

VULCAN UAV



Vulcan MutliFrame *SkyHook Series*

Frame Assembly Guide V1.05



www.VulcanUAV.com

Thank you for purchasing the Vulcan MultiFrame.

The MultiFrame is a very strong, light, durable airframe, and is very straightforward to assemble. Please follow these build instructions carefully, and we wish you many hours of safe and enjoyable flying!

Note on parts - Part designs are always changing and being improved. Do not worry if the parts you have or hole patterns do not exactly match those shown in this manual, details contained here will still apply.

SAFETY NOTICE

Multicopters can be dangerous and pose a significant risk of injury and damage to property. Always take all necessary safety precautions to avoid damage or injury to yourself and those around you!

Never fly near or over buildings, roads or people.

Always ensure you have plenty of space to fly with an uninterrupted view of your machine at all times.

Always stay well clear of moving propellers.

Before flying.....

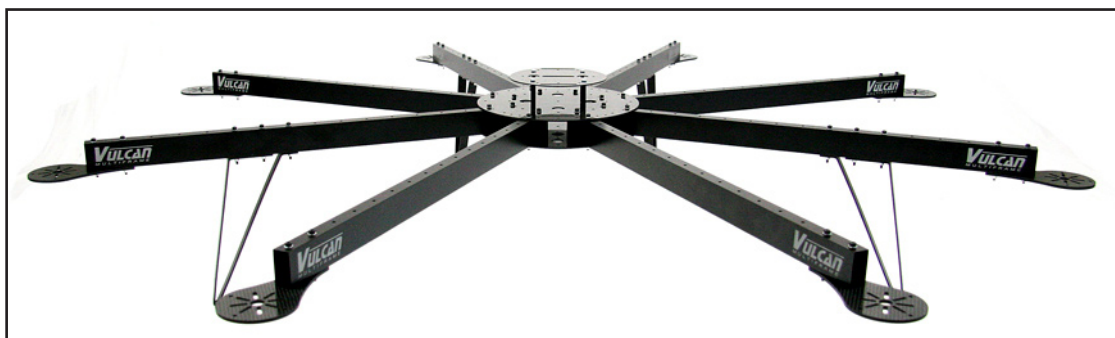
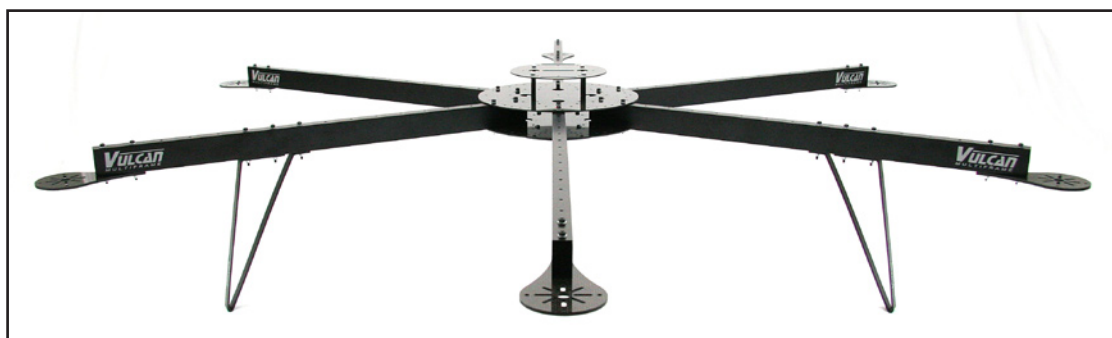
Ensure all nuts, bolts and linkages are tight and cannot come undone.

Check your propellers are securely tightened, have no chips, cracks or dents and if they do, replace them as necessary. Propellers should be attached with nylock nuts or double nuts, never rely on a single standard nut to attach your propellers.

Ensure all electrical connections are secure with good contacts, well insulated and cannot come apart.

Make sure all onboard equipment such as batteries, cameras or any other payload is properly and securely attached and cannot come loose, shake, vibrate or move around during flight.

Always make sure all batteries are fully charged and range check your radio.



The Power Distribution Board (PDB)

The first thing to do in your build is prepare the power distribution board. This is a critical part of your multi rotor as it ensures reliable and consistent power supply to all the onboard systems that need power from the main battery packs, including ESCs and your flight controller. Many will have their own ideas about the best way to distribute power on their machine, and whilst this manual is not really aimed at power distribution, we have included some general good practice tips:

Always protect your internal wiring. Any movement of internal wiring can lead to wear of the insulation and eventually a failure, so we would recommend protecting all power wires with heatshrink or similar - any suitable tough covering that is resistant to wear and heat.

ESC control wires are thin and quite vulnerable, and are best protected with something other than heatshrink as the heat from the shrinking process may damage them. Nylon braiding is a good alternative, and although it is less resistant to heat than heat shrink, it is easier to fit over pre fitted plugs, and better looking, so a good choice for any wires that will be visible. If your PDB is of the correct specification and correctly assembled, there should not be excessive heat present.

Good solder joints are critical, and enough heat must be present to fully melt the solder and allow a good bond between the PDB and wires. If you are using our *Vulcan Power* high current PDBs, the thick copper in them will suck the heat from your soldering iron very quickly. So use a powerful iron with a large head that can retain it's heat. A Weller 80W iron is a good choice.

It is a good idea to run dual independent battery connections for redundancy, rather than use battery splitters when using multiple LiPo batteries.

It is wise to run several auxilliary power feeds from the board to supply power to anything you may need now or in future. This will save you having to open the frame and solder in more feeds in future should you find you need them.

Use thread lock on PDB mountings to ensure there is no way the PDB can come free over time, or a short will occur. Carbon fibre is highly conductive.

*A typical PDB is shown at the end of this manual for reference -
see Appendix 1*

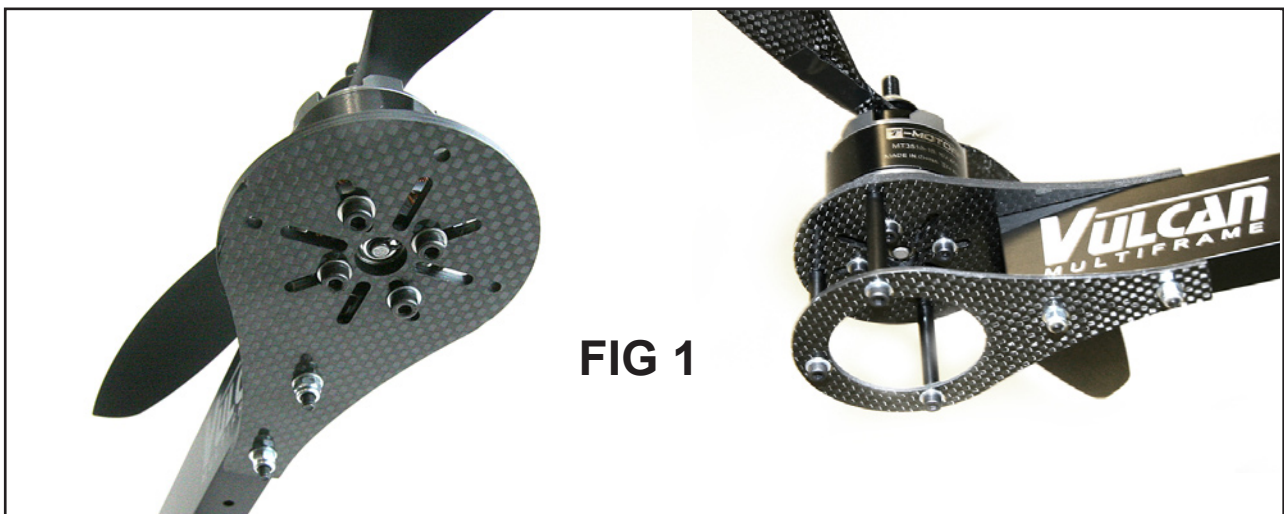
Motor Mounts & Arms

First, it is good practice to protect your motor wires from abrasion, especially where they enter and leave the arm, pass by the bolts, or if they need to go around any sharp edge such as the motor mount. Heat shrink is a good choice for this. Once you have protected your wires, fit your motors to the motor mounts. Do this before fitting the mount to the arm as it is easier to thread the motor wires before mounting bolts are in place. Use thread lock on the motor bolts, but be careful not to get any in the motor. Once the motor is attached to the mount, thread the wires down the arm and attach the mount to the bottom of the arm using 2 x M3 40mm hex head bolts, nylock nuts, 7mm washers on the motor mount underside and 10mm washers, or carbon fibre load spreaders (in your bolt kit) on top of the arm. Be careful not to pinch the motor wires when putting the bolts through the arm.

DO NOT OVERTIGHTEN THE NUTS! If you do you can crush the arm!

The nylock nuts will ensure they do not come loose, although you should always check nuts regularly for tightness.

If you are using single plate motor mounts, they **MUST** be mounted on the underside of the arm and **NOT** on the top or failure could result. If you wish to top mount your motors, use the motor ring supports (see FIG 1 right). The motor mount goes on top of the arm, and the ring underneath, with 3 x 30mm pillars between the two. Use thread lock on the pillar bolts.



If you are building a Y6 or X8, you will need to use a double motor mount configuration (see Fig 2 below). To assemble this, start with two motors attached to two motor mount plates. In this configuration, the motor wires will need to go round the side of the mount - you may wish to mount your motors at an angle to accommodate this. Next thread both sets of wires down the arms (it is a good idea to mark the wires so you can tell them apart later), then attach both motor mounts to the arm using 2 x M3 45mm hex head bolts, nylock nuts and washers.

Once the mounts are attached to the arm, take 3 x 30mm pillars and bolt them through the three holes in the motor mount plates using 6 x M3 8mm hex head bolts and washers (see Fig 2 below). Use thread lock on the pillar bolts.



FIG 2

Preparing Frame Centre Plates

The frame centre plates are pre-drilled for all common frame arm configurations, and have a specific orientation. You will see a red dot or a small flat on the edge of the frame plate, this shows the forward direction of your machine. If you are using a power distribution board, now is a good time to decide on its exact location and if necessary drill any mounting holes. The frame plates are pre drilled for our own *Vulcan Power 250A* or *400A* PDBs. We recommend installing your power board on the underside of the top frame plate rather than the base plate, as it allows you to easily remove the base plate for access later if necessary, without disturbing your internal wiring.

Now (if you are **not** using an alternative battery carrying system like the Dual Side or Rear Battery Tray) attach the standard battery tray to the underside of the lower frame plate, with 20mm M3 bolts through the nylon pillars, and secure with nylock nuts. Attach four pillars for the top standoff plate. Use the four holes marked with yellow rings in Fig 3 below for both plates, and attach the pillars through the matching holes in the top frame plate with M3 6mm or 8mm bolts provided. Both plates are identical.

Now fit your power distribution board to the underside of the top frame plate.

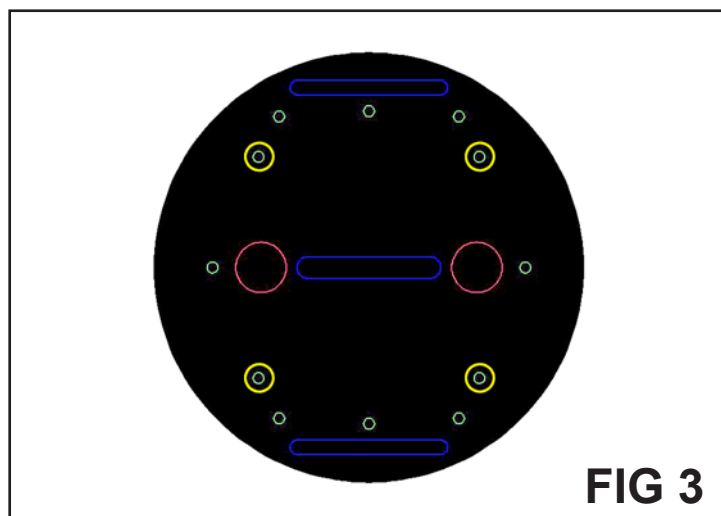
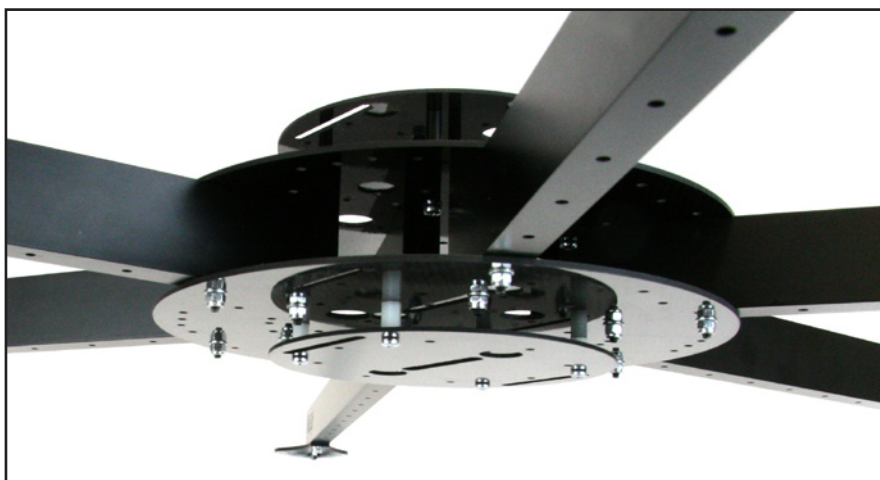
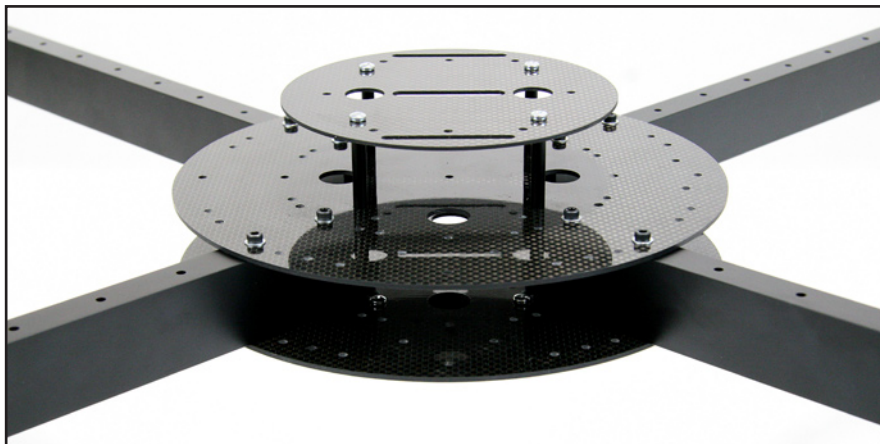
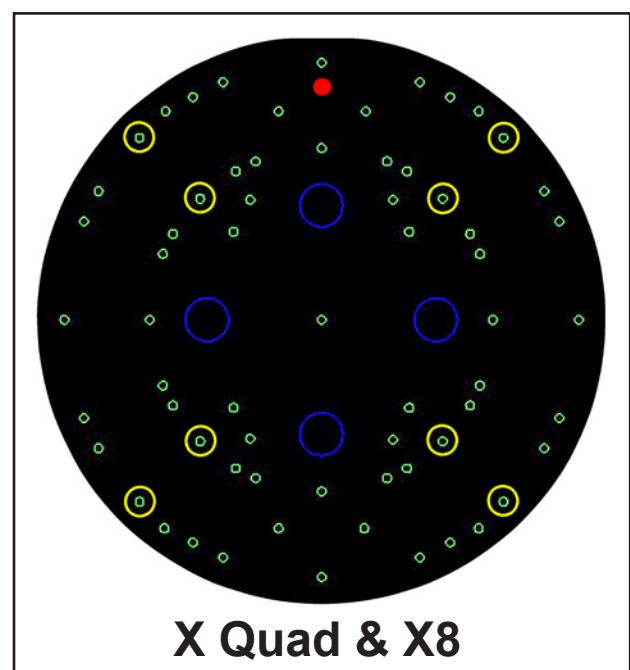
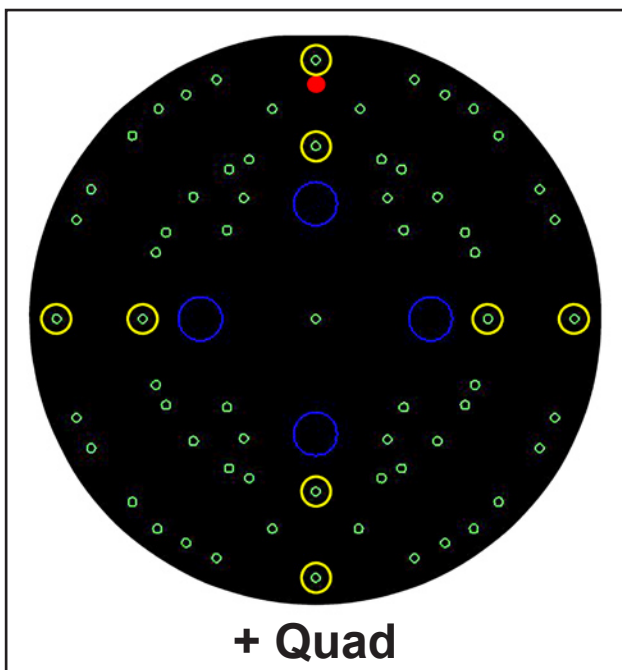
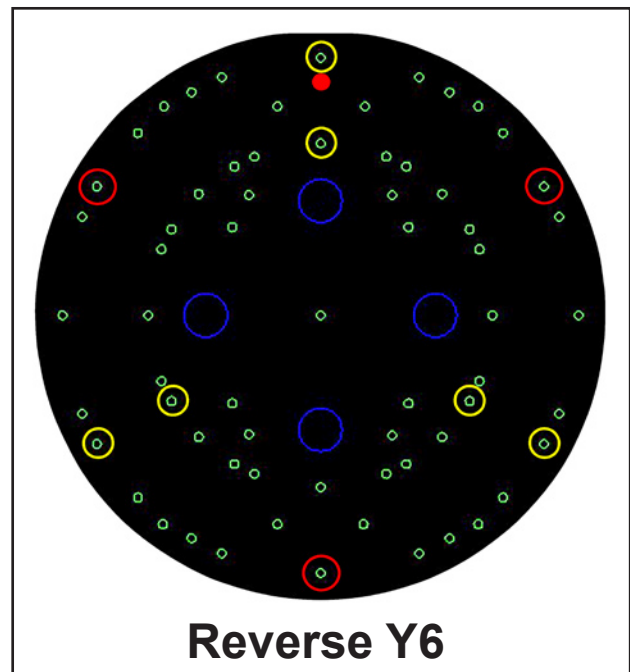
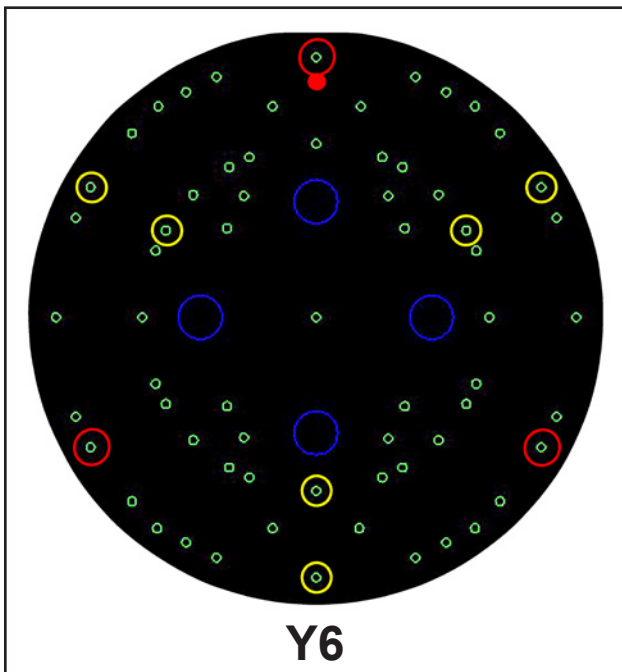


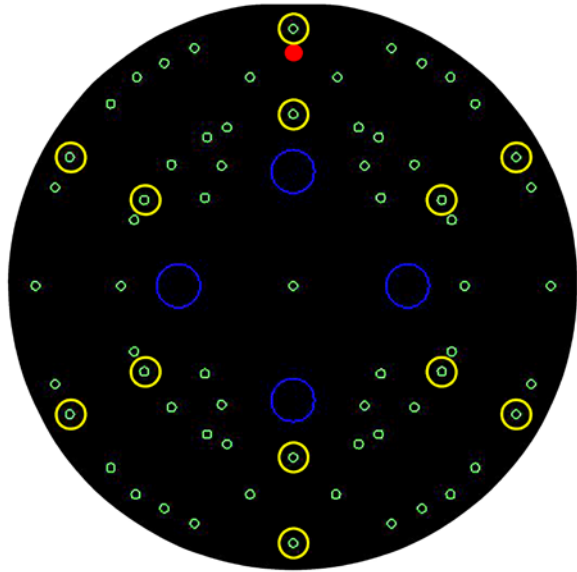
FIG 3



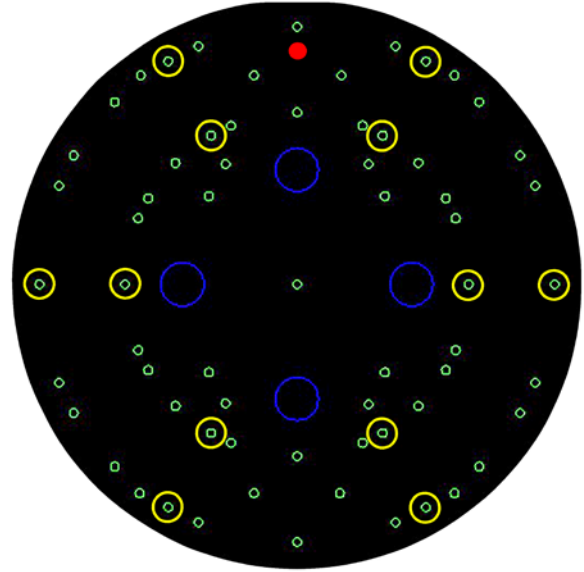
Fitting the Arms

First you must identify the correct holes for the frame arm configuration you are using. Place the upper frame plate on a flat surface top side down, with the front facing away from you. To identify the holes for mounting your arms, please refer to the diagrams below. The correct holes for each configuration are identified with yellow rings.

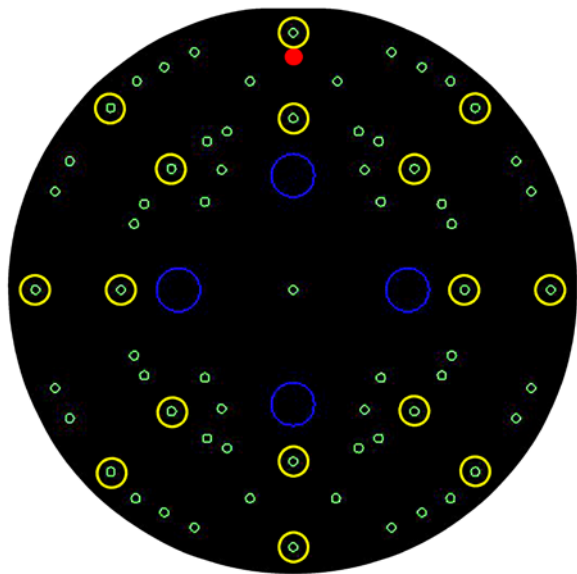




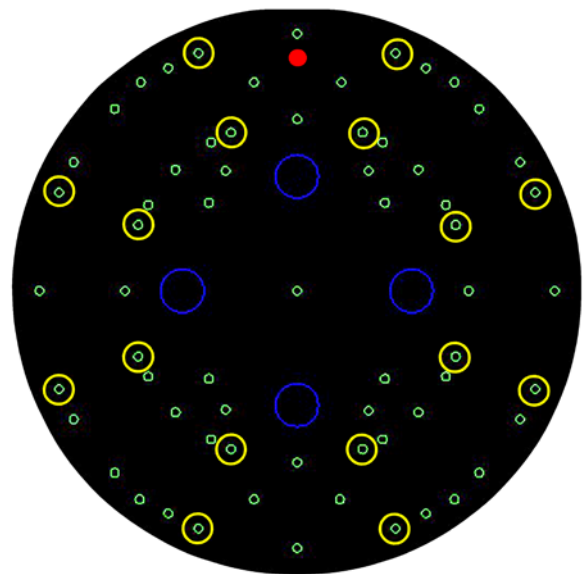
I Hexa



V Hexa

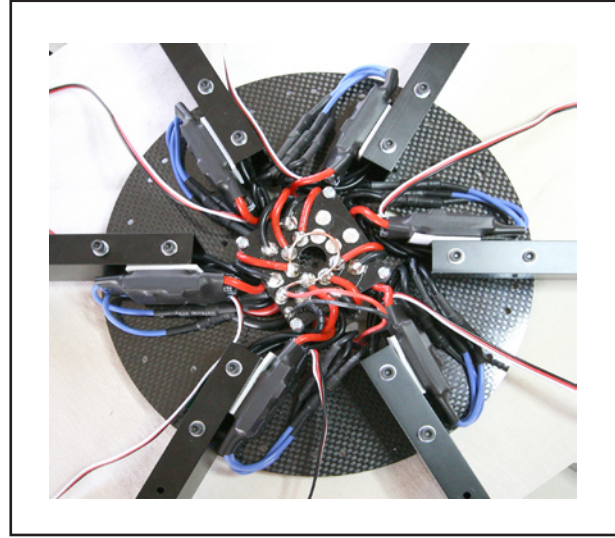
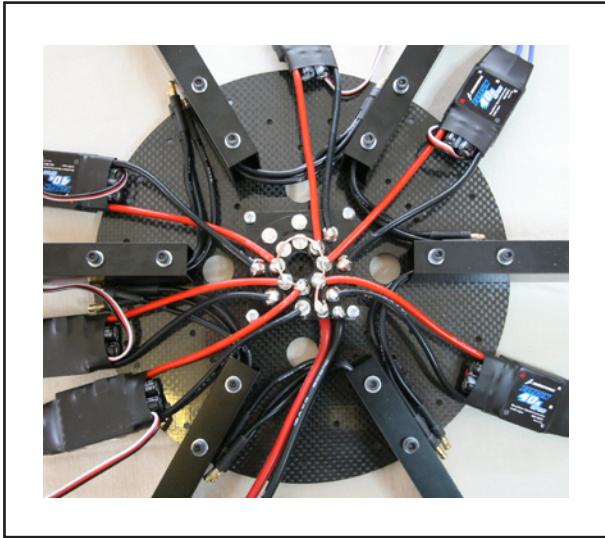


I Octo



V Octo

Once you have identified the correct holes, lay out your arms in position and decide on the location of your ESCs. Remember at some point you will need to set the rotation direction of your motors, you can do this now, or if your motor wires are long enough you can do it when the frame centre is assembled. You can install your ESCs how you like, but we recommend attaching them to the side of each arm. This is very important if at any time you wish to be able to fold the frame. By placing them on the side of the arms, they also get very good cooling and you can access them easily.



Please note: This is an example installation only. It is good practice to protect your motor wires at the point where they leave the arm to prevent abrasion!

If you are intending to fold the frame it is very important to get all wires positioned such that nothing is pulled, crushed or rubbed during arm movement. Always protect all wires with heatshrink or other covering to prevent wear!

Assembling the Frame Centre

When you are ready to complete assembly of the frame centre, thread one bolt with washer from underneath into the correct inside hole for one of the arms, and then carefully slide the arm down onto it so as not to damage the wires inside. Do this for all your arms. If you let the arms hang slightly, this will help prevent the bolts falling out. When all are in place, take your base plate and slide one of the bolts up through the matching hole and fit a vylock very loosely, just enough to stop the bolt falling out. Go round each bolt in order and repeat the process. When all bolts are in place, thread the outside bolt up through each arm and fit a washer and nylock nut loosely, then remove the inner nuts one at a time and refit with a washer. Ensure the correct arm is in the correct place and the arms are the correct way up, in this case upside down. Remember to thread your ESC control leads and any other necessary wiring through the top plate before completing assembly. Once all bolts are in place, carefully tighten the bolts making sure no wires are pinched inside the frame centre plates. Always use washers and **DO NOT OVERTIGHTEN NUTS!**

Nuts should be firm but should not be tight enough to significantly distort the frame plates.

NOTE FOR Y6 USERS: *If you are flying a Y6, we recommend the fitting of 3 x 30mm pillars inside the frame plates between each arm - correct holes are indicated by red circles in Y6 centre plate image under 'Fitting the Arms' Section.*

Landing Legs

Both Standard and High Clearance landing legs attach in the same way. Use 3 x M3 40mm hex head bolts with washers and nylock nuts for each leg, and take care not to pinch any motor wires when threading the bolts through the arm. The arms are drilled such that legs can be attached at any point on any arm. You can choose to fit them where you like to achieve the best combination of stability on landing, balance in the air, and if you are carrying a camera, an uninterrupted camera view. If your camera is mounted forward of the frame centre, you can help balance the offset weight by adjusting the position of the legs.

DO NOT OVERTIGHTEN NUTS! In the event of a bad landing the legs are designed to twist and bend round on themselves, minimising the risk of damage to the arms. If this happens you can normally simply bend the leg back into shape and carry on flying.

Final Steps

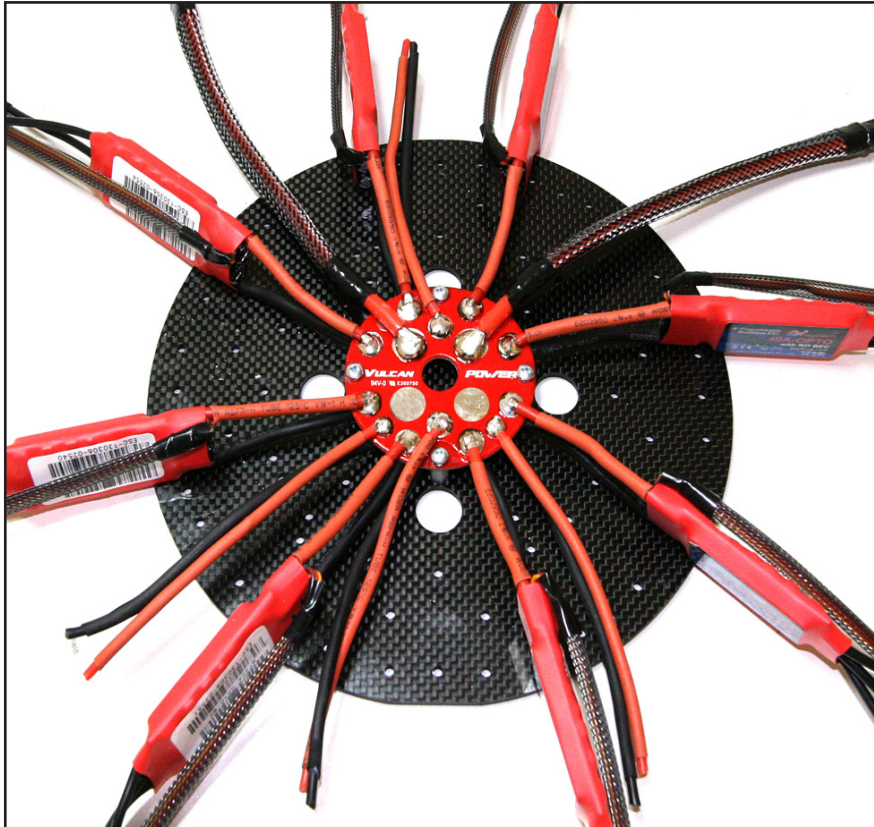
Once assembly is complete, install your flight controller and then fit the top standoff plate to protect it and provide a platform for further flight electronics as required. Standoff plates can be stacked as many high as you like using standoff pillars. A second plate fitted on top of the first is an ideal place to install your GPS receiver. For additional standoff plates and pillars, or any other spares or parts, contact your dealer.

Plastic dome covers for the frame centre are available in four colours, white, red, blue and yellow. They can be fitted to the top and bottom of the frame centre section (subject to the equipment installed). You can attach them how you like, however they are supplied with Velcro dots and tape. The dots can be stuck to the dome and up under the top frame plate between the arms for installation of the dome cover. Dome covers are entirely radio transparent and will not affect radio or GPS reception.



Appendix 1

Example of a typical PDB for a Octocopter. Note 8 ESCs, two independent 10 AWG battery connections (braided), three auxilliary power feeds (no connectors fitted in this picture), and that all wires are protected with heat shrink or braiding.



An example of a typical flight controller installation - in this case the DJI WKM





How Strong is the SkyHook?

We knew they were strong, but when the question was asked we thought we should find out.....

Supported on only three arms at full 1.2m span, this Hexa has 28Kgs of house bricks sitting on the centre of the frame!

And it could have taken more if we'd had any more bricks.....!

