VANNER POWER GROUP

OWNER'S MANUAL

Model 20-1050CUL—AC Power Inverter/Charger System

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20-1050CUL--OWNERS MANUAL

OM/A96283 REV. B

Section 1: Introduction

Thank you for purchasing a Vanner 20-1050CUL Power Inverter/Battery Charger 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 20-1050CUL is a 12 VDC to 120 VAC inverter with a built-in battery charger/conditioner and transfer relay. This unit is equipped with an AC line cord for connecting AC input power (shore/utility power) and a receptacle with a Ground Fault Circuit Interrupter (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 20-1050CUL Inverter

FUNCTIONALITY

Inverter

The 20-1050CUL 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.

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

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 on its output. Continuous output of 120 VAC resumes when a load greater than 5 The load demand feature can be disabled with the Setup Switch on the front panel.

A built-in transfer relay switches the AC output receptacle from the inverter to the AC input when the unit senses AC input from the shore/utility power.

Battery Charger

The 20-1050CUL Battery Charger's superior design incorporates a multi-stage charger. This design enables the unit to automatically charge batteries, maintaining the battery's integrity and reducing the likelihood of premature failure.

NOTE
If the battery is fully charged at the time AC input is applied, the unit will go directly into Ready/ Maintenance mode.

- ***High Charge Mode***

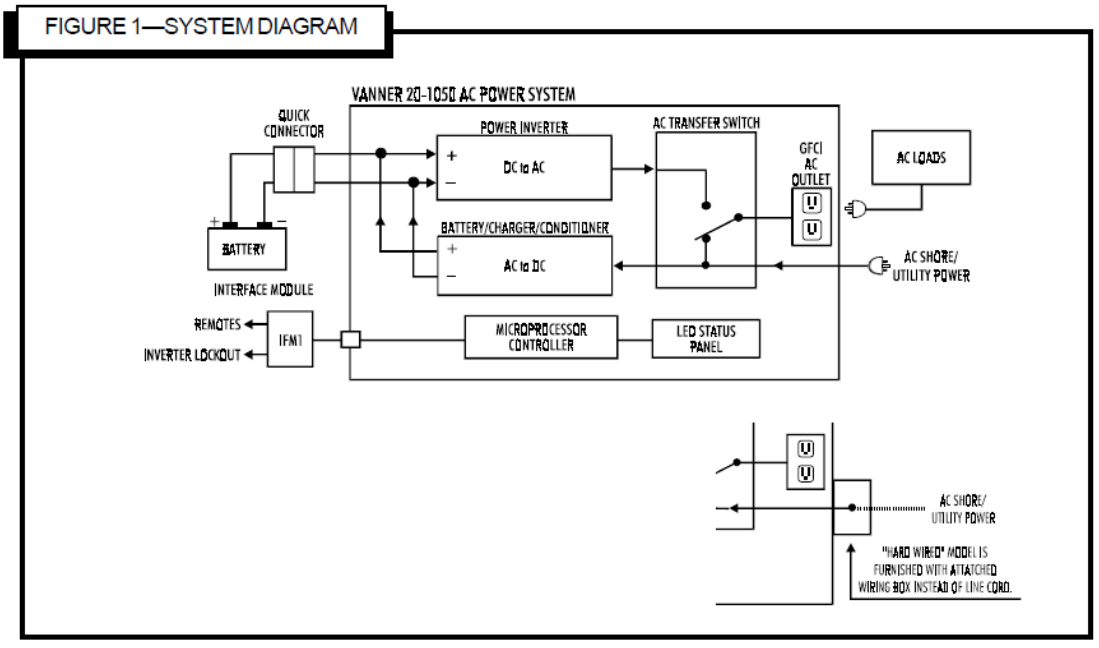
While in the High Charge mode, the unit continuously charges at a constant current of 55 Amps (high setting) for large battery banks, or 15.0 Amps (low setting) for small battery banks (such as two group 31 batteries). The unit will charge until the battery cells reach 14.2 VDC for flooded batteries. or 19.1 VDC for gel batteries. The unit then supplies a fixed voltage until the battery is fully charged.

- ***Ready/Maintenance Mode***

The charger automatically enters the Ready/Maintenance mode, maintaining the battery's proper voltage of 13.2 VDC for flooded batteries or 13.6 VDC for gel batteries. This Ready/Maintenance mode is designed to eliminate gassing (overcharging), helping to extend the life of the battery.

A Setup Switch is located on the front panel for selecting the type of battery (Flooded Lead Acid or Gel Lead Acid), the battery charger output current (High/Low), and Load Demand(On/Off).

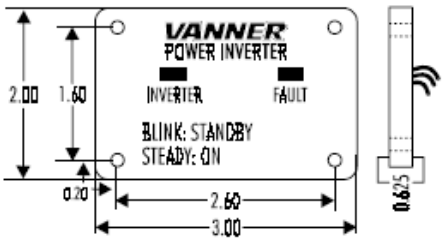
FIGURE 1—SYSTEM DIAGRAM



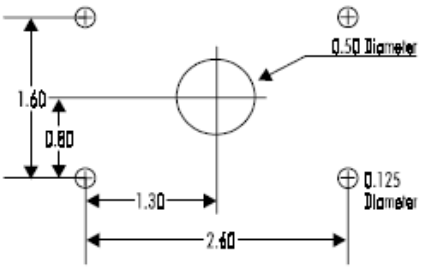
Specifications

Inverter	*20-1050CUL*
Output at 120 VAC RMS (Continuous Power Rating)	1050 Watts
Surge Capacity at 120 VAC (3 sec)	2100 Watts
Input Voltage, VDC	12 VDC, Nominal
(Deep Cycle Battery Recommended)	10.5 VDC min., 16.0 VDC max.
Output Voltage	120 VAC ± 5%
DC Current Draw (Battery)	
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 ÷ 10 or AC Load Amps x 12
Frequency	60 Hz ± 0.1%
Output Wave Form	Modified Sine Wave
Battery Charger	
Charging Capacity*	55 Amps (High)
	15.0 Amps (Low)
Input Voltage	120 VAC ± 10%
Input Current	8.0 Amps
Bulk Voltage*	14.2 VDC (flooded), 14.1 VDC (gel)
Float Voltage*	13.2 VDC (flooded), 13.6 V (gel)
Bypass Transfer	
Output Current, GFCI Outlet**	12 Amps
Other Specifications	
AC Input Termination	Hardwire Box, or 3ft. Line Cord
AC Output Termination	Duplex GFCI Receptacle
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 setting on front panel.	

**Note: If GFCI trips and the inverter is in load demand mode the GFCI may not reset until you toggle inverter off and back on and then you will have 5 seconds to reset GFCI before unit goes back into load demand again or you can disable load demand via dipswitch, if available.



Remote Panel—D06638 & D06639



Remote Panel—D06638 & D06639

WARNING

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

Section 2: Installing the 20-1050CUL

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.)

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

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.

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
- Protected from the weather

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 inline fuse.

Install an inline 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 in/line fuse near 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: Select battery type.
The charger is capable of charging both gel and flooded lead acid batteries. Select the battery type using the Setup Switch on the front panel.

WARNING
Improper Battery Type Switch setting may damage batteries.

Step 9: Select the charging rate.
In the high position the charge is 55 Amps. In the low position the output is 15.0 Amps. We recommend the low position as the best selection when two (group 31 or smaller) batteries are used. Charging at too high of a rate for a given battery will damage the batteries.

Step 10: 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 11: 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.

Inverter LED Displays cont.

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.
Charger High Charge	**Light Action**	**Description**
	Blinking Yellow	The charger is operating. The batteries were low and in need of a charge. The charger is in the process of charging the batteries to the bulk voltage. The charging current is limited based on the position of the Charger High/ Low switch.
Charger Ready/Maintenance	**Light Action**	**Description**
	Solid Green	The charger is operating. The batteries are near full charge and the charger is in the maintenance mode. In this mode, the charger is holding the batteries at the float voltage. The charging current is limited based on the position of the Charger High/Low switch.

Section 3: Installing the IFM1 Interface Module

This section describes the installation of the optional Vanner Model IFM 1 Interface Module. Refer to the information provided in the IFM 1 Interface Module Owner's Manual for information on installing the inverter and interface module in a vehicle rewired or retrofitted for the 20-1050C UL.

If you are installing a new 20-1050 CUL unit, you will need the interface module only if you are using the inverter or charger status panels (p/n D06638 or D06639), Remote Switch (pin D06781), or if you need to use the inverter lockout feature.

NOTE

Refer to the IFM1 manual for Pin identification and description.

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 close to the inverter as the interface cable is 2 ft. in length. 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 20-1050CUL, and the J1 connector on the IFM1 Interface Module.

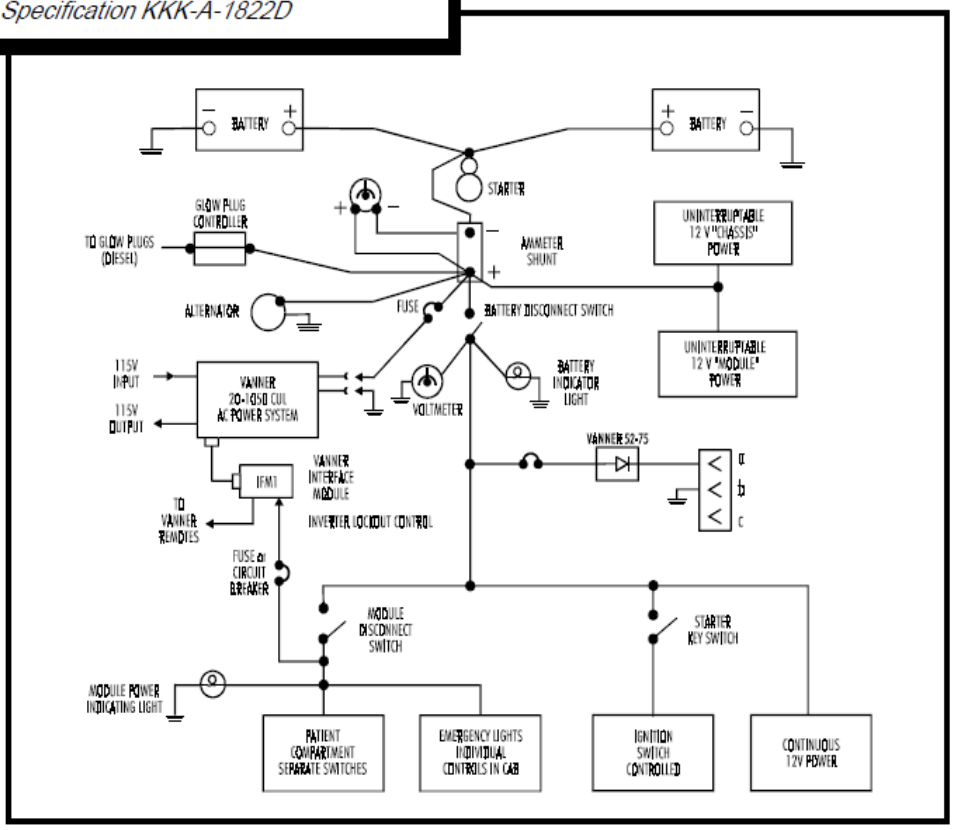
Step 3: **Connect the Battery Disconnect Switch.**
Connect the +12 V lead from the Module Disconnect Switch circuit to the inverter lockout Pin 1 (ignition switch or battery disconnect switch). The +12 V lead from the Battery Disconnect Switch must be fused with an inline fuse or circuit breaker of 2 Amps or less. See Figure 3.

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 3.

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).

Step 6: Connect the Charger Remote Display Status Panel (Optional).
Connect the brown, white, and black wires from the charger panel, through the OEM harness, to the IFM1 Module, Pins 9 (brown), 10 (white) and 11 (black)

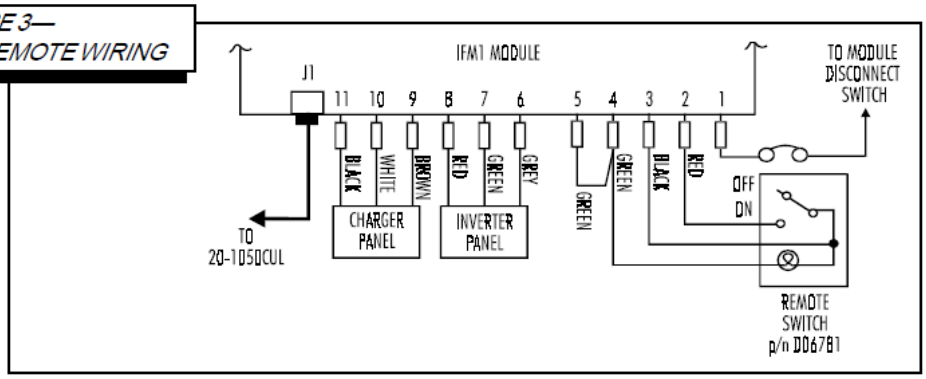
FIGURE 2—12 Volt Electrical System-Functional Diagram Federal Specification KKK-A-1822D



Section 4: Installing the Inverter and Charger Remote Status Display Panels

Both the inverter and charger Remote Status Display Panels contain a red and green LED indicator. On the inverter status panel, the green indicator light signifies the unit is ON or in the Standby mode. On the charger status panel, the green light indicates the presence of shore power or that the battery is being maintained at its current level. For both the inverter and charger, the red, Fault LED indicator shows problems such as over temperature, output overload, or low battery.

FIGURE 3— IFM1 MODULE REMOTE WIRING



The panels have a sealed overlay which mounts easily on a flat surface, Each panel is equipped with a 12-in. pigtail harness for easy installation. The following installation procedure applies to both the inverter and charger panels:

Step 1: Select a location for the panel.

Identify the desired location for the inverter and charger panels.

Step 2: Identify wires for installation.

Identify the gray, green, and red wires on the inverter panel and vehicle's electrical system. Identify the brown, white, and black wires on the charger panel and the vehicle's electrical system.

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

NOTE
When the remote charge indicator panel is installed to the outside of the vehicle, the status panel should be sealed with RTV.

Section 5: Inverter and Charger Status Panel Operation

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

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.	
Charger LED	**Light Action**	**Description**
	Blinking Green Light	AC (shore/utility power) is present and battery charger is in the High Charge (Bulk) mode.
	Steady Green Light	AC (shore/utility power) is present and the battery charger is in the Maintenance (Float) mode.
Charge 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 20-1050CUL Inverter/Charger

Use the following instructions to operate the 20- 1050CUL Inverter.

Step 1: Install the 20-1050CUL unit.
Completely install the inverter and charger using the instructions provided in Section 2 of this manual.

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

Step 2: Start the vehicle.
Turn the Battery Disconnect Switch on and start the vehicle.

Step 3: Turn switches on.
Turn on the Module Disconnect Switch and the Inverter Remote Switch.

Step 4: Apply shore power to the **20-1050CUL/Ambulance shore line connection.**
After shore power has been connected one of the Charger LEDs will light or flash. Push the ON-OFF/RESET Inverter Switch to the ON position. The inverter lamp will flash, 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 shore/ utility 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/shore 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 20-1050CUL

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 Incorporated Service Center.

Vanner Incorporated Customer Service:
1-800-AC-POWER

SYMPTOM	The LEDs on the front panel blink in sequence.
SOLUTION	It is normal for this to occure 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 is dipping in voltage.
	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 Inverter Switch.
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 and GFCI receptacle**.
	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 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 surge and continuous 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.

**Note: If GFCI trips and the inverter is in load demand mode the GFCI may not reset until you toggle inverter off and back on and then you will have 5 seconds to reset GFCI before unit goes back into load demand again or you can disable load demand via dipswitch, if available.

Section 8: 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.

ENTER YEAR	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
20_												

Limited Warranty

1. Vanner Inc., warrants that this product is free from defects in materials and workmanship for a period of one (1) year from its date of shipment from Vanner's factory.

2. This warranty does not cover defects caused by misuse, neglect, accident, reversed polarity, unauthorized repairs, and/or replacements.

3. All warranties of merchantability and fitness for a particular purpose; written or oral, express or implied, shall extend only for a period of one (1) year. There are no other warranties which extend beyond those described on the face of this warranty.

4. Vanner does not undertake responsibility to any purchaser of its product for any undertaking, representation, or warranty made by any dealers or distributors selling its products beyond herein expressed.

5. Vanner does not assume responsibility for incidental or consequential damages, including, but not limited to responsibility for loss of use of this product, loss of time, inconvenience, expense for telephone calls, shipping expense, loss or damage to property, or loss of revenue.

6. Vanner reserves the right to repair, replace, or allow credit for any material returned under this warranty. Any damage caused by the customer will be charged or deducted from the allowance.

7. All warranty work will be performed at Vanner's factory, or authorized repair facility. Products shall be delivered to Vanner's facility, freight prepaid. Products repaired under warranty, or replacement parts or products will be returned, F.O.B. Vanner factory.

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