



Construction manual

SPURT Classic

Model 2016 with motor Johnson 20703

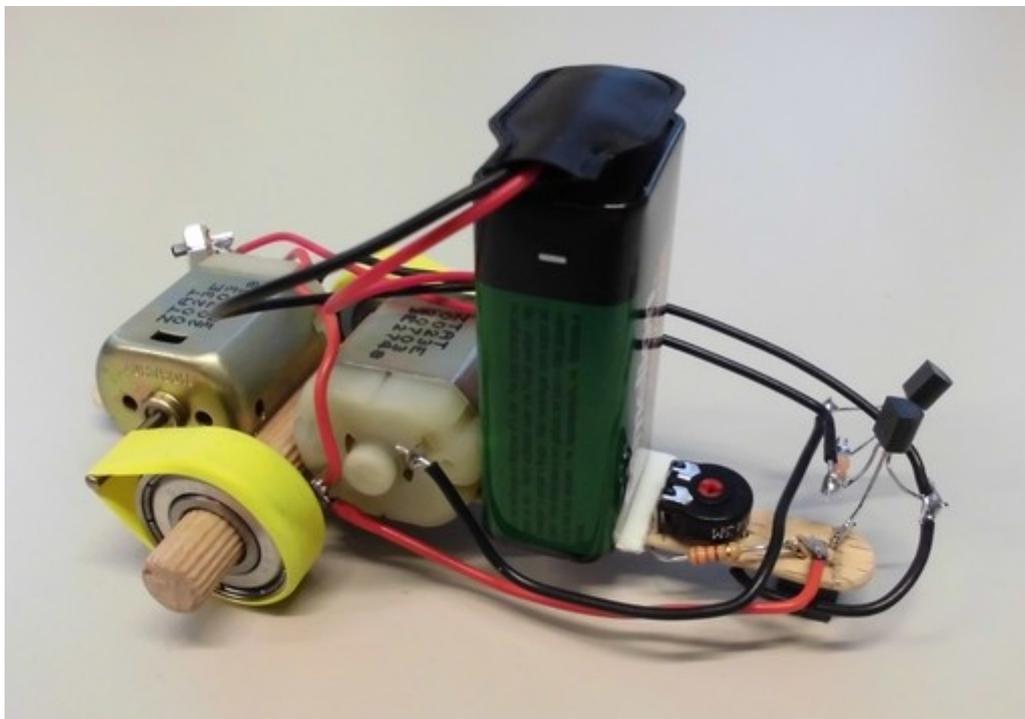
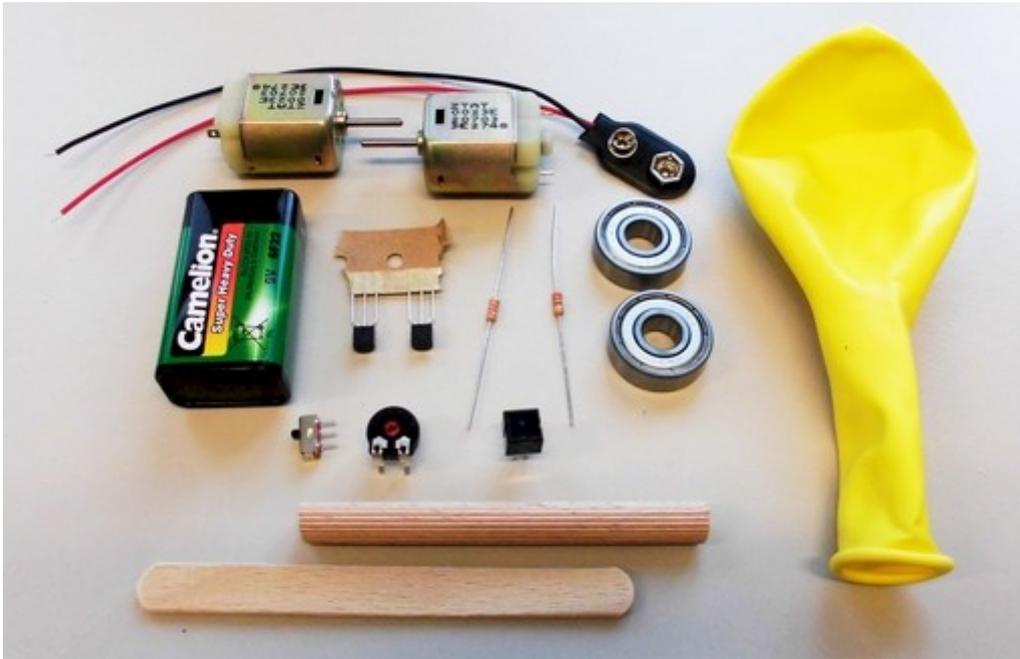


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Parts and stocklist



Quantity	Description
1	Photocopler CNY70
2	Transistor BC337-40
2	Motor Johnson 20703
1	Adjustable resistor 1 k Ω (PIHER PT-10)
1	Resistor 220 Ω , 0,25 W
1	Resistor 2,2 k Ω , 0,25 W
1	Sliding switch
1	Battery connector
1	Battery 9V
2	Ball bearing 22x7 mm with 8 mm hole
1	Rippled wooden axis, diameter 8 mm, length 70 mm
1	Wooden ice cream stick, length 110 mm
1	Big balloon, 300 mm
1	Small cable fixer

Additional material:

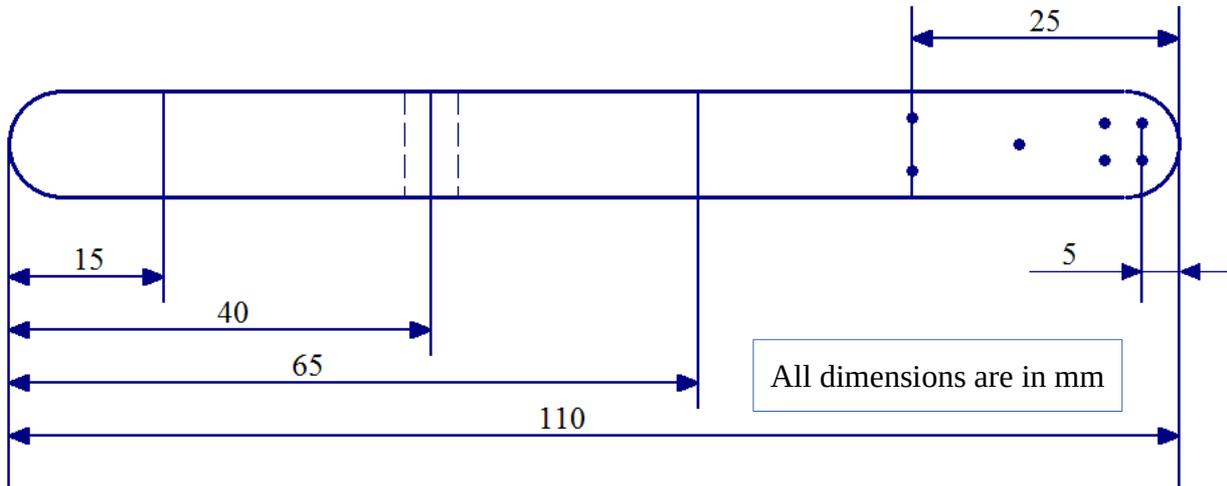
- 1 small piece of sandpaper
- Superglue / cyanoacrylate adhesive medium-fast
- Connective wire (0,8 x 1,4 or 0,8 x 1,1 mm) in red, green and black



1. Step: Chassis manufacturing

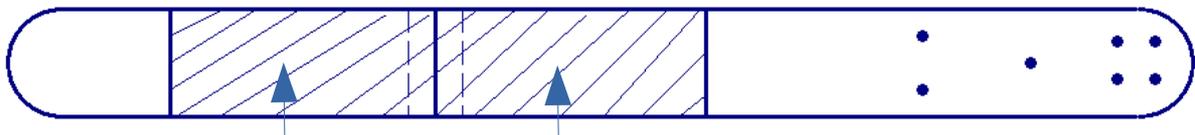
Preparation of the ice cream stick

First you should mark drill holes and guides with a pencil:



Tip: You should make a stencil for the drill holes.

→ Now you can drill the holes with 1 mm diameter.



→ Now the shaded area should be sanded easily.

Tip: Rough surfaces will adhere better when using superglue.

Sawing the axis



→ Saw the rippled wooden axis to a length of 70 mm!

- The ends of the axis should be rounded off with sandpaper.
- Later this allows the ball bearings to be pressed more easily onto the axle.
- Do not sand the entire axis! This could cause the ball bearings to be too loose.



Sticking the axis



- Just put a drop of glue onto the ice cream stick and place the axis.
- Do not apply pressure!
- The angle between the axis and the ice cream stick should be 90 degrees!

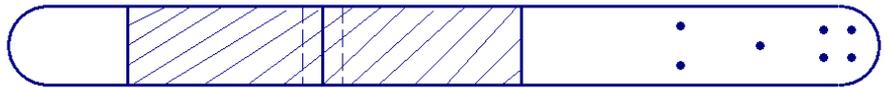
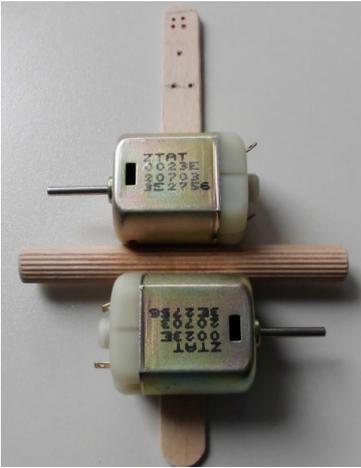
Now wait at least 10 minutes!

The unprinted side of each motor must be roughened:



Grind the unprinted side!

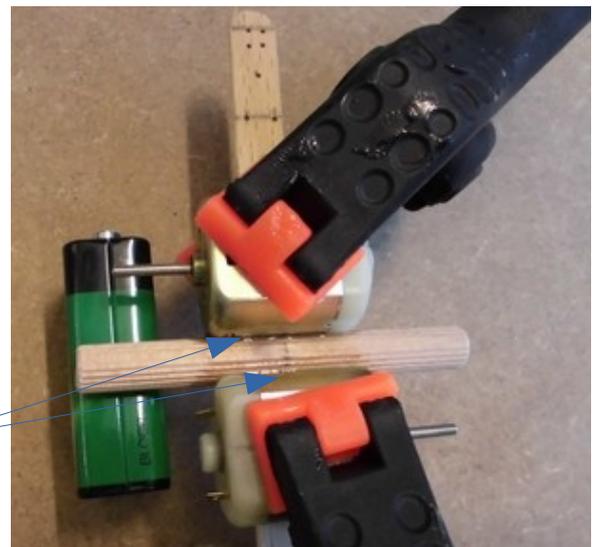
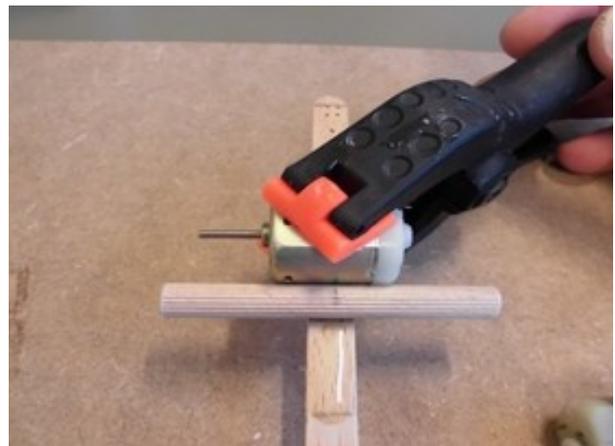
Gluing the motors



- Only the shaded area of the ice cream stick should be coated with glue! Not the motors!
- After sticking and drying, you must be able to see the labelling of the motors!

Look at the photo to see how the motors have to be installed!
Do not leave a gap between Motors and the axle!

- You should first stick only one motor and fix it with the clamp!
- The motors are magnetic and could otherwise move against each other.



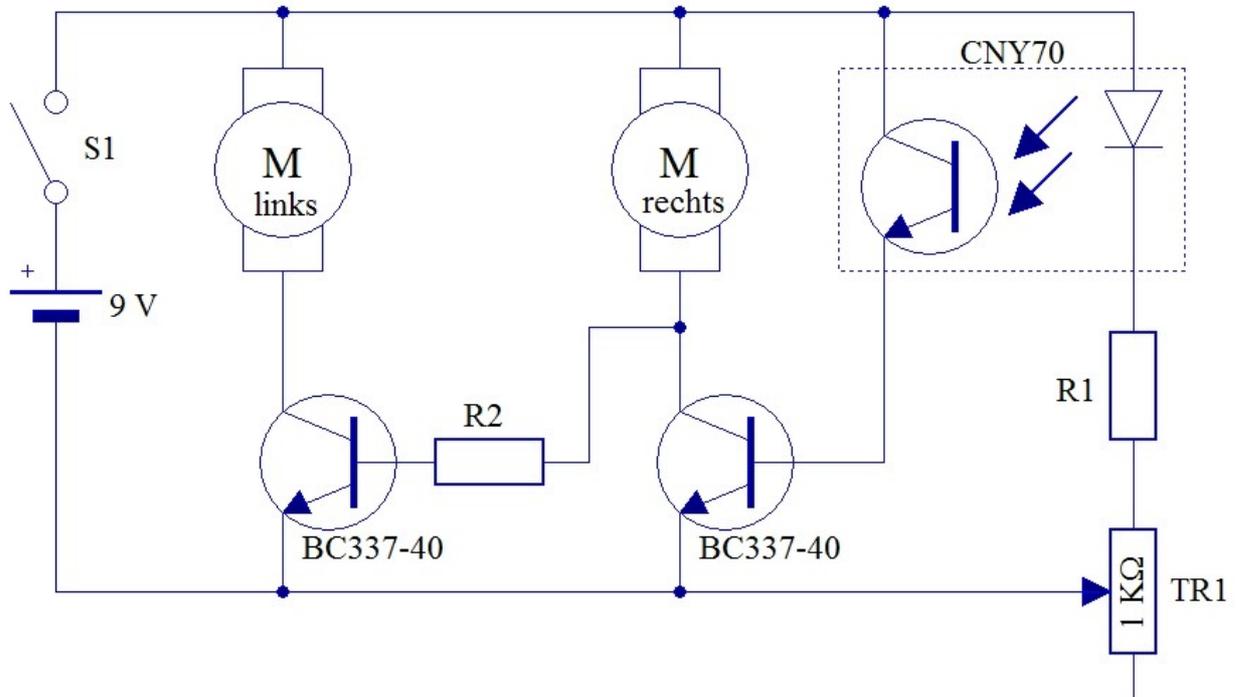
- Drop a little superglue into the gap between the motors and the axis!
- This makes the chassis more stable.

Now wait at least 30 minutes!

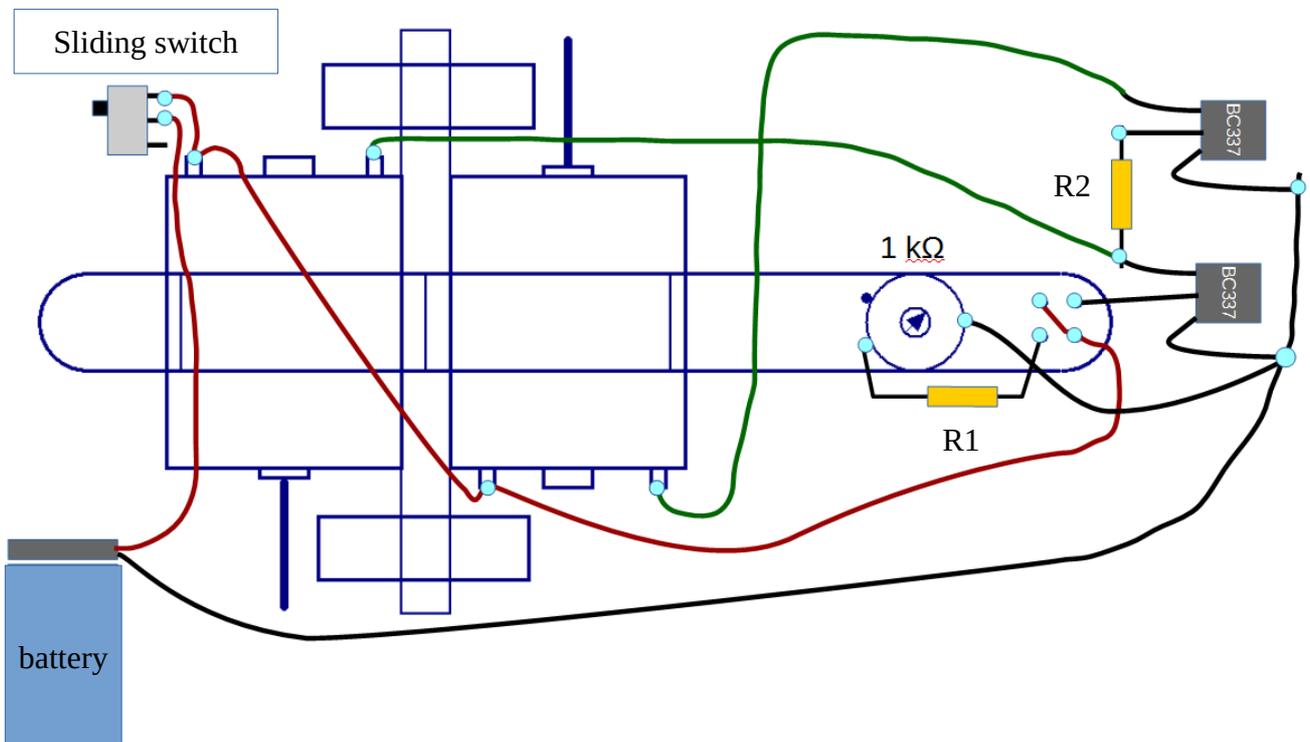


2. Step: Understanding the circuit

Circuit diagram



Wiring plan



R1 → 220 Ω → red red brown gold R2 → 2200 Ω → red red red gold

→ Think about how the electronic circuit works!

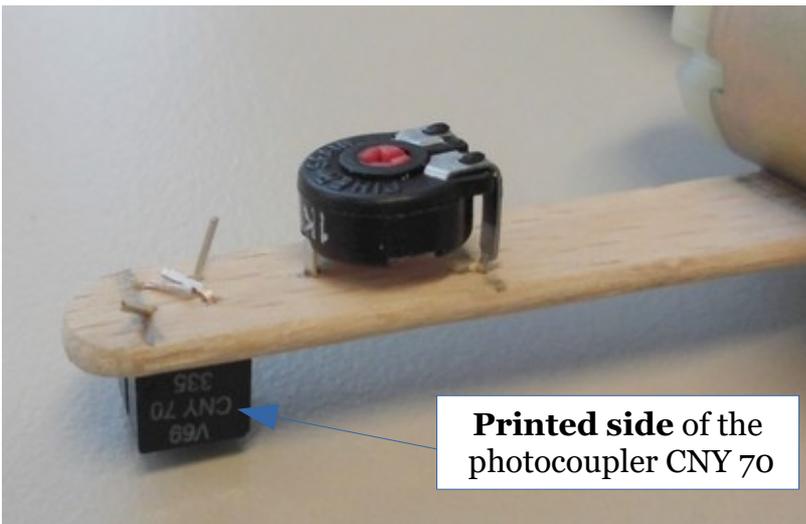
3. Step: Making the solder joints

If you are already familiar with soldering, you can simply work according to the wiring diagram on page 6. But for absolute beginners we have some tips here:



→ The „legs“ of the adjustable resistor should be bent straight.

Pay attention to the mounting orientation of the photocoupler!



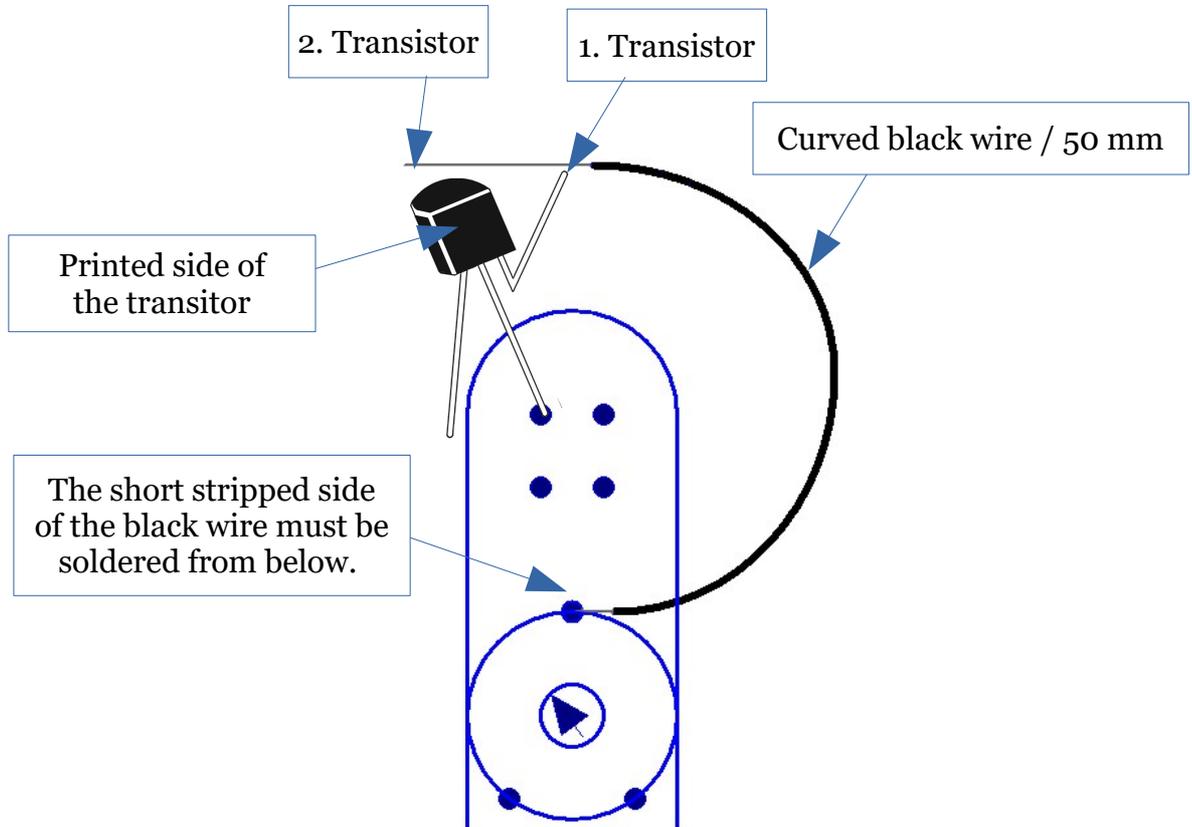
Two „legs“ of the photocoupler must be bent together and soldered.



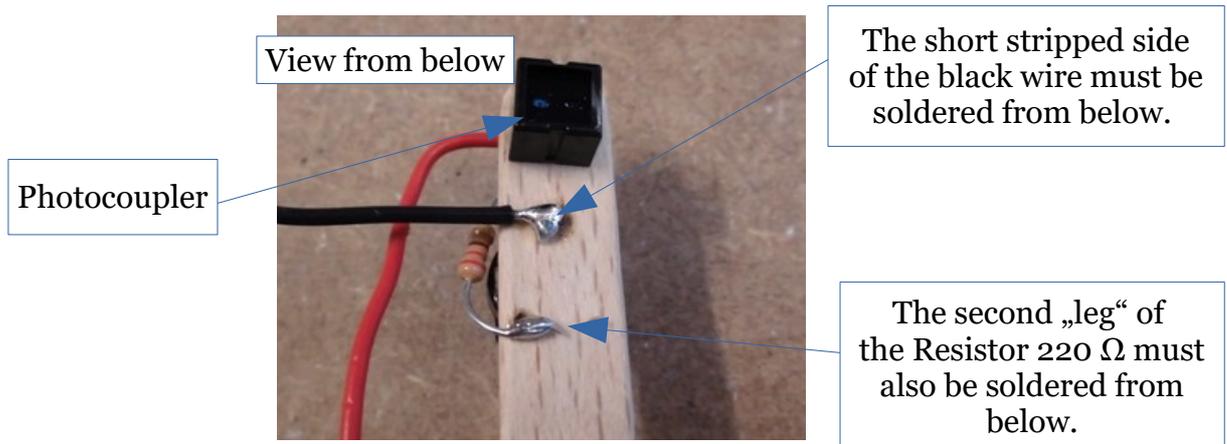
A red wire should be soldered additionally.

Add / solder the Resistor 220 Ω
Red – red – brown - gold

- Cut a black wire with a length of 50 mm.
- This curved black wire will be the basis for mounting the transistors.
- One side of the wire should be stripped with 5 mm.
- The other side should be stripped with 12 or 15 mm.



Install the transistors correctly!



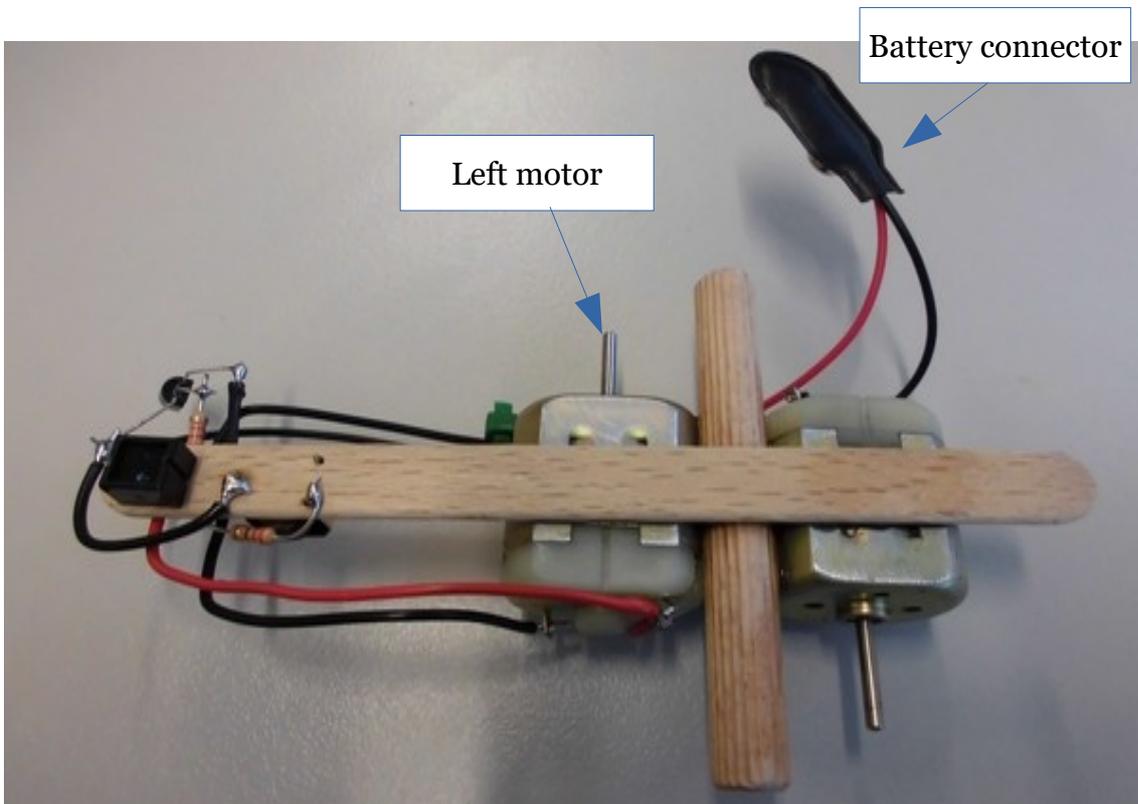
→ Now you should follow the wiring plan from page 6!

4. Step: Testing the electronic circuit

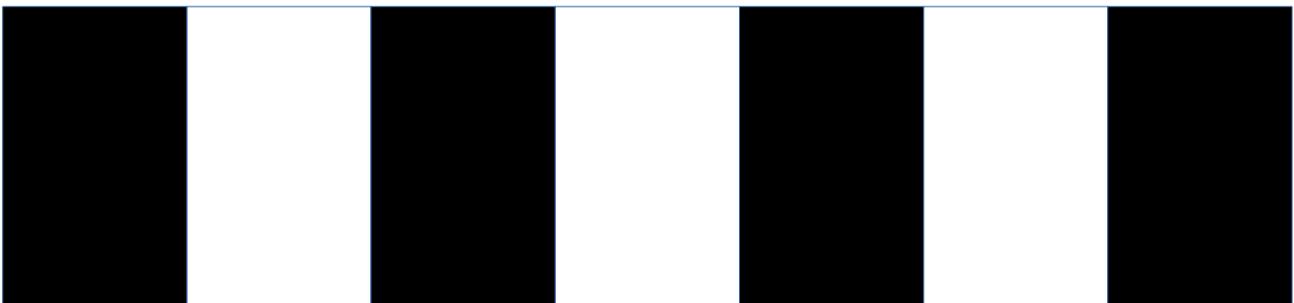
The battery should not be connected yet!

- Check that everything is connected correctly.
- Are the wires properly soldered to the motors?
- Take a multimeter and check at the battery connector whether there is a short circuit.
- Normally, the multimeter shows about 650Ω at the battery connector if everything is connected correctly.

Now you can connect the battery and see how the motors work!



This area can be used to test the function of the electronic circuit:



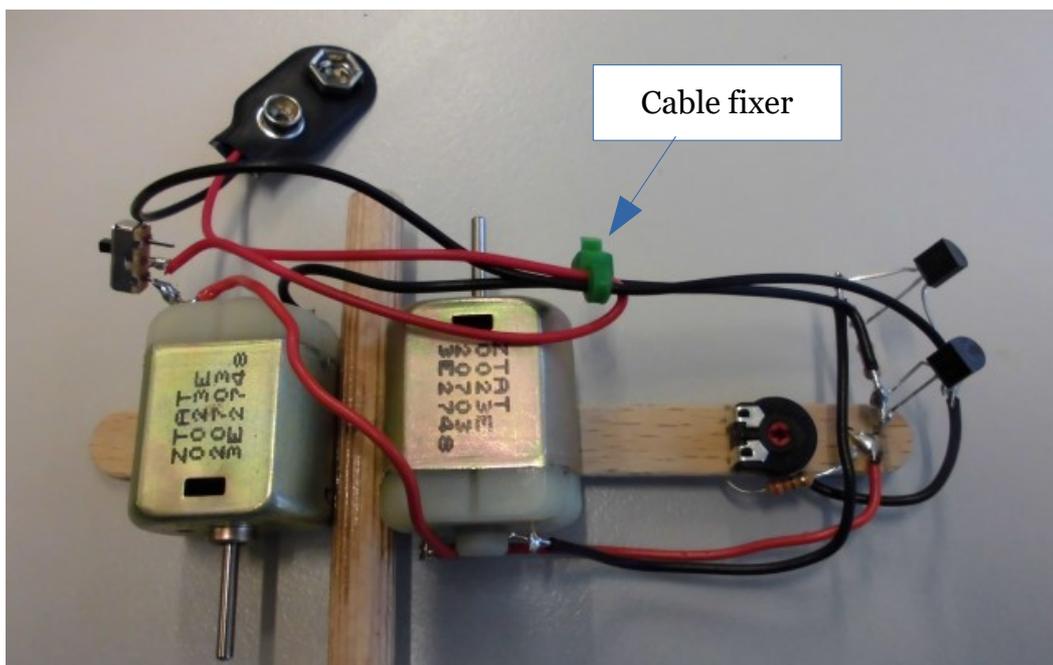
If the photocoupler is over the white area → the right motor must run.
If the photocoupler is over the black area → the left motor must run.

5. Step: Last handgrips

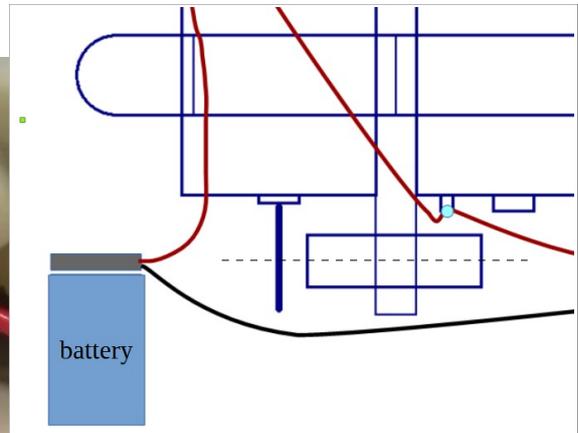
- The driving belts come from the neck of a balloon.
- Cut two strips of 8 to 10 mm



Tip: Use a really sharp scissors!



- Now slide the ball bearing onto the wooden axle.
- The ball bearing should be positioned approximately in the middle of the visible motor shaft.



Tip: A hammer and a socket or small pipe are useful to press the ball bearing onto the axle.

- Attaching the drive belts is tricky.
- You must find your own way... 😊



- Set the adjustable resistor to center position.
- Now the robot should be able to drive on a black and white border.

- **Fasten the battery with double-sided adhesive tape**



Ready for a race!