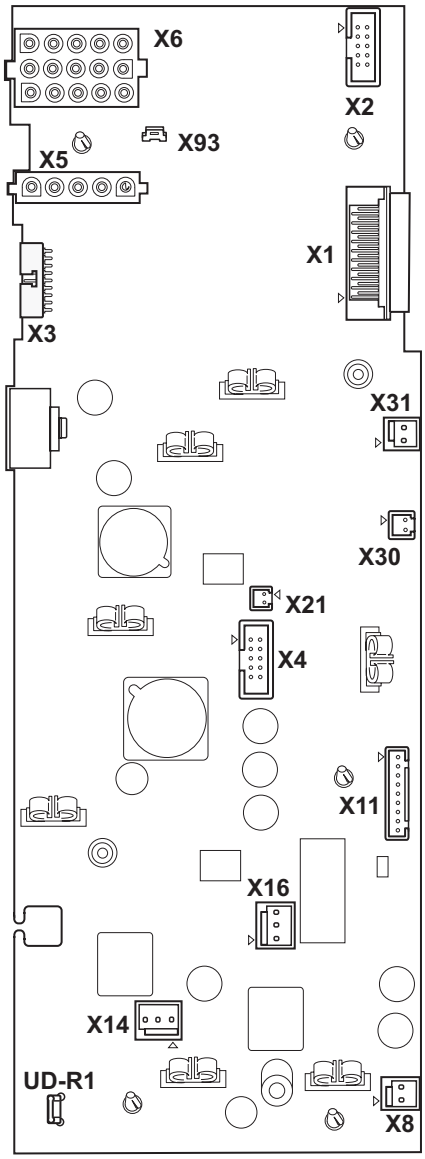
6 GDB: Gate driver board

7 DBB: Dynamic braking board

9. Using needle-nose pliers, carefully remove all wiring connections from the measuring board **except** the connections at terminals X2, X6, and X14. See Table 10 and Figure 31 for terminal locations.

NOTE: Do not remove the connections at terminals X2, X6, and X14.

Figure 31: Measuring Board Layout



NOTE: X16 is not used.

Remove the Fan Control Board Assembly

NOTE: The fan control board assembly consists of the fan control board, a plastic shield, and a metal back plate.

Table 11: Fan Control Board Wiring

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

1 See schematic on page 106 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 MB: Measuring board

3 FB: Filter board

10. Remove the fan control board connections as follows. See Table 11 and Figure 32 for connector locations.
    - — From the left side of the board, remove from top to bottom: the 3-pin connector from terminal X2, the 5-pin connector from terminal X1, and the 5-pin connector from terminal X4.
    - — From the bottom right, remove the 9-pin connector from terminal X3.
11. Remove the fan control board assembly as follows. See Figure 33.
    - — Using a 7/32 in. socket wrench, remove two nuts (**A**) securing the fan control board assembly to the bus assembly.
    - — Using a T-10 Torx driver, remove the screw (**B**) between terminals X1 and X4 on the left edge of the board.
    - — Remove the fan control board assembly from the drive.

Figure 32: Fan Control Board Connections

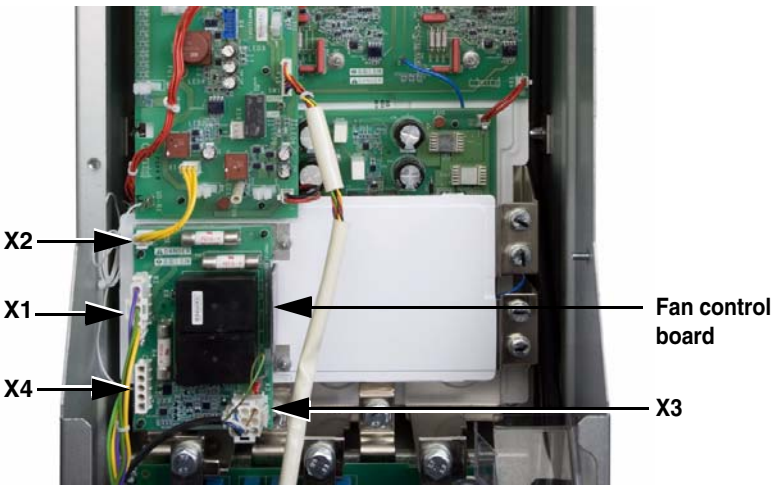
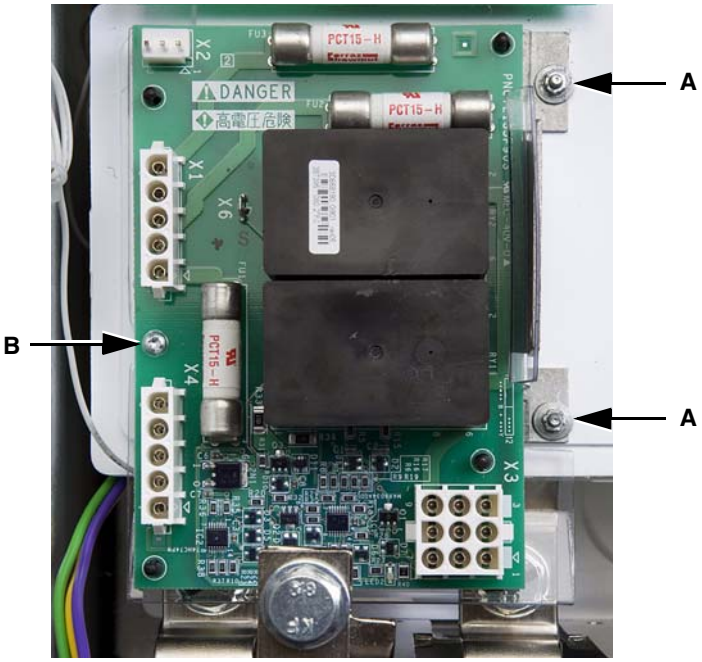


Figure 33: Fan Control Board



Remove the Bus Assembly

NOTE: The bus assembly consists of the laminated bus plate with the motor control board, measuring board, and fan control board attached. See Figure 34.

12. Remove the bus assembly as follows:

— Using a T-30 Torx driver, remove two screws (**A**, Figure 35 on page 46) securing the bus assembly to the braking positive and negative bus.

— Using a 13 mm socket wrench, remove three bolts (**B**, Figure 35 on page 46) securing the bus assembly to terminal 1 of the SCR modules.

— Using a 13 mm socket wrench, remove four bolts (**C**, Figure 36 on page 46) securing the bus assembly to the positive and negative bus.

— Using a 16 mm socket wrench, remove two bolts (**D**, Figure 35 on page 46) securing the bus assembly to the positive and negative SCR bus assembly connections.

— Using a 16 mm socket, remove three bolts (**E**, Figure 36 on page 46) securing the bus assembly to the AC input bus bars.

— Using a 21 mm wrench, remove the top half of the red insulator (**F**, Figure 35 on page 46).

— Remove the bus assembly from the drive.

NEXT STEP: If you are replacing the power board, skip to “Replacing the Power Board VX5A1HC1316” on page 51.

If you are replacing the gate driver boards or temperature sensor #1, skip to “Replacing Gate Driver Board VX5A1200 and Temperature Sensor #1 VZ3G1104” on page 55.

If you are replacing the power IGBT modules or the capacitors, skip to “Replacing the Power IGBT Modules VZ3IM1600M1271 and Capacitors VY1ADC1112” on page 59.

Figure 34: Bus Assembly Overview

Figure 35: Bus Assembly Top

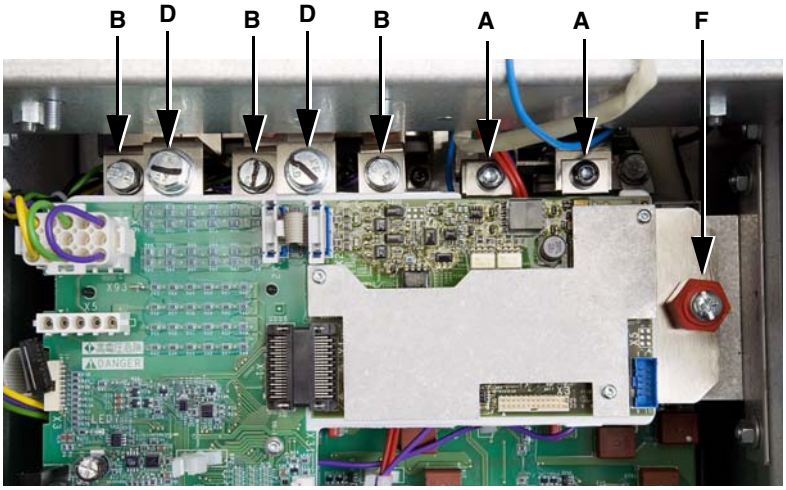
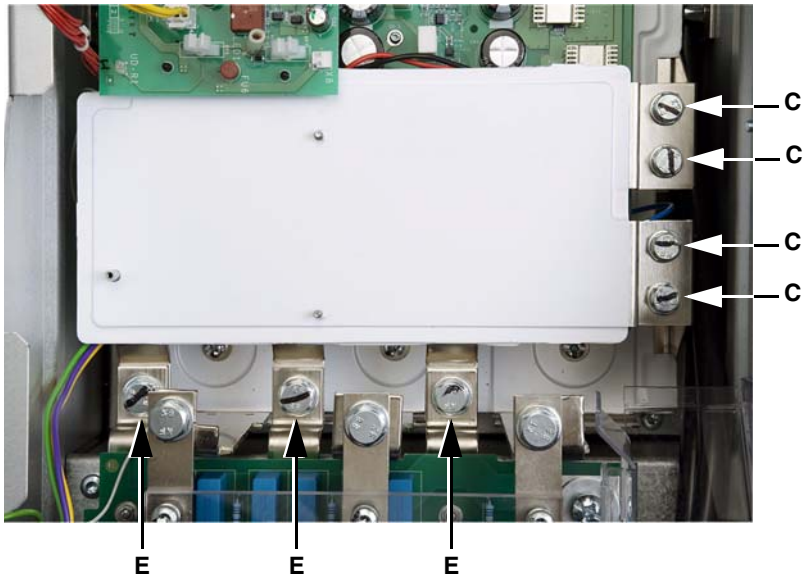


Figure 36: Bus Assembly Bottom



Replacing the Measuring Board VX5A71HC13N4

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 1–7 of "Disassembly Steps for Accessing Bottom Section Parts" beginning on page 37 to remove the following parts from the drive:

- ❏ The front cover
- ❏ The power terminal shield
- ❏ The soft charge board
- ❏ The EMC tray
- ❏ The control module assembly

Remove the Measuring Board Connections

1. Using needle-nose pliers, carefully remove all connections from the measuring board. See Table 12 and Figure 37 for terminal locations.

Table 12: Measuring Board Wiring

Wire No.[1]	Terminal No.	Description	To:
—	**X2**	10-pin, Gray ribbon	MCB[2]
E111	**X31**	2-pin, black	SCB[3] CN7A
E110	**X30**	2-pin, red	SCB CN2A
E106	**X21**	2-pin, red/black	Internal fan
E112	**X4**	10-pin, white ribbon	Control module
E103	**X11**	9-pin, multi-color	Output current sensors T1, T2, T3
E100	**X8**	2-pin, black/red	PB[4] X82
E141	**UD-R1**	1-pin, white	Bleeder resistor
E105	**X14**	3-pin, yellow	FCB[5] X2
E142	**X3**	18-pin, gray	GDB[6] X31
E143	**X5**	5-pin, 3-wires, violet/green/ yellow	GDB X21, X22, X23
E128	**X93**	1-pin, violet	DBB[7] X2
—	**X6**	15-pin jumper assembly, violet/green/ yellow	—

1 See schematic on page 106 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

2 MCB: Motor control board

3 SCB: Soft charge board

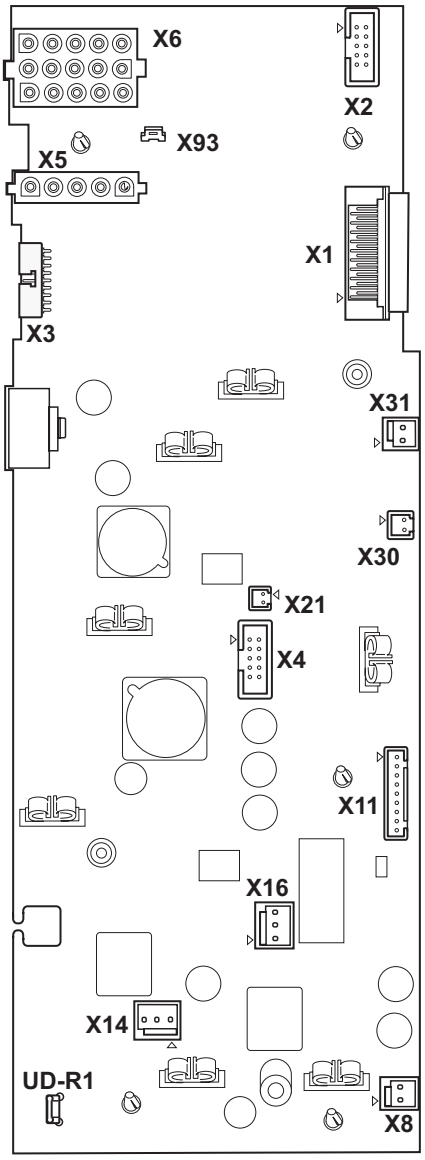
4 PB: Power board

5 FCB: Fan control board

6 GDB: Gate driver board

7 DBB: Dynamic braking board

Figure 37: Measuring Board Layout

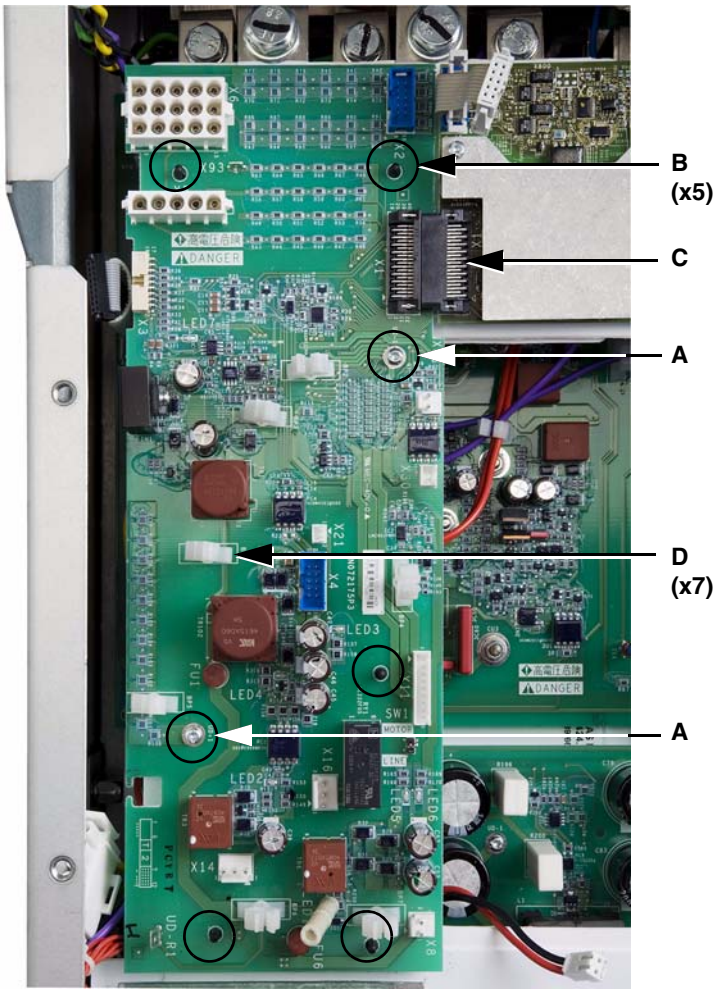


NOTE: X16 is not used.

Remove the Measuring Board

2. Using T-10 Torx driver, remove two screws (**A,** Figure 38) securing the measuring board to the bus assembly.
3. Using needle-nose pliers and working from the bottom of the board up, gently compress the five plastic mounting posts (**B,** Figure 38), one at a time, while lifting the measuring board off the posts.
4. Slide the measuring board to the left and disconnect it from motor control board terminal X1 (**C,** Figure 38). Remove the board from the drive.

Figure 38: Measuring Board



Install the New Measuring Board

5. Transfer the seven plastic cable clamps (**D,** Figure 38 on page 49) from the old measuring 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.
6. Transfer the 15-pin jumper assembly to terminal X6 of the new board. See Figure 37 on page 48 for the terminal location.
7. Position the new measuring board over the five plastic mounting posts (**B,** Figure 38 on page 49) on the bus assembly, but do not seat the board over the posts.
8. Connect the measuring board to motor control board terminal X1 (**C**, Figure 38 on page 49) then gently push the board down over the mounting posts until it is securely seated.
9. Using a T-10 Torx driver, secure the measuring board with two screws (**A,** Figure 38 on page 49). Tighten the screws to 0.5–0.7 N•m (4.4–6.2 lb-in).

Reassemble the Drive

If you are only replacing the measuring board, perform Steps 6–13 of "Reassembly Steps for Bottom Section Parts" beginning on page 65 to replace the following parts:

- ❑ The control module assembly
- ❑ The EMC tray
- ❑ The soft charge board
- ❑ The power terminal shield
- ❑ The front cover

Replacing the Power Board VX5A1HC1316

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 1–12 of "Disassembly Steps for Accessing Bottom Section Parts" beginning on page 37 to remove the following parts from the drive:

- ❑ The front cover
- ❑ The power terminal shield
- ❑ The soft charge board
- ❑ The EMC tray
- ❑ The control module assembly
- ❑ The bus assembly connection
- ❑ The measuring board connections
- ❑ The fan control board assembly
- ❑ The bus assembly

Remove the Power Board Connections

1. Using needle-nose pliers, carefully remove all connections from the power board. Retain the wires from terminal X30 and terminal X82 to transfer onto the new power board. See Table 13 and Figure 39 for connector locations.

Table 13: Power Board Wiring

Wire No.[1]	Terminal No.	Description	To:
E126	**X10**	3-pin, red	SB[2] X10 and X11
E139	**UD+R1**	1-pin, white	Bleeder resistor
E137	**UD+1**	1-pin, red	DC bus assembly
E104	**X30**	7-pin, red	MB[3] X30 and SCB[4] CN2A
E120	**X7**	5-pin, violet/green/yellow	FB[5] X11, X12, X13
E100	**X82**	2-pin, red/black	MB[6] X8
E136	**X50**	1-pin, blue	DC bus
E138	**X81**	2-pin, red/red	GDB[7] X81

[1] See schematic on page 106 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

[2] SB: Snubber board

[3] MB: Measuring board

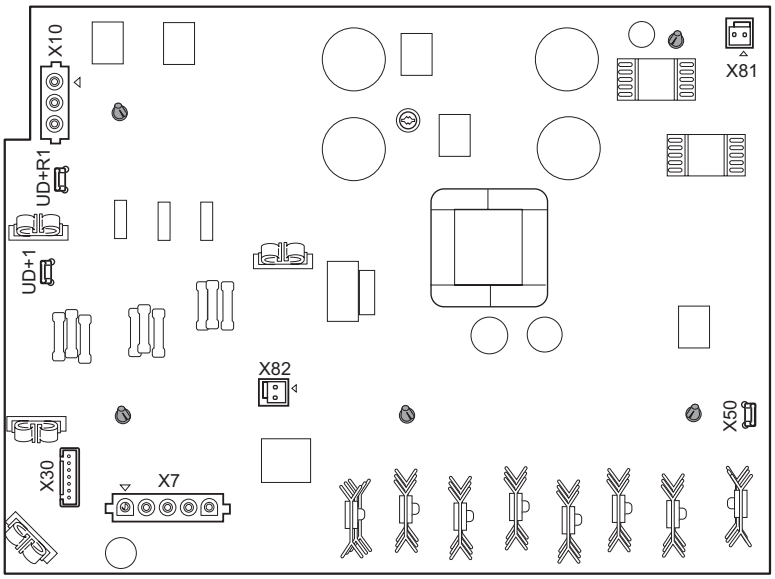
[4] SCB: Soft charge board

[5] FB: Filter board

[6] MB: Measuring board

[7] GDB: Gate driver board

Figure 39: Power Board Connections



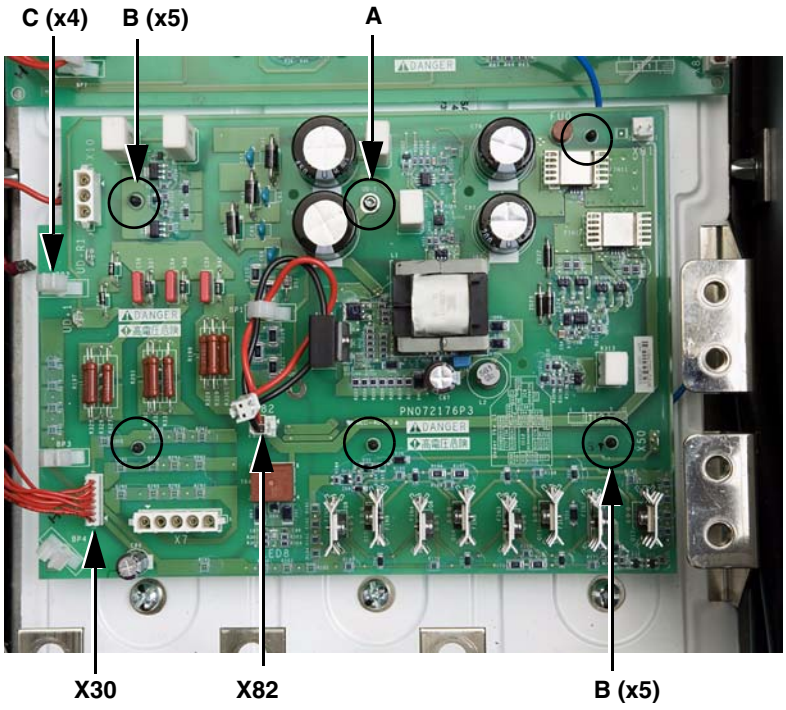
Remove the Power Board

2. Remove the old power board as follows.
   - — Using a T-10 Torx driver, remove one screw (**A,** Figure 40) securing the power board to the DC bus plate.
   - — Using needle-nose pliers, gently compress the five plastic mounting posts (**B**, Figure 40), one at a time, while lifting the power board off the posts.

Install the Power Board

3. Install the 7-pin red cable from terminal X30 and the 2-pin red/black cable from terminal X82 of the old board onto the corresponding terminals of the new board. See Figure 40.
4. Transfer the four plastic cable clamps (**C,** Figure 40) 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.
5. Gently push the new power board down over the five plastic mounting posts (**B**, Figure 40) until it is securely seated.
6. Using a T-10 Torx driver, secure the power board to the DC bus plate with one screw (**A,** Figure 40). Tighten the screw to 0.5–0.7 N•m (4.4–6.2 lb-in).
7. Replace the power board wiring. See Table 13 and Figure 39 on page 52 for the connections.

Figure 40: Power Board



Reassemble the Drive

If you are only replacing the power board, perform Steps 1–13 of "Reassembly Steps for Bottom Section Parts" beginning on page 65 to replace the following parts:

- ❑ The bus assembly
- ❑ The fan control board assembly
- ❑ The measuring board connections
- ❑ The bus assembly connection
- ❑ The control module assembly
- ❑ The EMC tray
- ❑ The soft charge board
- ❑ The power terminal shield
- ❑ The front cover

Replacing Gate Driver Board VX5A1200 and 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.

Before performing the steps in this procedure, perform Steps 1–12 of "Disassembly Steps for Accessing Bottom Section Parts" beginning on page 37 to remove the following parts from the drive:

- ❑ The front cover
- ❑ The power terminal shield
- ❑ The soft charge board
- ❑ The EMC tray
- ❑ The control module assembly
- ❑ The bus assembly connection
- ❑ The measuring board connections
- ❑ The fan control board assembly
- ❑ The bus assembly

Remove the Gate Driver Board Connections

1. Using needle-nose pliers, carefully remove all connections from the gate driver board **except** the 18-pin connector at terminal X31, the 1-pin connector at terminal X21, the 1-pin connector at terminal X22, and the 1-pin connector at terminal X23. See Table 14 and Figure 41 for connector locations.

NOTE: Do not remove the connections at terminals X31, X21, X22, and X23.

Table 14: Gate Driver Board Wiring

Wire No.[1]	Terminal No.	Description	To:
E135	**X4**	2-pin, black	Temperature sensor #1
E134	**X91**	10-pin, white	DBB[2] X1
E142	**X31**	18-pin, gray	MB[3] X3
E132	**X52**	1-pin, blue	DBB X6
E143	**X21**	1-pin, yellow	MB X5
	X22	1-pin, green	MB X5
	X23	1-pin, violet	MB X5
E129	**X51**	1-pin, blue	+ DC bus
E138	**X81**	2-pin, red/red	PB[4] X81

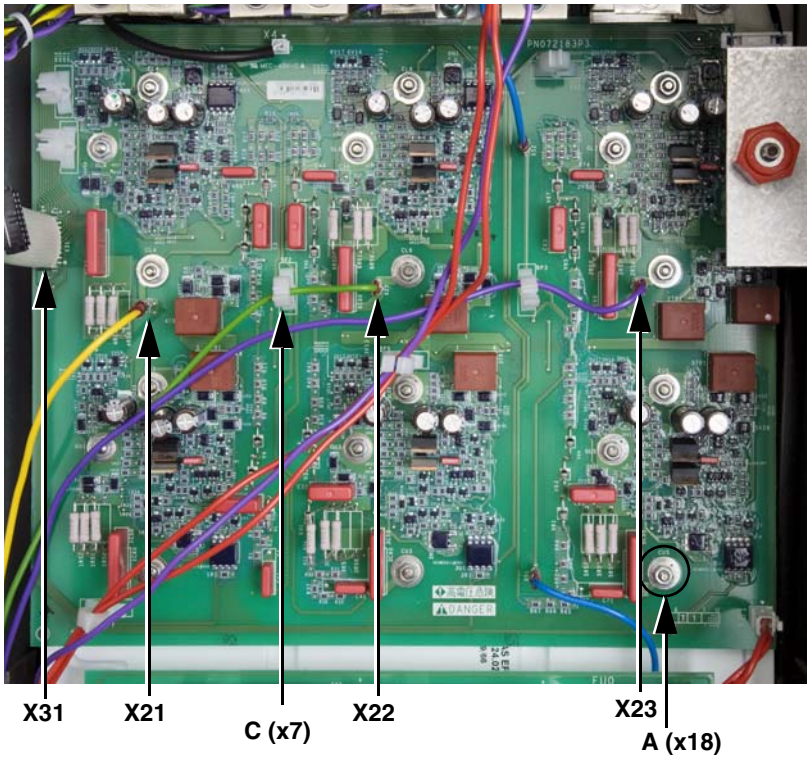
[1] See schematic on page 106 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

[2] DBB: Dynamic braking board

[3] MB: Measuring board

[4] PB: Power board

Figure 41: Gate Driver Board



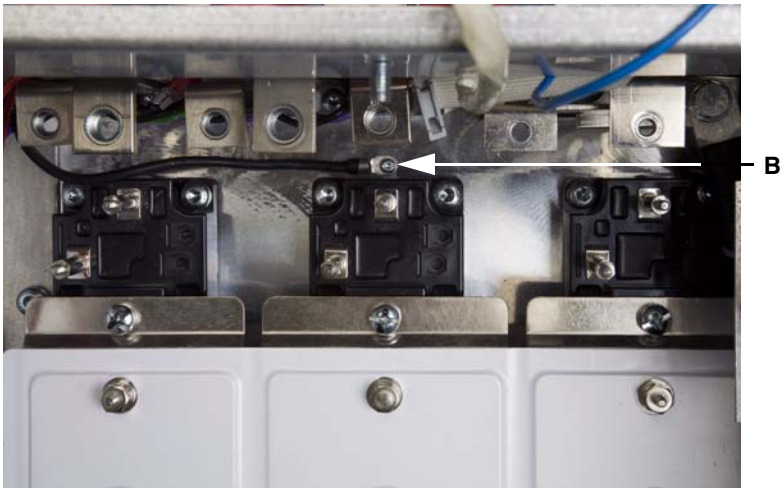
Remove the Gate Driver Board

2. Using a 7 mm socket wrench, remove 18 nuts (**A**, Figure 41 on page 56) securing the gate driver board to the DC bus plate, and remove the board from the drive.

Replace the Temperature Sensor #1

3. Replace the temperature sensor as follows.
   - — Using a T-10 Torx driver, remove one screw (**B,** Figure 42) securing the temperature sensor to the heatsink.
   - — Using a T-10 Torx driver, secure the new temperature sensor to the heatsink with one screw. Tighten the screw to 0.4–0.6 N•m (3.5–5.3 lb-in).

Figure 42: Temperature Sensor #1



Install the Gate Driver Board

4. Remove the following connections from the old gate driver board and transfer them to the corresponding terminals on the new board. See Table 14 and Figure 41 on page 56 for terminal locations.
   - — The 18-pin connector at terminal X31
   - — The 1-pin connector at terminal X21
   - — The 1-pin connector at terminal X22
   - — The 1-pin connector at terminal X23
5. Transfer the seven plastic cable clamps (**C,** Figure 41 on page 56) from the old gate driver board onto the new one as follows.
   - — To remove a clamp, pinch the clamp on the bottom side of the board and push it up through the mounting hole.
   - — Snap the cable clamps into the mounting holes on the new board.
6. Using a 7 mm socket wrench, secure the gate driver board to the DC bus plate with 18 nuts (**A**, Figure 41 on page 56). Tighten the nuts to 1.2 N•m (10.6 lb-in).
7. Replace the gate driver board wiring. See Table 14 and Figure 41 on page 56 for the terminal locations.

Reassemble the Drive

If you are only replacing the gate driver board or temperature sensor #1, perform Steps 1–13 of “Reassembly Steps for Bottom Section Parts” beginning on page 65 to replace the following parts:

- ❑ The bus assembly
- ❑ The fan control board assembly
- ❑ The measuring board connections
- ❑ The bus assembly connection
- ❑ The control module assembly
- ❑ The EMC tray
- ❑ The soft charge board
- ❑ The power terminal shield
- ❑ The front cover

Replacing the Power IGBT Modules VZ3IM1600M1271 and Capacitors VY1ADC1112

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 1–12 of "Disassembly Steps for Accessing Bottom Section Parts" beginning on page 37 to remove the following parts from the drive:

- ❑ The front cover
- ❑ The power terminal shield
- ❑ The soft charge board
- ❑ The EMC tray
- ❑ The control module assembly
- ❑ The bus assembly connection
- ❑ The measuring board connections
- ❑ The fan control board assembly
- ❑ The bus assembly

Remove the Power Board

1. Remove the power board as described in Steps 1 and 2 of "Replacing the Power Board VX5A1HC1316" beginning on page 51.

Remove the Gate Driver Board

2. Remove the gate driver board as described in Steps 1 and 2 of "Replacing Gate Driver Board VX5A1200 and Temperature Sensor #1 VZ3G1104" beginning on page 55.

Remove the DC Bus Plate

3. Remove the DC bus plate as follows. See Figure 43 on page 60.
   - — Using a 16 mm socket wrench, remove three bolts (**A**) securing the bus plate to the output bus bars.
   - — Using a size 2 Phillips driver, remove nine screws securing the bus plate to terminal C of the power IGBT modules (**B**) and the filter capacitors (**F** and **J**).
   - — Using a T-30 Torx driver, remove nine screws securing the bus plate to terminal C of the power IGBT modules (**D**) and the filter capacitors (**G**).

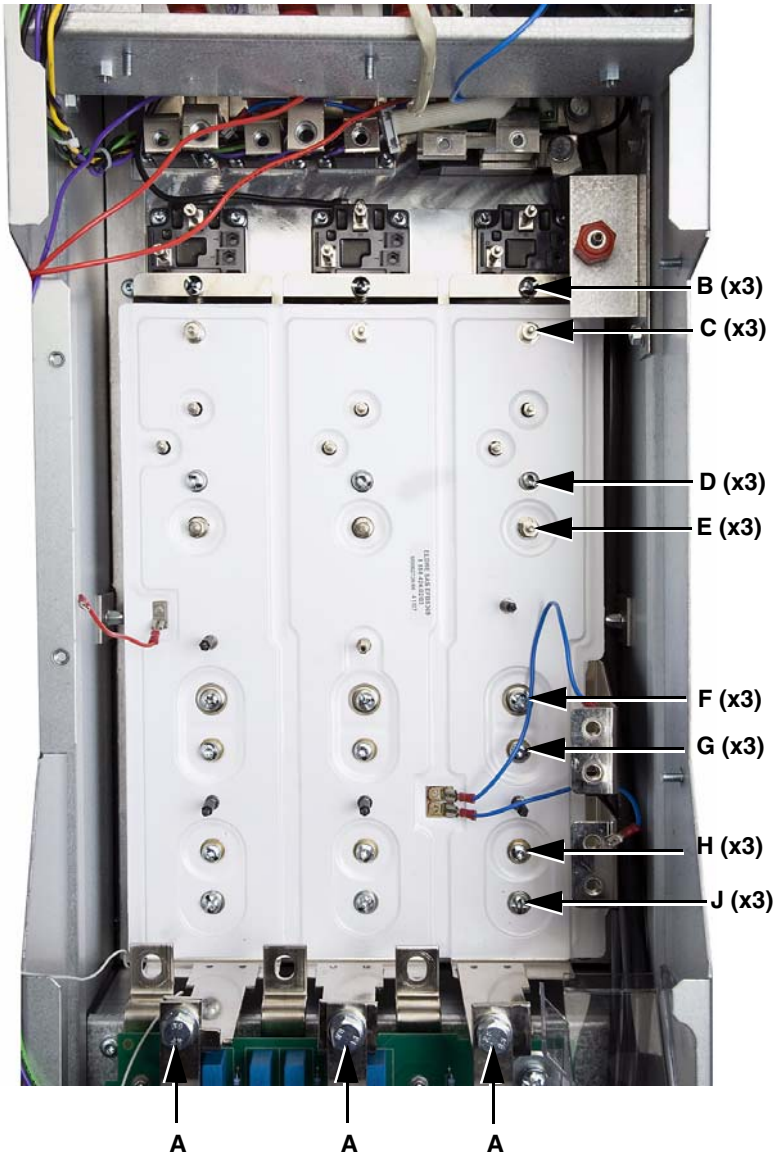
NOTE: The three T-30 screws (**D**) at the top of the bus plate are longer than the six T-30 screws (**G** and **H**) at the bottom.

   - — Using a 10 mm socket wrench, remove six standoffs (**C** and **E**).

NOTE: The top three standoffs (**C**) are shorter than the bottom ones (**E**).

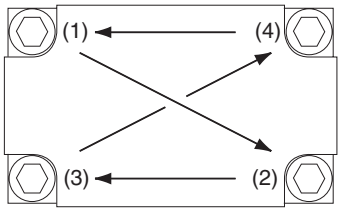
   - — Remove the bus plate from the drive.

Figure 43: DC Bus Plate



Replacing the Power IGBT Modules VZ3IM1600M1271

Figure 44: Torque Sequence

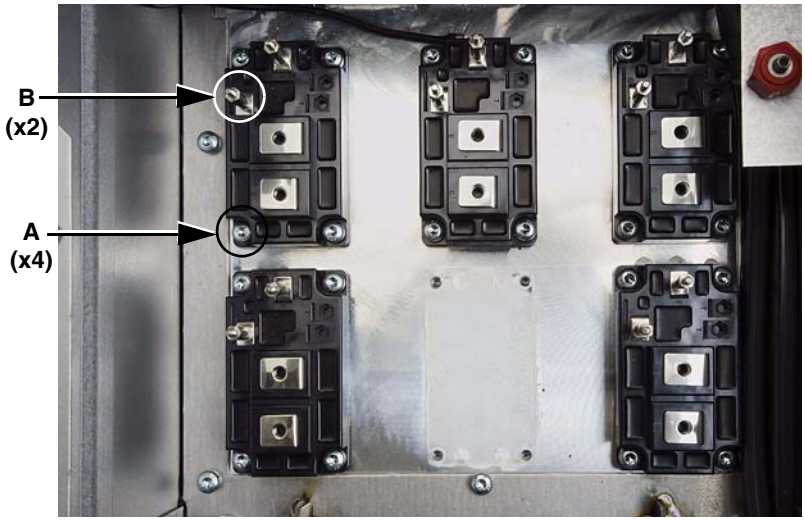


1. Replace a power IGBT module as follows. See Figure 45.
   - — Using a T-30 Torx driver, remove four screws (**A**) securing the module to the heatsink and remove the module from the drive.
   - — Using a 7 mm socket wrench, remove two standoffs (**B**) from the old IGBT module, and install them on 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 44, 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 only replacing the power IGBT modules, skip to Step 3 on page 62 to reinstall the DC bus plate.

If you are also replacing the capacitors, continue with Step 2 on page 62.

Figure 45: Power IGBT Modules

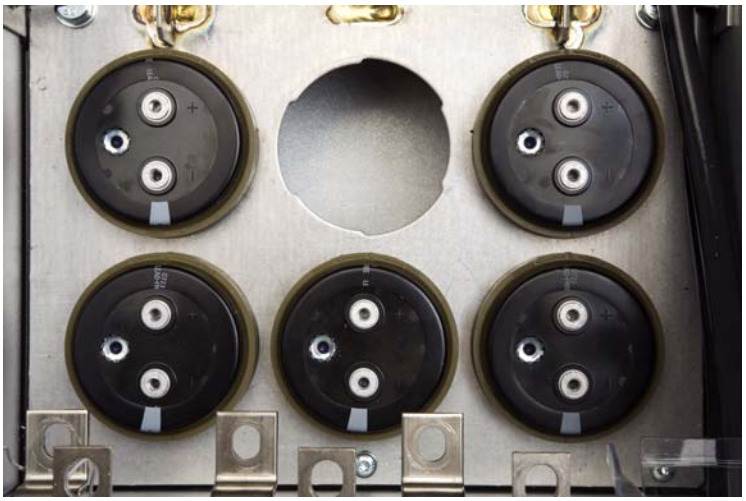


Replacing the Capacitors VY1ADC1112

2. Replace each of the six capacitors as follows. See Figure 46.
   - — 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 46: Capacitors



Reinstall the DC Bus Plate

3. Reinstall the DC bus plate as follows. See Figure 47 on page 63.
   - — Position the DC bus plate in the drive. Lift the plate above the level of the screws, slide it forward, drop the plate down, and then move it forward into position.
   - — Using a size 2 Phillips driver, secure the bus plate to the filter capacitors (**F** and **J**) and terminal C of the power IGBT modules (**B**) with nine screws.
   - — Using a T-30 Torx driver, secure the bus plate to terminal C of the power IGBT modules (**D**) and the filter capacitors (**G**) with nine screws.

NOTE: The three T-30 screws (**D**) at the top of the bus plate are longer than the six T-30 screws (**G** and **H**) at the bottom.

   - — Using a 16 mm socket wrench, secure the bus plate to the output bus bars with three bolts (**A**).
   - — Using a 10 mm socket wrench, install six standoffs (**C** and **E**).

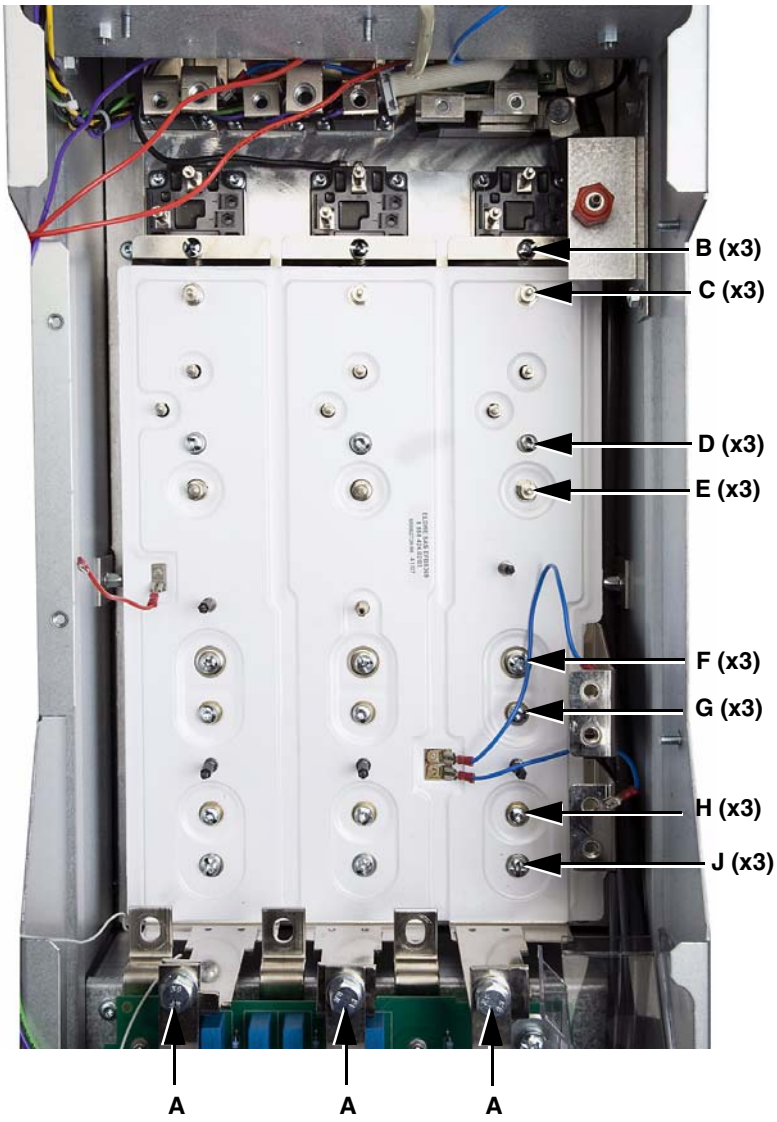
NOTE: The top three standoffs (**C**) are shorter than the bottom ones (**E**).

   - — Tighten the hardware to the torque values specified in Table 15.

Table 15: DC Bus Plate Hardware Torque Values

Item	Description	Torque Range	
		N•m	lb-in
A	(3) 16 mm bolts	27	239
B, F, J	(9) Size 2 Phillips screws (12 mm length)	3.3	29.2
D	(3) Long T-30 screws (20 mm length)	3.3	29.2
G, H	(6) Short T-30 screws (14 mm length)	3.3	29.2
C	(3) Short 10 mm standoffs (6 mm length)	3.3	29.2
E	(3) Long 10 mm standoffs (11 mm length)	3.3	29.2

Figure 47: DC Bus Plate



Reinstall the Gate Driver Board

4. Replace the gate driver board as described in Steps 6 and 7 of “Replacing Gate Driver Board VX5A1200 and Temperature Sensor #1 VZ3G1104” beginning on page 55.

Reinstall the Power Board

5. Replace the power board as described in Steps 5–7 of “Replacing the Power Board VX5A1HC1316” beginning on page 51.

Reassemble the Drive

If you are only replacing the power IGBT modules or the capacitors, perform Steps 1–13 of “Reassembly Steps for Bottom Section Parts” beginning on page 65 to replace the following parts.

- ❑ The bus assembly
- ❑ The fan control board assembly
- ❑ The measuring board connections
- ❑ The bus assembly connection
- ❑ The control module assembly
- ❑ The EMC tray
- ❑ The soft charge board
- ❑ The power terminal shield
- ❑ The front cover

Reassembly Steps for Bottom Section 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 equipment in the drive:

- ❏ The front cover
- ❏ The power terminal shield
- ❏ The soft charge board
- ❏ The EMC tray
- ❏ The control module assembly
- ❏ The fan control board
- ❏ The bus assembly

You must perform some or all of the procedures in this section after replacing the spare parts identified in Table 16. Consult Table 16 for the reassembly steps that must be performed for the corresponding spare parts.

Table 16: Reassembly Steps

If you replaced the:	Perform reassembly steps:
Measuring board VX5A71HC13N4	**Steps 6–13**
Power board VX5A1HC1316	**Steps 1–13**
Gate driver board VX5A1200	**Steps 1–13**
Temperature sensor #1 VZ3G1104	**Steps 1–13**
Power IGBT modules VZ3IM1600M1271	**Steps 1–13**
Capacitors VY1ADC1112	**Steps 1–13**

Replace the Bus Assembly

Table 17: Bus Assembly Hardware Torque Values

Item	Description	Torque Range	
		N•m	lb-in
A	(2) T-30 screws	5.5	48.7
B	(3) 13 mm bolts	13.5	119.5
C	(4) 13 mm bolts	13.5	119.5
D	(2) 16 mm bolts	27	239
E	(3) 16 mm bolts	27	239
F	(1) 21 mm insulator	5.5	48.7

1. Replace the bus assembly as follows:
   - — Using a T-30 Torx driver, secure the bus assembly to the braking positive and negative bus with two screws (**A**, Figure 48).
   - — Using a 13 mm socket wrench, secure the bus assembly to terminal 1 on the SCR modules with three bolts (**B**, Figure 48).
   - — Using a 13 mm socket wrench, secure the bus assembly to the positive and negative bus with four bolts (**C**, Figure 49).
   - — Using a 16 mm socket wrench, secure the bus assembly to the positive and negative connections from the SCR assembly with two bolts (**D**, Figure 48).
   - — Using a 16 mm socket, secure the bus assembly to the AC input bus bars with three bolts (**E**, Figure 49).
   - — Using a 21 mm wrench, replace the top half of the red insulator (**F**, Figure 48).
   - — Tighten the hardware to the torque values specified in Table 17.

Figure 48: Bus Assembly Top

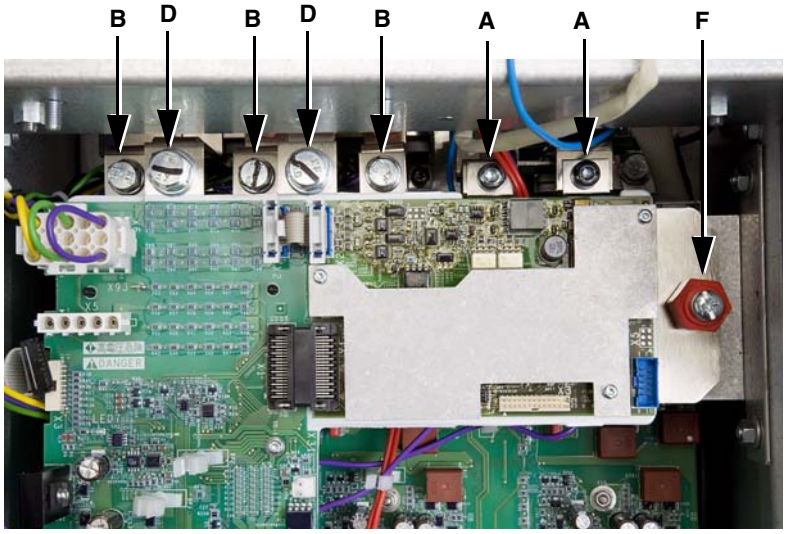
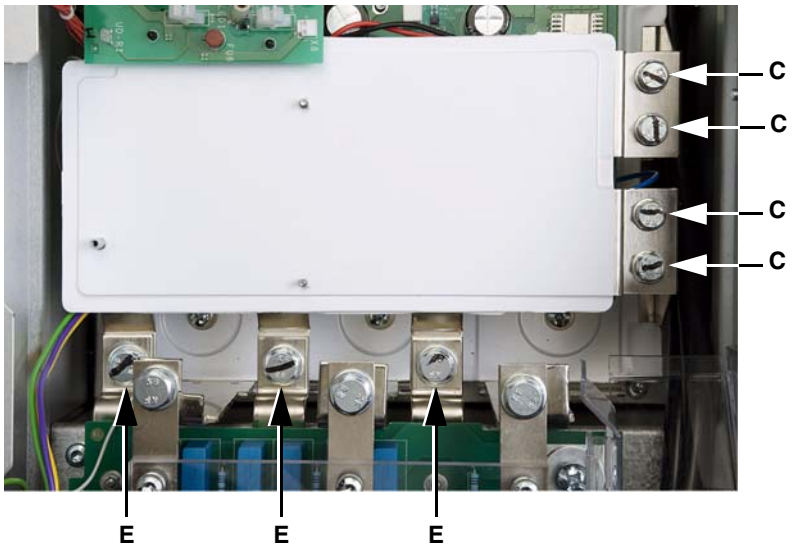


Figure 49: Bus Assembly Bottom

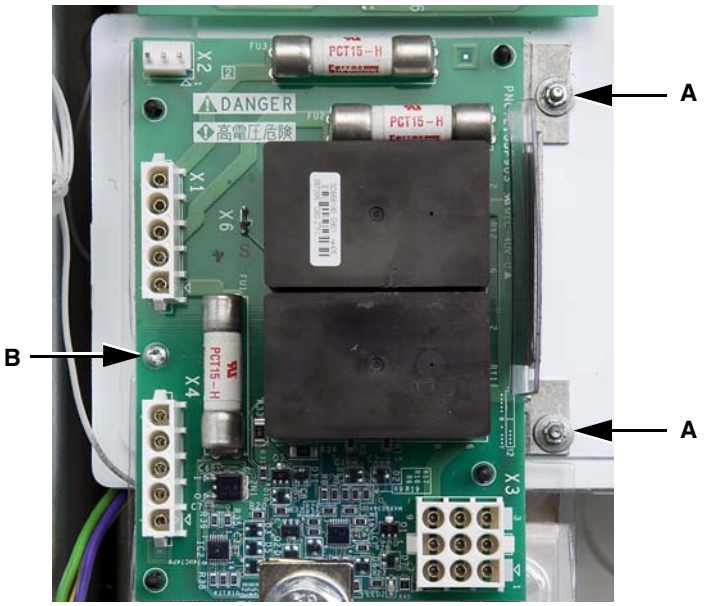


Replace the Fan Control Board Assembly

NOTE: The fan control board assembly consists of the fan control board, a plastic shield, and a metal back plate.

2. Replace the fan control board assembly as follows.
   - — Position the fan control board assembly on the bus assembly as shown in Figure 50.
   - — Using a 7/32 in. socket wrench, secure the right side of the assembly to the bus with two screws (**A**). Tighten the screws to 0.8 N•m (7.1 lb-in).
   - — Using a T-10 Torx driver, secure the left edge of the assembly to the bus assembly with one screw (**B**). Tighten the screw to 0.8 N•m (7.1 lb-in).

Figure 50: Fan Control Board Assembly



3. Replace the fan control board connections as follows. See Table 18 and Figure 51 for connector locations.
   - — At the left side, replace from top to bottom: the 3-pin connector at terminal X2, the 5-pin connector at terminal X1, and the 5-pin connector at terminal X4.
   - — At the bottom right, replace the 9-pin connector at terminal X3.

Figure 51: Fan Control Board Connections

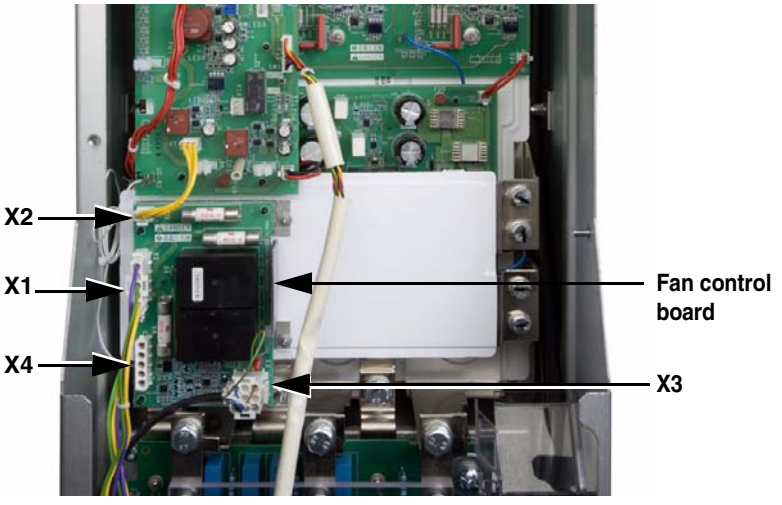


Table 18: Fan Control Board Wiring

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

1 See schematic on page 106 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 MB: Measuring board

3 FB: Filter board

Replace the Measuring Board Connections

Table 19: Measuring Board Wiring

Wire No.[1]	Terminal No.	Description	To:
—	**X2**	10-pin, Gray ribbon	MCB[2]
E111	**X31**	2-pin, black	SCB[3] CN7A
E110	**X30**	2-pin, red	SCB CN2A
E106	**X21**	2-pin, red/black	Internal fan
E112	**X4**	10-pin, white ribbon	Control module
E103	**X11**	9-pin, multi-color	Output current sensors T1, T2, T3
E100	**X8**	2-pin, black/red	PB[4] X82
E141	**UD-R1**	1-pin, white	Bleeder resistor
E105	**X14**	3-pin, yellow	FCB[5] X2
E142	**X3**	18-pin, gray	GDB[6] X31
E143	**X5**	5-pin, 3-wires, violet/green/ yellow	GDB X21, X22, X23
E128	**X93**	1-pin, violet	DBB[7] X2
—	**X6**	15-pin jumper assembly, violet/green/ black	—

1 See schematic on page 106 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

2 MCB: Motor control board

3 SCB: Soft charge board

4 PB: Power board

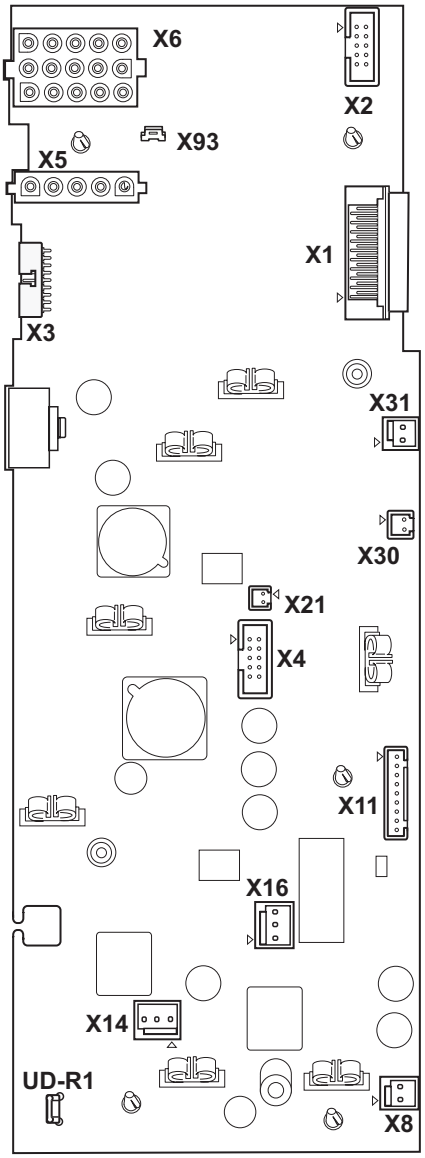
5 FCB: Fan control board

6 GDB: Gate driver board

7 DBB: Dynamic braking board

4. Carefully replace the connections to the measuring board. See Table 19 and Figure 52 for terminal locations.

Figure 52: Measuring Board Layout



NOTE: X16 is not used.

Replace the Bus Assembly Connection

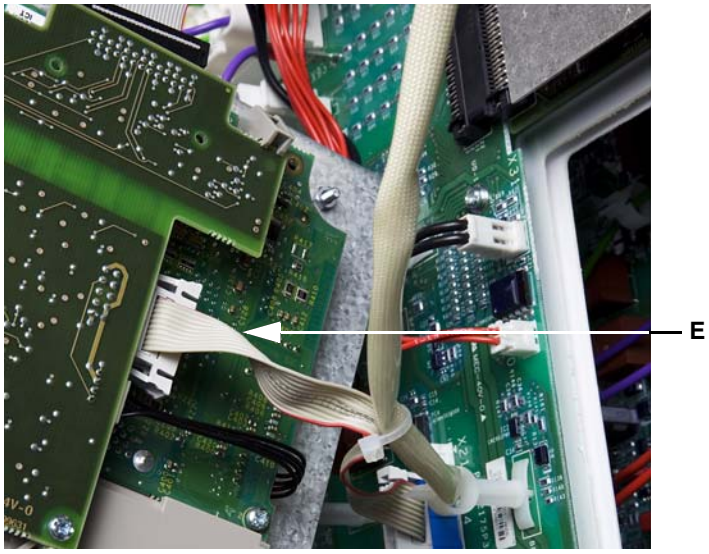
5. Using a size 2 Phillips driver, secure the blue wire from terminal X5 on the dynamic braking board to the red insulator on the bus assembly with one screw (**F,** Figure 53). Tighten the screw to 5.5 N•m (48.7 lb-in).

Figure 53: Bus Assembly Connection

Replace the Control Module Assembly

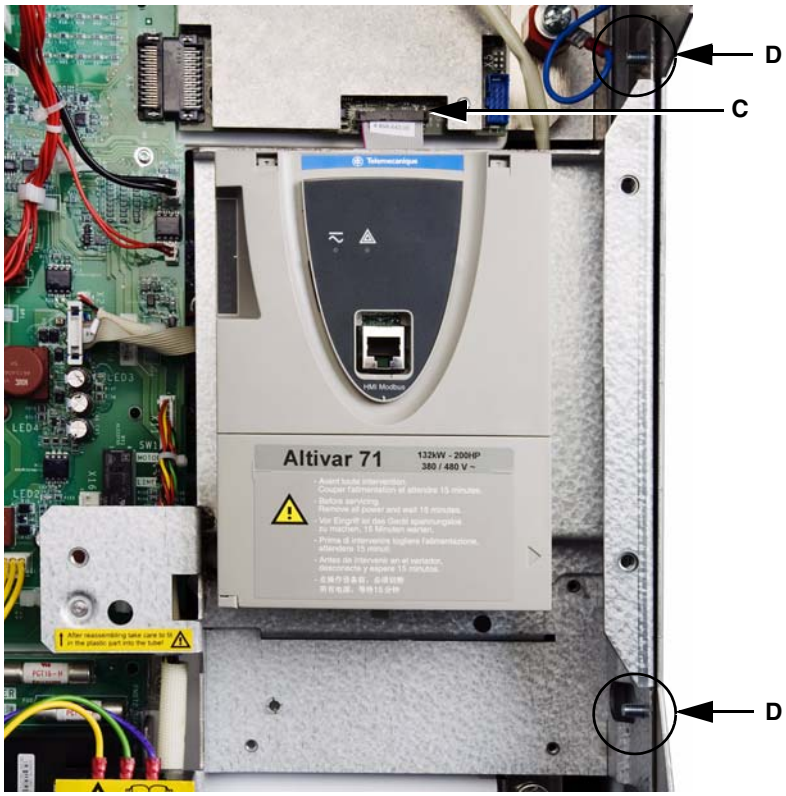
6. Connect the ribbon cable (**E,** Figure 54) from the measuring board to the back of the control module assembly.

Figure 54: Back of Control Module Assembly



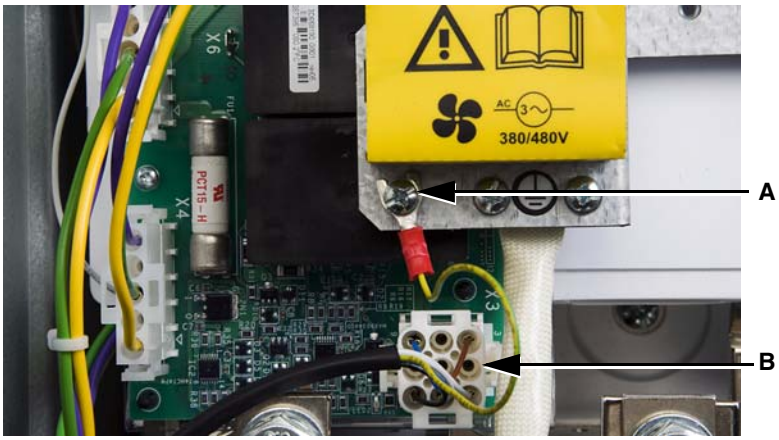
7. Using a 10 mm socket wrench, secure the control module assembly to the drive frame with two nuts (**D,** Figure 55). Tighten the nuts to 5.5 N•m (48.7 lb-in).

Figure 55: Control Module Assembly



8. Replace the following connections.
   - — Install the 26-pin ribbon cable (**C,** Figure 55 on page 70) from motor control board terminal X3.
   - — Install the 5-pin connector (**B,** Figure 56) 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 56). Tighten the screw to 1.2 N•m (10.6 lb-in).

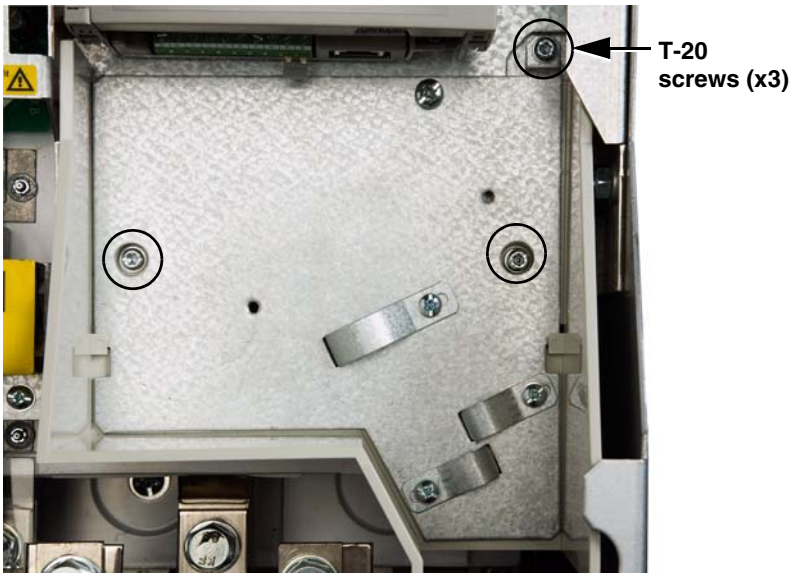
Figure 56: TB1 and Fan Control Board Connections



Replace the EMC Tray

9. Using a T-20 Torx driver, secure the EMC tray to the control module plate with three screws. See Figure 57. Tighten the screws to 1.1–1.7 N•m (9.7–15.0 lb-in).

Figure 57: EMC Tray



Replace the Soft Charge Board

Table 20: 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
E104	**CN2A**	9-pin, red	PB[3] X30 (7-pin)
E110			MB[4] X30 (2-pin)
E111	**CN7A**	2-pin, black	MB X31

1 See schematic on page 106 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.

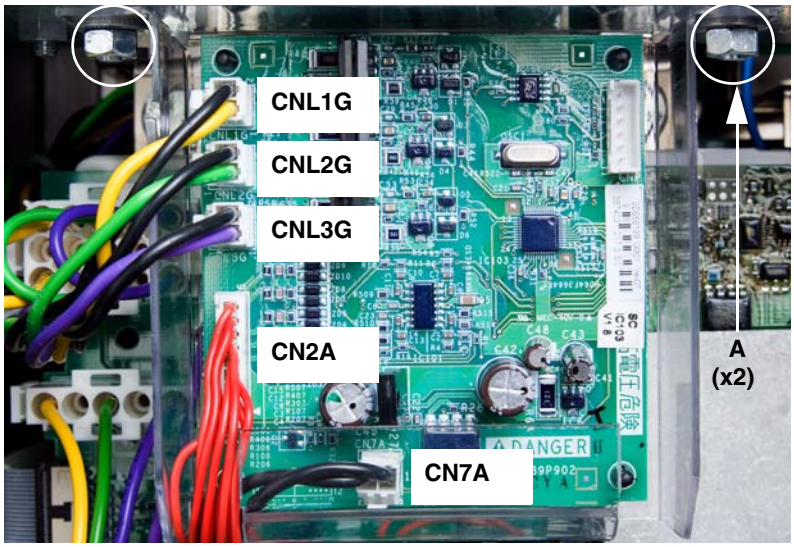
2 SCR: Silicon controlled rectifier

3 PB: Power board

4 MB: Measuring board

10. Using a 10 mm socket wrench, secure the soft charge board plastic tray to the top crossbrace with two nuts (**A**). See Figure 58. Tighten the nuts to 5.5 N•m (48.7 lb-in).
11. Replace the following connections on the soft charge board. See Table 20 and Figure 58 for connector locations.
    - — At the left side of the board, from top to bottom remove: the 2-pin connector from terminal CNL1G, the 2-pin connector from terminal CNL2G, the 2-pin connector from terminal CNL3G, and the 9-pin connector from terminal CN2A.
    - — At the bottom of the board, remove the 2-pin connector from terminal CN7A.

Figure 58: Soft Charge Board



Replace the Power Terminal Shield

12. Replace the power terminal shield as follows.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

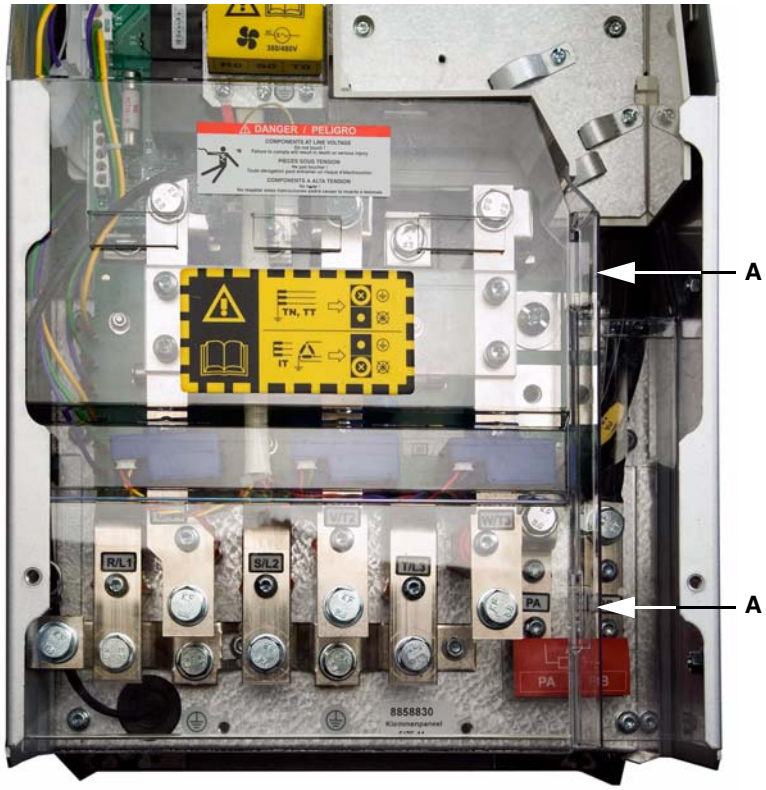
- Install the power terminal shield as shown in Figures 59 and 60 on page 73.
- Before installing the shield, ensure that it has no tears or cracks. If the shield is damaged, install a new piece from the plastic kit. See page 20.
- Do not install a damaged shield.

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 59 on page 73).
- — Insert the retaining tabs on the right side of the shield in the slots on the conduit tray (**A**, Figure 60 on page 73).

Figure 59: Power Terminal Shield Retaining Posts

Figure 60: Power Terminal Shield



Replace the Front Cover

13. Replace the front cover. Using a size 2 Phillips driver, secure the front cover with nine screws. See Figure 8 on page 19. Tighten the screws to 5.5 N•m (48.7 lb-in).

Installation Procedures for Top Section Parts

The top section parts are under the fan plate. They are:

SCR snubber board	Dynamic braking kit
SCR modules	Temperature sensor #2
DC reactor terminal shield (plastic kit)	

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

Disassembly Steps for Accessing Top Section 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 equipment from the drive:

- ❑ The front cover
- ❑ The fan plate
- ❑ The soft charge board assembly
- ❑ The top crossbrace
- ❑ The DC reactor terminal shield

You must perform some or all of the procedures in this section to access the top section spare parts. Consult Table 21 for the disassembly steps that must be performed for the spare parts that you are replacing.

Table 21: Disassembly Steps

If you are replacing:	Perform disassembly steps:	Then follow procedure:
SCR Snubber Board VX4A1200	**Steps 1–9**	"Replacing the SCR Snubber Board VX4A1200 and SCR Modules VZ3TD1285M1671" beginning on page 78
SCR Modules VZ3TD1285M1671	**Steps 1–9**	
Dynamic Braking Kit VZ3F1110	**Steps 1–9**	"Replacing Dynamic Braking Kit VZ3F1110 and Temperature Sensor #2 VZ3G1104" beginning on page 89
Temperature Sensor #2	**Steps 1–9**	
DC Reactor Terminal Shield	**Steps 1–9**	"Replace the DC Reactor Terminal Shield" on page 100

Remove the Front Cover

1. Using a size 2 Phillips driver, remove nine screws and take the front cover off the drive. See Figure 8 on page 19.

Remove the Fan Plate

2. Using a T-30 Torx driver, remove three screws (**A**) securing the fan plate to the drive frame, and remove two screws (**B**) securing the fan plate to the top crossbrace. See Figure 61.
3. Remove the connection (**C**) from the back of the fan plate, and remove the plate from the drive. See Figure 62.

Figure 61: Fan Plate

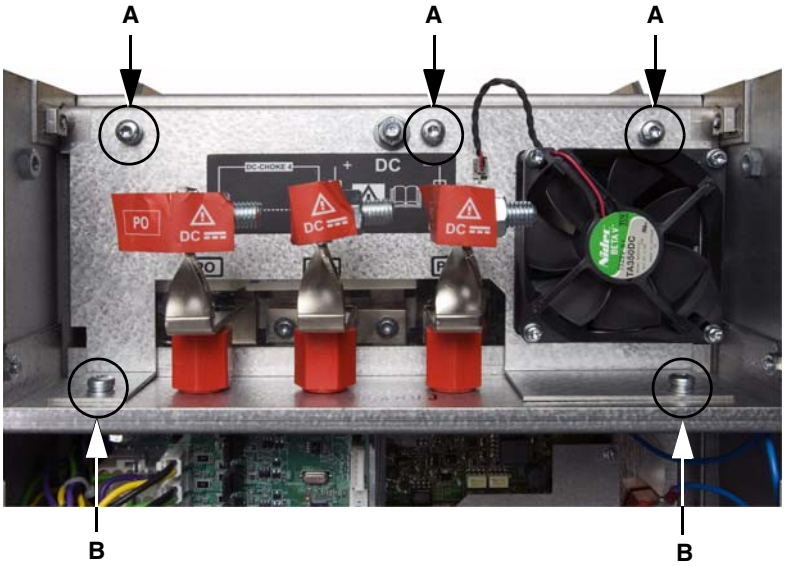
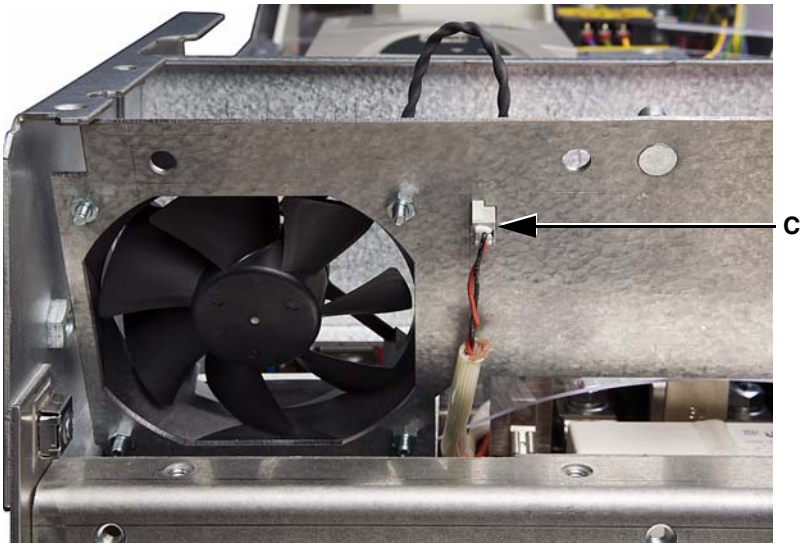


Figure 62: Fan Plate Connection



Remove the Soft Charge Board Assembly

Table 22: 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
E104	**CN2A**	9-pin, red	PB[3] X30 (7-pin)
E110			MB[4] X30 (2-pin)
E111	**CN7A**	2-pin, black	MB X31

1 See schematic on page 106 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.

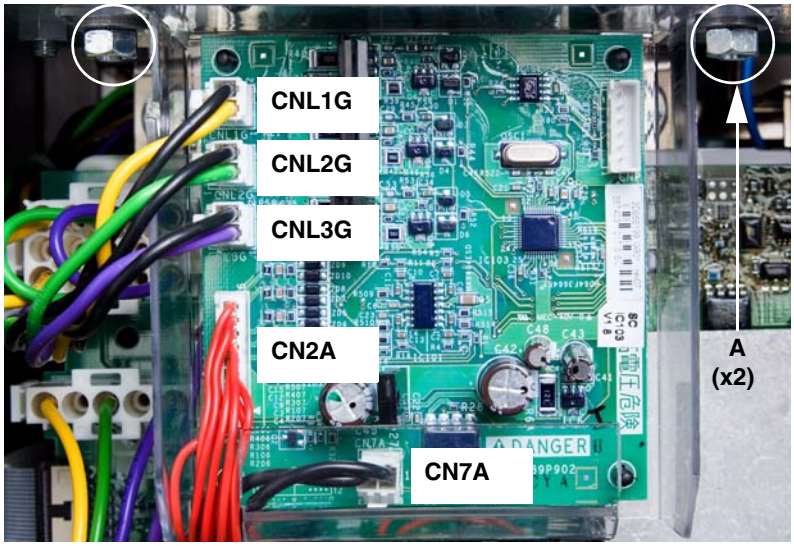
2 SCR: Silicon controlled rectifier

3 PB: Power board

4 MB: Measuring board

4. Using needle-nose pliers, carefully remove the following connections from the soft charge board. See Table 22 and Figure 63 for connector locations.
   - — At the left side of the board, from top to bottom remove: the 2-pin connector from terminal CNL1G, the 2-pin connector from terminal CNL2G, the 2-pin connector from terminal CNL3G, and the 9-pin connector from terminal CN2A.
   - — At the bottom of the board, remove the 2-pin connector from terminal CN7A.
5. Using a 10 mm socket wrench, remove the two nuts (**A,** Figure 63) securing the soft charge board plastic tray to the top crossbrace, and remove the tray and board from the drive.

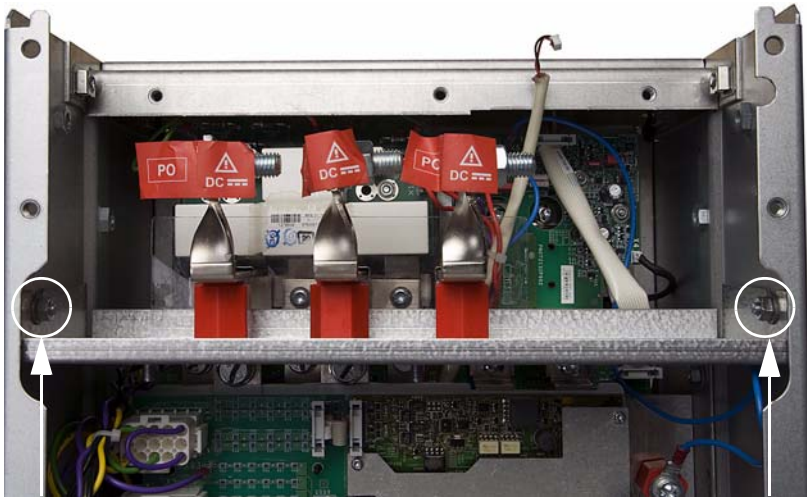
Figure 63: Soft Charge Board



Remove the Top Crossbrace

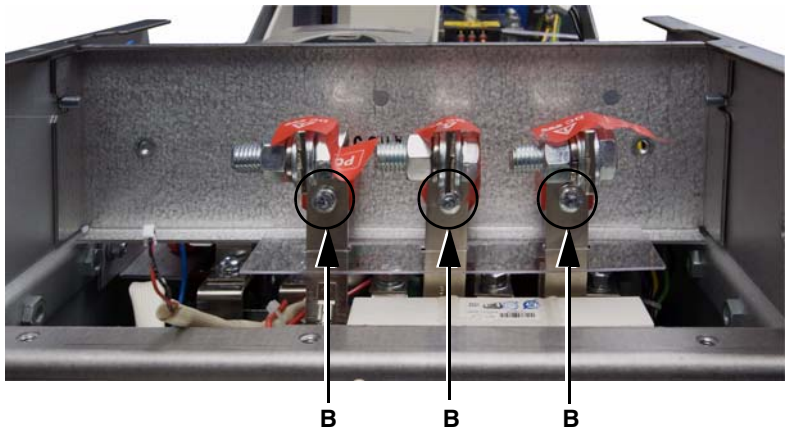
6. Using a 10 mm socket wrench, remove two nuts (**A**, Figure 64) securing the top crossbrace to the drive frame.

Figure 64: Top Crossbrace



7. Using a T-30 Torx driver, remove three screws (**B,** Figure 65) securing the crossbrace to the PO, PA/+, and PC/- connections.
8. Remove the top crossbrace from the drive.

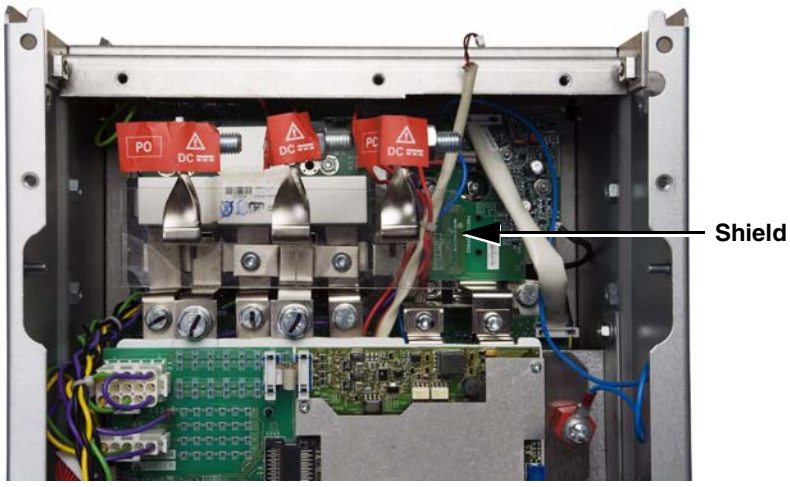
Figure 65: PO, PA/+, and PC/- Connections



Remove the DC Reactor Terminal Shield

9. Remove the transparent shield over the DC reactor terminals. Lift the shield up and remove the shield from the terminals one at a time. See Figure 66.

Figure 66: DC Reactor Terminal 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 VZ3TD1285M1671” on page 78.

If you are replacing the dynamic braking kit or temperature sensor #2, skip to “Replacing Dynamic Braking Kit VZ3F1110 and Temperature Sensor #2 VZ3G1104” on page 89.

If you are replacing the DC reactor terminal shield, skip to “Replace the DC Reactor Terminal Shield” on page 100.

Replacing the SCR Snubber Board VX4A1200 and SCR Modules VZ3TD1285M1671

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

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

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

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

Before performing the steps in this procedure, perform Steps 1–9 of "Disassembly Steps for Accessing Top Section Parts" beginning on page 74 to remove the following parts from the drive:

- ❑ The front cover
- ❑ The fan plate
- ❑ The soft charge board assembly
- ❑ The top crossbrace
- ❑ The DC reactor terminal shield

Remove the SCR Snubber Board Connections

1. Using needle-nose pliers, carefully remove all connections from the SCR snubber board. See Table 23 and Figure 67 for the connection locations.

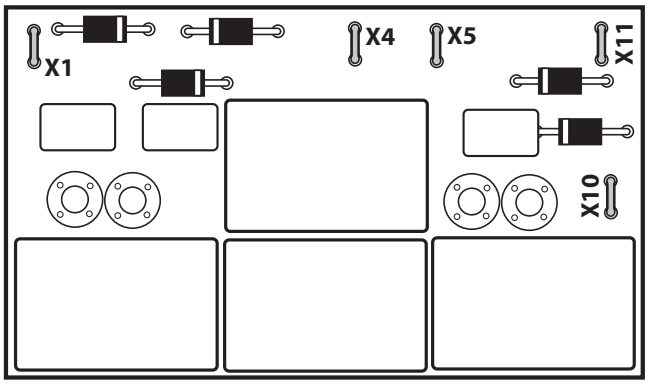
Table 23: SCR Snubber Board Wiring

Wire No.[1]	Terminal No.	Description	To:
E119	**X1**	Green	L2 bus bar
E121	**X4**	Red	PO bus bar
E122	**X5**	Black	PC bus bar
E126	**X10**	Red, 0.25 in. 1-pin	PB[2] X10
	X11	Red, 0.19 in. 1-pin	PB X10

[1] See schematic on page 106 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

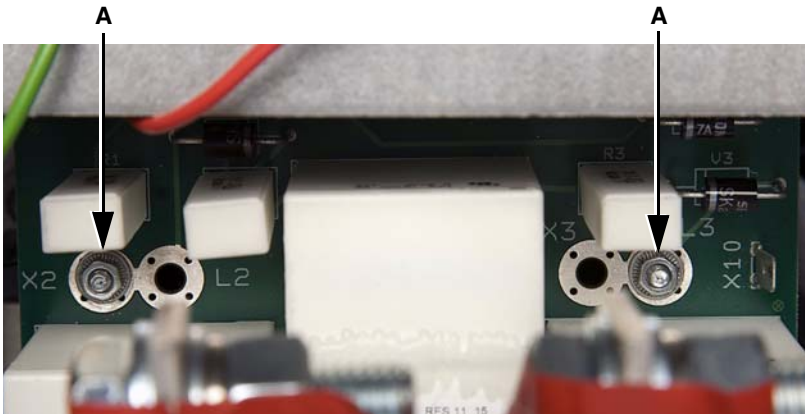
Figure 67: SCR Snubber Board Layout



Remove the SCR Snubber Board

2. Using a 7 mm socket wrench, remove two nuts (**A,** Figure 68) securing the SCR snubber board to the standoffs on the L1 and L3 SCR bus bars and remove the board from the drive.

Figure 68: SCR Snubber Board



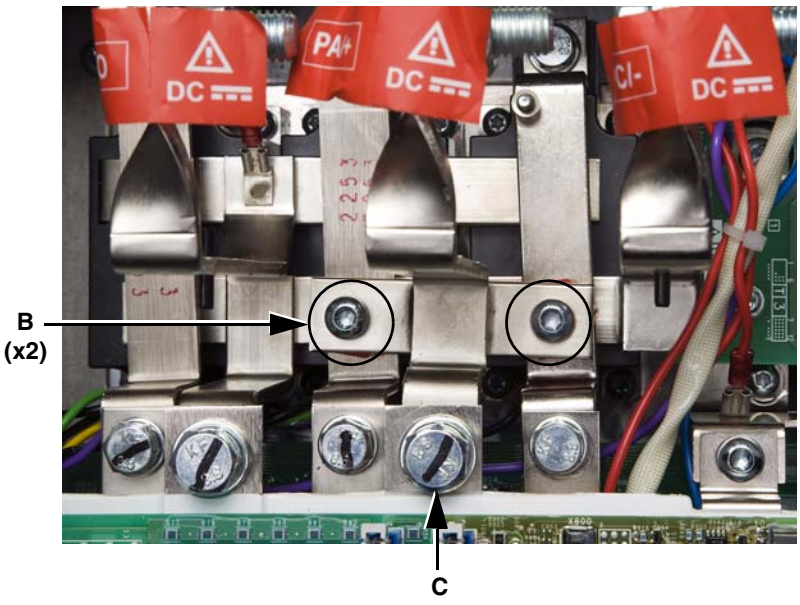
NEXT STEP: If you are replacing the SCR modules, continue with Step 3 below to remove the PA bus assembly.

If you are only replacing the SCR snubber board, skip to Step 12 on page 87 to install the new snubber board.

Remove the PA Bus Assembly

3. Remove the PA bus assembly as follows. See Figure 69.
   - — Using a T-30 Torx driver, remove two screws (**B**) securing the PA bus assembly to the insulators on the L2 and L3 SCR bus bars.
   - — Using a 16 mm socket wrench, remove the bolt (**C**) securing the PA bus assembly to the bus plate positive bus.
   - — Remove the PA bus assembly from the drive.

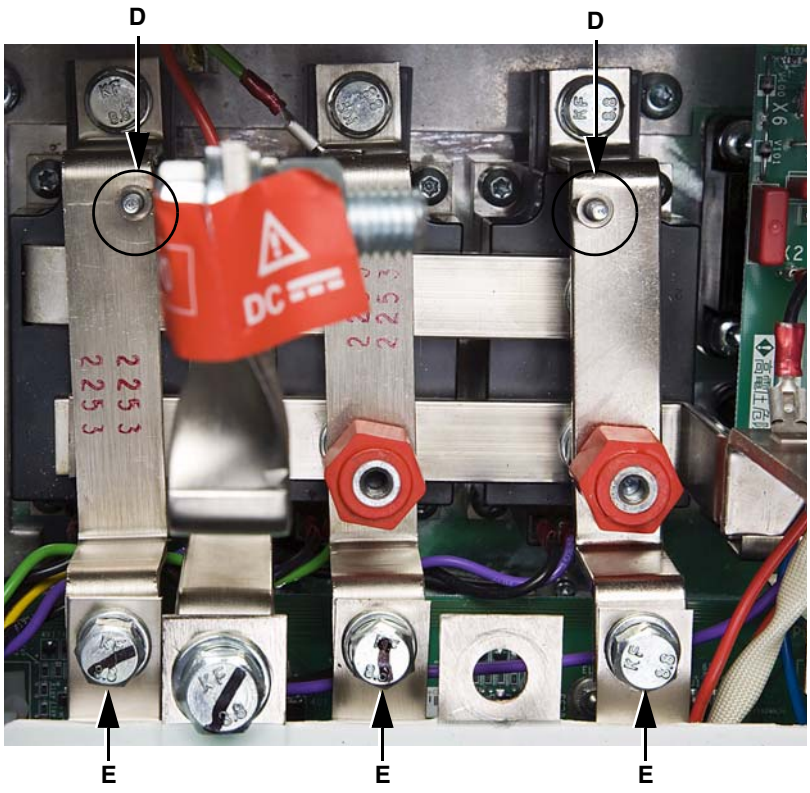
Figure 69: PA Bus Assembly



Remove the L1, L2, L3 SCR Bus Bars

4. Remove the spacers (**D**) from the standoffs on the L1 and L3 SCR bus bars. See Figure 70.

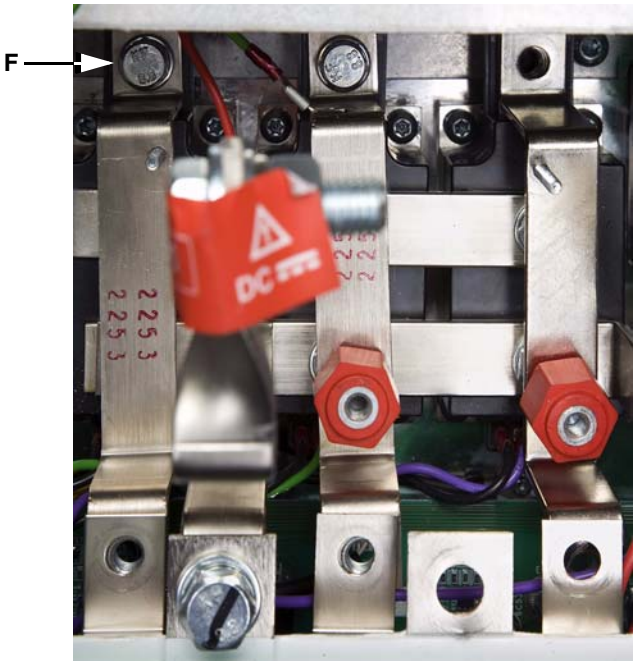
Figure 70: Spacers



5. Remove the L1, L2, and L3 SCR bus bars as follows.
   — Using a 13 mm socket wrench, remove three bolts (**E,** Figure 70 on page 80) securing the SCR bus bars to the AC bus assembly.
   — Using a 13 mm socket wrench, remove three bolts (**F,** Figure 71) securing the SCR bus bars to terminal 1 of the SCR modules and remove the bus bars from the drive.

> **NOTE:** Note the differences between the SCR bus bars: The L1 bar does not have a red insulator; the L2 bar has a red insulator and a green wire attached; the L3 bar green has a red insulator.

Figure 71: L1, L2, L3 SCR Bus Bars

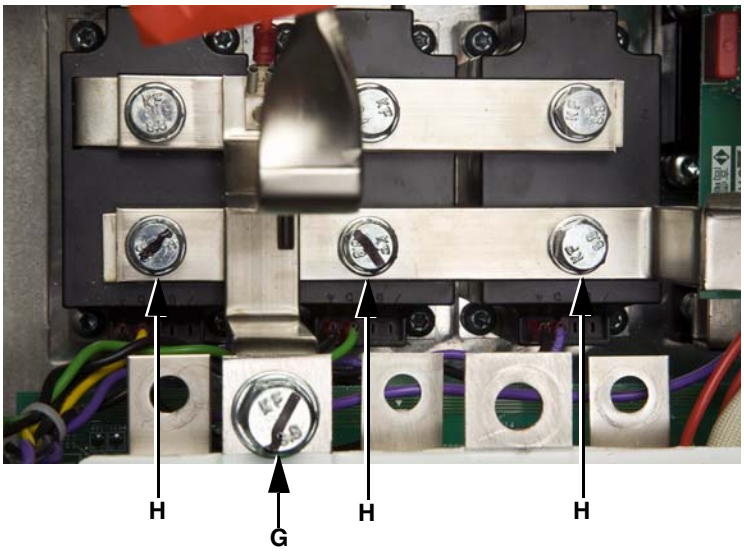


Remove the SCR Positive and Negative Bus Bar

6. Remove the SCR positive and negative bus bars as follows.
   - — Using a 16 mm socket wrench, remove one 16 mm bolt (**G,** Figure 72) securing the bracket from the SCR positive bus to the bus plate.
   - — Using a 13 mm socket wrench, remove three bolts (**H**, Figure 72) securing the SCR positive bus bar to terminal 3 on the SCR modules and remove the bar.

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

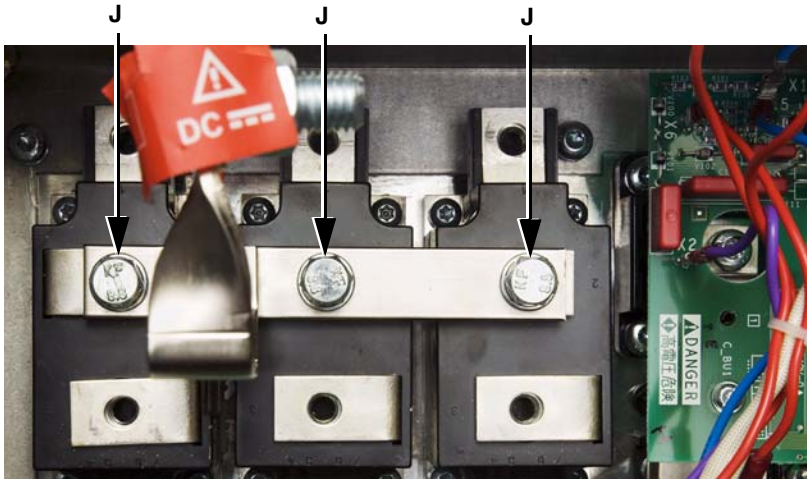
Figure 72: SCR Positive Bus Bar



   - — Using a 13 mm socket wrench, remove three bolts (**J**, Figure 73) securing the SCR negative bus bar to terminal 2 on the SCR modules and remove the bar.

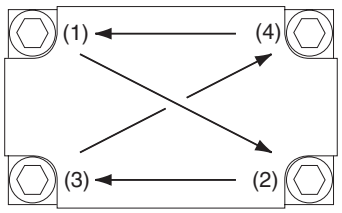
NOTE: A black wire is attached to this bus bar and comes out with it.

Figure 73: SCR Negative Bus Bar



Replace the SCR Module

Figure 74: Torque Sequence

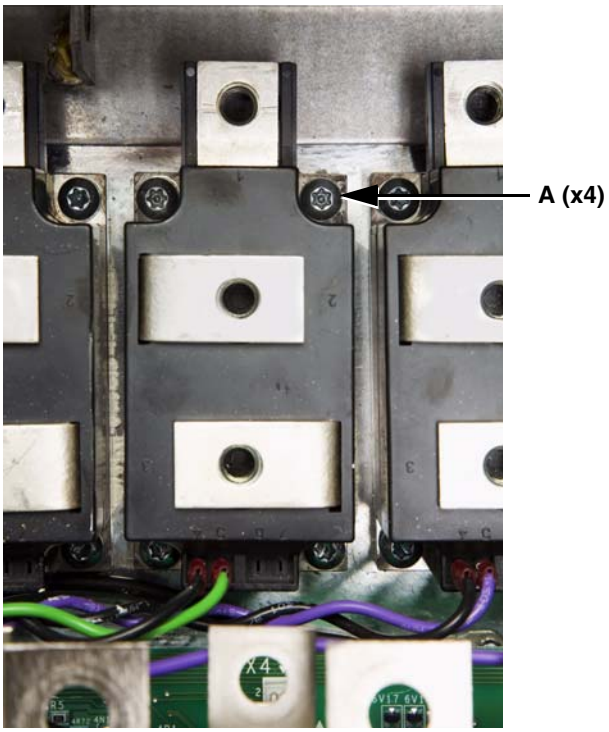


7. Replace an SCR module as follows.
   - — Remove the connections from terminals 4 and 5 of the SCR module. See Figure 75.

> **NOTE:** Note the cable positions. The yellow and black 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. Black wires are attached to pin 4 on all of the modules.

   - — 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 75.
   - — 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 75. Initially tighten the screws, in the sequence shown in Figure 74, 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 75.

Figure 75: SCR Module



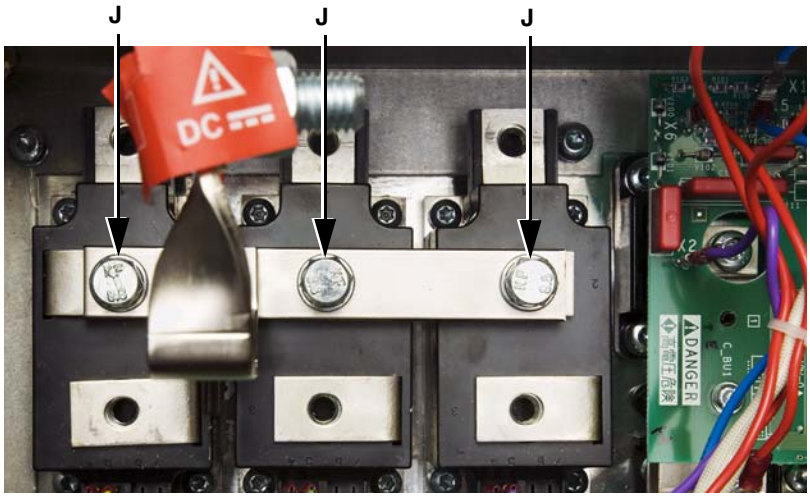
Replace the SCR Positive and Negative Bus Bar

Table 24: SCR (+) and (-) Bus Bar Hardware Torque Values

Item	Description	Torque Range	
		N•m	lb-in
J	(3) 13 mm bolts	13.5	119.5
H	(3) 13 mm bolts	13.5	119.5
G	(1) 16 mm bolt	27	239

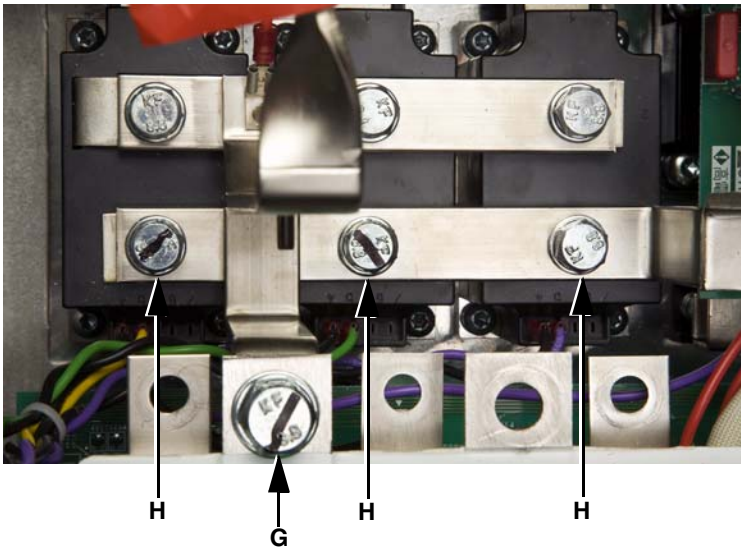
8. Replace the SCR positive and negative bus bars as follows.
   — Using a 13 mm socket wrench, secure the SCR negative bus bar to terminal 2 on the SCR modules with three bolts (**J**, Figure 76).

Figure 76: SCR Negative Bus Bar



   — Using a 13 mm socket wrench, secure the SCR positive bus bar to terminal 3 on the SCR modules with three bolts (**H**, Figure 77).
   — Using a 16 mm socket wrench, secure the bracket between the SCR positive bus and the bus plate with one 16 mm bolt (**G,** Figure 77).
   — Tighten the hardware to the torque values specified in Table 24.

Figure 77: SCR Positive Bus Bar



Replace the L1, L2, L3 SCR Bus Bars

Table 25: SCR Bus Bar Hardware Torque Values

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

9. Replace the L1, L2, and L3 SCR bus bars as follows.

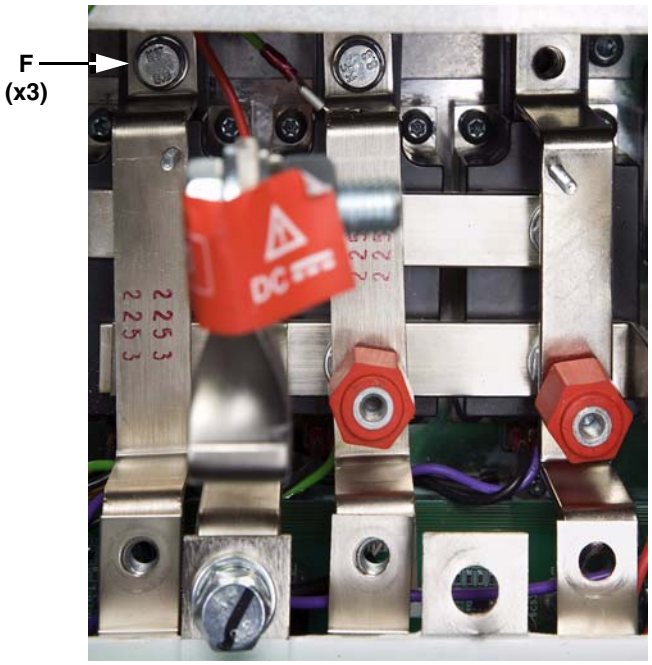
> **NOTE:** Note the differences between the SCR bus bars for reassembly: The L1 bar does not have a red insulator; the L2 bar has a red insulator and a green wire attached; the L3 bar green has a red insulator.

— Using a 13 mm socket wrench, secure the SCR bus bars to terminal 1 of the SCR modules with three bolts (**F**). See Figure 78.

— Using a 13 mm socket wrench, secure the SCR bus bars to the AC bus assembly with three bolts (**E**). See Figure 79 on page 86.

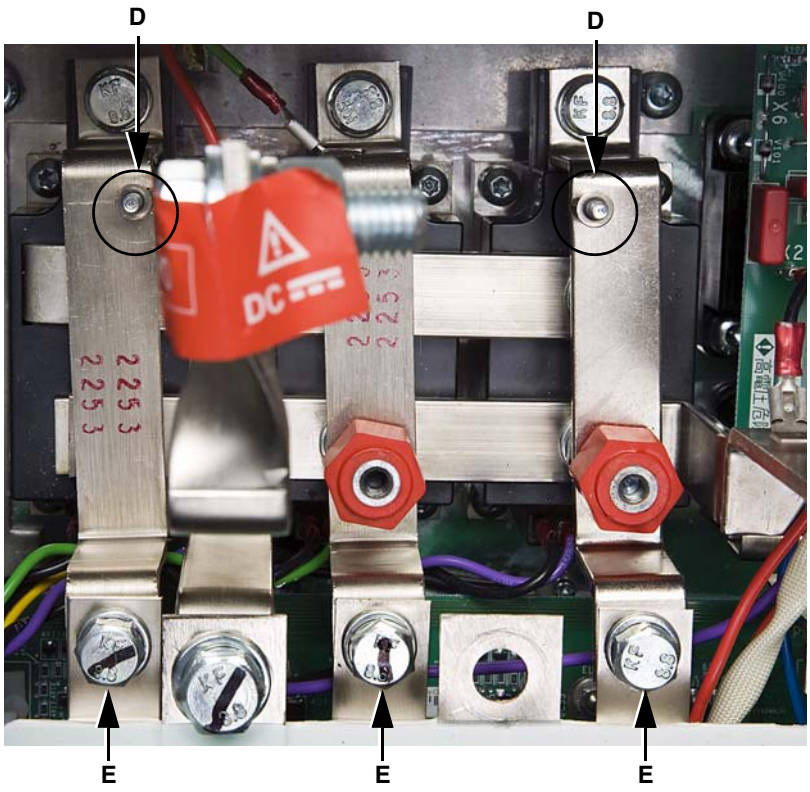
— Tighten the hardware to the torque values specified in Table 25.

Figure 78: L1, L2, L3 SCR Bus Bars



10. Install the spacers (**D**) on the standoffs on the L1 and L3 SCR bus bars. See Figure 79.

Figure 79: Spacers



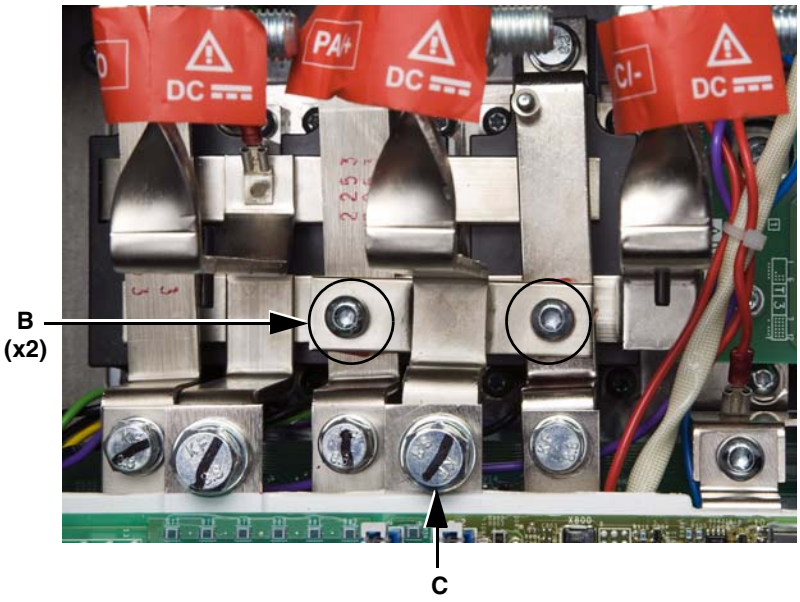
Replace the PA Bus Assembly

Table 26: PA Bus Assembly Hardware Torque Values

Item	Description	Torque Range	
		N•m	lb-in
B	(2) T-30 screws	5.5	48.7
C	(1) 16 mm bolt	27	239

11. Replace the PA bus assembly as follows. See Figure 80.
    - — Using a 16 mm socket wrench, secure the PA bus assembly to the bus plate positive bus with one bolt (**C**).
    - — Using a T-30 Torx driver, secure the PA bus assembly to the red insulators on the L2 and L3 SCR bus bars with two screws (**B**).
    - — Tighten the hardware to the torque values specified in Table 26.

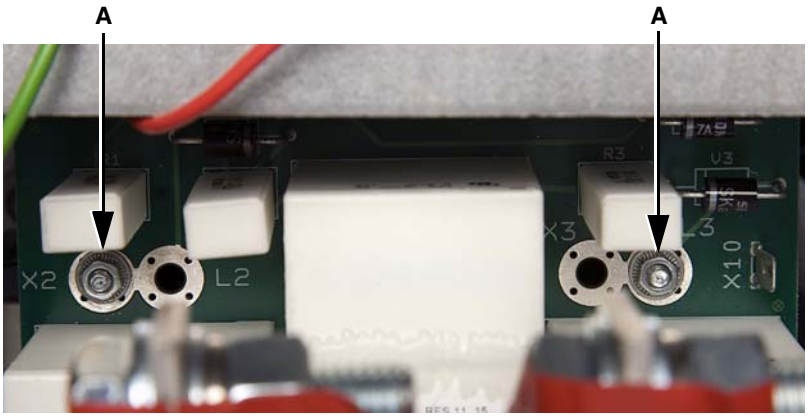
Figure 80: PA Bus Assembly



Replace the SCR Snubber Board

12. Using a 7 mm socket wrench, secure the SCR snubber board to the standoffs (**A,** Figure 81) on the L1 and L3 SCR bus bars with two nuts. Tighten the nuts to 1.1–1.7 N•m (9.7–15 lb-in).

Figure 81: SCR Snubber Board



Replace the SCR Snubber Board Connections

Table 27: SCR Snubber Board Wiring

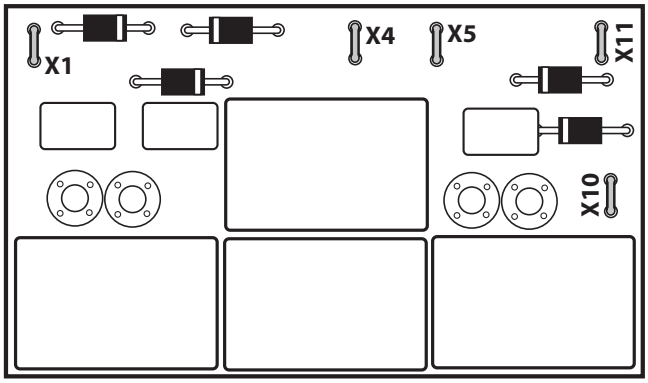
Wire No.[1]	Terminal No.	Description	To:
E119	**X1**	Green	L2 bus bar
E121	**X4**	Red	PO bus bar
E122	**X5**	Black	PC bus bar
E126	**X10**	Red, 0.25 in. 1-pin	PB[2] X10
	X11	Red, 0.19 in. 1-pin	PB X10

[1] See schematic on page 106 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

13. Replace all connections to the SCR snubber board. See Table 27 and Figure 82 for the connection locations.

Figure 82: SCR Snubber Board



Reassemble the Drive

If you are only replacing the SCR snubber board or the SCR modules, perform Steps 1–6 of “Reassembly Steps for Top Section Parts” beginning on page 100 to replace the following parts:

- ❏ The DC reactor terminal shield
- ❏ The top crossbrace
- ❏ The soft charge board assembly
- ❏ The fan plate
- ❏ The front cover

Replacing Dynamic Braking Kit VZ3F1110 and Temperature Sensor #2 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.

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 1–9 of "Disassembly Steps for Accessing Top Section Parts" beginning on page 74 to remove the following parts from the drive:

- ❑ The front cover
- ❑ The fan plate
- ❑ The soft charge board assembly
- ❑ The top crossbrace
- ❑ The DC reactor terminal shield

Remove the Dynamic Braking Board Connections

1. Using needle-nose pliers, carefully remove all connections from the dynamic braking board. See Table 28 and Figure 83 for the connection locations.

Table 28: Dynamic Braking Board Wiring

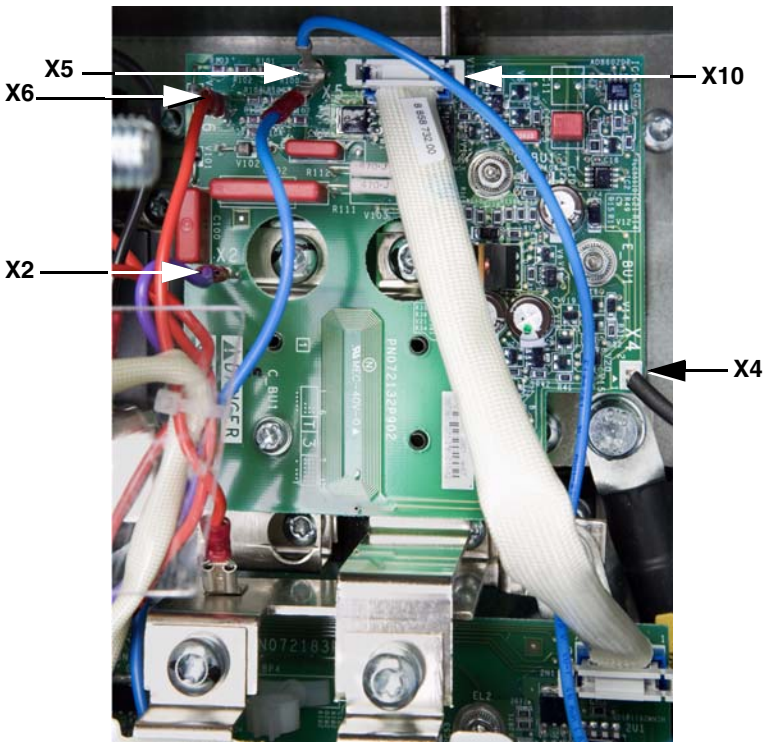
Wire No.[1]	Terminal No.	Description	To:
E134	**X1**	10-pin, white ribbon	GDB[2] X91
E128	**X2**	1-pin, violet	MB[3] X93
E130	**X4**	2-pin, black	Temperature sensor #2
E132–E133	**X5**	2-pin, blue	GDB X52 & red insulator near the control board
E131	**X6**	1-pin, red	Brake assy PA bus bar

[1] See schematic on page 106 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

[2] GDB: Gate driver board

[3] MB: Measuring board

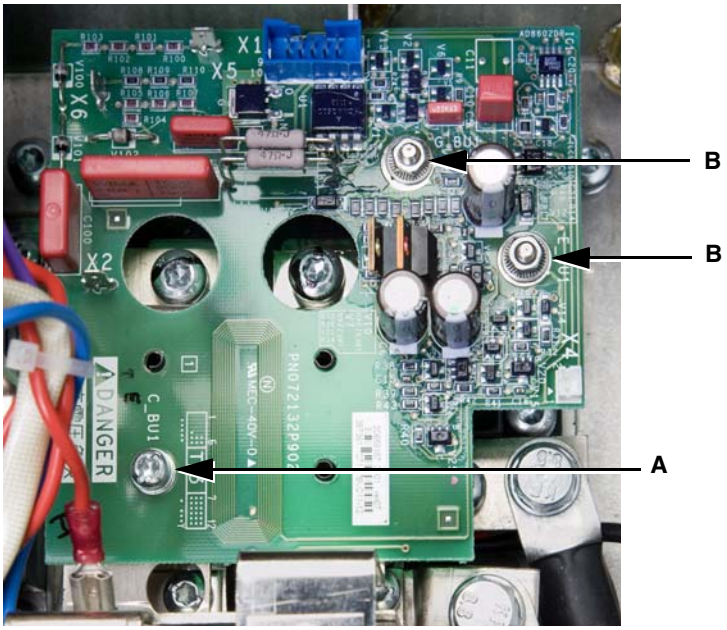
Figure 83: Dynamic Braking Board Connections



Remove the Dynamic Braking Board

2. Remove the dynamic braking board as follows. See Figure 84.
   - — Using a T-20 Torx driver, remove one screw (**A**) securing the dynamic braking board to the bus bar between the Braking IGBT module and the diode bus bar.
   - — Using a 7 mm socket wrench, remove two nuts (**B**) securing the dynamic braking board to the braking IGBT module standoffs and remove the board from the drive.

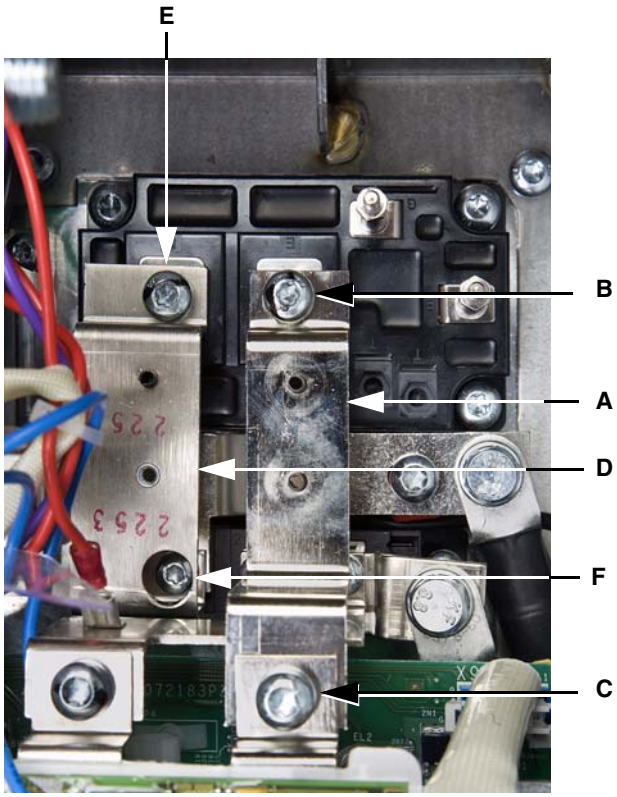
Figure 84: Dynamic Braking Board



Remove the Bus Bars from the Braking IGBT Module

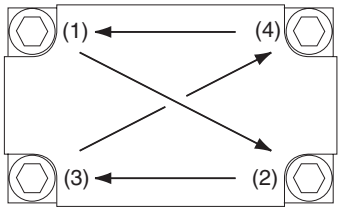
3. Remove the bus bars from the braking IGBT module as follows. See Figure 85.
   - — Using a T-30 Torx driver, remove two screws securing the bus bar (**A**) to terminal E (**B**) on the braking IGBT module and to the bus plate negative terminal (**C**). See Figure 85. Remove the bar from the drive.
   - — 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 85: Braking IGBT Module Bus Bars



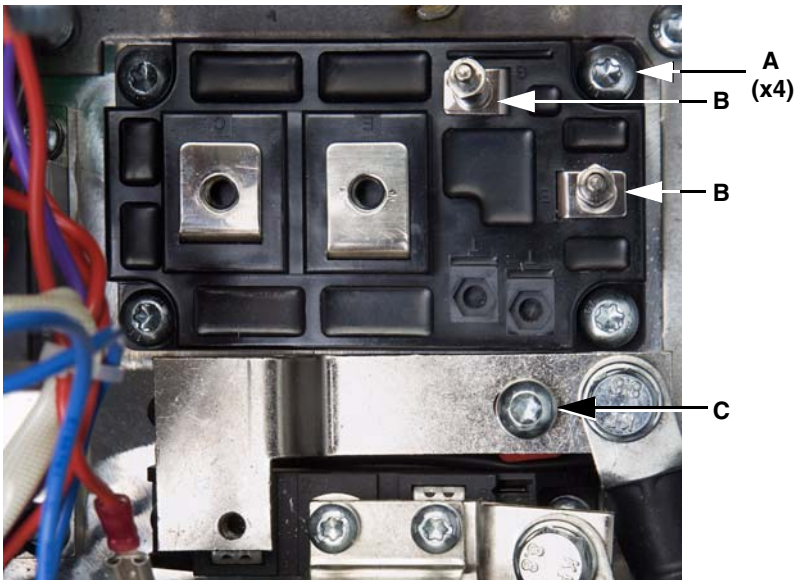
Replace the Braking IGBT Module

Figure 86: Torque Sequence



4. Replace the braking IGBT module as follows. See Figure 87.
   - — 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 86, 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).

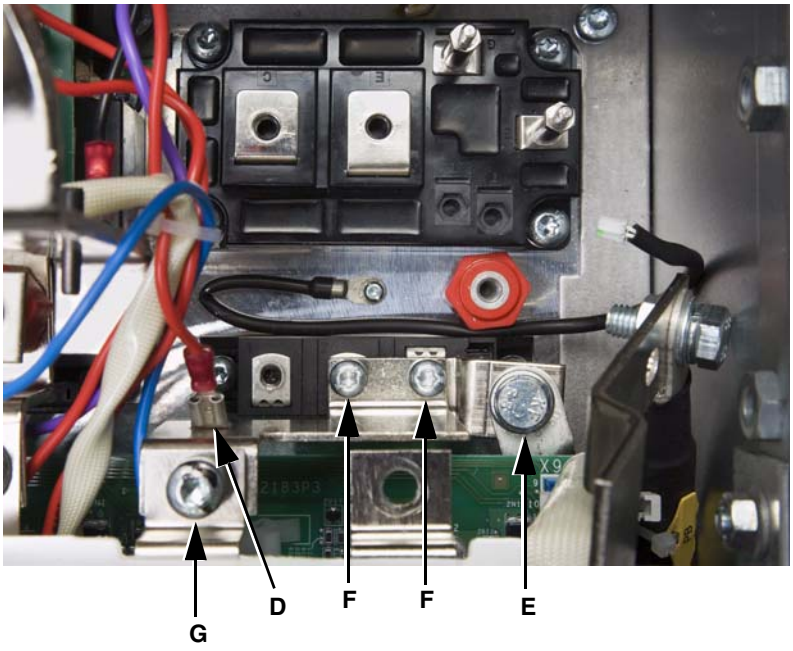
Figure 87: Braking IGBT Module and Diode Module Bus Bar



Remove the Bus Bars from the Diode Module

5. Using a T-30 Torx driver, remove one screw (**C**, Figure 87 on page 93) securing the top diode module bus bar to the insulator on the heatsink, and move the bus bar out of the way.
6. Remove the bottom diode module bus bar as follows.
   - — Remove the red wire (**D,** Figure 88) from the bus bar.
   - — Using a 13 mm socket wrench, remove one bolt (**E,** Figure 88) securing the PA cable to the bus bar.
   - — Using a T-20 Torx driver, remove two screws (**F**, Figure 88) from terminals 2 and 3 of the diode module.
   - — Using a T-30 Torx driver, remove one screw (**G**, Figure 88) securing the bus bar to the bus plate, and remove the bus bar.

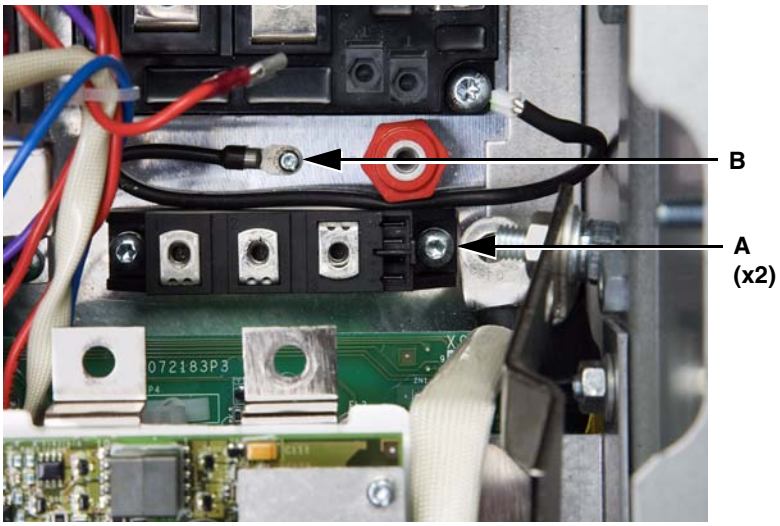
Figure 88: Diode Module Bus Bars



Replace the Diode Module

7. 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).

Figure 89: Diode Module



Replacing Temperature Sensor #2 VZ3G1104

8. Using a T-10 Torx driver, remove one screw securing temperature sensor #2 (**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).

Replace the Bus Bars on the Diode Module

Table 29: Diode Module Bus Bar Hardware Torque Values

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

Table 30: 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

9. Replace the bottom diode bus bar as follows. See Figure 90.
   - — Using a T-30 Torx driver, secure the bottom diode bus bar (**1**) to the bus plate with one screw (**G**). 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**) to terminals 2 and 3 of the diode module with two screws (**F**).
   - — Using a 13 mm socket wrench, secure the PA cable to the bottom diode bus bar (**1**) with one bolt (**E**).
   - — Connect the red wire (**D**) the bus bar.
   - — Tighten hardware **D**, **E**, **F**, and **G** to the torque values shown in Table 29.
10. Using a T-30 Torx driver, secure the top diode bus bar (**2,** Figure 91) to the insulator on the heatsink with one screw (**C**, Figure 91). This bus bar is supplied in the dynamic braking kit. Replace it if necessary.Tighten the screw to the torque value specified in Table 29.

Figure 90: Bottom Diode Module Bus Bar

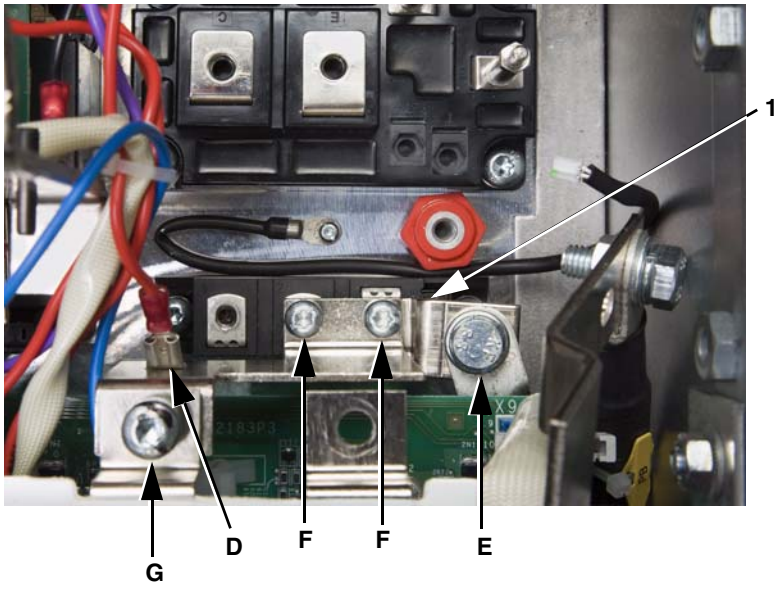
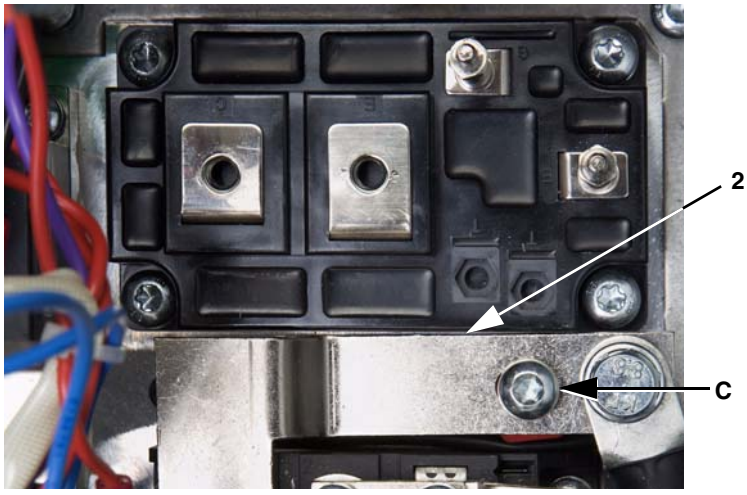


Figure 91: Top Diode Module Bus Bar



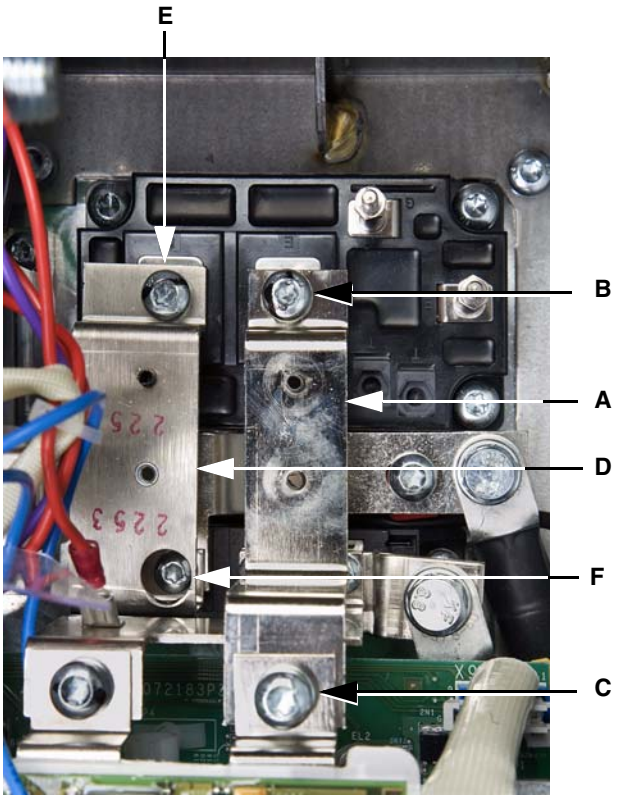
Replace the Bus Bars on the Braking IGBT Module

Table 31: Braking IGBT Bus Bar 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

11. Replace the bus bars on the braking IGBT module as follows. See Figure 92.
    - — Using a T-20 Torx driver, secure the bus bar (**D**) to terminal 1 (**F**) on the diode module with one screw.
    - — Using a T-30 Torx driver, secure the bus bar (**D**) to terminal C (**E**) on the braking IGBT module with one screw. Bus bar D is supplied in the dynamic braking kit. Replace it if necessary.
    - — Using a T-30 Torx driver, secure the bus bar (**A**) to terminal E (**B**) on the braking IGBT module and to the bus plate negative terminal (**C**) with two screws. Bus bar A is supplied in the dynamic braking kit. Replace it if necessary.
    - — Tighten the hardware to the torque values specified in Table 31.

Figure 92: Braking IGBT Module Bus Bars



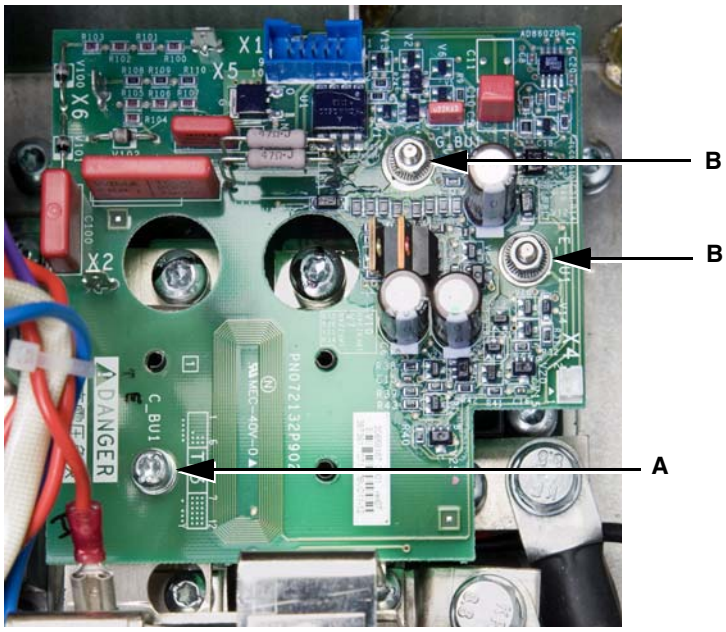
Replace the Dynamic Braking Board

Table 32: 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

12. Replace the dynamic braking board as follows.
    - — Using a 7 mm socket wrench, secure the dynamic braking board to standoffs G and E on the braking IGBT module with two nuts (**B,** Figure 93).
    - — Using a T-20 Torx driver, secure the dynamic braking board to the bus bar between the braking IGBT module and the diode bus bar with one screw (**A,** Figure 93).
    - — Tighten the hardware to the torque values specified in Table 32.

Figure 93: Dynamic Braking Board



Replace the Dynamic Braking Board Connections

13. Replace all connections to the dynamic braking board. See Table 33 and Figure 94 for the connection locations.

Table 33: Dynamic Braking Board Wiring

Wire No.[1]	Terminal No.	Description	To:
E134	**X1**	10-pin, white ribbon	GDB[2] X91
E128	**X2**	1-pin, violet	MB[3] X93
E130	**X4**	2-pin, black	Temperature sensor #2
E132–E133	**X5**	2-pin, blue	GDB X52 & red insulator near CB[4]
E131	**X6**	1-pin, red	Brake assy PA bus bar

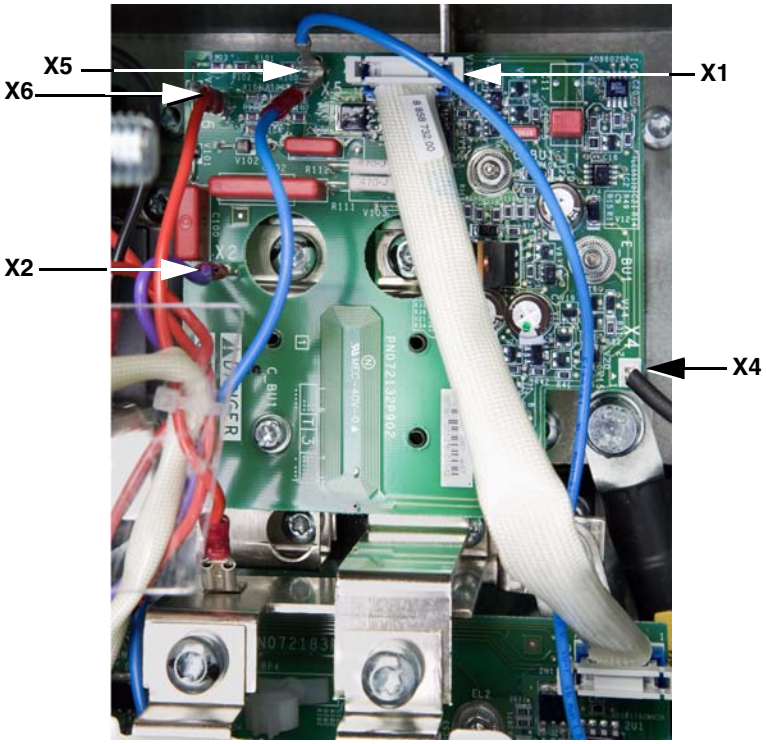
[1] See schematic on page 106 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

[2] GDB: Gate driver board

[3] MB: Measuring board

[4] CB: Control 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 1–6 of “Reassembly Steps for Top Section Parts” beginning on page 100 to replace the following parts:

- ❑ The DC reactor terminal shield
- ❑ The top crossbrace
- ❑ The soft charge board assembly
- ❑ The fan plate
- ❑ The front cover

Reassembly Steps for Top Section 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 equipment in the drive:

- ❑ The DC reactor terminal shield (plastic kit)
- ❑ The top crossbrace
- ❑ The soft charge board assembly
- ❑ The fan plate
- ❑ The front cover

You must perform some or all of the procedures in this section after replacing the spare parts identified in Table 34. Consult Table 34 for the reassembly steps that must be performed for the corresponding spare parts.

Table 34: Reassembly Steps

If you replaced the:	Perform reassembly steps:
SCR Snubber Board VX4A1200	**Steps 1–6**
SCR Modules VZ3TD1285M1671	**Steps 1–6**
Dynamic Braking Kit VZ3F1110	**Steps 1–6**
Temperate Sensor #2	**Steps 1–6**
DC Reactor Terminal Shield	**Steps 1–6**

Replace the DC Reactor Terminal Shield

⚠ DANGER

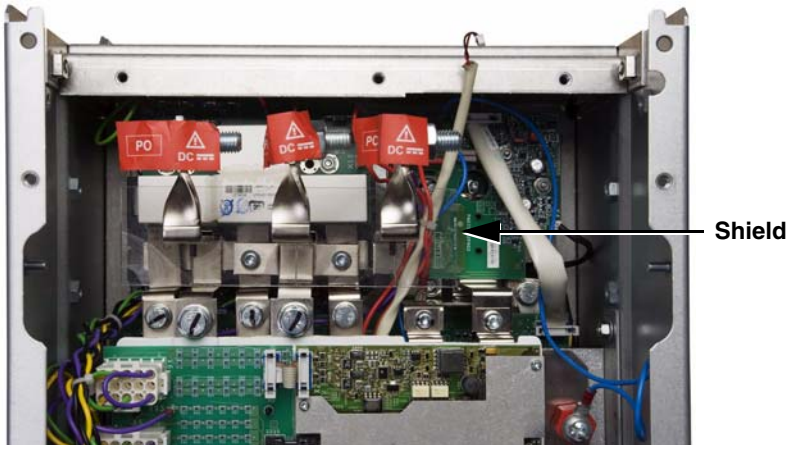
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Install the DC reactor terminal shield as shown in Figure 95.
- 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 20.
- Do not install a damaged shield.

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

1. Replace the plastic shield over the DC reactor terminals. See Figure 95. If the shield is damaged, replace it with the piece from the plastic kit, VY1A1401. See page 20.

Figure 95: DC Reactor Terminal Shield



Replace the Top Crossbrace

Table 35: Top Crossbrace Hardware Torque Values

Item	Description	Torque Range	
		N•m	lb-in
A	(2) 10 mm nuts	5.5	48.7
B	(3) T-30 screws	5.5	48.7

2. Replace the top crossbrace as follows.
   - — Using a 10 mm socket wrench, secure the top crossbrace to the drive frame with two nuts (**A**). See Figure 96.
   - — Using a T-30 Torx driver, secure the crossbrace to the PO, PA/+, and PC/- connections with three screws (**B**). See Figure 97.
   - — Tighten the hardware to the torque values specified in Table 35.

Figure 96: Top Crossbrace

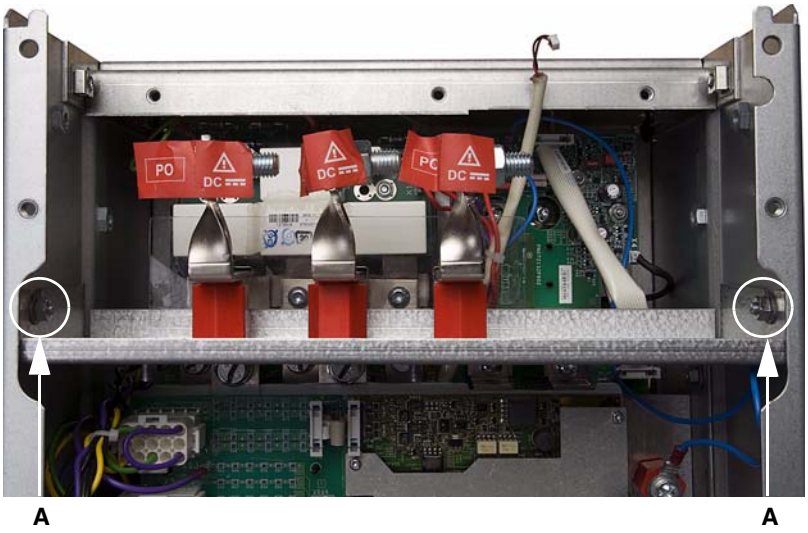
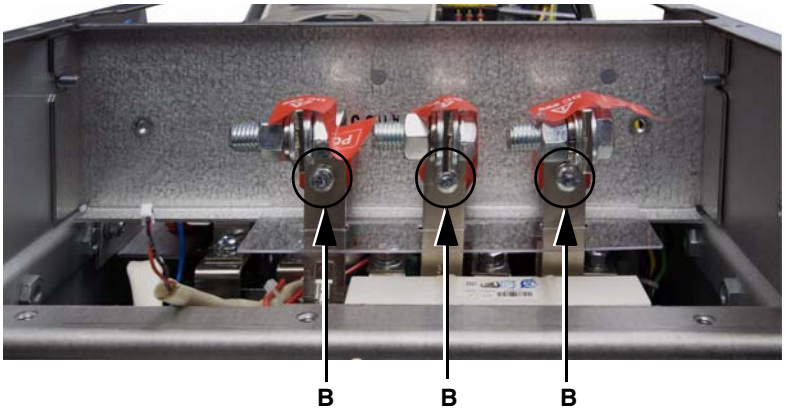


Figure 97: PO, PA/+, and PC/- Connections



Replace the Soft Charge Board Assembly

Table 36: 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
E104	**CN2A**	9-pin, red	PB[3] X30 (7-pin)
E110			MB[4] X30 (2-pin)
E111	**CN7A**	2-pin, black	MB X31

1 See schematic on page 106 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.

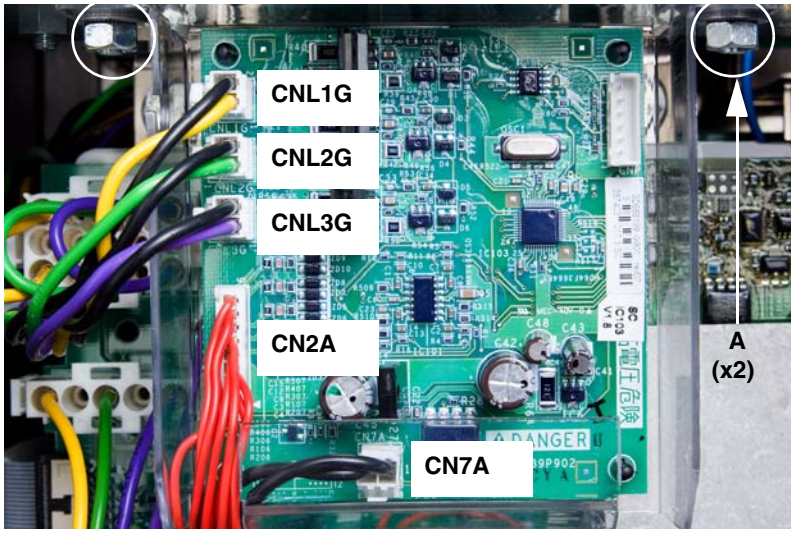
2 SCR: Silicon controlled rectifier

3 PB: Power board

4 MB: Measuring board

3. Using a 10 mm socket wrench, secure the soft charge board plastic tray to the top crossbrace with two nuts (**A**). See Figure 98. Tighten the nuts to 5.5 N•m (48.7 lb-in).
4. Replace the following connections on the soft charge board. See Table 36 and Figure 98 for connector locations.
   - — At the left side of the board, from top to bottom install: the 2-pin connector at terminal CNL1G, the 2-pin connector at terminal CNL2G, the 2-pin connector at terminal CNL3G, and the 9-pin connector at terminal CN2A.
   - — At the bottom of the board, install the 2-pin connector at terminal CN7A.

Figure 98: Soft Charge Board



Replace the Fan Plate

5. Replace the fan plate as follows.
   - — Using a T-30 Torx driver, secure the fan plate to the drive frame with three screws (**A,** Figure 99), and secure the fan plate to the top crossbrace with two screws (**B,** Figure 99). Tighten the screws to 5.5 N•m (48.7 lb-in).
   - — Plug the measuring board connection (**C,** Figure 100) into the back of the fan plate.

Figure 99: Fan Plate

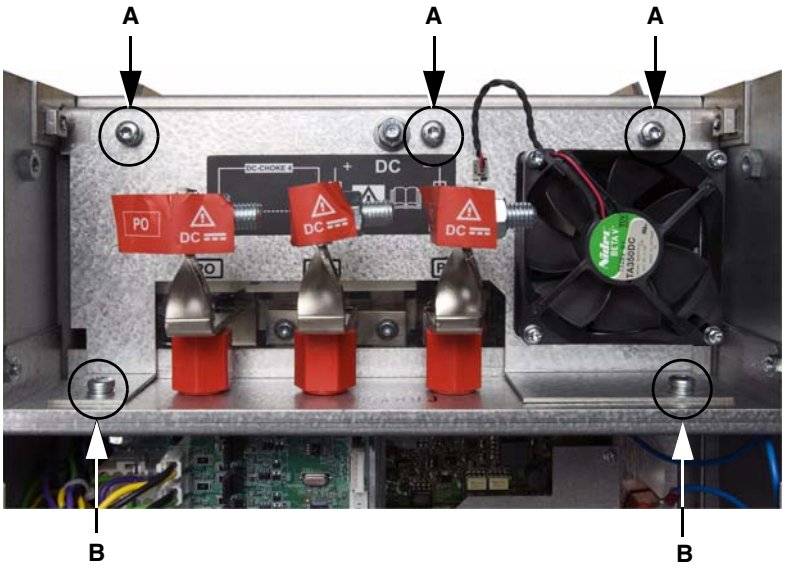
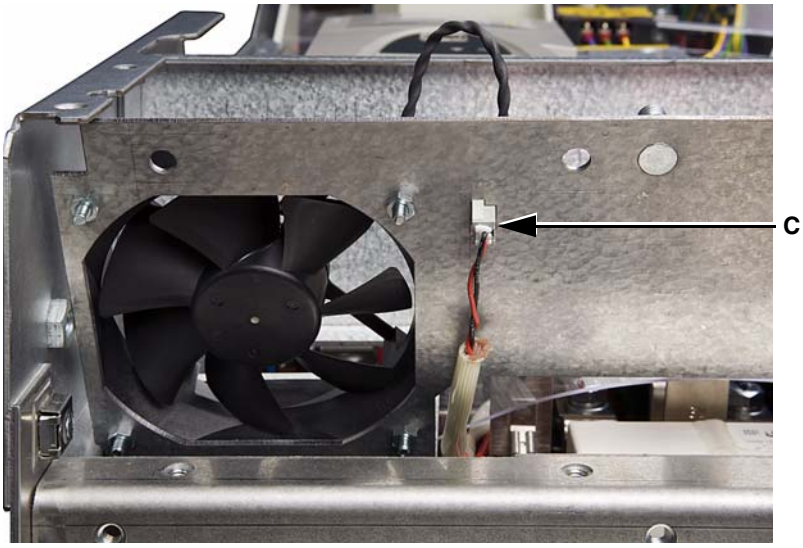


Figure 100: Fan Plate Connection



Replace the Front Cover

6. Replace the front cover. Using a size 2 Phillips driver, secure the front cover with nine screws. See Figure 8 on page 19. 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	2-pin, black/red	Measuring board	**X8**	Power board	**X82**
E103	9-pin, multi-color	Measuring board	**X11**	Current sensors	**T1**
					T2
					T3
E104[2]	9-pin/7-pin, red	Soft charge board	**CN2A (9-pin)**	Power board	**X30 (7-pin)**
E105	3-pin, yellow	Fan control board	**X2**	Measuring board	**X14**
E106	2-pin, red/black	Measuring board	**X21**	Internal fan	**—**
E107	2-pin, yellow/black	Soft charge board	**CNL1G**	SCR[3] 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[4]	9-pin, red	Soft charge board	**CN2A**	Measuring board	**X30 (2-pin)**
E111	2-pin, black	Soft charge board	**CN7A**	Measuring board	**X31**
E112	10-pin, white	Measuring board	**X4**	Control module	**—**
E118	5-pin, violet/green/ yellow	Fan control board	**X1**	Filter board	**X1**
				Filter board	**X2**
				Filter board	**X3**
E119	1-pin, green	SCR snubber board	**X1**	L2 bus bar	**—**
E120	5-pin, yellow/green/ violet	Power board	**X7**	Filter board	**X11**
					X12
					X13
E121	1-pin, red	SCR snubber board	**X4**	PO bus bar	**—**
E122	1-pin, black	SCR snubber board	**X5**	PC bus bar	**—**
E124	9-pin, black/white/ brown/blue with yellow/green ground wire	Fan control board	**X3**	Fan control terminal block TB1	**—**
E125	5-pin, violet/green/ yellow	Fan control board	**X4**	Heatsink fan	**—**

Table 37: Wiring Table *(continued)*

Wire No.[1]	Description	From:		To:	
		Component	Terminal No.	Component	Terminal No.
E126	3-pin, red	Power board	**X10 (3-pin)**	SCR Snubber board	**X10 (0.25 in. 1-pin**
					X11 (0.19 in. 1-pin)
E128	1-pin, violet	Measuring board	**X93**	Dynamic braking board	**X2**
E129	1-pin, blue	Gate driver board	**X51**	+DC 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	2-pin, blue	Dynamic braking board	**X5**	Gate driver board	**X52**
E133		Dynamic braking board	**X5**	Red standoff near control board	**—**
E134	10-pin, white	Dynamic braking board	**X1**	Gate driver board	**X91**
E135	2-pin, black	Gate driver board	**X4**	Temperature sensor #1	**—**
E136	1-pin, blue	Power board	**X50**	DC bus	**—**
E137	1-pin, red	Power board	**UD +1**	DC bus assembly	**—**
E138	2-pin, red/red	Power board	**X81**	Gate driver board	**X81**
E139	1-pin, white	Power board	**UD +R1**	Bleeder resistor	**—**
E141	1-pin, white	Measuring board	**UD -R1**	Bleeder resistor	**—**
E142	18-pin, gray	Measuring board	**X3**	Gate driver board	**X31**
E143	5-pin, violet/green/ yellow	Measuring board	**X5**	Gate driver board	**X21**
					X22
					X23

[1] Wire numbers are given for cross referencing the wires with the schematic on page 106. The numbers do not appear on the wires.

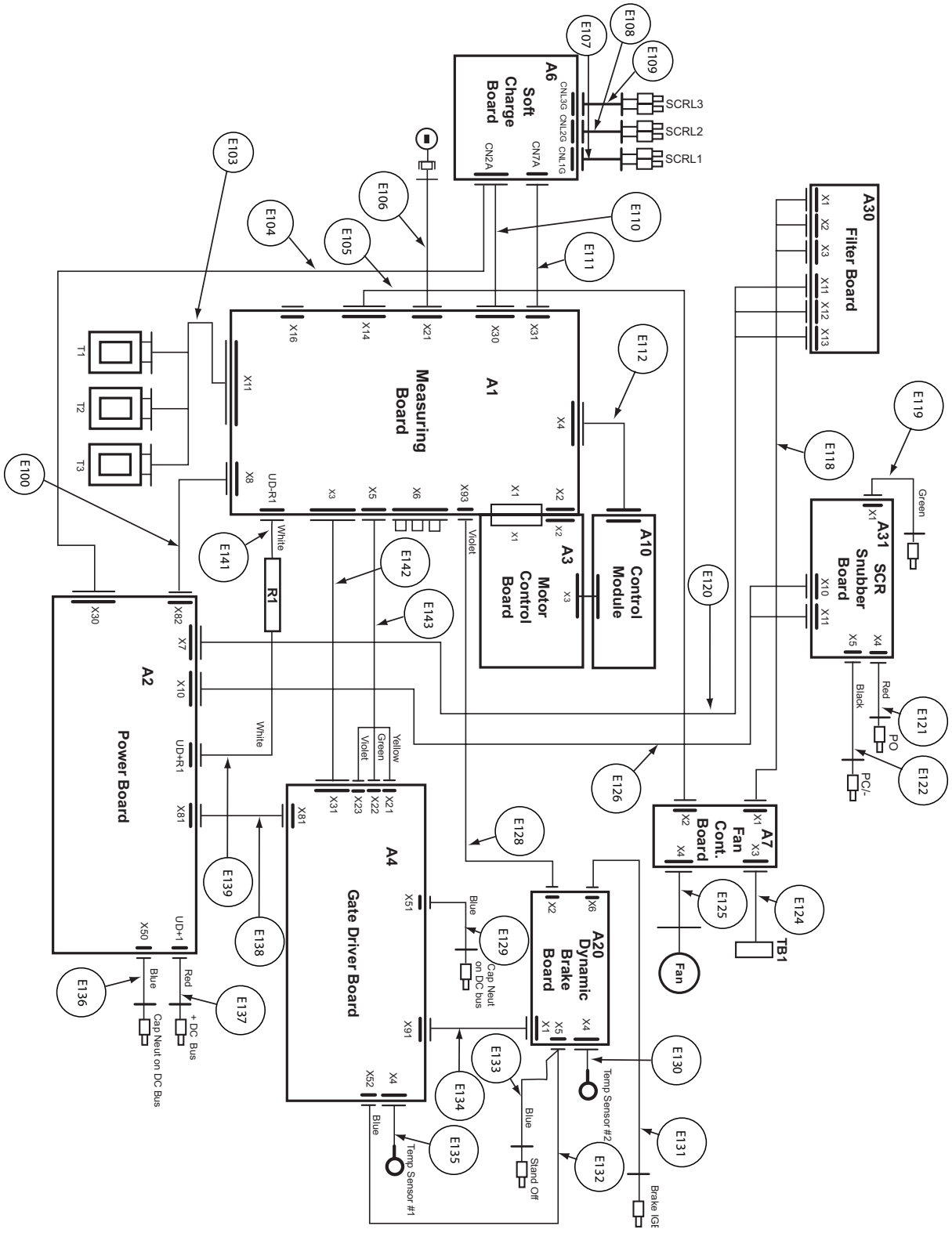
[2] See also wire E110.

[3] SCR: Silicon controlled rectifier

[4] See also wire E104.

Figure 101: Wiring Schematic

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



Spare Parts Kits for Altivar® 61/71 Drives, Frame Size 11
Instruction Bulletin

Schneider Electric USA

8001 Knightdale Blvd.
Raleigh, NC 27545 USA
1-888-SquareD
(1-888-778-2733)
www.schneider-electric.us

04/2009