
Rosco

Build Instructions for
Robot SCOut b1.0v

www.Arxterra.com

Rosco b1.0 Build Instructions

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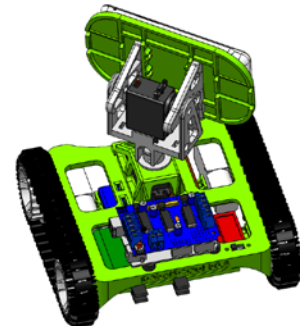
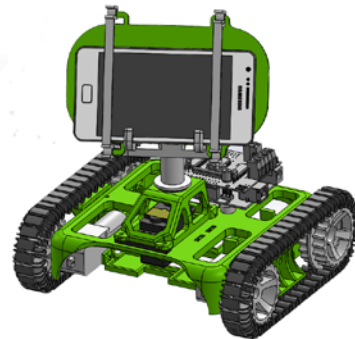
 Being Careful with the Printed Treads..... 33

Features

RObot SCOut beta 1.0

- Smart Device Running Android OS 3.1+
- No-Slip Silicon Gel Pad
- Custom Servo Load Balance System
- Metal Geared Standard Servos
- Arduino UNO R3
- Adafruit Motor Shield
- 7v DC Motors with 90 Degree 120:1 Gearbox
- Isolated Motor and Control Batteries
- 5v Regulated Direct Servo Power
- Mini-Breadboard
- 3D Printable ABS Treads
- Phone Strap Clips for Easy Mounting
- Open Source Design
- Costs under \$200 sans smart phone *

* excludes shipping, tax, or min order requirements



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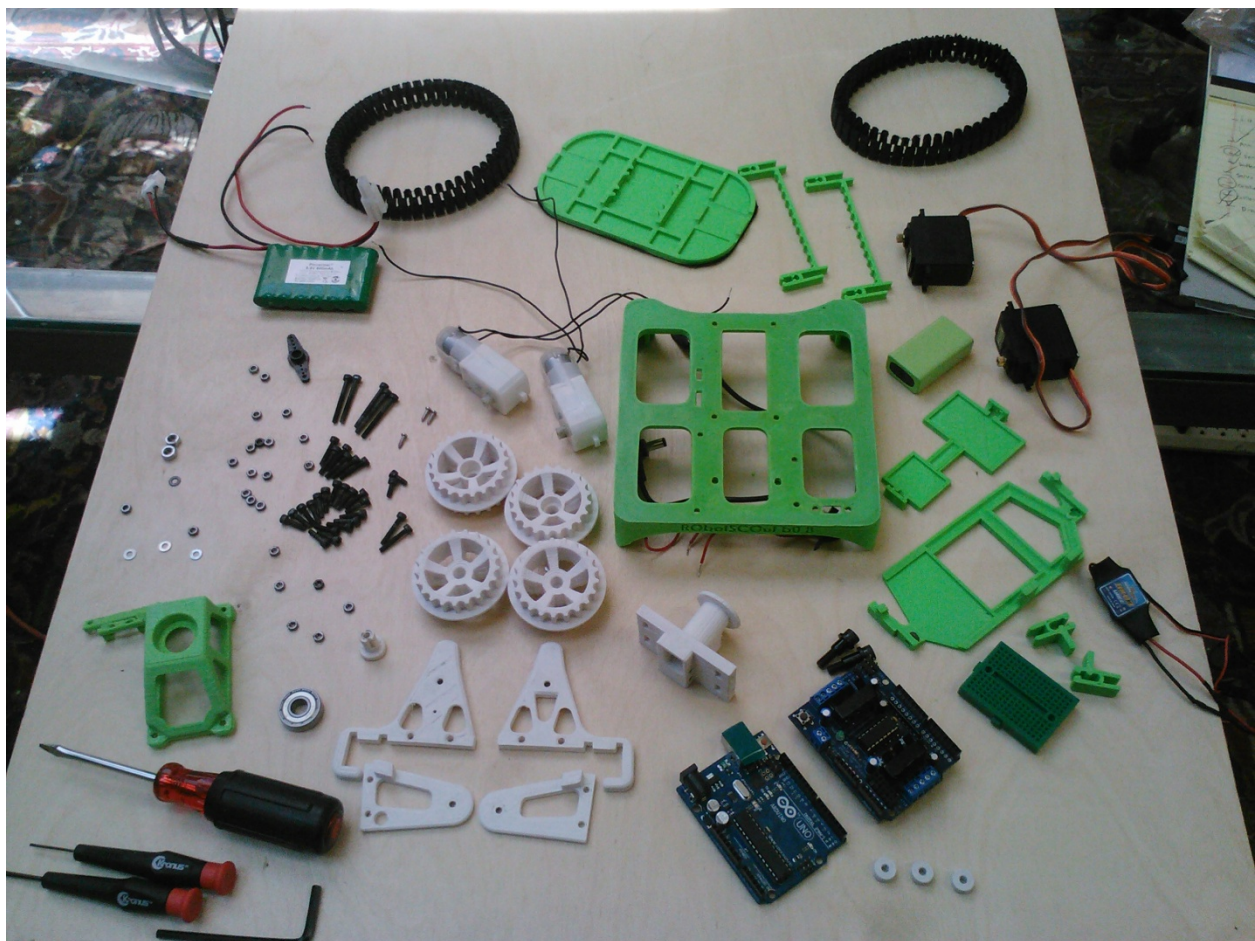
Rosco is open sourced to allow the design to evolve so it will have the features and specs desired by everyone. We only request that you keep your designs open source and available

to others in order to encourage creativity and innovation! Have Fun!

WARNING!

The apps to run this telerobotics platform are still under development. To ensure your phone is compatible with the Arduino Uno, please test by downloading [Arduino Uno Communicator](#) from google play. It's free. We have confirmed Samsung Galaxy S3 and HTC EVO 4G LTE have usb hosting capabilities. Newer models should work but due to hardware changes not guaranteed. Please build at your own risk and **test your phone before building**.

Bill of Materials



Component Kit

Retailers are only suggestions; we encourage you to look around for deals. Download actual spreadsheet file for active links. Moreover, Rosco is open source to allow you to make rosco into the rover you want.

We only request that you keep your designs open source to keep the creativity and innovative cycle going!

A bill of materials (BOM) spreadsheet can be found at www.arxterra.com. This includes a breakdown on cost and printing time.

3d Printed Parts

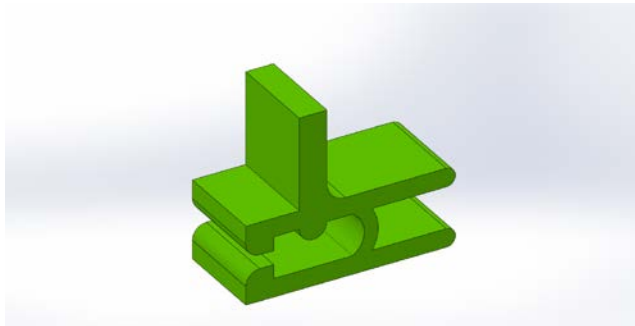
Chassis



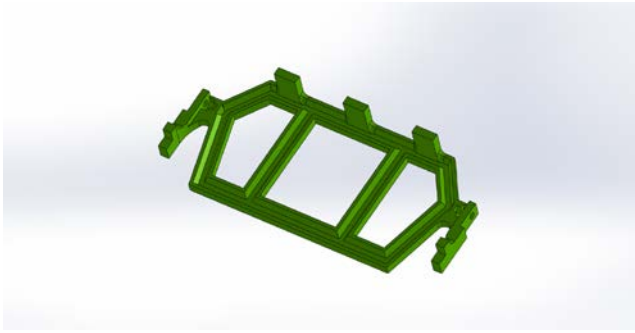
Back Wheel-45mm



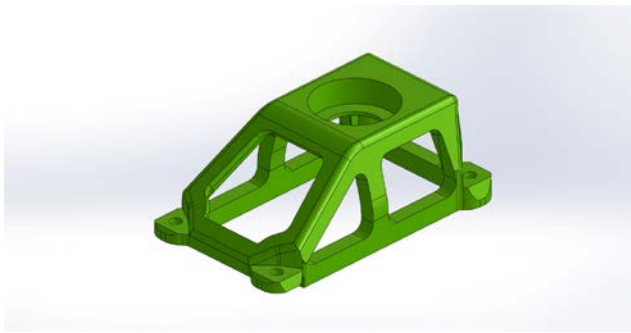
Battery Clip



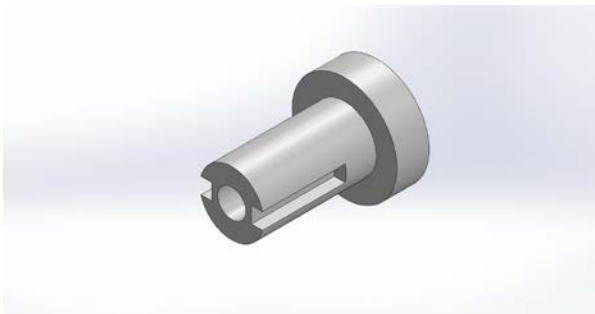
Battery Rack



Cuppola



Custom Bushing Servo Shoe



Drive Wheel - 45mm



M3x5 spacer



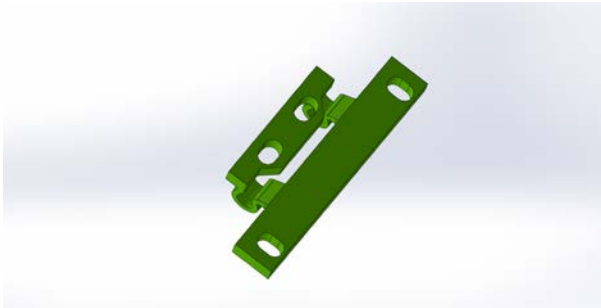
Neck Post



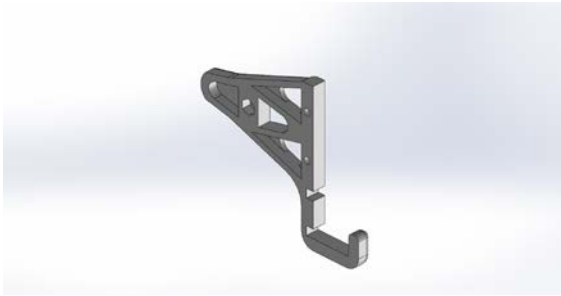
Phone Strap Clip



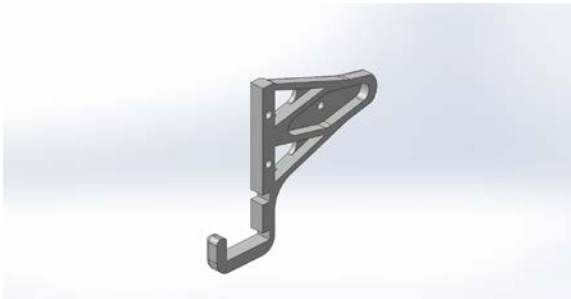
Servo Flex Hinge



Tilt Arm Pivot



Tilt Arm Shoe



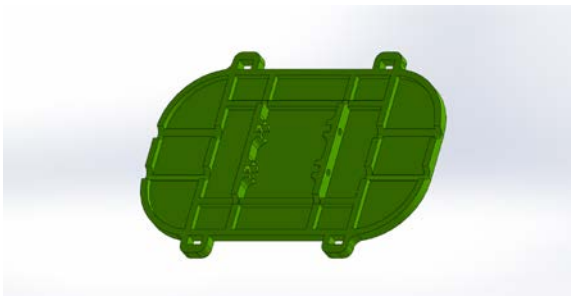
Tilt Base Left Arm



Tilt Base Right Arm



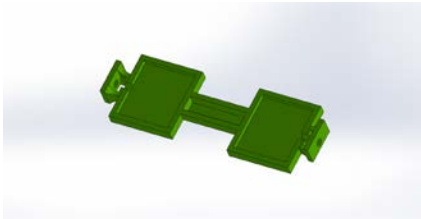
Tilt Face



Tracks



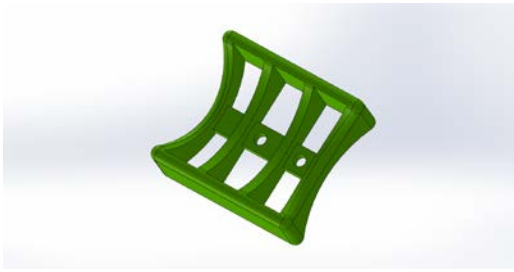
Understrut - 2 UBEC



Understrut - UBEC and 9V

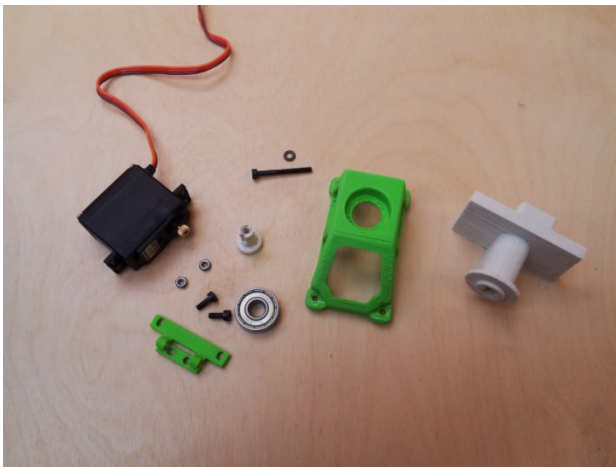


Tread Support



Build Instructions

Neck Assembly



Parts Needed:

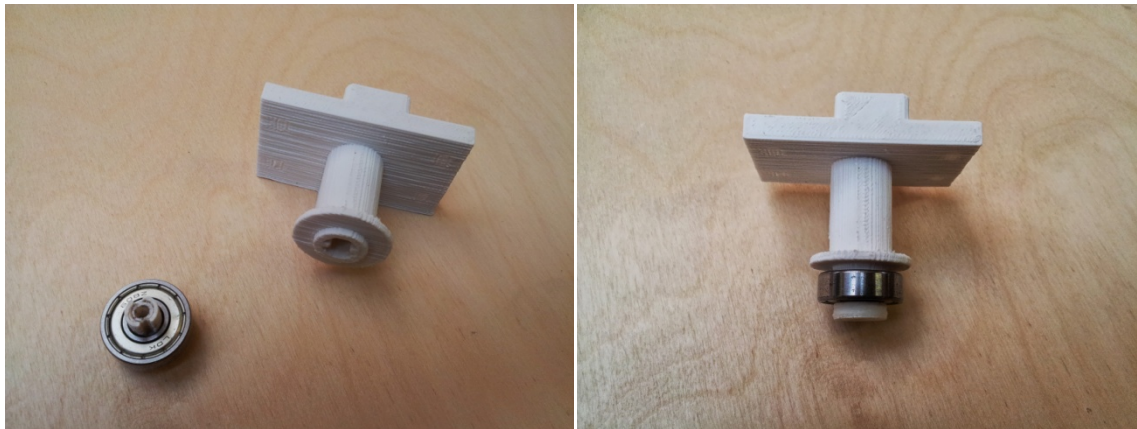
Servo Block (1), Neck Post (1), Custom Bushing (1), 608 Bearing (1), Servo (1), Servo Flex Hinge (1), M3x30 (1), M3x12 (2), M3 Washer (1), M3 Nut (2)

Directions:

1. Put custom bushing into 608 bearing, should be a snug fit on the inside of the bearing.



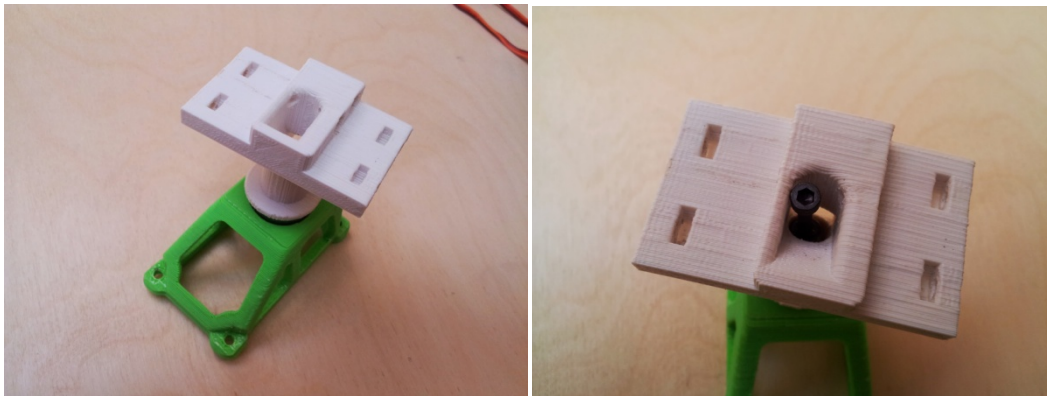
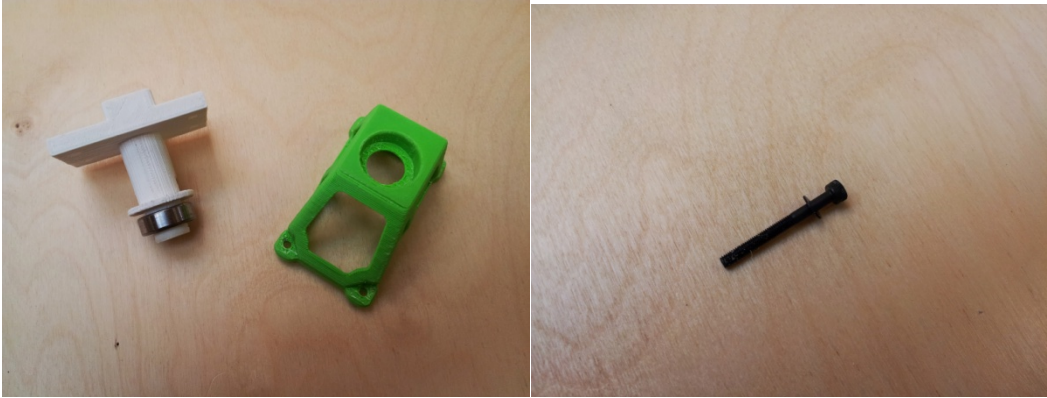
2. Push Custom bushing and 608 bearing into Neck Post. Should be able to slide in and out easily.



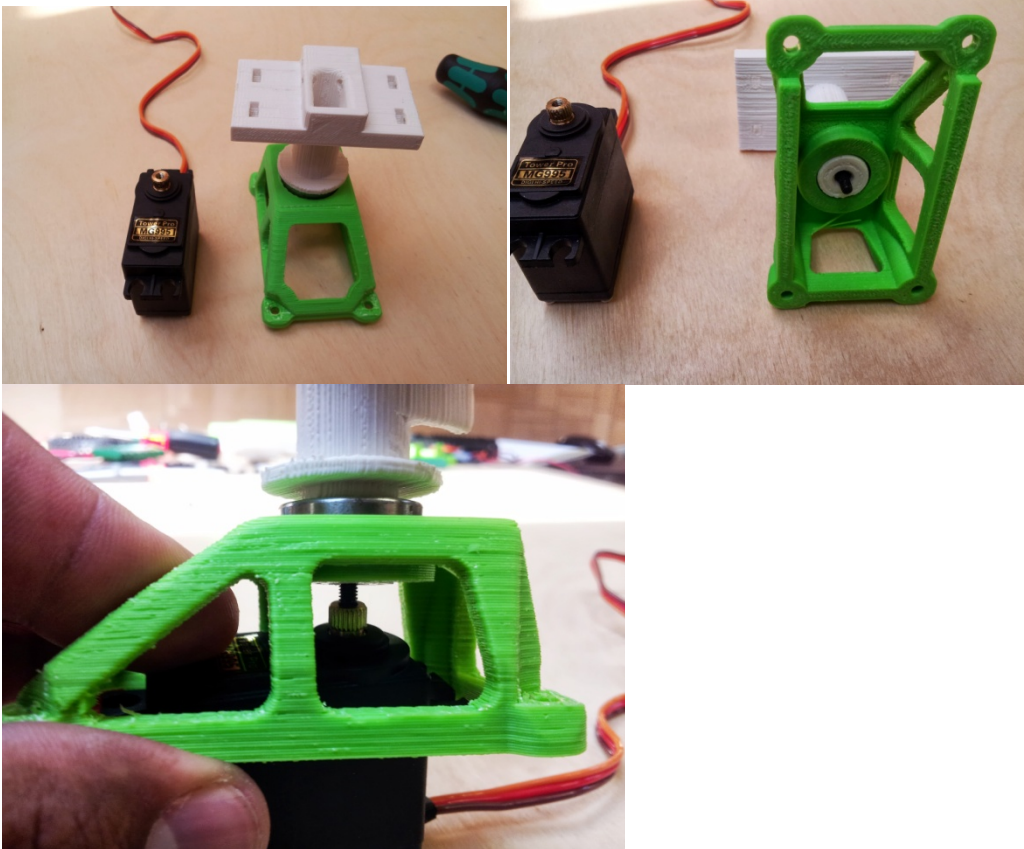
3. Zero Servo (note)



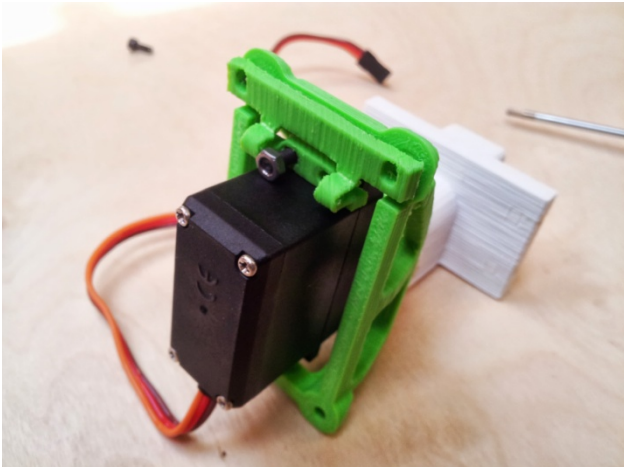
4. Attach neck post to cupola by fitting bearing inside top and put M3x30 with washer down the neck post. The screw should move loosely through center. Drill out if necessary.



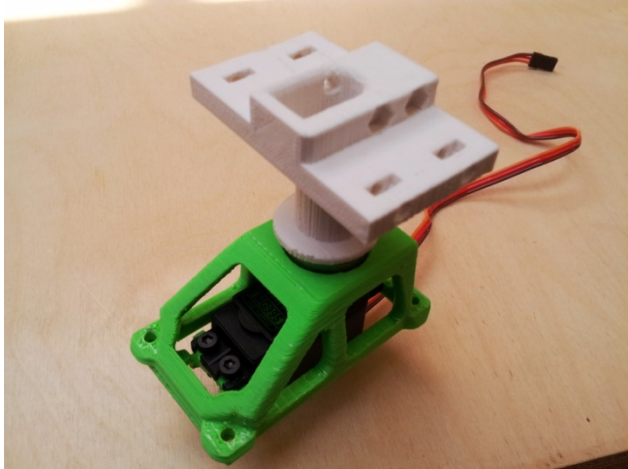
5. Make sure neck post is facing forward then screw to the zeroed servo with the M30 before clamping down.



6. Secure the servo to the Servo Flex Hinge with two M3x12s and nuts.



7. Check that servo is centered when the neck post is facing forward.



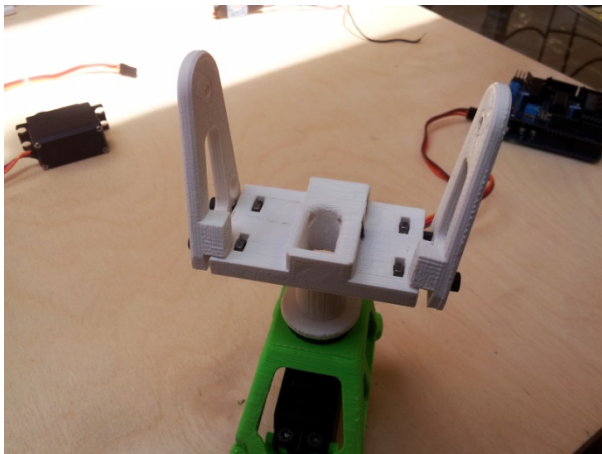
Head Assembly

Parts Needed:

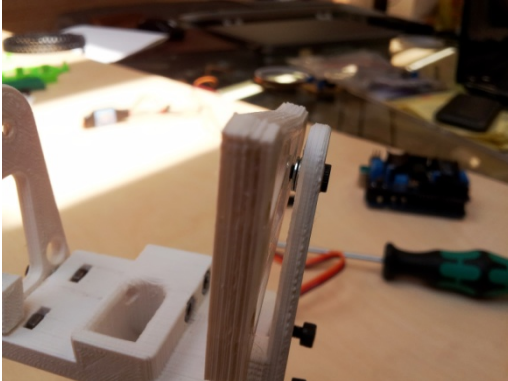
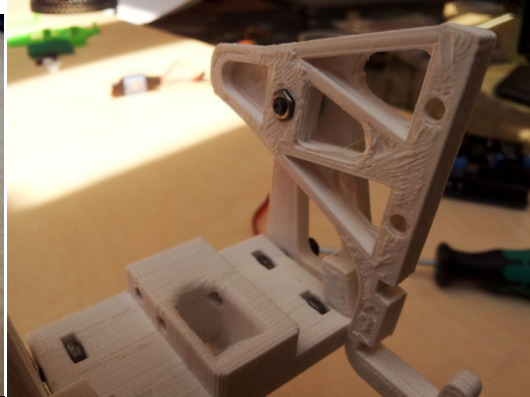
Tilt Arm-Right (1), Tilt Arm-Left (1), Tilt Arm Base-Pivot (1), Tilt Arm Base-Shoe (1), M3x30 (2), M3x12 (2), M3x16 (2), M3 washer (4), M3 nuts (6), #2 screw (1), Tilt Servo (1), Pan Servo (1)

Directions:

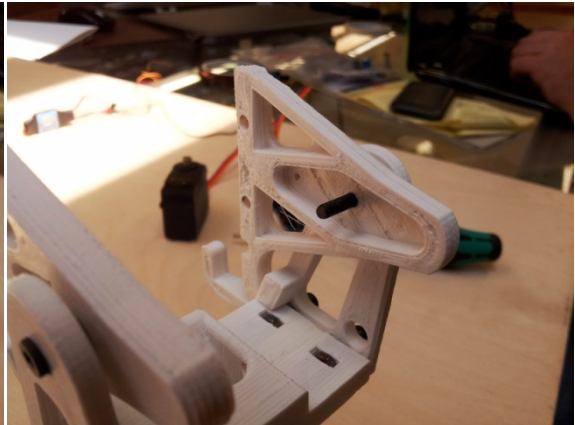
1. Put (6) M3 nuts into nut traps on the Neck Post.
2. Attach the tilt base arms to the Neck post loosely. Do not tighten down as you will need some give to assemble the entire head.



3. Put a nut in the nut trap of the tilt arm pivot and attach the tilt arm pivot to the left tilt base arm with 2 M3x12s and 2 washers on the inside of the tilt arm. DO not tighten down, loose fit please.



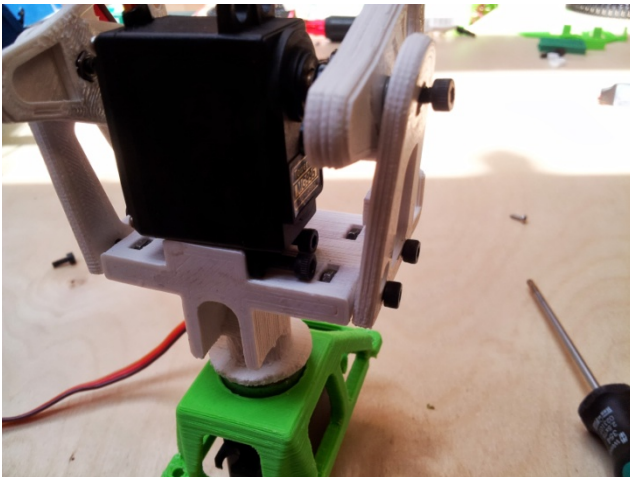
4. Attach tilt arm shoe to right tilt arm with M3x16 and 2 washers on the inside of the right tilt base arm.



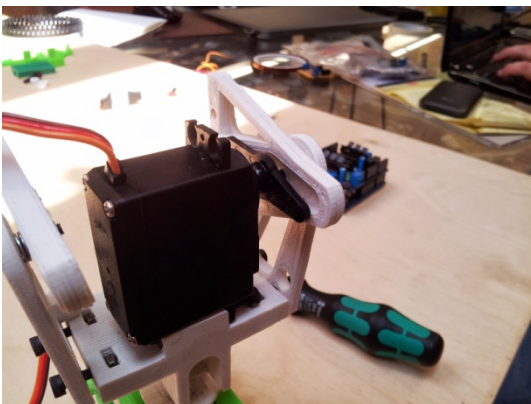
5. Screw in 2 M3x30s through the inside top of the Neck post, loosely.



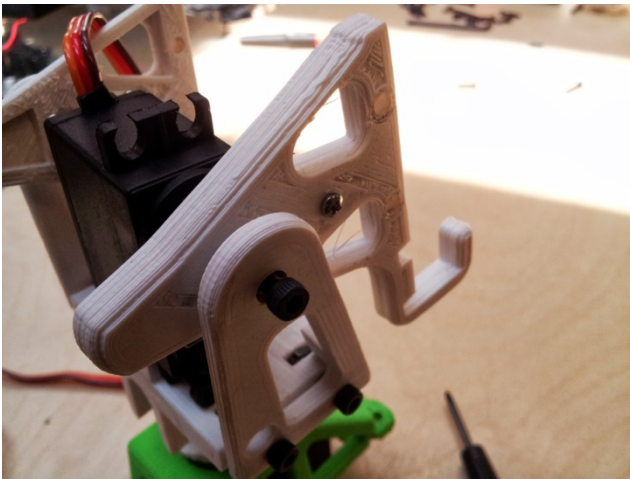
6. Zero Tilt Servo.
7. Secure the Tilt servo to the Neck Post using the M3x30s in the previous step. Make sure the servo horn is facing the tilt arm shoe and tilt base arm right.



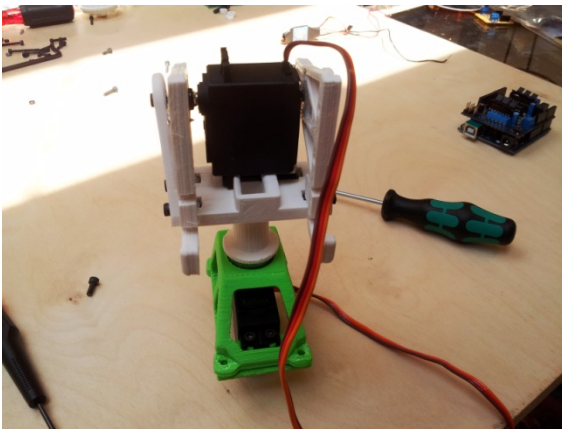
8. Now that servo horn is placed in shoe pocket, use the #2 screw to secure the horn to the tilt assembly.



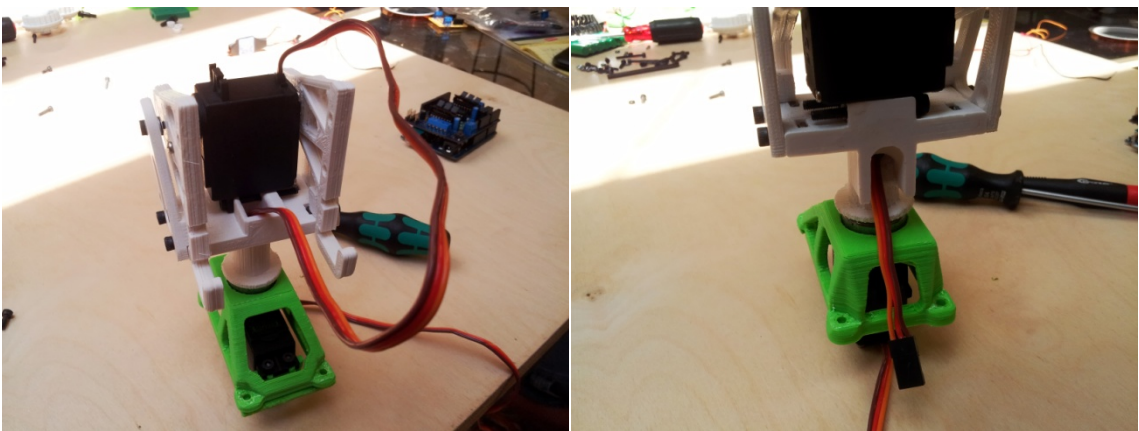
9. Tighten tilt servo screw, don't strip!



10. Tighten all screws on head assembly.



11. Run the servo wire through the center channel of the neck and out the back.



Attaching the Face Plate

Parts Needed:

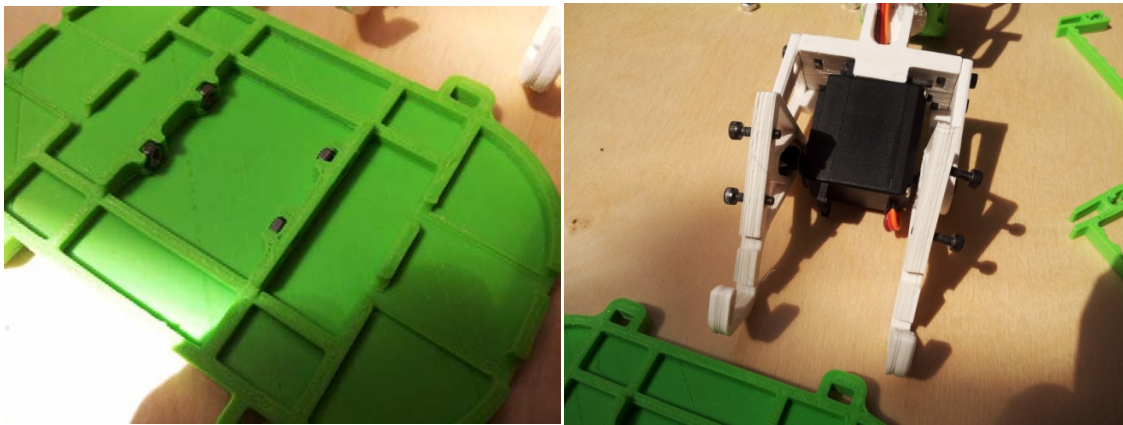
Tilt Face (1), Sticky Pad (1), Phone Bracket Clips (2), M3x12 (4), M3 nuts (4)

Directions:

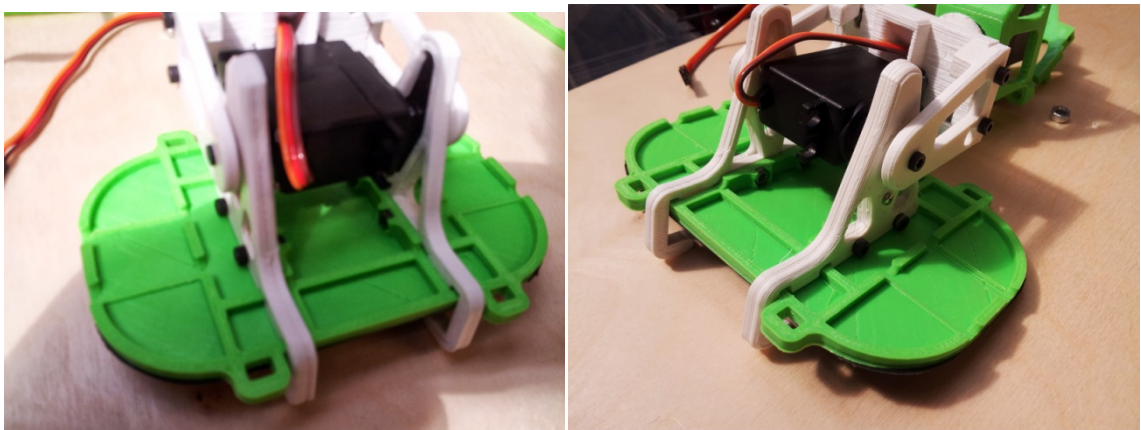
1. Affix the sticky pad to the Tilt Face so the grip side is where the phone will rest against.



2. Put 4 M3 nuts into the nut traps on the back of the tilt face.



3. Attach the tilt face to the left and right tilt arms with 4 M3x12.



4. Clip the Phone Bracket Clips to the Tilt Face.

Body

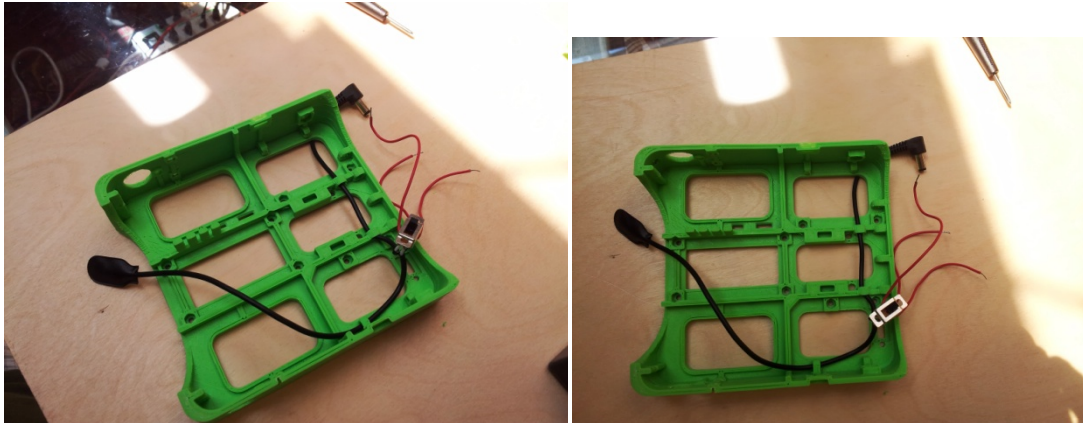
Wiring the Power

Parts Needed:

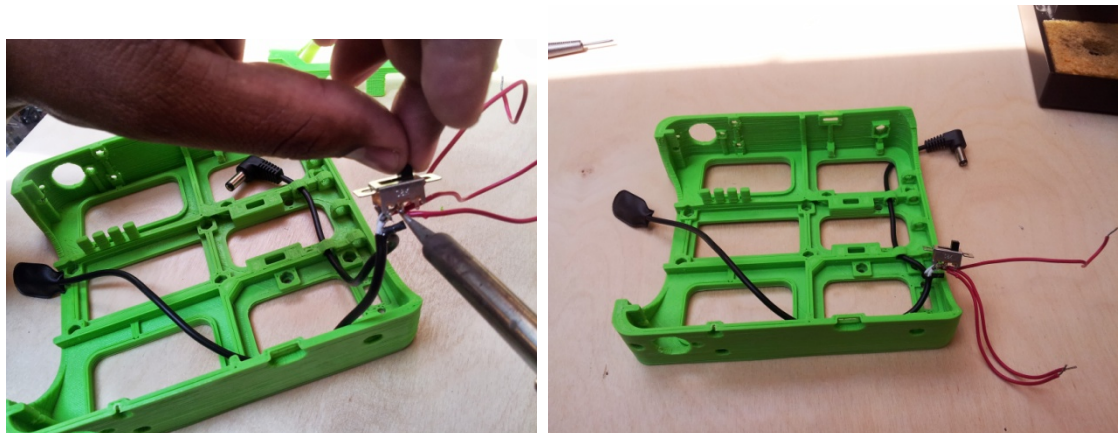
9v clip (1), Barrel adaptor (1), Switch (1), 22 gauge wire, Solder and Soldering Iron, Female tama connector

Directions:

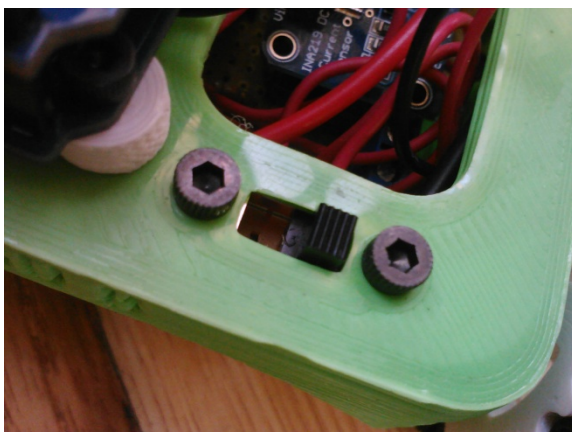
1. Run the wires of the 9v clip, female Tamiya, and the barrel adaptor being conscience of where they are going. See picture for help.



2. Solder the switch using the Switch circuit diagram. The switch should be able to turn on the power to the 9v and NiMH batteries.



3. Attach switch to the chassis through the switch cutout with 2 M3x8s and M3 nuts. Note: some newer chassis models have the switch go directly into bread board. If so, skip this step.



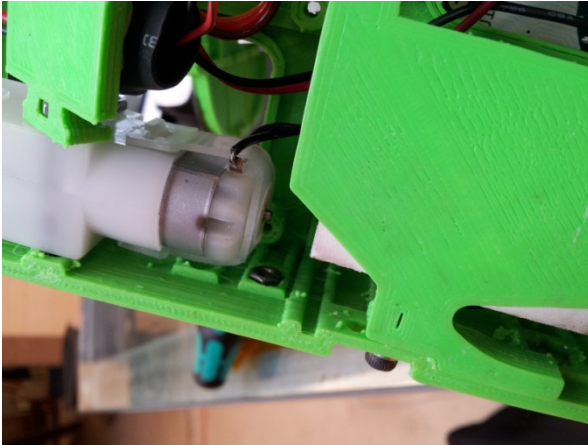
Installing Tread Supports

Parts Needed:

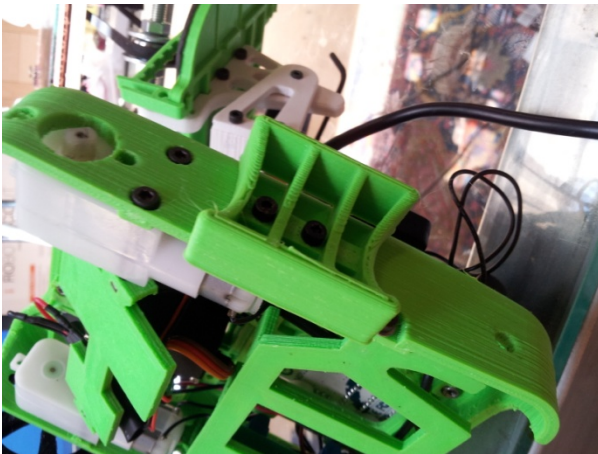
Tread Supports (2), M3x8 (4), M3 nuts (4)

Directions:

1. Put 4 M3 nuts in the nut traps located on the underside of the chassis. This is easier done before installing motors so please forgive the picture.



2. Attach each tread support to chassis with 2 M3x8s.



Attaching the Motors

Parts Needed:

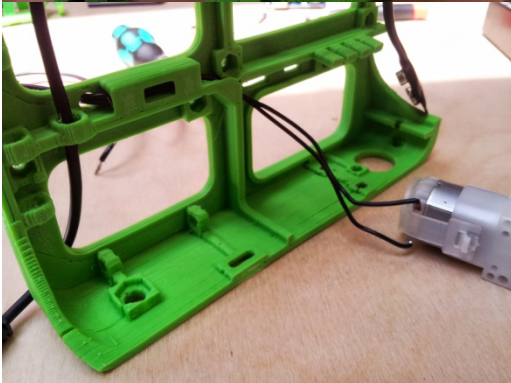
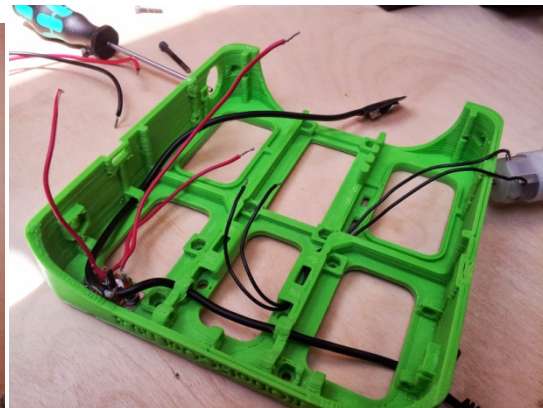
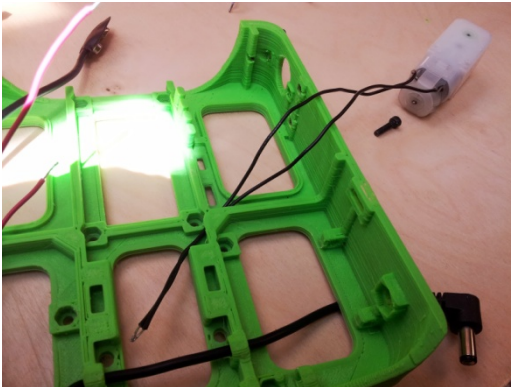
Motors (2), M3x12 (2), M3x30 (2)

Directions:

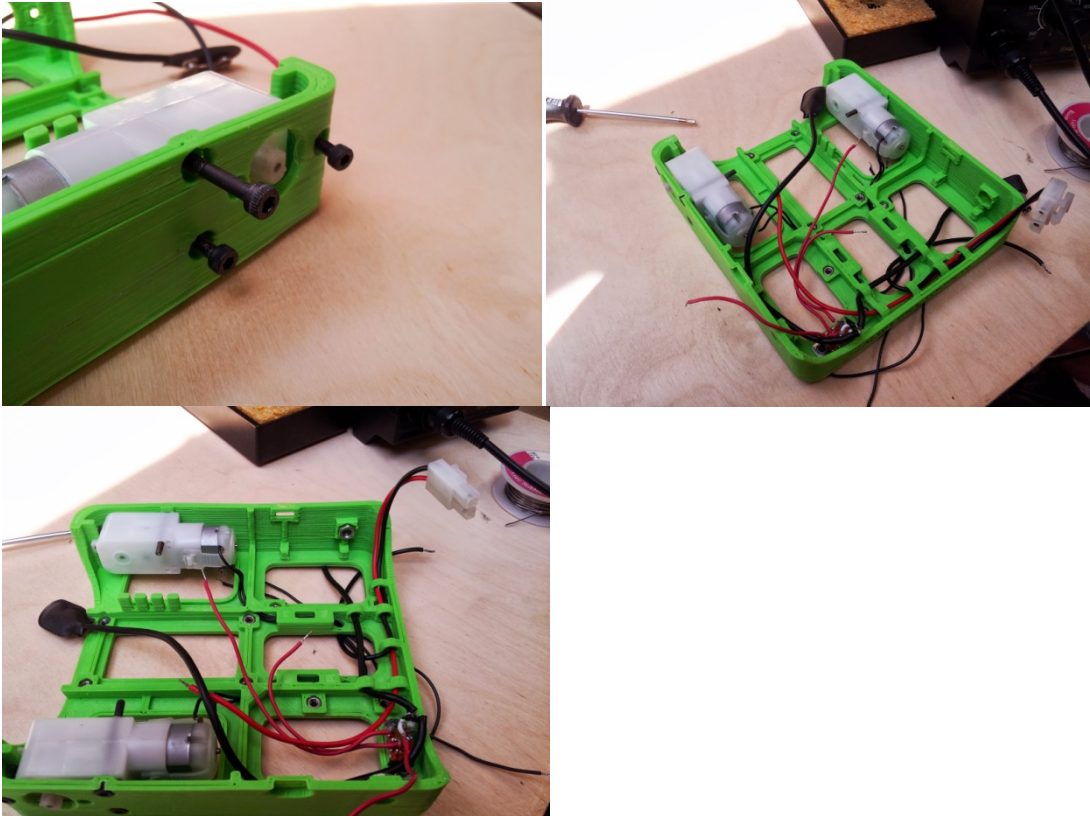
1. Solder wires to the motor, leaving enough wire to run to where motor shield connections are (the back of the chassis)



2. Run the wires through the allocated wire channels on the underside of the chassis. See picture for suggestions.



3. Attach the motors to the chassis with an M3x12, M3x16, and M3x30. See the diagram for which screws go where. In short, the M3x12 should be closest to the actual chassis top. The M3x16 should be closest to the front of the chassis. The M3x30 should be the closest to the bottom of the chassis. The M3x30 should be loose. If not, drill it out.



Attaching the UBEC

Parts Needed:

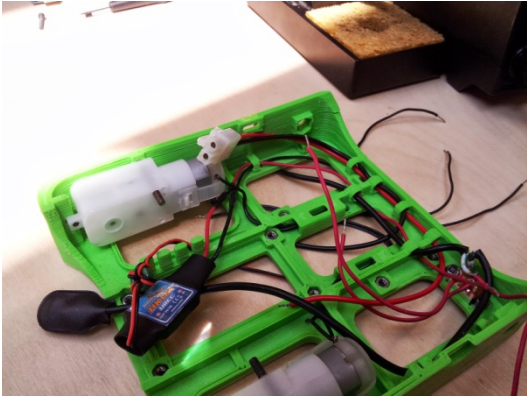
UBEC (1), Understrut - UBEC (1), Earthquake putty, zip tie, super glue, or other adhesion to hold ubec in place.

Directions:

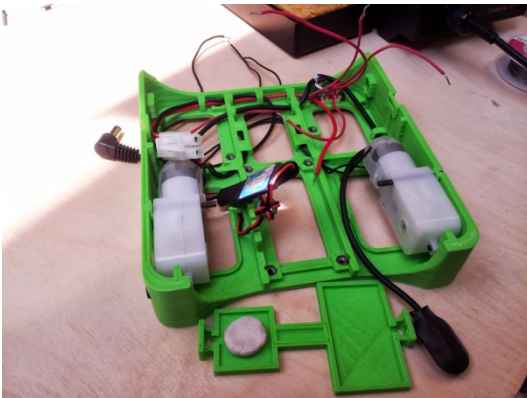
1. Thread UBEC out put through the appropriate chassis channel. See picture for details.



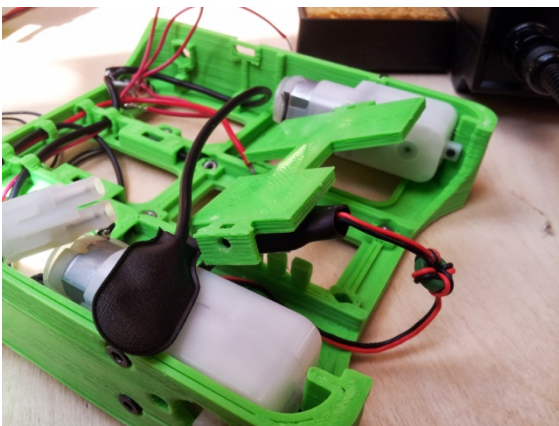
2. Wire the input through channels on the underside of the chassis. See picture for details.



3. Put 2 M3 nuts into the nut traps on the Understrut-UBEC.
4. Secure UBEC to Understrut-UBEC with putty or other means (tape?)



5. Attach the Understrut-UBEC to the underside of the chassis using the M3x30s going through the motors.



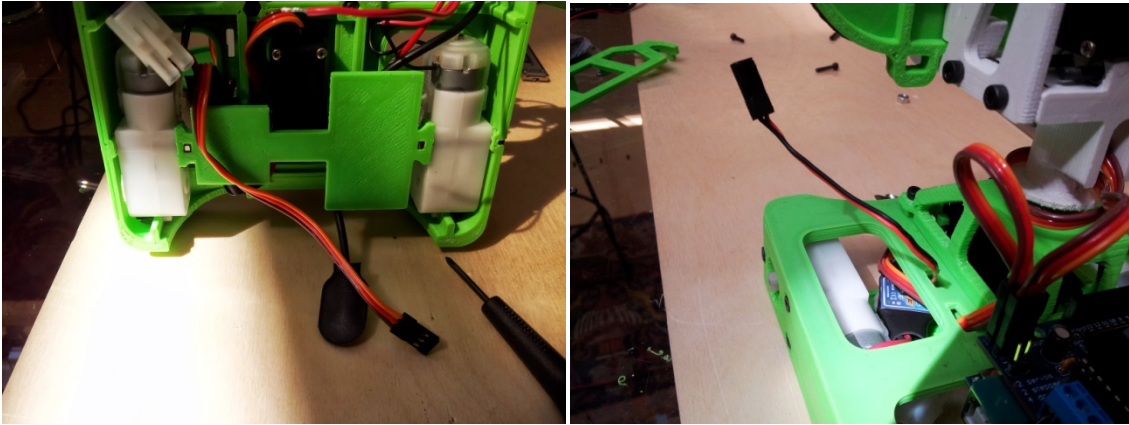
Mounting Neck and Head Assembly to the Chassis

Parts Needed:

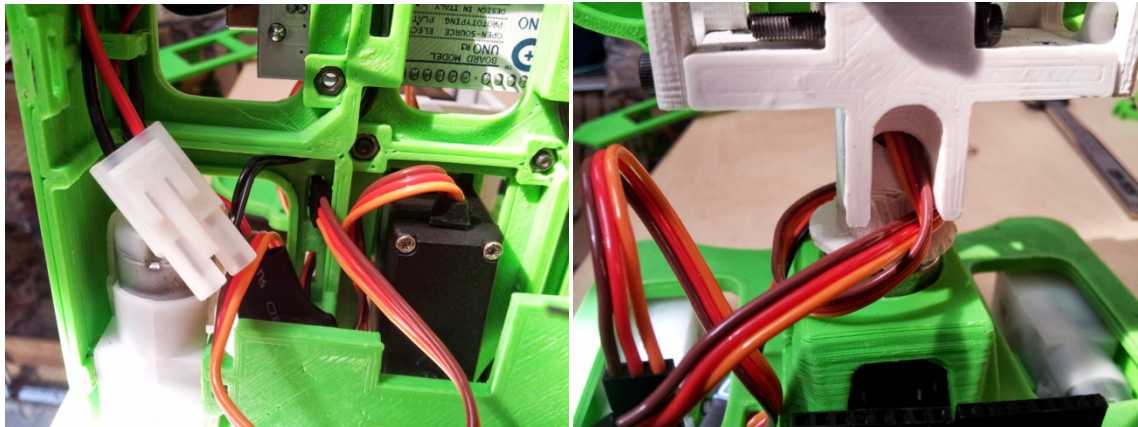
M3x12 (4), M3 nuts (4)

Directions:

1. Run Pan Servo wire through the servo hole of chassis.



2. Attach the Cupola to the chassis using 4 M3x12s and 4 M3 nuts in the nut traps on the underside of the chassis.



3. We've found it easier to finger tighten all 4 bolts first.

Mounting the Arduino

Parts Needed:

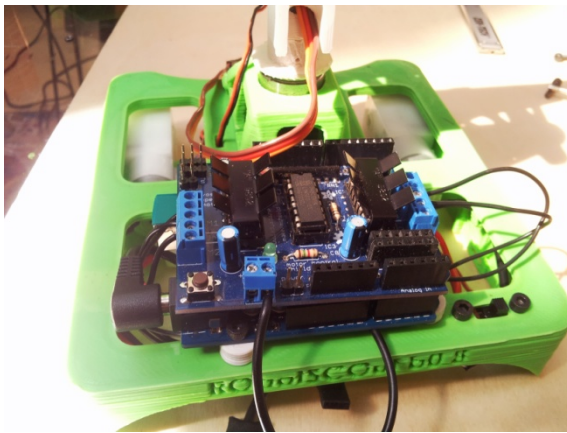
M3x12 (4), M3 nuts (4), M3x5 Spacer (4)

Directions:

1. Mount the Arduino to the chassis with the M3x12s through the M3 nuts in the nut traps on the underside of the chassis. Use the M3x5 Spacers between the chassis and the Arduino. This will give you clearance when connecting the usb cable.



2. Get in as many screws as you can, it is common for only 3 to fit.



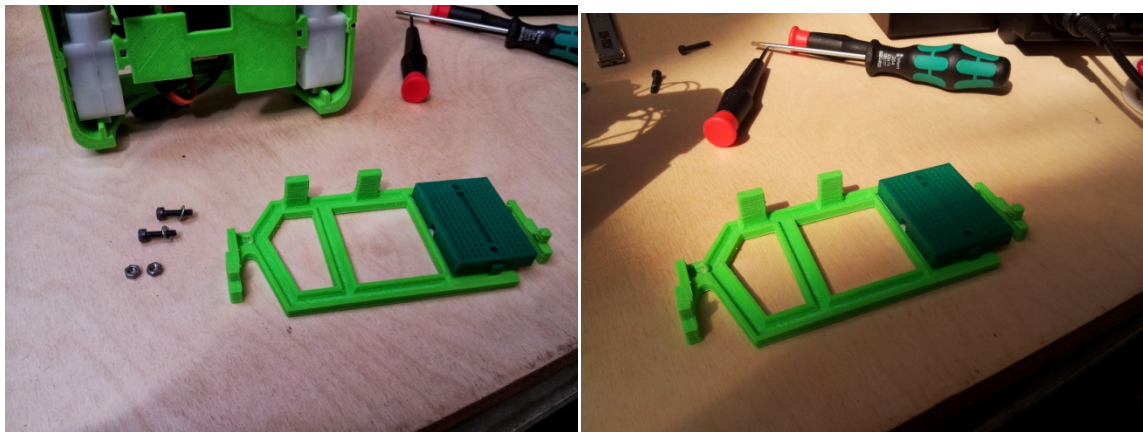
Mounting the Battery Rack and Breadboard/PCB

Parts Needed:

Battery Rack (1), Wireless breadboard (1), M3x12 (2), M3 nut (2), M3 Washer (2)

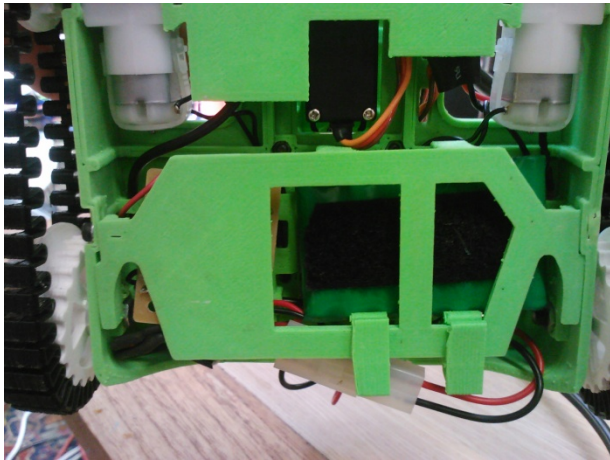
Directions:

1. Mount breadboard (or custom pcb) to Battery Rack. Usually, they are self adhering. If not use, putty or other adhesion method.



2. Put 2 M3 nuts into the nut traps on the Battery Rack.

3. Mount the Battery Rack to the chassis with 2 M3x12s. Put the M3 washers on the outside of the chassis where they should fit into the groove.



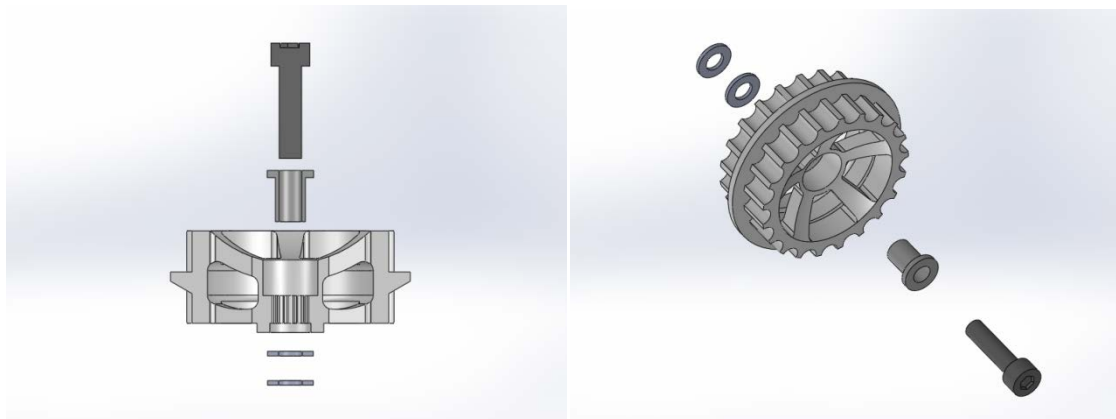
Attaching the Wheels

Rear Wheels

Parts Needed:

Rear wheels (2), Nylon Bushing (2), M5x20 (2), M5 Washer (4)

Directions:



1. Put M5x20 into the Nylon Bushing.
2. Insert into the rear wheel
3. Thread M5x20 through the chassis using 2 M5 washers to space the wheel from the chassis.
4. Secure with an M5 nut on the inside of the chassis.

Front Wheel

Parts Needed:

Front Wheels (2), #2 Screw (2)

Directions:

1. Attach the Front Wheels to the motors using the #2 screws

Printed Tracks

Parts Needed:

Printed Tracks (2)

Directions:

1. Carefully remove tracks from printing surface.
2. Carefully remove support material
3. Carefully remove any superfluous printed material.
4. Carefully break in track by gently rolling between hands.
5. Carefully stretch around rear wheel.
6. Carefully stretch around front wheel.
7. Be careful.

Wiring Rosco and Custom Circuits

Motor Shield

Modifying the Adafruit Motor Shield for External Power

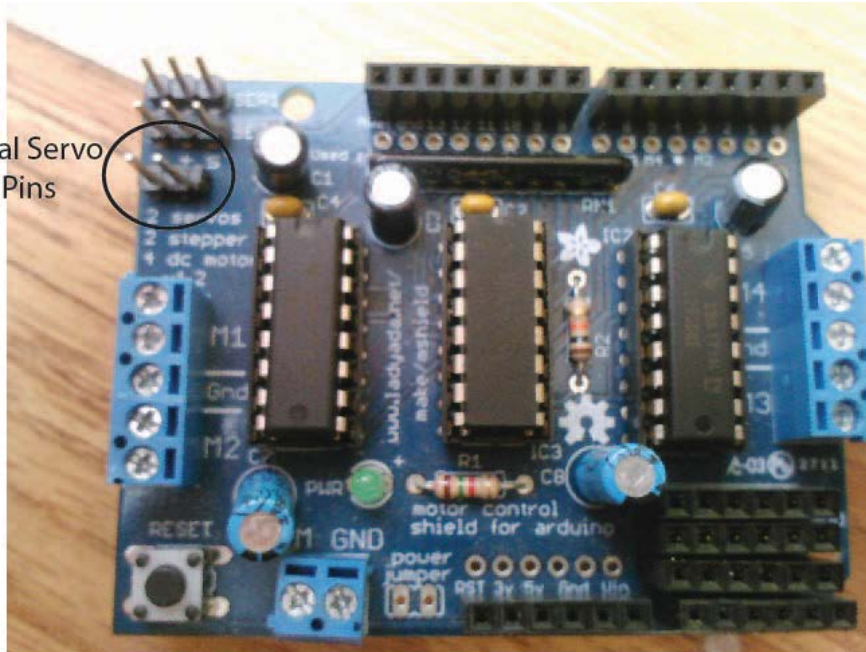
The motor shield is set up to depend on the Arduino to power the servos. This causes some undesired effects that can be circumvented by modifying the shield to allow the servos to be powered by external power. In this case, the external servo power is the 5v output of the UBEC. The UBEC is supplied power from the 8.4v NiMH battery.

To enable this feature you must cut the traces on the underside of the Adafruit motor shield.

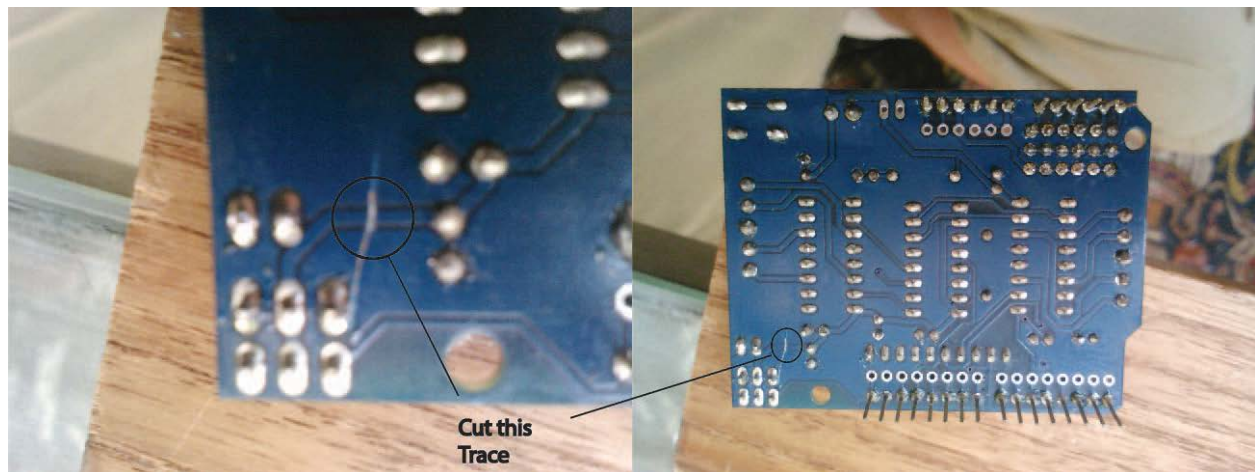
NOTE: THIS IS FOR THE ADAFRUIT MOTOR SHIELD V1.2. IF YOU HAVE A DIFFERENT VERSION CHECK SCHEMATICS FOR COMPADABILITY!!

1. Locate and/or solder in place the external servo power header pins .

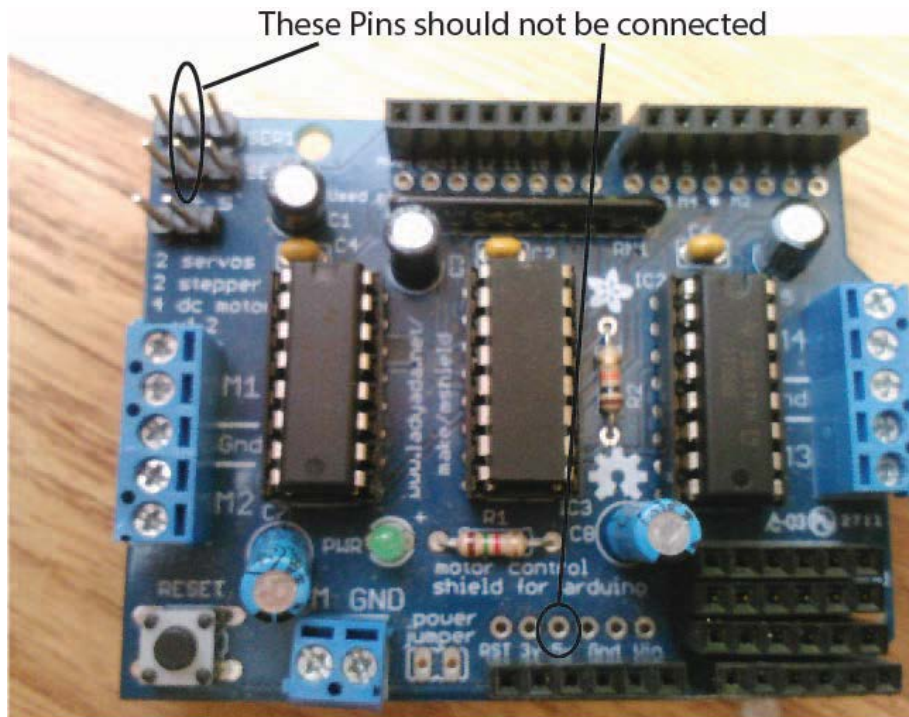
External Servo Power Pins



2. On the underside of the motor shield, locate the traces that connect the servo power to the 5v of the Arduino.



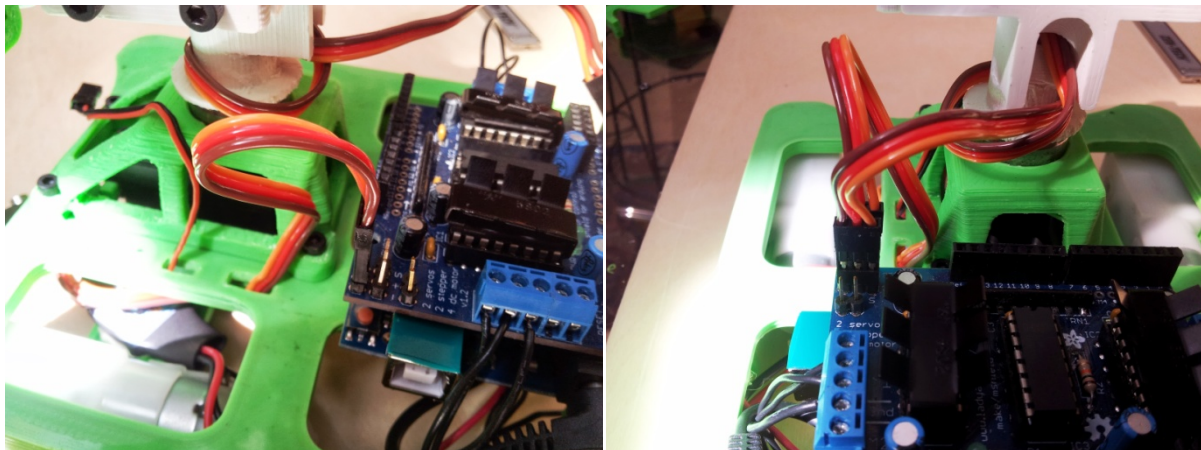
3. Using an exacto-knife, carefully sever the trace.
4. Using a multi-meter, check to make sure the old servo power supply pins are no longer connected to the 5v Arduino supply. The "grounds" will still be connected so make sure you're checking the correct pins.



5. Now your motor shield is ready to allow the servos to be powered by an external 5-6v power supply!!! Just make sure you connect the UBEC to the external servo power pins you follow the correct polarity.

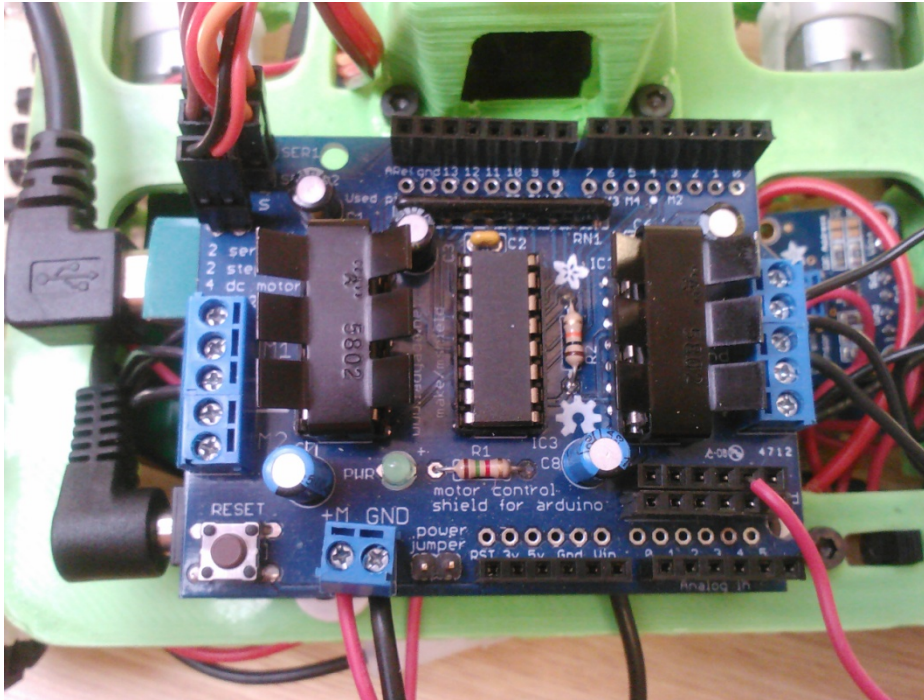
Wiring Adafruit Motor Shield

1. Connect motor shield to Arduino.
2. Connect the tilt Servo to Servo2 and pan servo to Servo1

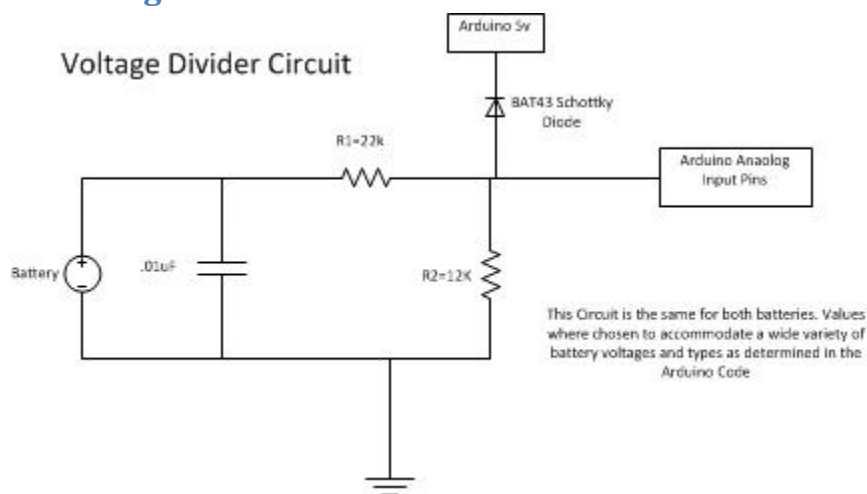


3. Make sure motor shield has been modified for external power or that your motor shield can regulate power for the servos away from the 5v supply of the Arduino.
4. Connect the Output of the UBEC to the pins for servo external power.

5. Connect the motor wires to the M1 and M4 headers on the shield. We use one h-bridge for each side but this can be modified if so desired. Don't worry about polarity, that can be fixed later once you start running the testing Arduino code.
6. Connect the Wires from the switch to the M+ and Gnd header on the Adafruit motor shield so that when the switch is closed the board will get power from the female tamiya connector . This is what the 8.4v NiMH battery will connect to and supplies power to the motors and UBEC. The UBEC, in turn, supplies a regulated voltage (5V) to the servos.



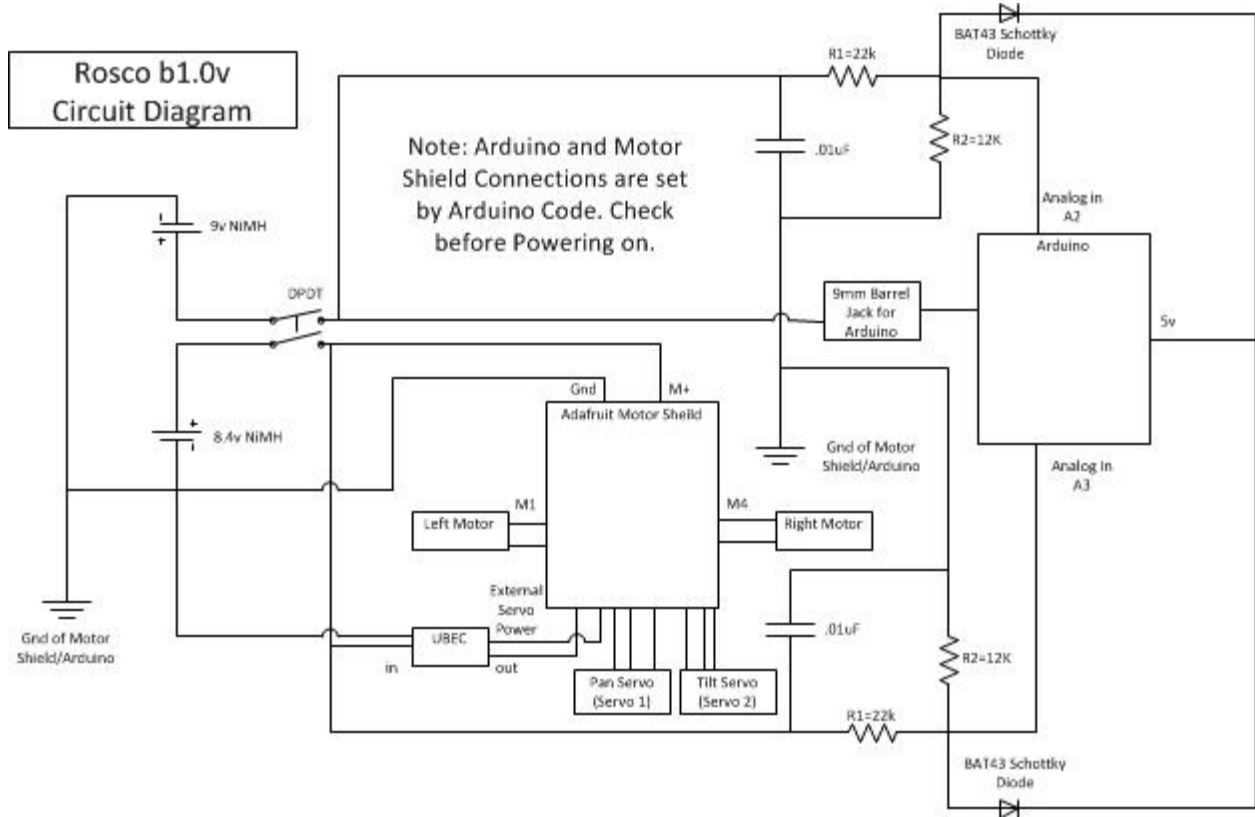
Fuel Gauge Circuit

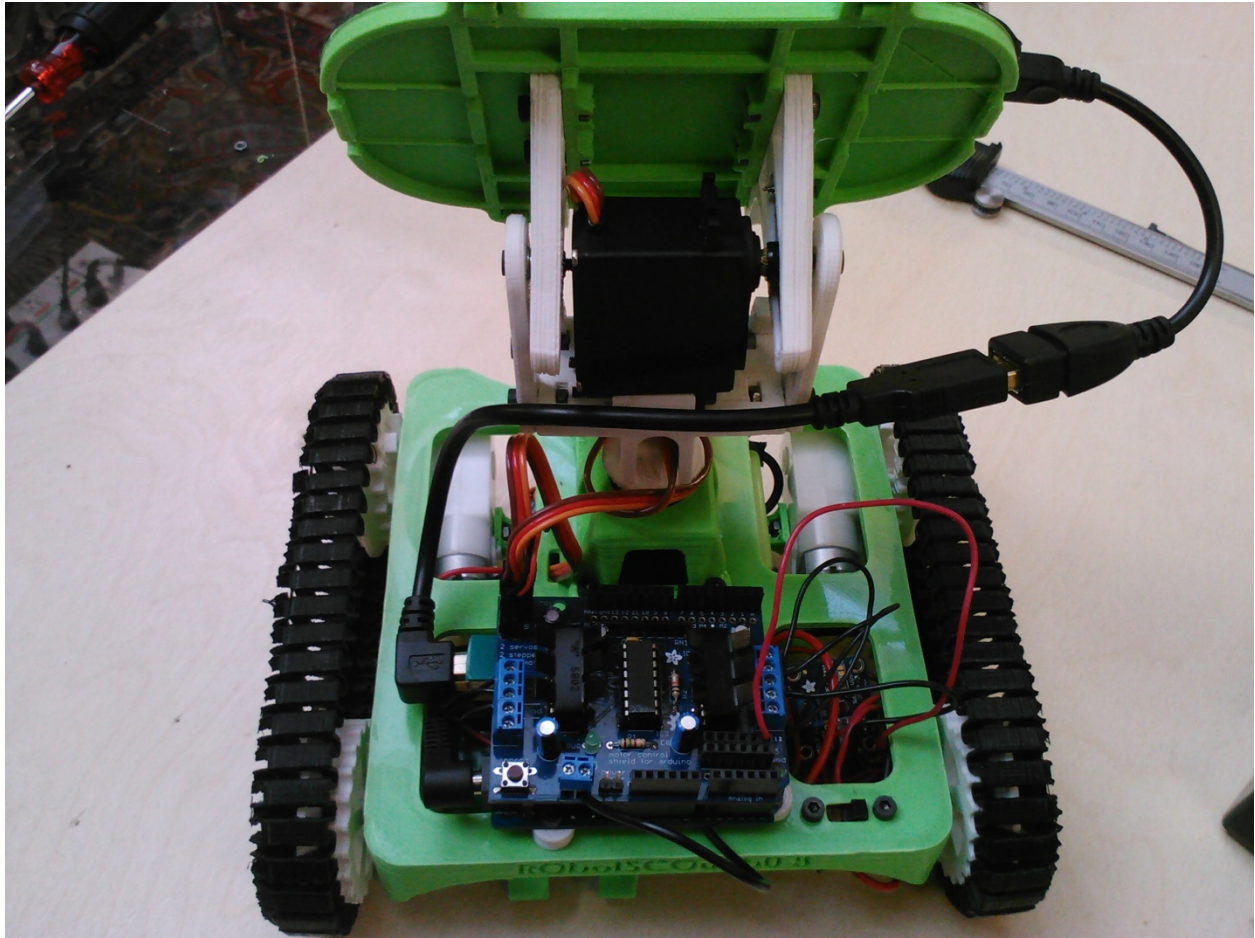


Custom PCB/Bread Board

The solder less proto-board allows you to customize Rosco with your own sensors, circuits, etc. We recommend using this board until you can finalize your design before creating your own custom PCB. We are currently at work finalizing a PCB which will include the fuel gauge along with a few extra goodies.

Rosco b1.0v Wiring Overview





3d Printing Notes

Most of the files are ready to print as is, but here are some notes on parts that may give you some trouble.

ABS vs. PLA

Most parts can be made of either material with the following exceptions:

Custom Bushing must be PLA or the servo post will grind out teeth.

One Piece Tracks, Servo Flex Hinge, Battery Clips, and Phone Strap Clips must be ABS or they will snap during use.

In short, use PLA for parts that need to be ridged and ABS for anything that needs to flex.

Happy Printing!

Support Material

We sliced our models with 90° support angles. The models needing support are the wheels, cupola, chassis, and servo hinge. You can adjust your support material settings in your CAM software.

The neck post and printed treads have support material put in the model.

Adding Brim

For some ABS parts, namely the chassis, you might want to add brim to keep the print from curling. With our setup we used 5mm of brim. Better safe than wasting long hours of printing!!! You can adjust you brim settings in your CAM software.

Being Careful with the Printed Treads

As stated before, the treads **must be ABS** and have support material in the model. **Carefully, remove the printed tracks from your printer bed. Carefully remove and support material and other misprinted plastic.** To prep the tracks for use, after removing support material and any other misprinted material, **CAREFULLY ROLL THE TREADS BETWEEN YOUR HANDS TO LOOSEN PRINT.** It is normal to hear some popping when this happens. Just be gentle.