**MANUAL**
**Model: VCS-1AL-TC**
***Small Signal***

Solar Converter Inc. "Voltage Controlled Switch" is a power relay which has user adjustable voltage set points. Normally the relay is not powered, connecting the common terminal to the normally closed (NC) terminal.

**Warning:** To be serviced and operated by qualified personnel only. This unit operates from hazardous energy sources. Ensure that all power sources are inactive before making any connections to this unit. Ensure proper procedures and the appropriate electrical codes are followed.

## 1.0 Introduction

This voltage controlled switch is multifunctional and may be set-up for Active high or Active Low service. As well the start-up condition may be easily adjusted. It features temperature compensation of the set points and secondary drive for an external “ON” LED, as well as remote sense capability to switch on a voltage other than its input voltage.

Basic Operation:

**Active High set-up:**
This unit monitors the incoming voltage and if it goes over the "high" setpoint for 3 seconds, the power relay will switch on, connecting the common terminal (C) to the normally open (NO) terminal. Once the relay is on, the unit monitors the incoming voltage and if it goes below the low voltage setpoint for 3 seconds, the unit will turn off the power relay, connecting the common (C) terminal to the normally closed (NC)

**Active Low set-up:**
This unit monitors the incoming voltage and if it goes under the "low" setpoint for 3 seconds, the power relay will switch on, connecting the common terminal (C) to the normally open (NO) terminal. Once the relay is on, the unit monitors the incoming voltage and if it goes above the high voltage setpoint for 3 seconds, the unit will turn off the power relay, connecting the common (C) terminal to the normally closed (NC)

## 2.0 Quick Set-up

While it is recommended that this manual be read in detail, for the experienced installer, this section describes a quick set-up.

1) Connect the ground to the ground terminal of the terminal block, the one on the left of the little connector - see board marking

2) Connect the power source to the V + terminal - the second on from the left of the little connector - see board marking

3) Connect the temperature sensor to the TC+ (Red wire) and TC- (Black wire) terminals.

4) With a voltmeter connected to the GND test point and the midpoint. This POT sets the range of the setpoint. It was added in this REV to decrease the sensitivity of the high and low POTS making them easier to set accurately. Adjust the midrange setpoint to a value between high and low setpoint.. Note there is a 1/10th scale factor. For example, to turn the relay on at 40.5 volts, set the pot to read 4.05 V.

5) Repeat with the low setpoint to set the low voltage to switch the relay

6) Repeat with the high setpoint to set the high voltage to switch the relay

7) Connect the power to be switch to the COM of the terminal block

8) Connect the load connection to the NO or NC connection depending if you want the load to be powered or un-powered on relay action. Not the “ON” LED is on with relay powered.

## 3.0 Electrical Specifications

| | | | | | |
|---|---|---|---|---|---|
| Nominal Voltage (V) | 12 | 18 | 24 | 36 | 48 |
| Maximum Voltage | 63 V | | | | |
| Minimum Voltage | 10 V | | | | |
| Max. Output (A) | 1 | 1 | 1 | 1 | 1 |

Basically rating of 1 amp small signal relay
Potter and Brumfield V2026 series

| | | | | | |
|---|---|---|---|---|---|
| Self Consumption | | | | | |
| Quiescent (ma) | 17 | 17 | 17 | 17 | 17 |
| Relay on (ma) | 20 | 20 | 20 | 19 | 18 |

Delay on action 3 seconds

**4.0 User Controls**

The unit has 3 adjustment pots for high and low set points and midpoint adjust.

The set points have a 1/10 scale factor. To set a setpoint to trip at 12 V for example, set the setpoint to 1.2 V. To set it to trip at 48.5 V, set the setpoint to 4.85 V.

1) Power the unit with any source 10 V to 60 V connected to its V+ and ground of the terminal blocks.

2) With a voltmeter connected to the test point ground and the midrange setpoint, adjust the midrange setpoint pot such that the voltmeter reads 1/10th the voltage between where you wish the relay is to switch at.

3) With a voltmeter connected to the test point ground and the high setpoint, adjust the high setpoint pot such that the voltmeter reads 1/10th the voltage that the relay is to switch at.

4) With a voltmeter connected to the test point ground and the low setpoint, adjust the low setpoint pot such that the voltmeter reads 1/10th the voltage that the relay is to switch at.

**5.0 Connections**

1) Ground:
Using wire of sufficient gauge (min. #20) connect the ground of the unit to the power ground of the voltage source. This wire only carries the power to operate the unit.

2) Power:
Using wire of sufficient gauge (min. #20) for the current to be carried per the appropriate electrical code, connect the positive of the voltage source to the V+ terminal.

**3) WARNING: SET-UP THE UNITS SETPOINT BEFORE CONNECTING THE LOAD to avoid unexpected operation from affecting your load.**

4) Switched Power:
Using wire of sufficient gauge (min. #16 for the current to be carried per the appropriate electrical code, connect the power source to be switched to the COM connection of the terminal block.

5) Load:
Using wire of sufficient gauge (min. #16) for the current to be carried per the appropriate electrical code connect the positive of the voltage source to the NO or NC terminal depending upon whether you require the load to be connected or disconnected on relay action.

**6.0 Temperature Compensation**

This regulator is designed to use the voltage of a temperature sensitive zener (National Semiconductor # LM335Z or equiv.) attached at the battery location (hence battery temperature). This unit is available from Solar Converters Inc. as Model No. TC-2.

**Warning: If temperature compensation is not used, a 3k precision resistor must be connected between the TC+ and TC- terminals ( its default condition). Lack of this resistor will not harm the regulator, but will require re-adjustment of the setpoint voltages.**

If temperature compensation is being used, remove the 3k resistor across terminals TC+ and TC-. Using a wire of sufficient amperage (#24 AWG or better) connect the TC+ terminal to the anode (the red lead) of the temperature sensitive zener. Similarly connect the TC- terminal to the cathode (the black lead) of the temperature sensitive zener (LM335Z).

**Warning:** This connection is not line isolated. Do not expose to any voltage not reference to the low voltage ground of the regulator.

Note: Shielded twisted pair is recommended if the batteries are a "substantial" distance from the regulator.

**7.0 DRV terminal** - external LED driver

This terminal is used to drive an external LED through a current limiting resistor if an external LED is required to come on with relay Action. This terminal pulls to Ground when the relay is on, so connect the LED form V+ to DRV to come on with relay action.

**8.0 Operating Mode**

This unit may be set-up for Active high or Active Low operation. It may also be set-up for relay SET or RESET on power up.

In the upper right corner is the set-up for the unit. The unit set up is determined by the position of the diode in the Set / Reset position for Start-up , and by the diode in the Mode area for Active high (AH) or Active Low(AL). to determine its operating mode.

For Active Low operation the diode is in the AL position for Mode and a diode is in the Reset position (Relay off) for initial power up start.

For Active High operation the diode is in the AH position for Mode and a diode is in the Reset position (Relay off) for initial power up start.

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**WARRANTY**

The product is warranted to be free from defects in material and workmanship for a period of one (1) year from the date of purchase by a retail customer. The purchase date must be evidenced by a valid and original sales receipt. In lieu of sales receipt, factory will use code date on its label. Removal of the Solar Converters Inc. label or serial number will void the warranty.

Product liability, except where mandated by law, is limited to repair or replacement at the manufacturer's discretion. No specific claim of merchantability or use shall be assumed or implied beyond what is printed on the manufacturers printed literature. No liability shall exist from circumstances arising from the inability to use the product, or its inappropriateness for any specific purpose or actual use, or consequences thereof for any purpose**. It is the user's responsibility to determine the suitability of the product for any particular use**. Solar Converters Inc. shall not be liable for any damages or any kind including without limitation, special, incidental or consequential obligations and liabilities of Solar Converters Inc. and the remedies of Buyer set forth herein shall be Solar Converters Inc. sole and exclusive liability.

Failure to provide a safe and correct installation, safe operation, or care for the product will void the warranty. Personal safety, and compatibility with any other equipment is the ultimate responsibility of the end user. Any returned product that shows significant evidence of abuse may not be covered by this warranty. Installation must be preformed by a person with qualification to insure safe and effective operation and the installation thereof certifies that the installer has the technical qualifications to do so.

Solar Converters Inc. cannot guarantee the compatibility of its products with other components used in conjunction with Solar Converters Inc. products, including, but not limited to, solar modules, batteries, and system interconnects, and such loads as inverters, transmitters and other loads which produce “noise” or electromagnetic interference, in excess of the levels to which Solar Converters Inc. products are compatible. Solar Converters Inc. shall not assume responsibility for any damages to any system components used in conjunction with Solar Converters Inc. products nor for claims for personal injury or property damage resulting from the use of Solar Converters Inc. products or the improper operation thereof or consequential damages arising from the products or use of the products.

The warranties set forth herein are Solar Converters Inc. sole and exclusive warranties for or relating to the goods. Seller neither makes nor assumes any warranty or merchantability, any warranty fitness for any particular purpose, or any other warranty of any kind, express, implied or statutory. Solar Converters Inc. neither assumes nor authorizes any person or entity to assume for it any other liability or obligation in connection with the sale or use of the goods, and there are no oral agreements or warranties collateral to or affecting the sale of the goods.

WARRANTY CLAIM PROCEDURE

In the event of product failure, follow this warranty claim procedure.

1. Make sure the problem you are having is actually due to the suspected product and not some other part of the system. You may call technical support for advanced troubleshooting assistance.
2. If you determine that a Solar Converters Inc. product is actually defective, describe on paper, in detail the exact nature of the failure.
3. The product must be accompanied by proof of the date of purchase satisfactory to Solar Converters Inc.
4. Return the product and description to the business office address, along with your address and a daytime phone number. Purchasers must prepay all delivery costs or shipping charges as well as any other charges encountered, in shipping any defective Solar Converters Inc. product under this warranty policy. **No shipment will be accepted Freight Collect.**
5. Any return shipment from Solar Converters Inc. will be via Canada Post. Foreign shipments will ship best way. Special shipping arrangements are available at the customer's expense.