

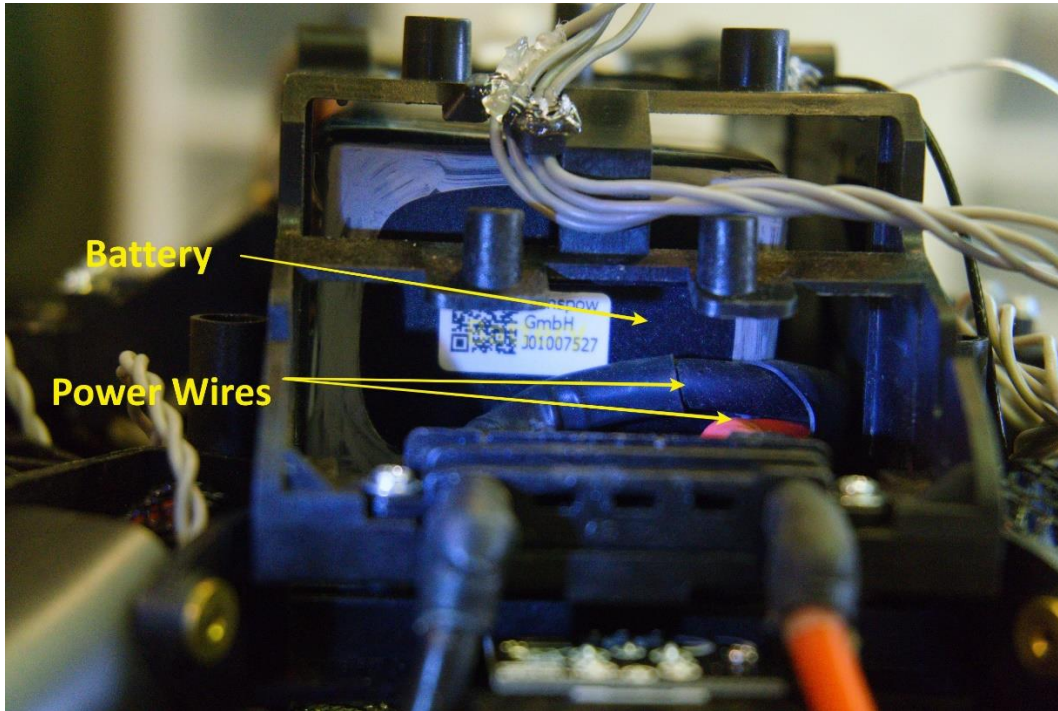
This thread is about choices. Alternative battery choices. Choices that will determine how long we will be able to continue flying models using proprietary batteries, models now out of production. Choices that will carry with them some personal responsibility.

As things now stand Typhoon H owners, along with Chroma and Q-500 owners, are limited to obtaining batteries from only a few sources, if and when batteries are available. In addition to supply limitations, owners are subject to product pricing that is at best elevated to price levels well above what the batteries justify. There are also quality concerns with factory shell batteries. We don't know how high- or low-quality levels are and must accept whatever is provided when and while it is available, regardless of how low that quality might be. Quality affects both performance and life cycle so being able to shop quality is an important factor in battery selection. For those with a Chroma or a Q, your manufacturing processes will be similar to what is seen for the H. Your batteries are 3S instead of 4S and your battery bay dimensions are different as well. Should you elect to modify a Chroma or Q power supply system choose your products and make decisions accordingly.

Disclaimer; I am not suggesting everyone, or anyone, alter the power supply wiring on their Typhoon H or other aircraft. *At this point in time electrical load testing is incomplete so I cannot state with certainty that heavier batteries will be safe, nor have I determined the maximum additional weight a Typhoon H can carry without experiencing negative impacts to the electrical system or flight stability. Safety testing is currently a work in progress.* So altering the power system to use standard Li-Po batteries is a personal decision that each will have to make for themselves. Those that have the desire are free to make use of the following as they wish. Understand that failure to create good, quality solder joints can cause the death of your aircraft, so strive to do things right. If you have any doubt about the quality of a solder joint, fix it before moving on. Damaging other electrical components during the process can or will also cause a crash so those that choose to participate need to be aware of what they are working with and around and avoid causing "collateral" damage.

Before we begin the descriptive process of creating a battery adapter for the Typhoon H, and because of airframe commonality, the H Plus and H-520, we need to recognize that a battery adapter can work for or against us, depending on our supply of factory shell batteries. If you choose to make and incorporate a "removable" adapter the process of removing the adapter to make use of factory batteries again is not "plug and play". You will not be able to tug on a "temporary" adapter to remove it from inside the aircraft. The bottom shell of the aircraft needs to be removed to

separate it from the board side power plug. Due to issues related to battery to wire chafing, bending wires at solder joints, a more rearward aircraft CG due to battery position, and difficulty in removing the adapter to make use of factory shell batteries, I do not recommend a temporary adapter. It can be done but, to me, it's not worth the effort and I advise against making and using the temporary battery adapter.. The option is presented for those that think otherwise.



For those people that desire to go back and forth between a standard lipo and factory shell batteries, probably the best current option would be to obtain the slide in adapter demonstrated in this video; however, recognize the primary power wires used for this adapter are not, IMO, of the best size and composition.

<https://www.youtube.com/watch?v=VKEyTFDJ94c>

Should you choose to modify your H's power system please remember the Typhoon H uses a 14.8V, 4S battery. Understand that Typhoon H board assemblies are RoHS compliant, using zero or near zero lead content solder. This will affect the soldering technique. Try to obtain batteries with C ratings above 10 and below 25. We have no need of high C rated batteries as the H system does not have any need for 100+ amp current supply, and lower C ratings make smaller, lighter, less expensive batteries. Lower C rated batteries will be difficult to find as it seems battery manufacturers are in a race to see who can make the highest C rating battery with little thought for what the market actually needs. However, if you cannot locate lower C rated batteries, obtain the lightest batteries you can. Choose batteries that are sized in a manner that leaves a few mm of free space inside the battery bay for wire passage. Understand that advertised battery weights are not accurate. They will at best be relatively close (+/-25 grams or so) to what a battery is advertised to weigh. Dimensions are usually more accurate but not precise. If you obtain a battery with advertised dimensions very close to or the same as the battery bay, be prepared for it not to fit when it arrives. Leave a little room.

Should you choose to make a permanent adapter you will not be able to use factory shell batteries again without fully reversing the process that created the permanent adapter. Save the main power plug and wires you removed when you installed new power wires. Construction of a permanent adapter is fairly simple and shares similarities with a temporary adapter.

So, a battery adapter has the potential to be both boon and bane, with the number of good "factory shell" batteries you have on hand leveraging what you might want to do. If you have more than one H the decision is a lot easier as you could modify one and leave the other stock to continue using factory shell batteries you have on hand. As we look though the following photo spread and review descriptions you will be able to better visualize why electing to make an

adapter may be a difficult decision. If you're fed up with factory shell batteries or all of yours are worn or wearing out, the decision is a lot easier, but for those with several good batteries on hand, the decision will be more complicated.

One final note before we begin; in no way does this thread attempt to teach people how to solder or use basic hand tools. You're already a tool user and know how to solder, or you don't. If you aren't or don't, **do not attempt this alteration**. Have someone that knows how do it for you. You can research other informational sources about soldering and conduct a lot of practice before embarking on this endeavor. If you wanted to be a heart surgeon you would not start out performing open heart surgery on your favorite relative and expect them to survive. The battery is the heart of your aircraft and if the battery connections fail the aircraft fails. Initiating the process of making an adaptor or altering the power supply wires is not a "success guaranteed" endeavor. If you make mistakes and do not notice and/or correct them your H could crash.

### **ESD Protection**

You will be working with and around electrical components and assemblies that are sensitive to electro-static discharge damage. Random static electricity discharged by your body or a charged tool can send electrical charges of several thousand volts through components that cannot tolerate a significant voltage spike, destroying them. I strongly suggest that anyone that works with and around PC boards, processing chips, and similar components learn about ESD, and use ESD safety equipment when working with sensitive electronics. If you are unfamiliar with ESD or ESD preventative practices there are numerous websites that can be found through a Google search for further explanations.

### **Flight Time**

Although this will come across a bit harsh it needs to be said. Flight time will be dependent upon the batteries you select and use, combined with aircraft, weight, center of gravity, weather conditions, and your flying style. Battery length and weight can and will impact flight time, just as higher or lower than stock battery mA capacities and C ratings will impact flight time. For the purposes of this article a single 6,000mA, 35C Tattu battery will be used and any referenced flight time will be applicable **only** to this battery, the manner I fly the aircraft, and the weather conditions of the moment. I do not write this with any suggestion or promise of obtaining more flight time. If you obtain more, great, but that is not the objective of this article. The objective is to assure long term access to battery sources that are not subject to control, or pricing, by an aircraft or battery manufacturer.

### **Guarantee**

There is no guaranty or warranty. Proceed at your own risk.

### **Tools**

The basic tools needed for this work are 1.5mm and 2mm hex keys/wrenches, small Phillips screwdriver, wire cutters, wire strippers, "helping hand" to hold wires and connectors, small needle nose pliers, soldering equipment of your preference, solder wick to remove old solder, 14"-16" of 12AWG multistrand silicone wire, soldering jig for connector plugs, and one or more connector plugs of your choice. I'll use an XT-60 as it is available on many 4S batteries. Wire can be obtained through numerous vendors at Amazon, usually in 3'/1m lengths. Do not use automotive, speaker, or home construction type wire. Match the gauge of the wire used on the battery. Most will be 12AWG, which is the same size used at the H main board power input. Should you desire to use a protective wire sleeve it can be obtained from numerous sources.

If you elect to make a temporary adapter you will also need one or more old, discharged factory shell batteries that will be disassembled to remove the battery plug. Make sure they have been discharged before initiating the disassembly process. Even if discharged, make it a point not to short the battery terminals. Protect the battery terminals that became exposed by removing the wires and connector.

### **Tips**

Although the main board does not need to be removed to make and install a temporary adapter it does need to be at least partially removed for a permanent adapter mod. The permanent adapter instructions occur near the end of this document. The top and bottom shells of the aircraft must be removed to access the power supply components inside the battery bay. Remove the camera and set it aside. If you left a battery in the H get that out of the way as well.

Locate something soft and clean to place the airframe on while you are working on it. As the main board will be exposed and vulnerable during all of the work I'll suggest using ESD safety practices to prevent ESC arc damage to sensitive electrical components on the various PC boards in the H. In any case, aside from separating a couple of JST connectors there is no reason to be fingering anything on the board except the main power input trace.

Speaking of JST connectors we should understand that mini JST's as used in the H are fragile and that tools should not be used to separate them. They have a "lip" at each side that allows us to use a fingernail under each lip to slide them straight out of the receiver side. Attempts to "walk" or "rock" a connector out of the receiver has a high probability of breaking the outer housing. Pull them straight back, do not ever leverage a connector away from the board it is soldered to. Breaking a housing is in and of itself not a disaster as long as the connector halves and pins will still fit tightly together, and the pins remained unbroken and securely soldered to the board. If the housing is broken the connector has a good chance of functioning correctly if a small amount of hot melt glue is used to secure the connector halves, preventing separation.

Once the photo spread and text are complete, a folder containing them will be uploaded to Dropbox and a link providing open access for everyone will be posted.

End Post #1

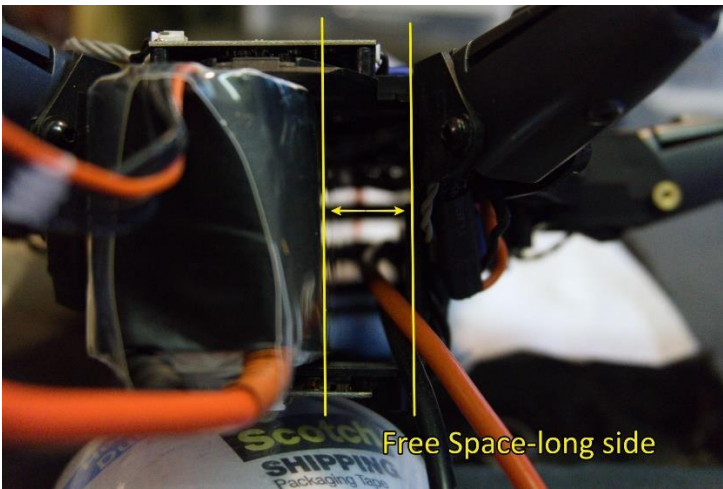
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Post #2

### **Battery Selection**

Use a little restraint when selecting batteries. Everyone wants as much flight time as possible but there are practical limits to what the Typhoon H can handle through the power system. We want them as light as possible. We want them to fit the battery box without having to get a run at it. We want to leave a little space in the battery box to route wires though and out the back. We want to avoid batteries that will extend a considerable distance aft of the battery box. We want to keep battery weight fairly similar to that of the factory battery. Weight and length can and will impact flight controller performance. Excessive weight forces the power system to demand and use more power than normal to carry it. That higher demand generates more heat than normal, and more heat negatively impacts ESC's and other electrical components, reducing their life span.

The useable dimensions of the battery box are 53.16mm high, 47.16mm wide, and 133mm long. A stock battery weighs an average of ~571 grams.



### Disassembly (common for temporary and permanent adapters)

Flip the H upside down and remove the two 2mm screws that secure each gear leg. Slide the legs up and out. Set them aside. There are no wires connected to them. **Note:** When you reinstall the gear legs they should angle outwards from the body of the H. If you happen to be one of those dyed in the wool hand launch, hand catch types, now's the time to decide if you want to save a couple ounces and really wow the crowd and leave the gear off when you put everything back together 😊 If you do, obtain some AD&D insurance before the next flight...

Remove the 10, 1.5mm screws located in the "wells" in the bottom of the aircraft. Exercise care to assure you capture the ten screws. Roll the aircraft up right and carefully lift the upper shell of the lower shell. You will likely need to start at one place and progressively work your way around the body, separating the two halves a little at a time. Once the upper shell is loose, lift it away from the bottom shell just enough to expose the GPS JST connector on top of the board at the aft end of the aircraft. Carefully separate the JST connector from the receptacle. To repeat; Do not use metal tools to separate JST connectors. The housings are fragile and can break easily. Use fingernails on both sides of a JST connector and pull straight out from the receptacle. Do not "rock" the plug to loosen it from the receptacle. You can remove the top shell now or leave it in place until later in the disassembly process if you desire. **Note:** The shell screws may or may not easily exit the wells once unscrewed so you may have to use a toothpick or similar to push them out of their holes after removing the top shell. Failure to extract them now will be because for them becoming lost when moving parts around on your work area. Collect them and place them in some type of container to prevent losing them.

With a soft pad to rest the aircraft on, roll the H inverted and set it on the pad. Using a 2mm hex wrench, remove and set aside the three screws securing the gimbal mount. Carefully lift the gimbal mount from the bottom shell and separate the JST connector located on the bottom of the gimbal mount. Tuck the wire group in with a group of other wires that will not be disturbed when working at either end of the battery bay. Remove the two 1/5mm screws that secure the aircraft state LED cover. Set the aircraft aside for now.

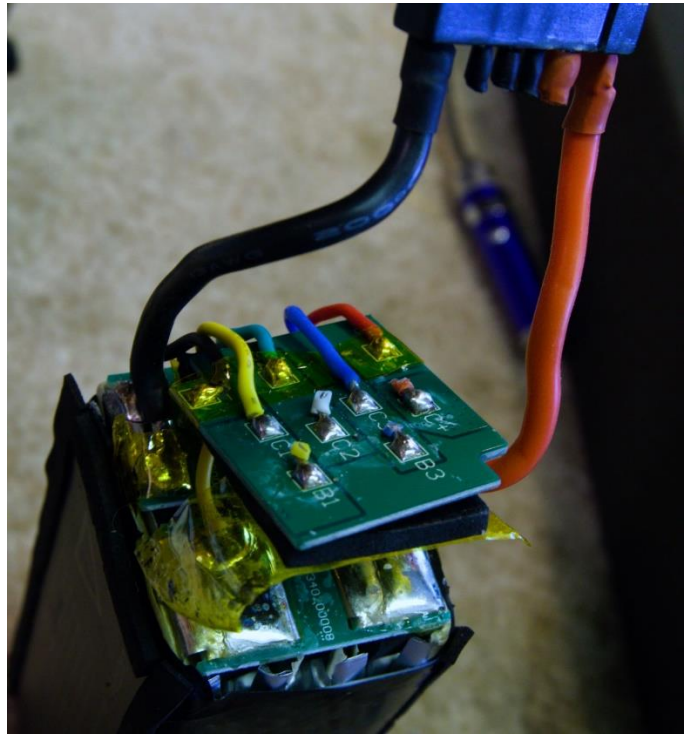
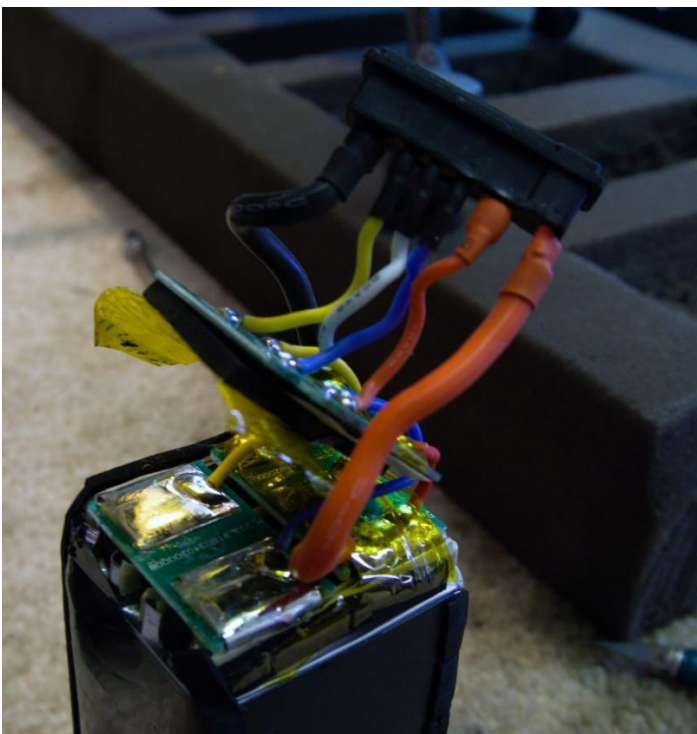
### Power Plug

For a temporary adapter, the connector plug must be obtained from an old, *discharged* battery that is no longer useful for flight. For a permanent adapter see Main Board Permanent Adapter later in this document. Separating the battery case involves the use of your choice of a heat gun, Xacto or other sharp bladed knife, and a flat bladed screwdriver or other tool that can be used for prying. The battery case is expendable, so unless you have a future purpose for the case do not be concerned about damaging the case. If using a heat gun use caution not to overheat the battery inside as that can cause a fire or explosion. The use of the heat gun requires warming the case seams to a temperature high enough to loosen the adhesive securing them. Using a flat bladed tool, pry the case apart from the side, starting at the connector end of the battery. Slowly work your way along the side to the other end. Repeat the process for the other side.



If you choose to use a sharp knife the process will require multiple passes along the case seams to cut deep enough for them to be separated. Please use extreme care to avoid cutting your hands or fingers. If at all possible use a jig made of wood blocks or a vise to hold the battery while cutting the seams instead of your hand. Once the case halves have been separated the battery, battery boards, and connector can be lifted from the case.

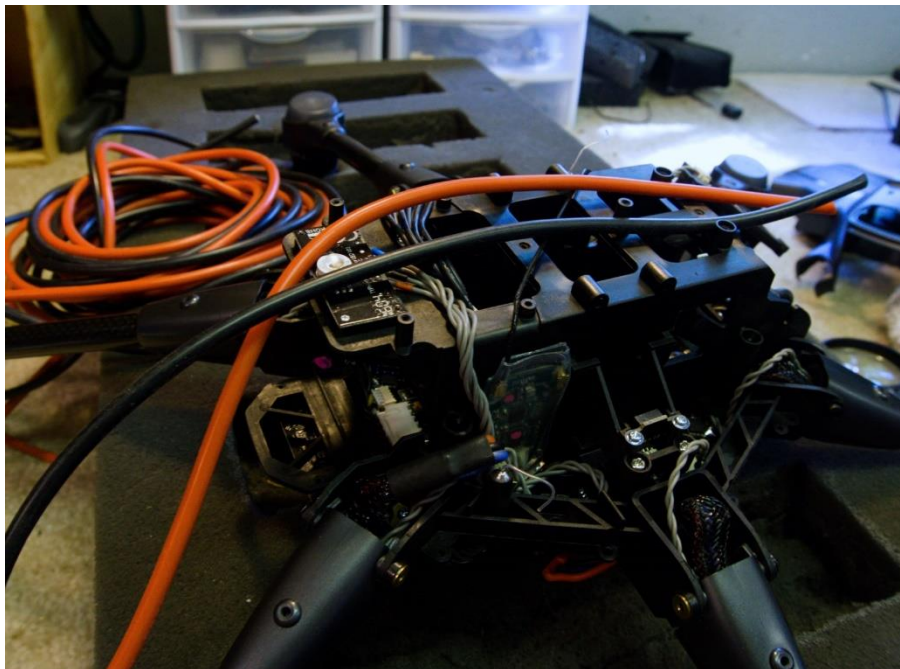
The connector plug must be removed from the battery for use on the adapter. Approach this process by using a small, sharp diagonal cutter to snip one wire at a time away from the connector. Immediately afterwards snip the opposite end of the wire from the board is attached to. Start at the red, positive wire and completely remove the wire from the plug/board/battery assembly. View each wire as being "hot" to assure that at no time do you short one wire with another or with one of the board assemblies. Cut the wires away from the plug as close as possible to the body of the plug. Once the plug is free, use a soldering iron to remove the 14AWG red and black wires from the plug. Cut, file, or grind the remnants of the balance connectors from the plug. Assure the remains of the balance connectors are left flush with the back of the connector plug. They do not need to be insulated or protected as there is nothing inside the aircraft for them to contact. Use some rubbing alcohol to finalize solder tab cleaning.





### **Wires**

Lay your silicone wires on top of the drone from front to back, roughly approximating the routing it will take. You can use a tool to measure the wire length if you wish but I've found the lay out method is more effective in allowing for bends and fudge factors since it is so flexible. Allow enough length for the wire to loop back 180° at the back of the aircraft. If constructing a temporary adapter, the wires will originate at the power plug at the front of the battery box. If building a permanent adapter, the wires have to pass the full length of the battery box and wrap up to the main board. Now is the time to strip and tin both ends of the wires. You will need a hot iron and a wide tip. While the iron is hot it's a good time to tin the solder pads on the power plug you removed from the battery.

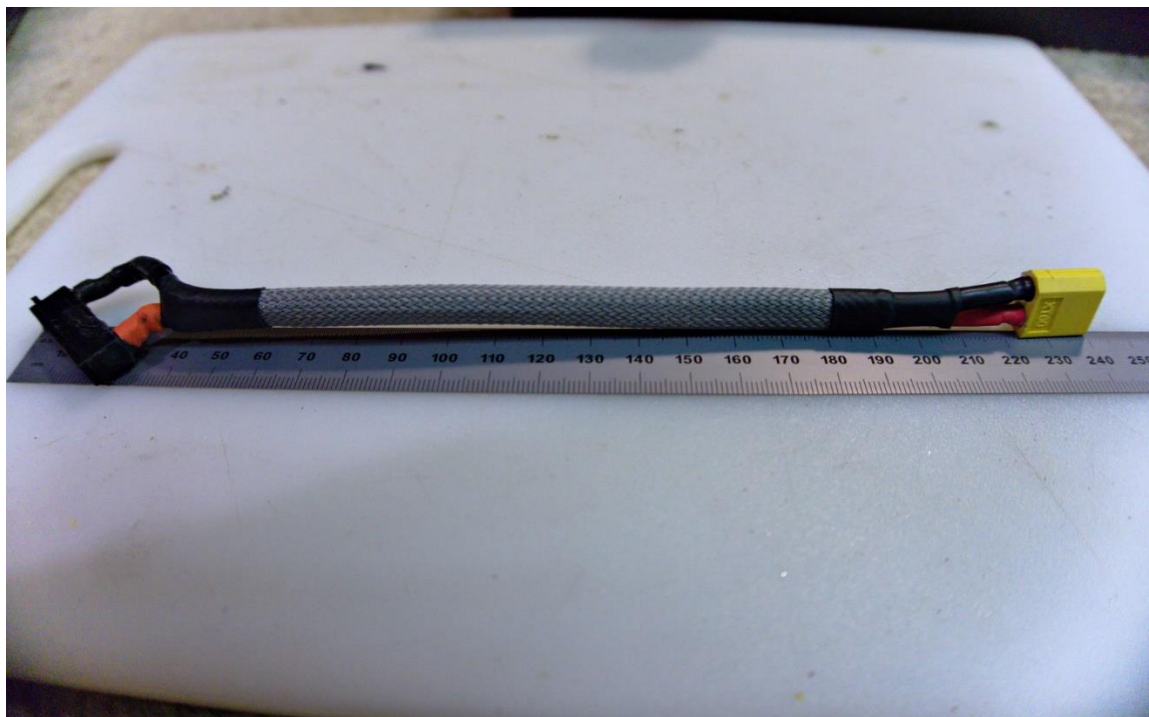
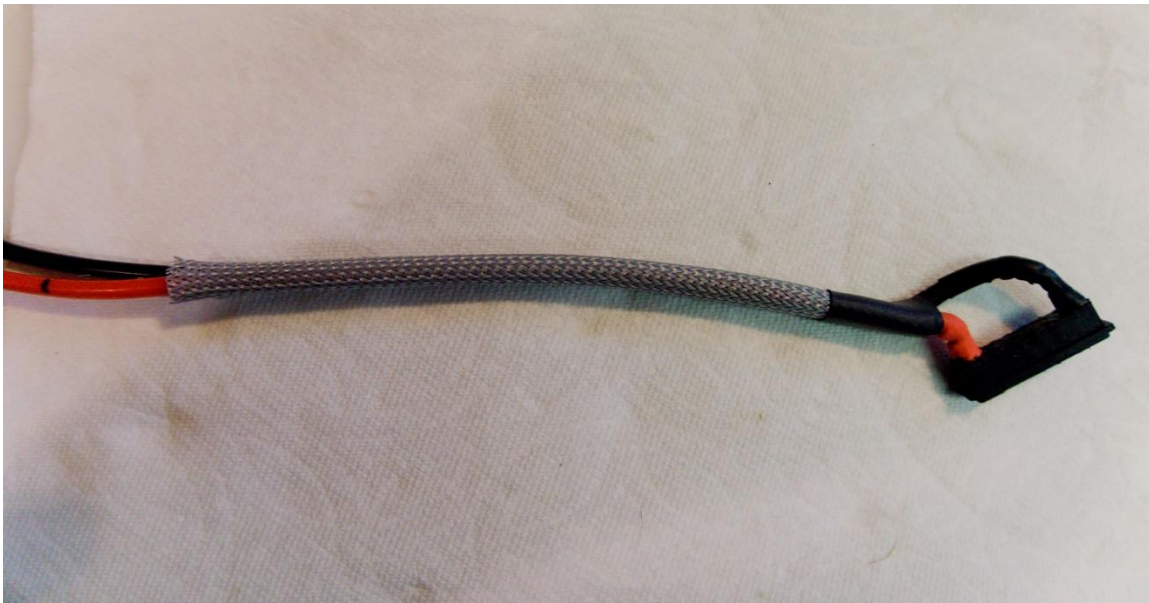


### **Power Plug**

When setting up to solder the power plug we need to consider some factors that will affect the wire lay out.

There is a bump stop built into the frame to prevent the battery from impacting the obstacle avoidance sensor. This is both good and bad as it provides some room for the battery plug and soldered wire. So that's good but is also prevents inserting the battery in a temporary adapter installation as far as it could otherwise be inserted. The wires on the back of the lug will interfere with the battery, even if the wires were soldered to the plug tabs sideways. You want to minimize the ability of the battery to ride against the wires in flight. The factory battery box provides additional room for plug wires and PC boards as it carries a short battery, but most of your standard lipo's will be longer than the stock battery. Minimizing the rear battery overhang will improve flight stability and general performance. In this a permanent adapter is superior to the temporary adapter.

When setting up to solder wires to the plug tabs it will help the battery fit if you angle the wires to one side or the other, not straight out the back of the plug. That will provide a little more space and better direct the wires to the side of the battery box. You don't want them exiting straight back as that would have the battery sitting on the wires in a loose battery installation and prevent the use of tighter fitting batteries. A straight back exit will also cause the battery to extend further aft.





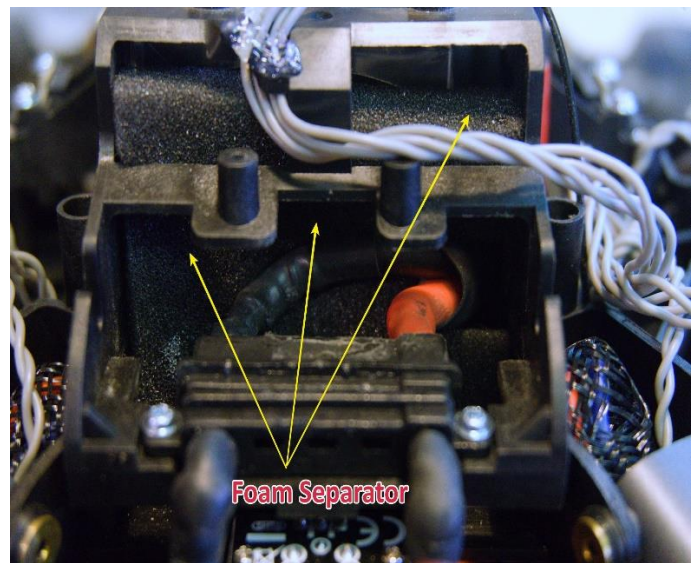
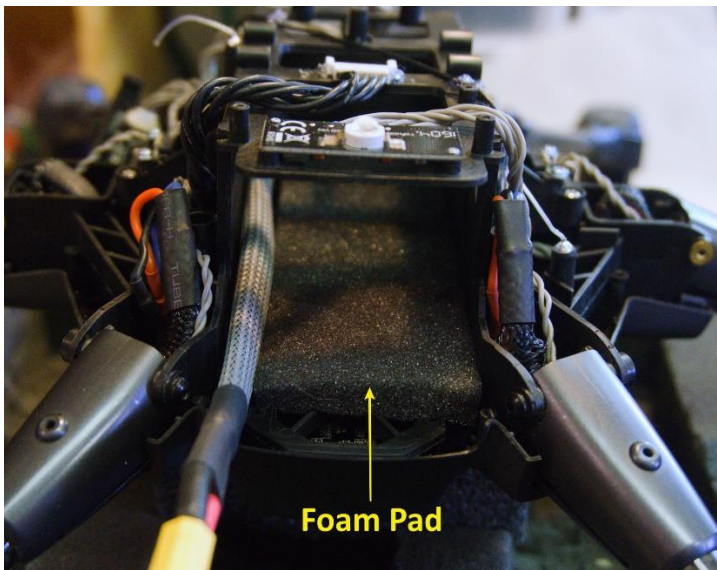
Once you have completed soldering wires to the plug it's time to fit the battery connector to the wires. Fit the adapter plug to the main board plug and determine how long the wiring needs to be to exit the battery box, extent aft of the box a couple or three inches, and loop back to the battery box to terminate at least an inch away from the battery box. Prior to attaching the plug determine if you want to employ a wire sleeve. Don't forget to clean your solder joints with alcohol or acetone, heat shrink the terminals at the adapter plug, and add a couple of loose pieces of heat shrink to insulate the battery plug before you install the plug. **Important;** check the polarity of the battery plugs before soldering the wire!!! The ST-60 has polarity markings (+/-) on the edges of the plug. In this example the adapter wire length worked out to 240mm. This length is not a requirement as batteries vary in length and people will have their personal preferences. The length only needs to be enough to make a connection without stressing the solder tabs.

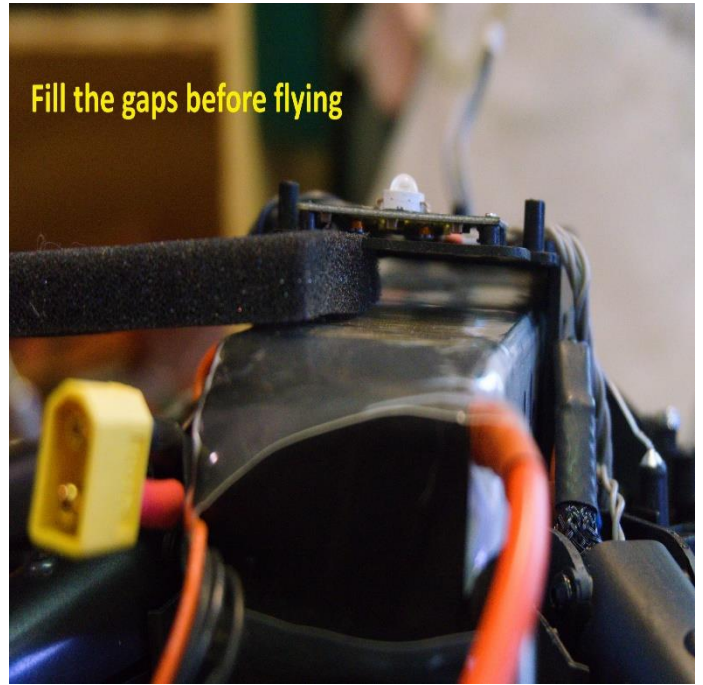
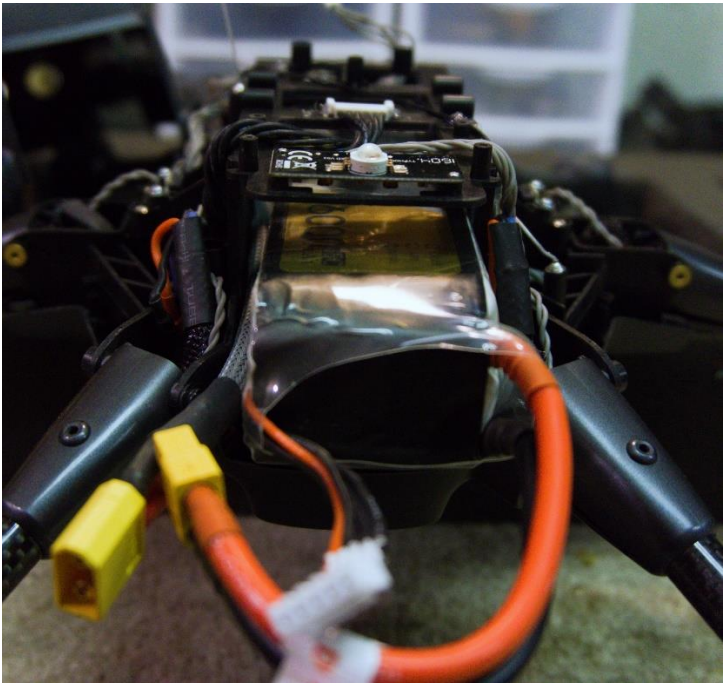
Use a voltmeter to perform a continuity check of your soldering work. Flex and tug on the connectors to assure they are secure.

### Battery Protection

Using a battery adapter means the process of changing batteries is no longer a mindless activity. You have to be *involved*. In addition to securing the battery to assure it does not depart the aircraft you must provide a means to protect the battery and wiring from chafing. For the lead wires themselves you have the option of covering them with a braided sleeve such as seen in the adapter photo. The stuff is available at many places but here's a link to a supplier;

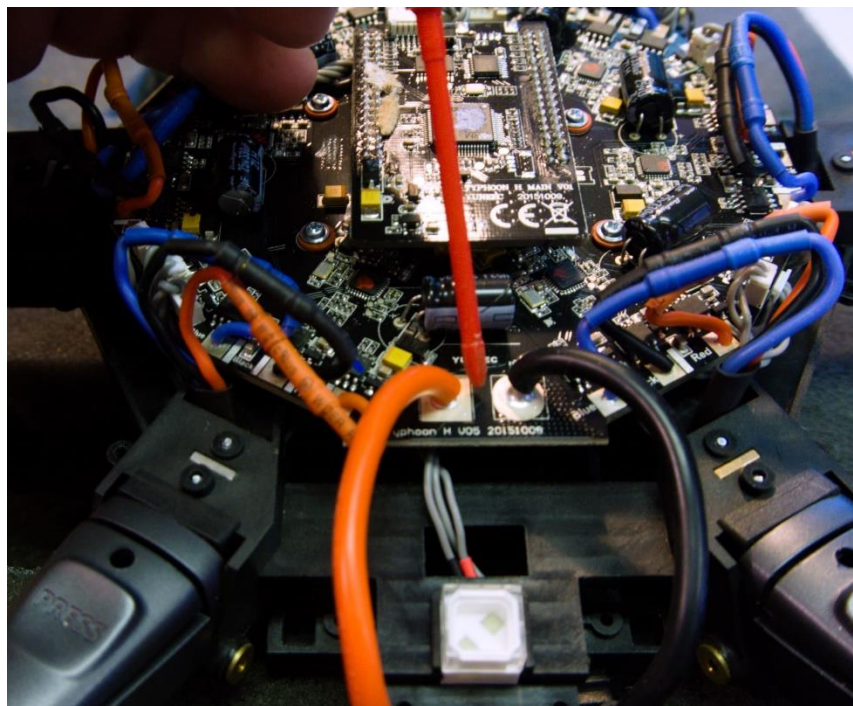
<https://www.techflex.com/> You also need to protect the battery sleeve and end from chafing. Inexpensive, soft foam is easy to use. For this application I used the 10mm foam that Tattu used to protect the battery during shipping. The foam is also used to take up free space between the battery and the battery box. We don't want a battery flopping around in flight.





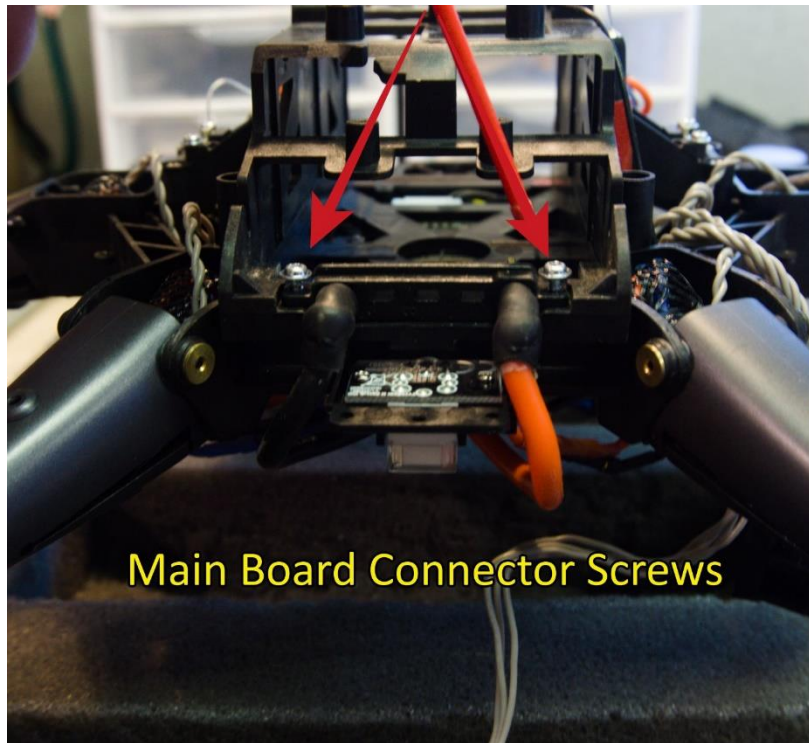
### Main Board Permanent Adapter

Advantage of a permanent adapter: no interference between the battery and board connector, allowing more of the battery to fit within the battery box. Eliminates rubbing of battery wires against the battery. Better equalizes center of gravity. Removal of board and battery connector lightens the aircraft, offsetting weight gains from larger batteries. Simpler modification process. Reduces connector count between the battery and the board. My apologies for not having pictures of the completed main board connection. This work will not be done until after testing the temporary adapter is complete.



**WARNING;** If you are not good at soldering, lack the proper tools, do not understand tip sizing for component sizes, have never soldered on a PC board before, do not know how to effectively use soldering tools, **DO NOT ATTEMPT TO ALTER THE MAIN BOARD POWER SUPPLY!** You have a very high probability of destroying the main board. This process is, as are those related to the temporary adapter, reserved for those that already know how to solder. This is a procedural document, not a tool use tutorial.

If going with a permanent adapter there are a couple of difference in the assembly process. The permanent method is simpler than the temporary adapter. Remove the two screws that secure the main board power plug to the end of the battery box. Remove the (4) Phillips screws that secure the main board to the frame. Carefully lift the front of the main board high enough to access the main power wires at the bottom of the board. Use a non-conductive, ESD safe spacer to elevate the front of the board during soldering activities to facilitate soldering of the pads from the underside..



De-solder the existing power wires from the main board. Clean old solder from the board pads and openings. Set aside and save the wire/connector assembly to maintain the possibility of returning the power system to stock form later down the road.

Tin your new power wires. Note, if you did a good job cleaning the pads and have it, you can use 60/40 lead solder to fix the new wires. 60/40 melts at a lower temperature but high enough to function well for the board temperatures that will be experienced. Flip the aircraft upside down to provide better access to the board pads.

Insert the new wires into the board, assuring the hot (red) wire was inserted into the correct pad. Solder the wires to the pads. Check your work for correctness. Affix the battery connector and your new permanent adapter is complete.

### **Final Assembly**

If building a temporary adapter, you're almost done. Obtain several pieces of soft foam that can be used under and over the battery. Cut a piece that will fit at the end of the battery box between the adapter plug and the battery. Tattu batteries make obtaining foam an easy task as they are shipped with 10mm foam on both side of the battery. But soft foam is not hard to come by so don't view the reference to Tattu as promotional.

Test fit your battery to assure everything works as intended before installing the top and bottom shells. If there are interference issues with the wires now is the best time to make corrections. You may have to un-solder them from the adapter plug and start that end over. Although irritating it's not disastrous and a lot better to fix than not. If you are satisfied with fit and function it's time to put the aircraft back together.

It's a lot easier if the bottom shell is re-installed first. If you install the top first it gets a bit rough routing the GPS wires through the bottom shell, holding the on/off button in place, avoiding stress on the GPS wires, and routing the gimbal wires with the frame floating loosely on the upper shell. If you attach the bottom first you end up with a better than even chance of only having to re-assemble once. In case you forgot, the three 2mm x 7mm screws are for the gimbal mount. The four 2mm x 10mm screws are for the landing gear. Note the frame has locator holes as alignment guides for the ten 1.5mm shell screws. When setting the screws remember the screws possess self-tapping threads. Don't over tighten them, they need only be snug.

### **Battery Security**

I haven't finalized a means of battery security yet, so stand by on that count. However, it appears "Velcro" will be a viable option. For the test process I'm using a 1" strip of Gorilla type tape across the battery on the lower shell. Hopefully the adhesive won't become hot enough to melt...

### **Testing**

Performance testing is currently underway and data will be posted as it is developed. Weight differences between two H's have established a weight baseline but there are a few differences in the aircraft. Neither H is completely stock. One has been subjected to the battery modification while the other possesses dipole GPS antennas and a PixAero lens in the camera. The different components have been weighed to determine the deltas.

The modified aircraft has been fitted with a WattsUp volt and ammeter using 3M two sided tape to affix the meter to the back of the gimbal mount without interfering with gimbal rotation. The location also helps keep the meter weight as close to aircraft center as possible. The meter with tape weighs 72.5 grams and unfortunately becomes part of the modified aircraft's basic weight. I cannot test in flight electrical loads without the meter. <https://www.rc-electronics-usa.com/>

### **Aircraft and Component Weights**

H1=battery modified aircraft using temporary adapter and battery

H2= "stock" aircraft and battery

H1 without camera: 1696.2g

H2 without camera: 1724.3g

H1 with camera: 1945.1g (no gimbal lock)

H2 with camera: 1980.8g (no gimbal lock)

2.4 dipole antennas: 16.9g (pair) [weight doubled to 33.8g to allow for antenna mounts]

PixAero camera: 257.5g (no gimbal lock) [no Sd card]

Stock camera: 249.0g (no gimbal lock) [no Sd card]

H1 weight equipped with stock camera, Tattu 6,000mA battery, and WattsUp meter: 2017.6 grams

Deducting for the weight of the optional accessories installed on H2, the basic weight of a box stock Typhoon H standard should be in the area of 1929.7g, making the test starting weight of the modified H1 87.9g (3.139oz) heavier than a stock aircraft. 2.57 ounces of that is the Watts Up meter so there has not been much change in fitting the adapter and a

standard battery. Anyone with a box stock Typhoon H without RealSense that has a gram scale accurate to 1/10 gram is welcome to weigh theirs and update us with a total aircraft weight.

Test data will be added as it is developed but some initial data shows that without a camera the Typhoon H boots up with a battery load of 0.28A, 4.2W. With the camera the current climbs a bit, with a max observed current of 0.98A, 13.5W. The camera is a hungry little bugger.



**Aircraft Boot Up**

More Photos at [https://www.dropbox.com/sh/8vj2mu0apectku7/AAAkLe\\_72ActauZn6djbxEvNa?dl=0](https://www.dropbox.com/sh/8vj2mu0apectku7/AAAkLe_72ActauZn6djbxEvNa?dl=0) Anyone with the link can access the folder.