

Altivar® 61/71

Adjustable Speed Drives

Spare Parts Kits

Instruction Bulletin

30072-452-75

Retain for future use.



For Frame Size 9:

**ATV61HD55M3X, ATV61HD75M3X, ATV61HD90N4,
ATV61HC11N4, ATV71HD55M3X, ATV71HD90N4**

Contents

Before You Begin	5
Introduction	6
Related Documentation	8
Receiving, Handling, and Storage	9
Electrostatic Precautions	9
Inspecting the Spare Part Kits	9
Preliminary Recommendations	10
Qualified Personnel	10
Working Procedures	10
Tools Required	10
Installation Procedures	11
Power Removal and Bus Voltage Measurement	11
Discharging Stored Energy in Capacitors	12
Removing and Replacing the Front Cover VY1A1210	13
Replacing the EMC Tray and Power Terminal Shield VY1A1404	14
Remove the Front Cover	14
Remove the Conduit Tray and Power Terminal Shield	14
Replace the EMC Tray	15
Replace the Power Terminal Shield and Reinstall the Conduit Tray ...	17
Replace the Front Cover	17
Replacing the Internal Fan VZ3V1214	18
Remove the Front Cover	18
Replace the Internal Fan	18
Replace the Front Cover	19
Replacing the Soft Charge Board VX5A1300	20
Replace the Front Cover	21
Replacing the Filter Board VX4A1116	22
Remove the Front Cover	23
Remove the Conduit Tray and Power Terminal Shield	23
Remove the Bottom Crossbrace	24
Replace the Filter Board	25
Replace the Bottom Crossbrace	26
Replace the Power Terminal Shield and Reinstall the Conduit Tray ...	27
Replace the Front Cover	27
Disassembling the Drive	28
Remove the Front Cover	29
Remove the Conduit Tray and Power Terminal Shield	29
Remove the Soft Charge Board Connections	30
Remove the Control Module Plate	31
Remove the Control Module Connections	32
Remove the Power Board Connections	33
Remove the Power Board Mounting Plate	35
Remove the Top Cover	36
Replacing the Power Board VX5A1HD5575, VX5A1HD9011, VX5A1HD7590	37
Replace the Power Board	38
Reassemble the Drive	38
Replacing the Current Sensors VY1A1105	39
Remove the Current Sensor Bar Assembly	40
Replace the Current Sensor	41
Reinstall the Current Sensor Bar Assembly	42
Reassemble the Drive	42
Replacing the Snubber Capacitor Kits VZ3S1910, VZ3S1911	43
Replace the SCR Snubber Board—240 V Units	44
Replace the SCR Snubber Board—480 V Units	45

Replace the Braking IGBT Snubber Capacitor	46
Replace the Power IGBT Snubber Capacitors	47
Reassemble the Drive	47
Replacing the SCR Modules and the Braking IGBT Module	48
Remove the SCR Snubber Board	49
Remove the SCR Buswork	50
Replace the Braking IGBT Module VZ3IM1600M0671, VZ3TM1400M0671, VZ3TM1400M1271	57
Replace the SCR Module VZ3TD1250M1671, VZ3TD1330M1601	59
Replace the SCR Buswork	61
Replace the SCR Snubber Board	68
Reassemble the Drive	68
Replacing the Power IGBT Modules, the Temperature Sensor Wire, and the Capacitors	69
Remove the Output Bus Bars	70
Remove the Input Bus Bars	71
Remove the Bottom Terminal Plate	73
Replace the Temperature Sensor Wire VZ3G1102	74
Remove the Jumper	74
Remove the Snubber Capacitors	75
Remove the Positive Bus Bar	76
Remove the Negative Bus Bar	77
Remove the Wiring from the Capacitors	78
Remove the Bus Plates	80
Replace the Capacitor Assembly VY1ADC1110, VY1ADC1115	81
Replace the Power IGBT Modules VZ3IM1400M1271, VZ3IM1600M061	82
Reinstall the Bus Plates	84
Replace the Capacitor Wiring	85
Replace the Negative Bus Bar	86
Replace the Positive Bus Bar	87
Replace the Snubber Capacitors	88
Replace the Jumper	89
Replace the Bottom Terminal Plate	90
Replace the Input Bus Bars and Filter Board	92
Replace the Output Bus Bars	94
Reassemble the Drive	94
Reassembling the Drive	95
Replace the Top Cover	96
Replace the Power Board Mounting Plate	97
Replace the Power Board Connections	98
Replace the Control Module Connections	100
Replace the Control Module Plate	101
Replace the Soft Charge Board Connections	102
Replace the Power Terminal Shield and Reinstall the Conduit Tray ..	103
Replace the Front Cover	103
Wiring	104

Before You Begin

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

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

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

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

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

Introduction

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

Table 1: Altivar® 61 and 71 Spare Parts Kits¹

Kit Catalog No.	Description	For Use on Drive:
VY1A1210	Front Cover and I/O Terminal Cover	ATV61HD75M3X ATV61HD90N4 ATV61HD55M3X ATV61HC11N4 ATV71HD90N4 ATV71HD55M3X
VY1ADV1105	Screw Kit	ATV61HD75M3X ATV61HD90N4 ATV61HD55M3X ATV61HC11N4 ATV71HD90N4 ATV71HD55M3X
VY1A1404	EMC Tray and Power Terminal Shield	ATV61HD75M3X ATV61HD90N4 ATV61HD55M3X ATV61HC11N4 ATV71HD90N4 ATV71HD55M3X
VZ3V1214	Internal Fan	ATV61HD75M3X ATV61HD90N4 ATV61HD55M3X ATV61HC11N4 ATV71HD90N4 ATV71HD55M3X
VX4A1116	Filter Board	ATV61HD75M3X ATV61HD90N4 ATV61HD55M3X ATV61HC11N4 ATV71HD90N4 ATV71HD55M3X
VX5A1HD5575	Power Board	ATV61HD55M3X ATV71HD55M3X
VX5A1HD7590	Power Board	ATV61HD75M3X
VX5A1HD9011	Power Board	ATV61HD90N4 ATV61HC11N4 ATV71HD90N4
VX5A1300	Soft Charge Board	ATV61HD75M3X ATV61HD90N4 ATV61HD55M3X ATV61HC11N4 ATV71HD90N4 ATV71HD55M3X
VY1A1105	Current Sensor	ATV61HD75M3X ATV61HD90N4 ATV61HD55M3X ATV61HC11N4 ATV71HD90N4 ATV71HD55M3X

Table 1: Altivar® 61 and 71 Spare Parts Kits¹ (continued)

Kit Catalog No.	Description	For Use on Drive:
VZ3N1323	Wire Kit	ATV61HD75M3X ATV61HD90N4 ATV61HD55M3X ATV61HC11N4 ATV71HD90N4 ATV71HD55M3X
VZ3S1910	Snubber Capacitor Kit	ATV61HD90N4 ATV61HC11N4 ATV71HD90N4
VZ3S1911	Snubber Capacitor Kit	ATV61HD75M3X ATV61HD55M3X ATV71HD55M3X
VZ3G1102	Temperature Sensor Wire	ATV61HD75M3X ATV61HD90N4 ATV61HD55M3X ATV61HC11N4 ATV71HD90N4 ATV71HD55M3X
VZ3TD1330M1601	SCR ² Module	ATV61HD75M3X ATV61HD55M3X ATV71HD55M3X
VZ3TD1250M1671	SCR Module	ATV61HD90N4 ATV61HC11N4 ATV71HD90N4
VZ3TM1400M0671	Braking IGBT ³ Module	ATV61HD75M3X ATV61HD55M3X ATV71HD55M3X
VZ3TM1400M1271	Braking IGBT Module	ATV61HD90N4 ATV61HC11N4 ATV71HD90N4
VZ3IM1600M0671	Power and Braking IGBT Kit	ATV61HD75M3X ATV61HD55M3X ATV71HD55M3X
VZ3IM1400M1271	Power IGBT Module	ATV61HD90N4 ATV61HC11N4 ATV71HD90N4
VY1ADC1110	Capacitor Assembly	ATV61HD90N4 ATV61HC11N4 ATV71HD90N4
VY1ADC1115	Capacitor Assembly	ATV61HD75M3X ATV61HD55M3X ATV71HD55M3X

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 drive 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 6. 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 17, 29, and 103 of the installation procedures.
- Install the insulators as specified on pages 61, 84, and 91 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, 0–15 N•m (0–150 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 5 before performing this procedure.

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

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

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

⚠ CAUTION

IMPROPER DRIVE OPERATION

- If 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 drive is damaged, voltage may remain on certain energy storage capacitors after de-energization of the drive 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 drives as energy storage devices. Some of the capacitors can store potentially lethal amounts of energy during normal drive operation.

When power is removed from an undamaged drive, the stored energy in these capacitors is automatically discharged to nonhazardous levels. However, the discharge mechanisms in a damaged drive 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.

Removing and Replacing the Front Cover VY1A1210

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

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

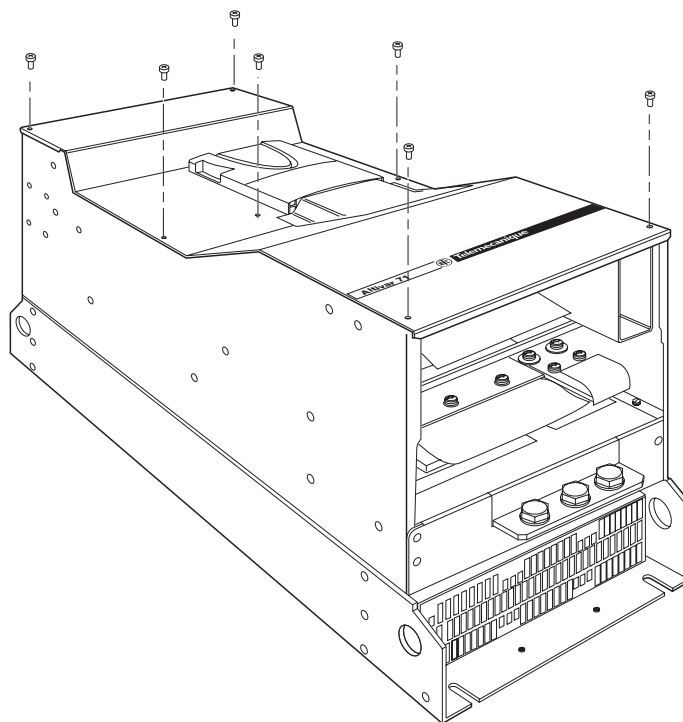
- Read and understand the precautions in “Before You Begin” starting on page 5 before performing this procedure.
- Before working on this equipment, turn off all power supplying it and perform the DC bus voltage measurement procedure on page 11.

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

All of the procedures in this manual require removal and replacement of the front cover. See Figure 1.

- To remove the front cover, using a size 2 Phillips driver, remove seven screws and take off the front cover.
- 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 (9.7–15.0 lb-in).

Figure 1: Front Cover Removal



Replacing the EMC Tray and Power Terminal Shield VY1A1404

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

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

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

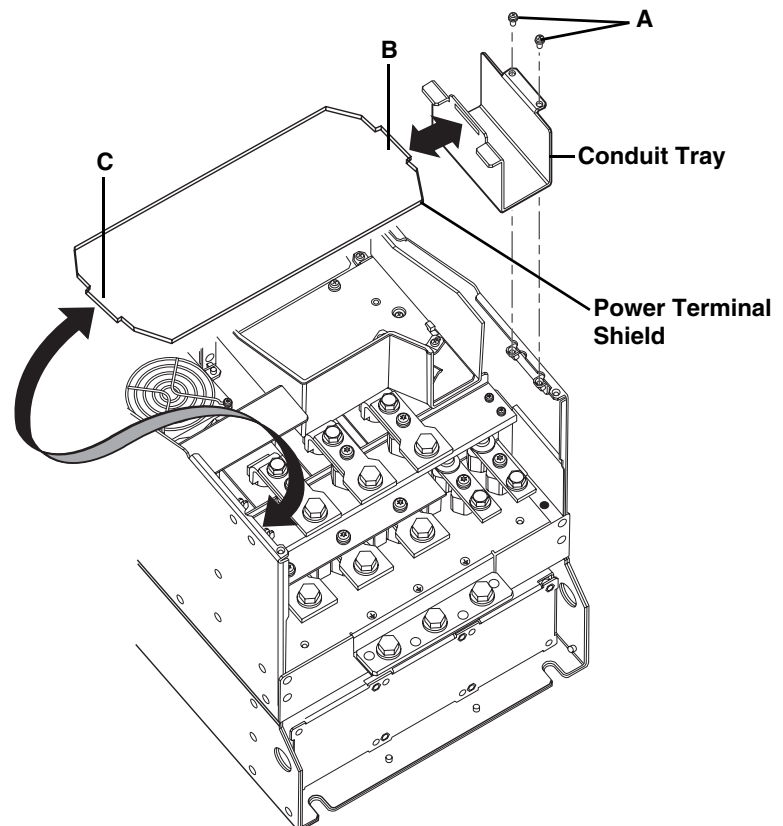
Failure to follow these instructions will result in death or serious injury.

Remove the Front Cover

Remove the Conduit Tray and Power Terminal Shield

1. Using a size 2 Phillips driver, remove seven screws and take off the front cover. See Figure 1 on page 13.
2. Using a size 2 Phillips driver, remove two screws (**A**) securing the conduit tray to the drive frame. See Figure 2.
3. Remove the conduit tray and power terminal shield as follows. See Figure 2.
 - The power terminal shield has two retaining tabs. The tab on the right (**B**) attaches to a slot in the conduit tray. The tab on the left (**C**) 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.

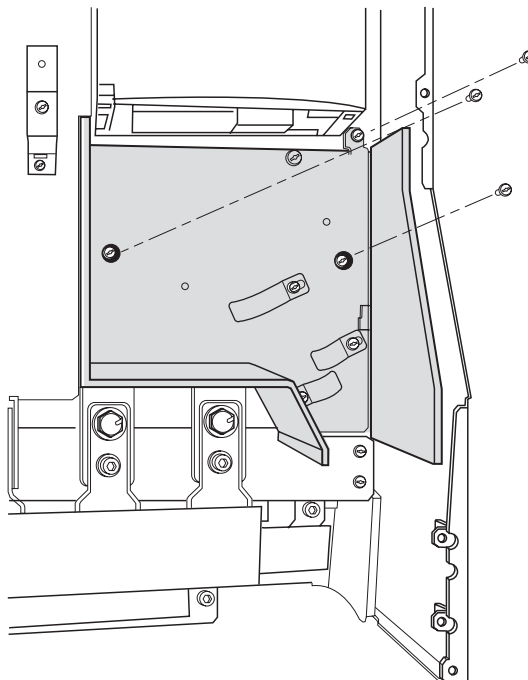
Figure 2: Conduit Tray and Terminal Shield Removal



Replace the EMC Tray

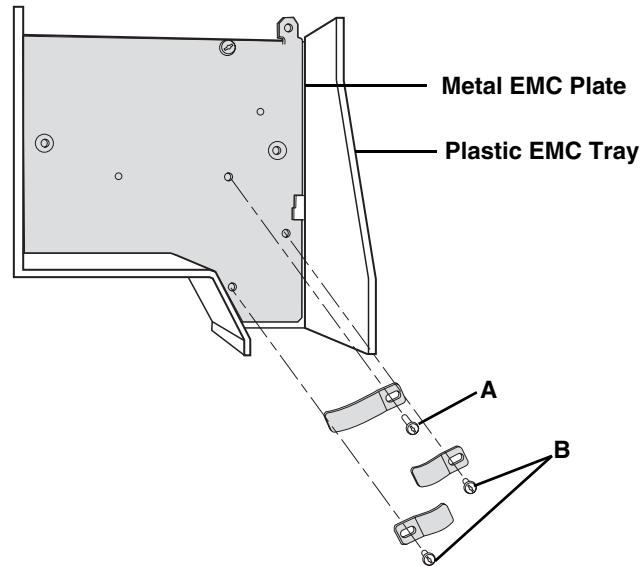
4. Using a T-20 Torx driver, remove three screws securing the plastic EMC tray to the control module mounting plate and remove the tray from the drive. See Figure 3.

Figure 3: EMC Tray Replacement



- 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.

Figure 4: Cable Clamp Replacement



- Remove the metal EMC plate from the plastic tray and discard the plastic tray.
- Place the metal EMC plate into the new plastic tray.

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.

- Using a size 2 Phillips driver, install the cable clamps on the EMC plate with three screws. See Figure 4. Tighten the screws to 0.4–0.6 N•m (3.5–5.3 lb-in).
- Using a T-20 Torx driver, secure the plastic EMC tray to the control module mounting plate with three screws. See Figure 3 on page 15. 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 5.

⚠ DANGER

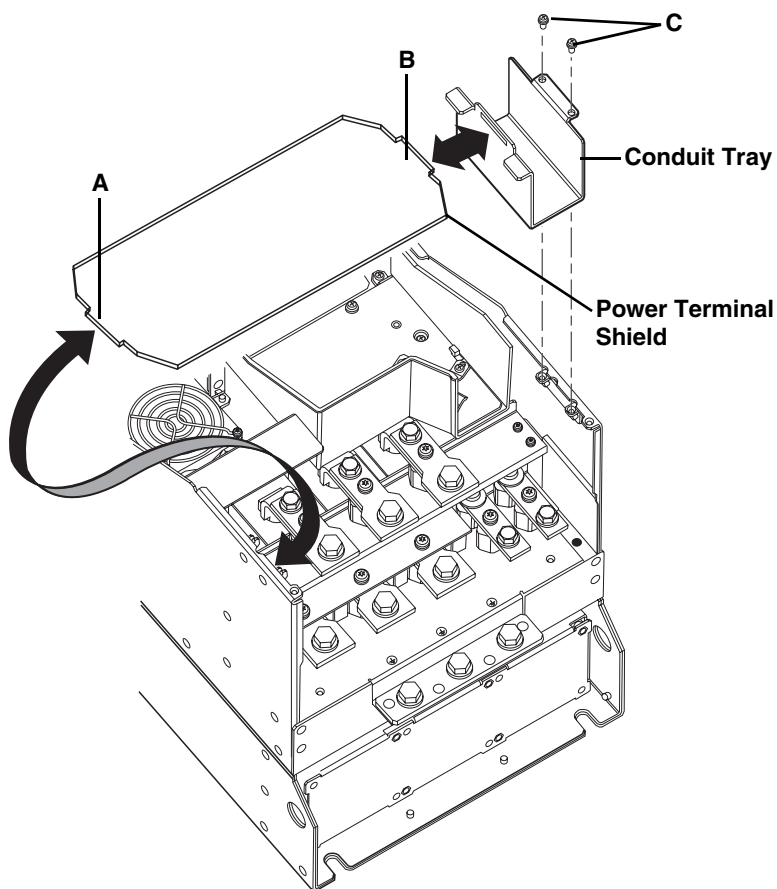
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Install the power terminal shield as shown in Figure 5.

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 (**A**) under the retaining notches on the drive frame, and slide the tab on the right side of the shield (**B**) 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 size 2 Phillips driver, secure the conduit tray to the drive frame with two screws (**C**). Tighten the screws to 1.1–1.7 N•m (9.7–15.0 lb-in).

Figure 5: Conduit Tray and Terminal Shield Replacement



Replace the Front Cover

11. Replace the front cover. Using a size 2 Phillips driver, secure the front cover with seven screws. See Figure 1 on page 13. Tighten the screws to 1.1–1.7 N•m (9.7–15.0 lb-in).

Replacing the Internal Fan VZ3V1214

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

Remove the Front Cover

Replace the Internal Fan

⚠ DANGER

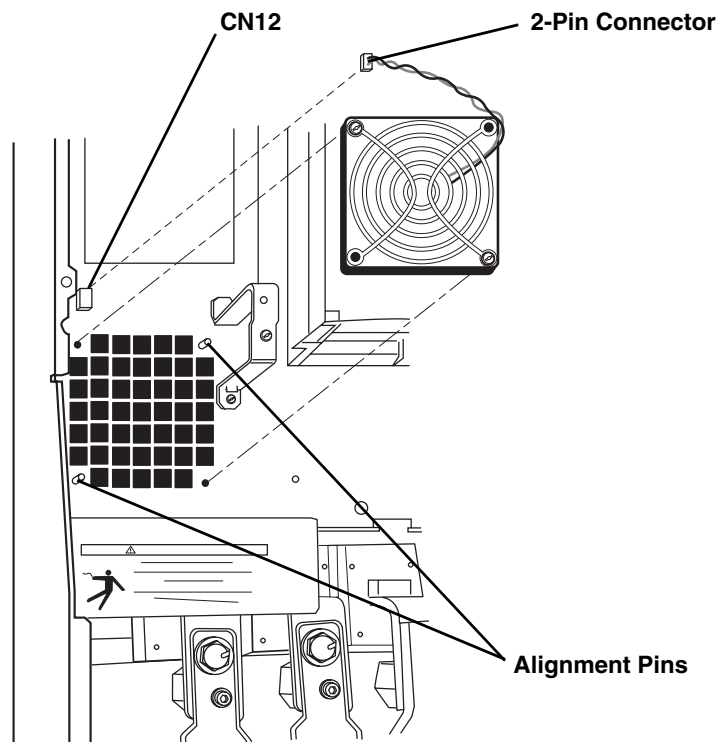
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

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

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

1. Using a size 2 Phillips driver, remove seven screws and take off the front cover. See Figure 1 on page 13.
2. Remove the fan as follows. See Figure 6.
 - Using needle-nose pliers, carefully unplug the 2-pin connector from the control module plate.
 - Using a T-20 Torx driver, loosen the two captive screws securing the fan to the control module plate and remove the fan from the drive. Discard the fan.

Figure 6: Internal Fan Replacement



3. Install the new fan as follows. See Figure 6 on page 18.
 - Position the fan over the alignment pins on the control module plate. The alignment pins fit into the top right and bottom left corners of the fan.
 - Using a T-20 Torx driver, secure the fan to the control module plate with the two captive screws. Tighten the screws to 1.1–1.7 N•m (9.7–15.0 lb-in).
 - Plug the 2-pin connector into terminal CN12 on the control module plate.

Replace the Front Cover

4. Replace the front cover. Using a size 2 Phillips driver, secure the front cover with seven screws. See Figure 1 on page 13. Tighten the screws to 1.1–1.7 N•m (9.7–15.0 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:
E105	CN2A	9-pin	PB ² CN2
E109	CNL1G	2-pin, Red/Black	SCR ³ 1
E108	CNL2G	2-pin, White/Black	SCR 2
E107	CNL3G	2-pin, Blue/Black	SCR 3
E106	CN7A	2-pin, Red/Black	PB CN7

¹ See schematic on page 105 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

² PB: Power board

³ SCR: Silicon controlled rectifier

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

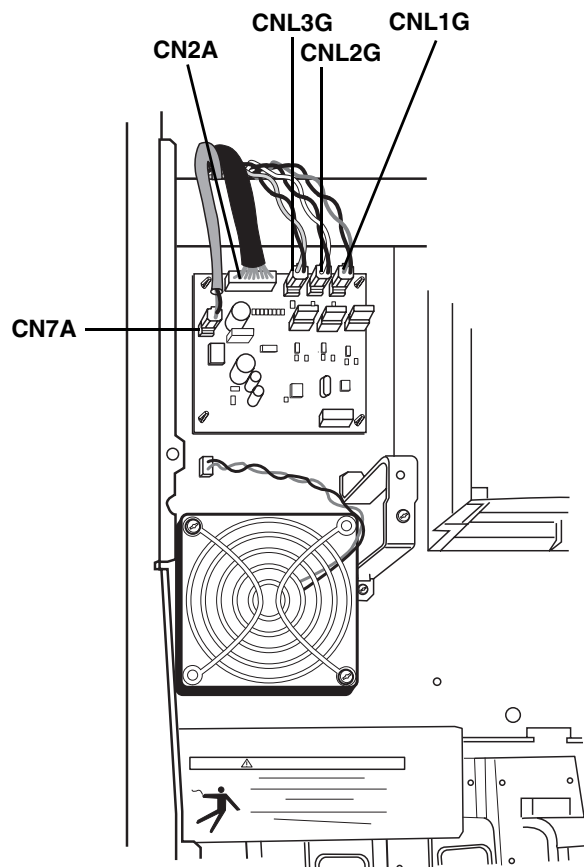
- Read and understand the precautions in “Before You Begin” starting on page 5 before performing this procedure.
- Before working on this equipment, turn off all power supplying it and perform the DC bus voltage measurement procedure on page 11.

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

Replace the soft charge board as follow see Figure 7 on page 21.

1. Using needle-nose pliers, 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.
2. 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.
3. Gently press the new soft charge board down over the four mounting posts until it is securely seated on the control module plate.
4. Install five connections to the new soft charge board. See Table 2 and Figure 7 on page 21 for connector locations.

Figure 7: Soft Charge Board Connections



Replace the Front Cover

5. Replace the front cover. Using a size 2 Phillips driver, secure the front cover with seven screws. See Figure 1 on page 13. Tighten the screws to 1.1–1.7 N•m (9.7–15.0 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 5 before performing this procedure.
- Before working on this equipment, turn off all power supplying it and perform the DC bus voltage measurement procedure on page 11.

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

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- When the drive is damaged, voltage may remain on certain energy storage capacitors after de-energization of the drive 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 9 on page 24.
- 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.

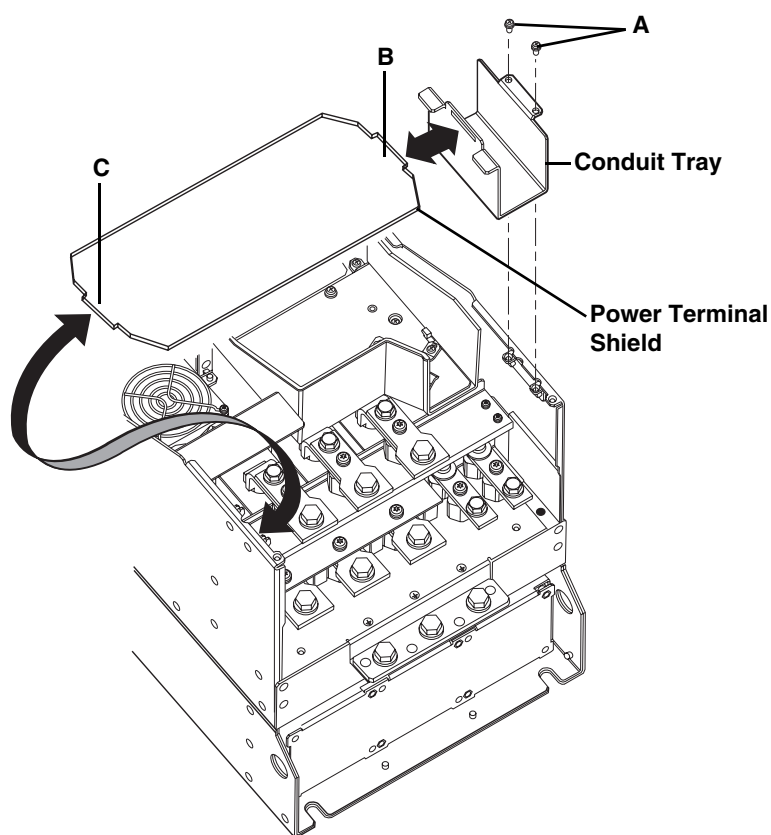
Failure to follow these instructions will result in death or serious injury.

Remove the Front Cover

Remove the Conduit Tray and Power Terminal Shield

1. Using a size 2 Phillips driver, remove seven screws and take off the front cover. See Figure 1 on page 13.
2. Using a size 2 Phillips driver, remove two screws (**A**) securing the conduit tray to the drive frame. See Figure 8.
3. Remove the conduit tray and power terminal shield as follows. See Figure 8.
 - The power terminal shield has two retaining tabs. The tab on the right (**B**) attaches to a slot in the conduit tray. The tab on the left (**C**) 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.

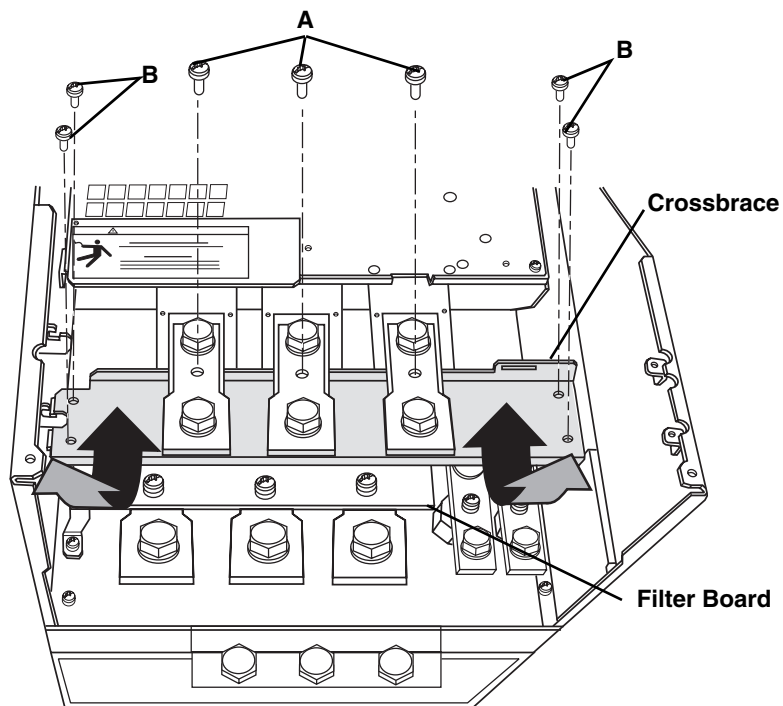
Figure 8: Conduit Tray and Terminal Shield Removal



Remove the Bottom Crossbrace

4. Remove the bottom crossbrace as follows. See Figure 9.
 - Using a T-30 Torx driver, remove three screws (A) securing the current sensor bars at terminals T1, T2, and T3.
 - Using a T-20 Torx driver, remove four screws (B) securing the bottom crossbrace to the drive frame.
 - Lift the current sensor bars up and slide the crossbrace off of the drive frame.

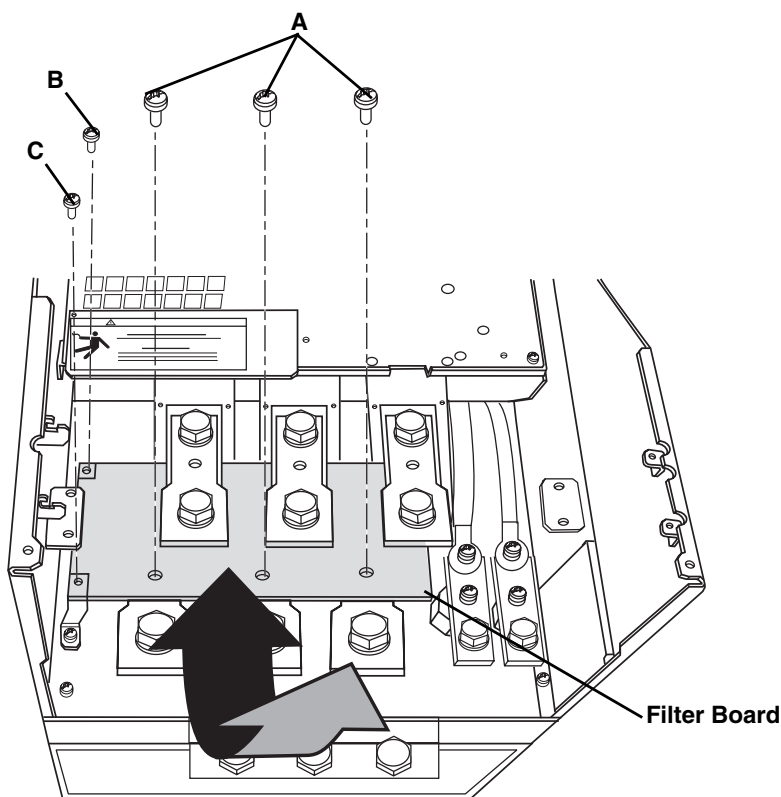
Figure 9: Crossbrace Removal



Replace the Filter Board

5. Replace the filter board as follows. See Figure 10.
 - Using a T-30 Torx driver, remove three screws (**A**) securing the filter board to input terminals L1, L2, and L3.
 - Using a T-20 Torx driver, remove one screw (**B**) securing the filter board to the drive frame.
 - Using a size 2 Phillips driver, remove one screw (**C**) securing the filter board to the ground bracket.
 - Remove the filter board from drive and discard it.
 - Install the new filter board between the current sensor bars and the input bus bars.
 - Using a size 2 Phillips driver, secure the filter board to the ground bracket with one screw (**C**). Tighten the screws to 1.1–1.7 N•m (9.7–15.0 lb-in).
 - Using a T-20 Torx driver, secure the filter board to the drive frame with one screw (**B**). Tighten the screws to 1.1–1.7 N•m (9.7–15.0 lb-in).
 - Using a T-30 Torx driver, secure the filter board to input terminals L1, L2, and L3 with three screws (**A**). Tighten the screws to 3.3–4.4 N•m (29.2–38.9 lb-in).

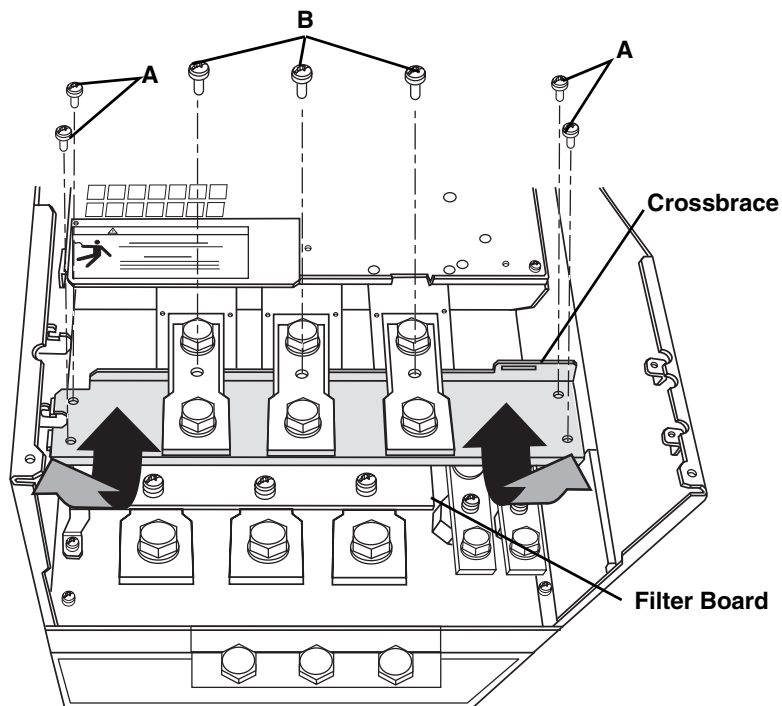
Figure 10: Filter Board Replacement



Replace the Bottom Crossbrace

6. Replace the bottom crossbrace as follows. See Figure 11
 - Position the bottom crossbrace under the current sensor bars.
 - Using a T-20 Torx driver, secure the crossbrace to the drive frame with four screws (A). Tighten the screws to 1.1–1.7 N•m (9.7–15.0 lb-in).
 - Using a T-30 Torx driver, secure the current sensor bars to terminals T1, T2, and T3 with three screws (B). Tighten the screws to 3.3–4.4 N•m (29.2–38.9 lb-in).

Figure 11: Crossbrace Replacement



Replace the Power Terminal Shield and Reinstall the Conduit Tray

7. Replace the power terminal shield and conduit tray as follows. See Figure 12.

⚠ DANGER

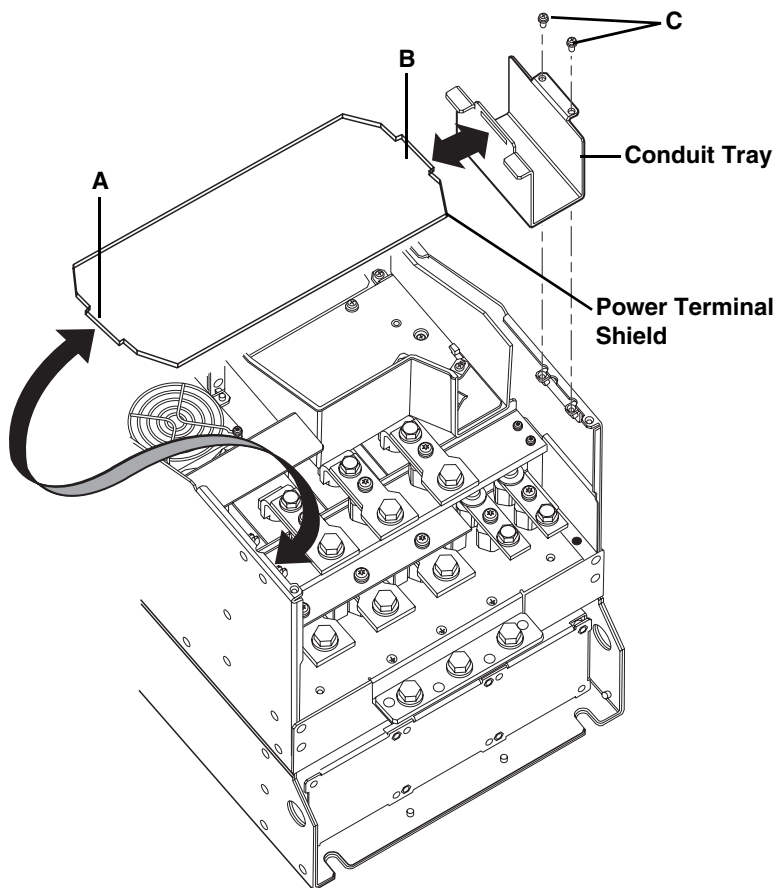
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Install the power terminal shield as shown in Figure 5.

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 (**A**) under the retaining notches on the drive frame, and slide the tab on the right side of the shield (**B**) 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 size 2 Phillips driver, secure the conduit tray to the drive frame with two screws (**C**). Tighten the screws to 1.1–1.7 N•m (9.7–15.0 lb-in).

Figure 12: Conduit Tray and Terminal Shield Replacement



Replace the Front Cover

8. Replace the front cover. Using a size 2 Phillips driver, secure the front cover with seven screws. See Figure 1 on page 13. Tighten the screws to 1.1–1.7 N•m (9.7–15.0 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 5 before performing this procedure.
- Before working on this equipment, turn off all power supplying it and perform the DC bus voltage measurement procedure on page 11.

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

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

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

You must perform some or all of the procedures in this section to access the spare parts identified in Table 3. Consult Table 3 for the disassembly steps that must be performed for the corresponding spare parts.

Table 3: Disassembly Steps

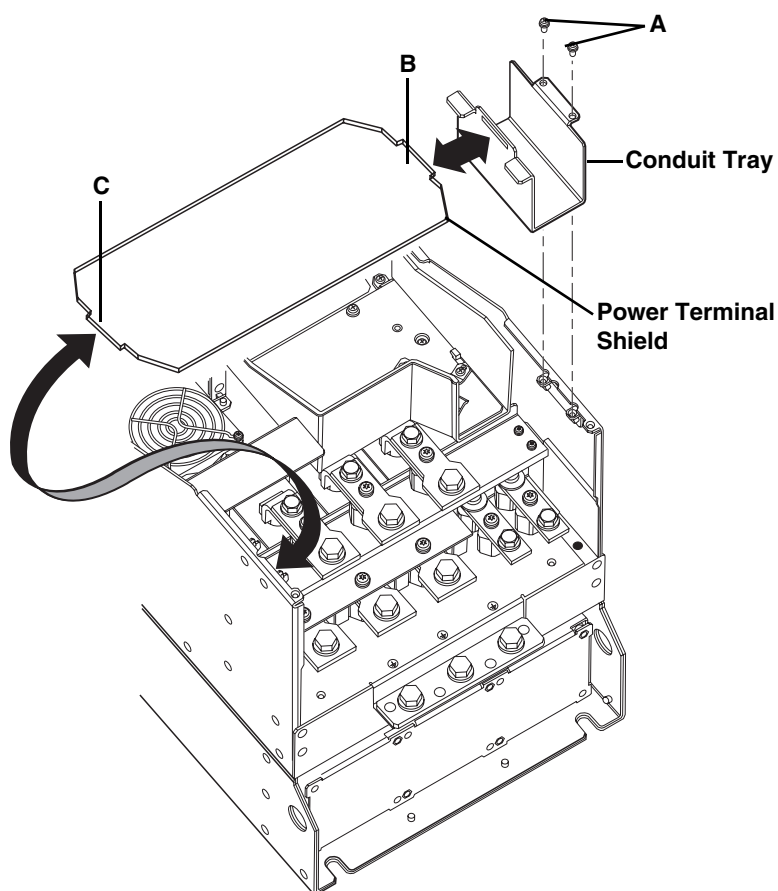
If you are replacing:	Perform disassembly steps:	Then follow procedure:
Power board	Steps 1–6	“Replacing the Power Board VX5A1HD5575, VX5A1HD9011, VX5A1HD7590” beginning on page 37
Current sensors	Steps 1–7	“Replacing the Current Sensors VY1A1105” beginning on page 39
Snubber capacitors and snubber board	Steps 1–8	“Replacing the Snubber Capacitor Kits VZ3S1910, VZ3S1911” beginning on page 43
Silicon controlled rectifiers (SCR) modules	Steps 1–8	“Replacing the SCR Modules and the Braking IGBT Module” beginning on page 48
Braking insulated-gate bipolar transistor (IGBT) module		
Power IGBT modules	Steps 1–8	“Replacing the Power IGBT Modules, the Temperature Sensor Wire, and the Capacitors” beginning on page 69
Capacitor assembly		

Remove the Front Cover

Remove the Conduit Tray and Power Terminal Shield

1. Using a size 2 Phillips driver, remove seven screws and take off the front cover. See Figure 1 on page 13.
2. Remove the conduit tray and power terminal shield as follows. See Figure 13.
 - Using a size 2 Phillips driver, remove two screws (**A**) securing the conduit tray to the drive frame.
 - The power terminal shield has two retaining tabs. The tab on the right (**B**) attaches to a slot in the conduit tray. The tab on the left (**C**) 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 13: Conduit Tray and Terminal Shield Removal



Remove the Soft Charge Board Connections

Table 4: Soft Charge Board Wiring

Wire No. ¹	Terminal No.	Description	To:
E105	CN2A	9-pin	PB ² CN2
E109	CNL1G	2-pin, Red/Black	SCR ³ 1
E108	CNL2G	2-pin, White/Black	SCR 2
E107	CNL3G	2-pin, Blue/Black	SCR 3
E106	CN7A	2-pin, Red/Black	PB CN7

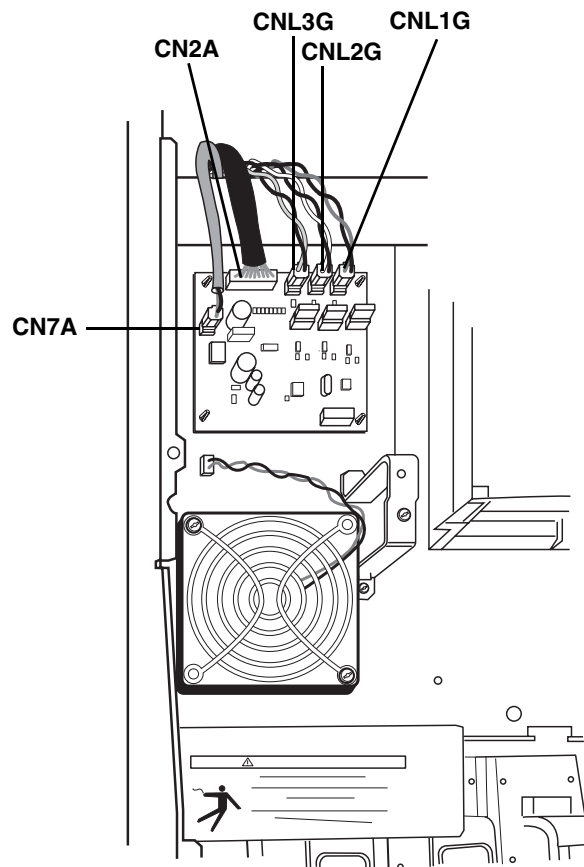
¹ See schematic on page 105 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

² PB: Power board

³ SCR: Silicon controlled rectifier

3. Using needle-nose pliers, carefully remove the following connections from the soft charge board. See Table 4 and Figure 14 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.

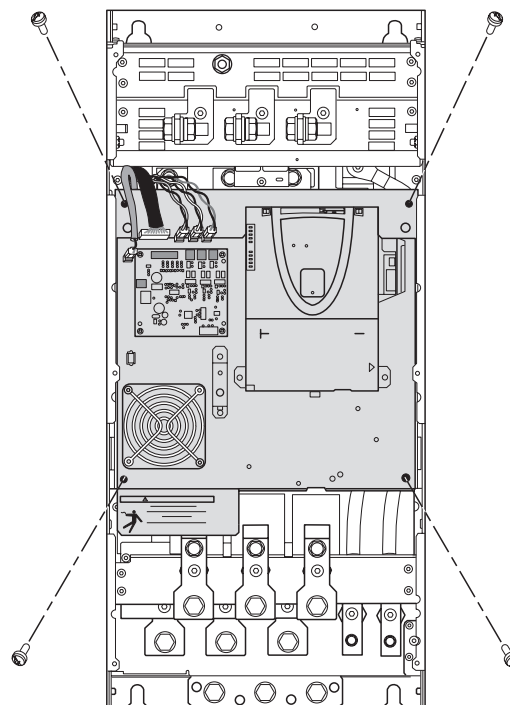
Figure 14: Soft Charge Board Connections



Remove the Control Module Plate

4. Remove the control module plate as follows. See Figure 15.
 - Using a T-20 Torx driver, remove four screws securing the control module plate to the drive frame.
 - Lift the control module plate from the drive to access the connections on the back of the plate.

Figure 15: Control Module Plate Removal



Remove the Control Module Connections

Table 5: Control Module Plate Wiring

Wire No. ¹	Terminal No.	Description	To:
E112	—	10-pin	PB ² CNX4
—	—	26-pin	MCB ³ X3
E104	PB CN12	2-pin	Internal fan
E101	PB CN24	2-pin	Charge LED

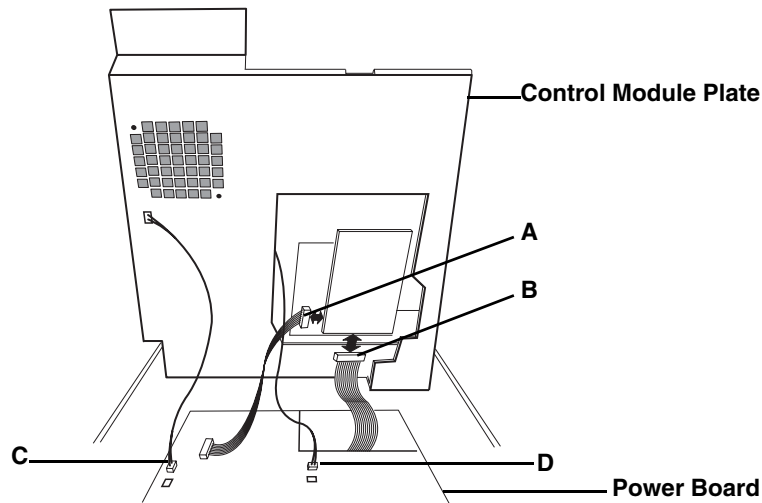
¹ See schematic on page 105 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

² PB: Power board

³ MCB: Motor control board

5. Using needle-nose pliers, carefully remove the control module plate connections as follows. See Figure 16.
- From the back of the control module, remove: the 10-pin connector (A) connecting the control module to terminal CNX4 on the power board and the 26-pin connector (B) connecting the control module to terminal X3 on the power board.
 - From the power board, remove: the 2-pin connector (C) from terminal CN12 and the 2-pin connector (D) from terminal CN24.

Figure 16: Control Module Plate Connections



Remove the Power Board Connections

6. Using needle-nose pliers, carefully remove the following connections from the power board. See Figure 17 and Table 6 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 10-pin connector from terminal CNX4, the 6-pin connector from terminal CN25, and the 2-pin connector from terminal CN12.
 - At the right side of the board, from top to bottom remove: the 10-pin connector from terminal CNX2, the 40-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, the 5-pin connector from terminal CN5, and the 9-pin connector from terminal CN2.

Figure 17: Power Board Connections

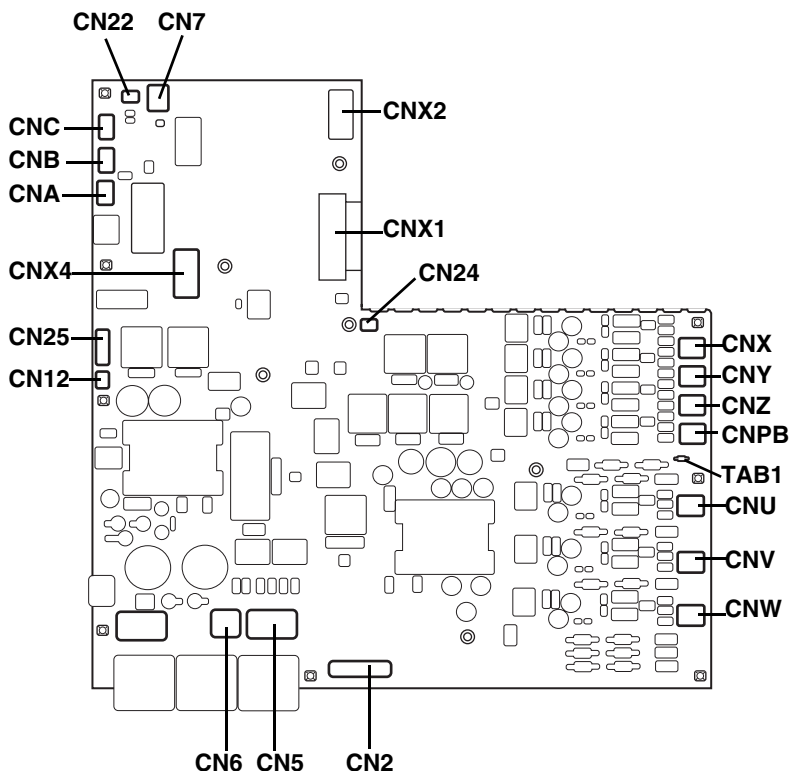


Table 6: Power Board Wiring

Wire No. ¹	Terminal No.	Description	To:
E102	CN22	2-pin, black	Temperature sensor wire
E106	CN7	2-pin, red/black	Soft charge board, CN7A
E124	CNC	3-pin, blue	Current sensor 3
E125	CNB	3-pin, white	Current sensor 2
E126	CNA	3-pin, red	Current sensor 1
E112	CNX4	10-pin	Control module
E103	CN25	6-pin	External fans
E104	CN12	2-pin	Internal fan
—	CNX2	10-pin	Motor control board, X2
—	CNX1	40-pin	Motor control board, X1
E101	CN24	2-pin	Charge LED
E114	CNX	2-pin, violet/red	Power IGBT ² module 1, G2 and E2
E115	CNY	2-pin, violet/white	Power IGBT module 2, G2 and E2
E116	CNZ	2-pin, violet/blue	Power IGBT module 3, G2 and E2
E117	CNPB	2-pin	Braking IGBT module, G2 and E2
E113	TAB1	lug	Braking IGBT module, C2E1
E118	CNU	2-pin, orange/red	Power IGBT module 1, E1 and G1
E119	CNV	2-pin, orange/white	Power IGBT module 2, E1 and G1
E120	CNW	2-pin, orange/blue	Power IGBT module 3, E1 and G1
E127	CN6	3-pin, black/red	Capacitor
E110	CN5	5-pin	SCR ³ 1 (Red) SCR 2 (White) SCR 3 (Blue)
E105	CN2	9-pin	Soft charge board, CN2A

¹ See schematic on page 105 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 IGBT: Insulated-gate bipolar transistor

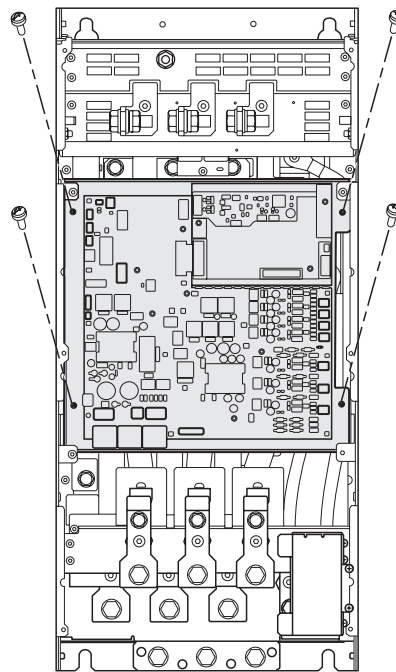
³ SCR: Silicon controlled rectifier

NEXT STEP: If you are replacing the power board, skip to “Replacing the Power Board” beginning on page 33.

Remove the Power Board Mounting Plate

7. Using a T-20 Torx driver, remove the four screws securing the power board mounting plate to the drive frame. See Figure 18.

Figure 18: Power Board Mounting Plate Removal

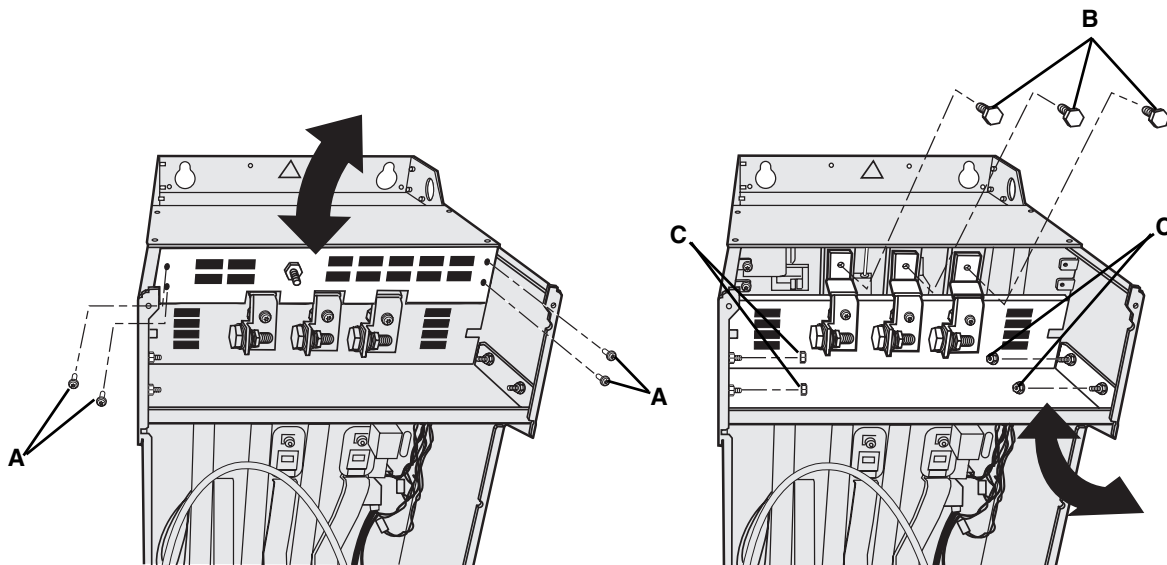


NEXT STEP: If you are replacing the current sensors, skip to “Replacing the Current Sensors VY1A1105” beginning on page 39.

Remove the Top Cover

8. The top cover consists of two plates; one in the back and one in the front. Remove the plates as follows. See Figure 19.
 - Using a T-20 Torx driver, remove four screws (A) securing the back plate to the drive frame and remove the plate.
 - Using a 13 mm socket wrench, remove three bolts (B) securing the DC choke connections to (from left to right): the silicon controlled rectifier (SCR) positive bus, the positive bus, and the SCR negative bus.
 - Using a 10 mm wrench, remove four nuts (C) securing the front plate to the drive frame and remove the plate from the drive.

Figure 19: Top Cover Plate Removal



NEXT STEP: If you are replacing the snubber capacitors and snubber board, skip to “Replacing the Snubber Capacitors and Snubber Board” beginning on page 39.

If you are replacing the silicon controlled rectifier modules or the braking IGBT module, skip to “Replacing the Silicon Controlled Rectifier (SCR) Modules and the Braking IGBT Module” beginning on page 44.

If you are replacing the power IGBT modules, the temperature sensor wire, or the capacitor assembly, skip to “Replacing the Power IGBT Modules, the Temperature Sensor Wire, and the Capacitors” beginning on page 64.

Replacing the Power Board VX5A1HD5575, VX5A1HD9011, 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 5 before performing this procedure.
- Before working on this equipment, turn off all power supplying it and perform the DC bus voltage measurement procedure on page 11.

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

Before performing the steps in this procedure, perform Steps 1–6 of “Disassembling the Drive” beginning on page 28 to remove the following parts from the drive:

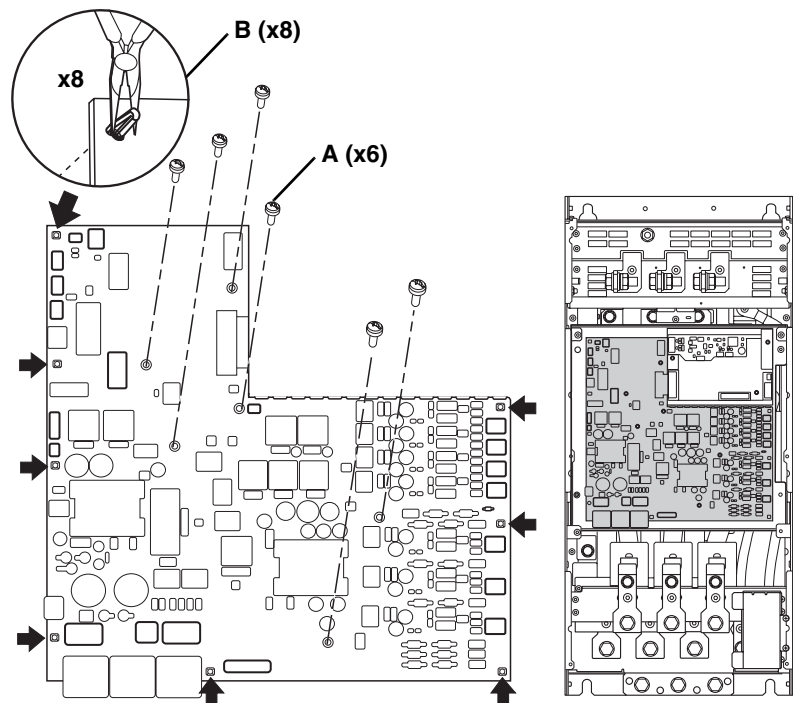
- ☐ The front cover
- ☐ The conduit tray and power terminal shield
- ☐ The soft charge board connections
- ☐ The control module plate
- ☐ The control module connections
- ☐ The power board connections

Replace the Power Board

Replace the power board as follows. See Figure 20.

1. Using a T-10 Torx driver, remove the six screws (A) securing the power board to the power board mounting plate.
2. Using needle-nose pliers, gently compress the eight plastic mounting posts (B), one at a time, while lifting the power board off the posts. Slide the board to the left to disconnect it from the control board.
3. Remove the power board from the drive and discard the board.
4. 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.
5. Connect the power board to the control board while gently pushing the board down over the mounting posts until it is securely seated.
6. 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 20: Power Board Replacement



Reassemble the Drive

If you are only replacing the power board, perform Steps 3–8 of “Reassembling the Drive” beginning on page 95 to replace the following parts:

- ☐ The power board connections
- ☐ The control module connections
- ☐ The control module plate
- ☐ The soft charge board connections
- ☐ The conduit tray and power terminal shield
- ☐ 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 5 before performing this procedure.
- Before working on this equipment, turn off all power supplying it and perform the DC bus voltage measurement procedure on page 11.

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

Before performing the steps in this procedure, perform Steps 1–7 of “Disassembling the Drive” beginning on page 28 to remove the following parts from the drive:

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

Remove the Current Sensor Bar Assembly

Table 7: Current Sensor Wiring

Wire No. ¹	Current Sensor	Description	To:
E126	T1	3-pin, red	PB ² CNA
E125	T2	3-pin, white	PB CNB
E124	T3	3-pin, blue	PB CNC

¹ See schematic on page 105 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

1. There are three current sensor bar assemblies (output bus bars) in the drive. To remove a current sensor bar assembly, follow these steps. See Figure 21.
- Using a T-30 Torx driver, remove one screw (A) securing the top of the current sensor bar assembly to its associated power IGBT module.

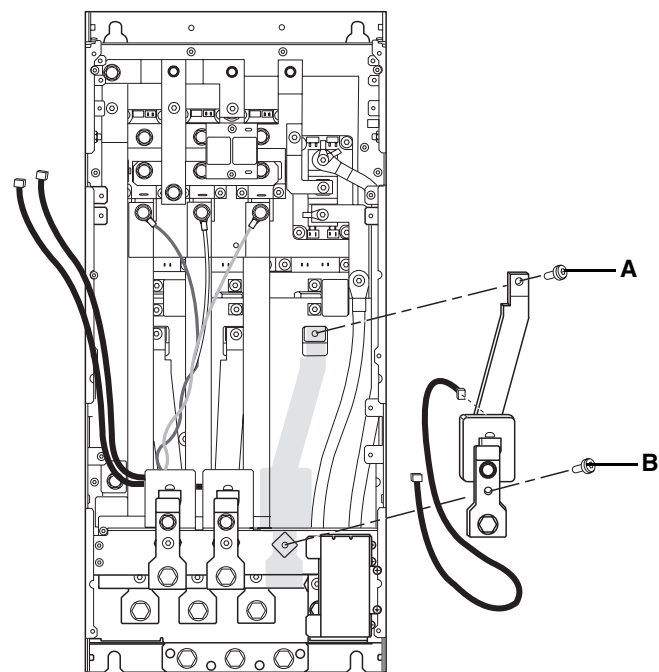
— Using a T-30 Torx driver, remove one screw (B) securing the bottom of current sensor bar assembly to its associated insulator on the bottom crossbrace.

— Remove the current sensor bar assembly from the drive.

— Carefully remove the 3-pin connector from the bottom of the current sensor.

NOTE: The T1 assembly has a red cable harness, the T2 assembly has a white cable harness, and the T3 assembly has a blue cable harness.

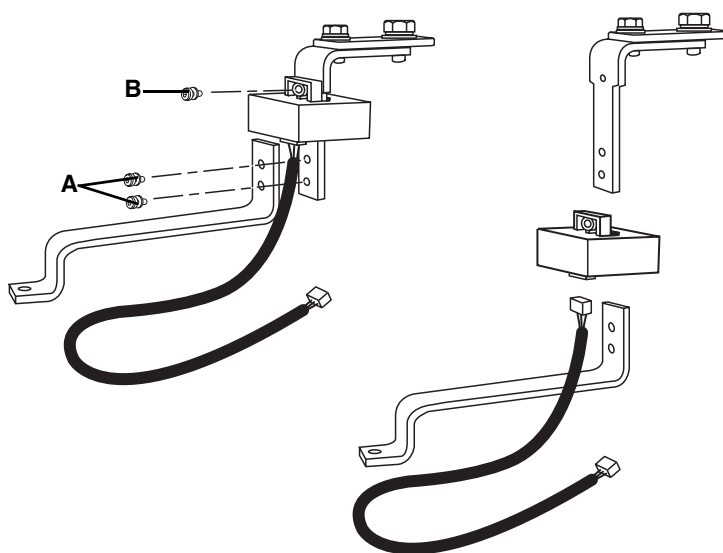
Figure 21: Current Sensor Bar Assembly Removal



Replace the Current Sensor

2. Replace the current sensor as follows. See Figure 22.
 - Using a T-30 Torx driver, remove two screws (**A**) attaching the two current sensor bar segments together.
 - Using a T-20 Torx driver, remove one screw (**B**) from the current sensor and remove the sensor from the top bar segment. Discard the current sensor.
 - Install the new current sensor on the top bar segment. Using a T-20 Torx driver, secure the sensor with one screw (**B**). Tighten the screw to 2.1–2.7 N•m (18.6–23.9 lb-in).
 - Using a T-30 Torx driver, join the two current sensor bar segments together with two screws (**A**). Tighten the screws to 3.3–4.4 N•m (29.2–38.9 lb-in).

Figure 22: Current Sensor Replacement



Reinstall the Current Sensor Bar Assembly

Table 8: Current Sensor Wiring

Wire No. ¹	Current Sensor	Description	To:
E126	T1	3-pin, red	PB ² CNA
E125	T2	3-pin, white	PB CNB
E124	T3	3-pin, blue	PB CNC

¹ See schematic on page 105 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

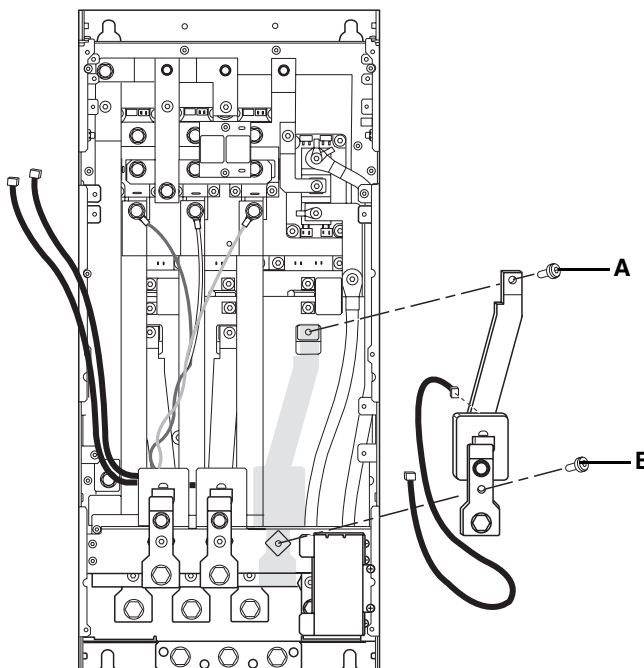
3. Reinstall the current sensor bar assembly as follows. See Figure 23.

- Carefully plug the 3-pin connector to the bottom of the current sensor.

NOTE: The T1 assembly has a red cable harness, the T2 assembly has a white cable harness, and the T3 assembly has a blue cable harness.

- Place the current sensor bar assembly into position in the drive between its associated power IGBT module and crossbrace insulator.
- Using a T-30 Torx driver, secure the top of the current sensor bar assembly to the power IGBT module 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 the crossbrace insulator with one screw (**B**). Tighten the screw to 3.3–4.4 N•m (29.2–38.9 lb-in).

Figure 23: Current Sensor Bar Assembly Replacement



Reassemble the Drive

If you are only replacing a current sensor, perform Steps 2–8 of “Reassembling the Drive” beginning on page 95 to replace the following parts:

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

Replacing the Snubber Capacitor Kits VZ3S1910, VZ3S1911

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

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

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

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

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- When the drive is damaged, voltage may remain on certain energy storage capacitors after de-energization of the drive 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 24 on page 44.
 - Snubber capacitors. See Figures 26 and 27 on pages 46 and 47.
- 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.

You must install all of the parts in the snubber capacitor kit. The kit includes:

- Three capacitors for the power IGBT modules
- One capacitor for the braking IGBT module (240 V units only)
- A snubber board for the silicon controlled rectifier (SCR) modules

Before performing the steps in this procedure, perform Steps 1–8 of “Disassembling the Drive” beginning on page 28 to remove the following parts from the drive:

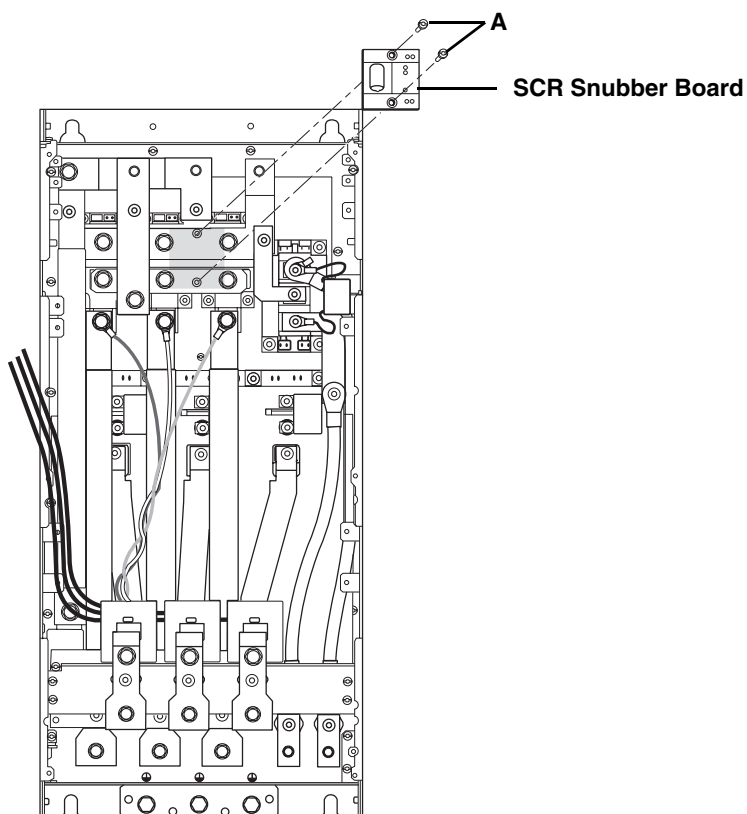
- ☐ The front cover
- ☐ The conduit tray and power terminal shield
- ☐ The soft charge board connections
- ☐ The control module plate
- ☐ The control module connections
- ☐ The power board connections
- ☐ The power board mounting plate
- ☐ The top cover

Replace the SCR Snubber Board—240 V Units

Replace the silicon controlled rectifier (SCR) snubber board on 240 V units as follows (see Figure 24). Refer to page 45 for 480 V units.

1. Using a T-20 Torx driver, remove two screws (**A**) securing the SCR snubber board to the output rectifier terminals.
2. Remove and discard the SCR snubber board.
3. Position the new SCR snubber board over the output rectifier terminals.
4. Using a T-20 Torx driver, secure the board with two screws (**A**). Tighten the screws to 1.1–1.7 N•m (9.7–15.0 lb-in).

Figure 24: SCR Snubber Board Replacement (240 V Units)

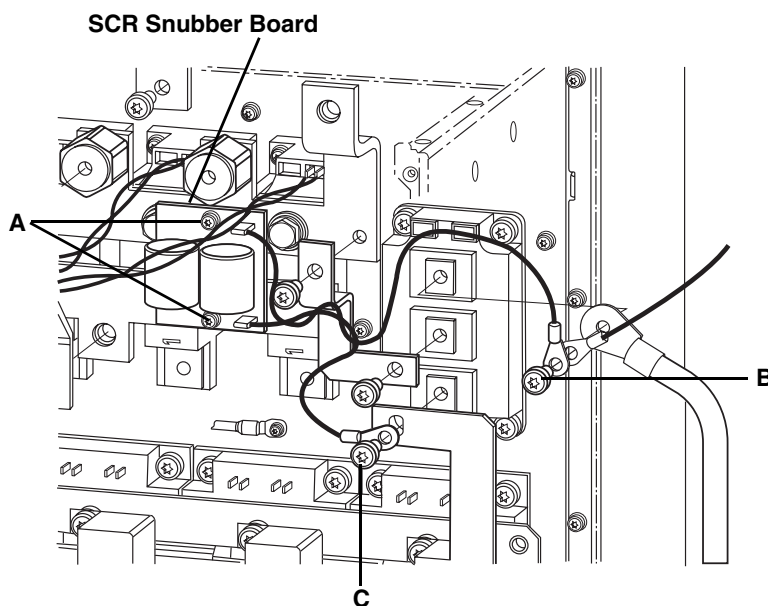


Replace the SCR Snubber Board—480 V Units

Replace the SCR snubber board as follows. See Figure 25.

1. Using a T-20 Torx driver, remove two screws (**A**) securing the SCR snubber board to the output rectifier terminals.
2. Using a T-30 Torx driver, remove two screws securing the snubber board wires to terminals C2E1 (**B**) and C1 (**C**) on the braking IGBT module.
3. Remove and discard the SCR snubber board.
4. Position the new SCR snubber board over the output rectifier terminals.
5. Using a T-20 Torx driver, secure the board with two screws (**A**). Tighten the screws to 1.1–1.7 N•m (9.7–15.0 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 25: SCR Snubber Board and Braking IGBT Snubber Capacitor Replacement (480 V Unit)



Replace the Braking IGBT Snubber Capacitor

NOTE: Perform this step for 240 V drives only. See page 45 for 480 V drives.

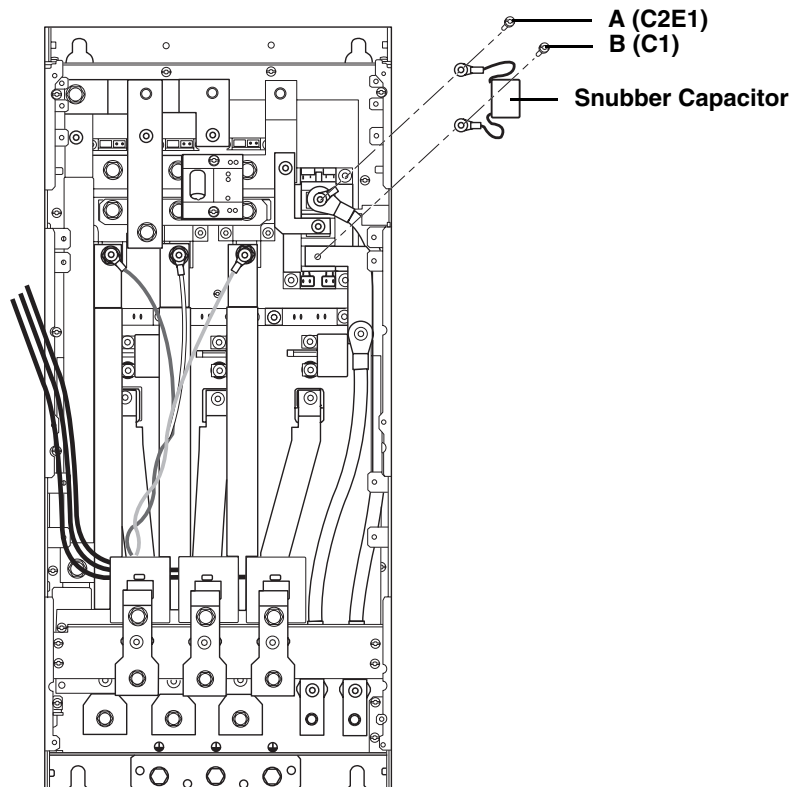
Replace the snubber capacitor on the braking IGBT module as follows. See Figure 26 for 240 V units.

1. Using a T-30 Torx driver, remove two screws securing the snubber capacitor to terminals C2E1 (**A**) and C1 (**B**) on the braking IGBT module.

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.

2. Remove the snubber capacitor.
3. With the PB power cable and the TAB1 connection in place on terminal C2E1, position the new snubber capacitor over terminals C2E1 and C1 on the braking IGBT module.
4. Using a T-30 Torx driver, secure the snubber capacitor to the braking IGBT module with two screws (**A** and **B**). Tighten the screws to 3.4–4.5 N•m (30.1–39.8 lb-in).

Figure 26: Braking IGBT Module Snubber Capacitor Replacement (240 V Unit)

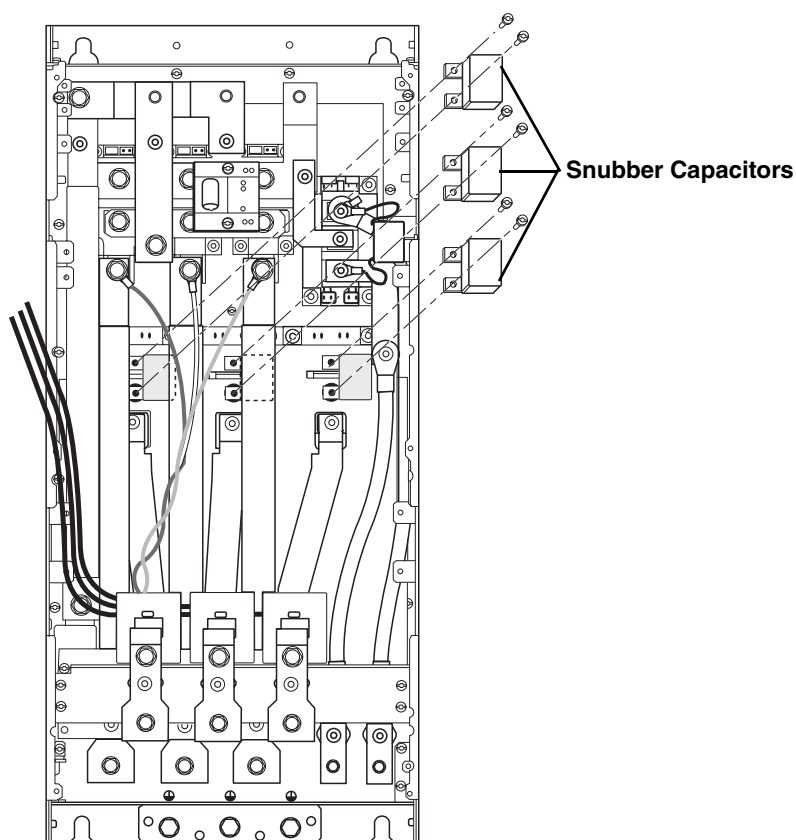


Replace the Power IGBT Snubber Capacitors

Replace the snubber capacitors on the three power IGBT modules as follows. See Figure 27.

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 and remove the snubber capacitors.
2. Position the three new snubber capacitors over terminals C1 and E2 of the three power IGBT modules.
3. Using a T-30 Torx driver, secure the snubber capacitors to the power IGBT modules with two screws each. Tighten the screws to 3.4–4.5 N•m (30.1–39.8 lb-in).

Figure 27: Power IGBT Module Snubber Capacitor Replacement



Reassemble the Drive

If you are only replacing the snubber capacitor kit, perform Steps 1–8 of “Reassembling the Drive” beginning on page 95 to replace the following parts:

- ☐ The top cover
- ☐ The power board mounting plate
- ☐ The power board connections
- ☐ The control module connections
- ☐ The control module plate
- ☐ The soft charge board connections
- ☐ The conduit tray and power terminal shield
- ☐ 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 5 before performing this procedure.
- Before working on this equipment, turn off all power supplying it and perform the DC bus voltage measurement procedure on page 11.

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

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- When the drive is damaged, voltage may remain on certain energy storage capacitors after de-energization of the drive 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 capacitor. See Figure 37 on page 58.
- 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 1–8 of “Disassembling the Drive” beginning on page 28 to remove the following parts from the drive:

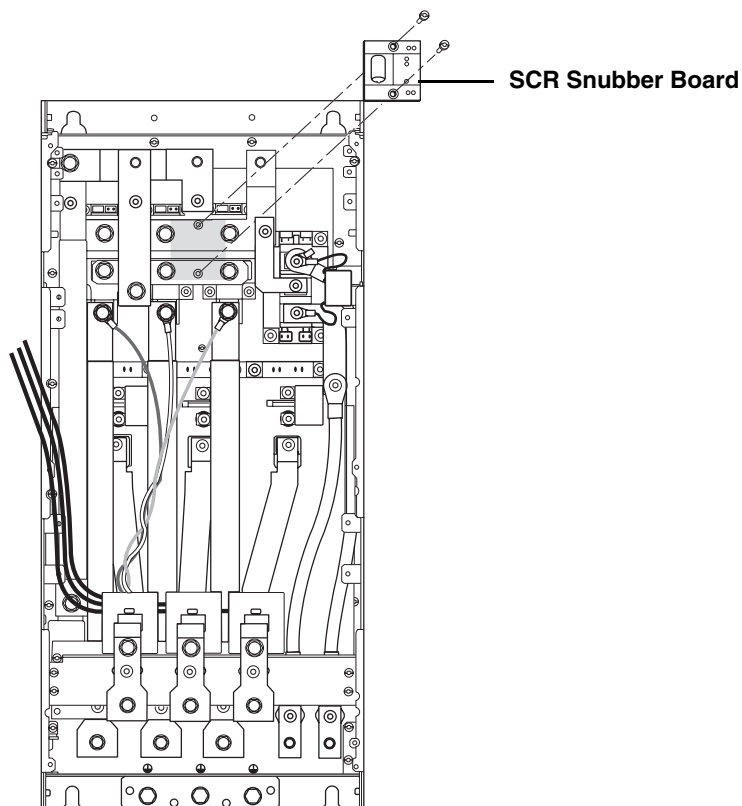
- ☐ The front cover
- ☐ The conduit tray and power terminal shield
- ☐ The soft charge board connections
- ☐ The control module plate
- ☐ The control board connections
- ☐ The power board connections
- ☐ The power board mounting plate
- ☐ The top cover

Remove the SCR Snubber Board

Remove the silicon controlled rectifier (SCR) snubber board as follows. See Figure 28.

1. Using a T-20 Torx driver, remove two screws securing the SCR snubber board to the output rectifier terminals.
2. Remove the SCR snubber board.

Figure 28: SCR Snubber Board Removal

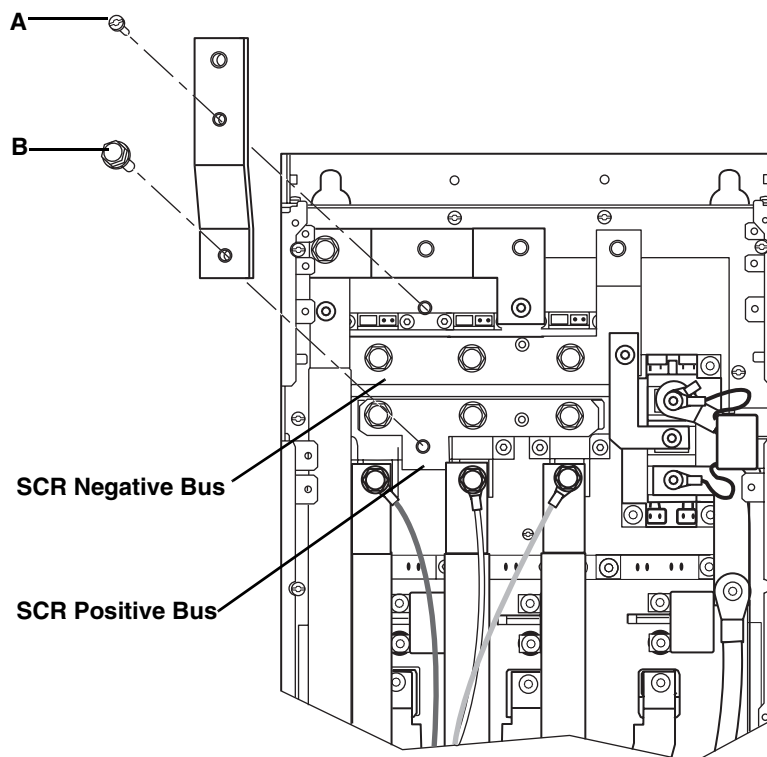


Remove the SCR Buswork

To replace the braking IGBT module or an SCR module, first remove the buswork over the modules as described in this section.

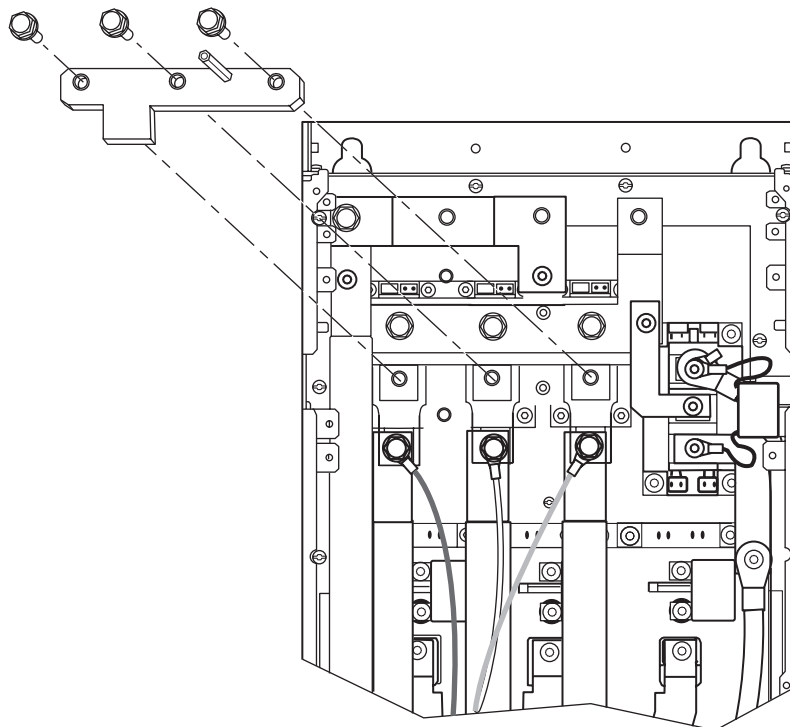
1. Remove the SCR positive bus jumper. See Figure 29.
 - Using a T-30 Torx driver, remove one screw (**A**) securing the jumper to the SCR negative bus.
 - Using a 13 mm socket, remove one screw (**B**) securing the jumper to the SCR positive bus and remove the jumper from the drive.

Figure 29: SCR Positive Bus Jumper Removal



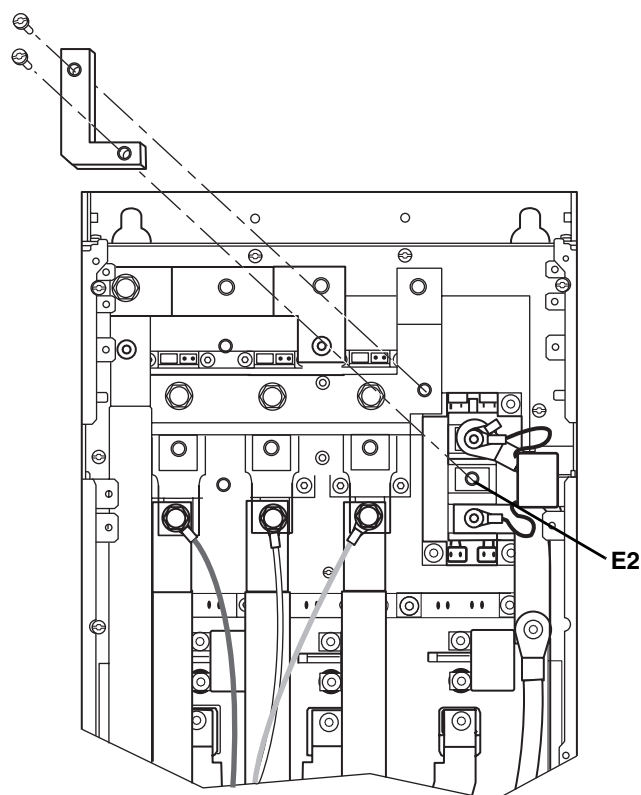
2. Using a 13 mm socket, remove three bolts connecting the SCR positive bus to the center terminals (terminal 2) of the SCR modules and take the bus out of the drive. See Figure 30.

Figure 30: SCR Positive Bus Removal



3. Using a T-30 Torx driver, remove two screws and take the jumper between braking IGBT module terminal E2 and the SCR negative bus out of the drive. See Figure 31.

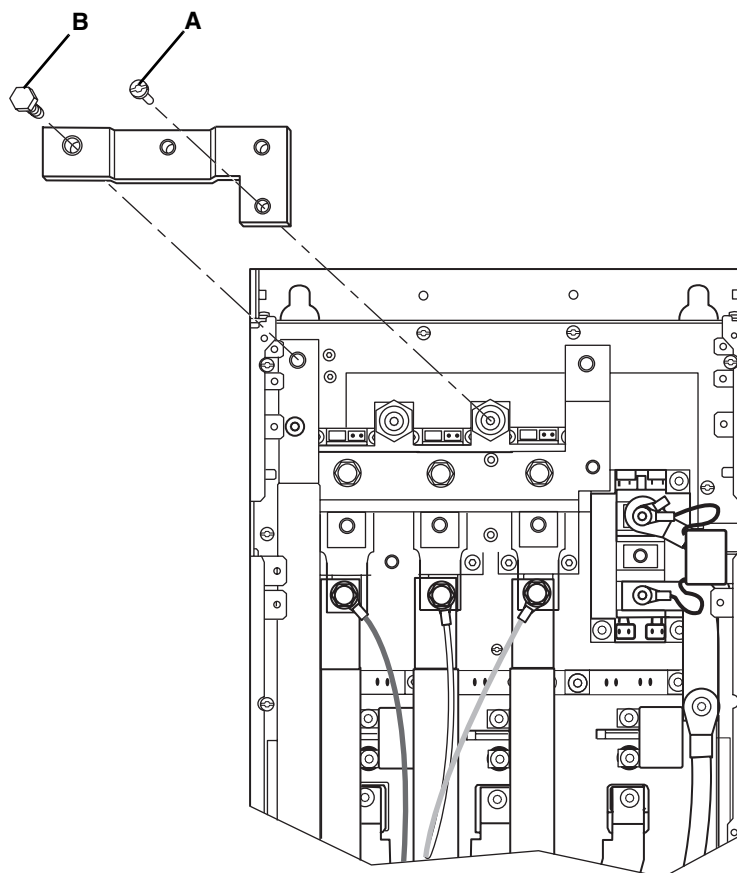
Figure 31: Jumper Removal



4. Remove the SCR negative bus jumper as follows. See Figure 32.
 - Using a T-30 Torx driver, remove one screw (**A**) securing the jumper to the SCR negative bus.
 - Using a 13 mm socket wrench, remove one bolt (**B**) securing the jumper to the positive bus bar.
 - Remove the jumper from the drive.

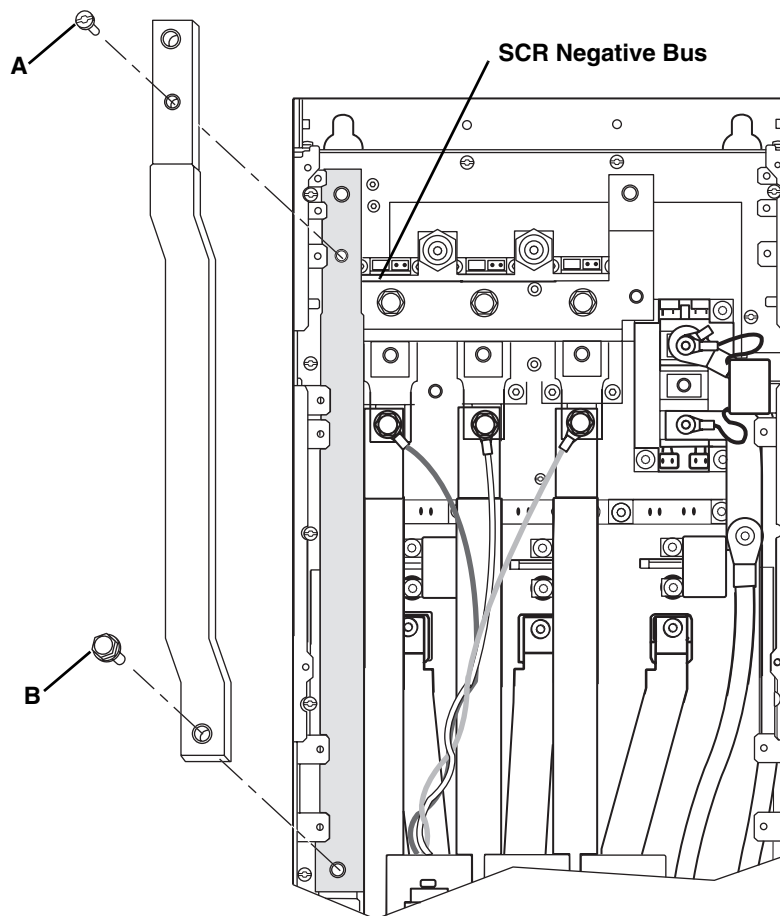
NOTE: You removed the screw at the left side of the jumper when you removed the top cover plates.

Figure 32: SCR Negative Bus Jumper Removal



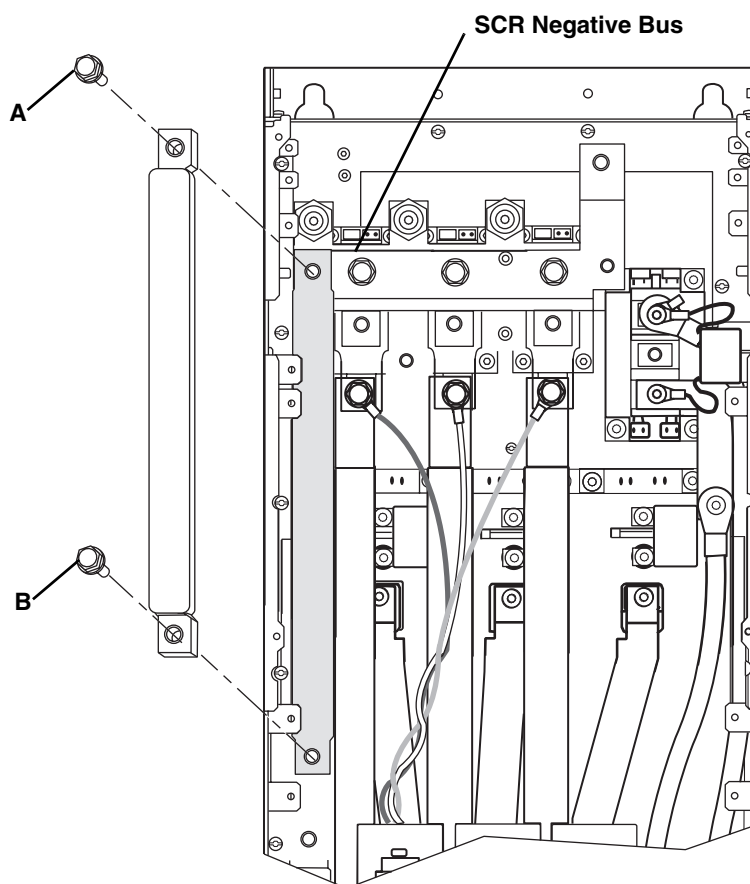
5. Remove the positive bus bar as follows. See Figure 33.
 - Using a T-30 Torx driver, remove one screw (A) securing the positive bus bar to the SCR negative bus.
 - Using a 13 mm socket, remove one bolt (B) securing the positive bus bar to the positive bus plate.
 - Remove the positive bus bar from the drive. The vertical negative bus bar is now exposed.

Figure 33: Positive Bus Bar Removal



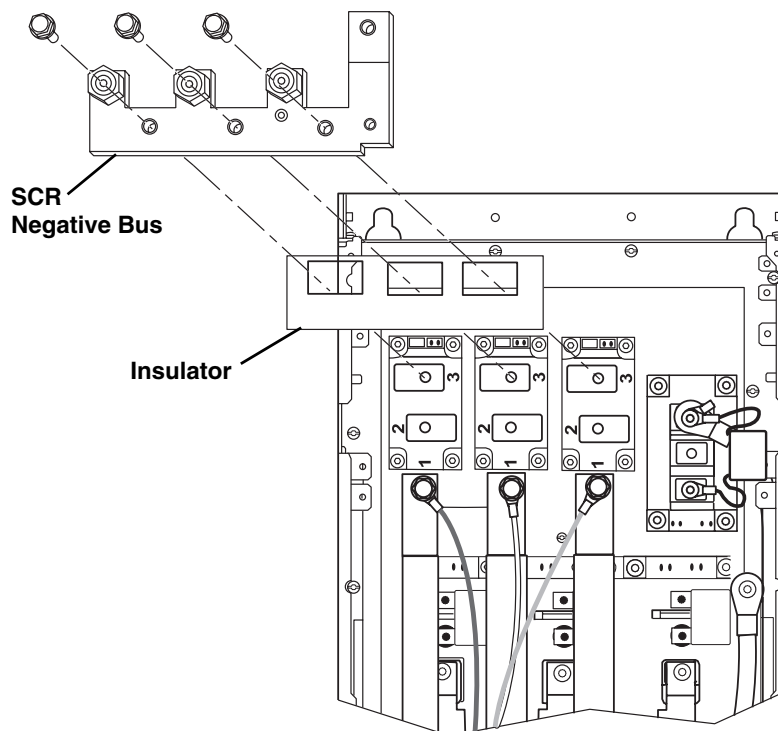
6. Remove the negative bus bar as follows. See Figure 34.
 - Using a 13 mm socket, remove one bolt (A) securing the negative bus bar to the SCR negative bus.
 - Using a 13 mm socket, remove one bolt (B) securing the negative bus bar to the negative bus plate.
 - Remove the negative bus bar from the drive.

Figure 34: Negative Bus Bar Removal



7. Using a 13 mm socket, remove the three bolts securing the SCR negative bus to the top terminals (terminal 3) of the SCR modules and remove the bus. See Figure 35.
8. Remove the insulator between the SCR negative bus and the SCR modules.

Figure 35: SCR Negative Bus Removal



NEXT STEP: If you are replacing the braking IGBT module, continue with “Replace the Braking IGBT Module VZ3IM1600M0671, VZ3TM1400M0671, VZ3TM1400M1271” on page 57.

If you are replacing an SCR module, skip to “Replace the SCR Module VZ3TD1250M1671, VZ3TD1330M1601” on page 59.

Replace the Braking IGBT Module VZ3IM1600M0671, VZ3TM1400M0671, VZ3TM1400M1271

Figure 36: Torque Sequence

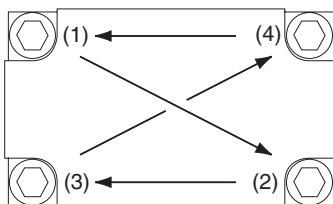


Table 9: Braking IGBT Module Wiring

Wire No. ¹	Braking IGBT Module	Description	To:
E113	C2E1	Lug	PB ² TAB1
E117	E2	Orange	PB CNPB
	G2	Purple	

¹ See schematic on page 105 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

² PB: Power board

Replace the braking IGBT module as follows. See Figure 37 on page 58.

1. Perform all steps of “Remove the SCR Buswork” beginning on page 50 to remove the SCR buswork from the drive.
2. **For 240 V drives only:** Using a T-30 Torx driver, remove two screws securing the snubber capacitor to terminals C2E1 (**A**) and C1 (**B**) on the braking IGBT module. 480 V drives do not have a snubber capacitor on the braking IGBT module.

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.

Releasing the snubber capacitor over terminal C1 also releases the top of the jumper (**D**) between the braking IGBT module and the positive bus plate.

3. **480 V drives only:** Using a T-30 Torx driver, remove one screw (**A**) securing the PB power cable and the TAB1 connection to terminal C2E1 of the braking IGBT module, and remove one screw (**B**) securing the top of the jumper (**D**) between the braking IGBT module and the positive bus plate.
4. Using a T-30 Torx driver, remove one screw (**C**) securing the bottom of the jumper (**D**) to the positive bus plate, and remove the jumper from the drive

NOTE: The PA power cable is under this screw.

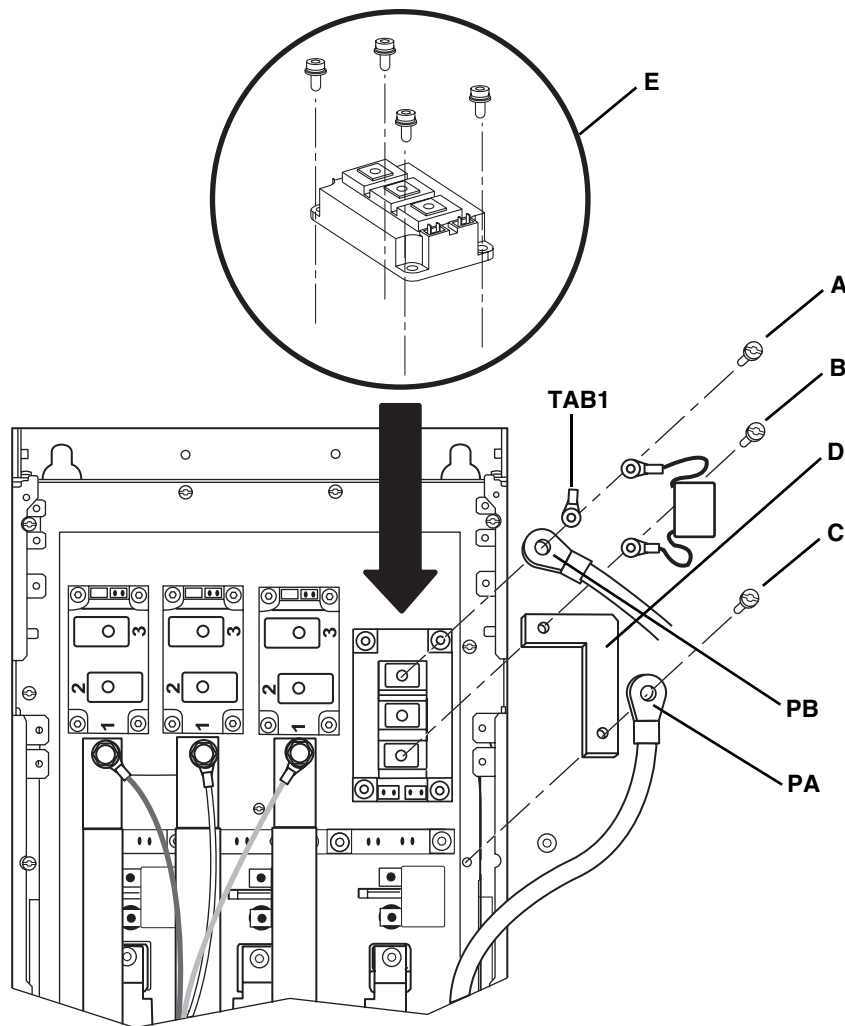
5. Remove the orange and purple cable from braking IGBT terminals E2 (orange) and G2 (purple). This cable connects to terminal CNPB on the power board.
6. Using a T-30 Torx driver, remove four screws (**E**) securing the braking IGBT module to the heatsink and remove the module from the drive.
7. Remove the blue wire jumper between terminals E1 and G1 of the braking IGBT module and install it on the new braking IGBT module.
8. Clean the portion of the heatsink that makes contact with the module.
9. Evenly coat the bottom of the new braking IGBT module with a thin layer of thermal compound and position the new module on the heatsink with the terminals at the bottom, as illustrated in Figure 37.
10. Using a T-30 Torx driver, secure the module with four screws. Initially tighten the screws, in the sequence shown in Figure 36, to 0.5–0.7 N•m (4.4–6.2 lb-in), and then to a final torque of 3–5 N•m (26.6–44.3 lb-in).
11. Position the jumper between the braking IGBT module and the positive bus plate with the PA power cable over the bottom terminal of the jumper. Using a T-30 Torx driver, secure the jumper to the positive bus plate with one screw. Tighten the screw to 3.4–4.5 N•m (30.1–39.8 lb-in).
12. **For 240 V drives only:** Reinstall the snubber capacitor on the braking IGBT module as follows.
 - 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 connection goes on top.
 - Ensure that the jumper (**D**) is under the snubber capacitor lug on terminal C1.
 - Using a T-30 Torx driver, secure the snubber capacitor to terminals C2E1 (**A**) and C1 (**B**) on the braking IGBT module. Tighten the screws to 3.4–4.5 N•m (30.1–39.8 lb-in).

13. **480 V drives only:** Reinstall the braking IGBT module connections as follows.
- Using a T-30 Torx driver, secure the PB power cable and the TAB1 connection to terminal C2E1 of the braking IGBT module with one screw **(A)**. Tighten the screw to 3.4–4.5 N•m (30.1–39.8 lb-in).
 - Using a T-30 Torx driver, secure the top of the jumper **(D)** between the braking IGBT module terminal C1 and the positive bus plate with one screw **(B)**. Tighten the screw to 3.4–4.5 N•m (30.1–39.8 lb-in).
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 9 on page 57.

NEXT STEP: If you are only replacing the braking IGBT module, skip to “Replace the SCR Buswork” on page 61.

If you are replacing a silicon controlled rectifier (SCR) module, continue with “Replace the SCR Module VZ3TD1250M1671, VZ3TD1330M1601” on page 59.

Figure 37: Braking IGBT Module Replacement



Replace the SCR Module VZ3TD1250M1671, VZ3TD1330M1601

Table 10: SCR Module Wiring

Wire No. ¹	SCR Module	Description	To:
E110	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
E107	SCR 1, Terminal 4	Black	SCB ³ CNL3G
	SCR 1, Terminal 5	Red	
E108	SCR 2, Terminal 4	Black	SCB CNL2G
	SCR 2, Terminal 5	White	
E109	SCR 3, Terminal 4	Black	SCB CNL1G
	SCR 3, Terminal 5	Blue	

¹ See schematic on page 105 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 SCB: Soft charge board

To replace one of the three silicon controlled rectifier (SCR) modules, follow these steps. See Figure 39 on page 60.

1. Perform all steps of "Remove the SCR Buswork" beginning on page 50 to remove the SCR buswork from the drive.
2. Using a 13 mm socket, remove one bolt securing the input bus bar to terminal 1 of the SCR module that you are replacing.

NOTE: Under each bolt is a wire that connects the SCR module to the to terminal CN5 on the power board. The red wire connects to SCR1, the white wire connects to SCR2, and the blue wire connects to SCR3. See Table 10.

3. Using a 13 mm socket wrench, loosen but do not remove the bolt securing the input bus bar to terminal L1, L2, or L3.
4. Move the input bus bar to the side to access the SCR module that you are replacing.
5. Remove the soft charge board connections from terminals 4 and 5 of the SCR module.
6. Using a T-20 Torx driver, remove four screws (**B**) securing the SCR module to the heatsink and remove the module from the drive.
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.
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. Initially tighten the screws, in the sequence shown in Figure 38, to 0.5–0.7 N•m (4.4–6.2 lb-in), and then to a final torque of 2.4–2.7 N•m (21.2–23.9 lb-in).
11. Replace the soft charge board connections to SCR terminals 4 and 5.

NOTE: Note the cable positions:

The red and black cable goes to SCR module 1, with red to terminal 5 and black to terminal 4.

The white and black cable goes to SCR module 2, with white to terminal 5 and black to terminal 4.

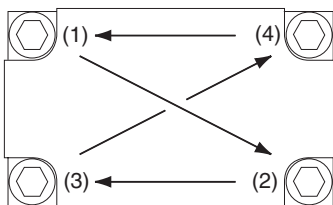
The blue and black cable goes to SCR module 3 with blue to terminal 5 and black to terminal 4.

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.

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.

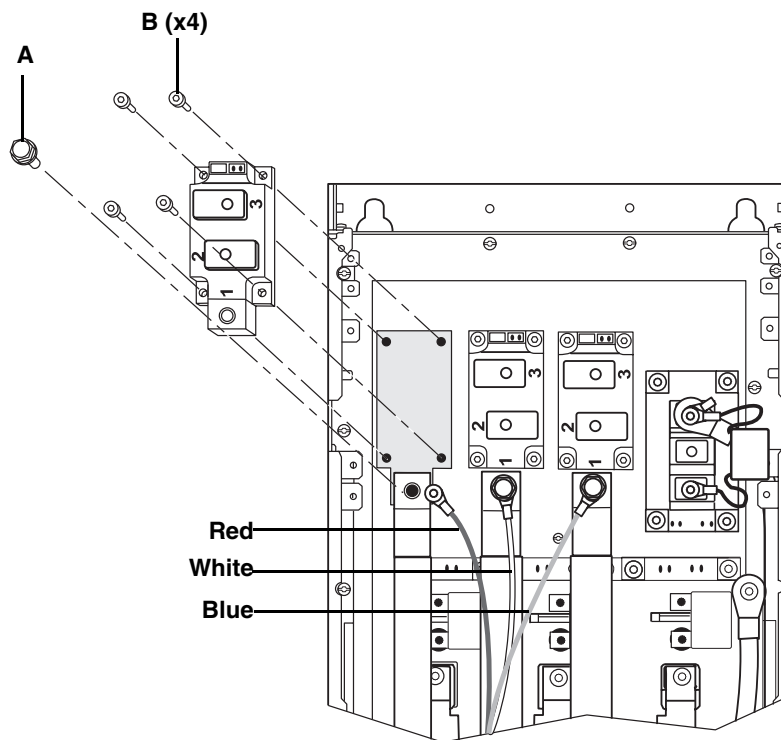
13. Using a 13 mm socket, reinstall the input bus bar and cable connections to the bottom terminal of the SCR module with one bolt. Tighten the bolt to 10–13.5 N•m (88.5–119.5 lb-in).

Figure 38: Torque Sequence



14. Using a 13 mm socket wrench, tighten the bolt securing the input bus bar to terminal L1, L2, or L3 (**G**) to 10–13.5 N•m (88.5–119.5 lb-in).
15. Replace the buswork as described in “Replace the SCR Buswork” on page 61.

Figure 39: SCR Module Replacement



Replace the SCR Buswork

Replace the buswork over the braking IGBT and SCR modules as described in this section.

1. Replace the SCR negative bus as follows. See Figure 40.

⚠ DANGER

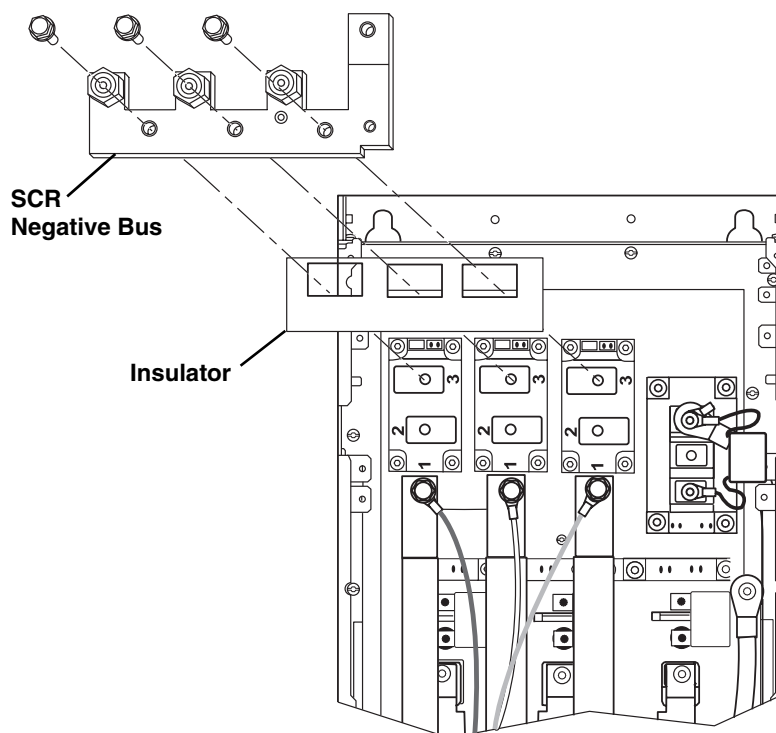
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Install the insulator as shown in Figure 40.
- 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.

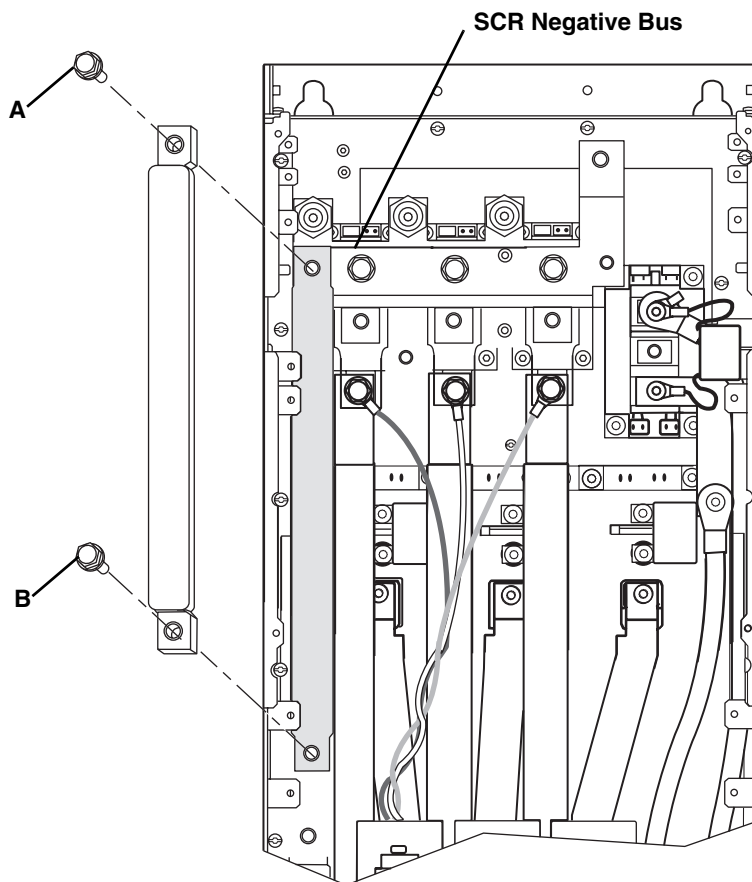
- Install the insulator over the SCR modules.
- Using a 13 mm socket, secure the SCR negative bus to the top terminals (terminal 3) of the SCR modules with three bolts. Tighten the bolts to 10–13.5 N•m (88.5–119.5 lb-in).

Figure 40: SCR Negative Bus Replacement



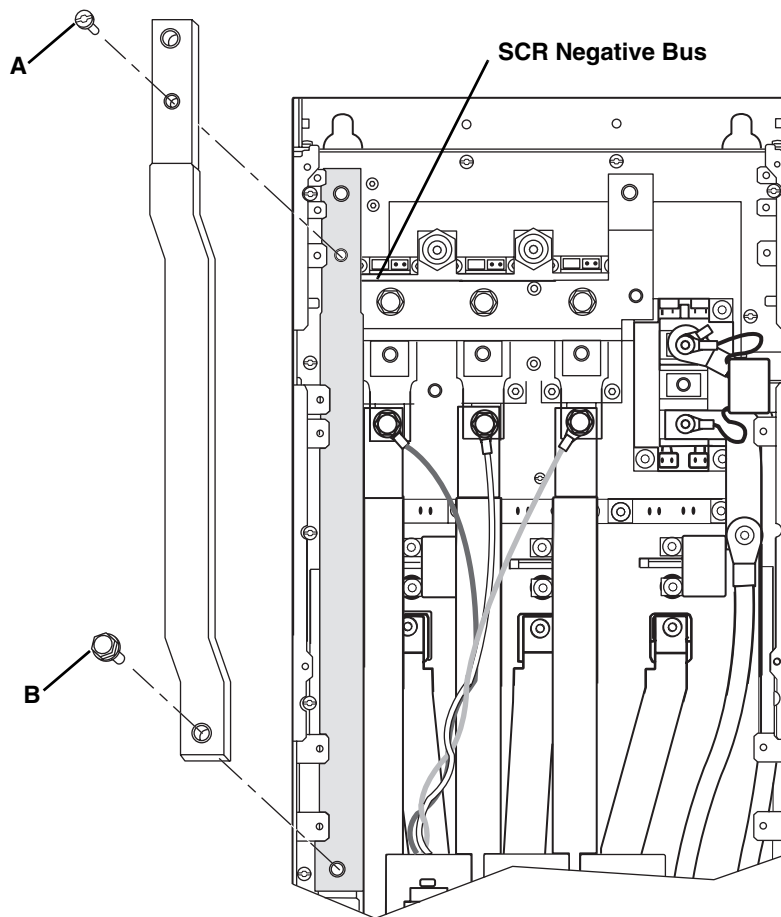
2. Replace the negative bus bar as follows. See Figure 41.
 - Using a 13 mm socket, secure the negative bus bar to the SCR negative bus with one bolt (A). Tighten the bolt to 10–13.5 N•m (88.5–119.5 lb-in).
 - Using a 13 mm socket, secure the negative bus bar to the negative bus plate with one bolt (B). Tighten the bolt to 10–13.5 N•m (88.5–119.5 lb-in).

Figure 41: Negative Bus Bar Replacement



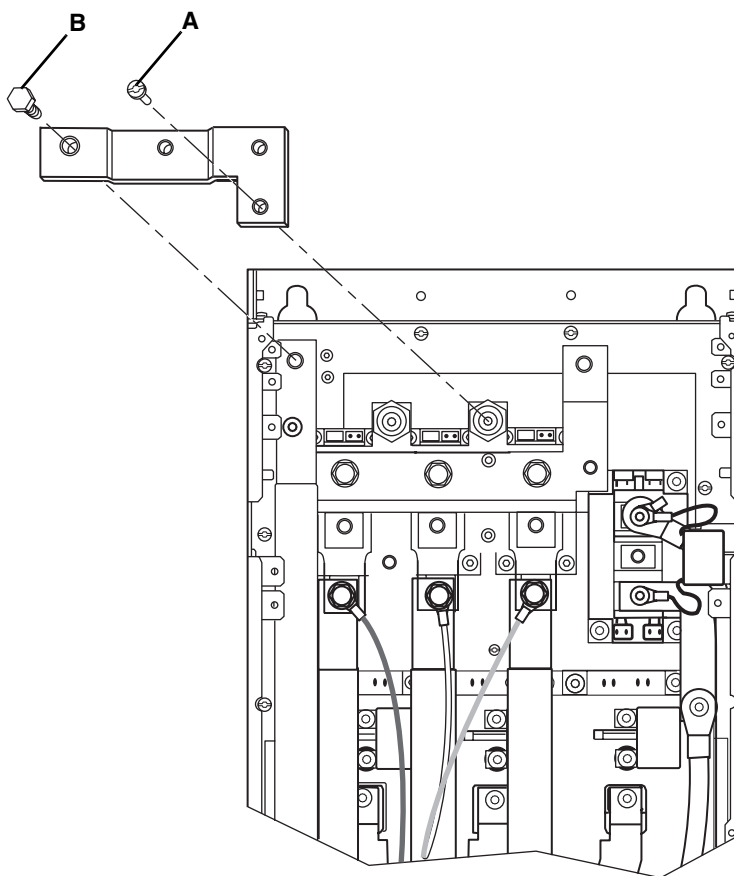
3. Replace the positive bus bar as follows. See Figure 42.
 - Using a T-30 Torx driver, secure the positive bus bar to the SCR negative bus with one screw (A). Tighten the screws to 3.4–4.5 N•m (30.1–39.8 lb-in).
 - Using a 13 mm socket, secure the positive bus bar to the positive bus plate with one bolt (B). Tighten the bolt to 10–13.5 N•m (88.5–119.5 lb-in).

Figure 42: Positive Bus Bar Replacement



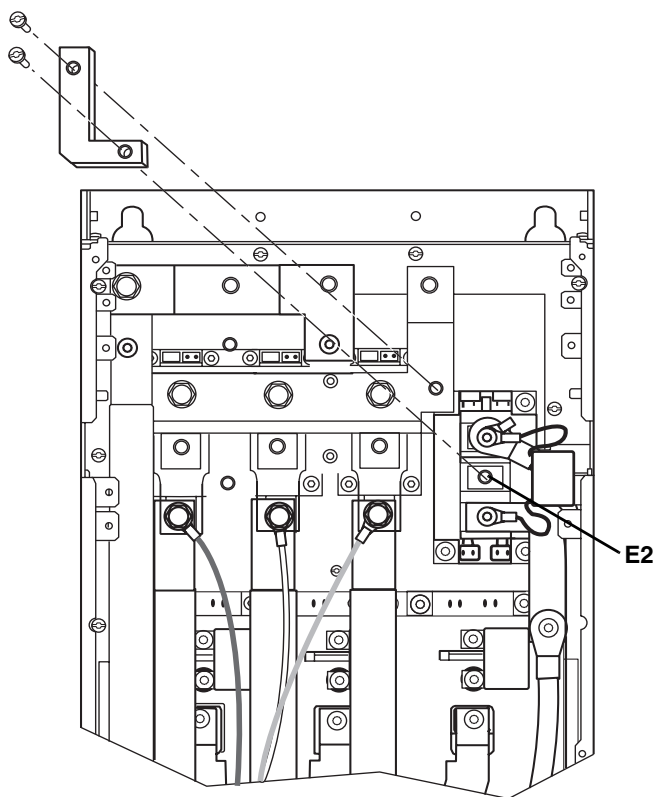
4. Replace the SCR negative bus jumper as follows. See Figure 43.
 - Position the jumper between the positive bus bar and the SCR negative bus as shown in Figure 43.
 - Using a T-30 Torx driver, secure the jumper to the SCR negative bus with one screw (A). Tighten the screw to 3.3–4.4 N•m (29.2–38.9 lb-in).
 - Using a 13 mm socket wrench, secure the jumper to the positive bus bar with one bolt (B). Tighten the screw to 10–13.5 N•m (88.5–119.5 lb-in).

Figure 43: SCR Negative Bus Jumper Replacement



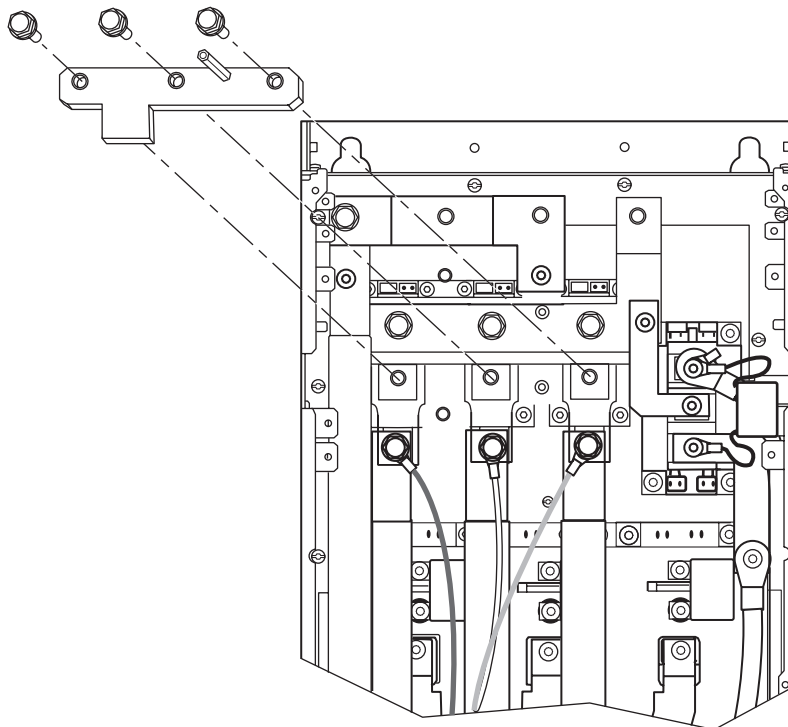
5. Using a T-30 Torx driver, secure the jumper between terminal E2 of the braking IGBT module and the SCR negative bus with two screws. See Figure 44. Tighten the screws to 4.2–5.1 N•m (37.2–45.1 lb-in).

Figure 44: Jumper Replacement



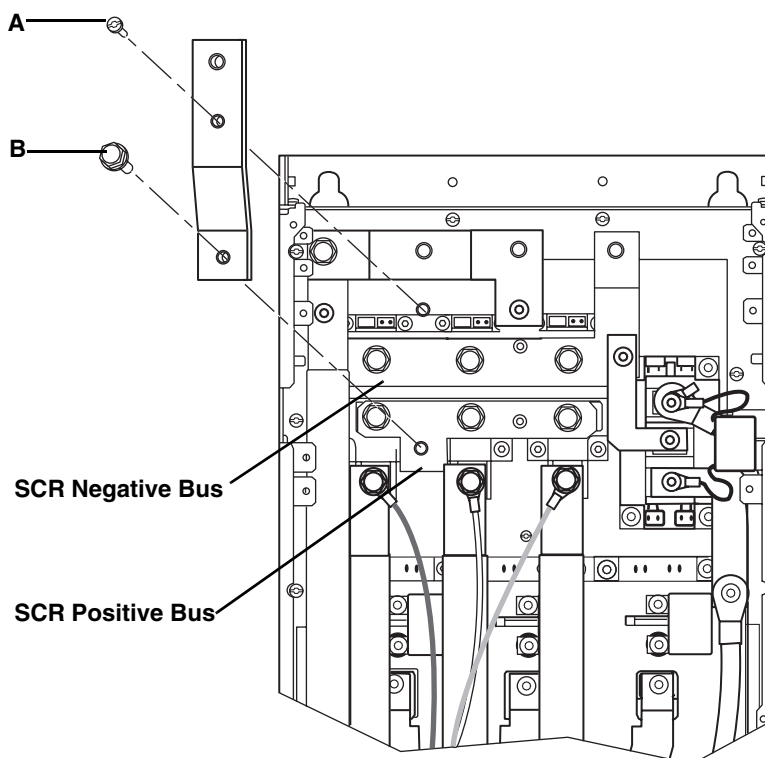
- Using a 13 mm socket, secure the SCR positive bus to the center terminals (terminal 2) of the SCR modules with three bolts. See Figure 45. Tighten the bolts to 10–13.5 N•m (88.5–119.5 lb-in).

Figure 45: SCR Positive Bus Replacement



7. Replace the SCR positive bus jumper as follows. See Figure 46.
 - Using a T-30 Torx driver, secure the jumper to the SCR negative bus with one screw **(A)**. Tighten the screw to 3.4–4.5 N•m (30.1–39.8 lb-in).
 - Using a 13 mm socket, secure the jumper to the SCR positive bus with one screw **(B)**. Tighten the screw to 10–13.5 N•m (88.5–119.5 lb-in).

Figure 46: SCR Positive Bus Jumper Replacement

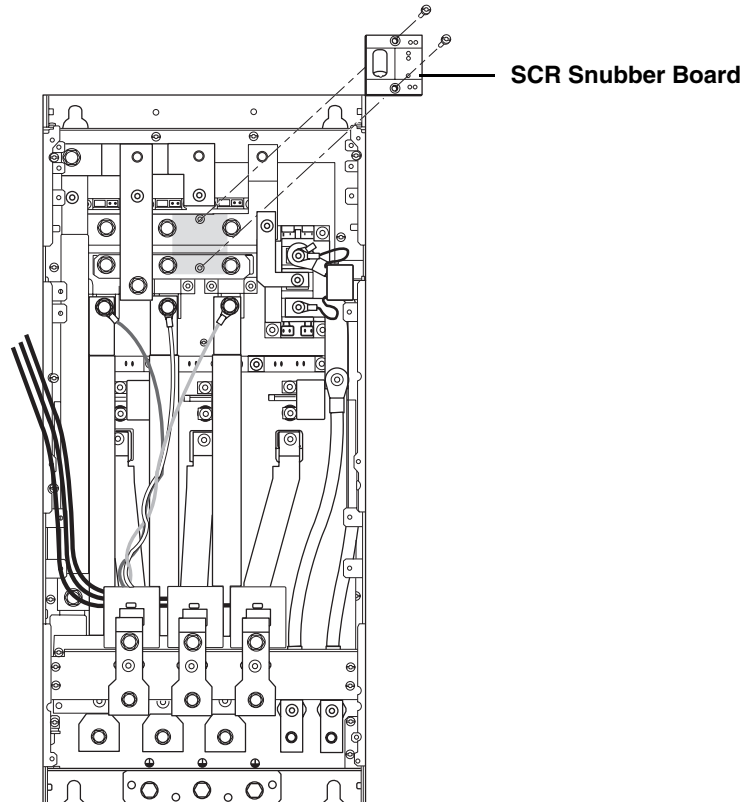


Replace the SCR Snubber Board

Replace the silicon controlled rectifier (SCR) snubber board as follows (see Figure 47). Refer to Figure 25 on page 45 for 480 V drives.

1. Position the new SCR snubber board over the output rectifier terminals.
2. Using a T-20 Torx driver, secure the board with two screws. Tighten the screws to 1.1–1.7 N•m (9.7–15.0 lb-in).

Figure 47: SCR Snubber Board Replacement (240 V Unit Shown)



Reassemble the Drive

If you are only replacing SCR modules or IGBT modules, perform Steps 1–8 of “Reassembling the Drive” beginning on page 95 to replace the following parts:

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

Replacing the Power IGBT Modules, the Temperature Sensor Wire, and the Capacitors

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

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

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

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

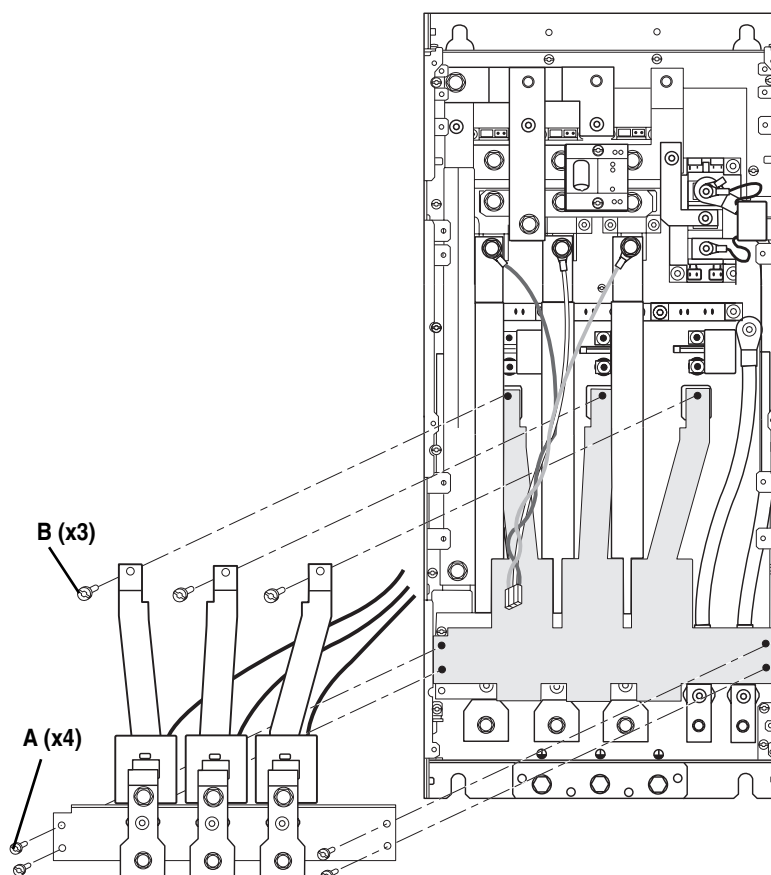
Before performing the steps in this procedure, perform Steps 1–8 of “Disassembling the Drive” beginning on page 28 to remove the following parts from the drive:

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

Remove the Output Bus Bars

1. Remove the output bus bars as follows. See Figure 48.
 - Using a T-30 Torx driver, remove three screws (**A**) securing the output bus bars to the power IGBT modules.
 - Using a T-20 Torx driver, remove four screws (**B**) securing the bottom crossbrace from the drive frame.
 - Remove the bottom crossbrace with the output bus bars attached.

Figure 48: Output Bus Bar Removal



Remove the Input Bus Bars

2. Remove the input bus bars as follows See Figure 49 on page 72.

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- When the drive is damaged, voltage may remain on certain energy storage capacitors after de-energization of the drive 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 49 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.

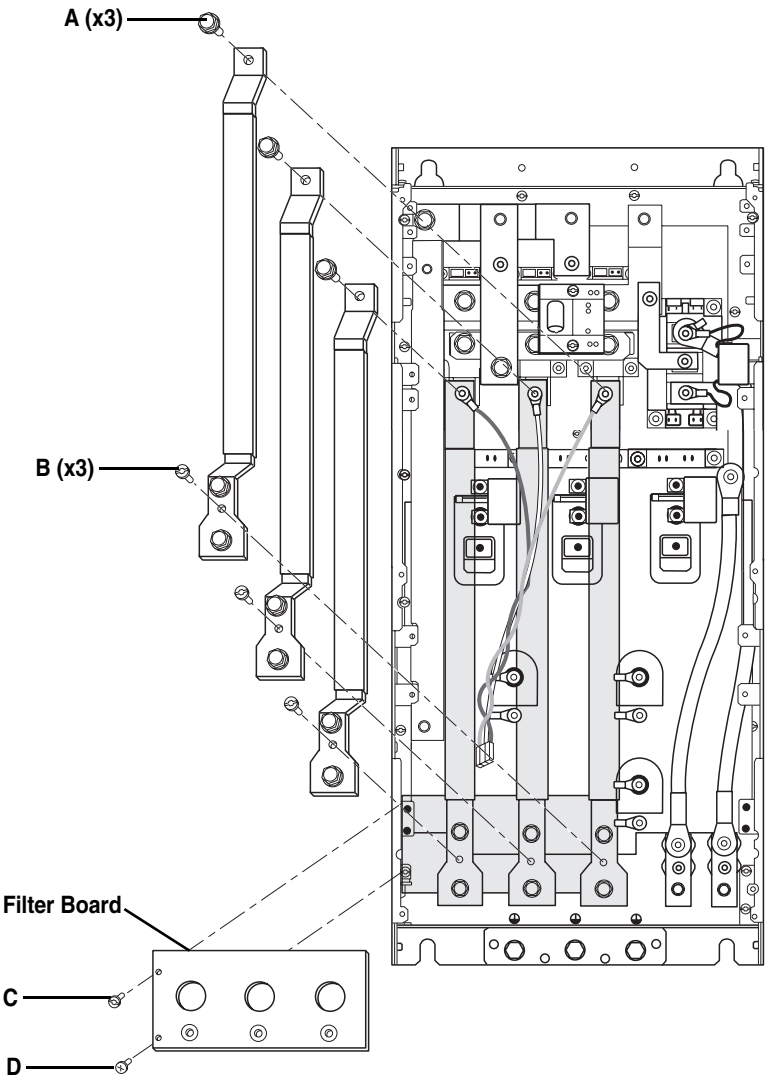
Failure to follow these instructions will result in death or serious injury.

- Using a 13 mm socket, remove the three bolts (**A**) attaching the input bus bars to terminal 1 of the silicon controlled rectifier (SCR) modules and remove the CN5 cable wiring.

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.

- Using a T-30 Torx driver, remove three screws (**B**) securing the filter board to the input terminals L1, L2, and L3.
- Using a T-20 Torx driver, remove one screw (**C**) securing the top left corner of the filter board to the drive frame.
- Using a Phillips driver, remove one screw (**D**) securing the bottom left corner of the filter board to the bottom terminal plate and remove the filter board.
- Remove the three input bus bars from the drive.

Figure 49: Input Bus Bar Removal

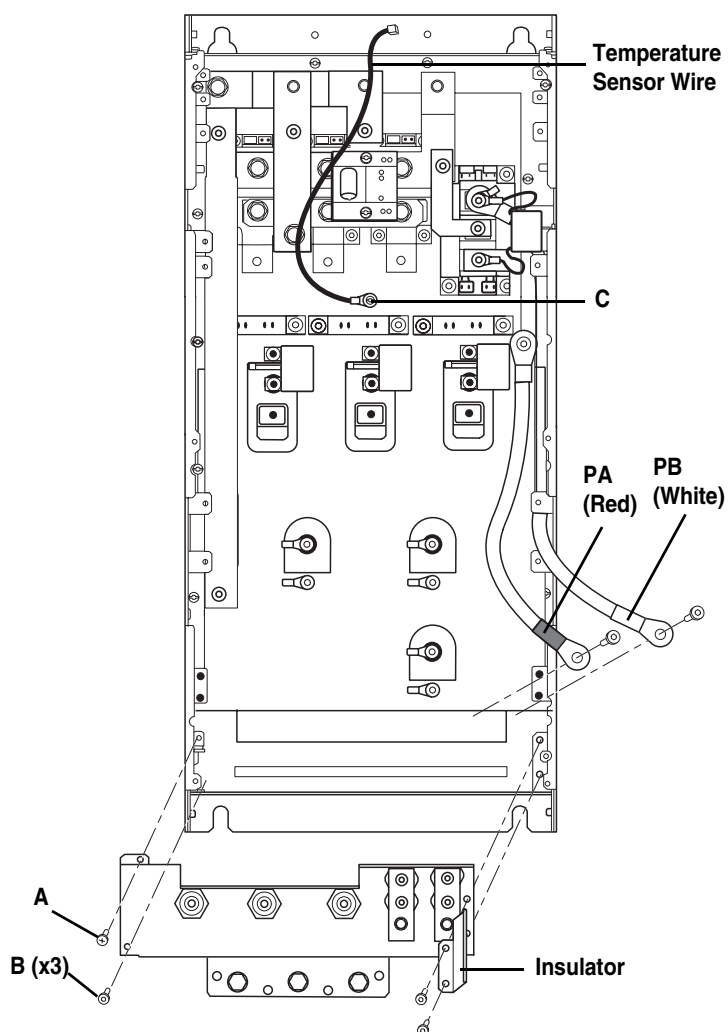


Remove the Bottom Terminal Plate

3. Remove the bottom terminal plate as follows. See Figure 50.
 - Using a T-30 Torx driver, remove two screws securing the PA (red) and PB (white) power cables to terminals PA and PB.
 - Using a Phillips driver, remove one screw (A) securing the top left corner of the terminal plate to the drive frame.
 - Using a T-20 Torx driver, remove the remaining three screws (B) securing the terminal plate to the drive frame and remove the terminal plate from the drive.

NOTE: There is an insulator under the two T-20 screws on the right side of the terminal plate. Carefully remove the insulator and retain it for reinstallation.

Figure 50: Bottom Terminal Plate Removal



Replace the Temperature Sensor Wire VZ3G1102

4. Replace the temperature sensor wire as follows. See Figure 50 on page 73.
 - Using a T-10 Torx driver, remove one screw (item **C** in Figure 50) 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 0.5–0.7 N•m (4.4–6.2 lb-in).

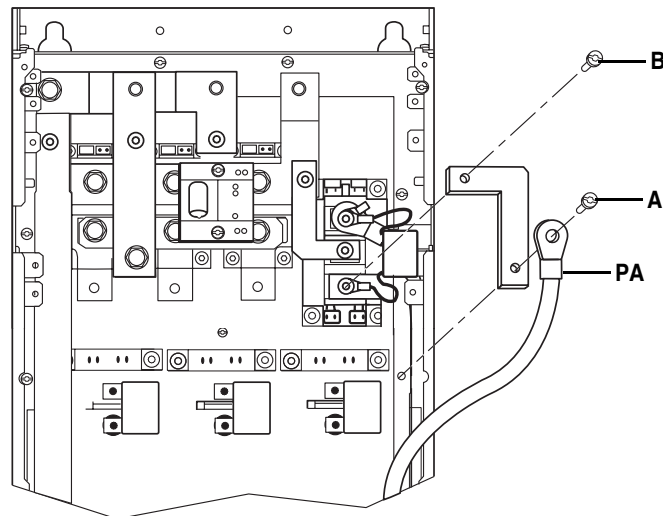
NEXT STEP: If you are also replacing the power IGBT modules or the capacitors, continue with Step 5.

Otherwise, skip to Step 13 on page 84.

Remove the Jumper

5. Remove the jumper between the braking IGBT module and the positive bus plate as follows. See Figure 51.
 - Using a T-30 Torx driver, remove one screw (**A**) securing the PA power cable to the positive bus plate. This also releases the bottom end of the jumper.
 - Using a T-30 Torx driver, remove the screw (**B**) connecting the jumper to terminal C1 on the braking IGBT module and remove jumper.

Figure 51: Jumper Removal



Remove the Snubber Capacitors

- 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 52.

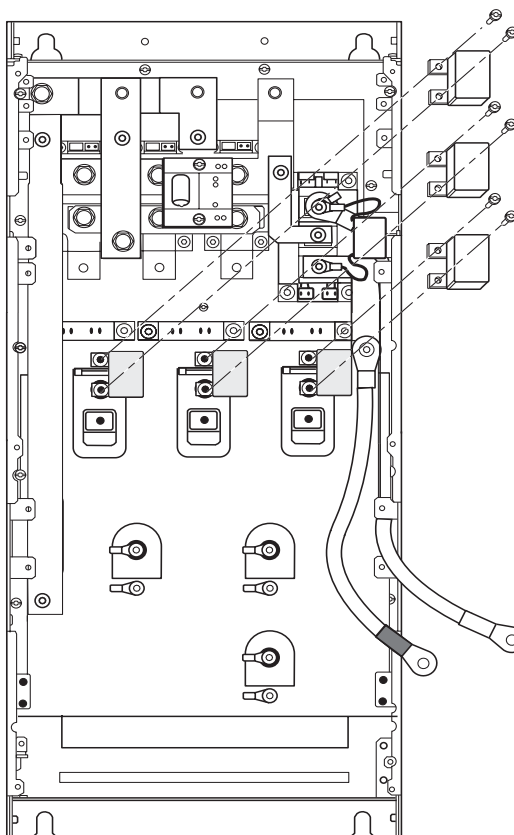
⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- When the drive is damaged, voltage may remain on certain energy storage capacitors after de-energization of the drive 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 52.
- 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.

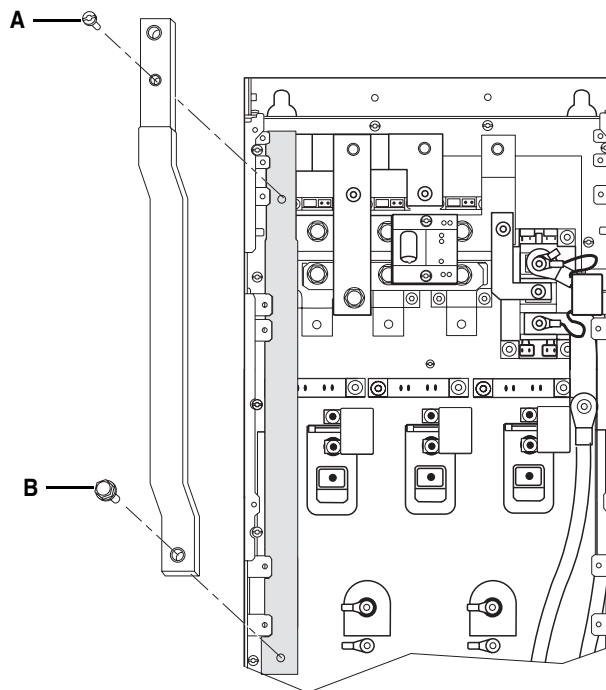
Figure 52: Snubber Capacitor Removal



Remove the Positive Bus Bar

7. Remove the positive bus bar as follows. See Figure 53.
 - Using a T-30 Torx driver, remove one screw (**A**) securing the positive bus bar to the silicon controlled rectifier (SCR) negative bus.
 - Using a 13 mm socket, remove one bolt (**B**) securing the positive bus bar to the positive bus plate.
 - Remove the positive bus bar from the drive. The vertical negative bus bar is now exposed.

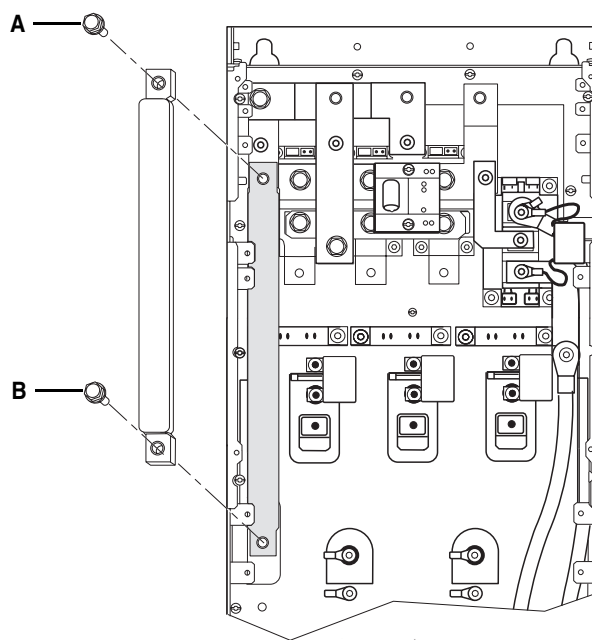
Figure 53: Positive Bus Bar Removal



Remove the Negative Bus Bar

8. Remove the negative bus bar as follows. See Figure 54.
 - Using a 13 mm socket, remove one bolt (A) securing the negative bus bar to the silicon controlled rectifier (SCR) negative bus.
 - Using a 13 mm socket, remove one bolt (B) securing the negative bus bar to the negative bus plate.
 - Remove the negative bus bar from the drive.

Figure 54: Negative Bus Bar Removal



Remove the Wiring from the Capacitors

9. Remove the wiring from the capacitors as follows.

- **240 V models:** Using a T-30 Torx driver, remove two screws on each of the three capacitors to release the wiring from the capacitor terminals. See Figure 55.
- **480 V models:** Using a T-30 Torx driver, remove two screws on each of the four capacitors to release the wiring from the capacitor terminals. See Figure 56 on page 79.

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 55: Capacitor Wiring Removal (240 V Unit Shown)

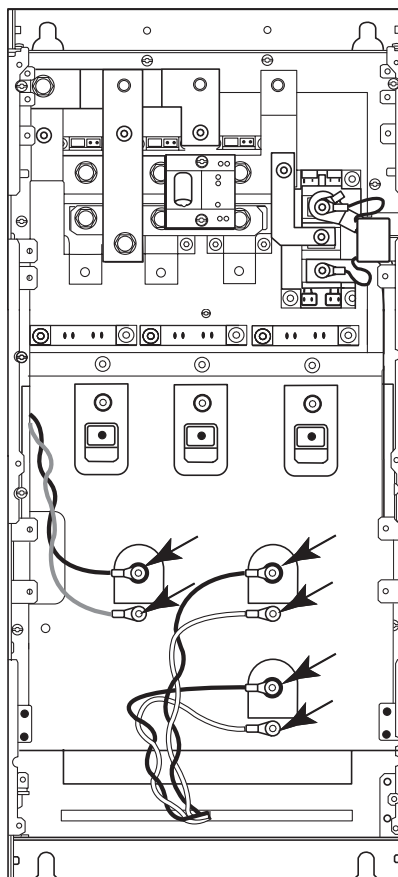
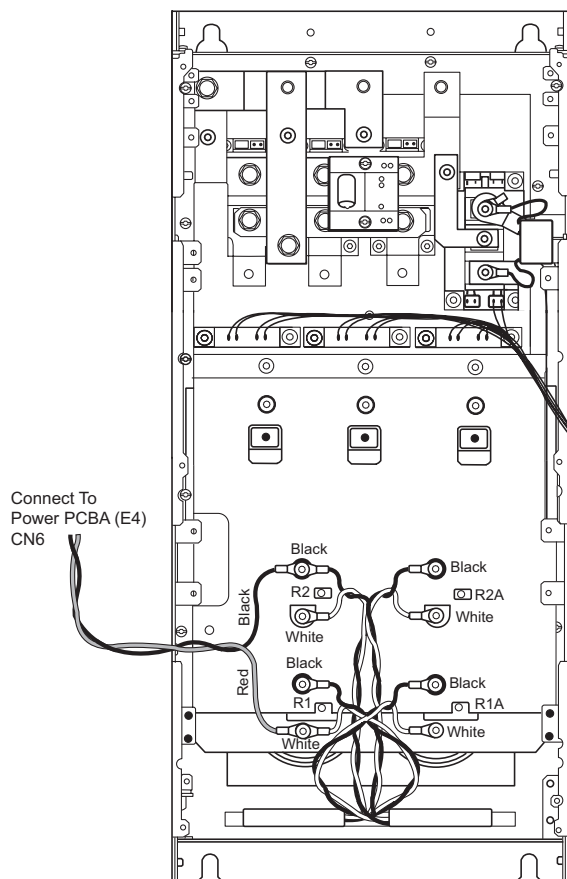


Figure 56: Capacitor Wiring Removal (480 V Unit Shown)

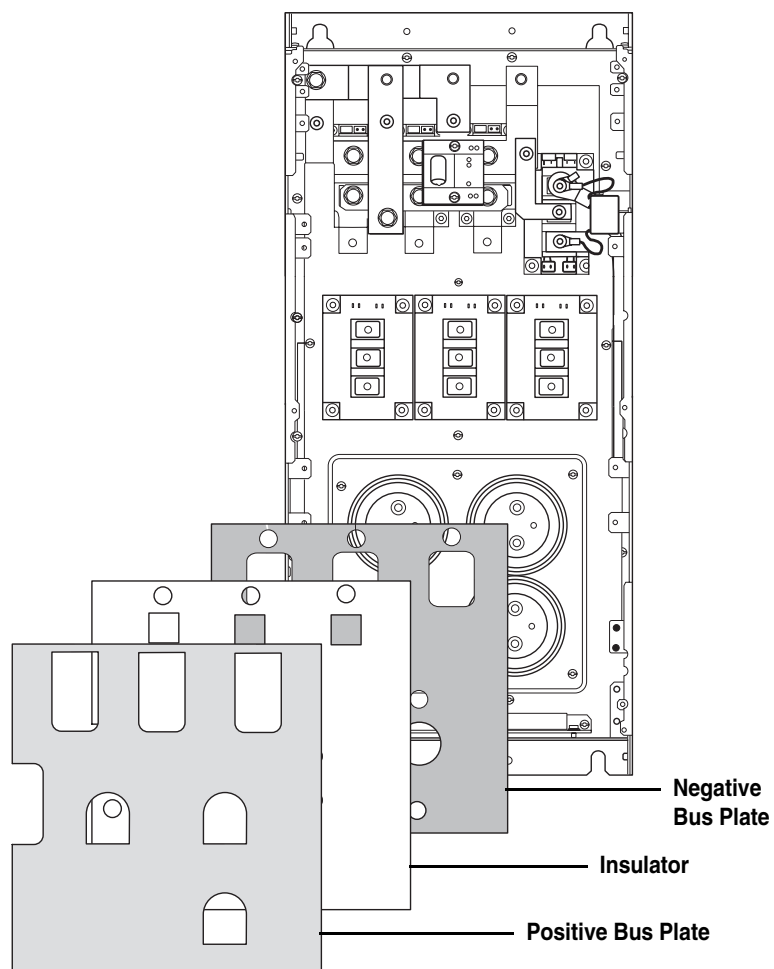


Remove the Bus Plates

10. Remove the bus plates as follows. See Figure 57.

- Lift the positive bus plate out of the drive.
- Remove the insulator between the positive and negative bus plates.
- Lift the negative bus plate out of the drive to expose the power IGBT modules and the capacitors.

Figure 57: Bus Plate Removal

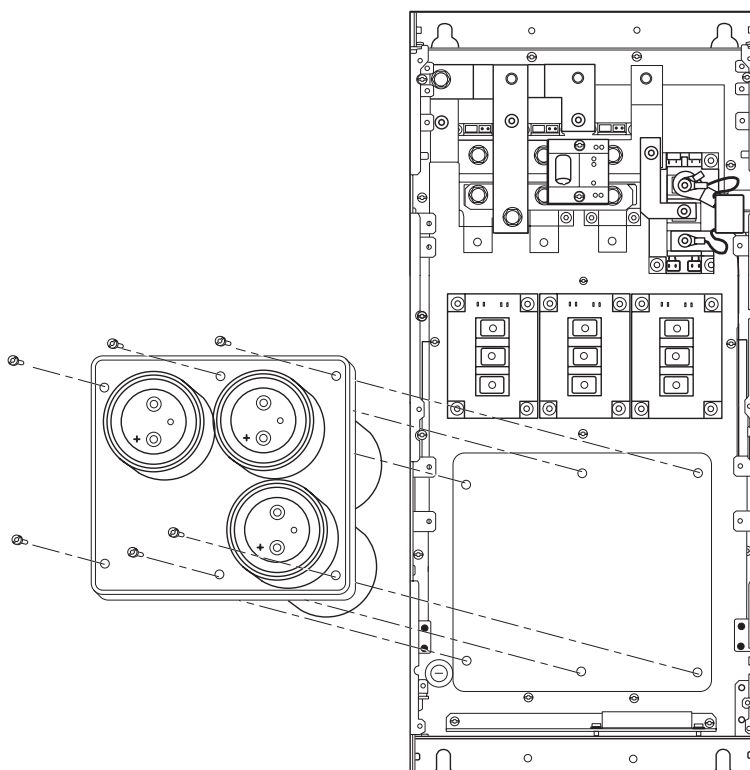


Replace the Capacitor Assembly VY1ADC1110, VY1ADC1115

11. Replace the capacitor assembly as follows. See Figure 58.

- Using a T-20 Torx driver, remove six screws securing the capacitor assembly to the drive frame and remove the 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 drive frame with six screws. Tighten the screws to 1.1–1.7 N•m (9.7–15.0 lb-in).

Figure 58: Capacitor Assembly Replacement (240 V Unit Shown)

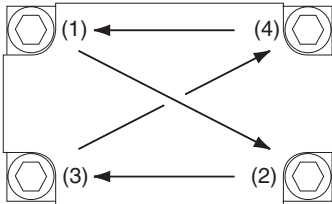


NEXT STEP: If you are also replacing the power IGBT modules, continue with Step 12 on page 82.

Otherwise, skip to Step 13 on page 84.

Replace the Power IGBT Modules VZ3IM1400M1271, VZ3IM1600M061

Figure 59: Torque Sequence



12. Replace the power IGBT modules as follows. See Figure 60.

- Remove the wiring from the power IGBT module that you are replacing. Carefully note the wiring connections for reassembly. See Table 11 on page 83.
- Using a T-30 Torx driver, remove four screws securing the power IGBT module to the heatsink.
- Remove the module from the heatsink and discard the module.
- 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.
- Position the new module on the heatsink.
- Using a T-30 Torx driver, secure the module with four screws. Initially tighten the screws, in the sequence shown in Figure 59, to 0.06–0.07 N•m (0.53–0.62 lb-in), and then to a final torque of 3.5–4.5 N•m (31.0–40.0 lb-in).
- Replace the wiring connections on the new power IGBT module. See Table 11 on page 83.

Figure 60: Power IGBT Module Replacement (240 V Unit Shown)

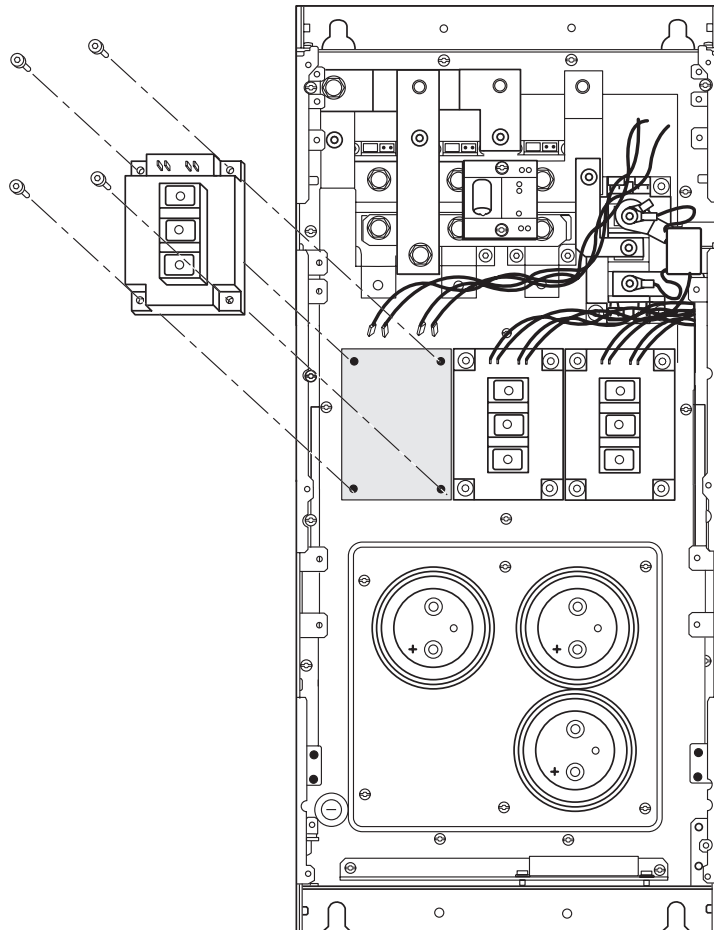


Table 11: Power IGBT Module Wiring

Wire No. ¹	Power IGBT ² No.	Power IGBT Terminal No.	Wire Description	To:
E114	IGBT 1	G2	Violet	PB ³ CNX
		E2	Red	
E118	IGBT 1	E1	Orange	PB CNU
		G1	Red	
E115	IGBT 2	G2	Violet	PB CNY
		E2	White	
E119	IGBT 2	E1	Orange	PB CNV
		G1	White	
E116	IGBT 3	G2	Violet	PB CNZ
		E2	Blue	
E120	IGBT 3	E1	Orange	PB CNW
		G1	Blue	

¹ See schematic on page 105 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 IGBT: Insulated-gate bipolar transistor

³ PB: Power board

Reinstall the Bus Plates

13. Reinstall the bus plates as follows. See Figure 61.

- Place the negative bus plate over the power IGBT modules and the capacitor assembly with the brass spacers facing up.
- Install the insulator over the negative bus plate. See Figure 61.

⚠ DANGER

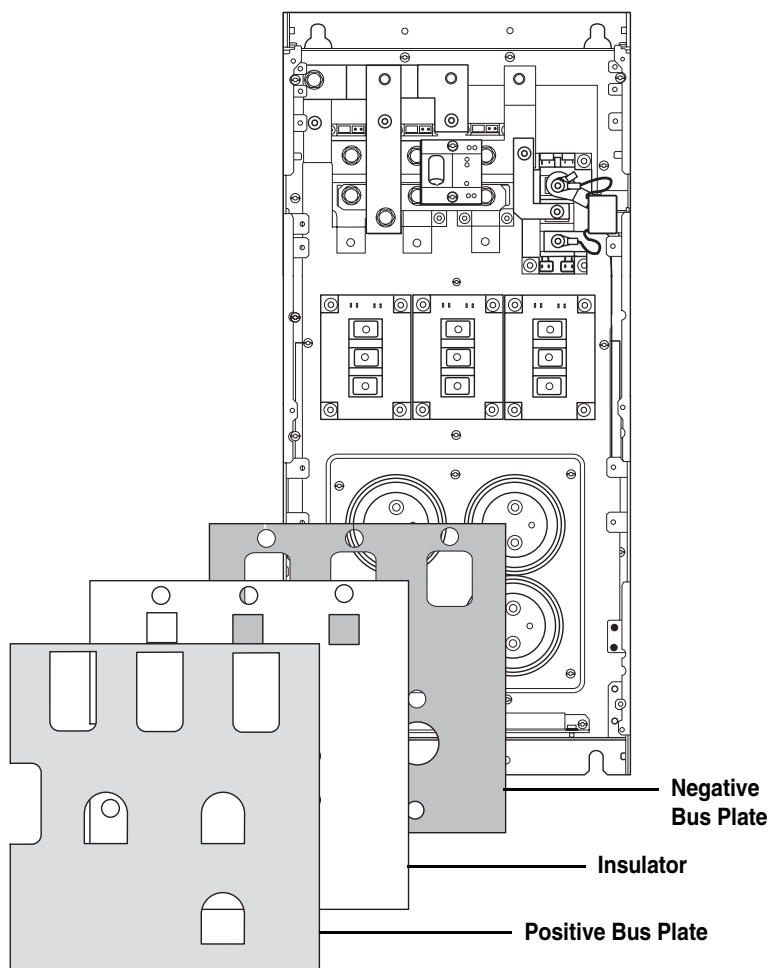
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Install the insulator as shown in Figure 61.
- 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.

- Place the positive bus plate over the insulator with the brass spacers at the top of the plate facing up.

Figure 61: Bus Plate Replacement



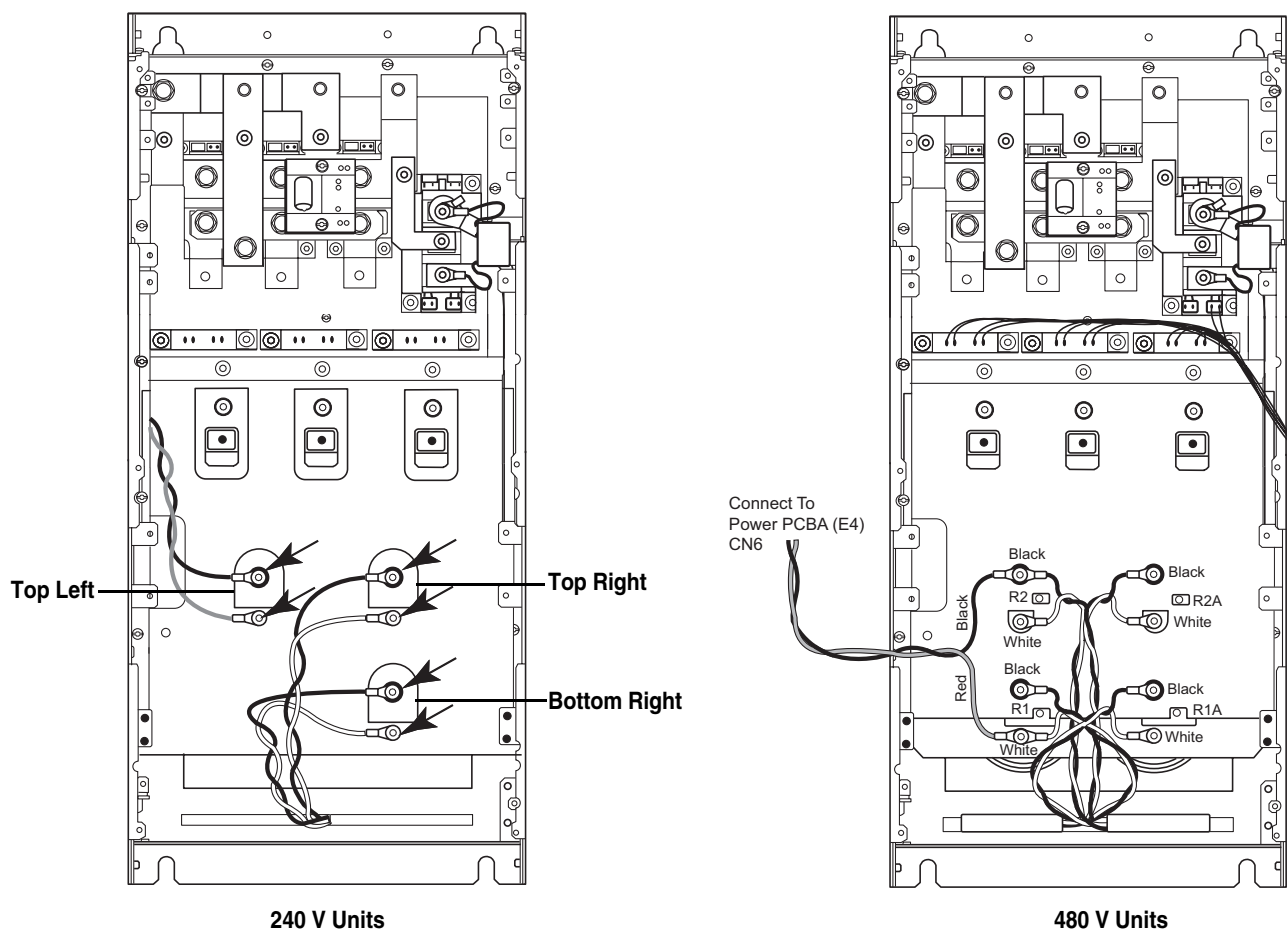
Replace the Capacitor Wiring

14. Connect the capacitor wiring as follows. See Figure 62.

NOTE: Refer to Figure 77 on page 105 for capacitor wiring. The capacitor assembly for the 240 V units has 3 capacitors. The assembly for the 480 V units has 4 capacitors.

- Top left capacitor: **Black** wire to negative (top) terminal, **red** wire to positive (bottom) terminal.
- Top right capacitor: **Black** wire to negative (top) terminal, **white** wire to positive (bottom) terminal.
- Bottom right capacitor: **Black** wire to negative (top) terminal, **white** wire to positive (bottom) terminal.
- **480 V units only:** Bottom left capacitor: **Black** wire to negative (top) terminal, **red** wire to positive (bottom) terminal.
- Using a T-30 Torx driver, secure the wiring with two screws on each of the capacitors as shown in Figure 62. Tighten the screws to 3.5–4.5 N•m (31.0–40.0 lb-in).

Figure 62: Capacitor Wiring

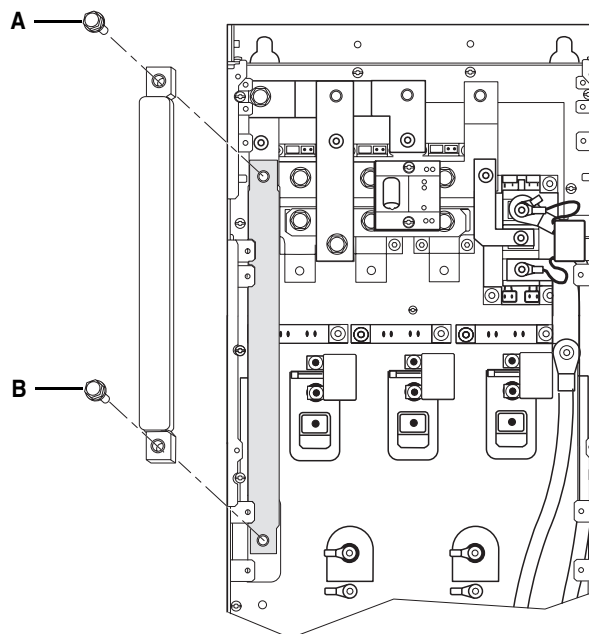


Replace the Negative Bus Bar

15. Replace the negative bus bar as follows: See Figure 63.

- Using a 13 mm socket, secure the negative bus bar to the silicon controlled rectifier (SCR) negative bus with one bolt (**A**). Tighten the bolt to 10–13.5 N•m (88.5–119.5 lb-in).
- Using a 13 mm socket, secure 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 63: Negative Bus Bar Replacement

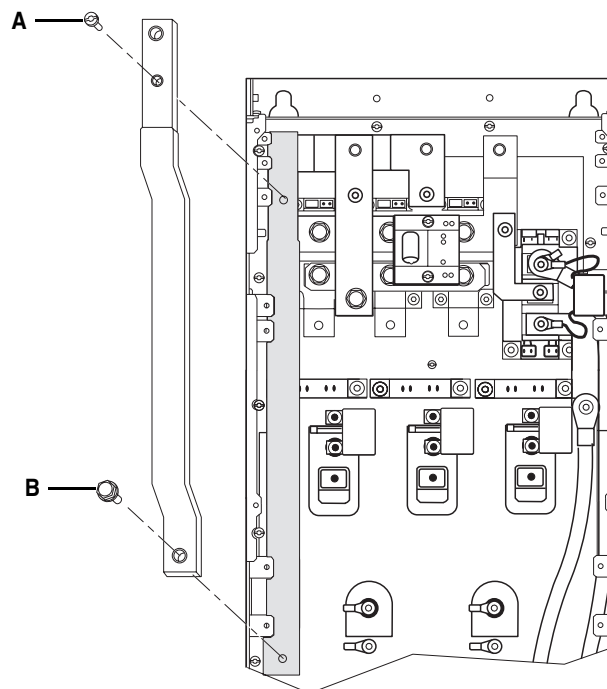


Replace the Positive Bus Bar

16. Replace the positive bus bar as follows. See Figure 64.

- Using a T-30 Torx driver, secure the positive bus bar to the silicon controlled rectifier (SCR) negative bus with one screw (**A**). Tighten the screw to 3.4–4.5 N•m (30.1–39.8 lb-in).
- Using a 13 mm socket, secure the positive bus bar to the positive bus plate with one bolt (**B**). Tighten the bolt to 10–13.5 N•m (88.5–119.5 lb-in).

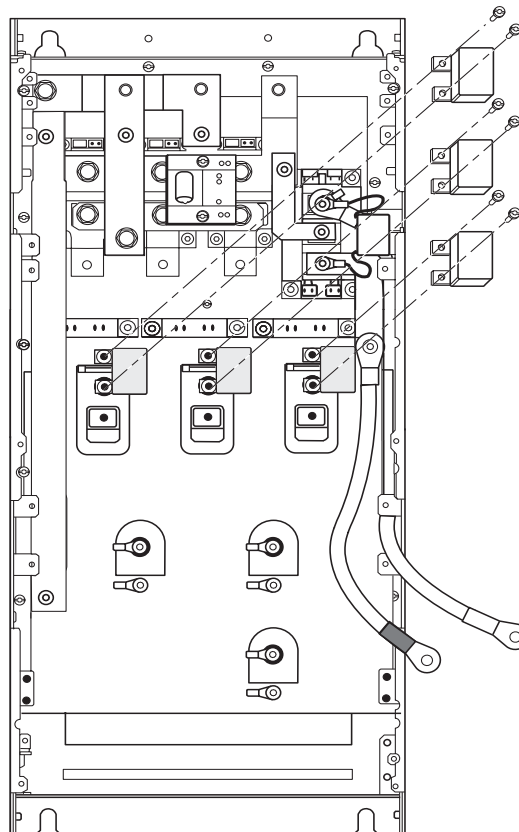
Figure 64: Positive Bus Bar Removal



Replace the Snubber Capacitors

17. Replace the three snubber capacitors on the power IGBT modules as follows. See Figure 65.
 - Position the three snubber capacitors over terminals C1 and E2 of the three power IGBT modules.
 - Using a T-30 Torx driver, secure the snubber capacitors to the power IGBT modules with two screws each. Tighten the screws to 3.4–4.5 N•m (30.1–39.8 lb-in).

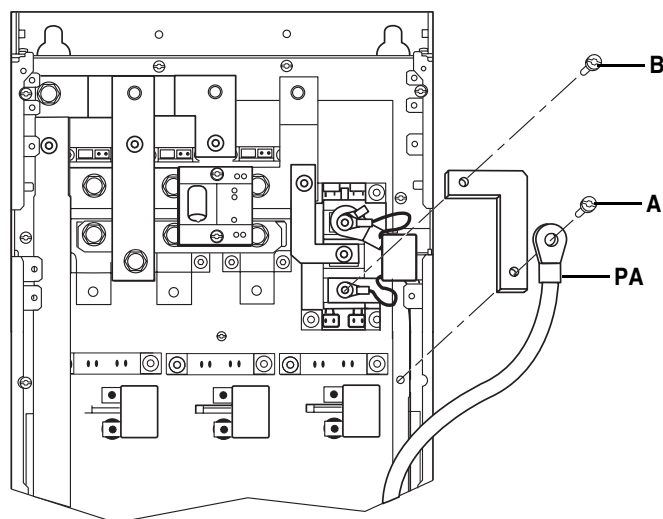
Figure 65: Snubber Capacitor Replacement



Replace the Jumper

18. Replace the jumper between the braking IGBT module and the positive bus plate as follows. See Figure 66.
 - Using a T-30 Torx driver, secure the jumper to terminal C1 on the braking IGBT module with one screw. Tighten the screw to 3.4–4.5 N•m (30.1–39.8 lb-in).
 - Using a T-30 Torx driver, secure the jumper and the PA power cable to the positive bus plate with one screw. Tighten the screw to 3.4–4.5 N•m (30.1–39.8 lb-in).

Figure 66: Jumper Replacement



Replace the Bottom Terminal Plate

19. Replace the bottom terminal plate as follows. See Figure 67 on page 91.

- Position the terminal plate on the drive frame.
- Using a Phillip's driver, secure the top left corner of the terminal plate to the drive frame with one screw (**A**). Tighten the screw to 1.1–1.7 N•m (9.7–15.0 lb-in).
- Position the insulator over the mounting holes at the right side of the terminal plate as illustrated in Figure 67 on page 91.

DANGER

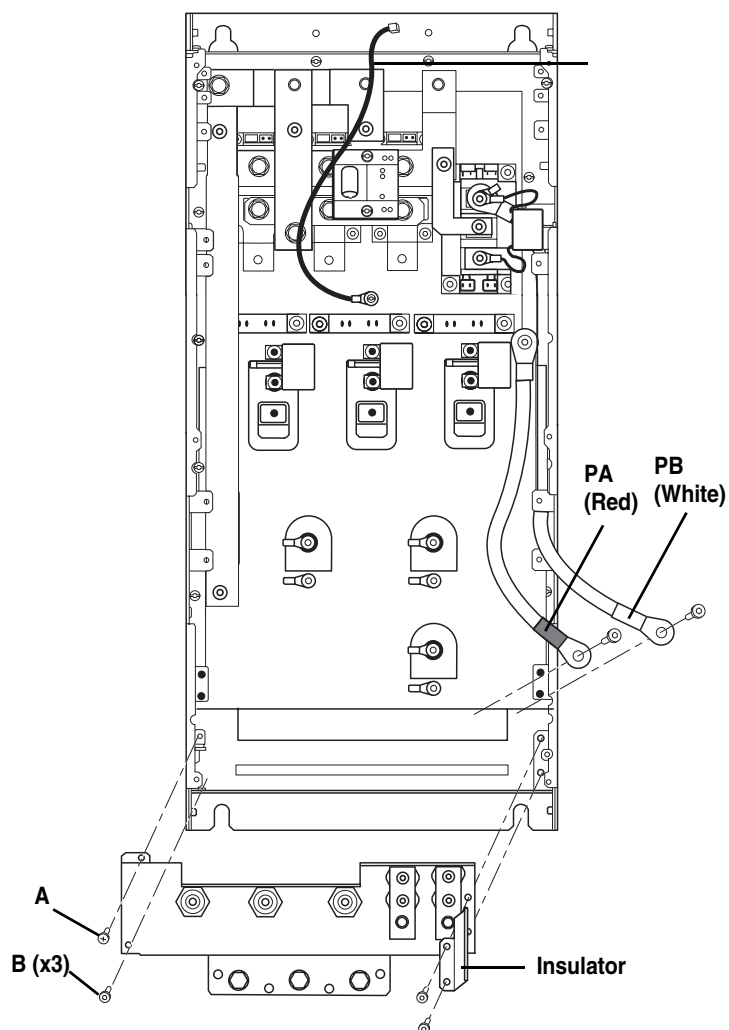
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Install the insulator as shown in Figure 67 on page 91.
- 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.

- Using a T-20 Torx driver, secure the terminal plate to the drive frame with three screws (**B**). Tighten the screws to 1.1–1.7 N•m (9.7–15.0 lb-in).
- Using a T-30 Torx driver, secure the PA (red) and PB (white) power cables to terminals PA and PB with two screws. Tighten the screw to 3.4–4.5 N•m (30.1–39.8 lb-in).

Figure 67: Bottom Terminal Plate Replacement



Replace the Input Bus Bars and Filter Board

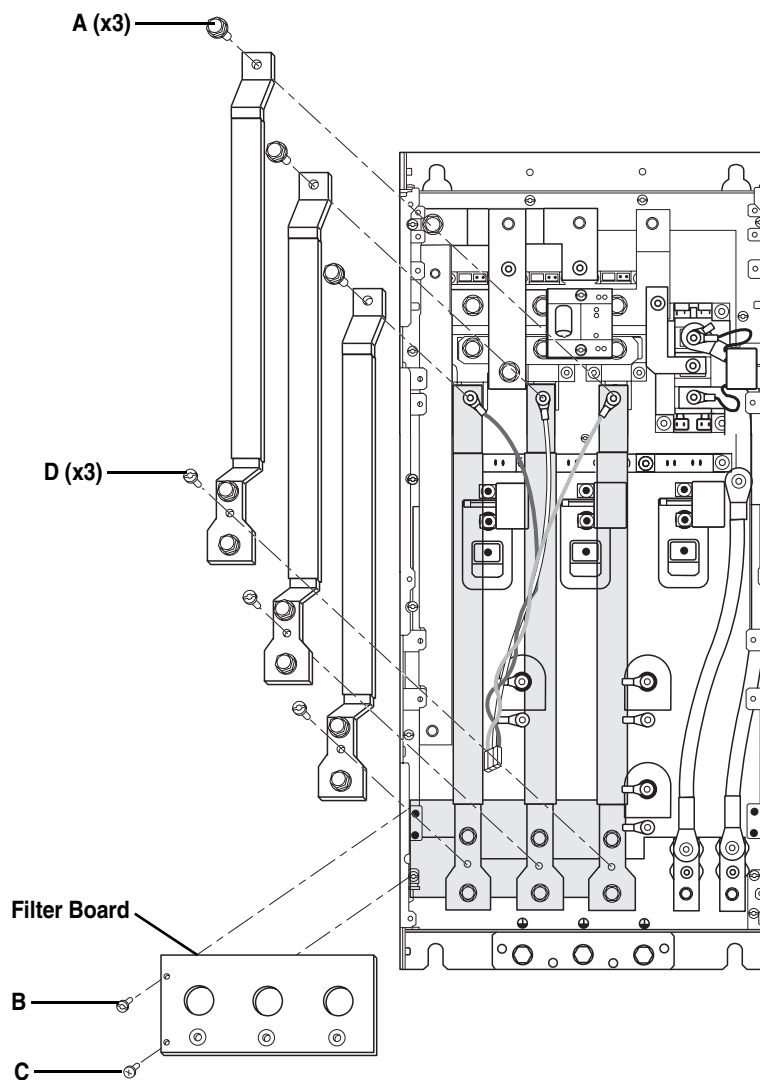
20. Replace the input bus bars as follows. See Figure 68 on page 93.

- Position the CN5 cable wiring and the input bus bars between terminal 1 on the silicon controlled rectifier (SCR) modules and the bottom terminal plate.
- Using a 13 mm socket, secure the CN5 cable wiring and input bus bars to terminal 1 of the SCR terminals with three bolts (**A**). Tighten the bolts to 10–13.5 N•m (88.5–119.5 lb-in).

NOTE: Note the cable positions. The red wire connects to SCR module 1, the white wire connects to SCR module 2, and the white wire connects to SCR module 3.

- Position the filter board over the input bus bars.
- Using a T-20 Torx driver, secure the top left corner of the filter board to the drive frame with one screw (**B**). Tighten the screw to 1.1–1.7 N•m (9.7–15.0 lb-in).
- Using a Phillips driver, secure the bottom left corner of the filter board to the terminal plate with one screw (**C**). Tighten the screw to 1.1–1.7 N•m (9.7–15.0 lb-in).
- Using a T-30 Torx driver, secure the filter board to the input line connections L1, L2, and L3 with three bolts (**D**). Tighten the bolts to 3.4–4.5 N•m (30.1–39.8 lb-in).

Figure 68: Input Bus Bar Replacement

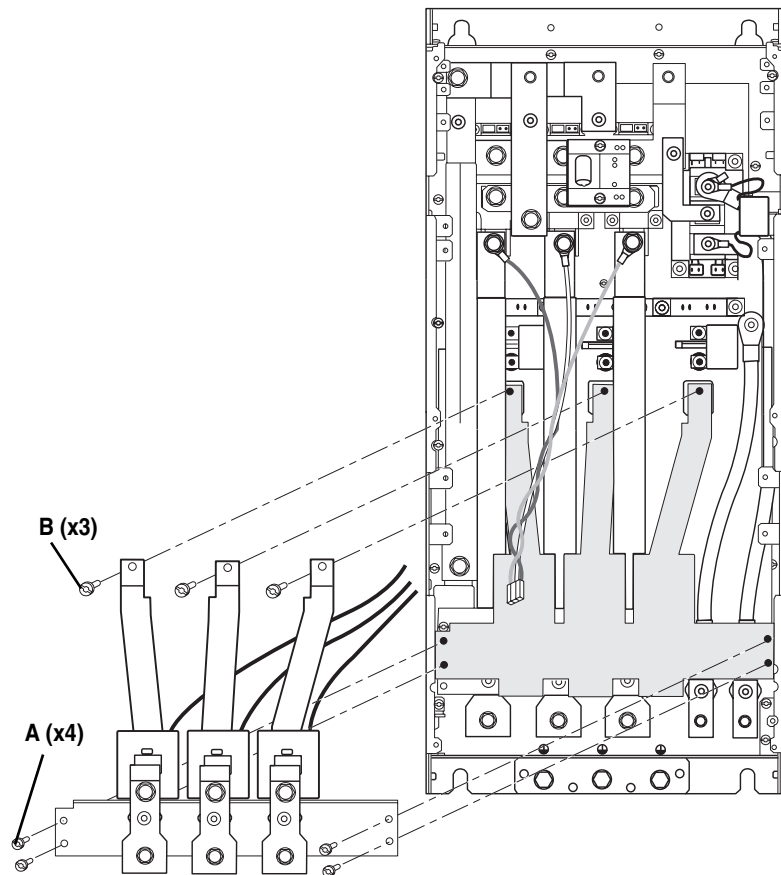


Replace the Output Bus Bars

21. Replace the output bus bars as follows. See Figure 69.

- With the output bus bars attached, position the bottom crossbrace in the drive.
- Using a T-20 Torx driver, secure the crossbrace to the drive frame with four screws **(A)**. Tighten the screws to 1.1–1.7 N•m (9.7–15.0 lb-in).
- Using a T-30 Torx driver, secure the output bus bars to the power IGBT modules with three screws **(B)**. Tighten the screws to 3.4–4.5 N•m (30.1–39.8 lb-in).

Figure 69: Output Bus Bar Replacement



Reassemble the Drive

If you are only replacing SCR or IGBT modules, perform Steps 1–8 of “Reassembling the Drive” beginning on page 95 to replace the following parts:

- ☐ The top cover
- ☐ The power board mounting plate
- ☐ The power board connections
- ☐ The control module connections
- ☐ The control module plate
- ☐ The soft charge board connections
- ☐ The conduit tray and power terminal shield
- ☐ 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 5 before performing this procedure.
- Before working on this equipment, turn off all power supplying it and perform the DC bus voltage measurement procedure on page 11.

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

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

- ☐ The top cover
- ☐ The power board mounting plate
- ☐ The power board connections
- ☐ The control module connections
- ☐ The control module plate
- ☐ The soft charge board connections
- ☐ The conduit tray and power terminal shield
- ☐ 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.

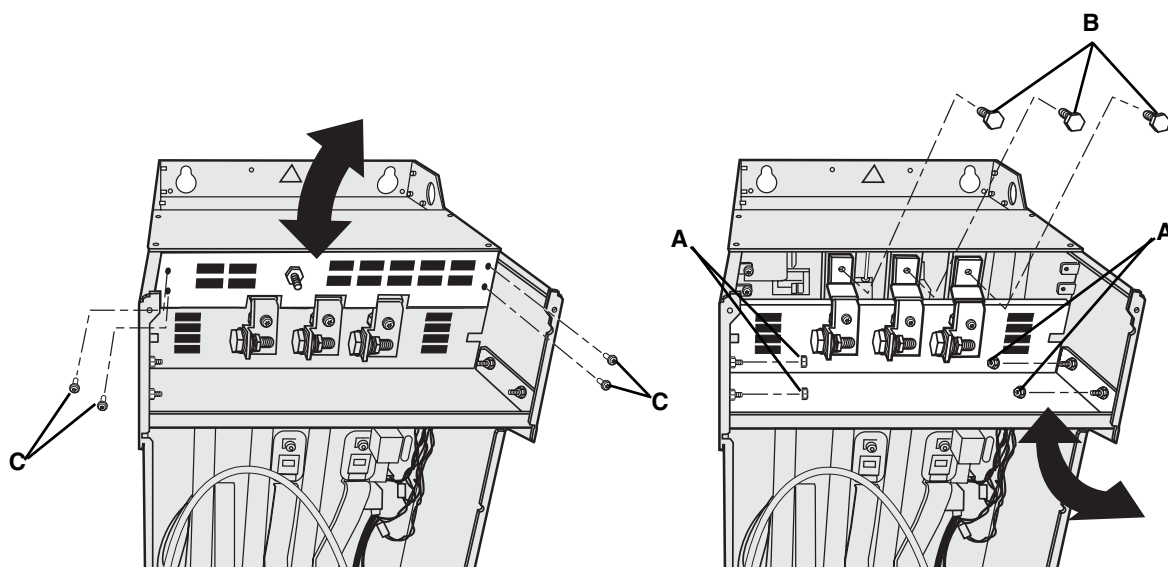
Table 12: Reassembly Steps

If you replaced the:	Perform reassembly steps:
Power board	Steps 3–8
Current sensors	Steps 2–8
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. The top cover consists of two plates; one in the back and one in the front. Reinstall the plates as follows. See Figure 70.
 - Using a 10 mm wrench, secure the front plate to the drive frame with four nuts (**A**). Tighten the nuts to 4.2–5.1 N•m (37.2–45.1 lb-in).
 - Using a 13 mm socket wrench, install three bolts (**B**) securing the DC choke connections to (from left to right): the silicon controlled rectifier (SCR) positive bus, the positive bus, and the SCR negative bus. Tighten the bolts to 10–13.5 N•m (88.5–119.5 lb-in).
 - Using a T-20 Torx driver, secure the back plate to the drive frame with four screws (**C**). Tighten the screws to 1.1–1.7 N•m (9.7–15.0 lb-in).

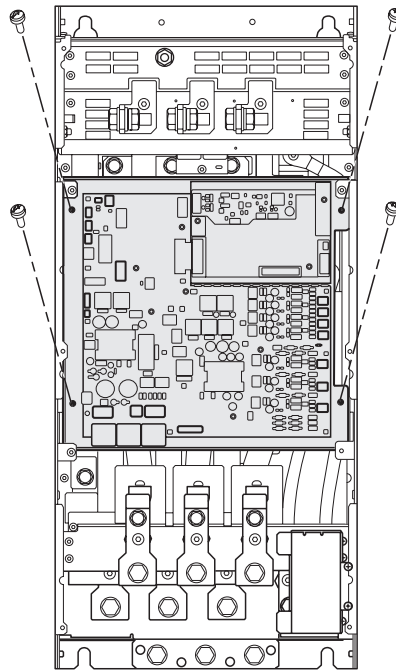
Figure 70: Top Cover Plate Replacement



Replace the Power Board Mounting Plate

2. Using a T-20 Torx driver, secure the power board mounting plate to the drive frame with the four screws. See Figure 71. Tighten the screws to 1.1–1.7 N•m (9.7–15.0 lb-in).

Figure 71: Power Board Mounting Plate Replacement



Replace the Power Board Connections

3. Install the following connections on the power bower board. See Figure 72 and Table 13 on pages 98 and 99 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 10-pin connector at terminal CNX4, the 6-pin connector at terminal CN25, and the 2-pin connector at terminal CN12.
 - At the right side of the board, from top to bottom install: the 10-pin connector at terminal CNX2, the 40-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 72: Power Board Connections

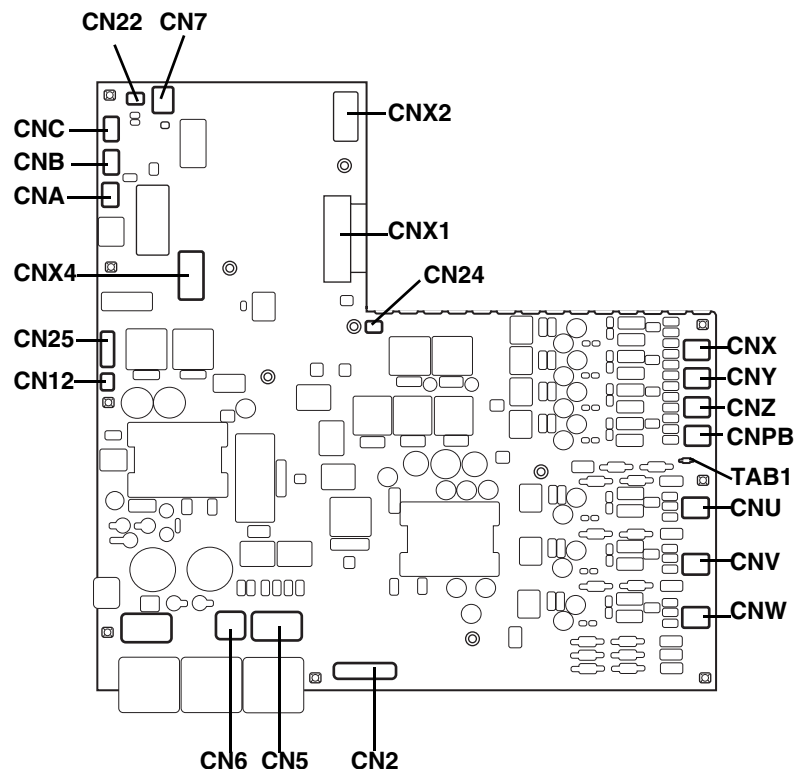


Table 13: Power Board Wiring

Wire No. ¹	Terminal No.	Description	To:
E102	CN22	2-pin, black	Temperature sensor wire
E106	CN7	2-pin, red/black	Soft charge board, CN7A
E124	CNC	3-pin, blue	Current sensor 3
E125	CNB	3-pin, white	Current sensor 2
E126	CNA	3-pin, red	Current sensor 1
E112	CNX4	10-pin	Control module
E103	CN25	6-pin	External fans
E104	CN12	2-pin	Internal fan
—	CNX2	10-pin	Motor control board, X2
—	CNX1	40-pin	Motor control board, X1
E101	CN24	2-pin	Charge LED
E114	CNX	2-pin, violet/red	Power IGBT ² module 1, G2 and E2
E115	CNY	2-pin, violet/white	Power IGBT module 2, G2 and E2
E116	CNZ	2-pin, violet/blue	Power IGBT module 3, G2 and E2
E117	CNPB	2-pin	Braking IGBT module, G2 and E2
E113	TAB1	lug	Braking IGBT module, C2E1
E118	CNU	2-pin, orange/red	Power IGBT module 1, E1 and G1
E119	CNV	2-pin, orange/white	Power IGBT module 2, E1 and G1
E120	CNW	2-pin, orange/blue	Power IGBT module 3, E1 and G1
E127	CN6	3-pin, black/red	Capacitor
E110	CN5	5-pin	SCR ³ 1 (Red) SCR 2 (White) SCR 3 (Blue)
E105	CN2	9-pin	Soft charge board, CN2A

¹ See schematic on page 105 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 IGBT: Insulated-gate bipolar transistor

³ SCR: Silicon controlled rectifier

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
E104	PB CN12	2-pin	Internal fan
E101	PB CN24	2-pin	Charge LED

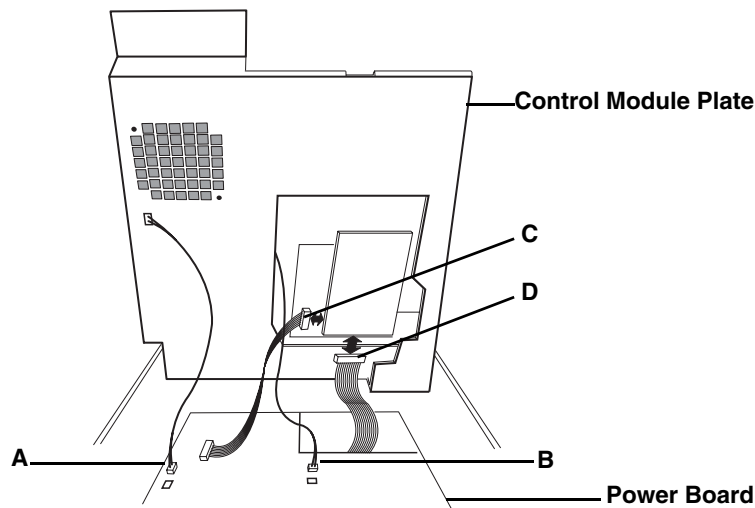
¹ See schematic on page 105 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

² PB: Power board

³ MCB: Motor control board

4. Install the control module connections as follows. See Figure 73.
- On the power board, install: the 2-pin connector (A) at terminal CN12 and the 2-pin connector (B) at terminal CN24.
 - On the back of the control module, install: the 10-pin connector (C) connecting the control module to terminal CNX4 on the power board and the 26-pin connector (D) connecting the control module to terminal X3 on the power board.

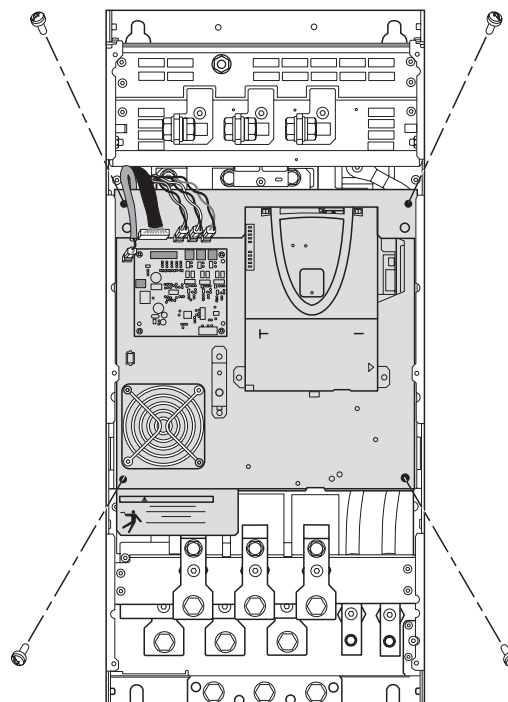
Figure 73: Control Module Plate Connections



Replace the Control Module Plate

5. Replace the control module plate as follows. See Figure 74.
 - Ensuring that the wires from the silicon controlled rectifier (SCR) modules and 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 (9.7–15.0 lb-in).

Figure 74: Control Module Plate Replacement



Replace the Soft Charge Board Connections

Table 15: Soft Charge Board Wiring

Wire No. ¹	Terminal No.	Description	To:
E105	CN2A	9-pin	PB ² CN2
E109	CNL1G	2-pin, Red/Black	SCR ³ 1
E108	CNL2G	2-pin, White/Black	SCR 2
E107	CNL3G	2-pin, Blue/Black	SCR 3
E106	CN7A	2-pin, Red/Black	PB CN7

¹ See schematic on page 105 for complete drive wiring. Wire numbers are given for cross referencing the wires with the wiring table and the schematic. The numbers do not appear on the wires.

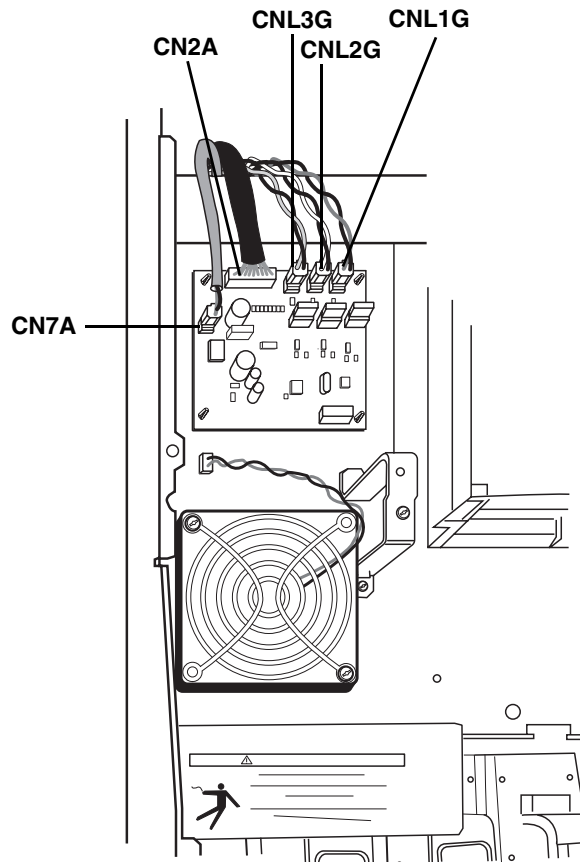
² PB: Power board

³ SCR: Silicon controlled rectifier

6. Install the following connections on the soft charge board. See Table 15 and Figure 75 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, install the 2-pin connector at terminal CN7A.

Figure 75: Soft Charge Board Connections



Replace the Power Terminal Shield and Reinstall the Conduit Tray

7. Replace the power terminal shield and conduit tray as follows. See Figure 76.

⚠ DANGER

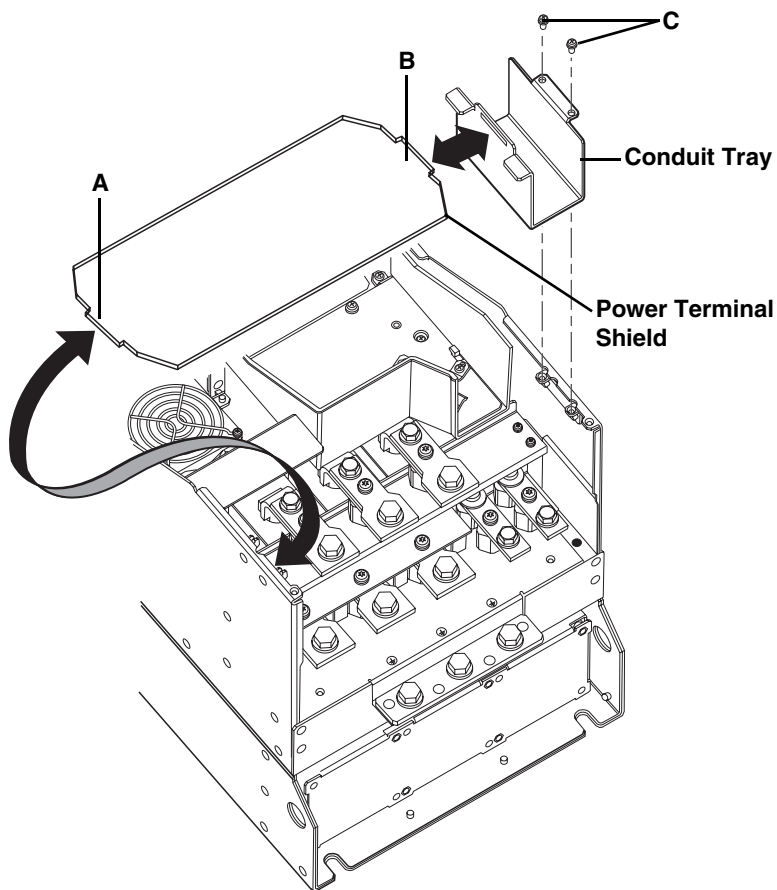
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Install the power terminal shield as shown in Figure 5.

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

- Slide the tab on the left side of the power terminal shield (**A**) under the retaining notches on the drive frame, and slide the tab on the right side of the shield (**B**) 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 size 2 Phillips driver, secure the conduit tray to the drive frame with two screws (**C**). Tighten the screws to 1.1–1.7 N•m (9.7–15.0 lb-in).

Figure 76: Conduit Tray and Terminal Shield Replacement



Replace the Front Cover

8. Replace the front cover. Using a size 2 Phillips driver, secure the front cover with seven screws. See Figure 1 on page 13. Tighten the screws to 1.1–1.7 N•m (9.7–15.0 lb-in).

Wiring

Table 16: Wiring Table

Wire No. ¹	Description	From:		To:	
		Component	Terminal No.	Component	Terminal No.
E101	2-pin	Power board	CN24	Charge LED	—
E102	2-pin, black	Power board	CN22	Temperature sensor wire	—
E103	6-pin	Power board	CN25	External fan	—
E104	2-pin	Power board	CN12	Internal fan	—
E105	9-pin	Power board	CN2	Soft charge board	CN2A
E106	2-pin, red/black	Power board	CN7	Soft charge board	CN7A
E107	2-pin, black/blue	SCR ² 3	4, 5	Soft charge board	CNL3G
E108	2-pin, black/white	SCR 2	4, 5	Soft charge board	CNL2G
E109	2-pin, black/red	SCR 1	4, 5	Soft charge board	CNL1G
E110	5-pin	Power board	CN5	SCR modules 1, 2, 3	1
E112	10-pin	Power board	CNX4	Control module	—
E113	Lug	Power board	TAB1	Braking IGBT ³ module	C2E1
E114	2-pin, violet/red	Power board	CNX	Power IGBT module 1	G2, E2
E115	2-pin, violet/white	Power board	CNY	Power IGBT module 2	G2, E2
E116	2-pin, violet/blue	Power board	CNZ	Power IGBT module 3	G2, E2
E117	2-pin, purple/orange	Power board	CNPB	Braking IGBT module	G2, E2
E118	2-pin, orange/red	Power board	CNU	Power IGBT module 1	G1, E1
E119	2-pin, orange/white	Power board	CNV	Power IGBT module 2	G1, E1
E120	2-pin, orange/blue	Power board	CNW	Power IGBT module 3	G1, E1
E124	3-pin, blue	Power board	CNC	Current sensor 3	—
E125	3-pin, white	Power board	CNB	Current sensor 2	—
E126	3-pin, red	Power board	CNA	Current sensor 1	—
E127	3-pin, black/red	Power board	CN6	Capacitors ⁴	—

¹ Wire numbers are given for cross referencing the wires with the schematic on page 105. The numbers do not appear on the wires.

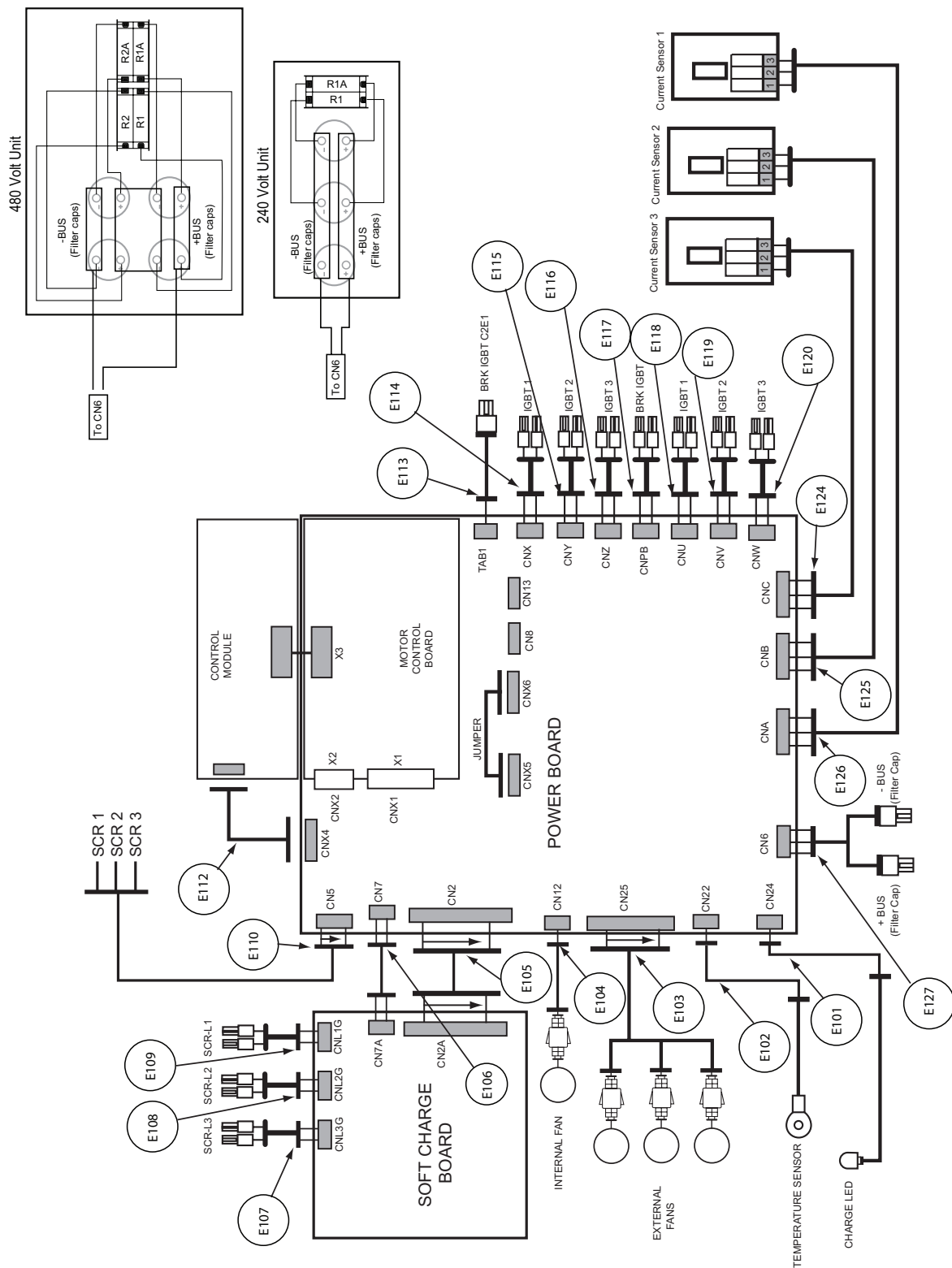
² SCR: Silicon controlled rectifier

³ IGBT: Insulated-gate bipolar transistor (IGBT) module

⁴ See Figure 77 for capacitor wiring.

Figure 77: Wiring Schematic

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



Spare Parts Kits for Altivar® 61/71 Drives, Frame Size 9
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