

Steadicam® Volt™



LIT-817001, RevA

STEADICAM®

Table of Contents

Introduction	1
Volt Components	2
Get Started	7
Neutral Balance	8
Powering On	11
Operating with Volt	15
Control Box settings	19
Installing the Volt	25
Control box	27
Gimbal prep	29
Mounting Volt motors	35
Flip button	37
Adding Belts	39
Upgrading gimbals	
Archer/Archer2 gimbal	45
Ultra2/Shadow gimbal	49
PRO gimbals	53
Balance Ultra2/PRO	57
Troubleshooting and Notes	61
Wiring and pin-outs	63
Contact Tiffen	65



The Tiffen Company
90 Oser Avenue
Hauppauge, NY 11788
Visit us at tiffen.com

The Steadicam® Volt™

Welcome to the future of professional Steadicam® stabilizer operating!

Working with the sled's inertia and neutral balance, the Volt generates an "artificial bottom-heaviness" to keep the horizon level and headroom stable. With the Volt, the operator can concentrate on precise framing, timing, navigating, and other more interesting aspects of operating.

The strength of the roll and the tilt assistance can be individually fine-tuned to suit the operator's preferences, and easily adjusted for different shots. The assistance can feel like operating a sled with a very long drop time – easy to tilt or roll – to full gyro-simulation, with the sled locked hard to the horizon in roll or tilt or both!

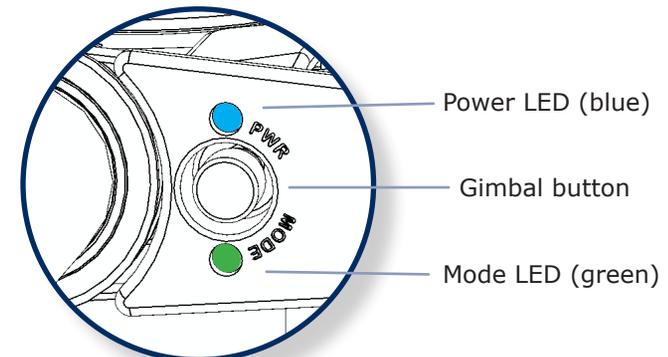
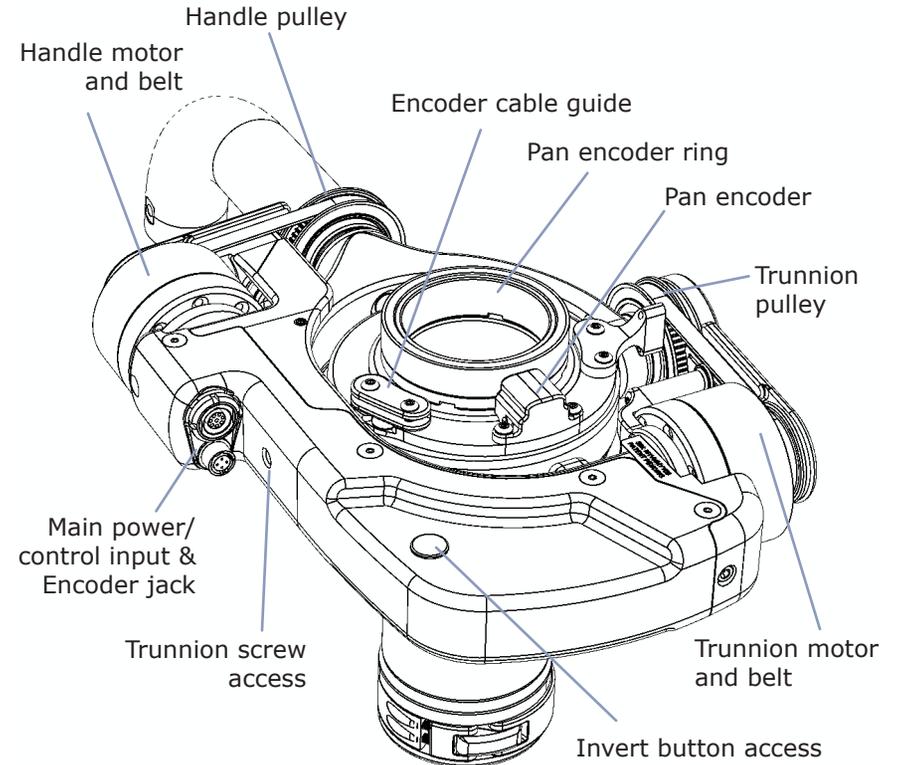
Because the sled is always balanced neutrally top-to-bottom, all pendular effects from acceleration and deceleration are eliminated. Plus, there is no re-balancing needed when switching to low mode!

The Volt also allows behaviors that were impossible before. Like "friction mode" which emulates a fluid head with tilt hold and a fixed horizon, bringing you new control options for each and every shot.

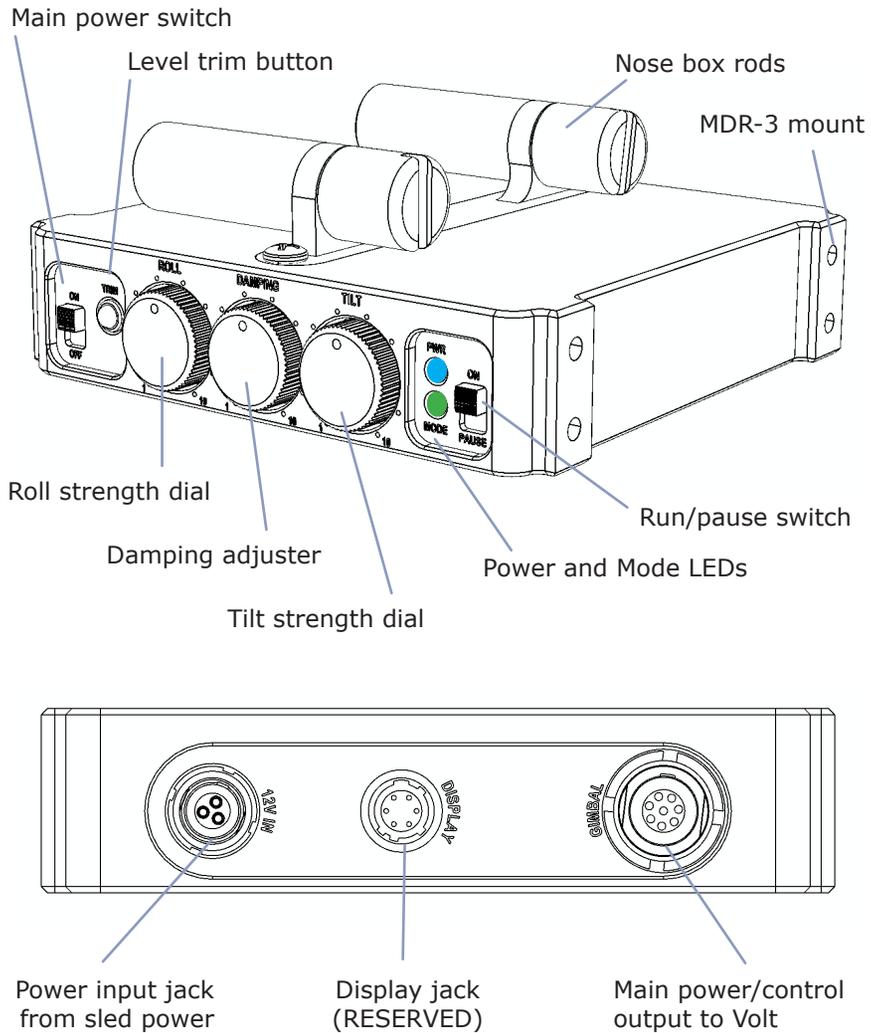
In use, the Volt is completely transparent to the operator, and it feels exactly like regular Steadicam operating – with perfect horizons. The operator is always in full and direct control of framing, and can easily override the Volt's assistance.



Steadicam® Volt™ shown on M-1™ gimbal

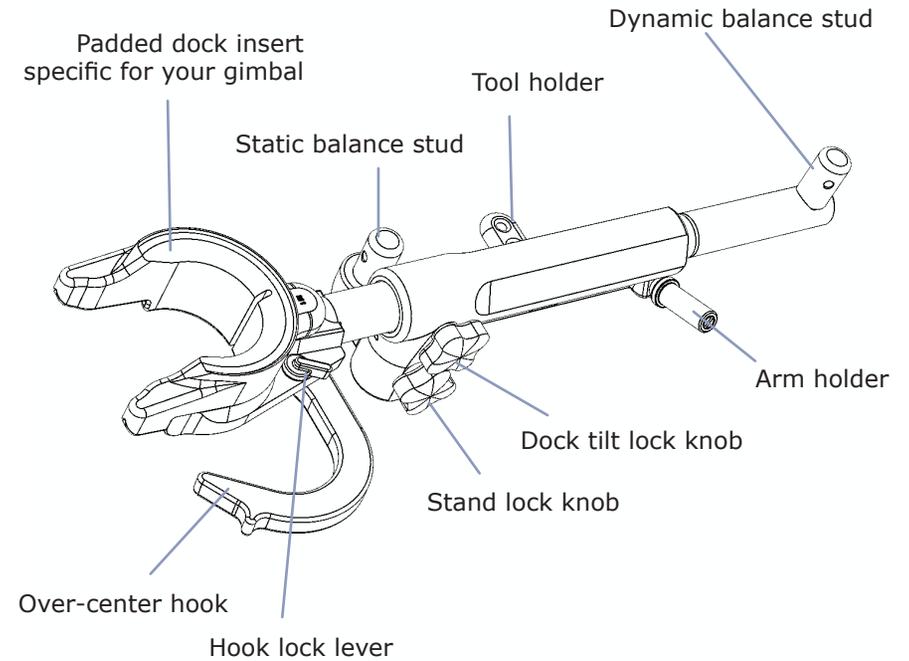


Steadicam® Volt™ Control Box



Note: The Lemo connectors rotate up to 90° in the control box chassis to allow you more options when running cables.

Steadicam® Padded Dock



The new dock

The padded dock is designed to protect the Volt electronics as well as make docking and balancing easier. The low-profile design ensures nothing contacts the Volt gimbal motor assembly when docked, and the "over-center" arm swings into place to secure the sled. Docking on the gimbal also reduces shock loads on your gimbal bearings. You'll note a low, primary balance stud on the side, which is barely higher than your gimbal handle, making it a simple task to lift for balancing regardless of the sled build.

Included with Steadicam® Volt™ for M-1

- Volt Gimbal Motor Assembly (hockey stick) and pulleys
- Volt Control Box (mustache box)
- Pan encoder assembly and pan encoder ring for gimbal
- 12V power cable (817-0131)
- Gimbal cable, short (817-0135)
- Padded Dock (with insert for your gimbal) and case (817-7980)
- Nose box mounting rods
- Spare adhesive tapes for pan encoder ring
- This operation manual (LIT-817001) on USB drive

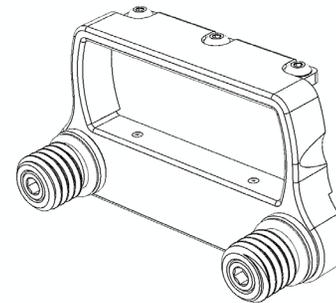
Included with Upgrade Kits for other gimbals

- Volt compatible yoke and mounting kit
- Power cable for your rig
- Blue pin wrench for your gimbal
- Mounting options you selected
- Upgrade kit details start on page 45

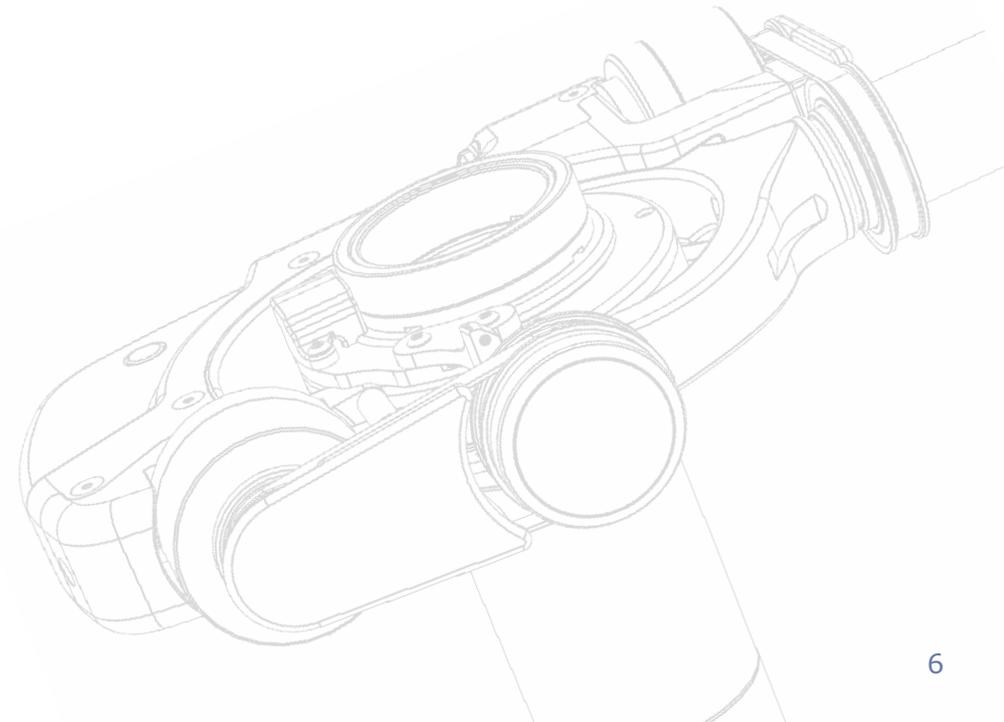
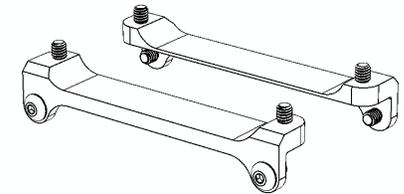
Tools required for installation

- Blue “whale” gimbal tool for your gimbal.
- Imperial Allen key set for install and belt adjustment.
- Flat screwdriver for nose box rods.
- Loctite® 222™ for post top screws and upgrade kits.

Nose box adapter U2, Shadow, Clipper, Archer



MDR-3 adapters PRO or any other MDR setup



Before you begin

The two major components of Steadicam® Volt™, the motor assembly and the control box, contain advanced sensors and electronics.

Each may be mounted left or right, to optimize the controls for your operating, but you must be aware of the differences these choices present for the Volt electronics.

- The control box may be mounted for regular or goofy operators. If your knobs are to the right of the sled (regular operator), you'll align the gimbal handle to the rear of the post on power up. If your knobs are to the left of the sled (goofy operator) you'll align the gimbal handle to the front of the post on power up. See page 11 about powering on.

Right knobs = REAR, Left knobs = FRONT

- Similarly, the Volt motor assembly may be mounted left or right on the gimbal. If you're doing this yourself, be aware that left side is default mode and right side mounting requires pressing the internal "flip" button once to reorient the Volt. See page 39 to learn about the flip button. If the system was installed at your dealer, the flip procedure will have been performed already.
- We strongly encourage professional installation of the Volt components onto your system by an authorized dealer.
- Installation instructions for Volt compatible gimbals, and upgrade kits for other gimbals, are provided later in this manual.
- For more information visit tiffen.com/steadicam/voltssystem/

Neutral balance

In order for the motors to exert maximum balancing assistance to the roll and tilt axes, we balance the sled completely neutral. No drop time at all! This also eliminates any pendulum effect when accelerating or stopping the sled. Static and dynamic balance are now even more critical, so panning the camera will not create diagonal forces and the sled can easily be held at any angle without rotating.



Balance

Balance the sled with a normal to long drop time. BOTH static and dynamic balance are important here. You know how to dynamic balance, right?

NOTE: You may wish to temporarily unplug the gimbal cable while dynamic balancing to allow multiple rotations.



Then, change the balance to be completely neutral top-to-bottom. It should hold any post angle and not rotate.

TIP: For a refresher on dynamic balancing, see Section One of *The Steadicam Operator's Handbook*.



Make sure the sled does not pan when holding a tilt. If so, a tiny adjustment to your side-side balance should correct this.

Otherwise, go back and re-check your dynamic balance.



When changing accessories above the gimbal, like lenses or filters, re-balance on the pin with a normal drop time and then go fully neutral again.



TIP: When you change anything ABOVE the gimbal and re-balance at the top stage, dynamic balance is maintained!

Powering up

Adding the Steadicam® Volt™ to your system requires an extra step when powering up, and when picking up your sled. First, you'll align the pan encoder while powering on, and later you'll run the system when you want the Volt motors active. It'll become second nature, but pay close attention while you're getting started for best results.

Make sure the power switch is in the OFF position and plug in the power cable from your sled to the Volt control box.

NOTE: If you're using an aftermarket power cable, confirm the polarity is correct. Volt is protected against reverse voltage, but won't work very well without power.



Plug in the Volt gimbal cable and wrap a couple of loops around the post as needed to control any slack.

NOTE: The Volt control box will not power up without the gimbal cable properly connected.



Before powering on the system, double check that the PAUSE switch is engaged.

TIP: Consider using the Roll, Damping and Tilt settings shown here as a starting point. More suggestions on page 21.



IF the control box is mounted for regular operators (knobs on the RIGHT) align the gimbal handle with the REAR of the post and simultaneously power on the Volt. Wait 2.5sec while the system registers the pan encoder position.

The blue LEDs glow.

You'll do this EVERY TIME you power on the Volt.



IF the control box is mounted for goofy operators (knobs on the LEFT) align the gimbal handle with the FRONT of the post and simultaneously power on the Volt. Wait 2.5sec while the system registers the pan encoder position.

The blue LEDs glow.

You'll do this EVERY TIME you power on the Volt.

Power on

Pick up the sled on your arm or use the balance pin.

With the post vertical, flip the pause switch to ON and the Volt becomes active.

The green LEDs glow.

You should now feel the horizon assistance and artificial bottom-heaviness of normal mode.



The Volt only needs to have the post encoder aligned when powering on.

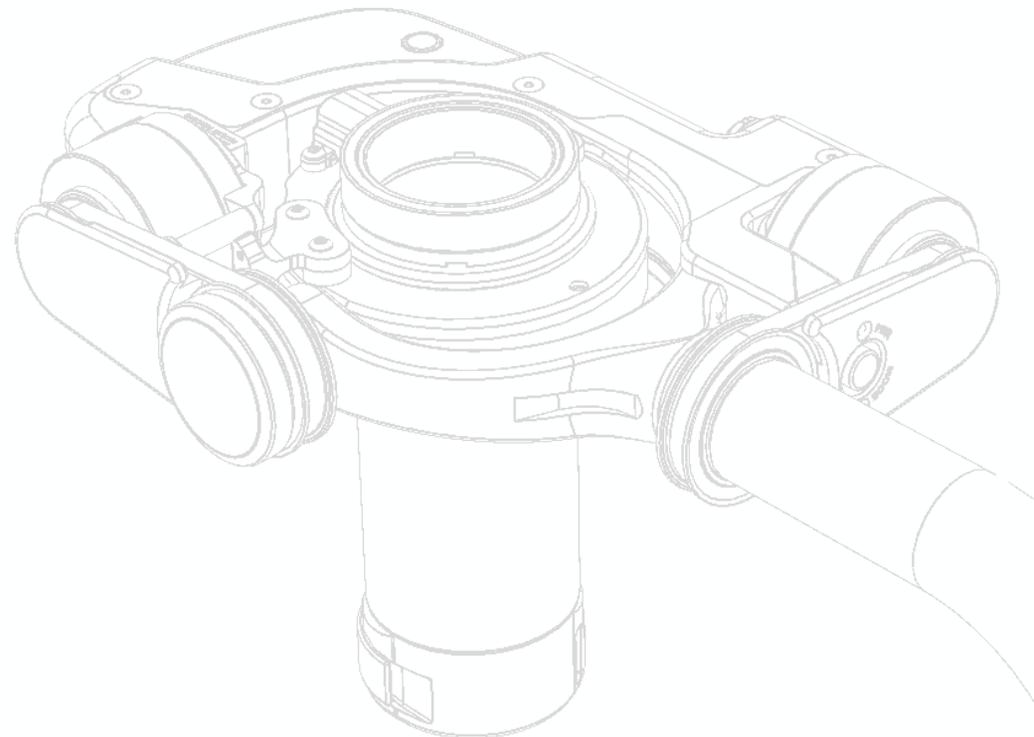
Pausing and activating the Volt can be toggled with the handle in any orientation.

If you do power down, remember to align the handle again when powering back up.



Powering on the system sets the roll and tilt trims to default horizon for a vertical post with level tilt head.

In the next section, we'll explore trimming and modes.



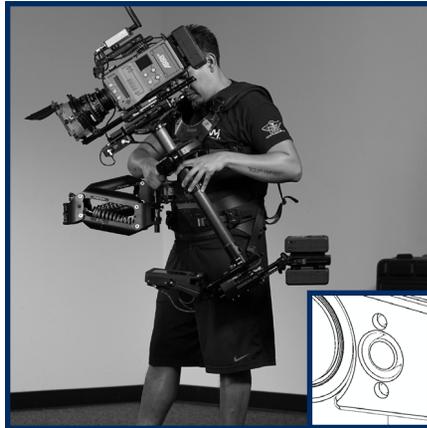
Operating with the Steadicam® Volt™

The best thing about adding this tool to your system is that you're still operating a mechanical stabilizer, and using your skills and years of experience to craft each shot. Here are some tips on how to optimize the Volt, starting with trimming the post angle and the two operating modes. We'll adjust the control box dials later.

To trim, tilt the sled to any angle and SHORT-press the gimbal handle (thumb) button. The new trim angle is set immediately.

In normal mode, the artificial bottom-heaviness will return the sled to THIS angle.

This can be done on the fly, during the shot - a huge advantage to your operating.



DO NOT TRIM with your top stage balance like you used to...

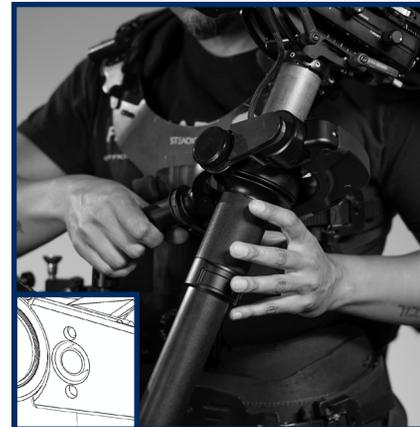
Leave the sled in perfect neutral balance at all times!



The two operating modes are toggled with a LONG press of the gimbal button.

In normal mode, the sled will return to your trimmed tilt angle, simulating a normally balanced Steadicam sled.

Normal mode is always default and displays SOLID green LEDs.



The second mode is called the "Friction mode" and displays PULSING green LEDs.

In friction mode, the sled will remain tilted where the operator places it and require force to change tilt position.

It's like having a fluid head on your Steadicam!



Using your sled's integrated tilt head maintains the vertical post, ideal for panning.

First, pause the system, change the tilt and re-balance the sled.

Then run the Volt and set a new tilt trim by short pressing the gimbal button.

Operating

Should you wish to set the ROLL trim, SHORT-press the trim button on the control box and position the sled to the new level position while the LEDs blink for 5 seconds.

When LED blinking stops, your new horizon position (or Dutch angle!) is now stored in memory.



To reset the roll horizon to default, LONG-press the trim button on the control box for 6 seconds until both LEDs on the control box turn off and pulse back on.

Horizon is now reset.

Any previous TILT trim will be maintained.



Quick low mode is now easier than ever! When flipping, there is no need to re-balance because the sled is neutral.

Simply invert the sled and rotate the monitor for viewability.

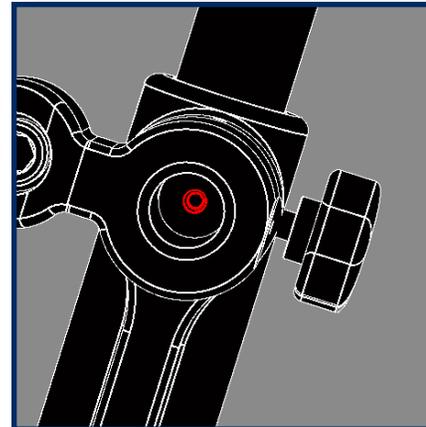
NOTE: If you tilt the head, make sure to set a new trim.



The included padded dock is essential to protect the Volt's motors and electronics. Other methods of docking may damage the unit.

Always use the over-center hook while docked.

TIP: You can remove unnecessary docking rings and gain precious gimbal height!



The dock offers the ability to tilt the gimbal up to 30° while remaining docked and secure.

To enable this feature, remove the set screw from beneath the stand mount with a 1/8" Allen key.

Tilt angle is now secured with the tilt lock knob pictured.



TIP: Instead of using the tilt dock, you can also place the rig on the balance stud and engage the Volt motors.

Setting trim will hold the shot with next to no operating required!

Control box settings

The three dials on the control box allow you to customize the behavior of the Volt in two axes, roll and tilt, independently. Additionally, the damping dial controls how the system returns the sled to vertical. Here are some general guides to all of the control box switches and knobs.

The trim button on the control box has two functions:

- SHORT-press sets ROLL trim to the current post angle.
- LONG-press of 6 seconds reverts roll trim to default.



The pause switch is there to keep the Volt powered on and tracking the encoder and motor positions.

Pausing does NOT require you to align the gimbal handle again, and your previous trim setting will be maintained.

It's great for quickly re-balancing or standing by.



The ROLL dial controls the strength of the motors in the roll axis. This equates to how strongly the rig seeks a level horizon side-to-side.

To help retain subtlety of control, start with low assist levels and add strength as needed for each shot.

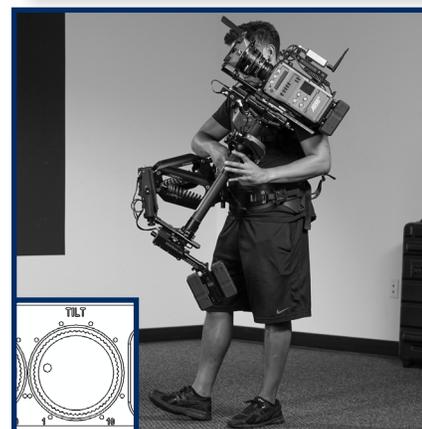
More isn't always better!



Damping works like friction to keep the sled from oscillating.

Set the DAMPING in proportion to your TILT strength, but use as little as possible.

The operator should do most of the damping (like normal operating) rather than letting the electronics do it.



The TILT dial controls the strength of the motors in the tilt axis. This alters the behavior:

In normal mode, more tilt strength equates to stronger artificial bottom-heaviness.

In friction mode, more tilt strength equates to firmer hold at the operator's set post angle, like drag on a fluid head.

Recommended settings

Try these settings for the different situations listed. These recipes are just a starting point; experiment, starting with reduced strength and find exactly what works best for you, for each shot.

ROLL Dampen TILT

TYPICAL MODE
Every day operating, easy tilt.



ROCK AND ROLL
Free to tilt or roll Dutch angles.



GYRO SIMULATOR
Tilt and roll set to 11.



WHIP PANS
Roll/tilt equal, vertical post.



VEHICLE MODE
High roll/tilt resistance.



FRICTION MODE
Fluid head sim, TILT is drag.



SO MANY TILTS
Normal mode, when tilting more than 60° from vertical.



Additional thoughts on settings:

- Use higher motor strength in both axes for heavier rigs and rigs with more inertia, like long mode. Less strength for lighter rigs.
- Full tilt assist is available to 22.5 degrees from vertical, HALF assist at 45 degrees, and ZERO assist beyond 67.5 degrees, allowing extreme tilts and a natural rest position without the motors intervening.
- When using friction mode, increasing the TILT strength enables the sled to “stick” to a tilt angle with more authority. It’s like the drag setting on a fluid head.
- Damping becomes LESS effective with increased motor strength settings. Tune this to taste.
- Share settings with other Volt operators as we all explore the future of Steadicam® operating!
- For more information visit tiffen.com/steadicam/voltssystem/

STANDARDIZM[®]

Installing Steadicam® Volt™ yourself

Professional installation is recommended, but a mechanically inclined, professional Steadicam® Operator such as yourself should be able to install a Volt in roughly an hour. But unlike other “horizon” gadgets, you’ll probably never want to take it off!

The steps involved are:

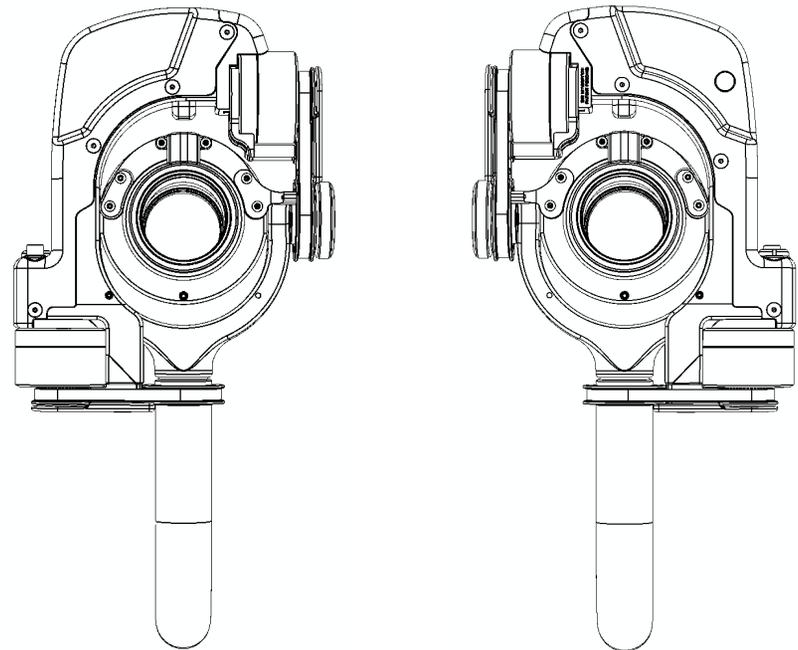
- Before beginning you should decide two details:
 1. Which side of the sled you’ll mount the control box knobs.
 2. Which side you’ll mount the gimbal motors.
- Add the control box to the top stage.
- Upgrade and balance the gimbal if your gimbal is not Volt compatible from the factory. Kits start on page 49.
- Prepare the gimbal for Volt.
- Install the gimbal motor assembly.
- Install power and gimbal cables.
- If mounting the gimbal motors on the RIGHT side of gimbal, press the FLIP button one time while powered on.
- Sit down for a moment to mentally prepare yourself for more creative, accurate and consistent shots!

NOTE: This portion of the manual takes you through a detailed RIGHT-side install on an M-1 gimbal, with special notes for upgraded gimbals and LEFT-side installs. The two sides are essentially mirror images with minor differences.

Because specifications are subject to change, visit tiffen.com/steadicam/voltssystem/ for the latest.

Note about choosing sides

The Volt gimbal motor assembly, casually referred to as the hockey stick, may be mounted to either side of your gimbal yoke. In general, regular operators prefer to mount it to the left and goofy operators mount it to the right. This allows maximum viewability of the monitor and places the gimbal button conveniently near your thumb. However, broadcast users may wish to test fit their zoom controller onto the handle to ensure access to the gimbal button. Also, keep in mind your rest position may need to change if the Volt gimbal motor assembly contacts your shoulder. The choice of side is up to you!



**LEFT side mount
(typically regular)**

**RIGHT side mount
(typically goofy)**

Installing the Control Box

The control box can be mounted to the nose of your sled with the knobs facing either side, to accommodate regular or goofy operators. Mounting to an integrated rod system, like on the M-1 nose, is easy. If you're using rod adapters or MDR plates on other rigs, make sure the control box is affixed rigidly to the sled.

Add the included short rod extensions to the nose box of your M-1 top stage and tighten with a flat head screwdriver.

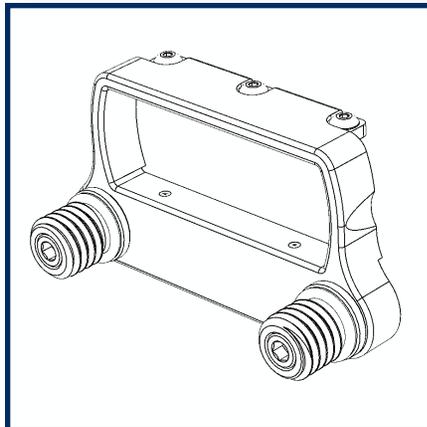
Slide on the control box and secure with the threaded rod caps. Tighten with a flat head screwdriver.



Other Tiffen rigs can utilize the nose box adapter.

Remove the three Allen screws from the top of your nose box, slide the adapter onto the rig and fasten with the included Allen screws.

Snug down the assembly by tightening the two set screws on the bottom.



Ensure the power switch is in the OFF position and connect the short power cable from sled power to the 12V IN port.

NOTE: If you use an aftermarket power cable, confirm the polarity is correct. Volt is protected against reverse voltage, but won't work very well without power.

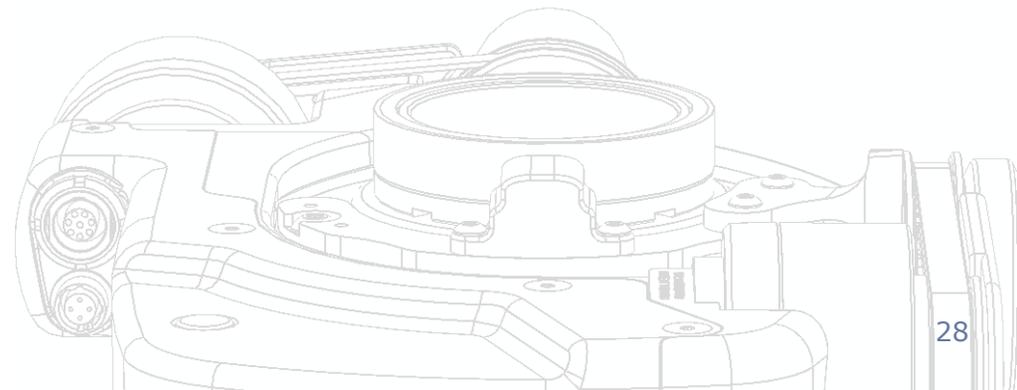


REMEMBER: If your box is mounted with the knobs to the RIGHT (regular), you'll align the gimbal handle to the REAR when powering on later.

However, if your box is mounted with the knobs to the LEFT (goofy), you'll align the gimbal handle to the FRONT when powering on later.

See page 11 about power up.

Now let's get to the gimbal!



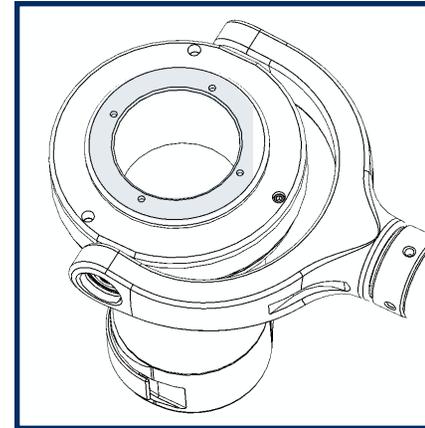
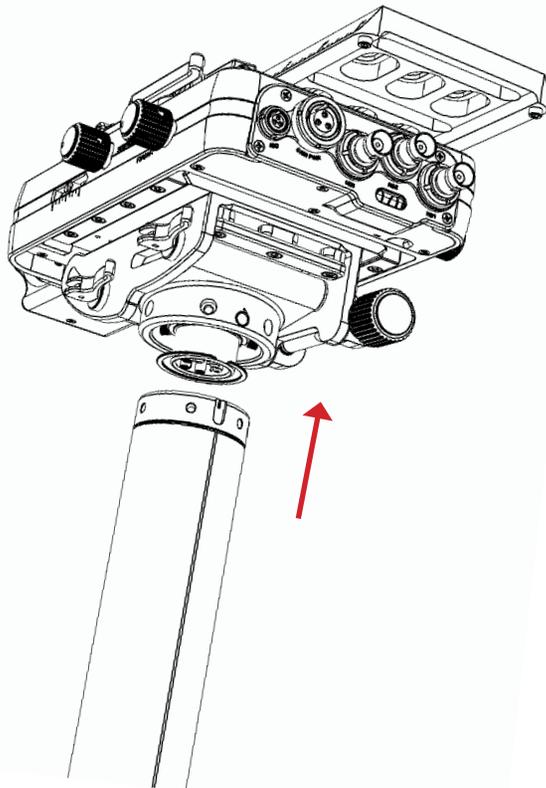
Installing the Steadicam® Volt™

The initial steps for ALL gimbals require you to pull the gimbal from your post, so take particular care if this is the first time you've disassembled the components of the system. The remaining steps can be performed with the gimbal ON or OFF the post, though you may find installing the belts easier with it removed.

If you're upgrading a non-Volt-compatible gimbal, exchange the yoke and balance the gimbal using the notes as shown starting on page 45. Then return to this page to see how the rest goes together.

To install the pan encoder ring onto the gimbal of any rig, you must remove the top stage from the post to gain access to the gimbal.

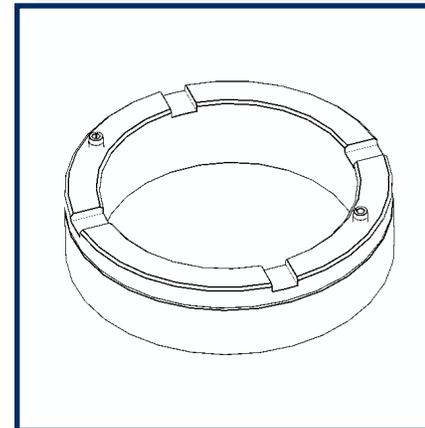
The modular design of the M-1 makes this extremely easy.



Take a moment with your blue whale wrench to make sure the gimbal top cap is tight and everything spins smoothly.

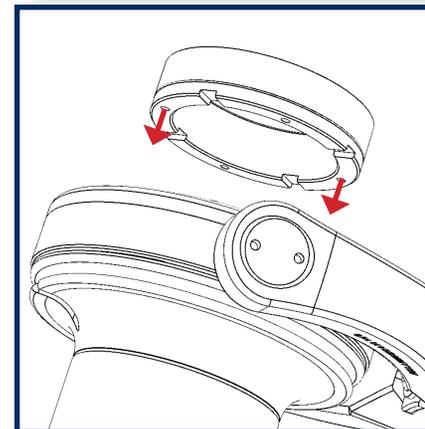
Use alcohol to clean the top cap when you're done.

NOTE: The pan encoder ring will cover the wrench holes. Future gimbal servicing may require removing the encoder.



Peel off the backing from the four adhesive strips on the pan encoder ring.

Careful, this stuff is sticky!



Carefully line up the two pins of the pan encoder ring with either two of the pin-wrench holes and press it onto the gimbal.

Orientation is not important.

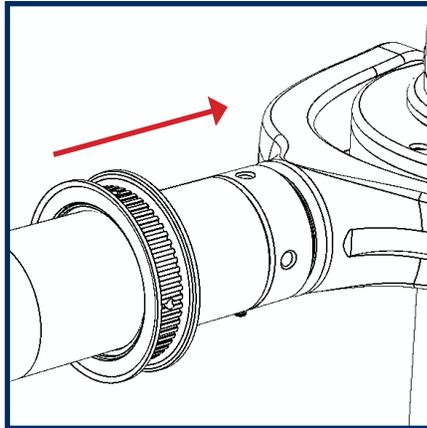
Make sure the ring sits flush and is adhered all the way around.

Installation

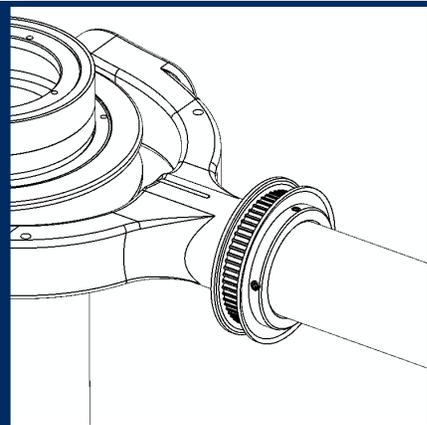
Slide the gimbal handle pulley over the gimbal handle.

Line up the lock screws with the four holes on the knurled blue ring.

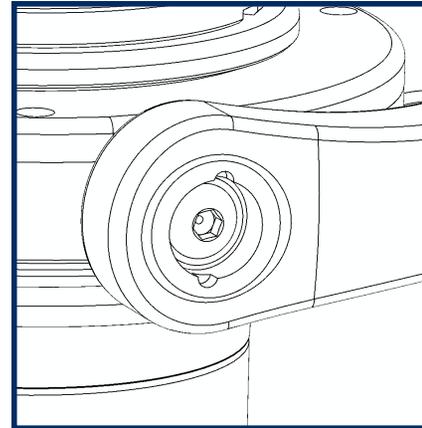
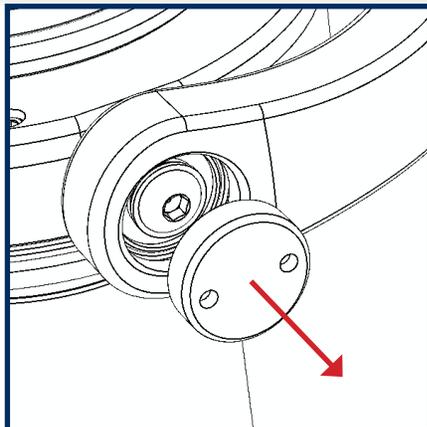
Use a 0.05" Allen key to tighten the four lock screws enough to secure the pulley. Do not over-tighten.



TIP: If you're upgrading a PRO gimbal, it's easier to install the handle pulley during the upgrade process.

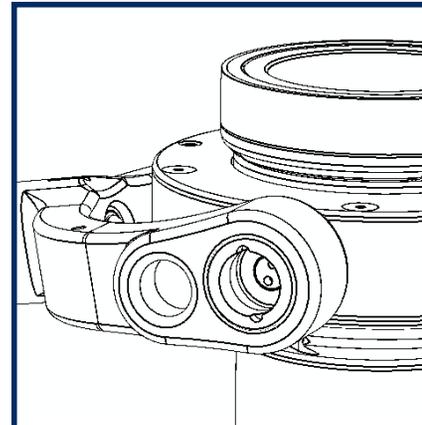


Next, if your gimbal is wearing trunnion covers, remove BOTH of them using the smallest pin set on the blue whale wrench supplied with your sled or gimbal upgrade.



For M-1 gimbals, replace BOTH covers with the supplied threaded cap adapters using the same pins on the blue whale wrench.

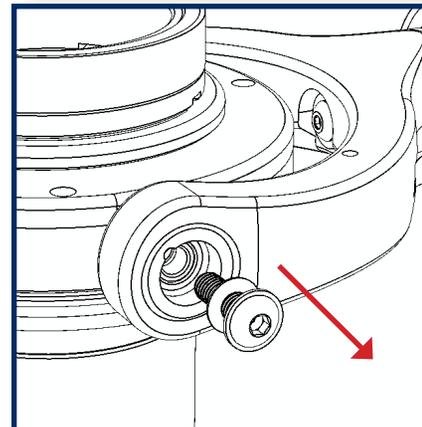
Leave the trunnion screws in place.



For upgraded gimbals, install one thread adapter ONLY on the side of the gimbal where you will mount the motor assembly.

Right side shown here. If mounting Volt on the left, thread the adapter to that side.

Leave the trunnion screws in place.



M-1 gimbals use a 1/8" Allen wrench to remove the small button screw and Belleville washer of the gimbal trunnion from the PULLEY side.

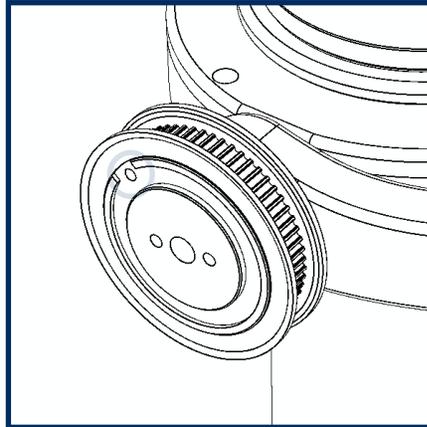
We will be re-using the washer, but set aside the screw.

Right side install shown.

Installation

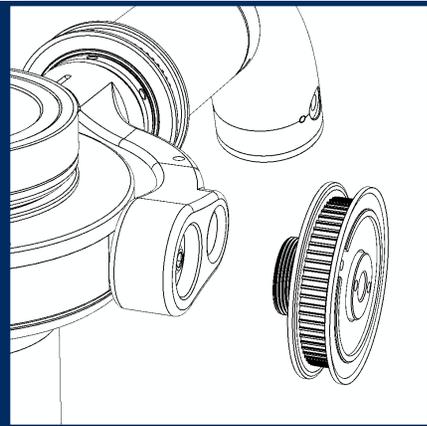
Install the trunnion pulley in place of the M-1 trunnion screw, with the washer behind it. Use the narrow pins on your blue whale wrench to tighten.

NOTE: The pulley should be installed as shown, with the relief around the lock screw hole facing outwards.

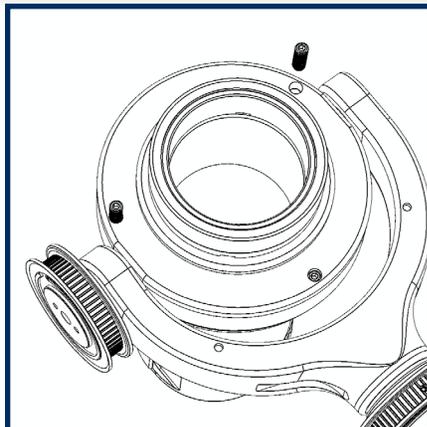


Gimbal upgrades will install the pulley with bearing OVER the trunnion screw.

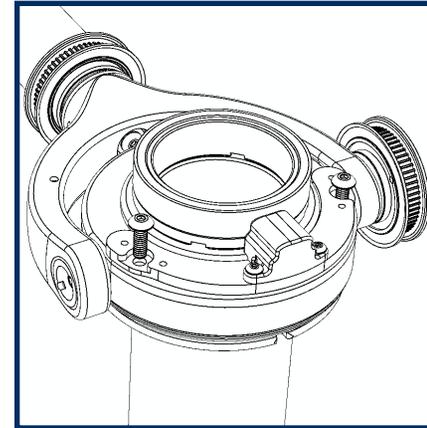
The blue pin wrench is used to secure the pulley.



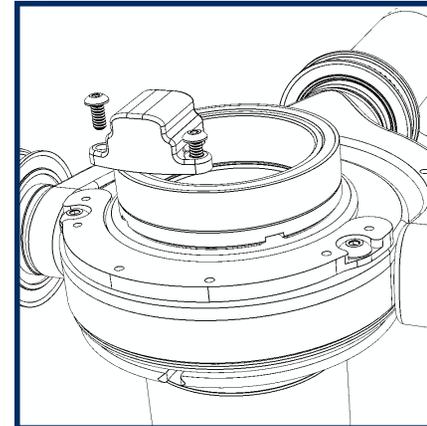
With a 5/64" Allen wrench, remove the place-holding set screws from the two holes opposite the gimbal handle.



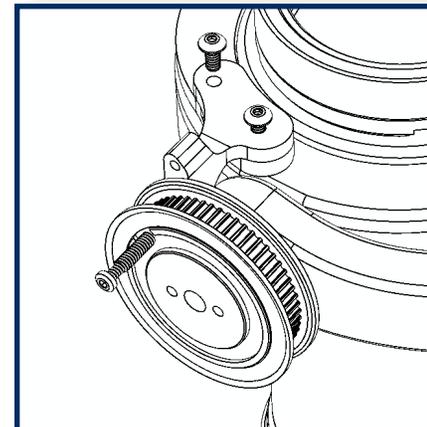
Affix the pan encoder horseshoe to the top of the gimbal, as shown, using a 3/32" Allen wrench to turn the included 1/2" long 8-32 button head screws.



For LEFT side motor installs on any gimbal, remove the encoder from the horseshoe bracket with your 1/16" Allen key, and re-route the cable so it exits opposite the pulley side and re-attach.



Use a 1/16" Allen key to attach the pulley lock bracket to the pulley side of the gimbal with the included SHORT 4-40 screws.



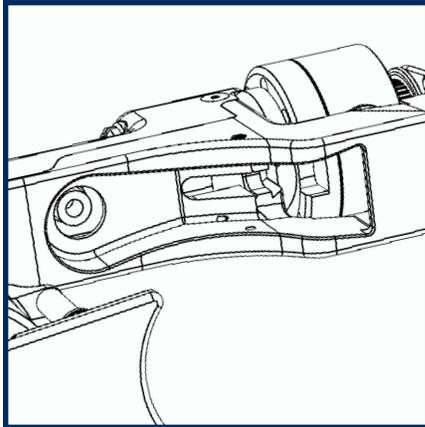
Use the same wrench to lock the pulley in place using the LONG 4-40 screw (part 817-7958) through the lower hole in the lock bracket.

Right side shown.

Installation

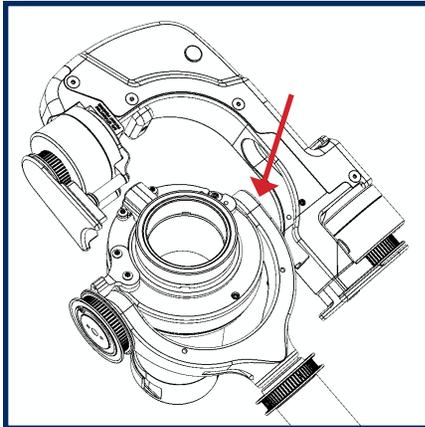
Before mounting the Volt motors, check that the internal wiring is properly routed and the captive trunnion screw is aligned with the housing.

TIP: Use a 1/8" Allen key to wiggle and turn the trunnion screw a few times to ensure it's seated in the Volt housing.



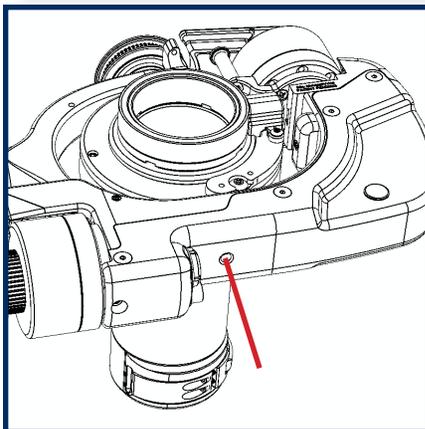
Hold the gimbal handle up slightly to enable proper clearance while installing the Volt.

Align the relief on the inside of the Volt and fit it against the gimbal.



Using the 1/8" Allen key inserted through the hole in the side of the housing, tighten the trunnion screw into the threaded cap adapter.

Take your time to make sure not to cross the fine threads. Fully seat the fastener, but do not over-tighten.

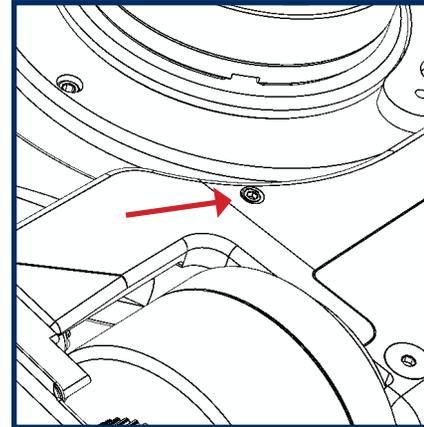


Gimbal Motor Assembly

Snug the opposing pair of set screws on Volt motor assembly with a 1/16" Allen key.

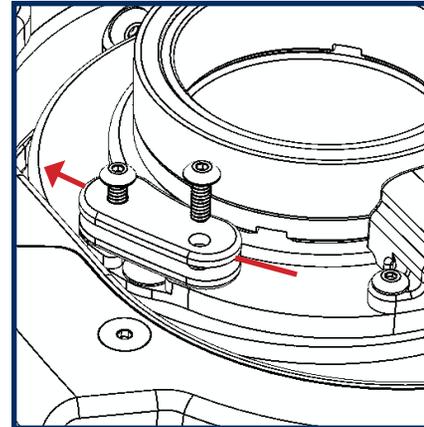
There's one above and one below the yoke. Tighten them each a little until they both contact the yoke.

Do not over-tighten.

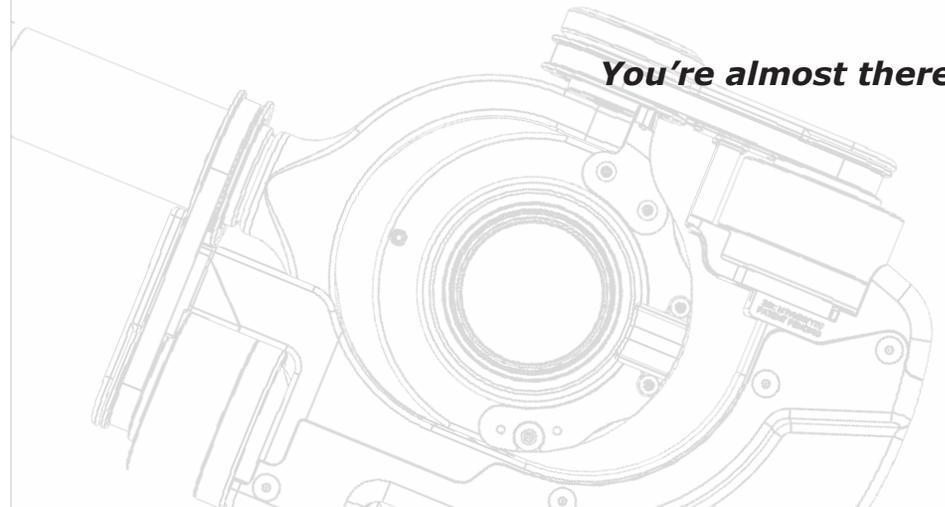


Thread the encoder cable through the guide and attach it to the horseshoe with a 1/16" Allen key and 4-40 screws.

Plug in the Hirose cable.



You're almost there!



Important step for RIGHT mounted Volt

Left side mounting is default to the electronics within the Volt, so if you mount the hockey stick on the right side, you must press the flip button on the internal PC board. It's just a button press, but pay attention here.

If you mounted Volt on the LEFT side of the gimbal, skip this step!

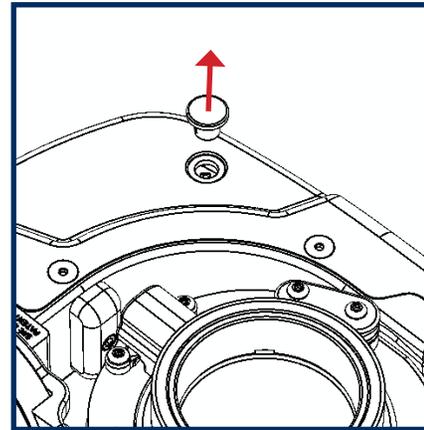
Plug in the 90° end of the gimbal cable to the control box, wrap a loop or two around the post and plug in the Volt.

The LEMO connectors rotate 90° in the control box to allow for convenient cable placement.



Make sure the pause switch is DOWN, indicating the Volt motors will not run.

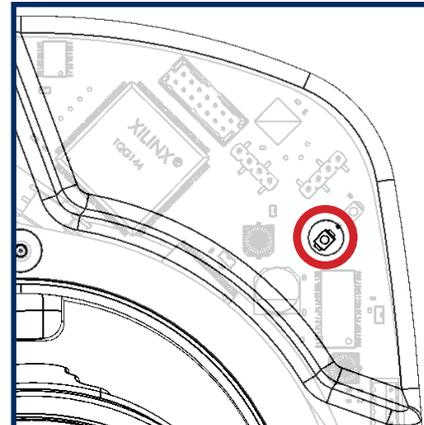
Switch the power ON and the blue LEDs will illuminate.



Pop out the little plastic plug from the cover.

Use a non-metallic object to carefully press and hold the invert button for 3 seconds. All LEDs will pulse off to indicate the mode change.

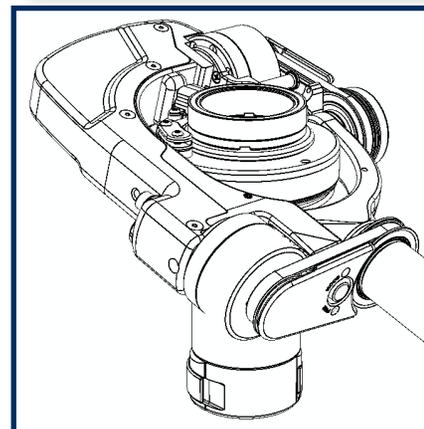
Power off the unit and you're done flipping.



Only press it once!

Each consecutive 3-second press will toggle LEFT/RIGHT side operation.

Replace the plastic cover.



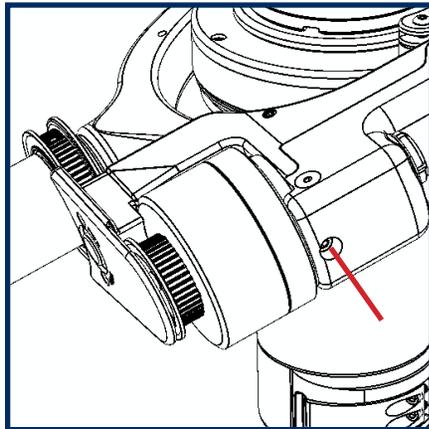
NOTE: If you flip your Volt to LEFT side mounting in the future, you'll have to repeat the invert button process.

Adding the belts

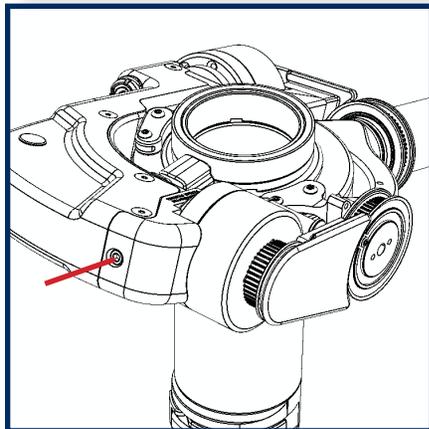
The two belts transfer power from the Volt motors to the gimbal yoke and gimbal handle. The belts will never stretch and should not need replacement with normal use. Installing them will take finding the right belt angle and rotation of the pulleys, but they are self-aligning once in place. Let's put on our belts!

NOTE: Right side build shown here; left side is a mirror image.

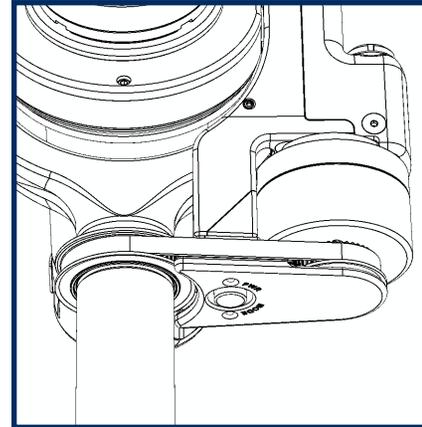
First, move the handle motor as close as possible to the gimbal handle by turning the belt tension screw counter-clockwise with a 7/64" Allen key.



With the same Allen key, turn the trunnion motor belt tension screw counter-clockwise, to slide that motor toward the gimbal.



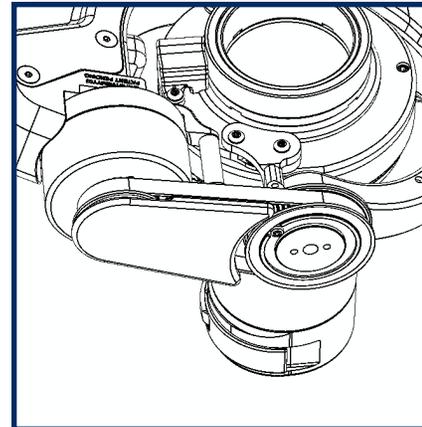
TIP: If you're installing belts with the gimbal ON the rig, stand your sled on a table so the gimbal handle is free to move during belt install.



Place one of the belts (they're identical) over the handle pulley and over the top of the motor pulley.

Rotate the handle and use your fingers to walk the belt over the sidewall of the pulley.

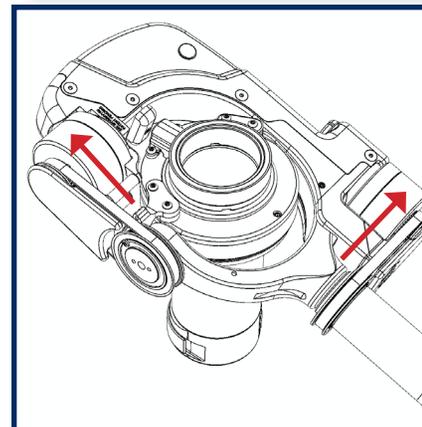
Be careful not to get pinched!



Place the other belt over the trunnion motor pulley and over the top of the trunnion pulley.

Use your fingers to walk the belt over the sidewall of the trunnion pulley.

TIP: If the belt is stubborn, try lifting the gimbal handle while installing the belt to help walk it onto the pulley



Slowly adjust each belt tension, a little at a time, so the Volt is loaded evenly.

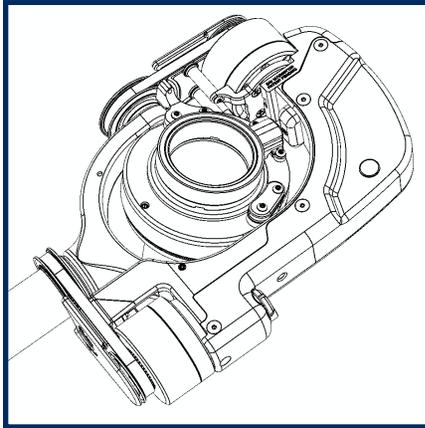
Adjust BOTH belt tensions by turning each tension screw clockwise with the 7/64" Allen key.

Installation

The belts should not have any slack, but not be so tight as to create friction.

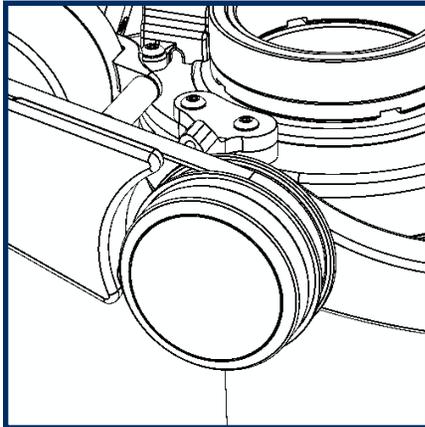
Slowly adjust, test and repeat.

TIP: You may wish to adjust the tension again with Volt powered on to check its behavior.



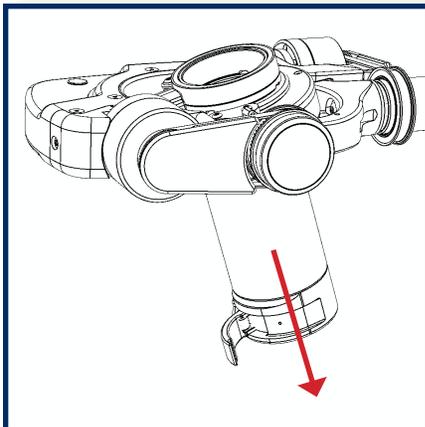
The finishing touch is to spin the trunnion weight into the 1/4-20" threads of the trunnion pulley.

Just make sure it's on tight, no need to over-torque it.



If you haven't yet, reinstall the gimbal onto the sled.

With the gimbal lock open, slide the gimbal back onto the post and re-assemble the top stage.



Motor belts

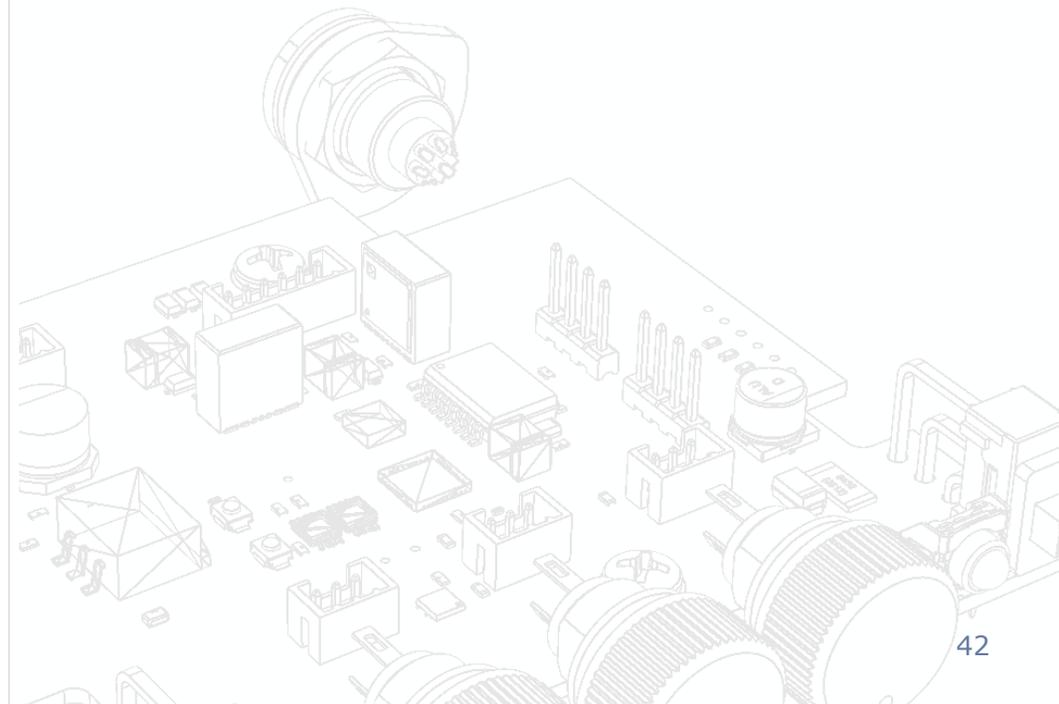
Plug in the 90° end of the gimbal cable to the control box, wrap a loop or two around the post and plug in the Volt.

The LEMO connectors rotate 90° in the control box to allow for convenient cable placement.

TIP: Depending on your normal builds, you may prefer the optional "long" gimbal cable.



Your Volt equipped sled should now be ready for action! Flip back to page 7, and get ready to balance before powering on.

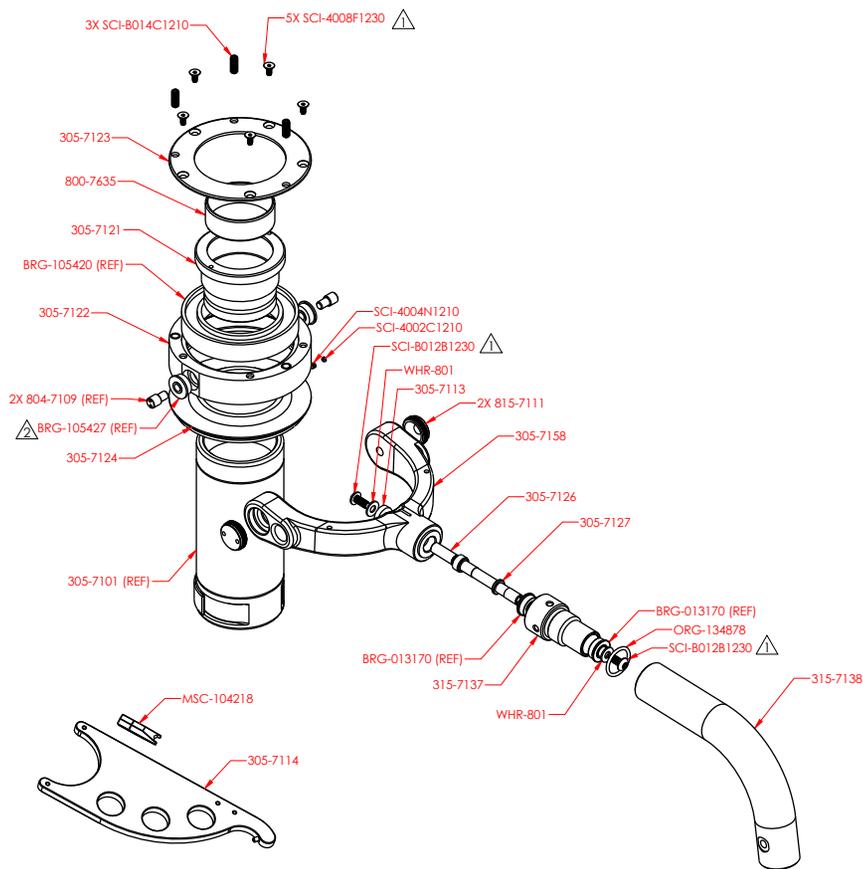


STANDARDIZM[®]

Gimbal upgrade

It's recommended you have an experienced Steadicam technician do the service for you, but upgrading an Archer or Archer2 gimbal is a fairly straightforward procedure. Here are the assembly notes used by the factory for reference.

Visit tiffen.com/steadicam/voltssystem/ for more information.



⚠ REBALANCE GIMBAL AND APPLY LOCTITE 222 AT TIME OF BALANCING.
 ⚠ APPLY LOCTITE 222.

ASSEMBLY PROCEDURE

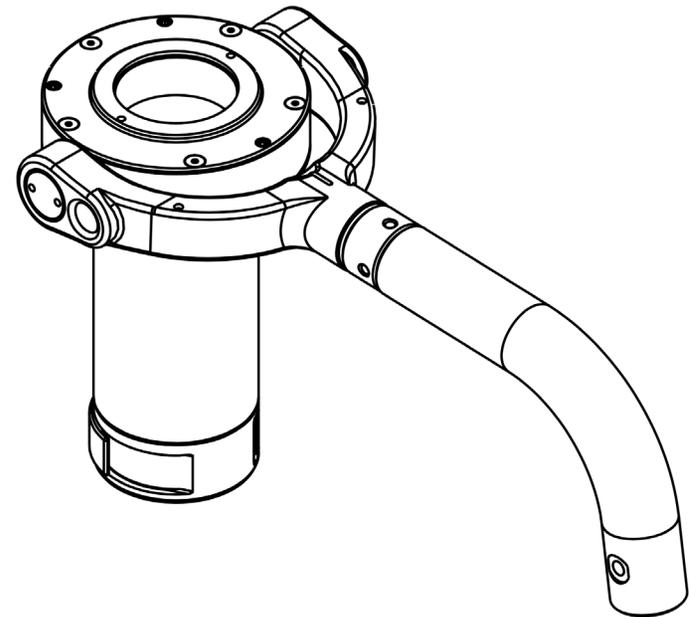
- 1.** REMOVE GIMBAL FROM SLED AND DIS-ASSEMBLE ALL PARTS FROM TOP BEARING PORTION OF GIMBAL. BE CAREFUL TO NOT DAMAGE ANY PARTS AS SOME WILL BE RE-USED UPON RE-ASSEMBLY.
- 2.** PERFORM BEARING CLEANING OR RE-LUBRICATION IF REQUIRED.
- 3.** PRESS BRG-105420 INTO 305-7122 OUTER RING, CAREFULLY AND EVENLY ONLY ON THE OUTER RACE OF THE BEARING UNTIL IT IS FULLY SEATED.
- 4.** PRESS BOTH BRG-105427 BEARINGS INTO 305-7122 OUTER RING CAREFULLY AND EVENLY ONLY ON THE OUTER RACE OF THE BEARING UNTIL THEY ARE FULLY SEATED.
- 5.** INSTALL 305-7124 ONTO 305-7101, AND ALIGN SCREW CLEARANCE SLOT WITH SCREW HOLES IN 305-7101.
- 6.** INSTALL AND TIGHTEN SCI-4004N1210 INTO 305-7124 AND THEN INSTALL AND TIGHTEN SCI-4002C1210 INTO SAME HOLE AND TIGHTEN.
- 7.** THREAD 305-7121 INTO 305-7101 AND FULLY TIGHTEN WITH 305-7114 WRENCH.
- 8.** INSTALL 800-7635 INTO 305-7121.
- 9.** INSTALL 305-7123 ONTO 305-7122 USING 3X SCI-4008F1230 SCREWS AND LOCTITE 222. NOTE ORIENTATION OF RING WITH RESPECT TO 305-7122.
- 10.** IF GIMBAL IS NOT BEING OUTFITTED WITH A VOLT SYSTEM AT THIS TIME, INSTALL 3X SCI-B014C1210 INTO THE THREADED HOLES IN 305-7122. OMIT IF A VOLT SYSTEM IS TO BE INSTALLED.
- 11.** NOTE SOME NEWER ARCHER 2 ASSEMBLIES ALREADY FITTED WITH 315-7137 AND ASSOCIATED PARTS. IN THIS CASE, ASSEMBLY OF 305-7158 YOKE AND ASSOCIATED PARTS ARE ONLY REQUIRED.
- 12.** IF AN OLDER ARCHER GIMBAL IS TO BE MODIFIED, ASSEMBLE ALL HANDLE COMPONENTS TOGETHER AS SHOWN NOTING THE USE OF LOCTITE 222 WHERE REQUIRED.
- 13.** INSTALL COMPLETED YOKE ASSEMBLY ONTO 305-7122 USING 2X 804-7109 ADJUSTMENT C SCREWS AND BALANCE GIMBAL AS REQUIRED USING BALANCE PROCEDURE AND MSC-104218 SPANNER SCREWDRIVER BIT.
- 14.** COMPLETE ASSEMBLY BY INSTALLING 2X 815-7111 CAPS. OMIT IF A VOLT SYSTEM IS TO BE INSTALLED.

Perform the balancing procedure found on the next page prior to Volt installation.

Gimbal Balancing Procedures for: Archer 2 Series 305-7120-XX

- 1.** Mount simulated camera weight (maximum payload capacity of sled recommended) onto sled and place onto appropriate balance spud.
- 2.** Fine tune fore-aft and left-right balance by adjusting fore/aft and side/side adjustment knobs on stage. Verify balance using a bubble level attached atop the stage on a flat surface.
- 3.** Balance sled with an approximate 3 second drop time by fine tuning vertical position of gimbal.
- 4.** With the front of the sled facing left, and the stage perpendicular to the curved gimbal handle, raise the sled to the right to a horizontal position and release until it swings back to a vertical position.
- 5.** Unit should always return to the established vertical position. If it does not, fine-tune the adjustment pin screws (part# 804-7109) using included #6, 0.125" spacing spanner screwdriver and repeat the previous step.
- 6.** To adjust pin screws remove bearing caps (815-7111) to access pin screws
- 7.** Gimbal ring (305-7122) to yoke (305-7158) clearance should have zero end play but swing free, this is adjusted by turning pin screws.
- 8.** The adjustment pin screws should have some resistance when turning.
- 9.** If the unit is leaning to the left of vertical: turn the right adjustment screw counter-clockwise and the left adjustment screw clockwise in equal increments. If leaning right of vertical, reverse this procedure.
- Warning:** turn these screws in small increments (1/16 of turn) as it will have a magnified affect when drop time is set at 3 seconds or more.
- 10.** Repeat drop test again. If unit does not repeat check to make sure all clamps, plates, camera and whatever else might shift or become loose is stable and not shifting the balance point.
- 11.** Re-install bearing cap covers, if not installing Volt.

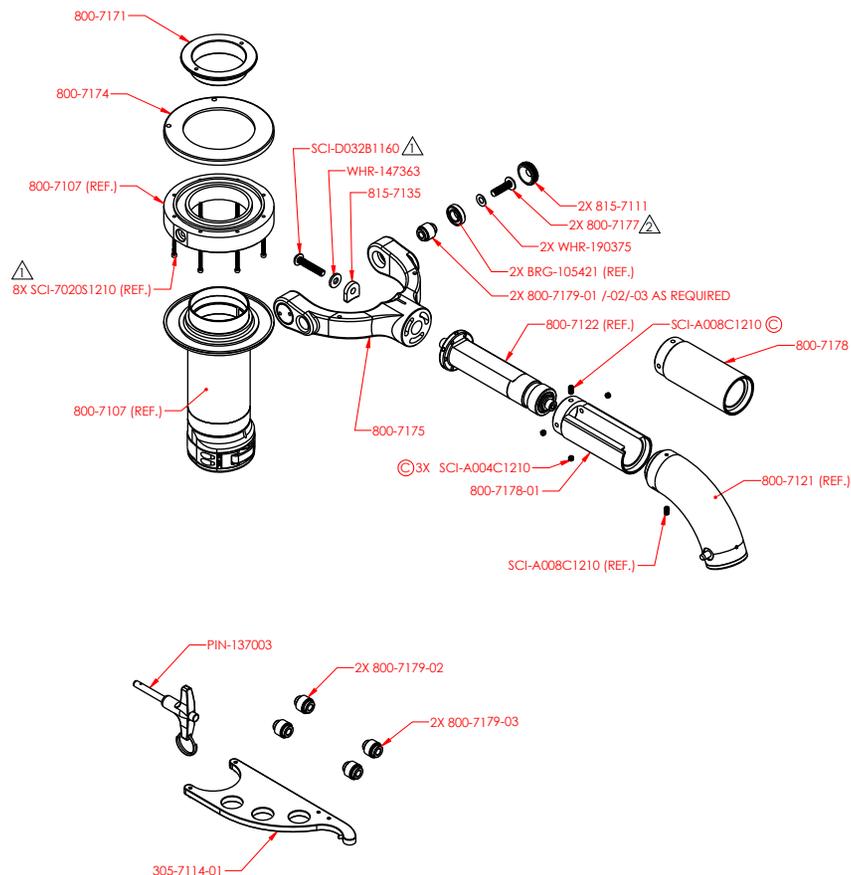
ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	305-7113	WASHER, GIMBAL STOP	1
2	305-7114	ASSY, GIMBAL TOOL	1
3	305-7121	INNER RACE TUBE,	1
4	305-7122	OUTER RING, GIMBAL, ARCHER2	1
5	305-7123	FLANGE, GIMBAL	1
6	305-7124	FLANGE, GIMBAL,	1
7	305-7126	PIVOT SHAFT, GIMBAL	1
8	305-7127	WASHER, GIMBAL	1
9	305-7158	YOKE, VOLT	1
10	315-7137	HANDLE, QUICK RELEASE	1
11	315-7138	HANDLE, GIMBAL	1
12	800-7635	BRAKE, .055" WALL, .560" TK	1
13	815-7111	CAP, YOKE, GIMBAL	2
14	INT-128175	HELICAL INSERT 8-32 X .164 LG	3
15	MSC-104218	DRILL SPANNER BIT, #6	1
16	ORG-134878	O-RING, 1/16 X 5/8 X 3/4	1
17	SCI-4002C1210	SCW, 4-40 X 1/16, SET_C HEX	1
18	SCI-4004N1210	4-40 X 1/8 SET_C HEX	1
19	SCI-4008F1230	SCW, 4-40 X 1/4 F82° HEX	5
20	SCI-B012B1230	SCW, 8-32 x 3/8 BUT HEX 18-8 SS BLK TEFLON	2
21	SCI-B014C1210	SCW, 8-32 X 7/16 SET CUP SS	3
22	WHR-801	#8 WASHER, SS	2



Gimbal upgrade

It's recommended you have an experienced Steadicam technician do the service for you, but upgrading an Ultra2 or Shadow gimbal is a fairly straightforward procedure.. Here are the assembly notes used by the factory for your reference.

Visit tiffen.com/steadicam/voltssystem/ for more information.



△ RE-BALANCE GIMBAL AND APPLY LOCTITE 222 AT TIME OF BALANCING.

△ APPLY LOCTITE 222.

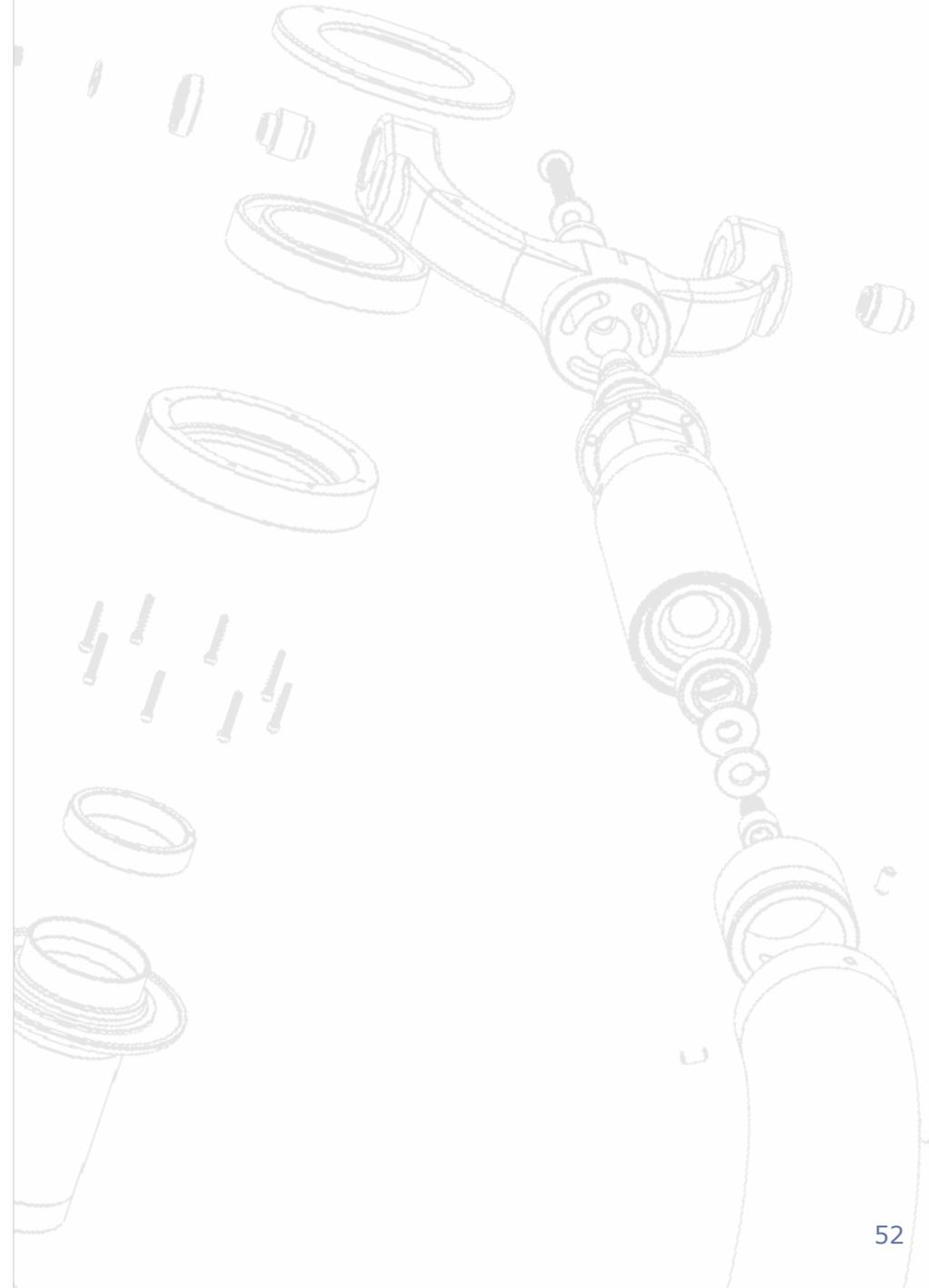
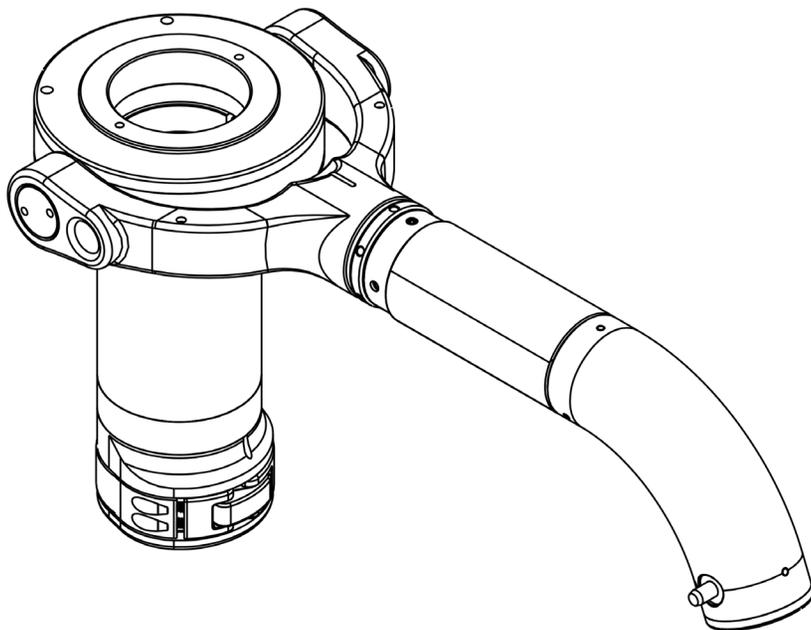
NOTES: UNLESS OTHERWISE SPECIFIED

ASSEMBLY PROCEDURE

1. REMOVE GIMBAL FROM SLED AND DIS-ASSEMBLE MAIN BEARING HOUSING FROM GIMBAL HANDLE. BE CAREFUL TO NOT DAMAGE ANY PARTS AS SOME WILL BE RE-USED UPON RE-ASSEMBLY.
2. PERFORM BEARING CLEANING OR RE-LUBRICATION IF REQUIRED.
3. INSTALL 800-7174 USING 8X SCI-7020S1210 SCREWS AND 222 LOCTITE. NOTE ORIENTATION OF BEARING CLAMP.
4. THREAD 800-7171 INTO 811-7107 AND FULLY TIGHTEN WITH 305-7114-01 WRENCH.
5. DISASSEMBLE YOKE COMPONENTS AND THEN RE-ASSEMBLE USING NEW 800-7175 YOKE AS SHOWN NOTING THE USE OF LOCTITE 222 WHERE REQUIRED.
6. REMOVE 800-7121 SUB ASSEMBLY FROM 800-7122 BY FIRST LOOSENING SCREW SCI-A008C1210.
7. INSTALL 800-7178 OR 800-7178-01 AS REQUIRED AND RE-ASSEMBLE 800-7121. NOTE THAT 800-7178-01 WILL BE USED FOR SLEDS WITH A GIMBAL STAGE REMOTE AND 800-7178 FOR THOSE SLEDS WITHOUT.
8. INSTALL COMPLETED YOKE ASSEMBLY ONTO 800-7107 USING INITIALLY 2 X 800-7179-01 PARTS ON EITHER SIDE OF YOKE.
9. BALANCE GIMBAL AS REQUIRED USING BALANCE PROCEDURE. NOTE THAT PIN- 137003 IS USED TO INSTALL AND REMOVE 800-7179-XX PARTS.
10. COMPLETE ASSEMBLY BY INSTALLING 2X 815-7111 CAPS. OMIT IF A VOLT SYSTEM IS TO BE INSTALLED.

Perform the balancing procedure found on page 57 prior to Volt installation.

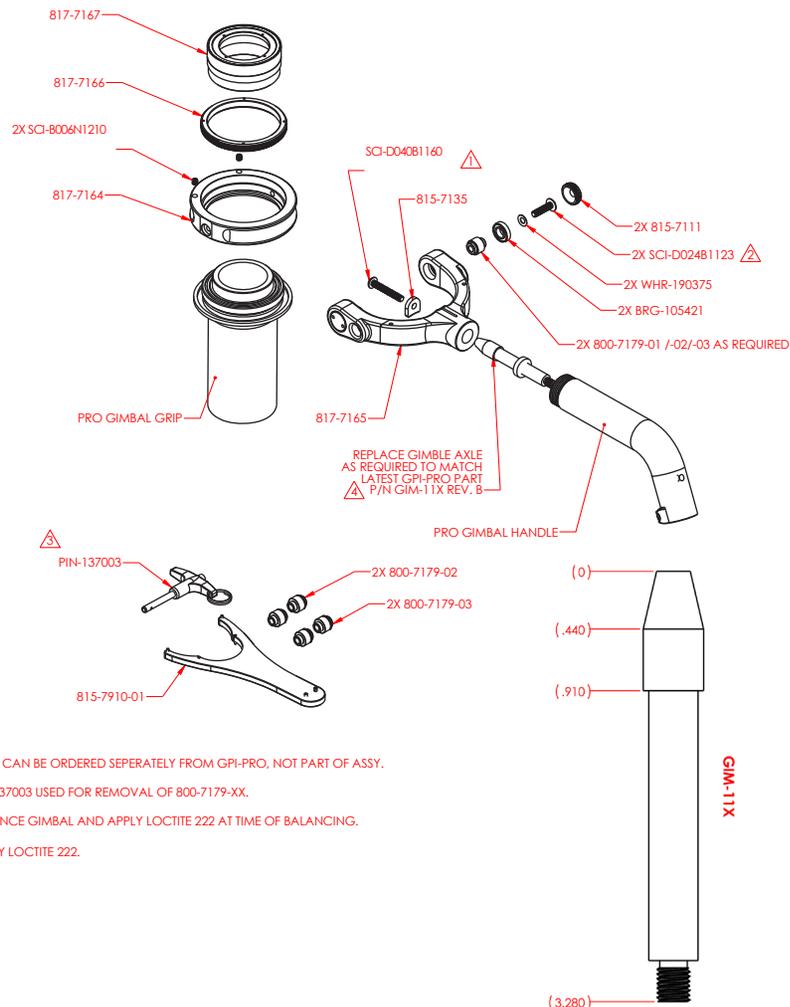
ITEM NO.	PART NUMBER	DESCRIPTION	800-7100-06 QTY.
1	305-7114-01	ASSY, GIMBAL TOOL	1
2	800-7171	BEARING CLAMP	1
3	800-7174	BEARING CLAMP CAP	1
4	800-7175	YOKE, VOLT	1
5	800-7177	LOCK SCREW	2
6	800-7178	HANDLE GRIP	1
7	800-7178-01	HANDLE GRIP	1
8	800-7179-01	TRUNION, GIMBAL, .0000	2
9	800-7179-02	TRUNION, GIMBAL, -.0010"	2
10	800-7179-03	TRUNION, GIMBAL, +.0010"	2
11	815-7111	CAP, YOKE, GIMBAL	2
12	815-7135	WASHER, GIMBAL STOP	1
13	PIN-137003	PIN, QUICK RELEASE, 3/16"	1
15	SCI-A004C1210	SCW, 6-32 x 1/8 SET_C HEX	3
16	SCI-A008C1210	SCW, 6-32 x 1/4 SET_C HEX	1
17	SCI-D032B1160	SCW, 10-32 x 1 BUT HEX	1
18	WHR-147363	WASHER, #8, .19ID .44OD .04-.07 THK. SS	1
19	WHR-190375	WASHER, .190" X .375" X .027" BELLEVILLE	2



Gimbal upgrade

It's recommended you have an experienced Steadicam technician do the service for you, but upgrading a PRO gimbal is a fairly straightforward procedure. Here are the assembly notes used by the factory for your reference.

Visit tiffen.com/steadicam/voltssystem/ for more information.



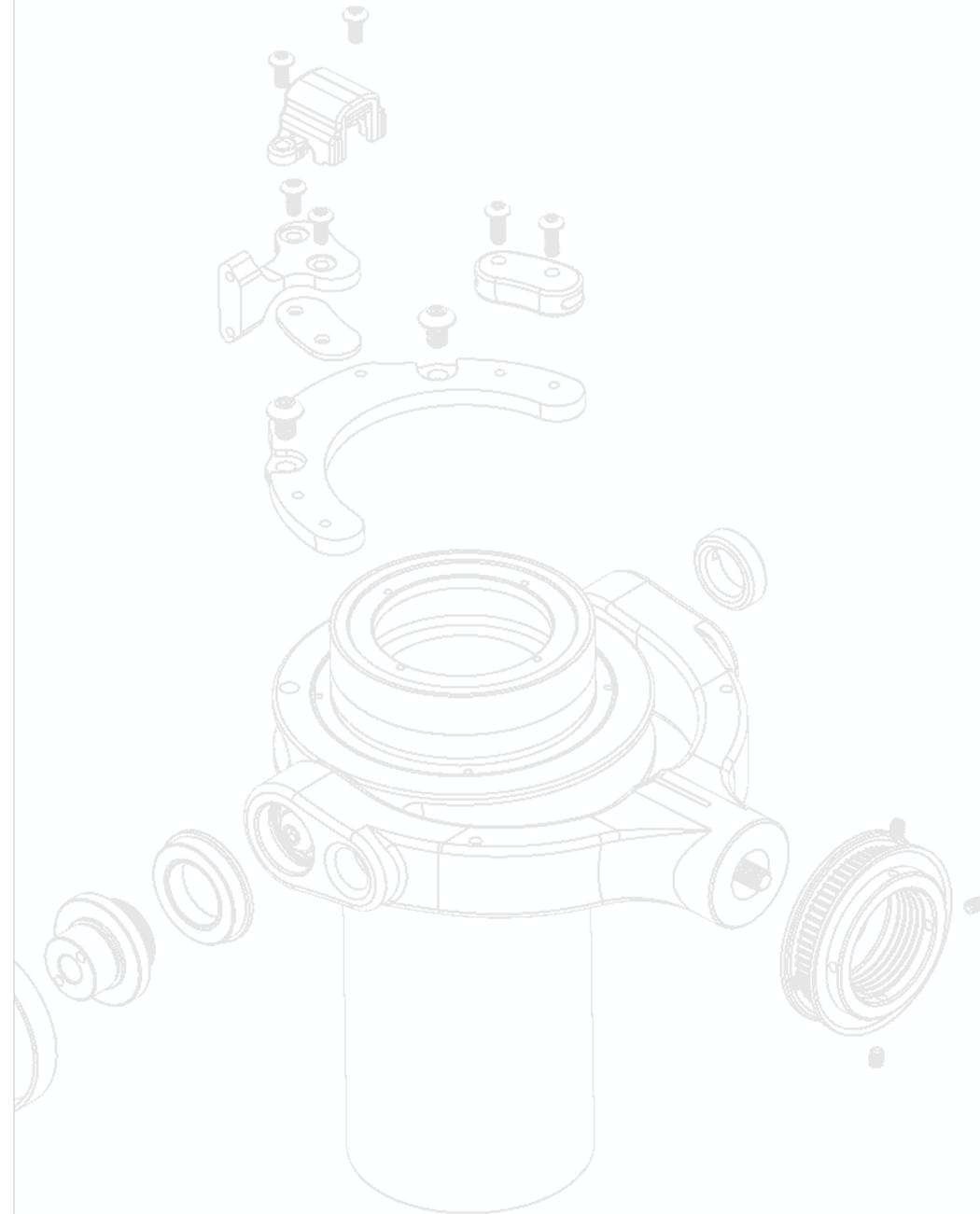
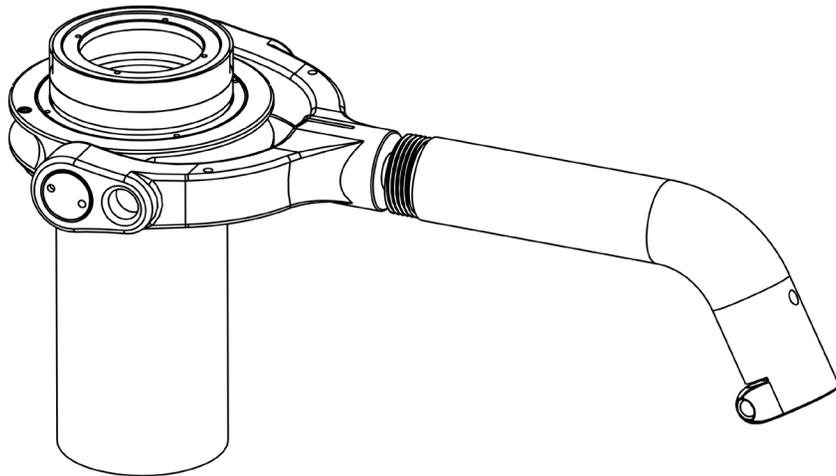
- ⚠ PART CAN BE ORDERED SEPERATELY FROM GPI-PRO, NOT PART OF ASSY.
- ⚠ PIN-137003 USED FOR REMOVAL OF 800-7179-XX.
- ⚠ BALANCE GIMBAL AND APPLY LOCTITE 222 AT TIME OF BALANCING.
- ⚠ APPLY LOCTITE 222.

ASSEMBLY PROCEDURE

- 1.** REMOVE PRO GIMBAL FROM SLED AND DIS-ASSEMBLE ALL PARTS FROM TOP BEARING PORTION OF GIMBAL. BE CAREFUL TO NOT DAMAGE ANY PARTS AS SOME WILL BE RE-USED UPON RE-ASSEMBLY.
- 2.** PRESS PRO BEARING INTO 817-7164 GIMBAL RING CAREFULLY AND EVENLY ONLY ON THE OUTER RACE OF THE BEARING UNTIL IT IS FULLY SEATED. IF ANY CLEANING OR RE-LUBRICATION OF A USED BEARING IS REQUIRED, DO IT BEFORE INSTALLATION.
- 3.** INSTALL 817-7166 BEARING CAP AND THREAD ON 817-7167 ENCODER ASSY SECURELY USING 815-7910-01 SPANNER TOOL.
- 4.** IF GIMBAL IS NOT BE OUTFITTED WITH A VOLT SYSTEM AT THIS TIME, INSTALL E 2X SCI-B006N1210 INTO THE THREADED HOLES IN 817-7164. OMIT IF A VOLT SYSTEM IS TO BE INSTALLED.
- 5.** DISASSEMBLE PRO YOKE COMPONENTS AND THEN RE-ASSEMBLE USING NEW 817-7165 YOKE AS SHOWN NOTING THE USE OF LOCTITE 222 WHERE REQUIRED. NOTE THAT THE USE OF LATEST PRO GIMBAL AXEL (P/N GIM-11X) IS REQUIRED AND IS NOT INCLUDED WITH THE GIMBAL UPGRADE KIT. IMAGE OF THE CORRECT AXEL IS SHOWN BELOW FOR COMPARISON.
- 6.** IF VOLT IS TO BE INSTALLED AT THIS POINT, FIRST INSTALL 305-7175 PULLEY (NOT SHOWN) ONTO THE PRO GIMBAL HANDLE BEFORE INSTALLING THE HANDLE ONTO THE YOKE.
- 7.** INSTALL COMPLETED YOKE ASSEMBLY ONTO 817-7164 USING INITIALLY 2 X 800- D 7179-01 PARTS ON EITHER SIDE OF YOKE.
- 8.** BALANCE GIMBAL AS REQUIRED USING BALANCE PROCEDURE. NOTE THAT PIN-137003 IS USED TO INSTALL AND REMOVE 800-7179-XX PARTS.
- 9.** COMPLETE ASSEMBLY BY INSTALLING 2X 815-7111 CAPS. OMIT IF A VOLT SYSTEM IS TO BE INSTALLED.

Perform the balancing procedure found on page 57 prior to Volt installation.

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	800-7179-01	TRUNION, GIMBAL, .0000	2
2	800-7179-02	TRUNION, GIMBAL, -.0010"	2
3	800-7179-03	TRUNION, GIMBAL, +.0010"	2
4	815-7111	CAP, YOKE, GIMBAL	2
5	815-7135	WASHER, GIMBAL STOP	1
6	815-7910-01	SPANNER, PRO	1
7	817-7164	GIMBAL RING	1
8	817-7165	YOKE, VOLT	1
9	817-7166	CAP, OUTER RING, GIMBAL	1
10	817-7167	ASSY, ENCODER	1
11	BRG-105421	BEARING, 8mm x 4mm THK.	2
12	PIN-137003	PIN, QUICK RELEASE, 3/16"	1
13	SCI-B006N1210	SCW, 8-32 x 3/16 SET_C HEX	2
14	SCI-D024B1123	SCW, 10-32 x 3/4 BUT HEX	2
15	SCI-D040B1160	SCW, 10-32 x 1-1/4 BUT HEX	1
16	WHR-190375	WASHER, .190" X .375" X .027" BELLEVILLE	2

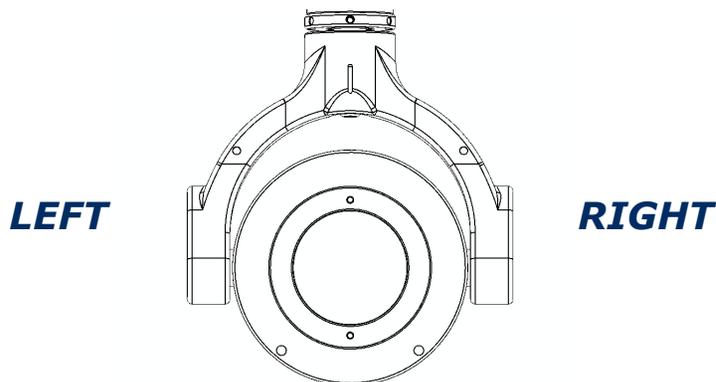


BALANCE PROCEDURE

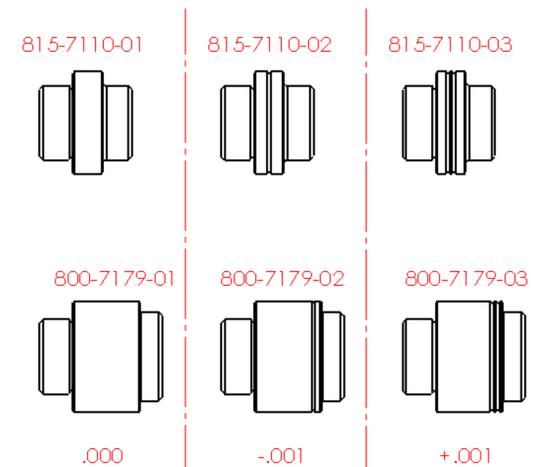
1. Mount simulated camera weight (maximum payload capacity of sled recommended) onto sled and place onto appropriate balance spud.
2. Fine tune fore-aft and left-right balance by adjusting fore/aft and side/side adjustment knobs on stage. Verify balance using a bubble level attached atop the stage on a flat surface.
3. Balance sled with an approximate 3-4 second drop time by fine tuning vertical position of gimbal.
4. With the front of the sled facing left, and the stage perpendicular to the curved gimbal handle, raise the sled to the right to a horizontal position and release until it swings back to a vertical position.
5. The sled should always return to the established vertical position as noted by the bubble level. If it does not, fine-tuning of the gimbal spacers 800-7179-XX or 815-7110-XX on either side of the yoke will be required as noted in the next steps to shift the gimbal center with respect to the yoke to help achieve balance.

a) If after the swing test in step 4 the sled has the right side of the sled is slightly raised, this will indicate that the gimbal bearing housing will need to be shifted to the left with respect to the positioning in the yoke. (See image below with respect to gimbal orientation.)

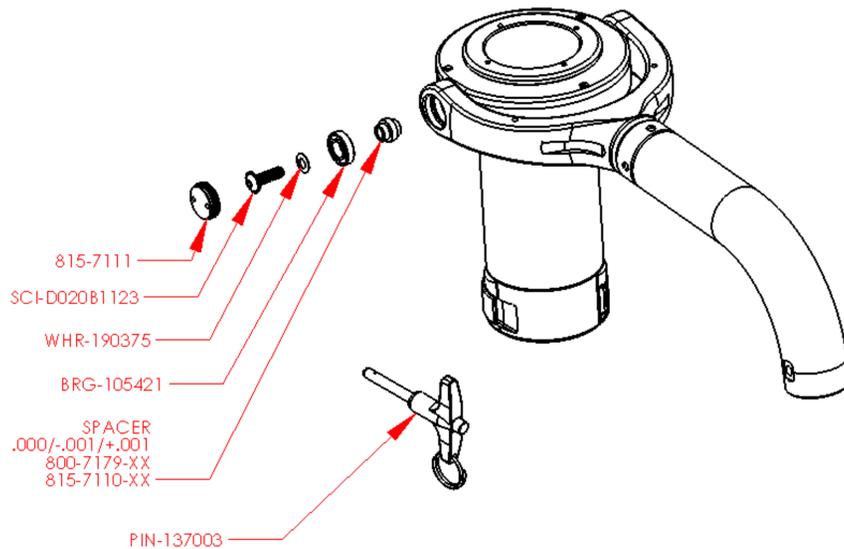
b) If after the swing test in step 4 the sled has the left side of the sled is slightly raised, this will indicate that the gimbal bearing housing will need to be shifted to the right with respect to the positioning in the yoke. (See image below with respect to gimbal orientation.)



c) Note that the 800-7179-xx and 815-7110-xx spacers come in three different sizes (.000", +.001" and -.001") as indicated by the grooves cut into the parts (Refer to image below). The type of spacer used will depend on the gimbal that is being balanced.



6. Dock the sled such there is no weight applied to the gimbal.
7. Remove the 815-7111 cap from using the supplied blue gimbal tool.
8. Remove the SCI-D020B1123 (10-32 screw) using a 1/8" hex key, along with washer WHR-190375.
9. In order to remove the BRG-105421 and spacer, insert 3/16" ball lock plunger (PIN-137003) into the spacer and pull out the spacer and bearing.

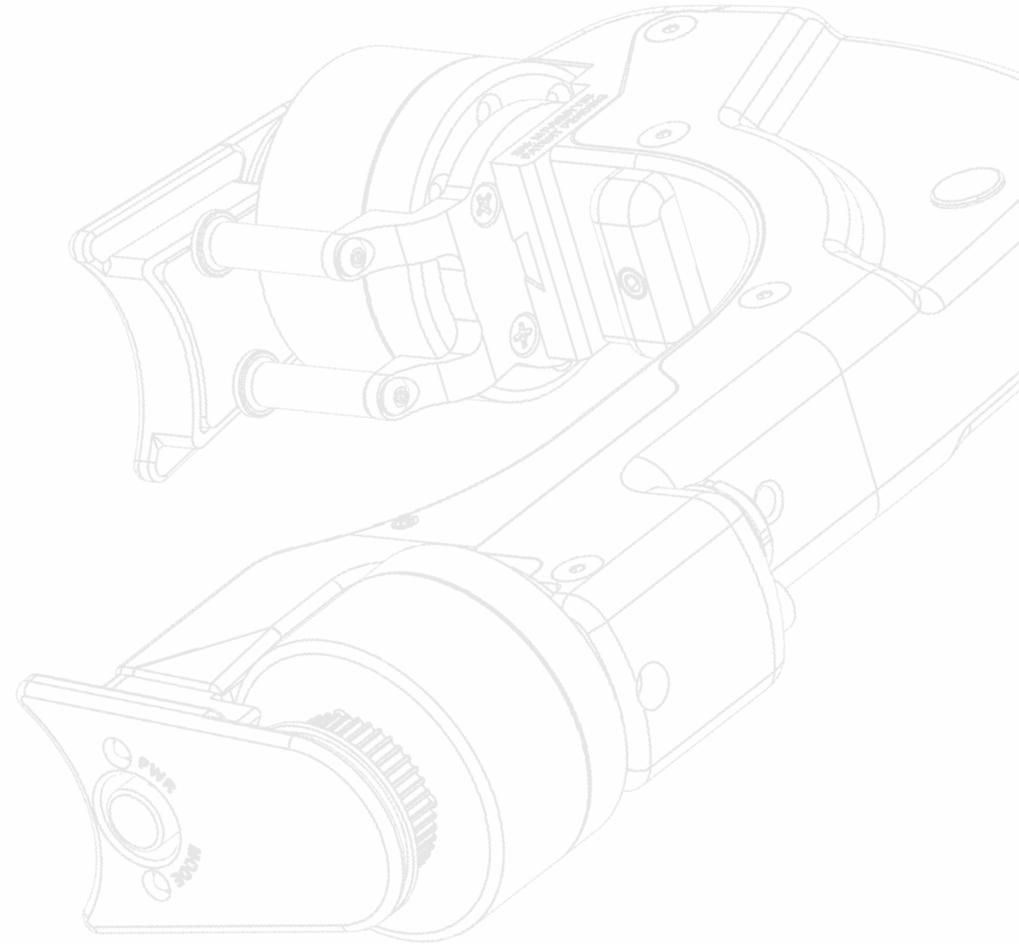


10. Note the type of spacer installed

11. If the gimbal housing bearing needs to be shifted to the left as noted in step 5a, this means that the spacer on the left side of yoke will need to be decreased (i.e. go from .000 to -.001) and the spacer on the right will need to be increased (i.e. go from .000 to +.001).

12. Replace spacers as required, re-assemble gimbal, verify that there is no Left – Right play in the gimbal, and repeat steps 4-11 as required until the gimbal is balanced.

13. Note that if the gimbal cannot be balanced within approximately 1-deg of accuracy, make sure all clamps, plates, camera and whatever else might shift or become loose is stable and not shifting the balance point, and re-test.



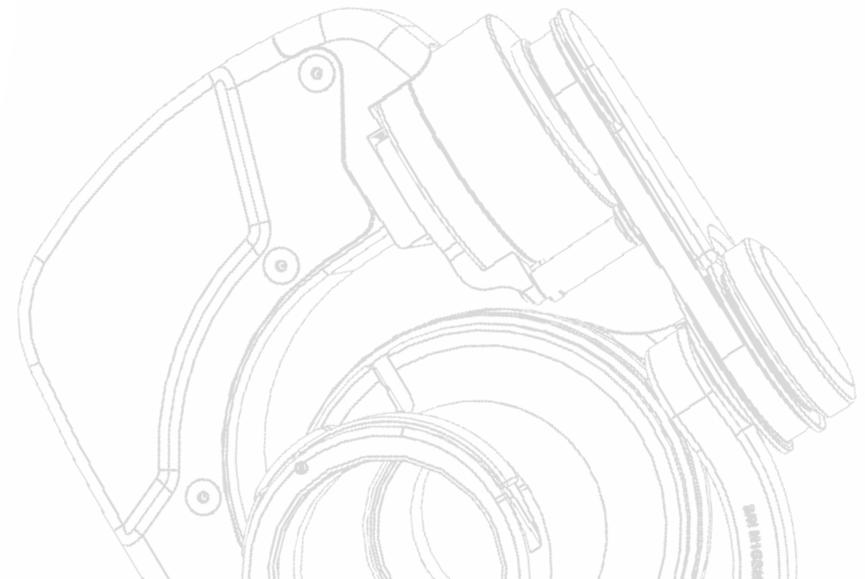
You can now fly with the upgraded yoke OR install the Steadicam™ Volt® starting on page 25.

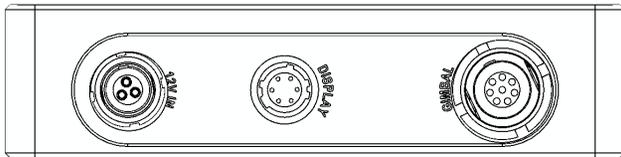
If you're experiencing undesirable behaviors, check the following:

- Is the control box receiving power? The control box will not power on without the gimbal cable attached to the motor unit.
- Is the Volt motor unit receiving power? Power LEDs should illuminate on both the control box and gimbal handle.
- Is the Volt paused? It's okay, we've all done that.
- Did you remember to align the gimbal handle before powering on? Control box knobs on the right, align with the rear of the post; knobs on the left, align with the front of the post.
- Did you tilt the top stage? Remember to re-balance and electronically set a new tilt trim to keep the post vertical.
- If you mounted the Volt on the RIGHT side of the gimbal, did you remember to press the "flip" switch once? See page 37.
- Does the gimbal cable have enough slack or is a cable catching?
- Is the control box mounted rigidly? It shouldn't move at all.
- Did the rig balance change? Precise, neutral balance is key to getting the most out of the Volt system.
- Did you trim for headroom with the stage knobs? That's not how we do it with Volt. Instead, leave the rig neutrally balanced and trim for headroom electronically OR by using an integrated tilt head and a new trim setting.
- Did the control box have time to warm up? Wait 3-4 minutes after powering up from cold before you store a new trim.
- The Volt allows such light control on the post that you may need to re-learn how to hold lock-offs. Less is truly more.
- Did you remember to eat breakfast? Some say it's the most important meal of the day.
- Visit tiffen.com/steadicam/voltssystem/ for more info.

A few additional notes on the Volt™ kit:

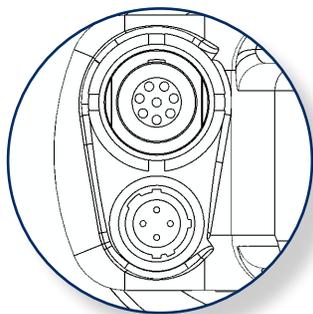
- Units are delivered with the latest available firmware. Stickers on the printed circuit boards indicate the firmware version.
- The current software revisions this manual reflect are:
 - Control box, M1VC-1_2
 - Motor drive, M1VG-1_0
 - Motor drive, M1VX-1_0
- The die cut foam in the cardboard shipping box is sized for a Pelican™ iM2200 case.
- New M-1™ sled cases are shipped with Volt™ compatible foam cutouts. Legacy cases may be modified by users.
- Refer to the M-1™ user guide for additional electronic info and mechanical adjustments for the gimbal and top stage.





12V IN
LEMO ECG.0B.303.CLL
1- PWR GND
2- 11-17Vdc
3- n/c

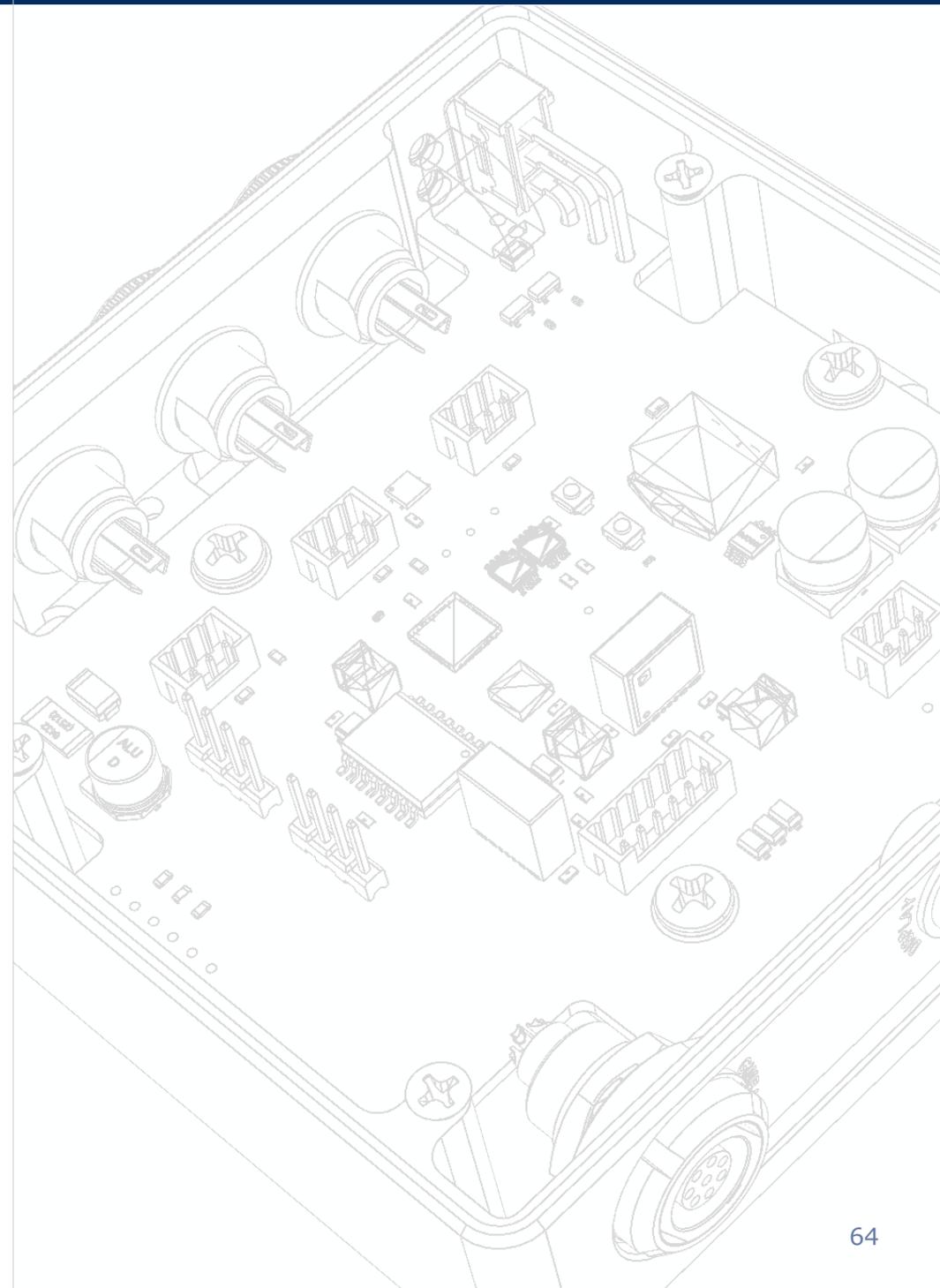
DISPLAY
HIROSE HR10-7R-6S73
1- VCC 5V
2- LED DATA
3- LED CLK
4- GP6
5- SIG GND
6- SIG GND



GIMBAL
LEMO ECG.1B.308.CLL
1- PWR GND
2- 11-17VDC
3- SIG GND
4- GP3
5- SIG GND
6- GP4
7- SIG GND
8- GP5

GIMBAL
LEMO ECG.1B.308.CLL
1- PWR GND
2- 11-17VDC
3- SIG GND
4- GP3
5- SIG GND
6- GP4
7- SIG GND
8- GP5

PAN ENCODER:
HIROSE HR10-7R-4S(73)
1 - PHASE A
2 - PHASE B
3 - VCC 5V
4 - GND



The Tiffen Company

90 Oser Avenue

Hauppauge, NY 11788

Phone: (631) 273-2500 or 1 (800) 645-2522

Fax: (631) 273-2557

Tiffen-Steadicam

2815 Winona Avenue

Burbank, CA 91504

Phone: (818) 843-4600 or 1 (800) 593-3331

Fax: (818) 843-8321

Tiffen International Ltd.

Pinewood Studios

Pinewood Road

Iver Heath SLO ONH

United Kingdom

Phone: +44 (0) 1753 783 960

Email:

techsupport@tiffen.com

Web:

tiffen.com/steadicam

Designed and manufactured in the United States of America.

Patents pending. Tiffen reserves the right to change specifications, accessories, etc. without prior notice.

There is no implied or expressed warranty regarding this material.

STEADICAM®, M-1™ and Steadicam® Volt™ are trademarks of the Tiffen Company, LLC.

All other trademarks and product names appearing herein are the property of their respective owners.

LIT-817001, RevA © 2018 Tiffen Company, LLC. Created by E. Barthelman

