Altivar® 61/71
Adjustable Speed Drives
Spare Parts Kits

Instruction Bulletin

30072-452-77

Retain for future use.

For Frame Size 10:

ATV61HD90M3X, ATV61HC13N4,
ATV71HD75M3X, ATV71HC11N4

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:
VY1A1211	Front Cover and I/O Terminal Cover	ATV61HC13N4, ATV61HD90M3X, ATV71HC11N4, ATV71HD75M3X	—
VY1A1405	EMC Tray and Power Terminal Shield	ATV61HC13N4 ATV61HD90M3X ATV71HC11N4 ATV71HD75M3X	page 13
VY1ADV1106	Screw Kit	ATV61HC13N4 ATV61HD90M3X ATV71HC11N4 ATV71HD75M3X	—
VZ3V1214	Internal Fan	ATV61HC13N4 ATV61HD90M3X ATV71HC11N4 ATV71HD75M3X	page 13
VX5A1300	Soft Charge Board	ATV61HC13N4 ATV61HD90M3X ATV71HC11N4 ATV71HD75M3X	page 13
VX5A1400	Fan Control Board	ATV61HC13N4 ATV61HD90M3X ATV71HC11N4 ATV71HD75M3X	page 13
VX4A1116	Filter Board	ATV61HC13N4 ATV61HD90M3X ATV71HC11N4 ATV71HD75M3X	page 14
VX5A1HC1113	Power Board	ATV61HC13N4 ATV71HC11N4	page 14
VX5A1HD7590	Power Board	ATV61HD90M3X ATV71HD75M3X	
VY1A1105	Current Sensor	ATV61HC13N4 ATV61HD90M3X ATV71HC11N4 ATV71HD75M3X	page 14
VZ3N1324	Wire Kit	ATV61HC13N4 ATV61HD90M3X ATV71HC11N4 ATV71HD75M3X	—
VZ3S1911	Snubber Capacitor Kit	ATV61HD90M3X ATV71HD75M3X	page 15
VZ3S1912	Snubber Capacitor Kit	ATV61HC13N4 ATV71HC11N4	
VZ3G1102	Temperature Sensor Wire	ATV61HC13N4 ATV61HD90M3X ATV71HC11N4 ATV71HD75M3X	page 16

Table 1: Altivar® 61 and 71 Spare Parts Kits[1] *(continued)*

Kit Catalog No.	Description	For Use On Drive:	For Location of Parts, See:
VZ3TD1285M1671	SCR[2] Module	ATV61HC13N4 ATV71HC11N4	page 16
VZ3TD1330M1601	SCR Module	ATV61HC13N4 ATV61HD90M3X ATV71HC11N4 ATV71HD75M3X	
VZ3IM1600M0671	Power and Braking IGBT[3] Module	ATV61HD90M3X ATV71HD75M3X	page 16
VZ3TM1400M1271	Braking IGBT Module	ATV61HC13N4 ATV71HC11N4	page 16
VZ3IM1400M1271	Power IGBT Module	ATV61HC13N4 ATV61HC11N4	page 16
VY1ADC1111	Capacitor Assembly	ATV61HC13N4 ATV71HC11N4	page 16
VY1ADC1116	Capacitor Assembly	ATV61HD90M3X ATV71HD75M3X	

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

2 SCR: Silicon controlled rectifier

3 IGBT: Insulated-gate bipolar transistor

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 24, 27, and 103 of the installation procedures.
- Install the insulators as specified on pages 20, 64, and 87 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, 0–13.6 N•m (0–120.4 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
- Socket wrenches:
  - — 13 mm
  - — 10 mm

Installation Procedures

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 6 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 the drive is not turned on for a long period, the performance of its electrolytic capacitors will be reduced.
- If the drive is stopped for a prolonged period, turn the drive on every two years for at least 5 hours to restore the performance of the capacitors, then check its operation.
- Do not connect the drive directly to line voltage. Increase the voltage gradually using an adjustable AC source.

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
  - — Rectifier snubber board
  - — Snubber capacitors
- 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 rectifier snubber board, unless you have first checked for voltage with a voltmeter!

To discharge the filter board capacitors, rectifier snubber board, and snubber 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.

Figure 1: Top Level Parts

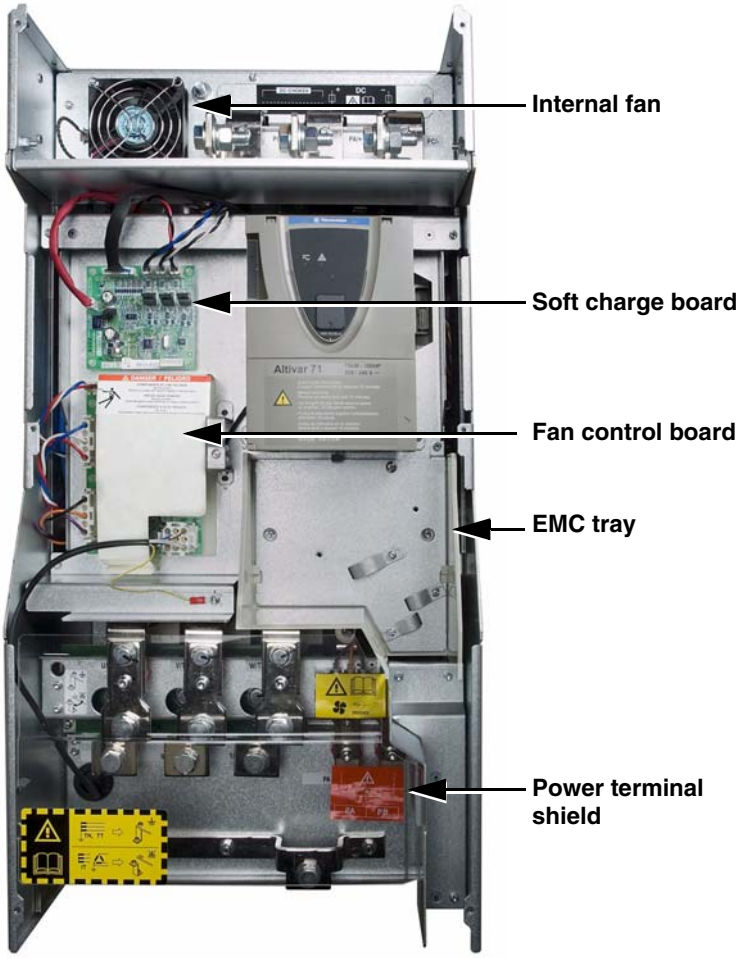


Figure 2: Power Board, Current Sensors, and Filter Board

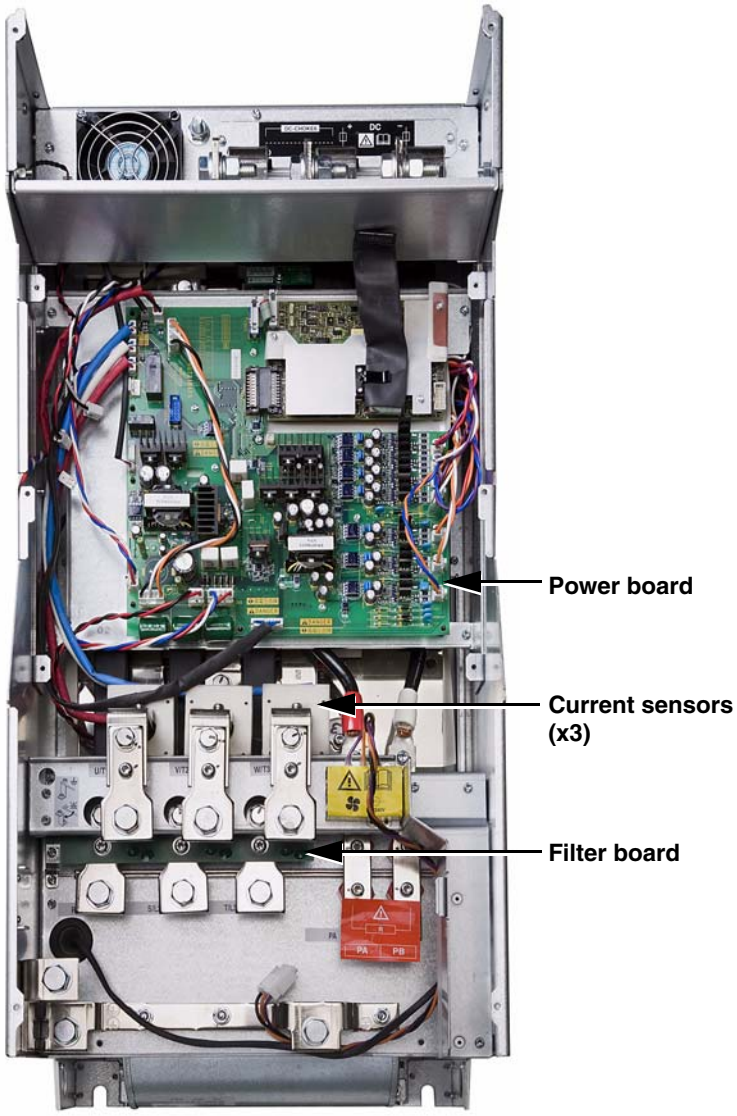


Figure 3: Snubber Board and Snubber Capacitors (240 V Unit Shown)

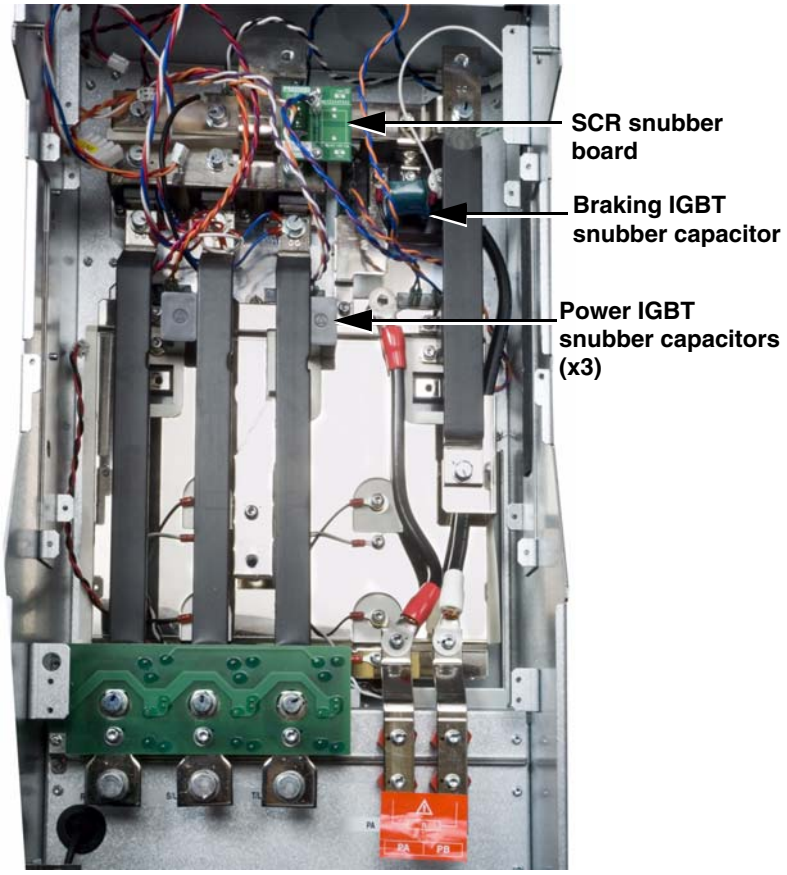
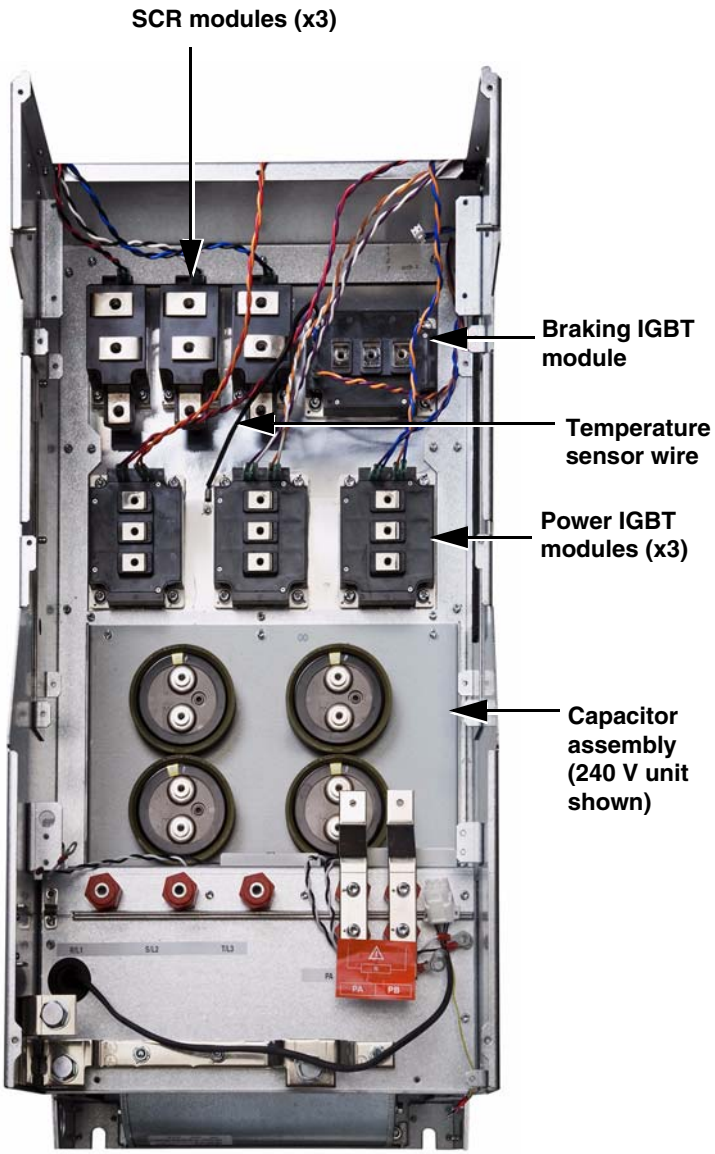


Figure 4: SCR Modules, Power IGBT Modules, Braking IBGT Module, Temperature Sensor Wire, Capacitor Assembly



Removing and Replacing the Front Cover VY1A1211

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 6 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.

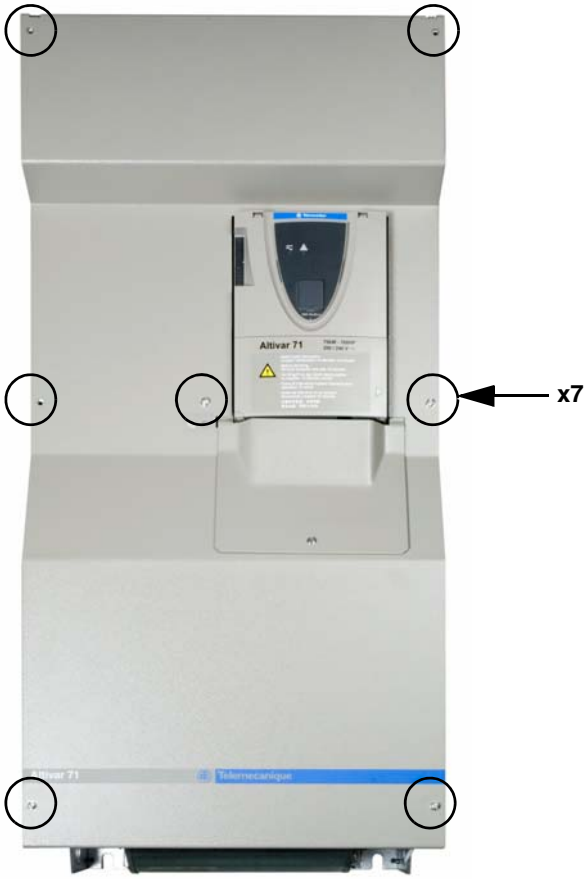
Failure to follow these instructions will result in death or serious injury.

All of the procedures in this manual require removal and replacement of the front cover. See Figure 5.

— To remove the front cover, using a size 2 Phillips driver, remove seven 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 seven screws. Tighten the screws to 1.1–1.7 N•m (9.7–15 lb-in).

Figure 5: Front Cover



Replacing the Internal Fan VZ3V1214

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 6 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.

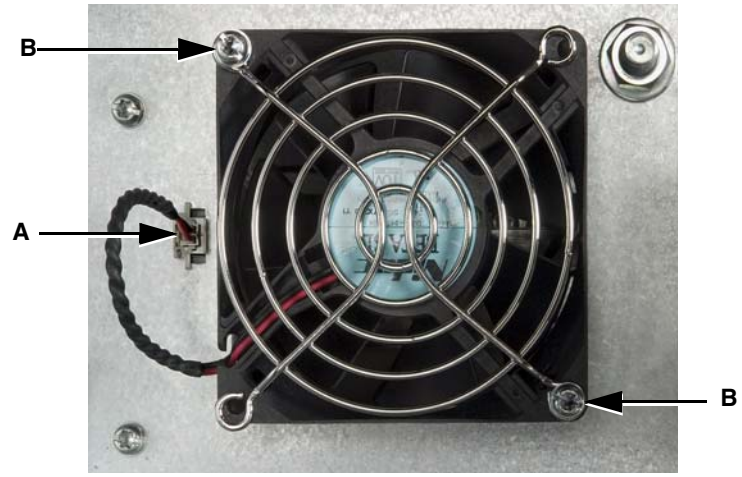
Remove the Front Cover

1. Using a size 2 Phillips driver, remove seven screws and take the front cover off the drive. See Figure 5 on page 17.

Replace the Internal Fan

2. Remove the internal fan as follows. See Figure 6.
   - — Using needle-nose pliers, carefully unplug the 2-pin connector (**A**) from the top bracket.
   - — Using a T-20 Torx driver, remove the two screws (**B**) securing the fan to the top bracket and remove the fan from the drive.

Figure 6: Internal Fan



3. Install the new fan as follows. See Figure 6.
   - — Using a T-20 Torx driver, secure the fan to the top bracket with two 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 seven screws. See Figure 5 on page 17. Tighten the screws to 1.1–1.7 N•m (9.7–15 lb-in).

Replacing the Soft Charge Board VX5A1300

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

Table 2: Soft Charge Board Wiring

Wire No.[1]	Terminal No.	Description	To:
E104	**CN2A**	9-pin Black sleeve	PB[2] CN2
E106	**CNL3G**	2-pin, Blue/Black	SCR 3[3] Terms. 4 & 5
E107	**CNL2G**	2-pin, White/Black	SCR 2 Terms. 4 & 5
E108	**CNL1G**	2-pin, Red/Black	SCR 1 Terms. 4 & 5
E105	**CN7A**	2-pin, Red sleeve	PB CN7

1 See schematic on page 113 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

2 PB: Power board

3 SCR: Silicon controlled rectifier

⚠ DANGER

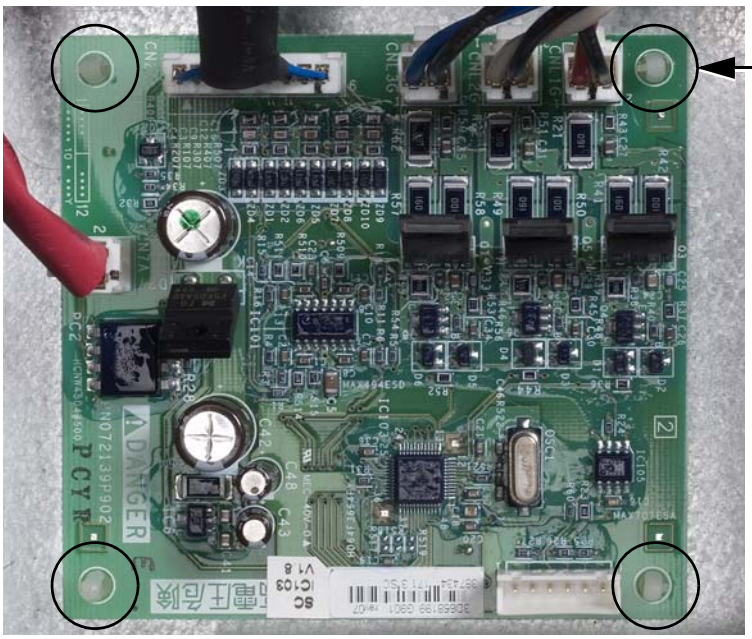
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Read and understand the precautions in "Before You Begin" starting on page 6 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 seven screws and take the front cover off the drive. See Figure 5 on page 17.
2. Carefully remove the following connections from the soft charge board. See Table 2 and Figure 7 for connector locations.
   - — At the top of the board, from left to right remove: the 9-pin connector from terminal CN2A, the 2-pin connector from terminal CNL3G, the 2-pin connector from terminal CNL2G, and the 2-pin connector from terminal CNL1G.
   - — At the left side of the board, remove the 2-pin connector from terminal CN7A.
3. Using needle-nose pliers, gently compress the four plastic mounting posts, one at a time, while lifting the board off the posts. Remove the soft charge board from the drive.
4. Gently press the new soft charge board down over the four mounting posts until it is securely seated on the control module plate.
5. Install five connections to the new soft charge board. See Table 2 and Figure 7 for connector locations.
6. Replace the front cover. Using a size 2 Phillips driver, secure the front cover with seven screws. See Figure 5 on page 17. Tighten the screws to 1.1–1.7 N•m (9.7–15 lb-in).

Figure 7: Soft Charge Board



Replacing the Fan Control Board VX5A1400

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

Table 3: Fan Control Board Wiring

Wire No.[1]	Terminal No.	Description	To:
E115	**X3**	9-pin, Black/White/ Brown/Blue with Yellow and Green Ground Wire	Heatsink fan
E113	**X2**	3-pin, Red/White/Blue	PB[2] CN13
E110	**X1**	5-pin, Red/White/Blue	SCR 1 Term. 1[3] SCR 2 Term. 1 SCR 3 Term. 1
E114	**X4**	5-pin, Violet/Orange/ Black	Fan control terminal block TB1

1 See schematic on page 113 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

2 PB: Power board.

3 SCR: Silicon controlled rectifier

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Read and understand the precautions in "Before You Begin" starting on page 6 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 seven screws and take off the front cover of the drive. See Figure 5 on page 17.
2. The fan control board is covered by a flexible insulator held closed with a tab at the bottom left. See Figure 9 on page 21. Unhook the tab and open the insulator, carefully bending it up out of the way.
3. Remove the following connections from the fan control board. See Table 3 and Figure 8 (page 21) for connector locations.
   - — From the bottom right, remove the 9-pin connector from terminal X3.
   - — Using a T-20 Torx driver, loosen one screw and remove the yellow and green ground wire from the control module plate.
   - — 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.
4. Using needle-nose pliers, gently compress the five plastic mounting posts, one at a time, while lifting the board off the posts. See Figure 8. Remove the board from the drive. Do not remove the insulator from under the fan control board.
5. Press the new fan control board down over the five mounting posts until it is securely seated over the insulator on the control module plate.
6. Install four connections on the new fan control board. See Table 3 and Figure 8 (page 21) for connector locations.
7. Using a T-20 Torx driver, secure the ground wire to the control module plate with one screw. Tighten the screw to 1.1–1.7 N•m (9.7–15 lb-in).
8. Wrap the insulator around the fan control board and close it with the tab at the bottom left.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Install the insulator as shown in Figure 9 on page 21.
- Before installing the insulator, ensure that it has no tears or cracks. If the insulator is damaged, contact your Schneider Electric representative.
- Do not install a damaged insulator.

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

9. Replace the front cover. Using a size 2 Phillips driver, secure the front cover with seven screws. See Figure 5 on page 17. Tighten the screws to 1.1–1.7 N•m (9.7–15 lb-in).

Figure 8: Fan Control Board

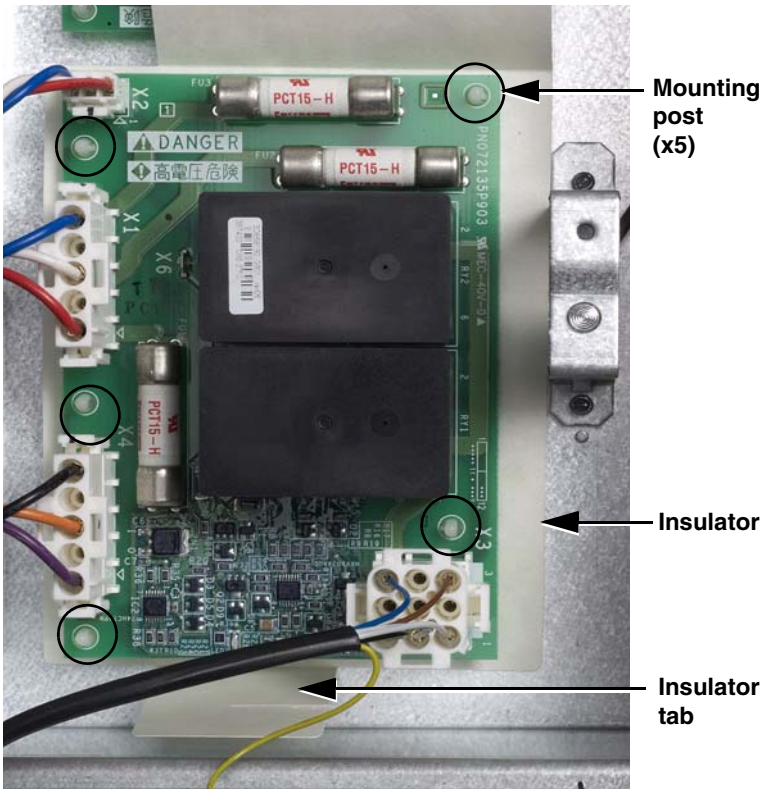
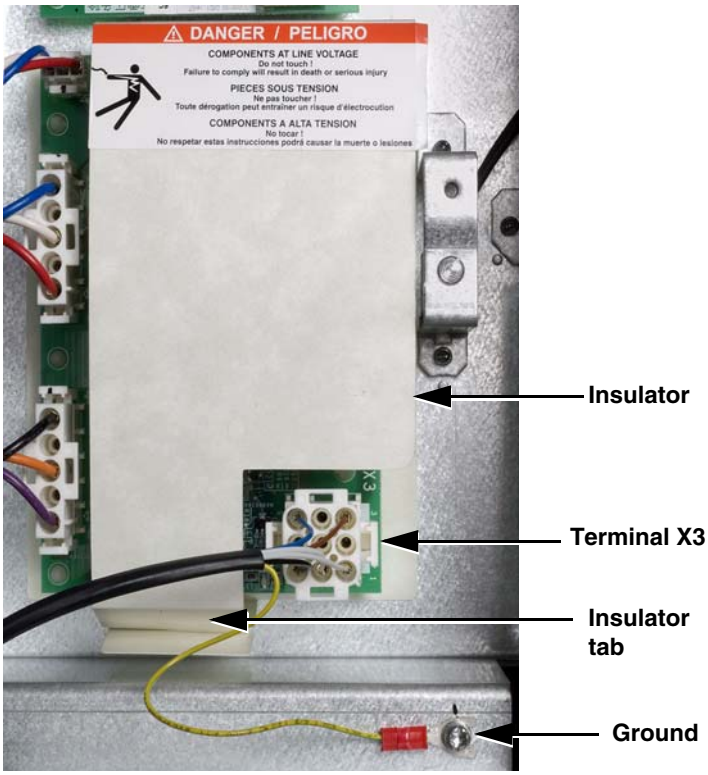


Figure 9: Fan Control Board Insulator



Replacing the EMC Tray and Power Terminal Shield VY1A1405

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 6 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 seven screws and take off the front cover of the drive. See Figure 5 on page 17.

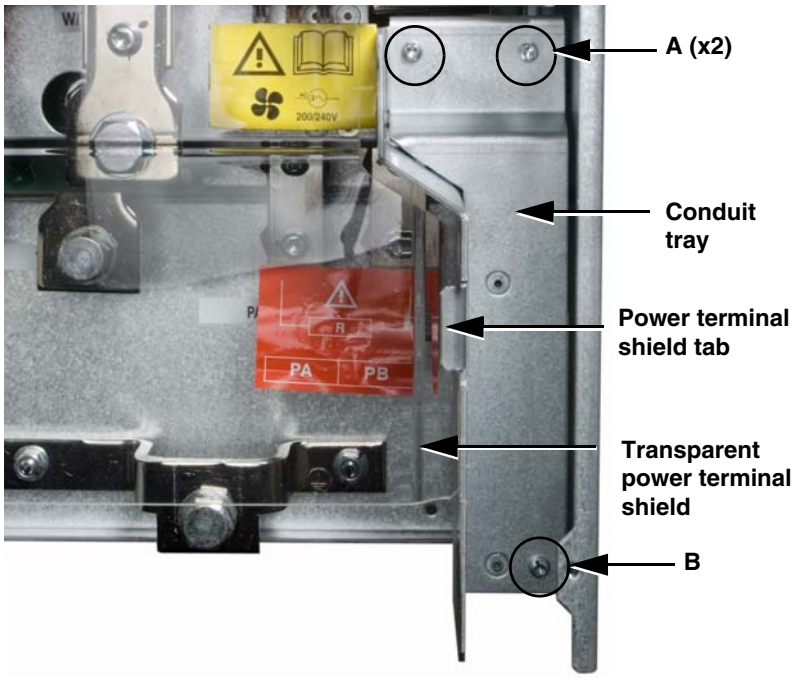
Remove the Conduit Tray and Power Terminal Shield

2. Using a T-20 Torx driver, remove three screws securing the conduit tray to the drive frame. See Figure 10.

NOTE: The screws (**A**) at the top of the conduit tray are longer than the screw (**B**) at the bottom.

3. Remove the conduit tray and power terminal shield as follows. See Figure 10.
   - — The transparent power terminal shield has two retaining tabs. The tab on the right attaches to a slot in the conduit tray. The tab on the left fits into notches on the drive frame.
   - — Lift the conduit tray and power terminal shield out of the drive at the same time, then release the shield from the notches on the drive frame.
   - — Discard the power terminal shield, but retain the conduit tray.

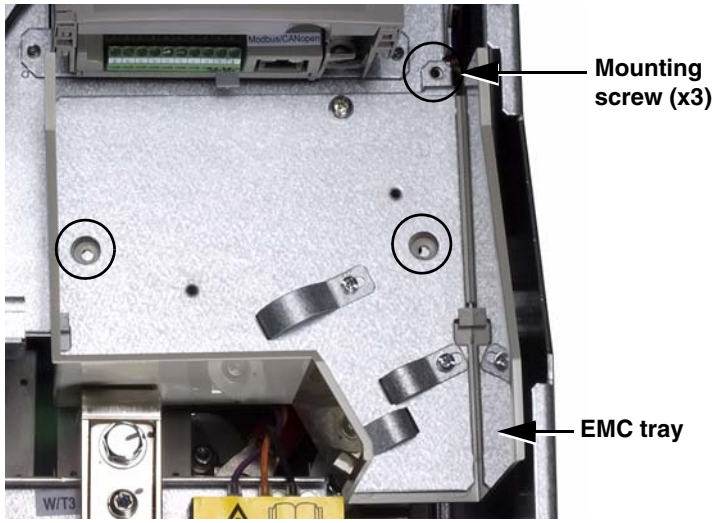
Figure 10: Conduit Tray and Power Terminal Shield



Replace the EMC Tray

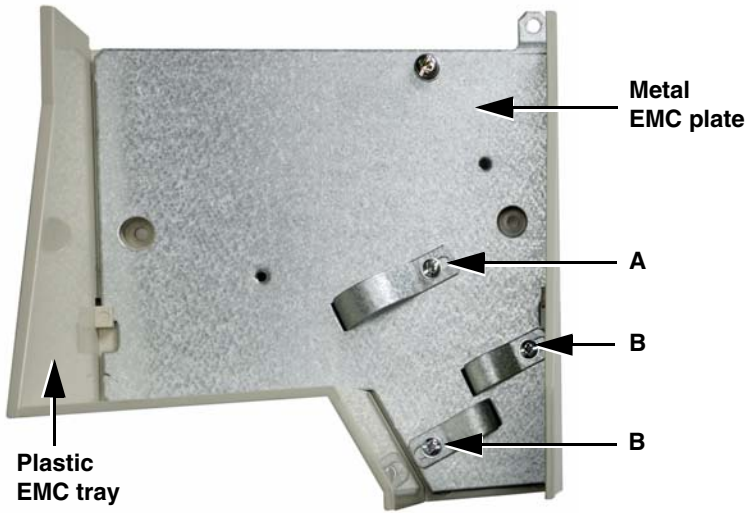
4. Using a T-20 Torx driver, remove three screws securing the EMC tray to the control module mounting plate and remove the tray from the drive. See Figure 11.

Figure 11: EMC Tray



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

Figure 12: Cable Clamps



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. See Figure 12.

6. Remove the metal EMC plate from the plastic tray and discard the plastic tray.
7. Place the metal EMC plate into the new plastic tray.
8. Using a size 2 Phillips driver, install the cable clamps on the EMC plate with three screws. See Figure 12. Tighten the screws to 0.4–0.6 N•m (3.5–5.3 lb-in).
9. Using a T-20 Torx driver, secure the plastic EMC tray to the control module mounting plate with three screws. See Figure 11. Tighten the screws to 0.4–0.6 N•m (3.5–5.3 lb-in).

Replace the Power Terminal Shield and Reinstall the Conduit Tray

10. Install the new power terminal shield and replace the conduit tray as follows. See Figure 13.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Install the power terminal shield as shown in Figure 13.

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

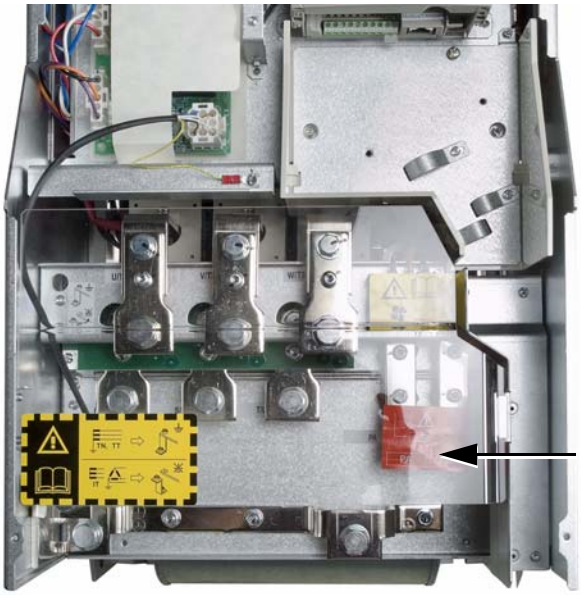
— Slide the tab on the left side of the new power terminal shield under the retaining notches on the drive frame, then slide the tab on the right side of the shield into the slot on the conduit tray.

— Angle the conduit tray and power terminal shield into position in the drive. Ensure that the left edge of the conduit tray is properly seated under the edge of the drive frame.

— Using a T-20 Torx driver, secure the conduit tray to the drive frame with three screws. See Figure 10 on page 22 for screw locations. Tighten the screws to 1.1–1.7 N•m (9.7–15 lb-in).

NOTE: The screws (**A**) at the top of the conduit tray are longer than the screw (**B**) at the bottom. See Figure 10 on page 22.

Figure 13: Power Terminal Shield



Replace the Front Cover

11. Replace the front cover. Using a size 2 Phillips driver, secure the front cover with seven screws. See Figure 5 on page 17. Tighten the screws to 1.1–1.7 N•m (9.7–15 lb-in).

Replacing the Filter Board VX4A1116

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 6 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 15 on page 26.
- Always check for the presence of voltage using a voltmeter set to the 1000 Vdc scale. When voltage is present, allow the voltmeter to discharge the capacitor's stored charge. Refer to "Discharging Stored Energy in Capacitors" on page 12.

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

Remove the Front Cover

1. Using a size 2 Phillips driver, remove seven screws and take the front cover off the drive. See Figure 5 on page 17.

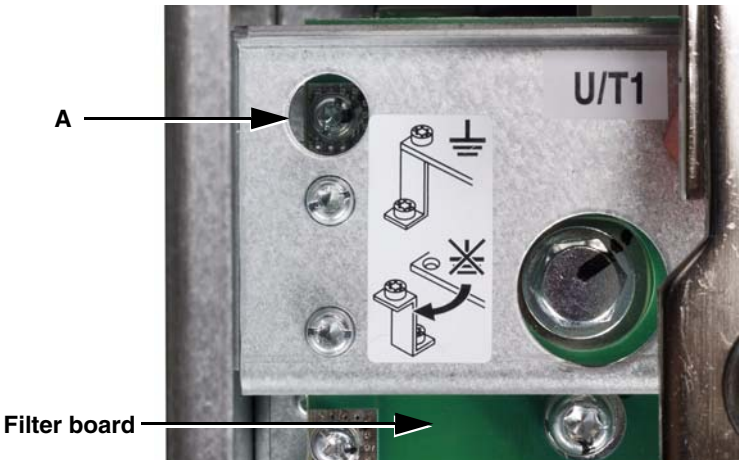
Remove the Conduit Tray and Power Terminal Shield

2. Perform Steps 2 and 3 of "Replacing the EMC Tray and Power Terminal Shield VY1A1405" beginning on page 22 to remove the conduit tray and the power terminal shield.

Replace the Filter Board

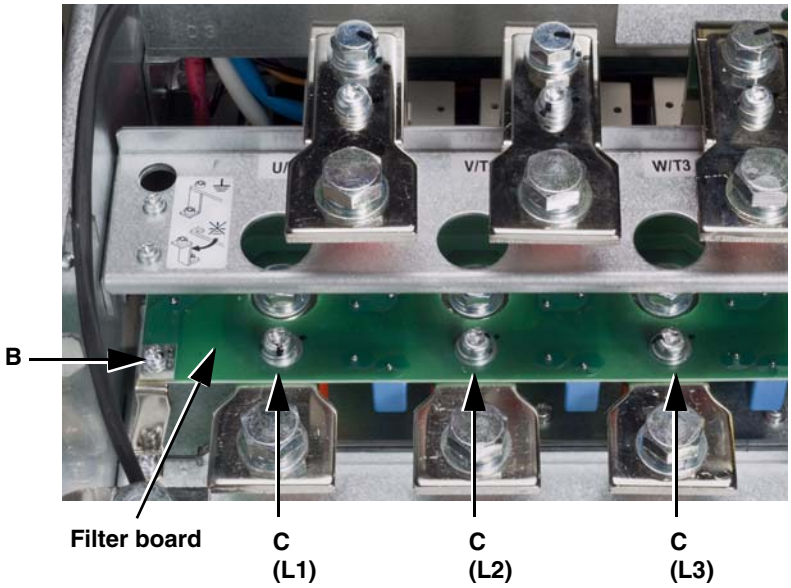
3. Using a T-20 Torx driver, remove one screw (**A**) securing the top left corner of the filter board to the drive frame. See Figure 14.

Figure 14: Filter Board, Top Left Screw



4. Using a size 2 Phillips driver, remove one screw (**B**) securing the filter board to the grounding bracket on the bottom terminal plate. See Figure 15.
5. Using a T-30 Torx driver, remove three screws (**C**) securing the filter board to input terminals L1, L2, and L3. See Figure 15. Remove and discard the filter board.

Figure 15: Filter Board



6. Install the new filter board over input terminals L1, L2, and L3.
7. Using a T-30 Torx driver, secure the filter board to the input terminals with three screws (**C**). Tighten the screws to 3.3–4.4 N•m (29.2–38.9 lb-in).
8. Using a T-20 Torx driver, secure the top left corner of the filter board to the drive frame with one screw (**A**). See Figure 14. Tighten the screw to 1.1–1.7 N•m (9.7–15 lb-in).

9. Using a size 2 Phillips driver, secure the filter board to the grounding bracket on the bottom terminal plate with one screw (**B**). See Figure 15. Tighten the screw to 1.1–1.7 N•m (9.7–15 lb-in).

Replace the Conduit Tray and Power Terminal Shield

10. Perform Step 10 of “Replacing the EMC Tray and Power Terminal Shield VY1A1405” beginning on page 22 to replace the conduit tray and the power terminal shield.

Replace the Front Cover

11. Replace the front cover. Using a size 2 Phillips driver, secure the front cover with seven screws. See Figure 5 on page 17. Tighten the screws to 1.1–1.7 N•m (9.7–15 lb-in).

Disassembling the Drive

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 6 before performing this procedure.
- Before working on this equipment, turn off all power supplying it and perform the DC bus voltage measurement procedure on page 11.

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

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

- ❏ The front cover
- ❏ The EMC tray
- ❏ The soft charge board connections
- ❏ The fan control board connections
- ❏ The control module plate
- ❏ The control module connections
- ❏ The power board connections
- ❏ The power board mounting plate
- ❏ The conduit tray and power terminal shield
- ❏ The top cover

You must perform some or all of the procedures in this section to access the spare parts identified in Table 4. Consult Table 4 for the disassembly steps that must be performed for the corresponding spare parts.

Table 4: Disassembly Steps

If you are replacing:	Perform disassembly steps:	Then follow procedure:
Power board	**Steps 1–7**	"Replacing the Power Board VX5A1HC1113, VX5A1HD7590" beginning on page 39
Current sensor	**Steps 1–9**	"Replacing the Snubber Capacitors and Snubber Board VZ3S1911 and VZ3S1912" beginning on page 47
Snubber capacitors and snubber board	**Steps 1–10**	"Replacing the Snubber Capacitors and Snubber Board VZ3S1911 and VZ3S1912" beginning on page 47
Silicon controlled rectifiers	**Steps 1–10**	"Replacing the SCR Modules and the Braking IGBT Module" beginning on page 55
Braking IGBT module		
Power IGBT modules	**Steps 1–10**	"Replacing the Power IGBT Modules, the Temperature Sensor, and the Capacitor Assembly" beginning on page 67
Capacitor assembly		

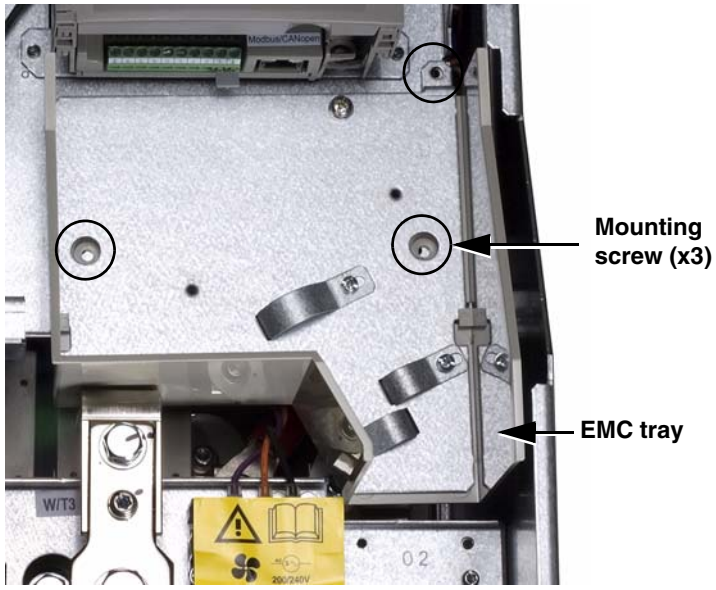
Remove the Front Cover

1. Using a size 2 Phillips driver, remove seven screws and take off the front cover. See Figure 5 on page 17.

Remove the EMC Tray

2. 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 16.

Figure 16: EMC Tray



Remove the Soft Charge Board Connections

Table 5: Soft Charge Board Wiring

Wire No.[1]	Terminal No.	Description	To:
E104	**CN2A**	9-pin Black sleeve	PB[2] CN2
E106	**CNL3G**	2-pin, Blue/Black	SCR 3[3] Terms. 4 & 5
E107	**CNL2G**	2-pin, White/Black	SCR 2 Terms. 4 & 5
E108	**CNL1G**	2-pin, Red/Black	SCR 1 Terms. 4 & 5
E105	**CN7A**	2-pin, Red sleeve	PB CN7

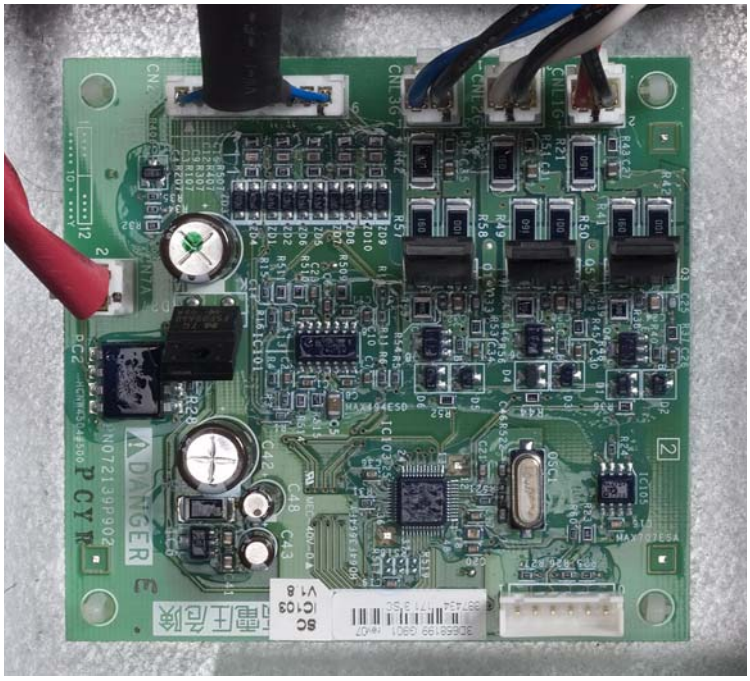
1 See schematic on page 113 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

2 PB: Power board

3 SCR: Silicon controlled rectifier

3. Carefully remove the following connections from the soft charge board. See Table 5 and Figure 17 for connector locations.
   - — At the top of the board, from left to right remove: the 9-pin connector from terminal CN2A, the 2-pin connector from terminal CNL3G, the 2-pin connector from terminal CNL2G, and the 2-pin connector from terminal CNL1G.
   - — At the left side of the board, remove the 2-pin connector from terminal CN7A.

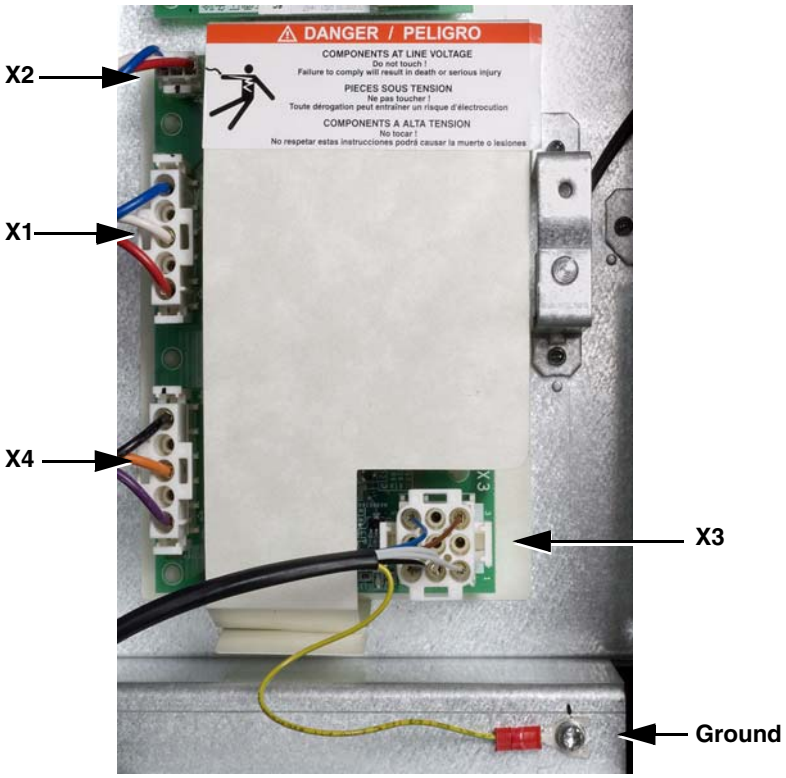
Figure 17: Soft Charge Board Connections



Remove the Fan Control Board Connections

4. Carefully remove the following connections from the fan control board. See Figure 18 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 of the board, remove the 9-pin connector from terminal X3.
   - — Using a T-20 Torx driver, loosen one screw and remove the yellow ground wire from the control module plate.

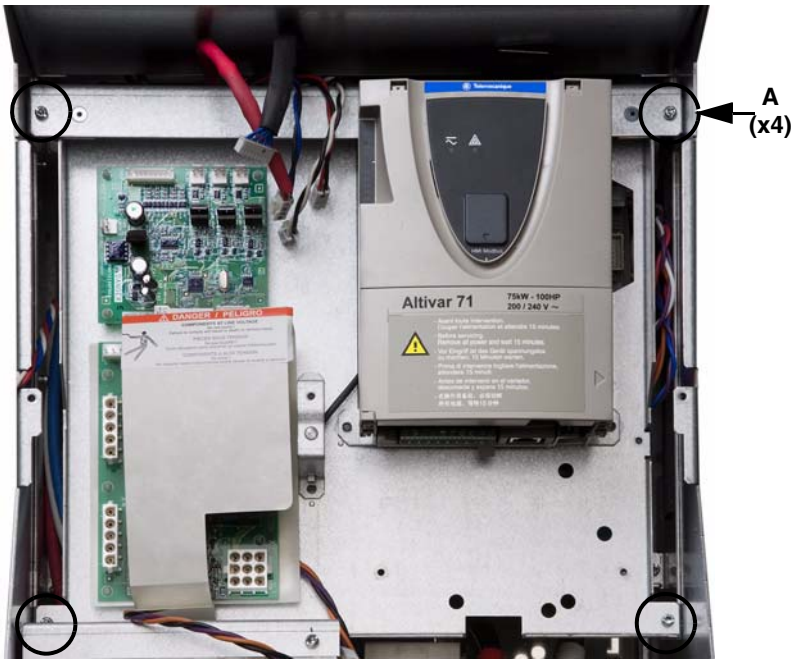
Figure 18: Fan Control Board Connections



Remove the Control Module Plate

5. Remove the control module plate as follows. See Figure 19.
   — Using a T-20 Torx driver, remove four screws and lift the control module plate from the drive frame.

Figure 19: Control Module Plate



Remove the Control Module Connections

6. Remove the control module plate connections as follows. See Figure 20.
   — From the control module, remove the 10-pin connection (**A**) connecting the module to power board terminal CNX4, and remove the 26-pin ribbon cable (**B**) connecting the module to motor control board terminal X3.
   — From the power board, remove the 2-pin LED connection (**C**) at terminal CN24.

Table 6: Control Module Plate Wiring

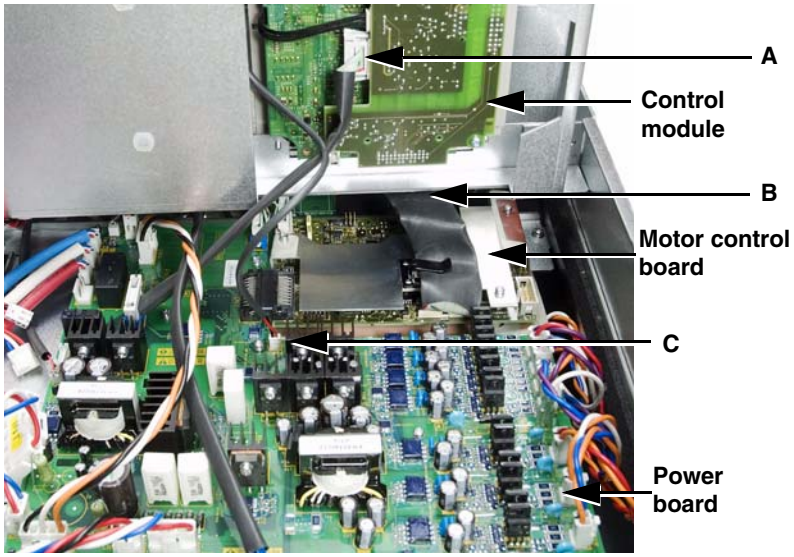
Wire No.[1]	Terminal No.	Description	To:
E112	—	10-pin	PB[2] CNX4
—	—	26-pin	MCB[3] X3
E131	**PB CN24**	2-pin	Charge LED

[1] See schematic on page 113 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

[2] PB: Power board

[3] MCB: Motor control board

Figure 20: Control Module Connections



Remove the Power Board Connections

7. Using needle-nose pliers, carefully remove the following connections from the power board. See Figure 21 and Table 7 on page 34 for connector locations.
   - — At the top of the board, from left to right remove: the 2-pin connector from terminal CN22 and the 2-pin connector from terminal CN7.
   - — At the left side of the board, from top to bottom remove: the 3-pin connector from terminal CNC, the 3-pin connector from terminal CNB, the 3-pin connector from terminal CNA, the 2-pin connector from terminal CN12, and the 3-pin connector from terminal CN13.
   - — At the right side of the board, from top to bottom remove: the 10-pin connector from terminal CNX2, the 22-pin connector from terminal CNX1, the 2-pin connector from terminal CN24, the 2-pin connector from terminal CNX, the 2-pin connector from terminal CNY, the 2-pin connector from terminal CNZ, the 2-pin connector from terminal CNPB, the lug from terminal TAB1, the 2-pin connector from terminal CNU, the 2-pin connector from terminal CNV, and the 2-pin connector from terminal CNW.
   - — At the bottom of the board, from left to right remove: the 3-pin connector from terminal CN6 and the 5-pin connector from terminal CN5.

Figure 21: Power Board Connections

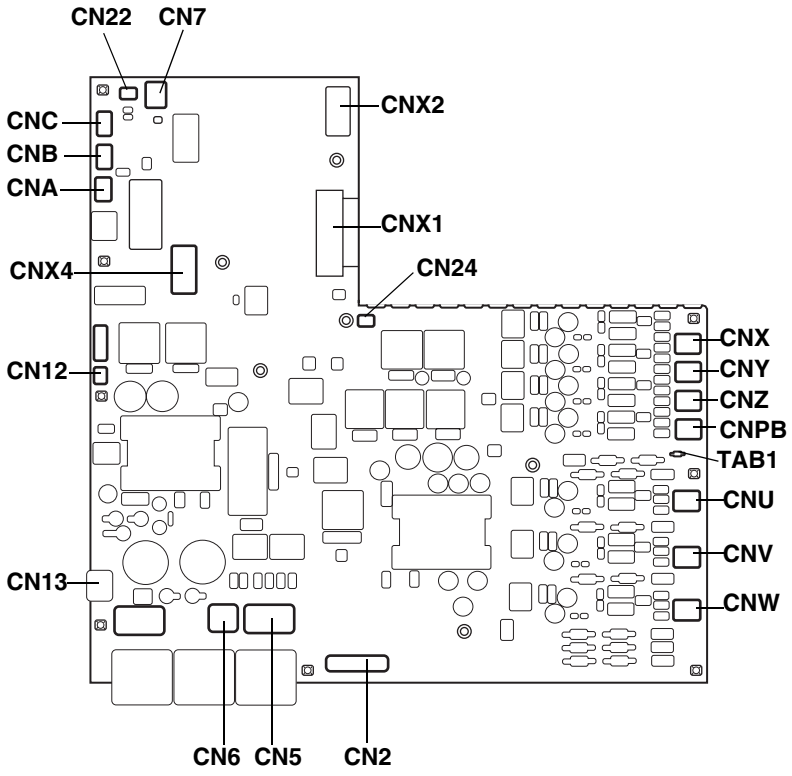


Table 7: Power Board Wiring

Wire No.[1]	Terminal No.	Description	To:
E101	**CN22**	2-pin, black sleeve	Temperature sensor wire
E105	**CN7**	2-pin, red sleeve	Soft charge board, CN7A
E127	**CNC**	3-pin, blue sleeve	Current sensor 3
E128	**CNB**	3-pin, white sleeve	Current sensor 2
E129	**CNA**	3-pin, red sleeve	Current sensor 1
E112	**CNX4**	10-pin	Control module
E103	**CN12**	2-pin, black sleeve	Internal fan
E113	**CN13**	3-pin, red/white/blue	X2 fan control board
E130	**CN6**	3-pin, black/red	Capacitor
E109	**CN5**	Ring, red/white/blue	SCR 1[2] (red), Term. 1 SCR 2 (white), Term. 1 SCR 3 (blue), Term. 1
E104	**CN2**	9-pin	Soft charge board, CN2A
—	**CNX2**	10-pin	Control board X2
—	**CNX1**	22-pin	Control board X1
E131	**CN24**	2-pin	Charge LED
E117	**CNX**	2-pin, violet/red	Power IGBT[3] module 1, G2 and E2
E118	**CNY**	2-pin, violet/white	Power IGBT module 2, G2 and E2
E119	**CNZ**	2-pin, violet/blue	Power IGBT module 3, G2 and E2
E120	**CNPB**	2-pin, violet/orange	Braking IGBT module, E2 and G2
E116	**TAB1**	lug, white	Braking IGBT module, C2E1
E121	**CNU**	2-pin, orange/red	Power IGBT module 1, E1 and G1
E122	**CNV**	2-pin, orange/white	Power IGBT module 2, E1 and G1
E126	**CNW**	2-pin, orange/blue	Power IGBT module 3, E1 and G1

[1] See schematic on page 113 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.

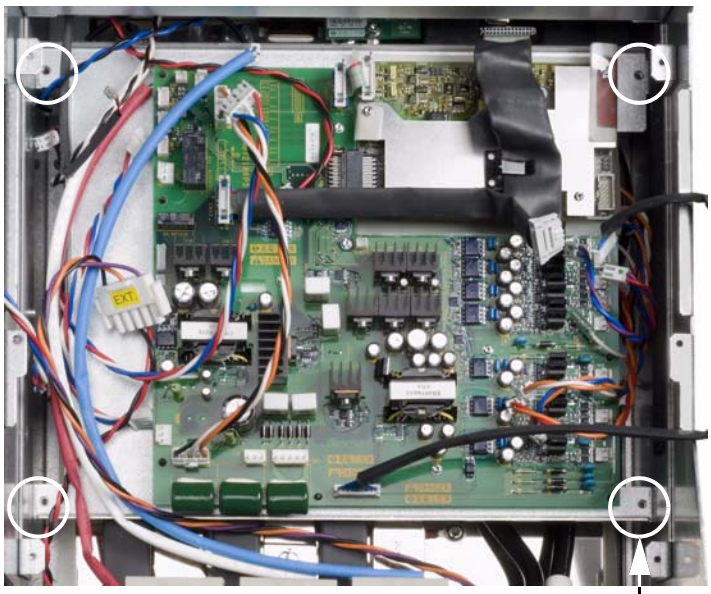
[2] SCR: Silicon controlled rectifier

[3] IGBT: Insulated-gate bipolar transistor

Remove the Power Board Mounting Plate

8. Using a T-20 Torx driver, remove the four screws securing the power board mounting plate to the drive frame and remove the plate. See Figure 22.

Figure 22: Power Board Mounting Plate



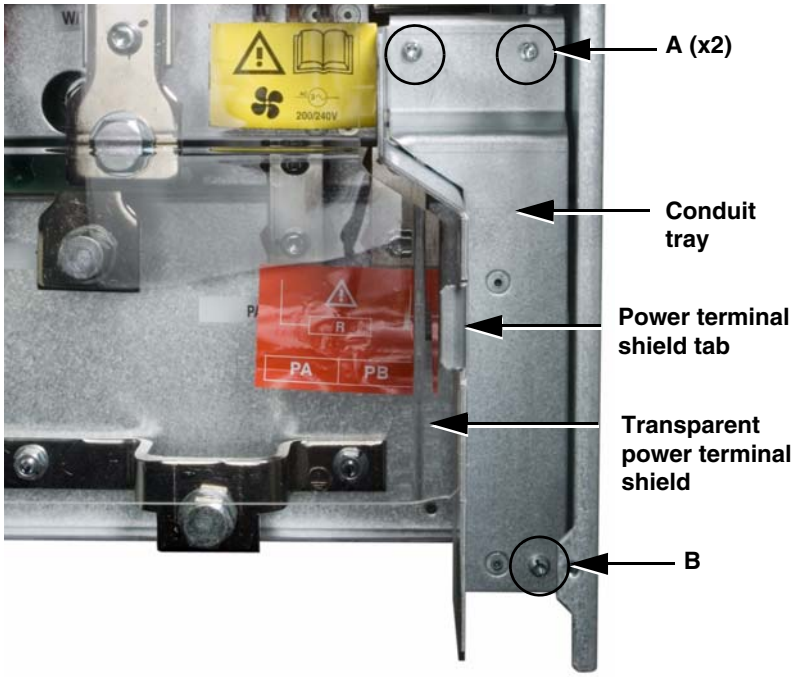
Remove the Conduit Tray and Power Terminal Shield

9. Remove the conduit tray and power terminal shield as follows. See Figure 23.
   — Using a T-20 Torx driver, remove three screws securing the conduit tray to the drive frame.

NOTE: The screws (**A**) at the top of the conduit tray are longer than the screw (**B**) at the bottom.

   — The power terminal shield has two retaining tabs. The tab on the right attaches to a slot in the conduit tray. The tab on the left fits into notches on the drive frame.
   — Lift the conduit tray and power terminal shield out of the drive at the same time, then release the shield from the notches on the drive frame.

Figure 23: Conduit Tray and Power Terminal Shield

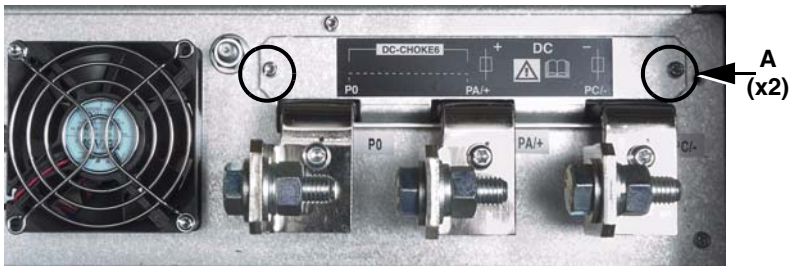


Remove the Top Cover

10. Remove the top cover as follows.

— Using a T-20 Torx driver, remove two screws (**A**) securing the DC choke label plate to the top cover and remove the plate. See Figure 24.

Figure 24: DC Choke Label Plate

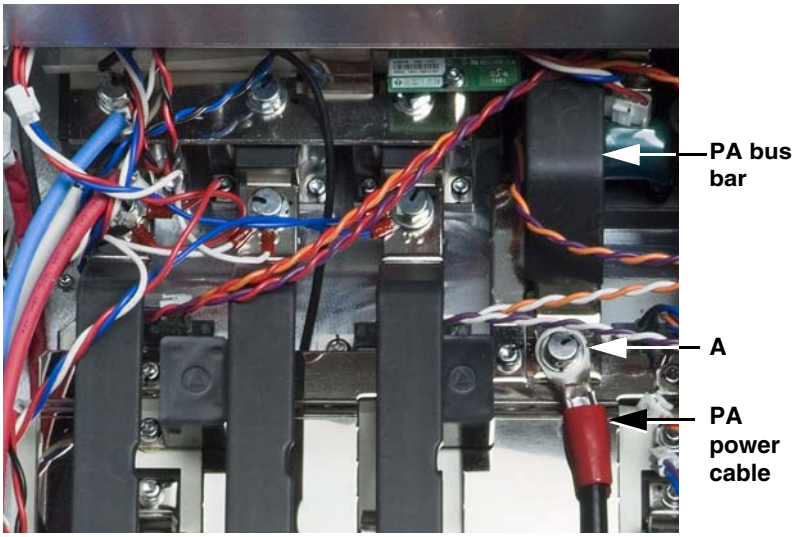


— Using a 13 mm socket wrench, remove two bolts (**B**) securing the DC choke to terminals PO and PC/-. See Figure 25.

Figure 25: DC Choke PO and PC/- Connections

— Using a 13 mm socket wrench, remove one bolt (**A**) securing the PA bus bar to the positive bus plate. See Figure 26. Note that the PA power cable is under this bolt.

Figure 26: PA Connection to Positive Bus Plate

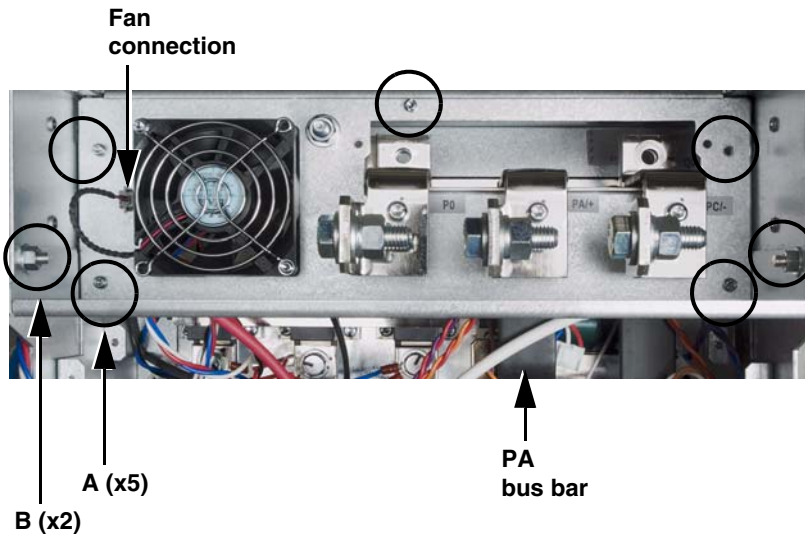


— Using a T-20 Torx driver, remove five screws (**A**) securing the top cover to the drive frame. See Figure 27.

— Using a 10 mm socket wrench, remove two nuts (**B**) securing the top cover to the drive side panels and remove the top cover. See Figure 27.

NOTE: The internal fan connection and the PA bus bar remain connected to the top cover and come out with it.

Figure 27: Top Cover



Replacing the Power Board VX5A1HC1113, VX5A1HD7590

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 6 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 "Disassembling the Drive" beginning on page 28 to remove the following parts from the drive:

- ❑ The front cover
- ❑ The EMC tray
- ❑ The soft charge board connections
- ❑ The fan control board connections
- ❑ The control module plate
- ❑ The control module connections
- ❑ The power board connections

Replace the Power Board

Replace the power board as follows.

1. Using a T-10 Torx driver, remove the six screws (item **A,** Figure 28) securing the power board to the power board mounting plate.
2. Using needle-nose pliers, gently compress the eight plastic mounting posts, one at a time, while lifting the power board off the posts (item **B**, Figure 28).
3. Slide the power board to the left to disconnect it from the control board (item **C,** Figure 29 on page 41) and remove the power board from the drive.
4. Remove the jumper cable (item **D,** Figure 29) between terminals CNX5 and CNX6 and transfer it to the new power board.
5. Remove the 10-pin ribbon cable (item **E,** Figure 29) from power board terminal CNX4 and remove the 9-pin ribbon cable (item **F,** Figure 29) from power board terminal CN2, and transfer the cables to the corresponding terminals on the new power board.
6. Position the new power board over the eight plastic mounting posts on the power board mounting plate, but do not seat the board over the posts.
7. Connect the power board to the control board while gently pushing the board down over the mounting posts until it is securely seated.
8. Using a T-10 Torx driver, secure the power board to its mounting plate with six screws. Tighten the screws to 0.5–0.7 N•m (4.4–6.2 lb-in).

Figure 28: Power Board

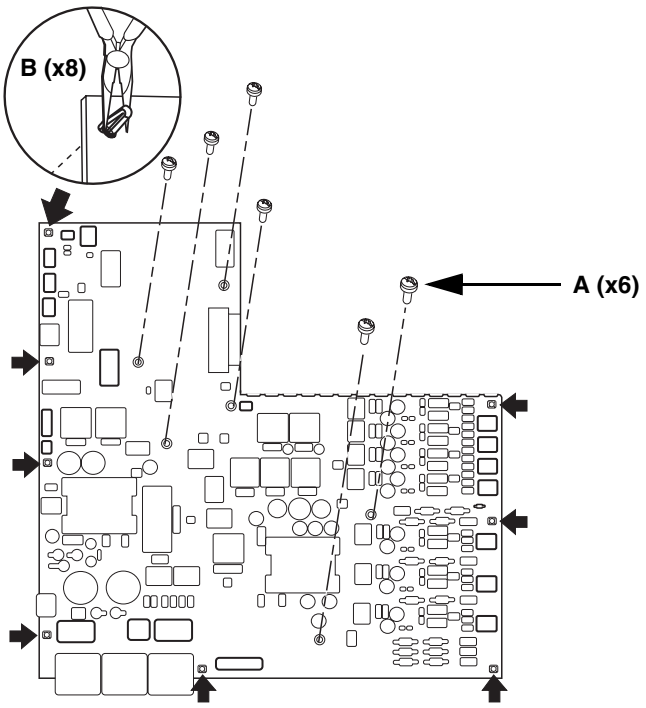
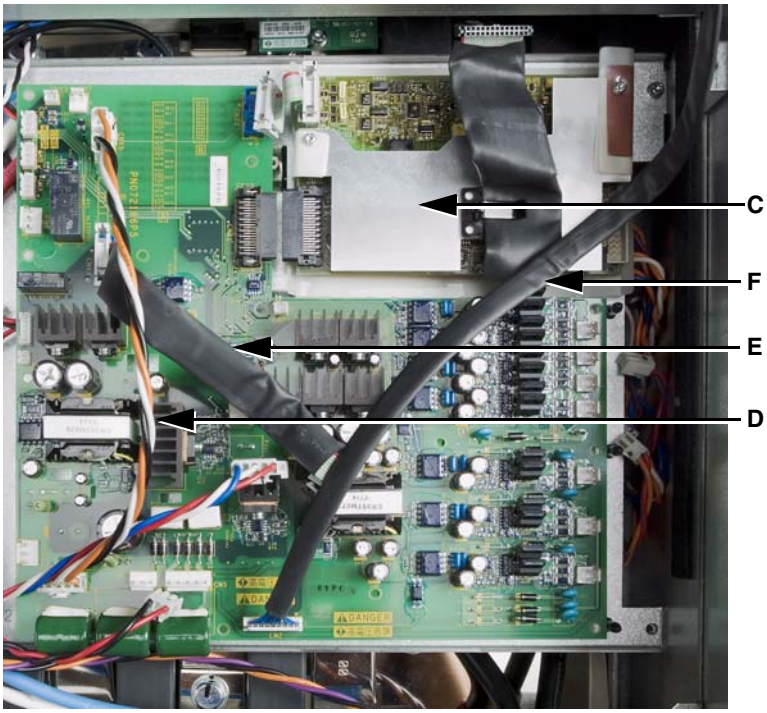


Figure 29: Power Board Removal



Reassemble the Drive

If you are only replacing the power board, perform Steps 4–10 of "Reassembling the Drive" beginning on page 100 to replace the following parts:

- ❏ The power board connections
- ❏ The control module connections
- ❏ The control module plate
- ❏ The fan control board connections
- ❏ The soft charge board connections
- ❏ The EMC tray
- ❏ The front cover

Replacing the Current Sensors VY1A1105

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 6 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 "Disassembling the Drive" beginning on page 28 to remove the following parts from the drive:

- ❑ The front cover
- ❑ The EMC tray
- ❑ The soft charge board connections
- ❑ The fan control board connections
- ❑ The control module plate
- ❑ The control module connections
- ❑ The power board connections
- ❑ The power board mounting plate
- ❑ The conduit tray and power terminal shield

There are three current sensors in the drive.

- If you are replacing the T1 current sensor or all three current sensors, start with "Removing the T1 Current Sensor Bar Assembly" on page 43.
- If you are only replacing the T2 current sensor, skip to "Removing the T2 Current Sensor Bar Assembly" on page 44.
- If you are only replacing the T3 current sensor, skip to "Removing the T3 Current Sensor Bar Assembly" on page 44.

Removing the T1 Current Sensor Bar Assembly

1. To remove the T1 current sensor bar assembly, follow these steps. See Figure 30.

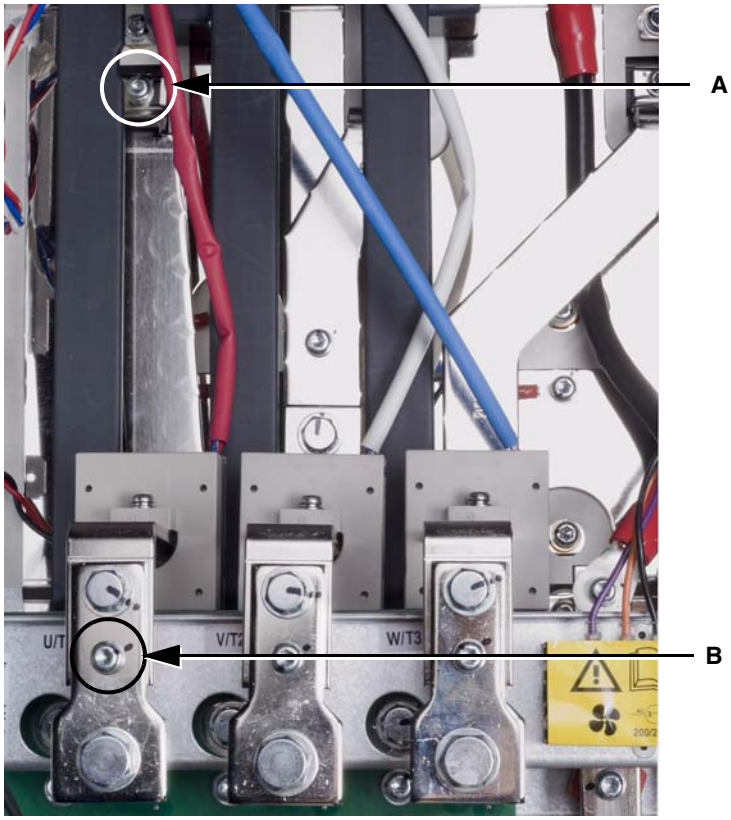
NOTE: The T1 current sensor bar assembly has a red cable harness.

— Using a T-30 Torx driver, remove one screw (**A**) from terminal C2E1 of power IGBT module 1.

— Using a T-30 Torx driver, remove one screw (**B**) from output terminal T1.

— Remove the T1 current sensor bar assembly from the drive.

Figure 30: T1 Current Sensor Bar Assembly



Removing the T2 Current Sensor Bar Assembly

2. To remove the T2 current sensor bar assembly, follow these steps. See Figure 31.

NOTE: The T2 current sensor bar assembly has a white cable harness.

— Using a 13 mm socket wrench, remove one bolt (**A**) connecting the two segments of the T2 current sensor bar assembly.

— Using a T-30 Torx driver, remove one screw (**B**) from output terminal T2.

— Remove the T2 current sensor bar assembly from the drive.

Removing the T3 Current Sensor Bar Assembly

3. To remove the T3 current sensor bar assembly, follow these steps. See Figure 31.

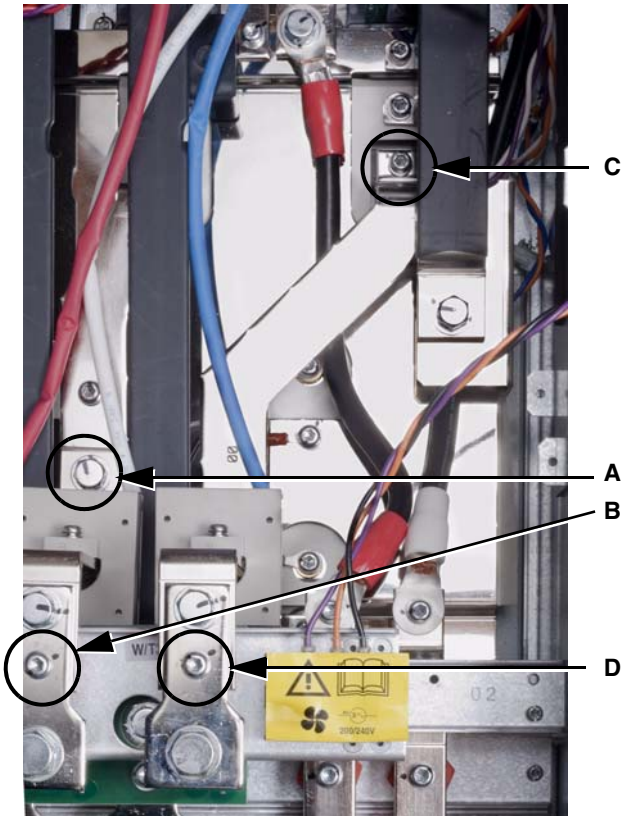
NOTE: The T3 current sensor bar assembly has a blue cable harness.

— Using a T-30 Torx driver, remove one screw (**C**) from terminal C2E1 of power IGBT module 3.

— Using a T-30 Torx driver, remove one screw (**D**) from output terminal T3.

— Remove the T3 current sensor bar assembly from the drive.

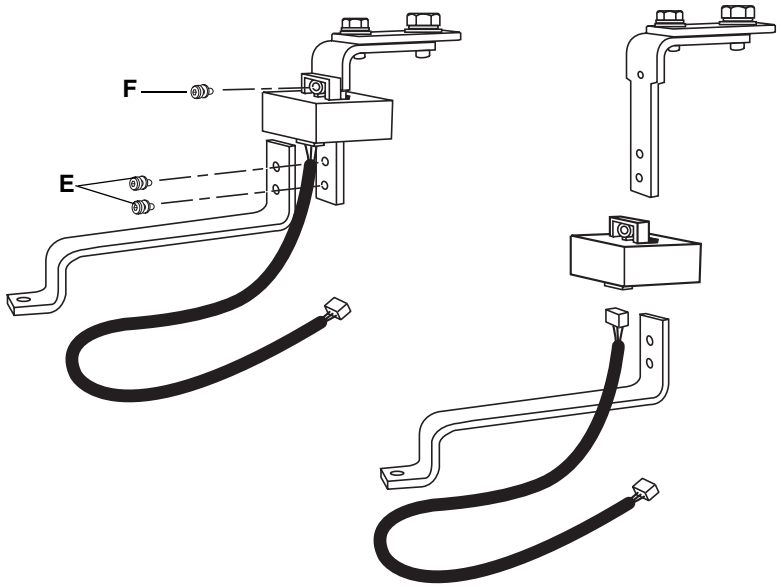
Figure 31: T2 and T3 Current Sensor Bar Assemblies



Replace the Current Sensor

4. Replace the current sensor as follows. See Figure 32.
   - — Carefully remove the 3-pin connector from the bottom of the current sensor.
   - — Using a T-30 Torx driver, remove two screws (**E**) attaching the two current sensor bar segments together.
   - — Using a T-20 Torx driver, remove one screw (**F**) from the current sensor and remove the sensor from the top bar segment.
   - — Install the new current sensor on the top bar segment. Using a T-20 Torx driver, secure the sensor with one screw (**F**). Tighten the screw to 1.1–1.4 N•m (9.7–12.4 lb-in).
   - — Using a T-30 Torx driver, join the two current sensor bar segments together with two screws (**E**). Tighten the screws to 3.3–4.4 N•m (29.2–38.9 lb-in).

Figure 32: Current Sensors



Reinstall the T1 Current Sensor Bar Assembly

Table 8: Current Sensor Wiring

Wire No.[1]	Current Sensor	Description	To:
E129	**T1**	3-pin, red	PB[2] CNA
E128	**T2**	3-pin, white	PB CNB
E127	**T3**	3-pin, blue	PB CNC

[1] See schematic on page 114 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

5. Reinstall the T1 current sensor bar assembly as follows. See Figure 30 on page 43.
   - — Plug the 3-pin connector of the **red** cable harness into the bottom of the current sensor.
   - — Position the current sensor bar assembly between terminal C2E1 on power IGBT module 1 and output terminal T1.
   - — Using a T-30 Torx driver, secure the top of the current sensor bar assembly to terminal C2E1 with one screw (**A**). Tighten the screw to 4.2–5.1 N•m (37.2–45.1 lb-in).
   - — Using a T-30 Torx driver, secure the bottom of the current sensor bar assembly to output terminal T1 with one screw (**B**). Tighten the screw to 3.3–4.4 (29.2–38.9 lb-in).

Reinstall the T2 Current Sensor Bar Assembly

6. Reinstall the T2 current sensor bar assembly as follows. See Figure 31 on page 44.
   - — Plug the 3-pin connector of the **white** cable harness into the bottom of the current sensor.
   - — Position the current sensor bar assembly between the top segment of the output bus bar and output terminal T2.
   - — Using a 13 mm socket wrench, secure the current sensor bar assembly to the bottom segment of output bus bar T2 with one bolt (**A**). Tighten the bolt to 10–13.5 N•m (88.5–119.5 lb-in).
   - — Using a T-30 Torx driver, secure the bottom of the current sensor bar assembly to output terminal T2 with one screw (**B**). Tighten the screw to 3.3–4.4 N•m (29.2–38.9 lb-in).

Reinstall the T3 Current Sensor Bar Assembly

7. Reinstall the T3 current sensor bar assembly as follows. See Figure 31 on page 44.
   - — Plug the 3-pin connector of the **blue** cable harness into the bottom of the current sensor.
   - — Position the current sensor bar assembly between terminal C2E1 on power IGBT module 3 and output terminal T3.
   - — Using a T-30 Torx driver, secure the top of the current sensor bar assembly to terminal C2E1 with one screw (**C**). Tighten the screw to 4.2–5.1 N•m (37.2–45.1 lb-in).
   - — Using a T-30 Torx driver, secure the bottom of the current sensor bar assembly to output terminal T1 with one screw (**D**). Tighten the screw to 3.3–4.4 N•m (29.2–38.9 lb-in).

Reassemble the Drive

If you are only replacing the current sensor, perform Steps 2–10 of “Reassembling the Drive” beginning on page 100 to replace the following parts:

- ❑ The conduit tray and power terminal shield
- ❑ The power board mounting plate
- ❑ The power board connections
- ❑ The control module connections
- ❑ The control module plate
- ❑ The fan control board connections
- ❑ The soft charge board connections
- ❑ The EMC tray
- ❑ The front cover

Replacing the Snubber Capacitors and Snubber Board VZ3S1911 and VZ3S1912

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 6 before performing this procedure.
- Before working on this equipment, turn off all power supplying it and perform the DC bus voltage measurement procedure on page 11.

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

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- When the controller is damaged, voltage may remain on certain energy storage capacitors after de-energization of the controller and discharge of the main capacitor bank.
- Before working on or near assemblies containing energy storage capacitors, verify that the capacitor voltages are less than 42 Vdc.
- The following assemblies have energy-storing capacitors:
  - — SCR snubber board. See Figure 33 on page 48.
  - — Snubber capacitors. See Figures 36 and 39 on pages 51 and 53.
- 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.

The snubber capacitor kit includes:

- A snubber board for the silicon controlled rectifiers (SCR) modules
- One capacitor for the braking IGBT module
- Three capacitors for the power IGBT modules

You must install all of the parts in the kit.

Before performing the steps in this procedure, perform Steps 1–10 of "Disassembling the Drive" beginning on page 28 to remove the following parts from the drive:

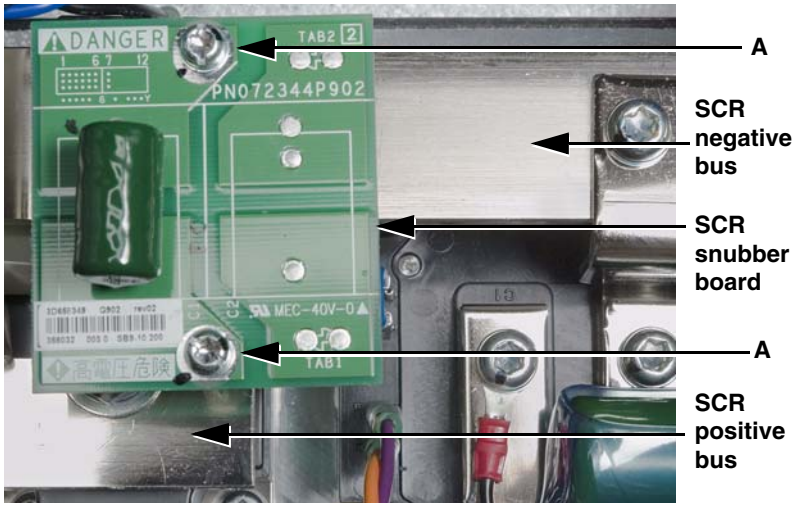
- ❑ The front cover
- ❑ The EMC tray
- ❑ The soft charge board connections
- ❑ The fan control board connections
- ❑ The control module plate
- ❑ The control module connections
- ❑ The power board connections
- ❑ The power board mounting plate
- ❑ The conduit tray and power terminal shield
- ❑ The top cover

Replace the SCR Snubber Board—240 V Units

Replace the silicon controlled rectifier (SCR) snubber board on 240 V units as follows. See Figure 33.

1. Using a T-20 Torx driver, remove two screws (**A**) securing the SCR snubber board to the SCR negative bus and the SCR positive bus.
2. Remove the SCR snubber board.
3. Position the new SCR snubber board over the terminals on the SCR negative bus and SCR positive bus.
4. Using a T-20 Torx driver, secure the snubber board with two screws (**A**). Tighten the screws to 1.1–1.7 N•m (9.7–15 lb-in).

Figure 33: SCR Snubber Board, 240 V Units

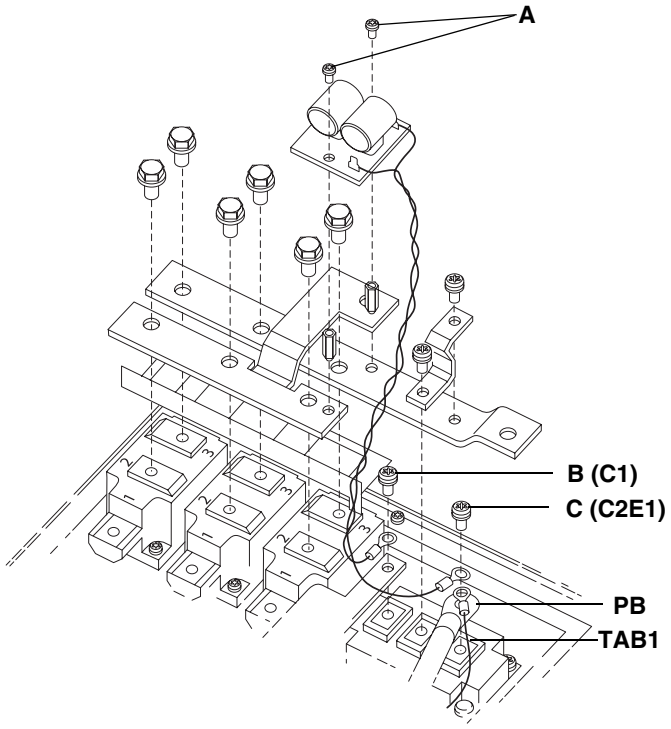


Replace the SCR Snubber Board and Braking IGBT Snubber Capacitor—480 V Units

Replace the silicon controlled rectifier (SCR) snubber board on 480 V units as follows.

1. Using a T-20 Torx driver, remove two screws (**A**) securing the SCR snubber board to the SCR negative bus and the SCR positive bus.
2. Using a T-30 Torx driver, remove two screws securing the snubber board wires to terminals C2E1 (**C**) and C1 (**B**) on the braking IGBT module.
3. Remove the SCR snubber board.
4. Position the new SCR snubber board over the terminals on the SCR negative bus and SCR positive bus.
5. Using a T-20 Torx driver, secure the snubber board with two screws (**A**). Tighten the screws to 1.1–1.7 N•m (9.7–15 lb-in).
6. With the PB power cable and the TAB1 connection in place on terminal C2E1, position the wires from the new snubber board over terminals C2E1 and C1 on the braking IGBT module.
7. Using a T-30 Torx driver, secure the wires from the snubber board to the braking IGBT module with two screws (**B** and **C**). Tighten the screws to 3.4–4.5 N•m (30.1–39.8 lb-in).

Figure 34: SCR Snubber Board, 480 V Units



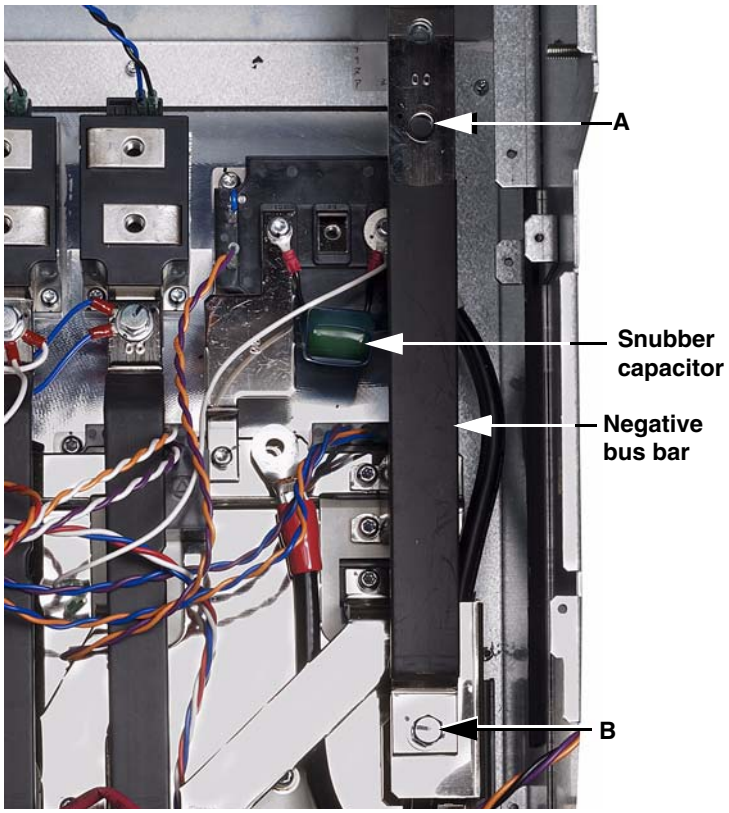
Replace the Braking IGBT Snubber Capacitor—240 V Units

NOTE: Perform this step for 240 V drives only. See page 49 for 480 V drives.

Replace the snubber capacitor on the braking IGBT module as follows.

1. Using a 13 mm socket wrench, remove the negative bus bar. See Figure 35.
   - — Remove one bolt (**A**) securing the top of the negative bus bar to the silicon controlled rectifier (SCR) negative bus.
   - — Remove one bolt (**B**) securing the bottom of the negative bus bar to the negative bus plate.

Figure 35: Negative Bus Bar



2. Using a T-30 Torx driver, remove two screws securing the snubber capacitor to terminals C1 and C2E1 on the braking IGBT module. See Figure 36 on page 51.

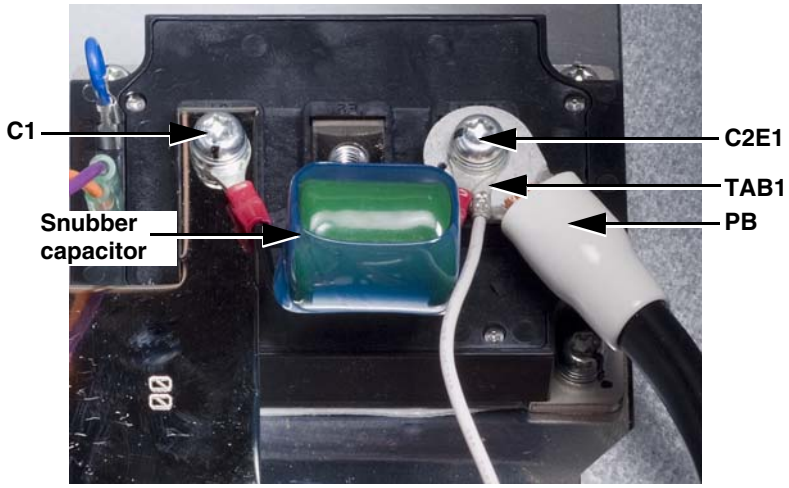
NOTE: There are two cables under the snubber capacitor lug on terminal C2E1—the PB power cable and the connection to power board terminal TAB1.

3. Remove the snubber capacitor.
4. Install the new snubber capacitor between terminals C1 and C2E1 of the braking IGBT module. Take care to correctly stack the connections on terminal C2E1—the PB power cable goes on bottom, the TAB1

connection goes in the middle, and the snubber capacitor connection goes on top.

5. Using a T-30 Torx driver, secure the snubber capacitor to terminals C1 and C2E1 with two screws. Tighten the screws to 4.2–5.1 N•m (37.2–45.1 lb-in).
6. Replace the negative bus bar and secure it with two 13 mm bolts as illustrated in Figure 35. Tighten the bolts to 10–13.5 N•m (88.5–119.5 lb-in).

Figure 36: Braking IGBT Module Snubber Capacitor, 240 V Units



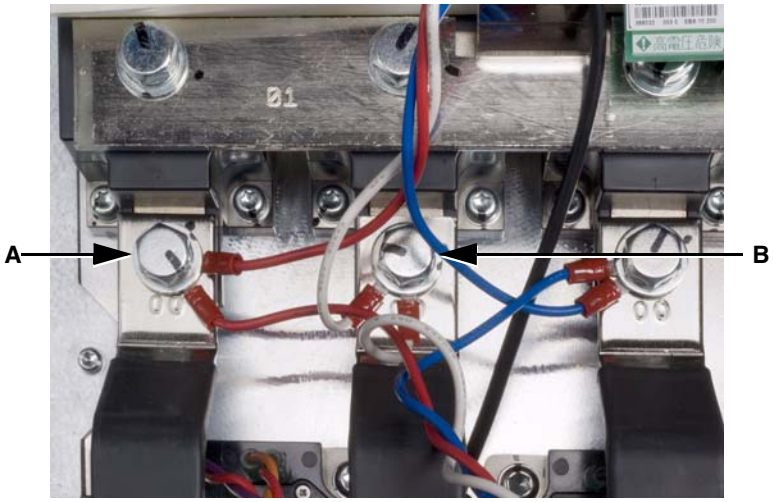
Move the Input Bus Bars

To access the snubber capacitors on power IGBT modules 1 and 2, move the L1 and L2 input bus bars out of the way as follows. It is not necessary to move the L3 input bus bar to access the snubber capacitor on IGBT module 3.

1. Using a 13 mm socket wrench, remove two bolts securing the input bus bars to silicon controlled rectifier (SCR) modules 1 (**A**) and 2 (**B**). See Figure 37.

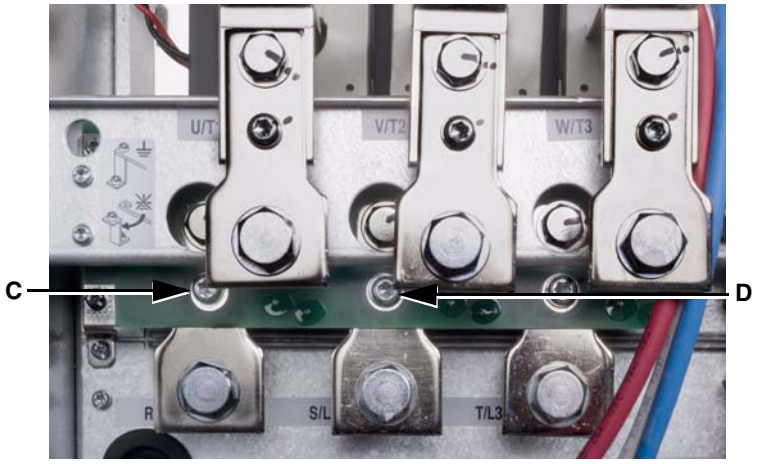
> **NOTE:** Under each bolt are two wires from cable assemblies that connect the SCR modules to fan control board connector X1 and to terminal CN5 on the power board.
>
> The red wires connect to SCR module 1, the white wires connect to SCR module 2, and the blue wires connect to SCR module 3.

Figure 37: Input Bus Bar Connections to SCR Modules



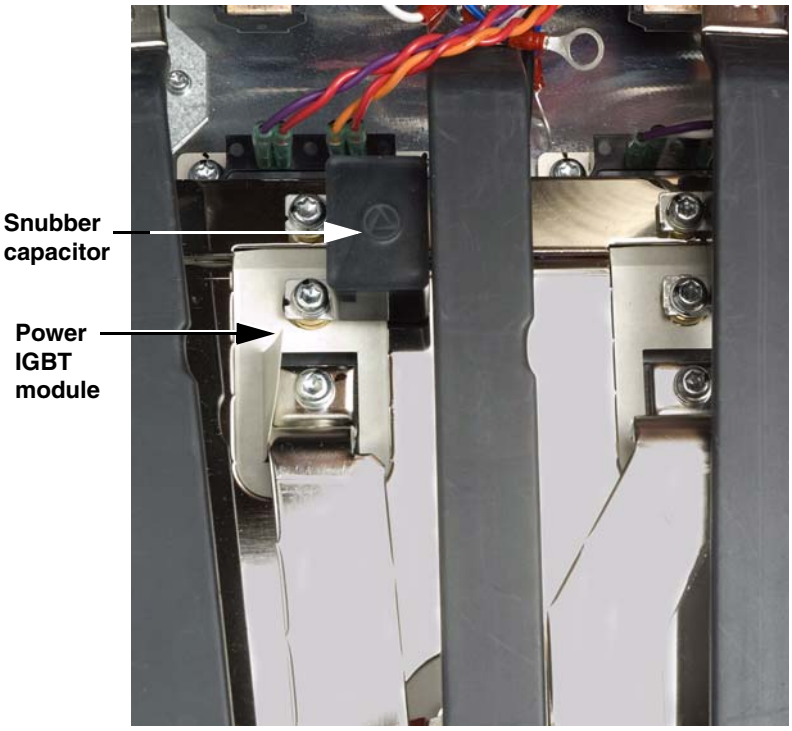
2. Using a T-30 Torx driver, loosen but do not remove the bolts securing the input bus bars to terminals L1 (**C**) and L2 (**D**). See Figure 38.

Figure 38: Input Bus Bar Connections to Terminals L1 and L2



3. Move the input bus bars away from the power IGBT modules to access the snubber capacitors. See Figure 39.

Figure 39: Power IGBT Module Snubber Capacitor

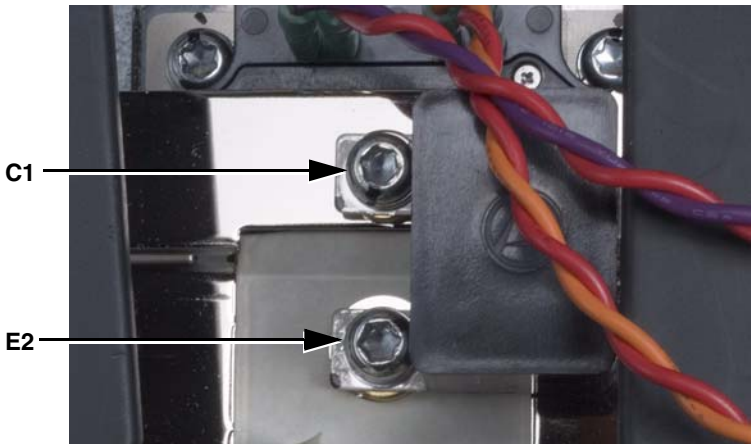


Replace the Power IGBT Snubber Capacitors

Replace the snubber capacitors on the three power IGBT modules as follows. See Figure 40.

1. Using a T-30 Torx driver, remove two screws securing the snubber capacitors to terminals C1 and E2 on each of the three power IGBT modules.
2. Remove the snubber capacitors.
3. Position the three new snubber capacitors over terminals C1 and E2 of the three power IGBT modules.
4. Using a T-30 Torx driver, secure the snubber capacitors to the power IGBT modules with two screws each. Tighten the screws to 4.2–5.1 N•m (37.2–45.1 lb-in).

Figure 40: Power IGBT Snubber Capacitor Detail



Reinstall the Input Bus Bars

Reinstall the input bus bars as follows.

1. Using a T-30 Torx driver, secure the input bus bars to SCR modules 1 and 2 with two bolts. See Figure 37 on page 52. Tighten the bolts to 3.3–4.4 N•m (29.2–38.9 lb-in).
2. Using a 13 mm socket wrench, tighten the bolts securing the input bus bars to terminals L1 and L2. See Figure 38 on page 53. Tighten the bolts to 10–13.5 N•m (88.5–119.5 lb-in).

Reassemble the Drive

If you are only replacing the snubber capacitor kit, perform Steps 1–10 of "Reassembling the Drive" beginning on page 100 to replace the following parts:

- ❑ The top cover
- ❑ The conduit tray and power terminal shield
- ❑ The power board mounting plate
- ❑ The power board connections
- ❑ The control module connections
- ❑ The control module plate
- ❑ The fan control board connections
- ❑ The soft charge board connections
- ❑ The EMC tray
- ❑ The front cover

Replacing the SCR Modules and the Braking IGBT Module

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 6 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:
  - — Silicon controlled rectifier (SCR) snubber board. See Figure 41 on page 56.
  - — Snubber capacitors. See Figure 49 on page 61.
- Always check for the presence of voltage using a voltmeter set to the 1000 Vdc scale. When voltage is present, allow the voltmeter to discharge the capacitor's stored charge. Refer to "Discharging Stored Energy in Capacitors" on page 12.

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

Before performing the steps in this procedure, perform Steps 1–10 of "Disassembling the Drive" beginning on page 28 to remove the following parts from the drive:

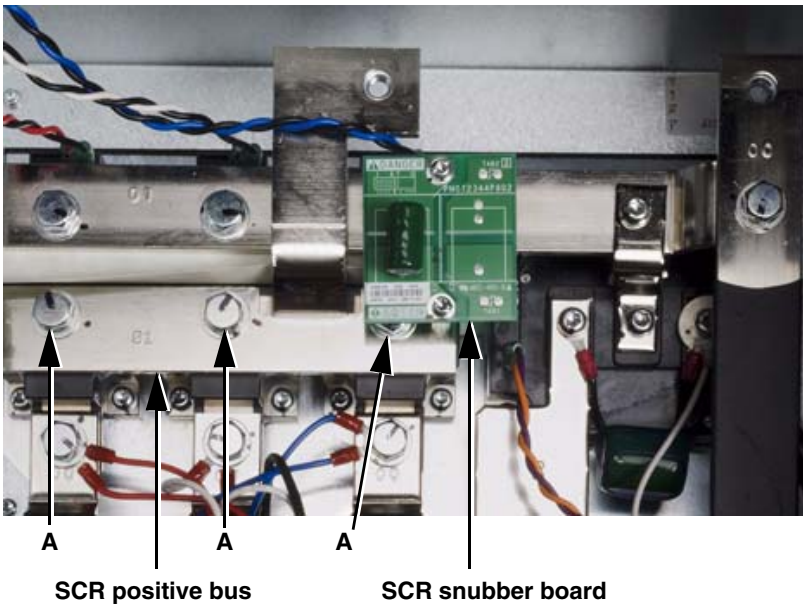
- ❑ The front cover
- ❑ The EMC tray
- ❑ The soft charge board connections
- ❑ The fan control board connections
- ❑ The control module plate
- ❑ The control module connections
- ❑ The power board connections
- ❑ The power board mounting plate
- ❑ The conduit tray and power terminal shield
- ❑ The top cover

Remove the SCR Buswork

Remove the buswork over the silicon controlled rectifier (SCR) modules as follows.

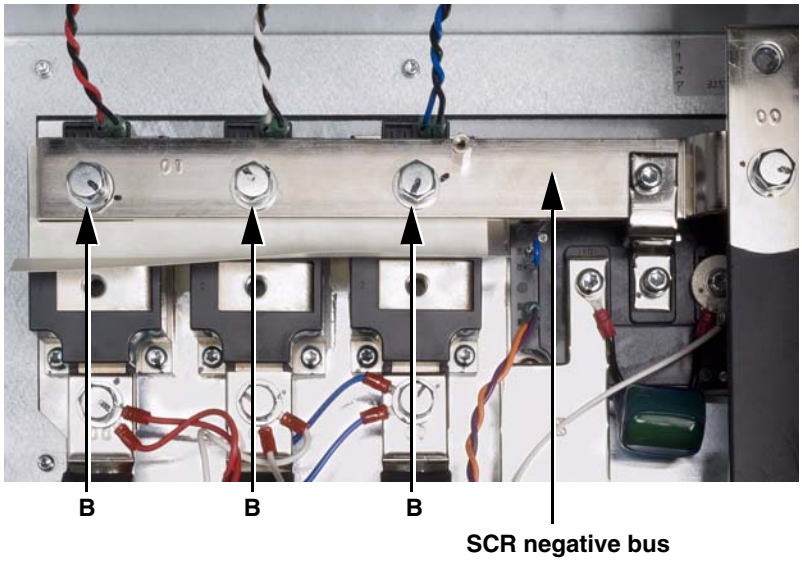
1. Remove the SCR snubber board as described in “Replacing the Snubber Capacitors and Snubber Board VZ3S1911 and VZ3S1912” beginning on page 47.
2. Using a 13 mm socket wrench, remove three bolts (**A**) securing the SCR positive bus to SCR 1, SCR 2, and SCR 3 and remove the SCR positive bus from the drive. See Figure 41.

Figure 41: SCR Positive Bus, 240 V Unit shown



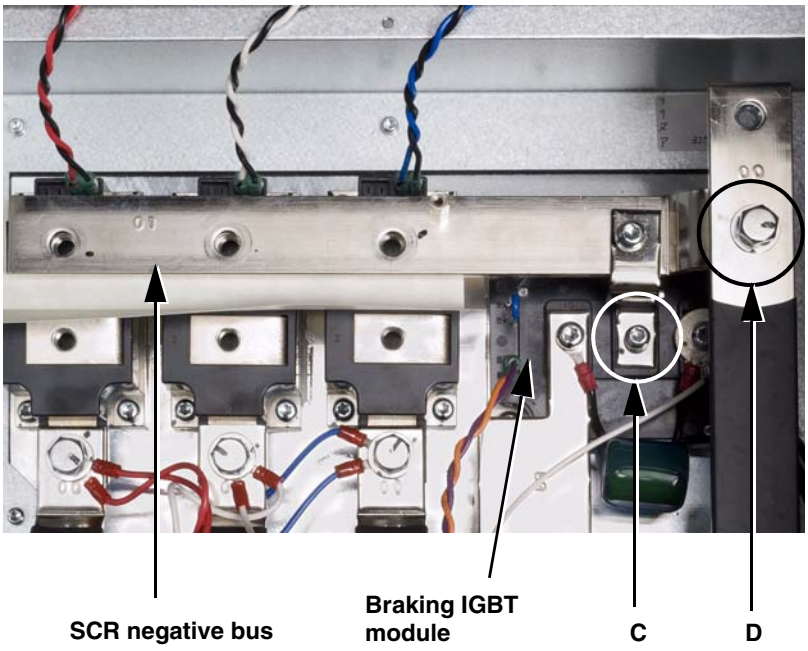
3. Using a 13 mm socket wrench, remove three bolts (**B**) securing the SCR negative bus to SCR 1, SCR 2, and SCR 3. See Figure 42.

Figure 42: SCR Negative Bus



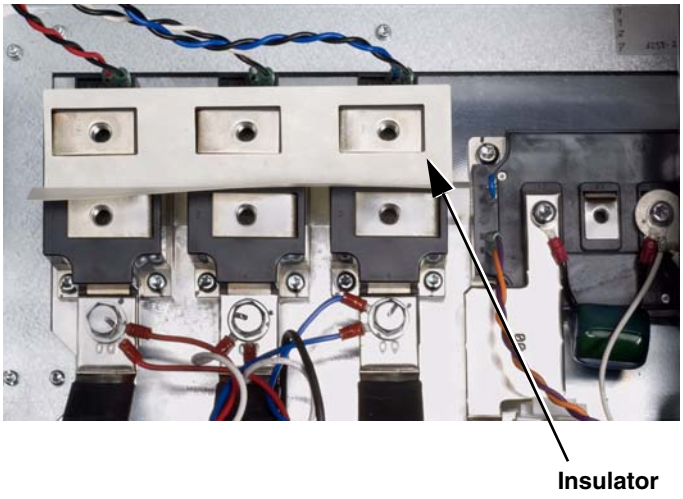
4. Using a T-30 Torx driver, remove one screw (**C**) securing the bracket between the SCR negative bus and the braking IGBT module. See Figure 43.
5. Using a 13 mm socket wrench, remove one bolt (**D**) securing the negative bus bar to the SCR negative bus.

Figure 43: Connections to SCR Negative Bus



6. Remove the SCR negative bus and remove the insulator covering the SCR modules. See Figure 44.

Figure 44: SCR Insulator



Replace the SCR Modules VZ3TD1330M1601, VZ3TD1285M1671

Table 9: SCR Module Wiring

Wire No.[1]	SCR Module	Description	To:
E109	**SCR 1, Terminal 1**	Ring connection, red	PB[2] CN5
	SCR 2, Terminal 1	Ring connection, white	PB CN5
	SCR 3, Terminal 1	Ring connection, blue	PB CN5
E110	**SCR 1, Terminal 1**	5-pin, Red/White/Blue	FCB[3] X1
	SCR 2, Terminal 1	5-pin, Red/White/Blue	FCB X1
	SCR 3, Terminal 1	5-pin, Red/White/Blue	FCB X1
E106	**SCR 3, Terminal 4**	Black	SCB[4] CNL3G
	SCR 3, Terminal 5	Red	
E107	**SCR 2, Terminal 4**	Black	SCB CNL2G
	SCR 2, Terminal 5	White	
E108	**SCR 1, Terminal 4**	Black	SCB CNL1G
	SCR 1, Terminal 5	Blue	

1 See schematic on page 114 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

2 PB: Power board

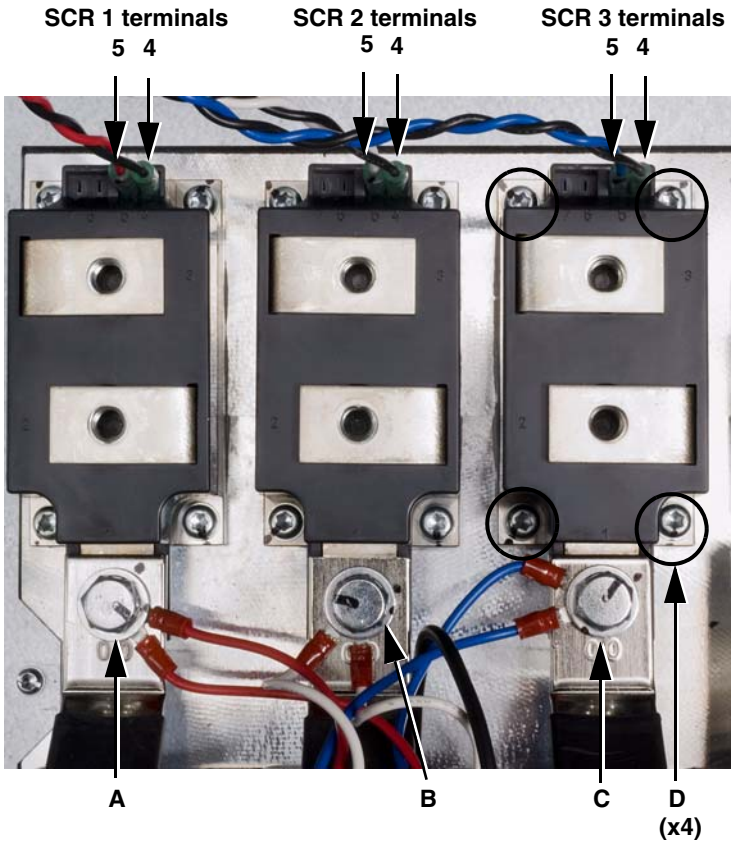
3 FCB: Fan control board

4 SCB: Soft charge board

To replace one of the three silicon controlled rectifier (SCR) modules, follow these steps.

1. Perform Steps 1–6 of “Remove the SCR Buswork” beginning on page 56 to remove the SCR snubber board and buswork from the drive.
2. Using a 13 mm socket wrench, remove one bolt (**A, B, or C**) securing the input bus bar to the SCR module that you are replacing. See Figure 45.

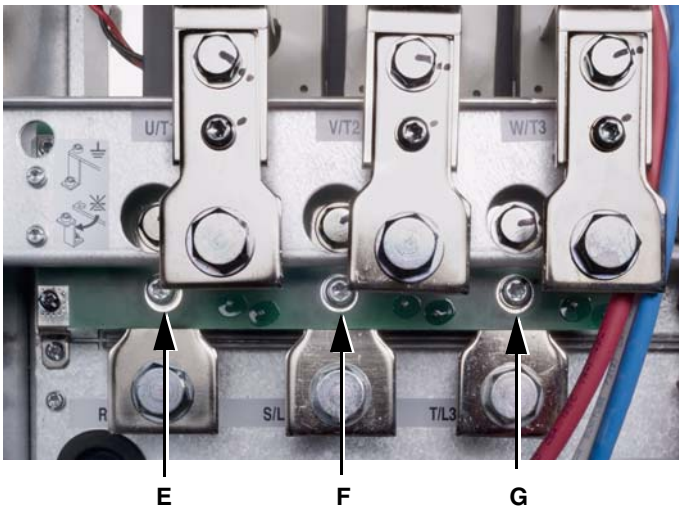
Figure 45: Input Bus Bar Connections to SCR Modules



NOTE: Under each bolt are wires from two cable assemblies that connect the SCR modules to the fan control board and to terminal CN5 on the power board. The red wires connect to SCR 1, the white wires connect to SCR 2, and the blue wires connect to SCR 3.

3. Using a T-30 Torx driver, loosen but do not remove the bolt securing the input bus bar to terminal L1 (**E**), L2 (**F**), or L3 (**G**). See Figure 46 on page 59.

Figure 46: Input Bus Bar Connections to Terminals L1, L2, and L3



4. Move the input bus bar to the side to access the SCR module that you are replacing.
5. Remove the connections from terminals 4 and 5 of the SCR module. See Figure 45 on page 58.

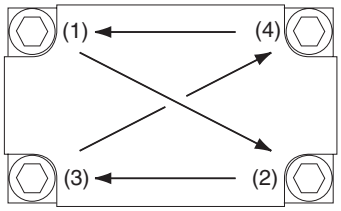
NOTE: Note the cable positions. The red and black twisted cable goes to SCR module 1, the white and black cable goes to SCR module 2, and the blue and black cable goes to SCR module 3.

6. Using a T-20 Torx driver, remove four screws (**D**) securing the SCR module to the heatsink and remove the SCR module from the drive. See See Figure 45 on page 58.
7. Clean the portion of the heatsink that makes contact with the SCR module.
8. Evenly coat the bottom of the new SCR module with a thin layer of thermal compound included in the kit.
9. Position the new SCR module on the heatsink under the input bus bar.
10. Using a T-20 Torx driver, secure the SCR module with four screws (**D**). See Figure 45. Initially tighten the screws, in the sequence shown in Figure 47, 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).
11. Replace the connections to SCR terminals 4 and 5. See Figure 45 on page 58.
12. Position the associated input bus bar over terminal 1 of the new SCR module, and install two wires from the cable assemblies that connect the module to the fan control board and to terminal CN5 on the power board. See Figure 45 on page 58.

NOTE: Note the cable positions. The red wires connect to SCR module 1, the white wires connect to SCR module 2, and the blue wires connect to SCR module 3.

13. Using a 13 mm socket wrench, secure the input bus bar and cable connections to the SCR module with one bolt (**A, B, or C**). See Figure 45 on page 58. Tighten the bolt to 10–13.5 N•m (88.5–119.5 lb-in).

Figure 47: Torque Sequence



14. Using a T-30 Torx driver, tighten the bolt securing the input bus bar to terminal L1 (**E**), L2 (**F**), or L3 (**G**) to 3.3–4.4 N•m (29.2–38.9 lb-in). See Figure 46 on page 59.

NEXT STEP: If you are only replacing the SCR modules, skip to "Reinstall the SCR Buswork" on page 64 to reinstall the SCR snubber board and buswork.

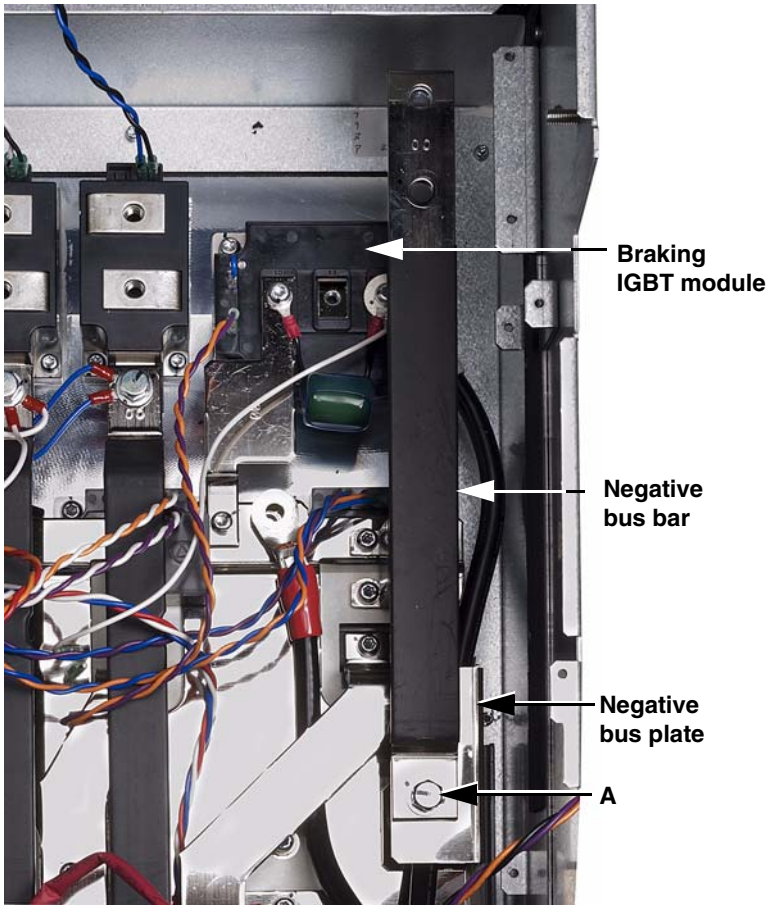
If you are also replacing the braking IGBT module, continue with "Replace the Braking IGBT Module VZ3IM1600M0671, VZ3TM1400M1271" below.

Replace the Braking IGBT Module VZ3IM1600M0671, VZ3TM1400M1271

Replace the braking IGBT module as follows.

1. Perform Steps 1–6 of "Remove the SCR Buswork" beginning on page 56 to remove the SCR snubber board and buswork from the drive.
2. Using a 13 mm socket wrench, remove one bolt (**A**) securing the negative bus bar to the negative bus plate and remove the bus bar. See Figure 48.

Figure 48: Negative Bus Bar Connection



3. **240 V drives**: Using a T-30 Torx driver, remove two screws (**B** and **C**) securing the jumper between braking IGBT module terminal C1 and the positive bus plate. See Figure 49. Remove the jumper from the drive.

   480 V drives: Using a T-30 Torx driver, remove one screw (**C**) securing the jumper between braking IGBT module terminal C1 and the positive bus plate. You removed screw (**B**) when you removed the SCR snubber board. See page 49.

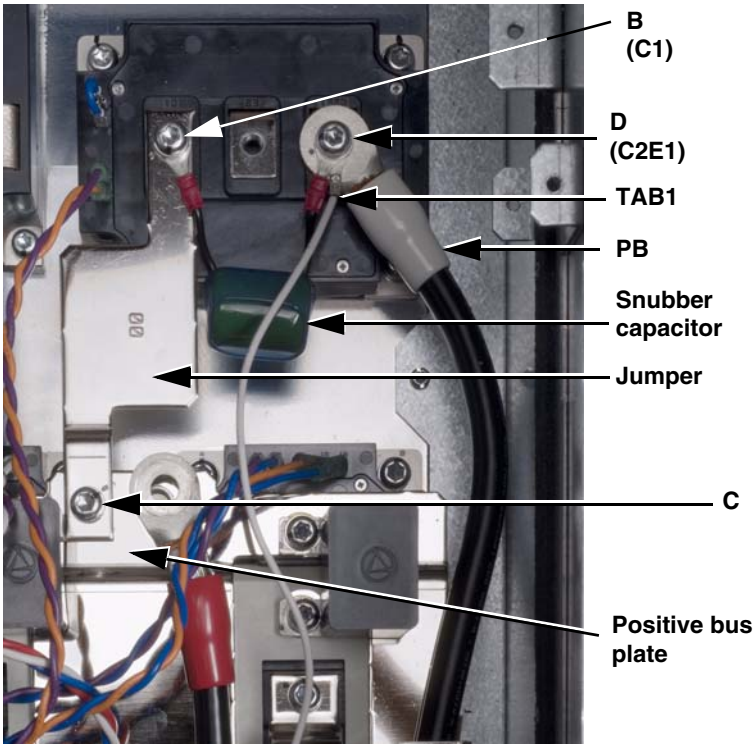
> **NOTE:** Removing the screw from terminal C1 of the braking IGBT module also releases one side of the braking IGBT snubber capacitor on 240 V drives. 480 V drives do not have a snubber capacitor on the braking IGBT module. See page 49 for 480 V drives.

4. **240 V drives**: Using a T-30 Torx driver, remove one screw (**D**) from terminal C2E1 of the braking IGBT module and remove the braking IGBT snubber capacitor.

   480 V drives: You removed the screw from terminal C2E1 when you removed the SCR snubber board. See page 49.

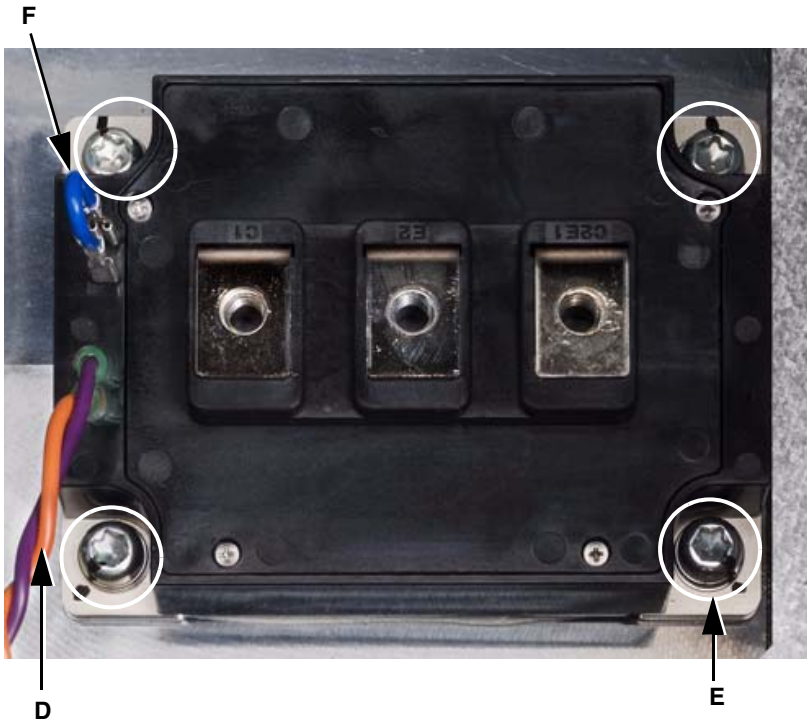
> **NOTE:** There are two cables under the snubber capacitor lug on terminal C2E1—the PB power cable and the connection to power board terminal TAB1.

Figure 49: Braking IGBT Module Snubber Capacitor, 240 V Unit Shown



5. Remove the orange and purple cable (**D**) from terminals E2 (purple) and G2 (orange) of the braking IGBT module. This cable connects to terminal CNPB on the power board.

Figure 50: Braking IGBT Module



6. Using a T-30 Torx driver, remove four screws (**E**) securing the braking IGBT module to the heatsink and remove the module from the drive.
7. Remove the blue wire jumper (**F**) between terminals E1 and G1 of the module and install it on the new braking IGBT module.
8. Clean the portion of the heatsink that makes contact with the braking IGBT module.
9. Evenly coat the bottom of the new braking IGBT module with a thin layer of thermal compound, included in the kit, and position the module on the heatsink.
10. Using a T-30 Torx driver, secure the module to the heatsink with four screws (**E**). Initially tighten the screws, in the sequence shown in Figure 51, 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 51: Torque Sequence

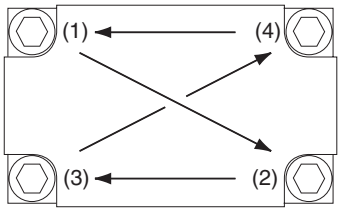


Table 10: Braking IGBT Module Wiring

Wire No.[1]	Braking IGBT Module	Description	To:
E116	**C2E1**	Lug	PB[2] TAB1
E120	**E2**	Orange	PB CNPB
	G2	Purple	

[1] See schematic on page 114 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

11. **240 V drives only:** install the right side of the snubber capacitor to braking IGBT module terminal C2E1 as follows. See Figure 49 on page 61.
    - — Take care to correctly stack the connections on terminal C2E1—the PB power cable goes on the bottom, the TAB1 connection goes in the middle, and the snubber capacitor goes on top.
    - — Using a T-30 Torx driver, secure the snubber capacitor and stacked connections to terminal C2E1 with one screw (item **D** in Figure 49). Tighten the screw to 4.2–5.1 N•m (37.2–45.1 lb-in).

    480 V drives only: you will install the connections on terminal C2E1 when you replace the SCR snubber board. See page 49.
12. Position the jumper between braking IGBT module terminal C1 and the positive bus plate.
13. **240 V drives only:** Install the left side of the snubber capacitor over the jumper at braking IGBT module terminal C1. See Figure 49 on page 61. Using a T-30 Torx driver, secure the snubber capacitor and jumper to the braking IGBT module with one screw (item **B** in Figure 49 on page 61). Tighten the screw to 4.2–5.1 N•m (37.2–45.1 lb-in).

    480 V drives only: Position the jumper over braking IGBT module terminal C1. You will replace screw (**B**) when you reinstall the SCR snubber board. See page 53.
14. Reinstall the cable from power board terminal CNPB on the new braking IGBT module. Install the orange wire in terminal E2 and the purple wire in terminal G2. See Table 10 on page 63.
15. Using a T-30 Torx driver, secure the jumper to the positive bus plate with one screw (item **C** in Figure 49). Tighten the screw to 4.2–5.1 N•m (37.2–45.1 lb-in).
16. Position the negative bus bar over the negative bus plate. Using a 13 mm socket wrench, secure the bus bar to the plate with one 13 mm screw (**A**). See Figure 48 on page 60. Tighten the screw to 10–13.5 N•m (88.5–119.5 lb-in).

Reinstall the SCR Buswork

Replace the buswork over the SCR modules as follows.

1. Install the insulator over the SCR modules. See Figure 52.

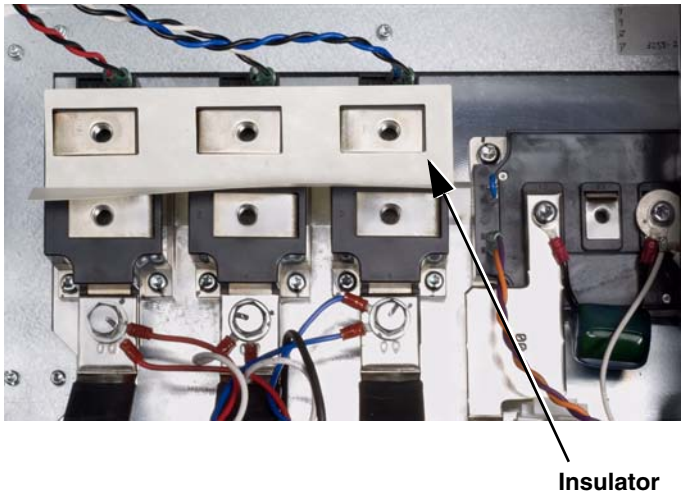
⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Install the insulator as shown in Figure 52.
- Before installing the insulator, ensure that it has no tears or cracks. If the insulator is damaged, contact your Schneider Electric representative.
- Do not install a damaged insulator.

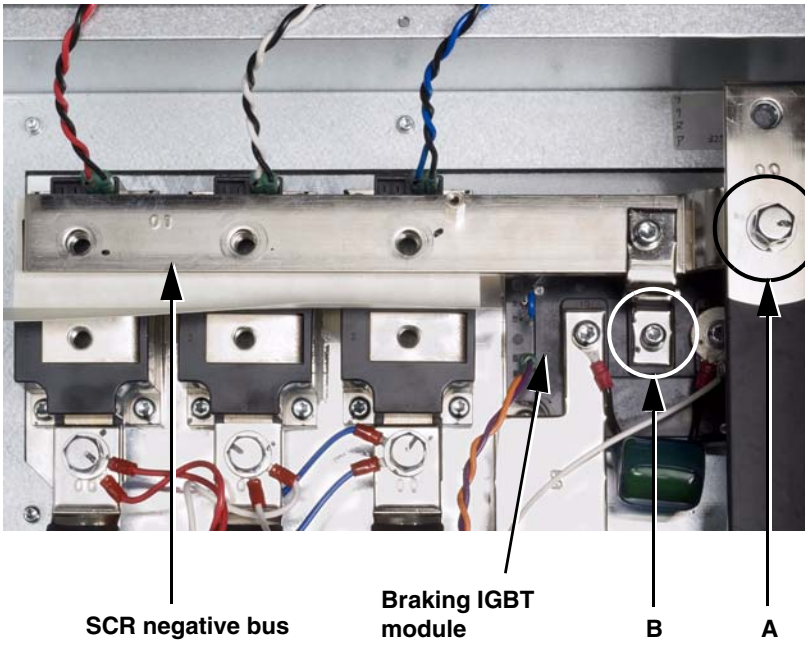
Failure to follow these instructions will result in death or serious injury.

Figure 52: SCR Insulator



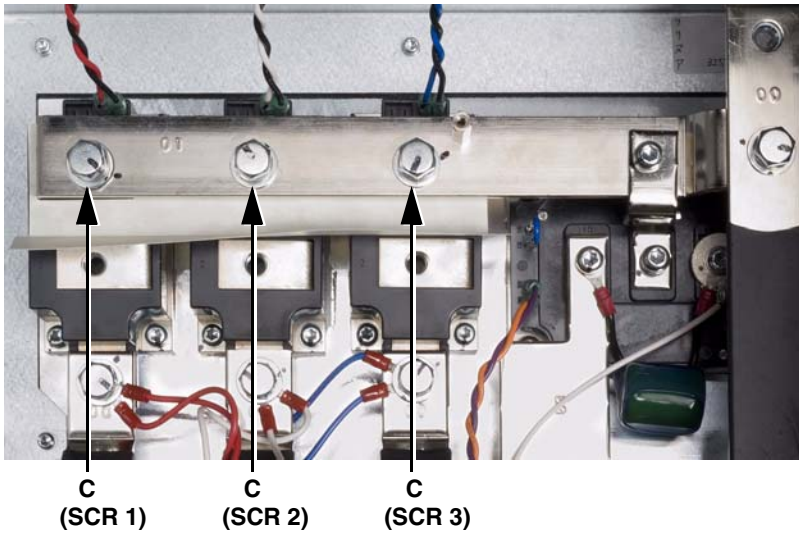
2. Position the SCR negative bus over the insulator and terminal 3 of SCR 1, SCR 2, and SCR 3. See Figure 53.
3. Using a 13 mm socket wrench, secure the top of the negative bus bar to the SCR negative bus with one bolt (**A**). See Figure 53. Tighten the bolt to 10–13.5 N•m (88.5–119.5 lb-in).
4. Using a T-30 Torx driver, secure the bracket between the SCR negative bus and the braking IGBT module with one screw **(B**). See Figure 53. Tighten the screw to 4.2–5.1 N•m (37.2–45.1 lb-in).

Figure 53: SCR Negative Bus



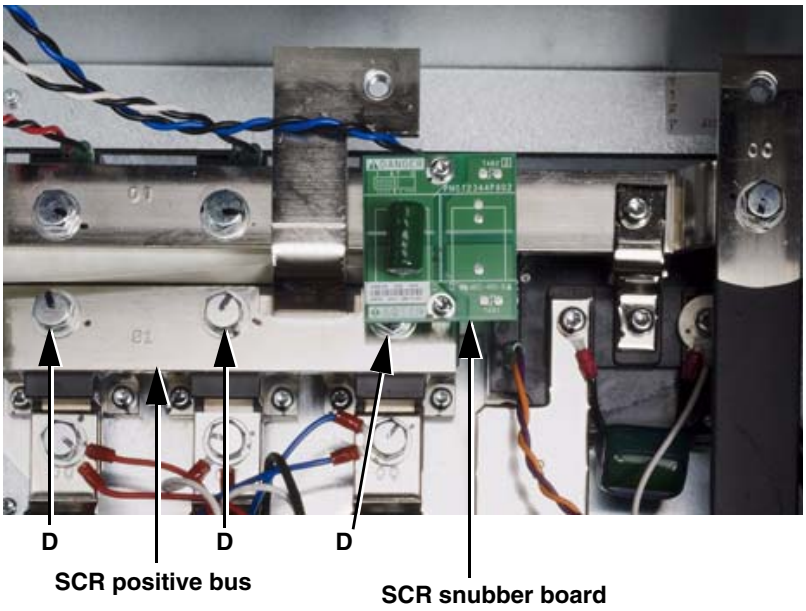
5. Using a 13 mm socket wrench, secure the SCR negative bus to terminal 3 of the SCR modules with three bolts **(C**). See Figure 54. Tighten the bolts to 10–13.5 N•m (88.5–119.5 lb-in).

Figure 54: SCR Negative Bus



6. Position the SCR positive bus over terminal 2 of SCR 1, SCR 2, and SCR 3. See Figure 55.
7. Using a 13 mm socket wrench, secure the SCR positive bus with three bolts (**D**). Tighten the bolts to 10–13.6 N•m (88.5–120.4 lb-in).
8. Install the SCR snubber board as described in as described in "Replacing the Snubber Capacitors and Snubber Board VZ3S1911 and VZ3S1912" beginning on page 47.

Figure 55: SCR Positive Bus



Reassemble the Drive

If you are only replacing the SCR or IGBT modules, perform Steps 1–10 of "Reassembling the Drive" beginning on page 100 to replace the following parts:

- ❏ The top cover
- ❏ The conduit tray and power terminal shield
- ❏ The power board mounting plate
- ❏ The power board connections
- ❏ The control module connections
- ❏ The control module plate
- ❏ The fan control board connections
- ❏ The soft charge board connections
- ❏ The EMC tray
- ❏ The front cover

Replacing the Power IGBT Modules, the Temperature Sensor, and the Capacitor Assembly

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 6 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 1–10 of "Disassembling the Drive" beginning on page 28 to remove the following parts from the drive:

- ❑ The front cover
- ❑ The EMC tray
- ❑ The soft charge board connections
- ❑ The fan control board connections
- ❑ The control module plate
- ❑ The control module connections
- ❑ The power board connections
- ❑ The power board mounting plate
- ❑ The conduit tray and power terminal shield
- ❑ The top cover

Remove the Output Bus Bars

1. Remove the output bus bars as follows.
   - — Using a T-30 Torx driver, remove two screws (**A**) securing the top of the output bus bars to terminal C2E1 of power IGBT modules 1 and 3. See Figure 56 on page 68.
   - — Using a T-30 Torx driver, remove one bolt (**B**) connecting the two segments of output bus bar T2. See Figure 56 on page 68.
   - — Using a T-20 Torx driver, remove three screws (**C**) securing the output terminal bracket to the drive frame and remove the terminal bracket from the drive. See Figure 57 on page 68.

Figure 56: Output Bus Bar Connections to Power IGBT Modules

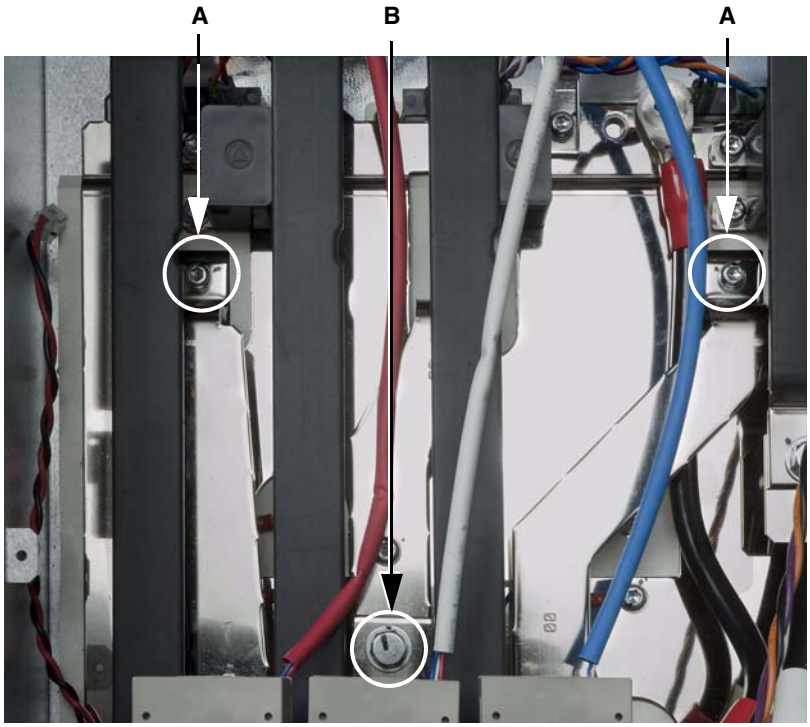
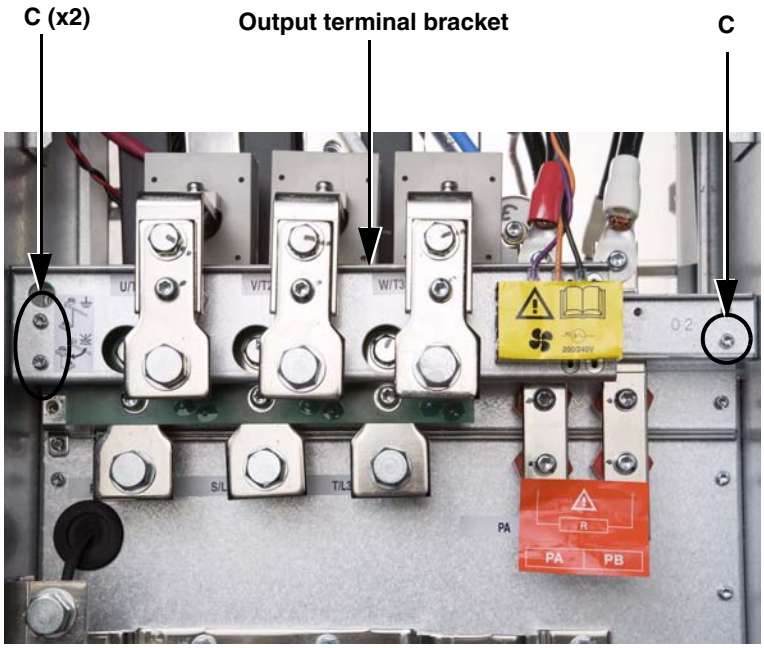


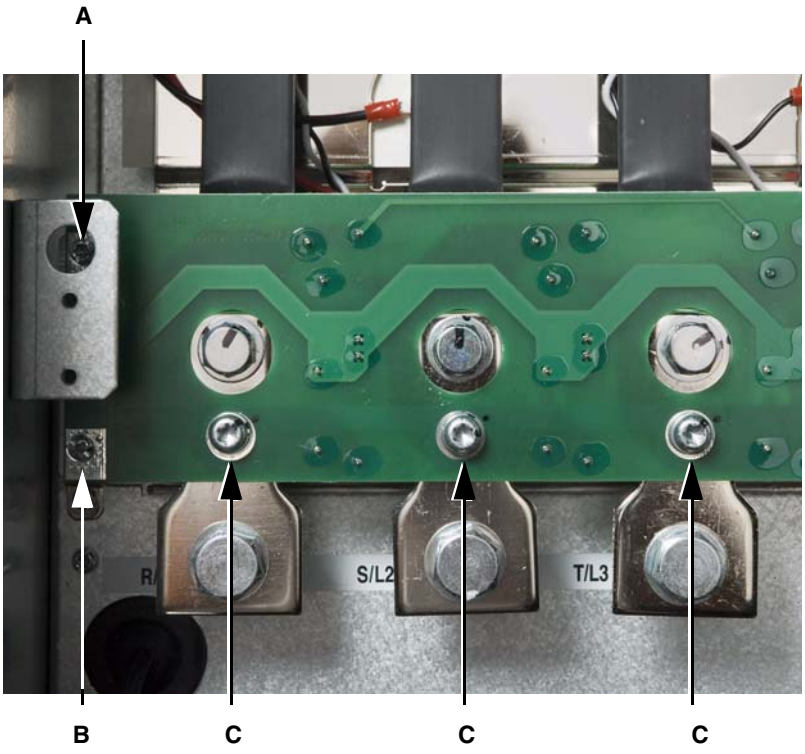
Figure 57: Output Terminal Bracket



Remove the Filter Board

2. Remove the filter board as follows. See Figure 58.
   - — Using a T-20 Torx driver, remove one screw (**A**) securing the top left corner of the filter board to the drive frame.
   - — Using a size 2 Phillips driver, remove one screw (**B**) securing the filter board to the grounding bracket on the bottom terminal plate.
   - — Using a T-30 Torx driver, remove three screws (**C**) securing the filter board to input terminals L1, L2, and L3 and remove the filter board.

Figure 58: Filter Board

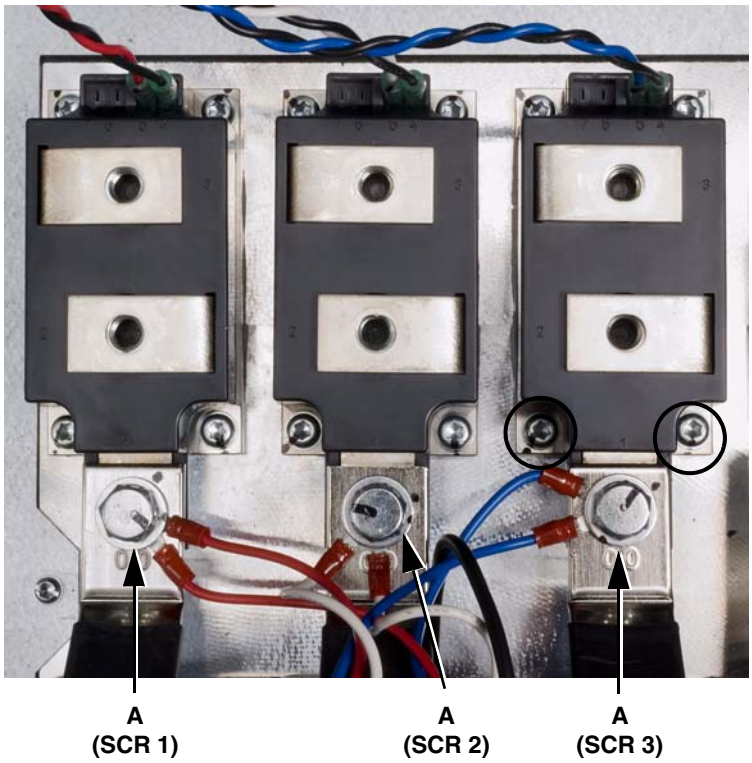


Remove the Input Bus Bars

3. Using a 13 mm socket wrench, remove three bolts (**A**) securing the input bus bars to terminal 1 of the silicon controlled rectifier (SCR) modules and remove the bus bars from the drive. See Figure 59.

> **NOTE:** Under each bolt are wires from two cable assemblies that connect the SCR modules to the fan control board and to terminal CN5 on the power board. The red wires connect to SCR module 1, the white wires connect to SCR module 2, and the blue wires connect to SCR module 3.

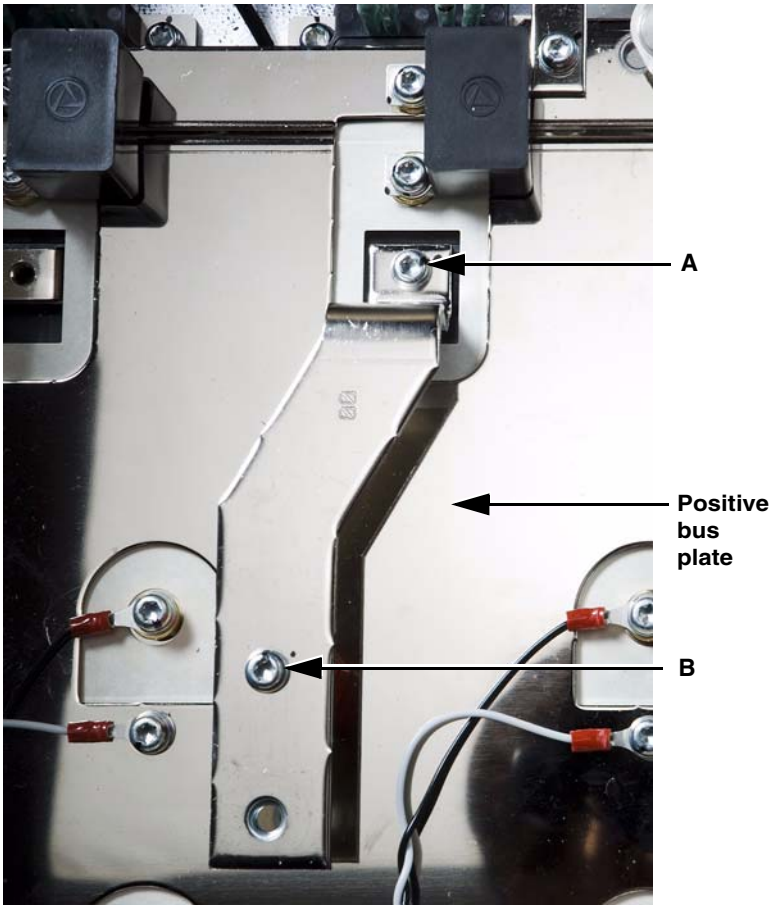
Figure 59: Input Bus Bar Connections to SCR Modules



Remove the T2 Output Bus Bar

4. Remove the T2 output bus bar as follows. See Figure 60.
   - — Using a T-30 Torx driver, remove one screw (**A**) securing the bus bar to power IGBT module 2.
   - — Using a T-30 Torx driver, remove one screw (**B**) securing the bus bar to the positive bus plate and remove the bus bar from the drive.

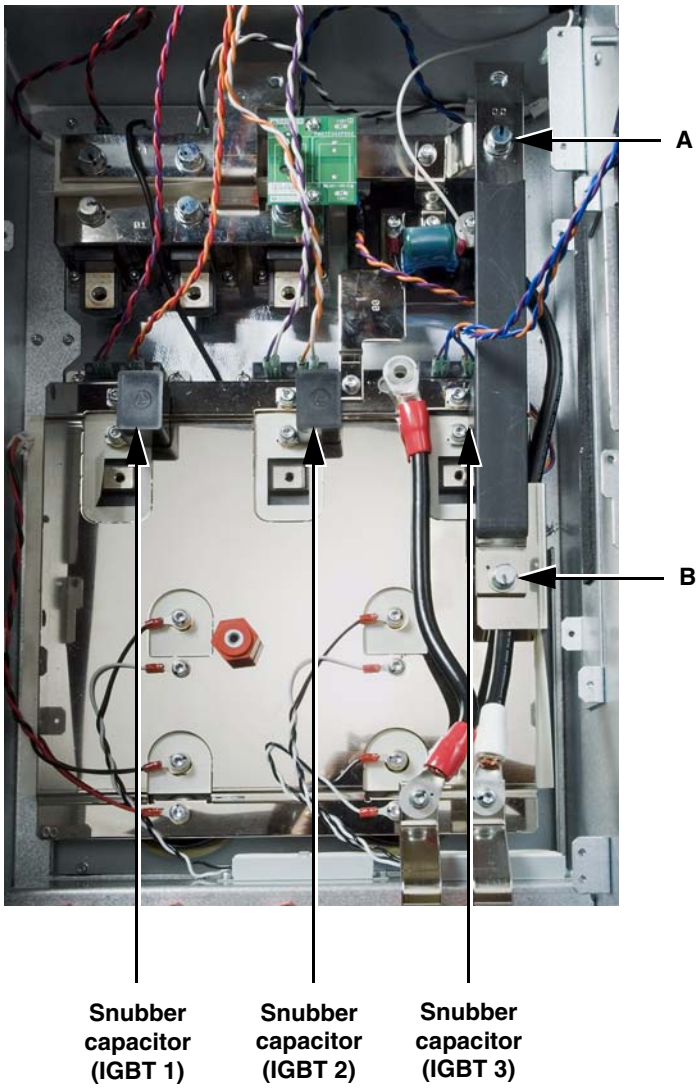
Figure 60: T2 Output Bus Bar



Remove the Negative Bus Bar

5. Remove the negative bus bar as follows to access the snubber capacitor on power IGBT module 3. See Figure 61.
   - — Using a 13 mm socket wrench, remove one bolt (**A**) securing the negative bus bar to the silicon controlled rectifier (SCR) negative bus.
   - — Using a 13 mm socket wrench, remove one bolt (**B**) securing the negative bus bar to the negative bus plate and remove the negative bus bar from the drive.

Figure 61: Negative Bus Bar



Remove the Power IGBT Snubber Capacitors

6. Remove the power IGBT snubber capacitors as follows. See Figure 61 on page 72 for capacitor location.

⚠ DANGER

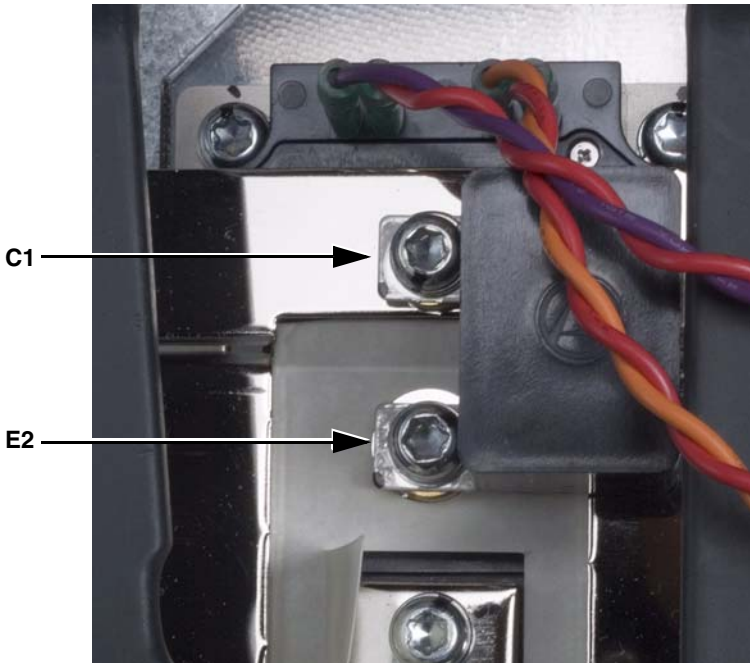
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- 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:
  - — Snubber Capacitors. See Figure 61 on page 72.
- 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.

— Using a T-30 Torx driver, remove two screws securing the snubber capacitors to terminals C1 and E2 on each of the three power IGBT modules and remove the snubber capacitors. See Figure 62.

Figure 62: Power IGBT Snubber Capacitor Connections

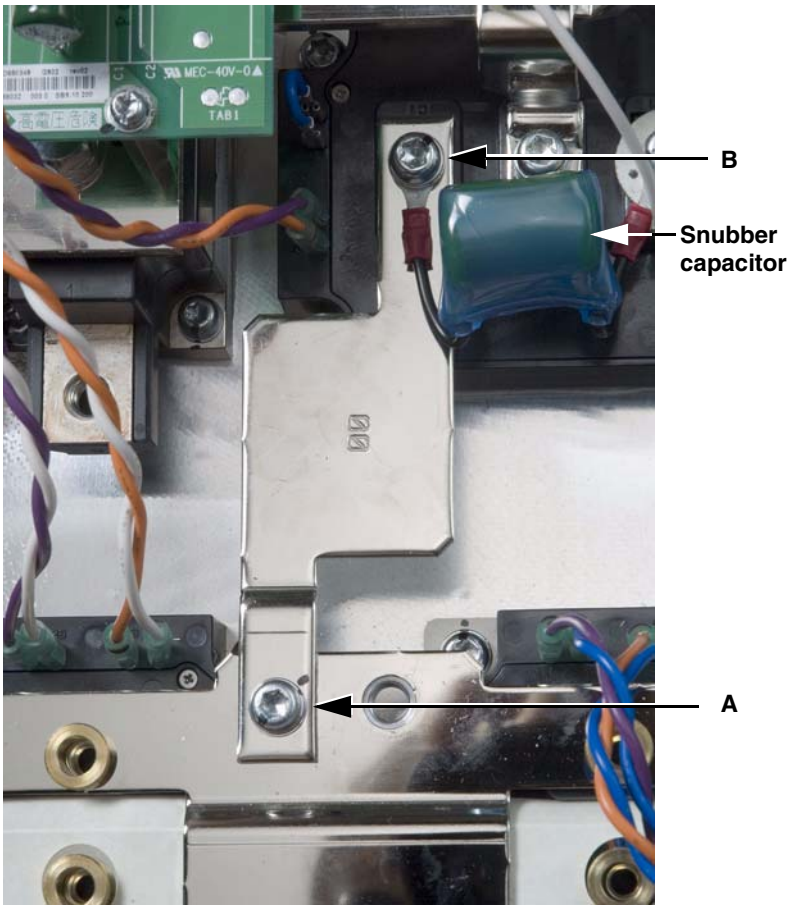


Remove the Braking IGBT Module Jumper

7. Remove the jumper between the braking IGBT module and the positive bus plate as follows. See Figure 63.
   - — Using a T-30 Torx driver, remove one screw (**A**) securing the braking IGBT jumper to the positive bus plate.
   - — Using a T-30 Torx driver, remove one screw (**B**) securing the jumper to terminal C1 on the braking IGBT module and remove the jumper.

NOTE: Removing the screw from terminal C1 of the braking IGBT module also releases the left side of the braking IGBT snubber capacitor (240 V drives) or the SCR snubber board wire (480 V drives). See page 49 for 480 V drives.

Figure 63: Braking IGBT Module Jumper, 240 V Unit Shown



Remove the Wiring from the Capacitors

8. Remove the wiring from the capacitors as follows.
   - — **240 V models**: Using a T-30 Torx driver, remove two screws (**A**) on each of the four capacitors to release the wiring from the capacitor terminals. See Figures 64 and 65 (page 76).
   - — **480 V models**: Using a T-30 Torx driver, remove two screws on each of the six capacitors to release the wiring from the capacitor terminals. See Figure 66 on page 76.

NOTE: Note the orientation of the wires. The black wires connect to the negative (top) capacitor terminals, and the white or red wires connect to the positive (bottom) capacitor terminals.

Figure 64: Capacitor Wiring, 240 V Unit

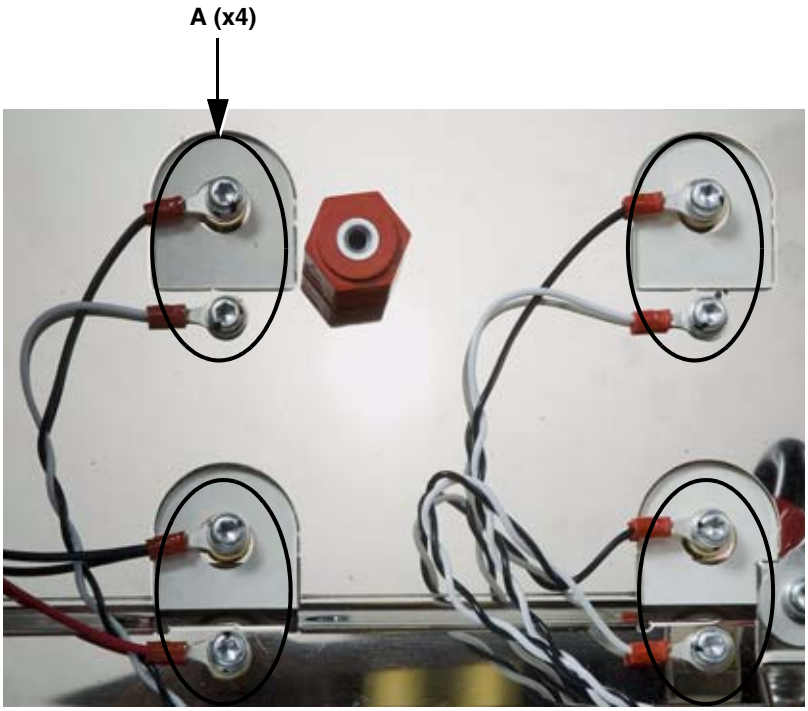


Figure 65: Capacitor Wiring, 240 V Drives

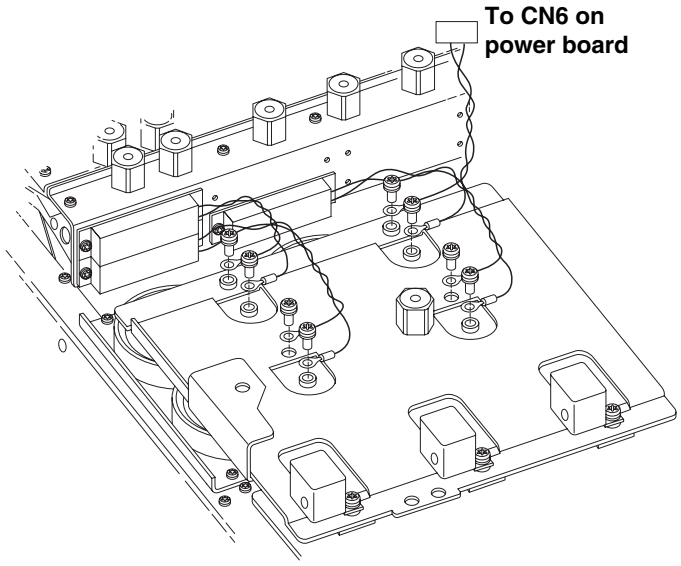
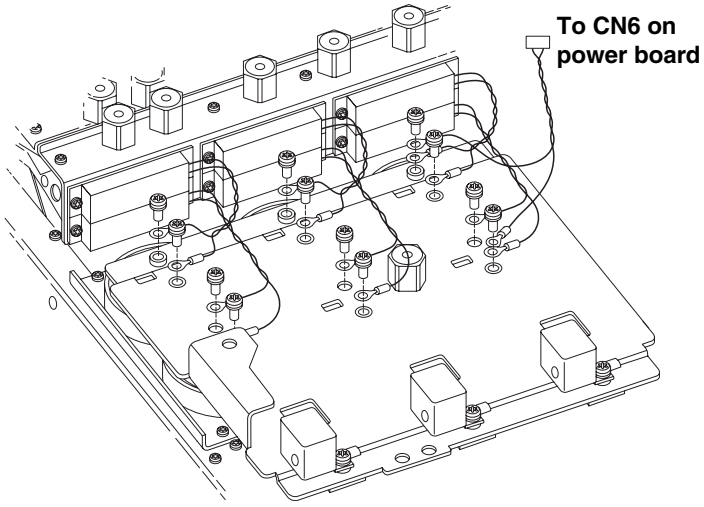


Figure 66: Capacitor Wiring, 480 V Drives

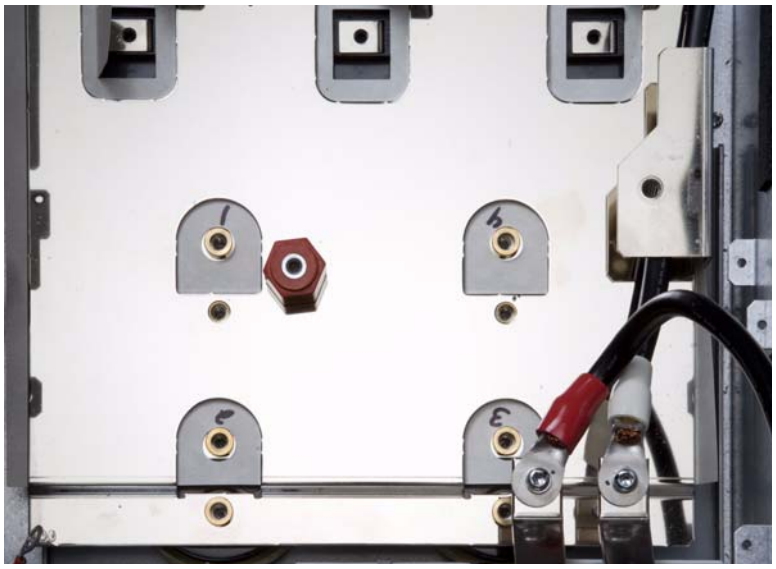


Remove the Bus Plates

9. Remove the bus plates as follows.

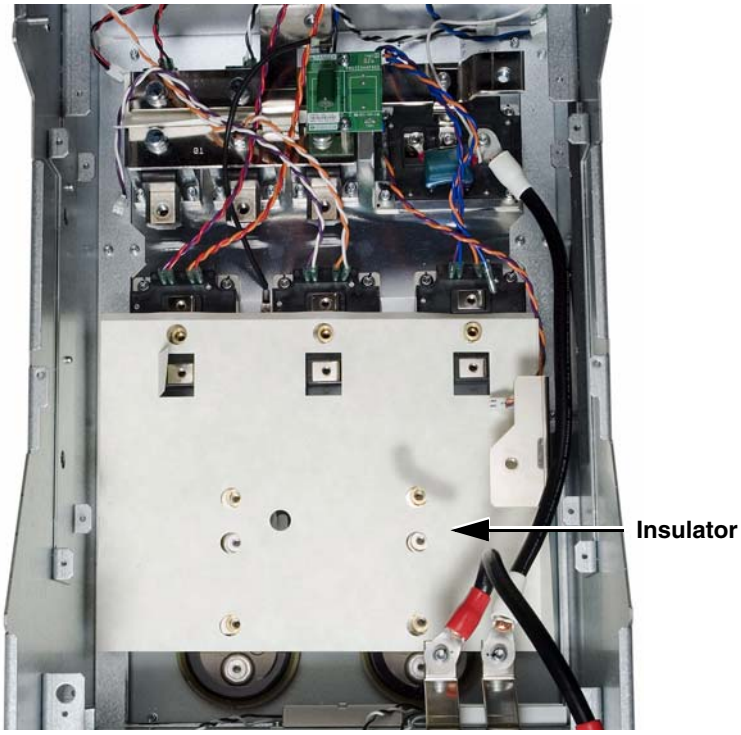
   — Lift the positive bus plate out of the drive. See Figures 67 and 70 (page 78) for 240 V drives. See Figure 71 (page 79) for 480 V drives.

Figure 67: Positive Bus Plate



   — Remove the insulator between the positive and negative bus plates. See Figures 68 and 70 (page 78) for 240 V drives. See Figure 71 (page 79) for 480 V drives.

Figure 68: Bus Plate Insulator



— Lift the negative bus plate out of the drive to access the power IGBT modules and the capacitors. See Figure 69.

Figure 69: Negative Bus Plate

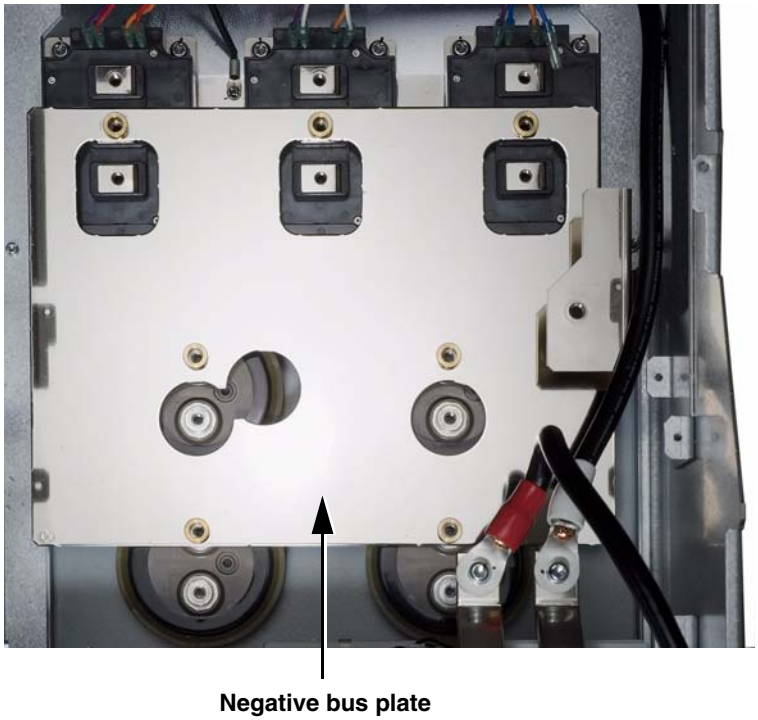


Figure 70: 240 V Drives

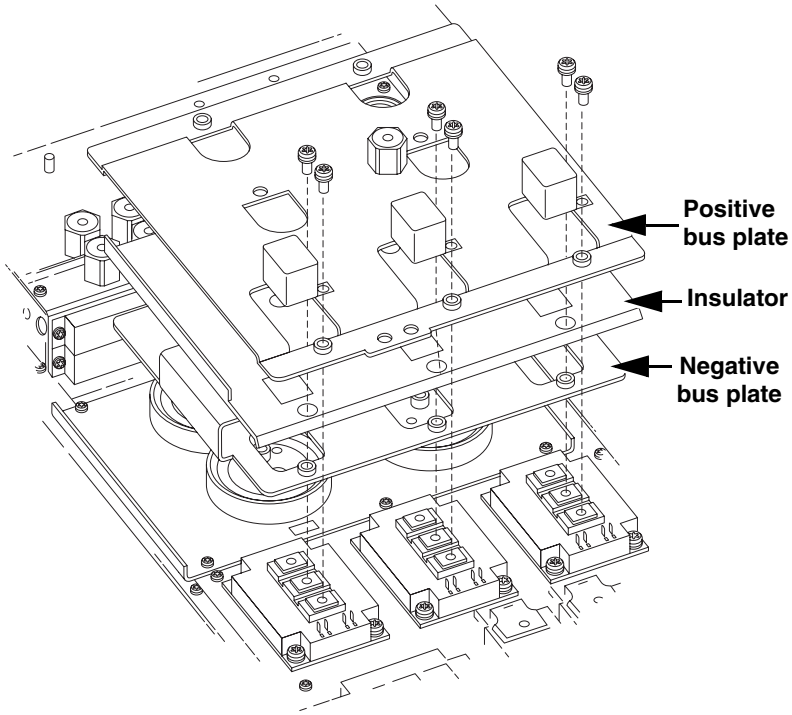
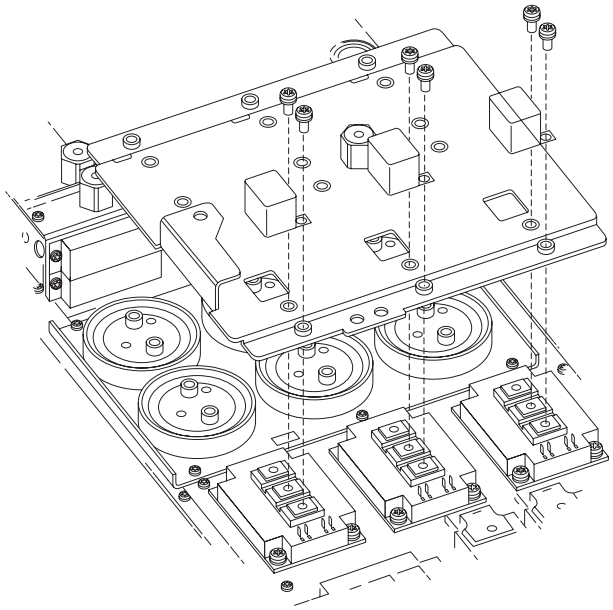


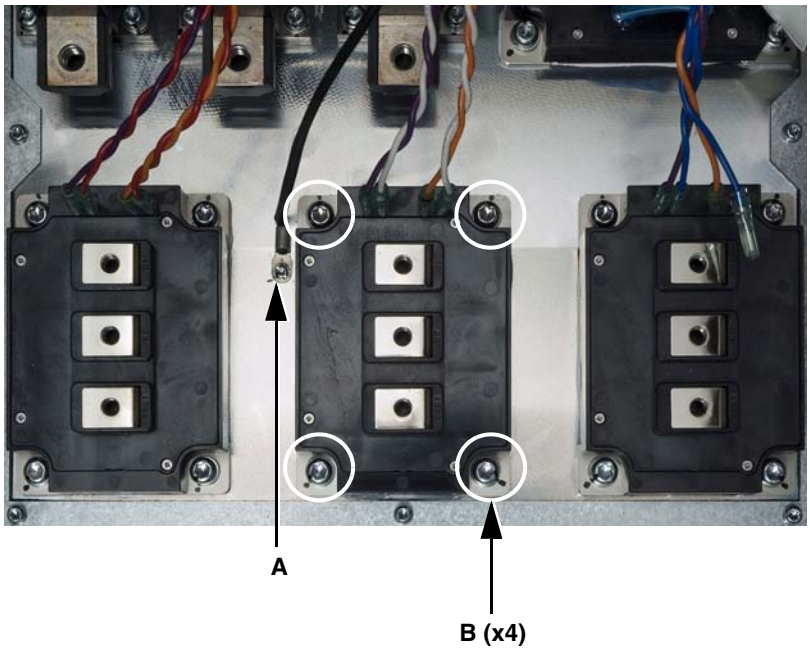
Figure 71: 480 V Drives



Replace the Temperature Sensor Wire VZ3G1102

10. Replace the temperature sensor wire as follows. See Figure 72.
    - — Using a T-10 Torx driver, remove one screw (**A**) securing the temperature sensor wire to the heatsink.
    - — Using a T-10 Torx driver, secure the new temperature sensor wire to the heatsink with one screw. Tighten the screw to 0.4–0.6 Nm (3.5–5.3 lb-in).

Figure 72: Temperature Sensor Wire and Power IGBT Modules



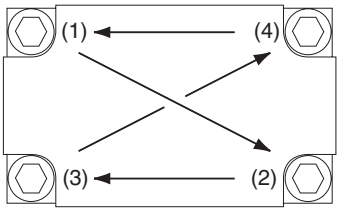
NEXT STEP: If you are also replacing the power IGBT modules, continue with Step 11 on page 81.

If you are replacing the capacitors, skip to Step 12 on page 82.

Otherwise, skip to Step 15 on page 86.

Replace the Power IGBT Modules VZ3IM1400M1271, VZ3IM1600M0671

Figure 73: Torque Sequence



11. Replace the power IGBT module as follows. See Figure 72 on page 80.
    - — Remove the wiring from the power IGBT module that you are replacing. Note the wiring connections for reassembly. See Table 11.
    - — Using a T-30 Torx driver, remove four screws (**B)** securing the power IGBT module to the heatsink. See Figure 72 on page 80.
    - — Remove the module from the heatsink.
    - — Clean the portion of the heatsink that makes contact with the module.
    - — Evenly coat the bottom of the new power IGBT module with a thin layer of thermal compound included in the kit.
    - — Position the new module on the heatsink.
    - — Using a T-30 Torx driver, secure the module with four screws (**B)**. Initially tighten the screws, in the sequence shown in Figure 73, 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 wiring connections on the new power IGBT module. See Figure 72 and Table 11.

Table 11: Power IGBT Module Wiring

Wire No.[1]	Power IGBT No.	Power IGBT Terminal No.	Description	To:
E117	IGBT 1	**G2**	Violet	PB[2] CNX
		E2	Red	
E121	IGBT 1	**E1**	Orange	PB CNU
		G1	Red	
E118	IGBT 2	**G2**	Violet	PB CNY
		E2	White	
E122	IGBT 2	**E1**	Orange	PB CNV
		G1	White	
E119	IGBT 3	**G2**	Violet	PB CNZ
		E2	Blue	
E126	IGBT 3	**E1**	Orange	PB CNW
		G1	Blue	

[1] See schematic on page 114 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.

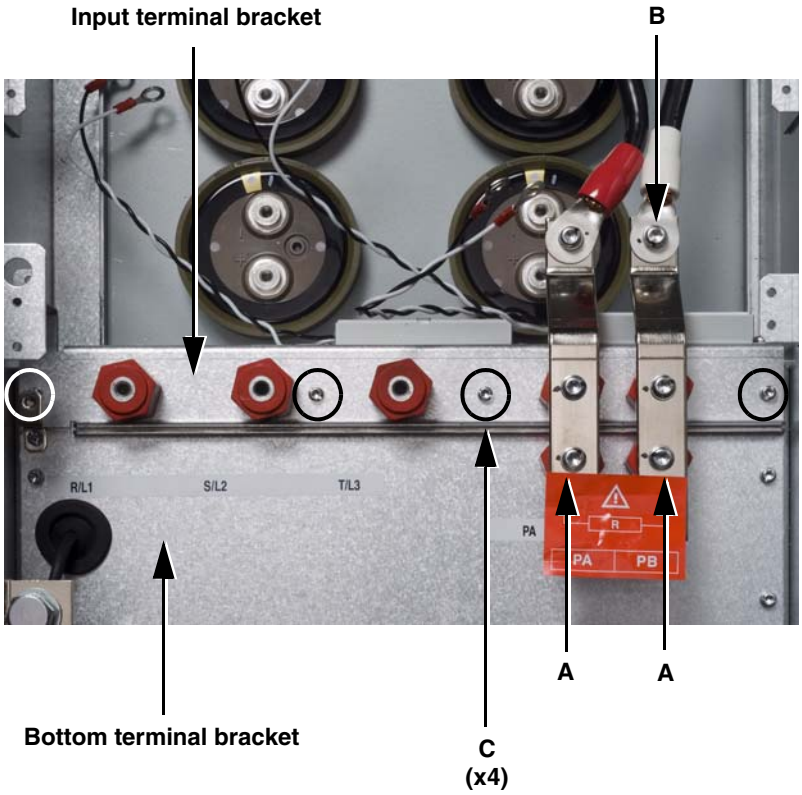
[2] PB: Power board.

NEXT STEP: If you are also replacing the capacitors, continue with Step 12 on page 82. Otherwise, skip to Step 15 on page 86.

Remove the Input Terminal Bracket

12. Remove the input terminal bracket as follows. See Figure 74.
    - — Using a T-30 Torx driver, remove two screws (**A**) securing the PA and PB bus bars to the bottom terminal bracket.
    - — Using a T-30 Torx driver, remove one screw (**B**) securing the PB power cable to the PB bus bar.
    - — Using a T-20 Torx driver, remove four screws (**C**) securing the input terminal bracket to the bottom terminal bracket. Remove the input terminal bracket from the drive.

Figure 74: Input Terminal Bracket



Replace the Capacitor Assembly VY1ADC1111, VY1ADC1116

13. Replace the capacitor assembly. See Figure 75 for 240 V units, and Figure 76 on page 84 for 480 V units.
    - — Using a T-20 Torx driver, remove 6 screws (**A**) securing the capacitor assembly to the drive frame and remove the capacitor assembly from the drive.
    - — Place the new capacitor assembly in the drive, ensuring that the positive terminals (+) are oriented toward the bottom of the drive and the negative terminals (-) are toward the top of the drive.
    - — Using a T-20 Torx driver, secure the assembly to the frame with six screws. Tighten the screws to 1.1–1.7 N•m (9.7–15 lb-in).

Figure 75: Capacitor Assembly, 240 V Units

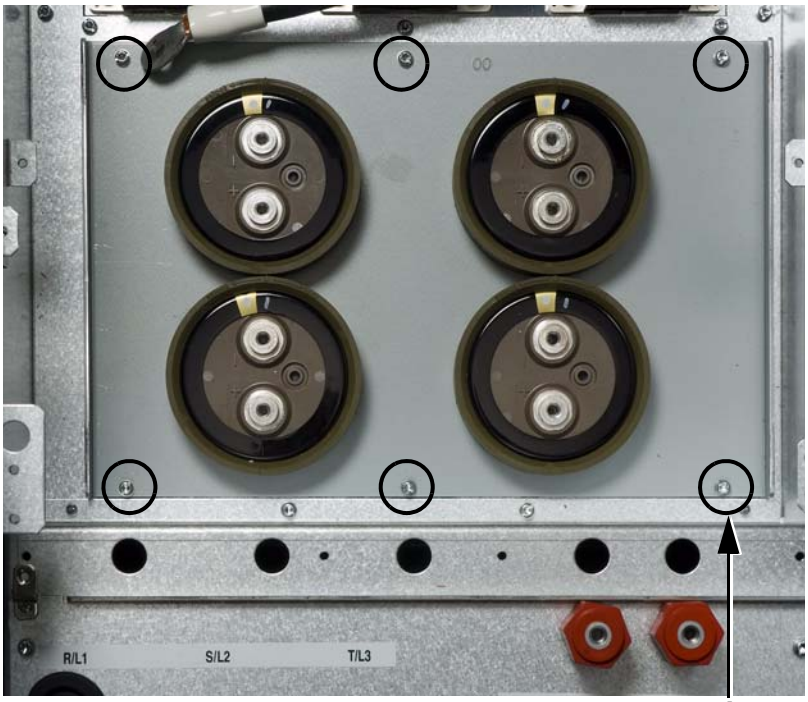
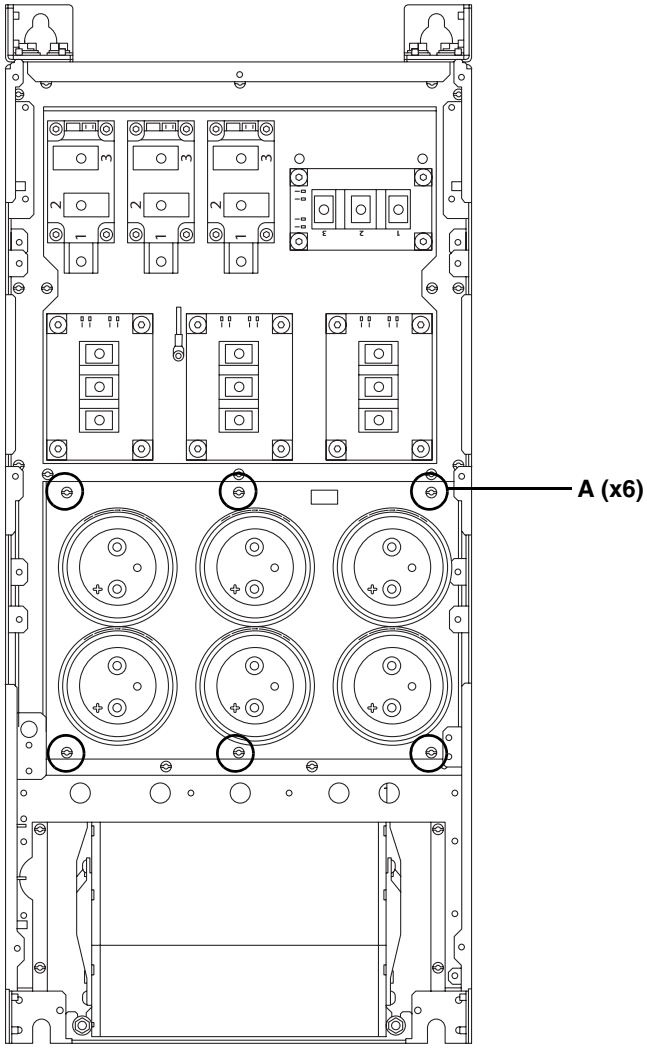


Figure 76: Capacitor Assembly, 480 V Units



Reinstall the Input Terminal Bracket

14. Reinstall the input terminal bracket as follows. See Figure 77.

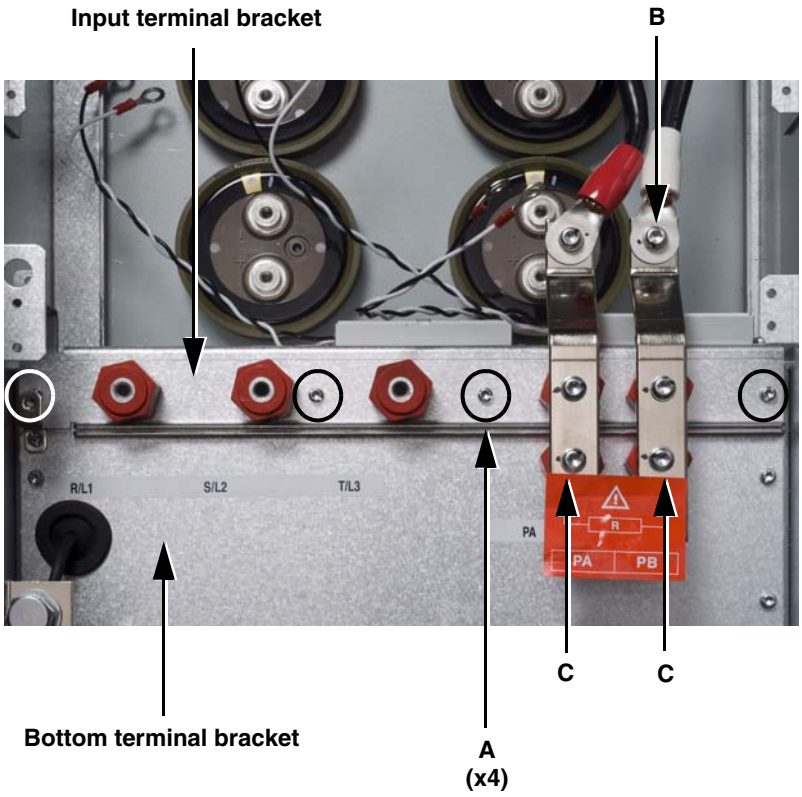
— Position the input terminal bracket in the drive over the bottom terminal bracket.

— Using a T-20 Torx driver, secure the input terminal bracket to the bottom terminal bracket with four screws (**A**). Tighten the screws to 1.1–1.7 N•m (9.7–15 lb-in).

— Using a T-30 Torx driver, secure the PB power cable to the PB bus bar with one screw (**B**). Tighten the screw to 4.3–5.1 N•m (38.1–45.1 lb-in).

— Using a T-30 Torx driver, secure the PA and PB bus bars to the bottom terminal bracket with two screws (**C**). Tighten the screws to 3.3–4.4 N•m (29.2–38.9 lb-in).

Figure 77: Input Terminal Bracket

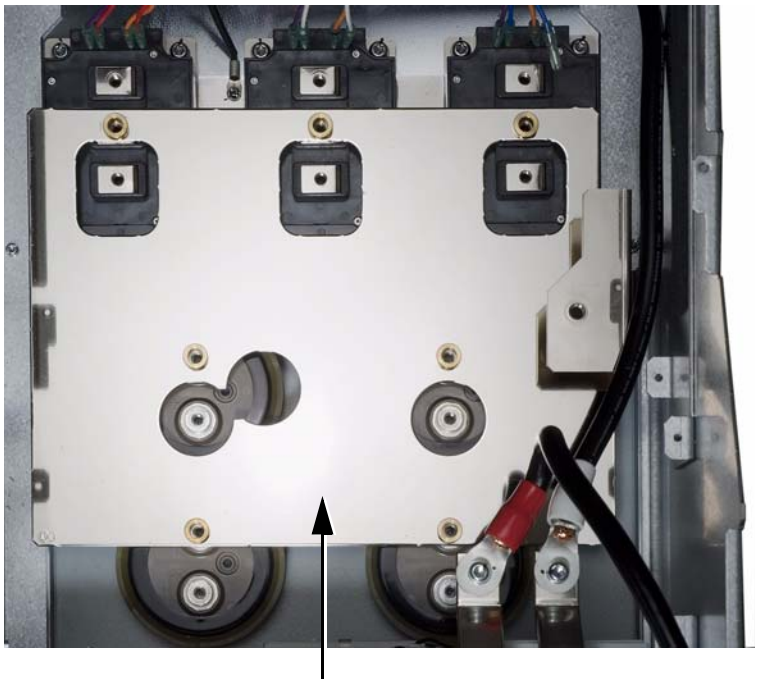


Reinstall the Bus Plates

15. Reinstall the bus plates as follows.

— Place the negative bus plate over the power IGBT modules and the capacitor assembly with the brass spacers facing up. See Figures 78 and 81 (page 88) for 240 V drives. See Figure 82 (page 89) for 480 V drives.

Figure 78: Negative Bus Plate



— Install the insulator over the negative bus plate. See Figures 79 and 81 (page 88) for 240 V drives. See Figure 82 (page 89) for 480 V drives.

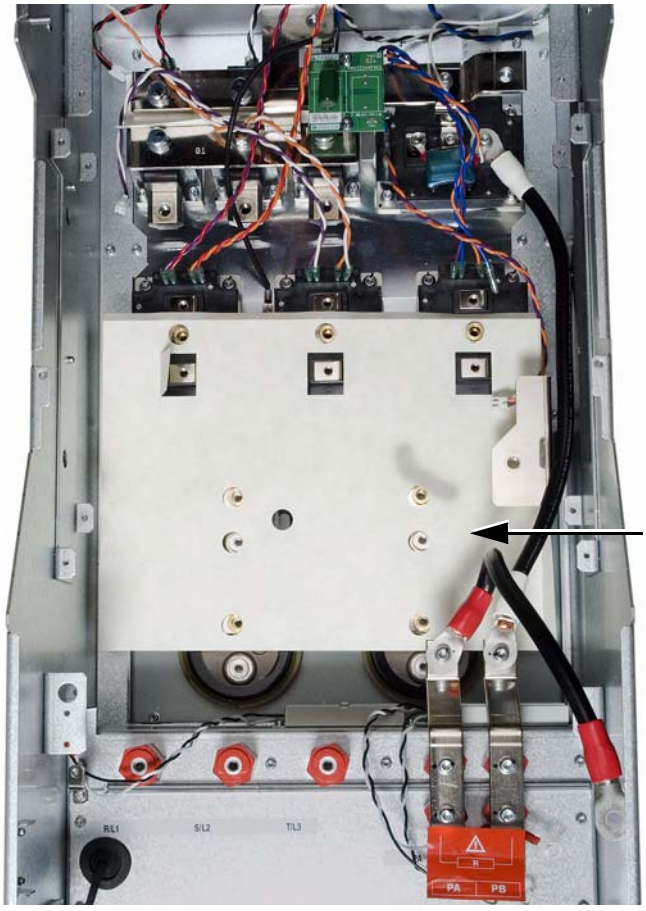
⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Install the insulator as shown in Figure 79.
- Before installing the insulator, ensure that it has no tears or cracks. If the insulator is damaged, contact your Schneider Electric representative.
- Do not install a damaged insulator.

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

Figure 79: Bus Plate Insulator



— Place the positive bus plate over the insulator with the brass spacers at the top of the plate facing up. See Figures 80 and 81 for 240 V drives. See Figure 82 (page 89) for 480 V drives.

Figure 80: Positive Bus Plate

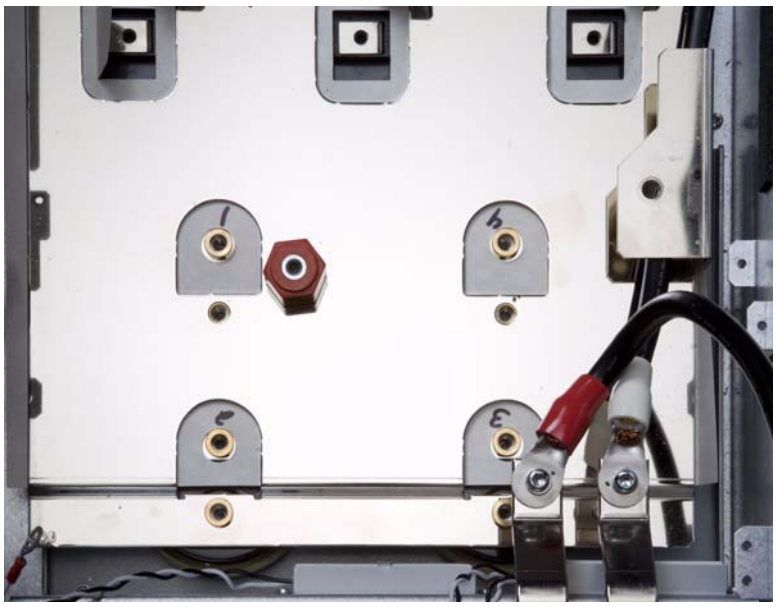


Figure 81: 240 V Drives

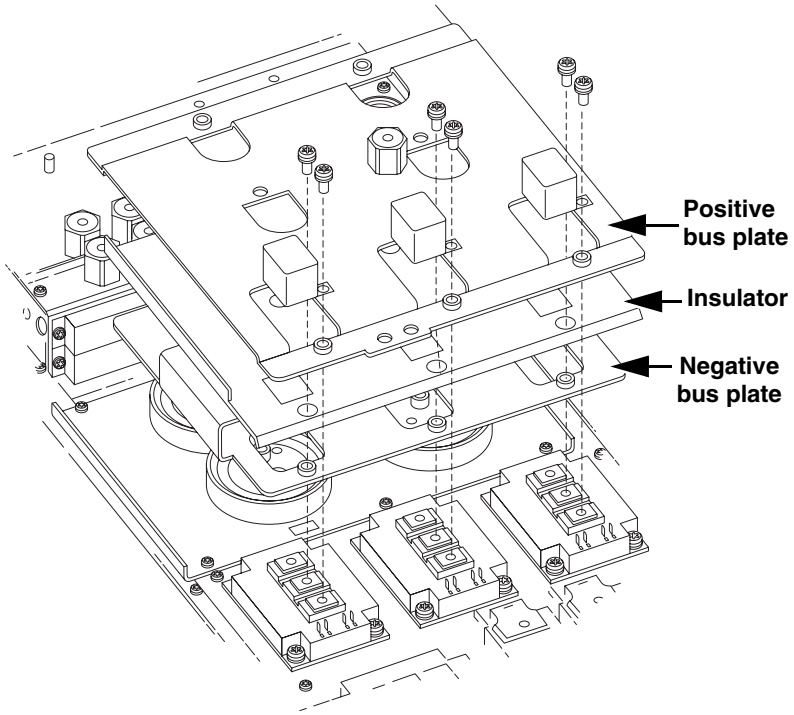
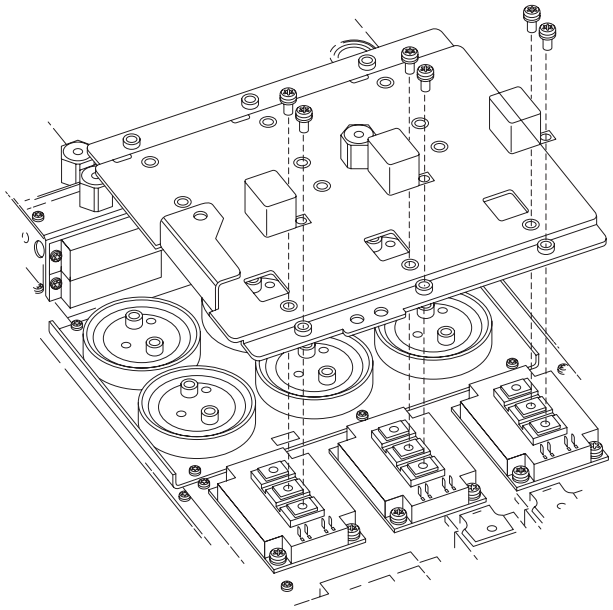


Figure 82: 480 V Drives



Reinstall the Capacitor Wiring

16. Reinstall the capacitor wiring as follows.

> **NOTE:** Refer to Figure 106 on page 114 for capacitor wiring. The capacitor assembly for the 240 V units has four capacitors. See Figures 83 and 84 (page 91). The assembly for the 480 V units has six capacitors. See Figure 85 on page 91.

240 V drives:

- Top left capacitor: **Black** wire to negative (top) terminal, **white** wire to positive (bottom) terminal.
- Top right capacitor: **Black** wire to negative (top) terminal, **white** wire to positive (bottom) terminal.
- Bottom left capacitor: **Black** wire to negative (top) terminal, **red** wire to positive (bottom) terminal.
- Bottom right capacitor: **Black** wire to negative (top) terminal, **white** wire to positive (bottom) terminal.
- Using a T-30 Torx driver, secure the capacitor wiring with two screws (**A**) on each of the four capacitors. Tighten the screws to 4.2–5.1 N•m (37.2–45.1 lb-in).

480 V drives (see Figure 85 on page 91):

- Resistor wiring: Install the **black** wire on the negative (top) terminal of each capacitor, and install the **white** wire on the positive (bottom) terminal of each capacitor.
- CN6 cable wiring: Install the **black** wire on the negative (top) terminal of the top left capacitor, and install the **red** wire on the positive (bottom) terminal of the bottom left capacitor.
- Using a T-30 Torx driver, secure the capacitor wires with two screws on each of the six capacitors. Tighten the screws to 4.2–5.1 N•m (37.2–45.1 lb-in).

Figure 83: Capacitor Wiring, 240 V Units

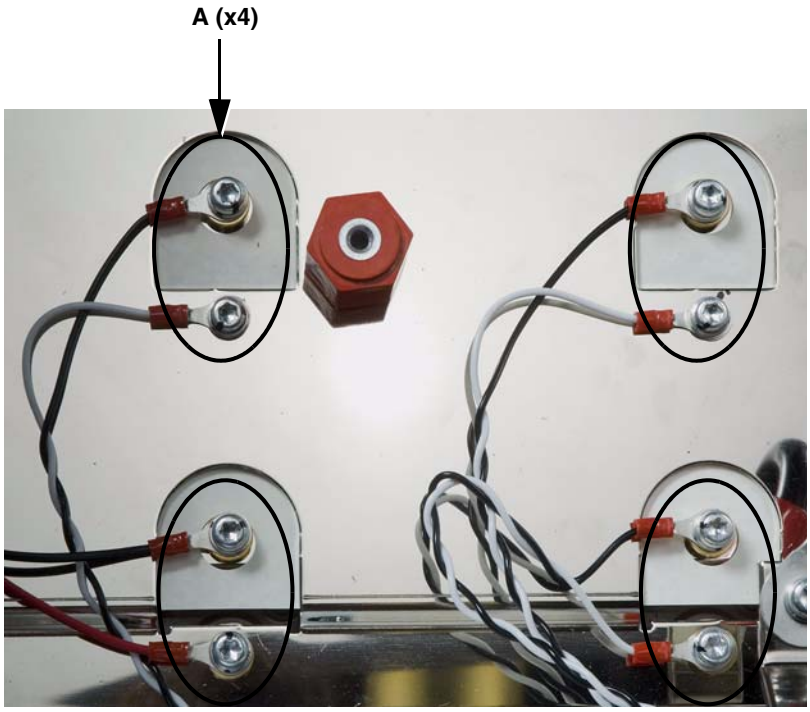


Figure 84: Capacitor Wiring, 240 V Units

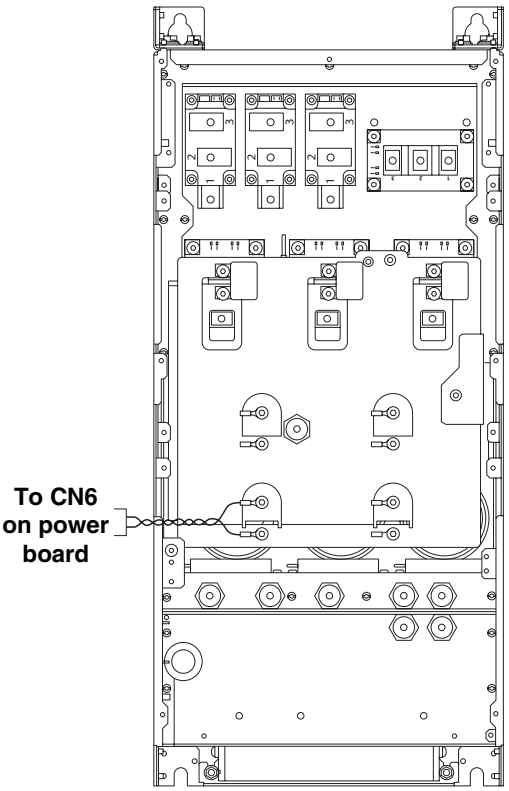
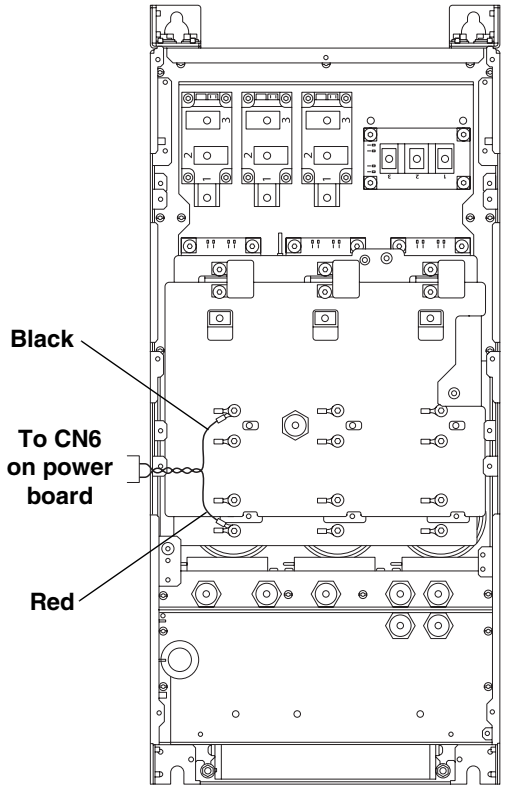


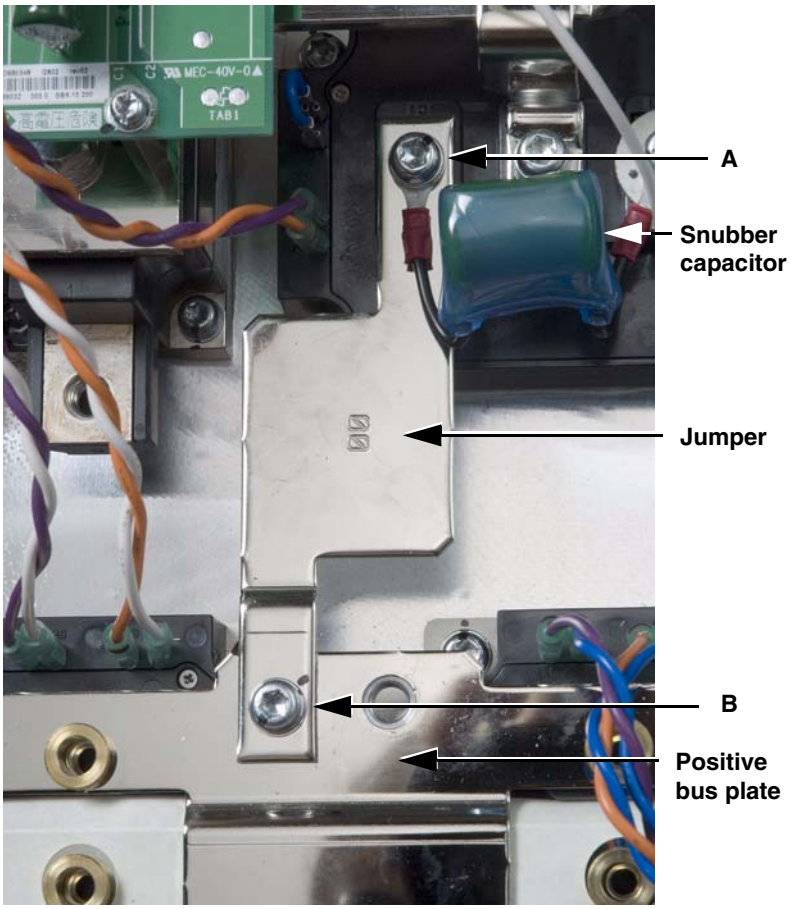
Figure 85: Capacitor Wiring, 480 V Units



Reinstall the Braking IGBT Module Jumper

17. Reinstall the jumper between the braking IGBT module and the positive bus plate as follows. See Figure 86.
    - — Position the jumper over braking IGBT module terminal C1 and place the left wire of the braking IGBT snubber capacitor (240 V drives) or the SCR snubber board wire (480 V drives) over the jumper. See page 49 for 480 V drives.
    - — Using a T-30 Torx driver, secure the jumper and snubber capacitor to braking IGBT module terminal C1 with one screw (**A**). Tighten the screw to 4.2–5.1 N•m (37.2–45.1 lb-in).
    - — Using a T-30 Torx driver, secure the jumper to the positive bus plate with one screw (**B**). Tighten the screw to 4.2–5.1 N•m (37.2–45.1 lb-in).

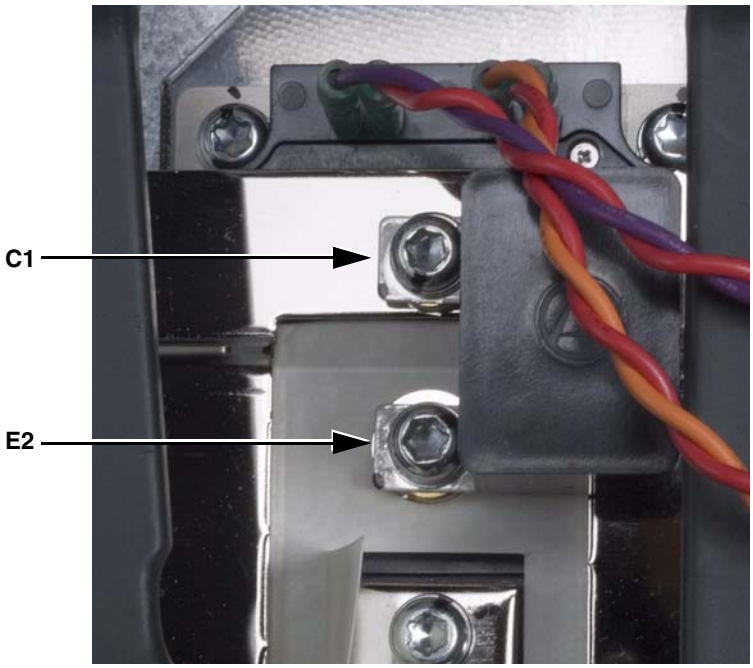
Figure 86: Braking IGBT Module Jumper, 240 V Units



Reinstall the Power IGBT Snubber Capacitors

18. Using a T-30 Torx driver, reinstall the snubber capacitors on terminals C1 and E2 of the three power IGBT modules and secure the capacitors with two screws each. See Figures 87 and 88 (page 94). Tighten the screws to 4.2–5.1 N•m (37.2–45.1 lb-in).

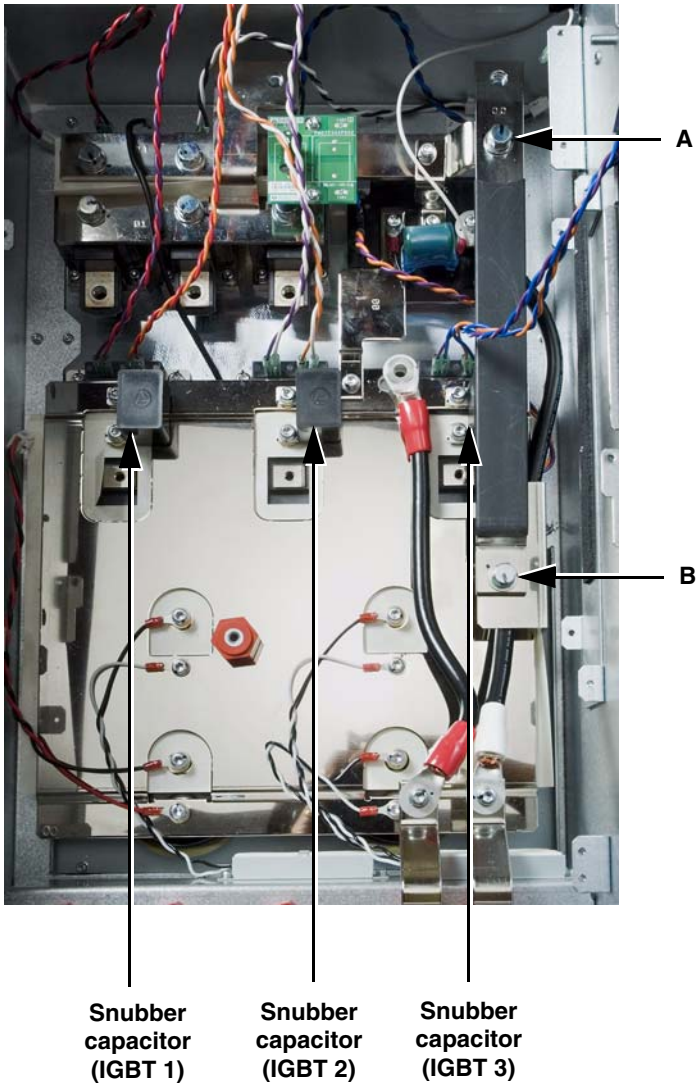
Figure 87: Power IGBT Snubber Capacitor Connections



Reinstall the Negative Bus Bar

19. Reinstall the negative bus bar as follows. See Figure 88.
    - — Using a 13 mm socket wrench, secure the top of the negative bus bar to the silicon controlled rectifier (SCR) negative bus with one bolt (**A**). Tighten the bolt to 10–13.6 N•m (88.5–120.4 lb-in).
    - — Using a 13 mm socket wrench, secure the bottom of the negative bus bar to the negative bus plate with one bolt (**B**). Tighten the bolt to 10–13.5 N•m (88.5–119.5 lb-in).

Figure 88: Negative Bus Bar



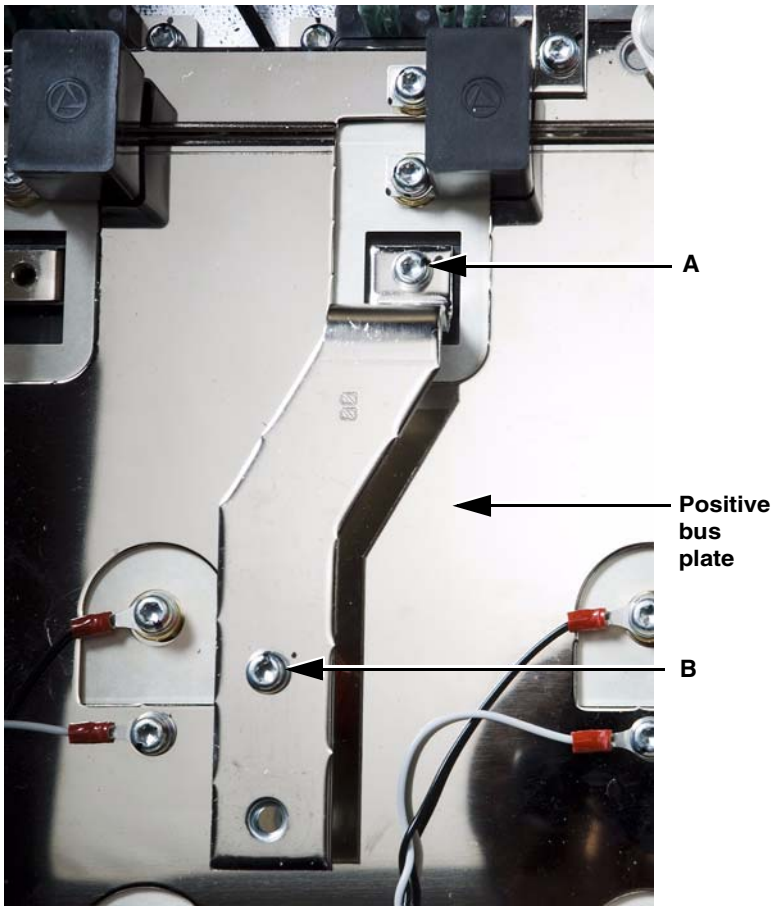
Reinstall the T2 Output Bus Bar

20. Reinstall the T2 output bus bar as follows. See Figure 89.

— Using a T-30 Torx driver, secure the bus bar to power IGBT module 2 with one screw (**A**). Tighten the screw to 4.2–5.1 N•m (37.2–45.1 lb-in).

— Using a a T-30 Torx driver, secure the bus bar to the positive bus plate one screw (**B**). Tighten the screw to 3.3–4.4 N•m (29.2–38.9 lb-in).

Figure 89: T2 Output Bus Bar

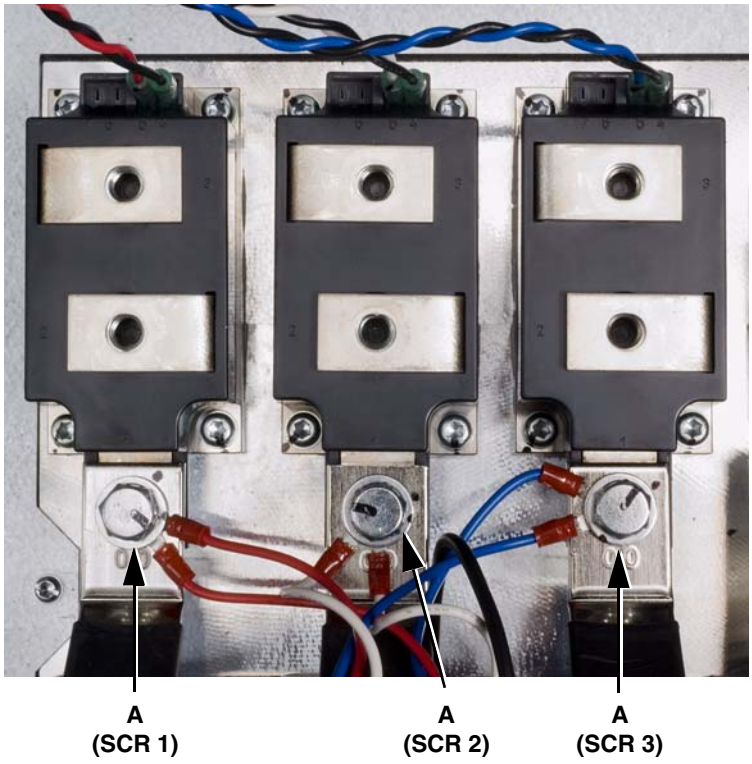


Reinstall the Input Bus Bars

21. Reinstall the input bus bars on the silicon controlled rectifier (SCR) modules as follows. See Figure 90.
    - — Position the input bus bars over terminal 1 of the SCR modules.
    - — Replace the wires from the two cable assemblies that connect the SCR modules to the fan control board and to terminal CN5 on the power board.

      Connect the **red** wires to SCR 1, connect the **white** wires to SCR 2, and connect the **blue** wires to SCR 3.
    - — Using a 13 mm socket wrench, secure the input bus bars and wires to the SCR modules with one bolt each (**A**). Tighten the bolts to 10–13.5 N•m (88.5–119.5 lb-in).

Figure 90: Input Bus Bar Connections to SCR Modules



Reinstall the Filter Board

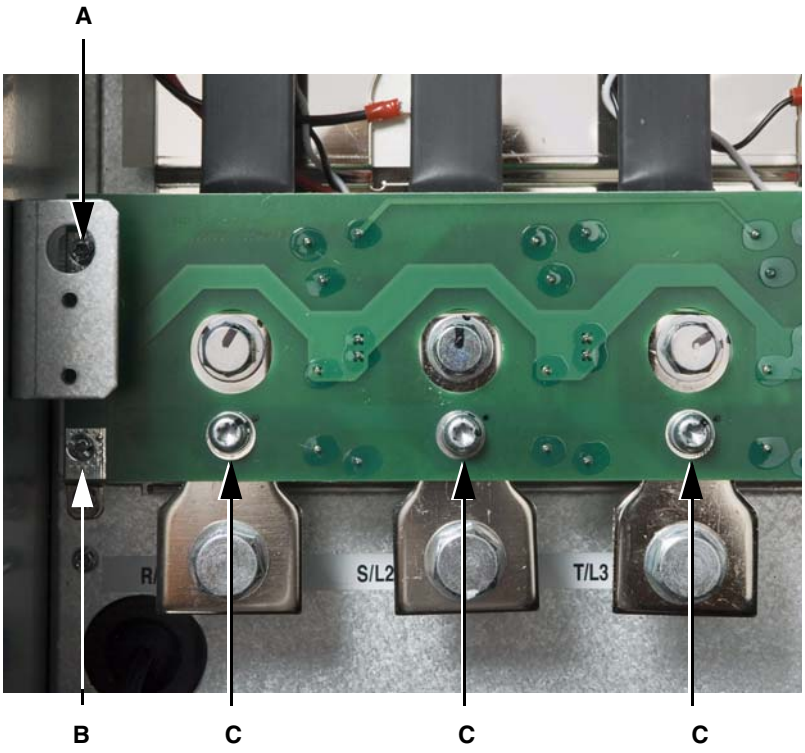
22. Reinstall the filter board as follows. See Figure 91.

— Using a T-20 Torx driver, secure the top left corner of the filter board to the drive frame with one screw (**A**). Tighten the screw to 1.1–1.7 N•m (9.7–15 lb-in).

— Using a size 2 Phillips driver, secure the filter board to the grounding bracket on the bottom terminal bracket with one screw (**B**). Tighten the screw to 1.1–1.7 N•m (9.7–15 lb-in).

— Using a T-30 Torx driver, secure the filter board to input terminals L1, L2, and L3 with three screws (**C**). Tighten the screws to 3.3–4.4 N•m (29.2–38.9 lb-in).

Figure 91: Filter Board



Reinstall the Output Bus Bars

23. Reinstall the output bus bars as follows.
    - — Position the output terminal bracket, with the output bus bars attached, over the drive frame as illustrated in Figure 92.
    - — Using a T-20 Torx driver, secure the bracket to the drive frame with three screws (**A**). Tighten the screws to 1.1–1.7 N•m (9.7–15 lb-in).
    - — Using a T-30 Torx driver, secure the two segments of output bus bar T2 with one bolt (**B**). See Figure 93 on page 99. Tighten the bolt to 10–13.5 N•m (88.5–119.5 lb-in).
    - — Using a T-30 Torx driver, secure the top of output bus bars T1 and T3 to terminal C2E1 of power IGBT modules 1 and 3 with two bolts (**C**). See Figure 93 on page 99. Tighten the screws to 4.2–5.1 N•m (37.2–45.1 lb-in).

Figure 92: Output Terminal Bracket

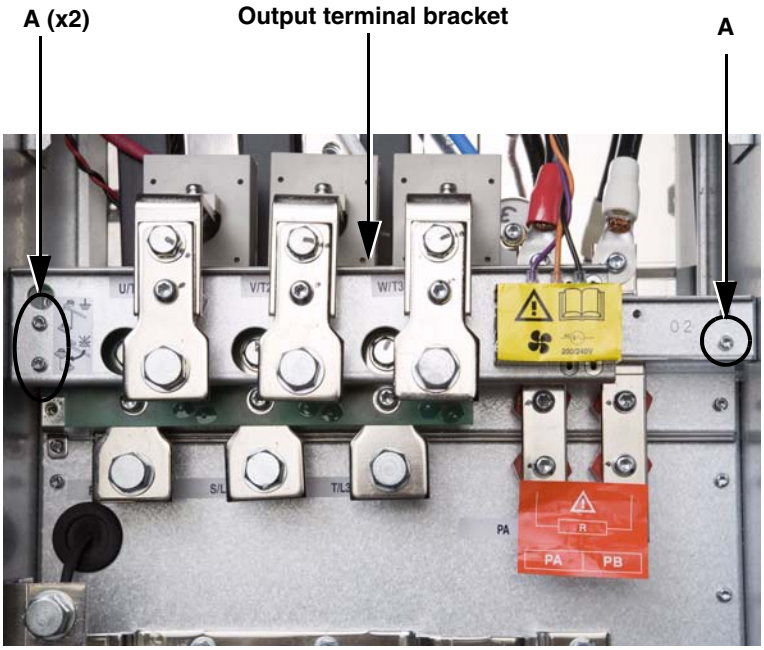
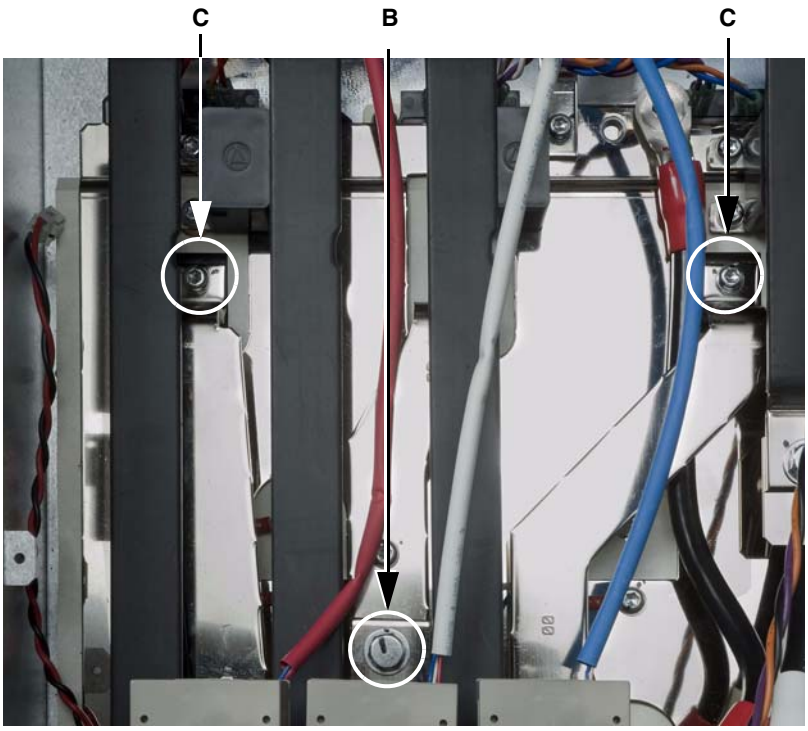


Figure 93: Output Bus Bar Connections to Power IGBT Modules



Reassemble the Drive

Perform Steps 1–10 of “Reassembling the Drive” beginning on page 100 to replace the following parts:

- ❏ The top cover
- ❏ The conduit tray and power terminal shield
- ❏ The power board mounting plate
- ❏ The power board connections
- ❏ The control module connections
- ❏ The control module plate
- ❏ The fan control board connections
- ❏ The soft charge board connections
- ❏ The EMC tray
- ❏ The front cover

Reassembling the Drive

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 6 before performing this procedure.
- Before working on this equipment, turn off all power supplying it and perform the DC bus voltage measurement procedure on page 11.

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

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

- ❑ The top cover
- ❑ The conduit tray and power terminal shield
- ❑ The power board mounting plate
- ❑ The power board connections
- ❑ The control module connections
- ❑ The control module plate
- ❑ The fan control board connections
- ❑ The soft charge board connections
- ❑ The EMC tray
- ❑ The front cover

You must perform some or all of the procedures in this section after replacing the spare parts identified in Table 12. Consult Table 12 for the reassembly steps that must be performed for the corresponding spare parts.

Table 12: Reassembly Steps

If you replaced the:	Perform reassembly steps:
Power board	**Steps 4–10**
Current sensor	**Steps 2–10**
Snubber capacitors and snubber board	**Steps 1–8**
Silicon controlled rectifiers	**Steps 1–8**
Braking IGBT module	
Power IGBT modules	**Steps 1–8**
Capacitor assembly	

Replace the Top Cover

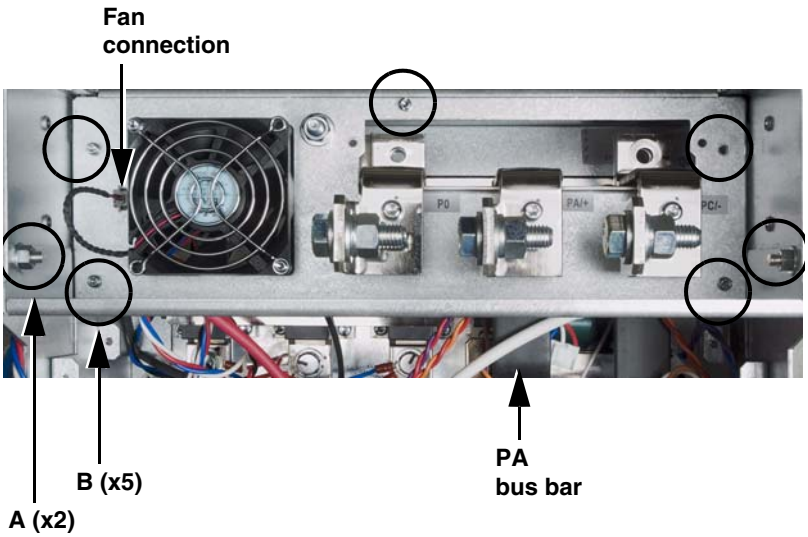
1. Reinstall the top cover as follows. See Figure 94.

   — Using a 10 mm socket wrench, secure the top cover to the drive side panels with two nuts (**A**). See Figure 94. Tighten the nuts to 4.2–5.1 N•m (37.2–45.1 lb-in).

> **NOTE:** Ensure that the internal fan connection is connected to the top cover.

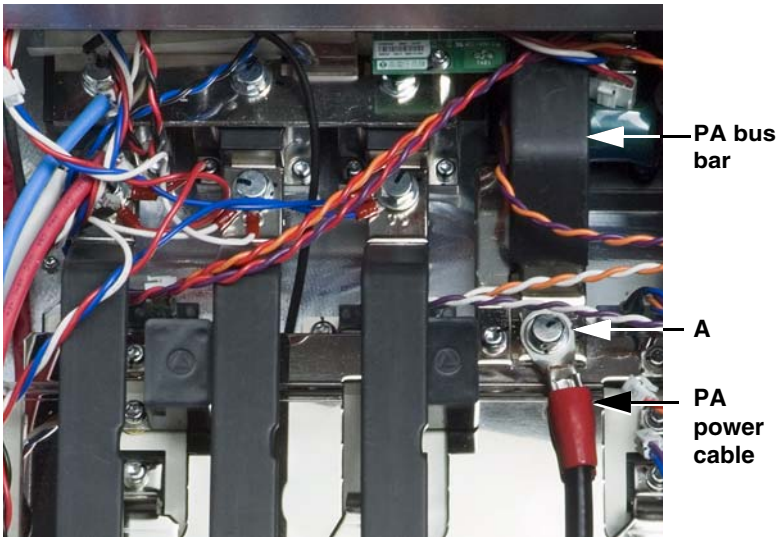
   — Using a T-20 Torx driver, secure the top cover to the drive frame with five screws (**B**). See Figure 94. Tighten the screws to 1.1–1.7 N•m (9.7–15 lb-in).

Figure 94: Top Cover



   — Place the PA power cable over the PA bus bar as illustrated in Figure 95. Using a 13 mm socket wrench, secure the PA bus bar to the positive bus plate with one bolt (**A**). See Figure 95. Tighten the bolt to 10–13.5 N•m (88.5–119.5 lb-in).

Figure 95: PA Connection to Positive Bus Plate

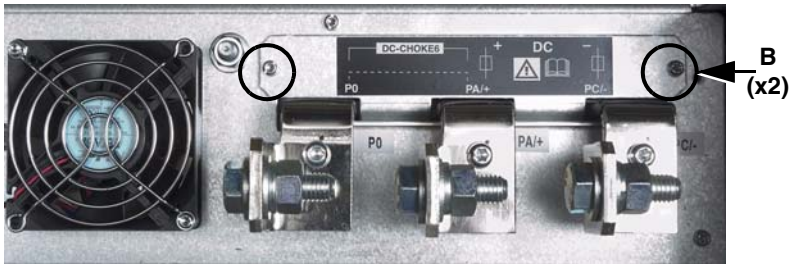


— Using a 13 mm socket wrench, secure the DC choke to terminals PO and PC/- with two bolts (**A**). See Figure 96. Tighten the bolts to 10–13.5 N•m (88.5–119.5 lb-in).

Figure 96: DC Choke PO and PC/- Connections

— Using a T-20 Torx driver, secure the DC choke label plate to the top cover with two screws (**B**). See Figure 97. Tighten the screws to 1.1–1.7 N•m (9.7–15 lb-in).

Figure 97: DC Choke Label Plate



Replace the Conduit Tray and Power Terminal Shield

2. Replace the power terminal shield and conduit tray as follows. See Figure 98.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Install the power terminal shield as shown in Figure 98.

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

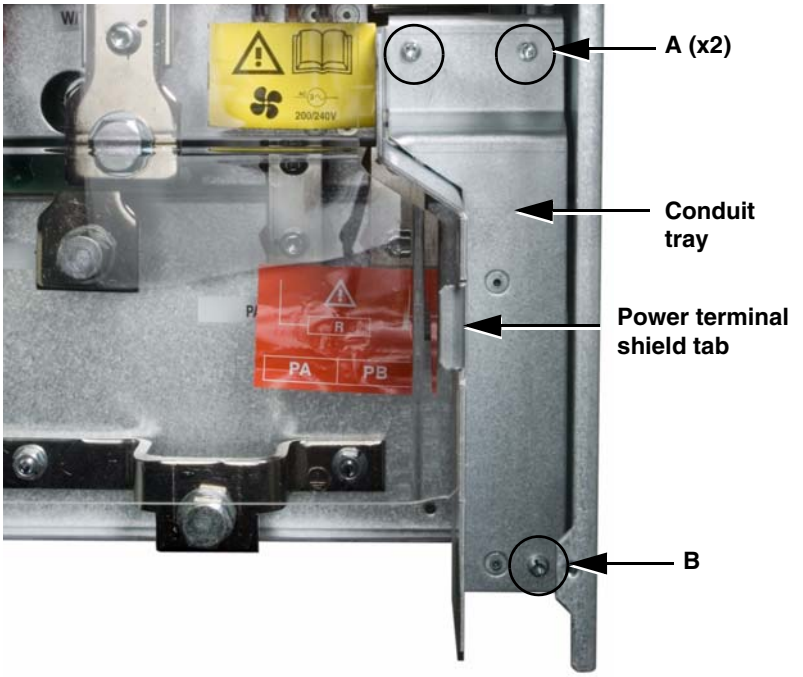
— Slide the tab on the left side of the power terminal shield under the retaining notches on the drive frame, and slide the tab on the right side of the shield into the slot on the conduit tray.

— Angle the conduit tray and power terminal shield into position in the drive. Ensure that the right edge of the conduit tray is properly seated under the edge of the drive frame.

— Using a T-20 Torx driver, secure the conduit tray to the drive frame with three screws (**A** and **B**). Tighten the screws to 1.1–1.7 N•m (9.7–15 lb-in).

NOTE: The screws (**A**) at the top of the conduit tray are longer than the screw (**B**) at the bottom.

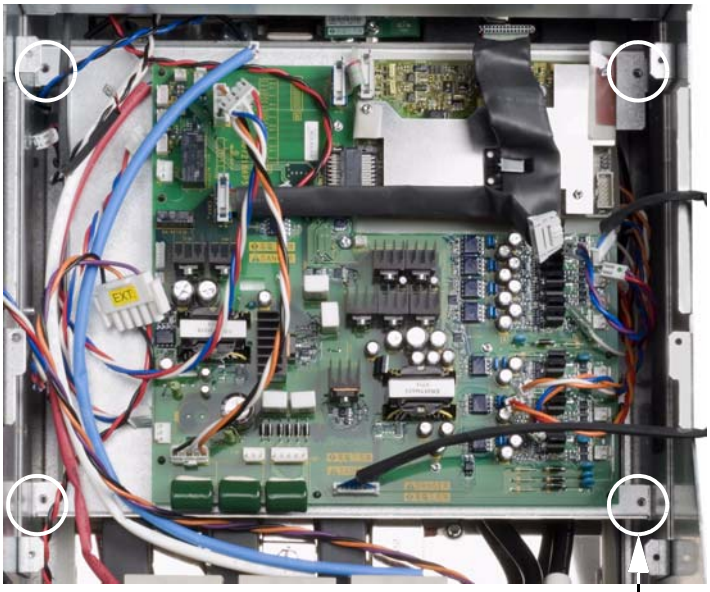
Figure 98: Conduit Tray and Power Terminal Shield



Replace the Power Board Mounting Plate

3. Using a T-20 Torx driver, secure the power board mounting plate to the drive frame with four screws. See Figure 99. Tighten the screws to 1.1–1.7 N•m (9.7–15 lb-in).

Figure 99: Power Board Mounting Plate



Replace the Power Board Connections

4. Install the following connections on the power bower board. See Figure 100 and Table 13 on page 106 for connector locations.
   - — At the top of the board, from left to right install: the 2-pin connector at terminal CN22 and the 2-pin connector at terminal CN7.
   - — At the left side of the board, from top to bottom install: the 3-pin connector at terminal CNC, the 3-pin connector at terminal CNB, the 3-pin connector at terminal CNA, the 2-pin connector at terminal CN12, and the 3-pin connector at terminal CN13.
   - — At the right side of the board, from top to bottom install: the 10-pin connector at terminal CNX2, the 22-pin connector at terminal CNX1, the 2-pin connector at terminal CN24, the 2-pin connector at terminal CNX, the 2-pin connector at terminal CNY, the 2-pin connector at terminal CNZ, the 2-pin connector at terminal CNPB, the lug at terminal TAB1, the 2-pin connector at terminal CNU, the 2-pin connector at terminal CNV, and the 2-pin connector at terminal CNW.
   - — At the bottom of the board, from left to right install: the 3-pin connector at terminal CN6, the 5-pin connector at terminal CN5, and the 9-pin connector at terminal CN2.

Figure 100: Power Board Connections

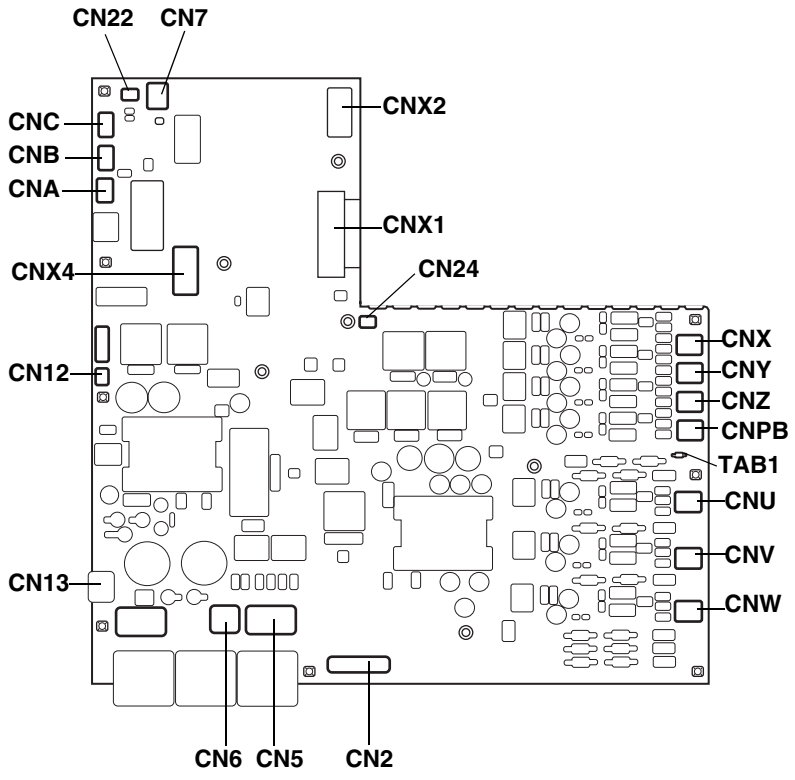


Table 13: Power Board Wiring

Wire No.[1]	Terminal No.	Description	To:
E101	**CN22**	2-pin, black sleeve	Temperature sensor wire
E105	**CN7**	2-pin, red sleeve	Soft charge board, CN7A
E127	**CNC**	3-pin, blue sleeve	Current sensor 3
E128	**CNB**	3-pin, white sleeve	Current sensor 2
E129	**CNA**	3-pin, red sleeve	Current sensor 1
E112	**CNX4**	10-pin	Control module
E103	**CN12**	2-pin, black sleeve	Internal fan
E113	**CN13**	3-pin, red/white/blue	X2 fan control board
E130	**CN6**	3-pin, black/red	Capacitor
E109	**CN5**	Ring, red/white/blue	SCR 1[2] (red), Term. 1 SCR 2 (white), Term. 1 SCR 3 (blue), Term. 1
E104	**CN2**	9-pin	Soft charge board, CN2A
—	**CNX2**	10-pin	Control board X2
—	**CNX1**	22-pin	Control board X1
E131	**CN24**	2-pin	Charge LED
E117	**CNX**	2-pin, violet/red	Power IGBT[3] module 1, G2 and E2
E118	**CNY**	2-pin, violet/white	Power IGBT module 2, G2 and E2
E119	**CNZ**	2-pin, violet/blue	Power IGBT module 3, G2 and E2
E120	**CNPB**	2-pin, violet/orange	Braking IGBT module, E2 and G2
E116	**TAB1**	lug, white	Braking IGBT module, C2E1
E121	**CNU**	2-pin, orange/red	Power IGBT module 1, E1 and G1
E122	**CNV**	2-pin, orange/white	Power IGBT module 2, E1 and G1
E126	**CNW**	2-pin, orange/blue	Power IGBT module 3, E1 and G1

[1] See schematic on page 113 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] IGBT: Insulated-gate bipolar transistor

Replace the Control Module Connections

Table 14: Control Module Plate Wiring

Wire No.[1]	Terminal No.	Description	To:
E112	—	10-pin	PB[2] CNX4
—	—	26-pin	MCB[3] X3
E131	**PB CN24**	2-pin	Charge LED

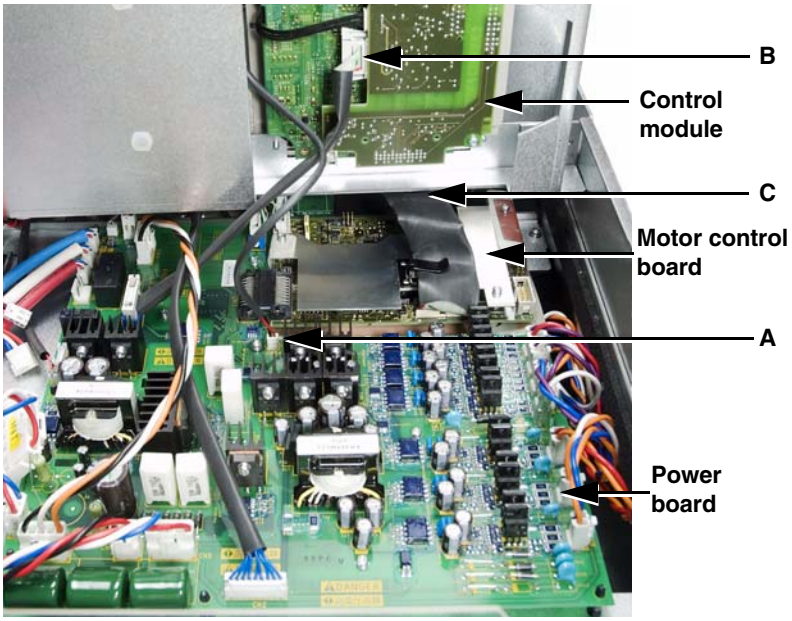
[1] See schematic on page 113 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

[2] PB: Power board

[3] MCB: Motor control board

5. Install the control module plate connections as follows. See Figure 101.
   - — On the power board, install: the 2-pin connector (**A**) at terminal CN24.
   - — On the control module, install: the 10-pin connector (**B**) connecting the module to power board terminal CNX4, and install the 26-pin ribbon cable (**C**) connecting the module to motor control board terminal X3.

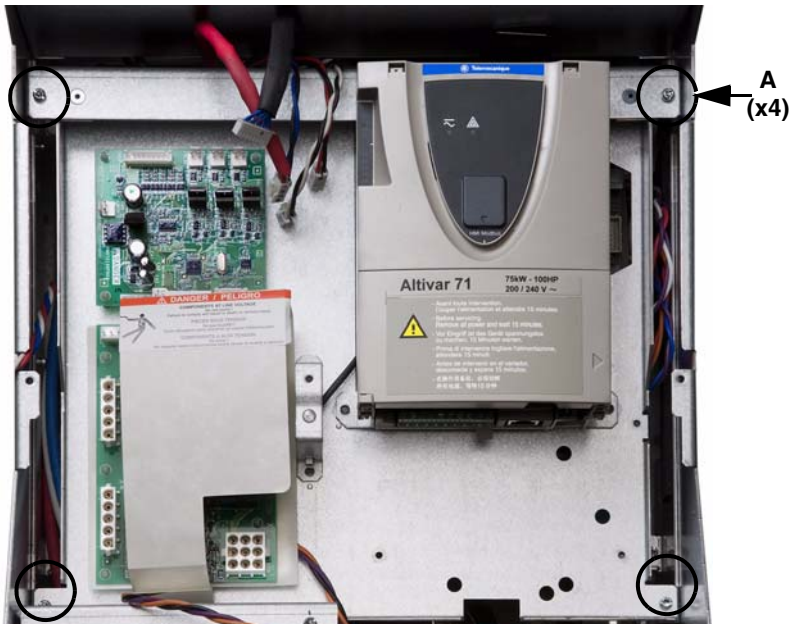
Figure 101: Control Module Connections Removal



Replace the Control Module Plate

6. Replace the control module plate as follows. See Figure 102.
   - — Ensuring that the wires from the silicon controlled rectifier (SCR) modules and the power board are routed up over the top of the control module plate, position the plate on its mounting brackets on the drive frame.
   - — Using a T-20 Torx driver, secure the plate to the mounting brackets with four screws. Tighten the screws to 1.1–1.7 N•m (9.7–15 lb-in).

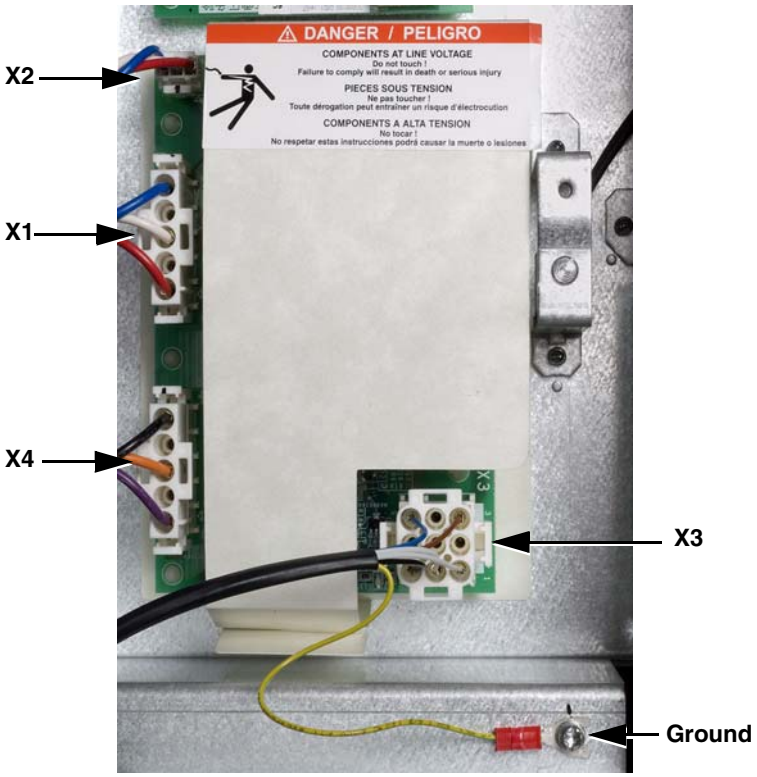
Figure 102: Control Module Plate



Replace the Fan Control Board Connections

7. Replace the fan control board connections as follows. See Figure 103 for connector locations.
   - — On the left side of the board, install 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.
   - — On the bottom right of the board, install the 9-pin connector at terminal X3.
   - — Using a T-20 Torx driver, secure the yellow ground wire to the control module plate with one screw. Tighten the screw to 1.1–1.7 N•m (9.7–15 lb-in).

Figure 103: Fan Control Board Connections



Replace the Soft Charge Board Connections

Table 15: Soft Charge Board Wiring

Wire No.[1]	Terminal No.	Description	To:
E104	**CN2A**	9-pin Black sleeve	PB[2] CN2
E106	**CNL3G**	2-pin, Blue/Black	SCR 3[3] Terms. 4 & 5
E107	**CNL2G**	2-pin, White/Black	SCR 2 Terms. 4 & 5
E108	**CNL1G**	2-pin, Red/Black	SCR 1 Terms. 4 & 5
E105	**CN7A**	2-pin, Red sleeve	PB CN7

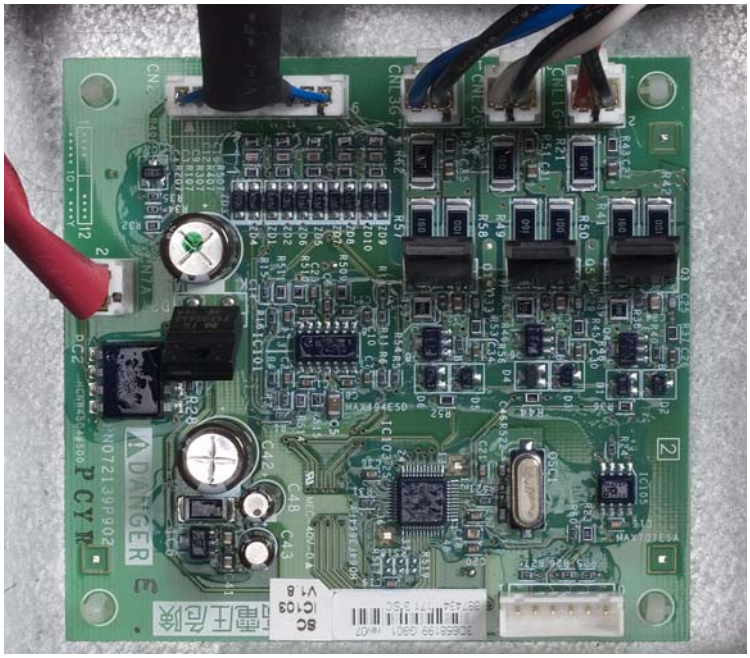
1 See schematic on page 113 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

2 PB: Power board

3 SCR: Silicon controlled rectifier

8. Install the following connections on the soft charge board. See Table 15 and Figure 104 for connector locations.
   - — At the top of the board, from left to right install: the 9-pin connector at terminal CN2A, the 2-pin connector at terminal CNL3G, the 2-pin connector at terminal CNL2G, and the 2-pin connector at terminal CNL1G.
   - — At the left side of the board, reinstall the 2-pin connector at terminal CN7A.

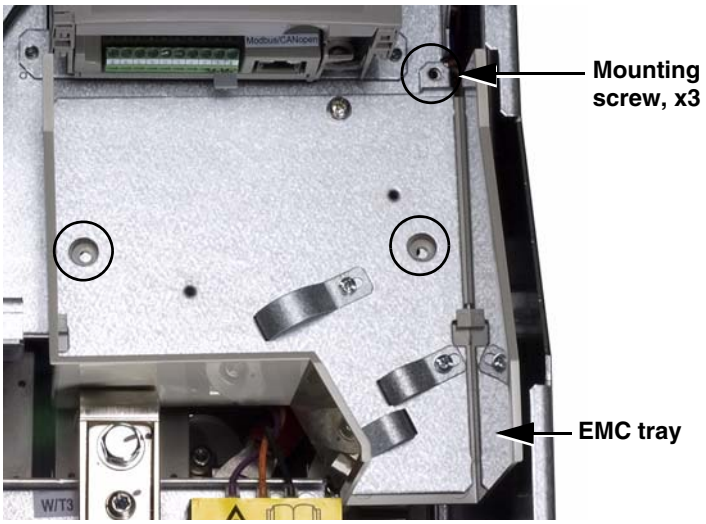
Figure 104: Soft Charge Board Connections



Replace the EMC Tray

9. Using a T-20 Torx driver, secure the EMC tray to the control module mounting plate with three screws. Tighten the screws to 1.1–1.7 N•m (9.7–15 lb-in). See Figure 105.

Figure 105: EMC Tray Replacement



Replace the Front Cover

10. Replace the front cover. Using a size 2 Phillips driver, secure the front cover with seven screws. See Figure 5 on page 17. Tighten the screws to 1.1–1.7 N•m (9.7–15 lb-in).

Wiring

Table 16: Wiring Table

Wire No.[1]	Description	From:		To:	
		Component	Terminal No.	Component	Terminal No.
E101	2-pin, black sleeve	Power board	**CN22**	Temperature sensor wire	**—**
E103	2-pin, black sleeve	Power board	**CN12**	Internal fan	**—**
E104	9-pin	Power board	**CN2**	Soft charge board	**CN2A**
E105	2-pin, red sleeve	Power board	**CN7**	Soft charge board	**CN7A**
E106	2-pin, blue/black	SCR[2]3	**4, 5**	Soft charge board	**CNL3G**
E107	2-pin, white/black	SCR 2	**4, 5**	Soft charge board	**CNL2G**
E108	2-pin, red/black	SCR 1	**4, 5**	Soft charge board	**CNL1G**
E109	Ring, red/white/blue	Power board	**CN5**	SCR modules 1, 2, 3	**1**
E110	5-pin red/white/blue	Fan control board	**X1**	SCR modules 1, 2, 3	**1**
E112	10-pin	Power board	**CNX4**	Control module	**—**
E113	3-pin, red/white/blue	Power board	**CN13**	Fan control board	**X2**
E114	5-pin, violet/orange/ black	Fan control board	**X4**	Fan control terminal block	**—**
E115	9-pin, black/white/ brown/blue with yellow and green ground wire	Fan control board	**X3**	Heatsink fans	**—**
E116	Lug, white	Power board	**TAB1**	Braking IGBT[3] module	**C2E1**
E117	2-pin, violet/red	Power board	**CNX**	Power IGBT module 1	**G2, E2**
E118	2-pin, violet/white	Power board	**CNY**	Power IGBT module 2	**G2, E2**
E119	2-pin, violet/blue	Power board	**CNZ**	Power IGBT module 3	**G2, E2**
E120	2-pin, violet/orange	Power board	**CNPB**	Braking IGBT module	**G2, E2**
E121	2-pin, orange/red	Power board	**CNU**	Power IGBT module 1	**E1, G1**
E122	2-pin, orange/white	Power board	**CNV**	Power IGBT module 2	**E1, G1**
E126	3-pin, orange/blue	Power board	**CNW**	Power IGBT module 3	**E1, G1**

Table 16: Wiring Table *(continued)*

Wire No.[1]	Description	From:		To:	
		Component	Terminal No.	Component	Terminal No.
E127	3-pin, blue sleeve	Power board	**CNC**	Current sensor 3	—
E128	3-pin, white sleeve	Power board	**CNB**	Current sensor 2	—
E129	3-pin, red sleeve	Power board	**CNA**	Current sensor 1	—
E130	3-pin, black/red	Power board	**CN6**	Capacitors	—
E131	2-pin	Power board	**CN24**	Charge LED	—

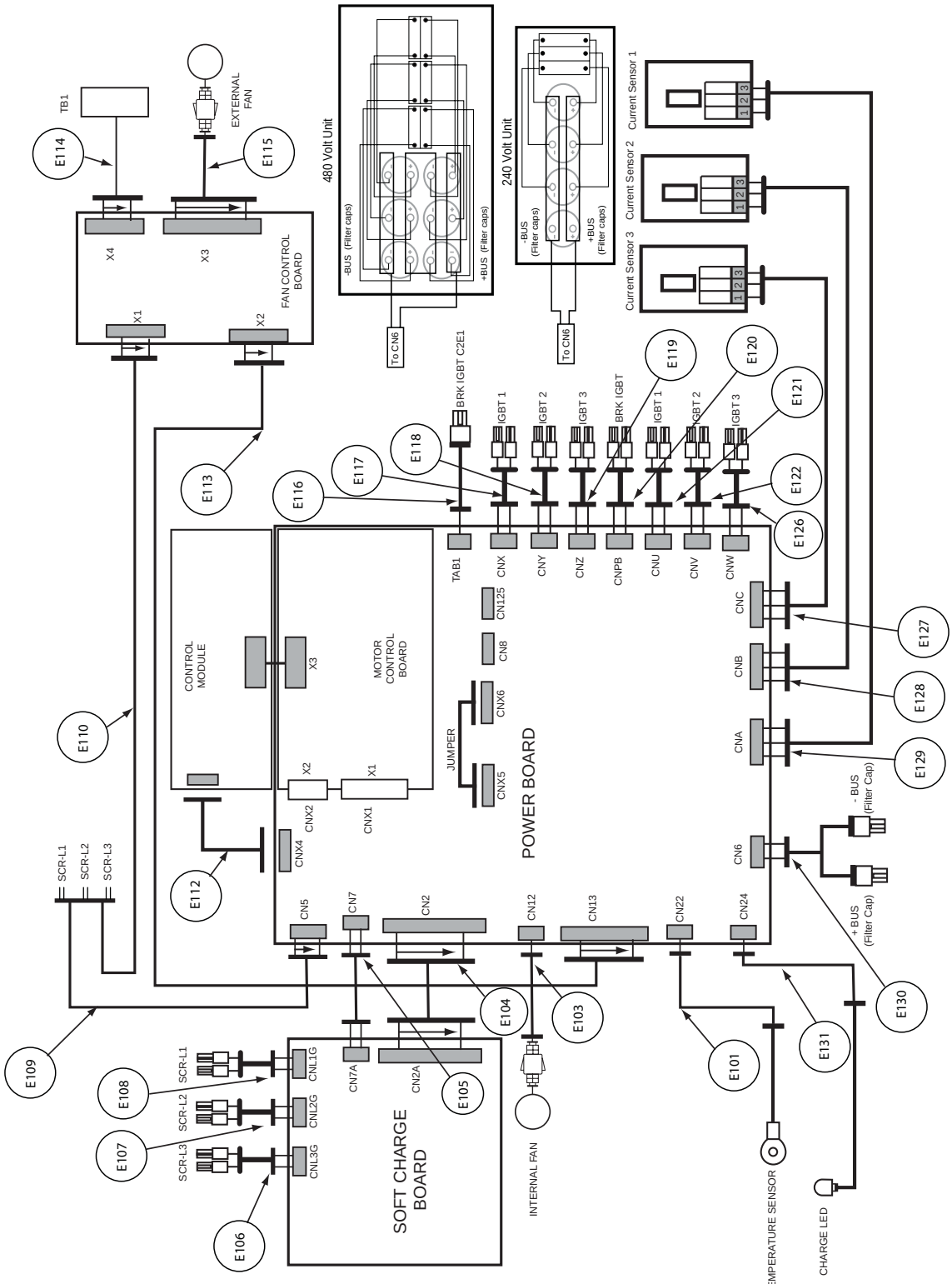
[1] Wire numbers are given for cross referencing the wires with the schematic on page 114. The numbers do not appear on the wires.

[2] SCR: Silicon controlled rectifier

[3] IGBT: Insulated-gate bipolar transistor

Figure 106: Wiring Schematic

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



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