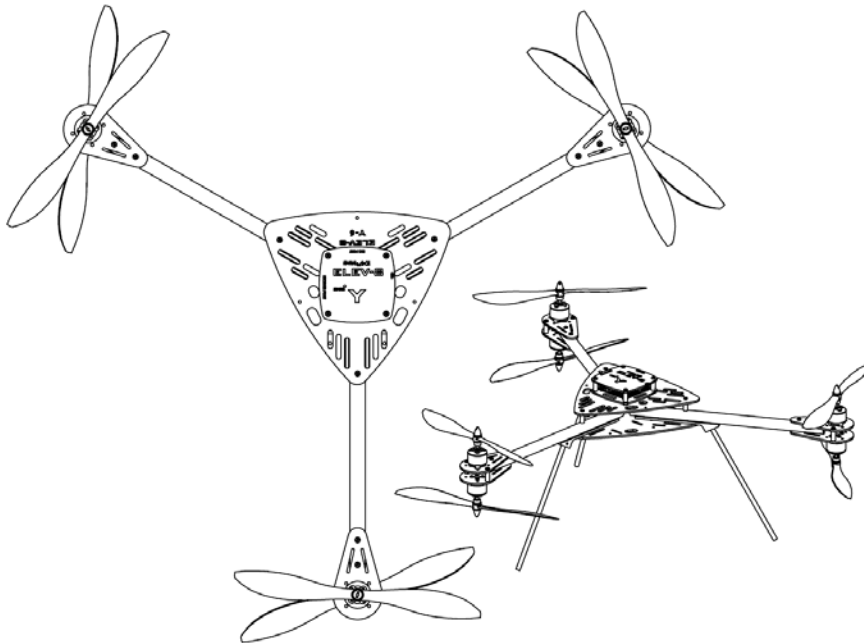# ELEV-8 Y-6 Multicopter Kit (#80100) Information and Assembly Guide

## Features

- Six-rotor system with fixed-pitch blades
- Propeller P8X32A microcontroller flight control board
- Pre-programmed with flight-control software
- Custom plates protect motors and electronics
- Designed to easily attach a camera mount
- Great for FPV (First-Person-View) Camera Systems

## Specifications

- Weight, without battery: 2.7 lbs (1.23 kg) fully assembled
- Payload capacity, excluding battery: ~ 4 lbs (1.8 kg)
- Average assembly time: 8 hours
- Height (assembled): 9 in (23 cm)
- Rotor-to-rotor width (centers): 22 in (55.9 cm)

## Additional Items Required

- RC radio controller and receiver, 5-channel minimum  for flight
- 2 LiPo Batteries, 3000 to 4400 mAh 3-cell 30 C discharge rate
- LiPo Battery Charger
- PC running Windows to configure the control board firmware for Y6 operation

## Application Ideas

- Hobby RC flying
- Aerial photography
- Flying tele-presence platform

⚠ **CAUTION:  READ ALL WARNINGS AND PRECAUTIONS (PAGE 2) BEFORE ASSEMBLY OR OPERATION!**

# ⚠ READ THIS FIRST – IMPORTANT SAFETY INFORMATION!

- READ ALL WARNINGS AND PRECAUTIONS ON THIS PAGE BEFORE ASSEMBLY OR OPERATION!

- WARNING: CUTTING HAZARD.  Rotating ELEV-8 Y-6 blades can cut skin and underlying tissues. Stay away from a powered ELEV-8 Y-6 Multicopter  and never become complacent during operation.

- WARNING: ENTANGLEMENT HAZARD. Secure long hair and loose clothing or jewelry when building, testing, and operating your ELEV-8 Y-6 Multicopter to avoid entanglement with motors.

- WARNING: EYE HAZARD. Always wear eye protection when assembling, soldering, operating, or repairing your ELEV-8 Y-6 Multicopter.

- Customer agrees to fly at Academy of Model Aeronautics (AMA) approved flying fields, maintaining insurance through their AMA membership.

- Inform yourself of and follow all current federal, state, and local laws regarding the use of hobby RC aircraft in the area where you plan to operate your ELEV-8 Multicopter craft. Review the FAA's rules in entirety – you are responsible for following them.

- An ELEV-8 Y-6 Multicopter assembled and used as directed in this document is an RC hobby aircraft and does not constitute the use of an autonomous UAV or drone.  Modifying your ELEV-8 Y-6 Multicopter to function as an autonomous UAV or drone is not supported, recommended, or endorsed by Parallax Inc.  If you choose to modify your ELEV-8 Y-6 Multicopter to function as an autonomous UAV or drone, you do so entirely at your own responsibility and risk.

- This kit is not for beginners.  Advanced mechanical skill is required for building and flying an ELEV-8 Y-6 Multicopter. RC aircraft experience is highly recommended.

- Follow the instructions carefully; incorrect assembly of your ELEV-8 Y-6 Multicopter could cause risk of catastrophic equipment failure, personal injury to you or others, and property damage.

- Perform initial electronic speed controller (ESC) programming before installing the propeller blades.  Remove propeller blades before reprogramming the ESCs.

- Establish and test the radio link between the RC controller and RC receiver before installing the propeller blades.  Remove propeller blades before testing a different controller.

- Always disconnect the battery when not in use.

- Store your ELEV-8 Y-6 Multicopter and its radio controller out of reach of children, pets, and those who do not know how to use them safely.

- Only operate your ELEV-8 Y-6 Multicopter in an area with no children, unsecured pets, or livestock, which can be harmed by contact with rotating blades.  For example, children and dogs may try to jump and catch a flying Y-6 Multicopter, or may run to investigate one that has just landed.

- Only operate your ELEV-8 Y-6 Multicopter outdoors and away from crowded areas.  All observers should stand a safe distance *behind*  the operator.

- Only operate your ELEV-8 Y-6 Multicopter in an environment where you can maintain unobstructed visual contact with it.  Do not operate at night, or where there is fog, smoke, or dust that could limit visibility.

- Keep your ELEV-8 Y-6 Multicopter dry! Do not submerge your ELEV-8 Y-6 Multicopter or operate it in rainy or damp conditions. Beware of sprinklers and of landing in wet vegetation.

- Check the wind speed before flying your ELEV-8 Y-6 Multicopter. Even a light breeze can make flying difficult for beginners. No one should fly in high winds.

# Bill of Materials

This bill of materials is provided so you may inventory each bag in your ELEV-8 Y-6 Multicopter Kit before beginning construction. If you are missing any parts, contact sales@parallax.com directly for assistance. Note that some items are small sub-kits with additional components not listed separately. Parts and quantities subject to change without notice. Some items are available online from www.parallax.com.

| ELEV-8 Y-6 Kit Contents (#80100) | | |
|---|---|---|
| Part # | Qty | Description |
| 31500 | 1 | Hoverfly OPEN Board |
| 700-10003 | 1 | Safety glasses |
| 80130 | 1 | ELEV-8 Y-6 Airframe Kit |
| 80120 | 1 | ELEV-8 Y-6 Hardware Kit |
| 80110 | 1 | ELEV-8 Y-6 Electronics Kit |
| 85000 | 1 | ESC Programming Card |

| ELEV-8 Y-6 Airframe Kit Contents (#80130) | | |
|---|---|---|
| Part # | Qty | Description |
| 730-00060 | 3 | ELEV-8 Boom (Black) |
| 721-80010 | 1 | ELEV-8 Control Board Top Plate |
| 721-80002 | 1 | Control Board Mounting Plate |
| 721-80012 | 1 | Y-6 Chassis Plate Top |
| 721-80013 | 1 | Y-6 Chassis Plate Bottom |
| 721-80006 | 6 | ELEV-8 Motor Mount Bottom |
| 730-00062 | 3 | Y-6 Landing Gear Mounts |
| 721-80014 | 3 | Y-6 Landing Gear(carbon fiber rods) |
| 120-00006 | 0.5 | 5" Red/White Checkered Sticker |
| 120-00007 | 1 | 5" Black/White Checkered Sticker |

| ELEV-8 Y-6 Hardware Kit (#80120) | | |
|---|---|---|
| Part # | Qty | Description |
| 712-00007 | 4 | Washer, #6, 3/8" OD, Zinc |
| 700-00085 | 3 | Screw, #6-32x1/8", Set, SS |
| 700-00036 | 4 | Nut, #4-40, Nylon |
| 713-00019 | 4 | Spacer, #4,x1/8", NY |
| 713-00043 | 16 | Standoff, nylon, 4-40, 5/8" threaded |
| 710-00036 | 12 | Screw, 4-40, 3/8", PH, SS |
| 710-00042 | 4 | Screw, 4-40, 1 1/4", PH, SS |
| 710-00006 | 8 | Screw,#4-40x1/2",PH,SS |
| 700-00024 | 4 | Locknut, 4-40, 1/4" |
| 710-00039 | 24 | Screw, 3 x 6 mm, 0.5 thread, black |
| 710-00100 | 6 | Screw, 4-40, 1/4", PH, Black |
| 720-28001 | 1 | Light Pipe |
| 725-00067 | 1 | 1.5 mm Hex Key |
| 700-00106 | 1 | Loctite 242 |
| 900-00021 | 2 | Nylon Strap, Black |
| 700-00059 | 24 | Washer, Lock, #4, Internal Zinc |
| 700-00093 | 12 | Zip Tie, 4", Black |

| ELEV-8 Y-6 Electronics Kit (#80110) | | |
|---|---|---|
| Part # | Qty | Description |
| 750-90002 | 6 | Brushless 1000kV |
| 721-80001 | 3 | GemFan 10x4.5-C Regular Carbon |
| 721-80000 | 3 | GemFan 10x4.5-C Pusher Carbon |
| 750-90000 | 6 | HW30A ESC |
| 750-00056 | 21 | 16 AWG silicone wire, stranded, red |
| 750-00058 | 1.25 | 12 AWG silicone wire, stranded, blk |
| 750-00059 | 1.25 | 12 AWG silicone wire, stranded, red |
| 800-00021 | 2 | 16" Red Pluggable Jumper-Male |
| 800-00022 | 2 | 16" Black Pluggable Jumper-Male |
| 350-00044 | 1.5 | Red LED Tape |
| 350-00045 | 3 | White LED Tape |
| 452-00088 | 1 | Nylon housing EC3 Plug 10-pack |
| 450-00050 | 2 | 3.5mm Gold Bullet Conn 10-Pk |
| 800-00036 | 13.5 | Heat-shrink 3/4" dia. tubing, clear |
| 800-00023 | 36 | Heat-shrink 3/16" dia. tubing, black |
| 800-00039 | 3 | Heat-shrink 1/2" dia. tubing, black |
| 800-00080 | 5 | 3-wire extension, 22AWG, F/F, 8" |

# ELEV-8 Y-6 ASSEMBLY INSTRUCTIONS

These instructions are for assembling the ELEV-8 Y-6 in its most standard configuration. Some steps are optional; we'll explain those along the way. The ELEV-8 Y-6 Multicopter platform is designed for creative experimentation and adaptation; however, we recommend that you try the standard configuration first, and then experiment at your own educated risk.

These instructions are available online as a full-color PDF; go to www.parallax.com and search "80100".

## Preparation

1. Read the entire assembly instructions before beginning. Assembly and testing takes about eight hours on average.

2. If you are missing any components, email support@parallax.com or call 888-512-1024 (inside continental US) or 916-624-8333.

3. Gather all of the additional items and tools required.

4. Charge your LiPo batteries with their charger.

## Additional Items Required

- RC radio controller and receiver, 5-channel minimum for flight
- 2 LiPo Batteries, 3000 to 4400 mAh 3-cell 30 C discharge rate
- LiPo Battery Charger
- PC running Windows to configure the control board firmware for Y6 operation

## Tools Required

- Soldering iron, solder, and flux
- Component vise
- #1 Phillips screwdriver
- 1/4 inch wrench, box-end or socket
- 11/32 inch wrench or nut driver
- Wire strippers/cutters (12-16 AWG)
- Scissors
- Needle-nose pliers
- Ruler or measuring tape
- Heat gun or blow dryer (for heat-shrink tubing)

## Step 1: Motor Set Screws

Start by applying Blue Loctite to the motor set screws, to prevent them from coming loose during flight and causing equipment failure.

1. Locate the Blue Loctite 242, the six motors, and the 1.5 mm Hex Key in the ELEV-8 Hardware Kit.

2. Refer to the drawing on the next page. Using the Hex Key, carefully remove the Motor Set Screws (item 2) from each motor (item 1). The screws may be very tight; be careful not to break your Hex Key.

3. For each motor, apply a small amount of Blue Loctite to the Set Screw threads and carefully reinstall the screws. Seat each screw firmly but do not over-tighten. Allow the Blue Loctite to set for 10 minutes. It fully cures in 24 hours.

USE BLUE LOCTITE
BEFORE INSTALLING
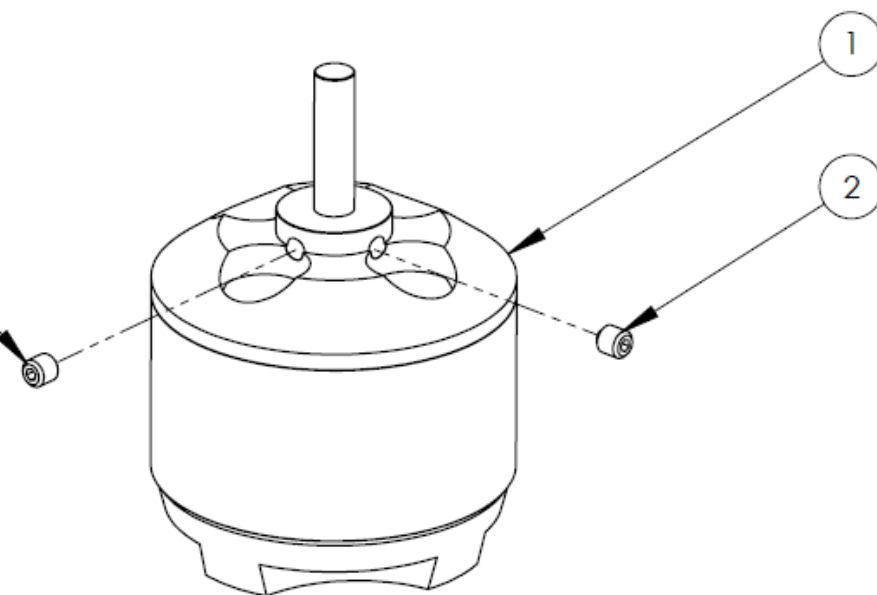
| ITEM NO. | DESCRIPTION | QTY. |
|----------|-------------|------|
| 1 | Motor 2 | 1 |
| 2 | SET SCREW | 2 |

ELEV-8 Y-6 Multicopter Kit (#80100)

## Step 2: Solder the Motor and ESC Speed Controller Connectors

In this step you will solder long leads to the motors.  Then, you will solder EC3 connectors to each lead and each Electronic Speed Controller (ESC).  The EC3 connectors will give you the ability to switch around the wire connections when you check your motor direction later in the build.  Be sure to use all of the same "gender" for the leads, and all of the opposite "gender" for the speed controllers.  Follow the instructions below.

1.  Gather together your motors, the red 16 AWG wire, EC3 connectors, wire cutters, wire stripper, ruler, and soldering supplies.

2.  Using a ruler and wire cutters, measure and cut eighteen lengths of the red 16 AWG wire, each 14 inches (35.6 cm) long.

3.  Use wire strippers to remove the insulation and expose about 1/4 inch (0.6 cm) of metal at one end, and 1/8 inch (0.3 cm) at the other end.

4.  Solder a wire (the 1/4-inch exposed end) to each lead on all six motors.

5.  For this step, use all male or all female EC3 connectors (we used male EC3s here). To solder an EC3 connector to the opposite end of each lead, insert the 1/8-inch exposed tip of the wire into the cup end of the bullet connector, and fill the cup with solder.
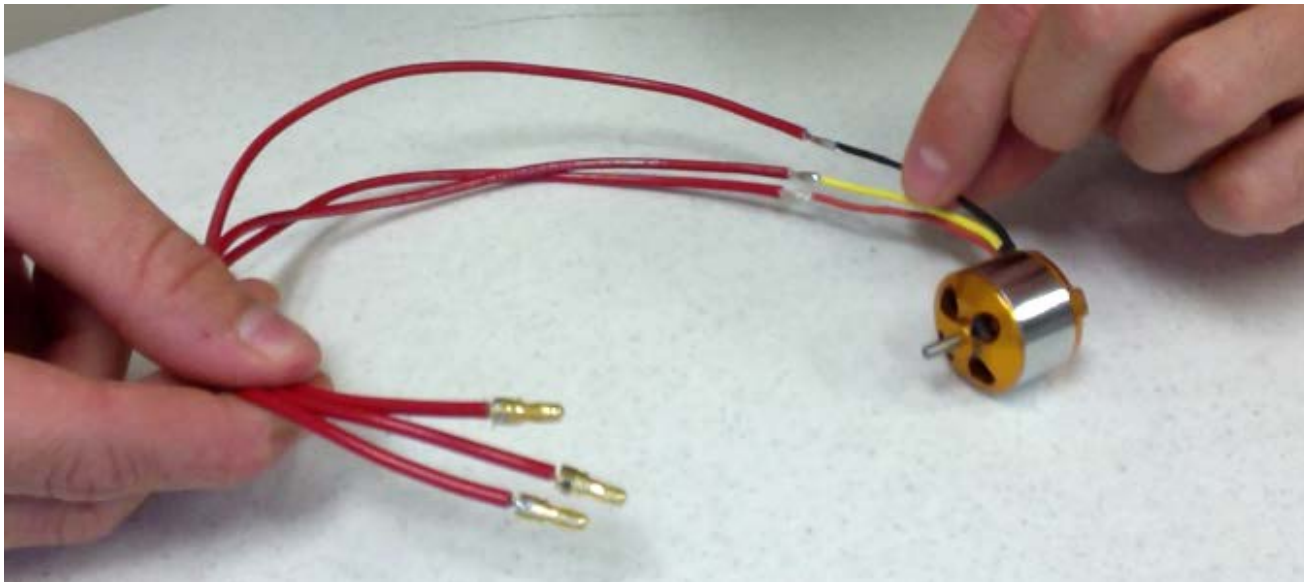
6.  If necessary, use wire strippers to expose 1/8 inch (0.3 cm) of metal on the end of each speed controllers' blue wire leads.

7.  Solder an opposite-gender EC3 connector to the end of each speed controllers' blue leads.
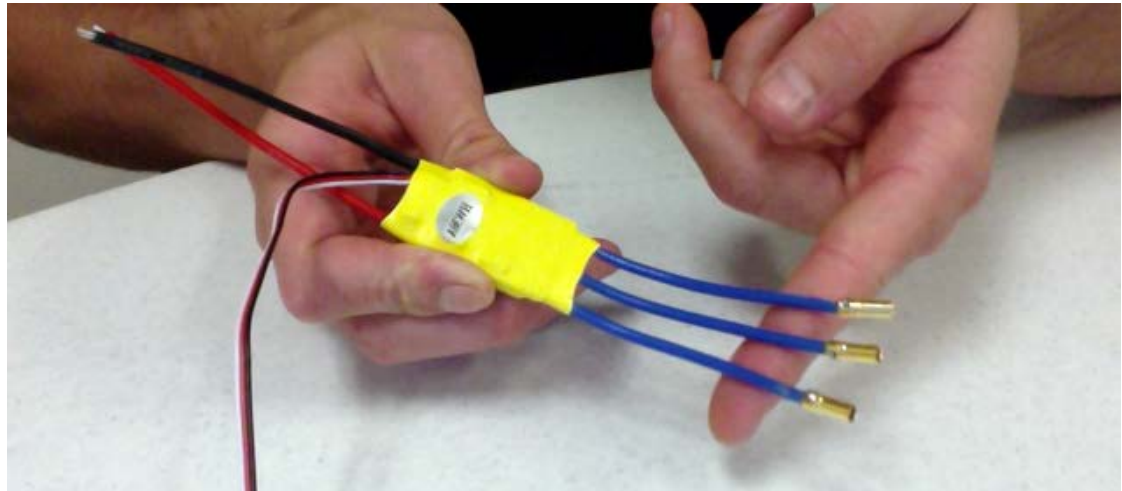


8.  Connect the male EC3 connectors to the female EC3 connectors of your speed controller, to verify that they fit properly.

9.  Disconnect them again for now.
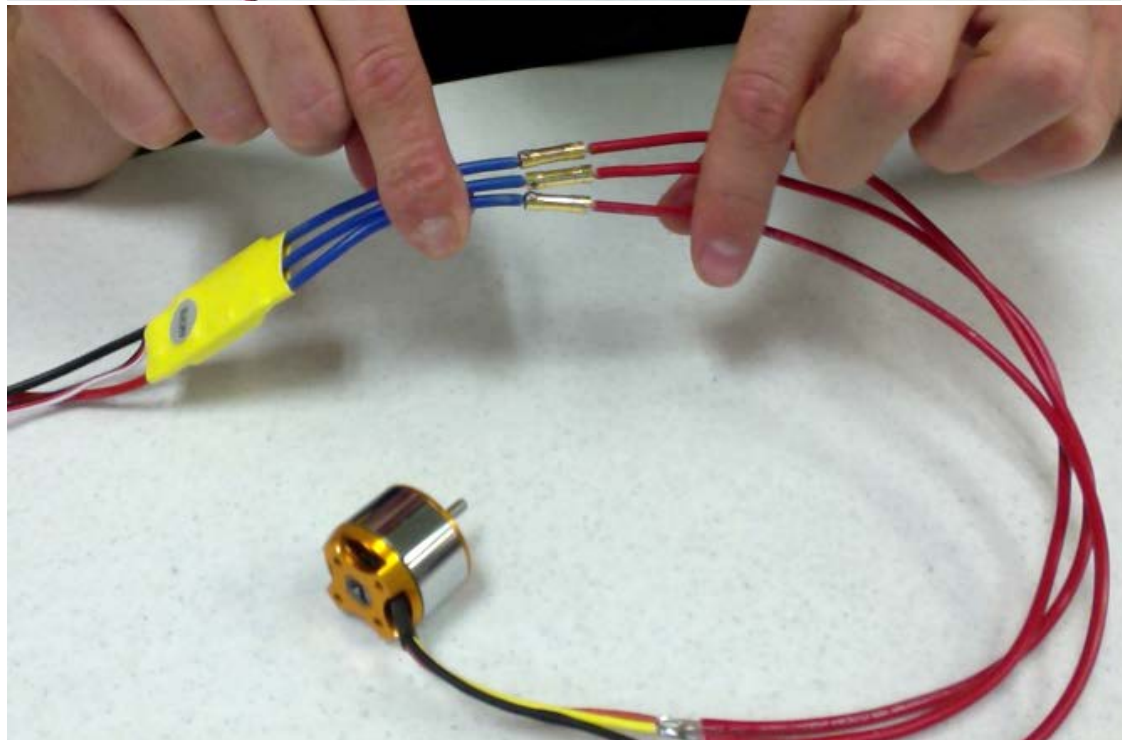
## Step 3: Apply Heat-shrink Tubing to Motor and ESC Leads

Heat-shrink tubing will protect the solder joints and prevent unintended electrical contact.  In the top picture, the tubing is fully shrunk over the motor-ESC lead solder joints.  However, in the bottom picture, the tubing is only partially shrunk over an ESC lead's EC3 connector. This keeps the leads from accidentally making contact with each other, yet allows the connectors to be plugged and unplugged if needed when testing motor connections in a later step.

1.  Locate the length of 3/16″ black tubing. Measure and cut eighteen pieces, each 3/4-inch (1.9 cm) long.

2.  Slip a piece of tubing over each solder joint on each motor lead.

3.  Apply heat with a heat gun or blow dryer to shrink the tubing over the solder joint, as shown (top).

4.  Measure and cut eighteen more pieces of heat-shrink tubing, each 1 inch (2.5 cm) long.

5.  Slide a piece of tubing over an ESC lead.

6.  Plug in the opposite connector from the motor assembly. Position the tubing to cover both connectors and solder joints.

7.  Disconnect the motor assembly lead but keep the tubing in place.  Carefully apply heat to just the very end of the tubing where it covers the ESC lead and connector solder joint. Apply just enough heat to secure the tube to the wire behind the connector, as shown in the picture (right).  Do not let the other end of the tubing shrink.

8.  Test that you can still plug and unplug the motor lead connector into the ESC connector.

9.  Repeat with the other 11 ESC leads, and then disconnect the motors from the ESCs for now.
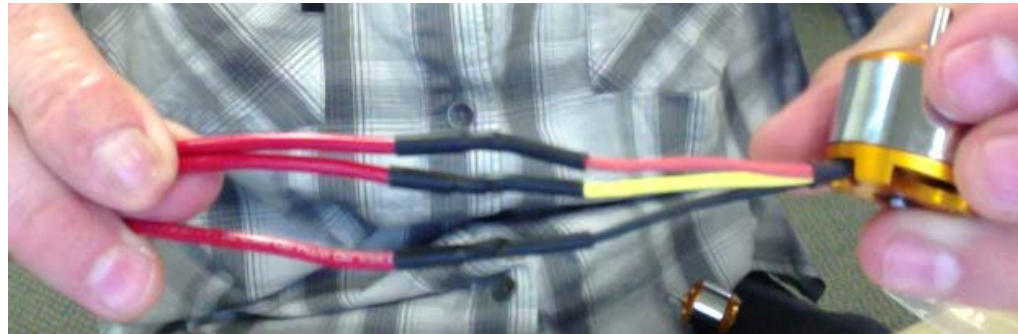
## Step 4: Motor Mount Assembly

In this step, you will attach the Motor Mounts and Motors to the Booms.  DO NOT ATTACH THE PROPELLERS TO THE MOTORS YET.

1.  Gather the items listed in the diagram on the next page.

2.  Attach each Motor (item 1) to a Motor Mount Bottom plate (item 4). Use four 3 mm x 6 mm screws (item 9) for each motor.

3.  Use two 3/8″ Panhead Screws (item 6) and two Internal Tooth Lock Washers (item 7) to attach two 5/8″ Nylon Standoffs (item 8) to one of the Motor Mount bottom plates.  Use two more 3/8″ Panhead Screws and Internal Tooth Lock Washers to attach the second Motor Assembly to the Nylon Standoffs (item 8).

4.  One end of each Boom (item 3) has two holes spaced about one inch apart. Slide an assembled Motor Mount on this end of each Boom so that the motor leads go through the Boom tube.  Holes in the Motor Mount plates will line up with the holes in the Boom.

    **PRO TIP:** Tape together the leads of one motor on the ends, and also put a piece of tape on the motor itself.  Then, after you thread the leads of both motors through the Boom, you will know which leads go to which motor.

5.  Secure the Motor Mount assembly to its Boom with two 1″ Pan Head Screws (item 2) and two Lock Nuts (item 5).

6.  Repeat this process for the other two Boom Assemblies.
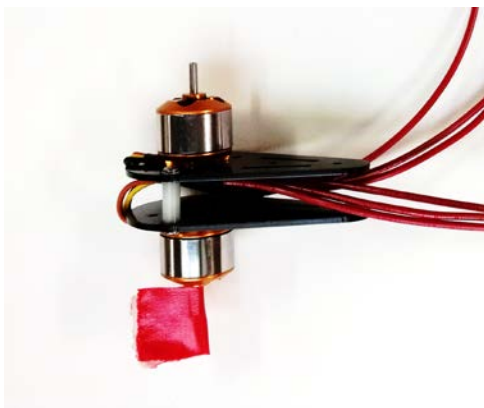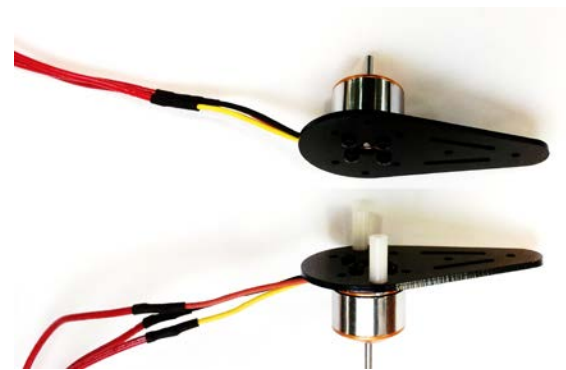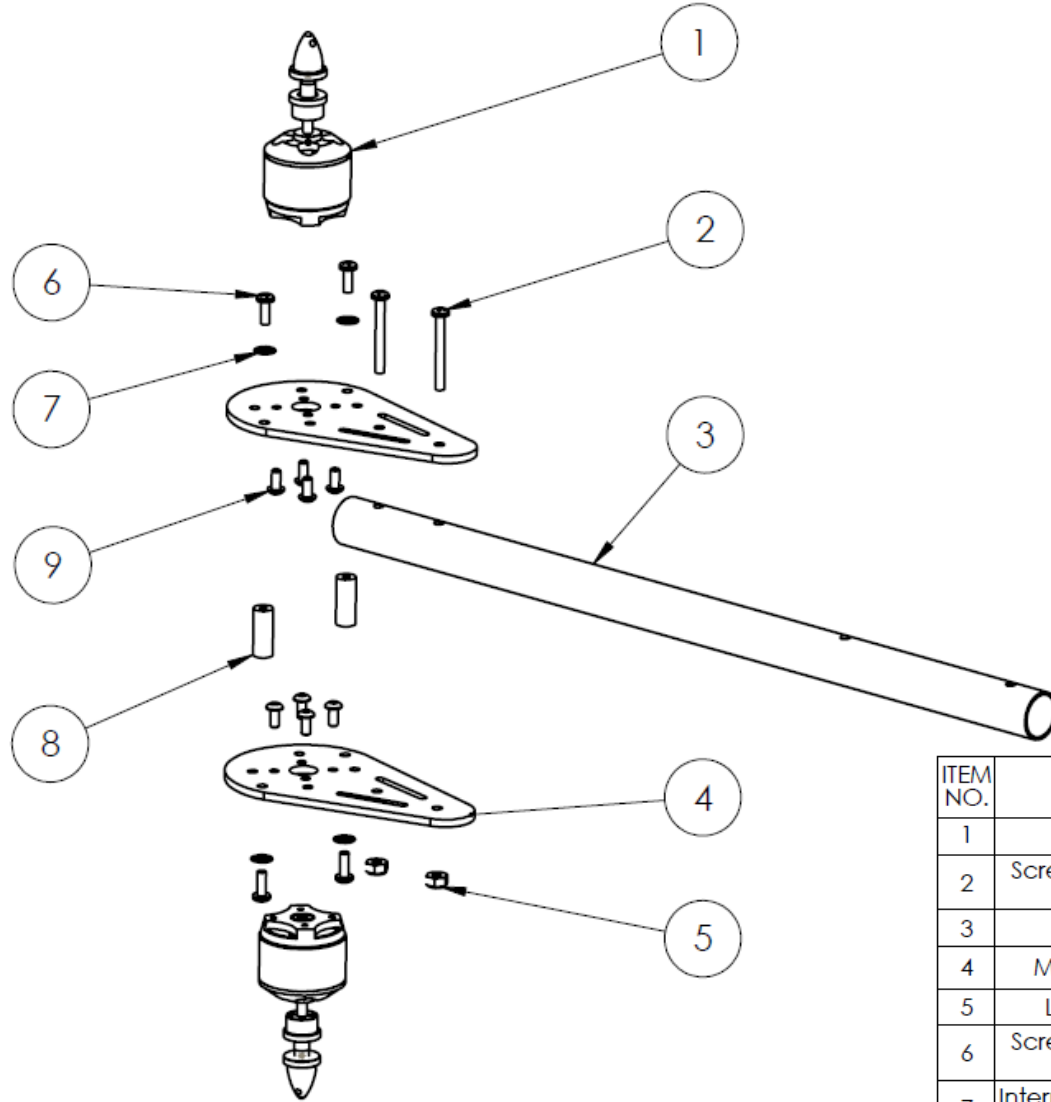
| ITEM NO. | Description | Part Number | QTY. |
|----------|-------------|-------------|------|
| 1 | Assy Motor | | 2 |
| 2 | Screw Pan Head SS Steel 4-40 x 1" | 710-00002 | 2 |
| 3 | Boom Arm Black | 730-00060 | 1 |
| 4 | Motor Mount Bottom | 721-80006 | 2 |
| 5 | Lock Nut 4-40 x 1/4 | 700-00024 | 2 |
| 6 | Screw Pan Head SS Steel 4-40 x 3/8" | 710-00036 | 4 |
| 7 | Internal Tooth Lock Washer #4 | 700-00059 | 4 |
| 8 | Nylon Standoff 4-40 x 5/8 | 713-00043 | 2 |
| 9 | Screw, 3mm x 6mm, 0.5 Thread | 710-00039 | 8 |

## Step 5: Boom Accessories (optional but highly recommended)

Your ELEV-8 Y-6 Multicopter Kit comes with two options for accessorizing the Booms: checkered tape and adhesive-backed LED light strips. You can apply either, both, or none to the Booms.

Many people choose to put white LED strips and black/white tape on the two front Booms, and a red LED strip and red/white tape on the back Boom. This makes it easy to identify the front and back of the multicopter during flight. If you wish to use both, apply the checkered tape before applying the LED light strips.

1.  Cut each sheet of checkered tape in half lengthwise to make two pieces. Apply a piece of black/white tape around two Booms. Then, apply a piece of red/white tape around the third Boom.

2.  Locate the black and red 22 AWG wires in the ELEV-8 Electronics Kit. Cut each 22 AWG wire into two pieces approximately 8 inches (20 cm) long, and then strip 1/4 inch (0.6 cm) of insulation from each end. You will need three black leads and three red leads for the LED tapes.

3.  Locate the two LED tape strips. The yellowish LEDs shine white, and the clear LEDs shine red. Cut the yellowish strip in half along the solid black line. Now you have three 18″ LED strips: two white and one red.

Cut here
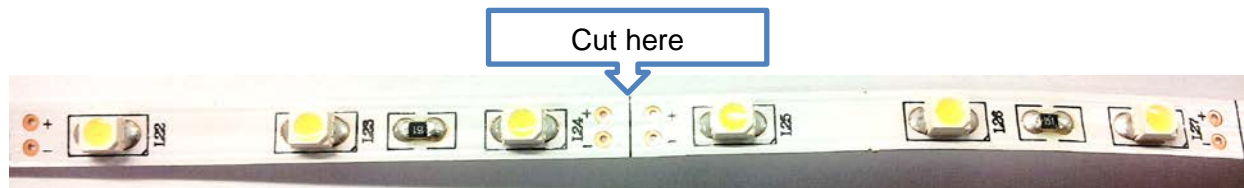


4.  Each LED tape section has tiny (+) and (–) contacts on one end. Solder a red 22 AWG lead to each (+) contact and solder a black 22 AWG lead to each (-) contact.

5.  Peel the backing off of an LED tape section and wrap it along the outside of a Boom (over the checkered tape), with the wires pointing in towards the chassis holes.

6.  Measure and cut three pieces of 3/4″ clear heat-shrink tubing, each 4.5 inches (11.5 cm) long.

7.  Slip the heat-shrink tubing over each Boom to cover the LED strip and its solder joints, and apply heat to shrink it in place.
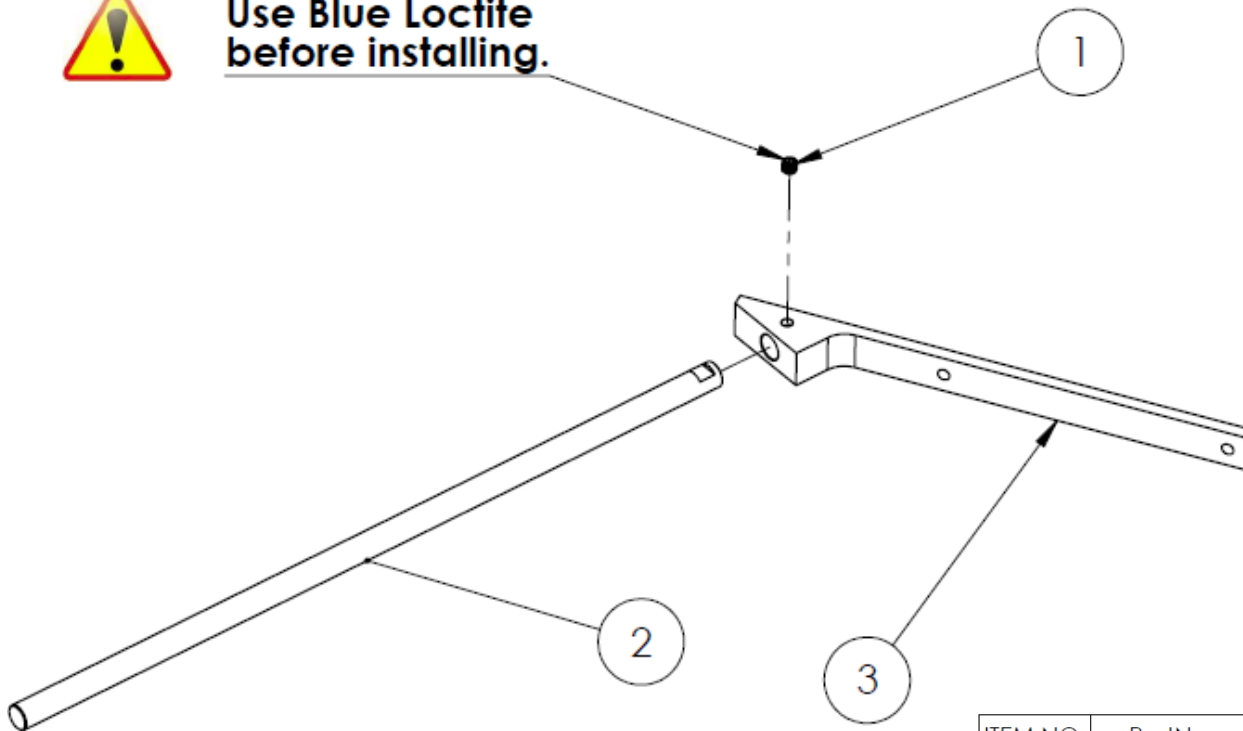
## Step 6:  Attach Landing Gear

In this step you will attach the carbon fiber rods to the landing gear mounts to make up the landing gear assembly.  Refer to the diagram below for the required parts in this step.

1.  The carbon fiber rods have a 1/16" notch on one end. Insert this end into the landing gear mount, and be sure that the notch is facing the set screw hole. This alignment will allow you to lock the carbon fiber rod in position.

2.  Apply a light coating of Loctite to the set screw and insert the set screw into the landing gear mount.  Using a small flat-head screwdriver, tighten gently but do not over-tighten — you do not want to strip the head.

**Use Blue Loctite before installing.**

| ITEM NO. | PartNo | DESCRIPTION | QTY. |
|---|---|---|---|
| 1 | 700-00085 | Set Screw 6-32 x 1/8" SS | 1 |
| 2 | | Black Fiberglass Rod 1/4" Dia. x 8" | 1 |
| 3 | 730-00062 | Y Landing Gear Mount | 1 |

## Step 8: Attach Motor/Boom Assemblies to the Bottom Chassis Plate

In this step, you will attach each Motor/Boom assembly to the Bottom Chassis Plate. (The top chassis plate is the one with the Parallax and Y-6 logos engraved on it, do not use this one.) Refer to the diagram on the next page for the items needed from your kit.

1. Orientation of the Bottom Chassis Plate does matter!  Make sure to attach the Booms in the positions shown in the picture at right. The rear Motor/Boom assembly (with the red checkered tape if you used it) mounts on the corner between the two large holes in the Bottom Chassis Plate.

2. Locate the correct mounting holes on the Bottom Chassis Plate to use for the rear Motor/Boom assembly

3. Position the rear Motor/Boom assembly (item 2) in the correct place on the Bottom Chassis Plate (item 3).  The Boom Tube will rest on the Landing Gear Mount (item 5).

4. Thread two 1-1/4″ long Pan-head Screws (item 4) up through the Chassis Plate, through the Landing Gear Assembly,  and into the Boom Tube.  Secure each screw into place with a threaded 5/8″ Nylon Standoff (item 1).

5. Repeat steps 3 and 4 to mount the remaining two Motor/Boom assemblies to the other two corners of the Bottom Chassis Plate.



Large hole

Large hole

Attach Red Boom between largest holes in bottom plate
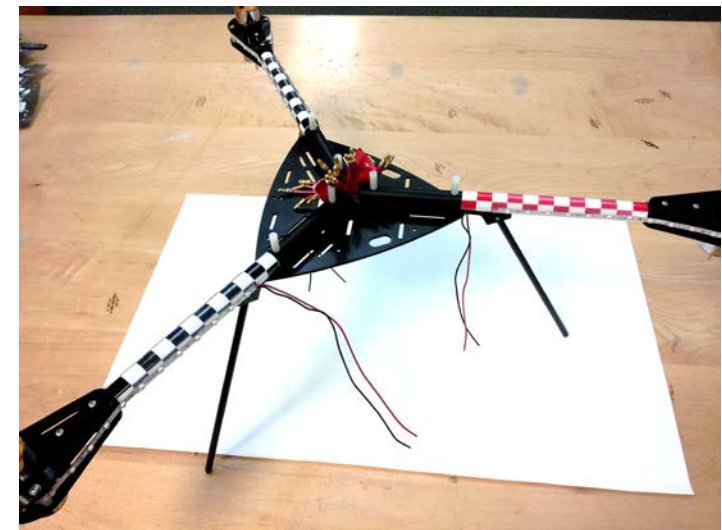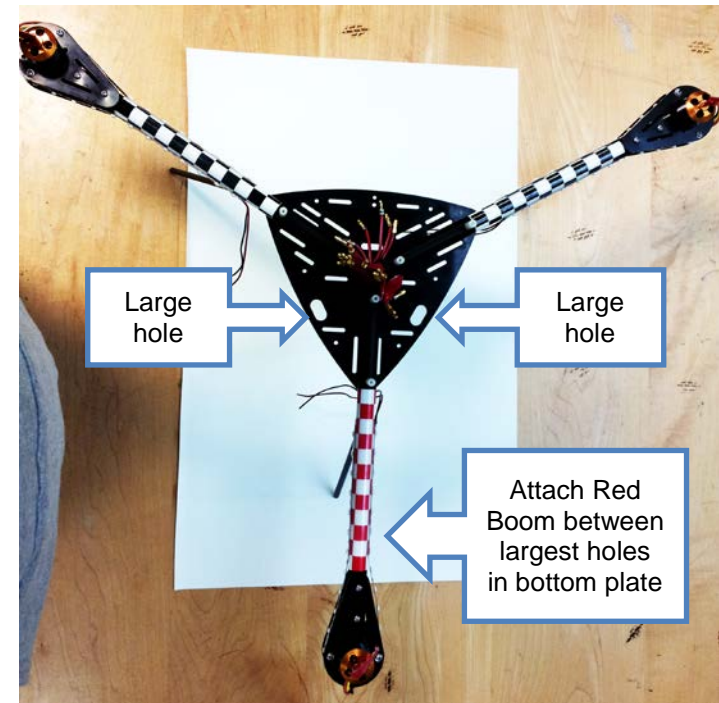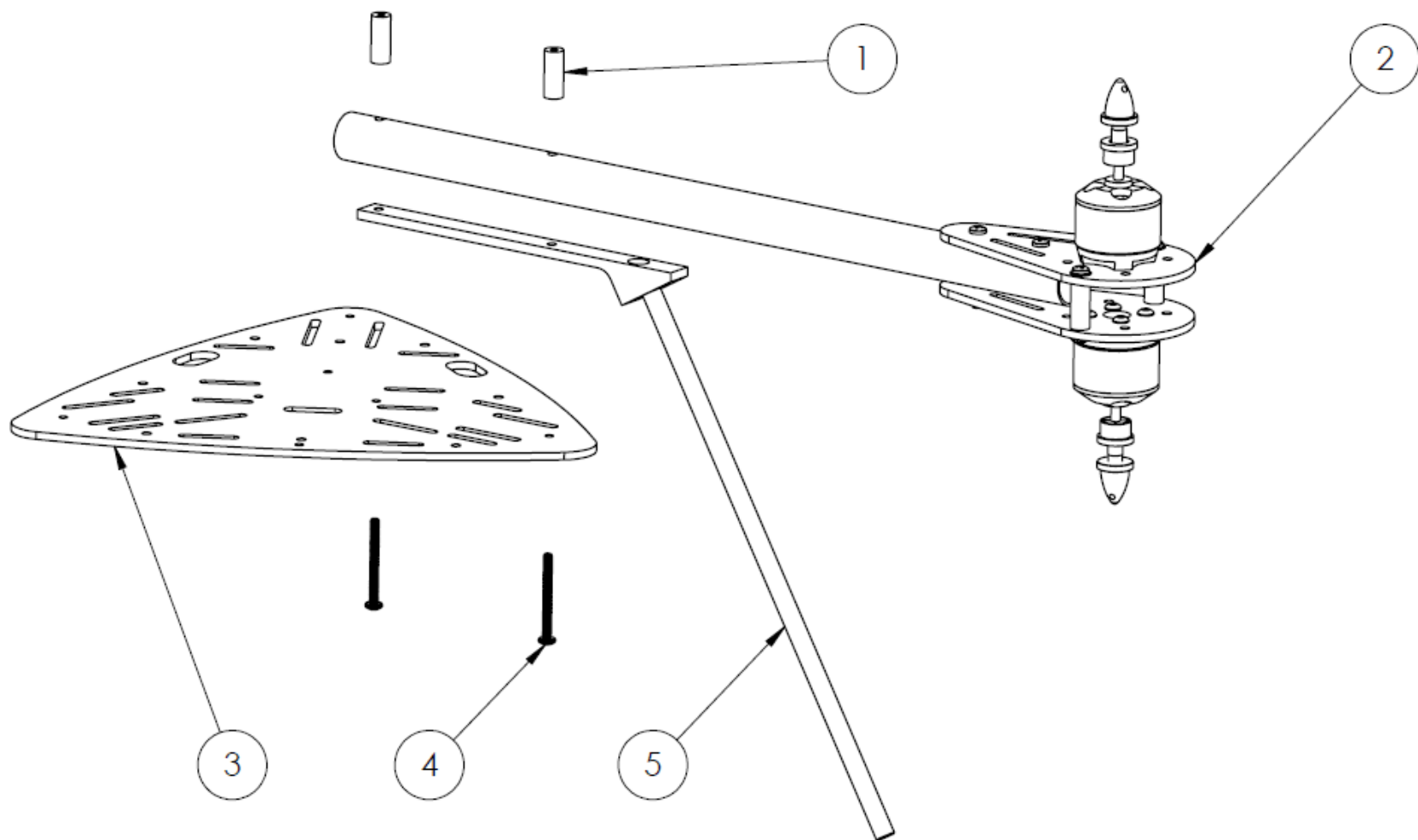
| ITEM NO. | PartNo | DESCRIPTION | QTY. |
|---|---|---|---|
| 1 | 713-00043 | Nylon Standoff 4-40 x 5/8" | 2 |
| 2 | | Assy Two Motor Boom Black | 1 |
| 3 | 721-80013 | Y-6 Chassis BTM | 1 |
| 4 | 710-00042 | Screw, 4-40, 1-1/4" Panheas SS | 2 |
| 5 | | Assy Landing Gear | 1 |

ELEV-8 Y-6 Multicopter Kit (#80100)

## Step 9: LED Tape Leads

Once your Booms are all mounted, it is time to connect your LED leads together and to make the adapter for plugging them into the power harness. You will need two male EC3 connectors and some 3/16 inch black heat-shrink tubing for this step.

1.  Bring the leads from your LED tape together in the center of your chassis.

2.  Solder the red leads together in an EC3 connector.

3.  Solder the black LED tape leads into another EC3 connector

4.  Cut two 3/4 inch lengths of the 3/16 inch heat-shrink tubing.  Place the heat-shrink tubing over the solder joints at the base of the EC3 connectors and apply heat.

Solder red LED tape leads together

Solder black LED tape leads together
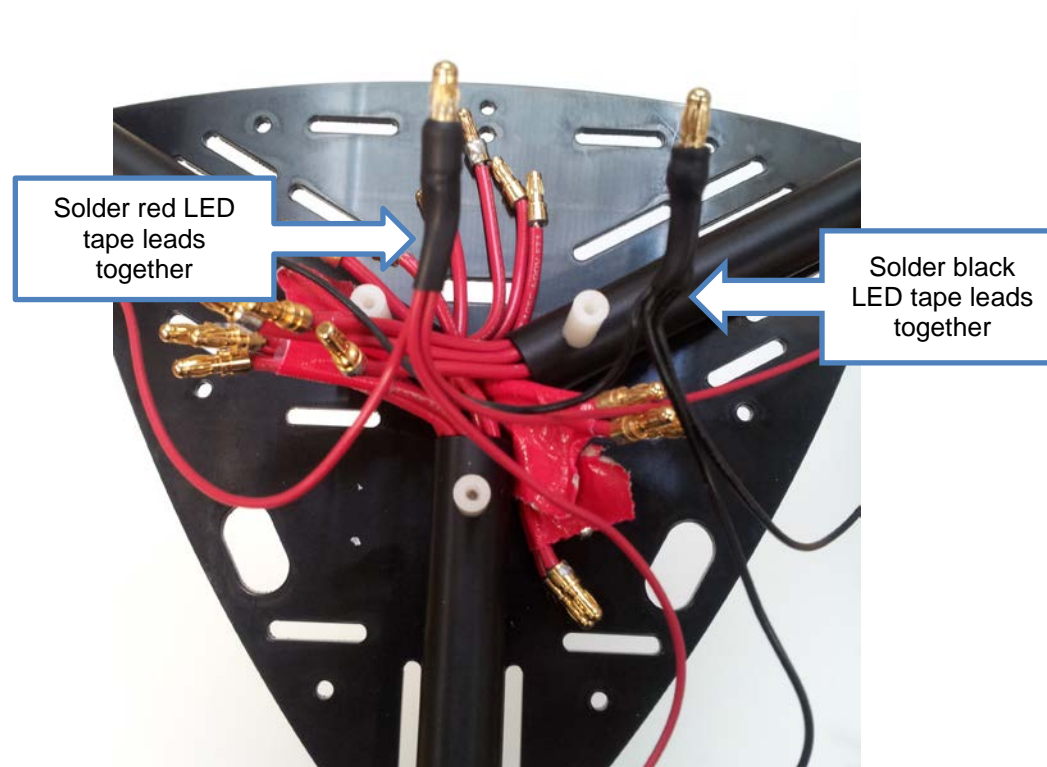
# Step 10:  Solder the Power Harness Together

In this step, you will solder together your ELEV-8 Y-6 Multicopter's power harness. It will provide the connection between the battery pack and the ESCs (and also the LED tape strips if you are using them).

1. Find the black and red 12 AWG wires in your Electronics Kit; these will be the power harness leads.  Cut each piece in half to give you (2) red and (2) black wires that are 6 inches long.  Strip ½ inch of insulation off one end of each wire.

2. You should have two pieces of 12 AWG remaining, both 3 inches long.  Strip ½ inch of insulation off of one end, and ¼ inch off of the other.  These two wires will be used for connecting your LEDs to your power harness.

3. Solder a female EC3 connector onto the ends of both 3 inch 12 AWG wires with ¼ inch of insulation removed.  Now, cut two ¾ inch pieces of 3/16 inch black heat shrink and apply heat to shrink the material.  Your 3 inch wires should look like the ones in the top right picture.  Set these aside for now.

4. Strip an additional ¼ inch length of insulation off of the ESC leads, as we will need more wire exposed to make the harness and ensure a good solder connection.  The bottom right figure shows how your ESC's leads should look after you trim them.
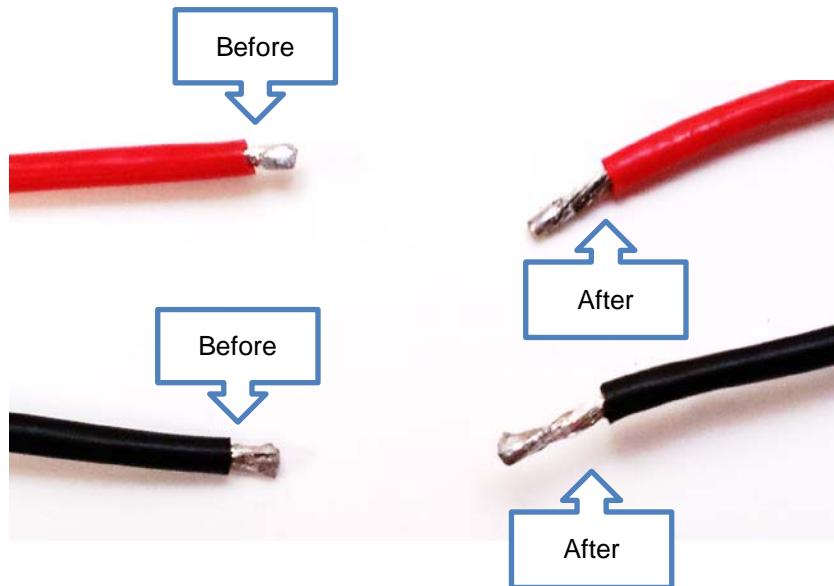
5.  Solder all of the ESCs, both 6 inch 12 AWG wires, and the 3 inch 12 AWG red leads together.  Likewise, solder all of the black leads together as shown in the picture to the right.

6.  Cut two 1-1/2 inch lengths of ½ inch black heat shrink.  Slip a piece of heat shrink onto the two solder joints you just made.  Ensure the entire joint is covered by the heat shrink before you apply heat.

7.  Decide how long you want the 12 AWG power harness leads to be.  If you use the layout shown below, you will be strapping both batteries together using the strap holes indicated, and you can trim the leads to about 4 inches.  If you are going to use a custom layout to accommodate extra electronics or anything else you may have, decide how long to make your harness leads and then trim them.  Once the leads are trimmed, strip 1/8 inch of insulation from the end of each lead.

8.  Locate the packet of gold bullet connectors and plastic housings.  You will need four male bullet connectors, and two female blue housings.

9.  Solder a bullet connector onto the end of each 12 AWG lead.

Battery (+)

LED Tape (+)

Battery (-)

LED Tape (-)

Holes for Velcro battery straps
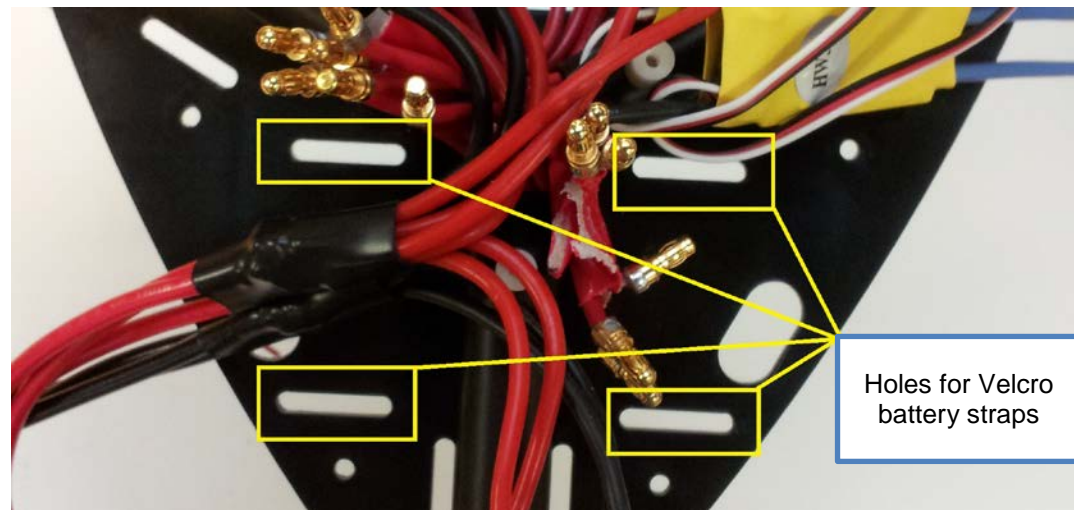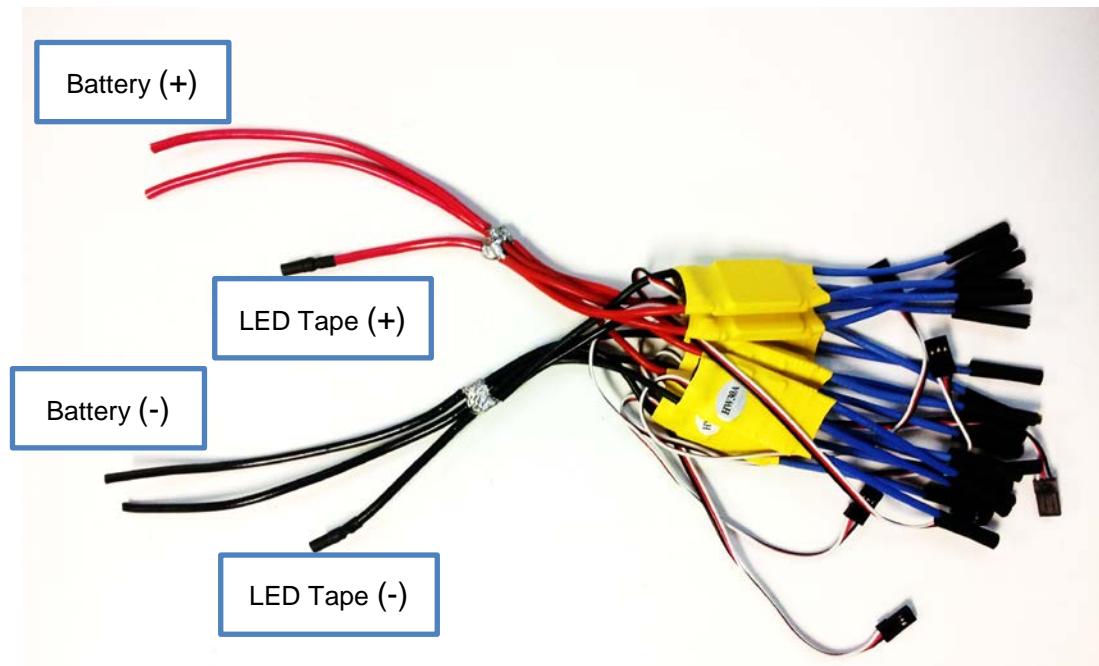
10. Insert the bullet connectors into the flattened end of the blue housings.  Insert the red leads into the D-shaped side, which also has a (+) on the housing.  Insert the black leads into the O-shaped side, also marked with a (-) on the blue housing.  It will take some force for the bullet connectors to click into place.

    **PRO TIP:** Use a flat-head screwdriver to hold the bullet connector in the blue housing, and then use a hammer to tap the connector into place.  Give the wires a tug to ensure they are properly seated and will not wiggle free.
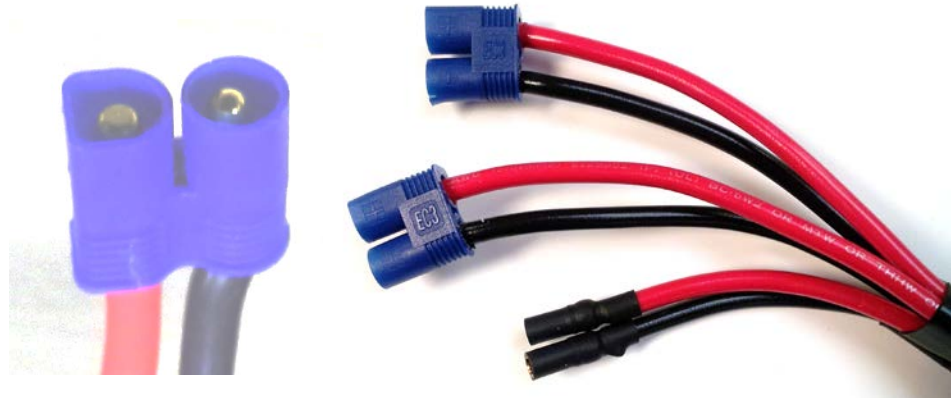
11. Reposition the harness onto the chassis.  Using a marker or method of your choosing, mark the ESCs so you can easily identify which lead goes to what motor when we have the chassis completely assembled.  Working clockwise from top to bottom, we will label the motors 1-6, with the front left Boom's top motor being 1, and the rear Boom's bottom motor being 6.  Ensure you mark each ESC's body and servo lead for an easier build later.  Refer to the images below for the numbering process.

1 - Top

2 - Bottom

3 - Top

4 - Bottom

5 - Top

6 - Bottom
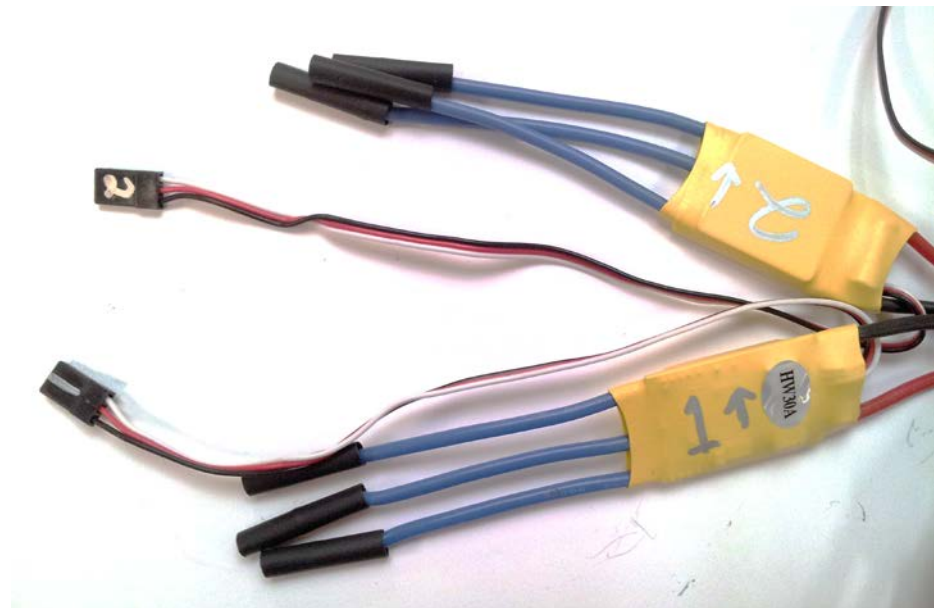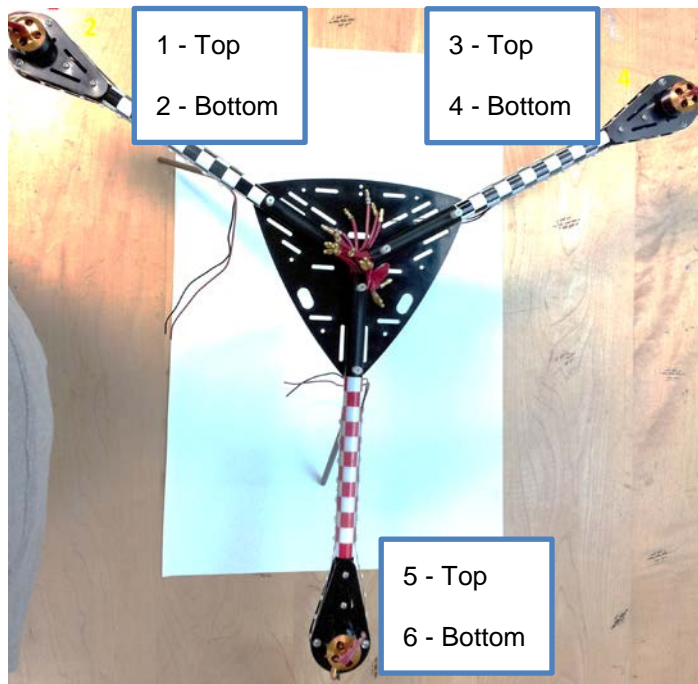
12. Remove the harness from your chassis.  Separate the motor wires coming out of the Booms and zip tie them together as shown, left.

13. Replace the harness back on the chassis, and position your ESCs where your motor wires are located per the last step for an easy hookup.

14. Once your ESCs are in position, zip tie them into place, and connect your motor leads to their ESC.  For the time being, the motor to ESC connections do not matter, as we will address this issue in a later step.  Also, be sure to connect your LED leads to their power harness leads so that you will have light!

15. Once you have everything connected, connect one of your batteries to your power harness.  You should hear beeping from your motors, and if you are using the LED tape, they should come on.  If you do not, check your connections
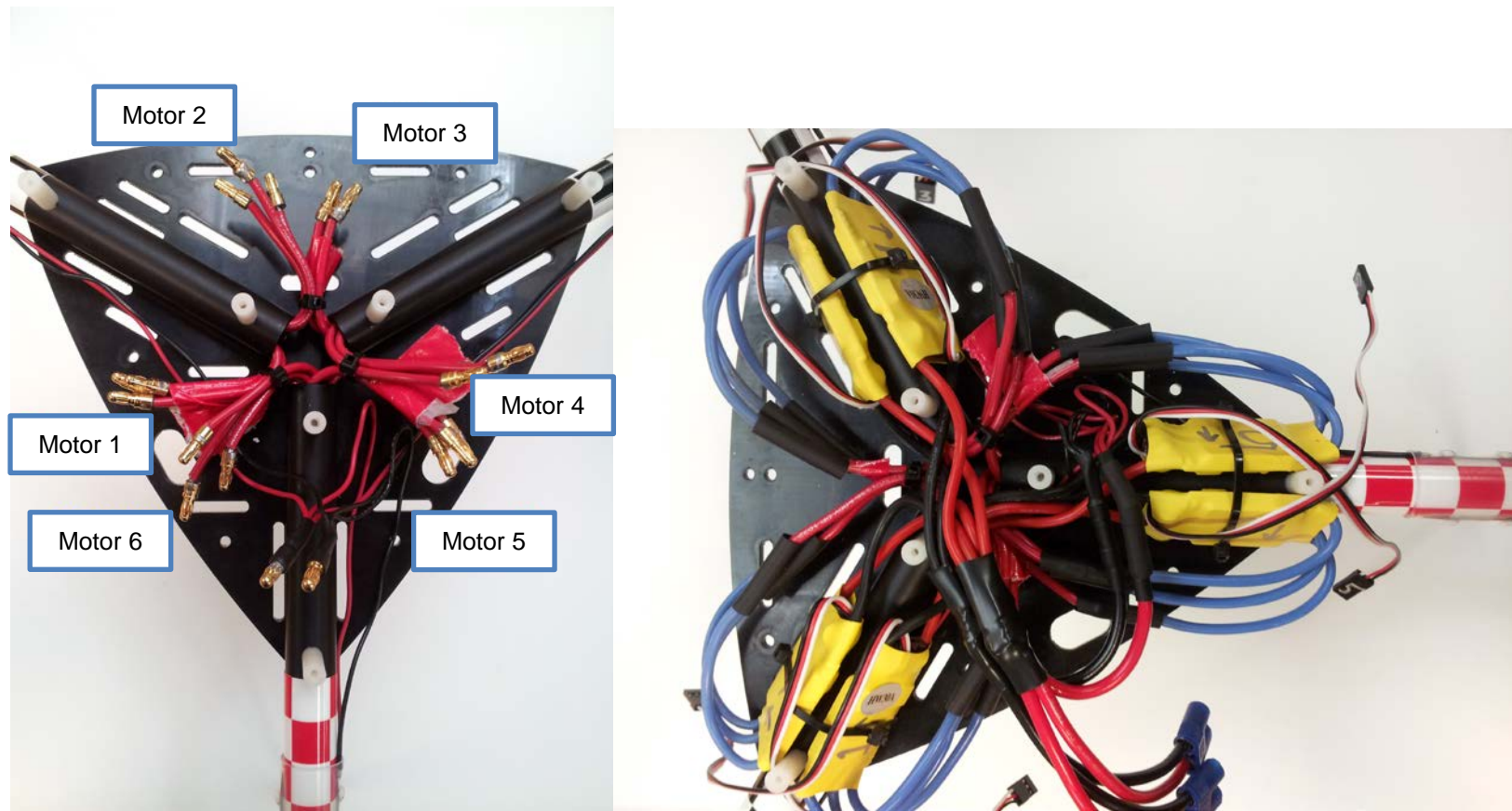
# Step 11: Configure your Transmitter

1. For best results, follow the Transmitter Setting Recommendations in the table below to configure your Transmitter.

2. Refer to the diagram below to see how your Transmitter's 2-axis joystick controls will translate into ELEV-8 Y-6 Multicopter motion with these settings.
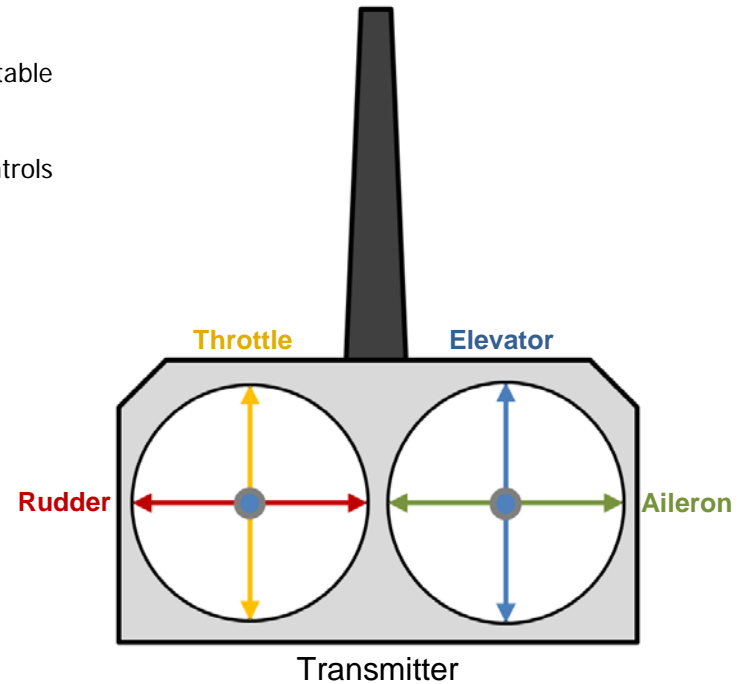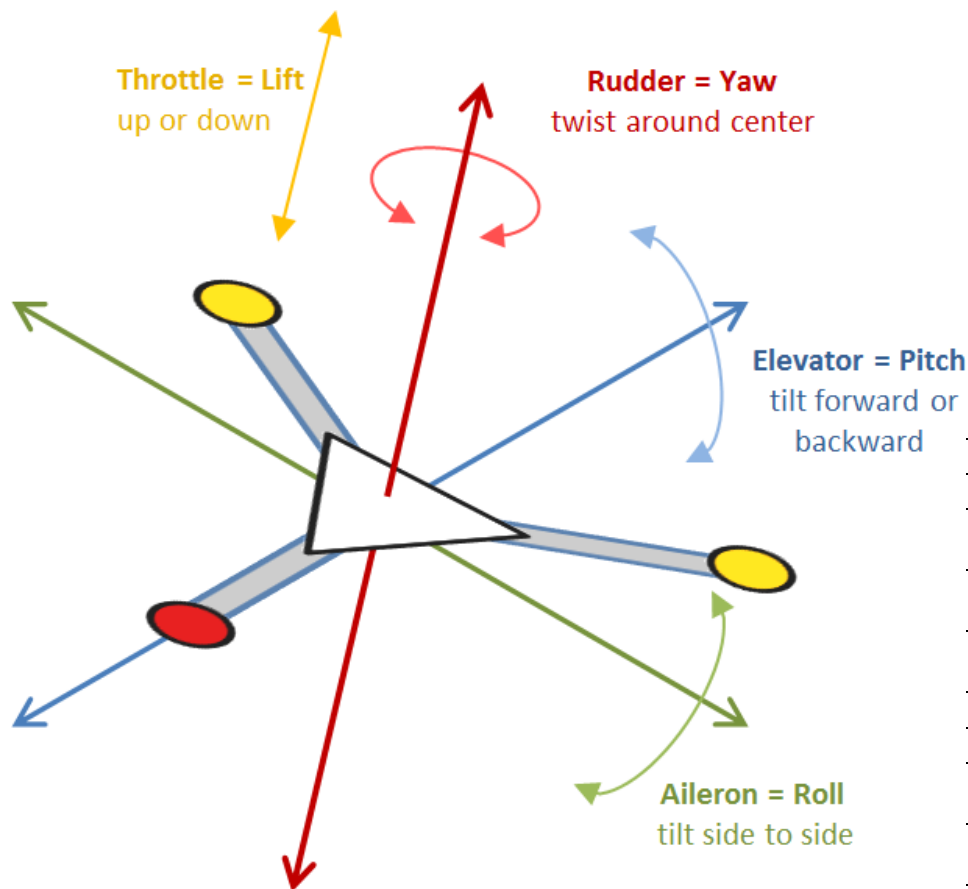


Transmitter

| Transmitter Setting Recommendations | |
|---|---|
| Box Model Type | ACRO (Plane Mode) |
| End point adjustment | Set to 50% initially. (If the ELEV-8 still seems too reactive, reduce to 30% until you get used to flying it.) |
| Dual-Rates (D/R) | 100% |
| Channel Reverse | Normal: Hi Tech Spektrum, JR brands <br> Reversed: Futaba brand |
| Trims | Centered |
| Sub-trims | Centered |
| Gain Adjust | Set Gain on $5^{th}$ channel. Start with 25%, add or subtract based on flight stability |
| Exponential | After gaining experience, add up to 30% into aileron and elevator |

## Step 12: Programming the ESC Speed Controllers

In this step, you will program the motor's electronic speed controllers (ESCs) with an ESC Programming Card.

Note: The ESC Programming Card was added to kits in April 2013. They are also available separately from www.parallax.com; search "85000".

1. Connect your charged LiPo battery to the power harness.

2. Connect an ESC to the ESC programming card's BEC port. Be sure to line up the black wire with (-), the red wire with (+), and the white wire with (Signal).

   **WARNING: Do not connect to the Programming Card's BEC port and Batt port at the same time; this would damage the card.**

3. Set the ESC card to the configuration shown in the picture and the table, then push OK to program the ESC. Repeat with each ESC, using the same settings. Be sure to cycle power between each programming cycle.

| 1 | Brake | Off |
|---|---|---|
| 2 | Battery Type | Li-xx |
| 3 | Cut Off Type | Soft-cut* |
| 4 | Cut Off Voltage | Middle |
| 5 | Start Mode | Normal |
| 6 | Timing Mode | Middle |
| 7 | Music/Li-Po Cells | (none) |
| 8 | Governor Mode | Off |

* Soft-cut (also called Reduce Power) lets you know when the multicopter's batteries are running low. If you set this to Cut-off/Shut Down, your multicopter will simply fall out of the sky when it reaches a low battery level.
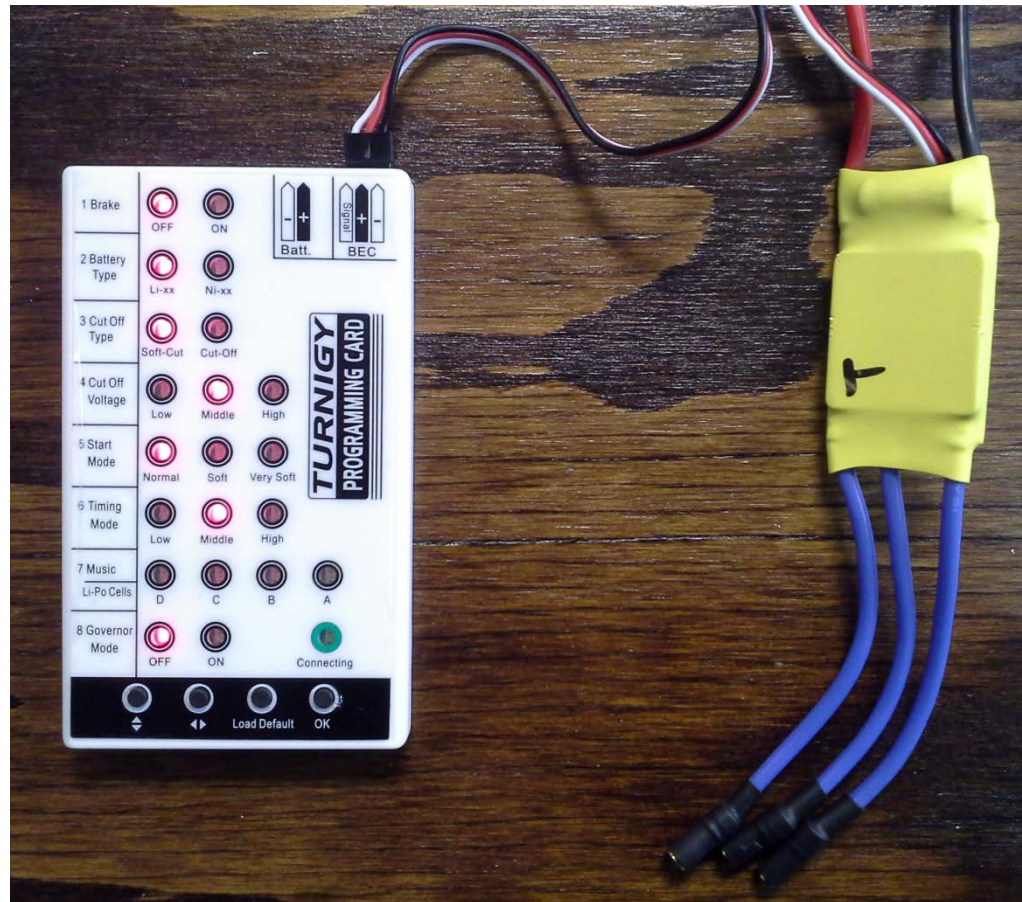
# Step 13: Connect the Motors and Synchronize the ESCs

After programming the ESCs, it is time to check and ensure that they are rotating in the proper direction.  For this step, your R/C Controller's Receiver will temporarily connect directly to; and receive power from, each ESC.

**Warning: Do not connect a battery or other power source and an ESC to your R/C Receiver at the same time.  If you do so, you will permanently and catastrophically damage both the ESC and Receiver.**

**STOP: YOU SHOULD NOT HAVE PROPELLER BLADES ON YOUR MOTORS YET! IF YOU DO, REMOVE THEM BEFORE PROCEEDING.**

1. If you have not done so already, bind your Transmitter to your Receiver as per your RC controller's instruction manual.

2. Identify which edge of the chassis will be the front of your ELEV-8 Y-6 Multicopter.   If you have used the checkered stickers and/or the LED tapes, the front edge would be between the two black-checkered, white-LED Booms.

3. Put a piece of tape on the output shaft of each motor, so you can easily tell the direction of rotation.

4. Connect an ESC's 3-pin socket to the Throttle port on your Receiver.

5. Gently apply the throttle to see which direction the motor turns.  Refer to the diagram to see which direction each motor needs to turn.

6. If the motor is not turning the proper direction, disconnect any two of its leads, reverse them, and reconnect.

7. Repeat with each ESC until all motors are turning in the correct direction and each ESC case and lead are numbered.

8. When you are sure your motor connections are all correct, apply heat to finish shrinking the tubing over the motor/ESC connector joints.
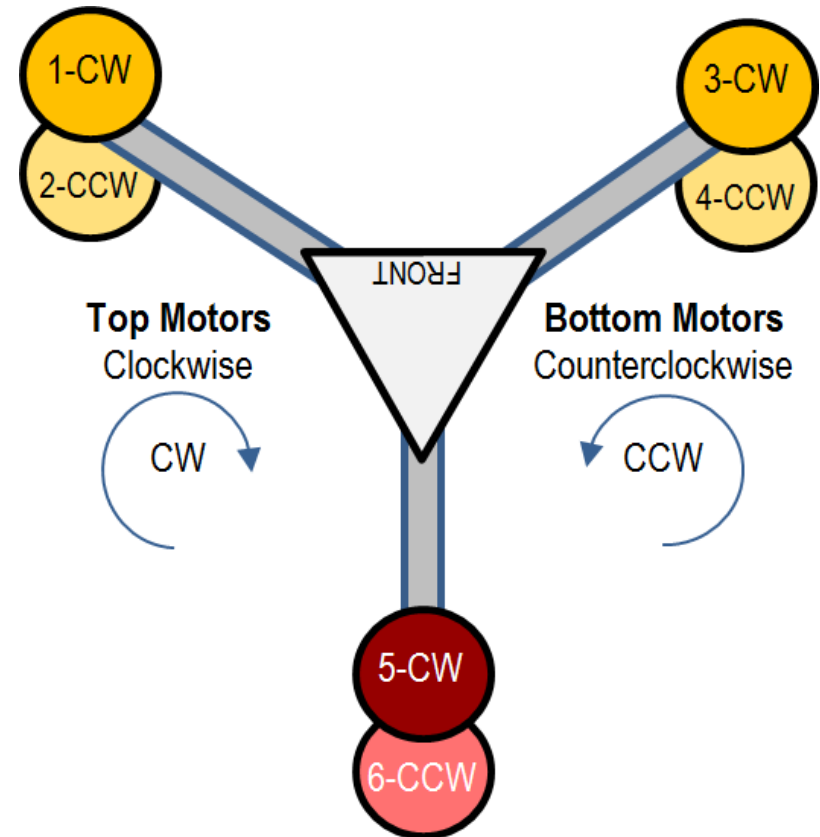
## Step 14:  Chassis Top Plate and Control Board Assemblies

In this step, you will prepare and attach the Chassis Top Plate.  Then, you will prepare and attach the control board to its mounting plate.

Gather the items shown in the diagrams on the next two pages. Note: the Control Board Mount Plate has slots around all four edges.

1. Pull all the ESCs′ 3-pin leads together towards the front of the chassis.

2. Referring to the diagram on the next page, locate the correct holes in the Top Chassis Plate for the ½ inch screws to come up through, and then put the nylon hex nut onto them and hand tighten.

3. Thread the ESCs′ 3-pin leads up through the top oval slot, as shown in the picture at right.

4. Attach the Top Chassis Plate to the standoffs on top of the Booms using six ¼ inch Black Pan-head Screws.

5. For the Control Board Assembly, refer to the diagram on page 25.  Blue rubber grommets are included with the Hoverfly Control Board.  Insert a rubber grommet (item 3) into the large mounting holes on each corner of the board.  These grommets reduce vibrations transferred to the Control Board during flight.

6. Insert each ½ inch Pan-head Screw (item 6) up through the Mounting plate (item 5), through the grommet (item 3), and then install a Plastic washer (item 2) and a Lock nut (item 1).  **Do not over tighten the locknut**. Hand tightening just enough so that the board does not move around works best.
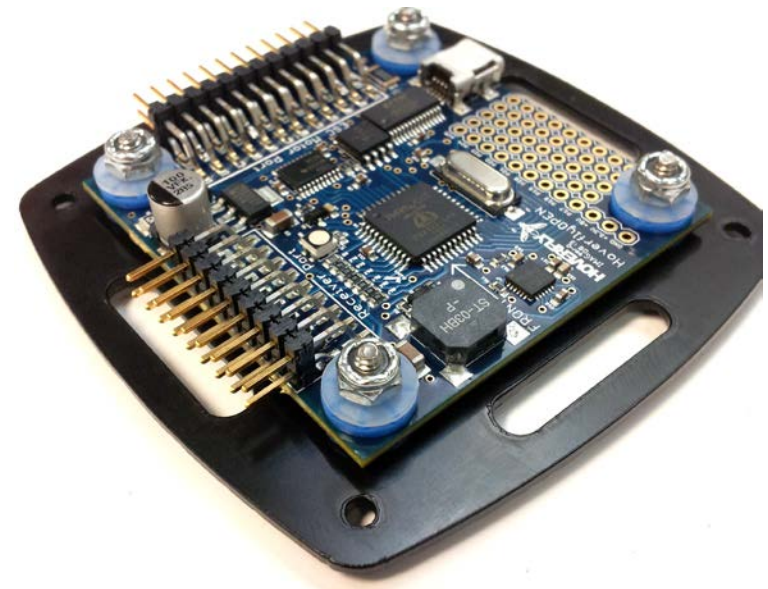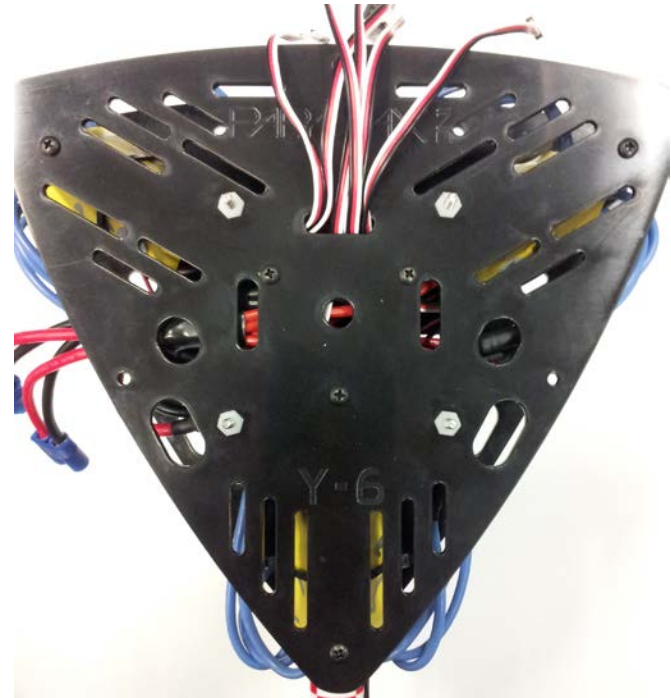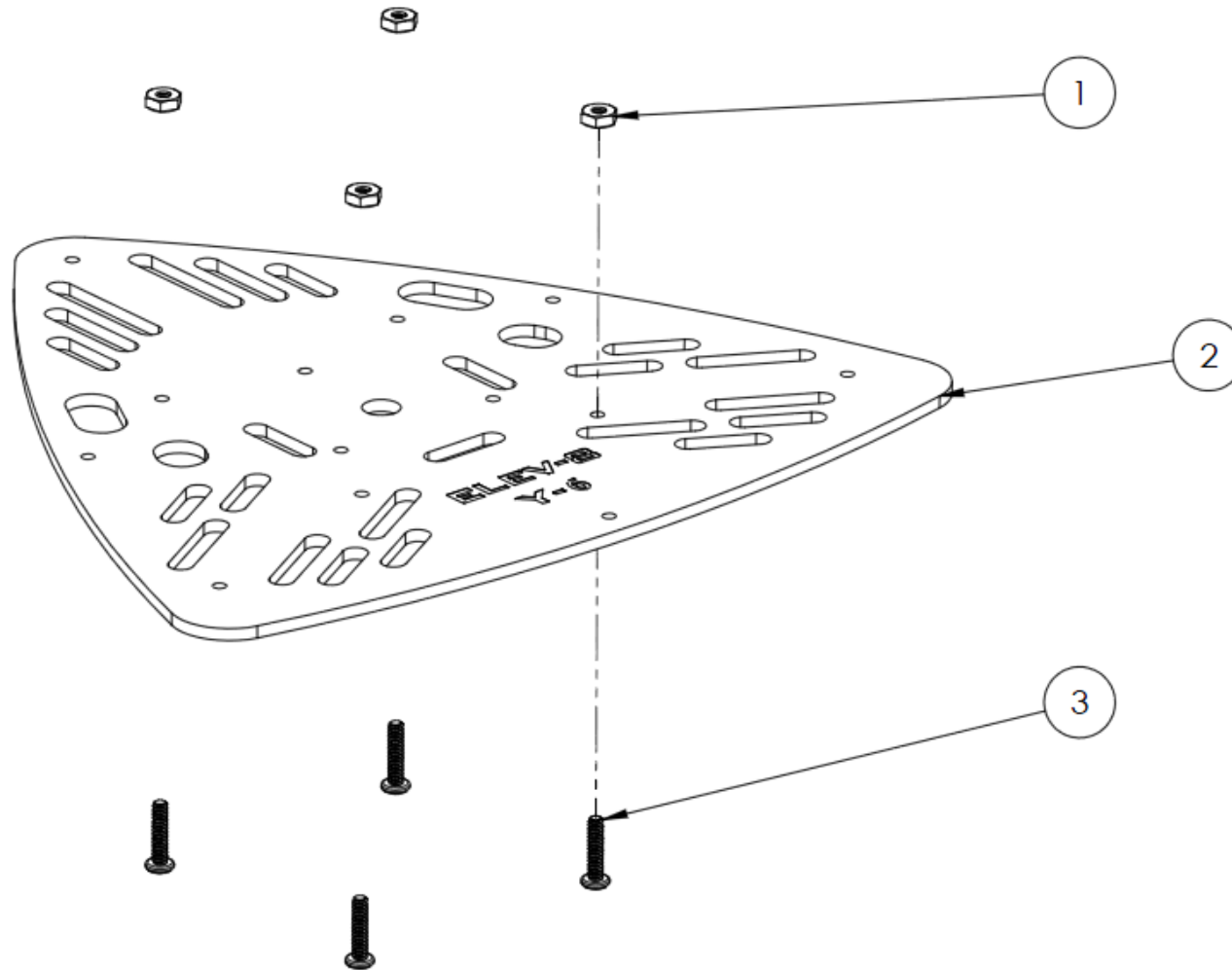
| ITEM NO. | PartNo | DESCRIPTION | QTY. |
|---|---|---|---|
| 1 | 700-00036 | Nylon Hex Nut 4-40 | 4 |
| 2 | 721-80012 | Y-6 Chassis Top | 1 |
| 3 | 710-00006 | Pan Head Phillips SS Screw 4-40 x 1/2" | 4 |

ELEV-8 Y-6 Multicopter Kit (#80100)
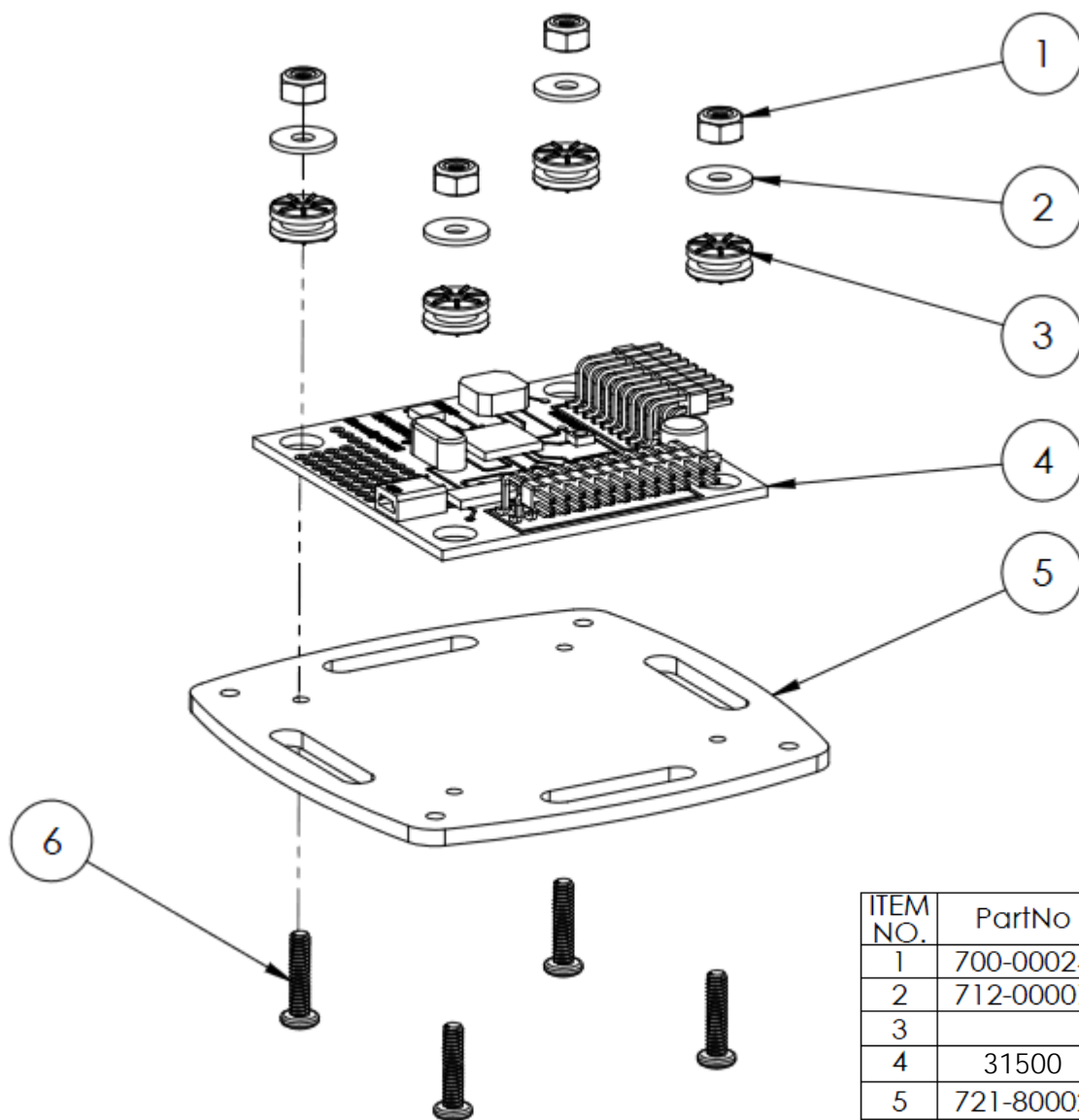
| ITEM NO. | PartNo | DESCRIPTION | QTY. |
|---|---|---|---|
| 1 | 700-00024 | Lock Nut 4-40 x 1/4" | 4 |
| 2 | 712-00007 | Plastic Washer #4 | 4 |
| 3 | | Rubber Grommet | 4 |
| 4 | 31500 | HoverFly Open PC Board | 1 |
| 5 | 721-80002 | Control Board Mount Plate | 1 |
| 6 | 710-00006 | Pan Head Phillips SS Screw 4-40 x 1/2" | 4 |

# Step 15: Reprogram the Control Board Firmware for Y-6

In this step you will program the Control Board to know it is in a Y-6 configuration.

1. If you have not done so already, go to the website listed here and download the Hoverfly Firmware Update Client:
   http://www.hoverflytech.com/Software_Updates.html

2. Once you have the software installed and opened, connect your Control Board to your PC. Follow the onscreen instructions to update your board's firmware for the Y-6 configuration.

3. Be sure to set Select Board to Hoverfly Open, and Select Mode to Y6.
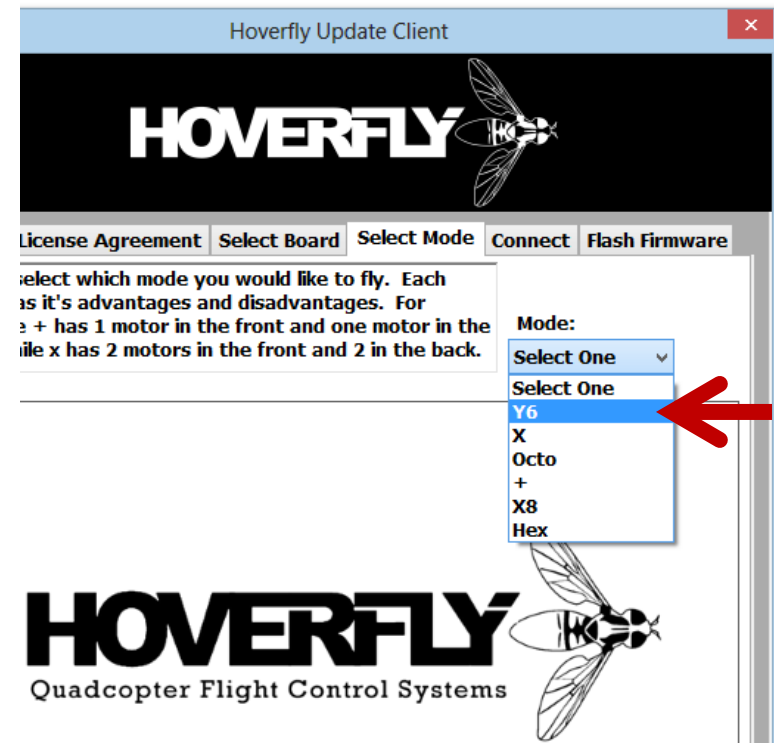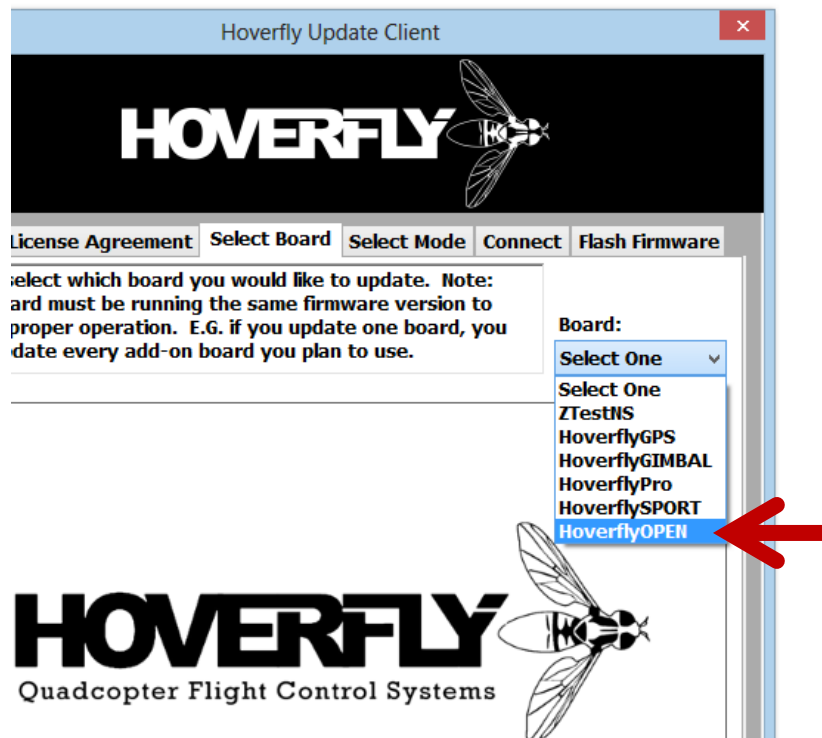
# Step 16: Mount the Control Board Assembly to the Chassis

In this step you will enclose the Control Board within its protective Top Plate, and then mount the assembly on to the completed Y-6 chassis. To begin the hardware assembly, gather the items listed on the diagram on the next page.

1.  Find the arrow on the Control Board silkscreen, as shown at right.  This arrow points to the front of the Control Board, which must be facing the same direction as the front of the chassis.

2.  Referring to the diagram on the next page, set the Control Board Assembly over the ½ inch screws that are protruding from the Top Chassis Plate, aligning the front of the control board with the front of the chassis.
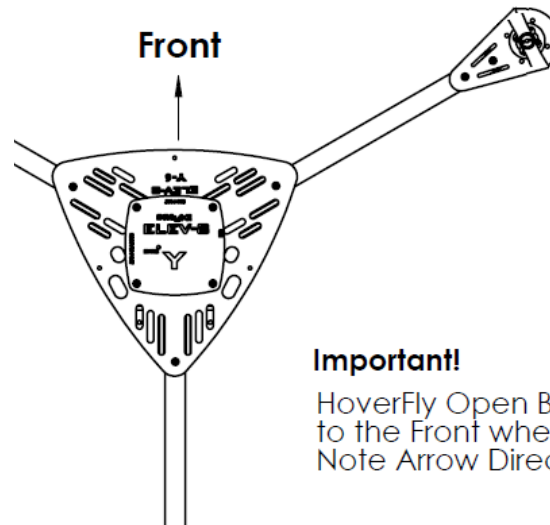
**Front**

**Important!**

HoverFly Open Board Must Point to the Front when mounted. Note Arrow Direction.
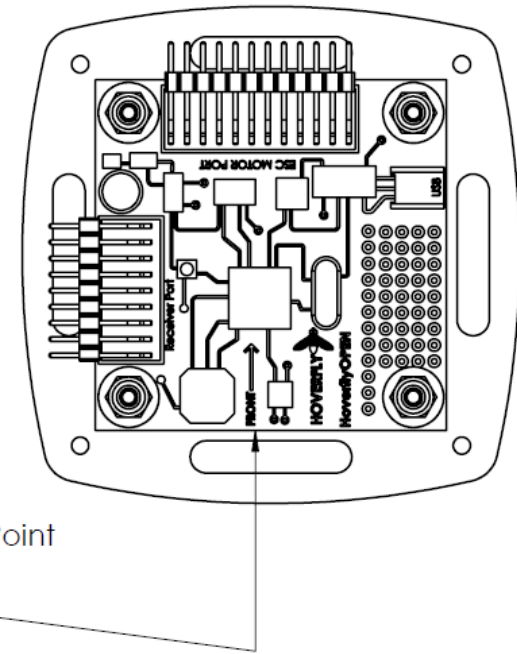
3.  Install and hand tighten the 5/8 inch Nylon Standoffs. This secures the Control Board Mount Plate to the Top Chassis Plate.

4.  Align the Control Board Top Plate over the Control Board.  The small hole near the center of the Top Plate is for a light pipe.  Ensure this hole is located above the LED on the Control Board so that you will be able to see the status of the Control Board when the Top Plate is installed.

5.  Place the Top Plate (item 3) on top of the 5/8 inch standoffs and secure it using ½ inch screws (item 2).

6.  Insert the Light Pipe (item 1) into its hole in the Control Board Top Plate.  Trim the light pipe so that it rests just above the LED on the Control Board.

7.  Mount your R/C Receiver to the chassis Plate using zip ties, double sided tape, or a method of your choosing.  Ensure that you refer to your R/C Receiver's manual for best placement recommendations.
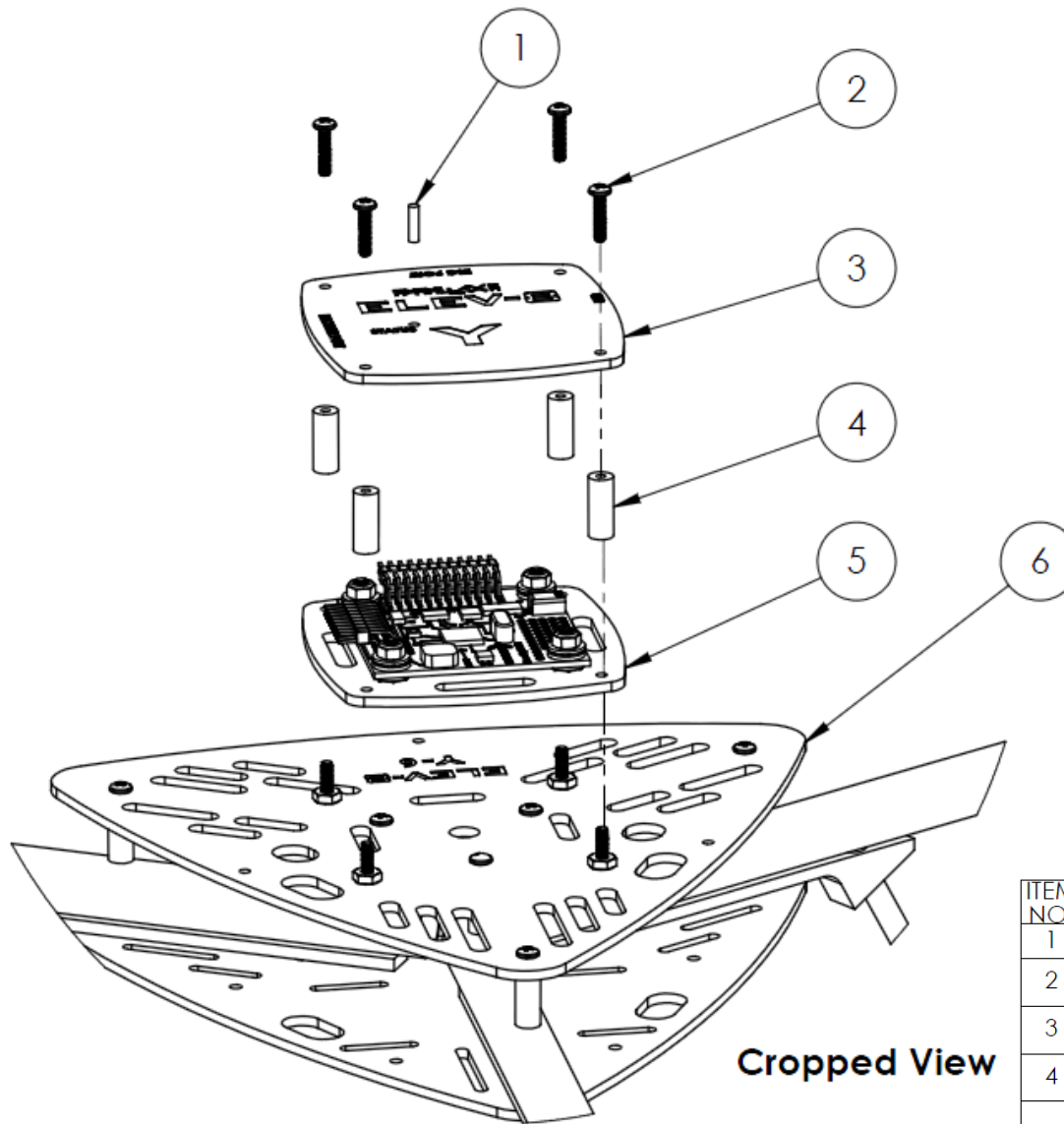
**Cropped View**

| ITEM NO. | PartNo | DESCRIPTION | QTY. |
|---|---|---|---|
| 1 | 720-28001 | Light Tube | 1 |
| 2 | 710-00006 | Pan Head Phillips SS Screw 4-40 x 1/2" | 4 |
| 3 | | Y control Board Top Plate | 1 |
| 4 | 713-00043 | Nylon Standoff 4-40 x 5/8" | 4 |
| 5 | | ELEV-8 Control Board & HoverFly PC Board | 1 |
| 6 | | Assy Y Copter | 1 |

## Step 17: Control Board Connections

In this step, you will connect your ESCs and Receiver to your Control Board. The Receiver connects to the Receiver Port's 2x9 male header on the left edge of the Control Board. The Electronic Speed Controllers connect to the ESC Port's 2x12 male header on the front edge of the Control Board.

1. Connect the Receiver to the Receiver Port, with the five signal connections listed below. Use the 3-wire extension cables included in the ELEV-8 Electronics Kit.

        A = Aileron
        T = Throttle
        R = Rudder
        E = Elevator
        G = Gear (ON: EPA value is Primary Gain, Altitude Hold is off.)
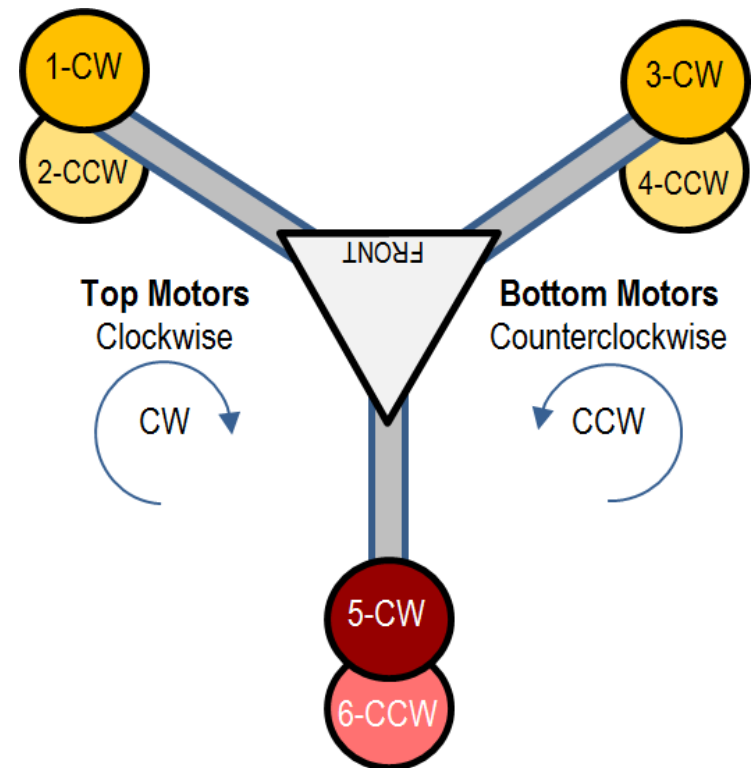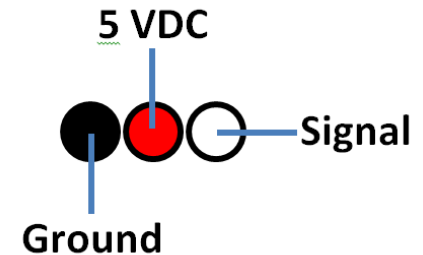                     (OFF: EPA value is Altitude Hold Gain, Altitude Hold is on.)

### Receiver Port: Control Board Left Edge

2. Connect each motor's ESC to the corresponding pins on the ESC port. Match the motor numbers at left to the port numbers below.

3. Double-check your connections – it's easy to make a mistake here.

### ESC Port: Control Board Front Edge

5 VDC

Signal

Ground

1-CW
2-CCW
3-CW
4-CCW
FRONT

Top Motors
Clockwise
CW

Bottom Motors
Counterclockwise
CCW

5-CW
6-CCW

# Step 18: Mounting the Propeller Blades

**Only mount the propeller blades when you are ready to fly.**

There are two different types of slow flyer propeller blades in the ELEV-8 Electronics Kit: Counterclockwise, (CCW, marked 1045C) and Clockwise (CW, marked 1045CR). The correct type of blade must be used on each motor for the ELEV-8 to fly. See the drawing below for label location; the blades are rounded-side-up.

1. Disconnect the battery from the Power Harness.

2. Refer to the diagram on this page for the correct placement of each blade.

3. Connect each blade to its motor, referring to the diagram on the next page. The Blade (item 2) should be mounted rounded-side-up, seated on a Cone Lock (item 3) over a Collet (item 4).

   **IMPORTANT! Even though the bottom motors are mounted upside-down, the propellers on them must be mounted right-side up. So, ALL the propellers on your Y-6 will have the rounded side up.**

4. Finger-tighten the Propeller Nut (item 1), then use a Hex Key to tighten ¼ turn more.

**Use Blue Loctite Before installing.**
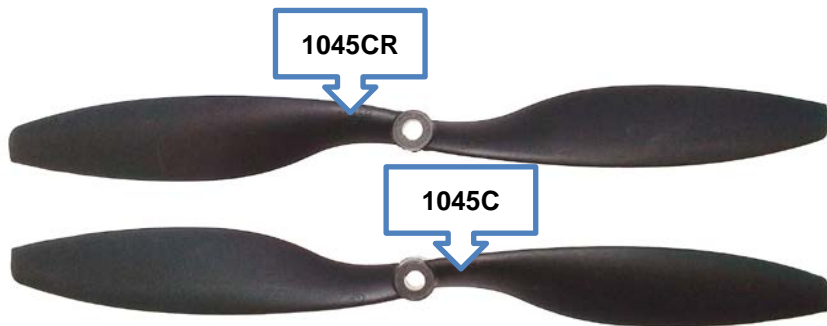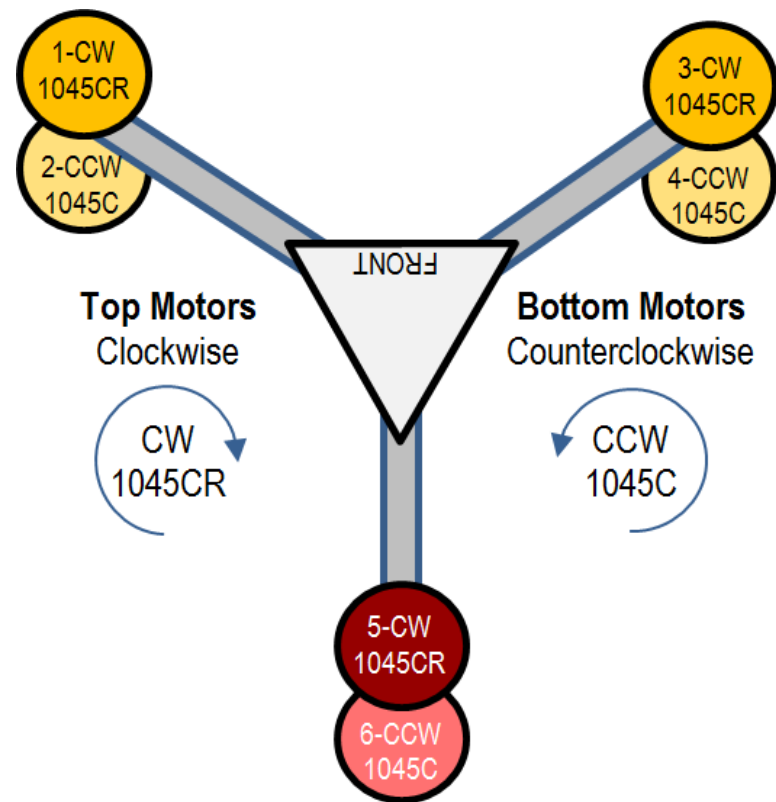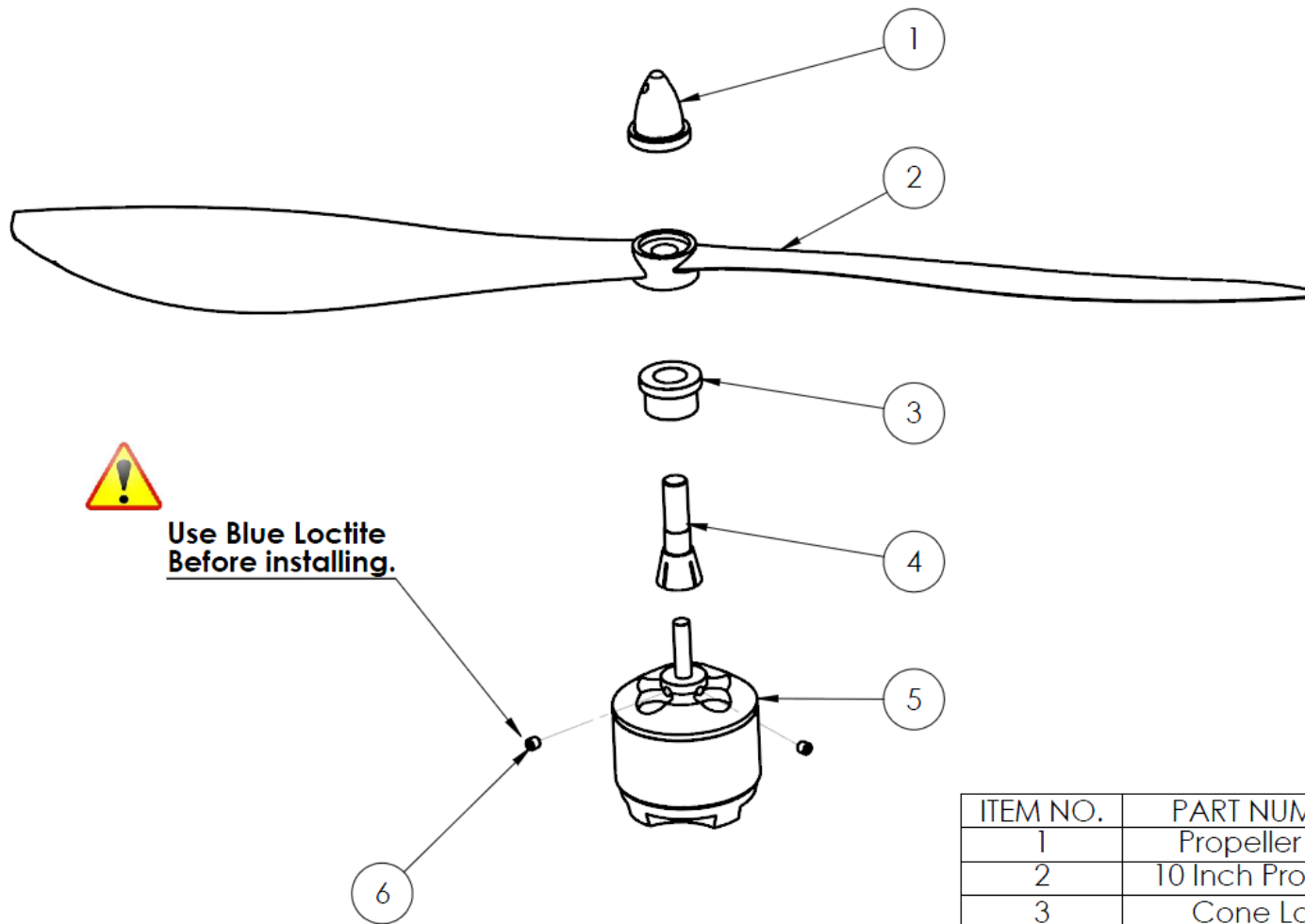
| ITEM NO. | PART NUMBER | QTY. |
|----------|-------------|------|
| 1 | Propeller Nut | 1 |
| 2 | 10 Inch Propeller | 1 |
| 3 | Cone Lock | 1 |
| 4 | Collet | 1 |
| 5 | Motor 2 | 1 |
| 6 | Set Screw | 2 |

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