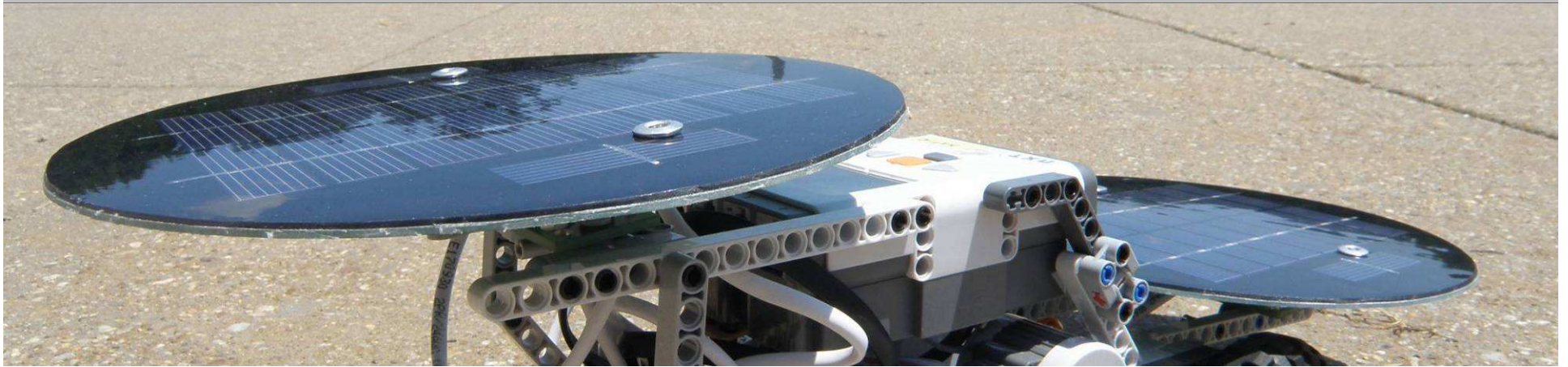




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## dSolar User Guide



The **dSolar System** allows you to power your Lego® Mindstorms® NXT robot using nothing but the sun! This 9V solar power system is compatible with Lego® Mindstorms® NXT creations and includes everything you need to get started.

*Additional accessories available for purchase:*

- dSolar CapBank
- dSolar Parallel
- dSolar Battery Pack Adapter



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## dSolar User Guide

### **Getting Started**

Basic Hardware

### **Hardware Setup**

Simple Configuration

Advanced Configuration

### **Appendices (For Additional Accessories)**

Appendix I: The **dSolar CapBank**

Appendix II: The **dSolar Parallel**

### **FAQ (Frequently Asked Questions)**





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## Getting Started

### Basic Hardware

#### Package Contents:

- dSolar Panel
- dSolar Power Cord
- dSolar NXT Adapter



#### Important Safety Notes

Read this entire guide before starting. Improper use of the solar panels may result in damage or destruction of expensive hardware, including but not limited to various sensors, the NXT itself, and the dSolar equipment. Use care and caution!

*Additional accessories for dSolar Systems are available for purchase, including:*

**dSolar CapBank**—The dSolar CapBank, or capacitor bank, serves as a mini-battery. It quickly charges the capacitors in the bank, providing steady power for your creation if it runs through a shadow or a cloud passes over.

**dSolar Parallel**—The dSolar Parallel connects up to three solar panels in parallel circuit to power more demanding projects.

**dSolar Battery Pack Adapter**—The Battery Pack Adapter connects your dSolar system to the Lego® rechargeable battery pack, allowing you to recharge your battery using the sun.



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## Getting Started

### Basic Hardware (continued)

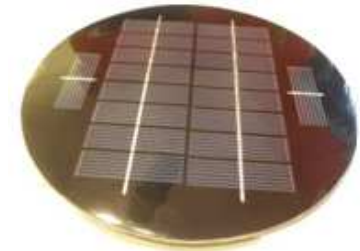
**1.dSolar Solar Panel** (2W and 4W models)—The solar panel has a power port and a protective printed circuit board on the back side. Solar panels are shipped with a thin plastic film over the panel. This protective film prevents scratches during shipping.



**CAUTION:**

Carefully remove the protective film before use.

**dSolar 2W Panel**—The 2W solar panel provides up to 10.5 Volts and 250 mA, depending on sunlight exposure. This panel has a diameter of 20 cm.



**dSolar 4W Panel**—The 4W solar panel provides up to 10.5 Volts and 500 mA, depending on sunlight exposure. This panel measures 21 cm by 17.5 cm.





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## Getting Started

### Basic Hardware (continued)

2. **dSolar Power Cord**—Use the dSolar Power Cord between the solar panel and the optional dSolar CapBank or dSolar Parallel (sold separately). The Power Cord uses a standard RJ12 style jack.



**CAUTION:** Do not insert Power Cord into sensor or motor ports on the NXT!



3. **dSolar NXT Adapter**—One end of the dSolar NXT Adapter contains a Female Power Port that fits the Power Cord and a Reset Button for resetting the power system of the NXT. The opposite end of the NXT Adapter contains both a Positive ( + ) Terminal Battery and a Negative ( - ) Terminal Alligator Clip that fit into the battery holder on the rear side of the NXT.





## Hardware Setup

### Simple Configuration: Directly Connects Solar Panel to the NXT.

This setup method connects the solar panel directly to the NXT terminals. No batteries are necessary.



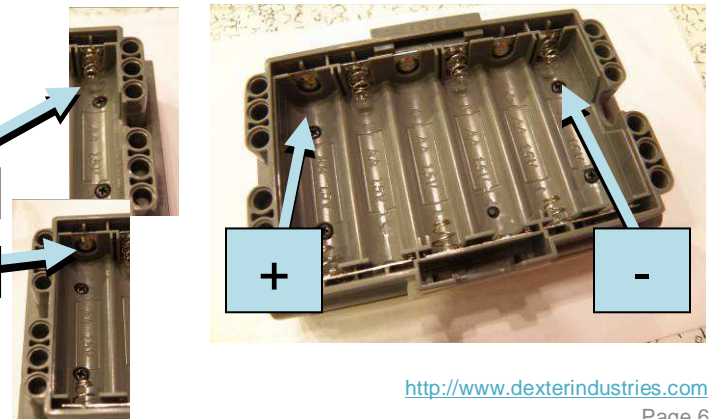
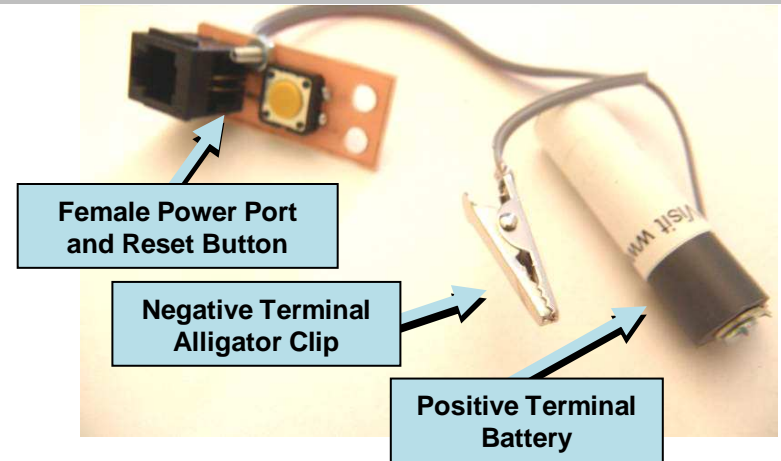
**CAUTION:** Placing the wires into the NXT incorrectly may result in damage to the dSolar Panel and your NXT. Ensure wires are properly oriented. Red connects to Positive (+). Gray connects to Negative (-). Use care when connecting the NXT Adapter.

The dSolar NXT Adapter has four components: a Female Power Port, a Reset Button, a Negative (-) Terminal Alligator Clip, and a Positive (+) Terminal Battery.

1. Open the back of the NXT. Position the NXT with the motor ports and the USB ports to your left and the sensor ports to your right.

The Negative Terminal (with a spring) is in the upper right hand corner of the battery box.

The Positive Terminal—a flat plate—is in the upper left hand corner of the battery box.



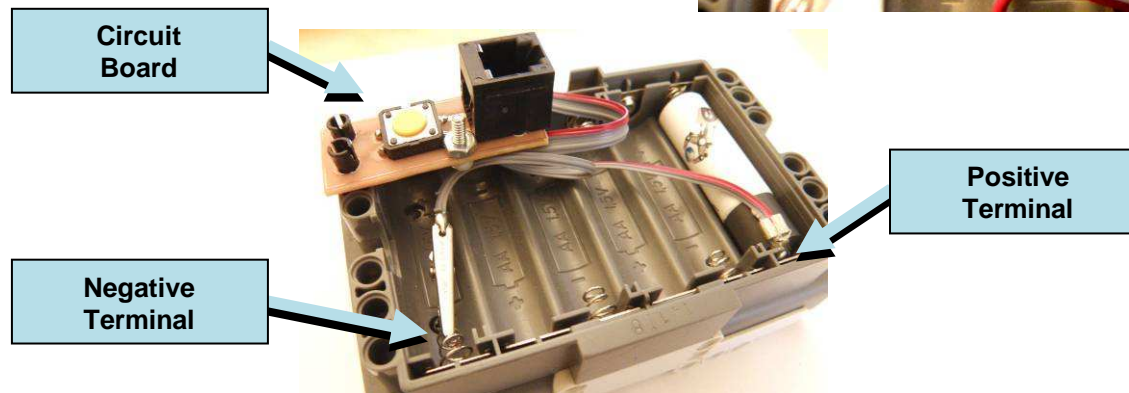
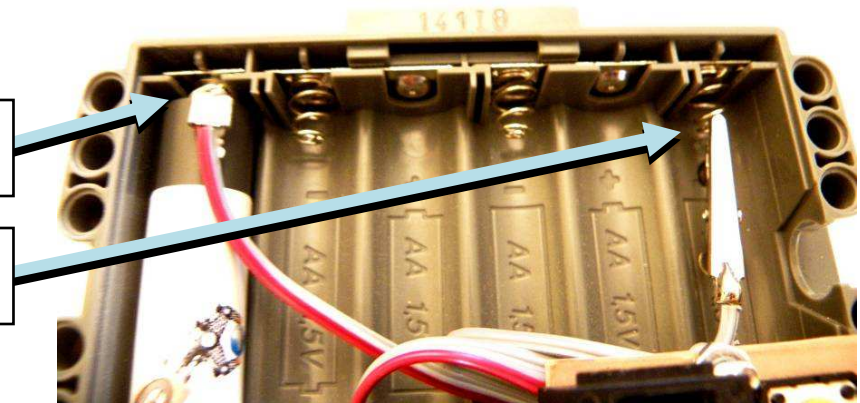


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## Hardware Setup

### Simple Configuration: Directly Connects Solar Panels to the NXT.

2. Secure the circuit board of the dSolar NXT Adapter to the back of the NXT using two Lego® pegs.
3. Insert the Positive Terminal Battery so it connects with the NXT's positive (+) terminal.
4. Attach the Negative Terminal Alligator Clip to the NXT's negative (-) terminal.





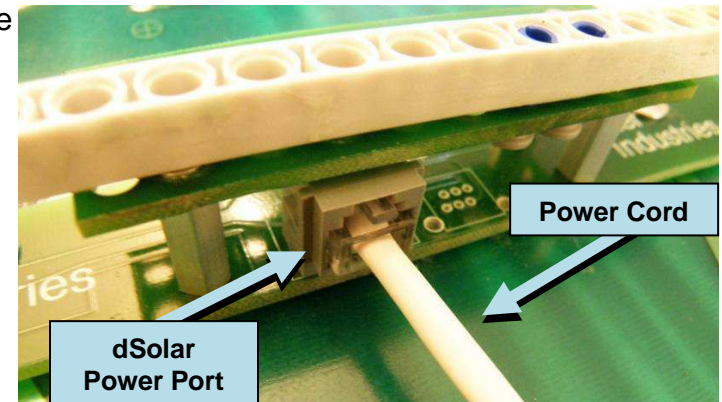
## Hardware Setup

### Simple Configuration: Directly Connects Solar Panels to the NXT.

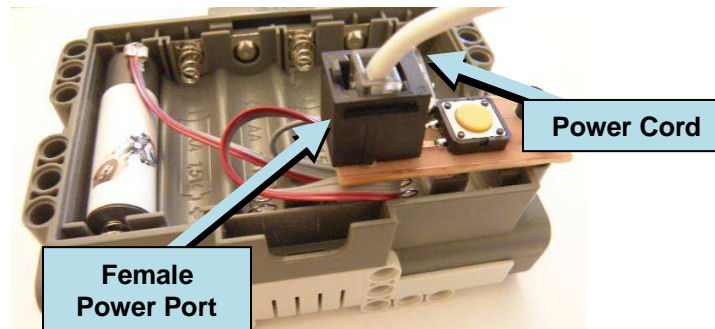
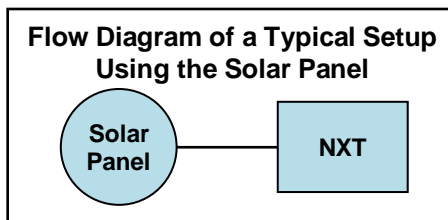
5. Insert the male end of the Power Cord into the dSolar Power Port of the solar panel.

**CAUTION:** You must use a Dexter Industries Power Cord to connect the solar panel. **CAREFUL:** Incorrectly connecting the power line may result in damage to the dSolar Panel and the NXT.

6. Insert the other male end of the Power Cord into the Female Power Port on the dSolar NXT Adapter.
7. Secure all loose power lines inside the NXT battery area.



The system is now ready for use!





## Hardware Setup

### Advanced Configuration: Directly Connects Solar Panels to the Lego® Rechargeable Lithium Battery Pack

A dSolar Battery Pack Adapter (sold separately) is required to connect the solar panels directly to the Lego® Rechargeable Lithium Battery Pack.

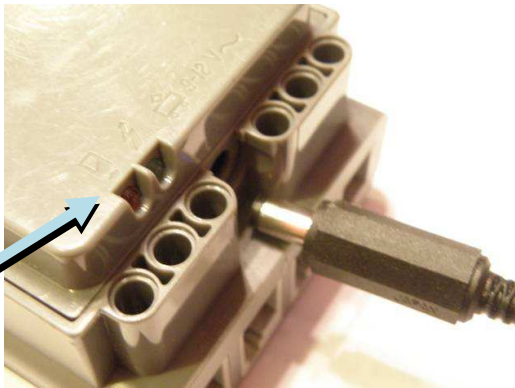
To connect the solar panels to the battery pack, place the lithium battery in the back of the NXT.

Insert the male adapter end of the dSolar Battery Pack Adapter into the port of the rechargeable battery pack.

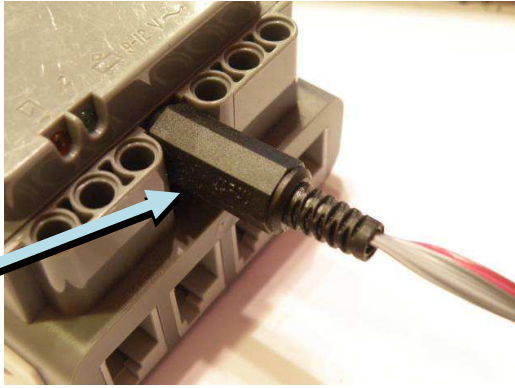
Insert the male plug (RJ12 style) of the dSolar Battery Pack Adapter into the CapBank or the solar panel power port.

The dSolar battery Pack Adapter fits Lego Product ID W979798.

**The system is now ready for use!**



Lego® Rechargeable Lithium Battery Pack



dSolar Battery Pack Adapter (male adapter end)



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## Hardware Setup

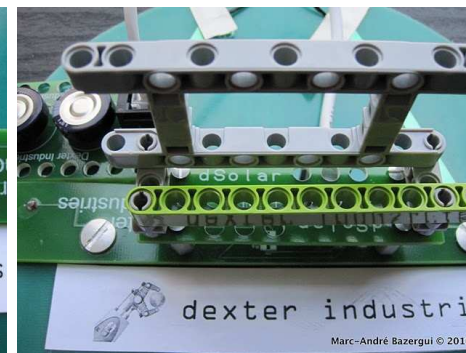
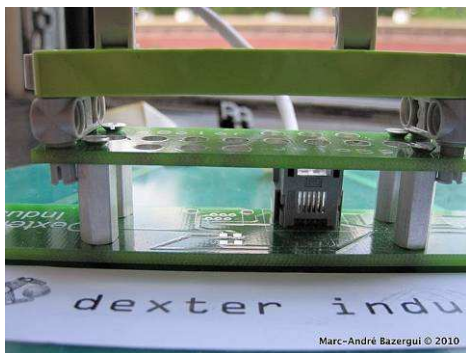
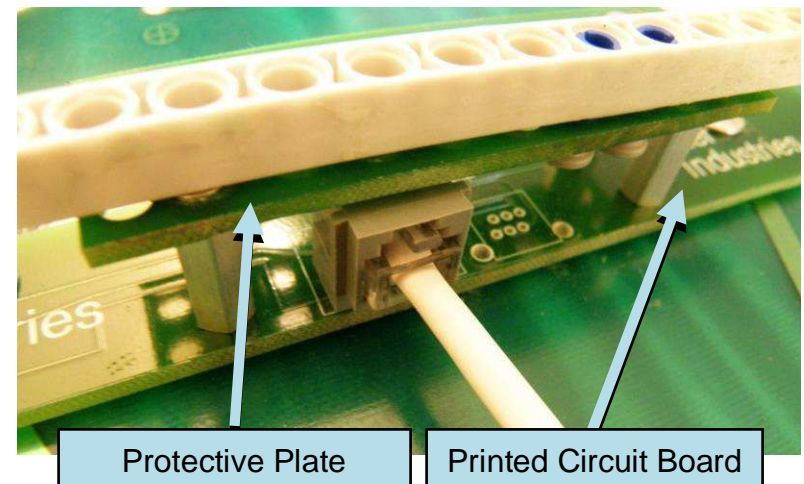
### Mounting the Solar Panel

The solar panel (both 4W and 2W) comes with a protective circuit board that houses and protects the electronics on the back of the solar panel.

The protective plate on the back of the solar panel is manufactured with holes that are properly sized for the Lego® Technic system.

Beams and other Lego® bricks may be attached with standard pegs and axles.

Some images are provided to give better context for mounting.

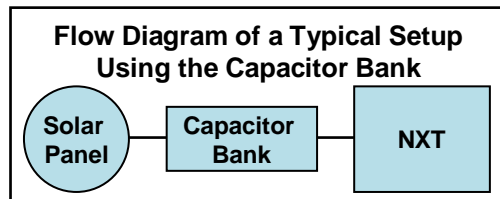




## Appendix I: The dSolar CapBank

### Connecting the dSolar CapBank

The dSolar CapBank (Capacitor Bank) connects between the solar panel and the NXT. The CapBank provides 1 Faraday of charge, evening out the power supply.

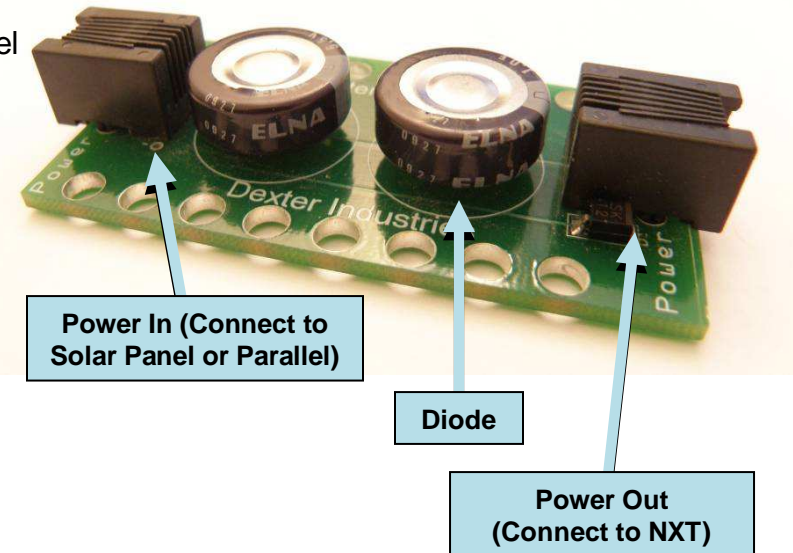


1. Connect the Power Cord between the dSolar Power Port located on the solar panel and the port labeled "Power In" on the CapBank. The "Power In" port is located opposite of the diode on the circuit board.
2. Insert the Power Cord into the "Power Out" port (located on the diode side of the circuit board).



**CAUTION:** Incorrectly connecting the Power In or Power Out may result in overheating of the diode and possible damage to the dSolar Panel or the NXT.

**The CapBank is ready for use!**





## Appendix II: The dSolar Parallel

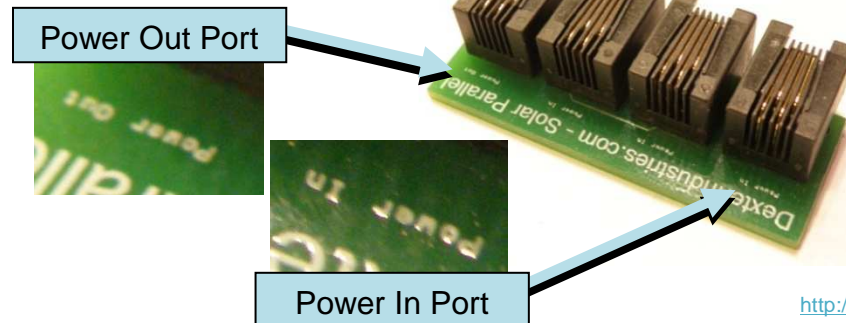
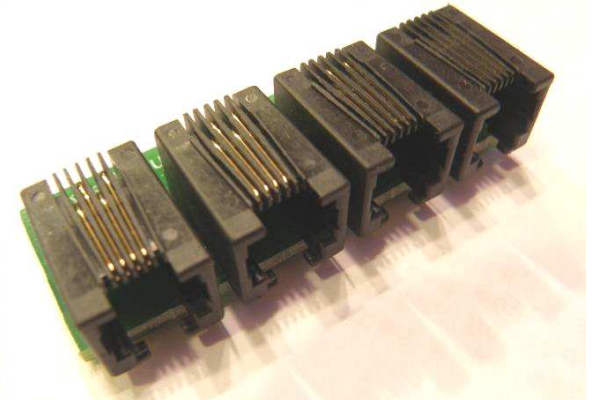
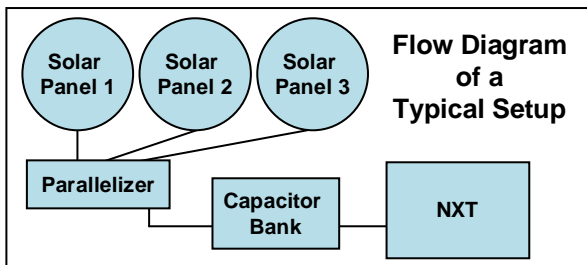
### Connecting the dSolar Parallel

The optional dSolar Parallel is used to increase the Amperage available to the NXT by allowing multiple solar panels to be connected in parallel circuit. Up to three solar panels may be used in parallel, delivering a maximum of 750 mA.



**CAUTION:** A MAXIMUM OF THREE SOLAR PANELS OR 750 mA may be used in parallel. Using more than three solar panels may result in damage to the dSolar Panels and to the NXT.

1. To connect dSolar Panels to the dSolar Parallel, insert one end of the Power Cord into the dSolar Power Port on the solar panel. Insert the other end into one of the "Power In" ports on the dSolar Parallel.
2. Connect the "Power Out" port either to the CapBank (Capacitor Bank) or directly to the Lego® Rechargeable Lithium Battery Pack on the NXT.





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## FAQ

### **Can I charge the Lithium Ion battery while using it?**

Yes, the Lithium Ion battery can be charged with the dSolar System Battery Adapter and used at the same time.



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## FAQ



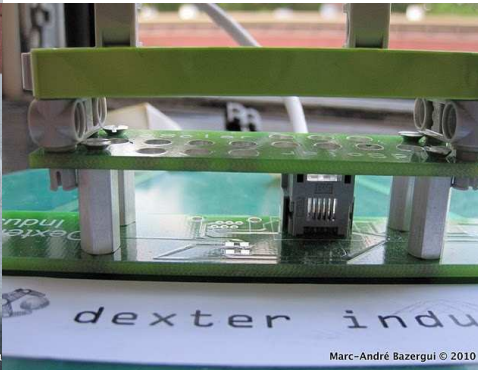
Marc-André Bazergui © 2010

**Got a question?**

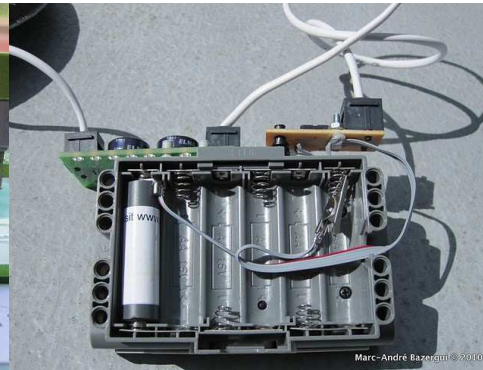
Write us at [info@dexterindustries.com](mailto:info@dexterindustries.com)



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## End Notes

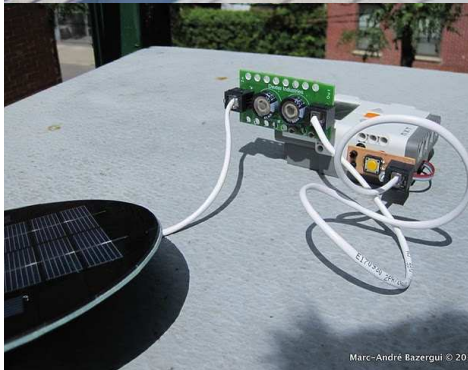


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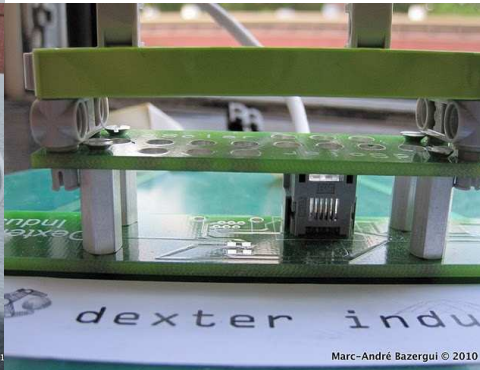
### Special Thanks:

Special thanks to our beta testers and contributors who made this project possible.

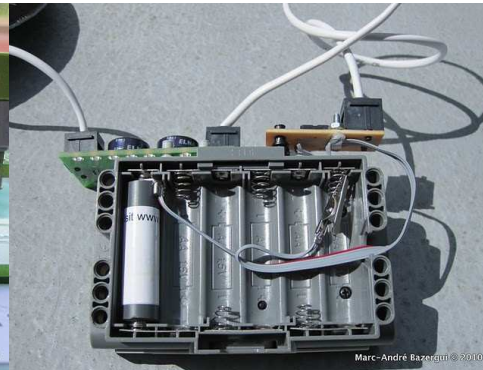
- Joey - <http://lego-x.com/>
- Marc-André - <http://www.youtube.com/bazmarc>
- Xander - <http://mightor.wordpress.com/>



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