airflo duo

4th Axis Stabilizer

User Guide

Getting Started with your 4th Axis Stabilizer

Handheld gimbals are the biggest game changer in the past few years for independent filmmakers! - You turn it on and out comes the magic footage! But they do have their (bumpy) limitations which is why you're here.

Our 4th Axis Stabilizers are designed to reduce that bounce that you typically see when someone is walking with a gimbal. That vertical bounce from your steps transferred to your hands can be mostly absorbed before it gets to the camera. But it doesn't stop at walking, you can go from softer motion all the way to jumping around like crazy.

The best steadicam support arm operators usually take years before they truly master their trade, but with our 4th Axis Stabilizers and a handheld gimbal the learning curve is vastly quicker to get smooth results. You might be a natural right out of the box but most of us will need to dedicate time to getting your technique and settings right for each shooting scenario. Follow this guide to get up to speed as quickly as possible and you'll soon understand the finer points about how to get lovely smooth footage!

As there are moving parts in the stabilizer there are a number of pinching hazards that you will need to take care of so as not to injure yourself.

Let's get your new Stabilizer out!

Your 4th axis stabilizer (also called a Z axis stabilizer) comes to you almost fully assembled with little more than adding the mount to your gimbal.

You'll also find this printed guide, an M4, M3 & M2.5 allen keys and an M5 socket. These are used for tuning and upgrades but typically you should rarely need to use them as the stabilizer is mostly tool-less.

Note: *Your stabilizer is fully tuned out of the box so don't be tempted to go and tighten everything before you start or else you'll have to go over the re-tuning process unessesarily!*

The only parts you'll normally be adjusting are the handles, payload adjusters, fluid damping adjusters and stabilizer arm attachments which are all tool-less! The re-tuning section near the end of this guide is helpful if you make upgrades to your stabilizer or on the rare occasion that the stabilizer has become out of tune.

Although your stabilizer is ‘tough as old boots’ extremely high temperatures can cause permanent damage so please remember:-

Note: *Just as you wouldn’t leave your expensive cameras in a car on an hot day, don’t do likewise with your AirFlo. Temperatures exceeding 50°C (120°F) can cause permanent deformation!*

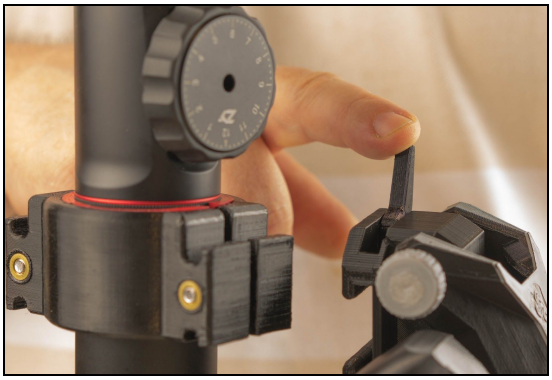
Attaching the gimbal mount to your gimbal

Before you add the stabilizer to your gimbal you need to first add the **gimbal mount** ***(Note****: This is for standard mounts. Some specialized mounts may connect differently)*. This mount is essentially a clamp that holds your stabilizer in place on your gimbal. In most cases the mount should attach high on the handle. Occasionally you may wish to change the position to lower down the handle for even higher shots or when inverted for even lower shooting positions.

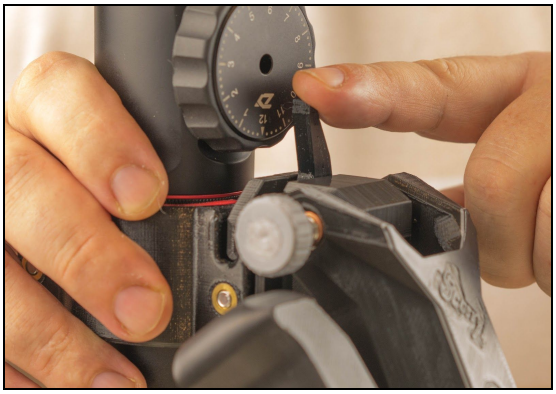
1. Take your mount halves, the bolts that came with the mount and the M4 allen key (the largest allen key)
2. Place both sides of the mount clamp around the handle and line them up so that the top sides sit level with each other.
3. While holding the clamp in position with one hand use your free hand to start to screw the bolts in by hand.
4. Then continue using the M4 allen key tightening each side alternately just a turn or two until the clamp holds firmly and won’t be moved easily by hand. There’s no need to tighten fully at this point. There should be a gap between the two clamp halves.

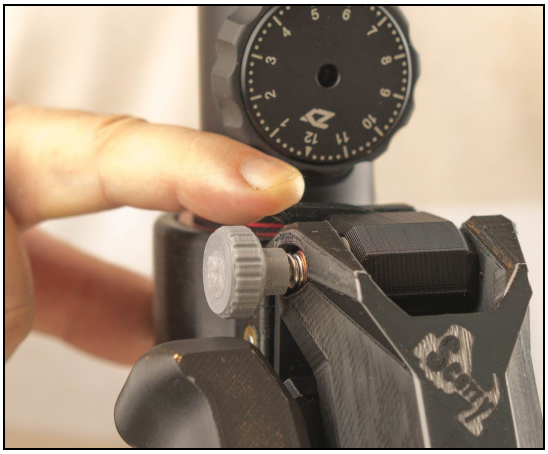
Note: *Do not overtighten! Unlike alloy dual rigid handles these don’t need excessive force to hold your gimbal securely! This is a very secure clamp and the rubber surface provides a strong hold.*

5. Add the two AirFlo Modules in the Upright Position ***Note:*** *Make sure the damping knobs face to the rear of the gimbal.*

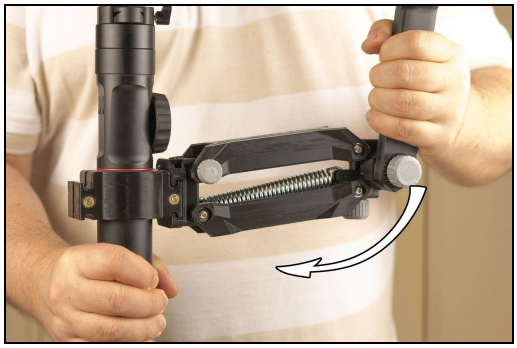


   a. Open the locking lever up
   b. Slide module along mounting rail
   c. Hold module firmly while locking down the locking lever until it locks down horizontally.





6. Now you finally test the holding power of the gimbal clamp by gripping the gimbal firmly and trying to rotate the 4th axis handle. If the gimbal rotates inside the clamp then tighten the clamp bolts another quarter turn and try again and repeat until it won't move easily.



Now for a quick once over

Variable Bounce Damping Controllers

On each side of the gimbal mount are the two smaller adjuster knobs for the variable bounce damping adjusters. The suspension springs, by their nature when stretched and released will bounce back and forth until the springs initial energy or bounce is lost in the system via friction.

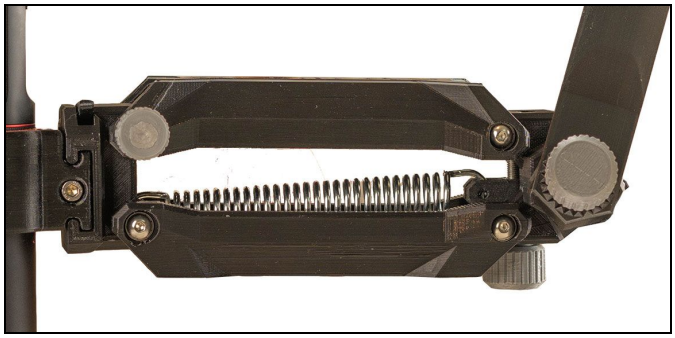
That bounce can be reduced and absorbed in the bounce damping system by setting the damping knob; turn it anti-clockwise to increase the strength of the damping and clockwise to lighten the damping. There is a bit more to it than that and it's a concept that's easy to misunderstand so please read the more detailed explanation about this in the 'Bounce Damping' section?

Suspension System

Support Arms

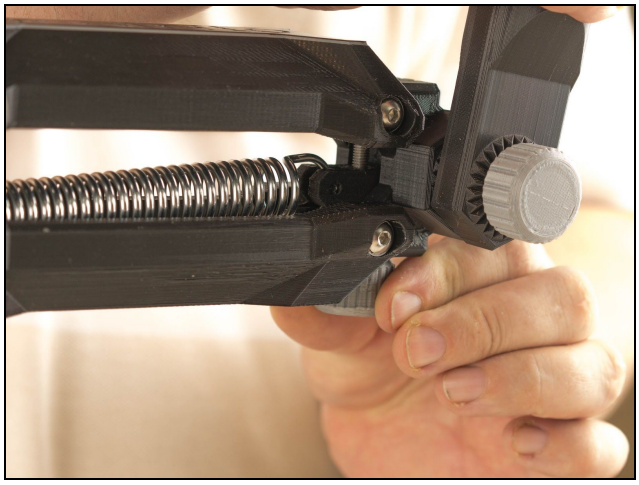
The two sets of support arms connect the spring adjusters to gimbal mount and holds the sprung system in tension in a 'McPherson Strut' arrangement.

This geometry is what gives you the range of support for different weight rigs. It's also mostly responsible for the very soft up to the more firm elastic suspension.



Payload Spring Adjusters

The payload spring adjusters attach under the ends of the support arms and the other side to the handles via the rosette mount. The main purpose though is to adjust the spring tension so that you can balance your rig properly.



The spring adjustment knob turns anti-clockwise to increase the spring tension and the bolt runner moves closer to the top. This will support an increased payload weight while at the same time decreasing the iso-elasticity.

Turn it clockwise and the bolt runner moves closer to the bottom. This will decrease the spring tension (also increasing the iso-elasticity). In most cases you want to be using the most 'Iso-Elastic' setting for your rig but please

read the ‘Balancing’ section to find out more about this as there’s reasons to break these rules too!

It’s all about control and how much you can do without!

In other words when the payload is adjusted towards;

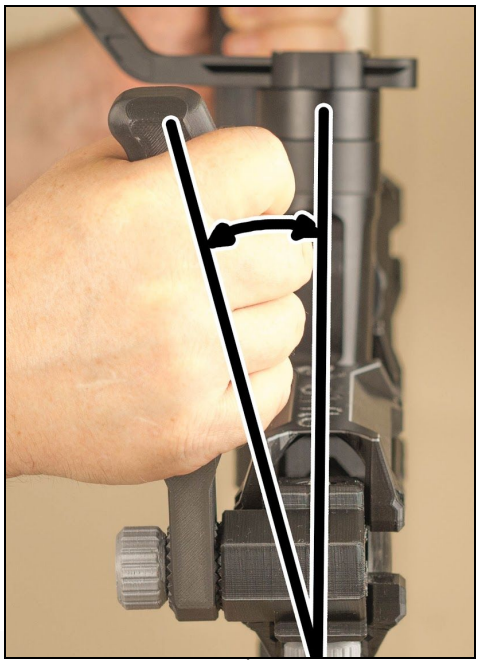
- ***the firmest end*** *allows enough control to frame the shot easier at the expense of more vertical movement in the footage and;*
- ***the softest end*** *has the potential to give you a shot that looks ‘like it’s on rails’ but until you master it you likely find it too hard to control and you’ll lose your framing easily - It usually takes some practice with the rig to master it - but if a guy like me with a bung knee can do it then you can too!*

Think of it in the same way that car suspension smooths out a bumpy road. So too our suspension system does the same to your bumps.
Now consider the difference between the super soft suspension of a luxury limo and the very rigid suspension of an off-roader.
In a luxury limo you barely feel any bumps and this is ‘Iso-Elastic’ suspension. With the stiff suspension of the off-roader you feel the bumps a lot more and this is more ‘Elastic’ or ‘springy’ suspension.

Handles

The handles are offset slightly towards the rear so as to give a slight forward pre-load to aid in reducing ‘forward / aft’ wobbles.

Secondly, there’s a slight lip at the top of the handles that aids in positioning your hands.



Lastly, they attach via a ‘Rosette Knob’ that gives a full 360 degree range of possible positioning.

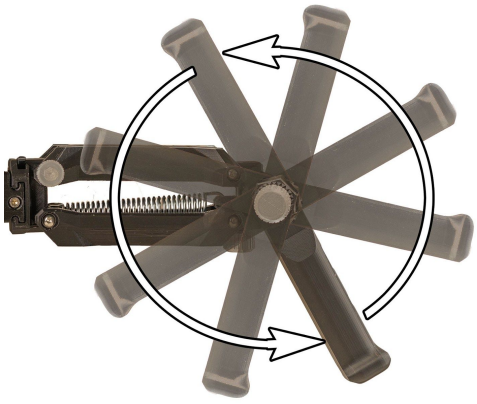
Initial Setup

Handle Position

Just for reference we call the side of your stabilizer with the bounce damping adjusters and rosette knobs the ‘back’ and this side should always face you when filming. This way you can make adjustments on the fly.

Now you’ll start with the modules in ‘Upright’ mode. Even if you’re planning on using your stabilizer predominantly with the modules inverted you’ll find it easier to set up and balance in ‘Upright’ mode first before moving to ‘Inverted’ mode.

Loosen the Rosette Knobs until the handles can be rotated.

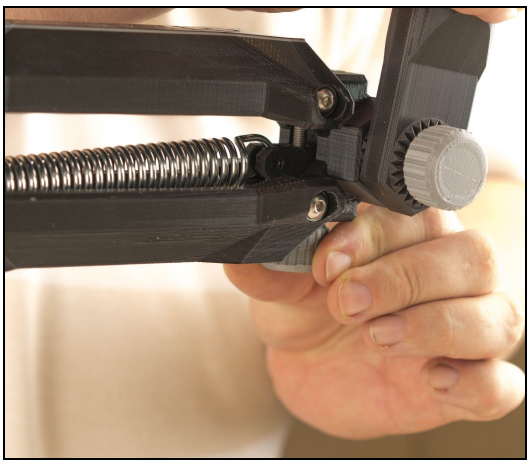


I prefer my handles pointing out at around a 10 degree angle but this is just my preference so whatever angle you’re comfortable with. Some people like the handles rotated in slightly as it narrows the width for a narrower grip and more compact form. Once both sides are at the same angle just tighten up the Rosette knobs making sure that the rosette teeth are meshed together and locked in place. You don’t need to overtighten these knobs, just tighten until you meet a firm resistance. You may find if you’re shooting for instance while ‘crabbing’ to the side that adjusting the handles independently to different angles may be more ergonomic for you.

Balancing Your Payload

1. Preparation

To start balancing you'll first need to balance your camera on your gimbal just as you normally do. It helps if you have your gimbal on a mini tripod for this.
Now you'll adjust both of the Bounce Damping Knobs anti-clockwise until the compression spring becomes almost loose (see pic to the right). This is so that the damping doesn't affect the balancing.



2. Initial Payload Adjustment

We start by getting to a baseline loading where the support arms are roughly horizontal. We adjust the Payload Adjuster knobs roughly equal amounts to get the support arms close to that position. This payload setting will be fine tuned later.

3. Support Arm Angle

When you hold the stabilizer with the rig loaded you'll notice that the support arms either point up towards the centre or down. The most common use is for typical walking shots and the angle of the support arms is not as important as the setting for the most optimal smoothing as the vertical movement tends to be small. As long as your stabilizer doesn't 'bottom out' during your shot then you can go as low as you like with the support arms pointing down in the middle. The lower you go the more iso-elastic the stabilizer will behave.

4. Even Out the Payload

One of the biggest sources of inconsistent smoothing occurs when one support arm has the payload set differently to the other. To test this you'll need to do a bounce test but before that we'll need to work on your form...

Holding your stabilizer with a soft touch

Before you start testing you first need to perfect your grip technique.

Many of us that come from using rigid dual handles are used to operating with the dual handle 'power grip of death' ;-)

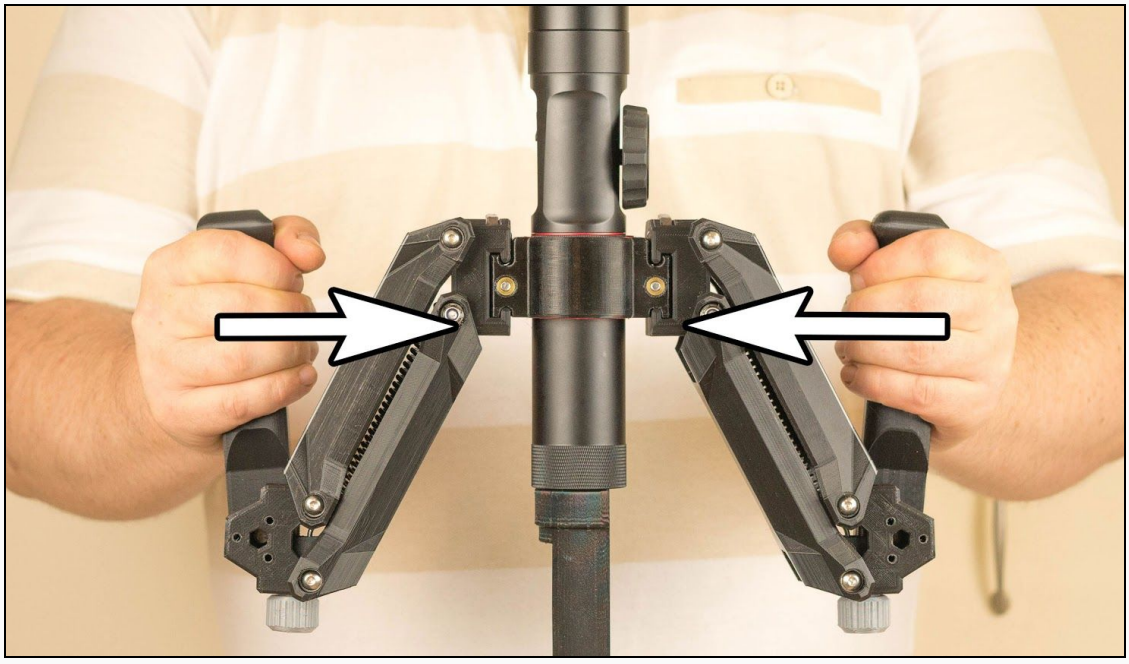
The biggest key to transitioning to the AirFlo Duo 4th axis is to relax that strong grip and start using **'soft hands'** instead. There's an art to 'soft hands' so please read on?

The reason this is so important is that your Duo is a truly dynamic system and what you want to do is eliminate any inward or outward pressure on this dynamic system. It may be hard to 'un-learn' the techniques you've learnt but the silky smooth footage you get will be worth it!

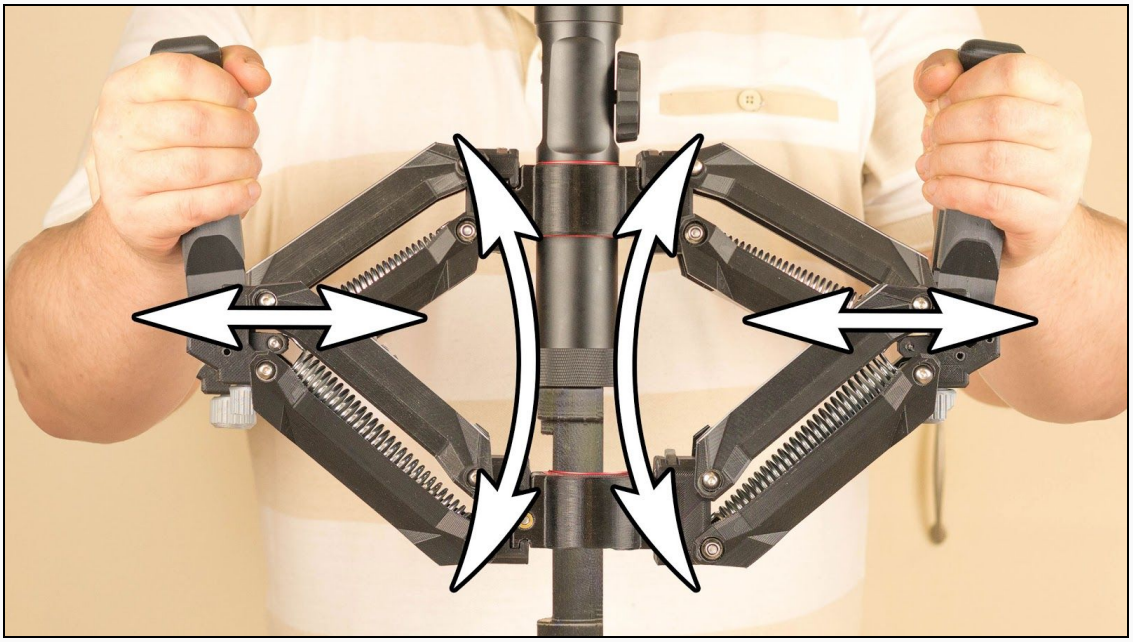
1. The first step is to hold your Duo and place your hands so that the slight lip at the top of the handles sits on your hand.

2. Now feel the rig in your hands. You should feel the rig leaning slightly forward. This forward pre-load is by design and assists in preventing unwanted forward to aft wobbles that can affect overall stability.

3. Now try pushing inwards and outwards to see what effect it has on the vertical position of the gimbal. This will vary by whether the arms are pointing up or down. This is the motion you're attempting to avoid.



4. Finally drop your hands to make the gimbal bounce without any inwards or outwards pressure.



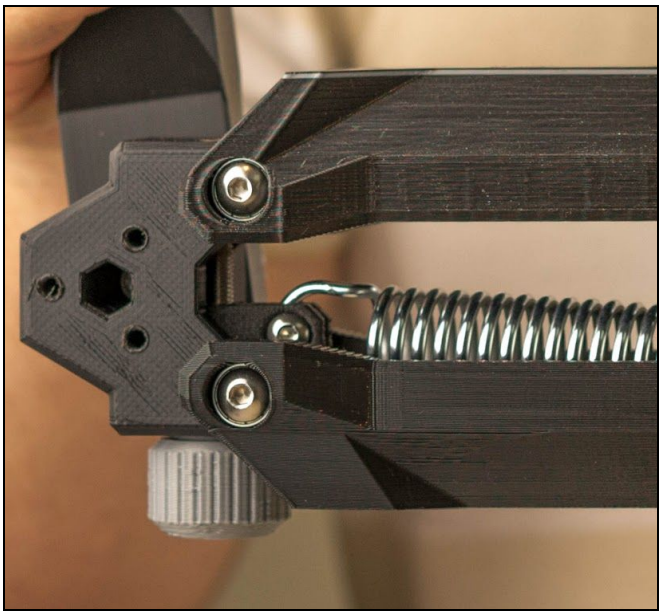
When you look at the AirFlo Duo in motion you'll see that both suspension modules sweep in an arc. You're trying to reduce any sideways force from your hands affecting this smooth arc. It takes time but there's one very easy way to practice this technique so you can get a feel for it fairly quickly. It might remind you of that weird 'jerking exercise gadget' on tv but bouncing the arms up and down repetitively will quickly teach you whether you are doing it right or not. The aim is to bounce the hands while keeping the gimbal as steady as possible. At first you'll find it may be hard to keep it steady but not before too you'll get the hang of it!

Testing

Payload -> Shoot, Analyse, Adjust, Repeat

You'll start your testing by finding the best settings for your payload and your current level of ability.
The easiest way to do this is to practise the same short filming movement and analyse it to find the best settings for you.

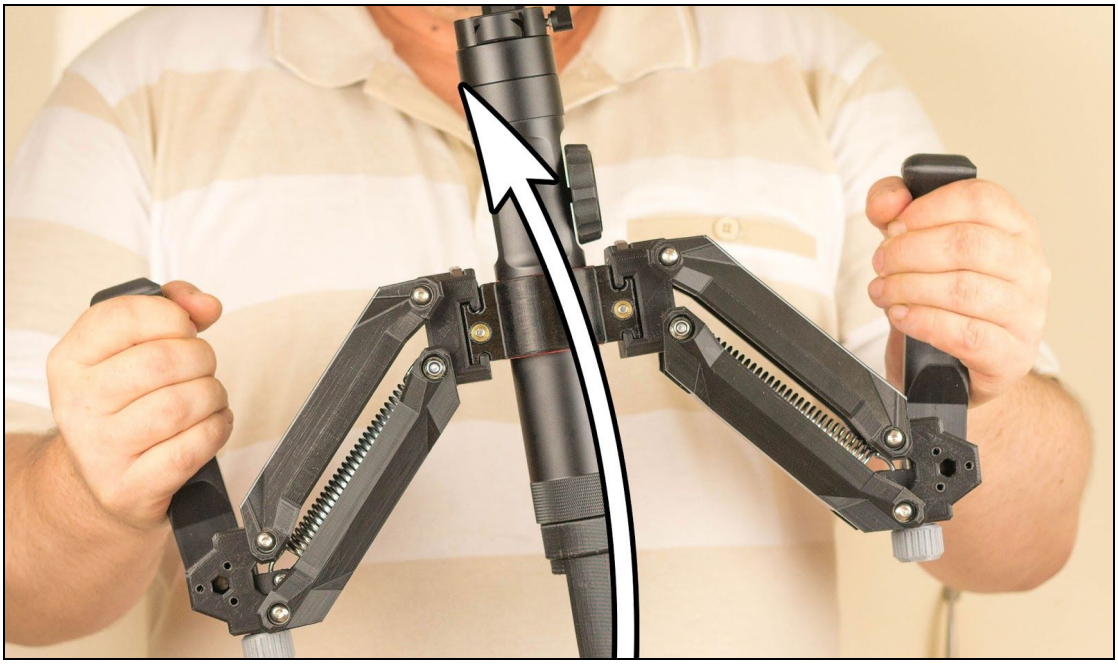
What works best is if you repeat a short 15 to 30 second shot that involves walking on hard and soft surfaces, with some changes in direction and if possible also on an uneven surface such as that found on a lawn.



1. Start with both Payload Spring Adjusters set all the way to the bottom - make sure you stop when you feel the resistance at the bottom.

2. Set both damping adjustment knobs so that they're turned off (Fully tighten the knobs at first and then loosen them 5 revolutions to turn off the damping). This may give you some uncontrolled bouncing during the test but that will be fixed in the next section when we adjust the variable damping.
3. Rotate in full revolutions both Payload Spring Adjusters the same number of revolutions until they're high enough not to bottom out on your practise shoot. (This is now the minimum setting for the weight of your rig)

4. Next is the ‘Bounce Test’ to make sure the spring tension is even. It’s critical to focus on using soft hands or the test might fail. Once you have the arms roughly in the right position then you evenly bounce your hands down and



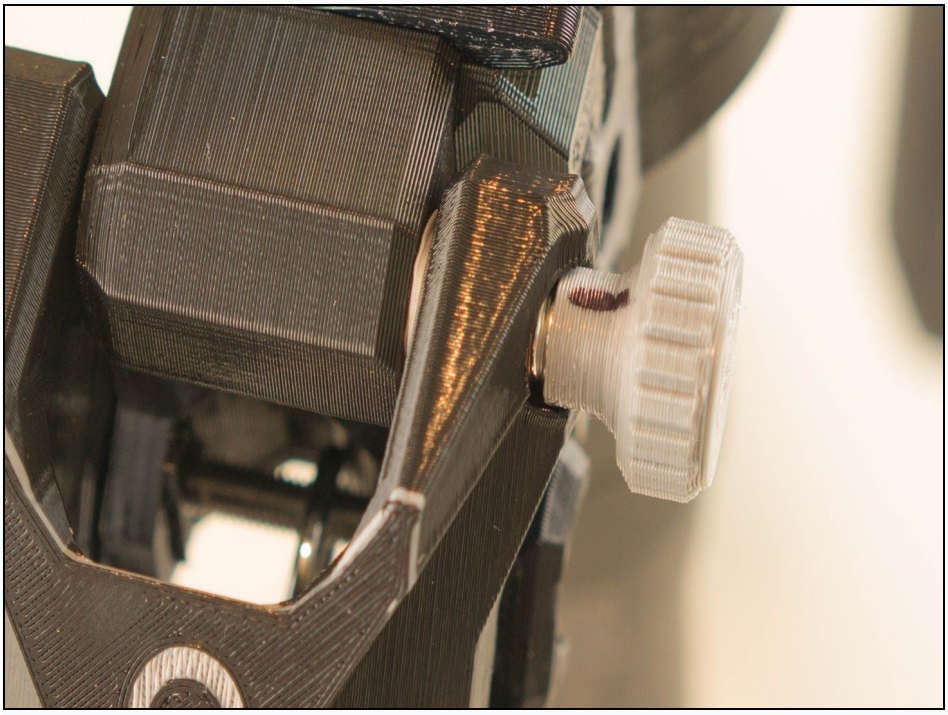
let it bounce back up to see if the gimbal favours one side or the other. If your gimbal bounces say to the right then the right Payload Spring is weaker than the left and you need to increase the payload adjuster tension on the right side to even it up with the left. When your gimbal bounces straight up you’re all set to start your test shot!

5. Let’s be optimistic and start at this low setting! Film the movement with this setting and if possible look at the results on a monitor to see 1) how well bounce was controlled and 2) if you lost your framing or not. If you’re not there yet then increase both Payload Spring Adjustment Knobs exactly the same quantity of revolutions, check with a ‘Bounce Test’ and then shoot again and repeat until you find the optimal balance (*pun intended!*) for your own style of filming.

Variable Damping System

Your stabilizer has two independently adjustable damping systems using PTFE (AKA Teflon) to give ‘fluid like’ bounce damping. These can be adjusted to smooth out a large range of spring bounce in your stabilizer.

The range of damping goes from zero to 100%. At 100% the small compression spring is fully compressed and can’t be screwed in further. Loosening the damping knob 5 full rotations will give you zero damping. Each clockwise rotation increases the damping by 20%. There is a black line on the top and a red line on the bottom of each damping knob so that you can count every 20% increase using the black line and use the red line to count the odd settings i.e. 10%, 30%, 50%,70%, 90%.



To zero the damping first tighten the damping knobs to 100% each and then loosen them 5 full rotations to get to 0% damping. This is always a good starting point rather than using guesswork.

We each move and shoot differently for our various filming movements. This guide is a good starting point but you each need to find the range of damping to suit your own shooting styles.

Understanding how to set the damping

When you set the damping to a certain level you are actually setting the dampening range i.e. Setting the damping to 100% will not dampen out all vertical motion. Max damping will only dampen the most extreme vertical motion and light to medium motion will not be damped out.

You need to think of this setting more as a range - For instance, if I set the damping to around 20% I find that motion from slow walking thru to walking down stairs will be smoothed out but any harder or softer motion won't be smoothed out.

Damping Settings:

To give you an idea of where to set the damping here's a range of filming movements with the level of fluid damping that I use for each. This uses the single black line in the white gauge:-

- The most gentle camera movement - for this I tend to use from 0% damping up to 20% damping. (e.g. slow walking, all the faux slider shots, dolly/pans, faux crane shots, Push-In and Pull-Out)
- For walking or vertical or rotational motion (tilts, orbits or rotates) and stairs I'll have it set roughly between 15% and 30%.
- For brisk walking or sudden changes in camera direction - (20%-40%).
- For walking backwards or light jogging (follow /Lead) - (30%-45%).
- For medium pace jogging - (30%-60%).

- For running pace to hard running - (40%-70%).
- For jumping about or with very hard action on uneven surfaces - (60%-100%).

Note: *As with the spring adjusters you should do a similar style of* ***Bounce Test*** *to make sure both damping cartridges are set the same. First set the Payload Spring Adjusters to the exact level and then bounce the loaded stabilizer. If say the gimbal bounce leans towards the right side then the right has more damping than the left and you need to increase the left side damping adjustment or decrease the right side adjuster.*

Once set, do the bounce test to confirm

As with the spring adjusters you should do the same ***Bounce Test*** *to make sure both damping cartridges are set the same. As the payload springs are already adjusted you just do the bounce test with the loaded stabilizer. If say the gimbal bounce leans towards the right side then the right has more damping than the left and you need to increase the left side damping adjustment or decrease the right side adjuster.*

Damping -> Shoot, Analyse, Adjust, Repeat

This process is useful to do in advance so that you don't need to go through the full process when on a shoot. You'll work out the damping settings for different filming movements from very soft motion to very hard action.

Since you have already found the 'ideal' Payload Spring Setting for your rig you can start with that setting to next find the best damping adjustments for your own personal filming styles.

What I find works best is if you find a short 10 second circuit where you can vary your intensity from soft motion all the way to hard motion (or as hard as you can physically go).

1. Start with both Payload Spring Adjusters set to the ideal level that you already worked out before.
2. Set the fluid damping adjustment to 0%.
3. Do the 'Bounce Test' to make sure the the damping is even and adjust if necessary.
4. Do your 'soft' motion shot and examine footage.
5. Next turn both Fluid Damping Knobs half a full rotation to 10% Damping and do the 'bounce test' again (adjust if necessary).
6. Do your 'soft' motion shot again and examine the footage and compare it to the first footage.
    a. If the first shot was best then keep a note of the first setting.
    b. If the new shot was better then increase the damping again and keep testing until you find the footage smoothing declines.
7. Once you have your 'soft motion' settings nailed down then keep the damping at the last 'ideal' setting and start the process again but this time up the intensity to the next movement with gentle walking.
8. Next try normal walking
9. Then brisk walking
10. Then jogging
11. Then running
12. Finally hard motion such as on uneven ground or jumping about. Don't be too hard on yourself if this last one doesn't work out at first!

Once you apply these new 4th axis stabilizer techniques to your shoots you'll find you can get even better traditional gimbal moves such as push in, pull out, follow, lead, orbits etc.

Common Rig Configurations

Upright Mode

The most common is the Upright Mode which gives the viewer the ‘persons eye view’ that they’re already very familiar with. I tend to use it 80% of the time (e.g. walking head shots or head to waist shots, over shoulder, high to low shots and all the common moves such as push-ins out outs)

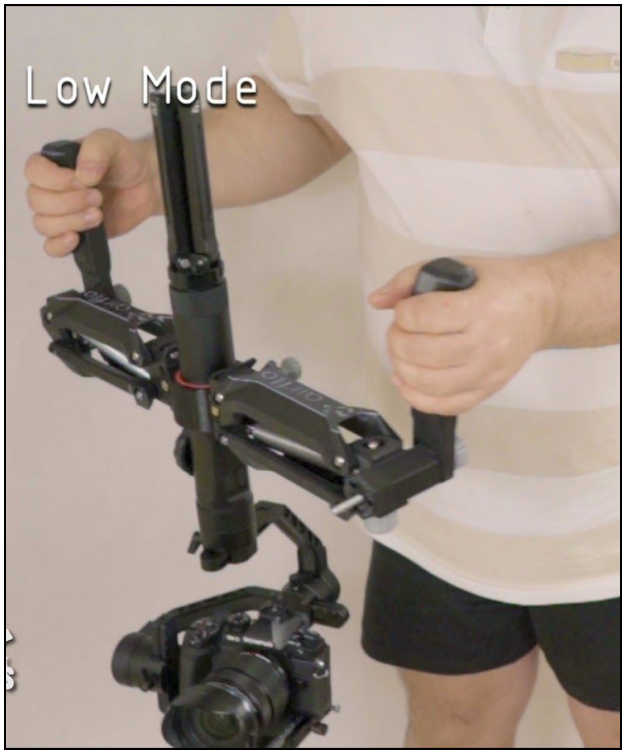
High Mode

From Upright Mode if you invert the handles you get the High Mode. This is useful for a range of high shots and can give some interesting faux crane shots. Its higher centre of gravity makes it harder to control than the other modes.

Mid Mode

Now you re-attach both modules while swapping sides to keep the handles in the correct orientation. This takes you to the inverted gimbal Mid Mode. If you're not yet silky smooth with Upright Mode then this will be an easier mode to get smooth shots as the height isn't too far away from Upright Mode. You can get some interesting creative angles such as tilted up 'Child's eye view' or moving along lower objects such as cars, railings, plants that's great for B-roll. It's also a good height for capturing smaller children.

Low Mode



Now with the gimbal in the Mid Mode you turn the handles upright to get to Low Mode (also called Briefcase Mode). It's great for those 'dog's eye view' of the world shots and the toe to head shot tilting up or a following behind legs or feet shots. Of all the stabilizer positions this is the easiest mode to operate as the lower centre of gravity keeps the gimbal nice and and smooth with minimal effort.

Rigid Mode

You might find that there are times when you want to do a controlled motion such as a whip pan or a tilt without having to attach rigid handles.
This is how you turn your Duo into rigid handles in just a second!

First make sure your handles are straight up or angled outwards as the next step can pinch your hand if they're angled inwards.
It's actually really easy and all you do is bounce down on the gimbal and on the up stroke push inwards on the handles and 'Hey Presto!' you're in Rigid Mode. You can also go to Rigid Mode from all other Modes as well!

Advanced Usage

As you get more and more familiar with the 4th Axis Stabilizer you'll uncover your own little tips and tricks to make your stabilizer do more. Here's a few things that I use on occasion;

Semi-Rigid Mode

Ok, I know some of you are having a chuckle at the name but I'm serious! This is a bit of a dark art to get right so don't worry if you can't get it easily. You can't use Rigid Mode as part of a shot that goes from soft suspension to Rigid Mode as the locking motion will give an obvious jolt in the footage. You might find that there are times when you want this transition so what you can do is rather than fully locking the arms just apply enough inward pressure on the handles to lift or lower the gimbal so that the majority of the suspension is mostly locked and you can do your controlled rapid movement. This takes a bit of practice but if you do these transitions like whip pans regularly then it's well worth the practice to get it right.

Re-Tuning AKA Troubleshooting

Occasionally you may need to re-tune your stabilizer if it isn't moving freely, makes a funny sound or if something just isn't working right and no amount of knob adjustments will get it working. You might have made an upgrade and need to retune it from scratch. This is where you get out the socket and Allen keys out that came with your stabilizer.

But first you need to get a little 'Stabilizer Whisperer' on it and listen to what your stabilizer has to say... seriously! :)

What you are listening for is knocks, scratches or scrapes. In a quiet place get your stabilizer (without the gimbal) and put it up to your ear while holding one handle at a time and moving the central gimbal mount up and down. There will be some just audible sounds that are mostly fine but if there's an odd sound that pipes up then try and work out where that is?

Some common problem sounds include the following:-

- Knocking around the spring adjuster
- Scratching or scraping around the spring adjuster
- Scratching or scraping around the gimbal mount

I run through every one of the following adjustments when I'm tuning the stabilizers. You may pick and choose what you want to tune but it doesn't take long to check it all.

Knocking spring adjuster

The **knocking spring adjuster** is a simple fix. This likely means that the spring adjuster bolt is slightly loose and the knocking sound is the bolt moving up and down in the mount. Take your socket and push it firmly over the recessed nut in the top so that if you turn it the spring adjuster knob turns too. Now what you'll do is firmly grip the spring adjuster knob and tighten the socket until it's firm.

Then you'll loosen off the socket by half a turn and then listen again to hear if the knocking sound is gone. You may need to fine tune this tightness further but it normally does the trick.

Scratching or scraping around the spring adjuster

This is likely an over tightened support arm bolt. Take your allen key and tighten one of the four bolts until it just starts to become firm.

Be very careful to only tighten the bolts until you just meet firm resistance as you can easily strip the threads if you go too far

Once firm then you loosen the bolt one complete revolution. Now do this to the other 3 bolts and test to see if the noise is gone.

Scratching or scraping around the gimbal mount

The **bottom attachment bolt** with the spring attached to it is rubbing somewhere. Firstly, you'll make sure that the nut on the front side lines up with the end of the bolt. If not take your socket and allen key and adjust it.

Then take your stabilizer and look thru to that bolt with a light above you so you can catch the reflection of the bolt. If one side shows the reflected bolt and the other shows none then you will need to take the Allen key and adjust the bolt so that the thin sliver of light reflecting of the bolt is close to equal on each side i.e. if the reflection is on the nut side then you will need to loosen the bolt.

General Care

Here's a few pointers that you should be aware of if you want to take best care of your stabilizer.

Temperature range

You should keep your stabilizer under 50°C (120°F) as some of the polymers will begin to soften after this point and potentially warp out of shape. **Don't leave it in a car on a hot day!** Think of it like any camera gear as you wouldn't leave your expensive camera gear in a hot car.

Rain, Dust and moisture

You should avoid situations where the sealed bearings are subjected to water or dust ingress. Your stabilizer can withstand light rain but heavy driving rain could force water or dust particles into the bearings. **Do not immerse your stabilizer in water or spray pressurised water at it!**

Cleaning, Maintenance, Care and Precautions

After any use where your stabilizer is subjected to dust or moisture you should wipe with a dry or slightly moist cloth.

When you store your stabilizer for extended periods to minimise the stress on the stabilizer you should adjust both of the spring adjusters to the minimum position.

The lubricated bearings are sealed so no lubrication is required to the bearings or any other part of the stabilizer.

Note: *We build our stabilizers extremely tough but occasionally under certain movements there can be exceptional forces inadvertently applied to the stabilizer. Although unlikely this can possibly lead to breaking forces being applied to components of the stabilizer possibly causing catastrophic failure. This is especially important during autonomous use where the stabilizer is mounted to an object such as a car. In these types of scenarios it's important to*

protect your rig with a safety line in the event of a catastrophic failure.

OK, that's it! Congratulations! :)

Now you have all the knowledge you need to get started. Just remember that at first you will need to practise those techniques before you use it on a shoot. You might be a complete natural but I generally suggest you dedicate at least a few hours shooting and reviewing footage to find the right settings for you. Then you can go out with confidence and make all your very own silky smooth footage!

And one last thing, if you post some footage online then we'd love to see it so please shoot me off a link?

Thanks again!

Scotty McPherson