

# STEADICAM® ARCHER

## Operating Manual

Archer Operating Manual  
v. 10/21/05  
p/n LIT-107002



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*This manual is written for experienced Steadicam operators.*

*If you are new to Steadicam operating, or if you have never taken a Steadicam workshop, we strongly urge you to take one of our two, three, or six day workshops.*

*For more information on our professional workshops worldwide, contact The Tiffen Company, LLC.*

[www.tiffen.com](http://www.tiffen.com)

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*This manual will be updated periodically and available on Tiffen's website.*

## Overview



# Overview

Congratulations on purchasing the Steadicam® Archer™!

Each component of the Archer is carefully designed so the operator can easily configure the Steadicam to the best possible advantage for each shot.

*Many adjustments are tool free*, so that the features can be used under real-life, fast-paced conditions.

*The Archer's modular design* makes the sled easily modified, serviced, and upgraded.

*The Archer Sled* folds for compact storage. All components fit into one small case.

*The Archer stage* is super strong and stiff. The fore-aft and side-to-side knobs micro-position the stage effortlessly. Its open architecture makes it easy to service in the field. Connectors on the rear of the stage provide camera power, power and composite video out for video transmitters, HD component in, and composite video in.

*The Archer's no-tools lever type camera mounting mechanism* has a unique safety to prevent accidental opening.

*The Archer's standard 7 inch LCD monitor* is state of the art. It's a daylight viewable (700 nits) 16x9 composite monitor, with a frame line generator. The optional HDSDI (and composite) monitor is 7", 16x9, and 400 nits.

*The monitor mount is fixed.* The monitor pivots on its center of gravity (c.g.).

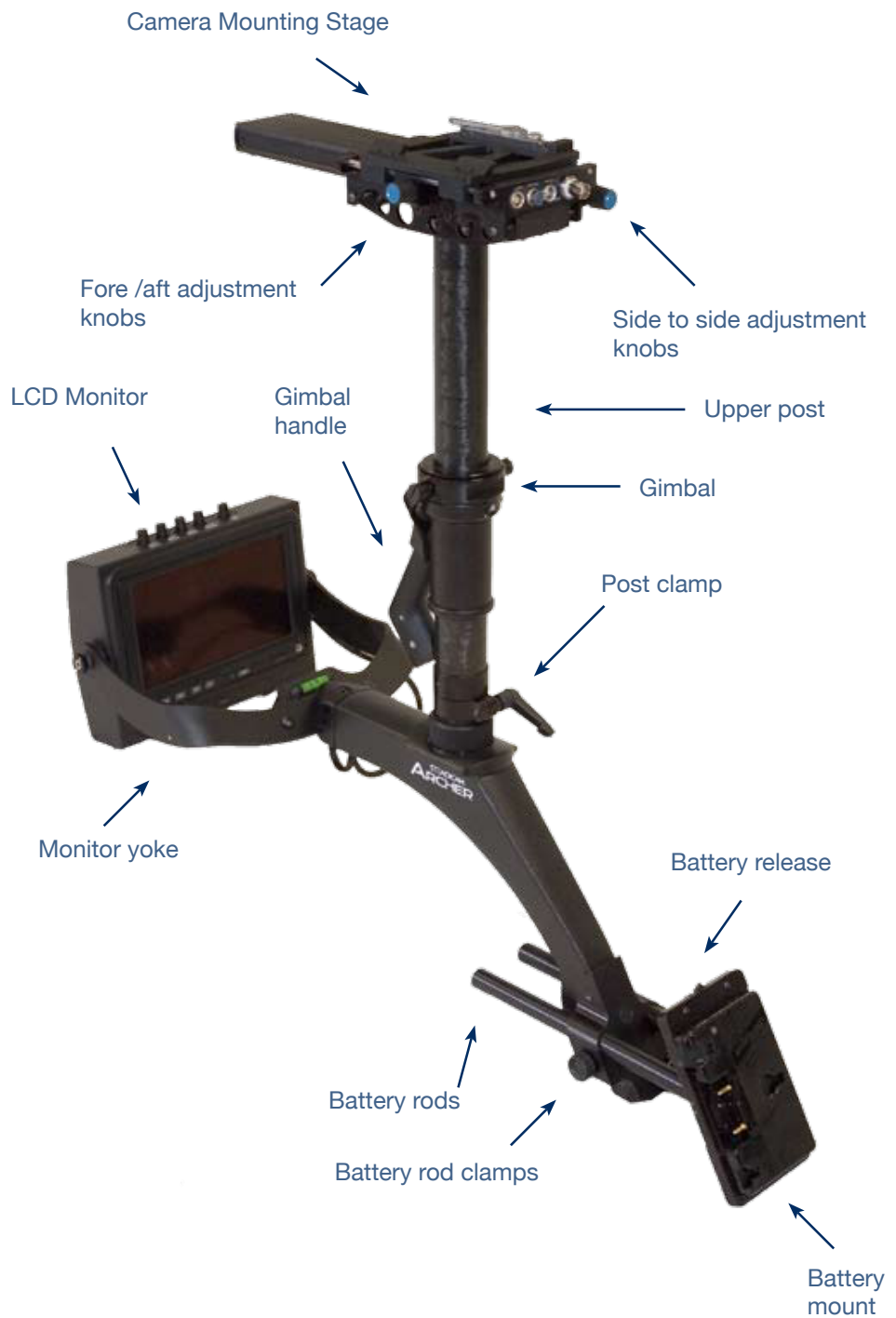
*The Archer battery mount* can be equipped with battery mounts for several types of batteries. The battery mount is supported by dual carbon fiber rods that are extremely rigid and provide a greater range of extension for dynamic balance and greater inertial control.

*The G-50 isoelastic arm* is simply a joy to use, with a total lift capacity of 50 lbs. The "G" is for "Geo," an active link that adjusts the spring tension as the arm booms up and down. The result is an amazing thirty-two inch boom range and very little effort to boom all the way up or down. The sled is also much less reactive to vertical changes or vibrations. The G-50 arm's performance can be fine-tuned to the shot requirements. We call this feature "Ride."

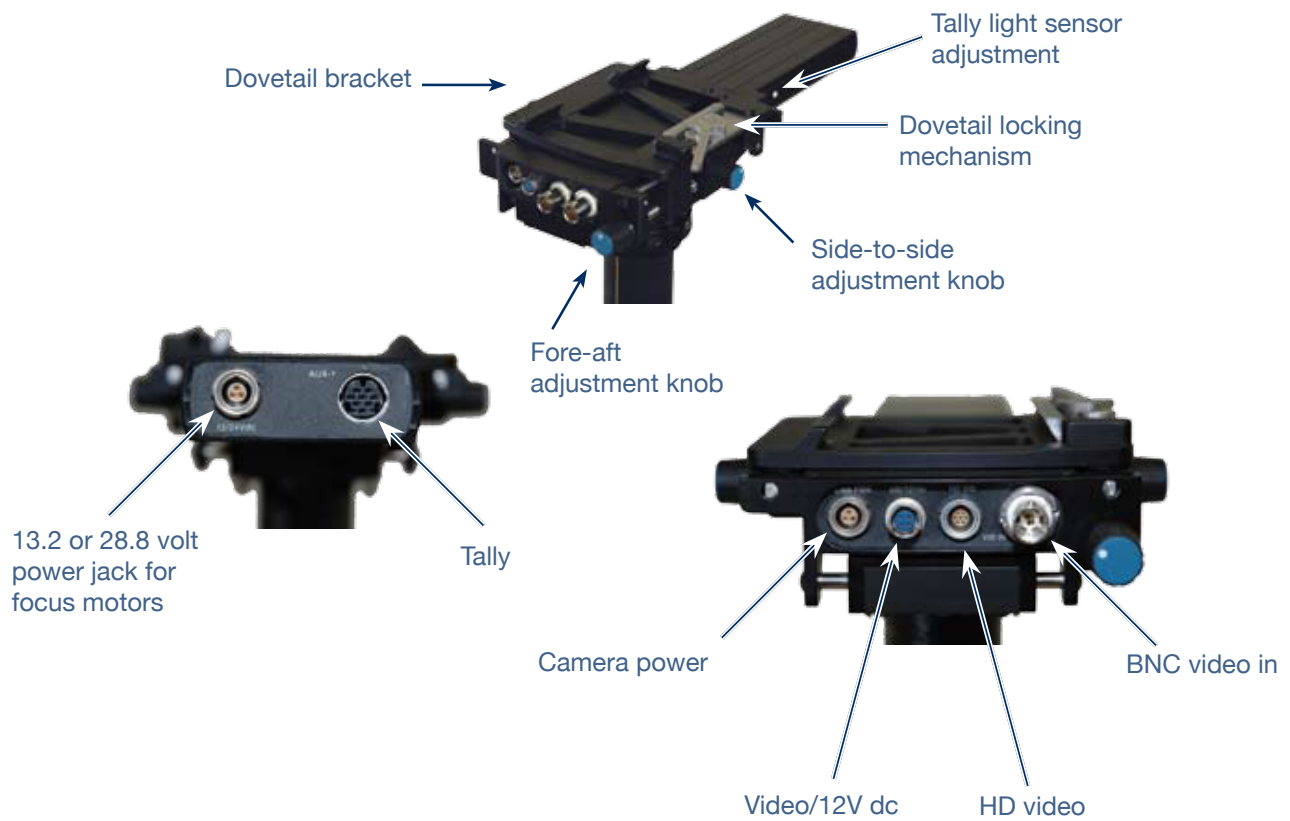
*The LX Vest* has new 100% positive shoulder clips, a stronger spar, ergonomic padding, and a wide range of adjustments for a perfect fit.

# *The Archer Sled*

## The Sled



### *detail: mounting stage*



### *detail: folding sled*



## Monitors

For information regarding your monitor, refer to the manufacturer's manual.

### *color LCD monitor (standard)*

**700 nits**

built in frameline generator



### *HD/SDI color 7" (optional)*

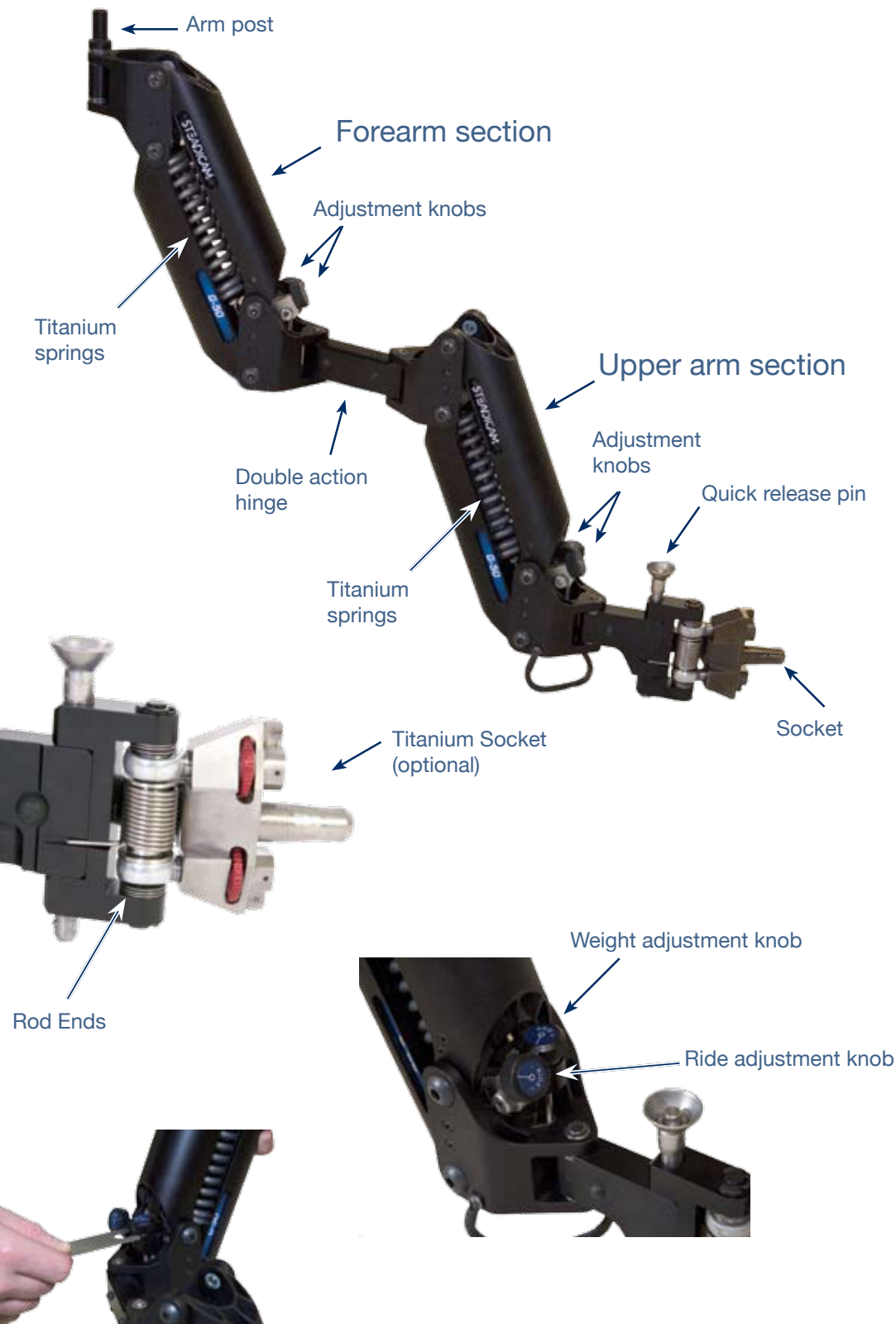
**400 nits**

no frameline generator available with this monitor





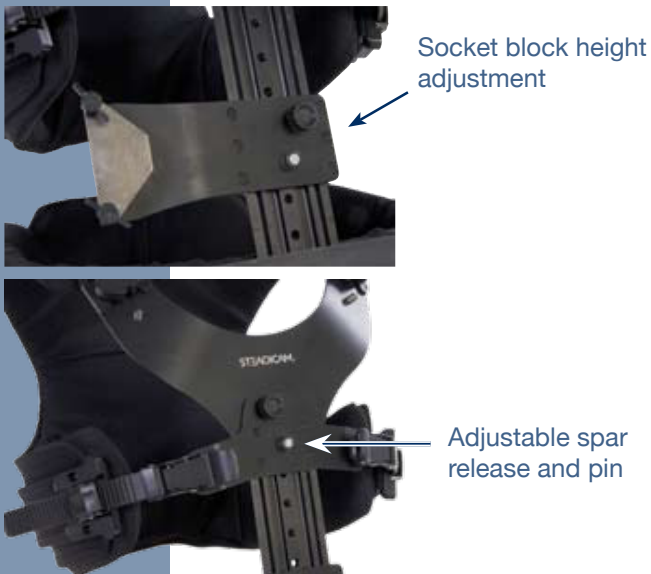
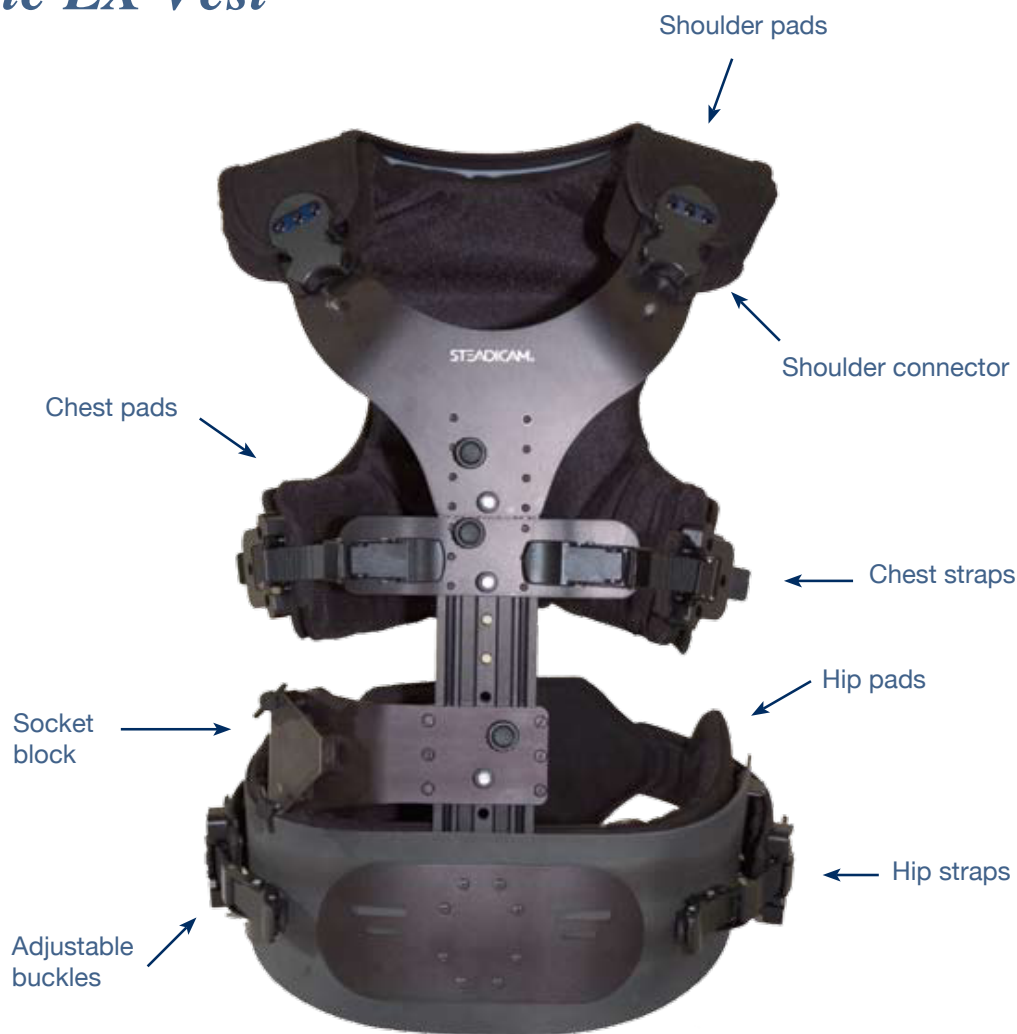
# The G-50 Arm



Use the flat tool if there is any play in the vertical adjustment of the arm.

# The LX Vest

## The Vest



# Fitting the Vest

The vest is the major connection between your body and the Steadicam. It must be adjusted properly and feel good on your body.

The vest is not intended to be a straightjacket. You should be able to move and breathe easily.

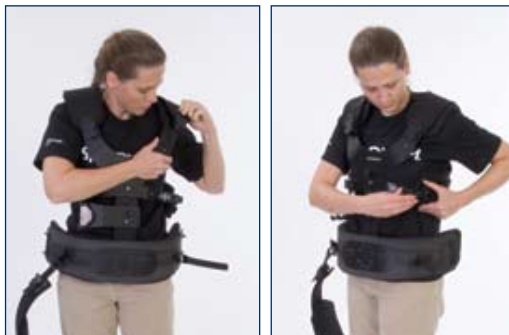
The socket block for the arm should move with you and not shift under load.

The overall length should be adjusted so that lifting your legs while taking a step up doesn't disturb the vest. The hip pads should comfortably grab your hips.

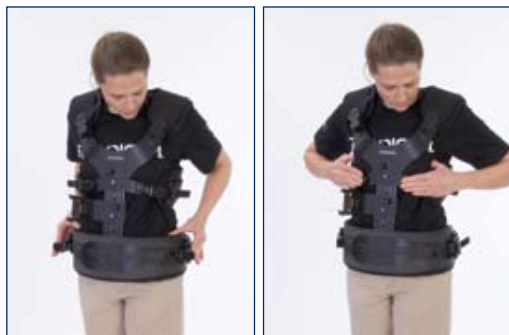
Start at the top. Be sure the shoulder pads are firmly down on your shoulders.

The chest pads are snugged up next. You should be able to breathe a little, but the vest should not be able to slip forward and down.

Diaphragmatic breathing (like a baby) works best.



Push the vest down on your shoulders again, be sure the spar is vertical, then snug up the hip pads. If the hip pads are tightened first, the vest will tend to ride high until loaded, and then it will slip around under load.



Note: A few operators have body shapes or sizes that are out of the general range of adjustments. You may find you have to add or remove padding, shorten or extend straps, etc. to make the vest fit perfectly.

Available options: a compact vest, and longer chest and hip straps.

Closing the clips on the hip and chest straps is the final step.

Tip: While wearing the vest and resting between takes, release the vest straps to increase blood flow and ease tension in your muscles.

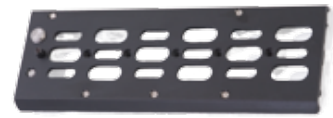
## Supplied Accessories

### Accessories



Docking bracket

Camera power cable, bnc video cable, T-handle 1/4" & 3/8" allen wrenches, camera mounting screws.



Camera mounting dovetail plate

## Optional accessories



Low-mode kit



more cables

Tally light sensor



Batteries and charger



## Cases and packing

### Cases



Many operators cut the foam to accommodate accessories kept on the sled - such as a focus motor receiver or a small VCR. A long, thin razor blade works fairly well to cut the foam, as does a serrated knife.

Most operators have several other cases for their accessories, tools, low mode brackets, video recorders, video transmitters, diversity receivers, remote focus equipment, etc.

The sled case has wheels and a handle.



A soft vest bag is provided, but it is not recommended for shipping. A hard case is available as an option.



## *Posts and clamps*

To balance heavy cameras, and/or to raise the lens height, make the rig longer. The telescoping post is adjusted by releasing the black wing clamp at the base of the post. Be sure to support the sled before you release the clamp.



Note: There is a safety line inside the posts to keep them from separating. The safety cable will prevent you from extending the post past 9.5"

# Attaching the Camera

## Camera

First, center the side-to-side and fore-aft adjustments of the camera mounting platform.

Attach all the accessories to the camera, including lenses, loaded film magazines, focus motors, oblie lights, transmitters, etc. Don't worry too much if you must add your motors or other accessories after you have attached the dovetail plate.

Using a rod or pencil, find the c.g. of the camera, both fore-aft and side-to side. Temporarily mark this with pieces of tape.



Finding the camera's side to side c.g.



Finding the camera's fore-aft c.g.



Attach the long dovetail plate to the bottom of the camera, centered as closely as possible under the camera's c.g. Use two screws to keep the camera from rotating.

If possible, attach a second dovetail to the top of the camera, directly above the first one. This may require additional hardware, such as a special low mode bracket for your camera.



Place the camera above the camera mounting platform. Be sure the locking lever is fully open. Angle the left edge of the dovetail into the holder. Be sure to keep everything parallel. Lower the right side into the holder.

Tip: If the camera won't drop fully into place, be sure the left side of the dovetail is fully inserted, all is parallel, and the locking lever is fully open. It's a close fit.



How the dovetail drops into place.





Camera's fore-aft c.g.  
.75" behind center post.

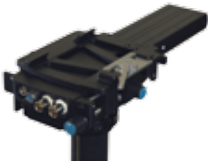
### *Place the camera's c.g. behind the center post*

After the dovetail drops into place, close the locking lever half way and slide the camera until the fore-aft c.g. mark is about .75 inches behind the centerline of the telescoping posts. Close the dovetail lever all the way to lock the camera in place.

Use the side-to-side adjustment knobs to center the camera's side-to-side c.g. directly over the centerline of the post.

If adding accessories causes the side-to-side position to drastically change, you may have to reposition the dovetail plate on the camera.

### *The dovetail locking lever has three positions:*



Dovetail locking  
lever fully open.



The dovetail can  
slide but cannot  
be removed.



Locked.  
Push firmly.

All the way back is fully open and the dovetail can be inserted or released.

At the half way or 90 degree position, the dovetail can slide back and forth for gross positioning of the camera, but it cannot be released.

All the way forward is the locked position.

**Cautionary Tip:** When in low mode and adjusting the camera position by sliding the dovetail, be sure to support the camera.



The button must be  
depressed to open  
dovetail locking lever  
fully.

# Static Balancing

The Steadicam sled should be carefully balanced to help the operator get the shot.

Before balancing, the sled should have the camera and battery attached, all cables secured, and all accessories on board. Place the camera c.g. about .75 inch behind the centerline of the telescoping posts.

Release the two rod clamps at the base of the sled and pull out the battery three or four inches. Retighten the battery rod clamps.



The camera mounting stage, monitor and battery should all be properly aligned.

Release the proper clamp and rotate any section that is out of alignment.



Mount the gimbal on the balancing stud. It's a good idea at this point to have an assistant hold the C-stand. You need to balance the sled in all three axes: fore-aft, side to side, and top to bottom.

Pick the most out of balance axis and get that close to being in balance, then work on another axis. You may have to go back to tweak the balance in any given axis several times.

When the sled is very bottom heavy, it has a short drop time and it will require bigger movements of a weight to properly balance the sled.

When the sled is nearly neutrally balanced top to bottom, very slight movements of the camera or battery will have a large effect on balance. The sled will behave differently depending on how bottom heavy it is.





## *Adjusting top to bottom balance*

To adjust top-to-bottom balance, tilt the sled until it is horizontal. Hold the sled firmly and release the gimbal clamp.

Slide the gimbal until the sled balances horizontally - but never allow the sled to move from horizontal with the gimbal clamp open.

Slide the gimbal up towards the camera about .5 inch and lock the gimbal.



## *Checking drop time*

Let the sled rotate (drop) through vertical and note the time. A two second drop time is a good starting point. Raise or lower the gimbal slightly to get a faster or slower drop time.



### *A Really Fast Balancing Tip:*

To speed up the process of side-to-side and fore-aft balancing, stand next to the sled as you would while operating. Hold the sled vertical with your operating hand on the gimbal. Hold the gimbal the same way you would do while operating.

## *Side-to-side and fore/aft balance*

Keep the camera c.g. about .75 inches behind the centerpost and move the battery in or out to get close to fore-aft balance. Fine tune fore-aft balance with the knobs on the stage.

Hold the sled absolutely vertical as you adjust the side-to-side or fore/aft balance. Turn the adjustment knobs with your other hand (or use the stage motor transmitter) until you feel no pressure on your operating hand, and the sled will be in static balance.

To adjust the side-to-side balance, use the knobs on the camera mounting stage.

Tip: When adjusting the balance fore-aft or side-to-side, moving any weight “up hill” makes the sled hang more vertically.

# Dynamic Balancing

A Steadicam sled is in dynamic balance when the center post remains vertical as the sled is panned.

Dynamic balance is extremely important for precise operating and also for whip pans.

For each arrangement of camera, monitor position, post length, accessories, etc., there are many possibilities for statically balancing the Steadicam.

However, for each arrangement, there is only one combination that also balances the sled dynamically.

There is some leeway as to the required precision of dynamic balance. What is acceptable depends upon the operator and the situation.

Dynamic balance can easily be achieved by the trial and error method.

In all cases, when a sled is in dynamic balance, the camera's c.g. will be to the rear of the center line of the center post. This rule gives you some point to begin balancing the Steadicam.

Position the camera so that its c.g. is about .75 inches (19mm) behind the center post.

Static balance with the battery so the sled hangs perfectly vertical fore and aft.

Trim side to side with the camera, using the knobs on the stage. You can also use the stage motor remote control, as shown. Fine tune fore and aft balance with the motors as well.

Give the sled several careful test spins and note the results. Good or bad; flat pan or wobbly? Is it your technique or is the sled out of dynamic balance?

If the sled is out of dynamic balance, move the battery in or out a bit. There are only two directions to choose from: you have a 50% chance of getting it right.

Be sure to make a note of which direction you move the battery.



Make sure to give it an even spin. Use your thumb and first finger up at the gimbal



Spinning a bit wobbly.



Looking good!

Rebalance statically with the camera (racking it in the opposite direction), and spin the sled again. Better or worse? Again, you have two choices.

Re-rack, rebalance, and spin again (and again!) until the sled pans flat. This should not take a lot of time. When the battery is within about 1/4th inch of ideal, the sled will behave nicely and feel “sweet.”

### *Adding any accessory will affect both static and dynamic balance*

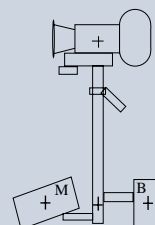
How much? It depends on the mass and position of the object, and the masses and positions of everything else on the sled.

You will discover that as the monitor is placed higher towards the camera, the closer the battery c.g. gets to the center post, and the more the camera c.g. moves away from the post to the rear. See the diagrams. With any given monitor position, the heavier the camera, the closer its c.g. will be to the center post.

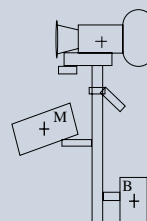
As you extend the telescoping post, you will discover the battery needs to move slightly further to the rear to maintain dynamic balance.

#### *Three figures to study for understanding dynamic balance.*

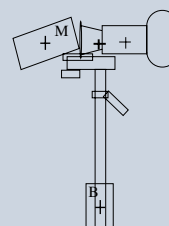
The top figure looks like the Model One or the SK. The camera c.g. is centered over the post; the monitor and battery are on the same horizontal plane, and their common c.g. is in the post. This unit is in dynamic balance and pans flat.



The second figure has the monitor raised a bit. This looks like most Steadicam configurations, high or low mode. Note that the battery c.g. is closer to the post, and the camera c.g. has moved to the rear. Why? See the third figure.



In the third figure, the monitor has been raised all the way up in front of the camera. It's absurd, of course, but it makes a point. Now the common monitor and camera c.g. is over the post, and the battery's c.g. is directly under the post.



So you can see that as the monitor is raised, the camera c.g. must move to the rear and the battery c.g. must move towards the post. With the Clipper 2 (and most Steadicams), the monitor is always raised above the battery. Therefore camera is always to the rear of the centerpost.

# Arm Adjustments

## Weight capacity

The G-50 arm has a lifting capacity of 10 to 50 pounds. No tools are required to adjust the arm strength, but the Steadicam must be worn to adjust the arm.

The section being adjusted must be held at a slightly upwards angle for the adjustment knob to turn.

Very important: Adjust the forearm section first. Make sure it properly carries the load. Then adjust the section closest to the operator (the upper arm) so that it follows or tracks with the forearm section as the operator booms fully up and down. Getting the second section to follow the first can be a little tricky, so you may have to repeat this process several times.



Adjusting the forearm section. The arm must be angled slightly up for the adjustment screw to turn.



Adjusting the upper arm section



Boom the arm up and down, watching to see if the upper arm follows the forearm.

## Arm Lift Angle

Determining your threads is part of basic operating technique. Two adjustment screws in the socket block on the vest and two “rod ends” in the mating section of the arm determine the angle of lift of the arm.

These two adjustments are your “threads.” They are personal and critical for good operating. Some combination of adjustment of these screws – and your physique and posture – will make the arm lift straight up when carrying the sled.

The angles of adjustment are not directly “in-out” and “side-to-side,” but rotated about 30 degrees clockwise (relative to the operator). We can suggest approximate threads to start, but the only way to test your threads is to pick up the Steadicam and see what happens.

## Side-to-side

For almost all operators, regardless of body type, the typical adjustment for the “side-to-side” screws (the rod ends in the arm) is 1.5 to 2 turns out on the top screw and ALWAYS all the way in on the bottom screw.



Use a 1/4" allen to adjust the “side-to-side” screws. When wearing the rig, be sure to hold the centerpost in line with the “in-out” thumbscrews. This will take the loading off the side-to-side screws.

If you have a titanium socket block, you can use the rollers to adjust your side to side threads, but only when the arm is not under load. When carrying the sled, use a 1/4 inch Allen wrench. The two side-to-side screws work independently of one another. Do not tighten the lower screw, but be sure it is all the way in, and then back it out 1/8th of a turn.



### *In-out*



Looking down at the top “in-and-out” screw. Count the threads indicated by the arrow. This is a typical adjustment for a person in reasonable shape.

The “in-out” adjustment on the socket block varies greatly by the operator’s body type. If you have big pecs and a flat stomach, the top screw is almost all the way in. If you’ve been eating well and exercising less, the top screw will be further out.

Always dial in the top screw first to your setting, then turn in the bottom screw until it just snugs up against the fitting. There is no need to tighten the bottom screw very hard.

With both pairs of screws properly adjusted, the camera will float in all positions with the operator standing relatively comfortably.

### *Adjusting the “Ride”*

The G-50 arm has an active “Geo” link that changes the spring tension as the arm booms up and down. The active link makes for a smoother ride, and enables the arm to have an extended range compared to older arms.

In the G-50 arm, this “Geo” link is adjustable, giving the operator the ultimate control over the arm’s behavior. You can make the arm extremely isoelastic or you can make the arm seek the center position more strongly.

In general, you want to make the arm as isoelastic as possible, so you do less work booming the sled up and down.

As the arm carries more weight, the isoelastic feel will change. Turn the ride control knob counter-clockwise to maintain the isoelastic response. Remember, a heavier rig needs “more” iso, and a lighter rig needs less



Adjusting the ride: the arm must be angled up at the top of its range.

Note: the ride knob is horizontal, the lift knob is vertical.

### *To set the ride control for the maximum isoelasticity:*

- Set the arm to carry the sled’s weight
- Be sure to stand in proper form
- Boom the arm section all the way up to adjust the ride control
- Unscrew the ride control knob a few turns at a time and test by booming up and down.
- At some point, the arm section will begin to lock up as you boom up. When it does, screw the ride control knob back in a couple of turns. Repeat for the other arm section.
- If you change the weight of the rig significantly, change the ride control. A heavier rig needs more “iso” and a lighter rig needs less “iso.”



## Getting Started

If you've never flown a Steadicam before and can't wait for a workshop, here's how to get started. It's better if you have a trained Steadicam operator helping you.

### Undocking the sled

Bend at the waist and insert the arm post into the gimbal handle

Hold the rig and arm as shown, then simultaneously step in and stand up straight.



Do not lift, but let the arm take the weight (if the arm is grossly out of adjustment for the weight of the rig, then you will have to lift up or push down on the arm).

Release the safety pin by pushing the button

Step back from the stand and bring the rig by your side

Use the reverse procedure to dock the rig

### Making the rig float next to you

Stand up straight and turn your hips slightly towards the rig

Adjust the arm to float the camera in the middle of its range (see page 18)

If the rig **strongly** moves away from you, readjust the arm threads (see pages 18-19)

Try to keep the rig floating next to you – lean slightly away from the direction the rig wants to go.



### The left hand

- holds the rig as lightly as possible
- aims the camera – pans and tilts
- keeps the rig upright – prevents unwanted pendular action



### The right hand

- holds the arm
- fine-tunes the camera's spatial position
- booms the sled up and down
- holds the lens height regardless of the bounce in the arm
- places the camera laterally



## *Walking correctly is the key to good operating*

Walk as normally as possible – with you hips turned slightly towards the rig

Do not bend your knees like a handheld cameraman – let the arm do the work

Walk with an intention: get to a specific spot, follow a specific path

To start a camera move, move the camera first, then walk with it

Use the handgrip to prevent the sled from going off level

To stop a camera move, stop yourself first, then “kiss off” the camera’s motion

When standing still, try to keep your weight mostly on one foot

Learn to walk forwards and backwards – be sure to stand up straight and be in balance at all times



Missionary position

## *Missionary and Don Juan positions*

In both positions, the main post is in the same place and the cameraman’s posture is the same.



Don Juan position

## *Goofy foot*

If you want to operate “goofy-foot,” – with the sled on the right side – you will need to reverse the socket block.

On the vest, you must remove the “Y” chest plate completely. Loosen the socket block height adjustment screw, pull out the pin and slide the plate off the top of the spar. Flip the plate and slide it back on the spar. Insert the “Y” chest plate.

On the arm, pull the “parachute pin,” flip the mating block, and reinsert the parachute pin.

Note that the mating block is now reversed; the upper side-to-side adjusting screw is now the lower screw and vice versa. To set your threads, first dial the lower screw all the way in, then adjust the upper screw to your threads - about 1.5 to 2 turns out. Use the same procedure to change back to left side operating.



## Low Mode

For low mode, the sled is flipped upside down, the monitor is re-righted, and the camera is mounted from its top. A special low mode bracket is required for every camera.

A low mode bracket should be placed so that the upper clamp plate will mount directly above the correctly located clamp plate on the bottom of the camera. Also, the bracket should be as close to the camera body as possible. It should be small, strong, and not interfere with other camera functions, such as tape loading for video cameras, video assist cameras, or mag loading for film cameras.



Custom made handle clamp



Hill Arri Low mode bracket



Handle clamp type low mode bracket.

Other than a film magazine, the top of the camera and its accessories should not extend above the upper clamp plate, as this may cause interference with the camera mounting stage. Lightweight “universal” cages generally flex too much to be useful. Many video handles are not stiff or strong enough for low mode.

## Low Mode Operating

The low mode bracketry might also provide a means of mounting motor rods (or a dovetail with motor rods), and this system should not interfere with camera functions, working with the camera in high mode, etc.



Flip the monitor 180° and invert the image on the LCD. (If you have the HDSDI monitor you will need to remove the monitor from the yoke and flip it.)

The other necessary accessory for low mode operating is the F-bracket. Its function is to bring the arm back into a proper relationship with the inverted sled.

Without an F-bracket, the end of the arm will be next to the camera and the operator will find it difficult to operate and impossible to make changes.



*Insert the punch pin to safety the F-bracket to the gimbal.*



An F-bracket is required for the gimbal, and this new arrangement of components must be balanced, both statically and dynamically.

*Traditionally, it's considered harder to operate in low mode than in high mode. Why?*

Several factors may work together to make low mode operating harder. The operator usually holds the sled further from his body than in high mode. The operator's hands are not at the same height. Many times, the post is tilted from vertical. The boom range is sometimes reduced. The rig may not be in dynamic balance. The operator often cranes his neck to see the image. In addition, every director wants the lens height lower or higher than one can properly reach. And it's just plain weird to have the monitor so far above the lens.



*Dynamic balance in low mode*

Rebalancing is often ignored because it's next to impossible to spin balance in low mode. But dynamic balance is critical for precise work.

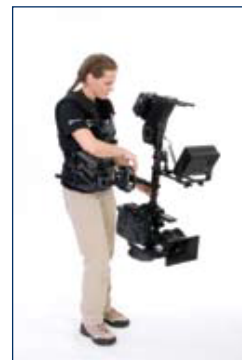
If the operator does not change the length of the sled or the monitor position, the sled remains in dynamic balance when flipped to low mode. (Remember, the monitor flips on its center of gravity.)

If the operator changes the sled length and/or the monitor position, the Clipper 2 sled must be rebalanced dynamically.

Tip: Dynamically balance the sled with the camera and monitor upside down (high mode). Then as your final step, move the gimbal away from the camera, so it hangs right side up in low mode.

But one still has to hold the camera further from one's body, and the monitor is still above the lens. So practice until low mode is as easy as.... it can be.

Cautionary Tip: When in low mode and adjusting the camera position by sliding the dovetail, be sure to support the camera.



# *Maintenance*

### *General:*

Keep the sled clean.

Protect the steel parts in the arm from water, salt water, and other corrosives.

Keep sand away from the rig.

Avoid baking the rig in the hot sun.

### *Vest:*

Keep it clean.

The pads are washable. Hand wash or use the gentle cycle; air dry.

Watch for loose buckles and worn out velcro. Both can be easily replaced.

### *Battery:*

Refer to the manual that comes with your batteries for the battery manufacturer's care and maintenance procedures.

### *Monitor:*

Refer to the manufacturer's manual.

#### Cautionary Tip:

Never apply WD-40 to any part of your Steadicam.





