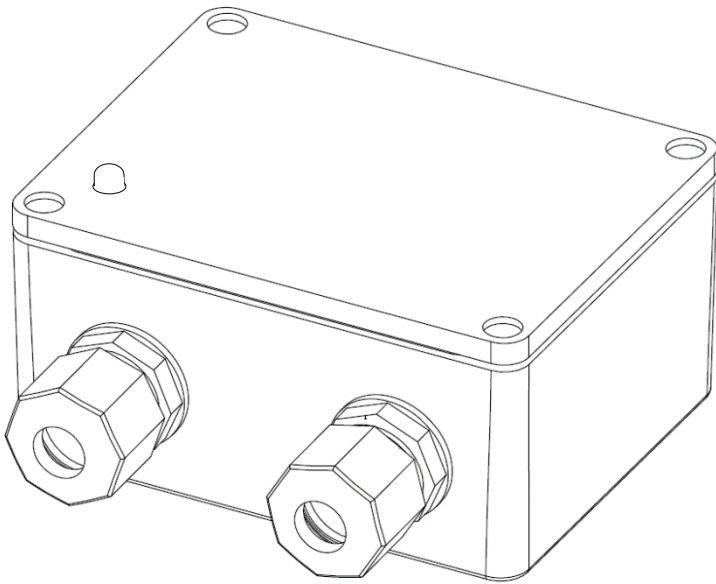


MAXIMUM POWER POINT TRACKER

MKI

Installation, Operation, and Technical Manual

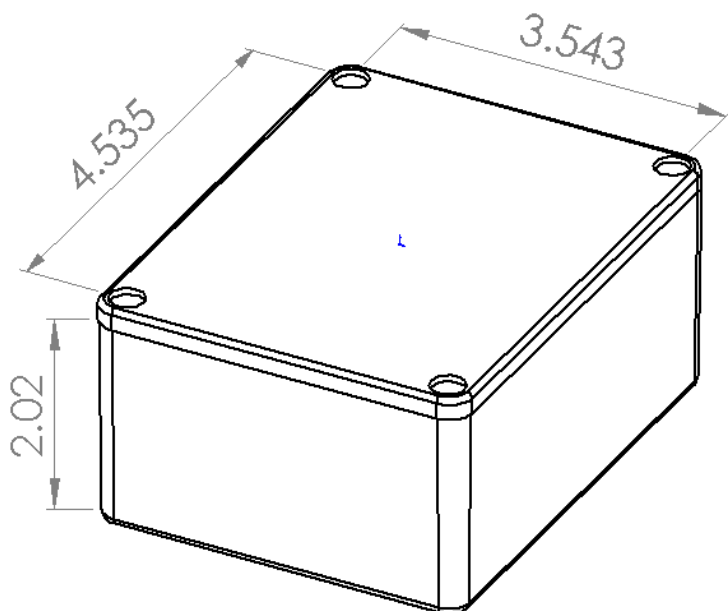


SOLARIS

POWER SYSTEMS

Product Dimensions

4.535" L x 3.543" W x 2.02" H



Specifications

Maximum Output Voltage: 25 Volts

Rated Load Current: 10 A

Maximum Input Voltage*: 38 Volts

*Array voltage should never exceed maximum input voltage. Refer to the PV panel documentation to determine the highest expected array V_{oc} as defined by the lowest expected ambient temperature for the system location.

TABLE OF CONTENTS

| | |
|---|----------|
| IMPORTANT SAFETY INSTRUCTIONS..... | 1 |
| GENERAL INFORMATION | 2 |
| Product Description | 2 |
| Features..... | 2 |
| INSTALLATION INSTRUCTIONS..... | 3 |
| Mounting Instructions | 3 |
| Prior to Wiring..... | 3 |
| Wiring Instructions | 3 |
| OPERATION | 4 |
| LED Indication | 4 |
| Inspection & Maintenance..... | 4 |
| TROUBLESHOOTING | 5 |
| Error Indications & Causes..... | 5 |
| SERVICING & REPAIR | 6 |
| Debugging Pins..... | 6 |
| Disassembly | 6 |
| Integrated Circuit Replacement..... | 6 |
| Through-Hole Component Replacement | 6 |
| Printed Circuit Board Diagram..... | 7 |
| Circuit Schematic..... | 8 |
| Bill of Materials | 9 |

IMPORTANT SAFETY INSTRUCTIONS

This manual contains important safety instructions for safe and proper handling, installation, operation, and maintenance of the Maximum Power Point Tracker. Do not discard this manual.

Take note of the following symbols. They will be used throughout the manual to indicate instructions and precautions that require particular care.



WARNING: This instruction/procedure is potentially dangerous and should be carried out with great consideration. Follow the listed precautions and steps very carefully.



CAUTION: This instruction presents an important procedure for the safety and functionality of the device.

General Safety Instructions

- Read all instructions and precautions in this manual before beginning installation.
- The MPPT should be serviced only by a qualified personnel. Do not disassemble or attempt to repair the device unless you are a licensed technician.
- Disconnect all sources of power to the MPPT before installation or adjustment.
- There are no fuses inside the MPPT. Install external fuses or breakers as required.
- Confirm that all power connections are securely tightened to avoid overheating.



WARNING: Servicing instructions listed in this manual are for use by qualified personnel only. Do not perform any servicing other than that specified in the operating instructions unless you are qualified to do so. Attempting to service without proper training could result in electric shock.



WARNING: Do not disconnect live circuit. To do so could result in permanent damage to the circuit.

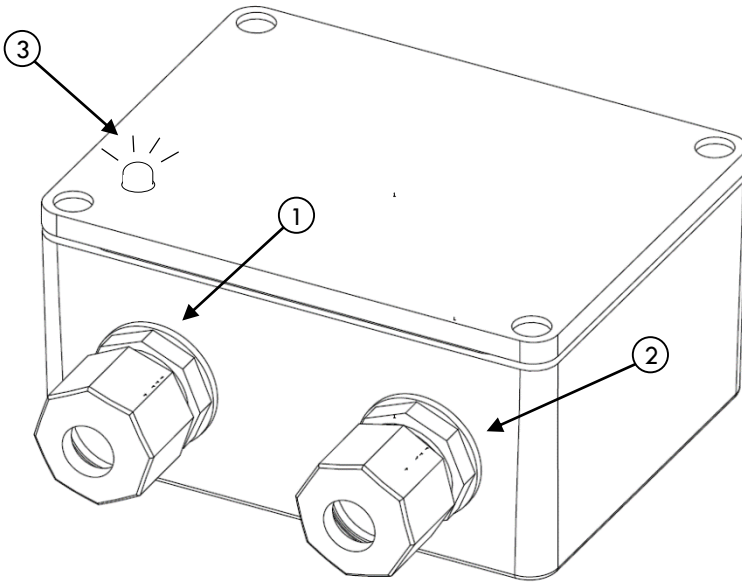


CAUTION: This device is not constructed to output to a battery. To do so may result in unpredictable and improper operation of the device. Output terminals should only be connected to a resistive load rated at the specifications given in this document.

GENERAL INFORMATION

Product Description

The Solaris Power Systems Maximum Power Point Tracker MKI is a device capable of boosting the power output of a solar panel to a resistive load. The MPPT requires minimal setup and configuration, and little to no maintenance, maximizing your investment in solar panels.



Features

Description:

1. Solar Panel POS-IN / NEG-IN Terminal: Positive and negative voltage terminal for solar panel input. Red wire for positive, black wire for negative.
2. Load POS-OUT / NEG-OUT Terminal: Positive and negative voltage terminal for resistive load. Red wire for positive, black wire for negative.
3. LED Indicator: Lit LED indicates device is receiving power and operating, unlit LED indicates device is not receiving power thus not operating. This LED may also assist in troubleshooting. For more information, see TROUBLESHOOTING on page 5.

INSTALLATION INSTRUCTIONS



Read through all instructions prior to performing installation.

Mounting Instructions

- It is recommended that the MPPT MKI be located in an area with consistent airflow to avoid the possibility of overheating.
- The MPPT MKI can be mounted by two different methods.
 - Standard Mount: Using the two diagonal holes in the bottom of the housing, MPPT MKI can be mounted a flat surface.
 - Pole Mount: Using the two diagonal holes in the bottom of the housing, the MPPT MKI can be mounted to pole-clamping hardware.

Prior to Wiring

- Ensure that solar panel or array is rated at a total power output of no greater than 100 W.
- Ensure that the resistive load is rated for a power output of no less than 100 W.

Wiring Instructions

1. Plug negative lead from resistive load into NEG-OUT terminal.
 2. Plug positive lead from resistive load into POS-OUT terminal.
 3. Plug negative lead from solar panel or array into NEG-IN terminal.
 4. Plug positive lead from solar panel or array into POS-IN terminal.
- NOTE: Upon completion of this step, the LED indicator should be lit. If so, the load will be receiving power. If not, see TROUBLESHOOTING on page 5.



WARNING: Do not connect solar panel terminals into the MPPT MKI before connecting load terminals.

OPERATION & MAINTENANCE

LED Indication

The LED will be lit if the MPPT MKI is receiving power and operating properly. If the LED is not lit, see TROUBLESHOOTING on page 5.

Inspection & Maintenance

While the MPPT MKI is designed to be durable and weather resistant, it is recommended that it be inspected and cleaned on occasion to ensure long life.

To clean the MPPT MKI:

- Ensure no power is being supplied to the device. Unplug all leads.
- Use a damp cloth (with a small amount of soap, if desired) to wipe down the device. Be careful around the terminals, to ensure no moisture enters.
- It is not necessary to clean the inside of the device. Do not open the case unless you are qualified to do so.

TROUBLESHOOTING

Error Indications & Causes

LED not lit

- Solar panel not providing enough power to MPPT MKI.
- Voltage regulator damaged.
- Load not connected properly.
- Panel/Array not connected properly.
- MPPT MKI malfunctioning.

Load not receiving power

- Solar panel not providing enough power to MPPT MKI.
- Load not connected properly.
- Panel/Array not connected properly.
- MPPT MKI malfunctioning.

General Troubleshooting

Before going further, be sure that you can answer 'yes' to all of the following questions:

- Is there a considerable amount of sunlight in view?
- Is the solar panel or array aimed toward the sunlight?
- Is the solar panel or array functional?
- If using an array, are all panels interconnected properly?
- Are all cables good?
- Are connections to solar panel(s) snug?
- Are cables connected to proper inputs on MPPT MKI? See Wiring Instructions on page 3.
- Are connections to MPPT MKI snug?
- Is load functioning properly? Test with other power source if necessary.

If you can answer 'yes' to all of these questions, and your MPPT MKI is still not functional, please contact a qualified service technician.

SERVICING & REPAIR



CAUTION: Do not attempt to service or repair the MPPT MKI unless you are a qualified technician. To do so could result in harm to yourself or to the device.

Debugging Pins

The PORT 1 header pins located at the bottom of the circuit board (relative to the orientation shown in the diagram below) are intended for debugging. The connections are given below.

- Pin 0: Input current sensor
- Pin 1: Input voltage sensor
- Pin 2: Output current sensor
- Pin 3: Output voltage sensor
- Pin 4: MOSFET control

Disassembly

1. Ensure no cables are plugged into the device.
2. Allow device to cool down if recently operating.
3. Remove (4) corner screws on housing lid.
4. Carefully tilt open lid and disconnect two wires attached to lid from MPPT MKI circuit board.
5. Remove lid.
6. Loosen (4) screws on screw terminals to release wire connecting printed circuit board terminals to cable glands.
7. Remove (4) screws securing printed circuit board to housing.
8. Remove circuit board from housing by grabbing the board itself, not the components.

Integrated Circuit Replacement

To replace an integrated circuit (IC) within the MPPT MKI, follow the steps given below.

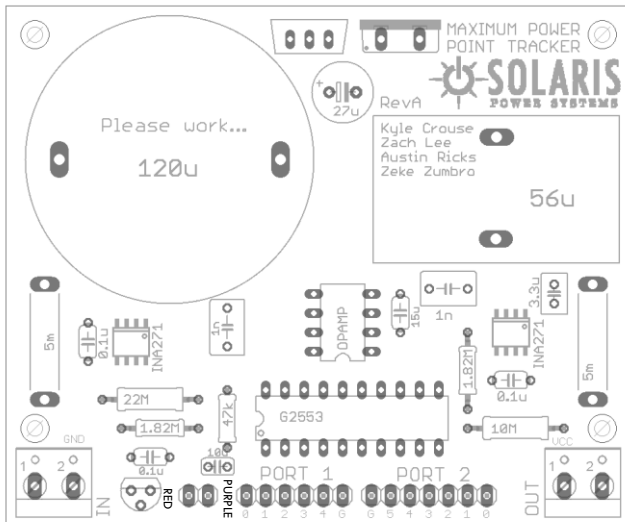
1. Follow steps 1-5 of the Disassembly section above.
2. Locate faulty IC. Use printed circuit board diagram shown on the following page if necessary.
3. Use IC puller to remove IC.
4. Insert replacement IC, ensuring it is facing the proper direction.
5. Reassemble device. NOTE: For wires attached to lid: red goes to right LED pin, purple goes to left LED pin.

Through-Hole Component Replacement

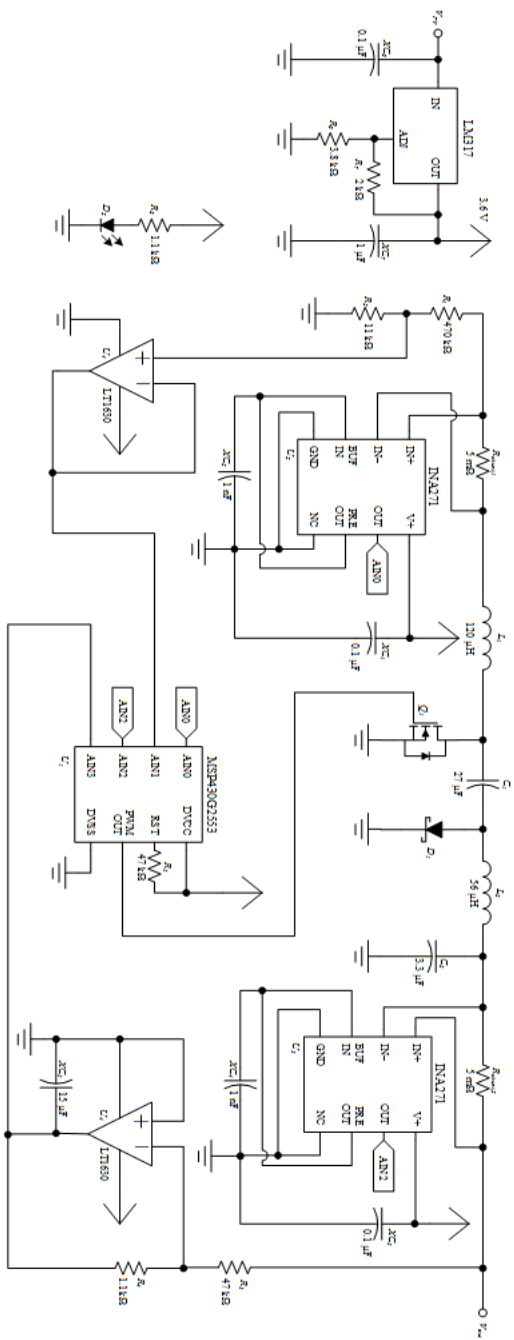
1. Follow steps 1-8 of the Disassembly section above.
2. Locate faulty component. Use printed circuit board diagram shown on the following page if necessary.

3. Remove faulty component using a soldering iron or other appropriate heat tool, being careful not to damage other components.
4. Solder in replacement component. If polarized, ensure proper direction.
5. Reassemble device. NOTE: For wires attached to lid: red goes to right LED pin, purple goes to left LED pin.

Printed Circuit Board Layout



Circuit Schematic



Bill of Materials

| QTY | DESCRIPTION | MAN | MAN P/N |
|-----|---------------------------------------|-----------------------------------|--------------------|
| 1 | 120 μ H Fixed Inductor | Bourns Inc. | 1140-121K-RC |
| 1 | 56 μ H Fixed Inductor | Bourns Inc. | 2310-V-RC |
| 1 | 27 μ F Aluminum-Polymer Capacitor | Nichicon | PLV1J270MD1TD |
| 1 | 3.3 μ F Ceramic Capacitor | TDK Corporation | FK16X7R1E335K |
| 1 | <u>Schottky</u> Diode | STMicroelectronics | STPS10L60D |
| 1 | N-Channel MOSFET | NXP Semiconductors | BUK6507-75C,127 |
| 1 | 4 Position Terminal Block | On Shore Technology | OSTTC040162 |
| 2 | 5 m Ω Current Sensing Resistor | <u>Stackpole</u> Electronics Inc. | BR3FB5L00 |
| 1 | 470 k Ω Resistor | <u>Stackpole</u> Electronics Inc. | CF18JT470K |
| 1 | 11 k Ω Resistor | <u>Yageo</u> | CFR-50JB-52-11K |
| 1 | 47 k Ω Resistor | <u>Yageo</u> | CFR-50JB-52-47K |
| 1 | 1.1 k Ω Resistor | <u>Yageo</u> | CFR-50JB-52-1K1 |
| 1 | IC MCU 16BIT 16KB FLASH 20DIP | Texas Instruments | MSP430G2553IN20 |
| 1 | IC REG LDO 3.3V 0.8A TO220AB | STMicroelectronics | LD1117V33 |
| 3 | 0.1 μ F Ceramic Capacitor | <u>Kemet</u> | C410C104M5U5TA7200 |
| 1 | 10 μ F Ceramic Capacitor | TDK Corporation | FK18X5R0J106M |

| | | | |
|---|-------------------------------------|-----------------------------------|--------------------|
| 1 | 47 <u>k</u> Ω Resistor | Vishay BC Components | PR01000104702JR500 |
| 1 | 20 Pin DIP Socket | On Shore Technology | ED20DT |
| 2 | Current Shunt Monitor | Texas Instruments | INA271AIDR |
| 2 | 1 <u>n</u> F Ceramic Capacitor | Vishay BC Components | S102K29Y5PN63J5R |
| 1 | 3mm Green LED | Lite-On <u>Inc</u> | LTL-4236N |
| 6 | 120 ohm Resistor | <u>Stackpole Electronics Inc.</u> | RNMF14TC120R |
| 1 | IC OPAMP GP 30MHZ RRO 8DIP | Linear Technology | LT1630CN8#PBF |
| 3 | IC MCU 16BIT 16KB FLASH 8DIP | <u>Assmann WSW Components</u> | A08-IC-TT |
| 1 | 15uF Capacitor | TDK Corporation | FK24X5R0J156M |
| 1 | 20 Pin Headers | <u>Harwin Inc</u> | M20-9992046 |
| 1 | Duck Brand Self-Locking Mailing Box | Duck | 1062959 |
| 1 | BOX ALUM 4.53X3.54X2.17" NAT | Bud Industries | AN-1304 |
| 4 | Cable Glands | Arlington | LPCG50 |
| 1 | Thermal Compound #5 | Arctic Silver, Inc. | - |

NOTES



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Maximum Power Point Tracker MKI™
CEO Zachary Lee
COO Kyle Crouse
Division Leader Zeke Zumbro
Fighter Pilot Austin Ricks