

## Important Information

- The bench testing procedure pertains to individuals with access to external power sources, a battery, and the various tools and materials outlined below.
- Due to the construction of the SunGuard controller, it may only be possible to determine if the unit is functioning properly. The exact damaged component or part may not be evident. Other factors however, may be apparent that will enable the technician to determine the cause for failure. These factors include, but are not limited to:
  - Burned leads
  - Burned or bubbled potting
  - Discoloration of case
  - Excessive loads

## 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 @ 15-20 Vdc

## Precautions

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

## Testing Procedure

### **Step 1: No Power Applied to the SunGuard**

- (a) With no power applied to the SunGuard, check for short circuits to ground between the following leads:
- PV(+) and PV(-) leads
  - Battery (+) and Battery(-) leads

**Note:** if shorts exist, FETs are damaged and controller is not operational

- (b) Check for continuity between both of the ground leads on the SunGuard. If an open circuit exists between any of the ground terminals, the controller has a damaged ground trace or a lead is broken.

### **Step 2: Only Battery Connected to Battery Leads**

- (a) Using a multi-meter, measure the voltage at the battery leads.
- (b) Using a multi-meter, measure the voltage at the array leads. The array lead voltage should be less than 2.5Vdc. If battery voltage is measured, the input FETs are damaged and the unit will not regulate the battery voltage properly.

### **Step 3: Power Supply on PV, Battery Connected to Battery Leads**

**Note:** It is important to observe the correct polarity when making connections. Reverse polarity connections will damage the controller.

- (a) Adjust the power supply voltage to 14 Vdc and limit the power supply current to about 2 Amps.
- (b) Connect the power supply to the PV leads, connect the battery to the battery leads
- (c) The voltage across the PV leads should be the same as the voltage across the battery leads if the battery is not fully charged.
- (d) Disconnect the power supply.
- (e) Adjust the output voltage of the power supply to 15 Vdc and reconnect the power supply to the PV leads.
- (f) If the battery is charged, there will be a voltage difference between the Battery(+) and PV(+). If the multi-meter has a frequency measuring option, a 260-340 Hz AC signal should be measured between Battery(+) and PV(+) leads. The duty cycle of this signal can also be measured to give a rough indication of the battery state of charge. The lower the duty cycle, the more fully charged the battery.

### **Step 4: SunGuard Installed in the Power System**

- (a) Check the correct operation of the SunGuard based on the above tests.
- (b) Check the condition of any fuses that might be in the power path.
- (c) Verify the system wiring is correct and intact.
- (d) Check all the connections and terminals for good electrical contact.