

ELECTRICAL GUIDELINES

- ⚠ WARNING:** Installation must comply with specifications from National Electrical Codes and standards (NEC, VDE, BSI, etc.) regarding wire types, conductor sizes, branch circuit protection, and disconnecting devices.
- ⚠ WARNING:** To avoid a possible shock hazard and/or nuisance tripping caused by induced voltages, unused wires in the conduit must be grounded at both ends. For the same reason, VFD output wires should not share a conduit with another VFDs output leads, or other power circuits (lighting, motors, etc.).
- ⚠ CAUTION:** MC or “Metal clad” cable cannot be used for controller output/motor leads. Both stranded and solid core varieties must be avoided. Do not use solid core cable of any size or insulation class for motor wiring. Use of such types of cabling may result in nuisance tripping or premature equipment failure.

Cable types

A variety of cable types are acceptable for variable frequency drive installations. *For many installations, unshielded cable is adequate if it can be separated from sensitive circuits.* In all cases, parallel runs of control and motor cabling should be avoided when unshielded cable is used. Do not use cable with an insulation thickness of less than 15 mils.

- UL installations in 50° C ambient must use 600 V, 75° C or 90° C wire.
- UL installations in 40° C ambient should use 600 V, 75° C or 90° C wire.

Acceptable unshielded types

THHN, THNW, or similar wire is acceptable for drive installations in dry environments if adequate free air space and/or conduit fill rate limits are provided. *Do not use THHN or similarly coated wire in wet areas.* Any wire chosen must have a minimum insulation thickness of 15 mils and should not have large variations in insulation concentricity.

Acceptable shielded types

The drain conductor included with shielded cables must be connected to both the motor frame and the PE/ Ground terminal of the Variable Frequency Drive.

Location	Rating / Type	Description
Standard (Option 1)	600 V, 75° C or 90° C (167° F or 194° F) RHH/RHW-2	<ul style="list-style-type: none">• Four tinned conductors with XLPE insulation• Foil shield and tinned copper drain wire with 85% braid coverage• PVC Jacket
	Belden 29501-29507 or equivalent	
Standard (Option 2)	Tray rated 600 V, 75° C or 90° C (167° F or 194° F) RHH/RHW-2	<ul style="list-style-type: none">• Three tinned copper conductors with XLPE insulation• 5 mil single helical copper tape (25% overlap minimum) with three bare copper grounds in contact with shield• PVC Jacket
	Shawflex 2ACD/3ACD or equivalent	
Class I & II Division I & II	Tray rated 600 V, 75° C or 90° C (167° F or 194° F) RHH/RHW-2	<ul style="list-style-type: none">• Three bare copper conductors with XLPE insulation with impervious corrugated continuously welded aluminum armor• Black sunlight resistant PVC jacket overall• Three copper grounds on #10 AWG and smaller

Output disconnects

A device, such as a contactor, that routinely disconnects and reapplies output power to the motor for the purpose of starting and stopping the motor cannot be used.

Recommended wire size


A minimum of 14 AWG is acceptable for motor leads. Power feeders to controllers must be governed by the fuse size included with the VFD and/or required circuit breaker.

Cable fittings

To maximize abrasion resistance and strain relief, make sure that cable fittings for the flexible cable/portable cord are the appropriate type and size for the cable/portable cord outer jacket diameter. **Do not install the flexible cable/portable cord in a manner that would place the cable in a bind or under excessive strain.**

Grounding

The nature of Variable Frequency Drive systems must be considered prior to and during the installation of Big Ass Fans. Due to high frequency content on the output side of the VFD, measures must be taken to ensure that all grounding connections conform to the recommendations made in this section.

The VFD's safety ground  must be connected to system ground. Ground impedance must conform to the requirements of national and local industrial safety regulations and electrical codes. The integrity of all ground connections should be periodically checked. All ground leads for downstream conduit boxes must be kept separate from the motor ground and terminated on the VFD's PE terminal.

Motor ground

The motor ground must be connected to a ground terminal on the VFD to aid in keeping high frequency electrical noise off of the building's ground grid.

Shielded motor cable terminations

Either of the safety ground terminals on the drive provides a grounding point for the motor cable shield. The motor cable shield connected to one of the drive terminals must also be connected to the motor frame. If no drain lead is present, the cable must be stripped back so that the braid can be twisted and soldered to a pigtail for proper termination.

Input voltage irregularities

 **CAUTION: Controllers damaged by input voltage irregularities may not be covered by the your warranty!**

The VFDs are suitable for direct connection to input power within the rated voltage of the VFD, but are sensitive to rapid changes in supply voltage. The table shows input power conditions that may cause nuisance tripping such as Overvoltage and Undervoltage faults. If any of the conditions exist as described, you can install one of the devices listed under the heading "Corrective Action" on the input side of the VFD. **One device is required for each VFD!**

Input Power Condition	Corrective Action
Low line impedance (less than 1% reactance)	Install a line reactor. Contact Big Ass Fans Customer Service if you need to order a line reactor.
Line has power factor correction capacitor	
Line has frequent power interruptions (voltage sags or swells)	
Line has intermittent noise spikes in excess of 6,000 V (lighting)	
Phase-to-ground voltage exceeds 125% of normal line-to-line voltage	Install a Delta/Wye isolation transformer with grounded secondary (1:1 turns ratio)
Ungrounded distribution system	
Supply transformer exceeds established kVA limit	Install a line reactor
More than one controller, one per branch circuit	

Conduit and piping guidelines

⚠ CAUTION: The presence of foreign signals on a drive's output wiring greatly reduces the controller's ability to control current and speed regulation of the fan. Any wiring practice that would allow this kind of "cross-talk" must be avoided. Failure to do so may result in nuisance tripping and/or premature equipment failure. Sources of foreign signals that could induce such signals include another VFD's output circuit, long "across-the-line" motor circuits, and lighting circuits.

⚠ CAUTION: Recommendations for fan controller output/motor lead routing deem some conventional wiring practices "unacceptable." National and/or local code does not differentiate between solid-state and electromechanical systems; however, due to the nature of the Big Ass Fan system, there are additional requirements that must be met to ensure proper operation.

Due to high frequency electrical noise on the output side of the fan controller, measures must be taken to ensure that wires and cabling are routed in a manner consistent with recommendations made in this section. Big Ass Fans controllers rely on "motor feedback" through the cabling to sense motor speed, slip, etc.

Controller AC supply

Most conventional methods of power distribution and branch circuit installation apply to all models of fan controllers. Installation must comply with specifications regarding wire types, conductor sizes, branch circuit protection, and disconnecting devices. Failure to do so may result in personal injury and/or equipment damage.

- AC supply feeds for one fan controller can share the same conduit with AC supply feeds for one or more additional controllers.
- AC supply feeds for a fan controller and output/motor leads for the same fan controller cannot share a conduit.
- AC supply feeds for one fan controller cannot share conduit with output/motor leads from one or more additional controllers/VFDs.
- Any unused conductors that share a conduit with an AC supply feed should be grounded on both ends to prevent risk of electric shock due to induced voltages.
- Output/motor leads for a fan controller and AC supply feeds for the same fan controller cannot share a conduit.
- Output/motor leads for one fan controller cannot share conduit with AC supply feeds or output/motor leads from one or more additional fan controllers.
- Any unused conductors that share a conduit with fan controller output/motor leads should be grounded on both ends to prevent risk of electric shock due to induced voltages.