Self Sustaining Arduino

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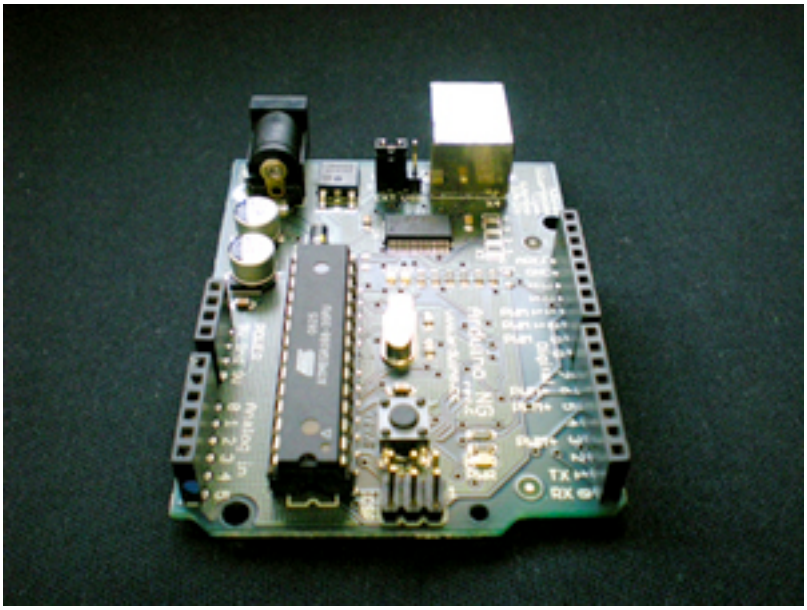
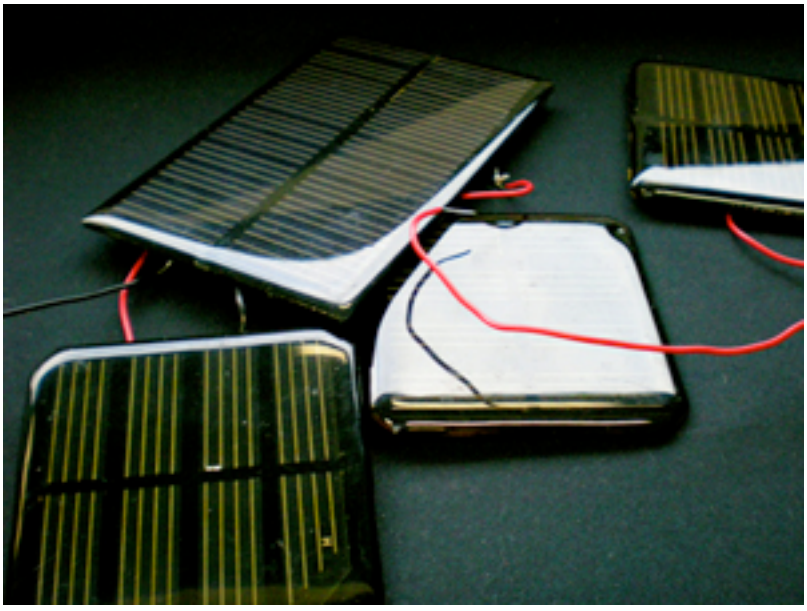
Description

This document is a tutorial for creating a self sustaining Arduino board, by harnessing solar energy. It would be incorporated with a rechargeable 9V battery. What makes this unique is that you do not need to be bound by any computer or power plug to provide an electrical supply to the Arduino board. This will allow for completely mobile and self sufficient interactive projects that use Arduino. This tutorial will provide a description for the use of each component of the circuit, with pictures, so as to guide anyone to creating their own self sufficient Arduino board.

Equipment List



Arduino Board
A microcontroller which is a good tool for creating electronics projects as well as interactive environments.



Solar Cells (About 11V)
11V is a good amount of electricity to supply to a 9V battery. It is not too much, neither is it too little.

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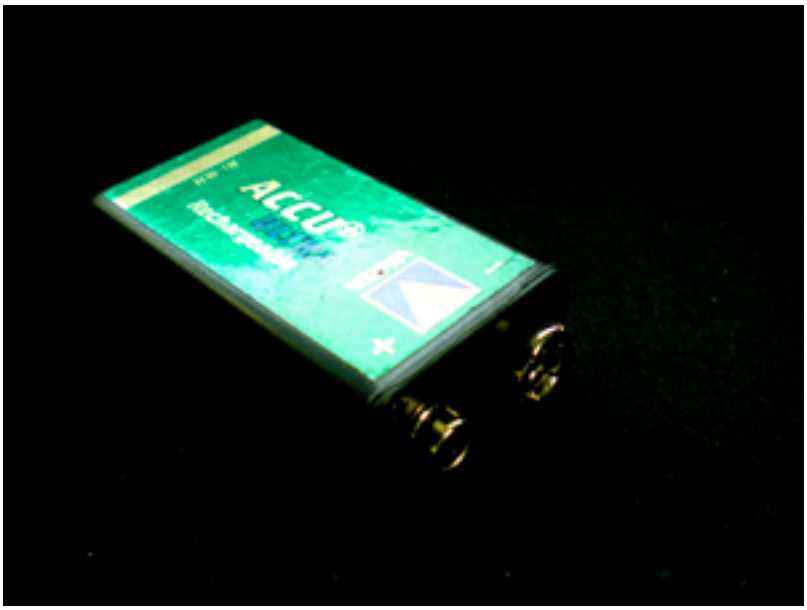

9V Rechargeable Battery
Please ensure that it is a rechargeable 9V battery.

1N4001 diode
This is a power diode. What it does is create a one-way traffic for electricity, from the solar cell to the battery. This ensures that there is no back-flow of electricity, from the battery to the solar cell, when it is dark.

The 1N4001 diode allows a maximum of 1A current, so it is quite suitable for this.

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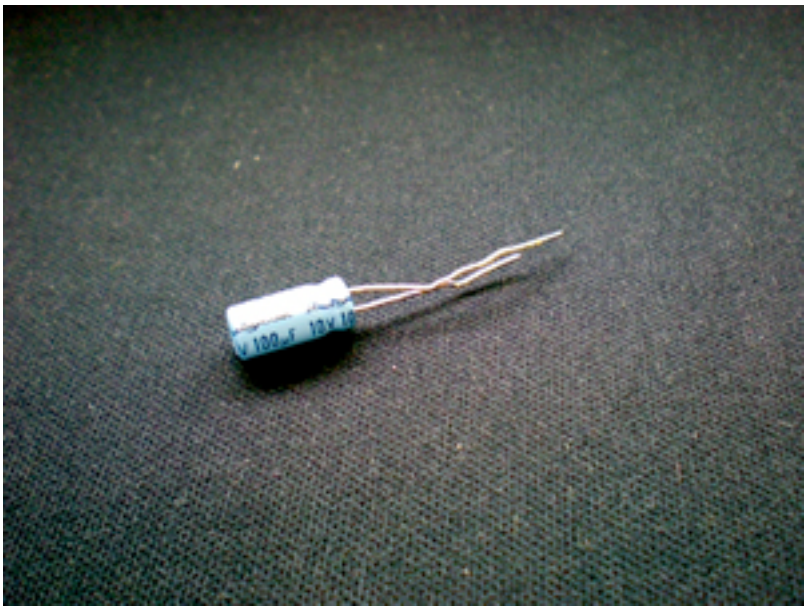
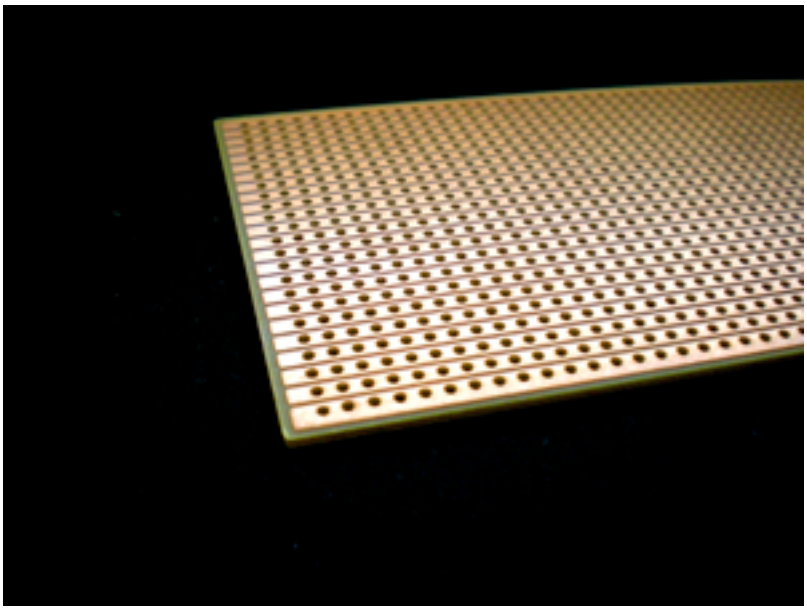


100uf 10V capacitor
A capacitor's use is to smooth the voltage supply to the Arduino. It also stores charge just to ensure that the Arduino does not get affected by any sudden drops in voltage. It is usually encouraged to get a capacitor that can store a voltage/charge slightly higher than required.



Circuit Board
This is where all your circuits will be soldered.

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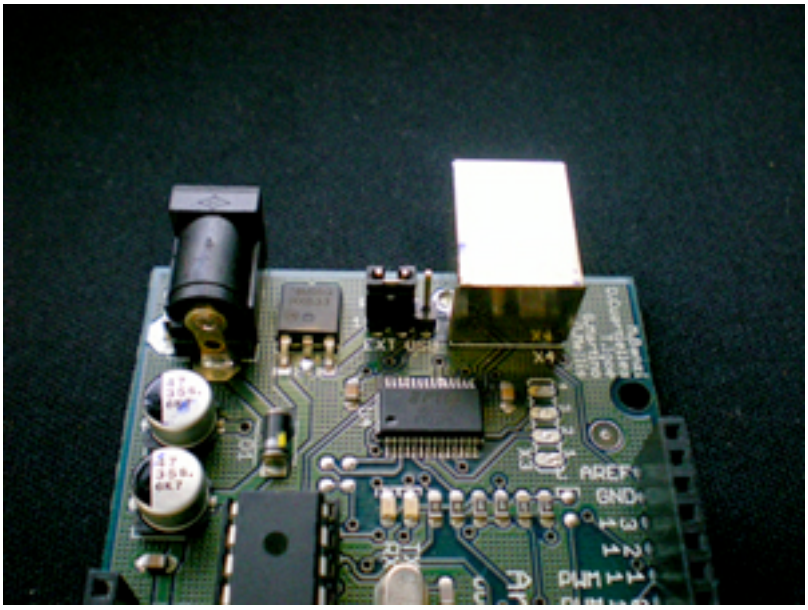
Power Connector
This is what is used to connect your circuit to the Arduino board.

Process

This would describe the process of connecting the circuit to get it working correctly. It would require soldering as well. A good practice is so have black wire for negative and red wire for positive. It makes identifying easier.

Arduino Jumper



The first part is to make sure that the power source jumper is set to “Ext” as shown in the picture. This is to tell the Arduino board that it is drawing power from an external source, rather than the USB port.

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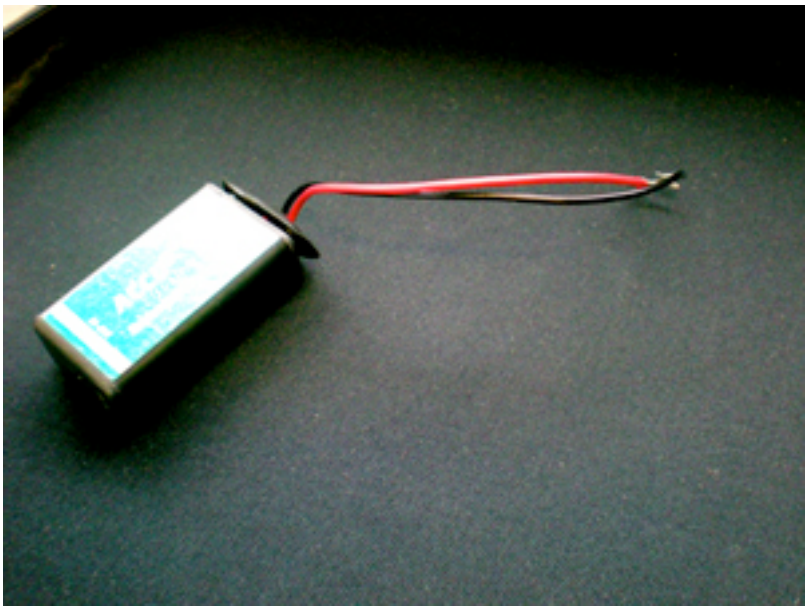
Solar Panel Connection
Solar cells are to be connected in series.

Diode Connection
The diode has 2 sides, one with a ring and one without. The side with the ring is to be connected to the positive side of the battery (red wire). The other side of the diode is to be connected to the positive side of the Solar panel connection (red wire). An example of how the battery would look with the battery connector is shown below.



The red wire denotes positive and black wire denotes negative. Red wire connects to the ringed side of the diode.

Capacitor Connection
The capacitor has 2 nodes as well, the positive and negative node. This can easily be identified by looking at the length of the legs. The longer leg is the positive node and the shorter leg is the negative node. The positive node will be connected to the positive end of the battery/solar panel connection and the negative node is connected to the negative end of the battery/solar panel connection.

It is from this capacitor that the final electrical output is sent to the Arduino board.

How It Works

Energy from the sun is constantly supplied to the solar panels. At any given time in the sun, it would generate about 11V, which charges the battery fairly quickly. At the same time, electricity is being supplied from the battery to the Arduino. So there is a constant charging of the battery as well, which removes all worry about overcharging it. If it gets dark or cloudy, the battery will be charged enough to last a fair few hours. All it would need is a little light to charge itself and keep going, thus making it self sustainable.

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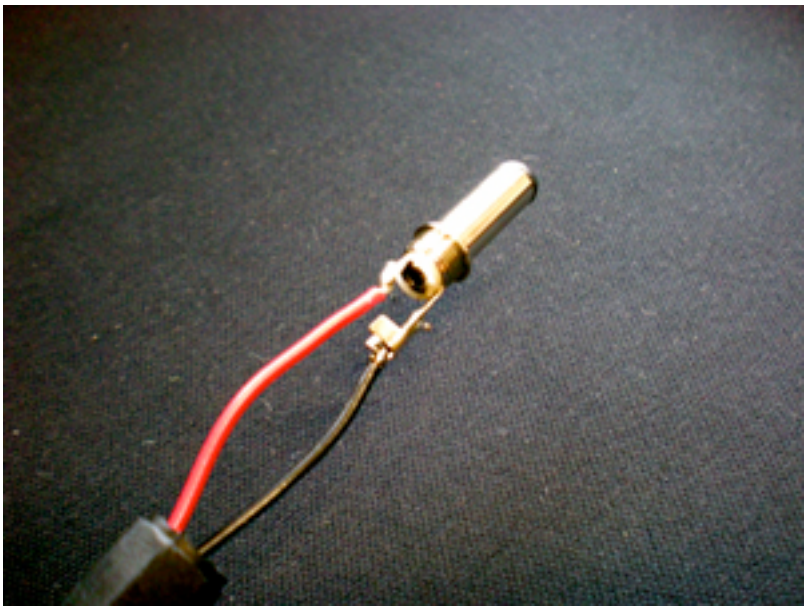
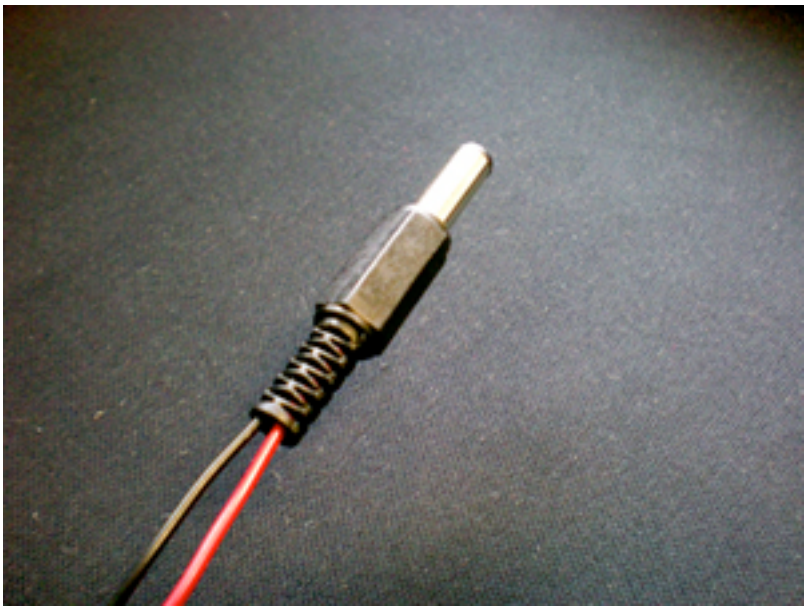
External Power Connection To Arduino

The next few steps involves soldering your positive (red) and negative (black) wires to the connecter which will supply power to your Arduino board.



Solder your wires as shown in the picture.



Screw the plastic insulation over it.

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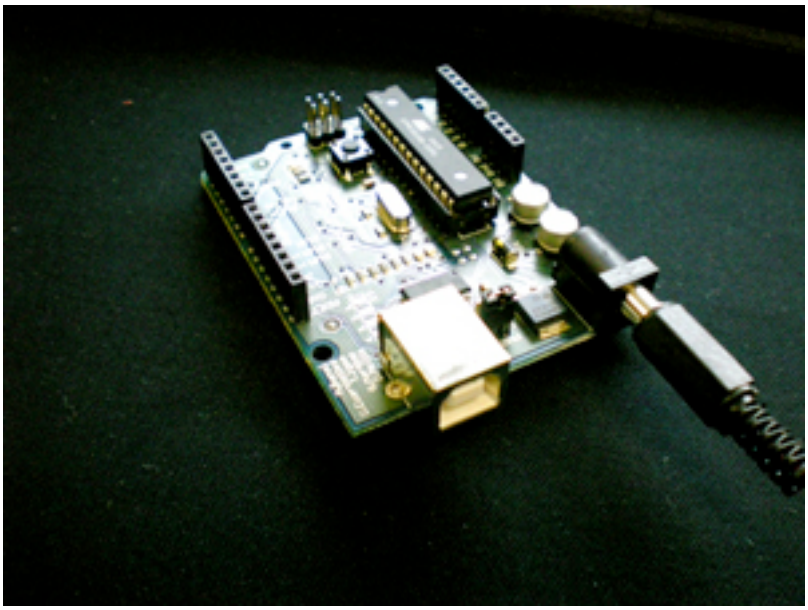

Connect to the Arduino board in the external power socket.