

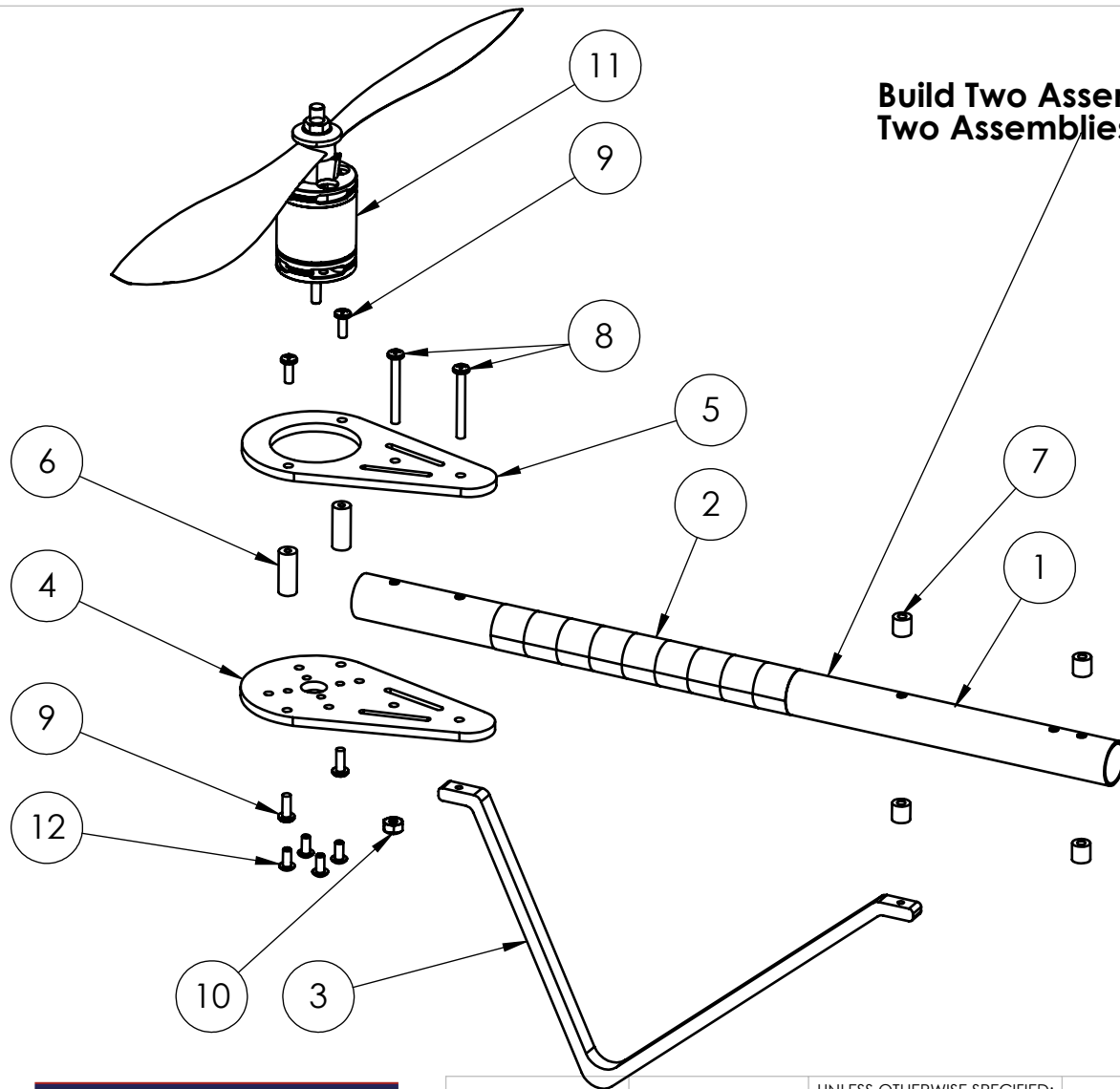
**Use Blue Loctite
Before installing.**

ITEM NO.	DESCRIPTION	QT Y.
1	Motor Main Body	1
2	Washer Propeller	1
3	10 Inch Propeller	1
4	Propeller Nut	1
5	Prop Adapter	1
6	Flat Head Screw	4
7	Set Screw	2



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		UNLESS OTHERWISE SPECIFIED:		NAME	DATE		
		DIMENSIONS ARE IN INCHES		DRAWN	KO	12.08.11	TITLE: Motor/Propelller Assy Exploded
		TOLERANCES:		CHECKED			
		FRACTIONAL ±		ENG APPR.			
		ANGULAR: MACH ± BEND ±		MFG APPR.			
		TWO PLACE DECIMAL ±		Q.A.			
		THREE PLACE DECIMAL ±		COMMENTS:			
		INTERPRET GEOMETRIC TOLERANCING PER:					
		MATERIAL					
		FINISH					
NEXT ASSY	USED ON						
APPLICATION		DO NOT SCALE DRAWING					



Build Two Assemblies with Red Boom and Two Assemblies with Black Boom.

ITEM NO.	Description	Part Number	QTY.
1	Motor Boom		1
2	Checkered Pattern	TOPQ4111-30"	1
3	Landing Gear	721-80007	1
4	Motor Mount Bottom	721-80006	1
5	Motor Mount top	721-80005	1
6	Nylon Standoff 4-40 x 5/8	713-00043	2
7	Nylon Standoff 4-40 screw size x1/4 long	713-00005	4
8	Screw, 4-40, 1", panhead, stainless steel	710-00002	2
9	Screw, 4-40, 3/8", panhead, stainless steel	710-00036	4
10	Lock Nut 4-40 x 1/4	700-00024	1
11	Motor Assembly		
12	Screw, 3mm x 6mm, 0.5 thread Black		4

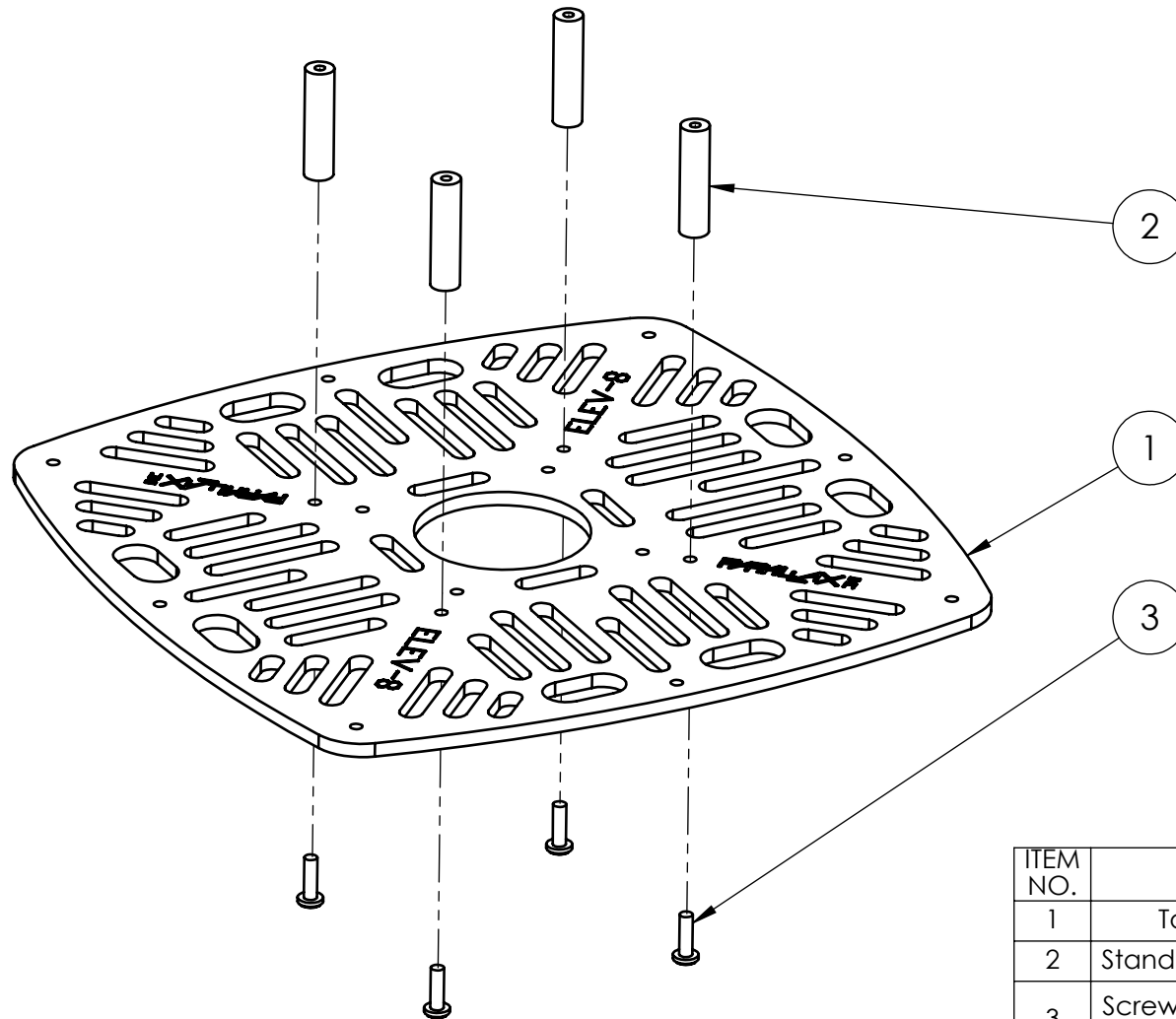


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		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
		DIMENSIONS ARE IN INCHES		DRAWN	KO
		TOLERANCES:		CHECKED	
		FRACTIONAL ±		ENG APPR.	
		ANGULAR: MACH ± BEND ±		MFG APPR.	
		INTERPRET GEOMETRIC TOLERANCING PER:		Q.A.	
		MATERIAL		COMMENTS:	
		FINISH			
NEXT ASSY	USED ON				
APPLICATION		DO NOT SCALE DRAWING			

TITLE:
Motor/Boom Assy

SIZE A	DWG. NO.	REV 2
SCALE: 1:1	WEIGHT:	SHEET 1 OF 1



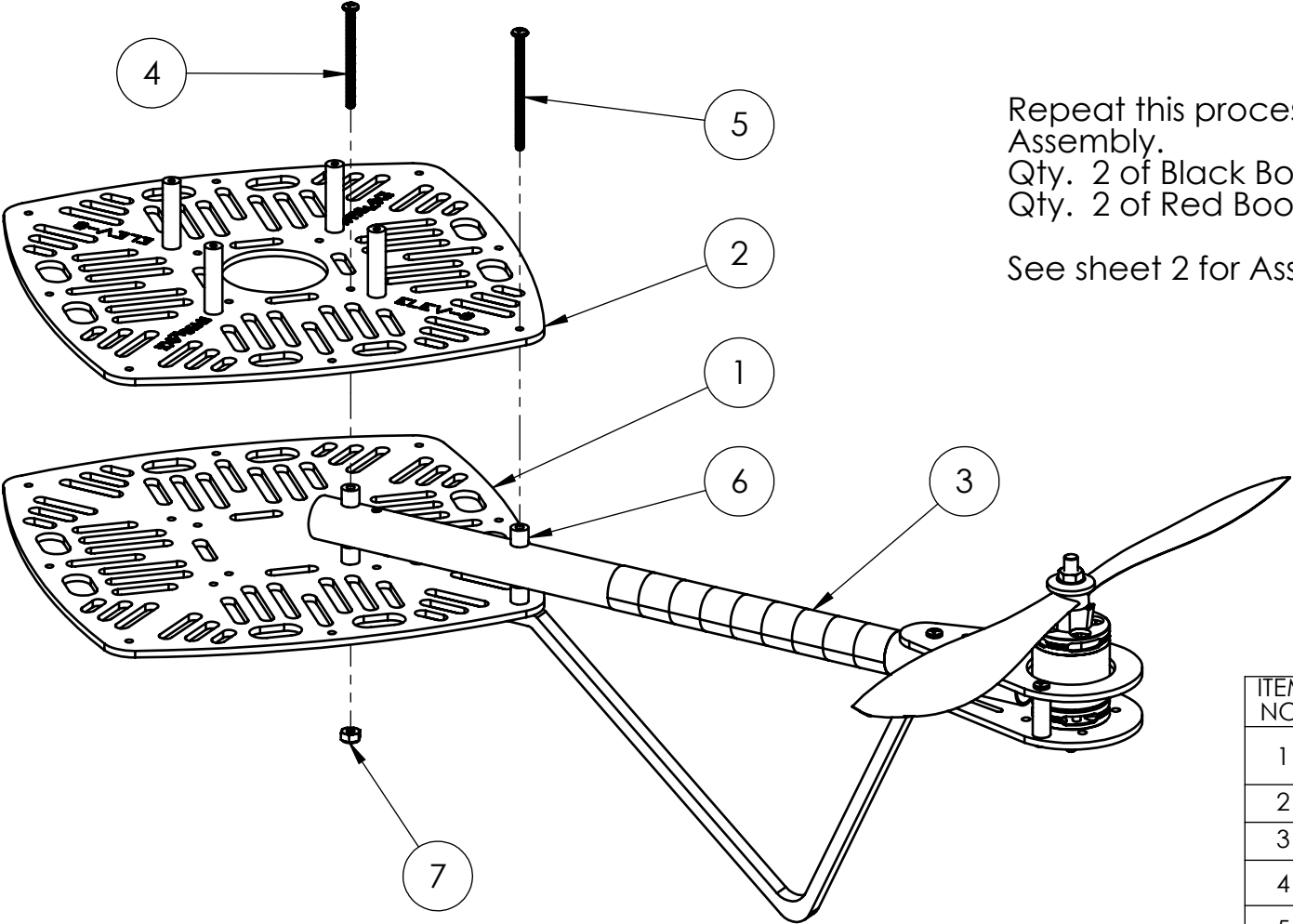
ITEM NO.	Description	Part Number	QTY.
1	Top Chassis Plate	721-80003	1
2	Stand off nylon, 1", Thread	713-00042	4
3	Screw 4-40 3/8 Pandhead stainless steel	713-00036	4



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		UNLESS OTHERWISE SPECIFIED:	NAME	DATE	TITLE: Assembly of Top Chassis Plate W/ Stand offs	
		DIMENSIONS ARE IN INCHES	DRAWN	KO		12.09.11
		TOLERANCES:	CHECKED			
		FRACTIONAL ±	ENG APPR.			
		ANGULAR: MACH ± BEND ±	MFG APPR.			
		TWO PLACE DECIMAL ±	Q.A.			
		THREE PLACE DECIMAL ±	COMMENTS:			
		INTERPRET GEOMETRIC TOLERANCING PER:				
		MATERIAL				
		FINISH				
NEXT ASSY	USED ON					
APPLICATION		DO NOT SCALE DRAWING				

SIZE A	DWG. NO.	REV 1
SCALE: 1:1	WEIGHT:	SHEET 1 OF 1



Repeat this process for each Boom Arm Assembly.

Qty. 2 of Black Boom Arm Assembly.

Qty. 2 of Red Boom Arm Assembly.

See sheet 2 for Assembly of Boom Arms

ITEM NO.	Description	Part Number	QTY.
1	Quad Chassis Bottom	721-80004	1
2	Quad Chassis Top	721-80003	1
3	Motor/Boom Assy		1
4	Screw, 4-40, 1-1/2", PH SS	710-00037	1
5	Screw 4-40, 1-3/4, PH, SS	710-00041	1
6	Stand off, Nylon, 1/4, 4-40 screw size	713-00005	4
7	Lock Nut 4-40 x 1/4	700-00024	1



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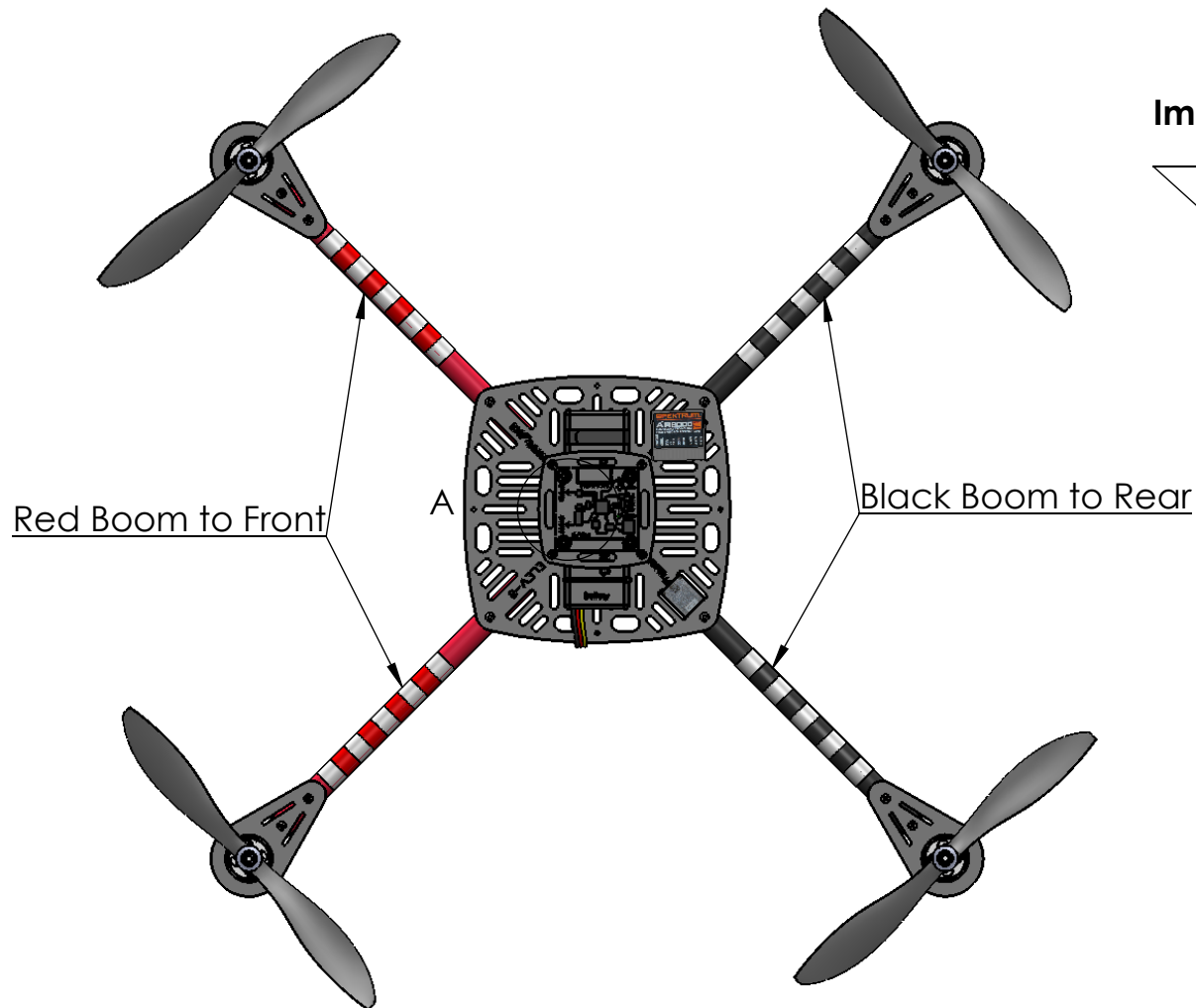
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		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
		DIMENSIONS ARE IN INCHES	DRAWN	KO	12.09.11
		TOLERANCES:	CHECKED		
		FRACTIONAL ±	ENG APPR.		
		ANGULAR: MACH ± BEND ±	MFG APPR.		
		TWO PLACE DECIMAL ±	COMMENTS:		
		THREE PLACE DECIMAL ±			
		INTERPRET GEOMETRIC		Q.A.	
		TOLERANCING PER:			
		MATERIAL			
		FINISH			
NEXT ASSY	USED ON				
APPLICATION		DO NOT SCALE DRAWING			

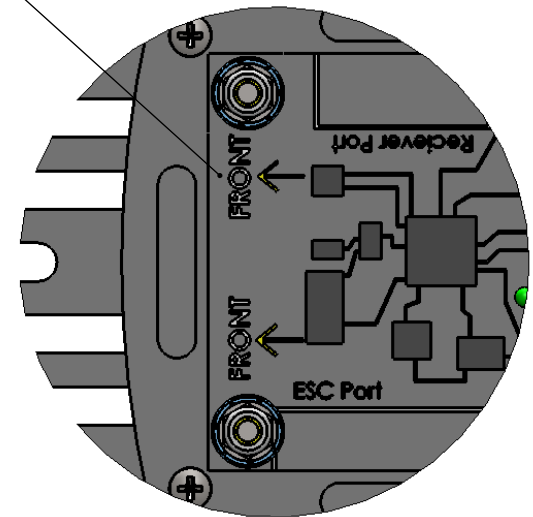
TITLE:
Assy of Boom Arms
to Chassis Plates

SIZE **A** DWG. NO. REV **2**

SCALE: 1:1 WEIGHT: SHEET 1 OF 2



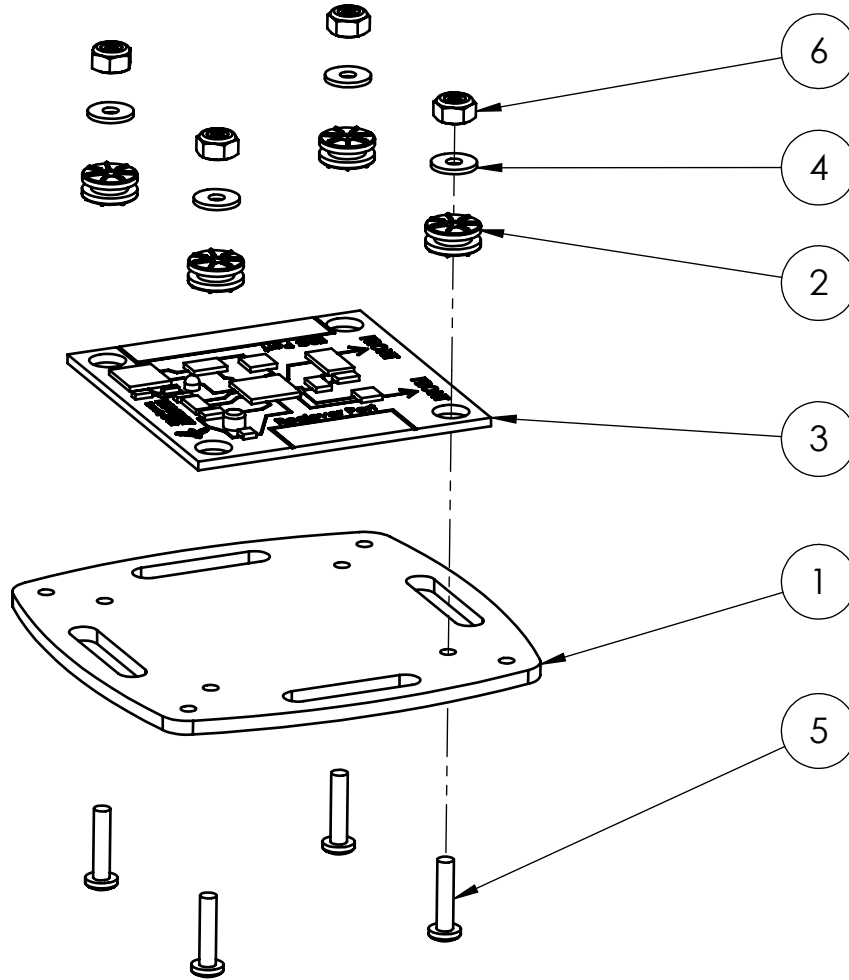
Important! HoverFly Sport Board Must Point to the Front.



DETAIL A
SCALE 1 : 1

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		UNLESS OTHERWISE SPECIFIED:		NAME	DATE	TITLE: Assembly of Boom Arms
		DIMENSIONS ARE IN INCHES		DRAWN		
		TOLERANCES:		CHECKED		
		FRACTIONAL ±		ENG APPR.		
		ANGULAR: MACH ± BEND ±		MFG APPR.		
		TWO PLACE DECIMAL ±		Q.A.		SIZE A
		THREE PLACE DECIMAL ±		COMMENTS:		
		INTERPRET GEOMETRIC TOLERANCING PER:				DWG. NO.
		MATERIAL				REV
		FINISH				
NEXT ASSY	USED ON	APPLICATION	DO NOT SCALE DRAWING			SCALE: 1:10
						WEIGHT:
						SHEET 2 OF 2



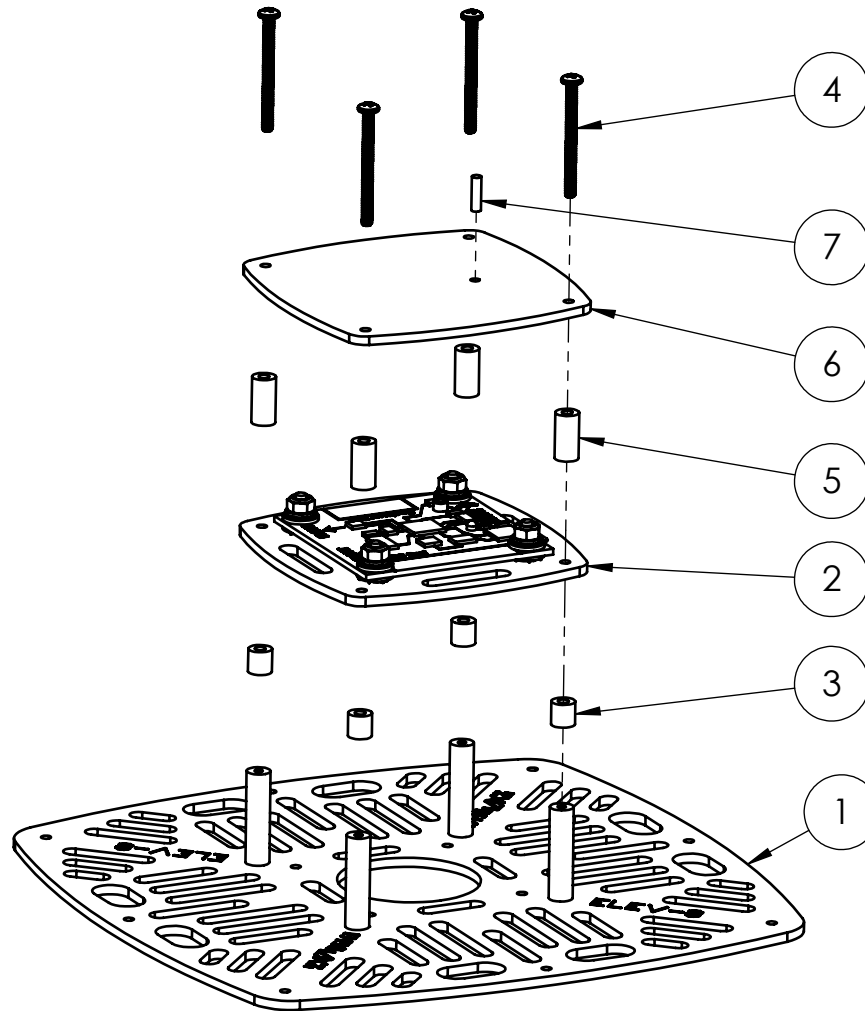
ITEM NO.	Description	Part Number	QTY.
1	ELEV-8 Control Board Mount Plate	721-80002	1
2	Rubber Grommet		4
3	HoverFly Sport Board	31500	1
4	# 4 SS Steel Washer		4
5	Screw, 4-40, 1/2", panhead, stainless steel	710-00006	4
6	Lock Nut 4-40 x 1/4	700-00024	4



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		UNLESS OTHERWISE SPECIFIED:	NAME	DATE	TITLE: Assembly of Control Board Mt. Plate and HoverFly Sport Board	
		DIMENSIONS ARE IN INCHES	DRAWN	KO		12.10.11
		TOLERANCES:	CHECKED			
		FRACTIONAL ±	ENG APPR.			
		ANGULAR: MACH ± BEND ±	MFG APPR.			
		TWO PLACE DECIMAL ±	Q.A.			
		THREE PLACE DECIMAL ±	COMMENTS:			
		INTERPRET GEOMETRIC TOLERANCING PER:				
		MATERIAL				
		FINISH				
NEXT ASSY	USED ON					
APPLICATION		DO NOT SCALE DRAWING				

SIZE A	DWG. NO.	REV 2
SCALE: 1:1	WEIGHT:	SHEET 1 OF 1



Note: #7, Light Tube comes 5/8" long.
Cut to length needed

ITEM NO.	Description	Part Number	QTY.
1	Assy of Top Chassis Plate w/Stand offs		1
2	ELEV-8 Control Board Mount Plate Assy		1
3	Spacer, nylon, 1/4", 4-40 screw size	713-00005	4
4	Screw, 4-40, 1-1/4", panhead, stainless steel		4
5	Spacer, nylon, 1/2", 4-40 screw size		4
6	ELEV-8 Control Board Top Plate		1
7	light tube	720-28001	1



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		UNLESS OTHERWISE SPECIFIED:		NAME	DATE	TITLE: Control Board Assy And Chassis Top Plate Assy			
		DIMENSIONS ARE IN INCHES		DRAWN	KO		12.14.11		
		TOLERANCES:		CHECKED					
		FRACTIONAL ±		ENG APPR.					
		ANGULAR: MACH ± BEND ±		MFG APPR.					
		TWO PLACE DECIMAL ±		Q.A.		SIZE A	DWG. NO.	REV 2	
		THREE PLACE DECIMAL ±		COMMENTS:					
		INTERPRET GEOMETRIC TOLERANCING PER:							
		MATERIAL				SCALE: 1:1		WEIGHT:	SHEET 1 OF 1
NEXT ASSY		USED ON							
APPLICATION				DO NOT SCALE DRAWING					

ELEV-8 ASSEMBLY GUIDE

**Disclaimer of liability:**

Parallax Inc. is not responsible for any special, incidental, or consequential damages and personal injuries, including that to life and health, resulting from the customer's application and use of any Parallax Inc. products. You, the customer, assume full and unlimited responsibility for all customer ELEV-8 Quadcopter applications and uses.



This document is intended to be a guide during the assembly of an ELEV-8 Quadcopter. It is not a step by step walk-through of how to assemble the platform. In this document you will find specific instructions on how to assemble components that should be followed. These will help to decrease your potential for catastrophic failure of your ELEV-8. You will also find broad suggestions on assembly of components and their counter parts that are not as detrimental to one specific way of assembly, which leaves the door open for creativity and customization of the craft. There is no way to fully eliminate your potential for unwanted operation, as user error cannot be fully accounted for! With this said, let's get building!

Open "ELEV-8 Assembly Document.pdf", as it is the counterpart to this guide, and will be the reference for this process. In this guide, you will find references to specific items in the Assembly Doc. They will have the corresponding item number next to each of the references. For example, on Page 1 of the Assembly Doc, if we were to reference the Prop Adapter, it would be referenced as "Prop Adapter(5)". We have identified the part name, as well as the item number in the drawings.

STEP 1: Motor/Propeller Assembly

We start with the motors, as they are the only components that require the use of Blue Loctite, so we want to give the Loctite ample time to dry and set. The components needed for the assembly of the motors, are in the Turnigy motor's package. However, the Blue Loctite is not, as you are required to purchase this independently. Ensure to place Loctite on the Set screws(7) and on the Flat Head Screws(6), as these are areas that have been known to come loose during flight, and could lead to a catastrophic failure of the motor, and of the craft. Now would be a good time to solder your 16 AWG wire to your motors. A good length that we have found to work well is 13 inches of wire per lead. Any more or any less tends to increase your amount of headaches down the road. Soldering your leads directly to the motor, and having EC3 connectors on the ESC side of the leads has been found to work well. Which ever method you choose, ensure that you will have the ability to disconnect the Motor's wires from the ESC. You need this capability due to the fact that each motor will need to be connected to it's ESC in a different way. When you check your motor direction, you will need to have the ability of switching wire connections to change the rotation direction of the motors. This will all be done in Step 4, when you connect the Boom Assemblies to the Chassis, and wire your harness. Once you have assembled your motor and soldered on your leads, be sure to heat shrink the solder points and cover exposed connections. Repeat this process for all four motors before proceeding on to the next step.

STEP 2: Motor/Boom Assembly

Make all additions and modifications to the Motor Boom(1); such as LED tape, Checker tape and Clear heat shrink, before putting together the Motor/Boom Assembly. Use the Checkered tape(2), or method of your choice, to make two Red and two Black Boom Assemblies for ease of identifying front from rear during flight. Once modifications have been completed, feed the Motor's leads down the boom. Once the wires have been run, attach the Motor Assembly(11) to the Motor Mount Bottom(4). Next, attach the Motor Mount Top(5) using the hardware per the Assembly Doc. The Nylon Standoffs(7) will not be used until you attach the Boom Assembly to the Chassis. Place the standoffs in a safe place until later. Repeat this process for all four Motor/Boom Assemblies before proceeding on to the next step.

STEP 3: Assembly of Top Chassis Plate with Standoffs

The Standoffs(2) need to be attached to the Top Chassis Plate(1) now, as you will not have access to the bottom side of the Chassis Plate later on during assembly.

STEP 4: Assembly of Boom Arms to Chassis Plates

Now is the time that you will want to do a temporary attachment of your Motor/Boom Assy(3) to the Quad Chassis Top(2). Do this so that you can flip the Top Plate with the Boom Assemblies over and have

a clear view of how you will need to construct your power harness. You will essentially be working from the top down, just upside down! Insert the Screws(4 & 5) into the Top Chassis Plate(2) for each of the four booms, and flip over on a table. Place one Standoff(6) onto each screw. Take your Motor/Boom Assembly(3), flip it over, and place one Boom Assembly onto each set of screws.

Once you have the booms in place, you can see how much room you have to create a power harness, and to attach your ESC's. A good starting point is to lay out your ESC's where you believe you will want to attach them, and then begin running wire and measuring for a power distribution harness. You may find that you want to lay things out differently after some thought, so do not start cutting wire until you are positive about how you want to configure your set up. Ensure that you have the correct polarity through your wiring harness before soldering it together. Use the ½" Heat Shrink included in the kit for your harness, as you will have many wires soldered together, and will need the larger Heat shrink to fit over the wires. Once you have decided, solder away!

The Programming of your ESC's should be done at this time, and can be accomplished using either an ESC Programming Card, or by using your Transmitter and Receiver. For instructions on how to use your transmitter and receive, refer to the Turnigy ESC Manual. The settings that you want to program into your ESC's are listed in figure 1 below.

Once you have completed all steps up to this point, you will want to check the rotation direction of your motors. Use figure 2 below, which has the direction requirements for each motor. Once you have changed the Motor to ESC wire connections to obtain the specified rotation direction, ensure all connections are covered, with no bare wire or connectors exposed.

Upon completion of wiring your ELEV-8, attach the remaining Standoffs(6) and the Quad Chassis Bottom(1) to the rest of the assembly, and tighten the assembly together

STEP 5: Assembly of Control Board Mounting Plate and Hoverfly Sport Board

Mount the Hoverfly Sport Board(3) to the Control Board Mounting Plate(1), and be sure to install the rubber anti-vibration grommets on the Sport Board to reduce vibrations transferred to the board during flight. Only hand tighten the Screws(5) to the Locknuts(6), as you do not want to have excessive pressure on the board.

STEP 6: Control Board Assembly and Chassis Top Plate Assembly

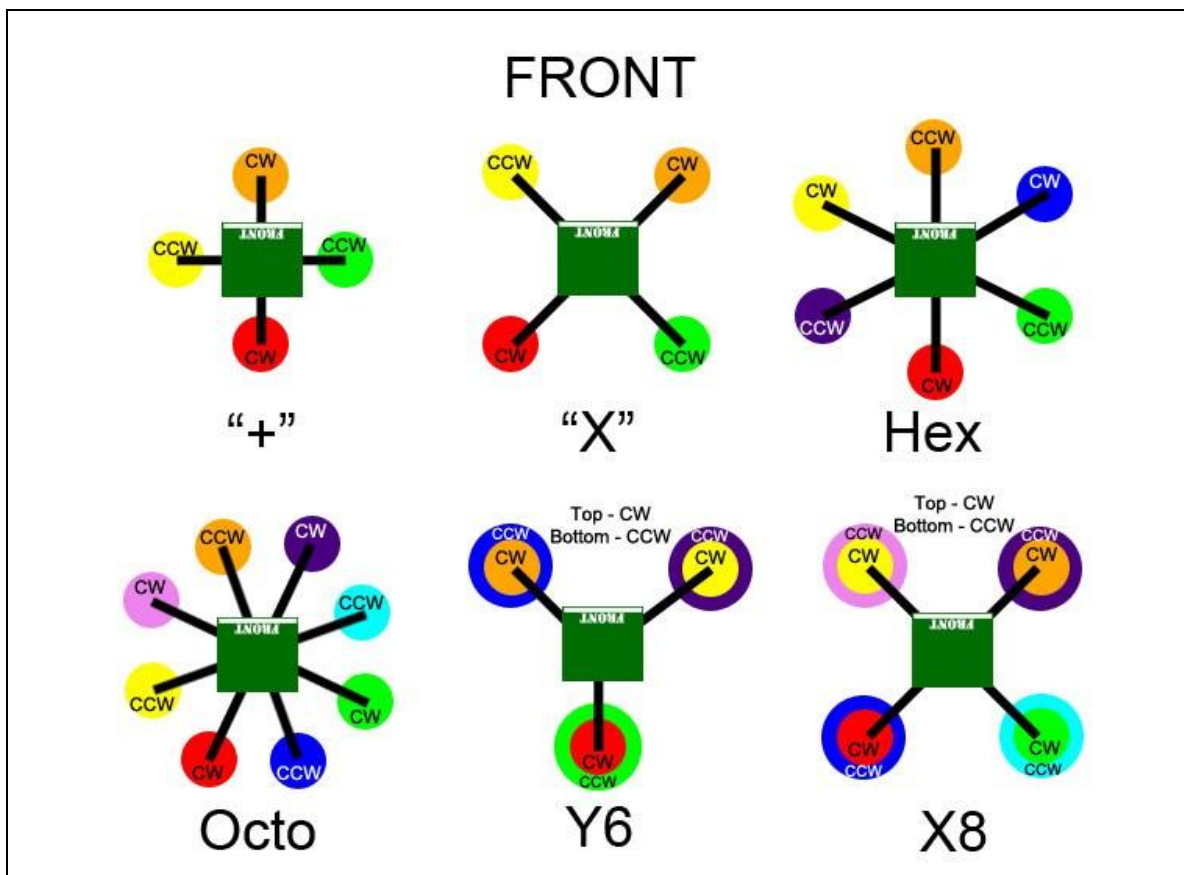
Take the Light Tube(7) and set it aside for now, it needs to be cut to size and will be attached last. When you attach the Sport board plate, ensure that it is oriented with the "Front" side pointing towards the front of your ELEV-8. Also, ensure that the Light Tube hole on top of the Control Board Top Plate(6) is directly above the LED on your Sport Board. This will ensure that when you place your Light Tube(7) into the Top Plate(6), it will be directly above the Sport Board LED. Hand tighten, and do not overtighten.

Figure 1

Transmitter parameter settings.

Parameter	Setting
End point adjustment	100% for "+" and "-" sides
Dual-Rates (D/R)	100%
Channel Reverse	Normal – HiTec, Spektrum, JR Reversed - Futaba
Trims	Centered
Sub Trims	Centered
Exponential	After experienced add up to 30% into aileron and elevator

Figure 2



CW- Clock Wise

CCW- Counter Clock Wise

TURNIGY Manual for Brushless Motor Speed Controller

Thank you for purchasing our Electronic Speed Controller (ESC). High power systems for RC model can be very dangerous; we strongly suggest you read this manual carefully. We have no control over the correct use, installation, application, or maintenance of our products, no liability shall be assumed nor accepted for any damages, losses or costs resulting from the use of the product. Any claims arising from the operating, failure or malfunctioning etc. will be denied. We assume no liability for personal injury, property damage or consequential loss resulting from our product or our workmanship. As far as is legally permitted, the obligation to compensation is limited to the invoice amount of the affected product.

Features:

- Lithium battery Balance Discharge Monitoring and Protecting Design, monitors in real time the discharge voltage of each lithium (Li-ion/Li-poly) cell in a battery pack. Don't worry about the over discharge problem again, your lithium battery pack will have a much longer life. (Remark: This function is ONLY available for "SENTRY" series ESC)
- Extreme low resistance, high current endurance.
- Full protection features: Low-voltage cutoff protection / over-heat protection / throttle signal lost protection
- 3 startup modes: Normal / Soft / Super-Soft, can be used for both fixed-wing aircraft or helicopter models.
- Throttle range can be configured, fully compatible with all kinds of available transmitters.
- Smooth and accurate speed control, excellent throttle linearity.
- Microprocessor uses separate voltage regulator IC (except PULSAR-6A and PULSAR-10A), with high anti-jamming capability.
- Supports up to: 210000 RPM (2 poles), 70000 RPM (8 poles), 35000 RPM (12 poles) motors.
- The program card is a very small device which can be purchased additionally for easy programming the ESC in the field.
- With a program card, you can activate the music playing function of ESC, and there are 15 songs can be selected.

Specifications:

PLUSH Series									
Class	Model	Cont. Current	Burst Current (P-10s)	BEC Mode	BEC Output	Battery Cell	User Programmable	Balance Discharge Protection	Weight
						Li-Ion Li-poly NiMH NiCd			Size L*W*H
6A	PLUSH-6	6A	18A	Linear	5V/0.8	2-5.9	Available	N/A	6g
10A	PLUSH-10	10A	12A	Linear	5V/2A	2-4	5-12	Available	N/A
12A	PLUSH-12	12A	15A	Linear	5V/1A	2-4	5-12	Available	N/A
12A	PLUSH-12B	12A	15A	Linear	5V/2A	2-4	5-12	Available	N/A
18A	PLUSH-18	18A	22A	Linear	5V/2A	2-4	5-12	Available	N/A
25A	PLUSH-25	25A	35A	Linear	5V/2A	2-4	5-12	Available	N/A
25A	PLUSH-25-OPTO	25A	35A	N/A	N/A	2-4	5-12	Available	N/A
30A	PLUSH-30	30A	40A	Linear	5V/2A	2-4	5-12	Available	N/A
40A	PLUSH-40	40A	55A	Linear	5V/3A	2-5	5-15	Available	N/A
40A	PLUSH-40-OPTO	40A	55A	N/A	N/A	2-5	5-15	Available	N/A
60A	PLUSH-60	60A	80A	Switch	5V/3A	2-6	5-18	Available	N/A
60A	PLUSH-60-OPTO	60A	80A	N/A	N/A	2-6	5-18	Available	N/A
80A	PLUSH-80	80A	100A	Switch	5V/3A	2-6	5-18	Available	N/A
80A	PLUSH-80-OPTO	80A	100A	N/A	N/A	2-6	5-18	Available	N/A
100A	PLUSH-100	100A	120A	N/A	N/A	2-6	5-18	Available	N/A

SENTRY Series									
Class	Model	Cont. Current	Burst Current (P-10s)	BEC Mode	BEC Output	Battery Cell	User Programmable	Balance Discharge Protection	Weight
						Li-Ion Li-poly NiMH NiCd			Size L*W*H
18A	SENTRY-18	18A	22A	Linear	5V/2A	2-4	5-12	Available	24g
25A	SENTRY-25	25A	35A	Linear	5V/2A	2-4	5-12	Available	27g
30A	SENTRY-30	30A	40A	Linear	5V/2A	2-4	5-12	Available	29g
40A	SENTRY-40	40A	55A	Switch	5V/3A	2-5	5-15	Available	40g
60A	SENTRY-60	60A	80A	Switch	5V/3A	2-6	5-18	Available	62g
80A	SENTRY-80	80A	100A	Switch	5V/3A	2-6	5-18	Available	67g

BASIC Series									
Class	Model	Cont. Current	Burst Current (P-10s)	BEC Mode	BEC Output	Battery Cell	User Programmable	Balance Discharge Protection	Weight
						Li-Ion Li-poly NiMH NiCd			Size L*W*H
18A	BASIC-18	18A	22A	Linear	5V/2A	2-4	5-12	Available	24g
25A	BASIC-25	25A	35A	Linear	5V/2A	2-4	5-12	Available	27g

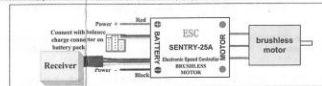
Combo Products									
BEC Output Capability					Switch Mode BEC(SV/3A)				
Linear Mode BEC(SV/2A)					2S --- 4S Li-Poly				
2S Li-Poly	3S Li-Poly	4S Li-Poly	5S Li-Poly	6S Li-Poly	2S --- 4S Li-Poly	5S Li-Poly	6S Li-Poly	7S Li-Poly	8S Li-Poly
Standard micro servos(Max.)	5	4	3	2	5	4	3	2	1

IMPORTANT! For ESC named "xxx-xxx-OPTO" or without a built-in BEC, an UBEC (Ultimate-BEC) or an individual battery pack should be used to power the receiver. And an individual battery pack is needed to power the program card when setting the

TURNIGY Manual for Brushless Motor Speed Controller

programmable value of ESC, please read the user manual of program card for reference.

Wiring Diagram:



Lithium Battery Balance Discharge Monitoring and Protecting Adapter For "SENTRY" Series ESC:
We provide 2 kinds of Lithium Battery Balance Discharge Monitoring and Protecting Adapters for user to choose.

Adapter #1



Adapter #2



VERY IMPORTANT! You MUST connect the adapter with the balance charge connector on battery pack BEFORE connecting the main power to ESC. And if you use banana-shape connectors on main power wires (input wires), please connect the black wire (negative polarity) BEFORE red wire (positive polarity). So the right sequence is:
Balance discharge adapter → BLACK wire of main power → RED wire of main power

Feature Explanation:

- Brake Settings:** Brake Enabled / Brake Disabled, default is Brake Disabled
- Battery Type:** Li-ion/Li-ion or Li-poly / NiMH/NiCd or NiCd - default is Li-ion
- Low Voltage Protection Mode(Cutoff Mode):** Reduce / Cutoff Output Power, default is Reduce the output power gradually.
- Low Voltage Protection Threshold(Cutoff Threshold):** Low / Medium / High, default is Medium.
 - When NOT using balance discharge monitoring and protecting function (i.e. Do NOT plug the balance charge connector into the balance discharge protecting socket on ESC, in this case, the ESC only monitors the voltage of whole battery pack.)
 - For Li-xx battery, number of battery cells are calculated automatically, low / medium / high cutoff voltage for each cell are: 2.8V/2.85V/3.0V. For example: 3 cells Li-Poly, when medium cutoff voltage is set, the cutoff voltage is: 2.85*3=8.55V.
 - For Ni-xx battery, low / medium / high cutoff voltages are 0%/45%/60% of the startup voltage (i.e. the initial voltage of battery pack), and 0% means low voltage cutoff function is disabled. For example: 10 cells NiMH battery, fully charged voltage is 1.44*10=14.4V, when "medium" cutoff voltage is set, the cutoff voltage is: 14.4*45%=6.48V.
 - When using balance discharge monitoring and protecting function (i.e. Plug the balance charge connector on battery pack into the balance discharge protecting socket on ESC, in this case, the ESC monitors not only the voltage of whole battery pack but also the voltage of each cell). For Li-xx battery, low / medium / high cutoff voltage for each cell are: 2.8V/2.85V/3.0V. When the voltage of any cell in battery pack is lower than the cutoff threshold, the protecting program is activated.
- Startup Mode:** Normal / Soft / Super-soft, default is Normal startup.
 - Normal is good for fixed-wing aircraft. Soft and Super-soft are good for helicopters. The initial speed of soft / super-soft mode is very slow, 1 second (soft startup) / 2 seconds (super-soft startup) from startup to full speed. But if throttle is closed (throttle stick is moved to bottom) and opened again (throttle stick is moved upwards) within 3 seconds after the first startup, the restart will be temporarily changed to normal mode to get rid of the chances of crash caused by slow throttle response in aerobatic fly.
- Timing:** Low / Medium / High, default is Low.
 - In normal cases, low timing can be used for most motors. But for high efficiency, we recommend the Low timing for 2 poles motor and Medium timing for 8 poles and above. For higher speed, High timing can be chosen.

Special Hint

Some high KV out-runner motors have very special configuration, the space between each airfoil is very large, and lots of ESCs can't drive these motors. After updating the program, our ESCs have very good compatibility with them. But some RC fans still have several questions about the programmable value for some special motors. So we just give some suggestions as follows:

Motor	Programmable Value Suggestion	Timing	Startup Mode
General in-runner motor	Low	Low	Usually, aircraft uses "normal" startup mode
General out-runner motor	Low or Medium	Low or Medium	helicopter uses "super-soft" startup mode
Align 420LF (Made in TAIWAN, out-runner)	High (MUST)	High	
450TH (Made in TAIWAN, out-runner)	Low	Low	Soft (MUST)

Begin To Use Your New ESC

Please start up the ESC in the following sequence:

- Move the throttle stick to bottom position and then switch on the transmitter.
- Connect battery pack to ESC, the ESC begins the self-test process, a special tone "♪ 123" is emitted, which means the voltage of battery pack is in normal range, and then "N beep" tones will be emitted, means the quantity of lithium battery cells. Finally a long "beep-----" tone will be emitted, which means self-test is OK, the aircraft/helicopter is ready to go flying.
- If nothing is happened, please check the battery pack and all the connections;

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- If a special tone "J 16112" is emitted after 2 beep tones ("beep-beep-"), means the ESC has entered the program mode, i.e. the throttle channel of your transmitter is reversed, please set it correctly.
 - If a very rapid "beep-beep-," tone is emitted, means the input voltage is too low or too high, please check your battery's voltage.
- VERY IMPORTANT!** Because different transmitter has different throttle range, we strongly suggest you using the "Throttle Range Setting Function" to calibrate throttle range. Please read the instruction on page 4-----"Throttle Range Setting".

Alert Tone

- Input voltage abnormal alert tone: The ESC begins to check the voltage of battery pack when power on, if the voltage is not in acceptable range, such an alert tone will be emitted: "beep-beep-," every "beep-beep-" has a time interval about 1 second.)
- Throttle signal abnormal alert tone: When the ESC can't detect the normal throttle signal, such an alert tone will be emitted: "beep-," every "beep-" has a time interval about 2 seconds)
- Throttle stick not at bottom position alert tone: When the throttle stick is not in bottom (lowest) position, a very rapid alert tone will be emitted: "beep-," every "beep-" has a time interval about 0.25 second.)

Protection Function

- Start up protection: If the motor failed to start up in 2 seconds while the throttle stick is being moved upwards, the ESC will cut off the output power. In this case, the throttle stick **MUST** be moved to bottom again to restart the motor. (Such a situation happens in the following cases: The connection between ESC and motor is not reliable, propeller is blocked, gearbox is damaged, etc.)
- Over-heat protection: When the temperature of ESC is over 110°C, the ESC will reduce the output power.
- Throttle signal lost protection: The ESC will reduce output power if throttle signal lost for 1 second, further lost for 2 seconds will cause its output to be cut off.

Program example

Setting startup mode to "super-soft", i.e. value #3 in program item #5

1. Enter Program Mode Switch on transmitter, move throttle stick to top, connect battery pack to ESC, wait for 2 seconds, "beep-beep-" tone should be emitted. Then wait another 3 seconds, special tone like "16112" should be emitted, means program mode is entered.
2. Select Programmable Items Now you'll hear 8 tones in loop. When a long "beep-----" tone is emitted, move throttle stick to bottom to enter the "Startup Mode".
3. Set Item Value (Programmable Value) "Beep-", wait for 3 seconds; "Beep-beep-", wait for another 3 seconds; then you'll hear "beep-beep-beep-", move throttle stick to top, then a special tone "16112" is emitted, now you have set the "Startup Mode" item to the value of "Super-Soft Startup".
4. Exit Program Mode After the special tone "16112", move throttle stick to bottom within 2 seconds.

Trouble Shooting

Trouble	Possible Reason	Action
After power on, motor can't work, no sound is emitted	The connection between battery pack and ESC is not OK.	Check the power connection. Replace the connector.
After power on, motor can't work, such an alert tone is emitted.	Input voltage is abnormal, too high or too low.	Check the voltage of battery pack
"beep-beep-," every "beep-beep-" has a time interval about 1 second)	Throttle signal is abnormal	Check the receiver and transmitter Check the cable of throttle channel
After power on, motor can't work, such an alert tone is emitted.	Throttle stick is not in bottom (lowest) position	Move the throttle stick to bottom
"beep-," every "beep-" has a time interval about 2 seconds)	The direction of throttle channel is reversed, so the ESC has entered the program mode.	Set the direction of throttle channel correctly
After power on, motor can't work, such an alert tone is emitted.	The connection between ESC and the motor need to be changed.	Swap any two wire connections between ESC and motor
"beep-," every "beep-" has a time interval about 0.25 second)	ESC has entered Low Voltage Protection mode	Check the cable of throttle channel Check the cable of throttle channel Land RC model as soon as possible, and then replace the battery pack.
The motor runs in opposite direction	Some Connections are not reliable	Check all the connections: battery pack connection, throttle signal cable, motor connections, etc.
The motor stop running while in working state	Throttle signal is lost	Check the receiver and transmitter Check the cable of throttle channel
Stochastic restart or abnormal work state	There is strong Electro - Magnetic interference in flying field.	The normal function of the ESC may be disturbed by strong Electro - Magnetic interference. If so, simply read the ESC to resume normal operation by following the instruction manual. In case the function could not be resumed, please use the ESC in other places.

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Normal startup procedure:

Switch on transmitter, move throttle stick to bottom	Connect battery pack to ESC, special tone like "J123" means power supply is OK	Several "beep-" tones should be emitted, presenting the quantity of lithium battery cells	When self-test is finished, a long "beep-----" tone should be emitted	Ready to go flying now
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Throttle range setting: (Throttle range should be reset when a new transmitter is being used)

Switch on transmitter, move throttle stick to top	Connect battery pack to ESC, and wait for about 2 seconds	"Beep-beep-" tone should be emitted, means throttle range highest point has been correctly confirmed	Move throttle stick to the bottom, several "beep-" tones should be emitted, presenting the quantity of battery cells	A long "Beep-" tone should be emitted, means throttle range lowest point has been correctly confirmed
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Program ESC with transmitter (4 Steps):

- Enter program mode
- Select programmable items
- Set item value (Programmable value)
- Exit program mode

1. Enter program mode 1) Switch on transmitter, move throttle stick to top position, connect the battery pack to ESC 2) Wait for 2 seconds, the motor should emit special tone like "beep-beep-" 3) Wait for another 5 seconds, special tone like "16112" should be emitted, which means program mode is entered	2. Select programmable items: After entering program mode, you can hear 8 tones in a loop in the following sequence. If you move the throttle stick to bottom within 3 seconds after one kind of tones, then this item will be selected. 1. "beep" brake (1 short tone) 2. "beep-beep-" battery type (2 short tone) 3. "beep-beep-beep-" cutoff mode (3 short tone) 4. "beep-beep-beep-beep-" cutoff threshold (4 short tone) 5. "beep-----" startup mode (1 long tone) 6. "beep-----beep-" timing (1 long 1 short) 7. "beep-----beep-beep-" set all to default (1 long 2 short) 8. "beep-----beep-----" exit (2 long tone) Remark: 1 long "beep-----" = 5 short "beep-"
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3. Set item value (Programmable value):

You will hear several tones in loop. Set the value matching to a tone by moving throttle stick to top when you hear the tone, then a special tone "16112" emits, means the value is set and saved. (Keeping the throttle stick at top position, you will go back to step 2 and select other items; Moving the stick to bottom within 2 seconds, you will exit the program mode directly)

Items	"beep-" 1 short tone	"beep-beep-" 2 short tones	"beep-beep-beep-" 3 short tones
Brake	Off	On	
Battery type	Li-Ion / Li-poly	NiMH / NiCd	
Cutoff mode	Reduce power	Shut down	
Cutoff threshold	Low	Medium	High
Startup mode	Normal	Soft	Super soft
Timing	Low	Medium	High

4. Exit program mode

- There are 2 ways to exit program mode:
- In step 3, after special tone "16112", move throttle stick to bottom within 2 seconds.
 - In step 2, after tone "beep-----beep-----" (i.e. The item #8), move throttle stick to bottom within 3 seconds.

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