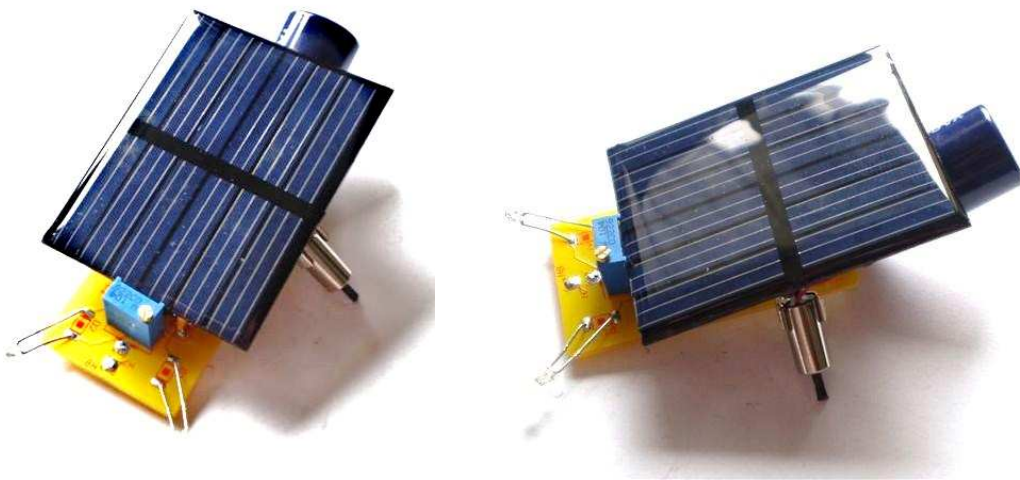




www.budgetronics.eu www.budgetronics.com www.budgetronics.nl www.budgetronics.tel

Build your own light seeking robot.



A robot that lives from the sun.

A Photovore is a light seeking robot that gets its energy from the sun. The robot gets its energy from a solar cell which is provided for in this building kit. A capacitor is used to store the energy and as soon as the energy is at a high enough level the robot starts to move.

Easy to build with this comprehensive building manual complete with detailed photos. All parts are provided for in the kit and you only need to add a soldering iron and solder to put the robot together.

An original Budgetronics building kit.

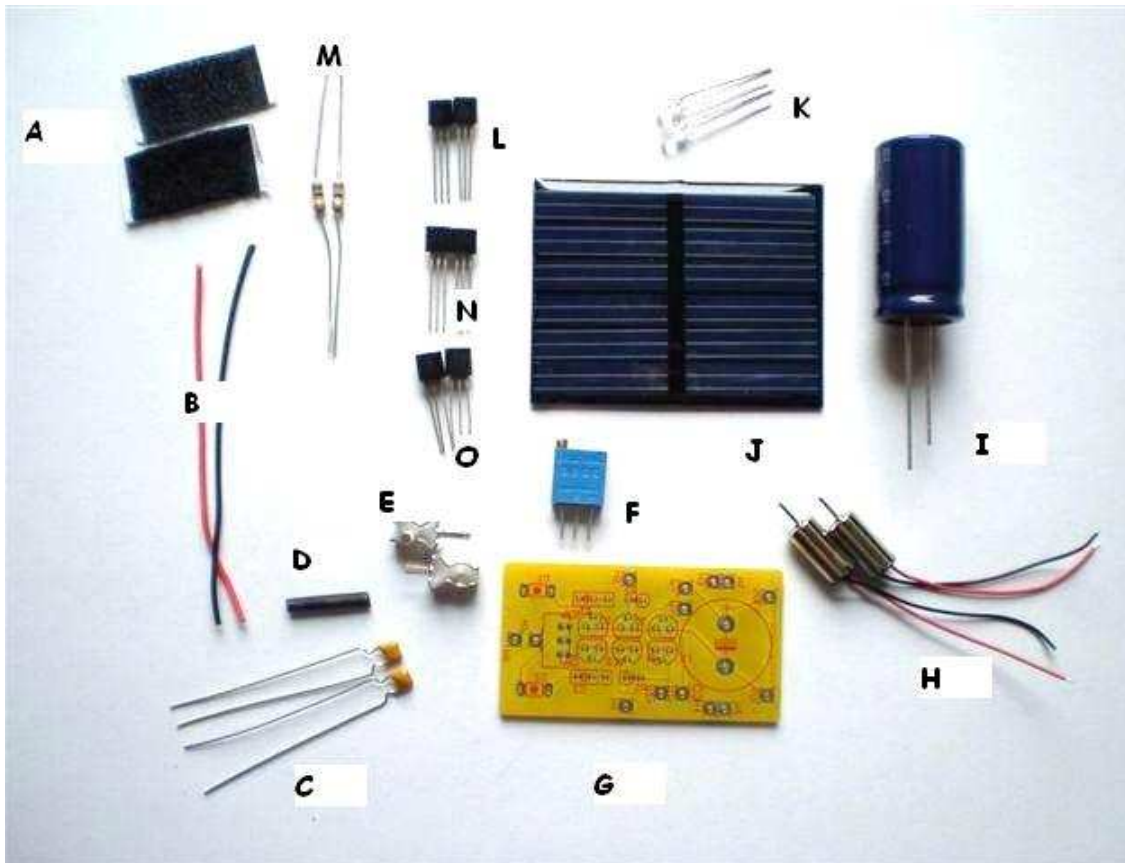
Introduction

The Photovore

With this kit you can build a little robot who lives his own little life and feeds itself with sunlight energy. Te Photovore is a environment friendly robot who needs NO batteries to move around. At daytime the robot will be very active as long as the sun is shining. By night it will go to sleep and waits for the next sunny day.

Partslist building kit

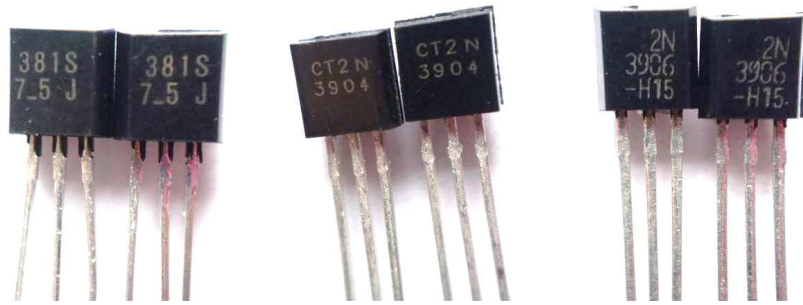
Check and identify the parts with the list and photo below and sort the parts out for yourself.



Your building kit contains the following parts:

- A: Piece of Velcro tape
- B: 2 x connection wires
- C: 2 x capacitors 100nF
- D: Piece of shrink tubing
- E: 2 x micromotor holders
- F: Precision potmeter
- G: Photovore PCB
- H: 2 x micromotors
- I: Electrolytic capacitor
- J: 2 x phototransistor
- L: 2 x transistor 2n3904
- M: 2 x resistor 39 Ohm (colour code orange, white, black)
- N: 2 x transistor 2n3906
- O: 2 x voltage trigger 1381

Keep the different transistors apart! The two 2N3904's, the two 2N3906's and the two 1381's look exactly the same so you have to take care you are placing the right part number on the right spot. Use a magnifying glass to read their type number on the flat side of their package.



Attention: double check before you solder these parts on the PCB. Be very sure it's the right type on the right spot. Only if you are sure you must solder them. If you solder them in the wrong place it is not easy to get them out again and your robot will NOT work.

If you don't know a lot of Electronics this will not be a problem. The building description is very clear and detailed. Just look closely at the photos and read all there is to read and you will be fine.

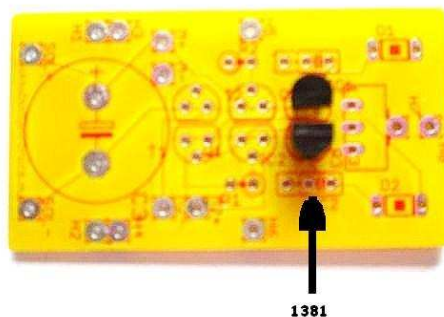
Now that you have identified all the parts we can start building the robot.

Construction

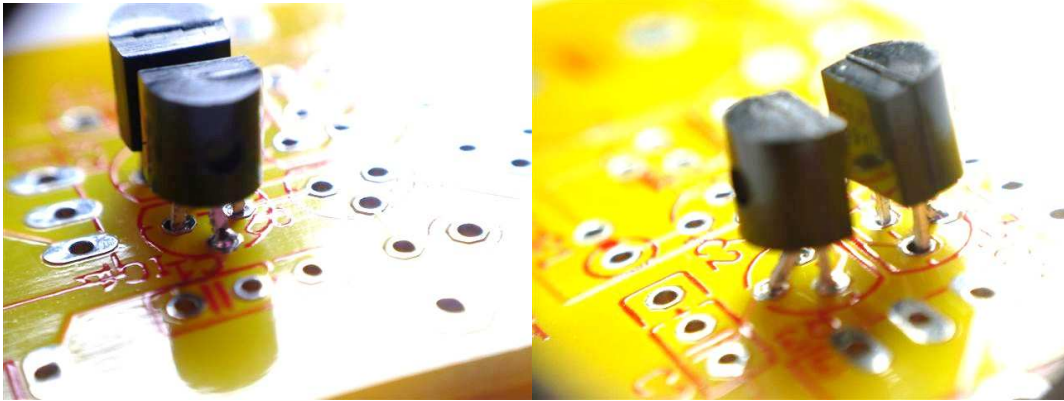
Take the empty PCB and place it in front of you.



We will begin placing the two 1381's, the two 2N3906's and the two 2N3904's. Take the two 1381 voltage triggers and check (look at the photo) that you place them in the right spot. You will have to bend the middle legs a little bit to make it fit.



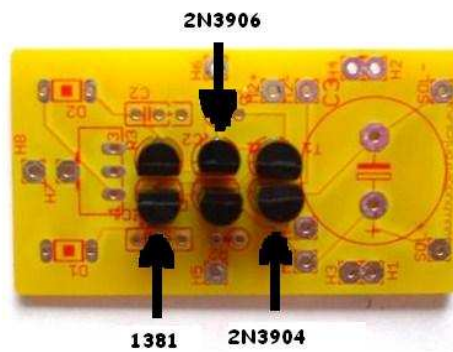
A close-up of the two soldered 1381 voltage triggers.



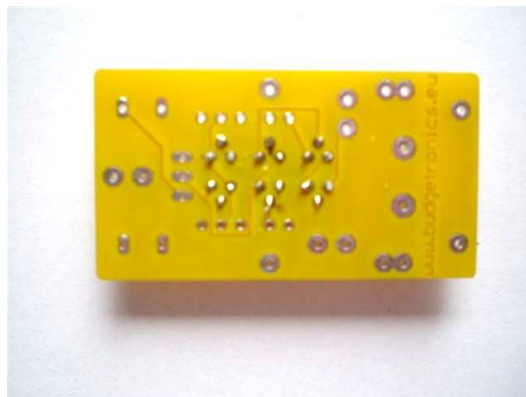
Now you go ahead by placing the two 2N3906 transistors.



After this place the two 2N3904 transistors. Your PCB must look like this now (Attention! PCB is turned around here).



The backside of the PCB should look like this

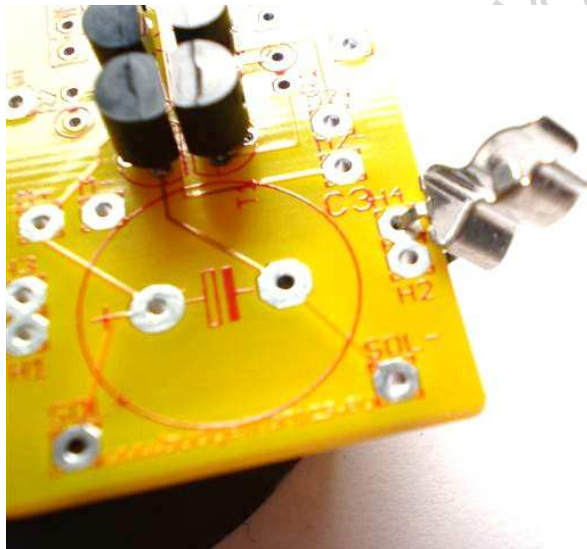


We are going to place the motor holders on the PCB. Look very closely to the pictures to understand how they are placed on the side of the PCB

Take the two motorholders and bend one leg as is shown on the photos. Bend the leg on the side with the small bit sticking out, see the photo.



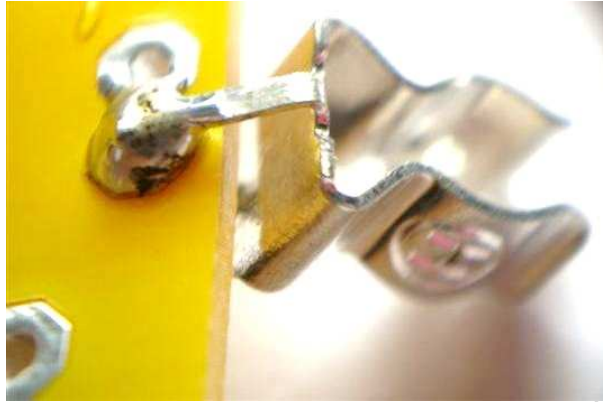
Put a small item, like a roll of tape, under your PCB to lift it from the underground. In this way you can hang the motor holders on the PCB and solder them in place.



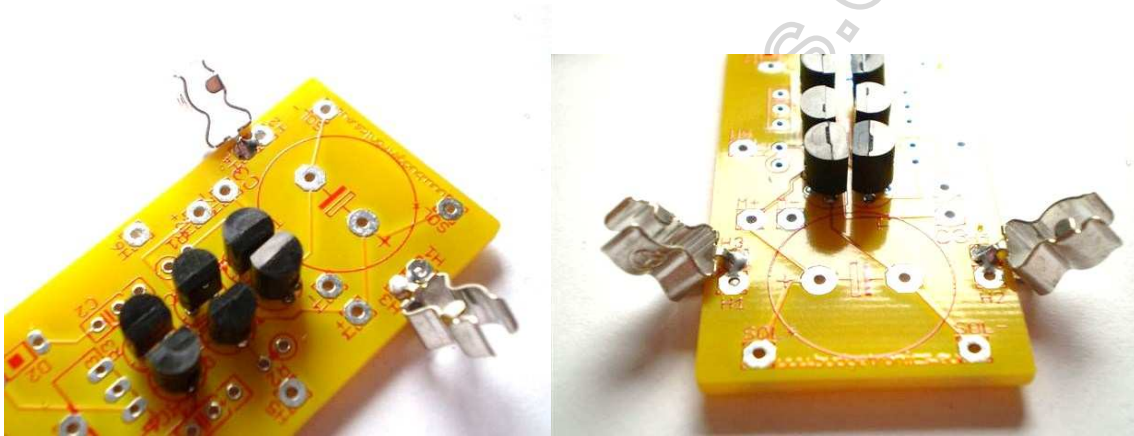
It should look like this:



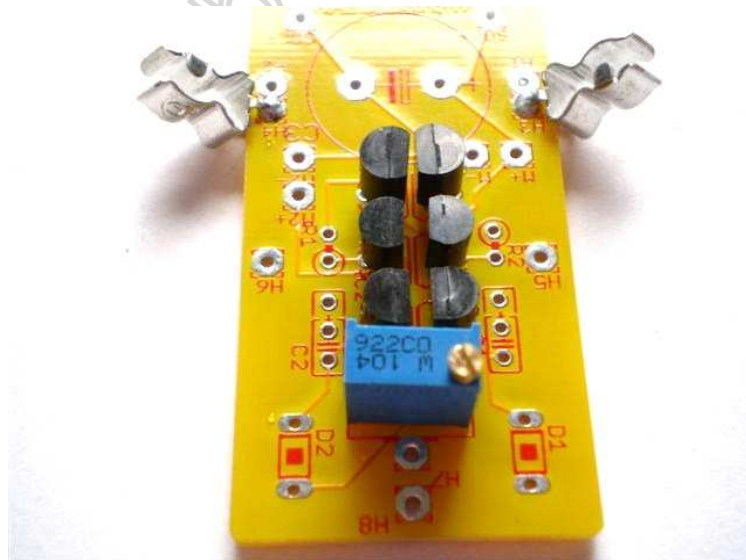
Bend the leg that is pointing down to the side and solder this to the underside of the pcb. Look at the photo for details.



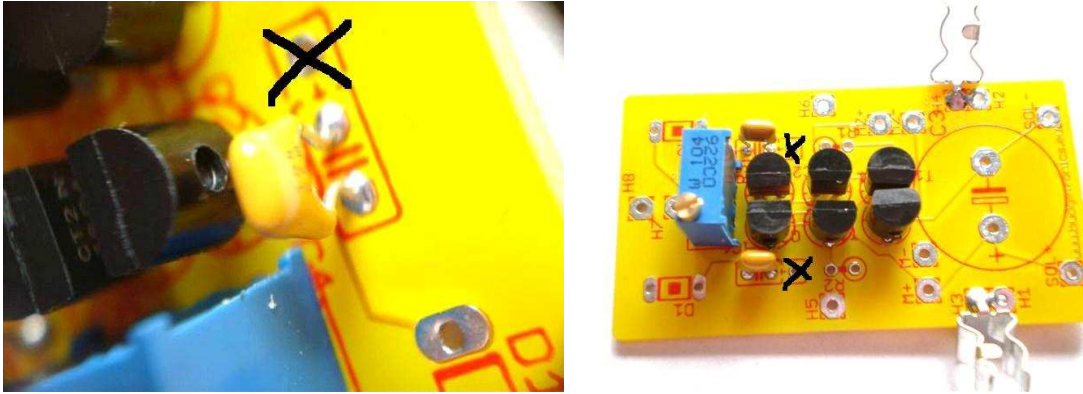
Do the same at the other side of the PCB and your work should look like this:



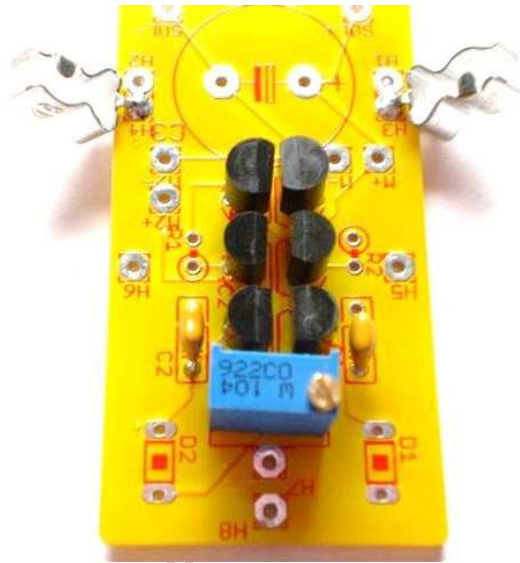
The precision potmeter is placed next.



Now you place the two capacitors of 100 nF. **ATTENTION!** On the Photo you will see one hole crossed out. Don't use this hole because it has no connection to anything! Place the capacitor precisely as is shown on the photo. They have no positive or negative side so it does not matter in which way you place them.

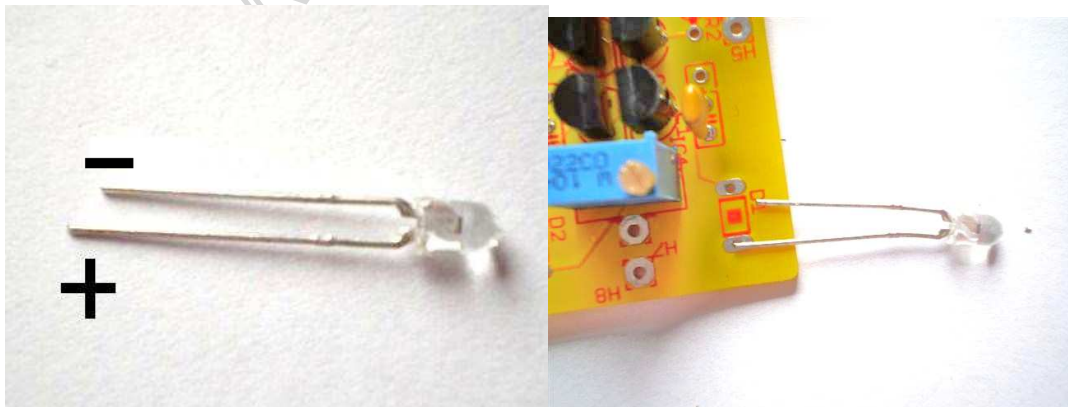


The result until now must look like this:



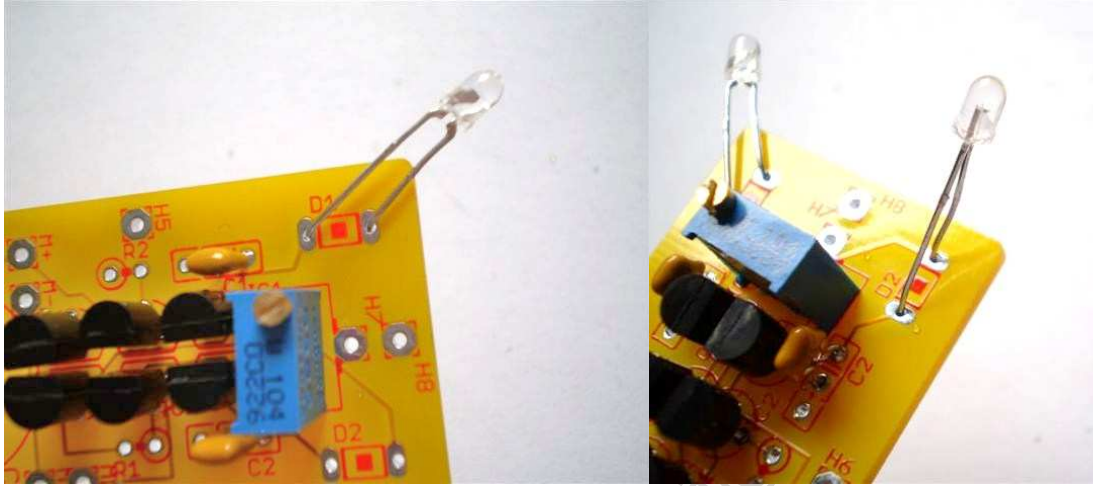
Now is the time to give our little friend its eyes. His eyes are formed by two phototransistors. You **MUST NOT** connect these parts the wrong way round because your robot will not work! If you look closely at the phototransistors you will see that one leg is shorter than the other. This short leg is the negative side (-). Take a close look at the photo's and make sure you connect them in the right way!

The positive side of the phototransistors is on both sides at the top of the PCB. As you can also see in the Photo to the right.

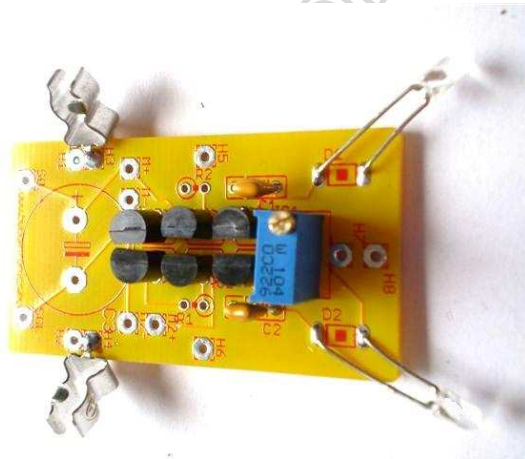


Place the phototransistors pointing to the outside as shown on the Photo. At first only solder one leg of the phototransistor so you can bend it in the right position. If it's as you wish you can solder the second leg to the PCB.

KEEP CHECKING THE NEGATIVE AND THE POSITIVE SIDE OF THE PHOTODIODES! If you do this wrong your robot will not work.



Your result until now must look like this.



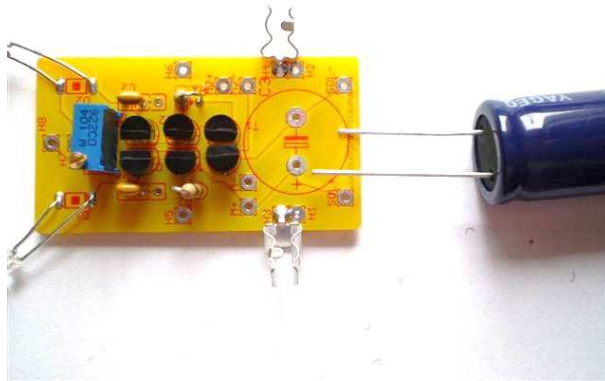
Place the two resistors by bending the leads. It does not matter in which way you place resistors. Your PCB must look like this:



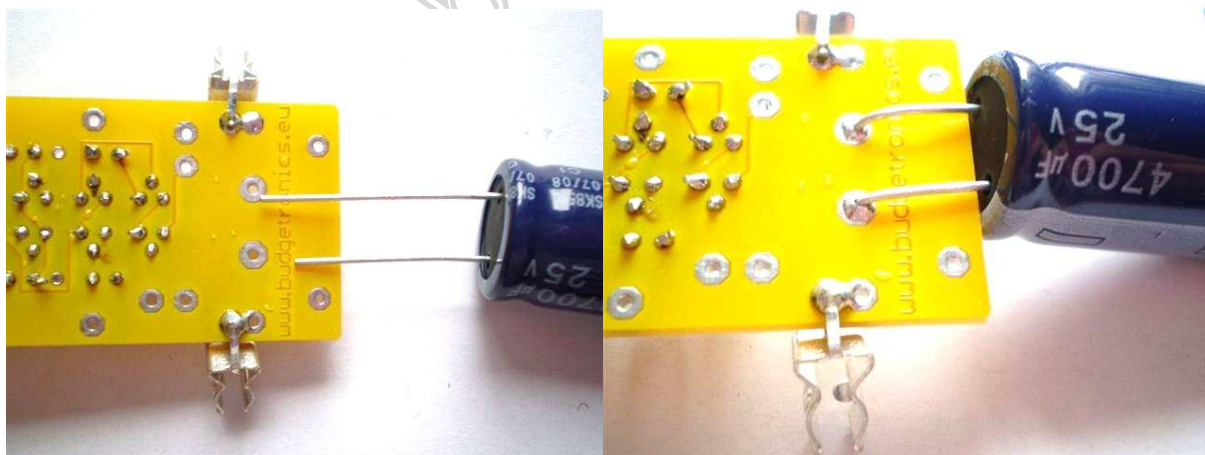
Take the big electrolyte and place it in position. Watch the polarity it has a negative and positive side. Look at the photo for more details. The short lead is the negative side.



On the Photo down here you see which side is connected to which lead. **BUT WATCH OUT! The electrolyte is placed on the BOTTOM of the PCB and NOT on the top.** The photo below is only placed to show you which lead is connected to what.

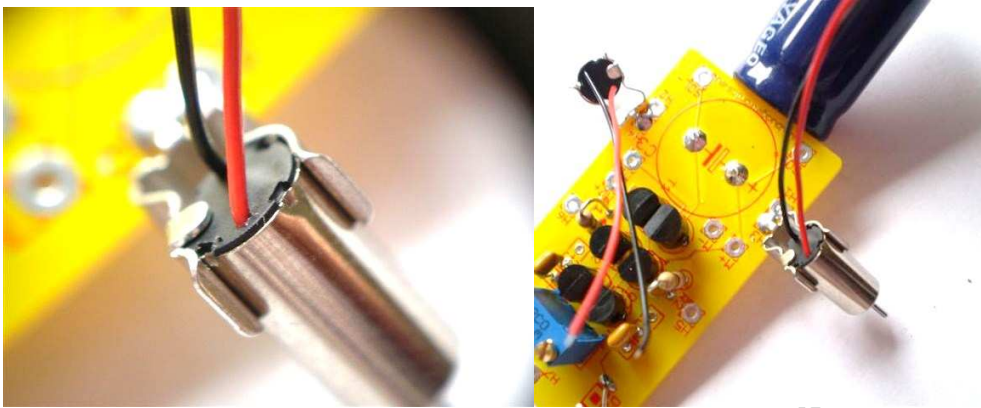


Turn the PCB upside down and connect the electrolyte as shown in the photo.



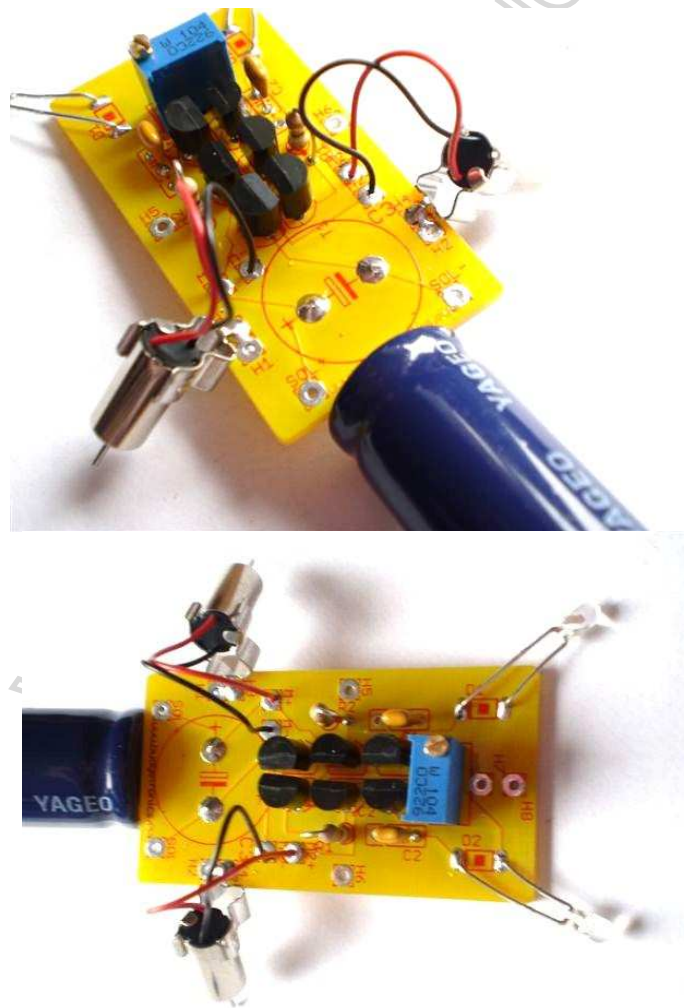
Bend the electrolyte in position as is shown. Later, when the motors are installed, you will have to position the electrolyte in a way to make the motors touch the ground. So make sure you have a little moving space when soldering the electrolyte in place. If the connection are to tight you cannot position the electrolyte in the right way.

Put the two motors in their motor holders.



They go in easily. Solder the wires as is shown in the photos with **the exception of the motor which is on the left in the photo (seen from the side of the electrolyte). Here you have to connect the black wire to the positive (+) and the red wire to the negative (-). Exactly the opposite as is shown.**

If you connect it as is shown in the photo's it will not be a problem but your robot will just move in circles



You will also find a little piece of shrinking tube in your kit. Cut this in half and place it on the motor shafts. Not too far because the shaft must move freely. Heat the shrinking tube with a lighter for a

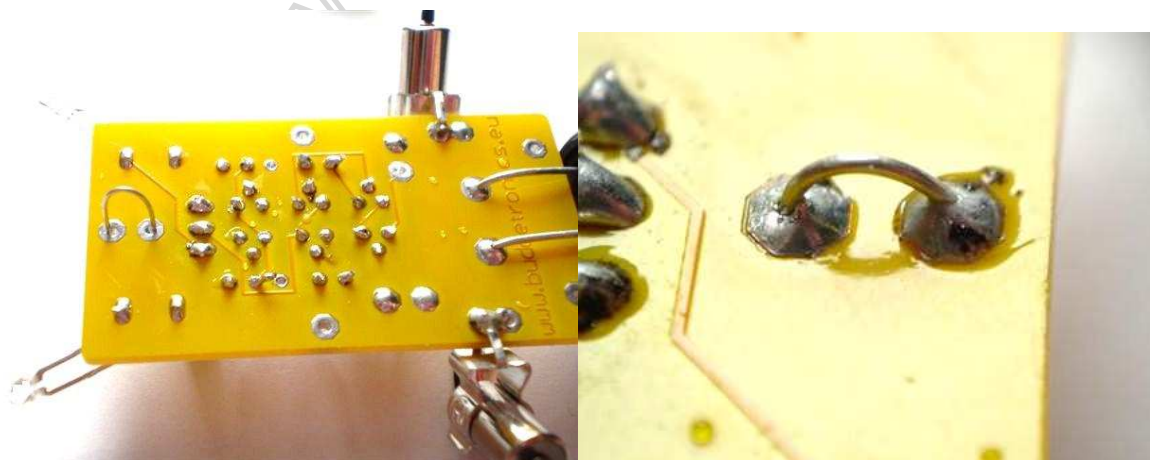
short time making sure the flame does not touch the tube. The tube will shrink and when it's cooled down will sit tight round the shaft. In this way to motor will have more grip when moving around.



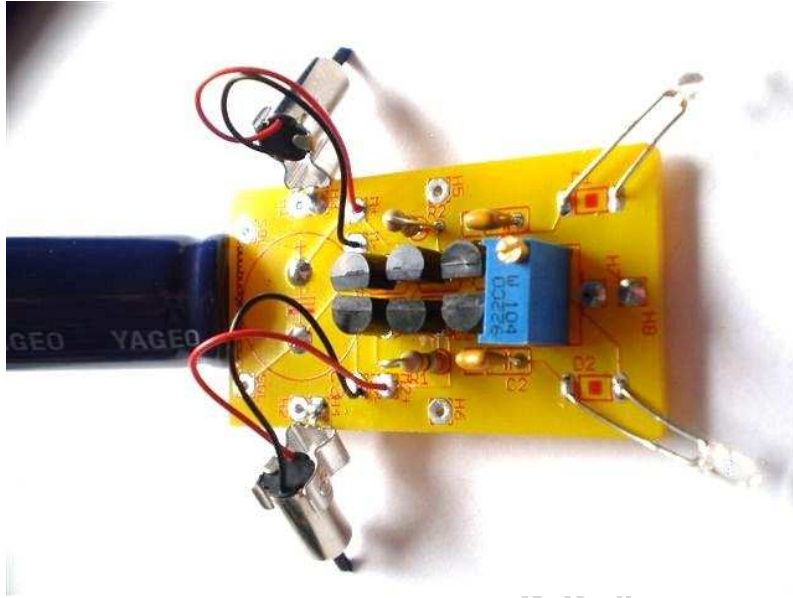
Cut of the tube where it sticks out.



Now we place a wire bridge in the front of the PCB. You can use a cut of wire from one of the resistor for this purpose. First solder one side and place the robot on its legs. Bend the electrolyte in a way where the motors and the wire bridge are touching ground. Solder the second side of the wire when everything is lined out right. Look closely at the photo's.



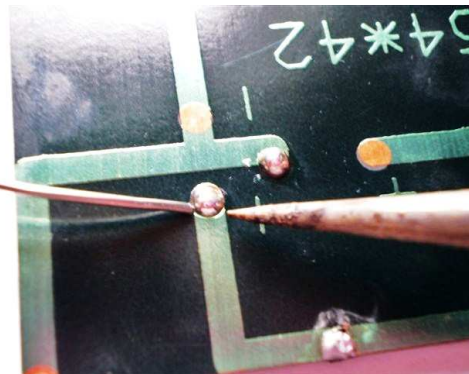
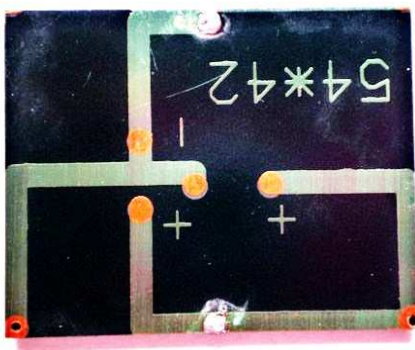
Your robot will look like this now. The front is lifted a little bit from the ground by the wire bridge and both motors are touching the underground.

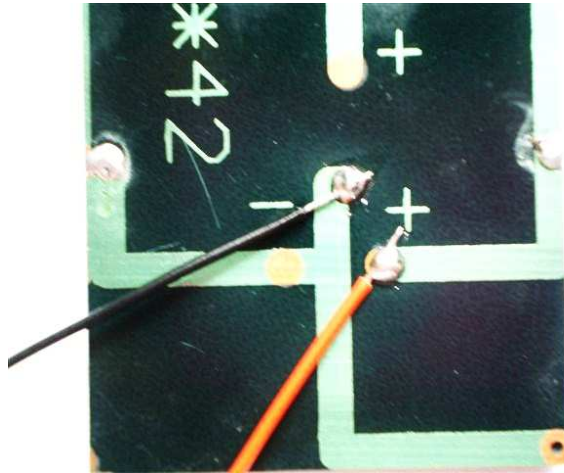


Now take the red and black wires that came with your kit. Strip the wires at both sides and place some solder on them.

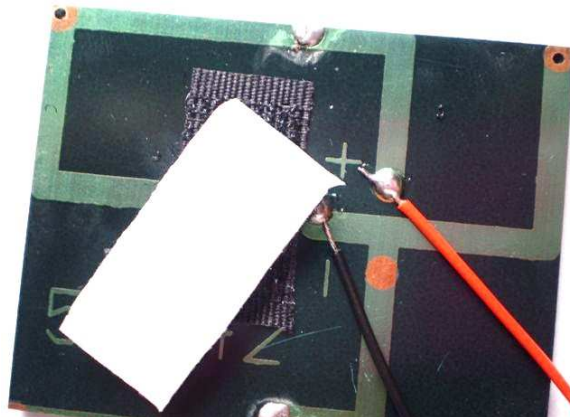


Take the solar cell and look at the connection side. You will see a positive and a negative mark. Put some solder on the two power pads and place the red and black wires as is shown.

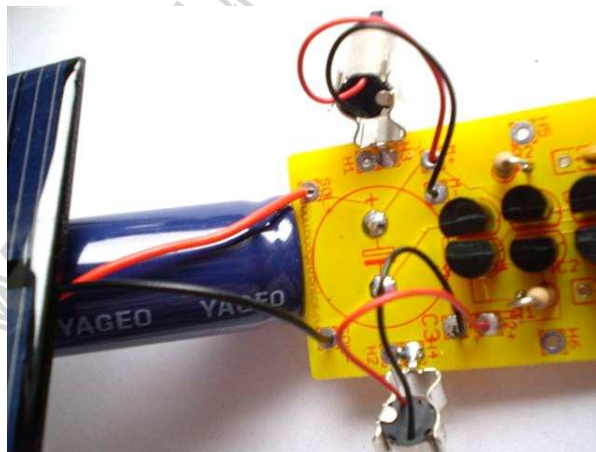




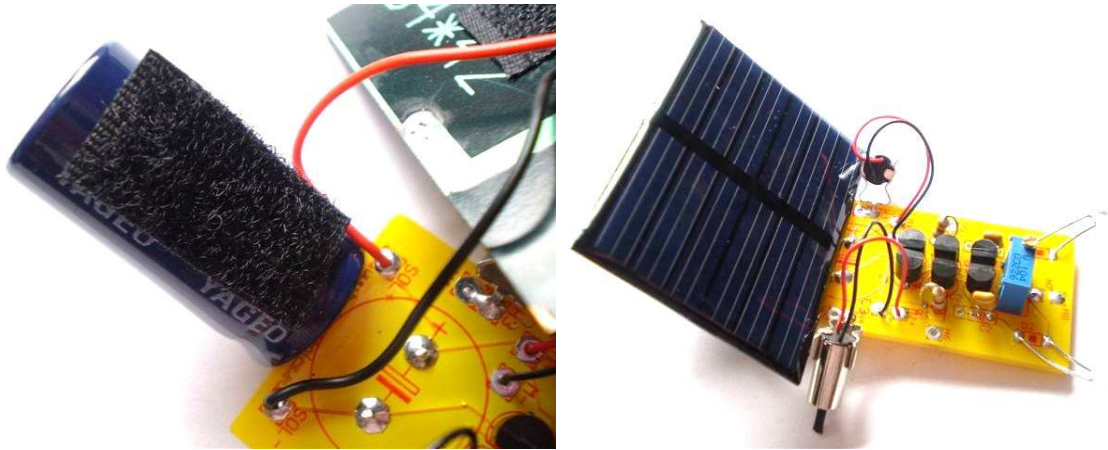
Put the Velcro tape on the solar cell. With this you can install the solar cell to the robot.



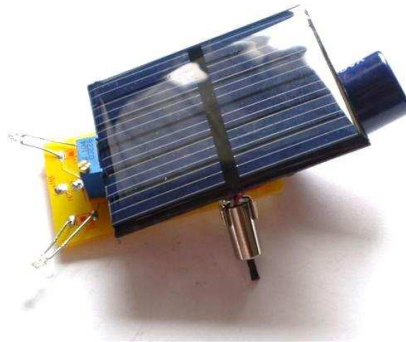
Solder the solar cell connections to the PCB. Watch the positive and negative side!



Stick the other piece of Velcro tape to the electrolyte.

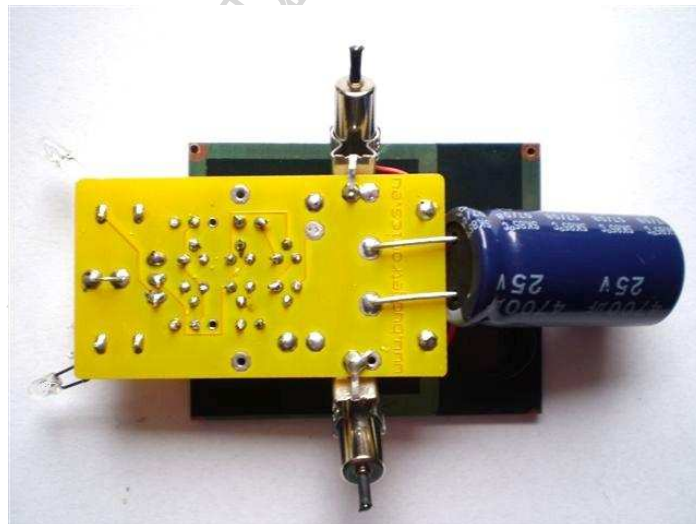


This is one possibility. You could also place the solar cell as shown down here.



Checking and fine-tuning

Your robot is ready now and must look at the solder side as follows:



Does your robot look exactly the same at this side? No loose connections, no shorting of contacts? Everything is placed on the right spot and in the right way?

If this is the case you can place your robot in the full sun. Within 10-20 seconds your robot must make its first move. If it does not work check everything again. You must have made a mistake somewhere. Look at the polarity of the solar cell, the electrolyte and the phototransistors. Are the transistors and the 1381's placed in the right way?

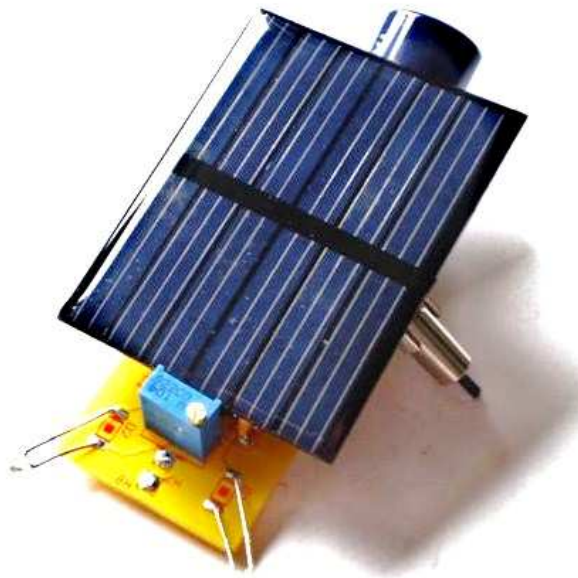
Remember the robot only works in full sunlight! Normal daylight is not enough to activate your robot.

Your robot works? Congratulations!

Now you can fine-tune the robot. In the beginning your robot will have a preference to move in one direction. You can fine tune this by turning the potmeter left or right. Keep on turning the potmeter until the robot moves in a straight line to the sun.

You will see that the robot makes small moves towards the sun without any batteries!
For more excitement you can use two or more robots to keep competitions with each other.

Now you have build your robot successfully you can also experiment with different values of parts like resistors, capacitors, electrolytes, different solar cells and so on. You can also change the motor connections to make the robot move away from light or turn around in circles.



Lots of fun and experimenting with your new robot