

OWNERS MANUAL
VANNER INVERTER

20-500 Series

20-1000 Series

24-1500 Series

Table of Contents

General Information	2
General Specifications and Dimensions	3
User Selectable Features	4
Installation	8
DC Input Wiring	9
Wire Sizing and Fusing - DC Input	10
Operation	11
Trouble Shooting Guide	12
General Maintenance	13
Replacement Parts	14
Warranty	15

Thank you for making your inverter purchase a Vanner inverter. We are confident that you will be very pleased with its performance because we engineer into our inverters as much automatic control as possible eliminating the need to monitor your unit visually. Important to us is our philosophy that insures that every Vanner inverter is designed and manufactured by skilled technicians using the highest quality components together with the highest standards in workmanship. With minimal maintenance and average care, you can be assured of many years of trouble free service from your new Vanner inverter.

GENERAL INFORMATION

Vanner inverters are electronic devices which convert 12 or 24 VDC into 120 VAC 60 Hz power. They employ patented circuitry and proven technology to deliver True RMS Regulated, quasi-sinewave AC power to all types of electrical loads. These Vanner inverters are fan cooled and incorporate the following basic features: Remote Control On/Off Switch Assembly, Panel Light indicating inverter power available, thermal cut-off, factory installed DC input cables with battery connectors and an additional matching set of battery connectors to facilitate installation, DC input circuit breaker, convenience outlets for standard AC loads and a microprocessor-based control board. All T-type Vanner inverters incorporate the same features as above plus a factory installed Transfer Switch.

These Vanner inverters with their microprocessor-based control boards allow the user to easily adjust the following functions: Low Input Voltage, High Input Voltage, Minimum Battery Start Voltage and Load Demand. These adjustment features are explained in detail later in the manual.

Table 1

GENERAL SPECIFICATIONS AND DIMENSIONS

	<u>20-500*</u>	<u>20-1000*</u>	<u>24-1500*</u>
AC Output Power Ratings	500 watts	1000 watts	1500 watts
*AC Output Voltage (RMS)	120±1.5%	120±1.5%	120±1.5%
Frequency	60±0.2 Hz	60±0.2 Hz	60±0.2 Hz
DC Input Voltage	10.0 - 15.0	10.0 - 15.0	20.0 - 30.0
DC Input Current	60 Amps Max.	100 Amps Max.	75 Amps Max.
Transfer Switch Rating	----- 120 VAC, 15 Amp -----		

*For Transfer Switch option, add T to part number

Length (inches)	12½	12½	12½
Width (inches)	8½	8½	8½
Height (inches)	6½	6½	6½
Unit Weight (pounds)	28	28	28
Shipping Weight (pounds)	31	31	31
Recommended Clearances (inches)	9H	9H	9H
	13W	13W	13W
	16D	16D	16D

*When DC input voltage drops below 10.8 volts (21.6 volts for 24 volt units) the AC output voltage may also drop.

USER SELECTABLE FEATURES

Feature Description

Before installing your new inverter, carefully review the factory preset functional options that are available and make any changes necessary for your particular application. A description of these options and the factory settings follows.

1. High Battery Voltage Shutdown. This feature protects your Vanner inverter from a high input voltage condition which may adversely affect its operation. If a high input voltage is present at the time the inverter is first turned on, it will wait in a standby mode until the voltage drops below the preset high battery voltage limit and then start automatically. If the high battery voltage limit is exceeded during operation for more than a few seconds, the inverter will automatically shut down and not re-start until the unit has been reset by switching Off then On again at either the main input breaker or the remote On/Off switch. Factory Setting: 12VDC = 15.00V; 24 VDC = 30.0V.

2. Minimum Battery Voltage Start. This feature protects the storage batteries connected to your inverter from being used when they are discharged below their rated capacity. This feature is in effect only when the unit is first turned on, either by the main input circuit breaker or the remote On/Off switch. When the battery voltage is too low, the unit will wait in a standby mode until the minimum start voltage is reached, and then will start automatically. Factory Setting: 12VDC = 11.75V; 24VDC = 23.5V.

3. Low Battery Voltage Shutdown. This feature protects the storage batteries connected to your unit from being discharged past their minimum rated voltage. The unit will automatically shut down if presented with a voltage lower than the low battery voltage limit for more than a few seconds. The unit will not re-start until it has been reset by switching Off then On again at either the main input circuit breaker or the remote On/Off switch. The minimum battery voltage start requirement must also be met before the unit will re-start. Factory Setting: 12VDC = 10.0V; 24VDC = 20.0V.

4. Load Demand. This feature saves energy by keeping the inverter in a standby mode when output power is not required. When a load is switched on, such as a light bulb or electric motor, the inverter will automatically start after a short delay of approximately one second. The inverter will automatically return to the standby mode again when all loads are switched off. The sensitivity, or the amount of load to start the inverter, is selectable to suit the needs of your installation. On occasion, when operating a light load such as a radio or TV,

there is not enough demand on the inverter to cause it to turn on. You may have to turn on another appliance (such as a 100 watt light bulb) to get the inverter to start - then turn this appliance off. Usually the inverter will continue to operate. The Load Demand feature may be disabled entirely so that the unit will run whenever the main input breaker and remote On/Off switch are both on. Note: Certain TV's, with the "instant on" feature, or wireless remote control draw a small amount of current at all times. There may be enough of a current draw to cause the inverter to remain on at all times, defeating the energy saving feature. Check red light on inverter to determine if inverter goes off when TV is turned off. Other appliances that can keep an inverter on are clocks and GFI receptacles. Factory setting: NO LOAD.

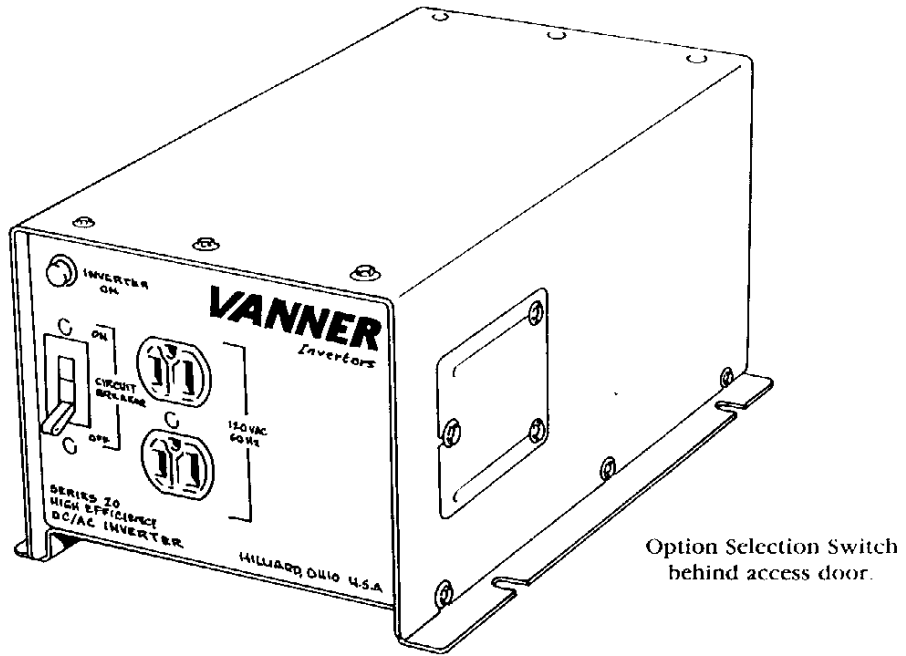
Feature Setting Procedure

Your Vanner inverter is outfitted with a microprocessor-based control board which allows you to customize each feature to suit your particular needs. Figure 1 shows the location of the access door on the unit and the circuit board with the option select switches. Table 2 lists the features, the settings for the particular features and the switch positions for both 12 and 24 volt battery systems.

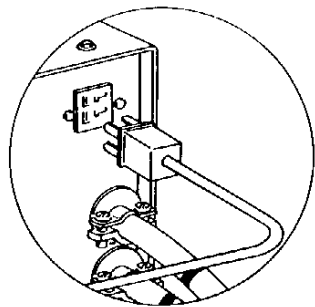
WARNING: High Voltage. It is necessary that the inverter circuit breakers be turned OFF and all input power be disconnected before attempting to adjust unit to avoid potential damage. Failure to do so will also cause unit to ignore the adjustments. Do not use the point of a lead pencil to change switch positions, use the tip of a ballpoint pen or small screw driver.

1. Disconnect all input power before attempting to adjust unit.
2. Double check unit specification label for input voltage rating to insure proper switch selection.
3. Locate access door at right front side of unit.
4. Loosen (do not remove) the three screws and slide access door back.
5. Locate switch assembly mounted on circuit board.
6. Set each switch in desired position (On or Off). Reference Table 2.
7. Replace access door and tighten access door screws.
8. Restore power to the unit. It is now operational according to your selected settings.

Figure 1



Typical 20-1000 Vanner Inverter Producing 1000 watts AC



Remote Switch Plug

OPTION SELECTION SWITCH

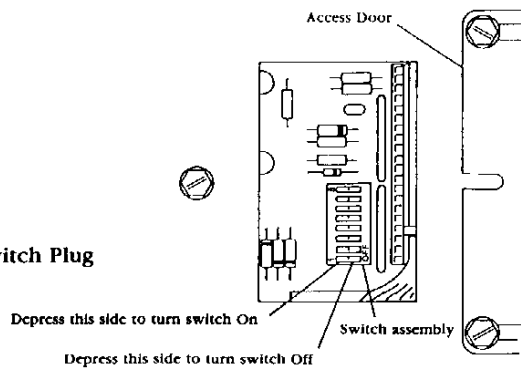


Table 2

OPTION SELECTION TABLE

OPTION	SETTING		SWITCH SETTINGS							
	12V UNIT	24V UNIT	1	2	3	4	5	6	7	8
	HIGH BATT. SHUTDOWN	14.25	28.50	OFF	OFF					
14.50		29.00	OFF	ON						
14.75		29.50	ON	OFF						
15.00*		30.00*	ON	ON						
MINIMUM BATTERY START	12.50	25.00			OFF	OFF				
	12.25	24.50			OFF	ON				
	12.00	24.00			ON	OFF				
	11.75*	23.50*			ON	ON				
LOW BATTERY SHUTDOWN	11.50	23.00					OFF	OFF		
	11.00	22.00					OFF	ON		
	10.50	21.00					ON	OFF		
	10.00*	20.00*					ON	ON		
LOAD DEMAND	NO LOAD*								OFF	OFF
	7.5 WATTS								OFF	ON
	15 WATTS								ON	OFF
	25 WATTS								ON	ON

* INDICATES PRESET FACTORY SETTINGS

INSTALLATION

Installation and wiring must conform to the National Electric Code, state, local or other codes in effect at the time of installation.

Caution

To prevent fire, do not cover or obstruct ventilating openings. Allow plenty of room for inverter to breathe on all sides. See Table 1.

Do not mount in zero-clearance compartment. Over heating may result. If high loads for long periods of time are anticipated, recommend a cooling fan be installed to ventilate the compartment where inverter is located.

Do not expose to rain or moisture.

This equipment employs components that tend to produce arcs and sparks, therefore do not install in compartments containing batteries or flammable materials.

Safety

Safety goggles should always be worn when working near batteries, especially the lead-acid type.

Make sure that the inverter is **off** during installation.

Mounting

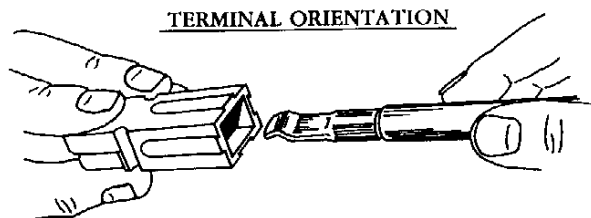
Locate a secure, flat surface as close to the battery as possible without being in the same compartment. The location should provide adequate ventilation and clearance to maintain room temperature while the unit is operating. At least 4 inches of clearance should be maintained on all sides. The unit should be secured to the mounting surface with 4 quarter inch bolts (not supplied), through the slots in the bottom flange of the inverter.

DC Input Wiring

Vanner inverters are supplied with a DC input pigtail, approximately 14" long, terminated with a high current capacity connector. These input terminals are silver plated and therefore are not to be solder dipped as this can damage the contact plating. A mating connector is supplied for termination of cables from the battery and is marked with "+" for battery positive and "-" for battery negative. Reference Figure 2 for proper orientation of insertion of terminal into plastic housing. For installation in vehicles we recommend quality stranded copper cable for connections between the DC power source and the inverter. For best performance, the negative ground conductor should be routed back to the battery negative terminal or to the bolt that is afixed to the frame where the battery negative is connected.

The recommended tool for crimping the DC input connector terminals to the battery leads is Anderson Power Products Part No. 1368 (telephone 617-787-5880), or equivalent.

Figure 2



Caution: The inverter input connections are RED for battery POSITIVE and BLACK for battery NEGATIVE. Reversing these connections will damage the inverter.

To protect the input wiring between the DC power source and the inverter, we recommend that a fuse be installed within 18 inches of the power source. The fuse holder should be U.L. listed. (For installation in a vehicle, please refer to N.E.C. Article 551.) A time delay fuse, such as manufactured by Bussman or the equivalent, is recommended as shown on Table 3.

Table 3

Wire Sizing and Fusing - DC Input

	<u>20-500</u>	<u>20-1000</u>	<u>24-1500</u>
Suggested Minimum Wire Size Up To 15'	4AWG	2AWG	4AWG
Suggested Minimum Wire Size For 15-20'	2AWG	1/0AWG	2AWG
Suggested Fuse Size	80 Amp	150 Amp	125 Amp
Bussman Fuse	ANL-80	ANL-150	ANL-125
Bussman Fuse Holder	3576	3576	3576

AC Output Wiring

Vanner inverters are supplied with convenience outlets for connecting loads to the inverter. The main input circuit breaker disconnects the inverter from the DC source but does not disconnect the inverter from the AC output. It is up to the user to supply a switching mechanism to prevent accidental back feeding of 120 volt power, such as shore power or some other form of alternate power, into the AC output of the inverter when alternate power is applied to the system. If the inverter is supplied with a built in Transfer Switch, most instances of back feeding are eliminated provided the inverter is connected to the electrical systems properly. For more information, please call or write to Vanner Inc.

Remote Switch Wiring

The Remote Switch is a standard feature on Vanner inverters and is supplied with an 8 foot long pre-wired cable assembly. The Remote Switch cable plugs into the back of the inverter just above the DC input cables. The remote cable plug is polarized and can be connected only one way. Reference Figure 1.

The Remote Switch supplied with the unit should be mounted in a convenient location with an appropriate strain relief. The Remote Switch has color dots to match the connecting red, black and green wires of the cable assembly.

Note: The inverter will not operate unless the Remote Switch is plugged in and turned on. In the event you do not wish to utilize the Remote Switch, we recommend ordering an ASM-35 Remote Bypass Plug that eliminates the need for the Remote Switch and remote wiring.

OPERATION

Before initial startup, check all electrical connections.

To operate the inverter, the input breaker on the front panel must be On. The inverter is turned On and Off from the Remote Switch. If you set the Load Demand option as explained on Page 3-4, when you turn the inverter On, the inverter will remain in a standby mode until a sufficient load is applied to the inverter such as an electric appliance. At this time, there will be a slight delay before the appliance will operate. When the appliance no longer draws current, the inverter will automatically return to standby. The amperage draw in standby mode is approximately 0.15 amps D.C. An indicator light on the front panel indicates inverter power is available at the convenience outlet. The indicator light will not be On while shore power is being used on units with the factory installed Transfer Relay (T). The inverter automatically turns Off when shore power is applied and automatically restarts when shore power is removed. If the inverter will not be used for an extended period of time, turn circuit breakers OFF to eliminate standby draw. NOTE: When Remote Switch is off, the inverter will be off. When the Remote Switch is turned on and the circuit breaker is on, the Remote Switch light will light indicating that the inverter is ready for operation in keeping with the settings programmed into the Option Selection Switch.

TROUBLE SHOOTING GUIDE

Vanner inverters are electronically protected against potentially damaging operating conditions by way of the factory preset options or user adjusted options that were discussed earlier in this manual. Protections include the following conditions:

LOW INPUT VOLTAGE
HIGH INPUT VOLTAGE
OUTPUT OVERLOAD

If one or more of these conditions exist, the unit will automatically shut off, or fail to start at all. If you want to check the output of the unit you must use a true RMS reading volt meter. Most common meters are not true RMS meters and will not give an accurate reading of the output voltage. The following list should be helpful in isolating problems that could be keeping the inverter from functioning properly. Photocopy this Trouble Shooting Guide and keep in a handy location.

PROBLEM: Inverter will not turn on.

CHECK:

1. Inverter will not operate without Remote Switch plugged in and turned On.
2. Main input circuit breaker must be in On position.
3. Battery voltage must be between the Low Battery and High Battery setting.
4. Shore power must be disconnected for inverter to turn on.
5. Load must exceed minimum load demand setting (see Load Demand Options).

PROBLEM: Inverter runs for short period of time then turns off.

CHECK:

1. Inverter may be overloaded. Disconnect all loads, turn on a small load such as a light bulb and reset inverter by switching Off then On at either the Remote Switch or main input breaker.
2. Be sure air vents at sides and rear of unit are not obstructed. This may cause overheating and permanent damage to the unit.

3. Battery voltage must remain between the Low Battery and High Battery settings at all times during inverter operation. If a short circuit occurs in an appliance or the wiring to the appliance, the unit will automatically shut down. Check for short circuits.

PROBLEM: Main input breaker trips immediately when switched on.

CHECK:

1. Battery connections may have reversed polarity. The inverter input connections are RED for battery Positive and BLACK for battery negative.

CAUTION: Unit may be severely damaged by reversed input polarity.

PROBLEM: The Main Input Breaker and Remote Switch are On, all connections are correct and accessories are plugged in but inverter will not run.

CHECK:

1. Check Load Demand sensitivity setting. It may need to be reduced so that the inverter will respond to a very light load such as an electric clock, hand drill, etc.

If further assistance is required, call your dealer or Vanner.

GENERAL MAINTENANCE

For continued reliability and safety, a visual maintenance program should be implemented each month. Your Vanner inverter is designed to be virtually maintenance free requiring little or no regular maintenance or repair service. However, for long term reliability and safety, below is a short list of checks you are encouraged to perform.

1. Check all wiring to be certain that there is no corrosion buildup at the terminals and that all connections are secure, that insulation is free of cracks, breaks and abrasions.
2. Check air ventilation openings on the inverter for dust, dirt, moisture and possible obstructions.

Table 4

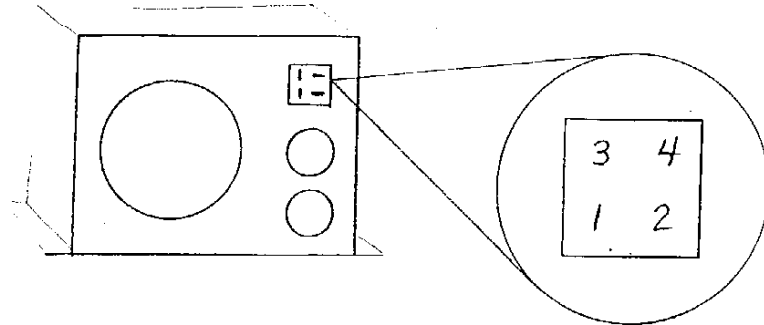
Below is a listing of common replacement parts available for your Vanner inverter. Please refer to the Vanner Warranty before attempting repairs.

<u>Part No.</u>	<u>Description</u>	<u>500</u>	<u>1000</u>	<u>1500</u>
02014	12 volt Remote Switch Kit with 8 ft. cable prewired to plug and lighted switch.	1	1	N/A
02015	24 volt Remote Switch Kit with 8 ft. cable prewired to plug and lighted switch.	N/A	N/A	1
02026	2 ft. Battery Cable Set with (2) CNP-01 connectors terminating one end and (2) 3/8 ring terminal connections at opposite end.	1	1	1
02028	Remote By-pass Plug	1	1	1
02183	Circuit Breaker, 100 amp	N/A	1	N/A
02192	Circuit Breaker, 75 amp	1	N/A	1
02206	DC Connector Housing, blue	2	2	2
02207	Contact (Max. 2 gauge)	2	2	2
02279	Fan, 120 volt AC	1	1	1
02635	Rocker Switch, lighted 12 volt	1	1	N/A
02638	Rocker Switch, lighted 24 volt	N/A	N/A	1

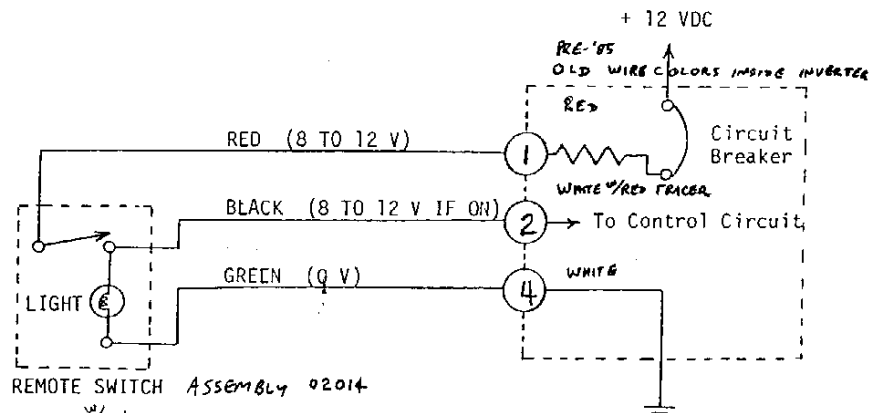
NON-UL UNITS

VANNER INC.

INVERTER REMOTE DETAIL



THIS IS NOT A
MOMENTARY SWITCH



Note:

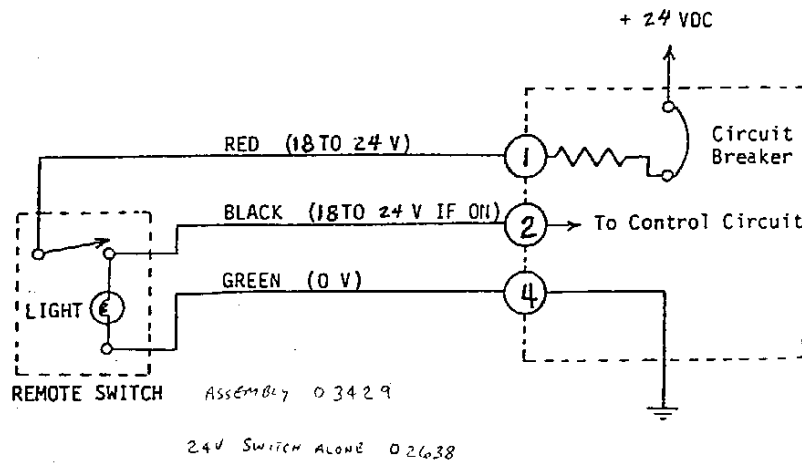
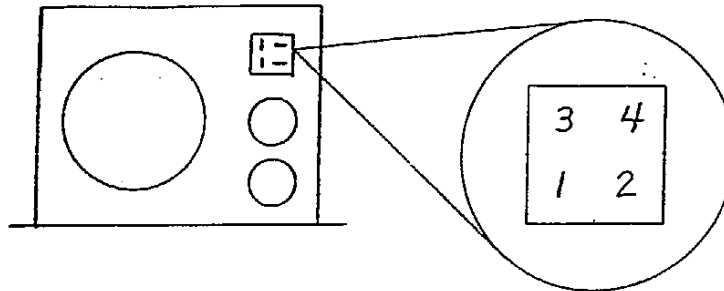
$\frac{1}{8}$ ' of 3 CONDUCTOR 22AWG

- This diagram does not apply to the 1000 watt UL Listed units.
- Units with a transfer relay will open the remote circuit just after the resistor.
- The 2200 watt units have an over temperature thermostat that opens the circuit just before the remote connector if the unit is too hot.

VANNER INC.

INVERTER REMOTE DETAIL

NON-UL



Note:

- Units with a transfer relay will open the remote circuit just after the resistor.
- The 2200 watt units have an over temperature thermostat that opens the circuit just before the remote connector if the unit is too hot.