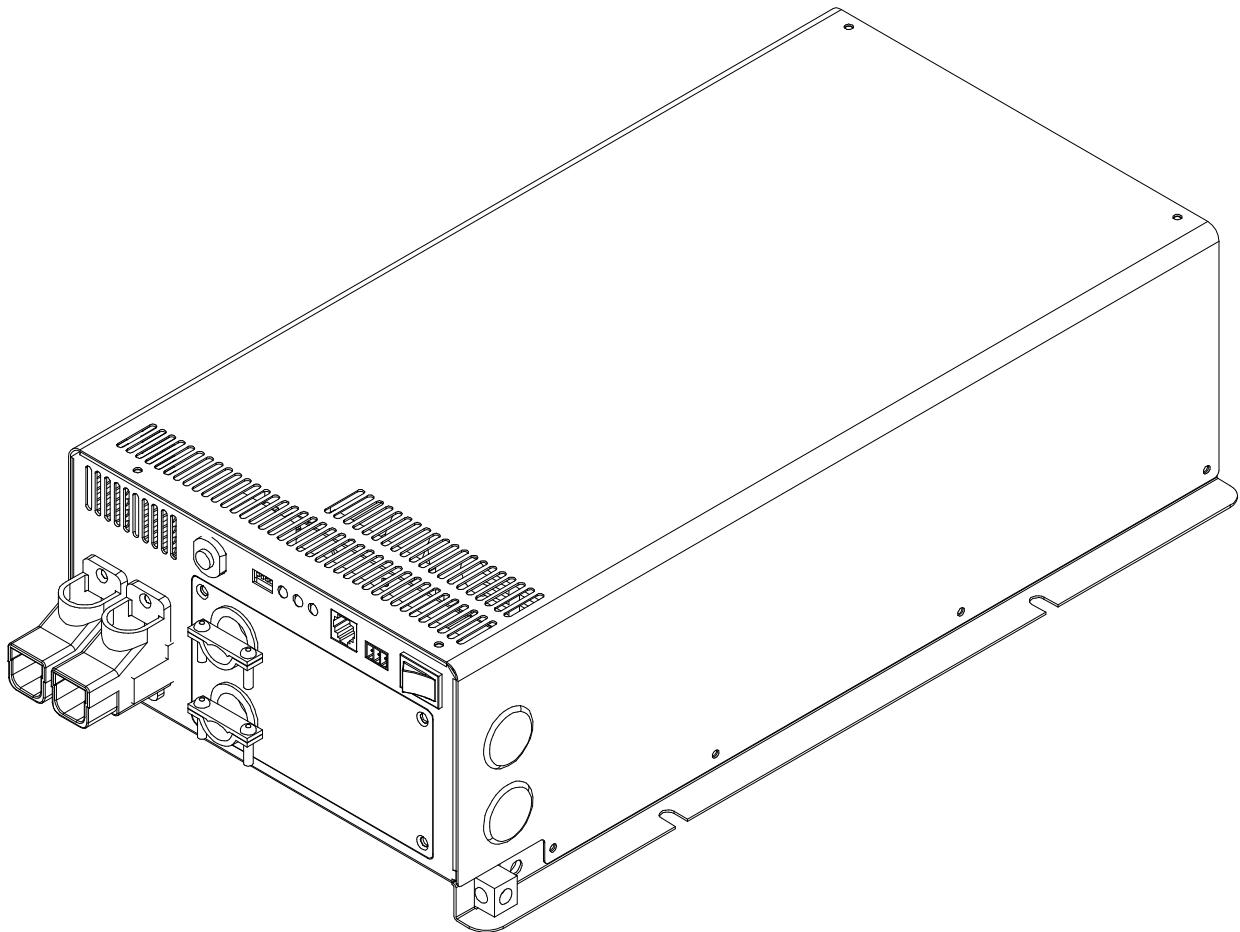


# **VTS Series True Sine Wave Inverter With built in Transfer Switch**



## **Models**

**VTS12-1500  
VTS24-1500**

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# 1. Important Safety Information

## 1-1. General Safety Precautions



- Do not expose the inverter to water, mist, snow, spray, or dust.
- To reduce risk of hazard, do not cover or obstruct the ventilation openings.
- Do not install the inverter in a zero-clearance compartment. Overheating may occur.
- To avoid risk of fire and electronic shock, be sure all DC and AC wiring is in good condition and not undersized.
- Do not operate the inverter with damaged or substandard wiring.
- This inverter contains components that can cause arcs and sparks.
- To prevent fire or explosion do not locate flammable materials near the inverter.

## 1-2. Precautions When Working with Batteries



- If battery acid contacts skin or clothing, wash it off with soap and water immediately. If battery acid contacts your eyes, wash it out with cold running water for at least 20 minutes and get medical attention immediately.
- Never smoke or create sparks or flame in the vicinity of the battery or the engine.
- Do not drop a metal tool on the battery. The resulting spark or short circuit may cause the battery to explode.
- Remove jewelry and personal metal items such as rings, bracelets, necklaces, and watches when working with batteries. Jewelry may cause a short circuit creating very high temperatures which can melt metal items and cause severe burns.

## 2. Features and Specifications

### 2-1. Standard Features

- Pure sine wave output (THD < 3%)
- Built in 25A transfer switch
- Hardware AC connections
- Output frequency : 60Hz (50Hz selectable by dip switch)
- Input & output fully isolated design
- Power Saving Mode to conserve energy
- High efficiency 88~93%
- Able to drive highly reactive & capacitive loads
- Tri-Color indicators show input voltage, output load level & power status
- Temperature controlled cooling fan
- Advanced microprocessor
- Protection :   Input low voltage      Input over voltage  
                          Low battery alarm      Overload  
                          Short circuit            Over temperature

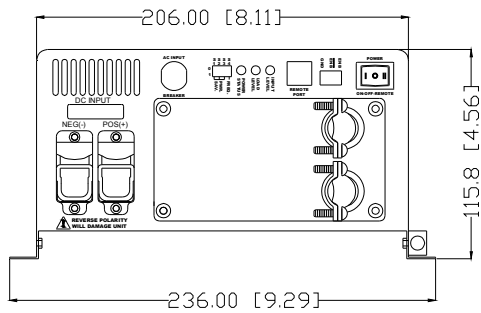
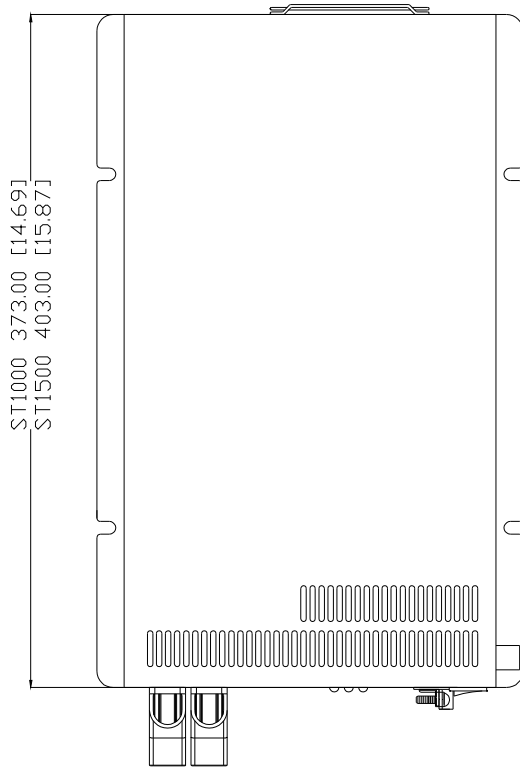
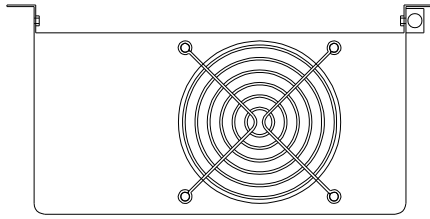
### 2-2. Typical AC Loads

- Power tools – circular saws, drills, grinders, sanders, weed and hedge trimmers, air compressors, etc.
- Office equipment – computers, printers, monitors, facsimile machines, scanner, etc.
- Household appliances – vacuum cleaners, fans, fluorescent and incandescent lights, shavers, sewing machines, coffee makers, blender, ice makers, toasters, etc.
- Industrial equipment – metal halide lamp, high – pressure sodium lamp, etc.
- Home entertainment electronics – television, VCRs, video games, stereos, musical instruments, satellite equipment, etc.

## 2-3. Electrical Performance and Specifications

<b>Specifications</b>	<b>Model Number</b>	
<b>Item</b>	<b>VTS12-1500</b>	<b>VTS24-1500</b>
<b>Continuous Output Power</b>	<b>1500W</b>	
<b>Maximum Output Power (3Min.)</b>	<b>1725W</b>	
<b>Surge Rating</b>	<b>3000W</b>	
<b>Nominal Input voltage</b>	<b>12V</b>	<b>24V</b>
<b>Output Voltage</b>	<b>120VAC (factory setting) +/- 5% 100/110/120 selectable via front panel dip switches</b>	
<b>Output Frequency</b>	<b>60Hz (factory setting) +/- 0.05% 50Hz selectable via front panel dip switch</b>	
<b>Output Waveform</b>	<b>Pure Sine Wave ( THD &lt; 3% )</b>	
<b>Efficiency (full load) MAX</b>	<b>88%</b>	<b>91%</b>
<b>No Load Current Draw</b>	<b>1.45A</b>	<b>0.75A</b>
<b>Stand-By Current Draw</b>	<b>0.28A</b>	<b>0.15A</b>
<b>Input Voltage Range</b>	<b>10.5-15.0 VDC</b>	<b>21.0-30.0 VDC</b>
<b>Input Level Indicator</b>	<b>Red / Orange / Green LED</b>	
<b>Load Level Indicator</b>		
<b>Failure Indicator</b>	<b>Red LED</b>	
<b>Protection</b>	<b>Overload, Short Circuit, Reverse Polarity (Fuse), Over/Under Input Voltage, Over Temperature. 30A AC Input circuit breaker</b>	
<b>Synchronous AC transfer</b>	<b>YES</b>	
<b>Transfer Switch</b>	<b>25Amp</b>	
<b>Remote</b>	<b>Optional</b>	
<b>Safety Certification</b>	<b>Built to UL468 standards</b>	
<b>Operating Temperature Range</b>	<b>32°F to 104°F ( 0°C to 40°C)</b>	
<b>Storage Temperature Range</b>	<b>-22°F to 160°F ( -30°C to 70°C)</b>	
<b>Cooling</b>	<b>Thermostatically controlled cooling fan</b>	
<b>Dimensions</b>	<b>15.9(L)*9.29(W)*4.53(H)</b>	
<b>Weight</b>	<b>16.4 lbs</b>	

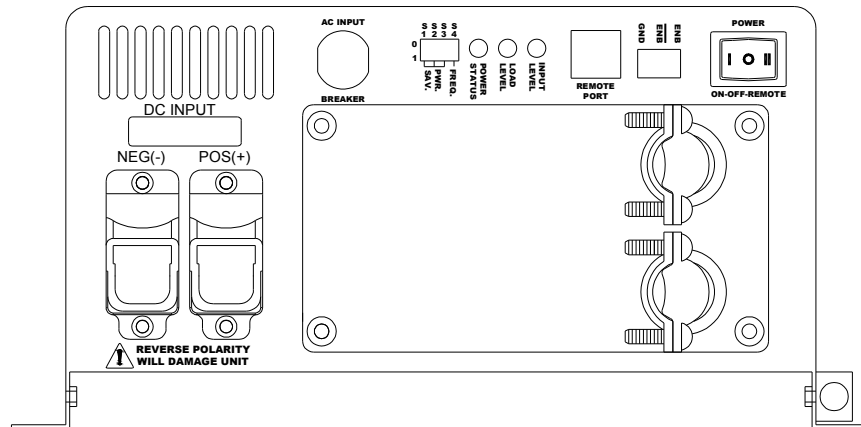
2-4. Mechanical Drawings



## 3. Installation and Operation

This inverter is one of the most advanced lines of mobile AC power systems. For best performance the inverter must be installed and used properly. Please read this instruction manual before installing and operating the inverter.

### 3-1. Front Panel Area:



#### 3-1-2. ON / OFF/ REMOTE (Main) Switch:

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

Before using the remote, you need to ensure the main switch is in the “REMOTE” position.

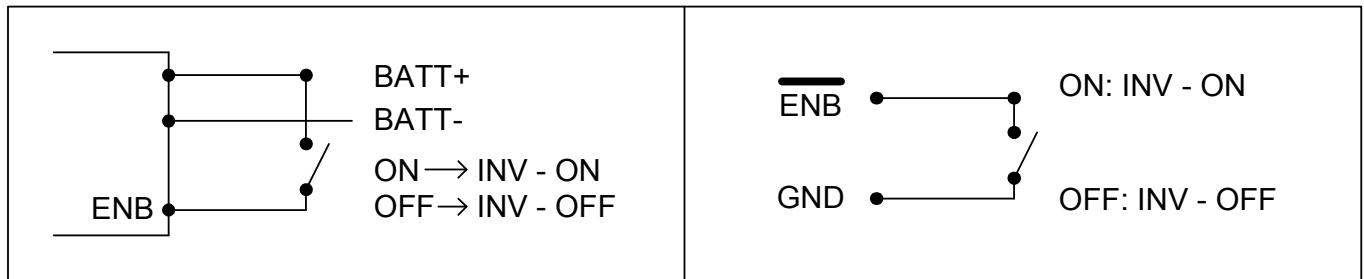
#### 3-1-3. AC Input Circuit Breaker:

The AC input circuit breaker protects the unit from overload. When an overload condition exists, the circuit breaker will trip. To reset push the breaker switch, the unit will resume normal operation.

#### 3-1-4. Remote Port: The modular jack labeled Remote Port is not used.

#### 3-1-5. Remote Control Connector:

(The Remote Control Connector is enabled when the ON/OFF/Remote main rocker switch, 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.



**3-1-6. DC Input Voltage Display**

LED Status	DC 12V	DC 24V
RED Slow Blink	10.3~10.6	20.5~21.2
RED	10.6~11.0	21.2~21.8
ORANGE	11.0~12.1	21.8~24.1
GREEN	12.1~14.2	24.1~28.6
ORANGE Blink	14.2~15.0	28.6~30.0
RED Fast Blink	Above 15.0	Above 30.0

**3-1-7. AC Load Display (Watts)**

Unit Power	DARK	GREEN	ORANGE	RED	RED BLINK
1500W	0 ~ 120W	120 ~ 495W	495 ~ 1125W	1125 ~ 1450W	Over 1450W

**3-1-8. Status: Display Power & Fault Status**

Orange 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
Green LED	LED Signal	Status
Solid	—————	AC Input OK



**3-1-9. 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
60 HZ	ON

**3-1-10. 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 40W, a load greater than 40W is required to "keep the inverter awake" to produce AC power. If the AC load falls below 40W 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
20W	ON	OFF	OFF
40W	OFF	ON	OFF
55W	ON	ON	OFF
75W	OFF	OFF	ON
95W	ON	OFF	ON
115W	OFF	ON	ON
135W	ON	ON	ON

**3-1-11. 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.

Model	DC Input Voltage	
	Minimum	Maximum
12 V	10.5	15.0
24 V	21.0	30.0



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

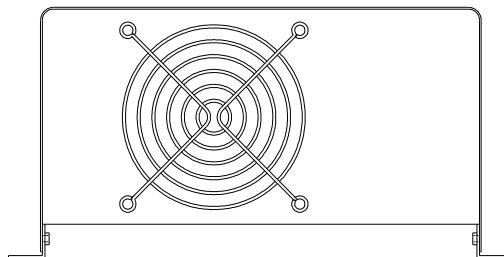
### 3-2. Chassis Ground Lug:

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

### 3-3. 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
12 V	15.3	14.3	11.0	10.2	12.7	70°	45°	90°	60°
24 V	30.6	28.6	22.0	20.3	25.2				

## 4. Rear Panel Area:



### 4-1. Cooling Fan and Ventilation:

Maintain at least 2" clearance all around the inverter at all times.

## 5. Installation location:

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

- 5-1-1. Dry – Do not allow water to drip on or to get inside the inverter.
- 5-1-2. Cool – Ambient air temperature should be between 32°F and 105°F, the cooler the better.
- 5-1-3. Safe – Do not install the inverter in a battery compartment or other areas where flammable fumes may exist, such as fuel storage areas.
- 5-1-4. Ventilation - Ventilation Openings on front and back are not to be obstructed.
- 5-1-5. Dust free – Do not install the Inverter in dusty environments. Dust will be drawn inside and will greatly shorten the life of the inverter.
- 5-1-6. Close to batteries but not exposed to battery fumes – Use the recommended wire lengths and sizes (see DC Wire and Fuse Sizes Chart). 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.

## 6. 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	VTS12-1500	VTS24-1500
<b>Cable Size</b>	<b>Distance from battery to inverter in feet</b> (Length of cable needed is 2 times the distance.)	
6 ga	NR	8.0
4 ga	NR	16.0
2 ga	11.0	20'
1 ga	14.0	20'
1/0	18.5	20'
Fuse (Amps) Vanner part number	200 013914	100 013910
Fuse Holder	Vanner part number 011876	

### 6.1. DC Connections:

When ready to connect DC cables, connect battery positive (+) to inverter positive then connect battery negative (-) to inverter negative. **Be aware, there will be a large spark when the last DC connection is made. This is normal. Never connect inverter positive to battery negative.** Be very careful to NEVER connect DC terminals to the inverter backwards. Reverse polarity connection may cause permanent damage to the inverter. Torque the DC terminal bolts to 9 -10 ft-lbs.

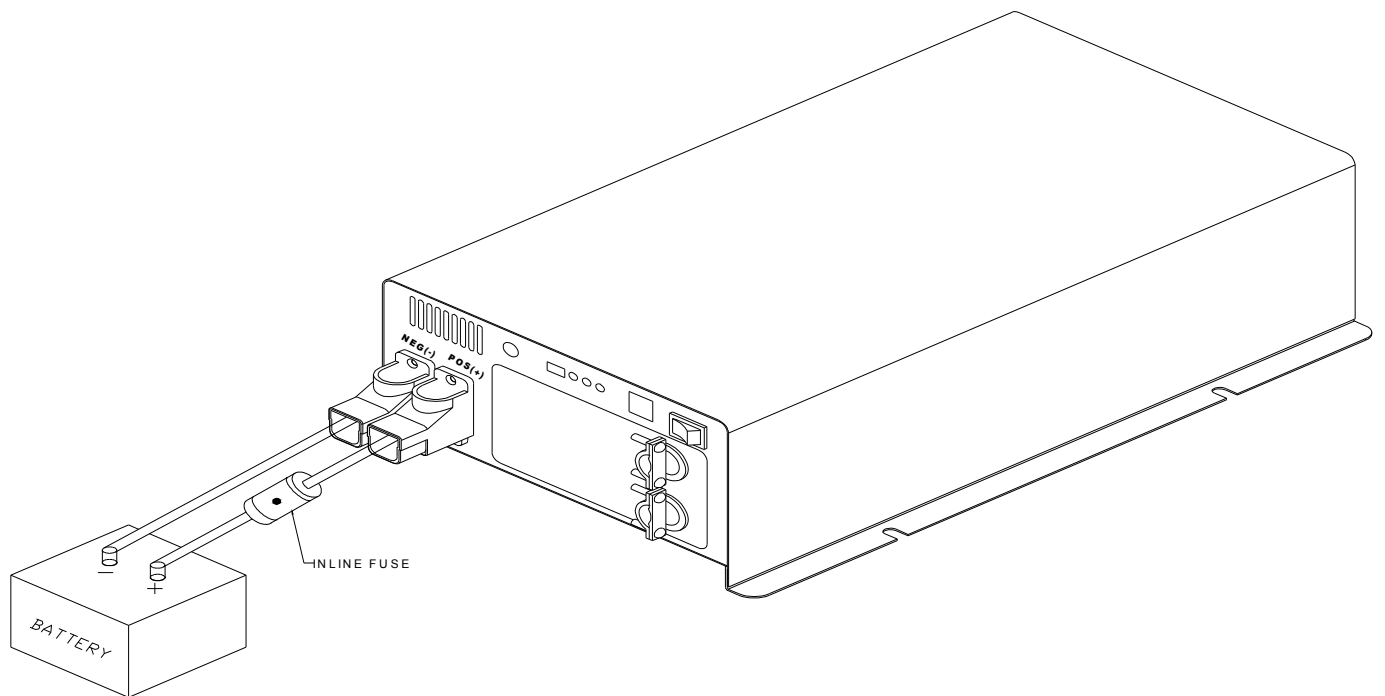
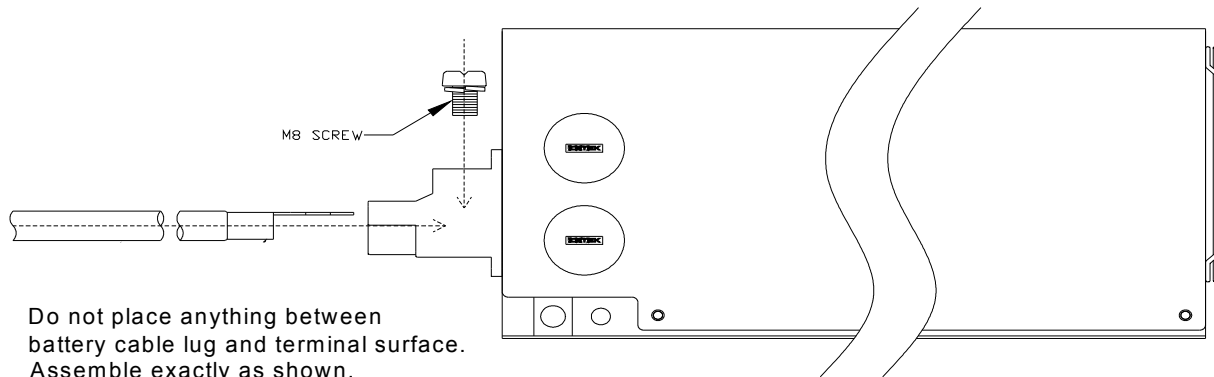


**WARNING:** Loose DC connections will overheat and cause a fire



**WARNING:** To protect the DC cables, and to protect the inverter if positive and negative are reversed, a DC fuse must be installed in the positive inverter cable within 18" of the battery. Failure to place a fuse in the inverter positive cable will void the warranty.

### Battery to inverter cable connection



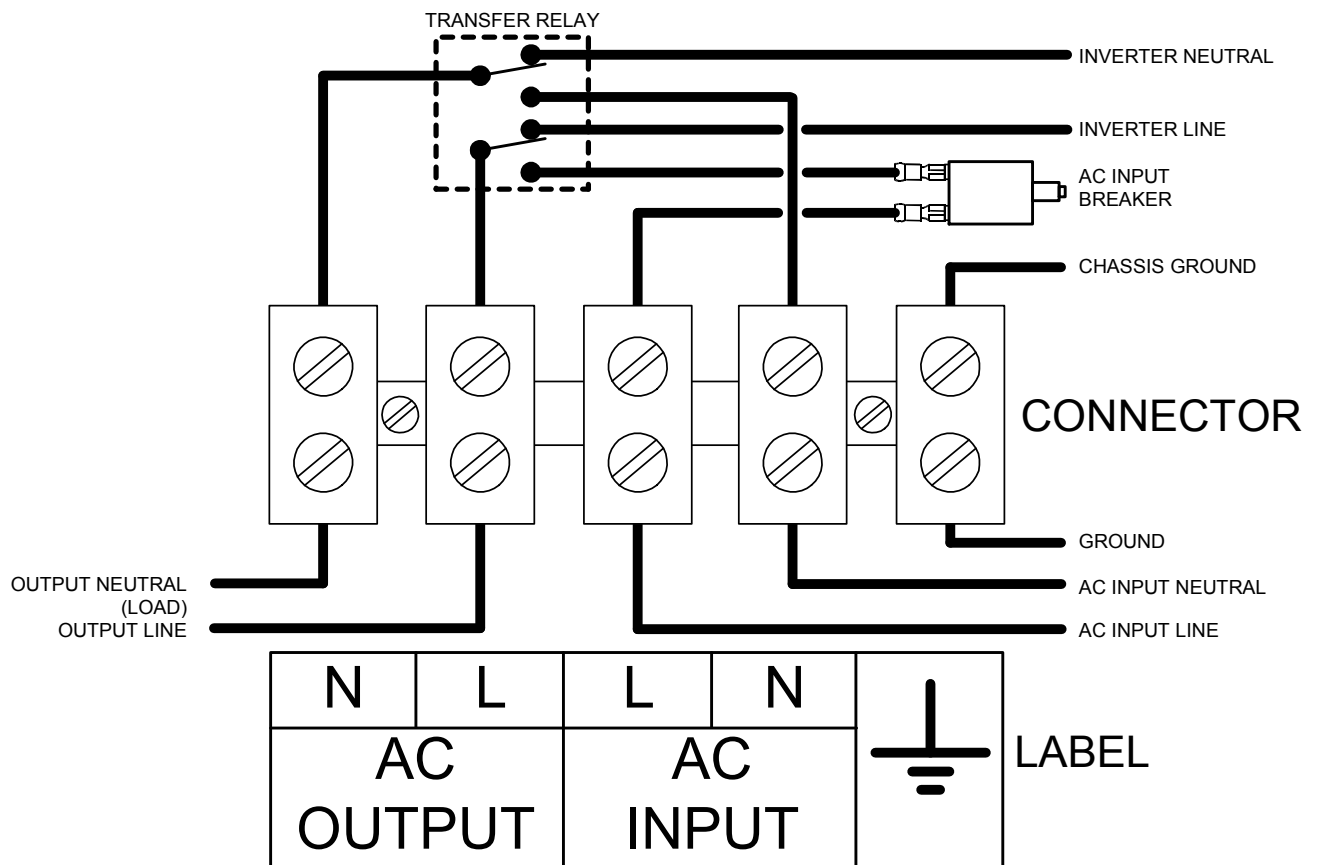


**WARNING:** Before proceeding further, verify that the inverter is NOT connected to batteries, and that all wiring is disconnected from any electrical sources.

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

## 7. AC Hard Wiring:

### 7-1. AC Wiring Connections



Connect AC output and AC input wiring to the VTS series terminals.  
Please take the following information as your reference.

Terminal		Wire color	Wire length / gauge
			VTS12-1500/VTS24-1500
AC OUTPUT	Line (L)	Black	Within 16 feet / 14-16AWG# 26~32 feet / 12-14AWG#
	Neutral (N)	White	
AC INPUT	Line (L)	Brown	
	Neutral (N)	Blue	
Ground		Green / Yellow or Bare copper	

Please double check and review all connections to ensure the wires are in correct terminals and the connections are tight. 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. Inverter Operation:

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

8-1. 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.

8-2. Set the rocker switch to the OFF position to turn the inverter OFF.

8-3. Set the rocker switch to the REMOTE position if a customer-supplied remote control switch is used with the Remote Control Connector (See section 3-1-2.)

## 9. Troubleshooting

<b>Problems and Symptoms</b>	<b>Possible Cause</b>	<b>Solutions</b>
<i>No AC Power "Output" STATUS illuminates the LED</i>		
a. Power status light is blinking fast.	Over input voltage. (OVP)	Check input voltage Reduce input voltage.
b. Power status light is Blinking slowly.	Low input voltage. (UVP)	Recharge battery. Check connections and cables.
c. Power status light is blinking Intermittently.	Thermal shutdown. (OTP)	Improve ventilation. Make sure ventilation, shafts of the inverter are not obstructed. Lower ambient temperature.
d. Power status light is glowed steadily.	Short circuit. Wiring error. Over Loading (OLP)	Check AC wiring for short circuit. Reduce load.

## 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.

Vanner Inc.  
4282 Reynolds Drive  
Hilliard, OH 43026  
800-227-6937  
800-ACPOWER  
email: [info@vanner.com](mailto:info@vanner.com)  
[www.vanner.com](http://www.vanner.com)

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