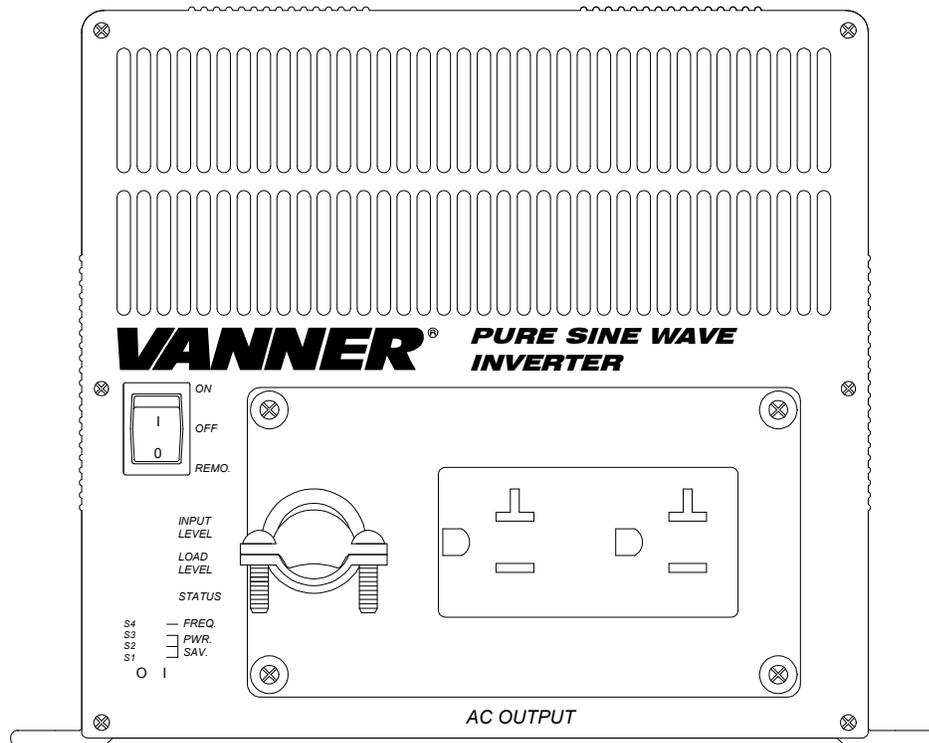


VLT Series 2000/3000 Watt True Sine Wave Inverter



Models

VLT12-2000
VLT12-2000-LV
VLT12-3000
VLT12-3000-LV

VLT24-2000
VLT24-2000-LV
VLT24-3000
VLT24-3000-LV

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1 Introduction

Thank you for purchasing a Vanner VLT SERIES Inverter. We are confident that you will be satisfied with the inverter's performance and its many features. With proper installation and care, you can look forward to years of service from this high performance product.

This document will describe the operation, technical specifications and installation procedures.

2 Important Safety Instructions



Electrocution hazard exists



Fire hazard exists



A potentially dangerous condition



Explosive hazard exists



Corrosive hazard exists

To get the most out of the power inverter, it must be installed and used properly. Please read the instructions in this manual before installation. Keep this manual for future reference.

2.1 General Safety Precautions



Do not expose the inverter to rain, snow, spray, or dust. To reduce risk of hazard, do not obstruct the ventilation openings. Do not install the inverter in a zero-clearance compartment. Overheating may result.



To avoid a risk of fire and electric shock, make sure the wiring is in good electrical condition and is proper gauge. Do not operate the inverter with damaged or substandard wiring.



This equipment contains components that can produce arc or sparks. To prevent fire or explosion, do not install in compartments containing batteries or flammable materials or in locations which require ignition protected equipment. This includes any space containing gasoline-powered machinery, fuel tanks, or joints, fittings, or other connection between components of the fuel system.

2.2 Precautions When Working With Batteries



If battery acid contacts skin or clothing, wash immediately with soap and water. If acid enters eye, immediately flood eye with running cold water for at least 20 minutes and get medical attention immediately.



Never smoke or allow a spark or flame in vicinity of battery or Engine.



Do not drop a metal tool onto the battery. The resulting spark or short-circuit on the battery or other electrical part may cause an explosion.



Remove personal metal items such as rings, necklaces, and watches when working with a lead-acid battery. A lead-acid battery can produce a short-circuit current high enough to weld a ring or the like to metal, causing severe burns.

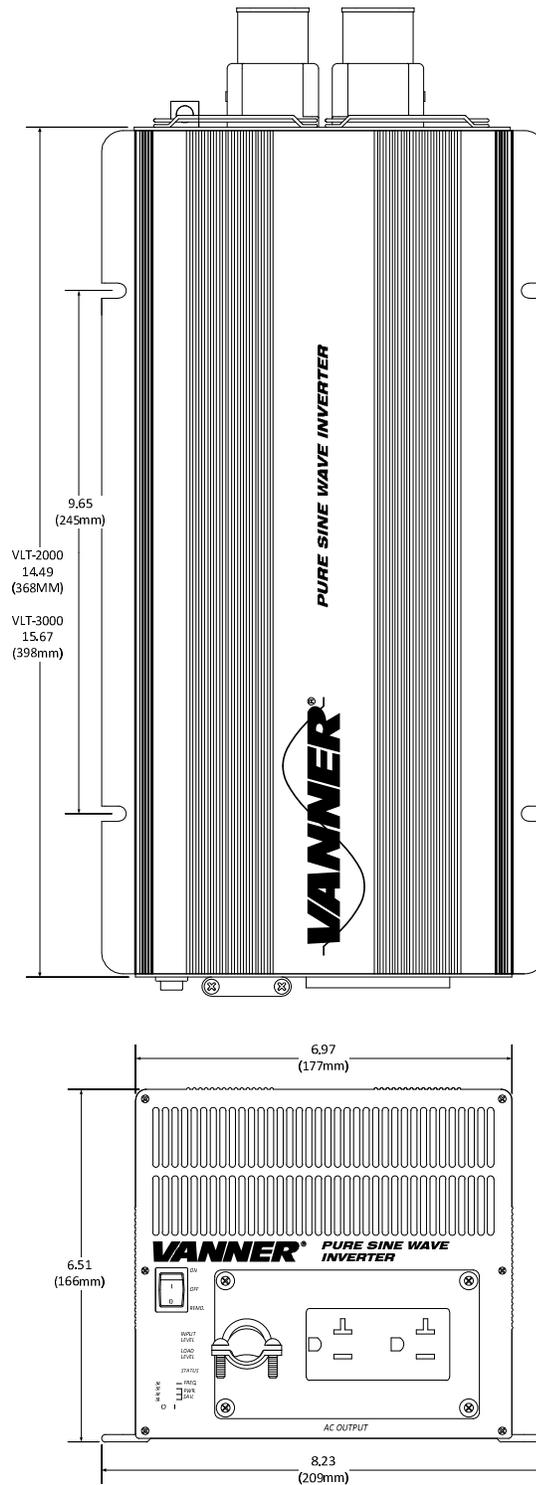
3 Specifications and Features

3.1 Specifications

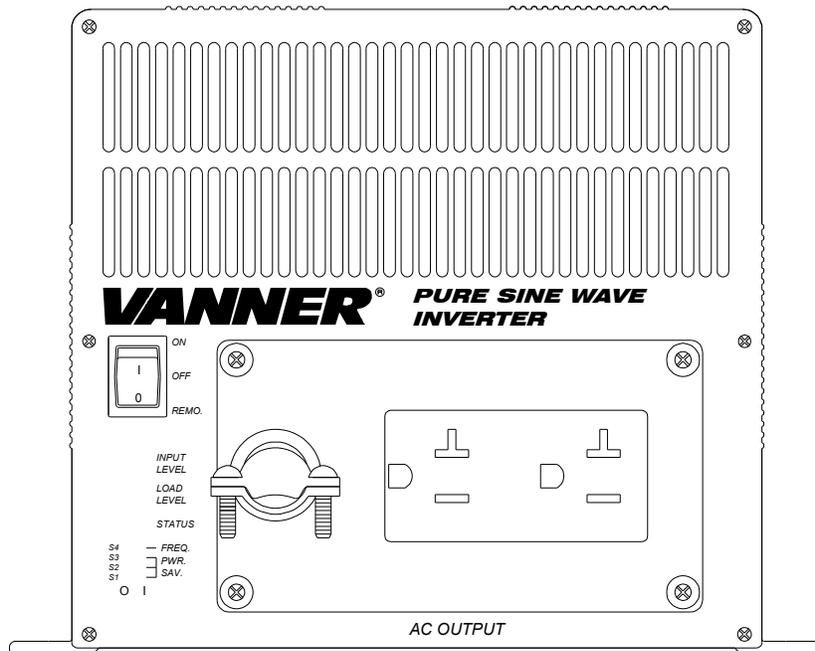
Specifications	Model Number							
	VLT12-2000	VLT12-2000-LV	VLT24-2000	VLT24-2000-LV	VLT12-3000	VLT12-3000-LV	VLT24-3000	VLT24-3000-LV
Continuous Output Power	2000W				3000W			
Maximum Output Power (3Min.)	2000W				3000W			
Surge Rating	4000W				6000W			
Nominal Input voltage	12V		24V		12V		24V	
Output Voltage	120VAC (factory setting) +/- 5% 100/110/115 selectable via internal front panel dip switches							
Output Frequency	60Hz (factory setting) +/- 0.05% 50Hz selectable via front panel dip switch							
Output Waveform	True Sine Wave (THD < 3%)							
Efficiency (full load) MAX	89.0%		92.0%		88.0%		91.0%	
No Load Current Draw	2.8A		1.5A		3.0A		1.6A	
Stand-By Current Draw	0.60A		0.30A		0.55A		0.35A	
Input Voltage Range (VDC)	11.5-16	10.5-15.0	23-32	21.0-30.0	11.5-16	10.5-15.0	23-32	21.0-30.0
Input Level Indicator	Red / Orange / Green LED							
Load Level Indicator	Red / Orange / Green LED							
Failure Indicator	Red LED							
Protection	Overload, Short Circuit, Reverse Polarity (Fuse), Over / Under Input Voltage, Over temperature.							
Safety Certification	Meets UL458							
EMC	FCC Class A							
Operating Temperature Range	-25°F to 104°F (-31°C to 40°C)							
Storage Temperature Range	-30°F to 160°F (-34°C to 70°C)							
Cooling	Thermostatically controlled cooling fan							
Dimensions	17.8 L x 8.2 W x 6.5 H							
Weight	22 lbs							

Note: Specifications are subject to change without notice.

3.2 Measurements



4 Front Panel Area:



4.1 ON / OFF/ REMOTE (Main) Rocker Switch:

Before installing the inverter, be sure the main rocker switch is set to "OFF".

Use the ON/OFF/REMOTE main rocker switch on the front panel to turn the inverter ON.

Set the rocker switch to the ON position to turn the inverter ON. Notice the beeps and the activity of the indicator light display. The Status led should be green indicating the inverter is ready to deliver AC power to the loads. If multiple AC loads will be operated at the same time it may be necessary to turn the loads ON one-at-a-time to prevent inverter overload due to the initial surge required to start the loads.

Set the rocker switch to the OFF position to turn the inverter OFF.

Set the rocker switch to the REMOTE position if a customer-supplied remote control switch is used with the Remote Control Connector, located on the inverter back panel. (See section 3-8-2.)

4.2 DC Input Voltage Display

MODEL	VLT12-2000	VLT12-2000-LV	VLT24-2000	VLT24-2000-LV
	VLT12-3000	VLT12-3000-LV	VLT24-3000	VLT24-3000-LV
LED Status	DC 12V		DC 24V	
RED Slow Blink	11.3~11.7	10.3~10.6	22.5~23.2	20.5~21.2
RED	11.7~12	10.6~11.0	23.2~24	21.2~21.8
ORANGE	12~13.1	11.0~12.1	24~26.2	21.8~24.1
GREEN	13.1~15.2	12.1~14.2	26.2~30.5	24.1~28.6
ORANGE Blink	15.2~16	14.2~15.0	30.5~32	28.6~30.0
OVER RED Blink	Above 16	Above 15.0	Above 32	Above 30.0

4.3 AC Load Display (Watts)

Unit Power	DARK	GREEN	ORANGE	RED	RED BLINK
2000W	0 ~ 160W	160 ~ 660W	660 ~ 1500W	1500 ~ 1920W	Over 2000W
3000W	0 ~ 240W	240 ~ 990W	990 ~ 2250W	2250 ~ 2880W	Over 3000W

4.4 AC Output Wiring Methods:

Three AC output wiring methods are provided.

- GFCI Protected Receptacle
- GFCI Protected Hardwired Output (LOAD terminals on GFCI Receptacle)
- Non-GFCI Hardwired output via terminal strip inside receptacle compartment.

4.5 AC Output GFCI Duplex Receptacle

The AC output neutral conductor is connected to AC ground and inverter chassis ground inside the inverter. This conforms to National Electrical Code requirements that separately derived AC sources (such as inverter and generators) have their neutral conductors tied to ground in the same way that the neutral conductor from the utility is tied to ground at the AC breaker panel.



Do not connect AC neutral to AC ground downstream of the GFCI. This would cause the GFCI to trip.



Never connect the inverter output to another AC power source such as a generator or utility power. The inverter would be destroyed.

4.6 AC Frequency Selection

AC output frequency is selected by Dip Switch "S4".

Important Note: 60Hz AC loads may be damaged if 50Hz is selected.

The unit must be turned OFF/ON to accept new dip switch settings.

Frequency	S4
50 HZ	OFF (left)
60 HZ	ON (right)

4.7 AC Voltage Selection

Only qualified persons should change the AC output voltage setting. The AC output voltage is selected by a two-position dip switch located inside the inverter behind the ON/OFF/Remote switch. To access the internal 2-position dip switch, remove the top cover by removing the front four and rear four screws.

The unit must be turned OFF/ON to accept new dip switch settings.

AC Output Voltage	Display Panel internal 2-position DIP Switch Setting	
	Switch 1	Switch 2
120 VAC	ON (up)	ON (up)
115 VAC	ON (up)	OFF (down)
110 VAC	OFF (down)	ON (up)
100 VAC	OFF (down)	OFF (down)

4.8 Load Demand (Power Saving Mode)

The Load Demand feature allows the inverter to "go to sleep" if the inverter is ON but no AC loads are present. Load Demand is adjustable via Dip Switches S1, S2 and S3 on the front panel.

Example: With the Load Demand Threshold watt setting at 45W, a load greater than 45W is required to "keep the inverter awake" to produce AC power. If the AC load falls below 45W the inverter will "go to sleep", entering Load Demand power saving mode.

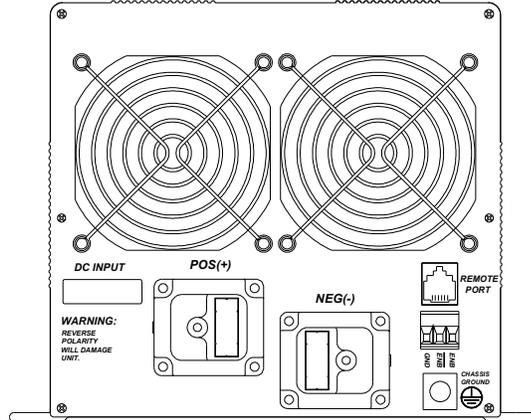
The unit must be turned OFF/ON to accept new dip switch settings.

Load Demand Threshold Watts	S1	S2	S3
Load Demand OFF	OFF	OFF	OFF
45W	ON	OFF	OFF
85W	OFF	ON	OFF
130W	ON	ON	OFF
175W	OFF	OFF	ON
220W	ON	OFF	ON
265W	OFF	ON	ON
300W	ON	ON	ON

5 Protection Features and Set Points:

Model	DC Input (VDC)					Over Temperature Protection			
	Over Voltage		Under Voltage Alarm	Under Voltage		INTERIOR		HEAT SINK	
	Shut-down	Restart		Shut-down	Restart	Shut-down	Restart	Shut-down	Restart
12V	16.5	15.5	12	11.2	13.5	70°	45°	90°	60°
12 V (LV)	15.3	14.3	11.0	10.2	12.7				
24V	33.0	23.0	24	22.4	27.0				
24 V (LV)	30.6	28.8	22.0	20.3	25.2				

6 Rear Panel Area:

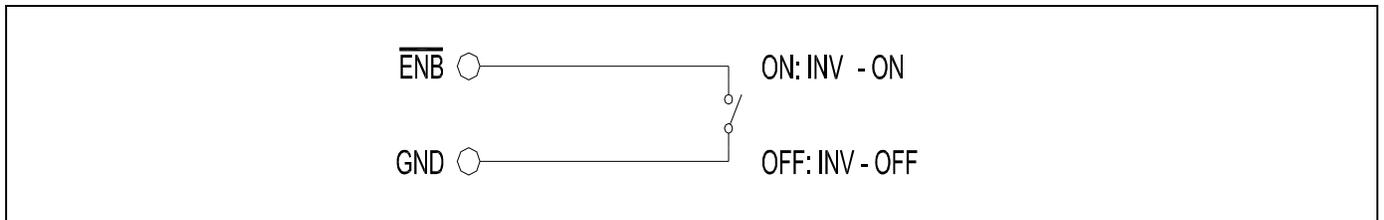
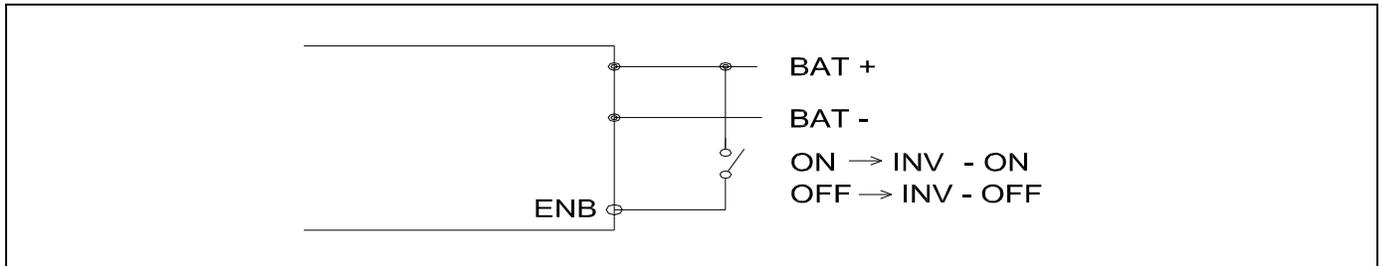


6.1 Remote Port

The modular jack labeled Remote Port is not used.

6.2 Remote Control Connector

(The Remote Control Connector is enabled when the ON/OFF/Remote main rocker switch, located on the front of the inverter, is in the Remote position.) This three-position connector, Phoenix part number 1911868, is labeled GND, ENBBAR, and ENB. Use this connector with a customer supplied SPST switch to provide remote ON/OFF control of the inverter. Remote switch circuit arrangement options are +12v to ENB, or Battery Negative to ENBBAR, or GND to ENBBAR. The most common application (+12v to ENB) uses a +12v hot-in-run from vehicle fuse panel to turn inverter ON when vehicle is ON, and OFF when vehicle is OFF.



6.3 Cooling Fans and Ventilation

Maintain at least 3" clearance all around the inverter at all times.

6.4 DC Input Terminals

Connect DC cables, battery positive (+) to inverter positive (red); battery negative (-) to inverter negative (black). Be aware, there will be a large spark when the last DC connection is made. **Be very careful to NEVER connect DC terminals to the inverter backwards (inverter positive to battery negative). Reverse polarity connection may cause permanent damage to the inverter.**

6.5 Chassis Ground Lug

Use a # 8 AWG or larger wire to connect inverter chassis ground lug to vehicle chassis.



WARNING!

Operating the inverter without a proper ground connection may cause an electrical hazard.

7 Installation

7.1 Inverter Installation Considerations

Install the inverter in an environment that meets the following requirements:

Mounting: Locate a flat secure, dry, horizontal surface large enough to mount the inverter.

Dry – Do not allow water to drip on or to get inside the inverter.

Cool – Ambient air temperature should be between 32°F and 105°F, the cooler the better.

Safe – Do not install the inverter in a battery compartment or other areas where flammable fumes may exist, such as fuel storage areas.

Ventilated – Maintain at least 3" clearance all around inverter. Be sure ventilation openings on front and back are not obstructed.

Dust free – Do not install the Inverter in dusty environments. Dust will be drawn inside and will greatly shorten the life of the inverter.

Close to batteries but not exposed to battery fumes – Use the recommended wire lengths and sizes (see section 3-5). Avoid excessive cable lengths. Do not install the Inverter in a non-vented compartment with the batteries. Do not mount the Inverter where it will be exposed to the gases produced by the batteries. Battery gases are very corrosive. Prolonged exposure will damage the Inverter.



WARNING! Shock Hazard.

Before proceeding further, verify that the Inverter is NOT connected to batteries, and that all wiring is disconnected from any electrical sources.

NEVER connect the inverter AC output terminals to an incoming AC source.

7.2 DC Wiring Considerations

-  Do not connect the 12V model to a 24V battery. The unit will be destroyed immediately. Operation of the inverter without a proper ground connection may result an electrical safety hazard. Damage caused by reversed polarity will void warranty.
-  **WARNING!** Loose DC connections will overheat and could cause a fire. Torque the DC terminal bolts to 9 -12 ft-lbs.



A DC FUSE IS REQUIRED to protect the DC cables in case of a short circuit. The wiring of the inverter installation should conform to the National Electric Code (NEC) and any other state or local codes in effect at the time of installation. Article 551 of the NEC requires any DC cable from a battery, which measures longer than 18 inches along its length, be protected by a fuse. **Failure to place a fuse in the inverter positive cable will void warranty.**



- **BE AWARE**, as a large number of capacitors become charged upon completion of the DC circuit, **THERE WILL BE A LARGE SPARK** when the last battery connection is made. The spark is normal and will occur every time the batteries are connected. It is advisable to make the last DC connection at the inverter, not at the battery, to reduce the risk of battery explosion.
- To minimize electromagnetic radiation that could interfere with sensitive electronics, route the AC output wiring and DC power wiring with as much physical separation as possible from low voltage wiring such as audio and video signal wires. Route the DC positive and negative cables as close together as possible and use cable ties to keep them together.
- If passing through steel or other ferrous metal walls, the DC input cables need to pass through the same hole to prevent causing a transformer effect. If two holes are required, cut a slot to connect the two holes to prevent heating of the ferrous metal.



- **Proper DC cable size is critical** for the performance and safe operation of the inverter system. *The DC Cable and Fuse Sizing Chart* shows the minimum cable sizes recommended. These sizes allow a ½ volt maximum voltage drop at maximum inverter capacity and will insure optimum inverter performance. DC cable to be used with these fuse sizes should be minimum insulation temperature rating of 105°C and voltage rating of 600V.
- DC cables should be as short as possible.
- Do not use the vehicle chassis as the DC negative conductor. The negative cable should be the same size as the DC positive cable and should be connected directly to the battery negative terminal.

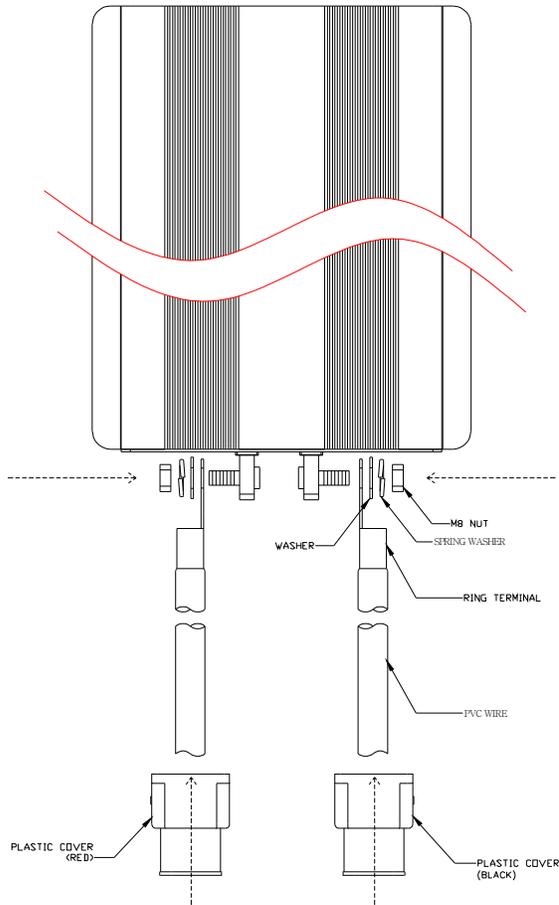
7.3 DC Wire and Fuse Sizes:

Use the following DC cable and inline fuse sizes. DC cables should be as short as possible (ideally less than 10 feet, never exceeding 20') and large enough to handle the required current in accordance with the electrical codes or regulations applicable to the installation. DC cables that are too small or too long will cause DC voltage drop which will result in deteriorated inverter performance such as poor surge capability and frequent low-input voltage warnings and shutdowns.

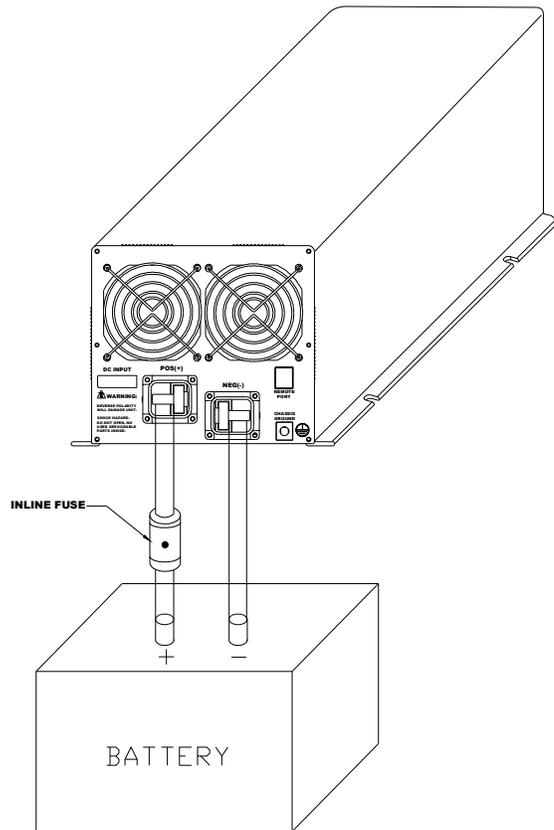
Model Number	VLT12-2000 VLT12-2000-LV	VLT24-2000 VLT24-2000-LV	VLT12-3000 VLT12-3000-LV	VLT24-3000 VLT24-3000-LV
Cable Size	Distance from battery to inverter in feet (Length of cable needed is 2 times the distance.)			
1/0	10	20	6	13
2/0	13	26	8	17
3/0	16	33	11	22
4/0	21	42	14	28
250MCM	24	49	16	32
Fuse (Bussmann) Vanner part number	AMG250 013916	AMG175 013913	AMG300 013917	AMG175 013913
Fuse Holder	Vanner part number 012992 (Bussmann AMG Series)			

7.4 DC WIRING DRAWING

Battery to inverter cable connection



Do not place anything between battery cable lug and terminal surface. Assemble exactly as shown.



8 AC Wiring Considerations

8.1 AC Neutral Bonding

The neutral conductor of the inverter AC output circuit is connected to ground (the bare wire) inside the inverter. This conforms to National Electrical Code requirements that separately derived AC sources (such as inverters and generators) must have their neutral conductors tied to ground. The AC output ground wire should go to the grounding point for the AC loads; for example, if there is a distribution panel ground bus. Do not connect neutral to ground in any panel, receptacle or device downstream of a GFCI as this would cause the GFCI to trip.

8.2 GFCI Receptacles

While the pure sine wave output of the Inverter is equivalent to the waveform provided by utilities, it is possible that some GFCI's may not perform properly on inverter power. If additional GFCI receptacles are needed use Hubbell GFR5252WA or Pass & Seymour 2091 or 2094.

9 Troubleshooting



WARNING! Do not open or disassemble the Inverter. Attempting to service the unit yourself may result in a risk of electrical shock or fire, and will void warranty.

Problems and Symptoms	Possible Cause	Solutions
No AC Output Power		
STATUS LED is RED		
a. Blinking fast	Shutdown for High Input Voltage.	Reduce input voltage.
b. Blinking slowly.	Shutdown for Low Input Voltage.	Recharge battery. Check DC connections. Verify correct cable size.
c. Blinking Intermittently.	Shutdown for Over Temperature.	Improve ventilation. Make sure vent openings are not obstructed. Reduce ambient temperature.
d. Solid ON.	Shutdown for overload, short circuit or wiring error.	Reduce AC load. Check AC wiring for short circuit.

9.1 Status: Display Power & Fault Status

Green LED	LED Signal	Status
Solid	—————	Power OK
Slow Blink	- - - -	Power Saving
Red LED	LED Signal	Status
Fast Blink	- - - - -	Overvoltage Shutdown
Slow Blink	- - - -	Undervoltage Shutdown
Intermittent Blink	Overtemp Shutdown
Solid	—————	Overload Shutdown

10 Maintenance

Very little maintenance is required to keep the inverter operating properly. Clean the exterior periodically with a damp cloth to prevent accumulation of dust and dirt. Verify DC connections are all clean and tight.

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