

OutBack Power Systems

MX60 PV MPPT Charge Controller



MX60 CHARGE CONTROLLER CONTROL BOARD AND FAN REPLACEMENT PROCEDURES

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OVERVIEW

This step-by-step guide illustrates the replacement of two separate components: the MX60 Charge Controller Control Board and the Charge Controller Fan. A static-safeguarded workspace should be used to preserve the MX60's static-sensitive components during the removal and installation procedure. This includes grounding yourself and your workspace to remove any possible static charge. Standing on a concrete floor, preferably on a rubber floor mat, doing the repairs on a metal workbench, and avoiding static-causing synthetic clothing are practices that will help avoid static.

Please review this guide and familiarize yourself with the complete repair procedure. OutBack technical support is also available at (360) 435-6030 or engineering@outbackpwr.com. We can assist you throughout the procedure to ensure proper operation of the control board and fan.

Note: This procedure involves sensitive electronics which must be handled *gently* and *carefully* during removal and installation. Applying excess force can damage the components and cause the MX60 to malfunction.

DISASSEMBLY OF THE MX60 CHARGE CONTROLLER

A Preliminary Procedure

- Allow the MX60 to “rest” for ~10 minutes to fully discharge the PV input capacitors.
- “Rest” means no electrical connections are applied to the MX60 (Figure 1).
- Required Tools:
 - a. Phillips Screwdriver
 - b. needle nose pliers
 - c. flathead screwdriver



Figure 1 MX60 Charge Controller at “rest”

NOTE: As many as 27 screws will be removed during this procedure. Be sure to put them aside in the order they are removed.

B Removal Procedure

1

- Start by setting the unit on its side to remove the two back screws (Figure 2).
- Keep the screws and star-washers together.



Figure 2 Back screw removal

2

- With the unit still on its side, remove two side screws (Figure 3).



Figure 3 Side screw removal

3

- Set the MX60 on its other side and remove the two remaining screws.
- The heat sink can now be removed from the chassis.



Figure 4 Side screw removal

4

- To remove the heat sink, raise its lower end (Figure 5a).
- Slide the control board past the grounding lug.
- Slide the heat sink away from chassis (Figure 5b).



Figure 5a Heat sink removal procedure



Figure 5b Sliding the heat sink off the chassis

5

- Set the unit on its side and remove the 12 screws holding the FET mounting bar (Figure 6).
- The alignment of the MOSFETs between the screw holes protects them from damage when reinstalling the FET mounting bar and screws.



Figure 6. FET bar removal procedure

6

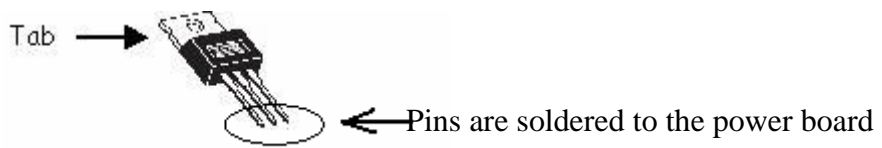
- Lift the tab of the MOSFETs off from the Sil-Pad (gray insulator pad) using your finger and thumb (Figure 7a).
- If the MOSFETs are difficult to break free, rock the tabs gently with needle nose pliers until they lift off the Sil-Pad (Figure 7b).
- **CAUTION!** Do *not* attempt to remove the MOSFETs off the power board as the pins are soldered to it.



Figure 7a Freeing the MOSFET from the insulator



Figure 7b Loosening the MOSFET with needle nose pliers



7

- Place the MX60 upside down and remove the seven screws highlighted in **black** (Figure 8).
- The four cradle screws and washers highlighted in **red** should not be removed. *Note: Some units may have four screws instead of seven.*

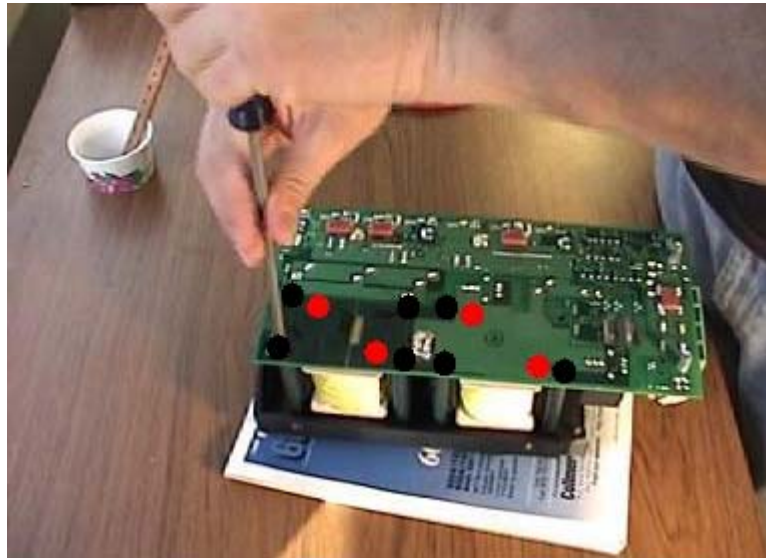


Figure 8 Bottom/Cradle screw removal

8

- Remove the last three remaining screws, identified in **black** (Figure 9).

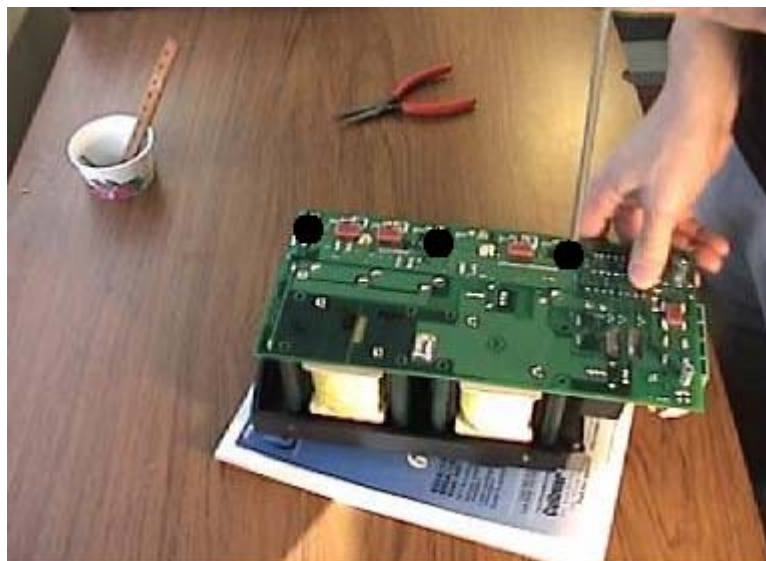


Figure 9 Removing the three remaining screws from the power board

9

- With all the screws removed, the heat sink can be separated from the power board.
- Set the unit upright and carefully pry and lift the heat sink off the power board (Figures 10a and 10b).
- Do not force the removal as the heat sink is connected to the power board by a ribbon cable from the control board.

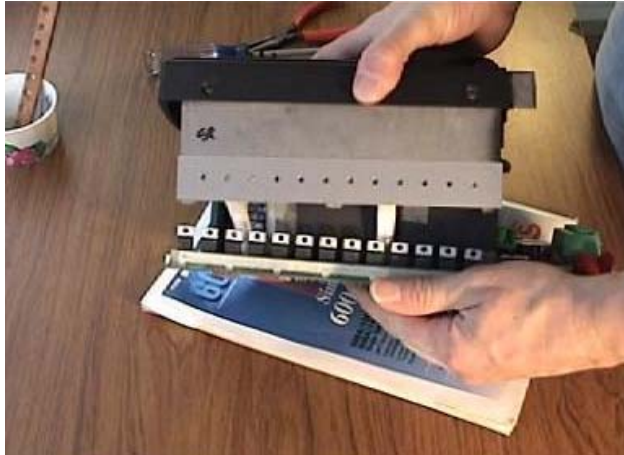


Figure 10a Separating the heat sink from the power board

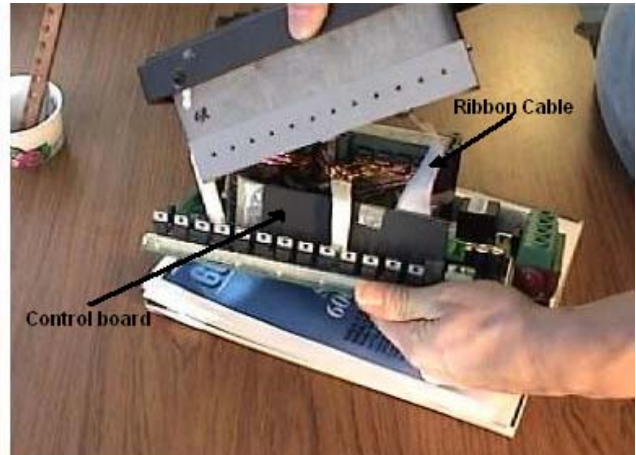


Figure 10b Lifting the heat sink off the power board



To remove and install a new control board, continue to the next page. To remove and replace the fan, please go to page 14.

10

- Set the heat sink on its side and the power board down flat (Figures 11a and 11b).
- Remove the ribbon cable connector from the LCD connector—the connector may have a dollop of RTV silicone sealant on it which does not need to be replaced.
- Set the heat sink aside. Figure 11b shows the assembly of the control board into the power board.



Figure 11a Ribbon cable removal

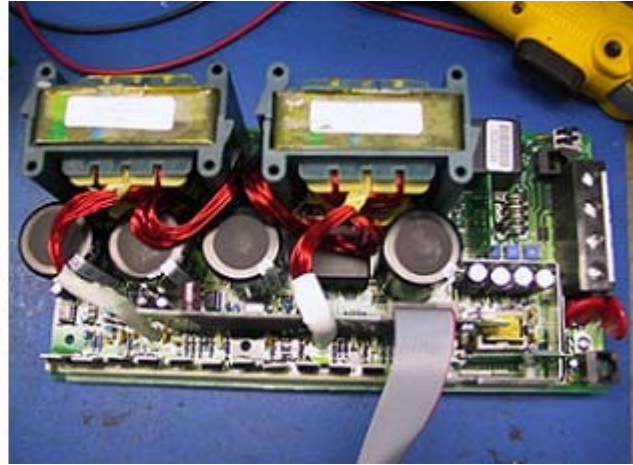
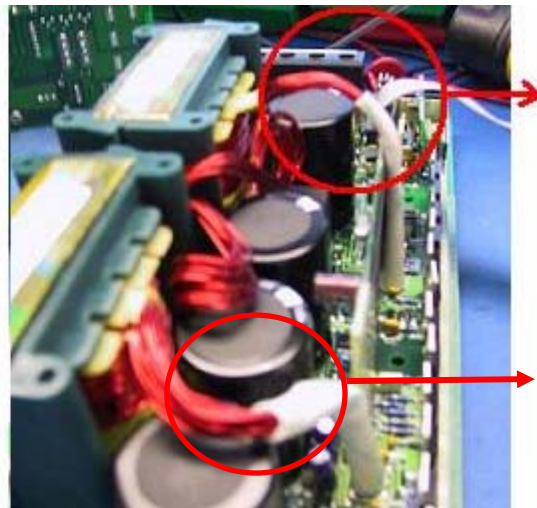


Figure 11b Top view of the power board

11

- Raise the inductor wires (Figure 12).



View of the raised inductor wires

Do NOT raise this inductor wire.

Figure 12 Orientation of inductor wires.

12

- Pinch the ends of the control board (Figure 13a) and pull upward.
- If the board resists, gradually pull up one end at a time, alternating between the two ends.
- Remove the control board by sliding it out of the power board (Figure 13b), avoiding any components on the board.
- **Caution!** The pins/connectors of control board should not be obstructed by the components on the power board.

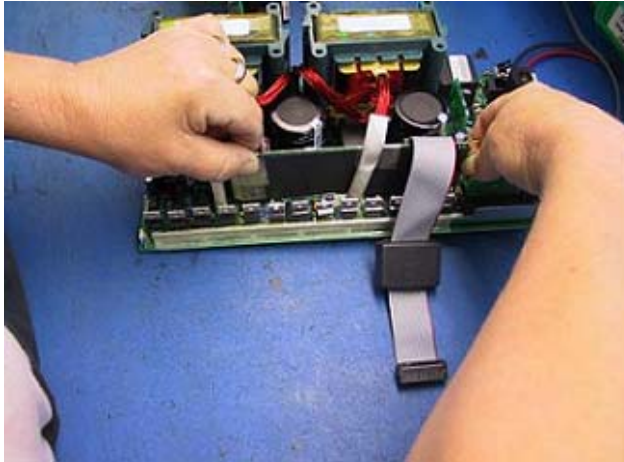


Figure 13a Lifting the controller off the power board

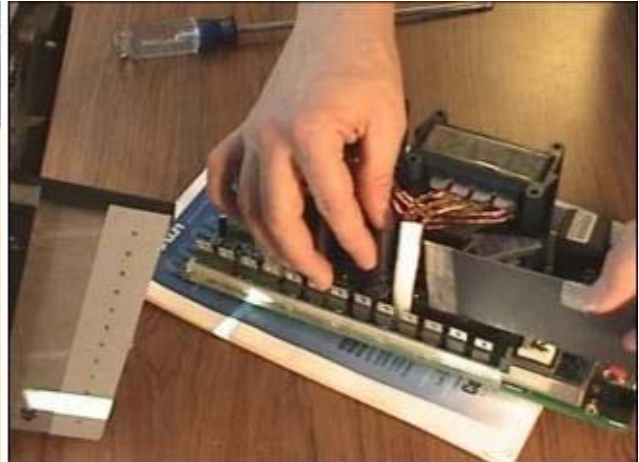


Figure 13b Sliding the control board out of the power board

Replacement Control Board

13

- Inspect the connector pins for bends. Straighten any bent pins, (Figure 14a) with a flathead screw driver or your finger.
- Slide the replacement control board into the power board (Figure 14b) without hitting any components on the board.
- Inspect the pins again before connecting the control board to the power board.
- The control board connector should be aligned with the power board connector—**be sure the pins and connectors line up with each other.**
- When the pins and connectors line up, push the control board into the power board.

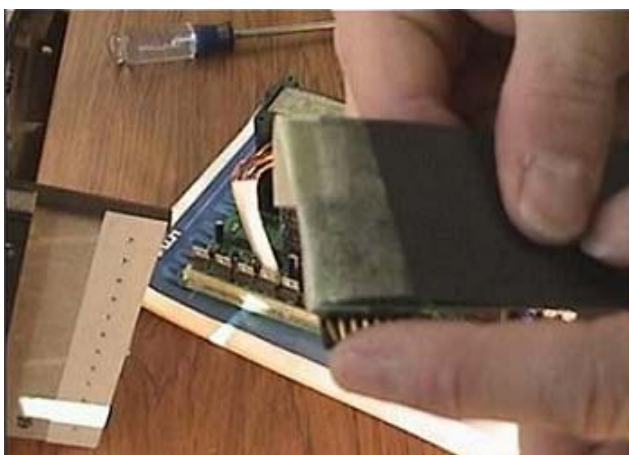
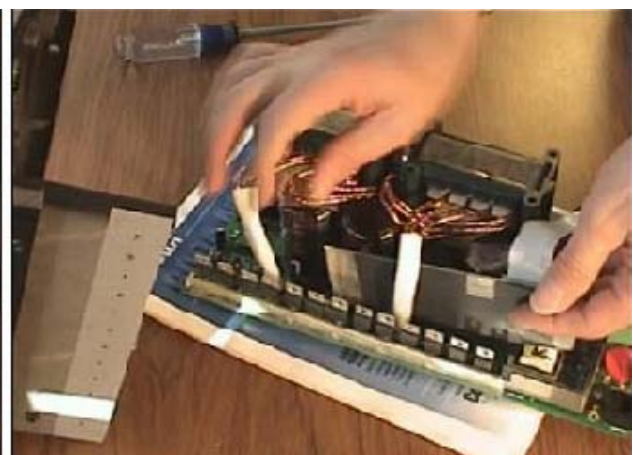


Figure 14a Bent pin on the control board



14b Sliding the upgraded/replacement control board into the power board

14

- With the control board secured to the power board, connect the ribbon cable to the LCD connector (Figure 14c).
- The red stripe must face the heat sink side wall. This is also an ideal time to replace the old Sil-Pad (if provided).

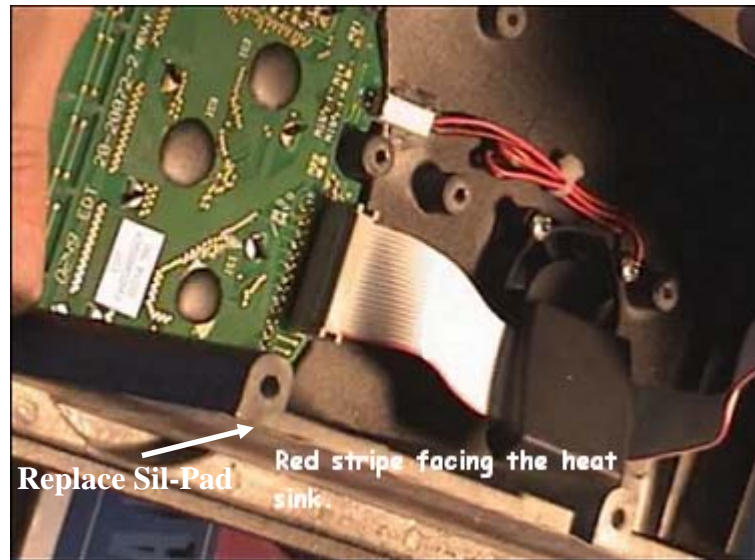


Figure 14c Ribbon cable's red stripe faces the heat sink wall

REASSEMBLY OF THE MX60 CHARGE CONTROLLER

C Reassembly Procedure

1

- Push on both ends of the control board to confirm it is still properly seated on the power board

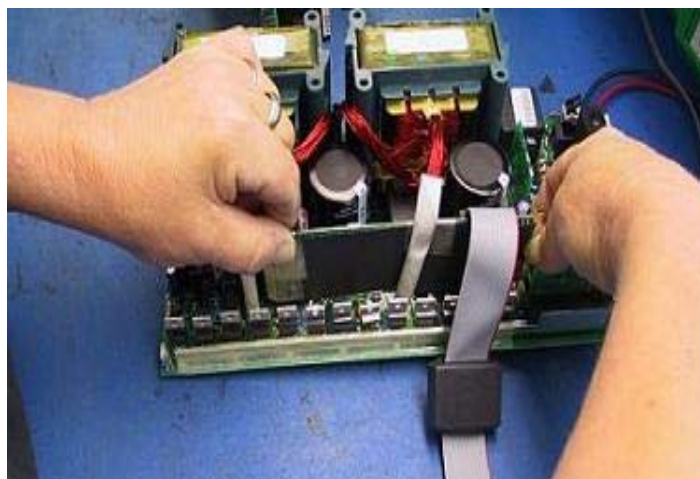
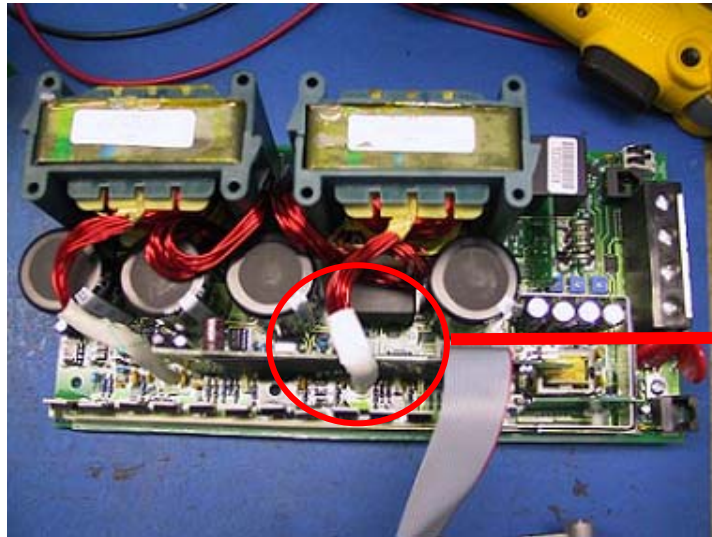


Figure 15 Ensuring proper connection of the control to power board

2

- Bend and move the inductor wires over the control board (Figure 15a), allowing some slack between them and the control board. *Note: Skip this step if replacing the fan.*



The inductor wires should be neatly tucked down over the control board.

Figure 15a

3

- Tuck the ribbon cable neatly over the back of the LCD (Figure 16).
- The ribbon cable connector should still be attached to the LCD.



Figure 16 Ribbon cable connector over the LCD

4

- Set and align the heat sink onto the power board.
- Pull the ribbon cable to ensure the heat sink makes proper contact against the power board (Figure 17).



Figure 17 Gently pulling on the ribbon cable

5

- Set the unit upside down, and align the power board screw holes against the heat sink screw holes.
- Install **all** screws and hand-tighten them (Figure 18).

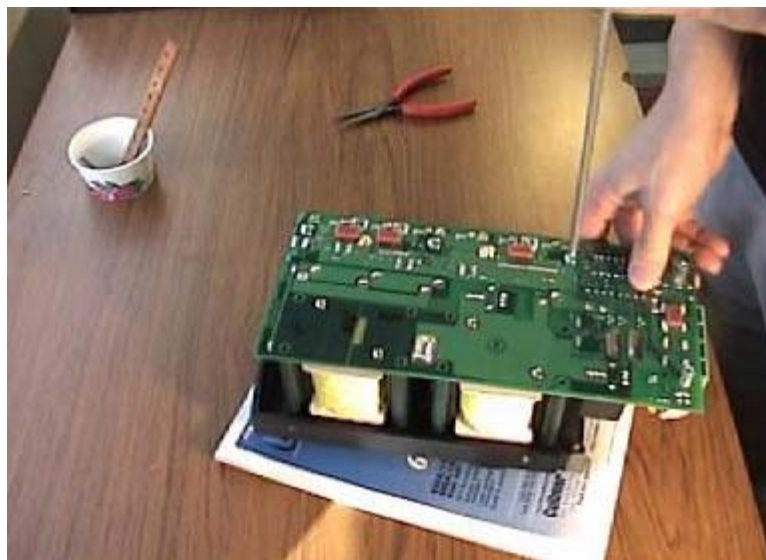


Figure 18 Installing and tightening screws

6

- Set the unit on its side with the MOSFETs in-between the screw holes of the heat sink.
- If they do not line up, move the tabs on the MOSFET to align it between the screw holes.
- Place the FET mounting bar on the MOSFET, install the screws and tighten.



Figure 19 Installing and tightening the FET mounting screws

7

- When the installation is completed, install the unit into the chassis and tighten down **all** the screws.
- The MX60 can now be installed in your system. We recommend that you power the unit without any PV input—**apply only battery power** to the MX60.
- The display should “boot up” and soft keys function properly. Once proper operation is verified, apply PV input to the MX60 Charge Controller to resume charging.

REPLACING THE MX60 CHARGE CONTROLLER FAN (continued from page 7)

After being lifted off the power board, Figure 20 below shows the heat sink upright and against the power board. Lay the heat sink upside down to begin the removal of the fan. The ribbon cable does **NOT** have to be removed.

1

- Remove the four screws highlighted in red and holding the fan in place.
- Disconnect the connector from the LCD.
- The connector may have a dollop of silicone on it to ensure firm connection between the connector and the LCD pins.

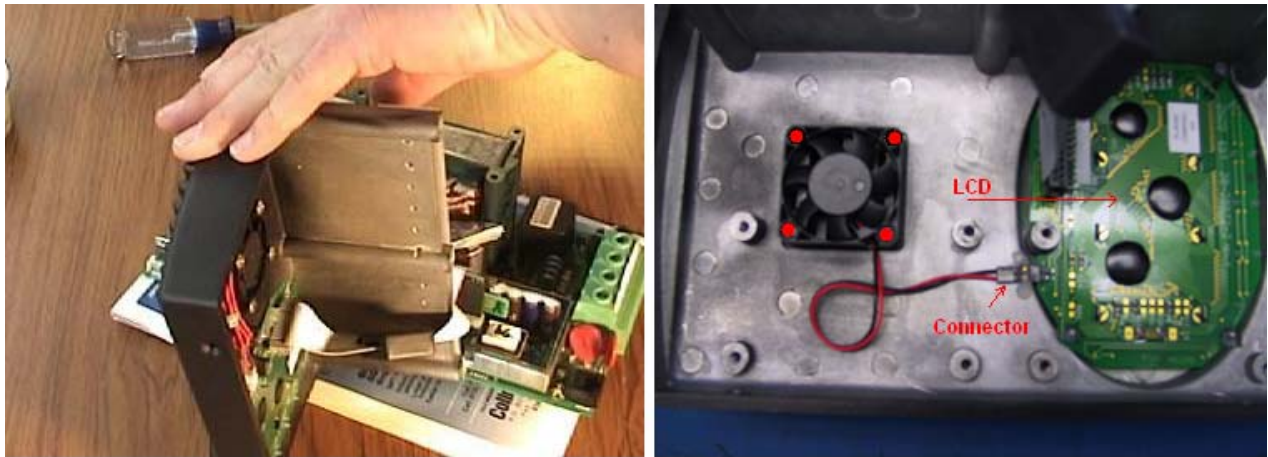


Figure 20 Fan Removal

2

- Orient the replacement fan and wires correctly (Figure 21).
- The red wire of the connector must line up with the positive (+) pin and the black wire with the negative (-) pin.
- Tighten the screws so the fan is snug against heat sink.
- Note: The wires are positioned away from/ in between the screw posts.

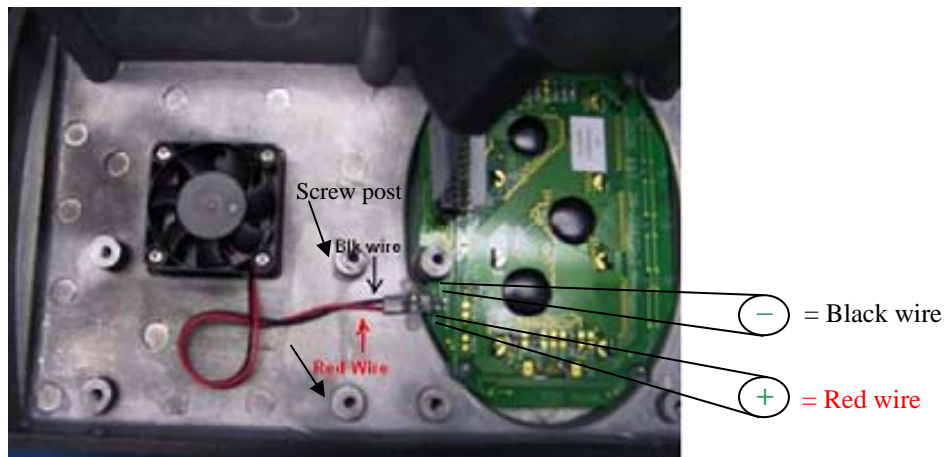


Figure 21 Orientation of fan wires.

3

- With the new fan installed, go to page 10, REASSEMBLY OF THE MX60 CHARGE CONTROLLER.

After the MX60 is reassembled and powered up, test the fan using the following procedure:

4

- Insert a flathead screwdriver inside the battery temperature sensor jack (Figure 22) and *gently* press against the pins.
- The operational mode on the MX60 screen should change from “Sleeping” to “BatTmpErr” and the fan will be active/on.
- Once the fan operation has been verified, remove the screwdriver from the battery temperature sensor jack and reconnect the RTS, if available.
- You may now apply PV input to the MX60 Charge Controller to resume charging.



Figure 22 Battery temperature sensor jack location

Insert flathead screwdriver inside the battery remote temperature sensor and gently press against the pins.

```
IN 005 V OUT 25.0 V
00.0 A 00.0 A
Watts 0000 Aux Off
kWHrs 00.0 BatTmpErr
```



When the pins are pressed, the “BatTmpErr” operational mode will be displayed and the fan will be active/on.

Please contact OutBack at (360)435-6030 or e-mail engineering@outbackpower.com throughout the replacement service for any needed assistance.

Thank you.

MX60 Service & Warranty Department
OutBack Power Systems, Inc.