

VANNER **POWER GROUP**

OWNER'S MANUAL



Model 20-1000TUL—AC Power Inverter System

OM/A96751 REV. A

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Warning

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1-800-AC POWER

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Section 1: Introduction

Thank you for purchasing a Vanner 20-1000TUL Power Inverter for your emergency vehicle. We are confident you will be satisfied with its performance.

Vanner products are designed and manufactured by skilled professionals using the highest standards in workmanship, guaranteeing excellent performance and reliability for your emergency vehicle. With minimum maintenance and care, you can expect years of trouble-free service from your Vanner product.

The 20-1000TUL is a 12 VDC to 120 VAC inverter with a transfer relay and Ground Fault Circuit Interrupter (GFCI) protected AC output. This unit is equipped with an AC line cord for AC input power (shore/utility power) and a receptacle with a GFCI for AC output. This enables you to plug AC loads directly into the inverter. The DC cables have quick connectors to facilitate installation and pre-wiring of emergency vehicles.



Vanner 20-1000TUL Inverter

Functionality



WARNING

Battery input cables must be connected to the battery with proper polarity to avoid damaging the inverter.

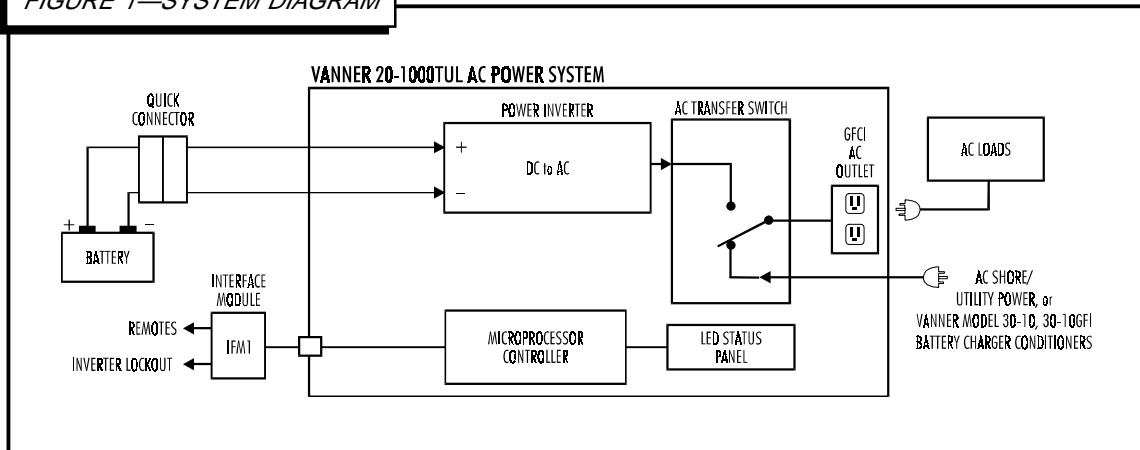
Inverter

The 20-1000TUL converts battery power to 1050 Watts of 120 VAC modified sine wave power to operate vital emergency vehicle equipment. The unit is easily connected to the positive and negative posts of a battery system with appropriate fusing, and when turned ON, produces 120 VAC True RMS power.

The inverter also has an energy-saving feature called Load Demand. With this feature, the inverter output is pulsed, significantly reducing the current draw from the battery until a demand is made on its output. Continuous output of 120 VAC resumes when a load greater than 5 Watts is applied. The load demand feature can be disabled with the Setup Switch on the front panel.

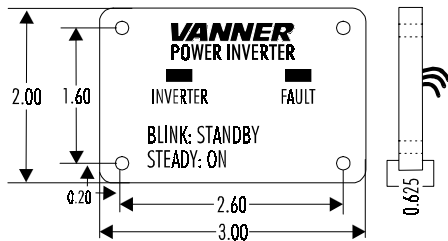
A built-in transfer relay senses AC input to the emergency vehicle (shore/utility power) and connects the AC input directly to the GFCI receptacle. At that time, all equipment which was operating on the inverter is now powered by the AC shore line.

FIGURE 1—SYSTEM DIAGRAM

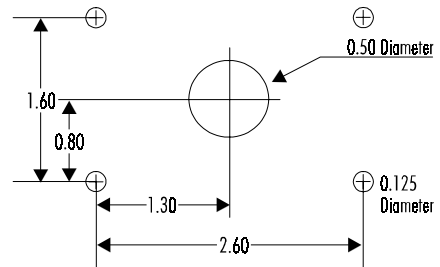


Specifications

<i>Inverter</i>	<i>20-1000TUL</i>
Output at 120 VAC RMS (Continuous Power Rating)	1050 Watts
Surge Capacity at 120 VAC (3 sec)	2100 Watts
Input Voltage, VDC (Deep Cycle Battery Recommended)	12 VDC, Nominal 10.5 VDC min., 16.0 VDC max.
Output Voltage	120 VAC \pm 5%
<i>DC Current Draw (Battery)</i>	
OFF	0.017 Amps Typical
Load Demand (waiting)*	0.09 Amps Typical
Full ON at No Load	0.7 Amps Typical
Full ON with Load	Approx. AC Load Watts \div 10 or AC Load Amps x 12
Frequency	60 Hz \pm 0.1%
Output Wave Form	Modified Sine Wave
<i>Bypass Transfer</i>	
Output Current, GFCI Outlet	12 Amps
<i>Other Specifications</i>	
Ambient Temperature	-20° to +110°F, -29° to +43.4°C
Cooling Air	Fan Cooled, 30 cfm
Chassis	Aluminum
Dimensions	11.57"W x 5.94"H x 11.04"D
Weight	22 lbs
* Determined by Setup Switch on front panel	



Remote Panel—D06638 & D06639



Remote Panel—D06638 & D06639

Section 2: Installing the 20-1000TUL



NOTE

Air enters by the fan at the rear of the unit, and exits through the sides of the unit. For maximum unit performance, avoid recirculating the same hot air through the unit.

Unpacking the Inverter

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

Installing the Inverter

Step 1: Turn the inverter OFF/disconnect power to the wiring harness.

Make sure power to the vehicle wiring harness is disconnected. Verify that the inverter is turned OFF by checking that the ON-OFF/RESET Inverter Switch is in the OFF-RESET position. (The button should NOT be pushed in.)

Step 2: Select a location for the unit.

An ideal installation location has the following characteristics:

- Close to the battery (within six feet using #2 AWG wire)
- Protected from the weather
- Well ventilated

DC Cable Length	
Size	Maximum
2 AWG	12ft.
1/0 AWG	20 ft.

Step 3: Route DC input cables.

Route the negative and positive DC input cables from the inverter (through the quick connector) to the battery. If required, protect cables where they contact hard, sharp edges.

Step 4: Install in-line fuse.

Install an in-line Bussman ANN 125 or equivalent fuse (Vanner p/n 03640-fuse and 03637-fuse holder) in the red, positive DC input cable between the battery and inverter, within 18 in. of the battery or DC wiring bus system.

Step 5: Connect Bonding Lug.

Use a AWG #8 or larger copper conductor to connect the chassis bonding lug to the vehicle chassis and/or earth ground.

Step 6: Connect the inverter to the battery.

Connect the black, negative DC input cable from the quick connector to the battery negative (-) terminal. This battery negative terminal is usually where the battery negative connects to the engine block or frame.

Connect the red, positive DC input cable from the quick connector to the fuse of the battery positive (+) terminal. This battery terminal is usually connected to the DC electrical system at the load side of the Battery Disconnect Switch.



WARNING

Battery input cables must be connected to the battery with proper polarity to avoid damaging the inverter.

Step 7: Select Load Demand option.

Select Load Demand option, if desired, using the proper switch position on the front panel Setup Switch. With Load demand ON, the inverter conserves battery energy and operates only when a load greater than 5 Watts is applied.

Step 8: Connect the AC loads.

Connect the AC loads to the inverter GFCI receptacle. Any time AC power is applied to the AC input (shore/utility power), it will pass through this GFCI receptacle.

Step 9: Verify installation.

Verify all connections are tight and secure for maximum performance.

Inverter LED Displays

Inverter	Light	Action	Description
	Steady Green	Light	Inverter is On and operating.
	Single Blink Green	Light	Inverter circuit is Off. Shore power is On and supplying AC power to the AC loads. The inverter will turn On and supply the load if shore power is lost.
	Double Blink Green	Light	Inverter circuit is Off. Shore power is Off. The inverter is waiting for a load greater than 5 watts to be turned on.
Battery Low	Light	Action	Description
	Solid Red		Inverter is On and the battery is almost too low to operate the inverter.
	Blinking Red		The inverter is Off. The battery voltage dropped below 10.5 volts DC and the inverter shut itself Off. Once shut off, the batteries must be recharged. Then, the inverter On/Off switch must be cycled to reset the unit.
Overtemp	Light	Action	Description
	Solid Red		The unit is Off. The unit has turned itself Off because the power MOSFET's are operating too hot. This can be caused by operating an AC load which is too large for the inverter, or lack of ventilation. When the unit cools the inverter will start operating again.
Overload	Light	Action	Description
	Blinking Red		The inverter is On but it is overloaded. Reduce the AC load quickly or the inverter will shut off due to the overload condition.
	Solid Red		The inverter is Off. An overload has occurred and the inverter has shut off to protect itself. Once shut off, the inverter On/Off switch must be cycled to reset the unit.

Section 3: Installing the IFM1 Interface Module

This section describes the installation of the optional Vanner Model IFM1 Interface Module. Refer to the information provided in the IFM1 Interface Module Owner's Manual for more information on installing the inverter and interface module in a vehicle rewired or retrofitted for the 20-1000TUL.

If you are installing a new 20-1000TUL unit, you will need the interface module only if you are using the inverter status panel (p/n D06638), Remote Switch (p/n D06781), or if you require the inverter lockout feature.

Installing the IFM1 Interface Module

Step 1: Mount the Interface Module.

Mount the interface module in the vehicle's existing 12 V electrical system wiring harness with #8 screws. Select a physical orientation best suited for your application environment; however, it must be within the 2ft Interface Cable length to the inverter. Additionally, the unit should not be installed with pin connections facing upward.

Step 2: Connect the Inverter to the Interface Module.

Install the 2 ft. interface cable by plugging it into the remote RJ-11 connector on the 20-1000TUL and the J1 connector on the IFM1 Interface Module.

Step 3: Connect the Battery Disconnect Switch.

Connect the +12 V lead from the Module Disconnect Switch circuit to the inverter lockout Pin 1 (ignition switch or battery disconnect switch). The +12 V lead from the Battery Disconnect Switch must be fused with an in-line fuse or circuit breaker of 2 Amps or less. See Figure 2.

Step 4: Wire the Remote Switch (p/n D06781) to Pins 2 through 5.

Red to Pin 2, Black to Pin 3, Green to Pins 4 and 5. If no remote switch is used, two jumpers must be installed. The first jumper connects Pin 2 to Pin 3, the second jumper connects Pin 4 to Pin 5. See Figure 2.

Step 5: Connect the Inverter Remote Status Display Panel (Optional).

Connect the gray, green, and red wires from the inverter panel, through the OEM harness, to the IFM1 Module, Pins 6 (grey), 7 (green), and 8 (red).

Section 4: Installing the Inverter Remote Status Display Panel

The Inverter Remote Status Display Panel (p/n D06638) contains separate, red and green LED indicators. The green indicator light signifies the inverter is On or in Standby mode. The red, Fault LED indicator shows problems such as over temperature, output overload, or low battery. The panel has a sealed overlay which mounts easily on a flat surface. A 12-in. pigtail harness is included for easy installation. Use the following procedure to install the Inverter Remote Status Display Panel.

Step 1: Select a location for the panel.

Identify the desired location for the inverter panel.

Step 2: Identify wires for installation.

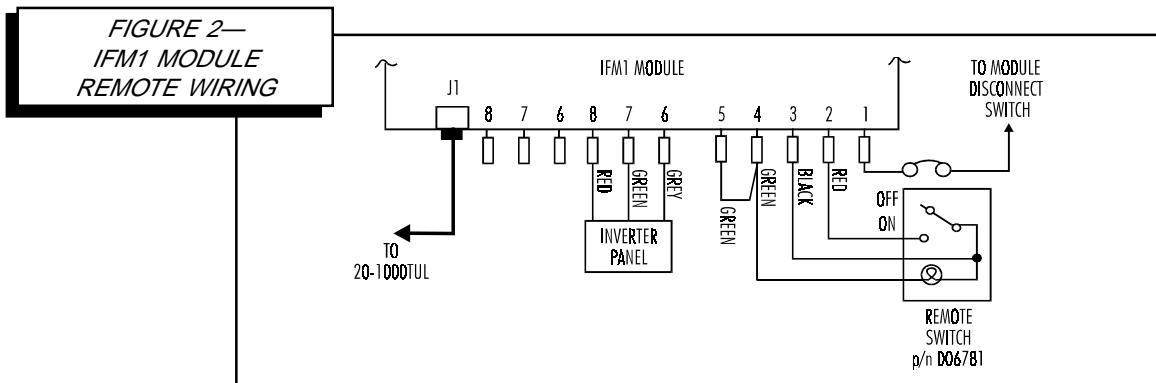
Identify the gray, green, and red wires on the inverter panel and vehicle's electrical system wires that will connect to the IFM1 Interface Module.

Step 3: Splice and arrange wires.

Splice together like-colored wires from the vehicle's electrical system to the status panel using an insulated butt splice or equivalent. Carefully arrange the wires such that the panel mounts flush against the surface to which it is mounted.

Step 4: Secure panels to surface.

Mount the panels using #8 screws through the four holes in the panel.



Section 5: Inverter Status Panel Operation

Two LEDs on the front of the Remote Status Display Panel indicate the status of the inverter. The status indicated by the LED displays is directly related to the status indicated by the LEDs on the front of the inverter.

Inverter LED	Light Action	Description
	Steady Green Light	Inverter is operational.
	Single Blink-Green Light	Inverter is not being used. Shore power is applied to load. Inverter will activate when shore power is unavailable.
	Double Blink-Green Light	Inverter is on in the Load Demand mode and is waiting for AC load to be turned ON.
Inverter Fault LED	Light Action	Description
	Red Light	Unit shutdown *— Check the inverter's front panel LEDs for reason of shutdown: Low Battery, Overload, or Overtemp.

**Refer to the Troubleshooting section of this manual for fault diagnostic information.*

Section 6: Operating the 20-1000TUL Inverter

Use the following instructions to operate the 20-1000TUL Inverter.



NOTE

Throughout this manual, shore/utility power is referred to as AC input power.

Step 1: Install the 20-1000TUL unit.

Completely install the inverter and charger using the instructions provided in Section 2 of this manual.

Step 2: Apply an AC load.

Apply an AC load with AC input power present. The AC load is run directly from AC input power. The ON-OFF/RESET Inverter Switch does not affect the inverter's AC output when shore power is present.

Step 3: Turn on the inverter Remote Switch.

Step 4: Apply shore power to the 20-1000TUL/Ambulance shore line connection.

Push the ON-OFF/RESET Inverter Switch to the ON position. When powered by the AC power, the ON lamp flashes, indicating that the inverter is standing by.

Step 5: Verify Power.

Apply an AC load, such as a shop light or drill. The AC load is run directly from AC input power.

Step 6: Observe the inverter operation.

Remove the shore line connection from the emergency vehicle. The unit will automatically switch to Inverter mode and operate the AC load using battery power. When shore power is restored, the unit examines the AC input for five seconds and then switches the loads back to run directly from AC input power.

With the ON-OFF/RESET Switch in the ON position, a double flash of the ON light indicates the load demand is turned ON and the load is less than 5 Watts.

Section 7: Troubleshooting the 20-1000TUL

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.

Vanner Power Group Customer Service: 1-800-AC-POWER

SYMPTOM	The LEDs on the front panel blink in sequence.
SOLUTION	It is normal for this to occur if the inverter switch is On when the DC input is connected to the unit. If the DC is already connected and the LEDs blink in sequence then the DC input voltage is dropping. Check for poor connections in the DC wiring, bad battery or a heavy DC load.
SYMPTOM	ON lamp does not light steadily after pushing in the ON-OFF/RESET Switch. Inverter
SOLUTION	Lamp flashes when utility power is present. Lamp flashes in Load Demand Waiting mode. Check/Reset GFCI on the receptacle. Check battery connections if utility power is OFF. Check DC fuses if utility power is OFF.
SYMPTOM	ON lamp fully illuminates. AC load does not run.
SOLUTION	Check and reset circuit breaker. Verify AC load and cord are in proper condition.
SYMPTOM	BATTERY LOW lamp illuminates when AC load is applied.
SOLUTION	Check battery connections. Check battery condition. Recharge battery if voltage is less than 10.5 VDC. Check AC loads for shorted circuit. Check the vehicle's alternator charging system for proper operation.
SYMPTOM	OVERTEMP lamp illuminates.
SOLUTION	Something has caused the unit to overheat. Check for obstruction of air flow to the cooling fan or from ventilation holes. Verify AC load is within unit's rated capacity.
SYMPTOM	OVERLOAD lamp illuminates with AC load applied.
SOLUTION	Verify AC load is within unit's rated capacity.
SYMPTOM	DC fuse blows when connecting DC input cables.
SOLUTION	Check for reverse polarity: red cable to battery positive (+), black cable to battery negative (-). The unit may be damaged and require repair service.

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Specifications Subject to Change
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