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ALTIVAR™ 66

Adjustable Frequency Drive Controllers for Asynchronous Motors

Service and Troubleshooting Manual
1 to 200 hp, 460 V

Note:

This manual does not cover:

- **230V Drives**
- **250-400 Hp Drives**
- **ATV56 Drives**

Telemecanique

SQUARE D

⚠ DANGER

HAZARDOUS VOLTAGE

This product contains energy storage devices. Read and understand this bulletin as well as bulletins supplied with your specific equipment before maintaining or servicing the ALTIVAR 66 Drive controller. Installation, adjustment, service and maintenance of these drive controllers must be performed by qualified personnel.

- Confirm that drive controller has been correctly selected, installed, and applied before performing any service or maintenance.
- Verify that all drive controller overcurrent protective devices, conductors, enclosures, and other circuit elements have been correctly selected for application and that drive controller is properly grounded in accordance with equipment instruction bulletin recommendations and applicable code requirements.
- Some measurements must be done with power applied to equipment. Many parts in this drive controller, including printed circuit boards, operate at line voltage. DO NOT TOUCH. Use personal protective equipment and follow precautions and measurement procedures referenced in this bulletin when making any measurements on energized equipment. Use instruments and insulated tools approved for job.
- Disconnect all power before servicing drive controller. WAIT ONE MINUTE until DC bus capacitors discharge, then measure DC bus capacity or voltage between the PA and (-) terminals to verify that DC voltage is less than 45 VDC (refer to “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in Chapter 5). DC bus LED is not accurate indication of absence of DC bus voltage.
- DO NOT short across DC bus capacitors or touch unshielded components or terminal strip screw connections with voltage present.
- Install all covers and close drive controller door before applying power or starting and stopping drive controller.
- Observe and follow all applicable lock-out and tag-out procedures for specific installation.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

Chapter 1: Introduction

Chapter 2: Investigating the Problem

Chapter 3: Correcting the Problem

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CHAPTER 1: INTRODUCTION

ALTIVAR 66 FAMILY

ALTIVAR 66 is a family of 3 to 350 hp (CT) or 400 hp (VT), 2.2 to 300 kW, adjustable speed AC drive controllers. Capable of controlling either constant or variable torque loads, and designed to handle simple or complex applications, ALTIVAR 66 drive controllers can function as stand-alone drive controllers or as part of complex drive systems.

SCOPE OF MANUAL

This manual covers the ALTIVAR 66 drive controllers listed in Table 1.

Table 1: ALTIVAR 66 Drive Controllers

Model Number	Outline
ATV66U41N4 ATV66U54N4 ATV66U72N4	1
ATV66U90N4 ATV66D12N4	2
ATV66D16N4 ATV66D23N4	3
ATV66D33N4 ATV66D46N4	4
ATV66D54N4 ATV66D64N4 ATV66D79N4	5
ATV66C10N4 ATV66C13N4 ATV66C15N4 ATV66C19N4	6

HOW TO USE THIS MANUAL

This manual consists of five chapters.

Chapter 1, Introduction, explains how to use the troubleshooting manual and describes work practice precautions that should be read, understood, and observed before attempting any of the procedures in this manual. It also lists the tools and instruments required for the procedures described in this manual, related documentation, and applicable standards.

Chapter 2, Investigating the Problem, describes a general approach to identifying and correcting drive controller problems. It describes how to use the controller's LED indications, keypad display, and various menus for identifying drive controller faults and faulty operating conditions.

Chapter 3, Correcting the Problem, contains procedures for identifying and correcting the causes of the drive controller faults and faulty operating conditions described in chapter 2.

Chapter 4, Equipment Change Out, lists spare parts available for ALTIVAR 66 drive controllers and contains instructions for changing out faulty components and equipment.

Chapter 5, Basic Procedures, contains procedures for measuring bus and input line voltage, checking peripheral equipment, removing mains power, working on energized equipment, testing the drive controller after corrective action has been taken, checking fan operation, cleaning heat sinks and air passages, running the drive controller from control power only, and checking the software revision level.

To effectively use the manual, first review the work practice precautions in chapter 1, and then identify the problem using the approaches in chapter 2. After the problem has been identified, proceed to chapter 3 to find the cause and appropriate

corrective action.Where applicable, use the procedures in chapter 4 to change out defective component(s). The procedures detailed in chapter 5 are to be used whenever they are referenced in other places in the manual

WORK PRACTICE PRECAUTIONS

For the protection of personnel and equipment, a qualified maintenance person must perform the procedures detailed in this manual. The maintenance person should:

- Be able to read, interpret, and follow instructions and precautions in this manual and the other manuals referenced.
- Be able to use the tools listed on page 5 of this manual in a safe and technically correct manner.
- Be able to perform troubleshooting and equipment change out procedures while following the safety procedures recommended in ANSI / NFPA 70E.
- Be trained on the operation and fundamentals of AC controllers and systems and be familiar with the associated hazards.

Review the sections below for personnel and equipment protection precautions before performing any troubleshooting or equipment change out procedures.

Personnel Protection Precautions

The drive controller contains elements which can be potentially hazardous to maintenance personnel. Semiconductor devices can exhibit hazardous leakage currents in the “off” state, and bus capacitors store energy which can be hazardous to personnel for some period after the controller is disconnected from line power. All personnel who will perform troubleshooting or equipment change out procedures should be thoroughly familiar with ANSI / NFPA 70E. **Read and understand the precautions and hazard statements found on the inside front cover of this manual.**

A partial listing of safety measures which should be followed are listed below:

1. Verify that the equipment has been installed and applied in a fashion that is consistent with the information in the equipment instruction manual, applicable code requirements, and regulations.
2. Coordinate all troubleshooting / equipment change out procedures with the operations manager of the facility.
3. Ensure that the controlled equipment is disconnected from the drive controller or that access to it is prohibited.
4. Read all precautions in this manual which relate to the procedure being followed.
5. Make sure you are familiar with the tools and instruments required for the specific procedures described in this manual.
6. Ensure that you have proper body protection, including clothing, eye protection, helmet, etc.
7. Ensure that electrical equipment which surrounds the controller is either deenergized or isolated in such a way that maintenance personnel are not subject to electrical shock.
8. Ensure that all power sources which feed the controller are deenergized and locked and tagged out before opening the controller door or performing any equipment change out procedures. Never assume the power is off. Always check for voltage with a properly rated voltage sensing device.
9. Inspect the drive controller bonding and ground system and ensure that the drive controller is properly grounded per the applicable codes and recommendations in the drive controller instruction manual.

10. Ensure that the controller door is closed and secured by the applicable latches before energizing a controller.
11. If you must work on energized equipment, a number of safety rules must be followed. Use personal protective equipment and follow procedures to prevent accidental contact between tools and energized equipment. If contact occurs, arcing faults can be created. Ionized gas and a shower of high-temperature particles will be generated which can cause death and severe burns. Further information can be found in OSHA 29 CFR Part 1910, Electrical Safety-Related Work Practices.

Equipment Protection Precautions

The drive controller uses a complex system of interrelated subsystems and specialized components to achieve rated performance during operation. Many devices and components in the controller require special attention. For example, some of the controller components are sensitive to the method of handling or mounting. In addition, many fasteners require specific torque settings for proper operation. Follow the guidelines listed below and throughout the manual when performing change out procedures.

- Be sure to install thermal grease or the supplied Thermstrate™ foil when mounting components which use the heat sink for dissipating heat (i.e. voltage regulators and power semiconductor devices).
- Always torque semiconductor components using the method described in the applicable equipment change out procedure.
- When disconnecting the J3, J4, and J5 connectors from the control basket or printed circuit board, ensure that the cable connectors are in their released position.
- Never operate the controller after performing equipment change out procedures without verifying that the J3, J4, J5, J9, and J32 cables are properly connected to the printed circuit board and to the control basket.
- If the controller is removed from its permanent mounting location for performing troubleshooting / equipment change out procedures, ensure that it is properly secured in an upright position before reenergizing.
- During maintenance, do not block, impede, or otherwise diminish cooling air flow over or through the controller.
- A number of printed wiring board assemblies are equipped with non-volatile memory and will require programming if replaced. Existing or factory default programs within assemblies may not be suitable for the specific application. Always check the controller for the appropriate software configuration after replacing, removing, or swapping printed wiring board assemblies.

Static Sensitive Components

Observe the following precautions when handling electrostatic sensitive components (circuit boards, IGBT's, etc.):

- Keep static producing material (plastic, upholstery, carpeting, etc.) out of immediate work area.
- Leave electronic-sensitive assemblies in protective packaging when they are not installed in drive controller. Do not handle assembly or remove from protective package until assembly and wrist strap are properly grounded (see next precaution).
- Wear a conductive wrist strap connected through a minimum of one megohm resistance to the host device. If the host device (such as printed wiring board assembly) has no grounding point, place it on a grounded, conductive surface and connect the wrist strap through a minimum of one megohm to the conductive surface.

- Avoid touching exposed conductors and component leads with skin or clothing.

LIST OF TOOLS AND INSTRUMENTS

The tools and instruments required for performing maintenance and replacing components on the drive controllers are listed below:

- Set of magnetized flat blade screw drivers
- Set of magnetized phillips screw drivers
- Set of Torx® screw drivers
- 1/4" drive metric socket set, 5.5 to 14 mm
- 2" (1/4" drive) socket extension
- 12" (1/4" drive) socket extension
- Metric hex key set, 2 to 14 mm
- Regular hex key set, 1/4" to 9/16"
- Metric ball-end hex key set, 2 to 14 mm
- Clip pliers (Catalog No. VY1-ADV608)
- Torque wrench, 4.4 to 352 lb-in (0.5 to 40 N•m)
- Metric hex key sockets for torque wrench
- Metric drive sockets for torque wrench
- Phillips screw driver sockets for torque wrench
- Flat blade screw driver sockets for torque wrench
- 4" Needle nose pliers
- Antistatic wrist strap
- Antistatic carpet/ground connection
- Thermal grease (Thermalloy Thermalcote™ II, Part No. 349 or equivalent)
- Set of open/box end wrenches, 5.5 to 19 mm
- Wire cutters
- Plastic tie wraps (8” length)
- Multimeter, 0-1000 V (Fluke 87 or equivalent)
- Clamp-On Current Probe, 0-600 A (Fluke 80i-600A or equivalent)
- English hex wrenches, 5/16" and 3/8"
- Electrical tape

DOCUMENTATION LIST

The following ALTIVAR 66 drive controller documents are available:

- Instructions for Safe Handling, Installation, Operation and Maintenance of Electrical Control Equipment: 30072-200-50_ (latest revision)
- Enclosed ALTIVAR 66 Drive Controllers, Class 8839: 50006-523-07_ (latest revision)
- Receiving, Installation and Start-Up: VD0C06S304_ (latest revision)
- Level 1& 2 Configuration: VD0C06S305_ (latest revision)
- I/O Extension Module and Level 3 Configuration: VD0C06T306_ (latest revision)
- ALTIVAR 66 AC Drives Catalog: VD0C06S201_ (latest revision)
- Dynamic Braking Resistor Kit: VD0C06N908_ (latest revision)
- Application Guide: SC100 R5/95
- Communication Carrier Module, VD0C06N915_ (latest revision)
- PCMCIA Memory Card, VD0C06T919_ (latest revision)
- Gasket Kit for Recess Mounting: VD0C06T918_ (latest revision)
- Mounting Adapter Plate Kit: VD0C06N922_ (latest revision)

- Keypad Door Mounting Kit: VD0C06N904_ (latest revision)

Additional documentation is provided with the optional peripherals.

STANDARDS

The following standards are referenced:

- NFPA 70B, Electrical Equipment Maintenance, 1990 Edition
- NFPA 70E, Electrical Safety Requirements for Employee Workplaces, 1988 Edition
- NEMA ICS 1.1, Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control, 1990 Edition
- NEMA ICS 1.3, Preventive Maintenance of Industrial Control and Systems Equipment, 1992 Edition
- NEMA ICS 2 - 1993 Annex A, Maintenance of Motor Controllers After a Fault Condition
- NEMA ICS 7, Adjustable Speed Drives
- NEMA ICS 7.1, Safety Standards for Construction and Guide for Selection, Installation, and Operation of Adjustable-Speed Drive Systems
- OSHA 29 CFR Part 1910, Electrical Safety-Related Work Practices

REVISION LEVEL

This is a new document.

CHAPTER 2: INVESTIGATING THE PROBLEM

INTRODUCTION

The ALTIVAR 66 drive controller is part of an overall electrical distribution and control system. While a specific fault may occur with the drive controller, there are times when the fault may be caused by external factors. Figure 1 provides a general overview of the typical causes and severity of faults.

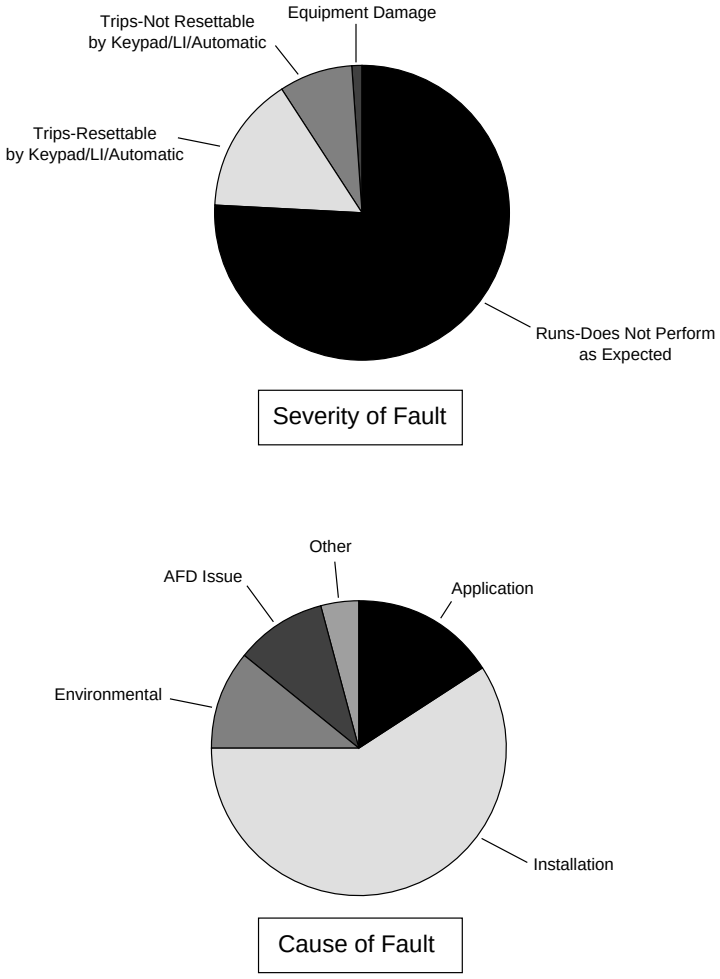


Figure 1: Typical Causes and Severity of Faults

RECOMMENDED TROUBLESHOOTING INSTRUCTIONS

This chapter contains procedures for detecting faults and faulty operating conditions in the drive controller. Before attempting the procedures, read the precaution statement on the inside front cover of this manual and the “Work Practice Precautions” section in chapter 1. Also, if directed to the equipment change out procedures in chapter 4 of this manual, read all applicable instructions and precautions before beginning work.

Always record the drive controller, motor, and auxiliary apparatus nameplate data. For the drive controller this should include part number, date code, voltage rating, power rating, and software revision number. See page 317 in chapter 5 for checking software revision level. Obtaining nameplate information generally requires de-energizing the controller.

Discussions with operating personnel can yield a wealth of information about symptoms and possible root causes of reported problems. It is extremely important for maintenance personnel to gather as much information as possible from operation personnel. Some questions to ask may include: “When was the problem

first noted?" "What is the description of the problem?" "Where was the problem noted?" Direct observation of the drive system and process is also extremely important when troubleshooting performance related problems such as a controller not performing as expected or tripping.

The troubleshooting instructions contained in this chapter are divided into two sections: "Drive System Energized" and "Drive System De-Energized (Power Removed)". Refer to the appropriate section, depending upon the present state of the drive system.

Drive System Energized

In many instances, the drive system may be energized and operating when troubleshooting assistance is requested. Exercise extreme care if power is present (refer to the "Work Practice Precautions" in chapter 1 of this manual). If the drive system is operating, additional hazards resulting from the driven machinery and process may be present. Always consult with the operating personnel responsible for the machinery and process before changing the operating state or removing or applying power to any equipment. Use and obey all applicable lock-out/tag-out procedures in force at the specific location.

Inspect the drive controller and other major components of the system, such as motor and auxiliaries, for external signs of physical damage. Look for:

- Cracked, charred, or damaged covers or enclosure parts
- Excessive surface temperatures of enclosures and conduits
- Damage to power or control conductor conduit
- Unusual noise or odors from any of the equipment
- Abnormal environmental conditions (i.e. temperature, humidity, vibration, etc.)
- Other conditions which may adversely affect the operation of the equipment

If external damage is apparent, immediately inform operating personnel and assess the risk of leaving the drive system powered. Outwardly visible signs of damage generally warrant shutdown, thorough internal inspections, and subsequent corrective action. Table 5 on page 17 contains specific information for troubleshooting damaged equipment.

Once external inspection is complete, maintenance personnel should consider using the controller's diagnostic features to help locate specific problems. If the LED indicators and keypad on the front of the controller are accessible without exposing maintenance personnel to hazardous conditions, a significant amount of status and fault trip information can be gathered. Information available through the LED indicators and keypad display is described on pages 12 to 16 of this chapter.

If the controller is operational, but not performing as expected, proceed to Table 2 on page 14 for specific troubleshooting information based upon reported symptoms. The keypad display can be used to gather status and operating parameter information to assist in the analysis.

If the controller has faulted and control power is still present, the red "FAULT LED" will be illuminated and a fault message will be displayed on the keypad display. If this is the case, make note of the fault displayed and proceed to Table 3 and Table 4 on page 17. The material referenced in the tables will guide maintenance personnel through troubleshooting procedures that are intended to expose the root cause of the problem. The procedures may ultimately recommend specific repair strategy for the controller or system.

Before performing any controller repairs, record the controller set-up and configuration programming by viewing the keypad menus and writing down parameter settings.

Once the controller diagnostic and set-up information is recorded, repair of the drive system should proceed. Removal of power is required to perform repairs. Review “WORK PRACTICE PRECAUTIONS” on page 3 prior to performing any repairs. Always consult with the operating personnel responsible for the machinery and process prior to removing power to any equipment. Use and obey all applicable lock-out/tag-out procedures in force at the specific location.

The repair process should also include inspection of the drive controller and other system components for internal damage. Such an inspection should include:

- Perform “PROCEDURE 4: CHECKING PERIPHERAL EQUIPMENT” on page 313. Repair or replace any damaged protective equipment per the manufacturer’s instruction.
- Check the integrity of the controller bonding and ground system and ensure that the controller is properly grounded per applicable codes and recommendations found in the “Receiving, Installation, and Start-Up, VD0C06S304_” manual.
- Check the integrity of insulation and connections of all incoming and outgoing wiring, both power and ground.
- Check the wiring method and routings. Ensure that wiring is as recommended in the “Receiving, Installation, and Start-Up, VD0C06S304_” manual.
- Check that the voltage present on the line-side of the controller disconnect is within the controller specifications as listed on the controller nameplate. Test with a properly rated voltage sensing device.
- Refer to Table 6 on page 17 when checking for controller damage. Follow referenced troubleshooting procedures and repairs as required.

Upon completion of any recommended repairs, the following should be performed:

- Refer to the Receiving, Installation, and Start-Up manual (bulletin number VD0C06S304_) and follow all procedures for checking integrity of the controller and for re-installing (if necessary) and starting up the controller.
- After the controller is re-installed and powered up, perform “PROCEDURE 5: VALIDATION AFTER REPAIR” on page 314 in chapter 5.
- The controller may require reprogramming. Refer to the Level 1 and 2 Configuration manual (bulletin number VD0C06S305_) for controller configuration programming. If the controller is a part of a larger system, refer to the specific programming instructions provided by the system builder. If the controller configuration program was saved in a PCMCIA Memory Card, reload the program. If the program was manually recorded, reload the program through the keypad.

If problems persist after performing the recommended procedures, then factory service may be required. Have the following information available:

- Controller part number

- Controller input voltage
- Controller power rating
- Controller software version (see “PROCEDURE 9: CHECKING THE SOFTWARE REVISION LEVEL” on page 317 in chapter 5)
- Description of any physical damage or defect
- Operating environment
- Application
- Any LED status light(s) illuminated
- Any fault message display on the keyboard screen

Contact your local Square D field office to arrange service.

Drive System De-energized (Power Removed)

It is not uncommon for the maintenance person to find that the drive controller has been de-energized and tagged-out / locked-out by operations or other maintenance personnel. The controller may have been removed from service for a number of reasons, such as:

- Drive system or process not performing as expected
- Drive system or process systems experiencing trips
- Internal or external damage to some component of the drive system or process

The maintenance person should be alert to the possibility that portions of the equipment may still be energized. Always confirm that all power has been removed using a properly-rated voltage sensing device before working inside any equipment. For the drive controller, use “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” on page 310 of chapter 5. Always consult with the operating personnel responsible for the machinery and process before changing the operating state or removing or applying power to any equipment. Use and obey all applicable lock-out / tag-out procedures in force at the specific location.

Before energizing the system, inspect the drive controller and other major components of the system, such as motor and auxiliaries, for external damage (see “Drive System Energized” on page 9). Visible signs of damage warrant a thorough internal examination and subsequent corrective action. Table 4 on page 17 contains specific information for troubleshooting damaged equipment.

The repair process should also include inspection of the drive controller and other system components for internal damage. Such an inspection should include:

- Perform “PROCEDURE 4: CHECKING PERIPHERAL EQUIPMENT” on page 313 of chapter 5. Repair or replace any damaged protective equipment per the manufacturer’s instruction.
- Check the integrity of the controller bonding and ground system and ensure that the controller is properly grounded per applicable codes and recommendations found in the Receiving, Installation, and Start-Up manual (bulletin number VD0C06S304_).
- Check the integrity of insulation and connections of all incoming and outgoing wiring, both power and ground.
- Check the wiring method and routings. Make sure that wiring is as recommended in the Receiving, Installation, and Start-Up manual (bulletin number VD0C06S304_).
- Check that the voltage present on the line-side of the controller disconnect is within the controller specifications as listed on the controller nameplate. Conduct the voltage test with a properly rated voltage sensing device.

- Refer to Table 6 on page 17 when checking for controller damage. Follow referenced troubleshooting and repair procedures, as required.

Upon completion of any recommended repairs, the following should be performed:

- Refer to the Receiving, Installation, and Start-Up manual (bulletin number VD0C06S304_) and follow all procedures for checking the integrity of the drive controller and for reinstalling (if necessary) and starting up the controller.
- After the controller is re-installed and powered-up, perform “PROCEDURE 5: VALIDATION AFTER REPAIR” on page 314 of chapter 5.
- The controller may require reprogramming. Refer to the Level 1 and 2 Configuration manual (bulletin number VD0C06S305_) for controller configuration programming. If the controller is a part of a larger system, refer to the specific programming instructions provided by the system builder. If the controller configuration program was saved in a PCMCIA Memory Card, reload the program. If the program was manually recorded, reload the program through the keypad.

If problems persist and the controller can be energized, follow the procedures as described in the section titled “Drive System Energized” on page 9.

If problems persist after performing the recommended procedures, then factory service may be required. Have the following information available:

- Controller part number
- Controller input voltage
- Controller power rating
- Controller software version (see “PROCEDURE 9: CHECKING THE SOFTWARE REVISION LEVEL” on page 317 of chapter 5)
- Description of any physical damage or defect
- Operating environment
- Application
- Any LED status light(s) illuminated
- Any fault message display on the keyboard screen

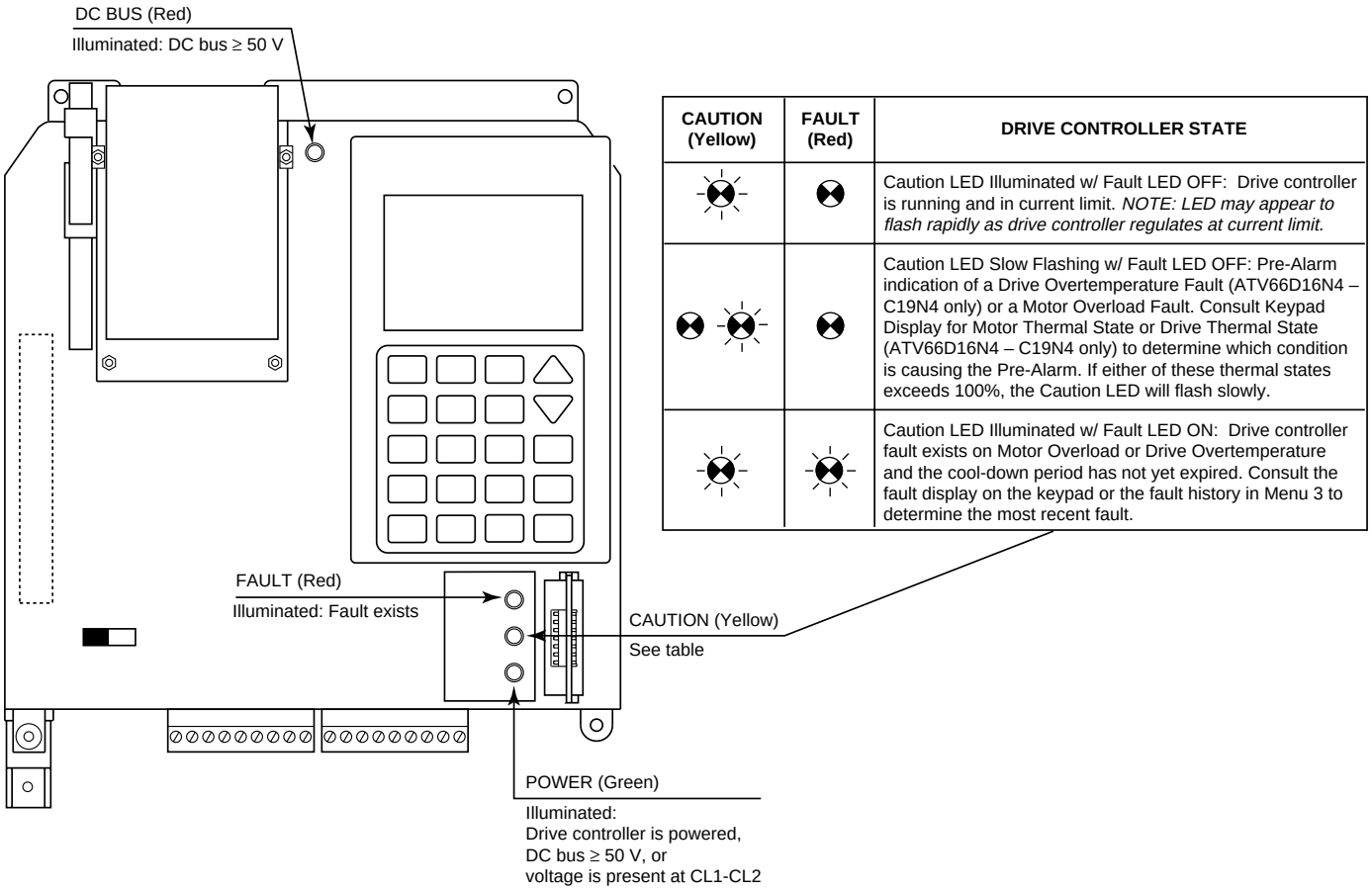
Contact your local Square D field office to arrange service.

LED INDICATIONS AND KEYPAD DISPLAY

Check the LED indicators and keypad display for controller status information. If the controller has faulted and control power is still present, the red “FAULT” LED will illuminate and a fault message appears on the keypad display. If this occurs, make note of the fault displayed and proceed to Tables 3 and 4 on page 16. If the controller has not faulted but does not perform as expected, proceed to Table 2 on page 14.

LEDs

Figure 2 illustrates the LED indications available on the drive controller. If the drive controller is powered up and the keypad display is OFF, proceed to Table 6 on page 17 for Equipment Damage.



CAUTION (Yellow)	FAULT (Red)	DRIVE CONTROLLER STATE
		Caution LED Illuminated w/ Fault LED OFF: Drive controller is running and in current limit. *NOTE: LED may appear to flash rapidly as drive controller regulates at current limit.*
		Caution LED Slow Flashing w/ Fault LED OFF: Pre-Alarm indication of a Drive Overtemperature Fault (ATV66D16N4 – C19N4 only) or a Motor Overload Fault. Consult Keypad Display for Motor Thermal State or Drive Thermal State (ATV66D16N4 – C19N4 only) to determine which condition is causing the Pre-Alarm. If either of these thermal states exceeds 100%, the Caution LED will flash slowly.
		Caution LED Illuminated w/ Fault LED ON: Drive controller fault exists on Motor Overload or Drive Overtemperature and the cool-down period has not yet expired. Consult the fault display on the keypad or the fault history in Menu 3 to determine the most recent fault.

Figure 2: LED Indications

Keypad Display

The keypad display can be used to determine:

- Drive controller status (Display screen)
- Drive controller measurements (Display screen)
- Logic input states (2.1→Logic Input Map)
- Logic output states (2.3→Logic Output Map)
- Analog input levels (2.2→Analog Input Map)
- Analog output levels (2.4→Analog Output Map)
- Fault history (3→Fault History Map)
- Parameter settings (7→General Configuration menu)

If the keypad display is operational, this is the best source of troubleshooting information. The following information may be viewed on the keypad display to assist in troubleshooting.

Status Codes

The following status codes may be displayed on the Display screen:

Table 2: Display Mode Status Codes

Code	Definition	Code	Definition
NLP	No Line Power (control power supplied separately)	CLI	Current Limit
RDY	Drive Controller Ready	DCB	DC Injection Braking
RUN	Drive Running (at speed)	JOG	Jog Operation
↻	Forward Direction	NRP	No Run Permissive
↺	Reverse Direction	BRK	Resistance Braking
ACC	Accelerating	SLC	Serial Link Command
DEC	Decelerating	FLT	Fault

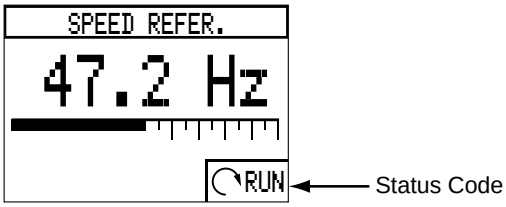


Figure 3: Display Screen Status Code Location

Measurements

The up / down arrow keys on the keypad display may be used to select and view the following measurements from the Display screen:

- Speed reference (Hz)
- Output frequency (Hz)
- Output current (A)
- Motor torque (%)
- Output power (W)
- Motor thermal state (%)
- Drive thermal state (%, ATV66D16N4 through ATV66C19N4)
- Line voltage (V)
- Output voltage (V)
- DC bus voltage (V)
- Elapsed time (H and Min)

I/O Map

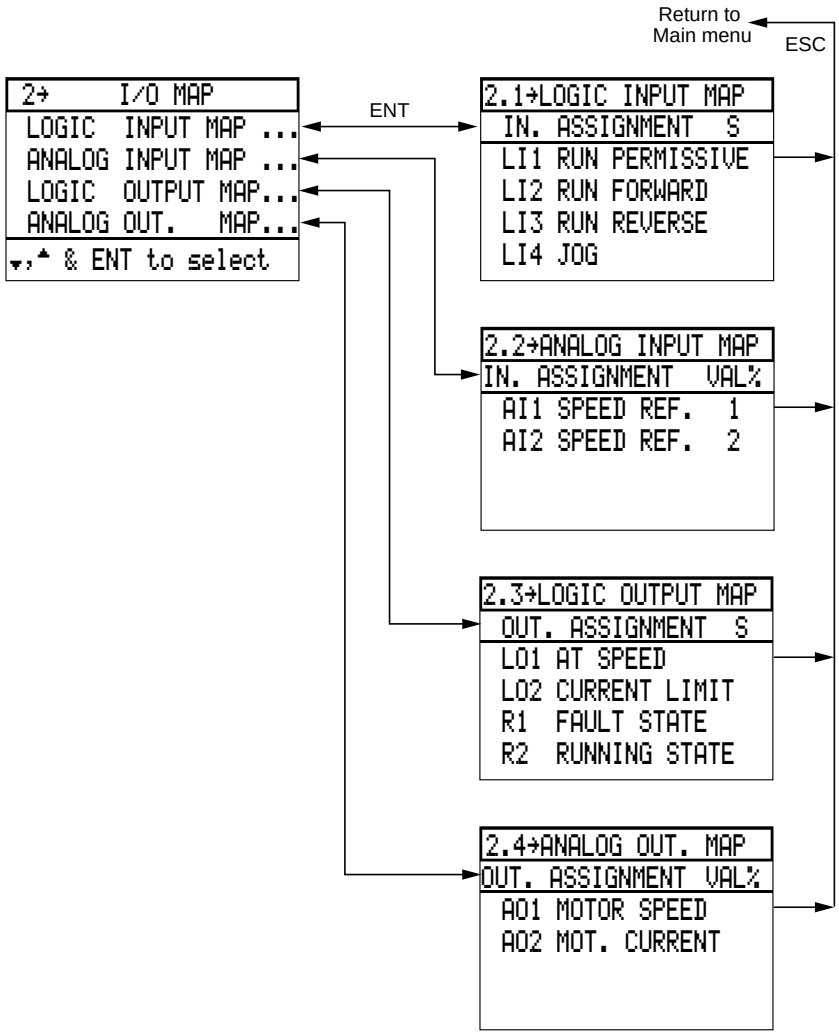


Figure 4: I/O Map

The I/O Map is a series of display-only screens that show the analog and logic input/output terminal assignments. The I/O Map is useful for determining whether the drive controller is receiving the proper terminal commands and reference levels.

Fault History

The last eight faults of the controller can be viewed in the 3→Fault History screen along with the run status at the time of the fault. The most recent fault is displayed first on the list. The arrow (←) under the "M" column is used to mark a fault so that it can be followed for future observation.

Figure 5: Fault History

Parameter Settings

It is often useful and necessary to determine the parameter settings when troubleshooting a drive controller. All parameter settings are viewable from the keypad display. See the Level 1 & 2 Configuration manual (VD0C06S305_) for more information on viewing parameter settings.

FAULT CATEGORIES

Tables 3 through 6 list the faulty operating conditions and faults for the drive controllers. For applicable troubleshooting procedure, see the sections in chapter 3 referenced in the tables.

Table 3: Runs—Does Not Perform as Expected

Operating Condition	Troubleshooting Procedure
Poor speed stability.	Chapter 3, page 20
Excessive motor temperature.	Chapter 3, page 22
Motor accelerates too slowly.	Chapter 3, page 25
Motor decelerates too slowly. Motor does not decelerate. Motor overspeeds (overspeed trip).	Chapter 3, page 28
Motor will not start.	Chapter 3, page 32
Motor will not stop.	Chapter 3, page 37
Motor turning/turns in wrong direction.	Chapter 3, page 40
The drive controller does not follow the speed command.	Chapter 3, page 41
A specific drive function does not work as expected or at all.	Chapter 3, page 41

Table 4: Trips—Resettable by Keypad/LI/Automatic/Power Cycle

Fault Designation on Keypad Display	Troubleshooting Procedure
UNDERVOLTAGE	Chapter 3, page 43
AC-LIN. OVERVOL.	Chapter 3, page 45
DC-BUS OVERVOL.	Chapter 3, page 47
IN-PHASE LOSS	Chapter 3, page 51
MOT. OVERLOAD	Chapter 3, page 53
DRIVE OVERTEMP.	Chapter 3, page 55
LOSS FOLLOWER	Chapter 3, page 57
OUT. PHASE LOSS	Chapter 3, page 58
SEQUENCE T.OUT	Chapter 3, page 58
PROCESS T.OUT	Chapter 3, page 58
SERIAL LINK FAULT	Chapter 3, page 60

Table 5: Trips—Requires Power to Be Recycled

Fault Designation on Keypad Display	Troubleshooting Procedure
SHORT CIRCUIT	Chapter 3, page 61
GROUND FAULT	Chapter 3, page 63
INTERNAL FAULT	Chapter 3, page 65
DYNAMIC BRAKE	Chapter 3, page 67
DB RESISTOR	Chapter 3, page 68
MEMORY FAILURE	Chapter 3, page 69
PRECHARGE FAIL	Chapter 3, page 69
LINK FAULT	Chapter 3, page 69
CONTROL SUPPLY FAULT	Chapter 3, page 69

Table 6: Equipment Damage

Keypad display is OFF.	Chapter 3, page 70
External signs of equipment damage.	Chapter 3, page 70
No external signs of equipment damage.	Chapter 3, page 70
Checkout of the power part of the drive controller.	Chapter 3, page 71
Checkout of the control part of the drive controller.	Chapter 3, page 77

CHAPTER 3: CORRECTING THE PROBLEM

RUNS—DOES NOT PERFORM AS EXPECTED

Poor Speed Stability

Figure 6 illustrates the troubleshooting procedure when poor speed stability is observed.

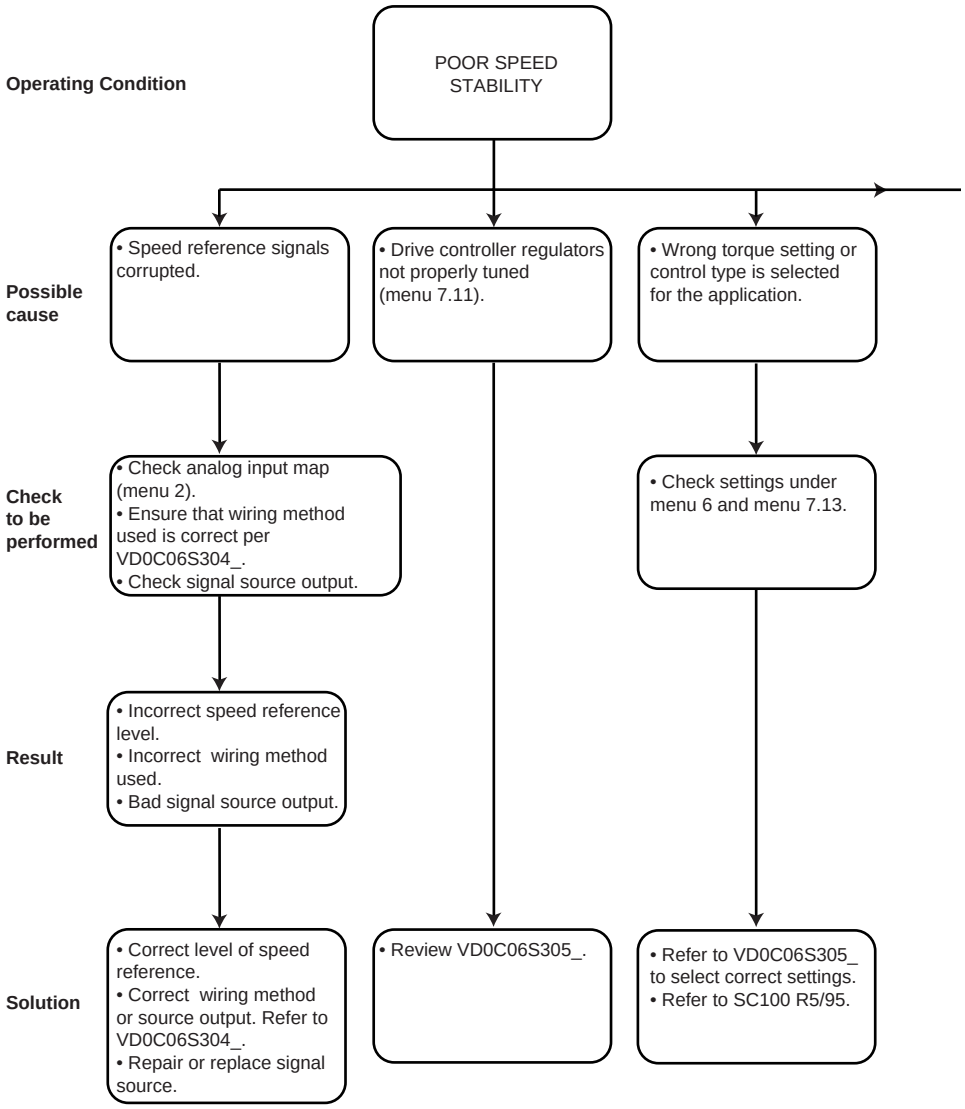
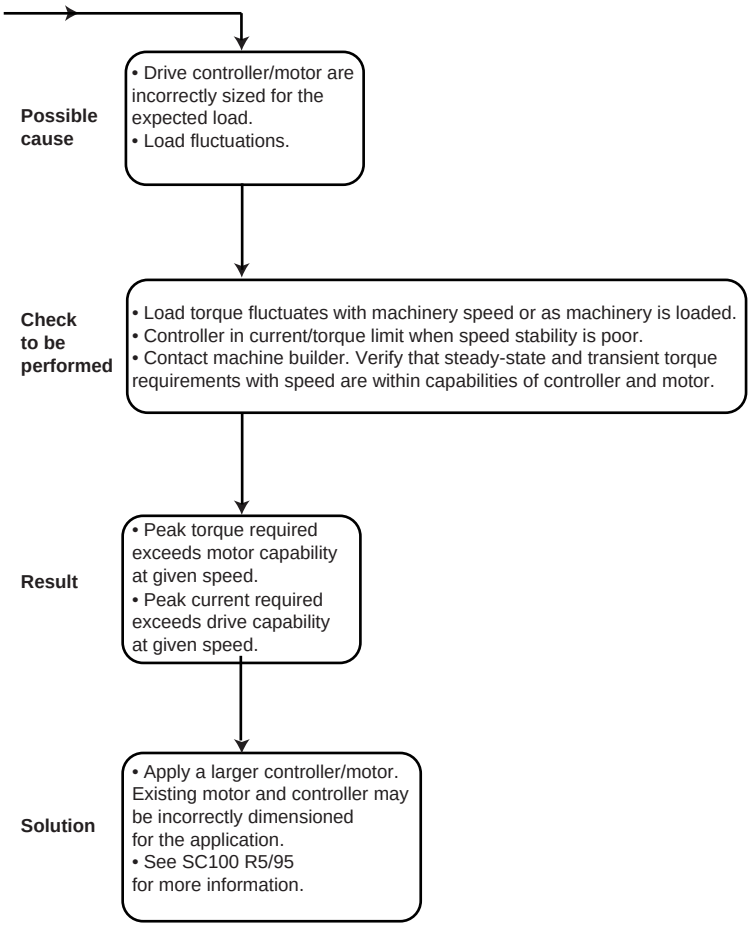


Figure 6: Poor Speed Stability

Poor Speed Stability (continued, 2 of 2)



Excessive Motor Temperature

Figure 7 illustrates the troubleshooting procedure when excessive motor temperature is observed.

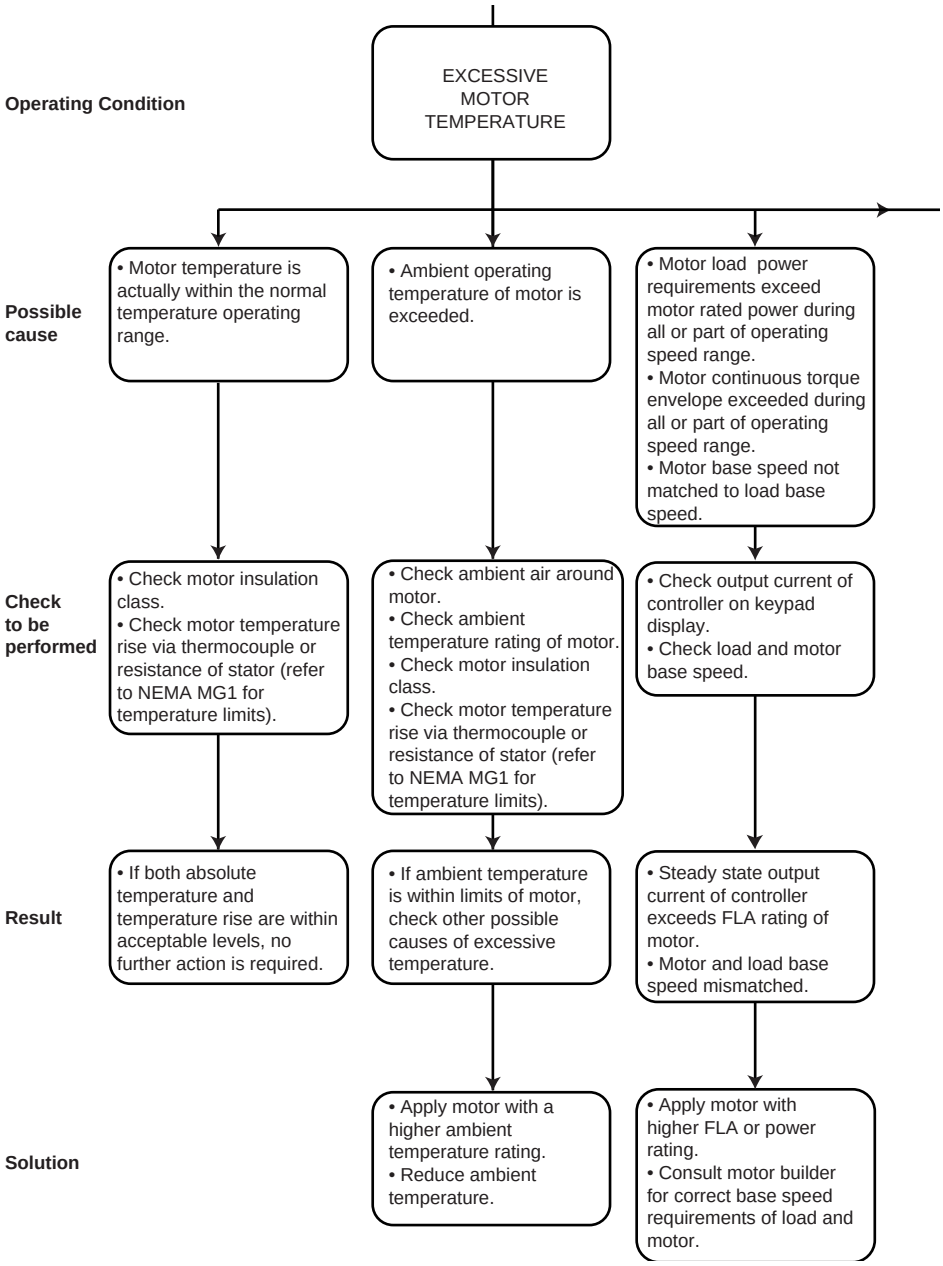
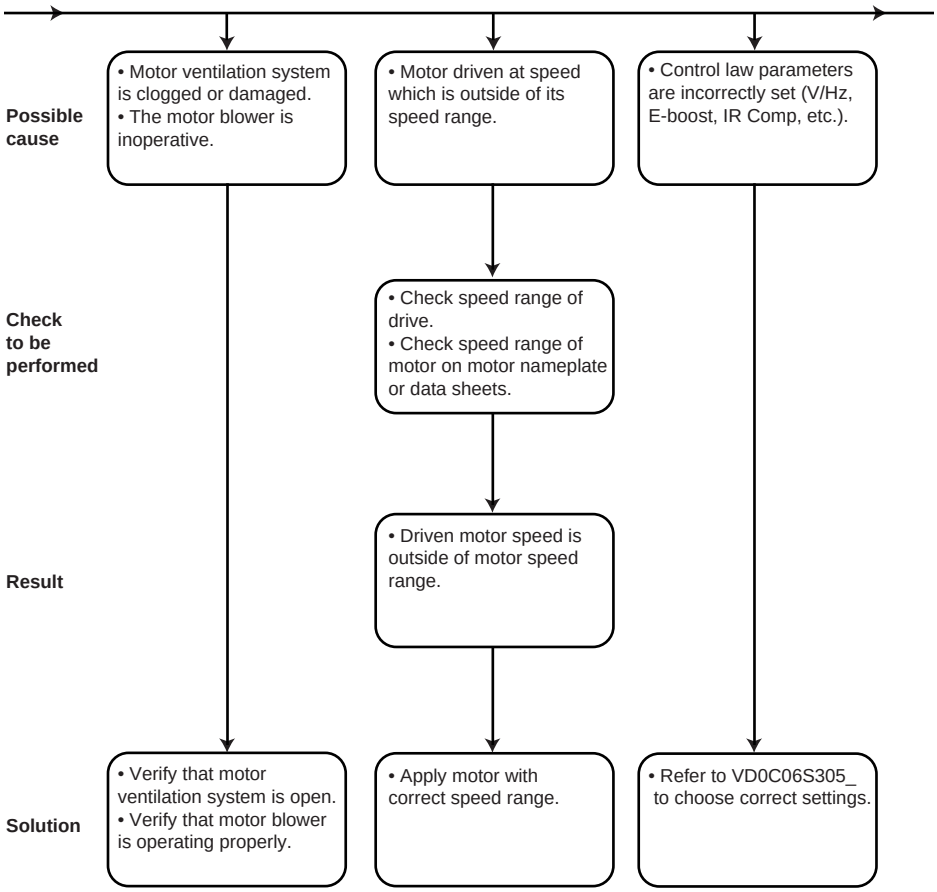
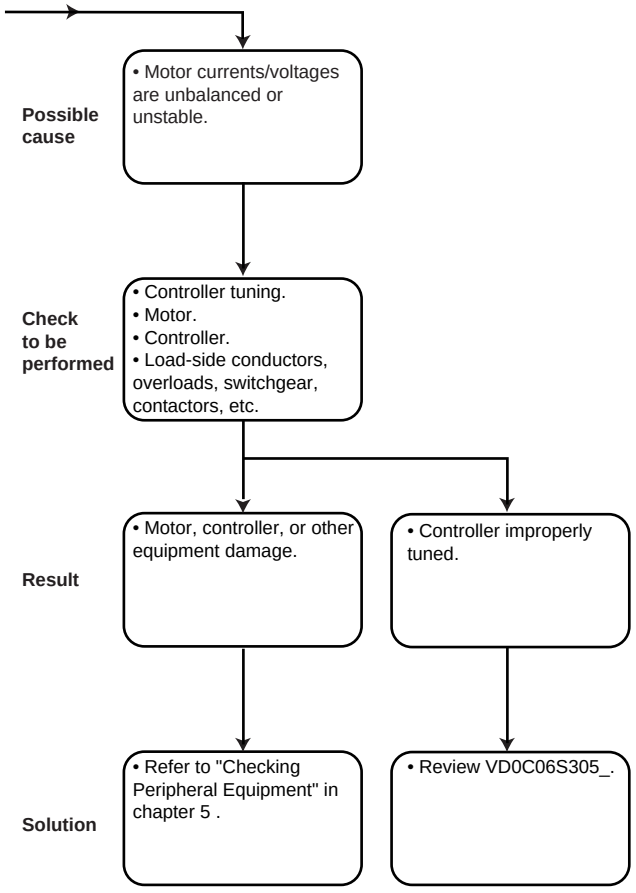


Figure 7: Excessive Motor Temperature

Excessive Motor Temperature (continued, 2 of 3)



Excessive Motor Temperature (continued, 3 of 3)



Motor Accelerates Too Slowly

Figure 8 illustrates the troubleshooting procedure if the motor is accelerating too slowly.

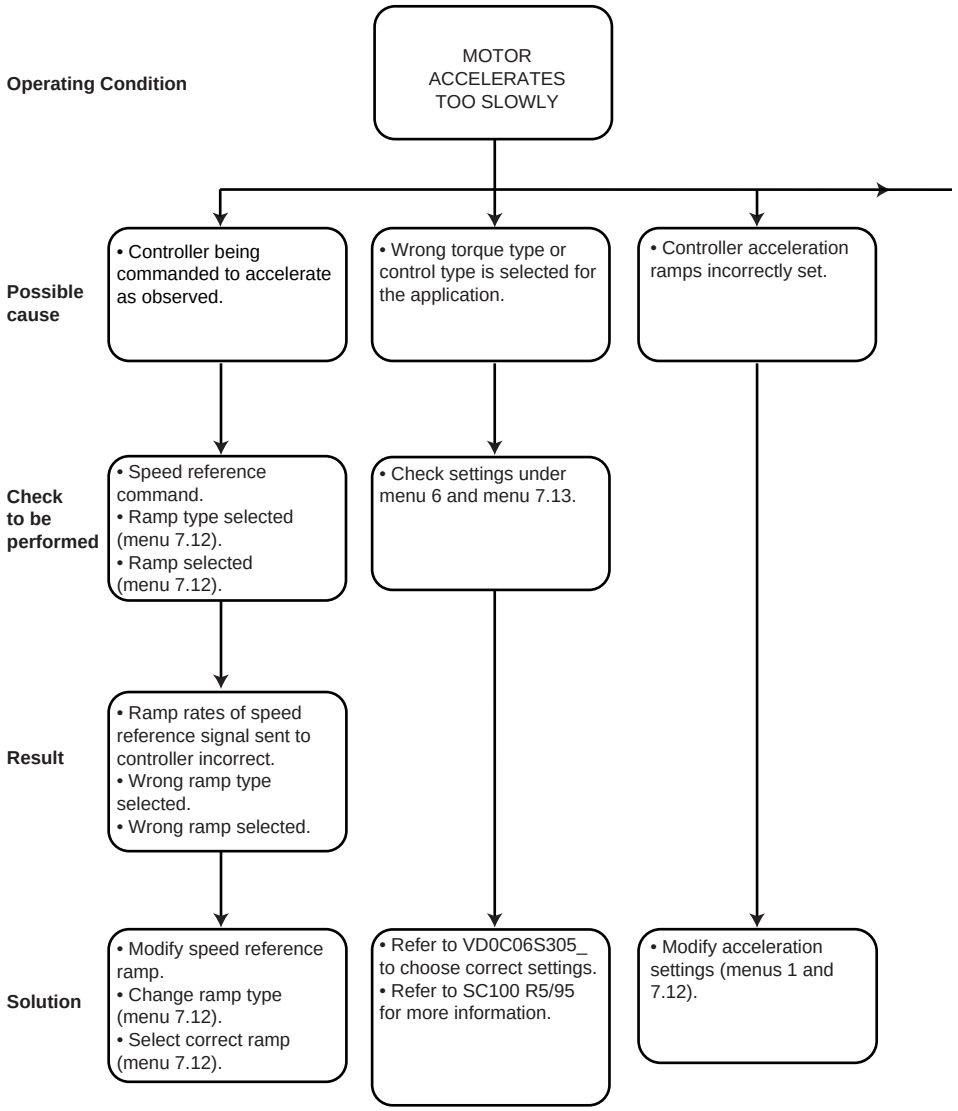
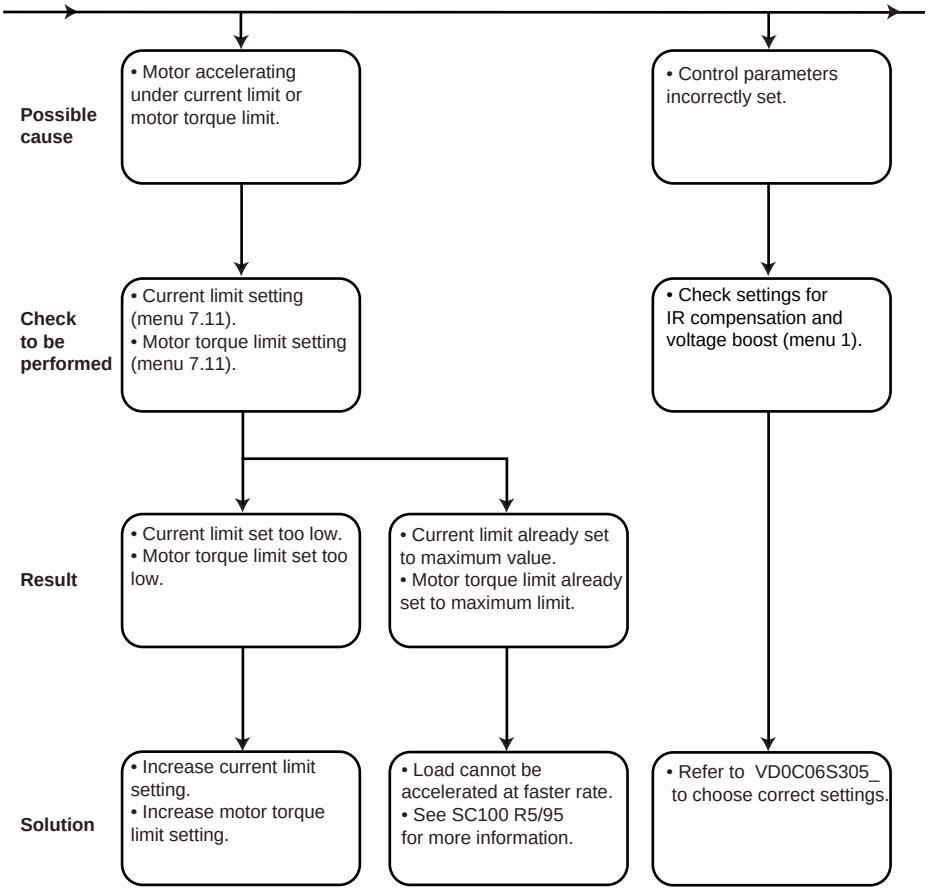
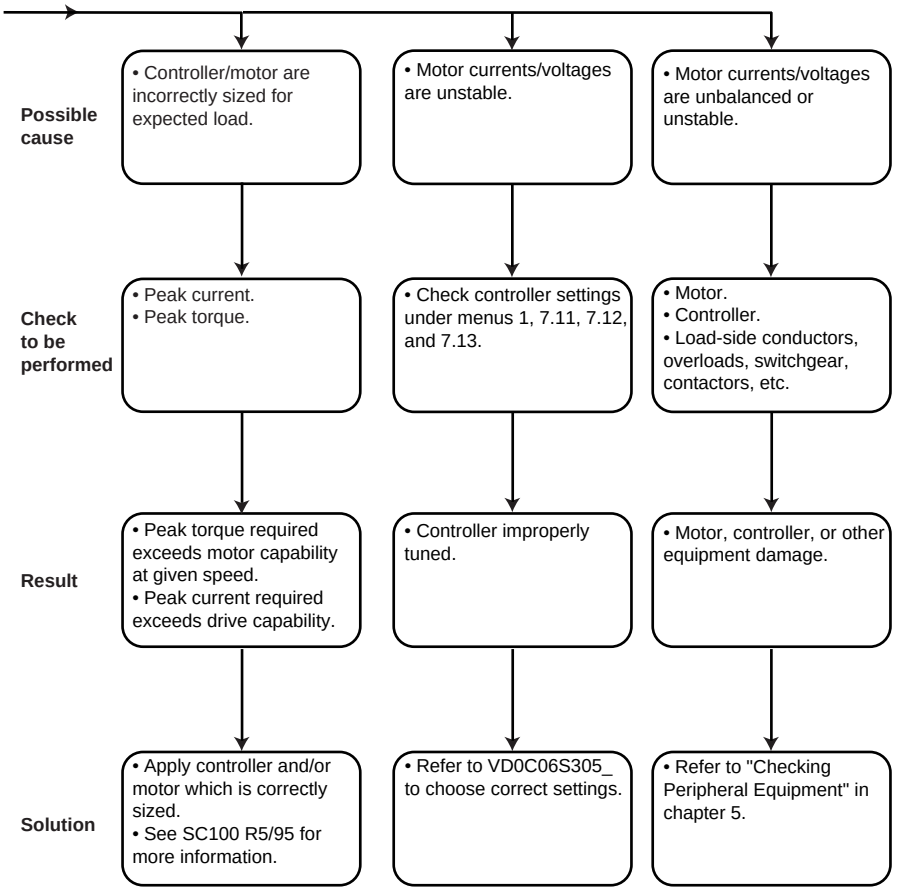


Figure 8: Motor Accelerates Too Slowly

Motor Accelerates Too Slowly (continued, 2 of 3)



Motor Accelerates Too Slowly (continued, 3 of 3)



Motor Decelerates Too Slowly/Overspeeds/Overspeed Trip

Figure 9 illustrates the troubleshooting procedure when the motor is decelerating too slowly.

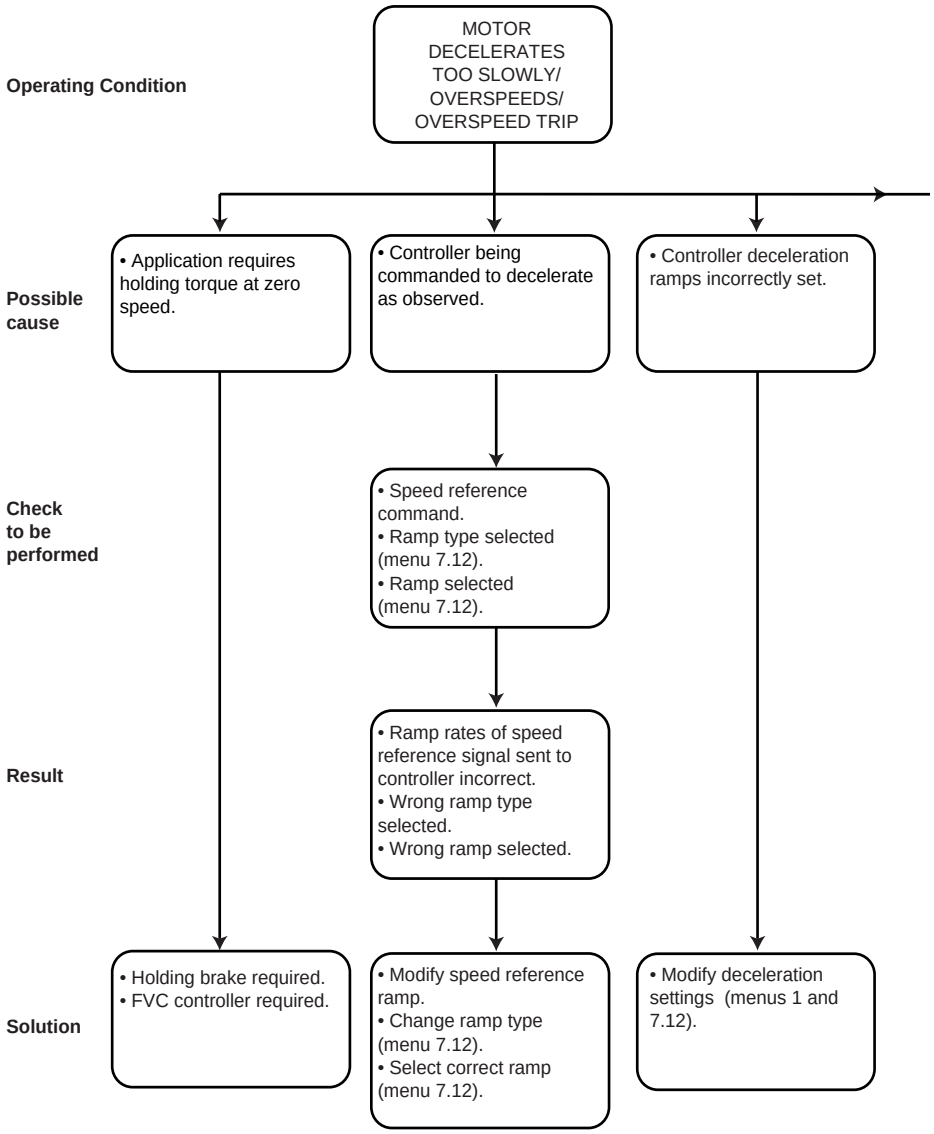
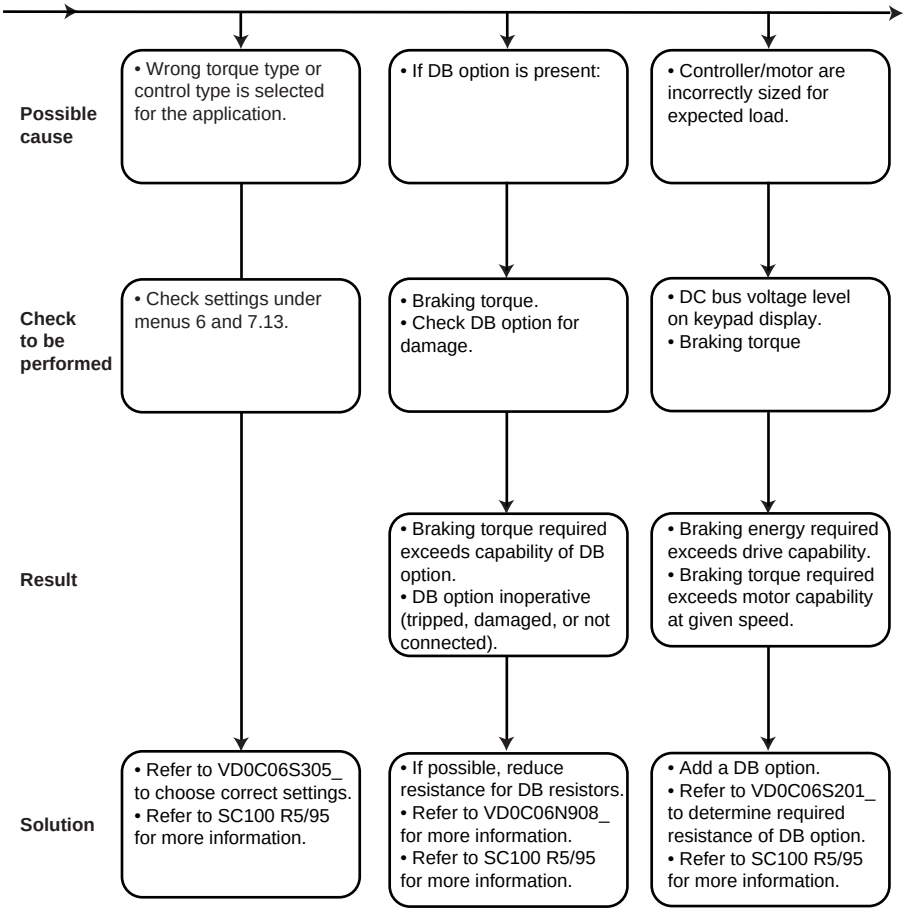
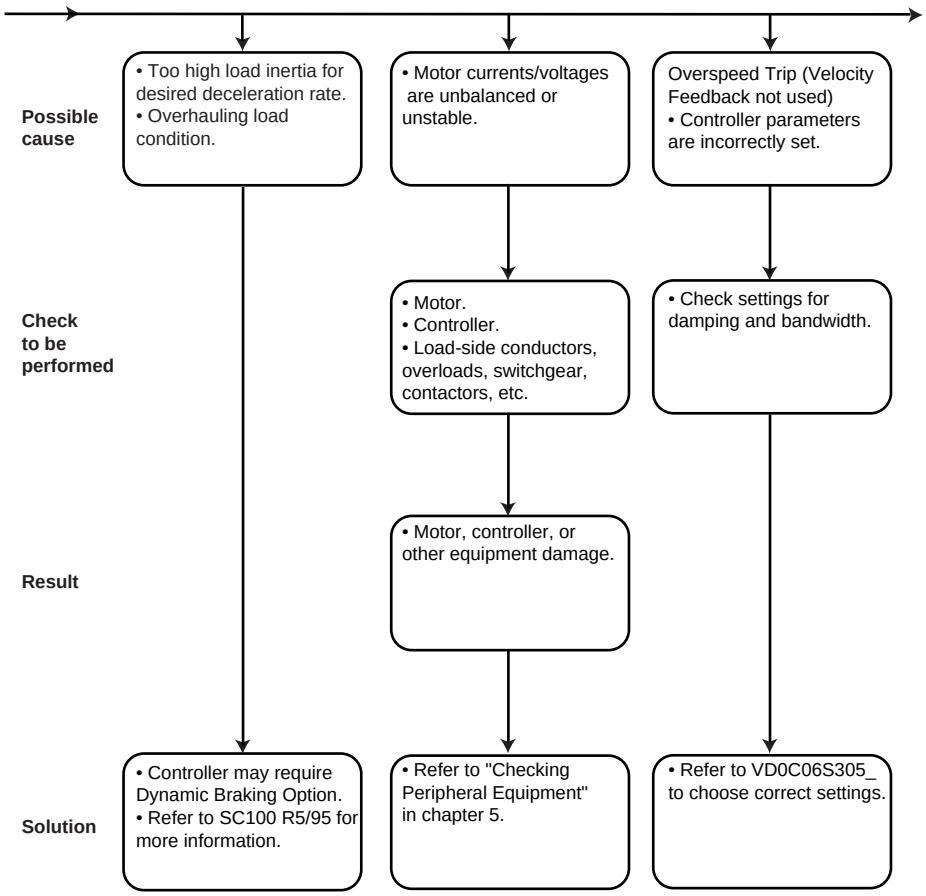


Figure 9: Motor Decelerates Too Slowly/Not at All/Overspeeds/Overspeed Trip

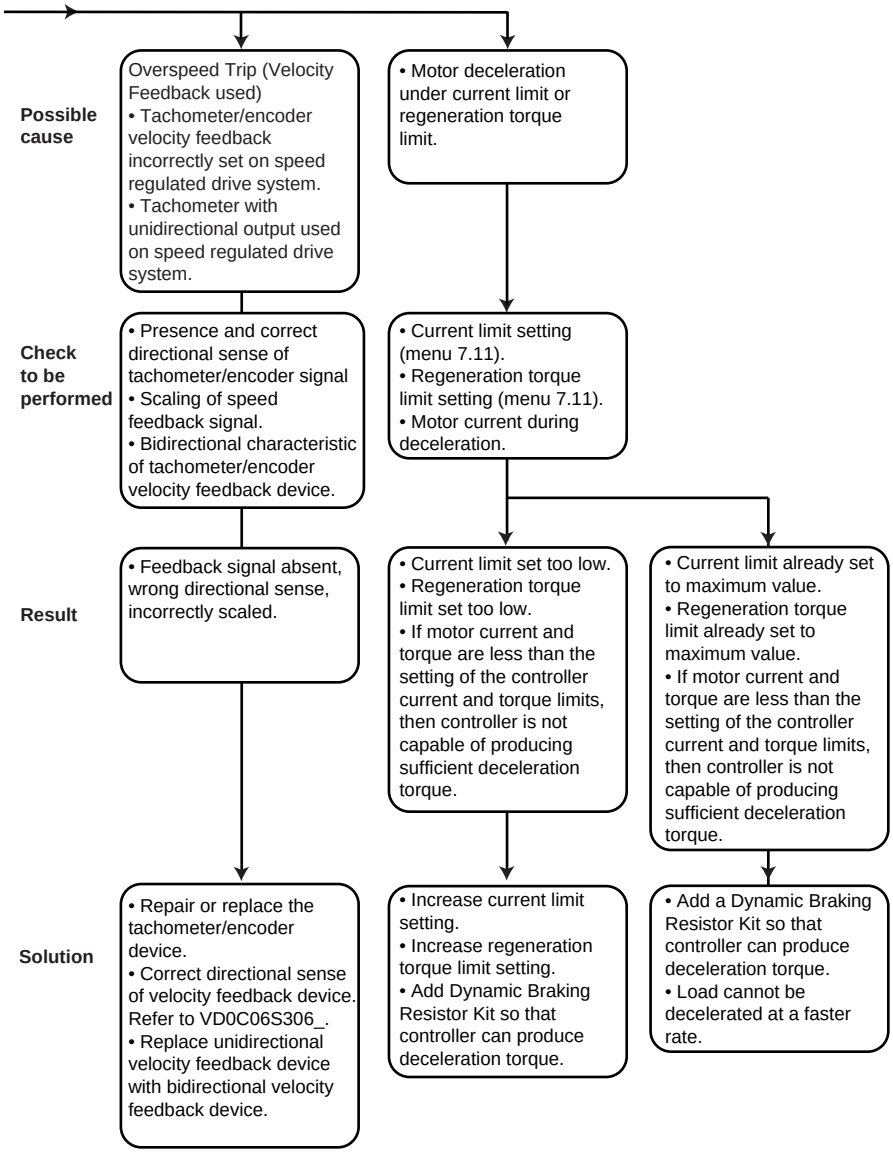
Motor Decelerates Too Slowly/ Overspeeds/Overspeed Trip (continued, 2 of 4)



Motor Decelerates Too Slowly/ Overspeeds/Overspeed Trip (continued, 3 of 4)



Motor DeceleratesToo Slowly/ Overspeeds/Overspeed Trip (continued, 4 of 4)



Cannot Start Motor

Figure 10 illustrates the troubleshooting procedure when the motor cannot be started (no controller faults present).

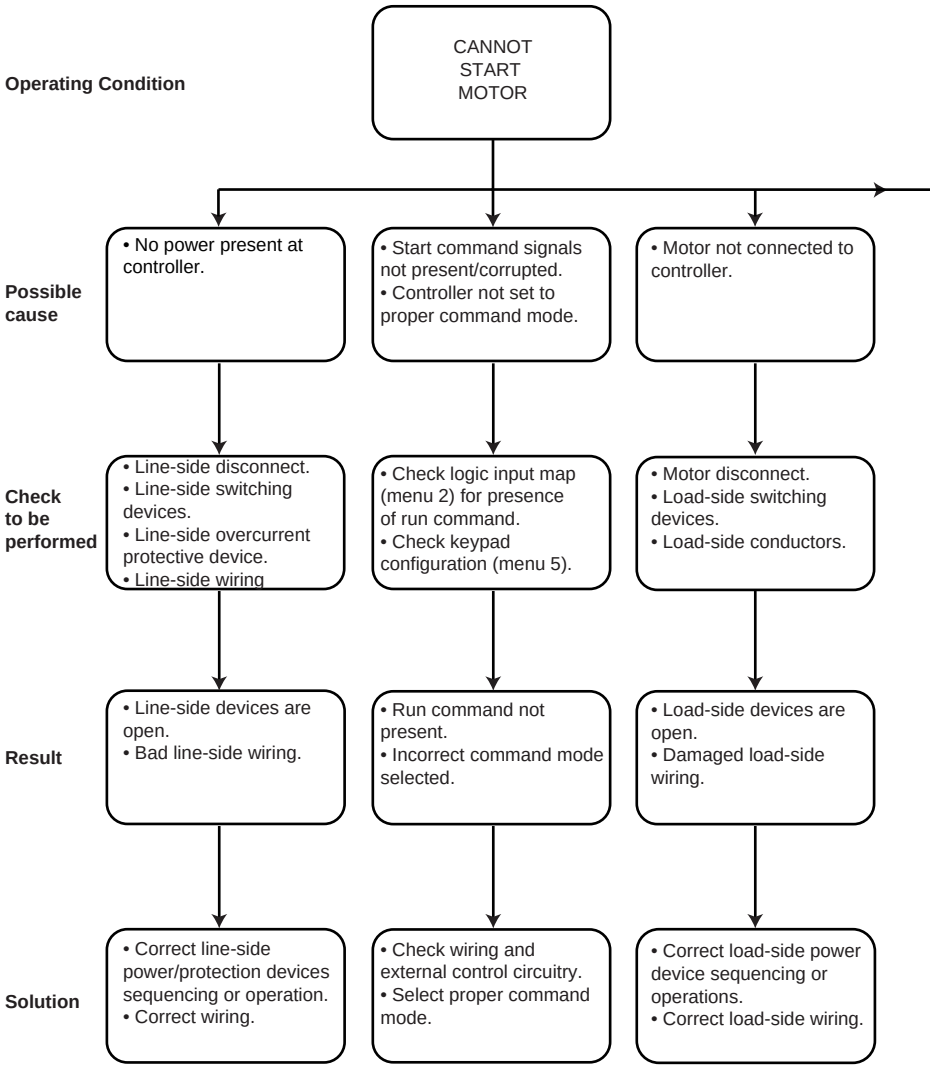
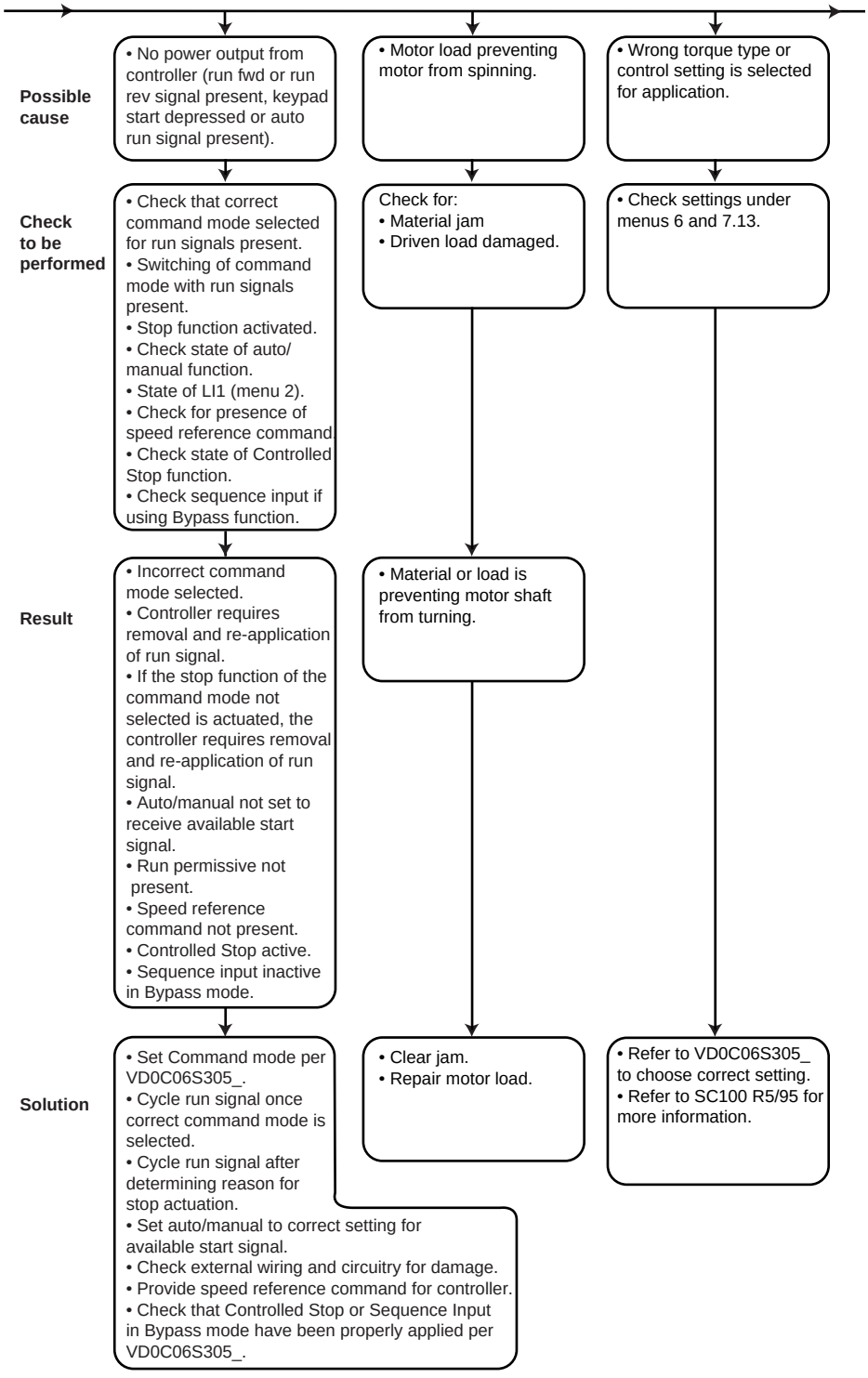
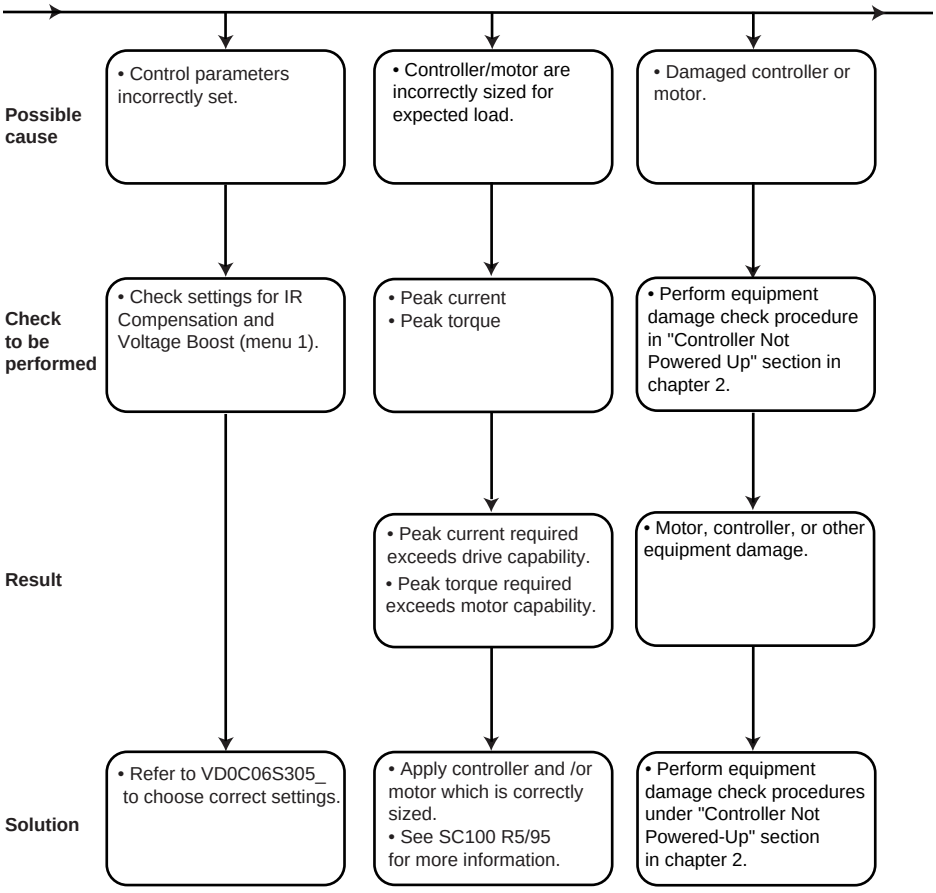


Figure 10: Cannot Start Motor

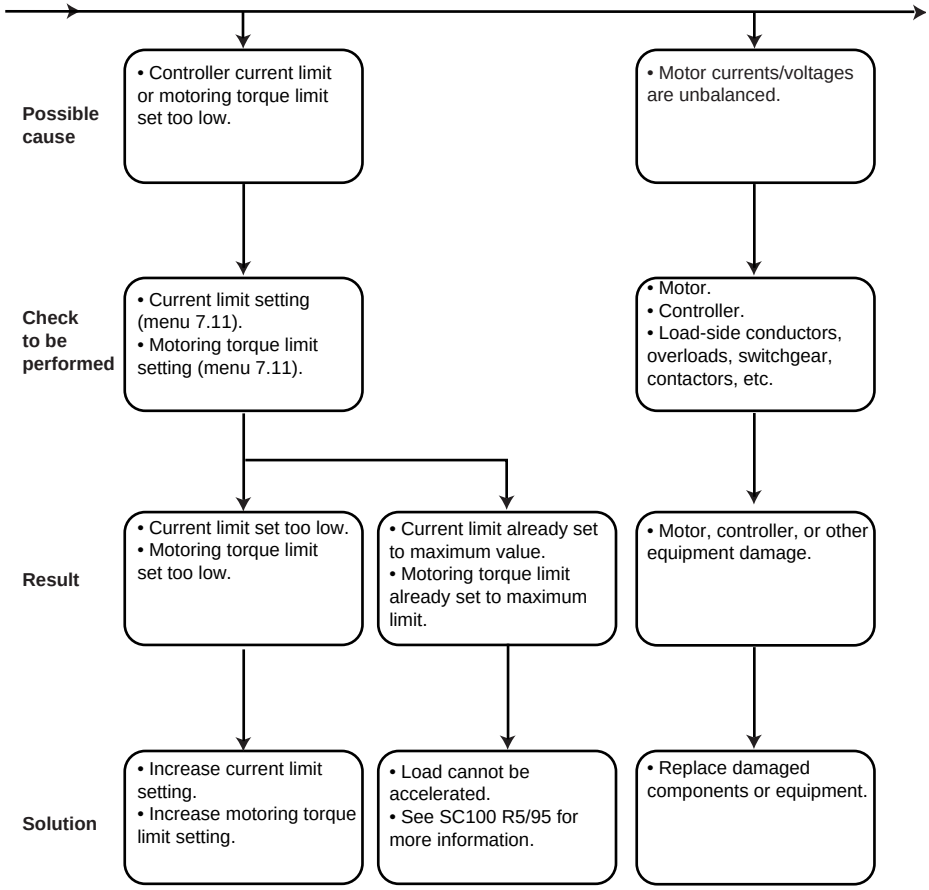
Cannot Start Motor (continued, 2 of 5)



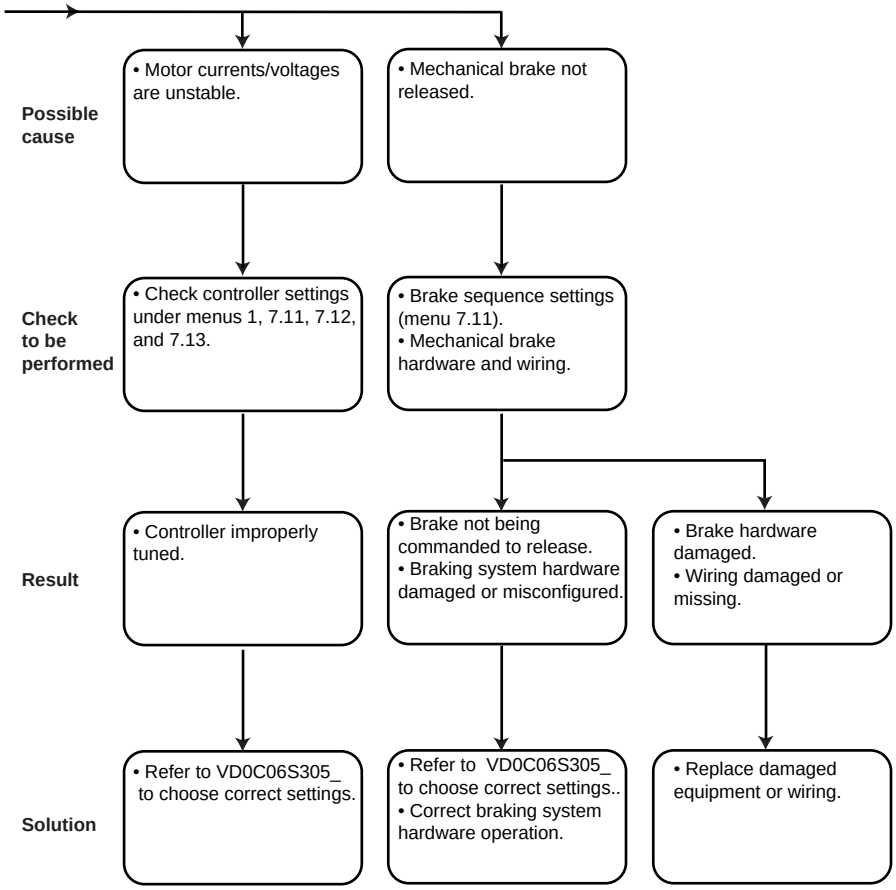
Cannot Start Motor (continued, 3 of 5)



Cannot Start Motor (continued, 4 of 5)



Cannot Start Motor
(continued, 5 of 5)



Cannot Stop Motor

Figure 11 illustrates the troubleshooting procedure when the motor cannot be stopped or has the appearance of not stopping.

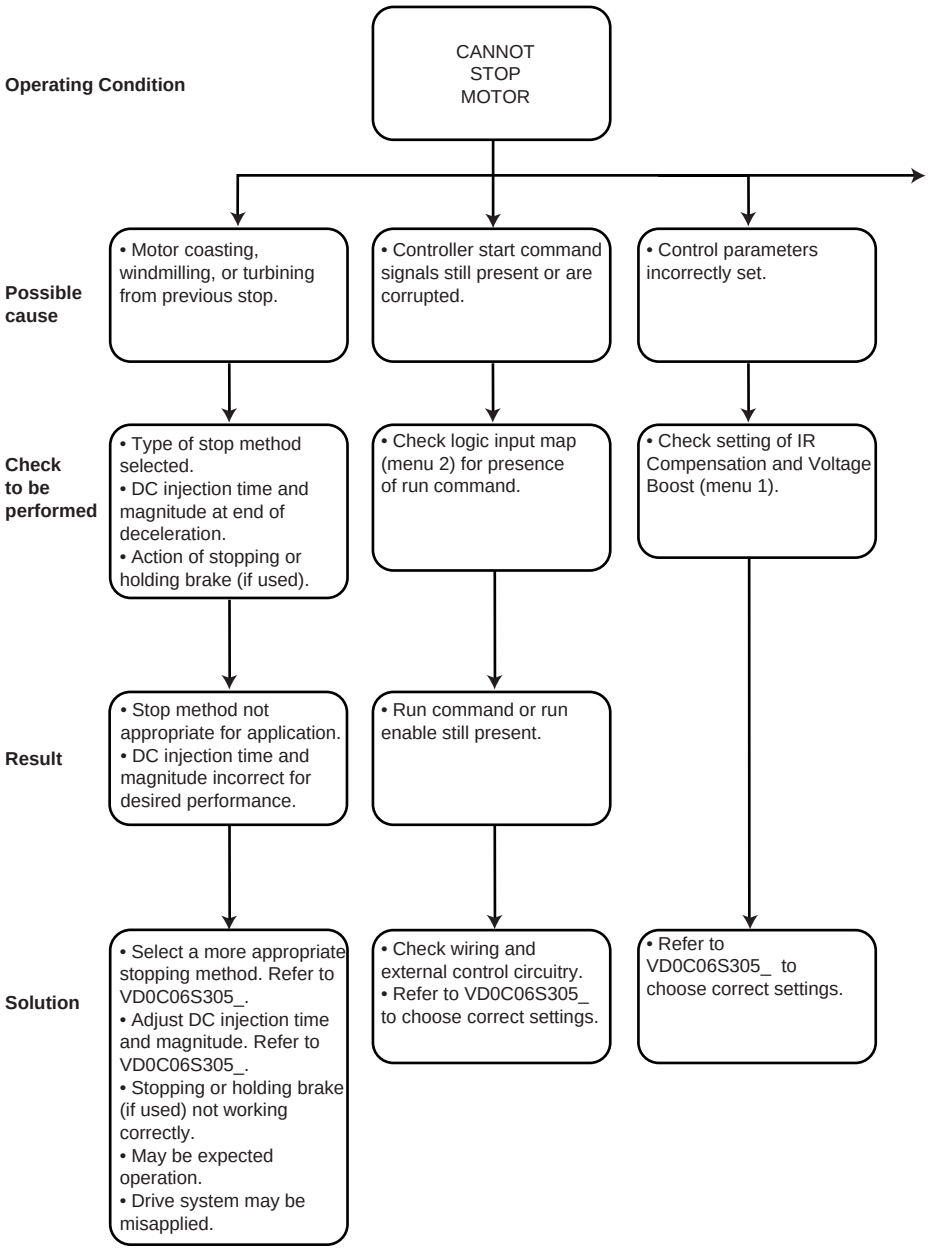
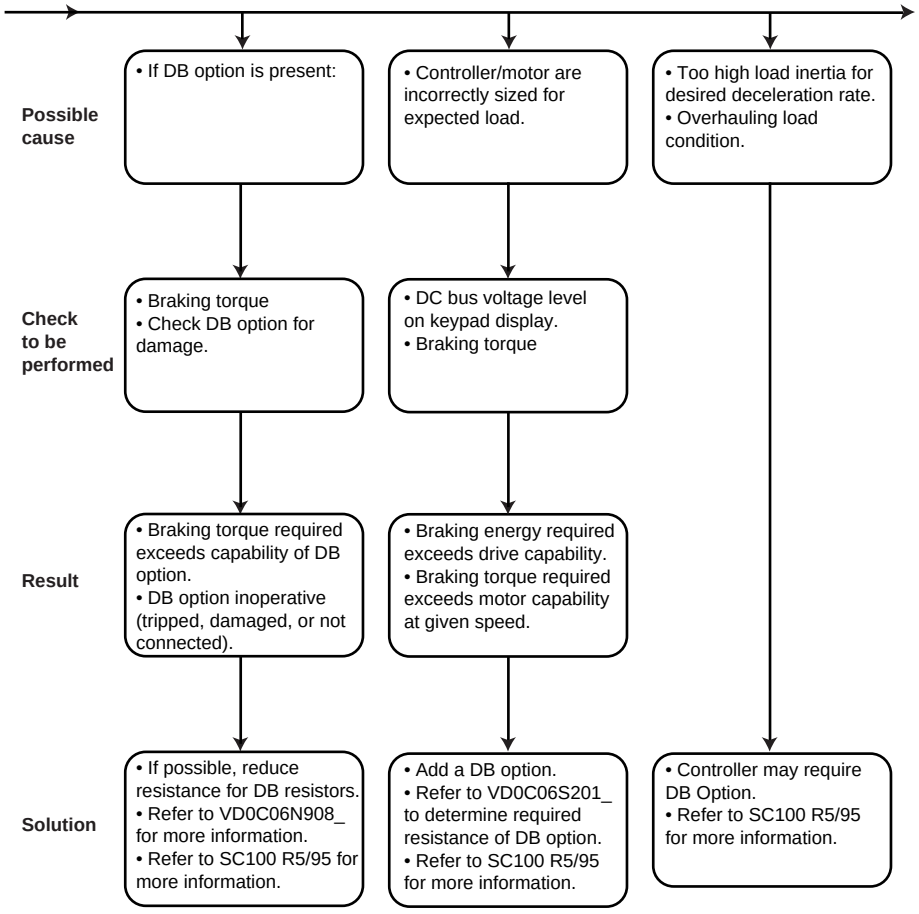
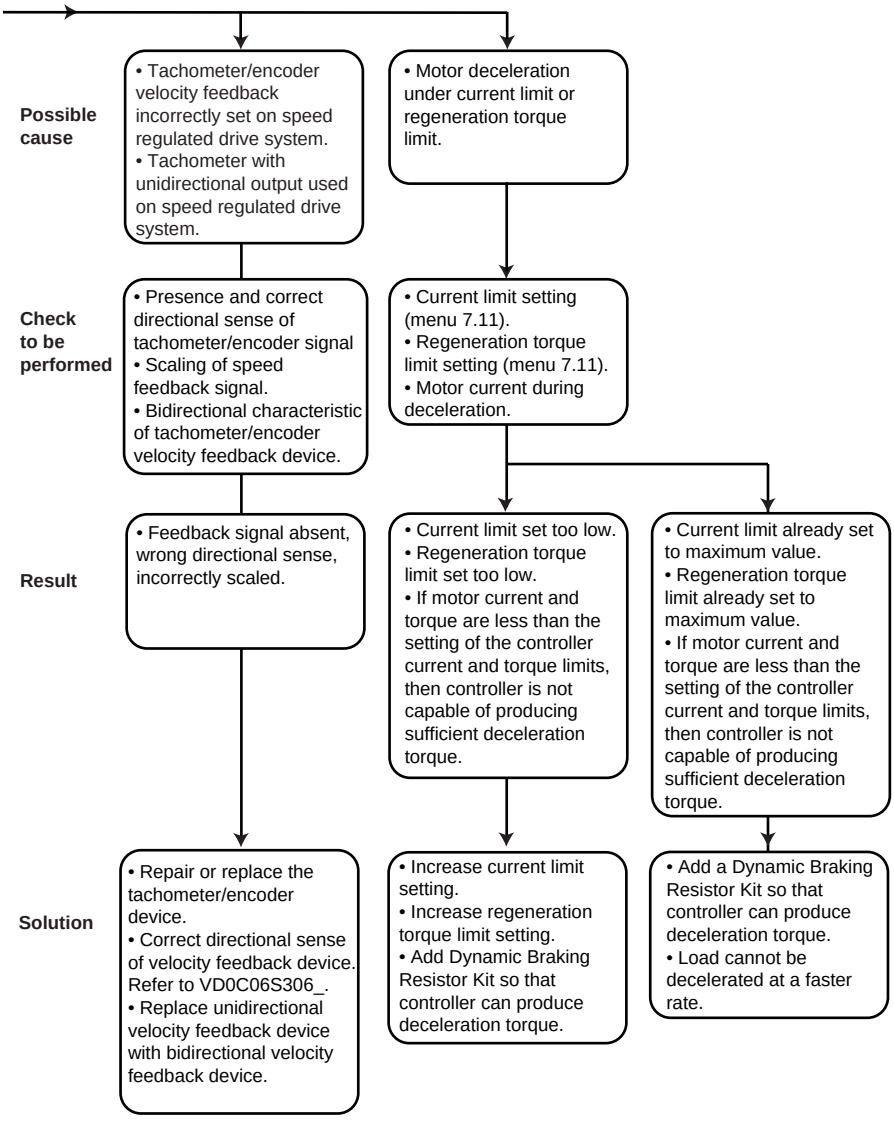


Figure 11: Cannot Stop Motor

Cannot Stop Motor (continued, 2 of 3)



Cannot Stop Motor (continued, 3 of 3)



Motor Turns in Wrong Direction

Figure 12 illustrates the troubleshooting procedure when the motor is turning in the wrong direction.

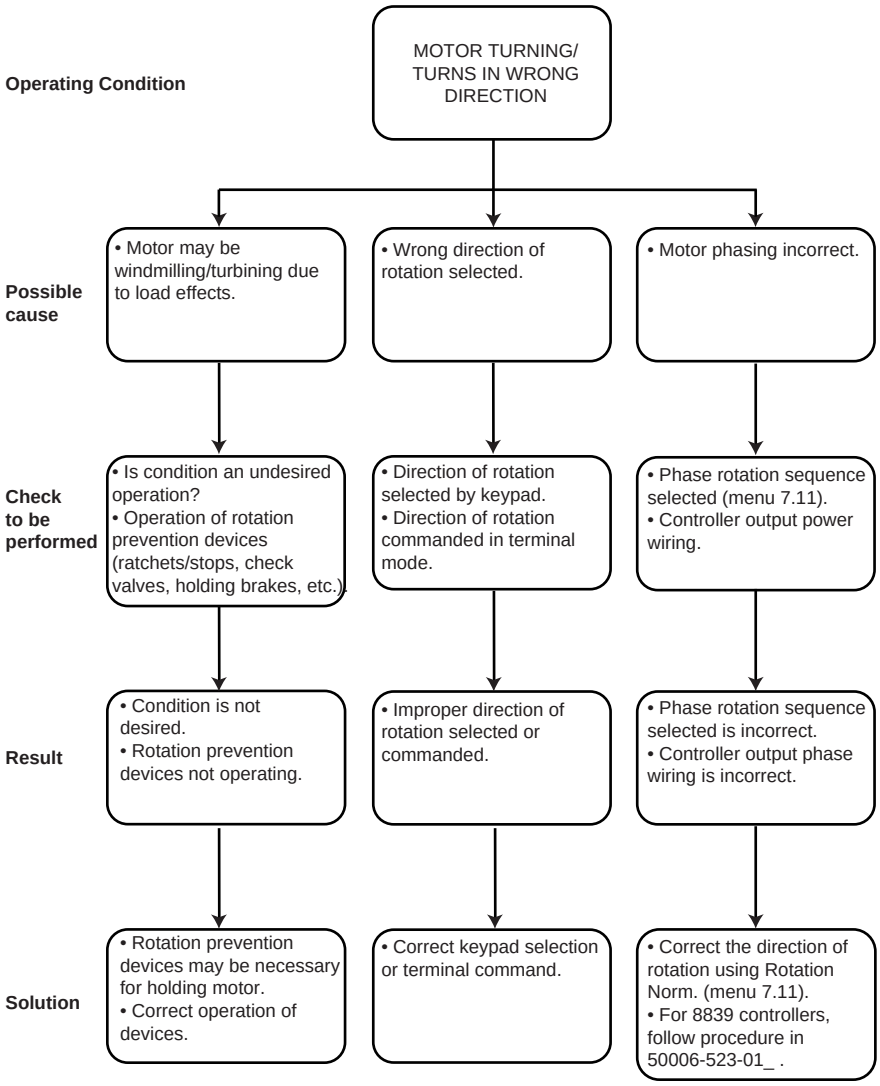


Figure 12: Motor Turns in Wrong Direction

Drive Will Not Follow Speed Command

Check the analog input level in the I/O Map (menu 2) for presence of input. If input is present, refer to the following sections:

- Poor Speed Stability (page 20)
- Motor Accelerates Too Slowly (page 25)
- Motor Decelerates Too Slowly / Overspeeds / Over speed Trip(page 28)

Specific Drive Function Does Not Work as Expected/ Not at All

Figure 13 illustrates the troubleshooting procedure when the specific drive function does not work as expected or not at all.

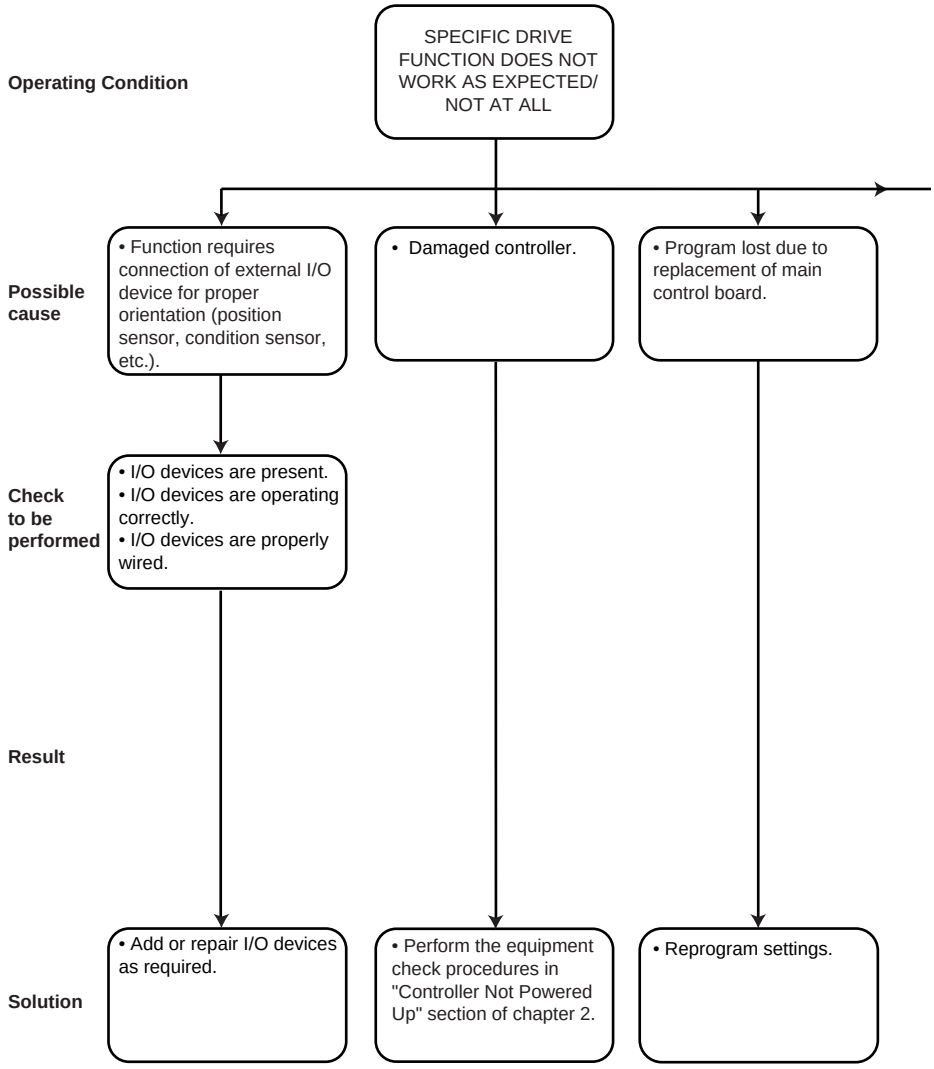
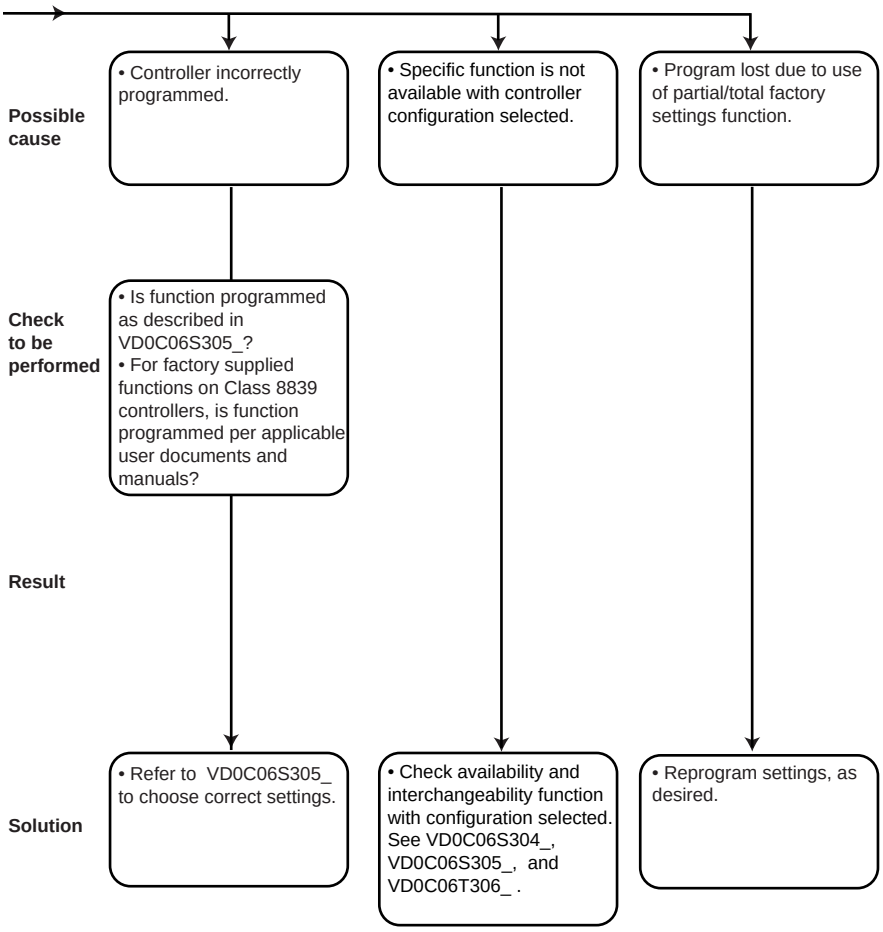


Figure 13: Specific Drive Function Does Not Work as Expected/Not at All

Specific Drive Function Does Not Work as Expected/ Not at All (continued, 2 of 2)



TRIPS—RESETTABLE BY KEYPAD/LI/ AUTOMATIC/POWER CYCLE

Undervoltage

Figure 14 illustrates the measurement principle used for the undervoltage fault.

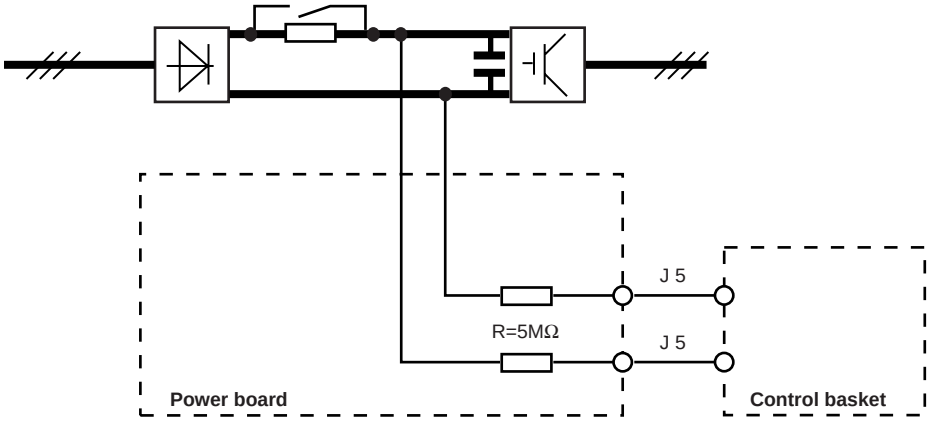


Figure 14: Undervoltage Measurement

The presence of the line supply is recognized from the measurement of frequency (when the control part is powered up) and line voltage (L1, L2, L3). The line undervoltage fault is detected from the measurement of the DC bus voltage.

The line undervoltage fault appears when one of the following occurs:

- With the line supply voltage present, the DC bus voltage is less than 450 VDC for a 380 VAC line supply, or less than 575 VDC with a 460 VAC line supply.
- During operation, if the DC bus voltage is less than 400 VDC for a 380 VAC line supply, or less than 525 VDC with a 460 VAC line supply.

The following faults are displayed during a line supply power break:

- The line undervoltage fault if the motor is driven
- The input phase loss fault if the motor is not driven

The voltage values can be displayed on the keypad display.

“Undervoltage” is a self-clearing fault. If the cause of the fault is corrected (i.e., the DC bus voltage is restored to the proper level), internal logic will clear the fault and unlatch the drive controller. The drive controller will then be ready to start.

Figure 15 illustrates the troubleshooting procedure when the undervoltage fault is present.

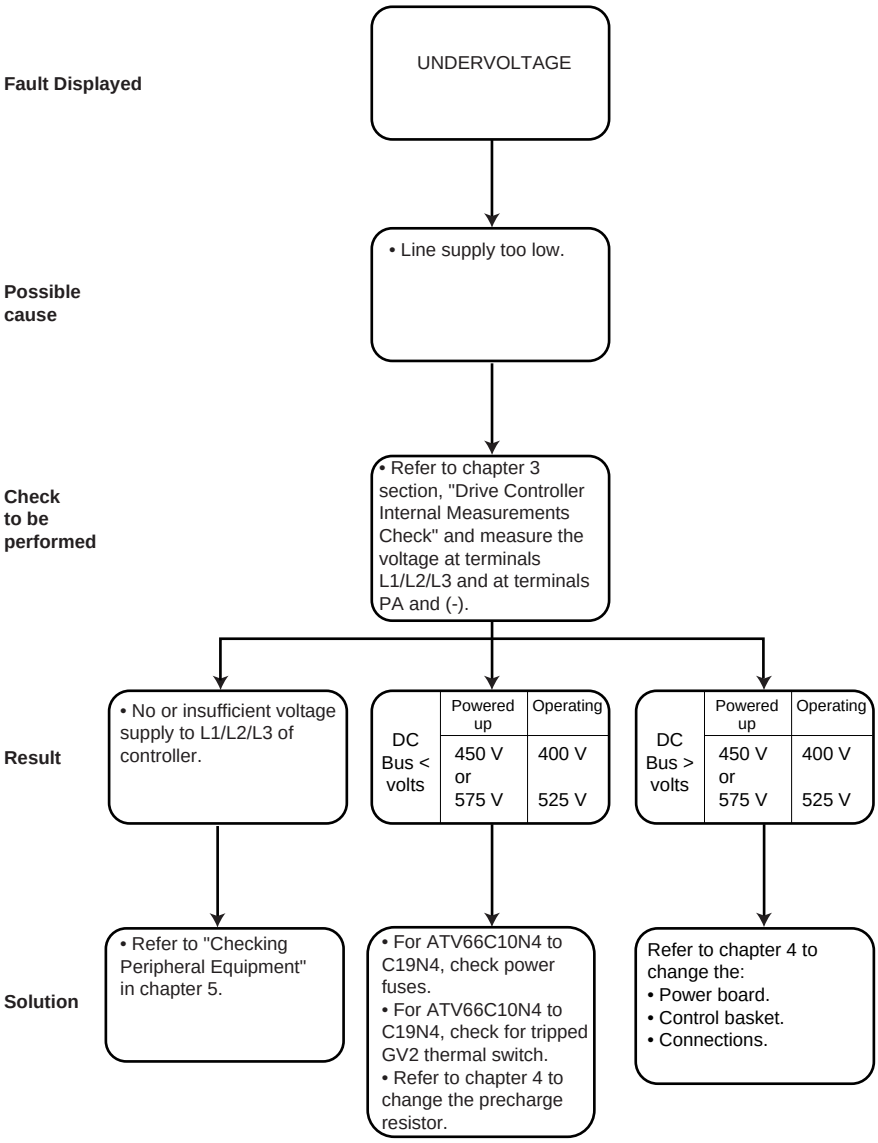


Figure 15: Undervoltage

Overvoltage

Figure 16 illustrates the measurement principle used for the overvoltage fault.

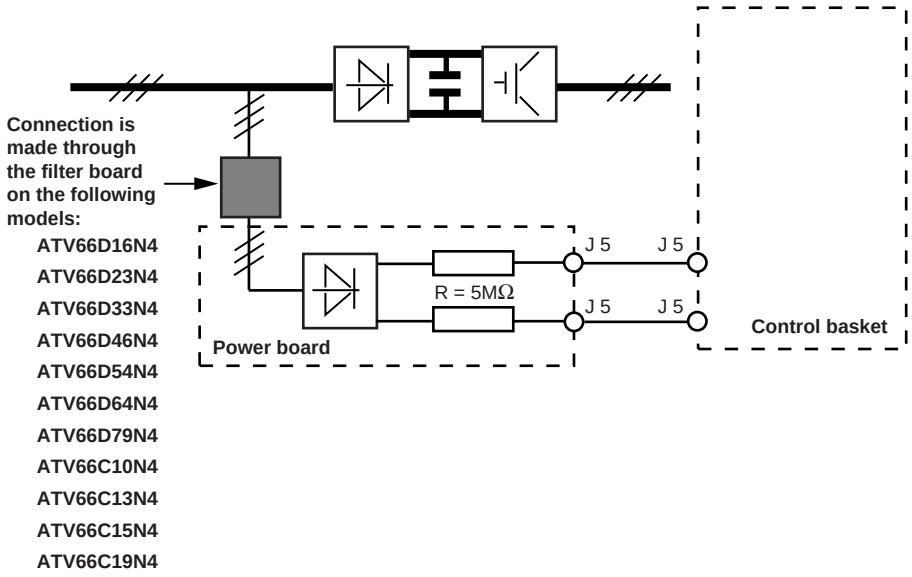


Figure 16: Line Overvoltage Measurement

The line overvoltage fault appears when line supply voltage is too high. The line voltage (L1, L2, L3) is rectified and filtered. Triggering occurs at the peak value.

The line overvoltage fault appears when line supply voltage is greater than 544 VRMS or 770 VAC peak.

The RMS value can be displayed on the keypad display.

Figure 17 illustrates the troubleshooting procedure when the line overvoltage fault is present.

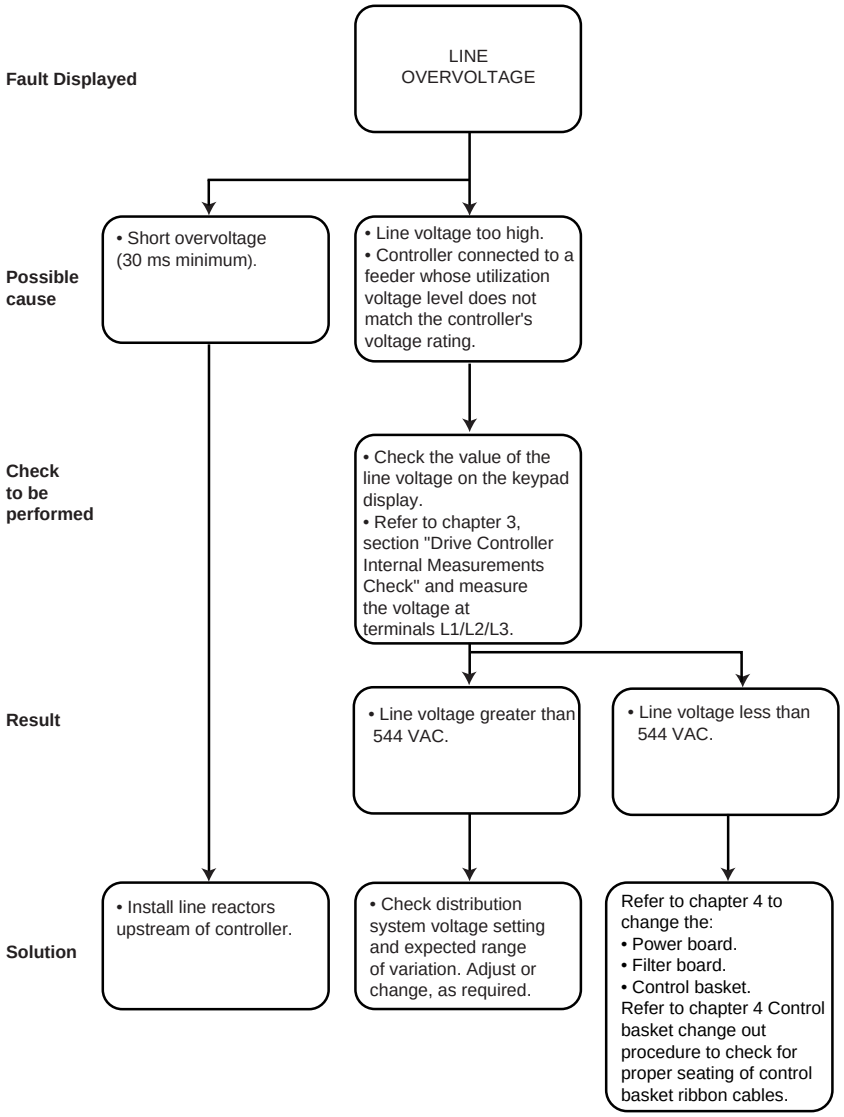


Figure 17: Line Overvoltage

DC Bus Overvoltage

Figure 18 illustrates the measurement principle used for the DC bus overvoltage fault.

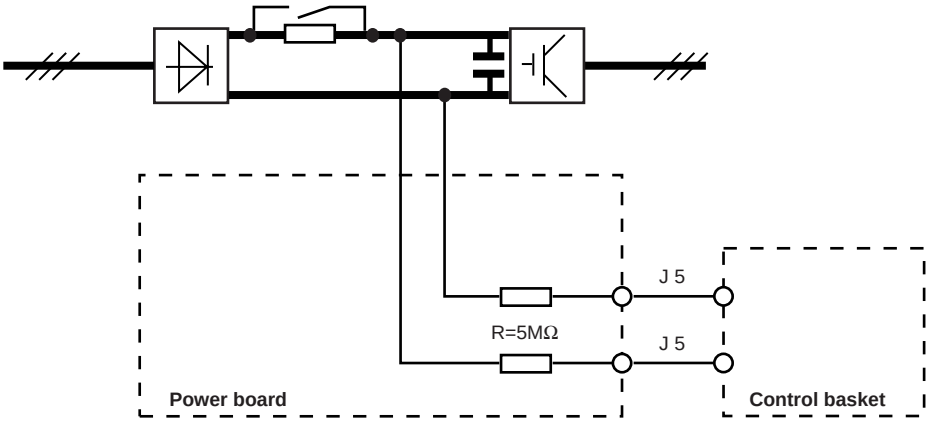


Figure 18: DC Bus Overvoltage Measurement

The measurement is taken from the capacitor terminals. The voltage is compared to a threshold voltage of 850 VDC. If the DC bus voltage is greater than 850 VDC, the DC bus overvoltage fault is triggered.

The DC bus voltage can be displayed on the keypad display at the line “DC BUS U”.

Figure 19 illustrates the troubleshooting procedure when the DC bus overvoltage fault is present.

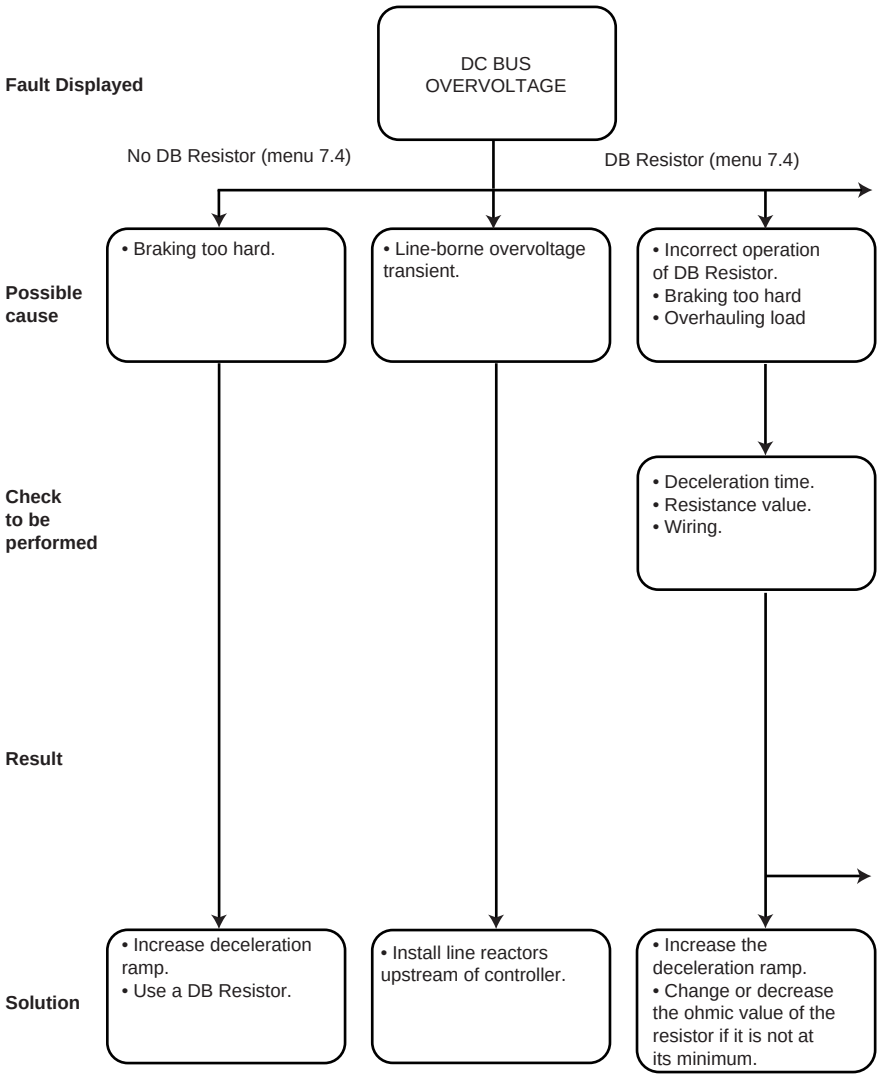
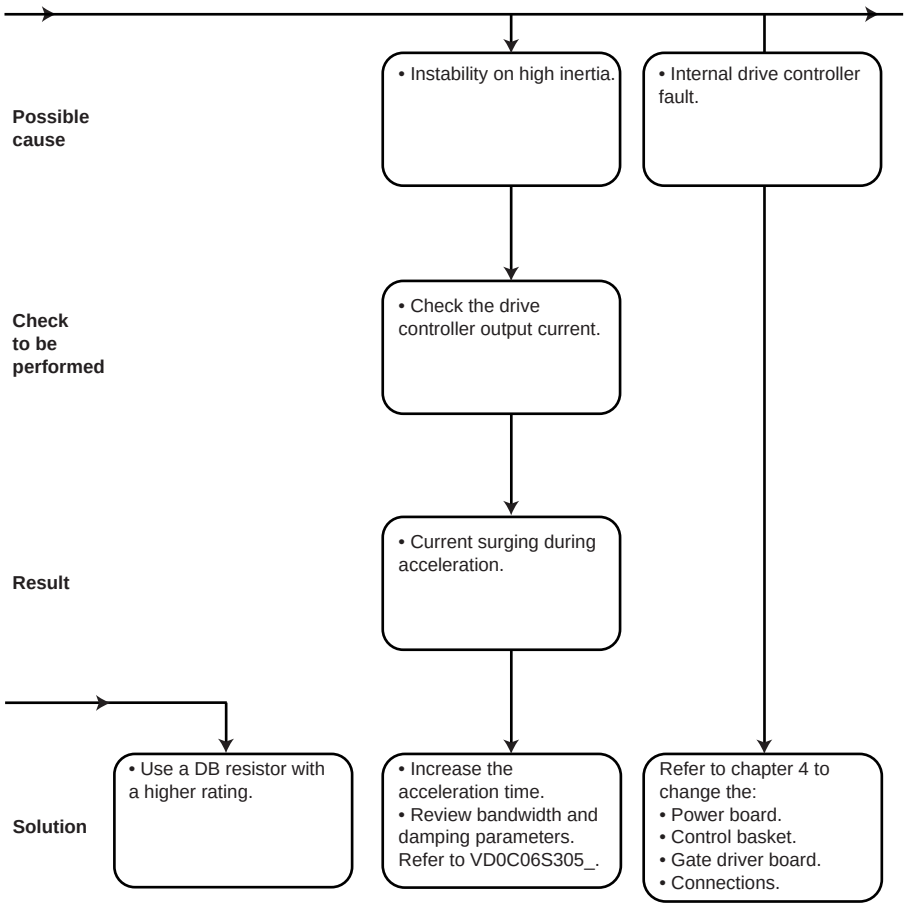
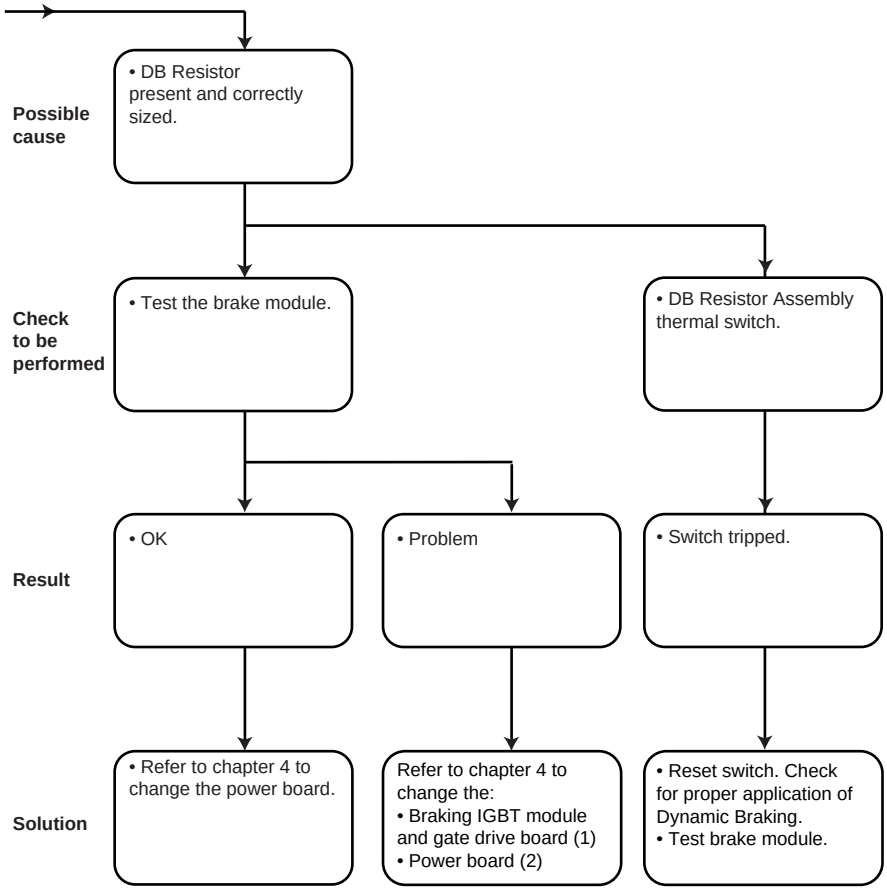


Figure 19: DC Bus Overvoltage

DC Bus Overvoltage (continued, 2 of 3)



DC Bus Overvoltage (continued, 3 of 3)



(1)

ATV66D16N4 ATV66D64N4 ATV66C19N4
ATV66D23N4 ATV66D79N4
ATV66D33N4 ATV66C10N4
ATV66D46N4 ATV66C13N4
ATV66D54N4 ATV66C15N4

(2)

ATV66U41N4
ATV66U54N4
ATV66U72N4
ATV66U90N4
ATV66D12N4

Input Phase Loss

Figure 20 illustrates the measurement principle used for the input phase loss fault.

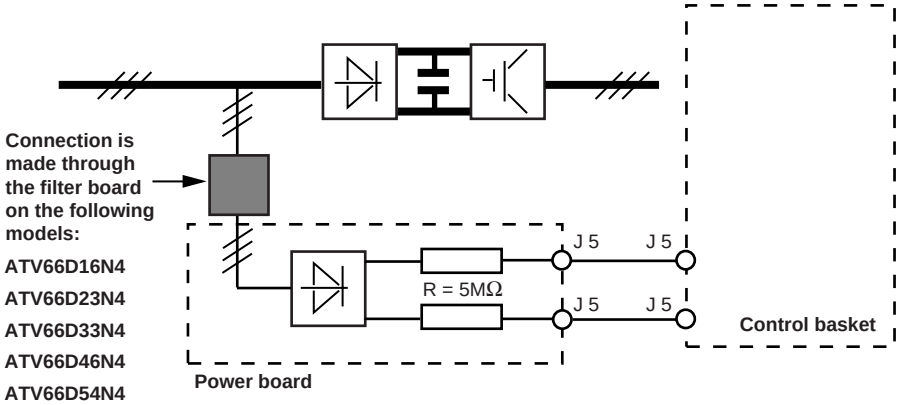


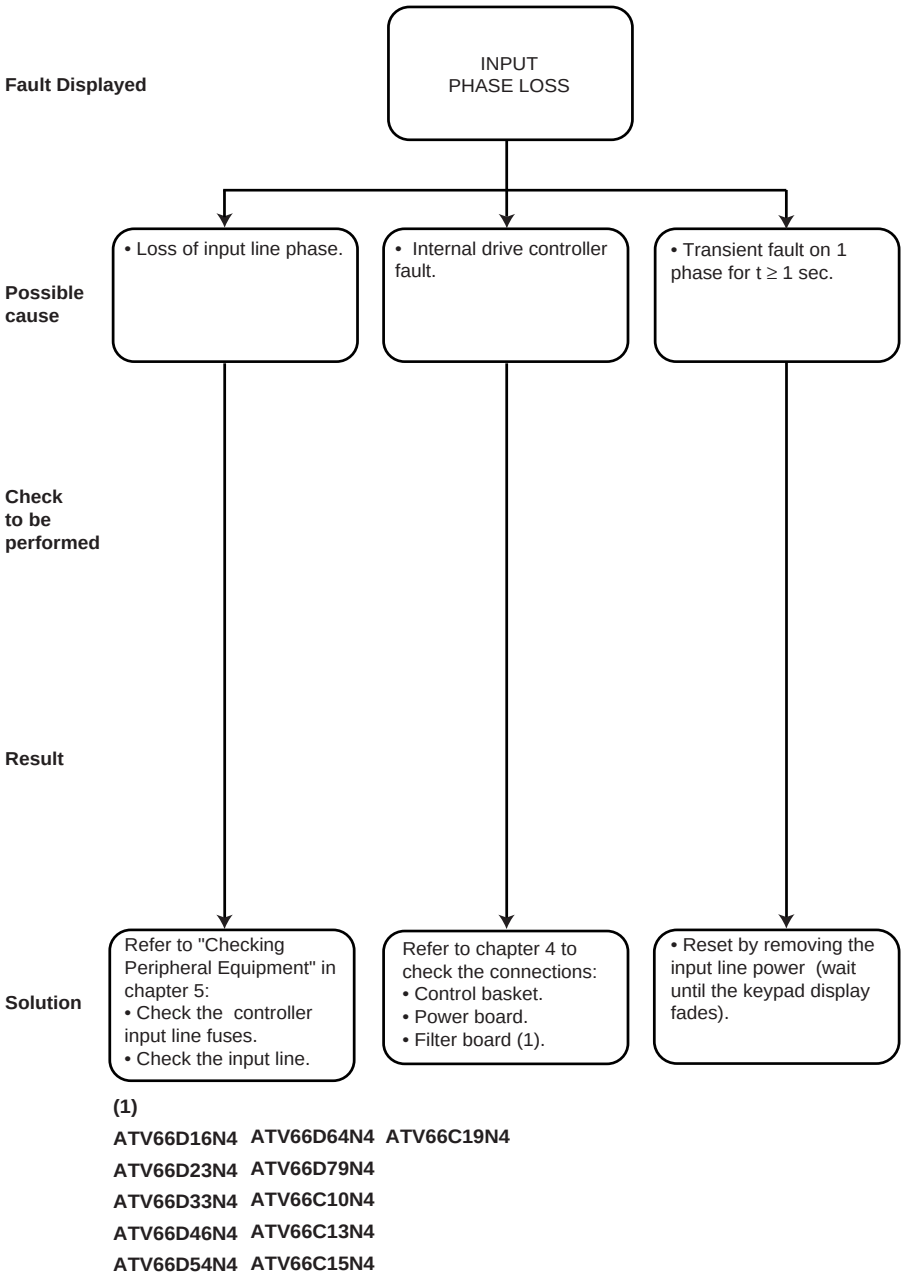
Figure 20: Input Phase Loss Measurement

The measurement diagram is the same as that for detection of line overvoltage. After rectifying the 3 phases, the mean value is used for detection. If all 3 phases are missing, a fault is triggered if the line voltage is less than 50 V peak. If 1 phase is missing, the value of the ripple rate is measured. In all cases, the presence of the fault is checked for 1 second before the input phase loss fault is triggered.

This circuit will also respond to input line voltage unbalance. Voltage unbalance greater than 18-20% will trigger an input phase loss. Voltage unbalance is defined in NEMA ICS 7.

“Input Phase Loss” is a self clearing fault. If the cause of the fault is corrected (i.e., the missing phase is restored to an acceptable level), internal logic will clear the fault and unlatch the drive controller. The drive controller will then be ready to start.

Figure 21 illustrates the troubleshooting procedure when the input phase loss fault is present.



(1)

ATV66D16N4 ATV66D64N4 ATV66C19N4
ATV66D23N4 ATV66D79N4
ATV66D33N4 ATV66C10N4
ATV66D46N4 ATV66C13N4
ATV66D54N4 ATV66C15N4

Figure 21: Input Phase Loss

Motor Overload

Using the signals provided by the T1 and T3 current sensors, the load status is calculated in relation to the thermal current (Ith) and the type of protection programmed in Fault Management (menu 7.4).

- Fan-cooled motor
- Force-cooled motor
- Manual adjustment

Two time constants are taken into account:

- Short constant: copper temperature rise (motor overload)
- Long constant: iron temperature rise (motor load status)

When the motor thermal state reaches 100%, there is a thermal early warning and the yellow LED blinks. The motor overload fault is triggered if the thermal state reaches 118%.

The motor overload thermal state percent can be displayed on the keypad display at the “MOTOR THERMAL STATE” line.

Figure 22 illustrates the troubleshooting procedure when the motor overload fault is present.

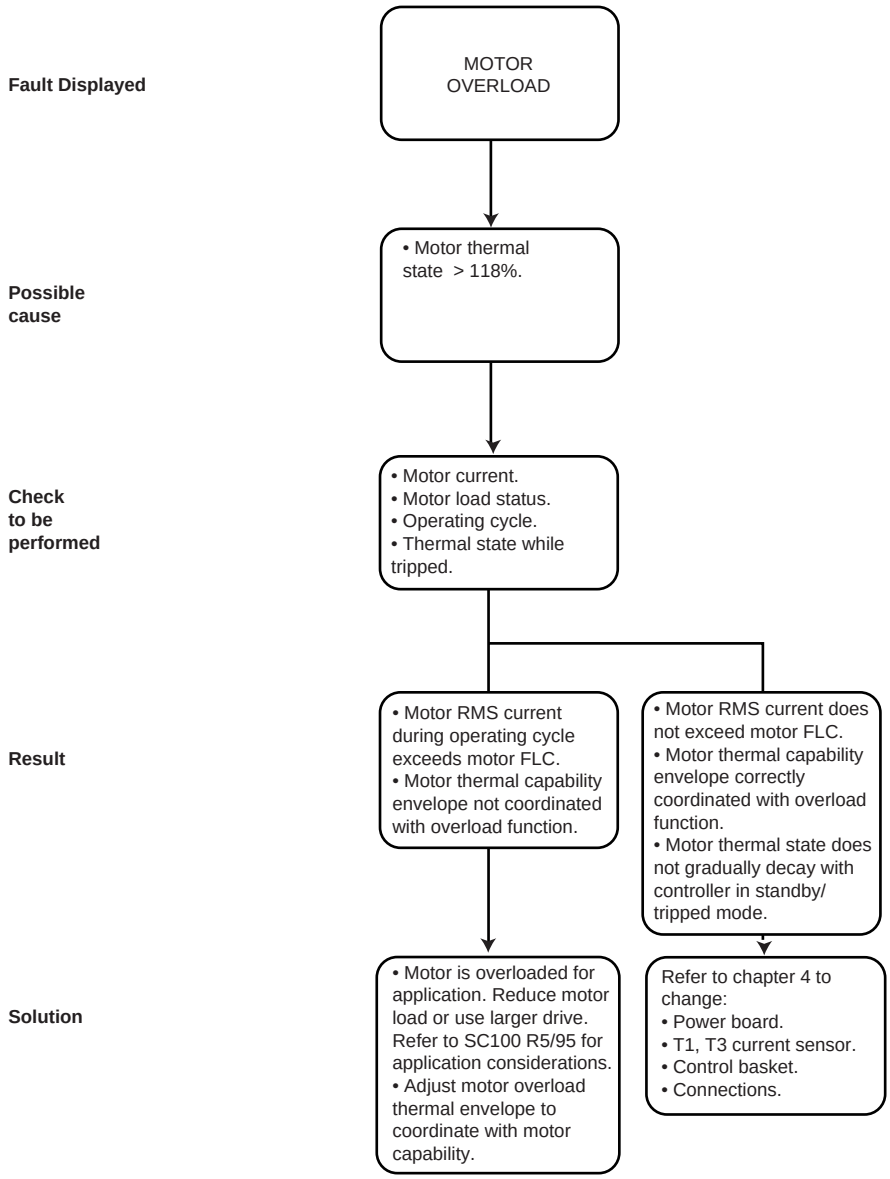


Figure 22: Motor Overload

Drive Overtemperature

Figure 23 illustrates the measurement principle used for the drive overtemperature fault.

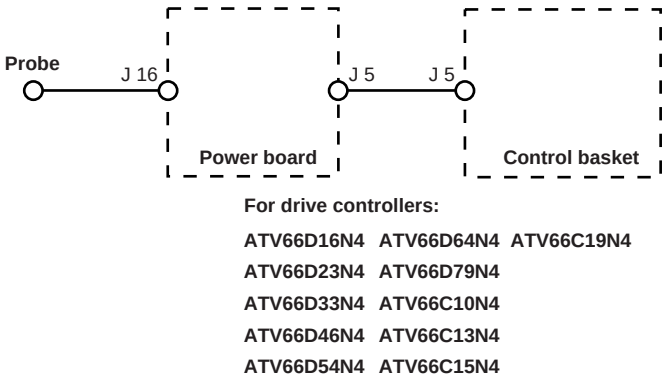


Figure 23: Drive Overtemperature Measurement

There is no temperature probe on the ATV66U41N4 through ATV66D12N4 drive controllers. For these sizes, overtemperature information is provided by the Intelligent Power Module (IPM). If the temperature of the module is greater than 111 ºC, the drive overtemperature fault is triggered.

For drive controllers ATV66D16N4 through ATV66C19N4, a probe is fixed to the heatsink.

If the drive thermal state reaches 100%, there is a thermal early warning and the yellow LED blinks. If after 1 minute, the drive thermal state has not dropped to 89%, the drive overtemperature fault is triggered.

The drive thermal state can be displayed on the keypad display at the “DRIVE THERMAL STATE” line.

The following are the triggering thresholds for the ATV66D16N4 through ATV66C19N4 drive controllers:

- ATV66D16N4, ATV66D23N4—heatsink temperature is greater than 100 ºC
- ATV66D33N4, ATV66D46N4—heatsink temperature is greater than 90 ºC
- ATV66D54N4, ATV66D64N4, ATV66D79N4—heatsink temperature is greater than 110 ºC
- ATV66C10N4, ATV66C13N4, ATV66C15N4, ATV66C19N4—heatsink temperature is greater than 110 ºC

In addition to the thermal probe, thermal switches are provided to shut down the drive controller should heatsink temperatures exceed certain levels.

Figure 24 illustrates the troubleshooting procedure when the drive overtemperature fault is present.

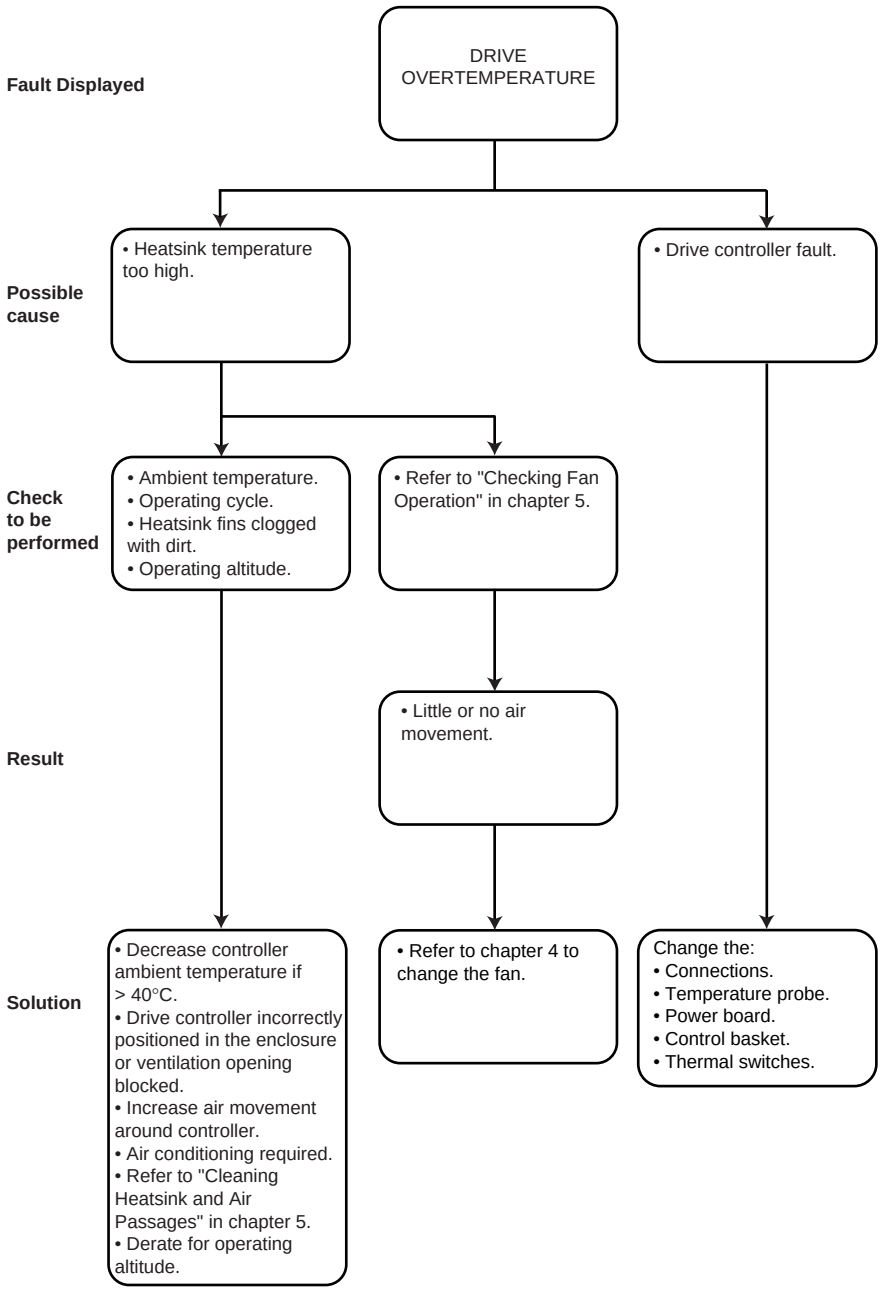


Figure 24: Drive Overtemperature

Loss of Follower

The loss of follower fault is triggered if the reference current to AI2 is less than 2.8 mA. There is an automatic reset if the current increases to 3.2 mA. This is valid if AI2 is configured as 4-20 mA or 20-4 mA.

Figure 25 details the troubleshooting procedure when the loss of follower fault is present.

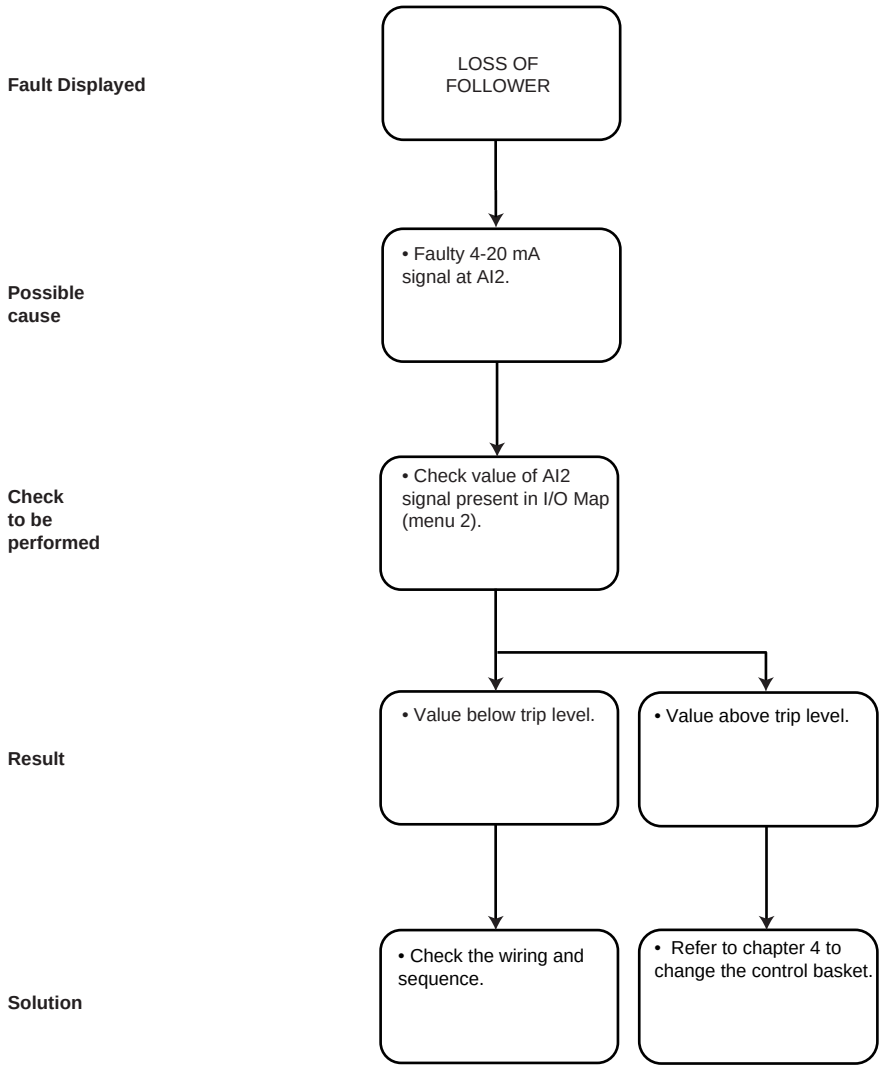


Figure 25: Loss Follower

Output Phase Loss

Figure 26 shows the measurement principle used for the output phase loss fault.

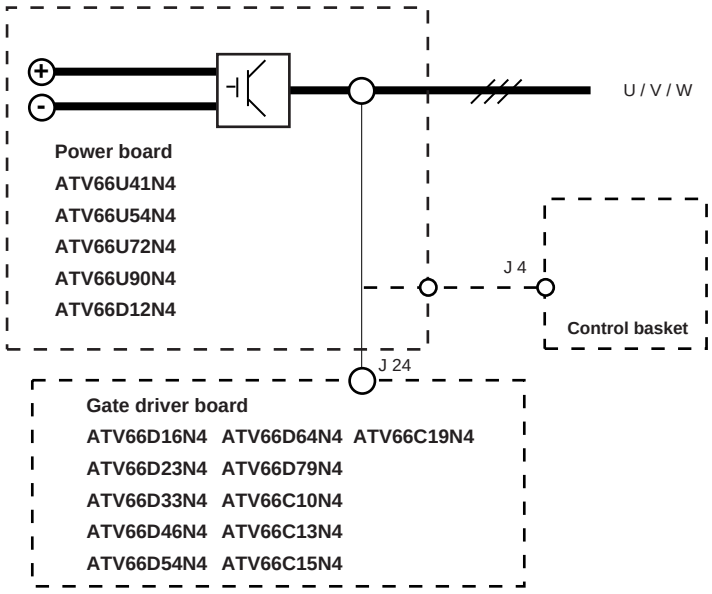


Figure 26: Output Phase Loss Measurement

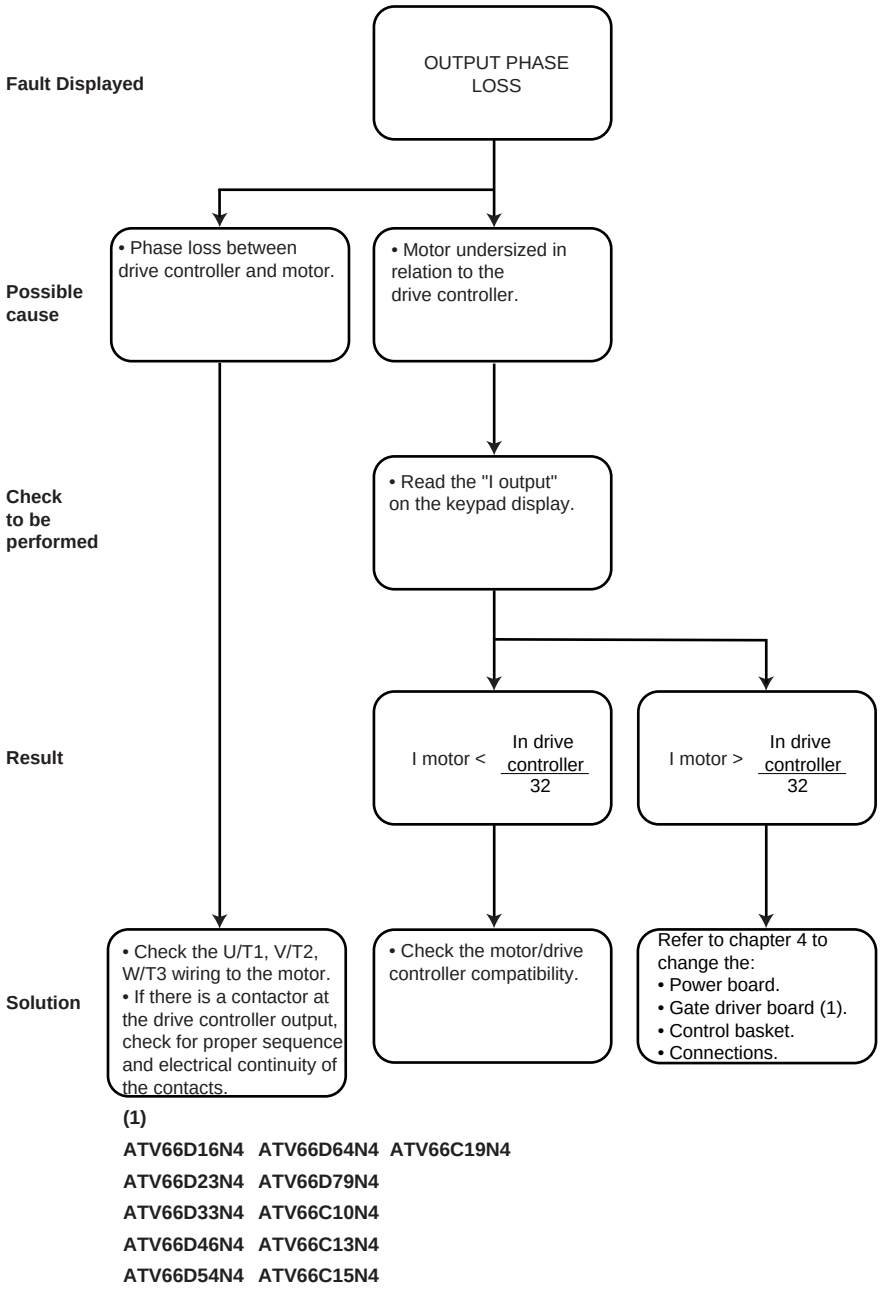
The motor phase current is measured by the T1, T3 sensors. The current is monitored continuously. The following conditions trigger the output phase loss fault:

- One phase is missing for 0.5 seconds
- The measured current is less than the nominal drive controller current divided by 32

In constant torque, there is no detection if the motor frequency is less than 1 Hz. In variable torque, there is no detection if the motor frequency is less than 20 Hz.

Output phase loss is automatically disabled when the bypass application function is enabled.

Figure 27 illustrates the troubleshooting procedure when the output phase loss fault is present.



(1)

ATV66D16N4 ATV66D64N4 ATV66C19N4
ATV66D23N4 ATV66D79N4
ATV66D33N4 ATV66C10N4
ATV66D46N4 ATV66C13N4
ATV66D54N4 ATV66C15N4

Figure 27: Output Phase Loss

Sequence Time Out

The sequence time out fault is only available if the bypass application function is configured. It is triggered:

- If the auxiliary contact on the drive controller output contactor is closed before a run command is issued or is not closed before the end of the time delay. This also prevents the drive controller from applying power to the motor.
- If the contactor opens while the motor is operating.

In the event of a fault, check the sequencing circuitry and operation of the output contactor.

Process Time Out

The process time out fault is associated with the bypass application function and is only available if the process function is configured.

The fault is triggered if after the process time out, the assigned LI has not changed to 1.

Serial Link Fault

Serial link faults occur, with the serial communication card option, when information exchange is not occurring at periodic intervals between the drive controller and the master device (i.e. PLC). Serial link faults can occur due to damaged communication cable, improperly configured communication options, incorrect control programs in the PLC, or excessive electrical noise.

TRIPS—REQUIRES POWER TO BE CYCLED

Short Circuit

Figure 28 illustrates the measurement principle used for the short circuit fault.

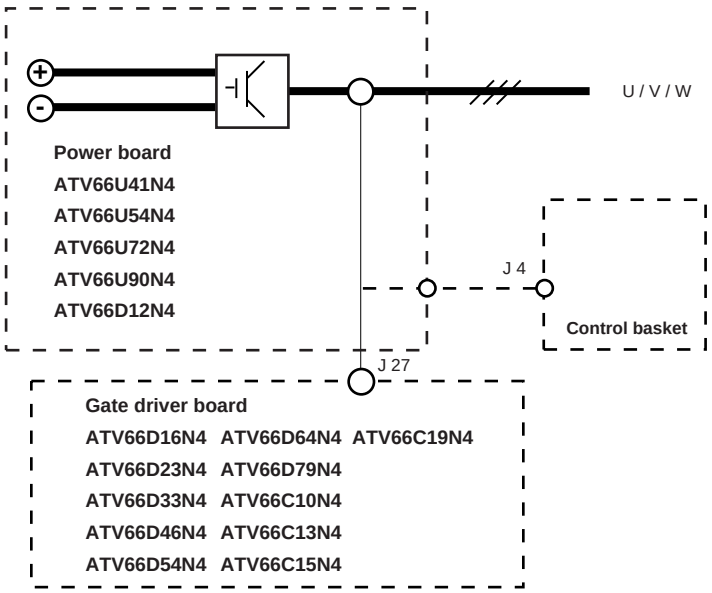


Figure 28: Short Circuit Measurement

Protection for drive controllers ATV66U41N4 through ATV66D12N4 is provided by Intelligent Power Module (IPM). Protection for drive controllers ATV66D16N4 through ATV66C19N4 is provided by the T1 and T3 current sensors as well as desaturation detectors in the gate driving circuitry. When desaturation is detected, it indicates an IGBT power block is not properly conducting current when it is gated on.

A display of “SHORT CIRCUIT” is generated in drive controllers ATV66U41N4 through ATV66D12N4 by the IPM when there is a short circuit in the power section of the drive controller or a short circuit between output phases. A display of “SHORT CIRCUIT” is generated in drive controllers ATV66D16N4 through ATV66C19N4 by the gate driver desaturation detection circuitry when there is a short circuit between output phases, a short circuit in the power section of the drive controller, a stressed or overheated IGBT power block, or a problem with the gate driver itself, its power supply or its connections to the IGBT power block.

A display of “SHORT CIRCUIT **.”** indicates that the output current sensors have detected an output overcurrent problem. If peak output current, as measured by the output current sensors, exceeds 2.828 times the continuous output 400V CT current rating of the drive controller (see Table 1-1 in the VDOC06S304_ manual), a LIC or warning pulse is generated. (example: continuous output 400V CT current rating for ATV66D79N4 is 115.5 amps.) More than 100 LIC pulses within 255 msecs will trigger the “SHORT CIRCUIT **.**” fault. For the ATV66C10N4 through ATV66C19N4, 5 LIC pulses within 255 msecs will trigger the “SHORT CIRCUIT **.”** fault.

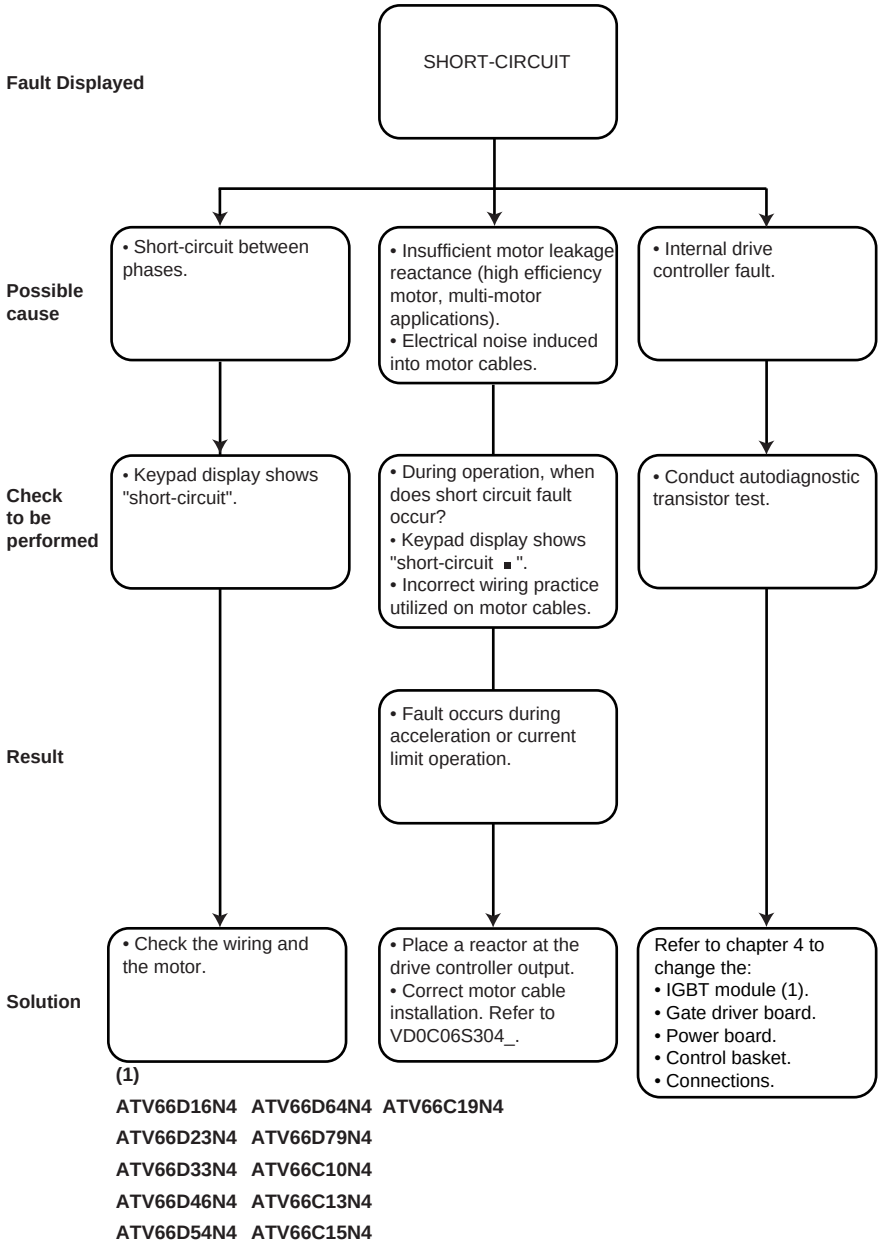


Figure 29: Short Circuit

Ground Fault

Figure 30 illustrates the measurement principle used for the ground fault.

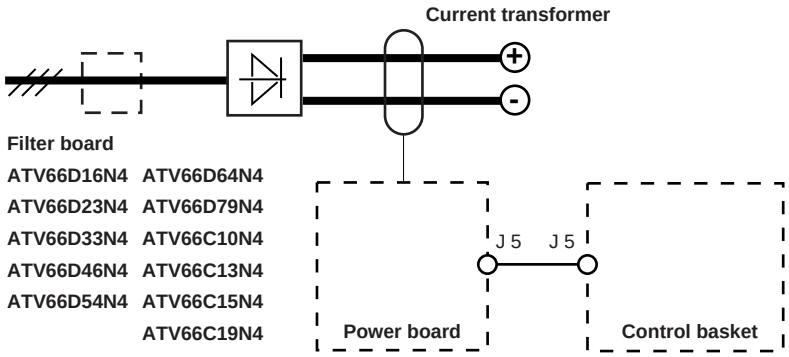


Figure 30: Ground Fault Measurement

For drive controllers ATV66U41N4 through ATV66D12N4, there is no ground fault. The output short circuit fault provides similar protection.

For drive controllers ATV66D16N4 through ATV66C19N4, the ground fault is triggered on a threshold of the current from the current transformer if the motor or the dynamic brake resistor are connected to ground. The ground fault is used to protect the drive controller only.

The + and - terminals on the DC bus pass via the current transformer. During normal operation, the difference in the current is close to 0. The ground fault is triggered upon the following deviation:

- ATV66D16N4, ATV66D23N4—current transformer with a turns ratio of 550. The fault is triggered if the deviation is > 15 A (rms).
- ATV66D33N4, ATV66D46N4—current transformer with a turns ratio of 500. The fault is triggered if the deviation is ≥ 6.5 A (rms).
- ATV66D54N4, ATV66D64N4, ATV66D79N4—current transformer with a turns ratio of 1800. The fault is triggered if the deviation is > 16 A (rms).
- ATV66C10N4, ATV66C13N4, ATV66C15N4, ATV66C19N4—current transformer with a turns ratio of 120. The fault is triggered if the deviation is > 21 A (rms).

The measurement is taken every millisecond. In the event of a ground fault, the transistors are locked directly by the control card at the channel controls.

Figure 31 illustrates the troubleshooting procedure when a ground fault is present.

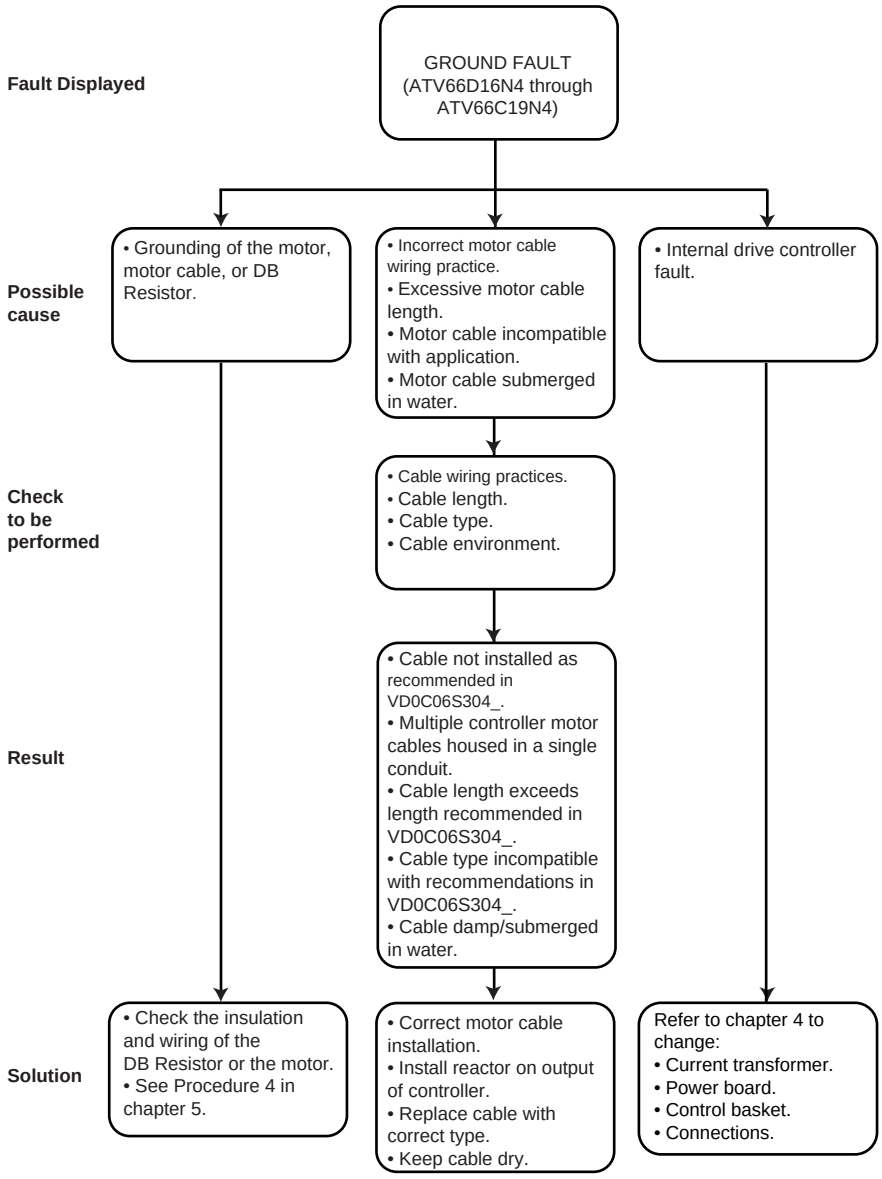


Figure 31: Ground Fault (ATV66D16N4 through ATV66C19N4)

Internal Fault

The fault code only appears on a fault caused by the drive controller. The internal fault is triggered:

- If there is no + 15 V / - 15 V power supply or if the power supply is less than + 11.5 V / - 11.5 V. The measurement is taken every millisecond and triggering occurs if the fault is present for 5 msec (terminal block J9 on the control board).
- If the controller rating information has not been recognized correctly on power-up.

Figure 32 details the troubleshooting procedure when an internal fault is present.

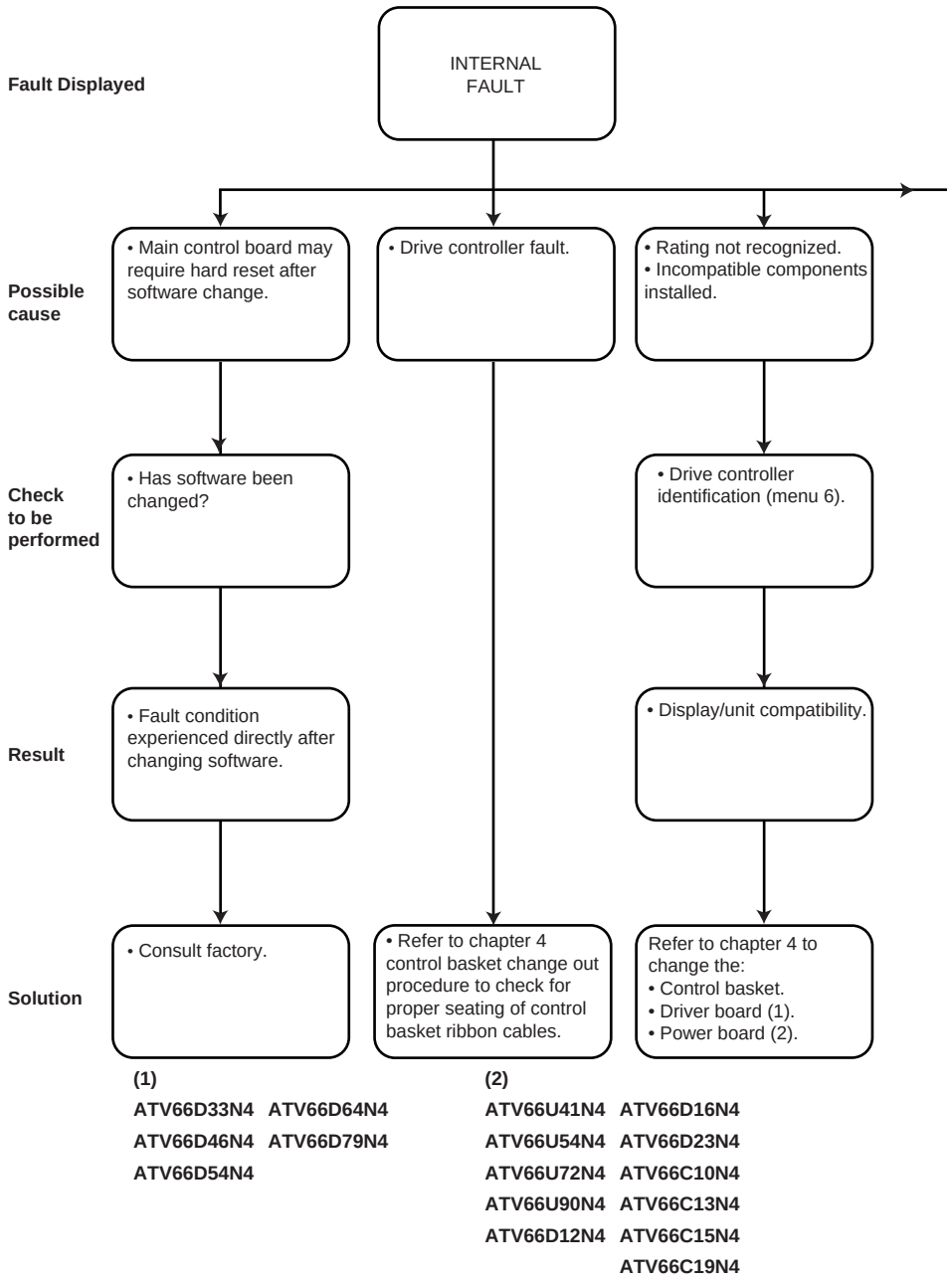
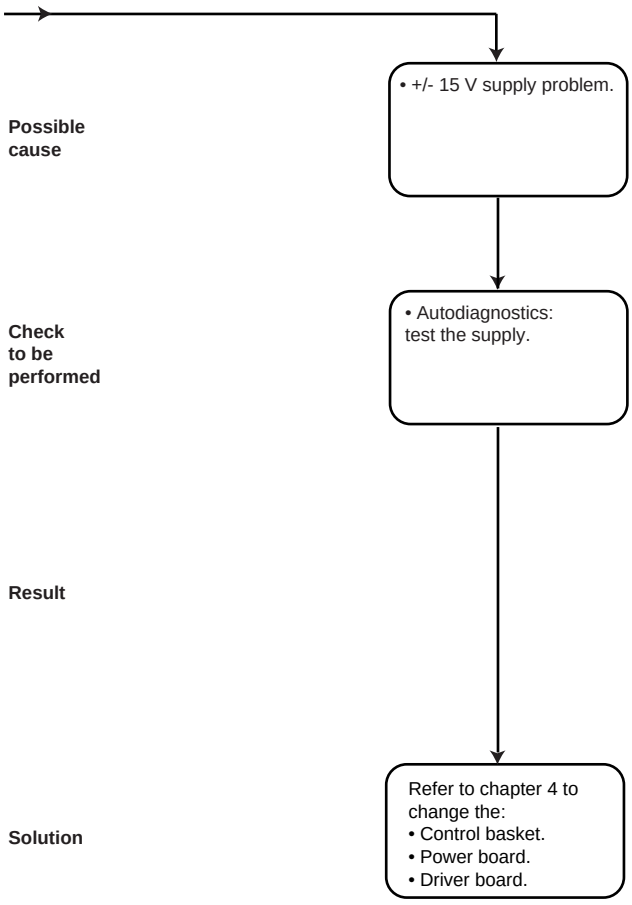


Figure 32: Internal Fault

Internal Fault
(continued, 2 of 2)



Dynamic Brake Fault

Figure 33 shows the measurement principle used for the dynamic brake fault.

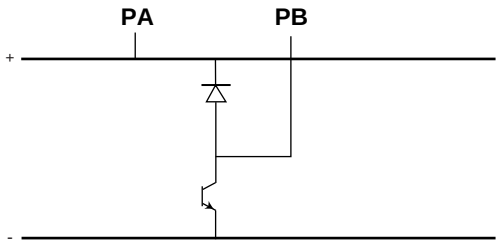


Figure 33: Dynamic Brake Fault Measurement

During power-up, the dynamic brake IGBT is operated and the voltage at the PA and (-) terminals is checked to determine if the DB Resistor is present. The dynamic brake fault appears if it has been selected in the Fault Management menu, and the resistor is missing, broken, or has too low of a resistance value (see Figure 34 below). Two conditions are needed to control the DB Resistor:

- DC bus voltage is greater than 750 VDC.
- DC bus voltage minus the peak line voltage multiplied by the square root of 2 (1.414) is greater than 20 V.

Review of the auto ramp adaptation

		Presence of DB resistor (menu 7.4)	
		NO	YES
Dynamic brake resistor	YES	ramp auto adaptation	Deceleration on a ramp
	NO	ramp auto adaptation (factory setting)	Dynamic braking fault

Controller model number *	Minimum resistance (ohms)
U41N4	120
U54N4	120
U72N4	120
U90N4	56
D12N4	56
D16N4	28
D23N4	28
D33N4	14
D46N4	14
D54N4	10
D64N4	5
D79N4	5
C10N4	2.5
C13N4	2.5
C15N4	2.5
C19N4	2.5

* ATV66*****

Figure 34: Review of Auto Ramp Adaptation

Dynamic Brake Resistor Overtemperature

The resistor temperature rise is calculated continuously using the value of the resistor programmed in the Fault Management menu, the DC bus voltage measurement, and the braking time measurement (minimum 1 msec).

The power is calculated according to the conduction time of the DB Resistor. The resistance value is set in the Fault Management menu and the thermal time constant is factory set in the controller.

There is no early warning for this fault. The temperature rise state cannot be displayed on the keypad display.

Figure 35 illustrates the troubleshooting procedure when a dynamic brake overtemperature fault is present.

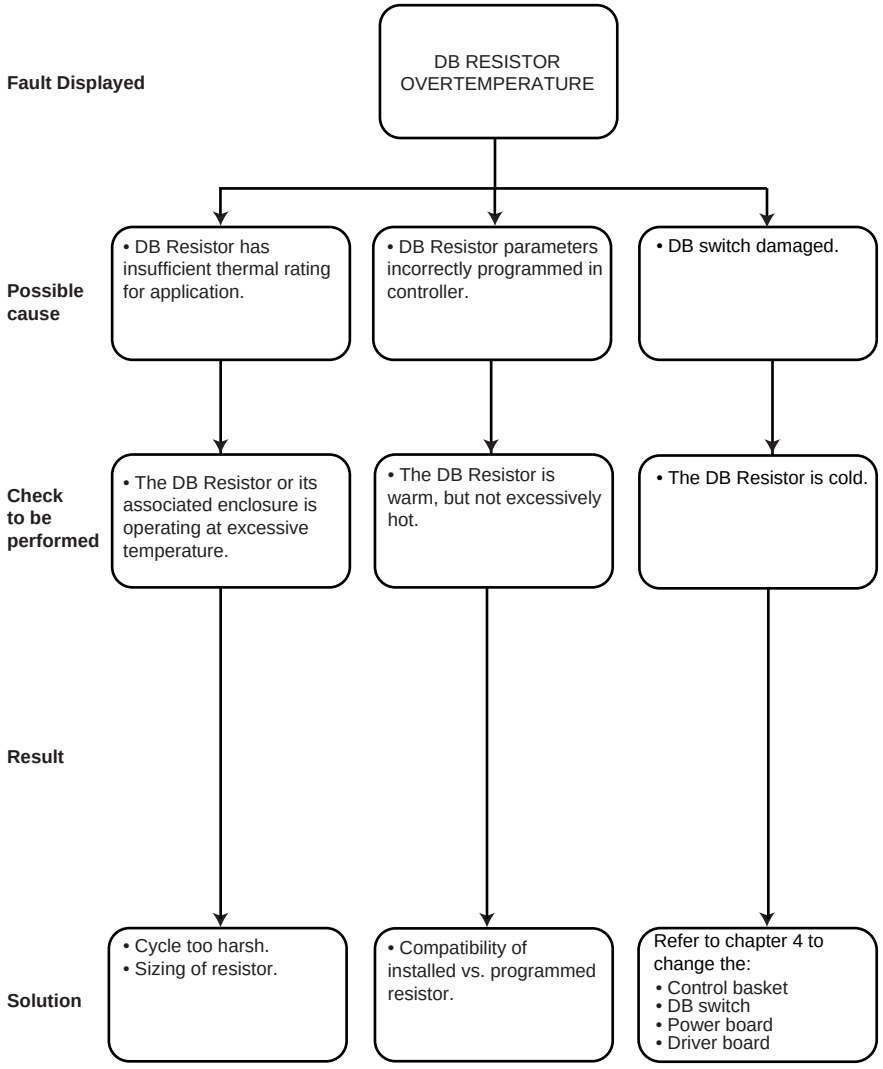


Figure 35: DB Resistor Overtemperature

Memory Failure

The fault only appears if there is a fault when writing to the EEPROM. If the fault occurs:

- Reset the controller to the factory settings.
- If the fault persists, change out the control card.

Precharge Failure

When the unit is powered up, the capacitor charging is monitored. When the capacitor voltage reaches 450 VDC, a 500 msec (for drive controllers ATV66U41N4 through ATV66D12N4) or 1500 msec (for drive controllers ATV66D16N4 through ATV66C19N4) timer is triggered.

While the timer is running, the voltage to the capacitor terminals must remain stable for 100 msec, otherwise a precharge failure fault is triggered

During operation, if the charging relay opens when RUN (LI1) is validated, a precharge failure fault is triggered. The check is made every millisecond.

If a precharge failure occurs, possible causes are:

- Failure of precharge relay / contactor or its associated coil drive circuitry.
- Control card ribbon cable incorrectly connected.
- Excessive mains voltage distortion.

Link Fault

The link fault covers several possible causes. As a general rule, it is a stop in the communication task between the keypad display and the control basket, or a software corruption caused by external influences. In the case of a software corruption, reset the unit by totally disconnecting the line power supply. Wait for the keypad display to fade before restarting.

Control Supply Fault

This type of fault occurs:

- If control power is supplied separately and if the L1, L2, L3 terminals are powered before the CL1 and CL2 terminals.
- If the shunts between CL1 / L1 and CL2 / L2 are missing and separate control power is not supplied.
- If the frequency is not between 48.1 and 52.1 for a 50 Hz line supply, and between 56.8 and 62.1 Hz for a 60 Hz line supply.

EQUIPMENT DAMAGE

Keypad Display is Off

When the drive controller is powered-up, and the keypad display is not active:

If the LEDs are not lit, check the unit supply or control card connections (J9 ribbon cable, + 5 V between 7 and 8).

If the LEDs are lit, check that the keypad display is properly connected to the control card. For controllers equipped with a cable between the keypad display and main control board, check continuity of cable assembly.

External Signs of Equipment Damage

Look for any sign of physical damage to the exterior of the drive controller, specifically:

- Cracked, charred, or damaged covers or enclosure parts
- Excessive surface temperatures of enclosures and conduits
- Damage to power or control conductor conduit
- Unusual noise or odors from any of the equipment
- Abnormal environmental conditions (i.e. temperature, humidity, vibration, etc.)
- Other conditions which may adversely affect the operation of the equipment
- Check the integrity of the keypad display unit. Note any scratches, punctures, burn marks, chemical burns, moisture in the screen, or any other signs of damage.
- Check the vents for any blockage or obstructions.
- Check the bottom of the drive controller for any signs of oil or electrolyte which might have leaked from capacitors inside the controller.

No External Signs of Equipment Damage

If no external damage is noted, thoroughly inspect the interior of the drive controller.

⚠ DANGER

HAZARDOUS VOLTAGE

Read and understand these procedures before servicing ALTIVAR 66 drive controllers. Installation, adjustment, repair, and maintenance of these drive controllers must be performed by qualified personnel.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

REMOVE ALL POWER FROM CONTROLLER BEFORE PROCEEDING! Read and follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in Chapter 5.

A thorough visual and mechanical check of the controller should include, but is not limited to the following points:

- General mechanical damage to components or assemblies.
- Loose or missing fasteners.
- Unplugged, loose, or damaged connectors.
- Damaged cables or cable assemblies.
- Cracked or damaged plastic castings.
- Leaking, bulging, or ruptured capacitors.
- Cracked or ruptured diode or IGBT power modules.
- Discolored, cracked, burnt, or flashed insulation surfaces.
- Burnt or discolored precharge or bus discharge resistors.

- Jammed or sticking fan impellers.
- Blocked or dirt laden air vents, heatsink fins or fan impellers.

If damage is found, refer to specific check-out procedures on the following pages and the replacement procedures in chapter 4. Remember that non-visible damage may be present even after visible damage is repaired.

If no external signs of equipment damage are observed, check the power and control parts of the drive controller. As defective parts or assemblies are found, refer to chapter 4 for change out procedures.

Checking the Power Part of the Drive Controller

Figure 36 illustrates the relationship between the power parts of the controller.

⚠ DANGER

HAZARDOUS VOLTAGE

Read and understand these procedures before servicing ALTIVAR 66 drive controllers. Installation, adjustment, repair, and maintenance of these drive controllers must be performed by qualified personnel.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

REMOVE ALL POWER FROM CONTROLLER BEFORE PROCEEDING! Read and follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

When power is removed from an undamaged controller, the stored energy in the bus and snubber capacitors is automatically discharged to nonhazardous levels. However, the discharge mechanisms in a damaged controller may not be operating properly and stored energy may be present. Before touching any capacitor terminals, always check for the presence of voltage across the capacitor terminals. The presence of voltage can affect resistance readings and may signal the presence of hazardous stored energy. If capacitive voltages are present, refer to “PROCEDURE 2: DISCHARGING STORED ENERGY IN CAPACITORS” in chapter 5.

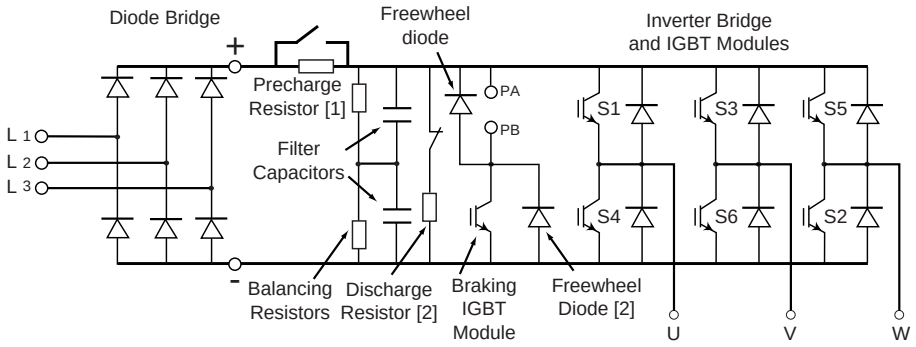


Figure 36: Power Part Electrical Schematic

Checking Fuses in ATV66C10N4 to C19N4 controllers

The ATV66C10N4 through ATV66C19N4 controllers are equipped with a DC bus fuse to minimize damage in the event of an inverter failure. Use the following procedure to check the DC bus fuse.

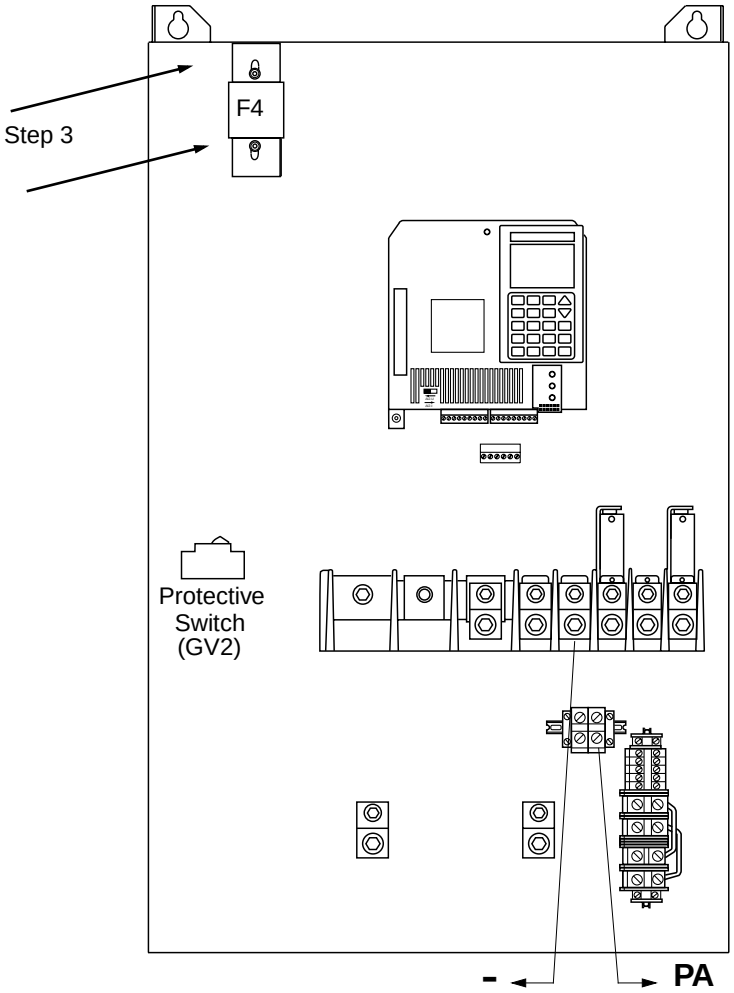


Figure 37: F4 Bus Fuse Test Procedure: ATV66C10N4 to C19N4

1. Set a voltmeter to the 1000 VDC scale. Measure the bus capacitor voltage between the PA and (-) terminals to verify that the DC voltage is less than 10 V. **Do not short across capacitor terminals with voltage present**.
2. If the bus capacitors are not fully discharged, refer to “PROCEDURE 2: DISCHARGING STORED ENERGY IN CAPACITORS” on page 311. Once the capacitor energy has been dissipated, continue with this procedure.
3. Measure the voltage between the PA terminal and both sides of fuse F4 to verify the voltage is less than 10 V.
4. If the voltage is not less than 10 V, refer to “PROCEDURE 2: DISCHARGING STORED ENERGY IN CAPACITORS” on page 311. Once the capacitor energy has been dissipated, continue with this procedure.
5. Check condition of the fuse with an ohmmeter. If the fuse is blown, this indicates that inverter or capacitor bank components may be damaged.

Checking the Diode Bridge

Check the diode bridge as shown in Figure 38. This should be done for each phase of the line supply with respect to the + and - terminals of the drive controller. Use a 0 - 1000 V multimeter as recommended in the “LIST OF TOOLS AND INSTRUMENTS” on page 5. Set the meter on the diode scale. In the event of any problem, disconnect the diodes and test them directly on their terminals.

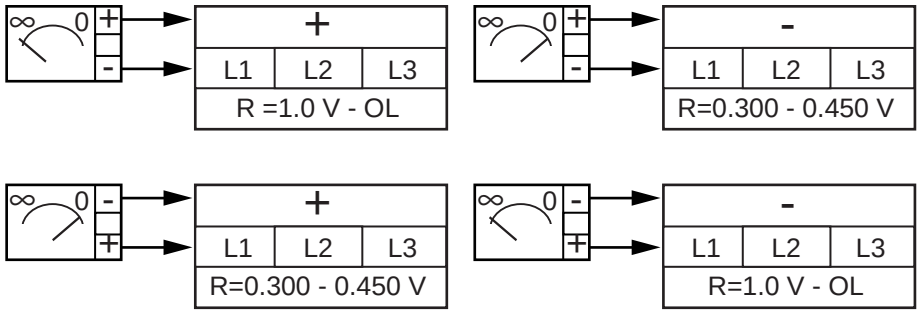


Figure 38: Checking the Diode Bridge

Checking the DC Bus

The DC Bus is composed of the bus capacitors, bus capacitor balancing resistors, means for discharging the bus capacitors upon removal of power, low impedance buswork connecting the bus capacitors to the inverter bridge, and on some controllers power semiconductor fuses to minimize damage in the event of a power diode or inverter switch failure.

For ATV66U41N4 to ATV66D12N4 controllers, the switch mode power supplies connected to the DC bus are used as the main discharge means. For the ATV66D16N4 to ATV66C19N4 controllers, resistors are switched across this bus when power is removed from CL1 and CL2. Switching is done by a normally closed auxiliary contact on the precharge contactor.

The DC bus may be checked for short circuits after performing “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5. On the ATV66C10N4 to ATV66C19N4 controllers, also perform “Checking Fuses in ATV66C10N4 to C19N4 controllers” on page 72.

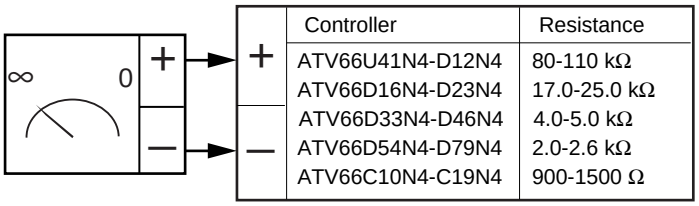
If a blown DC bus fuse is found, the inverter bridge is probably damaged. The blown fuse must be replaced before checking for DC bus short circuits.

To check for DC bus short circuits:

1. Connect the ohmmeter’s “volts/ohm” lead to the controller’s (+) terminal and the ohmmeter’s “com” lead to the controller’s (-) terminal and measure resistance readings.
2. Connect the ohmmeter’s “volts/ohm” lead to the controller’s PA terminal and the ohmmeter’s “com” lead to the controller’s (-) terminal and measure resistance readings.

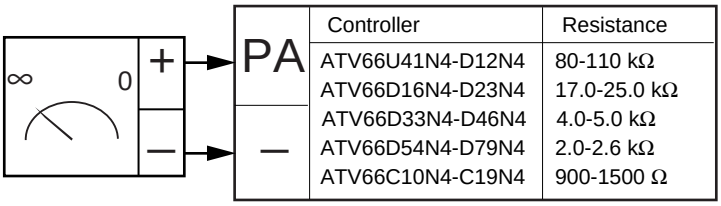
   The readings shown in Figures 39 and 40 (on page 74) should result.

   NOTE: Capacitance charging will be observed during these tests. The resistances listed are the steady-state values.



Controller	Resistance
ATV66U41N4-D12N4	80-110 kΩ
ATV66D16N4-D23N4	17.0-25.0 kΩ
ATV66D33N4-D46N4	4.0-5.0 kΩ
ATV66D54N4-D79N4	2.0-2.6 kΩ
ATV66C10N4-C19N4	900-1500 Ω

Figure 39: Checking the Rectifier Bus



Controller	Resistance
ATV66U41N4-D12N4	80-110 kΩ
ATV66D16N4-D23N4	17.0-25.0 kΩ
ATV66D33N4-D46N4	4.0-5.0 kΩ
ATV66D54N4-D79N4	2.0-2.6 kΩ
ATV66C10N4-C19N4	900-1500 Ω

Figure 40: Checking the Capacitor and Inverter Bus

3. If the resistance is greater than shown in Figures 39 and 40, there may be an open balancing or discharge resistor, a loose bus connection, or an open DC bus fuse (ATV66C10N4 through ATV66C19N4 only).
4. If the resistance is greater than shown in Figure 39 and the resistance is within the range shown in Figure 40, the precharge resistor or precharge protective switch (if used) may be open.
5. If the resistance is less than that shown in Figures 39 and 40, there may be a short circuit on the DC bus of the controller. If external wiring is present on the (+), (-), or (PA) terminals, disconnect the wiring and repeat the test to determine whether the cause of the lower resistance readings is internal or external to the controller. If the cause of the lower resistance readings is external to the controller, repeat the resistance measurement to determine the actual state of the drive controller. If the resistance measurements remain low after disconnecting the external wiring, then there may be damage to the rectifier bridge, multiple IGBTs and associated snubber boards (if used), DC bus insulation, or DC bus capacitors.
6. If the resistance is within the range shown in Figure 39 and the resistance is less than shown in Figure 40, the precharge resistor or precharge protective switch (if used) may be open. If external wiring is present on the (PA) and (-) terminals, disconnect the wiring and repeat the test to determine whether the cause of the lower resistance readings is internal or external to the controller. If the cause of the lower resistance readings is external to the controller, repeat the resistance measurements to determine the actual state of the drive controller. If the resistance measurements remain low after disconnecting the external wiring, additional damage may be present to multiple IGBTs and associated snubber boards (if used), DC bus insulation, or DC bus capacitors.
7. If the resistance is less than shown in Figure 39 and the resistance is within the range shown in Figure 40, the precharge resistor or precharge protective switch (if used) may be open. If external wiring is present on the (+) and (-) terminals, disconnect the wiring and repeat the test to determine whether the cause of the lower resistance readings is internal or external to the controller. If the cause of the lower resistance readings is external to the controller, repeat the resistance measurements to determine the actual state of the drive controller. If the resistance measurements remain low after disconnecting the external wiring, additional damage may be present in the rectifier bridge.

NOTE: If one filter capacitor is damaged, all the filter capacitors should be changed.

Checking the Precharge Resistor

Measure the ohmic value of the precharge resistor between the + and PA terminals. It must correspond to the values in Table 7.

Table 7: Checking the Precharge Resistor

Rp=50Ω	ATV66U41N4	
Rp=33Ω	ATV66U54N4	ATV66D12N4
	ATV66U72N4	ATV66D16N4
	ATV66U90N4	ATV66D23N4
Rp=10Ω	ATV66D33N4	ATV66C10N4
	ATV66D46N4	ATV66C13N4
	ATV66D54N4	ATV66C15N4
	ATV66D64N4	ATV66C19N4
	ATV66D79N4	

NOTE: ATV66C10N4 to ATV66C19N4 controllers are equipped with a series thermal cut-off switch to protect the precharge resistor in the event of a bus short circuit. If the thermal cut-off switch has tripped, reset the switch prior to making a precharge resistor resistance measurement.

Checking the Inverter Bridge

Check the inverter bridge as shown in Figure 41. This should be done for each phase of the motor output with respect to the PA and - terminals of the drive controller. Use a multimeter as recommended in “LIST OF TOOLS AND INSTRUMENTS” on page 5. Set the meter on the diode scale. In the event of any problem, disconnect the IGBT modules and test them directly on their terminals.

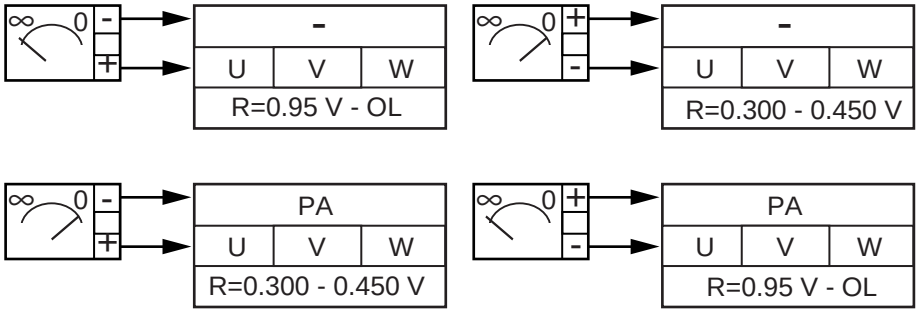


Figure 41: Checking the Inverter Bridge

Checking the IGBT Modules in ATV66D16N4 to C19N4 Drive Controllers

Check each IGBT module as shown in Figure 42 on page 76 for the resistance values shown. Use a multimeter as recommended in “LIST OF TOOLS AND INSTRUMENTS” on page 5. Set the meter on the diode scale. Refer to Figure 36 on page 71, Figure 66 on page 119, Figure 86 on page 155, and Figure 106 on page 199 to determine the correlation between the gate, collector, and emitter of each IGBT module. The gate connection on ATV66C10N4 to ATV66C19N4 controllers is the upper right hand mounting screw on each of the six gate cards (see Figure 128 on page 252).

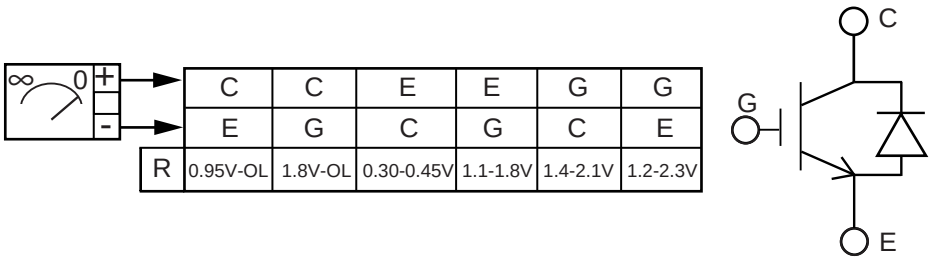


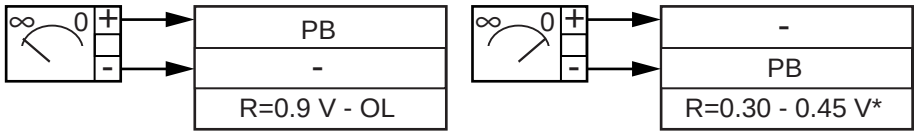
Figure 42: Checking the IGBT Modules

NOTE: All measurements referencing the G (gate) terminal will read "OL" if the gate lead is removed from the IGBT.

NOTE: If an IGBT module is changed on drive controllers ATV66D16N4 through ATV66C19N4, the gate driver board must also be changed.

Checking the Braking IGBT Module

Check the braking IGBT module as shown in Figure 43 for the resistance values shown. Use a multimeter as recommended in "LIST OF TOOLS AND INSTRUMENTS" on page 5. Set the meter on the diode scale. Refer to Figure 36 on page 71 for the relationship between the PB and (-) terminals.



* On ATV66U41N4 through ATV66D12N4, R=OL

Figure 43: Checking the Braking IGBT Module

NOTE: If a braking IGBT module is changed on drive controllers ATV66D16N4 through ATV66C19N4, the gate driver board must also be changed.

Checking the Braking IGBT Module Freewheel Diode

Check the braking IGBT module freewheel diode as shown in Figure 44 for the resistance values shown. Use a multimeter as recommended in "LIST OF TOOLS AND INSTRUMENTS" on page 5. Set the meter on the diode scale. Refer to Figure 36 on page 71 for the relationship between the PA and PB terminals.

NOTE: It is necessary to disconnect the dynamic brake resistor to perform this check.

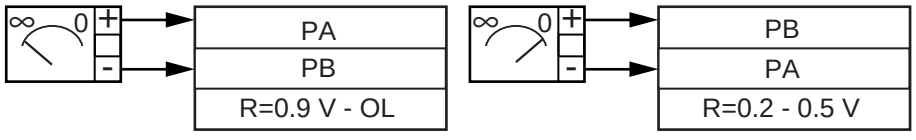


Figure 44: Checking the Braking IGBT Module Freewheel Diode

Checkout of the Control Part of the Drive Controller

⚠ DANGER

HAZARDOUS VOLTAGE

The remaining tests in this section are performed with power present in controller.

Read and understand these procedures before servicing ALTIVAR 66 drive controllers. Installation, adjustment, repair, and maintenance of these drive controllers must be performed by qualified personnel.

- Review “WORK PRACTICE PRECAUTIONS” on page 3 of this manual before proceeding.
- Before proceeding; any devices, components, or wiring removed or disconnected must be reassembled per the procedures found in chapter 4.
- Before restoring power, all shields and covers must be in place.
- Always attach test equipment to circuits prior to applying power to controller.
- Remove test equipment from circuits only after removing power from controller and following “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” on page 310 of this manual.
- Always remove all power and follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” on page 310 of this manual before working on controller.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

The following sections look at specific performance aspects of the control section of the controller. All the tests are done with power applied to the controller. Before restoring power, all shields and covers must be in place. Carefully review “WORK PRACTICE PRECAUTIONS” on page 3 of this manual. The person performing the tests must consider the following points prior to performing any test.

1. Do I have the appropriate skill set to understand the hazards involved and to safely implement the specific test in question?
2. Have I reviewed and understood the requirements of each test prior to implementation?
3. Have I the appropriate protective equipment and test apparatus to perform the test?
4. Do I have a thorough understanding of the safe operation and use of the protective equipment and test apparatus?
5. Have I constructed a test plan that meets the test requirements and allows the test to be safely implemented considering the specific controller installation and application?

If the answer to any point is “NO”, then STOP! Do not proceed further until all the points can be answered in the affirmative.

Some of the voltages and currents being measured are non-sinusoidal. To ensure consistent measurement results, always use the recommended test apparatus found in “LIST OF TOOLS AND INSTRUMENTS” on page 5 of this manual.

Drive Controller Internal Measurements Check

Figure 45 shows the measurements performed by the drive controller on the various power conversion stages. Incorrect operation of any sensor can affect overall performance of the controller. A number of monitored parameters are available for observation from the keypad display. By comparing the keypad values to those measured with appropriate test apparatus, the operation of the sensor circuits can be checked.

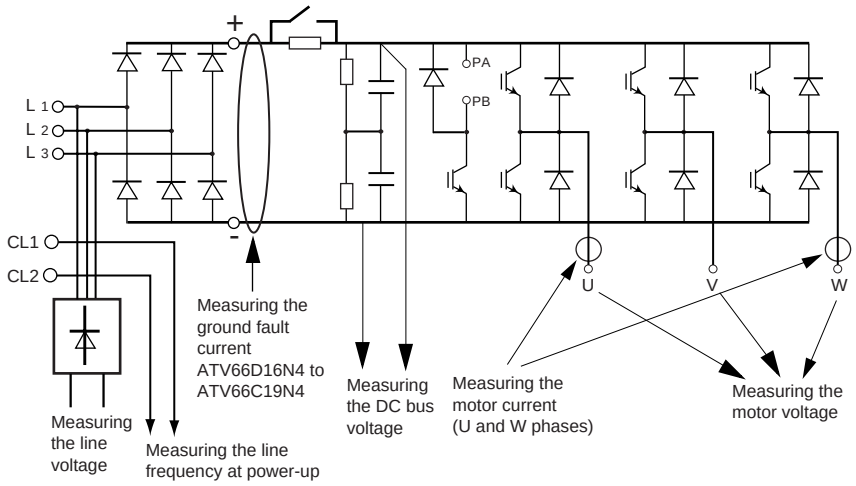


Figure 45: Drive Controller Power Part Measurements

The following checks should be performed. Refer to VD0C06S305_ for additional information on the use of the keypad display.

1. Line voltage is measured by a 3-phase rectifier bridge and a impedance-isolated circuit in the controller. The 3-phase average RMS value of line voltage is available on menu 4.1 of the keypad display. This voltage can be compared to the 3-phase average voltage measured at L1, L2, and L3 of the controller with the multimeter recommended in "LIST OF TOOLS AND INSTRUMENTS" on page 5 of this manual.

   NOTE: The accuracy of the controller line voltage measurement can be affected by the presence of voltage waveform distortion at the controller terminals. As a result, a comparison of keypad display values to direct measurements with the recommended test apparatus can differ by as much as 10%.

2. Line frequency is measured on the CL1-CL2 terminals of the control supply by the controller on each power-up. Absence of a frequency measurement will result in "CONTROL SUPPLY" fault being displayed on the keypad display. The value of frequency measured is not available on the keypad display. However, if serial link mode is used, the range of the value detected is available in word register 2203.
3. Voltage measurement of the DC bus is performed with an impedance-isolated circuit in the controller. The average value of the DC bus voltage is available on menu 4.1 of the keypad display. This voltage can be compared to the average DC bus voltage measured at PA and (-) of the controller with the multimeter recommended in "LIST OF TOOLS AND INSTRUMENTS" on page 5 of this manual.
4. Motor current is measured by two sensors placed on the T1/U and T3/W output phases of the controller. The information is conveyed to the power and control cards of the controller. The 3-phase average RMS value of current is available on menu 4.1 of the keypad display. This current can be compared to

the 3-phase average current measured at T1/U, T2/V, and T3/W of the controller with the multimeter and current probe recommended in "LIST OF TOOLS AND INSTRUMENTS" on page 5 of this manual.

5. The voltage of each output phase is measured using a galvanically-isolated circuit in the controller. The 3-phase average fundamental value of output voltage is available on menu 4.1 of the keypad display. Due to the harmonic content of the waveform, a comparison of the absolute values of the keypad display value and the 3-phase average voltage measured at T1/U, T2/V, and T3/W of the controller with a multimeter is not recommended (the measurement error can approach 20%). However, the relative balance of the output voltages as measured by multimeter can be checked and should be within 3% as defined in NEMA ICS 7.

Checking Fault History

The last eight faults stored by the drive controller and run status at time of fault can be displayed on menu 3 on keypad display. Refer to Table 2 on page 14 of this manual for run status codes.

Checking the 24 VDC and 10 VDC User Power Supplies

User power supply connections are available on the J12 and J13 connectors of the main control board and, if equipped with an I/O Extension Module, J22 and J23 connectors. Check the following voltages using the multimeter recommended in "LIST OF TOOLS AND INSTRUMENTS" on page 5 of this manual.

1. On J12 of the main control board, check the voltage between COM and +24 terminals. The voltage should be between +20 VDC to +30 VDC.
2. On J13 of the main control board, check the voltage between COM and +10 terminals. The voltage should be between +9.5 VDC to +11 VDC.
3. On J22 of the I/O Extension board, check the voltage between COM and +10 terminals. The voltage should be between +9.5 VDC to +11 VDC.
4. On J22 of the I/O Extension board, check the voltage between COM and -10 terminals. The voltage should be between -9.5 VDC to -11 VDC.
5. On J23 of the 24 VDC I/O Extension board (VW3A66201_), check the voltage between COM and +24 terminals. The voltage should be between +20 VDC to +30 VDC.

If no or low voltage is present, the user power supply may be overloaded due to the connected external load. Remove the user connections from the terminals and retest. If the voltage is now within limits, check the user load connected to the terminals to verify that an overload does not exist. Refer to the VD0C06S304_ and VD0C06T306_ instruction manuals for rated output current of each supply.

Checking the Keypad Display

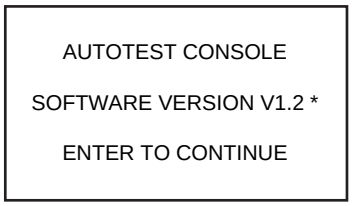
To enter the keypad display self-diagnostic routine, press the following keys simultaneously with the drive powered up and **NOT RUNNING**:

- F1 and 0 keys on V1.2 (see note)
- F1 and UP Arrow keys on V1.1 (see note)

NOTE: Keypad Version (V.*) is labeled on the reverse side of the keypad display.*

WARNING: The keys on the keypad do not function as normal during this test. The STOP key will not stop the drive while the keypad display self-diagnostic routine is in progress. MAKE SURE THE DRIVE IS NOT RUNNING BEFORE INITIATING THIS PROCEDURE!

The following message will appear:

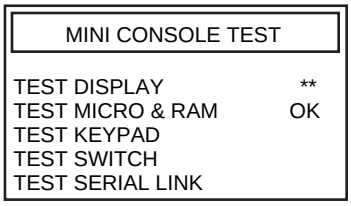


* If keypad display is V1.1, that number will appear.

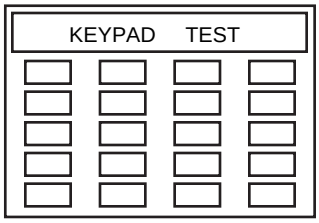
Press ENT to continue

The keypad will then proceed through 4 different tests of the screen pixels and characters. Press ENT to scroll through each test.

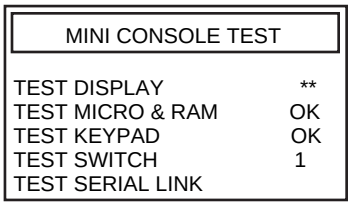
The following message will appear:



Pressing ENT starts the keypad test which generates a display like this:



Depressing each Keypad key should highlight it's corresponding box. Depressing ENT twice will exit this test and the keypad will display this message:



The Test Switch will indicate "0" if the lock switch on the back of the keypad is in the unlocked position. If the lock switch is in the Test Switch display will indicate "1".

Press ENT to enter the Serial Link Test. Currently, all of these tests fail with an ERROR message.

Press ENT again to exit the Keypad diagnostics.

Removing and reinstalling the keypad from the drive while the test is in progress will cause the test to abort.

Diagnostic Mode

Menu 8 allows access to various tests for locating failed components in case of an internal drive controller fault. This menu is accessible only when:

- The drive controller is stopped.
- Supply line power (L1, L2, and L3) is disconnected.
- Control power supply (CL1, CL2) is connected.

If any of these conditions are not met, an error message appears and access to the Diagnostic Mode is denied. Exit the error message screen and return to the Main menu by pressing ESC.

The motor should be connected when performing these tests. The following sections cover the functions available from the Diagnostic Mode.

For Class 8839 controllers, certain power circuit configurations (those with input line contactors) allow diagnostics to be run with the controller in the standby (ready) mode. All other configurations require the disconnection of the power to the L1, L2, and L3 terminals of the power converter. Refer to “Running the Drive Controller From Control Power Only” in chapter 5 for further information.

Autodiagnostics

Two tests are available from the Autodiagnostic Screen. Select either of the tests by scrolling with the ▲ and ▼ keys and pressing ENT.

1. Memory, ±15 V Supply, and Supply Frequency initiates a test on the ROM memory, a confirmation of the presence of ± 15 V, and a confirmation of the presence of supply frequency.
2. Transistors Tests initiates a test sequence on the drive controller inverter bridge. Note that the length of time required for this test varies with product size. While the test is in progress, the Result display will report “In Process” on line 2.

There are three possible responses for each element of a test:

- “OK” indicates that the tested element is good.
- “X” indicates that the tested element is defective.
- “?” (transistor test only) indicates that the transistor could not be tested.

Logic and Analog Input/ Output Tests

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

Forcing drive controller logic and analog outputs may cause undesired activation of connected equipment.

Set the connected equipment to ignore the change of state.

Failure to follow these instructions can result in death of serious injury.

Logic Input Test allows you to change the state of the logic inputs to check for good wiring connections. When the Logic Input Test screen is active, changes made to the inputs will change input bit status without affecting the state of the drive controller.

Analog Input Test is similar to Logic Input Test. When this screen is active, you can change the state of the analog inputs to check for good wiring connections without affecting the state of the drive controller.

Logic Output Test allows you to change the state of the logic outputs to check for good wiring connections without affecting drive controller operation

When the Logic Output Test screen is active, all outputs are forced to low (0) state regardless of actual drive controller settings. Changes then made to the outputs will alter bit status without affecting the state of the drive controller. When you leave the Diagnostic Mode and return to the Main menu, the logic outputs resume the programmed settings in place before the test sequence.

Analog Output Test allows you to change the value of the analog outputs to check for good wiring connections without affecting drive controller operation.

When the Analog Output Test screen is active, all output values are forced to 0 regardless of actual drive controller settings. Changes then made to the outputs will alter the setting without affecting the state of the drive controller. When you leave the Diagnostic Mode and return to the Main menu, the analog outputs resume the programmed settings in place before the test sequence.

CHAPTER 4: EQUIPMENT CHANGE OUT PROCEDURES

GENERAL

⚠ DANGER

HAZARDOUS VOLTAGE

Read and understand these procedures before servicing ALTIVAR 66 drive controllers. Installation, adjustment, repair, and maintenance of these drive controllers must be performed by qualified personnel.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

All procedures in this section must be performed with power removed from the controller.

⚠ CAUTION

EQUIPMENT DAMAGE

- The ALTIVAR 66 drive controllers use metric fasteners.
- Do not substitute SAE or alternate fasteners.

Failure to observe this instruction can result in injury or equipment damage.

The ALTIVAR 66 controllers use metric fasteners and require the use of metric driver tools. Do not substitute SAE or any alternate fastener. Substitution may result in damage to threaded inserts, breakage of components and subassemblies, overheated electrical connections due to improper torque levels, and general structural failure.

ATV66U41N4 to U72N4

This section contains spare part information and change out procedures for drive controllers:

- ATV66U41N4
- ATV66U54N4
- ATV66U72N4

Table 8 lists the spare parts. Refer to the pages indicated in the table for spare part change out procedures.

Table 8: Spare Parts for Drive Controllers ATV66U41N4 to 72N4

Description	For Drive Controllers:	Catalog Number	For Change Out Procedure See:
Control Kit	ATV66U41N4 to U72N4	VX4-A66CK1	Pages 87-91
Control Terminal Block Kit	ATV66U41N4 to U72N4	VZ3-N006	Pages 91-92
Power Board	ATV66U41N4	VX5-A66U41N4	Pages 92-94
	ATV66U54N4	VX5-A66U54N4	
	ATV66U72N4	VX5-A66U72N4	
Fan	ATV66U41N4 to U54N4	VZ3-V661	Pages 94-97
	ATV66U72N4	VZ3-V662	

Replacing the Keypad Display

This procedure explains how to replace the keypad display for the following drive controllers:

Drive Controller No.	Control Kit No.
ATV66U41N4	VX4-A66CK1
ATV66U54N4	
ATV66U72N4	

NOTE: All ALTIVAR 66 drive controllers use the same model keypad display. However, the version of software present within the keypad display may be specific to the version of software present in the control basket. Mixing incompatible versions of keypad display and control basket software can result in non-recognition of the keypad display by the drive controller or garbled message displays. Keypad displays are not supplied as separate kitted items. Keypad displays are supplied with control kits. Keep keypads with their associated control basket. Do not mix keypads and control baskets.

The keypad display is mounted on the control basket for drive controllers ATV66U41N4 through ATV66U72N4.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of magnetized flat blade screw drivers

With the drive controller door open:

1. Using a flat blade screw driver, push in on the keypad display tab and remove the keypad display (see Figure 46 on page 87).
2. Insert the new keypad display into the front of the control board. Ensure the lip on the bottom of the keypad display is behind the tab on the control basket.

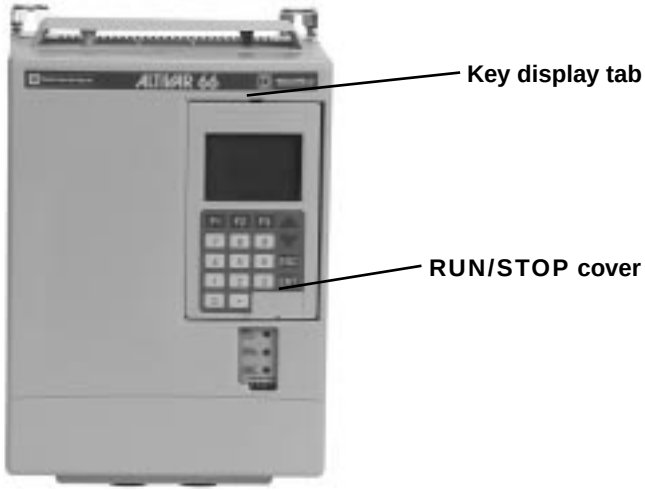


Figure 46: ATV66U41N4 to U72N4 Front View

Removing the Control Basket

This procedure explains how to remove the control basket for the following drive controllers:

Drive Controller No.	Control Kit No.
ATV66U41N4	VX4-A66CK1
ATV66U54N4	
ATV66U72N4	

Before removing power, note and record all the drive controller settings using the keypad display.

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on control basket, power board, and I/O Extension Module (if installed) connectors.
- Verify that all power has been removed from J1, J12, and J13 connectors.
- If I/O Extension Module is installed, verify that all power is removed from J22, J23, and J24 connectors.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of magnetized flat blade screwdrivers
- A set of magnetized phillips screwdrivers

With the drive controller door open:

1. Measure the bus voltage (if not already performed) as described in chapter 5 of this manual.
2. Remove the keypad display as described on page 87.
3. Remove options module if present. See User's Manual VDOC06T306_ for removal/installation instructions.
4. Using a phillips screwdriver, carefully loosen and remove the two screws holding the controller top cover in place.
5. Using a flat blade screwdriver, carefully loosen and disconnect the J9 and J32 connectors located at the top left of the control basket (see Figure 47 on page 89).

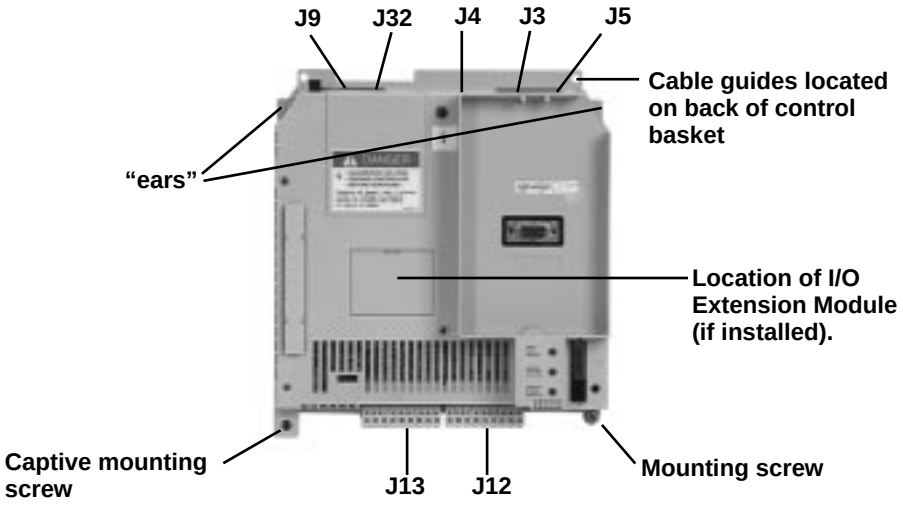


Figure 47: Control Basket Connector Locations

6. Using a flat blade screw driver, carefully loosen and disconnect the J12 and J13 connectors located at the bottom of the control basket.
7. Using two small flat blade screw drivers, carefully pull out on each side of the cable clasps of J3, J4, and J5 to the release position (see Figure 48 on page 89). Pull the ribbon cables from the sockets.

NOTE: Be sure the ribbon cables have been released before pulling to avoid damage to the cables. There are two versions of the cable clasps - blue and white.

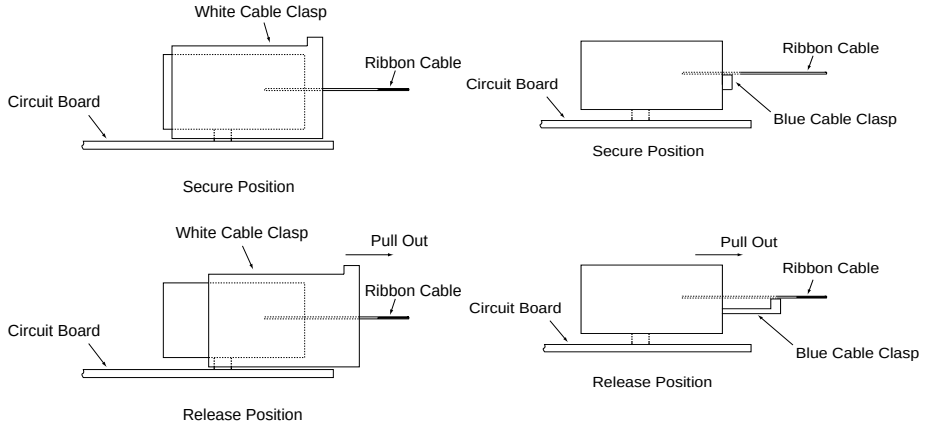


Figure 48: Cable Connector Secure and Release Positions

8. Using a phillips screw driver, loosen the two screws at the bottom of the control basket (see Figure 47 on page 89). Pull down on the control basket and remove it from the drive controller. As the control basket is removed, pull the three ribbon cables out of the guides on the back of the control basket.

Installing the Control Basket

This procedure explains how to install the control basket for the following drive controllers:

Drive Controller No.	Control Kit No.
ATV66U41N4	VX4-A66CK1
ATV66U54N4	
ATV66U72N4	

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of magnetized flat blade screw drivers
- A set of magnetized phillips screw drivers
- Torque wrench, set to 8.9 lb-in (1.0 N • m)
- A set of phillips screw driver sockets for torque wrench

For the control basket to be installed:

1. Thread the three ribbon cables through the cable guides on the back of the control basket (see Figure 47 on page 89).
2. Place the control basket in the controller and slide it up until the two bottom mounting holes are aligned with the holes in the controller. Ensure the two “ears” at the top of the control basket are behind the tabs on the drive controller (see Figure 47 on page 89).
3. Insert the bottom screw that is not captive and using a torque wrench with a phillips screw drive socket, tighten both screws to a torque of 8.9 lb-in (1.0 N • m).

   NOTE: The captive mounting screw provides the grounding connection for the control basket and shield connection on J13. Ensure this screw is properly threaded and torqued.
4. Snap the four connectors J9, J12, J13, and J32 into place (see Figure 47 on page 89).

   NOTE: The yellow keys in both the plugs and sockets are designed to prevent incorrect insertion of J12 and J13.
5. Make sure all three cable connectors are pulled out on connectors J3, J4, and J5 (see Figure 48 on page 89).

6. Carefully insert the three ribbon cables into the cable connectors at the J3 (seven connector cable), J4 (six connector cable), and J5 (18 connector cable) connectors. Ensure the silver leads of the cables are facing outwards from the controller.
7. Push the three ribbon cable connectors to their secure position.
8. Apply multi-lingual hazard labels supplied with kit to control basket, as required.
9. Reinstall options module if previously present. See User's Manual VDOC06T306_ for removal/installation instructions.
10. Install the controller top cover. Tighten the two screws using a phillips screw driver.
11. Install the keypad display as described in the procedure on page 87.
12. Reprogram the user settings as previously noted during the control basket removal.

Replacing Control Terminal Blocks

This procedure explains how to replace the control terminal blocks for the following drive controllers:

Drive Controller No.	Control Terminal Block Kit No.
ATV66U41N4	VZ3-N006
ATV66U54N4	
ATV66U72N4	

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow "PROCEDURE 1: BUS VOLTAGE MEASUREMENT" in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on control basket, power board, and I/O Extension Module (if installed) connectors.
- Verify that all power has been removed from J1, J12, and J13 connectors.
- If I/O Extension Module is installed, verify that all power is removed from J22, J23, and J24 connectors.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

Read "WORK PRACTICE PRECAUTIONS" on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of magnetized flat blade screw drivers

With the drive controller door open or removed:

1. Measure the bus voltage (if not already performed) as described in chapter 5 of this manual.
2. Remove options module, if present. See User's Manual VDOC06T306_ for removal / installation instructions.
3. Identify and tag all field wiring for future re-assembly.
4. Using a flat blade screw driver, loosen the terminal screws on the J1, J12, and J13 connectors (see Figure 49 on page 92). Pull the field wiring back out of the way.
5. Using a flat blade screw driver, gently pry the J1, J12, and J13 field connectors away from the board side connectors. Discard the old connectors.
6. Insert the new field side connectors into their associated board side connectors.

   NOTE: The yellow keys in both the plugs and sockets are designed to prevent incorrect insertion of both J12 and J13.
7. Install the field wiring on the new connectors for J1, J12, and J13. Using a flat blade screw driver, tighten the terminal screws for the field wiring installed.
8. Reinstall options module, if previously present. See User's Manual VDOC06T306_ for removal / installation instructions.

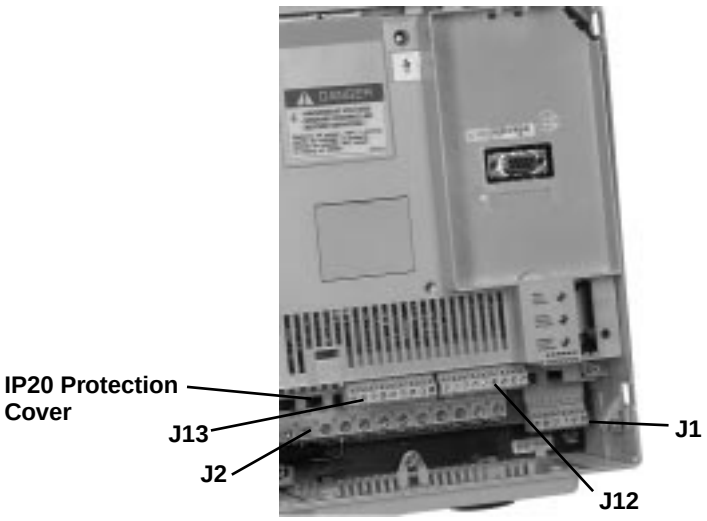


Figure 49: Location of J1, J2, J12, and J13 Connectors

Replacing the Power Board

For drive controllers ATV66U41N4 to U72N4, the power board and drive controller chassis come as one replacement part. This procedure explains how to replace the power board and chassis in the following drive controllers:

Drive Controller No.	Power Board No.
ATV66U41N4	VX5-A66U41N4
ATV66U54N4	VX5-A66U54N4
ATV66U72N4	VX5-A66U72N4

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on board connectors.
- Verify that all power has been removed from J1 connector.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Control basket procedure tool list, page 90
- Torque wrench, set to 17.4 lb-in (1.96 N • m)
- Flat blade screw driver sockets for torque wrench

With the drive controller door removed:

1. Remove the control basket as described in the procedure on page 88.
2. Remove the IP20 protective cover. (See Figure 49 on page 92).
3. Using a phillips screw driver, loosen and remove the two screws holding the controller top cover in place. Remove the top cover.
4. Using a phillips screw driver, loosen and remove the three screws holding the controller bottom cover in place. Remove the bottom cover.
5. Disconnect the J1 connector at the bottom of the power board. (See Figure 49 on page 92).
6. Identify and tag all field wiring for future re-assembly.
7. Disconnect the field wiring on the J2 connector at the bottom of the power board. (See Figure 50 on page 94).

8. Disconnect the J3, J4, and J5 cables at the connectors located on the power board (see Figure 50 on page 94). See Figure 48 on page 89 for connector construction.

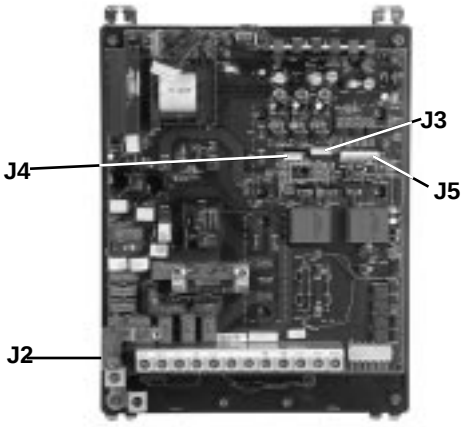


Figure 50: Power Board Connector Locations

9. Discard the old power board and chassis.
10. Install the controller bottom cover. Using a phillips screw driver, install and tighten the three screws holding the bottom cover in place.
11. Install the controller top cover. Using a phillips screw driver, install and tighten the two screws holding the top cover in place.
12. Install the IP20 protection cover saved from step 2 above.
13. On the new power board and chassis, connect J1 at the bottom of the power board. (See Figure 49 on page 92).
14. Using a torque wrench and a flat blade screw driver socket, install and tighten the field wiring at the termination points on connector J2. See Receiving, Installation manual VDOC06S304_ for torque specifications.
15. Install the J3, J4, and J5 cables at the connectors located on the power board (See Figure 50 on page 94).
16. Install the control basket as described in the procedure on page 90.

Removing the Fan

This procedure explains how to remove the fan from the following drive controllers:

Drive Controller No.	Fan No.
ATV66U41N4	VZ3-V661
ATV66U54N4	VZ3-V661
ATV66U72N4	VZ3-V662

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on board connectors.
- Verify that all power has been removed from J1 connector.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- 1/4” drive metric socket set, 5.5 to 14 mm
- 4” Needle nose pliers
- Wire cutters
- Control Basket procedure tool list, page 88.

With the drive controller door open or removed:

1. Remove the control basket as described in the procedure on page 88.
2. Disconnect the J1 connector at the bottom of the power board (see Figure 49 on page 92).
3. Identify and tag all field wiring for future re-assembly.
4. Disconnect the field wiring on the J2 connector at the bottom of the power board. (See Figure 50 on page 94).
5. Remove the IP20 protection cover (see Figure 49 on page 92).
6. Using a phillips screw driver, loosen and remove the three screws holding the bottom cover in place. Remove the bottom cover.
7. Using a phillips screw driver, loosen and remove the two screws holding the top cover in place. Remove the top cover.
8. Slide the side covers towards the top of the controller until they release. Remove the side covers.
9. Using a drive socket (or a phillips screw driver, as necessary), loosen the four screws holding the drive controller chassis to the controller back cover. Lift the drive controller away from the back cover to gain access to the fan.

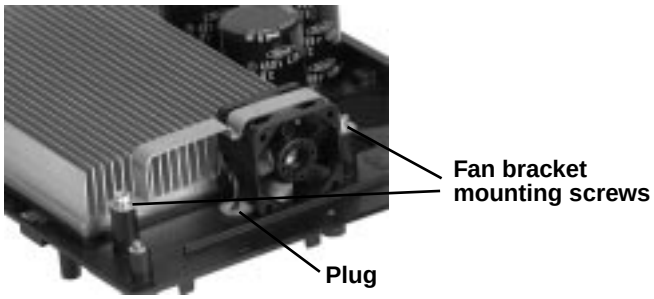


Figure 51: Fan Removal

10. Using a phillips screw driver, loosen and remove the two screws holding the fan bracket (see Figure 51 on page 96). Remove the fan bracket.
11. Pull the fan away from the controller until the plug that is attached to the fan leads pulls out of the socket in the drive chassis (see Figure 51 on page 96). Clip the fan leads on the controller side of the plug.
12. Using needle nose pliers, carefully remove the J6 connector located at the top of the power board (see Figure 52 on page 97). Pull the wire that is attached to the J6 connector through the controller. Discard the old fan, bracket, J6 connector, and wiring.

Installing the Fan

This procedure explains how to install the fan in the following drive controllers:

Drive Controller No.	Fan No.
ATV66U41N4	VZ3-V661
ATV66U54N4	VZ3-V661
ATV66U72N4	VZ3-V662

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Torque wrench, set to 17.4 lb-in (1.96 N • m)
- Flat blade screw driver sockets for torque wrench
- 1/4” drive metric socket set, 5.5 to 14 mm
- 4” Needle nose pliers
- Control Basket procedure tool list, page 90.

To install the fan:

1. With the drive controller inverted, thread the J6 connector from the new fan through the fan lead hole in the back of the controller (see Figure 52 on page 97).
2. Install the new fan. Ensure the label side of the fan is facing towards the heat sink.
3. Install the fan mounting bracket. Install and tighten the two mounting screws.
4. With the drive controller returned to its upright position, route the J6 connector and wire lead diagonally over to the right side of the controller (see Figure 52 on page 97).

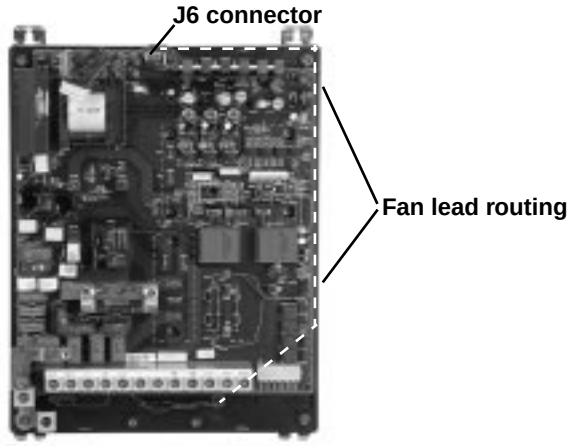


Figure 52: Fan Lead Routing

NOTE: When routing the wire in the above step, the J6 connector and attached fan leads are routed between the back of the heat sink and the underside of the printed circuit board.

5. Continue to route the J6 connector and wire leads along the right side of the controller, around the outside of the top right corner, and under the voltage regulator heat sink bar. Attach the J6 connector at the top of the power board. (See Figure 52 on page 97).
6. Fit the drive controller chassis to the controller back cover. Using a drive socket (or a phillips screw driver, as necessary), tighten the four screws holding the drive controller chassis to the back cover.
7. Install the two side panels by sliding them towards the bottom of the controller until the mounting tabs lock into place.
8. Install the bottom cover. Using a phillips screw driver, tighten the three screws holding the bottom cover in place.
9. Install the IP20 protection cover (see Figure 49 on page 92).
10. Install the top cover. Using a phillips screw driver, tighten the two screws holding the top cover in place.
11. Connect J1 at the bottom of the power board (see Figure 49 on page 92).
12. Using a torque wrench and a flat blade screwdriver socket, install and tighten the field wiring on the termination points on connector J2. See Receiving and Installation manual VDOC06S304_ for torque specification.
13. Install the control basket as described in the procedure on page 90.

ATV66U90N4 and D12N4

This section contains spare part information and change out procedures for drive controllers:

- ATV66U90N4
- ATV66D12N4

Table 9 lists the spare parts. Refer to the pages indicated in the table for spare part change out procedures.

Table 9: Spare Parts for Drive Controllers ATV66U90N4 and D12N4

Description	For Drive Controllers:	Catalog Number	For Change Out Procedure See:
Control Kit	ATV66U90N4, D12N4	VX4-A66CK1	Pages 100-104
Control Terminal Block Kit	ATV66U90N4, D12N4	VZ3-N006	Pages 104-105
Power Board	ATV66U90N4	VX5-A66U90N4	Pages 106-107
	ATV66D12N4	VX5-A66D12N4	
Fan	ATV66U90N4, D12N4	VZ3-V663	Pages 108-110

Replacing the Keypad Display

This procedure explains how to replace the keypad display for the following drive controllers:

Drive Controller No.	Control Kit No.
ATV66U90N4	VX4-A66CK1
ATV66D12N4	

NOTE: All ALTIVAR 66 drive controllers use the same model keypad display. However, the version of software present within the keypad display may be specific to the version of software present in the control basket. Mixing incompatible versions of keypad display and control basket software can result in non-recognition of the keypad display by the drive controller or garbled message displays. Therefore, keypad displays are not supplied as separate kitted items. Keypad displays are supplied with control kits. Keep keypads with their associated control basket. Do not mix keypads and control baskets.

The keypad display is mounted on the control basket for drive controllers ATV66U90N4 and ATV66D12N4 (see Figure 53 on page 100).

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of magnetized flat blade screw drivers

With the drive controller door open:

1. Using a flat blade screw driver, push in on the keypad display tab and remove the keypad display (see Figure 53 on page 100).
2. Insert the new keypad display into the front of the control board. Ensure the lip on the bottom of the keypad display is behind the tab on the control basket.

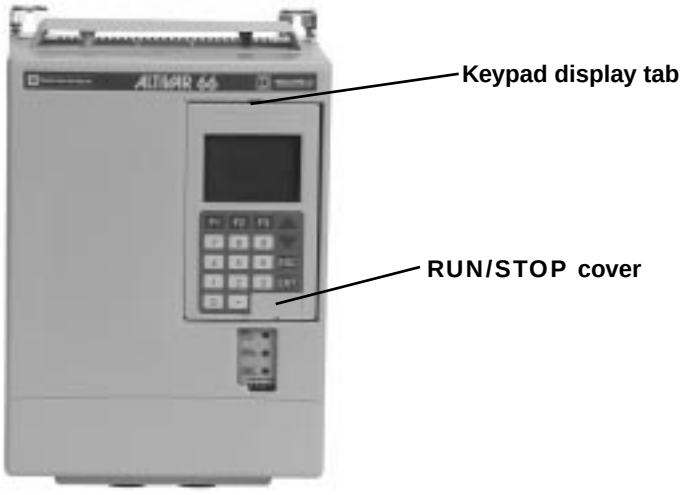


Figure 53: ATV66U90N4 and D12N4 Front View

Removing the Control Basket

This procedure explains how to remove the control basket from the following drive controllers:

Drive Controller No.	Control Kit No.
ATV66U90N4	VX4-A66CK1
ATV66D12N4	

Before removing power, note and record all the drive controller settings using the keypad display.

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on control basket, power board, and I/O Extension Module (if installed) connectors.
- Verify that all power has been removed from J1, J12, and J13 connectors.
- If I/O Extension Module is installed, verify that all power is removed from J22, J23, and J24 connectors.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of magnetized flat blade screw drivers
- A set of magnetized phillips screw drivers

With the drive controller door open:

1. Measure the bus voltage (if not already performed) as described in Chapter 5 of this manual.
2. Remove the keypad display as described on page 100.
3. Remove options module, if present. See User's Manual VDOC06T306_ for removal / installation instructions.
4. Using a phillips screw driver, carefully loosen and remove the two screws holding the controller top cover in place.
5. Using a flat blade screw driver, carefully loosen and disconnect the J9 and J32 connectors located at the top left of the control basket (see Figure 54 on page 102).

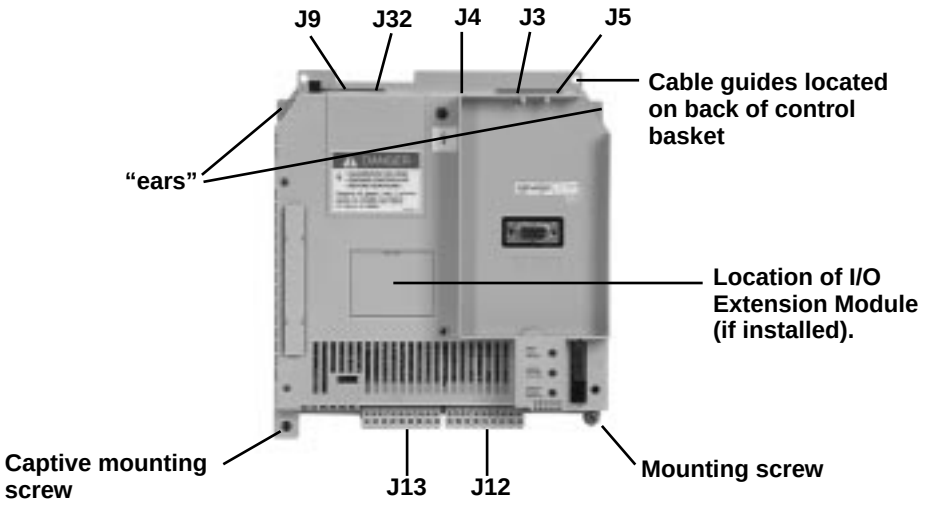


Figure 54: Control Basket Connector Locations

6. Using a flat blade screw driver, carefully loosen and disconnect the J12 and J13 connectors located at the bottom of the control basket.
7. Using two small flat blade screw drivers, carefully pull out on each side of the cable clasps of J3, J4, and J5 to the release position (see Figure 55 on page 102). Pull the ribbon cables from the sockets.

NOTE: Be sure the ribbon cables have been released before pulling to avoid damage to the cables. There are two versions of the cable clasps - blue and white.

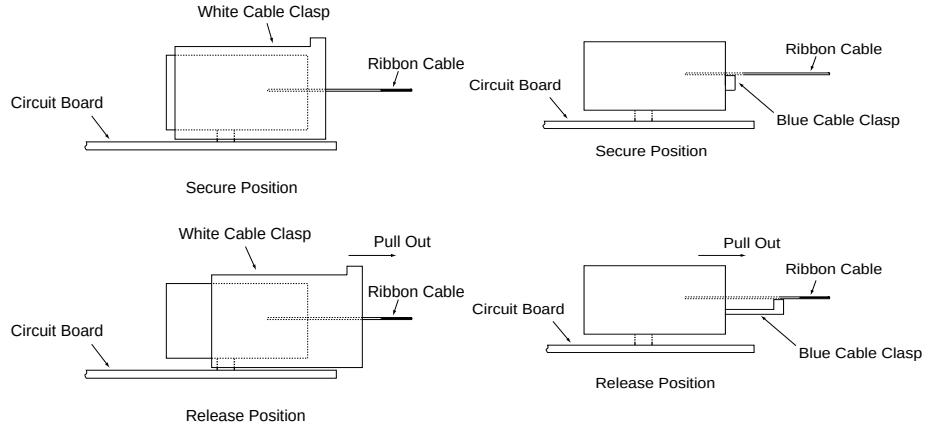


Figure 55: Cable Connector Secure and Release Positions

8. Using a phillips screw driver, loosen the two screws at the bottom of the control basket (see Figure 54 on page 102). Pull down on the control basket and remove it from the drive controller. As the control basket is removed, pull the three ribbon cables out of the guides on the back of the control basket.

Installing the Control Basket

This procedure explains how to install the control basket in the following drive controllers:

Drive Controller No.	Control Kit No.
ATV66U90N4	VX4-A66CK1
ATV66D12N4	

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of magnetized flat blade screw drivers
- A set of magnetized phillips screw drivers
- Torque wrench, set to 8.9 lb-in (1.0 N • m)
- A set of phillips screw driver sockets for torque wrench

For the control basket to be installed:

1. Thread the three ribbon cables through the cable guides on the back of the control basket (see Figure 54 on page 102).
2. Place the control basket in the controller and slide it up until the two bottom mounting holes are aligned with the holes in the controller. Ensure the two “ears” at the top of the control basket are behind the tabs on the drive controller (see Figure 54 on page 102).
3. Insert the bottom screw that is not captive and using a torque wrench with a phillips screw drive socket, tighten both screws to a torque of 8.5 lb-in (1.0 N • m).

   NOTE: The captive mounting screw provides the grounding connection for the control basket and shield connection on J13. Ensure this screw is properly threaded and torqued.
4. Snap the four connectors J9, J12, J13, and J32 into place (see Figure 54 on page 102).

   NOTE: The yellow keys in both the plugs and sockets are designed to prevent incorrect insertion of both J12 and J13.
5. Make sure all three cable connectors are pulled out on connectors J3, J4, and J5 (see Figure 55 on page 102).
6. Carefully insert the three ribbon cables into the cable connectors at the J3 (seven connector cable), J4 (six connector cable), and J5 (18 connector cable)

connectors. Ensure the silver leads of the cables are facing outwards from the controller.

7. Push the three ribbon cable connectors to their secure position.
8. Apply multi-lingual hazard labels supplied with kit to control basket as required.
9. Reinstall option module, if previously present. See User's Manual VDOC06T306_ for removal / installation instructions.
10. Install the controller top cover. Tighten the two screws using a phillips screw driver.
11. Install the keypad display as described in the procedure on page 100.
12. Reprogram the user settings as previously noted during the control basket removal.

Replacing Control Terminal Blocks

This procedure explains how to replace the control terminal blocks for the following drive controllers:

Drive Controller No.	Control Terminal Block Kit No.
ATV66U90N4	VZ3-N006
ATV66D12N4	

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow "PROCEDURE 1: BUS VOLTAGE MEASUREMENT" in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on control basket, power board, and I/O Extension Module (if installed) connectors.
- Verify that all power has been removed from J1, J12, and J13 connectors.
- If I/O Extension Module is installed, verify that all power is removed from J22, J23, and J24 connectors.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

Read "WORK PRACTICE PRECAUTIONS" on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of magnetized flat blade screw drivers

With the drive controller door open or removed:

1. Measure the bus voltage (if not already performed) as described in Chapter 5 of this manual.
2. Remove option module, if present. See User's Manual VDOC06T306_ for removal / installation instructions.
3. Identify and tag all field wiring for future re-assembly.
4. Using a flat blade screw driver, loosen the terminal screws on the J1, J12, and J13 connectors (see Figure 56 on page 105). Pull the field wiring back out of the way.
5. Using a flat blade screw driver, gently pry the J1, J12, and J13 field connectors away from the board side connectors. Discard the old connectors.
6. Insert the new field side connectors into their associated board side connectors.

   NOTE: The yellow keys in both the plugs and sockets are designed to prevent incorrect insertion of both J12 and J13.
7. Install the field wiring on the new connectors for J1, J12, and J13. Using a flat blade screw driver, tighten the terminal screws for the field wiring installed.
8. Reinstall option module, if previously present. See User's Manual VDOC06T306_ for removal / installation instructions.

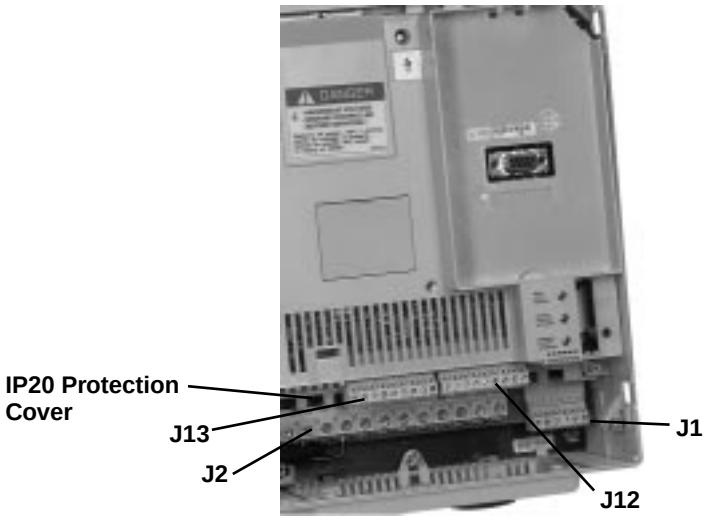


Figure 56: Location of J1, J2, J12, and J13 Connectors

Replacing the Power Board

For drive controllers ATV66U90N4 and ATV66D12N4, the power board and drive controller chassis come as one replacement part. This procedure explains how to replace the power board and chassis on the following drive controllers:

Drive Controller No.	Power Board No.
ATV66U90N4	VX5-A66U90N4
ATV66D12N4	VX5-A66D12N4

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow "PROCEDURE 1: BUS VOLTAGE MEASUREMENT" in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on power board connectors.
- Verify that all power has been removed from J1 connector.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in "Static Sensitive Components" on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read "WORK PRACTICE PRECAUTIONS" on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Torque wrench, set to 35.4 lb-in (4 N • m)
- Flat blade screw driver sockets for torque wrench
- Control basket procedure tool list, page 103.

With the drive controller door removed:

1. Remove the control basket as described in the procedure on page 101.
2. Remove the IP20 protection cover. (See Figure 56 on page 105).
3. Using a phillips screw driver, loosen and remove the two screws holding the controller top cover in place. Remove the top cover.
4. Using a phillips screw driver, loosen and remove the four screws holding the controller bottom cover in place. Remove the bottom cover.
5. Disconnect the J1 connector at the bottom of the power board.
6. Identify and tag all field wiring for future re-assembly.

7. Disconnect the field wiring on the J2 connector at the bottom of the power board. (See Figure 57 on page 107).
8. Disconnect the J3, J4, and J5 cables at the connectors located on the power board (see Figure 57 on page 107). See Figure 55 on page 102 for connector construction.

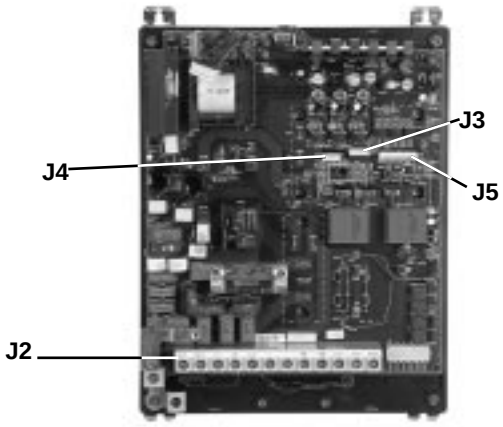


Figure 57: Power Board Connector Locations

9. Discard the old power board and chassis.
10. Install the controller bottom cover. Using a phillips screw driver, install and tighten the four screws holding the bottom cover in place.
11. Install the controller top cover. Using a phillips screw driver, install and tighten the two screws holding the top cover in place.
12. Install the IP20 protection cover saved from step 2 above.
13. On the new power board and chassis, connect J1 at the bottom of the power board. (See Figure 56 on page 105).
14. Using torque wrench and a flat blade screw driver socket, install and tighten the field wiring at the termination points on connector J2. See Receiving and Installation Manual VDOC06S304_ for torque specifications.
15. Install the J3, J4, and J5 cables at the connectors located on the power board (see Figure 57 on page 107).
16. Install the control basket as described in the procedure on page 103.

Removing the Fan

This procedure explains how to remove the fan from the following drive controllers:

Drive Controller No.	Fan No.
ATV66U90N4	VZ3-V663
ATV66D12N4	VZ3-V663

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on power board connectors.
- Verify that all power has been removed from J1 connector.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- 1/4” drive metric socket set, 5.5 to 14 mm
- 4” Needle nose pliers
- Wire cutters
- Control basket procedure tool list, page 101

With the drive controller door removed:

1. Remove the control basket as described in the procedure on page 101.
2. Disconnect the J1 connector at the bottom of the power board.
3. Identify and tag all field wiring for future re-assembly.
4. Disconnect the field wiring on the J2 connector at the bottom of the power board (see Figure 56 on page 105).
5. Remove the IP20 protection cover (see Figure 56 on page 105).
6. Using a phillips screw driver, loosen and remove the four screws holding the controller bottom cover in place. Remove the bottom cover.

7. Using a phillips screw driver, loosen and remove the two screws holding the controller top cover in place. Remove the top cover.
8. Slide the side covers towards the top of the controller until they release. Remove the side covers.
9. Using a drive socket (or a phillips screw driver, as necessary), loosen the four screws holding the drive controller chassis to the controller back cover. Lift the drive controller chassis away from the back cover to gain access to the fan.

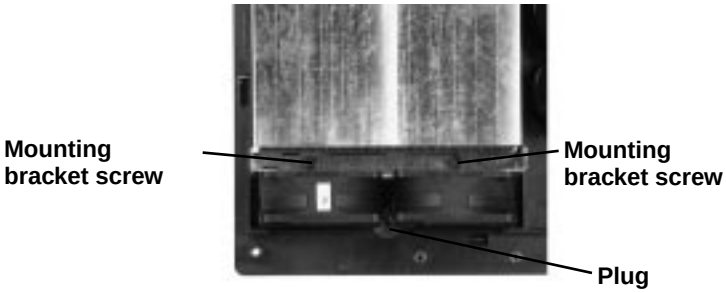


Figure 58: Fan Removal

10. Using a phillips screw driver, loosen and remove the two screws holding the fan bracket (see Figure 58 on page 109).
11. Pull the fan away from the controller until the plug that is attached to the fan leads pulls out of the socket in the drive chassis (see Figure 58 on page 109). Clip the fan leads on the controller side of the plug.
12. Using needle nose pliers, carefully remove the J6 connector located at the top of the power board. Pull the wire attached to the J6 connector through the controller. Discard the old fan, bracket, J6 connector, and wiring.

Installing the Fan

This procedure explains how to install the fan in the following drive controllers:

Drive Controller No.	Fan No.
ATV66U90N4	VZ3-V663
ATV66D12N4	VZ3-V663

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- 1/4” drive metric socket set, 5.5 to 14 mm
- Needle nose pliers
- Torque wrench, set to 35.4 lb-in (4 N • m)
- Flat blade screw drive sockets for torque wrench
- Control basket procedure tool list, page 103.

To install the fan:

1. With the drive controller inverted, thread the J6 connector from the new fan through the fan lead hole in the back of the drive controller (see Figure 59 on page 110).
2. Install the new twin fan. Ensure the label side of the side of the twin fan is facing towards the heat sink.
3. Install the twin fan mounting bracket. Install and tighten the two mounting screws.
4. With the drive controller returned to its upright position, route the J6 connector and wire lead diagonally over to the right side of the controller (see Figure 59 on page 110).

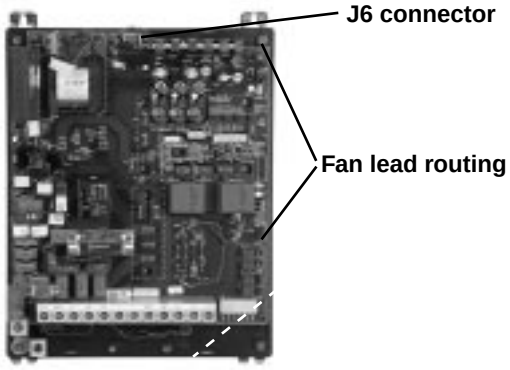


Figure 59: Fan Lead Routing

NOTE: When routing the wire in the above step, the J6 connector and attached fan leads are routed between the back of the heat sink and the underside of the printed circuit board.

5. Continue to route the J6 connector and wire leads along the right side of the controller, around the outside of the top right corner, and under the voltage regulator heat sink bar. Attach the J6 connector at the top of the power board. (See Figure 59 on page 110).
6. Fit the drive controller chassis to the controller back cover. Using a drive socket (or a phillips screw driver, as necessary), tighten the four screws holding the drive controller chassis to the back cover.
7. Install the two side panels by sliding them towards the bottom of the controller until the mounting tabs lock into place.
8. Install the controller bottom cover. Using a phillips screw driver, tighten the four screws holding the bottom cover in place.
9. Install the IP20 protection cover (see Figure 56 on page 105).
10. Install the controller top cover. Using a phillips screw driver, tighten the two screws holding the top cover in place.
11. Connect J1 at the bottom of the power board.
12. Using a torque wrench and a flat blade screw driver socket, install and tighten the field wiring on the termination points on connector J2. See Receiving and Installation Manual VDOC06S304_ for torque specifications.
13. Install the control basket as described in the procedure on page 103.

ATV66D16N4 and D23N4

This section contains spare part information and change out procedures for drive controllers:

- ATV66D16N4
- ATV66D23N4

Table 10 lists the spare parts. Refer to the pages indicated in the table for spare part change out procedures.

Table 10: Spare Parts for Drive Controllers ATV66D16N4 and D23N4

Description	For Drive Controllers:	Catalog Number	For Change Out Procedure See:
Control Kit	ATV66D16N4, D23N4	VX4-A66CK1	Pages 112-116
Control Terminal Block Kit	ATV66D16N4, D23N4	VZ3-N006	Pages 116-117
Gate Driver Board	ATV66D16N4	VX5-A66103	Pages 117-121
	ATV66D23N4	VX5-A66104	
Power Board	ATV66D16N4	VX5-A66D16N4	Pages 121-125
	ATV66D23N4	VX5-A66D23N4	
IGBT Module	ATV66D16N4	VZ3-IM2050M1201	Pages 126-129
	ATV66D23N4	VZ3-IM2075M1201	
Braking IGBT Module	ATV66D16N4, D23N4	VZ3-IM1025M1001	Pages 129-131
Filter Board	ATV66D16N4, D23N4	VX4-A66103	Pages 132-134
Diode Bridge	ATV66D16N4, D23N4	VZ3-DM6075M1601	Pages 135-136
Precharge Resistor	ATV66D16N4, D23N4	VZ3-R033W009	Pages 137-138
Fan Assembly (2 fans)	ATV66D16N4, D23N4	VZ3-V664	Pages 138-141
Bus Capacitor	ATV66D16N4, D23N4	VY1-ADC152V450	Pages 141-144

Replacing the Keypad Display

This procedure explains how to replace the keypad display for the following drive controllers:

Drive Controller No.	Control Kit No.
ATV66D16N4	VX4-A66CK1
ATV66D23N4	

NOTE: All ALTIVAR 66 drive controllers use the same model keypad display. However, the version of software present within the keypad display may be specific to the version of software present in the control basket. Mixing incompatible versions of keypad display and control basket software can result in non-recognition of the keypad display by the drive controller or garbled message displays. Therefore, keypad displays are not supplied as separate kitted items. Keypad displays are supplied with control kits. Keep keypads with their associated control basket. Do not mix keypads and control baskets.

The keypad display is mounted on the control basket for drive controllers ATV66D16N4 and ATV66D23N4 (see Figure 63 on page 117).

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of magnetized flat blade screw drivers

With the drive controller door open:

1. Using a flat blade screw driver, push in on the keypad display tab and remove the keypad display (see Figure 60 on page 112).
2. Insert the new keypad display into the front of the control board. Ensure the lip on the bottom of the keypad display is behind the tab on the control basket.

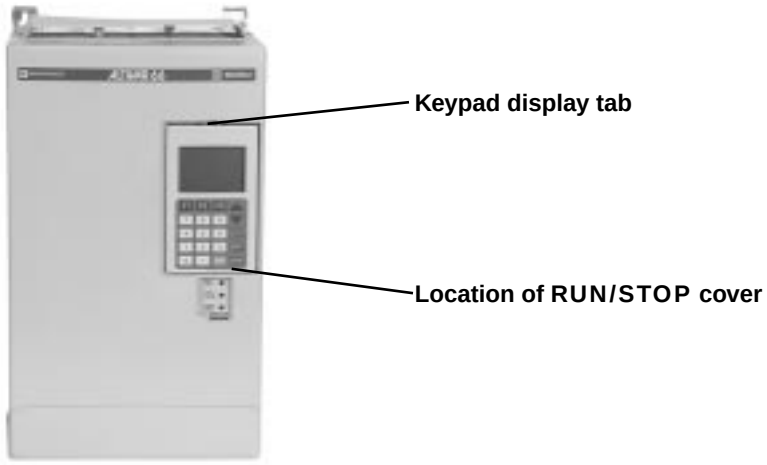


Figure 60: ATV66D16N4 to D23N4 Front View

Removing the Control Basket

This procedure explains how to remove the control basket from the following drive controllers:

Drive Controller No.	Control Kit No.
ATV66D16N4	VX4-A66CK1
ATV66D23N4	

Before removing power, note and record all the drive controller settings using the keypad display.

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on control basket, power board, and I/O Extension Module (if installed) connectors.
- Verify that all power has been removed from J1, J12, and J13 connectors.
- If I/O Extension Module is installed, verify that all power is removed from J22, J23, and J24 connectors.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of magnetized flat blade screw drivers
- A set of magnetized phillips screw drivers

With the drive controller door open:

1. Measure the bus voltage (if not already performed) as described in Chapter 5 of this manual.
2. Remove the keypad display as described on page 112.
3. Remove options module, if present. See User's Manual VDOC06T306_ for removal / installation instructions.
4. Using a flat blade screw driver, carefully loosen and disconnect the J9 and J32 connectors located at the top left of the control basket (see Figure 61 on page 114).
5. Using a flat blade screw driver, carefully loosen and disconnect the J12 and J13 connectors located at the bottom of the control basket (see Figure 61 on page 114).

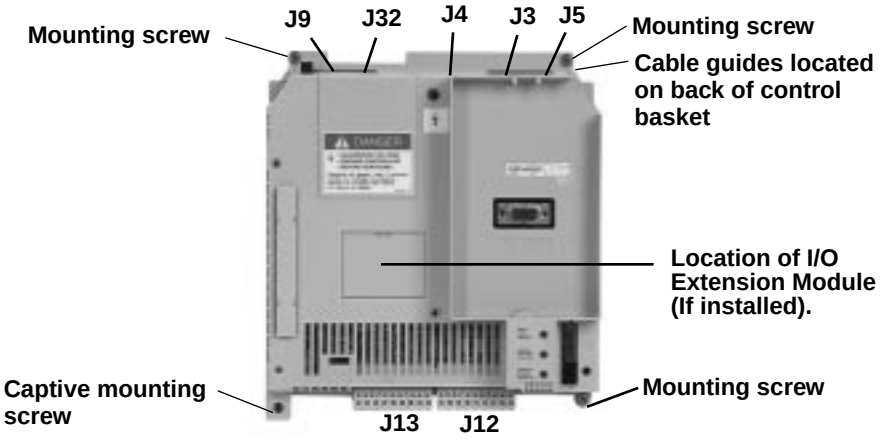


Figure 61: Control Basket Connector Locations

6. Using two small flat blade screw drivers, carefully pull out on each side of the cable clasps (may be either blue or white) of J3, J4, and J5 to the release position (see Figure 62 on page 114). Pull the ribbon cables from the sockets.
7. Using a phillips screw driver, loosen the four corner screws on the control basket. The bottom left screw is a captive screw (see Figure 61 on page 114).
8. Remove the control basket from the drive controller. As the control basket is removed, pull the three ribbon cables out of the guide on the back of the control basket.

   NOTE: Be sure the ribbon cables have been released before pulling to avoid damage to the cables. There are two versions of the cable clasps - blue and white.

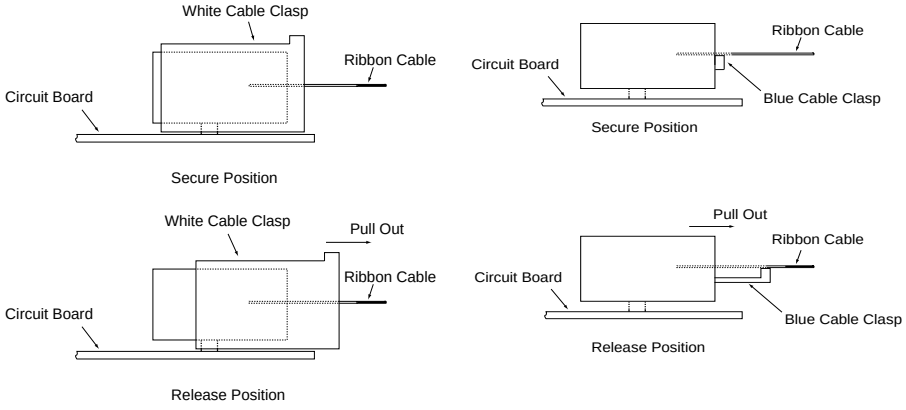


Figure 62: Cable Connector Secure and Release Positions

Installing the Control Basket

This procedure explains how to install the control basket in the following drive controllers:

Drive Controller No.	Control Kit No.
ATV66D16N4	VX4-A66CK1
ATV66D23N4	

Read "WORK PRACTICE PRECAUTIONS" on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in "Static Sensitive Components" on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

The tools needed for this procedure are:

- A set of magnetized flat blade screw drivers
- A set of magnetized phillips screw drivers
- Torque wrench, set to 8.9 lb-in (1.0 N • m)
- A set of phillips screw driver sockets for torque wrench

For the control basket to be installed:

1. Thread the three ribbon cables through the cable guides on the back of the control basket (see Figure 61 on page 114).
2. Place the control basket in the controller and ensure the mounting holes are aligned with the holes in the controller (see Figure 61 on page 114).
3. Insert the three screws that are not captive. Using a torque wrench and phillips screw drive socket, tighten the three screws and the one captive screw to 8.9 lb-in (1.0 N • m) (see Figure 61 on page 114).

   NOTE: The captive mounting screw provides the grounding connection for the control basket and shield connection on J13. Ensure this screw is properly threaded and torqued.
4. Snap the four connectors J9, J12, J13, and J32 into place (see Figure 61 on page 114).

   NOTE: The yellow keys in both the plugs and sockets are designed to prevent incorrect insertion of both J12 and J13.
5. Make sure all three cable connectors are pulled out on connectors J3, J4, and J5 (see Figure 62 on page 114).
6. Carefully insert the three ribbon cables into the cable clasp at the J3 (seven connector cable), J4 (six connector cable), and J5 (18 connector cable) connectors. Ensure the silver leads of the cables are facing outwards from the controller.
7. Push the three ribbon cable connectors to their secure position.
8. Apply multi-lingual hazard labels supplied with kit to control basket as required.
9. Reinstall options module, if previously present. See User's Manual VDOC06T306_ for removal / installation instructions.

10. Install the keypad display as described in the procedure on page 112.
11. Reprogram the user settings as previously noted during the control basket removal.

Replacing Control Terminal Blocks

This procedure explains how to replace the control terminal blocks for the following drive controllers:

Drive Controller No.	Control Terminal Block Kit No.
ATV66D16N4	VZ3-N006
ATV66D23N4	

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow "PROCEDURE 1: BUS VOLTAGE MEASUREMENT" in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on control basket, power board, and I/O Extension Module (if installed) connectors.
- Verify that all power has been removed from J1, J12, and J13 connectors.
- If I/O Extension Module is installed, verify that all power is removed from J22, J23, and J24 connectors.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

Read "WORK PRACTICE PRECAUTIONS" on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of magnetized flat blade screw drivers

With the drive controller door open or removed:

1. Measure the bus voltage (if not already performed) as described in Chapter 5 of this manual.
2. Remove options module, if present. See User's Manual VDOC06T306_ for removal / installation instructions.
3. Identify and tag all field wiring for future re-assembly.
4. Using a flat blade screw driver, loosen the terminal screws on the J1, J12, and J13 connectors (see Figure 63 on page 117). Pull the field wiring back out of the way.
5. Using a flat blade screw driver, gently pry the J1, J12, and J13 field connectors away from the board side connectors. Discard the old connectors.
6. Insert the new field side connectors into their associated board side connectors.

NOTE: The yellow keys in both the plugs and sockets are designed to prevent incorrect insertion of both J12 and J13.

7. Install the field wiring on the new connectors for J1, J12, and J13. Using a flat blade screw driver, tighten the terminal screws for the field wiring installed.
8. Reinstall options module, if previously present. See User's Manual VDOC06T306_ for removal / installation instructions.

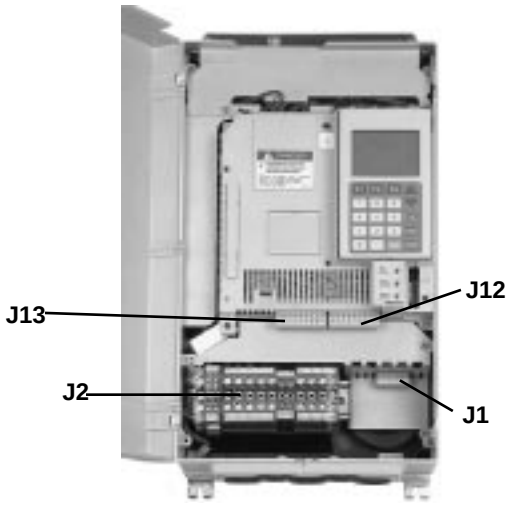


Figure 63: Location of J1, J2, J12, and J13 Connectors

Removing the Gate Driver Board

This procedure explains how to remove the gate driver board from the following drive controllers:

Drive Controller No.	Gate Driver Board No.
ATV66D16N4	VX5-A66103
ATV66D23N4	VX5-A66104

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow "PROCEDURE 1: BUS VOLTAGE MEASUREMENT" in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on power board connectors.
- Verify that all power has been removed from J1 connector.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- 4” Needle nose pliers
- Control basket procedure tool list, page 113

With the drive controller door removed:

1. Remove the control basket as described in the procedure on page 113.
2. Remove the J1 connector on the power board (see Figure 64 on page 118).
3. Using a phillips screw driver, loosen and remove the two screws which hold the top IP20 protection cover in place. Remove the top IP20 protection cover.
4. Using a phillips screw driver, loosen and remove the two screws which hold the bottom IP20 protection cover in place. Remove the bottom IP20 protection cover.
5. Using a phillips screw driver, loosen and remove the two screws which hold the top cover in place. Remove the top cover.

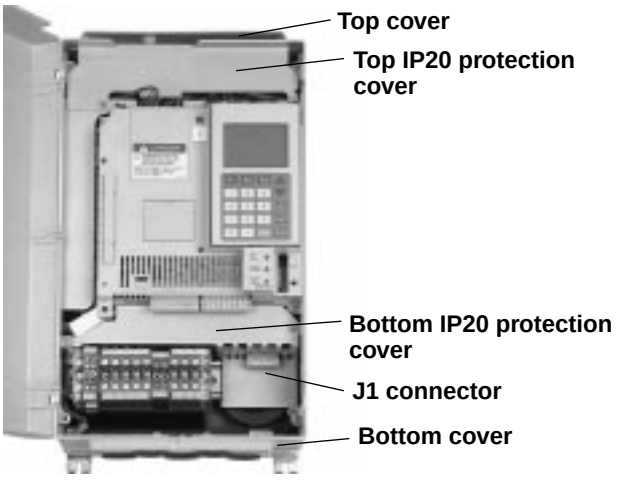


Figure 64: Location of Various Covers

6. Using a phillips screw driver, loosen and remove the three screws which hold the left side panel in place. Remove the left side panel.

7. Using needle nose pliers, carefully disconnect J26, J27, J28, J29, J30, J31, and J34 at the termination points located on the power board (see Figure 65 on page 119).

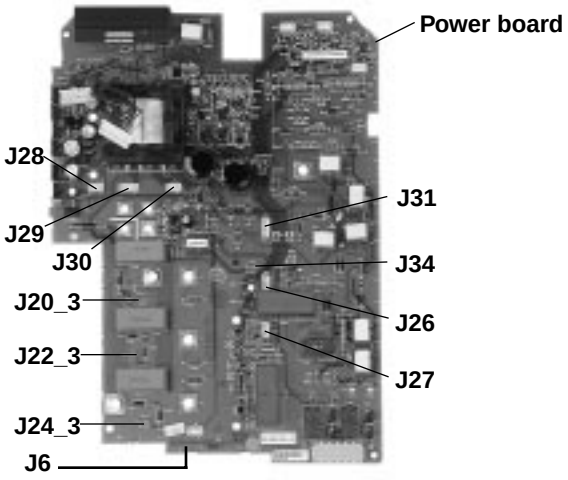


Figure 65: Gate Driver Board Connections on Power Board

8. Using needle nose pliers, carefully disconnect J20_1, J20_2, J21_1, J21_2, J22_1, J22_2, J23_1, J23_2, J24_1, J24_2, J25_1, and J25_2 at the termination points located on the IGBT modules. (See Figure 66 on page 119).
9. Using needle-nose pliers, depress the tabs on the five plastic fixing pins and unsnap the gate driver board from the fixing pins. Do not attempt to remove the gate driver board until all the connectors have been disconnected.
10. Lift the board and using the needle nose pliers, carefully disconnect J20_3 (grey), J22_3 (brown), and J24_3 (orange) at the termination points located on the power board underneath the gate driver board.

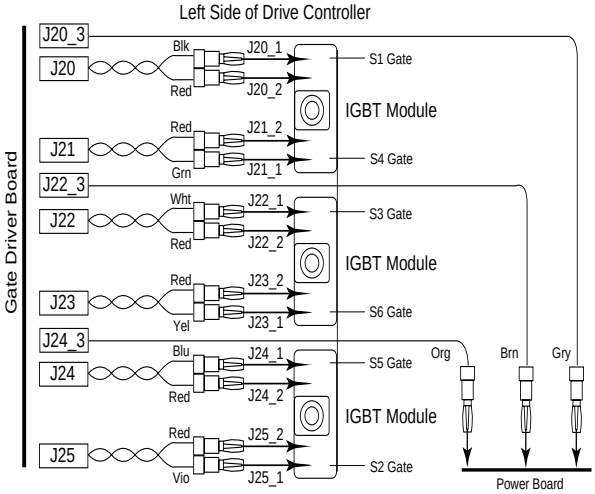


Figure 66: Gate Driver Board Connections on IGBT Modules

11. Remove the gate driver board.
12. If the gate driver board is to be replaced, loosen the J3 cable connector and remove the J3 cable. See Figure 62 on page 114 for instructions on loosening the J3 cable connector. This cable will be needed during the installation of the new gate driver board.

NOTE: Be sure the J3 Ribbon has been released before pulling to avoid damage to the cable.

Installing the Gate Driver Board

This procedure explains how to install the gate driver boards in the following drive controllers:

Drive Controller No.	Gate Driver Board No.
ATV66D16N4	VX5-A66103
ATV66D23N4	VX5-A66104

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- 4” Needle nose pliers
- Control basket procedure tool list, page 115

For the gate driver board to be installed:

1. Loosen the J3 cable connector on the gate driver card (see Figure 62 on page 114). Insert the J3 cable with the silver leads facing towards the top of the gate driver board. Push the connector to the secure position.
2. Using needle nose pliers, carefully connect J20_3, J22_3, and J24_3 on the power board (see Figure 65 on page 119).
3. Position the gate driver board over the fixing pins on the power board. Make sure the ribbon cable from J3 is routed under the gate driver board towards the top of the drive controller. Make sure other cables are pointed out away from the board.
4. Snap the gate driver board onto the fixing pins.
5. If required, re-braid the twisted pair wires before connecting them to the IGBT modules.
6. Using needle nose pliers, carefully connect J20_1, J20_2, J21_1, J21_2, J22_1, J22_2, J23_1, J23_2, J24_1, J24_2, J25_1, and J25_2 at the termination points located on the IGBT modules (see Figure 66 on page 119).
7. Using needle nose pliers, carefully connect J26, J27, J28, J29, J30, J31, and J34 at the termination points located on the power board.
8. Install the left side panel. Using a phillips screw driver, install and tighten the three screws which hold the left side panel in place.
9. Install the top cover. Using a phillips screw driver, install and tighten the two screws which hold the top cover in place.
10. Install the bottom IP20 protection cover. Using a phillips screw driver, install and tighten the two screws which hold the bottom IP20 protection cover in place.
11. Install the top IP20 protection cover. Using a phillips screw driver, install and tighten the two screws which hold the top IP20 protection cover in place.
12. Connect the J1 connector on the power board.
13. Install the control basket as described in the procedure on page 115.

Removing the Power Board

This procedure explains how to remove the power board from the following drive controllers:

Drive Controller No.	Power Board No.
ATV66D16N4	VX5-A66D16N4
ATV66D23N4	VX5-A66D23N4

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on power board connectors.
- Verify that all power has been removed from J1 connector.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Clip pliers (Catalog No. VY1-ADV608)
- 1/4” drive metric socket set, 5.5 to 14 mm
- Gate driver board procedure tool list, page 118.
- Control basket procedure tool list, page 113

With the drive controller door removed:

1. Remove the gate driver board as described in the procedure on page 117.
2. Using a phillips screw driver, loosen and remove the three screws which hold the right side panel in place. Remove the right side panel.
3. If replacing the power board, perform the following step. Using two small flat blade screw drivers, carefully pull out on each side of the cable connectors for J4 and J5 (on the power board) to the release position (see Figure 62 on page 114). Pull the ribbon cables from the connectors. Save for use on a new power board.

   NOTE: Be sure the ribbon cables have been released before pulling to avoid damage to the cables.
4. Using needle nose pliers, carefully disconnect J6, J16, J17, J33, J38 (blue), J39 (white), J40 (red), J66 (blue), and J67 (white) at the termination points located on the power board (see Figure 67 on page 123).

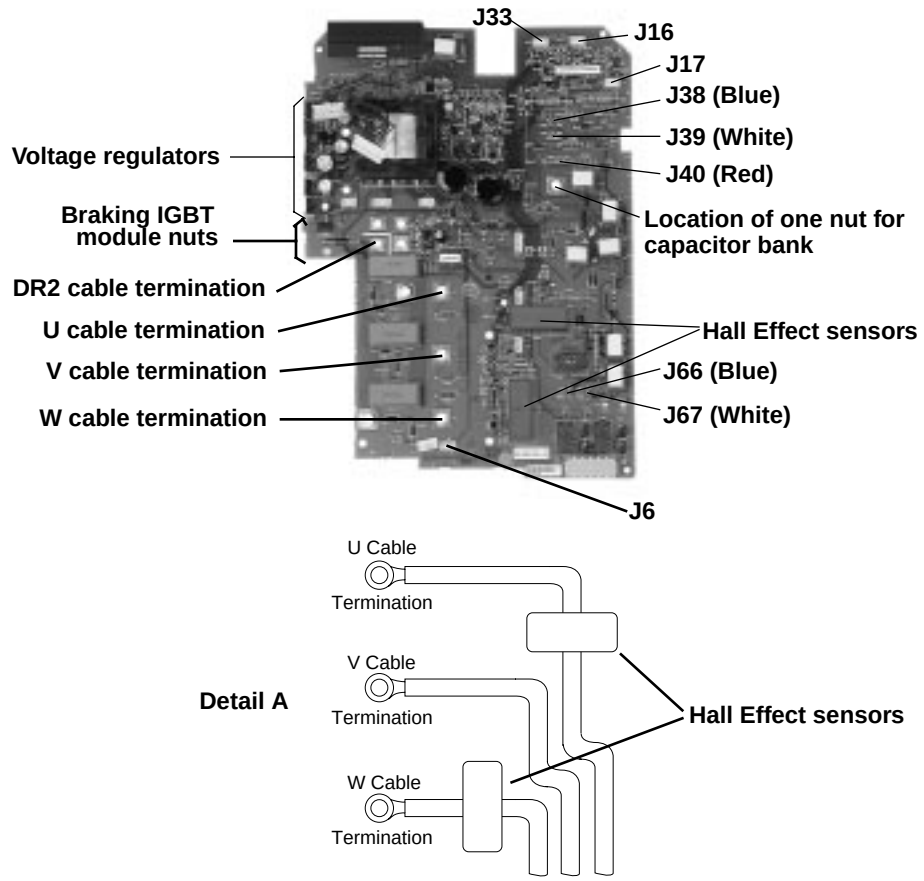


Figure 67: Connector, Wire, and Nut Locations on Power Board

5. Using a drive socket, loosen and remove the five nuts on the power board for the IGBT modules (see Figure 67 on page 123). Note which nuts have cables landed under them to assist in the re-installation of the power board.
6. Using a drive socket, loosen and remove the four nuts on the power board for the braking IGBT module (see Figure 67 on page 123). Note which nuts have cables landed under them to assist in the re-installation of the power board.
7. Using a drive socket, loosen and remove the one nut on the power board for the capacitor bank (see Figure 67 on page 123).
8. Using the clip pliers, remove the six clips holding the voltage regulators to the heat sink.
9. Using a phillips screw driver, loosen and remove the three power card mounting screws.
10. Pull the U and W power cables through the Hall effect sensors on the power board. Note the exact orientation of the U and W power wires through the Hall effect sensors to ensure proper re-installation. Refer to Detail A, Figure 67 on page 123.
11. Remove the power board. If the power board is being replaced, remove the five gate driver board standoffs for use during installation of the new board.

Installing the Power Board

This procedure explains how to install the power board in the following drive controllers:

Drive Controller No.	Power Board No.
ATV66D16N4	VX5-A66D16N4
ATV66D23N4	VX5-A66D23N4

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Clip pliers (Catalog No. VY1-ADV608)
- 1/4” drive metric socket set, 5.5 to 14 mm
- Torque wrench, set to 17.7 lb-in (2 N • m)
- Gate driver board procedure tool list, page 120
- Control basket procedure tool list, page 115

For the power board to be installed:

NOTE: Make sure the bus bar isolating screen is in place between the bus bar and the power board (see Figure 68 on page 124).

Figure 68: Bus Bar Isolating Screen

1. For a new power board, install the five gate driver board standoffs that were removed from the old power board.
2. Align the mounting holes on the power board to the studs and mounting posts on the drive controller.

3. Route the U and W power cables through the Hall Effect sensors on the power board (see Detail A in Figure 67 on page 123).

   NOTE: Routing of the power cables through the sensors must be correct for the sensors to function properly. Run the U and W power cables through the Hall effect sensors in the opposite direction of the direction in which the arrows point on the sensors.

4. Using a phillips screw driver, install the three power card mounting screws. Do not tighten until all of the nuts are installed.
5. Using a drive socket, install the five nuts for the IGBT modules (see Figure 67 on page 123). Ensure the U, V, and W cables that were disconnected in the power board removal procedure are landed on the power board at their respective marked locations. (Figure 67 on page 123, detail A). Do not tighten until all of the nuts are installed.
6. Using a drive socket, install the four nuts for the braking IGBT module (see Figure 67 on page 123). Ensure the cable that was disconnected in the power board removal procedure is properly connected under the nut on the bottom left mounting hole. Do not tighten until all of the nuts are installed.
7. Using a drive socket, install the one nut for the capacitor bank.
8. Using a torque wrench with a drive socket, tighten the ten nuts installed above to 17.7 lb-in (2 N • m).
9. Using a phillips screw driver, tighten the three power board mounting screws.
10. Place the insulating lining between the heatsink and the six voltage regulators.
11. Using the clip pliers, install the six clips which hold the voltage regulators on the heatsink.
12. Using needle nose pliers, carefully connect J6, J16, J17, J33, J38 (blue), J39 (white), J40 (red), J66 (blue), and J67 (white) at the termination points located on the power board (see Figure 67 on page 123).
13. If installing a new power board, perform the following step. Carefully insert the J4 and J5 cable saved earlier into their connectors on the power board with the silver leads facing the top of the controller. Ensure the connector is in the release position before inserting the cable (see Figure 62 on page 114). Once the cables are inserted, push the ribbon cable connectors to their secure position.
14. Install the right side panel. Using a phillips screw driver, install and tighten the three mounting screws for the right side panel.
15. Install the gate driver board as described in the procedure on 120.

Removing the IGBT Module

There are three IGBT modules in this size of drive controller. This procedure explains how to remove the IGBT modules from the following drive controllers:

Drive Controller No.	IGBT Module No.
ATV66D16N4	VZ3-IM2050M1201
ATV66D23N4	VZ3-IM2075M1201

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on power board connectors.
- Verify that all power has been removed from J1 connector.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Metric hex key set, 2 to 14 mm
- Set of open end wrenches, 5.5 to 19 mm
- Power board procedure tool list, page 122
- Gate drive board procedure tool list, page 118
- Control basket procedure tool list, page 113

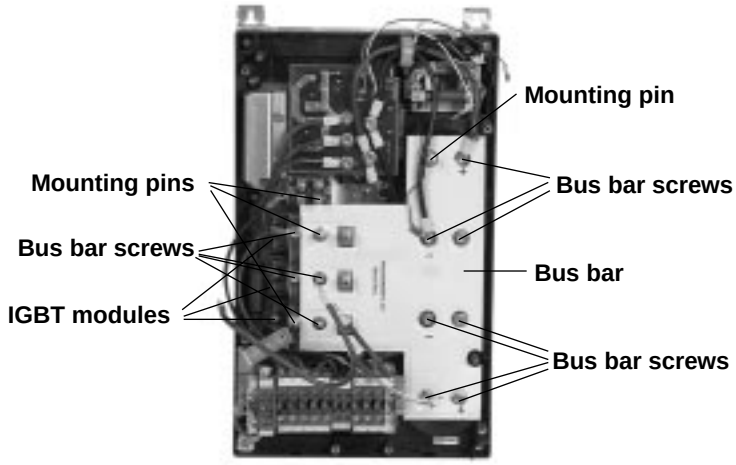


Figure 69: Bus Bar Screw and Mounting Pin Locations

With the drive controller door removed:

1. Remove the power board as described in the procedure on page 121.
2. Remove the bus bar isolating screen. (See Figure 68 on page 124.)

   NOTE: In order to keep the proper spacing for the components, keep all washers with their respective mounting pins or screws. Washers are used to level the power board.
3. Using an open end wrench, loosen and remove the four mounting pins on the bus bar (see Figure 69 on page 127). Keep the washers with each pin.
4. Using a hex key wrench, loosen and remove the 11 screws which hold the bus bar to the drive controller. Note the location of all cables connected to the bus bar to assist during the re-installation of the bus bar (see Figure 69 on page 127).

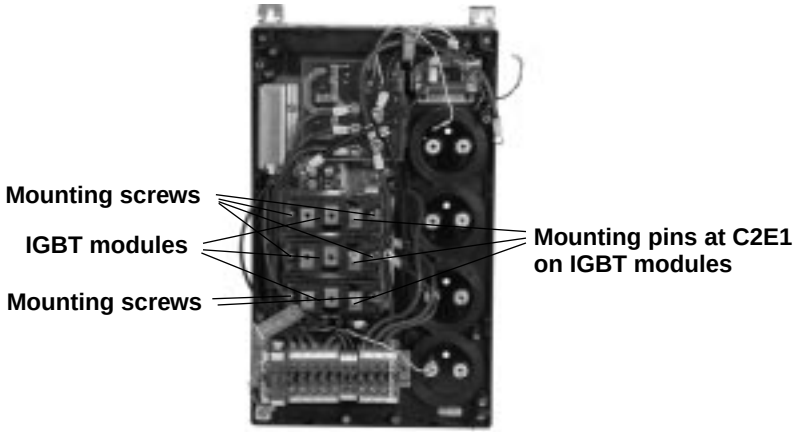


Figure 70: IGBT Modules (Bus Bar Removed)

5. Remove the bus bar.
6. For the IGBT module to be removed, use an open end wrench to loosen and remove the mounting pin located at the C2E1 terminal point (see Figure 70 on page 127). Keep the washers with the pin.
7. Using a hex key wrench, loosen and remove the two screws holding the inoperative IGBT module in place (see Figure 70 on page 127).
8. Remove the IGBT module.

Installing the IGBT Module

There are three IGBT modules in this size of drive controller. This procedure explains how to install the IGBT modules in the following drive controllers:

Drive Controller No.	IGBT Module No.
ATV66D16N4	VZ3-IM2050M1201
ATV66D23N4	VZ3-IM2075M1201

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in "Static Sensitive Components" on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read "WORK PRACTICE PRECAUTIONS" on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Metric hex key set, 2 to 14 mm
- Torque wrench, set to 13.3 lb-in (1.5 N • m) or 17.7 lb-in (2 N • m) per procedure
- Metric hex key sockets for torque wrench, 2 to 14 mm
- Set of open end wrenches, 5.5 to 19 mm
- Thermal grease (Thermalloy Thermalcote™ II, Part No. 349 or equivalent)
- Power board procedure tool list, page 124
- Gate driver board procedure tool list, page 120
- Control basket procedure tool list, page 115

For the IGBT module to be installed:

1. Clean the portion of the heatsink which will make contact with the new IGBT module.
2. Evenly coat the bottom of the new IGBT module with a thin coating of thermal grease.

   NOTE: Mounting pins and screws are marked with red paint. Always mount pins and screws with the red painted side facing upwards.
3. Install the new IGBT module with the push-on connectors toward the outside of the drive controller (see Figure 70 on page 127). Using a torque wrench and hex key socket, install and tighten the two mounting screws to 17.7 lb-in (2 N • m).
4. Using a torque wrench and drive socket, install and tighten the mounting pin at the C2E1 terminal point on the IGBT module to 17.7 lb-in (2 N • m) (see Figure 70 on page 127).
5. Position the bus bar and align the mounting holes.

   NOTE: Ensure the red cable from the precharge resistor is connected to the right hand side (+) of the top capacitor. Ensure the two black cables are connected to the left hand side of the second cap down from the top. Ensure the PA cable is connected to the screw on the left hand side of the top IGBT module (see Figure 71 on page 129).
6. Using a hex key wrench, install the 11 hex head screws (see Figure 69 on page 127). Using a drive socket or open end wrench, install the four mounting pins

(three on the bus bar, one on the braking IGBT module). Do not tighten until all of the hex head screws and mounting pins are started with any required cable connected.

Using a torque wrench and the appropriate socket, tighten the mounting pins and screws (except the braking IGBT module mounting pin) to 17.7 lb-in (2 N • m). The tightening torque for the braking IGBT module screw is 13.3 lb-in (1.5 N • m).

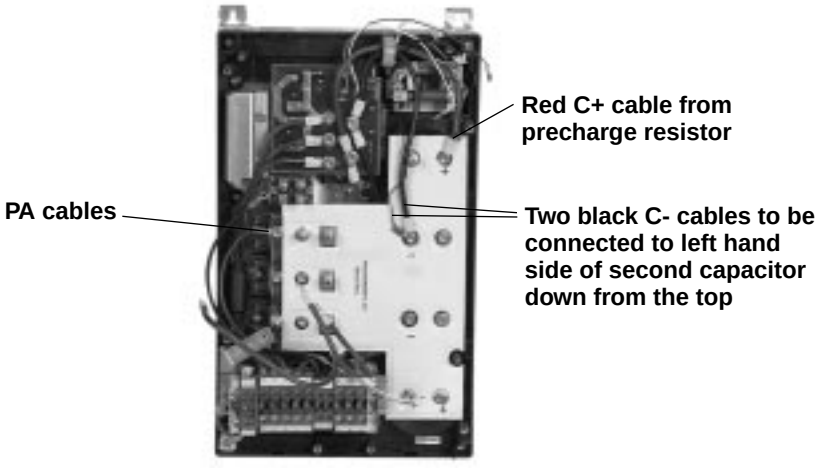


Figure 71: Bus Bar Cable Locations

7. Remove static protective foam from IGBT module control terminals.
8. Install the power board as described in the procedure on page 124.

Removing the Braking IGBT Module

This procedure explains how to remove the braking IGBT module from the following drive controllers:

Drive Controller No.	IGBT Module No.
ATV66D16N4	VZ3-IM1025M1001
ATV66D23N4	

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on power board connectors.
- Verify that all power has been removed from J1 connector.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Set of open end wrenches, 5.5 to 19 mm
- Power board procedure tool list, page 122
- Gate driver procedure tool list, page 118
- Control basket procedure tool list, page 113

With the drive controller door removed:

1. Remove the power board as described in the procedure on page 121.
2. Remove the bus bar isolating screen. (See Figure 68 on page 124.)

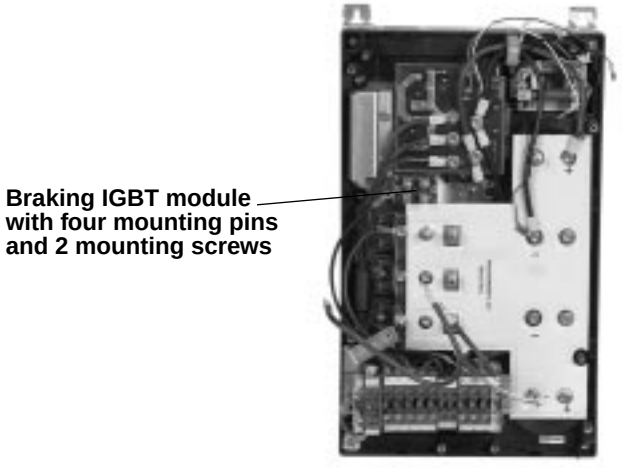


Figure 72: Braking IGBT Module Location

NOTE: Keep washers with respective mounting pins and screws for aiding in proper reinstallation.

3. Using an open end wrench, loosen and remove the four mounting pins on the braking IGBT module (see Figure 72 on page 130).
4. Using a flat blade screw driver, loosen and remove the two mounting screws for the braking IGBT module (see Figure 72 on page 130).
5. Carefully remove the braking IGBT module by pulling it out from under the bus bar. Leave the mounting pedestal with the drive controller for installation of the new braking IGBT module.

Installing the Braking IGBT Module

This procedure explains how to install the braking IGBT module in the following drive controllers:

Drive Controller No.	IGBT Module No.
ATV66D16N4	VZ3-IM1025M1001
ATV66D23N4	

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in "Static Sensitive Components" on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

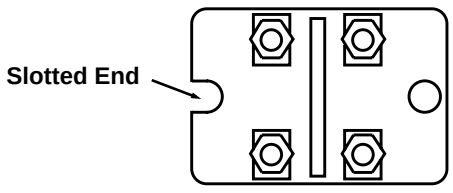
Read "WORK PRACTICE PRECAUTIONS" on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Torque wrench, set to 13.3 lb-in (1.5 N • m)
- Flat blade screw driver sockets for torque wrench
- Set of open end wrenches, 5.5 to 19 mm
- Thermal grease (Thermalloy Thermalcote™ II, Part No. 349 or equivalent)
- Power board procedure tool list, page 124
- Gate driver board procedure tool list, page 120
- Control basket procedure tool list, page 115

For the braking IGBT module to be installed:

1. Clean the portion of the mounting pedestal which will make contact with the new braking IGBT module.
2. Evenly coat the bottom of the new braking IGBT module with a thin coat of thermal grease.
3. Install the new braking IGBT module with the slotted hole toward the left side of the drive controller away from the bus capacitors. Using a torque wrench with a flat blade socket, install and tighten the two mounting screws to 13.3 lb-in (1.5 N • m).



Slotted end of Braking IGBT Module pointed towards the left side of the drive controller.

Figure 73: Braking IGBT Module Installation Orientation

NOTE: Mounting pins and screws are marked with red paint. Always mount pins and screws with the red painted side facing upwards.

4. Install the four mounting pins on the braking IGBT module. There should be two washers on the bus bar post and three washers each on the other three posts. Using a torque wrench and drive socket, tighten the mounting pins to 13.3 lb-in (1.5 N • m).
5. Install the power board as described in the procedure on page 124.

Removing the Filter Board

This procedure explains how to remove the filter board from the following drive controllers:

Drive Controller No.	Filter Board No.
ATV66D16N4	VX4-A66103
ATV66D23N4	

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on power board connectors.
- Verify that all power has been removed from J1 connector.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Metric hex key set, 2 to 14 mm
- Power board procedure tool list, page 122
- Gate driver procedure tool list, page 118
- Control basket procedure tool list, page 113

With the drive controller door removed:

1. Remove the power board as described in the procedure on page 121.
2. Remove the bus bar isolating screen (see Figure 68 on page 124).

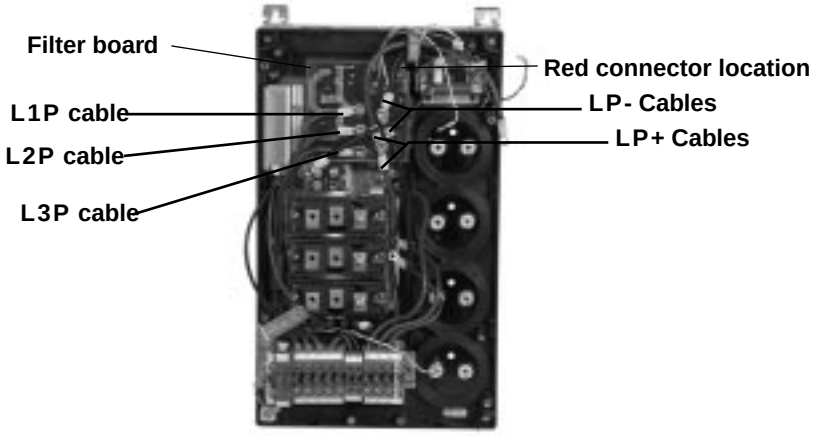


Figure 74: Filter Board Connections

3. Using needle nose pliers, carefully disconnect the small red connector at the top of the filter board (see Figure 74 on page 133).
4. Using a hex key wrench, loosen and remove the five screws holding the board to the diode bridge. Note the location of the cables and wires landed under the five screws (see Figure 74 on page 133).
5. Remove the filter board.

Installing the Filter Board

This procedure explains how to install the filter board in the following drive controllers:

Drive Controller No.	Filter Board No.
ATV66D16N4	VX4-A66103
ATV66D23N4	

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Metric hex key set, 2 to 14 mm
- Metric hex key sockets for torque wrench, 2 to 14 mm
- Power board procedure tool list, page 124
- Gate driver board procedure tool list, page 120
- Control basket procedure tool list, page 115

For the filter board to be installed:

1. Using needle nose pliers, carefully connect the small red connector at the top of the filter board (see Figure 74 on page 133).
2. Install the filter board. Using a torque wrench and hex key socket, install and tighten the five screws to 17.7 lb-in (2 N • m). Ensure the cables to the card are connected as follows (see Figure 74 on page 133):
   — Two black LP- wires on the negative.
   — Two red LP+ wires on the positive.
   — One blue wire per phase (L1P, L2P, L3P).
3. Install the power board as described in the procedure on page 124.

Removing the Diode Bridge

This procedure explains how to remove the diode bridge from the following drive controllers:

Drive Controller No.	Diode Bridge No.
ATV66D16N4	VZ3-DM6075M1601
ATV66D23N4	

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on power board connectors.
- Verify that all power has been removed from J1 connector.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Filter board procedure tool list, page 132
- Power board procedure tool list, page 122
- Gate driver procedure tool list, page 118
- Control basket procedure tool list, page 113

With the drive controller door removed:

1. Remove the filter board as described in the procedure on page 132.
2. Using a hex key wrench, loosen and remove the two screws on the diode bridge. The diode bridge is located directly under the filter board mounting location.
3. Remove the diode bridge.

Installing the Diode Bridge

This procedure explains how to install the diode bridge in drive controllers:

Drive Controller No.	Diode Bridge No.
ATV66D16N4	VZ3-DM6075M1601
ATV66D23N4	

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Thermal grease (Thermalloy Thermalcote™ II, Part No. 349 or equivalent)
- Filter board procedure tool list, page 134
- Power board procedure tool list, page 124
- Gate driver procedure tool list, page 120
- Control basket procedure tool list, page 115

For the diode bridge to be installed:

1. Clean the portion of the heatsink which will make contact with the diode bridge.
2. Evenly coat the bottom of the diode bridge with a thin coat of thermal grease.
3. Install the diode bridge with the PA and (-) terminals rotated toward the right side of the drive controller. Using a torque wrench with a hex key socket, install and tighten the two screws to 17.7 lb-in (2 N • m).
4. Install the filter board as described in the procedure on page 134.

Replacing the Precharge Resistor

This procedure explains how to replace the precharge resistor for the following drive controllers:

Drive Controller No.	Precharge Resistor No.
ATV66D16N4	VZ3-R033W009
ATV66D23N4	

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on power board connectors.
- Verify that all power has been removed from J1 connector.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Power board procedure tool list, page 124
- Gate driver procedure tool list, page 120
- Control basket procedure tool list, page 115

With the drive controller door removed:

1. Remove the power board as described in the procedure on page 121.
2. Remove the bus bar isolating screen (see Figure 68 on page 124).
3. Using a phillips screw driver, loosen and remove the two screws holding the precharge resistor and end clamps in place (see Figure 75 on page 138). The terminals for the precharge resistor also have cables connected to them. Note the installation of the cables for future reference.

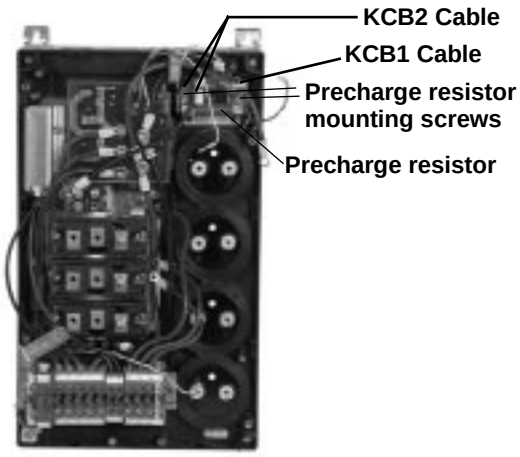


Figure 75: Precharge Resistor

4. Remove the old precharge resistor and end clamps.
5. Install the new precharge resistor with end clamps. Ensure the end clamps are properly secured to the precharge resistor.
6. Using a torque wrench and phillips screw driver socket, install and tighten the two screws to 13.3 lb-in (1.5 N • m). Ensure the cables are properly connected (see Figure 75 on page 138).
7. Install the bus bar isolating screen (see Figure 68 on page 124).
8. Install the power board as described in the procedure on page 124.

Removing the Fan

This procedure explains how to remove the fan from the following drive controllers:

Drive Controller No.	Fan No.
ATV66D16N4	VZ3-V664
ATV66D23N4	

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on power board connectors.
- Verify that all power has been removed from J1 connector.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

> **⚠ CAUTION**
>
> **STATIC SENSITIVE COMPONENTS**
>
> Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.
>
> **Failure to follow this instruction can result in equipment damage.**

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- 4” needle nose pliers
- Control basket procedure tool list, page 113

With the drive controller door removed:

1. Remove the control basket as described in the procedure on page 113.
2. Disconnect the J1 connector at the bottom of the power board.
3. Identify and tag all field wiring for future re-assembly.
4. Disconnect the field wiring on the J2 connector at the bottom of the controller (Figure 63 on page 117).
5. Using a phillips screw driver, loosen and remove the two screws which hold the top IP20 protection cover in place (see Figure 64 on page 118). Remove the top IP20 protection cover.
6. Using a phillips screw driver, loosen and remove the two screws which hold the bottom IP20 protection cover in place. Remove the bottom IP20 protection cover.
7. Using a phillips screw driver, loosen and remove the two screws which hold the top cover in place. Remove the top cover.
8. Using a phillips screw driver, loosen and remove the four screws which hold the bottom cover in place. Remove the bottom cover.
9. Using needle nose pliers, disconnect J6 from its termination point on the power board (see Figure 65 on page 119).
10. Using a phillips screw driver, loosen the four corner screws which hold the back cover to the drive controller. Remove the back cover from the drive controller. This allows access to the fan assembly.
11. Turn the drive controller chassis over to gain access to the fan mounting screws. Using a phillips screw driver, loosen and remove the two mounting screws.

12. Remove the inoperative fan; pulling the fan leads and J6 connector through the hole in the chassis of the drive controller.

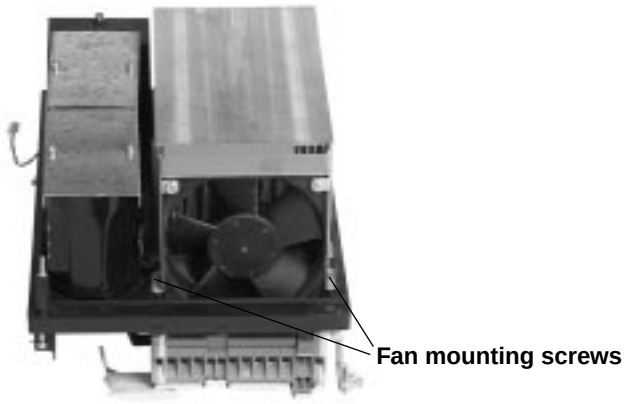


Figure 76: Fan Mounting

Installing the Fan

This procedure explains how to install the fan in the following drive controllers:

Drive Controller No.	Fan No.
ATV66D16N4	VZ3-V664
ATV66D23N4	

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Torque wrench, set to 17.7 lb-in (2 N • m)
- Flat blade screw driver sockets for torque wrench
- 4” Needle nose pliers
- Control basket procedure tool list, page 115

For the fan to be installed:

1. With the drive controller chassis inverted, pass the J6 connector and leads on the new fan through the hole in the chassis of the drive controller. Push the fan leads plug securely into the hole.
2. Install the fan. Using a torque wrench and a phillips screw driver socket, tighten the two mounting screws to 6.2 lb-in (0.7 N • m).
3. Turn the drive controller over and route the fan leads to the power board. Using needle nose pliers, carefully connect the J6 connector on the power board.

4. Fit up the drive controller chassis to the back cover. Using a phillips screw driver, install and tighten the four corner screws.
5. Install the bottom cover. Using a phillips screw driver, install and tighten the four screws which hold the bottom cover in place.
6. Install the top cover. Using a phillips screw driver, install and tighten the two screws which hold the top cover in place.
7. Install the bottom IP20 protection cover. Using a phillips screw driver, install and tighten the two screws which hold the bottom IP20 protection cover in place.
8. Install the top IP20 protection cover. Using a phillips screw driver, install and tighten the two screws which hold the top IP20 protection cover in place.
9. Install the J1 connector at the bottom of the power board.
10. Using torque wrench and a flat blade screw driver socket, install and tighten the field wiring on the termination points on connector J2. See Receiving and Installation Manual VDOC06S304_ for torque specifications.
11. Install the control basket as described in the procedure on page 115.

Removing the Bus Capacitors

In the event that one capacitor goes bad, at least two other capacitors will be damaged. Therefore, all four capacitors should be replaced. This procedure explains how to remove the bus capacitors from the following drive controllers:

Drive Controller No.	Bus Capacitor No.
ATV66D16N4	VY1-ADC152V450
ATV66D23N4	

NOTE: Kit # VY1-ADC152V450 contains one capacitor.

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on power board connectors.
- Verify that all power has been removed from J1 connector.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Metric hex key set, 2 to 14 mm
- Power board procedure tool list, page 122
- Gate driver board procedure tool list, page 118
- Control basket procedure tool list, page 113

With drive controller door removed:

1. Remove the power board as described in the procedure on page 121.
2. Identify and tag all field wiring for future re-assembly
3. Disconnect the field wiring of the J2 connector at the bottom of the controller (see Figure 63 on page 117).
4. Using a phillips screw driver, loosen and remove the remaining two screws which hold the bottom cover in place. Remove the bottom cover.
5. Remove the bus bar isolating screen (see Figure 68 on page 124).
6. Using a phillips screw driver, loosen the four corner screws which hold the back cover to the drive controller. Remove the back cover from the drive controller. This allows access to the bus capacitors.
7. Turn the drive controller chassis over to gain access to the bus capacitors. Using a phillips screw driver, loosen and remove the four mounting screws for the brackets which hold the bus capacitors in place.
8. Remove the bus capacitor brackets.
9. On the bus bar, use a hex key wrench to loosen and remove the eight screws which hold the capacitors to the bus bar.
10. Remove all four capacitors.

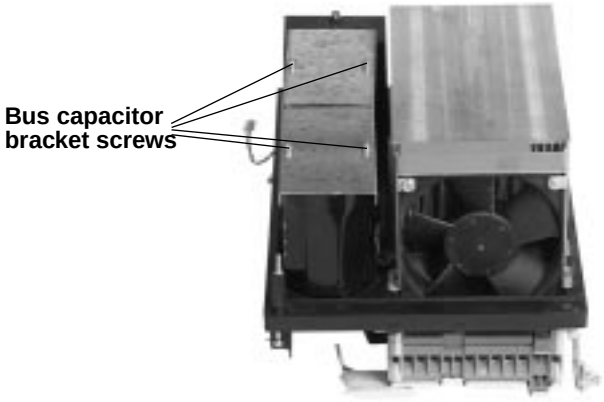


Figure 77: Bus Capacitors

Installing the Bus Capacitors

In the event that one capacitor goes bad, at least two other capacitors will be damaged. Therefore, all four capacitors should be replaced. This procedure explains how to install the bus capacitors in the following drive controllers:

Drive Controller No.	Bus Capacitor No.
ATV66D16N4	VY1-ADC152V450
ATV66D23N4	

NOTE: Kit # VY1-ADC152V450 contains one capacitor.

> **⚠ CAUTION**
>
> **STATIC SENSITIVE COMPONENTS**
>
> Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.
>
> **Failure to follow this instruction can result in equipment damage.**

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Flat blade screw driver sockets for torque wrench
- Metric hex key set, 2 to 14 mm
- Metric hex key sockets for torque wrench, 2 to 14 mm
- Power board procedure tool list, page 124
- Gate drive procedure tool list, page 120
- Control basket procedure tool list, page 115

For the bus capacitors to be installed:

1. Install the new capacitors. Ensure that the polarity matches the polarity marking on the bus bar. The PA terminal of a capacitor should be towards the outer right side of the drive controller (see Figure 78 on page 144).

2. Using a torque wrench and hex key socket, install and tighten the eight capacitor screws to 17.7 lb-in (2 N • m). Ensure the red C+ and black C- cables are properly connected (see Figure 71 on page 129).
3. Using a torque wrench and phillips screw driver socket, install and tighten the four screws to the bus capacitor brackets to 6.2 lb-in (0.7 N • m).
4. Fit up the drive controller chassis to the back cover. Using a phillips screw driver, install and tighten the four corner screws.
5. Install the bottom cover. Using a phillips screw driver, install and tighten the two screws which hold the bottom cover in place.
6. Install the power board as described in the procedure on page 124.
7. Using a torque wrench and a flat blade screw driver socket, install and tighten the field wiring on the termination points on connector J2. See Receiving and Installation Manual VDOC06S304_ for torque specifications.

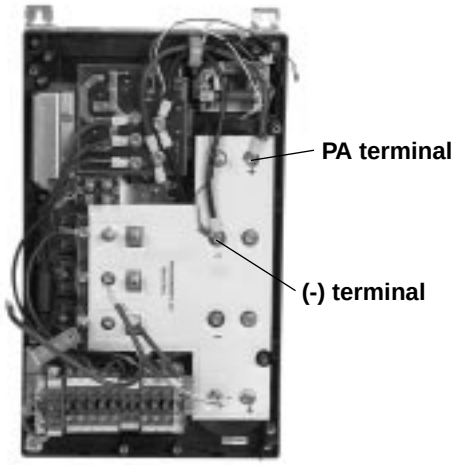


Figure 78: Bus Capacitor PA and (-) Terminals

ATV66D33N4 and D46N4

This section contains spare part information and change out procedures for the following drive controllers:

- ATV66D33N4
- ATV66D46N4

Table 11 lists the spare parts. Refer to the pages indicated in the table for spare part change out procedures.

Table 11: Spare Parts for Drive Controllers ATV66D33N4 and D46N4

Description	For Drive Controllers:	Catalog Number	For Change Out Procedure See:
Control Kit	ATV66D33N4, D46N4	VX4-A66CK1	Pages 146-150
Control Terminal Block Kit	ATV66D33N4, D46N4	VZ3-N006	Pages 150-151
Board Fan	ATV66D33N4, D46N4	VZ3-V6654	Pages 152-153
Gate Driver Board	ATV66D33N4	VX5-A66105	Pages 154-157
	ATV66D46N4	VX5-A66106	
Power Board	ATV66D33N4	VX5-A66D33N4	Pages 157-161
	ATV66D46N4	VX5-A66D46N4	
IGBT Module	ATV66D33N4	VZ3-IM2100M1201	Pages 161-164
	ATV66D46N4	VZ3-IM2150M1201	
Braking IGBT Module	ATV66D33N4, D46N4	VZ3-IM2050M1201	Pages 165-167
Bus Capacitor	ATV66D33N4, D46N4	VY1-ADC472V450	Pages 167-170
Filter Board	ATV66D33N4, D46N4	VX4-A66104	Pages 171-175
Diode Block	ATV66D33N4	VZ3-DM2080M1606	Pages 175-177
	ATV66D46N4	VZ3-DM2100M1601	
Current Sensors (2 in kit)	ATV66D33N4, D46N4	VY1-A66104	Pages 178-180
Fan	ATV66D33N4, D46N4	VZ3-V665	Pages 181-183
Discharge Resistor	ATV66D33N4, D46N4	VZ3-R5K0W040	Pages 183-184
Auto Transformer	ATV66D33N4, D46N4	VY1-ADA604	Pages 185-187

Replacing the Keypad Display

This procedure explains how to replace the keypad display for the following drive controllers.

Drive Controller No.	Control Kit No.
ATV66D33N4	VX4-A66CK1
ATV66D46N4	

NOTE: All ALTIVAR 66 drive controllers use the same model keypad display. However, the version of software present within the keypad display may be specific to the version of software present in the control basket. Mixing incompatible versions of keypad display and control basket software can result in non-recognition of the keypad display by the drive controller or garbled message displays. Therefore, keypad displays are not supplied as separate kitted items. Keypad displays are supplied with control kits. Keep keypads with their associated control basket. Do not mix keypads and control baskets.

The keypad display is mounted on the control basket for drive controllers ATV66D33N4 and ATV66D46N4 (see Figure 79 on page 146).

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of magnetized flat blade screw drivers

With the drive controller door open:

1. Using a flat blade screw driver, push in on the keypad display tab and remove the keypad display (see Figure 79 on page 146).
2. Insert the new keypad display into the front of the control board. Ensure the lip on the bottom of the keypad display is behind the tab on the control basket.

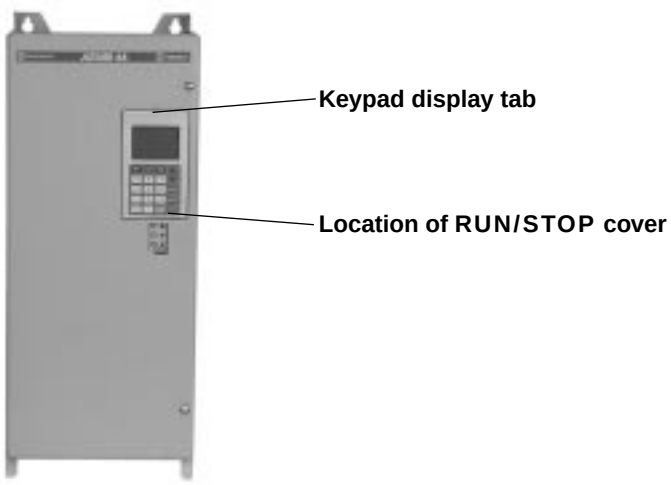


Figure 79: ATV66D33N4 to D46N4 Front View

Removing the Control Basket

This procedure explains how to remove the control basket from the following drive controllers:

Drive Controller No.	Control Kit No.
ATV66D33N4	VX4-A66CK1
ATV66D46N4	

Before removing power, note and record all the drive controller settings using the keypad display.

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on control basket, power board, and I/O Extension Module (if installed) connectors.
- Verify that all power has been removed from J1, J12, and J13 connectors.
- If I/O Extension Module is installed, verify that all power is removed from J22, J23, and J24 connectors.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of magnetized flat blade screw drivers
- A set of magnetized phillips screw drivers

With the drive controller door removed:

1. Measure the bus voltage (if not already performed) as described in Chapter 5 of this manual.
2. Remove the keypad display as described on page 146.
3. Remove the options module, if present. See User's Manual VDOC06T306_ for removal / installation instructions.
4. Using a flat blade screw driver, carefully loosen and disconnect the J9 and J32 connectors located at the top left of the control basket (see Figure 80 on page 148).
5. Using a flat blade screw driver, carefully loosen and disconnect the J12 and J13 connectors located at the bottom of the control basket (see Figure 80 on page 148).

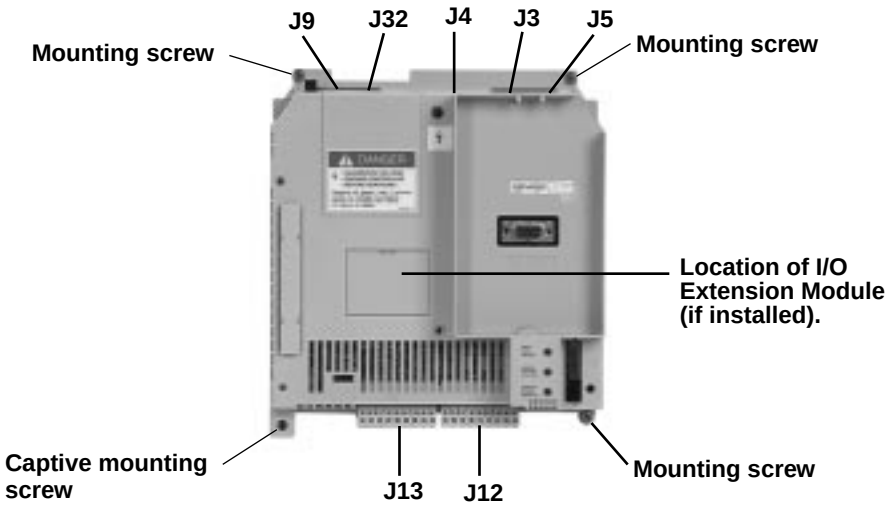


Figure 80: Control Basket Connector Locations

6. Using two small flat blade screw drivers, carefully pull out on each side of the cable clasps (may be either blue or white) of J3, J4, and J5 to the release position (see Figure 81 on page 149). Pull the ribbon cables from the sockets.
7. Using a phillips screw driver, loosen the four corner screws on the control basket. The bottom left screw is a captive screw (see Figure 80 on page 148).
8. Remove the control basket from the drive controller.

NOTE: Be sure the ribbon cables have been released before pulling to avoid damage to the cables. There are two versions of the cable clasps - blue and white.

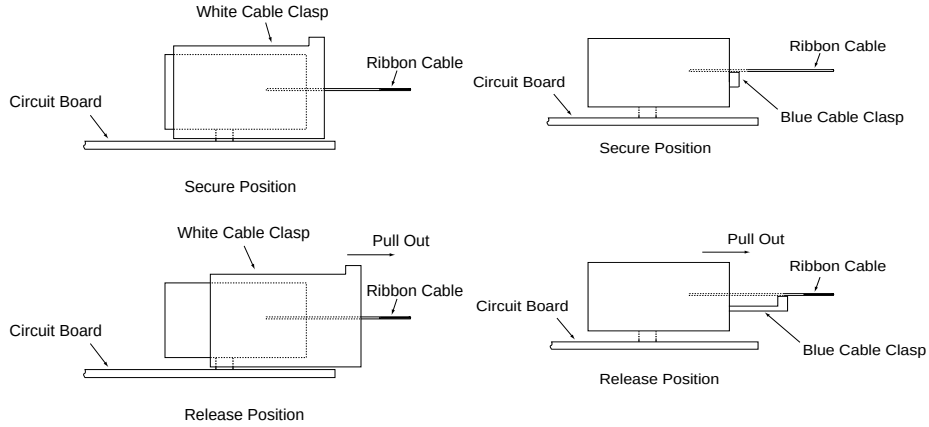


Figure 81: Cable Connector Secure and Release Positions

Installing the Control Basket

This procedure explains how to install the control basket in the following drive controllers:

Drive Controller No.	Control Kit No.
ATV66D33N4	VX4-A66CK1
ATV66D46N4	

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of magnetized flat blade screw drivers
- A set of magnetized phillips screw drivers
- Torque wrench, set to 8.9 lb-in (1.0 N • m)
- A set of phillips screw driver sockets for torque wrench

For the control basket to be installed:

1. Place the control basket in the controller and ensure the mounting holes are aligned with the holes in the controller (see Figure 80 on page 148).
2. Insert the three screws that are not captive. Using a torque wrench and phillips screw drive socket, tighten the three screws and the one captive screw to 8.9 lb-in (1.0 N • m) (see Figure 80 on page 148).

NOTE: The captive mounting screw provides the grounding connection for the control basket and shield connection on J13. Ensure this screw is properly threaded and torqued.

3. Snap the four connectors J9, J12, J13, and J32 into place (see Figure 80 on page 148).

   NOTE: The yellow keys in both the plugs and sockets are designed to prevent incorrect insertion of both J12 and J13.

4. Make sure all three cable connectors are pulled out on connectors J3, J4, and J5 (see Figure 81 on page 149).
5. Carefully insert the three ribbon cables into the cable clasp at the J3 (seven connector cable), J4 (six connector cable), and J5 (18 connector cable) connectors. Ensure the silver leads of the cables are facing outwards from the controller.
6. Push the three ribbon cable connectors to their secure position.
7. Apply multi-lingual hazard labels supplied with kit to control basket, as required.
8. Reinstall the options module, if previously present. See User's Manual VDOC06T306_ for removal / installation instructions.
9. Install the keypad display as described in the procedure on page 146.
10. Reprogram the user settings as previously noted during the control basket removal.

Replacing Control Terminal Blocks

This procedure explains how to replace the control terminal blocks for the following drive controllers:

Drive Controller No.	Control Terminal Block Kit No.
ATV66D33N4	VZ3-N006
ATV66D46N4	

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow "PROCEDURE 1: BUS VOLTAGE MEASUREMENT" in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on control basket, power board, and I/O Extension Module (if installed) connectors.
- Verify that all power has been removed from J1, J12, and J13 connectors.
- If I/O Extension Module is installed, verify that all power is removed from J22, J23, and J24 connectors.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of magnetized flat blade screw drivers

With the drive controller door removed:

1. Measure the bus voltage (if not already performed) as described in Chapter 5 of this manual.
2. Remove options module, if present. See User’s Manual VDOC06T306_ for removal / installation instructions.
3. Identify all field wiring for future re-assembly.
4. Using a flat blade screw driver, loosen the terminal screws on the J1, J12, and J13 connectors (see Figure 82 on page 151). Pull the field wiring back out of the way.
5. Using a flat blade screw driver, gently pry the J1, J12, and J13 terminal blocks away from the board side connectors. Discard the old terminal blocks.
6. Insert the new terminal blocks into their associated board side connectors.

   NOTE: The yellow keys in both the plugs and sockets are designed to prevent incorrect insertion of both J12 and J13.
7. Install the field wiring on the new terminal blocks for J1, J12, and J13. Using a flat blade screw driver, tighten the terminal screws for the field wiring installed.
8. Reinstall options module, if previously present. See User’s Manual VDOC06T306_ for removal / installation instructions.

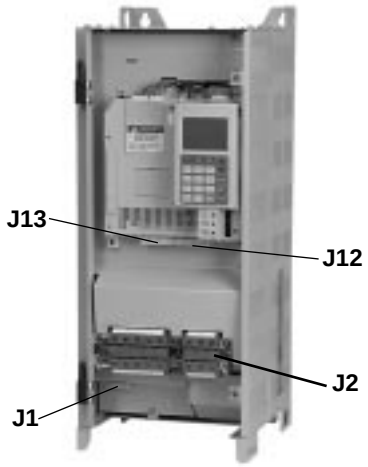


Figure 82: Location of J1, J2, J12, and J13 Connectors

Replacing the Board Fan

This procedure explains how to replace the board fan for the following drive controllers:

NOTE: Older versions of ATV66D33N4 and ATV66D46N4 controllers do not contain a board fan.

Drive Controller No.	Board Fan No.
ATV66D33N4	VZ3-V6654
ATV66D46N4	

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on power board connectors.
- Verify that all power has been removed from J1 connector.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of Torx® screw drivers
- 4” Needle nose pliers
- Control basket procedure tool list, page 149

With the drive controller door removed:

1. Remove the control basket as described in the procedure on page 147.
2. Using a phillips or Torx® screw driver, loosen and remove the four screws which hold the left side panel (see Figure 83 on page 153). Two screws are located at the top and two screws are located at the bottom. Remove the left side panel.

3. Using a phillips screw driver, loosen and remove the four screws which hold the top IP20 protection cover in place (see Figure 83 on page 153). Remove the top IP20 protection cover. This allows access to the gate driver board.

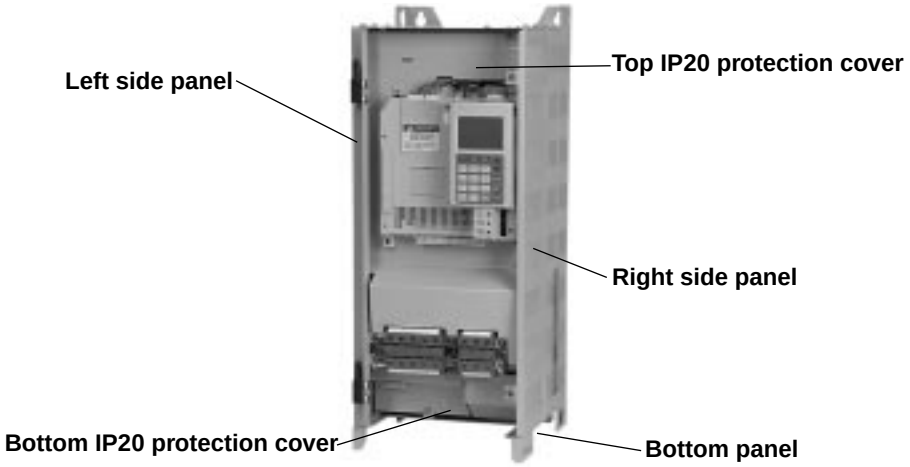


Figure 83: Location of Various Covers

4. Using needle nose pliers, carefully disconnect the J68 board fan connector from the power board (see Figure 84 on page 153 and Figure 87 on page 158).

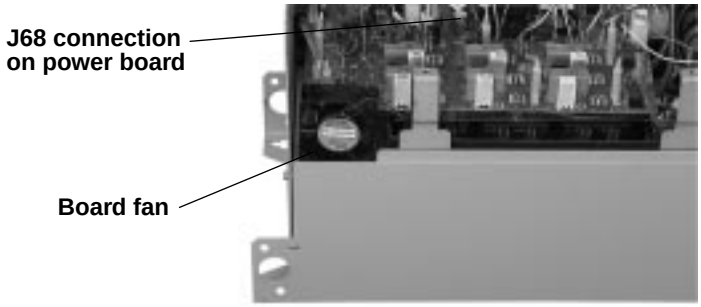


Figure 84: Board Fan-Top Left Side of Drive Controller

5. Carefully pull the board fan leads out from underneath the gate driver board.
6. Using the phillips or Torx® screw driver, loosen and remove the screw holding the board fan in place.
7. Slide the old board fan down and remove it from the drive controller.
8. Install the new board fan on the drive controller by sliding it up until the mounting holes are aligned. Ensure the airflow direction arrow on the new board fan is away from the drive controller.
9. Using needle nose pliers, route and connect the fan leads under the gate driver board to the J68 connection on the power board (see Figure 84 on page 153 and Figure 87 on page 158).
10. Using a phillips or Torx® screw driver, install and tighten the screw for the board fan.
11. Install the top IP20 protection cover. Using a phillips screw driver, install and tighten the four screws which hold the top IP20 protection cover in place.
12. Install the left side panel. Using a phillips or Torx® screw driver, install and tighten the four screws which hold the left side panel in place.
13. Install the control basket as described in the procedure on page 149.

Removing the Gate Driver Board

This procedure explains how to remove the gate driver board from the following drive controllers:

Drive Controller No.	Gate Driver Board No.
ATV66D33N4	VX5-A66105
ATV66D46N4	VX5-A66106

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on power board connectors.
- Verify that all power has been removed from J1 connector.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of Torx® screw drivers
- 4” Needle nose pliers
- Control Basket procedure tool list, page 147

With the drive controller door removed:

1. Remove the control basket as described in the procedure on page 147.
2. Using a phillips or Torx® screw driver, loosen and remove the four screws which hold the left side panel (see Figure 83 on page 153). Two screws are located at the top and two screws are located at the bottom. Remove the left side panel.

3. Using a phillips screw driver, loosen and remove the four screws which hold the top IP20 protection cover in place. Remove the top IP20 protection cover. This allows access to the gate driver board.
4. Using needle nose pliers, carefully disconnect J27, J28, J29, J30, J57, J58, J59, J60, and J61 at the termination points located on the gate driver board (see Figure 85 on page 155).

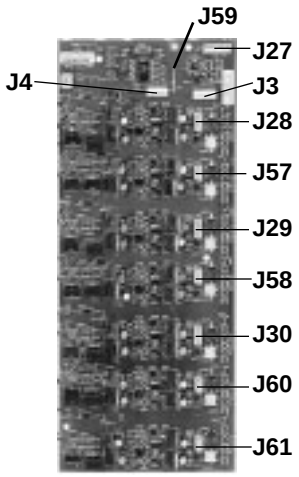


Figure 85: Gate Driver Board Connection Locations

5. Using needle nose pliers, carefully disconnect J20_1, J20_2, J21_1, J21_2, J22_1, J22_2, J23_1, J23_2, J24_1, J24_2, J25_1, and J25_2 at the termination points located on the IGBT modules (see Figure 86 on page 155).

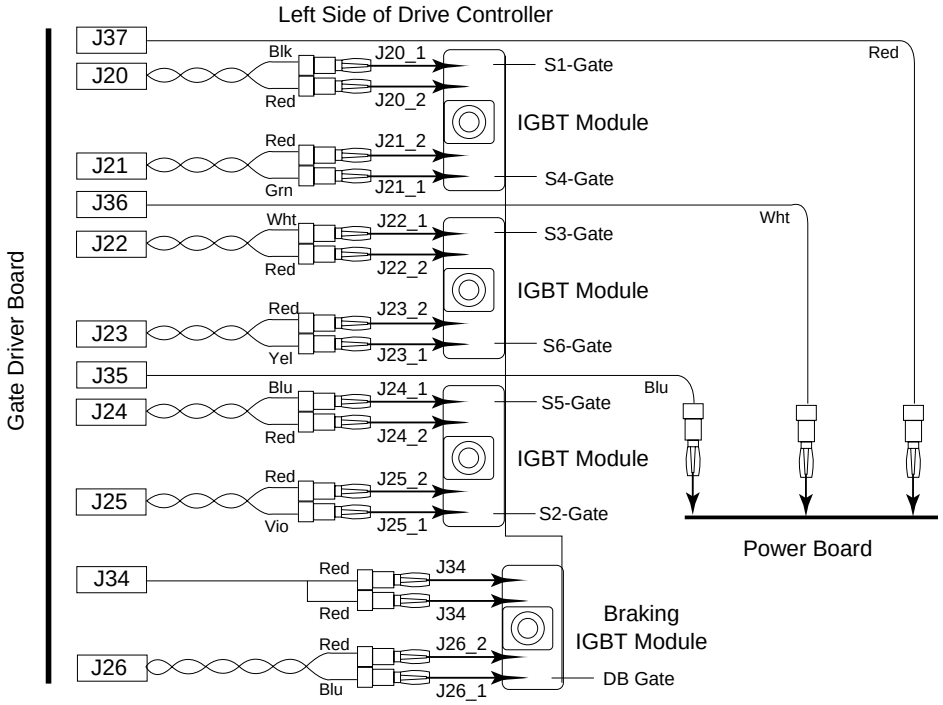


Figure 86: Gate Driver Board Connections on IGBT Modules

6. Using needle nose pliers, carefully disconnect J26_1, J26_2, and J34 at the termination points located on the braking IGBT module (see Figure 86 on page 155).

7. Using needle nose pliers, depress the tabs on the six plastic fixing pins and unsnap the gate driver board from the fixing pins. Do not attempt to remove the gate driver board until all the connectors have been disconnected.
8. Lift the board and using the needle nose pliers, carefully disconnect J35 (blue), J36 (white), and J37 (red) at the termination points located on the power board underneath the gate driver board (see Figure 86 on page 155).
9. Remove the gate driver board.
10. If the gate driver board is to be replaced, loosen the J3 and J4 cable connectors and remove the cables (see Figure 81 on page 149 and Figure 85 on page 155). These cables will be needed during the installation of the new gate driver board. Remove and save the ferrite cores from cables J28, J29 and J30 for use on the new board.

NOTE: Be sure the ribbon cables have been released before pulling to avoid damage to the cables.

Installing the Gate Driver Board

This procedure explains how to install the gate driver board in the following drive controllers:

Drive Controller No.	Gate Driver Board No.
ATV66D33N4	VX5-A66105
ATV66D46N4	VX5-A66106

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of Torx® screw drivers
- 4” Needle nose pliers
- Control basket procedure tool list, page 149

For the gate driver board to be installed:

1. If the gate driver board is being replaced, perform the following steps. Loosen the J3 and J4 cable connectors (see Figure 81 on page 149). Insert the J3 and J4 cables saved earlier with the silver leads facing towards the top of the gate driver board. Push the connectors to the secure position. Install the ferrite cores saved earlier onto cables J28, J29 and J30.
2. Using needle nose pliers, carefully connect J35 (blue), J36 (white), and J37 (red) on the power board (see Figure 86 on page 155).
3. Position the gate driver board over the fixing pins on the power board and snap the gate driver board onto the fixing pins.
4. If required, re-braid the twisted pair wires before connecting them to the IGBT modules.

5. Using needle nose pliers, carefully connect J20_1, J20_2, J21_1, J21_2, J22_1, J22_2, J23_1, J23_2, J24_1, J24_2, J25_1, and J25_2 at the termination points located on the IGBT modules (see Figure 86 on page 155).
6. Using needle nose pliers, carefully connect J26_1, J26_2, and J34 at the termination points located on the braking IGBT module (see Figure 86 on page 155).
7. Using needle nose pliers, carefully connect J27, J28, J29, J30, J57, J58, J59, J60, and J61 at the termination points located on the gate driver board (see Figure 85 on page 155).
8. Install the top IP20 protection cover. Route the five control basket cables through the hole in the protection cover. Using a phillips screw driver, install and tighten the four screws which hold the top IP20 protection cover in place.
9. Install the left side panel. Using a phillips or Torx® screw driver, install and tighten the four screws which hold the left side panel in place.
10. Install the control basket as described in the procedure on page 149.

Removing the Power Board

This procedure explains how to remove the power board from the following drive controllers:

Drive Controller No.	Power Board No.
ATV66D33N4	VX5-A66D33N4
ATV66D46N4	VX5-A66D46N4

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on power board connectors.
- Verify that all power has been removed from J1 connector.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Gate driver procedure tool list, page 154
- Control basket procedure tool list, page 147

With the drive controller door removed:

1. Remove the gate driver board as described in the procedure on page 154.
2. Using a phillips or Torx® screw driver, loosen and remove the four screws which hold the right side panel (see Figure 83 on page 153). Two screws are located at the top and two screws are located at the bottom. Remove the right side panel.
3. Using needle nose pliers, carefully disconnect J7, J8, J16_1, J17_1 (black), J17_2 (black), J68 (board fan leads), J33, J38 (blue), J39 (white), J40 (red), J53_1 (blue), and J53_2 (white) at the termination points located on the power board (see Figure 87 on page 158).

   NOTE: On older versions of ATV66D33N4 and ATV66D46N4 controllers a board fan and J68 connector are not present.

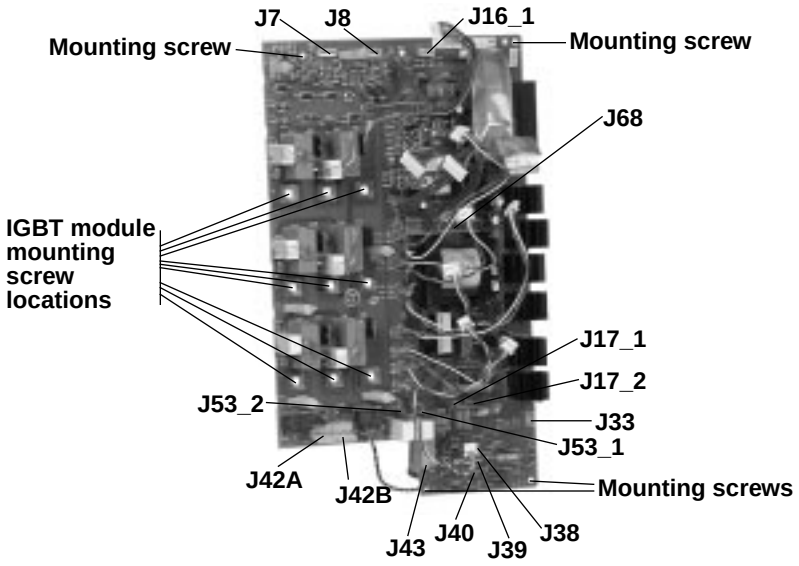


Figure 87: Power Board Connections

4. Using a flat blade screw driver, carefully disconnect J42A, J42B, J43 at the termination points located on the power board (see Figure 87 on page 158).
5. Disconnect the J1 connector. This will allow the bottom IP20 protection cover to be removed (see Figure 82 on page 151).
6. Using a phillips screw driver, loosen and remove the three screws which hold the bottom IP20 protection cover in place (see Figure 83 on page 153). Remove the bottom IP20 protection cover. This allows access to the fan leads.
7. Using needle nose pliers, carefully disconnect the two fan leads located at the terminals on the fan. These two wires are soldered at J6_1 and J6_2 on the power board. Pull the fan leads out from under the terminal block.
8. Using a phillips screw driver, loosen and remove the nine screws which attach the power board to the three IGBT modules (see Figure 87 on page 158).

9. Using a phillips screw driver, loosen and remove the four mounting screws for the power board (see Figure 87 on page 158).
10. If the power board is to be replaced, loosen the J5 cable connector and remove the J5 cable (see Figure 81 on page 149). This cable will be needed during the installation of the new power board. Additionally, remove the six gate driver board standoffs for use during installation of the new board.

    NOTE: Be sure the J5 ribbon cable has been released before pulling to avoid damage to the cable.
11. Remove the power board.

Installing the Power Board

This procedure explains how to install the power board in the following drive controllers:

Drive Controller No.	Power Board No.
ATV66D33N4	VX5-A66D33N4
ATV66D46N4	VX5-A66D46N4

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Torque wrench, set to 17.7 lb-in (2 N • m)
- Gate driver procedure tool list, page 156
- Control basket procedure tool list, page 149

For the power board to be installed:

NOTE: Make sure the bus bar isolating screen is in place between the bus bar and the power board (see Figure 88 on page 160).

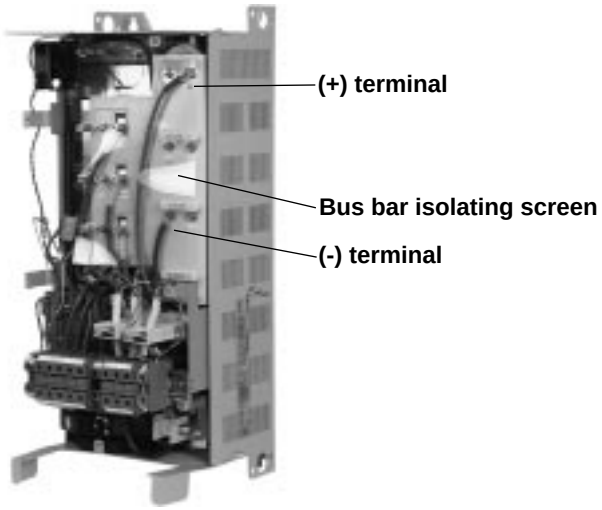


Figure 88: Bus Bar Isolating Screen

1. For a new power board, loosen the J5 cable connector (see Figure 81 on page 149). Insert the J5 cable with the silver leads facing towards the center of the drive controller. Push the connector to the secure position.
2. For a new power board, install the six gate driver board standoffs that were removed from the old power board.
3. Align the mounting holes on the power board to the studs and mounting posts on the drive controller.
4. Using a phillips screw driver, install the four power board mounting screws. Do not tighten until all of the screws are installed (see Figure 87 on page 158).
5. Using a phillips screw driver, install the nine screws which attach the power board to the three IGBT modules (see Figure 87 on page 158).
6. Using a torque wrench with a phillips screw driver socket, tighten the nine screws installed above to 17.7 lb-in (2 N • m)
7. Using a phillips screw driver, tighten the four power board mounting screws.
8. Route the two red fan leads soldered at J6_1 and J6_2 on the power board under the terminal block to the fan. Using needle nose pliers, carefully connect the two fan leads. This is an AC fan. The two red leads can be connected to either terminal.
9. Install the bottom IP20 protection cover. Using a phillips screw driver, install and tighten the three screws which hold the bottom IP20 protection cover in place.
10. Reconnect the J1 connector.
11. Connect J42A, J42B, J43 at the termination points located on the power board (see Figure 87 on page 158).

    NOTE: If controller does not contain a board fan (Figure 84 on page 153), the J68 jack will be left empty.

12. Using needle nose pliers, carefully connect J7, J8, J16_1, J17_1 (black), J17_2 (black), J68 (board fan leads), J33, J38 (blue), J39 (white), J40 (red), J53_1 (blue), and J53_2 (white) at the termination points located on the power board (see Figure 87 on page 158).

    NOTE: Ensure J53_1 and J53_2 are routed away from the power resistors located next to the J53 connection on the power board.

13. Install the right side panel. Using a phillips or Torx® screw driver, install and tighten the four screws which hold the right side panel in place. Two screws are located at the top and two screws are located at the bottom.
14. Install the gate driver board as described in the procedure on page 156.

Removing the IGBT Module

There are three IGBT modules in this size of drive controller. This procedure explains how to remove the IGBT module from the following drive controllers:

Drive Controller No.	IGBT Module No.
ATV66D33N4	VZ3-IM2100M1201
ATV66D46N4	VZ3-IM2150M1201

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on power board connectors.
- Verify that all power has been removed from J1 connector.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Metric hex key set, 2 to 14 mm
- Set of open end wrenches, 5.5 to 19 mm
- Power board procedure tool list, page 158
- Gate driver procedure tool list, page 154
- Control basket procedure tool list, page 147

With the drive controller door removed:

1. Remove the power board as described in the procedure on page 157.
2. Remove the bus bar isolating screen (see Figure 89 on page 162).

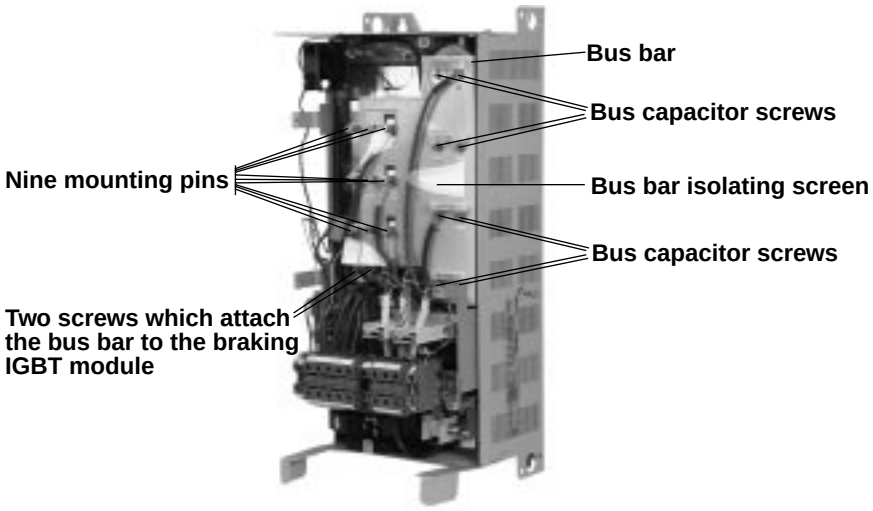


Figure 89: Bus Bar Screws

3. Using an open end wrench, loosen and remove the nine mounting pins and washers on the bus bar. Pull the U, V, and W cables back out of the way (see Figure 89 on page 162).
4. Using a phillips screw driver, loosen and remove the two screws which attach the bus bar to the braking IGBT module (see Figure 89 on page 162). The BR3 cable is connected to the C1 terminal of the braking IGBT module. Pull the BR3 cable back out of the way.
5. Using a hex key wrench, loosen and remove the eight screws which hold the bus bar to the bus capacitors (see Figure 89 on page 162). The balancing resistors are mounted under these screws. Note the location of all cables connected to the bus bar to assist during the re-installation of the bus bar.
6. Remove the bus bar.
7. Using a hex key wrench, loosen and remove the four screws holding the IGBT module to be removed (see Figure 90 on page 163).
8. Using a flat blade screw driver, gently pry loose and remove the IGBT module.

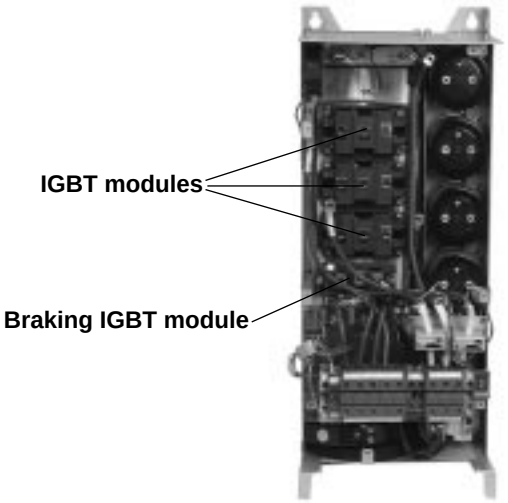


Figure 90: Drive Controller with Bus Bar Removed

Installing the IGBT Module

There are three IGBT modules in this size of drive controller. This procedure explains how to install the IGBT module in the following drive controllers:

Drive Controller No.	IGBT Module No.
ATV66D33N4	VZ3-IM2100M1201
ATV66D46N4	VZ3-IM2150M1201

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

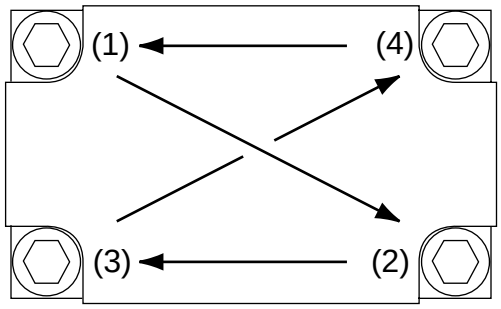
The tools needed for this procedure are:

- 1/4” drive metric socket set, 5.5 to 14 mm
- Metric hex key set, 2 to 14 mm
- Torque wrench, set to 26.5 lb-in (3 N • m)
- Metric hex key sockets for torque wrench, 2 to 14 mm
- Set of open end wrenches, 5.5 to 19 mm
- Thermal grease (Thermalloy Thermalcote™ II, Part No. 349 or equivalent)
- Power board procedure tool list, page 159
- Gate driver procedure tool list, page 156
- Control basket procedure tool list, page 149

For the IGBT module to be installed:

1. Clean the portion of the heatsink which will make contact with the new IGBT module.
2. Evenly coat the bottom of the new IGBT module with a thin coating of thermal grease.
3. Install the new IGBT module with the push-on connectors towards the outside of the drive controller. Using a torque wrench and hex key socket, install and tighten the four mounting screws to 26.5 lb-in (3 N • m).

   Torque screws in the sequence shown.



4. Position the bus bar and align the mounting holes.

   NOTE: When executing steps 5 through 8, perform the following checks. Ensure the red C+ cable from the contactor is connected to the (+) terminal of the top capacitor. Ensure the black C- cable is connected to the (-) terminal of the third capacitor from the top of the controller. Ensure the BR3 cable is connected to the C1 terminal of the braking IGBT module. Ensure the U, V, and W cables are connected to the C2E1 terminals of their respective IGBT modules (as labeled on the bus). Do not tighten any one screw or mounting pin until all of the hex head screws, phillips head screws, and mounting pins are started with all required cables connected.

5. Using a hex key wrench, install the eight bus capacitor hex head screws with the balancing resistors (see Figure 89 on page 162).
6. Using a drive socket or open end wrench, install the six mounting pins with two washers which connect the bus bar to the IGBT modules (see Figure 89 on page 162).
7. Using a phillips screw driver, install the two screws which attach the braking IGBT module to the bus bar (see Figure 89 on page 162).
8. Using a drive socket or open end wrench, install the three mounting pins with one washer which connect the U, V, and W cables to the IGBT modules.
9. Using a torque wrench and the appropriate socket, tighten the mounting pins and screws to 17.7 lb-in (2 N • m).
10. Replace the bus bar isolating screen (see Figure 89 on page 162).
11. Remove the static protective foam from IGBT module control terminals.
12. Install the power board as described in the procedure on page 159.

Removing the Braking IGBT Module

This procedure explains how to remove the braking IGBT module from the following drive controllers:

Drive Controller No.	IGBT Module No.
ATV66D33N4	VZ3-IM2050M1201
ATV66D46N4	

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on power board connectors.
- Verify that all power has been removed from J1 connector.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Metric hex key set, 2 to 14 mm
- Set of open end wrenches, 5.5 to 19 mm
- Power board procedure tool list, page 158
- Gate driver procedure tool list, page 154
- Control basket procedure tool list, page 147

With the drive controller door removed:

1. Remove the power board as described in the procedure on page 157.
2. Remove the bus bar isolating screen (see Figure 89 on page 162).
3. Using an open end wrench, loosen and remove the nine mounting pins and washers on the bus bar (see Figure 89 on page 162). Pull the U, V, and W cables back out of the way.

4. Using a phillips screw driver, loosen and remove the two screws which attach the bus bar to the braking IGBT module. The BR3 cable is connected to the C1 terminal of the braking IGBT module. Pull the BR3 cable back out of the way (see Figure 90 on page 163).
5. Using a hex key wrench, loosen and remove the eight screws which hold the bus bar to the bus capacitors. The balancing resistors are mounted under these screws. Note the location of all cables connected to the bus bar to assist during the re-installation of the bus bar (see Figure 89 on page 162).
6. Remove the bus bar.
7. Using a phillips screw driver, loosen and remove the screw at the C2E1 terminal of the braking IGBT module. The BR1 cable is connected at this terminal. Pull the BR1 cable back out of the way (see Figure 90 on page 163).
8. Using a hex key wrench, loosen and remove the two mounting screws for the braking IGBT module (see Figure 90 on page 163).
9. Using a flat blade screw driver, gently pry loose and remove the braking IGBT module.

Installing the Braking IGBT Module

This procedure explains how to install the braking IGBT module in the following drive controllers:

Drive Controller No.	IGBT Module No.
ATV66D33N4	VZ3-IM2050M1201
ATV66D46N4	

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- 1/4” drive metric socket set, 5.5 to 14 mm
- Torque wrench, set to 26.5 lb-in (3N • m)
- Metric hex key sockets for torque wrench, 2 to 14 mm
- Set of open end wrenches, 5.5 to 19 mm
- Thermal grease (Thermalloy Thermalcote™ II, Part No. 349 or equivalent)
- Power board procedure tool list, page 159
- Gate drive procedure tool list, page 156
- Control basket procedure tool list, page 149

For the braking IGBT module to be installed:

1. Clean the portion of the heatsink which will make contact with the new braking IGBT module.
2. Evenly coat the bottom of the new braking IGBT module with a thin coating of thermal grease.

3. Install the new braking IGBT module with the push-on connectors towards the outside of the drive controller. Using a torque wrench with a hex key socket, install and tighten the two mounting screws to 26.5 lb-in (3 N • m) (see Figure 90 on page 163).
4. Install the BR1 cable and the screw at the C2E1 terminal on the braking IGBT module. Using a torque wrench and phillips screw driver socket, tighten the screw to 17.7 lb-in (2 N • m).
5. Position the bus bar and align the mounting holes.

   NOTE: When executing steps 6 through 9, perform the following checks. Ensure the red C+ cable from the contactor is connected to the (+) terminal of the top capacitor. Ensure the black C- cable is connected to the (-) terminal of the third capacitor down from the top. Ensure the BR3 cable is connected to the C1 terminal of the braking IGBT module. Ensure the U, V, and W cables are connected to the C2E1 terminals of their respective IGBT modules (as labeled on the bus). Do not tighten any one screw or mounting pin until all of the hex head screws, phillips head screws, and mounting pins are started with all required cables connected.
6. Using a hex key wrench, install the eight bus capacitor hex head screws with the balancing resistors (see Figure 89 on page 162).
7. Using a drive socket or open end wrench, install the six mounting pins with two washers which connect the bus bar to the IGBT modules (see Figure 89 on page 162).
8. Using a phillips screw driver, install the two screws which attach the braking IGBT module to the bus bar (see Figure 89 on page 162).
9. Using a drive socket or open end wrench, install the three mounting pins with one washer which connect the U, V, and W cables to the IGBT modules.
10. Using a torque wrench and the appropriate socket, tighten the mounting pins and screws to 17.7 lb-in (2 N • m).
11. Replace the bus bar isolating screen (see Figure 89 on page 162).
12. Remove static protective foam from Braking IGBT module control terminals.
13. Install the power board as described in the procedure on page 159.

Removing the Bus Capacitors

In the event that one capacitor goes bad, at least two other capacitors will be damaged. Therefore, all four capacitors should be replaced. This procedure explains how to remove the bus capacitors from the following drive controllers:

Drive Controller No.	Bus Capacitor No.
ATV66D33N4	VY1-ADC472V450
ATV66D46N4	

NOTE: Kit# VY1-ADC472V450 contains one capacitor.

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on power board connectors.
- Verify that all power has been removed from J1 connector.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Metric hex key set, 2 to 14 mm
- Set of open end wrenches, 5.5 to 19 mm
- Power board procedure tool list, page 158
- Gate driver board procedure tool list, page 154
- Control basket procedure tool list, page 147

With the drive controller door removed:

1. Remove the power board as described in the procedure on page 157.
2. Remove the bus bar isolating screen (see Figure 89 on page 162).
3. Using an open end wrench, loosen and remove the nine mounting pins and washers on the bus bar. Pull the U, V, and W cables back out of the way (see Figure 89 on page 162).
4. Using a phillips screw driver, loosen and remove the two screws which attach the bus bar to the braking IGBT module. The BR3 cable is connected to the C1 terminal of the braking IGBT module. Pull the BR3 cable back out of the way.
5. Using a hex key wrench, loosen and remove the eight screws which hold the bus bar to the bus capacitors. The balancing resistors are mounted under these screws. Note the location of all cables connected to the bus bar to assist during the re-installation of the bus bar (see Figure 89 on page 162).
6. Remove the bus bar.
7. Using a phillips screw driver, loosen and remove the eight screws to the capacitor mounting brackets (see Figure 91 on page 169). For access to the bottom capacitor, loosen and remove the two current sensor mounting screws. Carefully pull the current sensors out of the way to allow access to the bottom capacitor.
8. Remove all four bus capacitors.
9. Remove mounting bracket from each capacitor and save for installation on new capacitors.

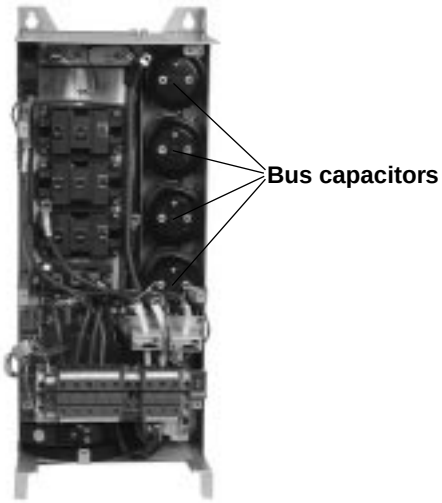


Figure 91: Bus Capacitors

Installing the Bus Capacitors

In the event that one capacitor goes bad, at least two other capacitors will be damaged. Therefore, all four capacitors should be replaced. This procedure explains how to install the bus capacitors in the following drive controllers:

Drive Controller No.	Bus Capacitor No.
ATV66D33N4	VY1-ADC472V450
ATV66D46N4	

NOTE: Kit# VY1-ADC472V450 contains one capacitor.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- 1/4” drive metric socket set, 5.5 to 14 mm
- Set of open end wrenches, 5.5 to 19 mm
- Torque wrench, set to 17.7 lb-in (2 N • m)
- Metric hex key sockets for torque wrench, 2 to 14 mm
- Power board procedure tool list, page 159
- Gate driver procedure tool list, page 156
- Control basket procedure tool list, page 149

For the bus capacitors to be installed:

1. Attach, to the new capacitors, the mounting brackets removed from the old capacitors. Do not tighten the hardware until proper alignment of capacitors is verified.
2. Install the new capacitors. Ensure that the polarity matches the polarity marking on the bus bar. The (+) terminal of a capacitor should be towards the outer right side of the drive controller (see Figure 88 on page 160).

   NOTE: The capacitor mounting brackets are properly installed when the capacitor rests on the bottom of the drive controller and a line drawn through the two capacitor posts would be perpendicular to the side of the drive controller.
3. When mounting brackets are properly installed, tighten the mounting bracket hardware. Using a phillips screw driver, install and tighten the eight capacitor mounting bracket screws.
4. Install the current sensor mounting bracket. Using a hex key wrench, install and tighten the two current sensor mounting screws.
5. Position the bus bar and align the mounting holes.

   NOTE: When executing steps 6 through 9, perform the following checks. Ensure the red C+ cable from the contactor is connected to the (+) terminal of the top capacitor. Ensure the black C- cable is connected to the (-) terminal of the third capacitor from the top of the controller. Ensure the BR3 cable is connected to the C1 terminal of the braking IGBT module. Ensure the U, V, and W cables are connected to the C2E1 terminals of their respective IGBT modules (as labeled on the bus). Do not tighten any one screw or mounting pin until all of the hex head screws, phillips head screws, and mounting pins are started with all required cables connected.
6. Using a hex key wrench, install the eight bus capacitor hex head screws with the balancing resistors (see Figure 89 on page 162).
7. Using a drive socket or open end wrench, install the six mounting pins with two washers which connect the bus bar to the IGBT modules (see Figure 89 on page 162).
8. Using a phillips screw driver, install the two screws which attach the braking IGBT module to the bus bar (see Figure 89 on page 162).
9. Using a drive socket or open end wrench, install the three mounting pins with one washer which connect the U, V, and W cables to the IGBT modules.
10. Using a torque wrench and the appropriate socket, tighten the mounting pins and screws to 17.7 lb-in (2 N • m).
11. Replace the bus bar isolating screen (see Figure 89 on page 162).
12. Install the power board as described in the procedure on page 159.

Removing the Filter Board

This procedure explains how to remove the filter board from the following drive controllers:

Drive Controller No.	Filter Board No.
ATV66D33N4	VX4-A66104
ATV66D46N4	

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- STORED ENERGY

- If controller is damaged, voltage may be present on large tubular capacitors on filter board assembly (see Figure 94 on page 176).
- Always check for presence of voltage between terminals L1, L2 and L3 on J2 connector (see Figure 82 on page 151) using voltmeter set to1000 VDC scale.
- If voltage is present, allow voltmeter to discharge capacitor stored charge. Refer to “PROCEDURE 2: DISCHARGING STORED ENERGY IN CAPACITORS” in chapter 5 for further information.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on power board connectors.
- Verify that all power has been removed from J1 connector.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of Torx® screw drivers
- Metric hex key set, 2 to 14 mm
- 4” Needle nose pliers
- Control basket procedure tool list, page 147

With the drive controller door removed:

1. Remove the control basket as described in the procedure on page 147.
2. Using a phillips or Torx® screw driver, loosen and remove the four screws which hold the left side panel. Two screws are located at the top and two screws are located at the bottom. Remove the left side panel (see Figure 83 on page 153).
3. Using a phillips screw driver, loosen and remove the four screws which hold the top IP20 protection cover in place. Remove the top IP20 protection cover (see Figure 83 on page 153).
4. Using a phillips or Torx® screw driver, loosen and remove the four screws which hold the right side panel. Two screws are located at the top and two screws are located at the bottom. Remove the right side panel (see Figure 83 on page 153).
5. Disconnect the J1 connector. This will allow the bottom IP20 protection cover to be removed (see Figure 82 on page 151).
6. Using a phillips screw driver, loosen and remove the three screws which hold the bottom IP20 protection cover in place. Remove the bottom IP20 protection cover (see Figure 83 on page 153).
7. Using a hex key wrench, loosen the terminal screws for L1, L2, L3, (+), (-), U / T1, V / T2, and W / T3 at both the field side and drive controller side of the J2 terminal block. Pull the cables and wires out of the way. Identify and tag all field wiring for future re-assembly (see Figure 82 on page 151).
8. Using a flat blade screw driver, loosen the terminal screws for CL1, CL2, L21, L22, PA, PB, and the ground connections at both the field side and drive controller side of the terminal block. The CL1, Cl2 jumper (if present) may be left in place. Pull the cables and wires out of the way. Identify and tag all field wiring for future re-assembly (see Figure 82 on page 151).
9. Using a hex key wrench, loosen and remove the two screws holding the J2 terminal block assembly in place. Remove the terminal block assembly (see Figure 82 on page 151).
10. On the gate driver board, use needle nose pliers to depress the tabs on the six plastic fixing pins and unsnap the gate driver board from the fixing pins. This allows access to the bottom of the power board to disconnect the J42A and J42B connector which are soldered to the filter board. No other wires need to be disconnected to do this.
11. Using a flat blade screw driver, carefully disconnect the J42A and J42B connector on the power board (see Figure 87 on page 158).
12. Using needle nose pliers, carefully disconnect J38 (blue), J39 (white), J40 (red), J53_1 (blue) and J53_2 (white) on the power board which are soldered on the filter board (see Figure 87 on page 158).

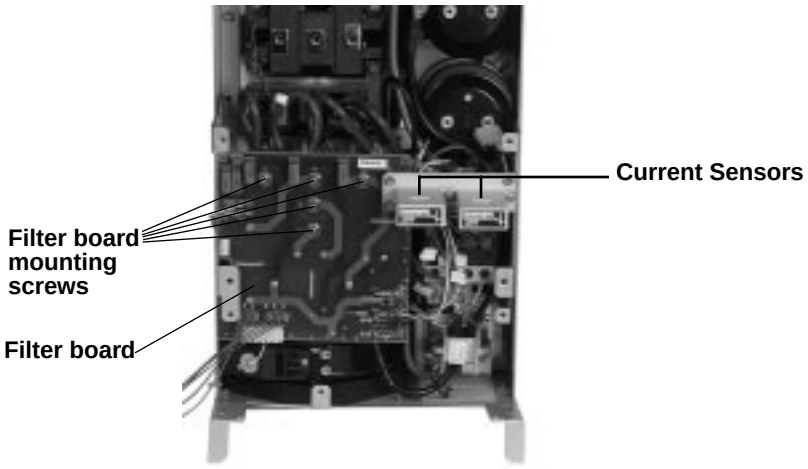


Figure 92: Filter Board (shown with Terminal Block Removed)

13. Using a phillips screw driver, loosen and remove the five screws holding the filter board to the diode bridge bus work (see Figure 92 on page 173).
14. Carefully remove the filter board.

Installing the Filter Board

This procedure explains how to install the filter board in the following drive controllers:

Drive Controller No.	Gate Driver Board No.
ATV66D33N4	VX4-A66104
ATV66D46N4	

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of Torx® screw drivers
- Flat blade screw driver sockets for torque wrench
- Metric hex key set, 2 to 14 mm
- Torque wrench, set to 26.5 lb-in (3 N • m)
- Metric hex key sockets for torque wrench, 2 to 14 mm
- 4” Needle nose pliers
- Control basket procedure tool list, page 149

For the filter board to be installed:

1. Install the new filter board in the drive controller and align the five mounting holes (see Figure 92 on page 173).
2. Using a torque wrench and phillips screw driver socket, install and tighten the five screws to 17.7 lb-in (2 N • m).
3. Using needle nose pliers, carefully connect J38 (blue), J39 (white), and J40 (red) on the power board (see Figure 87 on page 158). Route the wires underneath the sensor assembly bracket to the power board.
4. Using needle nose pliers, carefully connect J53_1 (blue) and J53_2 (white) on the power board (see Figure 87 on page 158).

   NOTE: Ensure J53_1 and J53_2 are routed away from the power resistors located next to the J53 connection on the power board.
5. Connect the J42A and J42B connector on the power board (see Figure 87 on page 158).
6. Align the gate driver board over the fixing pins on the power board and snap the gate driver board into place.
7. Install the J2 terminal block assembly. Using a hex key wrench, install and tighten the two screws holding the J2 terminal block assembly in place (see Figure 82 on page 151).
8. Install the cables and wires for L1, L2, L3, (+), (-), U / T1, V / T2, W / T3, CL1, CL2, L21, L22, PA, PB, and ground at both the field side and drive controller side of the J2 terminal block. Using a torque wrench and appropriate attachment, tighten the terminal screws as shown in Figure 93 on page 174**.** Ensure that the U / T1 cable passes through the left current sensor and that the W / T3 cable passes through the right current sensor.

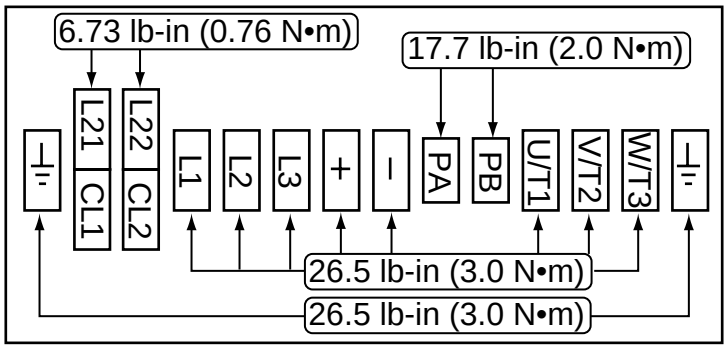


Figure 93: J2 Terminal Block Torque Specs

9. Install the bottom IP20 protection cover. Using a phillips screw driver, install and tighten the three screws which hold the bottom IP20 protection cover in place (see Figure 83 on page 153).
10. Reconnect the J1 connector (see Figure 80 on page 148).

11. Install the right side panel. Using a phillips or Torx® screw driver, install and tighten the four screws which hold the right side panel in place. Two screws are located at the top and two screws are located at the bottom (see Figure 83 on page 153).
12. Install the top IP20 protection cover. Route the five control basket cables through the hole in the protection cover. Using a phillips screw driver, install and tighten the four screws which hold the top IP20 protection cover in place (see Figure 83 on page 153).
13. Install the left side panel. Using a phillips or Torx® screw driver, install and tighten the four screws which hold the left side panel in place. Two screws are located at the top and two screws are located at the bottom (see Figure 83 on page 153).
14. Install the control basket as described in the procedure on page 149.

Removing the Diode Block

There are three diode blocks on this size of drive controller. This procedure explains how to remove a diode block from the following drive controllers:

Drive Controller No.	Diode Block No.
ATV66D33N4	VZ3-DM2080M1606
ATV66D46N4	VZ3-DM2100M1601

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on power board connectors.
- Verify that all power has been removed from J1 connector.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Set of open end wrenches, 5.5 to 19 mm
- Filter board procedure tool list, page 172
- Control basket procedure tool list, page 147

With the drive controller door removed:

1. Remove the filter board as described in the procedure on page 171.
2. Using an open end wrench, loosen and remove the top mounting post and incoming line cable for the diode block to be removed.

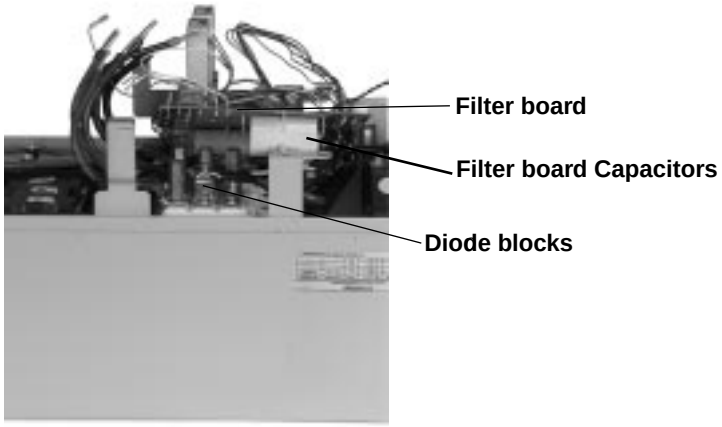


Figure 94: Diode Block - Bottom left side view of controller

NOTE: For the following steps, keep all washers with their respective screws or pins. Washers are used as spacing devices to level controller components.

3. Using an open end wrench, loosen and remove the two lower mounting posts on the center diode block which attaches the module to the bus work and the filter board (see Figure 94 on page 176).
4. Using a hex key wrench, loosen and remove the four screws which hold the diode bridge bus work to the outside diode blocks. Pull the bus work and cables out of the way.
5. For the diode block to be removed, use a hex key wrench to loosen and remove the two mounting screws.
6. Remove the diode block.

Installing the Diode Block

There are three diode blocks on this size of drive controller. This procedure explains how to install the a diode block in the following drive controllers:

Drive Controller No.	Diode Block No.
ATV66D33N4	VZ3-DM2080M1606
ATV66D46N4	VZ3-DM2100M1601

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in "Static Sensitive Components" on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read "WORK PRACTICE PRECAUTIONS" on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Torque wrench, set to 26.5 lb-in (3 N • m)
- 1/4" drive metric socket set, 5.5 to 14 mm
- Thermal grease (Thermalloy Thermalcote™ II, Part No. 349 or equivalent)
- Filter board procedure tool list, page 173
- Control basket procedure tool list, page 149

For the diode bridge to be installed:

1. Clean the portion of the heatsink which will make contact with the diode block.
2. Evenly coat the bottom of the diode block with a thin coating of thermal grease.
3. Install the diode block. Orient the diode block so that terminal #3 is located next to the fan. Using a torque wrench with a hex key socket, install and tighten the two screws to 26.5 lb-in (3 N • m).
4. Place the diode block bus work over the diode block mounting holes.
5. Using a torque wrench with a hex key socket, install and tighten the four screws which hold the diode bridge bus work to the outside diode blocks to 26.5 lb-in (3 N • m).
6. Using a torque wrench and drive socket, install and tighten the lower mounting posts on the center diode block which attach the block to the bus work and the filter board to 17.7 lb-in (2 N • m).
7. Using a torque wrench and drive socket, install and tighten the mounting post and incoming line cable for the diode block that was replaced to 17.7 lb-in (2 N • m).
8. Install the filter board as described in the procedure on page 173.

NOTE: Use the wiring termination chart in ***Figure 95 on page 178*** *to place the wires when performing steps 5 through 7.*

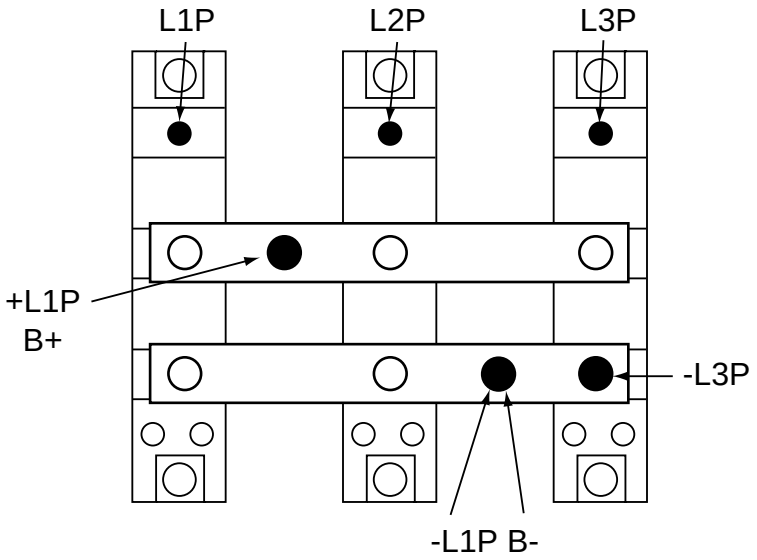


Figure 95: Diode Block Wiring Terminations

Replacing the Current Sensor

There are two current sensors in this size of drive controller. This procedure explains how to replace a current sensor for the following drive controllers:

Drive Controller No.	Current Sensor No.
ATV66D33N4	VY1-A66104
ATV66D46N4	

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on power board connectors.
- Verify that all power has been removed from J1 connector.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

> **⚠ CAUTION**
>
> **STATIC SENSITIVE COMPONENTS**
>
> Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.
>
> **Failure to follow this instruction can result in equipment damage.**

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Metric hex key set, 2 to 14 mm
- Torque wrench, set to 26.5 lb-in (3 N • m)
- Metric hex key sockets for torque wrench, 2 to 14 mm
- A set of Torx® screw drivers
- Flat blade screw driver sockets for torque wrench
- 4” Needle nose pliers
- Control basket procedure tool list, page 149

With the drive controller door removed:

1. Remove the control basket as described in the procedure on page 147.
2. Using a phillips or Torx® screw driver, loosen and remove the four screws which hold the left side panel. Two screws are located at the top and two screws are located at the bottom. Remove the left side panel (see Figure 83 on page 153).
3. Using a phillips screw driver, loosen and remove the four screws which hold the top IP20 protection cover in place. Remove the top IP20 protection cover (see Figure 83 on page 153).
4. Using a flat blade screw driver, loosen the ground terminal screw on the J2 terminal block assembly for the ground wires from the U/T1, V/T2, and W/T3 cables (see Figure 82 on page 151). Pull the ground wires out of the way.
5. Using a hex key wrench, loosen the terminal screw for V/T2 at the drive controller side of the terminal block. Pull the cable out of the way. This allows for access to the mounting screws to the current sensors.
6. Using a hex key wrench, loosen the terminal screw for U/T1 or W/T3 at the drive controller side of the terminal block. The terminal screw to be loosened will depend on which current sensor is to be replaced.
7. Pull the U/T1 or W/T3 cable back through the current sensor and out of the way.
8. Using needle nose pliers, carefully disconnect the wire at the bottom of the current sensor to be replaced.
9. Using a hex key wrench, loosen and remove the two mounting screws for the current sensor to be replaced (see Figure 96 on page 180).
10. Remove the old current sensor.

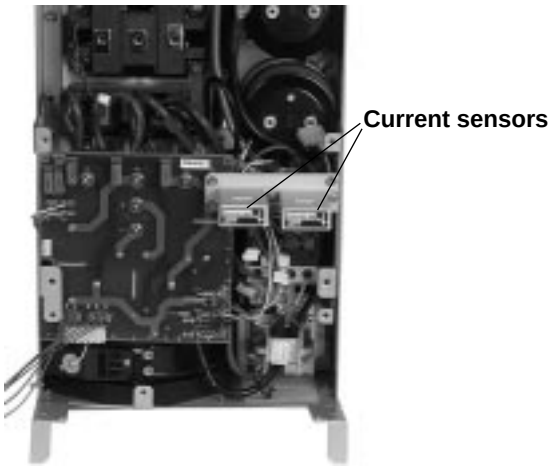


Figure 96: Current Sensor

11. Install the new current sensor. Do not disturb the settings of the potentiometers on the current sensor. The current sensor must be oriented with the arrow pointing towards the bottom of the controller. Using a hex key wrench, install and tighten the two mounting screws.
12. Using needle nose pliers, carefully connect the wire at the bottom of the sensor.
13. Pull the U / T1 or W / T3 cable back through the current sensor.
14. Insert the cable in its terminal on the J2 terminal block assembly and tighten the terminal screw using a torque wrench and hex key attachment. Tighten to 26.5 lb-in (3 N • m).
15. Insert the V / T2 cable in its terminal on the J2 terminal block assembly and tighten the terminal screw using a torque wrench and hex key socket to 26.5 lb-in (3 N • m).
16. Insert the ground wires in the J2 terminal block assembly and tighten the terminal screw using a torque wrench and flat blade attachment to 26.5 lb-in (3 N • m).
17. Install the top IP20 protection cover. Route the five control basket cables through the hole in the protection cover. Using a phillips screw driver, install and tighten the four screws which hold the top IP20 protection cover in place (see Figure 83 on page 153).
18. Install the left side panel. Using a phillips or Torx® screw driver, install and tighten the four screws which hold the left side panel in place. Two screws are located at the top and two screws are located at the bottom.
19. Install the control basket as described in the procedure on page 149.

Removing the Fan

This procedure explains how to remove the fan from the following drive controllers:

Drive Controller No.	Fan No.
ATV66D33N4	VZ3-V665
ATV66D46N4	

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on power board connectors.
- Verify that all power has been removed from J1 connector.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of magnetized phillips screw drivers
- 4” Needle nose pliers
- A set of thin shaft Torx® screw drivers
- Metric hex key set, 2 to 14 mm

With the drive controller door removed:

1. Using a phillips or Torx® screw driver, loosen and remove the four screws which hold the left side panel (see Figure 83 on page 153). Two screws are located at the top and two screws are located at the bottom. Remove the left side panel.
2. Disconnect the J1 connector. This will allow the bottom IP20 protection cover to be removed (see Figure 82 on page 151).
3. Using a phillips screw driver, loosen and remove the three screws which hold the bottom IP20 protection cover in place (see Figure 83 on page 153). Remove the bottom IP20 protection cover.

   NOTE: If repairing the controller with field wiring in place, the wiring knockout panel can be detached from the bottom panel in the next step.
4. Using a phillips or Torx® screw driver, loosen and remove the five screws which hold the bottom panel in place (see Figure 83 on page 153). Remove the bottom panel.

5. Using needle nose pliers, carefully disconnect the two connectors for the fan.
6. Using a Torx® screw driver, loosen and remove the two screws holding the fan to the fan shroud. If the Torx® screw driver will not fit through the fan housing holes, try using a hex key wrench. If using a hex key wrench is successful, replace the Torx® screws with hex head screws (see Figure 97 on page 182).
7. Remove the fan.

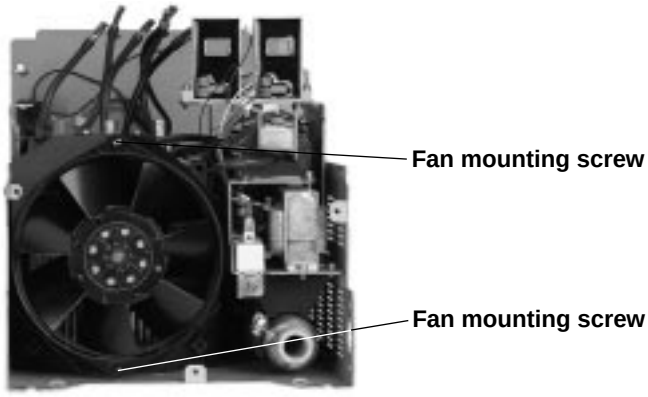


Figure 97: Fan Location and Mounting - Bottom View of Controller

Installing the Fan

This procedure explains how to install the fan in the following drive controllers:

Drive Controller No.	Fan No.
ATV66D33N4	VZ3-V665
ATV66D46N4	

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of magnetized phillips screw drivers
- A set of thin shaft Torx® screw drivers
- Metric hex key set, 2 to 14 mm
- 4” Needle nose pliers

For the fan to be installed:

1. Fit up the new fan and align the mounting holes with the holes on the fan shroud. Ensure the airflow arrow on the fan is facing towards the drive controller (see Figure 97 on page 182).
2. Using a Torx® screw driver (or hex key wrench), install and tighten the two mounting screws.
3. Using needle nose pliers, carefully connect the two fan leads. This is an AC fan. The two fan leads can be connected to either terminal.
4. Install the bottom IP20 protection cover. Using a phillips screw driver, install and tighten the three screws for the bottom IP20 protection cover (see Figure 83 on page 153).
5. Reconnect the J1 connector (see Figure 82 on page 151).
6. Install the left side panel. Using a phillips or Torx® screw driver, install and tighten the four screws which hold the left side panel in place. Two screws are

located at the top and two screws are located at the bottom (see Figure 83 on page 153).

7. Install the bottom panel. Using a phillips or Torx® screw driver, install and tighten the five screws for the bottom panel (see Figure 83 on page 153).

Replacing the Discharge Resistor

This procedure explains how to replace the discharge resistor from the following drive controllers:

Drive Controller No.	Fan No.
ATV66D33N4	VZ3-R5K0W040
ATV66D46N4	

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on power board connectors.
- Verify that all power has been removed from J1 connector.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of magnetized phillips screw drivers
- A set of Torx® screw drivers
- 4” Needle nose pliers

With the drive controller door removed:

1. Using a phillips screw or Torx® driver, loosen and remove the four screws which hold the left side panel (see Figure 83 on page 153). Two screws are located at the top and two screws are located at the bottom. Remove the left side panel.
2. Using a phillips or Torx® screw driver, loosen and remove the four screws which hold the right side panel (see Figure 83 on page 153). Two screws are located at the top and two screws are located at the bottom. Remove the right side panel.
3. Disconnect the J1 connector. This will allow the bottom IP20 protection cover to be removed (see Figure 82 on page 151).

4. Using a phillips screw driver, loosen and remove the three screws which hold the bottom IP20 protection cover in place (see Figure 83 on page 153). Remove the bottom IP20 protection cover.

   NOTE: If repairing the controller with field wiring in place, the wiring knockout panel can be detached from the bottom panel in the next step.

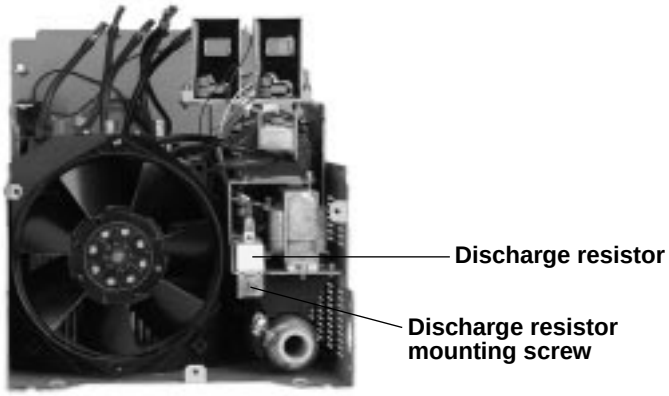


Figure 98: Discharge Resistor

5. Using a phillips or Torx® screw driver, loosen and remove the three screws which hold the bottom panel in place (see Figure 83 on page 153). Remove the bottom panel.
6. Using a phillips screw driver, loosen the one screw holding the discharge resistor in place (see Figure 98 on page 184).
7. Using needle nose pliers, carefully disconnect the wires connected to the terminals of the discharge resistor.
8. Remove the old discharge resistor.
9. Install the new discharge resistor.
10. Using needle nose pliers, carefully connect the wires to the discharge resistor.
11. Install the discharge resistor. Using a phillips screw driver, install and tighten the screw.
12. Install the bottom panel. Using a phillips or Torx® screw driver, install and tighten the three screws for the bottom panel.
13. Install the bottom IP20 protection cover. Using a phillips screw driver, install and tighten the three screws for the bottom IP20 protection cover.
14. Reconnect the J1 connector (see Figure 82 on page 151).
15. Install the right side panel. Using a phillips or Torx® screw driver, install and tighten the four screws which hold the right side panel in place. Two screws are located at the top and two screws are located at the bottom.
16. Install the left side panel. Using a phillips or Torx® screw driver, install and tighten the four screws which hold the left side panel in place. Two screws are located at the top and two screws are located at the bottom.

Replacing the Auto Transformer

This procedure explains how to replace the auto transformer for the following drive controllers:

Drive Controller No.	Auto Transformer No.
ATV66D33N4	VY1-ADA604
ATV66D46N4	

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow "PROCEDURE 1: BUS VOLTAGE MEASUREMENT" in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on power board connectors.
- Verify that all power has been removed from J1 connector.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in "Static Sensitive Components" on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read "WORK PRACTICE PRECAUTIONS" on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- 4" Needle nose pliers
- Metric hex key set, 2 to 14 mm
- A set of Torx® screw drivers
- Flat blade screw driver sockets for torque wrench
- Torque wrench, set to 26.5 lb-in (3 N • m)
- Control basket procedure tool list, page 149

With the drive controller door removed:

1. Remove the control basket as described in the procedure on page 147.
2. Using a phillips or Torx® screw driver, loosen and remove the four screws which hold the left side panel (see Figure 83 on page 153). Two screws are located at the top and two screws are located at the bottom. Remove the left side panel.

3. Using a phillips or Torx® screw driver, loosen and remove the four screws which hold the right side panel. Two screws are located at the top and two screws are located at the bottom. Remove the right side panel (see Figure 83 on page 153).
4. Using a phillips screw driver, loosen and remove the four screws which hold the top IP20 protection cover in place. Remove the top IP20 protection cover.
5. Disconnect the J1 connector. This will allow the bottom IP20 protection cover to be removed (see Figure 82 on page 151).
6. Using a phillips screw driver, loosen and remove the three screws which hold the bottom IP20 protection cover in place. Remove the bottom IP20 protection cover (see Figure 83 on page 153).
7. Using a phillips or Torx® screw driver, loosen and remove the three screws which hold the bottom panel in place. Remove the bottom panel (see Figure 83 on page 153).
8. Using a hex key wrench, loosen the terminal screws for L1, L2, L3, (+), (-), U / T1, V / T2, and W / T3 at both the field side and drive controller side of the J2 terminal block assembly. Pull the cables and wires out of the way. Identify and tag all field wiring for future re-assembly (see Figure 82 on page 151).
9. Using a flat blade screw driver, loosen the terminal screws for CL1, CL2, L21, L22, PA, PB, and the ground connections at both the field side and drive controller side of the terminal block. The CL1, CL2 jumper (if present) may be left in place. Pull the cables and wires out of the way. Identify and tag all field wiring for future re-assembly (see Figure 82 on page 151).
10. Using a hex key wrench, loosen and remove the two screws holding the J2 terminal block assembly in place. Remove the terminal block assembly (see Figure 82 on page 151).

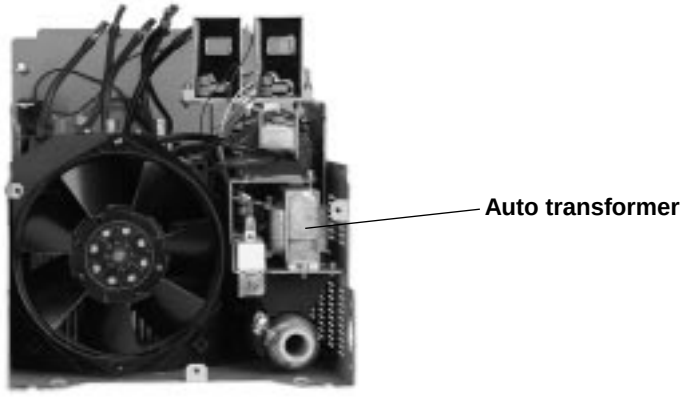


Figure 99: Auto Transformer

11. Using a phillips screw driver, loosen the two screws holding the auto transformer in place (see Figure 99 on page 186).
12. Using needle nose pliers, carefully disconnect the wires connected to the terminals of the auto transformer.
13. Remove the old auto transformer.
14. Install the new auto transformer.
15. Using needle nose pliers, carefully connect the wires to the auto transformer in accordance with Table 12 on page 187.

Table 12: Auto Transformer Connections

Auto Transformer Connection	Wire Color
1	Black
3	Red
5	White
7	Blue

16. Install the auto transformer. Using a phillips screw driver, install and tighten the two screws.
17. Install the J2 terminal block assembly. Using a hex key wrench, install and tighten the two screws holding the terminal block assembly in place.
18. Install the cables and wires for L1, L2, L3, (+), (-), U / T1, V / T2, W / T3, CL1, CL2, L21, L22, PA, PB, and ground at both the field side and drive controller side of the J2 terminal block. Using a torque wrench and appropriate attachment, tighten the terminal screws as shown in Figure 93 on page 174. Ensure that the U / T1 cable passes through the left current sensor and that the W / T3 cable passes through the right current sensor.
19. Install the bottom panel. Using a phillips or Torx® screw driver, install and tighten the three screws for the bottom panel (see Figure 83 on page 153).
20. Install the bottom IP20 protection cover. Using a phillips screw driver, install and tighten the three screws for the bottom IP20 protection cover (see Figure 83 on page 153).
21. Reconnect the J1 connector (see Figure 82 on page 151).
22. Install the top IP20 protection cover. Route the five control basket cables through the hole in the protection cover. Using a phillips screw driver, install and tighten the four screws for the top IP20 protection cover (see Figure 83 on page 153).
23. Install the right side panel. Using a phillips or Torx® screw driver, install and tighten the four screws which hold the right side panel in place. Two screws are located at the top and two screws are located at the bottom (see Figure 83 on page 153).
24. Install the left side panel. Using a phillips or Torx® screw driver, install and tighten the four screws which hold the left side panel in place. Two screws are located at the top and two screws are located at the bottom (see Figure 83 on page 153).
25. Install the control basket as described in the procedure on page 149.

ATV66D54N4 to D79N4

This section contains spare parts information and change out procedures for drive controllers:

- ATV66D54N4
- ATV66D64N4
- ATV66D79N4

Table 13: Spare Parts for Drive Controllers ATV66D54N4 to D79N4

Description	For Drive Controllers:	Catalog Number	For Change Out Procedure See:
Control Kit	ATV66D54N4 to D79N4	VX4-A66CK1	Pages 191-194
Control Terminal Block Kit	ATV66D54N4 to D79N4	VZ3-N006	Pages 194-195
Board Fan	ATV66D54N4 to D79N4	VZ3-V6654	Pages 196-197
Gate Driver Board	ATV66D54N4	VX5-A66107	Pages 198-201
	ATV66D64N4	VX5-A66108	
	ATV66D79N4	VX5-A66109	
Power Board	ATV66D54N4	VX5-A66D54N4	Pages 201-204
	ATV66D64N4	VX5-A66D64N4	
	ATV66D79N4	VX5-A66D79N4	
IGBT Module	ATV66D54N4	VZ3-IM2150M1201	Pages 205-208
	ATV66D64N4	VZ3-IM2200M1201	
	ATV66D79N4	VZ3-IM2300M1201	
Braking IGBT Module	ATV66D54N4	VZ3-IM2100M1201	Pages 208-211
	ATV66D64N4 and D79N4	VZ3-IM2150M1201	
Bus Capacitor Assembly	ATV66D54N4	VY1-ADC605	Pages 211-214
	ATV66D64N4 and D79N4	VY1-ADC606	
Filter Board	ATV66D54N4 to D79N4	VX4-A66105	Pages 215-218
Diode Block	ATV66D54N4 to D79N4	VZ3-DM2160M1606	Pages 219-221
Current Sensors (2 in kit)	ATV66D54N4 to D79N4	VY1-A66105	Pages 221-223
Main Fan	ATV66D54N4 to D79N4	VZ3-V665	Pages 223-225
Precharge Resistor	ATV66D54N4 to D79N4	VZ3-R010W481	Pages 226-227
Discharge Resistor (2 required)	ATV66D54N4 to D79N4	VZ3-R5K0W040	Pages 227-229
Auto Transformer	ATV66D54N4 to D79N4	VY1-ADA604	Pages 230-231

Replacing the Keypad Display

This procedure explains how to replace the keypad display for the following drive controllers:

Drive Controller No.	Control Kit No.
ATV66D54N4	VX4-A66CK1
ATV66D64N4	
ATV66D79N4	

NOTE: All ALTIVAR 66 drive controllers use the same model keypad display. However, the version of software present within the keypad display may be specific to the version of software present in the control basket. Mixing incompatible versions of keypad display and control basket software can result in non-recognition of the keypad display by the drive controller or garbled message displays. Therefore, keypad displays are not supplied as separate kitted items. Keypad displays are supplied with control kits. Keep keypads with their associated control basket. Do not mix keypads and control baskets.

The keypad display is mounted on the control basket for drive controllers ATV66D54N4 through ATV66D79N4 (see Figure 103 on page 195).

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of magnetized flat blade screw drivers

With the drive controller door open:

1. Using a flat blade screw driver, push in on the top of the keypad display tab and remove the keypad display.
2. Insert the new keypad display into the front of the control board. Ensure the lip on the bottom of the keypad display is behind the tab on the control basket.

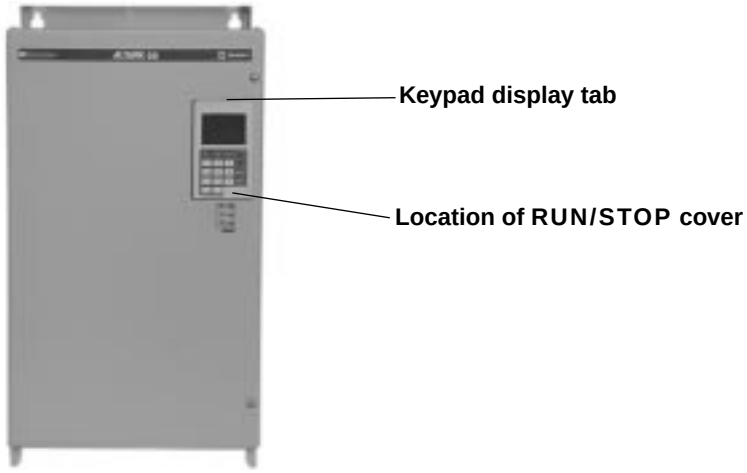


Figure 100: ATV66D54N4 to D79N4 Front View

Removing the Control Basket

This procedure explains how to remove the control basket from the following drive controllers:

Drive Controller No.	Control Kit No.
ATV66D54N4	VX4-A66CK1
ATV66D64N4	
ATV66D79N4	

Before removing power, note and record all the drive controller settings using the keypad display.

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow "PROCEDURE 1: BUS VOLTAGE MEASUREMENT" in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on control basket, power board, and I/O Extension Module (if installed) connectors.
- Verify that all power has been removed from J1, J12, and J13 connectors.
- If I/O Extension Module is installed, verify that all power is removed from J22, J23, and J24 connectors.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in "Static Sensitive Components" on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read "WORK PRACTICE PRECAUTIONS" on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of magnetized flat blade screw drivers
- A set of magnetized phillips screw drivers

With the drive controller door removed:

1. Measure the bus voltage (if not already performed) as described in Chapter 5 of this manual.
2. Remove the keypad display as described on page 190.
3. Remove options module, if present. See User's Manual VDOC06T306_ for removal / installation instructions.

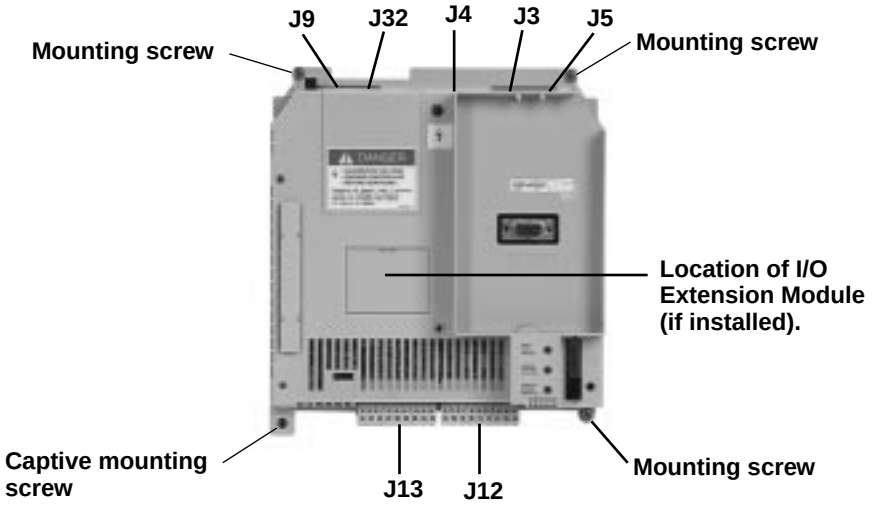


Figure 101: Control Basket Connector Locations

4. Using a flat blade screw driver, carefully loosen and disconnect the J9 and J32 connectors located at the top left of the control basket (see Figure 101 on page 192).
5. Using a flat blade screw driver, carefully loosen and disconnect the J12 and J13 connectors located at the bottom of the control basket.
6. Using two small flat blade screw drivers, carefully pull out on each side of the cable clasps of J3, J4, and J5 to the release position (see Figure 102 on page 193). Pull the ribbon cables from the sockets.
7. Using a phillips screw driver, loosen the four corner screws on the control basket (see Figure 101 on page 192).
8. Remove the control basket from the drive controller.

NOTE: Be sure the ribbon cables have been released before pulling to avoid damage to the cables. There are two versions of the cable clasps - blue and white.

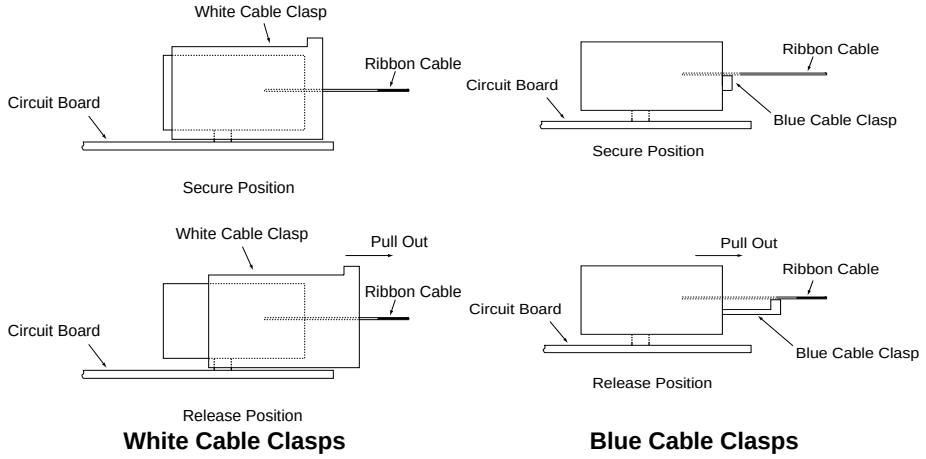


Figure 102: Cable Connector Secure and Release Positions

Installing the Control Basket

This procedure explains how to install the control basket in the following drive controllers:

Drive Controller No.	Control Kit No.
ATV66D54N4	VX4-A66CK1
ATV66D64N4	
ATV66D79N4	

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of magnetized flat blade screw drivers
- A set of magnetized phillips screw drivers
- Torque wrench, set to 8.9 lb-in (1.0 N • m)
- A set of phillips screw driver sockets for torque wrench

For the control basket to be installed:

1. Place the control basket in the controller. Using a torque wrench and a phillips screw driver socket, tighten the one captive screw and install and tighten the three other corner screws to 8.9 lb-in (1.0 N • m) (see Figure 101 on page 192).

   NOTE: The captive mounting screw provides the grounding connection for the control basket and shield connection on J13. Ensure this screw is properly threaded and torqued.

2. Snap the four connectors J9, J12, J13, and J32 into place (see Figure 101 on page 192).

   NOTE: The yellow keys in both the plugs and sockets are designed to prevent incorrect insertion of both J12 and J13.
3. Make sure all three cable connectors are pulled out on connectors J3, J4, and J5 (see Figure 102 on page 193).
4. Carefully insert the three ribbon cables into the white cable connectors at the J3 (seven connector cable), J4 (six connector cable), and J5 (18 connector cable) connectors. Ensure the silver leads of the cables are facing outwards from the controller.
5. Push the three ribbon cable connectors to their secure position.
6. Apply multi-lingual hazard labels supplied with kit to control basket, as required.
7. Reinstall options module, if previously present. See User's Manual VDOC06T306_ for removal / installation instructions.
8. Install the keypad display as described in the procedure on page 190.
9. Reprogram the user settings as previously noted during the control basket removal.

Replacing Control Terminal Blocks

This procedure explains how to replace the control terminal blocks for the following drive controllers:

Drive Controller No.	Control Terminal Block Kit No.
ATV66D54N4	VZ3-N006
ATV66D64N4	
ATV66D79N4	

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow "PROCEDURE 1: BUS VOLTAGE MEASUREMENT" in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on control basket, power board, and I/O Extension Module (if installed) connectors.
- Verify that all power has been removed from J1, J12, and J13 connectors.
- If I/O Extension Module is installed, verify that all power is removed from J22, J23, and J24 connectors.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

Read "WORK PRACTICE PRECAUTIONS" on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of magnetized flat blade screw drivers

With the drive controller door open:

1. Measure the bus voltage (if not already performed) as described in Chapter 5 of this manual.
2. Remove options module, if present. See User's Manual VDOC06T306_ for removal / installation instructions.
3. Identify and tag all field wiring for future re-assembly.
4. Using a flat blade screw driver, loosen the terminal screws on the J1, J12, and J13 connectors (see Figure 103 on page 195). Pull the field wiring back out of the way.
5. Using a flat blade screw driver, gently pry the J1, J12, and J13 terminal blocks away from the board side connectors. Discard the old terminal blocks.
6. Insert the new field side connectors into their associated board side connectors.

   NOTE: The yellow keys in both the plugs and sockets are designed to prevent incorrect insertion of both J12 and J13.
7. Install the field wiring on the new terminal blocks for J1, J12, and J13. Using a flat blade screw driver, tighten the terminal screws for the field wiring installed.
8. Reinstall options module, if previously present. See User's Manual VDOC06T306_ for removal / installation instructions.

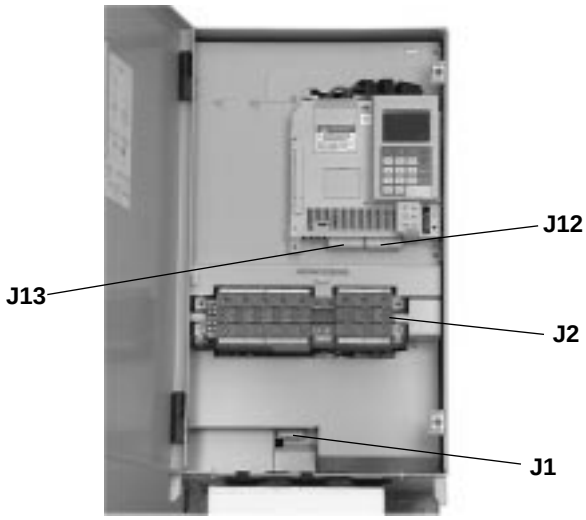


Figure 103: Location of J1, J2, J12, and J13 Connectors

Replacing the Board Fan

This procedure explains how to replace the board fan for the following drive controllers:

Drive Controller No.	Board Fan No.
ATV66D54N4	VZ3-V6654
ATV66D64N4	
ATV66D79N4	

NOTE: Older versions of the ATV66D54N4 to D79N4 drive controllers do not contain a board fan.

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on power board connectors.
- Verify that all power has been removed from J1 connector.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of Torx® screw drivers
- 4” Needle nose pliers
- Control basket procedure tool list, page 193

With the drive controller door removed:

1. Remove the control basket as described in the procedure on page 191.
2. Using a phillips or Torx® screw driver, loosen and remove the four screws located along the left edge of the controller top and bottom panels in order to remove the left side panel.

3. Remove the left side panel (see Figure 104 on page 197).
4. Using a phillips screw driver, loosen and remove the four screws which hold the top IP20 protection cover in place (see Figure 104 on page 197). Remove the top IP20 protection cover. This allows access to the gate driver board (see Figure 105 on page 199).
5. Using needle nose pliers, carefully disconnect the J68 board fan leads on the power board (see Figure 107 on page 202).
6. Carefully pull the board fan leads out from underneath the gate driver board (see Figure 105 on page 199).
7. Using the phillips screw driver, loosen and remove the screw holding the board fan in place.
8. Slide the old board fan down and remove it from the drive controller.

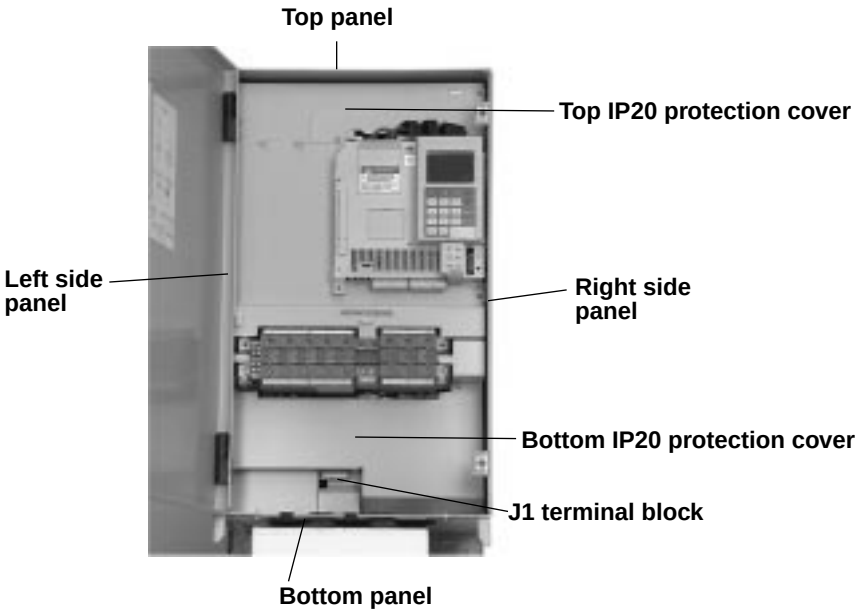


Figure 104: Location of IP20 Protection Covers and Panels

9. Install the new board fan on the drive controller by sliding it up until the mounting hole is aligned (see Figure 105 on page 199).
10. Using a phillips screw driver, install and tighten the screw for the board fan.
11. Using needle nose pliers, route and connect the fan leads under the gate driver board to the J68 connection on the power board (see Figure 107 on page 202).
12. Install the top IP20 protection cover. Route the five control basket cables through the hole in the protection cover. Using a phillips screw driver, install and tighten the four screws which hold the top IP20 protection cover in place.
13. Install the left side panel by sliding it downward into position. Using a phillips or Torx® screw driver, install and tighten the screws which hold the left side panel in place.
14. Install the control basket as described in the procedure on page 193.

Removing the Gate Driver Board

This procedure explains how to remove the gate driver board from the following drive controllers:

Drive Controller No.	Gate Driver Board No.
ATV66D54N4	VX5-A66107
ATV66D64N4	VX5-A66108
ATV66D79N4	VX5-A66109

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on power board connectors.
- Verify that all power has been removed from J1 connector.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of Torx® screw drivers
- 4” Needle nose pliers
- Control basket procedure tool list, page 192

With the drive controller door removed:

1. Remove the control basket as described in the procedure on page 191.
2. Using a phillips or Torx® screw driver, loosen and remove the four screws located along the left edge of the controller top and bottom panels in order to remove the left side panel.
3. Remove the left side panel (see Figure 104 on page 197).

4. Using a phillips screw driver, loosen and remove the four screws which hold the top IP20 protection cover in place (see Figure 104 on page 197). Remove the top IP20 protection cover. This allows access to the gate driver board.
5. Using needle nose pliers, carefully disconnect J27, J28, J29, J30, J57, J58, J59, J60, and J61 at the termination points located on the gate driver board (see Figure 105 on page 199).
6. Using needle nose pliers, carefully disconnect J20_1, J20_2, J21_1, J21_2, J22_1, J22_2, J23_1, J23_2, J24_1, J24_2, J25_1, and J25_2 at the termination points located on the IGBT modules (see Figure 106 on page 199).

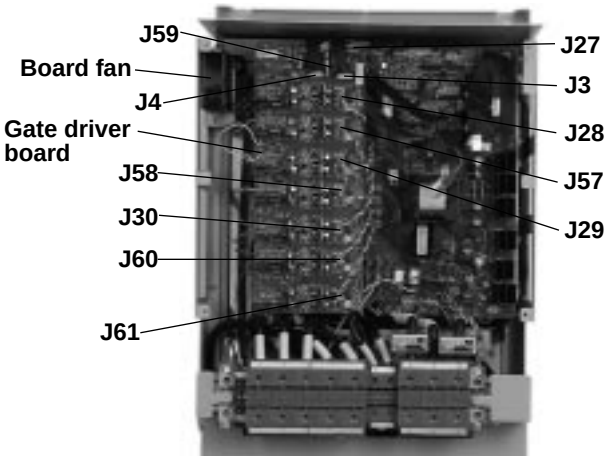


Figure 105: Gate Driver Board Connection and Board Fan Locations

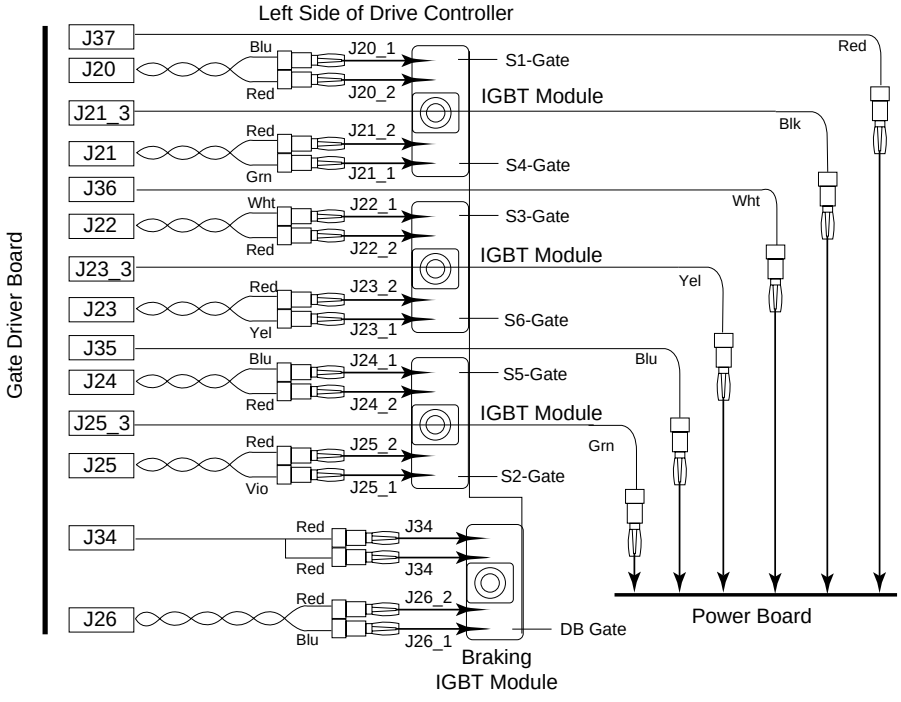


Figure 106: Gate Driver Board Connections on IGBT Modules

7. Using needle nose pliers, carefully disconnect J26_1, J26_2, and J34 at the termination points located on the braking IGBT module (see Figure 106 on page 199).
8. Using needle-nose pliers, depress the tabs on the six plastic fixing pins and unsnap the gate driver board from the fixing pins. Do not attempt to remove the gate driver board until all the connectors have been disconnected.
9. Lift the board and using the needle nose pliers, carefully disconnect J21_3 (black), J23_3 (yellow), J25_3 (green), J35 (blue), J36 (white), and J37 (red) at the termination points located on the power board underneath the gate driver board.
10. Remove the gate driver board.
11. If the gate driver board is to be replaced, loosen the J3 and J4 cable connectors and remove the J3 and J4 cables (see Figure 102 on page 193 and Figure 105 on page 199). These cables will be needed during the installation of the new gate driver board. Remove and save the ferrite cores from cables J28, J29 and J30 for use on the new board.

    NOTE: Be sure the ribbon cables have been released before pulling to avoid damage to the cables.

Installing the Gate Driver Board

This procedure explains how to install the gate driver board in the following drive controllers:

Drive Controller No.	Gate Driver Board No.
ATV66D54N4	VX5-A66107
ATV66D64N4	VX5-A66108
ATV66D79N4	VX5-A66109

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of Torx® screw drivers
- 4” Needle nose pliers
- Control basket procedure tool list, page 193

For the gate driver board to be installed:

1. Loosen the J3 and J4 cable connectors (see Figure 102 on page 193). Insert the J3 and J4 cables with the silver leads facing towards the top of the gate driver board. Push the connectors to the secure position. Install the ferrite cores saved earlier onto cables J28, J29 and J30.

2. Using needle nose pliers, carefully connect J21_3 (black), J23_3 (yellow), J25_3 (green), J35 (blue), J36 (white), and J37 (red) at the termination points located on the power board.
3. Position the gate driver board over the fixing pins on the power board and snap the gate driver board onto the fixing pins.
4. If required, re-braid the twisted pair wires before connecting them to the IGBT modules.
5. Using needle nose pliers, carefully connect J20_1, J20_2, J21_1, J21_2, J22_1, J22_2, J23_1, J23_2, J24_1, J24_2, J25_1, and J25_2 at the termination points located on the IGBT modules (see Figure 106 on page 199).
6. Using needle nose pliers, carefully connect J26_1, J26_2, and J34 at the termination points located on the braking IGBT module (see Figure 106 on page 199).
7. Using needle nose pliers, carefully connect J27, J28, J29, J30, J57, J58, J59, J60, and J61 at the termination points located on the gate driver board (see Figure 105 on page 199).
8. Install the top IP20 protection cover. Route the five control basket cables through the hole in the protection cover. Using a phillips screw driver, install and tighten the four screws which hold the top IP20 protection cover in place.
9. Install the left side panel by sliding it downward into position. Using a phillips or Torx® screw driver, install and tighten the screws which hold the left side panel in place.
10. Install the control basket as described in the procedure on page 193.

Removing the Power Board

This procedure explains how to remove the power board from the following drive controllers:

Drive Controller No.	Power Board No.
ATV66D54N4	VX5-A66D54N4
ATV66D64N4	VX5-A66D64N4
ATV66D79N4	VX5-A66D79N4

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on power board connectors.
- Verify that all power has been removed from J1 connector.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Metric hex key set, 2 to 14 mm
- 1/4” drive metric socket set, 5.5 to 14 mm
- Gate driver board procedure tool list, page 198
- Control basket procedure tool list, page 192

With the drive controller door removed:

1. Remove the gate driver board as described in the procedure on page 198.

   NOTE: Older model ATV66D54N4 to D79N4 controllers do not contain a board fan. Therefore, it is not necessary to remove the J69 connector as described in step 2.

2. Using needle nose pliers, carefully disconnect J7, J8, J16, J17_1 (black), J17_2 (black), J33, J38 (blue), J39 (white), J40 (red), J53_1 (blue), J53_2 (white), J68, and J69 at the termination points located on the power board (see Figure 107 on page 202).
3. Using a flat blade screw driver, carefully disconnect J42A, J42B, J43 at the termination points located on the power board (see Figure 107 on page 202).

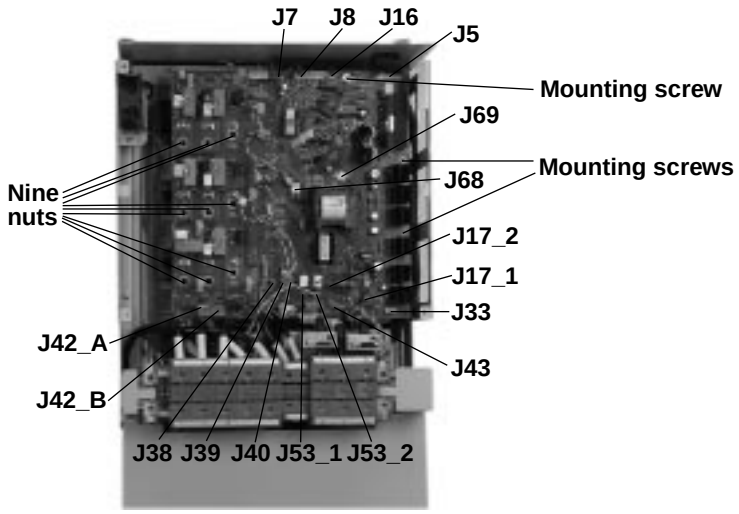


Figure 107: Power Board Connections

NOTE: On older model ATV66D54N4 to ATV66D79N4 controllers, J69 is not present. Furthermore, the J69 shown in this figure is labeled J68 on the older models.

4. Disconnect the J1 connector (see Figure 104 on page 197). This will allow the bottom IP20 protection cover to be removed.
5. Using a phillips screw driver, loosen and remove the three screws which hold the bottom IP20 protection cover in place (see Figure 104 on page 197). Remove the bottom IP20 protection cover. This allows access to the main fan leads.
6. Using needle nose pliers, carefully disconnect the two main fan leads at the fan (see Figure 114 on page 224).
7. Using a drive socket, loosen and remove the nine nuts which attach the power board to the three IGBT modules (see Figure 107 on page 202).
8. Using a phillips screw driver and a hex key wrench, loosen and remove the three mounting screws for the power board (see Figure 107 on page 202).
9. Remove the power board. Slide the main fan leads out as the power board is being removed.
10. If the power board is to be replaced, loosen the J5 cable connector and remove the J5 cable (see Figure 102 on page 193). This cable will be needed during the installation of the new power board. Additionally, remove the gate driver board standoffs for use during installation of the new power board.

    NOTE: Be sure the J5 ribbon cable has been released before pulling to avoid damage to the cable.

Installing the Power Board

This procedure explains how to install the power board in the following drive controllers:

Drive Controller No.	Power Board No.
ATV66D54N4	VX5-A66D54N4
ATV66D64N4	VX5-A66D64N4
ATV66D79N4	VX5-A66D79N4

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Torque wrench, set to 17.7 lb-in (2.0 N • m)
- Metric drive sockets for torque wrench
- Metric hex key set, 2 to 14 mm
- Metric hex key sockets for torque wrench, 2 to 14 mm
- Gate driver board procedure tool list, page 200
- Control basket procedure tool list, page 193

For the power board to be installed:

NOTE: Make sure the bus bar isolating screen is in place between the bus bar and the power board.

1. If a new power board is to be installed, loosen the J5 cable connector (see Figure 102 on page 193). Insert the J5 cable with the silver leads facing towards the center of the drive controller. Push the connector to the secure position.
2. Position the power board over the mounting holes in the controller.
3. Using a phillips screw driver and hex key wrench, install the three power card mounting screws (see Figure 107 on page 202). Do not tighten until all of the screws and nuts are installed.
4. Using a drive socket, install the nine nuts which attach the power board to the three IGBT modules (see Figure 107 on page 202).
5. Using a torque wrench with a drive socket, tighten the nine nuts installed above to 17.7 lb-in (2.0 N • m).
6. Using a phillips screw driver and hex key wrench, tighten the three power board mounting screws.
7. Thread the two main fan leads from the power board under the power terminal block assembly. Connect the two fan lead connectors to the fan (see Figure 114 on page 224). This is an AC fan. The two fan leads can be connected to either terminal.
8. Connect J42A, J42B, J43 at the termination points located on the power board (see Figure 107 on page 202).

   NOTE: If the controller does not contain a board fan (see Figure 105 on page 199), plug the J68 connector into the J69 jack on the power board. The J68 jack will be left empty.
9. Using needle nose pliers, carefully connect J7, J8, J16, J17_1 (black), J17_2 (black), J33, J38 (blue), J39 (white), J40 (red), J53_1 (blue), J53_2 (white), J68, and J69 at the termination points located on the power board (see Figure 107 on page 202).
10. Install the bottom IP20 protection cover. Using a phillips screw driver, install and tighten the three screws which hold the bottom IP20 protection cover in place (see Figure 104 on page 197).
11. Install the J1 terminal block (see Figure 104 on page 197).
12. Install the gate driver board as described in the procedure on page 200.

Removing the IGBT Module

There are three IGBT modules in this size of drive controller. This procedure explains how to remove the IGBT module in the following drive controllers:

Drive Controller No.	IGBT Module No.
ATV66D54N4	VZ3-IM2150M1201
ATV66D64N4	VZ3-IM2200M1201
ATV66D79N4	VZ3-IM2300M1201

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on power board connectors.
- Verify that all power has been removed from J1 connector.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Power board procedure tool list, page 202
- Gate driver procedure tool list, page 198
- Control basket procedure tool list, page 192

With the drive controller door removed:

1. Remove the power board as described in the procedure on page 201.
2. Remove the bus bar isolating screen.

   NOTE: In order to keep the proper spacing for the components, keep all washers with their respective mounting pins or screws. Washers are used to level the power board.

3. Using a drive socket, loosen and remove the nine mounting pins and washers on the bus bar (see Figure 108 on page 206). Pull the U, V, and W cables back out of the way.

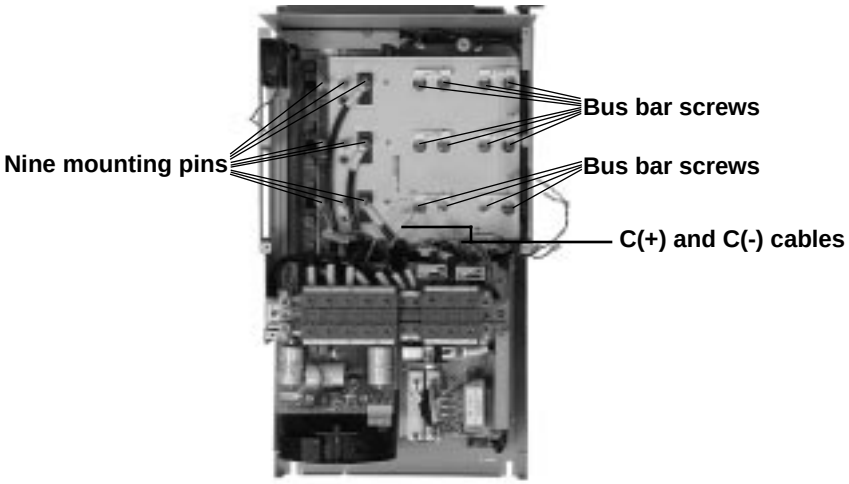


Figure 108: Bus Bar Screws

4. Using a phillips screw driver, loosen and remove the two screws which attach the bus bar to the braking IGBT module. Pull the cable marked BR3 back out of the way (see Figure 109 on page 206).
5. Using a hex key wrench, loosen and remove the 12 screws which hold the bus bar to the bus capacitors (see Figure 108 on page 206). The balancing resistors are mounted under these screws.
6. Using a hex key wrench, loosen and remove the two screws which hold the C(+) and C(-) cables to the bus bar. Pull the cables back out of the way (see Figure 108 on page 206).
7. Remove the bus bar.

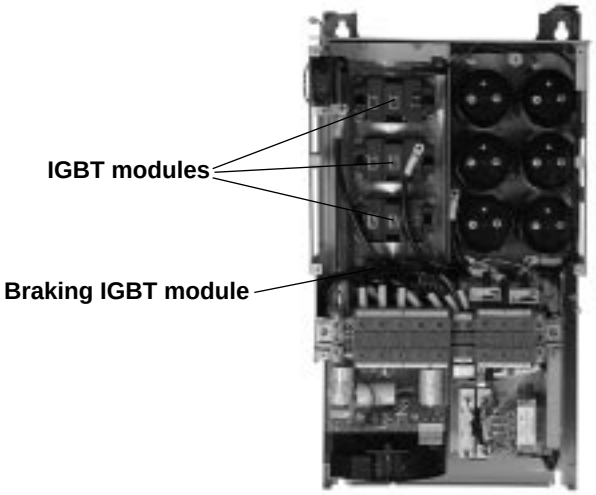


Figure 109: Drive Controller with Bus Bar Removed

8. Using a hex key wrench, loosen and remove the four screws for the IGBT module to be removed (see Figure 109 on page 206).
9. Using a flat blade screw driver, gently pry loose and remove the IGBT module.

Installing the IGBT Module

There are three IGBT modules in this size of drive controller. This procedure explains how to remove the IGBT module from the following drive controllers:

Drive Controller No.	IGBT Module No.
ATV66D54N4	VZ3-IM2150M1201
ATV66D64N4	VZ3-IM2200M1201
ATV66D79N4	VZ3-IM2300M1201

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

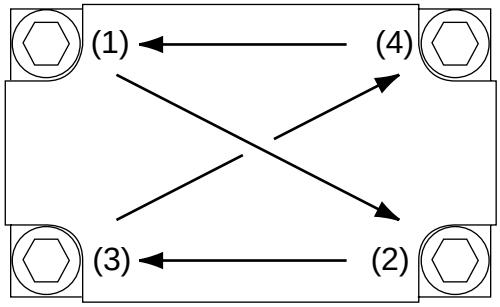
The tools needed for this procedure are:

- Torque wrench, 26.5 lb-in (3 N • m)
- Thermal grease (Thermalloy Thermalcote™ II, Part No. 349 or equivalent)
- Power board procedure tool list, page 203
- Gate driver procedure tool list, page 200
- Control basket procedure tool list, page 193

For the IGBT module to be installed:

1. Clean the portion of the heatsink which will make contact with the new IGBT module.
2. Evenly coat the bottom of the new IGBT module with a thin coating of thermal grease.
3. Install the new IGBT module. Using a torque wrench and hex key socket, install and tighten the four mounting screws to 26.5 lb-in (3 N • m).

   Torque screws in the sequence shown.



4. Position the bus bar and align the mounting holes.
5. Position the C(+) cable over the bus bar (+) terminal and the C(-) cable over the (-) bus bar terminal (see Figure 108 on page 206). Using a torque wrench with hex key attachment, install and tighten the two screws which hold the C(+) and C(-) cables to the bus bar to 17.7 lb-in (2 N • m).

NOTE: To ensure that the power board is mounted level, make sure that each mounting pin has two washers mounted under it and that the red end of the pins are facing up. Also, the three pins with the stripe(s) are to be used for connecting the U, V, and W cables to the IGBT modules.

6. Position the U cable over the mounting hole in the top IGBT. Position the V cable over the mounting hole in the middle IGBT and the W cable over the mounting hole on the bottom IGBT.
7. Using a torque wrench with hex key attachment, install the 12 hex head screws with the balancing resistors which connect the bus bar to the bus capacitors. Tighten to 17.7 lb-in (2 N • m). Using a torque wrench with drive socket attachment, install the nine mounting pins and washers which connect the bus bar or cables to the IGBT modules. Tighten to 26.5 lb-in (3 N • m).
8. Position the cable marked BR3 over the C1 terminal of the braking IGBT module. Using a torque wrench and phillips head attachment, install and tighten the two braking IGBT screws to 17.7 lb-in (2 N • m).
9. Replace the bus bar isolating screen.
10. Remove static protective foam from IGBT module control terminals.
11. Install the power board as described in the procedure on page 203.

Removing the Braking IGBT Module

This procedure explains how to remove the braking IGBT module from the following drive controllers:

Drive Controller No.	Braking IGBT Module No.
ATV66D54N4	VZ3-IM2100M1201
ATV66D64N4	VZ3-IM2150M1201
ATV66D79N4	VZ3-IM2150M1201

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on power board connectors.
- Verify that all power has been removed from J1 connector.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Power board procedure tool list, page 202
- Gate driver procedure tool list, page 198
- Control basket procedure tool list, page 192

With the drive controller door removed:

1. Remove the power board as described in the procedure on page 201.
2. Remove the bus bar isolating screen.

   NOTE: In order to keep the proper spacing for the components, keep all washers with their respective mounting pins or screws. Washers are used to level the power board.
3. Using a metric socket, loosen and remove the nine mounting pins on the bus bar (see Figure 108 on page 206). Pull the U, V, and W cables back out of the way.
4. Using a phillips screw driver, loosen and remove the three screws which attach the bus bar and two cables to the braking IGBT module (see Figure 109 on page 206). Pull the two cables marked BR1 and BR3 back out of the way.
5. Using a hex key wrench, loosen and remove the 12 screws which hold the bus bar to the bus capacitors (see Figure 108 on page 206). The balancing resistors are mounted under these screws.
6. Using a hex key wrench, loosen and remove the two screws which hold the C(+) and C(-) cables to the bus bar (see Figure 108 on page 206). Pull the cables back out of the way.
7. Remove the bus bar.
8. Using a hex key wrench, loosen and remove the four mounting screws for the braking IGBT module (see Figure 109 on page 206).
9. Using a flat blade screw driver, gently pry loose and remove the braking IGBT module.

Installing the Braking IGBT Module

This procedure explains how to install the braking IGBT module in the following drive controllers:

Drive Controller No.	Braking IGBT Module No.
ATV66D54N4	VZ3-IM2100M1201
ATV66D64N4	VZ3-IM2150M1201
ATV66D79N4	VZ3-IM2150M1201

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in "Static Sensitive Components" on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read "WORK PRACTICE PRECAUTIONS" on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

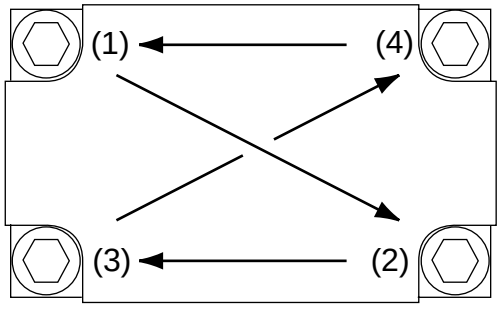
The tools needed for this procedure are:

- Torque wrench, set to 26.5 lb-in (3 N • m)
- Thermal grease (Thermalloy Thermalcote™ II, Part No. 349 or equivalent)
- Power board procedure tool list, page 203
- Gate driver procedure tool list, page 200
- Control basket procedure tool list, page 193

For the braking IGBT module to be installed:

1. Clean the portion of the heatsink which will make contact with the new braking IGBT module.
2. Evenly coat the bottom of the new braking IGBT module with a thin coating of thermal grease.
3. Install the new braking IGBT module. Using a torque wrench with a hex key socket, install and tighten the four mounting screws to 26.5 lb-in (3 N • m).

   Torque screws in the sequence shown.



4. Position the bus bar and align the mounting holes.
5. Position the C(+) cable over the bus bar (+) terminal and the C(-) cable over the (-) bus bar terminal (see Figure 108 on page 206). Using a torque wrench with hex key attachment, install and tighten the two screws which hold the C(+) and C(-) cables to the bus bar to 17.7 lb-in (2 N • m).

NOTE: To ensure that the power board is mounted level, make sure that each mounting pin has two washers mounted under it and that the red end of the pins are facing up. Also, the three pins with the stripe(s) are to be used for connecting the U, V, and W cables to the IGBT modules.

6. Position the U cable over the mounting hole in the top IGBT. Position the V cable over the mounting hole in the middle IGBT and the W cable over the mounting hole on the bottom IGBT.
7. Using a torque wrench with hex key attachment, install the 12 hex head screws with the balancing resistors which connect the bus bar to the bus capacitors. Tighten to 17.7 lb-in (2 N • m). Using a torque wrench with drive socket attachment, install the nine mounting pins and washers which connect the bus bar or cables to the IGBT modules. Tighten to 26.5 lb-in (3 N • m).
8. Position the cable marked BR1 over the C2E1 terminal of the braking IGBT module and the cable marked BR3 over the C1 terminal of the braking IGBT module. Using a torque wrench and phillips head attachment, install and tighten the three screws to 17.7 lb-in (2 N • m).
9. Replace the bus bar isolating screen.
10. Remove the static protective foam from the braking IGBT module control terminals.
11. Install the power board as described in the procedure on page 203.

Removing the Bus Capacitor Assembly

In the event that one capacitor goes bad, at least two other capacitors will be damaged. Therefore, all of the capacitors should be replaced. This procedure explains how to remove the bus capacitor assembly from the following drive controllers:

Drive Controller No.	Bus Capacitor Assembly No.
ATV66D54N4	VY1-ADC605
ATV66D64N4	VY1-ADC606
ATV66D79N4	VY1-ADC606

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on power board connectors.
- Verify that all power has been removed from J1 connector.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Power board procedure tool list, page 202
- Gate driver procedure tool list, page 198
- Control basket procedure tool list, page 192

With the drive controller door removed:

1. Remove the power board as described in the procedure on page 201.
2. Using a phillips or Torx® screw driver, loosen and remove the four screws which hold the right side panel. Remove the right side panel.
3. Remove the bus bar isolating screen.

   NOTE: In order to keep the proper spacing for the components, keep all washers with their respective mounting pins or screws. Washers are used to level the power board.
4. Using a drive socket, loosen and remove the nine mounting pins and washers on the bus bar (see Figure 108 on page 206). Pull the U, V, and W cables back out of the way.
5. Using a phillips screw driver, loosen and remove the two screws which attach the bus bar to the braking IGBT module. Pull the cable marked BR3 back out of the way (see Figure 109 on page 206).
6. Using a hex key wrench, loosen and remove the 12 screws which hold the bus bar to the bus capacitors (see Figure 108 on page 206). The balancing resistors are mounted under these screws.
7. Using a hex key wrench, loosen and remove the two screws which hold the C(+) and C(-) cables to the bus bar (see Figure 108 on page 206). Pull the cables back out of the way.
8. Remove the bus bar.

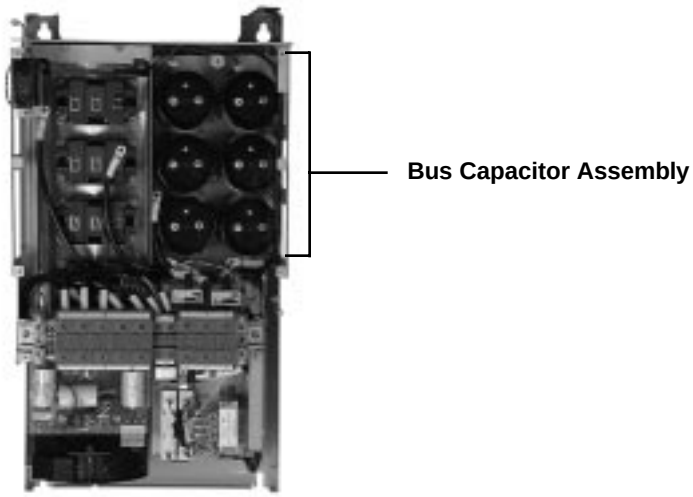


Figure 110: Bus Capacitor

9. Using a phillips screw driver, loosen and remove the two mounting screws on the left hand corners of the bus capacitor assembly (see Figure 110 on page 213).
10. Using a drive socket, loosen and remove the two mounting nuts on the right hand corners of the bus capacitor assembly (see Figure 110 on page 213).
11. Carefully pull the bus capacitor assembly up out of the drive chassis.

Installing the Bus Capacitor Assembly

In the event that one capacitor goes bad, at least two other capacitors will be damaged. Therefore, all of the capacitors should be replaced. This procedure explains how to remove the bus capacitor assembly from the following drive controllers:

Drive Controller No.	Bus Capacitor Assembly No.
ATV66D54N4	VY1-ADC605
ATV66D64N4	VY1-ADC606
ATV66D79N4	VY1-ADC606

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Torque wrench, set to 26.5 lb-in (3 N • m)
- Power board procedure tool list, page 203
- Gate driver procedure tool list, page 200
- Control basket procedure tool list, page 193

For the capacitor assembly to be installed:

1. Carefully install the new bus capacitor assembly into the drive chassis, aligning the bracket holes on the two right hand corners with the mounting posts in the drive and fitting the lip on the left side of the assembly into the channel on the heat sink assembly.
2. Using a torque wrench and the appropriate socket, install the two nuts in the right hand corners of the bus capacitor assembly. Tighten to 17.7 lb-in (2 N • m).
3. Using a torque wrench with a phillips screw driver socket, install the two screws in the left hand corners of the bus capacitor assembly. Tighten to 17.7 lb-in (2 N • m).
4. Position the bus bar and align the mounting holes. Make sure wire leads from the capacitor assembly fan are free to be connected to the power board.
5. Position the C(+) cable over the bus bar (+) terminal and the C(-) cable over the (-) bus bar terminal (see Figure 108 on page 206). Using a torque wrench and hex key socket, install and tighten the two screws which hold the C(+) and C(-) cables to the bus bar to 17.7 lb-in (2 N • m).

   NOTE: To ensure that the power board is mounted level, make sure that each mounting pin has two washers mounted under it and that the red end of the pins are facing up. Also, the three pins with the stripe(s) are to be used for connecting the U, V, and W cables to the IGBT modules.
6. Position the U cable over the mounting hole in the top IGBT. Position the V cable over the mounting hole in the middle IGBT and the W cable over the mounting hole on the bottom IGBT.
7. Using a torque wrench with hex key attachment, install the 12 hex head screws with the balancing resistors which connect the bus bar to the bus capacitors. Tighten to 17.7 lb-in (2 N • m). Using a torque wrench with drive socket attachment, install the nine mounting pins and washers which connect the bus bar or cables to the IGBT modules. Tighten to 26.5 lb-in (3 N • m).
8. Position the cable marked BR3 over the C1 terminal of the braking IGBT. Using a torque wrench with phillips head attachment, install and tighten the two braking IGBT screws to 17.7 lb-in (2 N • m).
9. Replace the bus bar isolating screen.
10. Install the right side panel. Using a phillips or Torx® screw driver, install and tighten the four screws which hold the right side panel in place.
11. Install the power board as described in the procedure on page 203.

Removing the Filter Board

This procedure explains how to remove the filter board from the following drive controllers:

Drive Controller No.	Filter Board No.
ATV66D54N4	VX4-A66105
ATV66D64N4	
ATV66D79N4	

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- STORED ENERGY

- If controller is damaged, voltage may be present on large tubular capacitors on filter board assembly (see Figure 111 on page 216).
- Always check for presence of voltage between terminals L1, L2 and L3 on J2 terminal block (see Figure 111 on page 216) using voltmeter set to 1000 VDC scale.
- If voltage is present, allow voltmeter to discharge capacitor stored charge. Refer to “PROCEDURE 2: DISCHARGING STORED ENERGY IN CAPACITORS” in chapter 5 for further information.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on power board connectors.
- Verify that all power has been removed from J1 connector.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Metric hex key set, 2 to 14 mm
- 1/4” drive metric socket set, 5.5 to 14 mm
- Gate driver board procedure tool list, page 198
- Control basket procedure tool list, page 192

With the drive controller door removed:

1. Remove the gate driver board as described in the procedure on page 198.
2. Using a phillips or Torx® screw driver, loosen and remove the four screws which hold the right side panel. Remove the right side panel (see Figure 104 on page 197).
3. Remove the J1 terminal block (see Figure 104 on page 197).
4. Using a phillips screw driver, loosen and remove the three screws which hold the bottom IP20 protection cover in place (see Figure 104 on page 197). Remove the bottom IP20 protection cover.
5. Using a hex key wrench, loosen the terminal screws for L1, L2, L3, (+), (-), PA, PB, U/T1, V/T2, W/T3, and ground connection at both the field side and drive controller side of the J2 terminal block (see Figure 111 on page 216). Pull the cables and wires out of the way. Identify all field wiring for future re-assembly.
6. Using a flat blade screw driver, loosen the J2 terminal block screws for CL1, CL2, L21, and L22 at both the field side and drive controller side of the terminal block. The CL1, CL2 jumpers (if present) may be left in place. Pull the cables and wires out of the way. Identify all field wiring for future re-assembly.
7. Using a hex key wrench, loosen and remove the two screws holding the terminal block mounting channel. Remove the terminal block assembly.

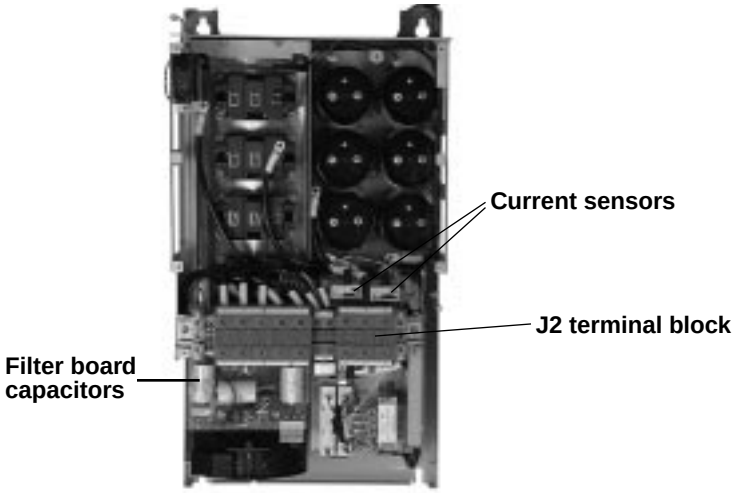


Figure 111: J2 Terminal Block

8. Using a flat blade screw driver, carefully disconnect the J42A and J42B connector on the power board (see Figure 107 on page 202).

9. Using needle nose pliers, carefully disconnect J38 (blue), J39 (white), J40 (red), J53_1 (blue) and J53_2 (white) on the power board which are soldered on the filter board (see Figure 107 on page 202).
10. Using a drive socket, loosen and remove the five nuts holding the filter board to the diode bridge bus work.
11. Using a hex key wrench, loosen and remove the two mounting screws on the filter board.
12. Carefully remove the filter board.
13. If the filter board is to be replaced, remove the yellow / green ground wire (J41 connector) and save the wire for installation on the new filter board.

Installing the Filter Board

This procedure explains how to install the filter board in the following drive controllers:

Drive Controller No.	Filter Board No.
ATV66D54N4	VX4-A66105
ATV66D64N4	
ATV66D79N4	

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Metric hex key set, 2 to 14 mm
- Torque wrench, set to 170 lb-in (19 N • m)
- Metric drive sockets for torque wrench
- Metric hex key sockets for torque wrench, 2 to 14 mm
- Flat blade screw driver sockets for torque wrench
- Gate driver procedure tool list, page 200
- Control basket procedure tool list, page 193

For the filter board to be installed:

1. If installing a new filter board, connect the J41 connector from the yellow / green ground wire to the new board.
2. Install the filter board in the drive controller and align the seven mounting holes.
3. Using a torque wrench and drive socket, install and tighten the five nuts to 17.7 lb-in (2 N • m).
4. Using a torque wrench and hex key socket, install and tighten the two mounting screws to 7.7 lb-in (1 N • m).

5. Using needle nose pliers, carefully connect J38 (blue), J39 (white), J40 (red), J53_1 (blue) and J53_2 (white) on the power board (see Figure 107 on page 202). Route the wires as necessary.
6. Connect the J42A and J42 B connector on the power board.
7. Install the J2 terminal block assembly (see Figure 111 on page 216). Using a hex key wrench, install and tighten the two screws holding the terminal block assembly in place.
8. Install the cables and wires for L1, L2, L3, (+), (-), PA, PB, U / T1, V / T2, W / T3, CL1, CL2, L21, L22 and the ground connection at both the field side and drive controller side of the J2 terminal block. Ensure the U / T1 and W / T3 cables are routed through their respective current sensors located in front of the J2 terminal block (see Figure 111 on page 216). Using a torque wrench and appropriate attachment, tighten the terminal screws as shown in Figure 112 on page 218.

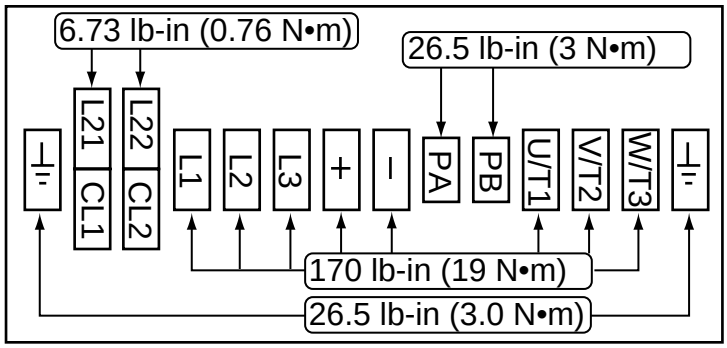


Figure 112: J2 Terminal Block Torque Specs

9. Install the bottom IP20 protection cover. Using a phillips screw driver, install and tighten the three screws which hold the bottom IP20 protection cover in place.
10. Install the J1 terminal block (see Figure 104 on page 197).
11. Install the right side panel. Using a phillips or Torx® screw driver, install and tighten the 4 screws which hold the right side panel in place.
12. Install the gate driver board as described in the procedure on page 200.

Removing the Diode Block

There are three diode blocks on this size of drive controller. This procedure explains how to remove the diode block from the following drive controllers:

Drive Controller No.	Diode Block No.
ATV66D54N4	VZ3-DM2160M1606
ATV66D64N4	
ATV66D79N4	

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on power board connectors.
- Verify that all power has been removed from J1 connector.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Set of open end wrenches, 5.5 to 19 mm
- Filter board procedure tool list, page 216
- Gate driver procedure tool list, page 198
- Control basket procedure tool list, page 192

With the drive controller door removed:

1. Remove the filter board as described in the procedure on page 215.
2. Using an open end wrench, loosen and remove the mounting post, washers and incoming line cable for the diode block to be removed.

3. Using an open end wrench, loosen and remove the two lower mounting posts and washers on the center diode block which attaches the diode block to the bus work and the filter board.
4. Using a hex key wrench, loosen and remove the four screws which hold the diode bridge bus work to the outside diode block modules. Pull the (+)L2P and (-)L1P cables out of the way.
5. On the diode block to be removed, use a hex key wrench to loosen and remove the two diode block mounting screws.
6. Using a flat blade screw driver, gently pry loose and remove the diode block.

Installing the Diode Block

There are three diode blocks on this size of drive controller. This procedure explains how to install the diode block in the following drive controllers:

Drive Controller No.	Diode Block No.
ATV66D54N4	VZ3-DM2160M1606
ATV66D64N4	
ATV66D79N4	

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Torque wrench, set to 26.5 lb-in (3 N • m)
- Thermal grease (Thermalloy Thermalcote™ II, Part No. 349 or equivalent)
- Filter board procedure tool list, page 217
- Gate driver procedure tool list, page 200
- Control basket procedure tool list, page 193

For the diode block to be installed:

1. Clean the portion of the heatsink which will make contact with the diode block.
2. Evenly coat the bottom of the diode block with a thin coat of thermal grease.
3. Install the diode block. Using a torque wrench with a hex key socket, install and tighten the two mounting screws to 17.7 lb-in (2 N • m). Position the cables over their respective mounting location (see Figure 113 on page 221).

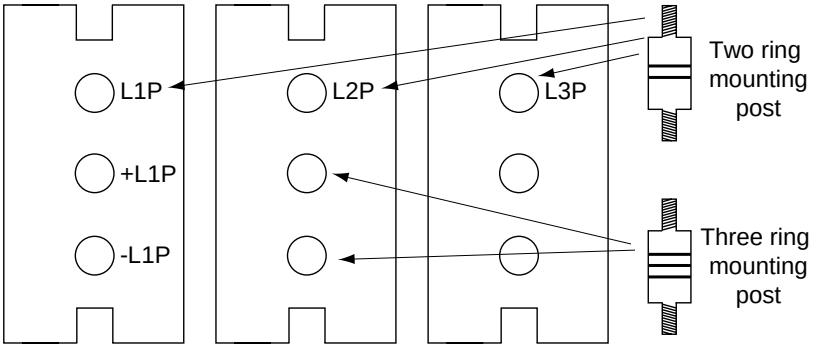


Figure 113: Diode Bridge Mounting

4. Using a torque wrench with a hex key socket, install and tighten the four screws and washers which hold the diode bridge bus work to the outside diode blocks. Tighten to 17.7 lb-in (2 N • m).
5. Using a torque wrench and drive socket, install and tighten the two mounting posts with three rings and washers (see Figure 113 on page 221) on the center diode block. Tighten to 26.5 lb-in (3 N • m).
6. Using a torque wrench and drive socket, install and tighten the mounting post with two rings, washers (see Figure 113 on page 221) and incoming line cable on the diode block that was replaced. Tighten to 26.5 lb-in (3 N • m).
7. Install the filter board as described in the procedure on page 217.

Replacing the Current Sensor

There are two current sensors in this size of drive controller. This procedure explains how to replace the current sensors for the following drive controllers:

Drive Controller No.	Current Sensor No.
ATV66D54N4	VY1-A66105
ATV66D64N4	
ATV66D79N4	

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on power board connectors.
- Verify that all power has been removed from J1 connector.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

> **⚠ CAUTION**
>
> **STATIC SENSITIVE COMPONENTS**
>
> Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.
>
> **Failure to follow this instruction can result in equipment damage.**

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of Torx® screw drivers
- Metric hex key set, 2 to 14 mm
- Torque wrench, set to 170 lb-in (19 N • m)
- Metric hex key sockets for torque wrench, 2 to 14 mm
- 4” Needle nose pliers
- Control basket procedure tool list, page 193

With the drive controller door removed:

1. Remove the control basket as described in the procedure on page 191.
2. Using a phillips or Torx® screw driver, loosen and remove the four screws which hold the left side panel. Remove the left side panel (see Figure 104 on page 197).
3. Using a phillips screw driver, loosen and remove the four screws which hold the top IP20 protection cover in place. Remove the top IP20 protection cover (see Figure 104 on page 197).
4. Using a phillips or Torx® screw driver, loosen and remove the four screws which hold the right side panel. Remove the right side panel (see Figure 104 on page 197).
5. Using a hex key wrench, loosen the terminal screw on the J2 terminal block for the ground wires from the U / T1, V / T2, and W / T3 cables (see Figure 111 on page 216). Pull the ground wires out of the way.
6. Using a hex key wrench, loosen the terminal screw for V / T2 at the drive controller side of the J2 terminal block. Pull the cable out of the way. This allows for access to the mounting screws to the current sensors.
7. Using a hex key wrench, loosen the terminal screw for U / T1 or W / T3 at the drive controller side of the J2 terminal block. The terminal screw to be loosened will depend on which current sensor is to be replaced.
8. Pull the U / T1 or W / T3 cable back through the current sensor and out of the way (see Figure 111 on page 216).
9. Using needle nose pliers, carefully remove the connector at the bottom of the current sensor to be replaced.
10. Using a flat blade screw driver or hex key wrench, loosen and remove the two mounting screws for the current sensor to be replaced.
11. Remove the old current sensor.
12. Install the new current sensor with the orientation arrow pointing towards the J2 terminal block. Do not disturb the settings of the potentiometers on the current sensor. Using a flat blade screw driver or hex key wrench, install and tighten the two mounting screws.

13. Using needle nose pliers, carefully reattach the connector at the bottom of the sensor.
14. Pull the U / T1 or W / T3 cable back through the current sensor.
15. Insert the V / T2 cable and the cable from the previous step into the J2 terminal block and tighten the terminal screws using a torque wrench and hex key attachment. Tighten to 170 lb-in (19 N • m).
16. Insert the ground wires in the J2 terminal block and tighten the terminal screw using a torque wrench and a hex key attachment to 26.5 lb-in (3 N • m).
17. Install the right side panel. Using a phillips or Torx® screw driver, install and tighten the four screws which hold the right side panel in place (see Figure 104 on page 197).
18. Install the top IP20 protection cover. Route the five control basket cables through the hole in the protection cover. Using a phillips screw driver, install and tighten the four screws which hold the top IP20 protection cover in place (see Figure 104 on page 197).
19. Install the left side panel. Using a phillips or Torx® screw driver, install and tighten the four screws which hold the left side panel in place (see Figure 104 on page 197).
20. Install the control basket as described in the procedure on page 193.

Removing the Main Fan

This procedure explains how to remove the main fan from the following drive controllers:

Drive Controller No.	Main Fan No.
ATV66D54N4	VZ3-V665
ATV66D64N4	
ATV66D79N4	

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on power board connectors.
- Verify that all power has been removed from J1 connector.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- 4” Needle nose pliers
- A set of Torx® screw drivers
- Control basket procedure tool list, page 192

With the drive controller door removed:

1. Remove the control basket as described in the procedure on page 191.
2. Using a phillips or Torx® screw driver, loosen and remove the four screws which hold the left side panel. Remove the left side panel (see Figure 104 on page 197).
3. Remove the J1 terminal block (see Figure 104 on page 197).
4. Using a phillips screw driver, loosen and remove the three screws which hold the bottom IP20 protection cover in place (see Figure 104 on page 197). Remove the bottom IP20 protection cover.

   NOTE: If repairing the controller with field wiring in place, the wiring knockout panel can be detached from the bottom panel in the next step.
5. Using a phillips or Torx® screw driver, loosen and remove the remaining four screws which hold the bottom panel in place (see Figure 104 on page 197).
6. Remove the bottom panel.

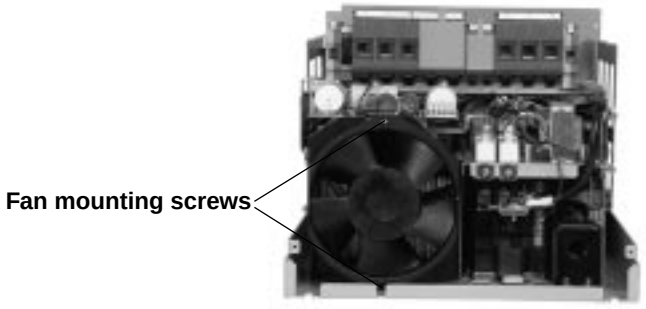


Figure 114: Fan Mounting

7. Using needle nose pliers, carefully disconnect the two connectors for the fan.
8. Using a Torx® screw driver, loosen and remove the two screws holding the fan to the fan shroud (see Figure 114 on page 224).
9. Remove the fan.

Installing the Main Fan

This procedure explains how to install the main fan in the following drive controllers:

Drive Controller No.	Main Fan No.
ATV66D54N4	VZ3-V665
ATV66D64N4	
ATV66D79N4	

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of Torx® screw drivers
- 4” Needle nose pliers
- Control basket procedure tool list, page 193

For the main fan to be installed:

1. Fit up the new fan and align the mounting holes with the holes on the fan shroud (see Figure 114 on page 224).
2. Using a Torx® screw driver, install and tighten the two mounting screws.
3. Using needle nose pliers, carefully connect the two fan leads. This is an AC fan. The two fan leads can be connected to either terminal.
4. Install the bottom panel. Using a phillips or Torx® screw driver, install and tighten the four screws which connect the right side panel to the bottom panel (see Figure 104 on page 197).
5. Install the bottom IP20 protection cover. Using a phillips screw driver, install and tighten the three screws for the bottom IP20 protection cover (see Figure 104 on page 197).
6. Install the J1 terminal block (see Figure 104 on page 197).
7. Install the left side panel. Using a phillips or Torx® screw driver, install and tighten the four screws which hold the left side panel in place (see Figure 104 on page 197).
8. Install the control basket as described in the procedure on page 193.

Replacing the Precharge Resistor

This procedure explains how to replace the precharge resistor for the following drive controllers:

Drive Controller No.	Precharge Resistor No.
ATV66D54N4	VZ3-R010W481
ATV66D64N4	
ATV66D79N4	

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on power board connectors.
- Verify that all power has been removed from J1 connector.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of open end wrenches, 5.5 to 19 mm
- A set of Torx® screw drivers
- Torque wrench, set to 17.7 lb-in (2 N • m)
- 1/4” drive metric socket set, 5.5 to 14 mm
- Metric hex key set, 2 to 14 mm
- Control basket procedure tool list, page 193

With the drive controller door removed:

1. Remove the control basket as described in the procedure on page 191.
2. Using a phillips or Torx® screw driver, loosen and remove the four screws which hold the left side panel. Remove the left side panel (see Figure 104 on page 197).

3. Using a phillips or Torx® screw driver, loosen and remove the four screws which hold the right side panel. Remove the right side panel (see Figure 104 on page 197).
4. Remove the J1 terminal block (see Figure 104 on page 197).
5. Using a phillips screw driver, loosen and remove the three screws which hold the bottom IP20 protection cover in place. Remove the bottom IP20 protection cover (see Figure 104 on page 197).

   NOTE: If repairing the controller with field wiring in place, the wiring knockout panel can be detached from the bottom panel in the next step.
6. Remove the bottom panel screws and remove the bottom panel.

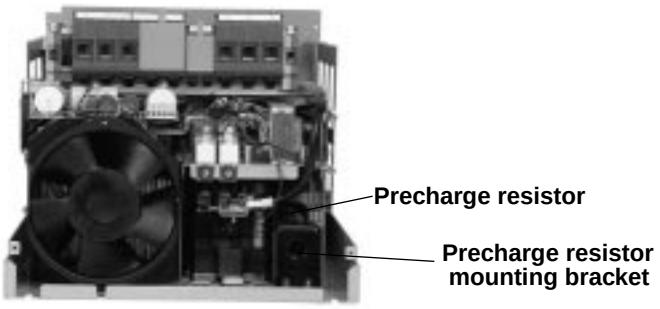


Figure 115: Precharge Resistor

7. Using a drive socket, loosen and remove the two nuts holding the bottom mounting bracket for the precharge resistor and remove the bottom bracket.
8. Slide the precharge resistor downwards to give better access to the terminals.
9. Using a hex key and open end wrench, carefully disconnect the wires connected to the terminals of the precharge resistor.
10. Remove the old precharge resistor.
11. Install the new precharge resistor.
12. Using a hex key and open end wrench, carefully connect the wires to the precharge resistor. Use a torque wrench and drive socket to tighten the terminal connections to 17.7 lb-in (2 N•m).
13. Fit up the precharge resistor to the top mounting bracket and install the bottom bracket. Using a drive socket, install and tighten the two nuts on the bottom mounting bracket.
14. Install the bottom panel (see Figure 104 on page 197).
15. Install the bottom IP20 protection cover. Using a phillips screw driver, install and tighten the three screws for the bottom IP20 protection cover (see Figure 104 on page 197).
16. Install the J1 terminal block (see Figure 104 on page 197).
17. Install the right side panel. Using a phillips or Torx® screw driver, install and tighten the four screws which hold the right side panel in place (see Figure 104 on page 197).
18. Install the left side panel. Using a phillips or Torx® screw driver, install and tighten the four screws which hold the left side panel in place (see Figure 104 on page 197).
19. Install the control basket as described in the procedure on page 193.

Replacing the Discharge Resistor

There are two discharge resistors in this size of drive controller. This procedure explains how to replace the discharge resistor for the following drive controllers:

Drive Controller No.	Main Fan No.
ATV66D54N4	VZ3-R5K0W040
ATV66D64N4	
ATV66D79N4	

NOTE: Kit #V23-R5KOW040 contains one resistor.

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow "PROCEDURE 1: BUS VOLTAGE MEASUREMENT" in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on power board connectors.
- Verify that all power has been removed from J1 connector.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in "Static Sensitive Components" on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read "WORK PRACTICE PRECAUTIONS" on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of Torx® screw drivers
- Torque wrench, set to 17.7 lb-in (2 N • m)
- 4" Needle nose pliers
- Control basket procedure tool list, page 193

With the drive controller door removed:

1. Remove the control basket as described in the procedure on page 191.
2. Using a phillips or Torx® screw driver, loosen and remove the four screws which hold the left side panel. Remove the left side panel (see Figure 104 on page 197).
3. Using a phillips or Torx® screw driver, loosen and remove the four screws which hold the right side panel. Remove the right side panel (see Figure 104 on page 197).
4. Remove the J1 terminal block (see Figure 104 on page 197).

5. Using a phillips screw driver, loosen and remove the three screws which hold the bottom IP20 protection cover in place. Remove the bottom IP20 protection cover (see Figure 104 on page 197).

   NOTE: If repairing the controller with field wiring in place, the wiring knockout panel can be detached from the bottom panel in the next step.
6. Remove the bottom panel screws and remove the bottom panel (see Figure 104 on page 197).
7. Using needle nose pliers, carefully disconnect the wires to the discharge resistor to be replaced (see Figure 116 on page 229).
8. Using a phillips screw driver, loosen and remove the mounting screw for the discharge resistor (see Figure 116 on page 229).
9. Remove the old discharge resistor.
10. Install the new discharge resistor.
11. Using a torque wrench and phillips screw driver socket, install and tighten the mounting screw to 17.7 lb-in (2 N • m).
12. Using needle nose pliers, carefully connect the wires to the discharge resistor.
13. Install the bottom panel (see Figure 104 on page 197).

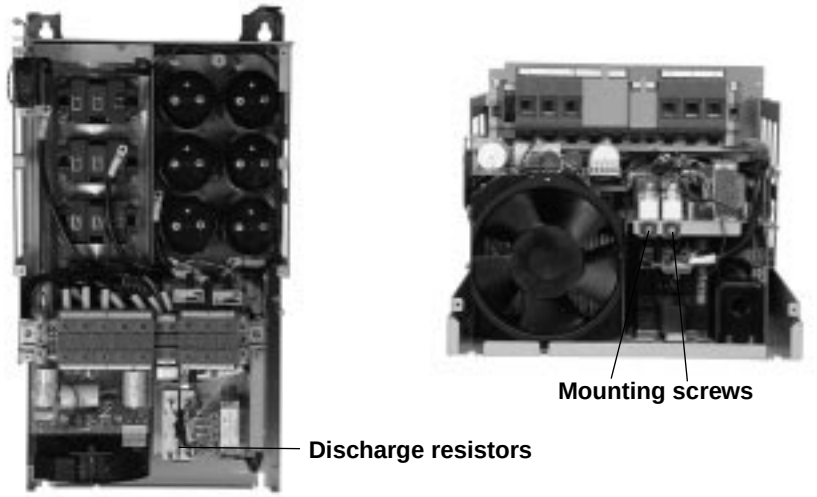


Figure 116: Discharge Resistor

14. Install the bottom IP20 protection cover. Using a phillips screw driver, install and tighten the three screws for the bottom IP20 protection cover (see Figure 104 on page 197).
15. Install the J1 terminal block (see Figure 104 on page 197).
16. Install the right side panel. Using a phillips or Torx® screw driver, install and tighten the four screws which hold the right side panel in place (see Figure 104 on page 197).
17. Install the left side panel. Using a phillips or Torx® screw driver, install and tighten the four screws which hold the left side panel in place (see Figure 104 on page 197).
18. Install the control basket as described in the procedure on page 193.

Replacing the Auto Transformer

This procedure explains how to replace the auto transformer for the following drive controllers:

Drive Controller No.	Main Fan No.
ATV66D54N4	VY1-ADA604
ATV66D64N4	
ATV66D79N4	

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on power board connectors.
- Verify that all power has been removed from J1 connector.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of Torx® screw drivers
- 4” Needle nose pliers
- Control basket procedure tool list, page 193

With the drive controller door removed:

1. Remove the control basket as described in the procedure on page 191.
2. Using a phillips or Torx® screw driver, loosen and remove the four screws which hold the right side panel. Remove the right side panel (see Figure 104 on page 197).
3. Remove the J1 terminal block (see Figure 104 on page 197).

4. Using a phillips screw driver, loosen and remove the three screws which hold the bottom IP20 protection cover in place (see Figure 104 on page 197). Remove the bottom IP20 protection cover.

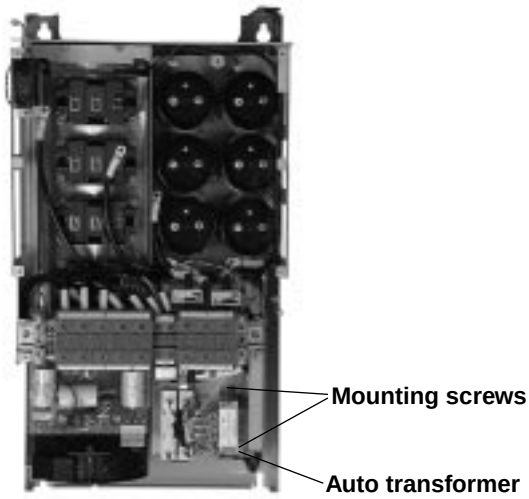


Figure 117: Auto Transformer

5. Using needle nose pliers, carefully disconnect the four wires connected to the terminals of the auto transformer (see Table 14 on page 231).

Table 14: Auto Transformer Connections

Auto Transformer Connection	Wire Color
1	Black
3	Red
5	White
7	Blue

6. Using a phillips screw driver, loosen the two screws holding the auto transformer in place (see Figure 117 on page 231).
7. Remove the old auto transformer.
8. Install the new auto transformer. Using a phillips screw driver, install and tighten the two screws.
9. Using needle nose pliers, carefully connect the four wires to the auto transformer (see Table 14 on page 231).
10. Install the bottom IP20 protection cover. Using a phillips screw driver, install and tighten the three screws for the bottom IP20 protection cover (see Figure 104 on page 197).
11. Install the J1 terminal block (see Figure 104 on page 197).
12. Install the right side panel. Using a phillips or Torx® screw driver, install and tighten the four screws which hold the right side panel in place (see Figure 104 on page 197).
13. Install the control basket as described in the procedure on page 193.

ATV66C10N4 to C19N4

This section contains spare part information and change out procedures for the following drive controllers:

- ATV66C10N4
- ATV66C13N4
- ATV66C15N4
- ATV66C19N4

Table 15 lists the spare parts. Refer to the pages indicated in the table for spare part change out procedures. For location of spare parts, see Figure 118 on page 234 and Figure 119 on page 235.

Table 15: Spare Parts for Drive Controllers ATV66C10N4 to C19N4

Description	For Drive Controllers:	Catalog Number	For Change Out Procedure See:
Control Kit	ATV66C10N4 to C19N4	VX4-A66CK2	Pages 236-241
Control Terminal Blocks Kit	ATV66C10N4 to C19N4	VZ3-N006	Pages 241-242
Power Board	ATV66C10N4	VX5-A66C10N4	Pages 243-246
	ATV66C13N4	VX5-A66C13N4	
	ATV66C15N4	VX5-A66C15N4	
	ATV66C19N4	VX5-A66C19N4	
Power Pole Kit	ATV66C10N4	VZ3-IM1300M1206	Pages 247-255
	ATV66C13N4, C15N4	VZ3-IM1400M1206	
	ATV66C19N4	VZ3-IM1500M1206	
Diode Bridge Kit	ATV66C10N4, C13N4	VZ3-DM2170M1601	Pages 257-260
	ATV66C15N4	VZ3-DM2260M1601	
	ATV66C19N4	VZ3-DM2350M1601	
Current Sensor Assembly	ATV66C10N4, C13N4	VY1-A66106	Pages 261-263
	ATV66C15N4, C19N4	VY1-A66107	
Dynamic Braking Module Kit	ATV66C10N4 to C19N4	VZ3-IM1300M1207	Pages 264-277
Thermal Switch Kit	ATV66C10N4 to C19N4	VZ3-G003	Pages 277-280
Filter Board Assembly	ATV66C10N4 to C19N4	VX4-A66106	Pages 280-282
Capacitor Assembly	ATV66C10N4 to C19N4	VY1-ADC607	Pages 282-287
Control Power Transformer	ATV66C10N4 to C19N4	VY1-ADA606	Pages 287-290
Stirring Fan	ATV66C10N4 to C19N4	VZ3-V667	Pages 291-292
Fan and Capacitor (main cooling fan)	ATV66C10N4 to C19N4	VZ3-V666	Pages 292-294
Discharge Resistor	ATV66C10N4 to C19N4	VZ3-R640W135	Pages 295-296
Precharge Resistor	ATV66C10N4 to C19N4	VZ3-R010W270	Pages 296-298
Contactor Aux Contact Block	ATV66C10N4 to C19N4	LA1DN04	Pages 298-299
Precharge Contactor	ATV66C10N4, C13N4	VY1-A661C1010	Pages 301-305
	ATV66C15N4, C19N4	VY1-A661C1510	
Circuit Protector Kit	ATV66C10N4 to C19N4	GV2M10	Page 305
Control Fuses	ATV66C10N4 to C19N4	DF3CF00501	Page 306
DC Bus Fuse	ATV66C10N4, C13N4	VY1-ADF400V700	Pages 306-307
	ATV66C15N4, C19N4	VY1-ADF450V700	

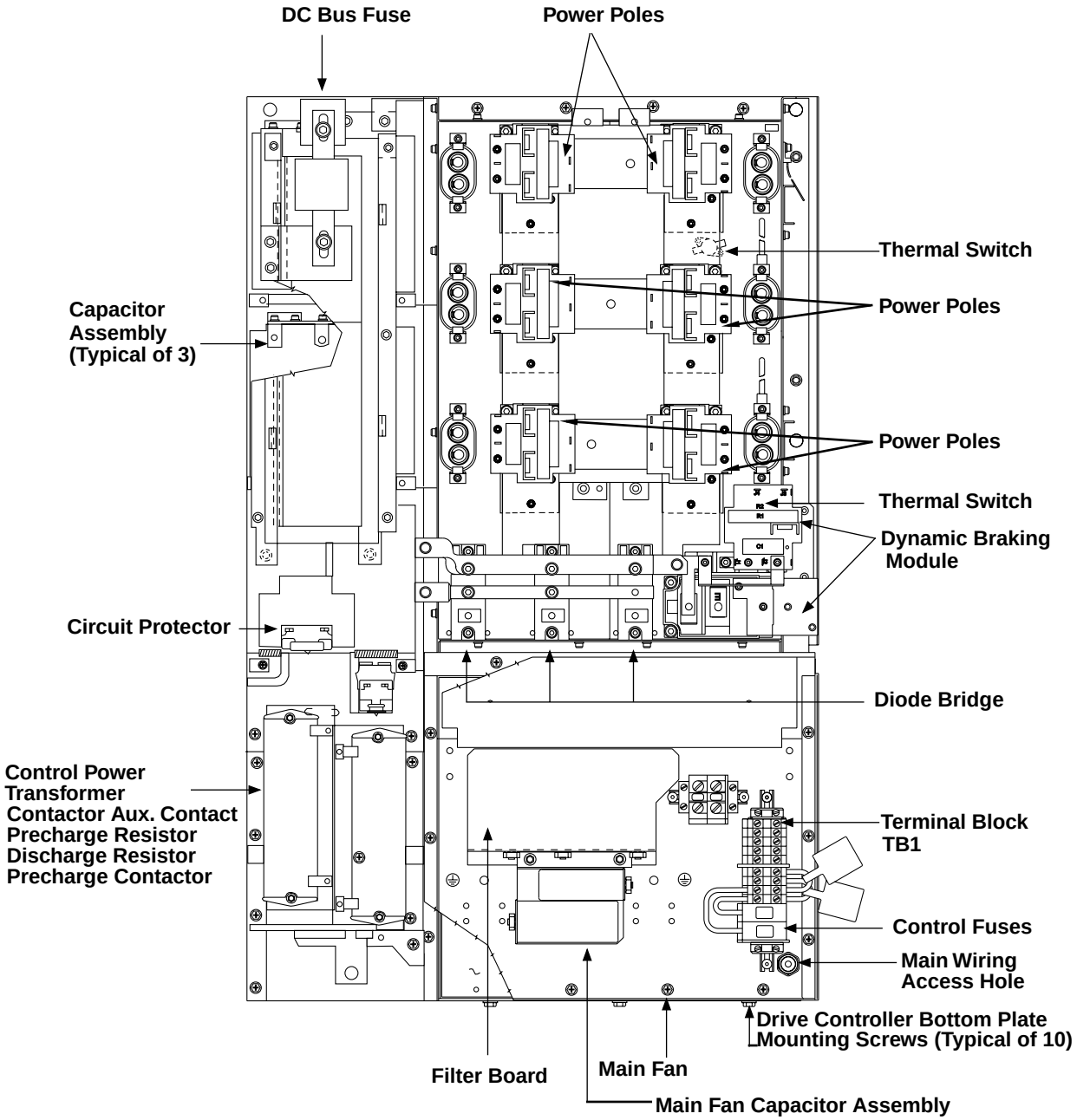


Figure 118: Spare Parts Location Diagram—Front View

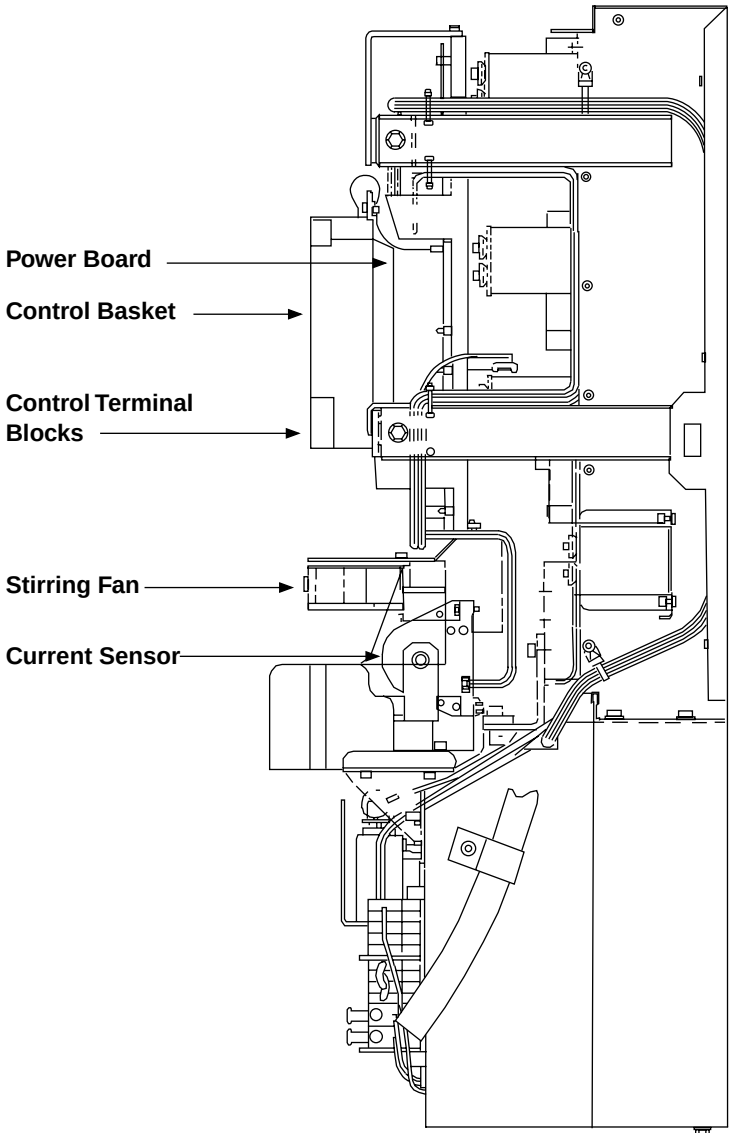


Figure 119: Spare Parts Location Diagram—Side View

Replacing the Keypad Display

This procedure explains how to replace the keypad display for the following drive controllers:

Drive Controller No.	Control Kit No.
ATV66C10N4	VX4-A66CK2
ATV66C13N4	
ATV66C15N4	
ATV66C19N4	

NOTE: All ALTIVAR 66 drive controllers use the same model keypad display. However, the version of software present within the keypad display may be specific to the version of software present in the control basket. Mixing incompatible versions of keypad display and control basket software can result in non-recognition of the keypad display by the drive controller or garbled message displays. Therefore, keypad displays are not supplied as separate kitted items. Keypad displays are supplied with control kits. Keep keypads with their associated control basket. Do not mix keypads and control baskets.

The keypad display is normally mounted on the control basket of ATV66U41N4 through ATV66D79N4 controllers. For ATV66C10N4 through ATV66C19N4 controllers and Class 8839 Enclosed controllers, the keypad display is located in a door-mounted holder. If the door-mounted holder requires replacement or repair, refer to document VDOC06N904_ for the VW3A66100 and VW3A66101 Keypad Door Mounting Kits.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of magnetized flat blade screw drivers

At the outside of the drive controller door:

1. Using the flat blade screw driver, push in on the top of the keypad display tab and remove the keypad display.
2. Insert the new keypad. Ensure that the lip on the bottom of the keypad display is behind the tab on the keypad display holder.
3. Remove the RUN / STOP cover, if desired (see Figure 120 on page 236).

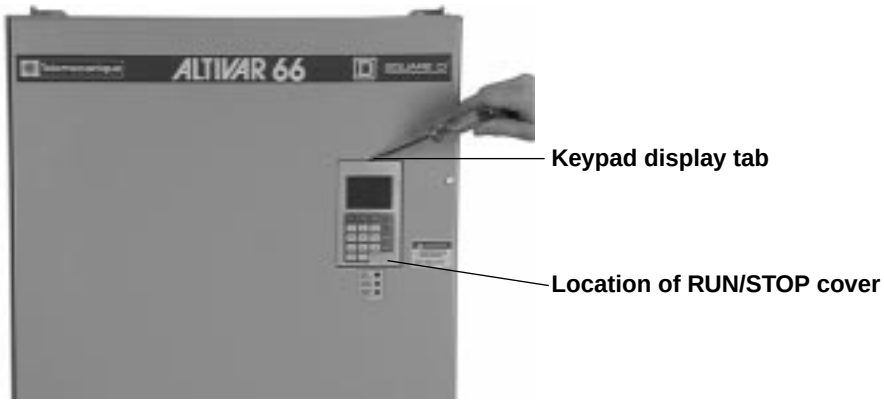


Figure 120: ATV66C10N4 to C19N4 Front View

Removing the Control Basket

This procedure describes how to remove the control basket from the following drive controllers:

Drive Controller No.	Control Kit No.
ATV66C10N4	VX4-A66CK2
ATV66C13N4	
ATV66C15N4	
ATV66C19N4	

Before removing power, note and record all the drive controller settings using the keypad display.

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on control basket, power board, and I/O Extension Module (if installed) connectors.
- Verify that all power has been removed from J1, J12, and J13 connectors.
- If I/O Extension Module is installed, verify that all power is removed from J22, J23, and J24 connectors.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of magnetized flat blade screw drivers
- A set of magnetized phillips screw drivers
- Metric hex key set, 2 to 14 mm
- Wire cutters

With the drive controller door open:

1. Measure the bus voltage (if not already performed) as described in chapter 5 of this manual.
2. If an I/O Extension Module is installed, remove the J22, J23, and J24 connectors then remove the module. See User’s Manual VDOC06T306_ for removal/installation instructions.
3. Using a flat blade screw driver, carefully loosen and disconnect the P9 and P18 connector plugs at the top left of the control basket (see Figure 121 on page 239). The P18 connector plug is landed at the J32 jack on the control basket and at the J18 jack on the power board.

   NOTE: On the power board, the jacks are designated with a “J”, whereas the corresponding connector plugs are designated with a “P”. For example, the P9 connector plug connects to the J9 jack on the power board and the J9 jack on the control basket.
4. Using a flat blade screw driver, carefully loosen and disconnect the J12 and J13 connectors located at the bottom of the control basket (see Figure 121 on page 239). Do not remove the field wiring from the connectors.
5. Using a flat blade screw driver, loosen the two screws and disconnect the connector for the cable to the remote keypad display (see Figure 123 on page 242). As needed, use wire cutters to remove any tie wraps.
6. Disconnect the connector for the cable to the remote LED status indicators (see Figure 123 on page 242). As needed, use wire cutters to remove any tie wraps.
7. Using two flat blade screw drivers, carefully pull out on each side of the cable clasp of J3, J4, and J5 to the release position (see Figure 122 on page 239). Pull the ribbon cables from the sockets.

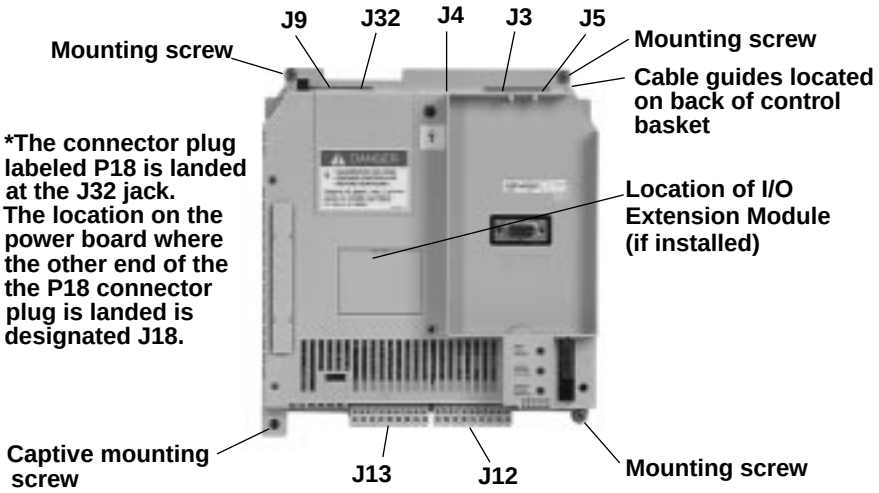


Figure 121: Control Basket Connector Locations

NOTE: Ensure that the ribbon cables have been released before pulling to avoid damage to the cables. There are two versions of the cable clasps - blue and white.

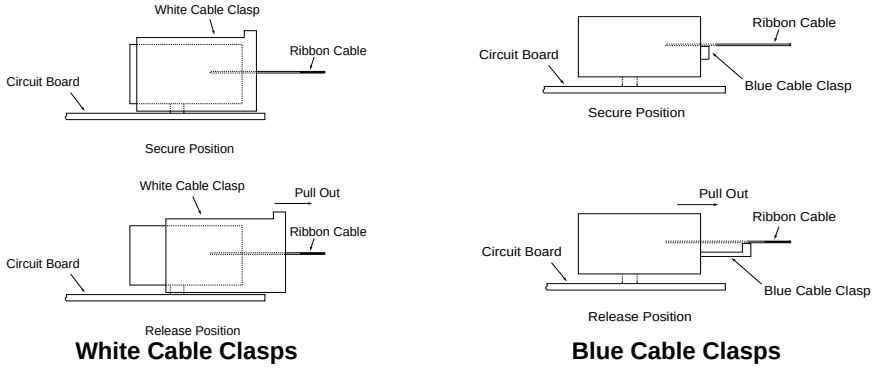


Figure 122: Cable Connector Secure and Release Positions

8. Using a phillips screw driver and hex key wrench, loosen the four corner screws on the control basket. Remove the control basket from the drive controller. As the control basket is removed, pull the three ribbon cables out of the guide on the back of the control basket.
9. Replace the old keypad per the procedure on page 236.

Installing the Control Basket

This procedure explains how to install the control basket in the following drive controllers:

Drive Controller No.	Control Kit No.
ATV66C10N4	VX4-A66CK2
ATV66C13N4	
ATV66C15N4	
ATV66C19N4	

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of magnetized flat blade screw drivers
- A set of magnetized phillips screw drivers
- Torque wrench, set to 8.9 lb-in (1.0 N • m)
- Metric hex key sockets for torque wrench, 5.5 to 14 mm
- A set of phillips screw driver sockets for torque wrench
- Plastic tie wraps
- Wire cutters

For the control basket to be installed:

1. Thread the three ribbon cables through the cable guides on the back of the control basket.
2. Place the control basket in the drive controller. Using a torque wrench and either phillips screw driver socket or a hex key attachment, tighten the one captive screw, and install and tighten the three other corner screws (see Figure 121 on page 239). Tighten the four corner screws to a torque of 8.9 lb-in (1.0 N • m).

   NOTE: The captive mounting screw provides the grounding connection for the control basket and shield connection on J13. Ensure that this screw is properly threaded and torqued to 8.9 lb-in (1.0 N • m).

   NOTE: On the power board, the jacks are designated with a “J”, whereas the corresponding connector plugs are designated with a “P”. For example, the P9 connector plug connects to the J9 jack on the power board and the J9 jack on the control basket.
3. Snap the two connector plugs P9 and P18 (connected at J32) into place.
4. Snap the two connectors J12 and J13 into place (see Figure 121 on page 239).

   NOTE: The yellow keys in both plugs and sockets are designed to prevent incorrect insertion of J12 and J13.

5. Ensure that all three cable clasps are pulled out on J3, J4, and J5 (see Figure 122 on page 239).
6. Carefully insert the three ribbon cables into the cable clasps at J3 (seven-wire cable), J4 (six-wire cable), and J5 (18 wire cable). Ensure that the silver leads of the cables are facing outwards from the controller and are seated firmly against the bottom of the jacks before engaging clasps.
7. Push the three ribbon cable clasps to their secure position.
8. Install the connector for the remote LED status indicators. Use tie wraps, as needed, to remove any slack from the cable (see Figure 119 on page 235).
9. Install the connector for the remote keypad display. Using a flat blade screw driver, tighten the two screws on the connector. Use tie wraps, as needed, to remove any slack from the cable (see Figure 119 on page 235).
10. Apply multi-lingual hazard labels supplied with kit to control basket, as required.
11. As required, install the I/O Extension Module. Install the J22, J23, and J24 connectors. See User's Manual VDOC06T306_ for removal/installation instructions.
12. Reprogram the user settings as previously noted during the control basket removal.

Replacing Control Terminal Blocks

This procedure explains how to replace the control terminal blocks (J1, J12, and J13) for the following drive controllers:

Drive Controller No.	Control Terminal Blocks No.
ATV66C10N4	VZ3-N006
ATV66C13N4	
ATV66C15N4	
ATV66C19N4	

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow "PROCEDURE 1: BUS VOLTAGE MEASUREMENT" in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on control basket, power board, and I/O Extension Module (if installed) connectors.
- Verify that all power has been removed from J1, J12, and J13 connectors.
- If I/O Extension Module is installed, verify that all power is removed from J22, J23, and J24 connectors.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

Read "WORK PRACTICE PRECAUTIONS" on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of magnetized flat blade screw drivers

With the drive controller door open:

1. Measure the bus voltage (if not already performed) as described in chapter 5 of this manual.
2. Remove options module, if present. See User's Manual VDOC06T306_ for removal / installation instructions.
3. Identify and tag all field wiring for future re-assembly.
4. Using a flat blade screw driver, loosen the terminal screws on the J1, J12, and J13 connectors (see Figure 123 on page 242). Pull the field wiring back out of the way.
5. Using a flat blade screw driver, gently pry the J1, J12, and J13 connectors away from the board side jacks. Discard the old connectors.
6. Insert the new connectors into their associated board side jacks.

   NOTE: The yellow keys in both plugs and sockets are designed to prevent incorrect insertion of J12 and J13.
7. Install the field wiring on the new connectors for J1, J12, and J13. Using a flat blade screw driver, tighten the terminal screws for the field wiring installed.
8. Reinstall options module, if previously present. See User's Manual VDOC06T306_ for removal / installation instructions.

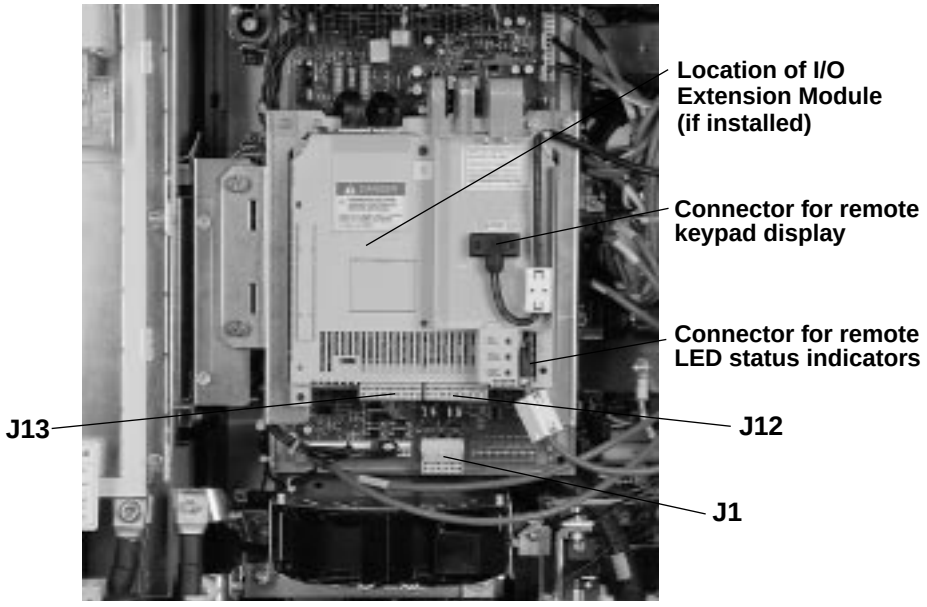


Figure 123: Location of J1, J12, and J13 Connectors

Removing the Power Board

This procedure explains how to remove the power board from the following drive controllers:

Drive Controller No.	Power Board No.
ATV66C10N4	VX5-A66C10N4
ATV66C13N4	VX5-A66C13N4
ATV66C15N4	VX5-A66C15N4
ATV66C19N4	VX5-A66C19N4

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- SEPARATE POWER

- Separate power may be present on power board connectors.
- Verify that all power has been removed from J1 connector.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- 4” Needle nose pliers
- Control basket procedure tool list, page 238

With the drive controller door open or removed:

1. Remove the control basket as described in the procedure on page 237. However, do not remove the keypad.
2. Using a flat blade screw driver, loosen the two screws holding the hinged assembly in place. Swing the hinged assembly out to the right.
3. Using a flat blade screw driver, remove the plastic rivet which attaches the plastic shield over the power board (see Figure 124 on page 244).

4. Using a hex key wrench, remove the three plastic shield mounting screws and remove the plastic shield (see Figure 124 on page 244).
5. Using needle nose pliers, carefully disconnect the connector plugs P1, P7, P8, and P15 at the bottom of the power board (see Figure 125 on page 245).

   NOTE: On the power board, the jacks are designated with a "J", whereas the corresponding connector plugs are designated with a "P". For example, the P9 connector plug connects to the J9 jack on the power board and the J9 jack on the control basket.

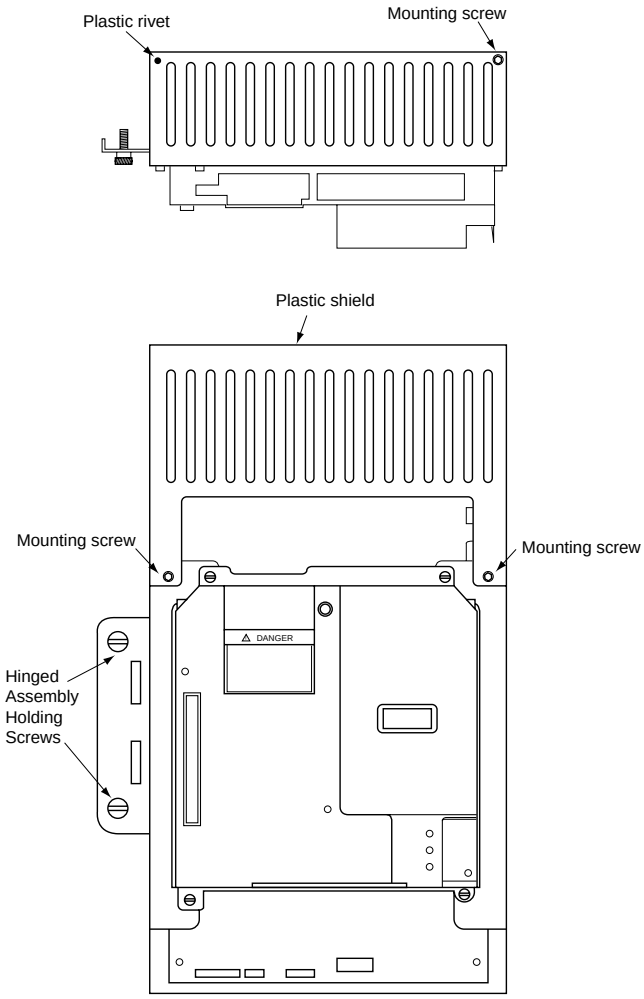


Figure 124: Front View of Hinged Assembly

6. Using needle nose pliers, carefully disconnect the connector plug P6 at the left side of the power board (see Figure 125 on page 245).
7. Using needle nose pliers, carefully disconnect the connector plugs P2 and P10 at the top of the power board (see Figure 125 on page 245).
8. Using needle nose pliers, carefully disconnect the connector plugs P11, P12, and P13 at the right side of the power board (see Figure 125 on page 245).
9. Using a hex key wrench, loosen and remove the ground screw at the top right corner of the power board (see Figure 125 on page 245).
10. If the power board is to be replaced, remove the cables attached at J3, J4, J5, J9, and J18 (see Figure 125 on page 245). Refer to Figure 122 on page 239 for removal of cable. These will be reused when the new power board is installed.

11. Unsnap the seven fixing pins and lift the power board out of the hinged assembly.

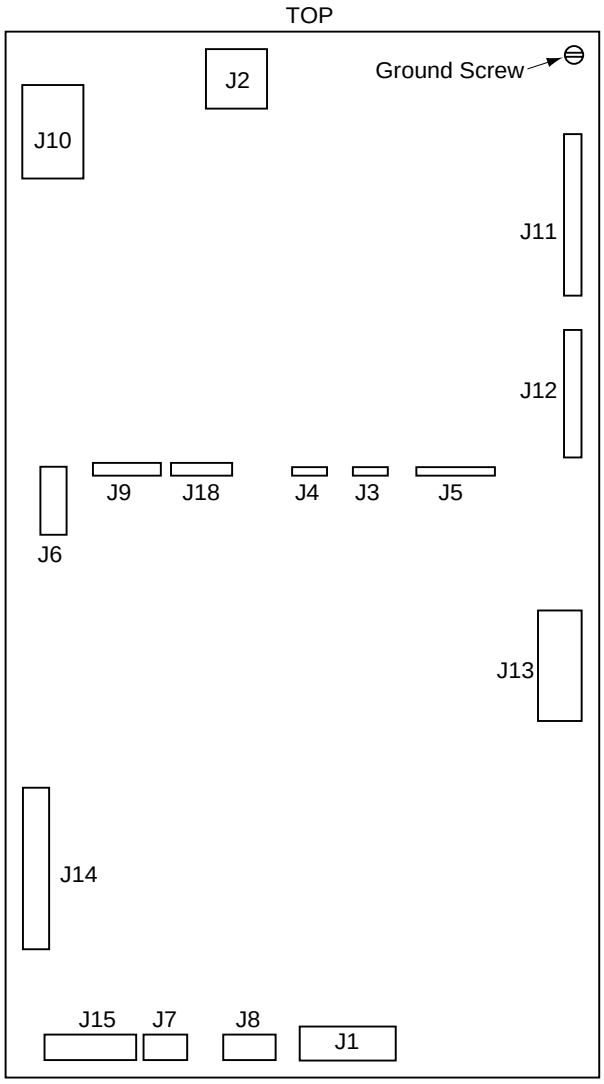


Figure 125: Power Board Connections

Installing the Power Board

This procedure explains how to install the power board in the following drive controllers:

Drive Controller No.	Power Board No.
ATV66C10N4	VX5-A66C10N4
ATV66C13N4	VX5-A66C13N4
ATV66C15N4	VX5-A66C15N4
ATV66C19N4	VX5-A66C19N4

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Torque wrench, set to 17.7 lb-in (2.0 N • m)
- Metric hex key set, 2 to 14 mm
- 4” Needle nose pliers
- Plastic tie wraps (8” length)
- Control basket procedure tool list, page 240

To install the power board:

1. If a new power board is being installed, install the cables removed from the old power board at the J3, J4, J5, J9, and J18 jacks on the new power board (see Figure 125 on page 245). Ensure that the silver leads of the cables are facing outwards from the controller and are seated firmly against the bottom of the cable jacks. Refer to Figure 122 on page 239 for cable installation.

   NOTE: J3 is a seven-wire cable, J4 is a six-wire cable, and J5 is an 18 wire cable.
2. Place the power board down into the hinged assembly and align the mounting holes with the seven fixing pins. Snap the board onto the fixing pins.
3. Using a torque wrench and a hex key attachment, tighten the ground screw at the top right corner of the power board to 17.7 lb-in (2.0 N • m).

   NOTE: On the power board, the jacks are designated with a “J”, whereas the corresponding connector plugs are designated with a “P”. For example, the P9 connector plug connects to the J9 jack on the power board and the J9 jack on the control basket.
4. Using needle nose pliers, install connector plugs P2, P10, and P11 at the top of the power board.
5. Using needle nose pliers, install connector plugs P1, P7, P8, and P15 at the bottom of the power board.
6. Using needle nose pliers, install connector plug P6 at the left side of the power board.

7. Using needle nose pliers, install connector plugs P12 and P13 at the right side of the power board.
8. Install the plastic mounting guard over the top half of the power board. Using a hex key wrench, install and tighten the three plastic guard mounting screws.
9. Install a plastic tie wrap in place of the plastic rivet that was previously removed. Snip the extra length from the tie wrap as close to the buckle as possible.
10. Swing the hinged assembly back to the left. Using a flat blade screw driver, tighten the two screws.
11. Install the control basket as described in the procedure on page 240.

Removing the Snubber Board

There are six snubber boards in the ATV66C10N4 to C19N4 drive controllers. The power pole kit contains snubber boards with four different part numbers. When replacing a snubber board, match the part number of the replacement board with the part number of the board to be replaced.

NOTE: Replace the snubber boards in horizontal pairs: SB1 and SB4, SB6 and SB3, SB5 and SB2 (see Figure 127 on page 249).

This procedure explains how to remove an individual snubber board from the following drive controllers:

Drive Controller No.	Power Pole Kit No.
ATV66C10N4	VZ3-IM1300M1206
ATV66C13N4	VZ3-IM1400M1206
ATV66C15N4	VZ3-IM1400M1206
ATV66C19N4	VZ3-IM1500M1206

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- STORED ENERGY

- If controller is damaged, voltage may be present on metal can capacitors and snubber board capacitors (see Figure 127 on page 249).
- Always check for presence of voltage using voltmeter set to 1000 VDC scale.
- If voltage is present, allow voltmeter to discharge capacitor stored charge. Refer to “PROCEDURE 2: DISCHARGING STORED ENERGY IN CAPACITORS” in chapter 5 for further information.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

> **⚠ CAUTION**
>
> **STATIC SENSITIVE COMPONENTS**
>
> Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.
>
> **Failure to follow this instruction can result in equipment damage.**

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of magnetized flat blade screw drivers
- Metric hex key set, 2 to 14 mm
- 4" Needle nose pliers

With the drive controller door open or removed:

1. Measure the bus voltage (if not already performed) as described in chapter 5 of this manual.
2. Using a flat blade screw driver, loosen the two screws holding the hinged assembly in place. Swing the hinged assembly out to the right (see Figure 124 on page 244). This allows access to the snubber boards.

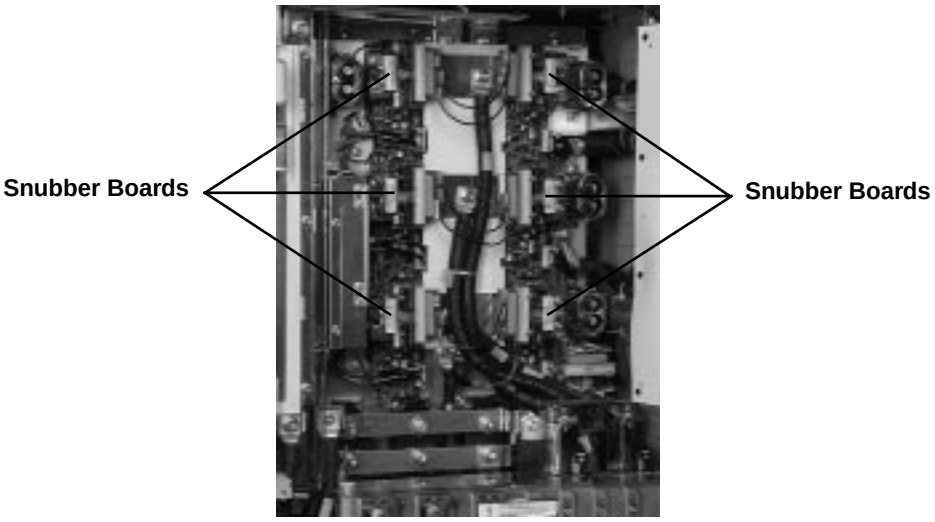


Figure 126: View of Snubber Boards

3. Using needle nose pliers, carefully disconnect the J1, J2, J3, and J4 connectors on the snubber board to be replaced (see Figure 127 on page 249).
4. Using a hex key wrench, loosen and remove the two mounting screws.
5. Remove the snubber board.

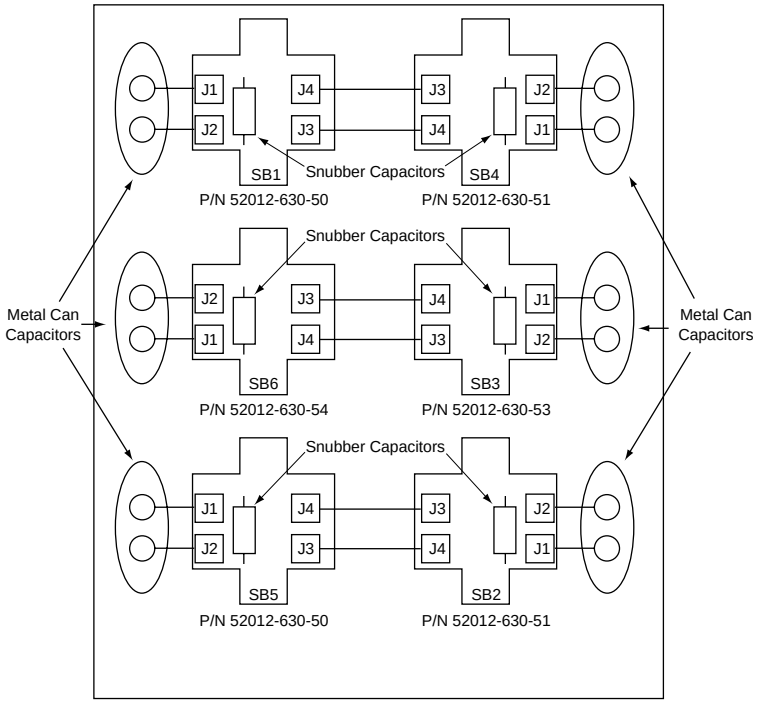


Figure 127: Snubber Board Connector and Capacitor Locations

Installing the Snubber Board

There are six snubber boards in the ATV66C10N4 to C19N4 drive controllers. The power pole kit contains snubber boards with four different part numbers. When replacing a snubber board, match the part number of the replacement board with the part number of the board to be replaced.

NOTE: Replace the snubber boards in horizontal pairs: SB1 and SB4, SB6 and SB3, SB5 and SB2 (see Figure 127 on page 249).

This procedure explains how to install an individual snubber board in the following drive controllers:

Drive Controller No.	Power Pole Kit No.
ATV66C10N4	VZ3-IM1300M1206
ATV66C13N4	VZ3-IM1400M1206
ATV66C15N4	VZ3-IM1400M1206
ATV66C19N4	VZ3-IM1500M1206

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of magnetized flat blade screw drivers
- Torque wrench, set to 17.7 lb-in (2 N • m)
- Metric hex key sockets for torque wrench, 2 to 14 mm
- 4” Needle nose pliers

To install a snubber board:

1. Align the mounting holes on the snubber board with the mounting posts in the drive controller.
2. Install the two mounting screws. Using the torque wrench with a hex key socket, tighten the two mounting screws to 17.7 lb-in (2 N • m).
3. Using needle nose pliers, carefully connect the J1, J2, J3, and J4 connectors on the snubber board (see Figure 127 on page 249).
4. Swing the hinged assembly back to its normal position. Using a flat blade screw driver, tighten the two screws.

Removing the Gate Driver Board

There are six gate driver boards in the ATV66C10N4 to C19N4 drive controllers. The power pole kit contains two gate driver boards.

NOTE: Replace the gate driver boards in horizontal pairs (see Figure 128 on page 252): GD1 and GD4, GD6 and GD3, GD5 and GD2.

This procedure explains how to remove an individual gate driver board from the following drive controllers:

Drive Controller No.	Power Pole Kit No.
ATV66C10N4	VZ3-IM1300M1206
ATV66C13N4	VZ3-IM1400M1206
ATV66C15N4	VZ3-IM1400M1206
ATV66C19N4	VZ3-IM1500M1206

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- STORED ENERGY

- If controller is damaged, voltage may be present on metal can capacitors and snubber board capacitors (see Figure 127 on page 249).
- Always check for presence of voltage using voltmeter set to 1000 VDC scale.
- If voltage is present, allow voltmeter to discharge capacitor stored charge. Refer to “PROCEDURE 2: DISCHARGING STORED ENERGY IN CAPACITORS” in chapter 5 for further information.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Snubber Board procedure tool list, page 248

With the drive controller door open or removed:

1. Remove the snubber board as described in the procedure on page 247.
2. Using needle nose pliers, carefully disconnect the P2 connector on the gate driver board (see Figure 128 on page 252).
3. Using a hex key wrench, loosen and remove the two mounting screws. At the associated IGBT module, use a hex key wrench to loosen and remove the top bus terminal screw and remove the gate driver wire landed underneath. This wire is landed on the gate driver board by one of the following:
   - — Soldered
   - — Connected by a zero force connector
   - — Connected by a detachable terminal connector
4. Remove the gate driver board and wire.

   NOTE: If the J1 wire landed on the gate driver board is connected with a detachable terminal connector or zero force connector, be sure to discard the wire and DO NOT reuse on new board.

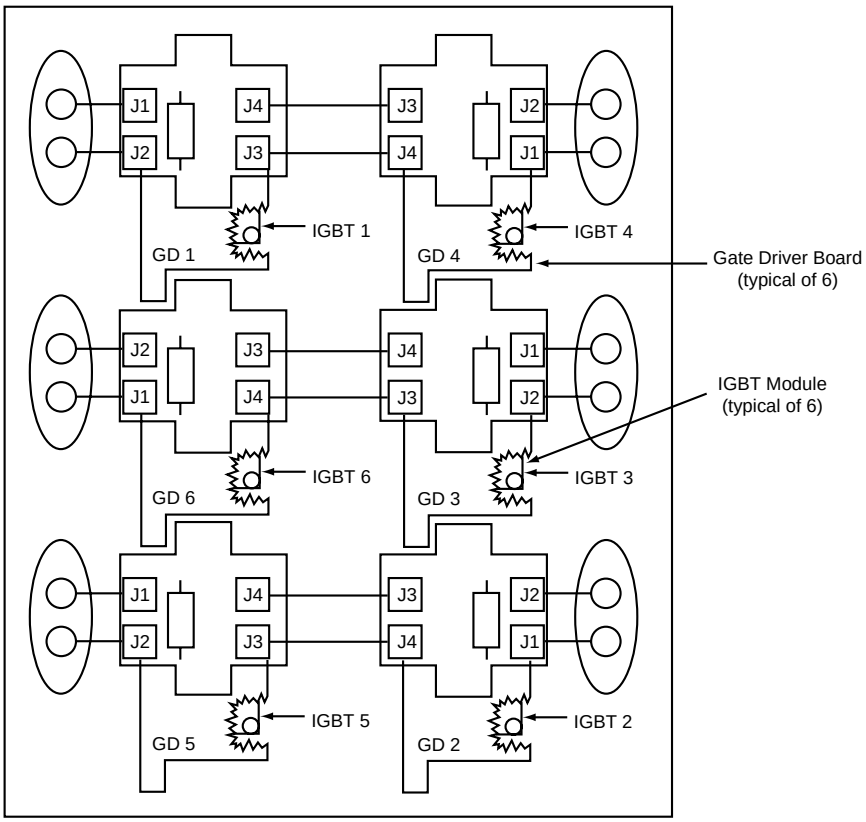


Figure 128: Gate Driver Board Locations

Installing the Gate Driver Board

There are six gate driver boards in the ATV66C10N4 to C19N4 drive controllers. The power pole kit contains two gate driver boards.

This procedure explains how to install an individual gate driver board in the following drive controllers:

Drive Controller No.	Power Pole Kit No.
ATV66C10N4	VZ3-IM1300M1206
ATV66C13N4	VZ3-IM1400M1206
ATV66C15N4	VZ3-IM1400M1206
ATV66C19N4	VZ3-IM1500M1206

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read "WORK PRACTICE PRECAUTIONS" on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Torque wrench, set to 26.5 lb-in (3 N • m)
- Snubber board procedure tool list, page 250

To install a gate driver board:

1. At the associated IGBT module, land the wire from terminal J1 on the gate driver board underneath the top bus terminal screw. Ensure that the non-insulated portion of this wire and the attached connector have a minimum of 3/8 " (9.5 mm) spacing from the lower bus bar.

   NOTE: Always use the J1 lead provided with the replacement gate driver board. DO NOT reuse the existing J1 Lead.
2. Using the torque wrench and a hex key socket, tighten the bus terminal screw to 26.5 lb-in (3 N • m).
3. Align the mounting holes on the gate driver board with the mounting posts in the controller (see Figure 128 on page 252).
4. Install the two mounting screws. Using the torque wrench with a hex key socket, tighten the two mounting screws to 17.7 lb-in (2 N • m).
5. Using needle nose pliers, carefully connect the P2 connector on the gate driver board.
6. Install the snubber board as described in the procedure on page 249.

Removing the IGBT Module

There are six IGBT modules in the ATV66C10N4 to C19N4 drive controllers. The power pole kit contains two IGBT modules.

NOTE: Replace the IGBT modules in horizontal pairs (see Figure 129 on page 255): IGBT 1 and IGBT 4, IGBT 6 and IGBT 3, IGBT 5 and IGBT 2.

This procedure explains how to remove an individual IGBT module from the following drive controllers:

Drive Controller No.	Power Pole Kit No.
ATV66C10N4	VZ3-IM1300M1206
ATV66C13N4	VZ3-IM1400M1206
ATV66C15N4	VZ3-IM1400M1206
ATV66C19N4	VZ3-IM1500M1206

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow "PROCEDURE 1: BUS VOLTAGE MEASUREMENT" in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- STORED ENERGY

- If controller is damaged, voltage may be present on metal can capacitors and snubber board capacitors (see Figure 127 on page 249).
- Always check for presence of voltage using voltmeter set to 1000 VDC scale.
- If voltage is present, allow voltmeter to discharge capacitor stored charge. Refer to “PROCEDURE 2: DISCHARGING STORED ENERGY IN CAPACITORS” in chapter 5 for further information.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Snubber board procedure tool list, page 248
- Gate driver procedure tool list, page 251

With the drive controller door open or removed:

1. Remove the gate driver boards as described in the procedure on page 250.

   NOTE: To remove IGBT 2,3,5, or 6, it is necessary to loosen gate driver board mounted above it. The gate driver board wiring may be left intact.
2. Using a hex key wrench, remove the mounting brackets for the metal can capacitors for the snubber board associated with IGBT being replace. Remove the metal can capacitor (see Figure 127 on page 249).
3. Using a hex key wrench, loosen and remove the remaining bus terminal screw (the other one was removed in the gate driver board removal procedure).
4. Using a hex key wrench, loosen and remove the four IGBT mounting screws.
5. Using a flat blade screw driver, gently pry loose the IGBT module from the heat sink.
6. Remove the IGBT module. Ensure that all of the old Thermstrate™ foil is removed from the heatsink.

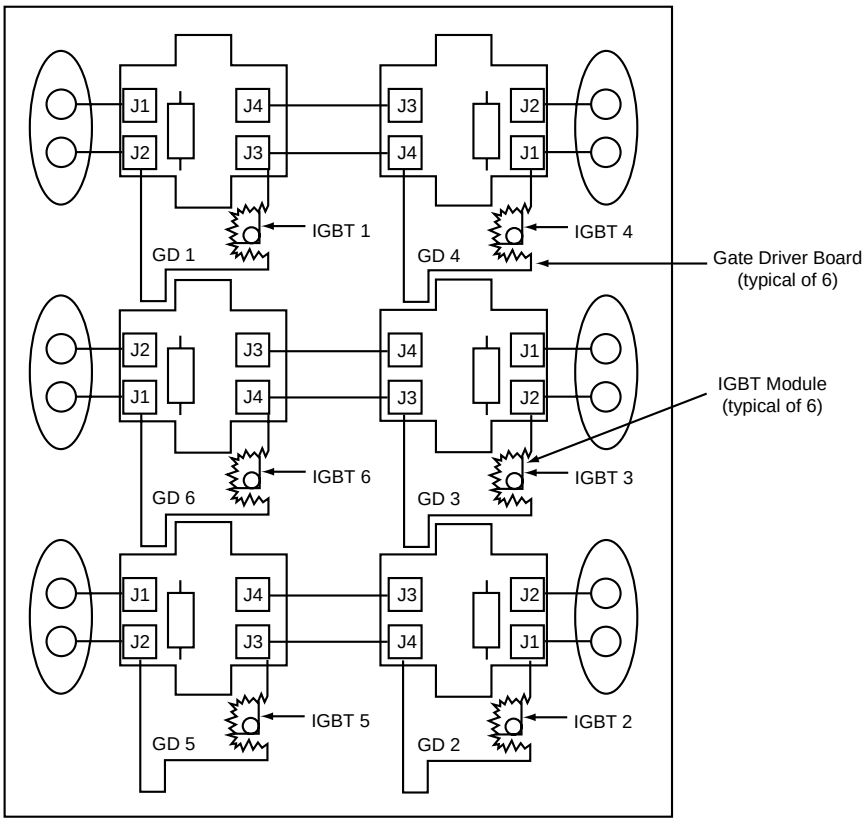


Figure 129: IGBT Module Locations

Installing the IGBT Module

There are six IGBT modules in the ATV66C10N4 to C19N4 drive controllers. The power pole kit contains two IGBT modules.

This procedure explains how to install an individual IGBT module in the following drive controllers:

Drive Controller No.	Power Pole Kit No.
ATV66C10N4	VZ3-IM1300M1206
ATV66C13N4	VZ3-IM1400M1206
ATV66C15N4	VZ3-IM1400M1206
ATV66C19N4	VZ3-IM1500M1206

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read "WORK PRACTICE PRECAUTIONS" on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

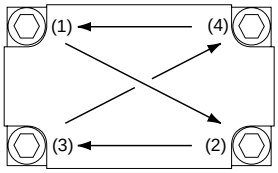
- Snubber board procedure tool list, page 250
- Gate driver procedure tool list, page 253

To install an IGBT module:

1. Install a new Thermstrate™ foil on the back of the new IGBT module. Remove the paper backing from the Thermstrate™ foil, but do not remove the white contact grease coating.

   NOTE: If the Thermstrate™ foil is damaged (i.e., wrinkled, coating gaps > 1/8" round), discard Thermstrate™ foil. Obtain new foil.

2. Place the new IGBT module behind the bus bar and align the mounting holes.
3. Install the four mounting screws, the wire from J1 on the gate driver board on the top bus terminal screw, and the two bus terminal screws.
4. Using the torque wrench with a hex key socket, initially tighten the four mounting screws, in the sequence shown below, to 6.0 -9.0 lb-in (0.7 - 1.0 N • m). Final torque is 26.5 lb-in (3 N • m).



5. Using the torque wrench with a hex key socket, tighten the two bus terminal screws to 26.5 lb-in (3 N • m). Ensure that the non-insulated portion of the J1 wire and the attached connector have a minimum of 3/8" (9.5 mm) spacing from the lower bus bar.

   NOTE: Always use the J1 lead provided with the replacement gate driver board. DO NOT reuse the existing J1 lead.

6. If the adjacent gate driver board was loosened in the IGBT module removal procedure (see note on page 254), tighten the mounting screws for the affected gate driver board (see procedure on page 252).
7. Using a torque wrench with a hex key socket, install the metal can capacitor that was removed in the IGBT removal procedure (see Figure 127 on page 249). Torque mounting screws to 12 lb-in (1.3 N • m).
8. Install the gate driver boards as described in the procedure on page 252.

Removing the Diode Block

There are three diode blocks in the ATV66C10N4 to C19N4 drive controllers. The diode bridge kit contains three diode blocks.

This procedure explains how to remove an individual diode block from the following drive controllers:

Drive Controller No.	Diode Bridge Kit No.
ATV66C10N4	VZ3-DM2170M1601
ATV66C13N4	VZ3-DM2170M1601
ATV66C15N4	VZ3-DM2260M1601
ATV66C19N4	VZ3-DM2350M1601

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- STORED ENERGY

- If controller is damaged, voltage may be present on metal can capacitors and snubber board capacitors (see Figure 127 on page 249).
- Always check for presence of voltage using voltmeter set to 1000 VDC scale.
- If voltage is present, allow voltmeter to discharge capacitor stored charge. Refer to “PROCEDURE 2: DISCHARGING STORED ENERGY IN CAPACITORS” in chapter 5 for further information.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of magnetized flat blade screw drivers
- Metric hex key set, 2 to 14 mm

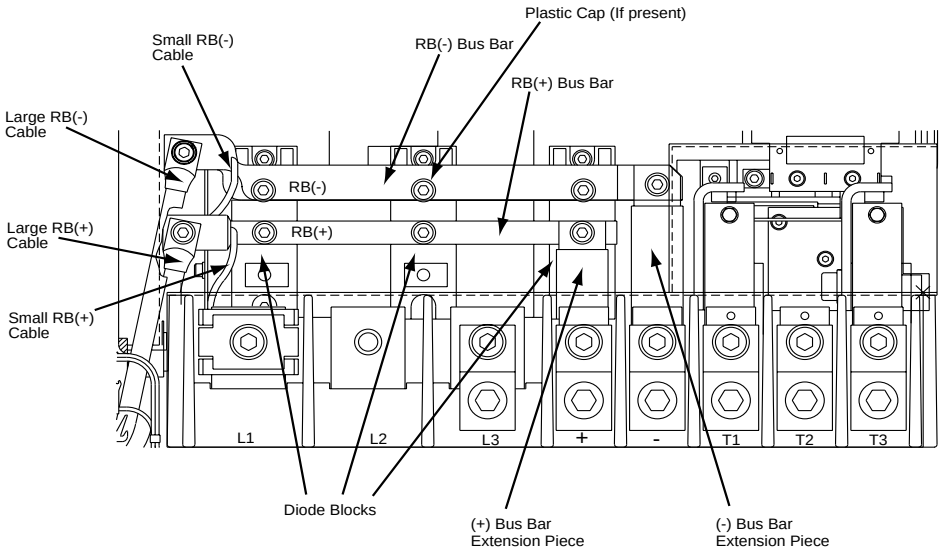
With the drive controller door open or removed:

1. Measure the bus voltage (if not already performed) as described in chapter 5 of this manual.
2. Using a flat blade screw driver, loosen the two screws holding the hinged assembly in place. Swing the hinged assembly out to the right (see Figure 124 on page 244).
3. Loosen the thumb screws and remove the plastic shield from in front of the line and motor terminals.

4. If present, remove the plastic cap from the center diode block screw (see Figure 130 on page 258).
5. Using a hex key wrench, loosen and remove the screws holding the large RB(-) and RB(+) cables in place on the left side of the bus bar (see Figure 130 on page 258).
6. Using a hex key wrench, loosen and remove the screws holding the small RB(-) and RB(+) cables in place on the left side of the bus bar (see Figure 130 on page 258).
7. Using a hex key wrench, loosen and remove the screw which holds the (-) bus bar extension piece to the RB(-) bus bar. Remove the bus bar extension piece (see Figure 130 on page 258).
8. Using a hex key wrench, loosen and remove the remaining six bus bar screws. Remove the two bus bar pieces (see Figure 130 on page 258).

   NOTE: On ATV66C10N4 and C13N4 controllers there are spacer blocks between the two bus bars and the diode blocks. Before removal, note their orientation. Save them for reinstallation.

   NOTE: To remove the far right diode block, it is necessary to also remove the (+) bus bar extension piece from the drive controller. Do this by removing the bus bar extension piece screw from the (+) terminal block with a hex key wrench.
9. Using a hex key wrench, loosen and remove the screws which attach the large power fuse (or shorting bar is fuses not present) associated with the diode block being removed. Remove the fuse or shorting bar.
10. Using a hex key wrench, loosen and remove the screw at the bottom power connection of the diode block. Pull L-bracket out of the way.
11. Using a hex key wrench, remove the four (or two) diode block mounting screws from the diode block being removed.
12. Using a flat blade screw driver, gently pry loose the diode block from the heat sink.
13. Remove the diode block. Ensure that all of the old Thermstrate™ foil is removed from the heatsink.



NOTE: Maintain a 3/8" (9.5 mm) spacing between RB(-) and RB(+) bus bars and non-insulated connectors

Figure 130: Removing the Diode Block (ATV66C10N4 and C13N4 shown)

Installing the Diode Block

There are three diode blocks in the ATV66C10N4 to C19N4 drive controllers. The diode bridge kit contains three diode blocks.

This procedure explains how to install an individual diode block in the following drive controllers:

Drive Controller No.	Diode Bridge Kit No.
ATV66C10N4	VZ3-DM2170M1601
ATV66C13N4	VZ3-DM2170M1601
ATV66C15N4	VZ3-DM2260M1601
ATV66C19N4	VZ3-DM2350M1601

Read "WORK PRACTICE PRECAUTIONS" on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of magnetized flat blade screw drivers
- Torque wrench, set to 141 lb-in (16 N • m)
- Metric hex key sockets for torque wrench, 2 to 14 mm

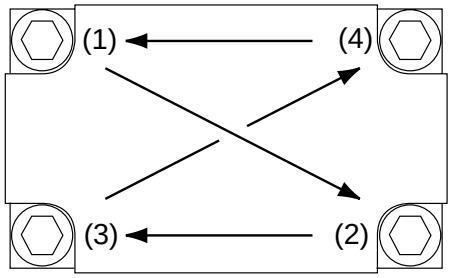
To install a diode block:

1. Install a new Thermstrate™ foil from the kit on the back of the new diode block. Remove the paper backing from the Thermstrate™ foil. Do not remove the white contact grease coating.

   NOTE: If Thermstrate™ foil is damaged (i.e., wrinkled, coating gaps > 1/8" round) discard foil. Obtain new Thermstrate™ foil.

2. Place the new diode block on the heat sink and align the mounting holes. Using a torque wrench with hex key socket, install and tighten the two or four diode mounting screws as described below:
   — **For drive controllers ATV66C10N4 and C13N4:** Initially torque the two screws, to 6.0 - 9.0 lb-in (0.7 - 1.0 N • m). The final torque is 53 lb-in (6 N • m).

   — **For drive controllers ATV66C15N4 and C19N4:** initially torque the four screws, in the sequence shown, to 6.0 - 9.0 lb-in (0.7 - 1.0 N • m). The final torque is 53 lb-in (6 N • m).



3. Install the L-bracket and mounting screw to the bottom power connection on the diode block. Using a torque wrench and hex key socket, tighten the L-bracket screw to a torque of 53 lb-in (6 N • m) for ATV66C10N4 / C13N4 controllers or 105.6 lb-in (12 N • m) for ATV66C15N4 / C 19N4 controllers. (In some cases, it may be necessary to attach the L-bracket to the diode block before it is installed into the drive controller).
4. Install the power fuse or shorting bar and the two mounting screws to the L-bracket and the line power terminal. Using a torque wrench and a hex key socket, tighten the fuse or shorting bar screws to 141 lb-in (16 N • m).
5. Install the two bus bar pieces. Using a torque wrench with hex key socket, install and tighten the six bus bar screws to a torque of 53 lb-in (6 N • m) for ATV66C10N4 / C13N4 controllers or 105.6 lb-in (12 N • m) for ATV66C15N4 / C 19N4 controllers. The top screw on the (+) bus bar extension piece is the longest of the six. See Figure 130 on page 258. Ensure that the bus bar spacing specifications are adhered to as described in the note in Figure 130 on page 258.

   NOTE: On ATV66C10N4 and C13N4 controllers, install spacer blocks under bus bars.

   NOTE: If installing the far right diode block, it is necessary to first install the (+) bus bar extension piece. Position the bus bar extension piece mounting hole over the corresponding hole on the (+) terminal block. Using a torque wrench and hex key socket, install the extension piece mounting screw and tighten to a torque of 141 lb-in (16 N • m).
6. Using a torque wrench with hex key socket, install and tighten the screw which holds the (-) bus bar extension piece to the RB(-) bus bar. Tighten to a torque of 74.3 lb-in (8.4 N • m).

   NOTE: Ensure that the bus bar spacing specifications are adhered to as described in the note on Figure 130 on page 258.
7. Place the small RB(-) cable over its mounting location on the RB(-) bus bar. Using a torque wrench with hex key socket, install and tighten the mounting screw to a torque of 35.4 lb-in (4 N • m). Place the small RB(+) cable over its mounting location on the RB(+) bus bar. Using a torque wrench and hex key socket, install and tighten the mounting screw to a torque of 35.4 lb-in (4 N • m). See Figure 130 on page 258.
8. Place the large RB(-) cable over its mounting location on the RB(-) bus bar. Using a torque wrench with a hex key socket, install and tighten the mounting screw to a torque of 70 lb-in (8 N • m). Place the large RB(+) cable over its mounting location on the RB(+) bus bar. Using a torque wrench and hex key socket, install and tighten the mounting screw to a torque of 70 lb-in (8 N • m). See Figure 130 on page 258.
9. For ATV66C15N4 and C19N4 controllers replace the plastic cap on the middle diode block upper screw. See Figure 130 on page 258.
10. Reinstall plastic terminal block cover.
11. Swing the hinged assembly back to the left. Using a flat blade screw driver, tighten the two screws.

Removing the Current Sensor Assembly

There are two current sensors in the ATV66C10N4 to C19N4 drive controllers. The current sensor kit contains one current sensor. This procedure explains how to remove the current sensor assembly from the following drive controllers:

Drive Controller No.	Current Sensor No.
ATV66C10N4	VY1-A66106
ATV66C13N4	VY1-A66106
ATV66C15N4	VY1-A66107
ATV66C19N4	VY1-A66107

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- STORED ENERGY

- If controller is damaged, voltage may be present on metal can capacitors and snubber board capacitors (see Figure 127 on page 249).
- Always check for presence of voltage using voltmeter set to 1000 VDC scale.
- If voltage is present, allow voltmeter to discharge capacitor stored charge. Refer to “PROCEDURE 2: DISCHARGING STORED ENERGY IN CAPACITORS” in chapter 5 for further information.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Set of magnetized flat blade screw drivers
- Set of magnetized phillips screw drivers
- Metric hex key set, 2 to 14 mm
- 4” Needle nose pliers

With the drive controller door open or removed:

Measure the bus voltage (if not already performed) as described in chapter 5 of this manual.

To remove the left current sensor:

1. Using a flat blade screw driver, loosen the two screws holding the hinged assembly in place. Swing the hinged assembly out to the right.
2. Loosen the thumb screws and remove the plastic shield from in front of the line and motor terminals.
3. Using needle nose pliers, carefully disconnect and pull back out of the way the T1 sensor wire (see Figure 131 on page 262).
4. Using a hex key wrench, loosen and remove the left sensor center cylinder screw (see Figure 131 on page 262).
5. Using a phillips screw driver, loosen and remove the top screw holding the current sensor to the mounting bracket.
6. While holding the T1 power cable out of the way, **gently** pull the current sensor out and then up. **Be aware** of the signal cable connected to the lower right hand corner of the sensor. As the sensor comes up out of the drive, remove the copper center cylinder from the center of the sensor. When the sensor is removed sufficiently to reach the signal cable, unplug it from the sensor using needle nose pliers (pull on the connector, not the wires). Remove the sensor completely from the drive.

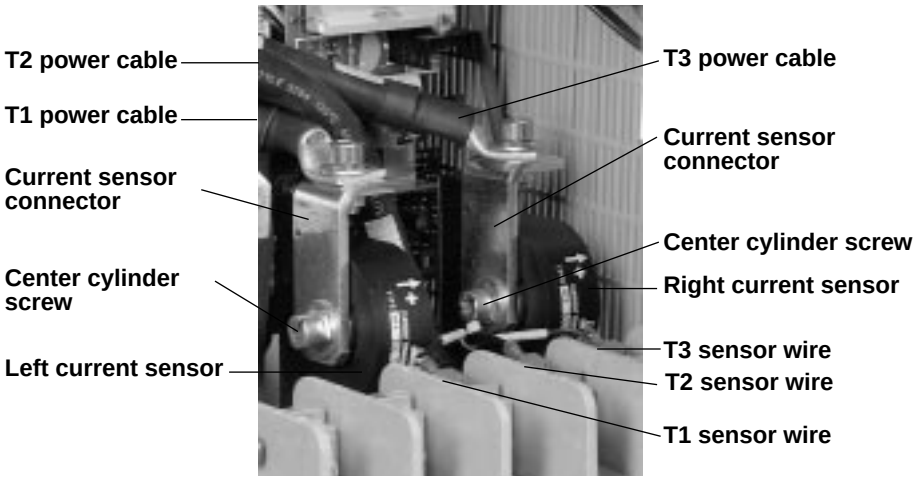


Figure 131: Current Sensor Assembly

To remove the right current sensor:

1. Remove the left current sensor by following the above procedure.
2. Using needle nose pliers, carefully disconnect and pull back out of the way the T3 sensor wire (see Figure 131 on page 262).
3. Using a hex key wrench, loosen and remove the screw at the back of the T1 terminal block. Remove the L-bar that goes from the T1 terminal block to the center cylinder on the left current sensor.
4. Using a hex key wrench, loosen and remove the center cylinder screw on the left side of the right current sensor (see Figure 131 on page 262). Pull the T3 power cable and current sensor connector back out of the way and remove the center cylinder.
5. Using a phillips screw driver, loosen and remove the top screw holding the current sensor to the mounting bracket.

6. **Gently** pull the current sensor out and then up. **Be aware** of the signal cable connected to the lower right hand corner of the sensor. When the sensor is removed sufficiently to reach the signal cable, unplug it from the sensor using needle nose pliers (pull on the connector, not the wires). Remove the sensor completely form the drive.

Installing the Current Sensor Assembly

There are two current sensors in the ATV66C10N4 to C19N4 drive controllers. The current sensor kit contains one current sensor. This procedure how to install the current sensor assembly in the following drive controllers:

Drive Controller No.	Current Sensor No.
ATV66C10N4	VY1-A66106
ATV66C13N4	VY1-A66106
ATV66C15N4	VY1-A66107
ATV66C19N4	VY1-A66107

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Set of magnetized flat blade screw drivers
- Torque wrench, set to 164 lb-in (18.5 N • m)
- Metric hex key sockets for torque wrench, 2 to 14 mm
- 4” Needle nose pliers
- Set of magnetized phillips screw drivers

To install the right current sensor:

NOTE: Do not alter the factory set current sensor adjustment settings.

1. **Gently** pull the right current sensor signal cable (labeled CT3) out from the drive **just enough** to attach it to the socket on current sensor using a needle nose pliers (pull on the wires, not the connector).
2. Install the current sensor into the drive, positioning the bottom mounting hole of the sensor over the fixed screw in the mounting bracket and aligning the top mounting hole of the sensor over the top screw hole in the mounting bracket. With a phillips screw driver, reinstall and tighten the mounting screw.
3. Install the copper center cylinder into the center of the current sensor.
4. While holding the T3 power cable and current sensor connector in place beside the right current sensor, install the center cylinder screw (see Figure 131 on page 262). Using the torque wrench and a hex key socket, tighten the center cylinder screw to 164 lb-in (18.5 N • m).

5. Install the L-bar that goes from the back of the T1 terminal block to the left current sensor. Using the torque wrench and a hex key socket, tighten the screw at the back of the T1 terminal block to 164 lb-in (18.5 N • m).
6. Using needle nose pliers, carefully reconnect the T3 sensing wire (see Figure 131 on page 262).
7. Reinstall the left current sensor using the following procedure.

To install the left current sensor:

NOTE: Do not alter the factory set current sensor adjustment settings.

1. If also installing the right current sensor, install it first with the above procedure.
2. **Gently** pull the left current sensor signal cable (labeled CT1) out from the drive **just enough** to attach it to the socket on current sensor using a needle nose pliers (pull on the wires, not the connector).
3. Install the current sensor into the drive, positioning the bottom mounting hole of the sensor over the fixed screw in the mounting bracket and aligning the top mount hole of the sensor over the top screw hole in the mounting bracket. With a phillips screw driver, reinstall and tighten the mounting screw.
4. Install the copper center cylinder into the center of the current sensor.
5. While holding the T1 power cable and current sensor connector in place beside the left current sensor, install the center cylinder screw (see Figure 131 on page 262). Using the torque wrench and hex key socket, tighten the center cylinder screw to 164 lb-in (18.5 N • m).
6. Using needle nose pliers, carefully reconnect the T1 sensing wire (see Figure 131 on page 262).
7. Install the plastic shield in front of the line and motor terminals. Tighten the thumb screws.
8. Swing the hinged assembly back to its normal position. Using a flat blade screw driver, tighten the two screws.

Removing the Dynamic Braking (DB) Snubber Board

The dynamic braking module kit contains one snubber board.

This procedure explains how to remove the snubber board from the following drive controllers:

Drive Controller No.	DB Module Kit No.
ATV66C10N4	VZ3-IM1300M1207
ATV66C13N4	
ATV66C15N4	
ATV66C19N4	

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- STORED ENERGY

- If controller is damaged, voltage may be present on metal can capacitors and snubber board capacitors (see Figure 127 on page 249).
- Always check for presence of voltage using voltmeter set to 1000 VDC scale.
- If voltage is present, allow voltmeter to discharge capacitor stored charge. Refer to “PROCEDURE 2: DISCHARGING STORED ENERGY IN CAPACITORS” in chapter 5 for further information.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Current sensor assembly procedure tool list, page 261

With the drive controller door open or removed:

1. Remove both current sensor assemblies as described in the procedure on page 261.
2. Using needle nose pliers, carefully disconnect the J2 connector on the dynamic braking snubber board (see Figure 133 on page 266).
3. If the board is being replaced, remove the jumper from J3 to J4.
4. Using a hex key wrench, loosen and remove the two mounting screws. Remove the dynamic braking snubber board.

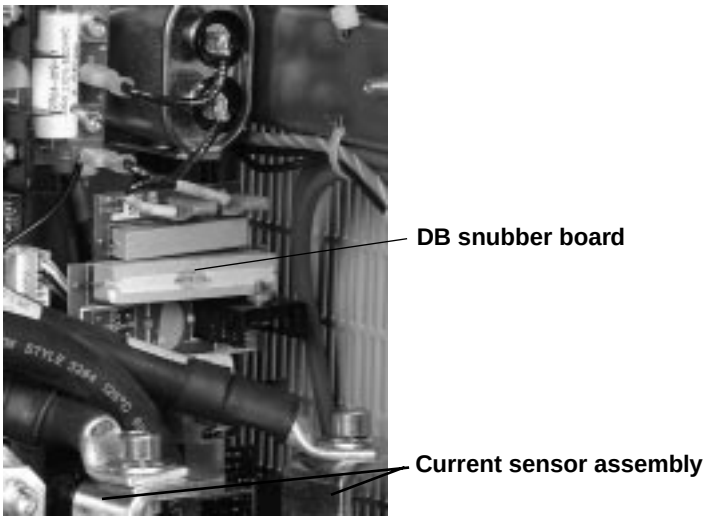


Figure 132: Dynamic Braking Snubber Board

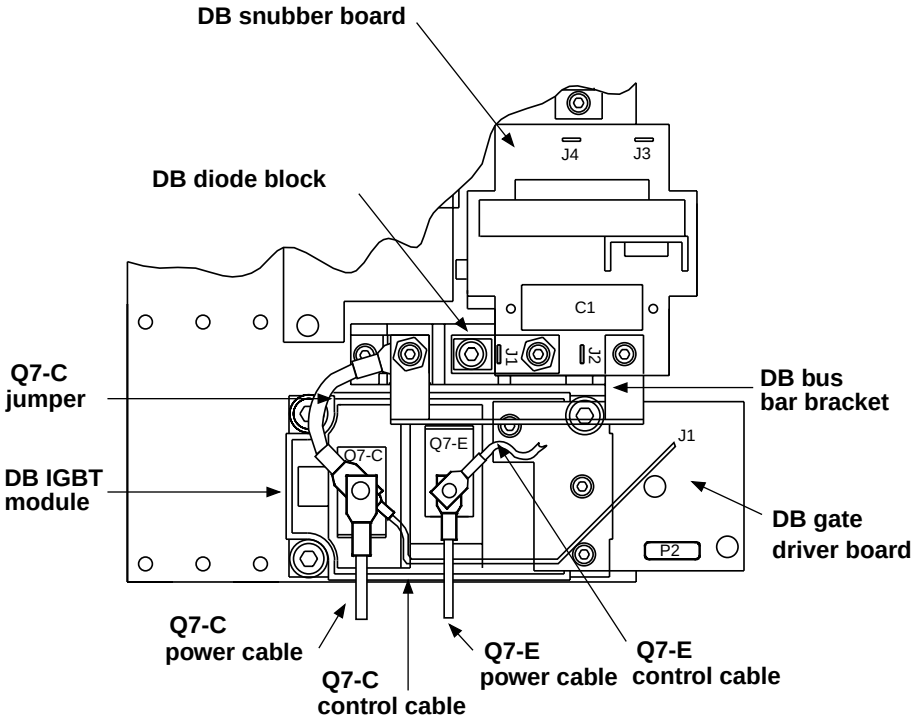


Figure 133: Dynamic Braking Snubber Board, Gate Driver Board, IGBT, Diode

Installing the Dynamic Braking (DB) Snubber Board

The dynamic braking module kit contains one snubber board.

This procedure explains how to install the dynamic braking snubber board in the following drive controllers:

Drive Controller No.	DB Module Kit No.
ATV66C10N4 ATV66C13N4 ATV66C15N4 ATV66C19N4	VZ3-IM1300M1207

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Torque wrench, set to 17.7 lb-in (2 N • m)
- Current sensor assembly procedure tool list, page 263

To install the dynamic braking snubber board:

1. Align the mounting holes on the dynamic braking snubber board with the mounting posts in the controller (see Figure 133 on page 266).
2. Install the two mounting screws. Using the torque wrench with a hex key socket, tighten the two mounting screws to 17.7 lb-in (2 N • m).
3. Connect the J2 connector on the dynamic braking snubber board.
4. If installing a new snubber board, install the jumper between J3 and J4.
5. Replace both current sensor assemblies as described in the procedure on page 263.

Removing the Dynamic Braking (DB) Gate Driver Board

The dynamic braking module kit contains one gate driver board.

This procedure explains how to remove the dynamic braking gate driver board from the following drive controllers:

Drive Controller No.	DB Module Kit No.
ATV66C10N4	VZ3-IM1300M1207
ATV66C13N4	
ATV66C15N4	
ATV66C19N4	

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- STORED ENERGY

- If controller is damaged, voltage may be present on metal can capacitors and snubber board capacitors (see Figure 127 on page 249).
- Always check for presence of voltage using voltmeter set to 1000 VDC scale.
- If voltage is present, allow voltmeter to discharge capacitor stored charge. Refer to “PROCEDURE 2: DISCHARGING STORED ENERGY IN CAPACITORS” in chapter 5 for further information.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- DB Snubber board procedure tool list, page 265
- Current sensor assembly procedure tool list, page 261

With the drive controller door open or removed:

1. Remove the dynamic braking snubber board as described in the procedure on page 264.
2. Using needle nose pliers, carefully disconnect and pull back out of the way the T2 sensor wire (see Figure 131 on page 262).
3. Using a hex key wrench, loosen and remove the screw at the back of the T2 terminal block. Pull the T2 power cable back out of the way.
4. Using a hex key wrench, loosen and remove the current sensor mounting bracket screw.
5. Using a hex key wrench, loosen and remove the remaining mounting screw for the dynamic braking snubber board bus bar bracket (see Figure 133 on page 266). Remove the bracket.
6. Disconnect the P2 connector on the dynamic braking gate driver board.
7. Using a hex key wrench, loosen and remove the two mounting screws for the (-) bus bar extension piece (see Figure 130 on page 258). Remove the (-) bus bar extension piece.
8. Using a hex key wrench, remove the screw located at the Q7-C terminal of the dynamic braking IGBT module (see Figure 133 on page 266). This frees the Q7-C control wire which is attached to the dynamic braking gate driver board at the J1 location.
9. Using a hex key wrench, loosen and remove the two mounting screws. Remove the dynamic braking gate driver board and wire.

   NOTE: If the J1 wire landed on the gate driver board is connected with a detachable terminal connector or zero force connector, be sure to discard the wire and DO NOT reuse on new board.

Installing the Dynamic Braking (DB) Gate Driver Board

The dynamic braking module kit contains one gate driver board.

This procedure explains how to install the dynamic braking gate driver board in the following drive controllers:

Drive Controller No.	DB Module Kit No.
ATV66C10N4	VZ3-IM1300M1207
ATV66C13N4	
ATV66C15N4	
ATV66C19N4	

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Metric hex key set, 2 to 14 mm

- DB Snubber board procedure tool list, page 267
- Current sensor assembly procedure tool list, page 263

To install the dynamic braking gate driver board:

1. Align the mounting holes on the dynamic braking gate driver board with the mounting holes on the dynamic braking IGBT module (see Figure 133 on page 266).
2. Install the two mounting screws. Using the torque wrench and a hex key socket, tighten the two mounting screws to 17.7 lb-in (2 N • m).

   NOTE: Always use the J1 lead provided with the replacement gate driver board. DO NOT reuse the existing J1 lead.
3. At the dynamic braking IGBT module Q7-C terminal, install and tighten the terminal screw with the Q7-C power, control, and jumper cables landed underneath. Using a torque wrench and hex key socket, tighten the screw to 26.5 lb-in (3 N • m).
4. Install the (-) bus bar extension piece (see Figure 130 on page 258). Using a torque wrench and hex key socket, install and tighten the two mounting screws. Tighten the bottom screw to 164 lb-in (18.5 N • m) and the top screw to 74.3 lb-in (8.4 N • m).
5. Using needle nose pliers, carefully connect the P2 connector on the DB gate driver board.
6. Install the DB gate driver board bus bar bracket (see Figure 135 on page 275). Using the torque wrench and a hex key socket, install and tighten the mounting screw to 17.7 lb-in (2 N • m).
7. Align the mounting hole for the current sensor mounting bracket with the mounting hole inside the controller. Using a hex key wrench, install and tighten the mounting screw.
8. Install the T2 power cable at the back of the T2 terminal block and install the mounting screw. Using the torque wrench and a hex key socket, tighten the screw to 164 lb-in (18.5 N • m).
9. Using needle nose pliers, carefully reconnect the T2 sensing wire (see Figure 131 on page 262).
10. Install the dynamic braking snubber board as described in the procedure page 267.

Removing the Dynamic Braking (DB) IGBT Module

The dynamic braking module kit contains one IGBT module.

This procedure explains how to remove the dynamic braking IGBT module from the following drive controllers:

Drive Controller No.	DB Module Kit No.
ATV66C10N4 ATV66C13N4 ATV66C15N4 ATV66C19N4	VZ3-IM1300M1207

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- STORED ENERGY

- If controller is damaged, voltage may be present on metal can capacitors and snubber board capacitors (see Figure 127 on page 249).
- Always check for presence of voltage using voltmeter set to 1000 VDC scale.
- If voltage is present, allow voltmeter to discharge capacitor stored charge. Refer to “PROCEDURE 2: DISCHARGING STORED ENERGY IN CAPACITORS” in chapter 5 for further information.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- DB Gate driver board procedure tool list, page 268
- DB Snubber board procedure tool list, page 265
- Current sensor assembly procedure tool list, page 261

With the drive controller door open or removed:

1. Remove the dynamic braking gate driver board as described in the procedure on page 268.
2. Using a hex key wrench, loosen and remove the Q7-E dynamic braking IGBT module screw (see Figure 133 on page 266). Pull the Q7-E power cable and control cable back away from the dynamic braking IGBT module.
3. Using a hex key wrench, loosen and remove the four mounting screws on the dynamic braking IGBT module.
4. Using a flat blade screw driver, gently pry loose the dynamic braking IGBT module from the heat sink.
5. Remove the dynamic braking IGBT module. Remove all of the old Thermstrate™ foil from the heatsink.

Installing the Dynamic Braking (DB) IGBT Module

The dynamic braking module kit contains one IGBT module.

This procedure explains how to install the dynamic braking IGBT module in the following drive controllers:

Drive Controller No.	DB Module Kit No.
ATV66C10N4	VZ3-IM1300M1207
ATV66C13N4	
ATV66C15N4	
ATV66C19N4	

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Torque wrench, set to 26.5 lb-in (3 N • m)
- DB gate driver board procedure tool list, page 269
- DB snubber board procedure tool list, page 267
- Current sensor assembly tool list, page 263

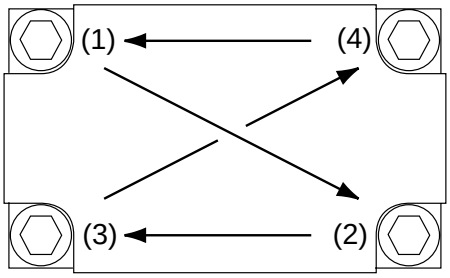
To install the dynamic braking IGBT module:

1. Install a new Thermstrate™ foil on the back of the new dynamic braking IGBT module. Ensure the paper backing is removed from the Thermstrate™ foil. Do not remove the white contact grease coating.

   NOTE: If the Thermstrate™ foil is damaged (i.e., wrinkled, coating gaps > 1/8” round), discard the Thermstrate™ foil. Obtain new foil.

2. Place the new dynamic braking IGBT module on the heat sink and align the mounting holes.

3. Using the torque wrench with a hex key socket, initially tighten the four mounting screws, in the sequence shown, to 6.0 -9.0 lb-in (0.7 - 1.0 N • m). The final torque is 26.5 lb-in (3 N • m).



4. Install the Q7-E terminal screw with the Q7-E power and control cables landed underneath. Using a torque wrench and hex key socket, tighten the screw to 26.5 lb-in (3 N • m) (see Figure 134 on page 275).
5. Install the dynamic braking gate driver board as described in the procedure on page 269.

Removing the Dynamic Braking (DB) Diode Block

This procedure explains how to remove the dynamic braking diode block from the following drive controllers:

Drive Controller No.	DB Block Kit No.
ATV66C10N4	VZ3-IM1300M1207
ATV66C13N4	
ATV66C15N4	
ATV66C19N4	

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- STORED ENERGY

- If controller is damaged, voltage may be present on metal can capacitors and snubber board capacitors (see Figure 127 on page 249).
- Always check for presence of voltage using voltmeter set to 1000 VDC scale.
- If voltage is present, allow voltmeter to discharge capacitor stored charge. Refer to “PROCEDURE 2: DISCHARGING STORED ENERGY IN CAPACITORS” in chapter 5 for further information.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- 1/4” drive metric socket set, 5.5 to14 mm
- DB snubber board procedure tool list, page 265
- Current sensor assembly procedure tool list, page 261

With the drive controller door open or removed:

1. Remove the dynamic braking snubber board as described in the procedure on page 264.
2. Using needle nose pliers, carefully disconnect and pull back out of the way the T2 sensor wire (see Figure 131 on page 262).
3. Using a hex key wrench, loosen and remove the screw at the back of the T2 terminal block. Pull the T2 power cable back out of the way.
4. Using a hex key wrench, loosen and remove the current sensor mounting bracket screw.
5. Using a hex key wrench, remove the remaining dynamic braking bus bar bracket screw (see Figure 134 on page 275). Remove the bus bar bracket.
6. Using a drive socket, remove the two standoffs. Pull the Q7-C jumper back out of the way (see Figure 135 on page 275).
7. Using a hex key wrench, remove the screw from the DM4-2 terminal of the dynamic braking diode block (see Figure 135 on page 275). Pull the DM4-2 cable back out of the way and remove the dynamic braking diode block connector (see Figure 135 on page 275).
8. Using a hex key wrench, remove the two dynamic braking diode block screws. Using a flat blade screw driver, gently pry loose the diode block (see Figure 135 on page 275).
9. Remove the dynamic braking diode block. Remove all of the old Thermstrate™ foil from the heatsink.

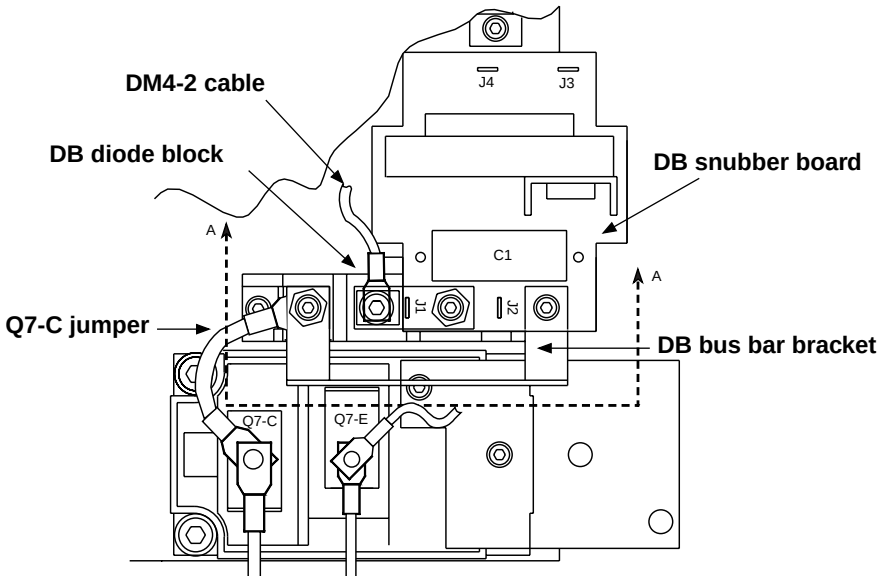


Figure 134: Top View of Dynamic Braking Module

NOTE: Maintain a 3/8" (9.5 mm) space between non-insulated connectors on terminals Q7-C, Q7-E, DM4-1, and DM4-2.

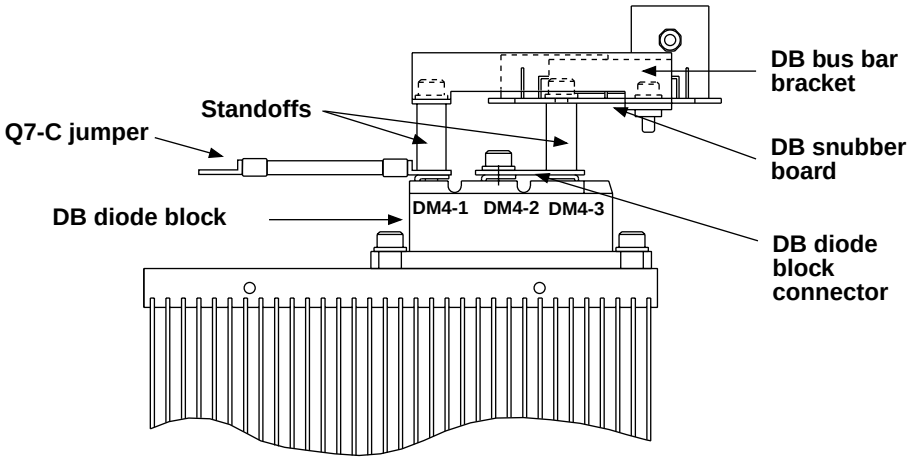


Figure 135: Side View of Dynamic Braking Module

Installing the Dynamic Braking (DB) Diode Block

This procedure explains how to install the dynamic braking diode block in the following drive controllers:

Drive Controller No.	DB Block Kit No.
ATV66C10N4	VZ3-IM1300M1207
ATV66C13N4	
ATV66C15N4	
ATV66C19N4	

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Metric drive sockets for torque wrench
- Metric hex key set , 2 to 14 mm
- DB snubber board procedure tool list, page 267
- Current sensor assembly procedure tool list, page 263

To install the dynamic braking diode block:

1. Install a new Thermstrate™ foil from the kit on the back of the new diode block. Remove the paper backing from the Thermstrate™ foil. Do not remove white contact grease coating.

   NOTE: If the Thermstrate™ foil is damaged (i.e., wrinkled, coating gaps > 1/8” round), discard the Thermstrate™ foil. Obtain new foil.

2. Place the new diode block on the heat sink with R11 terminal toward outer edge of controller and align the mounting holes. Using a torque wrench with hex key socket, install and tighten the two diode block mounting screws (see Figure 135 on page 275). Initially tighten to 6.0 - 9.0 lb-in (0.7 - 1.0 N • m). The final torque is 35.4 lb-in (4 N • m).
3. Align the dynamic braking diode block connector over the DM4-2 and DM4-3 mounting holes in the dynamic braking diode block. Align the DM4-2 cable over the DM4-2 mounting hole (see Figure 135 on page 275). Using a torque wrench and a hex key socket, install and tighten the mounting screw in DM4-2 mounting hole to 17.7 lb-in (2 N • m).
4. Align the Q7-C jumper over the DM4-1 mounting hole of the diode block. Using a torque wrench and a metric drive socket, install and tighten the two standoffs in the DM4-1 and DM4-3 mounting holes of the diode module to 17.7 lb-in (2 N • m).
5. Align the dynamic braking bus bar bracket over the left standoff. Using a torque wrench and a hex key socket, install and tighten the bus bar bracket screw to 17.7 lb-in (2 N • m).

6. Align the mounting hole for the current sensor mounting bracket with the mounting hole inside the controller. Using a hex key wrench, install and tighten the mounting screw.
7. Install the T2 power cable at the back of the T2 terminal block and install the mounting screw. Using the torque wrench and a hex key socket, tighten the screw to 164 lb-in (18.5 N • m).
8. Using needle nose pliers, carefully reconnect the T2 sensing wire (see Figure 131 on page 262).
9. Install the dynamic braking snubber board as described in the procedure on page 267.

Replacing the Thermal Switches

There are two thermal switches located on the heat sink (see Figure 136 on page 279). One is located behind the DB gate driver snubber board, another behind the GD 4 gate driver board. The thermal switch kit contains one switch.

This procedure explains how to replace the thermal switches for the following drive controllers:

Drive Controller No.	Thermal Switch No.
ATV66C10N4	VZ3-G003
ATV66C13N4	
ATV66C15N4	
ATV66C19N4	

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- STORED ENERGY

- If controller is damaged, voltage may be present on metal can capacitors and snubber board capacitors (see Figure 127 on page 249).
- Always check for presence of voltage using voltmeter set to 1000 VDC scale.
- If voltage is present, allow voltmeter to discharge capacitor stored charge. Refer to “PROCEDURE 2: DISCHARGING STORED ENERGY IN CAPACITORS” in chapter 5 for further information.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

Many drive controller components may be damaged by static electricity. Follow the electrostatic precautions listed in “Static Sensitive Components” on page 4 of this manual when handling controller circuit boards or testing components.

Failure to follow this instruction can result in equipment damage.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed to replace the thermal switch behind the DB snubber board:

- DB snubber board procedure tool list, page 267
- Current sensor assembly procedure tool list, page 263

The tools needed to replace the thermal switch behind the GD4 gate driver:

- Gate driver procedure tool list, page 253
- Snubber board procedure tool list, page 250

With the drive controller door open or removed:

Measure the bus voltage (if not already performed) as described in chapter 5 of this manual.

To replace the thermal switch located on the heat sink behind the DB snubber board (see Figure 136 on page 279):

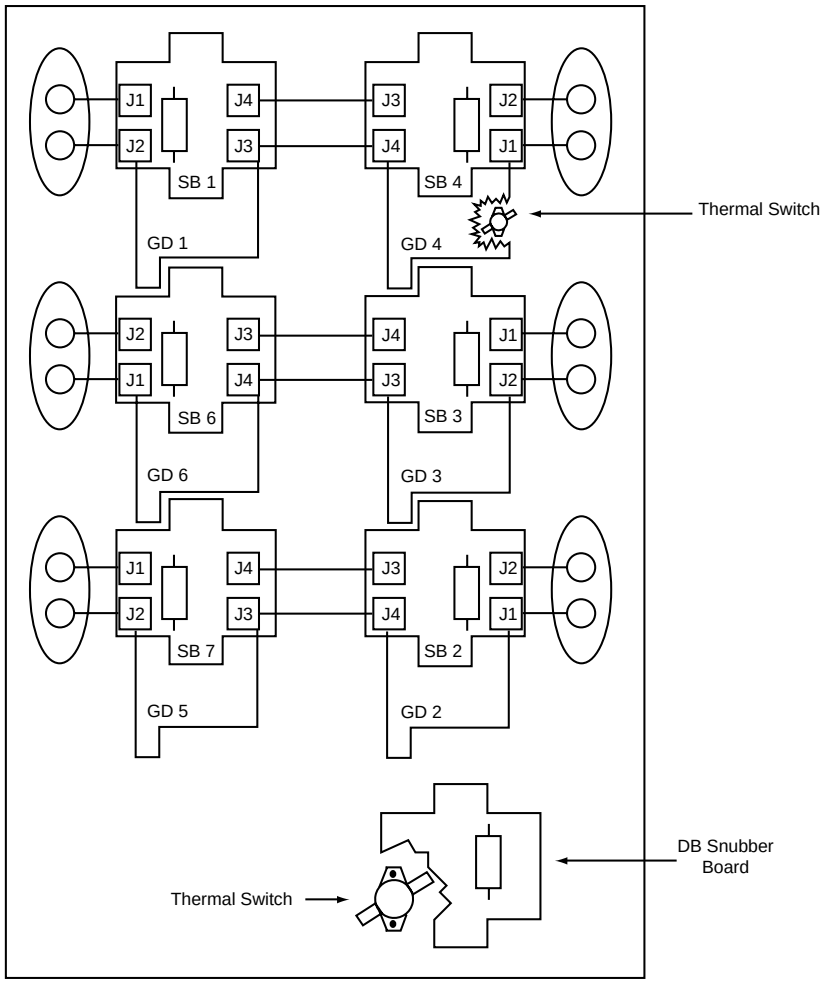


Figure 136: Thermal Switch Locations

1. Remove the dynamic braking snubber board as described in the procedure on page 264.
2. Using needle nose pliers, carefully disconnect the P2 connector from the GD2 gate driver board (see Figure 136 on page 279). This allows access to the mounting screws on the thermal switch.
3. Using needle nose pliers, carefully disconnect the two connectors to the thermal switch.
4. Using a phillips screw driver, loosen and remove the two mounting screws on the thermal switch.
5. Remove the old thermal switch.
6. Place the new thermal switch on the heatsink and align the mounting holes. Using a phillips screw driver, install and tighten the two mounting screws.
7. Using needle nose pliers, carefully connect the two connectors to the new thermal switch.
8. Replace P2 connector on the GD 2 gate driver board.
9. Install the dynamic braking snubber board as described in the procedure on page 267.

To replace the thermal switch located on the heat sink behind the GD4 gate driver board (see Figure 136 on page 279):

1. Remove the GD4 gate driver board as described in the procedure on page 250. Do not loosen IGBT bus terminal screw and remove J1 wire.
2. Using needle nose pliers, carefully disconnect the two connectors from the thermal switch.
3. Using a phillips screw driver, loosen and remove the two mounting screws on the thermal switch.
4. Remove the old thermal switch.
5. Place the new thermal switch on the heatsink and align the mounting holes. Using a phillips screw driver, install and tighten the two mounting screws.
6. Using needle nose pliers, carefully connect the two connectors to the new thermal switch.
7. Install the GD4 gate driver board as described in the procedure on page 252.

Replacing the Filter Board Assembly

This procedure explains how to replace the filter board assembly for the following drive controllers:

Drive Controller No.	Filter Board Assembly
ATV66C10N4	VX4-A66106
ATV66C13N4	
ATV66C15N4	
ATV66C19N4	

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- STORED ENERGY

- If controller is damaged, voltage may be present on metal can capacitors and snubber board capacitors (see Figure 127 on page 249).
- Always check for presence of voltage using voltmeter set to 1000 VDC scale.
- If voltage is present, allow voltmeter to discharge capacitor stored charge. Refer to “PROCEDURE 2: DISCHARGING STORED ENERGY IN CAPACITORS” in chapter 5 for further information.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- 1/4” drive metric socket set, 5.5 to 14 mm
- 4” Needle nose pliers

With the drive controller door open or removed:

1. Measure the bus voltage (if not already performed) as described in chapter 5 of this manual.
2. Using a drive socket, loosen and remove the two mounting nuts and lock washers located at the bottom of the filter board assembly (see Figure 137 on page 281). The fan capacitor assembly is also secured with the same mounting nuts.
3. Using needle nose pliers, carefully disconnect the nine connectors located at the top of the filter board assembly.
4. Pull the fan capacitor assembly out and then remove the old filter board assembly.
5. Install the filter board assembly and fan capacitor assembly on the two mounting posts (see Figure 137 on page 281).
6. Using needle nose pliers, carefully connect the nine connectors located at the top to the new filter board assembly (see Figure 138 on page 282).

   NOTE: Once the wiring has been connected to the filter board, an ohmmeter check should be made from points A to B, B to C, and C to A of Figure 138 on page 282. The ohmmeter should initially indicate a low resistance. The resistance should gradually increase over a period of 5-10 seconds as the filter and bus capacitors within the controller charge. Continuous low resistance is an indication of a mis-wiring of the filter board and possible phase-to-phase short circuit on the input wiring of the controller.
7. Using a drive socket, install and tighten the two mounting nuts and lock washers.

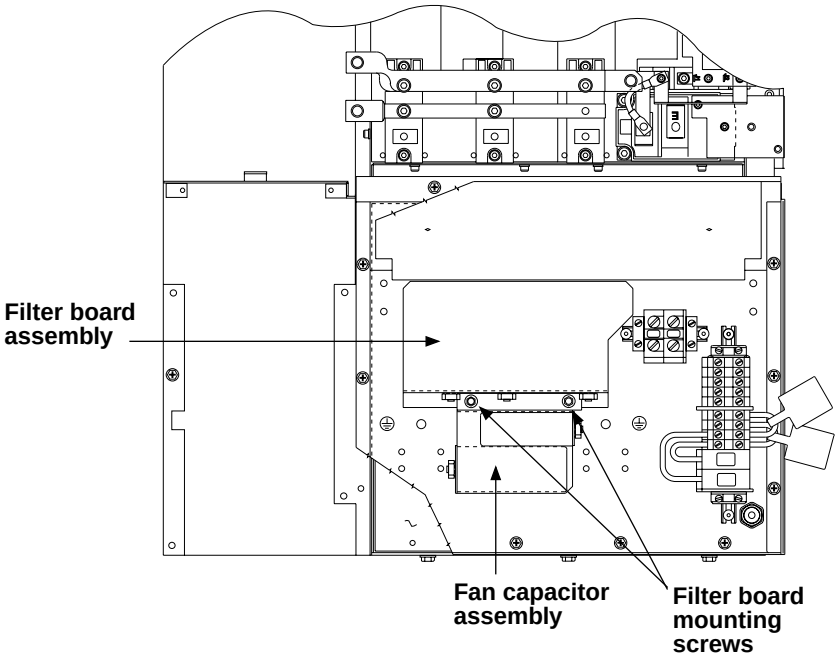


Figure 137: Filter Board and Fan Capacitor Assembly Locations

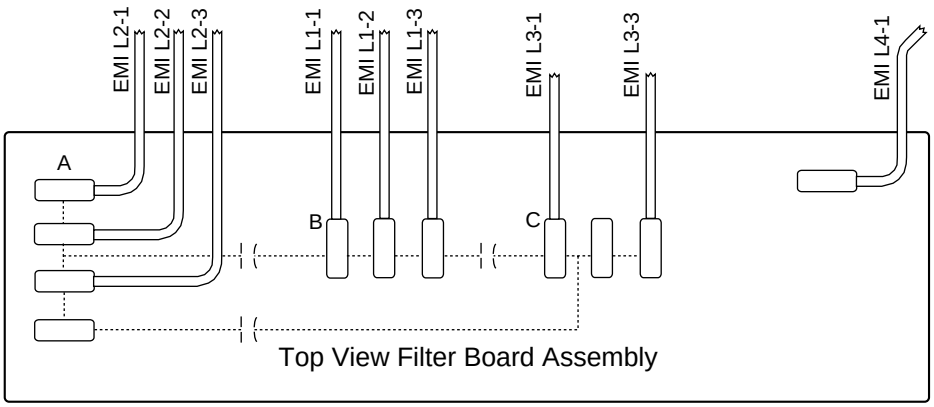


Figure 138: Filter Board Connections

Replacing the Capacitor Assembly

There are either two or three capacitor assemblies in the drive controller. The VY1-ADC607 Capacitor Assembly Kit contains 6 capacitors. This kit will also be used to replace the upper capacitor assembly on the ATV66C13N4 drive controller, which assembly contains 4 capacitors. This procedure explains how to replace an individual capacitor assembly for the following drive controllers:

Drive Controller No.	Capacitor Assembly No.
ATV66C10N4 ATV66C13N4 ATV66C15N4 ATV66C19N4	VY1-ADC607

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- STORED ENERGY

- If controller is damaged, voltage may be present on metal can capacitors and snubber board capacitors (see Figure 127 on page 249).
- Always check for presence of voltage using voltmeter set to 1000 VDC scale.
- If voltage is present, allow voltmeter to discharge capacitor stored charge. Refer to “PROCEDURE 2: DISCHARGING STORED ENERGY IN CAPACITORS” in chapter 5 for further information.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of magnetized flat blade screw drivers
- 1/4" drive metric socket set, 5.5 to 14 mm
- Torque wrench, set to 323 lb-in (36.5 N • m)
- Metric hex key set, 2 to 14 mm
- Metric hex key sockets for torque wrench, 2 to 14 mm
- Metric drive sockets for torque wrench

With the controller door open or removed:

1. Measure the bus voltage (if not already performed) as described in chapter 5 of this manual.
2. Using a drive socket, loosen and remove the two screws which hold the plexiglass shield in place (see Figure 139 on page 283).
3. Remove the plexiglass shield.
4. Using a hex key wrench, loosen and remove the two bus capacitor fuse screws. Remove the bus capacitor fuse (see Figure 140 on page 285).
5. Using a hex key wrench, loosen and remove the two bolts which hold the DCB(+) and DCB(-) power cables (see Figure 139 on page 283).
6. Using a hex key wrench, remove the positive (+) bus connector bolt (see Figure 139 on page 283).
7. Using a hex key wrench, loosen and remove the four or six capacitor bus bar screws which hold the laminated bus assembly in place. Remove the two DCB(-) and one DCB(+) control cables (see Figure 139 on page 283).

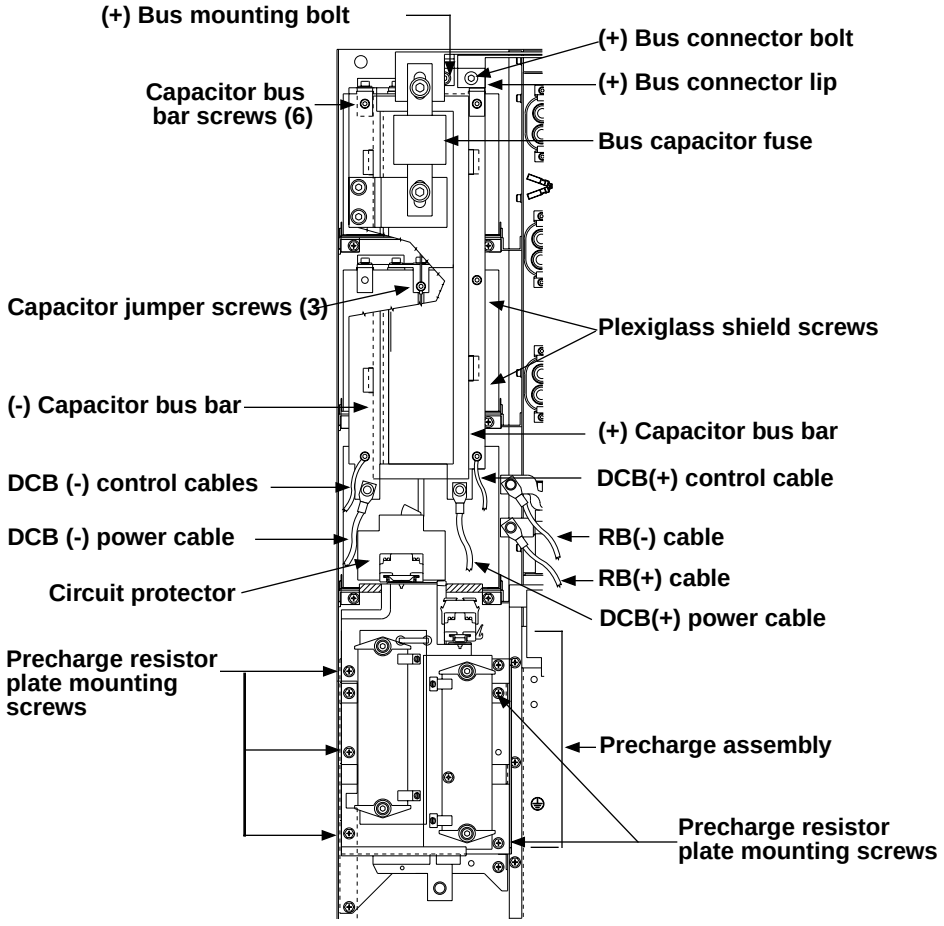


Figure 139: Capacitor Assembly Mounting Diagram—Front View

8. Remove the (-) capacitor bus bar and laminated insulating sheet.
9. Using a hex key wrench, loosen and remove the (+) bus mounting bolt (see Figure 139 on page 283).
10. Remove the (+) capacitor bus bar.
11. Using a hex key wrench, loosen and remove the three screws holding the two capacitor jumpers which connect the center posts of the three capacitor assemblies. Remove the two jumpers (see Figure 139 on page 283).
12. Using a drive socket, loosen and remove the two capacitor assembly screws holding the carriage of the capacitor assembly (see Figure 140 on page 285). Remove the capacitor assembly.

    NOTE: To remove the bottom capacitor assembly, it is necessary to pull the circuit protector, the precharge resistor plate, and the RB(-) and RB(+) cables out of the way (see Figure 139 on page 283). To loosen the circuit protector, follow the procedure on page 305, but do not remove any wiring. Loosen the precharge assembly by using a drive socket to remove the five precharge resistor plate mounting screws (see Figure 139 on page 283). Do not remove any of the wiring from the precharge assembly. Using a hex key wrench, loosen and remove the two bolts which hold the RB(-) and RB(+) cables to the rectifier bus bars.

13. Install the new capacitor assembly.

    NOTE: If the bottom capacitor assembly has been replaced, it will be necessary to reinstall the circuit protector, the precharge resistor plate and the RB(-) and RB(+) cables (see Figure 139 on page 283). First place the RB(+) cable over its mounting location on the RB(+) bus bar. Using a torque wrench with a hex key socket, install and tighten the mounting screw to a torque of 74.3 lb-in (8.4 N•m). Next, place the RB(-) cable over its mounting location on the RB(-) bus bar. Using a torque wrench with a hex key socket, install and tighten the mounting screw to a torque of 74.3 lb-in (8.4 N•m). Align the precharge resistor plate over the five mounting holes. Using a torque wrench with a drive socket, install and tighten the five mounting screw to 35.4 lb-in (4.0 N•m). Reinstall the circuit protector following the procedure on page 305.

14. Using a torque wrench with a drive socket, install the two capacitor assembly screws and tighten to 35.4 lb-in (4.0 N • m).
15. Install the two capacitor jumpers and three capacitor jumper screws (see Figure 139 on page 283). Using a torque wrench and a hex key socket, tighten the screws to 40.7 lb-in (4.6 N • m).
16. Install the (+) capacitor bus bar. See Figure 141 on page 286 for the correct orientation. The side with the captive mounting nut is the back side. The upper right corner of the (+) capacitor bus bar must be mounted under the (+) bus connector lip (see Figure 139 on page 283). Install the (+) bus mounting bolt. Using a torque wrench and hex key socket, tighten the bolt to 74.3 lb-in (8.4 N • m).

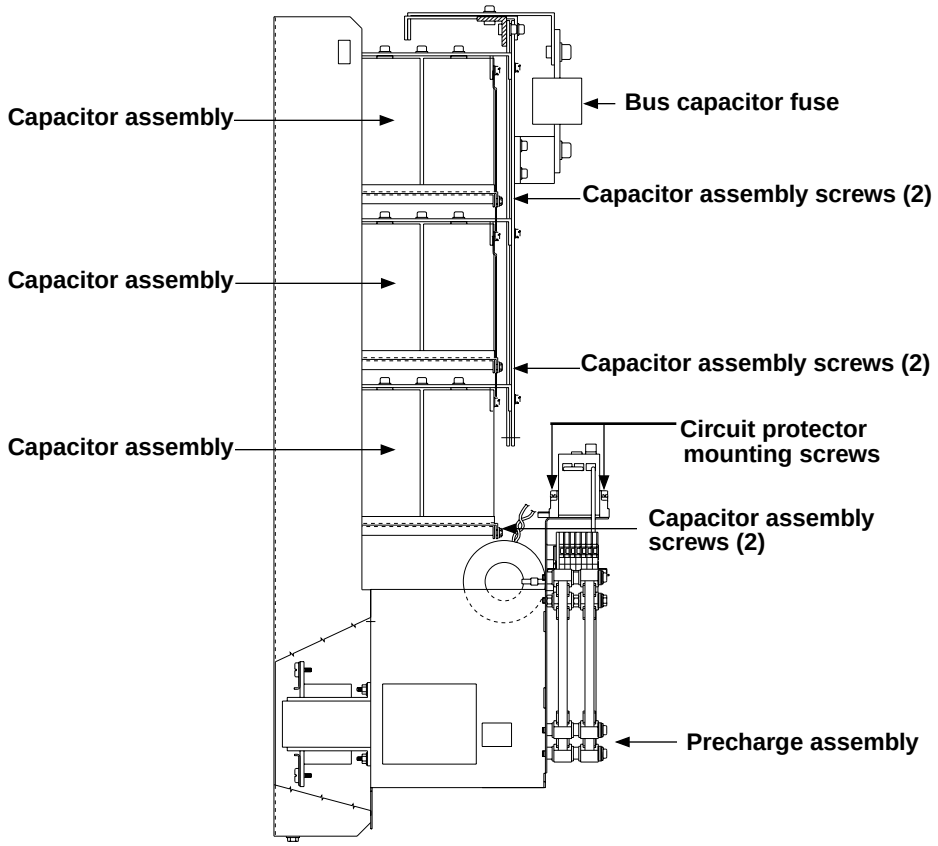


Figure 140: Capacitor Assembly Mounting Diagram—Side View

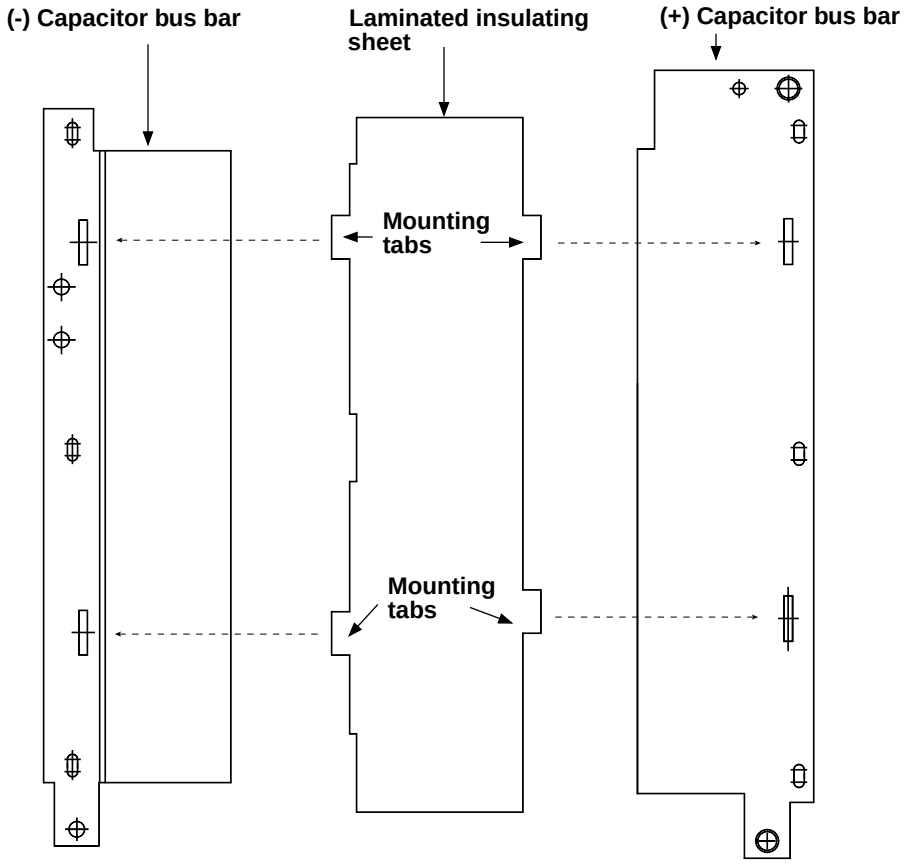


Figure 141: Orientation of Capacitor Bus Bars and Laminated Insulating Sheet

17. Install the laminated insulation sheet that electrically isolates the (+) and (-) capacitor bus bars. See Figure 141 on page 286 for correct orientation and where to insert tabs into buswork. **Do not scratch or damage laminated insulating sheet. If sheet has been damaged, replace.**

⚠ DANGER

EXPLOSION/EXPULSION HAZARD

- Inspect existing insulator for damage.

  DO NOT use damaged insulator.
- Install insulator per Figure 141 on page 286.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

18. Install the (-) capacitor bus bar. See Figure 141 on page 286 for correct orientation. The side with the danger label should be facing out. Install the four or six capacitor bus bar screws in the (+) and (-) capacitor bus bars. The two DCB(-) cables should be mounted under the bottom left screw and the DCB(+) cable should be mounted under the bottom right screw. Using a torque wrench and hex key socket, tighten the screws to 40.7 lb-in (4.6 N • m).

19. Install the DCB(-) and DCB(+) power cables and connection bolts on the capacitor bus bars (see Figure 139 on page 283). Using a torque wrench and a hex key socket, tighten the bolts to 164 lb-in (18.5 N • m).
20. Install the (+) bus connector bolt (see Figure 139 on page 283). Using a torque wrench and hex key socket, tighten the bolt to 164 lb-in (18.5 N • m).
21. Install the bus capacitor fuse and two screws (see Figure 139 on page 283). Using a torque wrench and a hex key socket, tighten the two screws to 323 lb-in (36.5 N • m).
22. Install the plexiglass shield. Using a drive socket, install and tighten the two screws which hold it in place (see Figure 139 on page 283).

Removing the Control Power Transformer

This procedure explains how to remove the control power transformer from the following drive controllers:

Drive Controller No.	Transformer Assembly No.
ATV66C10N4	VY1-ADA606
ATV66C13N4	
ATV66C15N4	
ATV66C19N4	

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- 1/4” drive metric socket set, 5.5 to 14 mm
- Set of magnetized flat blade screw drivers
- Metric hex key set, 2 to 14mm
- 12” (1/4” drive) socket extension

With the drive controller door open or removed:

1. Measure the bus voltage (if not already performed) as described in chapter 5 of this manual.
2. Using a drive socket, loosen and remove the two plexiglass shield screws (see Figure 139 on page 283). Remove the plexiglass shield.
3. Using a flat blade screw driver, loosen the right side terminal screws on TB3 (see Figure 142 on page 288). Remove the right side control wires from the terminal block assembly.
4. Using a hex key wrench, loosen and remove the DCB(-) and DCB(+) control wire connection screws (Figure 139 on page 283). Pull the wires back out of the way.

5. Using a hex key wrench, loosen and remove the DCB(-), DCB(+), RB(-), and RB(+) power wire connection screws (see Figure 139 on page 283).

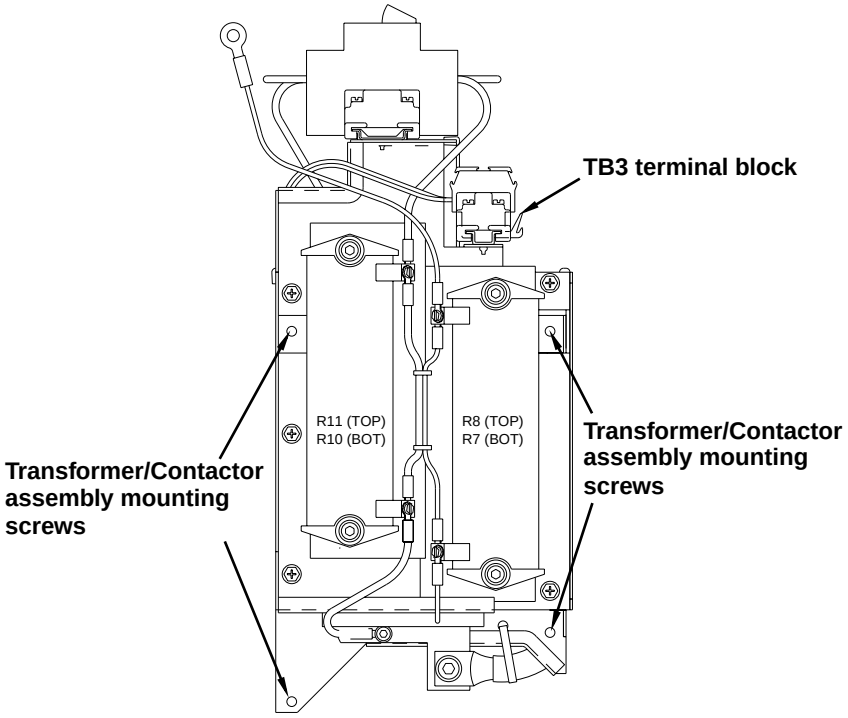


Figure 142: Transformer/Contactor Assembly Front View

6. While supporting the transformer / contactor assembly, use a drive socket with a 12" extension to loosen and remove the four transformer / contactor assembly mounting screws (see Figure 142 on page 288). Remove the assembly.
7. Using a flat blade screw driver, loosen and remove the screws for the T1-X1, T1-X2, T1-X3, T1-H1, and T1-H2 connections on the control power transformer (see Figure 143 on page 289).
8. Using a drive socket, loosen and remove the four transformer mounting nuts and washers. Remove the transformer (see Figure 143 on page 289).

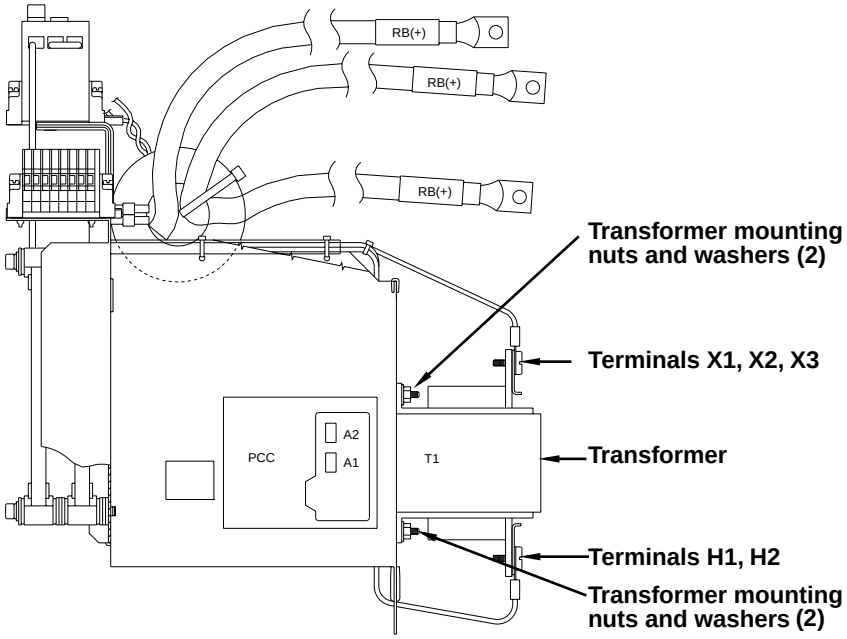


Figure 143: Transformer/Contactor Assembly, Side View

Installing the Control Power Transformer

This procedure explains how to install the control power transformer in the following drive controllers:

Drive Controller No.	Control Power Transformer No.
ATV66C10N4	VY1-ADA606
ATV66C13N4	
ATV66C15N4	
ATV66C19N4	

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- 1/4” drive metric socket set. 5.5 to 14 mm
- A set of magnetized flat blade screw drivers
- Torque wrench, set to164 lb-in (18.5 N • m)
- Electrical tape
- Metric hex key sockets for torque wrench, 2 to 14 mm
- 12” (1/4” drive) socket extension
- Metric drive sockets for torque wrench

To install the transformer:

1. Mount the control power transformer on the back on the transformer/contactor assembly (see Figure 143 on page 289). Orient the transformer such that the X1, X2, and X3 transformer terminals are facing the top of the transformer/contactor assembly.
2. Using a drive socket, install and tighten the four transformer mounting nuts and washers.

3. Make the transformer connections as shown in Table 16. Using a flat blade screw driver install and tighten the connection screws.

Table 16:Transformer Connections - ATV66C10N4 to C19N4

Wire Designation	Transformer Connection Point
T1-X1	X1
T1-X2	X2
T1-X3	X3
T1-H1	H1
T1-H2	H2

NOTE: Before performing step 4, make the following preparations. Cut off two 3/4 inch pieces of electrical tape. Place these pieces of tape where they will be easily accessible when installing the transformer/contactor assembly.

4. Position the transformer / contactor assembly over the four mounting holes. While supporting the transformer / contactor assembly with one hand, install the two bottom transformer / contactor assembly mounting screws (see Figure 142 on page 288) with other hand. Use a drive socket with a 12" extension to tighten the two screws.
5. While still supporting the top of the assembly with one hand, use the other hand to put one of the pieces of tape across the socket at the end of the 12" extension piece (the tape will help hold the screw in the socket). Insert one of the mounting screw heads into the socket. Thread the 12" extension piece with socket and screw through the upper left opening in the transformer / contactor assembly. Using the drive socket, install and tighten the transformer / contactor assembly mounting screw (Figure 142 on page 288).
6. Perform step 5 again for the upper right transformer / contactor assembly mounting screw.
7. Using a torque wrench, a 12” socket extension and a metric socket, torque the 4 transformer / contactor assembly mounting screws to 35.4 lb-in (4 N • m).
8. Using a torque wrench and hex key socket, install and tighten the power wire connection screws for the DCB(-) and DCB(+) power cables to 164 lb-in (18.5 N • m) (see Figure 139 on page 283).
9. Using a torque wrench and hex key socket, install and tighten the power wire connection screws for the RB(-) and RB(+) power cables to 74.3 lb-in (8.4 N • m) (see Figure 139 on page 283).
10. Position the two DCB(-) control wires over their mounting hole on the (-) capacitor bus bar plate. Using a torque wrench and hex key socket, install and tighten the mounting screw to 40.7 lb-in (4.6 N • m) (see Figure 139 on page 283).
11. Position the one DCB(+) control wire over its mounting hole on the (+) capacitor bus bar plate. Using a torque wrench and hex key socket, install and tighten the mounting screw to 40.7 lb-in (4.6 N • m) (see Figure 139 on page 283).
12. Install the TB3 control wires into their respective locations on the TB3 terminal block assembly (see Figure 142 on page 288). Using a flat blade screw driver, tighten the TB3 terminal screws.
13. Using a drive socket, install and tighten the two plexiglass shield screws while holding the plexiglass shield in place (see Figure 139 on page 283).

Replacing the Stirring Fan

This procedure explains how to replace the stirring fan for the following drive controllers:

Drive Controller No.	Stirring Fan No.
ATV66C10N4 ATV66C13N4 ATV66C15N4 ATV66C19N4	VZ3-V667

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- STORED ENERGY

- If controller is damaged, voltage may be present on metal can capacitors and snubber board capacitors (see Figure 127 on page 249).
- Always check for presence of voltage using voltmeter set to 1000 VDC scale.
- If voltage is present, allow voltmeter to discharge capacitor stored charge. Refer to “PROCEDURE 2: DISCHARGING STORED ENERGY IN CAPACITORS” in chapter 5 for further information.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of magnetized flat blade screw drivers
- 4” Needle nose pliers
- Metric hex key set, 2 to 14 mm
- 1/4” drive metric socket set, 5.5 to 14 mm

With drive controller door open or removed (refer to Figure 119 on page 235 for location of fan):

NOTE: Do not disturb white laminated insulating paper around stirring fan. If disturbed be sure to replace in original position. Do not operate drive controller if paper is damaged or scratched. If sheet is damaged, replace.

1. Measure the bus voltage (if not already performed) as described in chapter 5 of this manual.
2. Using needle nose pliers, carefully disconnect the two connectors on the right side of the fan.

3. Using a flat blade screw driver, loosen the two screws holding the hinged assembly in place. Swing the hinged assembly out to the right.
4. Using a hex key wrench or a drive socket, loosen and remove the two bolts on either side of the bottom of the fan.
5. Remove the old fan.
6. Transfer the finger guard from the old fan on the new fan.
7. Install the new fan with the airflow indicator pointing up. Using a drive socket or hex key wrench, install and tighten the two bolts on either side of the bottom of the fan.
8. Using needle nose pliers, carefully connect the two connectors on the right side of the fan. This is an AC fan. The two fan leads can be connected to either terminal.
9. Swing the hinged assembly back to its normal position and using a flat blade screw driver, tighten the two screws.

Removing the Main Fan

This procedure explains how to remove the main fan and fan capacitor from the following drive controllers:

Drive Controller No.	Fan and Capacitor No.
ATV66C10N4	VZ3-V666
ATV66C13N4	
ATV66C15N4	
ATV66C19N4	

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

⚠ DANGER

HAZARDOUS VOLTAGE -- STORED ENERGY

- If controller is damaged, voltage may be present on metal can capacitors and snubber board capacitors (see Figure 127 on page 249).
- Always check for presence of voltage using voltmeter set to 1000 VDC scale.
- If voltage is present, allow voltmeter to discharge capacitor stored charge. Refer to “PROCEDURE 2: DISCHARGING STORED ENERGY IN CAPACITORS” in chapter 5 for further information.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- 4” Needle nose pliers
- A set of magnetized flat blade screw drivers
- 1/4” metric drive socket set, 5.5 to 14 mm

With the drive controller door open or removed and with access to the bottom of the drive controller:

1. Measure the bus voltage (if not already performed) as described in chapter 5 of this manual.
2. Using needle nose pliers, disconnect the C34-A and C34-B connectors from the left side of the fan capacitor assembly (see Figure 118 on page 234).
3. Using a flat blade screw driver, loosen the left side terminal connectors 2 and 3 on terminal block TB1. Remove the blue wire from terminal 2 and the black wire from terminal 3 (see Figure 118 on page 234).
4. Using a flat blade screw driver, loosen the right side terminal connectors 1, 2, and 3 on terminal block TB1. Remove the blue, black, and brown wires (see Figure 118 on page 234).
5. Using a drive socket, loosen and remove the two mounting nuts and lock washers located at the top of the fan capacitor assembly (see Figure 118 on page 234). The filter board assembly is also secured with the same mounting nuts. Remove the fan capacitor assembly.
6. Using a drive socket, loosen and remove the ten screws which hold the bottom drive controller cover in place. Remove the bottom cover (see Figure 118 on page 234).
7. Loosen the black wire grommet (if present). Pull the main fan leads through the fan access hole (see Figure 118).
8. Using a drive socket, loosen and remove the three screws which hold the fan assembly in place.
9. Lift up fan and pull off of mounting ledge. Remove the old fan from the drive controller.

   NOTE: The fan capacitor assembly contains two capacitors. The top capacitor is used in conjunction with the filter board assembly. The bottom capacitor is the main fan capacitor.

10. Using a drive socket, remove the main fan capacitor mounting nut and washers. Remove the main fan capacitor from the fan capacitor assembly.

Installing the Main Fan

This procedure explains how to install the main fan and fan capacitor in the following drive controllers:

Drive Controller No.	Fan and Capacitor No.
ATV66C10N4	VZ3-V666
ATV66C13N4	
ATV66C15N4	
ATV66C19N4	

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- 4” Needle nose pliers
- A set of magnetized flat blade screw drivers
- 1/4” metric drive socket set, 5.5 to 14 mm

For the main fan and capacitor assembly to be installed:

1. Install the new main fan capacitor in the fan capacitor assembly. Using a drive socket, install and tighten the mounting washers and nut.
2. Slide the fan capacitor assembly and the filter board assembly onto their mounting screws in the drive controller. Using a drive socket, install and tighten the mounting washers and nuts (see Figure 118 on page 234).
3. Using needle nose pliers, connect the C34-A and C34-B connectors on the left side of the fan capacitor assembly (see Figure 118 on page 234).
4. Insert the blue main fan capacitor wire into the left side of terminal 2 of TB1. Insert the brown main fan capacitor wire into the left side of terminal 3 of TB1. Ensure that all wires that were previously installed in terminals 2 and 3 with the two fan wires are reinserted. Using a flat blade screw driver, tighten the two terminals (see Figure 118 on page 234).
5. Install the new main fan into the bottom of the drive controller (see Figure 118 on page 234).
6. Using a drive socket, install and tighten the three main fan mounting screws.
7. Route the three main fan wires through the fan access hole into the drive controller. If a black wire grommet is present, tighten grommet.
8. Install the blue, black, and brown wires into the right side of terminal blocks 1, 2, and 3 respectively of TB1. Using a flat blade screw driver, tighten the three terminal (see Figure 118 on page 234).
9. Install the bottom drive controller cover. Using a drive socket, install and tighten the ten bottom cover mounting screws.

Replacing the Discharge Resistor

This procedure explains how to replace the discharge resistor for the following drive controllers:

Drive Controller No.	Discharge Resistor No.
ATV66C10N4 ATV66C13N4 ATV66C15N4 ATV66C19N4	VZ3-R640W135

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow "PROCEDURE 1: BUS VOLTAGE MEASUREMENT" in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

Read "WORK PRACTICE PRECAUTIONS" on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of magnetized flat blade screw drivers
- Torque wrench, set to 35.4 lb-in (4.0 N • m)
- Flat blade screw driver sockets for torque wrench
- Metric hex key set, 2 to 14 mm
- Metric hex key sockets for torque wrench

With the drive controller door open or removed:

1. Measure the bus voltage (if not already performed) as described in chapter 5 of this manual.
2. Using a flat blade screw driver, loosen and remove the two wire connection screws on resistor R7 and the two wire connection screws on resistor R8 (see Figure 145 on page 297).
3. Using a hex key wrench, loosen the two precharge resistors mounting screws (see Figure 145 on page 297). Remove the two precharge resistors still stacked together. Record the arrangement of washers and use this as a guide when assembling the new precharge resistor assembly.
4. Stack the two new precharge resistors in the arrangement noted from step 2.
5. Place the new discharge resistor assembly in the drive controller with the white laminated insulating paper behind the assembly. Orient assembly with wire connection tabs on left.

   NOTE: Be careful not to scratch white laminated insulating paper when installing discharge resistor assembly. If the paper is torn or scratched, do not operate drive controller. Replace insulating paper.

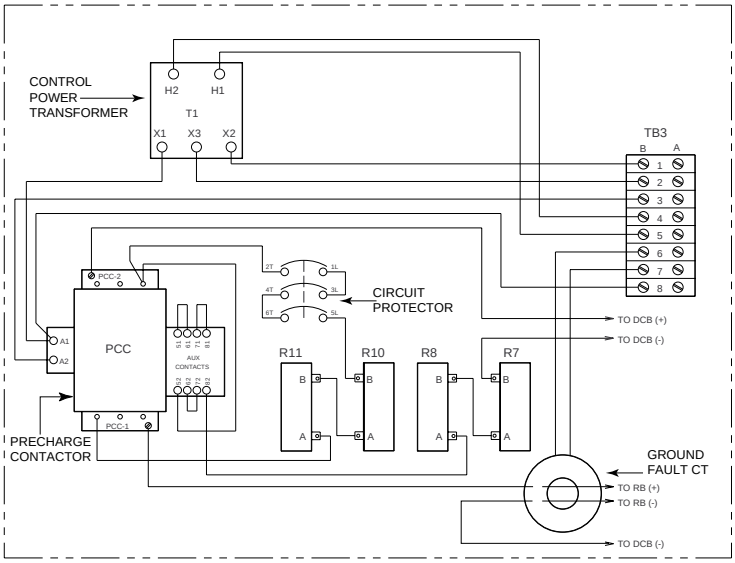


Figure 144: Wiring Diagram for Control Power Transformer, Precharge Contactor and Auxiliary Contact Block, Precharge Resistors, Discharge Resistors, Circuit Protector and Ground Fault CT

6. Using a torque wrench and a hex key socket, tighten the two discharge resistor mounting screws to 35.4 lb-in (4.0 N • m).
7. Install jumper between wire connection tabs R7-A (bottom resistor) and R8-B (top resistor) (see Figure 144 on page 296). Using a torque wrench and flat blade screw driver socket, tighten the wire connection screws to 8.9 lb-in (1.0 N • m).
8. Install R7-B and R8-A wires (see Figure 144 on page 296). Using a torque wrench with flat blade screw driver socket, tighten the wire connection screws to 8.9 lb-in (1.0 N • m).

Replacing the Precharge Resistor

This procedure explains how to replace the precharge resistor for the following drive controllers:

Drive Controller No.	Precharge Resistor No.
ATV66C10N4	VZ3-R010W270
ATV66C13N4	
ATV66C15N4	
ATV66C19N4	

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- A set of magnetized flat blade screw drivers
- Torque wrench, set to 35.4 lb-in (4.0 N • m)
- Metric hex key set, 2 to 14 mm
- Flat blade screw driver socket for torque wrench
- Metric hex key sockets for torque wrench

With the drive controller door open or removed:

1. Measure the bus voltage (if not already performed) as described in chapter 5 of this manual.
2. Using a flat blade screw driver, loosen and remove the two wire connection screws on resistor R10 and the two wire connection screws on resistor R11 (see Figure 145 on page 297).

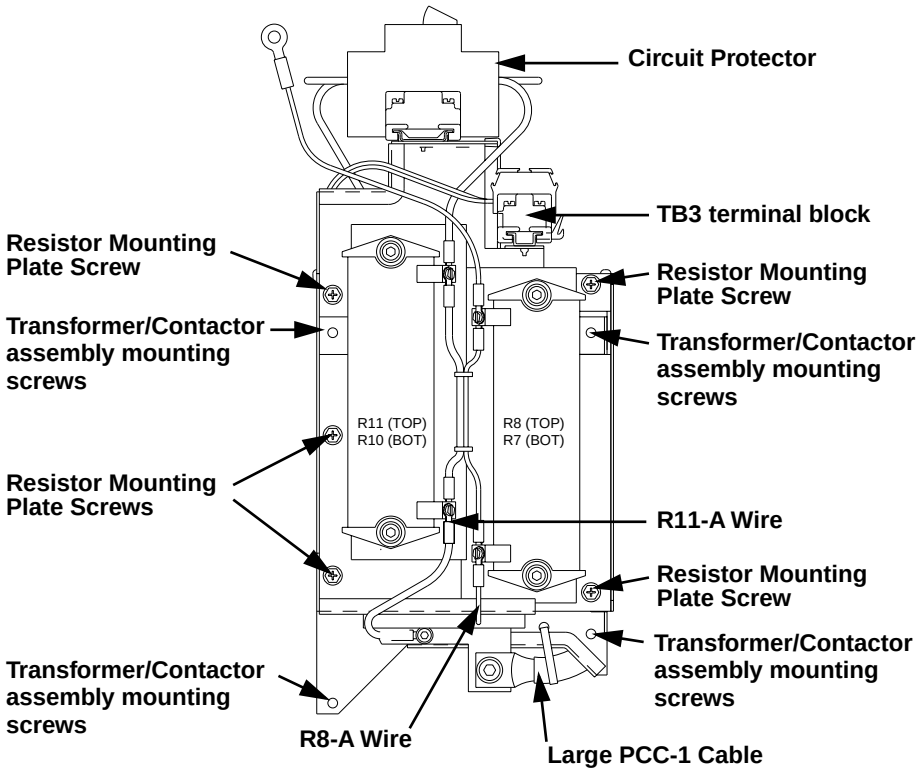


Figure 145: Transformer/Contactor Assembly Front View

3. Using a hex key wrench, loosen the two precharge resistor mounting screws (see Figure 145 on page 297). Remove the two precharge resistors still stacked together. Record the arrangement of washers and use this as a guide when assembling the new precharge resistor assembly.
4. Stack the two new precharge resistors in the arrangement noted from step 2.
5. Place the new precharge resistor assembly in the drive controller with the white laminated insulating paper behind the assembly. Orient assembly with wire connection screws on right.

NOTE: Be careful not to scratch white laminated insulating paper when installing precharge resistor assembly. If the paper is torn or scratched, do not operate drive controller. Replace the insulating paper.

6. Using torque wrench and a hex key socket, tighten the two discharge resistor mounting screws to 35.4 lb-in (4.0 N • m).
7. Install jumper between wire connection tabs R10-A (bottom resistor) and R11-B (top resistor) (see Figure 144 on page 296). Using a torque wrench and flat blade screw driver socket, tighten the wire connection screws to 8.9 lb-in (1.0 N • m).
8. Install R10-B and R11-A wires (see Figure 144 on page 296). Using a torque wrench with flat blade screw driver socket, tighten the wire connection screws to 8.9 lb-in (1.0 N • m).

Replacing the Contactor Auxiliary Contact Block

This procedure explains how to replace the auxiliary contact block for the following drive controllers:

Drive Controller No.	Auxiliary Contact Block No.
ATV66C10N4	LA1DN04
ATV66C13N4	
ATV66C15N4	
ATV66C19N4	

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

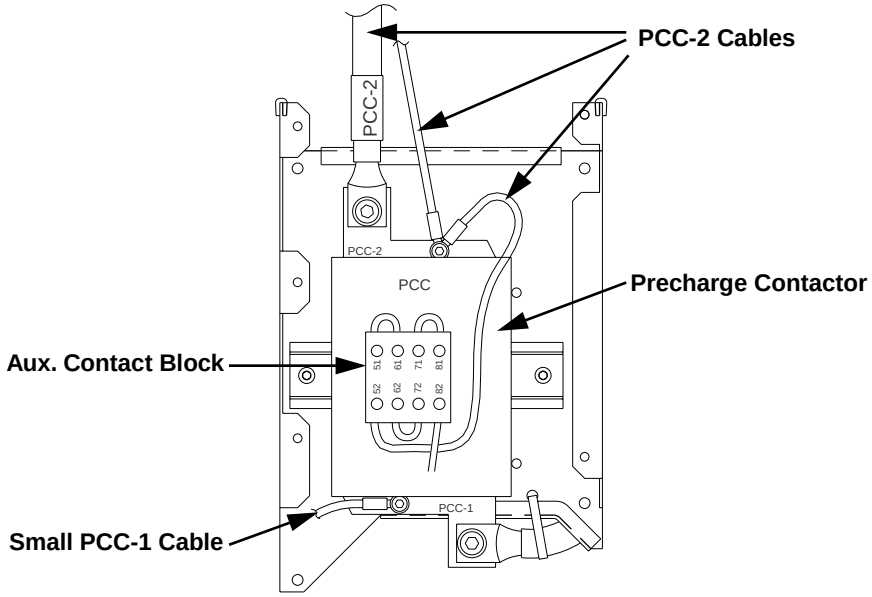
The tools needed for this procedure are:

- 1/4”drive metric socket set, 5.5 to 14 mm
- A set of magnetized flat blade screw drivers
- Torque wrench, set to 35.4 lb-in (4.0 N • m)
- Flat blade screw driver sockets for torque wrench
- Metric drive sockets for torque wrench

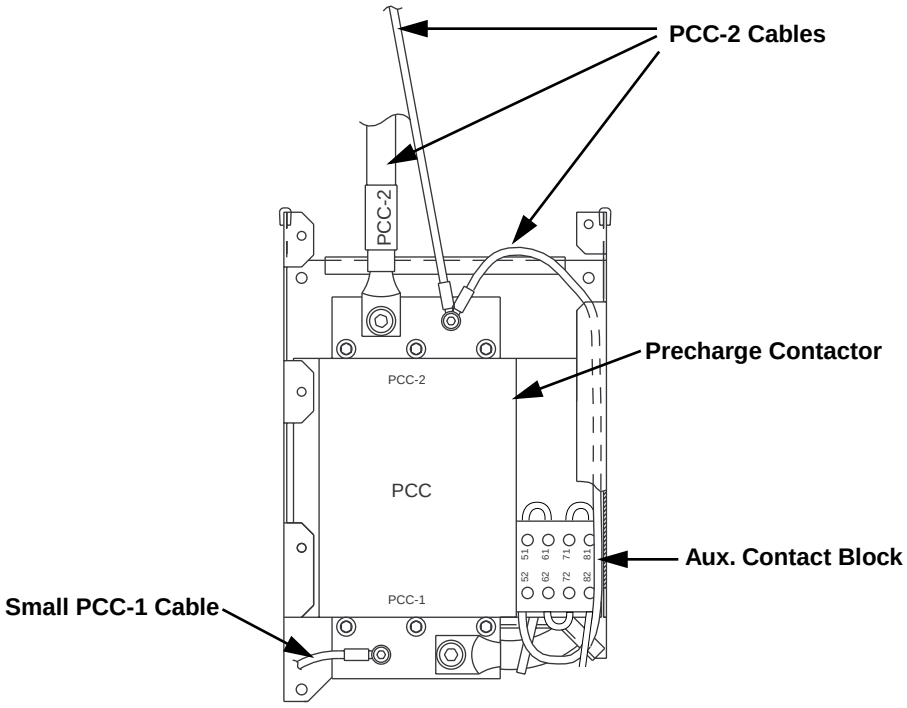
With the drive controller door open or removed:

1. Measure the bus voltage (if not already performed) as described in chapter 5 of this manual.
2. Using a flat blade screw driver, remove the screws which connect the R11-A and R8-A wires to the resistors (see Figure 145 on page 297).
3. Using a drive socket, loosen and remove the five resistor mounting plate screws. Lift the bottom of the resistor plate upwards to expose the precharge contactor (see Figure 145 on page 297). Secure resistor plate with wire ties or some other restraining device.

4. Using a flat blade screw driver, remove the AUX-51 / AUX-61 jumper; remove the AUX-71 / AUX-81 jumper; remove the AUX-62 / AUX-72 jumper; remove AUX-52 and AUX-82 control wires from the auxiliary contact block. Save the three jumpers for later use (see Figure 146 on page 300).
5. Using a flat blade screw driver, lift and hold the auxiliary contact block release lever at the top of the auxiliary contact block. While holding the release lever up, slide the auxiliary contact block upwards and remove from the contactor assembly.
6. Slide the new auxiliary contact block into place on the contactor assembly. Make sure that the release lever for the contact block locks into place (see Figure 146 on page 300).
7. Install the three saved jumpers on the auxiliary contact block: AUX-51 / AUX-61 jumper; AUX-71 / AUX-81 jumper; and AUX-62 / AUX-72 jumper. The jumpers should be installed into their marked locations on the auxiliary contact block. Install the AUX-52 and AUX-82 control wires into their marked locations on the auxiliary contact block (see Figure 144 on page 296 and Figure 145 on page 297).
8. Replace the resistor plate assembly into its mounting location on the front of the transformer / contactor assembly. Using a torque wrench with a drive socket, install and tighten the five mounting screws to 35.4 lb-in (4.0 N • m) (see Figure 145 on page 297).
9. Align the R11-A and R8-A wire connectors over their mounting locations on the two resistors. Using a torque wrench and flat blade screw driver socket, install and tighten the two mounting screws to 8.9 lb-in (1.0 N • m) (see Figure 144 on page 296 and Figure 145 on page 297).



Drive Controllers ATV66C10N4 and C13N4



Drive Controllers ATV66C15N4 and C19N4

Figure 146: Transformer/Contactor Assembly Inside View

Removing the Precharge Contactor

This procedure explains how to replace the precharge contactor for the following drive controllers:

Drive Controller No.	Precharge Contactor No.
ATV66C10N4 ATV66C13N4	VY1-A661C1010
ATV66C15N4 ATV66C19N4	VY1-A661C1510

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Set of magnetized flat blade screw drivers
- Metric hex key set, 2 to 14mm
- Set of open / box end wrenches, 5.5 to 19 mm
- 1 / 4” drive metric socket set, 5.5 to 14 mm
- 12” (1 / 4” drive) socket extension

With the drive controller door open or removed:

1. Measure the bus voltage (if not already performed) as described in chapter 5 of this manual.
2. Using a drive socket, loosen and remove the two plexiglass shield screws (see Figure 139 on page 283). Remove the plexiglass shield.
3. Using a flat blade screw driver, loosen the right side terminal screws on TB3 (see Figure 145 on page 297). Remove the right side control wires from the terminal block assembly.
4. Using a hex key wrench, loosen and remove the DCB(-) and DCB(+) control wire connection screws (Figure 139 on page 283). Pull the wires back out of the way.
5. Using a hex key wrench, loosen and remove the DCB(-), DCB(+), RB(-), and RB(+) power wire connection screws (see Figure 139 on page 283).
6. While supporting the transformer / contactor assembly, use a drive socket with a 12" extension to loosen and remove the four transformer / contactor assembly mounting screws (see Figure 145 on page 297). Remove the assembly.
7. Using a flat blade screw driver, remove the screws which connect the R11-A and R8-A wires to the resistors (see Figure 145 on page 297).
8. Using a hex key wrench, loosen and remove the bolt holding the large PCC-1 cable at the bottom of the precharge contactor. Pull the large PCC-1 cable through the wire tie in the back of the transformer / contactor assembly (see Figure 145 on page 297).

9. Using a drive socket, loosen and remove the five resistor mounting plate screws. Lift the resistor plate assembly out and swing over to the left to expose the precharge contactor (see Figure 145 on page 297).
10. Using a hex key wrench, loosen and remove the three screws holding the PCC-2 cables at the top of the precharge contactor. Pull the PCC-2 cables back out of the way (see Figure 146 on page 300).
11. Using a flat blade screw driver, loosen the A1 and A2 coil module terminal screws. Pull the two PCC-A1 cables and one PCC-A2 cable out of the terminals (see Figure 144 on page 296).
12. **For ATV66C10N4 and C13N4 drive controllers:**
    Pull on locking pull tab at bottom of precharge contactor and lift contactor away from the mounting rail.
    For ATV66C15N4 and C19N4 drive controllers:
    Using an open ended metric wrench, loosen and remove the four contactor mounting nuts. Slide the contactor assembly forward off of the mounting screws.
13. Remove the precharge contactor assembly through the bottom of the transformer/contactor mounting plate.
14. Using a hex key wrench, loosen and remove the screw holding the small PCC-1 cable at the bottom of the precharge contactor (see Figure 146 on page 300). Save the cable for later use.
15. Using a flat blade screw driver, remove AUX-52 and AUX-82 control wires from the auxiliary contact block.
16. **For ATV66C10N4 and C13N4 drive controllers:**
    Using a flat blade screw driver, loosen the three top precharge contactor terminal screws. Remove the terminal link and save for use on new precharge contactor. Repeat this step for the removal of the bottom terminal link.
    For ATV66C15N4 and C19N4 drive controllers:
    Using a hex key wrench, loosen and remove the three screws for the top terminal link. Save the screws and terminal link for later use. Repeat this step for the removal of the bottom terminal link.
17. Using a flat blade screw driver, lift and hold the auxiliary contact block release lever at the top of the auxiliary contact block. While holding the release lever up, slide the auxiliary contact block upwards and remove from the precharge contactor assembly. Save contact block for use on new precharge contactor.
18. Discard the old precharge contactor assembly.

Installing the Precharge Contactor

This procedure explains how to install the precharge contactor in the following drive controllers:

Drive Controller No.	Precharge Contactor No.
ATV66C10N4 ATV66C13N4	VY1-A661C1010
ATV66C15N4 ATV66C19N4	VY1-A661C1510

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Set of magnetized flat blade screw drivers
- Metric drive sockets for torque wrench
- Torque wrench, set to 164 lb-in (4.6 N • m)
- 1/4" drive metric socket set, 5.5 to 14 mm
- 12" (1/4" drive) socket extension
- Metric hex key sockets for torque wrench, 2 to 14mm
- Flat blade screw driver sockets for torque wrench
- Electrical tape
- Set of open/box end wrenches, 5.5 to 19 mm

To install the precharge contactor:

1. Slide the saved auxiliary contact block, LA1DN04, into place on the new precharge contactor. Make sure that the locking lever for the contact block locks into place (see Figure 146 on page 300).
2. **For ATV66C15N4 and C19N4 drive controllers:**
   Slide the new contactor coil module, into place on the side of the new precharge contactor assembly. Make sure that the lock lever for the coil module locks into place (see Figure 146 on page 300).
3. **For ATV66C10N4 and C13N4 drive controllers:**
   Insert the three prongs from one of the saved terminal links into the top three terminals of the new precharge contactor (see Figure 146 on page 300). Using a torque wrench with flat blade screw driver socket, tighten the terminal screws to 74.3 lb-in (8.4 N • m). Repeat for the bottom terminal link.
   For ATV66C15N4 and C19N4 drive controllers:
   While holding one of the new terminal links in place over the terminal link mounting holes on the top of the new precharge contactor assembly, use a torque wrench with hex key socket to install and tighten the three terminal link mounting screws to 74.3 lb-in (8.4 N • m) (see Figure 146 on page 300). Repeat for the bottom terminal link.
4. Install the AUX-52 and AUX-82 control wires into their marked locations on the auxiliary contact block (see Figure 144 on page 296 and Figure 145 on page 297).
5. Position the small PCC-1 cable over the bottom left mounting hole of the bottom precharge contactor terminal link. Using a torque wrench and hex key socket, install and tighten the mounting screw to 40.7 lb-in (4.6 N • m) (see Figure 146 on page 300).
6. Slide the precharge contactor assembly through the bottom of the transformer/contactor mounting plate.
   For ATV66C10N4 and C13N4 drive controllers:
   Position the precharge contactor over the mounting rail. Pull on locking tab at bottom of contactor and snap contactor into place on the mounting rail. Release tab.
   For ATV66C15N4 and C19N4 drive controllers:
   Slide the precharge contactor assembly mounting holes over the four mounting screws. Using an open ended metric wrench, install and tighten the four contactor mounting nuts.
7. Place the two PCC-A1 cables and one PCC-A2 cable into their respective terminals on the precharge contactor coil module. Using a flat blade screw driver, tighten the A1 and A2 terminal screws (see Figure 144 on page 296).
8. Position the three PCC-2 cables over the terminal link mounting holes at the top of the precharge contactor. Using a torque wrench and hex key socket,

install and tighten the large mounting screw to 164 lb-in (18.5 N • m). Install and tighten the small screw to 40.7 lb-in (4.6 N • m).

9. Replace the resistor plate assembly into its mounting location on the front of the transformer / contactor assembly. Using a torque wrench with a drive socket, install and tighten the five mounting screws to 35.4 lb-in (4.0 N • m) (see Figure 145 on page 297).
10. Put the large PCC-1 cable through the wire tie in the back of the transformer / contactor assembly. Position the large PCC-1 cable over the mounting hole at the bottom of the contactor. Using a torque wrench and hex key socket, install and tighten the mounting bolt to 164 lb-in (18.5 N • m) (see Figure 144 on page 296 and Figure 145 on page 297).
11. Align the R11-A and R8-A wire connectors over their mounting locations on the two resistors. Using a torque wrench and flat blade screw driver socket, install and tighten the two mounting screws to 8.9 lb-in (1.0 N • m) (see Figure 144 on page 296 and Figure 145 on page 297).

    NOTE: Before performing step 12, make the following preparations. Cut off two 3/4 inch pieces of electrical tape. Place these pieces of tape where they will be easily accessible when installing the transformer/contactor assembly.

12. Position the transformer / contactor assembly over the four mounting holes. While supporting the transformer / contactor assembly with one hand, install the two bottom transformer / contactor assembly mounting screws (see Figure 142 on page 288) with your other hand. Use a drive socket with a 12" extension to tighten the two screws.
13. While still supporting the top of the assembly with one hand, use the other hand to put one of the pieces of tape across the socket at the end of the 12" extension piece (the tape will help hold the screw in the socket). Insert one of the mounting screw heads into the socket. Thread the 12" extension piece with socket and screw through the upper left opening in the transformer / contactor assembly. Using the drive socket, install and tighten the transformer / contactor assembly mounting screw (see Figure 142 on page 288).
14. Perform step 13 again for the upper right transformer / contactor assembly mounting screw.
15. Using a torque wrench, a 12” socket extension and a metric socket, torque the four transformer / contactor assembly mounting screw to 35.4 lb-in (4.0 N • m).
16. Using a torque wrench and hex key socket, install and tighten the power wire connection screws for the DCB(-) and DCB(+) power cables to 164 lb-in (18.5 N • m) (see Figure 139 on page 283).
17. Using a torque wrench and hex key socket, install and tighten the power wire connection screws for the RB(-) and RB(+) power cables to 40.7 lb-in (4.6 N • m) (see Figure 139 on page 283).
18. Position the two DCB(-) control wires over their mounting hole on the (-) capacitor bus bar plate. Using a torque wrench and hex key socket, install and tighten the mounting screw to 40.7 lb-in (4.6 N • m) (see Figure 139 on page 283).
19. Position the one DCB(+) control wire over its mounting hole on the (+) capacitor bus bar plate. Using a torque wrench and hex key socket, install and tighten the mounting screw to 40.7 lb-in (4.6 N • m) (see Figure 139 on page 283).
20. Install the TB3 control wires into their respective locations on the TB3 terminal block assembly (see Figure 142 on page 288). Using a flat blade screw driver, tighten the TB3 terminal screws.

21. Using a drive socket, install and tighten the two plexiglass shield screws while holding the plexiglass shield in place (see Figure 139 on page 283).

Replacing the Circuit Protector

This procedure explains how to replace the circuit protector for the following drive controllers:

Drive Controller No.	Circuit Protector No.
ATV66C10N4	GV2M10
ATV66C13N4	
ATV66C15N4	
ATV66C19N4	

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow "PROCEDURE 1: BUS VOLTAGE MEASUREMENT" in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

Read "WORK PRACTICE PRECAUTIONS" on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Set of magnetized flat blade screw drivers
- Torque wrench, set to 15 lb-in (1.7 N • m)
- Flat blade screw drivers for torque wrench

With the drive controller door open or removed:

1. Measure the bus voltage (if not already performed) as described in chapter 5 of this manual.
2. Using a flat blade screw driver, loosen the six terminal screws on the circuit protector. Remove the two wires and two jumpers from terminals (see Figure 145 on page 297). Save the jumpers for later use.
3. Using a flat blade screw driver, loosen the two end clamp mounting screws. Slide the end clamp and circuit protector off of the mounting rail.
4. Slide the new circuit protector onto the mounting rail with the START button facing outwards (see Figure 145 on page 297).
5. Slide the end clamp onto the mounting rail. Using a flat blade screw driver, tighten the two end clamp mounting screws.
6. Install one of the saved jumpers between terminals 1L1 and 3L2 of the circuit protector. Install the second saved jumper between terminals 4T2 and 6T3 of the circuit protector. Using a torque wrench and flat blade screw driver socket, tighten the terminal screws to 15 lb-in (1.7 N • m).
7. Install the CKB-5L wire into the 5L3 terminal of the circuit protector. Install the CKB-2T into the 2T1 terminal of the circuit protector (see Figure 144 on page 296). Using a torque wrench and a flat blade screw driver socket, tighten the terminal screws to 15 lb-in (1.7 N • m).

Replacing the Control Fuses

This procedure explains how to replace the control fuses for the following drive controllers:

Drive Controller No.	Control Fuses No.
ATV66C10N4 ATV66C13N4 ATV66C15N4 ATV66C19N4	DF3CF00501

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

Read “WORK PRACTICE PRECAUTIONS” on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

With the drive controller door open or removed:

1. Measure the bus voltage (if not already performed) as described in chapter 5 of this manual.
2. Pull FU5 and FU6 fuse holders from their sockets (see Figure 118 on page 234).
3. Remove the two fuses from their fuse holders.
4. Install the two new fuses into the FU5 and FU6 fuse holders.
5. Insert the FU5 and FU6 fuse holders into their sockets (see Figure 118 on page 234).

Replacing the DC Bus Fuse

This procedure explains how to replace the DC bus fuse for the following drive controllers:

Drive Controller No.	DC Bus Fuse No.
ATV66C10N4 ATV66C13N4	VY1-ADF400V700
ATV66C15N4 ATV66C19N4	VY1-ADF450V700

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

Read "WORK PRACTICE PRECAUTIONS" on page 3 and the precaution statement on the inside cover of this manual before performing any maintenance or troubleshooting procedure.

The tools needed for this procedure are:

- Torque wrench, set to 323 lb-in (36.5 N • m).
- Metric hex key sockets for torque wrench, 2 to 14 mm
- Metric hex key set, 2 to 14 mm

With the drive controller door open or removed:

1. Measure the bus voltage (if not already performed) as described in chapter 5 of this manual.
2. Using a hex key wrench, loosen and remove the two DC bus fuse mounting screws (see Figure 118 on page 234). Remove the DC bus fuse.
3. Position the new DC bus fuse over the mounting holes in the drive controller (see Figure 118 on page 234).
4. Using a torque wrench and hex key socket, install and tighten the DC bus fuse mounting washers and screws to 323 lb-in (36.5 N • m) (see Figure 118 on page 234).

CHAPTER 5: BASIC PROCEDURES

PRECAUTIONS

This chapter contains basic procedures that are referenced throughout this manual. Read the safety statement below before proceeding with any maintenance or troubleshooting procedures.

⚠ DANGER

HAZARDOUS VOLTAGE

- Remove all power before performing this procedure.
- Follow "PROCEDURE 1: BUS VOLTAGE MEASUREMENT" in chapter 5.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

PROCEDURE 1: BUS VOLTAGE MEASUREMENT

⚠ DANGER

HAZARDOUS VOLTAGE

- This product contains energy storage devices. Read and understand this procedure before continuing. Measurement of DC bus capacitor voltage must be performed by qualified personnel.
- DC bus LED is not an accurate indication of absence of DC bus voltage.
- DO NOT short across capacitors or touch unshielded components or terminal strip screw connections with voltage present.
- Many parts in this drive controller, including printed wiring boards, operate at line voltage. DO NOT TOUCH. Use only electrically insulated tools.

Failure to follow these instructions will cause shock or burn, resulting in death or serious injury.

The PA and (–) terminals are located inside the drive controller (see Figure 147 on page 311). To measure the bus capacitor voltage:

1. Disconnect and verify all power is removed from drive controller.
2. Wait one minute to allow the DC bus to discharge.
3. Open the front cover of the drive controller.
4. Set the voltmeter to the 1000 VDC scale. Measure the bus capacitor voltage between the PA and (–)terminals to verify the DC voltage is less than 45 V. **Do not short across capacitor terminals with voltage present!**
5. If the bus capacitors are not fully discharged, – **do not operate the drive controller**.
6. If controller is to be serviced, refer to "PROCEDURE 2: DISCHARGING STORED ENERGY IN CAPACITORS" on page 311. Otherwise, contact your local Square D representative.

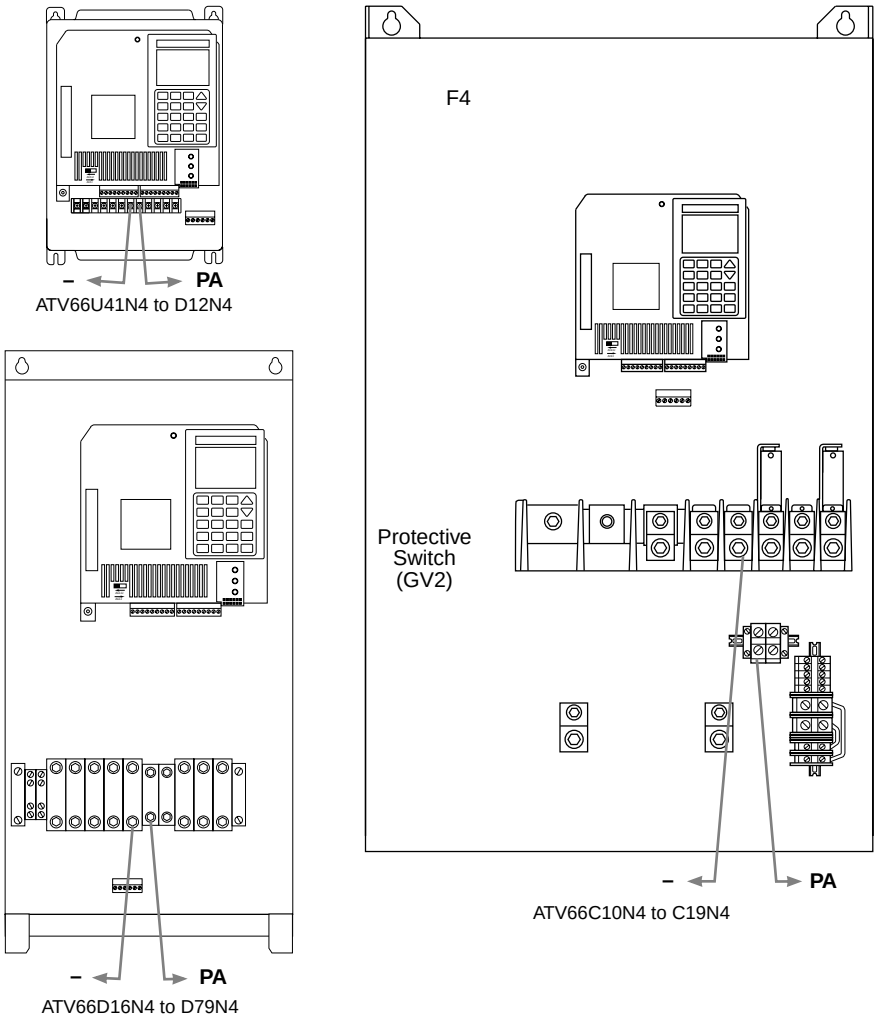


Figure 147: Location of PA and (–)Terminals: ATV66U41N4 to C19N4

PROCEDURE 2: DISCHARGING STORED ENERGY IN CAPACITORS

⚠ DANGER

HAZARDOUS VOLTAGE -- STORED ENERGY

Some capacitors used in drive controller store sufficient energy at voltage levels that can pose serious SHOCK, BURN or EXPLOSION effects if their terminal connections are contacted or capacitors are improperly discharged.

- Following procedure is for use only in event that normal capacitor discharge means are not operational.
- Read and understand following procedure before attempting to discharge stored energy in capacitor or group of capacitors.
- Wear protective equipment as recommended in “WORK PRACTICE PRECAUTIONS” on page 3 of this document.
- Use only electrically insulated tools.
- DO NOT short across capacitors or touch unshielded components or terminal strip screw connections with voltage present.

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

Capacitors are used throughout the ATV66 drive controllers as energy storage devices. Some of the capacitors can store potentially lethal amounts of energy at hazardous voltage levels during normal controller operation. Such capacitors are associated with the power circuit and include, but are not limited to, the following categories.

- DC bus capacitors found in all controllers.
- Line filter capacitors found on ATV66D33N4 through ATV66C19N4 controller filter boards.
- IGBT snubber capacitors found on ATV66C10N4 though ATV66C19N4 controller power and snubber boards.
- IGBT voltage clamping capacitors found on ATV66C10N4 through ATV66C19N4 controllers.

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

If voltage is present across any power circuit capacitor in the controller, use the following procedure to discharge stored energy.

- Capacitors whose capacitance is no greater than 10 microfarad --
  - — Capacitors which are included in this category are line filter capacitors, IGBT snubber capacitors and IGBT voltage clamping capacitors. Use a voltmeter set to the 1000 vdc scale to discharge the capacitors. It will take approximately 6.6 minutes for a 10 megohm input impedance voltmeter to discharge a 10 microfarad capacitor from 700v to less than to 50v. It will take approximately .66 minutes for a 1 megohm input impedance voltmeter to discharge a 10 microfarad capacitor from 700v to less than 50v.
  - — For snubber and voltage clamping capacitors found on the ATV66C10N4 through ATV66C19N4 controllers, connect the voltmeter directly across the capacitor terminals to discharge the stored energy. For line filter capacitors, connect the voltmeter as indicated in the “Removing the Filter Board” procedure found in Chapter 4 for the respective controller being serviced.

- Capacitors whose capacitance is greater than 10 microfarad --
  - — Capacitors which are included in this category are the DC bus capacitors found on all controllers. Discharge of these capacitors should occur automatically once power is removed from the controller. The discharge means for controllers ATV66U41N4 through ATV66D12N4 is the controller switching power supply. On larger controllers, the discharge is augmented with discharge resistors that are switched onto the DC bus when power is removed from the controller. The primary discharge means can discharge the DC bus to less than 50 V in 60 seconds.
  - — If the primary discharge means is not operating, a secondary discharge means consisting of balancing resistors can discharge the capacitors. The balancing resistors should discharge the controller capacitor bank to less than 50 V in 15 minutes.
  - — In the unlikely event that both the primary and secondary discharge means have failed, the capacitor can be discharged using a load bank constructed by connecting seven 120 V, 60 W lamps in series. The load bank should be connected across the capacitor until the capacitor voltage has been reduced to less than 50 V.

PROCEDURE 3: INPUT LINE VOLTAGE MEASUREMENT

To measure the input line voltage:

1. Perform Bus Voltage Measurement procedure (see page 310).
2. Attach meter leads to L1 and L2. Set voltmeter to the 600 VAC scale.
3. Reapply power and check for correct line voltage, per drive controller nameplate rating.
4. Remove power and repeat procedure for L2 and L3, and L1 and L3.
5. When all phases have been measured, remove power. Remove meter leads and reinstall covers.

PROCEDURE 4: CHECKING PERIPHERAL EQUIPMENT

The following equipment may need to be checked. Follow the manufacturer's procedures when checking this equipment.

1. A protective device such as fuse or circuit breaker may have tripped.
2. A switching device such as a contactor may not be closing at the correct time.
3. Conductors may require repair or replacement.
4. Connection of cables to the motor, DB resistor or connections to ground may need to be checked. Follow NEMA standard procedure WC-53.
5. Motor insulation may need to be checked. Follow NEMA standard procedure MG-1. Do not apply high voltage to drive controller output terminals (U/T1, V/T2 or W/T3). Do not connect high potential dielectric test equipment or insulation resistance tester to the drive controller since the test voltages utilized may damage the drive controller. Always disconnect the drive controller from the conductors or motor while performing such tests.

PROCEDURE 5: VALIDATION AFTER REPAIR

Conduct the validation after repair to ensure the drive controller is working properly prior to returning it to service.

1. Connect the controller to a test bench consisting of the following devices.

- A power source of appropriate current, voltage and frequency for the controller. The test bench power source should be equipped with a disconnect switch dimensioned for the power source and recommended input fuses of a type and current rating as indicated on the controller nameplate.
- A test motor whose voltage and frequency match the controller output rating. The motor power rating should be greater than 20% but not exceeding 100% of the controller power rating.
- A means for switching the logic inputs and providing an analog reference to the controller as described in VDOC06S304_.
- A dynamic braking resistor selected according to the selection chart in VDOC06S304_.

The test bench should be constructed in accordance with NFPA 70 and OSHA standards.

In the event that a test bench is not available, it may be possible to use the actual controller installation for check-out of the controller using some or all of the following procedures. Check the suitability of the actual installation prior to performing any procedures.

Read the “WORK PRACTICE PRECAUTIONS” in chapter 1 and the precaution statement on the inside cover of this manual before performing any of the following procedures.

2. From the drive initialization mode, reset the unit to the factory settings.
3. Perform the following:

a. Set the following:
— LI1 = 1 (run)
— LI2 = 1 (forward)
— AI1 + AI2 = 0 V (reference)
— The motor should remain stationary.

b. Set the following:
— LI1 = 1 (run)
— LI2 = 1 (forward)
— AI1 = 0 to 10 V (reference)
— The motor accelerates up to 60 Hz.

c. Set the following:
— LI1 = 0 (run)
— LI2 = 1 (forward)
— AI1 = 10 V (reference)
— The motor should freewheel to a stop.

d. Set the following:
— LI1 = 1 (run)
— LI3 = 1 (reverse)
— AI1 = 10 V (reference)
— The motor accelerates up to 60 Hz. in reverse.

e. Set the following:
— LI1 = 1 (run)

— LI2 = 1 (forward)
— LI3 = 1 (reverse)
— AI1 = 10V (reference)
— The motor speed remains constant.

f. Set the following:
— LI1 = 1 (run)
— LI2 = 1 (forward)
— LI3 = 0 (reverse)
— AI1 = 10 V (reference)
— The motor slows down and accelerates in the other direction.

g. Set the following:
— LI1 = 1 (run)
— LI2 = 0 (forward)
— LI3 = 0 (reverse)
— AI1 = 10 V (reference)
— The motor should stop in accordance with the deceleration ramp.

1. Reduce the ramp time to 0.1 seconds (acceleration and deceleration). During transient operation, check that the yellow indicator lamp on the controller is lit.
2. Check that the dynamic brake IGBT is operating correctly, either by noting that the current to the dynamic braking resistor is present, or by connecting the series combination of a LED and a 66 kΩ resistor in parallel with the dynamic brake resistor.
3. Check whether the motor current displayed on the keypad display is consistent with the nominal motor current. Measure the motor current at 5 Hz, 20 Hz, and 60 Hz.
4. Conduct an “endurance” test using the Process Cycle function available with the additional I/O card option (if installed). See User’s Manual VD0C06T306 for more information. Test the drive controller for about an hour.
5. Return to the total factory settings configuration.

PROCEDURE 6: CHECKING FAN OPERATION

All controllers are equipped with fans for cooling. Refer to VDOC06S304_ for air intake and exhaust locations on the controller. In addition, certain controllers are equipped with air stirring fans to maintain air flow over internal components.

To check the controller main heat sink fans, check the air flow from the controller exhaust louvers (free fan air flow values are found in VDOC06S304_ for each controller under the section entitled “Ventilation”). Absolute air velocity measurements are difficult and instrument dependent. However, a comparison of flow velocity between the controller under test and a properly operating controller can be done using hand-held anemometer. Pass the anemometer over the exhaust of each controller and compare the velocity readings. Generally, a controller with a damaged or blocked fan or air passage will have a significantly diminished flow rate which will be visible from the anemometer readings.

Stirring fans should be visually inspected. Look for damaged impellers, blocked or binding impellers, or incorrect installation following repair (check flow direction arrows).

PROCEDURE 7: CLEANING HEAT SINKSAND AIR PASSAGES

Cleaning heat sink passages generally requires some amount of controller disassembly. **All cleaning operations must be done with all power removed from the controller.**

- For ATV66U41 through ATV66D23 controllers, follow the procedures for fan replacement found in chapter 4 to remove the rear cover of the controller to expose the heat sinks. Use a compressed air jet applied to the exhaust openings of the heat sink to blow dirt and debris from the heat sink passages. Use a vacuum hose to clean debris blown into the fan(s).
- For ATV66D16 through ATV66D79 controllers, a compressed air jet should be applied to the exhaust opening of the controller to blow dirt and debris from the heat sink passages back through the fan.
- For ATV66C10 through ATV66C19 controllers, cleaning of the heat sink air passages is generally not required due to the normal operating velocity of the air. However, if cleaning is required, the main fan should be removed. Follow the procedures for fan replacement found in chapter 4 to remove the fan. Use a compressed air jet applied to the exhaust opening of the controller to blow dirt and debris from the heat sink passages. Debris blown into the fan cavity can be removed with a vacuum hose.

PROCEDURE 8: RUNNING THE DRIVE CONTROLLER FROM CONTROL POWER ONLY

To run the drive controller from control power only:

1. Disconnect and verify that all power is removed from the drive controller. Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” on page 310 of this manual.
2. Wait one minute to allow the DC bus to discharge.
3. Open the front cover of the drive controller.
4. Remove the CL1 and CL2 jumpers (refer to VDOC06S304_ “REMOVAL OF CL1 AND CL2 JUMPERS” for location and removal procedures) if present in the controller. For Class 8839 controllers, remove the conductors connected to the CL1 and CL2 controller terminals. Insulate and tape the disconnected conductors.
5. Remove the recommended user-supplied power fuses in series with the L1, L2, and L3 line terminals of the controller from their respective fuse holders.
6. Connect a #10 AWG, (600 V insulation) jumper conductor between CL1 terminal of the controller and the user-supplied L1 line-side power fuse terminal.
7. Connect a #10 AWG, (600V insulation) jumper conductor between CL2 terminal of the controller and the user-supplied L2 line-side power fuse terminal.
8. Close the drive controller cover.
9. Apply power to the controller.
10. After the drive controller displays “In-Phase Fail” on the keypad display screen, press “Enter” on the keypad display.
11. Go to the fault management screen (menu 7.4). Record the setting of the “In-Phase Fail” and “Output Phase Flt” functions. Change the “In-Phase Fail” and “Output Phase Flt” to “No”.
12. Remove and reapply power to clear fault condition. The controller is now ready for operation with control power applied.

    NOTE: If controller settings are changed during testing, record the original settings for restoration after completion of testing.

To restore the drive controller once testing is complete:

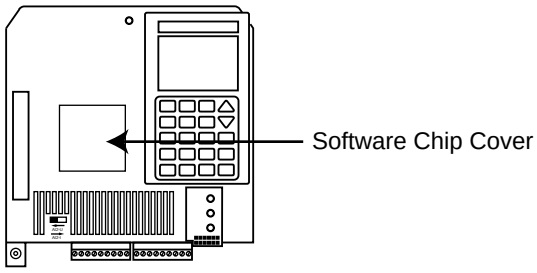
1. Disconnect and verify that all power is removed from the drive controller. Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” on page 310 of this manual.
2. Wait one minute to allow the DC bus to discharge.
3. Open the front cover of the drive controller.
4. Disconnect the jumper conductor between CL1 terminal of the controller and the user-supplied L1 line-side power fuse terminal.
5. Disconnect the jumper conductor between CL2 terminal of the controller and the user-supplied L2 line-side power fuse terminal.
6. Replace the CL1 and CL2 jumpers (refer to VDOC06S304_ “REMOVAL OF CL1 AND CL2 JUMPERS” for location and replacement procedures) if previously present in the controller. For Class 8839 controllers, replace the conductors previously connected to the CL1 and CL2 controller terminals.
7. Replace the recommended user-supplied power fuses in series with the L1, L2, and L3 line terminals of the controller from their respective fuse holders.
8. Close the drive controller cover.
9. Apply power to the controller.
10. After the drive controller displays the keypad display I/D screen, go to the fault management screen (menu 7.4). Change the “In-Phase Fail” and “Output Phase Flt” to settings previously recorded.
11. Press the F2 key to return to the controller keypad display I/D screen.

NOTE: If other controller settings were changed during testing, return the settings to those recorded prior to testing.

PROCEDURE 9: CHECKING THE SOFTWARE REVISION LEVEL

To access the software version number on the chip:

1. Disconnect and verify that all power is removed from the drive controller. Follow “PROCEDURE 1: BUS VOLTAGE MEASUREMENT” on page 310 of this manual.
2. Wait one minute to allow the DC bus to discharge.
3. Open the front cover of the drive controller.
4. Locate the plastic cover over the software chip.



5. Insert a small, electrically-insulated screw driver in the notch of the plastic cover. While applying slight upward pressure, pull out to remove cover.
6. Record the software revision number from the chip.
7. Replace the plastic cover over the software chip.
8. Close the drive controller cover.

If your drive controller contains a software version other than 1.6IE21, 1.6IE22, or 2.0IE23A or newer, contact your local field sales office for a software upgrade.

APPENDIX

TO ORDER REPLACEMENT PARTS

If you need more assistance:

Call your local Square D Distributor with the catalog numbers referenced in this manual.

Distributor Name: _____

Distributor Phone Number: _____

LOCAL SUPPORT

Call your local Square D Field Office for drive application assistance as well as price and delivery information on replacement equipment. For a list of phone numbers, see back cover of the Square D Digest.

Field Office Phone Number: _____

FACTORY TELEPHONE SUPPORT

Call Square D's AC Drives Product Support Group (phone 919-217-6535, FAX 919-217-6508) for ATV66 troubleshooting support. When placing a call, having the following information will be very helpful:

1. Drive catalog number, available from nameplate on drive heatsink or from drive identification screen on keypad display (example: ATV66D16N4U).
2. If drive was enclosed by Square D, provide catalog number from enclosure nameplate. (Example of freestanding enclosure: 8839 66UFA4VF A11, M09, A16, G16, L16, P16, R16, T16. Example of MCC enclosure: 8898 M6BVV7.6AU M09, A16, AG16, T2, P16, T16, N16.)
3. Information on how the drive is applied (type of load, motor, power distibution, etc.).
4. Drive installation environment (enclosure type, ambient temperature, etc.).
5. Control wiring diagrams.
6. All user's installation and configuration manuals.
7. This service and troubleshooting manual.
8. Listing of how drive is configured.
9. Listing of last eight faults from fault history menu.
10. History of drive and difficulties experienced.
11. Information on troubleshooting steps already taken.

FACTORY REPAIR

To arrange for your drive to be repaired at our factory, call your local Square D Distributor.

ON-SITE REPAIR

To arrange for a factory-trained repair technician to repair your drive at your site, call Square D's Field Service Organization at 1-800-634-2003.

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Numerics

■ Merlin Gerin ■ Square D ■ Telemecanique

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