

Field Testing Morningstar SunGuard Controllers

Updated 8/27/99

Notes:

- This testing procedure was developed for use in field conditions where no external power sources are available.
- Due to the construction of the SunGuard controllers, it is possible only to determine whether the unit is functioning properly. It is not always apparent what component has failed or the cause for the failure. It is left up to the technician to determine the cause for the controllers failure based on evidence present at the site (i.e. burned leads, excessive loads, evidence of short circuits on system wiring, over PV current rating, etc)
- The procedures outlined below assume a basic knowledge of electrical circuits and the necessary safety precautions to be used when working with live circuits present in solar energy systems.
- You will need a Digital multi-meter (frequency and duty cycle measurements are helpful) for this procedure.

Testing Procedure:

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:
 - i. PV(+) and PV(-)
 - ii. Battery(+) and Battery(-)
 - b) Check for continuity between the ground connections on the PV(-) and Battery(-) leads.
2. Battery power applied to the Battery leads only.
 - a) Measure the voltage at the battery leads
 - b) Measure the voltage at the array leads. The voltage should be less than 1.5 Vdc (negative due to the diode drop across the input FETs). If battery voltage is measured, the input FETs are damaged and the unit will not regulate the battery voltage properly.
3. PV and battery power applied to the controller.
 - a) The voltage across the PV leads should be the same as the voltage across the battery leads if the batteries are not fully charged.
 - b) If the batteries are charged, there will be a voltage difference between the Battery(+) lead and the PV(+) lead. If your DVM has a frequency measuring option, a 300 Hz AC signal should be measured between Battery (+) and PV (+). 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.

- c) Disconnect the PV array from the PV input leads of the controller. After approximately one minute, the voltage on the PV input leads should drop significantly lower than the battery voltage.

Final System Checks:

- a) Ensure that all connections are secure and weather-protected and that the controller is housed from the elements.
- 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 connections and terminals for good electrical contact.