Archer² Operating Manual

STEADICAM®

ARCHER²

CAMERA STABILIZING SYSTEMS

Archer² Operating Manual
v. 10/31/09
p/n LIT-305000

STEADICAM ARCHER^2

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This manual is primarily written to inform experienced Steadicam operators about specific features of the Archer 2 system. While there is some basic information in this manual to get a novice started, we strongly urge anyone with limited Steadicam experience to take one of our three or six day workshops. For more information on professional workshops worldwide, contact The Tiffen Company at www.tiffen.com or www.steadicam.com

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STEADICAM ARCHER 2

Overview

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The Tiffen Company takes great pride in producing the **Steadicam® Archer²™**. We are committed to excellence, innovation and service, and the Archer² is a system that will evolve with you. Each component of the Archer² is carefully designed so the operator can easily configure the Steadicam to the best possible advantage for each shot.

Tool free — Our guarantee that all the advanced features can be used under real-world, fast-paced conditions.

Modular design — We designed the Archer² to be easily modified, upgraded, maintained, and serviced.

The optional, position-sensing, super strong, motorized stage increases the precision and repeatability of every shot. Stage positioning is smooth and effortless, and operators can trim the sled's balance while shooting. "Go-to" buttons on the remote rebalance the sled to pre-determine positions — and return "home" — with just one touch.

The integral tilt head tilts +/– 15º to preserve dynamic balance, to maintain high or low lens height, to help with clearance, reach, or viewing problems, or to execute precise whip pans with the lens angled up or down.

The new, Wide Dovetail Lock has a broader, more positive grip on the dovetail plate. The handle has a safety stop to prevent accidental release.

The Archer² gimbal has been meticulously engineered to provide a smooth precise feel incorporating high precision bearings and a quick release ergonomically recessed clamp mechanism for fast adjustments.

Two section, carbon fiber telescoping post extends the sled from 23 to 34 inches (58-86cm) — or anywhere in between — for short to long mode shooting.

The swept-back monitor mount is designed for maximum stiffness, inertial control and viewing options. It has a wider range of positions, both vertically and horizontally and is uniquely designed to safely fold up for transport or storage.

The Archer² 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 optional UltraBrite 2™ monitor is 8.4" at an astonishing 1400 nits brightness, with advanced AR coating, and HDSDI, HD component, and analog composite direct input. Its unique design lets it run cool without a fan.

The connector rich sled design incorporates 3x HD quality video feeds from the top stage to sled base to accommodate RGB or any other video configuration. Main BNC composite video input, 3x 12/24V power connectors, 12V/Video connector for transmitters, monitor connector and tally connector are some of the other available connectors on the sled.

Structural Dovetail Base — solidly mount gyros, extra batteries, balance weights or other accessories.

Steadicam PowerCube™ dual battery pack provides 220 watt hours and high amperage discharge — plenty of power for the sled and today's power hungry 35mm and High Def video cameras. The Archer² is a 12 and 24V volt system that uses either a single or dual PowerCube or Anton Bauer® batteries. The new tilting battery mount creates more options for balancing and inertial control and also uniquely folds up for compact storage or transport.

The LX vest is lightweight and ergonomic, working perfectly with the new generation of G-series arms.

The G–40 arm is amazing, lifting from 12 to 40 pounds (5.4 to 18.1kg). This next generation of the G-Series arms provides a smooth Iso-elastic™ ride and incorporates a unique quick link mechanism to separate the arm sections for compact storage or transport. With an astounding boom range of 29 inches (74cm), and interchangeable arm post with rotational drag control, the G-40 arm gets the job done.

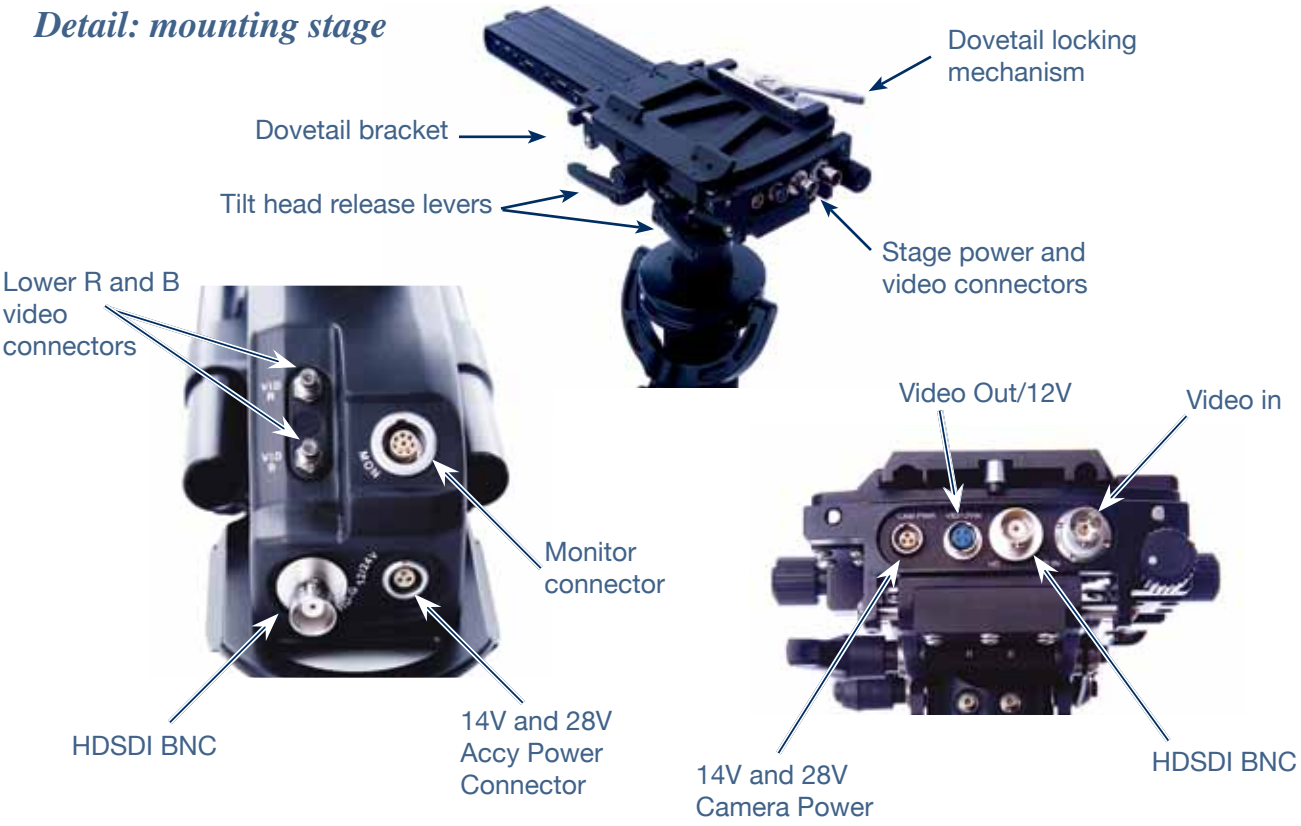
All the features are integral to the design; ready to be used when you need them.

The Archer² continues our tradition of building the world's most versatile and user-friendly Steadicams.

STEADICAM ARCHER 2

The Archer² Sled

Detail: mounting stage



Detail: folding sled

Battery Unfold/Fold Procedure:

- While holding the battery mount, rotate the blue locking knob for the battery counterclockwise (opposite direction to “LOCK” marking) until the stop.
- Rotate the battery mount down and slide the rail tubes into the guide holes in the sled base.
- Rotate the blue locking knob clockwise (same direction as “LOCK”marking) to secure the tubes in the desired operating position.
- Loosen the lobed knob below the battery mount and rotate the battery to the desired operating position; retighten the knob.
- The folding procedure for the battery is similar to the unfold procedure taking note that the rail tubes should be flush with the sled base when folded for ease of packing.

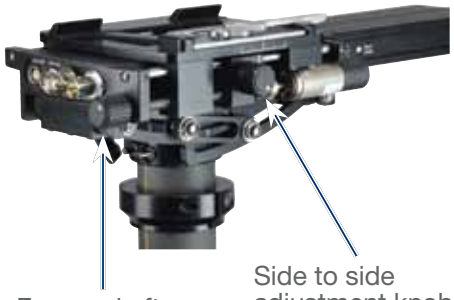
Monitor Unfold/Fold Procedure:

- The monitor fold/unfold procedure is similar to that of the battery unfold/fold procedure taking note that the monitor mounting bracket on the post should be lowered all the way down to base for ease of packing.

Stage mechanics and adjustments

The dovetail clamp lever has three positions: forward and locked, 90º for adjustments, and 60º back for mounting or removing the dovetail plate. A safety button must be pushed to move the lever to the unlocked position; the same button holds the lever fully open, making flips to low mode and back a bit easier. Do not force the lever backwards beyond its stop.

The stage is easy to adjust. The knob at the right rear controls fore and aft, and the two knobs on the side control side to side movement.



Fore and aft adjustment knob

Side to side adjustment knob

Note: The Archer² can be ordered without a motorized stage, or with a single motor, or with two motors. Upgrading to one or two motors is a simple “plug-and-play” operation.

The stage connectors

At the rear of the stage, left to right (port side to starboard side):

- Camera power connector. 3 pin Lemo, +28V, +14V, and ground.
- Video out/regulated 12V Power. 4 pin Hirose
- HDSDI video in BNC
- Composite video in base of sled. BNC

Under the stage where the post meets the tilt head:

- Two SMB connectors for two of the three RGB lines

At the front (nosebox), left to right:

- Power for focus motor receiver/amplifiers. 3 pin Lemo (+28V, +14V, and ground)
- Tally light connector (additional functions possible)

Nosebox starboard side:

- Pot to adjust Tally sensor sensitivity

• Rotary switch to set remote channel (0-8)

Starboard side of non-motorized stage shown

Nosebox port side:

- Power and mode LEDs
- Side/Side motor controls
- Fore/Aft motor controls
- Stage centering

The Archer²'s optional motorized stage is position sensing – much like a focus motor system for a lens. One use of this feature is to set the stage to the center of travel, both fore and aft and side to side – great for initial setups.

Pushing the double pole momentary switch on the "nosebox" to the "C" side centers the stage.

Flipping the switch the other way ("L") sets the stage to a pre-programmed position (more about that later.)

The speed and direction of the motors is set by the switches and thumbwheel pots on the left (port) side of the nosebox (S/S & F/A). Note that the motor direction switches also have a center-off position, just in case you are in an odd RF environment or you don't want your stage motors to move. Remember this "function" when a stage motor stops working between takes!

The electronics in the stage and nosebox are on "plug and play" circuit boards, easy to replace if there's ever a problem. It's also easy to access to the inside of the stage — to clean, add or swap motors, adjust the bearings, take apart for servicing, etc.

Port side of non-motorized stage shown

The Tilt Head

The integral, low profile head is designed to alter the lens angle +/-15º from horizontal with only a minor shift of the camera's c.g.

The most important use of the tilt head is in normal operating. Instead of trimming even two or three degrees for a shot by altering the Archer²'s balance, use the tilt head to preserve a perfectly vertical post and keep your sled in dynamic balance.

Trim for headroom

Without the tilt head, much of the benefit of getting the sled into dynamic balance is wasted when one alters the trim of the rig. For example, operators routinely trim their sleds for headroom. This action puts the rig out of both static and dynamic balance.

With the Archer², the operator determines the proper length of sled, optimal monitor viewing position, inertia, and lens height. Then the operator adjusts the camera to the nominal tilt angle for the shot.

Setting the tilt

The operator sets the tilt by releasing the two clamps and manually repositioning the camera to the proper angle.

The post remains vertical and the rig stays in (or close to) dynamic balance. Only minor static rebalancing is normally required, but exactly how much depends on the camera, accessories, sled length, monitor position, etc. In all cases, bringing the sled back into static balance by moving the camera will return the sled to dynamic balance as well (see page 28).

The Tilt Head — General Operating

Even if the Steadicam is slightly out of perfect dynamic balance, it's a whole lot easier to hold the post vertical than at any other angle, especially when panning and accelerating - which we tend to do a lot when operating a Steadicam. The tilt head keeps the post vertical in many situations, making it easier to operate and keep things level.

Another benefit of the tilt head: a whole new class of whip pans is now possible. All whip pans are done in dynamic balance with the post vertical. Previously this meant that the lens was always horizontal. With the tilt head, the lens can be angled up or down as much as fifteen degrees and the operator can still make extremely precise fast pans. Using the tilt head will increase the precision of any pan with a lens angled up or down – fast or slow.

Long mode pans with the lens looking down - say at a crowd - used to be exceedingly difficult or impossible, due to the large spatial translations of the battery, monitor, and camera. But the tilt head leaves the post vertical and therefore eliminates this spatial translation, and makes these pans routine.

Low mode and very low mode pans are also much easier and more precise.

STEADICAM ARCHER 2

Smart Motorized Stage

The motorized stage is important for precise operating

For precise work, the Steadicam must be carefully balanced or trimmed.

Before operators had a motorized stage, all balancing had to be done before the shot and therefore the Steadicam's balance was fixed throughout the shot. As well as that works, it was, as Garrett Brown has often said, "a situation akin to that of an airplane pilot landing his plane to adjust the flaps."

With the Archer^{2}s motorized stage, the operator can continuously adjust the sled's balance during the shot — assuring the utmost precision for every moment.

When you push a button to change the Steadicam's balance, you maintain your posture, stance, and grip, so even conventional, pre-shot balancing is quicker and more accurate.

Some situations where the motorized stage really helps:

• Anytime you want to trim precisely and quickly, whether trimming on the fly, in the middle of a shot, or holding an opening frame perfectly still.

• In long mode (and sometimes in standard low mode), it is often difficult or impossible for the operator to reach the stage to manually adjust the sled's balance.

• While shooting from a vehicle, it can be awkward or even dangerous to balance the Archer^2 without the remote control.

"Go-to" Buttons and the Smart Motorized Stage

On the remote control, there are three "go-to" buttons on one side in addition to the four original "trim" buttons (as well as two other "spare" buttons).

The go-to buttons move the stage to specific marks, defined by the operator. One position is usually the nominal balance, and the other two are programmed for some other part of the shot. During the shot, the operator (or an assistant holding the removable remote) pushes and quickly releases a go-to button to move the stage precisely to a new trim setting. Pushing the "home" button at any time returns the stage to the nominal trim. No more counting revolutions or so many seconds; the stage moves exactly where you want it to — and back.

In addition to big tilts and Dutch angles, you might set a button to "post perfectly vertical and in dynamic balance," and use another button for the nominal trim for the shot at hand. Or set the three buttons to roughly account for the side to side movement of film in some magazines.

Programming is a snap; it's just like programming stations on a car radio. Move the stage to the desired position, either manually or using the traditional trim buttons. Then hold one of the go-to buttons down for three seconds. The green LED will flash twice, and it's set. You can even program any button on the fly, during the shot, if you have the mental reserves...

Each go-to button simultaneously programs the fore and aft and the side to side position of the stage. Trimming fore and aft may slightly alter your side to side balance, or you may want to program in a severe Dutch angle. You can even program two or three buttons for the same trim if you like, so you don't have to think about which button to push!

The positions are stored in non-volatile memory, so changing batteries or turning off the sled power does not erase your presets.

The center go-to button on remote shares the same preset as the "L" position on the switch on the nose box. The "L" position is programmed exactly like the center go-to button on the remote, and the red mode LED on the nosebox will flash to confirm programming.

The "C" button can be programmed the same way as the "L" button. It might be useful to reprogram the "center" position if you were working with a camera and the nominal balance was shifted significantly side to side. Then every time you changed lenses or started the day you would not have far to go to rebalance side to side.

Holding one of the go-to buttons down for more than six seconds will clear all programming for that button and make it non-operational. The green LED will flash 3 times. It's a good idea to clear out all 3 buttons at the beginning of the day.

Charging the remote

If the transmitter's battery is low, the LED will blink continuously after any button is depressed. To charge the remote, remove it from the gimbal handle. Plug the supplied cable into the remote and the other end into either one of the 4-pin HRS connectors on the sled.

Leave the sled on as you charge the battery. It takes about 5 hours to charge a completely discharged remote battery. When the battery is charging, the green LED will be on. When the lithium-ion battery is fully charged, the green light goes off.

If plugging in a fully charged transmitter, the LED will remain lit for approximately ten minutes until the charge circuit determines the battery is actually full.

Battery life can vary depending on how often the transmitter is used and the storage and operating conditions.

Changing the frequency

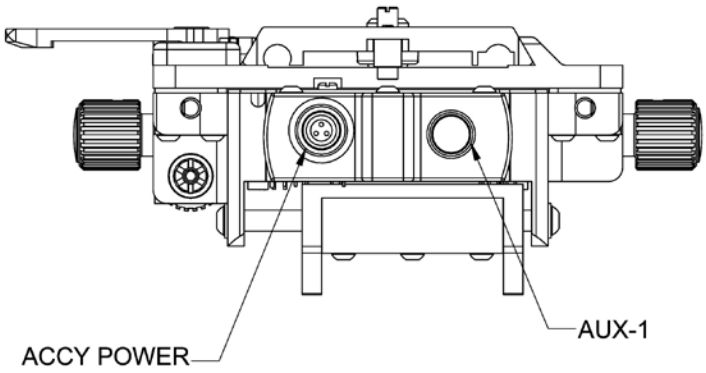
To avoid interference with other systems, 1 of 8 channels can be selected via the rotary switch on starboard side of nose box.

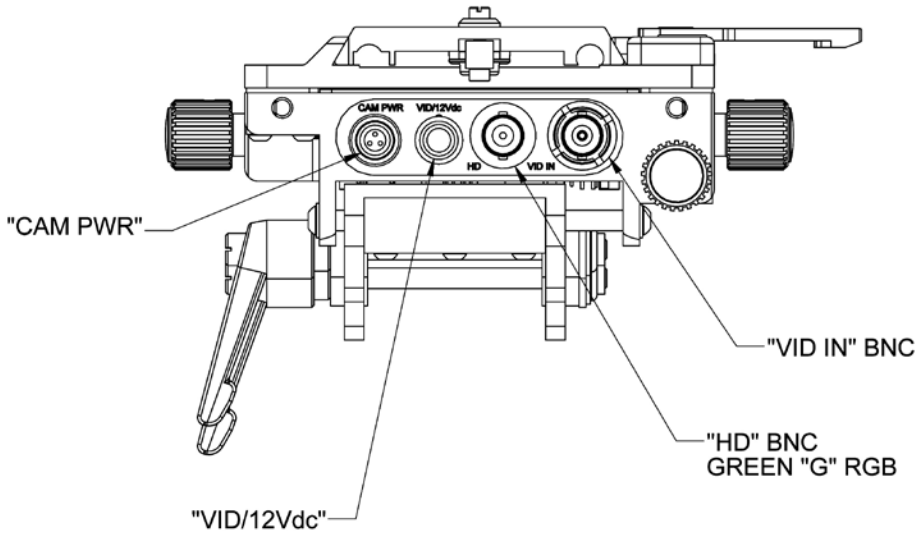
The remote and the receiver must be on the same channel. Simultaneously holding down the top 2 go-to buttons for 6 seconds will enter the remote into a channel change mode. The number of LED blinks will correspond to channel selected.

Change channels by pressing the fore or aft remote buttons (channel up or down). After the proper channel is selected, the programming mode will time out after 9 seconds and re-flash the selected channel number. Channel 0 corresponds to 8 flashes.

(For operation outside of the USA) To select between US and UK frequency operation, there are two jumpers that must be changed. One jumper is inside the nosebox, the other is inside the remote. They must match for the system to work. The jumpers are set at the factory at the time of shipping. (902 – 928MHz US and 868 to 870MHz UK)

The green "PWR" LED on nose box comes on when the CPU is operational.





STAGE CONNECTOR DESCRIPTION				
Connector Label	**Connector Type**	**Pin #**	**Description/Function**	**Comments**
VID/12Vdc	HIROSE HR10-7R-4S	1	PWR GND	See Note 4
VID/12Vdc	HIROSE HR10-7R-4S	2	VIDEO GND	See Note 4
VID/12Vdc	HIROSE HR10-7R-4S	3	VIDEO OUT	See Note 3
VID/12Vdc	HIROSE HR10-7R-4S	4	+12V BATTERY	See Note 1
CAM PWR	LEMO ECG.0B.303	1	PWR GND	See Note 4
CAM PWR	LEMO ECG.0B.303	2	+12V BATTERY	See Note 1
CAM PWR	LEMO ECG.0B.303	3	+24V BATTERY	See Note 2
HD	BNC MALE	N/A	HDSDI VIDEO	Direct coax connection to HDSI BNC on sled connector panel. Isolated Video gnd.
VID IN	BNC MALE	N/A	COMPOSITE VIDEO IN	
12/24Vdc	LEMO EPG.0B.303	1	PWR GND	See Note 4
12/24Vdc	LEMO EPG.0B.303	2	+12V BATTERY	See Note 1
12/24Vdc	LEMO EPG.0B.303	3	+24V BATTERY	See Note 2
AUX-1	HIROSE HR212-10RA-8SDL	1	PWR GND	See Note 4
AUX-1	HIROSE HR212-10RA-8SDL	2	RESERVED	
AUX-1	HIROSE HR212-10RA-8SDL	3	RESERVED	
AUX-1	HIROSE HR212-10RA-8SDL	4	RESERVED	
AUX-1	HIROSE HR212-10RA-8SDL	5	RESERVED	
AUX-1	HIROSE HR212-10RA-8SDL	6	RESERVED	
AUX-1	HIROSE HR212-10RA-8SDL	7	TALLY SENSE	
AUX-1	HIROSE HR212-10RA-8SDL	8	RESERVED	
Note 1:	- 12V BATTERY VOLTAGE is sourced directly from battery voltage in 12V mode. (Typically 11-17V)			
	- 12V BATTERY VOLTAGE is sourced directly either from DC-DC converter in 24V mode if present			
	or directly from battery (model dependant). (14.4 to 14.6Vdc at 100W max.)			
Note 2:	- 24V BATTERY VOLTAGE is sourced directly from two sled batteries connected in series. (Typically 11-34V)			
Note 3:	- Video source is determined by Video Matrix DIP switch if present on CLIPPER 312/324 models only.			
Note 4:	- POWER GND and VIDEO GND can be connected by internally jumpering JP2-1 to JP2-2 on 800-0005 board			
	on CLIPPER 312/324 models only.			

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

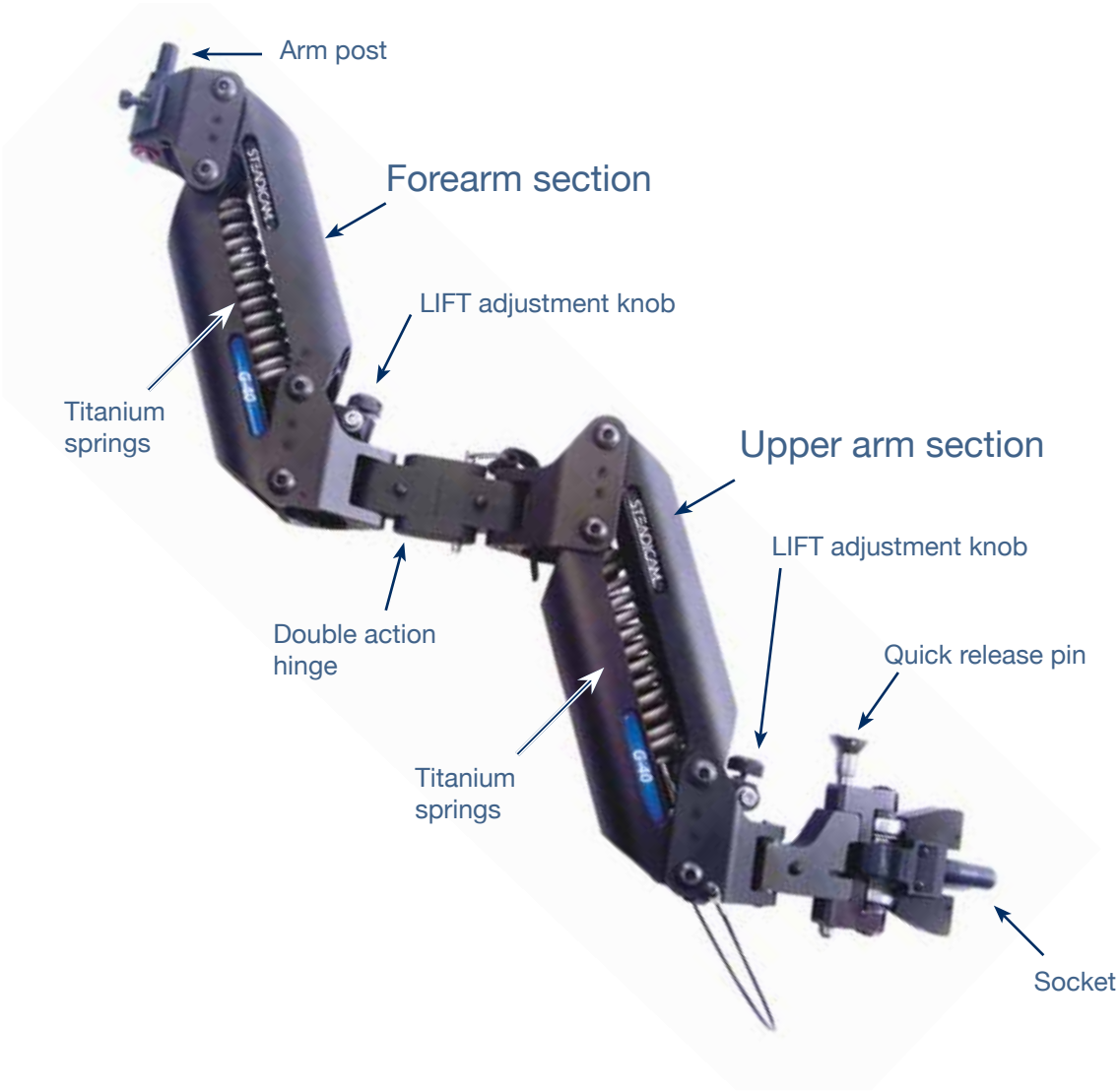
Fixed frame points standard.

HD UltraBrite LCD monitor (optional)

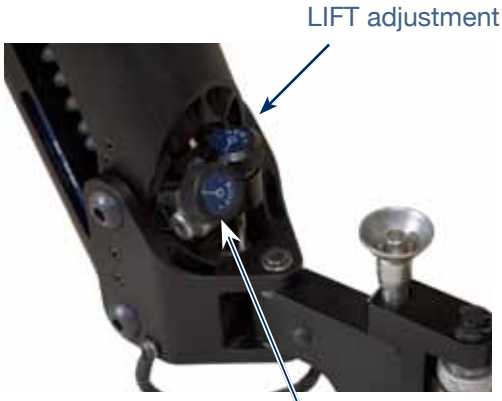
1400 nits

Built-in frameline generator

The G-40 Arm

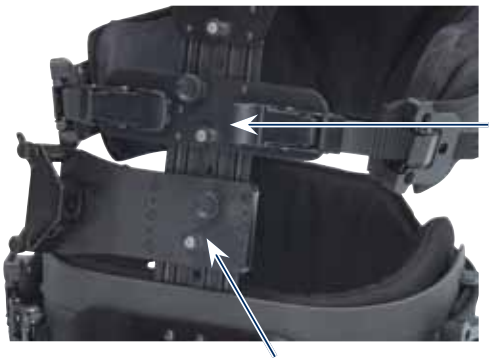


Use the flat tool if there is any play in the vertical adjustment of the arm.



RIDE adjustment knob shown for G-50 Series Arm available with S and SE Archer^2 models

The LX Vest



Optional Ultra Vest available

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.

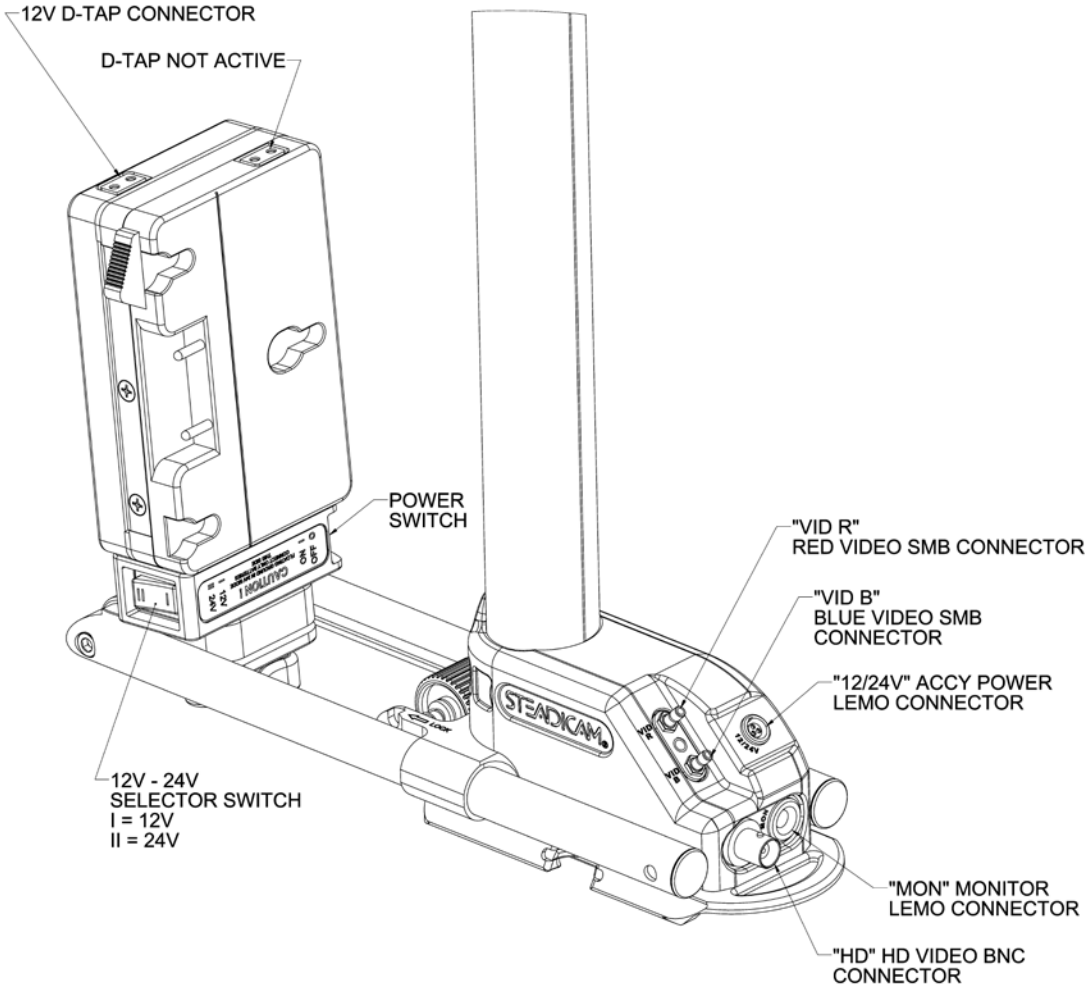
- **Push the vest down on your shoulders again,** be sure the spar is vertical, then snug up the hip pads. If the hip pads are tightened first, the vest will tend to ride high until loaded, and then it will slip around under load.

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

- Pay close attention to the good fit of the vest in the photo (left). It's very important how the shoulder pads contact the shoulders and the shoulder connectors are not too high (a common mistake).

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

Sled Base Connections



ARCHER 2 ANTON BAUER SLED BASE SHOWN

ARCHER 2 SLED BASE CONNECTOR DESCRIPTION				
Connector Label	**Connector Type**	**Pin #**	**Description/Function**	**Comments**
12/24V	LEMO EGG.0B.303	1	PWR GND	
12/24V	LEMO EGG.0B.303	2	+12V BATTERY	See Note 1
12/24V	LEMO EGG.0B.303	3	+24V BATTERY	See Note 2
HD	BNC MALE	N/A	HDSDI VIDEO (GREEN)	Direct coax connection to HDSI BNC on stage body. Isolated Video gnd.
VID R	SMB MALE	N/A	HDSDI VIDEO (RED)	Direct coax connection to "R" SMB on stage body. Isolated Video gnd.
VID B	SMB MALE	N/A	HDSDI VIDEO (BLUE)	Direct coax connection to "B" SMB on stage body. Isolated Video gnd.
MON	LEMO EGG.1B.308	1	PWR GND	
MON	LEMO EGG.1B.308	2	+12V BATTERY	See Note 1
MON	LEMO EGG.1B.308	3	VIDEO OUT FROM STAGE	
MON	LEMO EGG.1B.308	4	VIDEO GND	
MON	LEMO EGG.1B.308	5	N/C	
MON	LEMO EGG.1B.308	6	TALLY	
MON	LEMO EGG.1B.308	7	+24V BATTERY	See Note 2
MON	LEMO EGG.1B.308	8	N/C	
Note 1:	- 12V BATTERY VOLTAGE is sourced directly from rear battery (battery furthest from post) in 12V mode or 24V mode. (Typically 11-17V @5A Max.)			
Note 2:	- 24V BATTERY VOLTAGE is sourced directly from two sled batteries connected in series. (Typically 11-34V @ 5A Max.)			

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 too far. Do not twist the bottom section more than 180 degrees from the top section as this will also twist the internal cables.

Rotating Battery Mount

The battery mount pivots approximately 270º to facilitate static balance, dynamic balance, storage, and for inertial control. Pivoting the battery all the way down will enable it to get closer to the sled, reducing pan inertia and/or helping to balance very heavy cameras. Pan inertia is maximized with the batteries horizontal and the battery rods fully extended.

Attaching the Camera

Camera c.g. .75” (19mm) behind center post – fore-aft.

Camera c.g. centered over post – side to side.

The basic idea: We want to position the camera’s center of gravity about .75 inch (19mm) behind the centerline of the post fore-aft (as seen from the side) and directly over the centerline of the post side to side (as seen from the front or rear). We do this to facilitate both static and dynamic balancing. We fine-tune the placement of the camera as we balance the rig. See page 26.

First, center the side to side and fore-aft adjustments of the camera mounting platform, using the knobs, the remote control, or better yet, flip the centering switch to “C” and the motorized stage centers itself!

Attach all the accessories to the camera, including lenses, loaded film magazines, focus motors, obie 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 fore-aft center of gravity.

Finding the camera’s side to side center of gravity.

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 plate from rotating.

If possible, attach a second optional dovetail plate to the top of the camera, directly above the other dovetail. 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.

Dovetail locking lever fully open.

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.

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 (19mm) behind the centerline of the telescoping posts.

Push the locking lever forward to fully lock the camera into place. You are now ready to static balance the sled.

Closing the locking lever.

The dovetail locking lever has three positions (see page 8):

- 60° back is fully open and the dovetail plate 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. With the locking lever in this position, the dovetail can slide but cannot be removed.
- All the way forward is the locked position.

Tip: If you add your focus motors at this point, remark the camera c.g. If the side-to-side position drastically changes, you may have to reposition the dovetail plate on the camera.

Big, important tip: Wrap up, Tie up, Tie down, Hook and Loop, or Gaffer tape all cables so they don't flop around and mess up your precise balancing. If you have cables that run to the outside world, leave them off at this point.

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 (19mm) behind the centerline of the telescoping posts.

Release the rod clamp 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 (13mm) 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 (19mm) 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

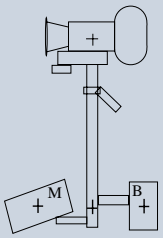
How much? It depends on the mass and position of the object, and the masses and positions of everything else on the sled.

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.

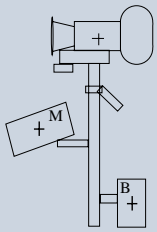
As you extend the telescoping post, you will discover the battery needs to move slightly further to the rear to maintain dynamic balance.

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.

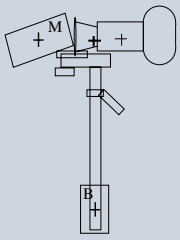


The second figure has the monitor raised a bit. This looks like most Steadicam configurations, high or low mode. Note that the battery c.g. is closer to the post, and the camera c.g. has moved to the rear. Why? See the third figure.



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 Archer[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-40 arm has a lifting capacity of 12 to 40 pounds (5.4 to 18.1kg). 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.

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.

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.

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.

In-out

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 optional G-50 arm (available on S and SE Archer^2 models) 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 Iso-elastic™ or you can make the arm seek the center position more strongly.

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

As the arm carries more weight, the Iso-elastic™ feel will change. Turn the ride control knob counter-clockwise to maintain the Iso-elastic™ 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 28)

If the rig ***strongly*** moves away from you, readjust the arm threads (see pages 29)

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 your 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 and Don Juan positions

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

Missionary position

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, flip the arm mating block and reset your threads.

On the LX vest, loosen the three clamping screws for the front yoke, the chest straps, and the socket block plate. You may have to tap the plates hard with your fist to get everything to release. Pull the pins and slide the plates off the spar. Flip the socket block plate, then reassemble the vest and retighten the clamps.

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, use a 1/4" Allen wrench and turn the lower side to side screw all the way in, then adjust the upper screw to your threads – about 2 to 2.5 turns out. Use the same procedure to change back to normal (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 Archer^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 hook and loop. 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.

Supplied Accessories

Docking bracket

Camera power cable, BNC video cable, T-handle 1/4” Allen wrench, camera mounting screws.

Camera mounting dovetail plate

Optional accessories

Low-mode kit

More cables

Tally light sensor

Batteries and charger

Cases and packing

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.

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