

An Introduction To Building A Solar Array and information for Cars and Houses
Paul Dennis 1999

About SOLAR and our CARS and HOUSES

The SUN is a big atomic furnace spewing tons of energy into space. Some of this hits and powers the earth – and some of it is the light that we see. The visible light plus ultra violet rays are the Solar Energy that we harvest with Solar Electric Cells. These Solar Cells are called Photo voltaic Cells because they produce voltage from the Sun's Photon Energy Rays.

The SOLAR MODEL CARS that we build and race are direct evidence that we can convert this Solar Power into mechanical power. This works great for cars at our model scale. Larger Solar Cars are built and raced to develop ideas but would not work very well to go to the grocery store – especially on a rainy day. Energy storage is necessary! Our Solar Model HOUSES demonstrate this storage.

Our CARS should be 3 dimensional – not just a flat plate. They may have 3, 4 or “N” wheels. Arrays and the motors must be used – other parts are optional. As our solar arrays produce 1 WATT of power, the cars must light and have low friction! A switch controls the power to be available as needed.

The races are double elimination on cords about 60' long.

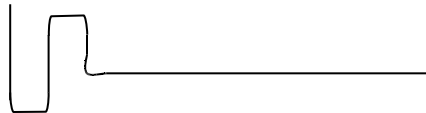
IMPORTANT – Make your car GUIDING HOOKS and try them!

This must be done BEFORE RACE DAY!

The cars are guided on a light cord, string, or fish line. It should be stretched tight about $\frac{3}{4}$ " high at ends.

TEST your CAR. If it curves to the left put the hook on the right front. If it curves to the right put the hook on the left front

Guiding Clip



The cars must be well constructed and tough to survive many heats in the races. Auto racers say “you can't win if you don't finish”!

AWARDS will be made for the race and ALSO for construction, ingenuity, and appearance.

SOLAR MODEL HOUSES show how we can store the Solar Energy in Batteries to use when we need it. The principles and circuits in these Model Houses are used in Real Houses!

Our HOUSES can take many forms – use your imagination!

You can make a model to show how these ideas could be used in the next 1000 years – after Y2K!

We will be going to Mars! What kind of a house will be necessary to live on Mars? Make a Model to show us!

The HOUSES should be about 30cm – 1' in size to bring them to a reasonable scale. This is a loose guideline. They must use the array, battery and light. All other features are optional.

AWARDS for the Homes will be made for construction, ingenuity, and appearance.

About SOLAR CELLS and making a 4 cell solar ARRAY

SOLAR CELLS are fragile – handle them carefully! When making connections place the cell on a flat surface. Assemble them on their foam board for protection.

A single 2” sq solar cell generates about 0.5 volts and 0.5 amps. The game is to connect them in series. This results in about 2.0 volts and 0.5 amps in good sun. This is necessary to match the motor requirements. $2.00 \text{ volts} * 0.5 \text{ amps} = 1 \text{ watt}$ of power! Cars should be light and have low friction to run on this power! The cells will not be harmed by a short circuit.

The 10x10 foam board can be cut into 2.5” strips of 5” squares for long or short arrays. Other arrangements are possible.

The blue side of the cell is the sun side. On these cells this is the negative side. The center conductive stripes on the faces of the cell collect the electron flow. Contact is made by taping the tin plated copper ribbons to these center stripes – “magic” tape is good as it can be removed if the placement is not proper.

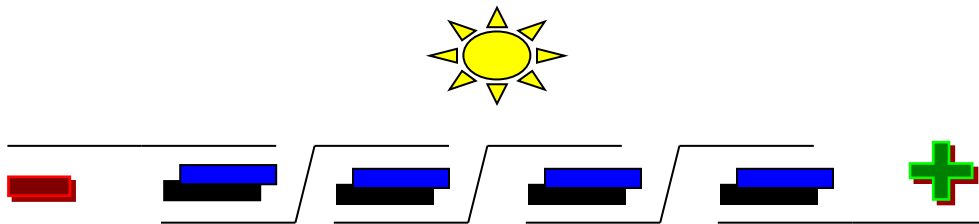
Start by taping 4” ribbon lengths on the back (silver) side of 3 cells leaving them about 1/8” short of the edge. It is important not to short circuit the cells at the edges. A strip of tape across the ribbon and then a strip along the ribbon is a possible technique. The last cell gets a longer ribbon. This is the positive lead.

Assemble the cells one at a time on the foam board with the sun side up! – see the diagram below. Finish by adding the longer negative lead to the top of the 4th cell.

Test in the sun – the array should produce 2+ volts. Be careful if you measure current – 0.5 amperes (500 ma) can burn out some meters – check the meters ratings.

The array is now ready for installation on the car or house.

Cells in series to add voltage



HOUSE CIRCUIT

Batteries do not like to be charged backwards – pay attention to polarity!

