

**Green-First Technologies Inc.**  
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## **ASSEMBLY INSTRUCTIONS FOR GF-JUNIOR DIY PV KIT**



The Junior DIY PV kit is made for repeated reassembly in a home and classroom environment designed for student hands-on learning basics of Photo-Voltaic power production. The Junior DIY allows experimentation of various electrical concepts encountered in real-life simulation of large-scale electricity production using photo-voltaic technology.

The Junior-DIY is made safe through the use of unbreakable materials (i.e. flexible transparent plastic), solderless assembly, and can be coupled with multiple DIY kits without exceeding safe voltage levels. All solder used in the fabrication of the kits is pre-approved ROHS compliant and lead-free.



The Junior DIY is ideal for assembly in both group and independent study environments, suitable for ages 6 - 14 and can be effectively used with multiple kits simulating an array, to be used in conjunction with a variety of experimentation models such as solar charge controllers, battery banks, wind turbines, and various low-voltage DC appliances.

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## 1: Kit Disassembly:

Each Junior DIY is pre-assembled for transport but is not yet ready for use as internal connections between cells are not connected. Remove the 6 bolts and their accompanying nuts to disassemble kit. Be careful not to mix parts from one kit to the next as kits are manufactured individually and their parts are not necessarily interchangeable. Framing material may or may not interchange between kits, however, the solar cells will readily interchange.

Parts of the kit include:

- 6 bolts with nuts
- 1 front protective cover glass
- 1 transparent backing board
- 2 aluminum angle rails
- 2 aluminum channel rails
- 15 solar cells with leads and connectors
- 2 output cables

NOTE: If cells are already interconnected, disconnect by grasping the metal tabs at the end of cell leads firmly before pulling apart. Do not pull on the leads.



## 2: Inserting Cells:

Lay backing plate with dividers facing upwards and with its corner labeled “A” (scribed on back of plate) situated at top left corner.

NOTE: All framing materials are labeled with “A”, “B”, “C”, and “D” to correspond with top left, top right, bottom right and bottom left corners respectively.

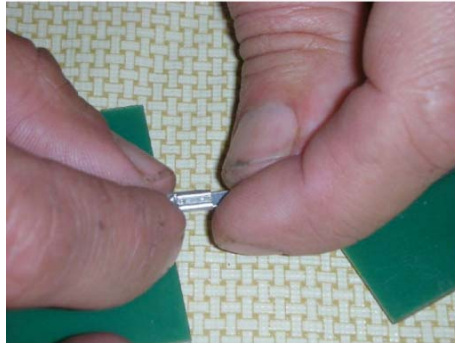


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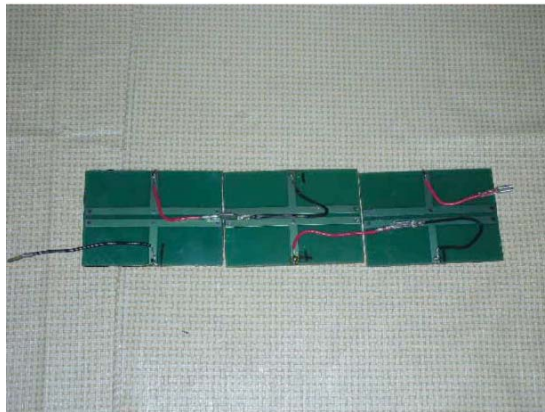


### **3: Cell Assembly:**

Begin inserting cells on backing plate starting from either top left corner or the right bottom corner. Take extra care not to bend cell leads immediately at soldered connection, but rather by bending the lead in a slow curve following the soldering connection at the back of each solar cell.

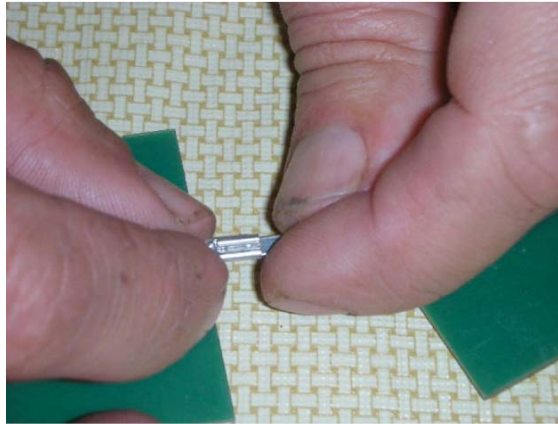


Connections must be made in a series configuration wherein the negative of one cell is connected to the positive of the next. The colors of the leads are black and red correspondingly. The leads must not cross, so each cell must be laid in an inverted manner from the one beside it.

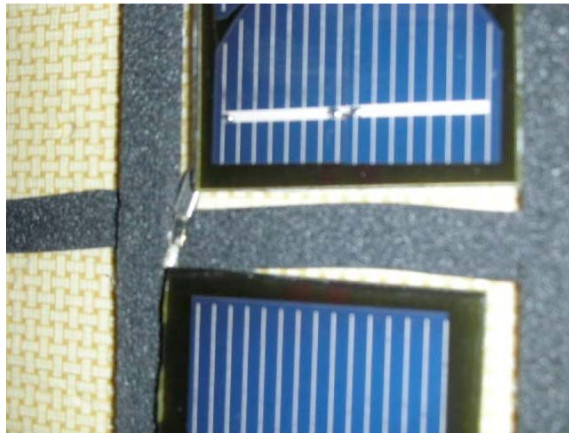


The leads must not be layered at the back of their cell, and the connectors should lay neatly between the cells.

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Connect each row of 3 cells with the remaining lead of the 3<sup>rd</sup> cell of each row with the first lead of the next cell beginning a new row. Leads must be placed so the cells do not jump out of their sockets on the backing board.



#### **4. Connecting Output Cables:**

Connect each output cable to the two unused leads of the first and last cell placed upon the backing board. You will notice the spade connector is attached to the red cable and the groove connector to the black cable so as to correspond to the polarity of the cell array of the PV panel.

Drape the cable neatly over the end of the backing plate so they are held in place once the channel framing is attached.

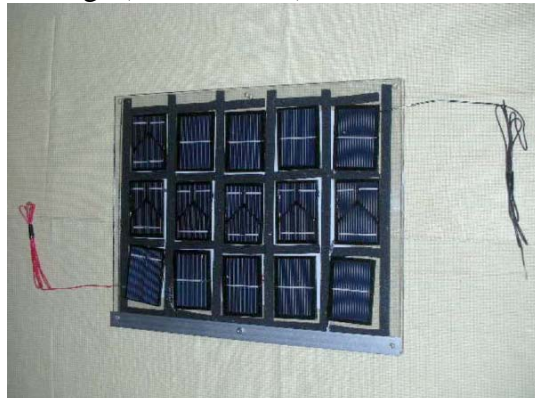
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**5: Frame Assembly:**

Place top flexible glass cover on cell array with “A” at top left corner.

Attach the left and right rails using the center bolts only, paying special attention to the frame markings (“A”, “B”, ...) to match the markings on the front and back plate.



Snug the bolts and nuts firmly by hand. Using a screwdriver is not recommended as over tightening of the bolts will damage solar cells and glass cover.

Next attach the top and bottom channel rails by gently lifting on the side angle rails and sliding the channel rails underneath the angle rails. This process could be difficult as the foam within the channel rails designed to hold the backing plate must also be compressed by the backing plate during assembly.

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Carefully insert all 4 corner bolts making sure all 4 components are properly lined up (side rail, end channel rail, front and back glass plates). No force should be used for the assembly procedure. If assembly is difficult, make sure the lettered corners of all frame members correspond with one another.

Congratulations! Your panel is now ready for use. Connect various buzzers, motors and other implements to the output wires while holding the panel in sunlight.



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### **Suggested Exercises for Instruction:**

- explain and demonstrate polarity of direct current
- demonstrate importance of sun tracking
- demonstrate effect of cell shading in a PV panel
- using 2 or 4 kits simultaneously, demonstrate series/parallel wiring configurations
- advantages of multi-panel arrays in parallel during partial cell shading
- demonstrate a model of battery storage with PV panel used for charging. Note that one Junior-DIY will safely charge an array of 4 nickle-cadmium batteries (AA, C and D cells) through direct connection, however, the batteries must be disconnected following the end of experimentation.
- demonstrate voltage/current relationships by varying numbers of cells within each kit and/or series/parallel connecting cells within a single kit using extra output cables

### **SPECIFICATIONS:**

V max: 6.0

V oc: 7.5

I max: 550 ma

I sc: 600 ma

Power max: 3.6 W