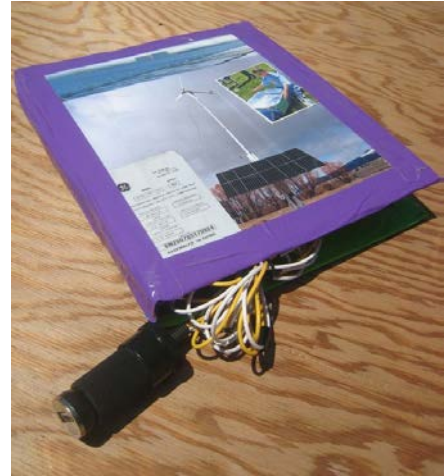


# Solar Notebook Charger - Instructions

## Description

The Solar Notebook Charger is a 12v dc solar charger that can charge a range of battery-based electronic devices, such as cell phones, iPods, and MP3 players. This particular design is based on a custom solar cell acquired by Solar Schoolhouse. We've found that 2 of these solar cells work fine for most phones but the iPhone 4&5, which need the extra 2 cells to charge. The Solar Notebook Charger encourages you to design and build your own enclosure using cardboard and duct tape. The steps shown here illustrate one solder-based option. You also have the choice to connect wires via a solderless approach (using wire nuts) and design a different notebook.



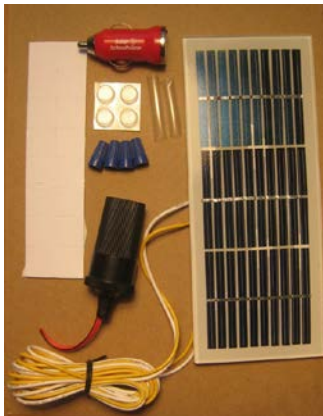
*This notebook is decorated with pictures cut from a Renewable Energy magazine. The 'name plate' sticker from one of the solar cells has been placed on the cover for ease in reading the solar specs for the charger.*

## Materials:

- (4) 13.3 Volt\* 0.1 Amp, 1.25watt Solar Laminates
- (16) double-sided 3/4" foam tape squares
- (4) wire nuts
- (2) heat shrink tubing, 1.5" long x 1/4" diameter
- (4) rubber bumpers
- (1) USB car charger
- (1) 12 Volt Auto socket ("cigarette lighter") with ~ 3" wire

You supply: Duct tape, cardboard, old magazines to create 'renewable energy' collage for outer cover.

Tools: wire stripper/cutter, utility blade or snap knife, pencil/ sharpie, ruler, Solder Iron (optional), Heat Gun (optional), Digital Multimeter (optional)



Materials Supplied



You Supply



Tools

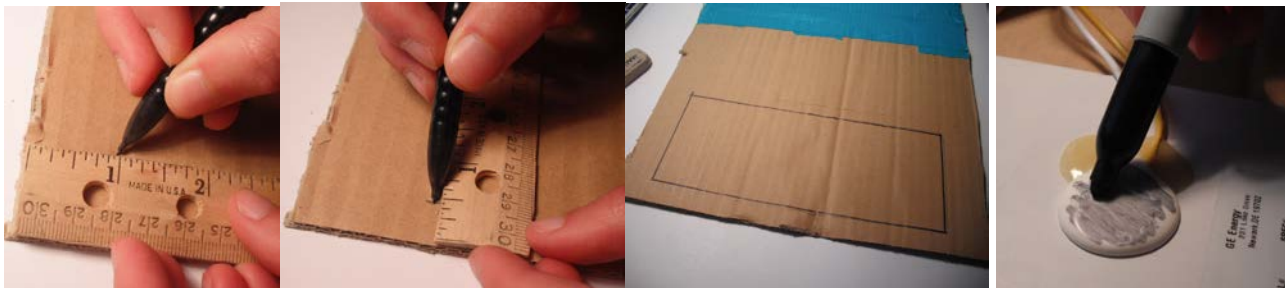
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## Directions:

1. Cut two pieces of quarter-inch thick corrugated cardboard ~ 9"x10.5".
2. Create a binding for your solar notebook by duct-taping the two cardboard pieces together on one of the long edges. Leave a two inch gap between cardboard pieces. This will allow room for wires and the auto socket later.
3. Use a pencil to mark the placement of your first solar cell on the cardboard by measuring 1" down and 1/2" in from the edge of the cardboard. **To make the solar cell lie flat**, turn it over and use a sharpie to mark the silicon blob on the back. Then flip cell over and press into cardboard. The sharpie should rub off of the blob onto the cardboard. Take the cell away and use the back of the sharpie to deepen the indentation where the silicon blob will rest. Also, make an indentation channel for the wires to go toward the binding of the notebook.
4. The second panel will be placed right next to the first. Repeat the same process for creating indentations for the silicon blob and the wires.

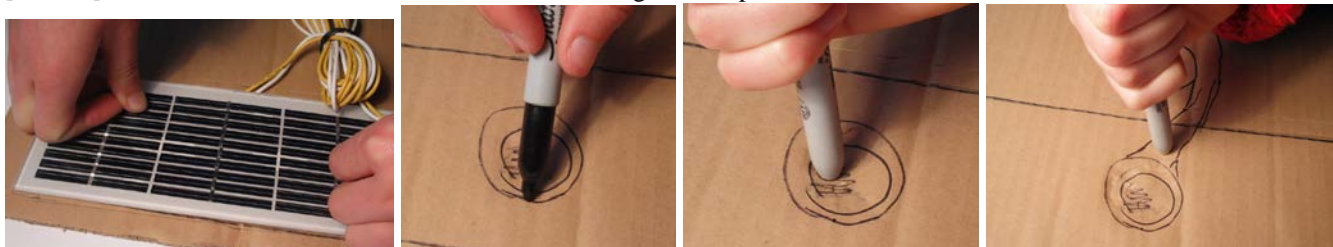


2" between cardboard



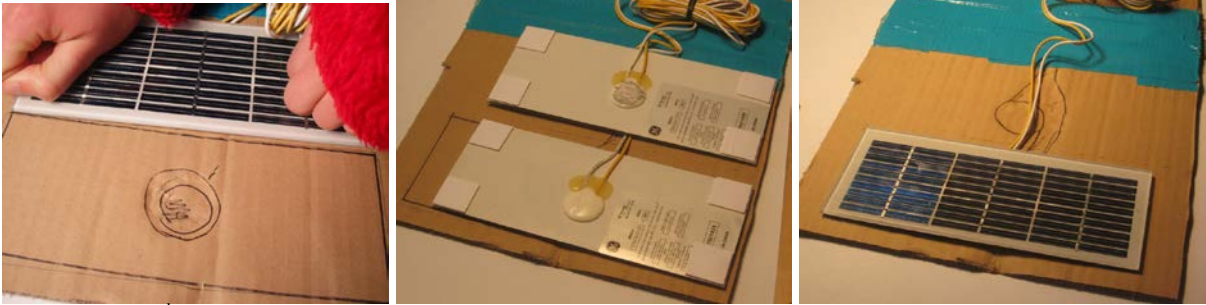
[Top from left to right] Measure 1" down. Measure 1/2" in. Mark placement of solar cell. Use a sharpie to mark the blob.

[Bottom] Press cell into cardboard. Circle area where blob goes. Deepen the indentation. Create channel for wires.



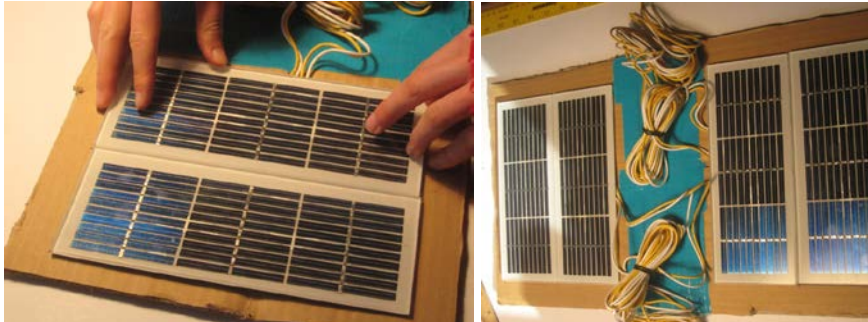
5. Attach the first two solar cells to the cardboard by placing a piece of double-sided foam tape in each corner on the back of the cells. Then press the cells down onto the cardboard. [Refer to the pictures on the next page]
6. Repeat steps 3-5 for the other two solar cells.

# Solar Notebook Charger - Instructions

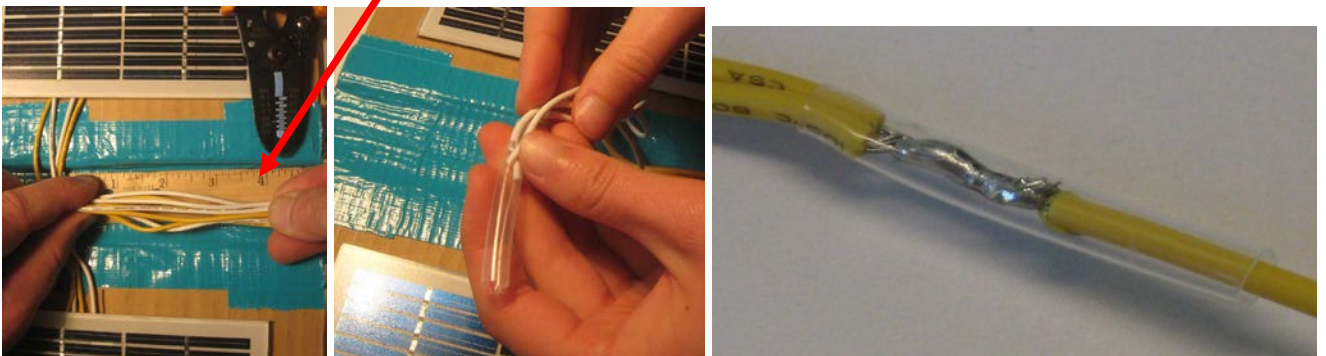


[Top left to right] 2<sup>nd</sup> panel goes next to the 1<sup>st</sup>. Put tape on solar cells. Tape the 1<sup>st</sup> panel down.

[Bottom] Tape 2<sup>nd</sup> panel down. Repeat steps 3-5 for the other 2 solar cells.



7. Gently pull wires together in the center and cut @4" from the seam where all the wires come together. [refer to pictures below]
8. Bundle all the yellow wires together and slide a piece of heat shrink tubing over them. Do the same for the white wires.
9. Strip the ends of all the wires ~ 3/4". Then twist yellow wires together. Twist white wires together. *This is considered an example of parallel wiring.*
10. Attach the yellow wire bundle to a long yellow wire. Solder connection, then slide the heat shrink tubing over the connection and apply heat to protect. Repeat process with the white wires.



[Top left to right] Cut wires 4" from center. Slide heat shrink tubing over wire bundles. Strip, solder, and slide tubing over connection.



## Solar Notebook Charger - Instructions

- Determine the **polarity** of the yellow and white wires\*. Strip ~ 1/2" of the insulation from the end of each wire. Set the Digital Multimeter (DMM) to the voltage setting, ~ 0-20V range, and connect the red test lead to either of solar cell wires, and the black test lead to the other. Red = Positive (+), and Black = Negative (-). If the reading on the DMM is positive, the red lead is connected to the positive wire of the solar cell. Mark the polarity of the wires near panel with a sharpie pen. This will matter when connecting to charging socket.
- Unscrew the cap of the of the auto socket. Hold the solder iron to the wire connections to un-solder the wires of the auto socket. [refer to picture below].
- Thread ends of the **long** yellow and white wires and the red and black wires through the cap of the auto socket. Tie an overhand knot with the yellow wire for **strain relief**. Twist the positive wires together and the negative wires together. Solder to the **positive wire in the center terminal** of the wire socket. Solder the negative wires to the other terminal. Reconnect the cap til snug.



[Top left to right] Un-solder wires from auto socket. Thread yellow and white wires through cap. Tie overhand knot for strain relief. Strip wires ~ 1/4". Solder to socket.

- Place a clear rubber bumper on the outside corners of two of the solar panels. This will help protect the glass when closing the Solar Notebook.
- You are now ready to charge your device. For cellphones with unique plugs, you'll need the auto adaptor that is designed for your phone. If your cellphone or ipod uses a USB connection, plug the **USB car charger** in the socket, then add the USB cord that is designed for your device. Test your connections by putting the Solar Notebook in the sun – If the red LED indicator on the USB charger lights up – it works!



Note: most portable electronics use Lithium-Ion batteries. Li-On batteries have a very high energy density, allowing for more power in a smaller space. Li-On cell voltage is typically 3.7volts. USB ports are designed at 5 volts. The USB car charge has a built-in voltage reducer to convert the input 12volts to the 5v that is compatible with your phone/ipod.

\***Yellow wire = positive, White wire = negative.**