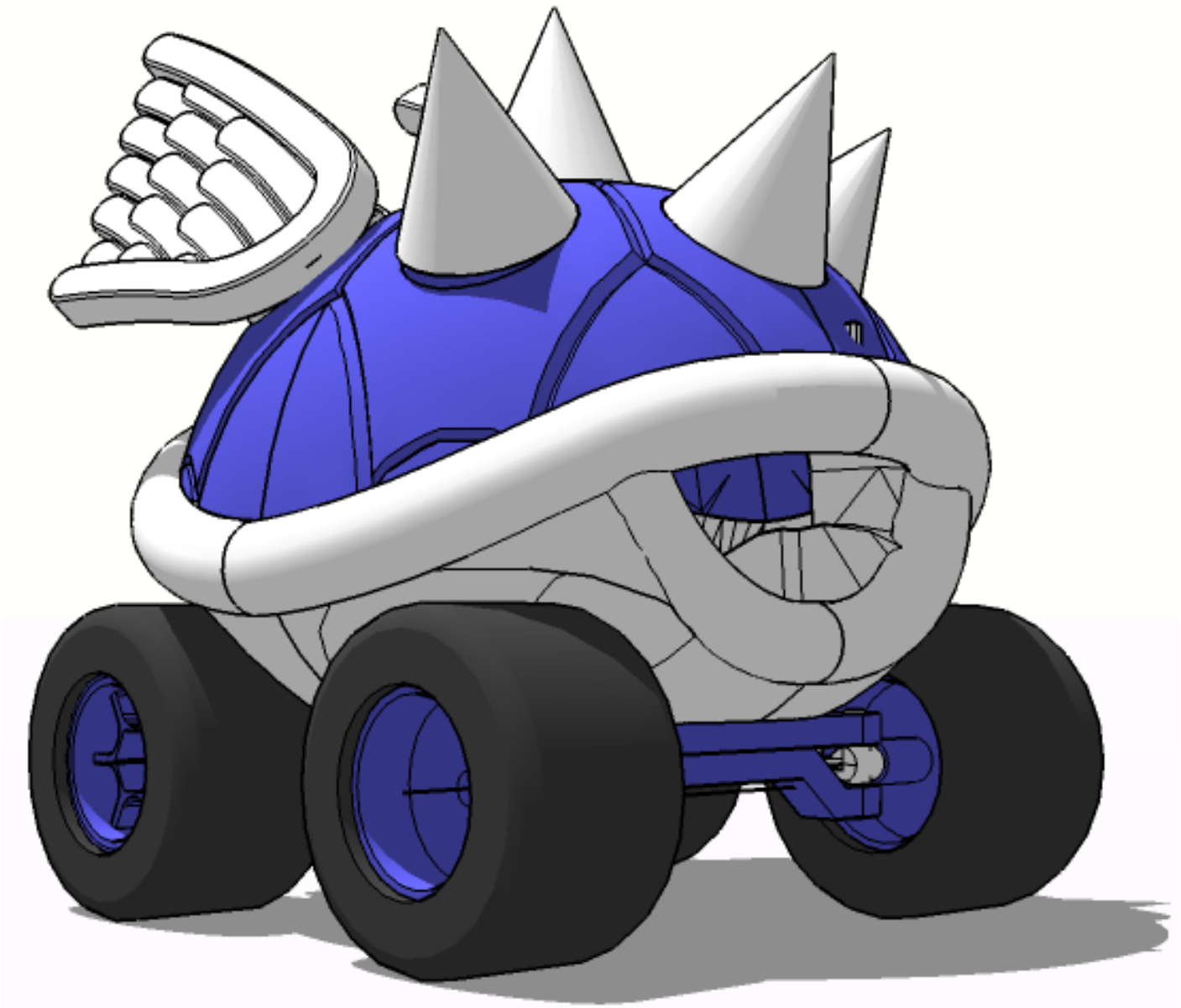
Turtle Shell Racer

High Power Edition



Michael Curry

DistractedArchitect.com

Electronics Supplement

Version 1.0

Parts

Shopping List

2 Channel RC Remote and Receiver

The two channel RC Remote is what you will use to control the Shell. In practice you can use any 2 channel RC remote. I like the Hobby King 2.4Ghz model. It inexpensive, long range, and you can run a lot of them at the same time without having to swap RC crystals.
Note: In these images I have panted the remotes to match the color of the car they control. Out of the box, the trim is orange.

Source:

Hobby King USA Warehouse, $19.99:
www.hobbyking.com/hobbyking/store/__15141__Hobby_King_GT_2_2_4Ghz_2Ch_Tx_Rx_USA_Warehouse_.html

Hobby King Hong Kong Warehouse, $14.99:
www.hobbyking.com/hobbyking/store/__10608__Hobby_King_GT_2_2_4Ghz_2Ch_Tx_Rx_.html

DC Motor Controller/ESC

This is the electronic heart of the Turtle Shell Racer. It performs two functions. First it takes signals from the RC Receiver and controls power to the drive motor. Second it provides regulated 5v power to the Receiver and steering servo.

Source:

Trossen Robotics, $28.75:
www.trossenrobotics.com/store/p/4265-BaneBots-Motor-Controller-9A-peak-.aspx

Micro Servo

The Micro Servo takes commands and power from the RC Receiver and drives the steering mechanism. These Servos are inexpensive, so I recommend ordering extras. If the shell slams into something really hard, this is the part that will break. Also, they are great for crazy experiments.

Source:

Hobby King Hong Kong Warehouse, $2.69:
www.hobbyking.com/hobbyking/store/__662__HXT900_9g_1_6kg_12sec_Micro_Servo.html

DC Motor

I have been using DC Motors salvage from around my home and Hackerspace. The motors from the Hackerspace were left over from failed attempt to build a Mantis Mill. Their Part number and link is below, but I would recommend experimenting with what you have available before buying one.

Source:

Alltronics $3.25:
www.alltronics.com/cgi-bin/item/28M083/search/12-24V-DC-Motor

Shopping List

Battery

Energy Storage. You can use whatever battery you have available. An inexpensive AA battery pack from Radio Shack works great. I am using LiPo Batteries from Hobby King that provide 11.1v and 2200mAh. This is overkill, but it allows the Shells to drive longer without recharging

Source:
Hobby King USA Warehouse, $21.99:
www.hobbyking.com/hobbyking/store/__14961__Turnigy_2200mAh_3S_35C_Lipo_Pack_USA_Warehouse_.html
Hobby King Hong Kong Warehouse, $14.99:
www.hobbyking.com/hobbyking/store/__10383__Turnigy_2200mAh_3S_35C_Lipo_Pack.html

Battery Connector

If you use the LiPo battery you will need a XT60 connector to plug the battery into the ESC.

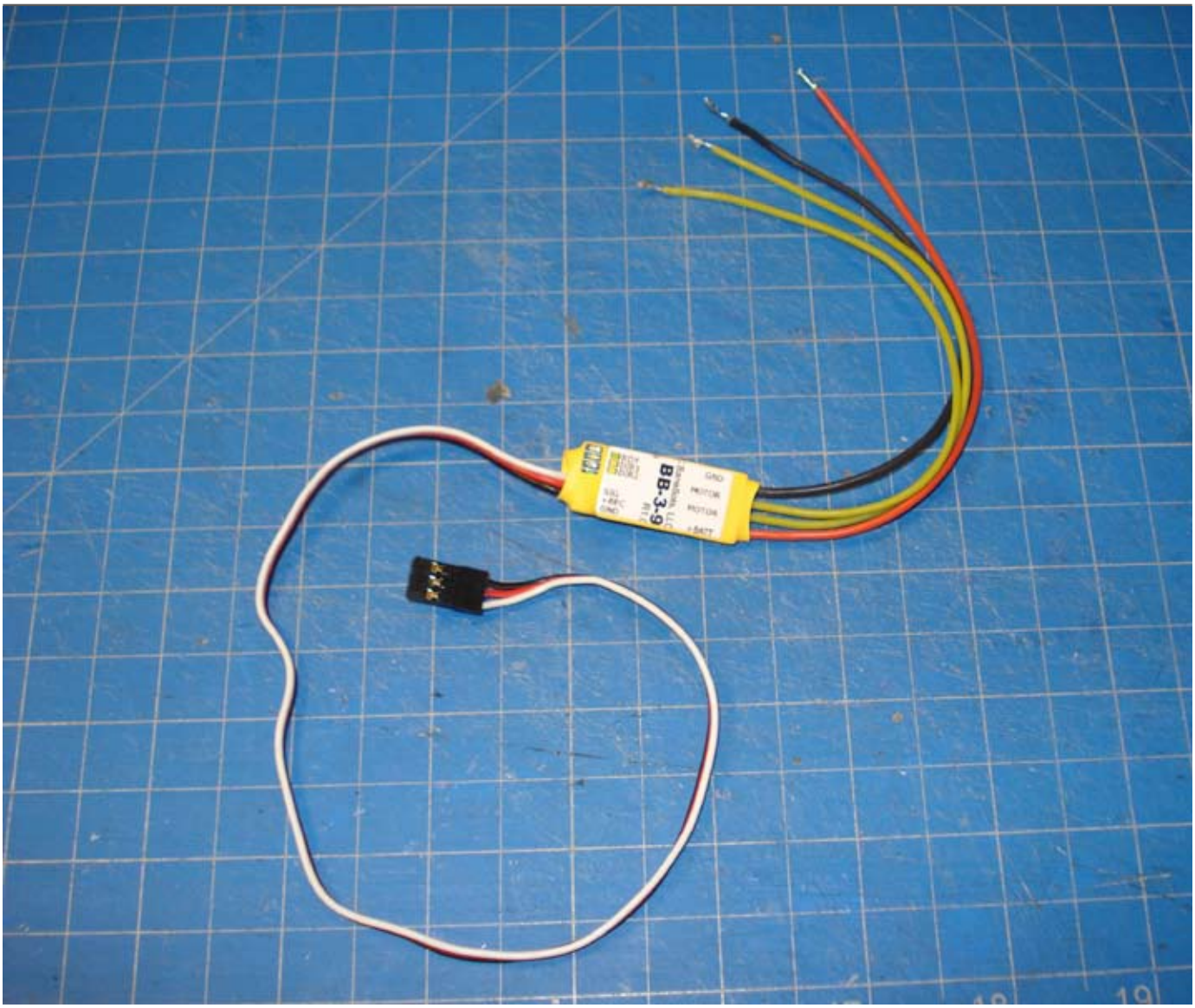
Source:
Hobby King Hong Kong Warehouse, $2.44:
www.hobbyking.com/hobbyking/store/uh_viewItem.asp?idProduct=10414

Battery Charger
(Not pictured)

If you use the LiPo Batteries you will need a charger to refill them. Very useful if you build lots of things that use RC Car batteries...

Source:
Hobby King Hong Kong Warehouse, $22.99:
www.hobbyking.com/hobbyking/store/__7028__Turnigy_Accucel_6_50W_6A_Balancer_Charger_w_accessories.html
Wall Wart, you have to buy this separately, $9.99:
www.hobbyking.com/hobbyking/store/__6256__12V_5A_110_240V_50_60Hz_Power_Supply.html

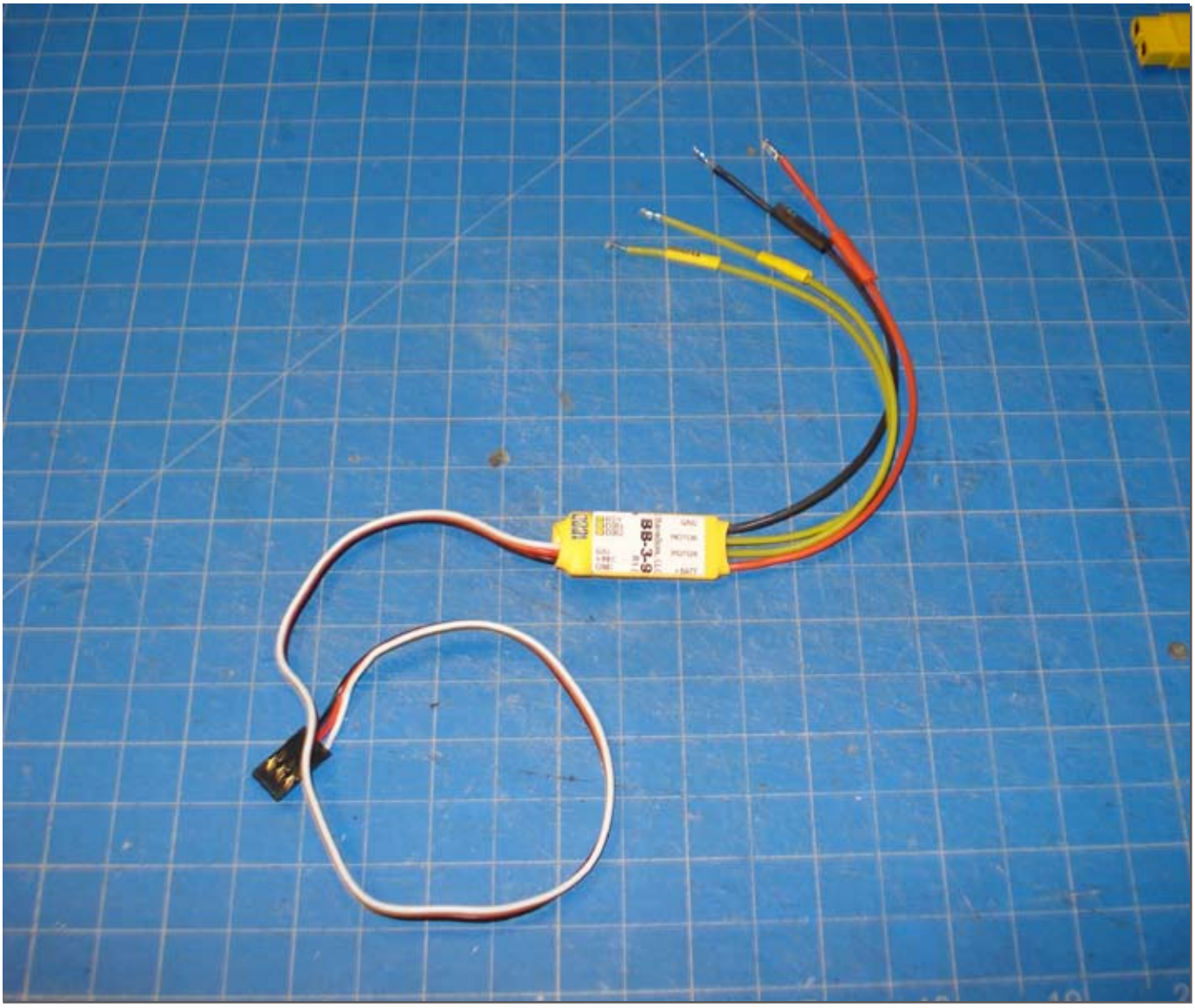
Parts:



This is the BaneBots Motor Controller, it is a simple ESC(Electonic Speed Controller) that is the heart of the Turtle shell racer electronics.
Strip each of the 4 leads and use your soldering iron to tin the ends.

Step 1

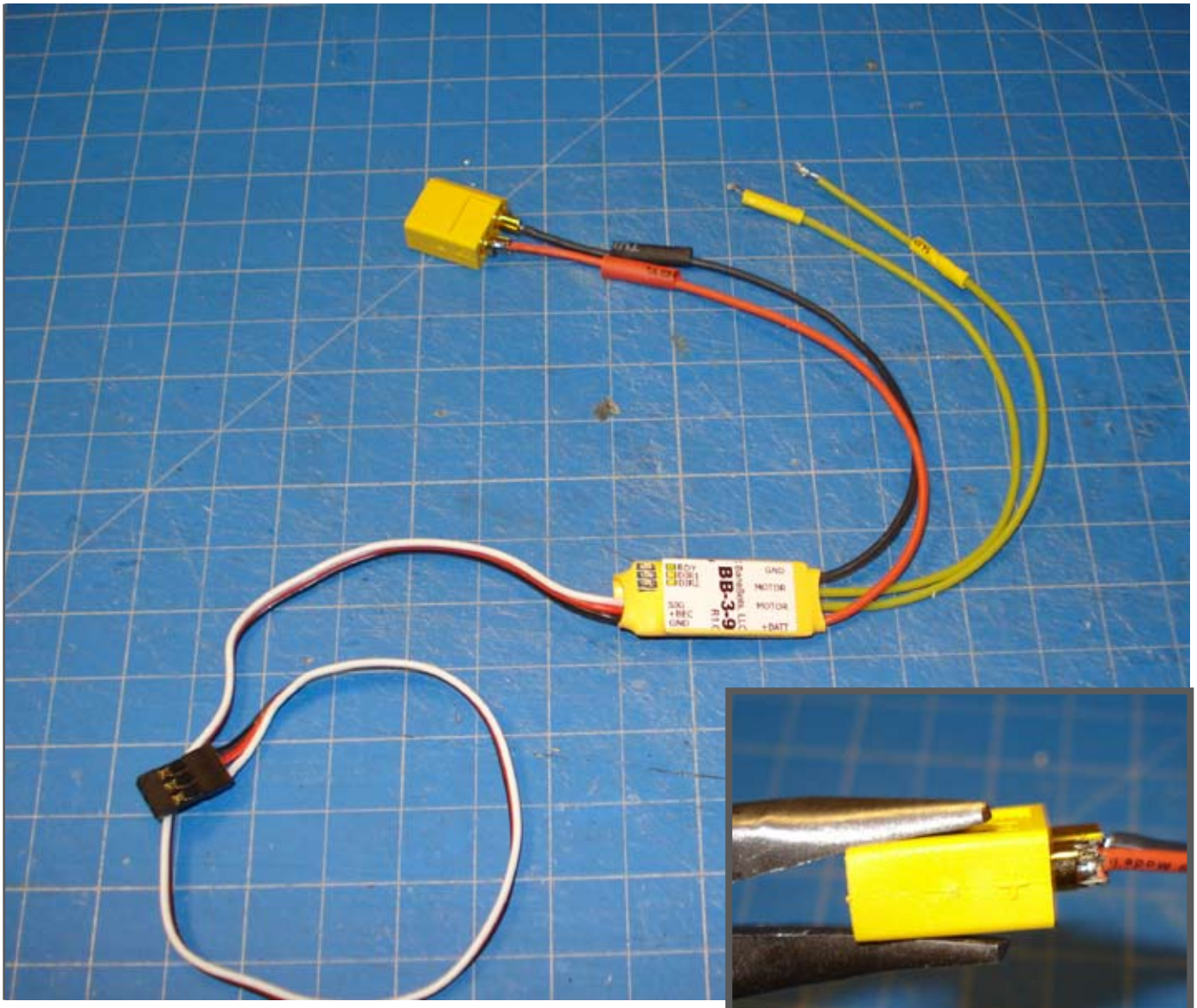
Parts:



If you are using heatshrink, slide short segments of it onto each wire now.

Step
2

Parts:

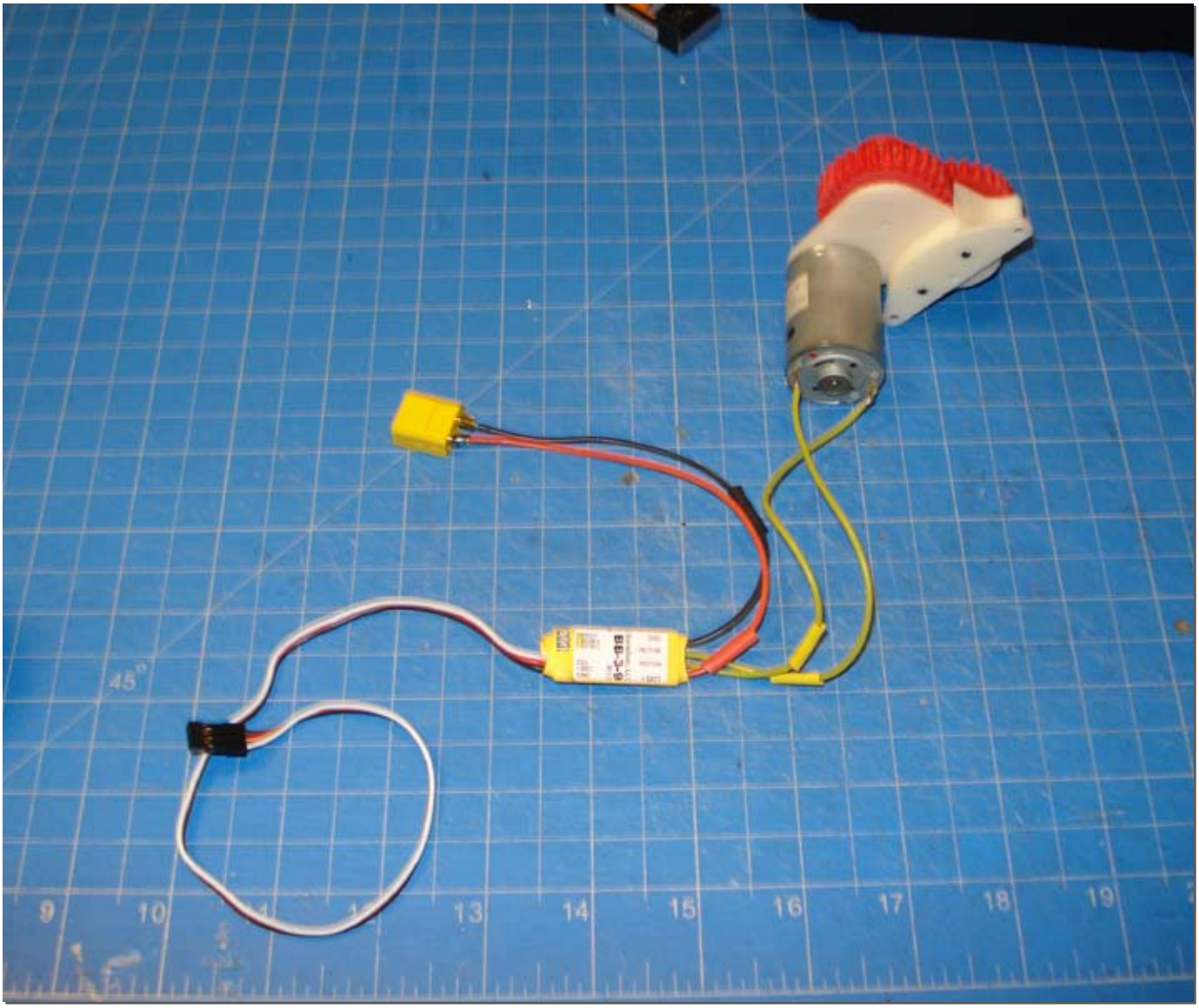


Detail of Markings on XT60 connector

Solder the battery connector of your choice onto the red and black battery leads. The XT60 connector I am using has markings on the sides that denote (+) and (-). Make sure to pay attention to polarity, Red goes to (+) and Black goes to (-)

Step 3

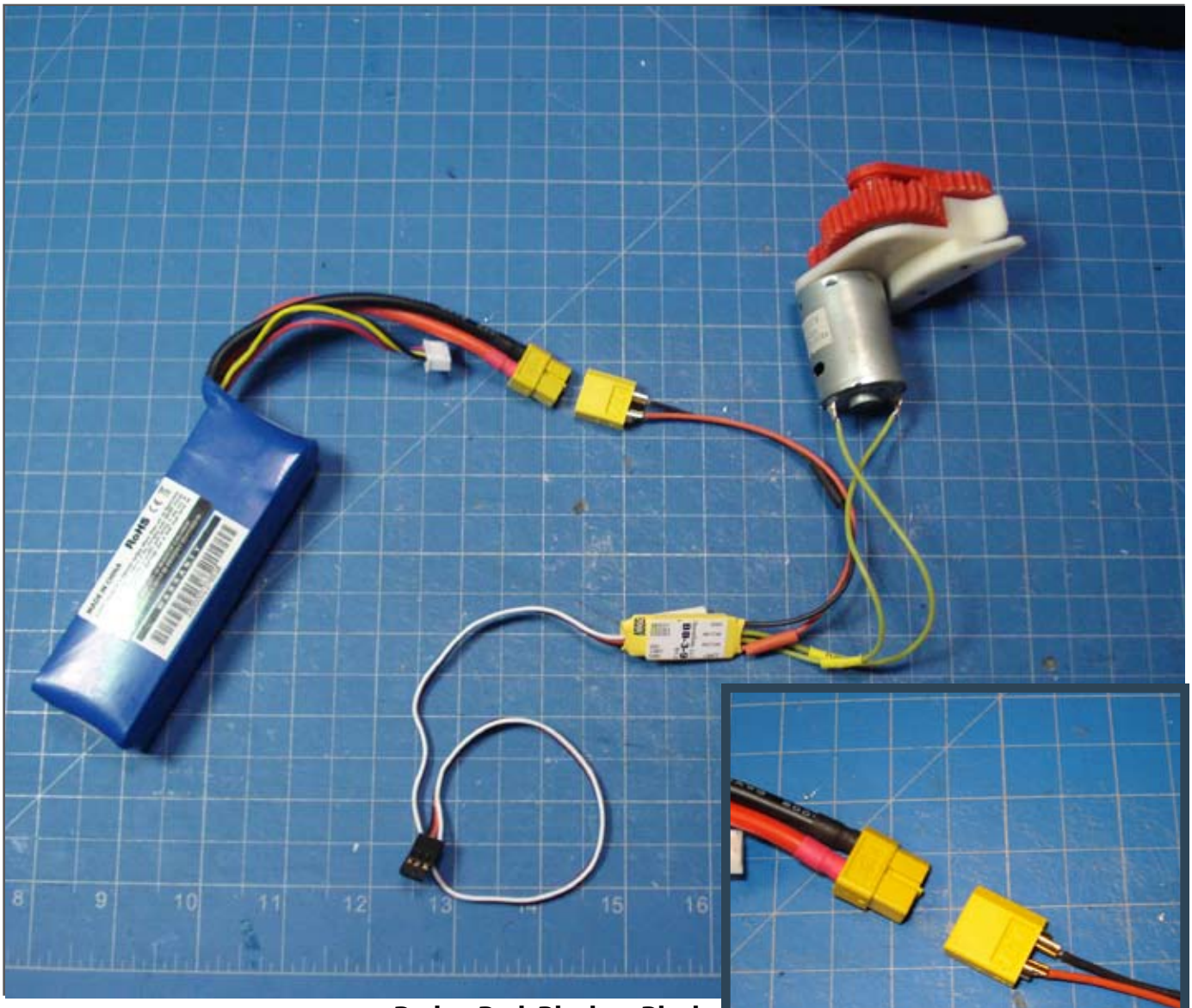
Parts:



Solder each of the yellow leads to one of the contacts of the motor.
I doesn't matter which lead goes to which contact.

Step
4

Parts:

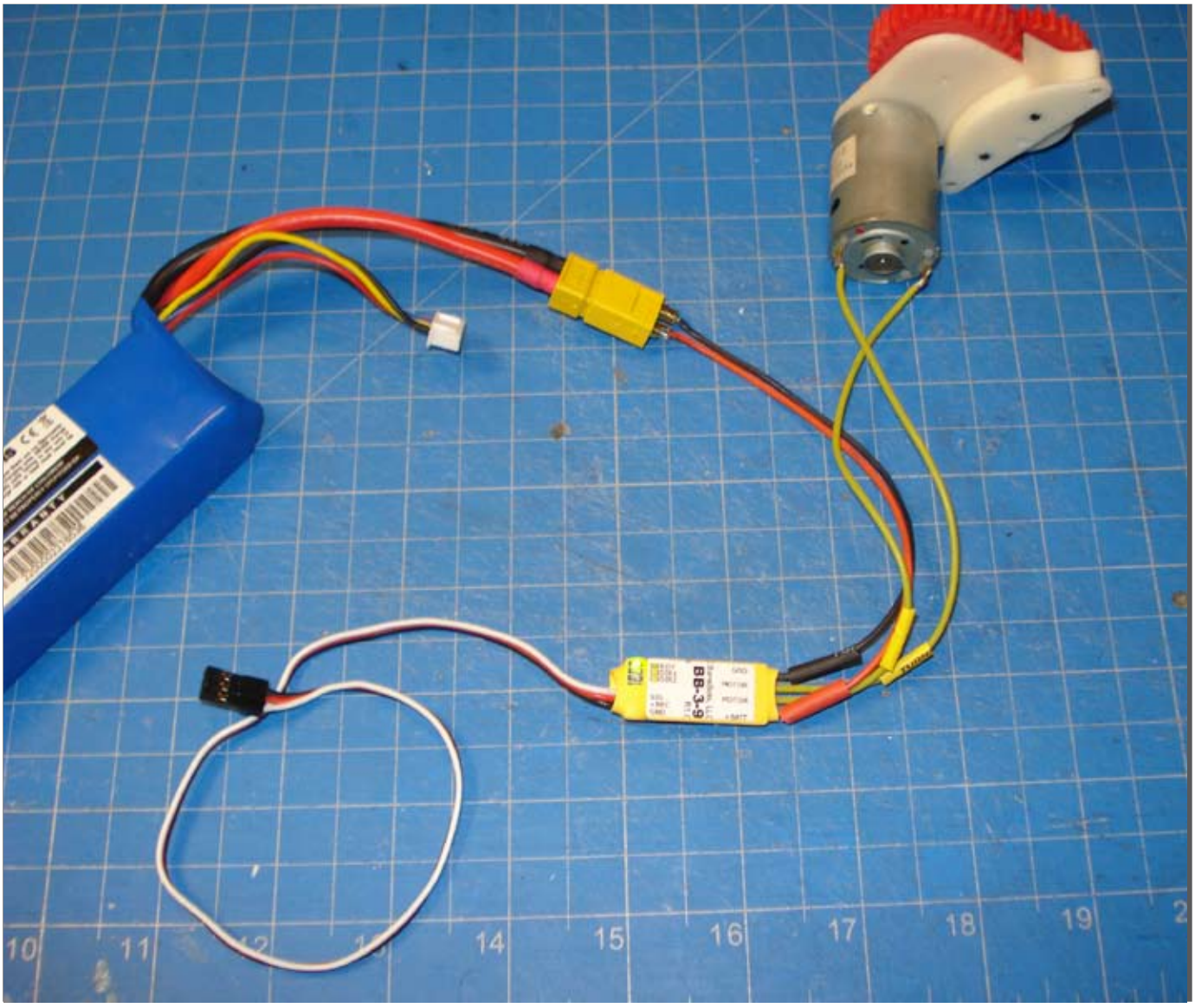


Red to Red, Black to Black.
Were good to go!

Confirm that the polarity of the battery and the ESC match.
WARNING: This ESC has no protection against reverse polarity. Which means, if you hook it up to the battery backwards the ESC will be destroyed.
Check Your Work!

Step 5

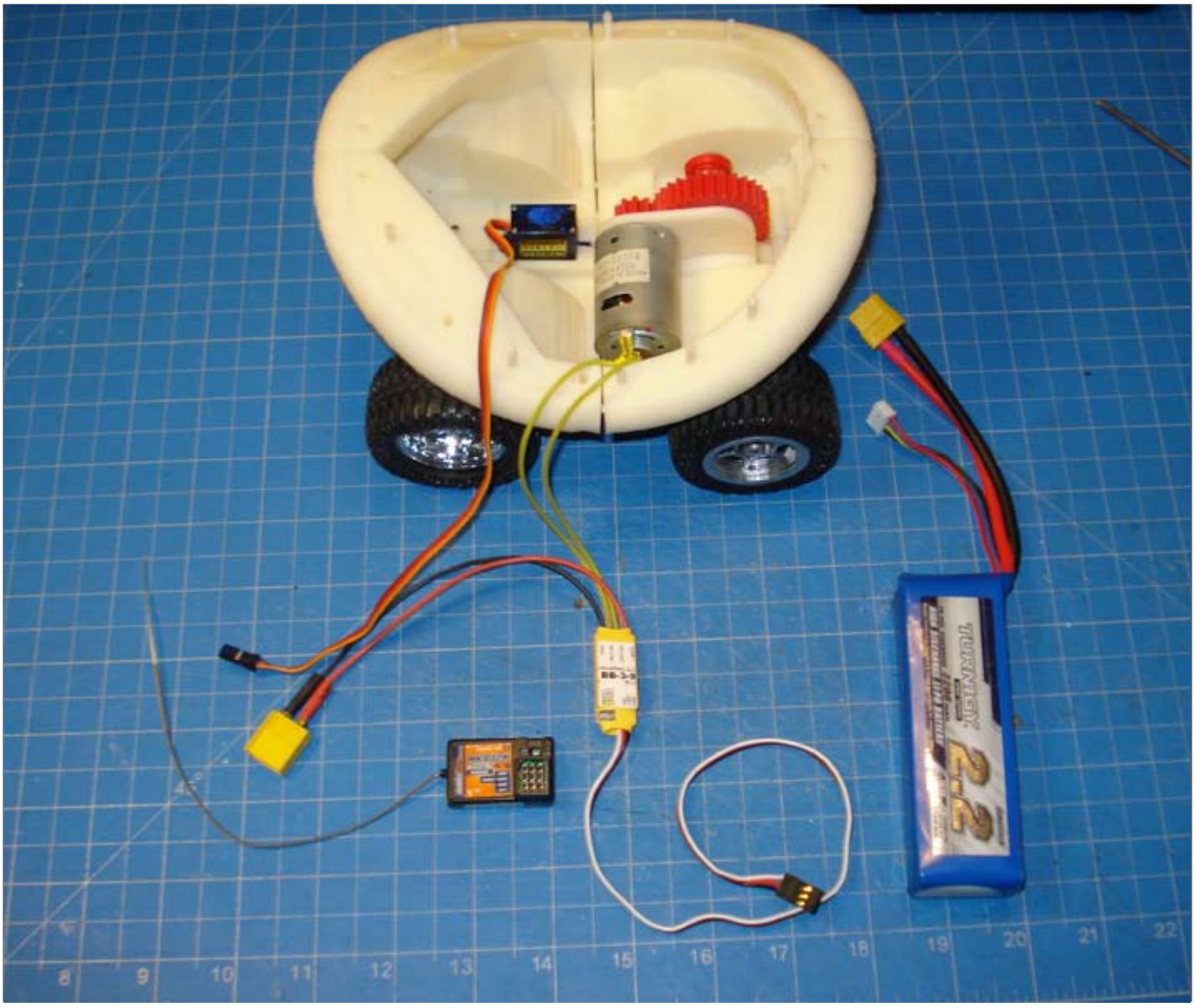
Parts:



Connect the battery to the ESC. The green (RDY) light should flash.
If it doesn't, recheck all of you solder connections.
Disconnect the Battery.

Step 6

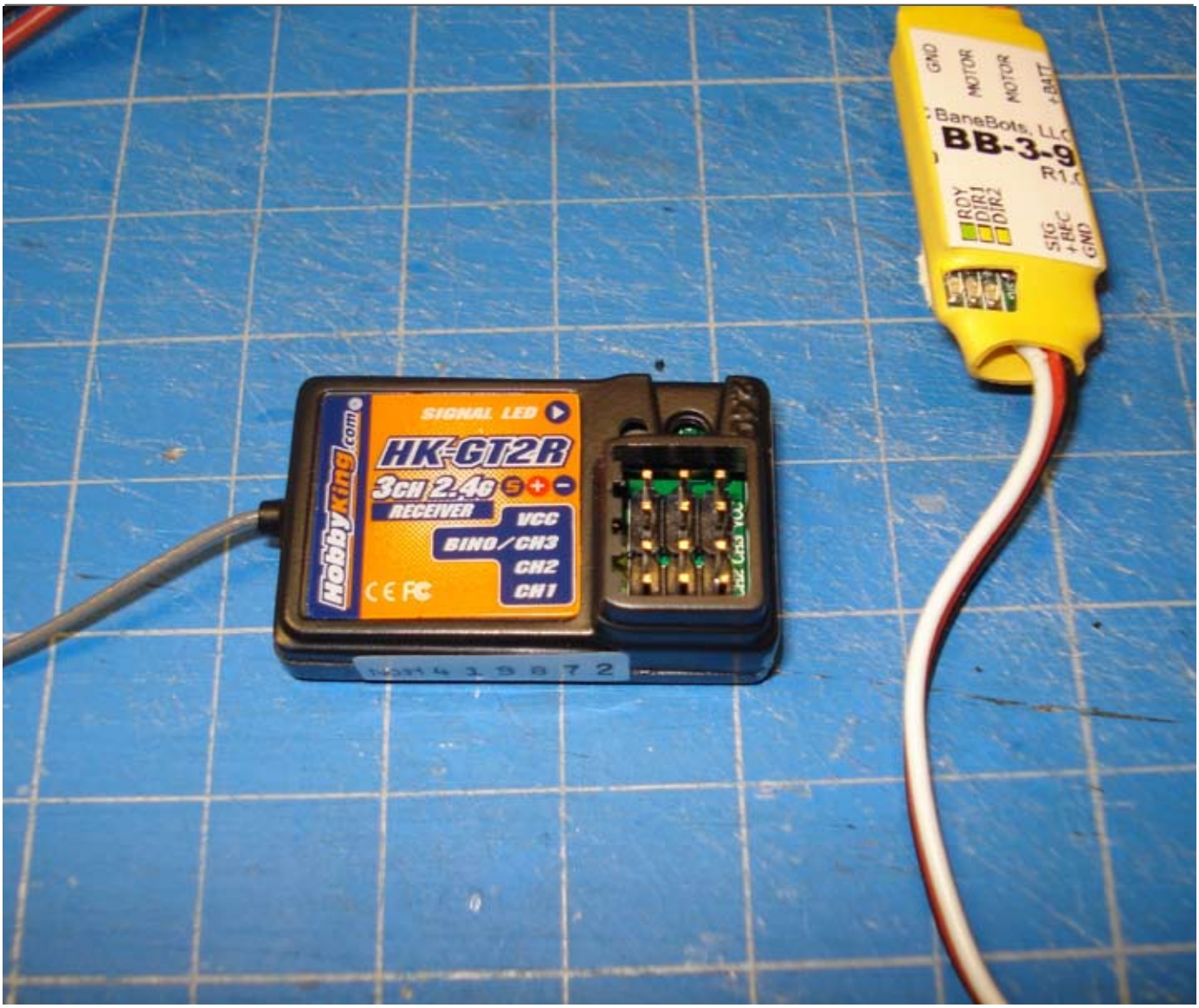
Parts:



Install the Gearbox/Motor combination in the Shell. Continue with the assembly instructions until you get to Step 34

Step 7

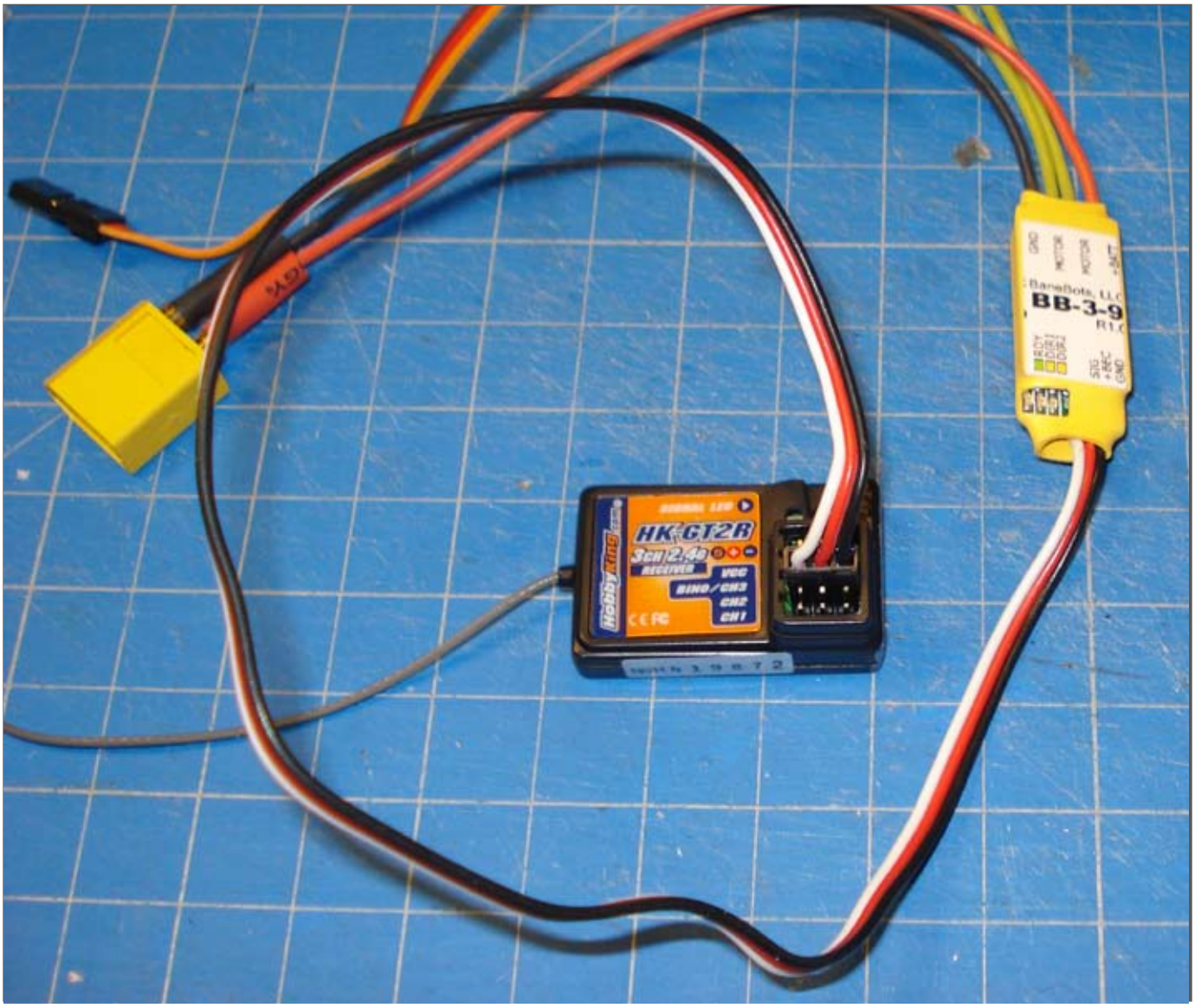
Parts:



This is the Hobby King 2.4gHz Receiver. It will receive signals from the controller and tell the ECS and Micro Servo what to do.

Step 8

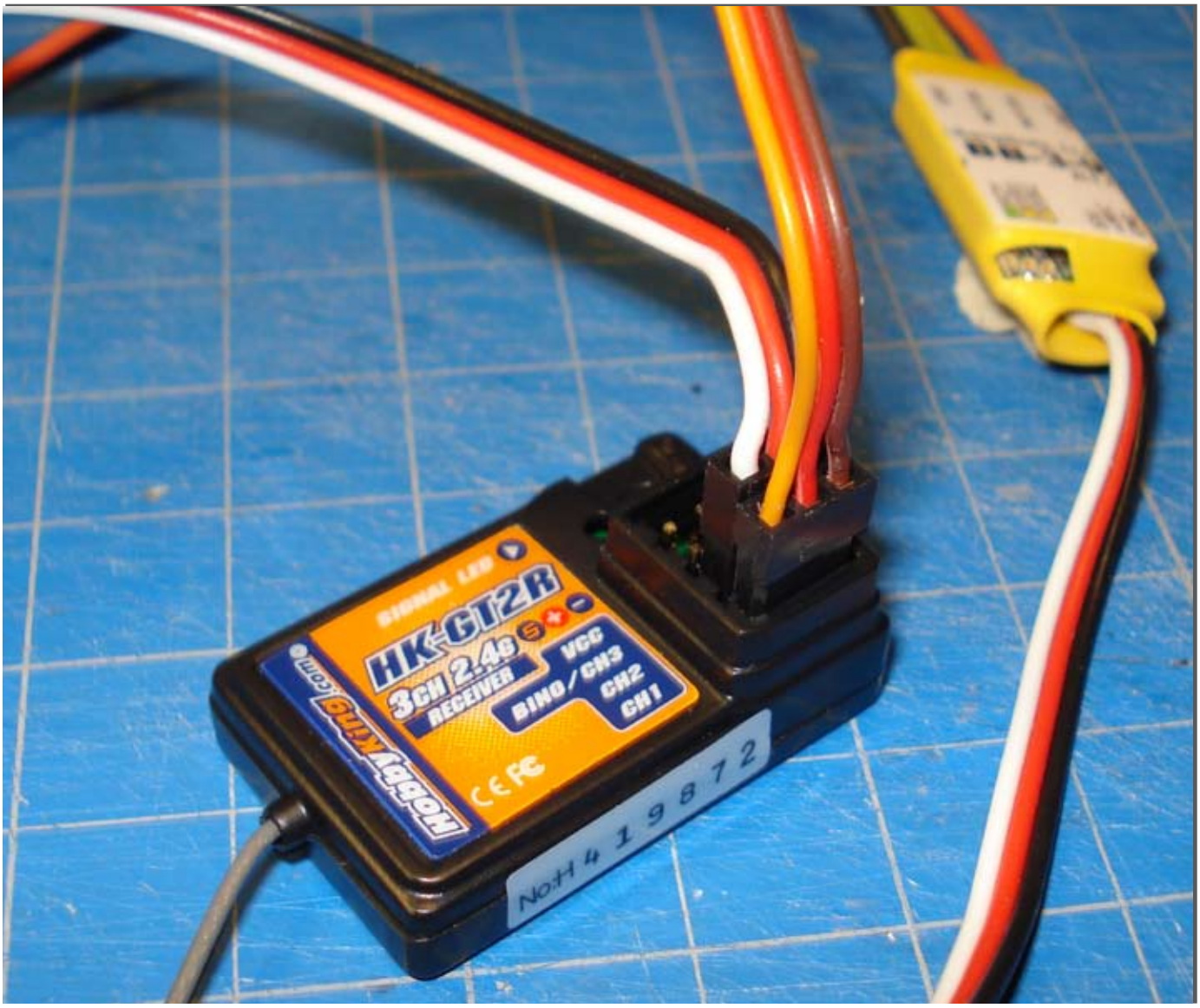
Parts:



Plug the lead from the ESC into Channel 2 (CH2) on the Receiver.
Make sure the wire is plugged in as show.
Black goes to ground(-), red to power(+) and white to signal(s).
This connection will provide power to the Receiver and signal to the ESC.

Step 9

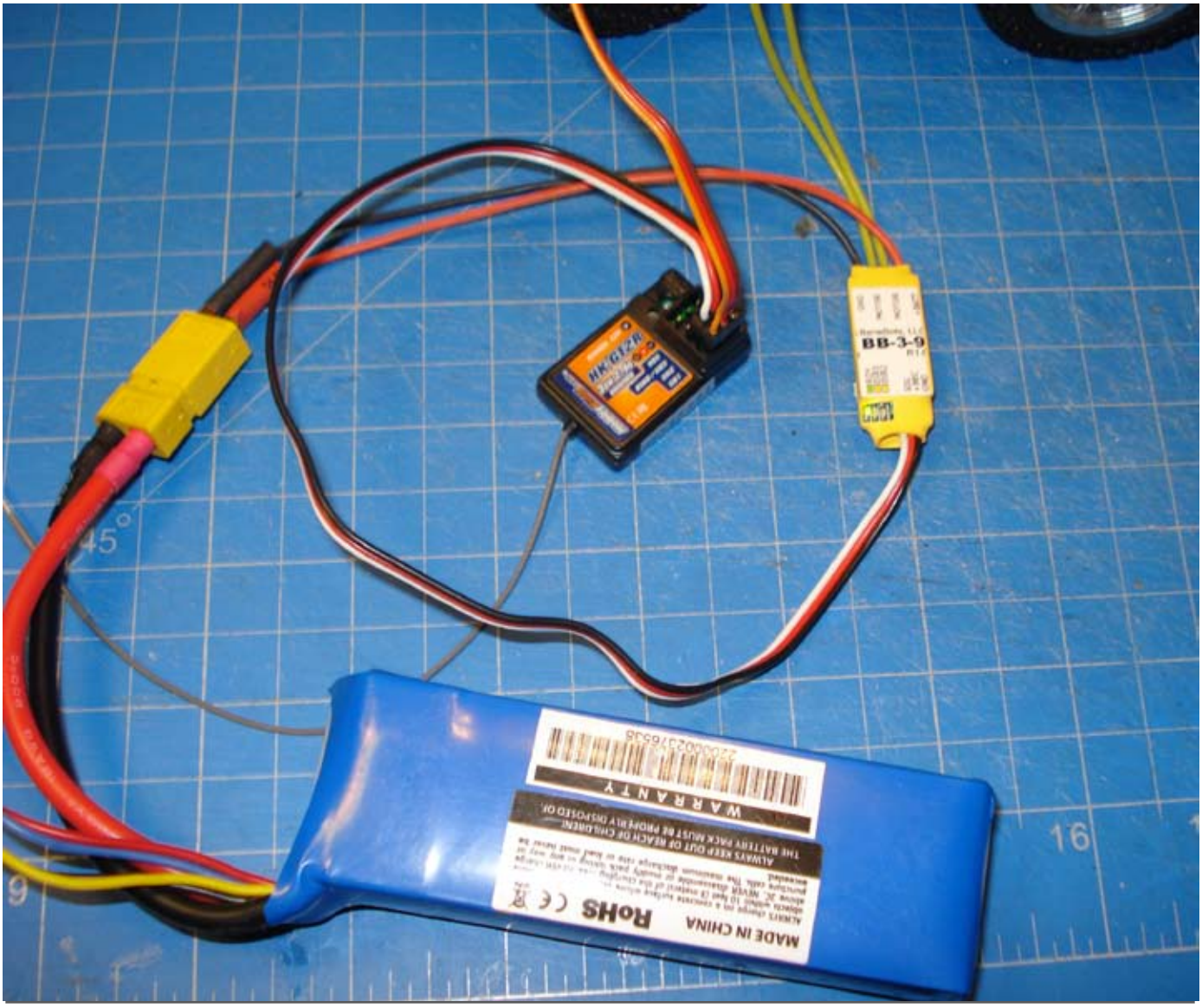
Parts:



Plug the lead from the Micro Servo into Channel 1 (CH1) on the Receiver.
Make sure the wire is plugged in a shown.
This time Brown goes to ground(-), red to power(+) and orange to signal(s).
Just remember, brown is the new black.

Step 10

Parts:



Plug the battery into the ESC.
The RDY light should flash green and the Receiver will stay dark.

Step 11

Parts:

Turn on the Transmitter.
The red light on the Receiver should light up and the RDY light on the ESC should be solid green.
Continue with the assembly instructions to finish the shell.

Step 12

Trouble Shooting

Q: When I pull the trigger on the remote my shell goes backwards.

A: Wow, what an embarrassing problem you have. Under the cover on the Transmitter is a switch labeled TH for throttle. It has two settings, Normal (NOR) and Reverse (REV). Whatever positions it is in now, switch it to the other. Your shell should now drive forward when you pull the trigger.

Q: When I steer Left the shell goes Right.

A: Under the cover on the Transmitter is a switch labeled ST, Steering. It has two settings, Normal (NOR) and Reverse (REV). Whatever positions it is in now, switch it to the other. The Shell should now steer properly.

Q: My shell can't follow a straight line, it always arcs off to one side or the other.

A: Under the cover on the Transmitter is a knob labeled ST TRIM, Steering trim. Drive the shell forward and adjust this knob until it follows a straight line.

Q: My shell seems to want to drive on its own, even when I'm not pulling the trigger.

A: Under the cover on the Transmitter is a knob labeled TH TRIM, Throttle Trim. Adjust this knob until the shell holds still when the trigger is in neutral.

Q: The steering traverses too far and binds against the underside of the shell.

A: Under the cover on the Transmitter is a knob labeled ST D/R. This adjusts how far the steering servo moves left and right. Adjust the knob to decrees how far the steering moves and keep the wheels from binding against the shell.

Q: The shell won't start, the RDY light on the ESC just keeps blinking even when the Controller and Receiver are connected.

A: Slowly rotate the TH TRIM knob back and forth until the light goes solid green, and then trim the throttle so the shell holds still in neutral. This has something to do with interference in the environment and is discussed in the data sheet for the ESC.

Q: What is the answer to the Ultimate Question of Life, the Universe, and Everything?

A: 42