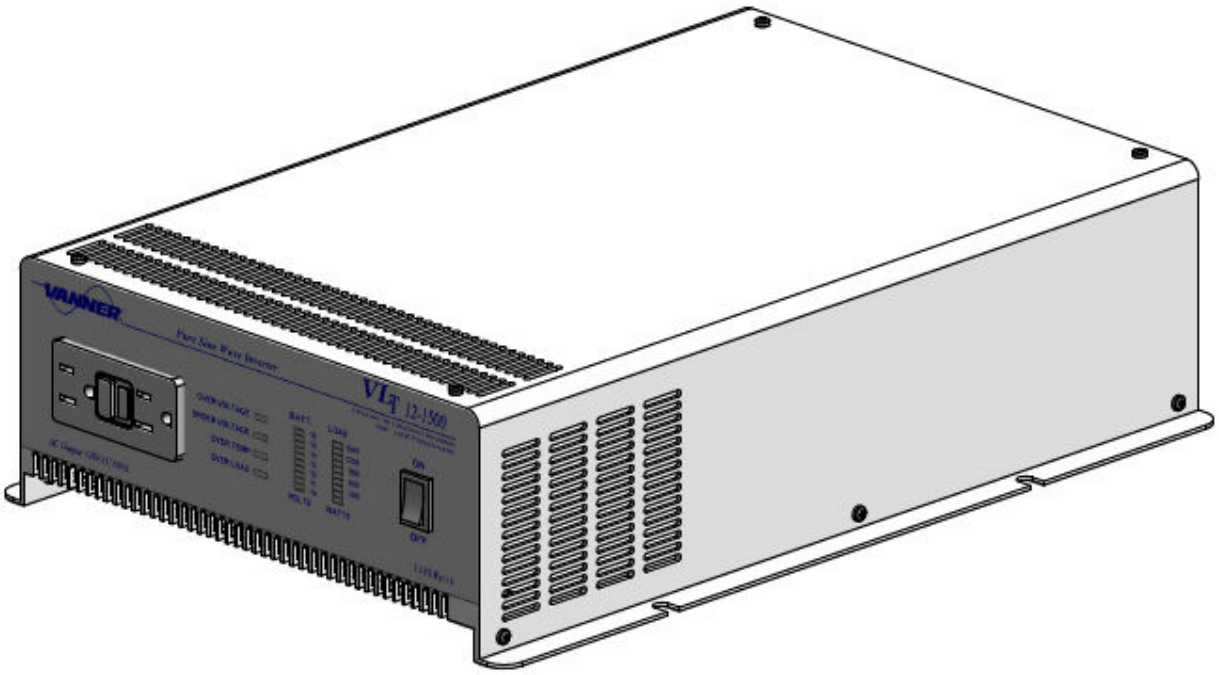
VLT SERIES

True Sine Wave
AC Power Inverter



60Hz Models

VLT12-1000 VLT12-1500
VLT24-1000 VLT24-1500

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1 INTRODUCTION

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

The ***VLT SERIES*** is a family of dependable inverters designed to meet common service requirements of the consumer, commercial and industrial markets. All models of the ***VLT SERIES*** produce true sine wave AC output power.

This document will describe the operation, technical specifications and installation procedures of the various models and accessories offered in this product family. We suggest that you familiarize yourself with the model numbers of the inverter and optional accessories you have purchased before proceeding with this manual. If you require additional information please contact your dealer, or contact us directly at
1-800-227-6937 (800 AC POWER) or www.vanner.com.

WARNING: Before you install and use your *VLT SERIES* Inverter be sure to read and save these safety instructions.

Model Listing

The ***VLT SERIES*** product line is designed to meet the requirements of a variety of applications.

NOTICE: Most models of the ***VLT SERIES*** use the same front panel and therefore look identical. To identify the model number of your particular unit it is necessary to refer to the Specification Label located on the right side of the unit or to the Identification Label located on the front.

Please note your model and serial number here for future reference.

Model No._____

Serial No._____

Date of Installation _____

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.

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

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 produces a short-circuit current high enough to weld a ring or the like to metal, causing severe burns.

3 SPECIFICATIONS & FEATURES

Model	VLT12-1000	VLT24-1000	VLT12-1500	VLT24-1500
Continuous Output	1000	1000	1500	1500
Surge (3S) A	16	16	16.7	16.7
Input Voltage	12	24	12	24
Output Voltage	120V +/- 3%			
Output Frequency	60Hz +/- .05%			
Peak Current A	25			
Efficiency FL - %	83	87	83	87
No Load Current	<1.0W In Power Saving Mode			
Output Waveform	Pure Sine Wave < 3% THD			
O/P Regulation	120V RMS -10% / +4%			
Low Battery Volts	10	20	10	20
Hi Battery Volts	16	32	16	32
Standby Recovery	5 Seconds			
Operating Temp.	-13F to 122F (-25C to 50C)			
Storage Temp.	-22F to 158F (-30C to 70C)			
Dimensions	4.13"H x 10.83"W x 15.35"D			
Weight	15.1 lbs.		15.4 lbs.	
LED Status	Low Battery, Over Temperature, Overload, Inverter On/Off			
Protection	Overload, Short Circuit, Reverse Polarity (fuse), Over/Under Input Voltage, Over Temperature			
Mounting	Inverter may be mounted in any orientation			

Standard Features

1. True sine wave 120 volt AC output.
2. Resilient electronic protection designed to handle output short circuits and output overloads.
3. Load Demand Feature to conserve DC power under no load conditions.
4. 15 amp GFCI Duplex Receptacle.
5. Automatic shut off for low or high battery voltage, overload or over temperature with indicator LEDs.
6. Remote control circuit.
7. Indicator lights for Low Battery Shutoff, Over Temperature Shutoff, Overload and Inverter ON/OFF/Load Demand status.
8. Thermostatically controlled cooling intake fan.

Definitions

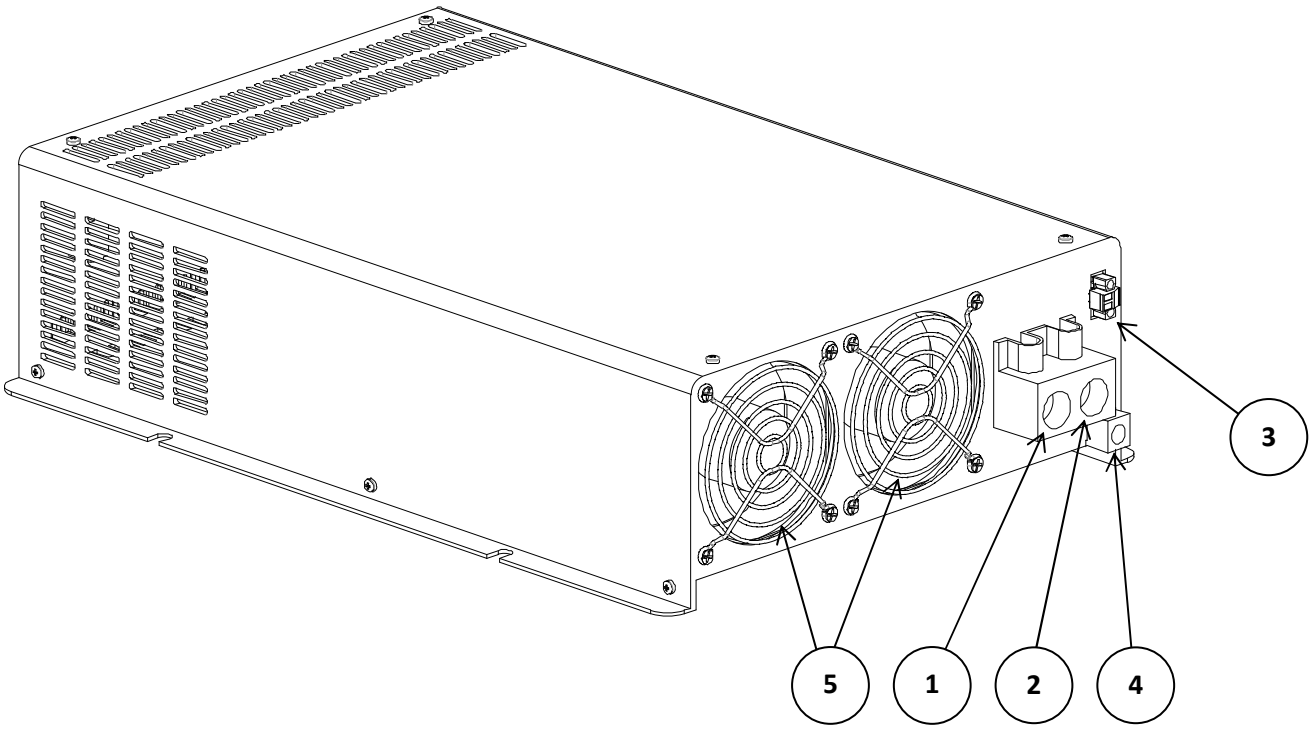
Load Demand Feature and Load Demand Mode:

The Load Demand Feature is an energy conserving feature which allows the inverter to enter the 'Load Demand Mode' whenever the inverter is ON and the AC load has been less than 10 watts for approximately 10 seconds. While in the 'Load Demand Mode' the inverter does not produce 120 volts AC but instead produces pulses of voltage which the inverter uses to look for a load. When a load greater than 10 watts is sensed, the inverter will turn fully ON to produce 120 Volts AC. The 'Load Demand Mode' is often also described as 'stand-by mode' or 'Sleep mode'. While in the 'Load Demand Mode' 12-volt models consume approximately 0.1 amps of DC and 24- volt models consume approximately 0.05 amps of DC.

Load Demand feature can be turned on by setting DIP switch #4 to the down position. Load demand option is shipped in the up position from the factory.

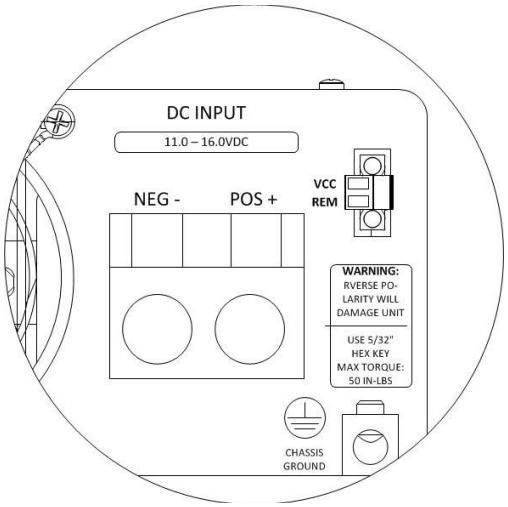
4 COMPONENT IDENTIFICATION and DESCRIPTION OF OPERATION

Inverter Top, Right Side & Rear View



1. Rear entry for negative DC input cable
2. Rear entry for positive DC input cable
3. Single Wire Remote
4. Chassis Ground Bonding Lug
5. Cooling Fans
   Draw air in through intake vents on the top, sides and bottom of inverter and exhaust it out the back for the purpose of cooling the unit. Fans will not continue running when the inverter goes to sleep.

Single Wire Remote



A green two-terminal connector located on the rear panel allows remote ON/OFF control of the inverter by a customer-supplied ON/OFF switch. The connector can be removed from the inverter by loosening the two screws and pulling the connector outward. The two upward facing screws are used to tighten the compression terminals for attachment of the signal wire(s). Torque to 4 lb-in max.

Remote Control via customer-supplied SPST switch: If it is desired to remotely control the inverter from a customer-supplied remote switch, remove the jumper connecting terminals VCC and REM. Supply a 12v (24v signal on 24v units) continuous signal to terminal REM to turn the inverter ON. The source of the 12v signal can be battery voltage for single-wire remote control or terminal VCC for two-wire-remote-control.

A common remote control arrangement uses a "hot in run" circuit from the vehicle fuse panel for the voltage signal. This arrangement automatically turns the inverter ON when the vehicle is running and automatically turns the inverter OFF when the vehicle is turned OFF.

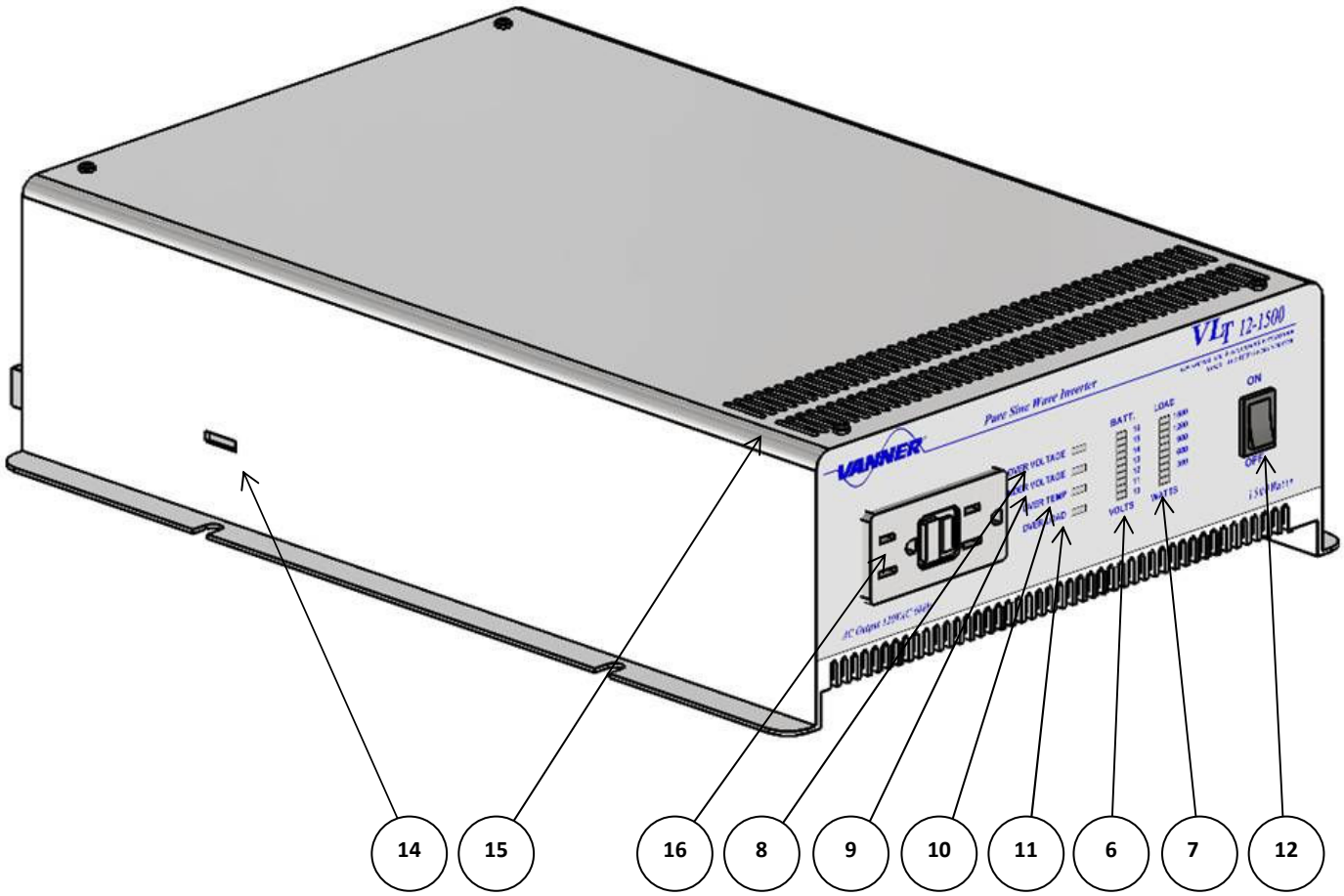
REM Details

REM will draw approximately 0.4 amps continuous while holding the inverter ON. If VCC is *not* used as the remote control signal, use a 5 amp fused circuit for the REM remote control signal.

VCC Details

When using VCC as the remote control voltage source, install a 2 amp fuse within 12" of the inverter. **The inverter will be damaged if VCC comes into contact with battery negative**

Inverter Top, Left Side & Front View



6. Battery Voltage Indicator

The battery voltage bar graph indicates the voltage at the input terminals of the inverter. At low input current, this voltage is very close to the battery voltage. At high input current, this voltage will be lower than the battery voltage because of the voltage drop across the cable and connections. Ideally, the voltage should remain in the green areas of the bar graph. If the voltage indicator light is in the red areas of the graph, the inverter may shut itself OFF.

7. Load Watt Indicator

The AC load watt bar graph indicates the approximate power drawn from the inverter. It will indicate wattage of the loads. For long term operation, indicated wattage should be in the green and orange area of the graph. Short term operation is possible with wattage in the red area. If total wattage allowed is reached, the entire bar graph will flash as a warning but the load will continue to be supported. If total wattage allowed is exceeded, the inverter will shut itself OFF.

8. Over Voltage Indicator

Indicates that the inverter has shut itself OFF due to input voltage over 16.5 volts (33.0 volts for 24 volt models).

9. Under Voltage Indicator

Indicates that the inverter has shut itself OFF due to input voltage under 10.0 volts (20.0 volts for 24 volt models).

10. Over Temperature Indicator

Indicates that the inverter has shut itself OFF due to overheating. The inverter may overheat if operated at power levels above its rating, or if installed in a location that does not allow for proper ventilation. The inverter will restart automatically after a cooling period.

11. Overload Indicator

The inverter has shut OFF because its output has been short circuited or drastically overloaded. Turn the ON/OFF switch to the OFF position, correct the fault condition, and turn the inverter back ON.

12. ON/OFF Switch (and RESET Switch)

The ON/OFF Switch is a two-position rocker switch used to turn the inverter ON/OFF and is used as a RESET Switch. When the inverter has automatically shut itself OFF due to a fault, the inverter must be RESET by turning the ON/OFF Switch OFF or by turning a remote switch OFF. (If an automatic shut- down has occurred due to a fault, one of the fault indicator lights will be displayed until the inverter is RESET.

13. Inverter Indicator Light

Light Display	**Description**
Green Light is OFF	Inverter is OFF
Solid Green	Inverter is ON and is producing AC power
Blinking Green	Inverter is in Load Demand Mode

14. Factory set-up dip switch

Dip Switches and Label located on the left side of the inverter.

S1	S2	VOUT (VAC)	S3	FREQ. (HZ)	S4	POWER SAVING	S5	S6	BAUD RATE
ON	ON	100	ON	50	ON	DISABLE	ON	ON	1200
OFF	ON	110	OFF	60	OFF	ENABLE	OFF	ON	2400
ON	OFF	115					ON	OFF	4800
OFF	OFF	120							

Switches 1 through 3 should be down (OFF). This selects 120VAC output, 60Hz.
Switch 4 should be up (ON). This selects Power Saving Disabled.
Switches 5 and 6 pertain to the VLT Remote Switch. The remote switch is not used so the settings do not matter. Factory default is both switches down (OFF).
The front rocker switch must be turned OFF and ON to read the new dip switch settings

15. AirIntake Vents

16. GFCI Duplex Receptacle

5 INSTALLATION and START UP

Unpacking the Inverter

Inspect the shipping container and equipment for loose or damaged parts. If any damage is found, immediately notify the freight carrier.

Inverter Installation Considerations

1. Mounting: Locate a secure, dry, flat horizontal or vertical surface large enough to mount the inverter.
2. The location should be as close to the battery as possible, usually within six feet, but not in the same compartment and should provide adequate ventilation while the inverter is operating. The location must be clean, dry and free from road spray, dripping water or other moisture contamination.

3. Cooling Fan Clearance: The mounting location must allow unobstructed airflow for cooling. Allow a minimum clearance of 1½ inches (40 mm) on the left, right and back sides of the inverter. The Cooling Fan is a thermostatically controlled intake fan. Air is drawn into the inverter from the front and side vents and exhausted through the fans. Obstruction of the fan intake or the exhaust vents will diminish the inverter output capacity due to overheating.

DC Wiring Considerations

1. **A DC FUSE IS REQUIRED** to properly protect the inverter in case the battery cables are connected backward (reverse polarity).

2. The wiring of your inverter installation should conform to the National Electric Code (NEC) and any other state or local codes in effect at the time of installation. These codes have been written for your protection and their requirements should be followed. 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.

3. **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 input fuse, not at the battery, to reduce the risk of battery explosion.

4. 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.

5. Route the DC positive and negative cables as close together as possible and use cable ties to keep them together. This reduces electromagnetic radiation that could interfere with sensitive electronics.

6. 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.

7. **Proper DC cable size is critical** for the performance and safe operation of the inverter system. The minimum recommended cable size allows a ½ volt maximum voltage drop at maximum inverter capacity and will insure optimum inverter performance. Quick DC cable connectors are available.
8. 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.
9. DC cables should be as short as possible (no longer than 15 feet to prevent performance loss).

VLT Series DC Cable and Fuse Sizing Chart

Model #	VLT12-1000	VLT24-1000	VLT12*1500	VLT24-1500
Distance (positive cable length) from battery to Inverter: 20' maximum length. Chart is based on negative cable being same length as positive cable. The recommended cable size holds voltage drop to 05vdc max at full load.				
Cable Size				
6 ga	NR	12.0'	NR	8.0'
4 ga	12.0'	20.0'	NR	16.0'
2ga	16.0'	20.0'	11.0'	20.0'
1 ga	20.0'	20.0'	14.0'	20.0'
1/0	20.0'	20.0'	18.5'	20.0'
Fuse Size (Amps)	150	80	200	100
Mega Fuse PN	010098	013910	013914	013910
Mega Fuse Holder	012992	012992	012992	012992

DC Wiring Installation Procedure

1. The DC wiring terminals are located on the right rear of the inverter.
2. Select a location for the inverter. An ideal location is close to the battery; protected from weather and moisture; and well ventilated.
3. Select an accessible location for the DC Fuse. The location should be within 18" of the battery and accessible for visual inspection and replacement. If possible locate so the last DC connection can safely be made at the fuse.
4. Prepare DC cable ends.
5. Verify that the battery positive cable is not connected to the battery. Insert DC cables into the DC wiring lugs of the inverter. Torque DC cable bolts to 50 inch pounds. Re-torque after 30 days**. Ferrules should be installed on the cable ends to ensure a proper connection. Not using ferrules may cause the connections to loosen over time causing performance and safety issues.**
6. Route the negative DC cable to the battery. Verify cable polarity before proceeding. The fuse will be blown and inverter can be damaged if the DC cables are reversed. Route the positive DC input cable to the fuse and then to the battery. Protect cables with loom and use grommets or other appropriate means where cables may contact hard, sharp edges. If possible, make the last DC connection at the fuse to avoid causing a spark at the battery.
7. Connect Chassis Ground Bonding Lug to the vehicle chassis and/or earth ground using AWG No.8 or larger copper conductor.
8. Verify that the inverter will turn ON but do not leave the inverter connected to the battery at this time (remove the fuse). Final battery connections will be made after all control and AC output installation issues have been inspected.

AC Output Wiring Installation Procedure

WARNING: Before proceeding with the AC wiring, verify that the inverter is OFF and that the inverter is NOT connected to the battery. Serious or fatal electrical shock may occur.

1. The wiring of your inverter installation should conform to the National Electric Code (NEC) and any other state or local codes in effect at the time of installation. These codes have been written for your protec- tion and their requirements should be followed

2. 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.

3. Verify AC wiring installation. Verify that all connections are tight. Secure all wiring.

Start-up and Test Procedure

After the inverter has been properly mounted with sufficient ventilation, DC cables have been connected to the inverter (but not yet to the battery), AC wiring has been completed, and all remote connections have been checked; the Start-up and Testing procedure should be performed.

WARNING: These procedures are to be performed only by a QUALIFIED INSTALLER.

Inverter Start-up and Testing

1. Place the Inverter ON/OFF switch in the OFF position.

2. Place any remote switches in the OFF position.

3. Verify that any external AC output circuit breakers and GFCI receptacles are reset.

4. Connect the battery to the inverter. **BE AWARE**, as a quantity of capacitors become charged upon completing the DC circuit, **THERE WILL BE A LARGE SPARK** when the last connection is made.

5. Turn the inverter ON and use a test load (75 watt trouble light) plugged into the 15 amp GFCI recep- tacle to verify the inverter produces AC power.

6. Refer to the description of operation of the indicator lights, Section 2, items 4 through 10 to follow and verify correct inverter operation.

7. If the inverter is not operating as described, see Trouble Shooting Procedures.

6 PREVENTATIVE MAINTENANCE and TROUBLESHOOTING PROCEDURES

There are no user serviceable components inside the inverter. If the inverter requires service, refer to Vanner Incorporated or other qualified service personnel.

Preventive Maintenance

For continued reliability and safety, a monthly maintenance program should be implemented to include the following:

1. Check to insure that all wiring connections are tight, secure and corrosion free.
2. Check fan intake and exhaust vents for obstructions.
3. Examine receptacle, indicators and switches for cracks and breaks.
4. Examine any surfaces that are discolored or deformed due to excessive heat.

Trouble Shooting Procedures

The following are the most common questions heard by Vanner service professionals. If your situation does not apply to the following categories, please contact your local Vanner Power Group Service Center or the Vanner Power Group Customer Service Department: 1-800-AC-POWER (1-800-227-6937). Please have your model and serial number available when consulting customer service.

Preliminary Checks

1. Indicator Light status
2. Inverter ON/OFF Switch and Remote ON/OFF Switch positions
3. Check all GFCI receptacles and circuit breakers as equipped throughout AC system
4. Battery voltage at battery and battery voltage at the inverter. Voltage present at inverter does not prove that all connections are sound especially under no AC load. (see item 7)
5. DC Fuse condition
6. Battery connections for tightness or corrosion
7. Try operating an AC load from the GFCI receptacle located on inverter front panel

Problem Symptoms and Troubleshooting Checks

Problem: Inverter Indicator Light does not turn ON.
Check: Verify DC voltage at the inverter.

Problem: Inverter Indicator Light is ON but the AC load will not operate.
Check: Check and reset GFCI receptacle or circuit breakers. Verify AC wiring. Try a different load such as a trouble light. Turn load demand OFF (DIP switch #4 up).

Problem: Low Battery Indicator Light is ON when AC load is applied.
Check: Check battery connections and condition. Recharge battery if voltage is less than 10.5 (21.0) VDC.

Problem: Over Temperature Indicator Light is ON.
Check: Verify fan operation. Remove obstructions from air exhaust vents and cooling fan.

Problem: Overload Indicator Light is ON when AC load is applied.
Check: Verify AC load is within the inverter's rated capacity. Remove excessive loads.

Problem: DC fuse blows when connecting DC input cables.
Check: Check for reverse polarity (Positive and negative DC cables reversed.)

Problem: Excessive audible buzzing during inverter operation but inverter operates loads.
Check: Check mounting bracket bolt tightness.

Problem: AC loads do not seem to be fully energized when operating from inverter power.
Check: Check AC output voltage at convenience receptacle. Check for overheated DC or AC wiring. Verify AC load specifications are not exceeded.

Problem: Unit does not operate and a "burned wire" smell emits from inverter.
Check: Disconnect AC loads and battery immediately. Unit likely will require service, contact Vanner service department.

7. APPENDIX

GFCI Test Record

For maximum protection against electrical shock hazard, operate the Test Switch on the Ground Fault Circuit Interrupter at least once a month and record the values in this supplied table.

GFCI Test Record

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
20___												

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Owner's Manual D910106 Rev.E