

Solar Lighting: Maintenance and Troubleshooting

This guide provides steps for maintaining solar lighting systems as well as steps to take to help fix a system that is not working. Installation and operation tasks are covered in a separate documents. The MPT Quick Reference Guide is helpful when working with the remote control.

Maintainance

A properly functioning system requires very little maintenance, however, there are a few things that can be done to keep your lighting system functioning at optimum performance.

Frequency	Items to check
Once per month	Verify lights are on at night as expected (visual inspection after dark). This is typically the first indication that a system has a problem.
Once per 6 months	Visually inspect solar panels and light fixture lenses for leaves, dirt and damage
	Using the remote control at each system (day or night), verify the lights are working on by pressing '10 on' for quick 30second demonstration.
Once per year	Visually inspect each LED lamp for operation, dirt and damage. Clean lamps with a wet cloth if needed.
	Using the remote push the "Error Codes" button. Count the flashes and record the result. Repeat until you get 1 flash meaning no more errors to report. Refer to the MPT quick reference sheet.
	Check battery voltage with a Voltmeter. Look for voltages below 11.0V which can indicate a dead battery.
	Check fuse and connections.
	Inspect battery terminals for corrosion and clean terminals as needed.
	Test system operation by running the "Final System test" as outlined in the Installation Instructions. These include Testing Solar Panel Voltage, Testing Battery Voltage, and running the Lights through the Accelerated Profile.
	Check for new obstructions which might shade the solar panel. Trees grow and if branches or leaves shade the solar panel, they should be trimmed for best performance.
Once per 5 years	The batteries in the system will eventually need to be replaced. Depending on the application and the environment, batteries can last from 3 to 7 years.

Troubleshooting

What to Bring:

When going into the field to troubleshoot a solar lighting system you should bring the following items:

- Screwdriver and/or key to access battery and controller compartment
- Mini automotive 20A spare fuses.
- Digital Volt meter capable of reading up to 60Vdc and performing continuity tests
- So*Bright remote control
- So*Bright MPT Quick Reference sheet
- Pen and paper to record results
- Cell phone to call SolarOne for technical assistance 339-225-4530 or 877-527-6461

When making any site visit to troubleshoot a system you should always follow procedures: **1.Check the Battery Voltage** and have the controller **2.Report Errors**, first before trying other things.

Common Problems:

Refer to the Procedures section for details on each test.

After the system was installed the lights came on and stayed on but it's not dark yet.

The controller is not seeing that a solar panel is connected.

CONTROLLER IS NOT SEEING THE SOLAR VOLTAGE

***Problem:** Solar Panel not connected, Reverse connection on solar wires or at controller, Internal damage on Solar Charging circuit inside the controller.*

***Solution:** Check all solar connection to the MPT15 controller, measured and check solar voltages, per page 6, 4.)Check Solar Panel Voltage, procedure.*

The lights are off at night and the LVD (Low Voltage Disconnect) Light is Blinking.

The problem may be the energy balance (more energy used by lights than the solar panel can supply). Verify the lighting profile (timing and light levels) using the Test Light button on the remote and check that Runtime Extension is set to at least 5 (Report->Runtime Ext). It could also be that the solar panel for some reason is not charging the battery – refer to **4. Check the Solar Panel Voltage**, procedure.

If the lights work and the profile is as expected the battery may be worn out and is simply not able to hold a charge. You could try [9.Recharging the Battery](#), procedure. But if the problem continues it may be time to replace the batteries.

CONTROLLER NOT CHARGING THE BATTERY.

Problem: Solar Panel not connected, reverse connection on solar wires or at controller, internal damage on solar charging circuit inside the controller.

Solution: Check all solar connection to the MPT15 controller, measured and check solar voltages, per page 6, 4.)Check Solar Panel Voltage, procedure and to the Remote Control Quick Reference Sheet

The lights are off at night and the LVD (Low Voltage Disconnect) light is NOT blinking but the controller is running.

Does the [2.Report Errors](#), procedure show any recent LVD errors? If so, refer to section above as if the LVD light was blinking.

ERROR CODES

-If controller is power up, do and check the error codes check with the remote control, per page 5, 2.)Report Errors, procedure and refer to the Remote Control Quick Reference Sheet

Check the lighting profile - it is possible to enter a profile that keeps the lights turned off.

Press the Test Light button. The lights come on and demonstrate the lighting profile where 1hr = 1 second. If the lights don't turn on try entering a new Preset profile. If the lights do turn on, try [8.Resetting the Controller](#), procedure.

If the profile is okay then Test the Drivers and the wiring running from the controller to the drivers.

PROFILE SETTINGS

-Use the report function on the remote control to verify each settings, per the profile on the wire diagram of your system and refer to the Remote Control Quick Reference Sheet.

The lights stopped working and the controller doesn't seem to have any power.

Unplug the solar panel from the controller and follow the procedure: [3.Check the Fuses and Circuit Breakers \(CB\)](#). Replace any blown fuses, and [1.Check the Battery Voltage](#). Check the voltage at the controller Battery terminals. If the controller is getting a voltage above 11.5V, the controller should be running. Try procedure, [8.Resetting the Controller](#). If the battery voltage is less than 10V the batteries have been damaged and will need to be replaced. If the controller has at least 11V at the battery input terminals and is not running, it may need to be replaced. Contact SolarOne Solutions.

NO LED INDICATORS ON CONTROLLER

Problem: Bad controller, Dead Battery, Fuse blown or Circuit Breaker tripped.

Solution: Check fuses or circuit breakers (CB). Fuses and CB are protection devices and they could trip due to a pinched wire, mis-wiring on wires and connectors, a damaged or faulty component on the system, solar or battery over voltages on the system. Refer to page 6, 3.)Check Fuses and Circuit Breakers, procedure.

The remote control doesn't work.

Confirm that the problem is the remote control and not the lights. When you press a button on the remote, the indicators on the MPT controller should respond (green, green, yellow, red). If the indicators respond but the overhead lights do not, then the problem is with the lights.

The remote control should work with either the sensor on the MPT controller or with the External IR sensor. Try unhooking the external sensor and aiming the remote at the MPT controller. Bright light can overload the IR sensors. Try shading the sensor to see if that helps. Try replacing the batteries in the remote control.

The lights work, but when we connect the ground wire they stop working.

The grounding system is doing its job. Somehow one of the metal parts is being energized when it shouldn't be. Leaving the system ungrounded is not a good option; the problem should be traced down and corrected. Try to isolate the problem. Leave the ground connected. Unhook everything from the controller except the battery. Does the controller turn on? Then one at a time connect the solar panel, led driver cable, external ir detector, and motion detector input (if being used) to try to identify which component is causing the problem.

The Motion Detector doesn't seem to be working.

Follow procedure: 6.Test the Motion Detector. The motion detector is best suited for sites where people will be stationary such as at a bus stop. The radius of detection is about 20 feet. Remove the gray plastic cover from the motion detector and check that the timing is set to the minimum (rotary dial), the day night threshold is set to Day, and the sensitivity is set to maximum.

With the remote do Report->Aux Time. Auxiliary timeout is measured in 2 minute increments. A value of 5 means the motion detector will cause the lights to stay on full for 10 minutes.

Procedures

1. Check the Battery Voltage

With the solar panel and battery connected the multimeter to read the voltage across the battery terminals. Then unhook the solar panel and wait about 30 seconds and read the voltage again. The voltage normally falls when you unhook the panel. In systems with two batteries, check the voltage at the terminals of each battery. Be sure to write these numbers down. Normally with the solar panel unhooked the battery voltage should be 12.5 to 13 volts. A battery voltage below 11.5V indicates a problem.

BATTERY VOLTAGE

- For 12V Systems, should read between 11.5V to 14.5V. For 24V Systems, should read between 23V to 27.5V.
- If battery voltage read below 11.5V (12V system) or 23V (24V system) the system it is on Low Voltage Disconnected (LVD) and the fixture will not turn ON until the battery voltage reach the reconnect low voltage (LVR) after going to LVD. For 12V system: 12.6 V, for 24V system: 25.2 V.
- If battery voltage reads below 10V, then battery probably is damaged and the system will need new batteries.

CHECKING FOR BAD BATTERIES

- Confirm that the Controller shows the batteries charging during the day.
- The batteries charge up but have no capacity to keep the pole running more than a short time.
- The luminaire may come on just a short time and then turn off quickly because the battery voltage drops quickly.
- The batteries have become weakened and have a greatly reduced capacity.
- This can be checked by monitoring the battery voltage when forcing the fixture to turn ON, by pressing #10 on the remote control and keep pressing every 5 seconds to keep the fixture ON.
- The luminaire should come ON and the battery voltage will be seen to drop back down to LVD perhaps in 3 to 5 minutes, maybe even faster.

2. Report Errors

The controller records when certain common errors occur, information which in some cases can help with troubleshooting. This information is lost if the controller is powered off so it is important to get the errors first (of course this only works if the controller is still powered on). Press the Errors button on the remote. Count the number of times the light flashes. Write down each error for reference. Up to ten Errors are recorded on a stack and pressing the Error button pops one off the stack. Continue getting errors until the light flashes only once which means there are no more errors.

Blinks	Means	Threshold	Is recorded
1	No More Errors		
2	Low Voltage Disconnect	11.5 or 10.5V	Every time
3	Battery over voltage	15.5V	Every time
4	PV over voltage	24V	Every time
5	Over temperature	140 F	Every Time
6	Cannot charge battery		Only the first time

The number of flashes and corresponding errors are:

1. No more errors
2. Low voltage disconnect was activated (11.5 or 10.5V depending on LVD setting)
3. Battery over-voltage protection (15.5V) was activated
4. PV over-voltage protection (24V) was activated
5. Over-temperature shutdown (140F)
Cannot limit charge current to battery (minimum duty cycle reached)

ERROR CODES

-Use the remote control error codes button. Count the flashes and record the result. Repeat until you get 1 flash meaning no more errors to report. MPT15 Controller record a maximum of 10 errors.

3. Check the fuses or Circuit Breakers (CB)

If the controller does not have power the problem could be as simple as a fuse on the battery harnesses. Fuses can occasionally blow even on a system that is otherwise functioning normally. Pull the fuses out and examine them closely to see if the fuse element has opened. Use a multimeter to check for continuity across the fuse terminals. If there is no continuity the fuse is blown. If the fuse blew at random and your system has a motion detector you may want to check the wiring on the motion detector since a mis-wired detector could blow fuses intermittently.

If the system has circuit breaker (CB), check the if they tripped. CB are protection devices and they could trip due to a pinched wire, mis-wired wire, faulty component on the system, solar or battery over voltages on the system.

4. Check the Solar Panel Voltage

Unhook the solar panel (cable with 2 position yellow connector) from the controller or turn OFF the solar circuit breaker (CB). Use a voltmeter and check the solar panel open circuit voltage, it must be daytime. If it is daytime the open circuit voltage should be between about 16 and 22 volts for a 12V System and about 38 and 44 for a 24V system. Also make sure the solar panel polarity is correct. A solar panel connected backwards will not charge the battery. Also check that the contacts are seated properly in the connector housing.

Solar Panel Voltage

- *Measured Solar Voltage at the controller Solar positive (+) and negative (-), it should read a positive voltage.*
- *If batteries are not fully charge, this solar voltage should be moving up and down. For 12V systems: 22V, 19V, 18V, 17V, 20V, 19V. For 24V systems: 42V, 39V, 37V, 38V, 39V, 42V. This voltage reading means that the Max Power Tracking is functioning and the controller is charging the batteries.*
- *Disconnect yellow connector from controller and measured Solar Voltage on yellow connector, it should a fix positive voltage: between 38 to 44V for 24V systems and 16 to 22 for 12V systems.*

5. Test the Lights

Aim the remote control at the MPT controller or at the external IR sensor and push # 10 (100% brightness). The lights should come on full brightness for 15 seconds indicating the lights and drivers are working. Then press #3, and the lights should dim to 30% brightness, this indicate that the driver and controller signal voltage are working and dimming the lights.

MEASURING LIGHT SIGNAL VOLTAGE AT THE CONTROLLER AND WIRES

- *Use the remote control to force the lights to turn ON by pressing #10 (100% brightness), then measure voltage between black (negative) and blue (signal) at the controller light output, should read 4.8V. Note: when #10 is pressed, the LED indicators on the controller will not light up, but the fixture will turn ON.*
- *Also, should read 4.8V, between the black and blue wires and green connectors, going up to fixture. Keep pressing #10 every 5 second while reading the voltage.*

6. Test the Motion Detector

Put the volt meter across the MPT controller Auxiliary – and Control terminals. Try to trigger the motion detector. The voltage on the control terminal should go from 0 or some very small value to a stable +12V (or whatever the battery is). If the motion detector can switch the control terminal in this manner it is working properly. The motion detector can be tested day or night.

7. Test a Driver

You need to access the light fixture, if the driver is on the fixture, not if it is installed on the battery enclosure. Unhook all but one driver and lamp. A single bad driver could cause the other drivers not to function. Follow procedure: [5. Test the Lights](#) . Try the other drivers/lamps one at a time. If none of the drivers work check the wiring from the controller to the led drivers. Use a voltmeter to check the voltage on the cable where it plugs into the drivers.

MEASURING LIGHT SIGNAL VOLTAGE AT THE CONTROLLER AND WIRES

- *Use the remote control to force the lights to turn ON by pressing #10 (100% brightness), then measure voltage between black (negative) and blue (signal) at the controller light output, should read 4.8V. Note: when #10 is pressed, the LED indicators on the controller will not light up, but the fixture will turn ON.*
- *Also, should read 4.8V, between the black and blue wires and green connectors, going up to fixture until the driver input. Keep pressing #10 every 5 to 10 seconds while reading the voltage.*
- *At the output of the driver, between the positive and the negative wires, it should measure above 40V, when it is disconnected from the LED lamp or board. Remember to keep pressing #10 on the remote control every 5 to 10 seconds.*

8. Resetting the Controller

Very rarely it is possible for the controller to glitch and require a reset. You can perform a soft reset using the Reset Button on the remote control. To perform a hard reset, open the battery compartment to gain access to the controller. Unhook the solar panel first (yellow connector), then unhook the battery (red connector). Wait about 30 seconds and reconnect the battery first and the solar panel second. The controller always starts assuming it is daytime so if this is done at night it can take 5 to 10 minutes for the lights to turn on.

Charging Indicator	Charging Stage
Off	No solar panel / night
Fast blink	Bulk (MPT) Stage
Slow blink	Absorb Stage
Full on	Float Stage
Occasional blink	Charging shut off

9. Recharge the Battery

The easy way to recharge the battery is to simply disable the lights for four or five days allowing the solar panel time to recharge the batteries. If this is acceptable for the site, use the Suspend key on the remote to disable night time lighting. To start lighting again press the Resume button.

Alternately the batteries can be removed from the system and brought indoors and charged in a matter of hours on an AC three stage battery charger designed for sealed batteries. **CAUTION: Unplug the solar panel before unplugging the battery. Be sure the charger is designed to charge sealed batteries. Automotive Chargers Typically are NOT Suitable. If the system uses Gel batteries, only charge them with a charger that is specifically designed to charge Gel batteries. A common automotive battery charger is not suitable for Gel cell batteries. When reconnecting to the system, always connect the battery before connecting the solar panel.**

RECHARGING BATTERIES WITH VOLTAGE BETWEEN 7V TO 10V

-If battery voltage reads below 10V, then probably the battery internal capacity is reduced or damaged.

- Sometimes the battery can be recover from a low voltage level (7V to 10V), by giving the battery a charge with a three stage battery charger, can provide extra months of battery life until it is time to definitely replace it.

MPT15-24 Charge Controller LED Indicators

Charging Status
LED Indicator

Battery Status
LED Indicators



Solar
Terminals

Battery
Terminals

Light
Terminals

MPT15 TROUBLESHOOTING**Battery Voltage Check Table**

System #	System SN (if available)	Battery Voltage with Remote (# of flashes)	Battery Voltage with Meter	Notes
1			V	
2			V	
3			V	
4			V	
5			V	
6			V	
7			V	
8			V	
9			V	
10			V	
11			V	
12			V	
13			V	
14			V	
15			V	
16			V	
17			V	
18			V	
19			V	
20			V	

MPT15 TROUBLESHOOTING**Solar Voltage Check Table**

System #	System SN (if available)	Battery Voltage with Remote (# of flashes)	Battery Voltage with Meter	Notes
1			V	
2			V	
3			V	
4			V	
5			V	
6			V	
7			V	
8			V	
9			V	
10			V	
11			V	
12			V	
13			V	
14			V	
15			V	
16			V	
17			V	
18			V	
19			V	
20			V	

MPT15 TROUBLESHOOTING

Light Signal Voltage between Negative (black) and Signal (blue). *Will need to press #10 on Remote Control every 10 seconds

System #	System SN (if available)	Signal Voltage at Controller Light Terminals between Negative (black) and Signal (blue)	Signal Voltage at Green Connectors between Negative (black) and Signal (blue) Wires	Signal Voltage on Wires between Negative (black) and Signal (blue)	Notes
1		V	V	V	
2		V	V	V	
3		V	V	V	
4		V	V	V	
5		V	V	V	
6		V	V	V	
7		V	V	V	
8		V	V	V	
9		V	V	V	
10		V	V	V	
11		V	V	V	
12		V	V	V	
13		V	V	V	
14		V	V	V	
15		V	V	V	
16		V	V	V	
17		V	V	V	
18		V	V	V	
19		V	V	V	
20		V	V	V	