Technical Documentation

SunSaver

Bench Testing Procedures

Abstract:

The following Bench test procedures pertain to individuals with access to an external power supply, a battery, and the necessary tools and equipment listed below. For on-site testing and troubleshooting where an external power supply is not available, refer to the SunSaver Field Testing document.

Note: Due to the fabrication process of the SunSaver controller, the exact damaged component may not be evident. It may only be possible to determine if the unit is functioning properly. However, other factors may be apparent that will assist the technician in determining the cause of the failure.

Recommended Tools:

- Digital Multi-meter with fine tip probes (frequency and duty cycle measurements helpful)
- Phillips Screwdriver
- Flat Bladed Screwdriver.

Materials and Equipment:

- Small motorcycle type battery (12V)
- Variable Power Supply capable of supplying 2A @ 15-20VDC
- 12V/2A load (e.g. type 1156 automotive lamp with socket)
- Short Length (8-12cm) of 12AWG (3.23 mm^2) solid wire.

Caution:

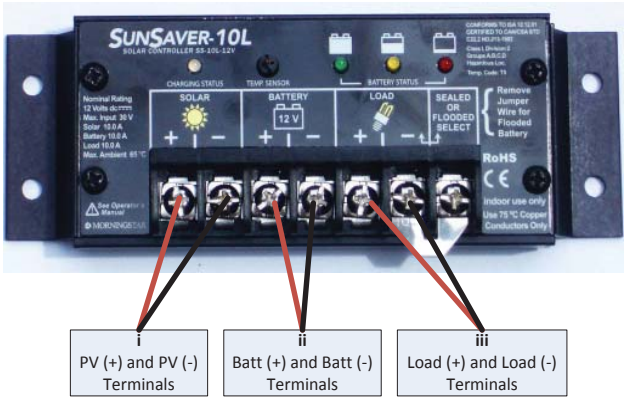
The following outlined procedures assume basic knowledge of electrical circuits. Exercise the necessary precautions when dealing with the live circuits present in solar energy systems.

Testing procedure:

<u>Step 1</u>: No Power Applied to the SunSaver:

A) With no power applied to the SunSaver, check for short curcuits betweeen the following terminals:

i) PV (+) and PV (-) terminals
ii) Battery (+) and Battery (-) terminals
iii) Load (+) and Load (-) terminals



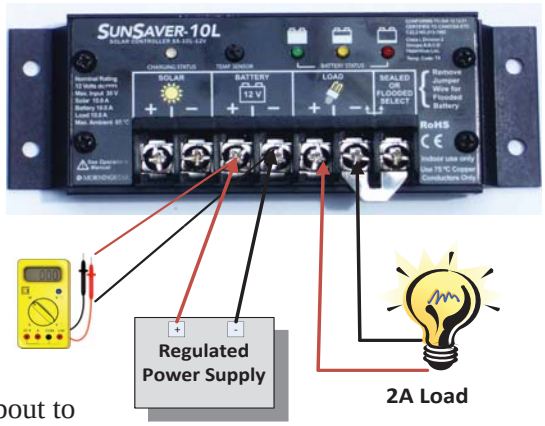
(step one cont.)

B) Check the LVD FET (if controller is equipped with LVD) by measuring a diode drop between the Battery (+) and Load (+) terminals. If no diode drop is present or if an open circuit is measured, the LVD FET is damaged. If there is a short circuit between the terminals, the unit will still (most likely) regulate the battery voltage, however the controller will no longer have LVD capability.

C) Check for continuity between the ground connections on the terminal strip (PV (-), Battery (-), and Load (-)). (Non LVD models, check for continuity between Battery (-) and Load (-) only.) If an open circuit exists between any of the ground terminals, the controller has a damaged ground trace. The unit is not operational.

D) Remove the 4 screws from the face plate. Bend a small hook in the end of a Solid 12AWG (3.23 mm^2) wire. insert the hook into one of the screw holes and pull off the face plate. The face plate may be stuck to the internal potting and may make a cracking sound when removed. This is normal and will not damage the internal circuitry. Inspect for burns, damaged traces, etc.

Step 2: Power Supply Connected to Battery Terminals of the SunSaver:



A)Adjust the power supply output voltage to about 13.5VDC . (27V for 24V models) and connect to Battery Terminals on the SunSaver. Check the voltage at the battery terminal using a multi-meter..

B) Attach the 2A load to the Load Terminals of the SunSaver. The load should operate correctly(assuming the power supply is capable of driving the load).

C) Adjust the voltage down to approx. 11.0V(22V for 24V models). The red LED should flash for several minutes indicating the unit is about to switch to LVD and disconnect the load. Adjust the power supply voltage to 14V. After a short delay, the red LED will turn off and the load will reconnect.

Step 3: Only Battery Connected to Battery Terminals.

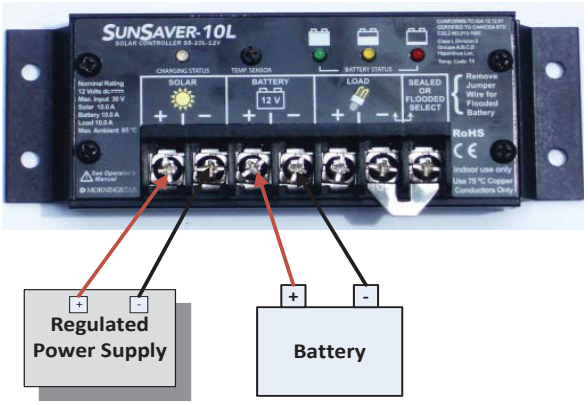
Note: the green “Charging” LED should be off.

A) Using a multi-meter, measure the voltage at the Battery terminals.

B) Using a multi-meter, measure the voltage at the Load terminals. The Load terminal voltage should be approximately the same as the battery voltage(+/- 200 mV). If it is significantly lower, the LVD FET’s or the power traces inside the SunSaver may be damaged.

C) Using a multi-meter, measure the voltage at the Array terminals. The voltage at the Array terminals should be less than 2.5Vdc. If the green LED is on and/or if the battery voltage is measured, the input FET’s are damaged and the unit will not regulate the Battery voltage properly

Step 4: Power Suppy Connected to Solar Terminals and Battery Connected to Controller.



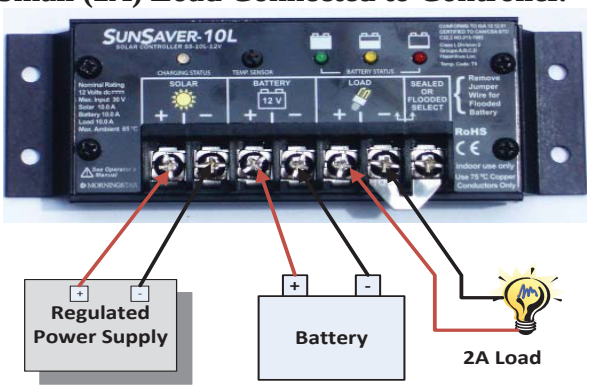
A) Adjust the Power supply voltage to 14.0V(28V for 24V config) and limit the power supply current to about 2A. The green "Charging" LED should be lit.

B) The voltage across the Solar terminals should be equal to the voltage across the Battery terminals if the battery is not fully charged.

C) Disconnect the power supply.

D) Adjust the ouput voltage of the power supply to 15Vdc (30V for 24V) and reconnect the power supply to the Solar terminals. If the battery is charged, there will be a voltage difference between the Battery (+) and Solar (+) terminals. If using a multi-meter with a frequency measuring option, an AC signal of ~ 300Hz should be measured between the Battery (+) and Solar (+) terminals.

Step 5: Power Supply and Battery Connected to Controller. Small (2A) Load Connected to Controller.



A) Adjust power supply voltage to approximately 15Vdc.

B) Wth the lanp turned on, measure the load voltage. It should be within 20-30mV of the battery voltage. If more than .25V lower than the battery voltage, the LVD FET's are damaged.

Step 6: SunSaver installed in the Power system

A) Check the correct operation of the SunSaver base on the above tests
B) Check the condition of any fuses that may be in the power path
C) Verify the system wiring is correct and intact
D) Check all connections and terminals for good electrical contact