

STEADICAM[®]

FLYER[™]

LE[™]

Operating Manual





STEADICAM® FLYER-LE™

Operating Manual
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Table of Contents

Overview	4	Basic Operating	22
The Flyer-LE™ Sled	6	Advanced Techniques	
Getting Started	8	Dynamic Balancing	24
Attaching the Camera	10	Low Mode	26
Balancing	12		
The Vest	14	PowerCube™ Batteries	28
Putting on the Vest	15	The Monitor	30
The Arm	16	Supplied Accessories	34
Setting your Threads	17	Recommended Accessories	35
Picking up the Sled	18	Cases and Packing	35
Adjusting the Lift	20		

This manual is to be used to instruct you in setting up and using your Steadicam® Flyer-LE™. If you have not already done so, we strongly urge you to take a 2, 3, or 6 day Steadicam® workshop for the best possible training and start to your Steadicam® career (find more information about workshops at www.steadicam.com).

The Flyer-LE™ is not a push-button magic stick that instantly creates great images. It's a precision instrument that responds to your touch. Although it's not that difficult to operate, it is a skill that takes a bit of time and effort to learn. The more effort and practice you put into Steadicam® operating, the better you will be, so it's important to develop good habits from the beginning.

Several two-hour sessions will get you started, but an operator can always be more skilled with a Steadicam® and also be more effective and artistic in choosing how to start, move, and stop the camera. In the beginning, it's helpful and more fun to have a friend work with you. Take turns practicing and spotting for each other. Use a second video camera to record your exercises – how you stand and move is critical for great operating.

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Overview

Tiffen continues to be the industry leader with the new, affordable

STEADICAM FLYER-LE

Camera Stabilization System.

Based on the innovative and award-winning features of the Steadicam® Flyer, the new Flyer-LE™ has been further redefined with upgraded sled features, an ergonomically designed vest, a newly designed stabilizer arm, and an enhanced battery package system. State-of-the-art technology, features, ease of use, and quality make this Steadicam® the perfect choice for your video and film productions.



New Flyer-LE™ Sled featuring:

- Robust, 2-section, indexed, carbon fiber, no-tools, extendable post.
- Index system and increased post diameter assures the alignment and stability of the sled
- Safety system prevents separation in normal operation
- Friction-free gimbal assembly, now with a larger, knurled extended handle, fits securely in the operator's hand
- Precision stage adjustments enable careful balancing of the camera to the rig
- Operates in standard or low mode
- Kipp® handle secure locking for the stage and the battery assemblies
- Proprietary 12 and 24-volt power capability
- 3 pin 12 and 24 volt power connectors
- New design battery mount assembly for easier dynamic balance adjustment and setup
- 7" NTSC/PAL monitor, standard
- 7" NTSC/PAL 700-nit monitor with FLG optional

The Flyer-LE™ incorporates the same revolutionary Steadicam® Arm that won the coveted DV Professional Association's "Best of Show":

- Frictionless, silky smooth, double-section arm
- Supports 19 pounds (8.61kg) of camera weight
- Huge, 30" (76cm) lifting range
- Iso-Elastic response for effortless booming and precise vertical control throughout the range
- Open design for a freedom of movement unknown in this weight class.
- Tool-free, one-touch, "on the fly" lift knobs for precise, quick adjustments
- New arm post assembly permits different length arm posts, a feature usually found on more expensive systems
- 2-section arm separates with a quick release pin for fast and neat storage

Plus:

- New spring design with rounded arm sections
- Pinch zone eliminated
- No-tools Arm/Vest interface

Ergonomic new Flyer-LE™ Vest:

- Based on the comfortable Flyer vest
- New ergonomic breastplate
- Metal shoulder connection with 100% positive vest-to-shoulder clips
- New removable vest and pad covers
- Proprietary, tool-free, arm to vest connector, with two axis arm-to-body angle adjustments
- Stiff front spar and yoke
- Vertical adjustment of socket block for extended lens height – especially useful in low-mode
- Socket block mounts left or right
- Two basic vest sizes to fit any operator

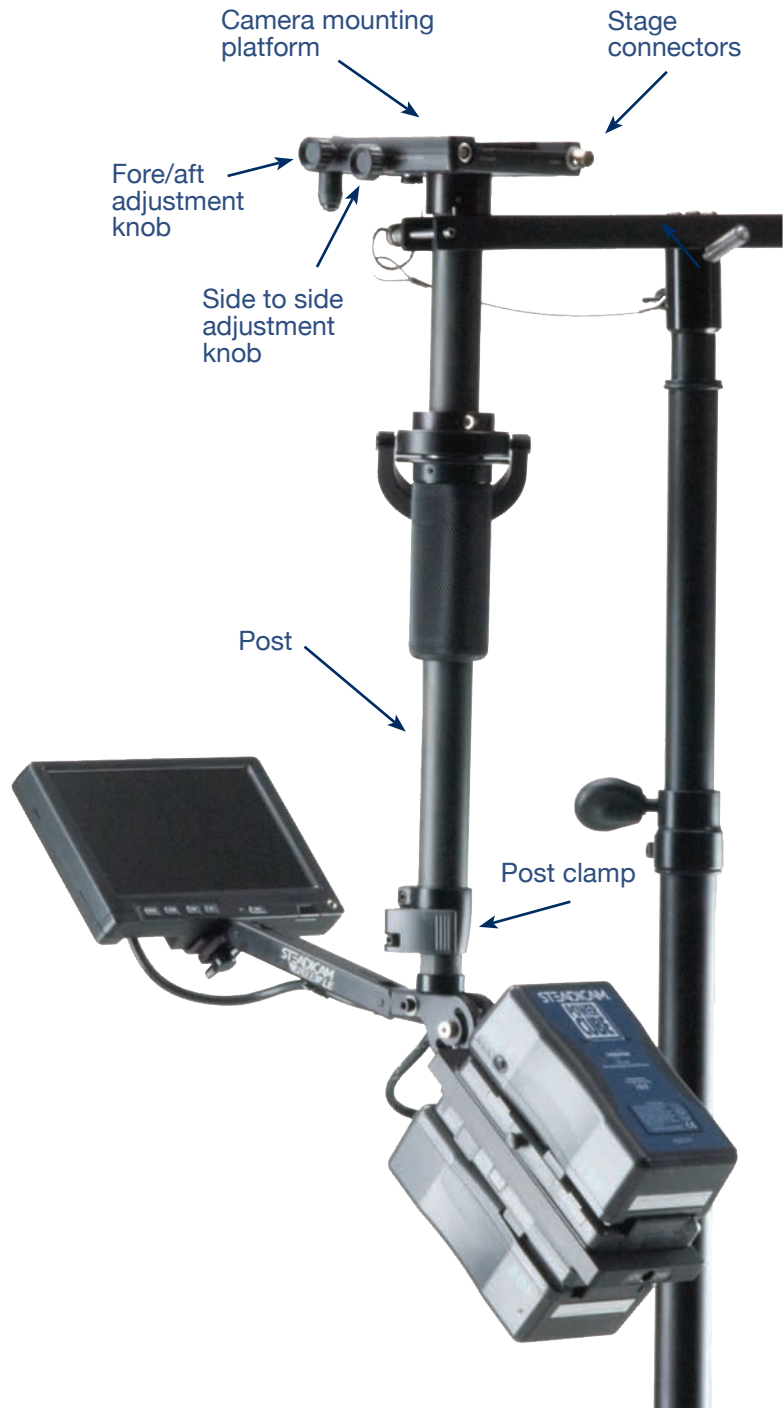
All components fit neatly and securely in the provided ***custom travel bag***, complete with a sleeve for an optional trolley for ease of transport.

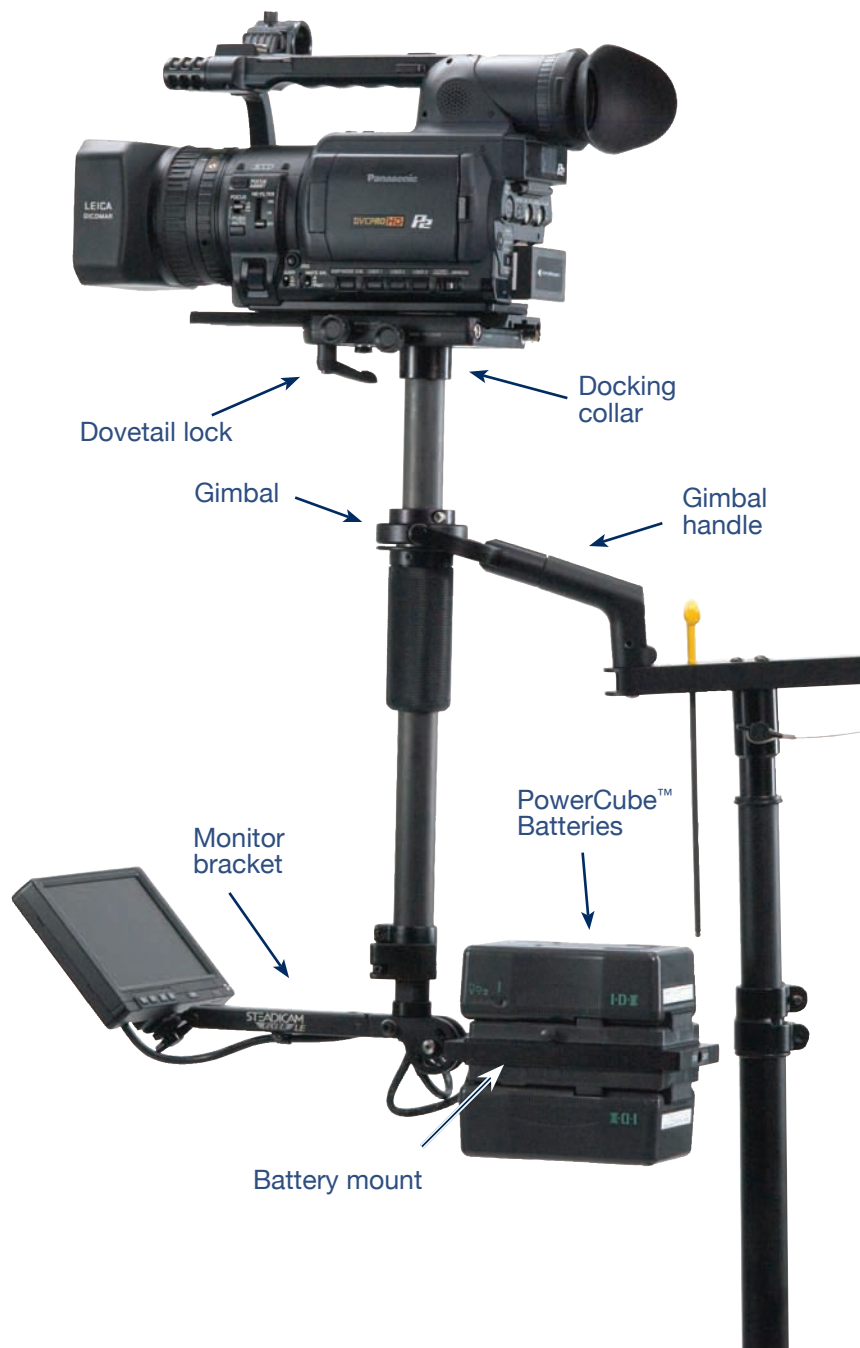
A featured system combines the Flyer-LE™ with ***IDX Dual Charger*** and two ***Tiffen PowerCube™ batteries***. These robust batteries will provide plenty of amps for any film or video camera.



The Flyer-LE™ Sled

The Flyer-LE™ Sled





Prepare the stand and docking bracket

Set up the stand and docking bracket:

- Set up your stand at about chest height.
- Use one or more sandbags to stabilize the stand.
- Put the docking bracket on the stand and tighten the docking bracket locking knob.
- Push the button at the end of the aircraft pin and pull the aircraft pin out of the yoke.



Prepare the sled for the camera

Adjust the monitor position:

- Set the monitor bracket horizontal
- Tilt the monitor to about 45 degrees.
- If the gimbal is not already near the top of the center post, move it there.



- Insert the T-handle Allen wrench into the locking Allen bolt on the gimbal.
- Loosen the bolt.
- Slide the gimbal to the top of the center post, but always leave enough space between the gimbal and the stage to accommodate the docking yoke (about 1 inch/25mm).



Adjust the battery position and attach the batteries:

- Rotate the battery mount down at least 45°.
- Attach both batteries onto the battery mounts.



use a small screwdriver to access the switch

In the Flyer-LE™, both battery mounts are active. You can choose 12 volts only with both batteries in parallel, or 12 and 24 volts – with the batteries in series, via the two-position switch.

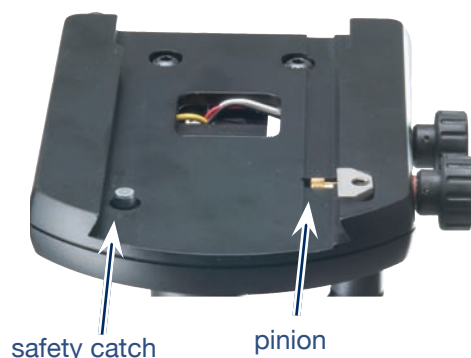
Dock the sled in the docking bracket:

- Hold the sled upright, with the monitor (front) facing to the left. Place the center post into the bracket so the bottom of the stage rests on the yoke.
- Push the aircraft pin back through the yoke, securing the post in the bracket.



Remove the dovetail from the stage and set aside:

- Loosen the dovetail locking knob about one half turn. (If you unscrew this knob all the way the spring may pop out.)
- Safety stops on the dovetail and a safety catch on the sled keep the dovetail from sliding off the stage when the dovetail locking knob is loose.
- Pull the dovetail to the back of the stage until the safety catch stops it.
- Pull the safety catch down and slide the dovetail out of the stage.
- Make sure the safety catch springs back into its position when the dovetail is out.
- Take a moment to look at the stage adjusting mechanism.
- Turn the fore/aft knob. The pinion engages with the rack on the dovetail plate.
- Turn the side-to-side adjustment knob.



Attaching the Camera

Attaching the camera to the sled

We attach the camera to the sled via a dovetail plate. With the Flyer-LE, this plate has a rack for adjusting fore-aft balance on the left side, safety stops on the right side, and several holes for mounting screws. We want to attach the dovetail to the camera so that we have the widest possible range of adjustment, both fore-aft and side-to-side.

We start this process by finding the camera's center of gravity (c.g.) or balance point, then properly position the dovetail plate relative to the camera's c.g.

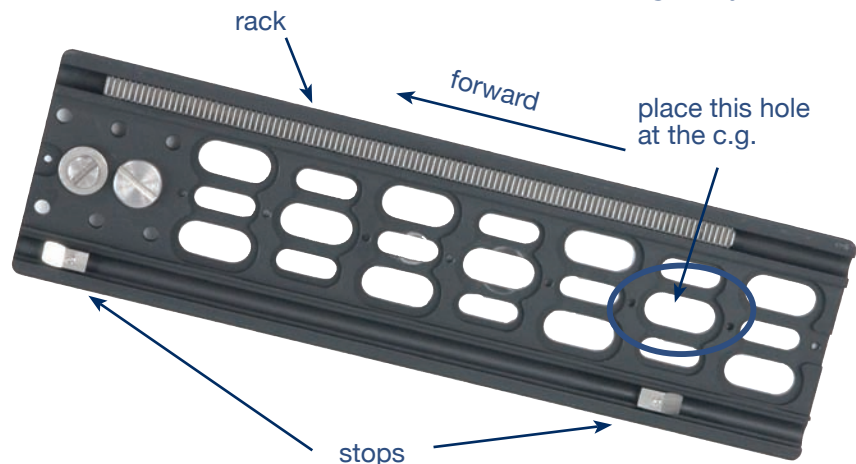
- If you like, remove the battery from your camera if it has an auxiliary power input, either 12 or 24 volts. With a very heavy camera (15+ pounds/6.8kg or so), this is a good idea, but it's not necessary or advisable with a very light camera.
- Attach all accessories, matte boxes, obie lights, etc. and load the tape or film. If the camera has a quick-release plate (tripod adaptor), leave it on the camera.
- Balance the camera fore-aft on a rod or pencil (as shown) and mark the balance point with a piece of tape.
- Repeat for side-to-side.



Finding the camera's fore-aft center of gravity.



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



- Examine the dovetail. Turn it over to locate the rack, the three rows of large and small slots, and the stops.
- Remove the screws that are stored at the front of the dovetail.
- Place the dovetail against the bottom of the camera (or quick release plate) and move the dovetail fore-aft until the Second slot from the rear is over the camera's c.g. ***This position is not intuitive, so pay close attention to this detail.***

- Now move the dovetail as little as possible until one or more screw holes are accessible. Choose holes as far apart as possible for maximum stability.
- Insert the screws and tighten with a screwdriver.



- Insert the dovetail into the back of the stage.
- Slide it forward until it clicks. If you encounter resistance, engage the rack and pinion by gently pushing the plate forward while turning the fore-aft knob until the pinion engages the rack. The fore-aft knob will now move the dovetail.
- Set the dovetail in the center of its range of movement. Ideally, your camera's c.g. mark should be about 1/2" (12mm) behind the centerline of the sled's centerpost.
- Tighten the dovetail locking knob securely.



fore and aft
adjustment knob side to side
adjustment knob

Connect the power and video cables and test

- Connect the BNC to BNC video cable (use the BNC to RCA adapter if necessary) from the camera to the video input on the back of the stage. If necessary, choose the camera's video output that allows you to watch playback as well as "live" video.
- If necessary, connect the power cable by plugging the three-pin Lemo into the Power output on the back of the stage and the other end into the appropriate DC power input on your camera. Several power cables are available for various cameras and voltages. See the accessories page for the power cable details.
- Secure the cables with cable ties, Velcro®, or gaffer tape. Leave enough slack for adjustment of the stage.
- Power up the monitor and camera to make sure you have a picture. If you do not, try adjusting the brightness and contrast controls; check the cables, battery voltage, etc.
- Turn off the camera and monitor.



- Camera power connector. 3 pin LEMO: EGG.0B.303.CLL
- Standard definition (PAL/NTSC) composite video in. BNC



- Tally connector. 8 pin
- HDSDI video in. BNC (on all Flyer SE, HD and RED versions)



Balancing

Note: Before letting go of the sled, be certain that it will hang more or less upright. If the sled wants hang upside down, the camera weighs more than 19 pounds (8.6 kg) and is beyond the weight specifications of the Steadicam Flyer-LE.

When balancing a heavier camera, you may have to extend the post. While holding the bottom of the sled, release the post clamp and lengthen the post. Close the clamp.

Note: changing the length also changes the range of lens heights. This can be a useful tool with any weight camera.



Balancing the sled

The Steadicam works, in part, by the careful balancing of components (camera, monitor, accessories, and battery). We always balance the sled to help us get the shot, so that the operator does the least amount of work to aim the camera. There are several components of balance. The first one to work on is “static” balance, where we balance the sled in all three axes (top-to-bottom, side-to-side, and fore-aft), so that the sled hangs upright and is not too bottom heavy.

To adjust the balance, we need to put the sled on the docking bracket balancing stud where it can hang freely

- Pull the aircraft pin and remove the sled and camera from the docking bracket.
- Loosen the locking knob of the docking bracket and turn the bracket 180 degrees to get the yoke out of the way. Tighten the locking knob.
- Place the gimbal's mounting hole on the balancing stud.



Top to bottom balance

Let's start with top-to-bottom balance, as it is one of the least understood aspects of balance.

It's best if the sled is slightly bottom heavy. Clearly, if it is top heavy, it will tip over. If it is too bottom heavy, it will hang upright (a good thing) but be hard to tilt and very hard to control as you move around (not good at all!).

If the sled is neutrally balanced (neither top nor bottom heavy) it's impossible to balance the sled fore-aft or side to side, and the operator must do all the aiming of the sled – not good either.

So immediately, you should understand that top-to-bottom balance is a compromise between competing desires. If it is just slightly bottom heavy, it can be both balanced to hang at a particular angle **and** easier to control.

How do we get the right top-to-bottom balance?

First we position the gimbal, which acts as a pivot point, just a bit above the center of gravity on the center post, and here's how we do that:

- Rotate the center post to horizontal. Hold it securely.



- With one hand firmly holding the camera or the center post, use the T-handle Allen wrench to loosen the gimbal locking screw. **Remember to always keep the post horizontal when the screw is loosened!** Take the wrench out of the screw but keep it within reach.
- Grasp the center post and carefully slide the post in the gimbal. Use your thumb to push against the gimbal. Find the place where the sled is balanced on the gimbal like a seesaw on a fulcrum. Then slide the post through the gimbal about 1/2" (12mm) towards the battery. This will place the sled's c.g. 1/2" (12mm) below the gimbal yoke bearings, and be slightly bottom heavy.
- Tighten the gimbal locking screw. Be careful not to over tighten as the Allen wrench can generate tremendous force.

WARNING: IF YOU LOOSEN THE GIMBAL LOCKING SCREW WHEN THE CENTER POST IS VERTICAL, THE WHOLE SLED WILL DROP RAPIDLY AND DAMAGE THE STEADICAM.

We will fine-tune top to bottom balance after we get close to fore-aft and side-to-side balance. We may need to fine-tune each axis as we balance in another axis, and we get closer to the perfect balance for the shot.

Look at the Steadicam from the side. If the sled is tipped up or down:

- Hold the center post vertical.
- Loosen the dovetail locking knob.
- Move the camera forward or backward by turning the fore-aft knob until the camera is level. You can use a bubble level to help you find vertical.
- Re-tighten the dovetail locking knob.



Fine tune the side-to-side balance:

- Look at the sled from the front or rear. Adjust the side-to-side knob on the stage until the center post is vertical. Again, you can use a bubble level to help you find vertical.

Now we are ready to fine-tune the top-to-bottom balance by using the "drop time" test

- Make sure the dovetail locking knob is tight.
- It's good to have our assistant hold the stand.
- Rotate the sled to horizontal.
- Let go of the center post.
- Count how many seconds it takes the center post to fall to vertical.

If the rig has a drop time of less than two seconds it is too bottom heavy. You need to move the sled's c.g. upwards, closer to the gimbal. If the drop time is more than two seconds, move the sled's c.g. lower, further from the gimbal:

- With the rig horizontal, loosen the clamp and slide the centerpost through the gimbal about 1/8" (3mm) in the proper direction.
- Re-tighten the gimbal locking screw.
- Re-do the drop test. Keep making small adjustments until the sled has a 2 second drop time.
- Recheck the fore-aft and side-to-side balance by looking at the sled. Trim with the fore/aft and side-to-side knobs as necessary.

Note: A drop time of 1 to 4 seconds might be best for a particular shot. You will eventually determine what works best for you for average shooting, and what works best for you for each shot. But let's start with a 2 second drop time.

The Vest

The Vest



Putting on the Vest

Please read the vest instructions completely before you try to put the vest on. It is very helpful to have a friend help you the first time you put on the vest. Otherwise use a full-length mirror.

Open the vest

- Loosen both chest straps.
- Release the hip straps on the left side.
- Open the chest buckle on the left side.
- Open the shoulder buckle on the left side.



- Pull out the chest plate release pin and adjust the center spar up or down so the hip pad sits centered on your hips. Replace the chest plate release pin in the nearest hole.



- Be sure the Velcro® straps are horizontal on the hip pads, and tighten the hip straps completely and evenly.
- The vest should be very snug, but not uncomfortable. Adjust the straps as necessary.

Removing the vest

The vest should be unbuckled on the left side only, from bottom to top:

- Undo the hip strap first.
- Undo the chest buckle.
- Undo the shoulder buckle and slip out of the vest. When you put it back on, you will not need to readjust the chest plate or the chest straps.



- Close the chest buckle.
- Center the chest plate on your chest.
- Tighten the chest straps evenly and secure the loose, Velcro® ends.
- Push down on the chest plate to seat the shoulder pads on your shoulders.

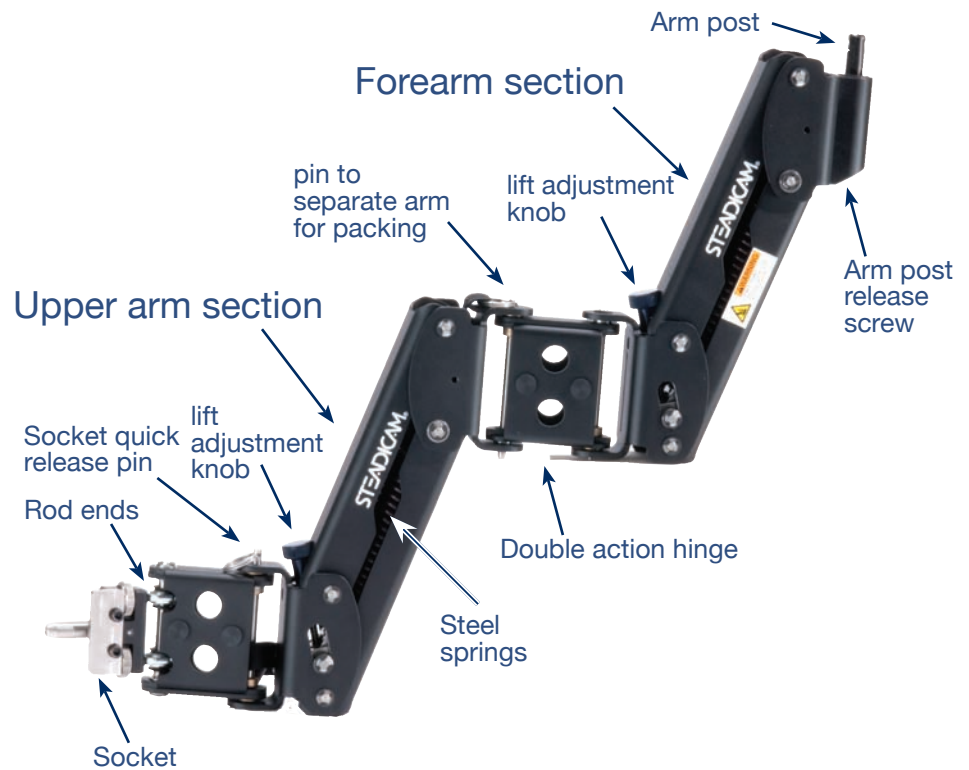


Pay close attention to the good fit of the vest in the photo above. It's very important how the shoulder pads contact the shoulders and the shoulder connectors are not too high (a common mistake).

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.

The Arm

The Arm



Mounting the arm to the vest

The arm mates with the vest via an adjustable socket in the arm and a female socket block on the vest. The two adjustment screws in the socket block on the vest and two “rod ends” in the mating section of the arm determine the lift angle of the arm. These two adjustments are your “threads,” and they are specific to your body size and shape. Setting your threads correctly is 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 will suggest approximate threads to start, but the only real way to test your threads is to pick up the Steadicam and see what happens. You can’t set your threads fully without picking up the Flyer.



The arm socket is inserted into the socket block on the vest.

Determining your threads is part of basic operating technique *Adjusting your threads*

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 the rollers when the arm is not under load. If you are flying the sled, lift it up with your left hand to take the weight off the screws before adjusting them. 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.

The “in-out” screws work in tandem, and the adjustment varies greatly by the operator’s body type.



side-to-side: 2 turns out on top

in-and-out: count threads here



- If you have big pectorals 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.
- Always keep a hand on the free end of the arm, otherwise it might swing around and hit something, someone, or you in the face.
- With both pairs of screws properly adjusted, the Flyer-LE will float in all positions with the operator standing in good posture with a vertical torso. If the threads are not adjusted well, the sled will tend to fly or fall away from you.

Goofy foot

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



- On the vest, loosen the four screws holding the socket block in place. Flip the block 180° and re-attach (above).
- On the arm, unscrew the rollers until the socket separates completely from the arm. Turn it over and re-attach (right).
- Set the top screw about two turns out, and the bottom screw all the way in.



Picking up the Sled



Undocking, setting your threads, and docking the sled

With the vest on and the arm attached to the vest, undock the rig:

- Face the sled and bow at the waist. Do not bend your knees. It is helpful to have a friend spotting you the first time you do it.
- Align the gimbal mounting hole to the arm post and slip the arm post completely into the hole. It's easiest to align the parts if the gimbal handle is positioned behind the rig (i.e., not to the side, aimed at you).
- Use your right hand to hold the arm and gimbal together (frame 4, above).
- Place your left hand on the center post just below the gimbal to control the Steadicam. Do not touch the camera (frame 4, above).
- Step forward and stand up straight. You are now flying the Steadicam, but still locked in the dock.
- Pull the aircraft pin out of the docking yoke (frame 6, above).
- Step back from the stand to remove the sled from the docking bracket.
- Take a deep breath. Relax.
- Move the sled to a position about 45° off your left hip as shown.
- Aim the sled slightly across your body (frame 9, above).





Holding the Steadicam might feel awkward at first. Don't worry – you will gain control and endurance rapidly as you practice. The first time is typically the most annoying, because there are so many adjustments to make before it all falls into place and “magically” works with you. It may be that you will want to adjust the lift capacity of the arm (see pages 20-21) before fine-tuning your threads. Eventually you must adjust them both.

Test your threads

- Stand as upright as possible, in good posture, with the rig off your left hip. Don't be stiff or tense. Do not ever let go of the Steadicam completely, but let it move a little.
- If it tends to stay in place, try moving it further out in front of you. Lean back a little as you feel the vest pushing against your stomach and pulling your torso forward. The trick is to lean a little bit away from the rig – more if it's further from you, less as it's closer to you – so that the sled wants to stay in place or float next to you.
- If the sled wants to move off in one direction rather dramatically and you can't lean forward or back easily to correct it, you need to adjust your threads. Typically it's a matter of the “in-out” screws rather than the side-to-side screws.
- If the sled wants to move away from you, loosen the bottom in-out screw and dial in the upper screw a few turns. Snug up the lower screw and re-test.
- If the sled wants to move towards you, loosen the upper in-out screw a few turns, snug up the lower screw, and re-test.
- Do not get too fussy with your threads at this point, as much of the trick is learning to properly stand and move, rather than adjusting your threads.
- Take a few steps and experiment with the feel of it all. Try panning and tilting. Before you get tired, dock the sled.

Practice replacing the sled in the docking bracket

- Step up next to the docking stand with the camera aimed to the left.
- Insert the center post in the bracket and rest the stage on the docking yoke.
- Insert the aircraft pin back in the docking yoke to secure the sled
- Bow from the waist and step back
- Move your left hand to the gimbal handle, and your right hand to the arm.
- Hold up the gimbal handle and let the arm post slide out of the gimbal mounting hole. Don't force it or bend your knees; just find the correct angle so that the arm post slips out of the gimbal.
- Always keep a hand on the free end of the arm, otherwise it might swing around and hit something.
- Rest. Stretch.
- When you don't have time to dock and undock, you can relieve some muscle tension by holding the rig close to your body on either side or clasping the camera close to your chest.

Adjusting the Lift

Important: The lift adjustment knobs can only be turned when the arm segments are slightly above horizontal. They cannot be turned when the arm is unloaded, i.e., when not lifting the Flyer-LE, nor if the arm sections are boomed too far up or down. Do not force the lift knobs. At the right angle, they turn very easily.

Setting the lift capacity of the arm

The arm tension is adjusted at the factory for the heaviest camera it can hold so the arm does not bottom out when you put the camera and sled on the arm for the first time. Now it's time to adjust the arm for the weight of your camera.

Adjusting the arm

- With the vest on, attach the arm and undock the rig as before.
- Stand with the sled off your left hip, with the lens slightly crossing your body.
- Move the arm to the middle of its boom range and let it rise or fall. Do not completely let go of the sled.



- Ideally, each section of the arm should come to rest slightly above horizontal, about 5°.
- Adjust the arm section nearest the sled first (the forearm section).
- If the arm floats at too high an angle, pull the sled down with your left hand until the forearm section is about 5° above horizontal. Turn the weight adjustment knob counterclockwise until the forearm wants to float at this angle.
- If the arm floats at too low an angle, pull the sled up with your left hand until the forearm section is about 5° above horizontal.



- Turn the weight adjustment knob clockwise until the forearm wants to float at this angle.



- Keep making small adjustments until the forearm settles at a 5° angle up from horizontal.



- Repeat the process with the upper arm section, but this time try to get the upper arm to follow the forearm as you boom up and down.



CAUTION: IF YOU REST YOUR RIGHT HAND ON THE CONNECTING ARM, KEEP YOUR FINGERS OUT OF THE SPACE BETWEEN THE ELBOW AND THE ARTICULATING ARM. A SUDDEN RISE OF THE CAMERA COULD INJURE YOUR FINGERS IF THEY ARE IN THIS SPACE.

- Remember, the weight adjustment knob turns freely when the arm section is slightly above horizontal. Never force it or use a tool to adjust the arm lift.

Now let's fly the rig again

- Move the sled off your left hip as before. Keep the camera close. This is what we call the "Missionary."
- Move your torso ever so slightly to test how your body angle controls the Steadicam.
- Repeat with the sled further away from you, but keep your torso vertical.
- The sled should stay in place with only a little help from your right hand.



Boom the sled up and down while watching the arm sections. The upper arm should follow the forearm —no arm section should lag behind the other.

Basic Operating



Hand grips

The two-handed technique was invented by Garrett Brown while working on *The Shining*, and it has been the preferred method of operating ever since. Basically, the right hand does the work of positioning the sled in space (moving horizontally and vertically relative to the body), and the left hand aims the sled (and therefore the camera) by panning and tilting.

If the Flyer-LE is properly balanced, very little force will be needed to aim the camera. Clenching the center post or gimbal hard will counteract the Steadicam's "float." Light control is the key to a steady camera and smooth moves.



The left hand also has the interesting job of keeping the sled level as we move about. As we accelerate or decelerate, go around corners, etc., the left hand must prevent the sled from going off-level before it happens. One of the big Steadicam operating skills is anticipating how the sled will behave as we move along. There are several classic "grips" we use to aim and control the sled.



The preferred grip, using the pinkie finger to prevent a pendulum effect.



Finding your grip

- Grab the center post with your left hand just below the gimbal. All five fingers should be LIGHTLY in contact with the post, but this isn't a tea party. Don't just use your fingertips – wrap your fingers a bit around the post.
- The right hand fine tunes the position of the Steadicam, moving it side-to-side or closer to or farther from your body, and booms the arm up and down. It also has the job of eliminating the bounce of the springs – i.e., preventing unwanted up and down movements as you move along.
- Grab the gimbal handle with your right hand.
- Make sure that this hand does not cross the bearing and touch any part of the Y-shaped yoke, as this will influence the aiming of the sled.



Full hand grip. All fingers surround the post with a light touch.



Basic movement

Practice moving around in the Steadicam and get used to the way it feels. Walk around. Pay attention to the way your movements and posture affect the Steadicam.

Relax your muscles and control the Flyer-LE with your body position and a light, finger-tip touch.

Leave the monitor off for now. Don't worry about making shots – you want to experiment, test, play.

Get used to walking with the Steadicam next to you.

Balancing with your body

As the Steadicam gets farther away from your body, you must lean back a tiny bit more and use your arm reach to keep that light balanced touch.

If you lean forward, the Steadicam will try to move away from you — fast! — requiring a firmer grip, tiring your back muscles more quickly, and most importantly, not flying properly with that great Steadicam feel.

Placing the camera in space

Swing the arm around to find its range of motion. Practice gentle boom moves with your right hand. Find the lowest and highest positions the camera can reach. Avoid hitting the stops as you boom (it won't hurt the Steadicam, just your shot).

More Practice and Training

For operators who have not yet taken a workshop, we (once again!) strongly urge you to do so, as it is the quickest way to learn how to operate a Steadicam properly.

However, there are several good training videos, including the 1990 Classic EFP Video Training Tape, which has been remastered to DVD. Although some of the information on the EFP video is specific to the EFP, most of the concepts, information, and exercises are common to all Steadicams and still taught in the workshops today.

We suggest you spend some time with your Flyer-LE learning how to start and stop moves cleanly, pan and tilt, boom up and down, walk the line, do switches, track sideways, do pass-bys, use long lenses, and a host of other techniques.

You already know what you want to do with your Flyer-LE. The exercises and concepts presented on the video will help you quickly develop the necessary skills to make your shots.

As often said in the workshops, running around chasing your dog is fun for awhile, but it's hard to judge how well you did or if you are improving.

Many experienced Steadicam operators are still perfecting their moving camera skills after 25 years of operating, and most of them thought they were pretty good at the end of their first workshop. How good you get is part of the artistry and fun of being a Steadicam operator. You have a great tool in your hands. Practice, practice, practice.



Dynamic Balancing

Dynamic Balancing the Flyer-LE™

A Steadicam sled is in dynamic balance when the center post remains vertical as the sled is panned (and this is critical) at any and all panning speeds.

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 of camera, monitor position, post length, accessories, etc., there is only one

combination that balances the sled both statically and 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 with the Flyer-LE can very easily and quickly be achieved by the trial and error method.

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

Three figures to study for understanding dynamic balance

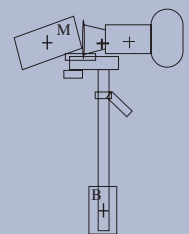
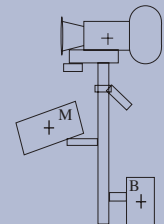
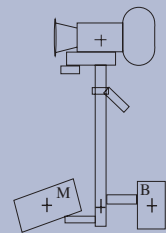
The top figure looks like the Model One or the SK Steadicams. The camera c.g. is centered over the post; the monitor and battery are on the same horizontal plane, and their common c.g. is in the post. This unit is in dynamic balance and pans flat.

The second figure has the monitor raised a bit. This looks like most Steadicam configurations, including the Flyer-LE, in either 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 Flyer-LE, the monitor is typically raised above the battery – and with 2 batteries, the monitor must be above the battery for dynamic balance. Therefore camera is always to the rear of the centerpost.

It typically works out that the camera c.g. is pretty close to 1/2 inch (12mm) to the rear – a bit more if the camera is light or the monitor is higher, and somewhat less if the camera is very heavy or the monitor is lower.



We put the rig in dynamic balance by first choosing the monitor position and then placing the camera close to its final position. By trial-and-error, we then discover the one-and-only ideal position for the battery.

First, set up your sled at the proper length for the shot and place the monitor where you want it for proper viewing and inertial control. Typically with the Flyer-LE, the monitor will be horizontal, for maximum pan inertia. Position the camera so that its c.g. is about .5 inches (12mm) behind the center post. The center post is 28mm in diameter, so you can use the back of the post as a guide.

Next, static balance by rotating the battery down from horizontal (your only choice) so the sled hangs perfectly vertical fore and aft. Make sure the top-to-bottom balance is set with a drop time of 2 seconds.

Trim side to side with the camera, using the knobs on the stage. Fine-tune the fore-aft balance with the camera. You want the sled perfectly vertical.

Give the sled several careful test spins. Very important: do not spin the rig very fast – certainly not much faster than a normal panning speed (3 – 6 rpm). Note the results. Is it good or bad, i.e., panning flat or wobbly? Is it your technique or is the sled out of dynamic balance?

If your Flyer-LE is not in dynamic balance, do not move the monitor!

Instead, move (rotate) the battery a little bit first, then rebalance statically with the camera. There are only two directions to move the battery, out or in (which is also up and down). You have a 50% chance of choosing the right direction, so stop worrying about it and give one direction a test. Just be sure to make a note of which direction you move the battery.

After you lock the battery in place, you must rebalance the sled statically with the camera. Do not move the monitor! Once

you are in static balance, spin the sled again. Is it better or worse? Again, you have two choices for moving the battery. 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 1/4 inch (6mm) of ideal, the sled will behave nicely – pan flat – and feel “sweet.” We suggest you do not attempt to do this for the first time on set!

Adding any accessory to the sled will affect both static and dynamic balance. Changing the length of the sled, and/or moving the monitor in, out, up, or down will change both static and dynamic balance.

How much will dynamic balance change? It depends on the mass and position of the new 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 (and inwards), 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.

With both batteries installed for 24 volts, it may be impossible to raise the monitor

from horizontal — unless you add some weight to the monitor. Adding weight to the monitor (about a pound) will also increase the inertia and give your Flyer-LE a more stable feel.

In practice, it's a lot easier than it sounds on the page, and luckily, there's one great gift in all this: it doesn't matter for dynamic balance what weight camera you are using or if you change lenses, filters, etc. Really!

So if you make any changes with the camera – or use a different camera – there are no worries about getting back in dynamic balance! You only need to rebalance statically and you will be in dynamic balance again. Honest.

Put the other way around: you can set up your rig in various ways with a practice camera at home, making it long or short, monitor high or low, with an extra weight, etc. Note the positions of the monitor and batteries, and you will be able to get into dynamic balance quickly on set, regardless of the camera you carry. Really. Honest. No fooling.

For the complete story, see the Dynamic Balance Primer and play with the Dynamic Balance Spreadsheet, available online at www.steadicam.com.

Dynamic balance spin test with an Ultra²™



Spinning a bit wobbly.



Looking good!

Low Mode

Configuring the sled for low mode

In order to configure the sled for low mode operating, you must:

- Flip the monitor and the camera upside-down.
- Attach the F-bracket to the gimbal. Use the provided safety pin.
- Rebalance the sled, both statically and dynamically.
- You also might change to a longer post in the arm and/or raise the socket block on the vest to restore some of the arm's lost boom range.



The camera will need some means of attaching a second dovetail (P/N 601-7412) to the top of the camera.



A low mode handle clamp (P/N 078-7393-01) works for some cameras, but be sure the camera's handle is strong enough. Many plastic handles on video cameras are inadequate, and a custom cage or bracket is required.



Many film cameras come with dedicated low mode brackets and 100% video viewfinders. Some camera-specific 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 or working with the camera in high mode.



Most operators work with the low mode bracketry and second dovetail in place — ready to go at all times.

Attach the second dovetail directly above the first dovetail. Check that it does not interfere with changing tapes, film mags or any other camera functions.

Tip: Many video cameras – or video cameras with film lens adaptors – do not have a proper way to mount a dovetail above the camera. We suggest you use the “bottom” dovetail for low mode, shooting upside down. You will need to flip the image in post production, so be sure that’s okay before you shoot. You can either leave the monitor upside down, or physically flip it over for better viewing. The latter will require electronic flipping of the image.

Flip the monitor by unscrewing the monitor mount, turn the monitor over and replace the screw.

Attach the f-bracket to the gimbal handle by inserting the post into the gimbal handle and securing it with the pin. The F-bracket brings the arm back into a proper relationship with the inverted sled. Without an F-bracket, the end of the arm can be next to the camera. When this is the case, switches are impossible and operating is severely limited.



Balancing on the stand with the f-bracket attached.



Hand positions for operating with the f-bracket.



Balance the Steadicam®

The sled can be balanced the same as in high mode. Hang the rig by its gimbal on the balancing stud. The camera will still be on top, but it is upside down. Balance statically and dynamically. Once balanced, adjust your drop time so the camera now falls to the bottom of the rig: simply slide the gimbal towards the electronics to achieve a proper drop time. Cautionary Tip: In low mode, the dovetail lock works better if the camera weight is supported as you lock the dovetail.

A useful trick

The range of low mode lens heights can be lowered by extending the center post and/or making the rig more bottom heavy.



Low mode operating

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.

Batteries

PowerCube™ Batteries and the Flyer-LE™

The PowerCube batteries are rated at 6.0 Ah, 14.8V. Please read the literature that comes with each battery and charger for details.



Generally we use the batteries in pairs, generating (nominally) 29.6VDC in series (24V setting of switch), or 13.8VDC in parallel (12 volt setting of switch).

It's best to use batteries that are roughly equally charged. In the 24 volt mode, one battery is "tapped" to also provide 12 volts at the power connectors.

For a lightweight, 12 volt running rig, you might want to remove a battery, and/or use one Endura 7 or compatible battery. Use two smaller batteries for a lightweight 24 volt rig.

Discharge rate

As your Lithium-Ion PowerCube™ batteries are used, the voltage drops at a fairly regular rate. However, the sample 30 watt discharge chart shows some interesting information. Hot off the charger, a single battery will read 16.8 volts, but within a minute drops to 16.1 volts when under load. This is normal, and not a cause for concern or an indication of a weak battery.

At the 30 watt discharge rate, the battery voltage drops slowly for about 3 hours from 16.1 volts to the "knee" voltage of 13.8 volts – slightly faster at the upper end, and more slowly as the battery is discharged. When the voltage reaches 13.8 volts, the voltage drops off very quickly to 11 volts (within 8 minutes). The batteries have a self-limiting cut-off of 11 volts.

If the voltage drops below 26 volts when the camera is not running, you will not get any appreciable run time with most 35mm, 24 volt film cameras.

Charging your batteries

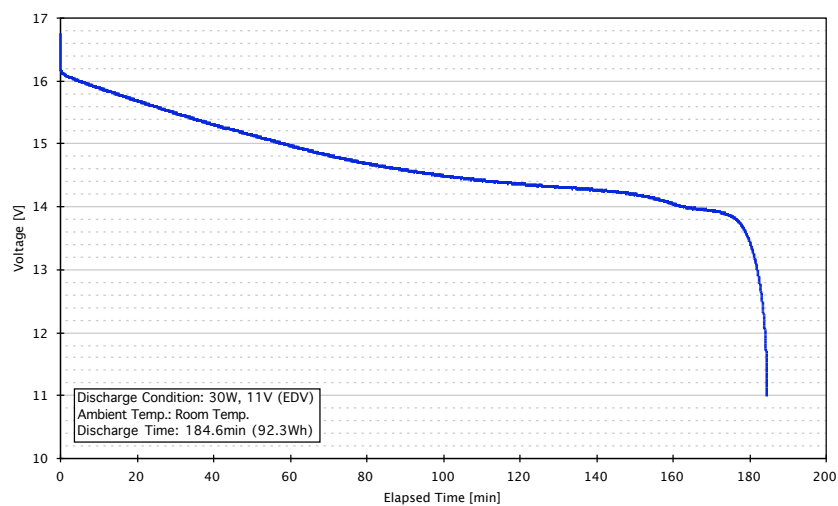
There is no memory effect with Lithium-Ion batteries. There is also no need to deep discharge your batteries to improve their response. Charging a completely discharged battery (11 volts) to fully charged (at 16.8 volts) with a 3.0 amp charge takes about 2 hours and 40 minutes, but the battery reaches 80% of a full charge (at about 16.5 volts) in just over 90 minutes. The last 20% of the charge cycle takes over an hour.

We suggest that if you have the time, fully charge your batteries. If you are in a hurry, however, charge them only for an hour and a half or less, as an 80% charge of these batteries is still a lot of watt-hours, and typically you are using two of them. Also don't discharge them much below 13.8 volts if possible.

Note: If you have the optional VL-4S charger, all batteries are charged simultaneously. With one, two, or three batteries on the charger, the charge current is 3.0 amps per battery. When the fourth battery is added to the charger, the charge current for each battery drops to 2.3 amps, which will increase the time it takes to charge each battery.



Discharge Characteristics of PowerCube



The Monitor

Standard 7" Color LCD Monitor

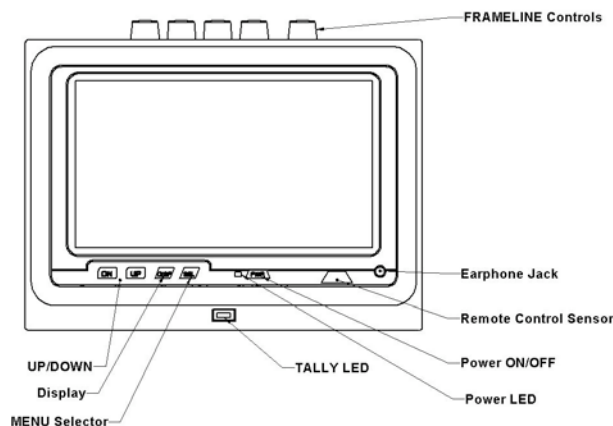
p/n 602-7500



7" color LCD monitor with optional frameline generator

p/n 302-7500-01 (available on the SE version - see opposite page for specs)





■ PWR (Power ON/OFF)

Press this button to turn the monitor on/off.
When the power is on, the LED on monitor will light up.

■ SEL (Menu Selector, AV1/AV2 Selection)

1. Long press this button to switch menus. The cycle is as follows.
BRIGHT→CONTRAST→COLOR→TINT→DIMMER→
LEFT/RIGHT→UP/DOWN→SAFETY→DEFAULT
2. Short press this button to switch AV1/AV2 mode.

■ DISP (Display Mode)

Press this button to switch 4 types display mode: Full Mode, Normal Mode, Wide Mode, Zoom Mode.
Note: Under menus, press this button to turn off the OSD menu immediately.

■ NTSC/PAL Auto Selection

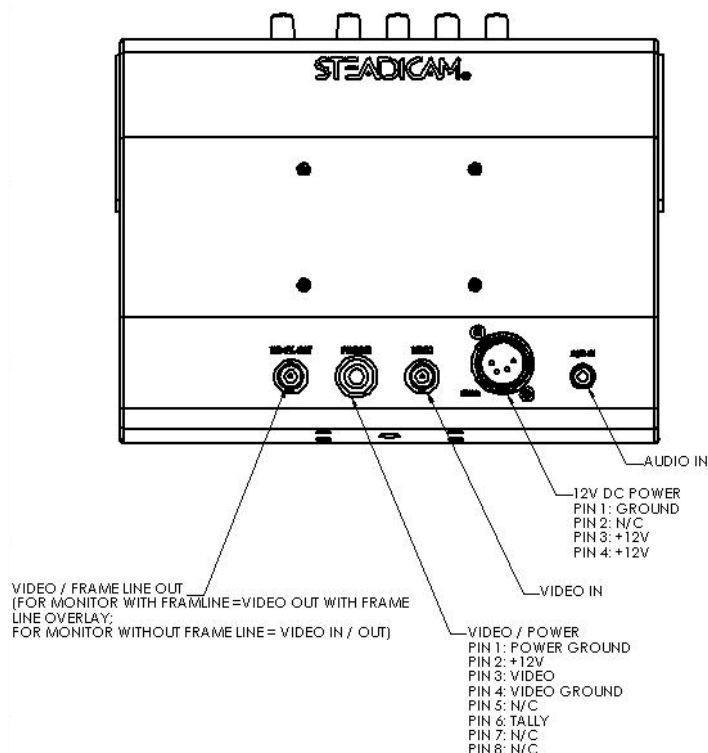
This monitor can detect and switch between NTSC/PAL video standards automatically.

■ SAFETY MODE

Note: The SAFETY mode in this monitor is a reserved feature and is factory set to OFF.

To Disable the SAFETY MODE use the following steps:

1. Make sure this monitor is in the ☐OFF☐ state.
2. Press and hold both ☐DN☐ and ☐UP☐ buttons at the same time, then press ☐PWR☐ button until the OSD shows the SAFETY selection menu. Release the ☐PWR☐ button, then release both the ☐DN☐ and ☐UP☐ buttons at the same time.
3. Press ☐DN☐ button to select ☐OFF☐ mode.
4. Press again the ☐PWR☐ button to complete this setting.
After this setting is completed, even when you press DEFAULT RESET, this setting will not be reset back to "ON" mode. If you want to go back to ☐ON☐ mode, you can select the menu to get ☐ON☐ mode.



IV. SPECIFICATIONS

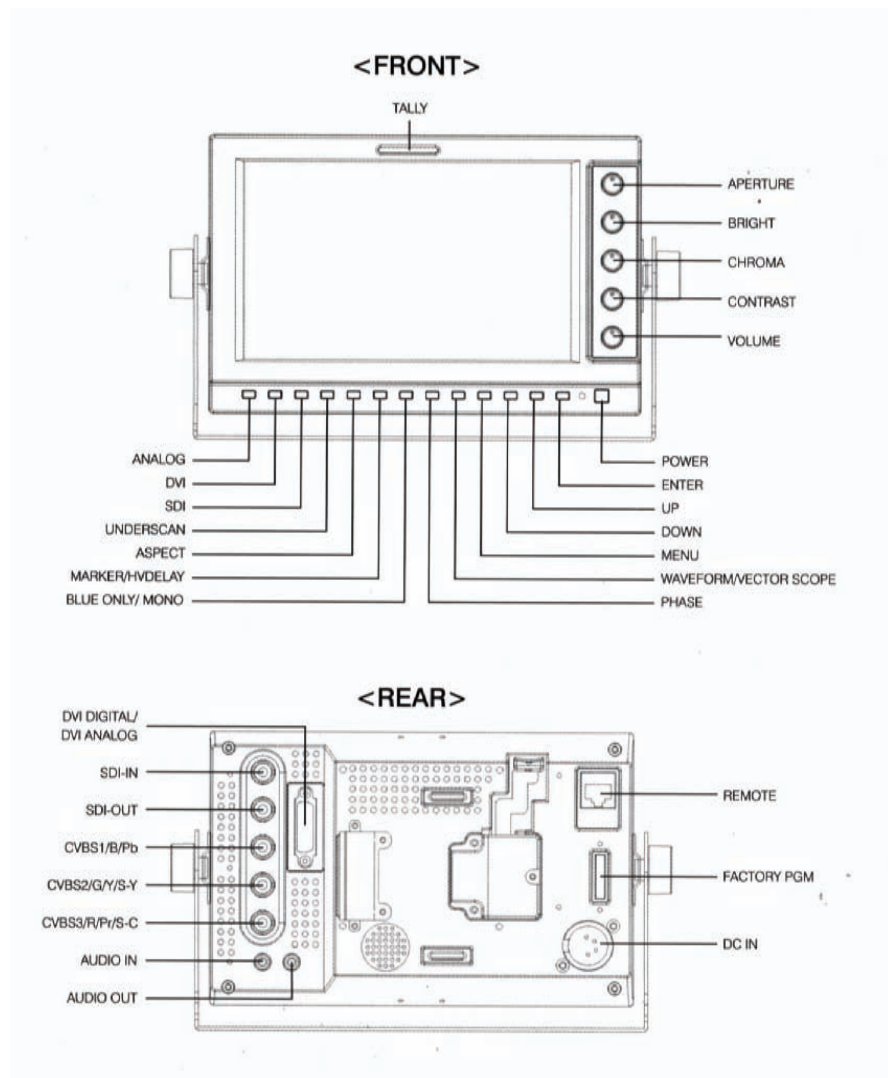
Item	Description
Screen Size	7"(Diagonal)
Display Method	TFT Active Matrix System
Configuration	RGB vertical stripe
Resolution	1440(H) *234(V)=336960dots
Active Area	154.08(W)*86.58(H) mm
Backlight	Cold Cathode Filament Tube
Brightness	700 nits (Typ)
Audio Input Signal	2.0 Vp-p (max)
Audio Output	0.5W , 8Ω
Video Input Signal	1.0Vp-p Composite Video
Viewing Angle (Left/Right)	60 deg./60 deg.
Viewing Angle (Top)	40 deg
Viewing Angle (Bottom)	60deg
Video System	NTSC/PAL auto select
Power Consumption	10W (12V / 0.84A)
Power Requirement	DC11V~ 16V allowable
Operating Condition	Temperature <input type="checkbox"/> -20 <input type="checkbox"/> ~+80 <input type="checkbox"/> Humidity <input type="checkbox"/> 10 <input type="checkbox"/> ~90 <input type="checkbox"/>
Storage Condition	Temperature <input type="checkbox"/> -30 <input type="checkbox"/> ~+85 <input type="checkbox"/> Humidity <input type="checkbox"/> 10 <input type="checkbox"/> ~90 <input type="checkbox"/>
Overall Dimensions	180(W)*115(H)*30(D) mm

Specifications contained herein are subject to change without notice

Optional 7" HD/Composite 16:9 LCD Monitor

p/n 257-7500

The Monitor



PRODUCT SPECIFICATIONS

Input	1 x DVI-I	DVI IN / VGA IN
	3 x BNC	Analog Input
	1 x BNC	SDI 1 Channel Input
Output	1 x BNC	SDI Channel (Active Through Out)
Input Signal	Analog	Composite / S-Video / Component / RGB
	HD-SDI	1.485Gbps
	SD-SDI	270Mbps
	DVI	640×480 / 800×600 / 1024×768 / 1280×768
	VGA	640×480 / 800×600 / 1024×768 / 1280×768
Analog Input Spec	Composite	1.0Vpp (With Sync)
	S-Video	1.0Vpp (Y With Sync), 0.286 Vpp (C)
	Component	1.0Vpp (Y With Sync), 0.7 Vpp (Pb,Pr)
	RGB	1.0Vpp (G With Sync), 0.7 Vpp (B,R)
SDI Input Signal Formats	SMPTE-274M	1080i (60 / 59.94 / 50)
		1080p (30 / 29.97 / 25 / 24 / 24sF / 23.98 / 23.98sF)
	SMPTE-296M	720p (60 / 59.94 / 50)
	SMPTE-260M	1035i (60 / 59.94)
	SMPTE-125M	480i (59.94)
	ITU-R BT.656	576i (50)
Audio IN		Embedded Audio
		Analog stereo (Phone Jack)
Audio OUT		Analog stereo (Phone Jack)
		Internal Speaker(Mono)
LCD	Size	7"
	Resolution	800 x 480 (15:9)
	Dot Pitch	0.190 mm
	Color	16.7M(true), 24bit
	Viewing Angle (Typical)	H : 130 degrees
		V : 115 degrees
	Luminance of White	350cd (center)
	Contrast	300:1
	Display Area	152 x 91 mm
Power		12V DC
Power Consumption (Approx.)		12 Watts(DC)
Operating Temperature		0 °C to 40 °C (32 °F to 104 °F)
Storage Temperature		-30 °C to 50 °C (-22 °F to 122 °F)
Main Body Dimensions (mm/inch)		203 x 131 x 60 (8.39 x 5.16 x 2.36)
Main Body Dimensions (with stand)		217 x 143 x 69 (8.54 x 5.63 x 2.72)
Weight		1Kg / 2.2 lb

* Above specifications may be changed without notice

Accessories

Supplied Equipment and Accessories

(not all items standard on all versions of Flyer-LE's)

Hard case, black, LE	011-0345-01
Cable, 3 ft video	078-4122-01
Cable, 3 ft BNC	CBL-017715
Cable, 12 volt power, HD	078-7351-01

Monitor, 7" 16:9	602-7500
Monitor, 7" HD 16:9*	257-7500
Monitor 7" 16:9 LCD with FLG	302-7500-01

Tally sensor**	800-7930
Low Mode Kit	078-7393-01

Battery Mount, V-Loc 24V	602-7303-01
Battery Mount Anton Bauer	602-7300-01
PowerCube 2+2 Starter Kit*	FFR-000040

Docking bracket, LE	803-7900
T-handle Allen wrench, 5/32	MSC-093270
Tool pouch	FFR-000013

Sand bags	FFR-000014
Cap, Steadicam®	FFR-000021
Turtle base C-stand	FGS-900041
Adaptor, Phono-BNC	JCK-130000
Adaptor, BNC-RCA	JCK-130001
Flyer-LE instruction manual	LIT-602740
DVD, EFP Training	DVD-200504

*Standard only with F24-LESE and F24-LERED models

**Standard only with F24-LESE



Optional Accessories

Dovetail plate assembly	601-7412
Vehicle Kit, Flyer	078-7410-03
Flyer mounting block	803-7801
Thumb screws for block	078-0627-01
Long straps for vest	803-7817
Long arm post	602-7237-01

Cable, 12V power, RED	802-0106
Cable, video, RED	802-0107

Spare 3 ft video cable	078-4122-01
Spare 1/4-20 camera screws	078-1121
Spare 1/3-16 camera screws	078-1122

Soft case, LE	078-7358-01
Foam insert	602-7905
SteadyStand	601-7910

Monitor, 7" 16:9 w/FLG	302-7500-01
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PowerCube™ Battery	FFR-000035
IDX VL-4S battery charger	FFR-000008
PowerCube battery hard case	011-0368

Compact vest	803-7800-01
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EFP Instructional Video	DVD-200504
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Also Recommended:

Wireless follow focus system
and brackets
Video transmitting and
receiving system
Wired zoom control system
Camera specific low mode brackets
Inertial augmentation
(Antlers™ or Gyros)
Video recording system



Cases & packing

When repacking the sled into the case, make sure the gear gets wiped down and not put away wet. The batteries are removed, the monitor and battery mounts are folded up toward the stage. Don't leave any loose components in the case as they may work their way over to the monitor and scratch the display. The arm and stand should be packed inside the vest to keep things compact.

The soft case works well, but you should also use the hard case when shipping your gear.

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



Disclaimer: There is no implied or expressed warranty regarding this material. Specifications, accessories, etc. are subject to change without notice.