



VOLTAGE REGULATOR

by Surge Guard

Model 10176 - Rated 120V, 30A

For use on single phase, 2-wire services

INSTALLATION & OPERATING INSTRUCTIONS

General Description

The Voltage Regulator by Surge Guard (VRSG) is intended for use with recreational vehicles to provide a regulated and reliable source of power. The VRSG continuously monitors line voltage conditions and uses a unique implementation of a special transformer to increase the incoming voltage to an acceptable level when low incoming line conditions exist. In the Boost mode the VRSG raises the output voltage by 10% over the incoming line voltage. In the Bypass mode the unit becomes a Bypass element and simply passes the input voltage directly to the output. In the Bypass mode the unit exhibits minimal insertion loss.

The VRSG is not a protective device and the connected RV will not be protected from damage should an open neutral develop during the course of operation. The fault indicator panel is for indication only. Note: The VRSG is not a surge protector. To achieve the ultimate combination of line voltage and surge protection, use with Surge Guard models 44750 or 34730 which must be plugged in after (downstream) of the VRSG. In addition, to provide surge protection for the VRSG, use Surge Guard model 44260 which must be plugged in before (upstream) of the VRSG.

The unit includes a clearly marked Status and Fault Indicator Panel with LED's to show line conditions as well as indicate the voltage status of each output line. The VRSG is designed to be fault tolerant so that it cannot be damaged by an open neutral that results in high voltage on one of the incoming lines.

The VRSG is housed in a metal case that meets the requirements of a rain-tight enclosure for operating in an outside environment. The unit has mounting feet so that it does not sit in standing water. An optional low profile mounting plate can be used to mount the VRSG in any orientation inside the RV.

Connection

It is mandatory that this device be connected and used in accordance with the requirements of the National Electrical Code, NFPA 70. For safety purposes, the enclosure is internally connected to the electrical system ground through the safety ground wire in the power cord. This assumes that an adequate ground to the metal chassis of the RV exists. The unit is intended primarily for outdoor use; however, if it is mounted in the RV, it should be located in a well-ventilated area where it is not near flammable objects and should be mounted in the RV by a qualified installer trained in the safety requirements essential to mounting.

When operating in an outdoor environment, the unit should be placed next to the power pedestal in the horizontal, upright position only, resting on the feet, and on a relatively flat surface. This mounting orientation is necessary to prevent the unit from standing in water or from rain intrusion.

Do not plug the RV into the VRSG until line conditions have been thoroughly checked. This can be done by using the following procedure:

Connection Procedure

1. Assure that the breaker at the power pedestal is in the **OFF** position before plugging in the VRSG and ensure that the RV is not plugged into the VRSG.
2. After plugging in the VRSG, turn **ON** the breaker and observe the Status and Fault Indicator Panel for signs of defective line power. There is an approximate 10 second initialization period before the indicator readings are valid. Should defective line conditions be indicated, the RV park management should be contacted to correct the problem before connecting the RV.

3. If no fault indication is present, turn **OFF** the breaker in preparation for connecting the RV.
4. Plug the RV into the VRSG. Turn on the breaker to the **ON** position. At this point, there should only be a few light loads on in the RV to prevent a large inrush current to the breaker which could cause nuisance tripping.
5. Again observe the Status and Fault Indicator Panel for indications of a problem. If an over voltage or under voltage condition is shown, immediately turn off the breaker and notify the RV park management of a problem.
6. Note: Poor connections in the power pedestal may not be indicated under light loads. For this reason it is recommended that the RV be momentarily brought close to full load conditions while the Status and Fault Indicator Panel is being monitored for signs of a problem.
7. If no fault indications are present, the user can be fairly confident that conditions are adequate for reliable power from the RV park or other locations.

CAUTION

Power conditions may be acceptable during initial plug in; however, ongoing line conditions may change during prolonged operation, therefore, it is recommended that a TRC Surge Guard RV Power Protection device be installed in conjunction with the VRSG to provide surge protection as well as regulated power.

WARNING

Always assure that power is OFF before connecting or disconnecting the VRSG by turning OFF the pedestal circuit breaker.

Never plug or unplug devices to the output of the VRSG without removing power from the VRSG by turning the breaker to the OFF position. Failure to follow this procedure could result in severe shock causing injury or death. This circumstance is worse in wet weather conditions. Never plug or unplug the VRSG in wet weather with the park pedestal circuit breaker in the ON position.

Operation

The VRSG has two basic modes of operation.

Low Voltage (Boost) Mode

If the park voltage should fall below 110V then the unit will go into the **Boost** mode and raise the output voltage by 10% over the input voltage. The **Boost** mode is indicated by a red illumination of the bi-colored status LED's. The VRSG will remain in the **Boost** mode unless the incoming line voltage drops below 90V. In this case, the unit returns to the **Bypass** mode and indicates a Low Voltage condition on the Status and Fault Indicator Panel. The VRSG cannot regulate below 90V.

Bypass Mode

If the incoming line voltage is above 110V, or below 90V, then the unit will be in the **Bypass** mode, and only passes the input voltage through to the output without any intervention. The **Bypass** mode is indicated by a green illumination of the bi-colored status LED's.

Switching modes is accomplished without the use of large contactors to assure a reliable, seamless transition between the **Bypass** and **Boost** modes of operation. Each line voltage control circuit operates independently so that an increase only occurs on the required line. The VRSG is protected from damage due to drastically unbalanced line conditions that can be caused by an open neutral connection.

As mentioned previously, the Status and Fault Indicator Panel LED's are provided to show the operating status of the unit. The panel is divided into two sections, one section indicates whether or not the unit is in **Boost** mode, and the other section indicates fault conditions associated with the incoming line. The fault section of the Status and Fault Indicator Panel continuously monitors incoming line voltage conditions and can separately indicate either over voltage or under voltage conditions on either line. An under voltage is indicated should the line voltage drop below 90V. An over voltage condition is indicated should the line voltage rise above 133V. Two red LEDs are used to indicate over or under voltage. Two red LEDs are provided to indicate the condition of the neutral and ground connections. One LED is illuminated if the neutral and ground connections are in good condition. The other LED will be illuminated if there is either an open neutral or an open ground. If

both LEDs are illuminated, then there is a phase reversal condition present. That is, the phase and neutral connections are miswired. The chart below outlines the indications on the panel and summarizes the operation of the unit:

GROUND STATUS			
Location	LED 1	LED 2	Condition
1 & 2	ON (Red)	OFF (Dark)	Ground and Neutral connections are good
	OFF (Dark)	ON (Red)	Open Ground or Open Neutral condition exists
	ON (Red)	ON (Red)	Line and Neutral are reversed
UNDER / OVER VOLTAGE CONDITION			
Location	Description	Indication	Condition
3	Red Under Voltage	ON	Incoming line is under 90V
		OFF	Incoming line is over 90V
4	Red Over Voltage	ON	Incoming line is over 133V
		OFF	Incoming line is under 133V
VOLTAGE STATUS			
Location	Description	Indication	Condition
5	Bi-Color Status LED	Green	Bypass Mode: Unit is passing the incoming line to the output.
		Red	Boost Mode: Incoming line is low.
		OFF	No Power