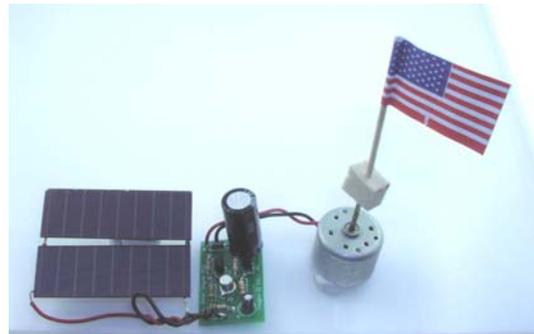


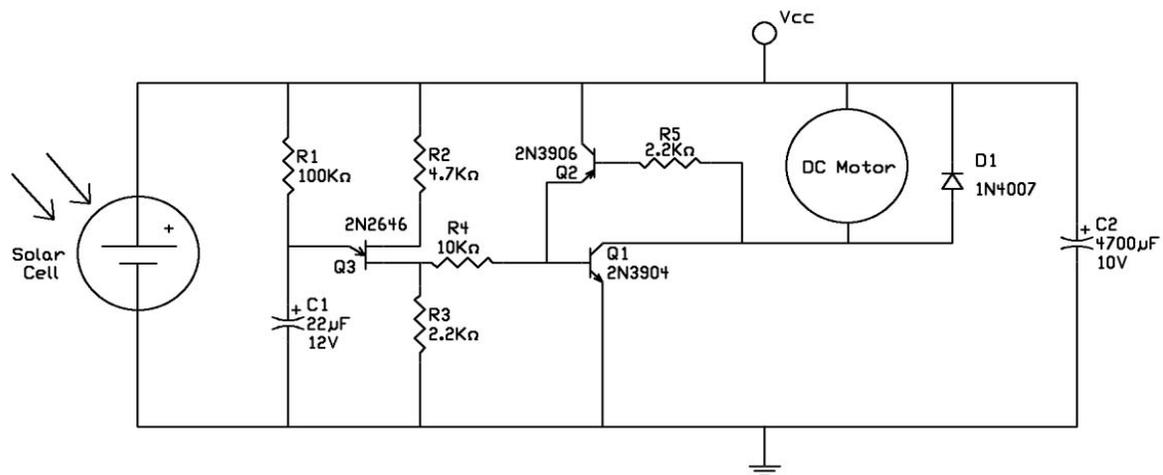
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Solar Engine Kit

The solar engine is an on board power plant for BEAM type robots, sometimes called living robots. The original Solar Engine was invented by Mark Tilden. Mark is a prolific inventor who also began the BEAM technology. He is currently designing robots like the RoboSapien for Wow Wee company. The circuit is simple in function. The main components are a solar cell, main capacitor and a slow oscillating or trigger circuit. The solar cell charges the capacitor, until a predetermined voltage is reached, where the trigger circuit dumps the stored electrical power from the main capacitor through the main load (usually a high efficiency motor). The cycle then repeats.

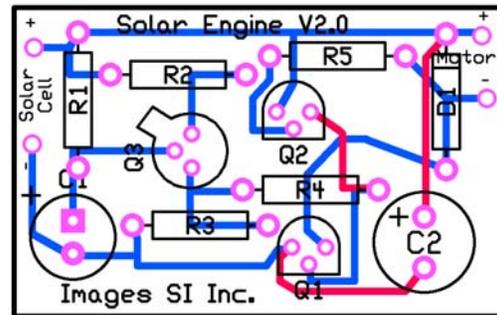
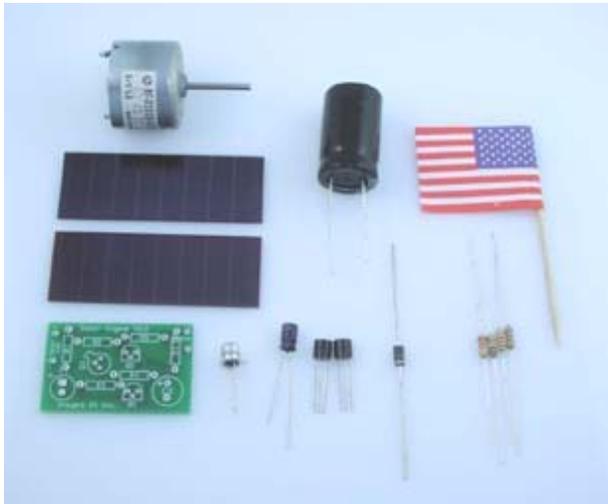


Solar Engine



How it Works

Figure 1 is the schematic for the solar engine. Here's how it works. The solar cell charges the main 4700 uF capacitor. As the capacitor charges, voltage level of the circuit increases. The UJT begins oscillating and sending a trigger pulse to the Q1. When the circuit voltage has risen to about 2 volts from the main capacitor, the trigger pulse is sufficient to turn on the Q1. When Q1 turns on, this turns on Q2 the 2N3906 transistor through the 2.2K resistor. The 2N3906 keeps the 2N3904 turned on until all the store power in the main capacitor is dumped through the 2N3904 and the high efficiency (HE) motor. The motor spins momentarily as the capacitor discharges then stops. The cycle repeats.



Construction

Start by placing and soldering the resistors onto the top (silk screen) side of the pc board. Resistor R1 is a 100K resistor (color bands brown, black, yellow and gold). Resistor R2 is a 4.7 K resistor (color bands yellow, violet, red and gold). Resistors R3 and R5 are 2.2K (color bands red, red, gold) and resistor R4 is a 10K resistor (color bands brown, black, orange and gold).

Next mount and solder the semi-conductors onto the board. Start with Q3, the 2N2646 UJT (uni-junction transistor). Orientate the 2N2646 case to match the silk screen outline on the pc board. Next mount and solder Q1 (2N3906) and Q2 (2N3906) to the pc board, orientating the transistor cases to the silk screen outline. Next mount diode D1 (1N4007) to the board. Make sure to align the band on the diode to the band on the top silk screen. Solder capacitors C1 (2 uF) and C2 (4700 uF) to the PC board. Match the positive lead of the capacitor (usually the longer lead) to the positive hole on the pc board.

Two solar cells are soldered in parallel. So the positive (+) leads of the solar cells are soldered together and then to the (+) solar cell lead on the pc board. The negative (-) leads are connected to each other and then to the (-) lead on the pc board.

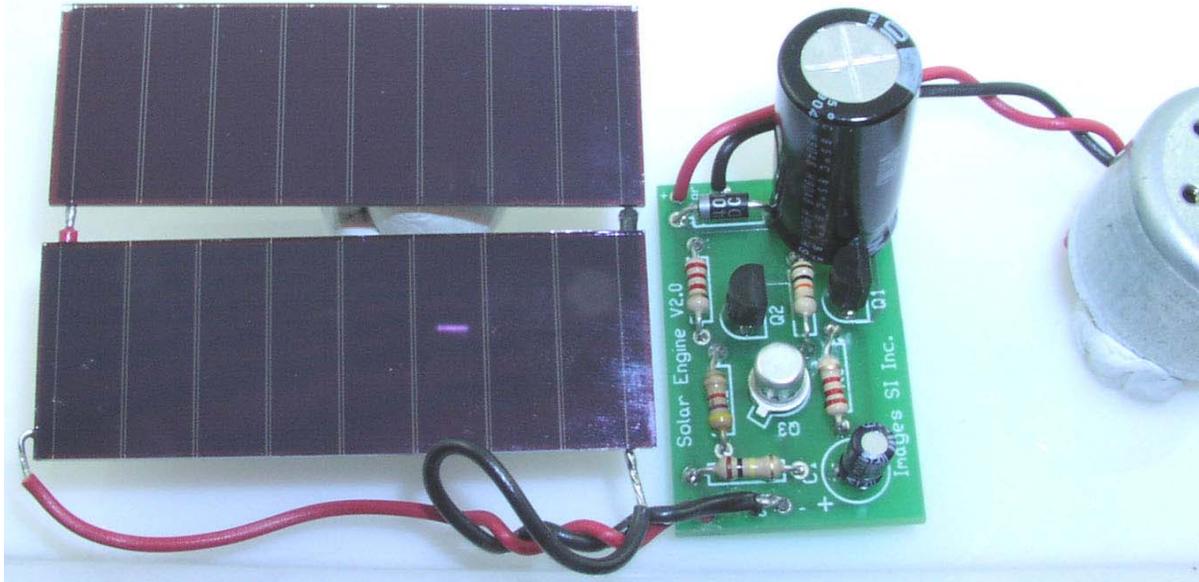
The high efficiency electric motor is connected with a few inches of wire to the motor leads on the pc board.

Testing

To test the solar engine place something on the shaft of the HE motor. The purpose of which is to see the rotation of the shaft when the motor becomes active. Place the solar cells under a light source. The motor should activate, by spinning momentarily, in about a minute, depending upon the intensity of the light.

Uses

The circuit may be used in many novel and innovative ways. It may be used as a on board power plant for a solar racer, supplying power to the car motor, flashing LED's, pumping fresh water intermittently from a solar distiller, or as the demo circuit describes, spinning an American Flag.

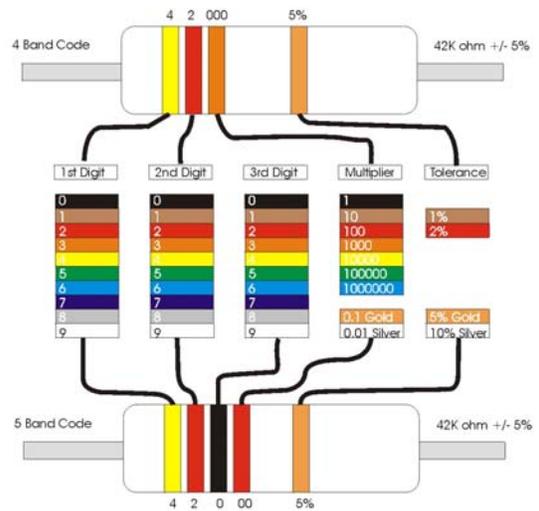


Close up Solar Engine

Parts List

Item	Qty.
Printed Circuit Board	1
Solar Panel	2
HE Motor	1
4700 uF Capacitor	1
22 uF Capacitor	1
2.2K resistor	2
4.7K resistor	1
10K resistor	1
100K resistor	1
1N4007 Diode	1
2N3904 Transistor	1
2N3906 Transistor	1
2N2646 Transistor	1

Resistor Color Code



How to Solder

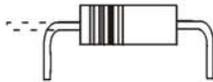


This page provides the basic steps for soldering electronic components onto a pc board.

Soldering Iron, small sponge, electronic rosin core solder, side cutters and needle nose pliers.

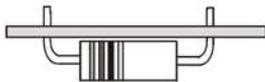
Step 1:

Turn on soldering iron. Moisten small sponge with water. When soldering iron is hot, tin the soldering iron tip using a small amount of rosin core solder. Melt the solder onto the tip until the tip is completely covered with solder. Excess solder on the tip may be removed by wiping the tip across the wet sponge. Keep the tip clean by wiping the iron across the wet sponge periodically.



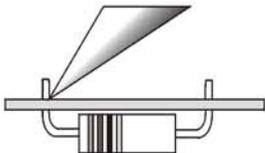
Step 2:

Bend the component leads to fit inside the PC board holes



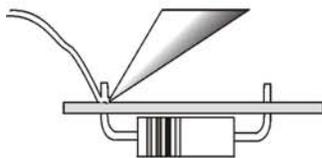
Step 3:

Insert the component into the pc board, taking care to orientate the component as described in the directions. Bend the leads slightly to hold the part into position



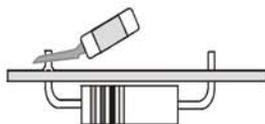
Step 4:

Tin soldering iron tip if necessary. Heat the joint by positioning soldering iron tip against the component lead and the pc board lead.



Step 5

After a few moments of heating, apply the solder to the joint. The solder should flow easily around the joint. After the solder flows, remove the solder, while keeping the soldering iron tip in contact. Then remove the soldering iron tip.



Step 6:

Trim the excess component lead from the bottom of the pc board using the side cutters.

Step 7: Inspect the solder connection

A good solder connection joints the component lead and pad together and has a bright finish.

If the connection is a glob of solder that looks like a ball, or bridges other solder connections.. Reflow the connection by remelting the connection using the soldering iron. Do not apply any more solder.